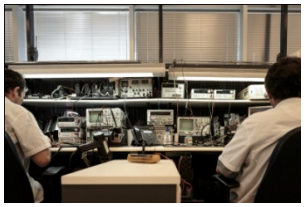
MOTOTRBO WORKSHOP

R2.4A






WHAT DMR IS NOT!

It is not proprietary or somehow owned by Motorola.

Wide variety of equipment manufacturers.

WHAT IS DMR?

ETSI Technical Standard 102 361 1~4 (ETSI DMR Standard).

Open Standard using TDMA and ABME+2.

Uses existing PMR frequencies: VHF and UHF.

Feature rich and future proof.

WHAT IS MOTOTRBO?

WHY MOTOTRBO?

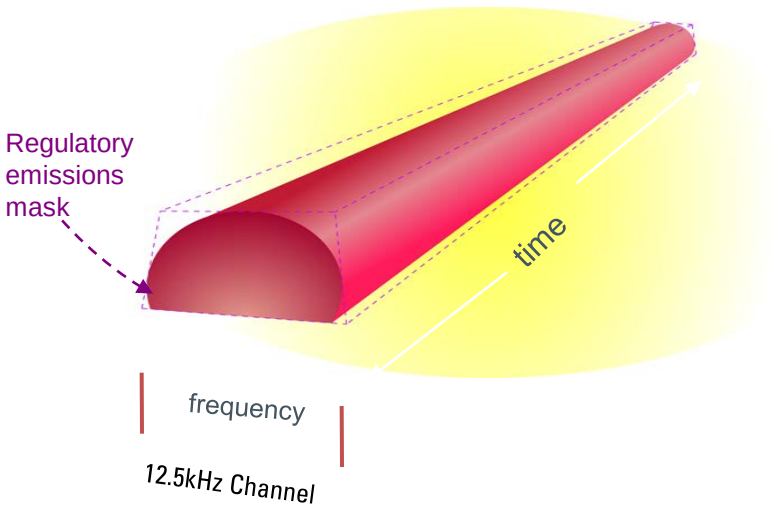
WHY MOTOTRBO?

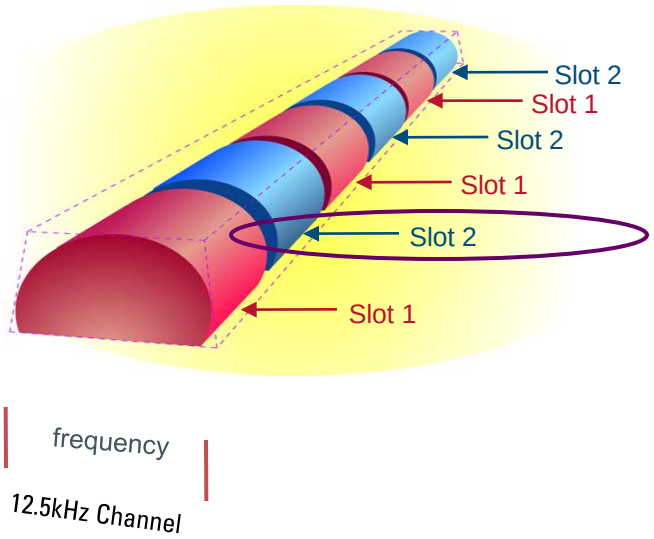
Market flooded with (cheap) unremarkable analogue equipment.

Such analogue equipment no longer meets the sophisticated needs of most customers.

Many regulators have or will soon require 6,25kHz operation.

TDMA





12.5kHz Analogue

1 voice for each 12.5kHz channel
1 repeater for each channel

12.5kHz TDMA

Divides existing channel into two timeslots
Delivers **twice** the capacity through repeater
Performance is same or better than 12.5kHz analogue
1 repeater does work of 2
Reduces need for combining equipment
Enables 40% increase in radio battery life

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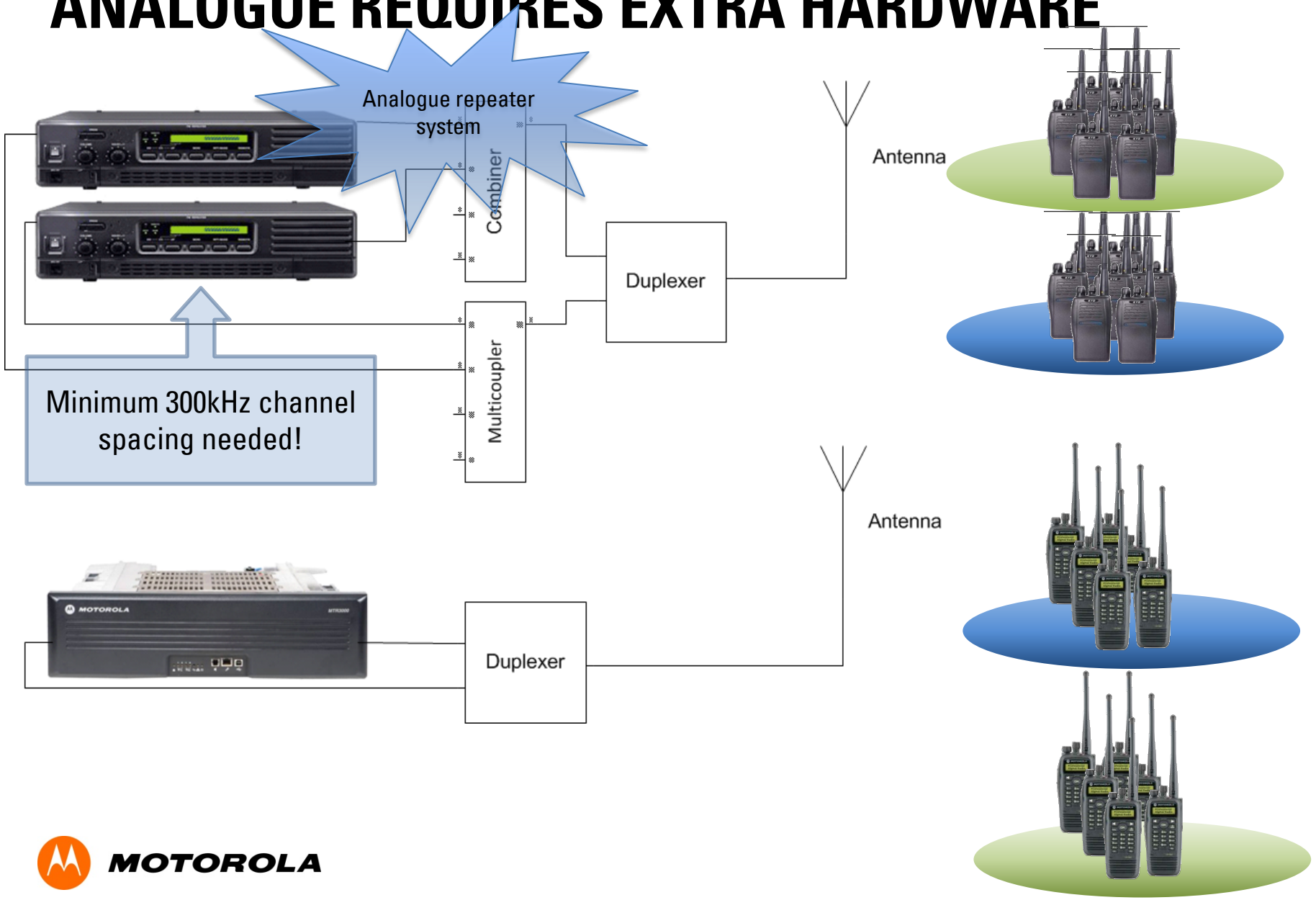
TDMA

Voice Call 1 (or Data)

timeslot 1	timeslot 2	timeslot 1	timeslot 2	timeslot 1	timeslot 2

Voice Call 2 (or Data)

ANALOGUE REQUIRES EXTRA HARDWARE



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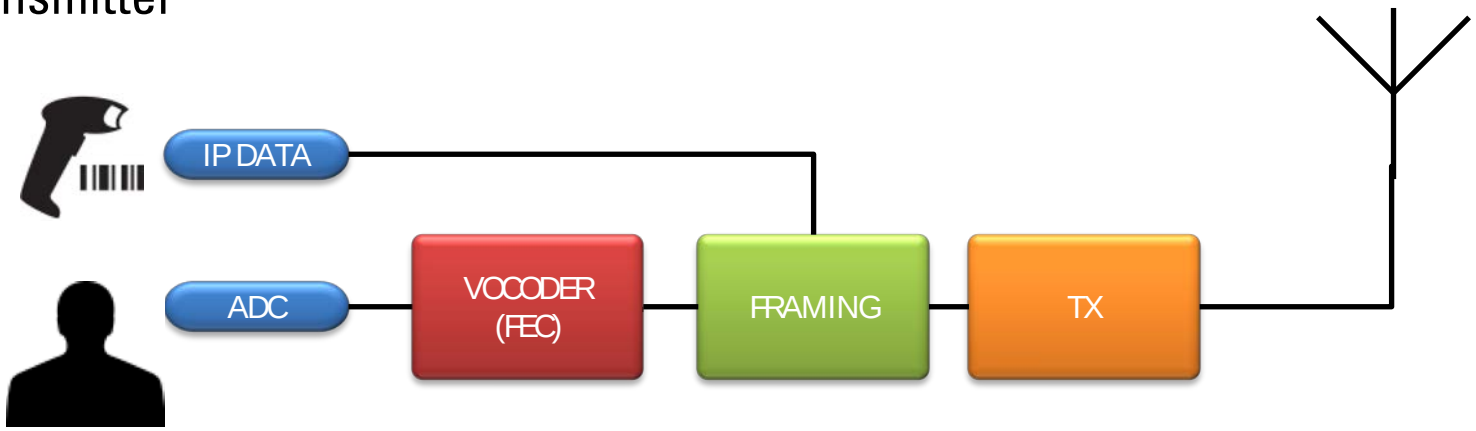
HOW SIGNALS ARE DIGITISED

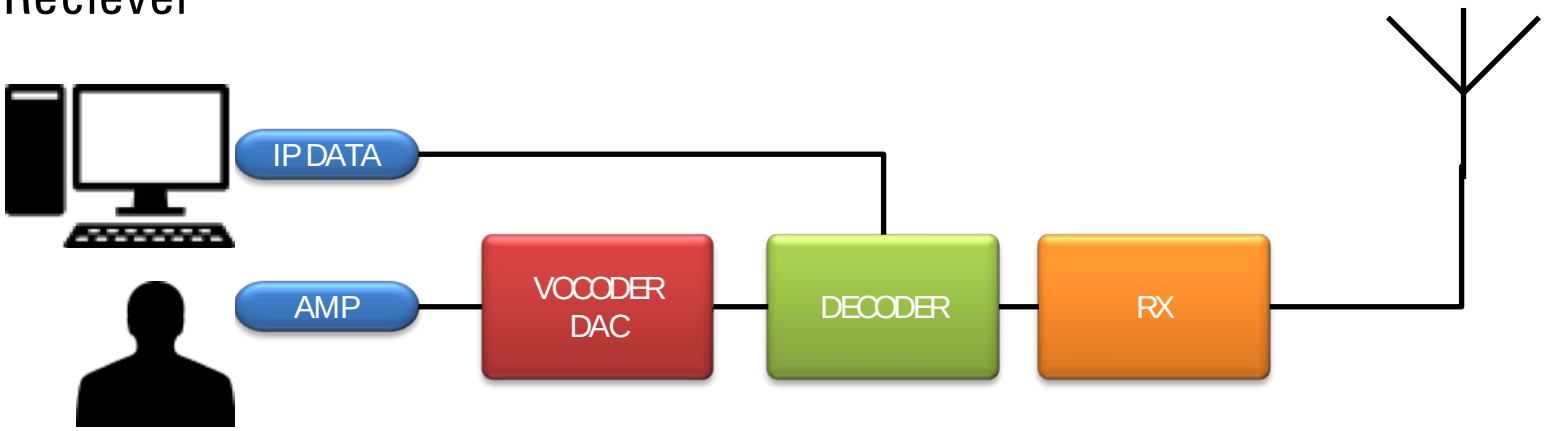
- Transmitter



Audio is digitised and converted into a 128kbps bitstram by the ADC. This is fed into the Vocoder which samples the bitstram and compresses the audio. Data is fed into the Vocoder when needed. Forward Error Correction is also addded here.

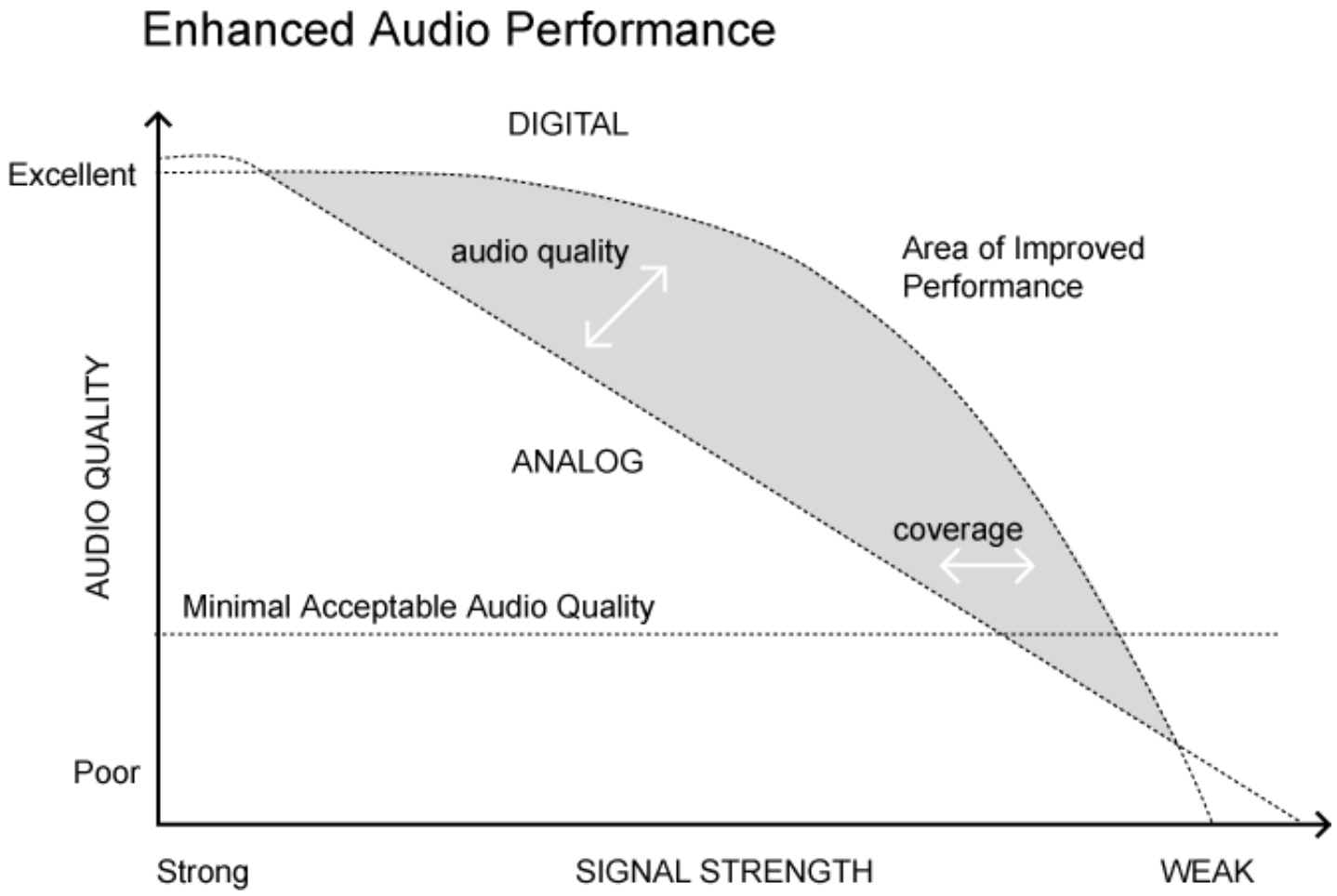
HOW SIGNALS ARE DIGITISED

- Reciever



In receive mode, the Vocoder looks at the incoming receive signal and converts this back to a bitstream. The bitstream is fed into the DAC and converted back into audio. If any errors are detected, the FEC corrects them.

FORWARD ERROR CORRECTION



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THE DIFFERENCE WITH DIGITAL

- What end user will experience with DMR:
    a. Consistent performance throughout coverage area with no gradual fade at the fringes.
    b. Digital sounds different.
    c. Background noise reduction.

- What end user will NOT experience with DMR:
    a. Digital radio or CD quality.
    b. Digital cannot solve historic problems.
    c. Digital is still influenced by the same physics of analogue.

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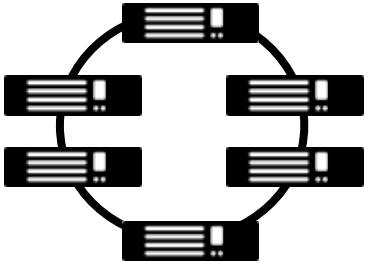
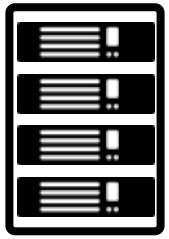
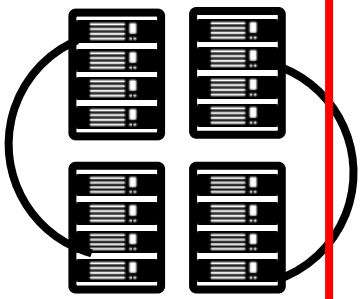
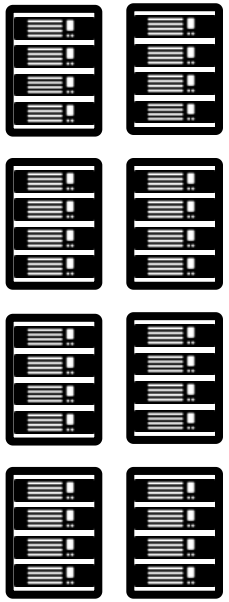
“FLAVOURS” OF MOTOTRBO

SINGLE SITE	IP SITE CONNECT	CAPACITY PLUS	LINKED CAPACITY PLUS	CONNECT PLUS
One or more repeaters on a site.	Up to 15 repeaters linked via IP.	Up to 8 repeaters in a trunked configuration	Up to 15 sites with up to 6 trunked repeaters on each site.	Up to 70 sites with up the 15 repeaters per site +++









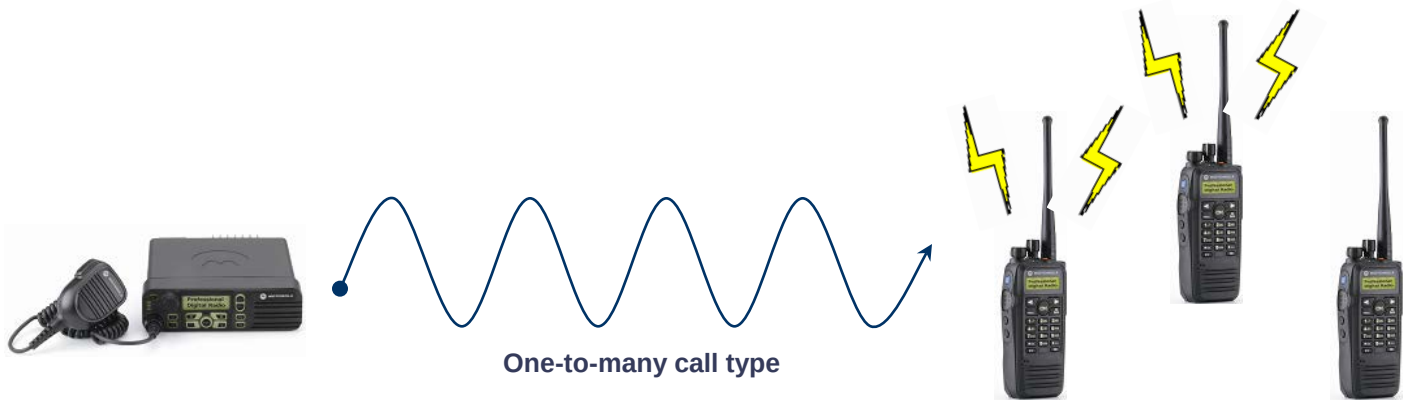
1 Repeater = two timeslots

VOICE CALL FEATURES

GROUP CALL

Digital Group Call is a way of enabling groups to share a channel without distracting and disrupting other radio users.

Both transmitting and receiving radios must be on the same logical channel (frequency and timeslot) and Talkgroup in a conventional system or on the same Talkgroup in a trunked system.

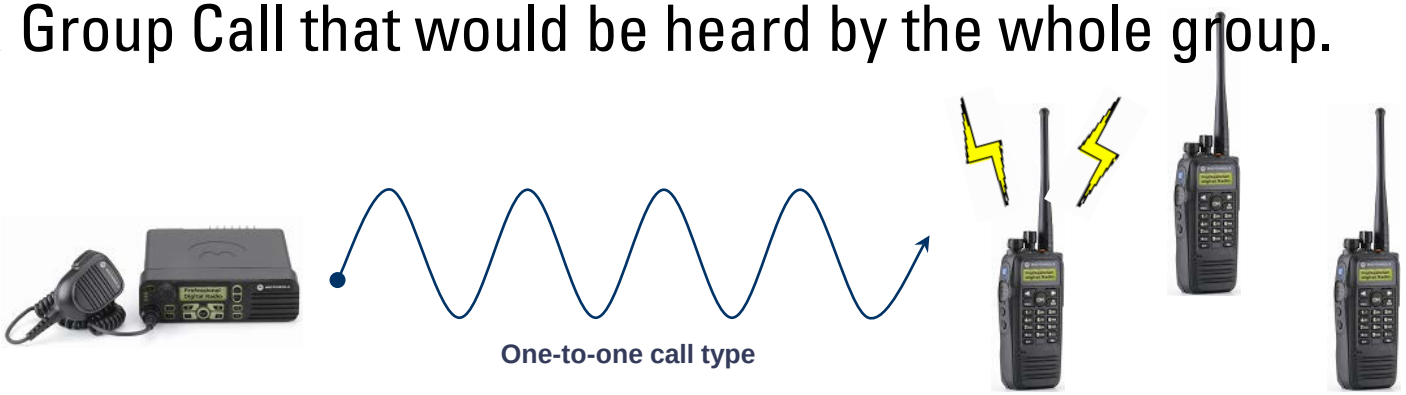


PRIVATE CALL

Private Call allows a radio user to directly communicate with another radio user, even if they are not within the same Talkgroup.

Private Call allows one-to-one communication between transmitting and receiving radio.

For example, an employee may use a Private Call to privately alert a specific manager about a security incident, rather than placing a Group Call that would be heard by the whole group.



ALL CALL

All Call is a one way voice communication between one radio with all radio users within the same logical channel.

Useful when a supervisor needs to communicate to all radios.

All Call follows the admit criteria of the selected channel.

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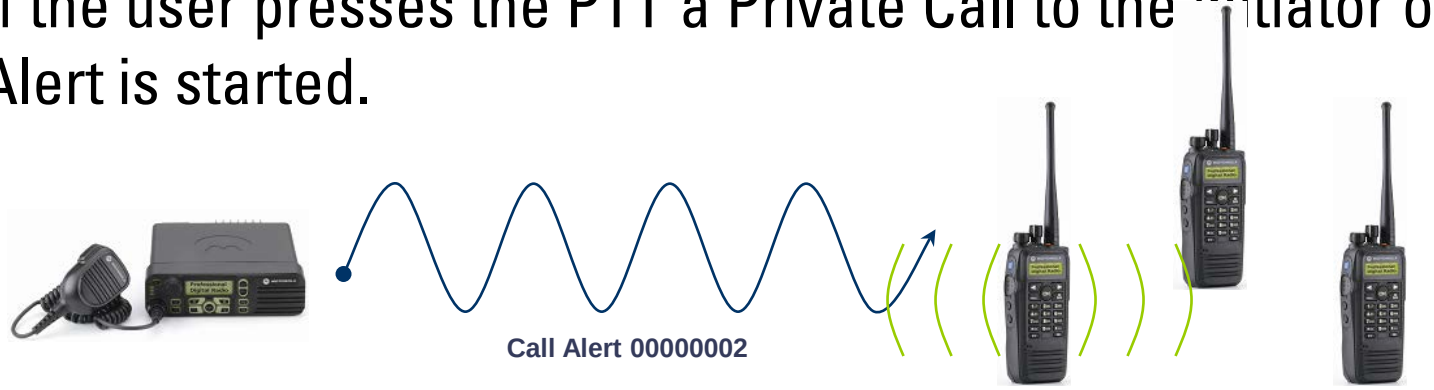
CALL ALERT

This feature allows the initiating radio to essentially page another radio user.

When a radio receives a Call Alert, a persistent audible and visual alert is given and the callers ID is shown on the display.

If the user presses the PTT a Private Call to the initiator of the Call Alert is started.



PHONE CALL

Radio users are able to make and receive telephone calls.

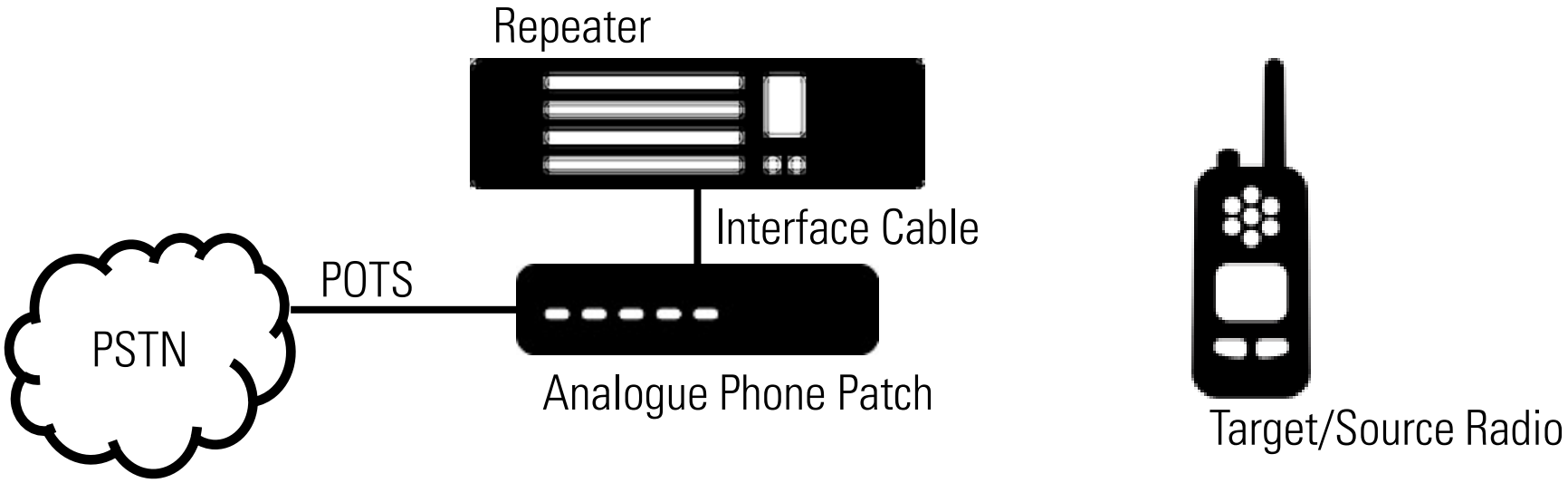
Phone callers can make phone calls to a MOTOTRBO Talkgroup.

Phone call is either routed via an Analogue Phone Patch or an Application Partner solution.

PHONE PATCH VIA APP

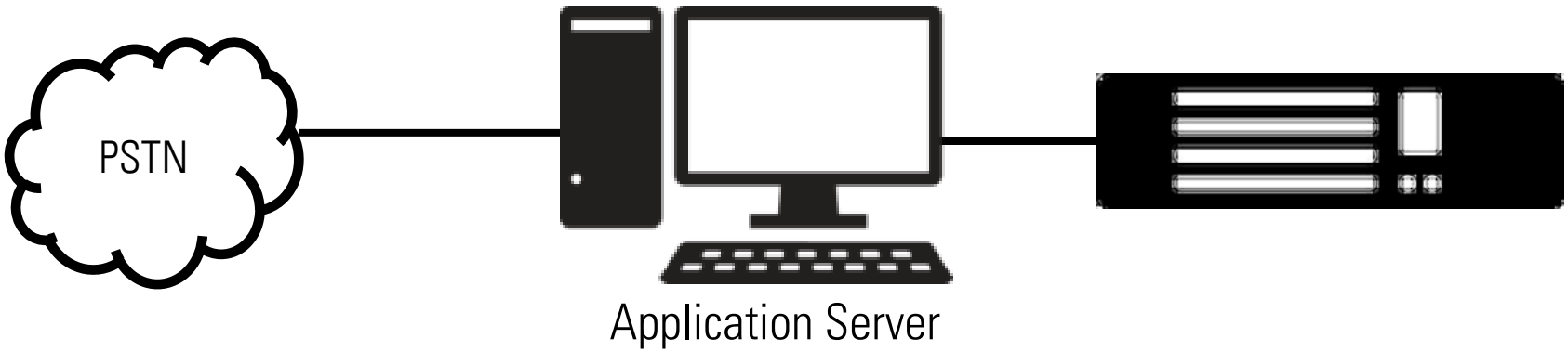
Previously phone patch was only possible via an APP.

Some Application Partner Solutions required private call and DTMF live-dial or text message.



PHONE PATCH VIA NAI

Possible now to interface MOTOTRBO radio network into SIP/PBX server and use phone call features in radio.

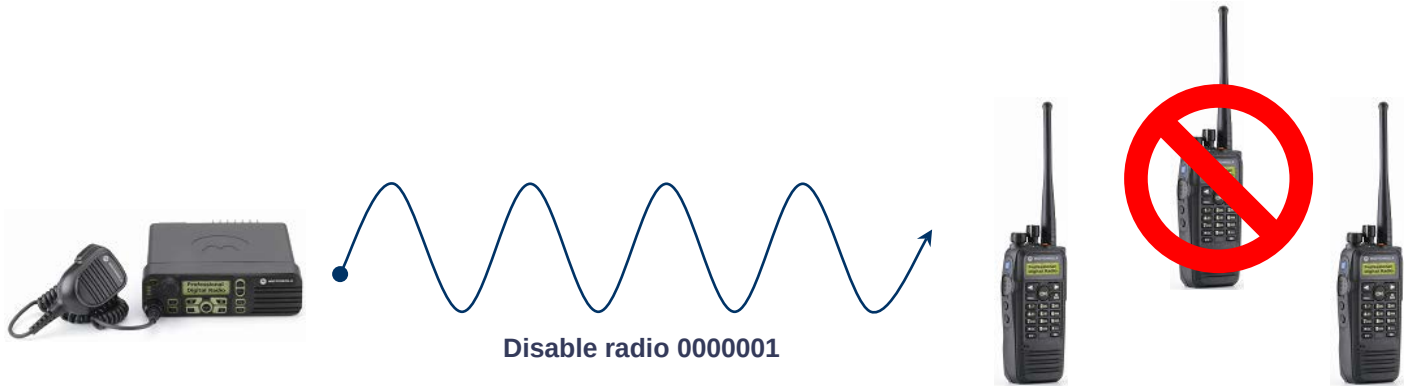


RADIO DISABLE

This feature allows a supervisor radio to disable another radio via over-the air signaling.

The disabled radio displays blank screen and is unable to make or receive calls.

Once disabled, the radio can only be enabled via CPS or by a Radio Enable command.



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RADIO PASSWORD

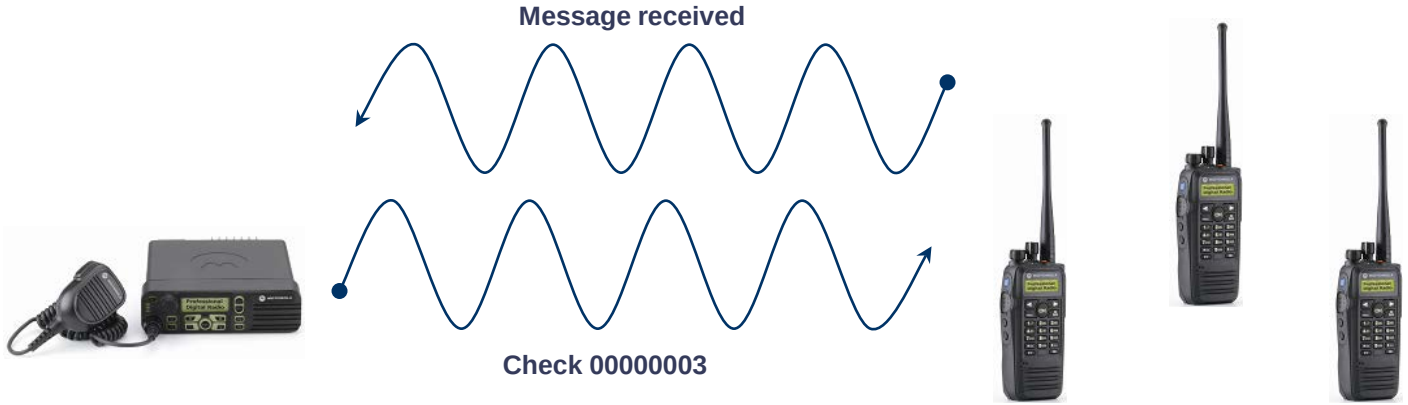
Optional 4 digit password used during radio power up to protect radios from unauthorised usage.

Radio will remain locked for 15 minutes upon 3 bad password entries.

RADIO CHECK

This feature allows the initiating radio to check if a target radio is active within the system without notifying the user.

The target radio automatically and silently responds with an acknowledgement to the initiating radio.

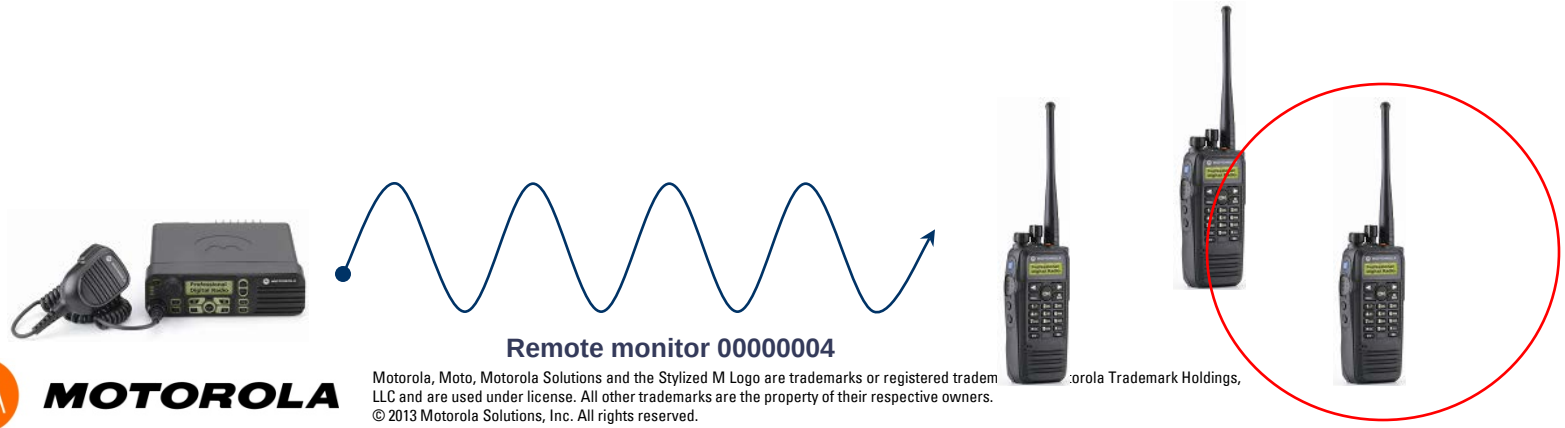


REMOTE MONITOR

This feature allows a remote user to activate a target radio's microphone and transmitter for a period of time.

A call is silently set up on the target radio, and its PTT is controlled remotely without any indications given to the end user.

This feature is used to ascertain the situation of a target radio which is powered-on, but is unresponsive.



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EMERGENCY

MOTOTRBO radios allow a user in distress to send out a confirmed emergency alarm message and emergency voice to any radio or group.

The emergency alarm message contains the individual radio ID of the initiator and if needed the GPS coordinates.

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LONE WORKER

Lone Worker provides a way to monitor if a radio user has stopped activity.
The user gets a periodic reminder to press a button. They have a certain time in which to do this.
If they fail to react, the radio will enter emergency mode.

PTT ID

Whenever a user presses the PTT, the radios identity is sent and is displayed on all receiving radios with displays. The signalling is embedded in the transmission.

LATE ENTRY

Allows a radio to join an existing group call if it is switched on after the call was set up.

The signalling used to set up a call is periodically resent during the conversation.

MULTI BUTTON PTT

Allows the user to call various groups by pressing a number of PTT buttons on the radio.

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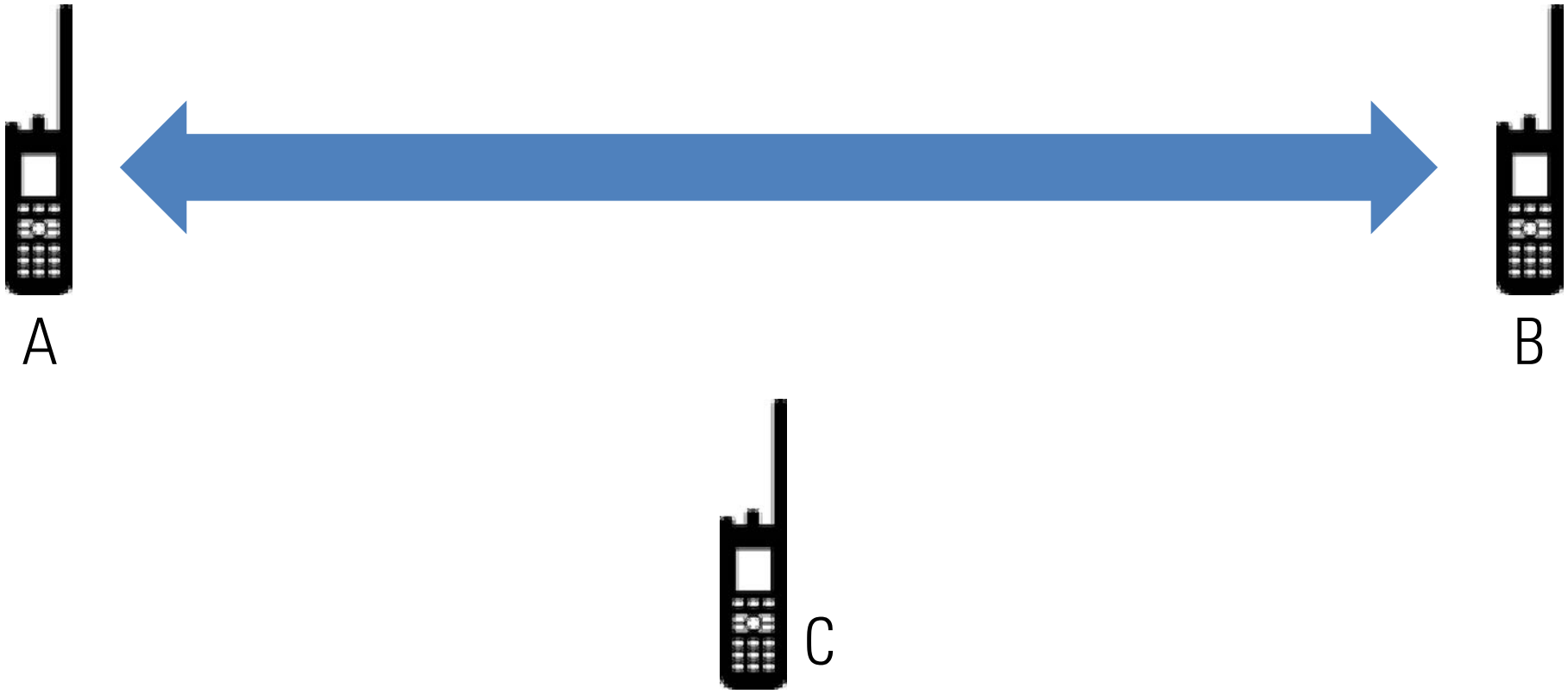
TRANSMIT INTERRUPT

REMOTE VOICE DEKEY	EMERGENCY VOICE INTERRUPT	DATA OVER VOICE INTERRUPT
Remote Voice Dekey can be sent to a radio which is blocking the channel. This feature should not be provisioned in all radios – only supervisor radios.	Emergency Voice Interrupt allows the radio to break an ongoing call to allow it's own emergency call.	Data Over Voice Interrupt allows a 3rd party application to break into a call to send data. By default MOTOTRBO gives preference to voice traffic.

TRANSMIT INTERRUPT



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DATA CAPABILITIES

TEXT MESSAGING

All MOTOTRBO radios support text messaging.

Non-display models have the ability to send pre-programmed text messages via a button press.

Non-display radios can use text-to-speech to “read out” a received message.

Display model radios can use “xt9” input to save on keypad button presses.

DMR STANDARD TEXT MESSAGING

Allows the radio to optionally send and receive text messages as per ETSI TS102-361-2.

This allows the radios to send and receive text messages from other vendors equipment.

TEXT TO SPEECH

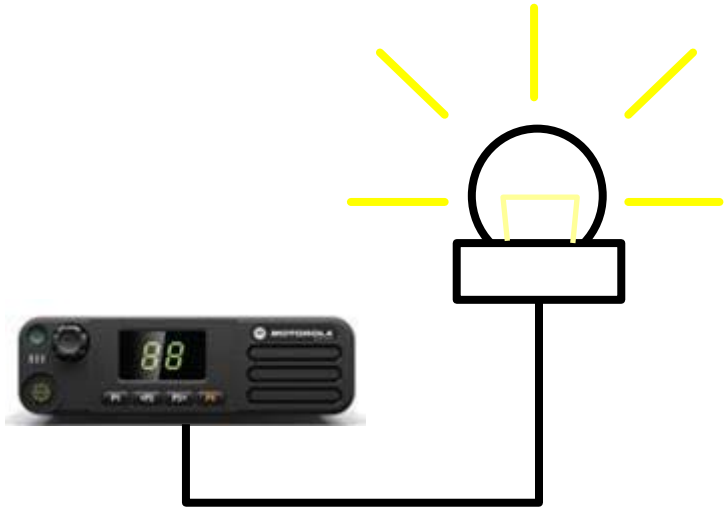
This allows generation of voice announcements using a speech synthesis algorithm in the MOTOTRBO subscriber.

The MOTOTRBO CPS loads the selected voice file into the MOTOTRBO subscriber.

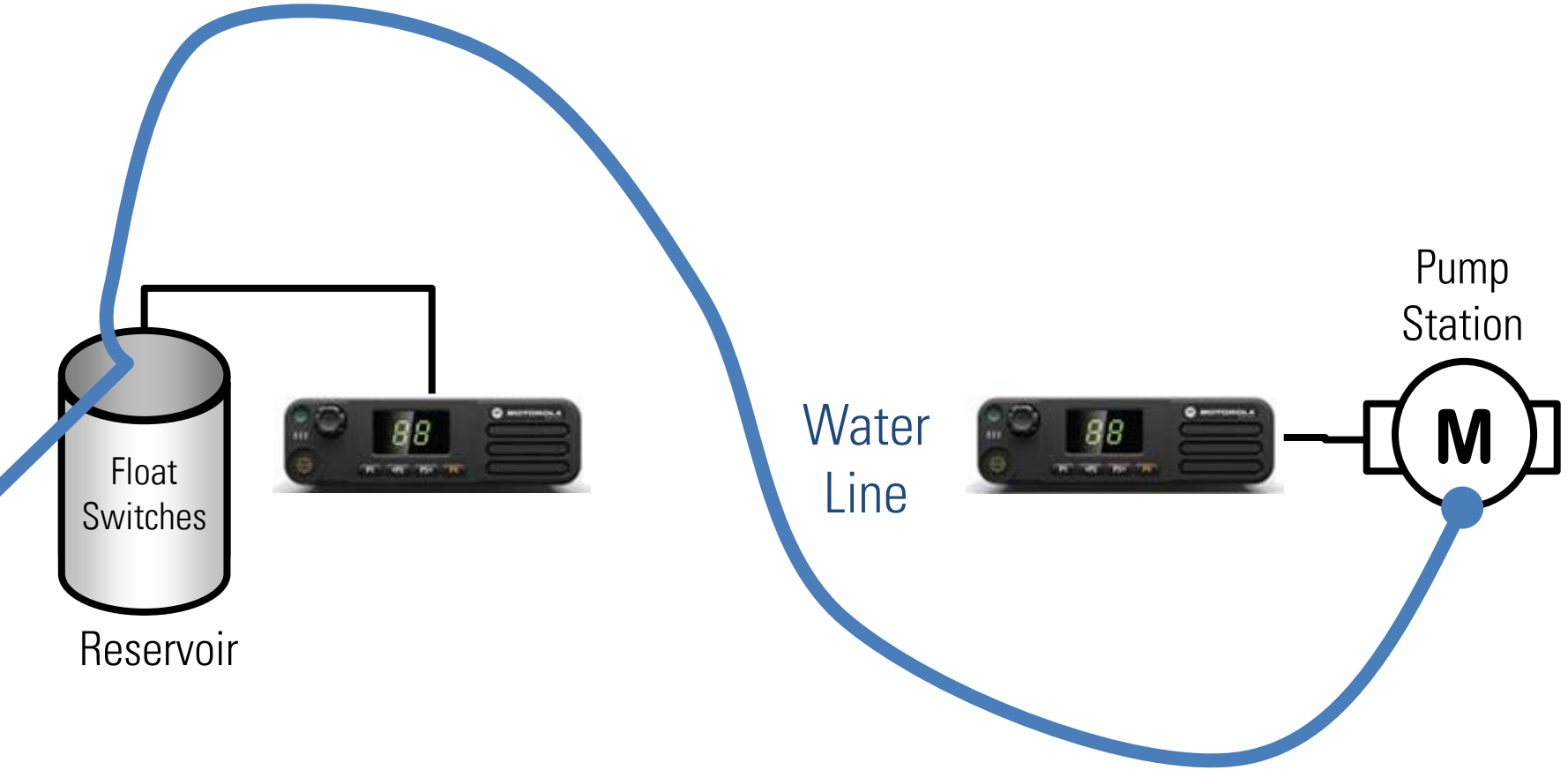
The radio management integration is seamless because the audio is generated in the MOTOTRBO subscriber.

Needs a HKVN4285A license per radio.

TELEMETRY



TELEMETRY



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SECURITY FEATURES

BASIC PRIVACY

Basic (voice and data) Privacy is enabled using a non-cryptographic algorithm (software scrambling) to protect information.
Its primary purpose to thwart eavesdropping, however it will not provide resistance against more sophisticated hacking attempts.

ENHANCED PRIVACY

Enhanced Privacy provides a higher level of protection

Multiple 40 bit keys

Cryptographic algorithm (ARC4)

Protects each super frame in a different manner

Basic and Enhanced Privacy are not interoperable with each other.

Highest level of encryption available without export licensing.

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AES ENCRYPTION

Provides a much high degree of security compared to Enhanced Privacy.

256 bit key length.

Group shared static cypher key.

New keys can sent via OTAP/OTAR.

EAR9900NR ECCN so cannot be exported to certain countries.

Supported by DP/DM/SL4000 series only.

CODEPLUG PASSWORD PROTECTION

As of R2.3A it possible to define a read-write password.

If this password is not known, the radio will have to returned to Motorola!

No backdoor password, no Wireshark hack!

It's maybe better to have a read password only.

RESTRICTED ACCESS TO SYSTEM

Prevents unauthorised radios from using a repeater.

Two methods can be used together or alone:

a. RAS key

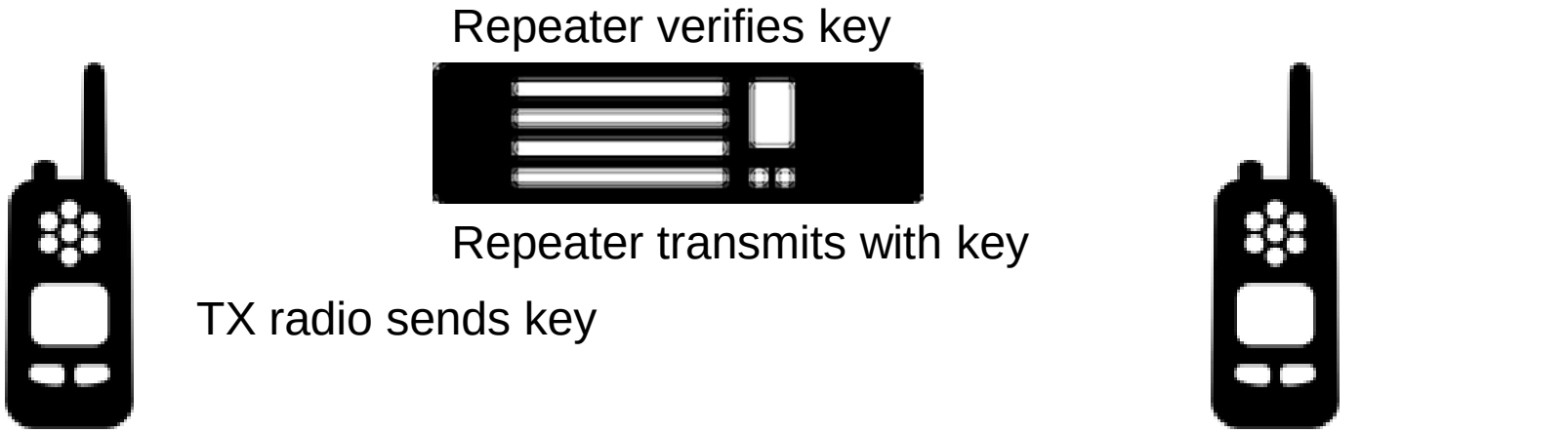
b. Radio subscriber ID range check

RESTRICTED ACCESS TO SYSTEM

Repeater software.

Supported on both 8Mb and 32Mb DR3000s.

No licence required – only software upgrade.



PRESENCE AND LOCATION FEATURES

ARS (PRESENCE NOTIFICATION)

ARS is a data message sent by a radio to a server or application when:

a. The radio switches on

b. The user moves to another channel

c. The radio roams to another site

ARS can be disabled or customised if desired.

SIGN IN / OUT

If set up, the radio user can sign in and out of the radio system by entering a password.

The radio then sends an ARS message based on this.

GNSS (GLOBAL NAVIGATION SATELLITE SYSTEM)

MOTOTRBO supports GPS; GLONASS and BDS location tracking.

Radios which have a 1 at the end of the model name have a built-in GPS/GLONASS receiver.

This receiver can be used to report the location of the radio.

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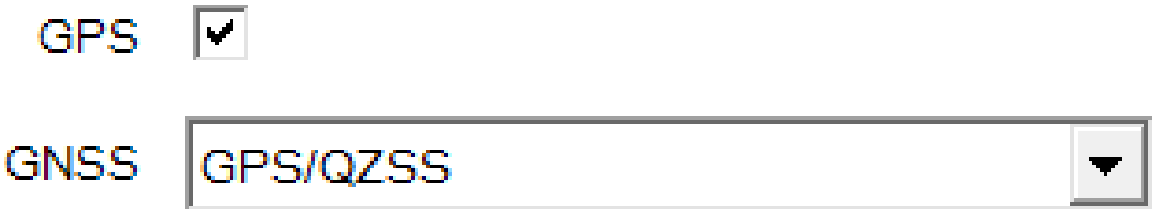
GNSS

Motorola uses LRRP for location tracking.

The location request originates from the tracking application.

Only one location request is needed to make the radio send continious updates.



ENHANCED GPS

The difficulty with GPS updates is that they are uncoordinated resulting in a certain number of data collisions.

Enhanced GPS allows radios to access the channel in a synchronized manner, eliminating collisions.

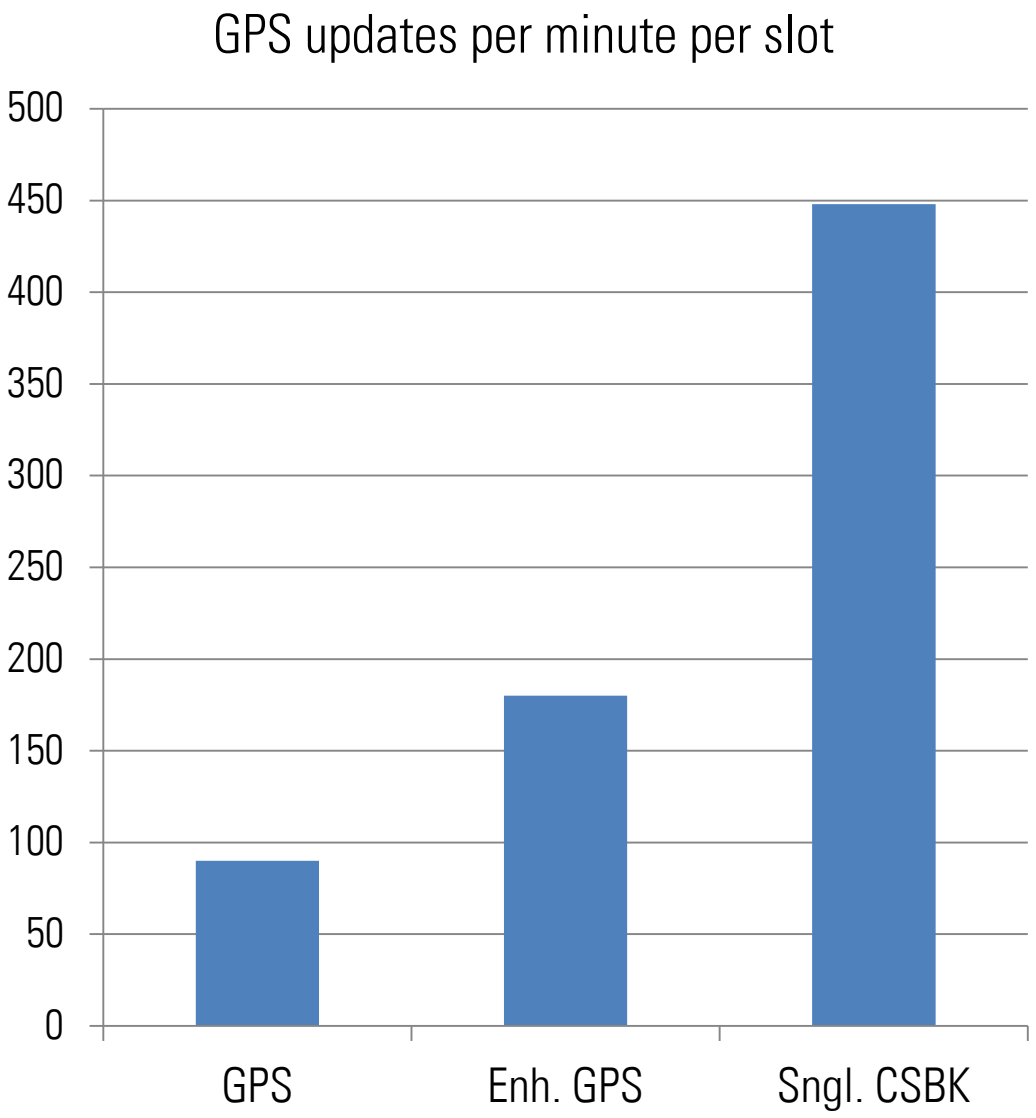
EVENT-DRIVEN LOCATION UPDATE

When an accessory pin changes state, the event can be reported via GPS.

Example: accelorometer to detect accident; door opening on cash transport van etc.

SINGLE CSBK DATA

Allows a GPS location update to be compressed to a single CSBK packet.



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DEVICE MANAGEMENT

IP REPEATER PROGRAMMING

IP Repeater Programming allows the CPS to program / upgrade a repeater and activate CPS features in a repeater remotely via an IP network.

The repeater hardware must have the 32Mb memory chipset.

RADIO MANAGEMENT

Centralised management of remote radio systems.

Minimises system down-time.

Saves time and cost.

Minimal impact on system performance.

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RADIO MANAGEMENT

Windows based software application with scalable licences.

Up to 50000 radios can be managed on a single server.

Radios can be provisioned:

a. Direct connection

b. OTAP

OVER THE AIR PROGRAMMING

Reads and writes radio configuration over the air

Common configuration templates created

Bandwidth efficient – only the changes are transmitted

Voice priority while transferring

Utilises existing over-the-air encryption

Convenient scheduling of over-the-air operations

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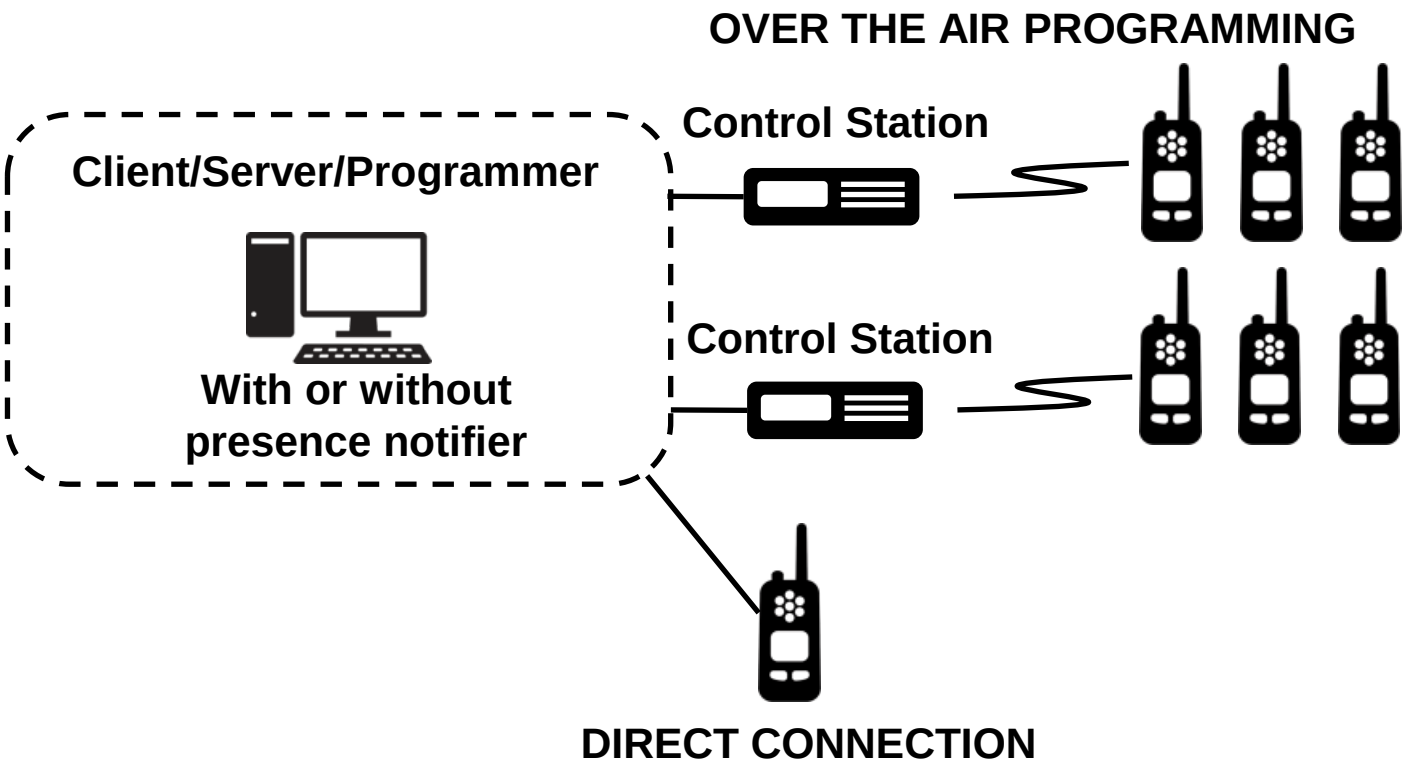
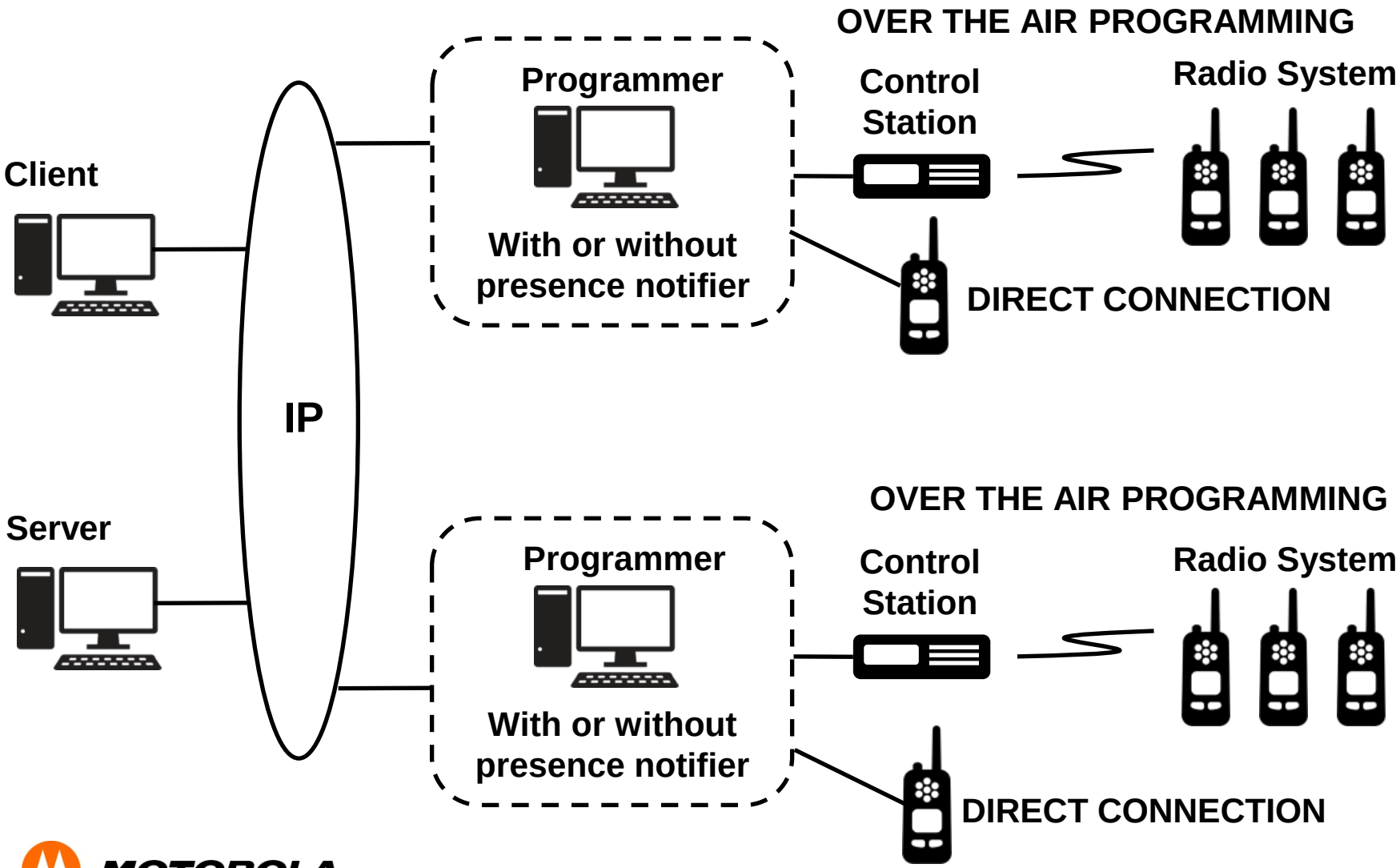
SINGLE SERVER AND CLIENT



RADIO MANAGEMENT SEPARATE SERVER



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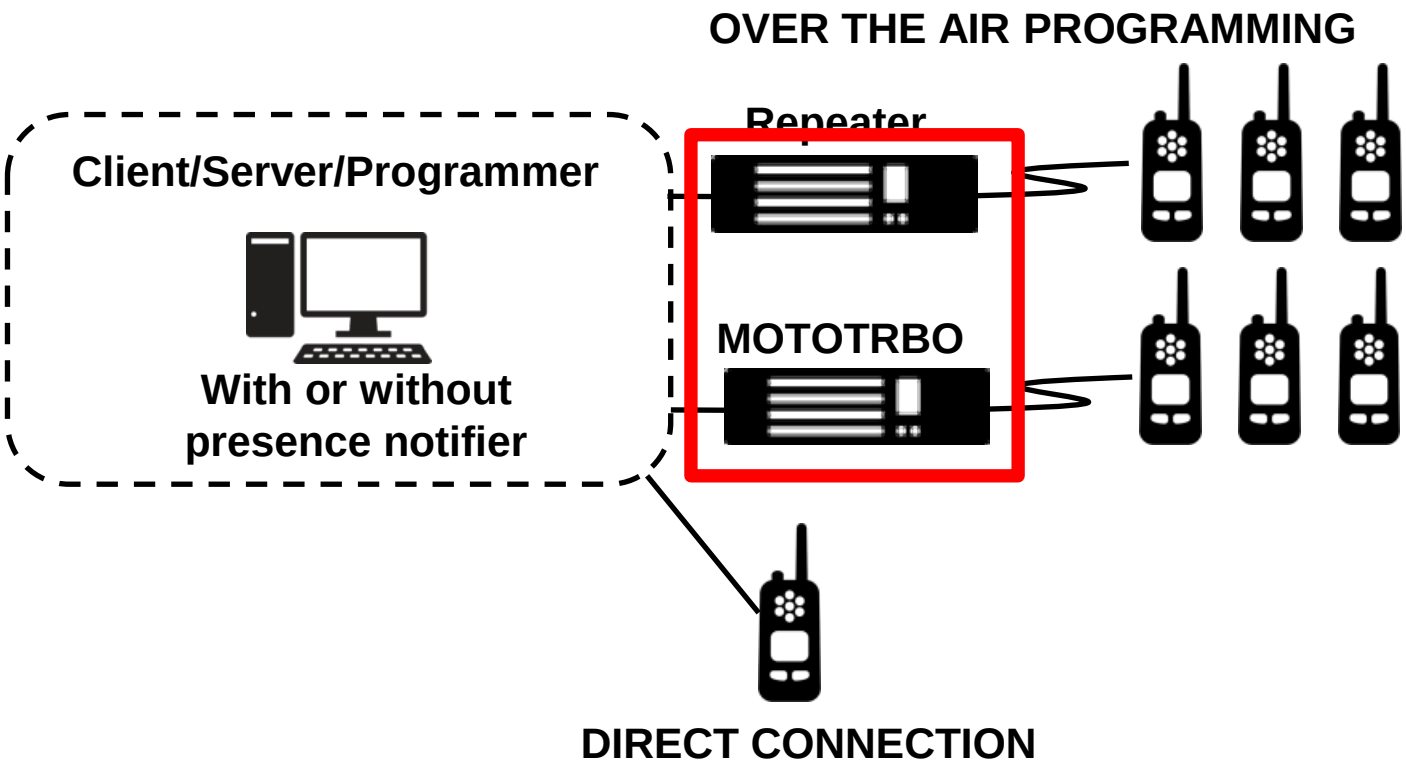
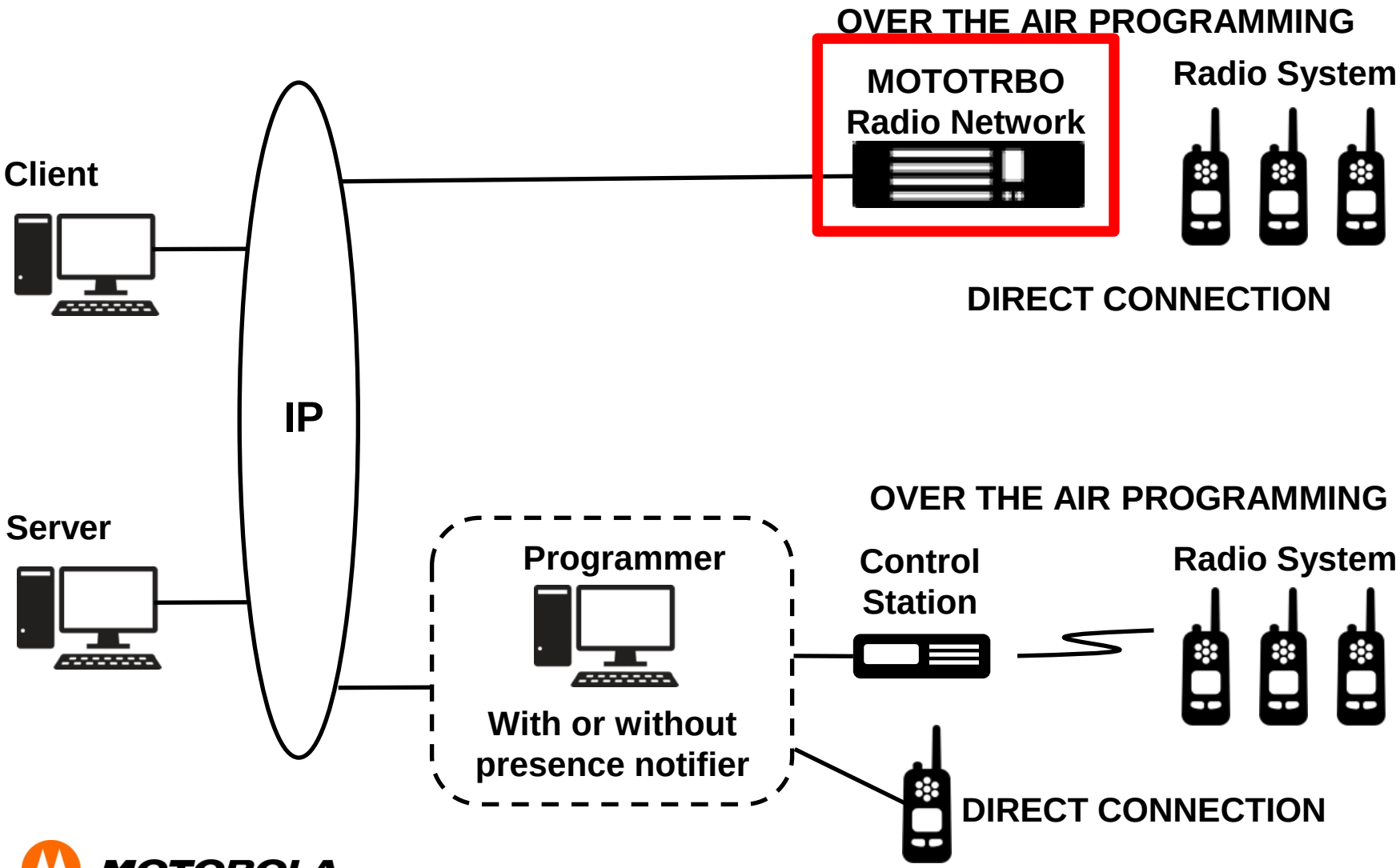
RADIO MANAGEMENT VIA NAI



RADIO MANAGEMENT VIA NAI



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RADIO MANAGEMENT

Via Control Station

- Uses MCDD
- Up to 16 devices can be attached to the host PC.
- Can be collocated with TRBONET+ or SmartPTT+ but a separate CS should be used for voice.

Via MNIS

- IP connection to Master repeater
- Up to 8 networks per MNIS instance
- Can be collocated with TRBONET+ or SmartPTT+

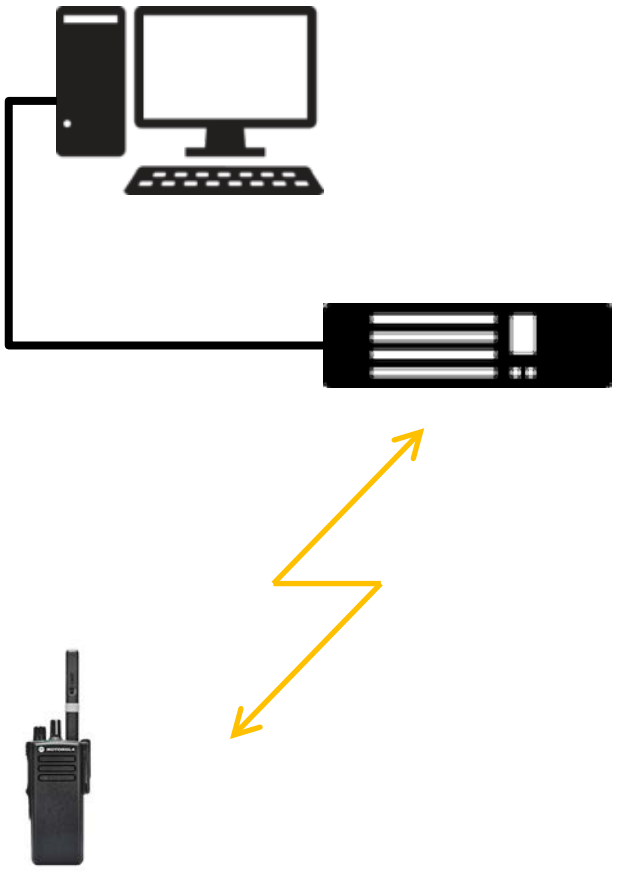
BATTERY MANAGEMENT OVER THE AIR

If an IMPRES battery is fitted to the radio, it is now possible to read the IMPRES chip over the air.

Allows you to manage your battery fleet without the need of bringing the batteries into a location where an IMPRES data reader is located.

Works almost the same as OTAP.

Uses the new IMPRES Fleet Management software.



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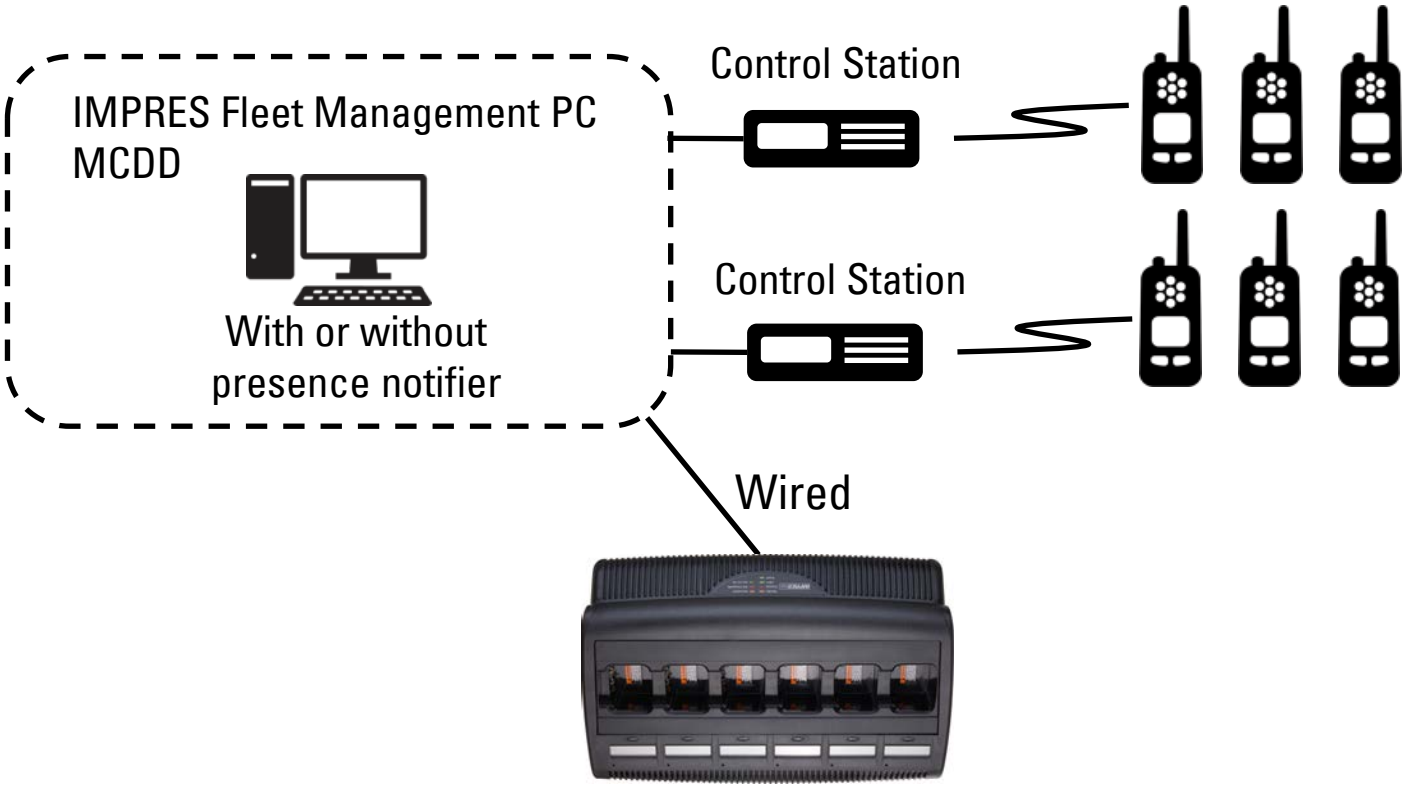
WIRED OR VIA CONTROL STATION



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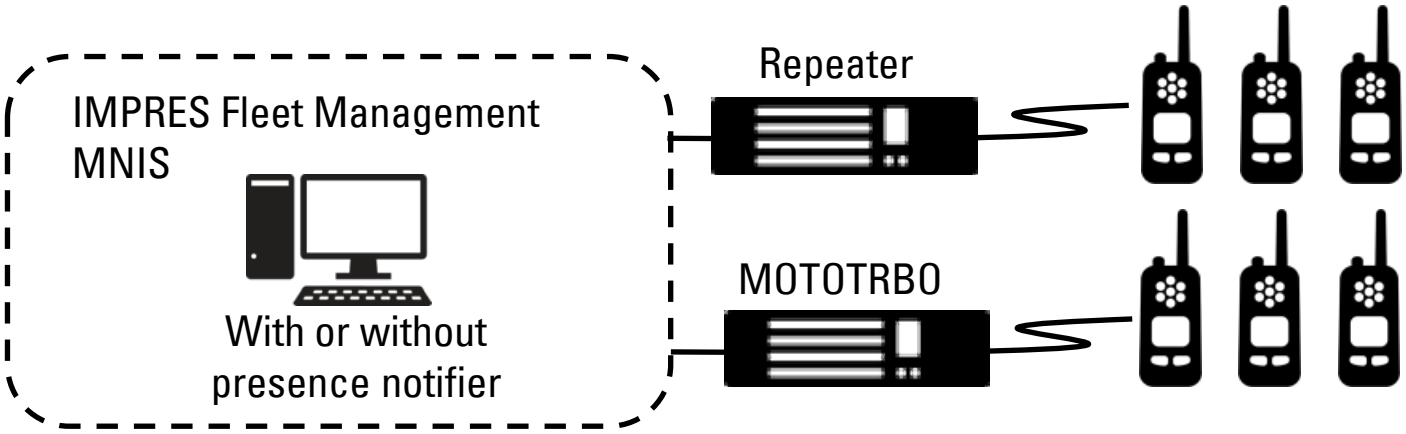
VIA MNIS AND NAI



SYSTEM FEATURES

DIGITAL VOTING

Now possible to extend the inbound coverage of a site with good outbound coverage.

Only improves the inbound coverage (radio to repeater).

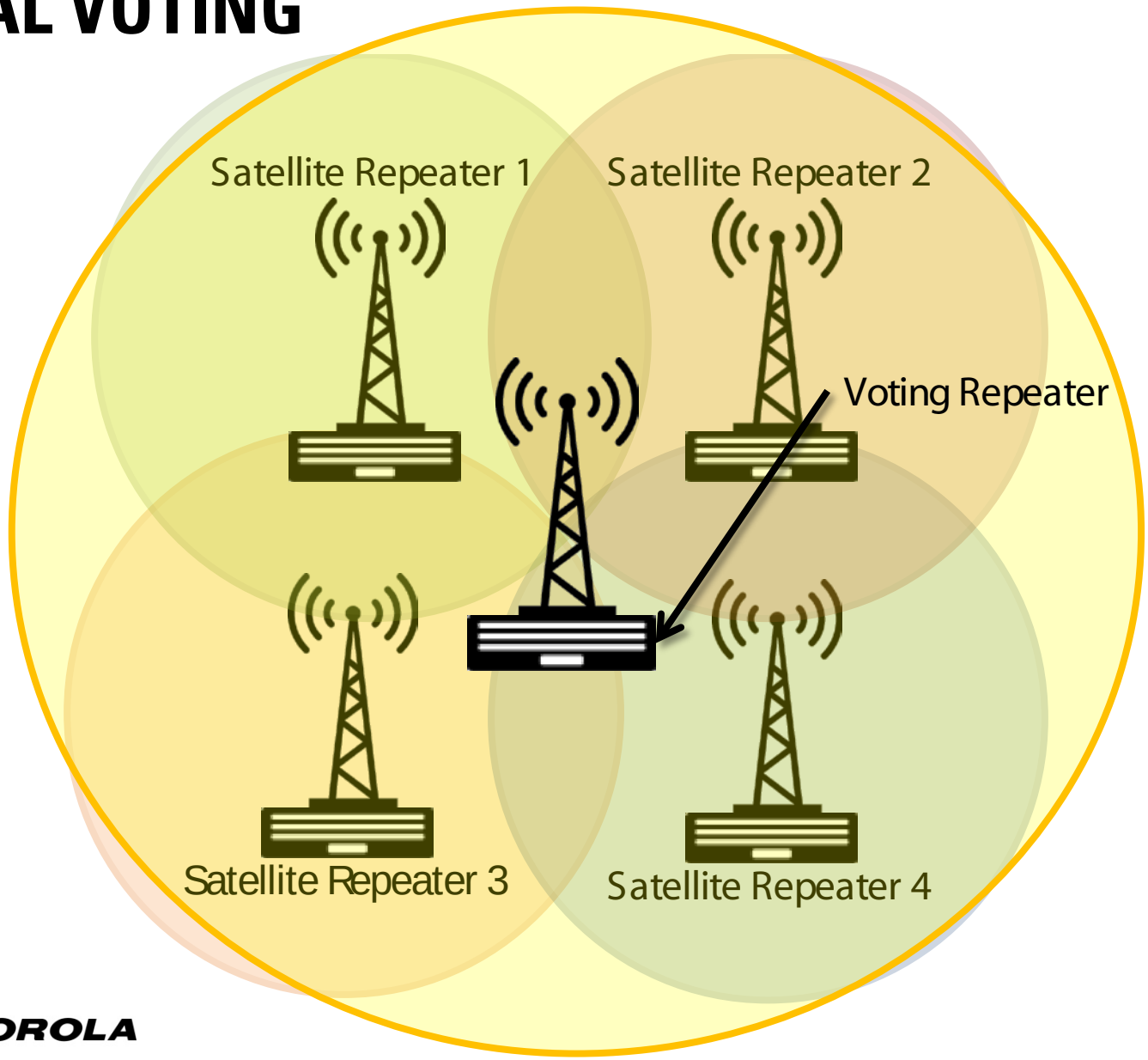
It is not simulcast.

Requires a Digital Voting licence in the repeaters.

Satellite Repeaters are standard MOTOTRBO repeaters – they do not transmit.

Satellite Repeaters add to the peer count.

DIGITAL VOTING



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DIGITAL VOTING

Supports all MOTOTRBO Architectures – except Connect Plus.

Up to X Satellite Repeaters per repeater – repeater can be a Peer or Master.

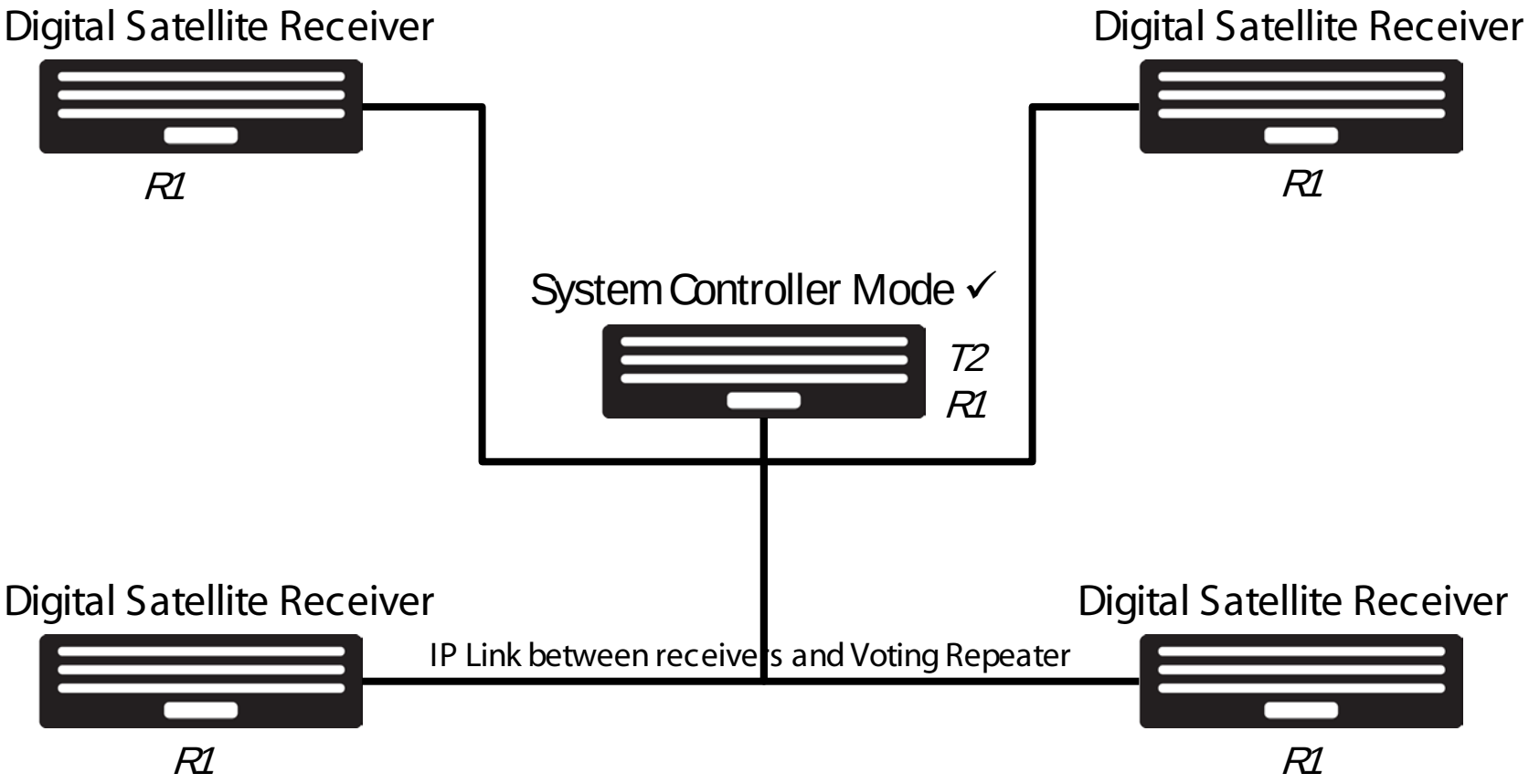
Satellite Repeaters will add to the site/system IP bandwidth requirements.

DIGITAL VOTING

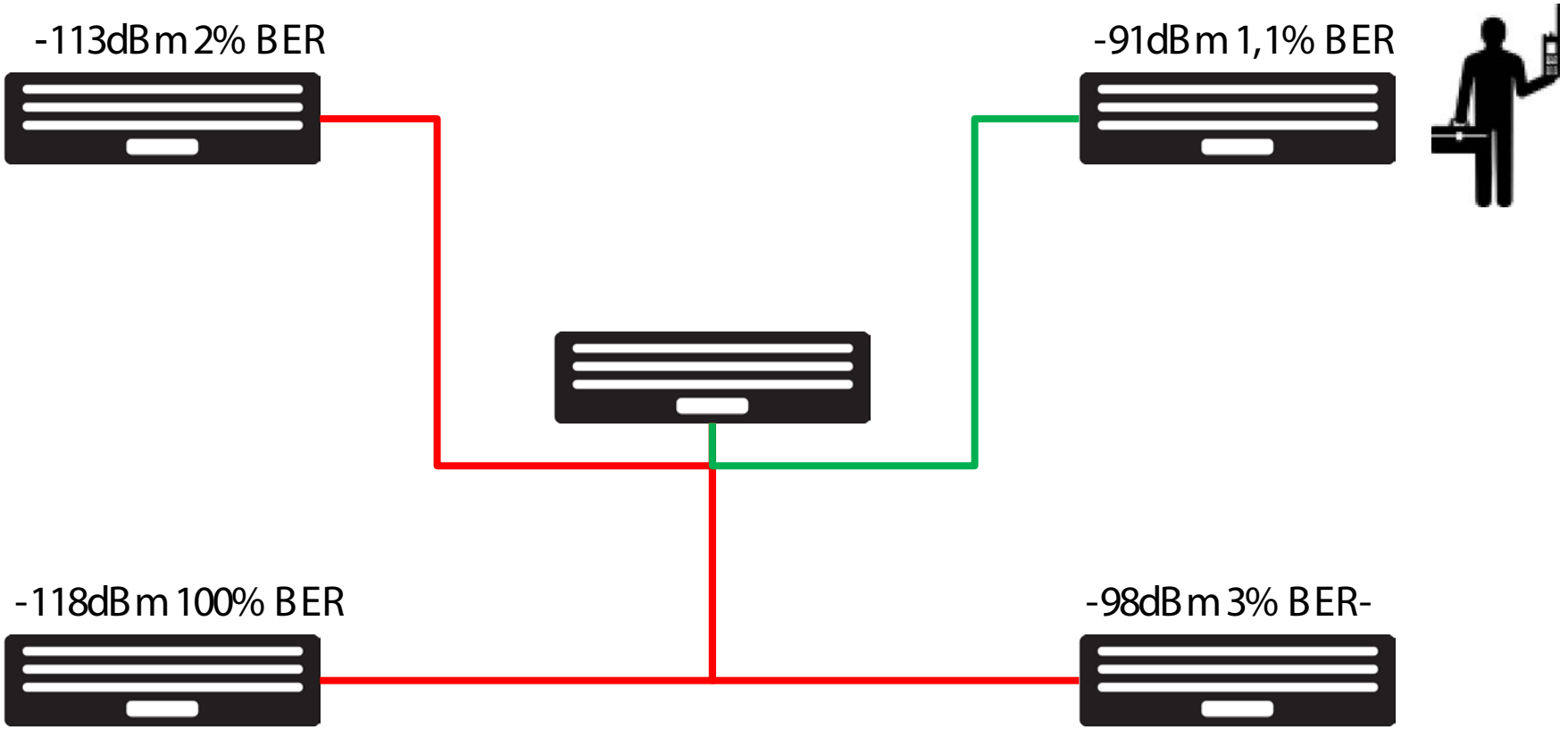
Practical Applications:

- Systems which use the low power or ATEX radios.
- Systems which use high power repeaters and portables.
- Systems with dead spots.

DIGITAL VOTING

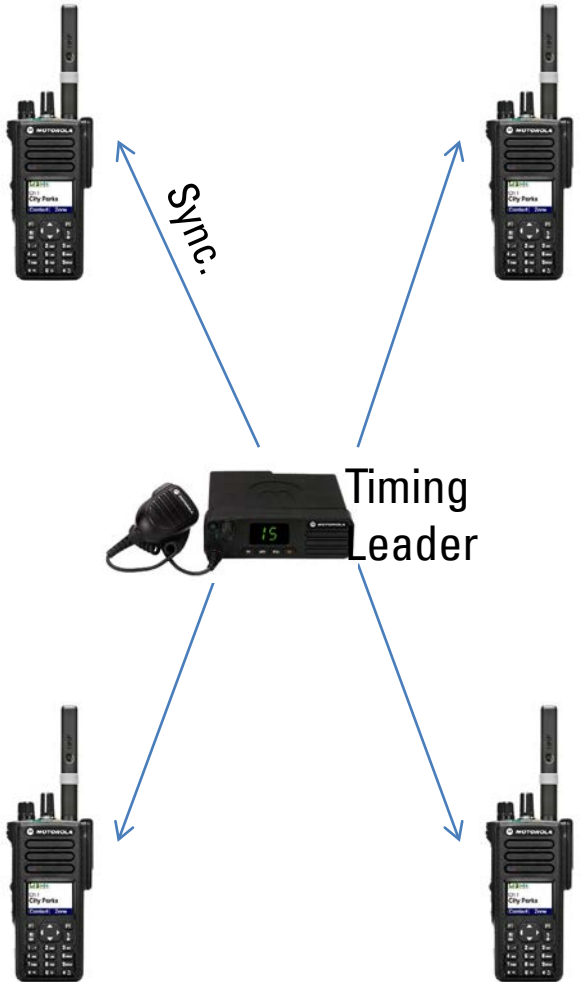


DIGITAL VOTING



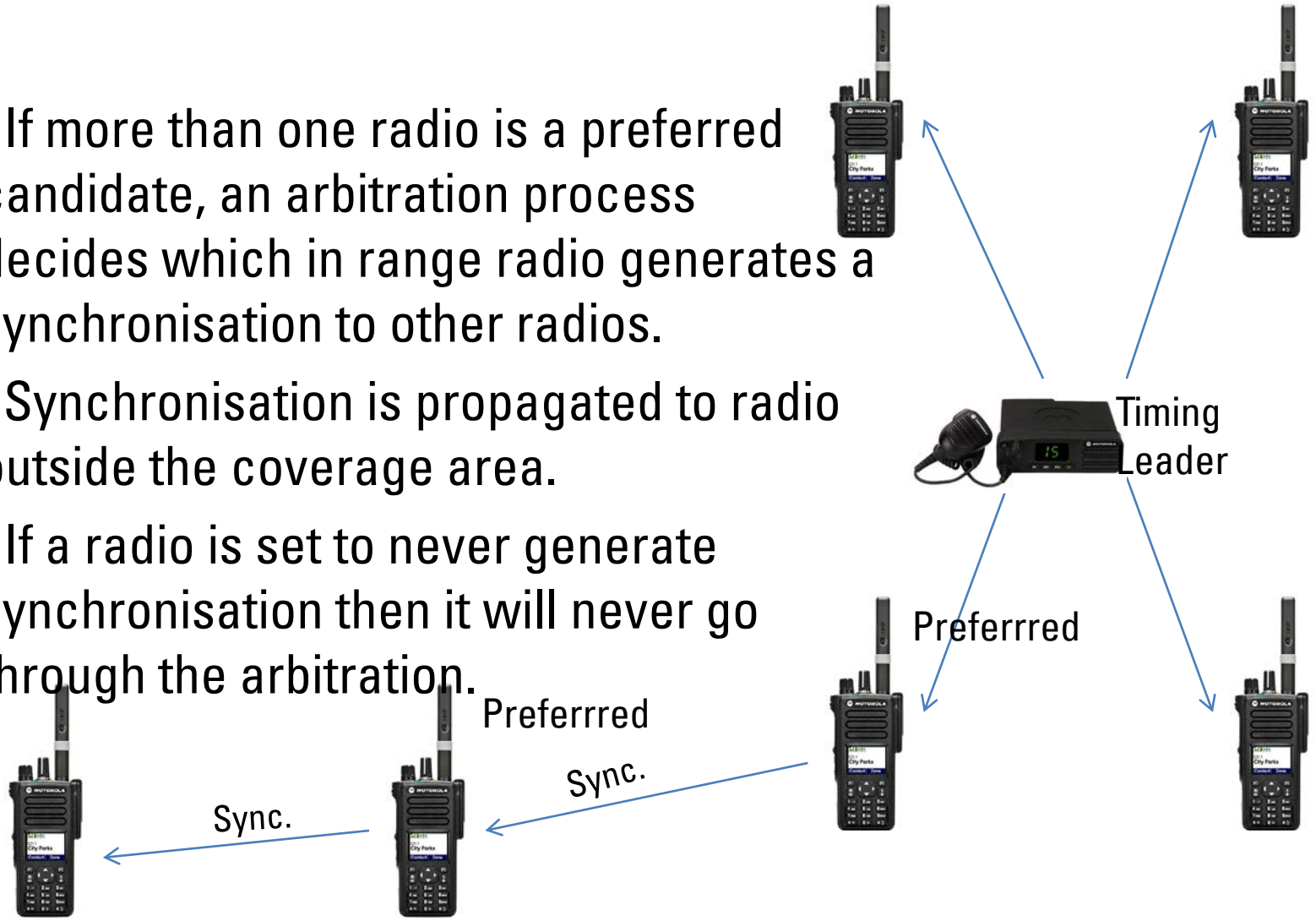
DCDM

- Double Capacity Direct Mode is a feature which allows two slot operation **on simplex** – no repeater.
- Complies with ETSI TS 102-361 §1-3 v2.1.1.
- One radio is selected to either always generate synchronisation or to be a preferred candidate for synchronisation.



DCDM

- If more than one radio is a preferred candidate, an arbitration process decides which in range radio generates a synchronisation to other radios.
- Synchronisation is propagated to radio outside the coverage area.
- If a radio is set to never generate synchronisation then it will never go through the arbitration.



MOTOROLA

DCDM

- Only supported in firmware R2.x
- It is recommended to enable this on fixed stations if available as this would have an effect of battery drain.

ANALOGUE FEATURES

ANALOGUE MODE

Nearly all MOTOTRBO radios support analogue mode operation.

Only exception is the SL4000.

MDC1200 SIGNALLING

Highly reliable analogue signalling scheme:

- PTT-ID
- Selective Call
- Group Call
- Status messaging
- Emergency call

180ms burst of 1200bps data

SELECT-5 SIGNALLING

Widely used analogue signalling scheme:

- PTT-ID
- Selective call
- Group call
- Emergency mode

Supported by a wide variety of radios – old and new.

Signalling standards:

- ZVEI
- CCIR
- EEA
- 2 custom formats

MOTOROLA

ANALOGUE SCRAMBLING

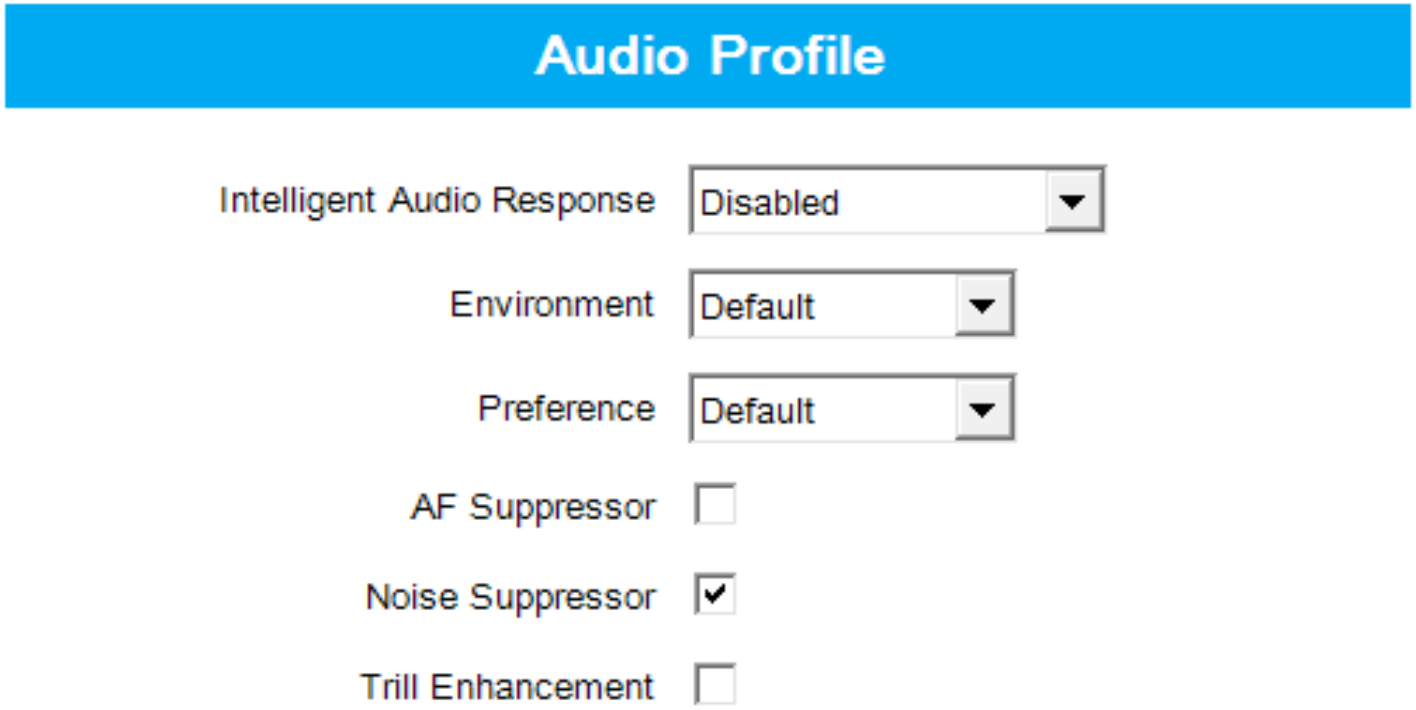
Initally only available on the Entry Level models.

Now available on all second generation models.

Frequency inversion scrambling.

AUDIO ENHANCEMENTS

Now possible to tweak the audio for various conditions…



AUDIO ENHANCEMENTS

AUDIO ENVIRONMENT

This allows the user or technician to choose an environmental audio profile.

Selecting Loud option boosts the RX volume by around 8dB.

Workgroup When set to Workgroup,

To block user access un-tick audio profile in the menu.

AUDIO PREFERENCE

This allows some customisation of the DSP audio processing to suit different user preferences:

Level 1:

Level 2:

Level 3:

Treble Boost: higher frequencies are boosted

Mid Boost: mid-range frequencies are boosted.

Bass Boost: Low frequencies are boosted.

TRILL ENHANCEMENT

This allows the technician to enable Trill Enhancement.

Trill Enhancement improves the voice quality for languages that have an alveolar trill sound (also known as a 'Rolling R').

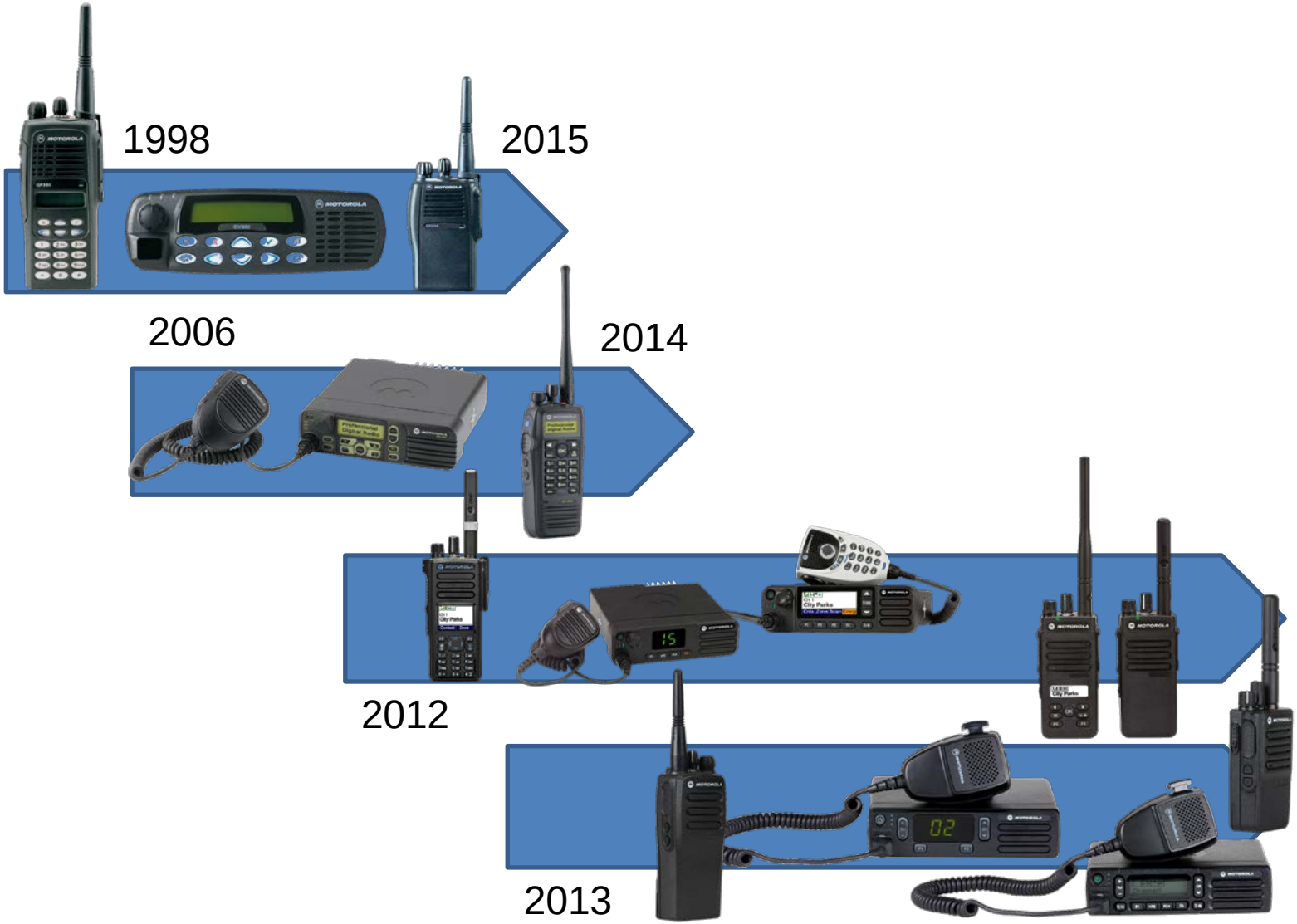
DISCUSSION

SUBSCRIBER EQUIPMENT


MOTOTRBO™
ADP
APPLICATIONS
CATALOGUE
MOTOROLA
MTR3000
City Parks
Security

MOTOROLA

SUBSCRIBER LAUNCHES AND CANCELLATIONS



MOTOROLA

SL1600

UHF VHF

160 channels

Maximum 3W analogue

Maximum 2W digital

4 character Alphanumeric display

Conventional mode

IP Site Connect*

No Select-5, no LCP, no OB.

MOTOROLA

DP1400

Non-display entry level model

16 channels

No Bluetooth; GPS or OTAP

No Enhanced Privacy or AES

IP Site Connect as of R01.02.xx**

Two model variants:

Analogue only (digital ready) – which can be upgraded to support digital later.

Digital and Analogue model.

MOTOROLA

DP2400

No display

16 channels

No Bluetooth

No GPS

Supports OTAP

IPSC standard.

Supports Enhanced Privacy and AES via licences.

Supports Select-5 signalling; Linked Capacity Plus via licences.

MOTOROLA

DP2600

Single line display

1000 channels

No Bluetooth

No GPS

Supports OTAP

IPSC standard.

Supports Enhanced Privacy and AES via licences.

Supports Select-5 signalling; Linked Capacity Plus via licences.

MOTOROLA

DP3441

Small form-factor!

No display

16 channels

Bluetooth

GPS

Supports OTAP

IPSC; Enhanced Privacy; Select-5 signalling; Linked Capacity Plus all standard.

MOTOROLA

DP440X

No display

16 channels

Bluetooth – DP4401

GPS – DP4401

Supports OTAP

IPSC; Enhanced Privacy; Select-5 signalling; Linked Capacity Plus all standard.

MOTOROLA

DP460X

B&W display

1000 channels

Bluetooth – DP4601

GPS – DP4601

Supports OTAP

IPSC; Enhanced Privacy; Select-5 signalling; Linked Capacity Plus all standard.

MOTOROLA

DP480X

Colour display

1000 channels

Bluetooth – DP4801

GPS – DP4801

Supports OTAP

IPSC; Enhanced Privacy; Select-5 signalling; Linked Capacity Plus all standard.

MOTOROLA

DP4X01EX

Two models DP4401Ex and DP4801Ex

16 or 1000 channels

Bluetooth and GPS

1W TX power – special battery.

Supports OTAP

IPSC; Enhanced Privacy; Select-5 signalling; Linked Capacity Plus all standard.

DM1400

Complementary mobile for the DP1400.

16 channels

Numeric display

25w and 45w models available

Basic Privacy and Voice Inversion

No Select-5 and no IPSC Roaming

Analogue only model available which can be upgraded to support digital later via a licence.

MOTOROLA

DM1600

Alphanumeric display

Same features as DM1400

1000 channels

DM2600

No DM2400

Alphanumeric Display

Can be upgraded to support Capacity Plus; Linked Capacity Plus and Select-5 signalling.

Can be upgraded to support OTAP.

256 channels.

DM440X

Numeric Display

Support Capacity Plus; Linked Capacity Plus and Select-5 signalling.

Supports OTAP.

DM4401 supports Bluetooth and GPS.

32 channels

MOTOROLA

DM460X

Same features as DM4400/4401

Colour display

1000 channels

Full featured

MOTOROLA

SL4000

Small

Sleek

UHF only

No GPS

Bluetooth

No analogue

SL4010 includes OB chipset.

INFRASTRUCTURE EQUIPMENT

DR3000

19inch 3RU

1-25W model

20-45W model

VHF

UHF

300MHz

16 channels (steering via RDAC or accessory connector).

MTR3000

19 inch 3RU

VHF

UHF

1 - 100W

16 channels (steering via TRC or RDAC).

Excellent RF performance characteristics.

SLR5500

19 inch 1RU

VHF

UHF

1 - 50W

16 channels

Supports all MPT1327 TSCs

MOTOROLA

ETHERNET SWITCH (OPTIONAL)

Required if there is more then one repeater on a site.

Allows a PC to be plugged into the network for diagnostic purposes.

ROUTER (MAY BE REQUIRED)

Required for Linked Capacity Plus or where repeaters will be connected to a CEN.

Some Routers have an integrated Ethernet switch.

NAT loopback is no longer needed for most sites.

RF FILTERING EQUIPMENT

Proper RF filtering is vital for reliable system operation.

RF combiner-multicoupler for sites with multiple same-band repeaters.

MOTOROLA

DISCUSSION

IP SITE CONNECT

IP SITE CONNECT

Wide Area IP Linking

Conventional Mode.

Up to 15 repeaters linked via IP.

Wide Area Slot.

Local Area Slot.

Subscriber Roaming

Radio is able to roam between sites

Repeater generates beacon messages when there is no traffic .

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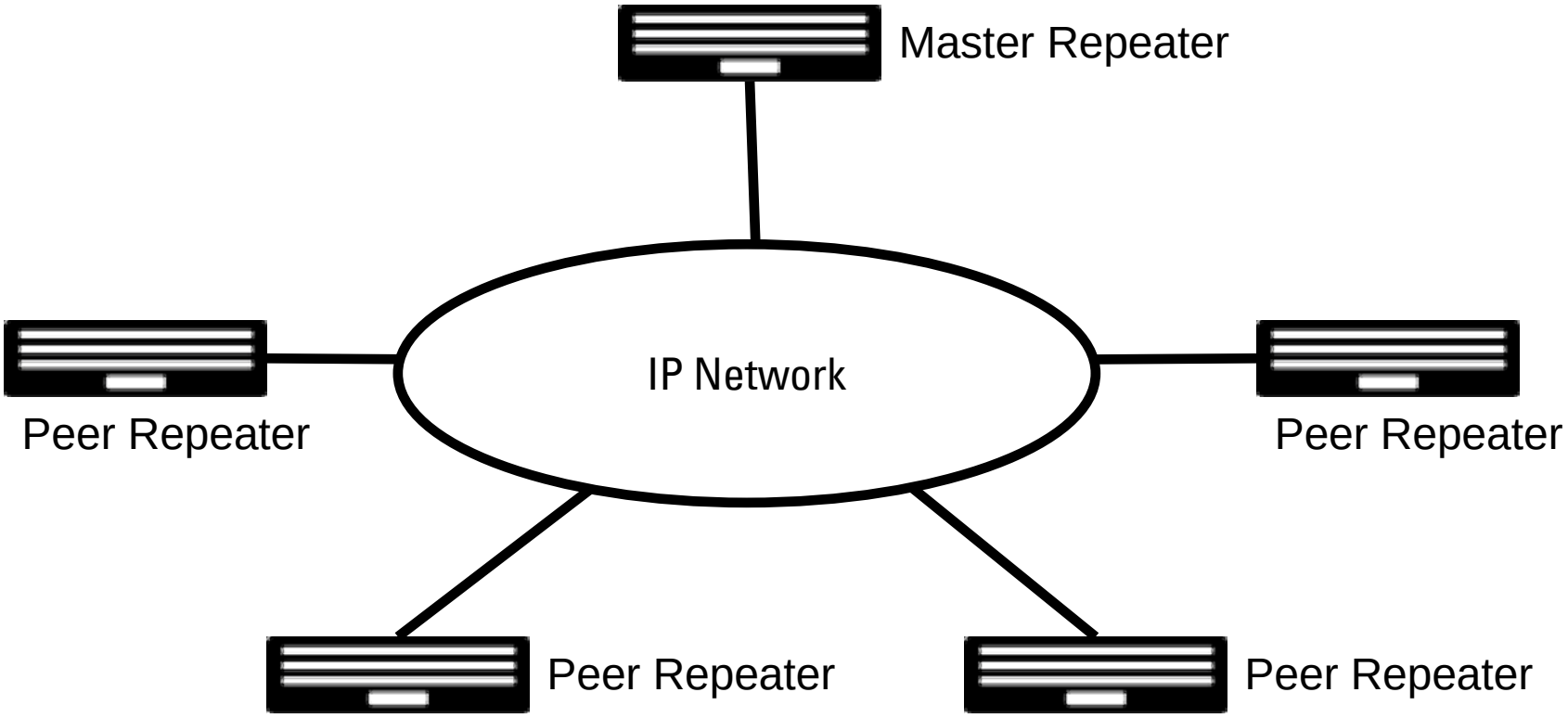
IP SITE CONNECT



IP SITE CONNECT

Master Repeater is a standard repeater which handles registration of peers.

Not contiguous for network operation but requires a static IP address.

The Peer Repeater can be a repeater or an application PC and can use DHCP.

IP SITE CONNECT

IPv4 is used.

Connection via the internet or private LAN/WAN.

Satellite latency too high dial-up too slow.

Repeaters use UDP because it is an efficient means for sending voice over IP.

Also used for RDAC information – no SNMP.

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IP SITE CONNECT

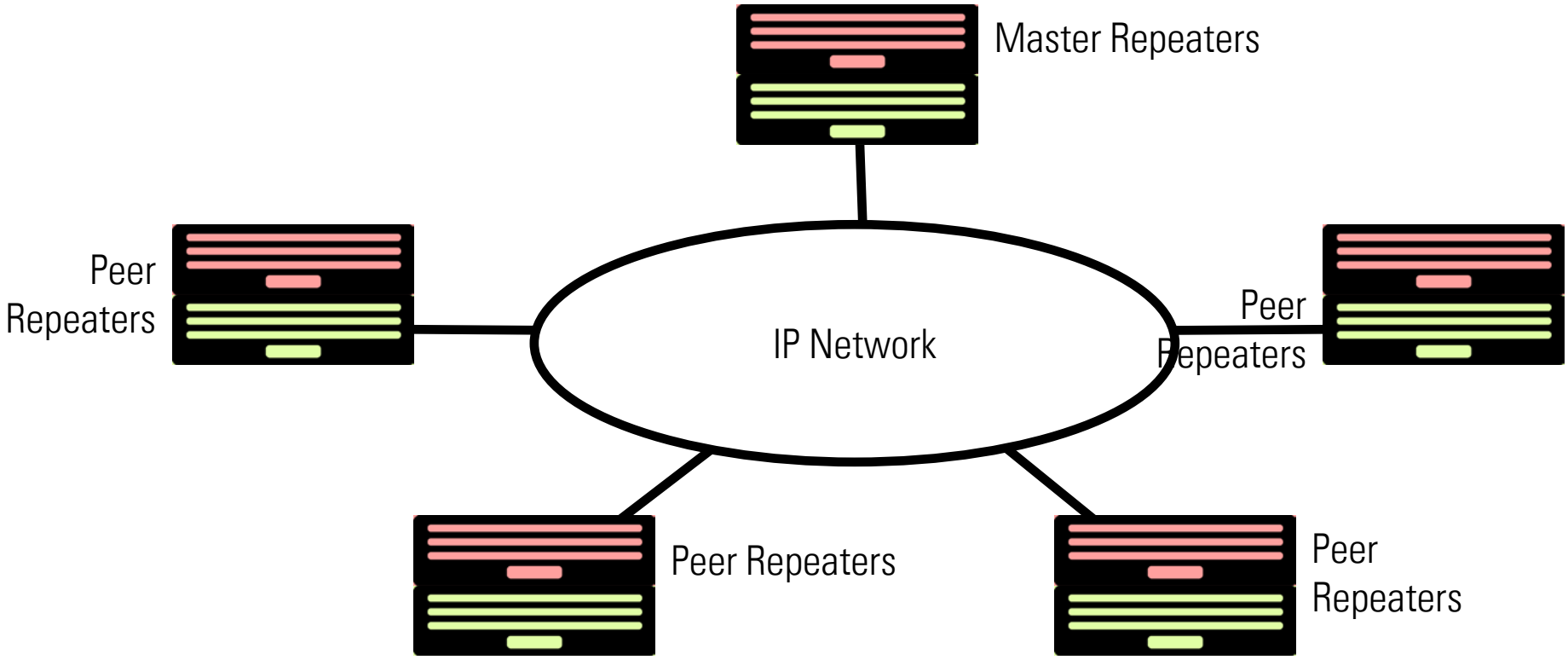
Wide area slot works like a single logical channel.

If a user talks on one site, all sites (for that slot) are busied.

Possible to increase capacity by adding channels

If a user talks on one site, all sites (for that slot) are busied.

IP SITE CONNECT



MOTOROLA

ROAMING

RSSI Threshold in Roam List

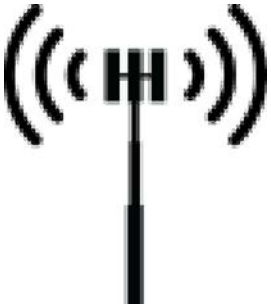
Signal qualitative threshold

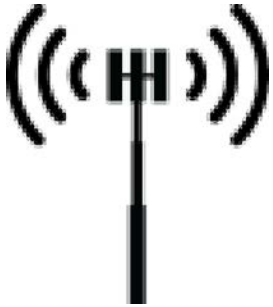
If no other sites seen radio ignores threshold

Active roaming

User presses button and radio sends wakeup

Repeater acknowledges with beacon



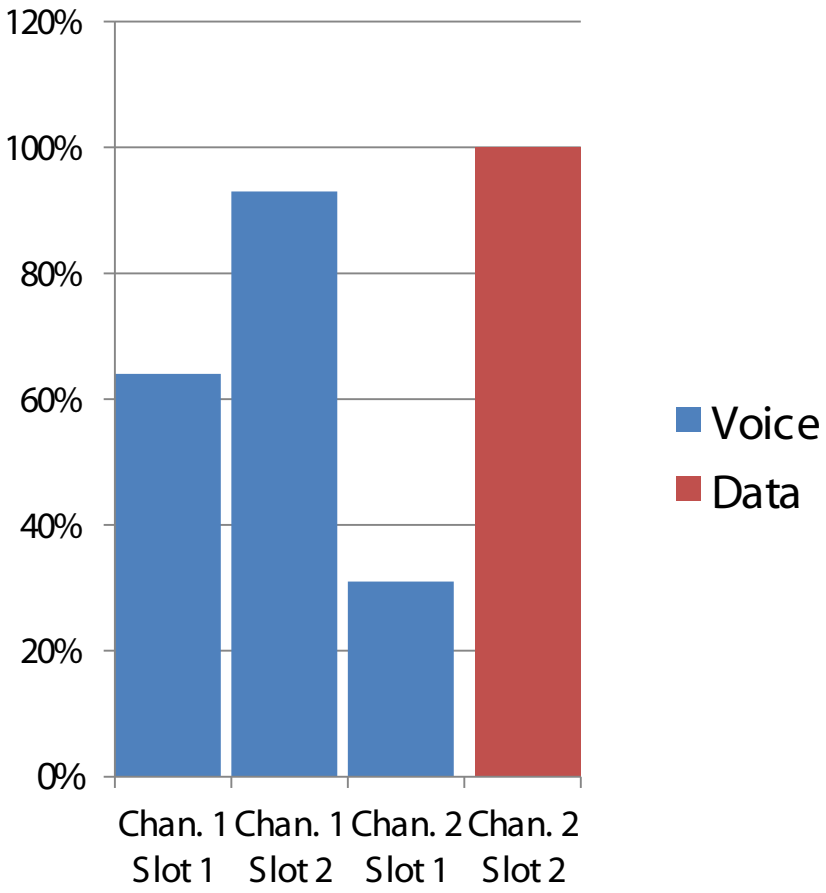


MOTOROLA

DISCUSSION

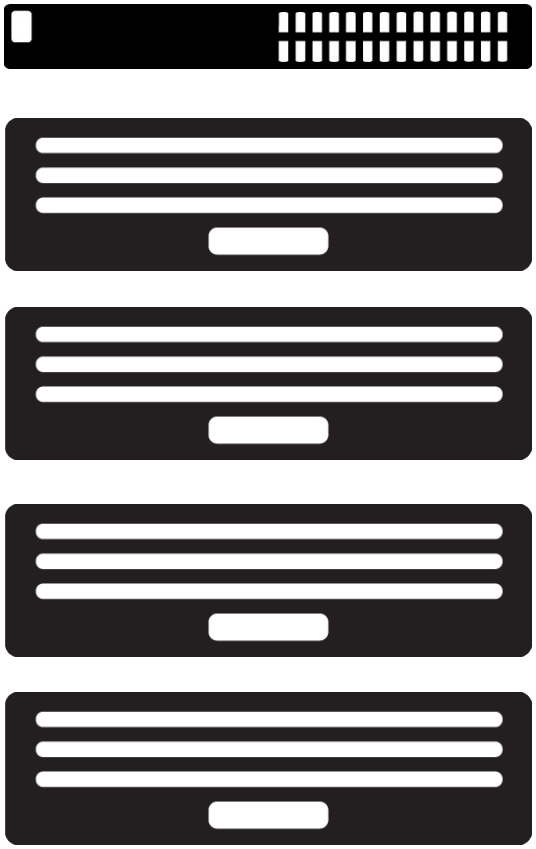
CAPACITY PLUS

THE TROUBLE WITH CONVENTIONAL



What problems can you see here?

CAPACITY PLUS



Dynamic channel assignment.

Up to eight voice/data channels.

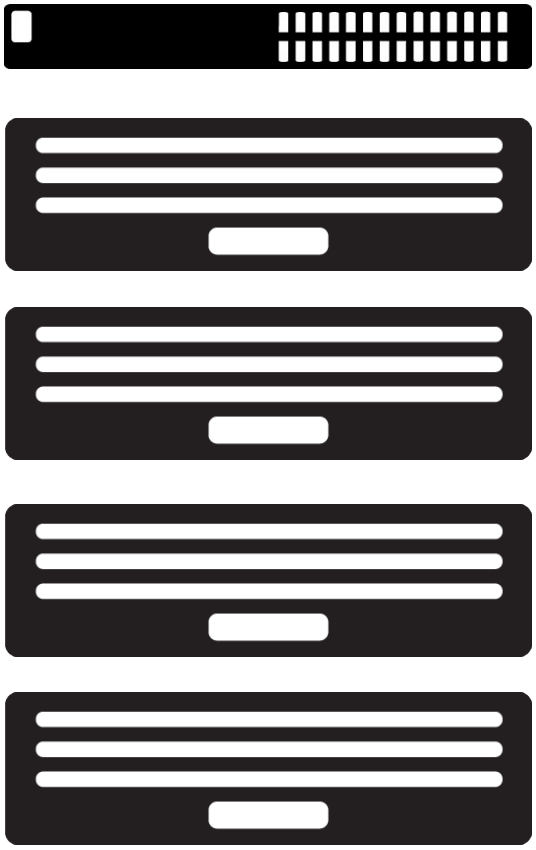
Up to twelve dedicated data revert channels.

Single site operation.

Up to 1200* users.

MOTOROLA

CAPACITY PLUS



At any time, one slot on one of the channels is a Rest Channel.

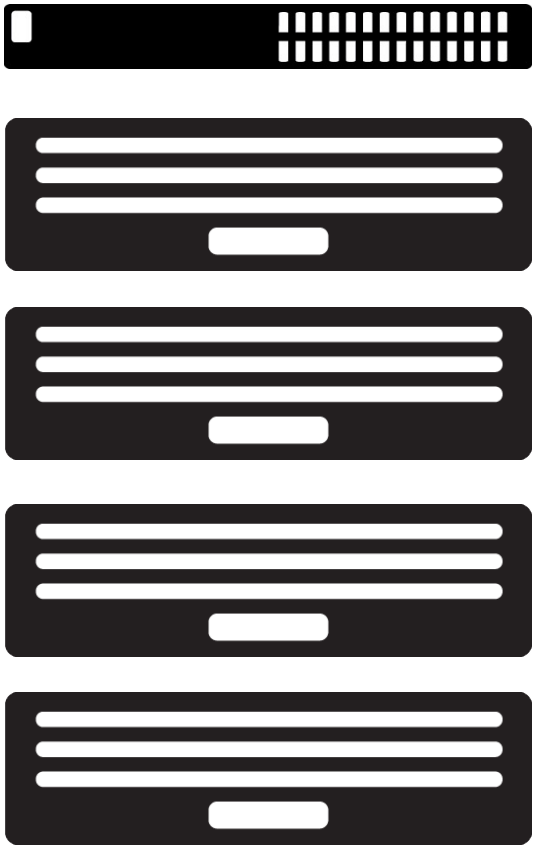
All calls are set up on the rest channel.

When a call is set up:

a) The rest channel moves to the next available slot.

b) The current rest channel becomes a voice channel.

CAPACITY PLUS



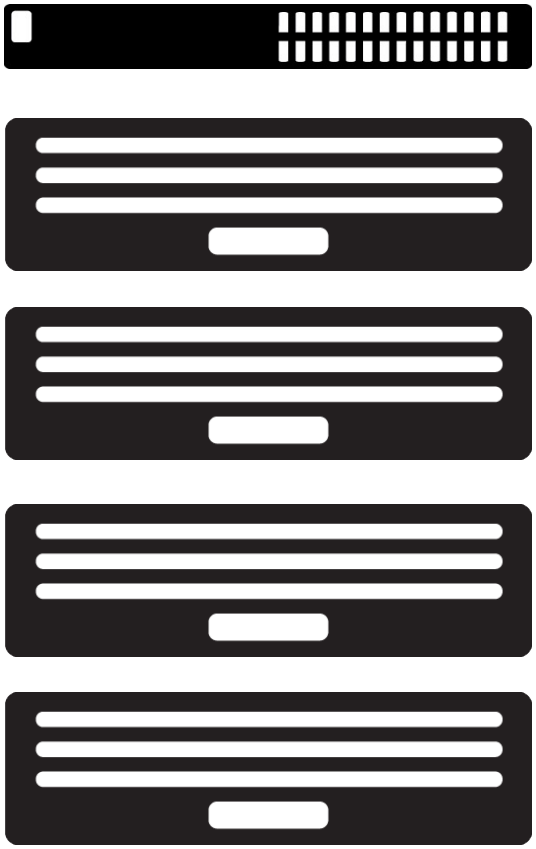
When switching on, radios will search for the Rest Channel.

When not in a call, the radios will monitor the Rest Channel.

If a call of interest is ongoing, a radio will join it (late entry).

When a call is over, all radios party to the call, will return to the Rest Channel.

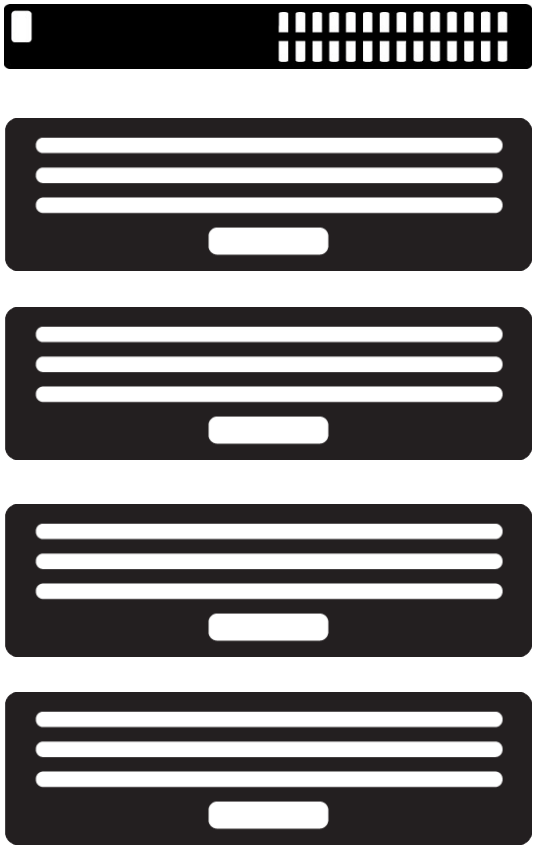
CAPACITY PLUS



Like IP Site Connect, one of the repeaters is set up as a Master Repeater and has a Static IP Address.

Repeaters are linked via an IP switch (L2).

CAPACITY PLUS

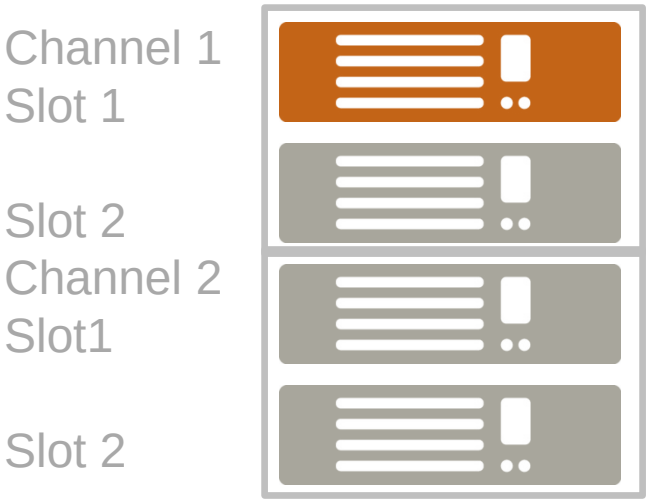


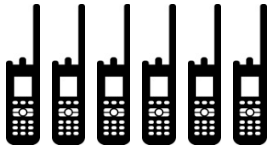
If the Master repeater fails, the remaining repeaters continue to operate as normal.

Any repeaters added while the Master repeater is down, will not join the pool of channels.

If there is interference, the repeater removes itself from contention.

REST CHANNEL SELECTION





Rest Channel

Idle Channels

System is idle.
Slot 1 on Channel 1 is the Rest Channel

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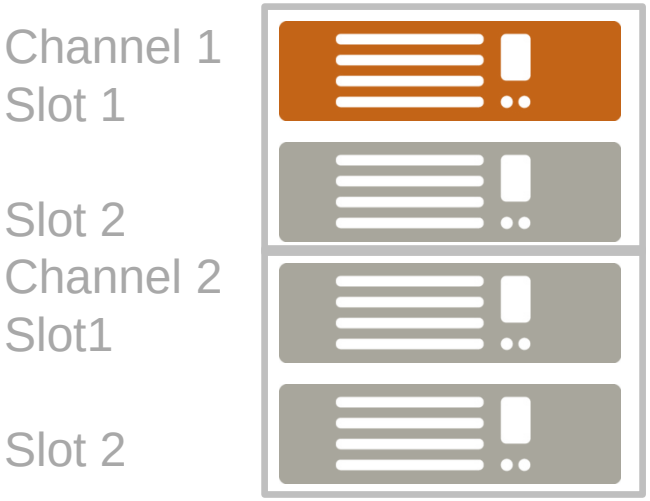
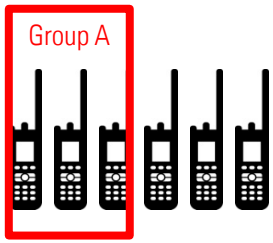
REST CHANNEL SELECTION





Rest Channel

Idle Channels

Radio Z makes a group call to Group A.
Call setup request goes over the rest channel.

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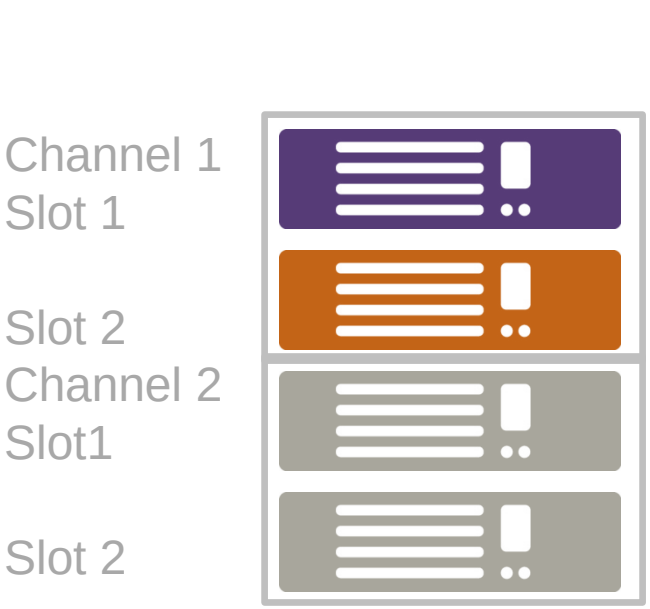
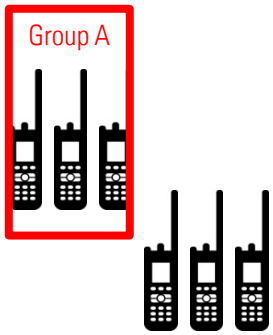
REST CHANNEL SELECTION



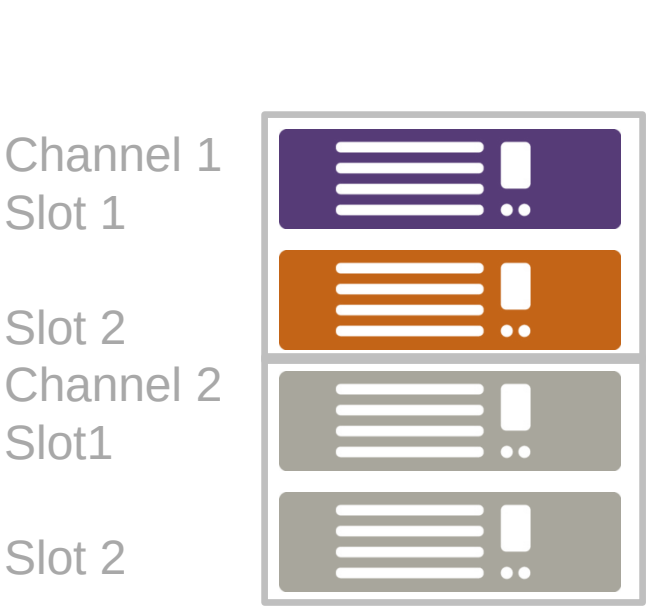


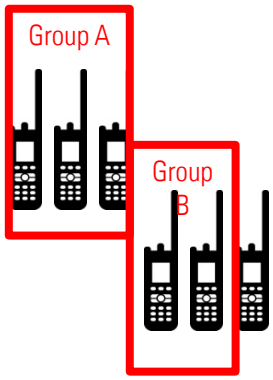
Rest Channel
Voice Channel
Idle

Channel 1, Slot 1 becomes a voice channel and passes call.
Channel 1, Slot 2 becomes the new rest channel.
Radios not in Group A move to the rest channel.

MOTOROLA

REST CHANNEL SELECTION





Rest Channel

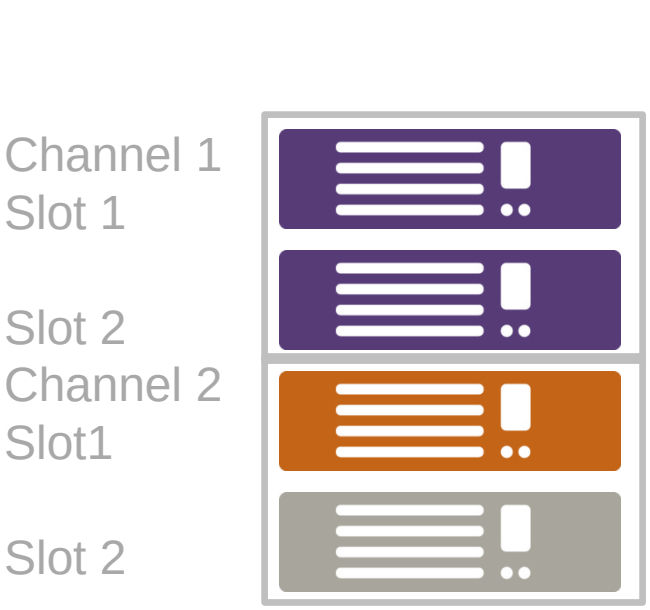
Voice Channel

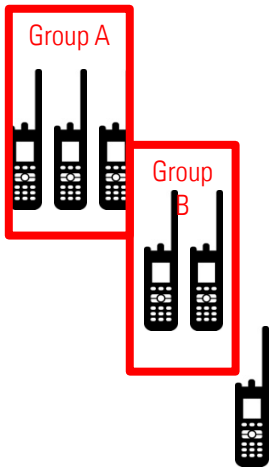
Idle

Radio X makes a group call to Group B.

MOTOROLA

REST CHANNEL SELECTION





Rest Channel

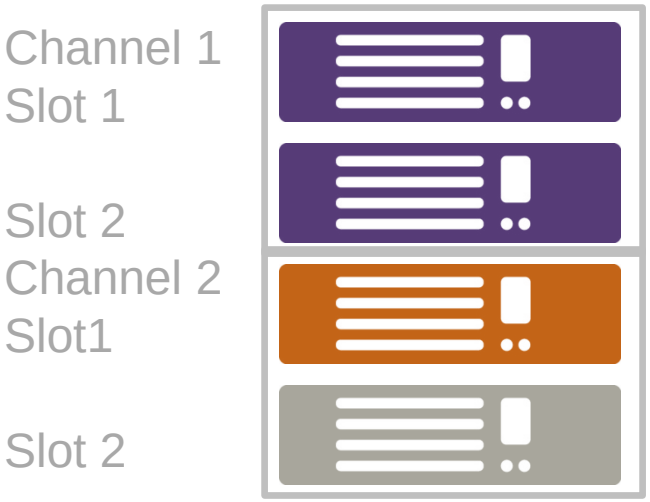
Voice Channel

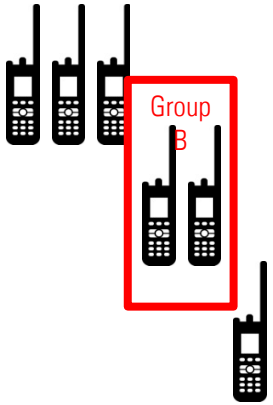
Idle

Channel 2 Slot 1 becomes the new rest channel.
Channel 1 Slot 2 becomes the voice channel and passes group call B.
Radios not involved in the call move to the rest channel.

MOTOROLA

REST CHANNEL SELECTION





Rest Channel

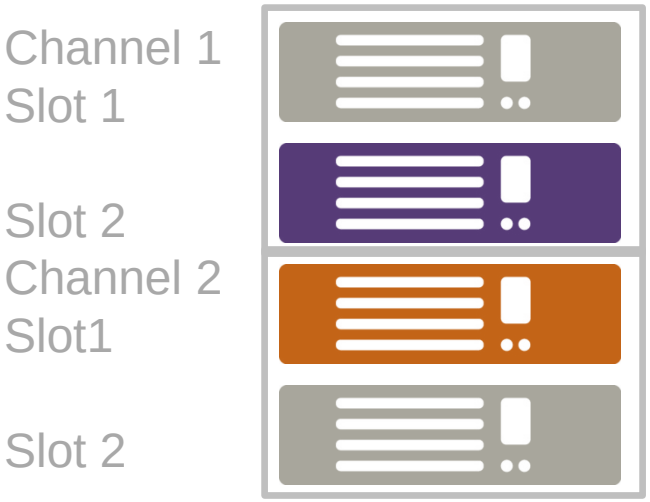
Voice Channel

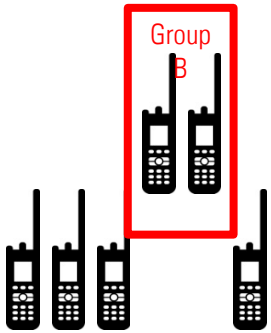
Idle

Group A finishes talking.

MOTOROLA

REST CHANNEL SELECTION





Rest Channel

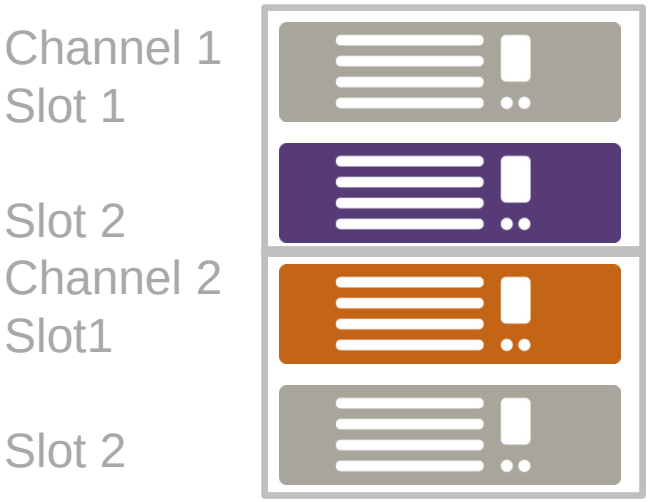
Voice Channel

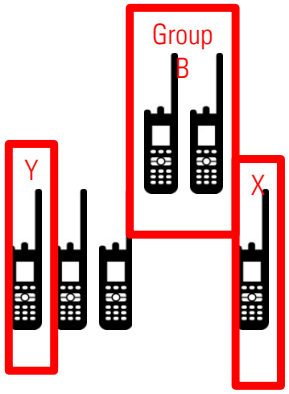
Idle

Radios that were in group call A move to the rest channel.

MOTOROLA

REST CHANNEL SELECTION





Rest Channel

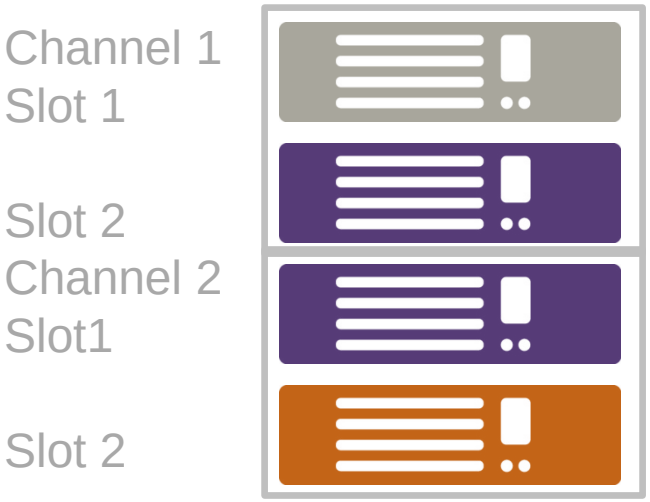
Voice Channel

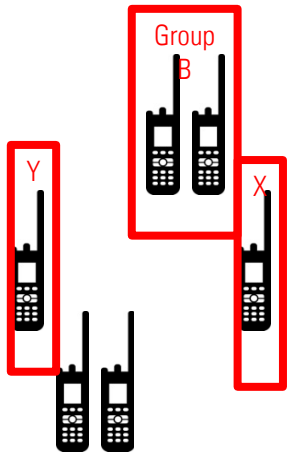
Idle

Radio X makes a private call to Radio Y.

MOTOROLA

REST CHANNEL SELECTION





Rest Channel

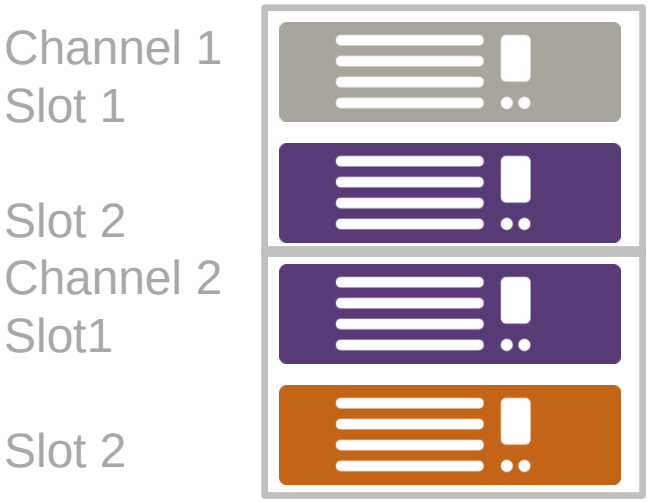
Voice Channel

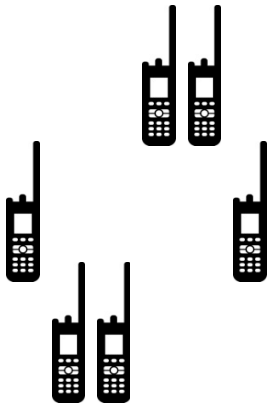
Idle

Channel 2 Slot 2 becomes the new rest channel
Channel 2 slot 1 becomes a voice channel.
All other radios not in a call move to the rest channel.

MOTOROLA

REST CHANNEL SELECTION





Rest Channel

Voice Channel

Idle

Radio X finishes call with Radio Y.
Group Call B ends.

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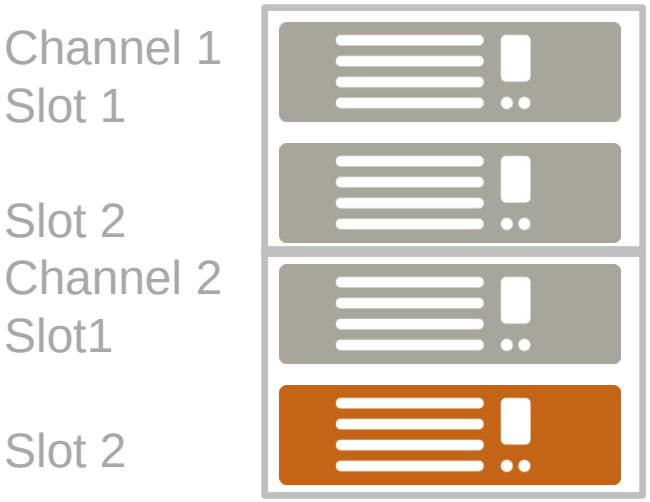
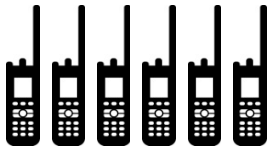
REST CHANNEL SELECTION





Rest Channel

Voice Channel

Idle

All radios move to the rest channel and wait for the next call.

MOTOROLA

CAPACITY PLUS

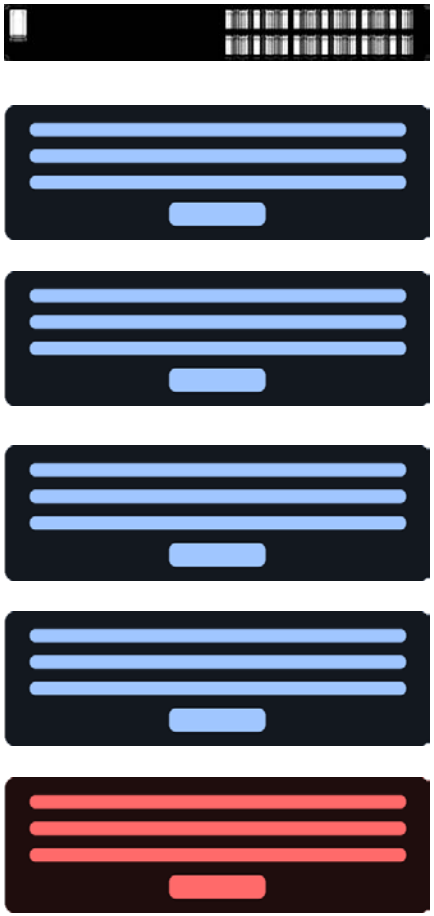
Capacity Plus supports RDAC

Possible to use redundant repeaters and Ethernet switches.

Supports a maximum of 254 talkgroups.

Supports a maximum of 65535 radio IDs (ignoring availability limitations: Erlang)

DATA REVERT



It is possible to transfer data messages on the trunked channel.

For larger volume data requirements, a data revert channel can be added.

With data revert:

a) Server to radio data is sent on the trunked channel.

b) Radio to server data can be sent on the revert channel.

DISCUSSION

LINKED CAPACITY PLUS

LINKED CAPACITY PLUS

Combines the channel management of Capacity Plus with the wide area service of IP Site Connect.

Supports up to 15 sites with 8 repeaters per site – of which a maximum of 6 can be trunked.

Requires no site controller but a router(s) should be used.

Not necessary to have the same number of channels per site!

LINKED CAPACITY PLUS

Like IP Site Connect, one repeater is set up as a Master.

The Master repeater (and Router) must have a static IP address.

Like Capacity Plus, each site has a rest channel.

You do not need to have the same number of channels on each site!

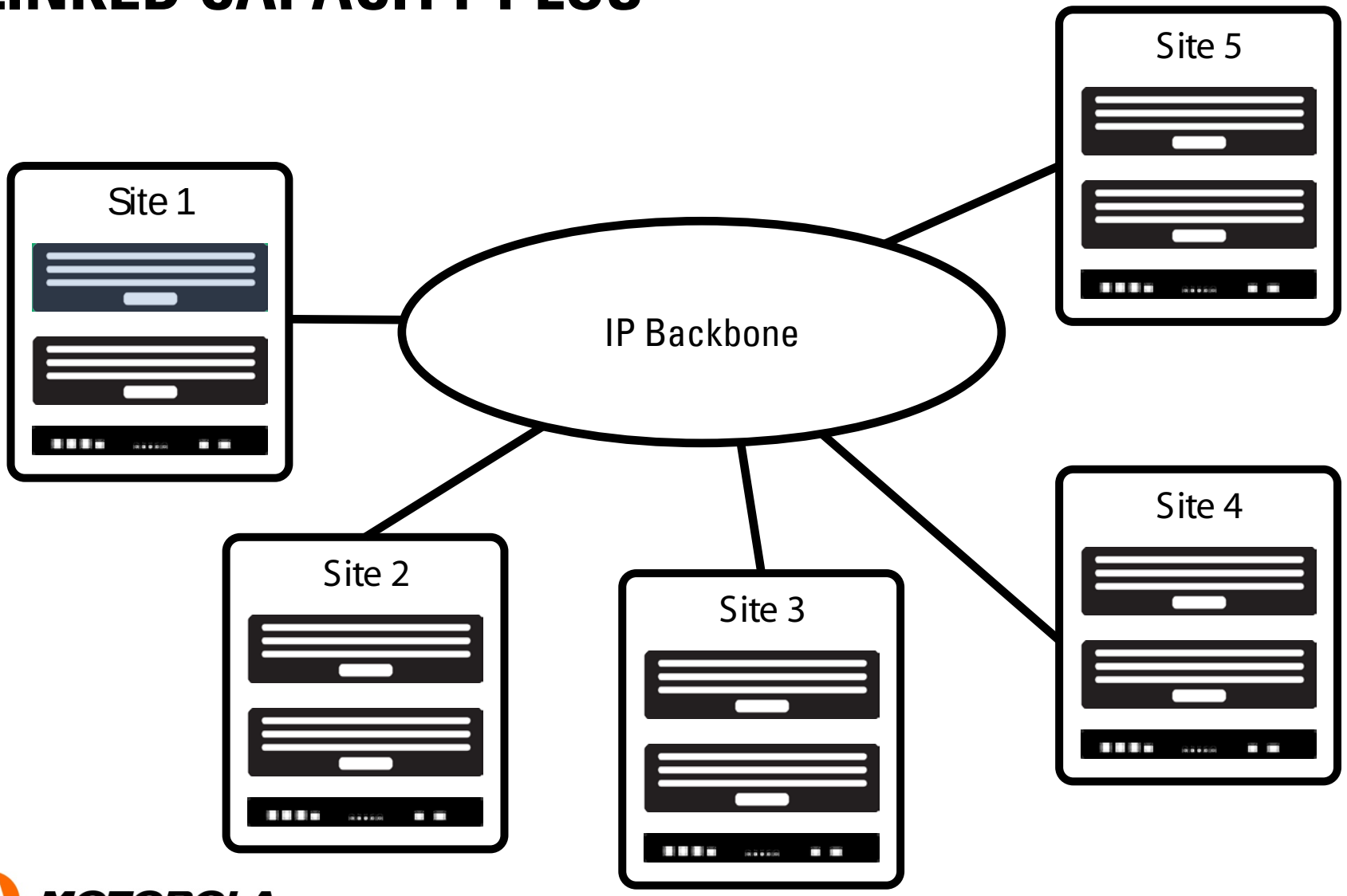
LINKED CAPACITY PLUS

Private call setups are dynamic: only the site where the called parties are located light up. (i.e. a voice channel is busied).

Group calls are static: sites on which the group call is to be relayed, is fixed (pre-programmed). This means that the group call is relayed on a site whether there are users there or not.

Remember there is no site controller!

LINKED CAPACITY PLUS



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LINKED CAPACITY PLUS

Requires 32Mb repeaters.

Requires Linked Capacity Plus licence.

Requires R02.10.xx firmware or later.

DISCUSSION

RADIO MANAGEMENT

ELEMENTS OF RADIO MANAGEMENT

RM SERVER.	RM CLIENT.	DEVICE PROGRAMMER
A PC on which the Radio Management Server software is installed.	A PC on which the CPS is installed. The CPS connects to the server.	An application usually installed together with Radio Management Server which carries out any codeplug updates.

ELEMENTS OF RADIO MANAGEMENT

CONTROL STATION	RNDIS	MCDD
A mobile or portable radio which acts as the RF interface between the Device Programmer and radio channel.	A Windows protocol and driver which runs on USB and allows the PC to „see“ the connected control station as a network connection.	Same as RNDIS but supports more than one radio at a time. Each radio gets its own IP and MCDD changes the PC routing table.

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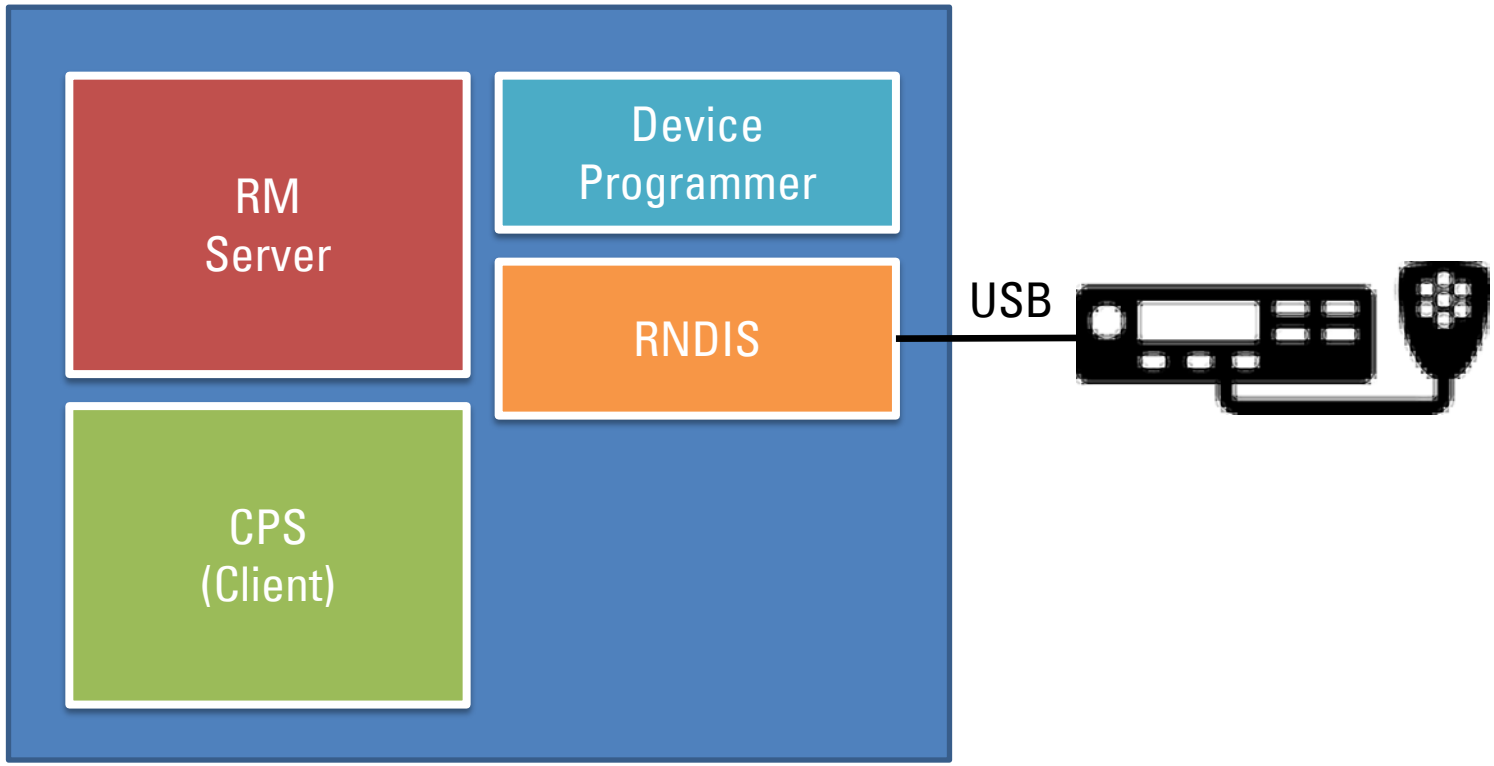
ELEMENTS OF RADIO MANAGEMENT

DDMS	MNIS	NAI
Middleware which processes the information from an incoming ARS message and tells MNIS and the radio management server where (which site and slot) the radio is.	Middleware which acts as a virtual radio on the network, processes call information and interfaces into NAI.	NAI (Network Application Interface) Motorola specification for interfacing between repeaters and applications via the ethernet interface.

SINGLE PC WITH CONTROL STATION



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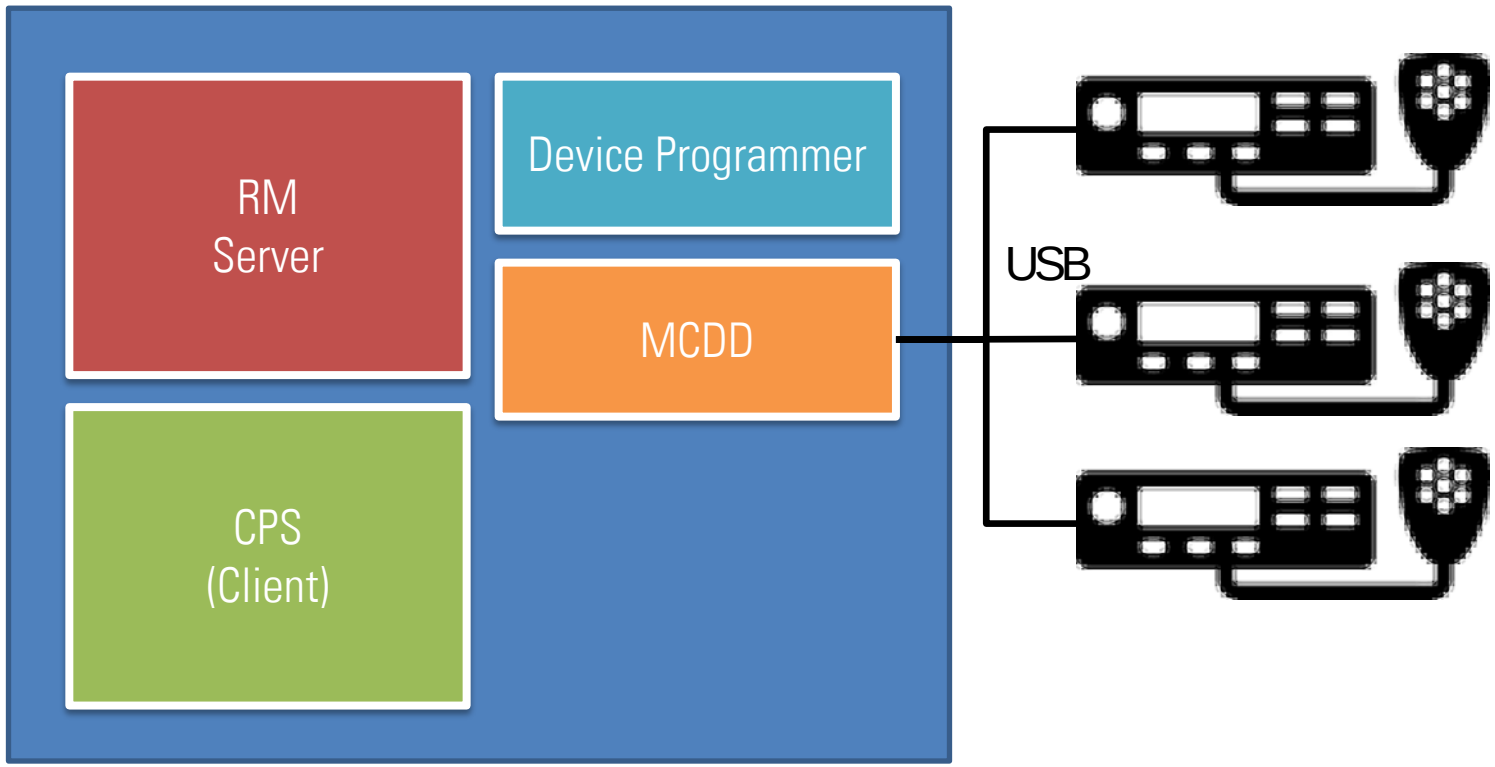
SINGLE PC WITH CONTROL STATIONS



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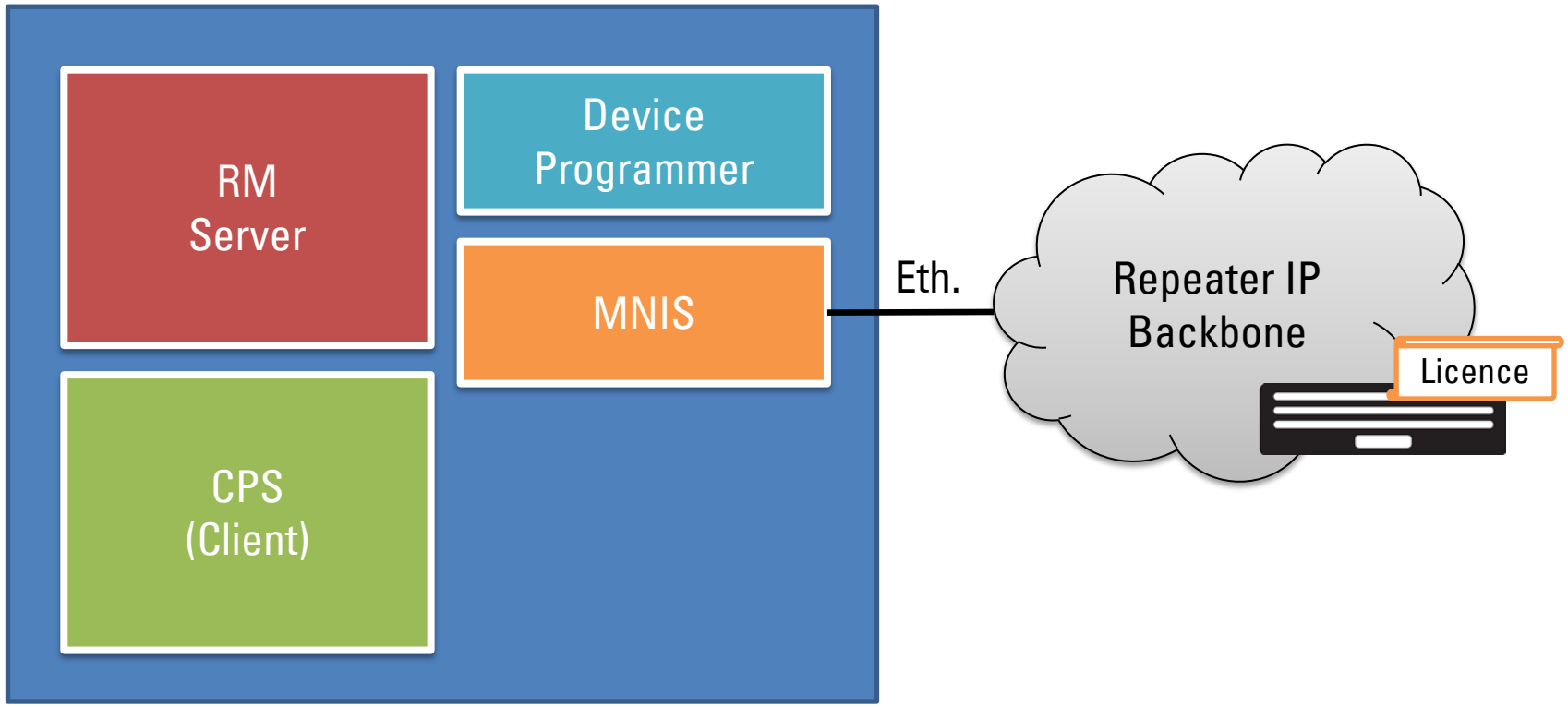
SINGLE PC WITH NAI



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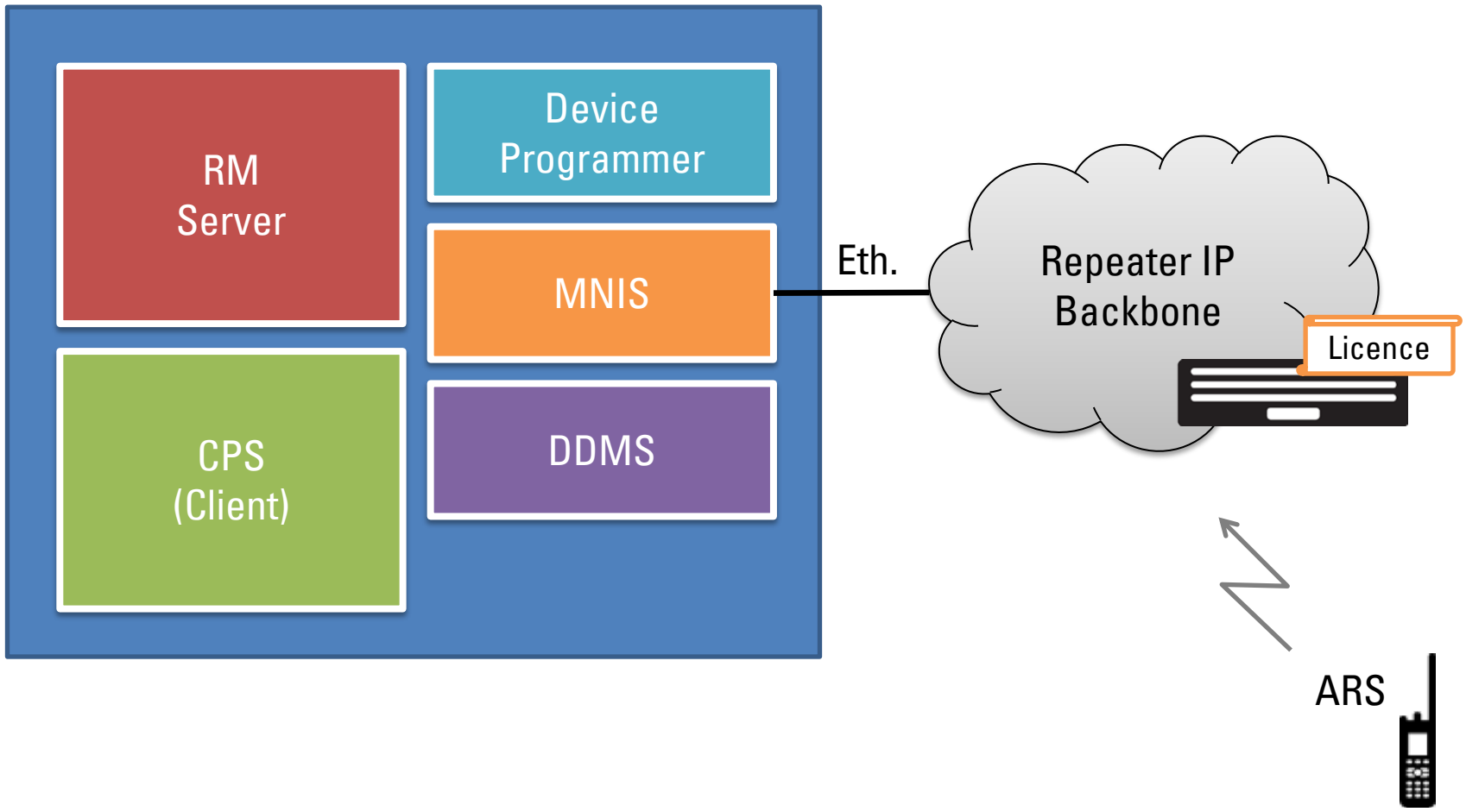
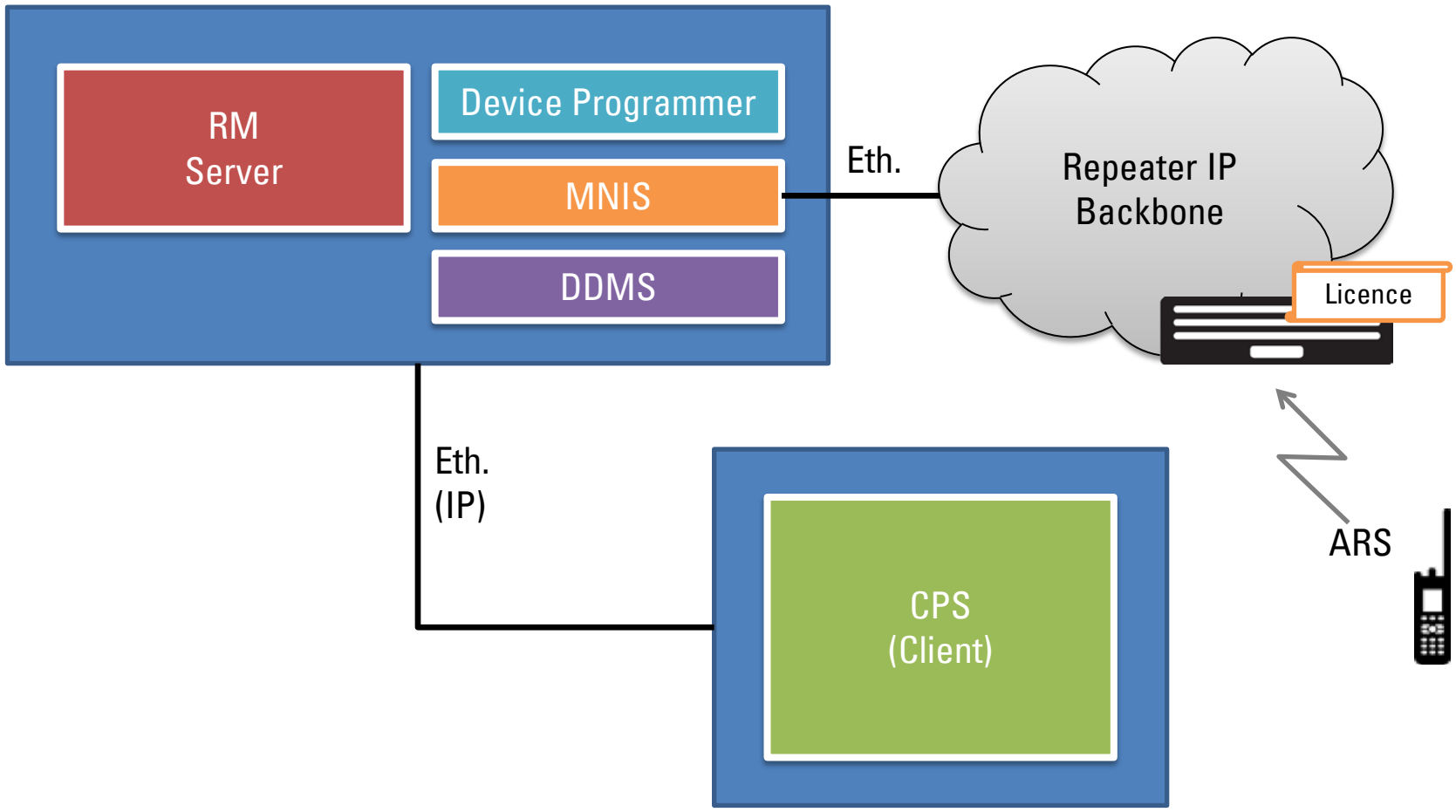
SINGLE PC WITH NAI & PN



SERVER-CLIENT WITH NAI & PN



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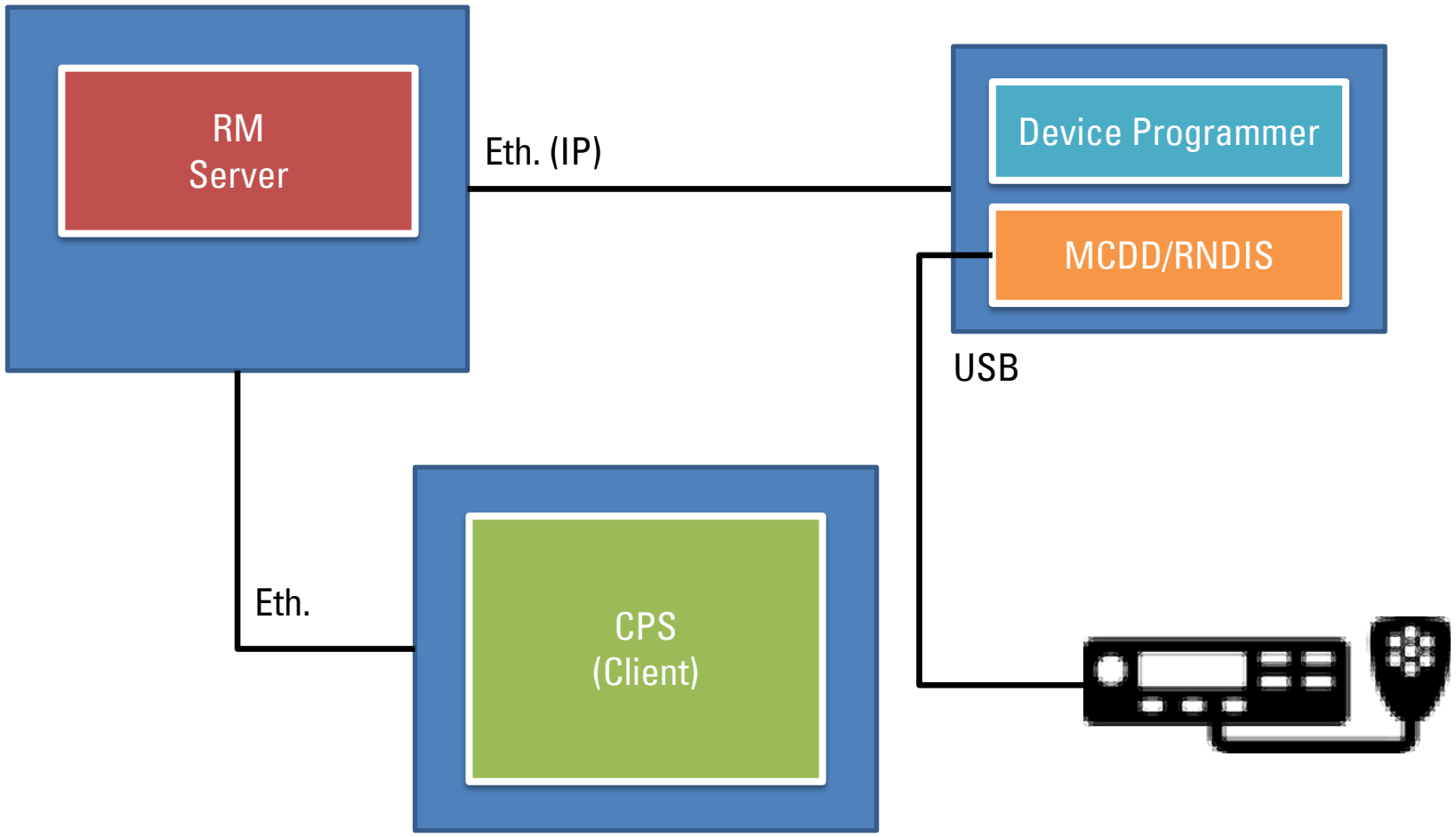
SERVER-CLIENT-DEVICE PROGRAMMER



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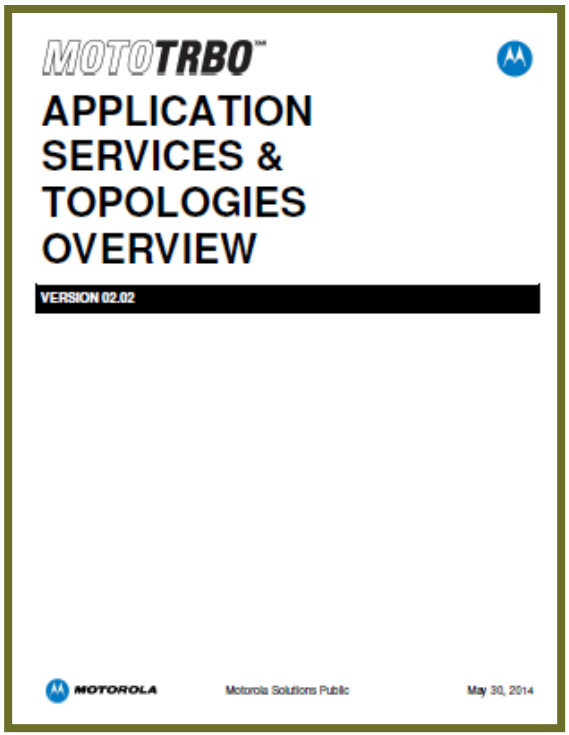
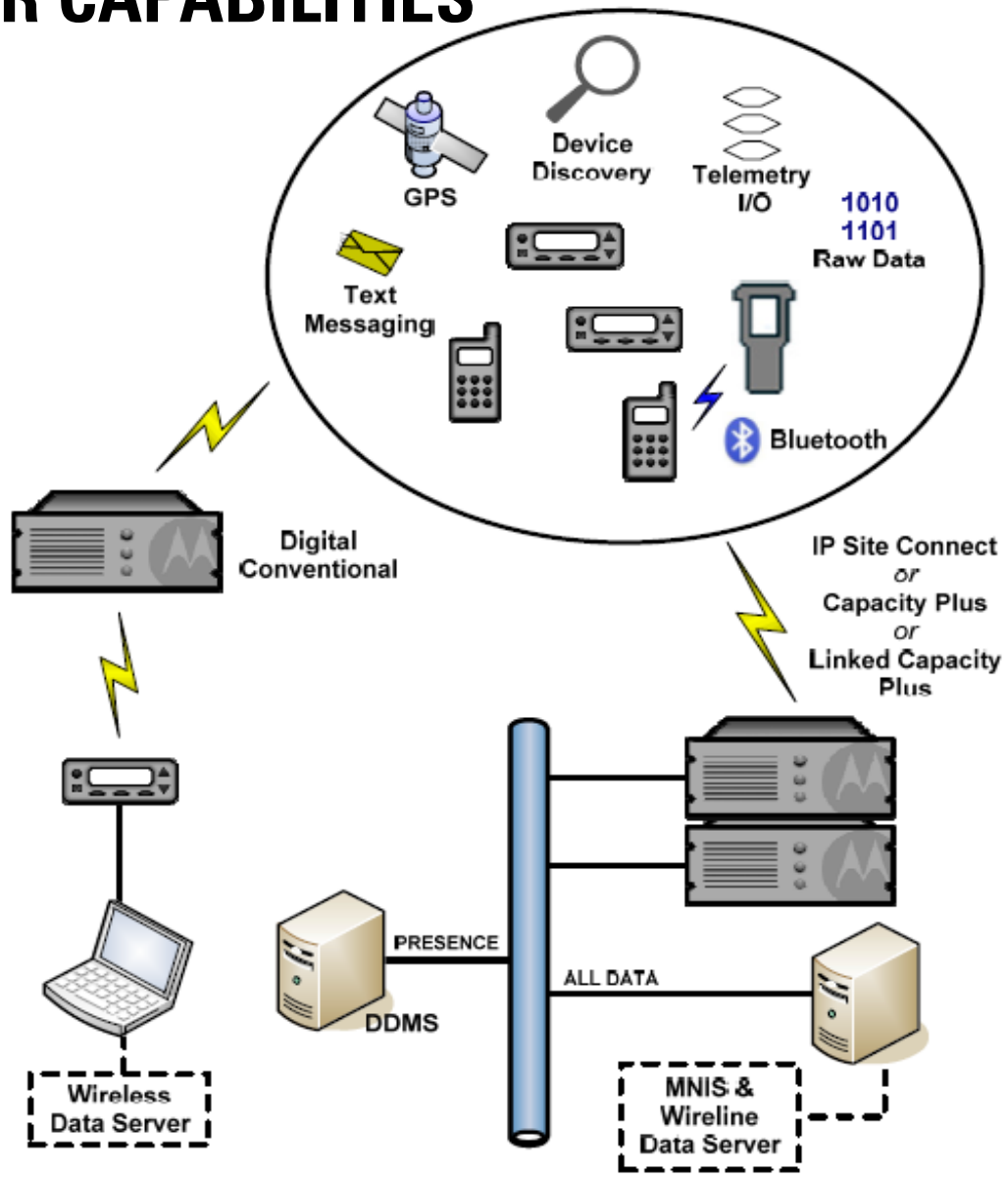
DISCUSSION

APPLICATION PARTNER SOLUTIONS

APPLICATION PARTNER - LICENSED DEVELOPER

APPLICATION PARTNER CAPABILITIES





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APPLICATION PARTNER PROGRAMME

Over 60 Application Partners

Over 200 Licensed Developers

Catalogue

Case Studies

Applications are sourced from the Developer.

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DISCUSSION

SOLD AND SUPPORTED SOLUTIONS

DISPATCH SOLUTIONS

Two applications available from Motorola: TRBONET Plus SmartPTT Plus.

TRBONET PLUS

TRBOnet PLUS provides a feature-rich and powerful solution for voice, text, telemetry dispatch and recording as well as location tracking and control.

The solution incorporates GPS positioning as well as text messaging, voice recording and telemetry processing. These features provide a complete overview of all station and unit activity for fast problem localization, job assignment, control and documentation. All data is recorded continuously and stored for an unlimited period. The data could then be used for further investigation as well as growth planning.

Telemetry | Job Ticketicng | GPS Position | Dispatcher | Telephone | Voice Recording | Automation

SMARTPTT PLUS

SmartPTT

- ✓ Networks of any size and topology
- ✓ System infrastructure monitoring and control
- ✓ Bridging for different radio networks

SmartPTT BASIC
- Small local systems
- Dispatch control through base stations

SmartPTT ENTERPRISE
- Large distributed systems
- IP Site Connect
- Capacity Plus
- Linked Capacity Plus
- Connect Plus

STANDARD FEATURES

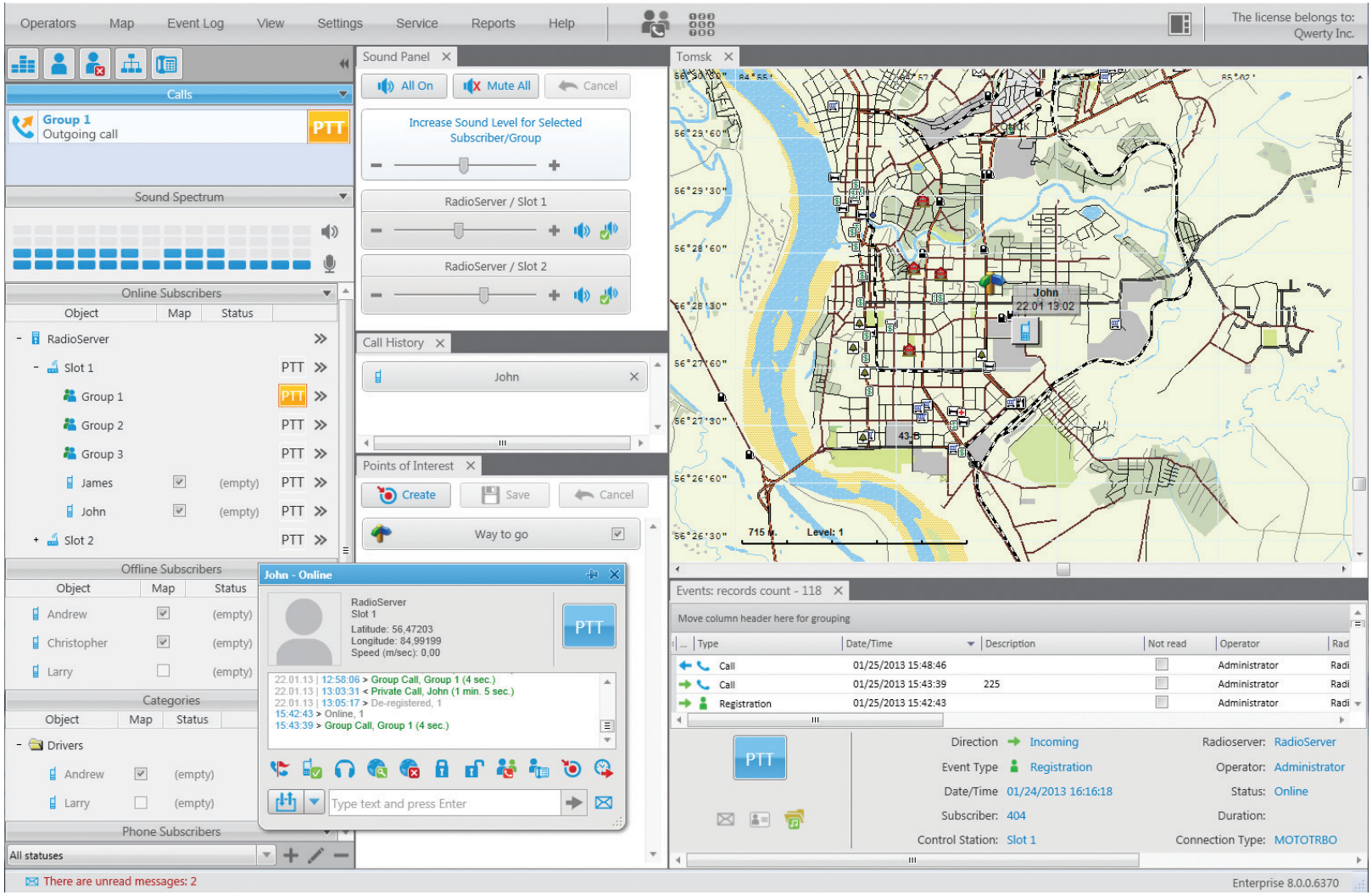
RADIO DISPATCH

GPS TRACKING

EVENT AND VOICE LOGGING

TEXT AND DATA TRANSFER

SMARTPTT PLUS



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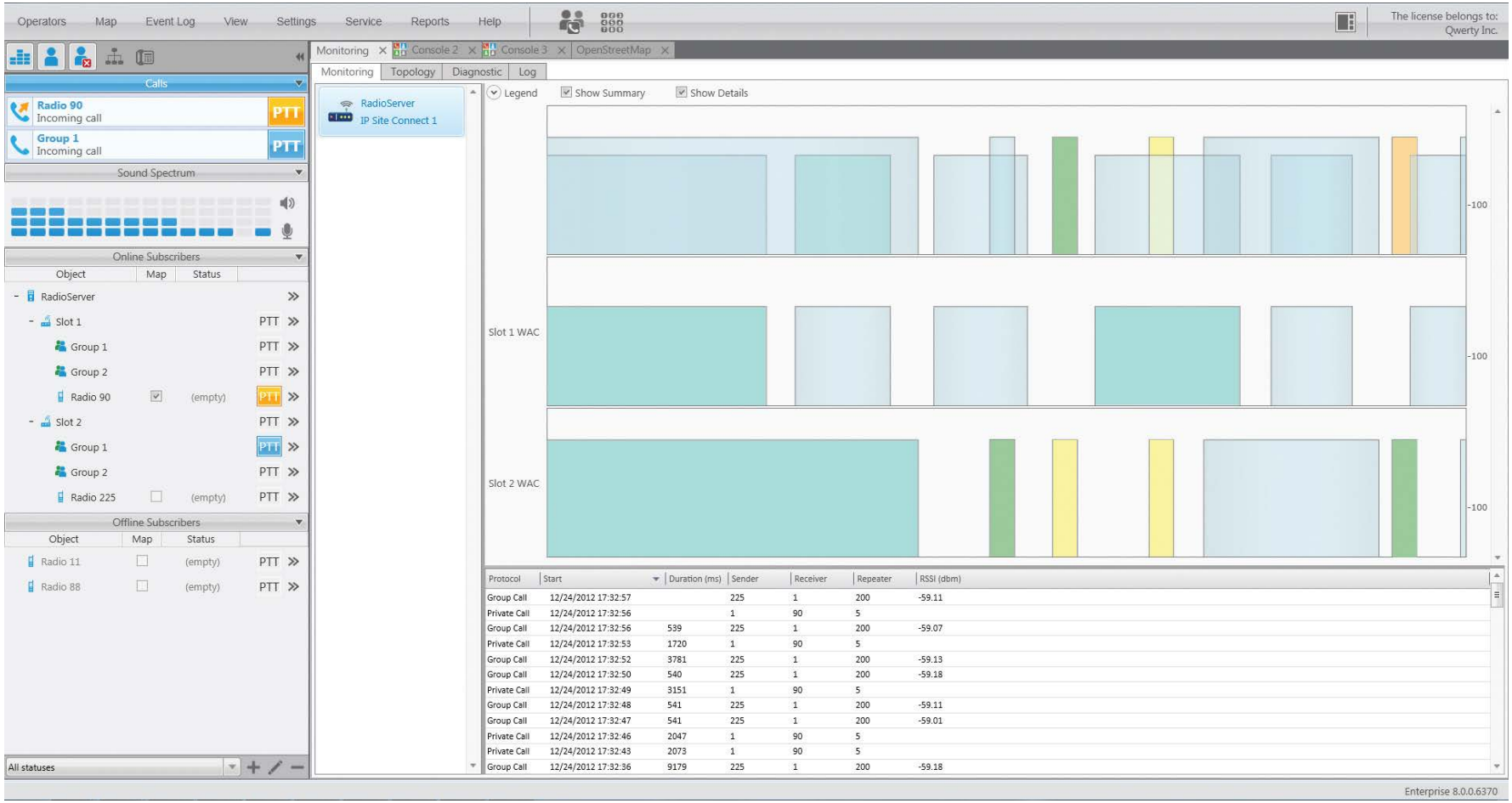
SMARTPTT PLUS



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OPTIONS TO CONNECT INTO RADIO NETWORK

VIA A CONTROL STATION

One control station required per data revert channel.

One control station required per talkgroup which the dispatcher must have access to.

Uses MCDD and may require a USB hub.

Sound card needed to support talkgroup audio.

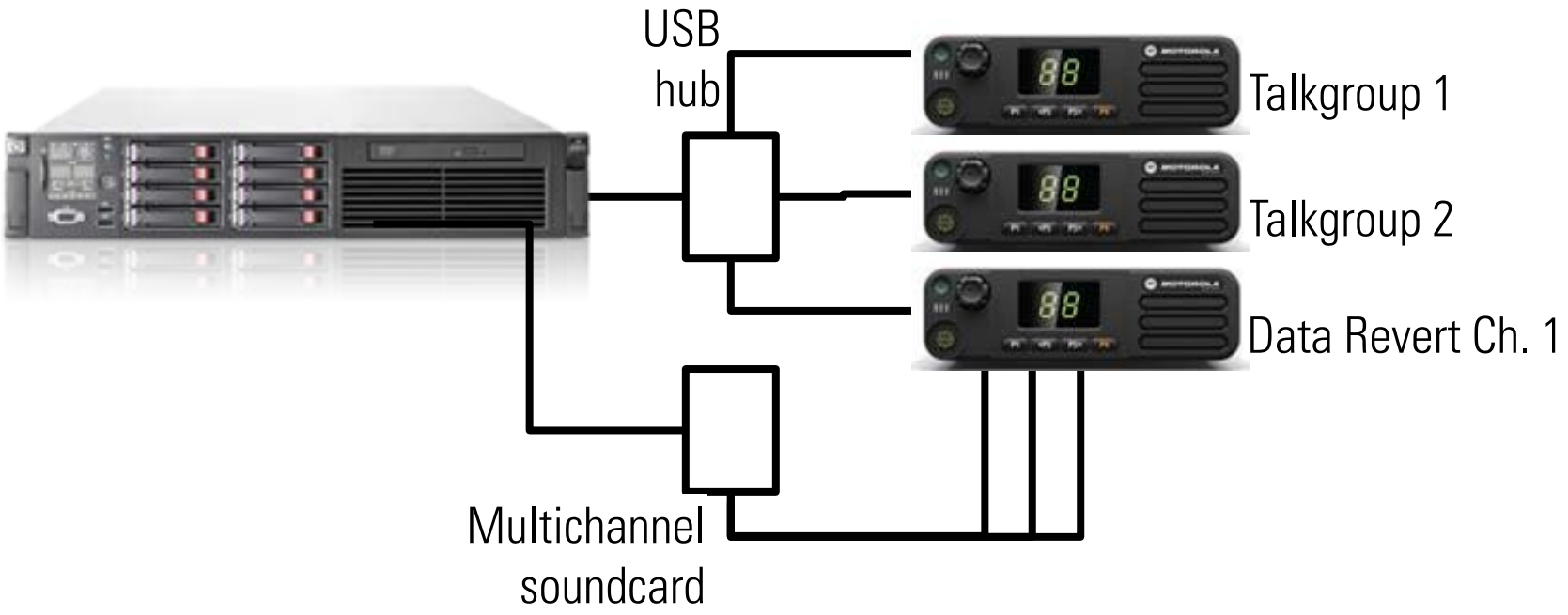
VIA MNIS AND NAI

No control stations required.

Requires one data and/or voice NAI licence per repeater.

Uses MNIS and IP.

CONTROL STATIONS



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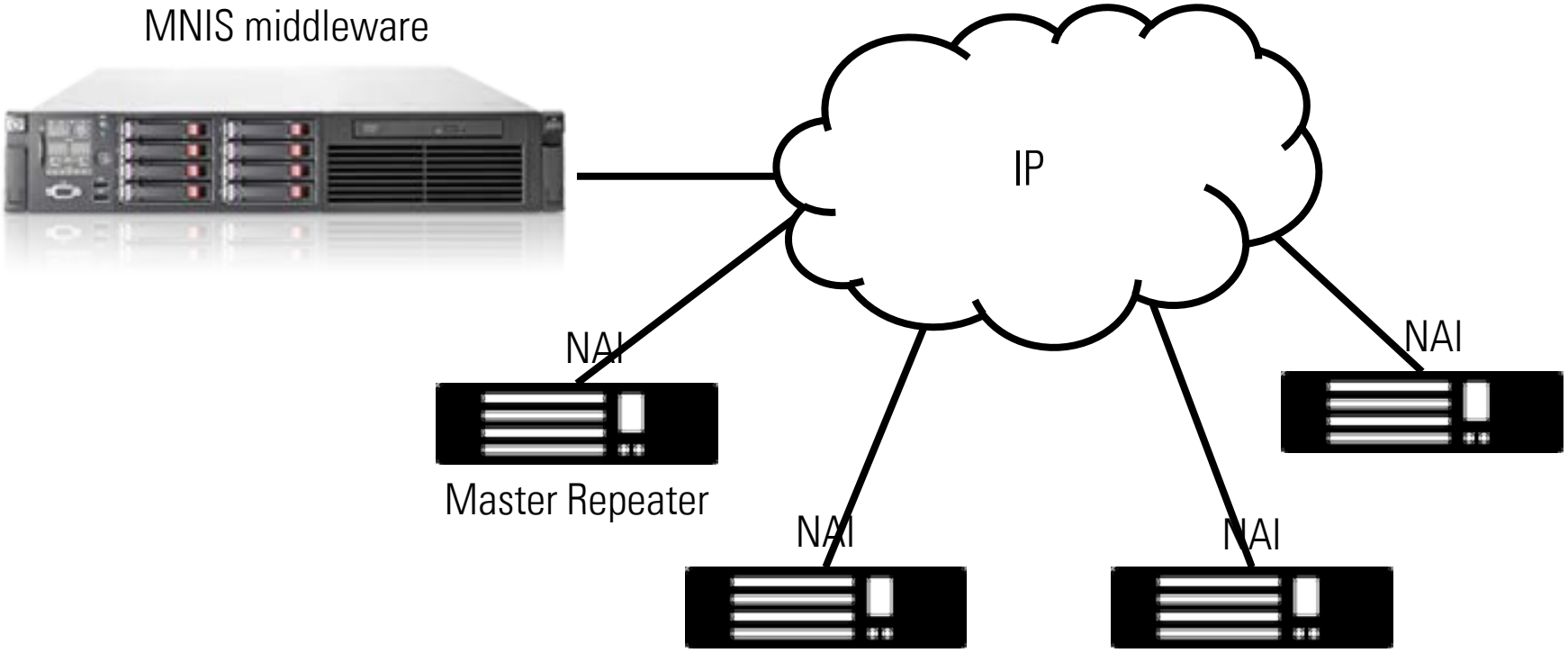
MNIS AND NAI



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NAI LICENCES

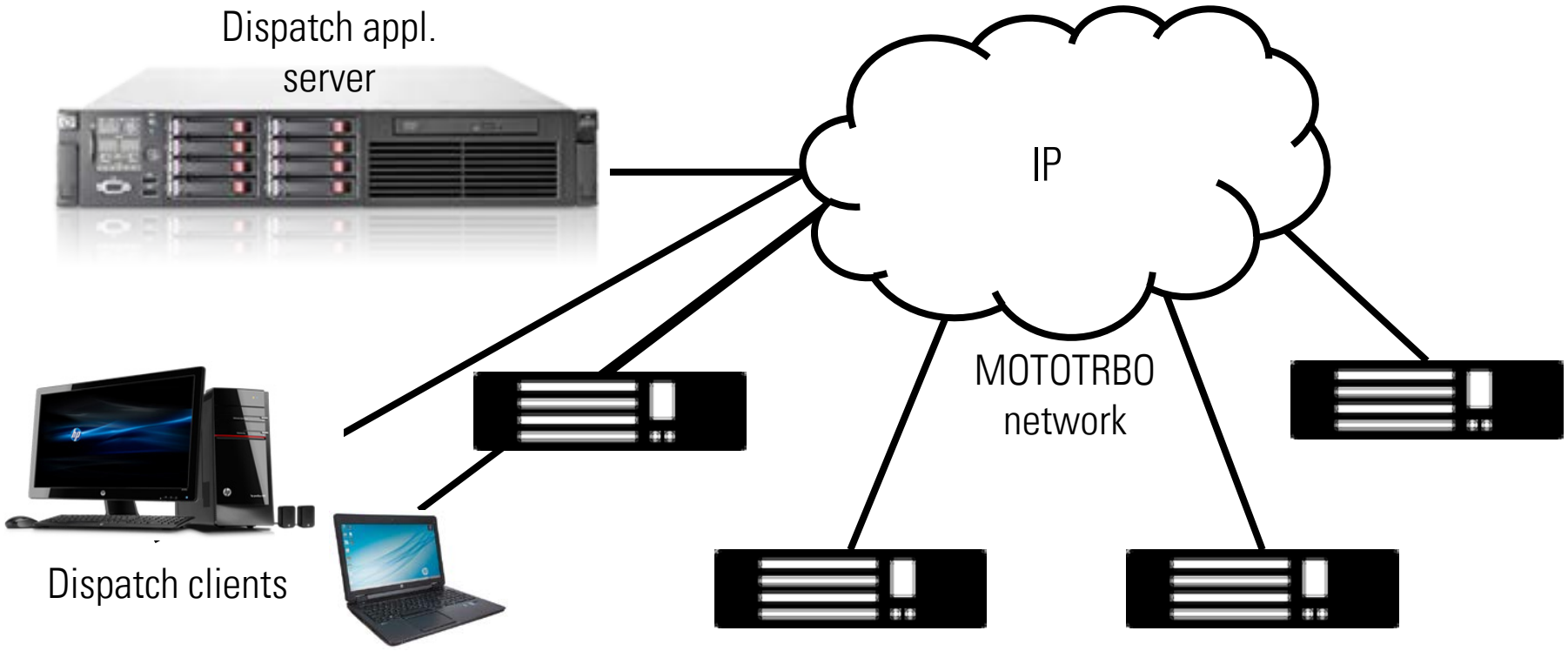
Two possible NAI licences.

NAI data licence only needed if data will pass on that repeater or trunked system (excludes Connect Plus).

NAI voice CSBK licence only needed if voice will pass on that repeater.

If voice and data will pass on that repeater then both licences are needed!

CLIENT SERVER



FEATURES

Linked Capacity Plus and IP Site Connect supported

Voice over IP between dispatchers and server

Voice Recording

Telephone Interconnect

Voice Calls: All Call; Group Call; Individual Call

Remote Monitor

Radio Disable/Enable

Telemetry

Job Ticketing

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ORDERING

CORE

- 1 x Radio Server
- 1 x Dispatcher
- 10 x Radios
- 1 year SW update
- Voice Dispatch
- Fleet Administration
- Event Logging
- Text / Email
- Telemetry
- Alarm/Lone Worker
- Job Ticketing

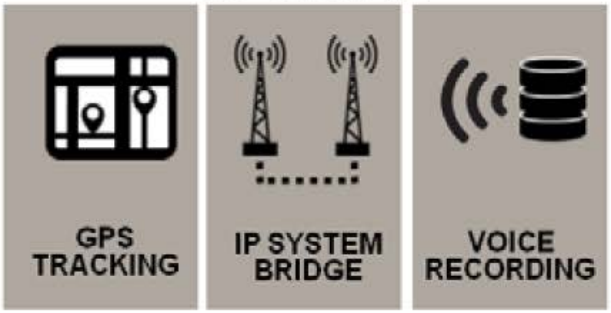
CONNECTIVITY

IPSC | CAPACITY PLUS | LINKED CAPACITY PLUS | CONNECT PLUS*

RADIOS

1-100 | 101-300 | 301-600 | >600

OPTIONAL



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* Requires firmware R2.3A or later.

Q&A

RESOURCES

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THANK YOU