



➤ INTRODUCTION TO DMR IN NEW ENGLAND

NE1B BILLERICA, MA CLUB APRIL 2021

K1DQ YCARC JAN. 2023



Amateur Digital Voice Systems

- **D-STAR (Icom / Flexradio / Kenwood) [54 in New England]**
 - **GMSK/AMBE Vocoder**
- **P25 Phase 1 (Multi-Vendor COMMERCIAL) [18 in New England]**
 - **FDMA/IMBE Vocoder**
- **P25 Phase 2 (Multi-Vendor COMMERCIAL) [None in New England]**
 - **2-slot TDMA/FDMA/AMBE+2 Vocoder**
- **Yaesu System Fusion known as YSF and C4FM [44 in New England]**
 - **FDMA/C4FM/AMBE+2 Vocoder**
- **DMR (Multi-Vendor) [125+ in New England]**
 - **2-slot TDMA/AMBE+2 Vocoder**
- **NXDN (Kenwood / Icom COMMERCIAL) [17 in New**

Digital Mobile Radio

- **An ETSI commercial worldwide standard**
- **Over a DOZEN manufacturers of radios (Motorola, Connect Systems, Tytera/TYT, Anytone, Hytera, Alinco, etc.)**
- **Superior voice quality (AMBE+2 vocoder) vs older digital modes (AMBE, IMBE, GMSK)**
- **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

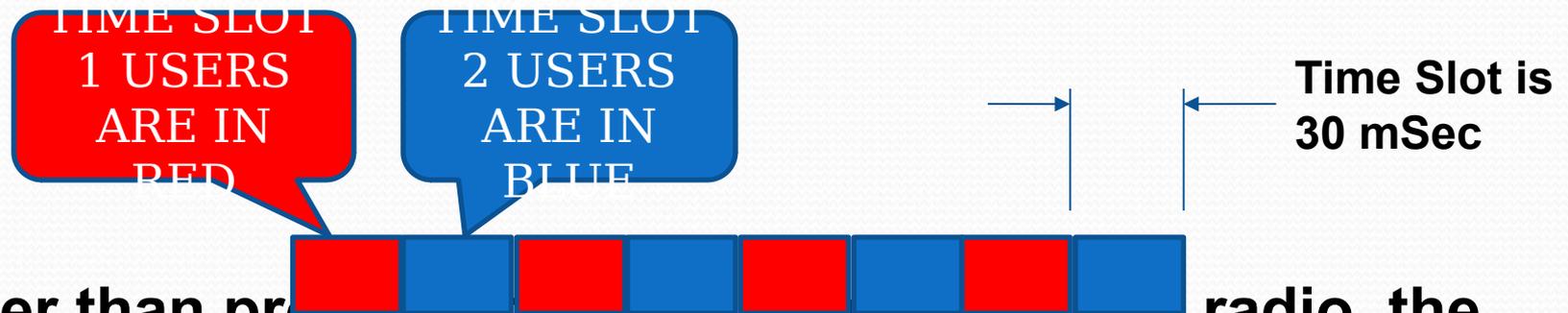
Advantages

- 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 as the radio is only actually transmitting half the time
- Better Audio Quality Over A Greater Ranger Than Analog

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.



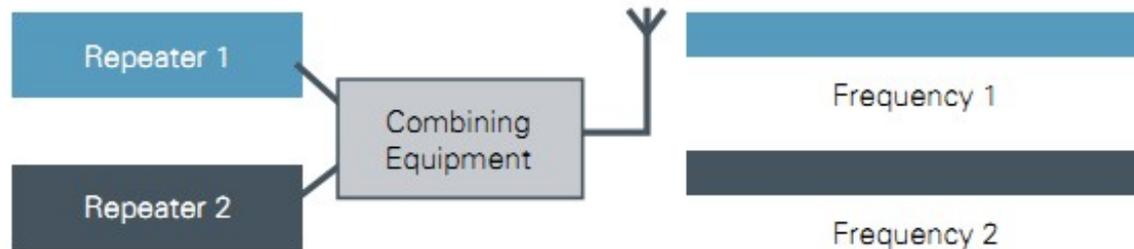
Other than programming the time slot in the radio, the radio and the system figures out how to do this.

DMR has TWO Repeaters in One!

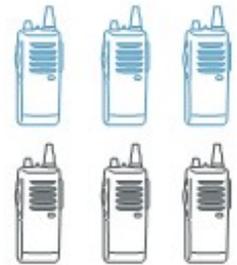
In FM and other digital systems if you want 2 simultaneous voice channels you needed 2 repeaters.

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

Two-channel Analog or Digital FDMA System

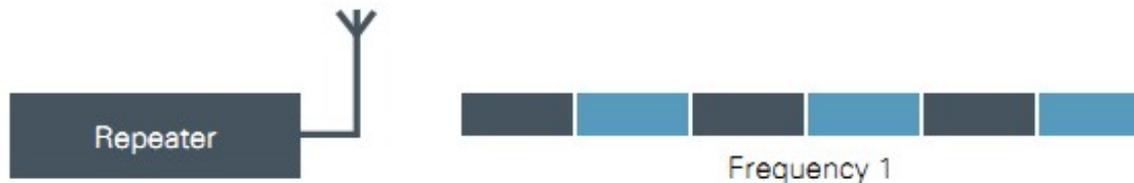


*One call per
repeater and channel*



Radio Groups

Two-channel Digital TDMA System



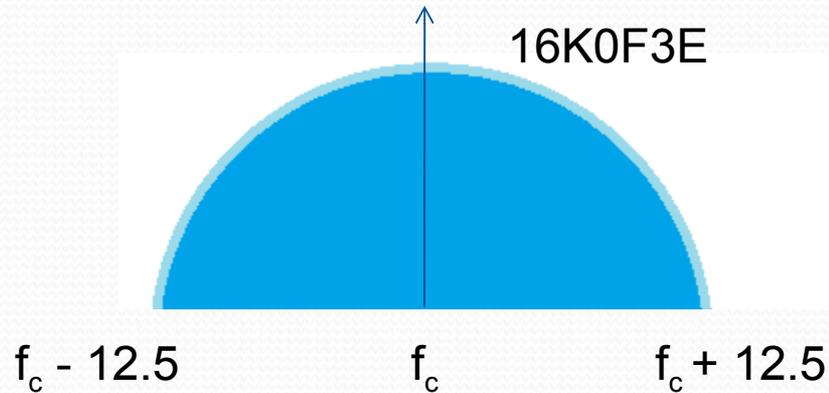
*Two calls per
repeater and channel*



Radio Groups

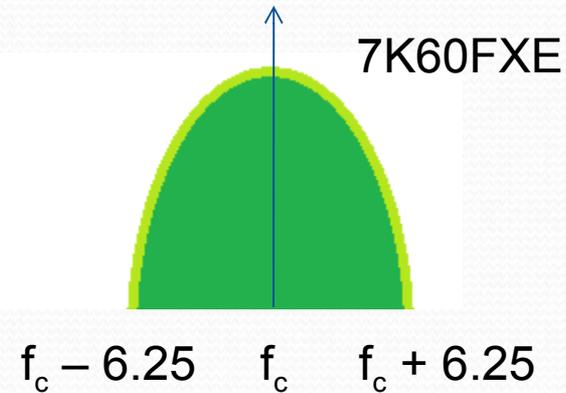
*Lower infrastructure cost, 1 box in rack
TWO voice/data channels from one repeater*

Half the Channel Bandwidth



Traditional Analog FM
25 kHz
Channel Bandwidth

1 Voice Channel
1 Repeater



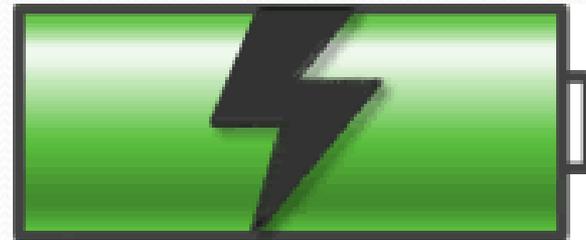
DMR
12.5 kHz
Channel Bandwidth

2 Voice Channels
1 Repeater

Longer Battery Life



Older Digital Modes
(GMSK & FDMA)

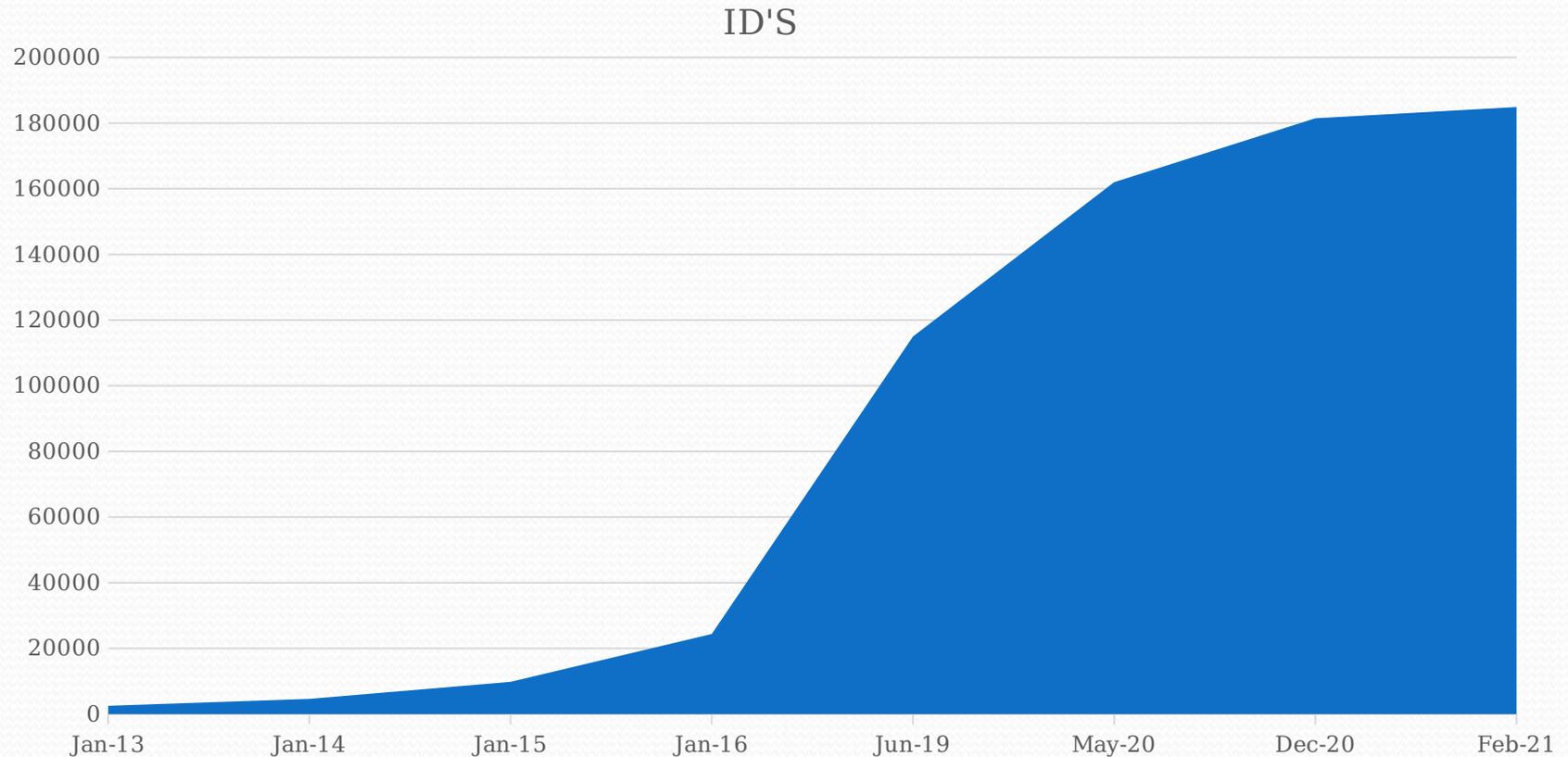


DMR
(TDMA)

“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



- **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
Jan 25, 2021 = 184,876 ID's
Dec 28, 2022 = 230,674 ID's
These are totals for DMR ID'S issued worldwide.

Some DMR

DMR TERM	DEFINITION / TERM	NOTES
TIME SLOT	In DMR each RF channel has two time slots. You must define which one you need to use for a particular application.	Time slots are assigned by repeater system. You must comply with the repeater system assignments.
DIGITAL CONTACT	A DMR user talks to a repeater or another user by defining an assigned digit number between 1 and 16776415 that is sent with every transmission.	Every talk group and user has a unique Digital Contact number. The DMR-MARC website explains how they are assigned.
RADIO ID	Every radio in a DMR system MUST HAVE a DIGITAL CONTACT NUMBER. For your radio this is referred to as a radio ID. This is put in general settings in the programming software.	You must get an ID from Radioid.Net <u>before</u> you start programming a radio
CODE PLUG	It is the programming file for a radio.	It includes all settings for that radio
ZONE	Scan Bank	In older radios a Zone can only have 16 entries, more recent radios have unlimited zone list size.
COLOR CODE	Digital PL	Color Code acts like Digital PL
NUISANCE DELETE	Scan Lock Out, Busy Channel Lockout	This locks out a channel in a scan bank that you temporarily don't want to hear. It will reset when the radio is

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)

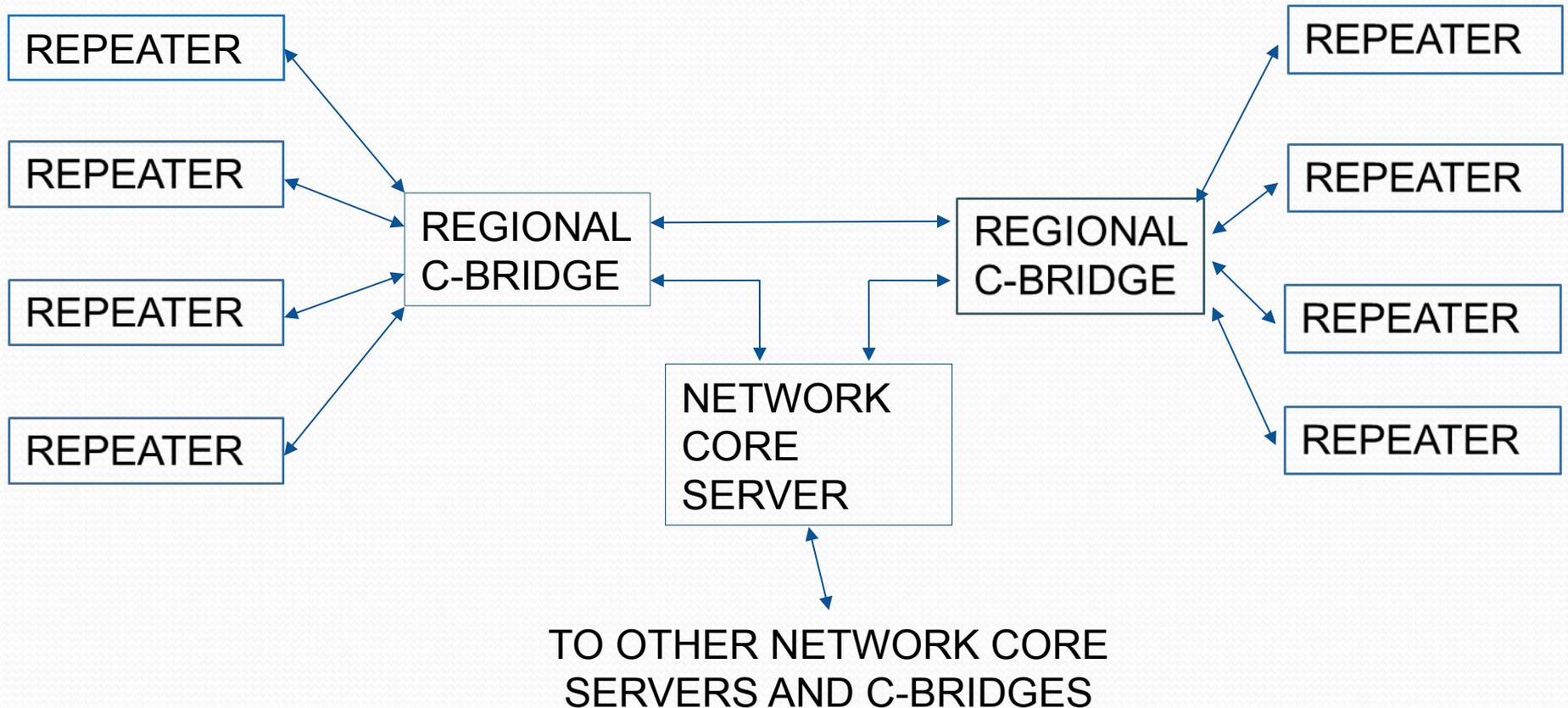
DMR-MARC

Motorola Amateur Radio Club Worldwide Network



- **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>**

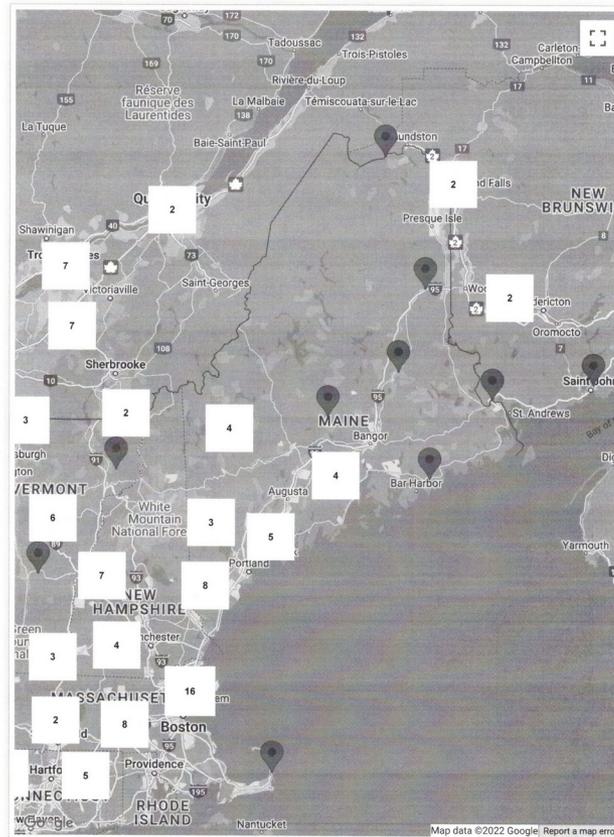
The Simplified DMR Network



90+ DMR REPEATERS IN NEW ENGLAND

DMR-MARC Repeater Map

<https://www.dmr-marc.net/MAP/fullscreen>



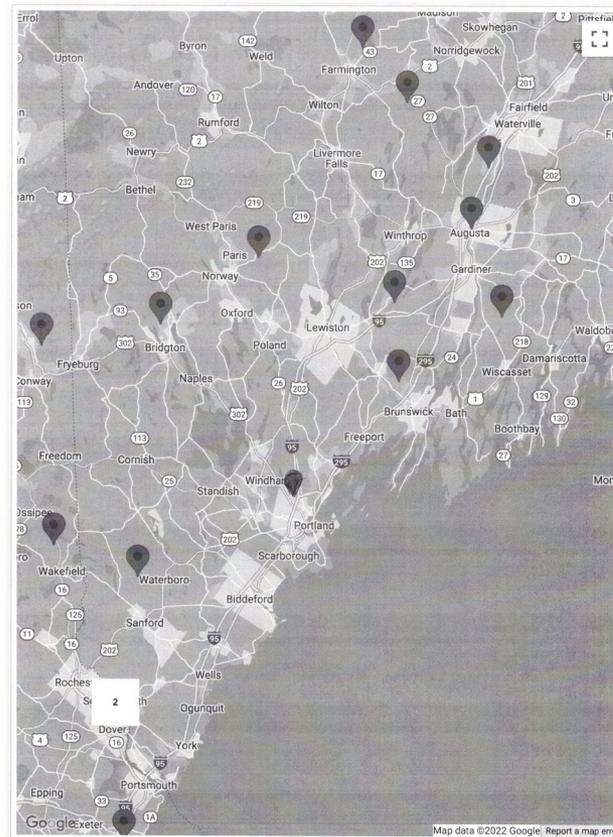
Local DMR Repeaters

- **NEDECN (DMR-MARC) Network**
 - **Shapleigh, ME**
 - **Portland, ME (Falmouth)**
 - **Buckfield, ME (Streaked Mtn)**
 - **Rochester, NH**
 - **Wakefield, NH**
 - **Ossipee, NH**
 - **Mt Washington (440)**

LOCAL DMR REPEATERS

DMR-MARC Repeater Map

<https://www.dmr-marc.net/MAP/fullscreen>



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	

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

SHAPLEIGH REPEATER

Time Slot #1 - NH Statewide

Time Slot #1 - Skywarn = 759

Time Slot #1 - Parrott = 9998*

Time Slot #1 - NECTAC 1 = 8801*

Time Slot #1 - World Wide = 1*

Time Slot #1 - WW English = 13*

Time Slot #1 - North America = 3*

Time Slot #1 - TAC 310 = 310*

Time Slot #1 - TAC 311 = 311*

Time Slot #1 - UA English 1 = 113*

Time Slot #1 - UA English2 - 123*

Time Slot #2 - Local = 9

Time Slot #2 - ME Statewide = 3123

Time Slot #2 - Region North = 8

**Time Slot #2 - New England Wide = 3181 * (Open For Net
Mon. 8PM)**

***PTT**

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 \$55 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)**

Programming your radio

BRINGING 180,000 ID'S INTO A RADIO IS AN ISSUE, BUT LUCKILY THE N0GSG.COM WEBSITE HAS PROVIDED A SOFTWARE TOOL CALLED 'CONTACT MANAGER' TO HELP WITH THIS. IT WORKS VERY WELL.

IT CAN BE FOUND AT:

<http://n0gsg.com/contact-manager/>

A SIMILAR TOOL IS AVAILABLE ON RADIOID.NET

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 REFLECTOR (SERVER) TO USE TO ACCESS NEDECN TALK GROUPS IS THE CAN-TRBO SYSTEM (ALSO KNOWN AS IPSC2-CAN-TRBO OR DMR+). SEE www.VE2TAX.com FOR INFO.

CAN-TRBO CURRENTLY HAS CONNECTION TO THE FOLLOWING DMR-MARC (NEDECN) TALK GROUPS:

WORLDWIDE, WORLDWIDE ENGLISH, NORTH AMERICA, TAC311, CT, MA, NH, ME, VT, NEW ENGLAND WIDE, NE TAC1, AND CAPENET

Hotspots

KNOWN GOOD HOTSPOTS FOR CAN-TRBO SYSTEM

- **SHARK OPEN SPOT 3 (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**

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

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**

Anyone 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**

Tytera XPR7550 MD380

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



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

**Both single and dual
band versions available**

Some Local DMR Nets

<u>DAY</u> <u>TALK GROUP</u>	<u>NAME</u>	<u>TIME</u>
● SUNDAY MAINE STATEWIDE	MAINE DIRIGO NET	10 AM
● MONDAY ENGLAND WIDE	NEW ENGLAND DMR NET	8 PM NEW
● TUESDAY STATEWIDE	VERMONT STATE NET	8 PM VT
● WEDNESDAY	YCCC DX & CONTEST NET	8 PM NETAC 1
● THURSDAY STATEWIDE	NEW HAMPSHIRE NET	8 PM NH

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

Ham Friendly DMR Dealers

- TwoWayDigitalRadio.com, contact Ken
 - [706.896.0000](tel:706.896.0000) (for Motorola radios)
- Connect Systems <http://csi-radios.com/>
- Ham Radio Outlet sells Alinco and Anytone DMR radios and Zumspot Hotspots
- Bridgecom sells Anytone and Hotspots

*WARNING: MOTOROLA AND HYTERA DMR radios are DMR-and-Analog **SINGLE BAND ONLY***