NYC Mesh

A community-owned network

“The Internet is for everyone”

Battlemesh v12

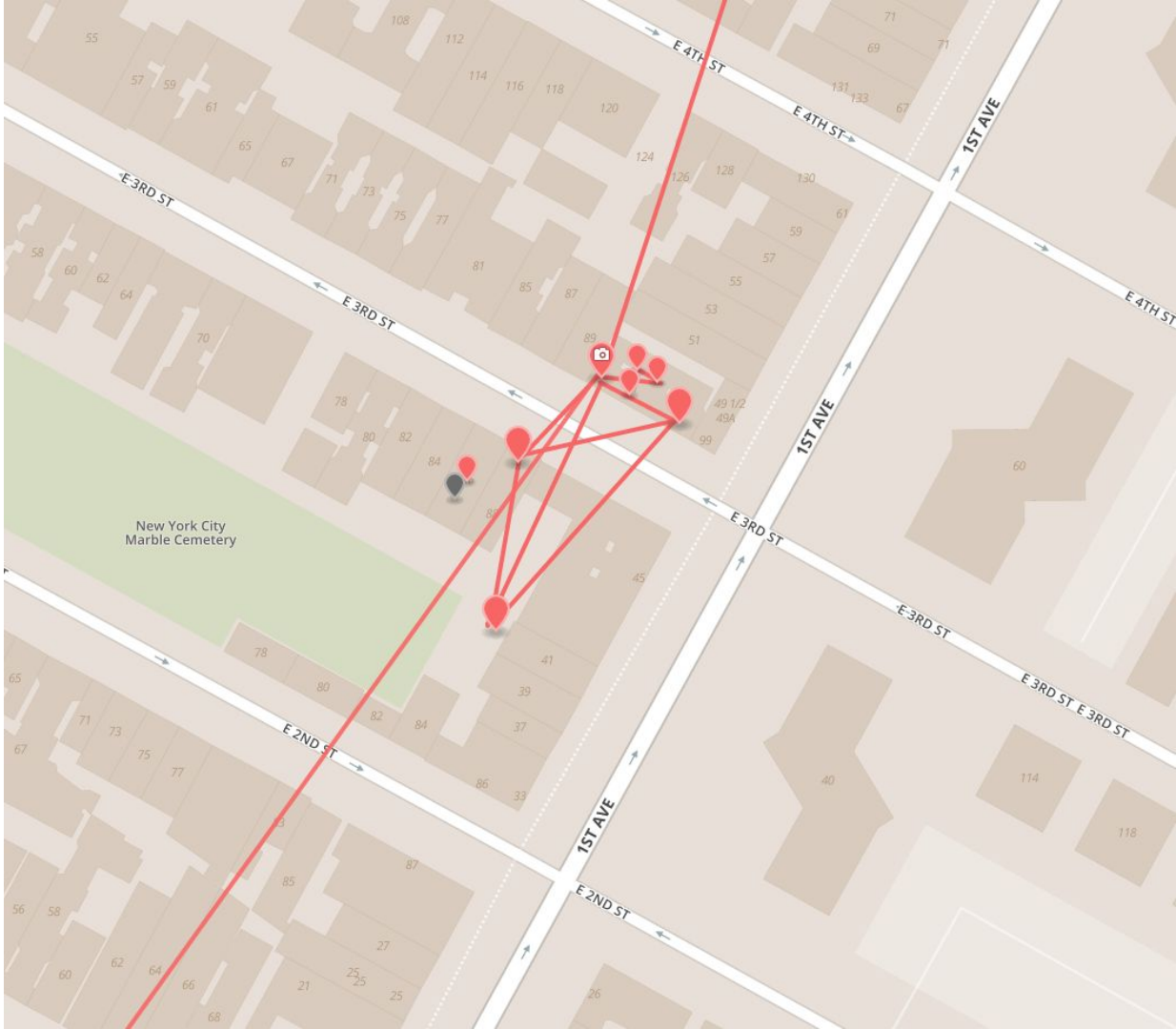
NYC Mesh

New York City, United States
~10M people in the area …

> But.. almost all copper lines are dead, cable company is bankrupt, and fiber company is a monopoly...

Goals:
- Connect the unconnected
- Provide choice
- Members “know” and understand their path to internet/others
- Offline and Online use at the same time (more available than online)
- Education / Devleopment / Fun

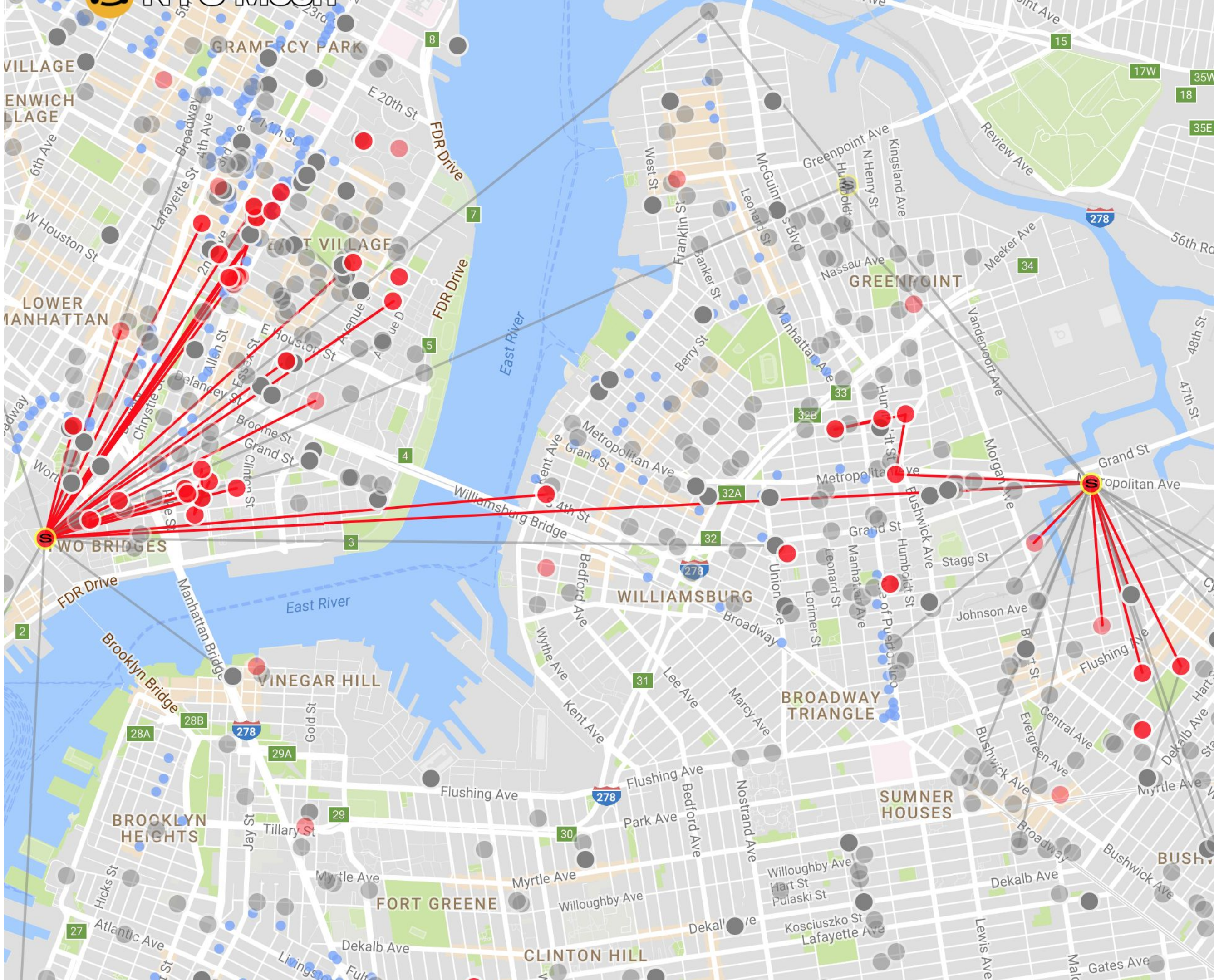
3 years ago:


E 4TH ST
E 4TH ST
1ST AVE
E 3RD ST
E 3RD ST
1ST AVE
E 4TH ST
New York City
Marble Cemetery
E 3RD ST
E 3RD ST
E 3RD ST
E 2ND ST
1ST AVE
E 2ND ST

2 year ago:

90 nodes online

1.5 supernodes

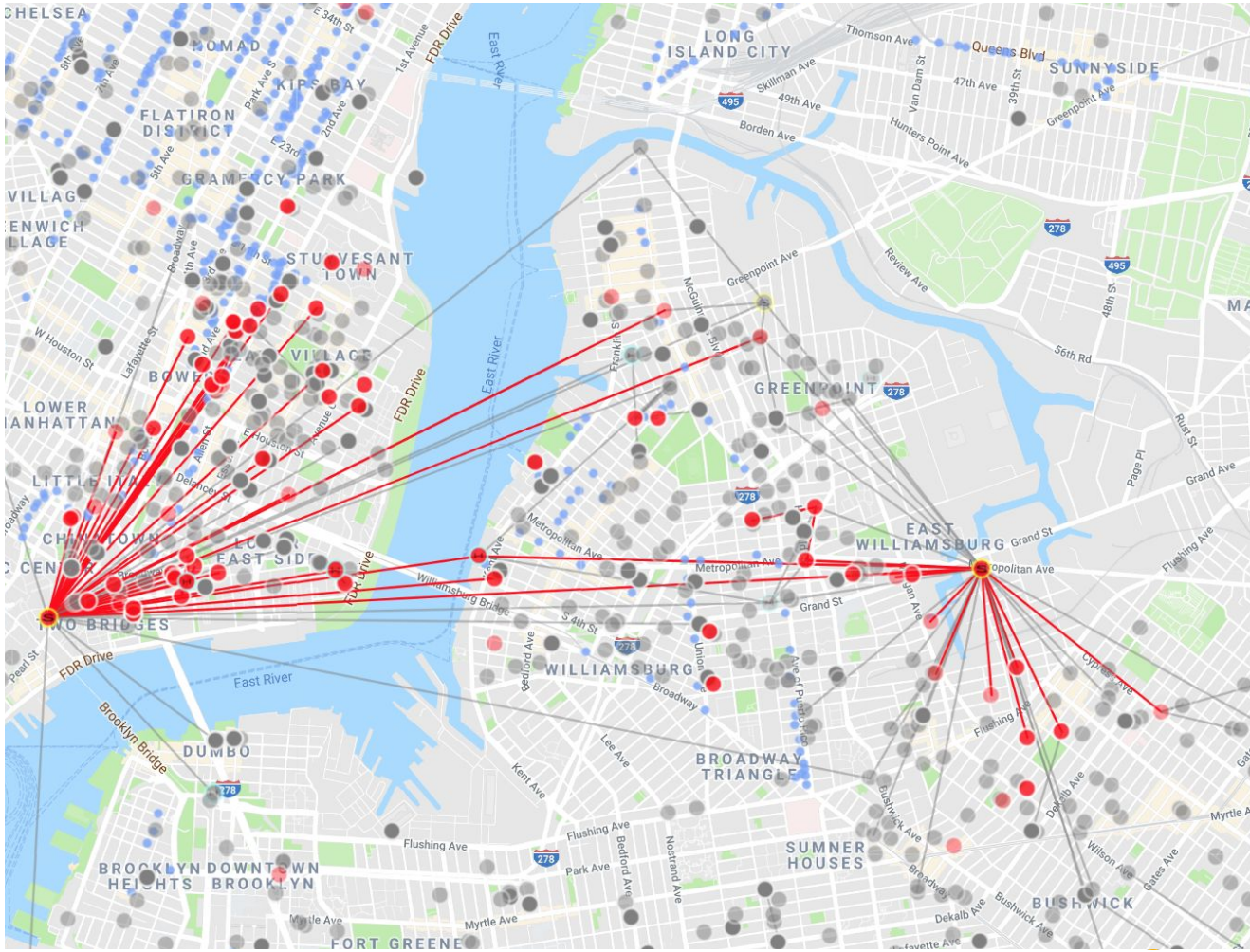


1 year ago:

143 nodes online

1.5 Supernodes

3 Hubs

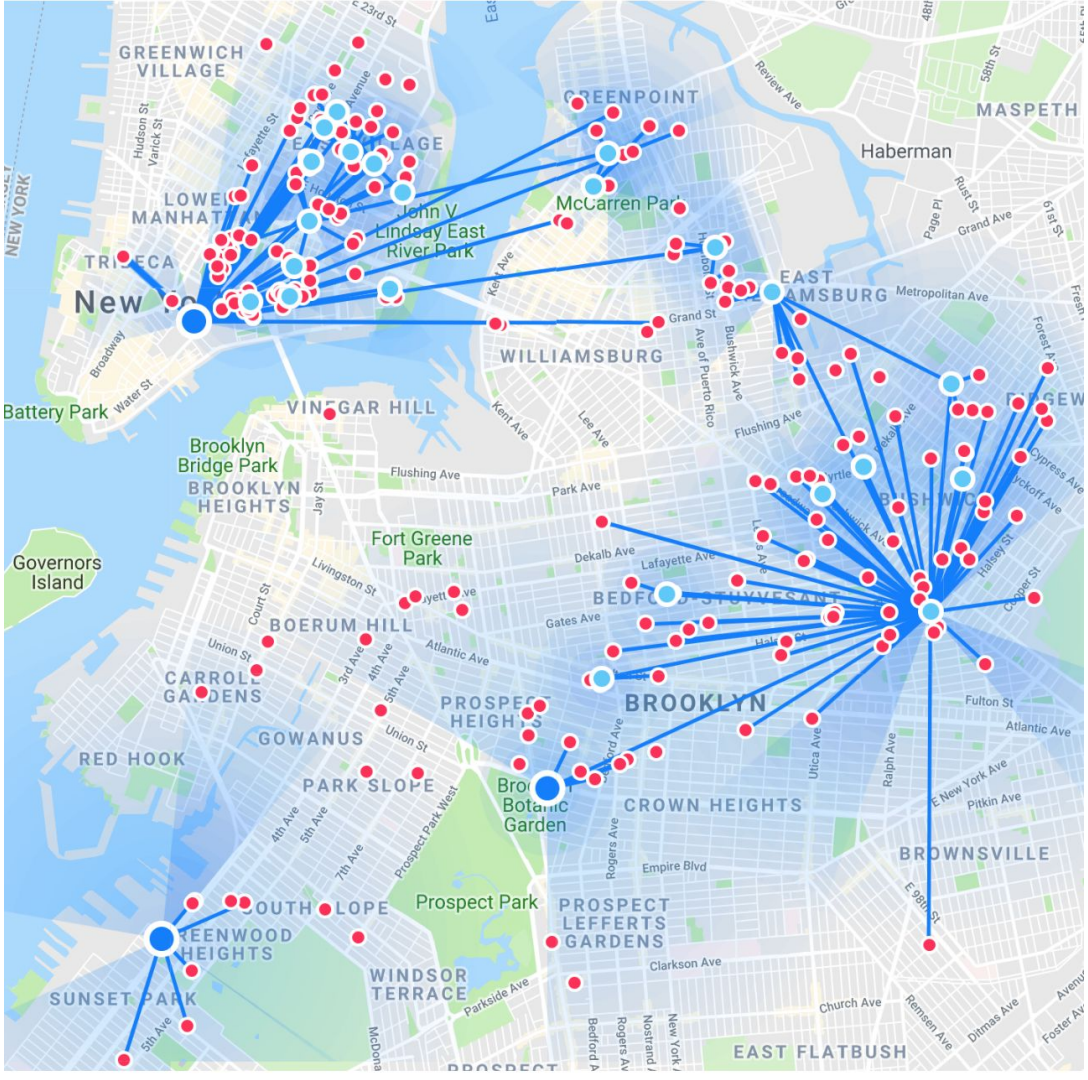


Today:

340 nodes online

25 Hubs

2 Supernodes



What can you do with it?

Online - Internet

Gateway nodes to the internet (home or supernode)

Offline - WAN Intranet

Apps can run on homes, nodes, servers.
All IPs can talk to all others. Like a University Campus

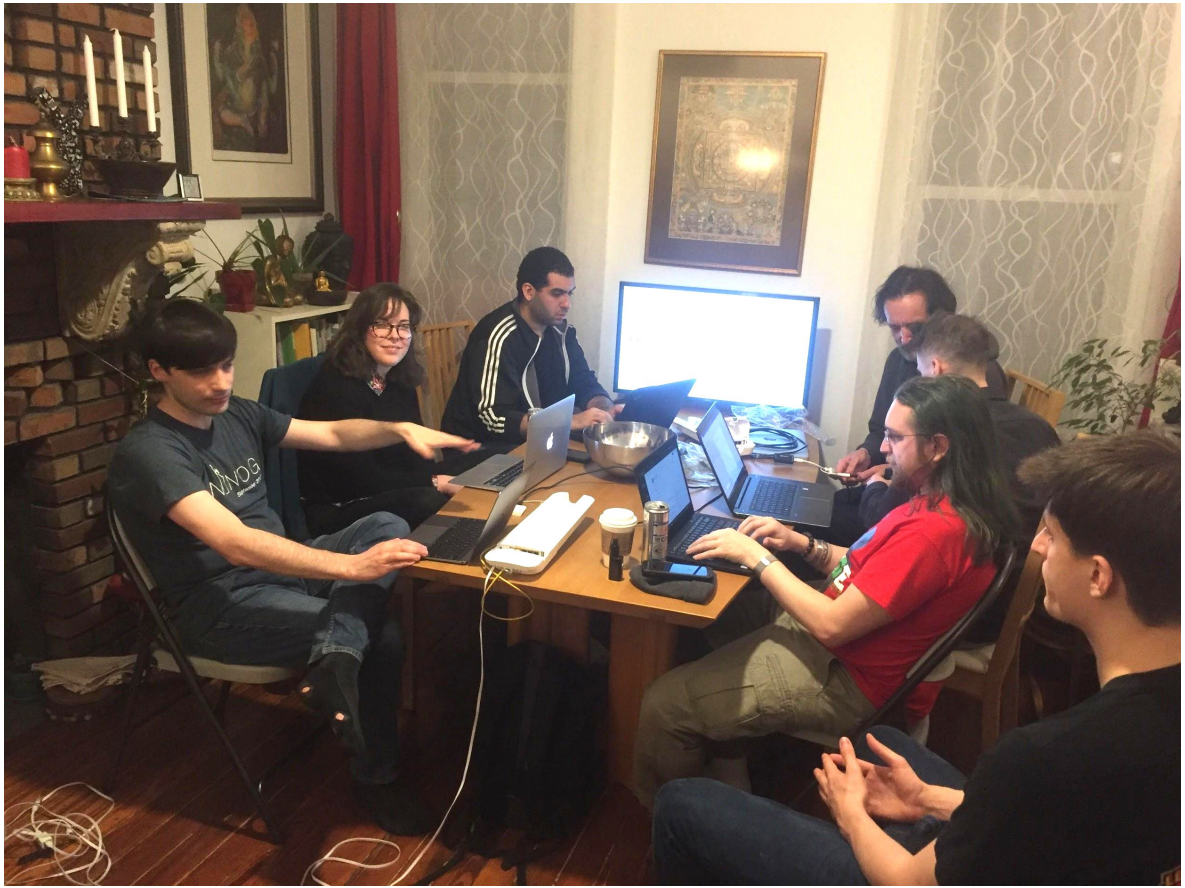
Various things in the mesh

- Secure Scuttlebutt (by members)
- DNS Zone (.mesh) from git repo, anycast, several nodes
- chat.mesh (github.com/zgiles/meshchat)
- Logical Map (not yet pub)
- Internal speedtest server, Multi-Gbit speeds (not yet pub)

Work Style:

Many small groups meeting on topics.

Website group
BGP group
Install team groups
Outreach groups
Each neighborhood...



Money..

Pay what you want.
Recommended $20/mo if you use it.
Some pay more / less…

Node owner pays for the equipment ($100-200)

DIY Install, or Volunteer-led install

All the above are flexible.

Money..

We received a few grants:

- $30K from ISOC - Beyond the Net.
  - Built SN1, Paid first year. Bought first many antennas..
- $10K from Mozilla WINS Phase I
  - Built “Saratoga” housing project network

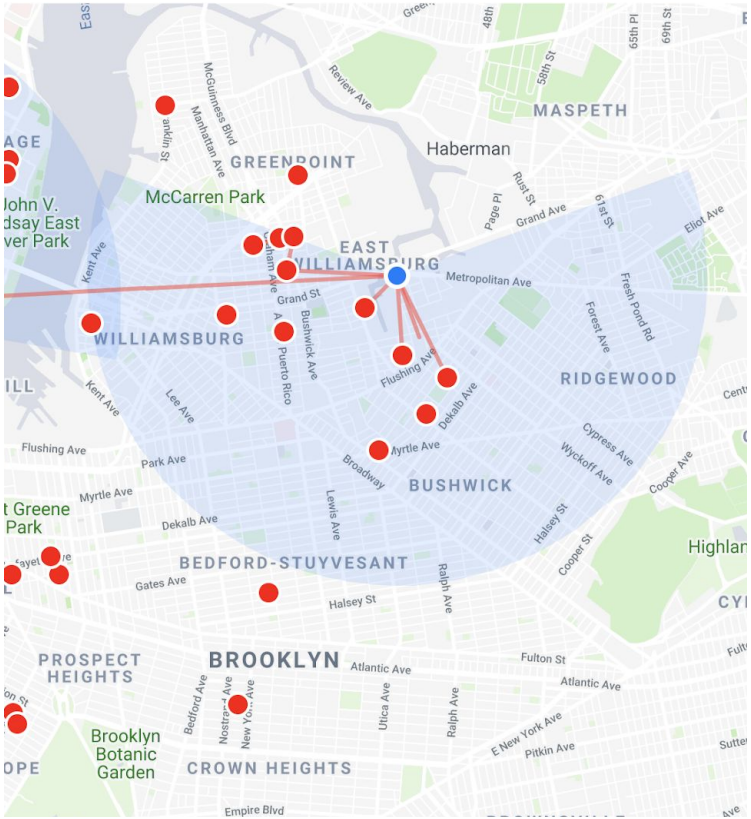

Residential Center
Brooklyn High School for Law and Technology
Metropolitan Missionary Baptist
New York City Housing Authority's 33-35...
Saratoga
Broadway Medical Center
2D
Google

Saratoga

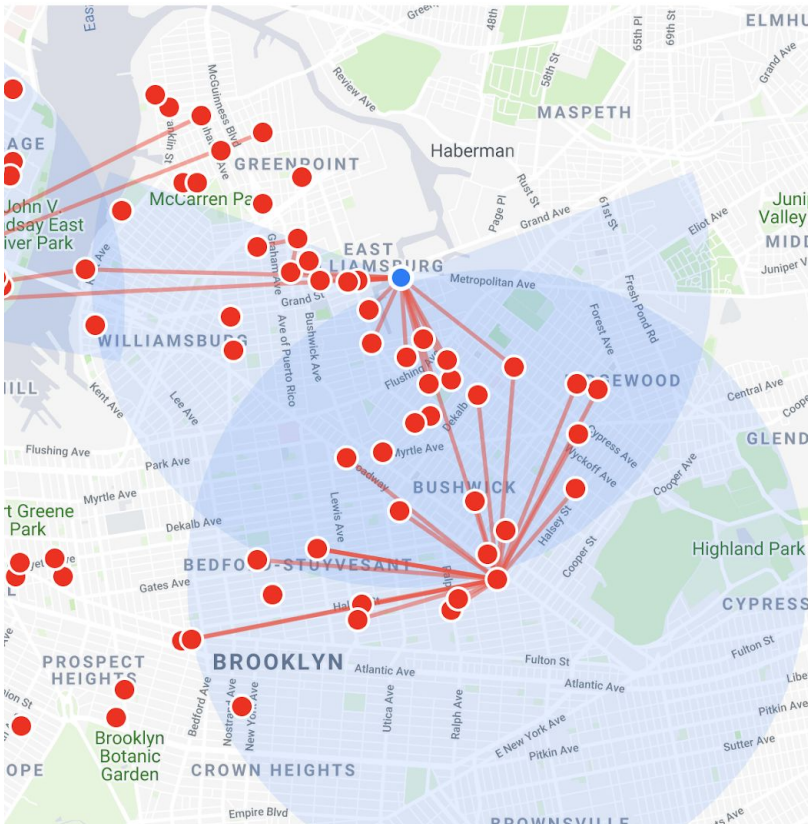
Low income housing
Cable is OK, but Phone is mostly dead there.
Many people can’t afford net.

Today:
- Touches ~50 buildings, 8 hubs interconnect,
- About 100-150Mbps continuous traffic

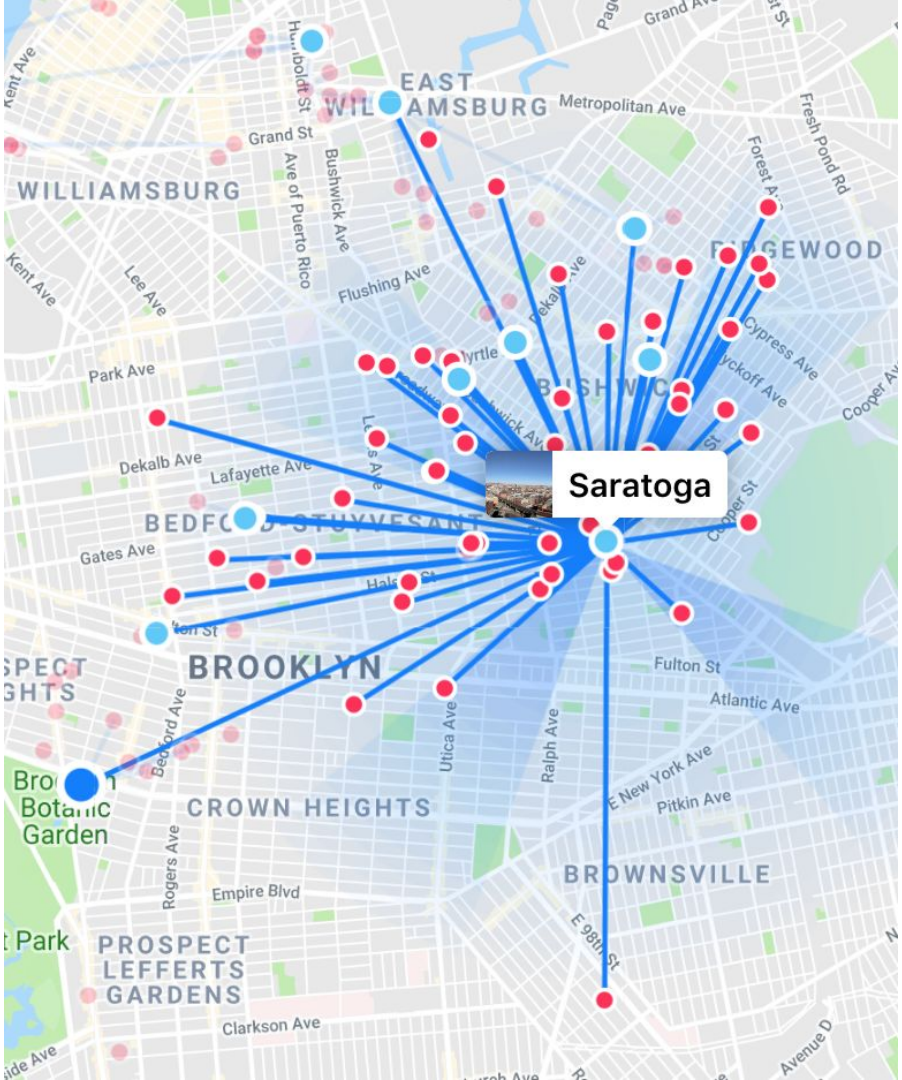
Before



After



Today


Saratoga
BROOKLYN
CROWN HEIGHTS
BROWNSVILLE
PROSPECT LEFFERTS GARDENS
WILLIAMSBURG
EAST WILLIAMSBURG
BUSHWICK
BEDFORD-STUYVESANT
Metropolitan Ave
Grand St
Flushing Ave
Park Ave
Dekalb Ave
Lafayette Ave
Gates Ave
Fulton St
Atlantic Ave
Pitkin Ave
Empire Blvd
Clarkson Ave
Cypress Ave
Fresh Pond Rd
Bushwick Ave
Ave of Puerto Rico
Lee Ave
Kent Ave
Bedford Ave
Utica Ave
Ralph Ave
Rogers Ave
Cooper St
Botanic Garden

NYC Mesh- Network Commons License (v1.0.2)

The Network Commons License is the framework that governs the network commons.

The License

The Network Commons License (NCL) describes the terms and conditions associated with the use of free and open networks, and so enables individuals, communities, companies, governments and other organizations to adopt or support the same.

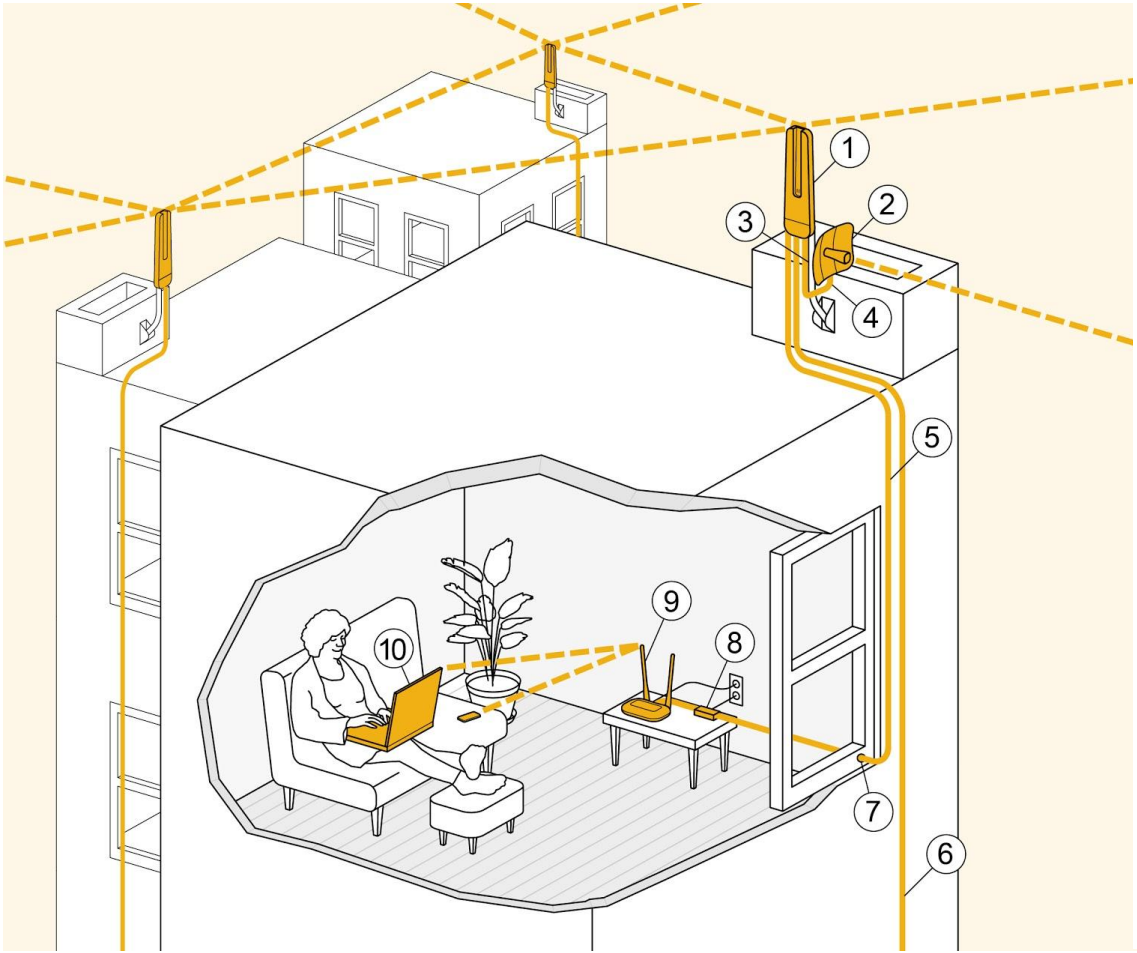
The NCL is rooted in the following four tenets:

- Participants are free to use the network for any purpose that does not limit the freedom of others to do the same.
- Participants are free to know how the network and its components function.
- Participants are free to offer and accept services on the network on their own terms.
- By joining the free network, you agree to extend the network to others under the same conditions.

(based on Guifi's The Compact for a Free, Open & Neutral Network (FONN Compact), and and Free Network Foundation Network Commons License)

Typical install

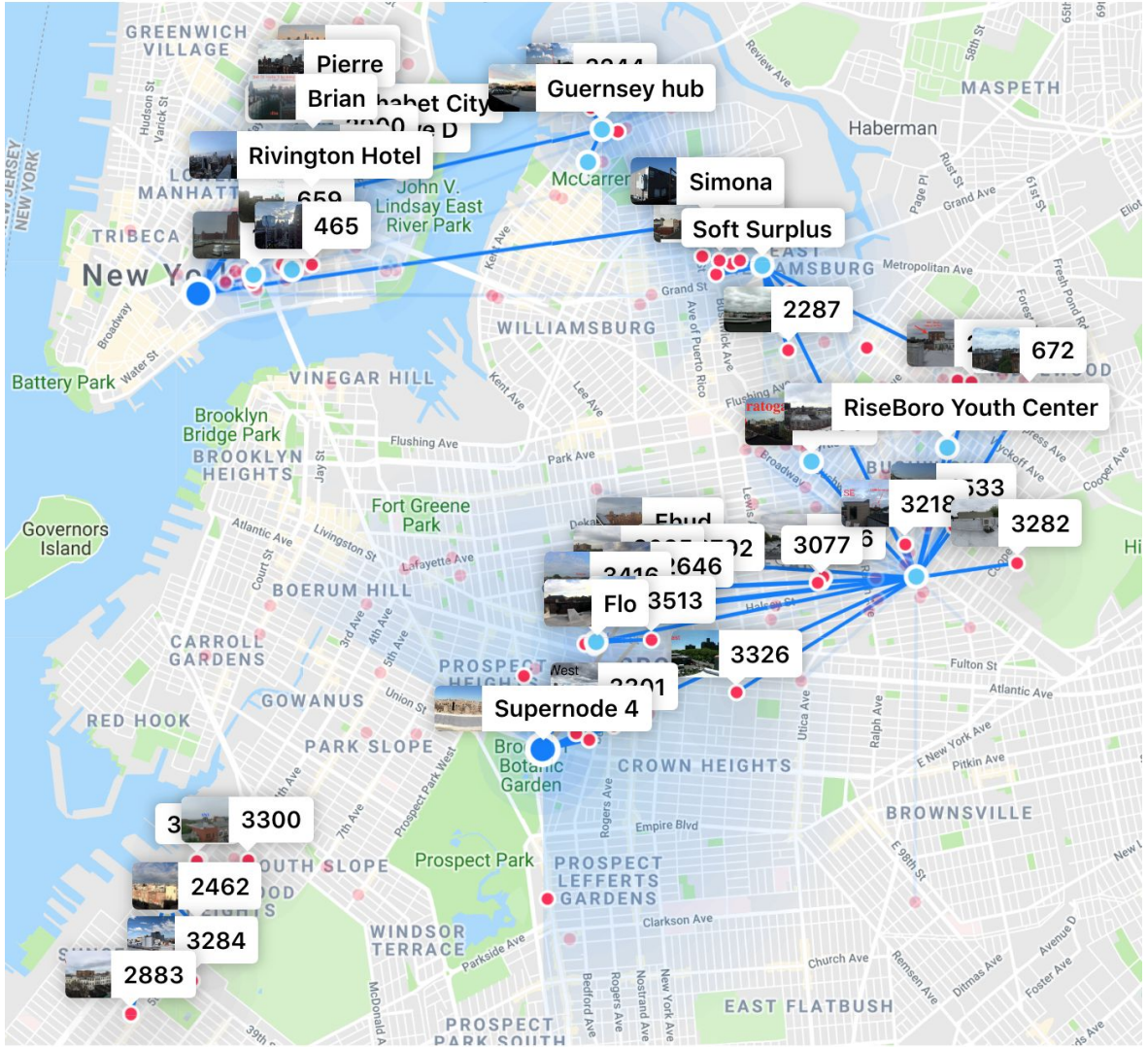
- Omni only
- Omni + PtMP / PtPs
- PtP + OpenWRT

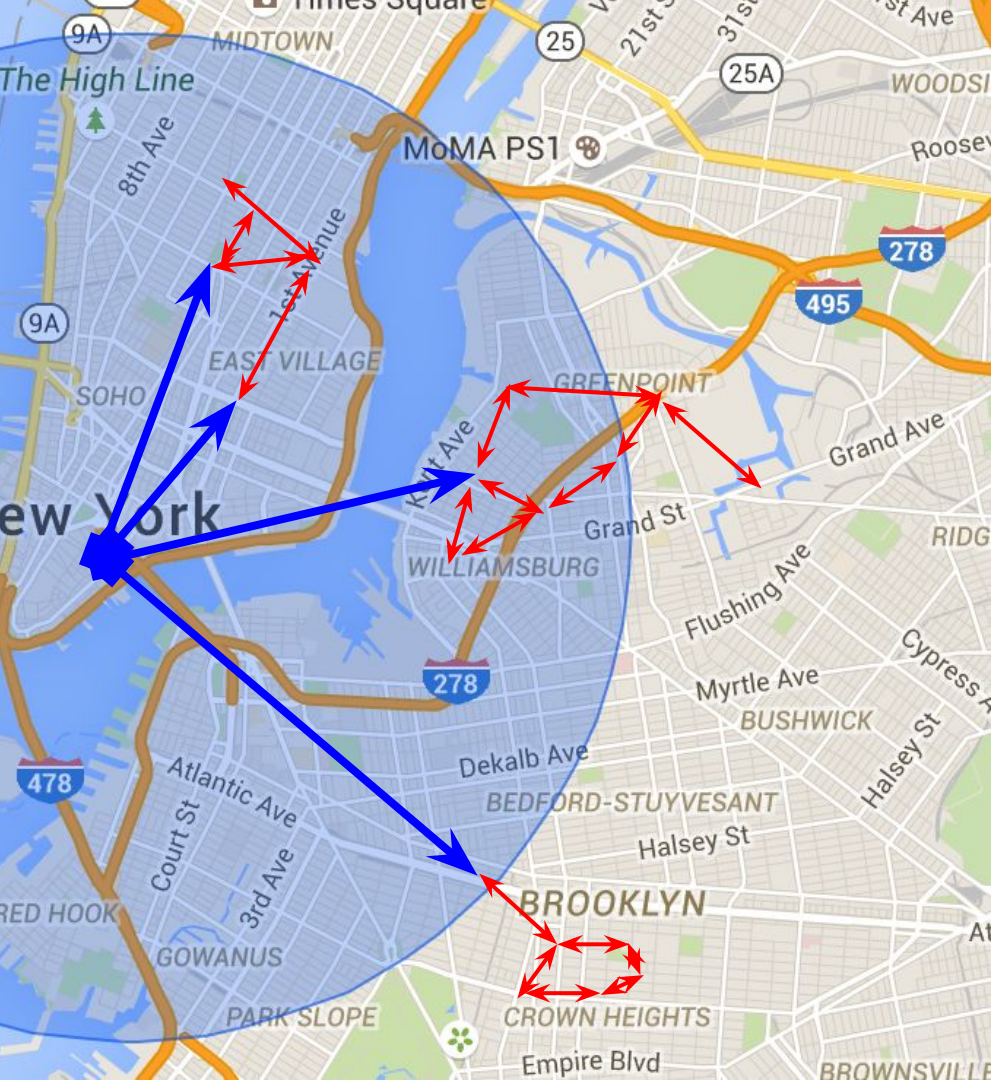


1. Omnidirectional router
2. Point-to-point router
3. Router mount
4. Ethernet cable connecting routers
5. Ethernet cable to main apartment
6. Ethernet cable to additional apartment
7. Hole in wall or window frame
8. Power over Ethernet injector
9. Indoor router
10. Device

Today:

~48 are Omni-enabled





Dual Mode:

Some people say we look like an ISP.
Some people say we look like a mesh.

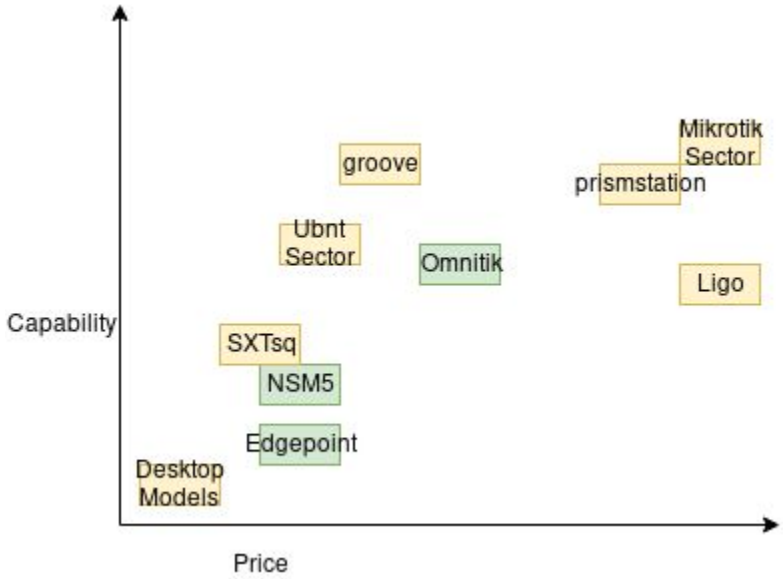
By having elements of both “style” we can be very open and enable members to self-grow the network, and connect between the city “valleys”.

Omni-directional

Why Omni-direction?

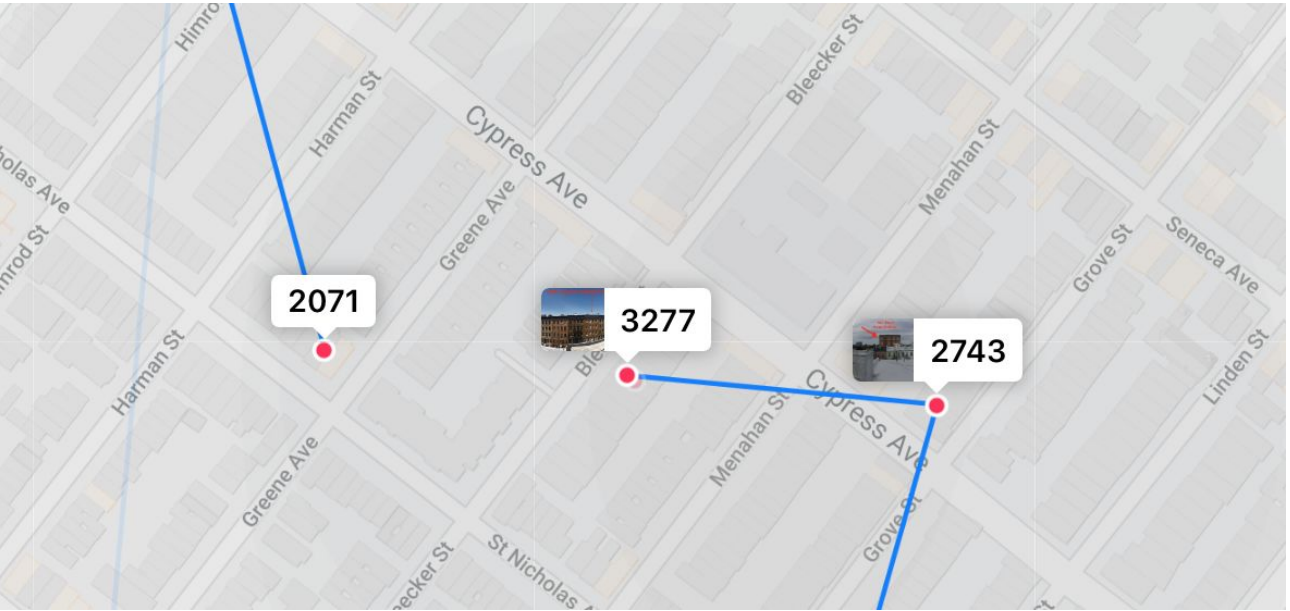
- We know it’s not the best….
- We switched to a new router model: better performance, better price, more ports, access point, so free short-range omni-mesh…
- Creates a base coverage layer across an area to fill-in between nodes.

  => 1-2 hops over Omnis then to a PtP.



Omni-directional

MAC Address	Interface	Uptime	AP	WDS	Activity (s)	Signal Strength (dBm)	Tx Rate	Rx Rate
CE:2D:E0:52:B1:98	wlan3	19:15:14	yes	yes	0.390	-55/-56	390Mbps-80MHz/2S/SG	240Mbps-40MHz/2S/SGI

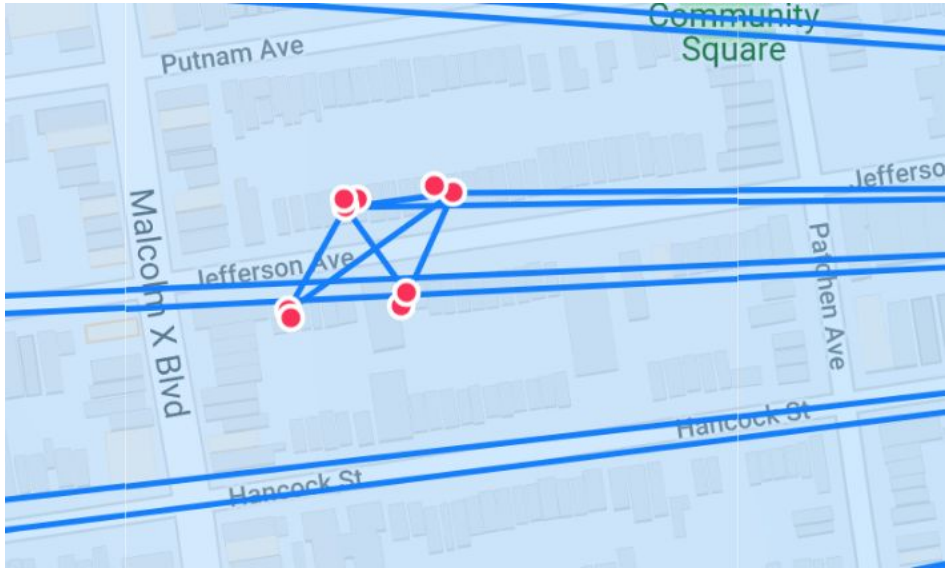


Very reasonable speeds at a-few-blocks distance.

802.11ac helps by varying speed for different clients.

Omni-directional

Block associations can build based on Omnis



What protocol do we use?

We mostly use OSPF.

Why? We Want:

- A standard supported widely so we can vary the hardware (open).
- Neighbor Discovery (obviously)
- Scalable

We see this as “more open” than some of the custom protocols because we have no lock-in on OS, Brand, Implementation, etc.

(We also have ~30 nodes on BMX6, and ~30 nodes on BGP)

What hardware do we use?

All hardware.

Mikrotik:	~5 models
Ubnt:	~8 models
Mimosa:	~2 models
OpenWRT:	~5 models (not a brand, but …)

+ Computers, Switches (various brands)... whatever

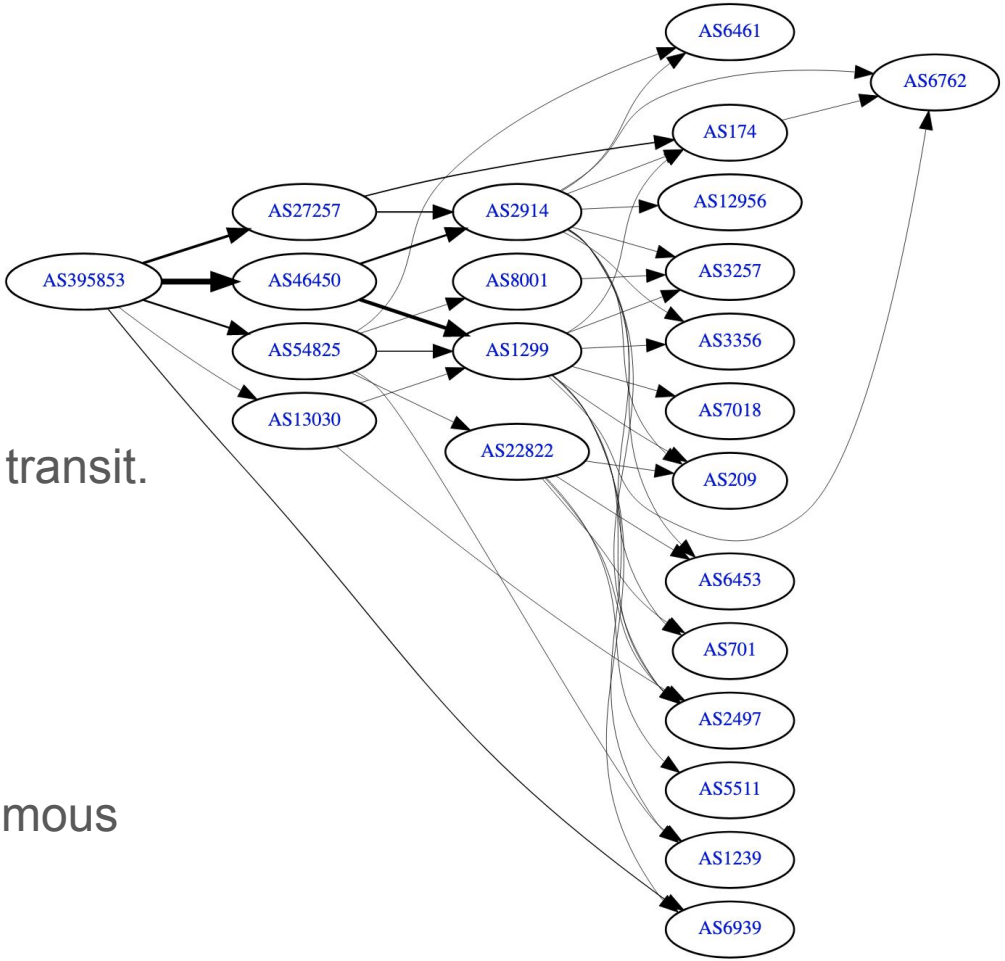
Public Network

We run a public ASN (AS395853)
Open peering policy
Connect also to DE-CIX NY
Five local ISPs donate BGP Full table transit.

Why?

- Neutral network for our members.
- Cheap/Free transit
- Being part of the internet / autonomous

Spans two of our Supernodes

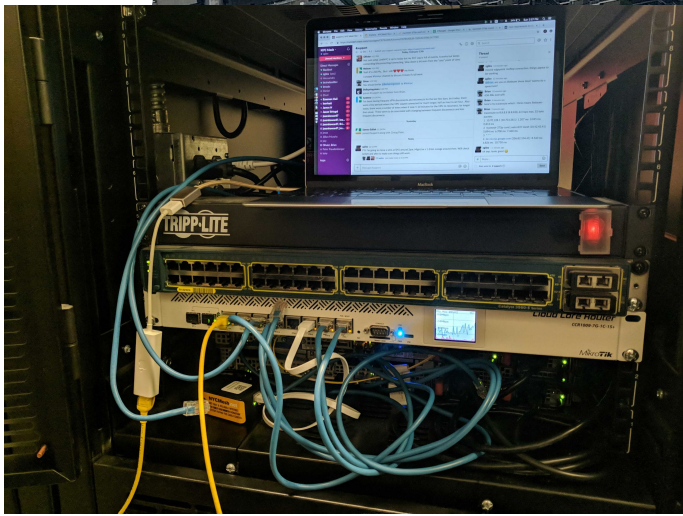


Supernode 1

Old telephone building, now a datacenter
171 meters tall
We lease rack space and roof space

Features:
- Exchange connection; Public exit
- Servers for network tools, dashboards, etc.
- 7 antennas
- VPN entry
- RIPE Probe

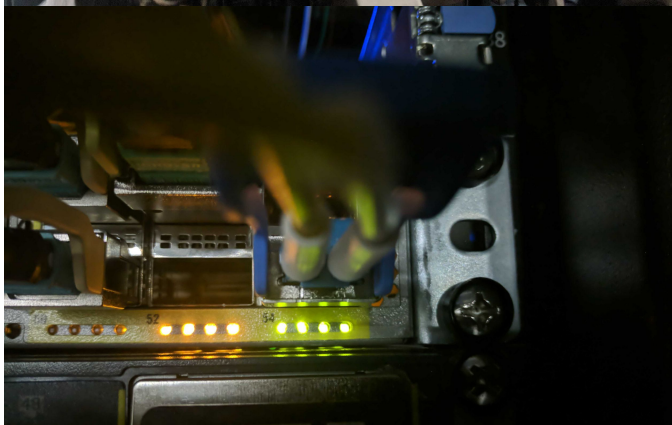
Around 500Mbps in/out daily high



Supernode 3

Old shipyard; now industrial and datacenter
50 meters tall
We lease rack space and roof space

Features:
- 40Gbit net donation
- Servers for network tools, dashboards, etc.
- 3 big poles for antennas
- 2x10G to the roof
- Community server colocation
- VPN entry
- RIPE Probe



Supernode 3 - Community Colo

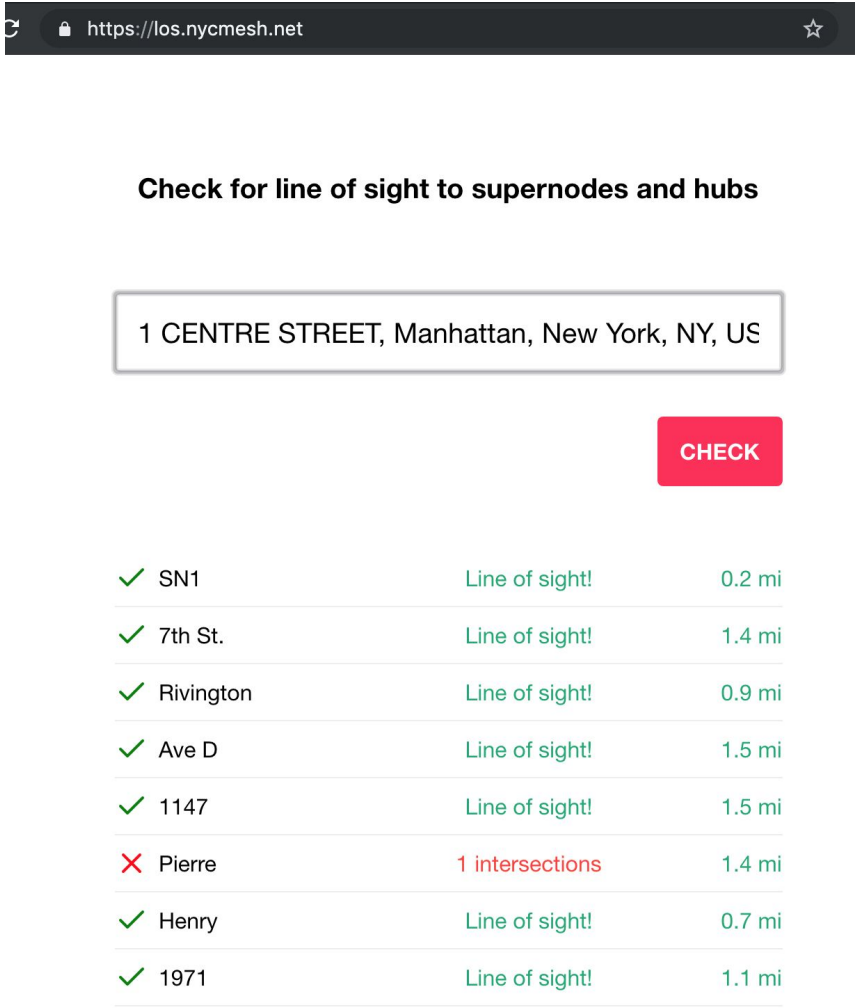
Members may host a server at the Supernode

Pay what you want ~$50/U/mo
No commercial use.

NYC Mesh Line of Sight tool

https://los.nycmesh.net

https://github.com/nycmeshnet/line-of-sight

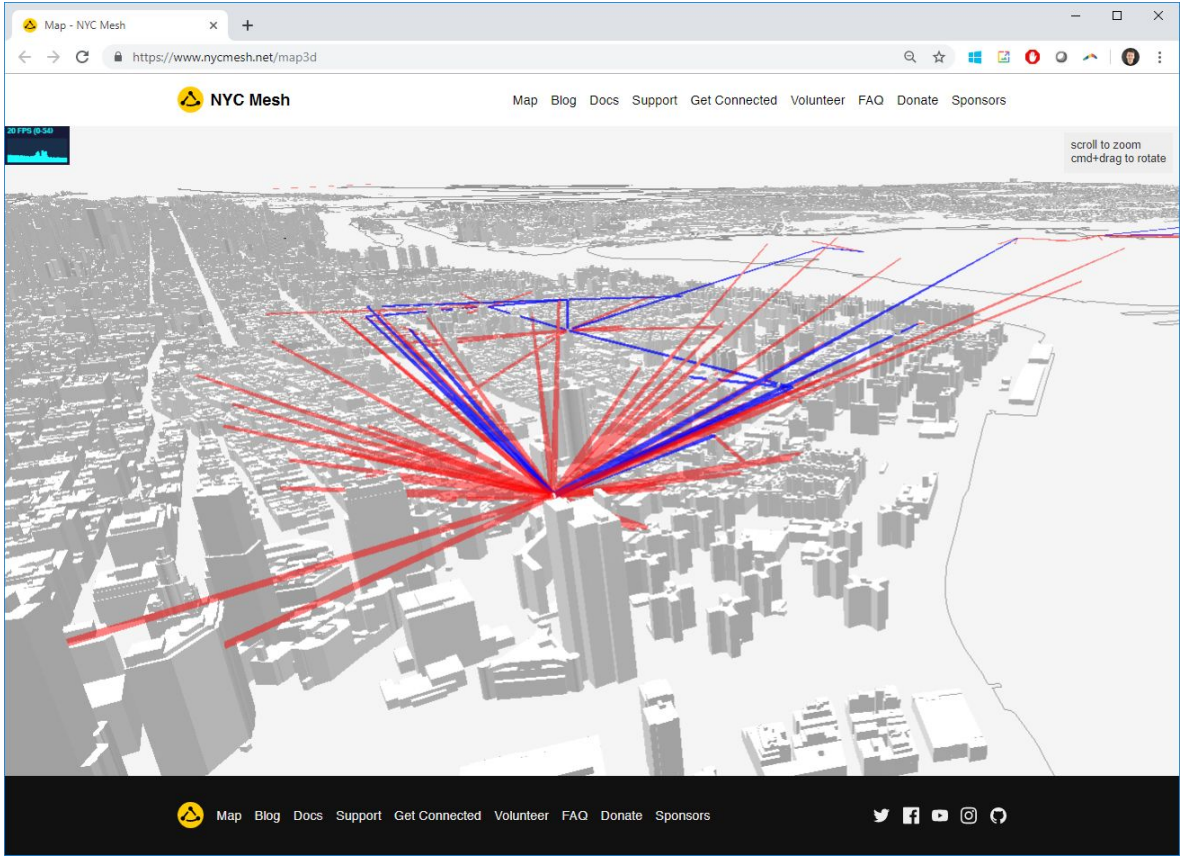


NYC Mesh 3D Map (WIP)

https://nycmesh.net/map3d

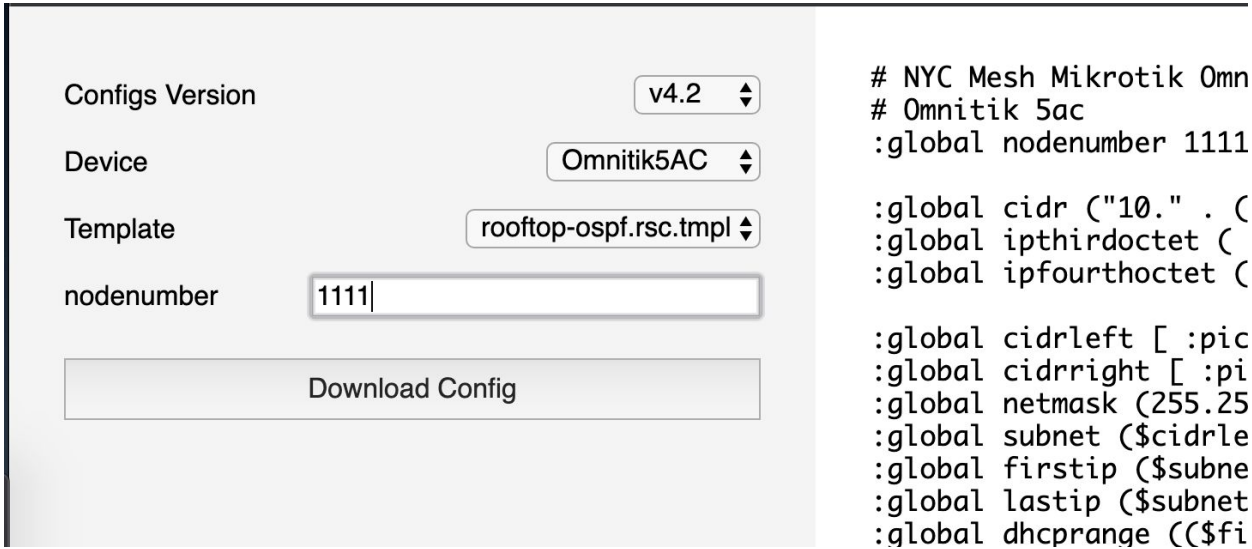
Still rough, but idea is:

- show the map in 3D
- no longer use Google Earth,
- use LOS tool and then show the path for review
    - Zoom to where the obstruction is… etc

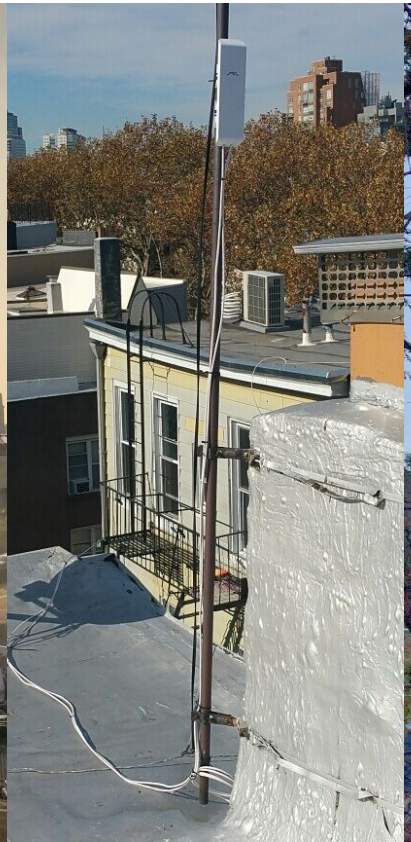


Config Generator

https://configgen.nycmesh.net



Installations



Installations