

# SARnet

**Presentation By Fred Perkins WB4BAG**  
**Presented to DCARC February 2019**

**S**tatewide **A**mateur **R**adio  
**N**etworking in Florida

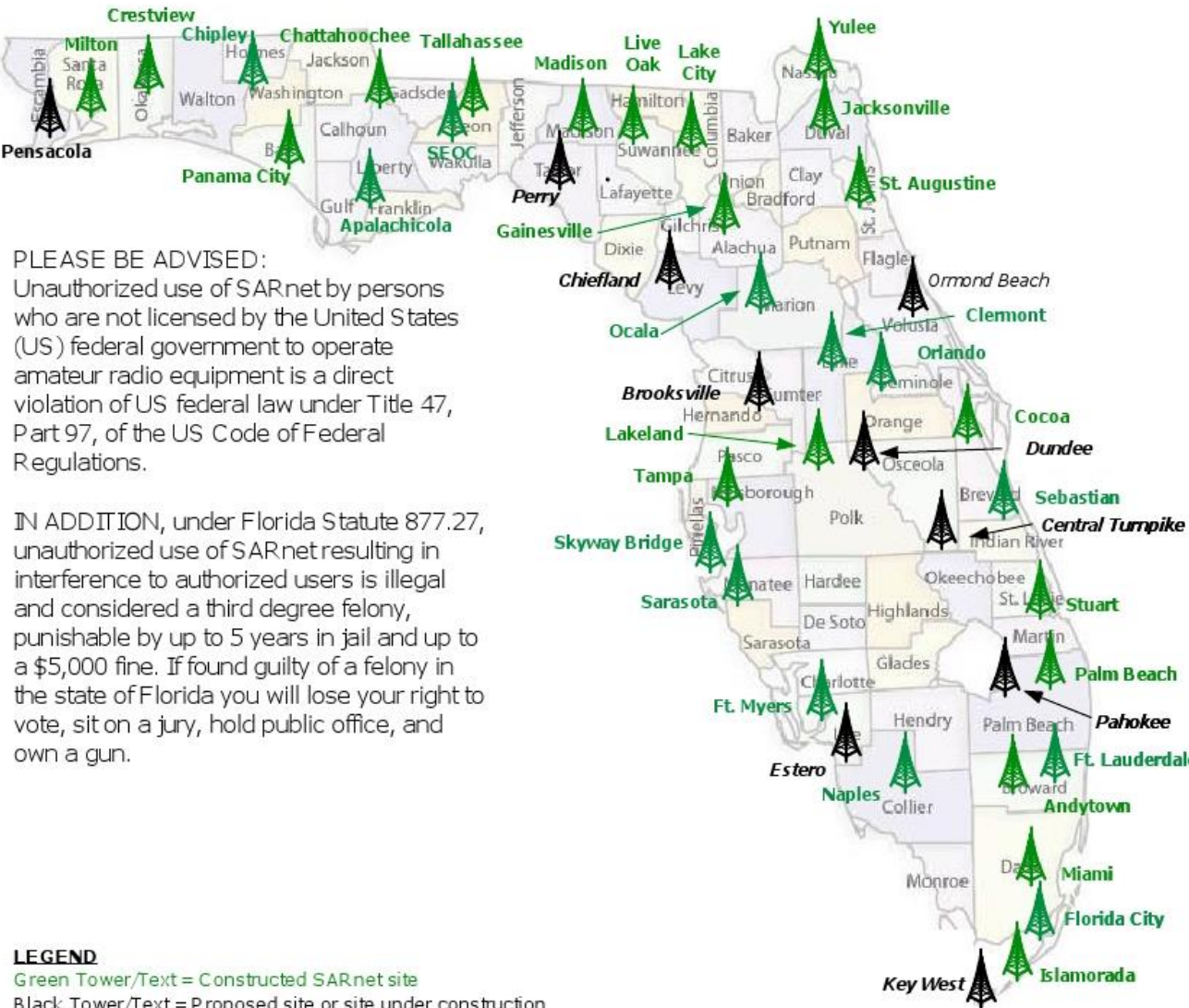
# What is SARnet?

- A network of interconnected local UHF (only) repeaters.
- A network that does not use the internet, cellular phones or landlines; instead it is made up of hardened microwave and fiber sites with automatic backup generators.
- A network provided by the FDOT and connected to repeaters provided by Amateur Licensees.
- Instead of using their live voice radio network, the FDOT has partnered with the amateur radio community to use SARnet as a live-traffic test bed to investigate Radio over IP technologies.

# Statewide Amateur Radio Network "SARnet" Constructed Sites as of January 3, 2019

YOU MUST BE A FEDERALLY LICENSED AMATEUR  
RADIO OPERATOR WITH A CALLSIGN TO USE SARnet

<u>SARnet SITE</u>	<u>TX (MHz)</u>	<u>Tone (Hz)</u>
Andytown	442.825	110.9
Apalachicola	444.400	94.8
Brooksville	444.825	146.2
Central Tumpike	444.975	107.2
Chattahoochee	444.975	94.8
Chiefland	TBD	TBD
Chipley	444.750	100.0
Clermont	444.975	103.5
Cocoa	444.650	107.2
Crestview	444.900	100.0
Dundee	444.350	103.5
Estero	TBD	TBD
Ft. Lauderdale	442.850	110.9
Florida City	442.050	114.8
Ft. Meyers	444.225	136.5
Gainesville	444.925	123.0
Islamorada	442.850	114.8
Jacksonville	444.700	127.3
Key West	444.400	114.8
Lake City	444.900	110.9
Lakeland	442.275	82.5
Live Oak	443.700	110.9
Madison	444.300	94.8
Miami	444.600	167.9
Milton	444.725	100.0
Naples	444.950	103.5
Ocala	444.025	123.0
Orlando	444.075	103.5
Ormond Beach	TBD	TBD
Pahokee	TBD	TBD
Palm Beach	443.975	110.9
Panama City	444.175	100.0
Pensacola	444.875	100.0
Perry	443.100	94.8
Sarasota	444.800	100.0
Sebastian	444.375	107.2
SEOC	443.500	94.8
Skyway Bridge	442.250	146.2
St. Augustine	442.800	127.3
Stuart	444.150	107.2
Tallahassee	442.100	94.8
Tampa	442.850	146.2
Yulee	442.900	127.3



PLEASE BE ADVISED:  
Unauthorized use of SARnet by persons who are not licensed by the United States (US) federal government to operate amateur radio equipment is a direct violation of US federal law under Title 47, Part 97, of the US Code of Federal Regulations.

IN ADDITION, under Florida Statute 877.27, unauthorized use of SARnet resulting in interference to authorized users is illegal and considered a third degree felony, punishable by up to 5 years in jail and up to a \$5,000 fine. If found guilty of a felony in the state of Florida you will lose your right to vote, sit on a jury, hold public office, and own a gun.

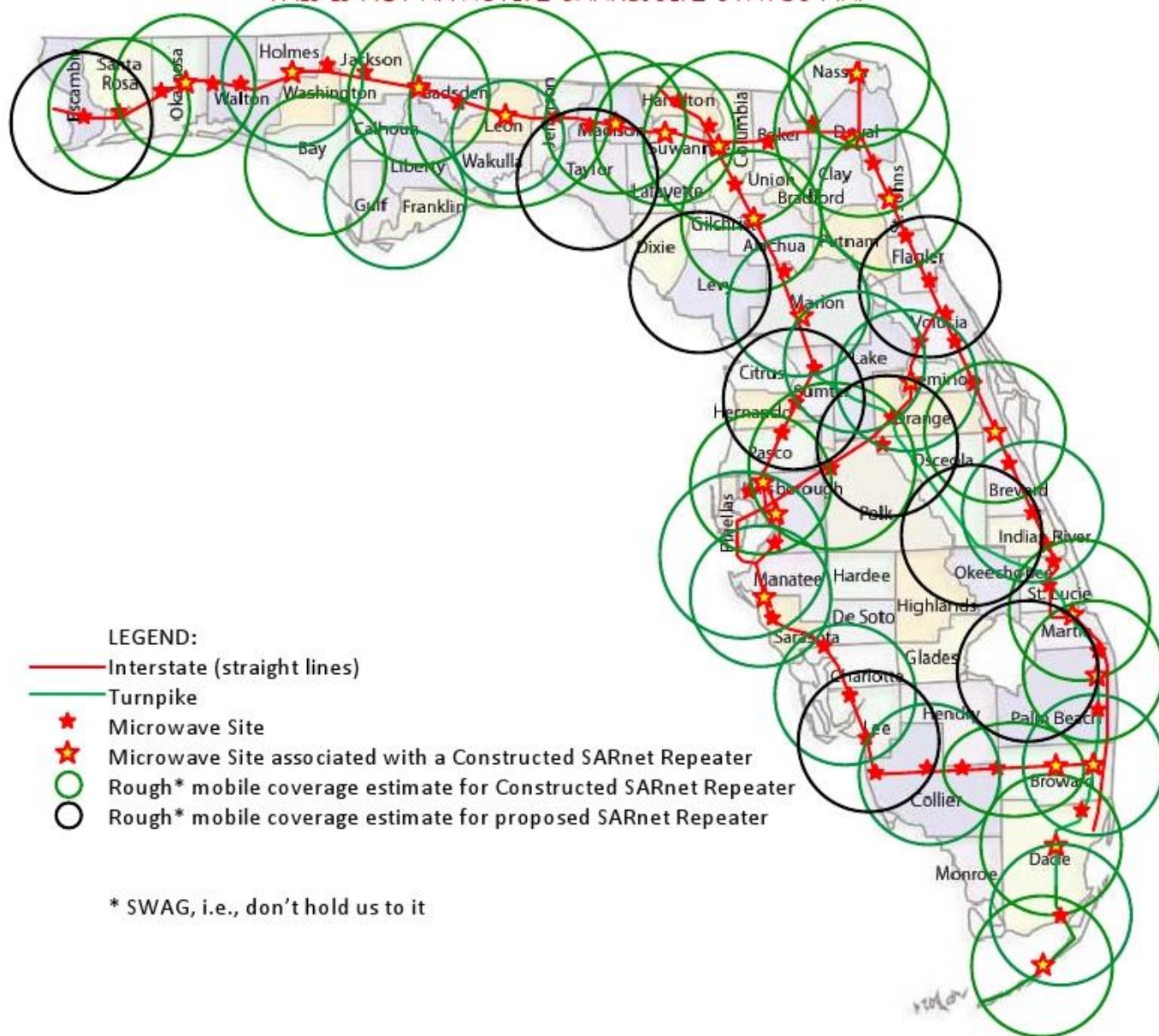
**LEGEND**  
Green Tower/Text = Constructed SARnet site  
Black Tower/Text = Proposed site or site under construction  
TX frequency is repeater talk-out. All UHF repeaters have a +5MHz offset for the talk-in repeater receiver



# Statewide Microwave Network

Constructed "SARnet" sites shown as of December 20, 2018

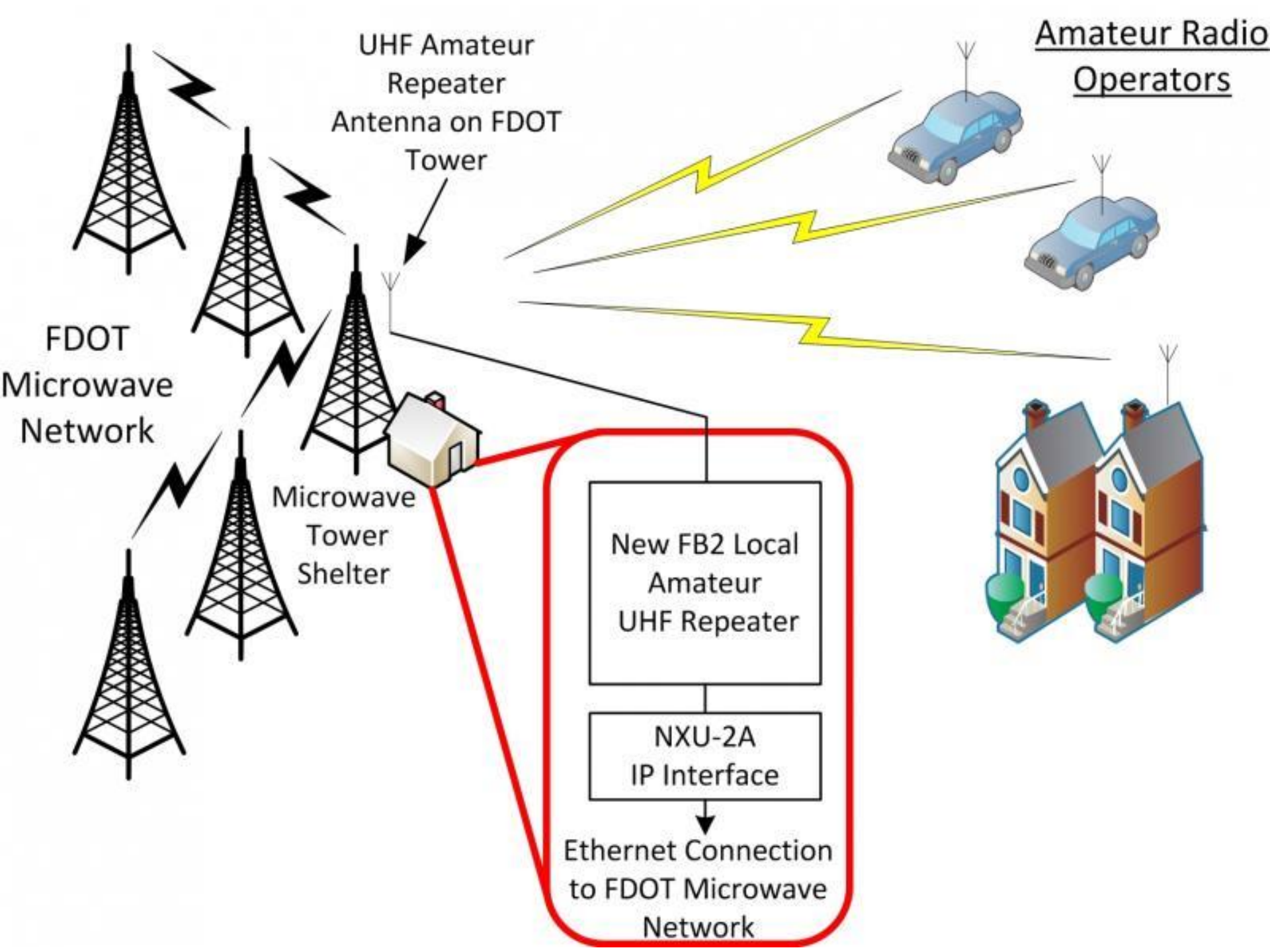
THIS IS NOT AN ACTIVE SARnet SITE STATUS MAP



\* SWAG, i.e., don't hold us to it

# Direct Connection Of Repeaters Into SARnet Sites

- Local repeater and SARnet node are physically connected and co-located.
- The local repeater transmitter accepts receive audio from the either the repeater receiver or from SARnet.
- To transmit SARnet traffic the attached SARnet node provides a PTT signal to the repeater transmitter along with the audio from the network.
- When the repeater receiver is receiving local traffic it is sent back out over the air via the repeater transmitter and also sent over SARnet via the attached SARnet node.
- The repeater receiver must also provide a Carrier Operated Relay (COR) signal to the SARnet node to initiate a transmission into SARnet.
- Direct Connection sites are known as FB2 sites



UHF Amateur  
Repeater  
Antenna on FDOT  
Tower

Amateur Radio  
Operators

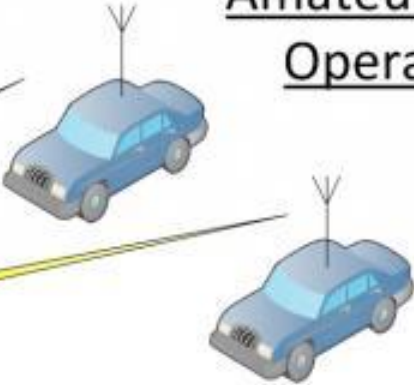
FDOT  
Microwave  
Network

Microwave  
Tower  
Shelter

New FB2 Local  
Amateur  
UHF Repeater

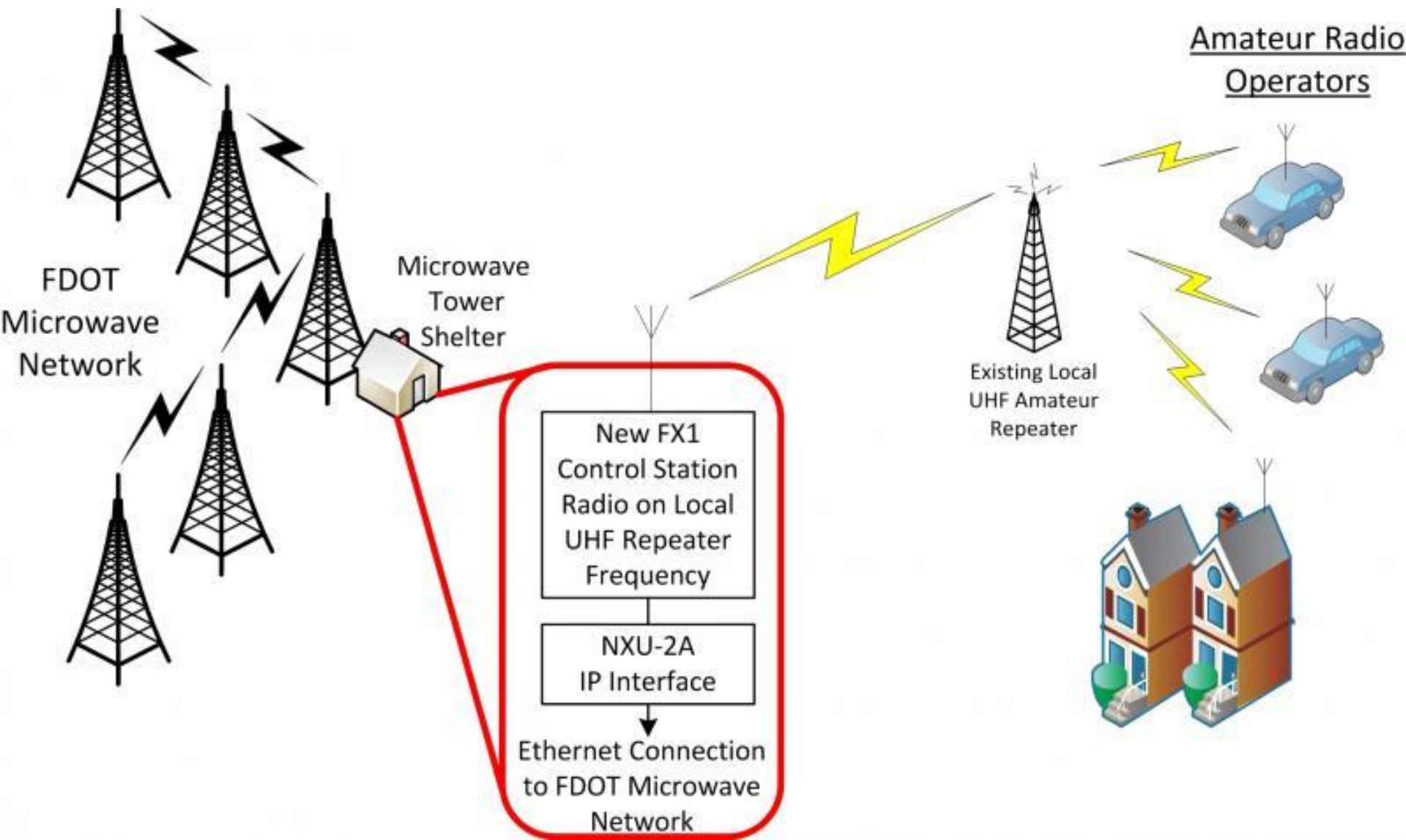
NXU-2A  
IP Interface

Ethernet Connection  
to FDOT Microwave  
Network



# Radio Connection Of Repeaters Into SARnet Sites

- Repeaters are NOT physically connected to SARnet.
- A SARnet node has a control station radio connected to it that accesses the repeater just like any other local repeater user.
- The type of control station radio used for SARnet is a GE MDX in a console mount.
- The MDX accepts transmit audio and a PTT from the SARnet node (network traffic) and provides received audio and a COR signal (local repeater traffic) to the SARnet node.
- Radio Connection sites are known as FX1 sites because they use a control station radio to access a repeater.





# The Network Side Interconnecting the Repeaters

- Each SARnet node is a JPS Raytheon NXU.
- The NXU converts the radio audio, PTT, and COR signals to Internet Protocol IP traffic.
- The backhaul network is an IP routed mesh network that traverses the statewide microwave and fiber networks.
- The network connection at each SARnet node site is a T1/Ethernet router and Ethernet switch.
- The microwave and fiber connections tie the routers together in a statewide mesh topology.

# SARnet and EMCOMM

- County EOCs run a Friday morning net (2015)
- Duval County EOC coord's quarterly net (2017)
- NHC 444.6 MHz repeater at FIU is the Miami repeater
- State EOC can monitor SARnet in Tallahassee
- FDOT microwave sites are hardened, have propane generators and large storage tanks.
- No vulnerable internet use.
- During an emergency it is hoped SARnet will be a contributing tool that is reliable and available.

# SARnet and EMCOMM (cont.)

- The National Hurricane Center in Miami expressed an interest in having access to SARnet. This moved a future Miami SARnet site up on the priority list and got them on the air earlier than planned.
- When power is down:
  - FB2 (direct connect) repeaters will be powered by the network node.
  - FX1 (radio connect) repeaters may or may not have backup power. If not, you can try reversing your repeater pair and entering SARnet directly through the control station at the network node site.

# Keep in Mind....

- When you key your radio on the frequency of a local repeater connected to SARnet, you are automatically talking on SARnet, all across the state of Florida!
- Long conversations and rag-chews are discouraged because the FDOT is trying to investigate short efficient communications between users (as in professional, public safety radio transactions).
- Signal reports are encouraged.
- When you key up your radio, only a brief momentary pause of no more than one second is needed to wait to talk. It is much more important to WAIT about 2-3 seconds after someone else unkeys before keying up your radio. This will allow the end of the transmission to propagate through the network and for all of the repeater squelch tails to drop out.



# More Information

- [WWW.SARNET.COM](http://WWW.SARNET.COM)
- There will be a SARnet forum at the Orlando Hamcation, at 15:00 hrs, Friday, February 8, 2019 for a system briefing and Q&A with the administrators.

# Acknowledgements

- Brian Kopp (KC5LPA), The Semaphore Group
  - Special thanks for giving me permission to use the information on the SARnet site and previous presentations
  - And the following who authored the material in those previous presentations
- Randy Pierce (AG4UU), FDOT
- Joe Poerschke (WB4HIS)
- David Krauss (NX4Y)