City of Jacksonville, Florida

Telecommunications

Master Plan

Volume I

Presented By:
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Telecommunications Division

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1.0 Executive Summary

> ***"the infrastructure needed to properly serve Jacksonville in the information age and knowledge-based economy includes more than traditional utilities such as water, electric, and sewer"***
>
> ***"telecommunications infrastructure … is fundamental to Jacksonville's future and must be provided to all citizens and businesses county-wide."***
>
> - Jacksonville City Council, Resolution 2002-147-A, February 2002 (Appendix A)

A Vision…

On March 12, 2002, the Jacksonville City Council and Mayor John A. Delaney adopted **Resolution 2002-174-A**, a vision to position the City of Jacksonville as a progressive city with the foresight to modernize their infrastructure and prepare for its future. In order to ensure this vision, the resolution called for the creation of this *Telecommunication Master Plan.*

The Telecommunications Plan is key in outlining the steps and identifying the factors to consider in building Jacksonville a new telecommunications infrastructure. This infrastructure is essential to the City's economic growth through the expansion of existing and new businesses and to improving Jacksonville citizens' quality of life. A robust telecommunication's infrastructure is fundamental to education, transportation, health care and public safety.

The Role of Communication in a Knowledge-based Economy

> *"a seamless web of communications networks, computers, databases, and consumer electronics that … will change forever the way people live, work, and interact with each other."*
>
> - US. Dept. of Commerce, National Information Infrastructure Agenda for Action, 1993

It was the Telecommunications Act of 1996 that ignited today's Information Age as we currently know it. Enacted to promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies, the Act fosters an ideal environment for building a state-of-the-art communications system.

The Federal Communications Commission has taken this initiative further and established a strategic goal to promote the availability of broadband to all Americans[1], thirteen states have deployed statewide networks to promote greater broadband service and greater than 50 communities nationwide have fiber to the home networks installed or under development. The

[1] www.fcc.gov/broadband

importance of advanced telecommunications infrastructure is recognized at the federal, state and city levels throughout our nation. It is the 21st century enabler for growth, productivity, security, education and national competitiveness.

There is a difference between broadband as defined by the FCC and broadband considered in this study. Our vision, evaluation and recommendations focused on gigabit service, 1000 Mbps, not the 1.5 Mbps service provided by DSL or cable modems.

Recognizing this and the positive impact a telecommunications infrastructure will have on Jacksonville's future, the City of Jacksonville has the opportunity to become a true leader in this communications driven society. This Telecommunications Master Plan validates the City's endeavor to serve its citizens to the best of its abilities and identifies the key forces that play a vital part in forming the foundation for this initiative.

Today's society relies heavily on Communications Networks.

The cities that will advance in the Information Age acknowledge and understand the technology behind our nation's communities. Computers and network infrastructure are an integral part of our daily lives; communication, business and financial transactions, the media, utilities, transportation, schools, military, – the list is practically endless. Forward-thinking cities, like Jacksonville, appreciate the benefits associated with preparing a flexible communications network, which will meet their citizen's current demands, yet is adaptable for future innovations.

Speed is the driver behind efficiency

Time is a precious commodity. Whether it's a manufacturer trying to boost production, a doctor racing against nature's clock or a busy parent trying to spend more time with their children, quick and efficient technology can clearly improve the quality of life. Gigabit Ethernet networks (similar to one provided in this plan's solution) operate 1000 times faster than "broadband" cable modems offered by cable television companies, or DSL from the telephone company; 20,000 times faster than a dial-up connection to America Online or MSN. Today's computers are already equipped to handle such functionality.

To truly experience the advantages of a superior infrastructure, the network connection must extend past the "big business" environment we experience at work.

We are not simply held to the confinement of our office or university. Staying connected to the information highway, whether through wireless connections or dial-up, is a common and everyday need. As media continues to envelop our everyday lives; professionals, small businesses, students and home-makers everywhere will continue to demand the same comforts a "networked environment" can provide regardless of their location. Imagine a world where the at-home professional can effectively produce the same quality of work as an office employee, small businesses can compete at the same level as a corporation, less trips to the office, quick and easy access to media files of all sizes – all because you have network access.

This telecommunications plan outlines how this is feasible through the implementation of a state-of-the-art gigabit Ethernet service to both public and private sector entities.

The *Telecommunications Master Plan* was prepared by Black & Veatch and Vectren Communication Services (VCS), under contract to the City, with support from the City's Telecommunications Task Force containing representatives from across the consolidated government, and the Center for Civic Networking (also under contract to the City). Black & Veatch and VCS conducted extensive research into Jacksonville's telecommunications needs and existing infrastructure; developed and compared multiple options for meeting critical needs; and developed an in-depth technical design and financial model for the network recommended in this plan.

1.1 Jacksonville's Telecommunications Demand and Current Environment

To ensure the resolution's goals and objectives are met, Black & Veatch and VCS embarked on a research campaign to answer key questions such as: "What is the Current Telecommunications Environment?", "Are Jacksonville's Telecommunications needs being met and at what price?" and "What Telecommunications Services are Needed?"

After an extensive series of interviews and focus groups Black & Veatch and VCS came to the following conclusions:

Jacksonville's Basic Telecommunications Needs are Well Served. But there is Widespread Demand for New Services and the Applications that Greater Bandwidth will Provide.

Telecommunications infrastructure is a substantial investment with considerable effect on a broad spectrum of community sectors. We took the time to conduct thorough investigations with businesses, education and health care professionals, the transportation, utilities and government sectors and Jacksonville residents. Following is a list of interviews.

Interviews	
• Approximately 30 Commercial and Industrial firms, ranging in size from six to 15,500 employees	• Florida Department of Transportation
• The Jacksonville Sports Complex & Convention Center	• Jacksonville Public Works Department
• The 2005 Super Bowl Host Committee	• City of Jacksonville Information Technologies Division
• The Duval County Public Schools	• City Council and the City Council Auditor

• Florida Community College at Jacksonville), Jacksonville University	• Clerk of the Courts, Housing Authority
• Bishop Kenny Catholic High School	• Jacksonville Sheriff, Jacksonville Fire and Rescue Departments
• The Bolles School	• Public Defenders Office
• Baptist Hospital	• Regulatory Services Office
• Jacksonville Transportation Authority	• Jacksonville Traffic Engineering Division
• JEA, Jacksonville Port Authority	• The Supervisor of Elections

Interviews were also conducted with the neighboring cities of Jacksonville Beach, Atlantic Beach, Neptune Beach, and Baldwin to examine regional needs and potential collaborations. The local State Attorney's Office was also interviewed. Residents were surveyed through two focus groups and 400 phone surveys.

The Current Telecommunications Environment

The research and analysis yielded the following conclusions about the current telecommunications environment:

- Close to all of the organizations use standard telephone services (local, long distance, voice mail, fax) and networked computer applications (electronic mail, file servers, network printers, databases of various sorts, financial transaction systems, payroll systems, etc.).
- Most maintain a web site, and many provide various forms of interactive services through their web sites (data retrieval, on-line ordering, etc.).
- Many organizations also operate computing and network applications specific to their fields of endeavor, including video uplinks (Sports Complex), educational video distribution (Duval County Schools), patient records and teleradiology (Baptist Hospital), and real-time traffic monitoring (Florida Department of Transportation).

Overall, the City is Satisfied with Basic Telecommunications Service

In summary, most respondents were using current generation equipment for their operations, and were relatively satisfied with the telecommunications services supporting their current operations. Several dozen private carriers provide a broad range of voice, data, Internet, cable, and wireless services; therefore Greater Jacksonville's basic telecommunications needs are well served. (See Volume II, Sections 9 and 10)

Wide-Spread Demand for High Quality Service

But while most respondents reported satisfaction with their current services and providers, the interviews disclosed **a pent-up demand for services not available in Jacksonville's market**. In particular, the respondents revealed the following needs:

1. **Faster, less expensive connections between their facilities**. Baptist Hospital, in particular, seeks a faster, fault-tolerant alternative to their current high-speed inter-building links. They also seek higher speed, more affordable data services to connect their hospital network to remote "doc in a box" facilities, and to link teleradiology viewing capabilities to all facilities, including radiologists' homes.

2. **Wider deployment of wireless access**. Several government agencies, in particular, called for County-wide wireless networks to support mobile employees (e.g. for building inspectors).

3. **Networks capable of handling video and videoconferencing traffic**. The Duval County Schools currently transmit video overnight, so that it is available in schools the next morning – a faster network would make video available to schools, on demand. Multiple schools and colleges described a need to "webcast" video of courses, school events, professional development materials, etc. to other school buildings and to students' homes. There is also increasing demand for carrying video surveillance traffic for security applications.

   John Fryer, Superintendent of Duval County Public Schools, expressed their needs well: "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 School District strongly advocate adoption of the proposed gigabit Ethernet as an important solution to our urgent needs".

4. **Bandwidth for State of the Art Emergency Management Applications –** The Jacksonville Fire and Rescue Department uses 1 T1 to connect their Communications Center and up to 19 Fire Stations. They desire increased bandwidth for emergency dispatching; GIS map transfer and other emergency management applications.

5. **Videoconferencing support**. The strongest calls come from the Public Defenders Office, States' Attorneys Office, and other criminal justice agencies – to support jail-courthouse traffic, conferences between attorneys and clients, and conferences between attorneys and judges. There is a specific call for video conferencing in attorneys' and judges' homes, to facilitate time-critical and off-hours consultations.

6. **Extend telemedicine applications.** Baptist Hospital wants to broaden this service to patients' homes, remote doctor offices and to increase collaboration with other hospitals.

7. **Remote storage area network services and remote data backup for disaster recovery purposes.**

8. **Temporary Networks**. The Supervisor of Elections identified a need for temporary networks at election time – a need that will increase as electronic voting machines are deployed. Several agencies also discussed a need for rapid, temporary network establishment during disaster responses.

9. **Intelligent Traffic Management Systems -** FDOT sees a need for increased network support for Intelligent Traffic Management Systems and the City's Traffic Division considers the current methods to control 284 of the 424 signals controlled remotely too slow to support current applications – an improved telecommunications infrastructure will improve traffic flow and their ability to provide alternate route plans in emergency situations such as accidents and hurricane evacuations.

10. **High-Speed Data Network** - The Super Bowl Host Committee identified a need for network support for 3000+ media personnel that are expected to cover the event, as well as network services to coordinate thousands of volunteers and local PR and marketing activities. In particular, they call for high-speed data access in the Prime Osborn Convention Center (where media operations will be housed), high-speed data access in the Adams Mark hotel (where NFL personnel will be housed) and in the two hotels where the teams will be housed, connections to several cruise ships that will be docked downtown for the event, and high-speed data service to additional locations around town where visitors and staff will be housed.

11. **Continue to meet the various demands of the residential community. -** Residents generally report satisfaction with available telephone, cable and internet options. At the same time employers are calling for **increased speeds and virtual private network services to support telecommuting, and Baptist Hospital is calling for services to support telemedicine applications to patients' homes**. Thus, the early drive for new services to the home is likely to come from employers. At the same time, a local developer reports that high-speed services will be required in new housing construction, particularly houses aimed at upper-income purchasers. Based on general trends from around the country, we also expect an increasing demand for **high-speed, business grade services to support home-based and very small businesses** (the "SOHO" market).

Respondents expressed widespread support for the Telecommunications Master Planning effort, and see it as a means to obtain faster, less expensive network services that reach more locations across Duval County. They also see the Master Plan as a vehicle for increasing coordination and data exchange across organizational boundaries.

1.2 Leveraging Jacksonville's Current Telecommunications Assets

A Core Finding: The Consolidated Government Has Much of What is Needed to Address Unmet Needs – And To Ultimately Save Taxpayer Dollars While Doing So

Perhaps the most significant finding of this study is that several agencies of the consolidated government already own and operate large telecommunications networks – and that much of these resources are underutilized. Through consolidation of these facilities, there is **a tremendous opportunity to avoid costs, achieve new levels of service, and extend network services to a broader user base**!

JEA has deployed an extensive fiber-optic network that reaches all of its power plants, water treatment plants, power substations, water pumps, and other facilities. JEA runs a variety of network services over this fiber, including point-to-point links, SONET, and gigabit Ethernet. JEA provides conduit space, fiber, and network services to other agencies of the consolidated government and to several carriers providing service in Jacksonville. The network passes within several blocks of most schools, libraries and other public buildings in Duval County. JEA is also experimenting with several wireless technologies, using its fiber network to link wireless access points. JEA operates a 24x7x365 control center that manages its electric, water, and network facilities.

The **City has recently** issued a request for proposal to connect downtown government offices, the Jacksonville arena, Baseball Park and Alltel Stadium.

The Florida Department of Transportation owns conduit and fiber-optic cable along several major highways and state roads in Duval County. Several other agencies own and operate smaller collections of network facilities.

Over 100 miles of new conduit are being placed under major roadway, as part of the Better Jacksonville Plan, (See Volume II, Section 8.0)

Residents and businesses express a high degree of satisfaction with services provided by JEA and by City Government, and are receptive to purchasing telecommunications services from either agency.

1.3 Recommendations - Needs and Assets Provide Opportunity

The future…Campus-Level Networking for Everyone

On many college campuses and corporate office complexes, networking is everywhere. Data wall plugs are at every desk and in every dorm room; wireless networking is common in conference rooms, libraries, auditoriums and outdoor courtyards.

Our ultimate vision is a world where this level of networking is everywhere. On a national and worldwide scale, our challenge is to move the highly interconnected world outward, into our small businesses, to doctors' offices, and to our homes.

This *Telecommunications Master Plan* will move Jacksonville forward into this new world. We recommend the following actions to bring this vision to reality:

1. **Make a Commitment to have Comprehensive Broadband Deployment a City Priority.**

2. **Create a new City Council standing committee,** task force, or other entity focused on telecommunications infrastructure development and application in Jacksonville.

3. **Enact a charter amendment** that provides for JEA deploying telecommunications infrastructure and offering telecommunications services, and specifying a governance structure to hold JEA accountable to users across the consolidated government. Developing and effectively using a consolidated network will require organizational focus from across the consolidated government. JEA is most likely to play a central role, thus, we make this recommendation.

4. **Charge the Jacksonville's Economic Development Commission (JEDC),** to focus on telecommunications infrastructure and its application to expand current businesses and attract new ones to Jacksonville.

5. **Enact a comprehensive right-of-way management ordinance** that requires the installation of conduit in new developments creating "fiber ready" communities.

6. **Enact an ordinance** creating a metropolitan area network, JAXMAN, designating organizational responsibilities and authority for its implementation and operation, directing that all entities of the consolidated government migrate their communications traffic to JAXMAN, and appropriating funds for the detailed engineering design of JAXMAN.

7. **Encourage private sector development of countywide wireless broadband network** through: (a) using the consolidated government as an anchor tenant, (b) providing access to existing sites for facilities, (c) facilitate permitting, and (d) providing reasonably priced access to the JAXMAN.

8. **Create a task force** for improving telecommunications infrastructure in our schools, to coordinate the schools' internal network development and application activities with JAXMAN deployment.

9. **Determine and develop an integrated GIS data base** for the greater Jacksonville. Establish guidelines and procedures to share this critical information for the police, fire, emergency department, property **and** other city departments.

10. **Develop a consolidated inventory** for all telecommunications infrastructure built out or utilized by all consolidated government entities.

11. **Initiate an analysis to determine specific agency telecommunications current costs that can be applied to this network and savings beyond network annual cost.** This requires a circuit by circuit analysis of all telecommunications services.

12. **Offer immediate connectivity** to JAXMAN to SOHO users by wireless connectivity.

13. **Implement a wireless pilot study** to determine the equipment, range, and demand for wireless connectivity to SOHO neighborhood users.

14. **Be Wireless for the Super Bowl –** engage hotel owners, the airport authority, the Sports Complex and Alltel Stadium to implement wireless broadband by Super Bowl 2005.

15. **Long term, deploy fiber to every home, business and school in Duval County.**

1.4 The Core Infrastructure - Jacksonville Metropolitan Network

At its core, this plan calls for integrating an extensive collection of conduit, fiber-optic cable, and switching equipment – currently owned and operated by various agencies of the consolidated government – into a consolidated **Jacksonville Metropolitan Area Network (JAXMAN)** serving 300 public buildings throughout Duval County.

JAXMAN will:

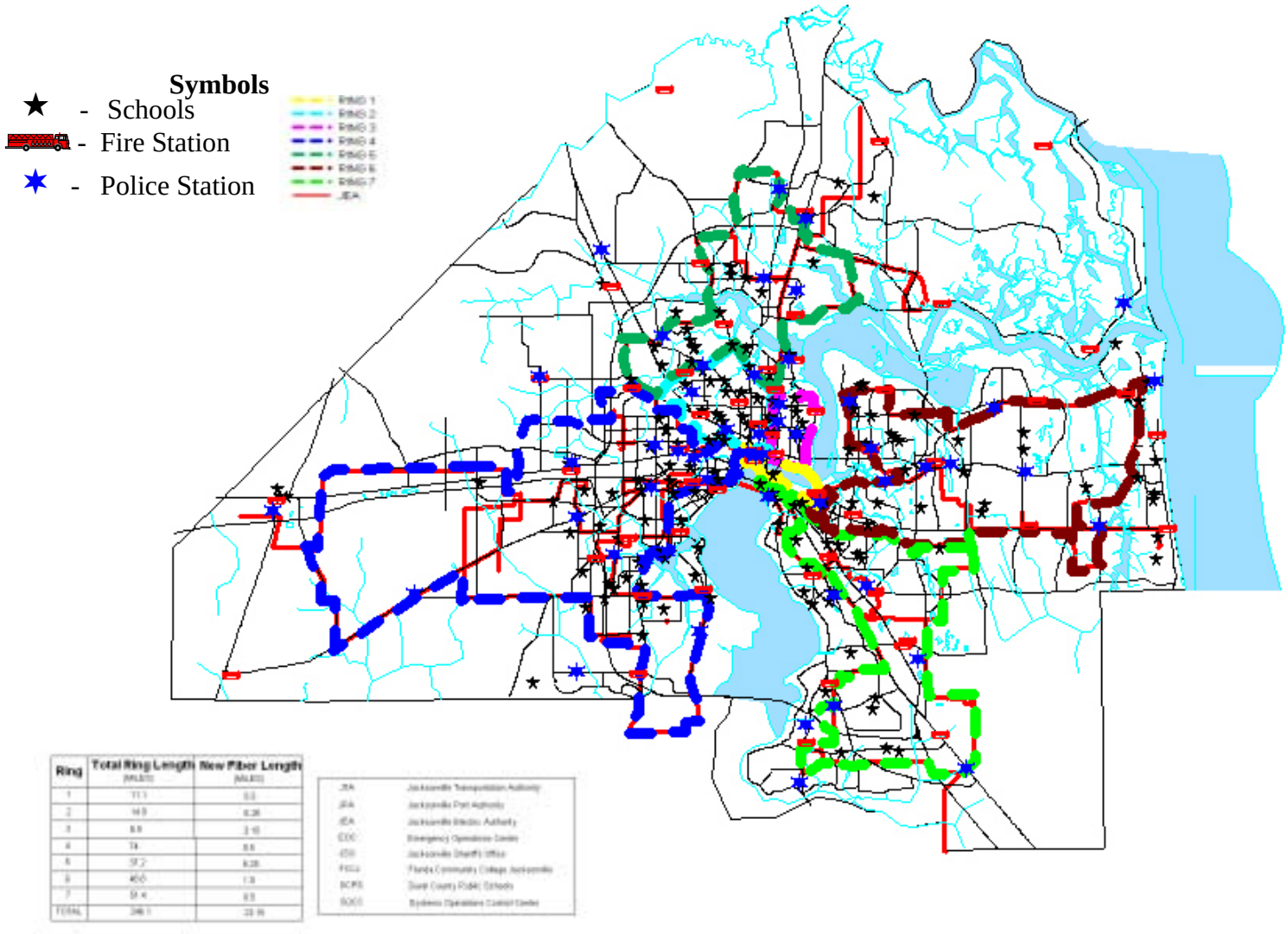
- Be self funding upon completion in two years with the potential to provide additional cost avoidance up to $2 million annually.
- Extend state-of-the-art gigabit Ethernet service (1000 times faster than "broadband" cable modem and DSL offerings) to our schools, libraries, police and fire stations, and other public facilities
- Provide a foundation for improvements in health care delivery, public safety operations, traffic management, and utility operations.
- Provide "backbone" facilities that could be used by competitive private carriers to extend wired and wireless services throughout Jacksonville.

The work already in progress under the **Better Jacksonville Plan**, coupled with a need for infrastructure to support **Super Bowl 2005**, provide an opportunity and a motive to move quickly.

JAXMAN is a consolidated Jacksonville Metropolitan Network that combines existing fiber and interfaces with network devices - owned and operated by various agencies of the consolidated government (notably JEA) – into a single, integrated network. (See figures 1.1 and 1.2).

These facilities are extended to reach a total of 300 sites, including:

- All 163 Duval County schools
- 53 police stations
- 55 fire stations
- The 15 libraries of the Better Jacksonville Plan, including the $95 million dollar, 300,000 square foot downtown main library
- The new $200 million dollar state courthouse.



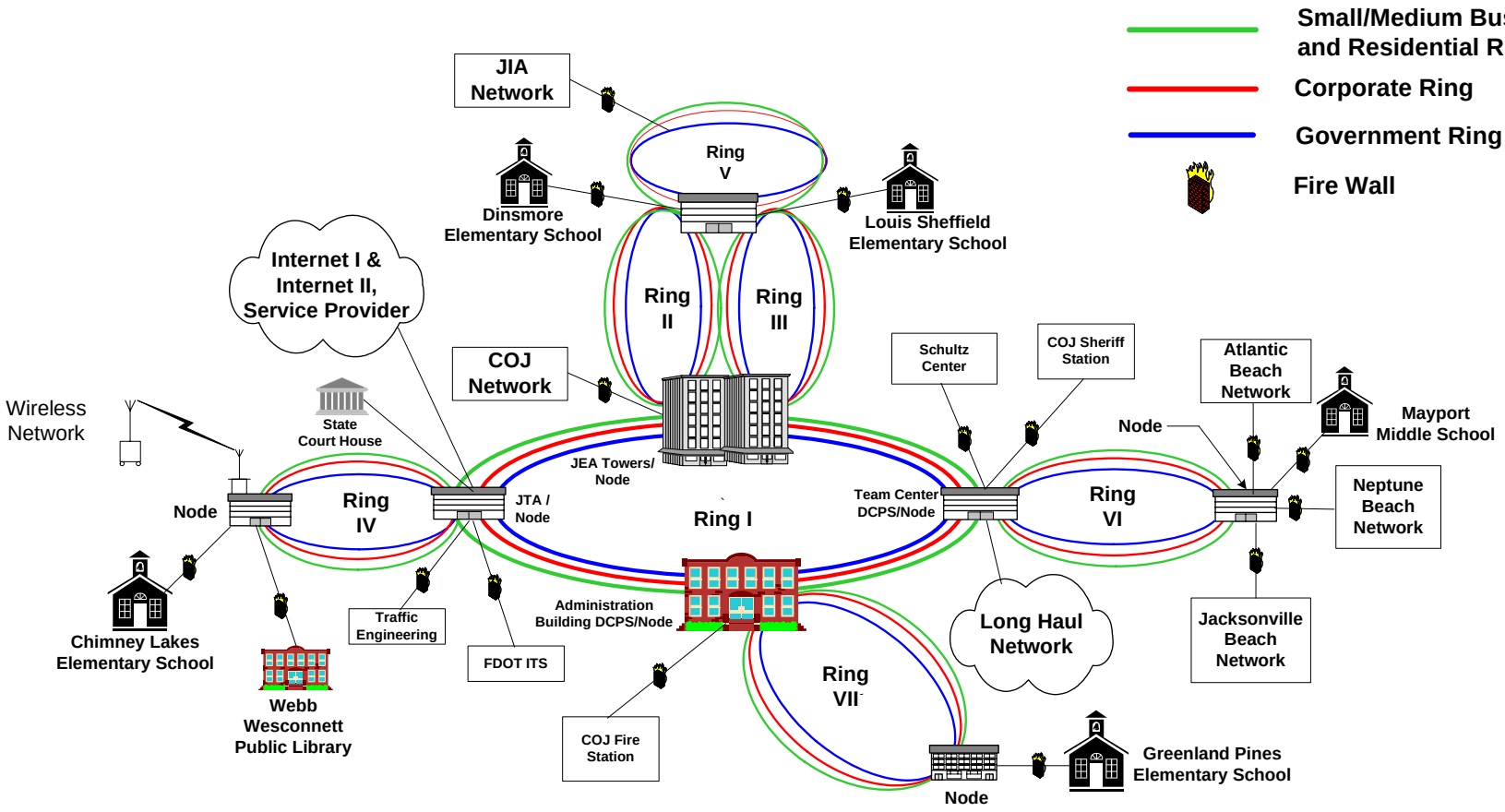
Jacksonville MAN Fiber Infrastructure Conceptual Design

Rings 1-7

Figure 1.1

Abbreviations and Symbols

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
SOCC-	System Operations Control Center



Jacksonville MAN Concept Design
Rings 1-7
Figure 1.2

If the City decides to move forward with the JAXMAN implementation, Jacksonville will experience the following benefits:

1. **Faster Voice, Data and Video Support**. JAXMAN will support a larger amount of traffic at gigabit speeds, allowing agencies both to consolidate all of their existing traffic onto the network and to implement videoconferencing and other high-payback applications that their current networks will not support. The network will support multiple "virtual networks" over the same fiber and switching equipment – allowing individual agencies to maintain the security and privacy of their traffic.

2. **A New Network for the Duval County School System**– which now pays over $1.0 million per year for a 1.5 Mbps network. This updated network will provide gigabit Ethernet to every school, approximately 700 times the speed of current facilities. This will allow for real-time video links between classrooms, video-on-demand, and access to university-based resources. Of particular note will be the ability of all schools to participate, by network, in professional development and other programs originating from the Schultz Center for Teaching and Leadership.

3. **The Jacksonville Fire and Rescue Department** will have a network that provides all 55 fire stations with a gigabit Ethernet connection replacing the current 69 Kbps connection per fire station with 14,000 times the capacity. This means that the City's fire and rescue services can implement today's advanced emergency management applications. This department will be able to quickly access GIS maps and communicate with all effected stations via simultaneous teleconferencing in an emergency. Per Lorin Mock, Jacksonville's Fire Operations Chief, "The receipt, interpretation and dissemination of this data can literally mean life or death for field units and the citizens they protect."

4. **A Significantly Improved Court System and Lower Operational Costs** - Many communities, across the country, are using jail-courthouse videoconferencing for arraignment hearings, which greatly reduces the **time**, **costs**, and **security problems** associated with prisoner transport. Videoconferencing can also **reduce travel** required for attorney-client and attorney-judge conferences, as well as pre-trial motions. Videoconferencing has been used, in Duval County, to obtain expert testimony from a witness in New York City. Support for teleconferencing was built into the new County Courthouse – JAXMAN will provide the connection to other buildings and to the outside world.

5. **Efficient Electronic Records Management -** Agencies, throughout the consolidated government, process and store warehouses full of paper documents. High-speed network services will allow the courts and other agencies to shift paperwork onto electronic records management systems, and to replace thousands of file cabinets with records scanned onto computer disks. Records will become available wherever

needed – for example, the Clerk of the Courts is implementing an electronics records system that will reduce or eliminate the need for lawyers to visit the Clerk's office.

6. **Current consolidated government budgets will support the JAXMAN**. The City's, Duval County School system's and JEA's existing telecommunications budget will cover the costs associated with a new infrastructure. By simply transferring the funds currently allocated for telecommunication services to the JAXMAN operating budget, each government sector will achieve a quantum leap in available bandwidth that will support additional applications. (All figures are in millions.)

Agency	Current Telecom Budget
JEA	$ 1.8
City of Jacksonville	$ 6.0
Duvall County Schools	$ 3.0
Total	$ 10.8

Purchasing telecommunications service from JAXMAN has the potential to reduce the combined budget to $8.8 million in addition to funding the new infrastructure.

7. **The value of the services offered by the JAXMAN to the consolidated government exceeds $10 million if purchased through common carriers.**

8. **The network provides the base for rapid-response, case-by-case extension to any location in Jacksonville where very-high speed network service is needed –** be it by a telecommuter, a doctor's office, a small business, or other location.

JAXMAN will provide a foundation for future expansion of Jacksonville's Telecommunications Infrastructure. Beyond its immediate benefits, JAXMAN will:

- Enable leading-edge applications in health care, disaster recovery and education
- Provide a core network that can be extended to support County-wide applications such as intelligent traffic management (networked traffic sensors, coupled with computer controlled traffic signals have the potential to increase rush-hour speeds by 35%); and,

- Offer “backbone” capabilities that lower the costs to wireless and other carriers seeking to enter the Jacksonville market.

The core network will require a capital investment of $27 million, and will have a positive cash flow by year three at the time of full use by all agencies.

Financial Summary – JAXMAN Capital Fund Balance

(All Figures in Millions)

	Year 1	Year 2	Year 3	Year 10	Year 20
Revenue					
Government Transfers	$ 0	$ 2.3	$ 4.6	$ 4.6	$ 4.6
Expenditures					
MAN Construction	$12.7	$12.7			
Operations Expense	$ 0.5	$ 1.5	$ 1.9	$ 2.1	$ 2.1
Interest Expense	$ 0.4	$ 1.1	$ 1.5	$ 1.0	$ 0.1
Total Expense	$13.6	$15.3	$ 3.4	$ 3.1	$ 2.2
Excess (Deficiency)	($13.6)	($13.0)	$ 1.2	$ 1.5	$2.4
Capital Financing					
Debt Issued	$13.6	$13.0			
Debt Repayment			$ 1.0	$ 1.3	$ 1.2
Change in Fund Balance			$ 0.2	$ 0.2	$ 1.2
Fund Balance, end of year	0	0	$ 0.2	$ 1.5	$ 3.6

Details of the network design can be found in Volume II, Section 16. Financial details can be found in Volume II, Section 14.

1.5 Immediate Step – Make JAXMAN a Reality

All visions require the determination and will to turn them into reality. The City of Jacksonville has the opportunity to transform how telecommunications is offered in the community. The following recommendations are the initial steps required to obtain ubiquitous telecommunications for Jacksonville.

It all starts with JAXMAN:

- Issue an RFP and award a contract for preliminary design sufficient for financing and grant funding.
- Issue an RFP for complete design and construction of JAXMAN.
- Initiate legal work needed to obtain any necessary regulatory approvals.
- Develop a consolidated inventory for all telecommunications infrastructure built out or utilized by all consolidated government entities.
- Perform further financial analysis to determine specific telecommunications current costs that can be applied to this network. This requires a circuit by circuit analysis of all telecommunications services. Identify e-rate funds that can be applied to the operation of the network.
- Authorize bonding or other funding mechanism for the project.

1.6 Conclusion

Our country was built by those who had the vision to dream big and the courage to implement their dreams. The Better Jacksonville Plan demonstrates Jacksonville's determination to make its community an exceptional place to live. It is time to extend this vision to provide Duval County school system with the network it needs to improve education, to give Jacksonville's emergency responders the best emergency response tools available, to create efficiencies throughout the City, to provide collaborative opportunities for it's universities and improve medical services for all.

Jacksonville has the telecommunications infrastructure base, an exceptional service provider and now a plan for becoming a highly interconnected community.

2.0 Introduction

2.1 The Purpose of the Telecommunications Master Plan

On September 5, 2000, the people of Jacksonville went to the polls and voted for the Better Jacksonville Plan - a $2.2 billion dollar investment in fundamental infrastructure.

In February, 2002, the City Council enacted **Resolution 2002-147-A (Appendix A)**, recognizing

> "…the infrastructure needed to properly serve Jacksonville in the information age and knowledge-based economy includes more than traditional utilities such as water, electric, and sewer;" and the "telecommunications infrastructure … is fundamental to Jacksonville's future and must be provided to all citizens and businesses county-wide."

The resolution requested the Mayor's Office to commission a comprehensive **"Telecommunications Master Plan",** including "a cost benefit study of a high speed, county-wide fiber optic/cable telecommunications network." The resolution established a "City Task Force on Telecommunications Infrastructure" to support the planning effort, with representation from across the consolidated government.

The City subsequently solicited bids, and awarded a contract to Black & Veatch, to prepare the Telecommunications Master Plan. A smaller contract was awarded to the non-profit Center for Civic Networking, to support the project. Black & Veatch performed the following tasks:

- Conducted extensive research and gathered information regarding Jacksonville's telecommunications use, needs, and current infrastructure - including 61 interviews, a formal market analysis, review of carrier offerings, and review of facilities owned and operated by agencies of the consolidated government;
- Examined telecommunications strategies from other communities across the country (starting from data gathered by the Telecommunications Task Force);
- Developed multiple designs for consolidating and extending telecommunications facilities owned and operated by agencies of the consolidated government;
- Performed cost/benefit analyses for each of these designs – looking at both direct cost savings to the consolidated government, and at benefits to the full Jacksonville and Duval County communities;
- Examined options for construction, development, ownership, and/or operation of a consolidated network;

- Examined opportunities afforded by the Better Jacksonville Plan, preparation for the upcoming Super Bowl, and other current initiatives;
- Based on the above, develop a detailed design, financial model, and organizational model for a consolidated Metropolitan Area Network (MAN) that best utilizes existing government assets to save costs and extend services;
- Prepared specific recommendations for City Council actions, if the Council chooses to move forward with this Master Plan.

As a result of this work, Black & Veatch and the Telecommunications Task Force determined:

- The Telecommunications infrastructure continues to be of critical importance to Jacksonville's residents, businesses, and public sector.
- Various agencies of the consolidated government, in support of their various missions, own and operate an extensive collection of conduit, fiber optic cable, switching equipment, and wireless facilities.
- Consolidation of these facilities into an integrated metropolitan area network (MAN) has the potential to save the consolidated government at least $2 million/year in operating costs; extend state-of-the-art capabilities to Jacksonville's schools, libraries, and other public buildings; and provide a foundation for improvements in health care delivery, public safety operations, traffic management, and other areas.
- A consolidated MAN would provide "backbone" facilities that could be used by competitive private carriers to extend wired and wireless services throughout Jacksonville. (Note that Bell South, Adelphia Business Systems, and other carriers already lease conduit and fiber optic cable from JEA).
- The JEA already operates a considerable telecommunications network, and provides a well-respected organizational base for operation of a consolidated network.
- Work in progress under the Better Jacksonville Plan, coupled with the need to expand infrastructure in support of Super Bowl 2005, provide an opportunity and an impetus to move quickly.
- These facilities represent a considerable investment of public funds, are significantly underutilized, and thus represent considerable value and opportunity.

3.0 Telecommunications Networks: Fundamental Infrastructure for the 21st Century

Infrastructure ... conveys a sense of pervasive universality. If it isn't everywhere, it isn't infrastructure. Things don't work without it. If something is infrastructure, then the (society/economy/your favorite term) depends on it. When it doesn't work, things are a mess (for some values of it).

Vinton G. Cerf (the "father of the Internet"), in *On National Information Infrastructure,* Bulletin of the American Society for Information Science, December/January 1994

"a seamless web of communications networks, computers, databases, and consumer electronics that … will change forever the way people live, work, and interact with each other."

US. Dept. of Commerce, *National Information Infrastructure Agenda for Action,* 1993

Jacksonville is blessed with extensive and high-quality traditional infrastructure: water, sewer, gas, and electric utilities; local roads and interstate highways; rail connections; an international airport; and a deep water seaport. Over the next few years, this infrastructure will be further strengthened through the Better Jacksonville Plan.

As we move into the information age, computer and network infrastructure have become as important to our daily lives as streets, electric wires, and waterworks. Communications infrastructure glues our society together: mail and package delivery; telephones and fax machines; pagers, cell phones and public safety radios; print and broadcast media. We rely on computers and data networks for electronic mail, news and information; attending remote meetings and classes; financial transactions; coordinating business processes; distributing medical records; directing air traffic; dispatching emergency services; controlling military operations; managing water, gas, and electric utilities; synchronizing traffic signals; even checking movie times. When our networks are down, our businesses, schools, hospitals, government agencies ... our lives.... become paralyzed.

The Future: "Industrial Strength" Telecommunications Infrastructure - Everywhere

Let us be clear: We are not talking about telephones – Jacksonville has telephones. We are not talking about television – Jacksonville has both broadcast and cable TV. We are not talking about dialing up consumer services such as America Online or MSN. We are not even talking about consumer-grade "broadband" – cable modems or DSL services that operate perhaps 20 times faster than dial-up. **We are talking about the kinds of industrial-strength "enterprise networks" that are commonplace in our corporate offices, on our university campuses, in our hospitals, and in our larger public agencies. We are talking about networks that**

operate at gigabit speeds – 1000 times faster than "broadband", 20,000 times faster than dial-up.

Nor are we talking about consumers surfing the web or playing on-line games. We are talking about critical infrastructure for business, medicine, education, and public safety. We are talking about working from home – with full access to the capabilities available in your office. We are talking about doctors looking at CAT scans, in the middle of the night, from anywhere they might be. We are talking about videoconferences among people who might be at home, at work, or waiting in an airport lounge. We are talking about taking a university course, from home, just as if one were sitting in a lecture hall.

Just as electrification changed a daylight-only society to a 24-hour one, "satisfaction" will bring a comparable level of change. We are talking about a new generation of infrastructure that will change our lives as much as irrigation, electrification, railroads, interstate highways, and air transport.

What Do We Mean by Industrial-Strength Networking?

For the technically minded, we are talking about **gigabit Ethernet** operating over fiber-optic cables, and **wireless Ethernet** operating at 10 to 50 million bits per second.

Dial-Up Service: You connect your computer to a phone line, and dial-up a service provider when you want to read email, surf the web, or otherwise access the Internet or your office network. Dial-up service ties up a phone line, requiring a second line if you wish to talk and telecompute at the same time. A typical connection operates at approximately 56kbps (56 thousand bits per second. Downloading a 10 second video clip takes around three minutes, downloading a DVD movie would typically take 10 days).

"Broadband:" Typically refers to cable modem service, from your cable TV provider, or DSL (Digital Subscriber Line) from your telephone company. These services are always on, or more accurately, always-available when your computer is turned on. They provide a separate wall plug – you can talk on the phone, telecompute, and watch TV at the same time. A typical connection operates at 1mbps (1 million bits per second, 20 times faster than dial-up). Downloading a 10 second video clip takes around 10 seconds, downloading a DVD movie would take 10 hours.

Ethernet: The standard networking technology used in corporate networks. Traditional Ethernet, now 20 years old, operates at 10 Mbps (10 million bits per second, 10 times as fast as "broadband" 200 times as fast as dial-up). Downloading a 10 second video clip takes one second, downloading a DVD would take one hour.

Wireless Ethernet: Often referred to as "WiFi" or "802.11": A wireless technology that operates at 11mbps, about the same speed as traditional Ethernet. Newer versions operate at 54 mbps.

Fast Ethernet: Today's most common office networking technology operates at 100 Mbps (100 times faster than "broadband," 2000 times faster than dialup). Downloading a 10 second video clip takes 1/10 second, downloading a DVD movie would take 6 minutes.

Gigabit Ethernet (gigE): Today's state-of-the-practice, and what is being deployed in most new corporate networks. Operates at 1Gbps (1 billion bits per second, 1000 times faster than "broadband" 20,000 times faster than dial up). A 10 second video clip transfers in the blink of an eye, an entire DVD movie can be downloaded in under a minute**.**

See Appendix B for a more detailed overview of telecommunications technology.

We need not look far to see this world of ubiquitous gigabit and wireless Ethernet – a world where networking is so ubiquitous as to be taken for granted; a world where ubiquitous network infrastructure has already changed the ways people conduct their daily affairs.

Walk into any computer store. Even the cheapest computer comes ready to plug into an Ethernet wall plug. $2500 buys a notebook computer with both gigabit and wireless Ethernet capabilities – ready to connect to the fastest networks you can find.

Walk into a corporate office, or onto a university campus. Every office has an Ethernet wall plug, right next to the electric outlet and phone jack - typically operating at least at Fast Ethernet speed. Even dorm rooms are wired up. Unplug your computer, carry it down the hall, and wireless networks keeps you connected – in a colleague's office, conference room, lecture hall, library, cafeteria, even outside on the lawn.

Wherever you are you can read email, surf the web, watch a lecture from a remote campus, research a business project or course assignment. At work you can pull words, data, images, and video from across your organization, build a complex multi-media presentation, email it to a large customer, and then fill out your time card – without leaving your desk. Doctors can access medical records, X-rays, and CAT scans from hospital databases. Engineers can send new designs to factory floor machines. Business teams can take part in videoconferences – from offices across the globe. And, at the same time, and over the same wire, you can make phone calls, watch the latest breaking story on CNN, and listen to music. Meanwhile, in the background, computers are talking to each other: order a product on-line, and messages flow to shipping systems, inventory control systems, and ultimately to your bank's computer; medical record systems talk to insurance company computers; inventory systems send re-orders to vendors; and so on.

This is a world where networking is everywhere, and has become core infrastructure supporting every aspect of life and work, a world where telecommunications infrastructure supports a myriad of applications, driven by economic imperatives.

Expanding the Network's Edge

But this world of ubiquitous networking ends at the office door and the campus wall. Unplug your laptop to head home, and you're suddenly traveling on "electronic dirt roads." You may find the occasional wireless "hotspot" – in a coffee shop, a hotel lobby, or an airport waiting area, but don't expect to connect while riding the bus or train, except perhaps at very slow speeds via a cell phone network. When you get home – unless you live in a dormitory – dialup or consumer broadband will, at best, connect you to your company or campus network at a fraction of the on-site speed. You'll be carrying a computer that can work at blinding speeds, but you're now forced to a crawl.

Teleworkers, outlying offices, smaller vendors and customers cannot access corporate networks to the same degree as those in offices at main locations. Working from home – as a telecommuter, freelancer, or home-based businessperson – can be painful. Transferring a large file – a photograph or business presentation – now takes minutes instead of seconds. The impact is severe if you're a graphic artist who must transfer high resolution images and video files. Taking part in a videoconference may require driving to the office. Taking a college course may require a drive to campus – even though video is being sent over the Internet, your home connection may turn it into jerky, low-quality, slow-moving pictures with scratchy sound. Doctors must still drive to hospitals to access emergency room X-rays and CAT scans, though they might be readily available from offices within the hospital. Small and home-based businesses - unable to acquire network services comparable to their larger competitors – are at a competitive disadvantage.

Our ultimate goal is a world where campus-level networking is everywhere, but today's world consists of heavily networked islands, often well-interconnected with each other, but surrounded by vast seas of isolation. It is a world of information super-highways, connected by private interchanges, to private road networks serving very large organizations. The rest of us must drive on electronic dirt roads, only poorly connected to the superhighways.

On a national and world-wide scale, our challenge is to move the highly interconnected world outward – into our small businesses, to doctors' offices, and to our homes.

4.0 Research, Findings, and Analysis: Jacksonville is Poised for a Major Leap Forward

To understand who lives and works in Jacksonville, their telecommunications use and needs, current telecommunications infrastructure and providers, and what will be needed in the future, Black & Veatch conducted an extensive series of interviews and focus groups. The research drives the *Telecommunications Master Plan.* In conjunction with a subcontractor (Vectren, Inc.) and the City's Telecommunications Task Force, Black & Veatch conducted 61 in-depth interviews with government organizations, businesses and residential communities in Duval County. In addition, 400 residents were surveyed by telephone, and three focus groups were convened (2 of residents, 1 of local businesses). Black & Veatch collected in-depth information from carriers and government agencies regarding their existing telecommunications deployed across Duval County.

The following pages summarize the results of this research. Further details can be found in Volume II Section 9 (Interviews), Volume II Section 10 (Market Survey), and Volume II Section 8 (Existing Infrastructure).

Interviews focused on key sectors of the economy that are heavy users of telecommunications infrastructure:

- Interviews were conducted with roughly 30 commercial and industrial firms, ranging in size from 6 to 15,500 employees.
- Jacksonville is home to the NFL's Jacksonville Jaguars, the PGA Tour, the World Golf Village, the Association of Tennis Professionals, and the PGA Hall of Fame – making sports-related tourism an important sector of the local economy.

  Black & Veatch interviewed top staff of the Jacksonville Sports Complex & Convention Center – who manage Alltel Stadium (home of the Jaguars), the Prime Osborn Convention Center, a new Coliseum slated to open in 2003, a new Baseball Park also slated to open in 2003, and the Times Union Arts Center. Jacksonville will host the 2005 NFL Super Bowl – and the Super Bowl Host Committee was interviewed as part of this study.
- Education is both a major area employer, and critical to maintaining a well-prepared workforce and citizenry – and computers and telecommunications are becoming central to the educational enterprise. Interviews were conducted with the Duval County Public Schools (163 schools, 129,000 students, 8000 teachers, and Jacksonville's 2nd largest employer), Florida Community College at Jacksonville (80,000 students, 5 campuses), Jacksonville University, Bishop Kenny Catholic High School, and The Bolles School – providing a broad view of public, and private education in Jacksonville, from K-University, at schools both large and small.

- Health Care is also both a major employer and a heavy user of telecommunications. Research focused on Baptist Hospital and its affiliated health system – the largest hospital system in Jacksonville.
- Transportation and Utilities represents core infrastructure supporting Jacksonville and Duval County, and increasingly are a heavy user of telecommunications services. Interviews were conducted with the Jacksonville Transportation Authority (bridges, highways, mass transit), Jacksonville Port Authority (seaport), Florida Department of Transportation (highways), and the City of Jacksonville-Public Works Department (local roads). Three of these agencies manage streets and highways, and under-street networks of conduit and fiber optic cables supporting various telecommunications networks. The Jacksonville Electric Authority (JEA) operates an extensive telecommunications network in support of its electric and water operations – and leases facilities and provides services to other government agencies and private carriers. The JEA was a critical source of data used to prepare this Master Plan.
- Government, particularly local government, is a large employer and a major user of telecommunications. Where most private employers concentrate their operations in 1 or 2 buildings, government has facilities spread throughout the community. Police and fire stations, libraries, public works depots, recreation facilities are located across Jacksonville and Duval County – and require extensive network support. During the course of the project, interviews were conducted with numerous public agencies, including the City of Jacksonville, Information Technologies Division (providing network support to most public offices, as well as e-government services to the public), the City Council Auditor, Clerk of the Courts, Housing Authority, Police and Fire Pension Fund, Property Appraisers Office, Public Defenders Office, Regulatory Services Office, Public Works Department, and Supervisor of Elections. Interviews were also conducted with the neighboring cities of Jacksonville Beach, Atlantic Beach, Neptune Beach, and Baldwin – to examine regional needs and potential collaborations. The local State Attorney's Office was also interviewed.
- The needs of Duval County residents were examined in 2 focus groups and through 400 phone surveys. In addition, a local developer of residential and commercial properties was interviewed – focusing on telecommunications needs and infrastructure for new properties.

4.1 How Jacksonville Uses Telecommunications Today

Virtually all the organizations we talked to were using standard telephone services (local, long distance, voice mail, fax) and networked computer applications (electronic mail, file servers, network printers, databases of various sorts, financial transaction systems, payroll systems, etc.). Most maintained a web site, and many provided various forms of interactive services through their web sites (data retrieval, on-line ordering, etc.).

Many organizations operate computing and network applications specific to their fields of endeavor, for example:

- The sports complex maintains video uplink facilities for television broadcasts.
- The Duval County School District runs both administrative applications (e.g. grading) and distributes educational videos over their network.
- Baptist Hospital operates patient accounting and records systems, telemedicine, and teleradiology systems.
- The Jacksonville Fire and Rescue Department currently has a voice and data network between the fire department and all 55 fire stations for emergency management applications.
- The Jacksonville Police Department uses CDPD wireless network to support field officers throughout the county.
- The Jacksonville Transportation Authority uses their network to manage various transit facilities (e.g. the Skyway). They also use their network to transfer engineering documents.
- The Florida DOT operates SunGuide, a traveler information management system containing video cameras, traffic sensors, etc.
- JEA operates an extensive network to manage their electric and water facilities, and is beginning to deploy a wireless network for meter reading.
- Multiple public agencies make extensive use of Geographic Information Systems – to map roadways, pipes, electric wires, etc.
- There is a web-based application that enables remote access to property value data.
- Several respondents indicated that they are transporting building control and/or video surveillance traffic over their networks.

4.2 Jacksonville's Basic Telecommunications Needs are Well Served

Most respondents were using current generation equipment for their operations, and were relatively satisfied with the telecommunications services supporting their current operations:

- Current generation computers and software are in widespread use throughout all sectors of the Jacksonville community.
- Current generation Local Area Networks (LANs) are in widespread use. Most respondents reported deployment of 100 Mbps Fast Ethernet LANs, and several reported deployment of gigabit Ethernet LANs.
- Wireless networks are becoming increasingly common within workplaces and public facilities (e.g. City Hall, Alltel Stadium).

- The City purchases CDPD wireless service for police, fire, and general government use.
- Bell South provides voice and data services to most respondents, at speeds up to 100 Mbps. T1 connections are in common use for both site-to-site links and links to the public voice network and the Internet. Larger organizations are using higher speed services – FCCJ connects to the Internet over a 45 Mbps connection from Bell South; Baptist Hospital connects several sites via a 100 Mbps Bell South service.
- Residents report a high penetration of cable and Internet service, including cable modems and DSL services.
- With several dozen private carriers, providing a mix of voice, data, Internet, cable, and wireless services, Greater Jacksonville's basic telecommunications needs are well served. (See Volume II Section 8).

4.3 But… There is Widespread Demand for Services that are Not Yet Available

While most respondents reported satisfaction with their current services and providers, the interviews disclosed a pent-up demand for services not available in Jacksonville's market, notably:

- Multiple respondents seek faster, less expensive connections between their facilities. Baptist Hospital, in particular, seeks a faster, fault-tolerant alternative to their current high-speed inter-building links. They also seek higher speed, more affordable data services to connect their hospital network to remote "doc in a box" facilities, and to link teleradiology viewing capabilities to all facilities, including radiologists' homes.
- Multiple respondents called for wider deployment of wireless access. Several government agencies, in particular, called for County-wide wireless networks to support mobile employees (e.g. for building inspectors).
- Multiple respondents, from multiple sectors, called for networks capable of handling video and videoconferencing traffic. The Duval County Schools currently transmit video overnight, so that it is available in schools the next morning – a faster network would make video available to schools, on demand. Multiple schools and colleges described a need to "webcast" video – of courses, school events, professional development materials, etc. – to other school buildings and to students' homes. There is also increasing demand for carrying video surveillance traffic for security applications.
- Multiple respondents called for networks that can support videoconferencing. The strongest calls come from the Public Defenders Office, States' Attorneys Office, and other criminal justice agencies – to support jail-courthouse traffic, conferences between attorneys and clients, and conferences between attorneys and judges. There is a specific call for video conferencing in attorneys' and judges' homes to facilitate time critical and off-hours consultations.

- Baptist Hospital wants to extend telemedicine applications to patients' homes.
- Several respondents discussed a need for remote storage area network services and remote data backup for disaster recovery purposes.
- The Supervisor of Elections identified a need for temporary networks at election time – a need that will increase as electronic voting machines are deployed. Several agencies also discussed a need for rapid, temporary network establishment during disaster responses.
- FDOT sees a need for increased network support for Intelligent Traffic Management Systems – for example by extending existing traffic management systems to monitor local streets and control traffic lights.
- The Super Bowl Host Committee identified a need for network support 3000+ media personnel that are expected to cover the event, as well as network services to coordinate thousands of volunteers and local PR and marketing activities. In particular, they call for high-speed data access in Alltel Stadium, the Prime Osborn Convention Center (where media operations will be housed), high-speed data access in the Adams Mark hotel (where NFL personnel will be housed) and in the 2 hotels where the teams will be housed, connections to several cruise ships that will be docked downtown for the event, and high-speed data service to additional locations around town where visitors and staff will be housed.
- The residential picture is a bit murkier. Residents generally report satisfaction with available telephone, cable and Internet options. But at the same time, employers are calling for increased speeds and virtual private network services to support telecommuting, and Baptist Hospital is calling for services supporting telemedicine applications to patients' homes. Thus, the early drive for new services to the home is likely to come from employers and the health care sector. At the same time, a local developer reports that high-speed services will be required in new housing construction, particularly houses aimed at upper-income purchasers. Based on general trends from around the country, we also expect an increasing demand for high-speed, business grade services to support home-based and very small businesses (the "SOHO" market).

4.4 What People Expect from the Telecommunications Master Plan

During our interviews, we asked respondents what they expected from the Telecommunications Master Plan. The answers clustered in several areas:

- There was widespread support for coordinated planning of Jacksonville's telecommunications infrastructure.
- Most respondents were interested in faster, less expensive network service that reaches more locations.
- Many respondents see the Telecommunications Master Plan and network services that may result from it as a vehicle for increasing communications across organizational

boundaries. For example, JTA interacts with FDOT, the Jacksonville Public Works Department, JEA, City Government, Police and the public – and sees a common network as creating operating efficiencies and increased communication. The Clerk of the Courts sees improved networking as a vehicle for streamline data exchange among various court-related agencies. Multiple agencies see a need for improved GIS data exchange.

- Many respondents were interested in the potential economic developments for the City of Jacksonville.

What does Telecommunications Infrastructure Mean to Economic Development

The creation of jobs, wealth, and the improvement of quality of life are all metrics of economic development. It is the base for growth and restructuring of an economy to enhance the economic well being of a community.

- A July 2001 report funded by Verizon contends that if every city deployed broadband services it would add $400 billion to the US economy.[2]

- The US Department of Commerce stated that:

  "The vitality of the digital economy is grounded in the IT-producing industries – the firms that supply the goods and services that support IT-enabled business processes, the Internet and e-commerce" - "The Digital Economy", USDOC.

- A 2002 report prepared by the Shpigler and Ashby Telecom Groups for JEA, predicted that a broadband network for Jacksonville would provide a potential economic gain to Jacksonville of $600 million dollars over the deployment and adoption period.

Many voices from government and industry consider telecommunications the enabler for 21st century economic growth.

4.5 A Core Finding: The Consolidated Government Has Much of What is Needed to Address Unmet Needs – And To Save Taxpayer Dollars While Doing So

Perhaps the most significant finding of this study, is that several agencies of the consolidated government already own and operate large telecommunications networks – and that much of these resources are underutilized. Through consolidation of these facilities there is a tremendous opportunity to save money, achieve new levels of service, and extend network services to a broader user base!

JEA, in order to serve its 335,000 electric customers, 192,000 water customers, and 143,000 sewer customers, has deployed an extensive fiber-optic network that reaches all of its power plants, water treatment plants, power substations, water pumps, and other facilities. JEA runs a variety of network services over this fiber, including point-to-point links, SONET, and gigabit Ethernet. JEA provides conduit space, fiber, and network services to other agencies of the

[2] Source: Verizon, "Internet Technology Report", July 2001

consolidated government and to several carriers providing service in Jacksonville. The network passes within several blocks of most schools, libraries and other public buildings in Duval County. JEA is also experimenting with several wireless technologies, using its fiber network to link wireless access points. JEA operates a 24x7x365 control center that manages its electric, water, and network facilities.

During development of the conceptual design, JEA offered two fibers throughout their main system. This plan utilizes this available fiber only. JEA's overall network operates at full capacity.

The City of Jacksonville ITD is implementing a significant fiber optic infrastructure in the downtown area 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.

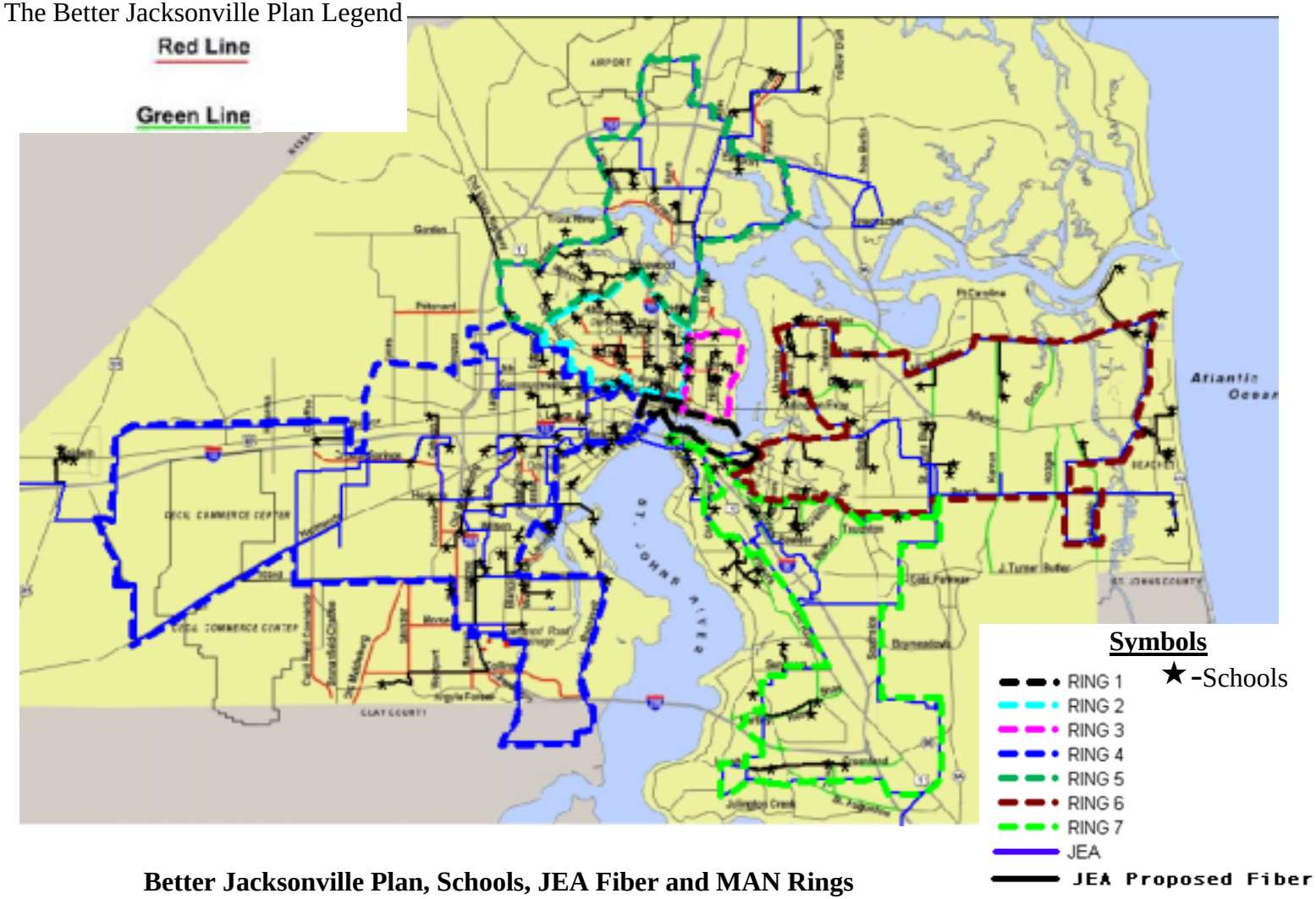
The Florida Department of Transportation owns conduit and fiber-optic cable along several major highways and state roads. Several other agencies own and operate smaller collections of network facilities.

As part of the Better Jacksonville Plan, approximately 154 miles of new conduit are being placed under major roadways. (See Volume II Section 8)

Figure 4.1 illustrates possible uses for this existing infrastructure from consolidating resources to providing network services:

- Schools could be provided with fiber connections using existing and proposed JEA fiber.
- Schools could be provided with fiber connections 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.

Residents and businesses express a high degree of satisfaction with services provided by JEA and by the City government, and are receptive to purchasing telecommunications services from either agency.



Better Jacksonville Plan, Schools, JEA Fiber and MAN Rings

Figure 4.1

5.0 Putting the Pieces Together for Jacksonville

At its core, this plan calls for integrating an extensive collection of conduit, fiber optic cable, currently owned and operated by various agencies of the consolidated government into a consolidated Jacksonville Metropolitan Area Network (JAXMAN) serving 300 public buildings throughout Duval County.

As discussed above, our ultimate goal is a campus-like network that reaches all corners of Duval County – fiber optic cables and gigabit Ethernet to every desktop, and wireless connectivity everywhere. This Telecommunications Master Plan will move Jacksonville toward that vision in manageable steps with meaningful benefits at each step.

Our examination of Jacksonville's existing telecommunications usage, unmet needs, priorities, and existing infrastructure tells us to start with:

- Consolidating existing public sector network facilities with the potential to yield an immediate savings to the consolidated government and enhance services at the same time.
- Extending this network to 163 public schools -- providing them with 700 times their current network capacity.
- Extending this network to the 15 libraries that are being renovated under the Better Jacksonville Plan, as well as police and fire stations and other public buildings.
- Extending the network to serve hotels and other locations critical to Super Bowl 2005.
- Extending this network, on a case-by-case basis, to serve health care, traffic management, and other applications that require capabilities beyond those available in Jacksonville's telecommunications market.
- Providing a capability to extend the network to specific small businesses and/or homes to serve telecommuters, medical applications (teleradiology, telemedicine), distance learning, and videoconferencing.
- Exploring public-private partnerships where JAXMAN can provide a "backbone" around which competing carriers can extend wireless and wired services to a broader range of homes and small offices.

The network will require a public investment of $27 million, most likely through a 20-year bond offering. During the payoff period, the JAXMAN can be funded by existing government budget transfers with the potential upside savings of $2 million.

5.1 Services for the Public Sector, Benefits to the Community

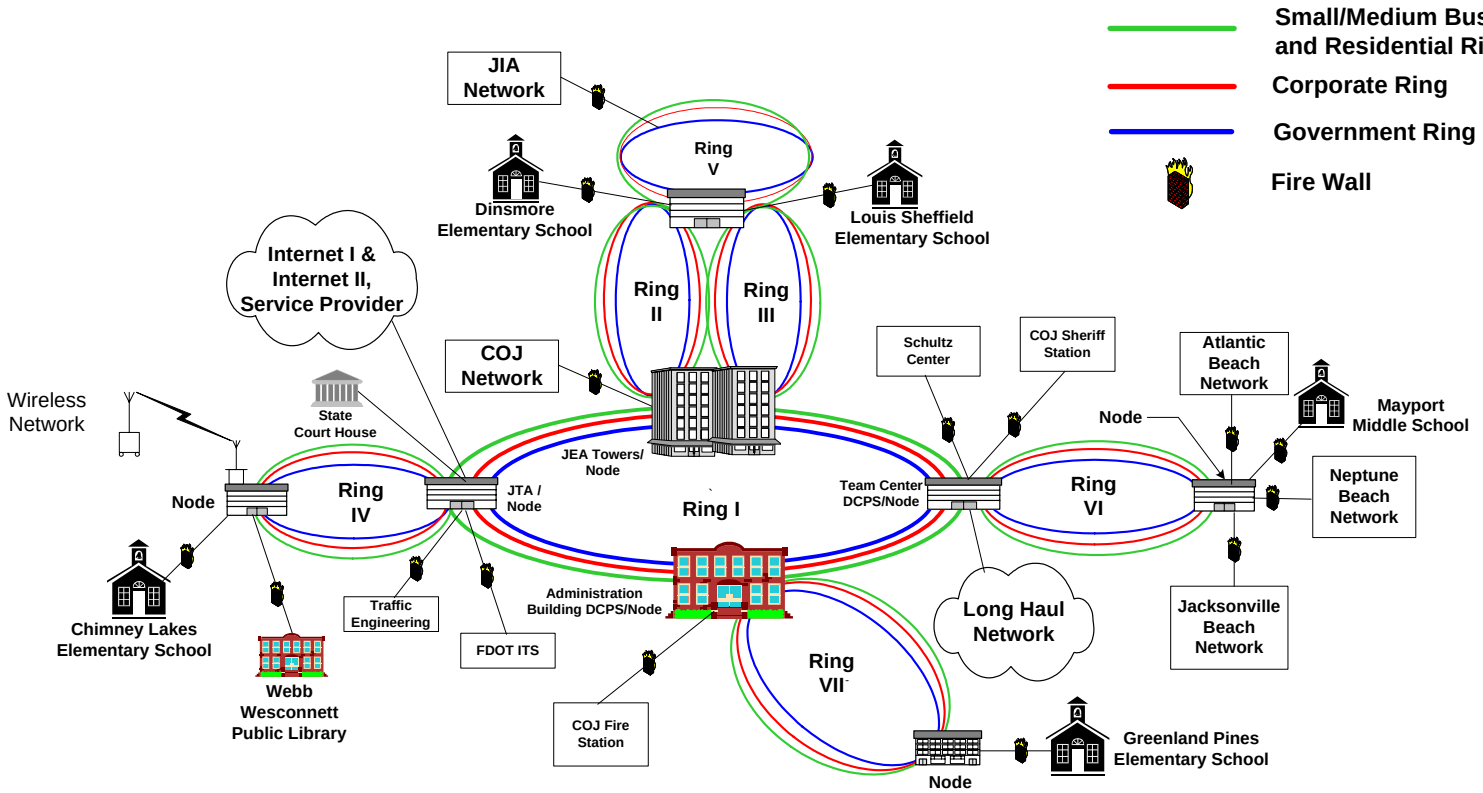
Figures 5.1 and 5.2 show the core design of the JAXMAN. The network consolidates existing fiber infrastructure - owned by various agencies of the consolidated government (notably JEA) – into a single, integrated fiber network.

This proposed network design is a high-speed countywide converged network that integrates the latest transport, switching, wireless and FTTH/B network technologies into one cohesive network. The MAN will initially have the capability to serve 300 sites, including all 163 Duval County Public schools, 53 police stations, 55 fire stations, 15 libraries counting the $95 million dollar and 300,000 square foot downtown main library and the new $200 million dollar state courthouse.

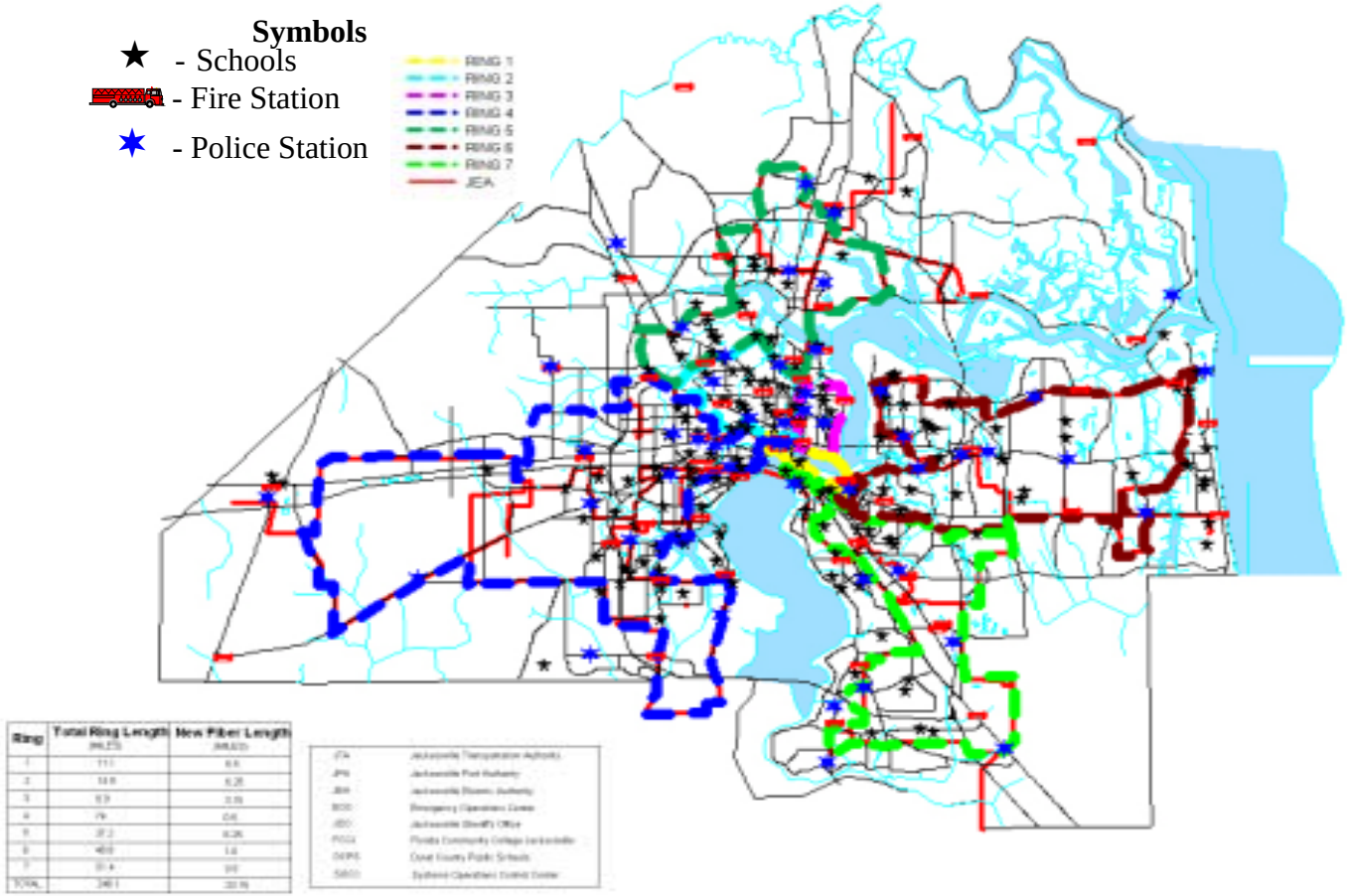
The JAXMAN will provide fast Gigabit Ethernet connections to all 300 sites and support state of the art multimedia applications. See Figures 5.1 and 5.2.

Abbreviations and Symbols

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
SOCC-	System Operations Control Center



Jacksonville MAN Concept Design
Rings 1-7
Figure 5.1



Jacksonville MAN Fiber Infrastructure Conceptual Design

Rings 1-7

Figure 5.2

The network will support voice, data, and video traffic at up to gigabit speeds – allowing agencies both to consolidate all of their existing traffic onto the network and to implement videoconferencing and other high-payback applications that their current networks will not support. The network will support multiple "virtual networks" over the same fiber and switching equipment – allowing individual agencies to maintain the security and privacy of their traffic.

The most immediate benefit from the JAXMAN will be to the Duval County School System. Duval County Public School District 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 8000 teachers. It is one of the largest school districts in the nation and is the second largest employer in Jacksonville.

The Duval County School Board has conducted a preliminary analysis of the impact of having direct network connections to all schools and administration buildings. Their analysis reveals not only significant savings, but also exciting applications such as the ability to utilize full motion video over IP for teleconferencing, video conferencing, and streaming video.

- A JAXMAN that would interconnect every school and student center at gigabit Ethernet speeds would make the imagined applications a reality. It would place the school district on the leading edge of education in the 21st century. Jacksonville University is one of the local colleges that has deployed online learning and utilizes the latest e-learning applications. A JAXMAN with gigabit connections between local colleges and Duval County's 17 high schools would provide the opportunity for students to earn college credit using state of the art applications without leaving their school.
- The Schultz Center is a state of the art facility in Jacksonville designed to enhance the professional skills of all education professionals. It has large auditoriums, individual conference rooms and three computer labs. It also has a multi-purpose resource area to support professional development efforts through an Internet-connected research room linked to city, state and higher education libraries. A high speed JAXMAN that interconnected all schools and the Schultz Center could support high quality professional development to educational professionals not able to attend due to busy teaching schedules. This would provide professional development training available to all educational professionals such as Teacher Induction Program for new teachers, workshops and continuing education required for teacher re-certification, provide flexible training schedules, increase collaboration and mentoring with peers.

A high speed MAN that interconnected all schools could provide learning opportunities for students between schools and the ability to utilize teacher resources more effectively to minimize teacher shortage problems.

- A MAN interconnected between schools and homes would provide the opportunity for home bound children with special needs direct mentoring from teachers. This would also provide a tool for parents to be more actively engaged with the schools.
- Almost an unlimited number of technologies could be applied. Such technologies as PC-based interactive courseware, total immersion virtual reality, stereoscopic visualization, partial task virtual workbench, and stereoscopic projection would be applicable county-wide with this advanced network.

Currently, 50% of the 163 school classrooms are wired to support computers in the classroom. Renovating a school to support 5 computers per classroom and meet specific codes is a major financial challenge. The costs range from $500,000 to $1.5 million per school. JAXMAN provides potential cost savings to the school district that could be utilized to renovate schools to support computers in every classroom and provide the opportunity for high quality education to every child while increasing network speeds to the schools up to 700 times.

John Fryer, Superintendent of Duval County Public Schools said

"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 School District strongly advocate adoption of the proposed gigabit Ethernet as an important solution to our urgent needs."

A high-speed countywide JAXMAN would aide in public safety and law enforcement. EMT and paramedics with mobile access to voice, data and video networks for communication with doctors en route to hospitals would aid in patient care. Video images, audio, vital signs, and ECG rhythm strips captured from within a moving ambulance and transmitted over a wireless network and MAN to a team of doctors at a hospital would increase the quality of initial care, save time, and save lives.

Jacksonville's Fire and Rescue Department could utilize the JAXMAN to implement state of the art emergency management applications between the 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."

Jacksonville's traffic management could utilize the JAXMAN to implement an Intelligent Traffic System (ITS). ITS would aid traffic management such as monitoring traffic flow of streets, highways and interstates with the use of Web cams connected with fiber extensions from the JAXMAN and adjust traffic signals as required. This application would help minimize congestion, especially along University and Beach Boulevards. It could also track and dispatch transit and public safety fleets, and decrease congestion by rerouting traffic flow around traffic accidents and construction. Fred Kyle, Division Chief of Traffic Engineering noted

> "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."

A JAXMAN would provide the potential to significantly expand telemedicine applications and make it widely accessible, support local research and interconnect area hospitals using gigabit network connections. This would present numerous benefits to doctors, medical professionals and patients.

Several initiatives in Jacksonville reflect the growing application of telecommunications in patient care, medical education, and health care administration.

- Jacksonville's Mayo Clinic uses videoconferencing to link the Mayo's sister sites in Rochester, MN, and Scottsdale, AZ. "We use telemedicine internally to link doctors in all our sites," said Carol Chaffin, specialist in marketing and communications at Mayo Clinic and St. Luke's Hospital. "Our doctors can link up with each other as they perform `grand rounds,' which are meetings with other physicians to discuss patient cases and to brainstorm."[3] Doctors at Mayo Clinic Jacksonville also use telemedicine as a way to communicate with patients. The technology uses phone lines and computers to allow doctors to monitor elderly patients without having to make hospital visits.
- Dr. Edward Bayne, University of Florida director of pediatric echocardiography in Jacksonville is also very excited about telemedicine. "Now specialists can be in two places at one time," said Dr. Edward.

[3] Telemedicne links patients, healthcare around the globe; The Business Journal , January 29, 1999

- A countywide MAN in Jacksonville would provide the potentials for telemedicine applications to be widely accessible, support local research and interconnect area hospitals using gigabit Ethernet such as Baptist's 5 hospitals that serves the metro area.

Early benefits will also go to the court system, where video links can provide a high and immediate payback. Many communities across the country are using jail-courthouse videoconferencing for arraignment hearings - greatly reducing the time, costs, and security problems associated with prisoner transport. Videoconferencing can also reduce travel required for attorney-client and attorney-judge conferences, as well as pre-trial motions. Videoconferencing has been used in Duval County to obtain expert testimony from a witness in New York City. Support for teleconferencing was built into the new County Courthouse.

Agencies throughout the consolidated government process and store warehouses full of paper documents. High-speed network services will allow the courts and other agencies to shift paperwork onto electronic records management systems, and to replace thousands of file cabinets with records scanned onto computer disks. Records will become available wherever needed. The Clerk of the Courts is in the process of implementing an electronics records system, that once on-line, will reduce or eliminate the need for lawyers to visit the Clerk's office.

The network has the potential to save the consolidated government approximately $2 million annually by off setting existing costs while providing tremendously increased capabilities. Further, indirect returns will result as agencies implement productivity boosting applications enabled by the new network (e.g. jailhouse / courthouse videoconferencing).

The core network will require a capital investment of $27 million. Figure 4.2 illustrates net cash flow, assuming a 20-year bond, at 5.5%.

Details of the network design can be found in Section 15. Financial details can be found in Section 13.

5.2 Super Bowl 2005

Super Bowl 2005 will require network support to the Alltel Stadium, Prime Osborne Convention Center (where 3000+ journalists will be based), and various locations housing the teams, NFL staff, support staff, and others involved with the game.

While Bell South and other carriers will provide much of these services, JAXMAN will serve, or pass near at least some of these locations – providing an additional alternative to the Super Bowl organizers, an opportunity to lease services to other carriers, and a potential

source of capital for JAXMAN expansion to selected locations. It also provides an option for hotels seeking to bring high-speed Internet services to their guests.

In particular, the Super Bowl represents an opportunity to expand JAXMAN to serve the Sports Complex, Convention Center, and selected hotels.

5.3 Case-By-Case Extension to Selected Locations

The interviews and market surveys presented in Volume II Sections 9 and 10 indicate that it is premature to extend the network on a countywide basis. Cable modem and DSL offerings seem to be sufficient to address most current demand.

At the same time, there is a pressing demand for very high speed network service in selected, widely dispersed locations to support small and home based businesses, doctors' offices, and some telecommuters.

We recommend a point-to-point and point-to-multipoint wireless deployment to offer 2 to 6 Mbps service. We estimate a one-time cost of $1,634 to set up a new site that which if amortized over 3 years would cost a user $45/month. The estimated recurring cost for a user is $50 per month.

We expect that as the number of case-by-case users grows demand will reach a level that stimulates market entry by private carriers. Alternatively, demand will improve for a countywide build out of JAXMAN.

5.4 Building a Foundation for the Future

JAXMAN will provide a foundation for future expansion of Jacksonville's Telecommunications Infrastructure. JAXMAN will:

- Provide near-term cost savings and enhanced services to public agencies, with particular benefits to the Duval County Public Schools;
- Support leading-edge applications in health care, education, and in the courts;
- Provide a core network that can be extended to support County-wide applications such as intelligent traffic management (networked traffic sensors, coupled with computer controlled traffic signals have the potential to increase rush-hour speeds by 35%); and,

- Offer “backbone” network capabilities that lower the costs to wireless vendors seeking to enter the Jacksonville market.

6.0 Recommendations - Getting the Ball Rolling

Dedication and action on part of the City is required to implement a state-of-the-art gigabit Ethernet service to Jacksonville's schools, libraries, police and fire stations, and other public facilities to provide "backbone" facilities that could be used by competitive private carriers to extend wired and wireless services throughout Jacksonville.

The deployment of a fiber optic network throughout the City of Jacksonville will return significant quantitative and qualitative benefits to the City. Our recommendations as listed below provide the action required to become a connected community and to achieve the associated benefits. The organization of the recommendations adheres to the implementation phasing presented throughout the report.

6.1 Commit to the Project

This endeavor will involve significant investment and changes to current ways of doing business that must coordinate across the consolidated government. Formal actions are required to move this project forward. We recommend the following:

1. **Make a Commitment** to have comprehensive broadband deployment be a City Priority. This commitment requires legal, organizational, and financial support for deployment and future operations.

2. **Create a new City Council standing committee,** task force, or other entity focused on telecommunications infrastructure development and application in Jacksonville. This entity may be a new City Council standing committee, task force, or other entity focused on telecommunications infrastructure development and application utilizing existing talent from the City of Jacksonville, JEA, and JTA and Duval County Public School District telecommunications staff. One of the initial tasks is to create telecommunication infrastructure rules and standards to maximize the use of the existing government telecommunications infrastructure.

3. **Enact a charter amendment** that provides for JEA deploying telecommunications infrastructure and offering telecommunications services, and specifying a governance structure to hold JEA accountable to users across the consolidated government. Developing and effectively using a consolidated network will require organizational focus from across the consolidated government. The JEA is most likely to play a central role, thus, we make this recommendation.

4. **Charge the Jacksonville's Economic Development Commission (JEDC)** to focus on telecommunications infrastructure and its application to expand current businesses and attract new ones to Jacksonville. This would support the Chamber of Commerce's agenda in recruiting information technology industries to initiate economic development in the Jacksonville metropolitan area.

5. **Enact a comprehensive right-of-way management ordinance** requiring the installation of empty conduit in new developments, thereby creating "fiber ready" communities; the creation and maintenance of a right-of-way documentation process; and mandatory participation in the documentation process by contractors when installing any type of infrastructure within City rights-of-way. A draft of an ordinance is in Appendix C.

6.2 Begin the Network

The core of our recommendation is to develop JAXMAN, and put it to effective use. This will require organizational focus across the consolidated government. During the research phase of this project, Black & Veatch and the Telecommunications Task Force examined telecommunications projects carried out by local governments across the U.S. and Canada. A fundamental message emerged: the most successful projects have been conducted under the aegis of well-managed and financially sound municipal electric utilities – which typically operate extensive internal networks to support utility operations, have much of the human organization needed to manage a utility, and have a 24x7x365 mission-critical mindset. JEA fits this model and is the obvious candidate to make JAXMAN a reality. Thus, we recommend that a critical step forward is to:

6. **Enact an ordinance** creating a metropolitan area network, JAXMAN, designating organizational responsibilities and authority for its implementation and operation, directing that all entities of the consolidated government migrate their communications traffic to JAXMAN, and appropriating funds for the detailed engineering design of JAXMAN.

    - As part of the JAXMAN ordinance, **amend purchasing regulations and procedures** to prevent consolidated government agencies from signing any long-term telecommunications service contracts that would preclude their use of JAXMAN as it becomes available.

    - Also as part of the JAXMAN ordinance, **direct that consolidated government agencies be required to use JAXMAN** unless it is unable to deliver required services.

Identification of all telecommunications infrastructure is important for the planning and designing phase of JAXMAN. This identification process applies both to exterior facilities, such as fiber optic cables, and the usage of communication circuits. Two key steps in this identification process are:

7. **Develop a consolidated inventory** for all telecommunications infrastructure built out or utilized by all consolidated government entities, especially the City of Jacksonville, JEA, Florida Department of Transportation and JTA.

8. **Initiate an analysis to determine specific agency telecommunications current costs** that can be applied to this network and savings beyond network annual cost. This requires a circuit-by-circuit analysis of all telecommunications services.

The Jacksonville community can benefit from prompt application of wireless technology as described later in this report. Therefore, we recommend that the City:

9. **Offer immediate connectivity** from JAXMAN to small office / home office users by wireless connectivity. The wireless network connections will support between 3 and 10 Mbps, which is 3 to 10 times faster than cable modems and DSL.

10. **Implement a wireless pilot study** to determine the equipment, range, propagation characteristics and demand for wireless connectivity to SOHO neighborhood users.

11. **Wireless for Super Bowl 2005 -**engage hotel owners, the airport authority, the Sports Complex and Alltel stadium to implement wireless broadband to guests and visitors by Super Bowl 2005. This could be implemented by creating a tack force of hotel owners or managers to develop the needs, coverage areas and implementation plans. A secondary purpose of this task force is to serve as a focal point for the networks and sporting teams as they travel between hotel and stadiums and make arrangements to use City facilities.

12. **Determine and develop an integrated GIS database for the greater Jacksonville.** Establish guidelines and procedures to share this critical information for sheriff, fire and rescue departments, JEA, property and other city agencies and departments. GIS could be applied into traffic and law enforcement and would improve response times location determination and data tracking.

6.3 Expanding the Network

Momentum in the initial implementation of telecommunications facilities can bring benefits to the private sector and the schools. The City's active support should extend beyond meeting the internal government needs. The following can provide this support:

13. **Encourage private sector development of countywide wireless broadband network** through: (a) using the consolidated government as an anchor tenant, (b) providing access to existing sites for facilities, (c) facilitate permitting, and (d) providing reasonably priced access to the JAXMAN.

14. **Create a task force** utilizing existing talent from the consolidated government's telecommunications staff for improving telecommunications infrastructure in the schools, to coordinate the schools' internal network development and application activities that will be available.

15. **Deploy fiber to every home, business and school** in Duval County. The ultimate infrastructure for connectivity to all.

6.4 Get to Work

Finally, and most importantly, get to work:

- Issue an RFP and award a contract for preliminary design sufficient for financing
- Issue an RFP for complete design and construction of JAXMAN.
- Initiate legal work needed to obtain any necessary regulatory approvals.
- Develop a consolidated inventory for all telecommunications infrastructure built out or utilized by all consolidated government entities.
- Perform an analysis to determine specific telecommunications current costs that can be applied to this network. This requires a circuit-by-circuit analysis of all telecommunications services.
- Authorize bonding or other funding mechanism for the project.

The vision started in 2002 by the Jacksonville City Council and Mayor John A. Delaney has the opportunity to become real – to provide the infrastructure needed to properly serve Jacksonville in the information age; a telecommunications infrastructure highly interconnected throughout the community; a fiber optic, gigabit Ethernet network.

With JEA, a utility service provider well accepted by the community, an extensive telecommunications infrastructure with capacity to allow for additional uses, telecommunication budgets that can be applied to self service Jacksonville is positioned to develop, fund and operate a telecommunications network for their future.

The benefits to Jacksonville's schools, fire and rescue department, court system and City operations combined with the economic development opportunities make this an opportunity requiring action - action to commit, plan and build the future of Jacksonville.