

telx | the interconnection & data center company<sup>®</sup>  
NYSERNet

# PLANNING FOR THE FUTURE:

RESEARCH EXCHANGE POINTS  
IN THE 21<sup>ST</sup> CENTURY





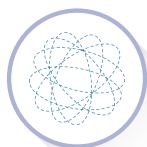


**GLOBAL POPULATION** = **7,200,000,000** + **82,000,000 Annually**

With its population of nearly 7.2 billion expanding by 1.14 percent annually (approximately 82 million people)<sup>1</sup>, our globe faces daunting problems, many of them related to its human burden. Natural processes that we understand only imperfectly help drive challenges like inadequate clean water, climate change, new and re-emerging diseases, and growing energy demands. However, unprecedented population size, rising per capita consumption of resources and production of carbon, heat, and waste are ominous new global forcing functions.

Better understanding of these issues and development of tools to help manage them depend on cooperation among corporate and academic research institutions, a vital trans-sector collaboration that requires seamless integration of ever more powerful instrumentation, computing, and networking. And hidden within this daunting set of problems lies another, equally fundamental issue: data is growing faster than the technologies that manage it. In fact, annual global IP traffic will surpass the zettabyte threshold in 2016.<sup>2</sup> To put this magnitude into perspective, it would take 15.7 years for the Hoover Dam to produce the amount of energy needed to power a zettabyte of light bulbs for one hour.<sup>3</sup> It would take an individual over five million years to watch the amount of video that will cross global IP networks each month in 2018.<sup>4</sup>

Let's consider reliable network connectivity. Dependent on robustness, stability and low latency in infrastructure design and materials, on the space, power and capacity of the data center facilities that industry-leading technology firms provide, it enables accessibility, collaboration and data transfer. Like its fellow R&E networks, the New York State Education and Research Network (NYSERNet), a private, not-for-profit corporation serving New York's research and education community, plays a vital role in that community's connectivity.



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<sup>1</sup> <http://www.worldometers.info/world-population/#growthrate>

<sup>2</sup> [http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white\\_paper\\_c11-481360.html](http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.html)

<sup>3</sup> <http://technografy.com/2013/04/so-how-much-is-a-zettabyte-infographic/>

<sup>4</sup> [http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white\\_paper\\_c11-481360.html](http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.html)

## NYSERNet

Founded in 1985, NYSERNet provides advanced networks, network technologies and related applications to support the research and education missions of institutions in New York State. Almost three decades ago NYSERNet, other emerging regional networks, and a nascent NSFNET together ushered in seminal change. NYSERNet's first backbone marked the first broad use of the Internet protocol outside the Defense Department (specifically DARPA). Its first spin off, the world's first commercial ISP, inaugurated a now vast industry unimagined five years earlier.

During its first dozen years of rapid growth and transformation NYSERNet was blessed with an essentially constant Board, but as the new millennium neared, new leadership, Board turnover through retirement, and a resolve to control the network down to the transport layer ushered in its optical decade. Taking many strategic risks, NYSERNet deployed fiber in a post-9/11 New York City, created a global exchange point for research and education in 32 Avenue of the Americas, built a statewide optical infrastructure, and constructed a business continuity center in Syracuse. NYSERNet forged strong partnerships with Lexent, Lighttower, Rudin Management, more recently Rudin's partner Telx, and with carriers who provided local loops for institutions not located near NYSERNet assets.

Despite organizational and national economic reverses, and these initiatives' uncertain financial impact, NYSERNet's Board boldly approved each, then patiently awaited their maturation. A decade earlier, NYSERNet had deliberately stepped away from experimental creations gone commercial to reaffirm its commitment to the research and education community. Today's expansion of fiber access in New York City and of space in 32 Avenue of the Americas and the Syracuse data center do not comprise strategic moves per se, but graphically illustrate NYSERNet's responsiveness to that community's rapidly evolving needs as network capacity dramatically increases. Conceptualizing hard problems anew and developing technologies to support these fresh perspectives, then seeing that technology move from experimental to critical infrastructure, is a now-familiar progression for NYSERNet.

**NYSERNET PROVIDES ADVANCED  
NETWORKS, NETWORK  
TECHNOLOGIES AND RELATED  
APPLICATIONS TO SUPPORT  
THE RESEARCH AND EDUCATION  
MISSIONS OF INSTITUTIONS IN  
NEW YORK STATE.**



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## *Tackling Global Challenges Together*

Data from the Worldometers site previously cited reveals that population and resource distribution, and contributions to global stressors like carbon dioxide, vary widely by country. Though still high per capita, conversion from coal to natural gas, plus greater overall efficiency, has decreased CO2 emissions by the United States. China and India's will continue their rapid rise, and climate energy distribution means that expression of carbon excesses occurs worldwide. The world population growth rate, dropping since 1963, is estimated to continue its sharp decline. But that very slowing, necessary for the planet, means that an aging population will present every nation with new challenges.

The problems described above subsume any single institution, discipline, or sector. The data-intensive research effort to understand and try to solve them necessitates unprecedented cooperation and collaboration. Researchers in the NYSERNet community work jointly with each other and with companies like IBM, GE, and Corning. In January, 2008, distinguished researchers and technologists, academic administrators, representatives from government (Ed Reinfurt, Executive Director of NYSTAR, New York's Division of Science, Technology, and Innovation and his senior staff) and industry (Dr. John E. Kelly III, Senior Vice President and Head of IBM Research and his senior staff) met at the New York Academy of Sciences (<http://www.nysernet.org/pub/nyas>) to grapple with boundary-crossing, collaboration, and integration of the many technologies that fundamental hard problems require. The high-performance computing consortium (<https://hpc2.org/>) and a deeper, broader discussion that continues to this day can both be traced directly to that meeting.

How do we respond going forward? We know that we cannot dictate the pace of change, that advances in genomics, data on carbon load, heat and carbon sequestration and a host of other factors suggest its acceleration. Moreover, growth in data seems to be outstripping advances in technology, including networking, computing, and storage. And we must understand as a seamless tool the end-to-end performance of all the technologies required to attack a problem.

***CONVERSION FROM COAL TO  
NATURAL GAS, PLUS GREATER  
OVERALL EFFICIENCY, HAS  
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THE UNITED STATES.***

## Strategic Partnerships

NYSErNet has long benefited from working with its strategic partners and its highly connected global community. Partnerships with Lexent and other carriers, with IBM, GE, Corning ION, the Development Authority of the North Country, Rudin Management, and with telecommunications partners Telx and Lightower Fiber Networks supplemented its own resources, helping NYSErNet create its world-class data center and networks, expanding its fiber connectivity and increasing its reliability.

For many global issues, only some of which we have mentioned, we remain in the early stages of discovery, with the direction and scope of needed research not yet clear. Albert Einstein once said, "If we knew what we were doing it wouldn't be called research, would it?" But with instrumentation improving the granularity of what is measurable and with decreasing costs dramatically increasing deployment of everything from sequencers to simple sensors, we already know that the data we will need to deal with will be of an unprecedented scale. The \$1,000 gene sequence is a reality today, for example, a quantitative reduction so great that it will cause a qualitative shift in basic research.

"A critical component of this effort is tracking, perhaps shaping, the evolving role of data centers and exchange points," notes Dr. Timothy Lance, president of NYSErNet. "Increasingly data-driven research makes these tools central today, and they may become more so in the near future as the size of the data our researchers deal with grows more rapidly than the technologies that manipulate, ship, and store it."

In 2013, there was over one exabyte of data stored in the cloud – that's over 67 million iPhones worth of data<sup>5</sup>. In 2015, we will have stored a total of eight zettabytes<sup>6</sup>, equivalent to 500 billion iPhones stacked for 2,367,424 miles (the distance of going to the moon and back at least four times)<sup>7</sup>.

"We have a valuable strategic partnership with NYSErNet today," adds Telx CEO Christopher Downie, "but for problems like these, this close working relationship becomes essential, with the research community pushing the envelope, and the scale Telx can bring contributing to their solution."



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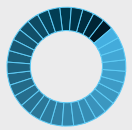
**Dr. Timothy Lance**  
President of NYSErNet

<sup>5</sup> <http://www.neowin.net/news/research-firm-over-1-exabyte-of-data-is-now-stored-in-the-cloud>

<sup>6</sup> <http://siliconangle.com/blog/2012/05/21/when-will-the-world-reach-8-zettabytes-of-stored-data-infographic/>

<sup>7</sup> <http://insider.foxnews.com/2013/06/07/how-much-zettabyte-nsa-utah-facility-can-hold-immense-amount-data>

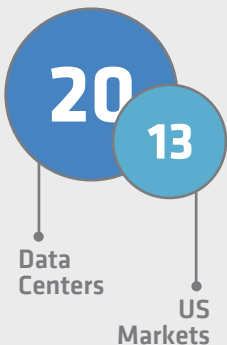
## TELX STATS



100% Uptime



100% On-time  
Service Delivery SLAs



**1,300,000**  
Square Feet of Data  
Center Space

**50,000**  
Network  
Connections

**10,000,000**  
Square Feet of Data Center  
Space Around the World

## The Telx Solution

Telx is a new kind of data center solution provider fueling infrastructure, interconnection and business progress. With industry-leading 100% uptime and 100% on-time service delivery SLAs, Telx helps companies and institutions like NYSENet build more agile businesses faster with reduced infrastructure complexity and broader reach to new markets. Along with the research and education community, Telx serves a broad range of industries types from 20 data centers located across 13 US markets: the New York/New Jersey metro area, Chicago, Dallas, Los Angeles, San Francisco, Santa Clara, Seattle, Portland, Atlanta, Miami, Phoenix and Charlotte, N.C. Telx manages 1.3 million square feet of data center space and more than 50,000 network connections, enabling the interconnection of more than 10 million square feet of data center space around the world.

Strategically located at 32 Avenue of the Americas, 6th Avenue, NYC3 is Telx's third New York City based data center and sixth within the greater NY/NJ metro area. Occupying an initial 72,000 square feet on multiple floors, NYC3 allows Telx to offer unparalleled levels of connectivity, resiliency and service throughout the New York metro with dominant assets in the three most sought after strategic locations for network connectivity in Manhattan.

NYC3's (32 Avenue of the Americas) Interconnection Center leverages Telx's dense connectivity environments at both NYC1 (60 Hudson) and NYC2 (111 8th Ave) offering the collective Telx customer base access to over 600+ network alternatives and more than 550,000 square feet. In combination with Telx's Tier III Clifton, NJ campus, Telx offers the most robust, connected and comprehensive set of data center solutions in the New York/New Jersey metro with significant capacity for customer growth requirements.

### NYC3 (32 Avenue of the Americas)



**1 of 3**  
New York Metro  
Data Centers



Square Feet on  
Multiple Floors



Accesses to Network  
Alternatives



of Accessible  
square feet  
in New York City



## Conclusion

The data center, advanced networks, computing, storage, and a host of technical assets are essential for fostering invention, innovation and new scientific discoveries within the research and education community. Incremental progress will surely occur, but we should heed the caution in Lincoln's Second Inaugural, "Each looked for an easier triumph, and a result less fundamental and astounding."

NYSERNet's partnerships of trust happily now include Telx. What we accomplish we do together, trusting and risking together. Very hard problems we can only do together. This report is not primarily about outcome, but process. For many issues that our collective community must grapple with, even formulating clear questions would constitute significant progress. So our vital journey continues. As Ben Franklin aptly phrased it, "We must all hang together, or assuredly we shall all hang separately."

**THE DATA CENTER,  
ADVANCED NETWORKS,  
COMPUTING, STORAGE,  
AND A HOST OF TECHNICAL  
ASSETS ARE ESSENTIAL FOR  
FOSTERING INVENTION,  
INNOVATION AND NEW  
SCIENTIFIC DISCOVERIES  
WITHIN THE RESEARCH AND  
EDUCATION COMMUNITY.**

## ABOUT NYSERNet

NYSERNet is a private not-for-profit corporation created to foster science and education in New York State. Its mission is to advance network technology and related applications to satisfy needs common to the institutions comprising New York State's research and education community, providing a forum for exploration of the opportunities and challenges these innovations present.

An Internet pioneer, NYSERNet has delivered next-generation Internet services to New York State's research and education community for more than twenty-five years. NYSERNet members include New York State's leading universities, colleges, museums, healthcare facilities, primary and secondary schools, and research institutions. NYSERNet's Board of Directors is composed of CIO's and other senior personnel drawn from and representing New York's leading research universities and institutions.

**NYSERNet**

## ABOUT TELX

Telx is a new kind of data center solution provider fueling infrastructure, interconnection and business progress. With an industry leading 100% uptime and 100% on-time service delivery SLAs, Telx helps companies build more agile businesses faster with reduced infrastructure complexity and broader reach to new markets. A privately held company headquartered in New York with west coast operations out of San Francisco, Telx serves a broad range of industries types from 20 data centers located across 13 US markets.

**Capacity. Capabilities. Connections.<sup>SM</sup>**