

So What Does \$7.2 Billion Buy You in Broadband?

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Launching FTTP in JULIET

Transforming America’s Broadband Infrastructure By Launching Local Fiber-To-The-Premise Networks (FTTP) Using JULIET, Joint Underground Location Of Infrastructure For Electric And Telecommunications

By Rita Stull

Launching local fiber-to-the-premise networks in JULIET offers the United States an unusual opportunity for transformational change. JULIET is an acronym for *Joint Underground Location of Infrastructure for Electric and Telecommunications*, conduits installed in every infrastructure project—roads, bridges, dams, water, sewer, gas, steam, railroads, and airports.

We propose that the Obama administration implement a national policy to install JULIET and simultaneously deploy fiber-to-the-premise (FTTP) networks as part of the Obama Infrastructure Recovery Program. Once conduits are installed, municipally owned, operated and managed fiber will be pulled through the ducts. Also during construction, electric lines would be moved underground into another duct in the

conduit bank. By extending the JULIET policy to all public infrastructure projects, ultimately all electric and telecom plants would be relocated underground. European countries have already moved utility pole infrastructure underground. The truly amazing fact about JULIET is that pulling fiber through conduits during project construction reduces FTTP deployment costs by up to 70%. Let’s look at the numbers.

COSTS FOR DEPLOYING FTTP NETWORKS IN JULIET

	RURAL	URBAN
FTTP Network as Stand-Alone Project Per mile cost	\$30,000	\$100,000
Fiber cost per mile *	\$5,000	\$15,000
Conduit cost per mile *	\$5,000	\$15,000
Cost of installing conduit & fiber in open trenches during construction	\$10,000	\$30,000
% SAVINGS DEPLOYING FIBER AND CONDUIT IN OPEN TRENCHES	66%	70%

* Cost depends on number of strands in fiber, number of conduits in bank

COST FOR SUBSCRIBER DROPS

Costs for installing drops to every home and business vary by street. Fiber-to-the-premise networks must be designed specifically for each city, town, county or region.

	RURAL	URBAN
Average cost for subscriber drops @ \$250 each	\$ 6,250	\$ 25,000
Estimate 25 sub/mi rural, 100 sub/mi urban		

Launching JULIET saves the country billions of dollars going forward as well. Locating electric, phone, cable and FTTP lines in underground conduits during construction, not only reduces the cost of deploying fiber by up to 70%, but saves money in the following ways:

- Eliminates utility poles and ongoing pole maintenance costs
- Eliminates need for street cuts thus extending street life
- Reduces highway maintenance costs
- Eliminates FEMA funds needed to restore outages caused by fallen poles
- Eliminates economic business and personal losses caused by outages.

WHY FTTP NETWORKS?

Fiber-to-the-premise networks are the next generation of last mile telecom infrastructure, replacing both phone and cable lines. The nation needs fiber to transmit high-definition videos and graphic intensive applications in seconds instead of hours or days. Transporting information is measured in bits per second (bps).

Phone and cable's copper based infrastructure is limited to upgrades of up to 25 Megabits per second (Mbps) Internet. Fiber carries 100 Mbps and can be upgraded to gigabits (G/bps) and terabits (T/bps) per second speeds, carrying bit streams of voice, video and data services thousands of times faster in the future. Last mile fiber will transform the entire U.S. economy, making it affordable for the first time for businesses and government to use the Internet to 'electronically restructure' information and communication delivery that supports manufacturing and service industries.

Portions of Europe and Asia already use FTTP to deliver 100 Mbps bidirectional Internet at \$40 per month. Individuals in the U.S. pay \$40 per month for 1.5 Mbps average downstream, and a meager 371 Kbps average upstream. U.S. businesses pay \$550 per month for T-1 phone lines to guarantee bidirectional, upstream as

TRANSPORTING INFORMATION ON THE INTERNET MEASURED IN BITS PER SECOND

Kilobit (Kbps)	1000 bits per second
Megabit Mbps)	1000 Kilobits or 1,000,000 bits per second
Gigabit (G/bps)	1000 Megabits or 1,000,000,000 bits per second
Terabit (T/bps)	1000 Gigabits or 1,000,000,000,000 bits per second

SERVICE	SPEED	COST
Typical U.S. high-speed Internet	Less than 1 Mbps	\$40 per month
■ ISDN copper phone line	5-10 Mbps	\$75 per month
■ Cable modem data service		
Japan high-speed FTTP bidirectional Internet for home and business	100 Mbps	\$40 per month ¹
U.S. Business dedicated phone T-1 line: Guaranteed bidirectional Internet	1.5 Mbps	\$550+ per month
Japan upgrading FTTP to bidirectional Internet @ 1 G/bps for home and business	1 G/bps	\$51.40 per month ²

¹ Internet Access in Japan: 100 Mbps FTTH for \$36 a month, M3 Sweatt: Satisfy Me, 8/19/2006, <http://blogs.msdn.com/mthree/archive/2006/08/19/708762.aspx>

² Japan's KDDI to Offer 1 G/bps Internet Connections to Homes, PC World, 9/25/08, http://www.pcworld.com/article/151562/.html?tk=rss_news

well as downstream, Internet at 1.5 Mbps. In October of 2008, Japan started upgrading 100 Mbps FTTP bidirectional Internet to 1 G/bps. To understand the deficiencies of U.S. Internet in laymen's terms, kilobits (Kbps), megabits (Mbps), gigabits (G/bps) and terabits (T/bps) are levels of service moving information at speeds thousands of bits greater per second than the previous level. Not only is America's 1.5 Mbps/371 Kbps Internet woefully inadequate, U.S. citizens and businesses grossly overpay for these deplorable Internet speeds when compared to what's available overseas today.

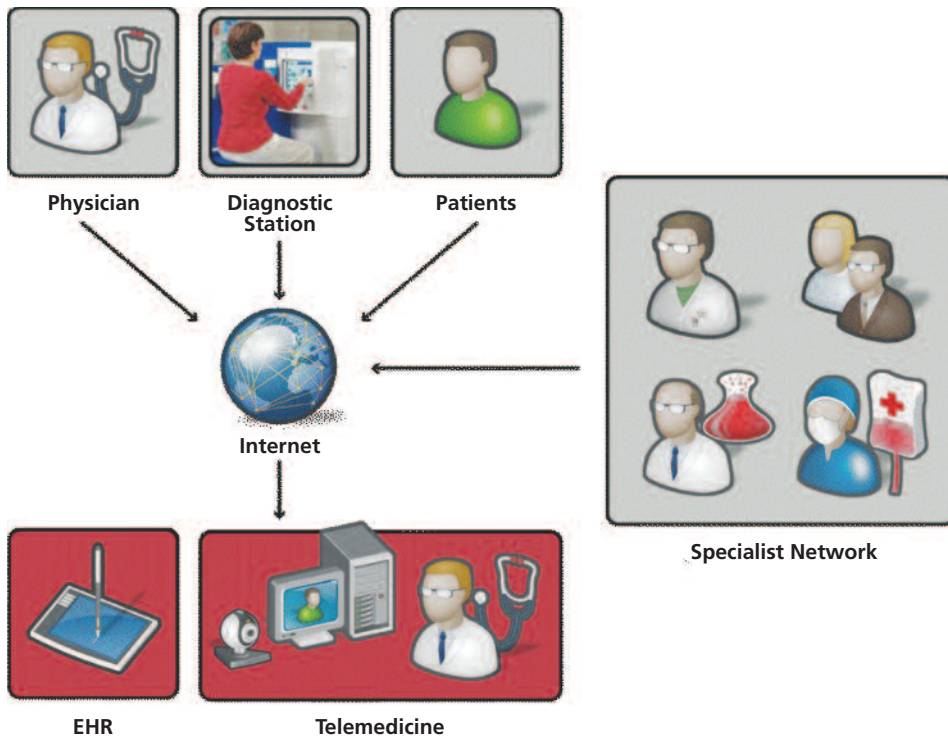
The U.S. needs FTTP Networks to compete in an Internet dependent global economy. Fiber that reaches curbs (FTTC) and neighborhoods (FTTN) now must be extended to every premise (FTTP) if the U.S. is to catch up with the rest of the world. Interestingly, not only have most European countries already deployed FTTP, they've relocated electric and telecom lines into underground conduits, thus ensuring long term

security and reliability for electronic applications and smart electric grid services in the future.

The Obama recovery program includes implementing new services that rely on high-speed Internet—online record keeping supporting telemedicine, smart electric grids, environmental initiatives, energy management, improved education, regional innovation clusters and more. These applications create high paying new jobs, but all need affordable, accessible fiber in order to succeed. In many cases, computers and application software already exist. What's missing is the universal accessibility of fiber carrying sufficient Internet capacity to deliver these services.

For example, medical diagnosis over distances between urban and rural areas would significantly reduce health care costs. But distance diagnosis can't be administered reliably without fiber carrying high definition, two way interactive video to patients living in remote areas. Copper-based phone and cable wires can't carry affordable, high-definition, two-way interactive

Telemedicine Model



video. Technology for conducting eye exams remotely is already available—but the specialist in the regional hospital and the patient located hundreds of miles away must be linked with fiber.

The U.S. can't compete in a global economy with the 25 Mbps, at the high-end, upgrades provided on phone, cable and wireless infrastructure. While debates rage about what constitutes 'high-speed Internet', what technology carries it, who requires it and when, the objective engineering consensus is that the U.S. needs next generation, last-mile fiber, capable of carrying 1 G/bps Internet and beyond. "Fiber represents the holy grail of communications networking, unlimited capacity, long life and global reach."³

The nation has two choices:

- Cross our fingers and WISH for universal, affordable 100 Mbps Internet at affordable prices and

continue to subsidize the private telecom industry, knowing that we have nothing to show for the \$200 billion dollars already invested;⁴ or

- Recognize that telecom evolved into an essential service, joining the public asset ranks of water, interstate highways and roads, and now must be transformed into a local government managed and regulated utility.

The current economic crisis forces the country to embark on a massive infrastructure reinvestment program to create jobs. This is the perfect time to transform management of public-rights-of-way, telecom and electric assets so they will be secure, affordable, and universally available throughout this century. Launching JULIET and moving electric and telecom lines underground will be a costly, politically contentious effort in the short term—but long term, the



Telemedicine Model Distant Pediatric Specialist Diagnosis

financial benefits will be considerable, both to the country in creating new 21st Century jobs and to the telecom and electric industries as electronic applications generate new revenue streams.

A NEW PUBLIC/PRIVATE TELECOM PARTNERSHIP MODEL

Obviously, launching JULIET and deploying FTTP as part of the Infrastructure Recovery program will be just a first phase—a start on a ten to fifteen year policy to relocate utilities underground. The process is complex: It requires reconciling laws governing public right-of-way, electric, telecom, and definitions of technical terms. Also, there must be coordination of authority, funding and transition planning for networks spread over various federal, state and local agencies. However, though complicated, comprehensively revising the national telecom regulatory structure is not an insurmountable task and it must be undertaken now. From 1980-1985, under a local government franchising process and stewardship, cable operators bid on and won local franchises and, in five years, wired the nation's metropolitan areas, including Washington D.C., the largest U.S. city with all underground

³ Fiber Optics for Government and Public Broadband: A Feasibility Study, prepared for City and County of San Francisco, January 2007, Columbia Telecommunications Corporation, <http://www.ctcnet.us>

⁴ "Where's that broadband fiber-optic access?" Bruce Kushnick, *Harvard's Nieman Watchdog Project*, 3-14-06. http://www.niemanwatchdog.org/index.cfm?fuseaction=ask_this.view&askthisid=186



Distance Live Eye Exams

utilities. FTTP is local—it's the last telecom mile—and it must be owned locally to ensure that community needs are met. There will be naysayers. But, please excuse the cliché: Where there's a will, there's a way.

Smart electric grids require the reliability of fiber and security of underground location, protected from the vagaries of outages caused by storms taking down power lines. New electronic applications require real high speed Internet, free from issues of net neutrality, insufficient capacity, high costs, and service gaps—issues originating from the industry squeezing upgrades out of a copper-based technology rapidly approaching obsolescence. Wireless has the same capacity limitations as phone and cable with a big difference—wireless isn't an *alternative* for fiber, it is an essential, complimentary, mobile network that needs fiber for signal backhaul. Every community needs Internet carried on FTTP *and* wireless networks.

At the heart of the high-speed Internet void is the issue of public versus private ownership of essential telecom infrastructure. The private sector can't afford, nor make the business case to stockholders, to universally deploy fiber-to-the-premise networks. Government can no longer



**Telemedicine Transport
Emergency Treatment**

deny the need for FTTP to support economic development in an Internet dependent world. If the telecom industry could profitably justify universal FTTP deployment, it would have done so long ago.

OWNING AND DEPLOYING FTTP NETWORKS—A NEW MODEL

In the new telecom regulatory model, successful FTTP networks operate in a public/private partnership, and are publicly owned to guarantee universal service, competition and affordability. Government sells capacity to competing private sector companies at wholesale rates. The telecom industry, using union workers, will continue to build and operate networks under contracts with government. The big difference is that the public will *own* the networks and can sell capacity at wholesale rates to all interested competitors, including Competitive Local Exchange Carriers (CLECs) that already own millions of miles of fiber backbone and only lack access to last mile FTTP connections to offer competitive services. Incumbent phone and cable companies can both lease as much capacity as they want from government while avoiding the costly investment of building FTTP as a proprietary infrastructure. Private companies can lease capacity to offer voice, video, data and Internet services

in an unlimited combination and variety of service packages. There will no longer be any reason to measure rates, slow down Internet speeds or limit service areas. Fiber, with its unlimited capacity, makes it possible for many companies to offer services at rates established in a competitive marketplace.

This proposed new regulatory structure faces a huge barrier because it breaks up long standing last mile phone and cable duopolies. Closing the existing, deregulated last mile telecom market will be a difficult, politically contentious undertaking, but a necessary one to guarantee development of competitive, affordable Internet on FTTP. The country must find a way to universally deploy last mile FTTP networks so businesses can compete in the information-based, Internet dependent world economy.

CREATING A SUSTAINABLE JULIET CONDUIT AND FTTP NETWORK

How can the country pay for JULIET and FTTP deployment? Two new local government revenue streams will pay back loans from the Infrastructure Recovery program. A JULIET fee structure would be developed and charged to all conduit tenants. JULIET fees would be managed by the public works departments that currently manage streets and public right-of-way.⁵ Fees would be calculated based on occupied linear foot, designed to recover costs plus upgrade items in the JULIET budget including repayment of conduit deployment loans, maintenance, management, operation and extending conduit to new build areas.

The FTTP Network pulled through JULIET conduits would be sustained by a Local Telecom Electronic License (LOTEL) based on a business fee structure. The LOTEL business license will be required for telecom companies

⁵ Public right of way: 3,933,985 miles of road—a valuable public asset, 75.2 % managed by local government—town, city, county, 20.5 % managed by state government, 4.3% managed by federal government.

in the business of carrying voice, video, data and Internet services. All companies transmitting bits of information to homes and businesses within a jurisdiction, no matter what technology is used, must be licensed to serve the community. The LOTEL fee structure will parallel the nation's thirty-year local cable franchising model which ensures that start-up telecom businesses pay fees for use of public land based on a percentage of actual gross revenues, which are low at start-up, and that government will recoup its investment over time as businesses mature and enjoy greater earnings. LOTEL business fees include 4% gross revenues for local government and Institutional Networks, 1% gross revenues for state government and I-Net interconnection, and 3% for local PEG Access channels, facilities, equipment, and training. The LOTEL fee structure is based on the precedent paid for local cable franchises: 5% of gross revenues in franchise fees for use of public right of way, acquiring a franchise and regulation, plus 3% of gross revenues for Institutional Networks, Public Education and Government (PEG) Access, channels, facilities, equipment and training. Rural communities will be required to create regional telecom commissions for economies of scale in engineering design, service delivery, creating public/private partnerships, management and operation of the FTTP as a regional public asset. Regional commission governance models are frequently created for other boundary-crossing services such as storm water management and economic development initiatives.

THE NATION'S FUTURE BROADBAND-FTTP

We need broadband – but REAL broadband on FTTP networks owned

by local governments, built and operated by public/private partnerships, guaranteeing universal deployment, affordability and competition. Phone, cable and competitive carriers can lease last-mile capacity from government and offer services in urban and rural areas. Only competition will decrease Internet costs. Only government can guarantee that businesses can buy fiber capacity at wholesale rates and everyone has access to 100 Mbps or 1 G/bps Internet or whatever greater capacity becomes the future norm.

Deploying fiber universally is an expensive proposition that cannot be justified with typical business models. "The business case for FTTP ... is not limited to such easily-quantified matters as cash flow and capital investment—rather, it includes the less quantifiable financial factors, ... economic development, small business empowerment, job creation, livability, environment protection, education, increased sales and real estate tax revenues, increased property values and other factors that measure the overall benefit of a next generation communications infrastructure such as FTTP."⁶

Private entities can't be expected to cast aside profitability requirements based on demographics and the public can't be expected to ignore its universal need for affordable fiber-based Internet based on demographics either. Fiber eliminates the barriers of distance. You can do business in Japan and China from your farm if you have Internet that equals the capacity of your client. But if your client sends you an 80 Mb document via the Internet and you can't receive it—can you really do business?

Copper-wire technology can't be upgraded to handle current 100 Mbps Internet needs, much less expanded to

accommodate the exponential growth of new electronic broadband applications such as smart electric grids and telemedicine. In the Obama spirit of cooperation, let's encourage every level of government and the telecom industry to negotiate new community-based, public/private partnerships—let's create a new model for owning, managing and operating telecom infrastructure in the 21st Century—one that respects the community's need for universal, affordable FTTP networks and the telecom industry's need to make a profit. It's time. ■

*Rita R. Stull is President of TeleDimensions, Inc. A specialist in designing telecom plans for local governments, Ms. Stull's twenty-eight years of public sector experience includes enforcing cable franchises, conducting needs assessments, implementing public, educational, government access and institutional networks, integrating telecom within municipal operating and economic development departments, training staff and restructuring delivery of public services. In the eighties, Ms. Stull acquired a telecom planning grant from the John and Mary Markle Foundation to develop the first Local Area Network Plan for a major city. As a result of her work in the regulatory arena, Ms. Stull testified on behalf of NATOA at the U.S. Senate Public Hearings opposing legislation leading up to passage of the 1984 Cable Act. Ms. Stull presents educational seminars and helps communities identify initiatives needed to compete in a 21st Century, Internet dependent, global economy.
www.teledimensionspublicsector.com*

⁶ Fiber Optics for Government and Public Broadband: A Feasibility Study, prepared for City & County of San Francisco, January 2007, Columbia Telecommunications Corporation, <http://www.ctcnet.us>