How Metropolitan Nashville and Davidson County can Promote Development of an Advanced Communications Network

Task Force on Telecommunications Innovation

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METROPOLITAN GOVERNMENT OF NASHVILLE & DAVIDSON COUNTY
Bill Purcell, Mayor

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Contents

Chairman's Letter

August 2006

Dear Vice Mayor Gentry,

The Task Force has concluded its work, as directed by the council's resolution. This report contains our findings, recommendations, and research.

The importance of this technology can not be understated to the future of Nashville, its citizens and economy. I would respectfully suggest that the candidates for Nashville's mayoral race read this report, digest its contents and be prepared to explain their positions on its findings and recommendations to the community. If they address this report, the community can be assured they have a thorough knowledge of an issue that will shape the economic and educational nature of the city.

The next step in adopting the recommendations to this report will require educating the public, business community and public officials on the technological issues that Nashville will face in maintaining its place among the most attractive and competitive cities. In this effort, the City should enlist the aid of the Nashville Technology Council to provide a forum to air these issues and lend their expertise to the discussion.

I want to publicly thank all the participants, witnesses and task force members for their time and efforts in exploring this issue. The work in developing this report, I believe, will be valuable as a blueprint for proceeding to create an atmosphere in Nashville that will continue to attract new businesses, as well as, increase educational and cultural opportunities for its residents.

Darrell Freeman, Chair
Task Force on Telecommunications Innovation

Executive Summary

The future demands of the digital economy means Nashville, its citizens and businesses, will require a robust network that allows high-speed transmission of both data, voice and video services at speeds presently unavailable. Theses services, known generically as broadband, have experienced tremendous growth; however the city should strive to remain at the forefront of universal Internet access at speeds which are competitive with those available in other parts of the world.

Growth in Tennessee Broadband Lines

June 2000 — 87,317
June 2005 — 682,970

Source: Tennessee Regulatory Authority, May 2006

Recognizing this, Nashville's Metropolitan Council adopted a resolution sponsored by Councilman David Briley last year to establish the Task Force on Telecommunications Innovation. Its purpose, spelled out in the resolution, was to investigate both the current situation and make recommendations for a course of action that would prove economically feasible and practical towards meeting the city's future broadband needs.

The Task Force spent more than seven months gathering and analyzing information and testimony from industry experts, business leaders and public officials to submit this report of its findings and recommendations to the city by August 2006.

The Task Force's conclusions indicate the city should take an active role in monitoring broadband network deployment. The city should also ensure Nashville's lower income population does not suffer a disproportionate exclusion from the benefits of broadband service and that it pursue economic development and education opportunities.

The city must take seriously its responsibility by proactively working towards a goal of symmetrical upstream and downstream speeds of broadband that will keep Nashville on the fast track in the knowledge-based economy and technology service industry.

The Task Force recommends that the city immediately adopt this goal: 100-megabit symmetrical — meaning identical upstream and downstream speeds — broadband service within five years should be available to the homes and businesses in the city.

This goal seems difficult to achieve and Nashville may likely not reach what the Task Force sees as the necessary goal of having 100-megabit network speeds without intervention of some form.

Although only one existing and deployed technology, fiber-optic cable, was identified as capable of reaching this 100-megabit goal, the Task Force feels that it is a reasonable supposition to expect new technologies currently under development will make this goal attainable.

The Task Force would like the city to be proactive in motivating the existing commercial network providers, sometimes known as incumbents, to accelerate their deployment of such new technologies.

In particular, the city should establish the role of a chief technology officer for the city to both encourage such deployment and measure its progress, especially against benchmarks of comparable cities, both national and international.

The chief technology officer's position will be critical in implementing another of the Task Force's recommendations: creating incentives to both increase investment in higher speeds by the existing providers, as well as encourage a wider penetration of Internet access to low-income households. This will take extensive cooperation with Nashville's current network providers to develop and monitor the effectiveness of such incentives.

image: courtesy of NASA

Broadband in Nashville

Nashville currently has access to several private broadband networks. The speeds currently associated with these private systems may not be what is needed for delivery of multiple advanced services in the future. Before the Task Force moved forward to make its recommendations on how to address the future, it spent several meetings gaining a better understanding of:

- Current and emerging broadband technologies.
- Existing and future services and applications.
- Existing coverage, penetration and speeds associated with our private broadband networks.
- How other cities are encouraging the further development of broadband .
- Existing providers plans to offer advanced broadband services to the community.
- Current broadband assets in Nashville, and plans to further develop private networks.

These topics and the information we gathered on the same are summarized in the Appendix to this Report.

Findings

Based on the information gathered, the Task Force came to the following group consensus conclusions:

I. For the foreseeable future, Nashville's economic success will depend, at least in part, on its broadband infrastructure.

Advanced broadband networks and applications enable and encourage new business opportunities, promote efficient delivery of medical services, provide expanded educational options, enhance personal communication, increase entertainment opportunities, and provide untold intangible benefits to the community. Broadband enables government entities to provide new and improved public services, to operate more efficiently, and to offer better ways for citizens to participate in democracy.

II. Nashville will benefit from the availability of increased internet speeds in the future because it is a leader in the information economy.

Nashville is home to most of the nation's for-profit health care industry, a substantial portion of its music entertainment industry as well as pioneering information-technology companies, research universities, skilled professionals and technology-savvy residents. These entities and individuals will have an ever increasing need for increases in internet speeds in the future.

III. A majority of Nashville residents use networked information technology today, both at work and at home, and their demand for access to state-of-the-art technologies, applications and services will continue and likely significantly increase.

Statically reliable research conducted by the independent research company Prince Market Research for one of our incumbent broadband providers found that 81 percent of all Nashville's citizens have at least one computer in their home. Seventy-three percent of households with computers have some sort of broadband service.

Forty-one percent of Nashville households (73 percent of the 81 percent), then, do not subscribe to a broadband service currently available in Nashville.

Anecdotal evidence indicates that of this 41 percent, a great number are either students in Metropolitan Nashville Public Schools, members of lower income and/or minority households or both.

IV. Nashville should lead the nation in providing computer and broadband access in our schools and in our lower income community. Nashville should also invest immediately in programs and initiatives

that integrate social, economic and education opportunities with broadband information applications.

Nashville can and should develop a holistic approach to technology and our schools and our lower income neighborhoods. To the extent legally permissible, we recommend that monies collected by Metro and/or affiliated services related to broadband infrastructure be used to make this vision a reality in the next five (5) years.

V. To serve future needs, our private broadband networks must have increased speed.

We believe that by 2011 our goal as a community should be that every household have access to symmetrical 100-megabit service. Broadband internet speeds available to over 99.5% of the homes in Nashville today are 6 to 8 megabits (Mbps) downstream, and up to 768 kilobits per second (Kbps) upstream. Comparable American cities are in the process of planning for deployment of symmetrical 100-megabit infrastructure in the same time frame. Some comparable international cities have already deployed such a network. To remain in the top tier of technological communities, the Task Force believes Nashville should deploy a symmetrical 100-megabit network contemporaneously with comparable cities.

VI. Fiber-optic cable is the preferable technology available today with the capacity to meet all of Nashville's long-term needs.

Fiber has significantly more capacity than any other existing broadband technology, and is unlikely, in our opinion , to become obsolete in the foreseeable future. Other wire and wireless technologies the Task Force studied cannot currently provide comparable speeds, and some have problematic technological issues.

It is possible, perhaps even likely, that new transmission technologies will emerge in the five-year planning window we propose.

The Task Force recognizes the potential for emerging technologies which could alter this landscape.

VII. Incumbent providers can provide the high-speed broadband networks that Nashville will need in the future.

Absent governmental incentives, private companies and investors, will continue to invest in their broadband infrastructure (and thus increase speed) in response to customer demand. Customer demand is primarily driven by the speeds needed for new and enhanced applications.

VIII. Nashville should encourage and incentivize infrastructure investments by private providers to develop the robust broadband infrastructure we will need in the future.

There is no question that we believe that the private sector should lead the way toward the technology infrastructure goals we propose. We believe that without some incentive, market demand alone may not drive our existing network providers to provide the speeds we desire in the timeframes we propose. We also believe that additional education, training and outreach are necessary to promote increased adoption of internet usage. This is especially true in segments of the community that are currently under served.

To monitor the accuracy of these findings, the City should periodically re-evaluate the private sector's progress in meeting the goals expresses in this report and if necessary re-evaluate the need for municipal participation in provision of technological infrastructure.

Based on these Conclusions, the Task Force believes that Nashville should take a proactive and aggressive leadership role in fostering and encouraging the continued development of its private broadband networks by its existing providers. The following recommendations for City action will not lead to achieving our recommended goals overnight. Long term development of our broadband network will be a complex and costly challenge. Further, the failure to meet the goals set forth herein would result in the loss of human capital and economic opportunity. The steps we recommend will set the City on a path toward achieving our goals; as we proceed, it will become evident what more must be done to ensure that Nashville has a 21st century broadband infrastructure.

Broadband Subscribers per 100 Inhabitants in OECD countries					
Rank	**Country**	**DSL**	**Cable**	**Other**	**Total**
1	Iceland	25.9	0.1	0.6	26.7
2	S. Korea	13.6	8.3	3.4	25.4
3	Netherlands	15.7	9.6	0.0	25.3
4	Denmark	15.3	7.2	2.5	25.0
5	Switzerland	14.7	8.0	0.4	23.1
6	Finland	19.5	2.8	0.1	22.5
7	Norway	17.8	2.9	1.2	21.9
8	Canada	10.1	10.8	0.1	21.9
9	Sweden	13.3	3.4	3.6	20.3
10	Belgium	11.3	7.0	0.0	18.3
11	Japan	11.3	2.5	3.8	17.6
12	United States	6.5	9.0	1.3	16.8

Source: Organization for Economic Cooperation & Development's Broadband Statistics, Dec. 2005
www.oecd.org/sti/ict/broadband

Residential Broadband Penetration, Southeastern States	
Florida	32.5%
Georgia	31.1%
North Carolina	29.1%
Louisiana	24.8%
Tennessee	**23.6%**
South Carolina	21.9%
Alabama	19.9%
Kentucky	18.0%
Mississippi	13.5%
Region	**26.9%**
United States	**31.3%**

Source: GAO Study of Broadband Deployment & Adoption, May 2006

Recommendations

The Task Force recommends that the City adopt this goal:

Within five years all of Nashville should have affordable access to an interactive, broadband network capable of supporting applications and services using integrated layers of voice, video and data, with sufficient capacity to meet the ongoing information, communications and entertainment needs of the city's citizens, businesses, institutions and municipal government.

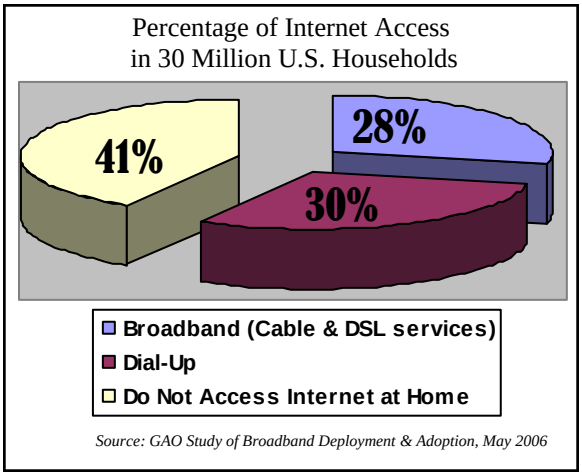
The Task Force proposes that the City take the following steps to move toward the goal:

I. The City should work with private companies to encourage them to develop high-speed networks for Nashville.

The Task Force began a dialogue with the existing cable and phone companies. We asked how the City could help them develop a broadband network meeting the goal of broadband for all. The companies have provided ideas and indicated their willingness to continue working with the City. The City should pursue this effort. The next phase in the dialogue should include a request for information from the private sector seeking the identification of specific steps that the City could take in partnership to reach the goals set out in the Report.

II. The City should develop its own network for municipal purposes. In conjunction with the period re-evaluation of private sector progress in deployment of a symmetrical 100 megabit network, the city should, if necessary and legally feasible, consider the creation of an open network available to the public.

The City already has done much to develop a broadband network for municipal purposes. For various reasons, development of this network has not always been sufficiently coordinated. Future deployment should continue to be centralized in planning, construction and management of broadband for all divisions of the City to ensure that its system is developed in a coordinated way.



This network should be deployed to strengthen connections, improve flow and management and support the functions and services of municipal government, and potentially to support the creation of an open network available to the public.

The Task Force believes that Wireless Internet service providers, including some, if not all, of our existing broadband providers, may be interested in using the municipality's fiber network to transmit data from remote sites to the Internet. Such uses could generate revenue for the City while increasing competition, bridging the digital divide and bringing more choices to citizens.

III. The City should monitor emerging Internet technologies, and take advantage of opportunities that make sense for Nashville.

Fiber-optic cable installed to the premises currently appears to be the best long-term solution for a Nashville; however, its expense should prompt exploration of other technologies for possible interim deployment.

Other cities' experiences with municipally supported or encouraged wireless networks is mixed at best. Changes occurring almost every month in wireless technology also make investment in wireless a risky proposition. Finally, and perhaps most importantly, the city would need to weigh possible benefits from any wireless venture against the disincentives for privately funded high-speed fiber network investments.

IV. The City should designate and empower a Chief Technology Officer with the authority and funding necessary to successfully carry out these recommendations.

The City should provide a focal point for these recommendations by elevating the role of the Chief Technology Officer. By empowering the Chief Technology Officer, the City will establish accountability for following through on the recommended strategies, ensure that the City develops its internal broadband network in the most efficient and far-sighted way, and underline the importance of the effort to develop broadband.

V. The City should monitor progress toward these goals.

The Chief Technology Officer should submit annual reports to the Mayor and City Council. The reports should monitor the availability and cost of broadband in Nashville; should compare the availability and cost of broadband in Nashville to other benchmark cities; should measure the penetration of broadband into low-income communities; and should provide a regular update on emerging needs, uses and technologies.

The chief technology officer should also monitor Metro Schools long-term information technology plans.

VI. Make Education a Priority.

Metro Schools should continue to prioritize deployment of advanced technology in the class room and investigate in-home deployment.

The Task Force believes Metro Schools should be on the leading edge of new technology, because of the importance of technology in education and work life.

Metro Schools should report the results of its technology studies annually to the chief technology officer.

image: courtesy of NASA

Appendix A: Council Resolutions

SUBSTITUTE RESOLUTION NO. RS2005-927

A resolution establishing a Task Force on Telecommunications Innovation to explore and report on the feasibility of using Metropolitan Government resources in a network that is available to the public using broadband technologies, broadband over power lines, Wi-Fi, Wi-Max, and other wireless applications, end-user fiber build out, and other telecommunications technologies.

WHEREAS, the economic vitality of Metro Nashville and Davidson County depends upon the adequacy of the county's physical infrastructure generally, and

WHEREAS, the United States is lagging behind its international competitors in providing access to broadband communication means, with incumbent providers of communication means not making sufficient investment in advancing Nashville's broadband network even though 1000 MBPS access to broadband networks will be necessary within 5-10 years; and

WHEREAS, the Metropolitan Council is committed to maintaining and expanding Nashville's position as a leader in technology and healthcare, to expanding the variety and lowering the cost of services provided to its citizens, to providing the City with greater access to technology, and to providing and using, when appropriate, the most advanced technologies available; and

WHEREAS, equal access for all citizens to media, Internet, and other digital technologies is critical to bridging the "digital divide," reconnecting citizens to government and community, invigorating public discourse and private enterprise, and promoting greater civic engagement, participation, and transparency in government; and

WHEREAS, the Metropolitan Council believes that technological innovations and expanded access to services can be major catalysts for economic development within Nashville, and have the potential to bolster Nashville's economy, spur the growth of private businesses and generate revenue for the Metropolitan Government; and

WHEREAS, Nashville and its surrounding areas are home to world-class technology experts in both the public and private sector, whose vision and vast experiences are substantial resources upon which the Metropolitan Government would like to draw, and whose collaborative efforts would likely have a major impact on technological advancements Nashville; and

WHEREAS, the Metropolitan Council is interested in utilizing the expertise of such persons in order to further the goals set forth in these recitals.

NOW THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY:

Section 1. The Metropolitan Council hereby establishes the Task Force on Telecommunications Innovation ("Task Force") to assist the Metropolitan Government in examining and evaluating the feasibility of and options for providing broadband technology and advanced telecommunications and information services in Nashville in order to further the goals set

forth in this Resolution.

Section 2. Composition. The Task Force shall consist of fifteen (15) members and shall be composed of the Director of the Metropolitan Department of Information Technology Services ("ITS"), or his designee and the following types of members who shall be selected and appointed by the Vice Mayor:

1. Five members of the business, technology, and telecommunication communities including one representative designated by BellSouth, one representative designated by Nashville Electric Service and one representative designated by Comcast;

2. Two persons with a background in community technology;

3. Two persons with expertise in technology and telecommunications law and regulation; and

4. Two citizens with an interest in technology, telecommunications, and the delivery of services to residents and businesses in Nashville; and

5. Three Members of the Metropolitan Council.

Section 3. Purpose. The purpose of the Task Force is to explore the feasibility of using Metropolitan Government resources in a network that is available to the public and allows public data access and transmission, and to make recommendations to the Council about which technologies the City should pursue, if any.

Section 4. Scope of Work. The Task Force shall:
1. Explore and evaluate broadband technologies, broadband over power lines, Wi-Fi, Wi-Max, and other wireless applications, end-user fiber build out, and other telecommunications technologies that provide public Internet and data access and transmission, and explore and evaluate the types of advanced telecommunications and information services such technologies would enable the City to use and/or offer to its citizens;
2. Explore various business models by which the City could use and/or offer these technologies and services, such as public/private partnerships, contract or lease arrangements, and other models, and examine what role(s) the City might play in such models;
3. Consider these and any related questions that might assist the Task Force in fulfilling its purpose:
a. Is it possible to create a network using municipal resources that is available to the public and that offers public data access and transmission and advanced telecommunications and information services? What City resources might be utilized?
b. What technologies/applications would best achieve the goal of creating such a network ("preferred alternatives")?
c. What is the fiscal viability of the preferred alternative(s)?
d. What are the direct benefits of providing this service through the preferred alternative (s)? What might be some of the indirect benefits or consequences?
e. Could such a network be revenue generating?
f. What are alternative sources to fund the network? If Metropolitan Government funds were needed, what funding source(s) would be used? Would new funding source(s) be created?
g. Does the Task Force think proposed Metropolitan Government capital expenditures would be a wise investment?

h. What are the risks of creating such a network? Would it be a low risk project? A high risk project?
i. What role would the Metropolitan Government play in such a network: owner, lessor, partner with private business, etc.?
j. To what extent could the network further the goals discussed above, including expanding the choice and lowering the costs of services provided to citizens, promoting economic development, enhancing access to and public participation in government, generating revenue, promoting technological innovation, and bolstering the City's position as a leader in technology?
k. Should the City pursue a small pilot program first?
4. Invite a wide array of experts and persons knowledgeable in the issues to be studied by the Task Force to inform its discussions and evaluation, including but not limited to ITS and various technology vendors and service providers;
5. Prepare a report reflecting the conclusions of the Task Force on the questions identified in subsection 3 above, in a format of the Task Force's choosing that contains the following elements and any other elements that the Task Force believes warrant further consideration:
a. An analysis of the financial and technological feasibility of the services and technologies examined, and a list of other services and technologies that were not considered;
b. Possible business models, including capital costs, funding sources (including grants if available), and possible opportunities for revenue generation;
c. Estimated time frames and implementation schedules for deploying the services and technologies examined;
d. Any federal and/or state regulatory or legal parameters affecting the services and technologies the City might offer, or the business models the City could use, including specific constraints, unresolved regulatory or legal issues, and other pertinent regulatory legal issues;
e. Physical and/or electronic security concerns, and proposals for addressing those concerns;
f. A list of options and specific recommendations for technologies, services, and/or business models that would best serve the goals set forth in the recitals of this Resolution (including possible pilot programs), and that the Task Force recommends that the City pursue;
g. Requirements for minimum capabilities that the network should possess at launch, 5 years after launch, and 10 years after launch; and
h. The data, research materials, and resources used to compile the report.

Section 5. The Task Force shall submit its final report to the Metropolitan Council within 180 days from the date of adoption of this Resolution.

Section 6. This Resolution shall take effect from and after its adoption, the welfare of The Metropolitan Government of Nashville and Davidson County requiring it.

Sponsored by: David Briley

RESOLUTION NO. RS2006-1207

A resolution amending Substitute Resolution No. RS2005-927 by extending the deadline for the Task Force on Telecommunications Innovation to issue its report to the Metropolitan Council until August 1, 2006.

WHEREAS, Substitute Resolution No. RS2005-927, adopted on October 4, 2005, established a Task Force on Telecommunications Innovation to assist the Metropolitan Government in examining and evaluating the feasibility of and options for providing broadband technology, and advanced telecommunications and information services in Nashville; and

WHEREAS, Substitute Resolution No. RS2005-927 provided that the Task Force was to report its findings to the Metropolitan Council within 180 days from the adoption of the resolution; and

WHEREAS, the Task Force of Telecommunications Innovation has requested a 90-day extension in order to complete its work; and

WHEREAS, the Council now desires to extend the reporting deadline for the Task Force on Telecommunications Innovation to August 1, 2006, in order to allow further time for the task force to complete its work.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY:

Section 1. That Substitute Resolution No. RS2005-927 be and the same is hereby amended by amending Section 5 by deleting the phrase "within 180 days from the date of adoption of this Resolution", and substituting in lieu thereof the phrase "not later than August 1, 2006".

Section 2. This Resolution shall take effect from and after its adoption, the welfare of The Metropolitan Government of Nashville and Davidson County requiring it.

Sponsored by: David Briley

Appendix B: Glossary of Terms Used in this Report

Broadband

A data transmission scheme where multiple transmissions share a common path. The Federal Communications Commission defines high-speed data transmissions as those capable of transferring 200 kilobits per second in any direction. For use in this report, the committee agreed on broadband speeds to be equal or greater to that of current DSL speeds.

Bypass

A term to describe an emerging approach to providing a broadband network, in which fiber would be connected to existing copper-wire at DSLAMs, bypassing ILEC central offices.

Cable

A distribution system that delivers content, usually analog television and data or digital television and data signals, via cable to either home or business subscribers.

Cable Ready

Usually describes a television set capable of receiving unscrambled cable television signals directly without additional equipment.

CLEC

Pronounced see-lek. Short for competitive local exchange carrier, a telephone company that competes with an incumbent local exchange carrier (ILEC) such as a Regional Bell Operating Co., GTE, ALLNET, etc.

The Telecommunications Act of 1996 allows companies with CLEC status to use ILEC infrastructure in two ways:

1) Access to UNEs

The availability of unbundled network elements (UNEs) is important to CLEC telecommunications networking. UNEs are defined by the Act as any "facility or equipment used in the provision of a telecommunications service," as well as "features, functions, and capabilities that are provided by means of such facility or equipment." For CLECs the most important UNE available to them is the local loop, which connects the ILEC switches to the ILEC's present customers. With the local loop, CLECs will be able to connect their switches with the ILEC's switches, thus giving them access to ILEC customers.

2) Resale

Another option open to CLECs is the resale strategy. The Act states that any telecommunications services ILECs offer at retail, must be offered to CLECs at a wholesale discount. This saves the CLEC from having to invest in switches, fiber optic transmission facilities, or collocation arrangements.

In any case, a CLEC may decide on one or the other or even both. CLEC status is very beneficial, especially for ISPs, who may easily get access to the copper loops and other switching elements necessary to provide xDSL services.

DOCSIS

Data Over Cable Service Interface Specification. This is an international standard which defines the communications and operation support interface requirements for sending data over an existing cable television system. Cable provider employ DOCSIS in order to offer cable modem services to subscribers.

Downstream

The flow of data from the Internet Service Provider to the subscriber.

DSLAM

Short for Digital Subscriber Line Access Multiplexer, a mechanism at a phone company's central location that links many customer DSL connections to a single highspeed ATM line. (ATM is short for Asynchronous Transfer Mode, a network technology based on transferring data in cells or packets of a fixed size.)

When the phone company receives a DSL signal, a modem detects voice calls and data. Voice calls are sent to the public switched telephone network, and data are sent to the DSLAM, where it passes through the ATM to the Internet, then back through the DSLAM and ADSL modem before returning to the customer's PC.

Ethernet

A local-area network (LAN) architecture that uses a bus or star topology and supports data transfer rates of 10 Mbps. The Ethernet specification served as the basis for the IEEE 802.3 standard, which specifies the physical and lower software layers. Ethernet uses the CSMA/CD access method to handle simultaneous demands. It is one of the most widely implemented LAN standards.

A newer version of Ethernet, called 100Base-T (or Fast Ethernet), supports data transfer rates of 100 Mbps. And the newest version, Gigabit Ethernet supports data rates of 1 gigabit (1,000 megabits) per second.

Fiber/Fiber Optic

A technology that uses glass (or plastic) threads (fibers) to transmit data. A fiber-optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages modulated onto light waves. Fiber optics has several advantages over traditional metal communications lines:

• Fiber-optic cables have a much greater bandwidth than metal cables. This means they can carry more data.

• Fiber-optic cables are less susceptible than metal cables to interference.

• Fiber-optic cables are much thinner and lighter than metal wires.

• Data can be transmitted digitally (the natural form for computer data) rather than analogically.

Fiber optic cabling can be used for higher-speed transmission than currently available on copper cabling.

FTTP

Fiber to the Premises. Refers to a broadband telecommunications system based on fiber optic cables for delivery of multiple advanced services such as telephone, broadband Internet and television to homes and businesses.

ILEC

Short for Incumbent Local Exchange Carrier. An ILEC is a telephone company that was providing local service when the Telecommunications Act of 1996 was enacted.

Compare with CLEC, a company that competes with the already established local telephone business.

IP

The part of TCP/IP protocol that performs the addressing functions for networks. Each device on an Internet network is assigned a 32-bit IP address.

Mbps

Megabits per second. A measure of data transfer speed reflecting the millions of bits transmitted per second.

Packet

A unit of data. Some networks employ a technique known as ‘packet switching’ to route data. Each packet contains addressing and error checking bits as well as the actual data transmitted by the user. The packets can travel separately and are reassembled at their destination by the recipient device.

Upstream

The flow of data from the subscriber to the Internet Service Provider.

VoIP

The telephone service that incorporates packet-switching to deliver voice as data.

Wi-Fi Mesh

A wireless network that relies on all nodes in the network to propagate signals. Although the wireless signal starts out at some base station (access point) attached to the wired network, a wireless mech network extends the transmission distance by relaying the signal from one active device to another.

WiMAX

World Interoperability for Microwave Access Inc. Also know as the Institute of Electrical and Electronics Engineers’ (IEEE) 802.16 wireless broadband standard, WiMAX is designed to extend local Wi-Fi networks across greater distances by using high-speed frequency radio spectrum.

Appendix C: Task Force Members and Staff

The Task Force was formed in October 2005 by a Metro Council resolution. Vice Mayor Howard Gentry selected individuals who have backgrounds in business, government, information technology and telecommunications law. Darrell Freeman, chairman of the committee, hired a staff at his own expense to take minutes and compile the task force's final report. Members are listed below. (Affiliations are for identification purposes only and are not meant to imply that the affiliated businesses or organizations endorse or share the views expressed in this report.)

Darrell Freeman, Chairman

Darrell S. Freeman Sr. is the president and chief executive officer of Zycron Inc., a company he founded in 1991 in Nashville. The company provides information technology staffing and outsourcing. The 15-year-old company employs over 200 IT professionals across the country.

Mr. Freeman is also one of the co-founders and organizers of Tennessee based Reliant Bank, where he currently serves on the board of directors and serves on the audit and compensation committee along with the executive loan committee. Reliant Bank is one of the fastest growing banks in Williamson County, Tenn. He is also a partner in DC Properties a real estate development company that owns and develops real estate through out the Nashville area.

He currently serves as the chairman of the board of the Nashville Chamber of Commerce and chairman of the board of Stone Crest Medical Center and is a past chairman of the board of the 100 Black Men of Middle Tennessee. Under his leadership, the 100 Black Men of Middle Tennessee was named as the chapter of the year in 2005.

Mr. Freeman also serves or has served on the board of the Nashville Community Foundation, the Nashville Downtown Rotary Club, the Federal Reserve Advisory Board, the African American Museum of Music Art and Culture, Middle Tennessee State University Board of Trustees and the chairman of the Metro Nashville Telecommunications Innovation Task Force.

Mr. Freeman's favorite pastime is spending time with Gloria, his wife of 15 years, and their four children: Ebony, Kenya, Darrell Jr. and Nathan. He is an avid runner and has completed seven marathons and numerous half marathons. He is an instrument-rated pilot with over 700 hours and is an Angel Flight Pilot. He is also an avid golfer and history buff.

Mr. Freeman holds a Bachelors and Masters Degree from Middle Tennessee State University.

Derek Carver

Mr. Carver is assistant director for the Information Technology Services Department of the Metropolitan Government of Nashville and Davidson County. In this capacity he manages the implementation and support of all voice and data networking technology for Metro government, providing broadband connectivity for over 17,000 employees at over 200 sites, including voice over IP, filtered/secure Internet services and wide area network connectivity via wired and wireless technologies across the 555 square miles of Davidson County.

Mr. Carver has over 16 years of management and hands-on technical experience in networking. He has worked for, among others, Hospital Corporation of America, the State of Tennessee and an Internet startup firm. He holds a B.A. from David Lipscomb University and an M.S. From Middle Tennessee State University. He has two children and currently lives in Hermitage, Tenn.

Ken Russell

Mr. Russell is the vice president and co-founder of ISDN-Net. He is responsible for business development, public-private partnerships and building out the next generations of the Internet.

He founded ISDN-Net with Jerry Dunlap in 1994 after the two worked on Project FYI Tennessee, the plan responsible for Tennessee having one of the nation's most advanced communication systems in the nation. Mr. Russell has nearly two decades' experience in implementing computerized management systems for businesses. He has designed large Novell networks for organizations and has integrated voice, data and video networks for universities and hospitals.

He served on the Tennessee Public Service Commissions' Tennessee Technology Task Force, the Emerging Technologies Committee of the High Tech Initiative, and was a volunteer instructor of the Vanderbilt Virtual School Program. He is currently president of the Tennessee Internet Service Providers Association and a board member of the Nashville Technology Council.

Joe Pell

Mr. Pell, director of engineering operations for Comcast in Nashville, has 25 years of cable operations, management and engineering experience. He is responsible for 10,000 miles of cable serving nearly 340,000 subscribers and for the training and development of staff. He oversees the technical end of key product launches in the region including digital cable, video on demand (VOD), HDTV and soon to be launched Comcast Digital Voice (CDV).

Mr. Pell joined Comcast in Chattanooga in 1991 and has been in the Nashville region since 2001. He began his career in the United States Air Force as a C-130 crew chief.

Steve Self

Mr. Self is a graduate of the University of Tennessee in Knoxville with over 20 years experience in the Information Systems and Telecommunications Industries. He began his career with IBM in 1984. He held various sales and technical support positions before leaving IBM in 1997 to join Covenant Health in Knoxville as a Network Engineer.

Mr. Self joined BellSouth as an Account Manager in 1998 in Knoxville. He moved to Nashville with BellSouth in 2000 as a Sales Manager and has held various management positions in Sales and Technical Sales Support with BellSouth since.

Paul Allen

Mr. Allen, vice president of operations (Engineering) at Nashville Electric Service (NES), is responsible for engineering activities relating to the planning, design, operation and maintenance of the electric system. NES is one of the 12 largest public utilities in the United States.

He joined NES in 1974 after graduation from college. He was promoted to his present position in 1993. He holds a bachelor of science degree in electrical engineering from Tennessee Technological University and a masters degree in Engineering Administration from the University of Tennessee.

Mr. Allen is a Licensed Professional Engineer in the State of Tennessee and is a Senior Member of the Institute of Electrical and Electronic Engineers.

Lance Lott

Mr. Lott was born and raised in South Florida. He attended the University of Florida earning a Bachelor of Science in Business Administration in 1975 and earned a CPA certificate in Tennessee in 1979.

He worked with HCA in various capacities from 1978-1987 including assistant vice president, Information Systems Support Services and vice president, HCA Healthcare Alliance. He was the director of Information Systems with HealthTrust, a spin-off from HCA, during the period of l987-1993. As the top ranking IT professional, he led the company in several enterprise-wide projects and the management of all outside vendors.

In l993, Mr. Lott and his wife, Martha, started InfoAdvantage Inc., a systems consulting firm specializing in collaborative technologies such as e-mail, groupware, and workflow applications.

InfoAdvantage had numerous clients, including Dollar General Corp., Deloitte & Touche, Carrier, and Southwestern Bell. In 2001, he accepted a position as the chief technology officer at Metropolitan Nashville Public Schools, a new cabinet level position.

In 2005, Mr. Lott earned a teaching license from the State of Tennessee and a Masters in Education with an emphasis in Curriculum and Instruction from Tennessee State University. His current responsibilities in MNPS include information technology, policies and procedures, strategic planning, quality improvement, customer service, and serving as a liaison with the board in governance matters.

Ray Capp

Mr. Capp has over 22 years of executive leadership experience in the distribution, publishing, and entertainment industries. He served as COO at Ingram Entertainment from its founding to over $1 billion in sales, and as EVP at Thomas Nelson Publishers, one of the top 10 publishers in the English language.

With considerable experience with mergers and acquisitions, product development, and marketing, Mr. Capp is highly regarded as an insightful strategist and no frills operator. He is also a successful author and inventor.

Hon. John P. Brown

John Brown is a General Sessions Court, Division 5, judge in the Metropolitan Government of Nashville. He was elected by popular election to his first 8-year term in 1982 and reelected in 1990 and 1998. He served as Presiding Judge of General Sessions Court from 1991-1992.

He was elected Chair of Justice Integration Services Policy Committee from 1992 to 1995, then reelected in 2004 and 2005. He also chaired the Justice Information Systems Operations Committee from 1994 to 1997.

Brown is a graduate of the University of Tennessee with a bachelors of science degree in Pharmacy and a earned his juris doctorate from the Nashville School of Law in 1969. He has professional licenses to practice both law and pharmacy.

He was a partner in J P Brown Drug Stores from 1996 to 1994 and a director of Moon Drug Co. from 1991 to 1997.

He is a member of the American, Tennessee and Nashville Bar Associations, the American Judges Association, American Judicature Society, Tennessee Pharmacist's Association and the Tennessee General Sessions Judges Association. He is married to Anne Brown and has four children and five grandchildren.

Ron Jones

Mr. Jones, a native of Harlem, New York City, is the joint appointee of the Governor, the Speaker of the Senate, and the Speaker of the House of Representatives.

A 19-year veteran of public service in the utility sector, he served his first ten years with the Tennessee Public Service Commission and the following six years with the Tennessee Regulatory Authority as a Senior Policy Advisor. Mr. Jones' utility experience in areas such as compliance, internal auditing, financial auditing and analysis, rate request evaluation, cost allocations, jurisdictional separations, and evaluation of the implementation of competitive carrier requirements has afforded him an appreciation of historical regulatory paradigms and developing regulatory initiatives.

In addition to having completed several Regulatory Studies Programs at Michigan State University, Graduate School of Business, Mr. Jones attended St. John's University. He is a graduate of Tennessee State University where he received a B.B.A. with distinction.

Amongst his community activities, Mr. Jones is most proud of his work, as a coach-volunteer at the East Nashville YMCA, as a member of the Board of Directors of the Village Cultural Arts Center Inc., and as a volunteer to The Youth Life Learning Center.

Mr. Jones currently represents the state of Tennessee as a member on the following organizations: National Association of Regulatory Utility Commissioners ("NARUC") Consumer Affairs Committee; NARUC Utility Market Access Partnership Board; NARUC Telecommunications Legislative Task Force; NARUC Representative to the Federal Communications Commission's ("FCC") Consumer Advisory Committee; State Regulatory Advisory Council for the FCC's Advisory Committee on Diversity for Communications in the Digital Age; Southeastern Association of Regulatory Utility Commissioners.

Dennis Gendron

Dr. Dennis Gendron is currently vice president for technology and administrative services at Tennessee State University, a position he has held since July 2002. He has previously served as TSU's associate vice president for academic affairs (1991-2002) and as associate dean of arts and sciences (1989-1991).

He was the first chair of TSU's Technology Vision Committee, the group responsible for technology planning at the university and for the TSU rankings of #55 and #27 on the *Yahoo!* Most Wired list. He has presented several times at EDUCAUSE and has had publications ranging from articles on technology and strategic planning to two chapters in a recent book on poet Robert Hayden.

Matt Hall

Mr. Hall is the Assistant Vice Chancellor for Information Technology Services and Associate Chief Information Architect for Enterprise Infrastructure. He is responsible for looking after the organization's electronic messaging, application hosting, and telecommunications services.

In addition to his operating roles in this capacity, he coordinates enterprise IT architecture processes with members of the research, clinical enterprise, and teach-

ing communities.

Mr. Hall assumed his appointment in April 2004. He started his career with Bank of America in 1992 in Tampa, Fla. and spent time on the Technology Planning & Control team before moving to the Global Corporate Investment Bank. There, he completed corporate credit training and managed a Business Assessment & Software Development team that supported Corporate Finance, Capital Markets (NCMI), Loan Syndications, Corporate Credit Services, High Yield Capital Markets, FX Trading, and the Financial Buyers Groups in Chicago, Charlotte, Dallas, and New York.

In 1997, Mr. Hall joined the Petroleum Trading Group at Koch Industries assigned primarily to acquisition due diligence and development of the new petroleum and derivatives trading floor in London. He led merger and acquisition diligence for various refineries and petroleum distillation operations in Rotterdam, London, Luxembourg, Breda, and Düsseldorf. He also supported petroleum-trading operations in Wichita, London, and Singapore.

After returning from London in 1998, Mr. Hall resumed his employment with Bank of America. In 2001, he assumed responsibility for business planning and project management of Bank of America's Global Corporate Investment Bank, Global Treasury Services, and the Asset Management Group's network and data center infrastructure. He managed $163 million in expense allocations and over $69 million in annual capital expenditures on behalf of the shareholders.

Key accomplishments include the Six Sigma designed 2000 node distributed high performance compute environment supporting the Global Corporate Investment Bank, the Bank's ASP / ISP strategy, Enterprise Systems Management and Mainframe Automation infrastructure deployment, standardized project management and service delivery processes, and management of the Gartner TITE benchmark for the firm's $1.9 billion technology spend.

David Briley

Mr. Briley has served on the Metropolitan Nashville and Davidson County Council for 6 years. He is currently an At-Large Representative. He has proven himself a leader on ethics, budget, solid waste and government efficiency issues. He has served on the Council's Budget and Finance Committee, the Charter Revision Committee, the Personnel Committee, the Ad Hoc Committee on Solid Waste and the Water Rate Oversight Committee.

He is the grandson of Beverly Briley, Nashville's first Mayor of Metropolitan Government, and the son of Cliff and Jeannine Briley, a respected long-time community volunteer and leader.

Raised in the Green Hills area, Mr. Briley attended Glendale Elementary, David Lipscomb Middle, and Montgomery Bell Academy. After graduation, he attended Georgetown University in Washington, D.C., where he earned a bachelor's degree in history.

After college, Mr. Briley traveled to Latin America where he worked as a volunteer teaching English while also becoming fluent in Spanish. He later attended law school at Golden Gate University in California, where he met his wife Jodie. He graduated from law school earning awards in environmental and administrative law.

In addition to his Council duties, Mr. Briley is active on the board or is a member of a number of community service groups, including The Housing Fund, Faith Family Medical Clinic, the Sister Cities of Nashville and the Community Resource Center, and is a member of the Nashville Sports Council.

Jamie D. Isabel

Mr. Isabel represents residents of District 2 on the Metropolitan Nashville and Davidson County Council. He is also owner and president of Dalmatian Creative Agency.

He earned a bachelor of science degree from Tennessee State University in 1989. He serves on the Northwest YMCA's board of directors and belongs to the TSU Alumni Association and the Nashville Black Chamber of Commerce.

Lynn Williams

Mrs. Williams is serving a second term on the Metropolitan Nashville and Davidson County Council, representing residents of District 34. An award-winning journalist, she also leads Lynn Williams Communications consulting firm. She earned her Masters of Science degree in

Mass Communications from Middle Tennessee University in 1998 and a Bachelors of Arts in Mass Communications at Memphis State University in 1977.

Mrs. Williams focuses her role in public service on promoting access to information and building a stronger community. To that aim, in 2000, she sponsored a bill that established educational access television in Nashville, bringing two cable channels alive with community-based arts and education programming this year. Last term, she updated PEG legislation and worked through three cable franchise negotiations with the city.

In the Metro Council, she serves on the Budget & Finance, Education, Tourism & Convention, and Personnel committees. She was recently appointed to serve on the city's first Task Force on Telecommunications Innovation to study and evaluate municipal broadband opportunities. She helped develop the Council laptop policy, website content and policy now in use. She monitors closely activity of Metro's Information Services department and serves as its Council liaison to the Budget & Finance committee. In 2004 she was appointed to serve on the NLC/ITC committee and has attended all scheduled meetings held since that time.

In 2005, Mrs. Williams was appointed to the NLC/ITC Action Team and participated in lobbying efforts with meetings on Capitol Hills and directly with Congresswoman Marsha Blackburn sponsor of HR 3146, national video franchise legislation.

She is married and mother of two school-age children.

Commission Staff

Staff support to the Task Force was provided by Jeremy Heidt, a Nashville-based freelance writer, and Roseanne Hayes, chief of staff for Metro City Council.

Jeremy Heidt

Mr. Heidt is the public information officer for the Tennessee Emergency Management Agency (TEMA) and has been a journalist for more than 15 years. He was previously business editor of *The Nashville City Paper*, a business writer covering technology and telecommunications for *The Tennessean* and an editor at the *Nashville* and *Toledo (Ohio) Business Journals*.

A graduate of Berea College in Kentucky, Mr. Heidt holds a bachelor of arts degree in history. He is working as communications staff for the task force at the request of Darrell Freeman through a contract with Zycron Computer Services.

Roseanne Hayes

Mrs. Hayes has worked for Metropolitan Government for 33 years. Currently, she serves as office manager and assistant to the vice mayor and the city's legal counsel.

She is a graduate of University of Tennessee—Downtown Campus in business. She belongs to the Metro Executive Secretaries Association, American Business Women's Association, Women's Political Caucus and Beta Sigma Phi Sorority.

Mrs. Hayes is president of the Chatham Pointe Homeowners Association and district chairwoman of the American Cancer Society.

Appendix D: The Task Force's Work

The full Task Force met regularly from January through July of 2006.

The Task Force worked to reach a consensus of common definitions as well as an understanding of broadband technologies. This work was accomplished through learning about a variety of examples of existing public broadband networks, testimony and research. The Task Force heard presentations by communication technology experts, telecommunications company representatives, experts on state and local telecommunications laws and representatives with experience in creating, operating or evaluating municipal broadband networks.

The Task Force established a subcommittee to draft findings and recommendations based on the consensus reached during discussions by the whole group, This subcommittee, which included David Briley, Lance Lott and Ken Russell, held two meetings between May and June. These two meetings, which were open to all members of the Task Force, were attended by industry observers unaffiliated with the Task Force.

This work, and the Task Force's discussions of information gathered, formed the basis for its final report.

Materials and briefings provided to the Task Force include:

Municipal Broadband -- Digging Beneath the Surface, 211-page report issued on Oct. 2005
http://www.balhoffrowe.com/pdf/Municipal%20Broadband--Digging%20Beneath%20the%20Surface.pdf

Public statements on Utah's UTOPIA broadband project, which Salt Lake City opted not to join.
http://www.ci.slc.ut.us/council/d6newsletter/UTOPIA-VOTE-DB.pdf

Deseret Morning News' story "Salt Lake opts not to enter UTOPIA," Oct. 14, 2004
http://deseretnews.com/dn/view/0,1249,595056042,00.html

A Tale of Two Cities: Cedar Falls and Waterloo.
http://www.iprovo.net/projectInfoDocs/economicAndCommunityBenefitsStudy.pdf

Broadband access issue in Pulaski, Tenn., Kingsport Times-News

International Telecommunication Union (ITU), a United Nations statistical source for international broadband adoption rates. Their home page can be found here: http://www.itu.int/ITU-D/ict/

UTOPIA feasibility study conducted by Dean & Co. of Washington, D.C.
http://www.telecomchoices.org/downloads/dean_report.pdf.

The International Network of E-Communities
http://www.smartcommunity.nl/.

Cable, telecom, Internet skirmishers march on Nashville venues, *NashvillePost.com*, March 29, 2006
http://www.nashvillepost.com/pub/news/topnews/9348-1.html

Seattle Broadband Task Force Report, May 2005
http://www.seattle.gov/cable/docs/SeaBTF.pdf

TRA chairman wants computers in low-income homes, *Tennessean*, June 12, 2006
http://www.tennessean.com/apps/pbcs.dll/article?AID=200660612006

U.S. General Accountability Office report on Broadband Deployment, May 2006
http://www.gao.gov/new.items/d06426.pdf

BellSouth to test WiMAX, *Atlanta Business Chronicle*, June 27, 2006

City of Sarasota, Florida. They have deployed a municipal broadband initiative, and done so without any resistance or equity access issues from the body politic. Basically, the used an ED organization called 82degreestech (http://82degreestech.com/82DegreesTech/home.aspx) to provide the broadband solution, and they utilized a municipal 802.11x wireless build out to provide the service.

www.wirelessphiladelphia.net

http://www.phila.gov/wireless/

www.hamiltontexas.com

Metro kids behind in home Web access, *Tennessean*, June 7, 2006

All children need to have access to computers, *Tennessean*, June 25, 2006
http://www.tennessean.com/apps/pbcs.dll/article?AID=2006606250366

"What Local Governments Should Consider in Planning Municipal Wireless Networks." Source: Gartner EXP

Pioneering Wi-Fi city seeing some startup problems, Associated Press, April 23, 2006

Rhode Island Wants Statewide Wi-Fi, Reuters, May 5, 2006

Metro Council votes to fight bill in Congress, *NashvillePost.com*, May 5, 2006

Speakers

Dave Buhler, City Councilman of Salt Lake City, Utah.

Stacey Briggs, President and Executive Director of the Tennessee Cable Telecommunications Association.

Michael J. Balhoff, Managing Partner of Balhoff & Rowe LLC of Washington D.C.

Richard McKinney, Microsoft Corp. and formerly Metro Chief Information Officer

Paul Morris, Executive Director of Utah Telecommunication Open Infrastructure Agency (UTOPIA)