

Digital Infrastructure: The New Public Works?

John S. Niles

This review and commentary of U.S. state and local government involvement in telecommunications infrastructure development finds a spectrum of activism defined by four patterns.

I begin consideration of the new public works with a review of the old. Public works—the government provision of roads, bridges, waterways, school buildings, parks, stadiums, and other physical facilities supporting the delivery of goods and services—is justified in part by making such spending a part of economic development programs. Constructing or improving public works provides one of the crucial foundations for growing economic activity. Modifying a state highway bridge to support heavier trucks and thus make a new factory feasible is an example of infrastructure improvement for economic development; so is construction of a new science building for a state university, a source of professional talent for business.

Job creation is the goal of most government economic development programs. Since World War II, state governments in the United States have routinely taken a variety of direct actions aimed at motivating the private sector to create more in-state jobs for residents. The linkage to public works infrastructure comes from the criteria business leaders use when deciding in which communities they should build factories or lease office space. Adequate infrastructure of all types is generally necessary.

Business activities in a healthy economy are often not distributed in alignment with where people live and with their skills. As a result, government economic development

programs typically have an equity focus that is aimed at helping population groups and geographic regions that are in the lower quartiles of income, wealth, opportunity, and hope. Rural regions and inner city districts with above-average unemployment are typical targets of state government economic development programs.

Telecommunications infrastructure, particularly high-capacity digital facilities, such as fiber optic cabling and digital switching, has become a growing focus for government economic development leaders over the past decade. This attention results from the perception that business leaders increasingly demand world-class, advanced telecommunications to support their operations, and that such telecommunications may not be readily available without special attention to the issue from community civic leadership. Furthermore, in the competition between states and regions that economic development leaders assume, there is a competitive advantage in having telecommunications that is simply better than what the majority of regions can offer.

Telecommunications in the United States is still largely a private sector responsibility, albeit one that is highly regulated by local, state, and federal government. This form of responsibility is unlike the usual public works infrastructure responsibility, where the private sector works under contract to government agencies. Still, in the past decade, there have been a number of new telecommunications initiatives by state and local government that could be characterized as steps toward “digital public works.” By this, I mean that governments contract for the construction of telecommunications infrastructure, and then either operate



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telecommunications services that are offered beyond the government, or else lease portions of such infrastructure to carriers. The most conspicuous examples of digital public works at the state and local level are in the city of Glasgow, Kentucky and the state of Iowa, both described later.

While these examples of government owned-and-operated networks are still isolated, there are indications of continuing and even growing interest by local and state governments in such approaches.¹ The passage of the 1996 Telecommunications Act has caused the U.S. telecommunications regulatory climate to enter a state of flux that interacts confusingly with business strategies and the accelerating development and deployment of technology. I will describe a series of ways in which U.S. state governments try to improve telecommunications infrastructure, up to and including building and operating government-owned telecommunications systems such as those in Glasgow and Iowa.

State governments approach their work on telecommunications infrastructure from one of two geographic perspectives: state-wide or community-by-community.

Statewide Approaches

Statewide government approaches try to achieve overall telecommunications benefit from the development of solutions to the government organization's own direct needs, such as access to local area networks, electronic mail, and Internet by government employees, or the sale of lottery tickets statewide. In state governments, there is typically an historical legacy of uncoordinated network and applications development by individual state agencies such as human services, transportation, and the university system. In pursuing a more coordinated government-wide telecommunications solution, a state government is such a large and geographically widespread customer that its own procurements have an impact on the infrastructure and services that are available to serve other organizations and the general public.

Coordinating these governmental "internal" efforts at telecommunications infrastructure development for purposes of economic development—a mouthful that I'll simply call *teledevelopment*—is usually meant to provide incentives for the private sector. The incentives are aimed at encouraging greater investment in broadband telecommunications infrastructure and affordable service deployment in the less lucrative rural markets or disadvantaged urban neighborhoods in a state. Depending on what the state government does, the intent is to stimulate more investment by either or both incumbent carriers and new entrants.

I categorize the teledevelopment approaches seen in state government infrastructure involvement according to the explicitness of their intended impact on teledevelopment, as follows:

- Inadvertent teledevelopment.
- Influencing teledevelopment.
- Leveraging state service procurement.
- Building digital public works.

In moving through the categories, the incidence seen around the United States of each succeeding approach becomes less common.

Inadvertent Teledevelopment

State government buys telecommunications services, leases dedicated facilities, or builds new infrastructure with no policy consideration of influencing telecommunications infrastructure that serves non-government customers in the state. However, in most cases that influence may very well occur anyway.

The majority of state government telecom procurements would fall into this category. Departmental microwave systems and leased lines, and even statewide procurements focused purely on state government offices, fall into this category.

The statewide data and voice network services purchased by the state of Virginia in 1992 from MCI to serve the telecommunications needs of state agencies and institutions

fits this pattern of inadvertent teledevelopment. The emphasis of this procurement is simply on how the state government directly benefits. J. Westwood Smithers, Jr., director of the Virginia Department of Information Technology, described the benefits, "MCI presented a customized solution that gives Virginia the kind of intelligent network it needs to efficiently handle the existing and future voice and data traffic among government agencies and institutions." Added Jonathan Crane, president of MCI's Eastern Division, "Bringing enhanced telecommunications services to government agencies at affordable market rates benefits taxpayers, government users, and private industry." There is no mention of any teledevelopment outside of state government.²

In the case of the Garden State Network, begun in 1984 and still under development by the state of New Jersey, the intent to focus mainly on serving state government agencies is also clear. However, beginning to move along the spectrum of possibility, this network goes a bit further:

Originally intended to address the needs of a mainframe-centric environment, today the Garden State Network provides interconnectivity among mainframes, minicomputers, local area networks, servers, and other distributed processing platforms delivering data, voice, text, graphics, and video services to state as well as certain county, federal, and private agencies. It provides access to a myriad of services and information including all major state databases, and use of the Internet and World Wide Web services for all GSN subscribers. All state departments, counties, and local police are current users of one or more services of the GSN.³

Since state governments are such large telecommunications customers, the spillover from serving them may very well provide telecommunications infrastructure development outside of government, and hence

provide teledevelopment. The point of development in this category, however, is that such results are peripheral to the direct service of government.

Influencing Teledevelopment

In this category, state government buys telecommunications services, leases dedicated facilities, or builds new infrastructure with the general intent of indirectly influencing infrastructure development to support new telecom capabilities for customers outside of state government.

When the state of Virginia let new contracts with two different carriers in 1996, the interest in teledevelopment was much more explicit, as reported in *Computerworld*:

The Commonwealth of Virginia is joining a small but growing group of states building high-powered broadband networks to improve their schools, increase their competitive edge, and lure business. The network could help lure businesses to the state by bringing better telecommunications services to remote areas, said Robert Skunda, Virginia's secretary of trade and economic development. Key to the deal was that each telecommunications company was willing to charge flat rates to users hooking up to the network instead of charging per mile. That means no matter where a user hooks up to the network in the state, use is unlimited and includes high-speed Internet access and teleconferencing capacity.⁴

This equalization of rates is appealing to state economic development leadership, because it does not add cost penalties to the more remote, rural areas of the state—the geographic areas that are the emphasis in economic development programs.

The state of Oregon frame relay net is another example of a government network development that influences teledevelopment. Oregon consolidated a number of separate state networks when it signed a

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five-year contract for frame relay service with a consortium made up of most of the LECs in the state. The \$35 million magnitude and five-year timeframe of the contract led these companies to increase the number of frame relay switches in the state from 14 to 28, extending the service to remote corners of the state.

For Oregon state agencies and local governments, the deal means that affordable, higher bandwidth services are available anywhere. The contract is also intended to lower telecommunications costs for businesses in remote areas, even though they can't take part in the state contract. With more frame relay switches scattered throughout the state, connections to these switches will be shorter and less expensive, according to state officials.⁵

It is always possible to criticize governments taking approaches like these for not doing enough to leverage their procurement actions into a wider teledevelopment impact. Over time, in response to the rhetoric of can-do economic development activism, more aggressive approaches develop, such as the following.

Leveraging State Procurement

In this category, state government buys telecom services or leases dedicated facilities in an arrangement that requires carriers to build new, underlying infrastructure that will then support telecommunications capabilities for customers outside of state government.

Into this category fall strategic partnerships between government and private companies that amount to the government making a major commitment of resources to a private company for the provision of infrastructure. In exchange, private companies make this infrastructure explicitly available to both the government as well as a wide range of non-government users, much more explicitly than in the just-described cases of Virginia and Oregon.

The North Carolina Information Highway (NCIH) is the leading example of this approach in the United States. This is a government-coordinated upgrade of this state's public switched network to include

fast packet switching for data. This upgrade includes 10 ATM switches installed by three incumbent LECs. The future full build-out would bring over 3,000 sites onto the network, including state and local government offices, hospitals, schools, and universities. Furthermore, the same network is tariffed and available for private businesses to connect, and some already have.⁶

However, after five years, the number of sites of all types connected to the NCIH to date is approximately 150. The development of the NCIH has been slowed as the reality of very high connection and operating costs has sunk in. The base rate for the NCIH is \$4,000 per month for 64 hours of video usage. Average startup costs for equipment and room renovations are approximately \$100,000 per site. Each site must also have a designated "site coordinator."

The NCIH is now being characterized as a high-speed backbone, with a variety of lower speed services now defined by the North Carolina state government for the use of government agencies and schools to achieve data connectivity. As of 1997, the executive and the legislative branches are rethinking the state role and level of investment in infrastructure.

The state of Utah has put forward a different model. This government is planning for a common broadband infrastructure running along state highways containing many fiber strands that can be leased to and utilized by many different telecommunications carriers, both incumbent and new.

An RFP for a Strategic Telecommunications Partnership provides this overview of Utah's intent:

The state is committed to a vision of broadband interactive networks which interoperate with one another by adhering to Open Network Architecture standards. Although there are a number of communications companies that have begun building fiber optic transport networks in the state, there currently is limited choice for government or the private sector to purchase these

broadband services. It is the state's vision to create a homogeneous environment that will stimulate competition and increase access for both the private and public sectors of the state. The state intends to select a partner or partners that will address public sector telecommunications needs directly and, through subleases of planned excess capacity, foster development of private telecommunications services as well.⁷

According to the state of Utah, the benefits to telecommunications customers will come about as follows:

Telecommunications customers will receive benefits in the form of increased services at competitive rates. Customers will also ultimately benefit from increased operating efficiency as telecommunications firms incur fewer transaction costs for ROW acquisition and as the primary partner subleases infrastructure capacity to other telecommunications providers, taking advantage of economies of scale and coordination in infrastructure construction encouraged by the partnership.⁸

The North Carolina Information Highway was a deal in the early 1990s involving incumbent franchised carriers, a particular technological design, and the regulatory climate that existed prior to the Telecommunications Act of 1996. The new competitive environment has led to great changes since the early 1990s, and the rise of the Internet has led to others. In the light of 20-20 hindsight, I believe that the NCIH was over-specified for the changes that were to come. Is Utah going to do any better in the post Telecom Act era? The Utah Telecommunications Partnership is being forged around a quite different technological concept than was pursued in North Carolina, and Utah furthermore includes an explicit recognition of the competitive environment in its design

for the future. Still, one can reasonably assume that change is unrelenting and unpredictable. Utah's framework will likely not prove to be any more robust than North Carolina's.

Building Digital Public Works

In this final pattern, state government contracts for the construction and operation of telecommunications infrastructure to state specifications, and offers services to organizations outside of state government. While at one end of the spectrum of possibilities presented here, digital public works at the state level is not the inevitable end point of the trend toward more government activism in teledevelopment.

The most notable example of digital public works is the Iowa Communications Network (ICN). This is a 3,000-mile, 2.4 gigabit Synchronous Optical Network (SONET) fiber backbone owned and operated by the state of Iowa. It has points of presence at over 480 universities, schools, government offices, hospitals, and National Guard armories. The Iowa Communications Network, with connections in all 99 of Iowa's counties, was built with approximately \$200 million of state money, and costs \$15 million annually for operations. It reaches around 430 school sites now, but will expand to approximately 600 sites in the near future.⁹

As reported in *Network World*, which gave the ICN an award for innovation, Iowa's director for state and federal relations, comments:

If carriers would provide the same capabilities at similar cost, we'd take it in a minute, but the services are simply not available, because there is no business case for the telephone companies to provide high-capacity fiber links into sparsely-populated areas. So we're assuming the risk.¹⁰

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over Iowa's role in owning and operating this network.¹¹ There are no other visible recent examples of state governments moving toward owning and operating networks, although there are older examples such as TechNet in New Mexico and EdNet in Oregon. Only at the local municipal level is their continuing interest in government ownership and operation of telecommunications infrastructure.

Another element that can replace or supplement these four statewide approaches is the effect of orders governing regulated carrier investment by public utility commissions. The typical event is a PUC order that directs a carrier to invest over-earnings in infrastructure development rather than make refunds to customers. The state of Maine provides an example: As a result of a Maine public utility commission ruling in May 1996, NYNEX has offered every school and library building a 56 kilobit frame relay connection, free through May 31, 2000. The order calls for directing \$4,000,000 per year out of a \$14.5 million annual over-earnings finding to establishment of the network, rather than to subscriber rate reductions.¹²

However, as the influence of PUCs gradually wanes over the next decade, their influence in teledevelopment is going to diminish as well.

Community-Specific Approaches

State government can also leave teledevelopment to be pursued community-by-community. A municipal or county government is not typically in a position to do this without the acquiescence of the state government. In California and Iowa, there is a great deal of municipal activity that appears to be unimpeded by state government restrictions. But, in several states including Texas¹³ and Nevada,¹⁴ state legislatures have passed laws that make it illegal for local governments to become involved in telecommunications. In another case, Lincoln County, Oregon, the state PUC blocked the county and its public electric utility from offering the local market a government-owned fiber optic backbone.¹⁵ Incumbent telecommunications carriers are

usually supporters or even instigators of state blockage of local initiatives.

Often, a municipality that is pursuing the role of telecommunications carrier has experience as a municipal electric utility, as is the case in Glasgow, Kentucky; Anaheim, California; and Tacoma, Washington. Electric utilities are gaining experience using telecommunications for load management and meter reading, but a system that meets these requirements can, in addition, also have ample bandwidth remaining for other functions. The leading national advocate of this approach is Steve Rivkin, who described in an earlier issue of this journal how electric utilities can cooperate with telecommunications carriers to build their infrastructure.¹⁶

The city of Glasgow, Kentucky offers cable TV, Internet access, and soon, ordinary voice telephone services through a network owned and operated by the municipal electric utility.¹⁷ Other city approaches involve expanding the kinds of customers that use coaxial cable institutional nets built by cable TV companies or that are allowed to lease capacity in fiber rings that connect municipal buildings or traffic signals. Examples of municipalities pursuing telecommunications are Burbank and Alameda, California; LaGrange, Georgia; Cedar Falls, Iowa; Braintree, Massachusetts; and Keane, New Hampshire.

Beyond expansion of the municipal electric utility, municipalities entering the telecommunications business cite other justifications:

- Because they are focused on the needs of just one community, municipal officials say they are more inclined to provide better telecommunications services to their citizens under a system of political accountability than will a private sector company where the management attention is spread over many communities. This claim has come up particularly in municipally-franchised cable TV services over the past decade.¹⁸ This argument can apply to poor quality in existing services, and also to a perceived lack of advanced services (e.g., broadband services) when

capital investment by the private carrier has been lacking.

- Municipalities stand to gain additional, non-tax revenue by selling telecommunications service outside of the government. In the last few years, this argument has been advanced by several consultants to local government.¹⁹ Of course, the revenue gains are offset by the additional costs that are borne.
- Municipalities also feel they have a basic responsibility to coordinate the placement of cabling in the public right-of-way. One form of strong coordination is to lease strands of a municipally-owned fiber cable already in place to a private carrier. ICG Telecom Group, Inc. has achieved such deals in the form of 10- to 15-year leases with municipal authorities in Burbank, Alameda, and Los Angeles, California.²⁰

Issues in Government Teledevelopment

This review illustrates that government teledevelopment efforts span a continuum of approaches: inadvertent and unconscious on one end of the scale, and reaching a new form of government-built public infrastructure on the other. The civic and political interest in addressing teledevelopment needs through some form of planned government action is laudable and within the economic development mainstream. However, the barriers to government involvement in teledevelopment are several.

One issue in extending state government internal networks is the requirement to balance government organizational needs for efficiency and effectiveness in operations with interest driven by economic development impulses to improve the telecommunications infrastructure that serves the general public. Managing the changing characteristics and prices of telecommunications for the agencies of state government is intrinsically quite different than influencing these technology offerings for the benefit of the general public.

The choice between buying and leasing, between outsourcing and in-house opera-

tions, is difficult enough for a government jurisdiction even before adding the overlay of stimulating teledevelopment in the general economy.

Government procurement regulations that compel drawn-out decision-making processes not adequately responsive to the cycles of change in technology are a potential barrier to the effective operation of a telecommunications service by a government agency.

Another issue of responsiveness to the demands of technology is the problem of government jurisdictions maintaining core competency in telecommunications service provision in an environment of nationwide skilled personnel shortages and constrained state and local government salary ceilings. Government electric utilities and traffic signal departments are the most likely among local agencies to have the capacity to manage telecommunications. State governments do not have these kinds of departments, but at least operate on a generally larger scale than local jurisdictions, which is more likely to generate the resources to support telecommunications operations.

Still another issue is the conflict of interest between government regulating and setting prices for the private telecommunications sector's use of the public right-of-way, and government competing with the private sector in offering services that also use the same right-of-way.

On the financial side, there is an issue in using taxpayers' money to fund government enterprises that compete with private corporations running on shareholder's investments.

There are potential constitutional issues around impediments to freedom of speech in the content of government-owned common-carrier telecommunications networks. Some would say that the contents of file servers connected to the World Wide Web through a taxpayer-owned broadband pipe are more vulnerable to abuse.

Deep political differences about the proper role of government—differences as wide as the philosophical outlook gap between Democrats and Republicans—can

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manifest easily in jurisdictions where teledevelopment through digital public works is being pursued. These differences have certainly kept the Iowa Communications Network and the North Carolina Information Highway in a state of ongoing controversy.

Conclusions

The performance risks seem greater than necessary on both ends of the spectrum of teledevelopment activism that we have outlined here.

- When teledevelopment is not considered at all by government in its telecommunications planning and procurements, the odds are too high that decisions will be made that harm teledevelopment.
- At the other end of the spectrum, the job of shaping the telecommunications landscape by building infrastructure and selling access and services is too likely to leave overextended governments trying to sell something that costs too much and does too little.

It is in the center of the spectrum that programs (like those of Virginia and Oregon) seem the most productive. These efforts are squarely focused on the state government's own functional needs and add only light-handed coordination with external teledevelopment needs. They make no attempt to define the overall network architecture of the state. They use government spending to leverage the investment dollars of private sector carriers in a much looser way than the North Carolina and Utah programs.

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