World WiFi Day Awards

Category:

Best WiFi Deployment to Connect the Unconnected in Urban Environment

Deployment of WiFi Network in the New York City Subway

Transit Wireless

a bai communications company

Overview:

Transit Wireless has a licence with the NYC Subway operator New York City Transit (NYCT) to provide wireless coverage and connectivity in 279 underground stations.

As part of the licence Transit Wireless is responsible for the design, deployment and operation of a multiband WiFi network for 2.4GHz and 5.8GHz unlicensed bands and the 4.9GHz public safety band.

Transit Wireless is also responsible for funding and monetising the entire network.

The NYC Subway

- Built 1900-1930s
- Comprises some 457 stations (279 underground) across 4 boroughs
- 24/7 operation
- 1050 km of track – local and *express*
- 1.7 billion rides per year
- 2 million sqm public space to be covered

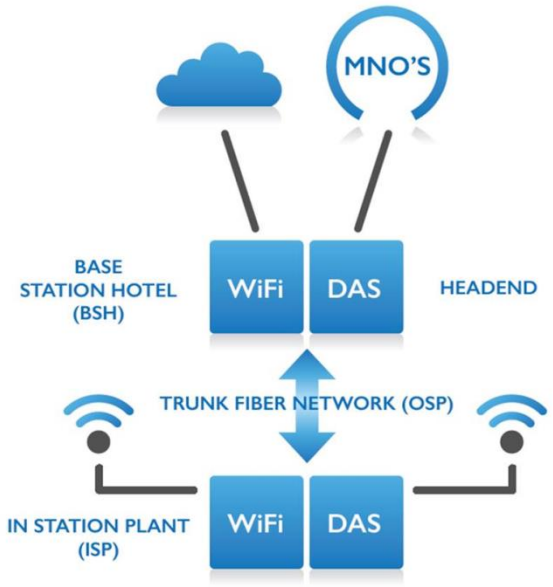
- Number of subway cars: 6,311
- Number of weekday train trips:7,817
- At peak hour some 580 trains operating simultaneously

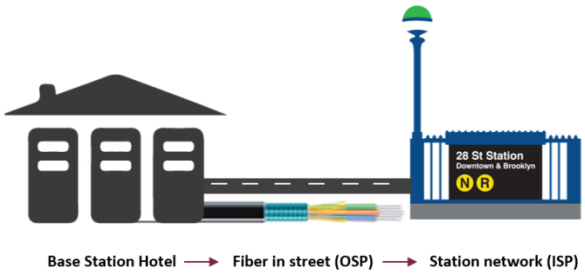
But up until 2011 no public wireless connectivity!

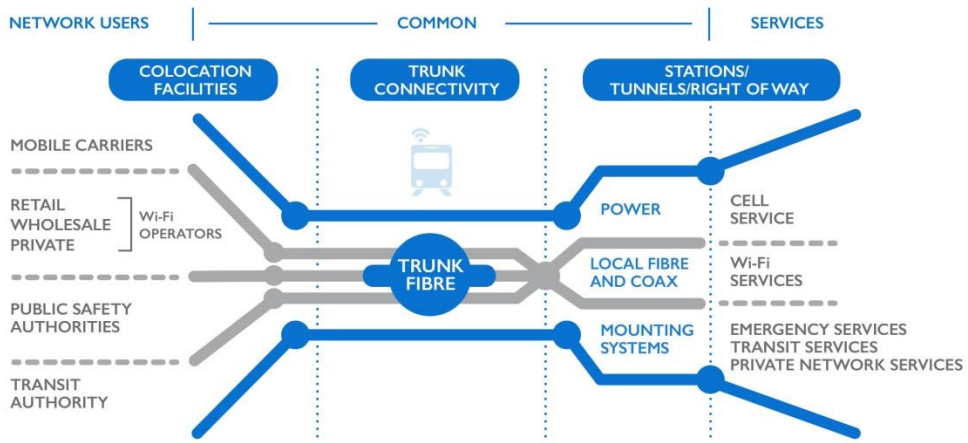
The Network:

The network comprises 3 distinct elements which when connected together on common infrastructure create parallel WiFi and DAS networks:

- In Station Network (ISP)
- Trunk Fibre Network (OSP)
- Base Station Hotels / Data Centres (BSH)







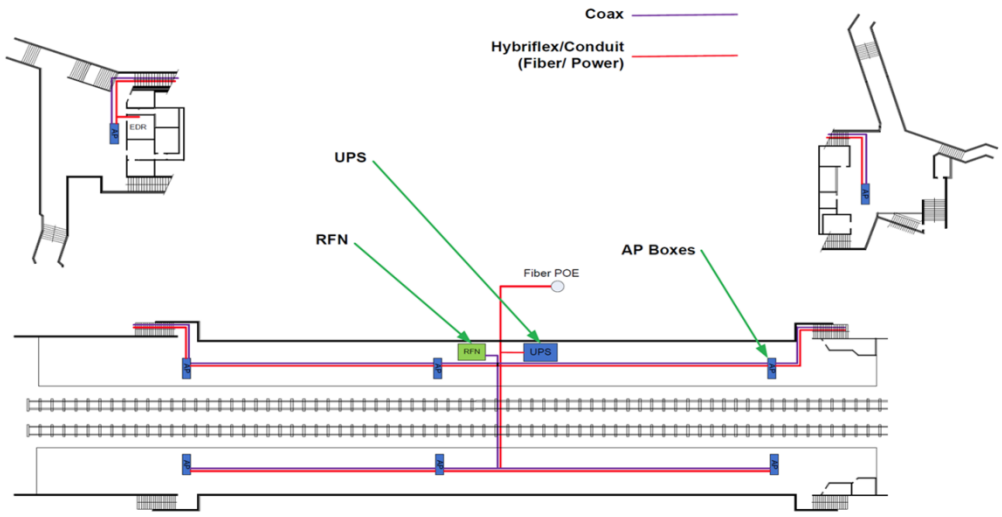
The ISP station network features a fibre-to-the edge design to access point (AP) boxes on the platforms and in the mezzanines and other public spaces in each subway station.

Each AP box (typically 8-10 per station) houses two dual band access points:

- 2.4GHz+5GHz
- 4.9GHz+5GHz

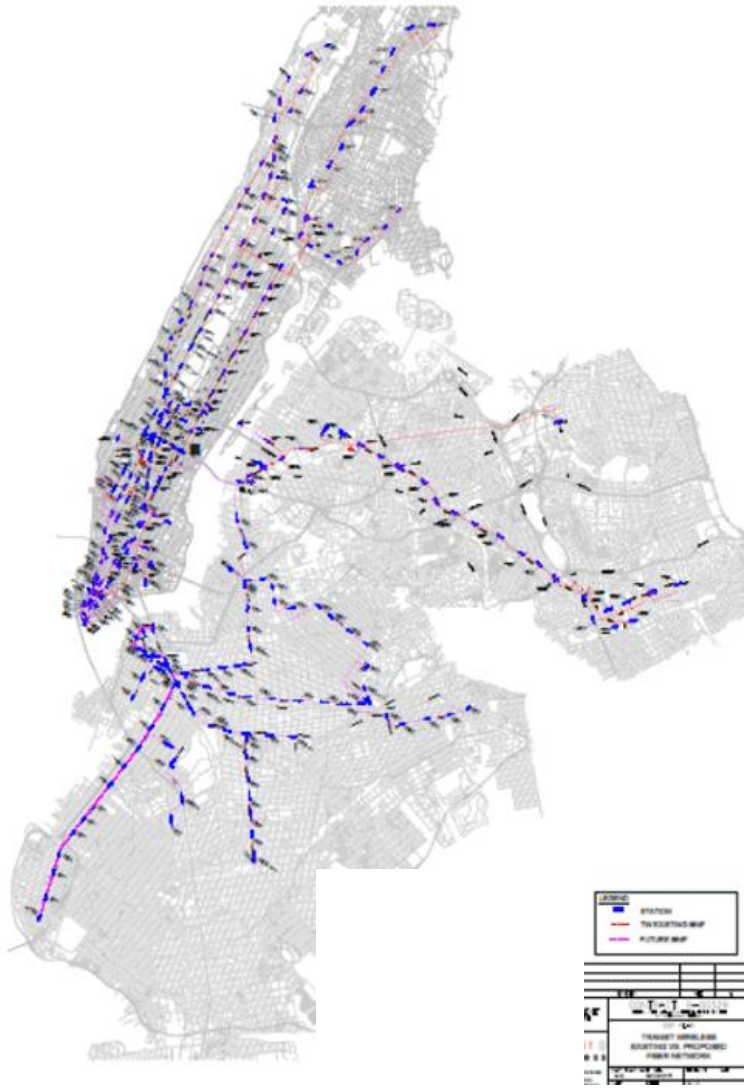
Each access point is Hotspot 2.0 and 802.11ac capable.

A typical station layout is shown here:



The OSP trunk fibre network connects each station to a BSH/data centre. The network, when fully built by the end of 2016, will comprise 200km of 864 count fibre. It is installed in the streets of NYC through existing duct systems. Lateral ducts from manholes to station points of entry are specifically constructed and 12 fibres are dropped into each station and from then on 12 fibres to each AP box.

The fibre network covers all subway lines across 4 boroughs in which the subway operates – Manhattan, The Bronx, Queens and Brooklyn



There are five BSH/data centres in the network:

- Midtown Manhattan (complete)
- Queens (complete)
- The Bronx (complete)
- Downtown Manhattan (to be completed 2016)
- Brooklyn (to be completed 2016)

At each BSH a WiFi headend is connected to an upgradable 5+5 Gbps internet connection.

MIDTOWN MANHATTAN	QUEENS	BRONX	DOWNTOWN MANHATTAN	BROOKLYN
•Completed 2012 •60 Stations •Minimal Colocation Capacity	•Completed 2013 •36 stations •Minimal Colocation Capacity	•Completed 2015 •65 stations •Significant Colocation Capacity	•In-Progress •40 Stations •Significant Colocation Capacity	•In-Progress •76 Stations •Significant Colocation Capacity

Applications and Monetization

The WiFi network is configured and segmented to securely provide the following services:

- Free public WiFi connectivity supported by advertising/sponsorship revenues
- Roaming services for international travellers
- Out of Home WiFi service for MSO's, MNO's and other WiFi SP's on a wholesale basis
- B2B services for:
    - Digital signage content delivery
    - E-commerce
    - Enterprise systems
    - Private networks
- M2M/IOT services for:
    - Sensor connectivity – remote condition monitoring
    - Crowd heat mapping/people movement
- Cellular offload (through HS2.0)

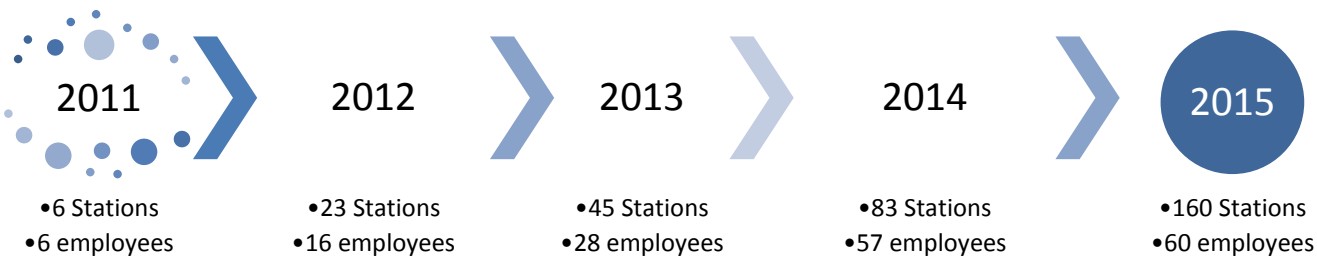
- Public Safety (4.9GHz)
    - Help Point Intercom
    - Security cameras
- …and much more…

Challenges Encountered/Overcome

- Very old subway station environment
- 55°C temperature specification – no active cooling allowed
- Brake dust
- IP67 water ingress requirement
- Historic stations requiring special solutions
- 24 hour subway operation – very challenging installation. Work only possible late night/early morning.
- Moratoriums on street work for fibre network construction

Deployment Schedule

- The 279 station network was programmed to be completed by July 2018.
- The actual completion will now be substantially ahead of schedule in December 2016.
- Some 200 stations are now complete and operational.
- It took 14 months to build first 6 stations. The current rate of construction is now 6 stations per month.
- In the second half of 2016 the monthly rate will peak at 14 stations per month.



System Performance Infographic – Free Public WiFi

SUMMARY

Scale of deployment:

- 279 stations
- 2 million sqm wireless coverage requirement
- 3 bands (2.4GHz, 5.8GHz, 4.9GHz)
- 200km fibre network – 864 count
- 5 base station hotels/data centres across 4 boroughs
- 5000 dual band APs - Hotspot 2.0 / 802.11n/ac

Innovation:

- Fibre to the edge architecture
- Use of common infrastructure to deploy parallel WiFi and DAS networks
- Scalable and interoperable high-density network architecture
- Over built fibre network for future proofing
- Many application layers to maximise revenue earning/monetisation
- Combination of public safety 4.9 GHz band with unlicensed 2.4 GHz and 5GHz bands
- Specially designed access point boxes to overcome substantial environmental challenges
- 3D photography of every station for design and approval productivity

Market Impact:

- 5.5 million rides per day – 1.7 billion rides per year
- Extremely busy stations:

	Station	Annual Ridership
1	Times Square	62,069,437
2	Grand Central	42,984,249
3	Herald Square	37,154,138
4	Union Square	34,639,575
5	Penn Station	27,010,176
6	Columbus Circle	21,599,586
7	Lexington Ave / 59th St	20,628,942
8	86th St	19,686,985
9	Lexington Av-53rd /51st St	19,280,036