



➤ INTRODUCTION TO DMR IN NEW ENGLAND

Country Pond Amateur Radio Group

Sept. 25, 2023 By Bill Barber, NE1B



Amateur Digital Voice Systems

- D-STAR (Icom / Flexradio / Kenwood) [54 in New England]
- P25 Phase 1 (Multi-Vendor COMMERCIAL) [18 in New England]
- P25 Phase 2 (Multi-Vendor COMMERCIAL) [None in New England]
- Yaesu System Fusion [44 in New England]
- DMR (Multi-Vendor) [125+ in New England]
- NXDN (Kenwood / Icom COMMERCIAL) [17 in New England]

Digital Mobile Radio

- **An ETSI commercial worldwide standard**
- **Over a DOZEN manufacturers of radios (Motorola, Connect Systems, Tytera/TYT, Anytone, Hytera, Alinco, etc.)**
- **New England growth since 2010**
- **Successful due to low cost radios**
- **Longer battery life!**
- **Supports multiple talk groups on one freq.**
- **Supports data applications (txt,email,gps)**

Digital Mobile Radio

- **Spectrum Efficient**
- **Network is digital end to end**
- **Supports Large Repeater Networks**
- **Resilient Networks (no servers needed at repeaters like D-STAR and APCO25 Phase 2)**
- **To learn more <http://NEDECN.org>**

Digital Mobile Radio

Advantages

- **One repeater can support two simultaneous conversations using time sharing (Each voice path is called a time slot)**
- **Each time slot can support various groups of users (called talk groups)**
- **Battery life is good because when transmitting using TDMA, the radio is only actually transmitting half the time**

DMR Standard - ETSI TS 102 361

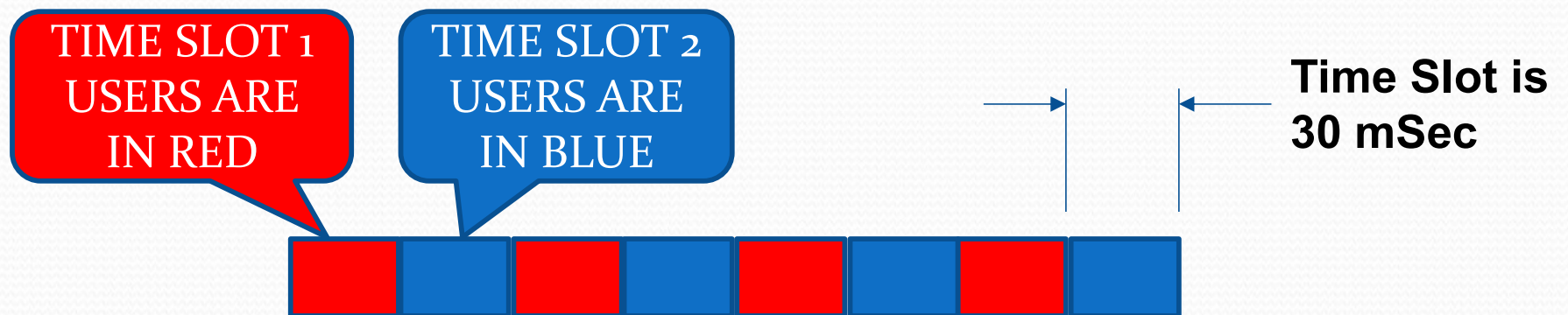
- **Tier 1 (Unlicensed)** **TIER 1 IS NOT USED FOR AMATEUR RADIO**
 - FDMA, Consumer applications, 0.5 watt
 - dPMR (446 MHz European unlicensed service)
- **Tier 2 (Conventional)**
 - 2-slot TDMA
 - IP Site Connect
- **Tier 3 (Trunked)**
 - 2-slot TDMA
 - Multi-channel, Multi-Site

THIS IS
WHAT
AMATEUR
DMR
NETWORKS
USE

The Magic of TDMA

How to get two conversations on one RF channel

The repeater system has two alternating time slots. One user group uses Time Slot 1 while the other uses Time Slot 2.



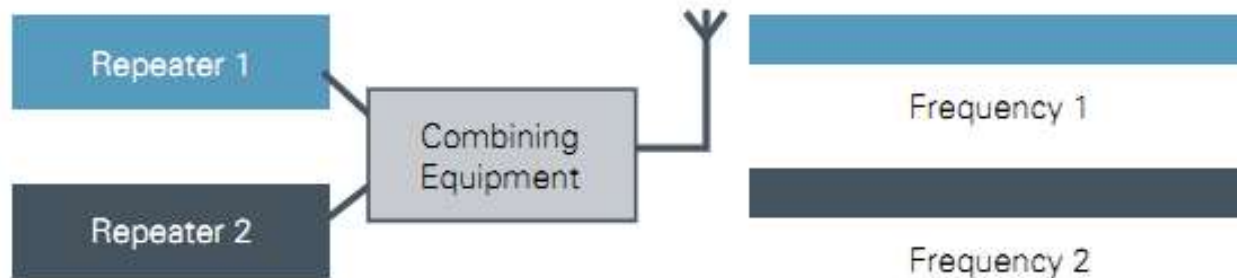
Other than programming the time slot in the radio, the radio and the system figures out how to do this.

DMR has TWO Repeaters in One!

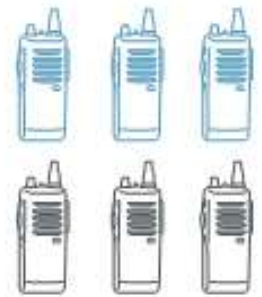
In FM and other digital systems if you want 2 simultaneous voice channels you needed 2 repeaters.

In DMR one repeater provides 2 simultaneous voice channels using one RF channel & one antenna.

Two-channel Analog or Digital FDMA System

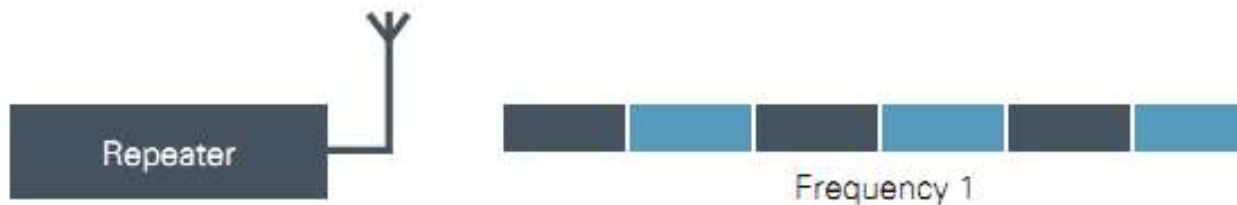


One call per repeater and channel



Radio Groups

Two-channel Digital TDMA System



Two calls per repeater and channel

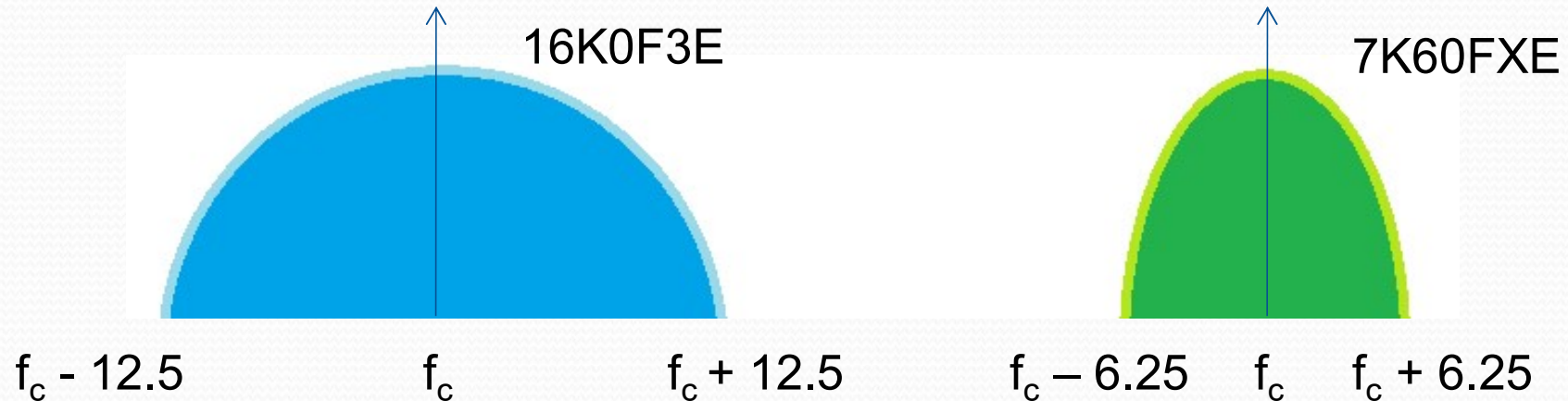


Radio Groups

Lower infrastructure cost, 1 box in rack

TWO voice/data channels from one repeater

Half the Channel Bandwidth



Traditional Analog FM
25 kHz

Channel Bandwidth

1 Voice Channel
1 Repeater

DMR

12.5 kHz

Channel Bandwidth

2 Voice Channels
1 Repeater

Longer Battery Life



Older Digital Modes
(GMSK & FDMA)



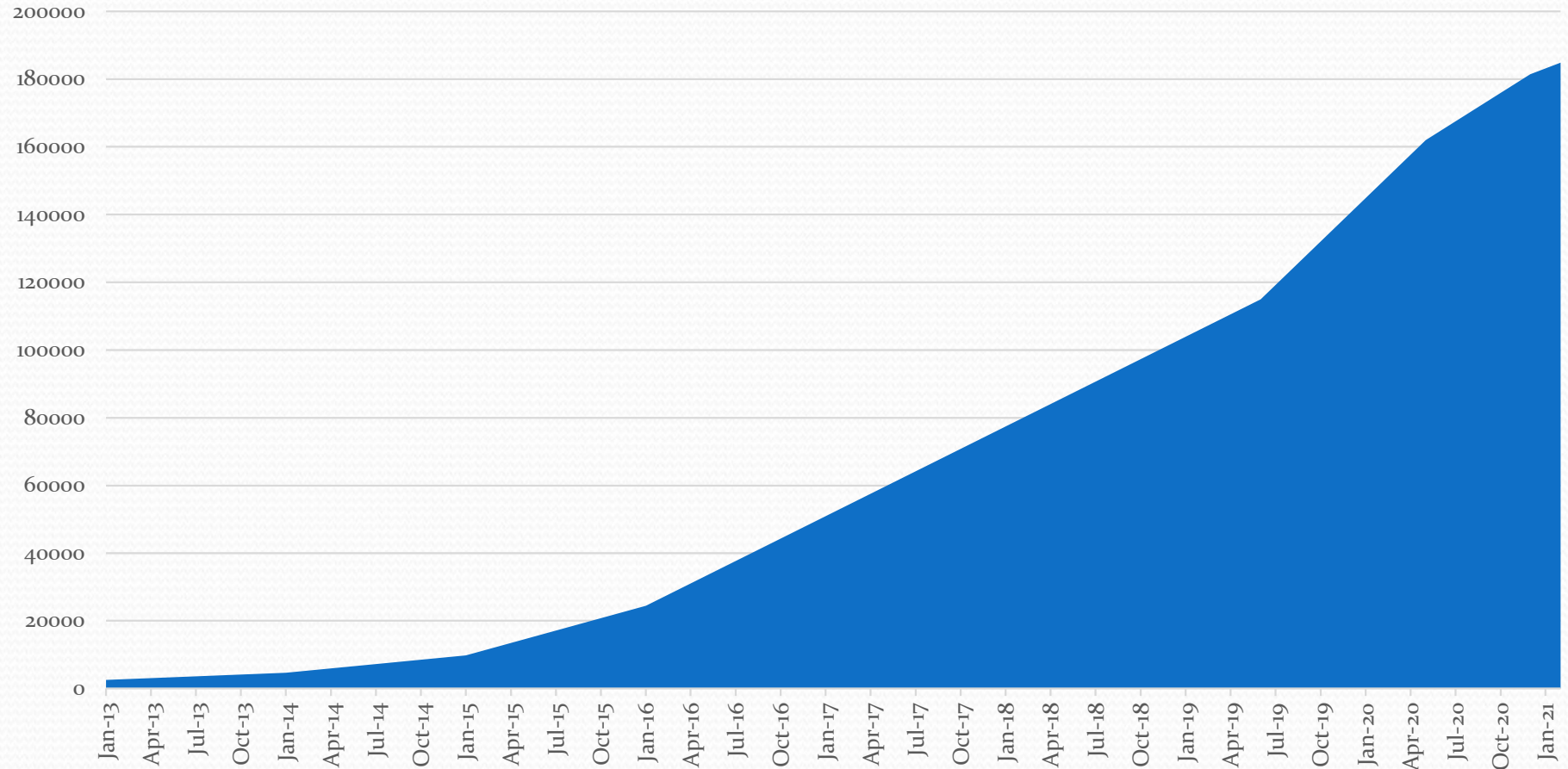
DMR
(TDMA)

“For each hour of usage the TDMA radios show between 19% and 34% less battery capacity is required than for the GMSK and FDMA models.”

“40 percent improvement in talk time in comparison with analog radios “

Amateur DMR activity continues Trending Up

ID'S



- **Jan 2013 = 2,511 ID's**
- **Jan 2014 = 4,618 ID's**
- **Jan 2015 = 9,802 ID's**
- **Jan 2016 = 24,388 ID's**
- **June 2019 = 115,000+ ID's**

May 2020 = 162,000+ ID's
Dec. 19, 2020 = 181,462 ID's
Sept 24, 2023 = 245,984 ID's

These are totals for DMR ID'S issued worldwide.

Amateur DMR activity in New England


Most New England DMR activity is on the New England Digital Emergency Communications Network (NEDECN) which is part of the DMR-MARC system (explained on next slide)

485 of the approx. 40,000 hams in New England used the NEDECN Repeater Network during 2022.



- **The New England Digital Emergency Communications Network (NEDECN) system distributes DMR-MARC talk groups**
- **Servers and repeaters are owned by Motorola Amateur Radio Clubs and other private repeater owners**
- **1500+ site network in more than 47 countries**
- **Also bridged to other networks DCI, NorCal, AZ, NC, MI, KS, CO and Texas DMR networks**
- **100% Pure Digital Network**
- **To learn more <http://dmr-marc.net>**

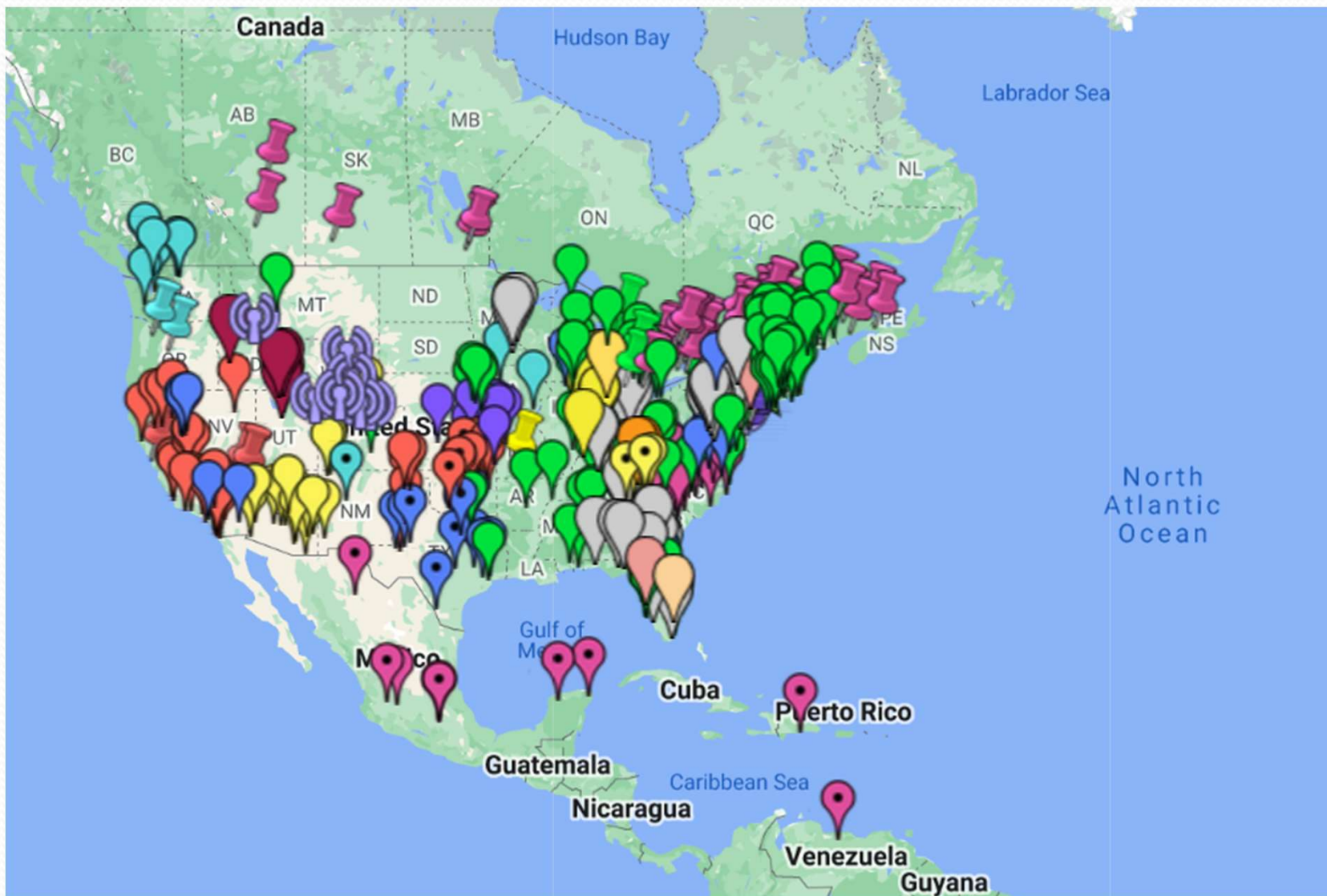
WHAT ARE SOME OF TALK GROUPS AND WHAT TIME SLOTS ARE THEY ON IN THE NEDECN NETWORK

| TIME SLOT 1 | TIME SLOT 2 |
|--|---|
| SKYWARN  | LOCAL (SINGLE REPEATER) |
| WORLDWIDE (PTT on demand link) | REGION NORTH (MA, ME, NH, VT) |
| WORLDWIDE ENGLISH (PTT on demand link) | IN-STATE STATEWIDE CHANNEL |
| NORTH AMERICA | NEW ENGLAND WIDE |
| NORTHEAST (New England, NY, NJ, PA) | NE TAC 2 (PTT on demand link for New England) |
| NETAC1(PTT on demand link for New England) | Other <u>in area</u> sub nets (i.e.: CAPENET) |
| TAC 311 (PTT on demand link for NA) | |
| UA 113 (PTT on demand link World Wide) | |
| UA 123 (PTT on demand link World Wide) | |
| PARROT (PTT on demand link that repeats your received audio) | |

Statewide channels for some adjacent states are typically on Time Slot 1

WHAT TALK GROUPS ARE ON MY LOCAL REPEATERS

(<https://www.radioid.net/map#!>)



WHAT TALK GROUPS ARE ON MY LOCAL REPEATERS

(<http://www.dmr-marc.net/repeaters.html>)

The screenshot shows a web browser window displaying the DMR-MARC website. The browser's address bar shows the URL www.dmr-marc.net/repeaters.html. The website's navigation menu includes links for Home, Database, Repeaters (which is highlighted), About Us, Register ID, and Contact Us. The main heading is "DMR-MARC Networked Repeaters". Below this is a map interface with "Map" and "Satellite" tabs. A popup window is open over a red location pin on the map, displaying the following information:

Callsign: AE1C
Frequency: 145.27000
Offset: -0.600
ColorCode: 7

NEDECN
Southboro, Massachusetts

Time Slot #1 - Group Call 759 = SKYWARN
Time Slot #1 - Group Call 1 = World Wide (Sat. Net)*
Time Slot #1 - Group Call 13 = WW English*
Time Slot #1 - Group Call 3 = North America

At the bottom of the popup, there is a "View Repeaters in a larger map" link. The browser's taskbar at the bottom shows the Windows logo, a search bar with the text "Type here to search", and several application icons. The system tray on the right shows the time as 9:39 PM and the date as 5/14/2020.

WHAT TALK GROUPS ARE ON MY LOCAL REPEATERS

(<https://www.radioid.net/map#!>)

Talkgroup Info

145.22 Mt. Uncanoonuc,
Goffstown, NH

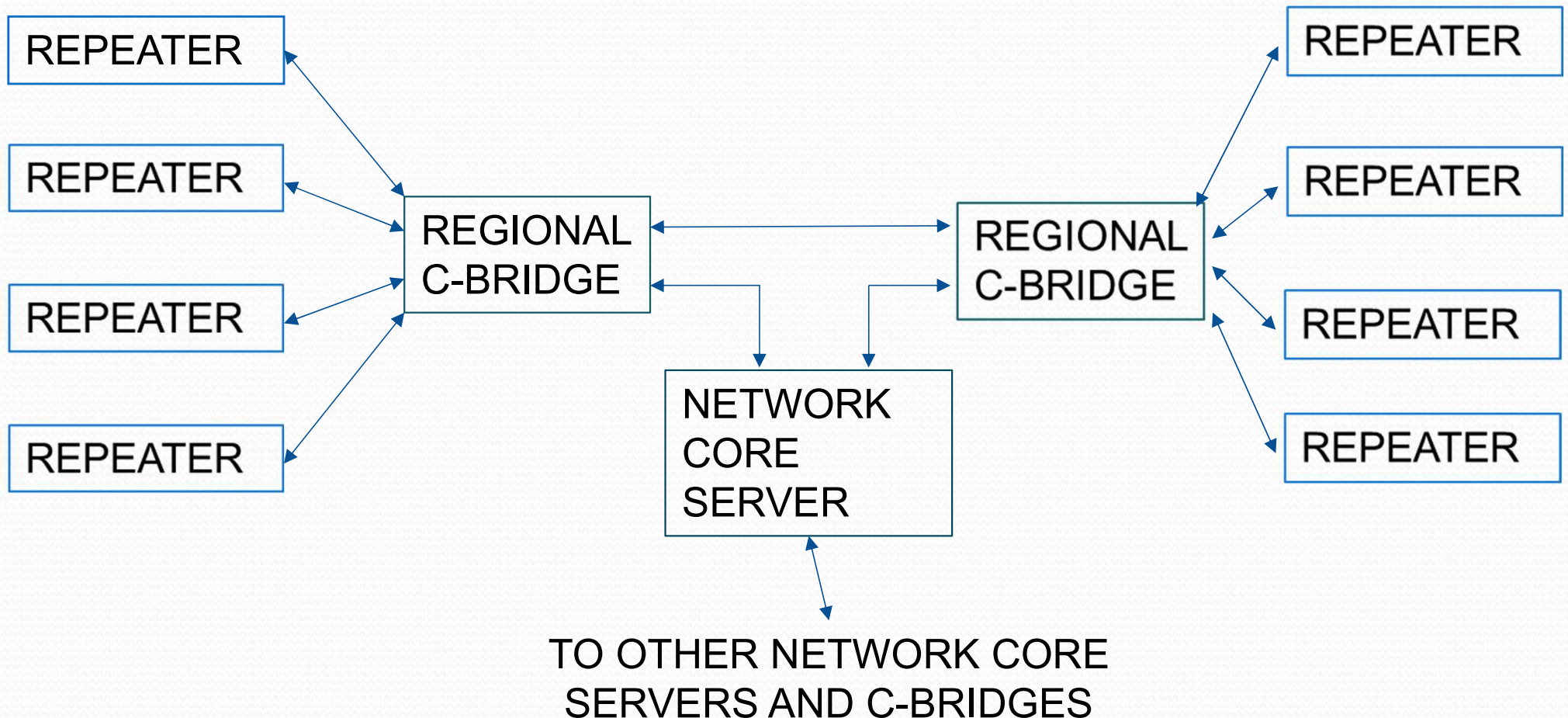
IPSC Network:NEDECN - Color Code:11 - Assigned:Peer - TS Linked:TS1 TS2 - Operator:KM3T

Time Slot # 1 - Group Call 1 = World Wide (PTT)*
Time Slot # 1 - Group Call 3 = North America
Time Slot # 1 - Group Call 13 = WW English (PTT)*
Time Slot # 1 - Group Call 113 = UA English 1 PTT
Time Slot # 1 - Group Call 123 = UA English 2 PTT
Time Slot # 1 - Group Call 310 = TAC310 PTT
Time Slot # 1 - Group Call 311 = TAC311 PTT
Time Slot # 1 - Group Call 317 = Indiana
Time Slot # 1 - Group Call 759 = SKYWARN/911
Time Slot # 1 - Group Call 3172 = Northeast
Time Slot # 1 - Group Call 8801 = NETAC 1 PTT
Time Slot # 1 - Group Call 9998 = Parrot PTT
Time Slot # 2 - Group Call 8 = Region North
Time Slot # 2 - Group Call 9 = Local Site
Time Slot # 2 - Group Call 3125 = MA Statewide PTT
Time Slot # 2 - Group Call 3133 = NH Statewide
Time Slot # 2 - Group Call 3181 = New England Wide
Time Slot # 2 - Group Call 8802 = NETAC 2 PTT


Last Update: 2023-02-06 20:41:55

Entries with an asterisk (*) or PTT after them only stay available for 3 or so minutes after they are kerchucked and there is no activity.

The Simplified DMR Network



Predominant New England DMR Networks

| Network | New England Repeaters | NH Repeaters |
|--|---------------------------------|----------------------------|
| DMR-MARC (NEDECN) | 95 | 21 |
| CT ARES | 32 (all in CT) | 0 |
| BRANDMEISTER | 18 | 7 |
|  | <i>YOUR ID WILL WORK</i> | <i>ON ALL THESE</i> |

The New England DMR-MARC network has connection to additional repeaters in Nova Scotia, New Brunswick, Quebec and New York.

“Brandmeister” is an ‘on demand’ system with a choice of 1300 talk groups. Kind of like D-STAR.

Local DMR Repeaters

- NEDECN (DMR-MARC) Network
 - Gunstock Mtn, NH-VHF and UHF
 - Concord, NH- VHF (SEOC)
 - Bow, NH-VHF
 - Goffstown, NH-VHF and UHF
 - Derry, NH-VHF
 - Hudson, NH-VHF and UHF
 - Chester, NH-VHF
 - Rochester, NH-VHF
 - Haverhill, MA-VHF

Getting Started

- REGISTER FOR A DMR ID ON THE RADIOID WEBSITE (<http://www.radioid.net>)
- BUY A TIER 2 RADIO
- GET IT PROGRAMMED
- TALK

WHY DO I NEED A DMR ID ?

THE NETWORK REQUIRES YOU TO HAVE A DIGITAL ID TO ALLOW ALL THE C-BRIDGES AND MASTERS TO PROPERLY DIRECT YOUR CONVERSATION BETWEEN REPEATERS AND TALK GROUPS.

Things to think about when buying a radio

- **ALL DMR RADIOS (EXCEPT SOME VERSIONS OF MOTOROLA SL SERIES) WILL DO TRADITIONAL ANALOG FM**
- **RADIOS MUST BE PROGRAMMED WITH SOFTWARE**
- **MOST RADIOS CANNOT BE REPROGRAMMED ON THE FLY (I.E.: VIA THE RADIO KEYPAD)**
- **RADIOS ARE SPREAD OVER A LARGE PRICE RANGE FROM \$15 TO \$1000 (WOW) FOR A WALKIE**
- **SOME DMR RADIOS HAVE LESS THAN 125 CHANNELS, AVOID THEM (EACH USER CHANNEL HAS A RF CHANNEL, TIME SLOT, COLOR CODE AND TALK GROUP).**

Programming your radio

YOU NEED THE CUSTOMER PROGRAMMING SOFTWARE (CPS) FOR YOUR PARTICULAR RADIO

AT THE MINIMUM YOU NEED TO KNOW THE FOLLOWING TO PROGRAM A RADIO:

- YOUR DMR RADIO ID

- THE TALK GROUP YOU WANT TO TALK ON AND PUT THAT IN THE DIGITAL CONTACTS LIST AS A GROUP CALL

- THE TIME SLOT BEING USED FOR THE TALK GROUP YOU ARE PROGRAMMING

- YOU NEED TO KNOW THE INPUT AND OUTPUT FREQUENCIES FOR THE REPEATER YOU WILL USE.

(ON 2 M THIS IS NOT ALWAYS A 600 KHZ DIFFERENCE)

- YOU NEED TO KNOW THE COLOR CODE FOR THE REPEATER YOU ARE USING. (COLOR CODE IS LIKE PL TONE)

Hotspots

HOTSPOTS ARE A VERY LOW POWER (<10 MW) RADIO THAT USES YOUR INTERNET CONNECTION TO TALK ON THE NETWORK. IT ALLOWS YOU TO USE YOUR HT OR MOBILE WHEN OUT OF RANGE OF A REPEATER.

OTHER THAN THE BRANDMEISTER NETWORK, HOTSPOTS ARE LIMITED IN WHAT TALK GROUPS THEY CAN ACCESS ON NETWORK REFLECTORS (SERVERS).

Hotspots

THE EASIEST REFLECTORS (SERVERS) TO USE TO ACCESS NEDECN TALK GROUPS ARE DMR+ IPSC2, FOUND IN THE HOTSPOT GATEWAY MENU.

Hotspots

KNOWN GOOD HOTSPOTS FOR NEW ENGLAND NETS ARE:

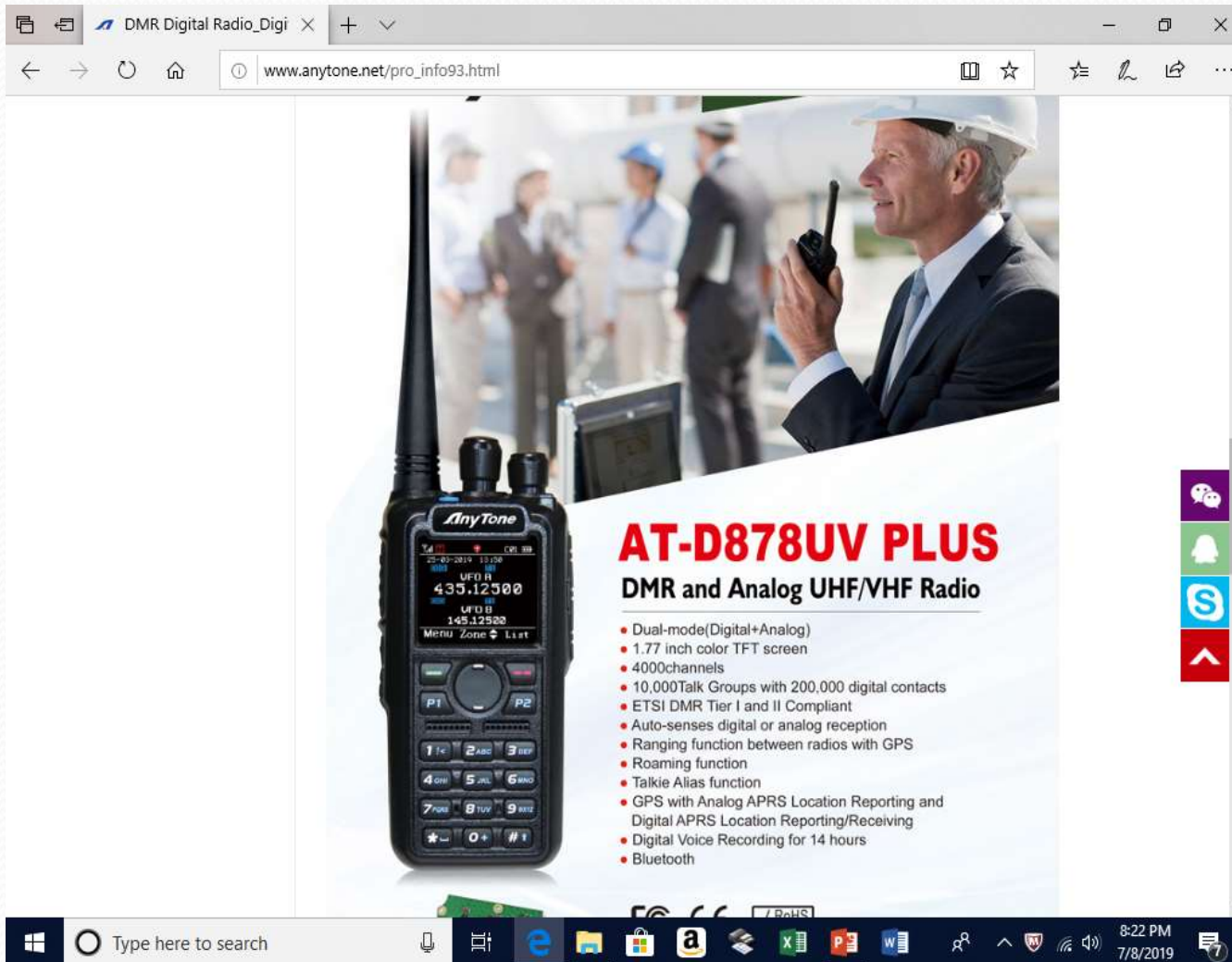
- **SHARK OPEN SPOT 3 NOW 4 (NOTE: OLD OPEN SPOT 1 DOES NOT HAVE WIFI CAPABILITY AND OPEN SPOT 2 HAD WIFI BUT IS DISCONTINUED)**
- **JUMBOSPOT (CHINESE) - CONFIGURATION IS A BIT DIFFICULT**
- **ZUMSPOT (HRO)**

What Radios will do DMR

THERE ARE A VARIETY OF RADIOS AVAILABLE AND THEY ALL WORK ON THE NEDECN NETWORK.

REMEMBER WHEN YOU BUY A RADIO TO BUY THE PROGRAMMING CABLE FOR IT.

Anytone AT-D878UV Plus



DMR Digital Radio_Digi X +

www.anytone.net/pro_info93.html



AT-D878UV PLUS
DMR and Analog UHF/VHF Radio

- Dual-mode(Digital+Analog)
- 1.77 inch color TFT screen
- 4000channels
- 10,000Talk Groups with 200,000 digital contacts
- ETSI DMR Tier I and II Compliant
- Auto-senses digital or analog reception
- Ranging function between radios with GPS
- Roaming function
- Talkie Alias function
- GPS with Analog APRS Location Reporting and Digital APRS Location Reporting/Receiving
- Digital Voice Recording for 14 hours
- Bluetooth

Windows taskbar: Type here to search, 8:22 PM 7/8/2019

**DUAL BAND
(2/440) WITH A
LOT OF
CHANNELS AND
ID SPACE**

**Available from
Bridgecom and
Ham Radio Outlet**

Anytone AT-D578UV PRO



**THREE BAND
(2/220/440) WITH
A LOT OF
CHANNELS AND
ID SPACE.
Note: 220 is low
power <10 watts**

**Available from
Bridgecom and
Ham Radio
Outlet.**

Alinco DJ-MD5



**DUAL BAND (2/440) WITH A LOT
OF CHANNELS AND ID SPACE
Available from Ham Radio Outlet**

Connect Systems CS800 Mobile



**A LOT OF
CHANNELS AND
ID SPACE**

**This radio is available in single (CS800) and dual band (CS800D) versions.
Buy the CS800 and CS800D available directly from Connect Systems**

Motorola XPR7550

**Only available in
single band versions
with very limited
number of Private
Call ID's**



Tytera MD380

**Very limited number of
Private Call ID's**



**Both single and dual
band versions available**

Some Local DMR Nets

| <u>DAY</u> | <u>NAME</u> | <u>TIME</u> | <u>TALK GROUP</u> |
|-------------|-----------------------|-------------|---------------------|
| • SUNDAY | PROVIDENCE RA NET | 8 PM | NE TAC ₁ |
| • MONDAY | NEW ENGLAND DMR NET | 8 PM | NEW ENGLAND WIDE |
| • TUESDAY | VERMONT STATE NET | 8 PM | VT STATEWIDE |
| • WEDNESDAY | YCCC DX & CONTEST NET | 8 PM | NE TAC ₁ |
| • THURSDAY | SKYWARN WX NET | 7:30 PM | SKYWARN |

ALL TIMES ARE LOCAL TIMES

ALL NETS WELCOME EVERYONE

Some DMR Web Sites

(check out the links below)

- <http://dmr-marc.net/> (THE GRANDDADDY OF DMR SITES)
- <http://nedecn.org> (NEW ENGLAND)
- <http://www.maine-dmr.org/> (MAINE DMR... VERY GOOD INTRODUCTORY MATERIAL)
- <https://www.radioid.net> THIS IS WHERE YOU GET YOUR RADIO ID