NYC Mesh
A community owned network

- Decentralized
- Resilient
- An infrastructure commons
Our reasons for building a mesh network-

- Self configuring (simple!)
- Decentralized, no single point of failure
- Emergency community networking (for next hurricane)
- Freedom from Time Warner, Verizon and Comcast
- A neutral network that does not block or discriminate content
- Public Wi-Fi access points
- Community building with highly localized websites
- Close the digital divide
- Symmetrical high bandwidth
- Creating an infrastructure commons. The community owns the network.
- Self-sufficient network as alternative to internet
- Encryption?
Mesh networks in USA are small (<40 nodes). Outside the U.S., huge meshes!

- guifi.net
- FUNKFEUER
- freifunk.net
- wlan slovenija

+ many others in Europe, South America, and Africa.
NYC Mesh is inspired by and collaborating with Guifi of Spain.

NYC Mesh - 40+ active nodes

Guifi - 30,000 nodes in Spain
Wi-Fi routers
Off the shelf routers running OpenWRT packages

We use qMp/OpenWRT with BMX6 mesh protocol
Mesh protocols extend Ad hoc. Devices can connect to any device that is within the network (multiple hop), automatically find the fastest routes and reroute around outages.
Mesh needs a backbone network

Problems with multiple hop mesh over Wi-Fi
- each hop halves bandwidth
- each hop adds ~100 milliseconds latency.

Mesh networks need to reduce the number of hops to keep network usable.
- Use rooftop backbone and make "supernodes".
- Use multiple radio routers (MIMO)
- Use fiber or Ethernet where possible-
3 types of mesh nodes:

Type 1-
2.4GHz or dual-band routers connecting apartments some with internet gateways.
Type 2-5GHz directional routers connecting rooftops
and coming soon-

Type 3-
SuperNodes sector antennas and point-to-point
SuperNode 1

Sabey
375 Pearl St.

DE-CIX bandwidth

We are planning antennas facing Brooklyn and Manhattan from this IXP
Brooklyn coverage-

Downtown Manhattan coverage-
Using sector antennas in P2M mode (point-to-multipoint)

2 mile radius-

Use P2P for further distance
Extend into neighborhoods using mesh M2M (multipoint to multipoint)
Modifications to qMp / OpenWRT

Let qMp do its setup first, then run our scripts

Created as an OpenWRT package

tinc VPN - Auto configure script (keys, conf)

HTTP POST script to upload public key

health scripts - check if tinc is running, bmx6 is using tap0, other bmx6 confs

Misc. NYC Mesh settings - SSID, Channel, Hostname, nodogsplash, firewall
Networking

Each node has a /24 from 10.0.0.0/8 (also a /64 ipv6, not used at the moment)

bmx6 tunnels all traffic via ipv6

Wondershaper for bandwidth limiting

Nodogsplash captive portal which can also be used to limit bandwidth per client
Hardware issues

Recent FCC ruling led to TP-Link lock down of 5GHz routers. We don't have replacement dual-band yet!

OpenWRT slow to fix bugs- so it has been forked- "LEDE" is the new fork. We will use LEDE when there is stable release

Rooftop access difficult and people move

Line-of-sight difficult from one roof to another
Organizing issues

Volunteers with limited time

Money-
Finally we are getting revenue stream-
New donation page- https://nycmesh.net/donate/
ISOC-NY our fiscal sponsor

Maintenance