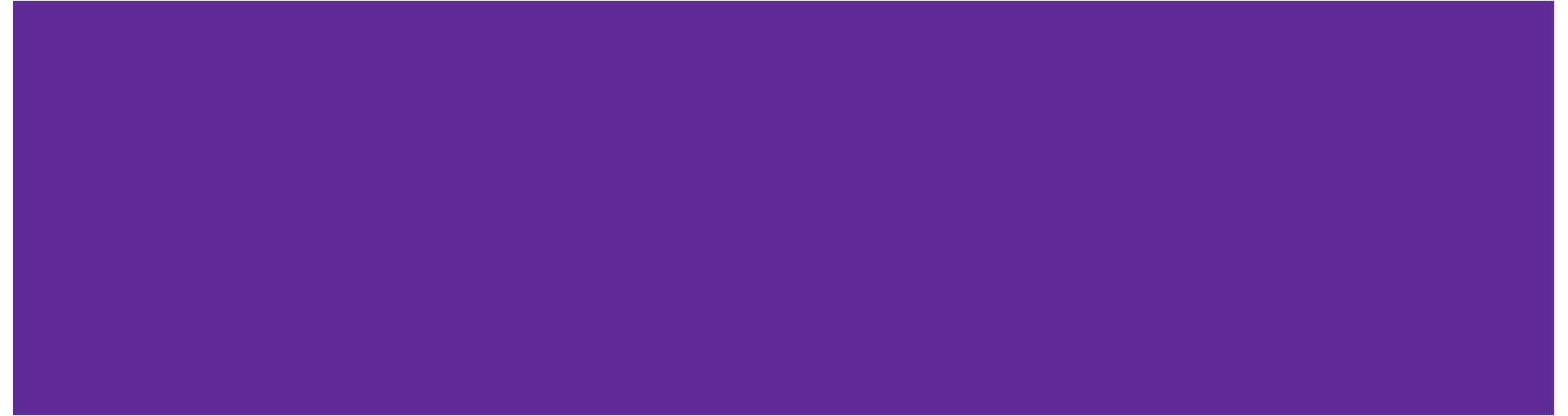Lets get meshy

SFWEM

.NET

SFWEM

San Francisco Wireless Emergency Mesh

A project to install resilient high-speed wireless connectivity throughout SF.

SFWEM is AREDN
(Amateur Radio Emergency Data Network)
but in SF
(San Francisco)

About AREDN

- Open Source Software
- Runs on COTS hardware, generally WISP gear
- ~600mw to 1W output
- Many manufacturers, generally low cost, often available used at a steep discount.
- Basic "Portable Access Node" can be easily built for ~$120 new.
- More expensive Hubs on high sites like towers can run up to ~$200 per node.

Timeline

OPENWRT 0.9

Initial Release of OpenWRT, open source firmware for WRT & other devices.

2006

AREDN FOUNDED

Evolution of BBHN-Mesh to support new ecosystem of devices.

2015

2004

WRT54G GPL

Linksys Releases Firmware for WRT54G under GPL (open source).

2009

BBHN-MESH FOUNDED

(aka Broadband-Hamnet) Customized OpenWRT for Part97 & Mesh use.

2017

SFWEM LAUNCHED

Inspired by SoCal Mesh, Berkeley Mesh, et al.

If it sounds like Packet
That's because it kinda is
(but with a twist)

The twist is

(((SPECTRUM)))

We have a lot of it

52 Channels, <u>14 Non-Shared</u>, on 5.8 GHz

5.8 GHz	Channel	133	134	135	136	137	138	139	140	141	142	143	144	145
	Status	Ham Band shared with U-NII-2C/wifi/unlicensed												
	Freq	5.665	5.670	5.675	5.680	5.685	5.690	5.695	5.700	5.705	5.710	5.715	5.720	5.725
		146	147	148	149	150	151	152	153	154	155	156	157	158
		Ham Band shared with U-NII-3/wifi/unlicensed												
		5.730	5.735	5.740	5.745	5.750	5.755	5.760	5.765	5.770	5.775	5.780	5.785	5.790
		159	160	161	162	163	164	165	166	167	168	169	170	171
		Ham Band shared with U-NII-3/wifi/unlicensed											Ham Band	
		5.795	5.800	5.805	5.810	5.815	5.820	5.825	5.830	5.835	5.840	5.845	5.850	5.855
		172	173	174	175	176	177	178	179	180	181	182	183	184
		Ham Band												
		5.860	5.865	5.870	5.875	5.880	5.885	5.890	5.895	5.900	5.905	5.910	5.915	5.920

Refer to your local band plan for coordination; ★5825 to 5850 Shared under Part 15.247 with a limited number of WISP operators and may be encountered at tower sites

Fourteen 5 MHz Channels
= 70 MHz
= Seven 10 MHz Channels

What can it do?
Email. Video. Chat.
File sharing.
Sensors.

Why build SFWEM today?

1. Hardware prices have dropped.
2. Firmware stable.
3. Technical barriers to entry low.
4. Beach head of established nodes.
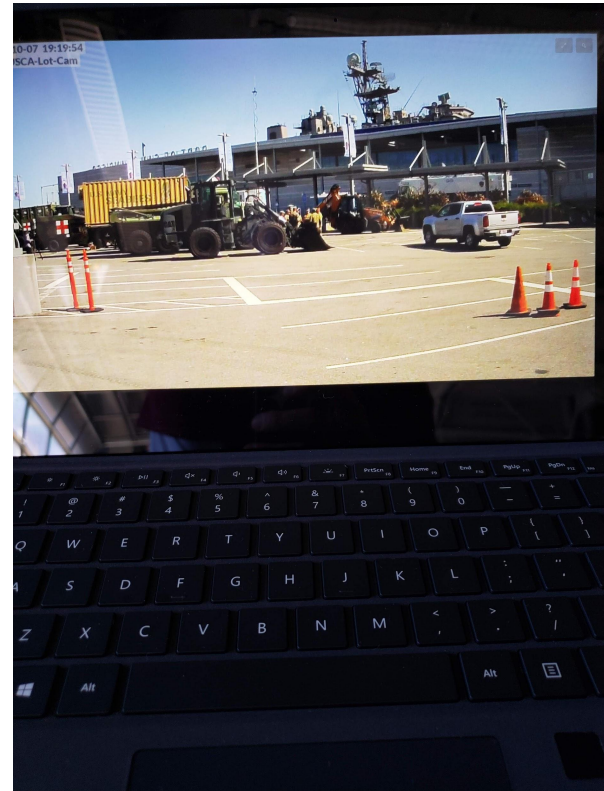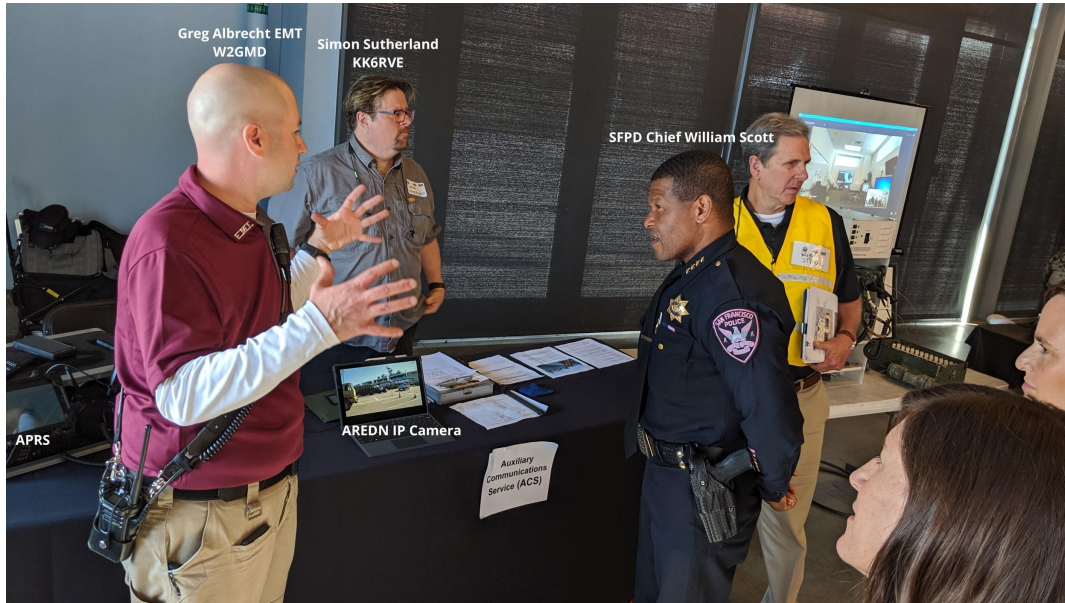5. Definitive use-cases.

Use Cases

Where would we use this?

- Cameras to cover planned and emergent events.
- Message passing from deployed teams.
- Remote sensor reading.
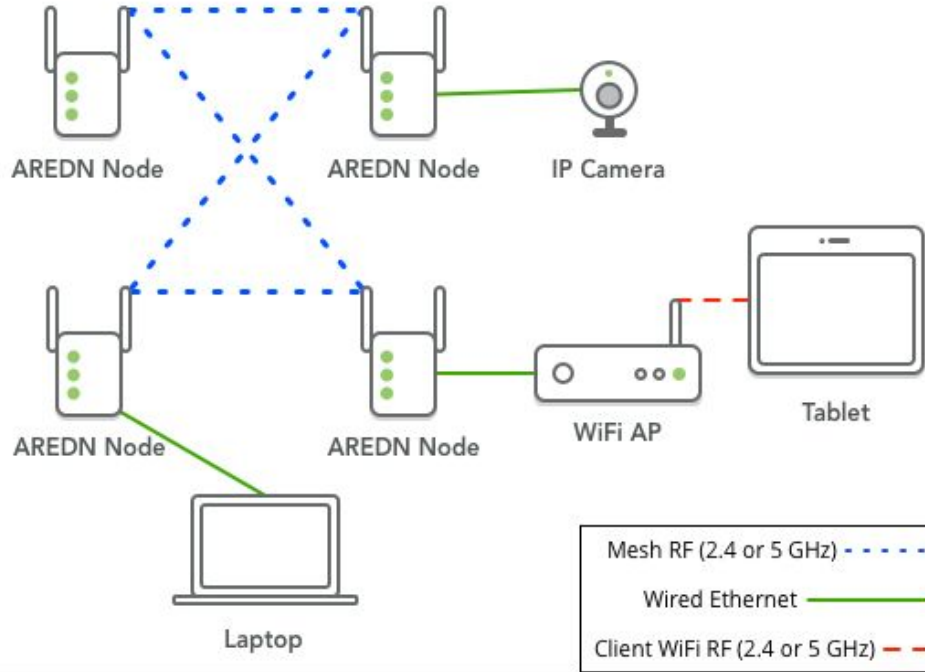- Redundant overlay for existing infrastructure.

Who is using it?
EMS. DEM. ACS.

PSPS.
Wild Fires.
Earthquakes.
Hurricanes.
Marathons.
Festivals.

SFWEM at Fleet Week 2019

Example Mesh Topology

AREDN Node — AREDN Node — IP Camera

AREDN Node — AREDN Node — WiFi AP — Tablet

AREDN Node — Laptop

Mesh RF (2.4 or 5 GHz) - - - - -
Wired Ethernet ————
Client WiFi RF (2.4 or 5 GHz) — —

Basic Network Setup

Current Network
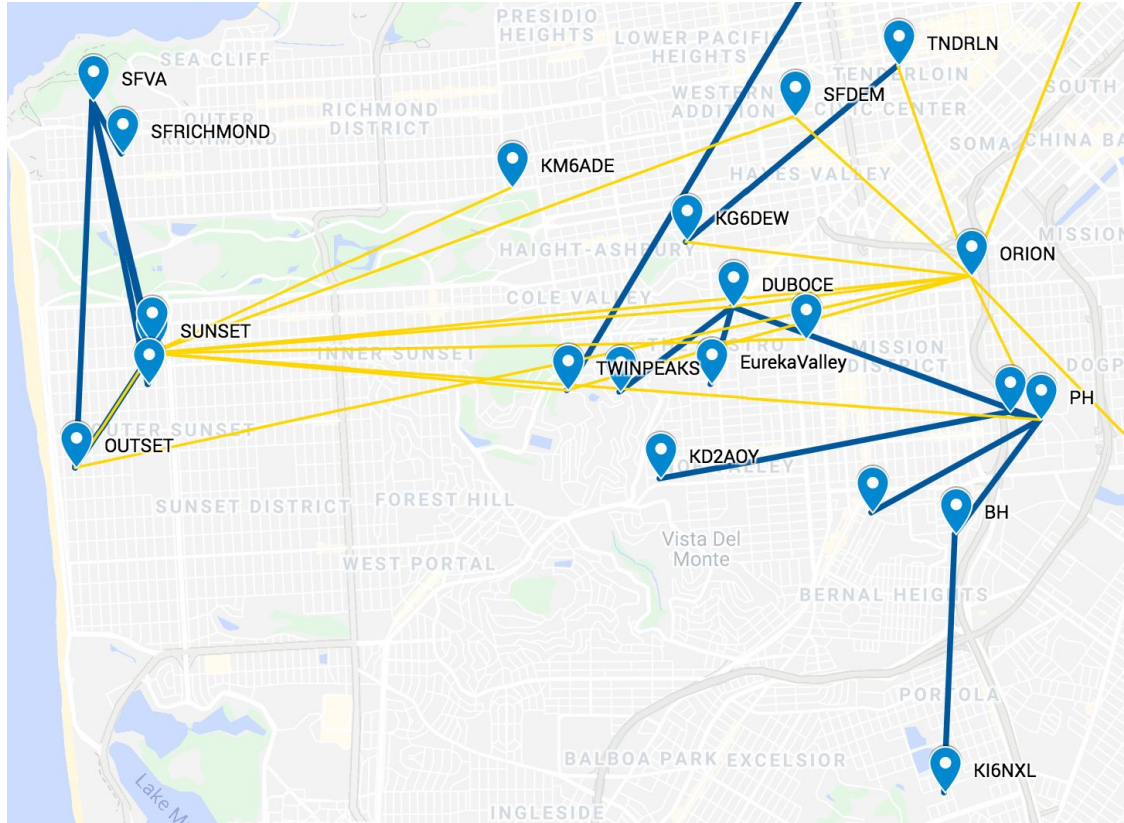
7 HILLS

(or 48, depending on who you ask)

Get started!

www.sfwem.net/start

One more thing...
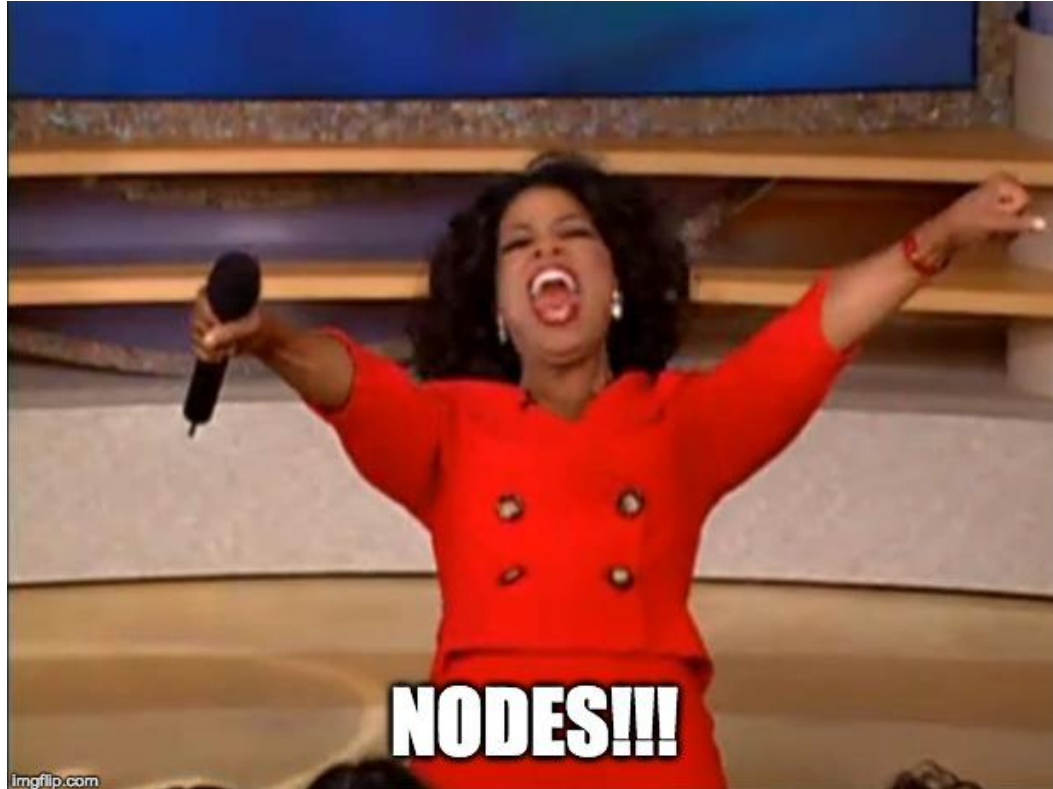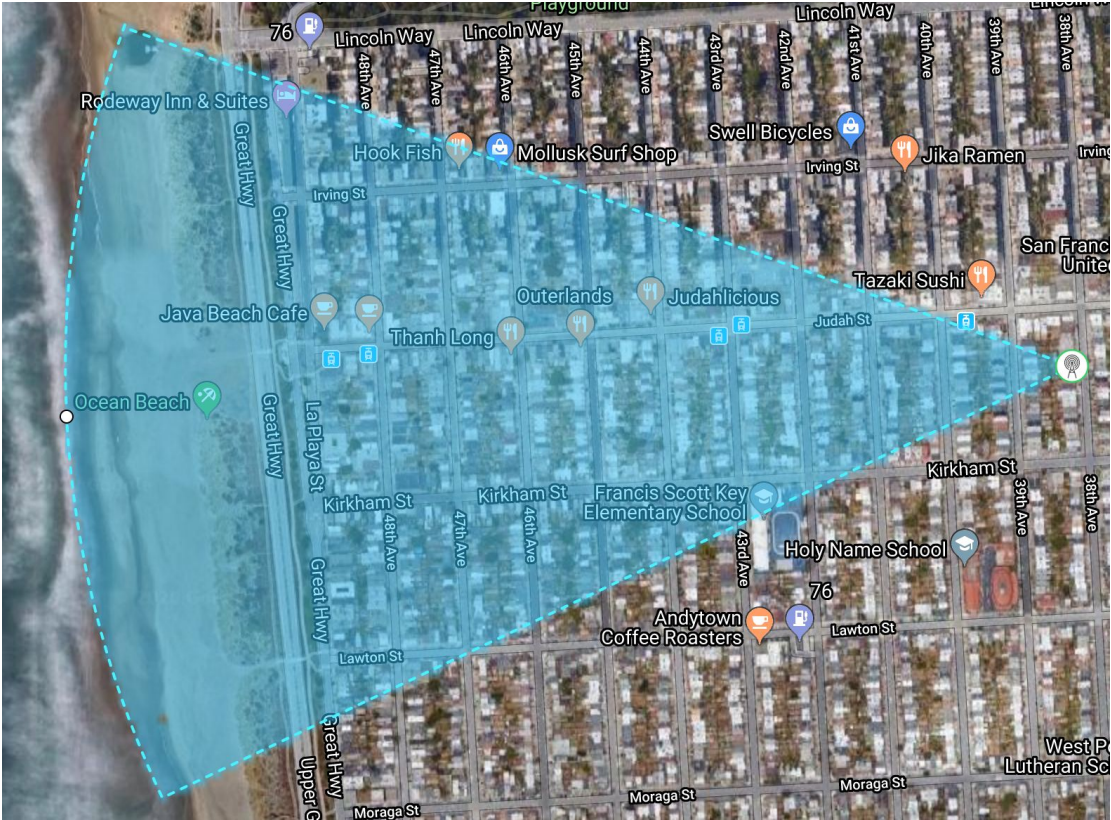
Hang In There!

Tools

- MeshMap
- TopoBot
- AirLink: https://link.ubnt.com

Tools: Dioptra (Android) & Theodolite (iOS)

Tools: AirLink https://link.ubnt.com
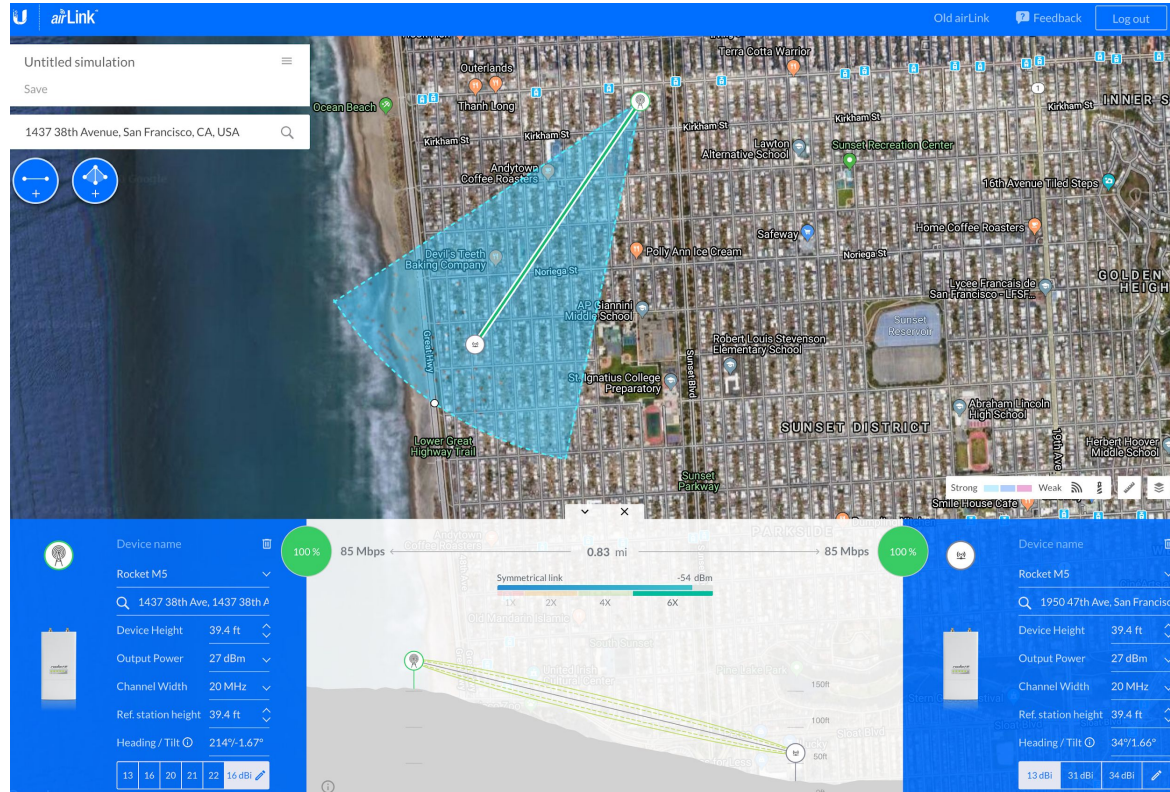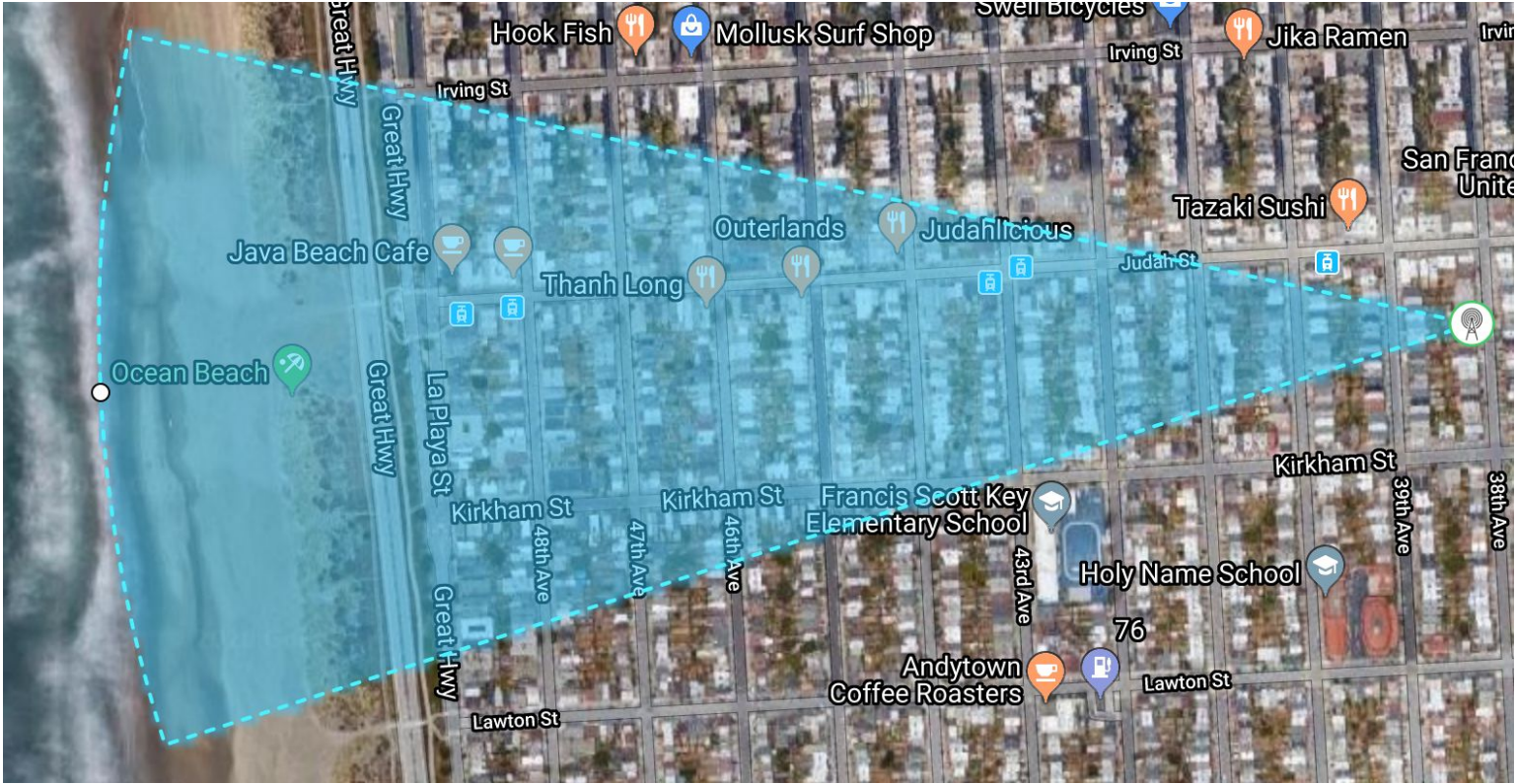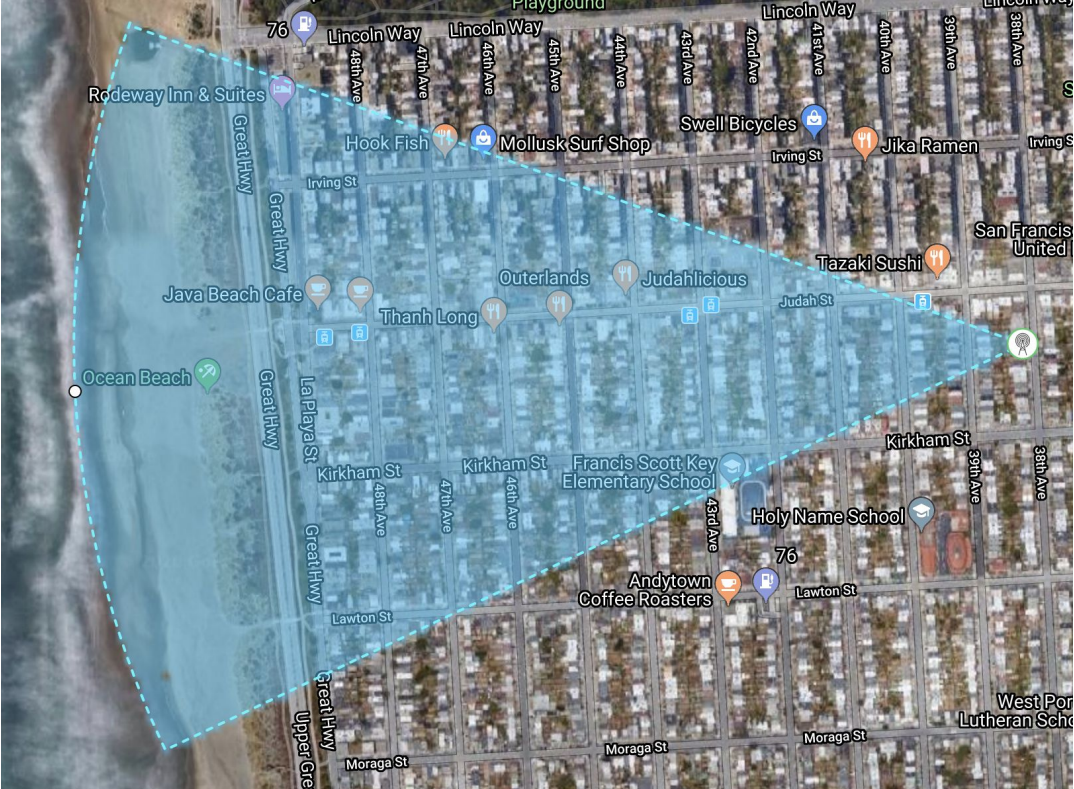
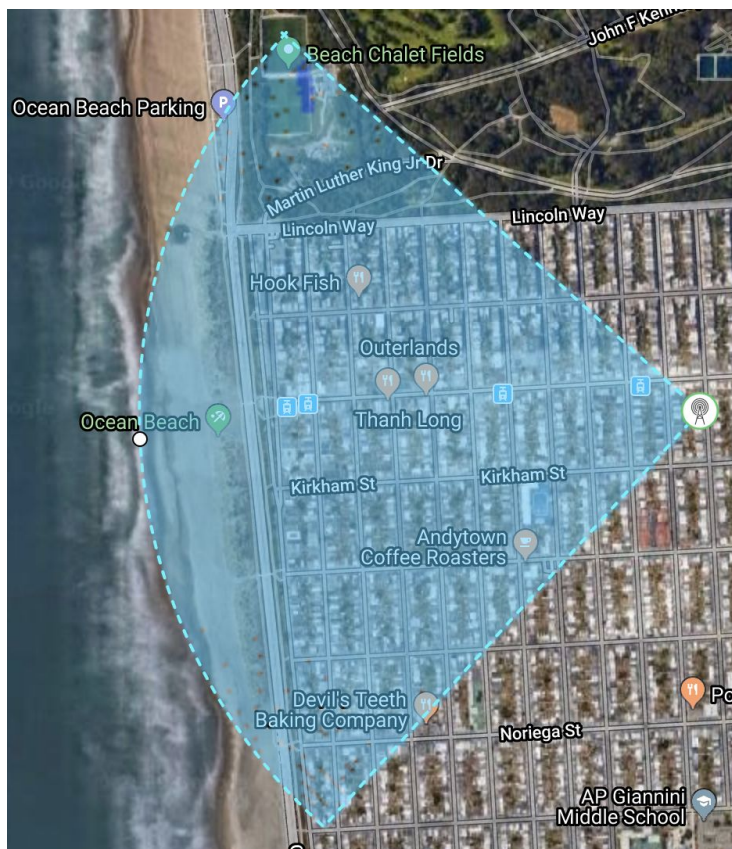# NanoBeam M5-16: MIMO, 26 dBm, 16 dBi, 35° Beam

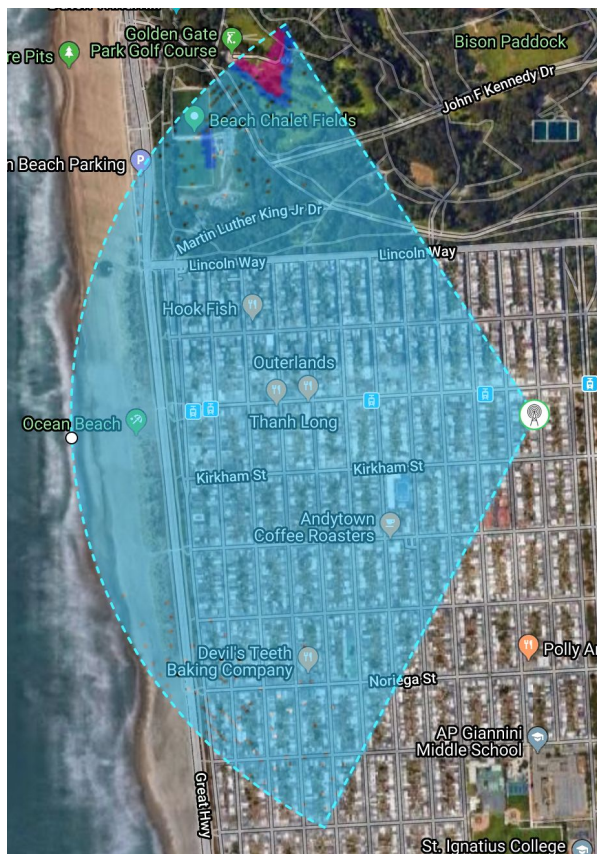# NanoBeam M5-19: MIMO, 26 dBm, 19 dBi, 25° Beam

NanoStation M5: MIMO, 27 dBm, 16 dBi, 45° Beam

Rocket M5+AM-5G17-90: MIMO, 27 dBm, 17 dBi, 90° Beam

Rocket M5+AM-5G16-120: MIMO, 27 dBm, 16 dBi, 120° BW

Rocket M5+AMO-5G13: MIMO, 27 dBm, 13 dBi, 360° Omni