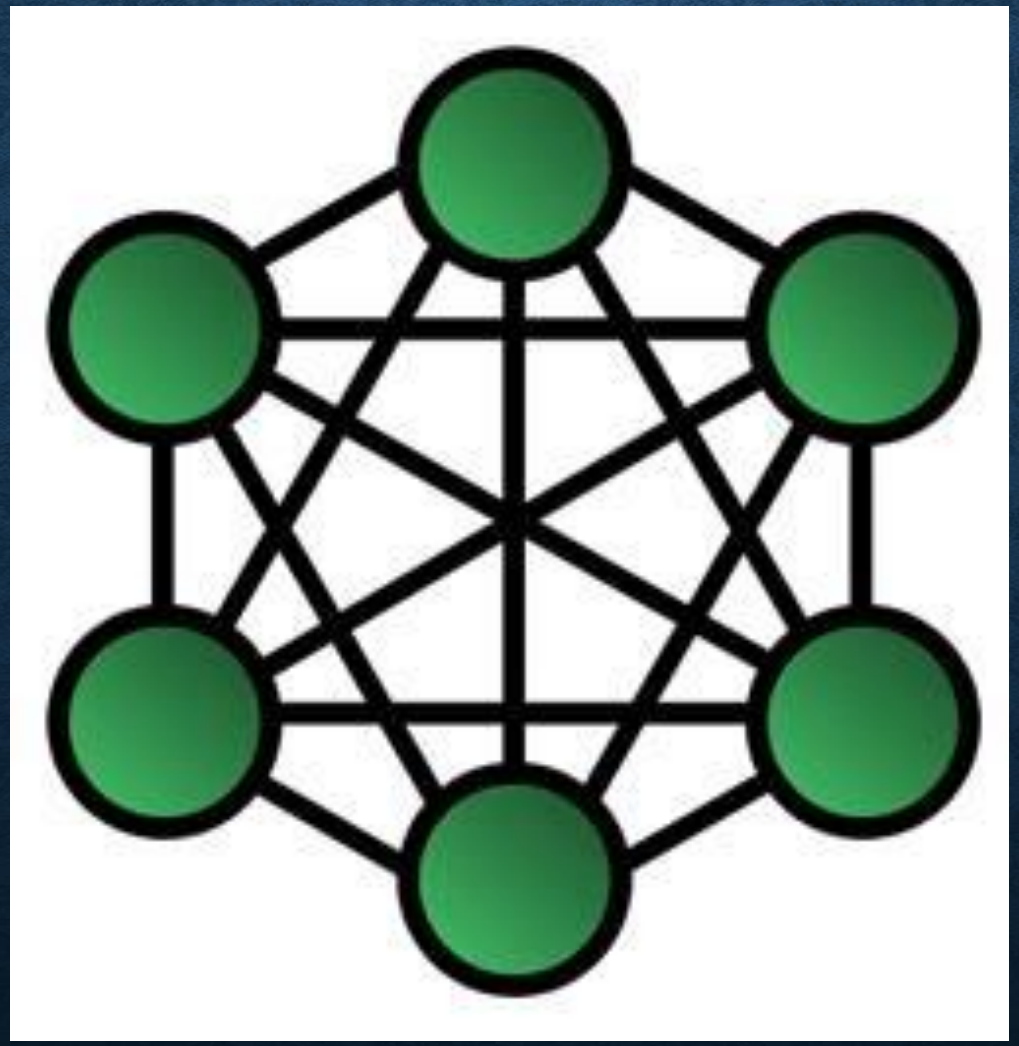
PREFACE

- The following presentation is a modified version of the original presentation by Dan Sohn, WL7COO.
- Dan is the San Joaquin Valley Section ASEC, Mariposa County's Assistant ARES EC, Deputy Mariposa County RACES Officer and CalOES ACS MAR-V AREDN Liaison.
- Dan is "ardent" about AREDN.

EMERGENCY PREPAREDNESS

- Amateur Radio Emergency Data Network

ARRL SJV AREDN, A MESH 'ISLAND' IN THE AMATEUR RADIO EMERGENCY DATA NETWORK



SJV SECTION AREDN

SJV-MESH

CREDIT WHERE CREDIT IS DUE

- I've been actively thinking about AREDN for almost 9 months, actively reading about it for almost 6 months and working hands on with it for about 5 months.
- I knew absolutely nothing, zip, zero, bubkas about Microwave for the first 66 + years of my life.
- Ken Stillwell, KF6IDK, Spencer Boyd, KJ6ART and Rich Larson, W6ABJ got me interested in this via listening to their radio conversations with 'Elmer Emeritus' Grady Williams, K6IXA on W6BXN in the fall of 2015.
- Blame Them !
- Hopefully to their credit, Jason Roydson KG6H, Dave Swickard KR6DY & Bruce Stone KK6OZL, Paul Marundee K6FAT, Robert Skegg KF6VFZ, Jerry Dunn KE6MTN and Don Melcher W6CZ have been functionally supportive and encouraging.
- Blame them too<g>
- Without the love , support and encouragement of Julie Sohn, KF6UTB I would never have undertaken this journey.

OVERVIEW

- Prepared for CalOES ACS MAR V June 27, 2016 Mtg
- Opportunities to engage and integrate AREDN with County ARES, RACES , SARComm and State CalOES ACS units abound.
- This slide show is a draft of a presentation intended to be made available for use by any Amateur to further the cause of Professional Emcomm Support by the Amateur Community.
- I received a version of this PPT from Merced ARES EC Ken Stillwell on May 10, 2016, some of it goes back more than 4 years when AREDN was just a gleam in BBHN and ARRL's HSMM's eyes.
- I am most definitely *not* a public speaker, so why am I here?
- Recognizing Ham Radio exists to perform EmComm & belief in AREDN makes me do it.

- Goals of this presentation are to:
- Get you thinking about how you can use AREDN for EmComm and Public Service events.
- Emphasize - It is up to you to decide if & when AREDN is worth the effort to you.
- Share some of what AREDN has accomplished to date.
- Encourage you to ask all of your questions by the end of this talk, then ask others which will come to you as you ponder, study and learn more.
- Have you help me learn how to more efficiently explain what AREDN is and how you can participate thereby ensuring it will contribute to the future of Amateur EmComm and Public Service support.

AREDN HISTORY

- HSMM, or High Speed Multimedia, is the name of an ARRL sponsored technical Working Group dating back to January 2001.
- By January 2006 dissatisfied with ARRL's unwillingness to communicate the Working Groups Recommendations to the FCC, all but one member resigned.
- Inthat short period HSMM spawned BroadBand HamNet (BBHN) and several other similar efforts.
- In February of 2014 the BBHN Development Team agreed to enhance and extend the Linksys WRT54G genre of HSMM to better serve EmComm purposes.
- Amateur Radio Emergeny Network AREDN was born with the goal of utilizing Wireless Internet Service Provider (WISP) Commercial Radios.
- Google "ARRL HSMM Working Group" for more details, it is a fascinating read.

SO… WHAT AND WHY IS AREDN

- AREDN's design intent is to provide an Internet like Communications capability to support Organized EmComm that can function independently of the Power Grid and the Internet.
- As Amateur Radio Clubs investigate, test and experiment with AREDN, each can decide to what extent they will adhere to AREDN's design intent.
- During this process they will realize that achieving those lofty goals will be easier than it sounds.
- Recognizing how easily an AREDN 'Island' can evolve, those who do get involved tend to collaborate and interconnect with adjacent 'islands'.
- AREDN has been growing at an accelerating rate for the 8 months I've been aware of it.

- Major Differences between WiFi and Amateur HSMM / AREDN
- PART 15 licensing, devices, users and business are much more limted than Amateurs wrt EIRP power levels and available frequencies.
- Part 15 WISPs have built a business based on a very shaky “wild west” type frequency allocation.
- Amateurs can use any antenna we can build limited to the Part 97 1,500 watt EIRP limitation. This is also true for Tech Licenses.
- Practically, we do not need to make use of even 1 watt of transmitter output power. Cross polarized Planar and Dish Antennas make it happen.
- We may not ‘encode’ traffic on Amateur Frequencies not **otherwise permitted** by Part 97.
- We may transmit traffic by any means at our disposal on behalf of all Emergency Communications efforts for protection of life and property.
- We are encouraged to make use of state of the art, publicly specified, security, reliability and non-repudiation technology.
- If the above 3 lines above are not clear, lets sort that now.

THE ELEPHANT IN THE ROOM

- Can we transport Served Agency encrypted data streams while transmitting clear text SSID and Part 97 Call Signs at appropriate intervals?
- That is an area that 'Armchair Lawyers' will debate into eternity and is, in practice, irrelevant. The FCC has never made an issue of Amateurs transmitting a data stream for a Served Agency in whatever form it has been created, including wrapped in 256 bit AES and similar.
- Actually read Part 97, it is well worth the time.
- Download and search Part 97 for 'encryption'. You won't find it.
- We are encouraged to use all publicly specified means of assuring: Security, Reliability and Non-repudiation of all traffic we handle for EmComm and Public Service. (you are expected to memorize this <g>)

WHAT DO I DO NEXT?

- Memorize www.AREDN.org.
- Click on the page labeled “Documentation”.
- Scroll down till you see; ‘New Paper on AREDN Published by TAPR’
- http://www.aredn.org/content/new-paper-aredn-published-tapr
- It is 14 pages and will tell you how AREDN is structured.
- Share it with your friends and family.
- Talk with your friends and family.
- Keep reading the ‘Forums’ on AREDN.org, it is the Mother Lode of useful AREDN how to.
- When you want to post a question or comment register, all you need is a legit callsign.
- Take a look at some of the links you’ll find on AREDN.org like …….

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

www.aredn.org

The Orange County (Broadband-Hamnet/AREDN) Mesh Organization

www.ocmesh.org

Santa Clara County OES, California ARES®/RACES

www.scc-ares-races.org/mesh/

Wireless Networking in the Developing World is a free book about designing, implementing, and maintaining low-cost wireless networks. See more at: www.wndw.net

www.wndw.net

WIRELESS NETWORKING IN THE DEVELOPING WORLD

- Memorize or make note of ‘ wndw.net ‘.
- There you can download a free, full color e-book PDF version of the book shown on the slide above. This freely distributable, i.e. can email it to you.
- You can purchase a Black and White version of the published book on Amazon for $17.83 PRIME.
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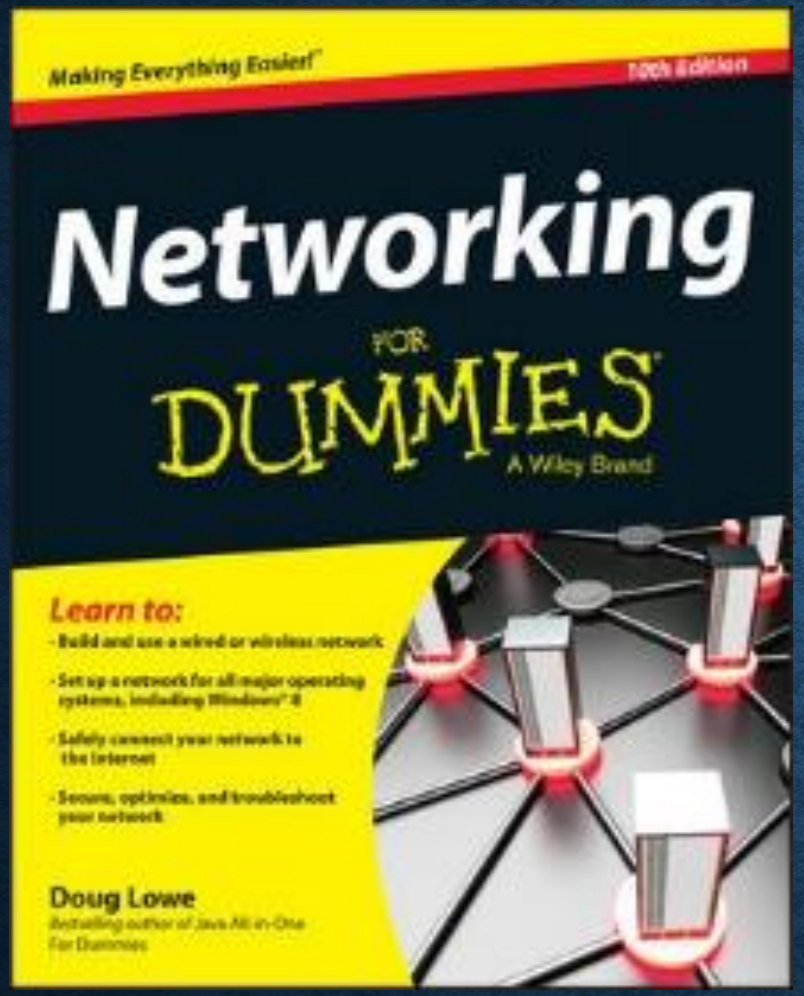
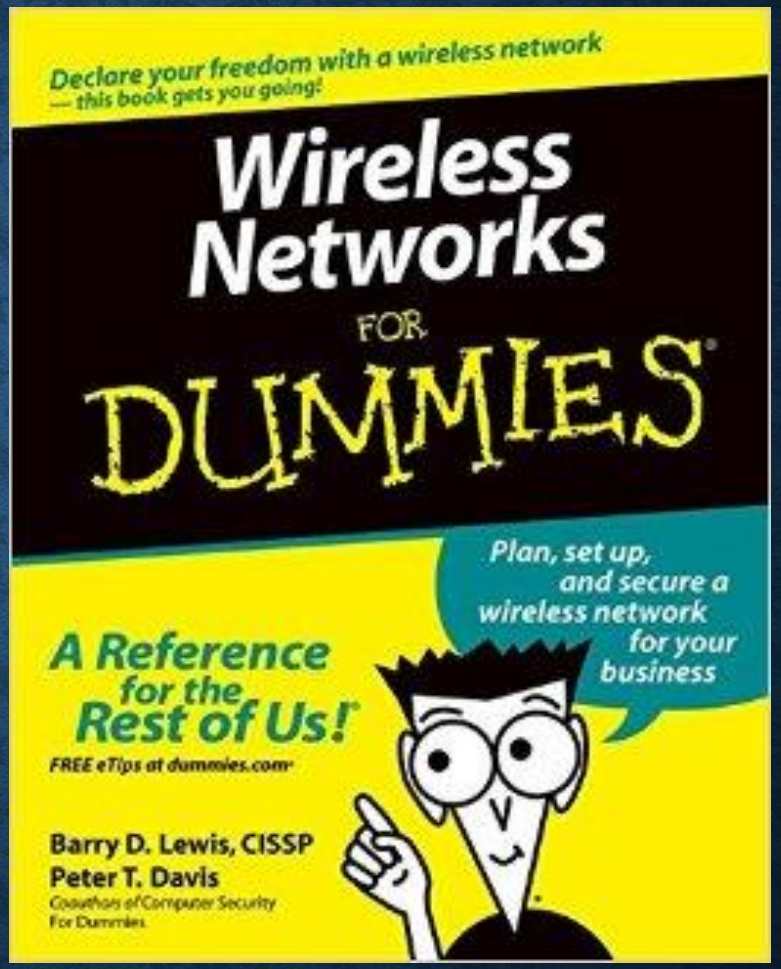
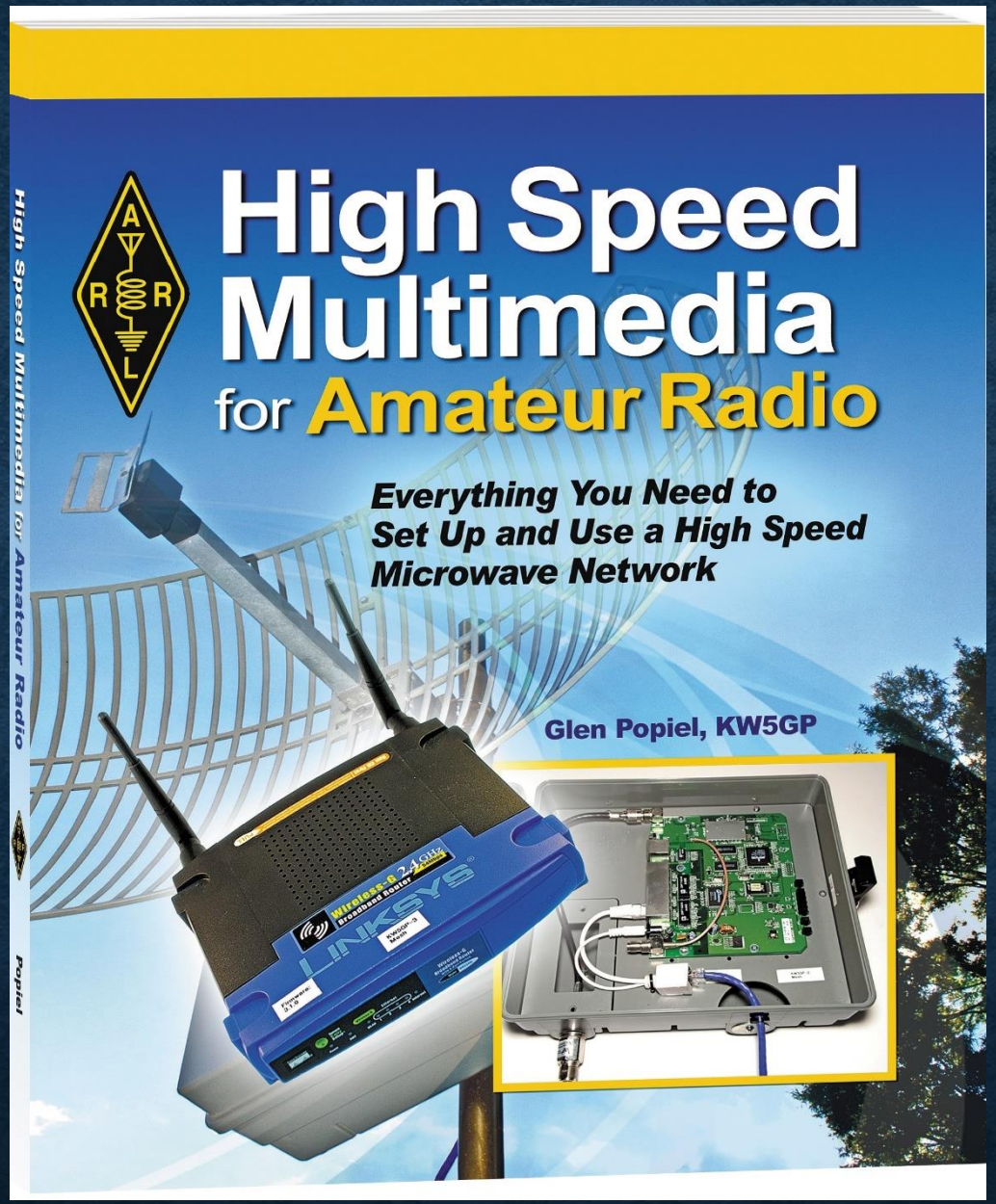
- wl7coo@arrl.net or sohn@sti.net
- It is an excellent text, easy to read and a comprehensive intro to both networking and microwave.





www.dummies.com/store/Computers-Internet/Networking.html



JUST PUBLISHED BY ARRL MARCH 2016

WHY DOES AMATEUR RADIO EXIST ?

- If/when you actually read Part 97, you learn that Amateur Radio Frequency Authorizations exist in order to create and maintain a diversely located population of ‘Amateur ‘ Emergency Communicators.
- Amateur as in non commercial, non governmental organized volunteer entities capable of and willing to undertake Emergency Communications, whenever & wherever needed.
- Your presence here suggests you do understand that trained, equipped and disciplined Amateurs are a National Emergency Response Resource.

US Amateur Radio Bands

US AMATEUR POWER LIMITS

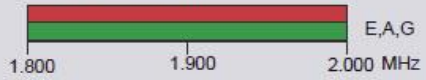
At all times, transmitter power should be kept down to that necessary to carry out the desired communications. Power is rated in watts PEP output. Except where noted, the maximum power output is *1500 Watts*.

Effective Date
February 23, 2007

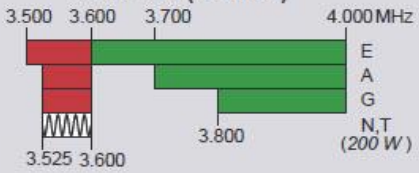
Published by:
ARRL The national association for AMATEUR RADIO™
www.arrl.org
225 Main Street, Newington, CT USA 06111-1494

160 Meters (1.8 MHz)

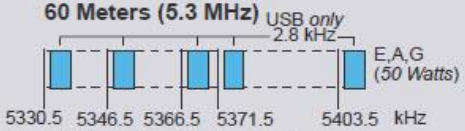
Avoid interference to radiolocation operations from 1.900 to 2.000 MHz



80 Meters (3.5 MHz)

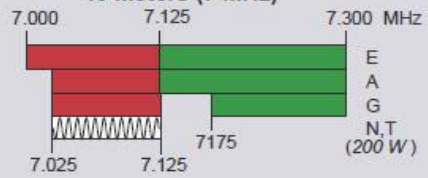


60 Meters (5.3 MHz)



General, Advanced, and Amateur Extra licensees may use the following five channels on a secondary basis with a maximum effective radiated power of 50 W PEP relative to a half wave dipole. Only upper sideband suppressed carrier voice transmissions may be used. The frequencies are 5330.5, 5346.5, 5366.5, 5371.5 and 5403.5 kHz. The occupied bandwidth is limited to 2.8 kHz centered on 5332, 5348, 5368, 5373, and 5405 kHz respectively.

40 Meters (7 MHz)

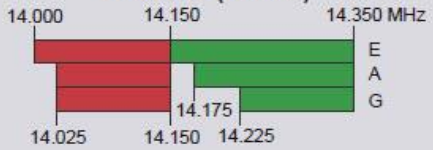


Phone and Image modes are permitted between 7.075 and 7.100 MHz for FCC licensed stations in ITU Regions 1 and 3 and by FCC licensed stations in ITU Region 2 West of 130 degrees West longitude or South of 20 degrees North latitude. See Sections 97.305(c) and 97.307(f)(11). Novice and Technician licensees outside ITU Region 2 may use CW only between 7.025 and 7.075 MHz. See Section 97.301(e). These exemptions do not apply to stations in the continental US.

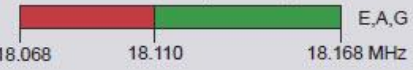
30 Meters (10.1 MHz)

Avoid interference to fixed services outside the US.

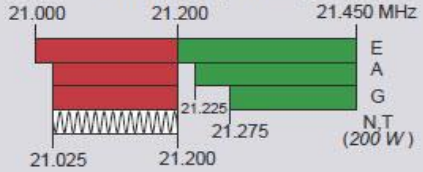
20 Meters (14 MHz)



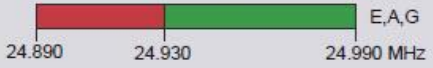
17 Meters (18 MHz)



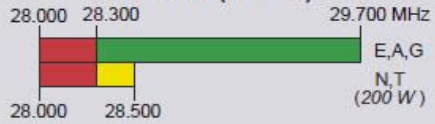
15 Meters (21 MHz)



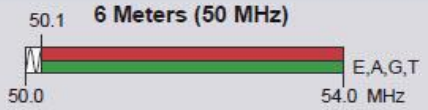
12 Meters (24 MHz)



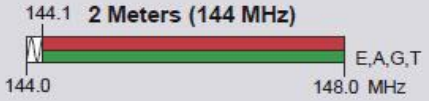
10 Meters (28 MHz)



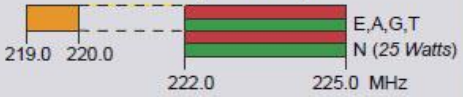
6 Meters (50 MHz)



2 Meters (144 MHz)

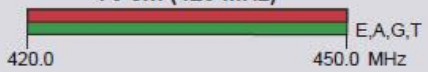


1.25 Meters (222 MHz)

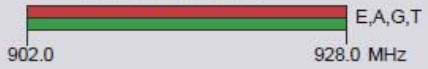


*Geographical and power restrictions may apply to all bands above 420 MHz. See *The ARRL Operating Manual* for information about your area.

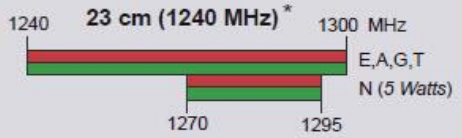
70 cm (420 MHz)*



33 cm (902 MHz)*



23 cm (1240 MHz)*



All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz	10.0-10.5 GHz	122.25-123.0 GHz
2390-2450 MHz	24.0-24.25 GHz	134-141 GHz
3300-3500 MHz	47.0-47.2 GHz	241-250 GHz
5650-5925 MHz	76.0-81.0 GHz	All above 275 GHz

KEY

Note:
CW operation is permitted throughout all amateur bands except 60 meters.

MCW is authorized above 50.1 MHz, except for 219-220 MHz.

Test transmissions are authorized above 51 MHz, except for 219-220 MHz

- = RTTY and data
- = phone and image
- = CW *only*
- = SSB phone
- = USB phone *only*
- = Fixed digital message forwarding systems *only*

E = Amateur Extra
A = Advanced
G = General
T = Technician
N = Novice

See *ARRLWeb at www.arrl.org* for more detailed band plans.

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AMATEUR FREQUENCY AUTHORIZATIONS

- A quirk in the way the 'Government' has historically chosen to allocate Radio Frequencies for Amateur Authorizations has resulted in in a unique situation.
- The History of Amateur Frquency Authorizations, as you probably know, is to allocate those bands that don't appear to be immediately useful
- We currently have immensely valuable and dangerously underutilized large chunks of bandwidth in 2.4, 3.4 and 5.8 Ghz because…… when it was authorized, no one thought it would every be valuable.
- Of those authorizations there is only 10 MHz just below 2.4 GHz that is not shared with ISM, 40 MHz at 5.8 GHz and an apparent wealth of 200 MHz at 3.4 GHz. These are the frequencies where Amateurs have vastly greater capability than the commercial WISP and ISM broadband communities.

AREDN Offers 2 Non-Shared Channels on 2.4 GHz

2.4 GHz										
Channel	-2	-1	0*	1	2	3	4	5	6
Status	Ham Band			Shared Ham and ISM/WiFi Band					
Freq	2.397	2.402	2.407	2.412	2.417	2.422	2.427	2.432	2.437

*Not available for use

24 Non-Shared Channels on 3.4 GHz

3.4 GHz													
Channel	76	77	78	79	80	81	82	83	84	85	86	87
Status	Ham Band											
Freq	3.380	3.385	3.390	3.395	3.400	3.405	3.410	3.415	3.420	3.425	3.430	3.435
	88	89	90	91	92	93	94	95	96	97	98	99
	3.440	3.445	3.450	3.455	3.460	3.465	3.470	3.475	3.480	3.485	3.490	3.495

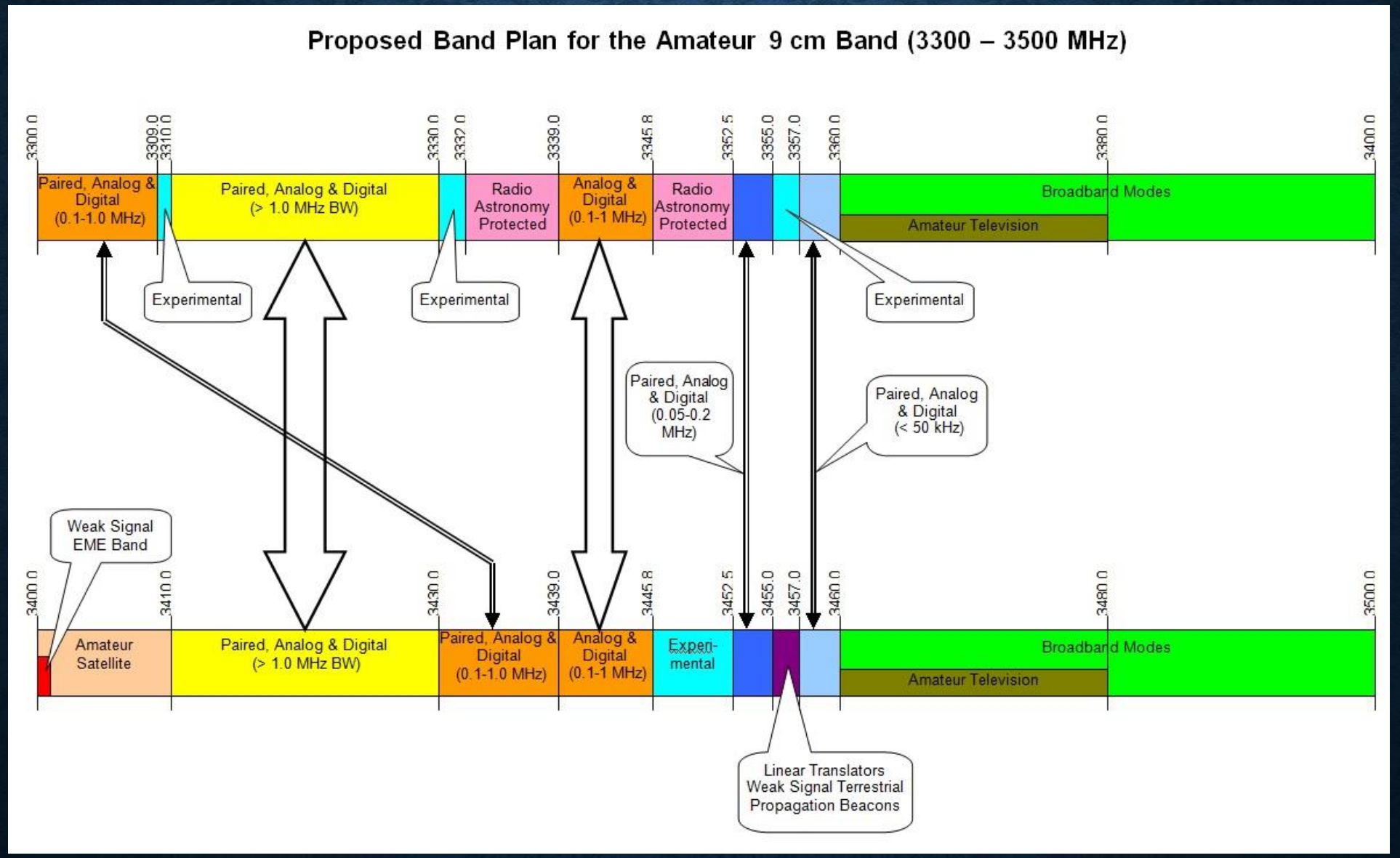
Refer to your local band plan for coordination

52 Channels, 7 Non-Shared, on 5.8 GHz

5.8 GHz													
Channel	133	134	135	136	137	138	139	140	141	142	143	144	145
Status	Shared Ham and ISM/WiFi Band												
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
	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
	Shared Ham and ISM/WiFi 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

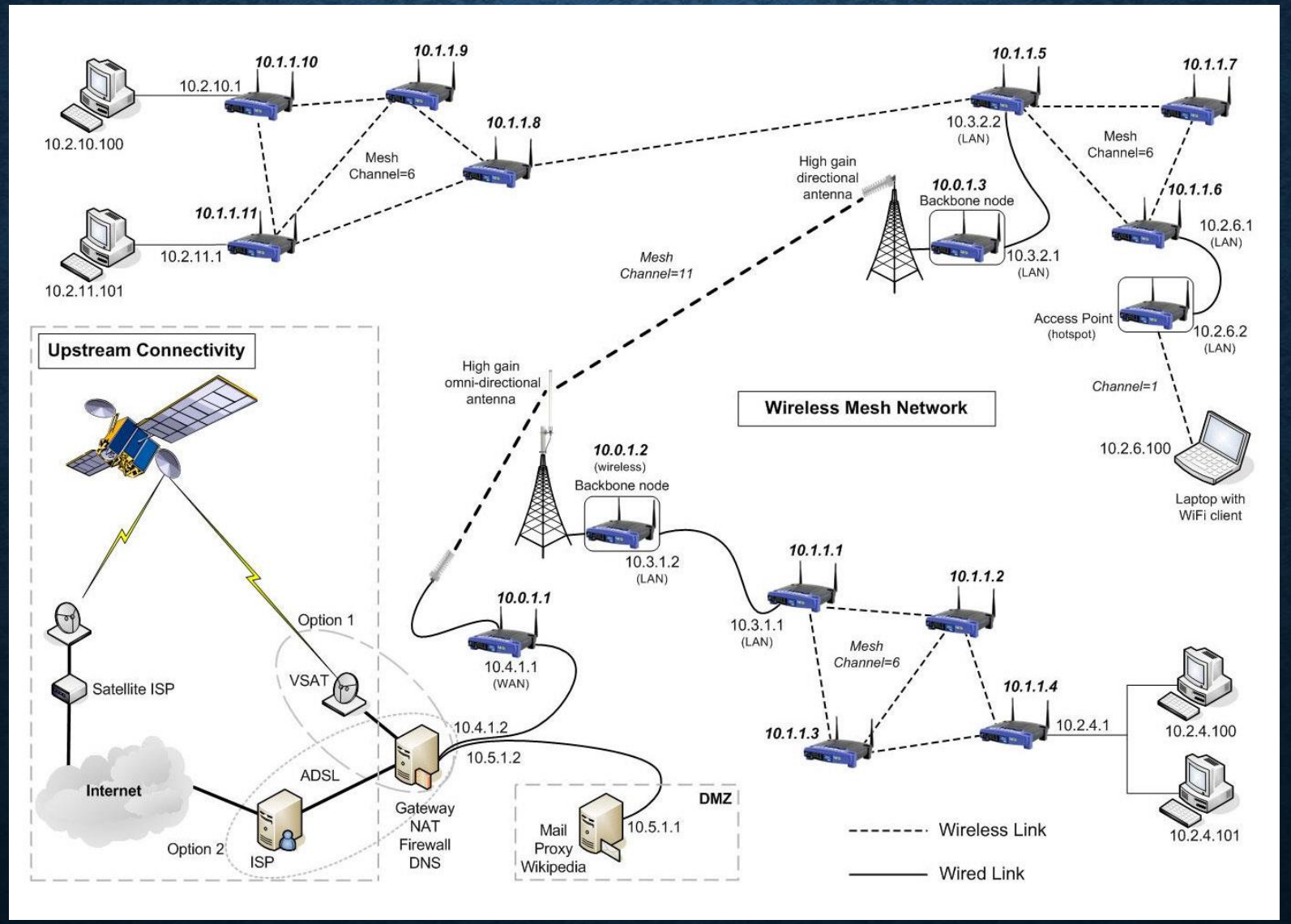
ARRL'S 3 GHZ BAND PLAN



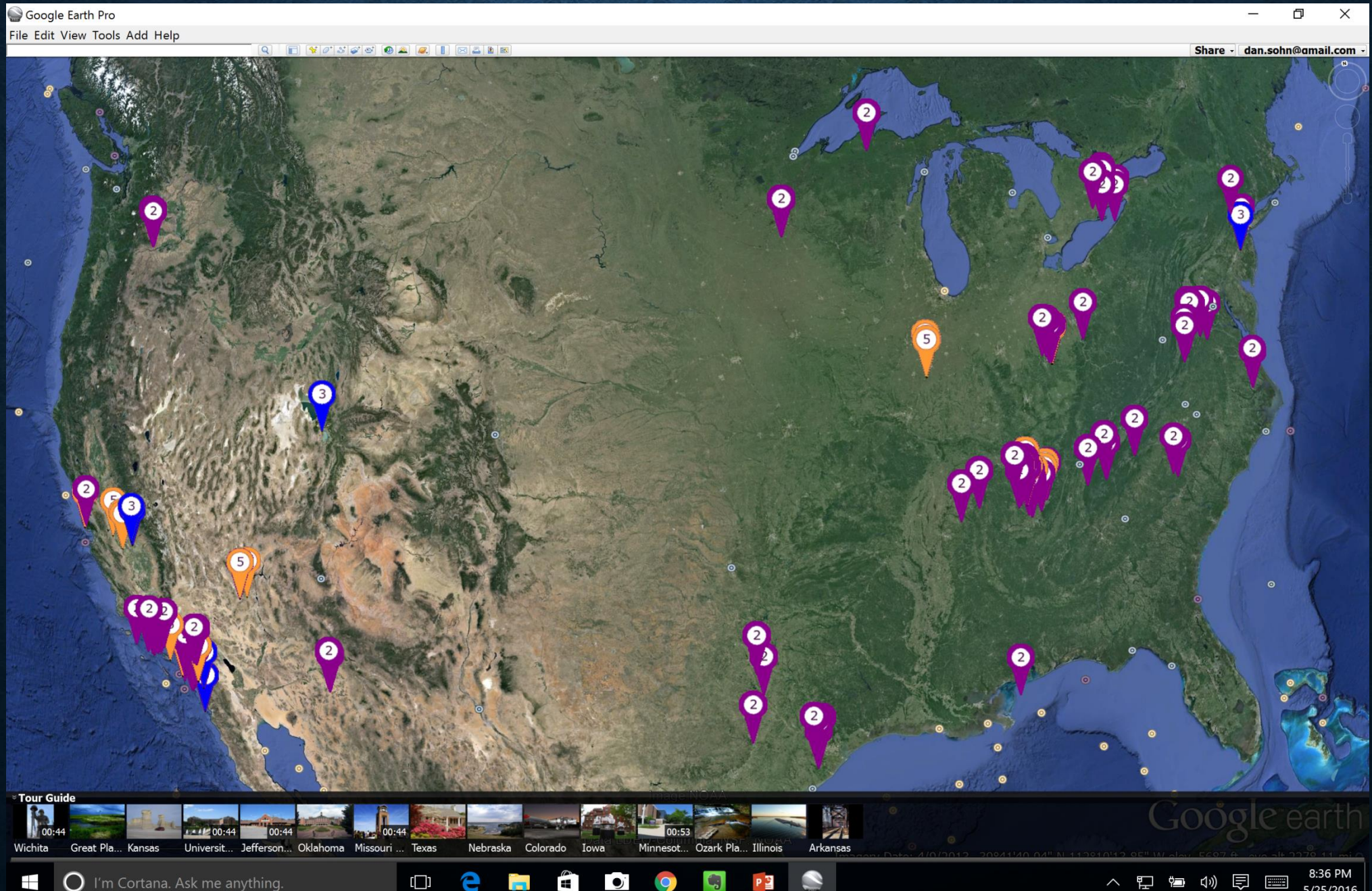
ABOVE ALL ELSE UNDERSTAND THE FOLLOWING

- Technician Class Licenses have full privileges on the microwave bands
- No one has to configure their own radios.
- You just have to commit to learning to make good use of them.
- AREDN is like the Internet.
- AREDN is different than the Internet.
- Amateurs, working together, always have and can still provide a more Professional service sooner and in some ways more efficient than any Commercial or Governmental Operation when it comes to Emergency communications.

HSMM BBHN MESH IN CALIFORNIA WHAT WAS



WHAT IS NOW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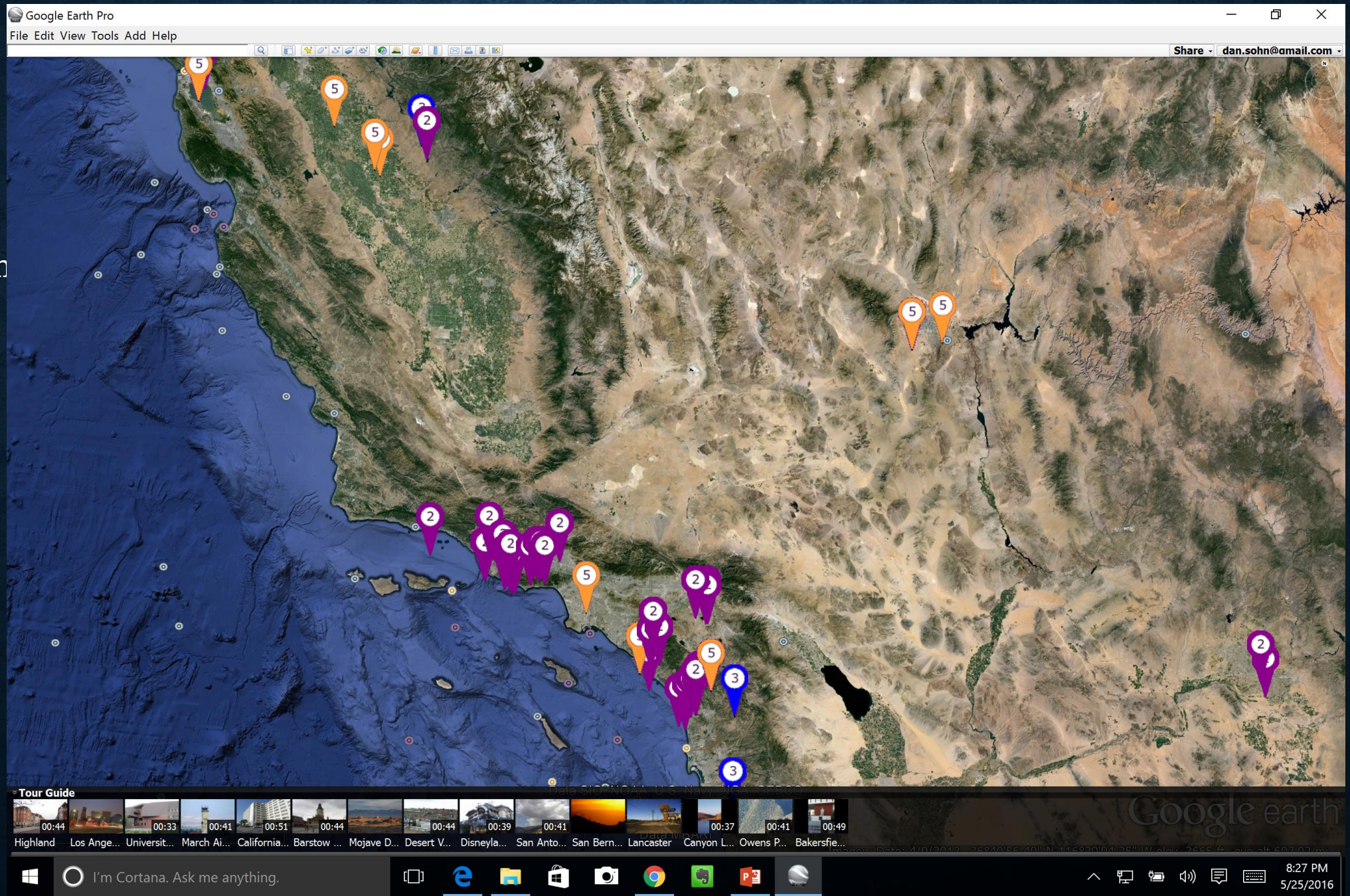
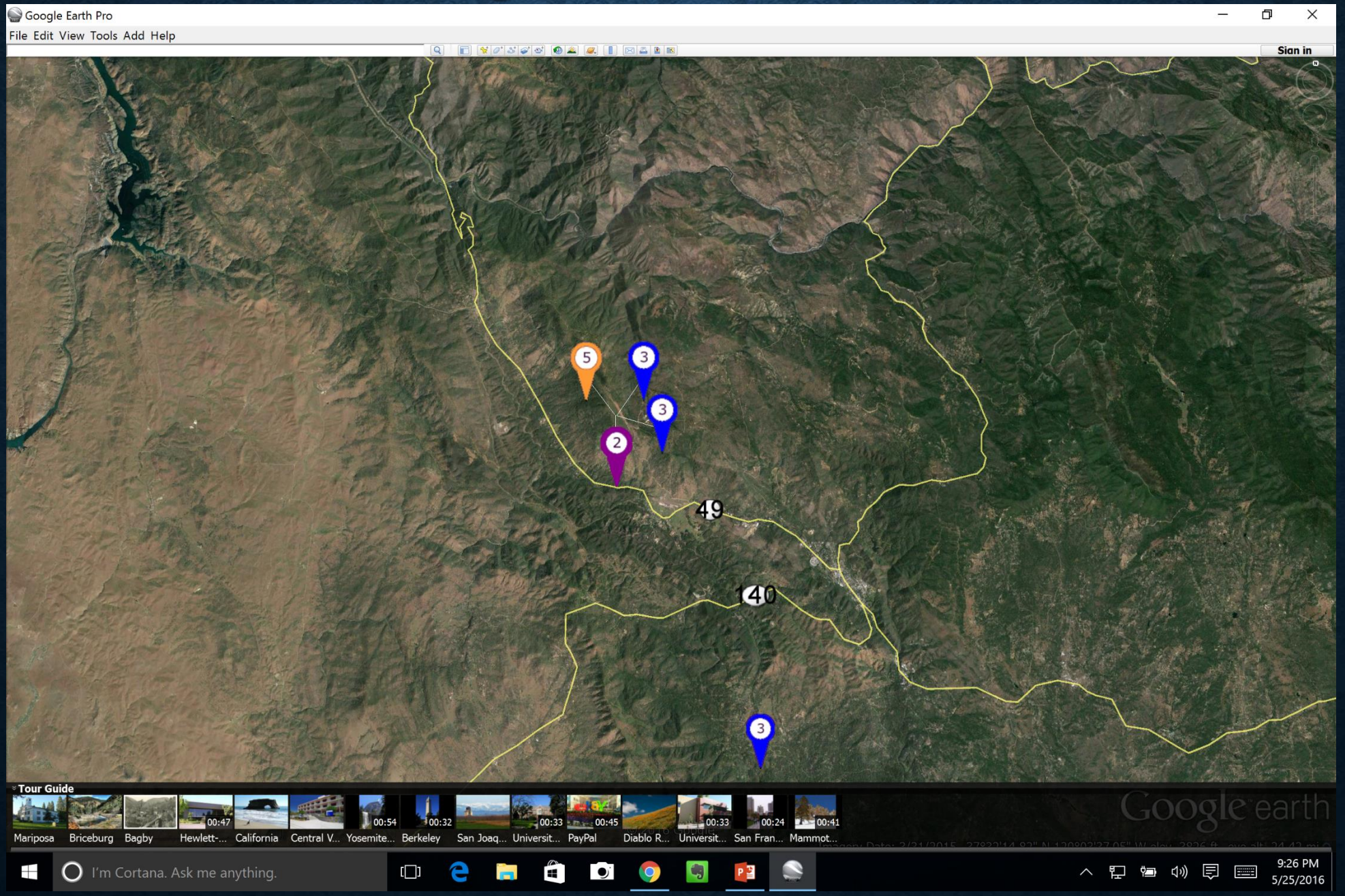
WHAT IS NOW IN CALIFORNIA

- In



SAN JOAQUIN VALLEY SECTION



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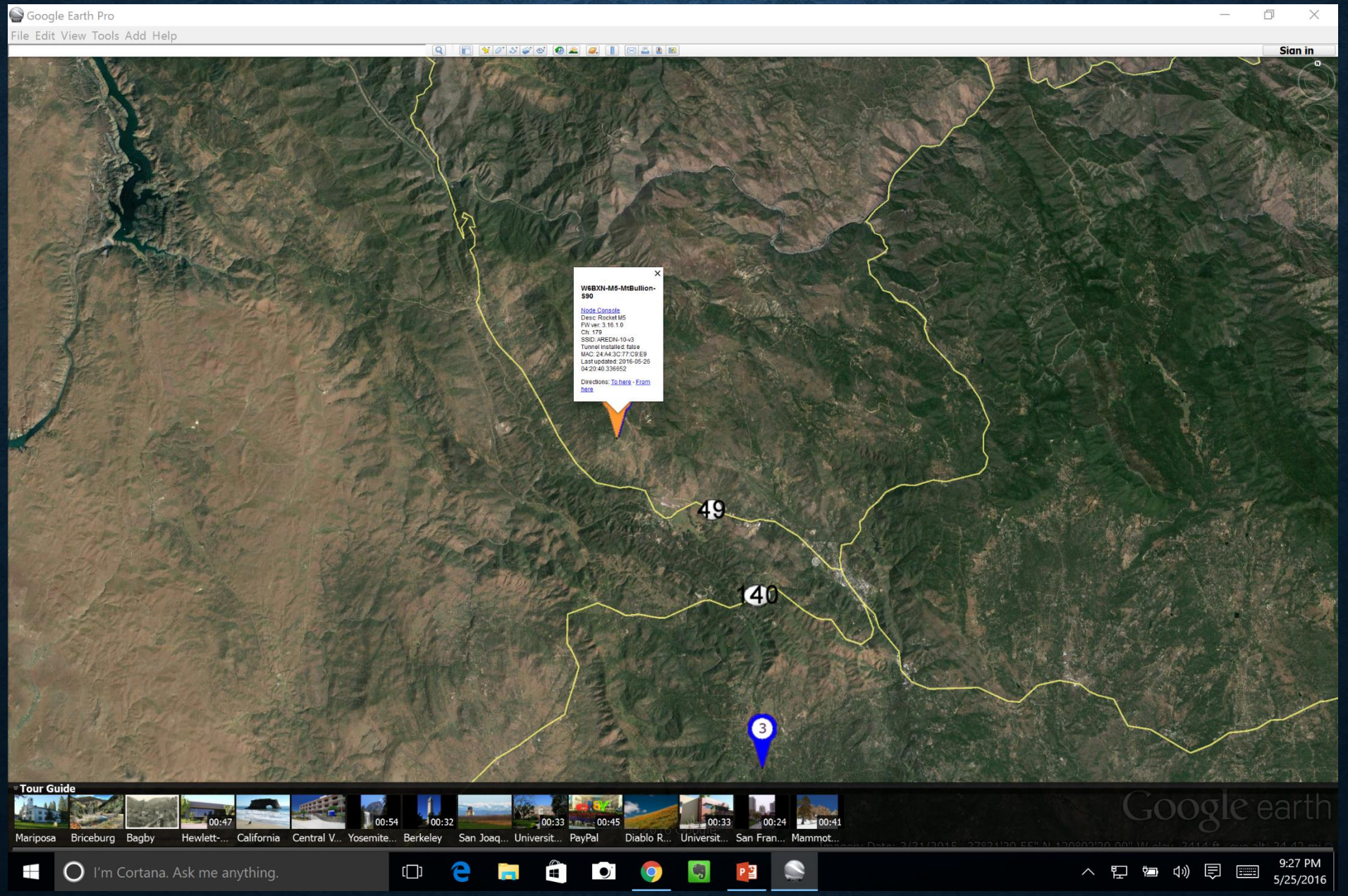

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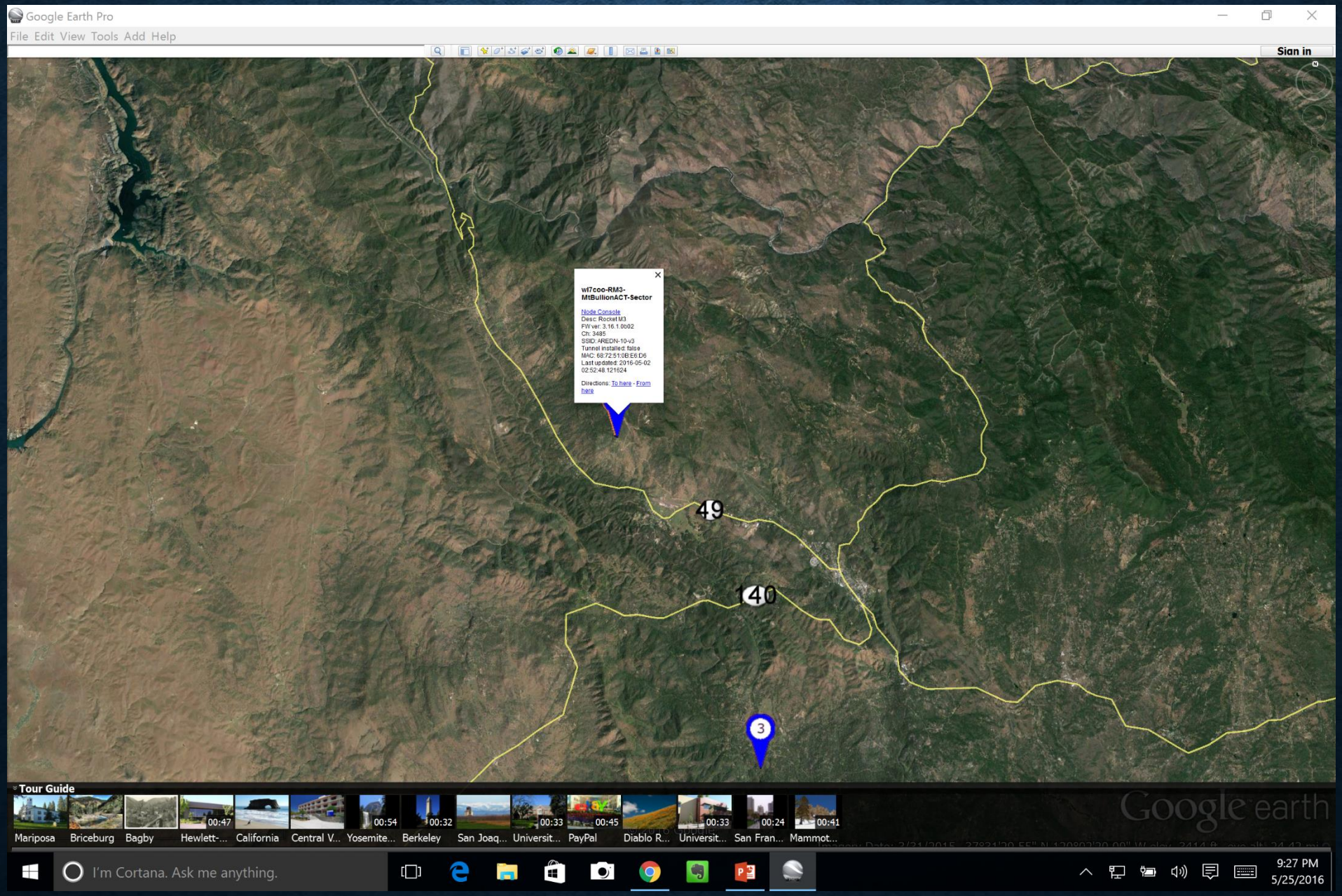

HOW IS AREDN GROWING?

- ‘Tunnels’ – an advanced configuration option that permits, where and when they are available, *temporary* use of Virtual LAN’s (“vtuns”) through the Internet to access functioning AREDN Islands pending creation of RF links.
- ‘Tunnel Services ‘ are an advanced configuration that enables access into an island for authorized individuals .
- ‘Gateways’ are an advanced configuration that permits access to and from the Internet for Part 97 compatible traffic.

WHAT CAN YOU DO ON AN AREDN ISLAND TODAY?

- Use VoIP Phones to call , even video call, other island users.
- Use 'Mesh-chat' a replicating multi user texting system for instantaneous text messaging within an island. Each message is date and time stamped and can be read by all other Mesh users in a given island. There can be separate topics to follow if it gets too overwhelming.
- Use Laptops and Multimedia VoIP Phones interoperable to have video conferences.
- See and control the equivalent of Web-Cams remotely across an island.
- Send and receive email without the Internet.
- Send and receive forms, files, videos without the Internet.
- View MESH only web sites and watch MESH only video broadcasts.
- If you can do it on the Internet and it does not require access to an Internet hosted server, It works on AREDN.

WHAT IS A MESH ?
WHAT IS OLSR ?

- The differences between traditional Internet routing and OLSR-based MESH routing is what makes AREDN possible.
- The immediate goal is to make the Network Architecture invisible to the Amateur ‘end users’ supporting EmComm

QUESTIONS??