INTRO TO DMR RADIO

Presented by:

Nate Russell, W9SDI

INTRO TO DMR RADIO

Areas covered:
- Brief History
- Audio Quality Difference
- Spectrum Efficiency
- Local and Worldwide Network
- Repeaters vs Hotspots
- Code Plug Basics

S.T.A.R.S
SUBURBAN TECHNICAL
AMATEUR RADIO SYSTEMS
CALL SIGN
W9SRC

DMR: HISTORY

DMR was developed in Europe by ETSI, European Telecom Standards Institute and adopted as the Commercial standard 20 years ago.
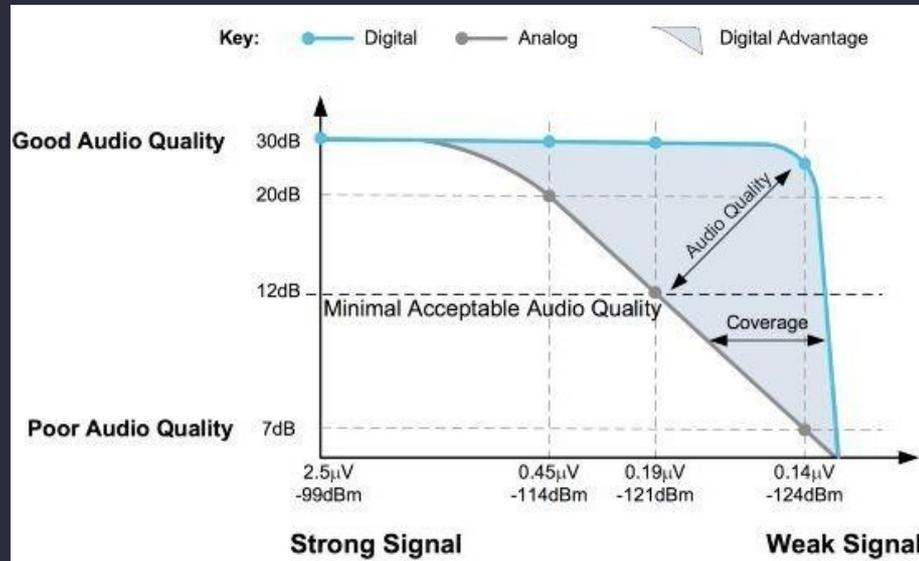
Initially, DMR was only available from commercial dealers, but several ham radio vendors have entered the DMR market.
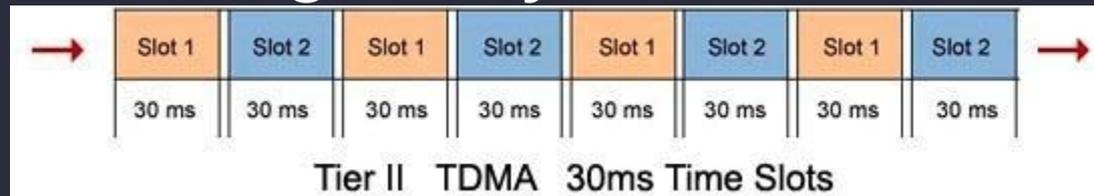
DMR: AUDIO QUALITY

Digital vs Analog

- An analog signal loses quality & readability as the signal strength is decreased.
- Digital signals remain clear until the signal is lost

DMR: SPECTRUM EFFICIENCY

Time slots

- FM Analog bandwidth is 25Khz
- DMR TDMA bandwidth is 12.5Khz
- TDMA = Time Division Multiple Access
- DMR signals have the ability to transmit two conversations at the same time.
- Each conversation is split into Time Slots alternating every 30 milliseconds.

Slot 1	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2	Slot 1	Slot 2
30 ms	30 ms	30 ms	30 ms	30 ms	30 ms	30 ms	30 ms

Tier II   TDMA   30ms Time Slots

DMR: SPECTRUM EFFICIENCY

- DMR repeaters interweave the incoming signals based on the Time Slot Requested
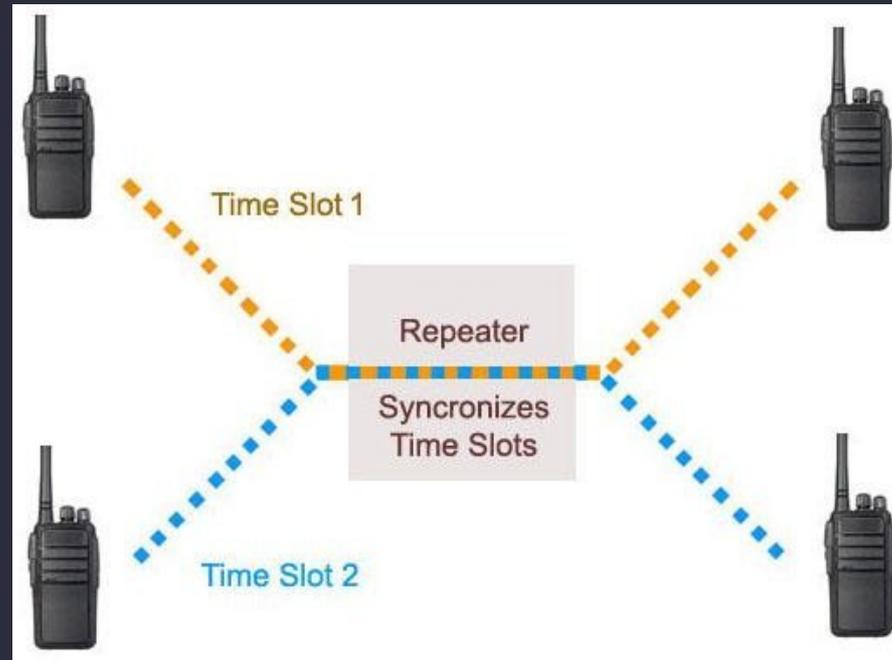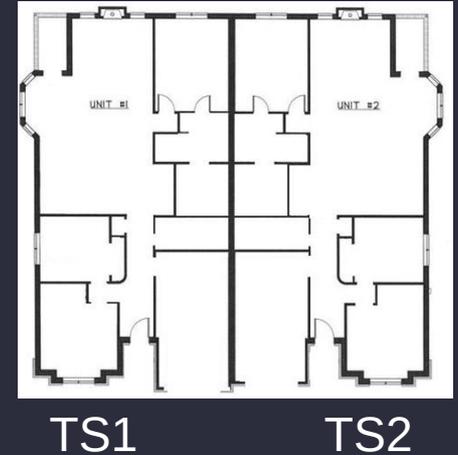
DMR: TIME SLOTS

- Duplex House, two separate families can live in one structure.
- These divisions are called Time Slots.

Each house has its own rooms, these are called Talk Groups (TG).

TS1   TS2

DMR: TALK GROUPS

- Over 1,500 available
- Local Repeater
- Local Network Repeaters
- Statewide Group
- Regional Groups
- Country Specific Groups
- Worldwide Groups
- Special Interest Groups

DMR: TALK GROUPS

- The repeater owner sets the TG and TS structure.

NAME	DESCRIPTION	TG	TS
LOCAL 2	CLUSTER OF RPTR	2	2
LOCAL 9	LOCAL RPTR	9	2
TAC 310, 311	SECD CHAT GRP	310	2
NATIONWIDE	NATL CALLING	3100	1
PA STATE	PA STATEWIDE	3142	1
MD STATE	MD STATEWIDE	3124	1
NE REGIONAL	NE REGION	3172	1

DMR: TALK GROUPS

- A full time group is always available for monitoring.
- If the TG becomes active, you will hear the traffic immediately.
- These are usually Local and Statewide talk groups.

DMR: TALK GROUPS

- A part time group is one that requires activation and only stays active for a predefined time.
- High traffic groups such as Nationwide and Worldwide.
- Only one TG can be active for each TS.

DMR: SAMPLE REPEATER CONFIG

Timeslot 1			Timeslot 2		
Talkgroup Name	**Hold**	**Talkgroup ID**	**Talkgroup Name**	**Hold**	**Talkgroup ID**
Penna State	FT	3142	Local Repeater	FT	9
Penna TAC	15	31421	Local Area	FT	2
Maryland State	FT	3124	TAC 310	5	310
North East Reg'l	FT	3172	TAC 311, 312	15	311, 312
Mid Atlantic	FT	3173	Delaware State	FT	3110
Nationwide	5	3100	Kentucky State	15	3121

Sample from Interstate c-Bridge

FT = Fulltime   5/15 = PTT activation time

Each repeater configuration will vary from another repeater.

DMR: LOCAL / WORLDWIDE NETWORK

A repeater can be stand alone to cover a local area or it can be connected to a DMR network server and provide worldwide access.

Repeaters aren't cheap and there's incurring charges. Please support your local club or repeater owners.

DMR: WORLD WIDE NETWORK

Although the Internet is fast, it's not instant.
Your audio is digitally processed in your portable,
forwarded to the repeater, then to a regional server
connected to a series of servers.

The process is then reversed before it is delivered
to a receiving station. This is called latency, your
signal can be delayed getting to the other end by as
much a 2 seconds.

Remember: pause 2 to 3 seconds before speaking.

DMR: ANALOG VS DIGITAL PTT

- Analog: pressing the PTT keys the TX and you're ready to go.

- Digital: when the PTT is pressed, a signal is sent to the repeater which checks the TS, if the TS is free, it gives you an all clear with a beep tone.
  - It's best practice to turn ON BCLO (Busy channel lock Out), this prevents a station from TX-ing on a time slot if it is active.

- When pressing the PTT, wait 2 or 3 seconds before speaking.

DMR: NETWORKS

- DMR-MARC, Brandmeister, TGIF, and others.
- Each network may share the same TG, but they might not have the same TG #.
- Not all DMR networks support GPS or digital APRS.

DMR: NETWORKS

- Not all DMR networks share the same talk groups.
- The location of the server is important too. The farther away you are, the longer the delay or latency.

TGIF and BrandMeister are excellent choices in the US.

DMR: REPEATER VS HOTSPOT

- To access a DMR network you can use a repeater or hotspot.
- Hotspots were developed for local access when repeaters aren't available.
- They run Pistar or WPSD software.

DMR: CODE PLUGS

- Data file for programming your DMR radio.
- Uses CPS (customer programming software).
- Stores the basic parameters for your radio.
- Contains the following:
- Contact List
- Channel Information
- Zones

DMR: CODE PLUGS – CONTACT LIST

- Include Talk Group Name, Talk Group #, and Talk Group Call Type .
- Talk Group types can be: Group or Private.
- If you want to talk to an entire Talk Group, you should select Group.
- If you want to talk to an individual, you should select Private.
- Most Call types will be Group.

No.	Contact Name	Call Type	Call ID	Call Receive Tone
1	Local 2	Group Call	2	No
2	Local 9	Group Call	9	No
3	Digital Simplex	Group Call	99	No
4	TAC 310	Group Call	310	No
5	TAC 311	Group Call	311	No
6	TAC 312	Group Call	312	No
7	MD 3124	Group Call	3124	No
8	PA 3142	Group Call	3142	No
9	PA TAC	Group Call	31421	No
10	Northeast	Group Call	3172	No
11	MidAtlantic	Group Call	3173	No
12	Southeast	Group Call	3174	No
13	WorldWide	Group Call	1	No
14	N America	Group Call	3	No
15	WorldWide Englsh	Group Call	13	No
16	Nat 3100	Group Call	3100	No

Digital Contacts

SUBURBAN TECHNICAL
S.T.A.R.S
AMATEUR RADIO SYSTEMS
W9SRC

DMR: CODE PLUGS – CONTACT LIST

No.	Contact Name	Call Type	Call ID	Call Receive Tone
1	Local 2	Group Call	2	No
2	Local 9	Group Call	9	No
3	Digital Simplex	Group Call	99	No
4	TAC 310	Group Call	310	No
5	TAC 311	Group Call	311	No
6	TAC 312	Group Call	312	No
7	MD 3124	Group Call	3124	No
8	PA 3142	Group Call	3142	No
9	PA TAC	Group Call	31421	No
10	Northeast	Group Call	3172	No
11	MidAtlantic	Group Call	3173	No
12	Southeast	Group Call	3174	No
13	WorldWide	Group Call	1	No
14	N America	Group Call	3	No
15	WorldWide Englsh	Group Call	13	No
16	Nat 3100	Group Call	3100	No

DMR: CODE PLUGS – CHANNEL INFO

- Mode: Digital
- Frequency: Duplex or Simplex Frequency
- Color Code: 1 or 2, equivalent of a PL tone for digital modes
- Bandwidth: 12.5Khz
- Time Slot: 1 or 2, whatever is assigned to the Talk Group
- TX contact: Talk Group selected from Contact List
- RX contact: Talk Group selected from Contact List
- Power: High or Low
- Tx Criteria: Channel Free or Busy Channel Lock Out

SUBURBAN TECHNICAL
S.T.A.R.S
AMATEUR RADIO SYSTEMS
CALL SIGN
W9SRC

DMR: CODE PLUGS – CHANNEL INFO

DMR: CODE PLUGS – ZONES

- Zones are where you organize your channels.
- You could organize them by:
  - Repeater
  - Location
  - Activity
  - Analog Repeaters
  - Digital Repeaters
  - Simplex

DMR: CODE PLUGS – ZONES
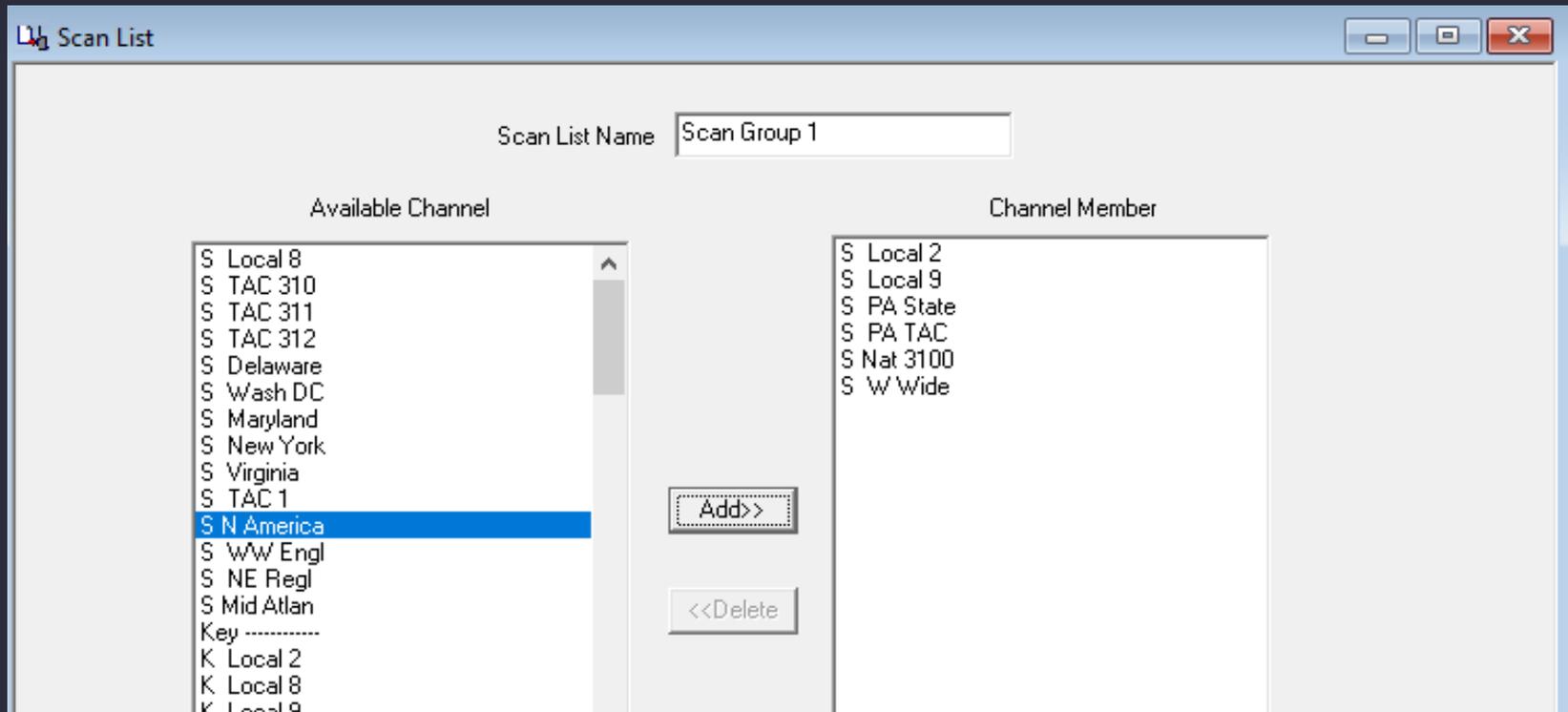
DMR: CODE PLUGS – SCAN LIST

- Scan lists allow you to create a list of channels to scan.
- Create a scan list and then add the channels to it.

DMR: CONCLUSION

- Remember this is a terrific hobby!
- If you need help, please ask! There are plenty of experts willing to help.
- Be thankful for the digital repeaters on the air.
- Repeaters, servers, and networks require maintenance and funding.
- Get involved in your local radio club and help others around you.

DMR: Questions & Comments