On August 31, 2000, Governor James S. Gilmore proclaimed Virginia the Digital Dominion. With the ambitious goal of making Virginia a model for the rest of the world, the governor is committed to promoting state growth and development through information technology (IT) and to using technology “to break down the barriers that distance people from their government.”

Virginia is undoubtedly in the forefront of the IT revolution. Not only is Northern Virginia the home of some of the world’s top Internet and IT companies, but state policymakers have initiated a number of innovative policies. Virginia was the first state to have an Internet policy, to sign the Uniform Computer Information Transaction Act, and to have a cabinet-level secretary of technology. Several of these initiatives are designed to promote e-commerce, while others set up a system of protections for state citizens.

But the state administration also recognizes that Virginia has a long way to go to fulfill the governor’s vision of a “freer and more advanced Virginia.” Standing in the way is the “Digital Divide,” a set of social, technological, and economic conditions that severely limit the ability of some individuals and communities to share in the promise and prosperity of the new information technologies. Our nation has a Digital Divide, as do all individual states. Virginia is no exception. Indeed, data suggest that in some respects the Digital Divide in Virginia is both deeper than might be expected—and growing rather than shrinking.

Several different sources of data on IT access exist. But differences in measurements, survey methods, and definitions make comparisons across surveys difficult. The most reliable data on access to information technologies is the computer and Internet supplement to the Current Population Survey (CPS) conducted regularly by the U.S. Bureau of the Census. Our analysis uses the August 2000 CPS survey data to measure access to information technology in Virginia.

**So what is a Digital Divide?**

The term “Digital Divide” generally refers to inequality in access to computing technology and the Internet by individuals within a society. While much of the discussion to date has focused on access to these IT resources by individuals—such as at home, school, and work—it is also clear that the concept of a Digital Divide applies to whole communities. In some regions of the United States, particularly in rural and poor areas, neighborhoods and towns lack critical telecommunications networks and computing resources that would let them promote their economic development, stimulate educational achievement, and enhance the quality of life of their residents. The lack of local Internet service providers, out-dated and inadequate computing equipment, and the absence of last-mile broadband access in many communities mean an inability to support business-to-business communication, telemedicine, distance learning, and video- and audio-enriched Internet content.

The Digital Divide is about more than technological access, however. It also includes concerns about computer literacy, information literacy, and the availability of Internet (and other multimedia) content appropriate to individuals’ needs and interests. National data suggest that the Digital Divide is as problematic on the dimensions of literacy and content as it is for access.

For example, The College Board found that only half of college-bound seniors had achieved basic levels of computer literacy, and many graduating
Seniors had little experience with a computer beyond basic word-processing. Studies at community technology centers around the country indicate that basic computing skills (turning the computer on and off, operating in a windows environment, the ability to click and drag icons) are some of the key skills missing with disadvantaged and low-income groups.

Similarly, the National Adult Literacy Survey identifies crucial literacy weaknesses in the U.S. population. About one-fifth of adult Americans cannot compare and contrast information or pick out relevant points from instructions or newspaper articles when distracting content is present. In addition to literacy difficulties, a landmark study by the Children’s Partnership estimates that at least 50 million Americans experience content-related obstacles to their use of the Internet. There is a shortage of local and community information about jobs and housing, websites are not written at appropriate levels of reading and critical thinking abilities, and most websites are in English. (Nearly 32 million Americans do not speak English as their primary language.)

The Digital Divide matters. It affects equality of opportunity in America, a basic cultural value in our society. Access to IT and skill with information will increasingly affect citizens’ ability to participate in the economy, their educational success, and their interactions with government. Data and research persistently show that traditionally underserved Americans—the poor, those living in rural areas, the less educated, and some ethnic minorities—have consistently been left out of the information revolution and experience all four barriers (access, computer literacy, information literacy, and appropriate content) to information achievement.

Figure 1 Availability of information technologies in Virginia, the U.S., and the South Atlantic Region, 2000

<table>
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<tr>
<th></th>
<th>Virginia</th>
<th>South Atlantic</th>
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<tr>
<td>Have a home computer</td>
<td>54.2</td>
<td>49.2</td>
<td>51.1</td>
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<td>Households with Internet</td>
<td>44.6</td>
<td>40.5</td>
<td>41.6</td>
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<tr>
<td>Households with computer with Internet</td>
<td>81.4</td>
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The Digital Divide also matters because of the broader economic need for a well-educated, well-trained workforce. The demand for workers in IT-related fields is expanding rapidly, and nationally about 300,000 jobs go unfilled each year. In Virginia, about 30,000 IT positions are chronically vacant (see feature article on page 10). The Digital Divide represents a stratum of individuals who could potentially fill these unmet needs of the nation's businesses.

Virginia's Digital Divide

While the Digital Divide has multiple dimensions—lack of access to computers and the Internet, computer and information literacy, adequate or appropriate content—access is the prerequisite to meaningful involvement in the information society. For that reason, we focus on Virginians' access to the fundamental technologies required for economic development, educational enhancement, and digital citizenship. These technologies include personal computers, Internet access, and last-mile broadband service.

When compared to the nation and to states in the South Atlantic region, Virginia's access to essential technologies is better than average. A larger percentage of all Virginia households own computers (54 percent) and have Internet connections (45 percent) than is true for the nation as a whole and for residents in South Atlantic states (figure 1). Yet the relatively high standing of Virginia on PC ownership and Internet connectivity masks the character and depth of the Digital Divide within the state. Overall, the distribution of information technologies is highly unequal. Disparities by income, ethnicity, age, and rural status are considerable; entire counties are also deprived of digital opportunities.

The “Income Divide”

In Virginia as elsewhere, income is the most important determinant of access to information technology. A study by the Organization for Economic Co-operation and Development found that throughout the advanced industrialized nations, income alone predicted 77 percent of the variability in home access to computers and the Internet. Income obviously indicates affordability of the technology, but it also tends to reflect higher levels of education and, consequently, a greater appreciation for the role of IT.

In Virginia the IT gap between the highest and lowest income levels is profound. High-income households (those earning $75,000 or more per year) have more than six times the level of PC ownership and Internet connectivity as the lowest income households (those earning less than $15,000 per year). In 2000, 86 percent of high income households owned a PC compared to 13 percent of low income households, a gap of 73 percentage points (figure 2). The income gap in Virginia is more extensive than in either the United States or the South Atlantic region, which have gaps of 67 and 69 percentage points, respectively.

Because the lowest income level also approximates the official poverty level, which is about $15,000 for a family of four, the data suggest important geographic disparities within the state. In a dozen counties, more than a fifth of the population is in poverty, and in three counties, poverty rates exceed 25 percent (figure 4). Virginia’s southern tier and Appalachian regions have very high poverty levels, a sharp contrast to Northern Virginia where poverty levels are often less than 5 percent and the median income exceeds $65,000. Not surprisingly, these areas are also at the greatest disadvantage with respect to Internet infrastructure.

The evidence suggests that income also plays a strong role in the differences in IT access between older and younger Virginians. As illustrated in figures 2 and 3, the gap in PC ownership for households where the head-of-household is over 55 and between the ages 35-44 is about 30 percentage points, while for Internet access among those owning PCs is in both age groups, it is 13 percent.

A final impact of income inequality is reflected in public schools. National data show that schools in more affluent districts have far more favorable ratios of Internet-connected computers per
student than do schools in the poorer areas. In 1998, there were 16 students per Internet computer in U.S. schools where more than 71 percent of the student body was eligible for school lunch programs. This is more than double the 6.5 students-per-computer ratio for the most affluent schools (where less than 11 percent of the student body is eligible for subsidized lunch programs).

The “Ethnic Divide”

In the United States, white Americans have typically had double the levels of home PC ownership and Internet connectivity of African-Americans, and this pattern is evident in the commonwealth. In Virginia, 60.3 percent of white households owned a computer in 2000 compared to 30.3 percent of black households. For Internet connectivity, these figures were roughly 50 percent and 25 percent, respectively. An unusual finding for Virginia—and one that merits further exploration—is the closing of the “Internet gap” among black and white households that own computers. Black homes with a PC are slightly more likely to have Internet access (82.6 percent) than such white homes (81.5 percent) (see figure 3).

What is most troublesome about the Digital Divide between ethnic groups is that it does not appear to be narrowing. Data on the Digital Divide have been systematically collected since the mid-1990s, and in each year the percentage point gap between white and black households has widened for PC ownership and Internet connectivity. Although access to IT is improving for both groups, the rate of increase is faster for whites than for all other groups except Asian-Americans.

Virginia must attend to these racial and ethnic differences. While income is a contributing factor (most ethnic households have lower average incomes than white), studies show that ethnic differences in household IT access persist beyond what can be explained by income alone. One explanation may be the perceived lack of IT’s usefulness, but there are additional socio-economic, technical, and geographic reasons for these persistent differences in access levels. Because Virginia has the 11th largest black population in the United States (accounting for one-fifth of the population in the commonwealth), it is critical that private action and public policies address the special IT concerns of these citizens.

The “Rural Divide”

Rural-urban gaps in access to IT are chronic and include complex telecommunications infrastructure issues, as well as household access problems. Of primary concern is the intense disparity in the last-mile telecommunications infrastructure available to rural homes, schools, and offices compared to their metropolitan counterparts. More than any other IT factor, this infrastructure affects the potential economic development of rural areas and the capacity of rural residents to take full advantage of Internet resources.

In Virginia just under one-third of state residents live in rural areas. Roughly 33 percent of state citizens live in towns smaller than 2,500 people; the official definition and data for rural communities exclude small towns that are effectively suburbs of large metropolitan areas such as Washington, D.C. Even though these residents represent a modest share of the population, more than half of Virginia’s counties have 95 percent or more of their housing units in rural areas, and three-quarters of Virginia’s counties have 75 percent or more of their housing classified as rural.
Virginia's ability to more evenly distribute the prosperity of its increasingly IT-based economy depends heavily on the telecommunications infrastructure in rural areas. The data are grim. The National Telecommunications and Information Administration (NTIA) recently reported that last-mile broadband infrastructure is, for all practical purposes, not available in rural communities. Fewer than 1 percent of all U.S. towns with a population of less than 2,500 have last-mile broadband cable access, the predominant form of broadband transmission. In contrast, over 70 minutes, if at all. Audio files download in hours rather than as streaming video, graphic images, and additional, enriched Internet content such as streaming video, graphic images, and audio files download in hours rather than minutes, if at all.

The low population density of rural areas—plus difficult terrain such as mountains and hollows—makes it costly and less profitable for private companies to make the necessary infrastructure investments. In many states, including Virginia, regulations also prevent local governments from taking aggressive action to compensate for these classic market failures by providing, in some capacity, a municipal telecommunications network. The problem is not insurmountable, however. The city of LaGrange, Ga., has been one of the few rural communities to successfully navigate regulatory constraints and provide crucial broadband and IT services for its citizens and businesses. The Blacksburg Electronic Village is another model that illustrates how broadband service can become widely available in a community.

Lack of infrastructure is often compounded by the inability of Virginia's rural communities to adequately inventory the advanced telecommunications capacity within their provenance. While the location of conventional telephone lines is commonly known and regulated by the State Corporation Commission, the fiber-optic backbone is not. Communities have experienced considerable difficulty in identifying the backbone that exists in their locale and determining what its unused capacity is. This unused capacity, known as dark fiber, represents the infrastructure available for economic development and is consequently critical knowledge for strategic economic planning.

Because IT companies consider both the location of the backbone and the dark fiber capacity proprietary knowledge, they are usually unwilling to share this information with local government officials and planners. Several states are addressing the issue. Arkansas, for example, provides an independent, publicly available geographic information system on the state’s advanced telecommunications network to help its communities with their development efforts.

These infrastructure issues help explain why, as the NTIA found, “at every income level, households in rural areas are significantly less likely—sometimes half as likely—to have home Internet access than those in urban or central city areas.” In Virginia the rural Digital Divide is notably worse than the national average: the gap between rural and metropolitan areas for homes with PCs with Internet connections is 11.7 percentage points compared to 6.9 percentage points for the United States (figure 3).

Rural residents cannot necessarily count on having public Internet access available at other locations. Nationally, for example, only two-thirds of rural libraries have public Internet access, compared to 80 percent of urban libraries. There is a growing network of community technology centers across the country, but these tend to be concentrated in urban areas, and the pattern for Virginia is not significantly different than that for the nation as a whole.

### Bridging Virginia’s Digital Divide

Improving digital equality in Virginia is not just a challenge for state government. Local government, the private sector, and universities all have an important role to play, and significant initiatives are already underway. Just a few of the many examples of public and private efforts to improve equality of access throughout the commonwealth include

![Figure 3 Digital Divide gaps in homes with computers with Internet connections by race, age, location, and income, 2000](image-url)
Governor Gilmore’s Digital Opportunity Program, which represents one of the most comprehensive efforts to address all dimensions of the Digital Divide on a coordinated, statewide basis. The program is designed to ensure that all Virginians have access to computer technology and the Internet. (More information on the program may be found at [www.sotech.state.us/digop.htm](http://www.sotech.state.us/digop.htm)).

- The commitment of over $26 million in state funds to enhance technology instruction at two of the nation’s leading historically black colleges and universities, Norfolk State and Virginia State.
- More than 200 public-access Internet and computing centers at libraries, housing complexes, and other locations across the state.
- StartUp, a partnership of America Online, several additional high-tech companies, and the commonwealth, which will create and operate over 100 Internet-ready computer centers for young people from disadvantaged communities.
- Technotrain, a mobile computer learning unit that brings computer training to children and adults who do not have access to the Internet (developed by J. Sargeant Reynolds Community College in Hampton Roads). See inset above.

As illustrated above, community groups, government at all levels, the private sector, academia, and individuals have important roles to play in bridging the divide. While many of the challenges can best be addressed at the local level, the commonwealth still has a critical role to play. We have identified five key ways in which Virginia can continue to bridge the Digital Divide within its borders:

**Aggressive Leadership.** The state must continue to take a strong leadership role by building and sustaining initiatives like the Digital Opportunity program; stressing the importance of the issue throughout state government; fostering initiatives at the community level; actively encouraging telecommunications firms to play their full part; and developing appropriate regulatory and procurement policies to encourage the commercial provision of affordable broadband access in under-served regions of the state.

**Community Networks.** The state should do all that it can—following the model of rural electric cooperatives—to offer a smoother regulatory path for communities wanting to provide telecommunications services to their citizens and businesses. When it is infeasible for the private sector to provide commercially...
viable IT services, many communities have encountered significant regulatory barriers in their attempts to create local IT networks.

Informed Planning. The state should support the development of the information and benchmark data needed to conduct community planning and to monitor the effectiveness of state and local Digital Divide initiatives. This includes publicly accessible geographic data on the location of telecommunications networks and facilities with broadband access. (The future Virtual Opportunities Center will address the need for a central clearinghouse of best practices.)

K-12 Education. The state can help the K-12 sector meet its needs, not just for classroom technology, but also for appropriate instructional materials and information literacy. Schools can benefit from increased funding for creative local programs: the acquisition, operation, and maintenance of equipment; teacher training and compensation; the development of creative Internet-based learning materials; and distance learning initiatives that bring specialized offerings to even the most remote locations.

Public/Private Collaboration. The state can play a critical, continuing role in fostering meaningful collaboration between Virginia’s high-tech business community and public efforts to address the challenges of the Digital Divide. Other than the federal government, the state is the biggest, most visible player on the block. It is a major purchaser of services, it can affect the success or failure of individual businesses, and it serves as a powerful ally. The state should be encouraged to use that leverage wherever appropriate.

References

2 The term broadband refers to telecommunication transmission capabilities that are substantially higher than the typical 56 kilobits per second that can be sent through a quality home telephone line. The Federal Communications Commission defines broadband as transmission rates of at least 200 kilobits per second. Most broadband transmission is supplied by fiber-optic cables, but satellite transmission and underwater cables are also part of this infrastructure. The term “last mile” refers to the actual connection of schools, homes, and offices to the backbone, or primary telecommunications network that transmits across long distances.

3 For more discussion of these issues, see James Bohland, Maria Papadakis, and Richard Worrall, Creating the CyberSouth, conference report for the Southern Growth Policies Board Conference “Telecomm South II: One South, Digitally Divided,” Roanoke, Va., October 1-3, 2000.


6 The South Atlantic region includes the states of Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia and the District of Columbia.


National Telecommunications and Information Administration, Advanced Telecommunications in Rural America: The Challenge of Bringing Broadband Service to All Americans (Washington, D.C.: NTIA, April 2000).

12 For more analysis of this issue, see Abdullah Masud and Brenda Neidigh, “Broadband Deployment in Small American Cities: State Regulation on Municipal Telecommunications in Virginia,” Virginia Polytechnic Institute and State University, June 2000.

13 See www.lagrange-ga.org.

14 See the Arkansas State Land Information Board [www.dis.state.ar.us/lib/htm].
