

## NY-UCAN

### Introduction

NY-UCAN, a project of NYSERNet (<http://www.nysernet.org/>), ION (<http://www.i-o-n.com/>) and the Development Authority of the North Country (DANC) (<http://www.danc.org/>), continue to provide high-performance networking to New York State's educational, research, cultural and government institutions. All three organizations have long supported this goal, but until recently the work to reach users in less populated and underserved parts of New York State was difficult and usually financially daunting, despite the total commitment by the partners. We are excited to say this work has accelerated recently with the round one BTOP stimulus award to ION and DANC to build 1308 miles of middle mile broadband throughout some of the most geographically challenged areas in New York.

This response, to the U.S. UCAN call for participation, focuses on the joint work of these three organizations to reach out to the community anchor institutions that will benefit from the BTOP award in an effort to better understand their unique needs. This proposal while clarifying and proposing to meet the individual needs of the community anchor institutions is set against the broader context of bringing more advanced networks to all parts of the State. NYSERNet's President and Chair Tim Lance served on the New York State Broadband Task Force that articulated goals consistent with the principals espoused herein. But our activities extend far beyond that to reach more communities and service sectors, some of which are described below. These activities are inherent to these partners and are included in their day to day work, which proves their ability to be leaders in the U.S. UCAN effort. DANC was a chosen provider for an FCC Rural Health Care Pilot Program award with their North County Telemedicine Project (NCTP) network, which provides service to 28 healthcare facilities across three counties. DANC was one of the first of the awardees to actually connect medical facilities. DANC's work has led to further expansion in conjunction with another FCC Rural Health Care Pilot Program awardee; the ACTION Network, which provides service to 48 healthcare facilities in 7 counties in northern NY State. The two together geographically serve most of the rural healthcare entities in northern New York State.

ION has had long standing relationships with medical facilities and consortia in the Southern Tier and Central New York. ION is also working directly with hospital systems, such as the Bassett Hospital and Healthcare system, affiliated with Columbia University. Bassett and similar healthcare providers depend on high availability broadband to offer critical services to their patients. Hospital and healthcare systems such as these have made great strides in adopting broadband telemedicine throughout their hospital networks, resulting in better patient care. This means families and children receive improved health care and have access to more services no matter where they may live and how rural it may be. ION, through partnerships, has worked with Bassett Hospital on Electronic Medical Records, the PACS radiology system, as well as other telemedicine applications. ION has been supporting Bassett's efforts to link its 5 hospital and 25 clinic locations with broadband connections that span several counties. These kind of rural broadband offerings go far to reduce medical errors, raise the level of medical services in rural areas, and reduce health care costs.

Many of the major hospitals in New York, located in metropolitan areas, connect to the NYSERNet network either through the universities with which they are affiliated (e.g. Strong Memorial affiliated with the University of Rochester or the Stony Brook medical center) or have fiber or direct connections

from NYSERNet (e.g. The New York Presbyterian Hospitals system, Mt. Sinai School of Medicine, and the Albert Einstein School of Medicine).

With their expertise and commitment these three entities have managed to encompass the broadband needs of a large portion of the educational, research, cultural and government institutions. But the population distribution in New York State presents special challenges to bring these advanced networks to all citizens. About 15 ½ million people live in NYC and Long Island – 80% of the State's population. New York City has a telecommunications density unlike any other city in the world, including international telecommunications. Figure 1 at the end of this document shows a 2010 fiber map with an unmatched concentration of landings in New York City. The second map, a global view, illustrates that the New York concentration is unique.

Thus ION, DANC, and NYSERNet all have as a base resource the superabundance of telecommunications capacity in New York City, both national and international. The Thruway corridor and roughly parallel power and rail rights of way all hold significant fiber facilities which extend the telecommunications facilities in New York City to the major upstate cities – Albany, Syracuse, Rochester, and Buffalo. Other areas, like Utica Rome, while on the fiber rights of way, until recently have not had adequate network resources available. Most of the population of the State lives in the greater New York City area, Long Island, and the major upstate cities and in principle is well served.

The challenges of reaching rural areas are far greater, but not unfamiliar to these partners. Long before the BIP and BTOP programs, ION and DANC were putting infrastructure in place to change the rural networking profile. ION is a consortium of rural ILECs that presciently pooled resources in anticipation of changes in USF that are just now happening, using the century-long experience in telephony of most of its members as the base of wisdom which, combined with their greater telecom needs makes the consortium viable. DANC, a Public Benefit Corporation of the State of New York leveraged their experience providing other infrastructure services to Fort Drum to create a fiber based telecommunications infrastructure in the surrounding North Country. NYSERNet has been engaged with both ION and DANC, acquiring services to reach rural members, occasionally offering advice, guidance (even encouraging DANC forward, when they first conceived of their new role), and partnerships to meet member needs.

There is no doubt that New York has a broad range of network capabilities. New York's significant community of tier one research and education institutions, combined with corporate research giants like IBM and GE that interact with the research community on many levels, has sustained multiple generations of dedicated research networks, fiber deployment in New York City, and an international exchange point and collocation facility at 32 Avenue of the Americas that houses the global peering fabric MANLAN, a collaborative effort of Internet2, the Global NOC, and NYSERNet. In the past, with each advance in the NYSERNet infrastructure (say from T1 to T3) the previous technology of the research network that was abandoned became more prevalent and affordable. The landscape became very different with the deployment of the DANC and ION infrastructure, bringing advanced telecommunications more rapidly and affordably to rural parts of the State. New York is blessed to have a research community, corporate and academic, large enough to sustain a dedicated and sometimes experimental research infrastructure, and equally blessed that in ION and DANC the State has a resource for rapid and more affordable deployment of advanced network resources and applications into the underserved rural areas. The partnership of these three entities makes a dynamic expert allegiance that can accomplish significant broadband development in even the most challenging conditions.

## Partnerships

Whether the goal is reaching one of the tier one commercial providers, each with a presence in New York City and most of them in multiple upstate cities as well, or the NYSERNet research network, connectivity in New York depends on the ongoing partnerships with a number of middle-mile and local providers. Previously for many rural parts of the state the best – in some cases only – connectivity option came from the rural ILECs and cable providers. But the close ION/DANC/NYSERNet partnership has not only simplified the process of extending middle- and last-mile connectivity to anchor institutions, but greatly expanded the scope of what we collectively believe is possible. The relationship not only brings choice, it brings a robust and affordable service that may not have otherwise been available.

Connecting to the NYSERNet network means reaching PoPs in the five largest cities; NYSERNet partners take the connections where they need to go, whether that's a few blocks in Manhattan or hundreds of miles away in some parts of the Northern and Southern Tiers. For seven years NYSERNet worked closely with Lextent Metro Connect (now a part of Lightower Communications) to custom-build and maintain a dark fiber network in New York City, not only connecting its members to the NYSERNet network but to commercial ISPs, and allowing them to tie their various locations together. NYSERNet partnered with one of its original members, the University at Buffalo, to join their private dark fiber build and extend it to meet the NYSERNet backbone; it connects local CAIs at bandwidth levels that would otherwise be unattainable.

Reaching away from the larger cities has always been a challenge, one that increases dramatically in the more distant corners of the state. DANC spent years organizing, funding and constructing their own carrier class-commercial grade, facilities based ring network from Syracuse northward all the way to the Canadian border. Along the way NYSERNet and DANC began working together, eventually bringing broadband connectivity to two colleges in the North Country. DANC's network has been operating for over eight years as an Open Access Network that combines middle-mile connectivity with last mile connections to CAI's. The network is comprised of 850 existing fiber miles and is growing to 1150 over the next year. DANC currently operates 2 separate 10 Gbit/s backbones, one SONET based for TDM and one stand-alone all Ethernet Network. The network architecture allows for easy expansion into additional CAI's in its operating territory. The network is the foundation for several broadband private networks including 2 K-12 networks that link over 70 schools in Northern, NY, the Adirondack-Champlain Telemedicine Information Network (ACTION), and the North Country Telemedicine Network, both of which began as FCC RHCPP awards and have expanded to include funding from the state. DANC also partnered with ION on the successful first-round BTOP application. DANC and NYSERNet interconnect at an open-access facility in Syracuse, as do ION and DANC.

Leveraging that BTOP grant, state funding and investments from member companies, ION continues to build fiber into areas of central and southern New York that have been underserved for decades. Utilizing their core network, ION has the ability via the grant to extend further into these underserved regions much more affordably than any other company could.. Not only will the network enable connections for hundreds of anchor institutions, it will utilize direct relationships with colleges and universities to house network PoPs. Those institutions literally become the hubs for access to their regions, helping from both a technologically and economically standpoint, benefiting from the network's bandwidth and enabling others to do so as well. This is also true for hospitals and healthcare facilities. As a perfect example, two hospitals in the Oneonta and Cooperstown area are going to start providing off-site back-up and disaster recovery for each other's core business and patient data on ION's new network by connecting their datacenter facilities.

## CAI Sectors

All of the NY-UCAN partners recognize the exceptional importance of connecting New York's higher education institutions and have a long history of providing them with advanced networking. All but one RU/VH institution and two dozen others are NYSERNet members and connectors. NYSERNet counts as members the New York Presbyterian Hospital, Mount Sinai Medical Center, Upstate Medical University and Weill Medical College; our university members connect their teaching hospitals.

The story of our involvement with K-12 stretches back to the very beginnings of the Internet, with NYSERNet in the role of proselytizing and endorsing the then-new technology as an educational tool through statewide conferences, customized end-user and teacher training, projects targeted specifically to K-12 educators and advocacy with the state government. Our involvement continues to this day. The networking staffs at K-12 institutions across the state have come to rely on NYSERNet as a trusted partner and technology advisor, as well as making extensive use of our network for some of their most advanced applications. NYSERNet coordinates some of those activities, including Teaching and Learning Across the Pond, a very well-received and expanding program pairing classrooms in New York with comparable level classrooms in England. NYSERNet has had a role in the Internet2 K-20 Advisory Council for many years, now serving on the Steering Committee.

As mentioned previously, ION is working closely with many higher education institutions, both public and private, in many cases locating network facilities on campus and providing their first truly affordable high-bandwidth connections. ION and its member companies have a long history (in many cases over a century long) of providing telephone and, with the advent of the Internet, broadband networking services to rural communities. ION has forged partnerships with hospitals, colleges, libraries, municipalities and many others in their efforts to extend the reach of the network.

Some of the most exciting work in healthcare networking is being carried out by DANC through the completed NCTP (connecting 28 medical institutes) and the pending ACTION project. When ACTION is complete in mid-2012 it will connect 48 medical institutions through 239 miles of network.

For eight years DANC has been operating a Distance Learning Network with additional data connections into over 90 K-12 institutions in Lewis, Jefferson and St. Lawrence Counties. DANC has also invested in the colleges and universities in their network footprint. DANC would like to continue supporting the education flow by building network connections to the public libraries in these same communities.

DANC's mission is to provide quality infrastructure and economic development opportunities throughout Northern New York. They have built their network for the development and support of the communities, locating many of their hubs at county seats serving State and local governments. With support this could provide a Public Safety Network through the Northern New York Counties.

And while the Round 1 BTOP NOFA seemed to miss the K-12 community as an anchor institution, ION and DANC are cognizant of where these institutions reside and are leaving splice points for future connectivity and use.

## **Applications Database**

DANC has built their network to carrier standards with full network diversity between central offices and secure facilities and will support the future applications of Data Storage and hosted applications in the region for education, healthcare, government, etc.

Knowledge of advanced network applications is a key tool in NYSERNet's outreach efforts, particularly to the K-12 world. NYSERNet maintains resources and contributes to the K-20 Advisory Council's efforts, and regularly demonstrates the network's capabilities at member institutions, K-12 conferences and meetings. As noted elsewhere, NYSERNet is the SEGP sponsor for New York, and in that role we collect member-contributed information about their use of the network. For several years NYSERNet maintained a database of network applications, a project they eventually handed off to a member institution; although the current approach is less formal, we actively solicit and redistribute information about how the network is being used and how it could be used to improve research and education at our member institutions. We welcome the opportunity to contribute and to benefit from the availability of a national-scale repository.

ION, DANC, and NYSERNet have the common goal of making community anchor institutions aware of applications that are available and also of their network requirements so that they run effectively. Video is an excellent example, where many CAIs have become discouraged because their connections previously had enough packet loss to make the video unusable almost independent of the size of the connection. The BTOP grant is accelerating the extension of networks capable of supporting the advanced applications, and ION, NYSERNet, and DANC are working together to bring the message that the connectivity now available to CAIs is different in kind.

## **Outreach to CAIs**

All of the partners in NY-UCAN are engaged in the effort to lower the cost, reduce the effort and eliminate other barriers to network adoption among New York's CAIs. The single most critical element has always been the cost: outdated infrastructure, long local loops, often without market competition; participation fees; training for network and technical staff; and on top of that a lack of concrete information about what those costs will be. We know that many of them understand the benefits of connecting, and can't justify it in their always-limited budgets. ION and DANC are working hard to make it possible for CAIs to afford the last mile (or last hundred miles) with new network builds and are committed to making this a priority in these rural, underserved locations. NYSERNet's board took the lead in reducing participation costs by acting as the New York State SEGP sponsor, paying all of the fees associated with the program for the last decade - more than three quarters of a million dollars - in order to reduce that financial barrier. Education programs offered through NYSERNet, available to any institution, help their technical staff understand routing, advanced services, IPv6 and other critical topics; they are typically a tenth as expensive as commercial offerings.

NYSERNet organizes and supports a major statewide conference for IT professionals in higher education focusing on the range of issues confronting CIOs. Technical forums provide a mechanism for the community to learn from experts and to exchange information; the most recent attracted more than 70 participants to discuss the challenges associated with IPv6 on campus. With roots deep into the local communities, ION and DANC similarly bring the same sort of technical expertise and support to a broader community encompassing essentially all rural parts of New York State.

Institutions of all sizes are challenged by continually increasing bandwidth demands and ever

constricting budgets, and we have worked with them to provide relief on other fronts as well. The same networks that provide competition and lowered prices for local loops to access advanced networks can also provide connections to larger markets where Internet bandwidth is available at lower cost. Even the NYSERNet network, which carries only R&E IP traffic, can be a pipeline for commercial Internet access at the transport layer. NYSERNet is an active participant in the Quilt commodity Internet service program, offering our members access to bandwidth at the lowest cost possible.

## **Wireless**

For all of us this is still uncharted territory. Verizon is the principal wireless provider in upstate New York and ION, DANC, and NYSERNet have all worked with Verizon on what will almost surely be the last mile for the most remote and least populated parts of the state. Fiber routes are often adjusted to reach new or even existing tower locations to build capacity for 4G and beyond. When the State was considering an LTE based emergency wireless grant application, NYSERNet being recognized as a leader in the State was asked to reach out to the CEO of Verizon and CTO of Northrup Grumman, to solicit experts for the State application. As applications on mobile devices increasingly dominate total network traffic, partnerships with wireless providers will strengthen.

## **Working with U.S. UCAN**

As a national-scale project focused on CAIs, U.S. UCAN will be a new kind of resource for us. In the same way that NYSERNet enables our members to help each other through our educational and outreach activities, we anticipate learning from and contributing at a national level through U.S. UCAN, just as we have in the past with the K-20 Advisory Committee and many national training sessions in areas such as IPv6. ION and DANC are a natural collaboration bringing with them an opportunity to add an important new step. A consolidated list containing all of the CAIs with advanced networking capabilities would be a powerful tool for explaining the value of the network and helping prospective connectors understand what their peers are doing, how they might use the network and who they can connect to.

## **NY-UCAN representing New York**

The years-long partnership between NYSERNet, ION and DANC, our participation in BTOP, our engagement with the state, and our breadth of involvement with CAIs at all levels makes NY-UCAN the logical, and practically the only choice to represent New York in the national UCAN effort. No other organization exists with this mixture of capabilities, goals and history. NYSERNet has always played the role of a trusted third party in connecting - literally and figuratively - the state's education community. DANC plays a unique role in the North Country, opening its network to all while insisting that its use benefit the many communities it touches. ION is itself a coalition of many individual companies, joined together both as a single network and as an entity to represent their regions. These efforts have been further reinforced and endorsed by the round one BTOP award. Jointly we have worked with New York State government on many levels, serving on the NYS Broadband Council, interacting with legislators and members of Governor Cuomo's staff, and helping build a unified communications framework to reach all parts of the State.

## **About the Organizations**

**NYSERNet:** NYSERNet is a 501(c)3 not for profit corporation incorporated in 1985 as one of the

original regional networks created part of NSFNET linking the NSF-sponsored supercomputer centers. NYSERNet's history has been a succession of ever more advanced networks, from pioneering the Internet in New York State to providing multi-gigabit access to some of the world's premiere research and education institutions. NYSERNet operates a facilities-based optical/IP network with connections throughout the state and to the world through the colocation facility in downtown Manhattan, and runs a business continuity center in Syracuse.

Dating back to the birth of the public Internet, not surprisingly NYSERNet's history includes many seminal contributions. Its initial 56 kbps backbone was the first use of the Internet protocol outside the US government. NYSERNet co-developed the network management tools SGMP and SNMP, and the distributed directory system X.500. NYSERNet's first spin off company was the world's first commercial Internet service provider. Since its founding NYSERNet has had a simple goal - connect New York's educational and research institutions. With each new network deployment, NYSERNet reached beyond its core community of leading research universities to engage, educate and connect the state's community colleges, libraries, museums, hospitals and K-12 schools.

NYSERNet was created by its members, is governed by their representatives and creates products and services to benefit them. Over the past 26 years this has led to the deployment of five generations of research networks, and creation of special resources such as the global exchange point in Manhattan and business continuity center in Syracuse. Increasing attention today is focused on the data intensive research problems and the globally distributed education enterprise of its members as well as new ways to leverage the resources the community has collectively created.

In the past, with each new generation of network NYSERNet began outreach efforts to bring the newly created resources to a broader set of institutions. Today, however, those efforts are collaborative with DANC and ION, building on existing relationships with those organizations that have grown and strengthened over several years, and now accelerated and reinforced by the BTOP grant to DANC and ION.

**ION:** ION is an Albany, New York based, statewide, redundant, and diversely routed fiber network currently connecting over 60 (soon to be 130+) rural New York State communities and their surrounding areas to a robust and affordable broadband fiber network, and the many opportunities it provides. The increased bandwidth for transfer of information that ION makes available to rural and underserved areas is a necessary component for residents, businesses, and community anchor institutions to participate and compete in today's world. In addition to being a carrier's carrier network, ION provides robust, redundant, and affordable access to advanced telecommunications services for businesses, educational institutions, health care providers, libraries, and governmental agencies throughout the state.

ION was founded on the vision and investment of thirteen (13) Independent Telephone service providers who have been supporting customers in rural upstate New York for over 1300 years collectively. The cooperative efforts of ION's founding companies has allowed for the development of this advanced telecommunications network, and has provided the sustainable core backbone for which the BTOP award will build upon. The current network contains over 2,200 route miles of fiber, and is comprised of four diverse fiber rings stretching from Buffalo to Albany, north to Champlain, and south to New York City. With its Round 1 BTOP award, ION will be adding an additional 800 miles of fiber, connecting another 70+ rural communities, and upgrading its network capability to 40G, and 100G ready, with additional fiber rings.

The economic prosperity of the State of New York requires that all of its citizens, whether rural, suburban, or metropolitan, have ubiquitous access to affordable, fast, redundant and scalable communications services. ION's carrier neutral approach allows all service providers in New York to have better access to advanced network connectivity, thus allowing all of New York to have access to the latest in voice, broadband and video services.

**DANC:** The Development Authority of the North Country was also founded in 1985 by New York State as a public benefit corporation. DANC is a New York State public authority that serves the common interests of Jefferson, Lewis and St. Lawrence Counties by providing technical services and infrastructure, which enhance economic opportunities in the region and promotes the health and well being of its communities. DANC works with its municipal partners through shared service solutions utilizing advanced technology and fostering municipal cooperation to achieve cost-effective services for the region.

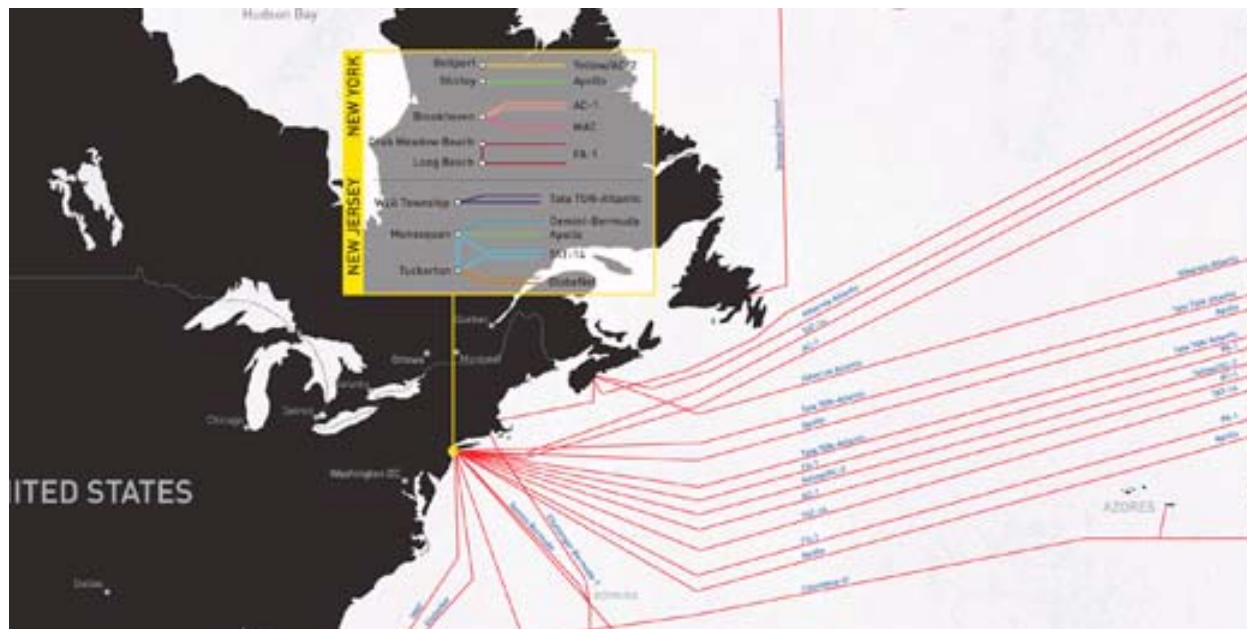
DANC currently operates 5 divisions including solid waste management, water quality, community development, engineering, and the telecommunications division. We are a recognized leader in providing sound technical solutions in the region including managing several municipalities GIS systems, overseeing the operation of many municipal water and wastewater facilities, being one of the first landfill gas to energy projects in the state, and being the first carrier Ethernet service provider in the area.

The telecommunications division was formed in 2003 and currently operates an 850 mile fiber network. When the ARRA grant project is complete by the end of 2012, the network will include 1150 miles of middle-mile transport.

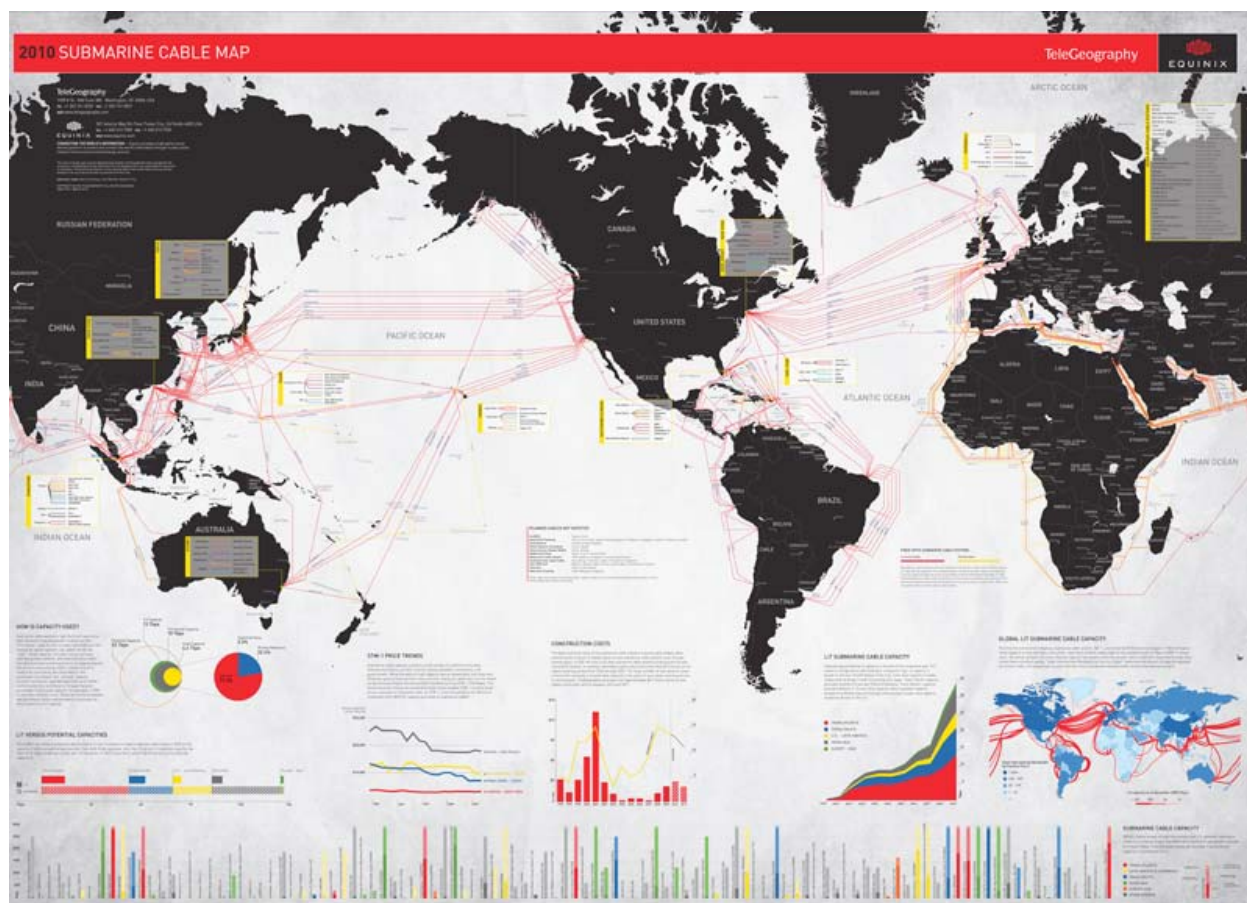
Maps are attached below of oceanic international cable system, of the combined ION/DANC map, and a detailed map of the DANC map.

**Figure 1. Maps of International Submarine Cables**

**Cables into New York City**

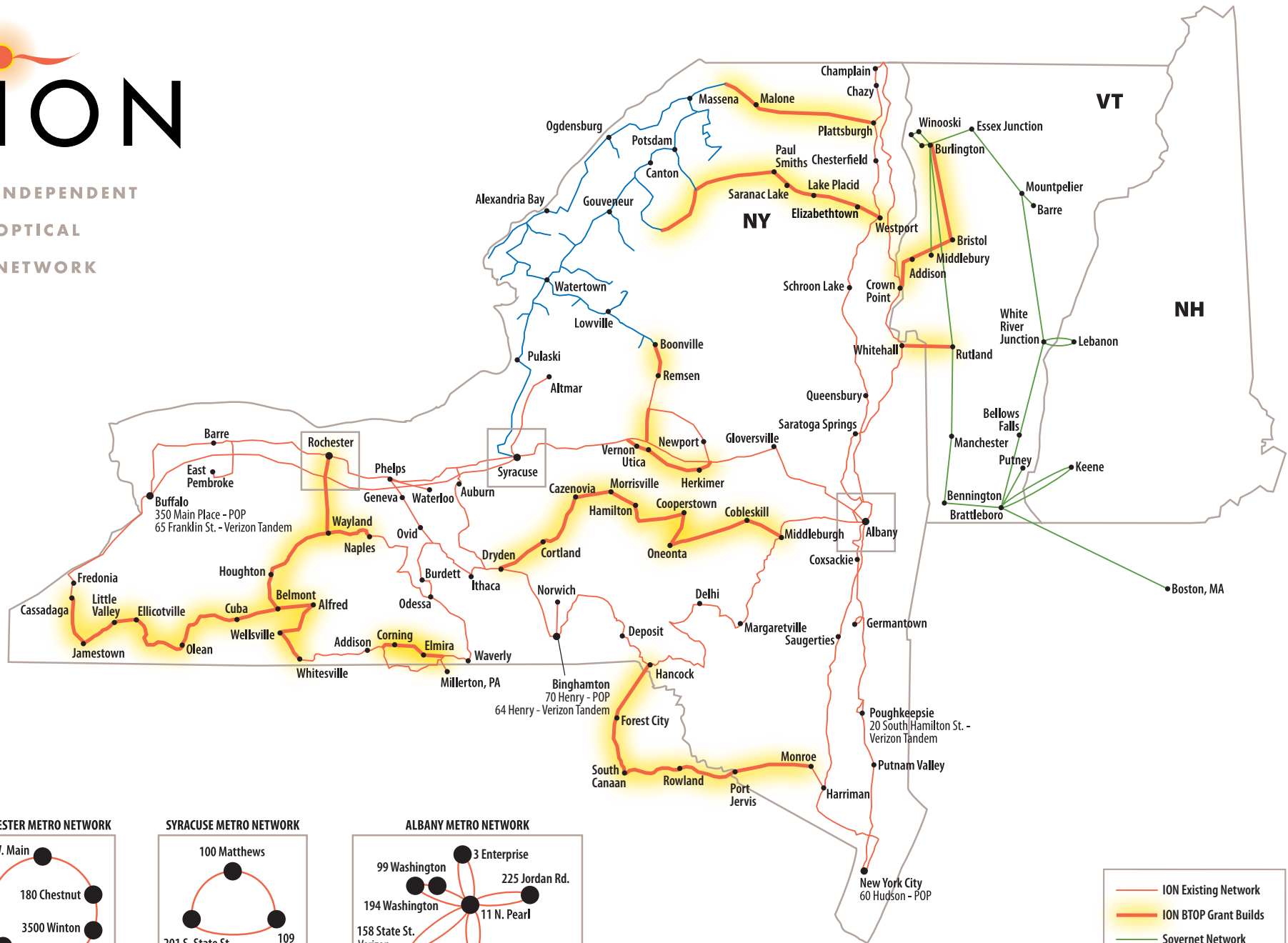


**Global Cable Map**

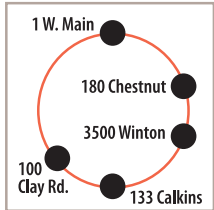


# ION

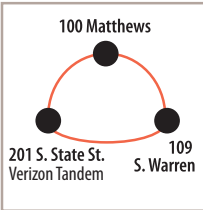
INDEPENDENT  
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NETWORK



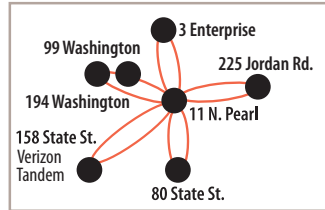
**ROCHESTER METRO NETWORK**



**SYRACUSE METRO NETWORK**

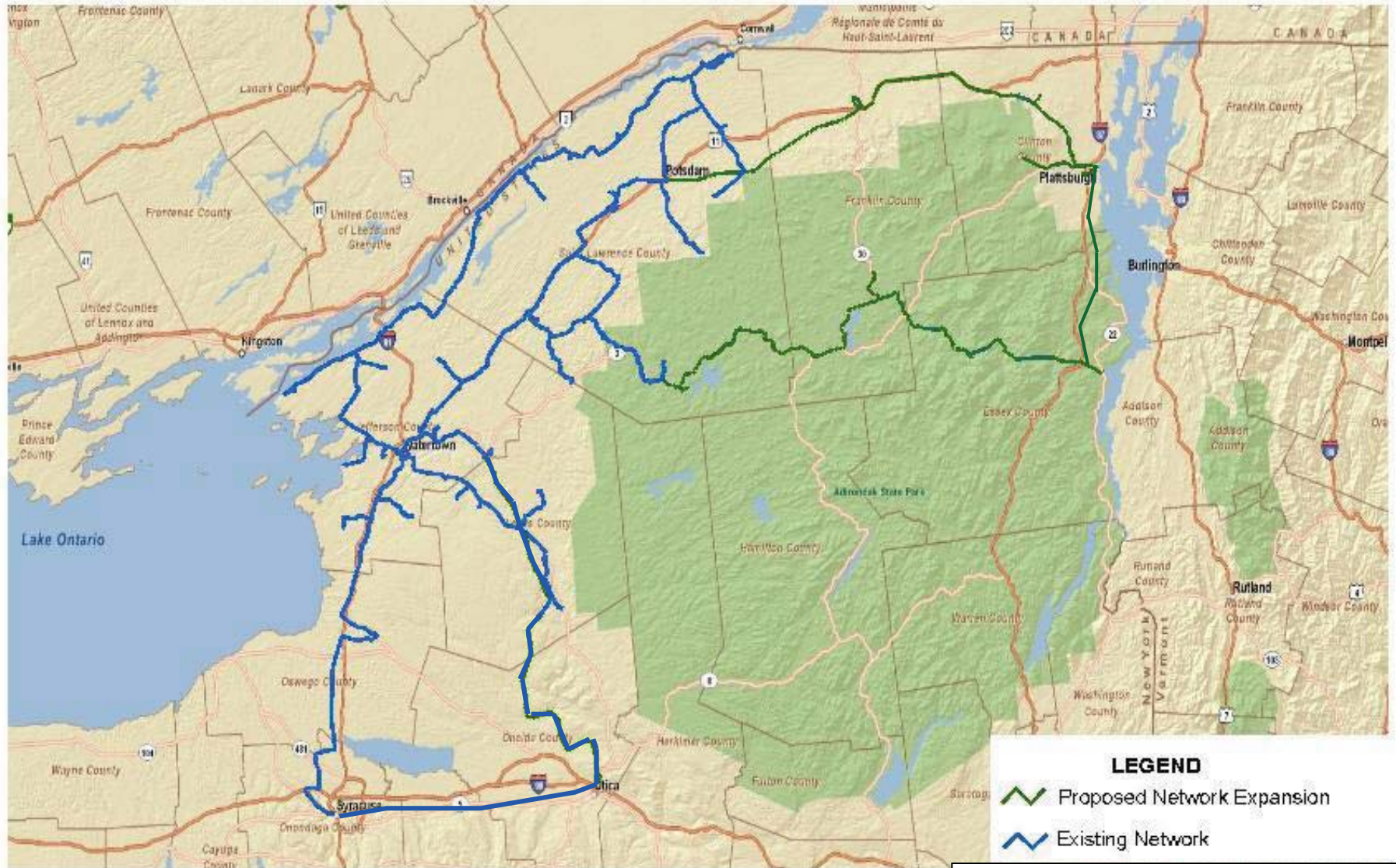


**ALBANY METRO NETWORK**



- ION Existing Network
- ION BTOP Grant Builds
- Sovernet Network
- DANC Network

# Development Authority of the North Country Open Access Telecommunications Network



Proposed Network Expansion to be completed 8-2012