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BY

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The opinions expressed herein represent those of the Technology Policy Group of OSC and not necessarily those of the Maryland Technology Policy Group (TEDCO)

INTRODUCTION

This paper was completed in November 2002 for the Maryland Technology Development Corporation. It was prepared by the Technology Policy Group to provide the following information:

- A brief synopsis of telecommunications market conditions and network infrastructure in Maryland.
- A review of new technologies that may be applicable to Maryland's challenges in bringing broadband to underserved areas.
- A scan of Federal and state regulatory developments and model regulatory frameworks.
- An outline of state and community best practices and public policy strategies related to information technology investments at the state and local level.
- A brief analysis of Maryland's performance on key digital economy rankings.

The analysis should not be viewed as exhaustive, but rather as a reference for referring policymakers to additional resources for each topic. Footnotes and references are noted liberally throughout the text and should be used by the reader for further guidance and information.

1 NETWORK INFRASTRUCTURE

Maryland's network infrastructure is critical to the state's ability to create and maintain new jobs in the Knowledge Economy. Maryland's information infrastructure consists of three components. The "first mile" consists of a global infrastructure that links major network access points in the U.S., such as Washington D.C., Chicago, and New York, to global internetworking points worldwide. The "middle mile" connects Maryland's Internet Service Providers (ISPs) and major private networks to the "first mile" global commodity Internet. The "last mile" connects every desktop, home, school and office to local ISPs for connectivity to the Internet.

Broadband services refer to high-speed Internet connections. They are important because many new web-enabled tools and application require high-speed connections to work. High levels of broadband access enable more businesses and individuals to participate in online applications, such as business-to-business (B2B) transactions and distance learning at a more robust and satisfying pace than dialup services. Industry experts agree that the use and sophistication of Internet technology applications increases exponentially with access to broadband.

Presently, Maryland's metropolitan areas are well served by a variety of broadband services, including cable, DSL and wireless access. Washington D.C. has a very high concentration of network connectivity that drives national traffic levels and surpasses that of surrounding cities and states. Connectivity in Baltimore compares favorably to other similar sized cities, such as Richmond, Virginia or Detroit, Michigan. Together, Washington and Baltimore provide direct links to every part of the nation, as well as direct international links to Britain, Germany, and Canada. Other urban areas, including Hagerstown, Largo, Silver Spring and Columbia also have good connectivity.

The development of Maryland's network backbone, however, has been driven almost solely by the pace of growth in Washington D.C. and the D.C./Baltimore corridor. This has resulted in regional disparities in network resources. Maryland's Eastern Shore region, for example, currently lacks any significant network assets. Similarly, the western mountain counties lack either network connectivity or significant broadband assets except for intermittent wireless service. Regional disparities emphasize the critical need to move forward with initiatives that address infrastructure development in rural and underserved areas throughout the state. Providing fast connections at broadband speeds to every Maryland home and business will ensure that all state residents and businesses have Internet access at the speed, quality and quantity they require.

1.1 Network Infrastructure Policy Challenges for Maryland

Maryland is very well situated in its middle mile. Like elsewhere in the U.S., however, the State's telecommunications economy suffers from a glut of overbuilding and a lack of demand for high bandwidth services. Many telecom providers face significant cash barriers to investment and capital for deploying fiber and broadband technologies to rural, underserved areas of the state, because they are stretched thin by a decade of

building out infrastructure to "cream" the most lucrative metropolitan markets, while ignoring many middle and smaller market opportunities. Maryland is not alone in this phenomenon. Nationally, the contraction of the telecommunications sector is putting the squeeze on hundreds of suppliers and vendors resulting in a general economic downturn. For states and governments interested in assuring broadband availability to the widest extent possible, there is little hope that market forces will spur companies to invest extensively in rural areas, particularly at the "middle mile" level.

Although the outlook seems bleak for shrinking the digital divide in network connectivity between Maryland's urban and rural areas, changes in technology may begin to loosen the grip of many dominant local exchange providers. With new technologies, such as wireless, many industry observers see the most dynamic growth in the telecom market occurring in a direction that moves it away from a centrally managed architecture. Instead, a new model is being created in communities across the country that provides businesses with the tools and technologies to control and operate their own networks, in much the same way that they control their own computing power today. In the words of Bill St. Arnaud, the visionary leader of Canada's CANARIE project:

> *"…in many ways, the telecom industry of today is very much like the computing industry of the early 70s. It is characterized by a centrally managed architecture that sells network connectivity and bandwidth as a service. But there is a technology revolution underway with Gigabit Ethernet, condominium dark fiber and condominium wavelengths."* [1]

Technology is also changing the economics and realities of broadband build out, especially in rural and underserved areas. Today, broadband technologies, which are affordable and only a fraction of the costs of conventional SONET and T-1 technologies, make it possible for far-flung communities to provide high bandwidth services to citizens.[2] Incumbent local exchange carriers (ILECs), however, may thwart the build out of these technologies because they lack credit or investment capital.

Many telecom industry experts predict that the impact of the credit squeeze on telecommunications firms will be a move away from competition based upon "facilities" to competition based upon "value-added" services. A vociferous national debate is taking place in many state regulatory commissions, as well as at the Federal Communications Commission, about the relevance, adequacy and efficacy of a facilities-based regulatory framework for regulating incumbent local exchange providers in the current marketplace. They anticipate a future where telecommunications providers are no longer the sole source provider for network services and bandwidth as a monthly service, but rather market high-margin value-added services, such as point-to-point security, VPNs and guaranteed throughput. When this occurs, the telecommunications industry will be operating in a marketplace where the customer owns key equipment more often than the telecommunications provider.

This evolution in technology, combined with the pressures of the capital markets for telecom, provides an opportunity for state policymakers with foresight to narrow the

[1] Bill St. Arnaud, quoted in The COOK Report on Internet, August-September 2002, **http://cookreport.com/11.07.shtml**
[2] See Section 2 of this report "Boosting Demand for Advanced Telecommunications Services."

urban-rural digital divide by developing new models of community ownership and operation of network assets. The state may wish to investigate models in which the ownership of the physical network is separated from the ownership of the businesses that provide services over the network as a way in which advanced telecommunications services can be affordably and profitably deployed in rural, hard-to-reach areas.

Later in this paper, we describe a number of community experiments to achieve this end. Miles Fidelman of Civicnet[3] and Nancy Stark of Small Communities[4] have developed well-regarded handbooks for municipalities and local governments on the technologies and economics of building out local telecom systems. There are significant economies to be achieved by local governments in building out their own voice and video networks. Income from utilities sales and ownerships of right-of-ways will be especially favorable to communities that operate their own electric utilities.

Often, incumbent local exchange providers have fought to block local infrastructure builds that they do not own, and that encroach on their market. In rural areas where they have chosen not to provide services, this argument can be overcome, and local communities with a strong desire to connect municipal services, provide an economic development asset of tremendous value, and forestall out-migration have already taken the plunge. [5]

Building on their experience in profitably managing "condo" fiber builds in rural communities, Canada's CANARIE project is taking steps to build a "next-generation" high bandwidth network that will enable businesses, communities and university partners to ultimately control and operate their own optical network, bringing high bandwidth connections to small communities and homes. Organizations such as schools, hospitals, businesses, municipalities and universities become anchor tenants in the fiber build—in much the same way that these organizations are the anchor tenants in many of the "demand aggregation" experiments taking place in the U.S.[6]

Understanding the desperate shortage of capital for conventional approaches, Governor John Engler's Link Michigan project provides capital resources for communities undertaking their own experiments to provide broadband infrastructure and services to their citizens. This model may be worth emulating in Maryland. [7]

1.2 New Broadband Technologies

New technologies in telecommunications over the next 5 years will focus on leveraging the current copper and cable infrastructure, largely because of the tremendous base already installed in most metropolitan areas throughout the country. New cable, DSL

3 See Miles Fidelman at http://civic.net/ccn.html.
4 See Nancy Stark at http://www.smallcommunities.org/ncsc/ and
http://www.smallcommunities.org/ncsc/Pubs/EDA/71482_NATT.
5 Several attorneys have distinguished themselves in advocating on behalf of communities, for example, Jim Baller at Baller-Herbst (see http://www.baller.com/practice-rep.html).
6 These "demand aggregation" experiments are further described in section 2.1 *" Models for Success."*
7 Link Michigan is further described in section 2.2.7. Refer to the website for more information at: www.linkmichigan.org.

and wireless technologies, however, have the potential to transform the provision of bandwidth in rural areas.

1.2.1 DSL Technology Assessment

Improvements in broadband digital subscriber line (DSL) technology, standards and efficiencies have lead to the global adoption of this high-speed access technology. Industry estimates show that the use of DSL has expanded globally by 207% annually. The DSL Forum, an industry advocacy organization, has set a benchmark challenge for a truly global mass market at 20% of copper lines using DSL broadband services.

In order for this level of market adoption to occur, several developments are critical. First, the end user must be provided fully interoperable equipment to enable a real broadband DSL mass market with low consumer prices and effortless availability for high-speed broadband access. Significant progress has occurred in this arena over the past two years. The industry recently approved testing suites as a vehicle by which broadband DSL vendors can verify that their products are interoperable and services providers can reduce their in-house testing expenses.[8] While DSL "horror stories" are legion, average installation processes for DSL appear to have decreased from several weeks, to within 3 days.

Currently, most DSL service is aDSL, or asymmetric digital subscriber line technology. It is most suited to residential and small business applications, which require a secure, point-to-point connection. While aDSL can receive information at up to 8 megabits per second, it can only transmit at one-tenth that rate, or 800 Kilobits per second. The higher downstream speed allows people to receive bandwidth-intensive applications, images, and sound files. Most technologists agree that downstream speeds are the limiting factor in terms of consumer satisfaction with broadband technologies, which makes aDSL a technology that will be able to support most home and small business requirements for the foreseeable future.

European carriers have developed and implemented anew DSL standard . Although DSL speeds vary widely, the new G.SHDSL could be two to three times faster than most versions of DSL targeted at business customers. The standard is capable of speeds to 2.3 megabits per second or up to 4.6 megabits per second. The data transfer speeds are symmetric, meaning people can download and upload information at the same rate. Providers can also deliver the new standard to customers farther than 18,000 feet, or about 3 miles, from the phone company switching facility by using repeaters to boost the signal over distances. In the US, there are number of lab trials with G.SHDSL, and competitive carriers have indicated that they will be moving to the new standard as soon as it is available.

Given the prominence of telecommunications firms and headquarters in Maryland, a potential strategy that technology leaders might consider is to ask Maryland

[8] DSL Forum recently announced the new approved Technical Report (TR 48 "ADSL Interoperability Test Plan", that specifies ADSL bit-rate and distance requirements.

telecommunications providers to deploy this technology in Maryland as a national test bed for US-wide deployment. The high broadband usage rates among Maryland's citizens and businesses, provides a compelling justification for using Maryland as a national testbed. This strategy would place Maryland in the forefront of telecommunications innovation in the deployment of new broadband technologies.

1.2.2 Cable Broadband Technology Assessment

Today's cable networks deliver data with download speeds roughly between 500 kilobits per second and two megabits per second, using the DOCSIS 1.1 protocols (Data Over Cable Service Interface Specification). Customers, however, are typically limited to about 128 kbps when they send data upstream. Uploading data at this speed is sufficient for Web surfing, sending e-mail and other files, but it significantly hampers highly interactive applications, such as distance learning, streaming video, high-end online gaming, voice over IP, and videoconferencing.

However, with new standards being developed, this situation will be changing over the next 5 years. In the last six months, a new version of DOCSIS has been piloted and certified by CableLabs. DOCSIS 2.0 significantly increases cable bandwidth and network capacity for upstream transmissions. It is designed to triple the speed at which users may send data and Internet traffic. DOCSIS 2.0 uses A-TDMA (advanced frequency agile time division multiple access) and S-CDMA (synchronous code division multiple access) to accomplish the gain in speed. The upgrade also means a host of new services, with additional tiered pricing plans. Equipment based upon the new specifications is not likely to be commercially available for installation by providers until 2003.

1.2.3 Wireless Technology Assessment

There are a number of wireless technologies with the potential to bring broadband coverage to rural and underserved areas of Maryland. Below, we have summarized each type of technology and the appropriateness of its application to the rural areas of the state.

1.2.3.1 Wireless Technologies operating in unlicensed spectrum

802.11 family

For unlicensed broadband wireless applications, there are a family of standards, commonly called 802.11a, 802.11b and 802.11g standards. The most commonly used of these is 802.11b. The equipment is widely available and reasonably priced compared to proprietary equipment. 802.11b uses the unlicensed 2.4GHz frequency and transmits at a rate of 11Mbps. 802.11a uses the unlicensed 5GHz frequency and transmits at a rate of 54Mbps. There are currently few to no products on the market that are 802.11a compliant. Higher frequency translates into shorter range and a need for more access points to cover the same area. 802.11g is applied to wireless LANs

and provides 20+ Mbps in the 2.4 GHz band. 802.11 b is useful up to 1 mile from its central point, although this distance varies based upon landscape, topology and other environmental factors.

802.16 family
A second family of standards is being developed, commonly termed 802.16. These are very new technologies with the standard's first publication in January 2002, and as of yet there are no vendors supplying equipment for this standard. This standard utilizes a higher frequency than the 802.11 family. This group will utilize the 10-66MHz frequencies for data transmission at a rate between 2Mbps and 155Mbps. This standard is geared for urban, short-range solutions, within about 1500 feet.

1.2.3.2 Wireless Technologies operating in Licensed Spectrums

ITFS and MMDS
Licensed band wireless solutions have many advantages over non-licensed, but this comes at a significant increase in cost. The Multi-channel Multi-point Distribution System (MMDS) and Instructional Television Fixed Service (ITFS) are both useable bands for this project. Both fall in the 2.5 GHz – 2.7 GHz frequency range giving them similar characteristics to the unlicensed 802.11 series equipment. These technologies cost more because they require additional research leasing fees for the use of the spectrum. MMDS licenses are sold to commercial enterprises, while ITFS licenses are originally sold to educational institutions. These schools may have leased their licenses to companies.

To determine the extent of licenses held in this technology in Maryland, further research into current license holders will be required and license fees may be $5000-$10000. Using these technologies provides the user with a licensed band that is guaranteed to have minimal interference from other broadcasts. In addition, the user has the right to broadcast at a higher power, several watts versus 100 milliwatts. This significant increase in power can help create an almost NLOS (No Line of Sight) environment that may extend for several miles from the source.

1.2.3.3 Other Wireless Technologies

Laser
Laser enables high bandwidth connectivity, but at significantly higher cost than other technologies discussed. Laser systems discussed at the WCA's 8th Annual Technical Symposium required one transmitter for each end user. While vendors quote 99.99% uptime this technology is completely dependent on clear Line-of-Sight and clear weather conditions, making deployment in most rural areas of Maryland impractical. Its range is between 1-2 miles, depending on environmental conditions.

Satellite
Satellite systems are currently the only available option in many portions of rural Maryland. In order to make a broadband wireless deployment practical it would need to

come in at a similar or lower price point than the current satellite systems. We investigated multiple satellite providers and collected the following information from their websites:

Table 1.1: Current Costs of Satellite Service in Maryland

Company Name	Unit Price	Installation	Monthly Cost	Speed
Direcway/DirecTV	399	200	89.95	up to 500k
MagicSat	399	200	50	up to 800k
MagicSat	299-349	self*	40	up to 500k
Starband	500	199	129.99	up to 500k
Skycasters	600	400	100-250	up to 384K

Additionally, the numbers in Table 1.1 do not show the inherent high latency related to round trip times. Also, the bandwidths quoted are shared with other users and vary widely in actual use. While the range of these systems extends throughout the State of Maryland, a well-engineered terrestrial wireless system is likely to provide higher performance and greater consistency.

1.2.3.4 First vs. Second Generation Wireless Systems

In addition to reviewing the "first generation" wireless systems noted above, we also reviewed "second generation" technologies for their appropriate application to rural Maryland. All currently deployed wireless systems are first generation wireless systems, typically characterized by:

Simple antennas that provide fixed areas of coverage. For example, an antenna on top of a tower, which provides omni directional coverage, or an antenna on the side of a tower, which provides coverage of a sector such as 60 degrees or 90 degrees. Simple modulation and radio systems like those used in office and campus environments today. Each end user communicates directly with the central location. Each end user has a clear line of sight to the central location. Each end user has an outdoor antenna, which must be pointed at the central location.

Second generation wireless systems are now being developed and a few of them are operational in pilot projects. There are many features of second-generation systems, and various vendors are incorporating many of these features into their products. No vendor is incorporating all of them, since some of the features are mutually exclusive. The second generation systems nearly all involve significant computer power to control them, and thus leverage the fact that computing power is becoming less expensive. Second-generation systems are characterized by:

Non Line of Sight (NLOS)
Using the techniques described below, it is possible to generate stronger radio signals that can penetrate thru walls (although with less range). It is also possible to use radio signals that bounce off of random, (perhaps moving) objects, and which may have multiple paths from the end user to the central location. Note that the term NLOS is used here only in a restricted sense, which can be confusing. It is NOT possible to penetrate through significant objects such as hills and entire buildings. However, using end points that can relay the radio signals around obstacles to one another makes it possible to serve end users in locations not visible from the central location.

"Smart" Antennas
An array of antennas may be used, for example, a ring of antennas located around the outside of a tower, or a group of them on top. A computer is used to process the different signals from each of the antennas, and form narrow optimized beams that point only at the end users who are active at any given instant in time. This simulates the results that would be obtained by having several huge antennas and being able to rotate them around instantaneously. The net result is much higher performance, the ability to penetrate walls, and less interference among multiple systems.

Complex Modulation Systems
Orthogonal Frequency Division Multiplexing (OFDM) provides much higher performance, at the cost of greater complexity and required computer power. This is another tool for penetrating walls.

Automatically Aimed End User Antennas
A phased array antenna can be constructed in a flat panel, and placed on the side of a house or building, by the owner of the house, almost anywhere on a side visible to the central location. It can be painted and made essentially invisible. This simplicity and do-it-yourself approach reduces the cost of installing a wireless system, since the homeowner does it all himself. The phased array automatically calibrates itself and creates a beam pointing at the central location.

Mesh Systems
A number of systems are being developed that add transmitters to each end user location, in addition to the receiver-only systems of first generation systems.
This makes it possible for each end point to receive signals from multiple neighbors, and to send it on to multiple neighbors. Nokia is furthest along with this, and they now offer a "full mesh" system where everyone can talk to everyone. Another system under development has local "master" stations that communicate with other "master" stations, and each master serves many end users in its vicinity. The most sophisticated system under development uses a full mesh at the town level, but then uses all the end points of the mesh to create a big phased array antenna pointing to the next town. Then the hierarchy is repeated to the next town etc.

Most second-generation features will be available only with 802.16 systems, and only then in several years. They are mostly designed for higher density population areas. The current first generation systems are quite capable of covering the rural areas in

Maryland—whether mountainous and hilly in Western Maryland, or flatter areas, such as the Eastern Shore.

2 BOOSTING DEMAND FOR ADVANCED TELECOMMUNICATION SERVICES

Today, a robust advanced telecommunications infrastructure is a necessary ingredient for a successful community or regional economy. Communities of all types and sizes realize that businesses, schools, governments and citizens increasingly rely on data transmission to live, learn and work efficiently and effectively. Yet, in many rural areas, the lack of access to broadband technologies continues to impede economic development initiatives and the promise of the digital revolution.

How do some rural communities manage to have access to broadband services at similar rates to their suburban and urban counterparts, while so many other rural communities languish? What strategies do these communities employ to improve access and the capacity of advanced telecom services? This section explores how some states and communities have created a competitive advantage by boosting demand for these critical services.

Historically, population and business density, along with income and educational factors have been the major factors that impact the digital-divide in rural areas. The issue is both capacity and use. Both factors need to be addressed to resolve the urban/rural disparity in connectivity. If a rural community creatively finances or creates a public-private partnership to increase the local network capacity, will the community's businesses and citizens take advantage of this investment? Conversely, will boosting local demand for these services guarantee private investment in the local network? Many rural communities are struggling with both these issues.

2.1 Models for Success

States and communities have developed many models to address increased access to high bandwidth capacity, and creative solutions to drive down network costs. This section deals with some common examples of models aimed at increasing access and lowering network costs.

2.1.1 Demand Aggregation

Demand aggregation refers to consolidating advanced telecommunications services to extract better services from providers at less expensive rates. Demand aggregation is possible at the local, state, regional or national level. The QUILT is an example of demand aggregation at the national level.[9] It is a consortium of research networks from across the country that aggregate their demand and release national RFP's to entice the most competitive service offerings from vendors. The more bandwidth aggregated, the better the response from vendors.

Demand aggregation is common at the state level where it is possible to consolidate multiple public networks, such as schools, state government, research, and law

[9] For more information on the QUILT see **http://www.thequilt.net**.

enforcement and transportation networks to substantially lower the telecommunication rates. Various models of state networks are examined in a recently published Appalachian Regional Commission report titled *"Links to the Future."*[10]

Demand aggregation is commonly referred to in economic development circles as the simple solution to the digital divide issue in many rural communities. Unfortunately, many rural communities do not have the necessary total capacity to aggregate to make an effective case for reduced rates. Many rural communities must pay extensive long-distance charges to move their Internet traffic through the closest Point of Presence (pop) before it makes it to the global commodity Internet. Anchor tenancy, a variation of demand aggregation relies on the demand of a single user, rather than multiple users.

2.1.2 Anchor Tenancy

Anchor tenancy is a demand aggregation model that typically relies upon a large public consumer of network services to subsidize smaller users by guaranteeing a level of service to the provider. Usually, the smaller users are other public institutions, but not always.

Findlay, Ohio is a small city in northwest Ohio. The local chamber of commerce was concerned that local companies paid a premium for advanced telecommunication services. Findlay Internet traffic was routed through the closest pop in Toledo before heading out onto the Internet and this forced businesses to pay long distance rates for data transmission. The local chamber of commerce partnered with the University of Findlay to commit to purchase an aggregate amount of bandwidth monthly, thus subsidizing the connectivity for local businesses.[11] By aggregating demand and bringing an Internet pop into Findlay, two anchor tenants in this instance were able to level the playing field for local businesses.

Although telecom providers sometimes view subsidized connectivity as anti-competitive, this model is often employed for public and economic development purposes. In rural communities, hospitals or other large users of network services can enhance the capacity and affordability of advanced telecommunication services for an entire community.

2.1.3 Resource Sharing

Resource sharing refers to communities or states leveraging right-of-way (ROW) access to extract favorable telecommunication agreements. Many states with extensive rural areas utilize resource sharing as a way to increase capacity without making investments in the network.

[10] See www.arc.gov
[11] See **http://www.findalyoh.com**.

Telecommunication providers entering into long-term contracts with public entities typically solidify resource sharing. Although this model works effectively in rolling-out services in areas previously without access, long-term contracts can prohibit adoption of new technologies.

2.1.4 Dark Fiber Initiatives

Dark fiber allows states and communities to manage their network growth in a more effective way. For years, many types of companies, from telecommunications providers and construction companies to utility providers have been installing conduit with dark fiber as a future revenue source. With the fall out in the telecommunications industry in the last few years, many companies are willing to sell off their dark fiber assets to try and recoup some of their initial investments. Given the significant increase in network costs most public and private organizations face, states are beginning to look at the purchase of dark fiber as a cost effective way to manage bandwidth growth.

2.2 States' Initiatives and Best Practices

The following are examples of what some states are doing to be competitive.

2.2.1 Alaska

Alaska entered into a 5-year, $92 million telecommunications contract with the Alaska Communications Systems Group, Inc. (ACS). ACS won the bid to provide a broad range of essential telecommunications services to state agencies, including telephone, long distance, cellular, Internet, video conferencing and satellite services. The convergence of voice, data and video services is expected to improve network efficiency, reliability and reduce costs for the State. Alaska utilized its significant annual investment in telephony and network services by putting the state's demand for these services in an RFP that sought to leverage this demand to incentivize bidders to provide additional investment in the state's infrastructure. This was such a significant restructuring of Alaska's telecommunications delivery model, Alaska utilized public employee unions in the negotiations to assign potentially laid-off state telecommunication workers with positions at ACS. The new IP network will also allow new advanced applications to be deployed for the benefit of all residents of Alaska, as well as other businesses and institutions throughout the State. Alaska's unique geography allowed the state to creatively deliver additional services to its constituencies.

2.2.2 Arizona

A new program, called the Telecommunications Open Partnership for Arizona (TOPAZ), is expected to provide broadband capabilities to 167 rural communities in the state. Nine different telecom providers are participating in what is expected to expand Internet service throughout the state and stimulate economic development through infrastructure development. The fiber optic network will cover approximately 1,118 route miles and 396,000 fiber miles along interstate highways in Arizona. The network will include a strategic east west corridor along I-10 that will link telecommunications between southern California and the rest of the country. When completed, this network will pass within 10 miles of approximately 90% of Arizona's population. The State is using its buying power and right-of-way access to leverage this investment. When completed, the network will be privately owned, with excess capacity on the network sold to other vendors.

Local government entities and school districts may choose to purchase telecommunications at a discount from the statewide service carrier contracts. TOPAZ will also facilitate distance learning, telemedicine and rural economic development.

Additionally, state agencies will benefit under the plan. It's expected that state agencies will collectively spend $100 million on telecommunications contracts over the next five years. The state recently announced that executive branch agencies have converted their existing services over to the new carriers, resulting in improved services and substantial savings.

Many of these agencies have program needs that require connection to areas in the state that fall outside the territory of Qwest, which is the state's main service provider. The Government Information Technology Agency (GITA) encourages carriers on the contract to work with each other in building a communication infrastructure in rural communities.

2.2.3 California

The Corporation for Education Network Initiatives in California (CENIC) has launched a statewide high-speed educational network that connects major research facilities across the state. CENIC recently announced a partnership with Level 3 communications to provide dark fiber to link the top 40 research institutions in the state. This project will create a multi-tiered network capable of handling all research network traffic, as well as the more commercial ISP services. This project will also connect California's community colleges and nearly 8,000 elementary and secondary schools.[13]

2.2.4 Florida

The new law establishing the Communications Services Tax is designed to simplify a complex structure of taxes on telecommunications, cable, direct-to-home satellite and related services. The law replaces and consolidates several different state and local

[13] For more information see **http://www.cenic.org**.

taxes with a single tax comprised of two parts: (1) the Florida communications services tax; and (2) the local communications services tax. The law also shifts the administration of taxes on communications services to the Florida Department of Revenue. The local revenue sources that have been repealed and replaced by this law include the cable franchise fees municipal public service tax on telecommunications, one-percent telecommunications franchise fees, and permit fees on right-of-way. At the state level the taxes include the state sales tax on telecommunications, discretionary sales surtax, and the gross receipts tax.[14]

2.2.5 Idaho Rural Initiative

Broadband connectivity is a major commitment of the Idaho Rural Initiative, which was adopted by the Idaho State Legislature during last year's session. Lawmakers approved a new three-percent investment tax credit for companies investing in broadband technology in Idaho. Idaho is one of a few states to specifically provide tax credit incentives to encourage broadband development.

On April 13, 2001, Syringa Networks LLC, a consortium of 12 Idaho local telecommunications companies, announced a planned $40M investment in fiber optic cable and other digital equipment to bring broadband capability to rural communities in southern and eastern Idaho.

2.2.6 Wireless Iowa Project

The Iowa Communications Network and the Information Technology Department are engaged in a long-term project to establish and support state-of-the-art wireless services across the entire state. This open public/private partnership will include governmental entities, educational institutions, wireless and networking service providers and manufacturers. The Wireless Iowa Project intends to issue a request for information (RFI), followed by an RFP.

2.2.7 LinkMichigan

Launched in May 2001, the LinkMichigan effort is working to transform Michigan's telecommunications infrastructure into one of the most robust and advanced in the nation. The four-step approach includes: (1) aggregating statewide telecommunication purchases to create a high-speed backbone; (2) implementing taxing and permitting fairness; (3) increasing access to information about the telecommunication infrastructure that exists in Michigan; and (4) providing funds for regional telecommunication planning of last mile solutions.[15]

[14] See **http://www.myflorida.com/dor/taxrules/index.html**.
[15] For more information on Link Michigan see <**http://www.linkmichigan.michigan.org**>.

2.2.8 North Carolina

The North Carolina Information Highway (NCIH) is the official communications and information network for government and education entities in the state of North Carolina. The NCIH is available to local, state and federal government agencies, K-12 schools, vocational-technical schools, higher education institutions, hospitals and clinics, and libraries in North Carolina.[16]

2.2.8.1 North Carolina's Rural Internet Access Authority (RIAA)

North Carolina's Rural Internet Access Authority (RIAA) was created by legislation that established aggressive goals and objectives regarding providing Internet access fairly throughout the state, with an emphasis on its rural areas. Establishing the RIAA was a primary recommendation of the Rural Prosperity Task Force established by the Governor in 1999 to determine how communities can develop strategies to compete in the 21st century economy.

North Carolina has an agreement with BellSouth, Sprint, and GTE to ensure that broadband access is available to the state's rural counties, as well as its metropolitan areas. Eighty–five of the state's 100 counties are considered rural. The goal of the agreement is to have affordable, high-speed Internet access to all North Carolinians within three years.[17]

2.2.9 Utah

The Utah right of way (ROW) fiber access project involves the construction of a fiber optic cable and SONET fiber electronics between the Eccles Broadcast Center, the State Office Building, the UDOT Traffic Operations Center and the Provo Regional Center. The network will be 262 miles and have an estimated value of $70 million.

Adesta Communications, Inc. is providing fiber to the state in lieu of monetary payment for use of the Interstate Right-of-Way. The state Information Technology Services (ITS) Division, the Utah Education Network (UEN) and UDOT have worked cooperatively in the planning and design of the network. This will be a shared backbone network that will provide services to state government, distance learning, and the Intelligent Transportation System.

Utah is expected to benefit from this agreement, as telecommunications service providers will compete to provide services to citizens, governments and businesses using the conduit. The system will also have the capacity to provide new and advanced services to state government and public schools, as well as the general public.

[16] For information on NCIH see <http://www.ncih.net/>.

[17] For additional information see the North Carolina Rural Prosperity Task Force <http://ruraltaskforce.state.nc.us/>.

2.2.10 Virginia

NOTE: In 2000 Virginia won the National Association of Chief Information Officer (NASCIO) award for Connectivity Infrastructure best practices. The award winning Virginia Advanced Deployment model was used to develop and implement Net.Work.Virginia, as well as the Commonwealth Of Virginia Network (COVANET), discussed below.[18]

2.2.10.1 Commonwealth Of Virginia Network (COVANET)

On June 1st 2000, a contract was signed with MCI WorldCom Inc, to provide telecommunications services for the Commonwealth of Virginia. The estimated $120 to $150 million contract consolidated five state networks into one, which will provide advanced technologies to its customers and partners.

Several agencies worked on the development of COVANET, including the Departments of Information Technology and Transportation, Virginia Tech, College of William and Mary, the Attorney General's Office and others.

Worldcom is fulfilling many requirements established by these groups. These requirements include:

- Lower costs for telecommunications services.
- Providing a world-class infrastructure to support state services and e-government in all corners of the commonwealth.
- Providing a procurement strategy that aggregates the state's buying powers and capitalizes on its experiences with technology.
- Facilitating high-technology services to businesses and citizens across the state even in rural areas.

In addition to the high-speed network, the contract has provisions enabling WorldCom to add new and emerging technologies as they become available to Virginia's state, county and local governments and educational institutions. COVANET takes advantage of converging technology to manage voice, data, video and Internet access. It provides a robust, high bandwidth telecommunications provided to local governments, state agencies, and universities through a single network. Major features include local toll, long distance, toll free, Internet, video, VPN's, remote access, frame relay, and ATM offered statewide at flat rates over a redundant OC-12 backbone infrastructure.[19]

2.2.10.2 Advanced Communications Assistance Fund

[18] For more information on the best practices award see <https://www.nascio.org/awards/2000awards/>.

[19] See <http://covanet.state.va.us/>.

Virginia's Center for Innovative Technology (CIT), a state-charted, nonprofit organization dedicated to the growth of technology and business in Virginia, oversees a program called the Advanced Communications Assistance Fund, which provides up to $50,000 per award to communities working to improve local telecommunications infrastructure. This is a relatively new program to boost connectivity in smaller communities. The first round of funding resulted in 3 awards at $50,000 each in 2000. CIT made nine additional awards in 2001.[20]

2.2.10.3 VirginiaLink

CIT also administers VirginiaLink, a multi-vendor telecommunications marketplace that offers substantial discounts on advanced telecommunications services to Virginia businesses. The cornerstone of this program is distance-insensitive, high-performance, broadband connectivity, which is available throughout the Commonwealth from participating carriers.

Offerings range from direct Internet access to enterprise-wide network solutions utilizing ATM and Frame Relay for voice, data, and video conferencing. To enhance these transport services, the program also makes available to participants router equipment, security products (firewalls), hosting services, and VPNs (Virtual Private Networks) at reduced prices. Long Distance Services, including traditional outbound, toll-free inbound and teleconferencing, have recently been added to VirginiaLink's marketplace with the introduction of additional products, services, and vendors planned for the near future.[21]

2.3 Local Connectivity Experiments

2.3.1 Blacksburg, Virginia

Blacksburg, Virginia is an example of a community not willing to wait for private investment in the local information infrastructure. Blacksburg created the Blacksburg Electronic Village (BEV) to make the community one of the most "connected" in the world. Today, 87% of Blacksburg's citizens are online, compared to 50% nationally.[22] About 50% of Blacksburg's citizens have high bandwidth connections and two-thirds of the towns businesses use the Internet for marketing. BEV was initiated as a community investment.[23]

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[20] For more information see <**http://www.cit.org/**>.
21 For more information on Virginia Link see <http://www.virginialink.org/>.
22 Ecom-Ohio Y3 Report, www.ecom-ohio.org
23 See <(www.bev.net) 23>.

2.3.2 Berkshire Connect

Berkshire Connect is an example of local demand aggregation. Berkshire Connect, Inc. is an organization of small businesses, schools, cultural organizations, hospitals, major employers and others who have worked together to enhance economic development and educational opportunities in Berkshire County by facilitating the improvement of the telecommunications infrastructure and services available to business and institutional users located in Berkshire County.[24]

2.3.3 Fiber to the Home

Fiber to the Home (FTTH)[25] is becoming an increasingly popular option, especially in some new builds for providing all telecommunication and entertainment options over one fiber optic cable that connects directly to the home. The greater the penetration levels, the less expensive per home the FTTH model.[26] Findings indicate that universal and affordable broadband access could be possible utilizing new Fiber to the Home (FTTH) technology, where a quasi-public entity builds and neutrally owns the fiber infrastructure. Because this technology is relatively new and expensive, and the demand for fiber optic speeds at every location is uncertain, FTTH is considered a longer-term goal, but one that provides an objective to pursue while planning for incremental network expansions using existing transport methods like cable and copper (DSL).[27]

The FTTH model has extended POTS (plain old telephone service) in some rural areas that were previously unserved by telephone service. In Grant County Washington, for example, the FTTH model extended telephone service to thousands of residents and businesses in the county. The Grant County Public Utilities District financed and coordinated the FTTH roll-out. .[28] The fiber extends to over 7000 homes with over 2600 households receiving the service. FTTH is responsible for helping Grant County recruit eight new businesses to the area, adding 96 jobs and $8M in economic development.[29] This technology has the potential to provide speeds of 100Mbps to the desktop. This speed is significantly faster than current household broadband offerings.

2.3.4 Very High Bit-Rate DSL (VDSL)

Very High Bit-Rate DSL (VDSL) is an example of a new technology that has transformed the rural broadband paradigm in a few markets and shows tremendous potential in other markets. Many see VDSL as the next step in providing a complete home-communications/entertainment package.[30] Private phone companies like Horizon

24 Berkshire Connect <(www.bconnect.org)>.
25 See FTTH Council ttp://www.ftthcouncil.com/index.shtml
26 See Marvin Sirbu, Carnege Mellon Presentation http://broadband.web.cmu.edu/
27 See Digital river Final report http://www.digitalrivers.info/html/report.html
28 See http://www.gcpud.org
29 See http//wpni.washtech.com/washwire/7412.html
30 See http://www.howstuffworks.com/vdsl.htm

Chillicothe Telephone[31] in rural Ross County Ohio offer bundled services at prices well below their suburban and urban counterparts. Although they are the ILECs in Ross County, their significant investments in this new technology and their ultra competitive price points have produced take rates at three times the industry average.

[31] See www.horizontel.com

3 LEGAL AND POLICY ISSUES

State policies, laws, and regulations can influence the rate at which citizens adopt and use Internet technologies for commercial transactions by creating an environment that either fosters or hinders their ability to purchase goods and services over the Internet. In this section, we examine four key policy areas in which state regulations directly affect consumers' ability to engage in e-commerce. These policy areas serve as general indicators of the level of support for e-commerce and include the following: (1) protectionist regulations; (2) Internet access taxation; (3) recognition of the legal validity of digital signatures; and (4) the opportunity to conduct business with the state electronically.

3.1 Indicators of Support for E-commerce [32]

3.1.1 Protectionist Regulations

Protectionist regulations are industry specific regulations that limit the sale of certain goods over the Internet. Although all states regulate commerce in order to protect consumers, how they approach these regulations can significantly impact consumer behavior. States that approach industry regulations from the perspective of the consumer, for example, tend to foster growth in e-commerce because they impose few restrictions on consumers' ability to purchase a variety of goods and services over the Internet. In contrast, states that approach regulations from the perspective of industry tend to inhibit the growth of e-commerce because they adopt regulations that protect industries from competition, and thus limit consumers' ability to purchase many types of goods online.

Table 3.1 shows the number of states with regulations that favor consumers' use of the Internet versus those with protectionist regulations that restrict consumers' ability to purchase goods and services online for eight key industries. The last column of the table indicates how Maryland's regulations compare to the other states for each of these industries.

As shown in the table, nearly all states permit consumers to buy and sell products through Internet auction sites like e-bay. Three states--North Carolina, Illinois and New Hampshire--however, recently passed laws requiring those who sell goods other than their own to be licensed auctioneers. The majority of states also permit consumers to purchase insurance (42 states), mortgages (35 states) and prescription drugs (39 states) online. Fewer than half of the states, however, permit consumers to purchase contact lenses (20 states) or medical services (23 states) online. Only a few states permit consumers to purchase wine (14 states) or automobiles (2 states) online.

[32] The data we present in this section draws heavily on following study by Atkinson and Wilhelm.
Atkinson, Robert D. and Thomas G. Wilhelm. Technology and New Economy Project: *The Best States for E-commerce*. Progressive Policy Institute, March 2002.

Table 3.1: Number of States with Industry-Specific Protectionist Regulations

	Number of states with regulations that favor consumer's use of the Internet	Number of states with protectionist regulations that limit consumers use of the Internet	Maryland's Status per Industry
Auctions	47	3	Consumer
Insurance	42	8	Consumer
Prescription Drugs	39	11	Industry
Mortgages	35	15	Consumer
Telemedicine	23	27	Consumer
Contact Lenses	20	30	Consumer
Wine	14	36	Industry
Autos	2	48	Industry

Maryland's regulations parallel the majority of states for most industries, but differ in some respects. Maryland, for example, permits consumers to purchase contact lenses and some types of medical services online, while the majority of states do not. Also, in contrast to the majority of states, Maryland does not permit online prescription drug purchases.

Note: Table 6.1 in the Appendix contains additional information on industry specific regulations by state.

3.1.2 Internet Access Taxation

Internet access taxes can increase consumer service costs sufficiently to discourage some people, particularly low-income people, from using the Internet. Although the 1996 Internet Tax Freedom Act prohibits states from charging Internet access taxes, it also permitted states with previously enacted laws to keep them. Presently, only Hawaii, North and South Dakota, Ohio, Wisconsin and Wyoming impose Internet access taxes.

3.1.3 Digital Signatures

A digital signature is used to authenticate the identity of the signer of a document, and in some cases to also ensure that the original content of a document has not been altered during transmission. Digital signatures are an important element of e-commerce transactions because they enable consumers to sign and submit legally binding documents. The Uniform Electronic Transaction Act (UETA) (2000) established the legal validity of electronic signatures and required all states to pass either UETA or comparable legislation. Presently, 38 states, including Maryland have passed legislation recognizing the legal validity of digital signatures. Several additional states have legislation pending.

3.1.4 E-government Initiatives[33]

Most states recognize that they can reduce the costs of government, provide convenient services to the public, and stimulate the growth of e-commerce in their states by providing greater opportunities for citizens to do business with the state electronically. Today, 42 states have created special executive branch offices, task forces or commissions to oversee and coordinate statewide e-government initiatives. All but a few states have Electronic Benefits Transfer (EBT), E-payment and Presentation, and Electronic Funds Transfer (EFT) programs in full production. A similar number of states allow citizens to file professional licensing applications and to file state taxes online. Twenty-eight states have programs that enable citizens to make park and facilities reservations online. While many other states have projects in the planning phase, states like California, Idaho, Virginia, and Colorado that were early adopters of Internet technologies are in the process of enhancing their programs with more sophisticated functions or for integration with their state portal or other systems. As shown in the table below, Maryland, also an early adopter of e-government initiatives compares favorably to these states.

Table 3.2: The Current Status of Initiatives for the Most Progressive E-government States

Legend: 1= Initiative in planning phase; 2 = Initiative in production; 3 = Initiative in enhancement phase

	California	Idaho	Virginia	Colorado	Maryland
Electronic benefits transfer	3	3	2	3	2
E-payment and presentation	3	3	2	1	2
Electronic funds transfer	3	3	2	3	2
Geographic information systems	3	3	3	3	3
Online Licensing	3	2	3	2	2
Parks & facilities reservations	3	1	3	2	2
File taxes online	3	2	3	2	2
Average	3	2.4	2.6	2.3	2.1

Note: Please see Table 6.2 of the Appendix for the current status of e-government initiatives by state.

3.1.5 Privacy and Security

Citizens often cite concerns for privacy and the security of personal data as reasons for avoiding business transactions and purchases over the Internet.[34] To address these concerns nearly half of all states have adopted policies that regulate the use, distribution and sale of information collected from citizens via the Internet. Further, although most states continue to rely on agency adherence to executive or statutory

[33] The information on e-government initiatives presented in this section was gleaned from the state profiles contained in NASCIO's Compendium of Digital Government in the States http://www.nascio.org.
[34] See E-com Ohio and other states' citizen surveys at <**http://www.ecom-ohio.org**>

privacy policies, a few states have established special, centralized oversight processes either in the form of a Chief Privacy Officer, a special board or commission, or a legislative committee.

The majority of states have also established some type of formal security oversight of state information systems. Half of the states, for example, have a Chief Security Officer (CSO), or a comparable position located under the CIO. Others have created centralized, statewide security coordination centers, while the remaining states rely on a distributed agency and/or department level security process, sometimes in addition to a state CSO.

3.1.6 Conclusion

States vary tremendously in their support for e-commerce, as do different regions of the country. Oregon, for example, is the most e-consumer friendly state followed by Utah, Indiana and Louisiana. As shown in Table 3.3, these states do not tax Internet access, they recognize the legal validity of digital signatures, they offer many types of government services online, and they impose few restrictions on consumers' ability to purchase a variety of products and services electronically. The Pacific Region states, including Alaska, Hawaii, Washington, Oregon and California, and the Southwestern Central states of Texas, Oklahoma, Arkansas and Louisiana also imposed few restrictions on citizens' ability to purchase online. In contrast to these regions, the South Atlantic states, including Virginia, West Virginia, Maryland, North and South Carolina, Georgia and Florida tend to have regulations that limit consumers' ability to purchase goods and services online. This is evident in the table 3.3, which compares Maryland to the most e-consumer friendly states.

Table 3.3: Maryland Compared to the Most E-consumer Friendly States

	Internet access taxation	Industry-specific protectionist regulations	Recognize digital signatures	E-government initiatives in production
Oregon	No	Few	Yes	Yes
Utah	No	Few	Yes	Yes
Indiana	No	Few	Yes	Yes
Louisiana	No	Few	Yes	Yes
Maryland	No	Moderate	Yes	Yes

3.2 Public Utility Commission Actions and Activities

Since the Telecommunications Act of 1996, many state public utility commissions have implemented new regulations to promote competition and reduce regulation, as well as to encourage the rapid deployment of new telecommunications technologies. Although public utility commissions were central to this activity immediately following the passage of the Telecommunications Act of 1996, their role has dwindled somewhat as they have withdrawn from regulating the value-added services provided by incumbent local

exchange providers. In this section, we summarize the work of state public utility commissions to advance the deployment of broadband technologies in underserved areas of their states or regulated territories.

Public Utility Commissions have focused on several discrete areas:

- The deregulation of value-added services, such as call-waiting, directory assistance, caller ID, etc. while retaining regulatory control of Plain Old Telephone Service (POTS).
- Lowering prices on unbundled network services to provide a level playing field for local services between ILECs and CLECs.
- Although public utility commissions have focused some attention on quality-of-service for advanced services, they have performed little quantitative or systematic work in this area.
- Cooperating with other agencies, such as economic development corporations, procurement agencies and other policy vehicles to deploy advanced telecommunications services in rural and underserved areas.

Many public utility commissions have extensively deregulated their telecommunications industry, providing added latitude to telecommunications providers to level the playing field between regulated and non-regulated telecommunications providers. The National Regulatory Research Institute has completed a state-to-state comparison of the current status of telecommunications regulation. Their evaluation indicates that states use about four different types of regulations in the current telecommunications marketplace: (1) conventional rate of return regulations; (2) price cap regulations; (3) price cap with interim rate freeze; and (4) rate freeze and non-indexed price caps. Only three states--Idaho, Nebraska and Pennsylvania--have entirely deregulated their local exchange carrier markets. The table below summarizes the major local exchange carriers and the type of regulation for each state:[35]

Table 3.4: Major Local Exchange Carriers and Their Regulations

State	Type of Regulation Scheme	Local Exchange Carriers (LECs) to which it applies
Alabama	Price Cap with Interim Rate Freeze	Bellsouth; Verizon
Alaska	ROR	All large incumbents
Arkansas	ROR	Century Telecom
	Price Cap	SBC; Alltel
California	Rate Freeze and non indexed caps	SBC; Pacific Bell; Verizon
Colorado	ROR	Century Telecom
	Price Cap with Interim Rate Freeze	Qwest
Connecticut	Price Cap	Southern New England Telephone
Delaware	Price Cap	Verizon
D.C.	Price Cap	Verizon-excluding residential
	Price Cap with Interim Rate Freeze on basic residential service	Verizon

[35] The table is derived from information collected by the National Regulatory Research Institute at**: <** http://www.nrri.ohio-state.edu/programs/telcom/pdf/Forms_of_regulation_2001.pdf**>**.

Florida	Price Cap on access charges	Bellsouth; Verizon; Sprint
	Price Cap with Interim Rate Freeze	Bellsouth; Verizon; Sprint
Georgia	Price Cap	Bellsouth
Hawaii	ROR	Verizon
Idaho	ROR for basic local exchanges with less than 5 lines; access line charges are totally deregulated	Qwest
	Rate Freeze and non indexed caps (no expiration date)	Qwest—basic local exchange below 5 lines in an exchange with local competition
	Deregulation for access charges	Qwest
Illinois	Price Cap on all but residential services	SBC Ameritech
	Price Cap with Interim Rate Freeze on basic residential service	Ameritech
Indiana	Price Cap for local rates	Ameritech; Sprint
Iowa	Price Cap	Qwest; Iowa Telecom Service; Frontier
Kansas	Price Cap	SBC; Sprint
Kentucky	Price Cap	Bellsouth
	Rate Freeze and non indexed caps (no expiration date)	Cincinnati Bell
Louisiana	Price Cap with Interim Rate Freeze	Bellsouth; Sprint
Maine	Price Cap	Verizon
Maryland	Price Cap	Verizon
Massachusetts	Price Cap on all but residential services	Verizon
	Price Cap with Interim Rate Freeze for basic residential	Verizon
Michigan	Price Cap	SBC; Ameritech; Verizon

Table 3.5: Major Local Exchange Carriers and Their Regulations (Continued)

State	Type of Regulation Scheme	Local Exchange Carriers (LECs) to which it applies
Minnesota	ROR	Citizens Telecom
	Price Cap with Interim Rate Freeze for basic residential	Qwest
	Rate Freeze and non indexed caps (no expiration date)	Sprint; Frontier
Mississippi	Price Cap	Bellsouth
Missouri	Price Cap	SBC; Verizon; Sprint
Montana	ROR	Qwest
Nebraska	Deregulation	Qwest
Nevada	Price Cap for access charges	Nevada Bell (SBC)
	Price Cap with Interim Rate Freeze	Sprint
	Rate Freeze and non indexed caps (no expiration date) for all services except access charges	Nevada Bell
New Hampshire	ROR	VZ
New Jersey	Price Cap for basic business service, access charges	Verizon
	Price Cap with Interim Rate Freeze for residential	Verizon
New Mexico	ROR	Valor Telecom; Qwest
New York	Price Cap with Interim Rate Freeze	Frontier Verizon
North Carolina	Price Cap	Bellsouth; Verizon; Sprint; Alltel; Carolina
North Dakota	Price Cap	Qwest
Ohio	Price Cap with Interim Rate Freeze	SBC; Ameritech
	Rate Freeze and non indexed caps (no expiration date)	Cincinnati Bell
Oklahoma	Price Cap with Interim Rate Freeze	SBC
Oregon	ROR	Verizon; Sprint
	Rate Freeze and non indexed caps (no expiration date)	Qwest
Pennsylvania	Price Cap with Interim Rate Freeze for basic services	Verizon; Verizon; North
	Deregulation for business services for large retail accounts	Verizon
Rhode Island	Price Cap for all but basic residential	Verizon
	Price Cap with Interim Rate Freeze for basic residential services	Verizon
South Carolina	ROR	GTE; South; United Telephone
	Price Cap	Sprint
	Price Cap with Interim Rate Freeze	Bellsouth
South Dakota	Rate Freeze and non indexed caps (no expiration)	Qwest
Tennessee	Price Cap	Bellsouth; Sprint; Citizens Telecom

Table 3.4: Major Local Exchange Carriers and Their Regulations (Continued)

State	Type of Regulation Scheme	Local Exchange Carriers (LECs) to which it applies
Texas	Price Cap with Interim Rate Freeze for basic business services	SBC; Verizon; Sprint
	Rate Freeze and non indexed caps (no expiration date)	SBC; Verizon; Sprint
Utah	Price Cap with Interim Rate Freeze for basic business services	Qwest
Vermont	Price Cap with Interim Rate Freeze	Verizon
Virginia	Price Cap	Sprint
	Price Cap with Interim Rate Freeze	Verizon
Washington	ROR	Qwest; Verizon
West Virginia	Price Cap for access charges	Verizon; Citizens Telecom
	Rate Freeze and non indexed caps (no expiration date)	Verizon; Citizens Telecom
Wisconsin	Price Cap	SBC; Ameritech; Verizon
Wyoming	Price Cap	Qwest

As Table 3.4 indicates, the vast majority of states have maintained some sort of regulatory framework for their telecommunications providers, although they have released numerous services by a variety of providers from rate of return and price cap regulation.

Another area in which public utility commissions have been actively involved is in the unbundling of local network elements (services) in response to the requirements of the Telecommunications Act of 1996. The National Regulatory Research Institute recently completed a study comparing pricing for unbundled network services across the nation. The study, conducted by Billy Jack Gregg, Director, Consumer Advocate Division, Public Service Commission of West Virginia, compares the results of five years of state oversight of unbundled network elements pricing.[36] Since April 2001, the National Regulatory Research Institute (NRRI) has served as a national clearinghouse for maintaining updates and accurate pricing information for unbundled network elements for each of the states.

As the deployment of advanced telecommunications services has increased, many states have begun to focus their efforts on measuring quality-of-service. The National Regulatory Research Institute recently surveyed states' efforts to regulate service quality for DSL.[37] Although Maryland did not participate in the survey, it revealed that because the majority of states do not have explicit statutory authority over advanced services, they use authority over general telecommunications service quality issues to determine performance on these criteria. The one exception, Florida, has explicit statutory authority only over the provisioning of advanced services to public entities. Most responding states do not regulate DSL tariffs, deployment or service quality

[36] The study can be downloaded in its entirety at: <http://www.nrri.ohio-state.edu/programs/telcom/pdf/Total0702.pdf>.
37 The results of this survey can be downloaded from the NRRI website at http://www.nrri.ohio-state.edu/programs/convergence/html.

standards for that service at all. While most states have authority over anti-competitive behavior related to advanced telecommunications services, none of them has explicit statutory authority over these practices. Only seven states have exercised authority over the provision of advanced services and competitive market issues.

As states have found that the provision of advanced services is critical to their economic development, jobs base and competitiveness, they have turned to other agencies, such as economic development agencies or bonding authorities, Information Technology Departments or higher education resources to encourage the deployment of advanced telecommunications services in underserved areas. A comprehensive survey conducted by The National Regulatory Research Institute shows that advanced telecommunications capabilities are commonly either owned or leased by states, and that they are generally available to the public and non-profit sectors.[38] Only two out of nine states that currently own or lease advanced capabilities allow the private sector to use those capabilities. Almost all states participate in programs to lease or own dark fiber, switches and routers, as well as long-term telecommunications contracts with high volume users, such as universities. The NRRI report summarizes the preferences of 39 states in this regard, and outlines key aspects of the type of programs used, and technologies implemented. Few states have experimented with satellite, wireless, cable or DSL. The most common applications are T-1s and higher bandwidth connections, as well as dark fiber, reflecting the high volume requirements of most state agencies. States have also used programs such as "anchor tenancy" and "demand aggregation" to encourage deployment of advanced services in remote or underserved areas.

3.3 Federal Policy Overview

Six years after its passage, the promise of the Telecommunications Act of 1996 has not been realized. Competition does not exist in the telecommunications marketplace in the way in which proponents of the Act envisioned, although competition for a range of telecommunications services is beginning to take place in some states. Competing technologies, regulatory uncertainties, urban-rural disparities and bankruptcies and accounting scandals have all added to the major uncertainties that currently exist within the broadband marketplace.

According to the February issue of the Wall Street Journal, Incumbent local exchange providers (ILECs) and the Regional Bell Operating Companies (RBOCs) are fighting with regulators while competition in the local marketplace is stalling, and capital markets are shrinking.[39] The phone companies began intense lobbying efforts of the Federal Communication Commission (FCC) immediately after the agency began unveiling rules and regulations designed to put the nation's 1996 Telecom Act into place. The local telephone marketplace represents a $112 billion dollar a year business in the US alone, according to The Wall Street Journal. Instead of losing out to their competitors, SBC,

38 See Report on Advanced Telecommunications Services at <**http://www.nrri.ohio-state.edu/programs/telcom/pdf/broadband_survey_3-01.pdf**> Also see Sections 2.1 and 2.2 of the present document for examples of innovative initiatives.

39 See <http://online.wsj.com/public/us>.

Verizon Communications, BellSouth and Qwest Communications International now control more than 90% of local phone lines and are already competing for long distance services in some states.

Competitive Local Exchange Carriers (Clecs) have been filing for bankruptcy across the country. Clec's rely on the incumbent phone provider's infrastructure to offer competitive services. According to Randolph May, director of communications policy studies at the Progress & Freedom Foundation, a Washington think tank:

> *"…they are too reliant on selling incumbents' facilities instead of constructing their own facilities. It was unrealistic to believe that Wall Street, which initially swooned at hundreds of new entrants, would continue to throw money at businesses so dependent on regulatory gaming for their survival."*[40]

Competitors are crying foul over broadband policy at both the state and federal levels. Baby Bells hoped to add broadband as a major revenue source for the future and invested heavily in DSL technology upgrades. Regulatory issues, however, have caused major revisions to DSL roll-out schedules nationally. Phone companies want parity in the broadband marketplace. They feel unfairly burdened by being forced to open their infrastructure to competition, while cable broadband infrastructure is not regulated in a similar fashion. As a result, many DSL investment plans have been halted and DSL providers point to their poor performance in the household consumer market share as evidence they are unfairly burdened. By year-end 2001, the cable industry had 7.2 million high-speed Internet customers, nearly twice the number of subscribers (3.7 million) in 2000.[41]

Cable providers argue that they face increasing competition from wire line and wireless providers for telecommunication services. Cable companies have argued that cable modem broadband service should be treated like cable television as opposed to interstate information services, to avoid additional regulation. In a recent ruling the FCC concluded that cable modem service is properly classified as an interstate information service and is therefore subject to FCC jurisdiction. The FCC determined that cable modem service is not a "cable service" as defined by the Communications Act. The FCC also said that cable modem service does not contain a separate "telecommunications service" offering and therefore is not subject to common carrier regulation.[42]

FCC Commissioner Kevin Martin stated in September of 2000 that the FCC should focus on facilities-based competition to achieve real deregulation in the marketplace.[43] Facilities-based competition refers to a simplified model for broadband regulation that encourages investment. ILEC's argue that the FCC should not impose unbundling obligations on new last-mile broadband investments. The High Tech Broadband Coalition reports that the lack of facilities-based competition has produced a decline in

[40] See Fast Company article <http://www.futurecompany.co.za/2002/04/26/featurea.htm>.
[41] See NCTA Industry Overview 2002 (Midyear) <http://www.ncta.com>.
[42] See FCC <http://www.fcc.gov/Bureaus/Cable/News_Releases/2002/nrcb0201.html>.
[43] See <http//telephonyonline.com/ar/telcom_fccs_martin_commissioner>.

broadband investments within the telecom markets from $115B in 2000, to $93B in 2001, to an estimated 57B in 2002.[44]

Michael Powell, Chairman of the FCC argues that less regulation is necessary to spur additional investment in broadband infrastructure. He states,

> *"Because the capital for infrastructure investment will have to come primarily from the private sector, the FCC must try to minimize the cost of bringing broadband services to the public by minimizing regulatory costs. These regulatory costs can be just as significant a barrier to deployment as the challenge of raising capital in the dark of a recession. We must now clarify the regulatory classification and treatment of these new services, so companies--incumbents and competitors alike--know what to expect and can make prudent decisions to build and enter these new markets."* [45]

Broadband deployment is supported through a number of federal initiatives to which states have access. The chart below cites examples from FY 2002 that may be of interest to the state of Maryland.

Congress recently passed the Farm Bill that authorized the United States Department of Agriculture (USDA) to spend $100M over the next five years to improve rural access to broadband infrastructure. The Office of Management and Budget is currently writing the rules and defining how these funds will be allocated. The Rural Utility Service (RUS) of the USDA is expected to administer these funds.

The United States Department of Commerce offers grants for infrastructure through the Technology Opportunities Program (TOP). TOP projects demonstrate how digital networks support lifelong learning for all Americans, help public safety officials protect the public, assist in the delivery of health care and public health services, and foster communication, resource-sharing, and economic development within rural and urban communities. The next funding cycle for this project is in FY03. Table 3.5 provides contact information for each program.

[44] See <http//www.htbc.org>
[45] See Powell Speech <http://www.fcc.gov/Speeches/Powell/Statements/2002/stmkp202.html>

Table 3.5: Federal Initiatives for Broadband Deployment

Agency	Program	Potential Award	Next Awards	Contact Info	URL
US Dept. of Agriculture	Broadband Pilot Loan	at least $100,000	FY 2003	Roberta Purcell Assistant Administrator (202) 720-9554 bpercell@rus.usda.gov	http://www.usda.gov/rus/telecom/
US Dept. of Agriculture	RUS/ Broadband Access Grants	$20M available in total	FY 2003	Roberta Percell Assistant Administrator (202) 720-9554 bpercell@rus.usda.gov	http://www.rurdev.usda.gov/rus/
US Dept. of Agriculture	RUS/ Internet Access Grants	$400k maximum	FY 2003	Roberta Percell Assistant Administrator (202) 720-9554 bpercell@rus.usda.gov	http://www.rurdev.usda.gov/rus/
US Dept. of Commerce	Technology Opportunity Program	$750k maximum	FY 2003	Stephen J. Downs, Director Technology Opportunities Program (202) 482-2048 sdowns@ntia.doc.gov	http://www.ntia.doc.gov/otiahome/top/grants/

Right of Way Practices

The passage of the Telecommunication Act of 1996 established new rules for fostering competition in the telecommunications marketplace. While the Act limited local and state regulatory authority in favor of market competition and innovation, it preserved the local authority to manage public rights-of-way (ROW) and to receive fair and reasonable compensation from telecommunications providers that use the public right of way. Under the Act, companies entering new markets and installing new facilities are subject to municipal control and must pay compensation for use of the public rights-of-way.[46] The National Association of Regulatory Utility Commissioners (NARUC) has spent a tremendous amount of time and effort on this issue by creating a study committee on public right-of way.[47] This section of the report focuses on the NARUC study committee report.

Several states have implemented right-of-way legislation since the Telecommunication Act of 1996 was passed. NTIA has defined four broad areas of contention that may arise when providers interact with local governments with regard to right-of-way issues.

[46] **Seongcheol Kim**, http://www.civicnet.org/comtechreview/michigan.htm
[47] Promoting Access Through Public Right-of-Way and Public Lands, **http://www.naruc.org/Committees/telecom/row.pdf**

These include: (1) timeliness of permitting; (2) fees; (3) regulations that duplicate the jurisdictional oversight of state and federal agencies; and (4) regulatory treatment that favors some right-of-way users over others. The NARUC report highlights different state actions with regard to each thematic area.

Michigan recently passed ROW legislation that is viewed by the NARUC committee and many around the country as model ROW legislation that encourages the deployment of broadband technologies across the state. The Metropolitan Extension Telecommunications Right-of Way Oversight Act of 2002 overcomes existing ROW issues in Michigan and introduces reforms that make ROW access available on terms that are fair, administratively efficient, nondiscriminatory and pro-competitive. Sensible legislation like this help foster an environment that encourages the deployment of broadband technologies.

The report highlights best practices for ROW access for service providers. The following guidelines are included:

- Access to public rights-of-way (PROW) should be extended to all telecommunications providers, as long as they receive authorization from the appropriate unit of government, given that such authorization shall not be unreasonably denied.
- Government entities should act on a request for authorization to operate and place equipment in the PROW within a reasonable and fixed period of time from the date that the request for such access is submitted.
- Authorized providers shall apply for construction permits to place equipment in the PROW with the proper unit of government. Such permits shall be processed within a reasonable and fixed period of time from the date that the request for construction is submitted.
- Fees charged for PROW access shall be published in writing.
- All providers should be subject to equivalent terms and conditions of access to the PROW, subject to reasonable alternatives in particular cases, such as overcrowding and/or alternate route planning.
- For management purposes, the appropriate state or local authority should be able to identify the owner and the location of all facilities in the PROW.
- PROW construction permits shall not contain terms, qualifications, procedures, or other requirements unrelated to the actual management of the PROW. This does not preclude requirements for proof of authorization, indemnification of liability, insurance bonding, or construction route planning.
- Appropriate unit of government authority may take into account relevant public safety concerns, zoning and planning regulations as long as they do not unreasonably discriminate among service providers.
- Standard engineering practices should be used to manage construction in the PROW and to guide the development of any engineering standards involving placement of facilities and equipment in the PROW. Standard engineering practices should include coordination with adjacent landowners where future road improvements will impact construction in the PROW.

To contribute further to the ongoing debate concerning the use of public rights-of-way by members of the telecommunications industry, the State and Local Policy Initiatives subgroup developed a set of uniform rights-of-way management practices and procedures. While there was certain disagreement between local governments and industry, they agreed upon principles. The first is that it is appropriate for local governments to manage the use of their rights of way. The legislative history of Section 253 of the Telecommunications Act of 1996 and subsequent case law define the following activities as falling within the "sphere of appropriate rights-of-way management:"

- Coordination of construction schedules.
- Insurance, bonding and indemnity requirements.
- Establishment and enforcement of building codes and other public safety codes, including police and fire codes.
- The tracking of multiple systems that use the rights-of-way, to prevent interference among them.
- General time, place and manner of construction regulations.
- Issuance of permits prior to excavations or construction work.
- Vehicular and pedestrian traffic regulations.
- Relocation procedures.
- Requirements to repair streets to return them to their pre-construction condition.
- Applicant contact information.
- A proposed construction schedule and construction map.

Industry members and units of government should work together to develop the appropriate scope of each of these activities, keeping in mind the key principle that these regulations should apply to all users of the rights-of-way, not just telecommunications companies, and that any costs resulting from such management activities must be allocated appropriately among all users. This management function should be administered, to the greatest extent possible, in a uniform and timely manner.

The following practices should be adopted to accomplish these fundamental goals:

Timing-- Units of government must act on a request for public rights-of-way access within a reasonable and fixed period of time from the date that the request for such access is submitted, or such request must be deemed approved.

Clarity-- The specific steps and appropriate documentation (i.e., documentation must relate to ROW management, rather than the financial, technical, or legal qualifications of the provider) necessary to obtain a permit should be clear and in writing. Each unit of government involved in the process, and its specific requirements, should be identified. To the greatest extent possible, the unit of government that issues permits should be centralized, to avoid requiring multiple or duplicative approvals.

Cooperation--To the extent a unit of government needs to (1) alter the location of facilities placed in the public rights-of-way by telecommunications providers, utilities, or other persons; or (2) coordinate the placement of facilities in the public rights-of-way due to constraints on available space in the existing public rights-of-way, it must

develop a process that will allow industry input to fully assess the issues and to develop solutions that accommodate both the government's concerns and each industry member's service goals and needs. To best facilitate a collaborative result, the unit of government responsible for public right of way management should provide ample written notice of its concerns and its intention to develop a plan to address them, and it should provide opportunities for industry members to provide written and in-person comments. Any plan that is adopted should be flexible to accommodate changes in an industry member's service goals. Cooperation and voluntary coordination between users of the public rights-of-way are appropriate; but mandatory requirements such as those imposed on telecommunications providers to construct or offer spare capacity to others, or to require a provider to use the facilities of another should be avoided.

Fees-- The industry agrees that a local government is entitled to recover fees directly related to the costs it actually incurs to manage the right-of-way as a result of the telecommunications provider's activities in the right-of-way. However, local governments do not uniformly agree with the industry concerning the nature and amount of such fees. Consequently, issues relating to appropriate fees potentially create delays in the permit approval process. For this reason, permits should not be conditioned on the payment of fees, but rather the fee issue should be resolved in a separate process.

4 STATES APPROACH TO INFORMATION TECHNOLOGY (IT)

Since the early 1990s states have been reorganizing their administrative structures to provide statewide oversight and coordinative functions for their information technology (IT) development and transition to a digital government. Thus far, the most comprehensive source of information on state's approach to IT administration and the status of states' enterprise IT initiatives is the recently published *"Compendium of Digital Government in the States."*[49] The report, published by the National Association of State Chief Information Officers (NASCIO), contains information collected from state CIOs regarding their states' executive IT authority, enterprise IT management and funding, and statewide privacy and security administration. It also contains information on the current status of states' enterprise applications development and e-commerce and internal automation initiatives. The report includes profiles for all but three states--Alaska, Florida and Oregon—that did not participate in the survey. In this section we draw upon this information to provide an overview of states' approach to IT management, network administration, IT procurement, IT staff recruitment and retention, and special enterprise information systems.

4.1 States' Approach to IT

Today, the majority of states (30) have some type of IT specific legislative committee or sub committee in either the House or Senate to oversee state government IT issues. In addition, nearly all states have some type of special executive branch office to oversee special state IT issues. Forty-two states, for example, have an e-government office to oversee the state's major IT initiatives. Many states also have other high-level task forces and/or commissions to oversee special state initiatives or issues, such as the state web portal, the integration of criminal justice systems or the creation of statewide electronic records policies and practices.

In addition to high-level offices, task forces and commissions, all states, with the exception of South Carolina, have created a state Chief Information Officer (CIO) position to oversee statewide IT planning and development. While the authority for the state CIO is established by legislation in most states, it is created by executive order in nine states. In 27 states either the Governor or the Governor and the legislature jointly appoint the state CIO. In 10 states the Governor shares appointing authority with cabinet officers and in an equal number of states the appointing authority resides with an entity other than the Governor. About half of all state CIOs head independent IT departments, while half manage IT functions in a division of a department.

Thirty-four states currently have an IT governing board that oversees the states' IT functions. In 22 states the CIO serves as the chair or leader of the board. In 8 states the CIO serves as a voting board member, and in 9 states the CIO serves in an advisory capacity only.

[49] The information in this section is drawn from the following survey: NASCIO. *"Compendium of Digital Government in the States."* NASCIO. Lexington: Kentucky. 2002.

State CIOs are typically responsible for overseeing the core aspects of state IT development, such as the development of enterprise architecture standards and best practices, the creation of statewide management practices and policies, the review of state agency strategic plans, the development of state broadband, and state procurement practices and policies.
Tables 6.3, 6.4 and 6.5 in the Appendix provide an easy means of comparing Maryland's administrative structures to other states. The tables contain information by state on CIO authority, the office of the CIO and the role and responsibilities of the CIO. The information is gleaned from the state profiles reported in the *"Compendium of Digital Government in the States."*

4.1.1 Network Administration

The majority of state CIOs (40) have oversight responsibilities for the deployment and administration of the state's network. Currently, 32 states administer their state network internally, while 10 states manage some aspect of it internally and outsource others. Presently, Maryland is the only state that out sources all of its network management functions. For information on specific state practices see Table 6.5 of the Appendix.

4.1.2 State Procurement

The majority of state CIOs (40) also have oversight responsibilities for state procurement, including approving hardware and software purchases and outsourced services. These responsibilities, however, are often shared with a centralized procurement office, which enables states to require agency compliance with enterprise architecture standards and accessibility standards as a condition of approval. In 6 states, the CIO does not approve purchases, but rather recommends approval to the centralized procurement office. Most states have automated their procurement processes. As Table 4.1 shows, twenty-one states, including Maryland have implemented enterprise e-procurement systems and an additional 16 states have initiatives in the planning stage. Of the 21 states that have systems in production, one-third are adding enhanced features. These states include California, Idaho, Illinois, Iowa, Kansas, Maine, and Wisconsin. For more information on states' e-procurement initiatives see Table 6.5 in the Appendix.

Table 4.1: Status of States E-procurement Initiatives

	E-procurement
Number of states with systems in production and under enhancement	7
Number of states with systems in production	14
Number of states with system in planning	16
Number of states with no initiatives	10
Maryland's Status	In production

4.1.3 IT Staff Retention and Recruitment

For many years state agencies have struggled to keep pace with the competitive forces of the IT industry. Currently, 22 states have IT staff retention and recruitment programs designed to attract and keep IT professionals. Eighteen states, for example, allow some types of IT positions to be classified as performance-based positions rather than civil service. Other states provide bonuses based on merit and additional skills achievement. The majority of states, however, still rely on perks, like flexible scheduling, the ability to work from home, and extensive training opportunities to recruit and retain IT staff. In a similar fashion, Maryland offers a combination of bonuses and finder fees for staff.

4.1.4 Enterprise Knowledge Management and Decision Support Systems

The migration to interoperable and Internet-based technologies has created a need for new types of enterprise knowledge management and decision support systems. Thus far, state's have focused on the implementation of three types of enterprise systems: (1) Enterprise Resource Planning (ERP) systems, which standardize and centralize state accounting, procurement and human resource functions; (2) Customer Relationship Management (CRM) systems, which manage customer information and provide the interactive tools necessary for the delivery of electronic services; and (3) Enterprise Knowledge Management (KM) systems, which collect information from multiple data sources and store it in a centralized repository where it is accessible to all entities that need it. In addition to providing data processing, search and data mining tools, these systems often provide tools for collaborative work arrangements, like e-mail, e-learning applications, and discussion technologies.

Although only a few states (8) have deployed KM systems, about a quarter of all states have deployed CRM and ERP initiatives. Another quarter of the states plan to deploy systems in the near future. As indicated in Table 4.2, Maryland may lag behind in developing these types of systems. Currently, the State does not have any major initiatives in these areas. Table 6.5 of the Appendix contains additional information on these initiatives and the states that may provide leadership in each of these technologies.

Table 4.2: States Status in Enterprise Knowledge Management and Decision Support Initiatives[50]

	Customer Relationship Management	Enterprise Resource Planning	Knowledge Management
Number of states with systems in production and being enhancement	2	5	3
Number of states with systems in production	9	13	5
Number of states with system in planning	12	12	9
Number of states with no initiatives	24	17	29
Maryland's Status	None	None	None

[50] The information on states' knowledge management initiatives was gleaned from the "Compendium of Digital Government in the States."

5 MARYLAND'S PERFORMANCE ON NATIONAL RANKINGS

Each year, many national periodicals and research organizations publish national rankings that rank different aspects of state performance on key indicators. These rankings are informative, and by comparing state performance year to year, policymakers can get some guidance on areas that need attention. Two such ranking tools are reviewed here, one which focuses on IT deployment and implementation within state government, and one which focuses on the extent to which the state's economy, businesses, and citizens are adopting to a new, knowledge-based economy.

5.1 Government Technology's Digital State Survey

Government Technology has developed a "digital state survey" to compare and contrast states' performance on different aspects of moving to e-commerce enabled operations within state government, its education systems, social services and law enforcement and the courts. This index is meant to measure the level of progress achieved by state and local government in transforming their operations using information technology. The rankings are measured based upon six categories:

- Social services
- Law Enforcement and Courts
- Electronic Commerce and Business Regulation
- Taxation and Revenue
- Management and Administration
- Digital Democracy

This survey is developed in three parts and results are published throughout the year in Government Technology Magazine. The Center for Digital Government performs the ranking and the judging of state's entries with their own staff. Criteria are not publicly available and the process is not particularly transparent. Maryland's performance on key indicators for the Digital State Survey is shown below:

Table 5.1: Maryland's Performance on Key Indicators

Indicators	2001	2002
Social Services	14	7
Law Enforcement and the Courts	5	18
Electronic Commerce/Business	1	17
Taxation/Revenue	14	19
Management/Administration	7	Not Ranked – Less Than 25th
Digital Democracy	14	8
Education	Not Ranked – Less Than 25th	6
GIS Utilization	14	5
National Ranking	**4**	**10**

Maryland was a consistent top performer, especially early on in the rankings in 2001. In 2002, its performance was not as high on a number of measures. Other states are very aggressive in marketing their prowess in these rankings and highlight specific key projects to Government Technology reporters, editors and staff. While Maryland may have been rated 1st in the country for its business and regulatory climate in 2001, other states have been lobbying Government Technology to market their business offerings to move their ratings up in the subsequent year. In discussions with Government Technology editorial leadership, we have found that states that do well in their rankings typically have:

1. Programs fully implemented (not just on the drawing boards), and have concrete metrics showing performance. For example, in the education area, some responses from Maryland focused on program plans, not programs that have been implemented.

2. Consistent leadership, with a strong executive level message. Changes in CIO leadership that shows a shifting focus, or a lack of gubernatorial priority on IT investments will have a tendency to pull down a state's performance. Here, Maryland's case may have been weakened somewhat by changes in its CIO leadership.

3. Strong partnerships with the private sector, both stakeholders and as project team partners. Publicity from a vendor for whom Maryland's system implementation is a "pilot" project or unique application is extremely helpful.

5.2 New Economy Index

The Progressive Policy Institute releases a biennial index comprised of New Economy indicators collected from numerous government and industry sources, such as the US Department of the Census, Federal Communications Commission, US Department of Commerce and other research organizations, such as the Milken Institute. The objective of this index is to rank states on their ability to transform their economies to compete in the New Economy.

Here, in contrast to Maryland's performance on the Digital States Survey, Maryland's performance has improved markedly overall, moving from 11th in 2000 to 5th in 2002, showing the tremendous growth in knowledge economy jobs in the state, as well as the true impact that e-commerce is having on IT, Maryland's largest job-creating sector. This finding is consistent with the high levels of business and citizen usage of e-commerce services and capabilities through Maryland's e-Readiness Assessment. In terms of Maryland's "digital economy", the state ranked 13th in the nation. In 1999, Maryland's "digital economy" ranking was 11th. As shown Table 5.2, eleven indicators make up this score.

Maryland's performance on this index supports many of the findings of the e-Readiness assessment. While Maryland has strong levels of business and citizen usage, especially in metropolitan areas, there are sectors of the state's traditional economy that

need to focus on e-commerce applications to improve productivity and competitiveness, and allow firms to compete in global markets. As other states race to catch up with the early leaders, states like Maryland that were early adopters will find the competition much more fierce. Without making the transition to adopting the new tools of e-commerce and trade, these traditional sectors will be continue to drift and decline, as more aggressive and innovative competitors build their market share. A strong economic development focus on e-commerce applications in key, job-producing, vertical markets such as manufacturing, food processing and agriculture, will spur productivity of Maryland's economy and its performance in creating jobs of the future in these industries.

Table 5.2: Maryland's Ranking on The New Economy Indicators

Indicator	1999 Maryland Rank	2002 Maryland Rank
Information Technology Jobs	N/A	5
Online Population	3	5
Commercial Internet Domain Names	9	6
Technology in Schools	40	42
Digital Government	12	14
Online Agriculture	N/A	30
Online Manufacturers	N/A	39
Broadband Telecommunciations	N/A	11
High Tech Jobs	10	8
Scientists and Engineers	3	3
Aggregated Digital Economy Scores	**6**	**13**

Maryland's performance on both the Digital States Survey and the PPI New Economy Index make it clear that the state is weak in usage and deployment of e-commerce and digital tools in its education system and in certain industry sectors. While higher education has make great strides in terms of its use of high bandwidth technologies, voice over IP and H.323 videoconferencing, there clearly are some hurdles in building technology into the agenda of Maryland's Department of Education. Many of the innovations cited for the Digital States Survey for the Education section of the evaluation were "planned" or "under construction", and the state has some catching up to do. Two issues typically stymie strong education technology programs: (1) the level of teacher adoption of tools; and (2) development of citizen-facing applications in education to help parents, students and teachers better access and use technology tools at home. Often, teachers require training programs to improve their familiarity with the technology and help them make it a integral part of the classroom curriculum. Using web technology to develop tools that build accountability between administrators, teachers, parents, students and community leaders would be a fertile area for innovation.

5.3 CONCLUSION

Maryland is poised to take leadership in key areas of information technology deployment to bring broadband technologies to rural and underserved areas of the

state, as well as to implement innovative state policies to leverage its investment in information technology to streamline operations and improve citizen services. Many examples of state leadership are shown in this report, and a state enterprise, like TEDCO, with the credibility and capability to bridge effectively between the private sector and the public sector is tailored to meet the challenge.

The opinions expressed herein represent those of the Technology Policy Group of OSC and not necessarily those of the Maryland Technology Policy Group (TEDCO)

APPENDIX

Table 6.1: Industry Specific Regulations by State

Legend
0 = Online sales and purchases are prohibited
1 = Online sales and purchases are permitted

Bolding indicates the most e-consumer friendly states.

	Contact Lenses	Prescription Drugs	Telemedicine	Mortgages	Insurance	Autos	Wine	Auctions
Alabama	0	1	0	0	1	0	0	1
Alaska	1	1	1	0	1	0	1	1
Arizona	0	1	0	0	1	0	0	1
Arkansas	0	1	0	1	1	0	0	1
California	1	1	0	0	0	0	1	1
Colorado	1	1	0	1	1	0	1	1
Connecticut	0	1	0	1	1	0	0	1
Delaware	0	0	1	1	1	0	0	1
Florida	1	1	0	1	0	0	0	1
Georgia	0	0	0	1	1	0	0	1
Hawaii	1	0	1	0	1	1	1	1
Idaho	1	0	0	1	1	0	1	1
Illinois	0	1	0	1	1	0	1	0
Indiana	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**1**
Iowa	1	1	0	1	1	0	1	1
Kansas	0	1	0	1	1	0	0	1
Kentucky	0	1	1	1	1	0	0	1
Louisiana	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**
Maine	1	0	0	1	1	0	0	1
Maryland	1	0	1	1	1	0	0	1
Massachusetts	0	1	1	1	0	0	0	1
Michigan	0	1	1	1	1	0	0	1
Minnesota	0	1	1	0	1	0	1	1
Mississippi	0	1	0	1	1	1	0	1
Missouri	0	1	1	0	1	0	1	1
Montana	0	1	0	1	1	0	0	1
Nebraska	1	0	0	1	1	0	0	1
Nevada	0	1	1	0	1	0	0	1
New Hampshire	1	1	0	1	1	0	0	0
New Jersey	1	0	1	0	1	0	0	1
New Mexico	0	0	1	0	0	0	1	1
New York	0	1	0	1	0	0	0	1

Note: The information contained in this table was gleaned from the "The Best States for E-commerce." Atkinson and Wilhelm, 2002.

Table 6.1: Industry Specific Regulations by State (Continued)

	Contact Lenses	Prescription Drugs	Telemedicine	Mortgages	Insurance	Autos	Wine	Auctions
North Carolina	0	1	0	1	1	0	0	0
North Dakota	0	1	1	1	1	0	0	1
Ohio	1	1	0	0	1	0	0	1
Oklahoma	0	1	0	1	1	0	0	1
Oregon	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**
Pennsylvania	0	1	1	0	1	0	0	1
Rhode Island	0	1	1	1	1	0	0	1
South Carolina	0	1	1	0	0	0	0	1
South Dakota	0	0	0	1	1	0	0	1
Tennessee	0	1	0	0	0	0	0	1
Texas	1	1	0	0	1	0	0	1
Utah	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**1**
Vermont	1	1	1	1	0	0	0	1
Virginia	1	1	0	1	1	0	0	1
Washington	0	1	1	1	1	0	1	1
West Virginia	0	1	1	1	0	0	1	1
Wisconsin	0	1	1	0	1	0	1	1
Wyoming	1	0	0	1	1	0	0	0
Number of state that permit Internet sales	10	22	13	17	21	1	6	24
Percent of states that permit Internet sales	20%	42%	26%	32%	40%	0%	12%	46%

Note: The information contained in this table was gleaned from the "The Best States for E-commerce." Atkinson and Wilhelm, 2002.

Table 6.2: The Status of States E-government Initiatives

Legend	
0 = No initiatives	p = Initiatives in productions
pl = Initiatives in planning phase	e = Initiatives in enhancement phase

Bolding indicates the most progressive states.

	EBT	EBPP	EFT	GIS	Licensing	Park Reservations	Tax Filing
Alabama	p	0	0	p	p	0	p
Arizona	p	p	p	p	p	p	pl
Arkansas	p	p	p	p	p	p	pl
California	**e**	**e**	**e**	**e**	**e**	**e**	**e**
Colorado	e	pl	e	e	p	p	p
Conneticut	p	pl	p	p	p	p	p
Delaware	0	0	p	p	0	p	p
Georgia	p	p	p	p	p	pl	p
Hawaii	p	pl	p	p	p	p	p
Idaho	**e**	**e**	**e**	**e**	**p**	**pl**	**p**
Illinois	p	p	p	p	p	p	p
Indiana	p	0	p	p	p	pl	p
Iowa	p	pl	p	p	p	0	p
Kansas	p	p	p	p	p	0	p
Kentucky	p	pl	p	p	p	p	p
Louisiana	p	p	p	p	p	pl	p
Maine	p	p	p	p	p	p	p
Maryland	p	p	p	e	p	p	p
Massachusetts	p	0	p	p	p	p	p
Michigan	p	p	p	p	p	p	p
Minnesota	pl	p	p	p	p	p	p
Mississippi	p	p	p	p	p	pl	p
Missouri	p	pl	p	p	pl	pl	p
Montana	pl	pl	p	p	p	p	p
Nebraska	p	pl	p	0	p	0	p
Nevada	pl	pl	p	e	e	0	pl
New Hampshire	p	pl	p	p	p	p	p
New Jersey	p	0	p	p	p	p	p
New Mexico	p	p	p	p	p	pl	p
New York	p	p	p	p	p	p	p
North Carolina	p	p	p	p	p	p	p
North Dakota	p	p	p	pl	p	pl	p
Ohio	p	p	p	p	p	p	p
Oklahoma	pl	pl	p	p	pl	p	p
Pennsylvania	p	p	p	p	p	0	p

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.

Table 6.2: The Status of States E-government Initiatives (Continued)

Legend

0 = No initiatives
pl = Initiatives in planning phase
p = Initiatives in productions
e = Initiatives in enhancement phase

Bolding indicates the most progressive states

	EBT	EBPP	EFT	GIS	Licensing	Park Reservations	Tax Filing
Rhode Island	p	0	p	pl	pl	pl	p
South Carolina	p	p	p	p	p	p	p
South Dakota	p	pl	p	p	p	p	p
Tennessee	p	0	p	p	p	pl	0
Texas	p	p	p	p	p	p	p
Utah	p	p	p	p	p	p	p
Vermont	0	0	p	p	pl	pl	p
Virginia	**p**	**0**	**p**	**e**	**e**	**e**	**e**
Washington	p	p	p	p	p	p	p
West Virginia	p	p	p	p	p	pl	pl
Wisconsin	0	0	0	p	p	p	p
Wyoming	pl	0	p	0	pl	0	p
Enhancement	3	2	3	6	3	2	2
In production	36	22	42	37	38	26	40
In planning	5	12	0	2	5	12	4
No initiatives	3	11	2	2	1	7	1

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.

The opinions expressed herein represent those of the Technology Policy Group of OSC and not necessarily those of the Maryland Technology Policy Group (TEDCO)

Table 6.3: CIO Authority by State

Legend
O = No; 1 = Yes

States	IT-specific Legislative Committees	Special Exec. Branch Digital Government offices, task force or commission	Authority for CIO Office		Appointing Authority for CIO		
			Executive Order	Legislation	Governor &/or Leg	Governor shares authority (e.g. cabinet officers)	Authority other than Governor
Alabama	0	1	0	1	0	1	0
Arizona	1	1	0	1	1	0	0
Arkansas	1	0	0	1	1	0	0
California	1	1	0	1	1	0	0
Colorado	1	1	0	1	0	1	0
Connecticut	1	1	0	1	1	0	0
Delaware	1	1	0	1	1	0	0
Georgia	1	0	0	1	1	0	0
Hawaii	0	1	1	0	0	0	1
Idaho	1	1	0	1	1	0	0
Illinois	1	1	1	0	1	0	0
Indiana	0	1	0	1	0	0	1
Iowa	1	1	0	1	1	0	0
Kansas	1	1	0	1	0	1	0
Kentucky	1	1	0	1	1	0	0
Louisiana	0	1	0	1	1	0	0
Maine	0	1	0	1	0	1	0
Maryland	0	1	0	1	0	0	1
Massachusetts	1	1	0	1	0	0	1
Michigan	1	1	1	0	1	0	0
Minnesota	0	1	0	1	1	0	0
Mississippi	1	1	0	1	0	0	1
Missouri	0	1	1	0	1	0	0
Montana	1	1	0	1	1	0	0
Nebraska	0	1	0	1	0	0	1
Nevada	1	1	1	0	1	0	0
New Hampshire	1	0	0	1	1	0	0
New Jersey	1	1	1	0	1	0	0
New Mexico	1	1	0	1	1	0	0
New York	0	1	1	0	1	0	0
North Carolina	1	1	0	1	1	0	0

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.

Table 6.3: CIO Authority by State Continued

Legend
0 = No; 1 = Yes

States	IT-specific Legislative Committees	Special Exec. Branch Digital Government offices, task force or commission	Authority for CIO Office		Appointing Authority for CIO		
			Executive Order	Legislation	Governor &/or Leg	Governor shares authority (e.g. cabinet officers)	Authority other than Governor
North Dakota	1	1	0	1	1	0	0
Ohio	0	1	1	0	1	0	0
Oklahoma	1	1	0	1	0	0	1
Pennsylvania	1	1	1	0	1	0	0
Rhode Island	0	1	0	1	1	0	0
South Carolina	0	0	0	0	0	0	1
South Dakota	0	1	0	1	1	0	0
Tennessee	0	1	0	1	0	0	1
Texas	1	1	0	1	0	0	1
Utah	1	1	0	1	0	1	0
Vermont	0	1	0	1	1	0	0
Virginia	1	1	0	1	0	1	0
Washington	1	1	0	1	0	1	0
West Virginia	1	1	0	1	0	1	0
Wisconsin	1	0	0	1	0	1	0
Wyoming	0	1	0	1	0	1	0

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.

Table 6.4: Office of the CIO by State

Legend
0 = No; 1 = Yes

States	Location of CIO & IT Office			Role of CIO on Governing Board			IT Governing Board
	CIO manages independent IT department or adjunct to Governor's Office	CIO works between sub-departmental IT function and the Governor's Office	CIO manages IT function that is a division of a department	Chair/ Leader	Voting Member	Advisory Only	Exec Branch agency reps
Alabama	0	0	1	1			1
Arizona	1	0	0	1	0	0	1
Arkansas	1	0	0	1	0	0	1
California	1	0	0	1	0	0	1
Colorado	1	0	0	1	0	0	0
Connecticut	1	0	0	1	0	0	0
Delaware	1	0	0	1	0	0	no
Georgia	1	0	0	1	0	0	0
Hawaii	0	0	1	0	0	0	0
Idaho	0	0	1	1	0	0	1
Illinois	1	0	0	1	0	0	0
Indiana	1	0	0	0	0	1	1
Iowa	0	0	1	0	1	0	1
Kansas	0	0	1	0	1	0	1
Kentucky	1	0	0	1	0	0	1
Louisiana	0	0	1	0	0	1	1
Maine	0	0	1	0	0	1	1
Maryland	0	0	1	0	0	1	1
Massachusetts	0	0	1	1	0	0	1
Michigan	1	0	0	0	0	0	0
Minnesota	0	0	1	1	0	0	1
Mississippi	1	0	0	0	0	1	0
Missouri	0	0	1	0	0	1	1
Montana	0	0	1	0	1	0	1
Nebraska	0	0	1	0	0	0	0
Nevada	1	0	0	0	1	0	0
New Hampshire	0	0	1	1	0	0	1
New Jersey	0	1	0	1	0	0	1
New Mexico	1	0	0	0	1	0	1
New York	1	0	0	1	0	0	1

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.

Table 6.4: Office of the CIO by State(Continued)

Legend
0 = No 1 = Yes

States	Location of CIO & IT Office			Role of CIO on Governing Board			IT Governing Board
	CIO manages independent IT department or adjunct to Governor's Office	CIO works between sub-departmental IT function and the Governor's Office	CIO manages IT function that is a division of a department	Chair/ Leader	Voting Member	Advisory Only	Exec Branch agency reps
North Carolina	1	0	0	0	0	1	1
North Dakota	0	0	1	0	0	1	1
Ohio	0	0	1	1	0	0	1
Oklahoma	0	0	1	0	1	0	1
Pennsylvania	0	0	1	0	0	0	0
Rhode Island	0	0	1	1	0	0	1
South Carolina	1	0	0	0	0	0	0
South Dakota	1	0	0	0	0	0	0
Tennessee	0	0	1	0	0	0	1
Texas	1	0	0	0	0	0	1
Utah	1	0	0	1	0	0	1
Vermont	0	0	1	1	0	0	1
Virginia	1	0	0	1	0	0	1
Washington	1	0	0	0	1	0	1
West Virginia	1	0	0	0	0	1	1
Wisconsin	1	0	0	0	1	0	1
Wyoming	0	0	1	1	0	0	1

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.

Table 6.5: IT Service and Management Functions by State

Legend
0 = No initiative; 1 = Initiative in planning phase;
2 = Initiative in production; 3 = Initiative in enhancement phase

States	IT Services & Management Functions						
	Network Administrative Services In-house	Enterprise Architecture Program	Strategic Plan	Web Portal	Hiring Incentives	CIO or IT Office Procurement & Out sourcing Approval	Electronic Procurement
Alabama	In-house	Yes	No	No	No	Yes	0
Arizona	No response	Yes	Yes	out	Yes	Yes	2
Arkansas	Combo	Yes	No	No	No	Yes	2
California	In-house	No	No	Yes	Yes	Yes	3
Colorado	In-house	Yes	Yes	No	No	Yes	2
Connecticut	In-house	Yes	Yes	No	No	Yes	2
Delaware	In-house	Yes	Yes	Yes	Planning	Recommend	0
Georgia	In-house	Yes	Yes	No	Planning	Yes	1
Hawaii	Combo	Yes	Yes	No	Yes	Recommend	1
Idaho	In-house	Yes	Yes	No	No	Yes	3
Illinois	In-house	Yes	Yes	Yes	No	Recommend	3
Indiana	Combo	Yes	No	No	No	Yes	1
Iowa	In-house	Yes	Yes	Yes	Yes	Yes	3
Kansas	In-house	Yes	Yes	Yes	Yes	Yes	3
Kentucky	Combo	Yes	Yes	No	No	Recommend	1
Louisiana	Combo	Yes	Yes	No	Yes	Yes	2
Maine	In-house	Yes	Yes	Yes	No	Yes	3
Maryland	Out-sourced	Yes	Yes	No	Yes	Yes	2
Massachusetts	In-house	Yes	Yes	Yes	No	Recommend	1
Michigan	Combo	Yes	Yes	Yes	Yes	Yes	2
Minnesota	In-house	Yes	Yes	Yes	Yes	Yes	1
Mississippi	Combo	Yes	Yes	Yes	Yes	Yes	0
Missouri	No response	Yes	Yes	Yes	No	No response	1
Montana	In-house	Yes	Yes	No	Yes	Yes	1
Nebraska	In-house	Yes	Yes	No	Yes	Yes	2
Nevada	In-house	Yes	Yes	No	Yes	Yes	1
New Hampshire	No response	Yes	Yes	No	No	Yes	1
New Jersey	In-house	Yes	Yes	Yes	Yes	Yes	0
New Mexico	Combo	Yes	Yes	No	Yes	Yes	0
New York	Combo	Yes	Yes	Yes	Yes	Yes	1

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.

Table 6.5: IT Service and Management Functions by State (Continued)

Legend
0 = No initiative; 1 = Initiative in planning phase;
2 = Initiative in production; 3 = Initiative in enhancement phase

States	IT Services & Management Functions						
	Network Administrative Services In-house	Enterprise Architecture Program	Strategic Plan	Web Portal	Hiring Incentives	CIO or IT Office Procurement & Outsourcing Approval	Electronic Procurement
North Carolina	In-house	Yes	Yes	Yes	No	Yes	1
North Dakota	In-house	Yes	Yes	Yes	Yes	Yes	2
Ohio	In-house	Yes	Yes	No	No	Yes	0
Oklahoma	In-house	Yes	Yes	No	No	Yes	1
Pennsylvania	Combo	Yes	Yes	Yes	Yes	Yes	2
Rhode Island	In-house	Yes	Yes	Yes	No	Recommend	0
South Carolina	No response	Yes	No	Yes	No	Yes	2
South Dakota	In-house	Yes	Yes	Yes	No	Yes	1
Tennessee	In-house	Yes	Yes	Yes	No	Yes	0
Texas	In-house	Yes	Yes	No	Yes	Yes	2
Utah	In-house	Yes	Yes	Yes	Yes	Yes	2
Vermont	In-house	Yes	Yes	No	Yes	Yes	0
Virginia	In-house	Yes	Yes	Yes	Yes	Yes	1
Washington	In-house	Yes	Yes	Yes	No	Yes	2
West Virginia	In-house	Yes	Yes	Yes	No	Yes	1
Wisconsin	In-house	Yes	Yes	Yes	No	Yes	3
Wyoming	In-house	Yes	Yes	Yes	No	Yes	0

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.

Table 6.6: Enterprise Knowledge Management and Decision Support Initiatives by State

Legend	
0 = No initiatives	pro = Initiative in production
plan = Initiative in planning phase	e = Initiative in enhancement phase

	Customer Relationship Management	Enterprise Resource Planning	Knowledge Management
Alabama	0	0	0
Arizona	plan	plan	plan
Arkansas	0	plan	0
California	**e**	**e**	**e**
Colorado	0	0	0
Connecticut	pro	pro	pro
Delaware	0	**e**	0
Georgia	plan	pro	plan
Hawaii	plan	plan	plan
Idaho	0	0	0
Illinois	plan	plan	plan
Indiana	0	pro	0
Iowa	**e**	plan	plan
Kansas	pro	pro	0
Kentucky	pro	pro	0
Louisiana	plan	plan	0
Maine	pro	pro	plan
Maryland	0	0	0
Massachusetts	0	pro	pro
Michigan	pro	pro	plan
Minnesota	plan	**e**	**e**
Mississippi	plan	0	0
Missouri	plan	pro	plan
Montana	plan	0	plan
Nebraska	0	plan	0
Nevada	0	0	0
New Hampshire	0	plan	0
New Jersey	plan	plan	plan
New Mexico	0	0	pro
New York	0	0	0
North Carolina	0	plan	0
North Dakota	0	plan	0
Ohio	0	plan	0
Oklahoma	plan	pro	pro

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.

Table 6.6: Enterprise Knowledge Management and Decision Support Initiatives by State

(Continued)

Legend

0 = No initiatives
pro = Initiative in production
plan = Initiative in planning phase
e = Initiative in enhancement phase

	Customer Relationship Management	Enterprise Resource Planning	Knowledge Management
Pennsylvania	0	pro	0
Rhode Island	0	**e**	0
South Carolina	0	0	0
South Dakota	pro	0	0
Tennessee	0	0	0
Texas	pro	pro	pro
Utah	pro	0	0
Vermont	0	0	0
Virginia	plan	pro	0
Washington	0	0	0
West Virginia	pro	**e**	**e**
Wisconsin	0	0	0
Wyoming	0	0	0
In production	9	13	5
In planning phase	12	12	10
Being enhanced	2	5	3

Note: The information contained in this table was gleaned from the state profiles published in the "Compendium of Digital Government in the States." NASCIO 2002.