Transit Wireless
a bai communications company

World Wi-Fi Day

Transit Wireless 2018 Case Study, updated from 2016

Overview - Transit Wireless is the company that was selected by the Metropolitan Transportation Authority (MTA) to finance, design, build, operate, and maintain a shared wireless infrastructure in all underground stations of the New York City subway system, providing commercial services for AT&T, Sprint, T-Mobile, and Verizon Wireless. As a result of a public private partnership and Transit Wireless' $350 million investment, the network was built at no cost to taxpayers or subway customers. The company's wireless network operates on all primary licensed cellular bands, public unlicensed bands, and the 4.9 GHz public safety band, and supports consumer, business, and transit communications services.

The NYC Subway

- Built 1900-1930s
- Comprised of 472 stations (283 underground) across 4 boroughs
- 24/7 operation
- 1,070 kilometers of track
- 1.76 billion riders per year
- Number of subway cars: 6,418
- Number of weekday train trips: 8,200

But up until 2011, no public wireless connectivity!

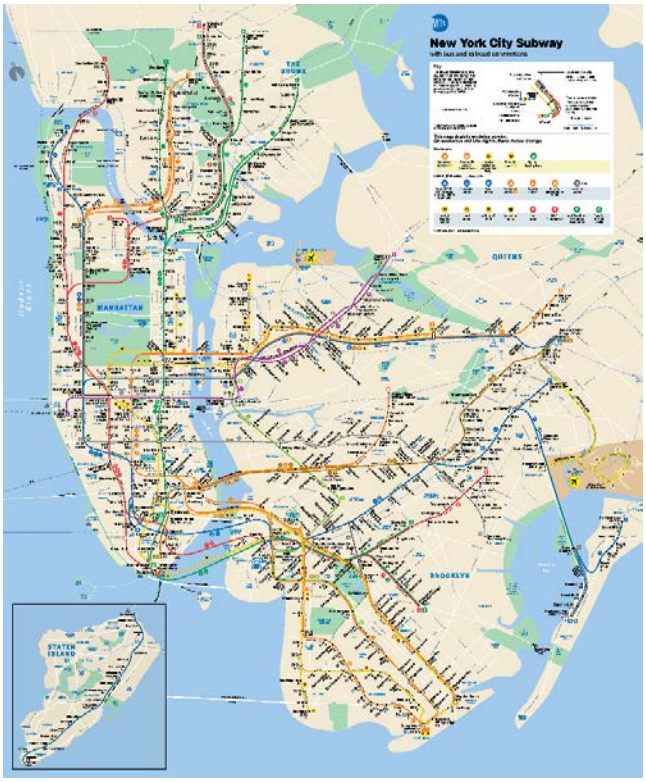

Image 1: MTA Subway Map 2018

The Network

Transit Wireless has built an indoor and outdoor neutral host and multi-band Distributed Antenna System (DAS) networks that enable cellular connectivity in areas with insufficient coverage as well as venues that require increased capacity.

These networks offer several advantages:

- They deliver wireless technologies including GSM, CDMA, EVDO, UMTS and LTE, in conjunction with any contracted wireless carrier.
- They are easily adaptable for bands ranging from LTE 700 MHz to BRS/EBS 2500 MHz.
- Neutral host DAS installations are readily scalable to meet growing demands on a network and future technologies such as 5G and future bands of operation.

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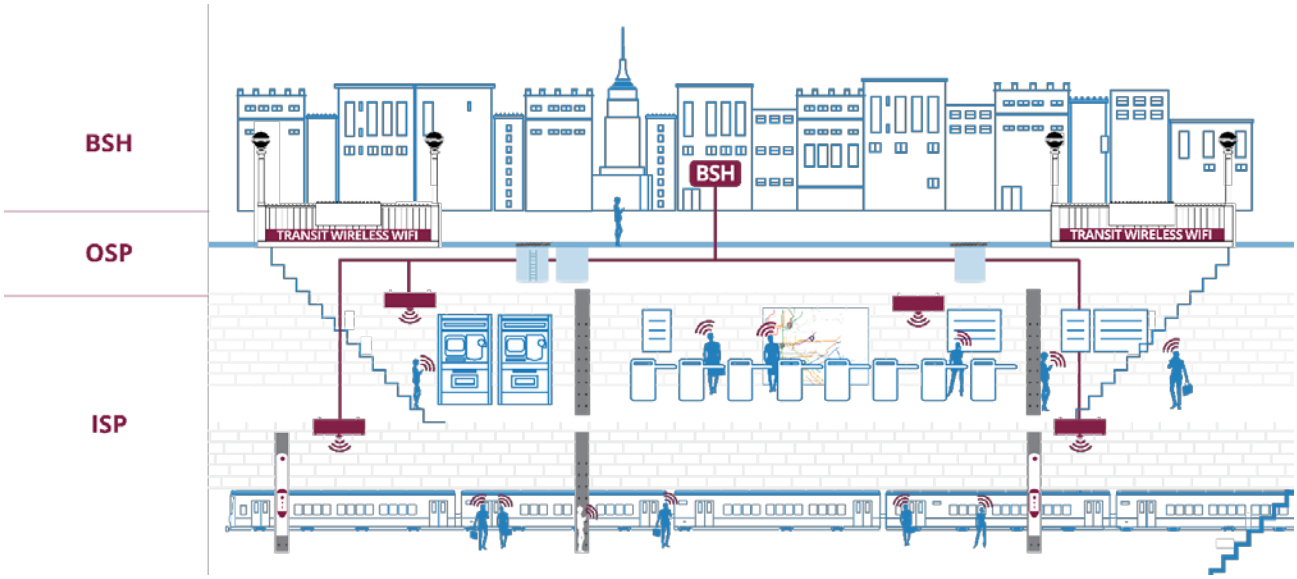

Image 2: Breakdown of Network Architecture

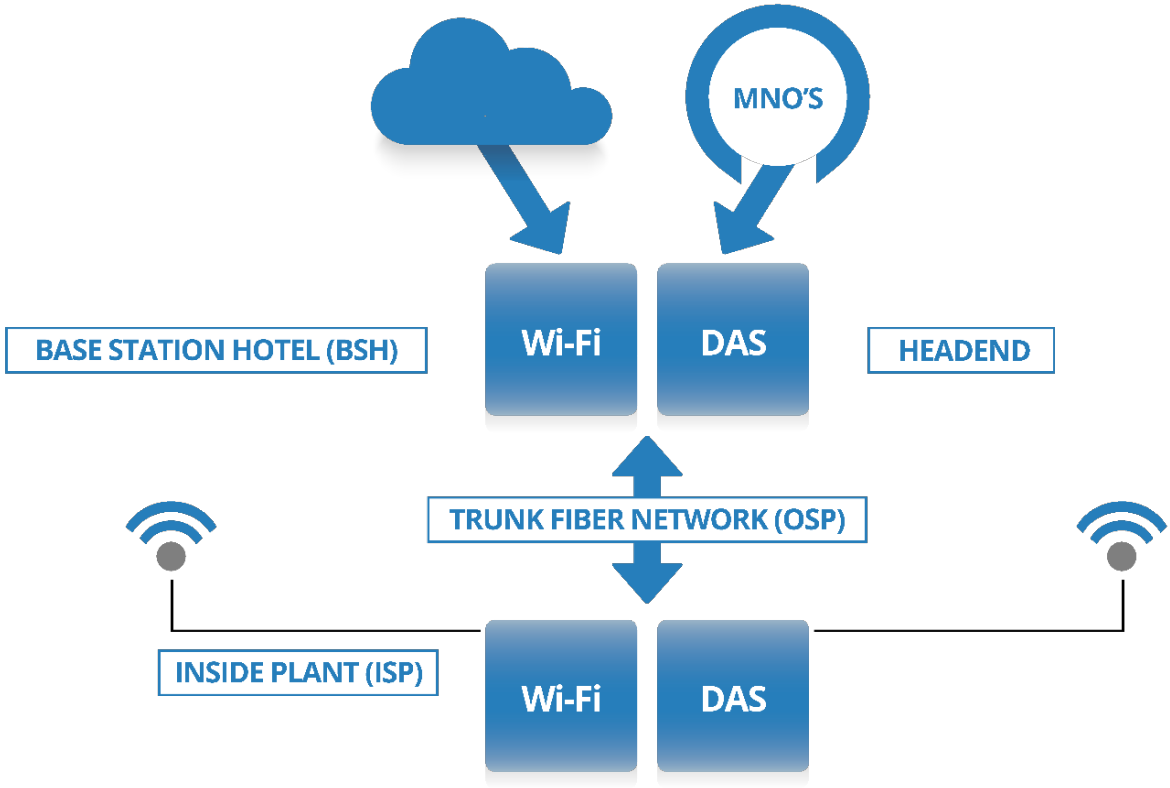

Image 3: DAS and Wi-Fi Architecture

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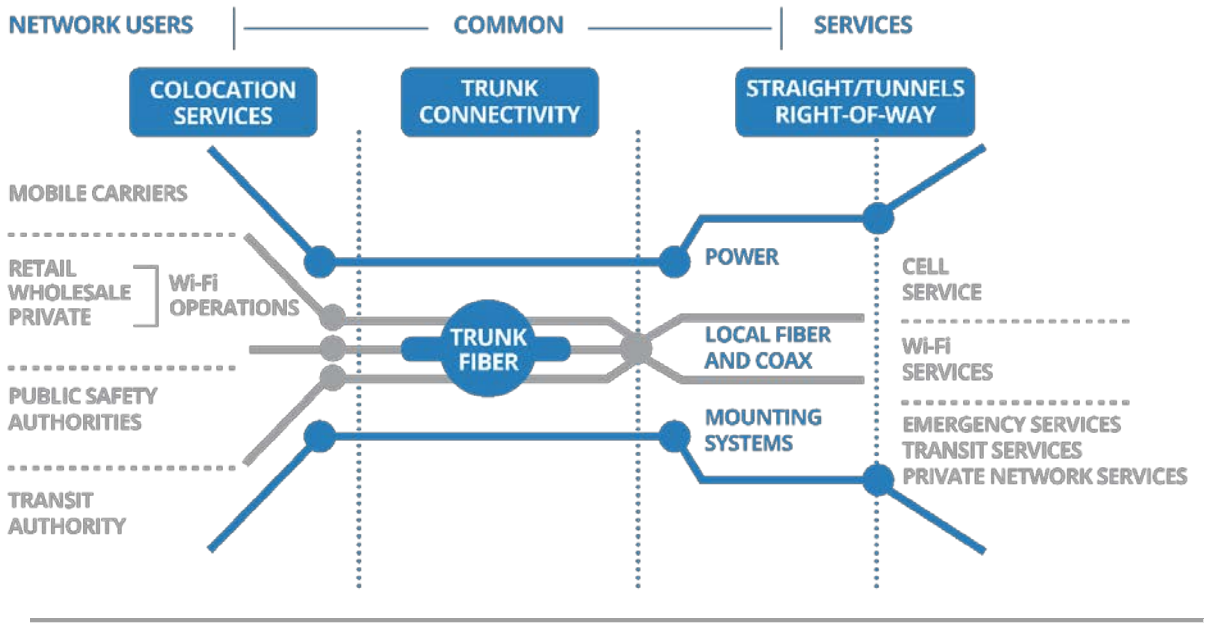

Image 4: Fiber

The Wi-Fi network is configured and segmented to securely provide the following services:

- Free public Wi-Fi connectivity
- Roaming for international travelers
- A 4.9 GHz public safety band
- Advertising opportunities
- IOT
- Supporting MTA/NYCT dedicated communications and network-reliant services.

Challenges - Building a Modern Network in a 100-Year-Old Man-Made System

Designing and building the wireless infrastructure in the more than 100- year-old subway stations was no easy task. With harsh environmental conditions like high temperatures, moisture, and water intrusion, customized equipment was required. There were also many structural challenges, such as low ceilings, narrow platforms, and extensive existing infrastructure, leaving relatively little space for the communications technology to be installed.

In the city that never sleeps, the trains also run 24/7/365, restricting the building hours of the infrastructure. The constant flow of 5.7 million daily riders had to be considered as well, to ensure subway riders' safety near the construction.

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Deployment Schedule

In 2011, Transit Wireless completed a proof of concept build and activated cellular and wireless connectivity in six subway stations in Chelsea. Following the initial six station openings in 2011, installation continued throughout the city until January 2017 when Transit Wireless successfully completed the deployment of the entire network. This accomplishment resulted in full cellular capabilities with the four major carriers, AT&T, Sprint, T-Mobile, and Verizon Wireless, as well as free public Wi-Fi connectivity in all of the MTA's underground stations, two years ahead of schedule.

In the first year of service:

- 120 million logins were made on the Wi-Fi network
- 280 million calls were made through the cellular connection
- 1,200 help point stations were connected
- 450+ countdown clocks were installed

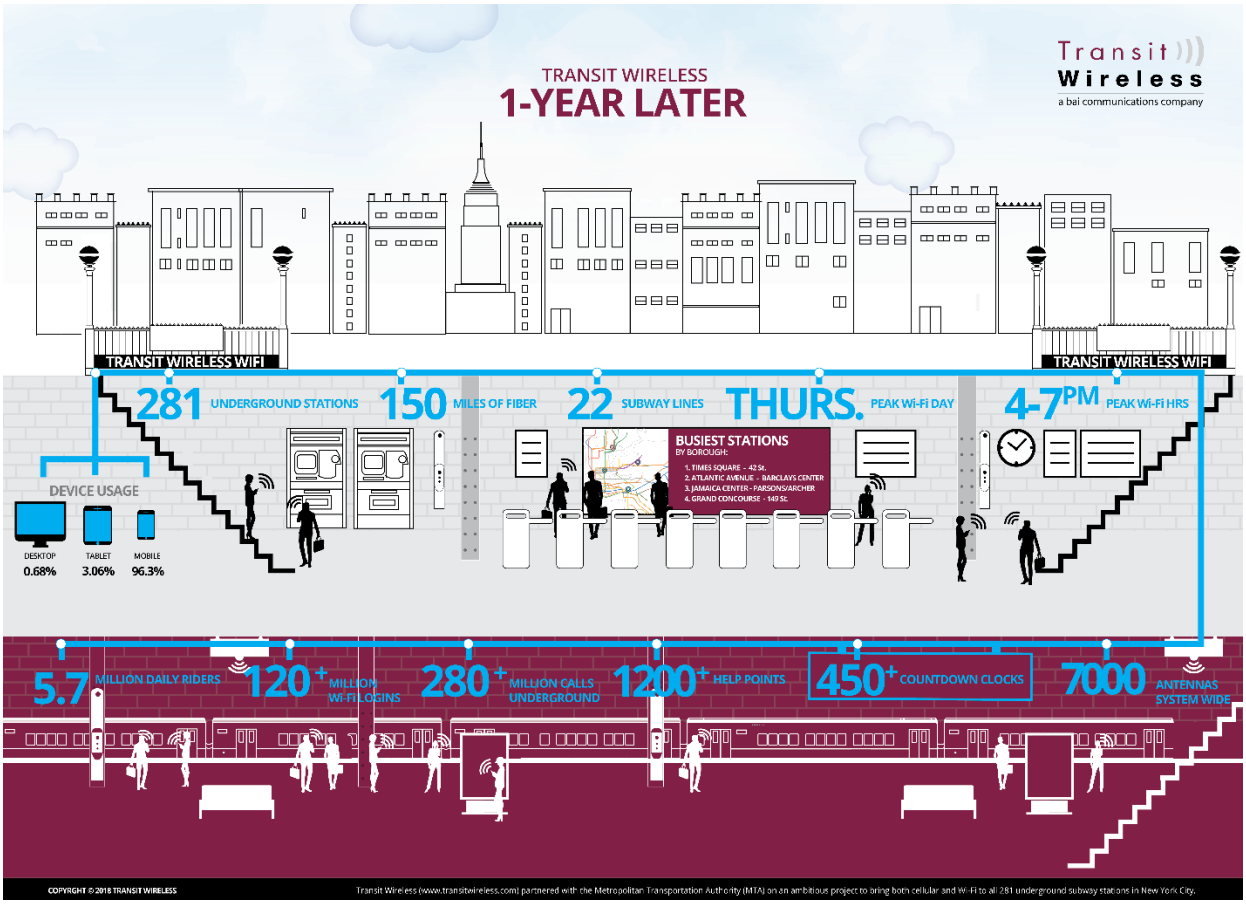

Image 5: 1 Year Infographic released January 2018

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System Performance

In addition to the millions of cellular calls and logins to the Wi-Fi network, the network has also handled countless text messages, app usage, and all of the many ways consumers use their smartphones. Customers are consuming more than 500 terabytes of data monthly.

SUMMARY

Scale of deployment:

- 283 connected stations
- 3 bands - 2.4 GHz, 5.x GHz (public unlicensed bands) and 4.9 GHz (public safety band)
- 257 kilometers of fiber
- 5 base station hotels/data centers across 4 boroughs
- 5000 access points
- 7000 antennas
- Fiber to the edge architecture
- Use of common infrastructure to deploy parallel Wi-Fi and DAS networks
- Scalable and interoperable high-density network architecture
- Over built fiber network for future proofing
- Many application layers to maximize revenue earning/monetization
- Combination of public safety 4.9 GHz band with unlicensed 2.4 GHz and 5 GHz bands
- Specially designed access point boxes to overcome substantial environmental challenges
- 3D photography of every station for design and approval productivity Market Impact:
- 5.7 million weekday riders per day – 1.7 billion riders per year
- Stations with the most logins by borough:

    1. Times Square - Manhattan
    2. Atlantic Avenue – Barclays Center - Brooklyn
    3. Jamaica Center – Parsons/Archer - Queens
    4. Grand Concourse - Bronx

The Success of the Public-Private Partnership

Perhaps one of the most impressive aspects of the project is that it came at no cost to the public. This landmark undertaking was made possible thanks to a public private partnership (P3) between Transit Wireless and the Metropolitan Transportation Authority (MTA). Transit Wireless made an initial investment of over $350 million. The company saw the importance of this project to the public and the MTA's evolving communication needs and shouldered the financial, scheduling, and business development responsibilities of the project. In addition to the assumption of financial risk and the responsibilities of maintaining a world-class, future-proof network for public and operational services, Transit Wireless shares revenues with the MTA. The P3 between Transit Wireless and the MTA succeeded in delivering a much-needed service to the public without fare

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hikes or an increased tax burden. This partnership was the ideal solution to tight federal, state, and local budgets and subway riders' pockets.

The overall initiative has been named "Best Wi-Fi Deployment to Connect the Unconnected in an Urban Environment" by the Wireless Broadband Alliance. Transit Wireless is also the winner of the 2018 IDC North America Award for Digital Equity and Accessibility. The success of the networks demonstrate how constant connectivity has become essential for commuters and New York City visitors, alike.

Transit Wireless continues to put forth innovative technology recommendations to further modernize the subway system. At the beginning of 2018, the company received an Honorable Mention in the MTA Genius Transit Challenge in the category, Increase Communications Infrastructure in the Subway System. Transit Wireless proposed the installation of a long-term evolution (LTE) network that would provide continuous Wi-Fi connectivity for trains in track tunnels, allowing for continuous communication service capabilities for train operators and subway riders. This expansion would build upon the Wi-Fi network infrastructure that Transit Wireless installed in all underground subway stations. The network upgrades could also support train control and signal systems, as well as digital advertising, public, and operational Wi-Fi services in the train cars.

Building New Opportunities and Usages for the Network

Expanding upon its main services, the Wi-Fi network also allows for various partnership opportunities, such as the "Subway Library" initiative with the New York Public Library in the summer of 2017. This partnership allowed subway riders to use the network to download free e-books from the New York Public Library to enjoy on summer commutes while in the underground subway stations.

Transit Wireless has played an indispensable role in modernizing New York City's subway system by ensuring that its installation is equipped to handle evolving technologies and innovations. With the success of the public private partnership with the MTA and the company's continued efforts toward developing future-forward ideas, Transit Wireless will continue to have a vital role in connecting subway riders during their commute. Public safety, streamlining operations, and the public desire for constant cellular access are demands that have been met and will continue to evolve with Transit Wireless leading the way and supporting the MTA's initiatives.

For more information, visit: transitwireless.com

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