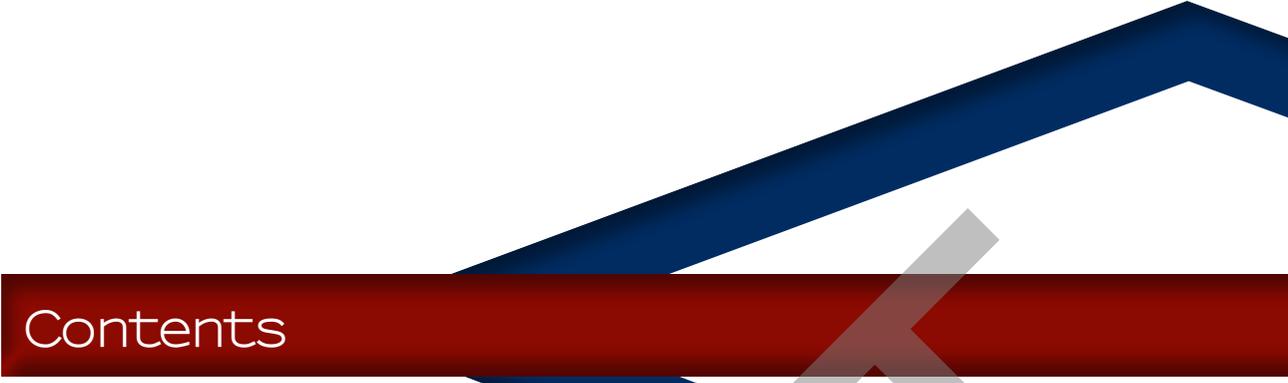




Arkansas Enterprise Network Strategy



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Executive Summary

The public sector communications infrastructure is one of the most critical components for carrying out the work of the people. Government agencies are challenged with unprecedented pressure to provide citizens, employees and other agencies with the services such as Next-Generation 9-1-1, video arraignment, video visitation, telehealth, real-time traffic measurement, smart utility metering and improved access to citizen services. These are enabled by next-generation applications and technologies such as Unified Communications (UC) and real-time collaboration solutions, mobile broadband, video surveillance, high-definition video, multimedia Web applications and other solutions.

Today's network plays a mission critical role in the execution of business functions and processes of the state of Arkansas. With the need to provide 24-hour access to information for the Arkansas Crime Information Network, the Department of Health, the Department of Emergency Management, the Arkansas State Police, the Department of Correction, the Department of Human Services and numerous other agencies that support the health and safety of the citizens of Arkansas, the next generation enterprise network supports the missions of providing services to Arkansas citizens.

Broadband is a foundation for economic growth, job creation and a better way of life. It is changing how we educate children, deliver health care, manage energy, ensure public safety, engage government, and access, organize and disseminate knowledge. As of October 2012, 72.4 percent of American households (88 million households) have high speed Internet at home—a 3.8 percentage point (5.5 percent) increase over the July 2011 figures.*

Bandwidth demand is soaring and in the process of straining current network capacity and performance to the breaking point. Federal, state and local governments are challenged to cost-efficiently deliver these high-bandwidth services over a mix of circuit- and packet-switched telecommunications core and access networks. Network evolutions, expansions

and enhancements are spurring innovative solutions to old problems and creating compelling benefits for constituents. To keep up and prepare for the future, public sector agencies are turning to next-generation networks.

*National Telecommunications and Information Administration (NTIA) June 6, 2013

Background

State network capabilities are being enhanced by the Next Generation State Network (NGN) as a combination of Multiprotocol Label Switching (MPLS) and Wide Area Ethernet (WAE) network elements are being implemented to address current and future requirements of the state network by providing network transport functions that allow high-performance packet forwarding with minimal overhead. Department of Information Systems (DIS) provides key public safety and public health systems access and support to critical state functions by providing operations 24-hours a day, every day of the year.

The ATM and Frame Relay technologies still represent a significant portion of the state network today and are being phased out by commercial carriers over the next few years because of higher cost. As the state moves towards the convergence of traditional voice, data, video, IP based voice and video, the new technologies allow for improved management and efficiencies. The state is experiencing dramatic growth in demands on voice, video, data, and radio wireless services. Next-generation networks are based on Internet technologies including Internet Protocol (IP) and MPLS and at the application level, Session Initiation Protocol (SIP).

Enterprise Network Mission Statement:

To provide highly available voice, data and video services to employees, citizens and business partners anytime, anywhere on any device.

Enterprise Network Defined

The Arkansas Enterprise Network is a single telecommunications network that's able to transport all information and services, including voice, data and multimedia. And while this may not have been the case a decade ago, IP based Wide Area Networks (WANs) are now robust enough to deliver comparable quality of service to circuit switched networks. The case for enterprise network rests on the ability to eliminate duplicate infrastructure, lower management costs and allow governments to move from proprietary to open standards-based equipment and services.

This Arkansas Enterprise Network provides for a secure enterprise network that will facilitate the convergence of data, voice and video technologies into a single network infrastructure that supports the efficient operation of applications and services across the entire public sector environment enabling users to get the information content they want, in any media/format, over any facilities, anytime, anywhere, and in any volume.

Some of the benefits are:

- More cost effective bandwidth and more bandwidth options
- More Quality of Service (QoS) options
- More robust and redundant backbone
- Significant reduction in the complexity in the core network
- Increased reliability
- Improved network performance
- No known scalability bound

Some of the characteristics important in an enterprise network environment are:

Ubiquitous, real-time, multi-media communications

This includes high-speed access and transport is available for any medium, anytime, anywhere, and in any volume providing services akin to communicating in person.

More “personal intelligence” distributed throughout the network

This Includes applications that can access users’ personal profiles, learn from their behavioral patterns and perform specific functions on behalf of them.

More “network intelligence” distributed throughout the network

This includes applications that know about, allow access to, and control network services, content, and resources.

More simplicity for users

This shields users from the complexity of information gathering, processing, customization, and transportation. It allows them to more easily access and use network services and content, including user interfaces that allows for natural interactions between users and the network.

Personal service customization and management

This involves the users’ ability to manage their personal profiles, self-provision network services, monitor usage and billing information, customize their user interfaces and the presentation and behavior of their applications, and create and provision new applications.

Intelligent information management

This helps users manage information overload by giving them the ability to search for, sort, and filter content, manage messages or data of any medium, and manage personal information (e.g., calendar, contact list, etc.)

Communications technologies are being driven by the growing demands of a mobile and agile workforce and the increasing migration of government services online. Government requires that new communications services offer greater security, availability, and performance while reducing costs, improving operations, and enhancing services to citizens.

In Arkansas, network service requirements are being transformed by the needs of business and government such as:

- The rapid convergence of voice, data and video requiring greater bandwidth over Internet protocol platforms
- Growing attention to network reliability and security with increased connectivity to data centers and the emergence of cloud services
- Increased demand for mobility, portability, and wireless
- Evolving requirements for remote offices and remote workers

The state of Arkansas network, StARnet, is a private network for the exclusive use of Arkansas government and education entities. **(See Appendix A: StARnet, Arkansas' Private Network)** StARnet capabilities are being enhanced as a combination of MPLS and Ethernet network elements of the next generation network are implemented to address future requirements of the state network.



Strategic Objectives

Strategy: Enhance statewide network access

Objective: Developing partnerships and contracts with local communications providers, allows the state network to provide internet services to rural and metro government agencies and schools thereby giving local providers the ability to offer new communications services to area residents. The state will work with the local providers to address current and future needs of the enterprise network relating to increased bandwidth, low network latency, reliable services, security, privacy, wireless connectivity, and low-cost access for the public sector. Enhancing broadband services that are available, accessible and affordable is critical.

Strategy: Increase bandwidth as required

Objective: Demands for internet access continue to increase by government and education entities to support business functions that ultimately benefit citizens. Many citizens no longer consider going to an office to stand in line as an acceptable form of interaction with government. To meet those needs, state government requires fast and reliable internet connectivity to function during peak access times and to accommodate failover. As the demand for bandwidth continues to rise, the core's capacity, too, must increase to help manage the additional workload created by greater bandwidth demand. Because broadband demands are growing quickly, it's necessary for the state of Arkansas to consider the infrastructure being deployed. The state's infrastructure must be able to accommodate bandwidth demands which could grow exponentially every 24-36 months.

Strategy: Expand network connectivity

Objective: Broadband services are no longer one of life's luxuries. It is becoming a way of life. In tough economic times, the risk of pandemics, and the rising costs of fuel and energy, people are looking for alternate ways to conduct business. E-commerce, mobile computing, video conferencing, and voice-over-IP are all services that are becoming integrated as business standards for state government or public schools.

Mobility of the workforce and education are becoming increasingly important. Employers and teachers are currently evaluating the use of technology incorporating remote locations. Plus, Ethernet services have allowed many rural schools to remain open and meet their classroom technology needs, primarily through the use of video conferencing. For example, StARnet hosts about 24,000 video conference hours for K-12 schools and approximately 4,000 video conference hours for state government agencies annually.

In order for state government and education to deliver the necessary services to its people, a network infrastructure must be in place and available to all. To meet the business needs of StARnet stakeholders, bandwidth must continue to increase to support new technologies.

Strategy: Improve statewide mobile communications

Objective: A multi-technology strategy to improve mobile connectivity can help address internet coverage issues in remote areas. In order to advance Arkansas's statewide network, StARnet must be upgraded to extend greater bandwidth, broadband services, and depth to all rural communities using wireline, cable, fiber optic, wireless, and other commercially viable emerging technologies.

Emergency communications in Arkansas requires a statewide mobile broadband emergency communications network that is accessible anywhere, anytime to first responders and other public safety partners. The Arkansas Wireless Information Network (AWIN) provides the State of Arkansas with a statewide wireless network for public safety and first responders with a focus on interoperability. Interoperability gives those with AWIN compatible equipment the ability to talk anywhere with the coverage area.

The ability to consolidate communications functions and services into an improved streamlined service model built around the Internet Protocol (IP) could give the state many valuable applications that could be used by government agencies and schools.

To meet strategic objectives, the State will continue to be the anchor tenant for the enterprise network to spur deployment of broadband networks that can support the convergence of voice, data and video technologies.

Trends

- All wireless office
- Hyperconvergence is the key emerging trend, breaking down boundaries among computing, storage and network infrastructure and between applications and infrastructure. In the era of hyperconvergence, all services are delivered by a common Internet Protocol (IP) network-not only for voice, video and data but also for wired and wireless, and for storage and computing.
- The evolution of networks must allow for the continuation of, and interoperability with, existing networks while in parallel enabling the implementation of new capabilities.
- The basic criterion for Quality of Service (QoS) evolution is "subjective user satisfaction", e.g. speed, accuracy, reliability, and security.
- Considering that the enterprise network involves a broad series of protocols at both service and network levels, it is essential to ensure interoperability between different systems and networks.
- Security is crucial as it is in today's network environment. Security issues interrelate with architecture, QoS, network management, mobility, charging and payment.
- Users and devices have the ability to communicate and to access services irrespective of change of location or technical environment including the ability to communicate from various locations using a variety of terminal equipment, with or without service continuity while in transit or while changing access means. This includes recognition of the need to converge the previously distinct worlds of fixed and mobile telecommunications into a coherent whole.

Technology Affecting Arkansas

Broadband

Broadband refers to telecommunications providing a high-speed, 'always-on' service connection to allow large amounts of information to be conveyed quickly, such as digital content, applications, graphic files, and video. 4G/5G pervasive bandwidths and further wireless generations will deliver high-speed, low-latency communications, multiple "pervasive" networks, and interoperable systems. Near Field Communication (NFC) is a short-range wireless technology that will be built into a majority of mobile devices by 2015. Unlike Bluetooth, NFC-enabled devices can interact with passive radiofrequency identification technology that could be embedded in posters, credit/debit cards, packaging, and products. NFC can also be used peer-to-peer with another NFC device.

In the 89th Arkansas General Assembly, Regular Session, 2013, Act 1168 created a state broadband manager to promote, develop, and coordinate broadband expansion and appropriate broadband infrastructure for all areas of the state. The director of the Department of Information Systems was designated as the broadband manager, serving as a single point of contact for:

- state agencies, boards, commissions, and constitutional officers, including without limitation the Governor, Department of Education, Department of Higher Education, and the Arkansas State Highway and Transportation Department;
- Private businesses, enterprises, and broadband providers;
- Nonprofit organizations;
- Governmental entities and organizations organized under federal law or the law of another state; and
- Individuals and entities that seek to assist the state's efforts to improve economic development, elementary education, and secondary education through the use of broadband technologies.

On January 8, 2013, the FCC announced up to \$400 Million for the Healthcare Connect Fund to create and expand telemedicine networks and to provide increased access to medical specialists.

In June 2013, President Obama announced the ConnectED initiative to connect 99% of America's students to the internet through high-speed broadband and high-speed wireless within 5 years calling on the FCC to modernize and leverage the existing E-Rate program to meet this goal.

In July 2013, Arkansas Governor Mike Beebe appointed a task force, FASTER (Fast Access for Students, Teachers and Economic Results) to study schools' broadband access availability statewide to support Common Core State Standards in public schools.

On July 19, 2013, the Federal Communication Committee (FCC) launched a modernization of the E-rate program to deliver students and teachers access to high-capacity broadband nationwide. The revitalized E-rate program will focus on 21st century broadband needs of schools and libraries.

The National Broadband Plan, Connecting America, is an important enabler for 21st century care, economic opportunity, job creation, education, health care, energy and environment, government performance, civic engagement, and public safety. It is changing how we educate children, deliver health care, manage energy, ensure public safety, engage government, and access, organize, and disseminate knowledge. Reliable, pervasive access to the network will further drive higher-level trends, such as instant information access, mobile transactions, collaboration, social networking, and the "Internet of things". Initial NFC applications include identification and mobile payment, but usage is expected to expand to include a broad set of entertainment, commerce, and peer-to-peer applications, for example.

Connect Arkansas, Arkansas Research & Education Optical Network (ARE-ON), Arkansas Telehealth Oversight and Management (ATOM), and the Next Generation State Network are examples of broadband-based initiatives in the state designed to improve personal lives and economic capabilities, while supporting key strategic efforts for economic development, education, and health care. The existing telemedicine program at University of Arkansas for Medical Sciences (UAMS) has produced a significant drop in infant mortality because women in rural areas are receiving better maternal care. In August 2010, UAMS applied for and was awarded a \$102 million grant, supplemented by \$26.2 million in matching funds, to vastly expand broadband access across the state. People living in the most remote corners of Arkansas have access to care and benefits from medical specialists through online video chats. Students and faculty at the state's two-year colleges received substantial improvements in broadband bandwidth and benefit from the same access to national and international research and education networks currently available to the state's four-year public universities.

Sufficient broadband availability is also the cornerstone of The Digital Learning Act of 2013 which provides for the expansion of digital learning opportunities to all Arkansas public school students and removes any impediments to the expansion of digital learning opportunities. Digital learning in this act means a digital technology or internet-based educational delivery model that does not rely exclusively on compressed interactive video.

This act specifies that beginning in the 2014-2015 school year, all public school districts and public charter schools shall provide at least one (1) digital learning course to their students as either a primary or supplementary method of instruction. It further states that beginning with the entering ninth grade class of the 2014-2015 school year, each high school student shall be required to take a least one (1) digital learning course for credit to graduate.

One of the basic requirements for digital learning is an infrastructure sufficient to handle and facilitate a quality digital learning environment. The House Committee on Education and the Senate Committee on Education is to implement a comprehensive study in collaboration with the Department of Education, the Department of Information Systems, and Arkansas service providers on methods to establish and maintain the necessary infrastructure and bandwidth to sufficiently facilitate and deliver a quality digital learning environment in each school district and public charter school. The final report is due no later than December 1, 2014.

Also, as schools plan for the Partnership for Assessment of Readiness for College and Careers (PARCC) assessments concurrent with enhancing bandwidth to support instructional needs, PARCC is recommending external connections to the Internet at 100 kbps per student or faster and internal school networks at 1000 kbps or faster. Minimum bandwidth requirements will be determined based on the final specifications of the PARCC assessment delivery platform and the level of multimedia and technology enhanced items in the final assessment design. PARCC will provide minimum specifications by October 2013.

Mobility

The trends in Arkansas, as well as across the globe have mobile becoming increasingly ubiquitous. In the government space, open government data, providing citizens and state agencies easy access to data is becoming more and more popular. Arkansas uses mobile technology to provide better access to information and services for citizens and businesses, with dozens of applications and websites now providing streamlined access for mobile users. The state has also established development standards that have promoted a consistent approach to mobile service delivery. Per a recent study released by the Centers for Disease Control (CDC), at 35.2 percent, Arkansas leads the nation in the percentage of citizens living in wireless only households.*

Arkansas.gov, the official portal of the state, has adopted a “mobile first” development methodology and standardized on the use of responsive design, which ensures that all online services will be usable on a variety of mobile devices. A growing number of websites make use of these standards. The state portal, Arkansas.gov, provides a streamlined responsive mobile interface for users and the state transparency portal, Transparency.Arkansas.gov, was the first state transparency site in the nation to provide an interface optimized for smartphones.

For business continuity and disaster recovery, state authorities can securely access communications and data from a remote or mobile location, in the event state facilities are affected by an emergency. Arkansas’s Continuity of Operation Program is available via mobile devices allowing access to online plans during a disaster. The state does not currently have a work from home policy.

Information Network of Arkansas (INA) improves online citizen and business access to public services and maintains and hosts the state’s official website, Arkansas.gov. Due to the explosive growth and demand for mobility, INA developed Arkansas.gov mobile allowing users to search for most state information and services available through Arkansas.gov from any mobile operating platform. Arkansas, in a study of 36 state websites, had six of the top 10 sites in mobile adoption. The average state government website currently experiences around 17 percent mobile traffic, a number that has doubled every year since 2010.

*2011 National Health Statistics Report, U.S. Centers for Disease Control and Prevention

Unified Communication and Collaboration (UCC)

Unified Communications and Collaboration promises to change the way people work, increase productivity and foster greater collaboration. The convergence of voice, video, and data communication services on a shared IP-based infrastructure may offer organizations significant gains in business productivity by removing latency in communications. UC is a suite of productivity applications unified by vision, security and usage policies, location-based service, unified purchasing and unified service providers.

Research identified sixteen (16) features that comprise a complete UCC solution:

- Telephony
- Unified messaging
- Desktop client
- Email
- Instant messaging (IM)
- Audio conferencing
- Video conferencing
- Web conferencing
- Converged conferencing-web, audio and video conferencing offered as one converged capability. Fully converged conferencing products should support the flexibility to switch between a desktop-based application, a hosted audio conference bridge
- Notification service
- Personal assistant
- Rich presence service
- Communications-enabled business processes
- Contact center
- Mobile solutions
- Collaboration

Next Generation 9-1-1 (NG 9-1-1)

The Next Generation 9-1-1 system provides for the public to make voice, text, or video emergency calls from any communications device via Internet Protocol (IP)-based networks. Today's 9-1-1 system provides for the public to primarily make emergency voice calls with the exception of messages from deaf or hearing impaired persons. The public safety answering points (PSAPs) will also be able to receive data from personal safety devices such as Advanced Automatic Collision Notification systems, medical alert systems and sensors of various types. In addition, the PSAP will be able to issue emergency alerts to wireless devices in an area via voice or text message and to highway alert systems.

The NG 9-1-1 vision relies on an Emergency Services IP Network (ESInet) to deliver voice, video, text and data "calls" to the PSAP. The protocol used for delivering these "calls" will be the Session Initiation Protocol (SIP), or IP Multimedia Subsystem (IMS, which incorporates SIP). The functional and interface standards developed by National Emergency Number Association (NENA) describe general SIP and IMS-based architectures that allow responsible agencies flexibility in developing an infrastructure to support the envisioned features of NG 9-1-1.

NG 9-1-1, an initiative of the NENA is designed to upgrade emergency networks to improve wireless mobile access to 9-1-1 and enable the public to transmit text, images, video and data. NG 9-1-1 will transition the 9-1-1 system from circuit-switched to IP networks that can quickly locate GPS-enable phones and interact with text message, multimedia content and other new types of data from the public.

The NG 9-1-1 technical development directives, approved by NENA in 2011 and known as i3,

provide a comprehensive architecture for NG 9-1-1 systems and details how networks and devices will be integrated to enable voice, text, photo and data exchange between the general public and first responders. I3 supports end-to-end IP networks, IP-based and legacy Time Division Multiplexing (TDM) PSAPs, and IP- and non-IP wireless and wireline networks.

Public Safety Emergency Network

Next generation networks enable first responders, public safety agencies, hospitals, and jurisdictions to share multimedia evidence, database information, patient records, databases and reports in real time, via the use of wireless and broadband networks. Solutions that are gaining traction in state and local governments include NG 9-1-1 networks and advance video applications such as surveillance and inmate arraignment and visitation.

Telejustice

Telejustice, the use of video in public safety and justice, provides footage of public safety incidents, including aerial images of fires and other disaster scenes, surveillance video at high-profile public events and locations, fixed-position traffic cameras and front-facing vehicle-mounted cameras in police cars. It's also used in criminal justice environments for inmate arraignment and visitation. For video to be useful to public safety agencies, it must be accessible in real time to all public safety personnel, regardless of endpoint device or location. Video is an ideal application for high-performance next-generation networks. NGNs allow public safety agencies to integrate networks to more easily connect, operate, manage, and support multiple Telejustice applications.

FirstNet

An important development for the public safety network is FirstNet, a national public safety wireless broadband network in the 700 MHz spectrum that will cover 96 percent of the U.S. population. It was established by federal legislation earlier this year, after a decade or more of lobbying by the Associate of Public Safety Communications Officers (APCO) and many other public safety organizations. The federal government committed to providing \$7 billion to establish FirstNet, but indicated clearly that public-private partnerships would be required to completely finance the project. Partnerships with the private sector for sharing cell towers, fiber optic networks, network operations and maintenance and other tasks will be crucial.

Security

Next-generation networks are by their nature easier to secure than legacy networks. For one thing, it's less complicated to provide security on a single network (versus multiple networks). And, with a number of built-in security features such as firewalls and encryption technology, NGNs help provide an integrated, multilayered approach to security that protects you from the failure of any layer. Securing the next-generation network requires going beyond endpoint device security tools such as anti-virus, anti-malware, anti-spyware, anti-spam and personal firewalls; and user identification security tools such as authentication, tokens and single sign-on software.

Public safety networks, especially those that are part of a national deployment such as

NENA's NG 9-1-1 or the future wireless LTE network, will need to be built to the security specifications of standards.

A comprehensive security strategy takes into account the following top five security threats, which were identified by the Government Accounting Office (GAO) as those most frequently reported by federal agencies.

1. **Unauthorized network access** to agency networks, systems, applications, data and other resources.
2. **Denial of service attacks** that drain network resources to hinder or disable normal functioning of networks, systems or applications.
3. **Malicious code** in the form of viruses, worms, trojan horses or other code-based infections in an operating system or application.
4. **Improper usage** or the violation of acceptable use policies.
5. **Scans, probes or attempted access** of computers, open ports, protocols or services for later exploit.

Future Arkansas Enterprise Network

As communication networks evolve from a luxury to a necessary component of the public infrastructure, they've taken on the importance of modern day highways and thoroughfares. Governments can no longer carry on the work of the people without them. The enterprise network can enable many new applications and services along with cost efficiencies and service improvements.

Machine-to Machine (M2M) communications looms ahead. M2M is also called the "Internet of things" because it connects objects, rather than people, to the network. Soon network-connected machines will far outnumber networked-connected people. One estimate says that the number of M2M-enabled consumer devices will triple between now and 2016. As more devices are connected to the network and traffic multiplies, efficiency becomes paramount.

As Long Term Evolution (LTE) and 4th generation (4G) mobile networks gain steam in the private and public sectors, more cell phone towers will need to be built to handle all the new traffic. The new cell towers will need to be backhauled to existing network cores- another motivation behind the federal governments' national broadband strategy.

The impact of mobility on our nation's mission-critical communications network infrastructure has been tremendous and will increase. As government agencies grapple with improving productivity and service levels while cutting costs, they can look to next-generation networks to navigate upcoming changes and enable their goals.

Network Jargon

ATM-Asynchronous Transfer Mode: A non-packet-based high-speed networking standard that supports voice and data. As IP-based networks increase in popularity, ATM networks are declining.

DWD-Dense Wavelength Division Multiplexing: An optical technology used to increase bandwidth over existing fiber optic facilities. It works by combining and transmitting multiple signals simultaneously at different wavelengths on the same fiber. In effect, one fiber is transformed into multiple virtual fibers.

FTTx-Fiber to the X: When optical fiber is used as the “last mile” access technology, it is generically termed FTTx; “x” depends on the connection endpoint. For example, FTTN is fiber to the node, when the node is a street cabinet that serves several neighborhoods and is located miles away. FTTC is fiber to the curb; the street cabinet is located closer to the customer premise and serves a small neighborhood. (In these cases the final feet or miles to the customer premise may be copper or wireless access.) FTTB is fiber to the building; FTTH is fiber to the home.

IP-Internet Protocol: The primary protocol for establishing the Internet. It specifies the delivery of packets of data across network boundaries in an internetwork. IP requires every device on the Internet to have an address, and it delivers data packets from source to destination based on the address of each.

IPv4-Internet Protocol Version 4: The fourth revision of the Internet Protocol was the first widely deployed version of the internet working standard for the Internet. IPv4 uses 32-bit addresses to specify delivery locations.

IPv6-Internet Protocol Version 6: The sixth version of the Internet Protocol and the second most widely adopted. IPv4's 32-bit address standard limits the number of addresses and thus devices that can connect to the Internet. IPv6, developed because it was anticipated that IPv4 would run out of address, uses a different addressing system that allows for more than 7.9×10^{28} times as many addresses to be assigned as IPv4.

MPLS-Multiprotocol Label Switching: A method of directing networks that uses IP routers at the customer edge (CE) of the network and routers at the network core or provider edge (PE).

NGN-Next Generation Network: Packet-based core, Internet and access networks that leverage high-speed protocols such as IP, MPLS and Ethernet to transport data, voice and multimedia services on a converged content, service and application aware network.

QoS-Quality of Service: Guidelines for trafficking and prioritizing data on telephony and computer networks.

SONET-Synchronous Optical Network: SONET is a North American standard for transmitting data over fiber optic lines.

TCP/IP- Transmission Control Protocol/Internet Protocol: The suite of Internet communications protocols is named after its two most important protocols, even though it contains many other specifications. It specifies how data traveling the Internet should be formatted, addressed, transmitted, routed and received.

WAE-Wide Area Ethernet: Ethernet has evolved from just a LAN technology to a scalable, cost-effective and manageable WAN solution for businesses of all sizes. Ethernet offers numerous cost and operational advantages over conventional WAN solutions. WAE offers robust and extremely scalable high-quality services that are superior to any traditional WAN technology.

Voice Acronyms

IMS-IP Multimedia Subsystem: IMS is a multimedia over IP architecture for mobile and fixed networks, based on the SIP. It supports both packet-and circuit-switched networks.

IP PBX-Internet Protocol Private Branch Exchange: An enterprise PBX that's designed to deliver voice or video over a data network and interoperate with the PSTN.

PBX-Private Branch Exchange: An enterprise traditional telephone system that is owned and operated by the enterprise or user rather than the phone company. The PBX switches calls between enterprise users on local station lines, and all users share a number of connections to the PSTN. Previously analog, PBX's now use digital technology.

PSTN-Public Switched Telephone Network: The legacy, circuit-switched voice/telephone network infrastructure, including both local service and long-distance service. It includes connected telephone lines, fiber optic cables, microwave transmission links, cellular networks, satellites and undersea cables. The PSTN core is now almost entirely digital and to a large part IP based.

SIP-Session Initiation Protocol: TCP/IP call control signaling protocol used for voice and video calls over IP networks. SIP can also be used for video conferencing, streaming multimedia distribution, instant messaging and other multimedia communications applications.

UC-Unified Communications: The integration of multiple real-time communication services, such as IP telephony, video conferencing, interactive presentation software and instant messaging, via TCP/IP networks.

Mobile and Wireless Acronyms

3G-Third Generation: A family of mobile telecommunications protocols for telephone, wireless voice, mobile Internet access, video calls and mobile TV. To meet 3G standards, a system must provide peak data rates of at least 0.2Mbit/sec.

4G-Fourth Generation: The successor to the 3G standard, 4G is a suite of protocols for mobile broadband Internet access to smartphones, tablets, laptops and other mobile devices. 4G systems must provide peak data rates of 100Mbit/sec for high mobility communication (e.g., from trains and cars) and 1 Gbit/sec for low mobility communication (e.g., pedestrians and stationary users.)

LTE-Long-Term Evolution: A mobile communication standard for high-speed data that is commonly marketed as 4G LTE. LTE doesn't have true 4G speeds – it provides peak stationary data rates of much less than 1Gbit/sec. However, the 4G standards body allowed that LTE and other technologies that delivered speeds at “beyond 3G” speeds could be marketed as 4G. LTE has proven to be the more popular “4G” technology so far.

M2M-Machine to Machine: M2M technologies allow devices to connect and communicate via public and private wired and wireless networks. Sensors built into devices collect data such as time, temperature, location, motion, even inventory level, and transmit it to an application or database for analysis and automated action.

Wi-Fi: Wi-Fi technology allows computers, cell phones, tables and other mobile devices to wirelessly exchange data using radio waves over high-speed Internet connections. Wireless access points have a range of about 65 feet indoors; the range is much greater outdoors.

WiMAX: WiMAX enables “last mile” wireless broadband access with speeds a little slower than DSL and cable. It can also be used for backhaul to the core in place of cellular technologies. Like LTE, WiMAX is a wireless communications standard that is commonly described as a 4G technology even though it does not meet the 4G technical specifications for data speed. WiMAX is often used with Wi-Fi and other wireless networking technologies.

Public Safety Acronyms

APCO-Association of Public-Safety Communications Officials: APCO is the world's largest organization of public safety communications professionals. It serves the needs of public safety communications practitioners worldwide and the welfare of the general public as a whole by providing complete expertise, professional development, technical assistance, advocacy and outreach.

i3: Established by the National Emergency Number Association (NENA), i3 is a standard that provides technical guidelines for implementing next-generation (NG) 9-1-1 systems.

LMR-Land Mobile Radio: Currently, the most commonly used radio technology for first responders and other radio system users. These systems can operate independently or connect to the PSTN or cellular networks.

NENA-National Emergency Number Association: Nena's goal is to implement an NG 9-1-1 solution in the US.

NG9-1-1- Next Generation 9-1-1: NENA's NG 9-1-1 initiative is designed to update emergency networks to improve wireless mobile access to 9-1-1 and enable the public to transmit text, images, video and data.

P25-Project 25: A set of APCO standards for digital radio systems, including LMR, that enable radios used by different agencies on different frequencies and to interoperate.

PSAP – Public Safety Answering Point: The call centers where 9-1-1 calls are routed. Trained operators answer calls, take caller information and dispatch first responders. Also known as 9-1-1 call centers.

Appendix A: StARnet, Arkansas' Private Network

Department of Information Systems (DIS) is legislatively mandated with the powers and duties necessary for implementing and managing the network and is responsible for “conceptualizing, designing, developing, building and maintaining common information technology infrastructure elements used by state agencies and governmental entities” (Arkansas Code 25-4-105). Over 2,100 governmental sites including K-12 schools are connected to the Internet and to the state technology infrastructure by the Arkansas statewide network.

The network supports the following:

- 3,067 circuits
- 2,130 addresses
- 2,059 network devices
- 2,024 routers provided by DIS including 1,712 customer edge routers. 588 routers serve 1,081 school buildings in 257 out of 258 school districts. The Little Rock School district is the exception.

Other services available on the state network are:

1. Cellular Data Wide Area Network (WAN) Connectivity

- Usable for primary connectivity for small branch/temporary service or as a backup to primary wired connection
- Direct connection to state network
- 24/7 monitoring

2. State Video Network

In addition to educational opportunities in support of K-12 public schools, the state video network was also developed to fulfill the following needs for other public entities:

A. Mobility:

- Ability to remotely view web-based video schedules, manage the video, and access content
- Empowers employees and enhances productivity and creativity by providing the means for workers to stay connected regardless of location

B. Criminal Justice:

- Cost Effective
- Ability to reduce travel costs and lost productivity related to professional training requirements
- Reduce the time law enforcement officials spend traveling to courts
- Enable a more efficient, effective, and productive means of providing parole hearings

C. Public Safety

- Reduce risks, time, and costs associated with transporting inmates
- Increase the safety of victims by controlling contact with suspects
- Ability to conduct video-based parole hearings that minimize the need to transport inmates

D. Accessibility

- Ability to provide video based expert testimony without requiring them to leave their office
- Ability for state employed experts to minimize travel time and streamline dockets
- Increasing the ability to include remote experts testimony by minimizing the effect of geography

E. Efficiency

- Streamline judicial process by eliminating the barriers of geography and time

3. Satellite Services

- Dialtone services including business lines, Voice Over IP and Centrex
- Originating long distance and toll free (800) services
- Voice and Web conferencing services
- Telephone instruments

4. Dedicated Internet Services

- Business class
- Consumer class including DSL and cable modem service

The following examples are evidence of how, even in the initial state rollout, NGN's effectiveness is already being realized.

Example 1: Supplemented by a grant for bandwidth through the Arkansas Telehealth Oversight and Management Network (ATOM), DIS was able to provide Arkansas Department of Health (ADH) with a least 1.5 Mb of additional bandwidth at each office. The power of a statewide bid made up to 10 Mb available at many offices without increasing costs.

Example 2: DIS is also working in conjunction with the Pulaski County School District and the vendor to provide more bandwidth throughout the AT&T territory of the district. The school district will soon have 100 Mb of bandwidth in the district's high schools, 50 Mb in its middle schools, and 20 Mb in elementary schools in Greater Little Rock to connect back to the district office. Through this same bid, the vendor is waiving \$500,000 of fiber placement cost normally included in the installation charges.