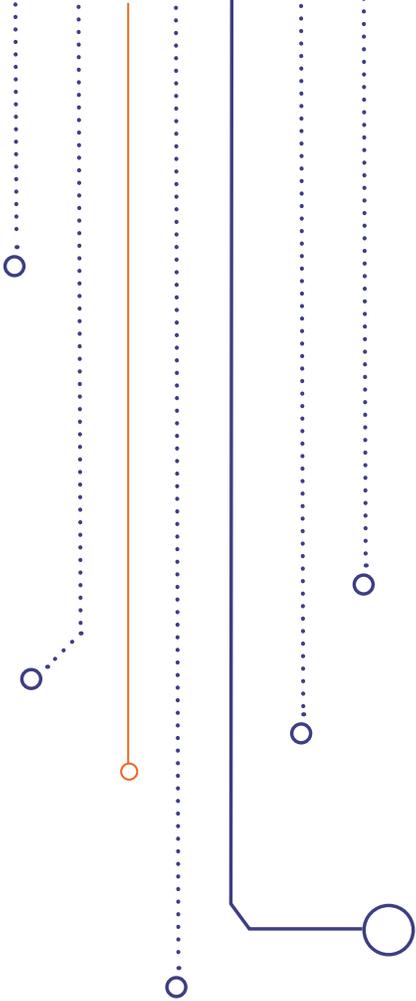


EXECUTIVE SUMMARY



Executive Summary

The internet is essential. As daily life in our city increasingly requires broadband connectivity, every New Yorker must be able to access and use the internet to its full potential.

New York City thrives on the flow and exchange of information throughout its five boroughs. However, internet service options vary throughout the city, both in terms of quality and pricing. This inequity reflects underlying disparities in infrastructure and market competition, impeding full economic and social inclusion.

People and businesses too often encounter an unaffordable cost of service, which is the biggest barrier to internet adoption in New York City. Achieving universal broadband will require lower-cost options for home and mobile service as well as no-cost access at computer centers, in public spaces, and through wireless corridors. No New Yorker should have to choose between a mobile phone bill and a monthly food bill.

The Internet Master Plan is a bold, far-reaching vision for broadband infrastructure and service in New York City. It frames the challenges of achieving universal connectivity, clearly states the City’s goals for the next generation of internet service, and outlines the actions the City will take to help all service providers contribute to those goals. It is both comprehensive in its view of the city and tailored to each neighborhood’s unique conditions. The Master Plan presents public and private actors with the opportunity to address major, persistent gaps in infrastructure; deliver higher-performing connectivity for residents and businesses; and set a course for eliminating the digital divide in New York City.

VISION AND PRINCIPLES

The City of New York envisions an internet for all New Yorkers that is founded upon five principles – equity, performance, affordability, privacy, and choice. These principles will serve as measures for success and as design parameters for the City’s approach to broadband infrastructure and services. The five principles are:



Equity

No one will face a barrier based on who they are or where they live.



Performance

The internet should be fast and reliable, and the quality should improve over time as uses of the internet continue to evolve.



Affordability

Cost should not be a barrier for any New Yorker who wants to connect to the internet.



Privacy

New Yorkers must be able to determine how their data is or is not used.



Choice

There should be sufficient competition among providers and diversity of technological solutions to sustain the other principles.

The Challenge

Today, there is a large digital divide in New York City.

The majority of New Yorkers use a mobile connection and a home connection, and they increasingly need both to make full use of the internet. Mobile connectivity is especially critical for people who commute to service jobs or for those with unstable housing, while a connection

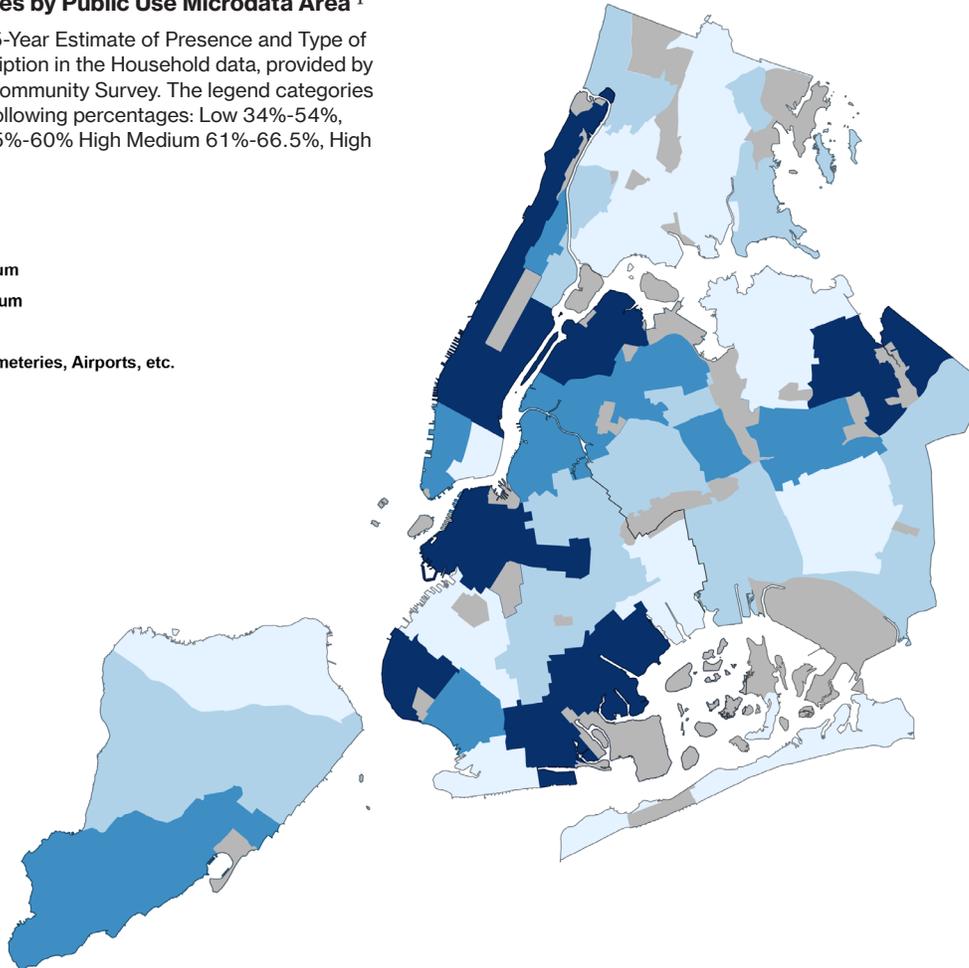
at home is essential for doing homework or applying for a job. However, 40% of New York City households do not have this level of comprehensive connectivity, which means that 3.4 million residents are excluded, entirely or in part, from digital life.

40% of New York City households lack the combination of home and mobile broadband, including 18% of residents – more than 1.5 million people – who lack both.

Map 1: Combined Home and Mobile Broadband Adoption Rates by Public Use Microdata Area ¹

Source: 2017 5-Year Estimate of Presence and Type of Internet Subscription in the Household data, provided by the American Community Survey. The legend categories represent the following percentages: Low 34%-54%, Low Medium 55%-60% High Medium 61%-66.5%, High 67%-81%.

- Low
- Low Medium
- High Medium
- High
- Parks, Cemeteries, Airports, etc.



DISPARITIES IN SERVICE

The private market has failed to deliver the internet in a way that works for all New Yorkers. Citywide, 29% of households do not have a broadband subscription at home. The same percentage of households are without a mobile broadband connection. The substantial overlap between these under-connected populations means that 18% of residents – more than 1.5 million New Yorkers – have neither a mobile connection nor a home broadband connection. This significant portion of the city’s residents face barriers to education, employment, banking, healthcare, social networks, and government services in ways that other residents do not.

The millions of underconnected New Yorkers tend to have lower household incomes compared to more

digitally-connected households. 46% of New York City households living in poverty do not have broadband at home. A map of internet service rates in New York City bears a striking resemblance to a map of poverty rates.

Internet use is foundational to economic mobility, but current broadband subscription costs can impose a considerable burden on the budgets of low-income families. New York City households living in poverty might need to spend as much as 10% of their monthly budget to have a home broadband connection and a single mobile connection.² These expenses further strain households already struggling to pay rent, access healthcare, and buy food.

Today in New York City, competitive residential broadband markets exist almost exclusively in high-density neighborhoods with high-income households. Areas with three or more residential broadband providers have an average household income 50% greater than households in areas with only two providers. A choice among several service providers can lead to greater affordability and improved service, as companies differentiate their products and compete for customers.

GAPS IN INFRASTRUCTURE

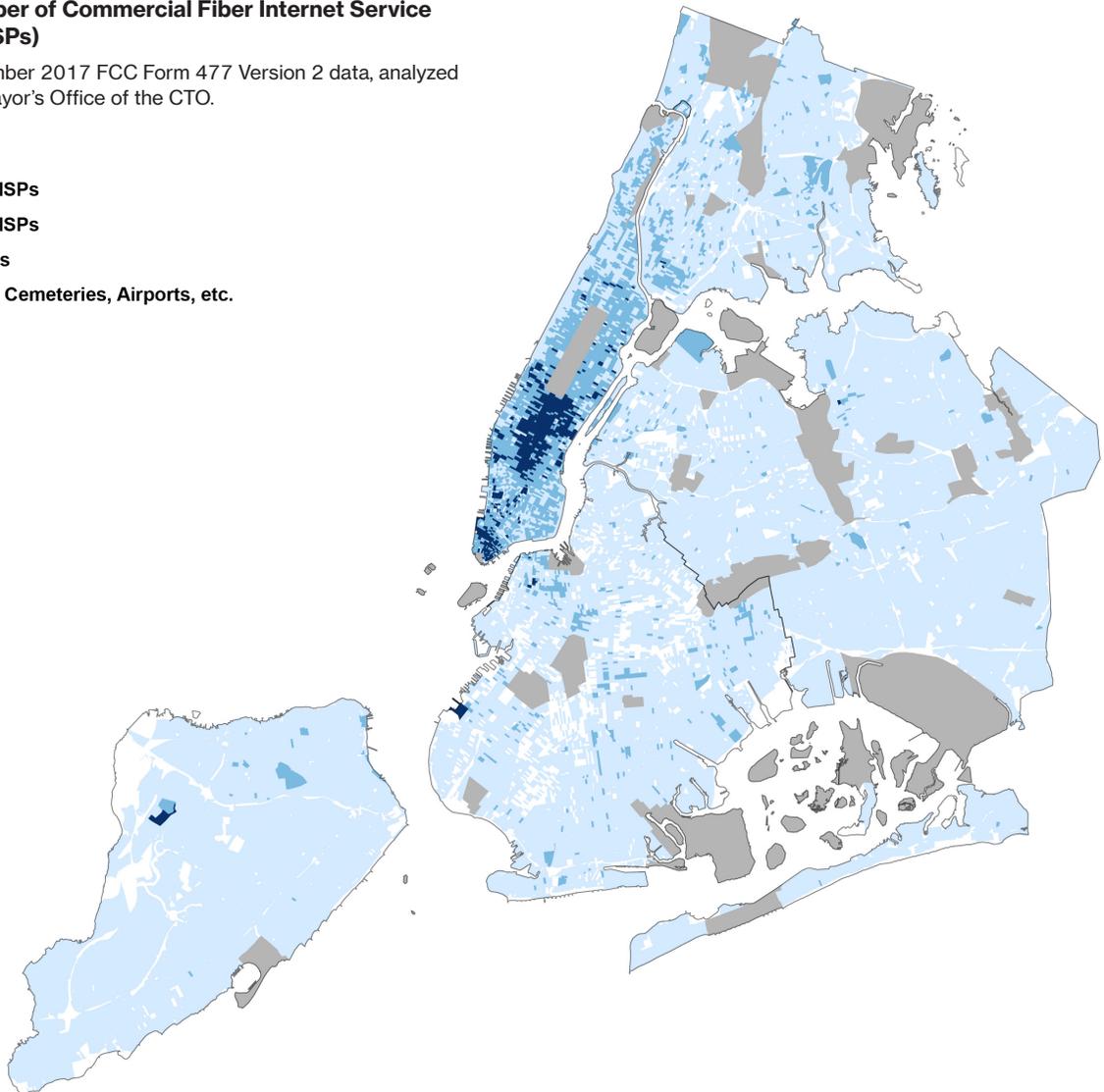
New York City suffers from disparities in the presence of fiber optic infrastructure, which is the basic building block of internet connectivity and a critical driver of economic development. Lower Manhattan has more options for commercial broadband service than perhaps anywhere else in the country. However, fiber optic infrastructure is

relatively sparse throughout the rest of the city. The most sizable gaps are in areas of Brooklyn and Queens where a lack of accessible conduit or utility poles limits opportunities for new services.

New Yorkers who live in these neighborhoods have fewer service options, which may be of lower quality. Gaps in fiber optic infrastructure can limit the types of businesses that take root in a neighborhood or the potential for small businesses already there to grow and adopt new technologies. Residents in these neighborhoods are less likely to experience the benefits of future technologies that rely on this infrastructure. Over time, without broadband as a foundational resource, neighborhood economies risk losing ground in the face of regional, national, and international competition. The digital divide in New York City is a serious barrier to economic opportunity for residents and small businesses and a threat to long-term economic growth.

Map 2: Number of Commercial Fiber Internet Service Providers (ISPs)

Source: December 2017 FCC Form 477 Version 2 data, analyzed by the NYC Mayor's Office of the CTO.





Students at P.S.188, The Island School in 2015
Source: Michael Appleton/NYC Mayoral Photography Office

The Plan

The City of New York will take advantage of a once-in-a-generation opportunity to dramatically reshape its role in enabling affordable, reliable broadband service for all. In addition to the urgent need to address disparities in infrastructure and service, the City is entering what may be the most pivotal period for its communications infrastructure since the dawn of the internet. The franchise agreements that establish the basic framework for broadband deployment in New York City are approaching key milestones. Simultaneously, emerging wireless technologies are accelerating private-sector demand for public assets while also lowering the barriers for new providers to enter the markets for both home and mobile broadband service.

NETWORK EXPANSION

Universal broadband throughout the five boroughs will require a network of multiple operators using a range of technologies. This network will support multi-modal use of the internet: constant, seamless mobile service

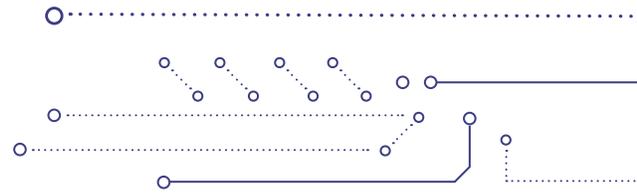
with robust, reliable service at home and at other fixed locations. It will prioritize and optimize “open access” or “neutral host” infrastructure, which can be shared by multiple operators to lower costs, increase competition, minimize physical disruption to the city, and incentivize private-sector investments to reach and serve customers.

Based on the data and analyses contained in this Master Plan, the City has determined that universal broadband calls for an open access fiber optic infrastructure built out to nearly every street intersection with an aggregation point in every neighborhood. Leveraging City real estate assets³ and public rights-of-way will allow network operators to extend fiber optic infrastructure from the intersection to a pole or building and deliver service using any of a number of potential technologies. This new infrastructure will support the rapid and equitable deployment of multiple choices for service.

The planned infrastructure, were it to be built entirely new throughout the whole city and rely on the open access conduit system in Manhattan and in the Bronx, is estimated to cost \$2.1 billion. The Master Plan prioritizes

infrastructure development for neighborhoods that have low levels of commercial fiber service and where new construction opens the way for new providers and services.

This fiber network will be overlaid with a neutral radio access network capable of providing mobile wireless service throughout every neighborhood. This wireless network will use shared spectrum to support multiple operators. The mobile network will enable efficient deployment of licensed spectrum by commercial operators to provide the most advanced mobile telecommunications services possible. The Master Plan prioritizes mobile wireless infrastructure in low-income areas where New Yorkers are most dependent on mobile service, as well as in areas where commercial broadband deployment is already placing the greatest burden on City assets. Determinations will be made on a neighborhood-by-neighborhood basis and will be adjusted as new information is assessed.



Broadband may be as important to New York City in the 21st century as the subway or electricity was in the 20th century.



A worker installs mobile wireless equipment on a City lightpole
Source: NYC Mayor's Office of the CTO

New York City's digital divide is a barrier to economic opportunity and a threat to long-term economic growth.

- Nearly a third of New York City households do not have a broadband connection at home.
- More than 1.5 million New Yorkers have neither a mobile connection nor a home broadband connection.
- New Yorkers without home or mobile connections have lower household incomes compared to more connected households.
- Neighborhoods with competitive residential broadband markets have higher household incomes than areas without the same level of choice.
- The Bronx has the lowest broadband adoption rates of any borough and the disparities are even more pronounced at the neighborhood level.
- Gaps in fiber optic infrastructure are most stark in areas of Brooklyn and Queens.

Figure 1: An Expanded Role for the City in Broadband Delivery

Real Estate Assets			Infrastructure	Service	
Permit the use of private property	Permit the use of public assets and public rights-of-way	Optimize and coordinate public assets	Optimize existing infrastructure and build new open access infrastructure that can support multiple operators	Install, operate, and maintain infrastructure and equipment	Acquire and support subscribers
City's Role Today		City's Role Expands		Role of Partners	

IMPLEMENTATION

This Internet Master Plan marks the beginning of a new era for the City in the delivery of broadband infrastructure and services. Specifically, the City will:

➤ Coordinate City Processes

The City will build on the interagency contributions to this Master Plan to maintain the consistency and clarity of City policies as broadband deployment increases.

➤ Optimize Public Assets

The City will invite proposals for the coordinated use of public real estate assets through a new Universal Solicitation for Broadband (USB). For the purposes of this Master Plan, “City assets” refers to those assets that are owned, operated, or otherwise controlled by the City, or available for City use. Private operators will be able to respond with requests for assets from multiple City agencies. The City will prioritize approaches that enable multiple operators to share in the use of an asset. The City will review responses to the USB for feasibility of implementation and potential impacts on City resources.

➤ Partner on Infrastructure

The City will invest in new infrastructure that can be shared by multiple broadband operators. In addition to its own seed investments, the City will leverage public-private partnerships to install, operate, and maintain the infrastructure.

➤ Enable Service Delivery

The City will support and promote the use of new, shared infrastructure by broadband operators to reach more areas with more services. New Yorkers will benefit from reliable and affordable broadband options that meet the City’s principles.

The Impact

Universal broadband that is in line with the City’s principles will produce transformative and widespread economic benefits. Broadband may be as important to New York City in the 21st century as the subway or electricity was in the 20th century. The means by which broadband is delivered will shape the future of neighborhoods, local industries, and the daily lives of millions of New Yorkers.

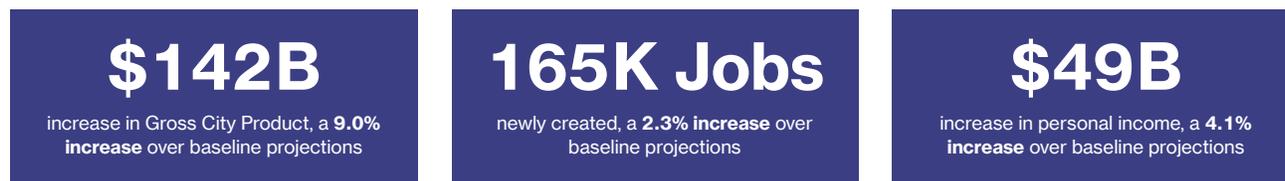
Broadband has already unlocked new forces in the local economy, from the delivery of internet service, to the development of websites and computer systems, to the growth of tech companies that have become mainstays of the city’s employment landscape. The larger tech sector accounts for over 240,000 jobs in New York City, and the growth in tech jobs was three times faster than general private sector jobs from 2010-2016.⁴ This technology-driven economic development has occurred so far with barely 60% of residents being fully connected and many neighborhoods facing gaps in service.

The economic and fiscal impacts of realizing this vision will have a transformational impact on New York City’s economy, residents’ quality of life, and the City’s ability to operate more efficiently. Based on an analysis of potential economic impacts of universal broadband, getting all New Yorkers connected and establishing equitable infrastructure citywide could, in the best-case scenario, result in up to 165,000 new jobs, up to a \$49 billion increase in personal income, and up to \$142 billion in incremental Gross City Product by 2045. These economic impacts cannot be fully realized under the current conditions of the internet in the city.

Benefits will be most dramatic for those who are currently excluded from full participation in the digital economy. A competitive service market that includes options for low-income New Yorkers will provide newly affordable services for 1.2 million households.⁵

Figure 2: Potential Economic Impacts of Universal Broadband

Consumer price reductions and broadband-enabled gains in labor productivity will create a more prosperous city economy. With universal broadband, New York City could gain, in the best-case scenario, up to \$142 billion in incremental Gross City Product, up to 165,000 new jobs, and up to a \$49 billion increase in personal income.



With universal broadband and a strong digital inclusion strategy, all New Yorkers will experience quality of life improvements. More children will be equipped to succeed in school with online resources. More adults will be able to participate in the media and technology sectors of the local economy. More seniors will be able to access health information and care. All New Yorkers will be more connected to each other in a City where they are protected online.

The City of New York is open to all potential partners that agree with the principles of equity, performance, affordability, privacy, and choice and that want to contribute to the realization of the New York City Internet Master Plan. Ideas, feedback, and suggestions in response to this Master Plan are welcome via email at:

InternetMasterPlan@cto.nyc.gov.

Endnotes

1. These geographic areas that combine multiple neighborhoods are Public Use Microdata Areas (PUMAs), which approximate New York City’s Community Districts and are the smallest unit of measure for combining American Community Survey data on home broadband and mobile data subscriptions. Predominantly throughout the Internet Master Plan, the unit of measure is Neighborhood Tabulation Areas (NTAs), which approximate a single neighborhood. For more information on these units see <https://www1.nyc.gov/site/planning>.
2. Assuming a rate of \$50 per month for each service. The U.S. poverty threshold is \$24,858 for a family of four (source: U.S. Bureau of the Census). Approximately 50% of New York City households in poverty have a home broadband subscription. The median household income for households in poverty with broadband is \$10,415, for which a \$100 monthly expense for broadband would be 10%.
3. City assets may include those that are owned, leased, or otherwise controlled by the City, or available for City use.
4. Office of the State Deputy Comptroller for the City of New York, “The Technology Sector in New York City,” Office of the New York State Comptroller (2017) at <https://www.osc.state.ny.us/osdc/rpt4-2018.pdf>.
5. Affordability assumptions based on the number of households that could newly subscribe to broadband service based on household income levels. Analysis compares economic impact study assumptions of new service pricing to 2016 American Community Survey data. Analysis assumes that universal broadband includes a more competitive service market and low-cost options for low-income New Yorkers.

Figure 3: The Impact of Universal Broadband

Universal broadband that embodies the City’s principles will drive significant economic growth benefiting all New Yorkers. The economic and fiscal benefits will result from three expansive transformations: closing the digital divide, catalyzing economic expansion, and improving public service delivery.

