City of Jacksonville, Florida

Telecommunications

Master Plan

Volume II

Presented By:
Black & Veatch Corporation
Telecommunications Division

May 19, 2003

Table of Contents

7.0 Telecommunications Technology Overview

7.1 Introduction

Telecommunications has become critical to everyday life in recent years. Every magazine article in both business and home states the advantages of higher speed and higher quality telecommunications. What is telecommunications and why is it so critical to everyday life?

7.2 Technology Findings

The capacity of fiber optic technology and fiber optic cable is significantly greater than any other method of communications. It will serve well as the basis for making bandwidth-intensive metropolitan networks "future-proof".

There is a regulatory risk pertaining to wireless networks that operate in the unlicensed portions of the spectrum. It is vitally important for the City administration to fully understand the implications of the FCC rules and to develop a policy for resolution of interference issues. This is particularly important with regard to the public safety entities who are expecting reliable interference-free service throughout their network.

7.3 What Is Telecommunications?

Telecommunications is the transfer of information (communications) from a transmitter or sender to a receiver over a distance (tele). Telecommunications is as old as civilization and has evolved with civilization. From a simple wave of an empty hand that communicated a lack of hostile intent to satellite communications where people can talk instantly around the world, communications has evolved in both media and the amount of data that can be sent over time.

No matter how telecommunications has evolved, the fundamental requirements remain the same. Telecommunications requires a sender, a receiver and a transmission medium. The beginning of telecommunications was visual or auditory. Messages were sent by hand signals or speaking but these are good for only short range communication. Longer distances were achieved by using smoke signals or semaphore flags. Communications was limited to line of sight until Samuel Morse used a simple electric circuit to transmit dots and dashes over a copper wire in 1849. Now it was possible to communicate over long distances. However, the speed of communications was limited by the telegraph operator' speed translating the message to Morse code and tapping it out to be decoded

by another operator at the receiving station. The quality and speed of copper line communications underwent an evolutionary change in 1877 with the invention of the telephone. The rate and quality of communications continued to improve, but were limited by electrical signal strength losses over distances as well as the susceptibility of electrical lines and equipment to environmental phenomena such as lightning.

World War II ushered in a new age in communications with the introduction of the computer. Now there was a means to have electronics perform calculations and store data. Post World War II developments transformed communications with the invention of the transistor in 1947. Transistors replaced bulky vacuum tubes that had been used to amplify electrical signals to the point. The transistor greatly reduced the size and power of computers at the time leading to a dramatic increase in the ability to process and store data. The direct result was a need to communicate at higher speeds to accommodate the increase in data and the ability to share the information.

Telecommunications reached a milestone in 1962 with the development of fiber optics. Fiber optics is the transmission of data via pulses of light over thin strands of glass. Fiber optics transmits data at the speed of light and can go very long distances without the re-amplification required in electrical circuits. Fiber optic cable is not hampered by the lightning susceptibility of copper or other electrical interference.

7.4 Protocols

7.4.1 Ethernet

The IEEE, in the development of the 802 series of LAN specifications, created a standard specification for access control and physical signaling for network communications based upon carrier sensing, multiple access with collision detection (No. 802.3 and various suffixes). We know this more commonly as Ethernet, Fast Ethernet, and Ethernet. The basic principle behind this technology is that devices on the LAN have the capability to listen before transmitting and the capability to detect the collision of data packets with data packets from other devices on the LAN. When such a collision occurs, a process is defined for sorting out the retransmission from all devices. The Ethernet protocol can be carried on a variety of media such as coaxial cable, twisted pairs of wires, fiber optic cable, and wireless. Other specifications apply to the media and media control; for example, 802.11b applies to the wireless networks so popular today.

Ethernet speeds are standardized for LAN segments. Currently, those speeds are 10 Mbps, 100 Mbps (Fast Ethernet), and 1000 Mbps (Gigabit Ethernet). Ethernet networks may be arranged in a variety of topologies and are often designed with some degree of redundancy of routes between local area networks. Hardware for Ethernet networking is

readily available from a large number of vendors. Pricing for basic Ethernet network devices (network access cards for computers, routers, switches, and media converters) have been decreasing and can be expected to decrease as technology advances. Features and advanced configuration and network management capabilities are being developed for these network devices.

7.4.2 Asynchronous Transfer Mode (ATM)

ATM service integrates voice, video, and data over a single local-area network (LAN) or wide-area network (WAN). ATM service can support speeds ranging from OC3 to OC12. Pricing is customized to each customers need and is determined by speed, distance, and location.

7.4.3 Frame Relay

Frame Relay Service is a common method of fast-packet data communications delivery service in the industry. Frame relay connects multiple locations in a logical format for the most efficient, effective use of data. Pricing is customized to each customers need and is determined by speed, distance, and location.

7.4.4 ISDN

Integrated Services Digital Network (ISDN) provides subscribers with video, voice, and data on a single pair of wires. The limited bandwidth will permit slow speed video and not the high performance of modern digital video transmission.

7.5 Transmission Mediums

This section of the report will focus on these most common forms of communication media: copper (telephone lines), coaxial cable (cable TV), fiber optics, and wireless (radio) with a description of the overall architecture of each system and how they relate to one another. In-depth discussion is given for the wireless medium.

7.5.1 Copper

While the technology behind the scenes has changed dramatically, the basic copper circuit architecture has remained unchanged for nearly 40 years. An electrical path or circuit must be established between the sender and receiver in order to establish communications.

The information, voice or data, is converted to an electrical signal by the sender's device, telephone for voice or modem for data. The data goes to a local exchange. If the desired receiver also is connected to that local exchange, a circuit is established and the communication takes place. If the desired receiver is not on the local exchange, the data is passed to the central office that will pass the data to the proper local exchange or to a central office containing the receiver's local exchange. The second central office may be in the same city or another state. Once the circuit has been established, the data transfer, or conversation, takes place. The circuit is released or disconnected once the data transfer or conversation is complete.

7.5.2 Coaxial Cable

A coaxial cable system has a higher data capacity than a telephone-type copper system. The higher data rates are achieved by using an analog signal and a wider range of frequencies. Initially the system was designed for the one-way transmission of data. The receiver could not send data back. The higher bandwidth allowed cable companies to offer data service and internet access at higher speeds than possible with traditional copper circuits. Speeds of up to 1.544 Megabits per second (Mbps) can now be obtained by the customer. The disadvantage of this architecture is that the 1.544 Mbps capacity, or bandwidth, is shared among all users of the service. Unlike the traditional copper line in which customers established individual circuits, this sharing of bandwidth is similar to a party line in voice communications.

7.5.3 Fiber Optic Cable

The ability to transmit information over fiber optic cable greatly increased both the speed and range of communications. Fiber optic networks operate by converting an electrical signal to pulses of light. The light travels through the fiber optic cable and is converted back to an electrical signal at the other end. The capacity of fiber optics is significantly greater than any other method of communications. The highest data rate achievable under today's standards is 10 Gigabits per second (Gbps).

A further advancement in fiber optics is the transmission of information using multiple wavelengths of light. This is known as wavelength division multiplexing. Just as multiple frequencies may travel through the air and be received by radio as individual radio stations, multiple wavelengths of light (often just called "lambdas" - from the Greek letter used by engineers to refer to wavelength) may be simultaneously transmitted over a fiber optic cable. CWDM (Coarse Wavelength Division Multiplexing) may utilize four or possibly eight wavelengths which are widely spaced but which fall within the fiber optic cable transmission windows (regions of low loss). DWDM (Dense Wavelength Division Multiplexing) may use as many as 80 wavelengths, though current equipment offers up to 64. Each of these wavelengths is capable of carrying data rates as high as 10 Gigabitss

per second. As can be seen, the capacity of a fiber optic based network will serve well as the basis for bandwidth-intensive metropolitan networks.

7.5.4 Satellite

Satellites offer speeds up to as much as 4 Mbps depending on the service selected. The up-link is a 128 Kbps burst technology and generally operates from 30 - 60 Kbps.

7.5.5 Wireless

Wireless communication is the transmission of information through the air by utilizing electromagnetic waves. We know this technology as "radio".

The frequencies used by non-Federal government wireless communications are regulated and administered by the Federal Communications Commission (FCC). The frequencies are organized and made available for licensed services and unlicensed services. Among the licensed services are broadcasting, cellular/PCS, some data radio services, (most) point to point microwave links, paging, and private radio services. Unlicensed services governed by the FCC under Part 15 include the radio devices which utilize the Industrial, Scientific, and Medical (ISM) frequency bands, low powered radio applications such as garage door openers, some unlicensed point to point microwave radios, 802.11 networking devices, cordless phones, and radio controlled toys.

Considering the current interest in 802.11b networks and devices, we will elaborate on the regulation of the associated frequencies. The 802.11b devices operate within the 2400 to 2483.5 MHz part of the spectrum. The applicable FCC rules are published in the Code of Federal Regulations, Title 47, Part 15[1].

Section 15.5, which governs use of intentional radiators operating under Part 15, is reproduced below:

> Sec. 15.5 General conditions of operation.
>
> (a) Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to Sec. 90.63(g) of this chapter.

[1] Part 15 of the FCC's rules is available from the Office of Engineering Technology at this web address: http://www.fcc.gov/oet/info/rules/part15/PART15_3_13_03.pdf

> (b) Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.
>
> (c) The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.
>
> (d) Intentional radiators that produce Class B emissions (damped wave) are prohibited.

There is great significance in this section of the FCC rules. Networks based upon unlicensed technologies, such as the 802.11 series, are subject to regulatory risks. Paragraph (a) above means that a user can not claim priority or "first rights" when an interference situation arises. Paragraph (b) means that the City can not cause interference to licensed users in this spectrum and must accept *any* interference received from *any* user in the spectrum. For example, a home network may be set up near one of the City's wireless locations and cause interference to the City's network. In such a case, the City must either accept the interference, make a technical change to avoid the interference (change antenna patterns or frequencies, for example), or the home network user may be requested (but not required) to change frequencies or take steps to alleviate the problem. This sort of interference is likely to be the biggest risk that the City will face. Under Paragraph (c), a licensed user, such as a radio amateur who has access to this spectrum at far greater power levels than these unlicensed devices, may cause interference to users in large areas of the proposed 802.11b network coverage (or to an 802.11a network in the 5.8 GHz spectrum). If the 802.11b network causes interference to the amateur radio operator, the City may be required to cease operations. Amateur use of this part of the spectrum is not widespread at the present time. Amateur users are licensed under Part 97 of the FCC's rules.

It is vitally important for the City administration to fully understand the implications of these rules and to develop a policy for resolution of interference issues. This is particularly important with regard to the public safety entities who are expecting reliable interference-free service throughout their network.

The 802.11b networks are also governed by technical regulations described in FCC Paragraph 15.247. These regulations place limitations on the occupied bandwidth of the emissions, the transmitter power level, antenna gain, and field strengths. The extent of these regulations varies for different applications and different frequency bands that fall within the Part 15 rules. Vendor products that operate in the unlicensed spectrum and follow standards such as 802.11, Bluetooth, and others, are often "Wi-Fi" certified. This

certification is primarily important when it comes to identifying interoperability with other vendors' devices that operate with the same protocol.

7.6 Network Technologies

7.6.1 Wired Network Technologies

7.6.1.1 DSL - Digital Subscriber Line. Digital Subscriber Line (DSL) is an Internet technology that provides a dedicated digital circuit between a user and a telephone company's central office (CO), allowing for high-speed Internet data transfer over existing 2-wire copper telephone lines. DSL uses the same copper lines that the standard telephone (plain old telephone service, POTS) uses. POTS use an analog signal2 that requires a very small portion of the copper lines available bandwidth. This is done to reduce any interference created by having numerous analog signals traveling along the same cable. Modern equipment, such as the computer, uses digital signals3, that safely use more of the telephone lines capacity.

The bandwidth capacity of DSL is in direct relationship with the distance from the CO and type of DSL technology used. The maximum range is 18,000 feet and decreases, as greater bandwidth is required. The available bandwidth ranges from 1.54 Mbps up to 52 Mbps and will be discussed further as it applies to each of the DSL technologies.

DSL technologies use existing telephone lines to provide a digital circuit path to the residence. The telephone copper infrastructure establishes distance limitations for DSL according to design parameters required for voice services. Telephone service providers use loading coils[4] to amplify analog telephone signals over a great distance. These loading coils are incompatible with DSL. Another copper infrastructure affecting DSL is

---

[2] **Analog signal:** A signal that has a continuous nature rather than a pulsed or discrete nature.

[3] **Digital signal (DS):** A signal in which 1's and O's (+3V for 1, 0V for 0) are used to represent information.

[4] **Loading coil:** A common application of loading coils is to improve the voice-frequency amplitude response characteristics of twisted cable pairs. When connected across a twisted pair at regular intervals, loading coils, in concert with the distributed resistance and capacitance of the pair, form an audio-frequency filter that improves the high-frequency audio response of the pair.

bridge taps[5] that can extend the total length of cable past the DSL distance limitations. Determining the distance and infrastructure limitations requires a skilled service provider technician familiar with the cable routing in the service area. Re-engineering and re-working the existing infrastructure to remove loading coils and bridge taps can reduce these limitations. Additionally, the construction of remote nodes connected to the CO by fiber optic cable can extend DSL service further from the CO.

The family of DSL technologies is referred to as xDSL. Within this family are various categories capable of supplying a wide range of bandwidth capacity. There has been numerous DSL technologies explored that have not made it to the consumer level.

7.6.1.2 Hybrid Fiber Coax (HFC). Hybrid Fiber Coax refers to a technology that is a mixture of fiber optic cable and coaxial cable transmission technologies that reflects the growth of conventional coaxial cable - based systems, used to carry entertainment video, to a higher bandwidth system that carries not only entertainment video (often digital) but also data. Several manufacturers provide equipment for this mature technology. Most often, fiber is used to carry signals from a head end (network source and interconnect point) to nodes. From node locations, communication is carried on coaxial cable. Customers utilize a set top box and/or cable modem to facilitate such functions as selecting digital programming, video on demand, and pay-per-view programming.

A logical extension of HFC networks is fiber to the home (FTTH) networks. These are networks in which the fiber cable is extended to the home and terminated in equipment which can not only provide the functions carried by HFC systems, but do so at far greater speeds.

7.6.1.3 PLC - Power Line Communications. Power Line Communications (PLC) technology is making it possible for the power utilities to provide high-speed data connections using their established power delivery system, just as DSL technologies are making it possible for incumbent telephone service providers to utilize their established copper infrastructure and compete with the large cable TV providers.

PLC is an emerging technology using existing local electric wires to provide digital communication services such as high-speed Internet access, Voice over IP (VoIP), video, and in-home networking. PLC equipment is being designed to provide symmetrical broadband access at throughput speeds better than DSL or cable modems. Additionally,

[5] **Bridge taps:** Extensions, between a customer and the central office that extends service to other customers.

PLC can provide automated meter reading (AMR), outage detection, demand side management, and power quality management.

This technology is still in the development stage with several start-up companies working on a PLC solution. Speeds and prices are expected to be competitive with cable and DSL, but with few trials and widely varying reported speeds it is difficult to make an accurate analysis of the technology. Test Pilot installation has provided bandwidth in the range of 1 Mbps - 18 Mbps. PLC Technology will continue to evolve as pressure increases from power utilities to enter into the telecommunications market place.

7.6.2 Wireless Network Technologies

Fixed wireless can be divided into four distinct solutions that utilize different technologies to deliver broadband: High frequency licensed wireless (LMDS), Low Frequency Licensed Wireless (MMDS), Unlicensed Wireless (WLAN), and free space optics. Most wireless solutions offer speeds comparable to the popular wire line solutions, but they suffer from coverage related problems. The advantages of MMDS is that it has building reach and an ease of deployment, but the disadvantages are that it has line of site issues, weather sensitivity, and it needs roof rights. The advantages of LMDS are that it has high speeds supporting a range of applications, but the disadvantages are that it has limited cell radius and therefore has limited coverage and weather sensitivity. The advantage of WLAN is that no spectrum is required and lower network costs, but the disadvantages are that there are security concerns and there is over crowding due to the free nature of the service. The advantages of free space optics are that it has a quick time to market and no right of way issues, but the disadvantages are that it has limited field trials and weather sensitivity.

LMDS technology can be deployed to offer any broadband service at throughputs ranging from DS-1 or greater. However, technical issues and high subscriber cost have resulted in lower penetration for LMDS services. Most of the key LMDS providers are no longer in business.

MMDS wireless technology can be deployed to offer “two-way” broadband service at throughputs ranging from DS-0 to 10 Mbps. However, MMDS suffers from technology issues and high CPE costs. The estimated total cost per subscriber is $1,840. New trends suggest positive growth from MMDS wireless.

Wireless LAN, 802.11(b) has widespread popularity and is focused on residential users. It has the most popular appeal because of low technological problems and reduced costs. The estimated cost per subscriber is $700. Pricing is based on the type of service mode. Wireless LAN costs support more widespread appeal.

Free space optics uses lasers to foster high-speed applications. It delivers high speed services to selected multi-tenant buildings in downtown urban areas or business parks, by connecting laser receivers between a network node, rooftops, or windowsills. The estimated cost per subscriber is $9000. However, expenses may be mitigated by the ability to smart-build more than one competing access technology.

New network equipment enabled by technologies such as Orthogonal Frequency Division Multiplexing (OFDM) provides better coverage for MMDS and WLAN networks. The new technology promises to reduce multi-path interference and increase coverage from 30-40% to as high as 75-80 % in a given deployment area.

Data rates for wireless are typically much slower than other media. Data communications in the licensed bands can reach data transfer rates up to 20 Mbps. Data communications in the unlicensed bands is commonly known as wireless fidelity (Wi-Fi).

8.0 Current Jacksonville Telecommunications Infrastructure

8.1 Introduction

The City of Jacksonville is a dynamic market in telecommunications and fiber connectivity. According to Expansion Management, Jacksonville is ranked in the top 15% of all U.S. metro areas for fiber optic connectivity.

A considerable number of private service providers have a significant presence in Jacksonville. These service providers offer a variety of telecommunication services to the public. Several government agencies also have a significant amount of private network and fiber infrastructure resources dedicated for internal business operations.

The objective of this section is to analyze the telecommunications services currently available, assess telecommunication deficiencies and identify existing resources that could be utilized to improve services. The analysis covers publicly available networks, government networks and wireless networks.

8.2 Findings

The City is a dynamic telecommunications market that supports all basic communications needs with 22 telephone service providers, 90 internet providers, 9 wireless phone service providers, 5 wireless “hot spot” service providers, 1 wireless broadband service provider, 1 cable TV provider and satellite TV provider.

Basic services for the public are provided, including telephone, DSL, limited wireless data services, paging, mobile phone, and video (cable and satellite). These technologies are generally well established, and in the case of data circuits, offer limited bandwidth to the subscriber.

Bandwidth above 1.5 Mbps is not available to the general public limiting some current applications.

The Consolidated Government of Jacksonville has a significant fiber infrastructure but lacks considerable documentation to indicate fiber quantity, quality, type and spare capacity. Due to limited information, it is not possible to accurately quantify the potentials gained by consolidating these resources. Figure 8.1 illustrates some possible

potentials that could be acquired in constructing a metropolitan area network utilizing existing government fiber infrastructure as discussed in Section 8.3.

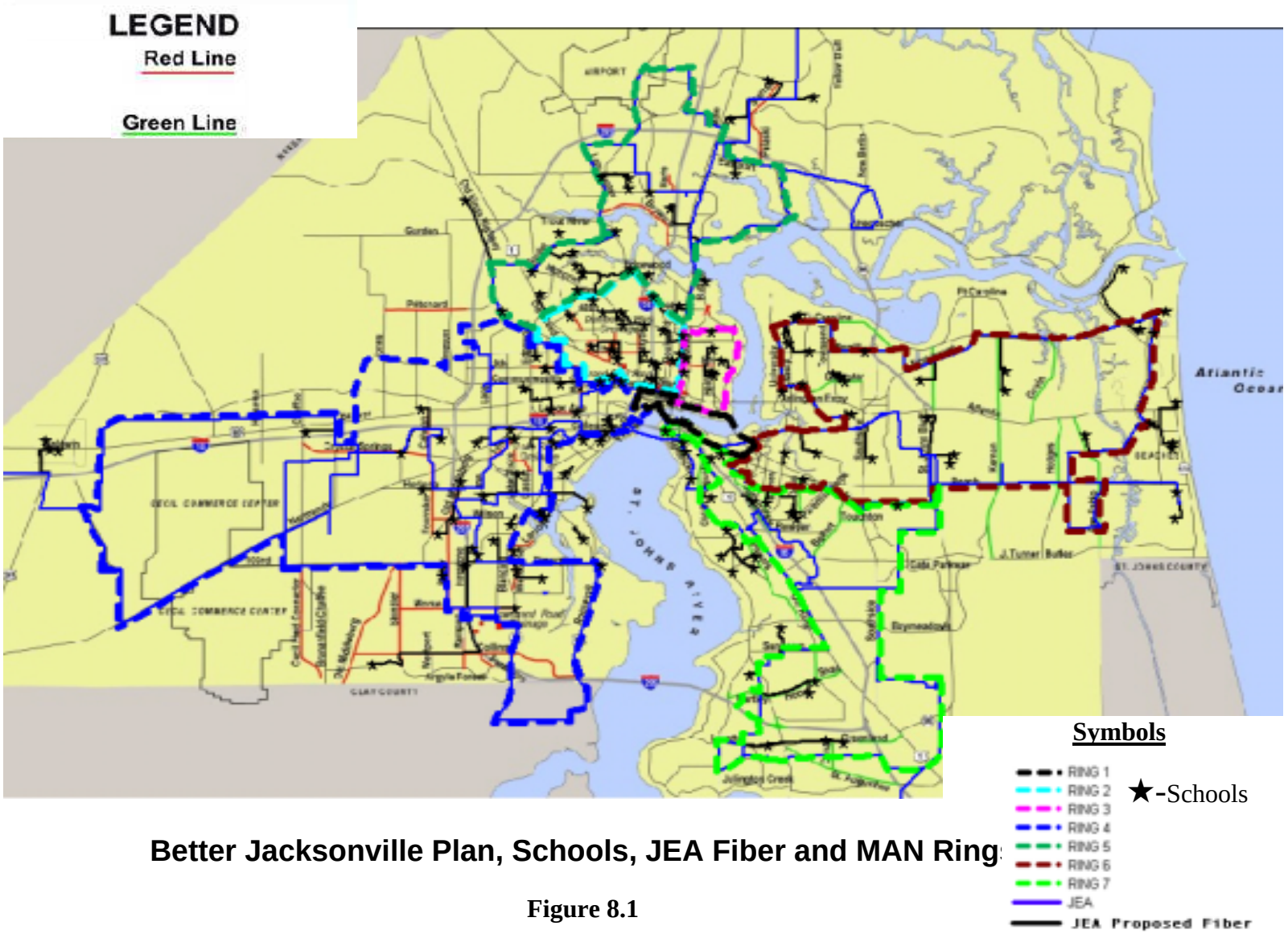
- Two existing JEA fiber strands are assumed to be available to construct 7 MAN rings in Duval County.
- Schools could connect to the MAN using existing and proposed JEA fiber.
- Schools could connect to the MAN using adjacent fiber infrastructure provided by the Better Jacksonville Plan.
- A majority of government buildings and sport complexes located downtown could be connected to the MAN utilizing City of Jacksonville ITD‘s proposed fiber infrastructure.
- A countywide Intelligent Transportation System (ITS) could connect to the MAN utilizing existing JEA, FDOT, JTA and COJ fiber infrastructure and ITS resources.

The Consolidated Government operates large local area networks (LANs) for internal business operations. These departments and agencies have their own staff to operate and maintain these networks.

As a telecommunications innovator, Jacksonville deployed wireless pilots that provide free Internet access to residents. Access is provided at the Jacksonville Landing, Twin Towers Community Center, Emmett Reed Center and Hemming Plaza.

City connectivity and underlying bandwidth is limited, but functional. It would offer great improvements to the efficiency of City/County government functions and interaction with the public that it serves if the bandwidth were substantially increased over that provided by the present mix of data services. A significant part of the telecommunications cost, as described elsewhere in this report, is spent right now to fund this collection of telecommunications services.

The WIZ program, a wireless pilot project and other local wireless coverage networks, are just the beginnings of the applications of 801.11b technology. Widespread deployment of this technology requires bandwidth and interconnecting media that presently is not in place.



Better Jacksonville Plan, Schools, JEA Fiber and MAN Rings

Figure 8.1

8.3 Publicly Available Networks

The City of Jacksonville has a dynamic public telecommunications market. As with the Telecommunications Industry, the market is in constant flux as telecommunication companies come and go. The current telecommunications services are concentrated in eight technology areas:

- Telephone service providers.
- Internet service providers.
- High speed data service providers.
- Wireless phone service providers.
- Wireless LAN services.
- Wireless broadband service providers.
- Messaging (pagers).
- Cable TV/Satellite service providers.

The deregulation of the telephone industry has had a tremendous affect on service providers. The old monopolistic model has opened up to provide customers with a choice of local and long distance service providers. This has created a highly competitive market, which has lowered the overall costs of phone service.

Service providers located in the Jacksonville area are discussed below.

8.3.1 Telephone Service Providers

Telephone service has undergone a dramatic change during the last decade; it has gone from simple dial tone to complete solutions that offer the consumer the most recent advancements in telephone features. In addition, deregulation has allowed other companies access to the existing telephone infrastructure. Currently, 22 telephone service providers have been identified operating in Jacksonville, Florida. Five of these companies are listed below as a representative cross section of telephone service providers.

BellSouth

- Local service.
- Home phone line.
- Unlimited local calling.
- Choice of easy-to-use calling features.
- No activation fee.
- One monthly rate of $30.00
- Long distance.
  - Plans with rates as low as 5¢ per minute.
  - Billed directly to the monthly BellSouth phone bill.

AT&T

- Local service.
- Currently, AT&T does not offer local service to residential residents.
- Various plans are available.
- Plans can be customized to fit requirements.
- Pricing depends on the plan.
- Long distance.
  - Plans available with unlimited connection to other AT&T customers and 7¢ a minute to other locations. A $19.95 per month fee is required.

BTI

- Local service.
- Currently, BTI does not offer local service to residential residents.
- Various plans are available.
- Plans can be customized to fit requirements.
- Pricing depends on the plan. They advertise a 30% communications savings with a package purchase.
- Long distance.
  - BTI offers plans from Qwest, AT&T, and MCI.

US LEC of Florida

- Local service.
- Currently, US LEC does not offer local service to residential residents.
- Bundled services are available.
- Different connections are available.
- Plans can be customized to fit requirements.
- Package, connection, and location determine pricing.
- Long distance.
  - US LEC provides long distance over their network and advertise the benefits of economy of scale to reduce a company's communications bill.

Qwest

- Local service - Quest does not provide residential or business local service.
- Long distance.
- Qwest Membership Plan: Pay only 4¢ per minute for state-to-state calls with an annual fee of $29.95.
- Qwest business dials.

The increase in computer use has been one of the major reasons for increased telephone service. Large portions of computer users use telephone lines to obtain Internet connections. They are connecting to Internet Service Providers (ISP) who provides the link to the World Wide Web. A portion of the ISPs' available in Jacksonville, Florida is discussed below.

8.3.2 Internet Service Providers

A search of the Jacksonville, Florida area identified at least 90 companies providing Internet services in one degree or another. For the purpose of this discussion, 9 major ISPs' with identified services are listed in at the end of this Section. Three of these providers are listed below for comparison.

AT&T

- Features.
  - 6 E-mail IDs.
  - E-mail Screener.
  - E-mail Anti-virus Protection.
  - Personal Web Space.
  - Parental Controls Software.
- $21.95 for unlimited access.

BellSouth

- Features.
  - Customizable Home Page.
  - Reliable e-mail.
  - Personal Web sites.
- $20.95 for unlimited access.

Wal-Mart

- Features.
  - Fast dial-up connections.
  - Family friendly controls.
- $9.94 per month for 700 hours of access.

With the continued evolution of the Internet and increasing complexity of programs, subscribers are demanding higher speed connections. To meet this demand for higher bandwidth, the major service providers have developed broadband delivery networks over established cable and telephone infrastructure. These high-speed data service providers are discussed in the next section.

8.3.3 High Speed Data Service Providers

Duval County's primary cable television service provider was AT&T Broadband until January 2003, when Comcast took over the system. At the end of 2001, the system was listed as having 3,490 miles of coaxial cable and 282 miles of fiber optic cable. These numbers have changed, with more fiber optic cable added since the upgrade activity that occurred in 2002. Before the 2002 upgrade, the system encompassed approximately

302,000 residences with 258,000 basic cable subscribers and 158,000 expanded cable subscribers.

High-speed data falls into several different categories, and is dependent on whether it is a residential or business application. The current technology used for residential high-speed data is cable modems, xDSL (generic digital subscriber line), and satellite. The primary cable, xDSL, and satellite providers for residential service are listed below for comparison. Additional providers are listed at the end of this Section.

8.3.4 Residential Service Providers and Services

ComCast

- Residential service.
- Cable Modem.
- Merged with AT&T broadband.
- Advertises 1.5 Mbps down-link/256 Kbps up-link.
  - Actual speeds will vary with amount of users per node.
- $49.95 per month.

BellSouth

- DSL (Digital Subscriber Line/Loop.)
- Advertises speeds up to1.5 Mbps down-link/256 Kbps up-link.
  - Actual down-link speeds will vary. Up-link speed is guaranteed to be 256 Kbps.
- $49.95 per month.
- BellSouth advised that every CO was cable of DSL service.

DiRECWAY

- Satellite.
- Advertises 384 Kbps down-link. Up-link is over dial-up modem.
  - Actual download speeds will vary based on total subscriber usage.
- $59.95 per month.

8.3.5 Business Service Providers and Services

Businesses have services to choose from in addition to xDSL and satellite. The bandwidth of these services can range from a fractional T1 up to 1000 Mbps. Four of these businesses are listed below for comparison.

AT&T

- DSL (Digital Subscriber Line/Loop).
- Several plans available to match business requirements.
- Speeds up to 1.5 Mbps down-link/256 Kbps up-link.
- Pricing dependent on circuit configuration.
- DSL single business user is $79.95 per month.
- SDSL is $395.95 per month for the 1.5 Mbps/1.5 Mbps configuration.

BellSouth

- DSL (Digital Subscriber Line/Loop.)
  - Several plans available to match business requirements.
  - Speeds up to 1.5 Mbps down-link/256 Kbps up-link.
  - Pricing dependent on circuit configuration and ranges from $79.95/mo. to $219.00/mo.
- ISDN (Integrated Services Digital Network).
  - ISDN (Basic Rate Interface) service allows a single telephone line to carry voice, video, and data simultaneously.
  - ISDN (Primary Rate Interface) service uses the public telephone network to carry an all-digital signal.
  - For a limited 320 hour access the cost is $98.00 per month and unlimited access is $260.00 per month. An installation cost of $206.00 would apply.
- ATM (Asynchronous Transfer Mode).

- ATM service. ATM integrates voice, video, and data over a single local-area network (LAN) or wide-area network (WAN). ATM service can support speeds ranging from OC3 to OC12.
- Pricing is customized to each customers need and is determined by speed, distance, and location. Contact service provider for pricing.

- NMLI (Native Mode LAN Interconnection).
  - An intra-LATA, high-speed, Ethernet transport service most commonly used to interconnect LANs.
  - Available at the native LAN speeds of 10 Mbps Ethernet, 100 Mbps Fast Ethernet and 1000 Mbps Gigabit Ethernet.
  - Pricing is customized to each customers need and is determined by speed, distance, and location. Contact service provider for pricing.

US LEC of Florida

- DSL (Digital Subscriber Line/Loop).
  - Several plans available to match business requirements.
  - Pricing is customized to each customers need and is determined by speed, distance.

8.3.6 Wireless Phone Service Providers

Wireless phone service is still the fastest growing market in the telecommunications industry. The service providers continue to upgrade their systems to provide greater diversity in the offered services. The current level of technology provides wireless data network connections for the customer over the cellular platform.

There are nine companies licensed to provide wireless phone service in Jacksonville. Seven of these companies have identified services in the Jacksonville area. Types of services these companies provide are listed at the end of this Section.

Verizon Wireless

- Cellular phone service.
- Wireless Internet access for laptops and PDA's.
  - Capable of data speeds bursting up to 144 Kbps. Delivering average speeds of 40 to 60 Kbps.
  - Circuit-switched connection to the Internet at 14.4 Kbps throughout the digital service area.

- High-end cost is $99.99 per month for unlimited access. This is in addition to the digital phone-calling plan.

T Mobile

- Cellular phone service.
- T Mobile Internet access for laptops and PDAs.
  - Capable of speeds up to 56 Kbps.
  - High-end cost is $99.99 per month for 200 MB of data transfer per month. Each additional MB costs $2.00. This is in addition to the digital phone-calling plan.

AT&T Wireless

- Cellular phone service.
- AT&T Wireless Mobile Internet for laptops and PDA's.
  - Capable of speeds up to 56 Kbps.
  - High-end cost is $99.99 per month for 100 MB per month of data transfer. Each additional MB costs $1.00. This is in addition to the digital phone-calling plan.

Cingular Wireless

- Cellular phone service.
- Cingular Wireless Data Connect Internet access for laptops and PDAs.
  - Capable of speeds up to 56 Kbps.
  - High-end cost is $49.99 per month for 13 MB of data transfer per month. Each additional MB costs $10.00. This is in addition to the digital phone-calling plan.

Nextel

- Cellular phone service.
- Packet Stream Gold Internet access for laptops and PDAs.
  - Capable of speeds up to 56 Kbps.
  - High-end cost is $54.99 per month for unlimited data transfer. This includes 300 minutes of anytime minutes and free incoming calls.

Sprint PCS

- Cellular phone service.
- Wireless Internet access for laptops and PDAs.
  - Capable of data speeds bursting up to 144 Kbps. Delivering average speeds of 40 to 60 kbps.
  - Circuit-switched connection to the Internet at 14.4 Kbps throughout the digital service area.
  - High-end cost is $100 per month for unlimited data transfer. This is in addition to the digital phone-calling plan.

ALLTEL

- Cellular phone service.
  - Starting at $39.95 per month.

The eighth wireless phone service provider is Jacksonville Wireless Communications and is licensed in the 1900 MHz band. The ninth is Wyndom Cellular and is licensed in the 800 MHz band.

8.3.7 Wireless LAN Service Providers

Another wireless technology is the 802.11 series that deals with the Wireless LAN (WLAN) specifications and is being used to expand business opportunities. WLANs were originally designed to provide simple and less expensive alternatives to cabling in certain work environments. It has been expanded to connect campus style LANs and is now being used to connect customers to the Internet at select locations called "hot spots".

Five hot spot service providers have been identified in Jacksonville and have coverage in four areas. For location information, see the end of this Section. An example of the cost structure for this service is listed below.

Boingo Wireless

- $7.95 for two days of connection. $7.95 for each additional day.
- $24.95 for ten days of connection.
- $49.95 month for unlimited connection.

Wayport

- $9.95 for one day of connection.
- Pre-pay $25 for three days, $50 for 8 days, and $100 for 20 days.
- $29.95 per month for unlimited connection with one year contract.
- $49.95 per month for unlimited connection on a month to month basis.

In addition to WLAN, BWA (Broadband Wireless Access) is being used to establish higher speed Internet connections over licensed frequencies.

8.3.8 Wireless Broadband Service Provider

One company, Clearwire, has been identified as providing BWA in Jacksonville. Clearwire holds the exclusive right to licensed 2.5 GHz next-generation, non-line of sight, self-install wireless technology in Jacksonville. Network connectivity can be established up to 7 miles from the base station antenna. Connection requires a separate communications device that is connected to the computer via the data port. This equipment is included at no cost when a contract is signed. Clearwire provides residential, SOHO (Small Office Home Office), and business connections.

- Residential service
  - 512 Kbps down-link and 128 Kbps up-link connection at a cost of $49.95 for unlimited access.
- SOHO (Small office home office).
  - 768 Kbps down-link and 128 Kbps up-link connection at a cost of $79.95 for unlimited access.
- Businesses.
  - Basic - 1.02 Mbps down-link and 256 Kbps up-link connection at a cost of $149.95 for unlimited access.
  - Business Enhanced – 1.5 Mbps down-link and 384 Kbps up-link connection at a cost of 179.95 for unlimited access, 5 IP addresses, and an additional 5 IP addresses for $20.00.
  - Premium - 1.5 Mbps down-link and 512 Kbps up-link connection at a cost of $199.95 for unlimited access, 5 IP addresses, and an additional 5 IP addresses for $20.00.
  - Deluxe – 2.0 Mbps down-link and 768 Kbps up-link connection at a cost of $239.95 for unlimited access and 20 IP address.

Note: All service plan down-link/up-link connection speeds may vary depending on location.

8.3.9 Messaging service providers

There are currently nine companies identified that provide messaging services in Jacksonville. See the Table at the end of this Section. However, there are many national companies that have coverage in the area. In addition, several of the cellular providers have messaging on their networks. Pager services can be either one way or two-way, and the prices vary for each service. The pricing for these services vary greatly from provider to provider, but average $9.95 for one way messaging and $24.95 for two way messaging.

8.3.10 Cable TV & Satellite TV providers

The cable provider is Comcast.

- Merged with AT&T broadband.
- Offers digital cable with an interactive programming guide.
- Offers limited HDTV Channels.
- Residential Packages.
- Bronze Package is $44.99 per month and includes standard cable, digital basic channels, and multiple channels of Encore, music, and pay per view.
- Standard Package is $53.99 per month and includes the Bronze service with a variety package of channels.
- Silver Package is $59.99 per month. This includes the Bronze and Standard package with one premium channel such as HBO or ShowTime.
- Gold Package is $69.99 per month. This includes the Bronze and Standard package with two premium channels such as HBO or ShowTime.
- Platinum Package is $81.99 per month. This includes the Bronze and Standard package with all premium channels such as HBO or ShowTime.

The satellite TV provider is Direct TV/ Prime TV.

- Offers digital cable with an interactive programming guide.
- Residential channels packages.
    - Total Choice base package is $31.99 per month for 110 channels, which includes movies, sports, family and music programming.
    - Total Choice Plus package is $35.98 per month for 125 channels, which includes even more movies, sports, family and music programming.

  - Total Choice Premier Package is $81.99 per month for 180 channels, which includes a more comprehensive movie channel, sports lineup, and the premium movie channels such as HBO and ShowTime.

- Business channel packages are provided for the following:
  - Restaurants and Bars.
  - Private offices.
  - Business viewing areas - such as retail stores, fitness clubs, etc.

8.4 Private Municipal Fiber Infrastructure and Networks

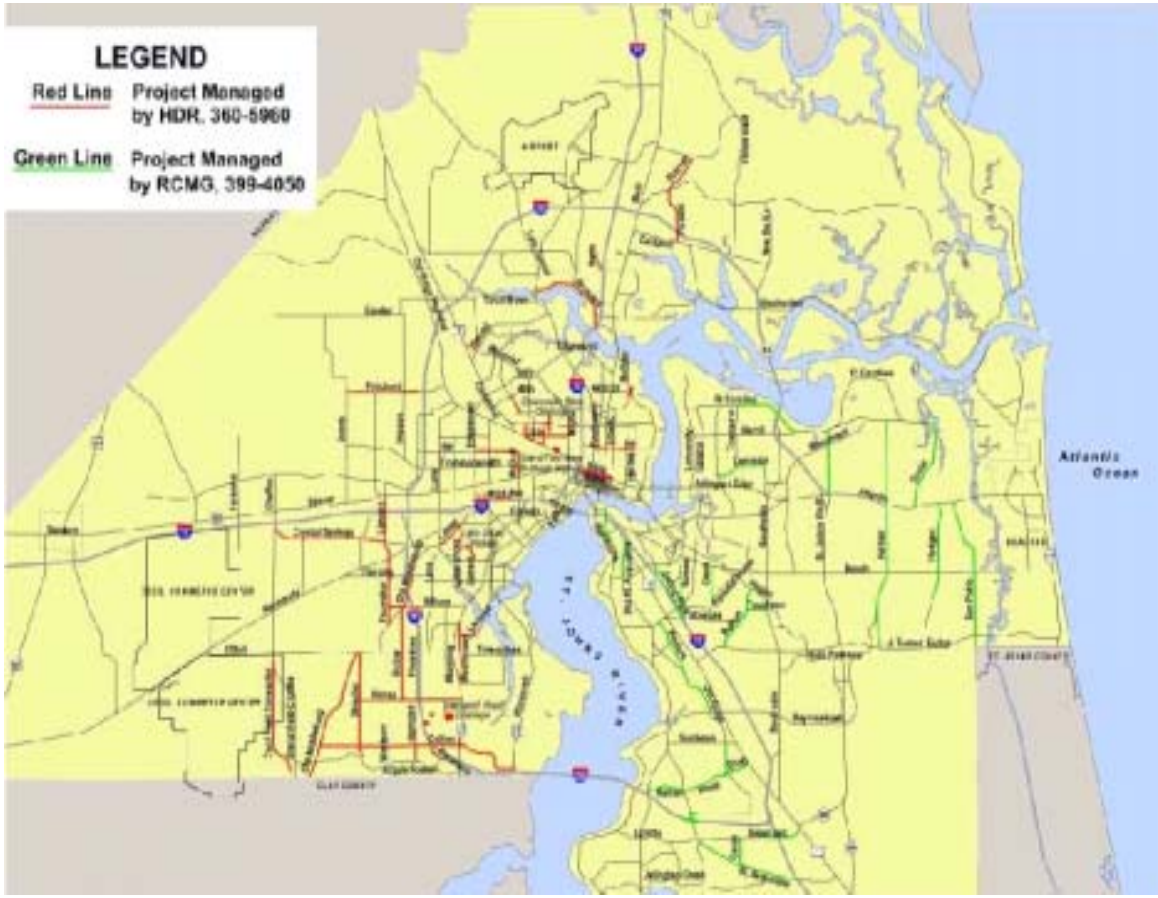
Some of Jacksonville's municipal government departments and agencies have a significant fiber infrastructure and local area networks (LANs) for internal business operations. The following highlights some of the larger fiber infrastructures and complex networks available for review.

8.4.1 The Better Jacksonville Plan-Fiber Infrastructure

The Better Jacksonville Plan is a $2.2 billion comprehensive growth management strategy that provides road and infrastructure improvements, environmental preservation, economic development, and new and improved public facilities. The Plan is currently being funded through a half-penny sales tax and from existing revenue sources.

About $1.5 billion dollars has been set aside for road and infrastructure improvement through restructuring Jacksonville Transportation Authority's local option sales tax and the City's local option gas tax revenues provides half of the funding for these projects. The remaining $750 million comes from the new half-cent sales tax passed by voters in September 2000.

A majority of the roads to be constructed and improved include installing (2) 2” conduit along the right of ways for fiber optic cables. Approximately 154 miles of conduit is to be installed. See Figure 8.2. The roads highlighted in green and red indicate the proposed areas for conduit installation.



Better Jacksonville Plan
Figure 8.2

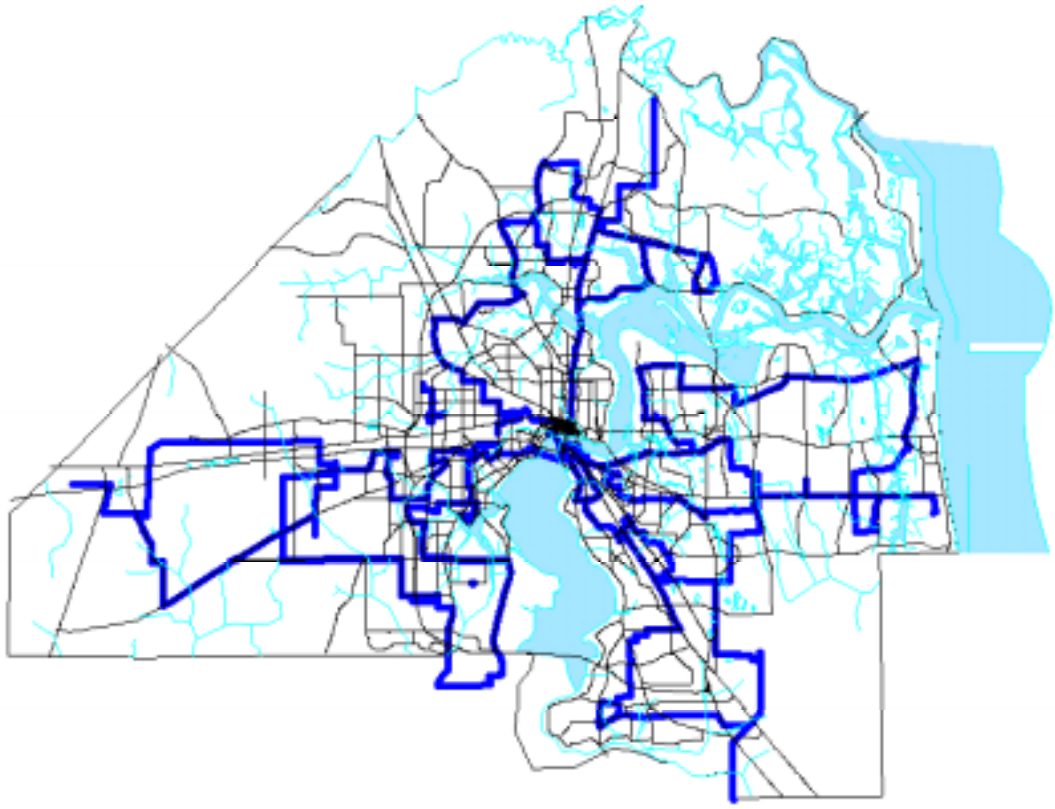
8.4.2 JEA Fiber Infrastructure

JEA has over 400 miles of fiber routes within the county. The primary geographic fiber routes are three loops or rings with numerous spurs and cross-ring connections. The fiber count within each ring varies between rings and along sections. The fiber quantities in each ring range from 6 to 288 strands. See Figure 8.3

JEA has installed fiber across the Hart and Acosta bridges. On the Acosta Bridge, a 288 fiber strand cable has been installed. The fiber is to be utilized by JEA and JTA.

JEA's fiber extends to all of JEA plants, buildings, and power substations. The fiber circuits were developed to primarily serve the mission of the JEA and carry critical SCADA data circuits to these facilities.

JEA also has proposed fiber plan to connect a majority of Duval County Public Schools. See Figure 8.1



JEA Fiber Infrastructure

Figure 8.3

Symbols

JEA Fiber

8.4.3 JEA Network

JEA Corporate production network (LAN) supports 3000 users. The network consists of different interconnected technologies between JEA Towers, System Operations Control Center (SOCC), Substations, Power Plants, Water Treatment Plants and numerous other government agencies.

Three fiber rings are routed throughout the Jacksonville area to provide these interconnections. The network currently uses SONET at the following data rates:

- Ring 1, North OC-3 at 155 Mbps.
- Ring 2, South OC-12 at 622 Mbps.
- Ring 3, West OC-3 at 155 Mbps.

JEA's ATM communications network is being converted to provide transport and switching networks comprised of SONET, gigabit Ethernet (GigE) and Fiber Channel over metro DWDM network.

The JEA plans to move most of the traffic from the three rings onto a gigabit Ethernet transport system but still utilize SONET for protective relaying and other deterministic applications.

The network organization has three levels:

- The Core Level: The core (located at the JEA data center) uses DMZs and Firewalls to control all traffic that enters and leaves the corporate network.
- Main and Distribution Level: The main distribution level (located at the JEA data center) distributes traffic using high-end switches to intermediate switches.
- Intermediate Distribution Level: Remotely located in JEA facilities throughout the metro area. JEA corporate production networks are supported by the two T1s and 768 Kbps frame relay external connections.

The core network backbone (gigabit Ethernet) is 1% utilized and the ATM network is 8 to 10% utilized. The network supports the following applications:

- RTU Communications.
- Inter-facility connections.
- Voice Communications.

- Broadcast IP over TV: IP over TV is distributed over the entire network, including remote sites. Cisco IP-TV technology is used with an average bandwidth of 1 Mbps.
- SCADA and PLC networks: Controls and monitors power and water plants.
- Wireless Network Meter Readings: The readings are done in geographic sections in order to control network traffic.

A wireless network pilot using 802.11b technology currently is being planned to be an extension of JEA's network. The first phase of the wireless pilot involves the following:

- Coverage of the downtown area for public safety and security. JEA, JTA's trolley service, the city, police and fire departments will have network access.
- Primary Access points: Water Street Substation and Water Sewer Building.

The second phase of the pilot will include urban, commercial and residential districts.

JEA's storage area network (SAN) alleviates congestion from the production network. The storage network is used to back up all databases to disk arrays using Fiber Channel. JEA currently is planning a disaster recovery center that will mirror data center operations. The disaster recovery center will be located within the System Operations Control Center (SOCC). The data will be transferred using a SAN.

8.4.4 City of Jacksonville Fiber Infrastructure

The Downtown City Buildings are interconnected using a variety of City, JEA and vendor multi-mode and single mode fiber. Quantities and quality of the fiber are unknown. The major buildings include City Hall, EOC, FTB, Yates, Lainer, Public Defender, Jail, JSO, JEA and the Courthouse.

The City of Jacksonville ITD has issued a request for bid (Bid Number XF-0508-03, A.P. Randolph Blvd. Fiber Optic Loop) to licensed contractors to furnish and install a large single-mode fiber optic infrastructure in downtown Jacksonville. The proposed fiber optic infrastructure consists of the following:

- Fiber loop in downtown Jacksonville to support the City's telephone and data systems. The proposed under ground fiber infrastructure area will cover from Highway 1 to Newnan Street (east to west) and from 1st Street to Bay Street. The proposed fiber infrastructure will also interconnect the following buildings:

- Police Memorial Building
- Jacksonville Arena
- Baseball Park
- AllTel Stadium
- Inspection/Permitting Building
- Court Records Building
- Children Commission Building
- Public Building Office Building
- Parks/Recreation Department Building
- 711 Liberty Street Building (FDLE)
- Yates Building

- The fiber loop will consist of (2) four inch PVC conduits, 4 inner-duct/conduit and a 36 pair single mode fiber optic cable.

8.4.5 City of Jacksonville Network

The City's production network (LAN/MAN) supports 3500 users. The network consists of different technologies interconnected throughout the city fiber optic infrastructure. The city's data center is the core area of the network and is located in the City Hall Annex Building. The network standardizes on Cisco routers and switches and Cisco recommended network-layering techniques. Firewalls and access servers provide network security.

The City of Jacksonville has the following network services for building interconnections:

- (8) 100 Mbps FDDI building locations.
- (2) 10 Mbps Ethernet building locations.
- (1) 200 Mbps Fast Ethernet Building Locations.
- (30+) Bell South frame relay connections to remote libraries, police and fire stations and other City of Jacksonville buildings.
- ISDN 128 Kbps connections to 51 remote city locations provided by BellSouth.
- 4 Point to Point connections.
- Wireless (CDPD) 128 Kbps connections for police, fire general government provided by AT&T and Winstar.
- AT&T Broadband/Comcast provides a T3 connection for Internet service.

The City of Jacksonville's bandwidth demand is organized into three groups:

- Library: 5-10 Mbps.
- General Government: 10 MMbps.
- E-commerce: 3 Mbps.

Data is the primary traffic volume on the network, followed by voice traffic. The LANs support 10 Mbps now and are being upgraded to 100 Mbps. The City estimates the network load to be about 40% of capacity. The average core network traffic is 12 Mbps. This traffic peaks at 15 to 18 Mbps. The amount of traffic is expected to double over the next two years.

The City's voice network has four interconnected PBX locations which serve over 5,500 telephone lines. These PBXs' are interconnected via approximately 560 digital and analog trunk lines that are provided by Bell South.

The City's wireless LAN uses 802.11b technology. Partial coverage is achieved in the Annex Building, City Hall, and Hemming Park.

8.4.6 Florida Department of Transportation-Fiber Infrastructure

FDOT has an extensive fiber infrastructure for monitoring Jacksonville's interstates using ITS. FDOT's ITS is an advanced traveler information and management system consisting of CCTV cameras, DMS, video image detection, inductive loop detection and fiber optics along segments of Jacksonville's metro interstate highway.

The existing infrastructure consists of the following:

- One 48-fiber single-mode fiber cable routed between hubs and the ITS control center.
- One 24-fiber single-mode fiber cable routed directly between the control center and Florida Highway Patrol.
- The fiber network runs through a multi-cell conduit along I-10 between the I –95 interchange and the I-295 interchange and along I-295 between the I-10 interchange and Florida highway Patrol building on Normandy Boulevard. A multi-cell conduit also runs along I-10 to the ITS control center.
- A 4" conduit network for Field elements was constructed along I –95 between Emerson Street and the southern I-95/I-295 interchange and from Hendricks Avenue to the I-10/I-95 interchange. The condition of the existing conduit is unknown at this time.

- FDOT expects to have conduit infrastructure in place along interstate I-295 loop and all interstate highways within I-295 by 2007. FDOT would consider sharing infrastructure resources with the City of Jacksonville for the county wide telecommunications network

8.4.7 Duval County Public School Network

The Duval County Public Schools (DCPS) network infrastructure has LAN, MAN, and Internet connectivity for almost every school and office in the school district. The school's network supports more than 30,000 users. The core network location is located in the TEAM Center building. Network management, operations, and maintenance are provided from this location.

A brief description of the network follows:

- An OC-3 ATM backbone connection interconnects the TEAM Center and Administration Building.
- The district is divided into five geographical regions. The school regions are used as intermediate distribution points to the schools and centers. Each region is interconnects the TEAM Center and Regional schools with Bell South Frame relay circuits. Two DS3 circuits feed the TEAM Center and one T1 circuit feeds each of the five regions.
- AT&T Broadband provides one DS3 for Internet services. AT&T Broadband also provides back up circuits and interconnects the Team Center with the Regional schools.
- Data is the primary traffic on the network followed by voice. The LANs are full duplex Fast Ethernet to the desktop. The internal network uses 60 to 80% of the total capacity. QOS has been implemented manage bandwidth. The external network uses 10% of the total capacity.
- The school district uses several applications for educational purposes. IP videos are the most bandwidth intensive applications. To minimize network traffic, Cache servers are installed at the local schools to run these applications. Videos and other intensive bandwidth applications are ordered in advanced and distributed via the network over night from the TEAM Center.

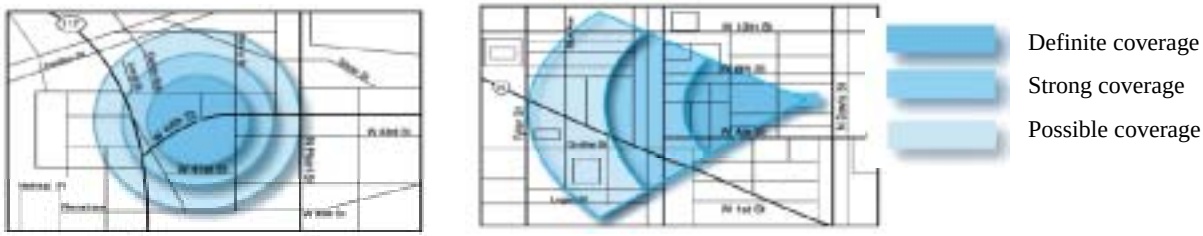
8.5 Wireless Networks

8.5.1 WIZ Program

Jacksonville's Wireless Internet Zone (WIZ) provides free high-speed Internet access to residents in specific areas. The WIZ was developed to address two key issues in the community: The Digital Divide and economic development. The Digital Divide is defined as the difference between residents with access to technology and those without. The areas with slower business and job growth are the economic development targets, with a focus on the small and medium-sized businesses in need of this high-speed Internet service.

Jacksonville is one of the first cities in the nation to provide this free service to the public. There was an initial WIZ test site launched at Jacksonville Landing in August of 2001 with the support of both public and private organizations. It is the hope of the WIZ team for citywide expansion of this initiative. Expansion of this initiative continues with two pilot WIZs'. One is located at the Twin Towers Community Center, and the other is located at the Emmett Reed Center.

At both the Twin Towers Community Center and the Emmett Reed Center, a high-speed Internet connection is broadcasted utilizing an access point (wireless transmitter/receiver) that conforms to the IEEE 802.11b standard. Areas covered by each of these access points are shown below:



Twin Towers Community Center Emmett Reed Center

Jacksonville residents living within the areas noted above may be able to participate in the WIZ program. To gain access, the residents will need a computer meeting the following minimum requirements: a Pentium II processor, 32 MB RAM, Windows 98, a Universal Serial Bus (USB) port, and a CD-ROM drive. They will also need a wireless card that supports the 802.11b standard. If the resident does not have a computer and/or a wireless card, this equipment may be provided at no cost to the resident. This free equipment will be given to qualified applicants on a first-come first-served basis and will depend on the availability of donated equipment. Once the residents have the proper hardware, they are able to access the Internet using browser software. They are then able

to easily access information relating to education, voter registration, job opportunities, and much more. The cost of these two WIZ pilots is expected not to exceed $170,000. The City Council has appropriated $175,000 to fund this pilot phase.

8.5.2 JEA AMR

JEA is installing an automatic meter reading system that will provide one-way communication from the meter at the house to JEA Control Center. The system uses a three tier configuration. Transmitters used at the houses transmit signals to 2700 neighborhood collectors located on distribution poles. The neighborhood collector signals are then transmitted to 36 substation masters that are connected to JEA's fiber grid. The substation masters are being placed on existing towers.

8.5.3 Other Wireless Projects

The City of Jacksonville has a Hemming Plaza (City Hall) open network both inside and outside that includes the annex floors and the metro park. Jacksonville Airport Authority is considering a wireless security system and Jacksonville Transit Authority is considering a wireless bus surveillance system. Duval County School Board has limited wireless access. JEA also has a wireless system for the Plaza floors.

`

8.5.4 Broadband Coverage

Many areas of Comcast's system had been upgraded. The upgraded areas have access to over 100 channels, compared to the 53 channels reported at the end of 2001. Requests for service coverage maps from AT&T/Comcast through the Office of General Counsel were denied.

8.5.5 Summary

The telecommunications infrastructure of Jacksonville, Florida is fairly well developed with established service providers expanding their service offerings to meet the needs of their customers. The residential customer has a limited amount of resources available when compared to the business offerings. These resources currently limit the amount of bandwidth available and will require a comprehensive upgrade if capacity is to increase. The business customer has a wider selection of resources and is able to more effectively tailor the resources to meet their needs.

TELEPHONE SERVICE PROVIDERS	SERVICES
Adelphia Business Solutions	A,B,C,D
AT&T Voice	A,D
Bellsouth	A,B,C,D,E,F
Boyd Communications	A,B,C,D
BTI	A,B,C,D,E,F
Distributech	A,D,E
E Spire Communications (Xspedius)	A,D,E
Epicus Inc	A,D,E
Excel Communications Inc	A,D,E
Florida Digital Network Inc	A,B,C,D,E,F
Intermedia Communications Inc	A,B,D
ITC Deltacom	A,B,D,E,F
Network Plus Inc (MetroCall)	A,D,E
Newsouth Communications	A,B,D
Nuvox Communications	A,B
MCI	A,B,C,D,E,F
Pinnacle Communications International Inc	A, D, E
Qwest	A,B,C,D,E,F
Sprint	D
Sun-Tel USA Inc	D,E
USA Telecom	D,E
US Lec Of Florida	A,B,C,D,F

A - Business Line (POTS)

B - Business Trunk (Direct Inward Dialing DID, Direct Outward Dialing DOD, Combination)

C - ISDN (BRI/PRI)

D - Long Distance, with 1+, toll free and calling cards

E - Residential Line (POTS)

F - xDSL

INTERNET SERVICE PROVIDERS	SERVICES
AOL	A,B
AT&T	A, B
	A, B
Compuserv	A
Earthlink	A,B
Juno	A
MSN	A,B
NetZero	A
Walmart	A
Yahoo	A
A - Dialup	
B - Highspeed	
MESSAGING SERVICE PROVIDERS	**SERVICES**

A-Plus Network Inc.		A,B,C,D		
Air One Paging		A,B,C,D		
Airborne Communications		A,B,C,D		
Allsafe Paging Systems		A,B,C,D		
Lets Talk Cellular & Wireless Inc		A,B,C,D		
Metrocall		A,B,C,D		
N Touch Communications		A,B,C,D		
Verizon Wireless Messaging		A,B,C,D		
A - 1 way paging				
B - 2 way paging				
C - Numeric paging				
D - Word Text messaging				
HIGH SPEED DATA SERVICE PROVIDERS		**SERVICES**		**MARKET**
Adelphia Business Solutions		A,B,C,E,F		Commercial
AT&T		C		Commercial
		A,B,C,D,E,F		Commercial and Residential
Boyd Communications		B,C,D,E,F		
Broadwing		C,D		
BTI		B,C		
Comcast		A,B,C,D,E,F		Commercial and Residential
Florida Digital Network Inc		F		
Lightyear		C		
MCI		A,B,C,F		
Newsouth Communications		B,C,F		
Nuvox Communications		C		
Qwest		C		
Sprint		C		
ITC Deltacom		B		
US LEC of Florida		A,B,C,F		
WorldCom		C		
A - ISDN				
B - Fractional T1				
C - T1				
D - DS3				
E - Ethernet up to 100 Mbps				
F - Frame Relay				
CELLULAR SERVICE PROVIDERS		**SERVICES**		

Alltel		A		
A T & T Wireless		A,B		
Cingular Wireless		A,B		
Jacksonville Wireless Communication		A		
Nextel		A,B		
Sprint PCS		A,C,D		
T Mobile		A,B		
Verizon Wireless		A,C,D		
Wyndom Cellular		A		
A - Cellular phone service				
B - Mobile Internet for Laptops and PDAs, 56 Kbps				
C - Mobile Internet for Laptops and PDAs with bursting up to 144 Kbps, delivering average speeds of 40 to 60 kbps				
D - Mobile Internet for Laptops and PDAs at 14.4 Kbps throughout the digital service area.				
HOTSPOT SERVICE PROVIDERS		**SERVICES**		**LOCATIONS**
iPass		WI-FI		Radisson Inn Riverwalk
Surf and Sip Network		WI-FI		Diedrich Coffee
Airpath Internet		WI-FI		Jacksonville International Airport
Wayport		WI-FI		Radisson Inn Riverwalk
Boingo Wireless		WI-FI		Diedrich Coffee
JAX-WIZ		WI-FI		Jacksonville Landing
WIRELESS BROADBAND PROVIDERS		**SERVICES**		
Clearwire		Business - 1.5 Mbps		
		SOHO - 768 Kbps		
		Residents - 512 Kbps		
CABLE TV & SATELLITE TV PROVIDERS		**SERVICES**		
Comcast		Digital Cable		
Direct TV / Prime TV		Digital Cable		

9.0 Interviews

9.1 Introduction

A series of interviews were conducted throughout the City of Jacksonville with various organizations, citizens, and businesses in order to assess the current telecommunications infrastructure, solicit feedback on telecommunications services, and to address future telecommunications needs. The interviews were categorized into six groups; government, business, education, health care, residential communities, and entertainment.

9.2 Findings

With 129,000 students and 8,000 teachers, Duval County Public School district is one of the largest districts in the nation, and the second largest employer in Jacksonville.

- The school board anticipates reduced costs, the ability to use applications that provide distance learning, increase parental involvement and bolster professional development and collaboration. Children bound to hospitals or homes could receive direct mentoring from teachers and say in contact with their peers.
- Jacksonville University and University of North Florida with a combined population of 17,000 students requires increased bandwidth with lower or same cost for distance learning, university collaboration, and the web casting of school events.
- Florida Community College at Jacksonville is the second “most wired” community college in the nation and is a Cisco Academy Training Center. However, their employees are very limited at home with their current broadband connection reducing application use and efficiency.
- The private school community is interested in the advanced services bandwidth provides, but fear the potential higher costs. These services include distance learning, video streaming, video conferencing and web casting of school events.
- The Chamber of Commerce considers the Telecommunications Master Plan indicative of Jacksonville’s commitment to the IT industry and is supportive of a network that permits multi-media applications such as IP video conferencing for education, training and other business applications, and a wireless network that is accessible to visiting businesses and guests.
- The network must meet future bandwidth requirements, be secure and reliable throughout the community and is cost effective.
- The City’s Traffic engineering Division operates and maintains 1,060 traffic signals throughout the county. Only 424 are interconnected and operated remotely. Of these

424, 140 signals are connected to the control center using fiber optic cables. The remaining 284 are controlled by dial up connections that are too slow to adequately support current applications.

- Over 600 traffic signals operated by the City are sequenced manually for optimal traffic flow. This can create traffic congestion problems during unexpected traffic flow. A fiber network that connects all traffic signals would help optimize traffic flow and decrease traffic congestion, especially along University and Beach Boulevards.
- A telecommunications network would aid FDOT, and the City in automated traffic management for better traffic flow and to provide alternate route plans in emergency situations such as traffic accidents and hurricane evacuations.
- A fiber and wireless network that support Video over IP applications would improve mass transit security while reducing liability. Additionally, the network can be used for road, bridges and property inspections.
- Interconnecting the Jail, Public Defender's Office, State Attorney's Office and external agencies would reduce the amount of overhead required to transfer people between facilities.
- To implement new services, applications support will be required either from ITD or outsourced. Outsourcing was recommended in order to speed up the process.
- A network infrastructure with a universal design that can adapt to future technologies, needs and applications will create infinite opportunities. As an example, a secure network for City authority and agency communication during emergencies, such as a hurricane.
- Insufficient bandwidth availability to home and business users limits application development.
- A county wide network will provide for the betterment of education by providing access to students not able to attend school, provide full motion video for teleconferencing, streaming video, distance learning to permit high school students to earn college credit, increase teacher training opportunities, increase collaboration and peer mentoring, improve teacher efficiency and help minimize teacher shortage problems.
- FDOT has an extensive conduit infrastructure along sections of I-10, I-295, I-95 and is expanding this infrastructure on the I-295 loop and all interstate highways within I-295 (completion is planned by 2007).
- Jacksonville's Fire and Rescue Departments with 1,050 firefighters and 55 fire stations responded to over 4,000 fires and 70,000 EMS incidents in 2001. Their Communications Center and up to 19 fire stations share a T1 connection. The network does not support simultaneous teleconferencing impairing the capability and quality of their communications.
- The Jacksonville Housing Authority sees significant value in being able to deploy video surveillance technology in their various housing projects. This would aid both

the Housing Authority and law enforcement in real time monitoring and event archival.

- The integration of GIS applications by Jacksonville's Property Appraisers, Fire and Rescue Departments, Sheriff's Department and other agencies would reduce capital and operational costs, reduce the duplication of data, and the erroneous data existing in different databases.
- The medical community wants high speed and affordable services to connect to their remote "doc in a box" facilities, radiology clinics and to provide telemedicine applications within the patient's home, teleradiology viewing capabilities and pharmacy applications.
- High speed services to new residential and commercial developments is expected to enhance residents lifestyle, increase the property's worth and competitive value.
- Day-to-day operations for the public works department would improve with a robust MAN. Permit processing, on-site inspections and document storage activities would all see increased efficiencies.
- A demand exists for a responsive network that can provide temporary services for agencies such as the Supervisor of Elections. Real time access to the voter registration database would reduce voter processing errors.
- SMG manager of Jacksonville Sports Complex and Convention Center desires high speed data services (5 Mbps to 100 Mbps) between all facilities, wireless access at the Convention Center for exhibitor use. The bandwidth would be used for video conferencing services, building system controls and video up-links.
- The Super Bowl is a significant bandwidth consumer required for the 3000+ media personnel, 100-400 NFL personnel and teams. Access is needed at the Prime Osborn Convention Center, and area hotels that will house the NFL personnel, the teams, and event attendees.

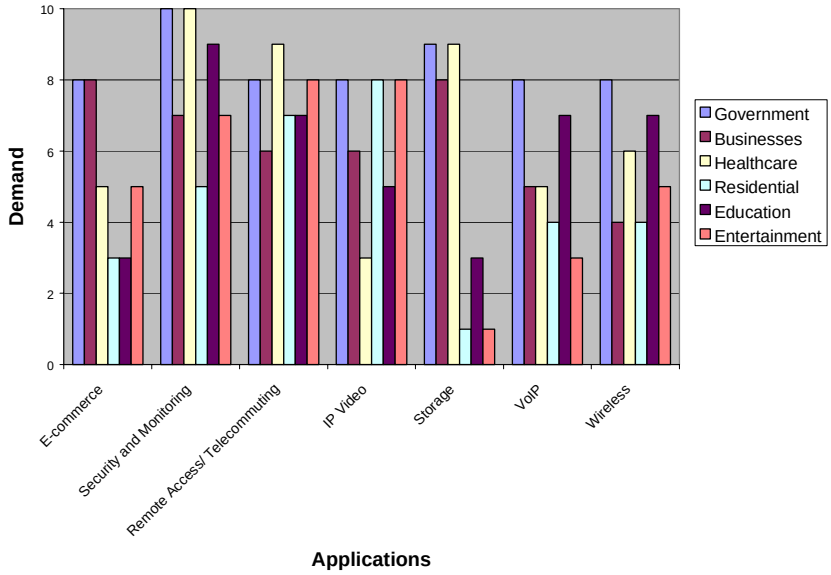
9.3 Personal Interview Summary

Black and Veatch and Vectren Communication Services conducted 62 interviews with government organizations, businesses, and residential communities in Duval County, Florida. The objective of these interviews was to obtain information on existing telecommunication infrastructures, current and future business network applications, and benefits that could be obtained from a high-speed county wide network. The interviews were categorized into the following groups.

1. Government: Jacksonville City Government, Jacksonville Authorities, Department of Transportation and Atlantic Beach, Neptune Beach and Jacksonville Beach City Governments.
2. Businesses: Large, Medium, and Small Private and Public Businesses.
3. Education.

4. Health Care.
5. Residential Communities.
6. Entertainment: Sports Complex and Convention Center.

The following chart summarizes the value of each application if a cost-effective high-speed countywide network were available.



A summary of the results for each category are given below.

1. ***Government***

   - Remote Access: City departments, agencies and authorities commonly have remote offices and employees that require secure network connections to access centrally located database files. Some of these database files consist of permits, drawings, official records, GIS information and control applications. A secure network that would efficiently transport large files is important to daily operations.

     E-Government applications would provide remote government access to citizens of Duval County. This would increase business efficiencies and communications.

   - E-commerce: Financial transactions such as business to business by electronic means continue to increase each year, especially for the City of Jacksonville.

   - Security and Monitoring: Florida Department of Transportation, Traffic Engineering Division and JTA would value a countywide network. A countywide fiber optic infrastructure could aide implementing Jacksonville's Intelligent Transportation System (ITS). ITS is a metro interstate highway managing and monitoring network. An accessible network to FDOT and Traffic Engineering would aid in traffic management such as monitoring traffic flow of streets,

highways and interstates, adjustment of traffic signals for better traffic flow, and increase public safety. This network could provide additional conveniences for the public using JTA's mass transit systems such as network access during commutes and better security.

- Storage: City departments and authorities have an important need to mirror and store critical business information remotely. If on-site data were to become corrupted or destroyed a copy could be restored from an off-site location. To efficiently access these large data files a cost-effective high-speed network connection would be required. This has limited most government organizations from implementing storage practices remotely.
- Video: Means of communicating effectively is important to the City such as the Public Works Department. The Works Department interacts with the public daily. Full motion video would help increase public interaction and improve public relations. Video applications are not available due to limited network bandwidth.
- VoIP: Voice Over Internet Protocol is desired. The existing data network infrastructure could be utilized to provide voice services to remote locations and minimize local service provider costs.
- Wireless: A wireless network is currently being planned for the downtown area to assist in public safety. It is desired to expand this network to include urban, commercial, and residential districts. A countywide network would be beneficial in providing fiber coverage to the wireless access nodes.

2. ***Businesses***

- E-commerce: Financial transactions such as business to business by electronic means continue to increase each year. A high-speed secure network to efficiently process transactions would be beneficial.
- Security: End-to-end service management such as VPNs will be required if business customers are to rely and use network services to establish their networks.
- Remote Access: A majority of employees could work from home, but due to limited bandwidth available; some applications cannot be used or are too slow thus affecting business efficiencies. A high-speed countywide network to support current and future business applications from home is important.
- Video: Quality interactive video conferencing for business and training purposes is desired.
- Storage: Businesses have an important need to mirror and store critical business information remotely for disaster recovery purposes. If on site data were destroyed a copy could be restored from an off site location. To efficiently access these large data files a cost-effective high-speed network connection would be required.

3. ***Education***

- Video: Distance Learning, better professional development and increased parental school involvement could be implemented with video over IP applications between schools, colleges and homes.

  The school district currently uses IP video applications for educational purposes which is highly bandwidth intensive. To minimize network traffic, cache servers are installed at the local schools to run these applications and videos are distributed via the network overnight. A high-speed network accessible to all schools would help minimize server costs to run these applications.

- Security: VPNs would be required to securely implement group data sharing.
- VoIP: Voice Over Internet Protocol is desired. The existing data network infrastructure could be utilized to provide voice services to remote locations and minimize local service provider costs.

4. ***Health Care***

- Security: End-to-end service management such as VPNs will be required to establish specific networks and meet the requirements of the Health Insurance Portability and Accountability Act of 1996 (HIPAA).
- Remote Access/Telecommuting: High-speed reliable remote access is important to healthcare operations such as doctors accessing patient's files, hospitals sharing information and providing consulting services. A network that would support tele-medicine applications would enable patients to be monitored from home. Enhancing network service to all the area hospitals would increase the level of healthcare delivery.
- Storage: Healthcare organizations have a need for storage services in which to mirror and store critical business information remotely for disaster recovery purposes.

5. ***Residential Communities***

- Providing residential communities with the bandwidth necessary to support enhanced services and bandwidth intensive applications would enable the following:
  - Enhance resident's lifestyle and increase property value.
  - Working from home.
  - Distance Learning.
  - Smart home control and monitoring.
  - Tele-medicine.

- Cost effective and quality video TV for educational and entertainment purposes.

6. ***Entertainment: Sports Complex and Convention Center***

- Video: IP multimedia applications that pertain to sports entertainment such as streaming video, video conferencing and high bandwidth video up-link transport would be important to support the Sports Complex and Convention Center's Telecommunication needs. These types of connections are also applicable for the Super Bowl 2005 event for media organizations and broadcast networks.
- Remote Access: Employees and sport production staff require high speed VPN connections to support their business applications. High speed data connections to all Super Bowl affiliated hotels will also be very important.
- Wireless: Wireless network access would be beneficial to guests attending sporting events and conventions.

9.4 Duval County Public Schools

Steve Barrow, Supervisor-Data Communications
Paul Smith, Supervisor-Telecommunications
Date: November 13, 2002

Organization Overview:

Duval County Public Schools has 104 elementary schools, 25 middle schools, 17 high schools, 7 charter schools, 3 student centers, 2 academies of technology and 5 special schools. The school district has more than 129,000 students and 8,000 teachers. It is one of the largest school districts in the nation and is the second largest employer in Jacksonville.

Telecommunications Profile:

The Duval County infrastructure has complete (LAN, MAN, and Internet) connectivity for almost every school and office. The school's network (LAN/MAN) supports more than 30,000 users. The school's data center is the core area of the network and located in the TEAM Center building. The data center is the central location for servers, storage, SAP Business and applications.

- An OC-3 ATM backbone connection interconnects the TEAM Center and Administration Building.
- The district is divided into five geographical regions. The school regions are used as intermediate distribution points to the schools and centers. Each region is interconnects the TEAM Center and Regional schools with BellSouth Frame relay circuits. Two DS3 circuits feed the TEAM Center and one T1 circuit feeds each of the five regions.
- AT&T Broadband provides one DS3 for Internet services.
- AT&T Broadband provides back up circuits and interconnects the Team Center with the Regional schools.

Data is the primary traffic on the network followed by voice. The LANs currently 100 Mbps switched full duplex. The internal network uses 60% to 80% of the total capacity. QOS has been implemented manage bandwidth. The external network uses 10% of the total capacity.

The school district uses several applications for educational purposes. IP videos are the most bandwidth intensive applications. To minimize network traffic, cache servers are installed at the local schools to run these applications. Videos and other intensive bandwidth applications are ordered in advanced and distributed via the network over night from the TEAM Center.

Telecommunication Master Plan Expectations:

A City / Countywide interconnected network is important to the school district. It would provide access to bandwidth that wasn't available before and support applications such as IP/TV applications.

- A countywide network that would enable students not able to attend school to interact with teachers and other students.
- Provide dark fiber to allow point to point connections between schools and government to school.
- Cost savings.

The Telecommunications Master Plan should provide an integrated relationship between Duval County Public Schools and the City of Jacksonville for the betterment of education.

John Fryer, Duval County Public Schools Superintendent stated: "Technology applications in Duval County's School District have grown exponentially over the past four years. Both the architecture and "pipes" that were considered adequate a few years ago are now woefully lacking. Many educational applications now require enormous bandwidth to realize their full potential. The power of full motion video and various interactive programs, for example, demand much more than our current system can provide. These needs also collide with increased reliance on networking to bring the district's business applications into the 21st Century. Distance learning and communication with district employees, students and stakeholders will put additional burdens on an already stressed system. We in the Duval County strongly advocate adoption of the proposed gigabit Ethernet as an important solution to our urgent needs."

9.5 Jacksonville University

Eddie Christian
Two other IT personnel
Date: November 15, 2002

Organization Overview:

The Jacksonville University is the second largest 4-year college in Jacksonville. It supports both on campus and commuting students. Total enrollment is approximately 3,000.

Telecommunications Profile:

The following summarizes the School's current and future telecommunications requirements and applications:

- Current voice service provider is BellSouth.
    - The PBX is from Siemens and was bought directly from Siemens.
    - The campus ethernet network provides IP trunking between the main PBX and remote shelves spread across the various campus buildings.
- Data services come from Sprint via 3 X T1s as a managed service
    - Approx. monthly cost is $2800/month
    - WAN access is almost exclusively used for internet access and very little traffic goes out to vendors or other schools.
- The campus LAN supports approximately 2000+ connections. The ethernet equipment is all from HP.
    - There are separate VLANS separating the administrative from student networks.
    - The campus backbone is a mix of 1 Gb/s and 100 Mb/s ethernet trunks all of which homerun in a hub and spoke back to the Founders Bldg.
    - All desktops across campus are now 100 Mb/s.
        - Most faculty & staff PCs are desktops.
        - There is roughly a 50/50 split between laptops and desktops being used by the students.
    - There is a small amount of 802.11B wireless access in several locations on campus. The wireless equipment is from Oronoco.

Current applications and services consist of:

- "Normal" academic and administrative applications.
- The IP network is used to transport building control system traffic.
- A separate non-IP/proprietary network is carrying video surveillance traffic from various locations around the campus.
- Remote access via VPN links are provided only for faculty use at this time.

- Remote access via dial up links is provided for everyone.
- Almost all on campus systems can be accessed remotely via a browser interface.
- A firewall has been installed to address security issues.

The following are future services and applications Jacksonville University would like to support via new network services:

- Video streaming to enhance the distance learning offerings.
- Video streaming to enable more collaboration with other universities.
- Webcast of various school events.

Jacksonville University is generally satisfied with their existing services but wants more bandwidth. The additional bandwidth must come at a cost lower than their current monthly cost or they won't be able to justify the new service.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be an important marketing tool for Jacksonville University. They will be able to increase their competitiveness, increase their collaborations, and increase streamlining of services through online offerings.

Jacksonville University would like the new network to have the following capabilities:

- Provide a network that would meet the future bandwidth requirements at lesser costs than current services.
- Provide a network that would support IP multi-media applications such as steaming video, video conferencing, distance learning and webcasting.
- The plan should enable employees, students and other institutions to access appropriate resources via a remote high-speed VPN connection. Having and available managed VPN service would be easier to adopt as it would require less internal support resources.
- The plan should enable users/customers to access all facility multimedia resources remotely.

The network should enable new revenue generating services.

9.6 University of North Florida

Lance Taylor, Director of IT
Kathy Hughes, Assoc. Director of IT.
Date: November 18, 2002

Organization Overview:

The University of North Florida is the largest 4-year college in Jacksonville. It supports both on-campus and commuting students. Total enrollment is approximately 14,000.

Telecommunications Profile:

The following summarizes the School's current and future telecommunications requirements and applications:

- Current provider is BellSouth.
- Voice services are supplied via Centrex services.
    - UNF is investigating installing their own voice switch.
- Data services are transported via a DS3.
    - Approx. monthly cost is $13,000/month.
        - This is near the high end budget limit.
    - This is a recent upgrade from a fractional DS3 from AT&T.
- The campus LAN supports approximately 5800 connections with roughly 4000 on the admin vlan and 1800 on the student vlan.
    - The campus backbone is an ATM OC48 running on Marconi ATM equipment.
    - There are OC3 links to most buildings with Marconi ATM/ethernet edge switches.
    - Most desktops across campus are now 100 Mb/s.
        - Most faculty & staff PCs are desktops.
        - There is roughly a 50/50 split between laptops and desktops being used by the students.
    - A pilot wireless network has recently come online. This will be expanded as the budget allows.

Current applications and services consist of:

- "Normal" academic and administrative applications.
    - Almost all the administrative applications are hosted remotely on the University of Florida campus in Gainesville, Florida.
- Initial set of ERP/CRM applications are streamlining registration and other functions.
- Distance Learning applications currently are being used for 12 classes.
    - The application supporting this is called Blackboard and uses mostly stored content.
    - Not much streaming video is currently being used, nor is it being asked for.
- A firewall has been installed to address security issues.

The following are future services and applications UNF would like to support via new network services:

- Expansion of their ERP/CRM capabilities. This would likely be done via off campus hosting which further increases the need for the high-speed metro network.
- Video streaming to enhance the distance learning offerings.
- Webcast of various school events.
- They eventually want to connect the adjacent R&D Business Park to the campus backbone.
- With a capable network, they would consider the possibility of more collaborative activities with other universities.

UNF is generally satisfied with their existing services but could always use more bandwidth. The additional bandwidth must come at a cost lower than their current monthly cost.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be an important marketing tool for UNF. They will be able to increase their competitiveness with increased network access and increased streamlining of services through online offerings.

UNF would like the new network to have the following capabilities:

- Provide a network that would to meet the future bandwidth requirements at equal or lesser costs than current services.

- Provide a network that would support IP multi-media applications such as steaming video, video conferencing, distance learning and webcasting.
- The plan should enable employees, students and parents to access appropriate resources via a remote high-speed VPN connection.
- The plan should enable users/customers to access all facility multimedia resources remotely.
- The network should enable new revenue generating services.

9.7 Florida Community College at Jacksonville-Technology Division

Dr. Robert Rennie, Vice President
Dr. Norman Schussler, Associate CIO
Date: November 14, 2002

Organization Overview:

Florida Community College at Jacksonville (FCCJ) has more than 80,000 enrolled, teaches more than 200 courses and has five campuses and five centers throughout the Jacksonville area. FCCJ is the second "most wired" community college in the nation and has been designated a Cisco Academy Training Center.

Telecommunications Profile:

The FCCJ infrastructure has complete (LAN, WAN, and Internet) connectivity for every campus, center, classroom, and office.

Computing and software systems today demand the ability to access a large amount of information available such as interactive resources (Interactive Video over IP, e-mail, and on-line forums). This is implemented through local, metropolitan, and wide area networks that interconnect to students, staff, machines, and other resources. These networks consist of fiber optic, copper, and wireless transmission media and switches, routers, and servers.

FCCJ's network supports WAN/MAN supports 20,000 users:

- 45 Mbps Frame Relay Internet access services by BellSouth at $139,000 annually.
- Demand is expected to grow 4 times in the next two years. BellSouth provides fiber infrastructure interconnections.
- FCCJ is satisfied with BellSouth WAN/Internet Services.

- The network is only slow during registration periods.
- The out bound applications are Open web, FTP, and Mail.
- The inbound applications are web access and courseware.
- Network security involves:
  - Firewall to the internet.
  - DMZ for contract vendors.
  - VPN for remote staff using third party ISP.
- Internet II external connection will be available at 15 Mbps for non-commercial use (military, medical, education and government).

FCCJ has several LANs within each campus and supports all applications.

- 1.54/100/1000 Mbps to the computer.
- Applications are Web, email, 3270, FTP, file sharing, chat, educational course using video IP.
- Operating cost is $270,000 annually for FCCJ LANs. This does not include video or Internet.
- Verify satisfied with LAN. The network consists of Cisco equipment that provides excellent bandwidth management.

The FCCJ wireless campus infrastructure gives faculty, staff, and students the ability to take advantage of network and Internet in between classes. The wireless network technology is Cisco Aironet 801.11b throughout FCCJ. One Campus uses directional wireless. A wireless gateway is being installed for security.

FCCJ network wireless needs continue to grow and would use a citywide 802.11b wireless network if available.

Telecommunication Master Plan Expectations:

FCCJ would be interested in using a county wide interconnected network if it could meet bandwidth needs and provide some guarantee. If the bandwidth could be provided in a point to point fashion, it would help reduce telecommunications cost and FCCJ customers would use it widely. The point to point connections would provide a guaranteed throughput to all locations.

- A majority of employees work from home using dial up and VPN using DSL or cable modems. This limits the ability to utilize all the applications available and affects employee efficiencies. A countywide network that would be able to support today's applications to homes and businesses will be important.
- Provide dark fiber to allow point to point connections between businesses and colleges with reasonable maintenance cost and guaranteed reliability and uptime.
- The County network would not provide any cost savings but could provide cost avoidance of approximately $300,000 per year.
- Due to insufficient bandwidth available to users at homes and businesses, application development is slow.

Norman Schussler feels the telecommunications plan will be important for the city and will provide a direction for the city to go in. "If you don't know where you're going, you'll end up somewhere else" Yogi Berra.

9.8 Bishop Kenny Catholic High School

John Taylor, Technology Coordinator
Date: November 19, 2002

Organization Overview:
Bishop Kenny High School is the largest high school in the Catholic Diocese of St. Augustine. All the catholic schools run independently of each other although most the schools have similar computing and communications services.

All the schools are very short on money and are very cautious when it comes to technology and communications service expenses. The school's current technology budget totals $200K. The computing and technology services are supported by two individuals only.

Telecommunications Profile:

The following summarizes the School's current and future telecommunications requirements and applications:

- Current provider is BellSouth. A single DSL link supports data access for the school. This link costs $50/month. Higher speed services are wanted and have been investigated but have been determined to be too expensive.

- Most of the computing and communications technology is from HP.
- Most desktops are 100 Mb/s. The LAN trunks are 100 Mb/s with MLT for higher trunk speeds.
- No wireless access is currently provided but the students want this access badly, along with the ability to bring their laptops to school.
    - The budget won't support this right now and there are also security concerns.
- Approximately 300 total PCs are on the network.
    - No student laptops are allowed on campus at this time.
- There are numerous occasions when external network access is slow.

Current applications and services consist of:

- "Normal" academic and administrative applications. Administrative and academic applications are centralized.
- Remote access is only provided to faculty and staff for email purposes.
- No VPN or dial up remote access is provided to faculty, students or parents.
    - VPN services are wanted by all but will likely only be provided to the faculty towards the end of the 2002-2003 school year. These services will not be provided to students and parents in the near term due to lack of support resources.
- The School's website is hosted remotely but is administered by the schools support staff.
- Currently, no distance learning is supported between remote campuses or external institutions.
- A firewall has been installed to address security issues and will likely support VPN access for the faculty and staff later this school year.

The following are future services and applications Bolles would like to support via new network services:

- Distance learning is of interest but they fear the costs may be too high. Their initial interest is to deliver these services within the diocese and later between external institutions.
- They want to be able to use video streaming and video conferencing for marketing and recruiting purposes.
- Webcast of various school events.

The Bishop Kenny is generally satisfied with their existing services but need more bandwidth with costs similar to what they are currently paying. Clear cost benefits would need to be seen before the school would invest more money in equipment or services associated with the new network.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be an important marketing tool Bishop Kenny and the other diocese schools. At first, it will likely be used just for marketing purposes to be able to say that they have access to new communications services. As the financial models prove out, they will subscribe to new services that reduce costs or boost revenues.

While financial analysis would need to be completed, Bishop Kenny would like the new network to have the following capabilities:

- Provide a network that would to meet the future bandwidth requirements at significantly lower costs.
- Provide a network that would support IP multi-media applications such as steaming video, video conferencing, distance learning and webcasting.
- The plan should enable employees, students and parents to access appropriate resources via a remote high-speed VPN connection.
- The plan should enable users/customers to access all facility multimedia resources remotely.
- The network should enable new revenue generating services.
- The network should significantly cut service costs.
- Bishop Kenny's biggest problem that won't be addressed by this plan is the need for more money to employ more tech support personnel.

9.9 The Bolles School

Dr. Trainer, President
Ed Stopyra, Sr. Associate Head of School
Paul Solley, Technology Director
Frank Adset, Academic Director
Date: November 20, 2002

Organization Overview:

The Bolles School is the largest and most prestigious non-parochial school in Northeast Florida. The school supports grades K-12 across three separate campuses throughout

greater Jacksonville. One of these campuses is outside the Duval County Limits and is located in Ponte Vedra, a beach town in adjoining St. Johns County.

The school attracts students from great distances due to the academic and athletic reputation. It also has international students which are supported via the school's boarding program which currently handles approximately 100 students.

While the school does have considerable funding, all expenses are evaluated on an ROI basis. Technology projects are closely scrutinized to ensure they are delivering true returns versus being pursued simply for "technology's sake".

Telecommunications Profile:

The following summarizes the School's current and future telecommunications requirements and applications:

- Current provider is BellSouth. The school is able to take advantage of State Contract pricing for telecom services. Their communications services bill totals $3200 per month.
- Internet access is provided through a centralized fractional T1 (384 Kb/s) frame relay link.
    - This link does not have enough capacity but faster services have been rejected due to cost issues.
- Voice services and data services share bandwidth on T1s between the campuses.
- There are approximately 400 PCs supported across the three campuses.
    - These are faculty, staff, and lab PCs. Students are not allowed to bring personal PCs on campus, with the exception of PCs in the dorm rooms of the boarding students.
- Almost all desktop connections are still 10 Mb/s and the LAN trunks are 100 Mb/s. They only have one small wireless LAN on the main campus.

Current applications and services consist of:

- "Normal" academic and administrative applications. Administrative applications are centralized and most academic applications are local to each campus.
- Remote access is only provided to faculty and staff for email purposes.
- No VPN or remote access is provided to students or parents.
- Currently, no distance learning is supported between remote campuses or external institutions.
- A firewall has been installed to address security issues.

The following are future services and applications Bolles would like to support via new network services:

- Distance learning for professor development and possibly for export to external institutions. Not interested in this for internal student use as they pride themselves on the high degree of face to face interaction between students and faculty.
- Video streaming.
- Webcast of various school events.

The Bolles School is generally satisfied with their existing services but need more bandwidth at a lower cost than is currently available. Clear cost benefits would need to be seen before the school would invest more money in equipment or services associated with the new network.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be an important marketing tool for The Bolles School. At first, it will likely be used just for marketing purposes to be able to say that they have access to new communications services. As the financial models prove out, they will subscribe to new services that reduce costs or boost revenues.

While financial analysis would need to be completed, Bolles would like the new network to have the following capabilities:

- Provide a network that would to meet the future bandwidth requirements at significantly lower costs.
- Provide a network that would support IP multi-media applications such as steaming video, video conferencing, distance learning and webcasting.
- The plan should enable employees, students and parents to access appropriate resources via a remote high-speed VPN connection.
- The plan should enable users/customers to access all facility multimedia resources remotely.
- The network should enable new revenue generating services.
- The network should significantly cut service costs.

9.10 Jacksonville Fire and Rescue Department

Lorin Mock-Fire Operations Chief
Ken Devin- Lieutenant, Fire and Rescue
McKinley Boutte, Information System Specialist
Date: March 21, 2003

Organization Overview:

The Jacksonville Fire and Rescue Department (JFRD) serves an area of 840 square miles and population of 740,000. The JFRD is comprised of the following division services:

- Fire Prevention: The goals of the Fire Prevention Division are to reduce life and property loss through public education, code enforcement and fire investigations.
- Emergency Preparedness: Provides coordination of the Comprehensive Emergency Management Plan for the citizens of Duval County during disasters. In the event of a disaster, emergency preparedness collects, processes and coordinates information and develops immediate actions and short-term plans. These activities are coordinated from the Emergency Operations Center (EOC) located at the JFRD.
- Fire/Rescue Communications: The Jacksonville Fire and Rescue Communications Center (JFRCC) located at the JFRD serves the entire City of Jacksonville 24 hours a day and 7 days a week. All 911 Fire and Rescue calls go through the Communications Center to dispatch related emergency units.
- Fire Operations: Fire operations provide emergency medical, suppression of fire and containment of hazardous materials services.

The JFRD employs over 1,050 firefighters and has 55 fire stations. JFRD responded to over 4,008 fires and 70,238 EMS incidents in 2001. The average response time to an emergency site was 5.25 minutes for fire and 4.42 minutes for EMS.

Telecommunications Profile:

All communication networks are maintained and operated by the COJ's Information Technology Department.

The JFRD has two communications center that are critical to its daily operations, Jacksonville Fire and Rescue Communications Center (JFRCC) is utilized to dispatch units at fire stations and the EOC is utilized for emergency management as discussed above. The following describes current applications and network limitations.

- JFRD currently has a voice network between the JFRCC and all 55 fire stations. The PBX voice network will not support simultaneous teleconferencing between all fire stations. A voice network that would support simultaneous calls would improve communications before units are dispatched, especially in 2nd and 3rd alarm situations.. Third Alarms can involve coordinating over 17 fire stations and 60 units. A unit describes a fire truck, fire boat, hazardous material vehicle, etc.

Direct communications would also help maintain the original content of the message rather than going through traditional chain of command techniques.

- JFRD currently has a data network between the JFRCC and all 55 fire stations. Up to 19 fire station networks are connected to one T1. This is approximately equivalent to a 69 Kbps connection per fire station, which is inadequate to support current emergency management applications. In the event of a 3rd alarm fire, which can involve dispatching units from 17 stations, GIS maps and other bandwidth demanding information, can not be immediately obtained over the current network.
- Video Conferencing (currently not available) would be beneficial for the EOC in Emergency Preparedness and disasters. Video links to State and Federal agencies could be used to help more effectively describe the current situations.
- Video applications for training distributed from the JFRD to fire stations is currently not applicable over the current network and would be beneficial to the department.
- Wireless Data Network: Currently utilize a CDPD wireless network for text transmission and will not support GIS, Cameo Hazardous Material and other emergency applications. GIS applications could be utilized over a wireless network by a dispatched fire truck to locate fire hydrants in areas of new construction that is currently if not available on the current hardcopy maps. Hazardous material software applications could be utilize to test and examine potential hazardous materials remotely and if required, for prompt evacuations of local areas.
- Wireless voice network: Currently is 800 MHZ radio system used for dispatch communications.

Telecommunication Master Plan Expectations:

The City/County Wide Telecommunications Master is very important to JFRD. Fire and Rescue Communications could utilize the MAN to implement state of the art emergency management applications between fire department and stations. GIS applications could be applied over a state of the art network with immediate access to most current information. This would improve response times, location determination and most importantly save lives

Jacksonville's Fire Operations Chief Lorin Mock stated:

"Today's multi-hazard environment requires Fire and Rescue Department Incident Commanders to quickly and efficiently manage more and more information. The receipt, interpretation and dissemination of this data can literally mean life or death for field units and the citizens they protect. Properly supporting these critical decision-makers will require an increasingly robust data network. To that end the Department strongly

endorses the development of a Metropolitan Area Network design for the City of Jacksonville."

9.11 Jacksonville Police and Fire Pension Fund

Richard Tohee, Director of IT
Date: December 9, 2002

Organization Overview:

The Police and Fire Pension Fund distributes benefits to former Jacksonville Police and Fire personnel who have qualified to collect benefits and have since retired.

The Fund has very few online tools for the recipients use as the recipients are of a demographic group that does not utilize online resources. As such, there are no ways currently identified for the Fund to benefit from the new network and the services it will enable.

Telecommunications Profile:

The following summarizes the Police and Fire Pension Fund current and future telecommunications requirements and applications:

- Current provider is BellSouth for dial tone.
    - They have a Nortel Meridian PBX.
- Their application server is hosted in the ITD data center. A T1 link over the City's fiber network is the connection to the ITD data center.

Current applications and services consist of:

- Normal office automation applications with little interaction with organizations and systems outside the Fund.
    - The following are future services and applications the Police and Fire Pension Fund would like to support via new network services:
- None identified.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be of little importance to the Fund or their benefit recipients.

9.12 Jacksonville Sheriff's Office

Sheriffs Office, Beth Horn
Two other IT staff members
Date: December 12, 2002

Organization Overview:

The Sheriffs Office is the primary law enforcement agency in Jacksonville. This Agency interacts a great deal with the Public Defenders Office, the Circuit Court, the State's Attorney's Office, external law enforcement agencies and the jail. There are 14 remote facilities in addition to the main office. They currently rely on both terrestrial and wireless communications throughout the Jacksonville area.

Telecommunications Profile:

The following summarizes the Sheriffs Office's current and future telecommunications requirements and applications:

- Current provider is BellSouth for dial tone.
    - They have a Nortel Meridian PBX.
- Data services are delivered over mostly T1s to 12 of the remote sites. ISDN BRIs connect the remaining 2 locations.
- There is wireless access (CDPD) to each officer in the field roaming throughout the County. This wireless service is from AT&T. Currently the total number of remote accounts is roughly 1800.
- All desktops are 100 Mb/s.
- Currently only the IT staff has remote VPN access.
- Collaboration with external entities is currently facilitated via dial up only. The remote access server is administered by the internal IT staff.

Current applications and services consist of:

- Normal office automation applications.
- Specialized law enforcement applications and databases.
- GIS information that is unique to the Sheriffs Office which is not integrated or synchronized with the GIS data from other agencies.
- Manual printing, copying, transferring and filing of numerous documents that make up each case file.

The following are future services and applications the Sheriffs Office would like to support via new network services:

- There is a need for video conferencing between the Sheriffs Office, the Jail, the Court House, the State's Attorneys Office, and the Public Defenders Office for interagency collaboration. Video conferencing would also be used for remote education and training.
- There is a need for high-speed digital image transfers between the Sheriffs Office, the Public Defenders Office, the Jail, and the Clerk of the Courts Office.
- There is a need for high-speed VPN access for all the external agencies that collaborate with the Sheriffs Office.
- There is a need to integrate the Sheriffs GIS database with those of other agencies.
- There is a need for higher bandwidth capacity on the wireless network to enable such things are streaming video to & from field officers, remote finger print & picture matching/ID and other remote applications.
- There is a need for remote video surveillance for real time analysis as well as storage.
- There is a need for real time access to pawn shops for real time inventory control versus the current system of daily FTP uploads.

The Sheriffs Office wants significantly enhanced network services that they are currently not receiving. All the new services listed above could be enabled by the new network with the exception of the higher bandwidth wireless capabilities.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important to the Sheriffs Office. They will be able to significantly streamline their operations as well as the operations of other agencies they collaborate with.

9.13 Public Defenders Office

Joseph Frasier, CDSI Coordinator
Date: December 12, 2002

Organization Overview:

The Public Defenders Office provides legal defense to those individuals who cannot obtain legal counsel on their own. This Agency interacts a great deal with the Sheriff's Office, the Circuit Court, the State's Attorney's Office and the jail. Most of their resources are located in a single location but have communications with various external entities. The Office processes 40,000 to 50,000 cases per year which generates a tremendous amount of documents.

This agency will be relocating to the old Federal Courthouse building in the future.

Telecommunications Profile:

The following summarizes the Public Defenders Office current and future telecommunications requirements and applications:

- Current provider is BellSouth for dial tone.
    - They have a Nortel Meridian PBX.
- Data services are delivered over a single T1 which is tied into the City's existing fiber network which is administered by ITD.
- All desktops are 100 Mb/s.
- Their ethernet backbone is 100 Mb/s.
- The only remote access available is via a dial up remote access server.

Current applications and services consist of:

- Normal office automation applications.
- Manual printing, copying, transferring and filing of numerous documents that make up each case file.
- A failed attempt to implement an imaging system (CORIS) to streamline the manual processes mentioned above. This application turned out to be too complicated to use and was too expensive per seat to deploy.
- A firewall controls access to this network. This firewall is administered by ITD.

The following are future services and applications the Public Defenders Office would like to support via new network services:

- There is a need for video conferencing with the jail to support remote consultations between defendants and their attorney.
- There is a need for video conferencing with the Courthouse to support consultations between attorneys and judges.

- There is a need for video conferencing with the Courthouse to support consultations between attorneys and judges.
- There is a need for video conferencing capabilities at attorneys and judges homes to facilitate time critical and off-hours consultations.
- There is a need for high-speed digital image transfers between the Defenders Office, the Sheriff's Office, the Jail, and the Clerk of the Courts Office.
- There is a need for VPN access from employees' homes.

The Public Defenders Office wants significantly enhanced network services that they are currently not receiving. All the new services listed above could be enabled by the new network.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important to the Public Defenders Office. They will be able to significantly streamline their operations as well as the operations of other agencies they collaborate with. In addition to the new network services, they will need application programming support from ITD or other third party resources.

9.14 Jacksonville Electric Authority (JEA)

Wanyoni Kendrick, Vice President-JEA
Rich Powell, Project Manager- JEA
Charles Bayless Director of O&M Information Grid-JEA
Dates: November 14, 20, 25, 2002

Organization Overview:

JEA's (JEA) electric system currently serves more than 355,000 customers in Jacksonville metro area. JEA's water system serves approximately 192,000 water customers and 143,000 sewer customers.

JEA owns and operates three generating plants. A fourth power plant, is jointly owned by JEA and Florida Power & Light Company (St. Johns River Power Park) and operated by JEA.

Telecommunications Profile:

JEA Corporate production network (LAN/MAN) supports 3000 users. The network consists of different interconnected technologies between JEA Towers, Systems Operations Control Center (SOCC), Substations, Power Plants, Water Treatment Plants and numerous other government agencies. Internet service is provided by AT&T Broadband /Comcast.

JEA's ATM communications network is being converted to provide transport and switching networks comprised of SONET, Gigabit Ethernet (GigE) and Fiber Channels over metro DWDM. The network consists primarily of Cisco equipment.

The network organization has three levels:

- The Core Level: The core (located at the JEA data center) uses DMZs and Firewalls to control all traffic that enters and leaves the corporate network.
- The Main and Intermediate Distribution Levels: The main distribution level (located at the JEA data center) distributes traffic using high-end switches to intermediate switches (Intermediate Distribution Level) remotely located in JEA facilities (Substations and plants) throughout the metro area. The network supports the following applications:
- RTU Communications.
- 56 K Circuits.
- Inter-facility connections.
- Voice Communications.
- Broadcast IP over TV: IP over TV is distributed over the entire network, including remote sites. Cisco IP-TV technology is used with an average bandwidth of 1 Mbps.
- SCADA and PLC networks: Controls and monitors power and water plants.
- Wireless Network Meter Readings: Currently installing a wireless network technology to read all electric and water meters in the service area. A transmitting module installed in the meter transmits the read data to pole mounted devices call Micro Cell Controllers. Cell Masters installed at area substations collects the data from the cell controllers and sends data to a central hub on the network for reading. The readings are done in geographic sections in order to control network traffic.

A wireless network pilot using 802.11b technology is currently being planned. Licensed frequencies were considered. Estimates for each unlicensed user are $50 versus $350 for each licensed user.

The first phase of the wireless pilot involves the following:

- Coverage of the downtown area for public safety and security. JEA, JTA's trolley service, the city, police and fire departments will have network access.
- Primary Access points: Water Street Substation and Water Sewer Building.

The second phase of the pilot will include urban, commercial and residential districts.

JEA corporate production networks are supported by the following external connections:

- (2) T1 connections, AT&T Broadband @ $3,200/month.
- (1) 768K Frame Relay connections, AT&T Wireless (CDPD)@ $1,000/month average.
- Voice services: Information forth coming from JEA.

The core network backbone (gigabit Ethernet) is 1% utilized and the ATM network is 8 to 10% utilized.

- Network Management: When the average network traffic exceeds 10% of the total capacity, bandwidth is increased.

JEA's storage area network (SAN) alleviates congestion from the production network. The storage network is used to back up all databases to disk arrays using fiber channel.

JEA is currently planning a disaster recovery center, which will mirror data center operations. The disaster recovery center will be located within the System Operations Control Center (SOCC). The data will be transferred using a SAN.

The SOCC is the central control for:

- Electric and water plants
- Protective relaying and loading of the electric power grid

The Network Infrastructure:

- JEA has three fiber rings, North (OC-3), South (OC-12) and West (OC-3). The south and north rings are near capacity.
- JEA purchased new fiber that goes over the Acosta and Hart bridges.
- JEA installed new fiber infrastructure with JTA over the Acosta Bridge ((1) 4" conduit with 288 strands of single mode fiber, JEA and JTA will each own 144 strands. One inner duct is vacant).
- JEA fiber infrastructure consists of 8 to 144 strands of single mode fiber and 12 strands of multi-mode fiber. A typical raceway is (1) 4" conduit underground with (3) 1 ½" inner ducts. A hand hole is installed every 1,500 ft. A RFP is to being issued to verify this information.
- Joint trenching is done as much as possible.

- Florida Department of Transportation has a fiber infrastructure along the interstate highways in Jacksonville and JEA would consider sharing infrastructure resources.

Telecommunication Master Plan Expectations:

JEA doesn't believe their role is to provide retail telecommunications services based on the data that they have analyzed but will support the City and their decisions.

JEA is reality driven but realizes a better telecommunications infrastructure is required. The current telecommunications infrastructure seems disjointed with a large technology divide in Jacksonville between Government / Large Business Corporations and residential communities / small businesses.

For the betterment of Jacksonville in regards to telecommunications, JEA feels the highest priority should be given to the schools and government agencies.

JEA would like to see three business cases / models included in the study:

- Public.
- Private.
- Joint Public / Private.

The business cases should be creative and scalable. JEA is not looking for a model that is not feasible and concerned with studies that collect dust.

The expectations are the following:

- A common vision to bring everyone together in Jacksonville.
- Provide a grass roots support. This will be important and the interviews conducted by Black &Veatch with the different government agencies and businesses help to initiate this approach.
- Create a partnership between builders, businesses and city, state and federal government agencies.
- Address the disadvantaged areas within the county.

"The Telecommunications Master Plan will need to fulfill a vision that we can all embrace as a community," said Wanyonyi Kendrick, Vice President –JEA.

9.15 City of Jacksonville-Public Works Department

Lynn Westbrook, Director
John Pappas, Engineer
Date: November 13, 2002

Organization Overview:

Public Works is one of the largest departments within the City. Public Works provides infrastructure improvements to accommodate the growth of the community.

Public works has six divisions:

- Building Inspection Division: Approves plans, issues permits, for residential and commercial construction, and performs construction inspections.
- Engineering Division: Provides information on permitting, project tracking, land development, and specifications, for work within the city.
- Public Buildings.
- Real Estate Division: acquires, appraises and manages property owned by the City.
- Streets and Drainage Division: Plans, constructs and maintains streets, highways, and drainage facilities.

Telecommunications Profile:

Local Network access is provided by the Information Technology Division and the department is satisfied with the quality of service. The department does have a need for the following services and applications to help make their day to day operations more efficient:

- Contractors limited access to the network: Processing permits and performing inspections.
- Storage: Per city regulations, permitting requires 10 copies of each drawing package, which results in a large amount of space required to file these documents. A storage area network and shared remote storage would help minimize the amount of space to file these documents.
- Security issues are required in regards to limited access to the network and internal control of RFPs, bid lists, etc.
- Wireless access for remote users is unavailable. A wireless network would be beneficial for inspectors in the field processing permits and resolving permit issues on site with the use of digital pictures. 85,000 permits are issued and 200,000 inspections are performed each year. Traffic Engineering coordinates over 1,060 traffic signals in the metro area. Interfacing remotely with the traffic

management system would make traffic light coordination more efficient and more resolving traffic complaints. Sooner.

- Video conferencing: The Public Works Department interacts with the public daily. Face to face, interaction is very important. Full motion video would help increase public interaction and improve public relations. Currently video applications are not available.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important for Jacksonville to be on the cutting edge of technology and attract premiere businesses. City operations efficiency will be increased and save tax dollars to be used better.

This will also provide the necessary means to aide our department and the City of Jacksonville to communicate more effectively. "More problems are created because we do not communicate effectively," said Lynn Westbrook, Director of Public Works Department.

9.16 Jacksonville Transportation Authority

David Nicks, Chief Information Officer
Date: November 19, 2002

Organization Overview:

The Jacksonville Transportation Authority (JTA) is an independent agency that serves the metro area. JTA designs and constructs bridges and highways and provides mass transit services, which includes the skyway monorail, trolley, and shuttle services.

Telecommunications Profile:

JTA Corporate network (LAN/MAN) supports 170 users and the primary networks are:

- JTA CTC Operations.
- Skyway Operations / Maintenance.
- Bay Terminal.
- JTA Administration.

The LANs are interconnected using Fast Ethernet via JTA's single mode fiber and leased T-1 and ADSL connections from BellSouth. The DSL connection is $69/month.

Internet and firewall services are provided by the Department of Management Services in Tallahassee through a 512 K frame relay connection by BellSouth at $600/month.

A direct fiber connection to JEA is being installed. JTA's network will be consolidated and Internet services will be accessed through JEA's network. Also, having the two networks interconnected will increase operating efficiencies by having access to permit information and GIS applications.

Contract professionals can access engineering documents and other related information on a FTP server via limited and controlled network access.

Current applications are transferring engineering documents and financial applications.

- JTA has two wireless LAN networks in two buildings using Aero-network.
- JTA has an important need to have a common interconnected fiber and wireless network that would support bandwidth intensive applications. JTA interacts with the DOT, Public Works, JEA, City Government, Police and Public Safety. A common network in which to share common files would increase operating efficiencies and increase quality of communications.
- A fiber and wireless network that would support Video over IP applications would be beneficial to JTA. These applications would be used on mass transit systems for security and liability issues and used for road, bridge and property inspections.
- Wireless network along the mass transit pathways would provide customers network access during commutes.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important for JTA and the City. A network infrastructure with a universal design that can adapt to future technologies, needs and applications will create infinite opportunities. For example, a network infrastructure that could support a separate and isolated network for all City authorities and agencies to be used in emergencies, such as city evacuations in event of hurricanes.

9.17 State Attorneys Office

Marleen Hayes, Director of IT
Date: December 13, 2002

Organization Overview:

The State Attorneys Office provides a variety of legal resources for all actions passing through the court system. This Agency interacts a great deal with the Sheriff's Office, the Circuit Court, the Public Defenders Office, Probation and Parole, the Court Administrators Office, the Department of Juvenile Justice and the jail. Their resources are located in 6 other locations in addition to their main office. They also have extensive communications with various external federal and state entities. The Office processes tens of thousands of cases per year which generates a tremendous amount of documents.

This agency will be relocating to the old Federal Courthouse building in the future.

Telecommunications Profile:

The following summarizes the State Attorneys Office current and future telecommunications requirements and applications:

- Current provider is BellSouth for dial tone.
    - They have Nortel Meridian PBXs.
- Data services are delivered over a fiber link to the ITD data center and by T1s from BellSouth which link to all the other remote locations.
- Roughly half of the desktops are 100 Mb/s and half are still 10 Mb/s
- The only remote access available is via a dial up remote access server which is hosted at the ITD data center. A request to for VPN access has been issued to ITD quite a while ago.

Current applications and services consist of:

- Normal office automation applications.
- Currently the case tracking system is hosted on the City's mainframe. This will migrate to a new client/server based application in May 2003.
- Manual printing, copying, transferring and filing of numerous documents that make up each case file.
- There are remote applications and database servers at each remote location to ensure the users get proper performance when accessing the servers.
- A firewall controls access to this network. This firewall is administered by ITD.

The following are future services and applications the State Attorneys Office would like to support via new network services:

- There is a need for video conferencing with the jail, Sheriff's Office, the Circuit Court, the Public Defenders Office, Probation and Parole, the Court Administrators Office, the Department of Juvenile Justice, their other remote locations and with the external state and federal agencies they work with. The video services would support remote consultations, remote appearances in front of a judge, defendant interviews, expert witness depositions and testimony delivery, training and a host of other uses.
- There is a need for high-speed digital image transfers between the jail, Sheriff's Office, the Circuit Court, the Public Defenders Office, Probation and Parole, the Court Administrators Office, the Department of Juvenile Justice, their other remote locations and with the external state and federal agencies they work with.
    - In addition to the digital image transfers, there is a need for an e-filing system that is integrated into all the operations of the above mentioned entities.
- There is a need for VPN access from employees homes and from other remote locations to allow higher speed access to all internal resources.

The State Attorneys Office wants significantly enhanced network services that they are currently not receiving. All the new services listed above could be enabled by the new network.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important to the State Attorneys Office. They will be able to significantly streamline their operations as well as the operations of other agencies they collaborate with. In addition to the new network services, they will need application programming support from ITD or other third party resources.

9.18 Clerk of the Courts Office

Deloris Battinelli, Asst. Chief Clerk of the Court
Jim Fuller, Chief Clerk of the Court
Two Additional IT Staff Members
Date: December 11, 2002

Organization Overview:

The Clerk of the Courts Office processes all paperwork and schedules all legal events as cases move through the court system. They additionally act as the depository and processing agent for things such as property deeds and titles, evictions, etc.

This Agency interacts a great deal with the Sheriff's Office, the State's Attorney's Office, the Public Defenders Office and the jail. In addition to the mail location, they have 8 remote locations where information is shared and have communications with various external entities. Two of the remote locations are in 2 adjoining counties which are also part of the 4th Circuit Court.

This agency will be relocating to the new Courthouse building in the future.

Telecommunications Profile:

The following summarizes the Clerk of the Courts current and future telecommunications requirements and applications:

- Current provider is BellSouth for dial tone.
    - They have a Nortel Meridian PBX.
- A T1 connects to 1 of their remote locations and the others are served with fractional T1s'.
- 7 of the 8 remote locations are shared facilities with the Tax Collectors Office. Both physical space and network resources are shared between the 2 organizations at these remote locations.
- All desktops are 100 Mb/s.

Current applications and services consist of:

- Normal office automation applications.
- Manual printing, copying, transferring and filing of numerous documents that make up each case file. The volume of paperwork processes is enormous. The Clerks Office processes between 350,000 and 520,000 traffic violations per year in addition to all the criminal cases that must be processed.
- There are some online ticket processing applications today but these services are only utilized in about 20% of the tickets issued.

The following are future services and applications the Clerk of the Court would like to support via new network services:

- There is a need for video conferencing with the jail, Public Defenders Office, State's Attorneys Office, and external agencies. This would reduce the amount of overhead each agency currently must carry just to handle the transferring of people between facilities for such things as criminal arraignments.
- There is a need for high-speed digital image transfers between the Defenders Office, the Sheriff's Office, the Jail, and the State Attorney's Office and external

agencies. This would reduce the amount of overhead needed to transfer and process the large paperwork volumes associated with the Court's caseload. This would also reduce overhead associated with other tasks such as title searches.

- There is a need for VPN access from various external entities to speed access to all the data the Clerks Office processes. In addition to VPN access for internal resources and external agencies, the Clerks Office wants to move to a paperless operation (as much as possible) and have the public access various records over the internet and through various CRM application interfaces.
    - Just decreasing the number of "call in" ticket payments and changing these to online payments will save the Court $9.50/ticket in processing fees from the organization that call in payments are outsourced to.
    - The Clerk wants to implement e-filing systems for things such as small claims, deed recordings, evictions, title searches, etc.
    - Adding these capabilities will require a significant programming effort that could be outsourced to external entities other than ITD to help speed the process and reduce costs.

The Clerk of the Court wants significantly enhanced network services and numerous new online service applications that are currently not available. All the new services listed above could be enabled by the new network.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important to the Clerk of the Court. They will be able to significantly streamline their operations as well as the operations of other agencies they collaborate with. In addition to the new network services, they will need application programming support from ITD or other third party resources.

9.19 Jacksonville Regulatory Services Office

Mario Taylor, Director of Regulatory Services
Date: December 6, 2002

Organization Overview:

The Regulatory Services Office is responsible for formulating, administering and enforcing all regulations related to telecommunications services and environmental issues. This office oversees the current cable franchise agreement with AT&T Broadband/Comcast. This office has been working very closely with other parts of the

City Government to try to resolve the numerous problems that have been encountered with AT&T Broadband's performance.

This office is in the process of rewriting various ordinances that will help ease the process of the City building the new network by broadening and streamlining the powers of the Regulatory Services Office.

This office will be one of the main enabling entities that help coordinate between the various service provider organizations that will ultimately partner with the City. Questions regarding current and future ordinances affecting the network construction and service delivery should be directed to this office.

Telecommunications Profile:

N/A

Current applications and services consist of:

N/A

The following are future services and applications the Regulatory Services Office would like to support via new network services:

- Any services that are desired by the potential customer base. Additionally, all future services not yet identified that will help ensure the success of this network initiative.

Telecommunication Master Plan Expectations:

N/A

9.20 Supervisor of Elections

Marilyn Bernard, Director of Information Technology
Date: December 10, 2002

Organization Overview:

The Supervisor of Elections Office is responsible for coordinating and administering all activities associated with public elections. All their operations are housed in their main location and a remote warehouse except during the elections when personnel are dispatched to all the remote voting precinct locations to execute voting activities in the field.

Telecommunications Profile:

The following summarizes the Supervisor of Elections Office current and future telecommunications requirements and applications:

- Current provider is BellSouth for dial tone.
    - They have a Nortel Meridian PBX.
- Their application server is hosted in the ITD data center. A T1 link over the City's fiber network is the connection to the ITD data center.
- During an election, 300 PCs are dispatched to the voting precincts in support of the local voting activities at each location. These PCs are loaded with a static image of the registered voters database relating to a specific precinct.

Current applications and services consist of:

- Normal office automation applications.
- Applications to help tabulate the voting results.
    - These applications and servers will likely be administered in house in the next 2 – 3 years.
- A database application that houses all the voting registration data.

The following are future services and applications the Supervisor of Elections Office would like to support via new network services:

- There is a need for temporary network access to be provided to each of the remote voting precinct locations. This would allow for real time access to the voter registration database instead of the current method of having multiple, static copies of the database being loaded onto the PC used at the precincts. Having multiple copies introduces the chance for having errors in one or more of the databases.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important to the Supervisor of Elections if it enables temporarily linking to remote voting precinct locations during times of elections.

9.21 Jacksonville Housing Authority

Tom Strother, CIO
Two other IT staff members
Date: December 12, 2002

Organization Overview:

The Jacksonville Housing Authority provides housing assistance to those needing help and administers the City's public housing programs.

The Authority does collaborate with the City but is a State chartered agency and is not directly controlled by, or answerable to the City government. They are also not obligated to use the services available from ITD but can exploit these services if they choose to do so.

In addition to the main building, the Authority has roughly 20 remote locations throughout Jacksonville, each with 2 or 3 employees. The Authority employs a total of 300 at this time.

Telecommunications Profile:

The following summarizes the Jacksonville Housing Authority's current and future telecommunications requirements and applications:

- Current provider is BellSouth for dial tone. For those remote locations near the Pearl St CO, the voice services are delivered by "essex" lines at a cost of $30 per month, per line.
    - The main facility has 2 X T1s for phone services.
    - The remote warehouse has a single T1 tie line for phone services.
- Data services are delivered over data circuits also provided by BellSouth.
    - The main facility has 1 X T1 for data services.
    - The remote warehouse has 1 X T1 for data services.
- Total telecommunications cost per month are $9000.

Current applications and services consist of:

- Normal office automation applications.
- Frequent reporting to HUD is supported via their external T1 circuit.

The following are future services and applications the Housing Authority would like to support via new network services:

- They see significant value in being able to deploy video surveillance technology into their various housing projects. This would be used for both real time monitoring as well as event archival which could be accessed at a later date if necessary by both Housing Authority and law enforcement personnel.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be of moderate importance to the Housing Authority initially but would likely enable new services and applications in the future.

9.22 Property Appraisers Office

Tony Puskar, Director of IT
Date: December 12, 2002

Organization Overview:

The Property Appraisers Office provides property residential and commercial property appraisals for the purpose of collecting property taxes.

This Agency is currently suffering from a political battle with the Mayor's Office. While this Office is directly responsible to a State Agency, their operational funding and support comes from the City.

All the operations for the Property Appraisers Office are located within a single building. Much of the Offices data though does need to be accessed by external organizations and individuals.

Telecommunications Profile:

The following summarizes the Property Appraisers Office current and future telecommunications requirements and applications:

- Current provider is BellSouth for dial tone.
- They have a Nortel Meridian PBX.
- Data services are delivered over a fiber link to the ITD.

Current applications and services consist of:

- Normal office automation applications.
- There is a web-based application that is hosted by ITD that enables remote access to property value data.
- This Office is currently implementing their own internal GIS system that will only be used by in house personnel. This data is not integrated or synchronized with other Agencies' GIS systems. It is currently not practical to have the systems

integrated as they are not physically collocated and the network links between the systems don't have enough capacity to support the large image transfers between systems.

- A firewall controls access to this network. This firewall is administered by ITD.

The following are future services and applications the Property Appraisers Office would like to support via new network services:

- There is a need to integrate and consolidate the GIS systems from various agencies. This will greatly reduce capital costs, operational costs, duplication of data, and will reduce erroneous data existing in different databases. It has been observed that no one person at the City level or at an Agency level is driving this issue.

The Property Appraisers Office wants to see citywide integration of the various GIS systems. The new network will help accomplish this goal but must be supplemented with new applications and programming services.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important to the Property Appraisers Office, only if it ultimately results in integration and consolidation of the various GIS systems. This consolidation and integration will significantly streamline their operations as well as the operations of other agencies they collaborate with. In addition to the new network services, they will need application programming support from ITD or other third party resources.

9.23 City of Jacksonville Traffic Engineering Division

Fred Kyle - Division Chief Traffic Engineering
Don Fullerton-Traffic Signals Engineer
Date: March 21, 2003

Organization Overview:

Traffic Engineering is one of six divisions within City of Jacksonville Public Works Department. Public Works is one of the largest departments within the City, second to Fire & Rescue. Traffic Engineering operates and maintains over 1,060 traffic signals in Duval County.

Telecommunications Profile:

Traffic engineering monitors and controls traffic signals from a control center using a dedicated closed looped network. Traffic signal coordination involves coordinating two or more traffic signals at different intersections so vehicles make the least number of stops possible. This is accomplished using a network that links sensors to a traffic management system. The management system measures traffic volume, speed and density. Currently no video cameras are used. The Traffic Control Center is located 4 miles west of the downtown area.

The following describes current applications and network limitations.

- Traffic Engineering operates and maintains 1,060 traffic signals. Approximately 424 or 40% of the traffic signals are interconnected and operated remotely using a Traffic Management System. QuickNet, Peek Traffic, and Aries are the management systems currently used.
- The Jacksonville's downtown area has 140 traffic signals connected to the control center using fiber optic cables. The traffic signals are interconnected with multi-mode fiber and organized into 5 zones. Fiber is connected from each of the five zones to a telecommunications room in the Police Memorial Building. Traffic Engineering utilizes their own SONET system to transport traffic data from the Police Memorial Building to Traffic Engineering Control Center.
- The remaining 284 countywide traffic signals are remotely controlled by using dial-up connections to master controllers located at traffic signal intersections. A master controller connects approximately 10 adjacent signal intersections using multi-mode or single mode fiber. The dial up connection currently is too slow to adequately support current applications.
- Two common types of traffic management plans are implemented in Jacksonville: Time of Day and Traffic Response.
  - Time of Day is implemented based on the traffic trends during certain times of the day, such as rush hour. It is reactive plan that controls traffic signals local to the intersection. Over 600 traffic signals are not remotely controlled and must be sequenced manually for optimal traffic flow. This can create traffic congestion problems, especially during times of unexpected traffic flow.
  - Traffic Response can be implemented using a traffic management system. It proactively controls traffic by collecting data at multiple intersections along a common highway or street. Traffic signals can automatically be adjusted to accommodate larger volumes of traffic before congestion occurs.
- Approximately 92 fiber connections would be required to connect all traffic master controllers to the Traffic Control Center. (There are 1,060 traffic signals with 140 currently connected with fiber to the control center. One fiber connection is required per master controller. One master controller connects approximately 10 traffic signals). Traffic Engineering has explored using JEA fiber to make these connections but no decisions have been made.

- The Better Jacksonville Plan is providing conduit and single mode and multimode fiber between intersections to interconnect traffic signals.
- A fiber network connected to all traffic signals would allow video cameras and the latest traffic management applications to implemented.
- A fiber network connected to all traffic signals would help optimize traffic flow and decrease traffic congestion, especially along University and Beach Boulevards, which only has partial coverage.
- Plans are currently being made to connect Traffic Engineering to FDOT's Intelligent Transportation System (ITS), which monitors some of the interstate highways using sensors and video cameras. This effort will improve interstate and highway coordination.

Telecommunication Master Plan Expectations:

The County Wide Telecommunications Master Plan is important to Traffic Engineering and Jacksonville Metro Area. Transportation is vital to Jacksonville's infrastructure and economy and involves managing traffic on highways and streets. The COJ's traffic engineering coordinates over 1,000 traffic signals and in order to implement efficient traffic flow, coordination is required between Traffic Engineering, FDOT, JTA and JEA.

An accessible countywide MAN could cost effectively extend fiber to all traffic signals and expand ITS. This would provide the potential for all area governments involved with transportation management to be integrated using state the art applications to improve the overall metro traffic environment. Web cams at congested intersections could be installed so people could check on traffic and make alternate route plans before leaving home. Traffic could be monitored and automatically adjusted for better traffic flow as well as improving Jacksonville's bus and shuttle schedules.

Traffic Engineering Division Chief Fred Kyle stated: "A MAN that would interconnect all traffic signals with fiber optics into one common network would aid in stabilizing traffic flow and provide the means for real time interactive traffic control and monitoring. This would undoubtedly improve the overall traffic welfare for the general public".

9.24 City of Jacksonville Office of the City Council Auditor

Robert Johnson, Council Auditor
Richard Wallace
Jeff Clements
Alison Luker
Date: November 14, 2002

Organization Overview:

The Council Auditor examines the accounting systems used by all offices and departments of the city government and agencies. The Auditors Office submits reports and financial statements to the City Council to help improve the effectiveness of the local government.

Telecommunications Profile:

Network service is provided by the Information Technology Division and satisfied with the quality and quantity of services. The network performance is slow at the beginning of the day when everyone is accessing the network to read e-mail. The current applications are audit software that requires access to large databases, email, and Microsoft applications.

The department does have a need for the following services and applications to help make their day to day operations more efficient:

- Wireless Network: Audits are done throughout the metro area and can take several weeks to complete. Having remote network access would increase communications for staff out in the field and minimize time to perform audits by having access to databases on the COJ network.

Telecommunication Master Plan Expectations:

The Telecommunications Master Plan will be important for the community and would like the following items to be addressed or taken into consideration:

- The plan should enable employees to be able to work from home. Residential communities should be provided with the bandwidth necessary to support enhanced services and support bandwidth intensive applications. An alternate cable TV provider should be considered.
- Limited government involvement. The Jacksonville government should provide the leadership for the planning stages but have limited ownership of the network.
- A network should be built based on what the user will practically use.
- The study should provide a practical plan that would increase quality and quantity of services that is affordable.

9.25 Jacksonville Port Authority

Ron Baker, Chief Financial Officer
Date: November 19, 2002

Organization Overview:

The Jacksonville Port Authority (JAXPORT) is a full-service international trade port in Jacksonville Florida and significantly contributes to the economy in the metro area. JAXPORT is an independent government agency that primarily manages the improvement and expansion of the facilities and use by private companies.

Telecommunications Profile:

JAXPORT network supports 8 LANs with a total of 275 users. The LANs currently support 10/100 Mbps Ethernet.

- External connections are from 56K to T-1 lines.
- BellSouth is the current service provider and provided frame relay management.
- Network performance is slow.
- Network applications:
- Financials-JD Edwards.
- GIS.
- Payroll-ADP.
- Management Applications: Expedition, Gold Mine, ACT.
- Departmental work order-MP2.

The LANs are interconnected using frame relay by BellSouth. Internet Security is Firewall-Check Point and VPN is used by staff to securely access the network. The network has good reliability and easy to manage. Network hardware is primarily Cisco.

The network dislikes are primarily due to internal reasons such as no web filtering, two separate operating systems, limited physical security, etc.

Remote LANs do not have enough available bandwidth.

JAXPORT does have a wireless network and uses BreezeNet and Cisco, but limits the applications due to security concerns.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important for JAXPORT. A countywide interconnected network would improve bandwidth between LANs and possibly reduce frame relay costs.

- Employees work from home using dial up and VPN using DSL or cable modems. This limits the ability to utilize all the applications available and affects employee efficiencies. A countywide network that would be able to support today's applications to homes and businesses will be important.
- Provide an infrastructure ring that is accessible to business at reasonable cost and guaranteed reliability and uptime.
- Provide a telecommunications infrastructure based on good business decisions and not politics.

9.26 City of Jacksonville, Information Technologies Division

Michael Marino-Assistant Information Technologies Officer
John C. Shevada- Data Communication Network Manager
Date: November 14, 2002

Organization Overview:

The Information Technologies Division (ITD) provides technical support for all IT and telecommunications-related hardware, software, personnel, service provider contracts, and other contractual services.

ITD also maintains a central data processing center for all operational computerized systems, and provide fiscal management and budget assistance to all departments for technology needs. ITD provides services to 300 city and county locations. Some of the services are:

- Upgraded computer equipment.
- Optimize the use of shared information by linking databases to the network.
- Develop standards.
- Network Security.
- Evaluate current technologies.

Telecommunications Profile:

The City's production network (LAN/MAN) supports 3500 users. The network consists of different technologies that are interconnected through city and vendor fiber infrastructure. The city's data center is the core area of the network and located in the City Hall Annex Building. The network standardizes on Cisco routers and switches and Cisco recommended network-layering techniques.

The following external connections are used:

- The Downtown City Buildings are interconnected using City and JEA multi-mode and single mode fiber ring (FDDI). The major buildings would include City hall, EOC, FTB, Yates, Lainer, Public Defender, Jail, JSO, and Courthouse.
- Frame Relay (T1-T3) connections to remote libraries by BellSouth.
- (1) T1 for internet.
- Library uses 5-10 Mbps.
- General Government uses 10 MMbps.
- E-commerce uses 3 Mbps.
- ISDN 128K connections to 51 remote city locations provided by BellSouth.
- Wireless (CDPD) 128 K connections for police, fire general government provided by AT&T and Winstar.
- Point to point fiber fast Ethernet connection to City Hall.

Two or more external connections are used per building for added redundancy to the network.

Data is the primary traffic on the network followed by voice. The LANs currently support 10 Mbps and currently upgrading to 100 Mbps.

There are several applications that are used on a daily basis:

- Web site uses for city departments and agencies.
- GIS Web site mapping.
- Departmental business applications: Traffic system databases, Human resources, etc.
- Microsoft applications.

Video applications are currently not used but would be beneficial to Libraries for educational purposes and courthouse during trials, hearings, etc. Cost is the primary reason for not implementing.

The network is loaded to 40%. The average core network traffic is 12 Mbps and peaks are 15-18 Mbps. The traffic is expected to double each year. The costs are:

- BellSouth services (ISDN, Frame relay, Leased Fiber): $1.5 million.
- AT&T Broadband/ Comcast (Internet I and II): $140,000.

The City's Voice network has 4 Interconnected PBX locations that serve over 5,500 telephones. The 4 PBXs are connected with approximately 560 BellSouth digital and analog trunks. The Costs are:

- Wireless(CDPD): $1.2 million.
- Wireless Cell Phones: $800,000.
- Voice: $2.5 million (includes long distance).
- Frame Relay: $10, 800.

The City also has a wireless LANs using 802.11b technology that provides partial coverage in the Annex building and City Hall.

Firewalls and domain access provide security for the network. The wireless LAN security has not been standardized.

Telecommunication Master Plan Expectations:

A City / Countywide interconnected network is important to ITD and the City. It would provide access to bandwidth that wasn't available before and support applications such as IP/TV applications.

- A majority of employees work from home using dial up or DSL/cable modems. A countywide network would be able to allow employees to work from home and the ability to use the same applications.
- Provide dark fiber to allow point to point connections between city government buildings, businesses and colleges for network and voice over IP applications.
- Cost savings.
- A City-owned/managed network would provide better control of the costs and quality of services.

9.27 City of Jacksonville-Information Technologies Division, E-Government

Emma Herrick, E-Government Manager
Date: November 20, 2002

Organization Overview:

E-government delivers governmental information and services via the Internet and other electronic technologies. Interacting with government allows citizens to obtain information easily.

Services provided via the Internet range from basic information to complete financial transactions such as government to citizens and government to business.

Telecommunications Profile:

- See City of Jacksonville, Information Technologies Division Interview

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important for Jacksonville. It will provide benefits to citizens, businesses and city government through creating efficiencies through better communication.

A Countywide telecommunications network would also support the following:

- Improve customer service.
- Improve internal and external communications.
- Promote a higher quality of life for all citizens of Jacksonville.

In order for e-government to be fully effective for the citizens of Jacksonville, a countywide high speed telecommunications network will be required that is accessible to all residents.

9.28 Jacksonville Chamber of Commerce

Sally Patch, Vice President-Jacksonville Chamber of Commerce
Bob Swanson, Information Technology Director-Jacksonville Chamber of Commerce
Date: November 15, 2002

Organization Overview:

The Jacksonville Chamber of Commerce provides leadership in the Jacksonville metro area to foster a business environment that enables existing businesses to succeed and attract new businesses.

The Jacksonville Chamber of Commerce has set a priority to focus on select industries that have the potential to become drivers that will initiate economic development for the First Coast Region. The industry with the highest priority is Information Technology and based this on the following:

- Electronic commerce, software development and computer services are three areas where tremendous growth is forecasted.
- The application of the emerging information technology products and services will be an important aspect of this industry.
- Business services (which include technology-based jobs) are a major component of the First Coast economy.
- Average wages for this industry are significantly higher than the national average.
- The top three growing occupations in Florida are information technology related.
- The NAP coming to the area will be Information Technology businesses.
- Information Technology is highly desired in the community.

Telecommunications Profile:

The following summarizes the Chamber of Commerce's current and future telecommunications requirements and applications:

- Current provider is BellSouth.
- T1 external connection meets their current bandwidth requirements.
- Current applications and services consist of telephone, email, and internet.
- The Chamber of Commerce future applications would involve developing interactive web pages and the ability to showcase state of the art telecommunications technology (wireless networks and video conferencing) for marketing purposes.
- Their current LAN is Fast Ethernet and has 100 users.
- A firewall has been installed to address security issues.
- A wireless network is currently unavailable.

The Chamber of Commerce is currently satisfied with their telecommunications service by BellSouth and didn't have any suggestions for improvements.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be an important marketing tool for the Chamber of Commerce to attract essential businesses and illustrate Jacksonville's commitment to the IT Industry.

A cost-effective and secure city/countywide high-speed telecommunications master plan with the initiative to enable the use of the latest technologies and applications will be important to the economic development of the city. The following technologies and issues the Chamber of Commerce would like to have addressed are:

- Provide a secure and reliable network.
- Provide a network that would to meet the future bandwidth requirements at the same or comparable costs.
- Provide a network that would support multi-media applications such as IP video conferencing for education, training, and other business uses.
- The plan should enable employees to be able to work from home. Residential communities should be provided with the bandwidth necessary to support enhanced services and support bandwidth intensive applications.
- Present revenue opportunities for businesses.
- Wireless networks that would be accessible to visiting businesses and guests.
- Further development of the WIZ project.

9.29 City of Jacksonville Beach

Heidi Reagan, City Clerk
Gary Quick, Director of Electric Utility, City of Jacksonville Beach
Date: November 20, 2002

City Overview:

Jacksonville Beach has a population over 21,000. The city's commercial businesses consist of shopping centers, a hospital, hotels and apartment complexes. Tourism is also important to the city's economy. Major employers include the United States Navy and Duval County School Board. A majority of the residents commute to Jacksonville for employment.

Telecommunications Profile:

The following summarizes Jacksonville Beach's current telecommunications infrastructure and application uses:

- Two T1 external connections that are 30% utilized.
- The local area network supports over 250 users.
- The network is secured by implementing hardware and software firewalls, intrusion detection, authentication, encryption and access lists.

- The only wireless network is for the police department and the technology is CDPD. A public wireless network would be beneficial to Jacksonville Beach.

The city is satisfied with the current telecommunications services. The service area that was not satisfactory was cable TV. Quality of service, limited cable TV services and reception are the primary reasons for the unsatisfactory rating.

Telecommunication Master Plan Expectations:

The City of Jacksonville Beach would expect the master plan to provide a cost-effective and secure countywide high-speed telecommunications network that would provide the following:

- Schools would have access to the latest technologies for teaching. Two-way instantaneous full motion video for distance learning, such as, school to home, school to school, and school to business would be one example.
- The ability to share information between local and state governments.
- The use of mapping and GIS applications.
- Residential communities with the bandwidth necessary to support enhanced services and support bandwidth intensive applications for business, educational and entertainment purposes.
- Provide a secure and reliable network.
- Provide a network that would meet the future bandwidth requirements at the same or comparable costs.
- Provide access to tourists, such as, a wireless network that is accessible on and near the beaches.

9.30 City of Atlantic Beach, Florida

Jim Hansen, City Manager
Bryan Smith, IT Director
Date: November 15, 2002

City Overview:

Atlantic Beach has a population of approximately 13,000 and is primarily a residential community. Electrical Power for the City of Atlantic Beach is provided by JEA. The City owns and operates four water treatment plants, thirty-two lift stations and operates two wastewater treatment facilities. A SCADA system is used to monitor these systems.

Telecommunications Profile:

The following summarizes Atlantic Beach's current telecommunications infrastructure and applications uses:

- Current provider is BellSouth.
- Data network services are satisfactory.
- The voice services are also provided by BellSouth and quality is poor to average.
- T1 and frame relay external connections @ $1,200 per month meets their current bandwidth requirements.
- The 256K frame relay service is at 90% capacity.
- Current applications and services consist of telephone, email, Web page and GIS.
- City hall is the core location for the city's networks. The networks are inter-connected to public works building, water treatment plants, parks administration building and police stations via fiber and frame-relay.
- LANs are Fast Ethernet.
- A firewall has been installed to address security issues.
- A wireless network is currently unavailable. Atlantic Beach would be interested in having wireless coverage for GIS, utility and public safety applications.

Telecommunication Master Plan Expectations:

The City of Atlantic Beach would expect the master plan to provide a cost-effective and secure countywide high-speed telecommunications network that would provide the following:

- Improved efficiency.
- Improved Costs.
- Interoperability between local governments and utilities for GIS and public safety applications.
- Schools access to the latest technologies for teaching, such as full duplex IP video for Distance Learning (school to home, school to school, and school to business).
- Residential communities with the bandwidth necessary to support enhanced services and support bandwidth intensive applications for business, educational and entertainment purposes.
- A secure and reliable network.
- A network that would meet the future bandwidth requirements at the same or comparable costs.
- A wireless network that is accessible to the community and tourists.

9.31 City of Neptune Beach, Florida

Richard Linn, City Manager
Date: November 15, 2002

Overview:

The City of Neptune Beach is a community of 7,500 residents. The primary focus of the community is residential. The city provides its own water and sewer. Power is provided by Jacksonville Beach Electric Utility.

Telecommunications Profile:

The following summarizes Neptune Beach's current telecommunications infrastructure and applications uses:

- Current provider is BellSouth.
- City Hall has a DSL Broadband connection.
- Current applications and services consist of telephone, email, and internet.
- Cable service is provided by AT&T / Comcast and the service is unsatisfactory. AT&T public relations are poor.
- A wireless network is currently not available but would like to have one implemented for public use.

Telecommunication Master Plan Expectations:

The City of Neptune favors a city / countywide network that is cost effective. The community is primarily a residential community and the focus of the expectations are public safety, education and recreation.

- Provide a secure and reliable network.
- Provide a network that would to meet the future bandwidth requirements at the same or comparable costs.
- The initiative should be based on quality and not dollar profit motives.
- The plan should enable employees to be able to work from home. Residential communities should be provided with the bandwidth necessary to support enhanced services and support bandwidth intensive applications. Several of the residents are architects and engineers that use bandwidth intensive applications such as AutoCAD.
- The master plan should address emergency management issues.

- Interoperability of databases between local governments to aid in right of way issues.

9.32 Florida Department of Transportation

Peter Vega, District ITS Engineer
Starling Kramer, Permits Engineer
Date: November 19, 2002

Organization Overview:

Florida Department of Transportation (FDOT) is a state agency with eight district offices and more than 8,500 employees. District 2 includes Jacksonville and Duval County. FDOT decentralized organization allows local governments direct input into planning and operations.

FDOT primarily constructs and maintains a transportation network of highways and bridges.

Telecommunications Profile:

FDOT has an extensive network called Sunguide to manage and monitor Jacksonville's Highway System.

SunGuide is an advance traveler information system and management system consisting of CCTV cameras, DMS, video image detection, inductive loop detection and fiber optics along segments of Jacksonville's metro interstate highway.

The existing communications network consists of single mode fiber optic cable.

- One 48-fiber cable routed between hubs and the ITS control center.
- One 24-fiber cable routed directly between the control center and Florida Highway Patrol.
- The network runs through a multi-cell conduit along I-10 between the I-95 interchange and the I-295 interchange and along I-295 between the I-10 interchange and Florida highway Patrol building on Normandy Boulevard. A multi-cell conduit also runs along I-10 to the ITS control center.
- A 4" conduit network for Field elements was constructed along I-95 between Emerson Street and the southern I-95 / I-295 interchange and from Hendricks Avenue to the I-10 / I-95 interchange. The condition of the existing conduit is unknown at this time.

FDOT expects to have conduit infrastructure in place along interstate I-295 loop and all interstate highways within I-295 by 2007. FDOT would consider sharing infrastructure resources with the City of Jacksonville for the countywide telecommunications network.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications network would be important to FDOT. The use of a Countywide infrastructure would aide in implementing ITS's network plans of managing and monitoring Jacksonville's metro interstate highway system.

An interconnected network would improve traffic coordination between FDOT and the City. Sharing information on a network would aid in automated traffic management such as monitoring traffic flow on streets, highways and interstates and adjust traffic signals for better traffic flow or provide alternate route plans upon traffic accidents.

An interconnected network would also provide better communications between city authorities and agencies to be used in emergencies, such as city evacuations in event of hurricanes.

9.33 City of Baldwin

Marvin Godbold, Mayor
Date: November 2, 2002

Organization Overview:

The City of Baldwin is a very small town in the Western reaches of Duval County. The population is quite small. The area of Baldwin only measures one square mile. The town has limited growth plans for the near-term. Most undeveloped land tracts are owned by three families.

The City of Jacksonville maintains a contentious relationship with the Town of Baldwin. Baldwin is somewhat interested in the potential new services but does not want anything forced upon them and does not feel that they "need" the new services. They are also not interested in using Town funds to build any infrastructure.

They currently operate their own sewer and water but receive power from JEA.

Telecommunications Profile:

The following summarizes the Town's current and future telecommunications requirements and applications:

- Current provider is BellSouth.
- They currently have no WAN communications network between any of the Town facilities.
- There is no municipal website in operation.
- Any internet access is provided through dial up/modem connections.

The following are future services and applications the Town would like to support via new network services:

- Communication links between all the Town facilities.
- Any and all high-speed services to the schools. Their schools are part of the Duval School System and they would want equivalent services delivered to the schools within the Town limits.
- They are somewhat interested in future residential video services but would want to give Comcast an opportunity to improve the current service level before overbuilding them.

The Town of Baldwin is currently satisfied with their telecommunications service from BellSouth and generally not satisfied with the service from AT&T Broadband, now Comcast.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be of marginal value to the Town of Baldwin. Their plans are modest so they see little opportunity to exploit the services that would be offered on the new network. Because of this, they are minimally supportive of the initiative.

9.34 Jacksonville Sports Complex & Convention Center

Jim Pritchard, Director of Convention Center
Tracy Evans, Director of Alltel Stadium
Keith Van Der Leest, Operations Manager
Two other operations personnel
Date: November 27, 2002

Organization Overview:

The Jacksonville Sports Complex and Convention Center serves as the home to local sports franchises and hosts a variety of shows and conventions.

The properties are all managed by SMG. The properties include:

- Alltel Stadium, home to the Jacksonville Jaguars, an NFL franchise.
- Prime Osborn Convention Center.
- The new Coliseum which will be completed in 2003 and will be home to a minor-league hockey franchise and possibly an Arena League Football franchise.
- The new Baseball Park which will be completed in 2003 and will be home to the Jacksonville Suns, a minor league baseball franchise.
- The Times Union Arts Center

Telecommunications Profile:

The following summarizes the Sports Complex's current and future telecommunications requirements and applications:

- Current provider is BellSouth.
- Data connections to each facility are via T1s'.
    - Higher bandwidth is needed to support internal applications.
- Voice connections are as follows:
    - Stadium has 5 X T1s for internal operations.
    - 4 X T1 are dedicated to Jaguars voice and data communications.
    - Convention Center has 3 X T1s'.
    - Times Union Arts Center has 2 X T1s'.
    - Old Coliseum has copper links back to the Alltel Stadium PBX.
    - The New Coliseum will have a remote shelf and will be fed via a fiber connection back to Alltel Stadium.
    - Plans are being formulated for the new Ballpark.

Current applications and services consist of:

- Centralized application server at the Convention Center which supports all local SMG operations.
- Voice services to all facilities.
- Data services to all facilities.

- Video services named "VIVEX" to Alltel Stadium from AT&T. These services facilitate video uplink for television broadcasts.
- Their current LAN network is Fast Ethernet within each facility with T1s between the facilities.
- A firewall has been installed to address security issues.
- A wireless network is currently available in a small section of Alltel Stadium and is for Jaguars only operations.

The following are future services and applications SMG would like to support via new network services:

- High-speed data services (5 Mbps to 100 Mbps) between all facilities which would replace the existing T1s'.
- IP voice tie lines between all facilities which would replace most of the existing voice PRIs'.
- Wireless access in the Convention Center for exhibitor use, and to act as a new source of revenue generation.
- Video conferencing services to all facilities for internal operations and as a new chargeable service for customers at the Convention Center.
- IP transport for building controls applications (Siemens).
- Potential for interactive kiosks at all facilities.
- Potential for video uplink services from Alltel Stadium.

The Sports Complex is currently satisfied with their telecommunications service from BellSouth. They realize however, that other services would be available from the new network and want to receive these services as soon as possible.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be an important marketing tool for Convention Center.

As mentioned before, SMG can see numerous ways to exploit the high-speed services that would be available on the new network. The network specifically needs to deliver the following capabilities:

- Provide a secure and reliable network:
  - Services need to be secured to support new business from transient customer using the facilities.
- Provide a reliable network.

  - Services need to be secured to support new business from transient customers using the facilities.
- Provide a network that would to meet the future bandwidth requirements at significantly lower costs.
- Provide a network that would support IP multi-media applications such as steaming video, video conferencing, and high bandwidth/highly reliable video uplink transport.
- The plan should enable employees to access all facility resources via a remote high-speed VPN connection.
- The plan should enable users/customers to access all facility multimedia resources remotely.
- The network should enable new revenue generating service delivery to each of the SMG facilities.
- Wireless networks that would be accessible to Convention Center customers as well as sports reporters at the sports facilities.

9.35 Merrill Lynch

Sam Perone, Jacksonville CIO
Two other IT Directors
Date: December 4, 2002

Organization Overview:

Merrill Lynch is a global retail securities brokerage. Their global operations are distributed across 600 branch locations throughout the world, of which the Jacksonville branch is one. All the Jacksonville staff, and operations are located within a single building. The Jacksonville branch and other branch locations act as the origination points for the securities transactions that Merrill processes.

Because of their operations model and the fact that they are housed in a single facility, the IT staff could only identify a few ways the new network could benefit their business. They do though see, and support the assertion that the new network will greatly benefit the community as a whole.

Most of the IT decisions regarding WAN services are made in their NY headquarters location but there is still an opportunity for the local facility to exploit some of the services that could be enabled by the new network.

Telecommunications Profile:

The following summarizes Merrill Lynch's current and future telecommunications requirements and applications:

The IT staff chose not to detail their existing network environment as most of this information is guarded as proprietary. The information they did share relates to several ways they could exploit new services which will be listed in a later section of this document.

Current applications and services consist of:

- Normal office automation applications.
- Transaction processing applications which link back to Merrill's main facility in NY.
- Have some telecommuting capabilities which are somewhat limited.

The following are future services and applications Merrill Lynch would like to support via new network services:

- Merrill would like to expand their telecommuting capabilities. The higher speed network connections would facilitate this expansion which would result in higher productivity, higher employee satisfaction and lower facilities costs.
- Merrill would like to expand the video teleconferencing capabilities to all their locations. They have these capabilities today but the costs for the circuits are too high and the quality of the image is marginal. These issues would be improved as a result of the new network's capabilities.
- The local IT staff believes that the new network might encourage expanded call center operations within Merrill and other organizations throughout Jacksonville as a result of the new network's capabilities.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be somewhat important to the local operations of Merrill Lynch. The new network will enable several new application capabilities that will mainly result in operational streamlining and cost savings.

9.36 Baptist Hospital

Karl Phares, Telecommunications Manager
Date: December 4, 2002

Organization Overview:

Baptist Hospital is the largest hospital system in greater Jacksonville. They were recently larger but are completing their split with St. Vincent's Hospital which was previously part of the system.

In addition to the main hospital, there are 2 other large buildings on the main campus. There are also 3 major remote locations not on the main campus LAN. They have numerous remote affiliated clinics, labs, diagnostic centers and "doc in a box" facilities.

Telecommunications Profile:

The following summarizes the Baptist Hospital's current and future telecommunications requirements and applications:

- The voice service provider is currently BellSouth.
- 30 X PRIs come into the main facility.
    - Roughly 60% are for external PSTN access and 30% are tie lines.

They have Nortel Meridian PBXs at all their facilities.

- Data services are varied. They have 100 Mb/s NMLI services to many locations but the monthly costs are very high.
- Between 3000 and 4000 network connections exist.
- Most desktops are currently shared 10 Mb/s
    - All desktops will be upgraded to switched 100 Mb/s by the end of 2003.
- Their shared resources are connected by either switched GigE or 100 Mb/s links. Their backbone is GigE.
- Baptist is currently deploying 125 X 802.11 wireless access points which should cover approximately 50% of the main campus. The wireless coverage for the rest of the main campus will be completed during the next fiscal year (Oct. to Oct).
- The main campus and many of the surrounding facilities (24 locations total) are linked on 2 X 100 Mb/s NMLI services from BellSouth.

These ethernet NMLI services run across an ATM backbone that currently has little or no redundancy. They are looking at changing this to a private metro wide SONET MAN.

- A dedicated point to point T1 provides data links to Blue Cross/Blue Shield.
- 2 X T1s currently provide internet access.
- Baptist is currently planning to upgrade the 2 X T1s to a fractional DS3 (7 Mb/s) service in early 2003.

Current applications and services consist of:

- Normal office automation applications.
- Patient Records system.
- Patients Account Processing system (linked with Blue Cross/Blue Shield).
- Normal hospital administration applications.
- Teleradiology applications which are currently only store & forward versus having any real time capabilities.
- Telemedicine applications. Some of which have real time capabilities and some of which are store & forward.
- VPN access is available for the IT staff, doctors, administrative staff, vendors, and for branch to branch communications. More VPN access is being provided for more users all the time.

The following are future services and applications Baptist Hospital would like to support via new network services:

- A high-speed and fault tolerant alternative to their current NMLI services.
    - More fault tolerance is critical which is one reason they are looking at SONET.
        - Note that fault tolerance could be achieved over the City's network with a combined DWDM & ethernet architecture that was designed to meet the hospital's specific requirements.
        - Whatever new high-speed services are offered by the City, they must have a better $/Mb ratio than is currently available to the hospital.
- Baptist wants available high-speed (but affordable) data services to connect to the remote "doc in a box" facilities.
- Baptist wants available high-speed (but affordable) data services to connect to the remote radiology clinics that are not currently connected via NMLI services.
- Baptist would like to be able to support a variety of telemedicine applications within the patient's home via higher speed access links to the home.

- Baptist would like a service provider to provide metro SAN services from a hardened facility for backup and disaster recovery purposes.
- There is a need to video conferencing capabilities between all their facilities.
- There is a need for real time video surveillance at all main campus locations as well as the remote facilities.
- Baptist wants to have teleradiology viewing capabilities at all facilities, whether they are radiology facilities or otherwise.
    - These services are also wanted at the homes of the radiologists.
- Baptist wants to be able to support the pharmacy application at all remote facilities.

While Baptist is generally satisfied with the service and services they receive from BellSouth, they still desire the enhancements and capabilities listed above. All the new services listed above could be enabled by the new network.

9.37 Local Commercial and Residential Developer

President/Owner of the Development Group
Date: Various meetings in 2002

Organization Overview:

This organization is a residential and commercial developer. Their developments are located in North Florida. One of his current developments is in Clay County, which directly adjoins Duval County. There is interest on the part of this developer to receive high-end communications services in their residential and commercial properties.

Their vision for the properties is to have every type of high-speed communications services to enhance the resident lifestyle and to enhance the property's monetary and competitive value. They also view this as a way to generate additional revenue for the developer and property owners association through revenue sharing agreements with the service providers should the service providers deliver services over an infrastructure that is installed and owned by the neighborhood. They additionally want a variety of high-end services available in the commercial properties to further boost their competitive value.

Telecommunications Profile:

The following summarizes this developer's current and future telecommunications requirements and applications:

- The existing neighborhoods and commercial properties have no special communications systems. The only systems and services currently available are those offered by the incumbent service providers.
- Clay County recently performed a study to build a countywide network such as the one being investigated by Duval. This project was not pursued so there is hope that services can be "exported" from Duval to various properties in Clay so those properties can have access to the new high-end services.

Current applications and services consist of:

- "Normal" services offered by the incumbents.

The following are future services and applications this developer would like to have delivered to, and in their developments:

- High-speed data services (1 Mb/s to 100 Mb/s) to each home. These incremental services would potentially support any, or all of the following in home applications:
    - Real time video on demand (via IP delivery).
    - Distance learning & family/learning institution interaction.
    - In home telemedicine.
    - IP access for telecommuting.
    - Smart home system transport & remote control.
    - Security system monitoring.
    - In neighborhood video monitoring.
    - Online gaming & other interactive multimedia.
    - In home video conferencing.
    - Future support for IP voice services (in community & external).
    - Community specific website.
    - Common area wireless access.
    - High-speed data services (1 Mb/s to 1 Gb/s) to each business or business complex. These incremental services would potentially support any, or all of the following in home applications:
    - Real time video on demand (via IP delivery).

- Video streaming.
- Distance learning for employee development.
- Telemedicine.
- VPN/IP access for telecommuting.
- Building control & security system monitoring.
- Video conferencing.
- IP voice tie line trunking.

This developer is generally satisfied with the telecommunications services from the incumbents but wishes to have other choices that enable the delivery of the new, high-end services discussed above.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be an important marketing tool for this developer and any other developer that understands how the new services could be employed and exploited in their properties.

This developer can see numerous ways to exploit the high-speed services that would be available on the new network. The network specifically needs to deliver the following capabilities:

- Support for the delivery of all the applications and service mentioned above.
- Ability for the City to deliver the infrastructure to new and existing properties.
- Ability for the City to attach to a developer owned/installed infrastructure in some new properties. This would also require some sort of revenue sharing agreement with the neighborhood.
- Ability for the City to export services to adjoining communities and properties.

9.38 Super Bowl Host Committee

Michael Kelly, President
Kandy Begue, Executive Assistant
Date: December 10, 2002

Organization Overview:

The Super Bowl Host Committee is the entity responsible for all the local planning and coordination activities associated with Jacksonville being the host city for the 2005 Super Bowl event.

They are responsible for all activities that are not handled specifically by the NFL and their broadcast network partner. These activities include such things as:

- Providing for adequate lodging which will include local hotels as well as the temporary berthing of cruise ships which will provide lodging for several thousand attendees as there are not enough normal hotel rooms to handle the estimated 100,000+ people that will come to Jacksonville for this event.
- Providing a base of operations for the 3000+ media personnel that will come to town to report on the event.
- Coordinating all local marketing, promotion, and PR activities in support of the event.
- Recruiting and organizing the 1000s of volunteers that will help produce the event at the local level.

Telecommunications Profile:

The following summarizes the Host Committee's current and future telecommunications requirements and applications:

- Their base operations are already set up and adequately meet their current and future needs. This relates specifically to their operations office and does not relate to the various facilities and locations that will be utilized in support of other activities associated with the event itself.

Current applications and services consist of:

- "Normal" office automation applications.

The following are future services and applications the Host Committee would like to support via new network services:

- High-speed data access to the Super Bowl affiliated hotels.
- High-speed data access to the Prime Osborn Convention Center which is the operational base for the 3000+ media personnel that will be in town covering the event. The marketing of such services would likely be coordinated through SMG which is the sports property management company that manages the convention center facility.

- High-speed data access to the Adams Mark hotel which is housing the personnel from the NFL that are producing the event. There will be numerous (100 – 400) NFL personnel in town for the 30 days leading up to the event.
- High-speed data access to the 2 hotels that will house the 2 teams and the teams' operations staffs.
- High-speed data access via wire line or wireless access to the cruise ships that will be docked down town for the event.
    - Note the logistical challenge associated with this goal because the cruise ships will not arrive in town until several days before the event.
    - Note also that such services will likely need to be marketed to each hotel and cruise line operator.
- High-speed data access to the non Super Bowl affiliated hotels that are still likely to house many event attendees.
- High-speed data access to locations being utilized by those broadcast networks that are not the primary carrier for the event.
    - Marketing such services to these entities would likely be coordinated through the NFL's Media Coordinator.
- The NFL has their own services contracted in support of the event. Some services available on the new network may be desirable to the NFL and would need to be marketed directly to them. An example of such a service would be a very high bandwidth service for the up-linking of video streams from each of the event cameras.
- Such video and data uplink services may also be desirable for the other media entities and would need to be marketed directly to those organizations.

Telecommunication Master Plan Expectations:

The City / Countywide Telecommunications Master plan will be important to the Super Bowl Host Committee in support of the event. Exploitation of the available services will require marketing to, and coordinating with various entities and facilities associated with the event.

Being able to commit to the delivery of specific services well ahead of the event will be important in the City's and the Host Committee's sponsorship of any marketing activities pursued with the potential customers of these new services.

10.0 Market Survey

10.1 Introduction

In November 2002, Vectren Communications Services (VCS) under the direction of Black & Veatch conducted market research among Duval County residents and commercial and industrial businesses for the City of Jacksonville. The purpose of the market research was to understand the community's needs and desires for advanced communication services and to determine their satisfaction level with the current providers. Three separate processes were used to gather market information: focus groups (residential and commercial businesses), personal interviews with commercial and industrial entities and telephone interviews with Duval County residents. The information in this section summarizes the significant responses provided by the participants.

10.2 Findings

Black & Veatch and Vectren conducted two residential focus groups, managed a four hundred sample phone survey and interviewed forty-eight personnel representing government organizations, businesses and residential communities. The purpose of the market research was to understand the community's current usage of telecommunication services, to determine their satisfaction level with the current providers and to predict the interest in alternate service providers.

Conclusions that can be drawn from the market survey and interviews are:

- Jacksonville's residents are generally as connected to the internet via DSL and cable modem as other communities throughout the United States.
- The community is highly satisfied with the services currently provided by City of Jacksonville and JEA as well as the local, long distance and Internet service providers.
- There is significant dissatisfaction with the incumbent cable TV provider (Note: this survey was conducted prior to Comcast becoming the cable TV service provider.)
- Telecommunication services are considered a commodity. A significant portion of users will readily switch to alternate service providers if quality and price are consistent.
- The demand for high-speed internet access is price driven and more of a luxury item, whereas, CATV services usage implies that CATV service is considered a necessity.

- The business community uses and desires additional services that demand bandwidth.

As a measure of the city's current "connectedness", we considered the number of residences with internet service. With a total residence count of 328,800, fifty-six percent (56%) or 184,100 residences are connected. Of these 184,100:

- 78,910 (24%) residences have high speed connections (DSL or cable modem)
- 92,100 (28%) residences have dial up connections

Note: Per BellSouth, DSL service passes 80% of Jacksonville homes.

An alternative view of connectivity is the level of television service subscription. Eighty-seven percent (87%) of Jacksonville residences subscribe to television services with twenty-one percent (21%) subscribing to satellite services and sixty-six percent (66%) subscribing to cable television services.

Jacksonville's consumer level of overall satisfaction with their service providers was measured through a series of questions that required a quantitative response to overall satisfaction, existing rates and tendency to switch providers. The survey results indicate the greatest satisfaction with the services provided by the electric utility, JEA. In addition to JEA's results, responses indicate high satisfaction with the long distance, local telephone and city service providers. A significant satisfaction decline was measured with the cable TV (CATV) provider.

Jacksonville consumers considered the electric utility, long distance, local telephone and internet service rates to be reasonable with fifty-eight percent (58%) of respondents rating the electric rates at very reasonable or reasonable. The long distance, local telephone and internet services ranged between fifty-seven percent (57%) and forty-eight percent (48%). Again a significant drop occurred with CATV rate satisfaction with twenty-five percent (25%) considering the service as very reasonable or reasonably priced.

The tendency to switch services is a critical variable when considering the viability of alternatives to the status quo whether the alternative is a new competitive service or an alternate service provider.

The responses received support the satisfaction levels previously indicated. Overall Jacksonville consumers are most likely to switch their CATV service provider (39%) if an alternative was available. The likelihood to switch internet, local telephone and long distance service drops to a range of nineteen percent (19%) to sixteen percent (16%).

As an alternative to the current service provider, respondents were asked their tendency to purchase services from the City of Jacksonville. The City of Jacksonville represents a not-for-profit entity with a high current satisfaction rating. Forty percent (40%) of Jacksonville consumers are likely or very likely to purchase CATV service from the City of Jacksonville while thirty-one percent (31%) are likely or very likely to purchase internet service. When current CATV subscribers are isolated from the overall population, the likelihood to purchase services from the City of Jacksonville increases to forty-nine percent (49%).

From our interviews within the business community of Jacksonville current and desired future applications were investigated. The current business applications for data communications are e-commerce, remote security or monitoring, telemedicine, distance learning, desktop video, video conferencing, telecommuting and VoIP. From the sample base interviewed, the greatest gap between services currently used and services desired were VoIP, video conferencing and telemedicine services.

10.3 Market Research Results

10.3.1 Market Research Methodology

On Tuesday, November 19, 2002, Vectren Communications Services (VCS) conducted two focus groups with a total of 21 residents from Jacksonville. In order to reduce the risk of sampling error, residential focus group participants were randomly recruited from a sample telephone list purchased from a nationally recognized research-sampling firm. All participants were compensated with a cooperation fee in appreciation of their time and contributions to the discussions.

During the focus group sessions, the Perceptions Analyzer™ (PA™) was used to gauge opinions on various topics prior to group discussion. Using hand-held dials to indicate their answers, respondents answered a series of questions. This allowed participants to answer anonymously and without peer influence. The results of the PA™ serve as an important indicator of the attitudes and opinions of group members prior to the discussion.

VCS also recruited 19 commercial entities to attend focus groups. However, only four commercial respondents actually attended. VCS has since learned JEA's commercial accounts are asked to participate in research studies quite often and are therefore difficult to recruit for other types of surveys. In addition, commercial accounts are often less likely to attend after hours meetings unless it is convenient to their office or home. Given

the geographical expanse of the City of Jacksonville, location of the focus group facility to area businesses may have also attributed to the low attendance of commercial customers. Because of the low response rate, the moderator deemed it necessary to use the personal survey instrument and interview the respondents individually to successfully obtain detailed information about their organizations and their telecommunications needs.

During the same week focus groups were conducted, personal interviews were conducted with 23 commercial and industrial entities. The commercial and industrial customers recruited for the personal interviews were randomly selected from a list of customers provided by the City and JEA. With only two organizations canceling, the completion rate among the personal interviews was excellent. This may have been attributed to the location of the interview – the respondent's office.

While the completion rate for the personal interviews was higher than that of the commercial and industrial focus groups, overall recruiting goals in Jacksonville were still very difficult to attain.

In addition, VCS conducted 400 telephone interviews with residents of Duval County. As in the residential focus groups, a random list of telephone numbers was purchased for all zip codes in the county. The data collected via the telephone interviews is statistically valid and represents a 95% confidence level on a cumulative basis, with a margin of error of plus or minus five percent (confidence interval). The confidence level indicates how often a percentage of the population would select an answer within the confidence interval. The confidence interval represents a range into which the results could fall. In other words, you can be 95% certain that the results will fall within a range of 5% points.

Telephone respondents were screened to ensure they were customers of JEA and interviewed regarding their satisfaction with various service providers and their likelihood of purchasing new services offered by the City of Jacksonville. VCS also experienced some difficulty in reaching its quota of telephone interviews. The potential respondents were difficult to reach and the initial refusal rate was somewhat higher than that of other markets. This did not impact the survey results however; it may be indication of future marketing effort requirements.

10.3.2 High-Speed Data

Fifteen of the organizations interviewed use high-speed data lines. While the majority of organizations currently use a T-1, three use a DS-3 line, and one has an OC-3 for high-speed data applications. Many of the larger organizations use a variety of lines and multiple providers. Eleven of the organizations are connected to a wide area network. Six organizations have plans to increase the use of high-speed services for data applications.

Only three organizations currently are dissatisfied with their high-speed data service provider. Nine of the organizations are likely or very likely to purchase high-speed data services from the City of Jacksonville. Given the satisfaction level and difficulty to switch high-speed data services among commercial organizations, there may be a reluctance to switch service providers unless they are offered an incentive. As one respondent stated, "We have a lot invested in our networks, there must be a compelling reason to switch."

10.3.3 Internet Service

Fifty-six percent of residential respondents have Internet service at home. Fifty percent of Internet subscribers have a dial-up connection, 21% have a cable modem, and 21% have DSL. Fourteen percent are likely or very likely to purchase high-speed Internet service for $45 per month, while 18% are likely or very likely to purchase this service for $40 per month, and 22% are likely or very likely to purchase this service for $35 per month.

Eleven percent of residential respondents are dissatisfied with their Internet provider. Due to high customer satisfaction with Internet providers, the City of Jacksonville may experience difficulty in marketing this service to existing customers and enticing them to switch. At the same time, however, 31% of respondents indicated they were very likely to purchase Internet service from the City of Jacksonville, and 58% of respondents believe the City of Jacksonville is capable of providing Internet service.

Twenty-five of the personal interview organizations subscribe to Internet service. Three have a dial-up connection, while the others use some type of high-speed Internet service. The personal interview respondents also expressed satisfaction with their current Internet service providers and require an incentive to switch. As one respondent said, "It must be competitively priced; these services are a commodity." Eight of the personal interview organizations are likely or very likely to purchase Internet service from the City of Jacksonville.

10.3.4 Cable Television Service

The following information is based on AT&T Broadband's service and rates. At the time of the study, Comcast had just announced that it would assume operation of the cable TV system in Jacksonville.

Sixty-six percent of residential respondents subscribe to cable television service and 12% have a satellite dish. Forty-two percent of current cable subscribers have expanded basic service, 33% receive basic service, and 23% subscribe to digital.

While approximately half of residential respondents are satisfied to some degree with their cable television provider, they rate it lowest among other listed service providers. Twenty percent of respondents are very satisfied, 14% are satisfied, and 20% are somewhat satisfied with their cable TV provider. At the same time, 39% are likely or very likely to switch their cable TV provider and 40% are likely or very likely to purchase cable TV from the City of Jacksonville. Sixty-one percent of respondents believe the City of Jacksonville is capable of providing cable TV service.

Respondents in the focus group discussions complain of billing issues, increasing rates, and unreliable service. All focus group respondents will consider purchasing cable TV from the City of Jacksonville. The data gathered from both the focus group sessions and from the telephone interviews indicate that respondents desire an alternative cable TV provider--one that will bring competition, better customer service, and improved reliability.

10.3.5 Local Telephone Service

Nearly half of residential respondents are very satisfied with their local telephone provider and 57% are very unlikely to switch to another provider if given the option. On the other hand, 21% of respondents indicated they are very likely to purchase local telephone service from the City of Jacksonville. In addition, 63% of respondents believe the City of Jacksonville is capable of providing local telephone service.

Many focus group respondents question the ability of a new entrant in an already competitive local telephone market. Others commented on the advantages of bundling services to reduce costs. Over half of focus group respondents believe the City is capable of providing local telephone service.

Approximately half of the personal interview respondents experience problems with their local telephone provider. The respondents cite poor reliability, customer service, and slow response time as the main issues. Nine respondents are likely or very likely to purchase local telephone services from the City of Jacksonville. The personal interview respondents are interested in competitive prices and reliable service.

10.3.6 Service Provider Comments

The results of the telephone interviews indicate a higher satisfaction level with JEA as compared to other utility service provides including the City--78% were satisfied/very satisfied with JEA compared to 64% satisfied/very satisfied with the City. Furthermore, during the focus group discussions, respondents seemed to have a higher preference for JEA as a telecommunications provider. JEA's high satisfaction level and solid reputation

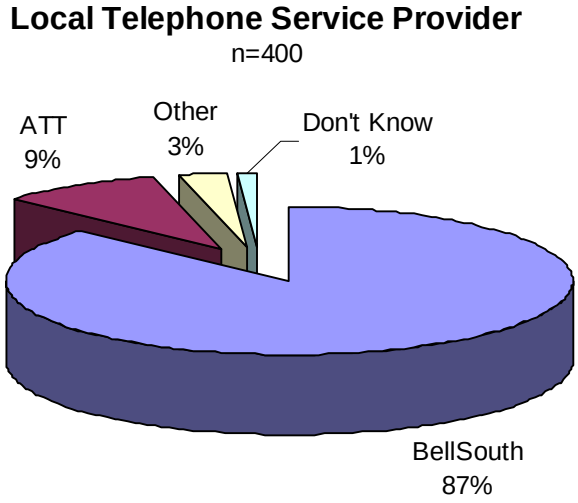
within the community are characteristics that have been shown to aid the municipal should it enter the telecommunications market.

10.3.7 Residential Telephone Analysis

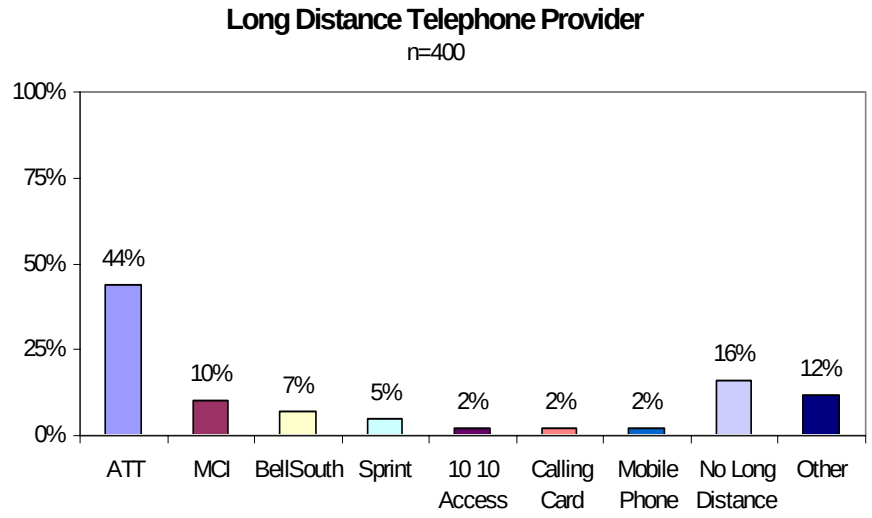
VCS conducted 400 telephone interviews with residents in Jacksonville, Florida in mid-November 2002. The survey began with a few screening questions to ensure that all those interviewed were customers of JEA. This ensured that the survey participants were residents of Duvall County and familiar with City of Jacksonville Utility Services. In order to eliminate bias, employees of the city, utility, local telephone company, Cable TV Company, Internet service providers, market research firms, and advertising agencies were not interviewed.

10.3.8 Telephone Service Usage

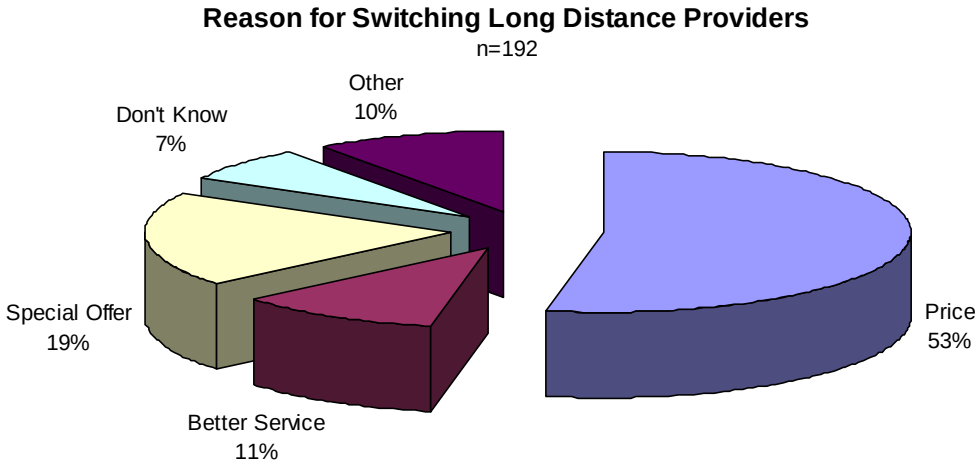
Eighty-seven percent of the respondents identified their local telephone service provider as BellSouth, 9% had AT&T, 3% had some other provider, and 1% was not sure.



Respondents also were asked to identify their long distance telephone provider. Forty-four percent received long distance from AT&T, 10% purchased from MCI, 7% from BellSouth, and 5% from Sprint. Twelve percent named various long distance service providers. Six percent used an alternative to traditional long distance service such as a 10-10 access number, calling card, or mobile phone. Sixteen percent of the respondents did not have long distance service.



Forty-eight percent of the respondents switched their long distance service provider. Respondents primarily switched long distance providers for lower prices (53%), a special offer (19%), or better service (11%).

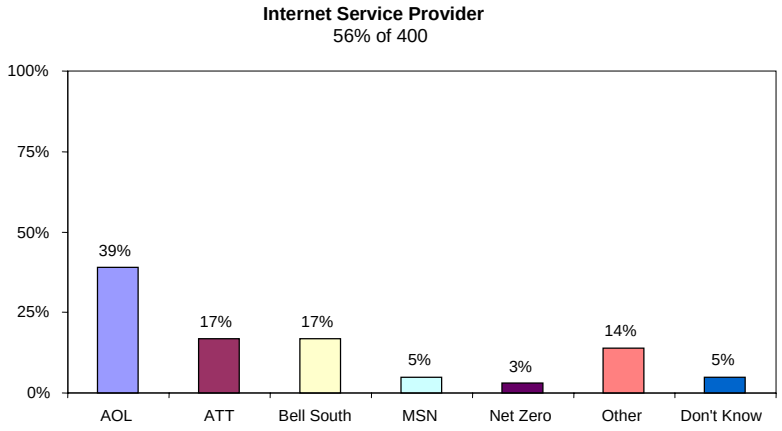


10.4 Computer and Internet Use

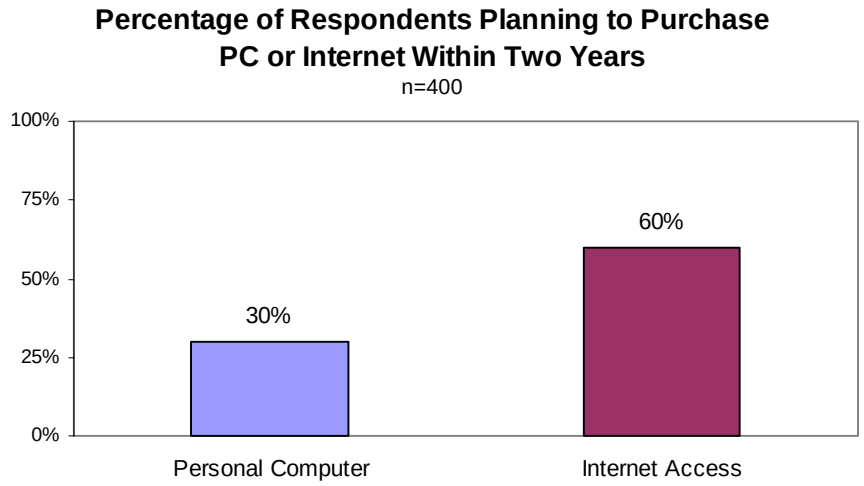
10.4.1 Personal Computer Usage and Internet Connectivity

Sixty-four percent (254) of residential respondents have a personal computer in their home. Of those respondents owning a personal computer, 88% subscribe to Internet service. That translates to 56% of all respondents with Internet service. In other areas of the country, where VC has conducted similar research, Internet penetration was found to be quite a bit lower—only 40% of respondents in VCS' database had Internet service at home.

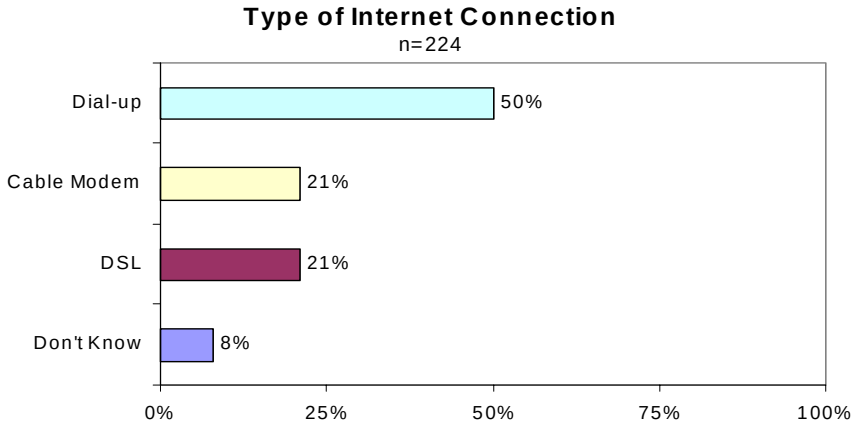
Respondents name a variety of Internet providers including AOL, AT&T, BellSouth, MSN, and Net Zero.



Sixty percent of all respondents plan to purchase or continue to purchase Internet services and 30% expect to purchase a computer within the next two years

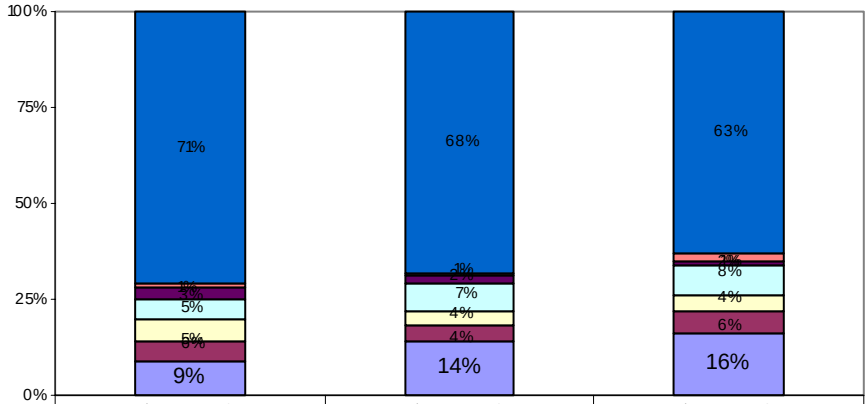


Fifty percent of Internet subscribers have a dial-up connection, 21% have a cable modem, 21% have DSL, and 8% are not sure of the type of Internet connection. Twenty-eight percent of Internet subscribers with a dial-up connection have a dedicated telephone line.



Thirty-eight percent (85) of current subscribers have switched Internet providers in the past. Respondents primarily switched for better service (29%), faster access speeds (28%), and lower prices (22%).

Likelihood of Purchasing High Speed Internet at Various Prices



	$45 per month	$40 per month	$35 per month
Very Unlikely	71%	68%	63%
Unlikely	1%	1%	2%
Somewhat Unlikely	3%	2%	1%
Neutral	5%	7%	8%
Somewhat Likely	6%	4%	4%
Likely	5%	4%	6%
Very Likely	9%	14%	16%

10.4.2 Price Elasticity

On a scale of one to seven, with one meaning "very unlikely" and seven meaning "very likely," respondents rate their likelihood of purchasing high-speed Internet at $35, $40 and $45 per month. As indicated in the graph below, customer likelihood of purchasing high-speed Internet increases slightly for a lower monthly price—9% are very likely to purchase high-speed Internet at $45 per month, 14% are very likely to purchase service at $40 per month, and 16% are very likely at $35 per month.

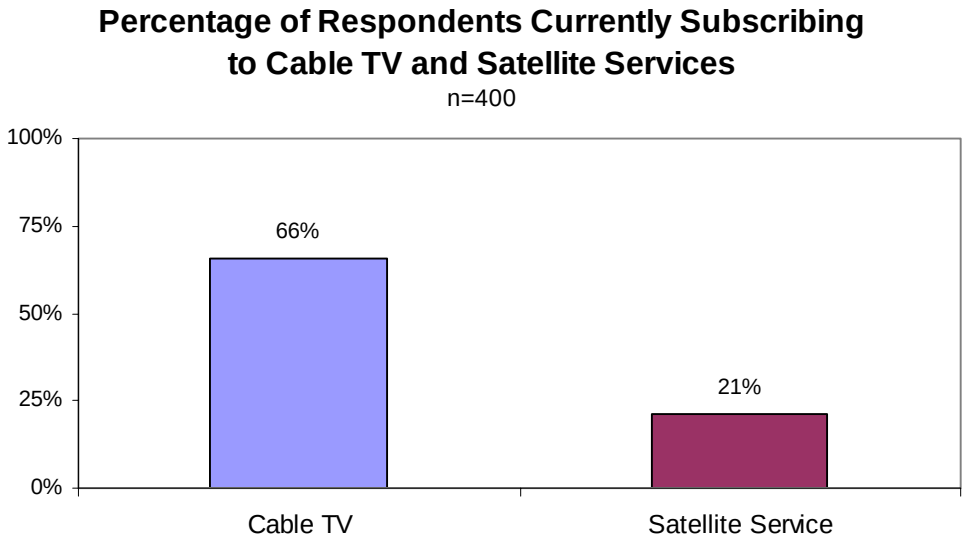
High speed internet was defined as always one with download speeds up to 5 to 10 times faster than dial up service.

10.5 Television Subscribers

10.5.1 Cable TV vs. Satellite Subscribers

Sixty-six percent of respondents currently subscribe to cable TV service and 21% have a satellite dish. In other areas of the country, where VCS has conducted similar research, cable TV penetration was higher (73%) and satellite dish penetration (12%) was lower compared to the Jacksonville market.

Ninety percent of respondents identify their cable provider as AT&T. In addition, 6% of respondents subscribe to both cable TV and satellite services. Note: At the time of the study, Comcast had just announced that it would take over AT&T's cable operation in Jacksonville.

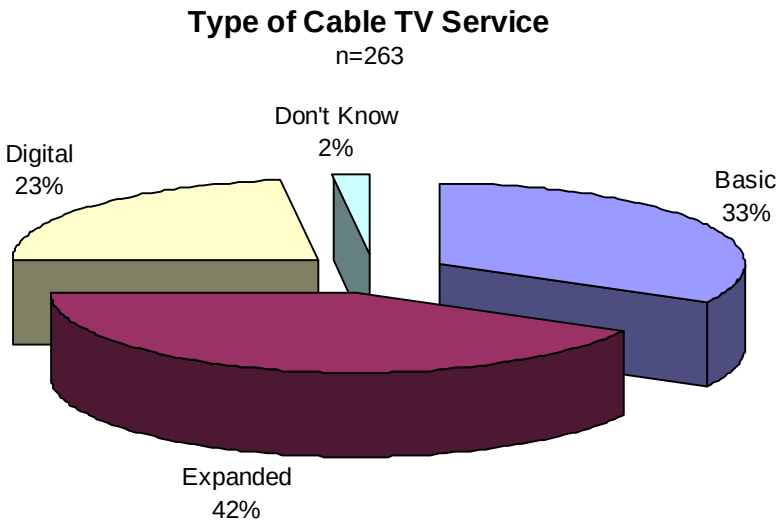


Non-cable TV subscribers (107) provide the following reasons for discontinuing service:

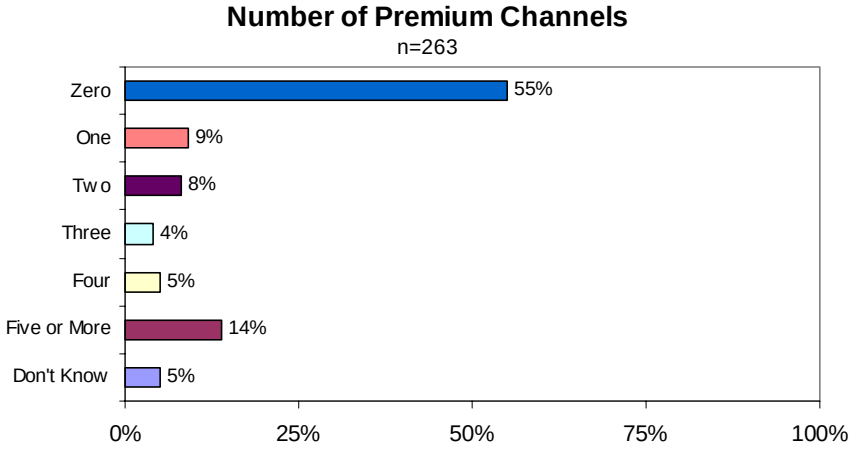
- 38% believe rates are too expensive.
- 18% purchased a satellite dish.
- 17% experienced problems with service provider.
- 11% moved.
- 15% provided some other reason.
- 1% dislikes the current channel line-up.

10.5.2 Type of Cable Service

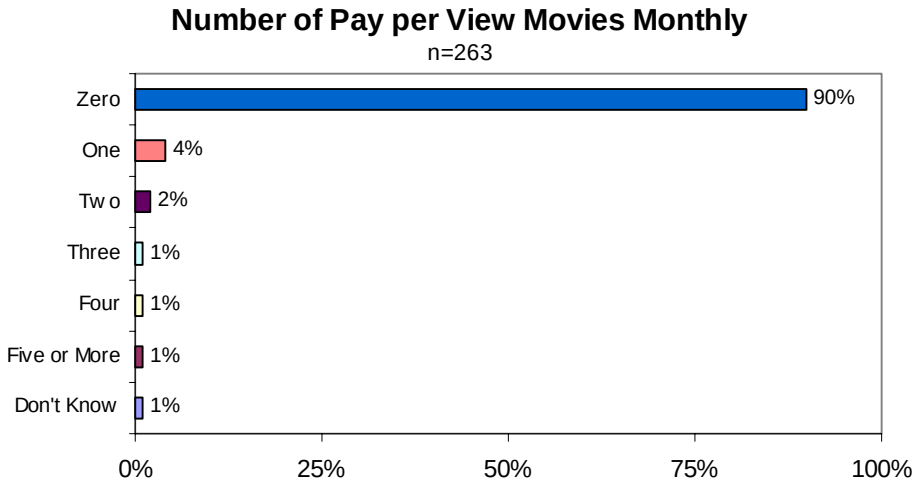
Forty-two percent of respondents have expanded basic cable TV service, 33% receive basic service, 23% have digital, and 2% are not sure of the type of service to which they subscribe.



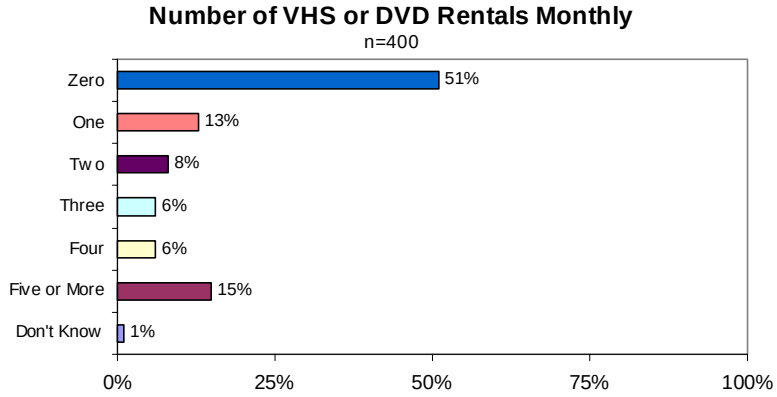
Less than half of respondents subscribe to premium channels—55% of cable subscribers do not have any premium channels. Overall, 14% of cable respondents have five or more premium channels, 5% have four, 4% have three, 8% have two, and 9% of respondents have one premium channel.



Ninety percent of cable respondents do not rent pay-per-view movies in a typical month. Four percent rent one per month, while 2% rent two, and three percent rent three or more. One percent of the respondents are not sure how many pay-per-view movies they rent per month.

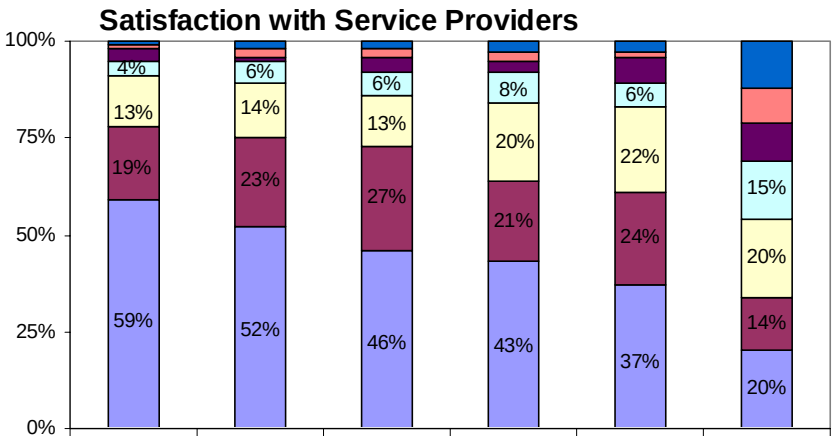


Over half of respondents do not rent VHS or DVD movies in a typical month. Thirteen percent rent one, 8% rent two, 6% rent three, 6% rent four, and 15% rent five or more movies in a typical month.



10.5.3 Satisfaction with Service Providers

Respondents rated their overall satisfaction with various utility providers using a scale of one to seven, with one meaning “very dissatisfied” and seven meaning “very satisfied.” Generally, respondents are satisfied with their service providers; respondents are most satisfied with their electric utility, long distance telephone, and local telephone providers. The cable television provider received the lowest ratings among the respondents with 21% expressing some level of dissatisfaction with their cable service.



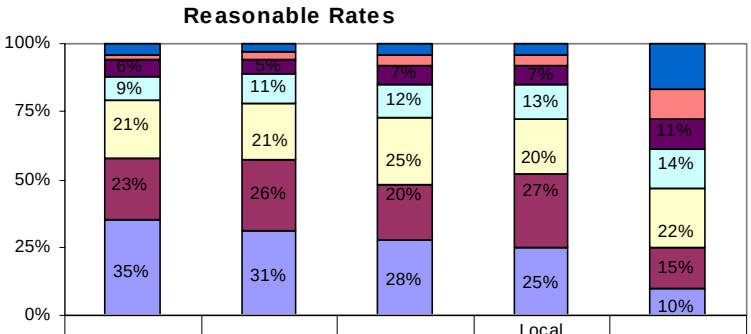
	Electric Utility n=399	Long Distance n=314	Local Telephone n=395	City of Jacksonville n=392	Internet n=224	Cable TV n=252
Very Dissatisfied	1%	2%	2%	3%	3%	12%
Dissatisfied	1%	2%	2%	2%	1%	9%
Somew hat Dissatisfied	3%	1%	4%	3%	7%	10%
Neutral	4%	6%	6%	8%	6%	15%
Somew hat Satisfied	13%	14%	13%	20%	22%	20%
Satisfied	19%	23%	27%	21%	24%	14%
Very Satisfied	59%	52%	46%	43%	37%	20%

In addition, statistical significance was measured at a 95% confidence level and a +-5% confidence interval. Statistical significance refers to the probability that the data is true and not due to chance. For the purpose of this analysis, only the top two scores were considered—very satisfied and satisfied. From experience, these two scores typically reflect actual decision making by the population.

Satisfaction with JEA and the City is statistically significant. Moreover, satisfaction with JEA and satisfaction with the City are both statistically different from the cable TV provider. Based on that fact, the confidence is high that the numbers are measuring what they were intended to measure and the data can be extrapolated to represent the opinions of the Jacksonville population. Respondents are most satisfied with JEA (78%), compared to the City (64%), and the cable TV (34%) provider.

10.5.4 Service Provider Rates

Next, on a scale of one to seven with one meaning "very unreasonable" and seven meaning "very reasonable," respondents indicate their perceptions of current service rates. Fifty-eight percent of respondents believe the electric utility rates are very reasonable, 57% of respondents feel that long distance telephone rates are very reasonable, 18% believe that Internet rates are very reasonable, 52% view local telephone rates as very reasonable, and 25% believe cable TV rates are very reasonable.

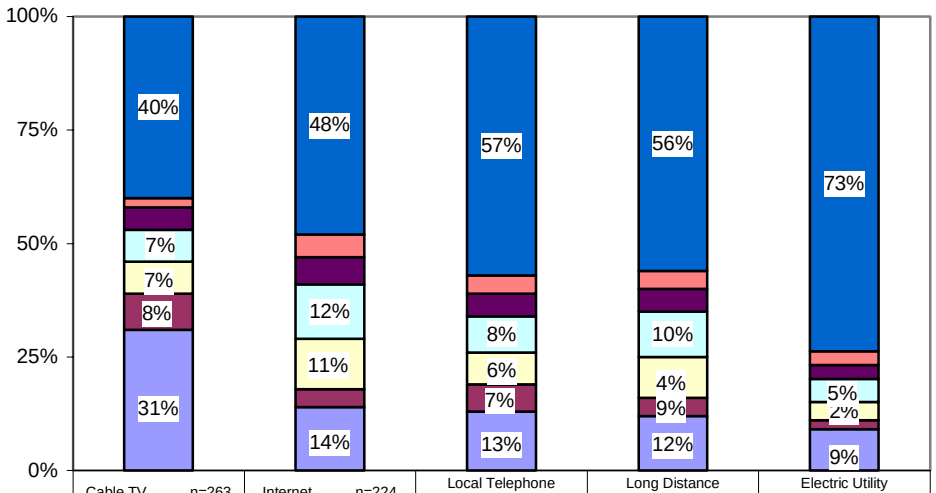


	Electric Utility n=396	Long Distance n=310	Internet n=224	Local Telephone n=393	Cable TV n=263
Very Unreasonable	4%	3%	4%	4%	17%
Unreasonable	2%	3%	4%	4%	11%
Somew hat Unreasonable	6%	5%	7%	7%	11%
Neutral	9%	11%	12%	13%	14%
Somew hat Reasonable	21%	21%	25%	20%	22%
Reasonable	23%	26%	20%	27%	15%
Very Reasonable	35%	31%	28%	25%	10%

10.5.5 Likelihood of Switching Providers

Given the same price and same service, respondents indicate their likelihood of switching providers on a scale of one to seven, where one represents “very unlikely” and seven represents “very likely” to switch service providers. Thirty-nine percent of respondents are very likely to switch their cable TV company, 18% are very likely to switch Internet companies, and 19% are very likely to switch their local telephone provider. Sixteen percent are very likely to switch their long distance provider and 11% are very likely to switch their electric utility. At the same time, over half of respondents are very unlikely to switch their electric utility provider, long distance, or local telephone provider.

Likelihood of Switching

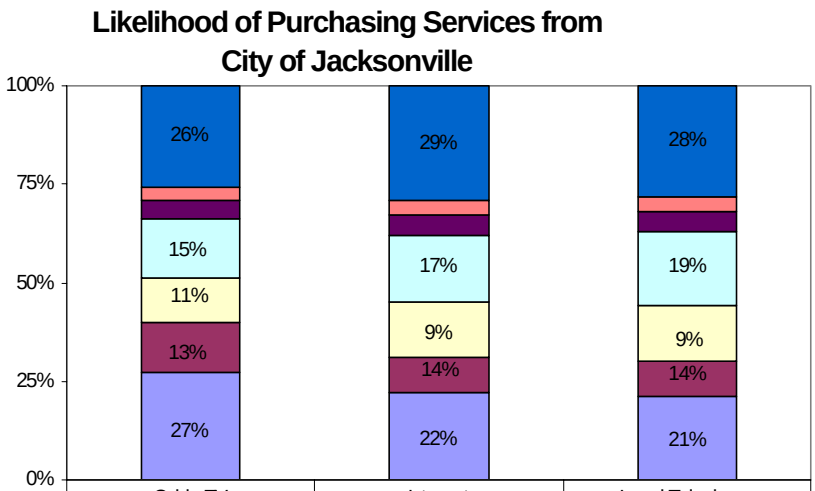


	Cable TV n=263	Internet n=224	Local Telephone n=393	Long Distance n=308	Electric Utility n=395
Very Unlikely	40%	48%	57%	56%	73%
Unlikely	2%	5%	4%	4%	3%
Somewhat Unlikely	5%	6%	5%	5%	3%
Neutral	7%	12%	8%	10%	5%
Somewhat Likely	7%	11%	7%	9%	4%
Likely	8%	4%	6%	4%	2%
Very Likely	31%	14%	13%	12%	9%

Again, statistical significance was measured for respondent likelihood to switch using the likely and very likely scores. There is a statistical difference between likelihood to switch from JEA and the likelihood to switch local telephone providers. Likelihood of switching from JEA and the local telephone provider are both statistically different from likelihood to switch cable TV providers. Thus, it can be concluded that respondents are more likely to switch their cable TV provider (39%) than their local telephone (19%) or electric utility (11%) providers.

10.5.6 Likelihood of Purchasing Services from the City of Jacksonville

A rating scale of one to seven was again used by respondents to indicate their likelihood of purchasing services from the City of Jacksonville. Thirty percent or more of the respondents are likely or very likely to purchase local telephone, cable TV, and Internet services from the City of Jacksonville.



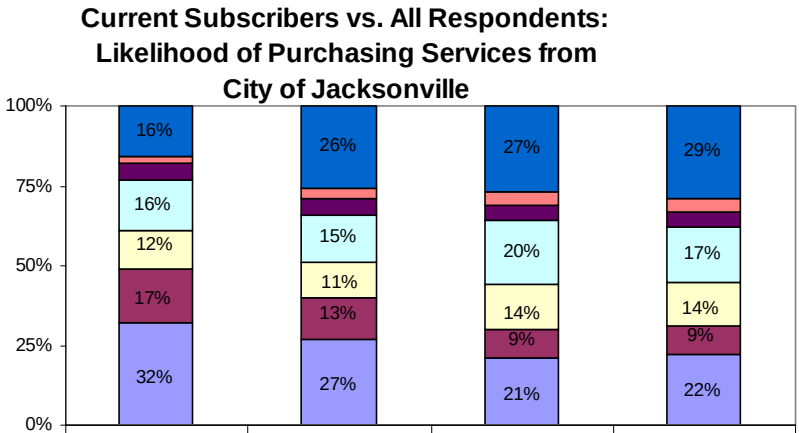
	Cable TV n=364	Internet n=295	Local Telephone n=384
Very Unlikely	26%	29%	28%
Somew hat Unlikely	3%	4%	4%
Unlikely	5%	5%	5%
Neutral	15%	17%	19%
Somew hat Likely	11%	14%	14%
Likely	13%	9%	9%
Very Likely	27%	22%	21%

A statistical difference exists between likelihood to purchase cable TV from the City and likelihood to purchase local telephone service from the City. The data indicates that more respondents are likely to purchase cable TV (40% are likely/very likely) than local telephone (30% are likely/very likely) from the City.

Due to sample size and results, it is unclear if the purchase Internet services from the City would be more or less than cable TV or telephone services.

10.5.7 Likelihood of Purchasing from City of Jacksonville Current Subscribers vs. All Respondents

The graph below compares customer likelihood of purchasing cable TV and Internet services of current subscribers to that of all respondents. Customer likelihood of purchasing cable TV increased slightly among current subscribers as compared to all respondents; 49% of current cable TV subscribers are likely or very likely to purchase as compared to 40% of all respondents. The likelihood of purchasing Internet services remained relatively the same when comparing current customers to all respondents.



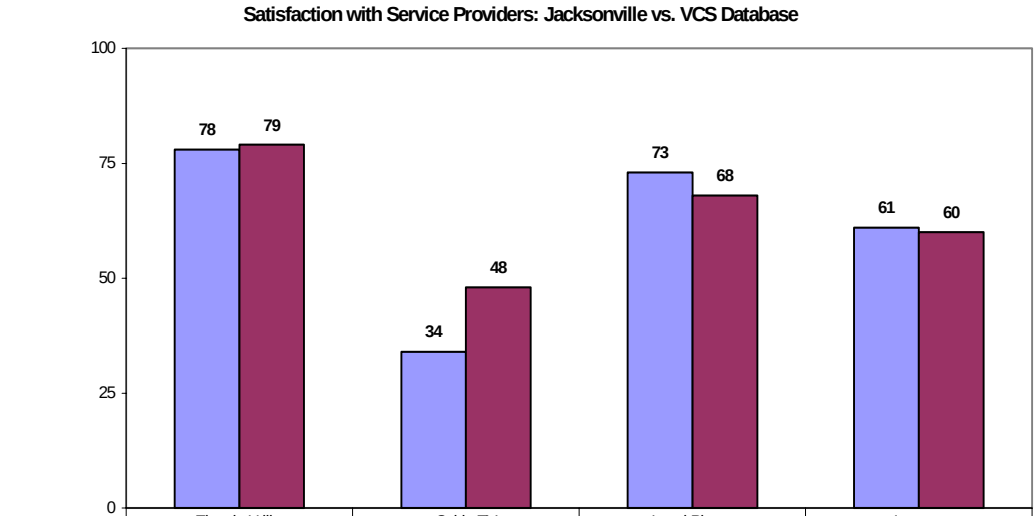
	Current Cable TV Subscribers n=263	All Respondents Cable TV n=364	Current Internet Subscribers n=254	All Respondents Internet n=295
Very Unlikely	16%	26%	27%	29%
Unlikely	2%	3%	4%	4%
Somew hat Unlikely	5%	5%	5%	5%
Neutral	16%	15%	20%	17%
Somew hat Likely	12%	11%	14%	14%
Likely	17%	13%	9%	9%
Very Likely	32%	27%	21%	22%

10.5.8 Jacksonville vs. VCS Database Results

Results for satisfaction, likelihood to switch, and likelihood to purchase services from the City were compared to data VCS has gathered by conducting similar studies across the U.S. The following comparisons are based on respondents' top two answers (scores of 6 and 7 on a 7-point scale).

10.5.9 Satisfaction with Service Providers

Jacksonville respondents are similarly satisfied with their electric utility, local telephone, and Internet providers as compared to the VCS database. However, only 34% of Jacksonville respondents are satisfied with their cable TV provider as compared to 48% of those in the database.

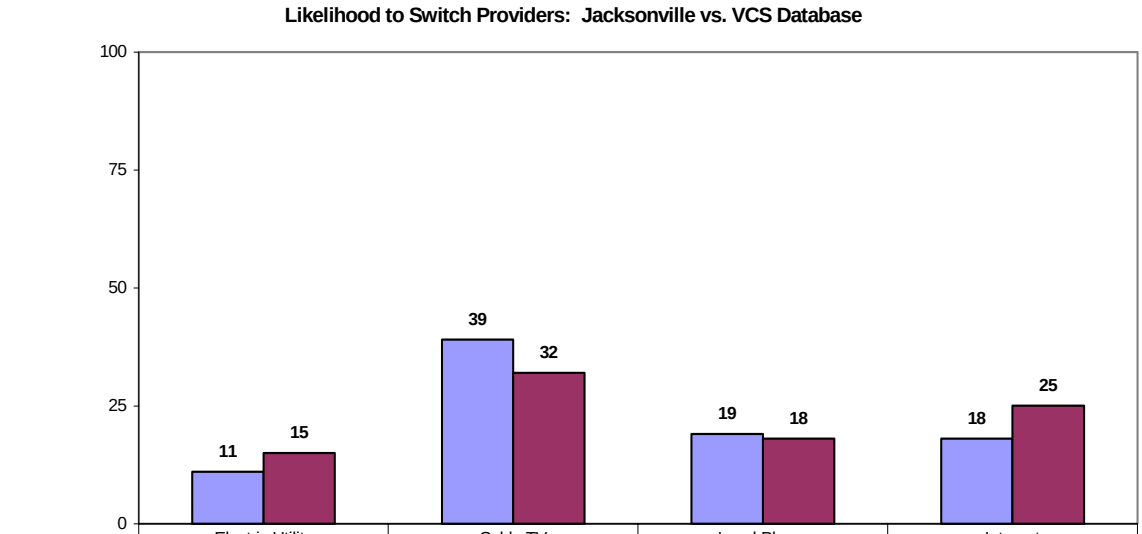


	Electric Utility	Cable TV	Local Phone	Internet
Jacksonville	78	34	73	61
VCS Database	79	48	68	60

Above chart based on very satisfied and satisfied scores = responses of 6 & 7 on a 7-point scale

10.5.10 Likelihood to Switch Service Providers

Both in Jacksonville and in the database, respondents are least likely to switch their electric utility provider if given an option. At the same time, respondents are more likely to switch their cable TV provider—39% of Jacksonville respondents are likely or very likely to switch their cable provider versus the database score of 32%.

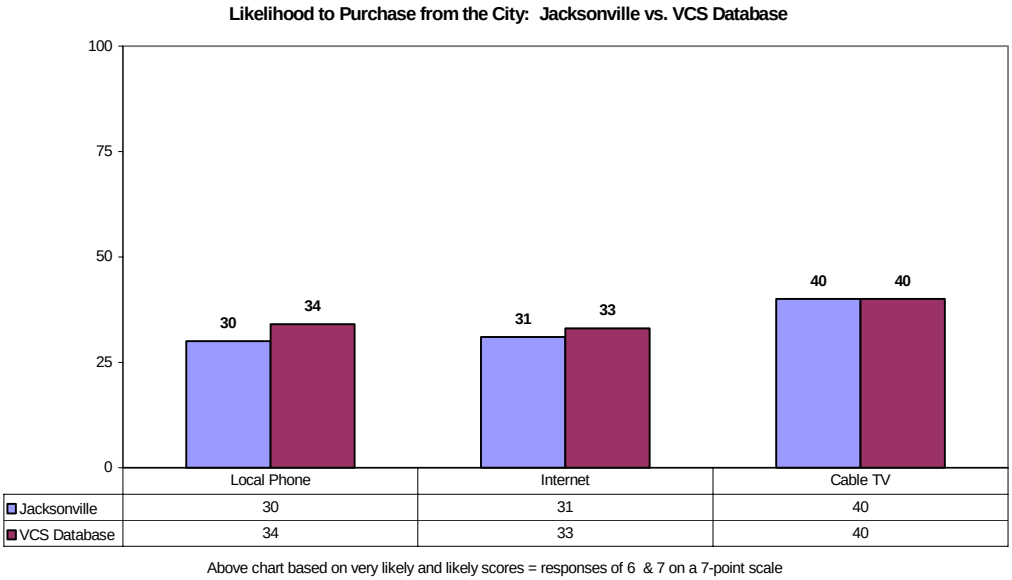


	Electric Utility	Cable TV	Local Phone	Internet
Jacksonville	11	39	19	18
VCS Database	15	32	18	25

Above chart based on very likely and likely scores = responses of 6 & 7 on a 7-point scale

10.5.11 Likelihood to Purchase Service from the City

Jacksonville results closely mirror the database results with regard to likelihood to purchase services from the City, if offered. In fact, 40% of respondents in Jacksonville and in the database are likely to purchase cable TV from the City.



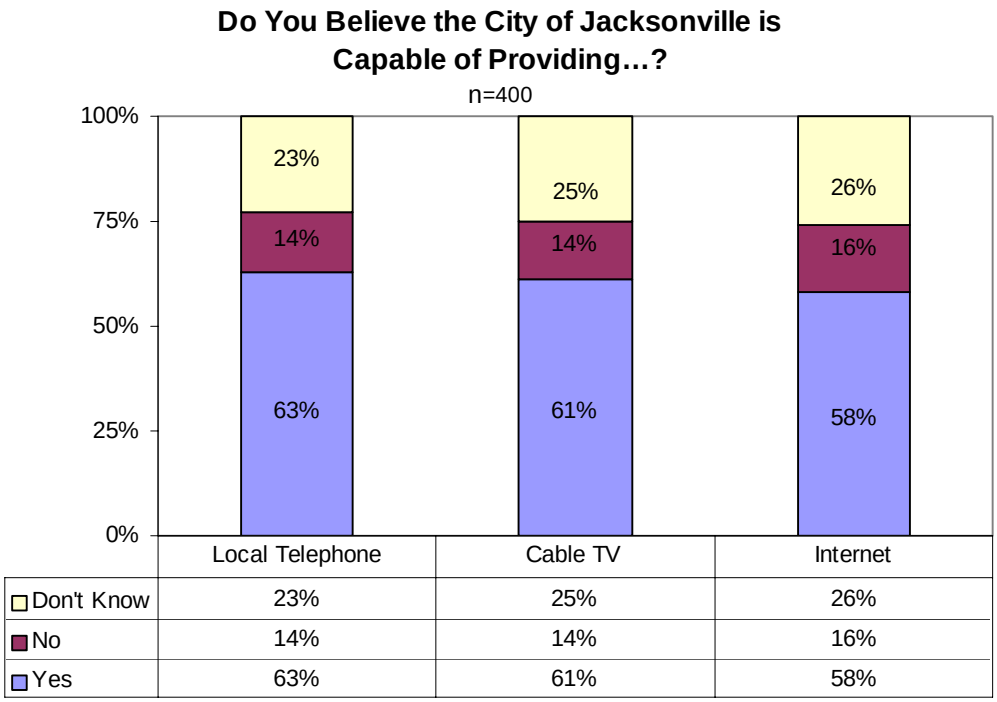
	Local Phone	Internet	Cable TV
Jacksonville	30	31	40
VCS Database	34	33	40

Above chart based on very likely and likely scores = responses of 6 & 7 on a 7-point scale

As illustrated above, there seems to be a link between overall satisfaction, likelihood to switch, and likelihood to purchase from the City. Obviously, if customers are dissatisfied, they prefer to purchase from an alternative provider, if given an option.

10.5.12 City of Jacksonville Capable of Providing Services

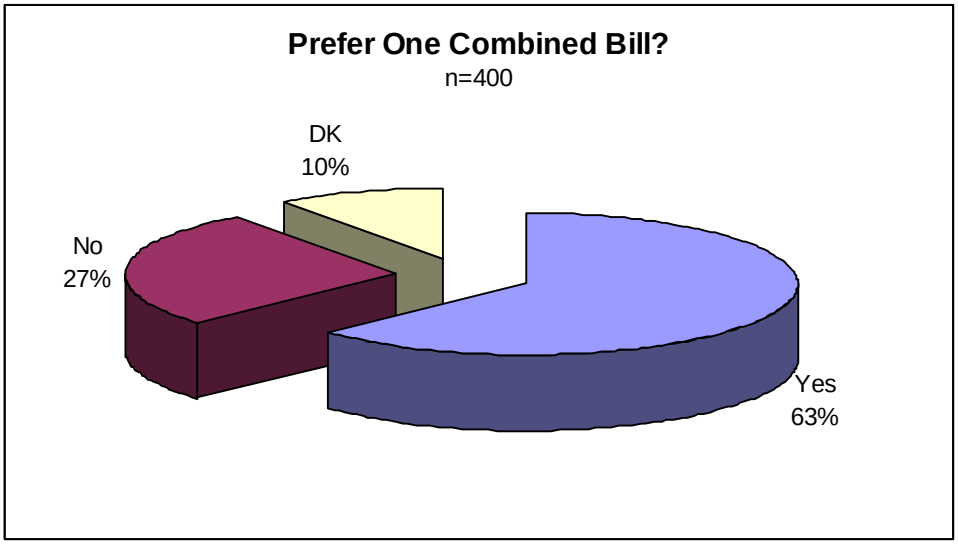
Approximately 60% of respondents believe that the City of Jacksonville is capable of providing cable TV, Internet, and local telephone services.



	Local Telephone	Cable TV	Internet
Don't Know	23%	25%	26%
No	14%	14%	16%
Yes	63%	61%	58%

10.5.13 Combined Utility Bill

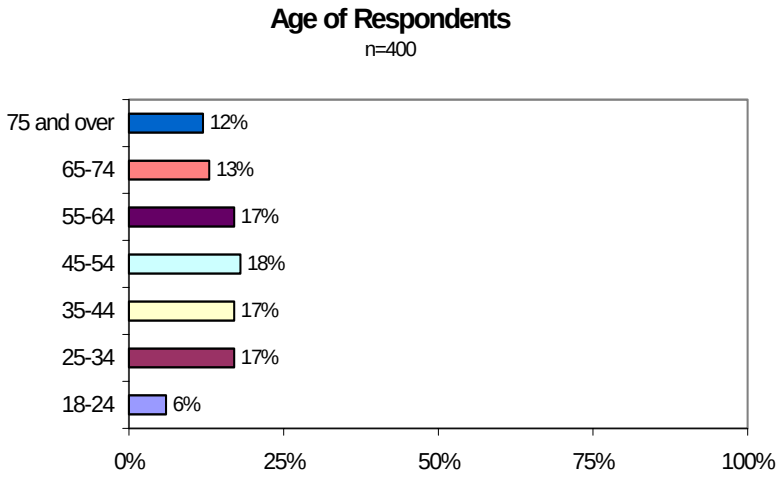
The respondents were asked if they would like to receive and pay for all of their utility services, including the electric utility, cable TV, and telephone services from one itemized bill. Sixty-three percent of the respondents prefer this type of bill, while 27% do not prefer it, and 10% are not sure.



10.6 Demographics

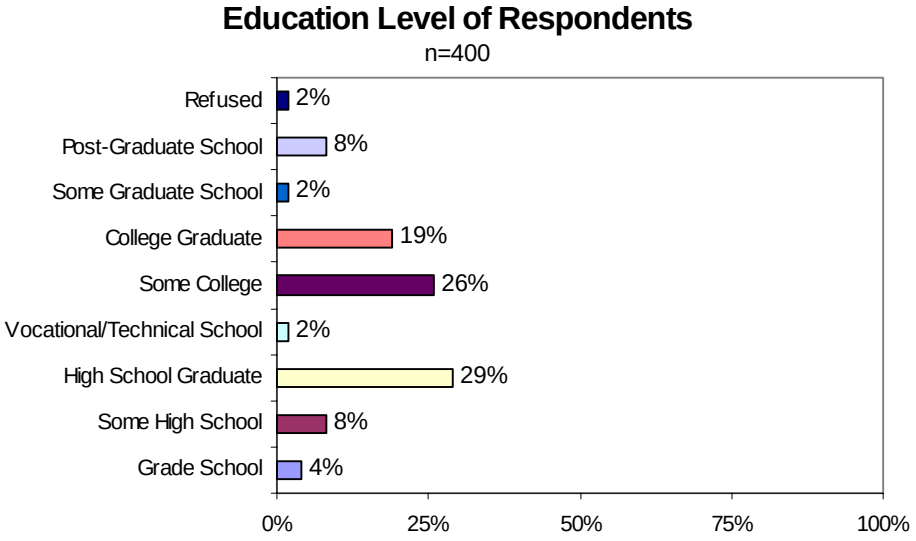
10.6.1 Gender and Age

Sixty-four percent of respondents are female and 36% are male. Forty-two percent of respondents are ages 55 and over, 18% are between the ages of 45 and 54, 17% are 35 to 44, 17% are 25 to 34, and 6% are between the ages 18 and 24.



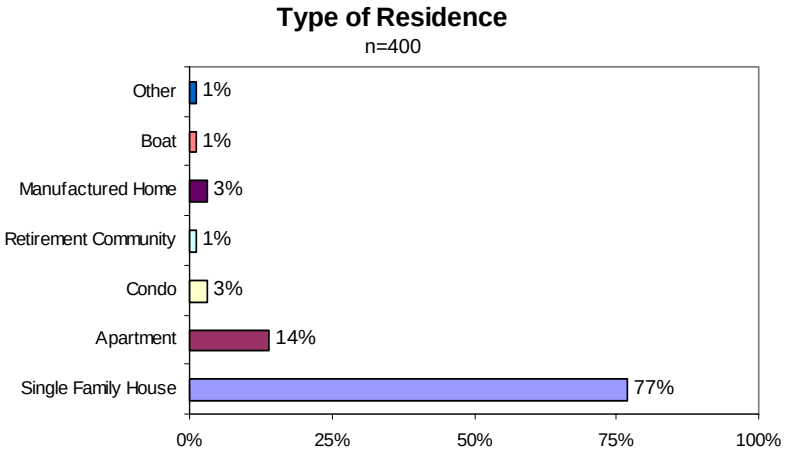
10.6.2 Education

Twenty-nine percent of respondents are high school graduates, 26% completed some college, 19% are college graduates, 8% have a post-graduate degree, and 8% completed some high school.



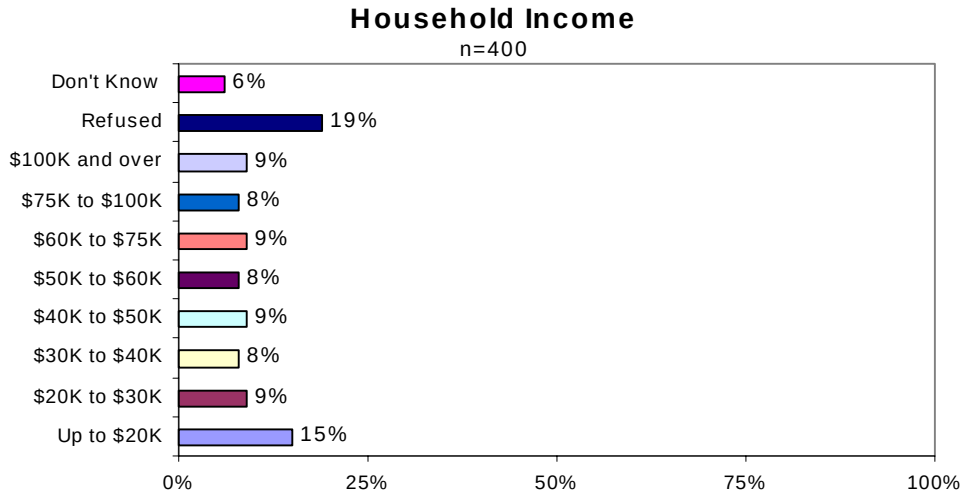
10.6.3 Residence

Most respondents (77%) live in a single-family house, 14% live in an apartment, 3% own a condo, and 3% reside in a manufactured home.



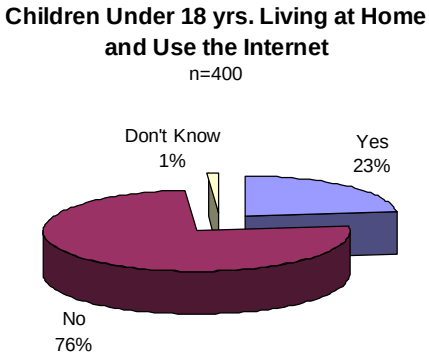
10.6.4 Income

Twenty-four percent of respondents earn less than $30,000 per year, 17% have an income between $30,000 and $49,999, 17% earn $50,000 to $74,999, and 17% have an income of $75,000 and over. In addition, 19% refused to provide their income level and 6% are not sure of their income level.



10.6.5 Children under 18 who Use the Internet

Nearly one-fourth (23%) of respondents have children under the age of 18 living at home who use the Internet.



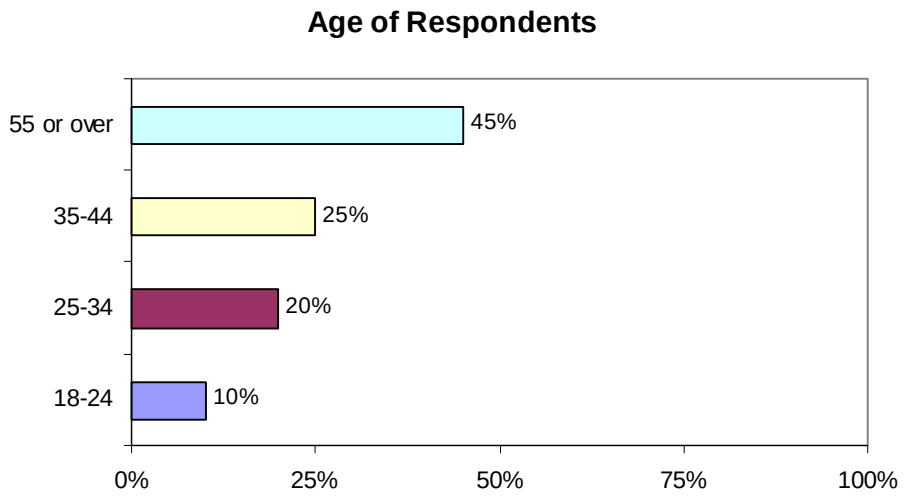
10.7 Residential Focus Group Analysis

10.7.1 Perception Analyzer™ Results

The results of the Perception Analyzer™ provide background information and illustration only and should not be viewed as a representative (or quantitative) sample. This exercise serves merely as an indicator of respondents' initial reactions to ideas and concepts without peer influence.

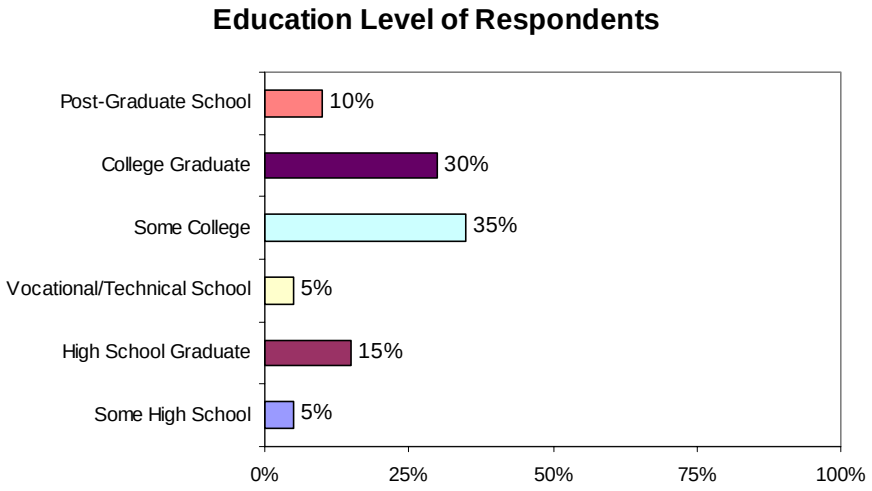
10.7.2 Gender and Age

Nine of the respondents attending the focus groups are male and eleven are female. Forty-five percent are ages 55 and over, 25% are 35 to 44 years, 20% are 25 to 34 years, and 10% are 18 to 24 years of age.



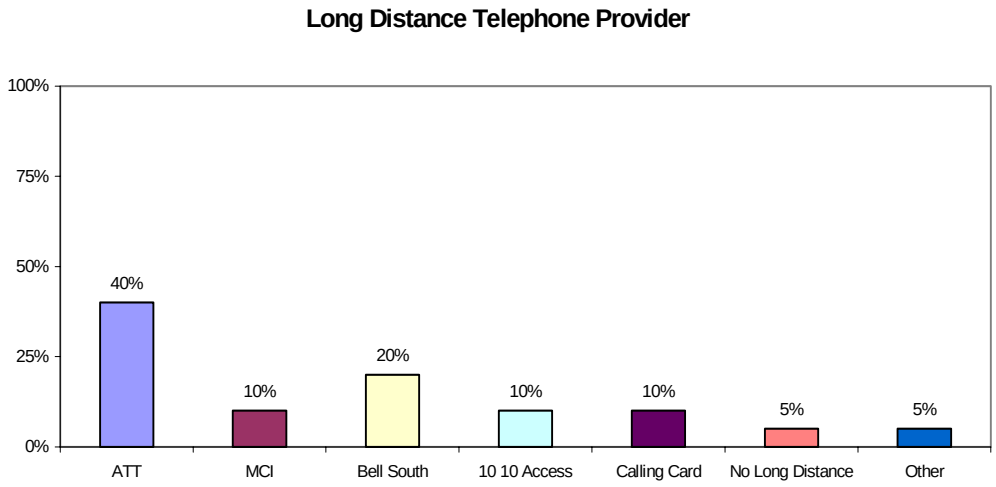
10.7.3 Education

Thirty-five percent of respondents completed some college, 30% are college graduates, 15% are high school graduates, and 10% have a post graduate degree.



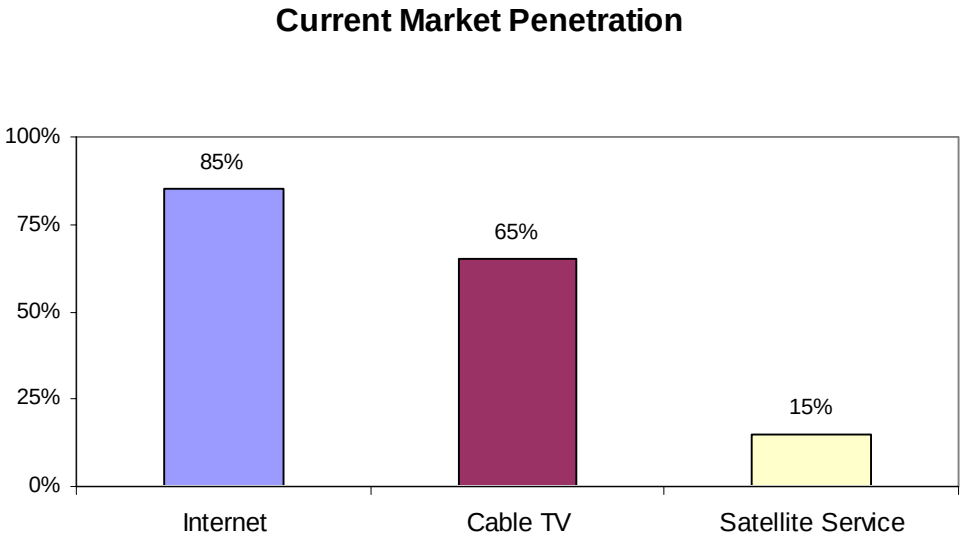
10.7.4 Long Distance Telephone Provider

Forty percent of respondents receive long distance telephone service from AT&T, 20% use Bell South, 10% receive service from MCI, 10% use a 10-10 access number, 10% use a calling card, 5% do not have long distance, and 5% have some other provider.



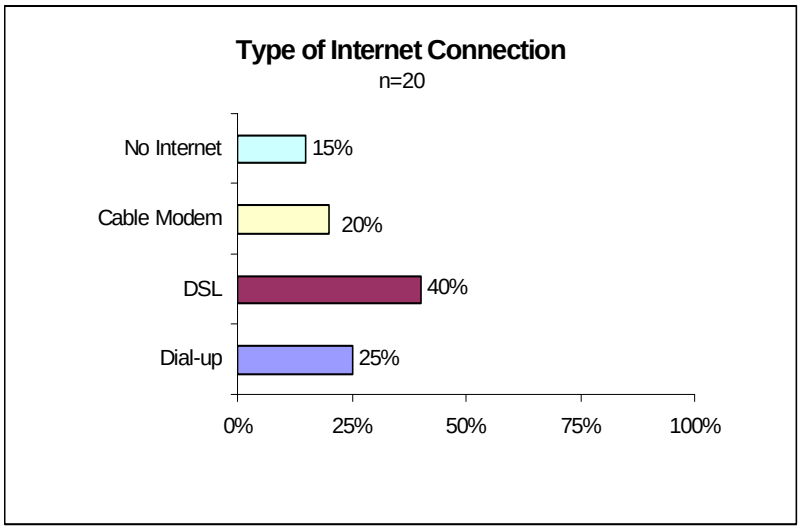
10.7.5 Current Service Penetration

Eighty-five percent of respondents have Internet access, 65% subscribe to cable television at home, and 15% have a satellite dish for television reception.

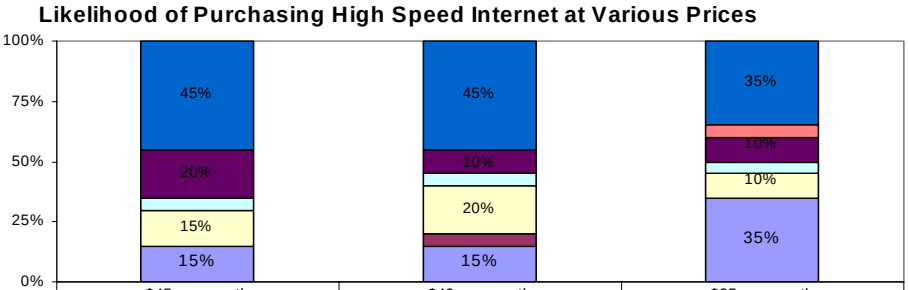


10.7.6 Internet Service

Forty percent of respondents have DSL Internet service, 25% have a dial-up, 20% have a cable modem, and 15% do not currently subscribe to Internet service.



On a scale of one to seven, with one meaning "very unlikely" and seven meaning "very likely," respondents rate their likelihood of purchasing high-speed Internet at $35, $40 and $45 per month. As indicated in the graph below, customer likelihood of purchasing high-speed Internet increases at the lowest presented monthly price—15% are very likely to purchase high-speed Internet at $45 per month and at $40 per month, and 35% are very likely at $35 per month.

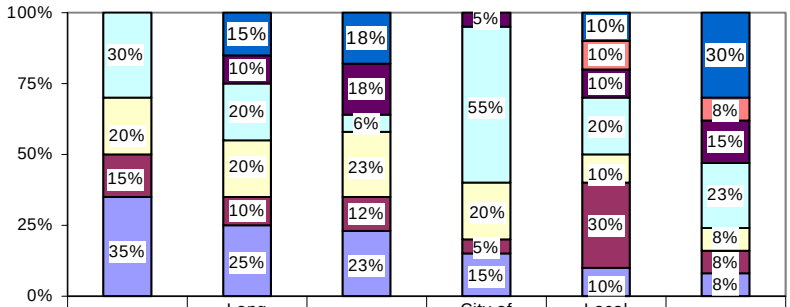


	$45 per month n=20	$40 per month n=20	$35 per month n=20
Very Unlikely	45%	45%	35%
Unlikely			5%
Somew hat Unlikely	20%	10%	10%
Neutral	5%	5%	5%
Somew hat Likely	15%	20%	10%
Likely		5%	
Very Likely	15%	15%	35%

10.7.7 Satisfaction with Service Providers

Respondents indicated their level of satisfaction with various service providers. JEA has the highest overall satisfaction rating (50% are satisfied/very satisfied) as compared to the other service providers. Thirty-five percent are satisfied/very satisfied with their long distance company, 35% are satisfied/very satisfied with their Internet Company, 20% are satisfied/very satisfied with the City of Jacksonville, and 16% are satisfied/very satisfied with their cable television provider. The cable television provider received the highest percentage of dissatisfied and very dissatisfied responses with 38% of the respondents.

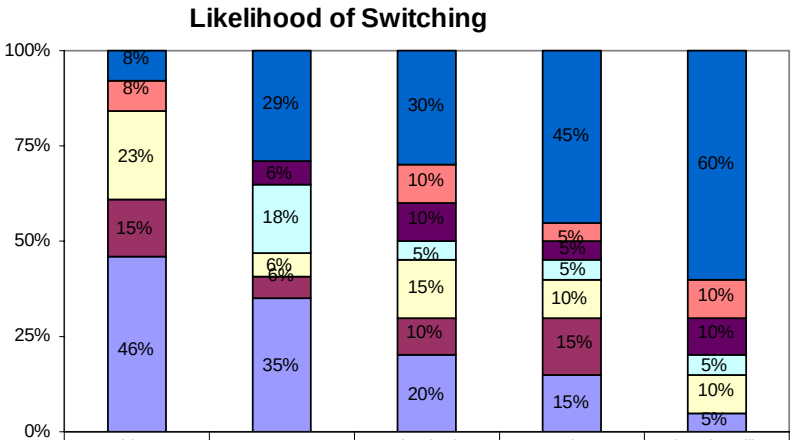
Satisfaction with Service Providers



	Electric Utility n=20	Long Distance n=20	Internet n=17	City of Jacksonville n=20	Local Telephone n=20	Cable TV n=13
Very Dissatisfied		15%	18%		10%	30%
Dissatisfied					10%	8%
Somewhat Dissatisfied		10%	18%	5%	10%	15%
Neutral	30%	20%	6%	55%	20%	23%
Somewhat Satisfied	20%	20%	23%	20%	10%	8%
Satisfied	15%	10%	12%	5%	30%	8%
Very Satisfied	35%	25%	23%	15%	10%	8%

10.7.8 Likelihood of Switching

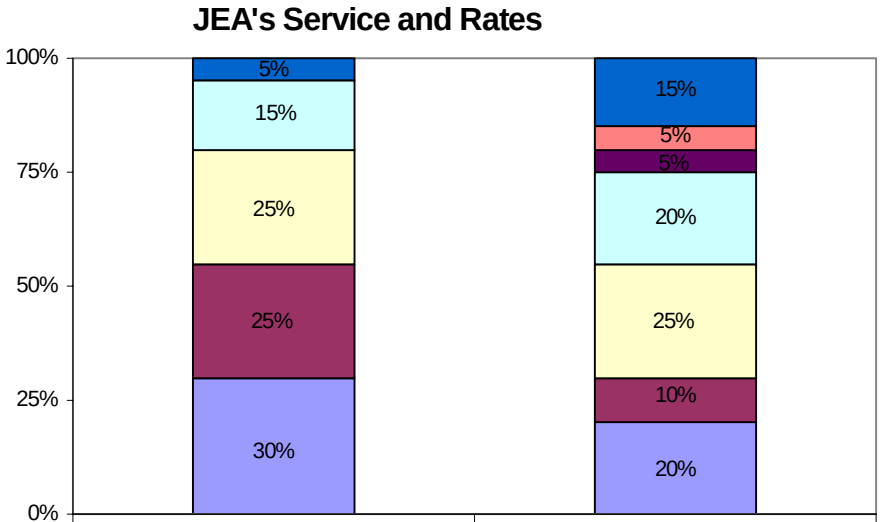
Given a choice, 46% of respondents are very likely to switch their cable television service, 35% are very likely to switch their Internet provider, 20% are very likely to switch their local telephone company, 15% are very likely to switch their long distance provider, and 5% are very likely to switch their electric utility.



	Cable TV n=13	Internet n=17	Local Telephone n=20	Long Distance n=20	Electric Utility n=20
Very Unlikely	8%	29%	30%	45%	60%
Unlikely	8%		10%	5%	10%
Somew hat Unlikely		6%	10%	5%	10%
Neutral		18%	5%	5%	5%
Somew hat Likely	23%	6%	15%	10%	10%
Likely	15%	6%	10%	15%	
Very Likely	46%	35%	20%	15%	5%

10.7.9 JEA's Service and Rates

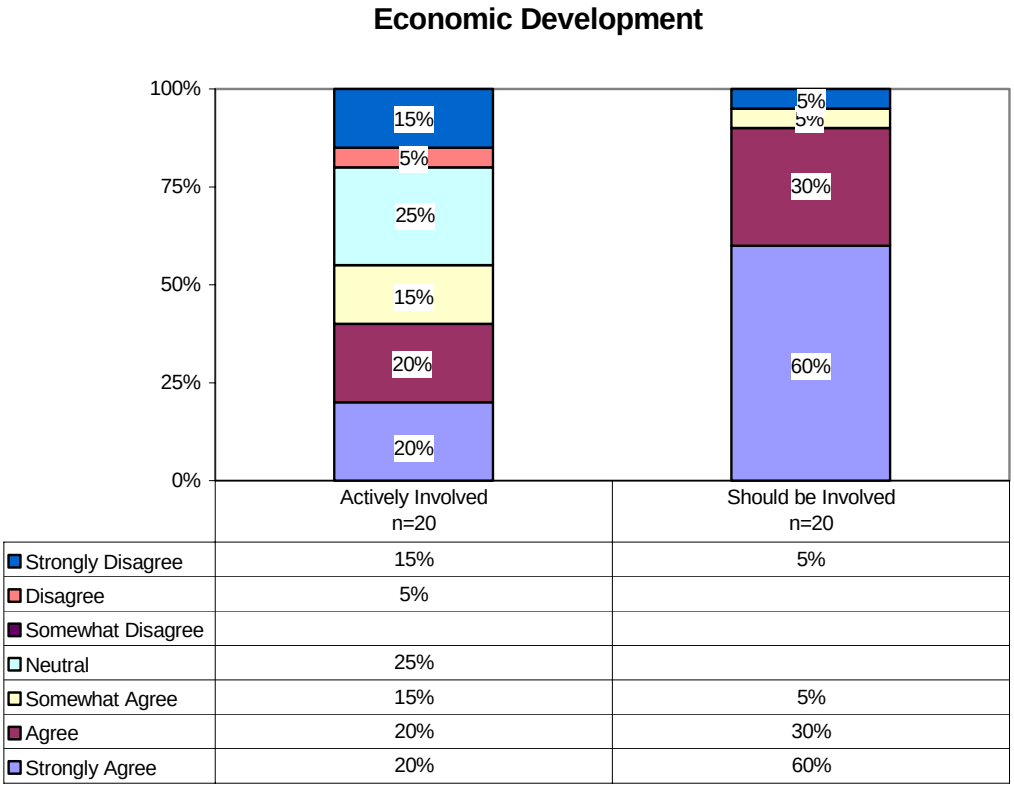
Respondents indicated their level of agreement with statements related to JEA's services and rates. Fifty-five percent of respondents agree/strongly agree that JEA provides good service and 30% agree/strongly agree that JEA has reasonable rates.



	Provides Good Service n=20	Rates are Reasonable n=20
Strongly Disagree	5%	15%
Disagree		5%
Somewhat Disagree		5%
Neutral	15%	20%
Somewhat Agree	25%	25%
Agree	25%	10%
Strongly Agree	30%	20%

10.7.10 Economic Development

Forty percent of respondents agree/strongly agree that the City of Jacksonville is actively involved in economic development, while 90% agree/strongly agree that the City should be involved.

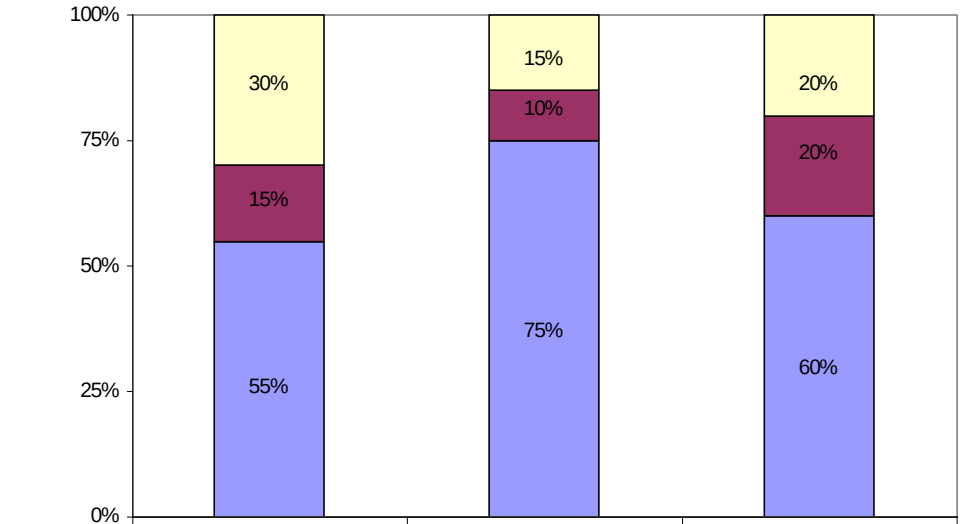


	Actively Involved n=20	Should be Involved n=20
Strongly Disagree	15%	5%
Disagree	5%	
Somewhat Disagree		
Neutral	25%	
Somewhat Agree	15%	5%
Agree	20%	30%
Strongly Agree	20%	60%

10.7.11 City of Jacksonville Capable of New Services

Over 50% of respondents strongly agree that the City of Jacksonville is capable of providing local telephone, cable TV, and Internet service.

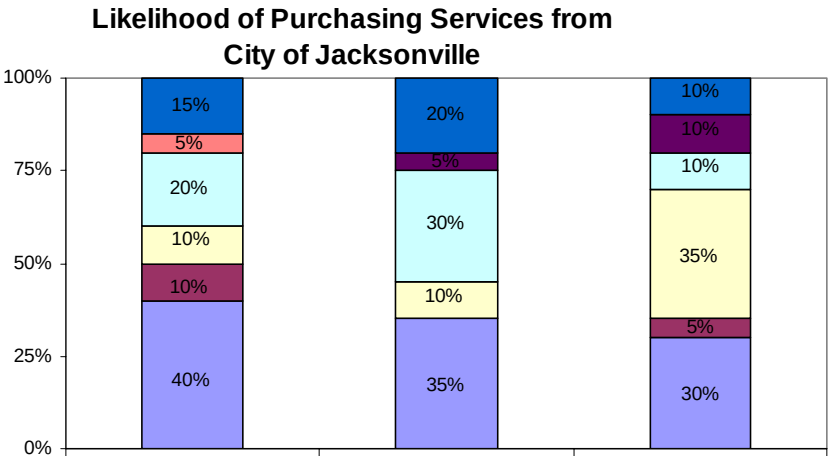
Do You Believe the City of Jacksonville is Capable of Providing…?



	Local Telephone n=20	Cable TV n=20	Internet n=20
Don't Know	30%	15%	20%
No	15%	10%	20%
Yes	55%	75%	60%

10.7.12 Likelihood of Purchasing

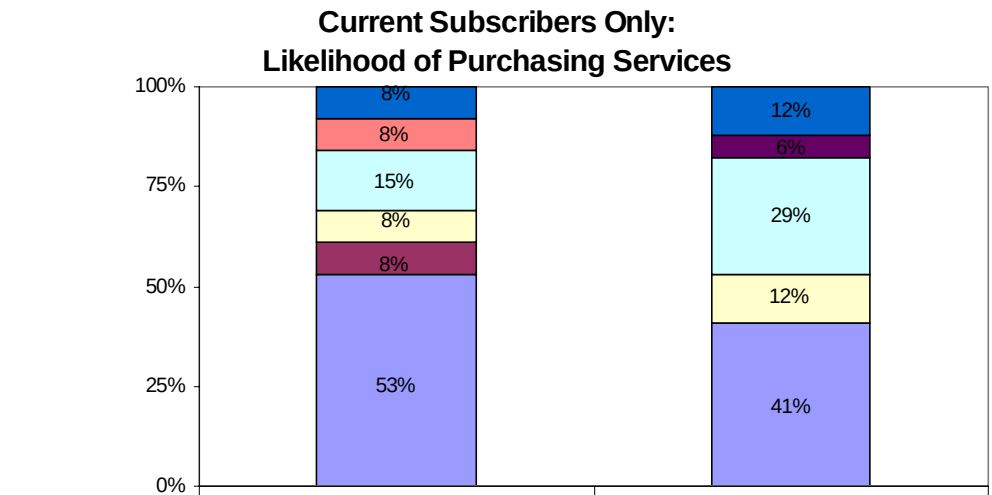
Half of respondents are likely/very likely to purchase cable TV, and 35% are likely/very likely to purchase Internet and local telephone services from the City of Jacksonville, if offered.



	Cable TV n=20	Internet n=20	Local Telephone n=20
Very Unlikely	15%	20%	10%
Somew hat Unlikely	5%		
Unlikely		5%	10%
Neutral	20%	30%	10%
Somew hat Likely	10%	10%	35%
Likely	10%		5%
Very Likely	40%	35%	30%

10.7.13 Current Subscribers Only: Likelihood of Purchasing

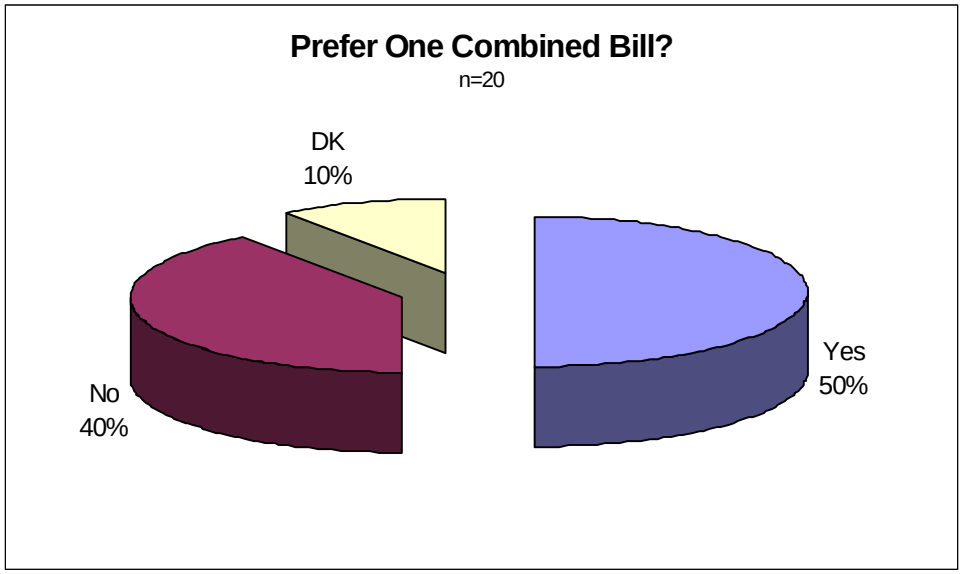
Likelihood of purchasing services from the City of Jacksonville was defined by current subscribers. Fifty-three percent of current cable TV subscribers and 41% of Internet subscribers are very likely to purchase services from the City if offered.



	Cable TV n=13	Internet n=17
Very Unlikely	8%	12%
Somew hat Unlikely	8%	
Unlikely		6%
Neutral	15%	29%
Somew hat Likely	8%	12%
Likely	8%	
Very Likely	53%	41%

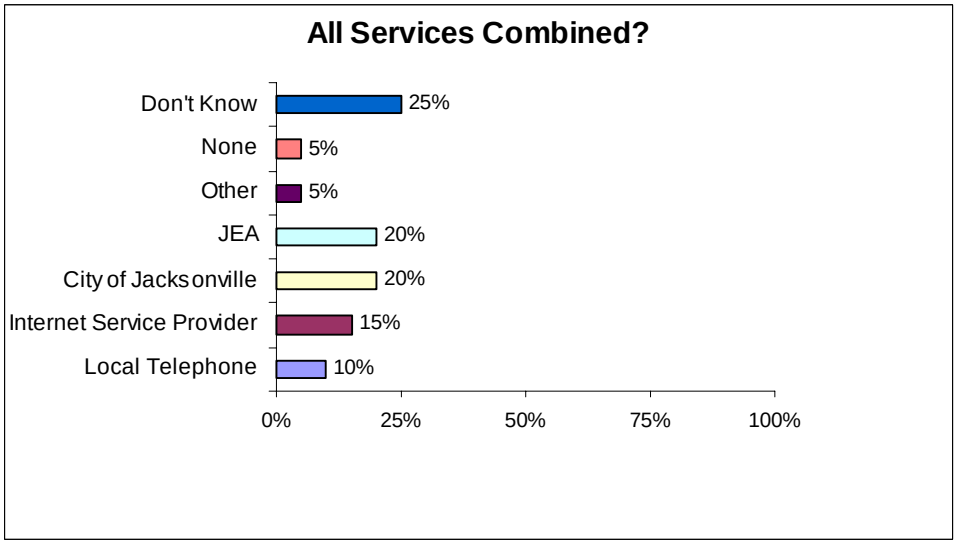
10.7.14 One Bill for All Services

Fifty percent of respondents would like to receive one combined bill for all of their utility and telecommunications services (such as cable TV, Internet, and telephone).



10.7.15 All Services Combined

If all utility and telecommunication services were combined and provided by one company, 20% of respondents believe the City of Jacksonville would provide the best service, 20% believe JEA, 15% believe their Internet provider, and 10% believe their local telephone company would provide the best service. In addition, 25% of respondents are not sure which company would provide the best service if one company offered all services.



10.8 Residential Group Discussion

10.8.1 Image of the City of Jacksonville

Respondents were first asked to provide their initial thoughts of the City of Jacksonville. Respondents mentioned the population growth, traffic, road conditions, city government and the skyway. The increase in population and general growth of the City was viewed with mixed reactions. Some respondents welcome growth, the possibility of new business and job opportunities, while others express some trepidation. One respondent said, "The City is well organized for its size." While another said, "I see lots of changes, more business openings; I think it will be a very lucrative place to live in terms of jobs." Conversely, a respondent commented, "its tough keeping up with population; traffic and roadways can't keep up."

Respondents expressed some concern with the limited expansion of the skyway. As one respondent said, "It doesn't go far enough it needs to expand to the beaches and downtown." Others view the skyway as an opportunity to ease traffic congestion. Several commented on problems with the bus system in Jacksonville. A respondent suggested adding routes to increase the service to more citizens in the city limits and in outlying areas.

A respondent suggested expanding downtown Jacksonville by developing the "many open lots." Another respondent added, "Put something besides apartments downtown; there is nothing here."

A respondent suggested giving the City Council more power than the mayor. Another complimented the mayor and City Council for being accessible. She said, "Even if you have something minimal to share, they are very responsive. It's almost like a small town." A respondent complained about the Better Jacksonville Plan. She claimed it was not beneficial to her neighborhood and has lost confidence in the mayor.

One respondent said, "We've come a long way within five to ten years…gained a lot in development in bringing industry and growth to the area. I like the idea of becoming a one stop shop for telecom – to eliminate clutter – to get the same level of service – the City knows itself best versus a typical corporate outside agency."

Good Service

Next respondents were asked to define good service in terms of cable TV, Internet, and telephone services. Respondents mention the importance of quick response times, affordable rates, courteous service, and most importantly, speaking to a human voice.

Long Distance Telephone Service

Few respondents expressed loyalty to their long distance telephone provider. Most have switched long distance companies for better rates. One respondent commented, "I am happy with mine. I could always switch if I'm not happy…you get free things when you switch."

Local Telephone Service

A couple of respondents have switched their local telephone service to Alltel because they found less expensive rates. Others expressed satisfaction with BellSouth as their local telephone provider. A respondent said, "They provide the best service, they are customer oriented and responsive." On the other hand, another respondent claimed, "Bills are too high and taxes are too high" with BellSouth. Another commented, "BellSouth has a monopoly."

Most respondents have additional features with their local telephone service, such as call waiting and caller ID. When asked if respondents are aware of any telephone services not available in Jacksonville, respondents could not identify any.

Nearly all respondents would consider purchasing local telephone service from the City provided that service and prices are the same as that of the current providers. A respondent said, "I am an advocate of having all services under one umbrella. It should be more cost effective, and savings should be passed on to me. I would switch if bundled and cheaper." Another said, "I would quit BellSouth in a heart beat."

A few respondents were concerned about obtaining service from a new company. One questioned whether the City would buy or lease existing equipment and lines.

Internet Services

Eighty-five percent of focus group respondents have Internet access at home. A variety of Internet providers are named including AOL, Net Zero, BellSouth, Juno, Yahoo, AT&T, Walmart, and complimentary service provided by a local college. The majority of respondents have a dial-up Internet connection; a few have DSL and cable modem service. Of those respondents with dial-up Internet, most complained of slow downloading speeds, while those with higher-speed connections were generally satisfied.

Few respondents are willing to pay more for high-speed Internet service. One respondent said, "I can't afford high speed with a family…we only have one computer that everyone in the family needs to use." A proponent of high-speed Internet commented, "Time is valuable."

Most respondents would consider purchasing Internet service from the City of Jacksonville. A respondent said, "It depends on how it compares to current service offerings." Another states, "I wouldn't because I am kind of scared…it's new."

Cable Television Service

All of the current cable television service subscribers obtain service from AT&T. Respondents are dissatisfied with services complaining of billing issues, increasing rates, lack of versatility in packages, and unreliable service. A respondent stated, "Every year prices increase, stations remain the same…too many promises…we need to get rid of them." Another said, "I complained to AT&T about service level and they told me the cable was bad because I had basic service, so I bought a satellite dish."

Most respondents believe their monthly cable TV bill is too high. A respondent called it "outrageous." Another said, "I stopped service due to cost, few quality shows, and I didn't watch TV that much." On the other hand, one respondent complimented AT&T's service and pricing by saying, "I've never had a problem in four years and the pricing is competitive."

All respondents would consider purchasing cable TV from the City of Jacksonville. As one respondent commented, "AT&T needs competition, that's why their service is so terrible."

Local Communications Network

In general, respondents believe the City of Jacksonville needs a competitive local communications network that is capable of providing telephone service, Internet, and cable TV. As a respondent said, "We are a growing city; we should be capable of serving our community. The current providers are not looking out for the citizens of Jacksonville. But I don't want to see those companies leave either. I don't want the City to monopolize. Competition is good." Others suggested a need for new infrastructure and increased competition in telecommunications.

Respondents discussed the possible implications of pursuing a local communications network. The perceived negative implications of pursuing a local communications network include: continued poor service with current providers, risk of poor service with new provider, increased costs, and governmental control. The perceived positive implications of pursuing this venture include: lower costs, profitability, and increased attractiveness of Jacksonville. According to one respondent, the primary implication of not pursuing this venture is a continued lack of competition.

Capable of Providing Services

The majority of respondents indicate in both the Perception Analyzer™ exercise and in the group discussion that they believe the City is capable of providing cable TV, Internet, and telephone services.

There was some hesitancy in the City's technical capability, but respondents suggested this issue results in an opportunity to "bring in high-paying, intelligent jobs for the future." All respondents would like to see the City of Jacksonville further investigate this venture.

Creative Thinking Exercise

Finally, respondents were asked to describe the City of Jacksonville in terms of an automobile. A couple of respondents describe the City as a Honda because it's "reliable and economical" and "every year it gets more stylish." Many respondents describe the City as a Ford. One compared it to a Ford Expedition because "The term expedition suggests a journey into the unknown…an adventure…and I believe the next five years will be an adventure." Another compared it to a Ford Thunderbird because "It has been reinvented. I see Jacksonville as previously dead, no excitement, however, the City is reinventing itself." A respondent said, "Ford Taurus because it constantly needs work, although it will still run." Another said, "Ford – because it's a good ride, not too flashy, sometimes slow and sometimes fast. It has more potential than it's using."

10.9 Business Community Interview Analysis

The following information is qualitative in nature and therefore is not a representative sample of the business community in Jacksonville. The data is intended to serve as a guide for the City of Jacksonville to assess the telecommunications services currently used and those desired by the business community.

VCS conducted 23 interviews with commercial and industrial entities in Jacksonville. The interviews were conducted at each respondent's office. In addition, four personal interviews were conducted with potential focus group respondents—these results are included in the following analysis.

10.9.1 Participant Company Information

Twelve organizations have multiple sites within Jacksonville. These locations are between one and forty miles from the main office. Fifteen organizations have locations outside of the City; four are in Florida only, while the others are spread out across the

United States. One organization has a location in the Bahamas, while another has locations worldwide.

Two organizations have ten or fewer employees, four have between 11 and 20 employees, two employ between 21 and 50 persons, six organizations have between 51 and 100 employees, and ten organizations employ more than 100 persons. The number of employees ranged between six and 15,500. Three of the participants were not sure of the number of employees in their organization.

Nearly all (22) organizations interviewed have been located in Jacksonville for more than ten years. Two organizations have been in Jacksonville for one to five years and three organizations have been in the community for six to ten years. One participant wasn't sure how long his organization has been located in Jacksonville.

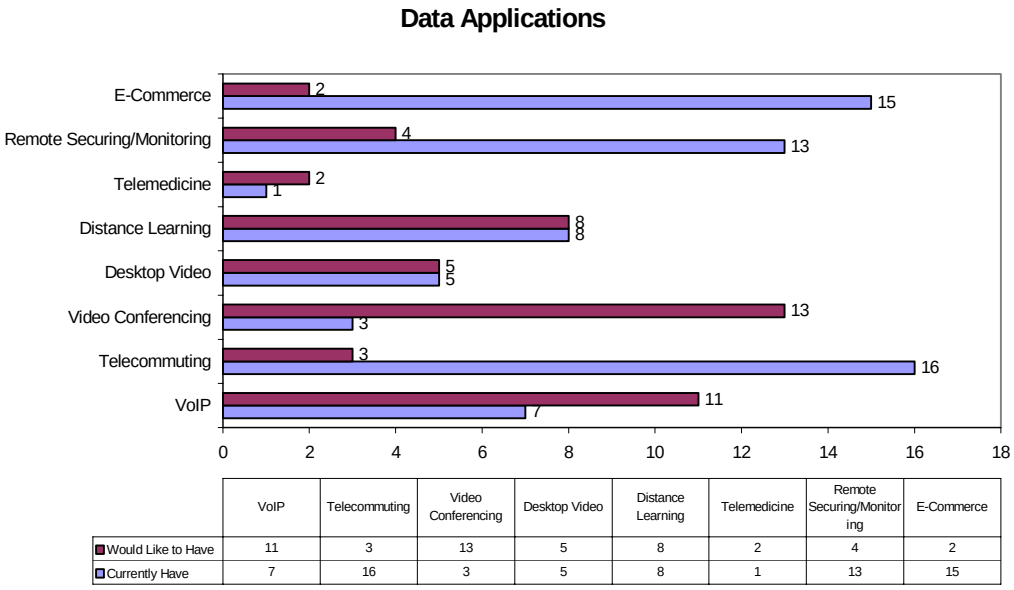
Fifteen organizations expect a 5% growth in annual gross revenue, four organizations expect a 2% to 5% increase, and one organization expects a 1% to 2% increase, while another expects less than a 1% increase in annual gross revenue. One organization does not expect an increase in gross revenue over the next three to five years and two are not sure what to expect in terms of growth in gross revenue.

Sixteen organizations plan to purchase, lease, or build additional sites in Jacksonville—two rental car agencies, a health care provider, a voice technology company, a heavy equipment contractor, a printer, a sign industry distributor, an electrical contractor, a restaurant, a florist, a grocery chain, the school district, a building materials distributor, an engineering firm, a community service organization, a transportation firm, and a distribution/warehousing firm.

Five organizations rely on the CEO/President or business owner to handle day-to-day telecommunications operations. Other organizations mention the following as responsible for telecommunications operations: Vice President, Information Technology Manager, Finance Department, Office Manager, Controller, Accounting Department, and corporate office.

10.9.2 Telecommunications Business Applications

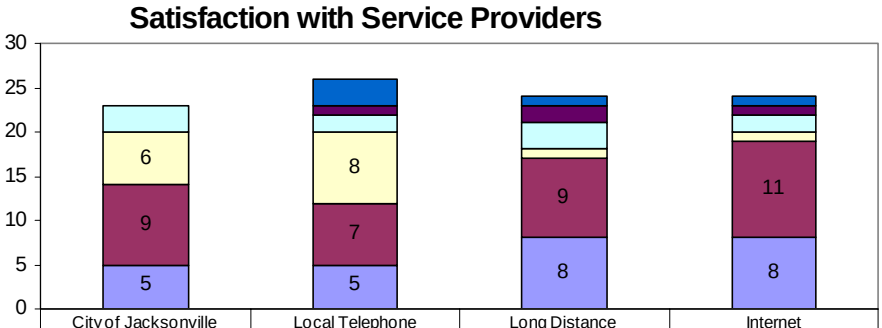
Respondents identified current data applications used within their organizations as well as those applications desired in the future. Videoconferencing and Voice over Internet Protocol (VoIP) are most desired by respondents as future applications.



	VoIP	Telecommuting	Video Conferencing	Desktop Video	Distance Learning	Telemedicine	Remote Securing/Monitoring	E-Commerce
Would Like to Have	11	3	13	5	8	2	4	2
Currently Have	7	16	3	5	8	1	13	15

10.9.3 Satisfaction with Service Providers

Respondents rate their overall satisfaction with various service providers on a scale of one to seven, with one meaning "very dissatisfied" and seven meaning "very satisfied." Respondents are most satisfied with their Internet followed by their long distance telephone provider.



	City of Jacksonville n=23	Local Telephone n=26	Long Distance n=26	Internet n=26
Very Dissatisfied		3	1	1
Dissatisfied				
Somewhat Dissatisfied		1	2	1
Neutral/Undecided	3	2	3	2
Somewhat Satisfied	6	8	1	1
Satisfied	9	7	9	11
Very Satisfied	5	5	8	8

10.9.4 Problems with Current Telecommunications Providers

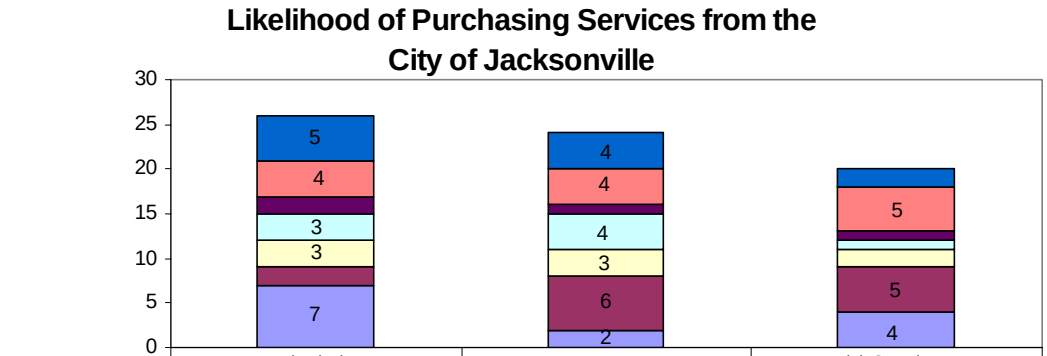
Approximately half of the respondents experience problems with their telephone provider. Of the respondents that were dissatisfied, eight complain of poor reliability and four complain of poor customer service and slow response times. One respondent suggests that their provider needs overall improvement, while another claims the provider does not accept responsibility for service issues.

With regard to Internet service, four organizations are dissatisfied with reliability and have problems accessing the Internet. Others complain of slow downloading speeds and customer service issues.

Six organizations complain of problems with the data provider. Most cite reliability of services and speed of data transfer as the main source of the problems.

10.9.5 Likelihood of Purchasing Services from the City of Jacksonville

A scale of one to seven, with one meaning, “very unlikely” and seven meaning “very likely,” respondents rate their likelihood of considering the purchase of local telephone, Internet, and high-speed data services from the City of Jacksonville. Nine respondents are likely or very likely to consider purchasing local telephone service, nine are likely or very likely to consider purchasing high-speed data, and eight are likely or very likely to consider purchasing Internet service from the City of Jacksonville.



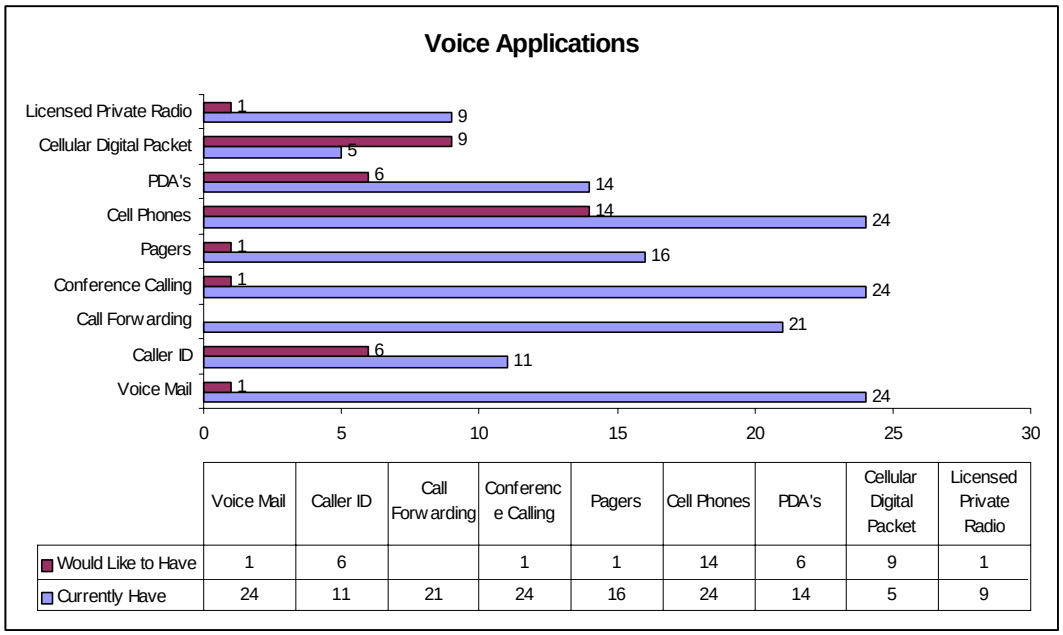
	Local Telephone n=26	Internet n=24	High Speed Data n=20
Very Unlikely	5	4	2
Unlikely	4	4	5
Somewhat Unlikely	2	1	1
Neutral/Undecided	3	4	1
Somewhat Likely	3	3	2
Likely	2	6	5
Very Likely	7	2	4

10.10 Voice Applications and Services

10.10.1 Local Telephone Service

Nearly half (13) of the organizations receive their local telephone service from BellSouth, three use AT&T, and two use BTI. Other providers include Adelphia, Espire, Florida Digital, Nuvox, and US LEC.

Twenty-four organizations currently have voice mail service, conference calling, and cell phones. Twenty-one use call forwarding, 16 use pagers, 14 use personal digital assistants (PDA's), 11 use caller ID, nine use licensed private radio, and five use cellular digital packet. A few are interested in adding services in the future, such as caller ID, call forwarding, or pagers. Cell phones, cellular digital packet data, PDA's, and caller ID are among the most desired features among the organizations interviewed.



	Voice Mail	Caller ID	Call Forwarding	Conference Calling	Pagers	Cell Phones	PDA's	Cellular Digital Packet	Licensed Private Radio
Would Like to Have	1	6		1	1	14	6	9	1
Currently Have	24	11	21	24	16	24	14	5	9

10.10.2 Monthly Costs for Telephone Services

Many respondents report a combined cost for local, long distance, and 800 services. Total costs for these services range from as little as $300 per month to more than $2,300,000 per month. The largest users have expenses over $80,000 per month and include the school district, a grocery chain, a ground transportation firm, and a transit organization (with expenditures of $2.3 million monthly).

10.10.3 Type of Telephone System

Respondents identify the type of voice system used within their organization. Twenty-four respondents are familiar with the type of voice system used within their company; their responses are included in the table below. Note: The following information was recorded according to respondent input only. VCS' engineers/technicians did not verify respondents' equipment/technologies.

Seventeen organizations identify their voice systems as a PBX, seven have a key system, and two organizations have a Centrex. Of those having a PBX or Centrex system, eleven use Automatic Call Distributor (ACD), and six have caller ID with this service. Eight organizations have ISDN lines.

Type of Organization	Voice System	Lease/ Own	Age	# Line Capacity	# Lines Used
Community Service	PBX Mitel	Own	New	DK	200
Community Service	PBX Toshiba	Lease	2 yrs	10	24
Construction	PBX Todarian	Lease	4 yrs	28	24
Construction – Engineering	PBX Nortel Option 61C	Own	4 yrs	2,000	750
Construction – Heavy Equip	PBX NEC	Own	1 yr	48	24
Distribution – Bldg Materials	PBX Toshiba	Own	8 yrs	30	27
Distribution – Vinyl Signs	PBX NEC Electra Elite	Own	9 mos.	DK	60
Distribution/Warehousing	PBX Todarian	Own	2 yrs	80	50
Education – 1st system	Key Comdial	Own	10 yrs	96	64
Education – 2nd system	PBX Nortel SL 100	Own	2 yrs	Indefinite	2,000
Education – 3rd system	Centrex DMS 100	------	-------	Indefinite	4,500
Engineering – Underwater	Key	Own	10 yrs	6	4
Health Care	PBX Avaya G3	Own	2 mos.	225 trunks	5,500
Health Services – Mental	PBX Toshiba	Own	6 yrs	80	65
Restaurant	Key	Own	3 yrs	5	5
Retail - Florist	Centrex	Own	-----	200	100
Retail – Grocery	PBX Intocom	Own	7 yrs	DK	950
Service – Car Rental	Key	Lease	1 yr	8	3
Service – Exec Search Firm	PBX	Own	5 yrs	25	16
Service – Legal Aid	Key Executone	Own	8 yrs	27	27
Service – Printer	Key	DK	DK	DK	11
Service – Realty	Key Merlin	Own	5 yrs	8	8
Service – Transcription	PBX Definity G3	Own	6 yrs	96	72
Technology – Voice System	PBX	Own	3 yrs	16	8
Transit - Rail	PBX Avaya	Own	4 yrs	6,000	3,000
Transit/Storage	PBX Avaya	Own	3 yrs	244	850

10.10.4 Tie Lines to Other Locations

Nine of the organizations currently have tie lines to other company sites. Most of these lines are located in Jacksonville, with a couple outside of the City, but in the state of Florida.

10.10.5 Changes to Current Voice System

Eleven organizations plan to change their current telephone system within the next two to five years. The school district plans to add remote locations, a legal service provider plans to replace its current voice system, a community service provider plans to explore VoIP and add more lines, a realty company would like to add data ports, a sign distributor

plans to add functionality and caller ID, and a construction firm plans to connect its server to offsite locations. Other organizations plan general upgrades to their systems.

10.10.6 High Capacity Lines for Services

Seventeen organizations currently use high capacity lines for telephone services. Thirteen have a T-1, the school district uses both T-1's and T-3's, and a transit organization uses T-1's, T-3's, and OC48's. In addition, a construction firm and two service providers use fractional T-1's.

Twelve organizations have plans to add or use high capacity lines or circuits within the next three to five years. A service firm with a fractional T-1 would like to add a full T-1. Eight organizations with T-1's would like to add additional T-1's. The school district plans to add a T-1 and T-3, while a transit organization plans to add a T-1, T-3, and OC48.

10.11 Data Applications and Services

10.11.1 Number of Employees with Computers

The approximate number of desktop and laptop computers for each organization is included in the table below.

Type of Organization	Number of Desktops	Number of Laptops
Community Service	13	6
Community Service	70	5
Construction	5	1
Construction – Engineering	800	200
Construction – Heavy Equip. Contractor	14	3
Distribution – Bldg. Materials	30	4
Distribution – Vinyl Signs	60	12
Distribution/Warehousing	50	4
Education	29,000	1,000
Electrical Contracting	10	2
Engineering – Underwater	5	2
Health Care	4,500	300
Health Services – Mental	35	1
Restaurant	10	0

Retail – Florist	60	2
Retail – Grocery	800	100
Service – Exec. Search Firm	13	2

Type of Organization	Number of Desktops	Number of Laptops
Service – Legal Aid	70	4
Service – Printer	7	0
Service – Realty	34	6
Service – Rental Car	4	0
Service – Rental Car	4	0
Service – Transcription	140	8
Technology – Voice System	8	2
Transit - Rail	2,150	50
Transit/Storage	1,200	250
Wholesaler – Restaurant Equipment	7	0

10.11.2 Internet Service

Only two organizations do not subscribe to Internet service—a construction firm and a rental car agency. Seven organizations receive service from BellSouth, five from AT&T, and three from UUNet. The remaining organizations receive Internet service from one of the following: Cable & Wireless, Xspedius, BTI, NuVox, Cyber Express, MSN, US LEC, Espire, or Qwest. Three respondents could not identify their organizations' Internet service provider.

Type of Organization	Internet Provider	Type of Connection	Download Speeds	Likelihood of Purchasing from City of JAX
Community Service	BellSouth	T-1	Somewhat Fast	Likely
Community Service	BellSouth	Fractional T-1	Somewhat Fast	Neutral
Construction – Engineering	Cable & Wireless	T-1	Very Fast	Likely
Construction – Heavy Equip.	Xspedius	Fractional T-1	Fast	Unlikely
Distribution – Bldg. Materials	BellSouth	DSL	Somewhat Fast	Neutral
Distribution – Vinyl Signs	BTI	Fractional T-1	Somewhat Slow	Likely
Distribution/Warehousing	AT&T	T-1	Somewhat Fast	Very Likely
Education	AT&T	DS3	Somewhat Fast	Very Unlikely
Electrical Contracting	NuVox	T-1	Fast	Somewhat Unlikely
Engineering – Underwater	Cyber Express	DSL	Average	Very Likely
Health Care	UUNet	DS3	Somewhat Fast	Unlikely
Health Services – Mental	BellSouth	Dial-up	Slow	Unlikely
Restaurant	AT&T	Dial-up	Somewhat Slow	Very Unlikely
Retail – Florist	MSN	T-1	Very Fast	Somewhat Likely
Retail – Grocery	BellSouth	Fractional DS3	Fast	Unlikely
Service – Exec. Search Firm	US LEC	Fractional T-1	Fast	Very Unlikely
Service – Legal Aid	Espire	DSL	Fast	Neutral
Service – Printer	Don't Know	T-1	Fast	Likely
Service – Realty	Southwest Bell	DSL	Somewhat Fast	Likely
Service – Rental Car	BellSouth	Dial-up	Average	Likely
Service – Transcription	Qwest	T-1	Fast	Neutral
Technology – Voice Systems	Don't Know	DSL	Somewhat Slow	Somewhat Likely
Transit – Rail	UUNet & AT&T	Dial-up, Cable, DSL	All Average	Very Unlikely
Transit/Storage	UUNet & AT&T	T-1	Both Very Fast	Somewhat Likely
Wholesaler – Rest Equipment	Don't Know	Cable Modem	Somewhat Fast	Don't Know

Eight organizations access the Internet via a T1 connection, four have a fractional T1, two use DS3, one has a fractional DS3, five have DSL service, one has a cable modem, three have dial-up, and one organization has a combination of services including dial-up, cable modem, and DSL. Four organizations believe download speeds are slow or somewhat slow.

10.11.3 Intranet

Sixteen organizations currently have a company Intranet and an additional five would like to develop an Intranet.

10.11.4 Local Area Networks (LAN) and Network Operating Systems

Twenty-three organizations have a LAN, and only twenty-one are able to identify the type and number of servers. One organization is interested in implementing a LAN. The following table details the information collected regarding number of servers, wired or wireless LANs, type of LANs, and type of network operating systems. Once again, this information is based on respondent input only; VCS' engineers/technicians did not verify the type of equipment/technologies.

Type of Organization	No. of Servers	Wireless LAN?	Type of LAN	Type of Network Operating System
Community Service	5	No	Switched Ethernet	Windows NT; Windows 2000; 0S400
Community Service	3	No	Switched Ethernet	Windows 2000; AS400
Construction	1	No	Windows for Workgroups	Windows NT
Construction – Engineering	25	No	Ethernet 10 Base T; 100 Base T	MS Office
Construction Heavy Equip.	3	No	Ethernet	Windows NT
Distribution – Bldg. Mat.	2	Yes	Ethernet 100 Base T	Windows 2000
Distribution – Vinyl Signs	4	Yes	Ethernet 100 Base T	Windows NT; UNIX, Windows 2000
Distribution/Warehousing	8	No	Ethernet 100 Base T	Windows NT; UNIX; Windows 2002
Education	400	Both	Ethernet Gigabit; Thinnet; 10 Base T; 100 Base T; 100 Base F; Switched Ethernet	Windows NT
Electrical Contracting	1	No	Ethernet 10 Base T	Windows NT
Health Care	245	Both	Ethernet Gigabit	Windows NT; UNIX; BMS
Health Services – Mental	8	No	Ethernet 100 Base T	Windows NT; UNIX; Windows 2000
Restaurant	1	No	Ethernet 100 Base T	Windows NT
Retail – Grocery	300	Both	Switched Ethernet	Windows NT; UNIX
Service – Exec. Search	4	No	Switched Ethernet	Windows NT
Service – Legal Aid	2	No	Switched Ethernet	Windows NT
Service – Printer	2	No	Appletalk; Ethernet 10 Base T	Windows NT
Service – Realty	4	No	Ethernet	Windows NT; UNIX-2003
Service – Rental Car	DK	No	DK	Windows NT
Service – Transcription	15	No	Ethernet 100 Base T	Windows NT; Netware by Novell; Windows 2000
Transit – Rail	800	Both	Token Ring; FDDI; Ethernet 100 Base T; Switched Ethernet	Windows NT; UNIX
Transit/Storage	150	Both	Ethernet Gigabit	Windows 2000
Wholesaler – Rest Equip	DK	No	DK	Windows NT

10.11.5 Networked Applications

The organizations have similarly networked applications; nearly half use MS Office. Several firms use groupware specific to their industry including two service providers, a retailer, and a community service provider.

10.11.6 Wide Area Network (WAN)

Eleven organizations are connected to a WAN. The table below outlines the number of connected sites and the extent of the connections geographically.

In addition, two organizations are interested in having a WAN in the future - a distributor of building materials and a community service provider.

Type of Organization	# of Connected Sites	City/County?	Intrastate?	Interstate?
Community Service	14		X	
Construction-Engineering	13	X	X	X
Distribution/Warehousing	5	X		
Education	90	X		
Health Care	8	X	X	X
Health Services – Mental	5	X		
Retail – Grocery	1,200	X	X	X
Service – Rental Car	DK	X	X	X
Transit – Rail	400	X	X	X
Transit/Storage	15			X
Wholesaler – Rest Equip	1		X	

10.11.7 Dedicated Low Speed Data Lines

Twenty-one organizations use dedicated low speed data lines, defined as speeds of 56K or less. The table below lists the organizations' service provider and level of satisfaction.

Type of Organization	Provider	Satisfaction
Community Service	BellSouth	Very Satisfied
Community Service	BellSouth	Very Satisfied
Construction	BTI	Very Satisfied
Construction – Heavy Equip.	Xspedius	Satisfied
Distribution – Bldg. Material	Florida Digital	Satisfied
Distribution – Vinyl Signs	BTI; Earthlink	Dissatisfied – Both
Distribution/Warehousing	AT&T	Very Dissatisfied
Education	BellSouth	Very Satisfied
Electrical Contracting	NuVox	Somewhat Satisfied
Engineering – Underwater	Cyber Express	Very Satisfied
Health Care	BellSouth	Somewhat Satisfied
Heath Service – Mental	Adelphia; BellSouth	Somewhat Satisfied - Both
Service – Legal Aid	Espire	Very Satisfied
Service – Realty	SW Bell	Somewhat Dissatisfied
Service – Rental Car	BellSouth	Satisfied
Service – Rental Car	FDN	Satisfied
Service – Transcription	BellSouth	Very Satisfied
Technology – Voice Systems	DK	Satisfied
Transit – Rail	WorldCom	Very Satisfied
Transit/Storage	WorldCom	Very Satisfied
Wholesaler – Rest. Equip	DK	Satisfied

10.11.8 High-Speed Data Lines

Fifteen organizations use high-speed data lines. The table below details the type of line, service provider, number of high-speed data lines, cost per month, length of time remaining on contract, and the organizations' satisfaction level. A grocery chain uses high-speed data lines but was unable to provide detailed information.

Type of Organization	Internet Provider	Type of Connection	Download Speeds	Likelihood of Purchasing from City of JAX
Community Service	BellSouth	T-1	Somewhat Fast	Likely
Community Service	BellSouth	Fractional T-1	Somewhat Fast	Neutral
Construction – Engineering	Cable & Wireless	T-1	Very Fast	Likely
Construction – Heavy Equip.	Xspedius	Fractional T-1	Fast	Unlikely
Distribution – Bldg. Materials	BellSouth	DSL	Somewhat Fast	Neutral
Distribution – Vinyl Signs	BTI	Fractional T-1	Somewhat Slow	Likely
Distribution/Warehousing	AT&T	T-1	Somewhat Fast	Very Likely
Education	AT&T	DS3	Somewhat Fast	Very Unlikely
Electrical Contracting	NuVox	T-1	Fast	Somewhat Unlikely
Engineering – Underwater	Cyber Express	DSL	Average	Very Likely
Health Care	UUNet	DS3	Somewhat Fast	Unlikely
Health Services – Mental	BellSouth	Dial-up	Slow	Unlikely
Restaurant	AT&T	Dial-up	Somewhat Slow	Very Unlikely
Retail – Florist	MSN	T-1	Very Fast	Somewhat Likely
Retail – Grocery	BellSouth	Fractional DS3	Fast	Unlikely
Service – Exec. Search Firm	US LEC	Fractional T-1	Fast	Very Unlikely
Service – Legal Aid	Espire	DSL	Fast	Neutral
Service – Printer	Don't Know	T-1	Fast	Likely
Service – Realty	Southwest Bell	DSL	Somewhat Fast	Likely
Service – Rental Car	BellSouth	Dial-up	Average	Likely
Service – Transcription	Qwest	T-1	Fast	Neutral
Technology – Voice Systems	Don't Know	DSL	Somewhat Slow	Somewhat Likely
Transit – Rail	UUNet & AT&T	Dial-up, Cable, DSL	All Average	Very Unlikely
Transit/Storage	UUNet & AT&T	T-1	Both Very Fast	Somewhat Likely
Wholesaler – Rest Equipment	Don't Know	Cable Modem	Somewhat Fast	Don't Know

10.11.9 High-Speed Services for Data/Internet

Six organizations have plans to increase the use of high-speed services for data applications. A distributor would like to upgrade from a fractional T-1 to full T-1 service. An engineering firm, a community service provider, and a warehouse would like to upgrade from T-1 to T-3 service. A health care provider would like to add OC-3 and OC-12 to enhance data reliability and quality. The school district plans to add T-3's and OC-3 as a part of its telecommunications plan.

10.11.10 Packet Switched Lines

A transit firm and an engineering firm use packet switched lines.

10.11.11 Frame Relay

Seven organizations utilize frame relay service. The type of organization, speed of service, and service provider is listed in the table below.

Type of Organization	Frame Relay Speed	Provider
Community Service	128K and T-1	BellSouth
Construction – Engineering	T-1 and less	Qwest
Distribution – Vinyl Signs	DK	BTI
Education	T-1; DS-3	BellSouth
Retail – Grocery	56K to Full DS-3	MCI; AT&T; BellSouth; Qwest
Transit – Rail	56K, 128K, 256K, 512K, 786K	WorldCom
Transit/Storage	Varies	WorldCom

10.11.12 Asynchronous Transfer Mode (ATM)

Four organizations use ATM service: a health care provider uses DS-3 speed from Qwest, the school district has OC-3 service provided by JEA, a grocery chain uses a speed of OC-12 provided by BellSouth, and a transit firm is not sure of the ATM speed, but service is provided by WorldCom.

A medical transcription service is considering ATM service for future applications.

10.11.13 Telecommuters

Thirteen organizations have telecommuters with speeds ranging from dial-up to T-1 service. The following table illustrates the speed of lines used for telecommuters, the organizations' need for faster lines, the desired speed, and the availability of a virtual private network (VPN).

While most telecommuters have a dial-up connection, a few organizations supplement the dial-up with DSL or cable modem service. Several organizations have a T-1 for telecommuters. Seven organizations believe that faster speeds are needed for telecommuters; most of those desire DSL.

Six organizations have virtual private networks available for telecommuters.

Type of Organization	Speed of Lines	Need Faster Lines?	Speed Needed	VPN Available?
Community Service	Dial-up; DSL	Yes for Dial-up	DSL	Yes
Construction	Dial-up	Yes	DSL	No
Construction – Engineering	Dial-up	No		No
Distribution – Vinyl Signs	Dial-up; DSL	Yes	DSL; Cable Modem	Yes
Distribution/Warehousing	T-1	No		Yes
Education	Dial-up	No		No
Electrical Contracting	Dial-up	Yes	DSL	No
Health Care	Dial-up; DSL; Cable Modem	Yes	DK	Yes
Retail – Florist	Dial-up	No		No
Service – Realty	Dial-up; DSL	Yes	DSL; Cable Modem	No
Service – Rental Car	Dial-up	No		No
Service – Transcription	Dial-up; T-1	Yes	T-3	Yes
Transit/Storage	Dial-up; DSL; Cable Modem; T-1	No		Yes

10.12 Video Applications and Services

10.12.1 Videoconferencing

Three organizations currently utilize videoconferencing. A community service provider uses video conferencing within its LAN so it does not have an immediate need for an outside line. A health care provider uses a dual DS-3 line provided by Sprint. An engineering firm uses an ISDN line provided by BellSouth.

10.12.2 Additional Participant Comments

- Several respondents had additional comments for the City of Jacksonville.
- A community service provider suggests, "…get tough with AT&T, the service is horrible. I would like to see the City come in with some competition to BellSouth. I would be interested in it if service were reliable. If it were reliable I would switch."
- "No options here, so there's no competition…services are forced on you. This could affect the growth of business in Jacksonville. We are looking for options and diversity."

- "The City still owes me $10,000 for a lighting job my company did in 1999 through a general contractor. I would be very suspect if the City offered telecommunications."
- "Jacksonville has enough infrastructure problems…they need to concentrate on current issues."
- "If the City is going to do this, don't lease infrastructure from BellSouth; build your own network…they need to be totally responsible for their network."
- "We're looking at wireless applications."
- "It must be competitively priced, these services are a commodity."
- "We have a lot invested in our networks; there must be a compelling reason to switch."
- "Always looking for telecom alternatives to save money or some guaranteed performance improvements in service. Looking for less expensive way to connect sites rather than using frame relay."
- "I would like to see the City offer telecom competitively.

11.0 Research on Telecom Master Plans

11.1 Introduction

Numerous communities around the country and North America have implemented telecommunications infrastructure enhancement programs to bring telecommunications services to their governments. As part of the development of the City of Jacksonville Telecommunications Master Plan, it was prudent to review the technological, logistical, and financial options that other communities have used to implement their infrastructure upgrades.

11.2 Findings and Summary

The Jacksonville Telecommunications Master Plan Task Force studied various telecommunications enhancement programs around the country which have already been implemented or are under construction. The task force examined each community to explore the opportunities and threats provided by each program. The investigation conducted by the Jacksonville Telecommunications Master Plan Task Force highlights the opportunities and threats experienced by other communities in fulfilling a common purpose-providing affordable bandwidth to their communities that exceeds their short term requirements and prepares their communities for the future.

Their experience offers the following:

- At a global level, nations and communities have recognized that for their future advancement communities must take responsibility for providing advanced telecommunications to their businesses and residents.
- Communities throughout the U.S. have deployed advanced gigabit Ethernet networks. These networks were deployed using varying business models from private-public partnerships to owned and operated by municipal owned utilities to carrier's carrier and retail and wholesale business models. Many of these networks started through the leveraging of existing assets to improve efficiencies in meeting their current needs.
- Significant efficiencies are gained by utilizing existing utility staff and expertise.
- Support at all levels in the community is essential. City council, civic and business organizations, and the individual need to understand the purpose and goals of providing advance telecom services.
- The most differentiated service provided is data service due to the extreme leap in capability and speeds.

The following communities were investigated:

- **Canada**

  The Government of Canada has setup a National Broadband Task Force with the goal of ensuring that broadband services are available in every Canadian community by 2004. The business model used by Canada's Broadband Taskforce consisted of private networks with public sector anchor tenant, public private joint built networks, ILEC investment commitments, and public seed funding for community owned networks. New opportunities include e-commerce, e-learning, e-health, and e-government. Threats include slow infrastructure construction development and financing.

- **Chattanooga, Tennessee**

  The Electric Power Board of Chattanooga currently has 1700 telecommunications customers and telecommunications revenues of $7 million dollars. It averages ten lines per customer. It has less than 40 employees and it does not advertise its telecommunications services. The business model used by EPB was to be a public utility owned network. New opportunities include cable, Internet, telephony services, and home security. Threats include opposition from local cable television group.

- **Chicago, Illinois**

  The City of Chicago is currently in the early stages of implementing their Civic Net project. Civic Net is a public-private partnership, created to install the most extensive fiber-optic infrastructure in the nation and to bring high-speed communications to every city neighborhood of Chicago. The business model used by the City of Chicago was a public/private partnership. New opportunities include high-speed Internet access, and other advanced communication services. Threats include competition from incumbent providers and other telecom service provider entities.

- **Gainesville, Florida**

  In 1994, Gainesville Regional Utilities (GRU) partnered with Shands Healthcare to install a fiber optic ring around Gainesville. The 171-mile network of fiber optic cable provides high bandwidth transmission for voice, data, and video communications. In 1996 GRU formed GRUCom, its own telecommunications division. The business model used by GRU was to be a municipal community owned utility with a public/private partnership with Shands Healthcare to build the initial fiber ring. New opportunities include shared document processing, e-medicine, and GRU.net Internet service. Threats include ongoing litigation over government tax exemptions for government owned telecommunications systems.

- **Grant County, Washington**

  The Grant County ZIPP program seeks to provide a fiber-to-the-home network to its citizens with the goal of providing an open access gigabit Ethernet system to 40,000

homes and businesses by 2006. The business model used by Grant County was to be a Not-for-Profit Open Access Carrier's Carrier. New opportunities include broadband service to homes and businesses. Threats include hindrance of incumbent telecommunication providers to help in upgrading Grant County's infrastructure.

- **Los Angeles, California**

  The Los Angeles Department of Water and Power (LADWP) is the largest municipally owned utility in the nation. The vision of the LADWP Fiber Optic Enterprise is to promote state-of-the-art telecommunications by providing infrastructure and services. The LADWP network includes more than 15,000 fiber miles within the City. LADWP customers lease dark fiber or procure telecommunications services from an ISP that leases fiber from the LADWP. The business model used by LADWP is a municipal owned utility, wholesale carrier's carrier. New opportunities include voice, data, and video service. Threats include problems with equipment compatibilities with different bandwidths.

- **Marietta, Georgia**

  In 1996, Marietta established the Marietta FiberNet, a subsidiary of the Marietta Board of Lights and Water. Consisting of 450 miles of fiber, the FiberNet is able to offer services to major business, educational, and government facilities throughout Cobb County and North Metro Atlanta. The business model used for FiberNet is a competitive Local Exchange Carrier and full ISP. New opportunities include residential voice, commercial telephone service, data, and Internet service. Threats include problems with financing the addition of new cable television service for FiberNet.

- **Memphis, Tennessee**

  In order to help bridge the digital divide within Memphis, Memphis Networx LLC was created to offer high speed data communications, video, and voice service. Memphis Networx was able to take advantage of the technology market downturn to purchase much of its infrastructure equipment at a substantial discount. The business model used by Memphis Networx is a for-profit wholesale carrier's carrier. New opportunities include enhanced broadband service to residents. Threats include legal challenges by private incumbent telecommunications companies to municipal utility provision of services.

- **Pittsburgh, Pennsylvania**

  Pittsburgh, through a local non profit organization named 3 Rivers Connect has developed its 3rcNet program, which focuses on providing bandwidth to schools, libraries, and community groups within the City of Pittsburgh. 3rcNet can be connected to current and other future internal networks for data, intranets, video, and

other such services. The business model used 3 Rivers Connect is a non-profit corporation. New opportunities include network homework help, on-line mentoring, e-medicine, and on-line parent-teacher conferences. Threats include numerous water crossings and resistance from incumbent telecom providers on accessing existing infrastructure.

- **Poplar Bluff, Missouri**

  Poplar Bluff is located in the Ozark Mountain region of Southeast Missouri with a population of 17,000 people living in Poplar Bluff and 41,000 living in Butler County. With no regional or national telecom service providers in the area, the City began its own telecommunications service and cable TV service. Eventually the incumbent cable TV provider sold its system to the City leaving it as the sole provider. Through the City's Municipal Utility Company the City has deployed a hybrid fiber coax system to its residents. The business model used for Poplar Bluff is a municipal owned utility, non-profit ISP CATV and ISP service provider while providing open access to other ISPs. New opportunities include extension of service to other residents of Butler County, opening fiber access to ISPs of high speed data and Internet services. Threats include customer service personnel shortage and logistical challenges.

- **Scottsboro, Alabama**

  Scottsboro Electric Power Board began by offering cable, Internet, and telephone then began leasing dark fiber to the school system. There are eight video teleconference locations in Scottsboro. It is involved in Internet meter reading pilots, it has a gigabit Ethernet network and it has distribution automation with capacitor control and packet switching. The business model used by the Electric Power Board is a private utility owned organization. New opportunities include Internet access, home security service, and telephony services. Threats include competition from local cable service provider.

- **State of Georgia**

  The Georgia Public Web operates throughout the state of Georgia in 31 municipalities and one county. The Georgia Public Web was started in 2001 by MEAG Telecom after MEAG faced ongoing challenges to its certification as a CLEC by the Cable Television Association of Georgia. The Georgia Public web operates as a publicly owned lit carrier's carrier. New opportunities include improvements in education, economic development, and other vital aspects of Georgia's communities. Threats include geographical barriers to gain rural connectivity.

- **Tacoma, Washington**

  acoma Power conducted an initial telecommunications study in 1995 and by 1998; the utility had created the Click! Network to provide cable television services. Over the next four years the Click! Network evolved to offer the Tacoma area broadband services. Click! Network operates as a modified open uccess service provider. The system offers open access to ISPs. New opportunities include high speed Internet, and voice services. Threats include competition from incumbent service providers.

- **Thomasville, Georgia**

  In 1995, the City of Thomasville began building a fiber optic network to serve local schools, libraries, businesses, and hospitals with state-of-the-art telecommunications and Internet services. They named the network Community Network Services (CNS). New opportunities include cable television, Internet access, and telephony service.

Actions by Incumbents

Incumbent providers have fought the municipal telecommunications expansion through its opposition of the applications of the municipalities to provide telecommunications services. ILECs, cable companies and cable associations are filing formal oppositions against the applications filed before the state utility commissions and the state legislatures. The oppositions filed by these entities are delaying the progress of the municipal telecommunications expansion and depleting the finances for the expansion.

In 1997 MEAG Telecom filed a CLEC application. The application was originally filed as a division of MEAG, a municipal power provider. The Cable Television Association of Georgia fought MEAG's application for certification as a CLEC. MEAG was forced to form a separate company with separate financial records. Georgia Public Web was formed as a separate company and it was certified as a CLEC in September 2001.

Memphis Networx began with a $20 million dollar investment from public and private investors. However half of the money was used to fight its battles with its ILEC

opposition, BellSouth and Time Warner. Memphis Networx did not start building its network until after it received its CLEC certification in 2001, but the application was filed in 1999.

In 1997 EPB Chattanooga presented legislation before the Tennessee House of Representatives regarding the right to provide cable, internet, and home security and telephone services. The bill passed in the House. However, by the time the bill passed out of the Tennessee Senate EPB Chattanooga could only provide telephone service. The legislation was opposed by the cable television group. EPB Chattanooga was granted the right to use the same name for its municipal power company and the telephone service.

Detailed information regarding these municipalities is provided in the next section.

11.1.2 Municipalities

This section presents information from several municipalities that have completed or are in the process of enhancing telecommunications services to their citizens.

Canada

Telecommunications services have played an increasingly important role in the Canadian economy over the last five years. In 2000, industry gross revenues were approximately $28.7 billion and have been growing at an average rate of 9% per year since 1996. Canadian cable and telecommunications companies have made considerable investments in broadband infrastructure over the last several years. Approximately three-quarters of Canadians live in communities where high-speed services are provided by such companies. On a per capita basis, Canada is ahead of all other G8 countries in terms of subscription to high-speed services but approximately six million Canadians live in communities that do not have access to high-speed service. Canada realized that absent programs or incentives to encourage investment in advanced telecommunications infrastructure, access to high-speed service may never be provided to these unserved communities.

To address this issue, the National Broadband Task Force was established in January 2001 by the Minister of Industry. The principal mandate of the Task Force was to map out a strategy for achieving the Government of Canada's goal of ensuring that broadband services are available to businesses and residents in every Canadian community by 2004. In addition, the Task Force was asked to advise the government on issues related to the development and deployment of broadband networks and services in Canada.

Realizing that broadband access is a key enabler for a number of new opportunities, including e-commerce, e-learning, e-health, and e-government. Governments in Canada have responded in a number of ways to the challenge of increasing the deployment of broadband infrastructure and services. Initiatives have included contracting for high-speed services for government institutions or personnel, providing seed funding to community projects, providing capital funding for infrastructure projects, providing research and development tax credits to equipment manufacturers, funding trials for broadband applications, and development of web content. Additionally, industry Canada has made available and licensed the use of new spectrum for fixed wireless services, allocated orbital position for advanced satellite services, and funded a range of broadband initiatives for the purpose of research and application.

Providing broadband access to all unserved communities by 2004 is a major national objective as evidenced by the number of local communities dedicating resources to infrastructure construction, Canada is meeting this challenge through the combined

efforts of all stakeholders – governments, the private sector, and the communities themselves.

Canada – Survey Summary

Area Demographic Description	**Approximately 30 million people in 6,000 distinct communities.**
Number of Households	**DSL and/or High-Speed Internet Service are offered in 1,203 communities, representing approximately 75% of the population. In 4,781 communities, with a combined population of 6.4 million people, neither DSL nor Internet Cable is available.**
Description of Network	**Fiber throughout major urban areas with smaller communities connecting to transport facilities using fiber, cable, or fixed wireless technologies.**
Services Provided by Network	• **Local and Long Distance Telephone** • **Internet Cable** • **DSL** • **High Speed Data Transfer**
Business Model	**Private networks with public sector anchor tenant, public private joint built networks, public networks with private sector operators, ILEC investment commitments, public seed funding for community owned networks. Task Force Recommendation: Infrastructure Support Model focused on incentives to stimulate the supply of broadband infrastructure; bottom up Community Aggregator Model focused on stimulation of demand for broadband capabilities.**
Financing	**Private, Public, and Public-Private Partnerships. Portions funded by government vary depending on density & remoteness of community. Cost estimates: Transport to unserved communities=1.3 to 1.9 billion; connecting public institutions=500 to 600 million; connecting businesses and residences=900 million to 2 billion; funding for communities=50 to 70 million.**
Legal and Regulatory Issues	**Canadian Radio-television and Telecommunications Act, Canada Broadcasting Act, Canada Telecommunications Act, Bell Canada Act**
Technical Issues	**Unserved communities face both transport and access issues; interconnectivity of remote communities to backbone transport facilities.**

Chattanooga, Tennessee

Chattanooga is located in southern Tennessee on the Tennessee/Georgia border. It has a population of over 155,500. The Electric Power Board of Chattanooga (EPB Chattanooga) is the municipal power producer serving Chattanooga and three counties in Georgia. It is a non-generating, sole source provider and it has 158,000 electric customers.

In 1994-95, EPB Chattanooga was inundated with calls from competitive access providers regarding providing access for telecommunications services. After receiving the calls, EPB Chattanooga determined that it would expand its market and provide telecommunications services. EPB Chattanooga had no authority to enter into the telecommunications business at the time that it made the decision.

EPB Chattanooga originally sought to enter into a consulting agreement with a private partner. A small local company responded to an RFP, but the deal dissolved before an agreement was reached. EPB then prepared to provide services without a partner.

In 1997 EPB Chattanooga presented legislation before the Tennessee legislature for certification to provide cable, internet, and home security and telephone services. The only opposition to the legislation was supported by a cable television group. The bill that passed the Tennessee house and senate authorized EPB Chattanooga to provide telephone service. EPB Chattanooga uses the same company name for its power and telephone service. However, there is no consolidated billing.

EPB Chattanooga currently has 1700 telecommunications customers and telecommunications revenues of $7 million dollars. It averages ten lines per customer. It has less than 40 employees and it does not advertise its telecommunications services.

EPB Chattanooga credits its success to engaging the customer in the decision making process. It also learned that the customer's perception of performance and the employee's opinions and attitudes are important. The account executive that sold the service, on behalf of EPB Chattanooga, keeps his/her name on the contract for the first six months. All customer concerns are addressed by the account executive during the first six months of service.

Chattanooga, Tennessee – Survey Summary

Area Demographic Description	**Population: Approximately 155,500**
Number of Households	**Unknown**
Description of Network	**Private network**
Services Provided by Network	• **Internet Access** • **Home Security Service** • **Local and Long Distance Telephone Services**
Business Model	**Private Utility Owned**
Financing	**Funded by the Electric Power Board of Chattanooga**
Legal and Regulatory Issues	**In 1997, EPB Chattanooga presented legislation before the Tennessee legislature for certification to provide cable, internet, and home security and telephone services. The only opposition to the legislation was supported by a cable television group. The bill that passed the Tennessee house and senate authorized EPB Chattanooga to provide telephone service. EPB Chattanooga uses the same company name for its power and telephone service.**
Technical Issues	**None reported**

Chicago, Illinois

The City intends to partner with multiple entities in the private sector to build out this infrastructure, which will be managed and operated by the City's private sector partners and marketed by them to all interested parties in the private, public, and institutional sectors. The City, which will be the service's anchor tenant, is also seeking partners to be co-tenants. Corporations, businesses, banks, universities, healthcare organizations, and community technology centers that have locations throughout the City have been offered the opportunity to participate in Civic Net and obtain high-speed communications at a lower cost than is currently possible.

Chicago's government agencies spend $32 million a year on voice and data communications, giving them the ability to leverage $320 million on the project over 10 years. In addition, the local governments would provide right-of-way access such as tunnels, alongside rapid transit lines and inside existing conduits that will dramatically lower the cost of bringing high-speed fiber to city neighborhoods. Using sewer pipes for fiber installation, for example, cuts in half the cost of digging up the streets and trenching and has the added benefit of not disrupting traffic or diminishing the integrity of the street surface.

Chicago is currently receiving bids for the implementation phase of its Civic Net program.

Chicago, Illinois – Survey Summary

Area Demographic Description	**Population: Approximately 2.9 Million** **Land Area: 234 Square Miles**
Number of Households	**1,152,867 Households**
Description of Network	**Proposed 100% Fiber Optic Network**
Services Provided by Network	• **Commercial, governmental, and residential Internet** • **Local and Long Distance Telephone Services**
Business Model	**Public/Private Partnership**
Financing	**Leveraged aggregate annual City telephone and data expenses, totaling approximately $320 million over ten years**
Legal and Regulatory Issues	**Because the City intends to partner with private entities to build the infrastructure and market it to all interested parties, it has experienced no resistance from incumbent providers. However, it is still in the RFP process and has not yet been implemented.**
Technical Issues	**Civic Net is in the RFP process and has not yet been implemented.**

Gainesville, Florida

Gainesville, Florida is located in north central Florida. It is a university city and it has a population of approximately one hundred and ten thousand. Gainesville Regional Utilities (GRU) is a community owned, multi-service utility providing electric, natural gas, water, wastewater, and telecommunications services to Gainesville and portions of Alachua County. GRU employs 760 employees who help provide one or more of the above services to approximately 80,000 homes and businesses. The utility also provides wholesale power to the City of Alachua.

In 1994, GRU partnered with Shands Healthcare to install a fiber optic ring around Gainesville. The 171-mile network of fiber optic cable provides high bandwidth transmission for voice, data, and video communications. It allows Shands Healthcare to electronically share document processing and medical imaging with its many community clinics and affiliated hospitals.

In 1996 Gainesville Regional Utilities introduced GRU.com as its telecommunications services division. GRU.com provides transport services, internet access services for retail and wholesale carriers, public safety radio and tower space leasing. GRU.com has built over 100 miles of fiber throughout the market and it offers fractional T1 at 10 Mbps.

The expectation is that GRU.com will operate in the red in its telecommunications business for at least five years from inception. In order to avoid the possibility of any Internal Revenue Service issues, GRU.com used taxable financing for its start-up costs. To address the legislative and legal issues, GRU.com participated in the Community Telecom Counsel which is a legal trust fund to help address legal battles for municipalities in Florida.

GRU.com generated 56% more revenue in 2001 than 2000, but the City of Gainesville has exempted GRU.com revenue from the General Fund Transfer for five years to support its growth. Financial impacts are at the forefront of current litigation pending in Florida. Gainesville joined several other Florida cities in a lawsuit to challenge recently enacted Florida Statutes, which specifically prohibit traditional government tax exemptions for government owned telecommunications systems. The Cities received a favorable ruling at the Circuit Court level and the case is currently on appeal.

The process issues that GRU.com found in the operation of its telecommunications business addressed compensation, organizational alignment, billing and records, and purchasing. In addressing processing issues GRU.com found that it could not operate its telecommunications division like an electric utility. Hence, a different method that specifically addresses the issues for the expanded telecommunications market and specifically shows how it will respond to issues regarding requests for proposals and purchasing was developed.

GRU.com plans to expand to gigabit Ethernet and it is also considering offering video in the future.

Gainesville, Florida – Survey Summary

Area Demographic Description	**City of Gainesville: 95,447 Total Population** **Alachua County: 217,955 Total Population**
Number of Households	**City of Gainesville: 37,279** **Alachua County: 87,509** **GRU serves 80,000 homes and businesses for all services. Currently, telecom services reach approx. 1000 households and businesses, including Shands Hospital.**
Description of Network	**171 mile fiber optic ring around Gainesville, with additional spokes under construction to connect more neighborhoods.**
Services Provided by Network	• **High Speed Internet** • **Dedicated Internet Access (DS1, T1, and DS3)** • **Carrier Services** • **Data and Voice Transport** • **Tower Leasing** • **Trunked Radio Service** • **Wholesale and Retail ISP**
Business Model	**Municipal community owned utility with public/private partnership with Shands Healthcare to build initial ring.**
Financing	**2/3 of initial capital cost provided by Shands Healthcare, GRU.com revenue exempt from General Fund Transfer for first five years.**
Legal and Regulatory Issues	**Joined other cities in Florida to challenge Florida Statute 166.047 and 196.012 regarding taxing municipally owned telecom activities, and local ISP opposition.**
Technical Issues	**Business process issues, internal computing systems needed adjustment to accommodate telecom billing, purchasing, and employee compensation.**

Grant County, Washington

Grant County is located in central Washington between Seattle and Spokane. It is an agricultural community comprised of two thousand seven hundred and seventy-seven square miles. The population of Grant County is approximately 70,000. Grant County Public Utility District (Grant County PUD) has approximately thirty-nine thousand electric customers and it averages approximately twelve homes per square mile.

ZIPP Fiber Optic Network (ZIPP) is the Grant County PUD ultra speed fiber optic distribution network. ZIPP is bridging fiber to every home, business and farm in Grant County using gigabit Ethernet over a fully "open access" fiber network. ZIPP only provides distribution. There are no end user services. ZIPP is designed to support an even playing field and promote rural economic development. It is cost effective and affordable. There is no incumbent competition.

Grant County PUD funded ZIPP through cash reserves. Grant County PUD generates excess power and it then sells some of the excess power to generate cash reserves. It has invested approximately two hundred million dollars in cash reserves. Approximately, fifty percent of the funding for ZIPP came from cash reserves, the remaining portion of the funding came from municipal bonds. Grant County PUD did not raise rates to support the new network.

Grant County PUD developed a Network Operation Center to help manage the network. To date it has invested 3.5 million dollars into the system and it anticipates investing another three million. It has also developed a Cisco Network Academy Program to train local youth on the network.

Grant County PUD expanded its work force to address the increased volume from ZIPP. Fifty additional employees were hired to support the system. College students and community volunteers always work with ZIPP collecting signatures in support of the new network during the evening and on weekends.

After one year Grant County Public Utility District has increased economic development. It has attracted five new high tech customers to the area. It currently has twelve ISPs, two video service providers, one telephone service provider and one security system providing service on the network.

Grant County PUD focuses on customer service. It believes that the fiber to the home project will influence community change by removing the access bottleneck, eliminating the impact of distance, removing barriers to entry and creating open access/non-

discriminatory pricing. It has further learned that flat rates and bundled services sell better.

Grant County, Washington – Survey Summary

Area Demographic Description	**Population: Approximately 76,000** **Land Area: 2681 Square Miles**
Number of Households	**29,081 Households**
Description of Network	**100% Fiber Optic Network**
Services Provided by Network	• **Cable TV** • **Internet** • **Telephone and Broadband Service Providers** • **Automated Meter Reading**
Business Model	**Not-for-Profit Open Access Carrier's Carrier**
Financing	**$30-40 million of the estimated $130 million financed by Grant County Public Utility District cash reserves, remainder to come from revenues.**
Legal and Regulatory Issues	**Washington state law precludes public utilities from providing telecommunications services, so Grant County had to partner with private corporations to provide these services.**
Technical Issues	**Since the goal is to run fiber to every home and business, extensive education efforts to the general public as to the importance of the program had to be undertaken.**

Los Angeles, California

Los Angeles, California is one of the largest cities in the United States. It has an estimated population in excess of 3.8 million. Los Angeles is the largest international trade center in the United States and it has a labor force of 4.5 million people. The Los Angeles Department of Water and Power (DWP) serve a four hundred and sixty five mile area with over a 1.5 million customer base.

The Los Angeles Department of Water and Power expanded it services and created a niche market as a wholesale carriers' carrier. The wholesale telecommunications provider leases fiber from the Los Angeles Department of Water and Power to deliver its services over the Los Angeles Department of Water and Power network. The DWP is a wholesale carriers' carrier that leases dark fiber to interested parties.

Los Angeles Department of Water and Power has been building fiber for ten years. In 1995 it expanded into the fiber optic enterprise market. While building the fiber optic network, it built more fiber that it needed and created value out of the surplus. Los Angeles Department of Water and Power leases the spare fiber to service providers.

The size of the service territory and the number of telecommunications service providers in the service area were key factors considered by Los Angeles Water and Power and its telecommunications market expansion. Due to the size of the territory, Los Angeles Water and Power has limited its expansion to small areas. There are no future plans to cover the entire market. The number of telecommunications service providers in the area was also considered by Los Angels Water and Power. In many cases their customers have several options for telecommunications service. The need for services does not cover the entire service market.

The initial investment for the fiber was $16 million dollars. The lease agreements with the service providers have generated twenty-six million dollars in revenues. Los Angeles Department of Water and Power, has in-house construction capability and it utilizes its existing right of way ownership and rights to building entry. It provided fiber to 30 buildings in 60 days at the end of last year, without digging up the street. Fiber was installed in buildings that would not otherwise have the service.

Los Angeles Department of Water and Power developed a special project to help address digital divide issues. In the Los Angeles area, inner city/low income neighborhoods were not receiving expanded telecom services as quickly as other neighbors. Los Angeles Department of Water and Power partnered with a non-profit agency to develop the Watts Wide Area Network to help service South Central Los Angeles. The goal is to build a fiber network for the Watts community and help to service the schools, libraries, housing tracks and projects. This program is exclusively financed with grants.

The wholesale carrier's carrier model allows the DWP to operate outside of many state and federal licensing requirements and will allow the DWP to provide services beyond it borders through leases.

Los Angeles, California – Survey Summary

Area Demographic Description	**The City of Los Angeles is 465 Square Miles**
Number of Households	**Currently, LADWP leases fiber to commercial and governmental organizations only, however, it does not preclude anyone from leasing fiber optic cables. LADWP total customer base is 1.5 million for all services. LADWP has 30-35 leases of dark fiber spanning 130 buildings.**
Description of Network	**15,000 fiber miles (approx. 100 route miles) within the City, with ongoing construction to complete the metro area backbone loops to provide connectivity to additional key points of presence. Only portions of this dark fiber optical network are leased to local exchange carriers.**
Services Provided by Network	**Does not provide direct services, leases dark fiber directly to independent service providers. LADWP does not attach light transmitters, receivers, multiplexers, or associated electronic equipment. Customers are free to attach the telecom equipment of choice in order to light the fibers and transmit voice, data, or video information between locations.**
Business Model	**Municipal Utility, Wholesale carrier's carrier**
Financing	**LADWP used existing communications budget to build original fiber optic network (16 million dollars). LADWP found that it overbuilt the network, so it used the surplus to build the dark fiber leasing business. Some grant funding from federal government to provide services to low income areas.**
Legal and Regulatory Issues	**City avoids state and federal licensing requirements by operating as a wholesaler.**
Technical Issues	**Some problems with equipment compatibility with different bandwidths; City recommends using top of the line glass and fiber to assure compatibility.**

Marietta, Georgia

Marietta, Georgia is located in the northwest fringes of metropolitan Atlanta. It is the county seat of Cobb County and it has a population of approximately 500,000. Marietta Board of Lights and Water is the municipal operating company that supplies utilities to the city of Marietta, Georgia and surrounding areas. Marietta FiberNet was developed as the third division of the Marietta Board of Lights and Water in 1996. The other two divisions are Marietta Power and Marietta Water. Oversight for Marietta FiberNet is delegated to a seven-member board comprised of the Mayor and six others appointed by him.

Marietta FiberNet provides voice services – business lines, primary interface trunks, channelized T-1s, long distance and local residential service. Marietta FiberNet was certified as a CLEC in July 1997. It also transports traffic for other competitive local exchange companies and it is a full service ISP. There are twelve CLECs in metro Atlanta and one large ILEC. Marietta FiberNet is more attractive to the Enterprise customer because it installs quicker and it responds faster to service calls.

Thirty-one million dollars has been invested in Marietta FiberNet. All of the capital came from the Marietta Board of Lights and Water reserves. Marietta FiberNet has no debt. This year it is estimated to generate $8 million in revenues and recover a net profit of $460,000. Marietta FiberNet has 450 miles of fiber in north metro Atlanta and south into downtown Atlanta. The Network Operating Center operations are handled by Georgia Public Web. It is capable of providing service throughout the southeast from northern Virginia to Miami, Florida. Currently it has co-located in three different sites in downtown Atlanta.

The operating income for Marietta FiberNet flows back into Marietta Board of Lights and Water, even though financial reporting is totally handled separately. Marietta FiberNet does not retain ownership of net income or operating funds.

Marietta FiberNet considered offering cable television, but decided against it because of a $39 million dollar estimated cost. It is considering dial-up internet but the margins are small. It is also considering fixed wireless high speed internet, but the hills in the regions may present a problem.

Marietta, Georgia – Survey Summary

Area Demographic Description	**Population: Approximately 58,750** **Land Area: 22 Square Miles**
Number of Households	**25,277 Households**
Description of Network	**100% Fiber Synchronous Optical Network (SONET), incorporating Dense Wavelength Division Multiplexing (DWDM)**
Services Provided by Network	• **Internet** • **Local & Long Distance Residential & Commercial Telephone Service**
Business Model	**For Profit Carrier's Carrier**
Financing	**Funded by capital reserves of Marietta Board of Lights and Water**
Legal and Regulatory Issues	• **Regulations imposed by Georgia Public Service Commission regarding cross subsidization, payment of franchise fees, and fair and non-discriminatory competition.** • **Challenges by incumbent telecom providers to CLEC certification.**
Technical Issues	• **Coordination with carriers to provide network access across the State and East Coast and interconnect within the FiberNet System;** • **City hesitancy to invest in system and opportunities to expand.**

Memphis, Tennessee

Memphis, Tennessee is located on the southwest corner of the state of Tennessee. It is bordered by Arkansas and Mississippi. It has a metropolitan population of over one million.

Memphis Networx, LLC is a public-private corporation formed in 1999 to create a Memphis citywide fiber optic network, and provide metro access and metro core services that remove the "last mile" bandwidth bottleneck that persists in the 2nd and 3rd Tier metro space. The first charter of the corporation is to make money and the second goal is to serve the public.

Memphis Networx is a large investor owned utility with investments from public and private entities. It is a wholesale carriers' carrier and it has 90 miles of fiber in place. Memphis Networx is capitalized for growth with investments from Memphis Lights Gas and Water and Memphis Broadband, LLC. It also received funding from the Memphis Angels, a group of successful and prominent local business leaders. The private investors indicated that they wanted to come together and help to build the broadband infrastructure for the Memphis community. It also provided opportunities for diverse investors from the community.

Memphis Networx began with a $20 million dollar investment. However half of the money was used to fight its legal battles with BellSouth and Time Warner, who opposed the CLEC application. Memphis Networx took advantage of the downturn of the market. The leverage of the local investors has helped to build the local client base.

Memphis Networx currently provides access to more than 40% of the commercial class an office space in the Memphis metropolitan area, encompassing approximately 295 square miles and having a population of approximately 650,000 people. Memphis Networx owns and operates a 95 mile, 144 strand fiber networks throughout Memphis and Shelby County and will expand the network to 110 miles in the near future.

The system was designed for use as a central transit, from which the various carriers would extend services to the City's households and businesses. The system utilizes a fully redundant, self-healing architecture to preclude outages from fiber optic cuts. The network connects a main Technology Center with 13 BellSouth central offices and includes fiber laterals connecting the network to major carrier locations, service provider POPs, data centers and multi-tenant office buildings.

The success of Memphis Networx is attributed to its wholesale provider business model. It selected the wholesale carriers' carrier business model because it keeps the rhetoric down and there are fewer competitors in that market. It leverages its customer usage to

get access to other carriers. It has tapped into a local base of investors that have a genuine interest in the success of the company and it leverages the relationships to help the company. It is a good mix because the company can make a return and uplift the community.

Memphis, Tennessee – Survey Summary

Area Demographic Description	**Population: Approximately 650,000** **Land Area: 295 Square Miles**
Number of Households	**271,552 Households**
Description of Network	**95 – 110 mile, 144 strand Fiber Network**
Services Provided by Network	• **Cable TV** • **High Speed Internet** • **Video on Demand Service** • **Telephony**
Business Model	**For-Profit Wholesale Carrier's Carrier**
Financing	**$37 Million in capital raised through Public/Private purchase of shareholder stakes in Memphis Networx**
Legal and Regulatory Issues	**Legal challenges by private incumbent telecommunication companies to municipal utility provision of services.**
Technical Issues	**Most of network uses aerial cable strung along MLGW's poles; though some underground cables are used in the downtown area.**

Pittsburgh, Pennsylvania

Pittsburgh is located in Allegany County, Pennsylvania. In Allegheny County, there are 130 municipalities and 350 households. There are 40 counties in the state of Pennsylvania. Each county and municipality has a unique arrangement with it telecommunications service provider. The area is geographically challenged because of the three rivers. There are more bridges in Pittsburgh than in any other city in the world except Venice.

3 Rivers Connect was organized as a non-profit corporation in 1998 and funded with a seed grant of $200,000. The private foundations were one of several from the technology industry leaders. The mission of 3 Rivers Connect is to accelerate economic, social and educational development through technological advances. The focus of the corporation is on connecting the last mile.

3 Rivers Connect has 11,000 customers. Its first customers were economic development agencies in the area and it now focuses on schools, libraries and other non-profit agencies. It has one multi port tower on the roof top of its building and it has an open public network that supplies wireless to two open parks. 3 Rivers Connect does not rely solely upon its own networks. It buys and re-sells and it brings stakeholders to the table. 3 Rivers Connect is one of only two gigabit Ethernet service providers in its area. Its' primary competitor is Adelphia Communications.

3 Rivers Connect is involved with the Pittsburgh Institutional Network (I-Net), a group focused on providing bandwidth to schools, libraries, and community groups within the City of Pittsburgh. I-Nets are distinct telecommunications networks built in parallel with the upgrade of a cable company's commercial system. I-Nets provide dedicated bandwidth in orders of magnitude greater than cable modems.

3 Rivers Connect is also involved in a project with the Hosanna House in Wilkinsburg to help provide students with information technology at Home. The project is branded as, IT*@Home*.

Over a period of eighteen months, 3 Rivers Connect has grown to $3 million dollars in revenues with zero debt. It has nine employees and a network of 100 consultants. It is a fast growing non-profit corporation. The success of 3 Rivers Connect is attributed to its business model. Within this model, each project has its own individual business plan.

Pittsburgh, Pennsylvania – Survey Summary

Area Demographic Description	**12 County Pittsburgh Region Population: Approximately 2.9 Million** **12 County Pittsburgh Region Land Area: Approximately 8893 Sq. Miles** **Pittsburg Population: Approximately 334,500** **Pittsburgh Land Area: Approximately 58 Sq. Miles**
Number of Households	**Approximately 1.275 Million Households**
Description of Network	**A combination of coaxial cable, dial up, fiber, and wireless technologies with the goal of becoming entirely fiber optic with supplemental wireless and running fiber to every home in the region.**
Services Provided by Network	• **Internet and Broadband Service Providers** • **Private and non-profit**
Business Model	**Non-profit**
Financing	**Plan to leverage $10 million from initial investment of $3 million from public and private entities, as well as state and federal grants and service fees. Will also seek to secure a tax-exempt bond backed by the State.**
Legal and Regulatory Issues	• **Challenge coordinating buy-in from numerous county and municipal governments in the region** • **Difficulty resolving rights-of-way issues for installation of the program's infrastructure**
Technical Issues	• **Large service area initially required use of pre-existing coaxial and dial-up** • **Numerous water crossings required point-to-point wireless technology** • **Incumbent telecom providers resisted access to existing infrastructures.**

Poplar Bluff, Missouri

Poplar Bluff is located in Southwest Missouri among the hills of the Ozark Mountains in the Ozark Foothills Region. It is situated midway between St. Louis and Memphis with an area population of approximately 25,000.

In 1998 the citizens of Poplar Bluff voted for the city to create a cable television service. The vote was in response to the existing cable service's refusal to upgrade its system. Seventy-two percent of the citizens of Poplar Bluff voted in favor of the cable expansion.

The city of Poplar Bluff closed its first bond issue to fund the expansion shortly after the vote. It later funded its second bond issue after it purchased the incumbent cable company. The bonds were backed by the city. The total amount of the bonds was sixteen million dollars. The city of Poplar Bluff offers cable service and high speed internet. It also provides open access for internet service providers.

In the open access arrangement the city of Poplar Bluff provides dark fiber from the plant to the internet service provider. The internet service provider is then responsible for pushing Ethernet across the dark fiber and putting the equipment on both sides. The city installs and is responsible for everything up to and including the modem. The internet service provider is responsible for everything from the modem to the computer. The city charges the internet service provider a flat rate plus a fee for each customer. The rates are on a sliding scale based upon the number of customers that each internet service provider has signed-up on the network. The city and the internet service provider charge the same rates to the end users for the internet services.

Semo.net is a private internet service provider that has been in business since 1995 it participates in the open access arrangement with the city of Poplar Bluff. Semo.net has fifteen thousand customers in fifty communities in SW Missouri. Seventy percent of the users are residential. Semo.net offers dial-up access in all communities, DSL in six communities, fixed wireless in three communities and one shopping mall and cable television services in one community. There are no national or regional internet service providers in the area.

The open access arrangement with the city of Poplar Bluff and the internet service providers is successful. The city of Poplar Bluff worked with the local internet service providers to reach an agreement that would benefit the city, the internet service providers and the citizens. The city has not been able to handle the call volume for its internet customers and it has out sourced some of its technical support. Internet customers indicate that they prefer a local person to respond to its technical support questions. The city's out sourcing of technical support has lead to switching to the competitive carrier in order to get a local technical support contact.

The only real problem with the arrangement has been with scheduling. Three different entities are involved in the process – the customer, the internet service provider and the city's contracted employee must coordinate their schedules.

Poplar Bluff, Missouri – Survey Summary

Area Demographic Description	**Population: Approximately 17,000 City; 41,000 County** **Land Area: 11.5 Square Miles, City; 700 Square Miles, County**
Number of Households	**7,871 Households, City** **18,707 Household, County**
Description of Network	**Fiber optic backbone with coaxial cable "last mile" connection**
Services Provided by Network	**Digital Internet and Cable Television Services**
Business Model	**Carrier's carrier non-profit, public municipal utility company**
Financing	**Two general obligation bonds totaling $16 million**
Legal and Regulatory Issues	**Legal issues minimized by the fact that there are few national or regional providers in the area to challenge the program.**
Technical Issues	**"Back End" issues: customer service personnel shortage and logistical challenges coordinating customers needing support and technical personnel who can provide answers.**

Scottsboro, Alabama

The population of Scottsboro, Alabama is approximately 16,000. It is located in northern Alabama at the foothills of the Appalachian Plateau. There are eight thousand electric meters in the Scottsboro area. Scottsboro is a part of the Tennessee Valley Authority (TVA). There are 180 municipalities and 50 cooperatives within the TVA.

The citizens of Scottsboro signed petitions to get the Scottsboro Electric Power Board to expand its services and offer cable, internet, and telephone. It provides services for business and residential customers. The first telecommunications customer was on line in March 1998.

Scottsboro Electric Power Board began with cable, internet and telephone and then began leasing dark fiber to the school system. There are eight video teleconference locations in Scottsboro. It is involved in internet meter reading pilots, it has a gigabit Ethernet network and it has distribution automation with capacitor control and pastor switching.

In its original business plan, the Scottsboro Electric Power Board estimated that if 37% of the homes were reached, the telecommunications expansion would be successful. The expansion exceeded its best estimates and reached 90% penetration of the market.

Scottsboro Electric Power Board funded its expansion by issuing bonds. It worked with a local bond consultant who worked with Regents Bank. The bond consultant used the petitions that the citizens signed to confirm the citizen's support of the project. Scottsboro Electric Power Board closed 8.5 million in bonds with no existing revenue at 6% interest. The bonds were unrated and uninsured. Scottsboro did not have enough cash reserves to float the project.

Scottsboro Electric Power Board is in direct competition with a local cable provider. In 2000 the competitive cable company dropped its rates in order to compete. Scottsboro lost 25% of its customer base because of the rate decrease.

The focus of the Scottsboro Electric Power Board is on people, not technology. The Scottsboro Electric Power Board is looking to create a quality of life that will help people to enjoy living in the community.

Jimmy Sandlin sees the municipalities as the last line of defense – "the last entity to provide services for the community." He considers Scottsboro Electric Power Board as a publicly traded company with public opinion stock.

Scottsboro, Alabama – Survey Summary

Area Demographic Description	**Population: Approximately 16,000**
Number of Households	**Unknown**
Description of Network	**Private network**
Services Provided by Network	• **Internet Access** • **Analog & Digital Cable** • **Local and Long Distance Telephone Services**
Business Model	**For-profit service provider**
Financing	**Funded by bonds, $8.5 million dollars worth**
Legal and Regulatory Issues	**The citizens of Scottsboro signed petitions to get the Scottsboro Electric Power Board to expand its services and offer cable, internet, and telephone. It provides services for business and residential customers.**
Technical Issues	**None reported**

State of Georgia

Georgia Public Web operates throughout the state of Georgia and it is publicly owned. Thirty-two municipalities in Georgia joined together to generate $35 million dollars to build a statewide network to connect their communities. Georgia Public Web is building the network to connect the communities. It is a carriers' carrier whose goal is to bring economic development opportunities for tier three and tier four markets. It is a registered competitive local exchange company and it transports and provides internet services throughout the state of Georgia and fiber in the Florida.

Georgia Public Web utilizes a state of the art fiber optic network that incorporates digital "on ramps" and "off ramps" in many of Georgia's metro and non-metro communities.

Georgia Public Web's members include thirty-one cities and one county. It provides cost effective state of the art internet transport and web solutions throughout Georgia.

Georgia Public Web originally began as MEAG Telecom. MEAG Telecom was created as the telecommunications division of MEAG Power. MEAG Power is a public generation and transmission corporation providing power to 49 Georgia communities. It is the third largest power supplier in the state of Georgia.

The Cable Television Association of Georgia opposed MEAG Telecom's application for certification as a CLEC. In order to certify as a CLEC, MEAG was forced to form a separate company with separate financial records. Georgia Public Web was certified as a competitive local exchange company in September 2001.

Georgia Public Web members believe that the real driver of their communities is economic development. Through its service offerings, Georgia Public Web hopes to improve education, economic development, and other vital aspects of Georgia's rural and small town communities.

State of Georgia – Survey Summary

Area Demographic Description	**Thirty-one municipalities and one county joined together to form the Georgia Public Web. Example municipality is LaGrange, Georgia with a population of 25,998**
Number of Households	**Approximately 300,000 over 31 cities, and one county**
Description of Network	**Fiber optic network connecting thirty-two communities, digital on and off ramps; Example: LaGrange has, OC-12 SONET ring with 32 Nodes, 1 Node at ITC POP and 1 Node at MEAG POP (Georgia Public Web), T1 local loop, T1 point to point, VPN, Ethernet point to point, Token Ring point to point, dark fiber, PBX switching services**
Services Provided by Network	**Internet, POP, and various others depending on local government. LaGrange offers digital switching service, multi-carrier POP, Competitive Naccess Provider for interstate carriers, CLEC and OCC certifications and licenses.**
Business Model	**Publicly owned carrier's carrier**
Financing	**Participating governments contributed 35 million to build statewide network. LaGrange finances through sales tax and utility revenues.**
Legal and Regulatory Issues	**Challenges to CLEC certification**
Technical Issues	**Must overcome geographic barriers to gain rural connectivity.**

Tacoma, Washington

Tacoma is the third largest city in Washington State and it is located approximately forty miles south of Seattle. The population of Tacoma is approximately 193,500. Tacoma Public Utilities is organized into three divisions: Tacoma Rail, Tacoma Water and Tacoma Power. The service area for Tacoma Public Utilities is 180 square miles. Click! Network is the telecommunications division of Tacoma Power.

In response to deregulation and increased competition, Tacoma Power planned to build a fiber-optic network to control its substations. Tacoma Power retained Stanford Research Incorporated to conduct an initial telecommunications study in 1995 and the business plan was developed in 1996. Tacoma Power discovered that it was feasible to provide telecommunications services beyond its initial plan of building a fiber-optic network to control its substations, and it learned that it could use the additional services to assist with funding the expanded network.

Tacoma Power initially funded the build-out for the Click! Network with cash reserves gained from the sell of power on the open market. Approximately one million dollars in investments for the Click! Network came from cash reserves. The city charter requires that cash reserves are spent on capital improvements.

The Tacoma Power expansion into the telecommunications market with Click! Network was not well received by its competitors. Click! Network marketing materials were intentionally removed by its competitors. Contractors were threatened and advised that if they did any installation work for Click! Network they would not receive any other contracts. Click! Network was forced to get installers from other states. It was also very difficult for the Network to purchase installation equipment

Network provides service for business and residential end users and it provides access for service providers. Click! Network has installed 635 miles of fiber optic and coaxial cable in the city of Tacoma. There are five network applications: electric utility system monitoring and diagnostics, cable television services (193 video channels, 47 digital audio channels and internet over television), high speed data connections for businesses, high speed internet access over cable modems with multiple internet service providers and City Net (institutional network for the City of Tacoma). There are 19,384 cable television customers and 2,530 World Gate (internet over television) customers. One hundred new businesses have moved to Tacoma and connected to the network.

Tacoma, Washington – Survey Summary

Area Demographic Description	**49.05 Square Miles** **193,556 Total Population;** **Located on Commencement Bay in lower Puget Sound, 36 miles south of Seattle; the Port of Tacoma is the 6th largest container port in North America covering over 2,400 acres.**
Number of Households	**76,152 Households;** **Currently, 19,384 Cable TV customers and 2,530 Internet over TV customers.**
Description of Network	**635 miles of fiber optic and coaxial cable; Initial fiber-optic network build out by Tacoma Power to control its substations led to realization that network could provide a wide range of telecommunications services that would benefit customers.**
Services Provided by Network	• **Electric Utility System Monitoring** • **Cable TV** • **High Speed Data Connections** • **High Speed Internet Access over cable modems with multiple ISPs and City Net**
Business Model	**Municipal Corporation, Cable TV provider, Wholesale ISP provider**
Financing	**90 million for initial broadband build out, Initial funding from cash reserves (City Charter requires reserves to be spent on capital improvements)**
Legal and Regulatory Issues	**Installers, contractors, and equipment difficult to procure due to pressure from incumbent providers.**
Technical Issues	**In October 2001, the City signed an agreement with Optic Fusion, Inc. which will enable Optic Fusion to open a carrier neutral co-location facility in downtown. Optic Fusion will offer a broader range of business class communications services in downtown (201,000 residents live within 5 miles of the Downtown Central Business District).**

Thomasville, Georgia

Thomasville, Georgia is a small town in southern Georgia. The population of the city of Thomasville is twenty thousand, while there are approximately forty-two thousand residents in Thomas County. Thomasville Utilities is the municipal electric, water, wastewater, and telecommunications provider in the Thomasville area. Thomasville Utilities expanded its services to offer telecommunications services to support existing industry, promote economic development and to ensure a quality education for children in the community.

Thomasville Utilities teamed with neighboring cities: Moultry, Camilla, and Cairo Georgia to form the South Georgia Government Services Authority. These cities work together through the Authority to provide high speed internet, cable television and telecom services. Each city is a certified CLEC. The Authority owns some of the assets and it manages some of the responsibilities for each of the cities. Each individual city owns the infrastructure within its city limits. Thomasville delivers its telecommunications services with hybrid coaxial cable and OC-48 SONET. Moultry, Camilla, and Cairo use gigabit Ethernet to deliver its telecom services.

Before expanding into the telecommunications business, Thomasville Utilities met with the businesses in the community to determine what the city could do to support local business. At that time the businesses advised of the high costs that they were paying to meet their advanced telecommunications needs in the community. The city then met with the ILEC to try to get the ILEC to work with the local businesses and expand the services. However, the ILEC was unwilling to invest any money into improving the current telecommunications service. Hence, Thomasville Utilities expanded its services to meet the economic needs of the businesses in its communities and to improve the quality of education in the community.

Community Network Services (CNS), a division of Thomasville Utilities, offers cable television (CNS Television), Internet access (rose.net), and telecom service using a state of the art fiber optic network. CNS also provides telecommunications solutions for all types of organizations, including services ranging from single dedicated data circuits to video conferencing and interactive distance learning applications.

The Authority is funding the expansion with a walk away lease. An investment banking entity owns the system. The Authority leases the system back and it makes payments for the next ten years. At the end of the ten-year period the Authority owns the system. The user fees pay the lease agreement.

Initially, the ILECs and the Cable Association of Georgia objected to the Thomasville Utility CLEC application. However, the application was eventually granted. Although

Bell South does not currently show much interest in competing with Thomasville Utilities, Alltel and Media.com are aggressively competing for customers.

Coordination between the four cities in the South Georgia Government Services Authority has been a little difficult. The Authority, however, has certainly provided an opportunity for all of the communities to benefit. Thomasville Utilities is considering changing to gigabit Ethernet for its telecom services in the future.

Thomasville, Georgia – Survey Summary

Area Demographic Description	**Thomasville Population: 18,162** **Cairo Population: 9,239** **Camilla Population: 5,669** **Moultrie Population: 14,387**
Number of Households	**Thomasville Total Households: 7,021** **Cairo Total Households: 3,465** **Camilla Total Households: 1,994** **Moultrie Total Households: 5,663**
Description of Network	**Hybrid fiber optic/coaxial cable system;** **Thomasville began building a fiber optic network to serve local schools, libraries, businesses, and hospitals in 1995. By 1996, the City determined that the system could provide previously unavailable services to the community. In 1997, the partnership of four cities was formed.**
Services Provided by Network	• **Analog and Digital Cable** • **Dial-Up and High Speed cable modem Internet Access** • **Single dedicated circuits for businesses**
Business Model	**Municipal Corporation, Cable TV provider, ISP provider**
Financing	**Original Thomasville infrastructure financed through utility budget. South Georgia Governmental Services Authority is authorized to issue tax-exempt revenue bonds.**
Legal and Regulatory Issues	**Community challenges to cable programming decisions by local government; some opposition to creation of regional entity.**
Technical Issues	**May 2002—SGGSA selected SONET Solutions to deploy network architecture for advanced telecom services. Nortel Networks OPTera Metro 3500 next generation SONET solution will provide new services: interactive distance learning services for schools, access to affordable broadband, and access to internal applications like storage, disaster recovery, content networking, and Ethernet services.**

11.1.3 Municipality Approach Business Case Analysis

The work compiled by Jacksonville's Telecommunications Master Plan Task Force provides compelling evidence that there is no "one size fits all" approach to the municipal telecommunications business. Therefore, it is important to come to agreement on some basic business premises specific to Jacksonville to create a foundation on which the business model will be built.

Two important business concepts that permeate the telecommunications discussions in Jacksonville are open access and utilization of a public entity such as JEA as the operating entity. Open access is a wonderful vision with its primary driver being to provide competition in a semi-natural monopoly market. Although open access success to-date has been limited, it is still a worthy goal and all planning should have open access as a possible future outcome.

The concept of open access has its roots in two of the systems included in the Telecommunications Master Plan Task Force study. Therefore a deeper look into Tacoma Washington's Click Network and Grant County Washington's ZIPP Network is warranted. Both cases also offer insight into melding a competitive telecommunications culture into a well-established electric utility. While an integrated network for Jacksonville would be larger, Click Network is the largest competitive municipal telecommunications system to-date and is therefore an excellent model to analyze further.

City of Tacoma > Tacoma Public Utilities > Tacoma Power > Click! Network

Tacoma's telecommunications effort actually started in the early 1990's when Tacoma Power (then known as Tacoma City Light) began planning for an eventual full implementation of distribution automation/system management. It became apparent that a significant investment in leasing or owning telecommunications infrastructure was required to maximize the system efficiencies from automation. When Tacoma Power pursued leasing bandwidth for their distribution automation/system management needs, the incumbent cable operator felt in a solid negotiating position and demanded more in a lease than Tacoma Power could justify. It actually made more sense for Tacoma Power to build its own system rather than lease from the incumbent cable provider.

The cable operator's franchise with the city had expired in the early 1990's and although the City and cable operator made several attempts at negotiating a new franchise, the process stalled and extensions were granted for several years. (Note: Tacoma Power/Click! Network signed a franchise with the City in 1998, the incumbent followed suit in 1999).

As this same incumbent provider proceeded to upgrade systems in areas with more political clout, it became apparent Tacoma was being left out. Thus, when Tacoma Power proposed entering the telecommunications business, the frustration levels of elected officials and residents were high and the need for competition was very recognizable.

Through considerable effort and study, it was determined that Tacoma Public Utilities had significant positive name recognition within the community and would be welcomed as a cable television and data service provider. These services could in-turn help offset some of the costs of constructing the infrastructure necessary for efficient operation of the power system.

In preparation for competition in the utility industry, branding and positioning focus groups were held in early 1998. Results indicated that Tacoma Public Utilities as a whole and Tacoma City Light as a separate entity had significant market appeal in the City of Tacoma and the surrounding area served by Tacoma City Light. However strong this appeal, these same focus groups suggested separately branding the telecommunication effort to support the innovation and expected in the start-up venture, as well as the view that cable was an entertainment offering with little correlation to the other utility offerings. This separation was also seen as important to allay fears that any cost over-runs in the cable venture would adversely affect utility bills.

Tacoma Power created a new section in their organizational structure for the telecommunications effort and was able to attract top-notch individuals from the telecom industry by offering them the chance to “build it and operate it the way it should be.” The system is not gold-plated or bleeding edge technologically, it is top of the line for what could be supported by the business climate of the mid to late 1990’s, and expandable to meet future needs. The main differentiator is service – both quality of product and quality of customer care. The key service aspects most important to customers when purchasing cable TV service are the quality of reception (picture), reliability of the service and the quality of the customer service. Click! Continues to have the highest ratings in these three areas due to the focus on employee training, call monitoring and ongoing process improvement projects that are customer centered.

Hybrid fiber coax (HFC) was the system of choice. The fiber backbone runs multiple SONET rings for redundancy, and distribution fiber loops off the backbone feed each node bi-directionally to maintain this redundancy all the way to the node. Additionally, there is fiber available to offer a variety of business services.

Frequently, you will hear that Click! Is a “modified open access” system. The access is limited to a small number of pre-qualified and certified Internet service providers (ISPs) competing for the retail cable modem data market on the Click! System. The

certification process occurs only occasionally and through an RFQ process to ensure the ISP is capable of meeting operational standards set forth by Click! While this may sound somewhat stifling, it provides the residents with the choice in providers they desire and allows Click! To properly manage their HFC system and the customer experience. With the considerable changes in the ISP industry locally and nationally, click! has experienced several fluctuations with its ISP. Click! started with four and have had a total of seven different providers over time, but there are currently only three providing service on the system.

At the time the system was designed, there was no feasible way to allow for open competition for the video business, thus Click! is the sole provider of video services.

Click!, as a carrier's carrier, leases bandwidth to competitive local exchange carriers (CLECs) that target larger businesses with significant telephony and data transport needs. Again, these providers are pre-qualified and limited in numbers. The Click! standard is to run fiber drops and install multiplexing equipment for any business in the downtown core within 30 days of signing a contract. In the past, the incumbent providers often quoted a year for construction or "not available" prior to Click! entering the market.

Lessons Learned[6]

Business Management:

a. Take more time to formalize relationships and processes within the utility as a whole, while at the same time striving to maintain the nimbleness and flexibility required to compete. There are significant efficiencies to be gained by utilizing the staff and expertise from within the other areas of the utility.

b. Physically, stay more integrated with the utility – Click! is in their own office separated from other utility staff by several hundred yards (except for a retail space in the main lobby of the utility). This has established a sometimes-challenging bi-directional them and us attitude.

c. The total employee compensation package must compete well within the industry. The competition will try to lure key staff away, and they often have the flexibility in pay scales and perks to do it.

d. Spend more time becoming educated about the political landscape surrounding elected officials, political agendas, and city staff, as well as educating these groups about the various businesses the utility plans to enter. While the day-to-day operations are handled within Click!/Tacoma Power/Tacoma Public Utilities, certain overarching decisions must be made by the City Council with input from

[6] Conversations with Dana Toulson, Manager; Diane Lachel, Government and Community Relations; Cyndi Wikstrom, Marketing and Business Operations; Peter Rumble, Network Operations - Click! Network

City of Tacoma general government staff. The rights-of-way and franchise are also managed by general government.

e. Build alliances at all levels of governance as well as outside government. Civic organizations and influential individuals are very important to success.

f. Public Relations: Get to know the reporters that will be covering the business (in Tacoma that meant different reporters covering city business, commercial business, technology, television, and editorial staff); adjust press releases/presentations to create meaning for the specific audience; hold critical information very tightly until the appropriate release time, as the competition will have sources, quite possibly even within your own organization.

g. Keeps a detailed log of competitive practices being instituted in the area. This assists in remaining competitive, as well as potentially showing practices/trends that may later be deemed anti-competitive in a court of law. Compare stories with other cities in the business to keep abreast of practices that may migrate to your area.

Public Utility District # 2 of Grant County > ZIPP Network

As with most generation/transmission/distribution electric utilities, Grant County Public Utility District (PUD) had plenty of experience installing fiber optic cable for their internal telecommunications needs. Unlike most electric utilities, they also had a significant cash flow from power sales. Since they already had some of the lowest power rates in the United States, reducing them was not as attractive as it might have been in other places. Also, as one of the more rural and sparsely populated counties in Washington, they had never attracted much attention from telecommunications providers. This set the stage for a monumental decision by the PUD Commission to view telecommunications as a critical infrastructure for their customers, as well as the utility. Since the PUD was formed to provide in critical infrastructure (electricity), it seemed a natural extension of the PUD principles to install excess capacity within the utility's telecommunication system to spur innovation in meeting the current and future needs of the residents.

The PUD studied which system architecture would best utilize the fiber backbone already in place or planned. They chose an active fiber-to-the-home (FTTH) system for its flexibility, manageability, security, and long term prospects for avoiding technological obsolescence. The normal private company way of looking at payback would not support this decision, but the long range planning perspective of an infrastructure builder (public utility) made this a palatable decision.

The PUD next undertook a pilot to test technologies and construction techniques to determine how to proceed. Although the rules of the game were changed by the state legislature (choreographed by the incumbent provider) during this planning stage, the decision was made to continue, albeit with a wholesale model in place of the originally planned retail model. The PUD never planned on being a retail service provider, just a

retail bandwidth marketer, so the change to wholesale merely constituted a change in who would receive the bill from the PUD.

It was soon discovered that regardless of what the manufacturers had been saying, all the pieces of this puzzle had never been constructed on a scale such as this. The PUD became a real-life R&D lab for manufacturers hoping to be in on the FTTH dream. They have now proven that multicast IP video, voice over IP telephony and of course data can all be provided on an open access system – technically.

The difficulty is in finding service providers. Providing service only instead of serving a protected customer base over a proprietary infrastructure is such a different business model as to hinder financing options for start-up service providers. To compound this, the population of Grant County is less than 80,000 and therefore not a significant market for the national companies. The system currently hosts fifteen ISPs, two video providers, one telephone provider and one security provider. Of these nineteen businesses, only two existed prior to the creation of ZIPP.

A significant percentage of the PUD's staff time is spent pursuing and assisting service providers for the system. While each service provider has technical staff, the first trouble call frequently comes to the PUD, which troubleshoots the transport portion of the network and coordinates resolution with the service provider. The PUD has network operation, technical, and customer care staffs that are all involved in seeing that customer expectations are met. Even though it is a wholesale only model, the PUD has more invested than individual service providers and is therefore willing to expend additional resources to see that the network is a success.

Since it is a seven year process to build out the entire county, the PUD invested in market research to determine a construction schedule that reached the most probable customers the quickest. They followed this schedule for approximately one year until capital got tight. The PUD commission became a little tentative and authorized a petition process to determine the locations of the highest densities of probable customers. They discovered an overwhelming desire for the services and now find themselves managing customer expectations nearly as much as the construction process.

As for integration within the utility, the PUD created a new workgroup for the fiber project and chose to utilize existing staff in lead positions and supplement this with new hires. Although this organizational structure is very reasonable, it is not free of the occasional internal strife. Staff left positions in the electric side to work on telecom, and some of those on the electric side felt they had to pick up extra work. Also, the converted electric staff spent considerable time and effort gaining knowledge of the telecom business.

Internally, the PUD management works hard to keep effective communication flowing between ZIPP staff and the rest of the utility. Some view the fiber project as using financial resources that would otherwise be available for their projects. While this may be true or false depending on the specific situation, supervisors and senior management must continually engage staff to address these concerns.

Specific suggestions provided are:

1. A differentiated product is critical. Data is the easiest service to distinguish from the competition due to the high bandwidth and extreme speeds available, however, video and residential telephony are tougher to sell.
2. Integrating staff from outside the electric industry and/or establishing a new group within the utility sets the perfect stage for a "favored child" mentality to gain a toehold.
3. Within any large organization there will be a number of innovators that will be offended if they are not given the opportunity to be a part of the new business. There will also be a number of naysayers because they do not agree with nor support the vision. It requires a concerted effort on the part of management to maintain harmony. Always address the negatives to keep them from gaining "urban legend" status. This is critical, as the entirety of the utility staff is the number one sales force and must be dealing with good information.
4. Opinions and policies of elected bodies are fluid. Elections and personal affiliations are equal in their potential for change; one is very public, the other very quiet.
5. A government enterprise does not compete to win, only stay in the game to provide choice. A private enterprise would prefer to put the competition out of business.
6. In response to two and three above, keep as much decision-making authority as possible at as low as level as possible (particularly products and timing of rollouts). Otherwise, your business plan is as fluid as the demeanor of the elected bodies.

Conclusion

The drive behind modern telecommunication infrastructures has resulted in a fundamental trend in their development and construction.

As in the past municipalities are emerging as the natural owners and builders of infrastructure in their community. Municipalities provide an opportunity for all entities in the community to be served. Their existing capabilities, access to capital and concern for the betterment of their residents position municipalities to develop the future utility — gigabit speed data networks.

12.0 Right of Way, Jacksonville's Network Access Point and Minority Business Opportunities

12.1 Jacksonville's Right of Way Regulation

Because of many issues related to problems in right of way management many cities and counties are looking closer at the management of their right of ways and the costs associated with this management.

The City of Jacksonville has right of way permitting requirements that are effective in controlling access for telecommunications development. In order to perform any construction on right of ways within the City of Jacksonville paragraph 744.110 of the City Ordinance Code requires a written permit to disturb, excavate, block, obstruct, tamper with or place any construction or other material on or in any public road, right of way, or easement of the City of Jacksonville.

Within the Downtown Development Authority area, underground utility construction which is 1,000' or more in length or any utility construction, aerial or underground, is required to go through a Civil Plan Review process. The contractor is required to provide protection or mitigation of protected trees, adequate maintenance or traffic, erosion and sediment control general notes and details, and adequate restoration of pavement and grassing in areas of trenching.

Further, Chapter 710 of the Jacksonville Municipal Code requires that a permit be obtained and written notice given of proposed construction at least ten days prior to construction so as to coordinate all work between the city and the contractor. The Director of Public Works has the right to inspect all construction or installation work performed by the company in the streets, and to make such periodic inspections as the City deems necessary to ensure compliance with the terms of its franchise and other pertinent provisions of law[7].

However, the opportunity offered when controlling Jacksonville's right of way is to include as a requirement the expansion of telecommunications infrastructure for the benefit of the community. Innovative recommendations for inclusion in a right of way ordinance are:

- Require the placement of telecom conduit in new developments to create fiber ready communities.

[7] Source: Jacksonville Municipal Code, Ch. 710.105

- Whenever a public road, right of way or easement is accessed for construction, the request for access will consider the installation of telecommunications conduit.

Visionary management of the public right of way can define the future telecommunications infrastructure of Jacksonville.

12.2 Network Access Point (NAP)

The NAP (Network Access Point) was planned to be a terminus for an Atlantic crossing of fiber optic cable as part of the Jacksonville International Technology Center, a project development located on a 550 acre site west of I-95 and southeast of Pecan Park Road. The developer, Trinity Partners LLC, owned by Park Beeler, has halted the proposed project due to funding constraints. The terminal location was to be the site for extensive commercial development.

JEA had planned for several initiatives for this development. Among those were substantial power supply provisions and conduit for communications including conduit from the terminal site to the shore landing point.

It is possible that the conditions which caused the developer to halt the work may reverse themselves and again make this NAP a financially viable project. If that should happen, the City of Jacksonville would want to incorporate a conduit-based system into the overall cable plant development as it becomes feasible to do so. A network design for a city-wide broadband network would probably be revised to incorporate the buried conduit requirements which come from a NAP. Until the technical definition of the NAP is more firm, the City should not expend construction funds on conduit which is primarily intended for a future NAP.

12.3 MBE

The creation of a high speed, county-wide, telecommunications system, similar to those provided by the Better Jacksonville Plan, will create county-wide economic development opportunities. Contractors, suppliers, consultants, technicians and other local businesses will directly benefit from the design, implementation and operation of such a system.

Because of the broad range of expertise levels required in the creation of the telecommunication system, economic opportunities exist in areas of technical design and planning of the system, physical installation of the telecommunication infrastructure, and operation of the business model ultimately selected by the City for the system. Small or

minority owned businesses can play an integral role in multiple phases of the creation of the system.

Establishing such system will require technical expertise in an ever changing telecommunication world to plan a system that maximizes the telecommunication experience of Jacksonville's diverse citizens and businesses, while possessing foresight to create a system that will evolve to meet tomorrow's demands. Installing the system's infrastructure will require the ability to coordinate with construction schedules and contractors of the Better Jacksonville Plan, as well as the ability to compensate for Jacksonville's unique geographical climate, including river and intracoastal crossings and large land size.

Utilization of the Equal Business Opportunity Program should model other successful, broad-based programs within the City, such as the Better Jacksonville Plan.

13.0 Business Case Analysis

13.1 Introduction

At the turn of the 20th century there were approximately 6000 independent telephone operators with AT&T in control of all long distance circuits. With a monopoly in control of long distance service the system was non-functioning and the legislation of the industry started. From the Willis-Graham Act in 1921 that recognized AT&T as a natural monopoly to AT&T's 1982 acceptance of the government's proposal to break up and divest itself of the Bell System's local operating companies to the Telecommunications Act of 1996 the industry has been molded by regulation.

The Telecommunications Act of 1996 was intended to transform the U.S. tele-communications industry from a staid, regulated, monopolistic environment to an aggressive, deregulated, competitive market. One of the primary objectives of the Act was to open the market to new types of service providers who would provide competition to the entrenched incumbents. Its vision at inception was to facilitate the provisioning of competing and complementary telecommunications services.

While the success of the 1996 Act continues to be debated and legislated at the local and federal level, it is important to focus on its objectives "to promote competition and reduce regulation in order to secure lower prices and higher quality services" for American consumers. These objectives are readily met with a telecommunications infrastructure that provides access to all service providers.

A publicly owned infrastructure with access to service providers eliminates the financial barrier to entry and the natural monopoly tendencies of this industry. In this section, we consider the alternate business structures to own and operate a publicly owned telecommunications network, the organization to operate the network, discuss the financing options and financially evaluate the project.

13.2 Findings

The business factors effecting the development of a gigabit Ethernet network in Jacksonville are summarized below:

- Jacksonville's telecommunications services are a commodity with success measured by economies of scale and efficient management of costs. To succeed, all government agencies must use the network and operations need to be tightly controlled.

- A disruptive technology is required to create value to the user in this environment. A fiber optic, DWDM, gigabit Ethernet network provides this technology (see Volume II, Section 14).
- Bell South advised that 80% to 90% of the Jacksonville residential market has DSL or cable modem access (Maps were requested but not provided). The demand for advance services to residents is from the employers. They do not perceive the current network as providing the services required for effective telecommuting.
- Recent FCC rulings, if enacted, will phase out facility sharing by the RBOCs for data services. Essentially, Bell South will not be required to give alternate ISPs access to their facilities.
- We have been advised that current grants such as the Universal Service E-Rate program is applicable when the service is provided by a public entity. This grants are currently used by Jacksonville's schools and libraries to subsidize their telecommunications service cost. This subsidy is often paid directly to the service provider and could be an additional source of revenue for the City. This was not included in our financial analysis.
- The most likely sources for financing are the equipment manufacturers or bonding. Nortel Networks advised that the network should qualify under their OE-SEI group program. However, details were not provided for the report.
- From discussion with a municipal bond underwriter interest and operating expenses can be capitalized when appropriate for a limited duration (2-4 years) and amount (5-10%).
- With JAXMAN in place, the consolidated government telecommunications usage can be leveraged to create a public/private network for county wide wireless.
- Additionally, incremental cost for a wireless connection to high bandwidth consumers is economically reasonable.

Details of the above major points are provided within this section.

13.3 Market Position

With 22 telephone providers (primarily long distance), 90 Internet service providers, 17 high speed data service providers (primarily serving the business market), 9 wireless phone service providers, Jacksonville's telecommunications market is clearly a competitive environment. The competition is based upon non-facilities based operations with the exceptions of wireless services, cable TV and local telephone service. With cable TV and local telephone services exhibiting monopolistic characteristics in the residential market.

The evaluation of overall competition and discussion of the appropriate business structure for the market requires definition of the product to be offered over the network. Components of this product are the service to be offered, customer service and support, service provider reputation and name recognition, and service quality. In order to

successfully compete in a competitive market, the services offered must be clearly differentiated from the competition. We defined these components consistent with the vision to provide an extremely improved telecommunications infrastructure for Jacksonville.

13.4 Service Offering

The Metropolitan Network will provide gigabit Ethernet technology over DWDM transport. The extended FTTH network has the potential to use varying technologies dependent upon the final system equipment chosen. The capacity provided through the conceptual design architecture provides the following bandwidth to the service provider.

Entity	MAN/FTTH Network	Comparable to Existing
Government Agencies	100-1000 Mbps symmetric	T1 or DS-3 Service: 1.5 Mbps/45 Mbps
Businesses	100-1000 Mbps symmetric	T1 or DS-3 Service: 1.5 Mbps/45 Mbps
Small Business/Home Business	40-100 Mbps symmetric	DSL or Cable Modem Service: 1.5 Mbps down/ 256 kbps up
Residences	40-100 Mbps symmetric	DSL or Cable Modem Service: 1.5 Mbps down/ 256 kbps up

The bandwidth offered by this network is in excess of any current service to the residential consumer. This is a key differentiator of this market offering and an enabler of economic growth, improvements in education, emergency response and SOHO businesses.

This network is capable of providing all telecommunications services – voice, video and data. In consideration of the regulations and entanglements involved when providing voice service the business model details only data and video services.

13.5 Customer Service and Support

Customer service is a significant differentiator in the telecommunications market. When Tacoma Public Utilities entered their market the incumbent provider offered T-1 service to small businesses with a wait of a month for connection to the service. When Tacoma Power/Click! Network began to offer service, they committed to facility connections within one week. The foundation from which a system reputation is built is customer service.

Customer service and support are integral to a larger effort to market the services provided. A marketing plan or program is necessary and should be developed at a later stage in this process. A typical marketing plan will address advertising, sales promotions, personal selling, customer service and new-product development. Focus group discussions confirmed these consumer concerns.

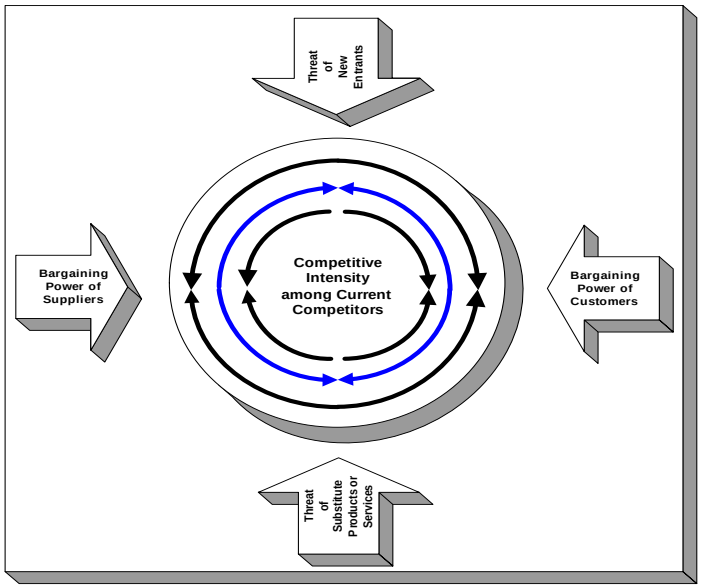
Residential users defined service in terms of response time, affordable rates, courteous service and, most importantly, speaking to a human voice. Business users defined service similarly with the addition of reliability, and speed of data transfer. The conceptual design will meet the technical requirements of the users. It will be the responsibility of the operating organization to meet the non-technical demands.

13.6 Existing Market Assessment

The Michael Porter competitive analysis model provides a useful lens to view the major forces impacting the market. These forces are:

- Threat of New Entrants
- Bargaining Power of Customers
- Threat of Substitute Products and Services
- Bargaining Power of Suppliers
- Competitive Intensity among Current Competitors8

[8] Michael Porter, "How Competitive Forces Shape Strategy", Harvard Business Review, March-April 1979



Source: Michael Porter, "How Competitive Forces Shape Strategy", Harvard Business Review, March-April 1979

13.6.1 Threat of New Entrants

As previously indicated Jacksonville has a robust telecommunications market. Both the wireless and land based market have multiple service providers and a variety of service offerings.

With over 150 service providers in the area, competition is fierce, and the pricing competitive. The services provided are considered a commodity in the market. The fundamentals of a commodity market are driven by the price to the consumer and the costs of goods sold. Economies of scale, determine success assuming the costs of goods sold are efficiently managed.

With the capital-intensive large infrastructure requirements of the telecom industry, the biggest barrier-to-entry is access to financial resources. The current market situation has made telecommunications investments extremely difficult.

The service differentiator offered by the proposed network is the bandwidth capacity. The capacity proposed requires an infrastructure that is not currently available and requires a significant investment to implement. This is a considerable barrier to entry to overcome.

Logical threats to this new service are the current incumbent service providers. Bellsouth and Comcast are the two best positioned to respond aggressively and most threatened by a new facility provider.

As the recent merger partner with AT&T Broadband, Comcast has pledged to finish rebuilding its telecommunications network and to improve customer service. Rebuilding of the system will not improve high speed internet access beyond the capabilities of a cable modem service but it will increase the access to improve service above a dial-up connection.

In the February 2003 edition of Cable World magazine, Comcast indicates their response to competition in an effort to gain back more customers[9]. The AT&T Broadband system in Sacramento, CA that Comcast assumed has seen direct broadcast satellite (DBS) penetration climbed to the mid-teens. Comcast has committed to upgrade its systems in order to provide a better product and improve customer service. The upgrade in Sacramento consists of upgrading about 2,800 miles of plant, which includes bringing 100% of the Sacramento system up to 750 MHz with two-way capability. The situation in Sacramento is similar to other geographic areas served by Comcast, where competition is increasing and customer churn has increased. Comcast has also committed to upgrade their system in Jacksonville. These upgrades will provide cable modem capabilities to the residences served. These capabilities pale in comparison to a fiber optic network to the residence.

Bell South advised that their network currently provides DSL coverage from all their central offices. Their DSL coverage maps were requested but could not be obtained.

The decision to upgrade facilities by the RBOC community is considerably restrained by FCC requirements to lease their networks to competitors at steep discounts. These requirements are currently being reconsidered. On February 20, 2003, the FCC struck down "line-sharing" requirements to RBOCs to provide digital lines to competitive data carriers while upholding facility sharing for other services. If enacted, Bell South and Comcast will have duopoly power for providing data services to residents.

The competitive threat is considered very high in this market. An aggressive response is anticipated by both incumbents. The threat to the system proposed is mitigated by the technology proposed. The system proposed is a quantitative leap in service offerings and will improve the limited options available to the residential and SOHO communities.

[9] Source: Cable World, "Battle-Scarred But Ready To Do Battle", February 2003

13.6.2 Bargaining Power of Customers

From the perspective of the telecommunication services and considering the commodity nature of the market, large users of services have significant bargaining power. The City of Jacksonville's negotiation of CDPD service agreements is indicative of the power a large user can wield with a service provider. It is the SOHO and residential consumers that have limited choice and usage, that causes them to suffer from the lack of competition.

In a discussion with the owner of "Rent-A-Cellular", an 802.11b service provider at the Jacksonville airport, he advised that he has no leverage over the cost of the service provided. There is no competition to provide his bandwidth needs and he cannot negotiate as a high-end consumer.

The bargaining power of consumers is dependent upon the size of the consumer. The anticipated outcome to a high speed county wide network is that the small consumer would benefit with additional choices, and therefore bargaining power. Price control would remain with the incumbents and the new service providers. A price war situation may ensue but it is unlikely considering the current state of the industry, particularly, the cable TV industry.

Cable operators typically pay a monthly per subscriber fee to run networks such as ESPN, MTV, TNN, and others. According to industry surveys, those fees have been increasing 10 to 15 percent each year for the past five years[10.] These fees leave cable companies with unattractive options. They can either absorb the extra costs, pass the costs on to their subscribers in the form of higher rates (most likely), or do a combination of both. The increasing fees have caused a severe problem for the cable industry because historically cable operators have been able to increase rates by 4 to 5 percent a year before they start losing subscribers. The consumer ultimately ends up on the losing end in most situations, either with a higher bill for services or with less service in the form of reduced programming.

13.6.3 Threat of Substitute Products and Services

The threat to this network is not from the applications that would be carried over it but from a displacement network architecture that provides the services with less deployment cost.

The HSCW network as conceived is state of the art in regard to deployment architecture. From the perspective of the existing telecommunication current incumbent system, it is

[10] Source: Lawrence Journal-World, "Drowning in a Sea of Fees", February, 2003

disruptive technology redefining the capability and expectations of the existing system. A fiber infrastructure provides the scalability to support future applications that will place additional demands on the system. The electronics associated with the delivery of bandwidth are also upgradeable and interchangeable. By installing this network, Jacksonville is providing as near to a future proof network as possible.

However, considering the time required to install a county wide fiber network, many advances in technologies may occur. Research is aggressively working to improve the capabilities of both DSL and cable modem technologies. But the future of communications is in the transmission of light, which is why a fiber optic infrastructure is key.

13.6.4 Bargaining Power of Suppliers

The bargaining power of suppliers is based how much pressure suppliers can place on a business. If one supplier has a large enough impact to affect a company's margins and volumes, then they hold substantial power. Here are a few reasons why suppliers might have greater bargaining power:

- There are very few suppliers of a particular product.
- There are no substitutes.
- Switching to another (competitive) product is very costly.
- The product is extremely important to the buyer; they can not do without it.
- The supplying industry has a higher profitability than the buying industry.

The suppliers in question here are long term suppliers that provide necessary resources for operations. Considering the competitive nature of this market and the present overall telecom network, the bargaining power of suppliers is consider a minimal threat.

13.6.5 Competitive Intensity among Current Competitors

Highly competitive industries generally earn low returns because the cost of competition is high. Several basic conditions foster intense competition:

- Competitors are numerous.
- Industry growth is slow.
- Products and services are undifferentiated.
- The cost of switching is low.
- Economies of scale are significant.

- Periods of over capacity[11.]

With the exception of data transmission growth, the above list is a made to fit description of the current telecommunications industry not the general assessment criteria that it is. The competitive intensity for the industry is considered high with the caveat of the residential and SOHO market.

13.6.6 Porter Analysis Results

The results of the Porter Analysis are:

Market Force	Probability	Comments
Competitive Threats	High	Local incumbent reaction.
Bargaining Power of Customers	Large Users – High Small Users - Low	Dependent upon the market served. An additional network will increase bargaining power.
Threat of Substitute Products and Services	Low	Proposed system is state of the art and scalable/upgradeable.
Bargaining Power of Suppliers	Low	Although data transport demand is up, capacity is available to meet the demand.
Competitive Intensity	High	The state of the industry has created many providers with limited demand growth.

The meaning of the competitive analysis for Jacksonville is two-fold. Primarily, to enter this market it is extremely critical to differentiate the services offered. Secondly, as a large consumer of telecommunication services, the City has considerable customer buying power. This leverage can be used as an incentive to entice existing providers to cooperatively participate in any infrastructure advances in Jacksonville and will be discussed further.

13.7 Organizational Considerations

The business structure to provide telecommunications services via a publicly owned network varies dependent upon the network considered. At its simplest, the MAN is an extension of the existing JEA system. Once services are offered outside of government agencies other service, maintenance and sales considerations need to be included.

[11] IBID

Two aspects to the management of telecommunications are to be considered - managing the technology and managing the organization. In both cases, the objective is to have an organization and the equipment in place to support the telecommunications needs of the City of the Jacksonville. The telecommunications organization requires route engineers, system engineers, installation technicians, network administration, purchasing agents and staff responsible for customer service, marketing and sales. Diversity is the prime adjective for this group ranging from telecommunications engineers to purchasing agents.

A brief description of personnel and responsibilities follows:

13.7.1 Design Staff

The first group to consider in the organization is the most engineering oriented; these are the individuals who design new facilities. They need to know present equipment, wiring, circuits, terminals, switches, and vendors who might interface with or maintain them. The designers start with the requirement for the new or improved telecommunications capability and end up engineering and planning for the detailed physical components.

13.7.2 Network Operations and Technical Support

Once the designers have engineered new capabilities and have seen the installation to completion, these capabilities are turned over to the group who cares for them on a day to day basis. These are the people you call on when something does not work and who perform routine and emergency maintenance to keep the system operational. The operations and support group has people on duty to answer trouble calls and fix equipment. When a call comes to the telecommunications help desk, or an alarm sounds on the trouble board, or the network operating system displays a message on the operator's terminal, someone from the network operations group must respond.

13.7.3 Administrative Support

The administration group performs the type of work that business administration graduates are qualified to perform. While it takes an engineer or engineering trained person to do design and troubleshooting, much of the other work takes a more broadly trained and educated person. Administrative support personnel will have jobs such as:

- Ordering and purchasing communications products and services
- Receiving equipment
- Inventorying equipment
- Checking and paying communications bills

- Determining charge back methods to users
- Coordinating adds, moves, and changes of equipment
- Registering new telecommunications users for access
- Training users
- Maintaining operations procedures
- Marketing and Sales

The network organization needed to perform following the functions in order to maintain the City of Jacksonville's telecommunications infrastructure:

1. System Creation and Upgrade
   a. Design and configuration
      i. Network Equipment
      ii. Media & Bandwidth
      iii. Software
      iv. Tariffs

   b. Testing
      i. Initial Turn-Up
      ii. Continuous Reporting

   c. Evaluation
      i. Specifications Met
      ii. Troubleshooting
      iii. Optimization

   d. Documentation
      i. Assets (Database)
      ii. Operations
      iii. Repair & Maintenance

2. Operations
   a. Metropolitan Area Network Operation
      i. Familiarity with fiber optic construction techniques, specifications and contracting procedures.
      ii. Experienced personnel for the management of construction, turn-up and operations.
      iii. NOC Service Technician
      iv. Field Technicians, Equipment and Tools

   b. On-Demand Data Service Extension off the MAN – Wireless or Fiber Optic Connection
      i. Customer Installation

ii. Customer Billing
iii. Customer Service
iv. General Service Agreements with Installation Contractors

c. Wireless County Wide Network
   i. Supplier/Vendor Management
   ii. Customer Billing
   iii. Customer Service
   iv. General Service Agreements with Wireless Consumer

d. FTTH/B
   i. Marketing and Sales Personnel
   ii. Headed Operations Managers
   iii. Field Technicians

3. Administration
   a. Human Resources
      i. Attract and retain qualified personnel
      ii. Training
   b. Asset Management
   c. Purchasing
   d. Billing and Operations System Support (OSS)

This description highlights the types of personnel and the complexity of operating a large network. The three networks presented in Volume II Section 8 are indicative of large networks that require similar organizations. JEA's current capabilities to bill consumers, maintain outside plant on a large scale and operate complex networks. They are the prime candidate for operations of the network.

13.8 Financing Options

The most frequently asked question is how municipalities fund the expansion into the telecommunications market? We have described seven commonly used methods to finance municipal telecommunications expansion.

Often municipalities will use a combination of these options to finance the project.

Funding Options

1. ***Funding from the municipality or the municipal power producer***. With funding from the municipality or the municipal power producer the telecommunications expansion is funded from the cash reserves of the existing system. The funds may be loaned to the Telecommunications expansion project or they may be considered as an investment into an expansion or the development of a new division of the municipal

power company. An initial investment may be used to fund stages of the telecommunications expansion with the expectation that the use of the services will cover the costs. This is considered as an optimal financing option, but few municipalities have the cash reserves available to cover the cost of the expansion.

2. ***Local Bank Loan.*** A municipality may consider a local bank loan to finance the expansion into the telecommunications market. Although the local bank may be interested in investing in its community and supporting a local project, generally the terms and conditions of a traditional bank are difficult to fit within the parameters of a municipal expansion. The terms for the re-payment of the local bank loan are generally not long enough and are comparatively shorter than the terms provided with bond financing. The security interest that a local lender generally requires with a traditional loan is not available in the municipal telecommunications expansion project.

3. ***Bonds***

   A. ***Revenue bonds – designated funds restricted to financing the new expansion.*** The municipality may issue bonds wherein the net revenue is only used to capitalize the new expansion project. However, these bonds are generally not rated, uninsured, and they have no credit enhancement. Hence, these revenue bonds may be difficult to sell on the open market.

   B. ***General Obligation bonds – issued with a general obligation from the city.*** The municipality may issue bonds with a general obligation from the city or some cross revenue pledge. This type of bond financing is easier to sell because it confirms that the city is supporting the project and that there is support for the project.

   The general obligation issue bonds require a referendum from the citizens to confirm their support for the project. General obligation bonds issued with support from the citizens are easier to sell because it confirms that the citizens are backing the expansion project.

4. ***Grant funding from the federal government.*** The federal government provides grant funding through several different agencies that may be used to finance the expansion project. We have described two grant programs below, see Appendix E for further grant programs.

   A. ***E-Rate***

   The “schools and libraries” Universal Service Program was established as part of the Telecommunications Act of 1996. One of the purpose of this Act was to provide affordable access to telecommunications services for all eligible K-12

public schools, private schools and public libraries, particularly those in rural and inner-city areas. Funded at up to $2.25 billion annually, the program provides discounts of 20 percent to 90 percent on three categories of service - Telecommunications Services, Internet Access and Internal Connections. Funding for these discounts comes from the telecommunications industry through the Universal Service Fund (USF). The Schools and Libraries Division (SLD) administers the program for the Universal Service Administrative Company (USAC). The discount percentage schools and libraries are eligible to receive depends on economic need, as determined by the National School Lunch Program, and location (i.e., rural or urban).

B. ***Homeland Security Department Grants.*** On March 10, 2003, the Homeland Security Department announced $750 M in grants for fire departments. The program aims to promote inter operable communications for first responders and will award grants for integrated communication systems for base stations, computer-aided dispatch systems and communications gear.

Applications are due April 11, 2003 with distribution of funds planned to start no later than July.

Last year FEMA issued $5,316 firefighter grants totaling more than $334 M.

5. ***Department of Commerce - Economic Development Administration.*** The responsibility of this organization is to create and retain jobs in a region. A regional planning committee develops a master plan for the region. The plan must show that the new telecommunications expansion will create jobs. The money is traditionally used for roads, bridges and infrastructure. It is a good appropriation for digital divide programs or bridging the gap.

6. ***Department of Agriculture – Rural Utilities Services.*** This grant funding is the champion of bringing telecom to rural America. It has different programs for municipalities with populations less than 20,000. There is also a program for Distant Learning in Telemedicine. The goal of this funding is to provide services that are not otherwise available. The focus is on educational facilities and hospitals. These funds are only available for a specific purpose; however, once the network is built there is no restriction on its use.

7. ***Manufacturer's Finance Programs***

Many manufacturers offer varying financial packages or degrees of financing support. For example, Nortel Networks offers its OE-SEI group program. This program will examine all funding sources while leveraging assessment information already provided to the City of Jacksonville from other sources. Similarly, Cisco Systems offers a 36-month commercial lease program that is

designed to lessen the scheduling, maintenance, and financial difficulties in establishing large networks.

13.9 Financial Analysis

The financial analysis corresponds to the network components and is described accordingly. The MAN to support the Consolidated Government is considered, the MAN with large business connections and the MAN with FTTH. The wireless network is presented first as it is not included in the financial analysis.

13.9.1 Ubiquitous Wireless Service

The financial costs to provide ubiquitous county wide wireless connectivity was explored and detailed in Volume II Section 15. Ubiquitous coverage over a large portion of Duval County (80% coverage) capable of providing reliable service for critical applications such as police, fire and other emergency utility support has FCC regulation limitations and considered a liability not recommended. Alternatively as a more feasible possibility, we detailed the cost to provide 50 county wide hot spots at a cost of $31 million dollars. It is our opinion that a county wide wireless infrastructure is best built and operated through a public/private relationship. With 9 wireless service providers in the Jacksonville area and the Consolidated Government usage level, Jacksonville is in an excellent position to be the anchor tenant on a network defined to meet the greater objectives – ubiquitous coverage that provides critical and consumer oriented service.

A further concern with a 802.11b system with the required density of coverage is the potential to create significant interference problems and result in considerable jurisdiction disputes. As commented by Robert Dunlap, Data Wave's president, "As these companies grow and put in hot spots (802.11b), they're going to find everybody's going to be tripping on top of them". The FCC strictly regulates usage priorities. The potential exists where the non-regulated system could be forced to shut down.

Wireless data access is being expanded by multiple service providers using varying technologies. Trials are currently on the way to develop wireless data access over the PCS network with peak rates up to 2.4 Mbps. The technology, 1XEV-DO, has been deployed in Duluth, MN and Boise, ID. Clearwire, Jacksonville's wireless broadband provider, is using the 2.4 GHz spectrum to provide download speeds of 1.5 Mbps for the small business and residential market. Data Wave is providing broadband wireless services to the enterprise market of Jacksonville at 1 Mbps and 5 Mbps speeds. Case Western University outside of Cleveland Ohio has begun deployment of a campus wide wireless network using 802.11b and PCS capability via contract with Sprint and Cisco

Systems[12]. The technology, reliability and maintenance capability is available. We recommend that Jacksonville issue a request for qualifications to provide only wide wireless service leveraging the City's current usage and assets. Further details are provided in our recommendation section.

13.9.2 Local Wireless Option

The conceptual design includes an immediate access option for high demand users once the JAXMAN is complete. The proposed option for this connection is a wireless solution. This recommendation is based upon the costs to connect from the JAXMAN to the high-end user.

Comparative connection costs are as follows:

Fiber Optic Connection			
Distance from the MAN Node	**1,500 ft.**	**3,000 ft.**	**6,000 ft.**
Construction Cost	$16,500	$22,500	$34,500
Equipment Cost	$3,000	$3,000	$3,000
Total	$19,500	$25,500	$37,500

Wireless, 802.11b		
Node Equipment	$1,750	Note: Node equipment expense supports numerous users.
CPE Equipment	$1,450	
Total	$3,200	

The intent of the service is to provide bandwidth in the 1 Mbps to 6 Mbps range to high bandwidth users immediately after JAXMAN completion. The intended market is the SOHO market. Considering the anticipated cost for a fiber optic connection, only the wireless application will be considered.

The existing high speed wireless service price is $49 per month. With the node equipment shared with 10 users, a total price of $95 per month for a three year period is required to pay for the consumer premise equipment and provide an equivalent return to the service provider.

[12] Sprint and Cisco are deploying Gigabit Ethernet to the desktop and a full campus wireless network. The wireless network will cover interior and exterior campus areas. From conversation with the Sprint project manager, he advised that there intention is to provide dual band service (PCS/802.11b) to maintain continuity off campus by the end of the year.

Typically, a node can accommodate 20 to 30 users at this service level. The primary concerns are the take rate for the service within the node range and the actual quality of service. The useable distance from a wireless node can range from 800 ft. to 2000 ft. The level of service is best effort as opposed to the guaranteed service considered necessary for a ubiquitous wireless network.

This application is not a major driver of the financial results and was not included in the financial model for this reason. We recommend that a pilot be implemented after the MAN is complete to determine the demand for this service, actual service coverage and to select the final technology. Dependent upon demand, it may be appropriate to install a wireless mesh throughout the local area.

The purpose of this alternative also requires consideration. The intent is to provide connectivity to the high bandwidth users from day one. This provides benefit to these users from the outset of the deployment and builds support for the immediate network effort. However, it does not support the greater goal of providing high bandwidth availability to all residents. If it is decided to provide a FTTH solution, this scenario may erode the support of the community for a larger scale effort.

13.10 Financial Model Variables

13.10.1 Market Rates – Service Agreements and Service Provider

Market rate assumptions are based upon current market retail rates and estimated wholesale rates. These market rates are for pro-forma financial evaluation only. A comprehensive billing schedule should be developed when the network is developed. Wholesale pricing listed was developed based on industry research and is an average pricing offered in the industry for applicable services. Retail pricing was based on pricing structures from national and local providers.

Bandwidth Product	End User Retail Rate	Wholesale Rate
Shared (Includes Internet Access)		
Residential Video	$44.99/mo	$25/mo
Residential Data	$49.00/mo	$20/mo
Commercial Video	$60.00/mo	$30/mo
SOHO Data (10 Mbps)	$49.00/mo	$25/mo

Dedicated – Local Loop Only (Metro Ethernet)[13]		
50 Mbps		$1,600/mo
100 Mbps		$2,800/mo
1 Gbps		$5,400/mo

13.10.2 Conceptual Design Network Costs

The estimated costs used for this financial analysis were developed in Volume II, Section 14 of this plan and are detailed at the end of that section. The critical costs for this analysis are:

Critical Network Costs			
MAN	Miles	339	Excludes existing mileage
	Construction Cost per Mile	$80,020	
	Connection Cost	$35,000	
FTTH	Miles	4,276	
	Construction Cost per Mile	$44,680	
	Equipment Cost per Mile	$10,400	
	Customer Connection	$1,600	

13.10.3 Take Rates –Residential, Commercial, and Consolidated Government

Based upon the market survey results the anticipated residential take rates for a FTTH network were derived. It should be noted that at the time of the survey, Comcast had not assumed control of the cable TV system. It is our understanding that customer complaints have significantly decreased. Comcast's public statements across the nation indicate a commitment to improve service, upgrade systems and improve consumer satisfaction. However for this market segment, the product offered is disruptive in nature – the bandwidth offered at the price point used will redefine the market. Considering the balancing effect of these two factors, it is reasonable to use the current take rate assumptions – residential video penetration at 30% and residential data at 10%. The actual figures are listed below:

Projected Take-Rates			
Residential	**Customers Passed**	**Video**	**Data**
Year 5	115,453	34,636	11,545
Year 10	**328,800**	**98,640**	**32,880**

[13] Source: UTC Research, 2002 Fiber Rate Study, Sept. 2002

Commercial take rates are more difficult to determine. The response received during the survey was very limited and not representative of the total population. We estimated a minimal take rate of 5% for 50 Mbps service, 2% for 100 Mbps service and .04% for 1 Gbps service. Considering the business population of Jacksonville, this is a conservative estimation of total commercial users.

Projected Take-Rates				
Commercial	**Customers Passed**	**50 Mbps**	**100 Mbps**	**1 Gbps**
Year 5	10,885	544	218	4
Year 10	31,000	1,550	620	12

The model assumes that all 300 facilities of the Consolidated Government will be connected to the JAXMAN network.

13.10.4 Stand Alone JAXMAN

The stand alone JAXMAN analysis considers the Consolidated Government agencies potential budget transfers as the only revenue. These transfers are estimated at $4.6 million but could exceed $6.0 million dependent upon grant fund application and the voice applications used by the agency. Details are provided in the following graph.

Description of Service	Annual $	% Savings	Potential Annual Transfers	Notes
Jacksonville Electric Authority (JEA)				
Telecommunication Services - 800 Data Service	$ 7,997	0%	$ -	Worldcom (prev. Intermedia) (Name Chg. 12/1)
Telecommunication Services - Alt. Telephone Svc.	$ 8,642	50%	$ 4,321	Adelphia Business - 100-522-0245
Telecommunication Services - Alternate Trunks	$ 30,020	50%	$ 15,010	Adelphia Business (Alternate Trunks) 522-800-0
Telecommunication Services - Broadband Service	$ 53,735	100%	$ 53,735	AT&T (Broadband-8495740015386634) Cable Modem
Telecommunication Services - Conference Line	$ 1,560	0%	$ -	Sprint Conference Line
Telecommunication Services - DCHC Repair	$ 14,982	0%	$ -	First Coast
Telecommunication Services - Frame Relay	$ 3,462	100%	$ 3,462	Winstar Broadband Services
Telecommunication Services - Leased Lines	$ 1,264	50%	$ 632	Qwest - 60613689
Telecommunication Services - Leased Lines	$ 82	50%	$ 41	AT&T ('856 - '359) (Business Service)
Telecommunication Services - Leased Lines Scherer	$ -	0%	$ -	Florida Power & Light Co.
Telecommunication Services - Local Svc. (See note below)	$ 1,847,381	75%	$ 1,235,536	BellSouth (Local Service)
Telecommunication Services - Local Svc.	$ 6,526	50%	$ 2,414	Florida Digital Network
Total	$ 1,775,982		$ 1,316,172	
City of Jacksonville (COJ)				
Wireless (CDPD)	$ 1,200,000	0%	$ -	
Wireless (cell phones)	$ 800,000	0%	$ -	
ISDN, Frame Relay, Leased Fiber	$ 1,500,000	90%	$ 1,350,000	
Internet I and II (ATT Broadband / Comcat)	$ 140,000	100%	$ 140,000	
Voice (See note below)	$ 2,375,000	30%	$ 712,500	$125,000 was removed from original amount for long distance
Frame Relay	$ 10,800	100%	$ 10,800	
Total	$ 6,025,800		$ 2,213,300	
Duval County Schools				
3,400 Centrex Analog - Schools	$ -	0%	$ -	Includes costs of all features
26 SS7 Trunks (For SL-100)	$ 171,600	0%	$ -	Supports the District Admin offices with an SL100 node
Pinpoint 911 Services	$ 1,440	0%	$ -	Tells 911 dispatchers the building and room number of the call
Directory Assistance	$ 4,200	0%	$ -	
148 56KB Fr. Relay - Schools	$ 172,272	100%	$ 172,272	Supports data services to schools. Upgrading to T-1 July 2002
18 T-1 Frame Relay - Mixed	$ 813,000	100%	$ 813,000	Supports data services to some schools and admin locations
5 T-1 Point to Point	$ 25,200	100%	$ 25,200	Supports data services to some schools and admin locations
2 Remote Access PRI T-1's	$ 16,224	0%	$ -	Server
9 ISDN Circuits - Mixed	$ 8,796	100%	$ 8,796	Supports S.A.P. access and distance learning at some schools
Flexserv 9600BPS Circuits	$ 22,548	100%	$ 22,548	Supports Charter and Special Education sites
3 Native Mode Lan (10MBPS)	$ 28,800	100%	$ 28,800	Fiber backup circuit between Team Center, City and Dist. Office
BTI - Services Schools	$ 39,600	0%	$ -	Primary LD carrier until Suncom is completely merged to schools
Florida Suncom (Admin Offices)	$ 15,840	0%	$ -	Serves all District administrative offices having an SL 100 node
AT&T	$ 15,600	0%	$ -	Used for S.A.P. data and some school's LD service
Other Carriers	$ 4,380	0%	$ -	
250 Voice Stream	$ 136,000	0%	$ -	Primary cell phone service
6 Cingular	$ 3,900	0%	$ -	Users are being converted to the Voice Stream contract
Aastra - 30 schools keysystems	$ 300,000	0%	$ -	Most will be replaced with owned Comdial systems in 2002
District SL100	$ 1,200,000	0%	$ -	3 year bank loan - end of 2nd year will be Nov. 2002
Total	$ 2,901,400		$ 1,070,616	
Total All Entities			**$ 4,600,088**	

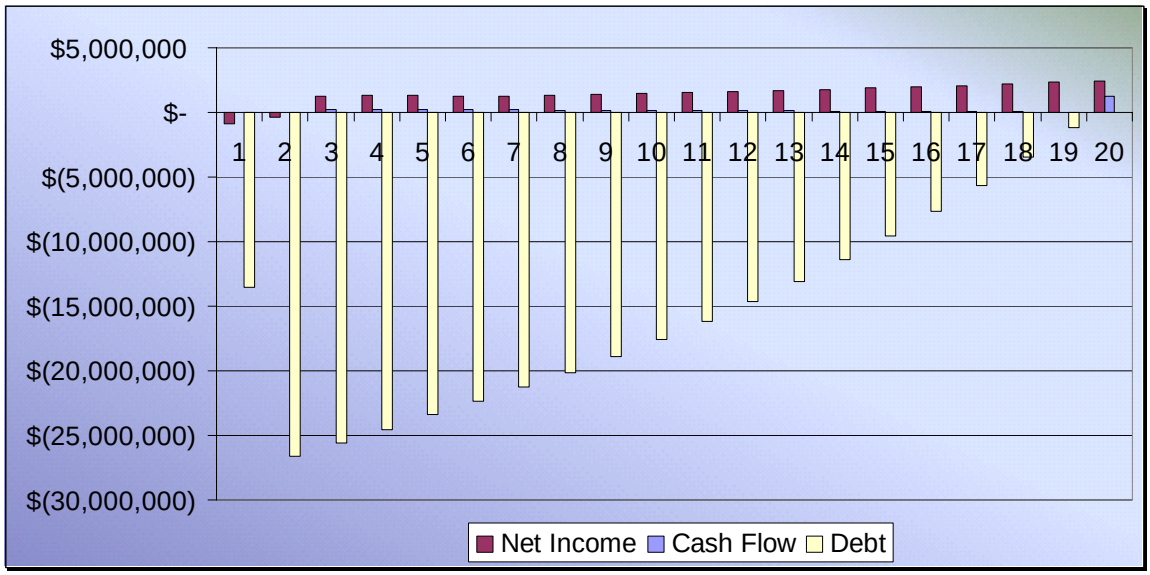
Current Telecommunications Cost by Agency and Potential Transfers

The JAXMAN is scheduled to complete in a 2 year period with the associated debt reaching $26.6 million. The operations and maintenance annual expense averages $2.0 million. JAXMAN is cash positive in year 3 with a surplus of $200,000 that increases to $3.6 million by year 20. A 20 year bond at 5.5% is used for debt purposes with interest capitalized in years 1 and 2. This scenario relies on JEA's existing fiber infrastructure, and Data Center facilities. (See the end of this section for pro-forma details.)

The costs for the network are developed in Volume II Section 15 and include all core equipment; the fiber optic cable and installation to complete the core ring; and the cost of lateral fiber optic connections to the 300 users. Note the core network cost is based on 100% underground construction. Lateral connections from Ring 1 are for underground construction. Lateral connections from the other rings use a 62% aerial and 38% underground construction methodology. (See Volume II Section 15 for additional details)

Our analysis evaluates the JAXMAN using the minimum existing government budgets for transfers to support the development, operations, and financing of the JAXMAN. As previously stated the potential immediate upside savings, the economic development benefit to Jacksonville and the dramatic impact to the quality of life in Jacksonville justifies this initiative.

The net income, cash flow and debt are illustrated below.



JAXMAN Only - Financial Pro-Forma

13.10.5 JAXMAN with Large Commercial Customers

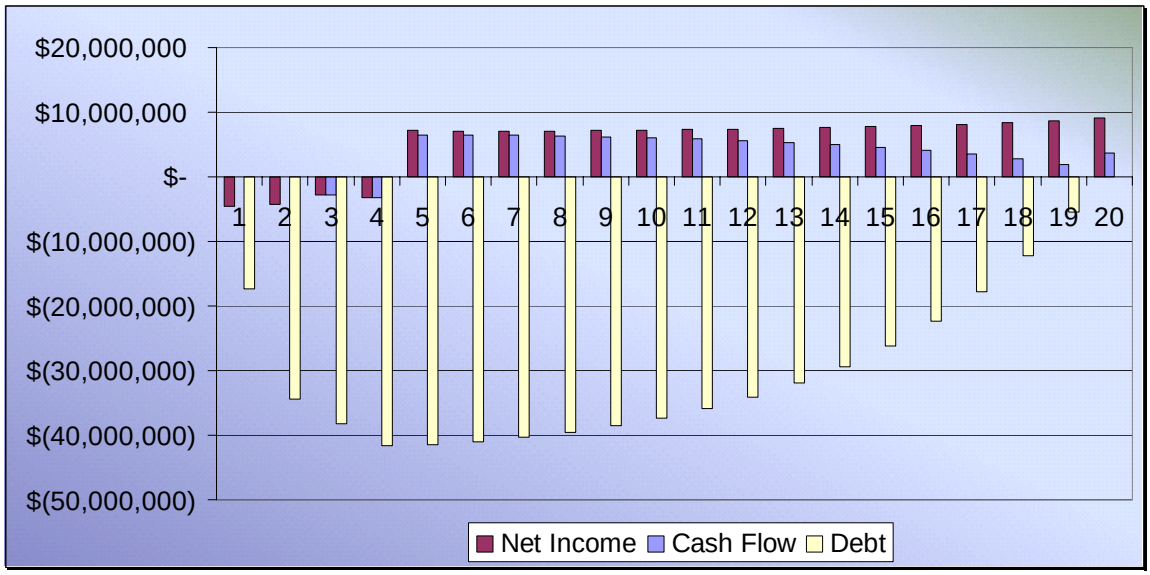
The JAXMAN with large commercial customers includes the cost savings from the Consolidated Government and revenue from large bandwidth customers. The costs include those estimated for the JAXMAN plus installation to the users building. The build starts in year 1 with budget transfers beginning in year 2 and commercial revenue starting in year 3. The capacity of JAXMAN's initial equipment chasis is scalable to 720 users. For this analysis we added 12 (2% of all large users) 1 Gbps users and 310 (1% of all medium business users) 100 Mbps users. The incremental cost to add a user to JAXMAN is estimated at $15,000. This uses a cost per mile of $80,000 and an average distance from a consolidation point of 1000 feet.

JAXMAN with large commercial customer is completed in a 4 year period with the associated debt reaching $41.6 million. The pro-forma stabilizes in year 4. All 322 commercial customers are brought onto the network by year 5. The operations and maintenance annual expense averages $6.6 million, the network generates a positive cash

flow in year 5 of $422,000 and accumulates to $74 million at the time of debt pay off. A 20 year, 5.5% bond is assumed for debt financing. (See the end of this section for pro-forma details.)

JAXMAN with large business per customers is a viable option, we recommend dependent upon actual commercial user interest. We recommend pre-selling to commercial customers to determine actual interest and commitment prior to proceeding.

The net income, cash flow and debt are illustrated below.



JAXMAN with Large Commercial Users - Financial Pro-Forma

13.10.6 JAXMAN with FTTH

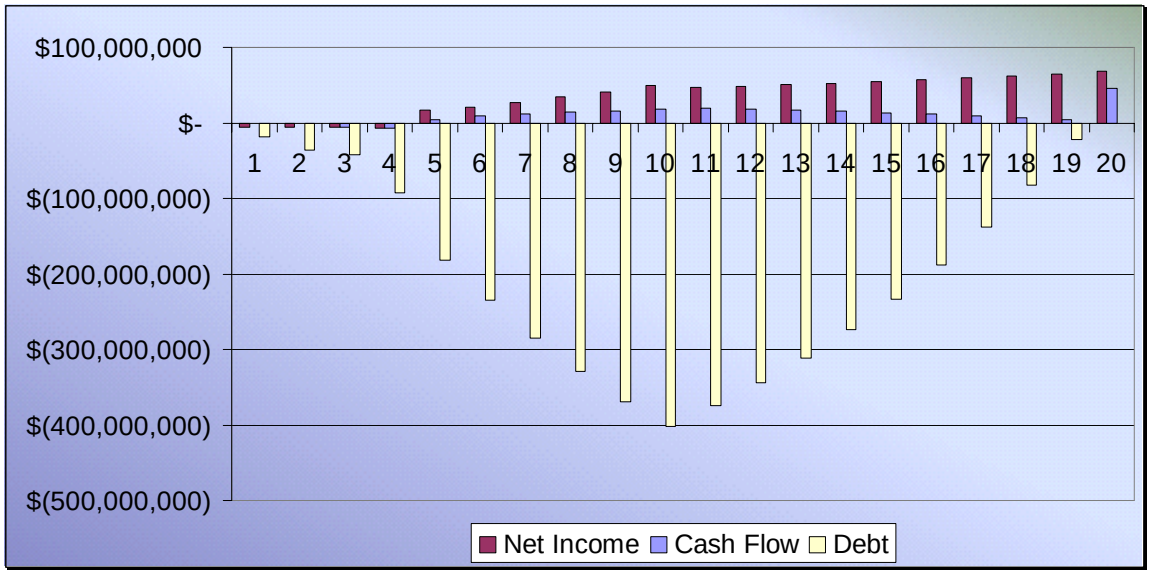
JAXMAN with FTTH customers includes all customers of the JAXMAN with large commercial users and residential and SOHO customers. The penetration rates used for residential customers are 30% and are further described in section 13.8.3 above. The fiber optic distribution and equipment costs are included in this scenario (see Volume 1 Section 15.6.3 for further detail). The planned FTTH build starts in year 3 and completes in year 10.

The scenario reaches a maximum debt in year 10 of $402 million. The operations and maintenance annual expense stabilizes at $20.0 million. Cash flows are a negative $5.2 million in year 1, turn positive in year 5 at $4.6 million and accumulate to $224 million in year 20 at time of debt pay off. A 20 year, 5.5% bond is assumed for debt financing. (See the end of this section for pro-forma details).

JAXMAN with FTTH brings advanced speed broadband (10-100 Mbps) to all consumers, is financially feasible but requires significant investment. The commercial user take rate is critical to the success of this scenario.

Considering the high degree of financial risk and flux of the local residential telecommunications market with Comcast's entry, we consider this alternative as a long term goal that requires re-assessment after the successful implementation of JAXMAN.

The net income, cash flow and debt are illustrated below.



JAXMAN w/ FTTH Network - Financial Pro-Forma

13.10.7 Conclusion

The development of a metropolitan area network, JAXMAN, for the City of Jacksonville is feasible and affordable based upon existing Consolidated Government telecommunications budgets. JAXMAN provides for future development for business and residential use. It provides economic opportunity, creates efficiencies for City agencies and supports extended telecommunication services. The recommendations provided in Volume I Section 6.0 are intended to start the process for development of a greater telecommunications network for Jacksonville.

ProForma										
Debt Paydown Variable	1.15									
	1	2	3	4	5	6	7	8	9	10
Revenue										
Government Transfers	$ -	$ 2,300,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000
Expenses										
O&M	$ 523,740	$ 1,592,509	$ 1,962,115	$ 1,962,115	$ 1,962,115	$ 2,161,483	$ 2,161,483	$ 2,161,483	$ 2,147,119	$ 2,147,119
Retained Earnings from Previous Year	$ -									
Marketing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
City Contribution	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Expenses	$ 523,740	$ 1,592,509	$ 1,962,115	$ 1,962,115	$ 1,962,115	$ 2,161,483	$ 2,161,483	$ 2,161,483	$ 2,147,119	$ 2,147,119
Earnings Before Interest Inc/Exp	$ (523,740)	$ 707,491	$ 2,637,885	$ 2,637,885	$ 2,637,885	$ 2,438,517	$ 2,438,517	$ 2,438,517	$ 2,452,881	$ 2,452,881
Avg Interest Income @5%	$ (13,094)	$ 17,687	$ 65,947	$ 65,947	$ 65,947	$ 60,963	$ 60,963	$ 60,963	$ 61,322	$ 61,322
Earnings Before Interest Expense	$ (536,834)	$ 725,178	$ 2,703,832	$ 2,703,832	$ 2,703,832	$ 2,499,480	$ 2,499,480	$ 2,499,480	$ 2,514,203	$ 2,514,203
Interest Expense @5.5%	$ 372,973	$ 1,105,252	$ 1,464,558	$ 1,408,480	$ 1,348,856	$ 1,285,460	$ 1,229,294	$ 1,169,576	$ 1,106,080	$ 1,037,758
Net Book Income	$ (909,807)	$ (380,074)	$ 1,239,274	$ 1,295,352	$ 1,354,976	$ 1,214,019	$ 1,270,185	$ 1,329,904	$ 1,408,123	$ 1,476,444
DS Coverage Before Debt Paydown	(1.44)	0.66	1.85	1.92	2.00	1.94	2.03	2.14	2.27	2.42
Debt Paydown: Current Year	$ -	$ -	$ 1,019,591	$ 1,084,080	$ 1,152,648	$ 1,021,200	$ 1,085,791	$ 1,154,468	$ 1,242,211	$ 1,320,781
DS Coverage After Debt Paydown	-1.4393	0.6561	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500
Net Income after Debt Paydown	$ (909,807)	$ (380,074)	$ 219,684	$ 211,272	$ 202,328	$ 192,819	$ 184,394	$ 175,436	$ 165,912	$ 155,664
Retained Earnings	$ -	$ -	$ 219,684	$ 430,956	$ 633,284	$ 826,103	$ 1,010,497	$ 1,185,933	$ 1,351,845	$ 1,507,509
Capital Expenditure Schedule										
Total Annual Capital Required	$ 12,650,660	$ 12,650,660	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Working Capital Required	$ 912,000	$ 415,000								
Current Yr. Capital Required	$ 13,562,660	$ 13,065,660	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Paydown	$ -	$ -	$ 1,019,591	$ 1,084,080	$ 1,152,648	$ 1,021,200	$ 1,085,791	$ 1,154,468	$ 1,242,211	$ 1,320,781
Capital Required/Yr (Less Debt Repayment)	$ 13,562,660	$ 13,065,660	$ (1,019,591)	$ (1,084,080)	$ (1,152,648)	$ (1,021,200)	$ (1,085,791)	$ (1,154,468)	$ (1,242,211)	$ (1,320,781)
Cummulative Debt Outstanding	$ 13,562,660	$ 26,628,320	$ 25,608,729	$ 24,524,650	$ 23,372,002	$ 22,350,802	$ 21,265,010	$ 20,110,543	$ 18,868,332	$ 17,547,551
Capital Cost per Customer Passed										
Cash Flow	$ -	$ -	$ 219,684	$ 211,272	$ 202,328	$ 192,819	$ 184,394	$ 175,436	$ 165,912	$ 155,664
Cumulative Cash Flow	$ -	$ -	$ 219,684	$ 430,956	$ 633,284	$ 826,103	$ 1,010,497	$ 1,185,933	$ 1,351,845	$ 1,507,509

Financials (Pro-Forma) JAXMAN Only (Years 1-10)

ProForma Debt Paydown Variable	11	12	13	14	15	16	17	18	19	20
Revenue										
Government Transfers	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000
Expenses										
O&M	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119
Retained Earnings from Previous Year										
Marketing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
City Contribution	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Expenses	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119
Earnings Before Interest Inc/Exp	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**
Avg Interest Income @5%	$ 61,322	$ 61,322	$ 61,322	$ 61,322	$ 61,322	$ 61,322	$ 61,322	$ 61,322	$ 61,322	$ 61,322
Earnings Before Interest Expense	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203
Interest Expense @5.5%	$ 965,115	$ 887,878	$ 805,755	$ 718,438	$ 625,598	$ 526,886	$ 421,930	$ 310,336	$ 191,683	$ 65,526
Net Book Income	**$ 1,549,087**	**$ 1,626,325**	**$ 1,708,448**	**$ 1,795,765**	**$ 1,888,605**	**$ 1,987,317**	**$ 2,092,273**	**$ 2,203,867**	**$ 2,322,519**	**$ 2,448,676**
DS Coverage Before Debt Paydown	2.61	2.83	3.12	3.50	4.02	4.77	5.96	8.10	13.12	38.37
Debt Paydown: Current Year	**$ 1,404,320**	**$ 1,493,143**	**$ 1,587,585**	**$ 1,687,999**	**$ 1,794,765**	**$ 1,908,284**	**$ 2,028,983**	**$ 2,157,316**	**$ 2,293,767**	**$ 1,191,388**
DS Coverage After Debt Paydown	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	1.1500	20.1875
Net Income after Debt Paydown	**$ 144,767**	**$ 133,182**	**$ 120,863**	**$ 107,766**	**$ 93,840**	**$ 79,033**	**$ 63,289**	**$ 46,550**	**$ 28,753**	**$ 1,257,289**
Retained Earnings	**$ 1,652,276**	**$ 1,785,458**	**$ 1,906,321**	**$ 2,014,087**	**$ 2,107,927**	**$ 2,186,960**	**$ 2,250,249**	**$ 2,296,799**	**$ 2,325,552**	**$ 3,582,840**
Capital Expenditure Schedule										
Total Annual Capital Required	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Working Capital Required										
Current Yr. Capital Required	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Paydown	**$ 1,404,320**	**$ 1,493,143**	**$ 1,587,585**	**$ 1,687,999**	**$ 1,794,765**	**$ 1,908,284**	**$ 2,028,983**	**$ 2,157,316**	**$ 2,293,767**	**$ 1,191,388**
Capital Required/Yr (Less Debt Repayment)	**$ (1,404,320)**	**$ (1,493,143)**	**$ (1,587,585)**	**$ (1,687,999)**	**$ (1,794,765)**	**$ (1,908,284)**	**$ (2,028,983)**	**$ (2,157,316)**	**$ (2,293,767)**	**$ (1,191,388)**
Cummulative Debt Outstanding	**$ 16,143,231**	**$ 14,650,088**	**$ 13,062,503**	**$ 11,374,504**	**$ 9,579,738**	**$ 7,671,454**	**$ 5,642,471**	**$ 3,485,154**	**$ 1,191,388**	**$ -**
Capital Cost per Customer Passed										
Cash Flow	$ 144,767	$ 133,182	$ 120,863	$ 107,766	$ 93,840	$ 79,033	$ 63,289	$ 46,550	$ 28,753	$ 1,257,289
Cumulative Cash Flow	$ 1,652,276	$ 1,785,458	$ 1,906,321	$ 2,014,087	$ 2,107,927	$ 2,186,960	$ 2,250,249	$ 2,296,799	$ 2,325,552	$ 3,582,840

Financials (Pro-Forma) JAXMAN Only (Years 11-20)

ProForma Debt Paydown Variable	21	22	23	24	25
Revenue					
Government Transfers	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000	$ 4,600,000
Expenses					
O&M	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119
Retained Earnings from Previous Year					
Marketing	$ -	$ -	$ -	$ -	$ -
City Contribution	$ -	$ -	$ -	$ -	$ -
Total Expenses	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119	$ 2,147,119
Earnings Before Interest Inc/Exp	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**	**$ 2,452,881**
Avg Interest Income @5%	$ 61,322	$ 61,322	$ 61,322	$ 61,322	$ 61,322
Earnings Before Interest Expense	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203
Interest Expense @5.5%	$ -	$ -	$ -	$ -	$ -
Net Book Income	**$ 2,514,203**	**$ 2,514,203**	**$ 2,514,203**	**$ 2,514,203**	**$ 2,514,203**
DS Coverage Before Debt Paydown	0.00	0.00	0.00	0.00	0.00
Debt Paydown: Current Year	$ -	$ -	$ -	$ -	$ -
DS Coverage After Debt Paydown	0.0000	0.0000	0.0000	0.0000	0.0000
Net Income after Debt Paydown	**$ 2,514,203**	**$ 2,514,203**	**$ 2,514,203**	**$ 2,514,203**	**$ 2,514,203**
Retained Earnings	**$ 6,097,043**	**$ 8,611,246**	**$ 11,125,449**	**$ 13,639,651**	**$ 16,153,854**
Capital Expenditure Schedule					
Total Annual Capital Required	$ -	$ -	$ -	$ -	$ -
Working Capital Required					
Current Yr. Capital Required	$ -	$ -	$ -	$ -	$ -
Debt Paydown	$ -	$ -	$ -	$ -	$ -
Capital Required/Yr (Less Debt Repayment)	$ -	$ -	$ -	$ -	$ -
Cummulative Debt Outstanding	$ -	$ -	$ -	$ -	$ -
Capital Cost per Customer Passed					
Cash Flow	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203	$ 2,514,203
Cumulative Cash Flow					
NPV (10%, 20 yr)					

Financials (Pro-Forma) JAXMAN Only (Years 21-25)

ProForma										
Debt Paydown Variable	3.85									
	1	2	3	4	5	6	7	8	9	10
Revenue										
All Revenue	$ -	$ 3,103,520	$ 5,403,520	$ 5,403,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520
Expenses										
O&M	$ 3,800,420	$ 5,676,976	$ 6,046,582	$ 6,446,582	$ 6,446,582	$ 6,645,950	$ 6,645,950	$ 6,645,950	$ 6,631,586	$ 6,631,586
Retained Earnings from Previous Year	$ -									
Marketing	$ 184,200	$ 178,200	$ 151,700	$ 106,200	$ 121,700	$ 88,200	$ 28,200	$ 58,200	$ 28,200	$ 58,200
City Contribution	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Expenses	$ 3,984,620	$ 5,855,176	$ 6,198,282	$ 6,552,782	$ 6,568,282	$ 6,734,150	$ 6,674,150	$ 6,704,150	$ 6,659,786	$ 6,689,786
Earnings Before Interest Inc/Exp	$ (3,984,620)	$ (2,751,656)	$ (794,762)	$ (1,149,262)	$ 9,251,238	$ 9,085,370	$ 9,145,370	$ 9,115,370	$ 9,159,734	$ 9,129,734
Avg Interest Income @5%	$ (99,616)	$ (68,791)	$ (19,869)	$ (28,732)	$ 231,281	$ 227,134	$ 228,634	$ 227,884	$ 228,993	$ 228,243
Earnings Before Interest Expense	$ (4,084,236)	$ (2,820,447)	$ (814,631)	$ (1,177,994)	$ 9,482,519	$ 9,312,504	$ 9,374,004	$ 9,343,254	$ 9,388,727	$ 9,357,977
Interest Expense @5.5%	$ 477,968	$ 1,423,586	$ 1,998,652	$ 2,106,067	$ 2,287,567	$ 2,284,520	$ 2,256,080	$ 2,218,234	$ 2,174,067	$ 2,118,045
Net Book Income	$ (4,562,204)	$ (4,244,034)	$ (2,813,283)	$ (3,284,060)	$ 7,194,952	$ 7,027,984	$ 7,117,925	$ 7,125,020	$ 7,214,661	$ 7,239,932
DS Coverage Before Debt Paydown	(8.54)	(1.98)	(0.41)	(0.56)	4.15	4.08	4.15	4.21	4.32	4.42
Debt Paydown: Current Year	$ -	$ -	$ -	$ -	$ 675,388	$ 517,101	$ 688,097	$ 803,052	$ 1,018,571	$ 1,203,504
DS Coverage After Debt Paydown	-8.5450	-1.9812	-0.4076	-0.5593	3.8500	3.8500	3.8500	3.8500	3.8500	3.8500
Net Income after Debt Paydown	$ (4,562,204)	$ (4,244,034)	$ (2,813,283)	$ (3,284,060)	$ 6,519,565	$ 6,510,883	$ 6,429,827	$ 6,321,968	$ 6,196,090	$ 6,036,429
Retained Earnings	$ -	$ -	$ (2,813,283)	$ (6,097,343)	$ 422,222	$ 6,933,105	$ 13,362,932	$ 19,684,900	$ 25,880,990	$ 31,917,418
Capital Expenditure Schedule										
Total Annual Capital Required	$ 12,680,660	$ 12,705,460	$ 1,006,000	$ -	$ 620,000	$ -	$ -	$ -	$ -	$ -
Working Capital Required	$ 4,700,000	$ 4,300,000	$ 2,900,000	$ 3,300,000	$ -					
Current Yr. Capital Required	$ 17,380,660	$ 17,005,460	$ 3,906,000	$ 3,300,000	$ 620,000	$ -	$ -	$ -	$ -	$ -
Debt Paydown	$ -	$ -	$ -	$ -	$ 675,388	$ 517,101	$ 688,097	$ 803,052	$ 1,018,571	$ 1,203,504
Capital Required/Yr (Less Debt Repayment)	$ 17,380,660	$ 17,005,460	$ 3,906,000	$ 3,300,000	$ (55,388)	$ (517,101)	$ (688,097)	$ (803,052)	$ (1,018,571)	$ (1,203,504)
Cummulative Debt Outstanding	$ 17,380,660	$ 34,386,120	$ 38,292,120	$ 41,592,120	$ 41,536,732	$ 41,019,631	$ 40,331,534	$ 39,528,482	$ 38,509,911	$ 37,306,407
Capital Cost per Customer Passed										
Cash Flow	$ -	$ -	$ (2,813,283)	$ (3,284,060)	$ 6,519,565	$ 6,510,883	$ 6,429,827	$ 6,321,968	$ 6,196,090	$ 6,036,429
Cumulative Cash Flow	$ -	$ -	$ (2,813,283)	$ (6,097,343)	$ 422,222	$ 6,933,105	$ 13,362,932	$ 19,684,900	$ 25,880,990	$ 31,917,418

Financials (Pro-Forma) JAXMAN w/ Large Commercial Users (Years 1-10)

ProForma Debt Paydown Variable	11	12	13	14	15	16	17	18	19	20
Revenue										
All Revenue	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520
Expenses										
O&M	$ 6,631,586	$ 6,631,586	$ 6,631,586	$ 6,631,586	$ 6,631,586	$ 6,631,586	$ 6,631,586	$ 6,631,586	$ 6,631,586	$ 6,631,586
Retained Earnings from Previous Year										
Marketing	$ 58,200	$ 58,200	$ 58,200	$ 58,200	$ 58,200	$ 58,200	$ 58,200	$ 58,200	$ 58,200	$ 58,200
City Contribution	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Expenses	$ 6,689,786	$ 6,689,786	$ 6,689,786	$ 6,689,786	$ 6,689,786	$ 6,689,786	$ 6,689,786	$ 6,689,786	$ 6,689,786	$ 6,689,786
Earnings Before Interest Inc/Exp	$ 9,129,734	$ 9,129,734	$ 9,129,734	$ 9,129,734	$ 9,129,734	$ 9,129,734	$ 9,129,734	$ 9,129,734	$ 9,129,734	$ 9,129,734
Avg Interest Income @5%	$ 228,243	$ 228,243	$ 228,243	$ 228,243	$ 228,243	$ 228,243	$ 228,243	$ 228,243	$ 228,243	$ 228,243
Earnings Before Interest Expense	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977
Interest Expense @5.5%	$ 2,051,852	$ 1,971,643	$ 1,874,450	$ 1,756,676	$ 1,613,964	$ 1,441,032	$ 1,231,481	$ 977,559	$ 669,868	$ 297,024
Net Book Income	$ 7,306,125	$ 7,386,334	$ 7,483,527	$ 7,601,301	$ 7,744,014	$ 7,916,946	$ 8,126,496	$ 8,380,419	$ 8,688,109	$ 9,060,954
DS Coverage Before Debt Paydown	4.56	4.75	4.99	5.33	5.80	6.49	7.60	9.57	13.97	31.51
Debt Paydown: Current Year	$ 1,458,346	$ 1,767,150	$ 2,141,344	$ 2,594,774	$ 3,144,218	$ 3,810,006	$ 4,616,774	$ 5,594,376	$ 6,778,985	$ 5,400,433
DS Coverage After Debt Paydown	3.8500	3.8500	3.8500	3.8500	3.8500	3.8500	3.8500	3.8500	3.8500	13.3240
Net Income after Debt Paydown	$ 5,847,779	$ 5,619,184	$ 5,342,183	$ 5,006,527	$ 4,599,796	$ 4,106,940	$ 3,509,722	$ 2,786,042	$ 1,909,124	$ 3,660,520
Retained Earnings	$ 37,765,197	$ 43,384,381	$ 48,726,564	$ 53,733,091	$ 58,332,887	$ 62,439,827	$ 65,949,549	$ 68,735,591	$ 70,644,715	$ 74,305,235
Capital Expenditure Schedule										
Total Annual Capital Required	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Working Capital Required										
Current Yr. Capital Required	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Paydown	$ 1,458,346	$ 1,767,150	$ 2,141,344	$ 2,594,774	$ 3,144,218	$ 3,810,006	$ 4,616,774	$ 5,594,376	$ 6,778,985	$ 5,400,433
Capital Required/Yr (Less Debt Repayment)	$ (1,458,346)	$ (1,767,150)	$ (2,141,344)	$ (2,594,774)	$ (3,144,218)	$ (3,810,006)	$ (4,616,774)	$ (5,594,376)	$ (6,778,985)	$ (5,400,433)
Cummulative Debt Outstanding	$ 35,848,061	$ 34,080,911	$ 31,939,567	$ 29,344,792	$ 26,200,575	$ 22,390,569	$ 17,773,795	$ 12,179,419	$ 5,400,433	$ -
Capital Cost per Customer Passed										
Cash Flow	$ 5,847,779	$ 5,619,184	$ 5,342,183	$ 5,006,527	$ 4,599,796	$ 4,106,940	$ 3,509,722	$ 2,786,042	$ 1,909,124	$ 3,660,520
Cumulative Cash Flow	$ 37,765,197	$ 43,384,381	$ 48,726,564	$ 53,733,091	$ 58,332,887	$ 62,439,827	$ 65,949,549	$ 68,735,591	$ 70,644,715	$ 74,305,235

Financials (Pro-Forma) JAXMAN w/ Large Commercial Users (Years 11-20)

ProForma Debt Paydown Variable	21	22	23	24	25
Revenue					
All Revenue	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520	$ 15,819,520
Expenses					
O&M	$ 6,631,586	$ 6,631,586	$ 6,631,586	$ 6,631,586	$ 6,631,586
Retained Earnings from Previous Year					
Marketing	$ 58,200	$ 58,200	$ 58,200	$ 58,200	$ 58,200
City Contribution	$ -	$ -	$ -	$ -	$ -
Total Expenses	$ 6,689,786	$ 6,689,786	$ 6,689,786	$ 6,689,786	$ 6,689,786
Earnings Before Interest Inc/Exp	**$ 9,129,734**	**$ 9,129,734**	**$ 9,129,734**	**$ 9,129,734**	**$ 9,129,734**
Avg Interest Income @5%	$ 228,243	$ 228,243	$ 228,243	$ 228,243	$ 228,243
Earnings Before Interest Expense	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977
Interest Expense @5.5%	$ -	$ -	$ -	$ -	$ -
Net Book Income	**$ 9,357,977**	**$ 9,357,977**	**$ 9,357,977**	**$ 9,357,977**	**$ 9,357,977**
DS Coverage Before Debt Paydown	0.00	0.00	0.00	0.00	0.00
Debt Paydown: Current Year	$ -	$ -	$ -	$ -	$ -
DS Coverage After Debt Paydown	0.0000	0.0000	0.0000	0.0000	0.0000
Net Income after Debt Paydown	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977
Retained Earnings	$ 83,663,213	$ 93,021,190	$ 102,379,167	$ 111,737,145	$ 121,095,122
Capital Expenditure Schedule					
Total Annual Capital Required	$ -	$ -	$ -	$ -	$ -
Working Capital Required					
Current Yr. Capital Required	$ -	$ -	$ -	$ -	$ -
Debt Paydown	$ -	$ -	$ -	$ -	$ -
Capital Required/Yr (Less Debt Repayment)	$ -	$ -	$ -	$ -	$ -
Cummulative Debt Outstanding	$ -	$ -	$ -	$ -	$ -
Capital Cost per Customer Passed					
Cash Flow	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977	$ 9,357,977
Cumulative Cash Flow					

Financials (Pro-Forma) JAXMAN w/ Large Commercial Users (Years 21-25)

ProForma										
Debt Paydown Variable	1.9									
	1	2	3	4	5	6	7	8	9	10
Revenue										
All Revenue	$ -	$ 2,373,593	$ 4,673,593	$ 4,777,869	$ 34,017,628	$ 44,889,846	$ 55,762,065	$ 66,634,283	$ 77,506,502	$ 88,378,720
Expenses										
O&M	$ 4,253,420	$ 6,304,976	$ 7,174,582	$ 9,104,703	$ 12,839,324	$ 14,588,151	$ 16,876,846	$ 17,970,371	$ 19,365,348	$ 20,442,788
Retained Earnings from Previous Year	$ -									
Marketing	$ 368,400	$ 254,400	$ 302,900	$ 212,400	$ 242,900	$ 176,400	$ 56,400	$ 116,400	$ 56,400	$ 116,400
City Contribution	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Expenses	$ 4,621,820	$ 6,559,376	$ 7,477,482	$ 9,317,103	$ 13,082,224	$ 14,764,551	$ 16,933,246	$ 18,086,771	$ 19,421,748	$ 20,559,188
Earnings Before Interest Inc/Exp	**$ (4,621,820)**	**$ (4,185,783)**	**$ (2,803,889)**	**$ (4,539,235)**	**$ 20,935,404**	**$ 30,125,295**	**$ 38,828,819**	**$ 48,547,513**	**$ 58,084,753**	**$ 67,819,532**
Avg Interest Income @5%	$ (115,546)	$ (104,645)	$ (70,097)	$ (113,481)	$ 523,385	$ 753,132	$ 970,720	$ 1,213,688	$ 1,452,119	$ 1,695,488
Earnings Before Interest Expense	$ (4,737,366)	$ (4,290,427)	$ (2,873,986)	$ (4,652,716)	$ 21,458,789	$ 30,878,427	$ 39,799,539	$ 49,761,200	$ 59,536,872	$ 69,515,020
Interest Expense @5.5%	$ 493,712	$ 1,496,461	$ 2,172,038	$ 2,338,578	$ 5,100,147	$ 10,021,096	$ 12,926,131	$ 15,644,081	$ 18,098,165	$ 20,271,039
Net Book Income	**$ (5,231,077)**	**$ (5,786,888)**	**$ (5,046,023)**	**$ (6,991,293)**	**$ 16,358,642**	**$ 20,857,332**	**$ 26,873,409**	**$ 34,117,120**	**$ 41,438,707**	**$ 49,243,981**
DS Coverage Before Debt Paydown	(9.60)	(2.87)	(1.32)	(1.99)	4.21	3.08	3.08	3.18	3.29	3.43
Debt Paydown: Current Year	$ -	$ -	$ -	$ -	$ 11,768,510	$ 11,838,346	$ 15,239,891	$ 20,037,447	$ 25,150,358	$ 31,000,045
DS Coverage After Debt Paydown	-9.5954	-2.8670	-1.3232	-1.9895	1.9000	1.9000	1.9000	1.9000	1.9000	1.9000
Net Income after Debt Paydown	$ (5,231,077)	$ (5,786,888)	$ (5,046,023)	$ (6,991,293)	$ 4,590,132	$ 9,018,986	$ 11,633,518	$ 14,079,673	$ 16,288,349	$ 18,243,936
Retained Earnings	$ -	$ -	$ (5,046,023)	$ (12,037,317)	$ (7,447,184)	$ 1,571,802	$ 13,205,319	$ 27,284,992	$ 43,573,341	$ 61,817,276
Capital Expenditure Schedule										
Total Annual Capital Required	$ 12,718,160	$ 12,720,431	$ 1,006,000	$ 43,210,354	$ 101,240,303	$ 64,657,164	$ 64,657,164	$ 64,657,164	$ 64,657,164	$ 64,657,164
Working Capital Required	$ 5,235,000	$ 5,790,000	$ 5,050,000	$ 7,000,000						
Current Yr. Capital Required	$ 17,953,160	$ 18,510,431	$ 6,056,000	$ 50,210,354	$ 101,240,303	$ 64,657,164	$ 64,657,164	$ 64,657,164	$ 64,657,164	$ 64,657,164
Debt Paydown	$ -	$ -	$ -	$ -	$ 11,768,510	$ 11,838,346	$ 15,239,891	$ 20,037,447	$ 25,150,358	$ 31,000,045
Capital Required/Yr (Less Debt Repayment)	$ 17,953,160	$ 18,510,431	$ 6,056,000	$ 50,210,354	$ 89,471,793	$ 52,818,819	$ 49,417,273	$ 44,619,717	$ 39,506,806	$ 33,657,119
Cummulative Debt Outstanding	$ 17,953,160	$ 36,463,591	$ 42,519,591	$ 92,729,945	$ 182,201,739	$ 235,020,557	$ 284,437,830	$ 329,057,548	$ 368,564,354	$ 402,221,473
Capital Cost per Customer Passed										
Cash Flow	$ -	$ -	$ (5,046,023)	$ (6,991,293)	$ 4,590,132	$ 9,018,986	$ 11,633,518	$ 14,079,673	$ 16,288,349	$ 18,243,936
Cumulative Cash Flow	$ -	$ -	$ (5,046,023)	$ (12,037,317)	$ (7,447,184)	$ 1,571,802	$ 13,205,319	$ 27,284,992	$ 43,573,341	$ 61,817,276

Financials (Pro-Forma) JAXMAN w/ FTTH Users (Years 1-10)

ProForma Debt Paydown Variable	11	12	13	14	15	16	17	18	19	20
Revenue										
All Revenue	$ 88,378,720	$ 88,378,720	$ 88,378,720	$ 88,378,720	$ 88,378,720	$ 88,378,720	$ 88,378,720	$ 88,378,720	$ 88,378,720	$ 88,378,720
Expenses										
O&M	$ 20,442,788	$ 20,442,788	$ 20,442,788	$ 20,442,788	$ 20,442,788	$ 20,442,788	$ 20,442,788	$ 20,442,788	$ 20,442,788	$ 20,442,788
Retained Earnings from Previous Year										
Marketing	$ 116,400	$ 116,400	$ 116,400	$ 116,400	$ 116,400	$ 116,400	$ 116,400	$ 116,400	$ 116,400	$ 116,400
City Contribution	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Expenses	$ 20,559,188	$ 20,559,188	$ 20,559,188	$ 20,559,188	$ 20,559,188	$ 20,559,188	$ 20,559,188	$ 20,559,188	$ 20,559,188	$ 20,559,188
Earnings Before Interest Inc/Exp	$ 67,819,532	$ 67,819,532	$ 67,819,532	$ 67,819,532	$ 67,819,532	$ 67,819,532	$ 67,819,532	$ 67,819,532	$ 67,819,532	$ 67,819,532
Avg Interest Income @5%	$ 1,695,488	$ 1,695,488	$ 1,695,488	$ 1,695,488	$ 1,695,488	$ 1,695,488	$ 1,695,488	$ 1,695,488	$ 1,695,488	$ 1,695,488
Earnings Before Interest Expense	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020
Interest Expense @5.5%	$ 22,122,181	$ 20,610,623	$ 18,941,107	$ 17,097,126	$ 15,060,450	$ 12,810,941	$ 10,326,358	$ 7,582,136	$ 4,551,143	$ 1,203,412
Net Book Income	$ 47,392,839	$ 48,904,398	$ 50,573,914	$ 52,417,894	$ 54,454,570	$ 56,704,080	$ 59,188,662	$ 61,932,884	$ 64,963,877	$ 68,311,609
DS Coverage Before Debt Paydown	3.14	3.37	3.67	4.07	4.62	5.43	6.73	9.17	15.27	57.76
Debt Paydown: Current Year	$ 27,482,876	$ 30,354,837	$ 33,526,917	$ 37,030,480	$ 40,900,166	$ 45,174,233	$ 49,894,940	$ 55,108,961	$ 60,867,848	$ 21,880,213
DS Coverage After Debt Paydown	1.9000	1.9000	1.9000	1.9000	1.9000	1.9000	1.9000	1.9000	1.9000	39.5831
Net Income after Debt Paydown	$ 19,909,963	$ 18,549,561	$ 17,046,996	$ 15,387,414	$ 13,554,405	$ 11,529,847	$ 9,293,722	$ 6,823,923	$ 4,096,029	$ 46,431,395
Retained Earnings	$ 81,727,239	$ 100,276,800	$ 117,323,796	$ 132,711,209	$ 146,265,614	$ 157,795,461	$ 167,089,183	$ 173,913,106	$ 178,009,135	$ 224,440,530
Capital Expenditure Schedule										
Total Annual Capital Required	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Working Capital Required										
Current Yr. Capital Required	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Paydown	$ 27,482,876	$ 30,354,837	$ 33,526,917	$ 37,030,480	$ 40,900,166	$ 45,174,233	$ 49,894,940	$ 55,108,961	$ 60,867,848	$ 21,880,213
Capital Required/Yr (Less Debt Repayment)	$ (27,482,876)	$ (30,354,837)	$ (33,526,917)	$ (37,030,480)	$ (40,900,166)	$ (45,174,233)	$ (49,894,940)	$ (55,108,961)	$ (60,867,848)	$ (21,880,213)
Cummulative Debt Outstanding	$ 374,738,596	$ 344,383,759	$ 310,856,842	$ 273,826,361	$ 232,926,196	$ 187,751,963	$ 137,857,023	$ 82,748,061	$ 21,880,213	$ -
Capital Cost per Customer Passed										
Cash Flow	$ 19,909,963	$ 18,549,561	$ 17,046,996	$ 15,387,414	$ 13,554,405	$ 11,529,847	$ 9,293,722	$ 6,823,923	$ 4,096,029	$ 46,431,395
Cumulative Cash Flow	$ 81,727,239	$ 100,276,800	$ 117,323,796	$ 132,711,209	$ 146,265,614	$ 157,795,461	$ 167,089,183	$ 173,913,106	$ 178,009,135	$ 224,440,530

Financials (Pro-Forma) JAXMAN w/ FTTH Users (Years 11-20)

ProForma Debt Paydown Variable	21	22	23	24	25
Revenue					
All Revenue	$ 88,378,720	$ 88,378,720	$ 88,378,720	$ 88,378,720	$ 88,378,720
Expenses					
O&M	$ 20,442,788	$ 20,442,788	$ 20,442,788	$ 20,442,788	$ 20,442,788
Retained Earnings from Previous Year					
Marketing	$ 116,400	$ 116,400	$ 116,400	$ 116,400	$ 116,400
City Contribution	$ -	$ -	$ -	$ -	$ -
Total Expenses	$ 20,559,188	$ 20,559,188	$ 20,559,188	$ 20,559,188	$ 20,559,188
Earnings Before Interest Inc/Exp	**$ 67,819,532**	**$ 67,819,532**	**$ 67,819,532**	**$ 67,819,532**	**$ 67,819,532**
Avg Interest Income @5%	$ 1,695,488	$ 1,695,488	$ 1,695,488	$ 1,695,488	$ 1,695,488
Earnings Before Interest Expense	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020
Interest Expense @5.5%	$ -	$ -	$ -	$ -	$ -
Net Book Income	**$ 69,515,020**	**$ 69,515,020**	**$ 69,515,020**	**$ 69,515,020**	**$ 69,515,020**
DS Coverage Before Debt Paydown	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Debt Paydown: Current Year	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
DS Coverage After Debt Paydown	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**
Net Income after Debt Paydown	**$ 69,515,020**	**$ 69,515,020**	**$ 69,515,020**	**$ 69,515,020**	**$ 69,515,020**
Retained Earnings	**$ 293,955,550**	**$ 363,470,570**	**$ 432,985,591**	**$ 502,500,611**	**$ 572,015,631**
Capital Expenditure Schedule					
Total Annual Capital Required	**$ -**	**$ -**	**$ -**	**$ -**	$ -
Working Capital Required					
Current Yr. Capital Required	$ -	$ -	$ -	$ -	$ -
Debt Paydown	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Capital Required/Yr (Less Debt Repayment)	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Cummulative Debt Outstanding	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Capital Cost per Customer Passed					
Cash Flow	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020	$ 69,515,020
Cumulative Cash Flow					

Financials (Pro-Forma) JAXMAN w/ FTTH Users (Years 21-25)

14.0 Legal and Regulatory Issues

14.1 Introduction

This section assessed Jacksonville's authority to enter the telecommunications business and identified legal and regulatory issues of importance to the city in offering telecommunications services. The findings in this section suggest that the City of Jacksonville is well positioned to offer telecommunications services to its citizens with little legal or regulatory resistance.

Florida legislature does not prohibit counties or municipalities from providing telecommunications services or creating and operating a telecommunications infrastructure. The only state barrier found in offering telecommunications services is that the state of Florida imposes various taxes to increase the price of telecommunications services sold by public entities. The City of Jacksonville may need to amend its Charter and seek certification from the Public Services Commission.

14.2 Legal and Regulatory Issues

Telecommunications services have been historically provided by the efforts and investment of private corporations and partnerships. Over the past several years, deployment of advanced communication services by these private companies has been driven by traditional market considerations, thus contributing to what has become known as the "digital divide." Since the deployment of advanced communications services is essential to the continued vitality of communities, local governments and government utilities have begun entering the telecommunications field across the country. Local governments have found that providing telecommunication infrastructure and services to their citizens offers economic development and educational and employment opportunities that may have been delayed in the traditional telecommunications services market. Congress has specifically recognized the importance of access to advanced telecommunications services in §254(b)(3) of the Telecommunications Act, stating that "Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including inter-exchange services and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas".

Jacksonville has recognized the importance of a county-wide high speed network and has undertaken a Telecommunications Master Plan to evaluate the telecommunications needs

of the City and to determine how to meet those needs. As part of this ongoing research, the Task Force evaluated the legal and regulatory issues related to municipal provision of such services and this section outlines those findings. Specifically, this section addresses Jacksonville's authority to enter the telecommunications field at the federal, state, and local levels and identifies other legal and regulatory issues that may become important as the City moves forward with a specific business model. This section also briefly discusses pending litigation in Florida related to taxation which may adversely impact municipalities depending on the outcomes.

Federal Legal and Regulatory Issues

At the federal level, telecommunications services, cable services, and high-speed Internet services are regulated by The Telecommunications Act of 1996 (originally enacted in 1934). The 1996 Act sought to promote competition in the telecommunications industry and encourage the roll out of telecommunications infrastructure on a large scale. To remove regulatory barriers to accomplish these goals, Congress wrote Section 253 into the Act, which states that "[n]o State or local statute or regulation, or other State or local legal requirement, may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service."

The Federal Communications Commission has interpreted this statement as not applying to municipalities that do not operate electric utilities. This interpretation was challenged, and subsequently overruled, in courts in Missouri and Virginia[14.] However, the eventual outcome of this legal issue is may not affect Jacksonville, since the City owns its municipal utility. The FCC has never taken the position that the Telecommunications Act bars a municipality that owns its utility provider from entering the telecommunications industry. While the Act does not specifically grant local governments the authority to provide telecommunications services, it does not specifically prohibit local governments from doing so.

Similarly, the 1996 Act does not affirmatively grant local governments the authority to provide cable television service or high-speed Internet access but it does not prohibit these services either. There is a strong argument that local governments can operate cable systems based on the definition of "franchising authority' in the Act and since Congress strongly supports the nation-wide rapid deployment of high-speed Internet services, it can be inferred that municipal provision of these services was contemplated.

It is safe to state that municipalities may provide telecommunications services under federal laws, however, there are additional federal requirements depending on which

[14] See The Missouri Municipal League v. The Federal Communications Comm'n, 299 F.3d 949 (8th Cir. 2002) and City of Bristol, Virginia v. Earley, 145 F.Supp.2d 741 (W.D.Va. 2001), *appeal pending*.

types of services a municipality chooses to provide. For example, operating local exchange and long distance telephone services offered on a common carrier basis requires compliance with many federal regulations, while operating cable systems or Internet systems is less burdensome. The regulatory structures applying to each of these types of services should be evaluated to determine the benefits of each, however, that analysis is beyond the scope of this report.

State of Florida Legal and Regulatory Issues

Pursuant to Article VIII, Section 2(b) of the Florida Constitution, Florida is considered a "home rule" state. This means that the City of Jacksonville, along with all other municipalities in the state, is authorized to exercise any power, and perform any function, that is not expressly prohibited by the Florida Constitution, the Florida Statutes, Jacksonville's Charter, or Jacksonville's Ordinance Code.

The Florida Constitution is silent on whether a municipal government can provide telecommunications services to its citizens. Therefore, under Home Rule analysis, this silence authorizes Jacksonville to enter the telecommunications field, if it so chooses.

The Florida Legislature, likewise, has not expressly prohibited counties or municipalities from providing telecommunications services, or creating and operating a telecommunications infrastructure. Cable and Internet services can be provided under Home Rule powers and Section 166.047, Florida Statutes, specifically authorizes municipalities to enter the telephone business. Additionally, a liberal reading of Section 166.021(9), Florida Statutes, indicates that the Florida Legislature encourages the use of public funds to enhance and expand economic activity in the municipalities of the state, lure new businesses to relocate into the community, and develop and improve local infrastructure to attract new businesses to the community.

State law has, however, restricted the provision of telecommunications services by requiring a certificate of necessity, granted by the Public Service Commission, before beginning construction or operation of any telecommunications facility which provides telecommunications services to the public.[15] In applying for such a certificate, Section 364.335, Florida Statutes, requires a detailed inquiry into the ability of the applicant to provide such service, into what geographic area and physical facilities will be utilized, and into the existence of service from other sources within the geographic proximity where the applicant is proposing to operate its service. The applicant must also provide a schedule of rates. The specific services authorized by certain certificates granted by the Public Service Commission are outlined in the chart attached to this report, obtained from the Public Service Commission website.

[15] Section 364.33, Florida Statutes

Additionally, Chapter 364, Florida Statutes, restricts cross subsidization of "non-basic" telecommunication services using revenue from rates charged for "basic" services.[16] Cross subsidization has been defined as existing "when competitive services are priced below their incremental costs, and the resulting revenue shortfall is recovered through rates for monopoly services[17]." "Monopoly service" is defined as a telecommunication service for which there is no effective competition, either in fact or by operation of law.[18] Cross subsidization is regulated to foster a competitive environment in the telecommunications field, to ensure that basic telecommunications services are provided to the residents of Florida at reasonably and affordable prices, and to ensure that monopoly services provided by telecommunications companies are subject to effective price, service and rate regulation.[19]

This policy was developed to address areas where the service provider offers non-basic, competitive, services below the actual cost of providing those services by using revenues generated by overpriced, monopolistic, basic services to make up the shortfall. Cross subsidization effectively allows an incumbent service provider to use revenue generated by those services for which it has no effective competition to offset below market rate prices on those services for which it has competition in order to undercut the competition.

An area of state regulation that has recently come under fire is that specified in Sections 125.421 and 166.047, Florida Statutes. These identical provisions deal with the ability of the State to tax a local government which provides telecommunication services. These Sections require the local government to separately account for the revenues and costs associated with the provision of the telecommunication services, require the local government to comply with the same regulatory requirements as a privately held telecommunication service provider, and require payment of ad valorem taxes on all telecommunication facilities the local government uses in the provision of its telecommunication services.

The requirement of the local government service provider to pay ad valorem taxes has recently been challenged in The City of Gainesville v. Zingale, CA No. 2000-CA-1582 (Cir. Ct. 2nd Cir., March 20,2002). The City of Gainesville received a favorable ruling at the Circuit Court level and the case is currently on appeal. Other pending litigation originating in Gainesville addresses the applicability of the tangible personal property tax to municipally owned telecommunication towers and antennas. The outcomes of both of these cases will affect the financial implications of municipally owned and operated telecommunications systems.

Finally, with regard to state issues, the Florida Legislature passed the Communications Services Tax Simplification Law in 2001, which simplified the structure of taxes imposed

[16] Section 364.3381, Florida Statutes
[17] Florida Cable Television Ass'n v. Deason, 635 So.2d 14 (Fla. 1994).
[18] Section 364.02(7), Florida Statutes
[19] Section 364.01(4)(a) – (c), Florida Statutes

on telecommunication, cable, and satellite services. This new law does not adversely effect the ability of local governments to provide telecommunications services and it contains several exemptions from the taxing structure, including the provision of services to governmental entities.

Local Legal and Regulatory Issues

Jacksonville's Charter, like the Florida Constitution, is silent on whether the City can provide telecommunication services to its citizens. This silence authorizes Jacksonville to enter the telecommunication field if it so chooses. Likewise, the Jacksonville Ordinance Code does not prohibit the City from providing telecommunication services.

Though neither the Charter nor the Ordinance Code prohibits the City from providing telecommunication services, certain aspects of each should be studied to address the practical implications associated with such service.

Depending on the business model the City chooses, the Charter may need to be amended to authorize the provision of telecommunications services by the City's utility. "Utilities systems" is defined in Section 21.02 of the Charter as meaning the electric, water and sewer systems now operated by JEA, and any natural gas system to be operated in the future. If the City wished JEA to provide telecommunication services as part of its municipal utility service, the Charter would have to be amended to reflect this additional charge. Once that change was made, the existing Charter provisions would broadly grant JEA the authority to fully develop, deploy, and operate whatever telecommunication services the City chooses. There may be certain services that do not require a Charter amendment, but that issue will need to be evaluated after the City determines which services it chooses to provide.

Other Legal and Regulatory Considerations

As stated above, additional legal and regulatory considerations will be identified after a specific business model is determined by the City. At a minimum, any business model must be evaluated to determine the implications on bond financing, the necessary steps to avoid cross-subsidization, and the effect of any partnerships between the City and other entities.

Conclusion

As stated above, no federal, state, or local laws or regulations prohibit the City from providing telecommunications services to its citizens; however, there can be federal, state, and local regulations applicable to the City depending on which services the City chooses to provide. To comply with these regulations, the City may need to amend its Charter, seek certifications from the Public Services Commission, and evaluate the potential tax implications from alternative business models. These issues however, can

be effectively evaluated and addressed and do not create insurmountable barriers to Jacksonville's desire to provide its citizens with advanced telecommunications systems.

15.0 JAXMAN Design Details
Integrated Metropolitan Area Network Concept Design

15.1 Introduction

A high-speed countywide network for the greater Jacksonville area that integrates government entities, schools, businesses and residential communities will be required to compete in the ever competitive knowledge based economy. Effective communications and universal access to information that is affordable will be important for cities to advance in the information age of the twenty-first century.

In the past, large companies and government entities were the primary customers that required high-speed metropolitan area networks (MAN). Residential communities are now beginning to require access to these networks as more employees choose to work from home and use bandwidth intensive video applications.

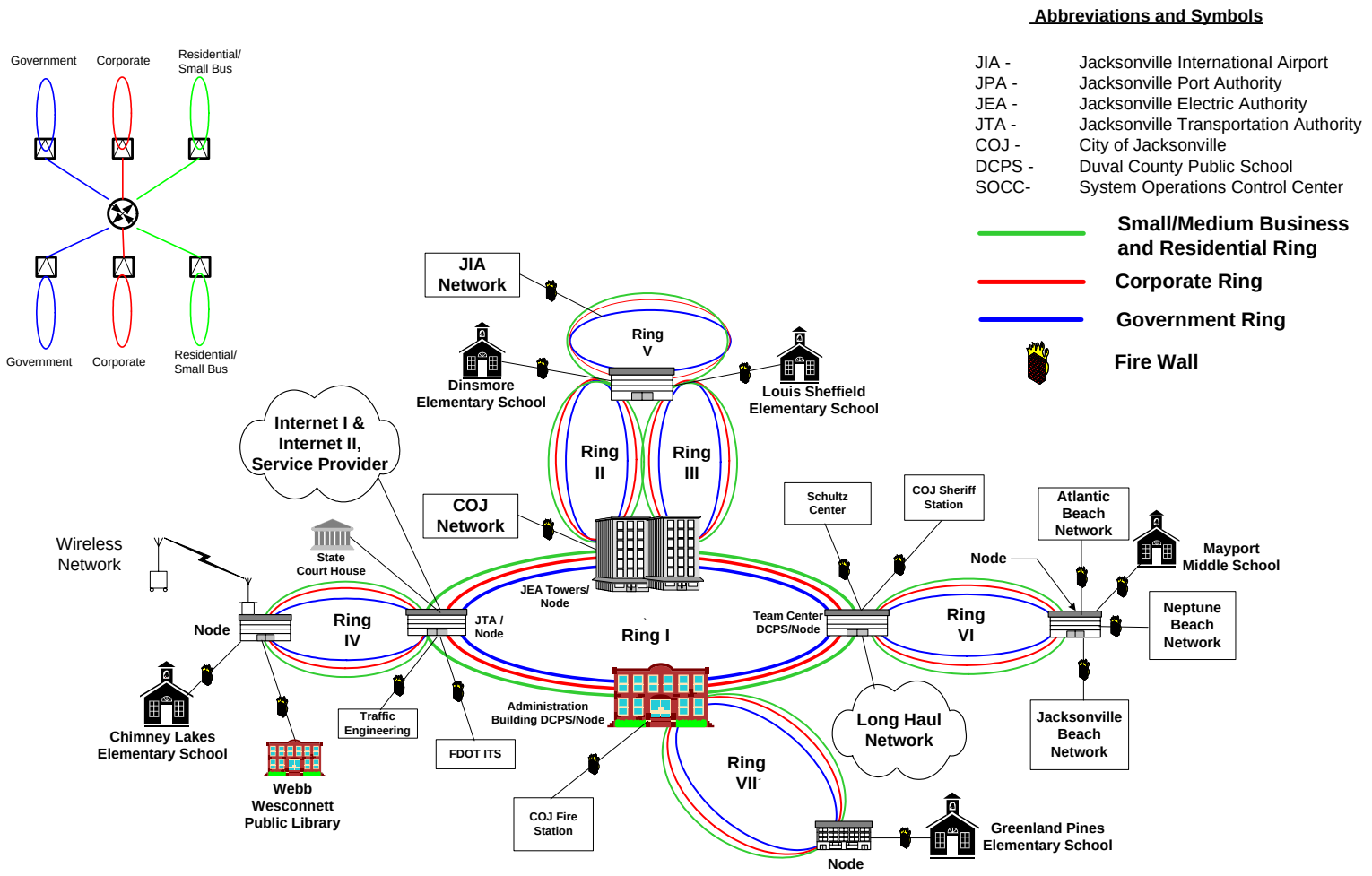
Solutions are required for MANs to bridge access, Internet and long haul networks that deliver various forms of applications and fiber connectivity for servers, production, storage, backup, and disaster prevention without network congestion. The traditional bottleneck of the network was, and will continue to be, the MAN, if proper design techniques are not implemented.

MANs must be scalable, cost-effective and meet demands for a wide range of broadband services, on-demand access, and service diversity. The proposed MAN design for the greater Jacksonville area demonstrates this approach. The MAN conceptual design is a high-speed countywide network that integrates the latest transport, switching, wireless and FTTH/B network technologies into one cohesive network. The MAN will have the capability to serve government entities, schools, businesses and residential communities and support current and future multimedia applications. This endeavor will place Jacksonville on the leading edge of communications technology and fulfill the vision of becoming the “most wired city” in the twenty-first century. Figure 15.1 highlights the major segments of the overall conceptual design.

- Integrated MAN: The Metro Area Network has 7 interconnected fiber backbone rings using Dense Wave Division Multiplexing (DWDM) as a high-speed data transport throughout the Jacksonville metro area. The transport network will interconnect customer’s networks through shared and dedicated fiber and wireless connections at nodes and access points. Customers may include service providers, government entities, schools, businesses, residents and visiting tourists.

- Fiber to the Home and Business Network (FTTH/B): The fiber to the Home/Business Network will extend voice, data, and video services throughout the residential communities and small and medium businesses. The MAN will transport these services from a centralized area, reducing the need for multiple head-ends and service provider co-location facilities. The fiber to the Business/Home Network will use technologies that will maximize customer services and minimize fiber optic concentrations. The fiber to the Business/Home Network design will be engineered to be scalable and integrate with an established MAN.
- Wireless Network: The wireless network will extend mobile data services for select users through access points along the MAN nodes. The wireless network will require a fiber infrastructure and is a natural compliment to the MAN. The wireless network will provide additional benefits such as rapid deployment, support for use by personnel in temporary or industrial locations, and cost effective deployment.

Each customer will still control and manage its internal networks but will have the added convenience of high-speed network access to remote campus sites, Internets, long haul networks, and data centers.



Jacksonville MAN Concept Design
Figure 15.1

15.2 Metropolitan Area Network

The MAN design process entails researching and recommending applicable MAN network technologies to support current and future applications. It also includes design assumptions, architecture organization, infrastructure requirements, management techniques, and personnel to successfully provide reliable network services.

15.2.1 Applicable Network Technologies

Numerous MAN technologies exist for data transport and network technologies, such as DWDM, SONET, ATM, Fiber Channel and gigabit Ethernet.

Transport technologies provide the means to carry large amounts of network traffic from different network technologies over long distances at very high speeds. The network traffic is transported from one point to another without making the routing pathway decisions.

Network Technologies are devices within a network that make routing pathway decisions for network traffic. These devices primarily consist of switches and routers.

15.2.1.1 Transport Technologies. DWDM network technology increases the bandwidth capacity over a single fiber by utilizing separate wavelengths of light to transport network traffic. DWDM technology can transport over 320 Gbps over a single pair of fibers and transport a wide range of networking technologies such as Gigabit Ethernet, Fiber Channel and optical carrier rates. DWDM is protocol transparent, which eliminates protocol conversions and resultant additional transmission latencies.

SONET was the primary MAN technology used over the last ten years that revolved around time division multiplexing (TDM) networks. Transmission rates are OC-1, 51, 84 Mbps and greater. SONET remains fairly expensive to implement.

DWDM is the preferred MAN transport technology for the following reasons:

- It is transparent to the protocol being carried.
- Will support service provider and carrier networks.

- Promotes a single network infrastructure that will support all types of traffic with packet based protocols such as ATM, Frame Relay and IP[20].
- DWDM products are scalable and capable of transporting very high bandwidth.
- Point-to-point, ring, and mesh topologies can be implemented.
- Efficiently uses existing fiber infrastructure.

15.2.1.2 Network Technologies. ATM can incorporate different protocols and traffic types such as leased lines and frame relay into a common format for transmission over SONET. Many service providers favor this technology. However, today's preference is IP oriented and is shifting to packet over SONET. With a packet over SONET protocol, the ATM intermediate layer and associated costs are eliminated.

Gigabit Ethernet is a proven scalable[21] technology that can be easily linked into traditional Ethernet. It is relatively inexpensive compared to other technologies that offer the same transmission rate. Using point-to-point topologies, collisions are not a concern. Gigabit Ethernet can be transported via single mode fiber using DWDM.

Fiber Channel is the primary technology used in storage area networks (SANs). Fiber Channel provides a high-speed interface (100 Mbps) for applications such as data backup, recovery, and mirroring. Fiber Channel, like other protocols, can be transported directly over DWDM.

The recommended network technology for the MAN is gigabit Ethernet. Gigabit Ethernet implementations are standardized and interoperable, and cost much less than SONET or ATM. Ethernet networks are also modular[22] and scalable.

15.2.2 DWDM Design Assumptions

The following are assumptions pertaining to DWDM Technology for the conceptual MAN design:

---

[20] Internet Protocol is a common Internet routing protocol. IP accepts data from a computer and sends it across the Internet through routers and other network equipment until data reaches its destination.

[21] Scalable networks can handle additional bandwidth requirements with minimal impacts to equipment and infrastructure.

[22] Modular networks can be arranged in a variety of ways to meet bandwidth requirements as they develop.

- The existing fiber infrastructure will support DWDM. Some older types of fiber such as dispersion-shifted fiber are not suitable for DWDM use. New fiber installations should use non-zero dispersion shifted fiber for DWDM usage.
- A minimum of two strands of JEA single mode fiber is available for the 7 interconnected fiber backbone rings.
- One DWDM network equipment vendor will be used consistently. Using different vendors on the same network may create interoperability issues such as vendors using different lambda numbering scheme, power levels, and Polarization Mode Dispersion (PMD) tolerances.

15.2.3 Integrated MAN Design

15.2.3.1 MAN Architecture and Network. The MAN design has 7 fiber rings in the overall network topology that consists of metro core and edge rings. Ring 1 is the metro core ring and rings 2-7 are the edge rings. The metro core ring interconnects the edge rings and transports network traffic between users and service providers throughout the Jacksonville metro area.

Ninety percent of the MAN fiber will utilize JEA's existing fiber and therefore govern the physical location of the fiber rings. The remaining 10% of the fiber will be new construction. See Figures 15.8 and 15.9 at the end of this Section for the geographic ring locations.

The ring architecture as illustrated in Figure 15.2 will provide the following benefits:

- Distributed Network: The MAN design is distributed which means transport equipment, routers, and switches are strategically distributed in nodes throughout the Jacksonville metro area. Each node will operate independently and therefore provide high network reliability and redundancy, eliminating single points of failure.
- Flexibility: Ring architectures[23] can accommodate a variety of topologies such as point to point[24] and mesh[25].
- Implementation: The MAN rings can be built strategically, allowing for a particular ring to be built and become operational while the remaining rings can be phased in over time.

[23] Ring Architecture: Each node is connected to its adjacent nodes and network paths are circulated in a ring.
[24] Point to Point Architecture: Direct linear network path between nodes.
[25] Mesh Architecture: Multiple direct and indirect network paths between nodes.

- Maintenance: Maintenance can be performed on a ring without comprising the availability of the remaining network rings.

The proposed MAN design uses DWDM and Ethernet in a point to point configuration. The DWDM equipment will transport network traffic between nodes. The core switches will manage network traffic bi-directionally between nodes and access networks. See Figure 15.2.

Design Notes

Metro/County Conceptual Fiber Network Design

Architecture: Point to Point Gigabit Ethernet over DWDM and Ethernet Switching. Ring and Mesh architectures can also apply

3 Network Groups: Government, Corporations, Residential

DWDM Network: 2 channels or wavelengths per network group, 6 channels total. 1 channel to be designated for voice and data and 1 channel designated for video per group.

Ethernet Core Switching: Layer 3 switching to bi-directionally manage network traffic between rings and nodes.

MAN will support legacy networks such as ATM and SONET utilized by some service providers.

Large and Medium Businesses

Approx. business population: 512,000

County Government population: 43,000 (state, local, schools, utilities, does not include military)

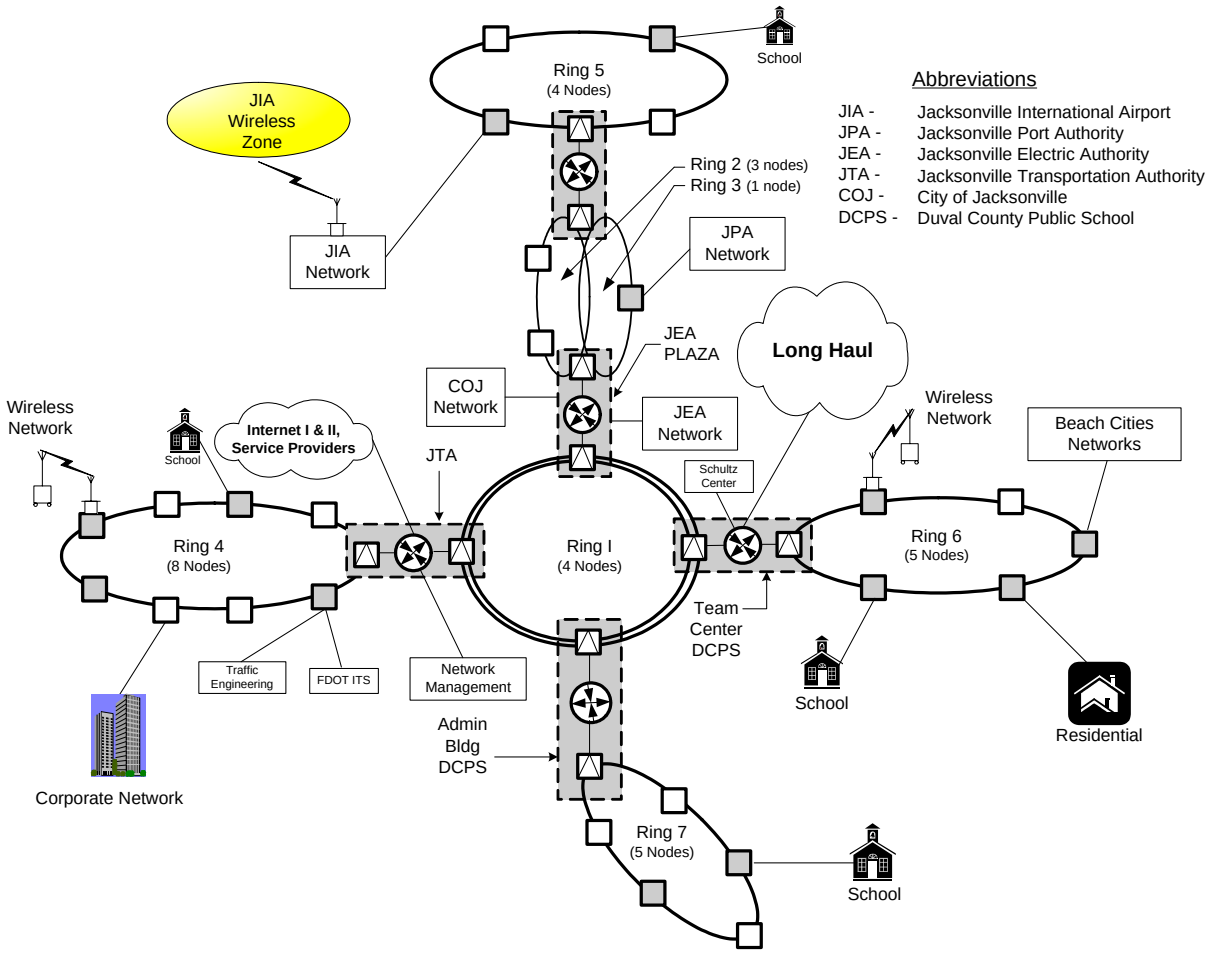
Business Locations: 32,000

2% Large Businesses: Dedicated Gigabit Ethernet Connections

38% Medium Businesses: Dedicated Fast Ethernet Connections

Symbols

- DWDM Network Equipment
- Core Switching: Layer 3
- Access Nodes to Support Government Entities (18): Schools, Fire & Police Stations, COJ, Libraries, Jacksonville Authorities
- Additional Access Nodes Required to Support FTTB/H at 30% Penetration (12)



Abbreviations

JIA -	Jacksonville International Airport
JPA -	Jacksonville Port Authority
JEA -	Jacksonville Electric Authority
JTA -	Jacksonville Transportation Authority
COJ -	City of Jacksonville
DCPS -	Duval County Public School

Jacksonville MAN Concept Design
Figure 15.2

15.2.3.2 Node Facilities. The nodes are facilities that will house the MAN equipment and fiber and wireless access network equipment. The nodes on Ring 1 are existing facilities and the nodes on rings 2-7 are new facilities. These facilities will be located on government agency property. These locations will optimally provide fiber and wireless connections to customer users.

For the purpose of this conceptual design, node facilities will have the following proposed requirements:

- Modular Prefabricated shelters (10'X24').
- HVAC.
- Emergency back up generators.
- Equipment racks and cabling management.
- Space may be available in existing government agency facilities that would eliminate or reduce the facility requirements and can be determined when the detailed design is performed.

15.2.3.3 MAN Organization. To provide better management, control and deployment of the network, the networks are divided into three customer user segments: government, large corporations and small/medium businesses and residential communities.

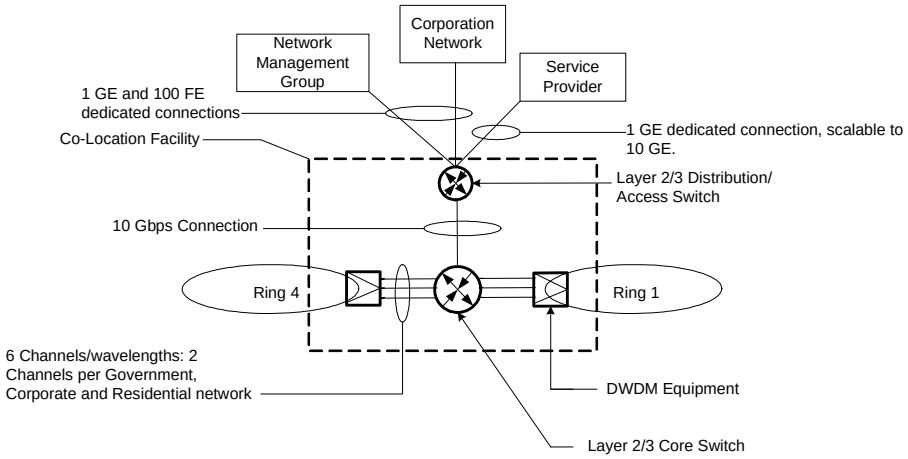
Each customer user group will utilize two wavelengths for transporting network traffic between nodes. The first wavelength will be designated for voice and data applications and the second wavelength will be designated for video. Access Networks provide last mile connectivity between nodes and users. See Figures 15.3 and 15.4.

1. User Group 1-Government Agencies: Government entities will include COJ, Authorities, Sheriff and Fire Departments, and other government users. To provide access to the entire user group, the following MAN infrastructure will be required:
    - 18 strategically placed nodes on all 7 MAN rings will be required to provide network connectivity to group 1. Each node will serve customers up to 2 miles radically from each node. See Figure 15.10 at the end of this Section for node locations.
    - New construction of approximately 24 miles of single-mode fiber for the MAN.
    - DWDM transport and Core switching network equipment: This will provide two wavelengths for transporting network traffic between nodes. The first wavelength will be designated for voice and data applications and the second wavelength will be designated for video.

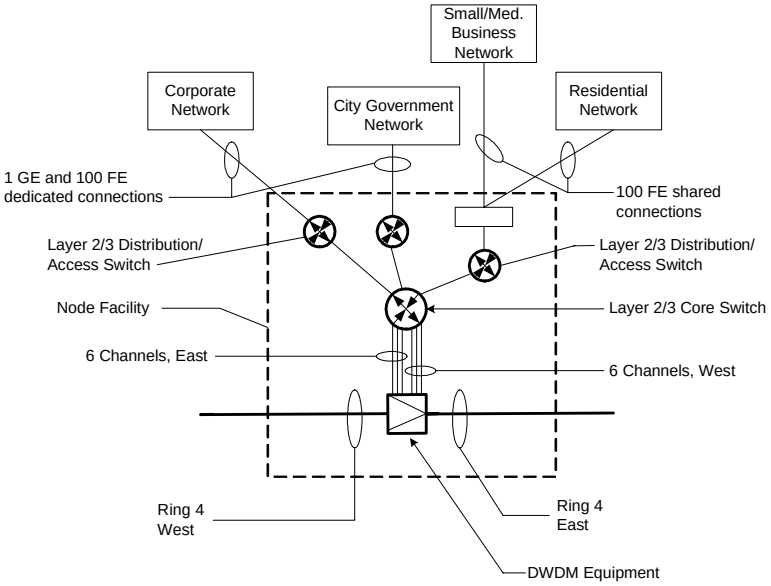
- Access network switches for fiber and wireless network connections.
- Single-mode fiber from MAN nodes to customer locations. The average distance for a fiber connection will be one mile.
- The network design is scalable and modular. The government user network infrastructure will initially support between 300 and 720 dedicated connections of Fast Ethernet and gigabit Ethernet. As customer demand exceeds capacity, network cards and access switches can be added.

2. User Group 2-Large Corporations: After incorporating group one, adding large corporate users to the MAN will be relatively simple.
   - Two DWDM network cards will be added to transport equipment. This will provide two wavelengths for transporting network traffic between nodes for large corporations. The first wavelength will be designated for voice and data applications and the second wavelength will be designated for video.
   - Access network switches for fiber and wireless network connections. (See Wireless Design section for design description).
   - Single-mode fiber between nodes and customer locations. The average distance for a fiber connection will be one mile.

3. User Group 3-Small/Medium Businesses and Residential Communities: FTTH/B technology would be implemented to serve group 3. FTTH/B technology requires the following from the MAN:
   - Two DWDM network cards would be added to transport equipment. This would provide two wavelengths for transporting network traffic between nodes. The first wavelength will be designated for voice and data applications and the second wavelength will be designated for video.
   - Access network switches for FTTH/B network equipment connections.
   - To provide FTTH coverage for all residential communities in the Jacksonville metro area, 12 additional MAN nodes would be required. (See Section 5.4.for FTTH network equipment and fiber infrastructure design description and requirements).
   - The MAN will also support existing and new service providers and carriers. Service providers and carriers will be able to utilize the MAN to provide services to customers and transport data throughout the Jacksonville metro area.



Typical Ring Interconnection
Figure 15.3



Typical Access Connection
Figure 15.4

15.2.3.4 MAN Bandwidth. IP services will continue to grow dramatically especially with the use of multimedia applications. The MAN is scalable and can adapt to current and future bandwidth while minimizing initial capital costs.

Current bandwidth estimates for the MAN design are based on the following criteria:

- Jacksonville's large and medium business population is approximately 250,000.
- The average size for a large business is 3,500 network users.
- The average internal LAN connection to the desktop is 100 Mbps.
- The average external connection (WAN/MAN) per large business is 18 Mbps and 50% utilized. This equals 5,142 bps external bandwidth demands per user.
- The average bandwidth demand per user for IP Video is 1 Mbps.
- The average bandwidth demand assumptions are based on 10% simultaneous internal use (LAN) with an over-subscription ratio of 1:10 for the MAN.
- Large businesses estimate their external bandwidth demand to double in the next two years.

MAN Bandwidth 2002 Demand Summary			
	(Data)	(Video)	(Data and Video)
Business Population	Total Bandwidth Demand	Total Bandwidth Demand	Total Bandwidth Demand
248,000	1.27 Gbps	2.4 Gbps	3.75 Gbps

The overall MAN with all groups incorporated, will support 157.5 Gbps and scalable to 420 Gbps.

- The MAN for Government Users is designed to support 35 Gbps at 2.5 Gbps per channel. The network is scalable to 140 Gbps at 10 Gbps per channel.
- The MAN for Corporate Users is designed to support 35 Gbps at 2.5 Gbps per channel. The network is scalable to 140 Gbps at 10 Gbps per channel.
- The MAN for residential and medium/small businesses is designed to support 87.5 Gbps. The network is scalable to 140 Gbps.

15.2.3.5 Quality of Service (QoS). QoS defines a level of network performance for a given application. Network performance includes but not limited to availability (uptime), bandwidth (throughput), latency (delay), and error rate. A MAN with a large amount of bandwidth is not enough to ensure optimal performance with today's multi-media applications. A QoS management system is required to provide optimal performance. QoS manages network connections from end to end i.e., from user network to user network via LANs and MAN. These connections travel through multiple points such as routers and switches**.** Without implementing QoS, all IP-based network packets would travel different routes and arrive at different times, thus creating a low quality effect in real-time voice and video applications. The table below demonstrates latency sensitivity for certain applications. Typically for sensitive applications to operate, a separate network for each application was required. However with the proper QoS control an integrated MAN can handle all types of traffic providing economies of scale to the system. The service provider's QoS control begins and ends at the access switch (See Figure 15.4), thus the overall network performance will require coordination between the MAN's and all users, i.e., LAN customers, carriers and Internet service providers.

Application	Bandwidth	Latency Sensitivity (Delay)	Loss Sensitivity
Storage (Bulk Data Transfer)	10-100 Mbps	Low	Low
E-Commerce	3 Mbps	Moderate	None
Voice	Less than 1 Mbps	High	Low
Video	1 Mbps and greater	Low	Low
Real Time Video	1 Mbps and greater	High	Low

15.2.3.6 Network Management. The management of procedures and end-to-end service will be required if these business and organization customers are to rely and use the network services to establish or link their networks.

To handle these customer issues effectively, an operation management team and network operation center (NOC) will be required to supervise, monitor, and maintain the network. The management team will consist of network and system engineers and managers to monitor, control, and operate the network using the necessary hardware and software-integrated management tools. The NOC facility infrastructure will also require a high degree of reliability and availability.

The NOC will be the focal point for the following operational support systems.

- Maintenance Management: Network troubleshooting, software distribution and updating.
- IP management: Static IP addressing and dynamic addressing which will include DNS servers that will use Dynamic Host Configuration Protocols to assign IP addresses as needed from a pool of addresses.
- Service Management: Performance monitoring and coordination with affiliated networks and providing support for customers, service providers and carriers.
- QoS Management: QoS will be able to be incorporated at any layer on the Ethernet MAN, allowing performance management flexibility. It will also be important in establishing service level agreements with customers, service providers and carriers and the ability for dynamic control to maintain high quality of service for valued customers.
- Event Management: Troubleshooting of all network and system related problems. Opening tickets to track and document resolution of problems on a 24 hours a day, 7 days a week basis.
- Security: Network security will be important and the following have been implemented in the conceptual design. The distributed network architecture design will optimally accommodate a high performance security implementation without negatively impacting performance.
    1. Authentication and Authorization: Access control list (ACL) to prevent unauthorized user entry.
    2. Intrusion Detection: Intrusion detection system (IDS).
    3. Content and traffic filtering management.
    4. IP VPN Management: Virtual private networks managed by the MAN will enable dedicated, secure network connections with the use of shared network resources for customers.
    5. Policy Development: Network security is only good as its policies are enforced which means a set of rules must be developed and tightly regulated.
    6. Identity: The ability to permit, track and bill customers based on identity of the person. An identity based system supports different types of services for different customers on the same connection.

- Disaster Recovery Management: Mirroring all operational and financial related network databases to a remote location for disaster recovery purposes should be implemented as part of standard internal business practices. Disaster recovery services could also be extended to customers and create other potential business revenues.

A separate network to monitor and control the MAN is recommended. Using the same network (or in-band network) can create problems. If the network is disabled because of an element failure then the network management will also fail. When a remote switch or router fails, it is not possible for a network engineer to quickly access via in-band communications. The time to repair is dependent on getting a technician on site as soon as possible.

The overall network management is simplified by implementing an Ethernet network. An Ethernet network eliminates several levels of network management because a common connection is delivered to the customer premises or building. An Ethernet router at the customer premises can be a single demarcation between the customer and MAN. The equipment can be managed remotely and the lack of protocol conversions simplifies the role of the NOC which alleviates the need for two separate sets of tools for managing two separate protocols.

15.3 Fiber to the Home and Business Network

"Broadband -- the capacity to deliver Internet access with a continuous "always on" connection and the ability to both receive and transmit digital content or services at high speeds -- has the potential to transform the way we live, learn, work and play.

To be effective, a high-speed data network needs to provide services at the residential and small and medium business levels. The current methods of high-speed bandwidth delivery consist of cable broadband, xDSL, and wireless. Each of these technologies is capable of providing Internet connectivity with higher bandwidth than that provided by a typical dial up modem. However, new technologies and commercial offerings are requiring additional bandwidth for real-time interaction.

Fiber to the homes and businesses has long been the goal of service providers for offering true broadband connections to every home and business. Only recently have FTTH/B deployments been able to come close to the cost competitive edge when compared to more traditional copper-based technologies.

15.3.1 Technologies

The cable, telephone, and wireless industries are working to expand their current technologies to adapt to the increased bandwidth requirements. However, their medium of delivery has a finite amount of bandwidth available. FTTH/B provides a distribution medium that is capable of delivering an exponentially higher amount of bandwidth than a copper-based system.

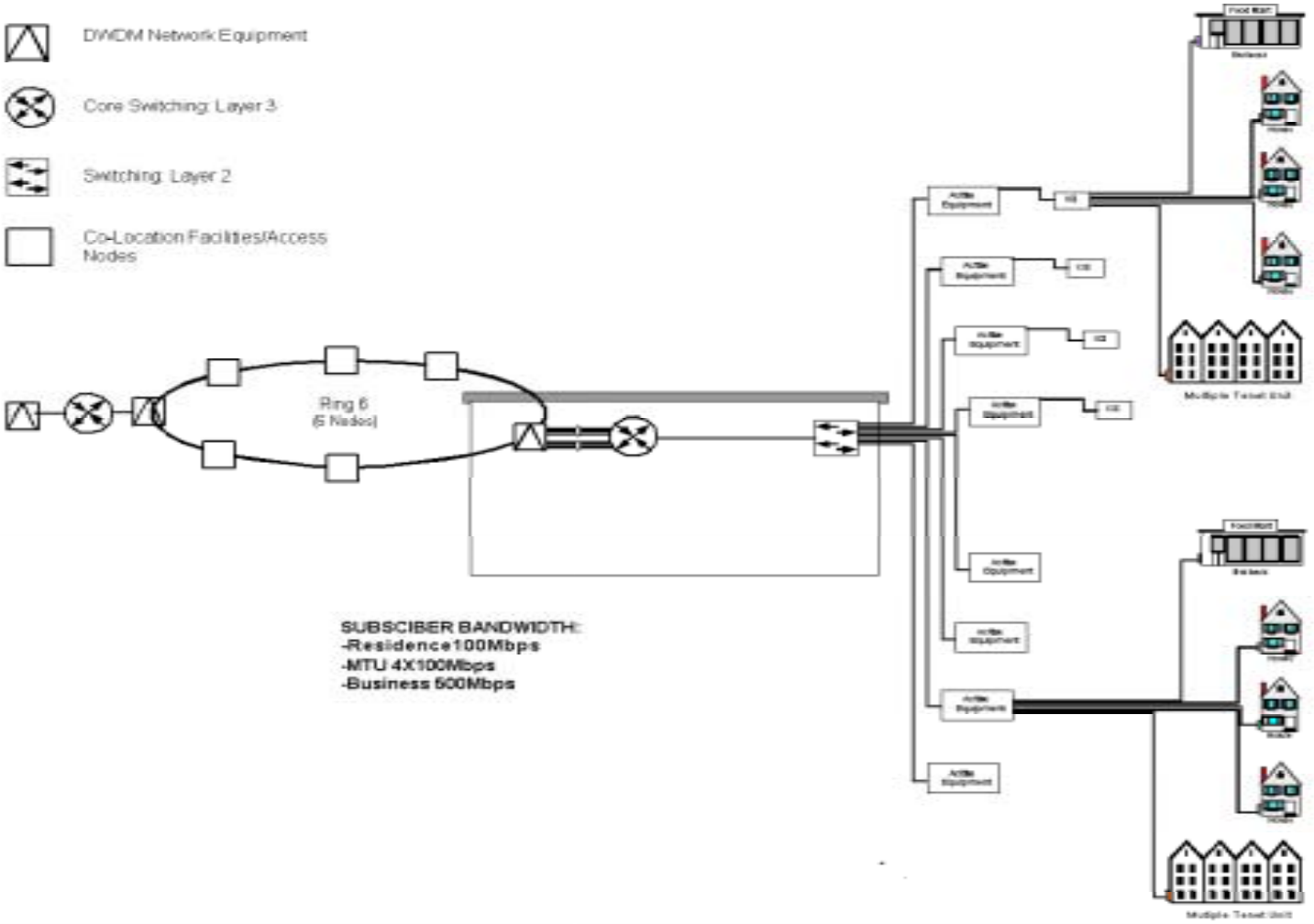
The FTTH/B industry is in the development stage with several equipment manufactures developing and deploying solutions. Each company has a unique method of bandwidth delivery; however they can be classified into four unique categories. The first is a Passive Optic Network (PON), the second is an active/passive optical network, and the last is a point to point network.

15.3.1.1 Passive Optical Network

The PON is currently the most popular form of FTTH/B because of its simplicity and scalability. The typical PON network consists of an optical line terminal (OLT), optical network unit (ONU), passive splitters and combiners, and of course the fiber optic cable. The OLT usually resides in the central office or headed and provides the aggregation point that allows customers to share one fiber. The OLT is connected to a switch/router for data and IP based video services. Some manufactures provide connection for a video EFMA that provides RF video services over the same fiber using wave division

multiplexing. However, the recommended delivery method for RF video delivery is to establish a separate VPON (Video Passive Optical Network).

The ONU resides on the exterior wall of a home or business and provides the customer connection to the devices in the home, i.e. telephone, computer, TV, etc. (See Figure 15.5). The available bandwidth for each subscriber is 40 Mbps sustained IP load with the capacity to burst up to 100 Mbps.



Jacksonville Fiber to the Business and Residence PON Concept Design
Figure 15.5

The advantages of a PON system include:

- Efficient use of fiber optic cable - Optical splitters allow up to 32 subscribers to be served over a single fiber run back to the OLT.
- Inexpensive field components - Splitters and couplers are simple passive fiber devices that are easily obtained and installed in the field.
- Field components are low maintenance - With no active components in the field, the PON system does not require network powering, and it has no RF interference issues, and has no scheduled maintenance.
- Field components are future proof - All field devices are capable of supporting any and all services that are available now, and in the future. These devices allow easy migration as bandwidth or service offerings increase.

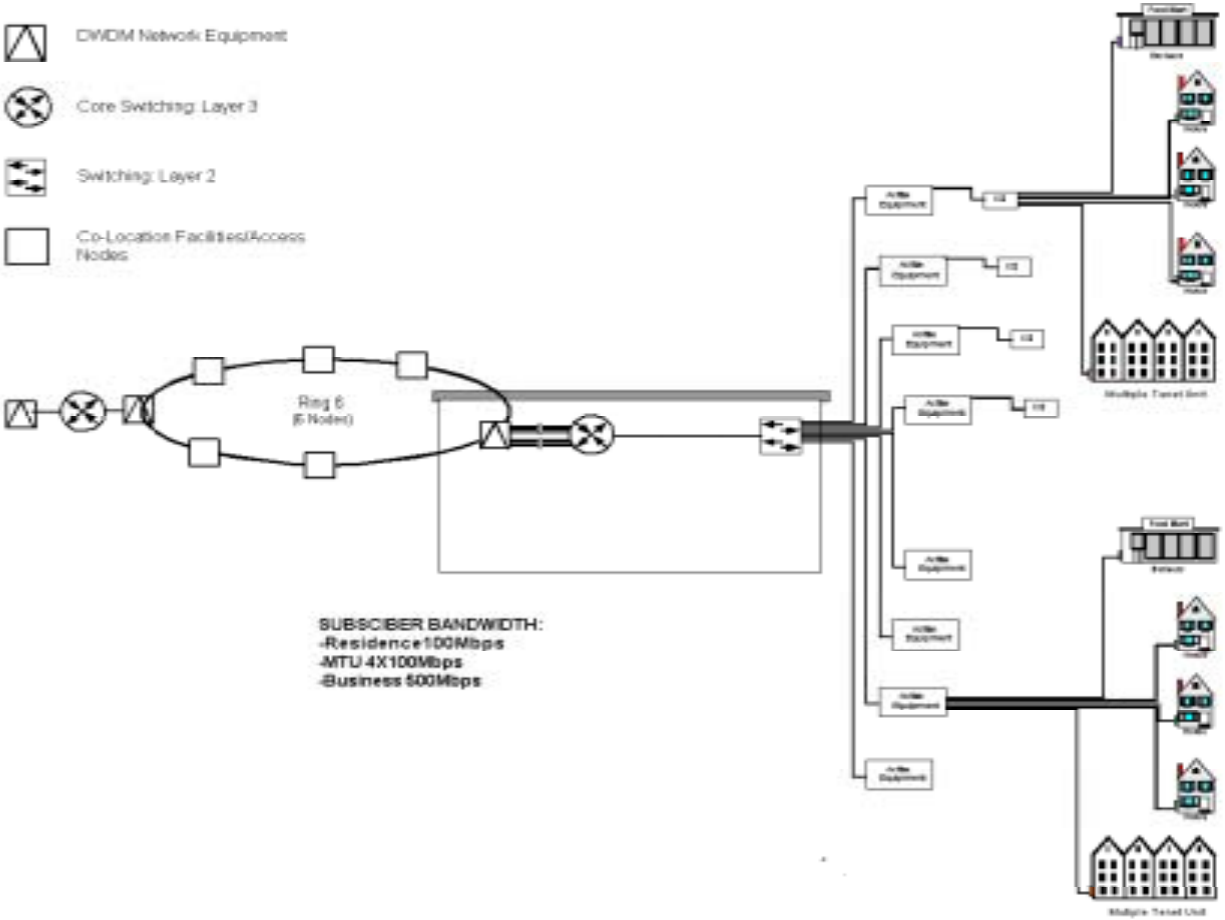
The disadvantages of a PON system include:

- Distance limitations- Distance is are based on the attenuation of the fiber, splices, and splitters. The average PON distance based on splitter ratio is:
- A 1:32 splitter can provide reliable service up to 5 miles.
- A 1:16 splitter can provide reliable service from 5 to 10 miles.
- A 1:8 splitter can provide reliable service from 10 to 15 miles.
- Specific distances will be addressed in the description of each vendor solution.
- Bandwidth is shared - The bandwidth available to each customer is dependent on the number of splits from the OLT. The average bandwidth per subscriber is dependent on the equipment manufacturer and will be addressed in the description of each vendor solution.
- PON security - The security mechanisms in the APON (ATM Passive Optical Network) standard are weak and should not be the sole security measure for the system.

15.3.1.2 Active/Passive Optical Network

In an active/PON topology, active components are distributed further out into the network. The fiber path originates in a central office, and extends into the network where an active device amplifies and redistributes the signal to the ONU via splitters, which are at the active equipment location or placed closer to the network edge.

This active equipment is connected to the head end or remote access building via 1 to 4 gigabit uplinks. This extends the distance up to 70 KM. The active equipment then uses optical splitters to distribute the bandwidth to the individual customers. The available bandwidth for the active/passive technology is 100 Mbps residential customers and 500 Mbps for business applications. See Figure 15.6.



Jacksonville Fiber to the Business and Residence Active/PON Concept Design
Figure 15.6

The advantages of an active/PON system include:

- Efficient use of fiber optic cable - By placing active components closer to the network edge, network aggregated bandwidth is transported over 'trunk' fibers, reducing fiber counts from the active device back to the central office.
- Longer transmission distances - Extended reach optics allow transport distances from the subscriber to the central office far beyond that of basic PON capabilities.
- Less central office equipment - Some vendors operate off of an existing third party router at the central office so that the OLT device is not required.
- Field components are future proof - All field devices are capable of supporting any services that are available now. They are also designed to meet any future services, which have been identified or proposed. These devices allow easy migration as bandwidth or service offerings increase.

The disadvantages of an active/PON system include:

- Field components require power - In field network powering degrades total system availability because of power interruption and battery backup limits. Field powering also adds operation cost and increased maintenance.
- Not competitively neutral - An active/PON system does not support competition at the data link layer it only supports competition in higher layer services.
- Bandwidth is shared - The bandwidth available to a customer is dependent on the number of splits from the last active. The average bandwidth per subscriber is dependent on the equipment manufacturer and will be addressed in the description of each vendor solution.

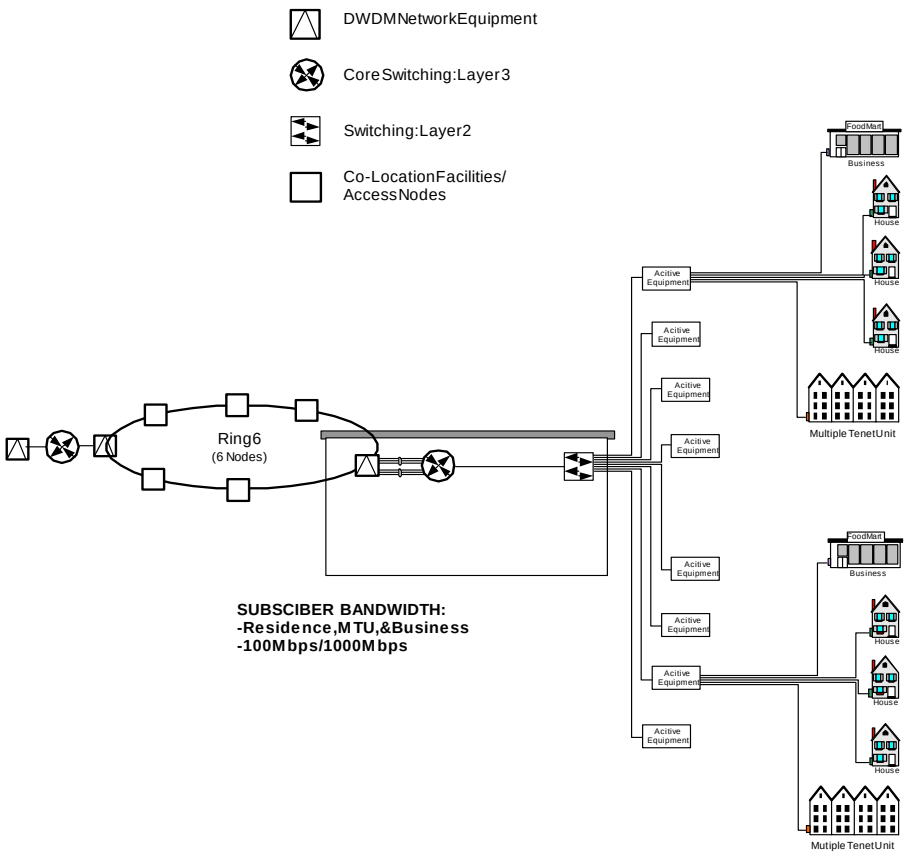
15.3.1.3 Point to Point (P2P)

In an active P2P topology, the subscriber becomes an individual member of the network. Network equipment is located at the subscriber and is connected to an active switching equipment location. This location is connected to the headed via a large capacity trunk to switching equipment located in a central office. The concept is to have a completely dedicated fiber path between the active equipment and a service subscriber.

The network equipment is connected to the next layer located at the head end or the remote equipment building via multiple Gigabit uplinks. Like the previous solution, the active equipment can be located 70 KM from the end. Unlike the previous solution subscriber connection is accomplished by an individual fiber extended to the customer interface. See Figure 15.7.

90% Penetration

VARIABLES	
Population	778879
Housing units	329778
Percentage of businesses/housing	0.1
Businesses	32978
Total housing/businesses	362756
Res/bus per facility	12,500
Number of facilities required	30
Penetration rate (=<1)	0.9
Over subscription rate, example 10/1=10%, 5/1=20%	0.1
Data rate per subscriber	1,000,000
Settop boxes per subscriber	2
Average bandwidth for video/IP	5,000,000
Bandwidth for 80% of settop boxes	
20 channels x avg bandwidth for video/IP	100,000,000
Maximum TV channels	100
Percentage aerial construction	0.60
Percentage underground construction	0.40
BANDWIDTH	
maximum field switch payload	600,000,000
maximum data bandwidth requirement per facility	11,250,000,000
internet bandwidth w/oversubscription	1,125,000,000
number of settop boxes per facility	22,500
video bandwidth w/blocking factor	20,340,000,000
video bandwidth worst case	101,250,000,000
total bandwidth per facility	**21,465,000,000**
number of users per field switch, 60 is base + MTU	96
number of field switches per facility	118
number of GigE per field switch (1-4)	1
max number of GigE per facility	118
number of GigE connections to headend or multicaster	22
maximum field switch, variable will use 96/core as benchmark	131
maximum GigE connections, 4 per core	524



Jacksonville Fiber to the Business and Residence Active Concept Design
Figure 15.7

Currently, the available bandwidth for the active technology is 100 Mbps/1000 Mbps for residential customers and business applications.

The advantages of a P2P system include:

- Gigabit bandwidth capabilities - Bandwidth will be addressed in the description of each vendor solution.
- Longer transmission distances - Actual distances will be addressed in the description of each vendor solution.
- Unlimited competitive access - P2P provides access on the physical layer to any subscriber without the cost of overbuilding a city. Interfaces can be located in a central location for easier service provider connection.

The disadvantages of a P2P system include:

- Difficult fiber management - With a fiber to each subscriber, it is difficult and costly to provide the management and real estate needed to terminate all subscribers in one location.
- Increased Maintenance - To reduce the amount of fiber from one location active components are placed in the field, which require power. In field powered network devices system availability is degraded powering degraded because of power interruption and battery backup limits. Field powering also adds operation costs and increased maintenance.
- Requires many transceivers - Each subscriber, no matter what services they purchase, requires a dedicated transceiver adding to the cost and power requirements at the active equipment location.
- Expensive installation costs - High fiber counts and a multitude of field splices add considerable cost to the network deployment.

15.3.1.4 Assumptions

The following assumptions were used in the design concept:

- A centralized head end will be constructed to provide services to the entire FTTH/B network.
- Video over IP will be used to extend the video signal from the centralized head end to end-user.
- Single fiber to each subscriber.

15.3.1.5 Design

The FTTH/B network is designed be incorporated into the node facilities and mesh smoothly with Metro Area Fiber Network for delivery of services throughout Jacksonville. The FTTH/B conceptual design has been engineered to be adaptable to any of the current FTTH/B solutions currently available. Additionally, as new residential areas are developed FTTH/B coverage is easily established by installing new node facilities and connecting them into the MAN.

The building of a centralized head end simplifies the maintenance and supervisory requirements associated with the day to day maintenance of a complex distribution system. The MAN will transport video service to any node facility located in Jacksonville. Additional services, such as Internet and voice, can be located at the headed or at any node facility.

15.4 Wireless Network

High-speed data services can be provided from each of the MAN node locations to nearby residents. This service can be carried over fiber optic cable direct to homes and small businesses or via a wireless link using the 802.11b protocol.

The wireless conceptual design is based upon a last mile connectivity using 802.11 technology to small office and home offices (SOHO). 802.11 technology was used for financial illustration purposes due to the following features:

- Relatively easy to deploy access points (AP).
- Relatively inexpensive.
- No spectrum license requirements.
- Data rates from 6 Mbps to 54 Mbps.
- Traffic prioritization and security capable.
- Increased vendor support.
- Standards based (IEEE 802.11 series).

There are limitations to this technology as discussed in Section 8 of this report but for the purpose of bringing wireless data to the demand users in Jacksonville, 802.11 is a sound choice.

Buildings in close proximity to the schools could receive a useable radio signal without need of an outdoor antenna. Locations that are somewhat distant from a school would

require an external antenna and some internal cabling to reach the home/business network or to a local in-home (or business) router.

Fiber-based circuits would require a media converter (Ethernet to fiber optic cable pairs) to be placed within the home or residence. Circuits would be constructed underground from the node to nearby overhead power distribution lines and then extended to the customer. Additional underground circuits may be desired within proximity to homes and businesses in some instances.

Connectivity through the nodes would require that the node's local router be provisioned to direct non-government agency traffic to hardware that would take care of firewall issues, access issues, and traffic routing for localized recipients of the data services. Data circuits would extend from this hardware to a local rooftop access point for wireless connections and to media converters for fiber-based circuits described above.

The fiber circuits from nodes to customers would be installed in accordance with the fiber distribution master plan. This would help prevent duplicating infrastructure costs as network demand rises. As the number of users around a school increases, it will become economical to implement localized fiber-to-the-home implementations as described elsewhere in this report.

15.5 Potential Opportunities

The MAN construction can be phased in over time to address current and future high-speed access demand and minimize up-front capital costs. The following phases are based on user groups with the highest demand for high-speed access:

15.5.1 Local Government

The first phase of the MAN deployment would connect governmental users as discussed in Section 15.2.3. This phase will involve the following:

- 18 strategically placed nodes on all 7 MAN rings. Each node will serve customers up to 2 miles from each node.
- Installing approximately 24 miles of MAN fiber backbone.
- DWDM transport, Core and access network equipment.
- 300 single-mode fiber connections from MAN nodes to customer premise locations. The average distance for a fiber connection will be one mile.

The network design is scalable and modular. The government network infrastructure will initially support between 300 and 720 dedicated connections of Fast Ethernet and Gigabit Ethernet. As customer demand exceeds capacity, network cards and access switches can be added.

The first phase of the MAN will provide high-speed fiber network access to all public schools, City of Jacksonville's major buildings, Jacksonville Authorities and key Fire and Sheriff building locations.

15.5.2 Local Network Services from Nodes

Using a demand based approach; the second phase of the development. Would consist of strategically placing wireless network hotspots along MAN nodes to provide network access to small/medium-sized businesses and residential communities. Fast and economical network deployment to customers can be achieved once the MAN fiber-network infrastructure is in place. This wireless connectivity will be provided initially from the nodes.

15.5.3 FTTH/B Network Services from Nodes

The third phase of the infrastructure development would consist of implementing a FTTH/B network. As market and bandwidth demand grows, fiber would replace wireless connections and serve customers with advanced needs. Phasing from wireless to shared fiber connections using FTTH/B technology could also provide opportunities to provide additional services such as voice and video. These customers would consist of medium and small size businesses, SOHOs and residential communities.

To implement FTTH/B technology from one selected node, the following would be required:

- Two DWDM network cards in all transport equipment at all 18 nodes. This would provide two wavelengths for transporting network traffic between nodes. The first wavelength will be designated for voice and data applications and the second wavelength will be designated for video.
- Core Switching cards in all core switches at all 18 nodes.
- One Access Switch per node for FTTH/B network equipment connections.
- FTTH/B transport and network interface equipment.
- Fiber distribution infrastructure: Fiber connections would be installed in accordance with a fiber distribution master plan.

To provide FTTH coverage for all residential communities in the Jacksonville metro area, 12 additional MAN nodes would be required.

15.5.4 Wireless Network

Our approach to a conceptual design of a wireless network started with an evaluation of the cost and coverage to provide hot spot wireless coverage. These costs are extrapolated in Section 15.6 Conceptual Design Cost Estimate. Due to the expense to provide ubiquitous county-wide wireless network, we focused on the requirements for covering a selected number of hot spots and the costs for such an installation.

15.5.4.1 Assumptions used in analysis of hot spot coverage. The following assumptions were used in the design and estimating:

- Only outdoor hot spots will be covered.
- The design will be subject to specific site surveys and system-wide frequency planning.
- The number of hot spots will support 12,000 users (8000 City/County employees and 4000 others comprised of transients, some businesses, and some residences).
- 20 users per access point will be considered as the initial loading for an access point.
- An average of 12 access points will be used for hot spot coverage.
- 3000 mobile access routers will be required (explained below).
- Access points will support 802.11a or 802.11b formats - determined in the design phase.
- Power will be available at all sites.
- Mounting locations (towers, poles, etc.) will be existing.
- Zoning for enclosures or for equipment space will be provided by others.
- Any necessary right-of-way is existing or will be obtained by others.
- Only data will be supported initially over the wireless network.
- Connectivity to APs will be via fiber optic cable extensions from the MAN nodes. There will be no use of APs as relay stations because such use will decrease data through put capacity.

15.5.4.2 Design. Given the assumptions above, there will be approximately 50 hot spots required and 600 access points constructed to serve those hot spots. The number of antenna support structures and the estimated coverage in a metropolitan / suburban environment are significant detailed design issues that are not covered in this conceptual plan.

The conceptual design includes access point locations with a single access point and an omni-directional antenna.

It is also expected that not all APs will be able to operate at maximum power to avoid interference with other existing wireless applications or other in-system sites that must be on the same frequency assignment. This power reduction will reduce the effective area that will be covered by these APs.

Reasonable assumptions for coverage are:

- APs with omni-directional antennas - 4 square blocks.
- Specific site surveys and propagation modeling will more accurately determine the actual coverage from the APs.

15.5.4.3 Coverage beyond hot spots. Users such as police, fire, and utility workers will require more than hot spot coverage. The combination of other providers and mobile access routers will fill in coverage gaps not supported by the 802.11 hot spots. A mobile access router would have its first priority set to the 802.11 network. As an example, when coverage is not available with the 802.11 network, the router could access a lesser priority system such as a CDMA network or CDPD network. If there is no longer CDMA, CDPD, or 802.11 coverage available, then the router could access a satellite network.

15.6 Conceptual Design Cost Estimate

The MAN, wireless network hotspots and FTTH/B cost estimates are based on the criteria as discussed in Sections 15.4 and 15.5.

15.6.1 MAN

The cost estimate to build a MAN and support 300 government users as discussed in Section 15.5.1 is summarized in Table 15.8 under government organizations. The cost summary includes the following:

- Required nodes on each ring.
- Network and software equipment material costs (DWDM, core switches and access switches).
- Network Construction: This includes the costs to manage, install, provision network equipment at all 18 nodes.
- MAN Fiber: Fiber costs to provide and install 7 MAN fiber rings.
- Last Mile fiber: Fiber costs to provide and install connections to customers.
- Node/Facilities: The facility construction costs.
- Network Management: The software and hardware to provide the overall MAN network management. This price does not include the NOC facility.

The MAN cost estimate to support FTTH/B network as discussed in Section 15.5.3 is summarized in Table 15.10.

The cost estimate to add large corporate businesses to the MAN as discussed in Section 15.2.3 is summarized in Table 15.8.

Government (300 Dedicated Connections)											
Ring #	Nodes	Total Hardware/Software Cost	Discount Hardware/ Software	Total Network Construction Includes Turn Key Program Management (5%)	Total MAN Fiber	Total Last Mile Fiber	Node/Facilities	Network Management 15%	Total without Discount	Total/Node	Total with Discount
Ring 1	4	$3,454,200	40%	$110,100	$1,129,200	$6,405,500	$400,000	$518,200	$12,017,200	3,004,300	$10,635,600
Ring 2	1	$469,800	40%	$24,800	$797,800	$332,300	$100,000	$70,500	$1,795,200	1,795,200	$1,607,300
Ring 3	1	$469,800	40%	$24,800	$228,200	$238,300	$100,000	$70,500	$1,131,600	1,131,600	$943,700
Ring 4	4	$1,879,200	40%	$99,200	$65,300	$1,186,300	$400,000	$281,900	$3,911,900	977,975	$3,160,300
Ring 5	3	$1,409,400	40%	$74,400	$70,200	$917,300	$300,000	$211,500	$2,982,800	994,267	$2,419,100
Ring 6	3	$1,409,400	40%	$74,400	$129,000	$839,000	$300,000	$211,500	$2,963,300	987,767	$2,399,600
Ring 7	2	$939,600	40%	$49,600	$65,300	$601,300	$200,000	$141,000	$1,996,800	998,400	$1,621,000
Total	**18**	**$10,031,400**		**$457,300**	**$2,485,000**	**$10,520,000**	**$1,800,000**	**$1,505,100**	**$26,798,800**		**$22,786,600**

Add Large Businesses (Does not include Fiber Distribution)											
Ring #	Nodes	Total Hardware/Software Cost (DWDM and Core Switch Cards)	Discount Hardware/ Software	Total Network Construction Includes Turn Key Program Management (5%)	Total MAN Fiber	Total Last Mile Fiber	Node/Facilities	Network Management 15%	Total without Discount	Total/Node	Total with Discount
Ring 1	4	$927,200	40%	$46,400	$0	$0	$0	$139,100	$1,112,700	278,175	$741,900
Ring 2	1	$115,900	40%	$5,800	$0	$0	$0	$17,400	$139,100	139,100	$92,800
Ring 3	1	$115,900	40%	$5,800	$0	$0	$0	$17,400	$139,100	139,100	$92,800
Ring 4	4	$463,600	40%	$23,200	$0	$0	$0	$69,600	$556,400	139,100	$371,000
Ring 5	3	$347,700	40%	$17,400	$0	$0	$0	$52,200	$417,300	139,100	$278,300
Ring 6	3	$347,700	40%	$17,400	$0	$0	$0	$52,200	$417,300	139,100	$278,300
Ring 7	2	$231,800	40%	$11,600	$0	$0	$0	$34,800	$278,200	139,100	$185,500
Total	**18**	**$2,549,800**		**$127,600**	**$0**	**$0**	**$0**	**$382,700**	**$3,060,100**		**$2,040,600**

Add FTTH/B (Does not include FTTH/B Network Equipment, Fiber Distribution and Access Switch)											
Ring #	Nodes	Total Hardware/Software Cost (DWDM and Core Switch Cards)	Discount Hardware/ Software	Total Network Construction Includes Turn Key Program Management (5%)	Total MAN Fiber	Total Last Mile Fiber	Node/Facilities	Network Management 15%	Total without Discount	Total/Node	Total with Discount
Ring 1	4	$1,590,800	40%	$79,600	$0	$0	$0	$238,700	$1,909,100	477,275	$1,272,800
Ring 2	1	$295,900	40%	$14,800	$0	$0	$0	$44,400	$355,100	355,100	$236,800
Ring 3	1	$295,900	40%	$14,800	$0	$0	$0	$44,400	$355,100	355,100	$236,800
Ring 4	4	$850,900	40%	$42,600	$0	$0	$0	$127,700	$1,021,200	255,300	$680,900
Ring 5	3	$665,900	40%	$33,300	$0	$0	$0	$99,900	$799,100	266,367	$532,800
Ring 6	3	$665,900	40%	$33,300	$0	$0	$0	$99,900	$799,100	266,367	$532,800
Ring 7	2	$480,900	40%	$24,100	$0	$0	$0	$72,200	$577,200	288,600	$384,900
Total	**18**	**$4,846,200**		**$242,500**	**$0**	**$0**	**$0**	**$727,200**	**$5,815,900**		**$3,877,800**

Table 15.8

15.6.2 Wireless Hotspots

With the assumptions stated earlier, 50 county wide hot spots will cover approximately five percent of Duval County and will cost approximately $31 million. This cost includes the wireless equipment, supporting fiber optic infrastructure, and installation. See Table 15.9 for the wireless network hotspot cost estimate summary.

Locations of hotspots and associated APs will be determined by the detailed design.

Wireless Hotspot Cost Estimate				
Description	**Quantity**	**Materials Each**	**Installation Each**	**Total**
List pricing for Hotspots	50	$734,712	$163,156	$44,893,383
20% Installation Discount, 40% Cisco Materials Discount, no Discount on other Material	50	$459,106	$159,328	$30,921,720

Table 15.9

15.6.3 FTTH/B

The cost estimate to build a FTTH/B network as discussed in Section 15.5.3 is summarized in Table 15.10.

The cost summary includes the following:

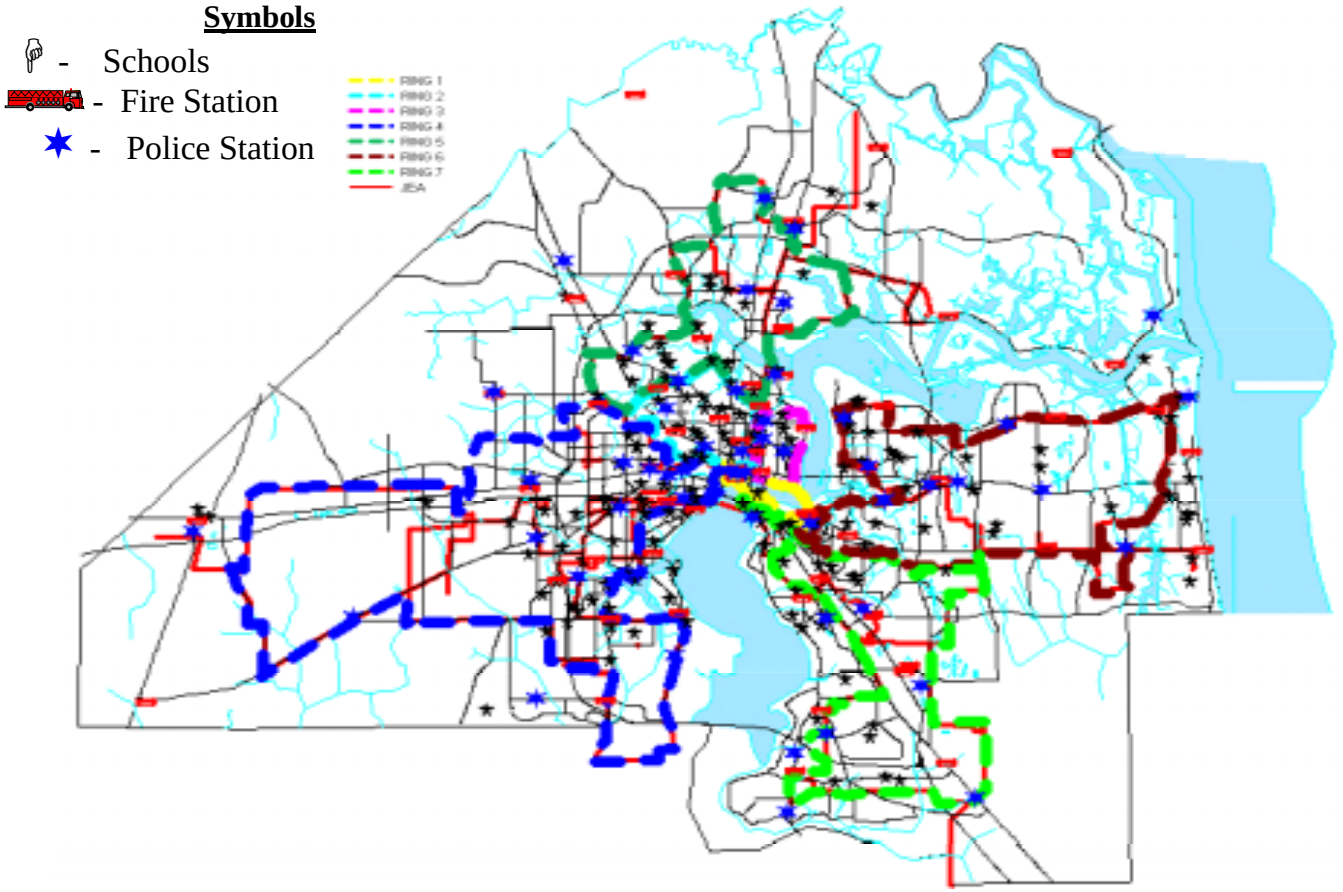
- FTTH/B network equipment and fiber distribution costs.
- The number of customers for 20, 30, 40, 50, and 60 percent penetration and associated construction costs per node.
- Total construction cost for all 30 nodes.

FTTH/B Estimate Cost Summary
Jacksonville, FL

Penetration rate	20%	30%	40%	50%	60%
Program Management	$ 525,160	$ 611,047	$ 697,677	$ 783,028	$ 869,658
Project Design	$ 525,160	$ 611,047	$ 697,677	$ 783,028	$ 869,658
Fiber Distribution Materials Cost	$ 7,020,761	$ 7,020,761	$ 7,020,761	$ 7,020,761	$ 7,020,761
Headend Building, New	$ 158,013	$ 158,013	$ 158,013	$ 158,013	$ 158,013
Headend Equipment	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000
FTTH Electronics	$ 3,871,608	$ 5,479,456	$ 7,105,904	$ 8,700,373	$ 10,326,821
Customer Drops Materials	$ 135,168	$ 202,752	$ 270,336	$ 337,920	$ 405,504
Customer Drops Installation	$ 943,453	$ 1,415,180	$ 1,886,907	$ 2,358,634	$ 2,830,361
FTTH per Node	**$ 14,179,324**	**$ 16,498,256**	**$ 18,837,276**	**$ 21,141,758**	**$ 23,480,777**
Nodes Built	30	30	30	30	30
FTTH Deployment for all nodes	425379747	$ 494,947,690	$ 565,118,272	$ 634,252,740	$ 704,423,322
Suscribers per Node	2457	3686	4915	6144	7373
Maximum Suscribers per Node	12,288	12,288	12,288	12,288	12,288

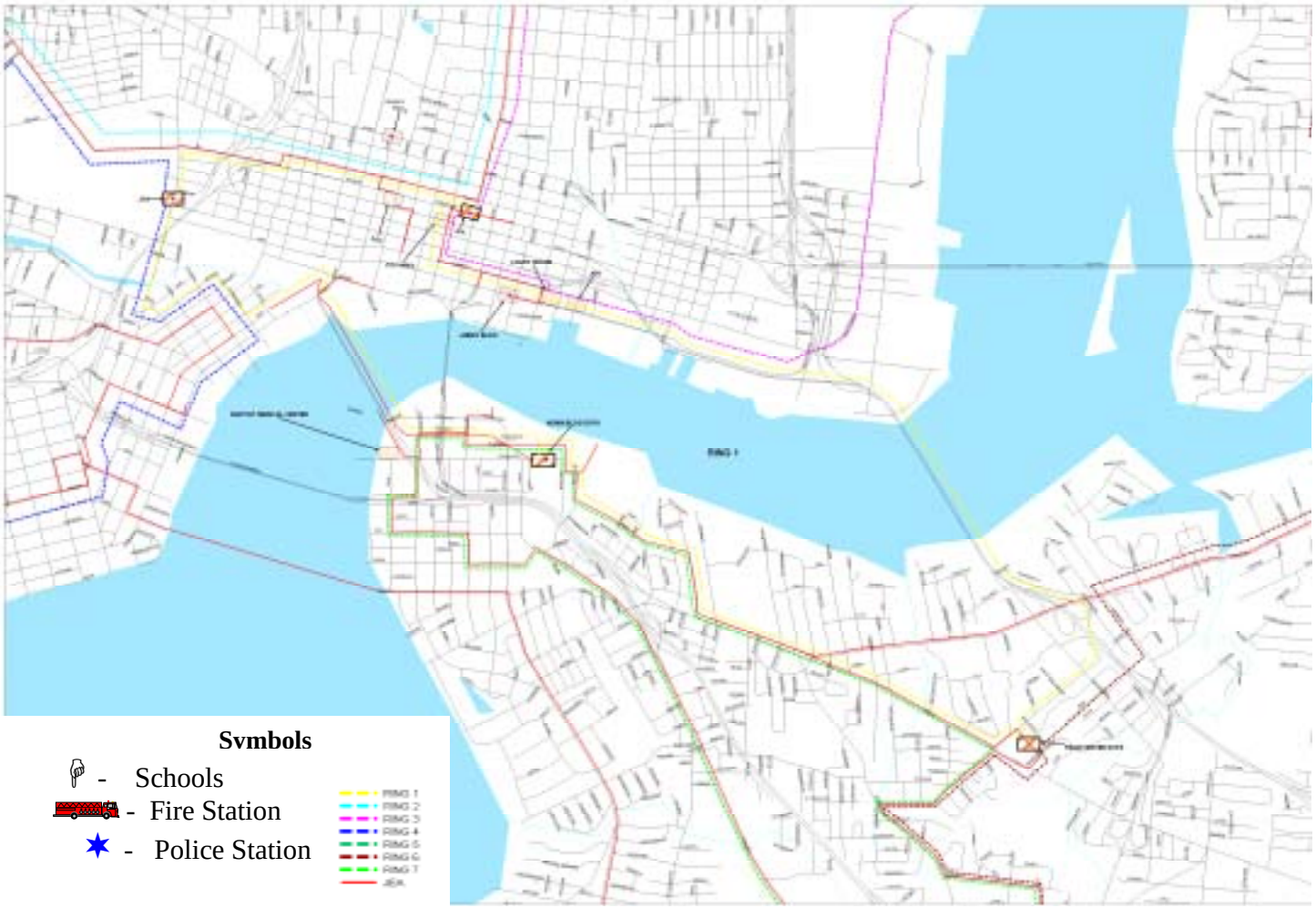
Table 15.10

City of Jacksonville, Florida

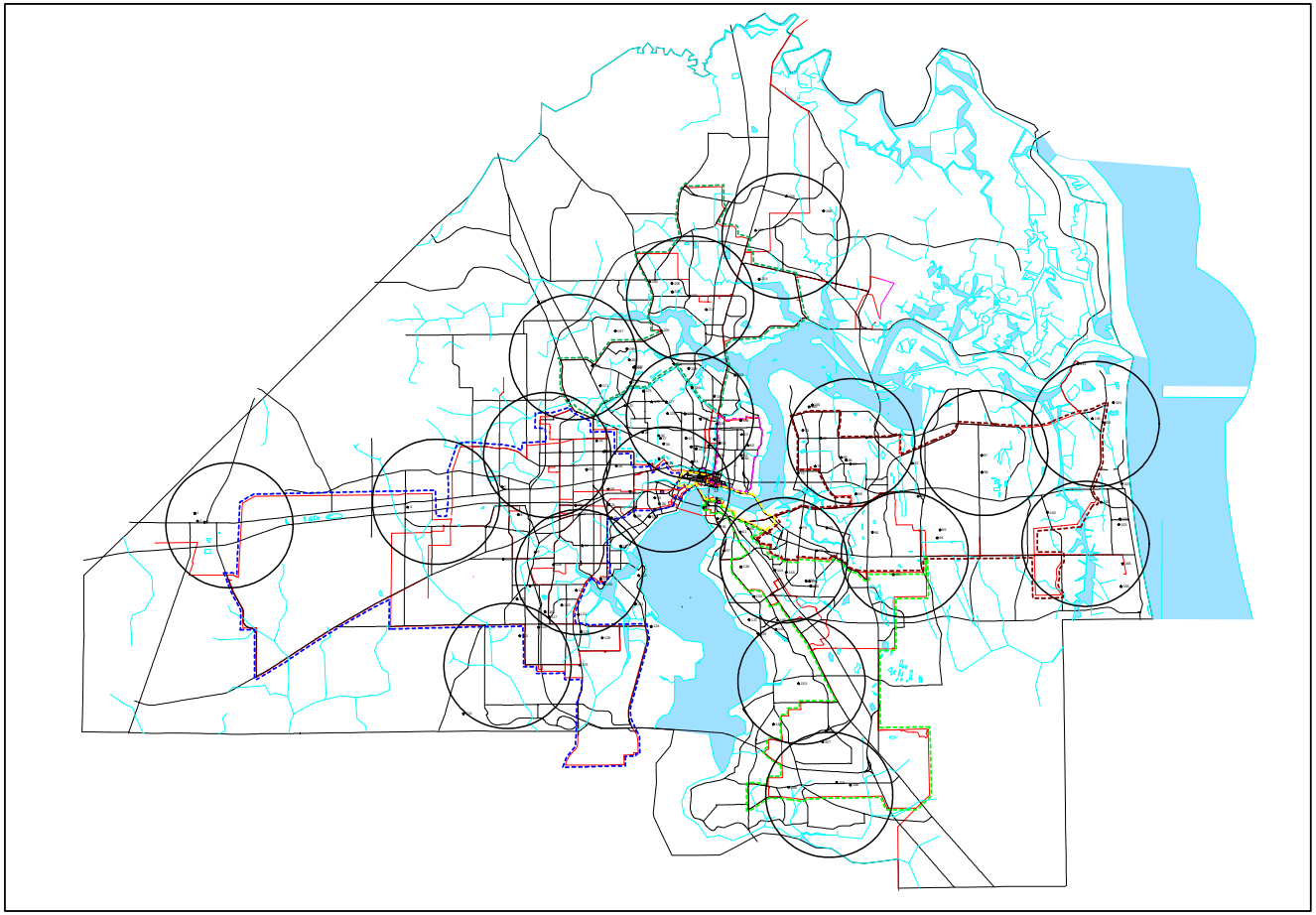


Jacksonville MAN Fiber Infrastructure Conceptual Design
Rings 1-7
Figure 15.8

132206



Jacksonville MAN Fiber Infrastructure Conceptual Design
Rings 1
Figure 15.9



Node Coverage Area:
2 mile radius

Jacksonville MAN Node Layout
Rings 1-7
Figure 15.10