Preparation Guide to Emergency Comms and Networking using Amateur Radios (HAM)

Jimmy Alignay
Solutions Engineer, @jimmyalignay

BRKGEN-1012

Cisco Webex App

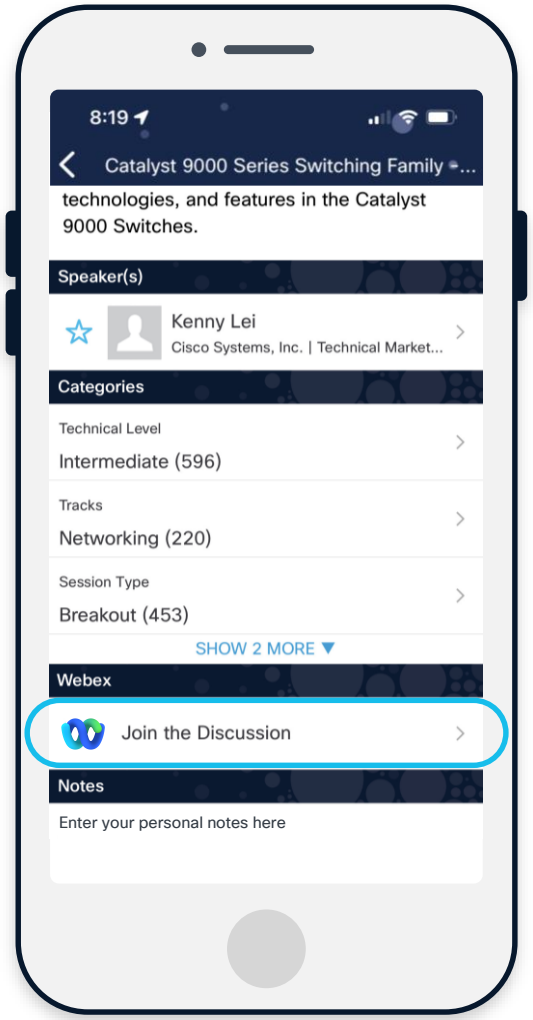
Questions?

Use Cisco Webex App to chat
with the speaker after the session

How

1. Find this session in the Cisco Live Mobile App
2. Click “Join the Discussion”
3. Install the Webex App or go directly to the Webex space
4. Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 13, 2025.



https://ciscolive.ciscoevents.com/
ciscolivebot/**#BRKGEN-1012**

Agenda

01 EMCOMM

02 Amateur Radio (HAM)

03 Packet Radio Networking

04 Use Cases

05 FREE IPv4 Address Space

+Special Bonus

What is your current level of involvement with Amateur Radio?

Objective: Mission for Today

1. Importance of EMCOMM
2. Introduction to Amateur Radio
3. Discuss Packet Radio and it built the foundation of networking solutions used today.
4. Your use case.

EMCOMM
“How are you gonna call”

EmComm, short for emergency communications, is a program where Amateur Radio operators can assist through maintaining communications before, during and after emergencies and disasters.

https://gtarc.org/emcom/

“How are you gonna call” EMCOMM

Hurricane Helene North Carolina 2024

Hurricane Milton Florida Oct 2024

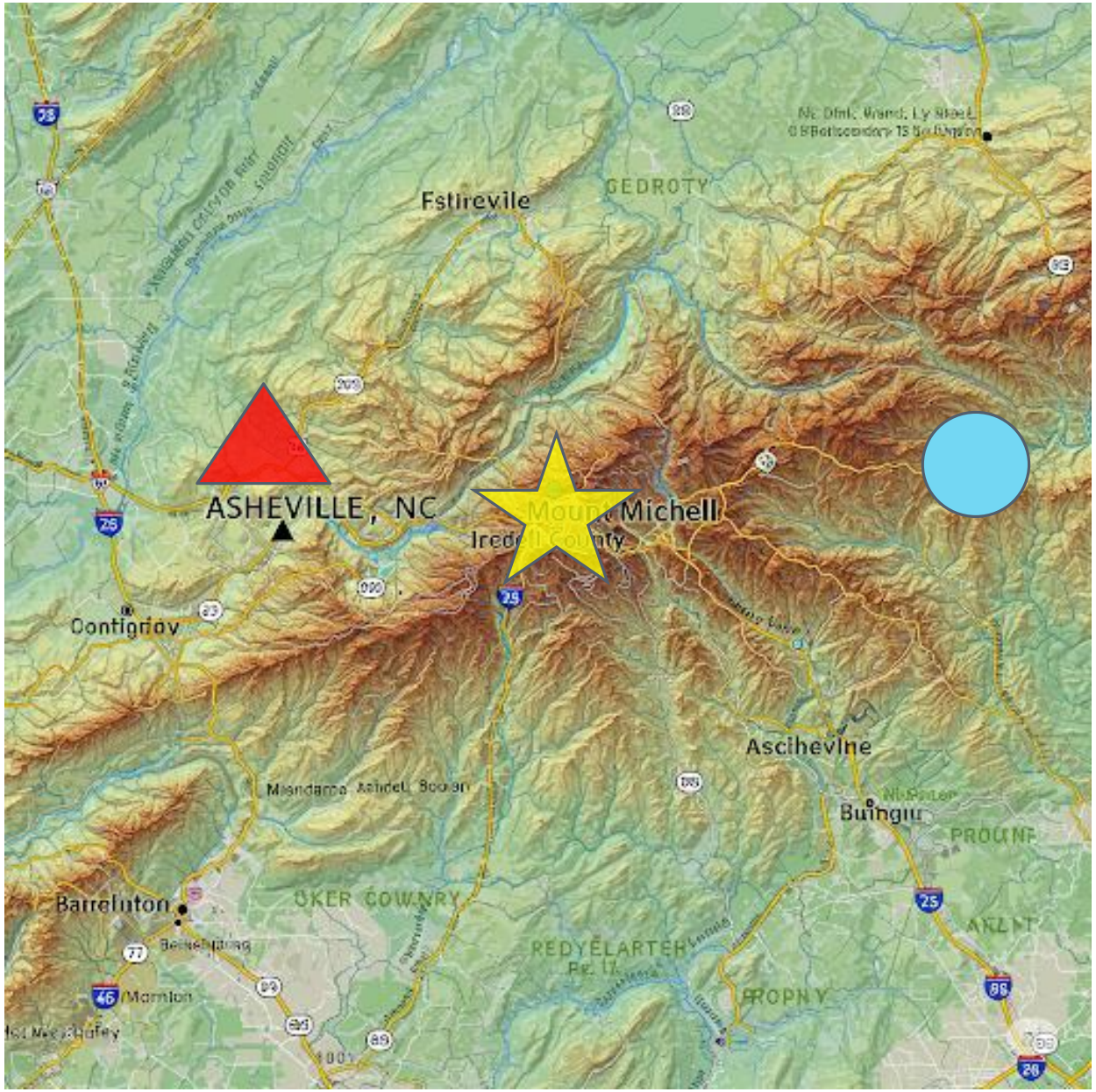
Hurricane Helene North Carolina Sept 2024

Cyberattacks, Electronic/Space Warfare, Vulnerabilities

Loss of Life, Power, Comms, and Road Access

Amateur Radio key mode of communication

Hurricane Helene 2024



Amateur Radio key mode of communication

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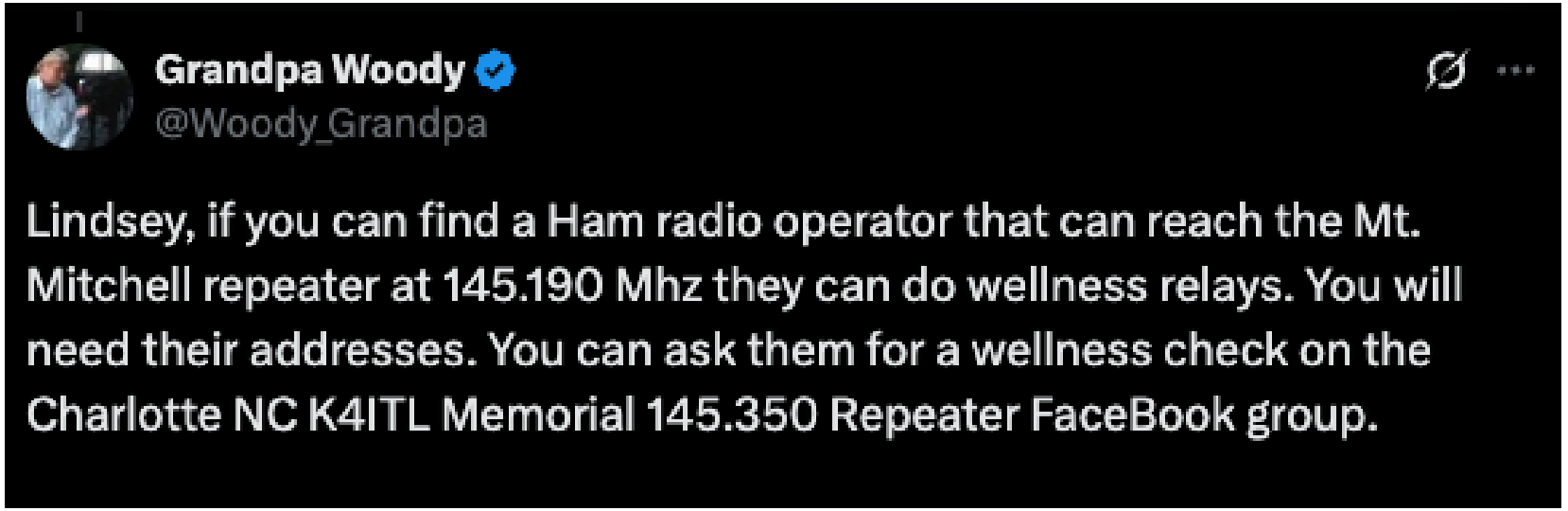


https://x.com/Woody_Grandpa/status/1840369232665616497

Amateur Radio key mode of communication

Hurricane Helene 2024

IMMEDIATE NEEDS for "We The People Mission" Distribution Point

Please note: Items CAN NOT be delivered by Amazon at this time.
Do not ship items to the airport – this is a DROP OFF ONLY zone.

- VOLUNTEERS – VOLUNTEERS – VOLUNTEERS
- Buddy heaters
- Propane – 20 lb size
- Propane adapter hose for buddy heaters
- Generators 3000w
- Generators (any size)
- Extension cords (especially 12 gauge grounded)
- Dehumidifiers
- Antacids
- Chainsaws (150 chainsaws needed) – these items will need bar oil, oil/gas mixture (as per manufacturer), and a tourniquet
- Engine oil (10w30)
- Damp Rid
- Cold weather gear – like long johns (think outdoor protection)
- Kerosene
- Gas
- **Due to your generous support, we are currently overstocked with diapers, formula, socks, water, and radios.**

Hurricane Helene 2024 Lessons Learned

People

Local community self-reliance and volunteerism are paramount, filling critical gaps when official aid is delayed.

Process

Basic radio proficiency, including manual programming, is essential, and willingness to adapt rules for real-world emergencies is crucial

Technology

Individual radio, antennas, and portable power. Simple 5W HT (handy talky)

Enable wifi calling, Alternative to MFA texting (Cisco Duo)

Florida Statewide Amateur Radio Network

- The Statewide Amateur Radio Network (SARnet) is a network of linked UHF voice repeaters that serves the State of Florida.
- Florida Department of Transportation (FDOT) has partnered with the amateur radio community to use their radio systems throughout the state as part of a test bed to support the FDOT's research
- In exchange for supporting this research, the amateur radio community can talk across the state using the same amateur radio equipment they use everyday
- Others: New York, Empire State Network;
- Source: sarnetfl.org

EMCOMM Mobile Components (Example)

Radios & Gear

- VHF/UHF Radios
- HF Radios
- Digital Radios
- Portable Antennas
- Smart devices, PC, Mac

Modes & Protocols

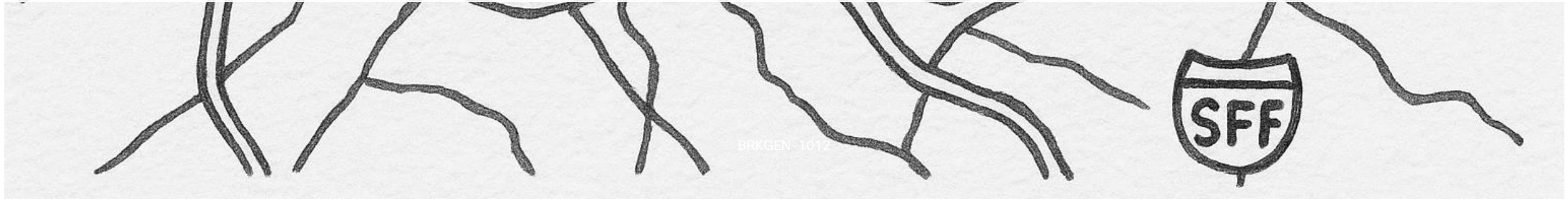
- Voice: Analog & Digital
- Data: Foundational
  - Packet Radio (AX.25)
    - APRS
    - Apps Messaging

Power

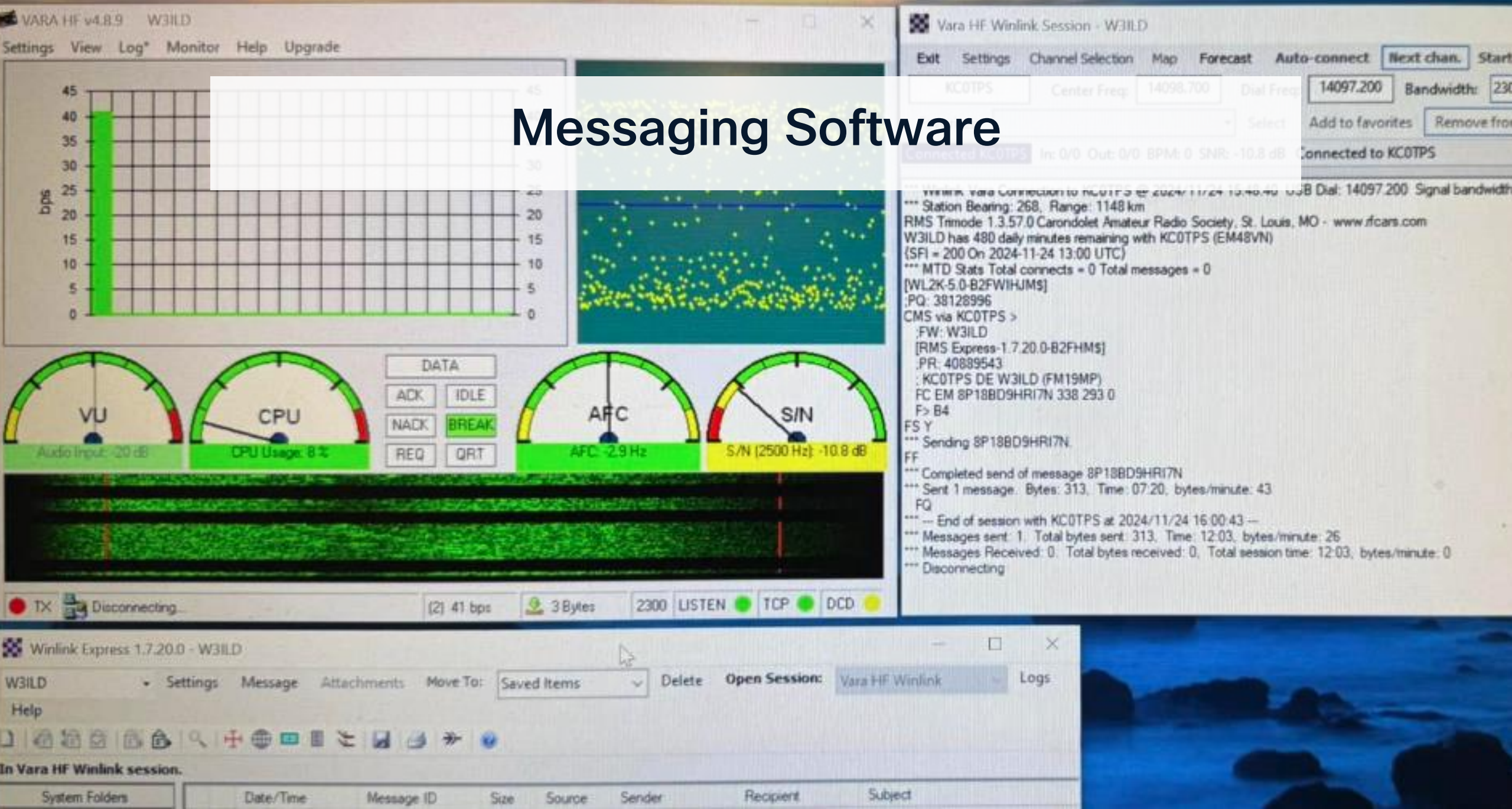
- Power Generation
- Battery Systems
- Fuel & Solar Panels

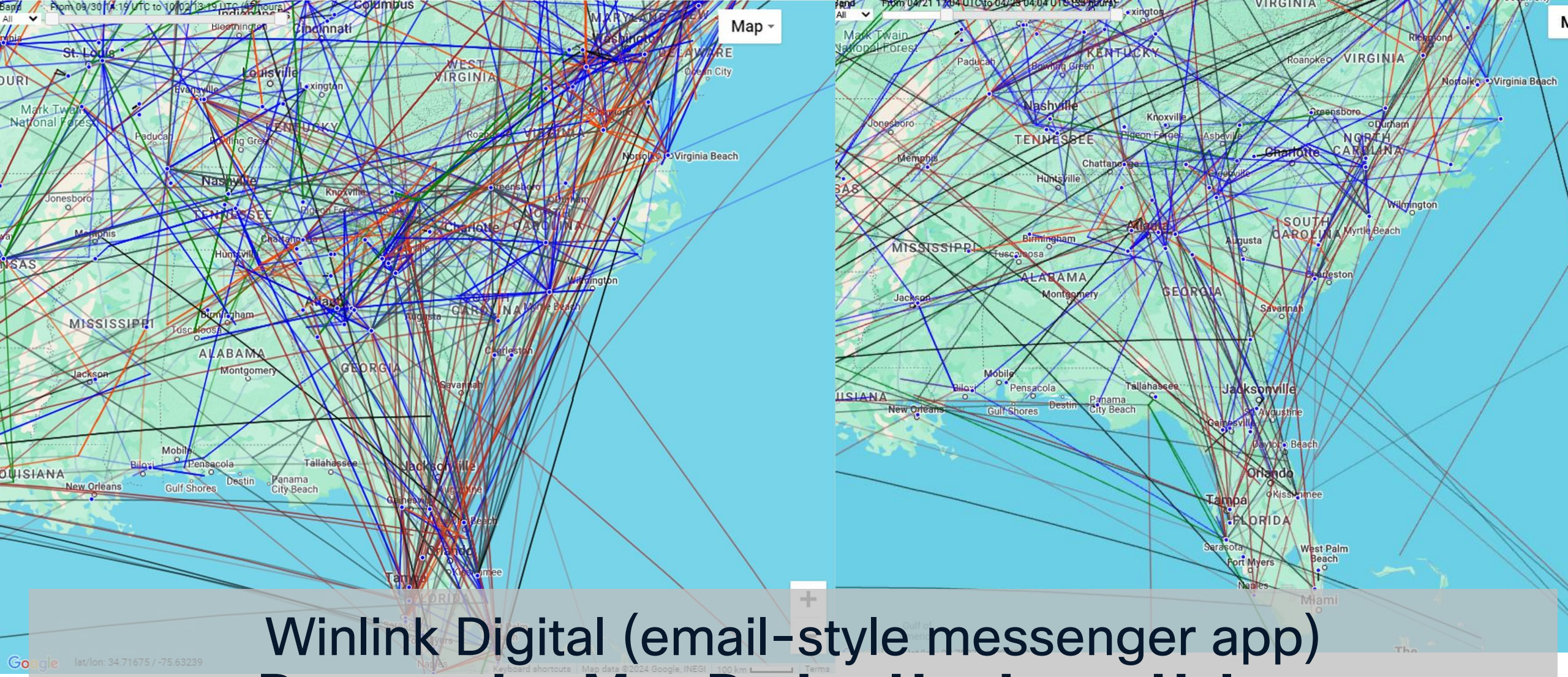
Mobile HT Radios Power

Protocols Packet Radio & APRS showing flood areas



Messaging Software





Winlink Digital (email-style messenger app)
Propagation Map During Hurricane Helene

source: https://winlink.org/RMSChannels

Local Civilian EMCOMM

100% Volunteers:

First responders, EOC, Hospitals, Local & National Agencies

Radio Amateur Civil Emergency Service - RACES

Government-backed service defined in FCC Part 97, specifically section 97.407.

Activated by local civil defense officials who support government agencies during emergencies subject to specific FCC rules.

Amateur Radio Emergency Service- ARES

Sponsored by American Radio Relay League (ARRL) and licensed HAM operators who register their qualifications and equipment. ARES have a greater flexibility.

National/Federal Agency Programs

SKYWARN

National Weather Service

Volunteers help keep their local communities safe by providing timely and accurate reports of severe weather

Civil Air Patrol (CAP) Emergency Services

Over 19,000 CAP members are trained in the using radios

Military Auxiliary Radio System (MARS)

Department of Defense (DoD) programs with U.S. Army, Air Force, Coast Guard

Program that trains, organizes and tasks volunteers

SHAred RESources (SHARES) High Frequency

Department of Homeland Security (DHS) Cybersecurity and Infrastructure Security Agency (CISA)

HF use with interop for national security and emergency preparedness missions to communicate when landline and cellular communications are unavailable.

Examples of Non-Governmental, Non-Profit, Commercial Organizations

National Organizations

- **American Red Cross** Disaster Services Technology (DST) team use a team of ham radio operators
- **The Salvation Army** Emergency Disaster Services
- **Southern Baptist** Disaster Relief
- **IEEE MOVE** International (move.ieee.org)
- **Information Technology Disaster Resource Center** (ITDC) (Itdrc.org)

Enterprise Organizations w/ Response Teams

- **Cisco Crisis Response (CCR)** a dedicated team of Information and Communications Technology (ICT) / Emergency Communications specialists.
- **Erricson** Response Team

Introduction

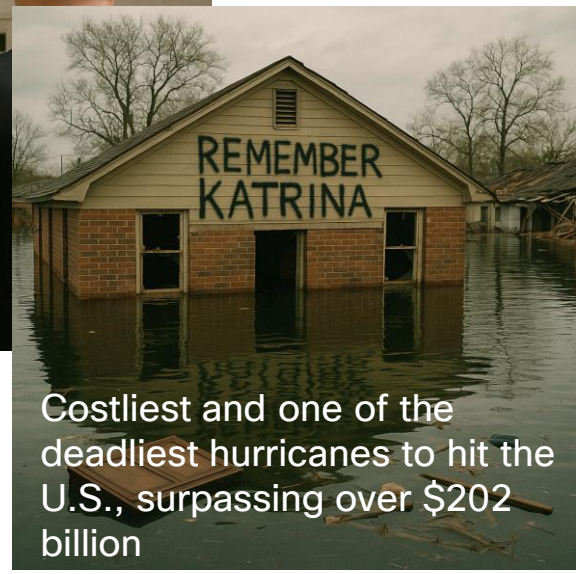
Jimmy Alignay

Cisco Solutions Engineer

jaaligna@cisco.com

Social Media @jimmyalignay

- 30+ Yrs = Cisco Engineer (17+Yrs Cisco SE)
- 20+ Yrs = Amateur Radio HAM, W3ILD
- Volunteer = Fire Dept, Pickleball Coach & Referee
- Impactful events in my life…
  - Father was a 9/11 Survivor
  - Lead Network Architect for Army National Guard during Hurricane Katrina



What types of disasters have you experienced that disrupted of critical services in your community? (Select all that apply)

Amateur Radio
How are you gonna call?

Amateur Radio (Ham) is a personal radio service authorized by the Federal Communications Commission (FCC)

Governed by Part 97 of the FCC
Rules and Regulations

Fun Facts about Amateur Radio

- 1901 – Guglielmo Marconi, an Italian experimenter, transmitted the Morse Code letter “s” from Newfoundland to England
- 1909 **“HAM”** Origin theories…
  - Hamming it up
  - “Am” Amateur
  - Acronym for the initials of 3 College students from the Harvard Radio Club, Hyman-Almy-Murray
- 1912 – Congress passed the first laws regulating radio transmissions in the U.S
- Call Sign – Unique identifier assigned by the FCC to amateur radio licensees. Consists of a combination of letters and numbers. For example, mine is W3ILD

Source: https://www.fcc.gov/wireless/bureau-divisions/mobility-division/amateur-radio-service/operator-class

Amateur Radio

FCC Rules & Guidelines

US Rules & Regulations

The Amateur Radio Service is governed by Part 97 of the FCC Rules and Regulations.

Operators

No age limit. Anyone interested in becoming an operator just needs to pass a competence exam & file with the FCC.

Foreign amateurs can operate in the US under reciprocal agreements.

https://www.fcc.gov/general/international-agreements

Guidelines

Amateur Radio operators cannot accept payment of any type for operating their radio, whether money or other goods or services.

https://www.fcc.gov/wireless/bureau-divisions/mobility-division/amateur-radio-service

Amateur Radio

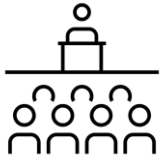
Purpose & General uses (FCC Part 97.1)

Radio & Tech

Advancement of the radio art and technology.

Communications & Technical Skills

Advancement of radio skills in both the art of communication and technical art.



Train All Levels

Provide a trained reservoir of operators, technicians and electronics experts.

Promote Goodwill

Promote and enhance international goodwill.

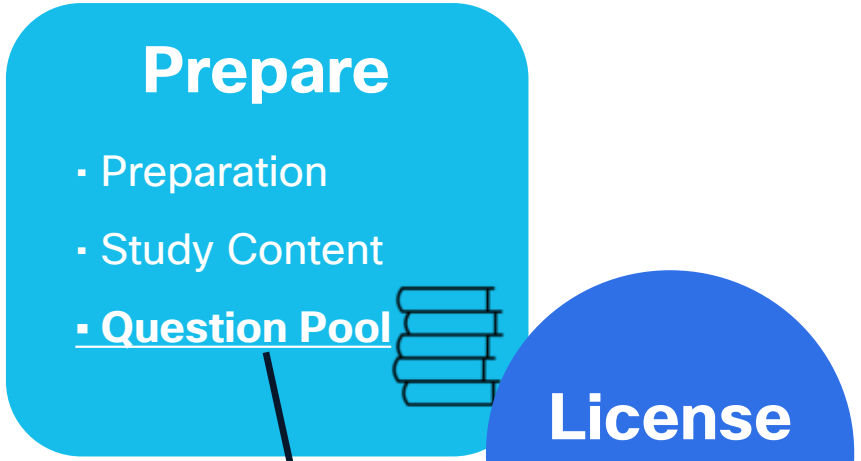
Source: https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-97

FCC Three Operators Classes:

- **Technician**: Base-entry, may transmit on channels in any of 17 frequency bands above 50 MHz with up to 1,500 watts of power
- **General**: Authorizes privileges in all 29 amateur service bands
- **Extra**: Includes additional spectrum in the HF bands

Source: https://www.fcc.gov/wireless/bureau-divisions/mobility-division/amateur-radio-service/operator-class

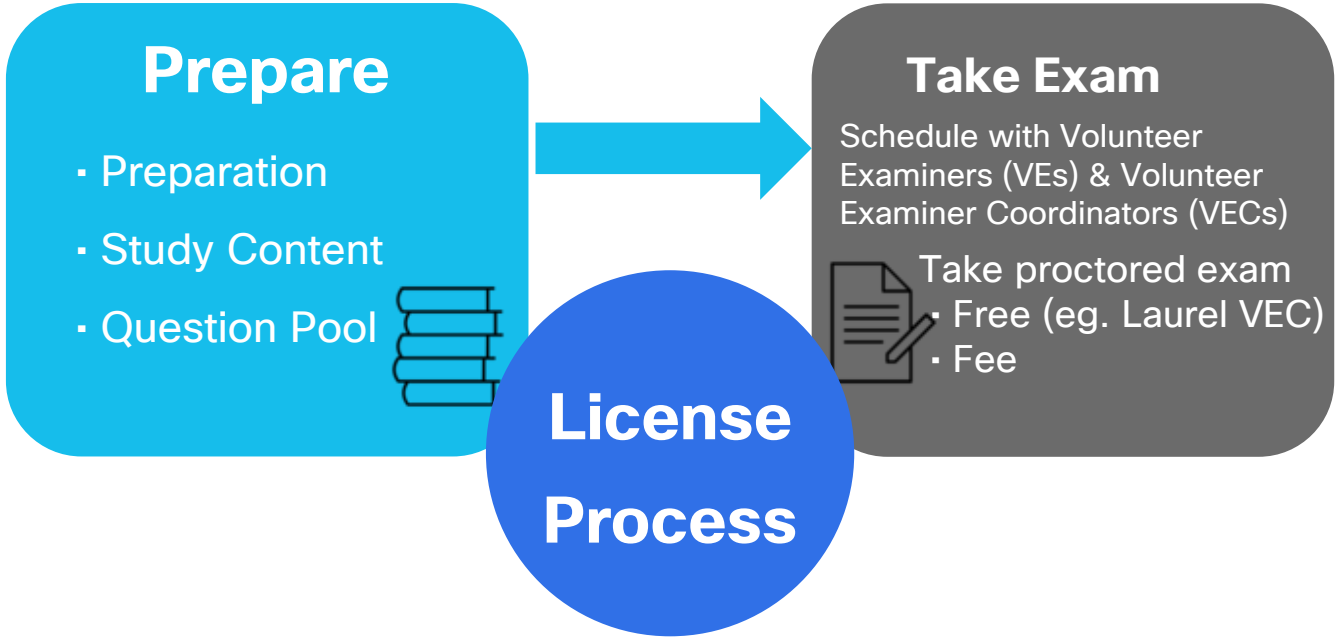
Amateur Radio



National Conference of Volunteer Examiner Coordinators (NCVEC) manages Question Pools developed and maintained by the Question Pool Committee (QPC) of the NCVEC by FCC instruction and Part 97 Rules & Regulation : Sec. 97.523 Question pools All VECs must cooperate in maintaining one question pool for each written examination element.

https://ncvec.org/index.php/amateur-question-pools

Amateur Radio



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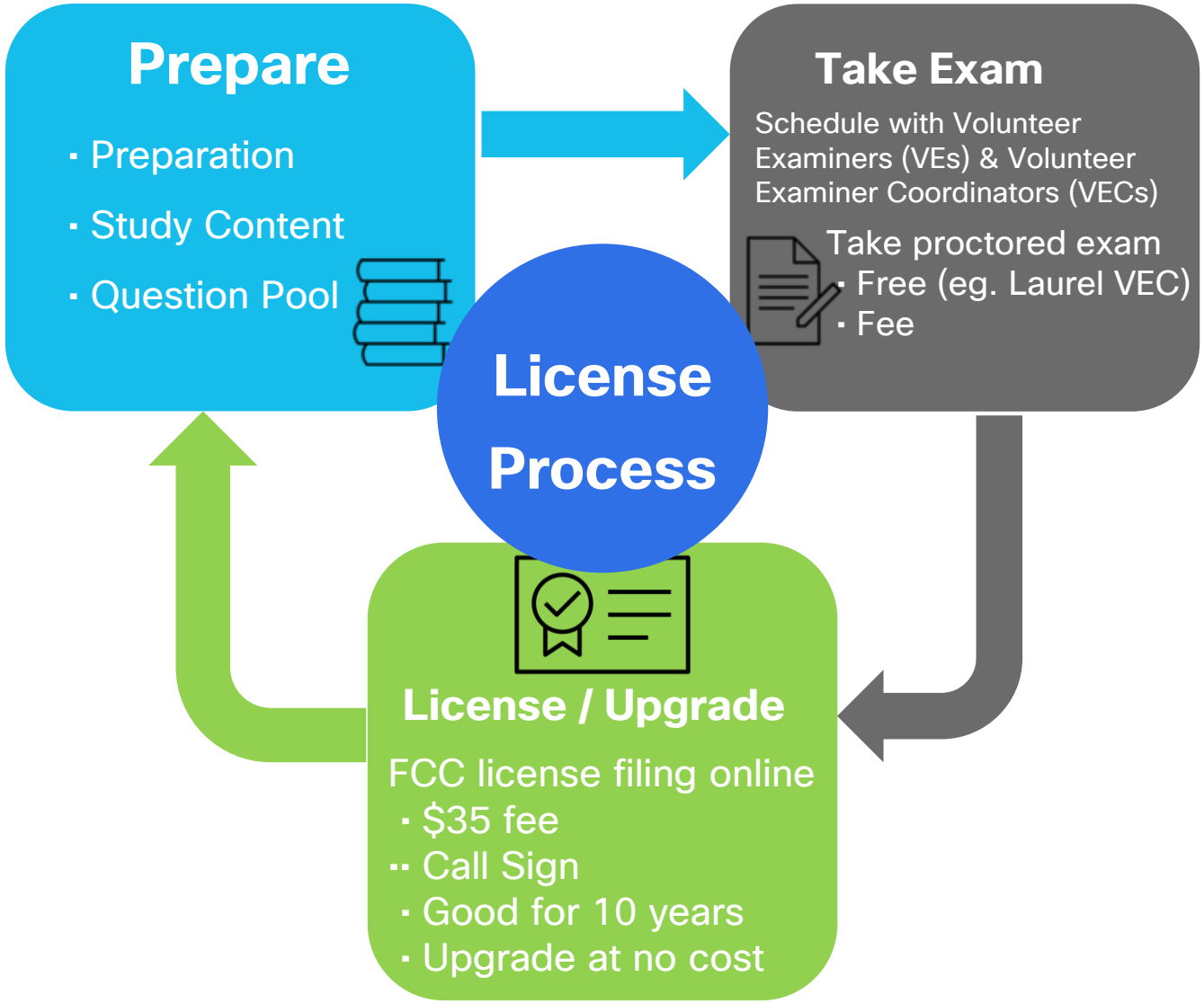
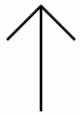


Amateur Radio
Things you can do!

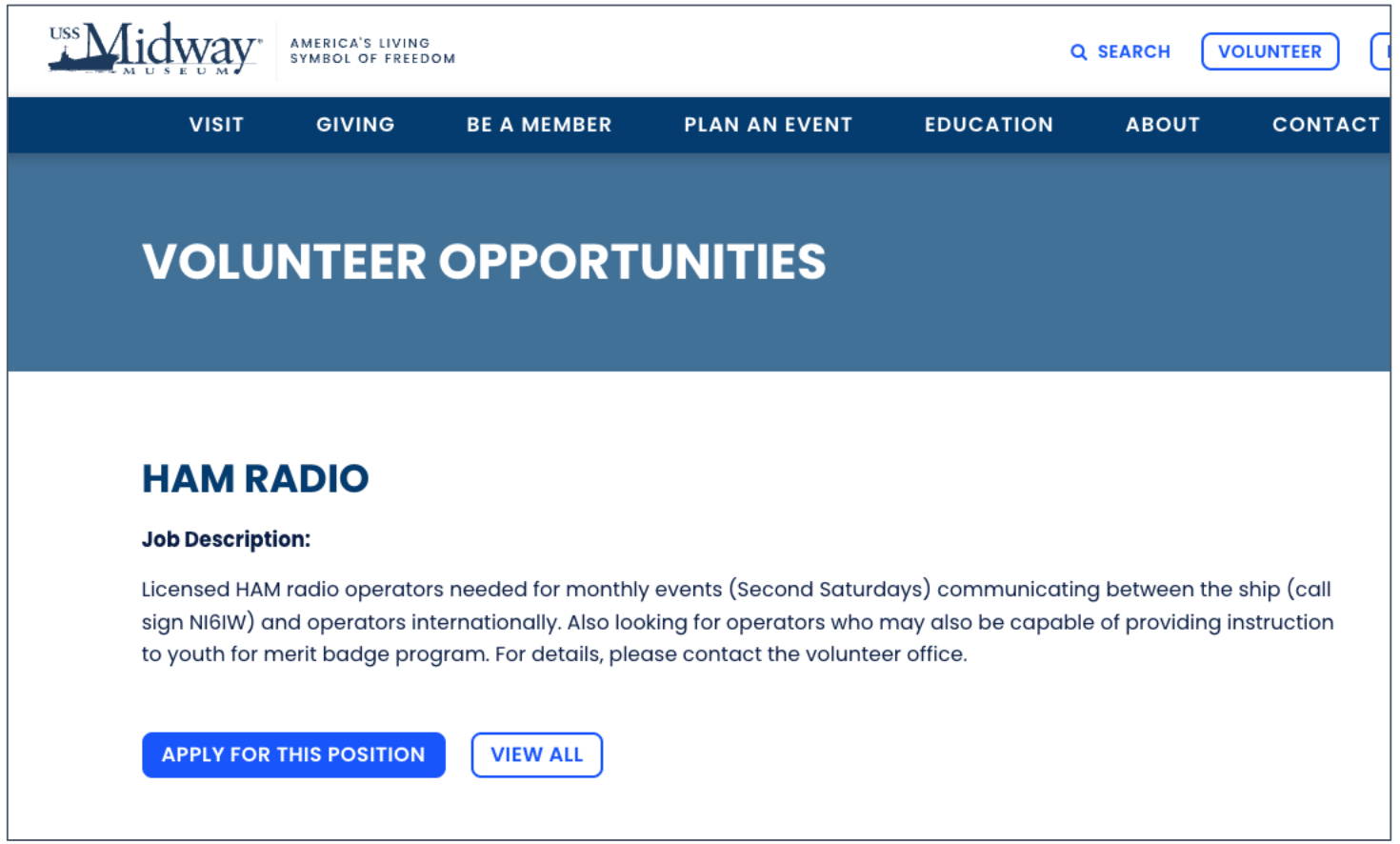


Maximum of 1500 watts peak envelope power (exceptions)

Frequency Privileges

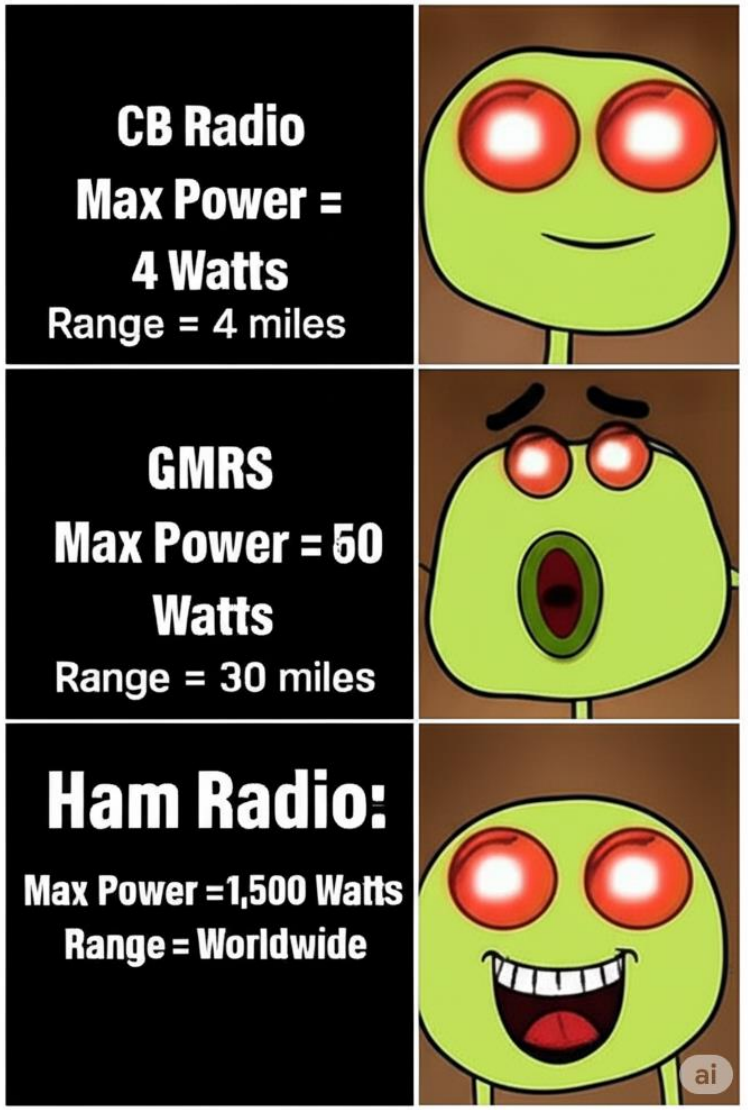
VHF/UHF/Microwave 2.4/5.8 GHz

EMCOMM, Contests, Dx'ing, Go Portable: Parks, Summits, Islands, Ships On-the-air



https://www.midway.org/volunteer-post/ham-radio

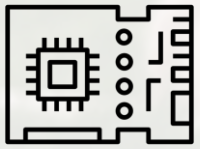
Balance power & Capabailities



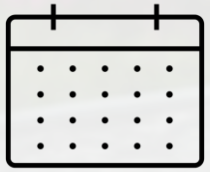
Packet Radio Networking
How are you gonna call?

Which of the following networking technologies have you personally configured or used?

Packet Radio Networking



Components



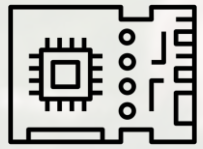
Networking History

Packet Radio Architecture

Packet radio is a system of digital communication where data is transmitted over radio waves in discrete blocks called "packets".

- It's a form of packet switching, where data is broken down into packets, sent independently, and reassembled at the destination.
- In amateur radio, packet radio allows for data transmission, including digital communication and the creation of networks, even in the absence of internet infrastructure.

Packet Radio Networking



Components

Networking History

Packet Radio Architecture

Packet Radio Networking Components

Compute – Device that run software that generates AX.25 packets. (Linux, Raspi, Smart devices)

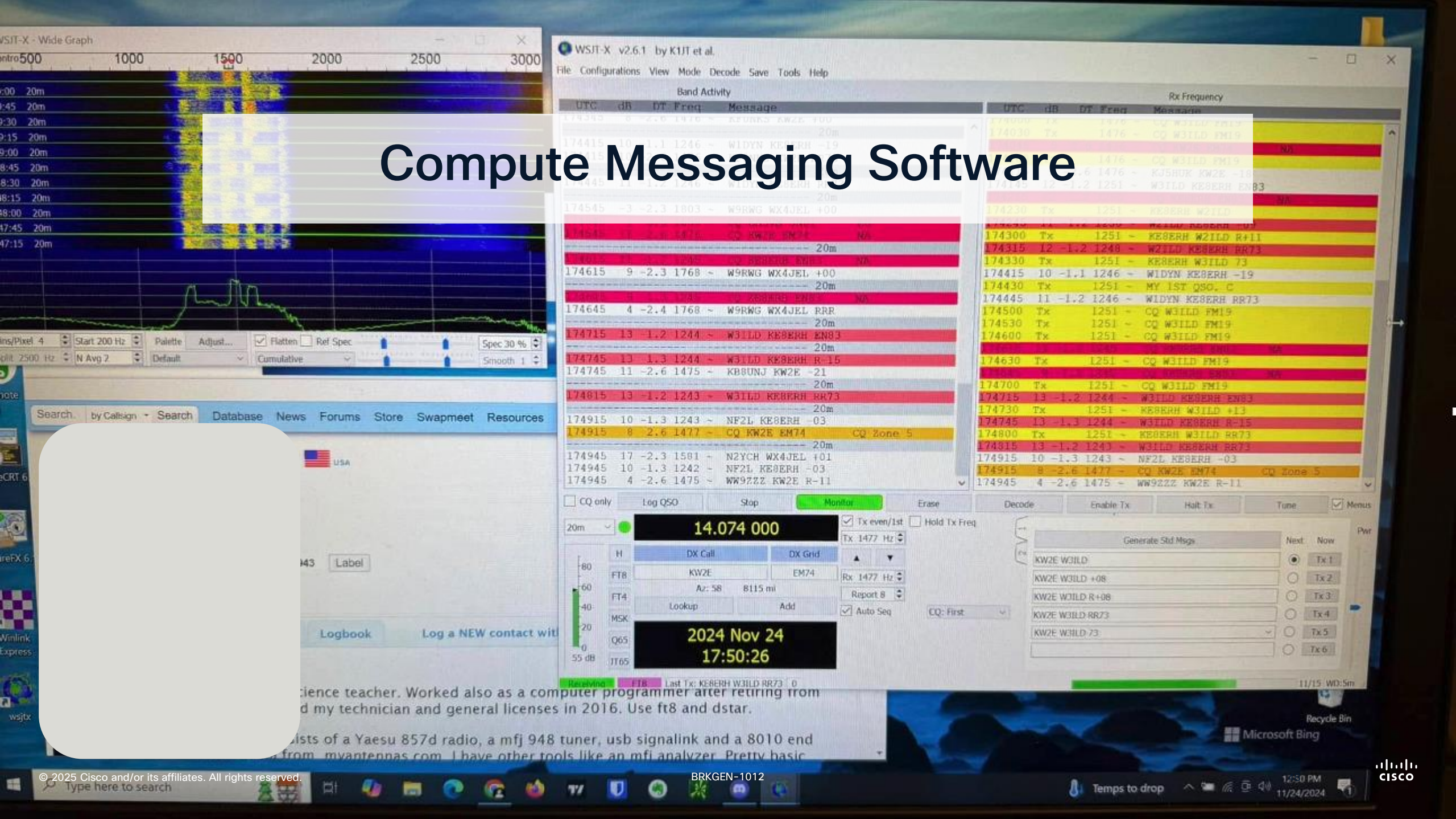
Terminal Node Controller (TNC) – software or hardware based

Radio connecting via sound card

Compute

Compute

Compute Messaging Software



Terminal Node Controller (TNC)

Radio & Gear

Sound card

Radio & Gear

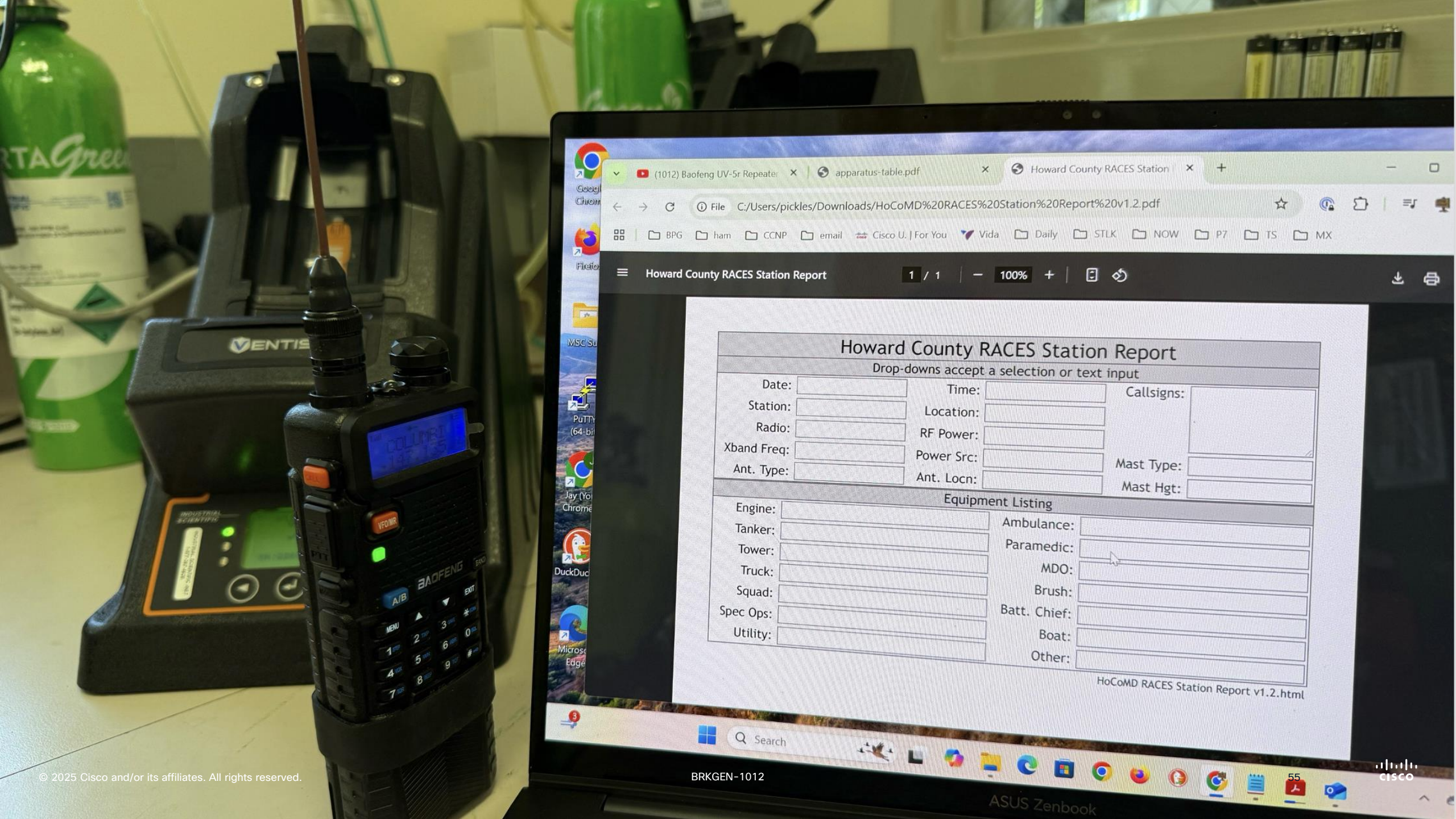
LiFePO4 Batteries/Solar/Generator

Radio & Gear

Antennas

Radio & Gear

Antennas



Importance of local volunteerism, how are you involved in your community? (Select all that apply)

Packet Radio Networking

Components

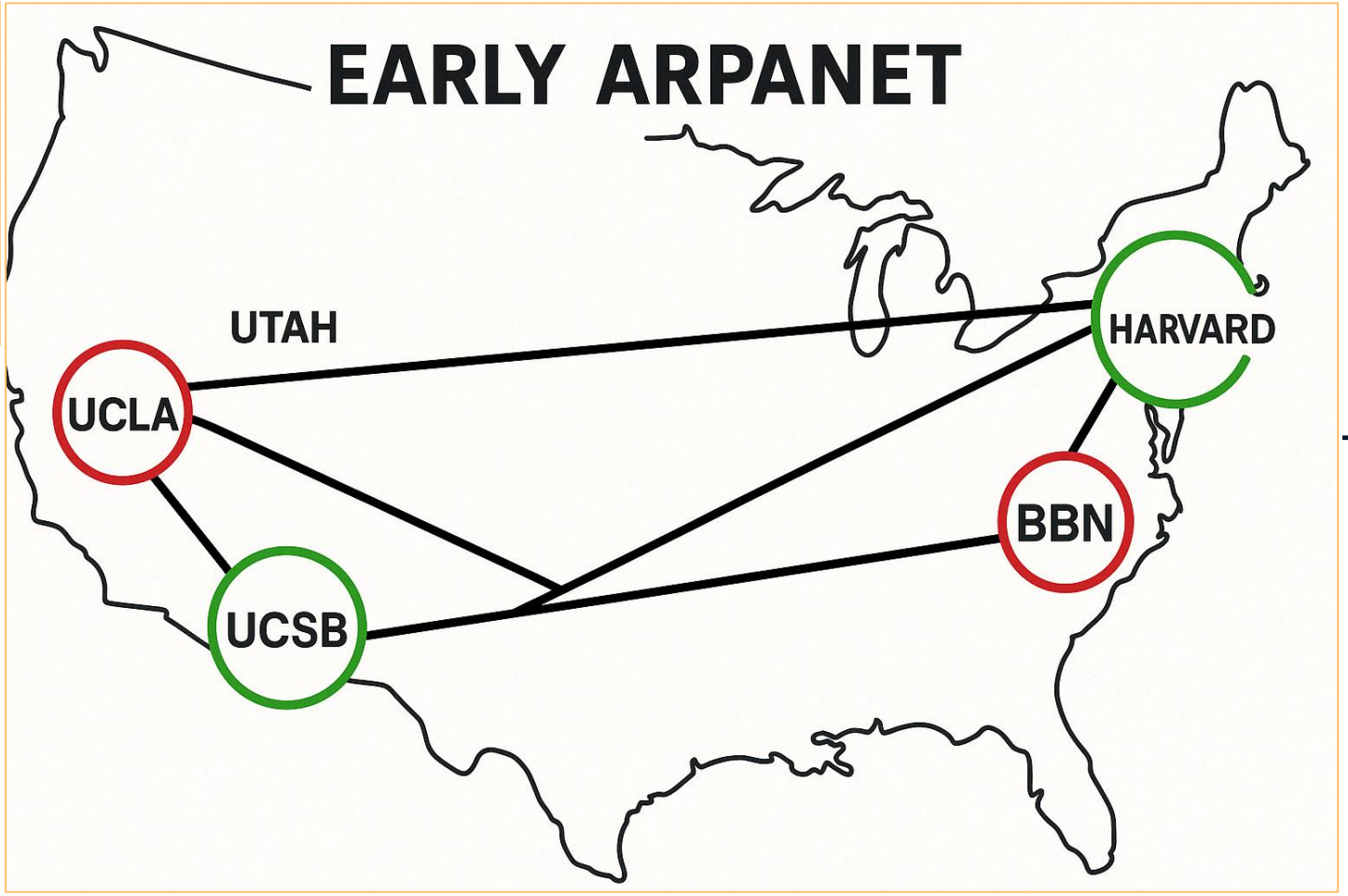
Networking History

Packet Radio Architecture

Timeline History of Packet Radio & Network Engineering

1969

ARPAnet Network Engineers developed ways to internetwork devices



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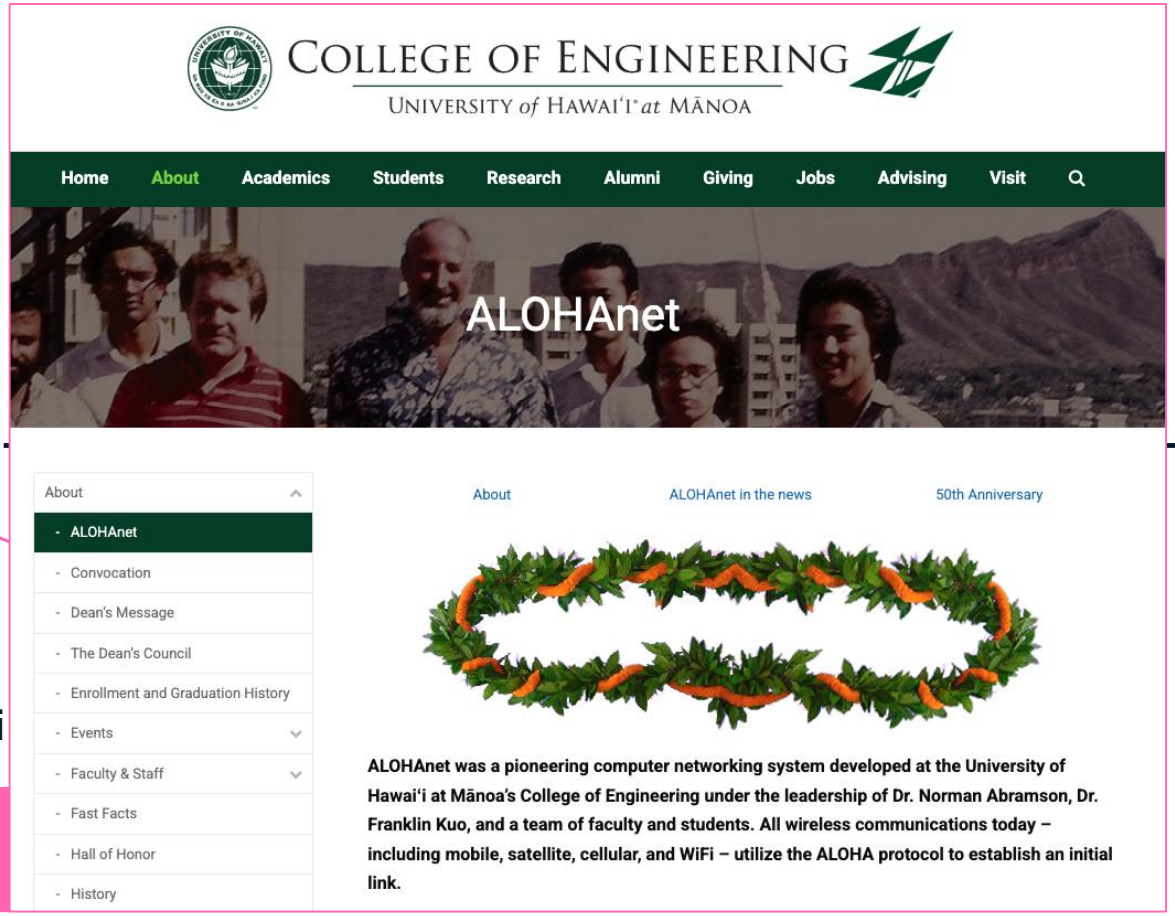

https://www.eng.hawaii.edu/about/history/alohanet/

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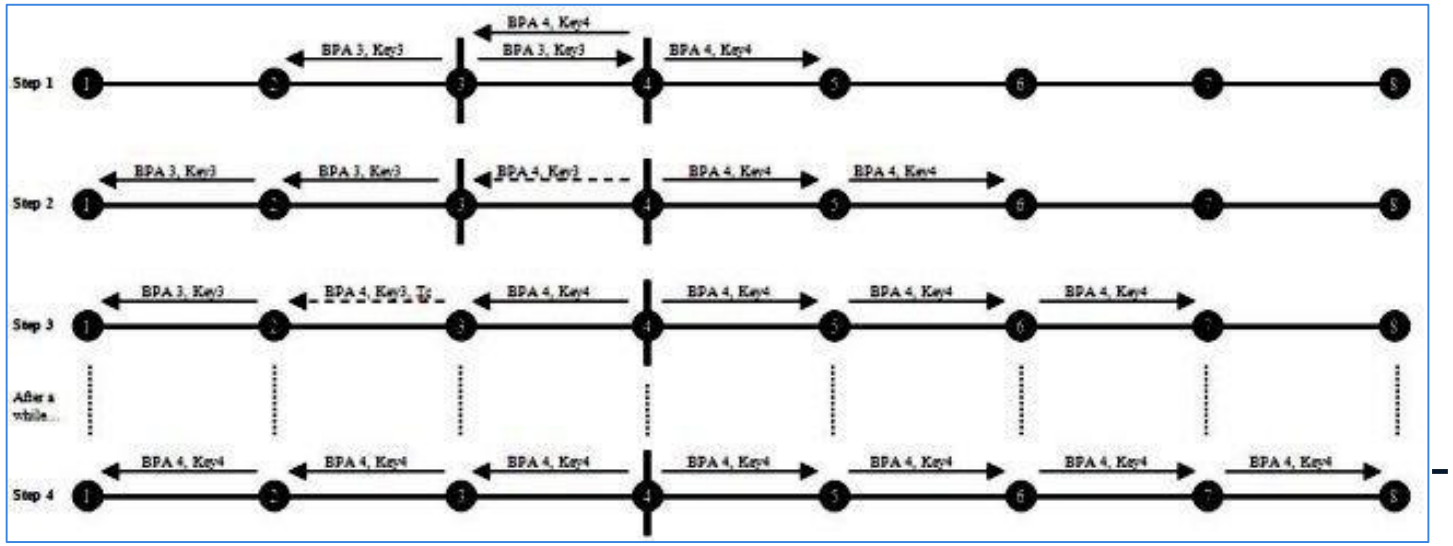
Robert Metcalfe spent time on his dissertation in Hawaii that led to his creation of Ethernet



https://www.cisco.com/c/en/us/solutions/enterprise-networks/what-is-ethernet.html

https://ethw.org/Oral-History:Robert_Metcalfe

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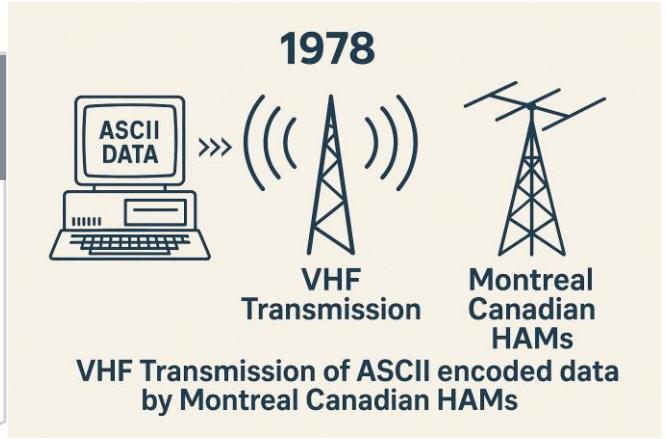
Internetworking Projects

DAPPA, PRNET, ARPANET

1978

VHF Transmission of ASCII encoded data by Montreal Canadians HAMs



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Standford Research Institute Packet Radio van

1980

FCC granted HAMs to start using Packet Radio

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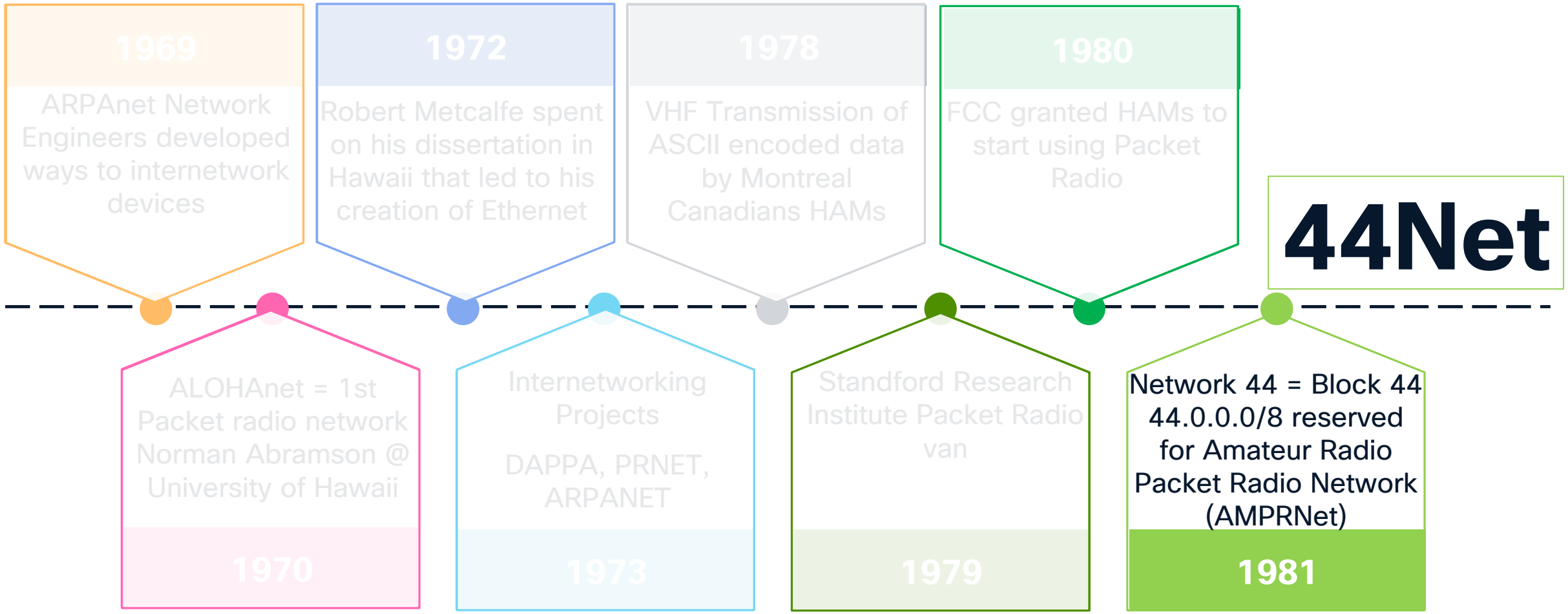

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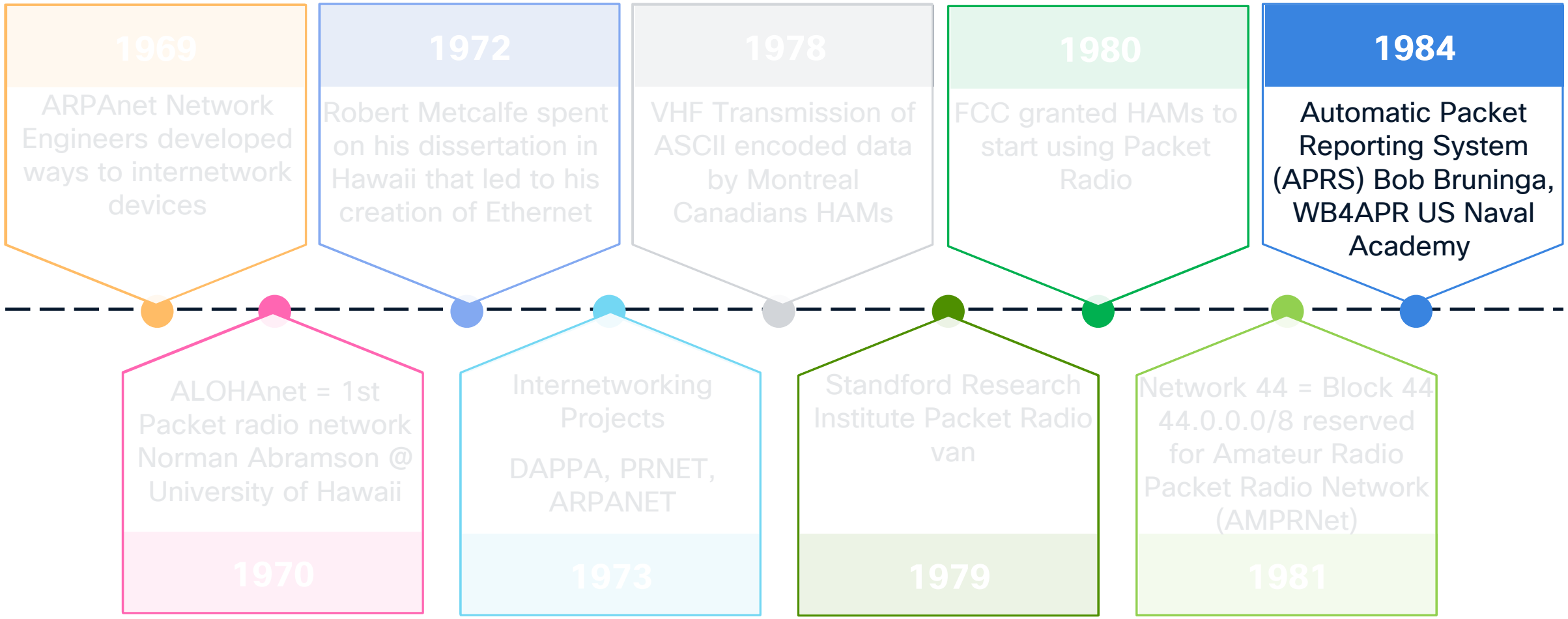

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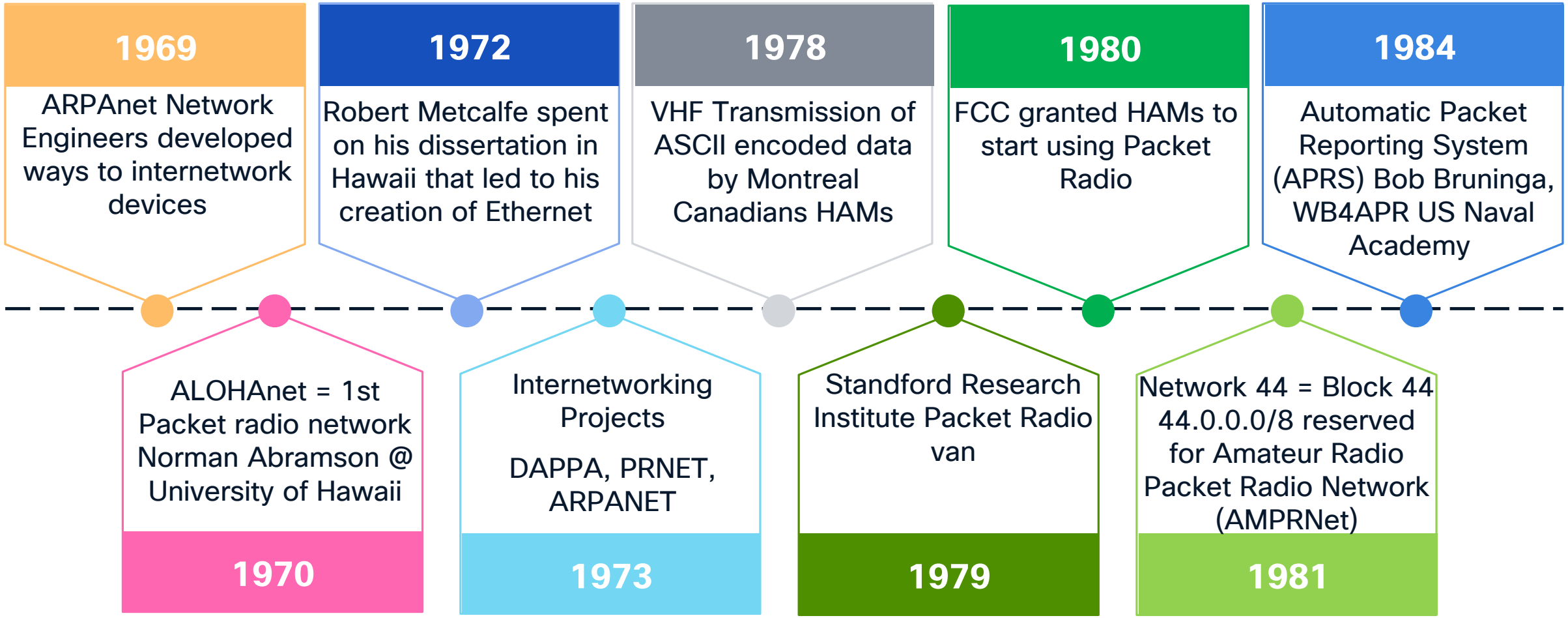

How prepared do you feel for emergency communications?

Packet Radio Networking

Components

Networking History

Packet Radio Architecture

Packet Radio Architecture

Physical Layer (Layer 1) Radio

Radio is similar to network cabling in our OSI Model

RF Engineering + Complexity

OSI Model

#CiscoCert Shortcuts

Build your self-study plan with help directly from Cisco.
Join CCNA Prep and gain access to exclusive preparation resources.

LAYER	APPLICATION/ EXAMPLE	CENTRAL DEVICE PROTOCOLS	DOD4 MODEL
APPLICATION (7) Serves as the window for users and application processes to access the network services.	End User Layer: Program that opens what was sent or creates what is to be sent	**User Applications** SMTP	Process
PRESENTATION (6) Formats the data to be presented to the Application layer. It can be viewed as the "Translator" for the network.	Syntax Layer: Encrypt & decrypt (if needed)	JPEG/ASCII/EBDIC/ TIFF/GIF/PICT	
SESSION (5) Allow session establishment between processes running on different stations.	Synch & send to ports (logical ports)	**Logical Ports** RPC/SQL/NFS/ NetBIOS names	
TRANSPORT (4) Ensures that messages are delivered error-free, in sequence, and with no losses or duplications.	TCP: Host to Host, Flow Control	TCP/SPX/UDP	Host to Host
NETWORK (3) Controls the operations of the subnet, deciding which physical path the data takes.	Packets: "letter", contains IP address	**Routers** IP/IPX/ICMP	Internet
DATA LINK (2) Provides error-free transfer of data frames from one node to another over the Physical layer.	Frames: "envelopes", contains layer 2 address (ex MAC address)	**Switch Bridge WAP** PPP/SLIP	
PHYSICAL (1) Concerned with the transmission and reception of the unstructured raw bit stream over the physical medium.	Physical structure: Cables, hubs, etc.	**Hub**	

PACKET FILTERING

LAN Base ayers

GATEWAY

Data Link Layer (Layer 2)
AX.25 v2.2

AX.25 Amateur Packet-Radio link-layer protocol

Open-source Protocol created for Amateur Packet Radio.

Amateur X.25 – it's a modified version of X.25 protocol by the International Telegraph and Telephone Consultative Committee (CCITT)

X.25 is an International Telecommunication Union Telecommunication Standardization Sector (ITU-T) standard for packet-switched data communication in wide area networks (WANs). Predecessor to protocols like Frame Relay and ATM.

OSI Model

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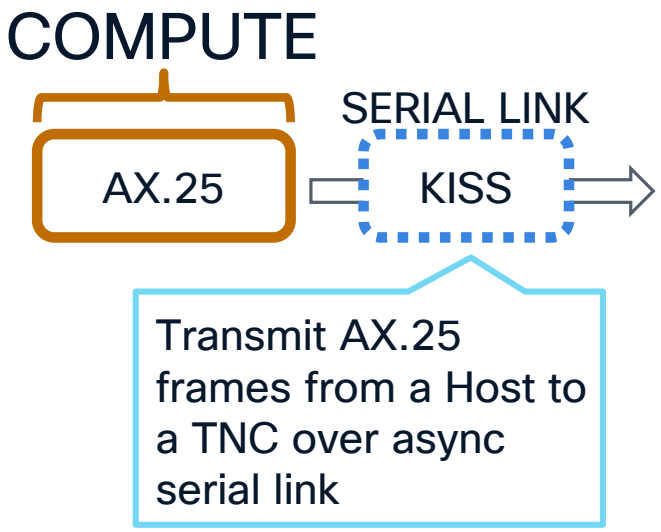
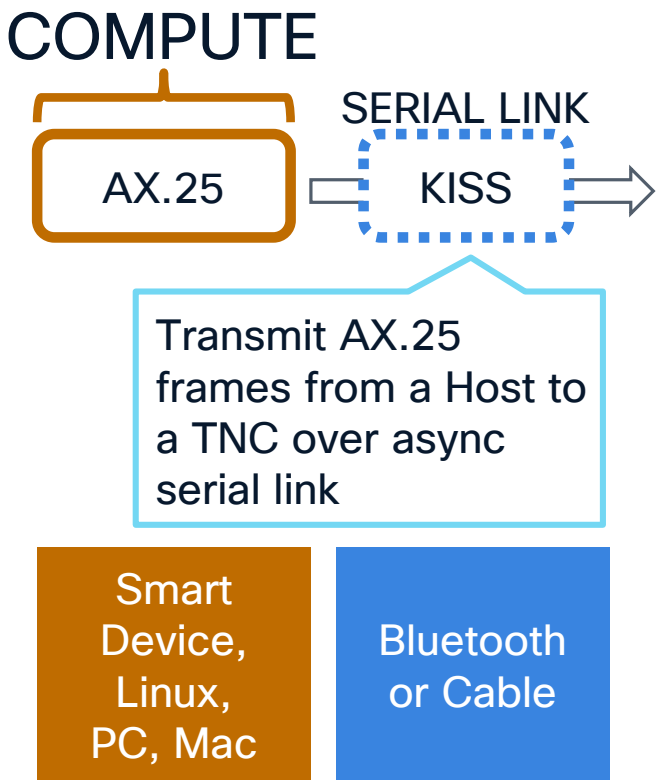
Packet Radio Architecture

Search for the HAM Easter egg

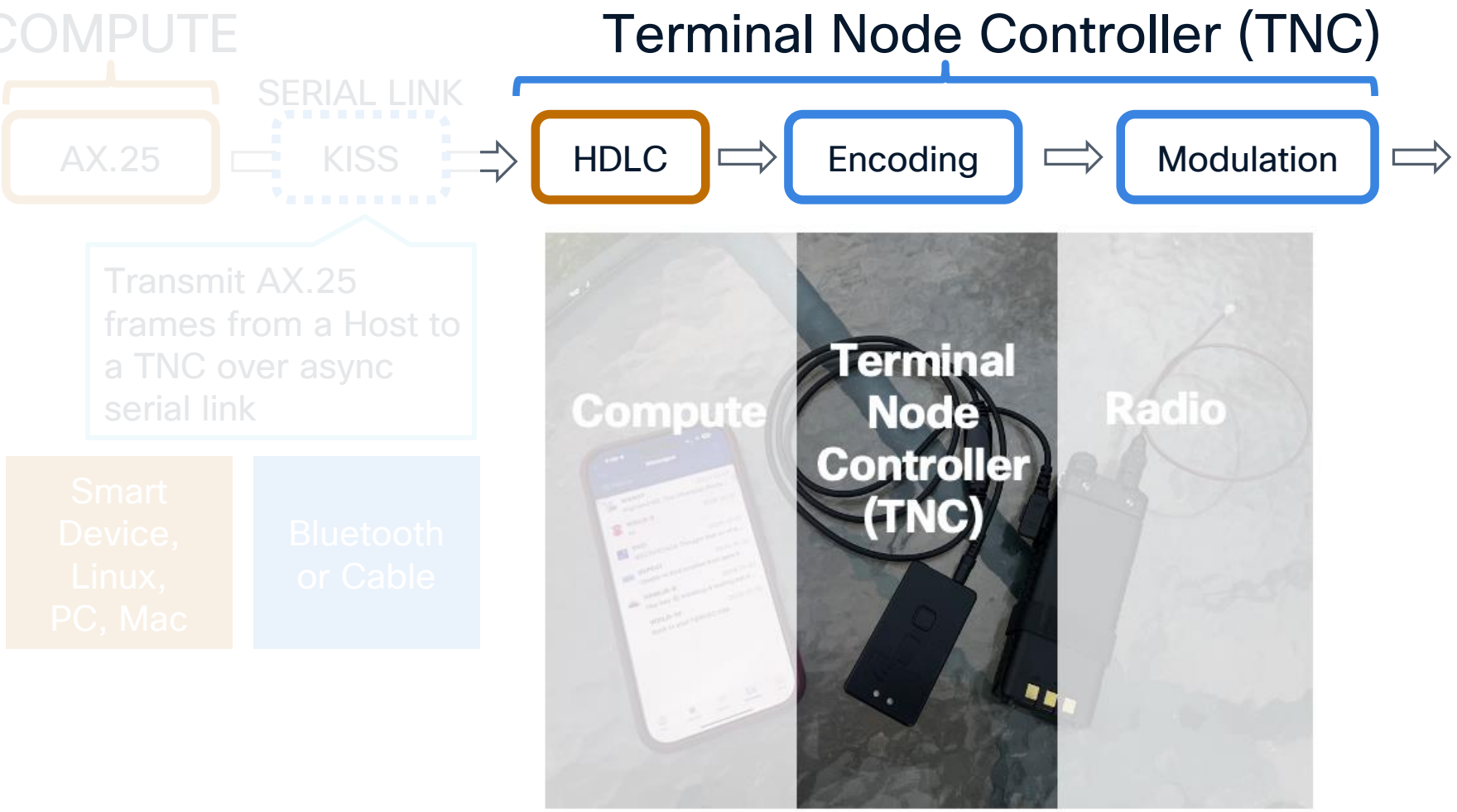
Packet Radio Architecture



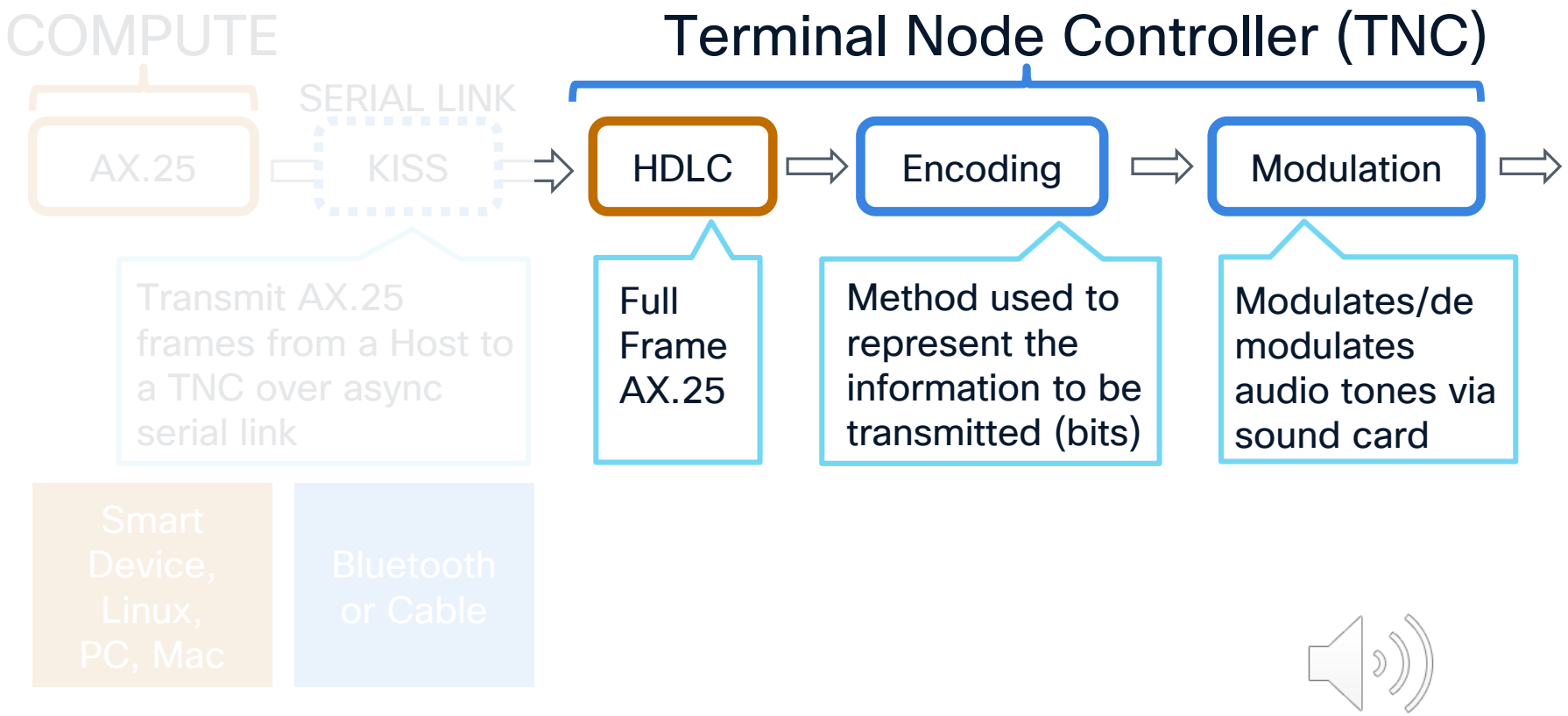
Packet Radio Architecture



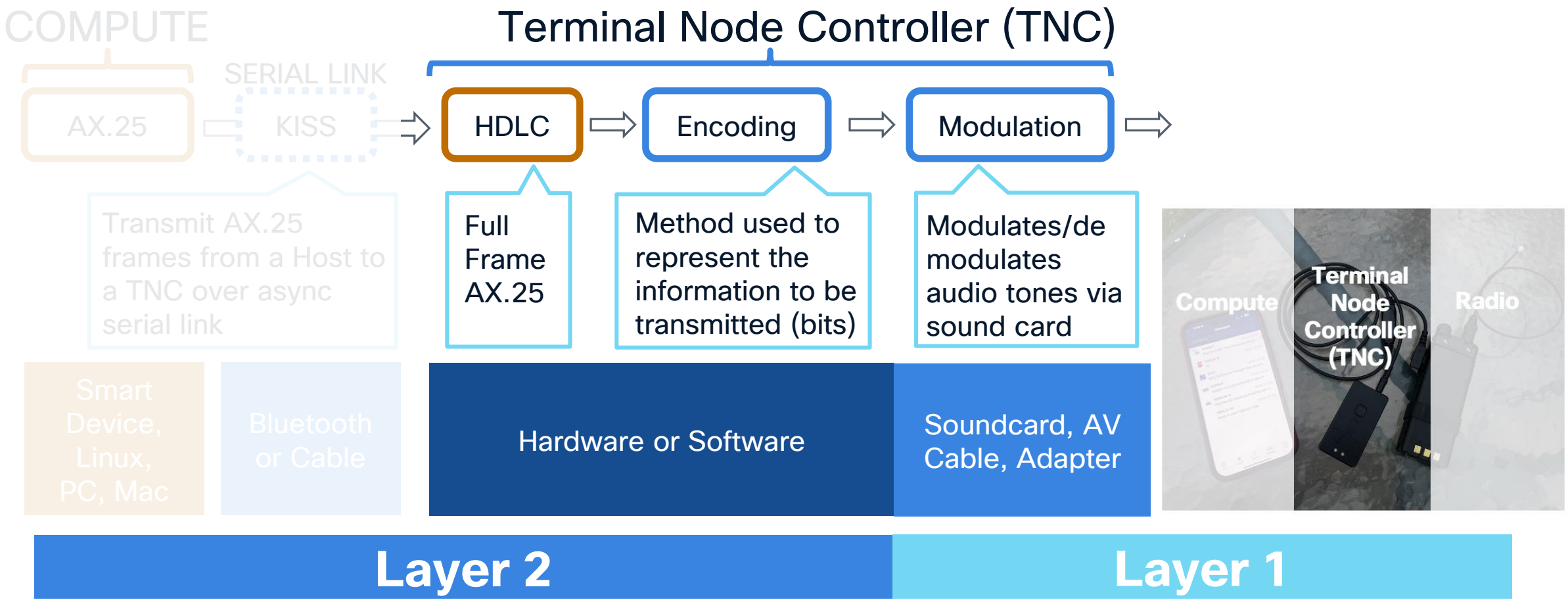
Packet Radio Architecture



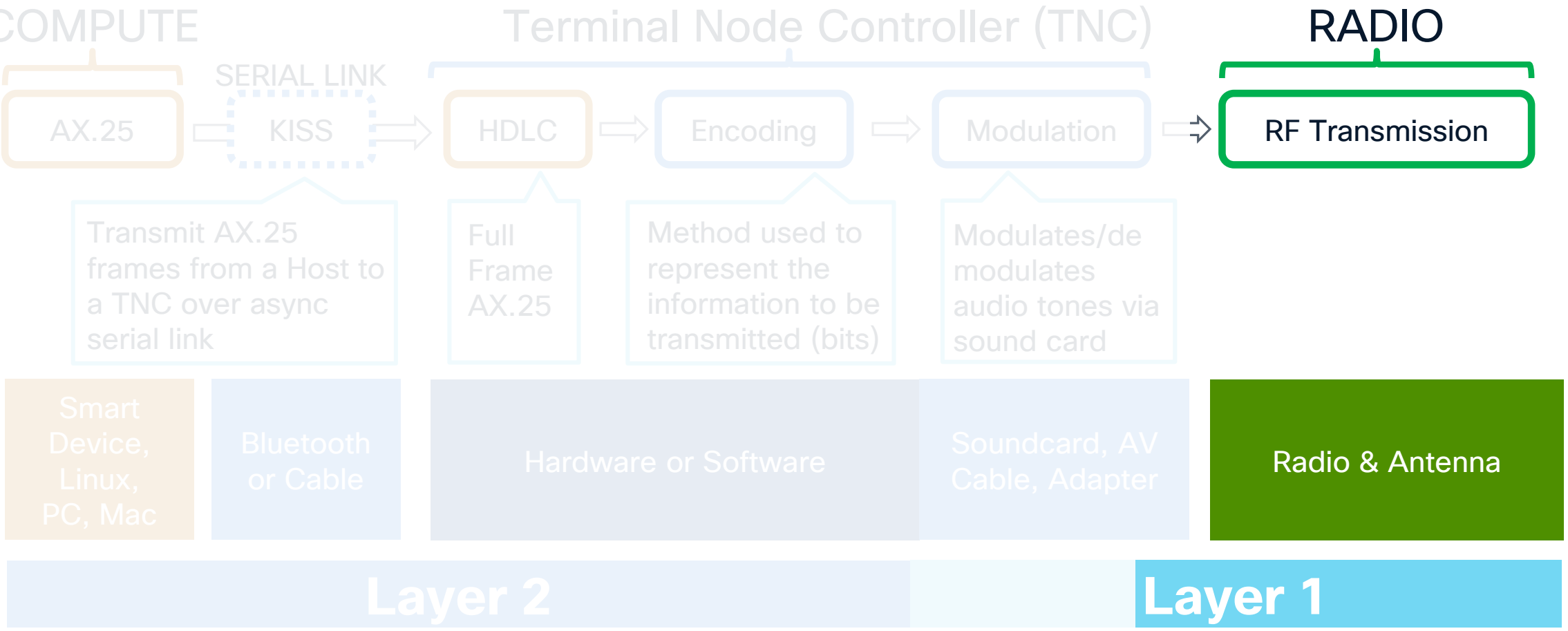
Packet Radio Architecture



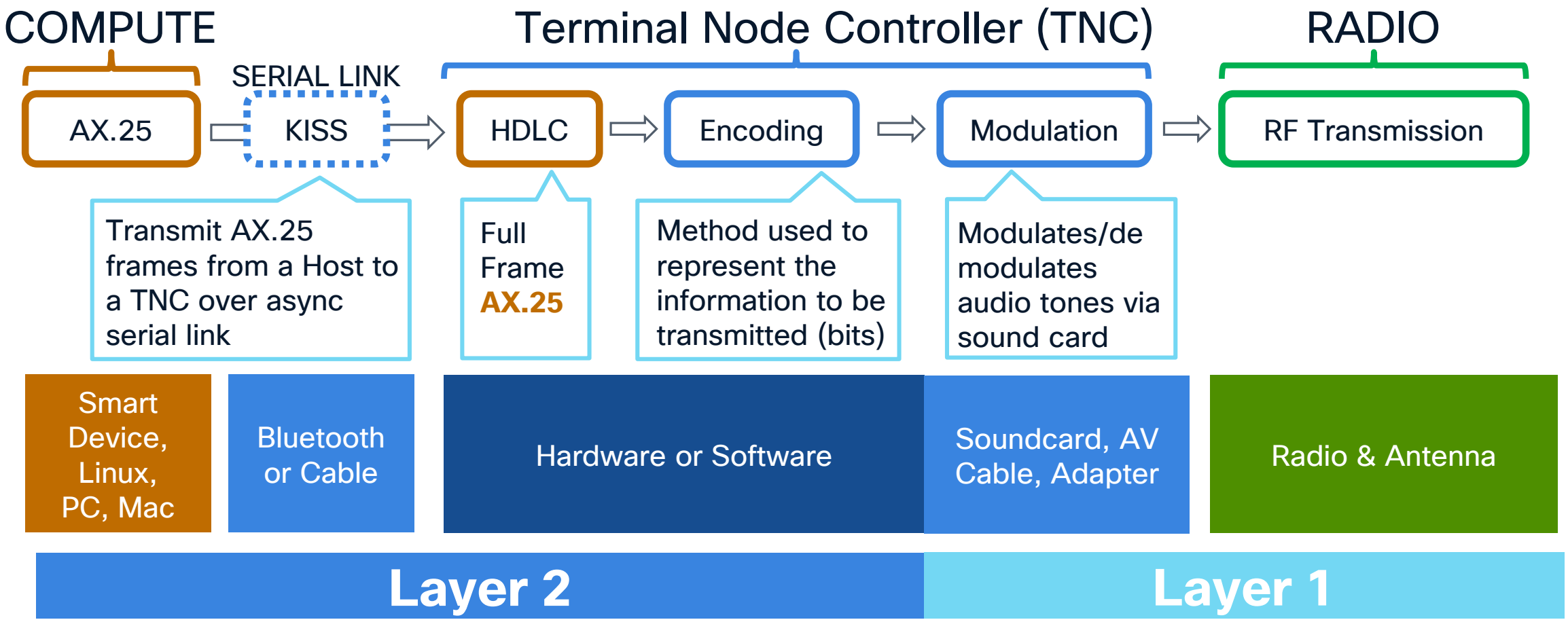
Packet Radio Architecture



Packet Radio Architecture

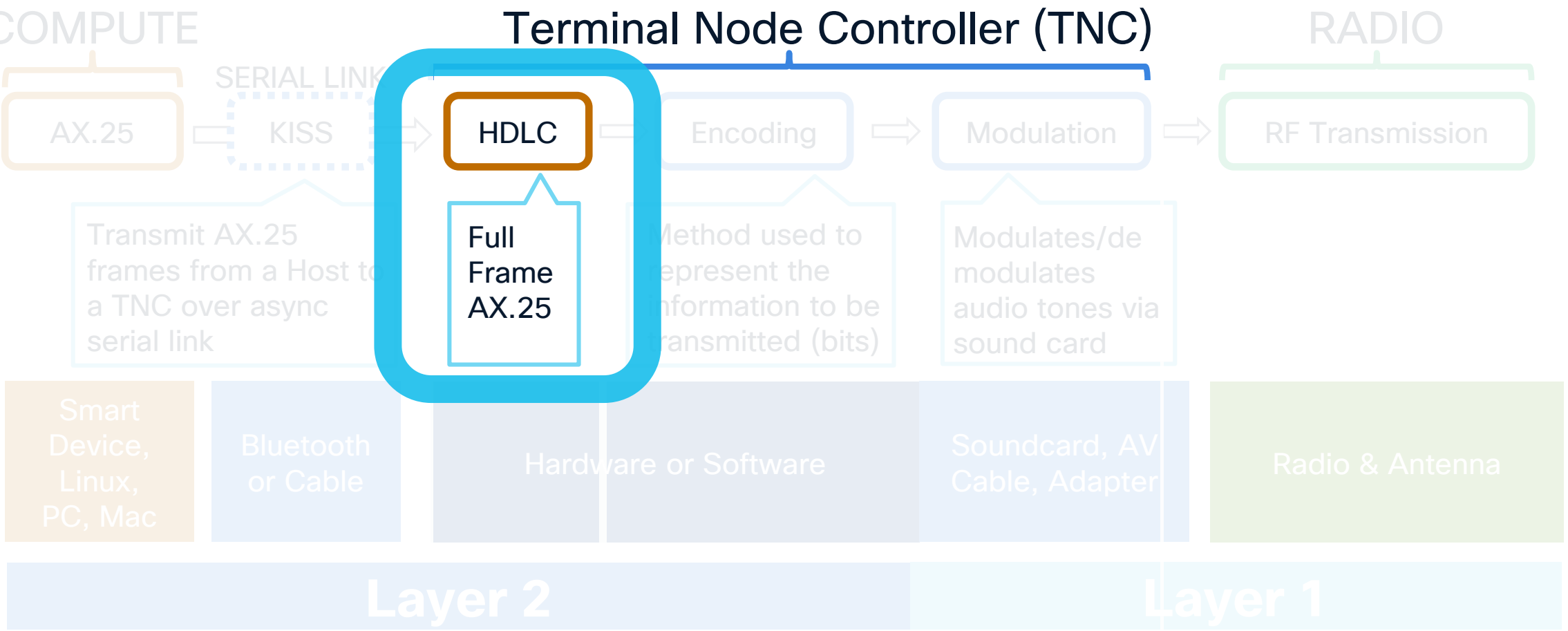


Packet Radio Architecture

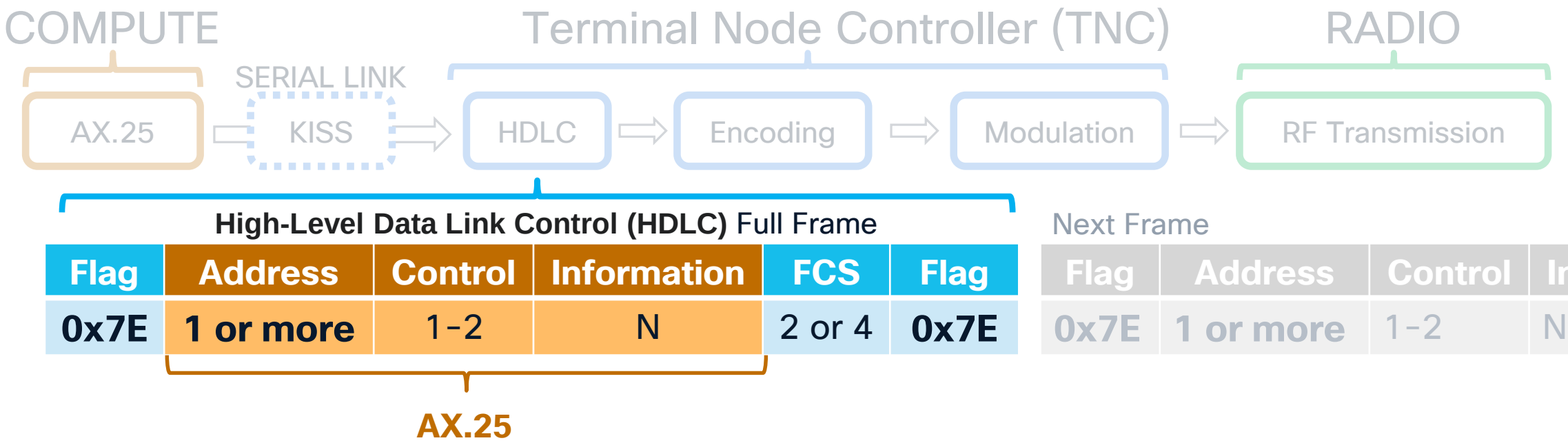


Source TAPR.org: AX.25 Link Access Protocol 2.2 Revision: 10 September 2017, 4th Edition

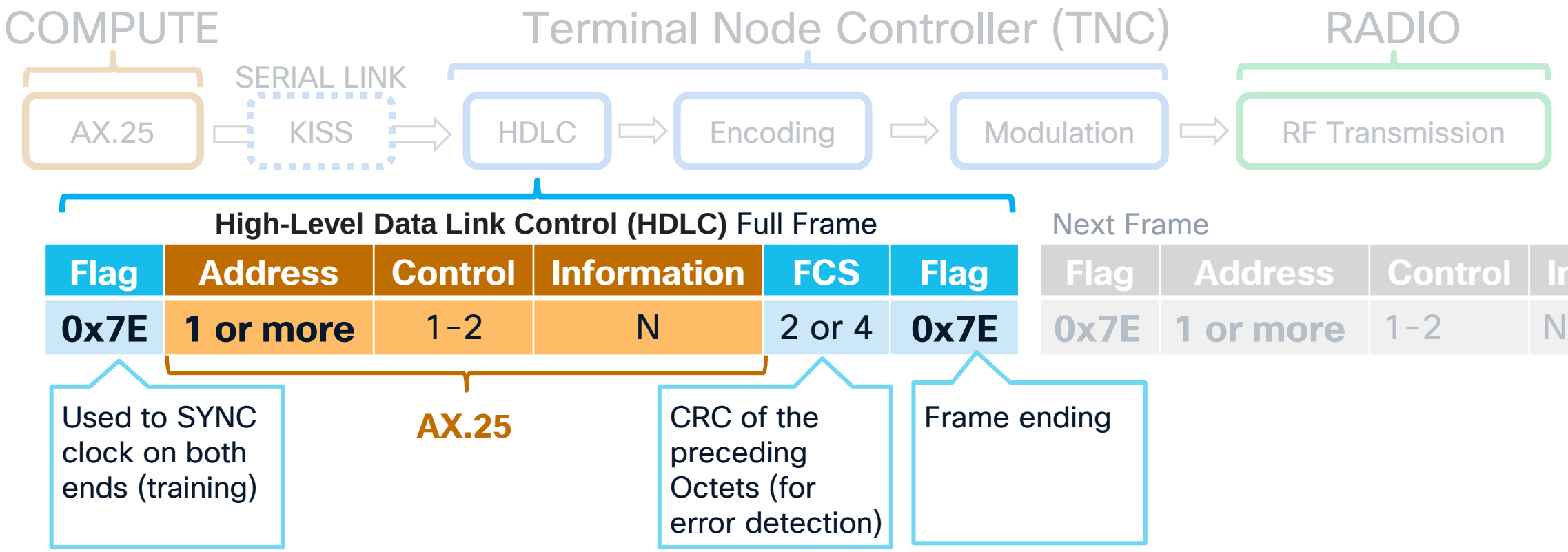
Packet Radio Architecture



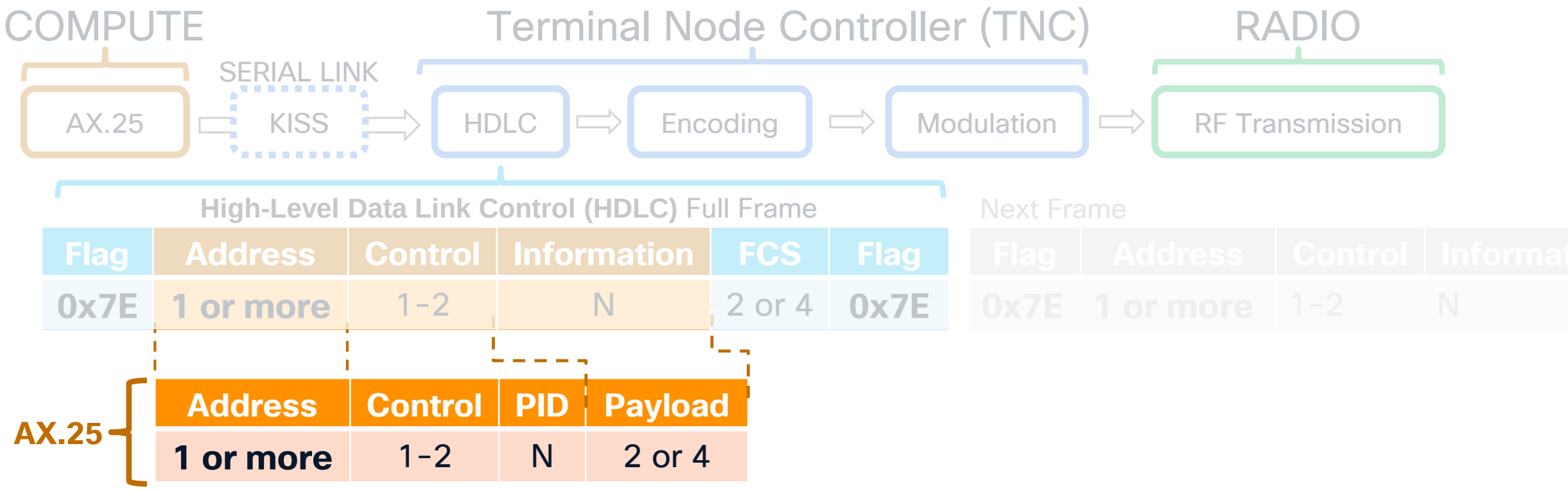
Packet Radio Architecture



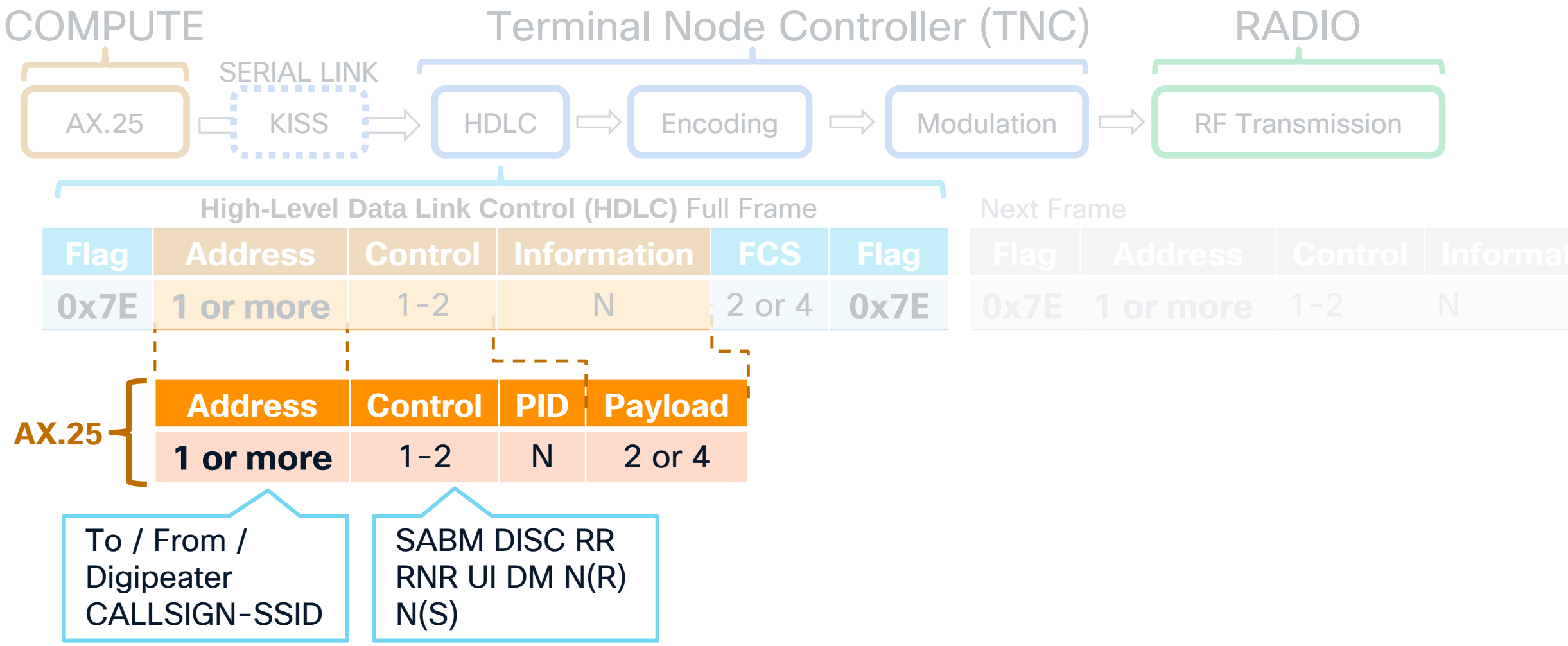
Packet Radio Architecture



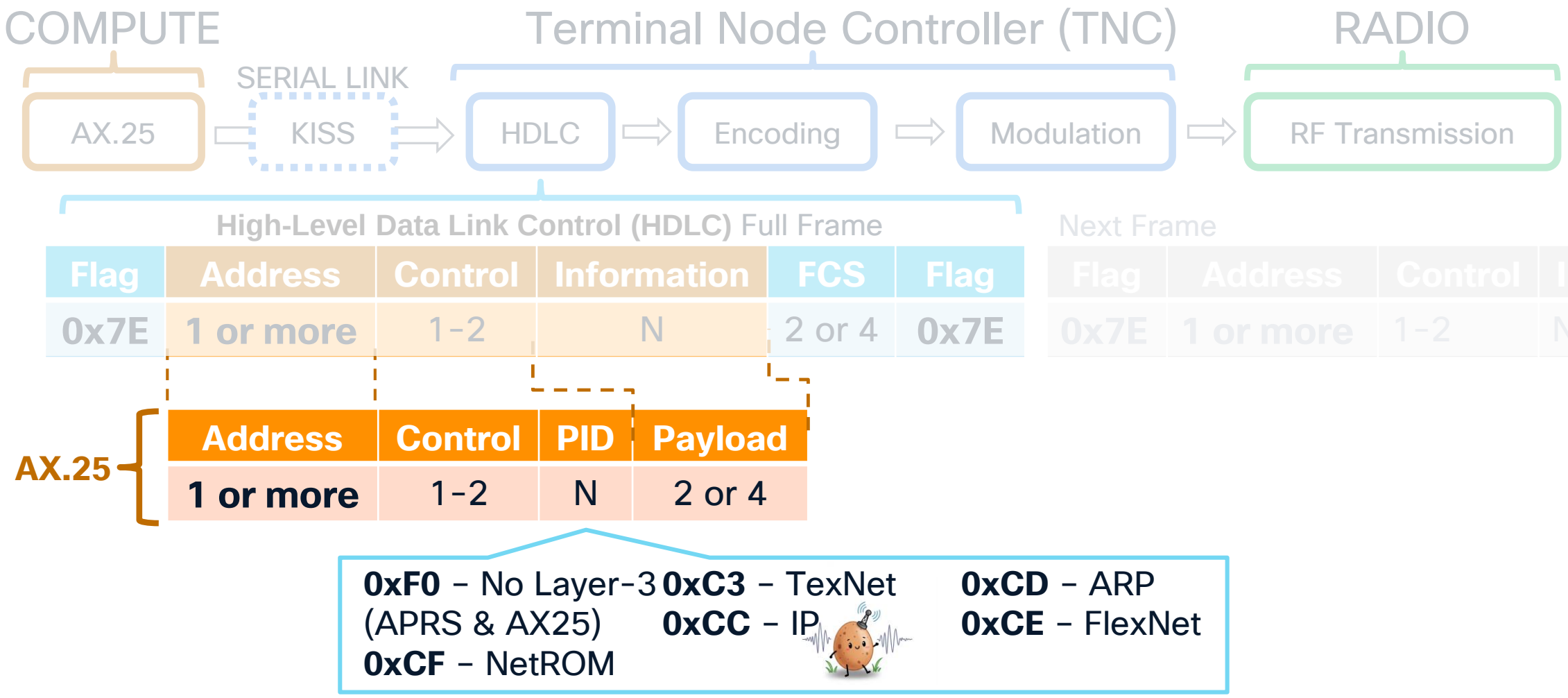
Packet Radio Architecture



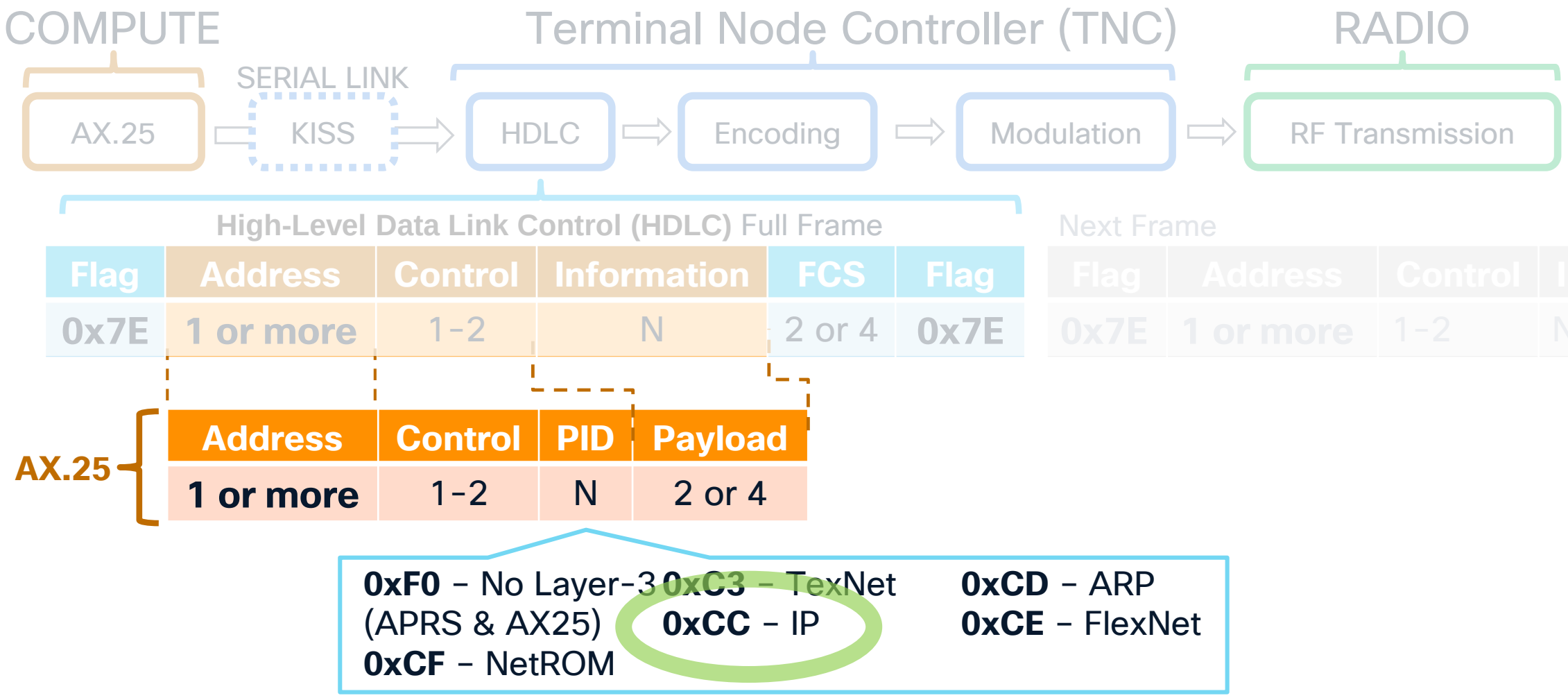
Packet Radio Architecture



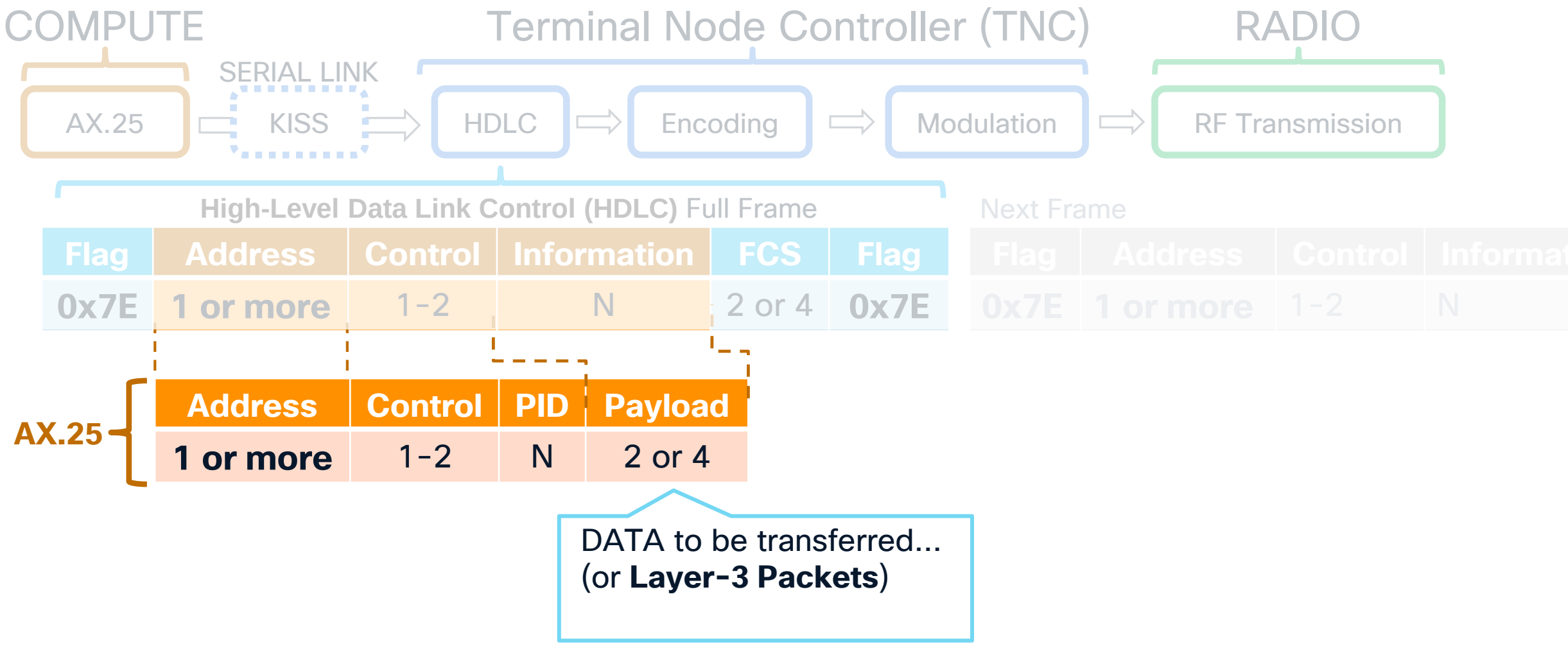
Packet Radio Architecture



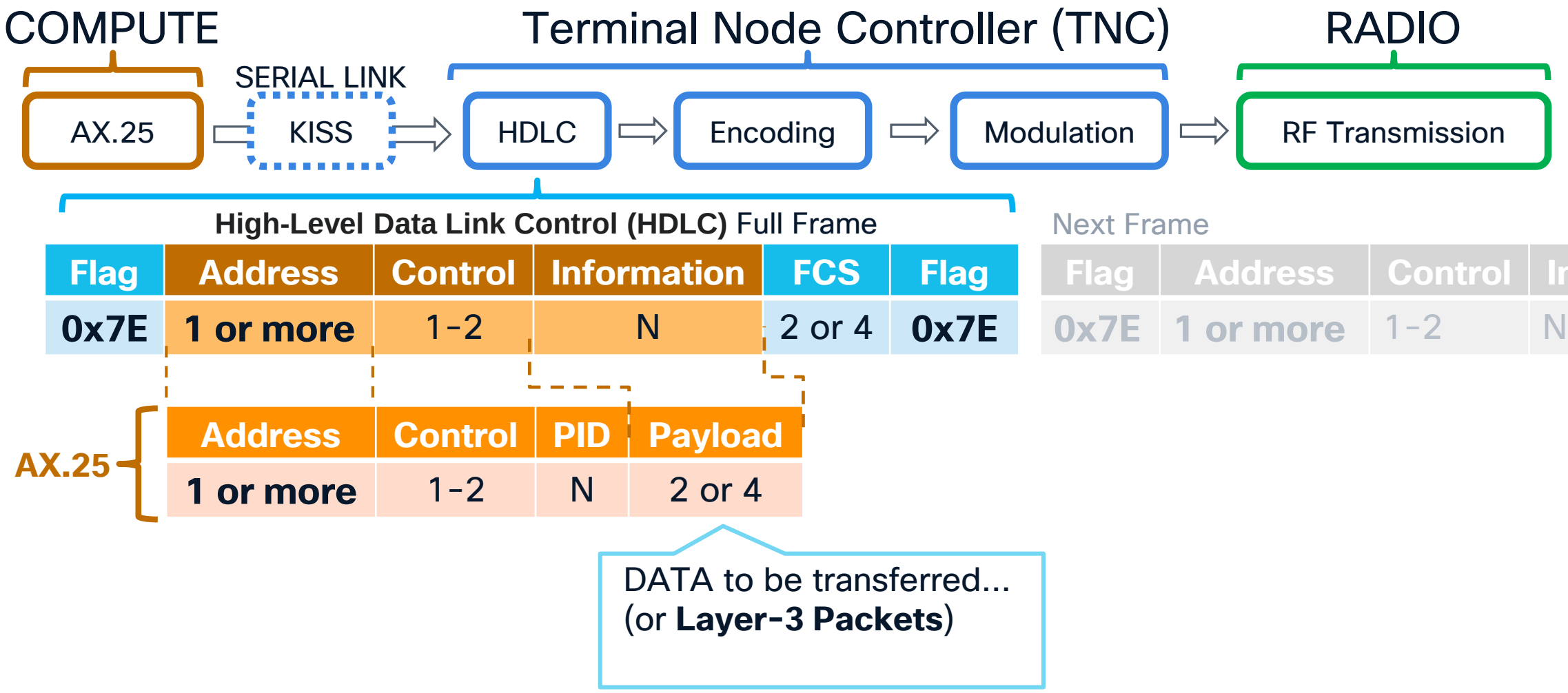
Packet Radio Architecture



Packet Radio Architecture



Packet Radio Architecture



Packet Radio Architecture

Use Cases

How are you gonna call?

Use Cases

Amateur Radio

Purpose & General uses (FCC Part 97.1)

Radio & Tech

Advancement of the radio art and technology.

Communications & Technical Skills

Advancement of radio skills in both the art of communication and technical art.

Train All Levels

Provide a trained reservoir of operators, technicians and electronics experts.

Promote Goodwill

Promote and enhance international goodwill.

Source: https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-97

Advancement & Applications of Packet Radio: Automatic Packet Reporting System (APRS)

- Popular use of Packet Radio & AX.25
- Radio built-in Support - Standard for sending GPS position data over interval based on time and speed
- Send short messages
- Large Install base and extend APRS
  - Digipeaters - Repeats packets between repeater to expand range
  - APRS iGate (Internet Gateway) - routes RF packets to the Internet.

Advancement & Applications of Packet Radio:

Winlink (Winlink 2000)

email over HF/VHF radio

- **Transmission Protocols Used with Winlink:**
  - **Packet Radio** – fully open-source, low-speed up to 9600bps
  - **VARA** – A high-efficiency modem used over HF and VHF, speed up to 24kbps.
  - **PACTOR (I-IV)** – Popular for long-distance email communications over HF.
  - **ARDOP** – An open-source protocol for HF digital communications.

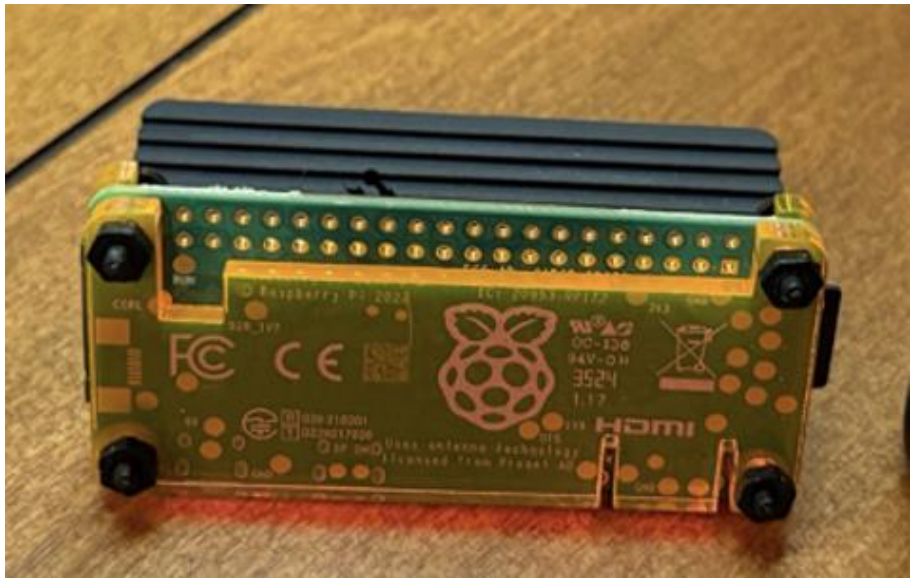
Advance Technology Open Source Projects: Hardware Radio New Packet Radio

- NPR (New Packet Radio) is a custom radio protocol, designed to transport bidirectional IP traffic over 430MHz radio links (ham radio frequencies 420-450MHz).
- https://hackaday.io/project/164092-npr-new-packet-radio

Advancing Technology Open Source Projects Hardware TNC Mobilinkd TNC4

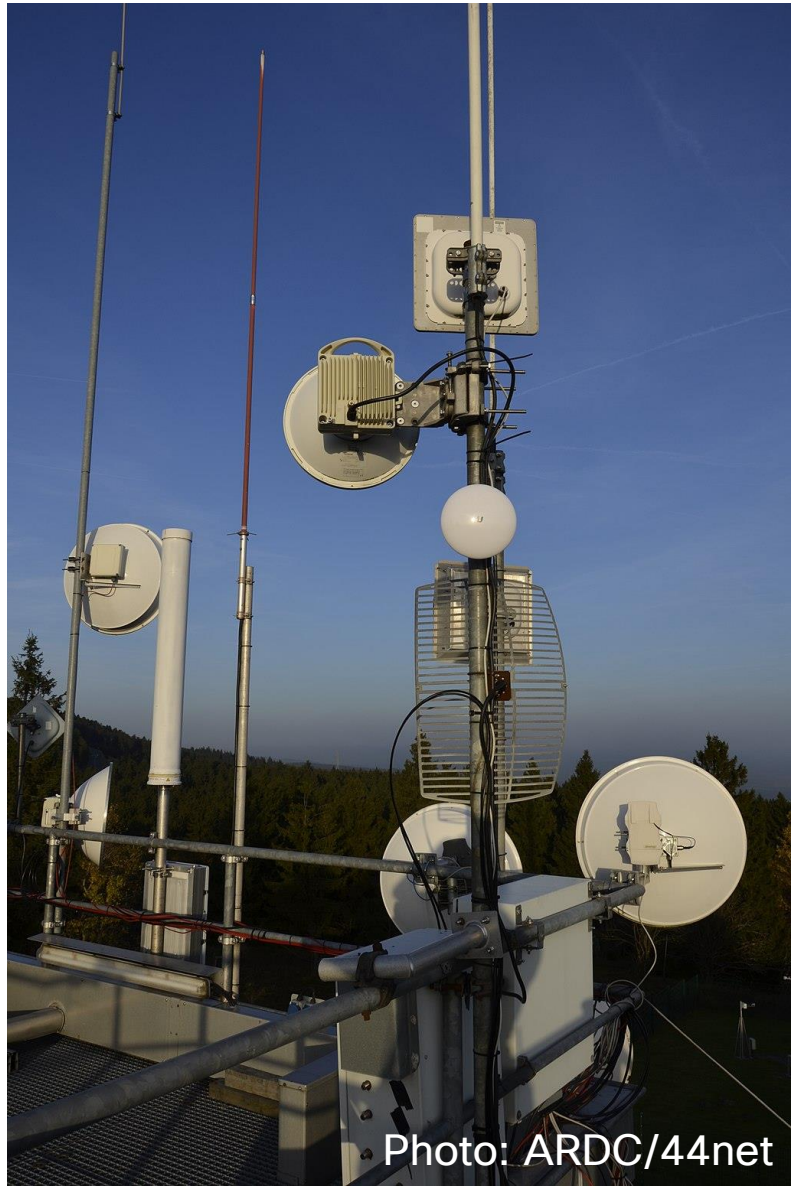
- Mobilinkd TNC – The Nucleo TNC is a breadboard implementation
- https://github.com/mobilinkd

Advancing Technology Open Source Projects Software TNC Direwolf



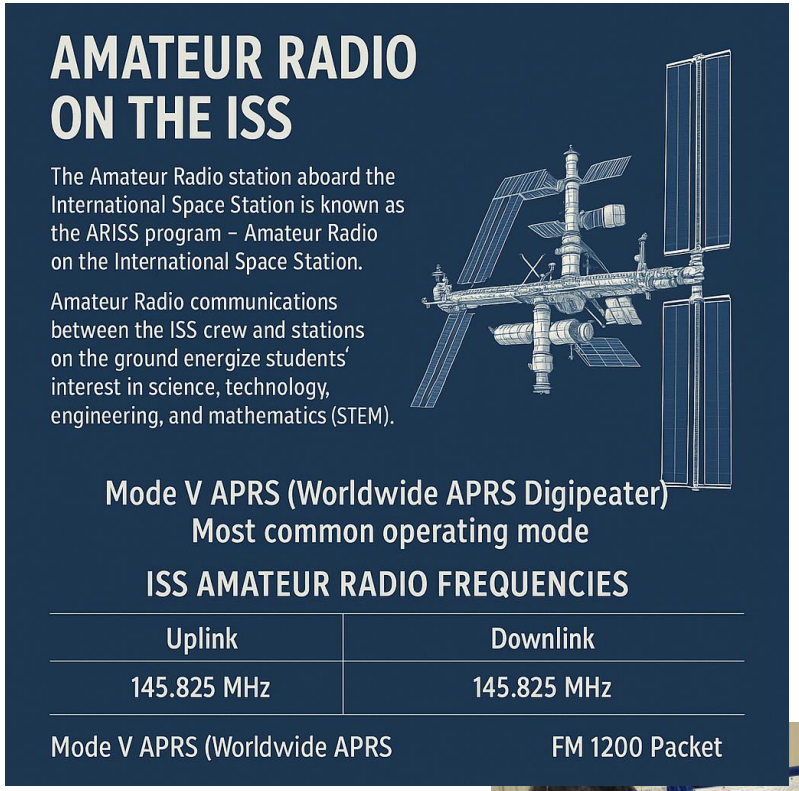
- Dire Wolf is a software “soundcard” AX.25 packet modem/TNC and APRS encoder/decoder
- Run on linux or raspberry pi
- https://github.com/wb2osz/direwolf

Advancing Technology
Wireless 2.4GHz & 5.8GHz
Highspeed Amateur Radio



- BPG Peers – https://hamnet.eu/site/index.html
- OSFP mesh Seattle/USA – HAMWAN https://hamwan.org/
- EIGRP (Babel) mesh – AREDN Mesh https://www.arednmesh.org/

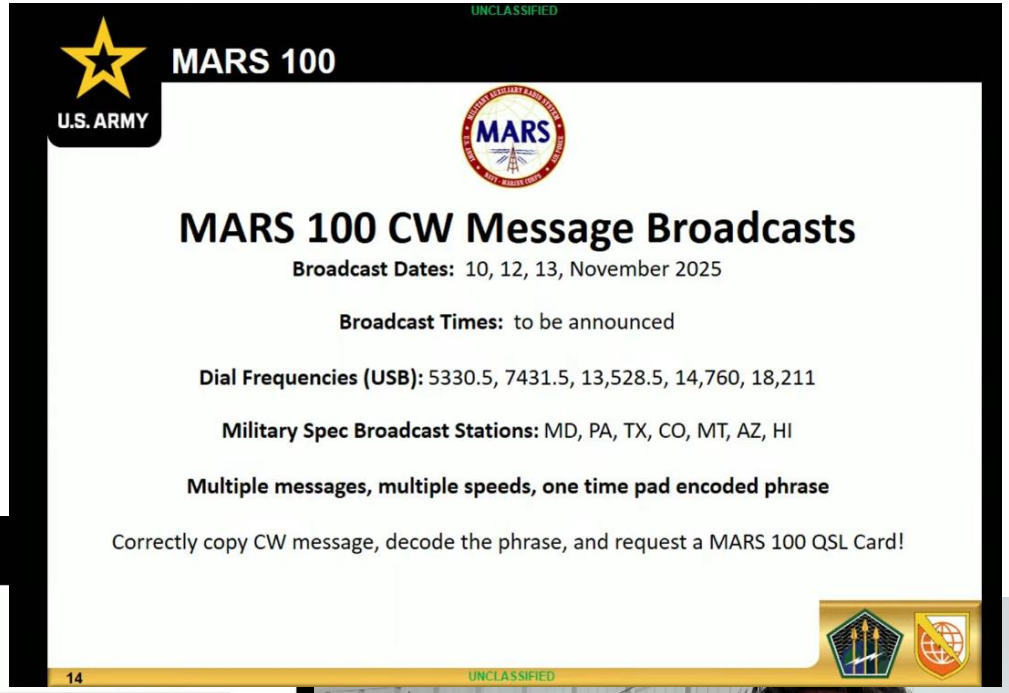
Training & STEM Education
HAM in Space

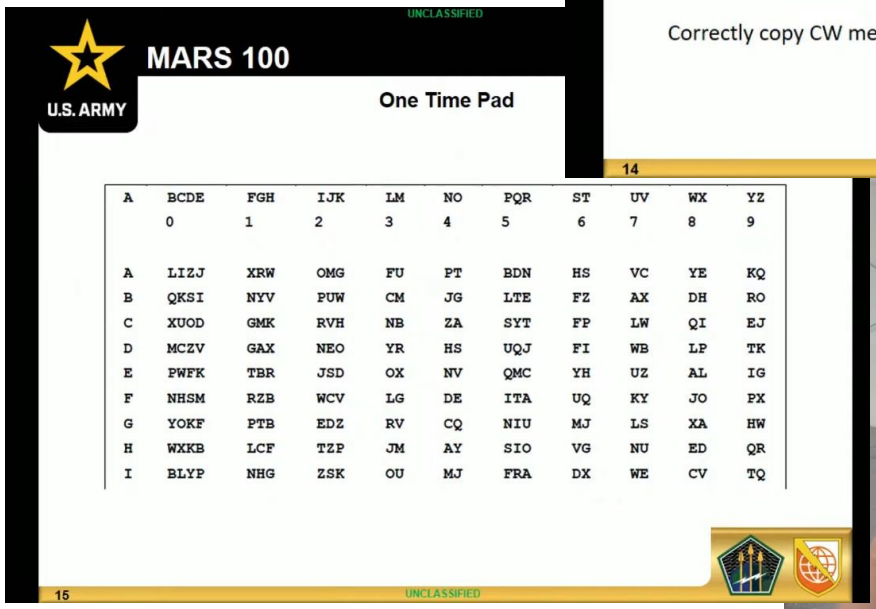


- ARISS – Amateur Radio on the International Space Station (https://www.ariss.org/)
- Worldwide APRS Digipeater
- 2025 first amateur radio contacts from aboard a SpaceX Dragon capsule (https://fram2ham.com)
- AMSAT – Radio Amateur Satellite Corporation https://www.amsat.org/

Training & STEM Education

MARS 100th Anniversary





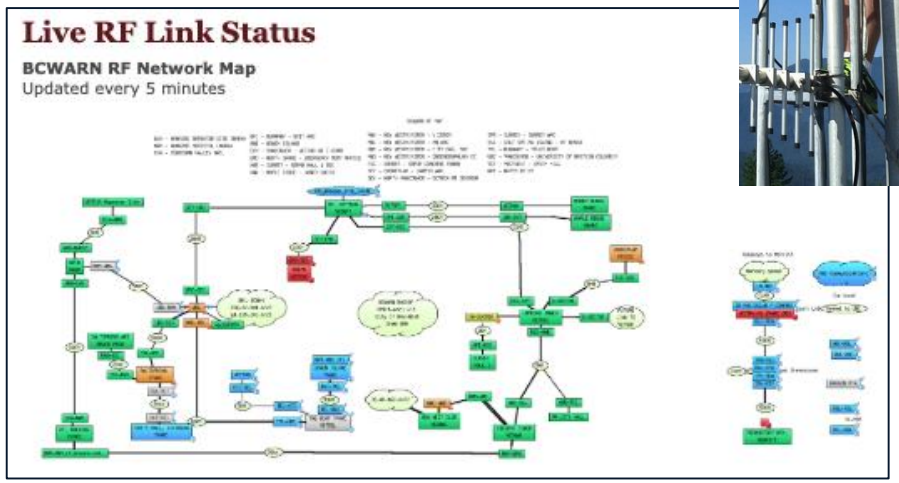
A	BCDE	FGH	IJK	LM	NO	PQR	ST	UV	WX	YZ
	0	1	2	3	4	5	6	7	8	9
A	LIZJ	XRW	OMG	FU	PT	BDN	HS	VC	YE	KQ
B	QKSI	NYV	PUW	CM	JG	LTE	FZ	AX	DH	RO
C	XUOD	GMK	RVH	NB	ZA	SYT	FP	LW	QI	EJ
D	MCZV	GAX	NEO	YR	HS	UQJ	FI	WB	LP	TK
E	PWFK	TBR	JSD	OX	NV	QMC	YH	UZ	AL	IG
F	NHSM	RZB	WCV	LG	DE	ITA	UQ	KY	JO	PX
G	YOKF	PTB	EDZ	RV	CQ	NIU	MJ	LS	XA	HW
H	WXKB	LCF	TZP	JM	AY	SIO	VG	NU	ED	QR
I	BLYP	NHG	ZSK	OU	MJ	FRA	DX	WE	CV	TQ

https://www.usarmymars.org/home

Training & STEM Education
AI and Amateur Radio

- AI Operation w/ Tim N3QE
- Generative AI for Text-to-Speech & Speech-to-Text
- Voice Synthesis by Google, Amazon, Microsoft
- International Language translation services
- Other usage: Signal Processing to filter out noise, etc

Training & Operate: British Columbia Wireless Amateur Radio Network BCWARN

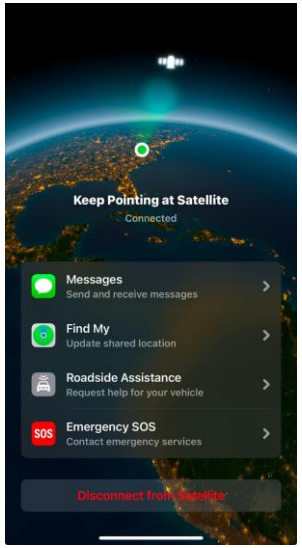


- BCWARN is an association of amateur radio groups sharing the common goal of building a high-speed data network
- 20 Years of operations wireless point to point to EOCs
- Ian Procyk, VE7HHS Cisco Wireless Solutions Engineer
- https://www.bcwarn.net/

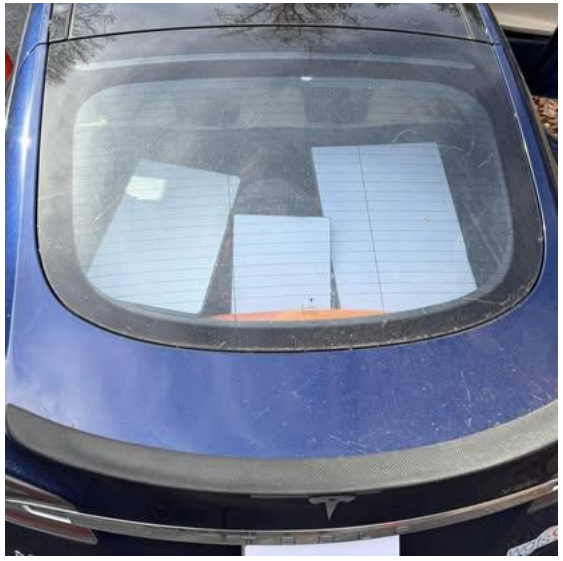
Services

Cisco IP Phones
Meraki MS

Training & Operating: Satellite Internet + Cisco Meraki + Amateur Radio



- Quick setup for Internet access
- Nontechnical personnel
- Connectivity & advanced network security that the modern world requires



Promote Goodwill:
Cisco Crisis Response Team
Network Emergency Response Vehicle (NERV)

https://www.cisco.com/c/en/us/about/csr/impact/cisco-crisis-response.html

Visit in the World of Solutions

Supported by Cisco Crisis Response (CCR), a dedicated team of Information and Communications Technology (ICT) / Emergency Communications specialists.

Promote Goodwill: Cisco Crisis Response: Response Kits

Continuity of Operations (Continuity of Government), Humanitarian Assistance and Disaster Response teams.

- **Cisco Rapid Response Kit**
- **Emergency Communication Kit**
- **Mesh Response Kit**
- **Phone Kit**

https://www.cisco.com/c/en/us/about/csr/impact/cisco-crisis-response/incident-response.html

Cisco Ultra-Reliable Wireless Backhaul (CRUWB)

Cisco ultra-reliable wireless backhaul (URWB) quickly—it's built on 802.11 standards and deploys just like Wi-Fi.

Cisco Catalyst IW9167 Heavy Duty Series Access Points

Cisco Catalyst IW9165D

Cisco Catalyst IW9165E Rugged Access Point

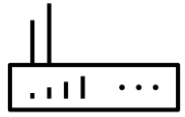
FREE IPv4 Address Space
+Special Bonus
How are you gonna call?

What use cases are you interested in building with Amateur Radio and Cisco networking? (eg drones, sensors, meshtastic, AI, etc)

Build Your Use Case = DIY

Amateur Radio

EMCOMM, Digital/Packet Radio, Contesting & fun



Cisco Networking

Core Networking Foundations

44net – IPv4 Address

IP Address Grant Space for Amateur Radio

What is 44Net

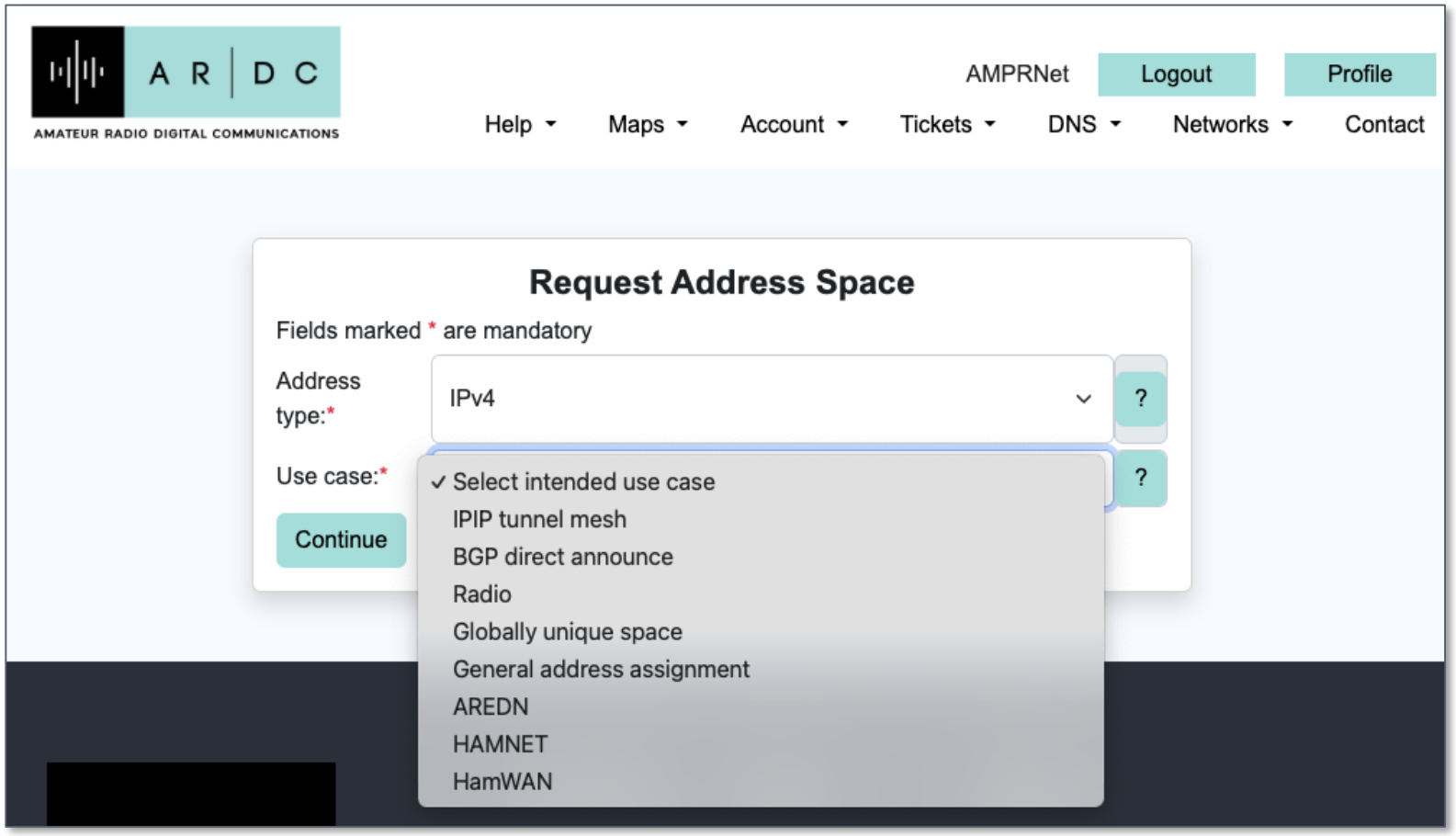
Your Use Case

44Net = AMPRNet Internet network 44 (44.0.0.0/9, 44.128.0.0/10)

44Net is managed by Amateur Radio Digital Communications (ARDC) a private foundation that exists to support amateur radio and digital communication science and technology.

Their goals are to advance state of the art Amateur Radio networking and to educate amateur radio operators in these techniques.

How to request free IPv4 Addresses from 44Net



- Details @ https://www.ardc.net/44net/
- Portal @ https://portal.ampr.org/
  - 44.63.0.0/16 IPIP Tunnel Mesh, AKA AMPRNet
  - 44.61.0.0/16 – Standalone
  - 44.31.0.0/16 BGP announced assignment

BGP = High-speed Amateur-radio Multimedia NETwork (HAMNET)

- Packet radio, fast transmission of AX25 data
- EchoLink
- WinLink2000
- Instant Messaging
- VoIP
- DATV/IP ATV
- APRS
- Amateur radio websites (exclusive HAMNET)

European-based High-speed Amateur-radio Multimedia NETwork (HAMNET) offered a multi-megabit using BGP and 44net

https://www.de.ampr.org/

https://www.darc.de/der-club/referate/ausland/english-version/

Other Cisco Live 2025 Sessions

Cisco Ultra-Reliable Wireless Backhaul (CRUWB)

- **Wednesday, June 11** 11:45 AM – 12:15 PM PDT
  - CSSEWN-1020 Building Digital Equity with Cisco Ultra-Reliable Wireless Backhaul CURWB IoT and Local Governments
- **Thursday, Jun 12** @ 10:30 AM – 12:00 PM PDT
  - BRKEWN-2049 Connectivity beyond the basics: Design and Deployment tips for MESH, WGB and URWB

Cisco Crisis Response Team

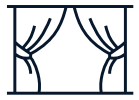
- **ALL WEEK @ World of Solutions** Cisco Crisis Response**:** Network Emergency Response Vehicle (NERV)
- **Monday, Jun 9** 1:30 PM – 2:00 PM PDT & **Thursday, Jun 12** 10:30 AM – 11:00 AM PDT
  - PP-1308 Small Team, Big Impact: How to Navigate Disasters with Cisco Crisis Response
- **Tuesday, Jun 10** 3:00 PM – 4:00 PM PDT
  - IF-1035 Backdoors and Breaches: Live! incident response tabletop session

Other Cisco Live 2025 Sessions

Satellite Internet / Starlink

- **Monday, Jun 9** @ 8:00 AM – 9:00 AM PDT
  - BRKMSI-1000 Connecting the unconnected with Starlink & Cisco validated solution
- **Tuesday, Jun 10** @ 2:00 PM – 3:30 PM PDT
  - BRKNWT-2505 Practical LEOsat Deployments – Technologies Use Cases and Outcomes
- **Tuesday, Jun 10** 2:00 PM – 3:30 PM PDT
  - BRKSEC-2173 Starlink Security Advanced

Action Items



Discover & Reach out
Next week: Workplace, Communities, Volunteer to support EMCOMM

Amateur Radio
Month: learn more about HAM & get license

Build
Quarter: Build & test use cases in your area

Share
Year share your use cases with us & others

Contact me at: jaaligna@cisco.com

Complete Your Session Evaluations

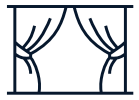
Complete a minimum of 4 session surveys and the Overall Event Survey to be entered in a drawing to win 1 of 5 full conference passes to Cisco Live 2026.

Earn 100 points per survey completed and compete on the Cisco Live Challenge leaderboard.

Level up and earn exclusive prizes!

Complete your surveys in the Cisco Live mobile app.

Continue your education



Visit the Cisco Showcase for related demos

Book your one-on-one Meet the Engineer meeting

Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs

Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand

Contact me at: jaaligna@cisco.com

Thank you & 73


CISCO