

Krakow, May 30, 2012

MOTOTRBOTM

Shift into digital.

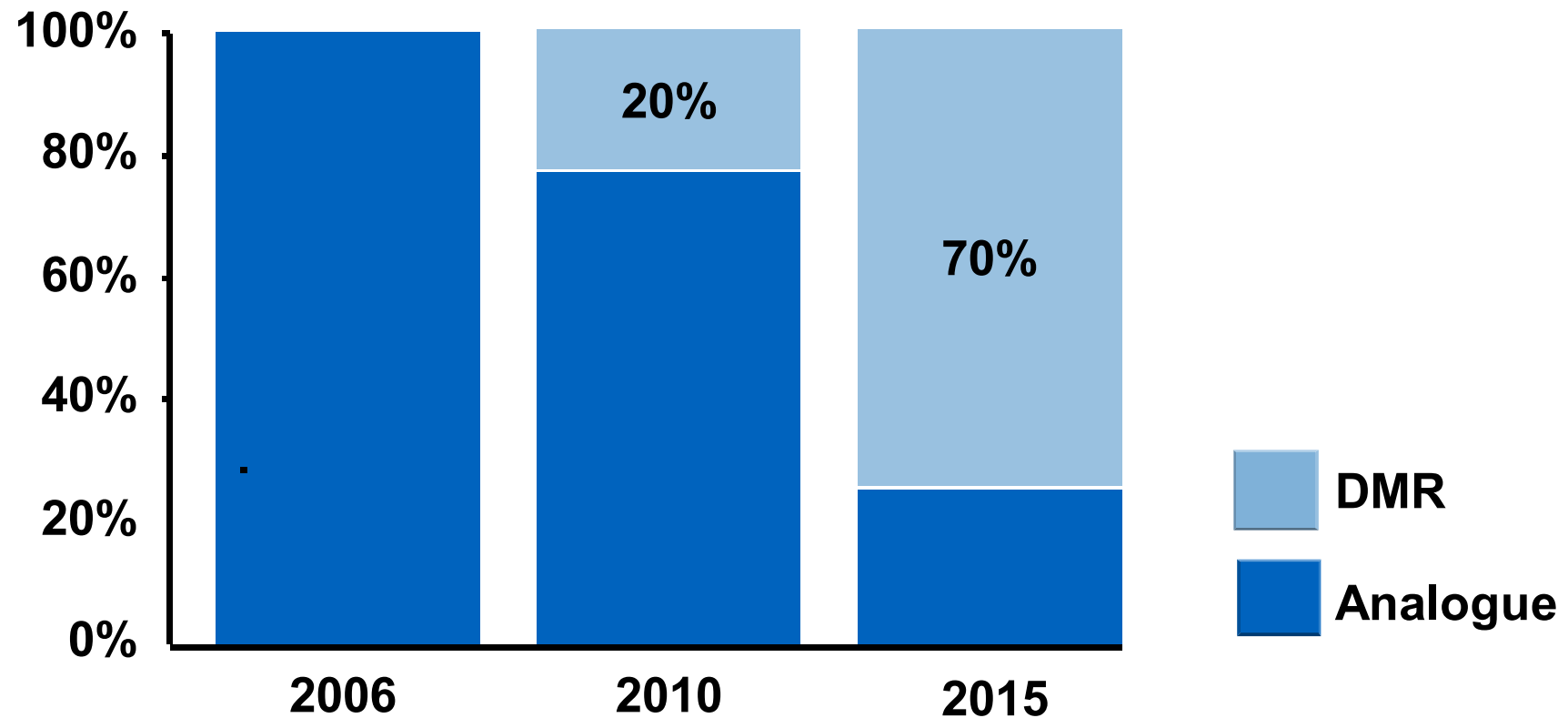


Siegfried Punzenberger
Distributor Development & Training Manager
Radio Channel EMEA

RAPID DIGITISATION



Professional radio market, EMEA (\$)



Source: Motorola Business Analysts, based on IMS data

DIGITAL MOBILE RADIO



Open ETSI Standard

- *ETSI TS 102 361*
- *Published 2005*



DMR Association

- *www.dmrassociation.org*



Motorola market leadership

- *Launched 2007*



DMR ASSOCIATION



Raising market awareness

- *Whitepapers*
- *Industry events*
- *Videos & Twitter*
- *Multi-lingual website planned*



Ensuring market adoption

- *Working with regulators*

Multivendor interoperability

- *Motorola, Selex & Vertex completed June 2011*
- *Ongoing enhancements to ETSI DMR standard*

MOTOTRBO™ PORTFOLIO



Portables



Accessories



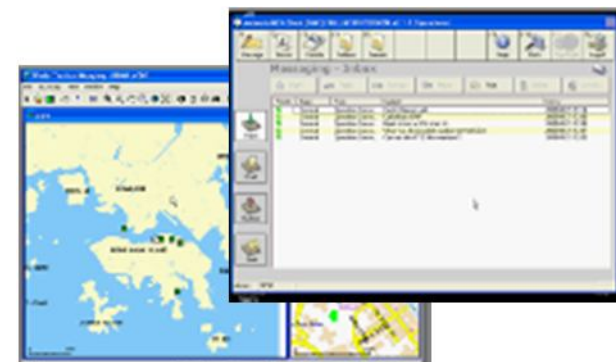
Mobiles



Repeaters



Applications

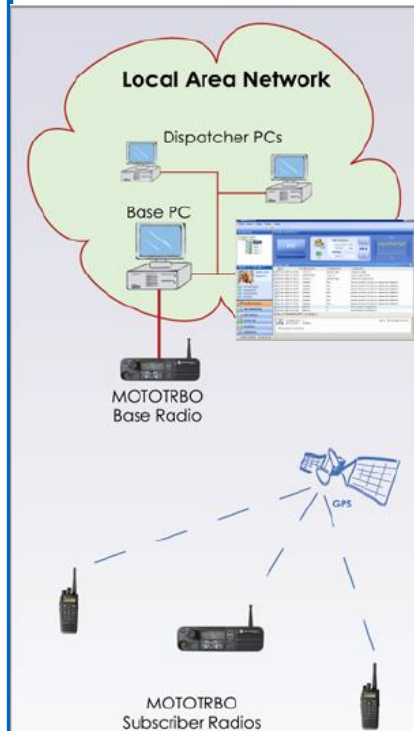


MOTOTRBO™ APPLICATIONS



Over 300 MOTOTRBO™ Application Developers worldwide

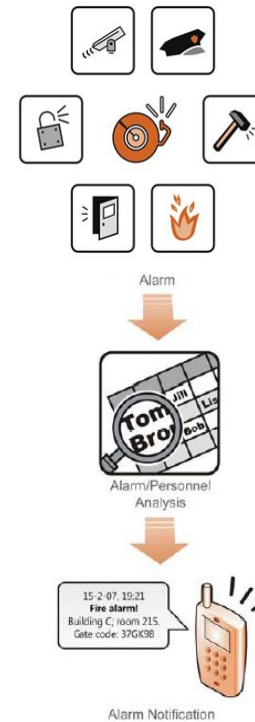
FLEET MANAGEMENT DISPATCHER



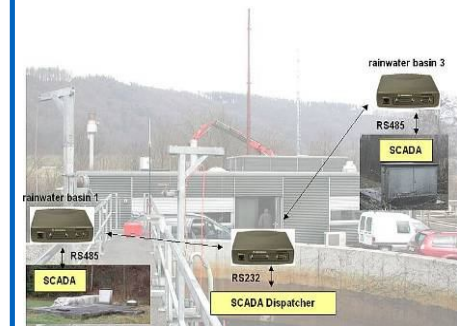
PERSONNEL SECURITY



ALARM CONTROL



TELEMETRY / SCADA



ANALOGUE MIGRATION

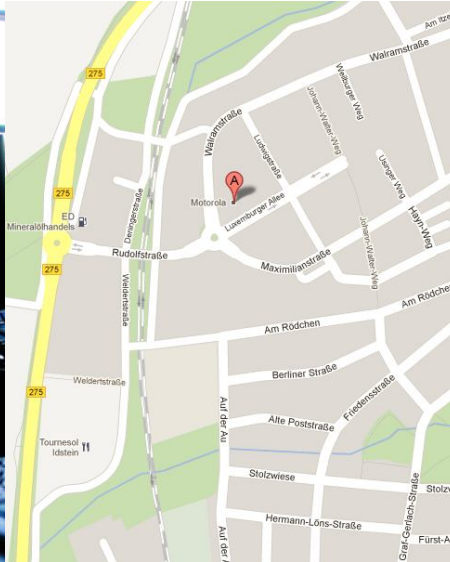


APPLICATION PARTNERS

- *Over 300 Application Partners*
- *Over 50 Applications covering a wide spectrum of industries.*
- *Consult the Application Partner and Solutions brochure provided*



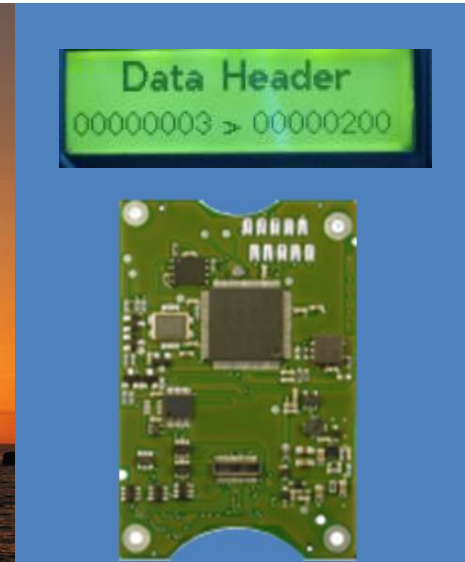
Dispatch



Location



Data



Specialist



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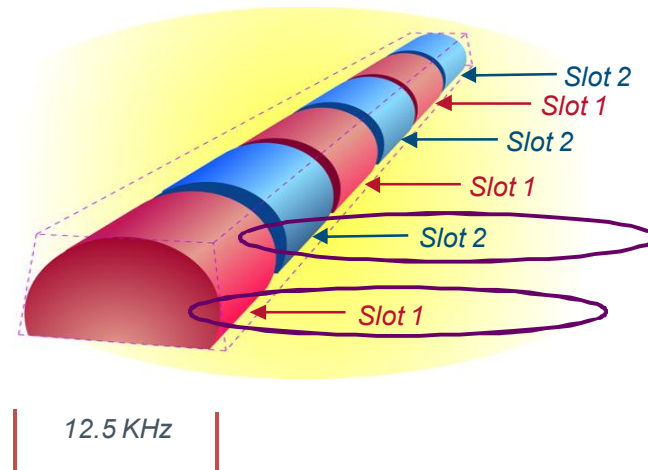
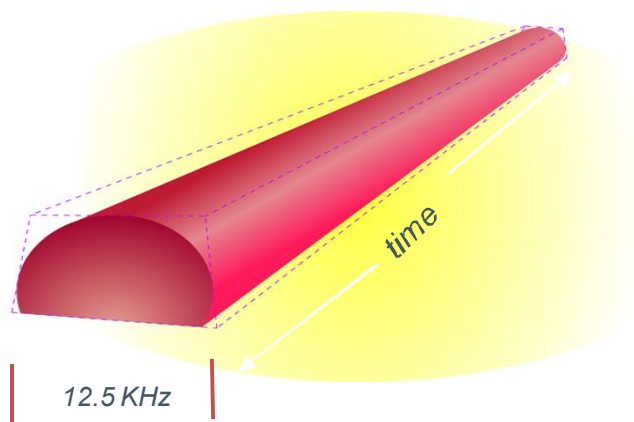
WHAT IS DMR?

- **ETSI Technical Standard 102 361 1~3 (ETSI DMR)**
- **Open Standard using TDMA and ABME+2**
- **Uses existing PMR frequencies: VHF and UHF.**
- **Feature rich and future proof**



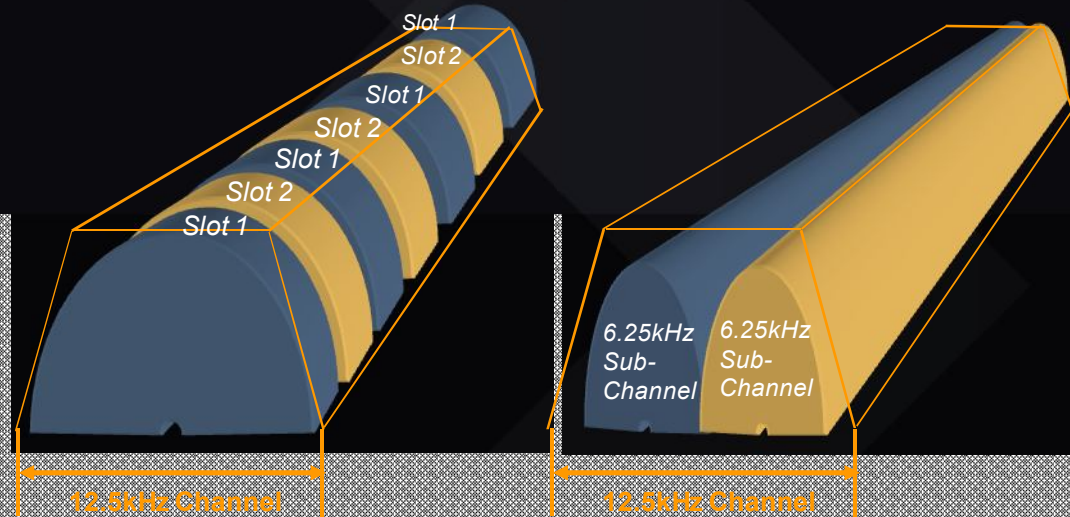
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FDMA vs. TDMA



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TDMA vs. FDMA



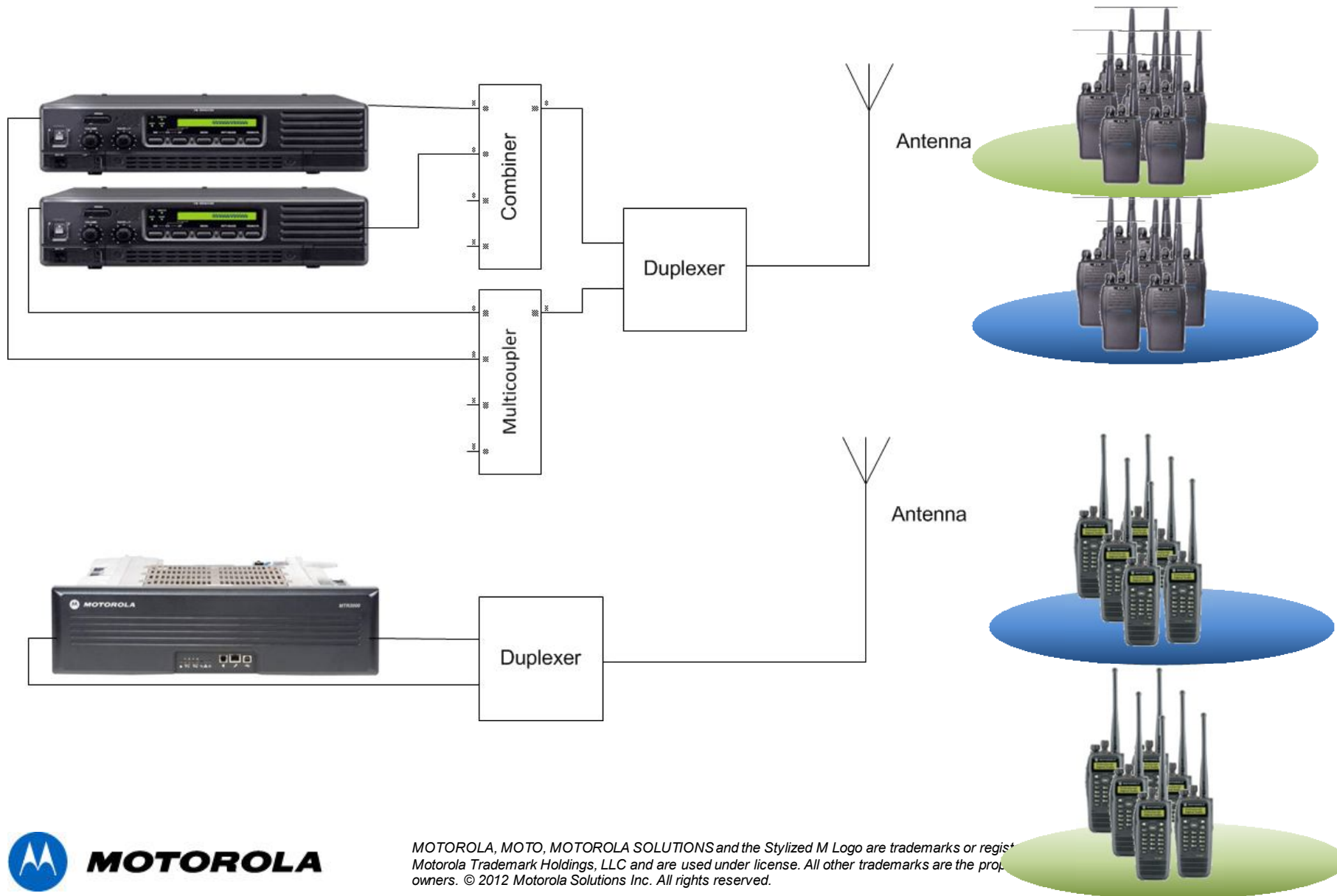
Comparison

DMR 12.5kHz TDMA

dPMR, NXDN 6.25kHz FDMA

Spectrum Efficiency	Twice capacity in existing or new 12.5Khz repeater channel	Poor spectrum efficiency - New 6.25K licenses from required
Standard	ETSI DMR Tier 2 Standard	ETSI dPMR (NXDN proprietary)
Licensing	Fits into existing channel space	Re-farming and new license required. Limited number of 6.25K licenses available
End User Total Cost of Ownership	Lower cost than equivalent 2-channel system; no combining equipment for <2 channels	Additional cost to achieve spectrum efficiency gains. Need 1 repeater for each sub-channel; cannot combine repeaters to share antenna site

FDMA VS. TDMA



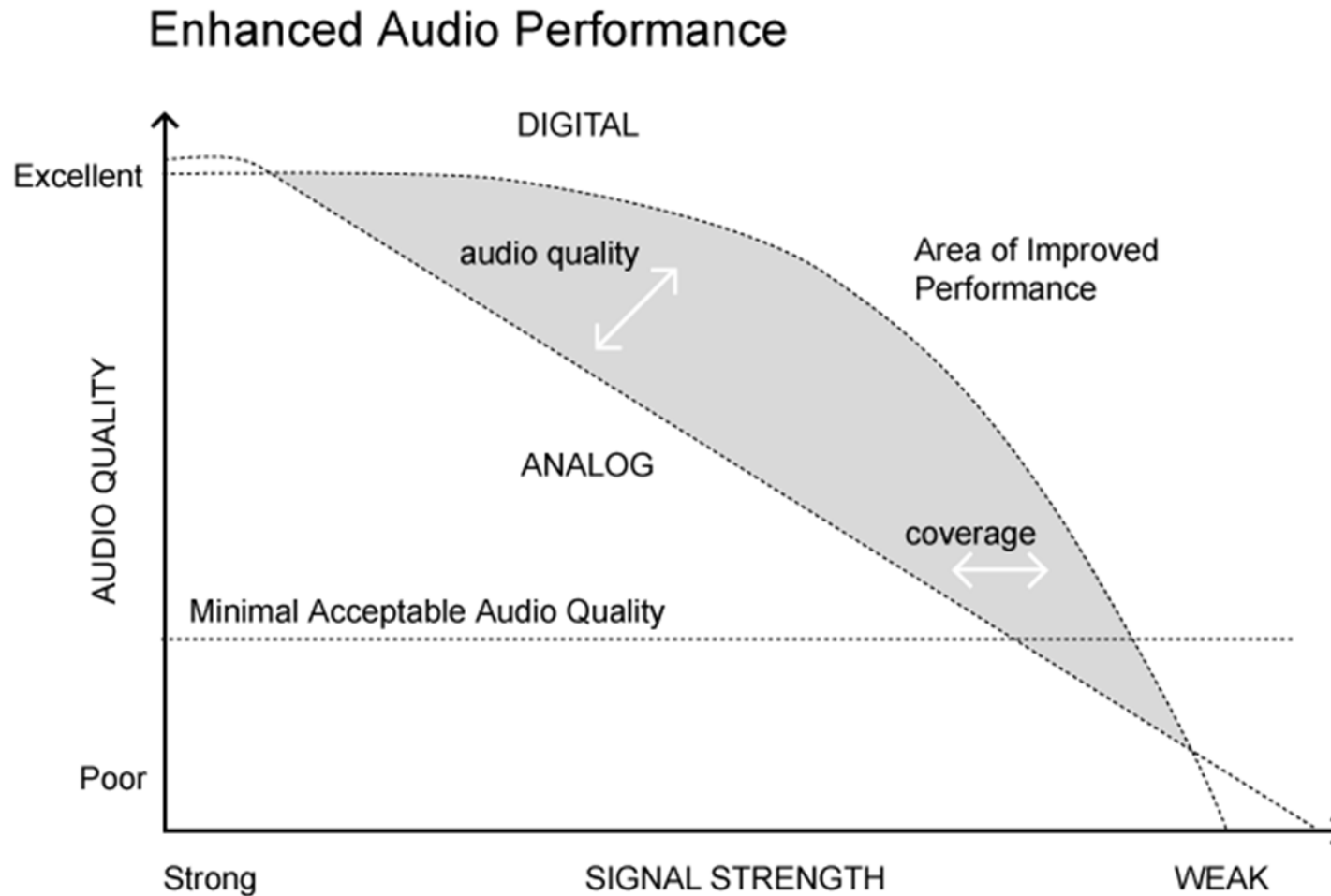
WHY MOTOTRBO?



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COVERAGE ENHANCEMENT



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THE DIFFERENCE WITH DIGITAL

- *What end user will experience with Digital Audio:*
 - *Consistent performance throughout coverage area with no gradual fade at the fringes.*
 - *Digital sounds different.*
 - *Background noise reduction.*
- *What end user will NOT experience with Digital Audio:*
 - *Digital radio CD quality.*
 - *Digital cannot solve historic problems.*



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MOTOTRBO SUBSCRIBER EQUIPMENT



SUBSCRIBER EQUIPMENT

- *DP340x*
 - *Non-display portable*
 - *32 channels*
- *DM340x*
 - *Numeric display mobile*
 - *32 channels*



*If the model names ends with 1 (eg DP3401)
then radio has GPS.*



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SUBSCRIBER EQUIPMENT

- *DP360x*
 - *Display portable*
 - *1000 channels*
- *DM360x*
 - *Display mobile*
 - *1000 channels*

If the model names ends with 1 (eg DP3601) then radio has GPS.



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INFRASTRUCTURE EQUIPMENT

- *DR3000*
 - 25 or 45W model
 - Analogue/ digital operation
 - VHF or UHF
- *MTR3000*
 - 100W model
 - Analogue / digital operation
 - VHF or UHF



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ACCESSORIES

- *Broad range of intelligent accessories.*



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MOTOTRBO™ NEXT GENERATION

HIGH



DP 3000 SERIES



DP4000 SERIES
Q2 2012



SL4000 SERIES
Available now

MID



GP SERIES



GP-R SERIES



DP2000 SERIES
Q2 2012

ENTRY



CP040



P100 SERIES



MOTOROLA

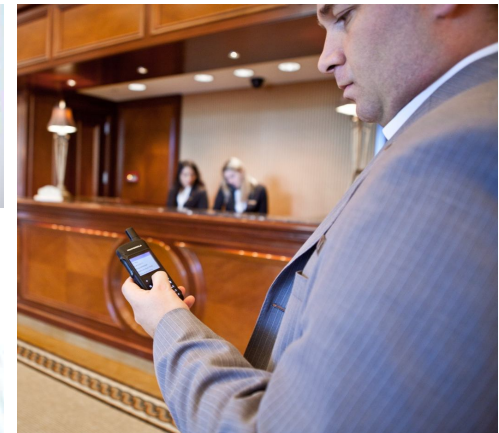
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SL SERIES PORTABLES



SL4000 / SL4010

- *MOTOTRBO™ platform digital only*
- *UHF 403-470MHz*
- *Less than half the size of a traditional 2-way radio*
- *IP54 rated*
- *>8 hrs Battery life (standard)*
- *>11 hrs Battery life (high-capacity)*



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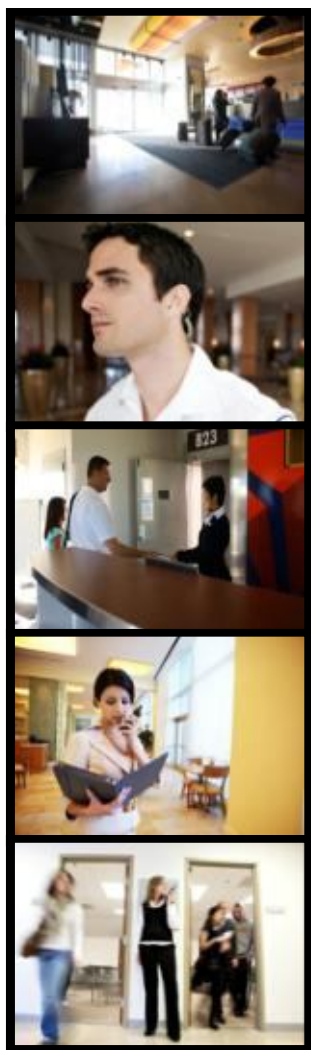
SL SERIES BUSINESS OBJECTIVES

- *Generate INCREMENTAL business*
- *New radio concept to address new markets*
- *Targeted at new “suits & skirts” users*
- *Management*
- *Customer-facing workers*
- *Meet customer requirements*
- *Easy-to-use*
- *Discreet use*
- *Onsite communications, primarily indoor use*
- *Best-in-class voice communications*
- *Integrated data applications*



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PRIMARY TARGET MARKETS

 Market	Applications	User
Hospitality (Hotels, Resorts, Casinos)	Primary device for voice communications Text messaging, hotel management applications	Hotel Manager Hotel Security Front Desk Event Planning/Management
Private Security	Primary device for voice communications Vibrate Call for discreet communications Easy to access and use controls (keep eye on scene)	Security Officers Security Manager
Airlines/Airports	Primary device for voice communications Intelligent Audio for noisy and quiet environments Communicate with ground crews	Ticketing/Boarding Staff Supervisor
Services (Events & Property Mgt.)	Primary device for voice communications Event planning communications Text messaging and data applications	Event coordinator/manager Property Manager/Owner Security Lead
Education	Primary device for voice communications Vibrate Call for discreet communications in classrooms/offices Easy to access and use controls	School Principal Administration Security Lead



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SL4000 SERIES



- *On-site digital communications*
- *MOTOTRBO™ platform (digital only)*
- *2W RF power*
- *UHF 403-470MHz*
- *1,000 channels*
- *Dimensions:*
 - *Height: 121mm*
 - *Width: 55mm*
 - *Depth: 17.3mm*
- *Weight: ~ 140g*
- *Military specs 810 C, D, E, F & G*
- *IP54 dust & water protection*
- *Battery life:*
 - *8.5 hours (Standard battery)*
 - *11.5 hours (High-capacity battery)*



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SL4000 SERIES

SL4000 *non-GOB model*



SL4010 *GOB model*



• *Features*

- *Embedded **G**eneric **O**ption **B**oard model*
- *Integrated Bluetooth audio & data*
- *Full-color display with day/night mode*
- *Intelligent audio*
- *Enhanced programmable button*
- *Voice announcement*
- *Covert mode*
- *Vibrate alert*
- *Text messaging*

• *Accessories*

- *Wired & Bluetooth audio accessories*
- *Micro-USB plug-in charger*
- *Drop-in Multi-Unit Charger*



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BEST-IN-CLASS AUDIO



INTELLIGENT AUDIO

- *Automatic volume adjustment to suit the environment*

LOUD AUDIO

- *Loud, crisp audio in a compact design*
- *Dual speakers*
- *Minimizes distortion at high volumes*

BLUETOOTH AUDIO

- *Wireless audio options provide comfortable, discreet communications*

VOICE ANNOUNCEMENT

- *Verbal announcement of zone, channel or programmable button selected*



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INTELLIGENT AUDIO

RADIO VOLUME THAT AUTOMATICALLY ADJUSTS TO THE ENVIRONMENT

Loud Environments

- *Radio volume is automatically increased when a loud environment is detected*

Quiet Environments

- *Radio volume is automatically decreased when a quiet environment is detected*



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VOICE ANNOUNCEMENT

AUDIBLE CONFIRMATION

Confirm zone changes, channel changes and programmable buttons without having to look at the radio

- *Features customizable and default audio files*
- *160 channel announcement default files*
- *25 zone announcement default files*
- *Default files for all possible programmable buttons*



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DISCREET COMMUNICATION



COVERT MODE

Disables all visual indicators

- *Display, LED and audio*
- *Radio goes dark*
- *Eliminates audible tones*
- *Option to hear audio transmissions using Bluetooth wireless or wired surveillance accessories*

VIBRATE ALERT

- *Radio vibrates to alert users of communication quietly and discreetly*



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INNOVATIVE ANTENNA DESIGN

INNOVATIVE ANTENNA DESIGN PROVIDES THE SMALLEST FORM FACTOR AND MAXIMIZES RANGE PERFORMANCE

- *The SL Series portables cover the 403-470 MHz band.*
- *UHF stubby antennas are optimized into sub-bands to help maximize range performance.*
 - 403-425 MHz
 - 420-445 MHz
 - 438-470 MHz
- *Antennas can be easily changed if needed by removing a single Torx screw*

1. Remove antenna screw plug



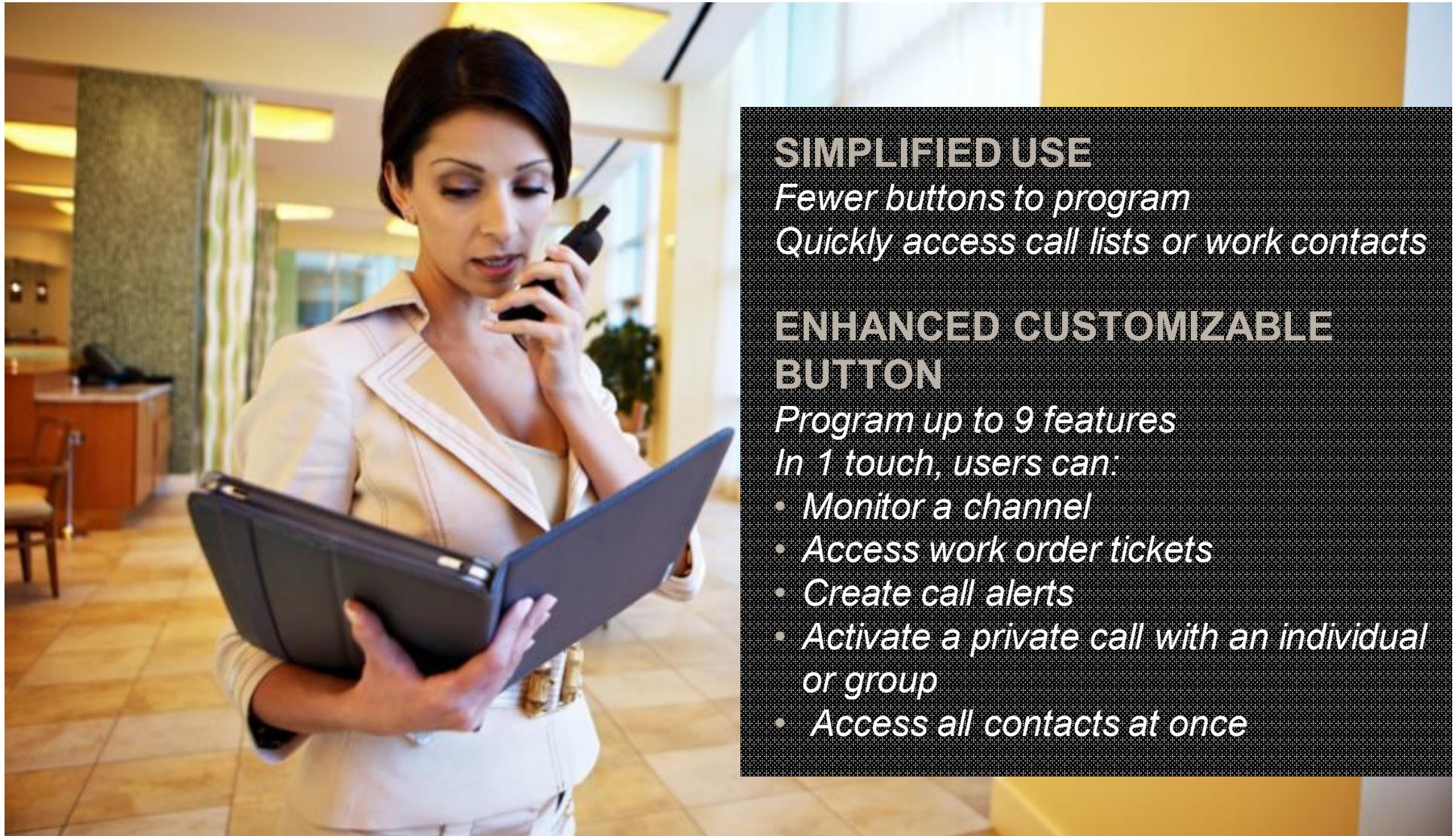
2. Remove the antenna screw



3. Pull out the antenna from the radio.



ENHANCED PROGRAMMABLE BUTTON



SIMPLIFIED USE

Fewer buttons to program

Quickly access call lists or work contacts

ENHANCED CUSTOMIZABLE BUTTON

Program up to 9 features

In 1 touch, users can:

- *Monitor a channel*
- *Access work order tickets*
- *Create call alerts*
- *Activate a private call with an individual or group*
- *Access all contacts at once*



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SL SERIES ACCESSORIES

AUDIO

- *Integrated Bluetooth enables Operations Critical Wireless earpiece*
- *Slim, discreet, comfortable earpiece options*

ENERGY

- *High capacity and slim battery options*
- *Micro USB plug-in charger and multi-unit charger*

CARRY OPTIONS

- *Lightweight swivel carry holder*
- *Wrist strap*



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DP4000 SERIES PORTABLES

Available : Q2 2012



DP4400

DP4800

DP4600

DP4401

DP4801

DP4601

- Full keypad, colour display
- Limited keypad, monochrome display
- Non-display
- VHF (136-174MHz)
- Wideband UHF (403-527MHz)
- Integrated GPS and Bluetooth models



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NEW FEATURES

- *Intelligent audio*
- *Embedded Bluetooth audio & data*
- *Loudest speaker volume*
- *Voice announcement*
- *Integrated 5-tone analogue signaling*

DATA APPLICATIONS

- *Integrated Bluetooth data*
- *Integrated GPS*
- *Canned & free-form text messaging*
- *Largest application ecosystem*

DP2000 SERIES PORTABLES

Available : Q2 2012



DP2400

DP2600

NEW FEATURES

- *Intelligent audio*
- *Canned unit-to-unit text messaging*
- *Canned voice announcement*

PURCHASABLE SOFTWARE OPTIONS

- *Capacity Plus compatibility*
- *Transmit Interrupt*
- *Enhanced Privacy*
- *5-tone signalling*



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DP2000 SERIES ACCESSORIES



AUDIO

- *Slim, compact 8-pin connector*
- *Tight, sealed radio interface*
- *Quick, one-hand disconnect*

MICROPHONES, EARPIECES

- *Supports IMPRES audio*
- *Supports Mag One accessories*
- *NEW swivel earpiece*



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MOTOTRBO™ ATEX (Q1 2013)



- **Highest ATEX rating:**
 - Gas: II 2G Ex ib IIC T4
 - Dust: II 2D Ex tD A21 IP6x ib D21 T110°C
 - Mining: I M2 Ex ib I
- **Man-down option board**



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MOTOTRBO™ NEXT GENERATION

HIGH



MID



ENTRY



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DM4000 SERIES MOBILES

Available Now!



DM4600 / DM4601



DM4400 / DM4401

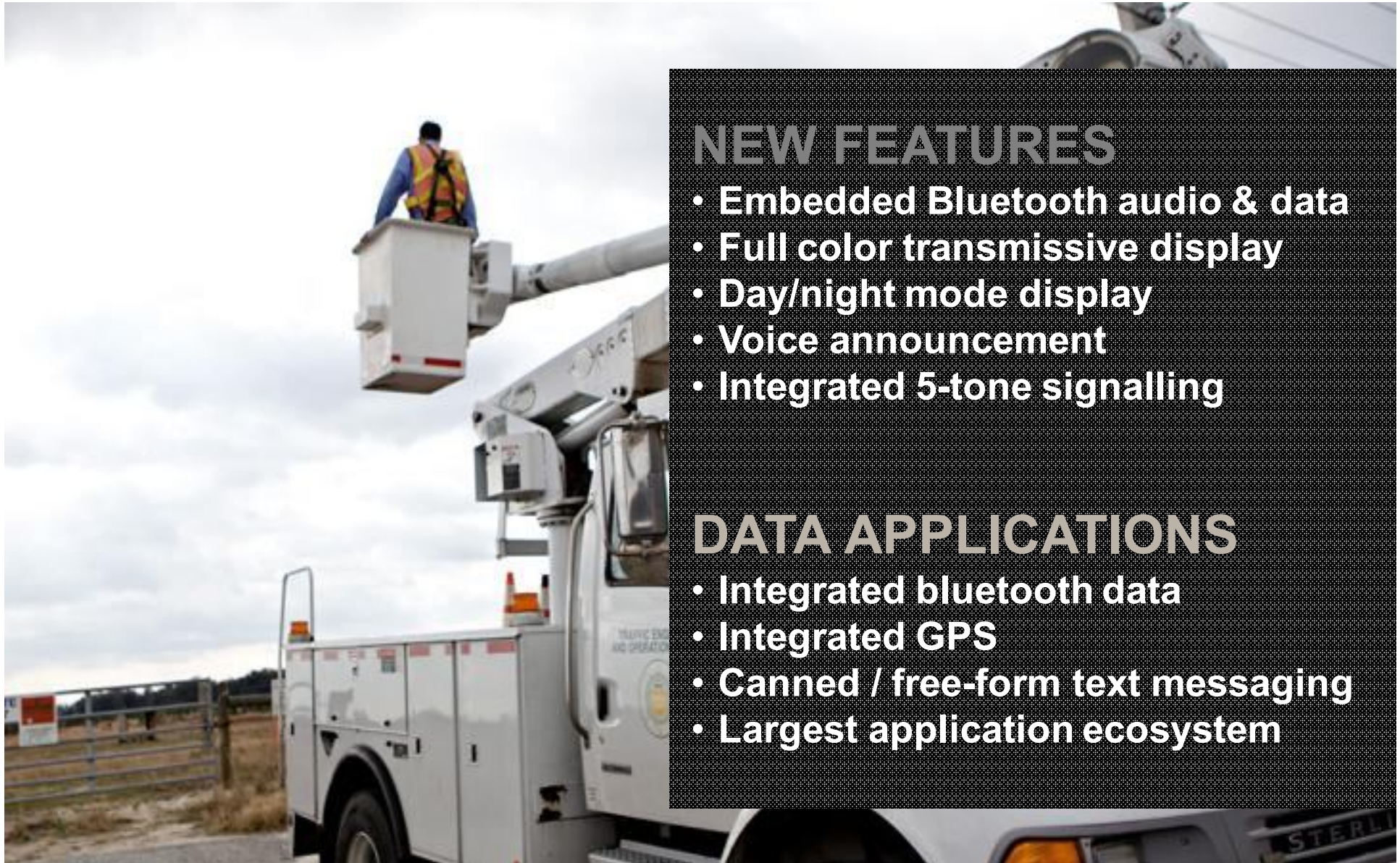
- Full-color alphanumeric display
- Monochrome numeric display
- VHF (136-174MHz)
- UHF (403-470MHz)
- Integrated GPS and Bluetooth



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DM4000 SERIES MOBILES



NEW FEATURES

- Embedded Bluetooth audio & data
- Full color transmissive display
- Day/night mode display
- Voice announcement
- Integrated 5-tone signalling

DATA APPLICATIONS

- Integrated bluetooth data
- Integrated GPS
- Canned / free-form text messaging
- Largest application ecosystem

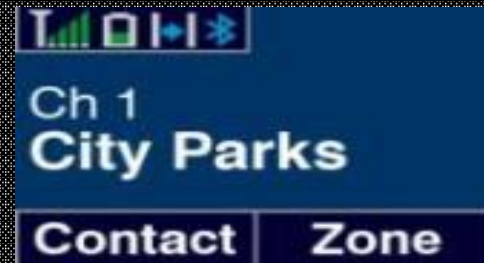
FULL-COLOUR DISPLAY



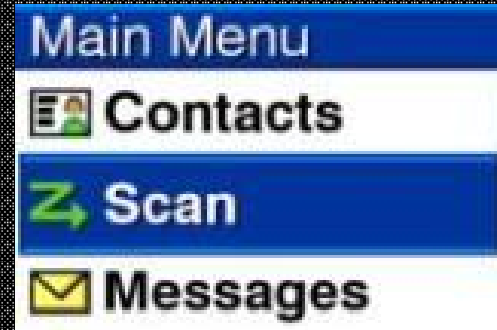
- Full color transmissive display



- Day/night mode display



- Easy menu structure



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INDUSTRY-LEADING AUDIO



INTELLIGENT AUDIO

- Automatic volume adjustment

LOUD AUDIO

- Louder than existing MOTOTRBO mobiles
- Minimizes distortion even at high volumes

IMPRES ACCESSORY AUDIO

- Optimizes audio according to accessory

BLUETOOTH AUDIO

- Portfolio of wireless earpieces available for both portable and mobile radios

VOICE ANNOUNCEMENT

- Verbal announcement of zone, channel or programmable button selected

DM4000 SERIES ACCESSORIES

AUDIO

- Same accessories as DM 3000
- Supports IMPRES audio portfolio
- NEW Keypad microphone with 4-way navigation button
- Future Bluetooth wireless portfolio (no adapter required)

CONTROL STATIONS

- Common portfolio with DM 3000 mobile radios

MOUNTING

- NEW mounting brackets

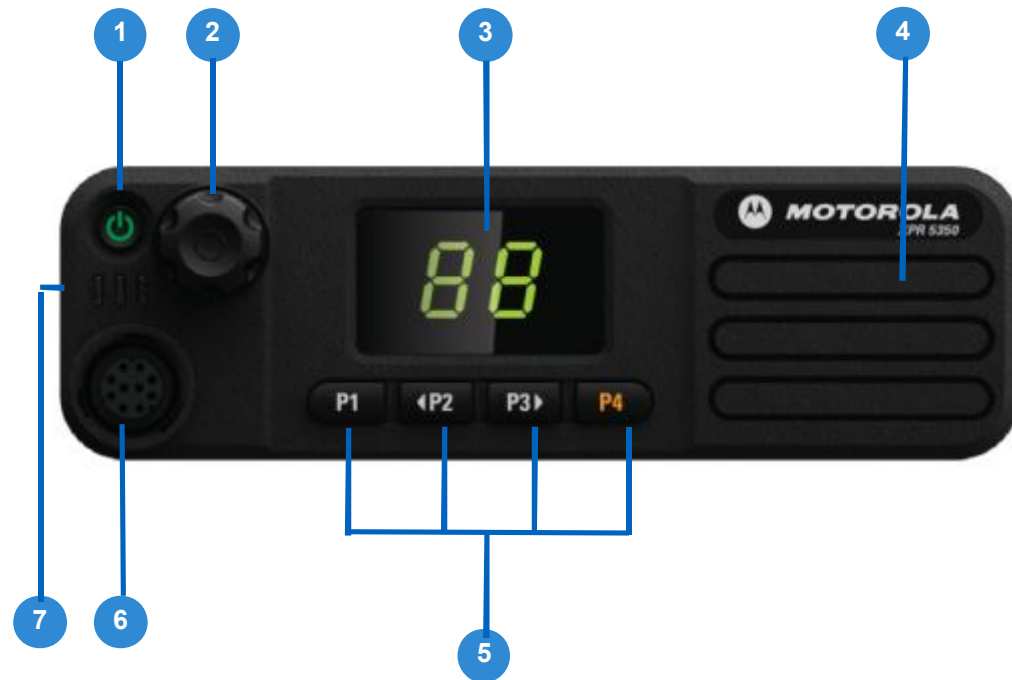
ANTENNAS

- Re-use DM 3000 portfolio



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DM4400/1 MOBILE



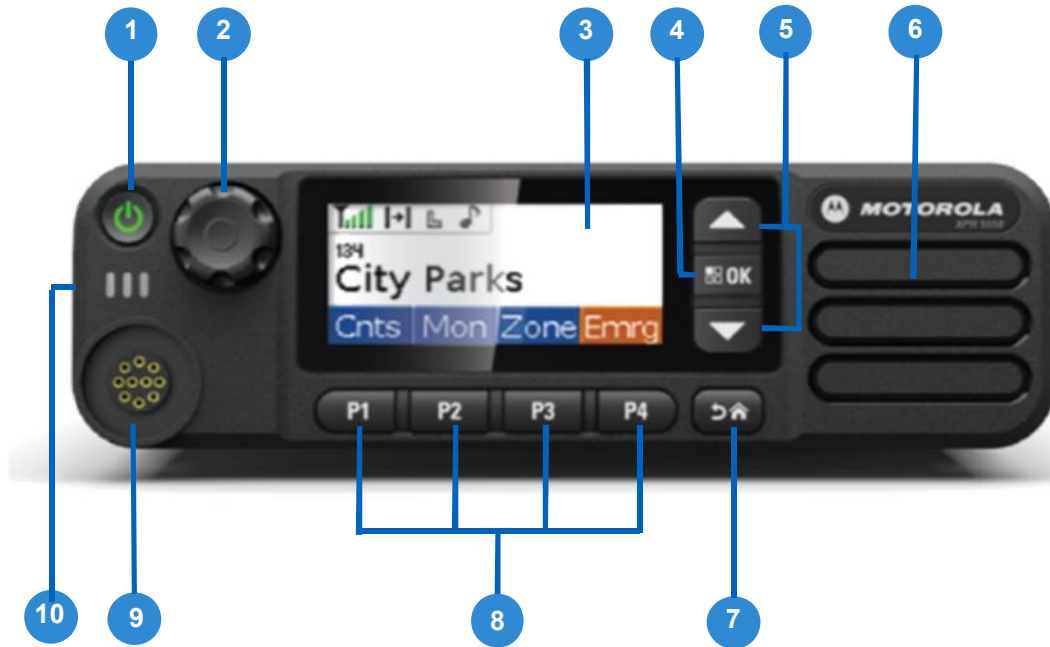
- 99 channels
- VHF (136-174MHz), UHF (403-470MHz)
- Low-power, (1-25W), high power (25-40/45W)

- 1 On/off button
- 2 Volume/channel knob
- 3 2-digit numeric display
- 4 Speaker
- 5 Front programmable buttons
- 6 Accessory connector
- 7 LED indicators



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DM4600/1 MOBILE



- 1 On/off button
- 2 Volume/channel knob
- 3 Full-colour display
- 4 Menu/OK button
- 5 Scroll up/down
- 6 Speaker
- 7 Return/home button
- 8 Front programmable buttons
- 9 Accessory connector
- 10 LED indicators

- 1,000 channels
- VHF (136-174MHz), UHF (403-470MHz)
- Low-power, (1-25W), high power (25-40/45W)



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DIGITAL MOBILE COMPARISON

	DM 3000 SERIES	DM4000 SERIES
GENERAL SPECS		
Band Availability	<i>UHF, VHF</i>	<i>UHF, VHF</i>
Bluetooth Capability	<i>No</i>	<i>Integrated Audio and Data</i>
Integrated GPS Available	<i>Yes</i>	<i>Yes</i>
Text Messaging	<i>Canned and Free Form</i>	<i>Canned and Free Form</i>
PHYSICAL FEATURES		
Models Available	<i>Alphanumeric Display Numeric Display</i>	<i>Alphanumeric Display Numeric Display</i>
Full Display	<i>2-line, black and white</i>	<i>4-line, full colour</i>
Day/Night Display Mode	<i>No</i>	<i>Yes</i>
Hardware Option Board	<i>Yes</i>	<i>Yes</i>
IP Rating	<i>IP54</i>	<i>IP54</i>
ACCESSORIES		
Accessory Connector	<i>Standard accessory connector</i>	<i>Standard accessory connector</i>
IMPRES Audio Accessories	<i>Yes</i>	<i>Yes</i>
WARRANTY		
	<i>2 years standard</i>	<i>2 years standard</i>



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FEATURE COMPARISON

	DM 3000 SERIES	DM4000 SERIES
FEATURES		
Intelligent Audio	No	Yes
Digital Telephone Interconnect	Yes	Future
Emergency Button	Yes	Yes
Transmit Interrupt	Yes	Yes
Enhanced Privacy	Yes	Yes
Voice Announcement	No	Yes (customizable)
Analog 5 Tone Signaling	Yes Option Board	Yes
SYSTEM CONFIGURATIONS		
Conventional	Yes	Yes
IP Site Connect	Yes	Yes
Capacity Plus ²	Yes	Yes
Linked Capacity Plus ²	Yes	Yes
Connect Plus	Yes ¹	Future ¹

¹ Purchasable software option

² Requires repeater software license



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BLUETOOTH

- *Bluetooth supported on DP3000 Series via adapter.*
- *DP4000 Series has Bluetooth functionality built-in.*



**Wireless
Adapter**



Wireless PTT

Wireless Earpiece



**Off-the-shelf
Bluetooth Headsets**



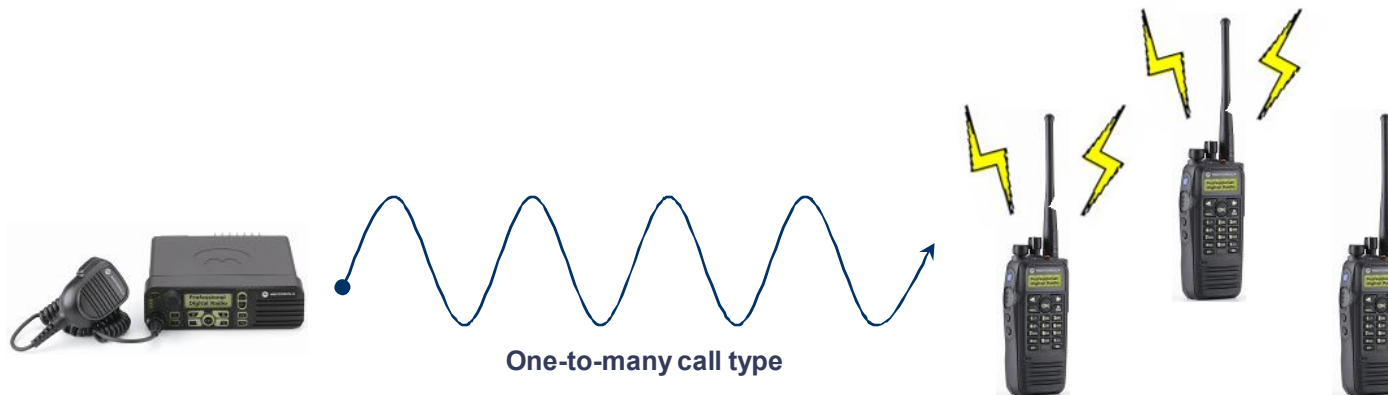
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VOICE CALL FEATURES

GROUP CALL

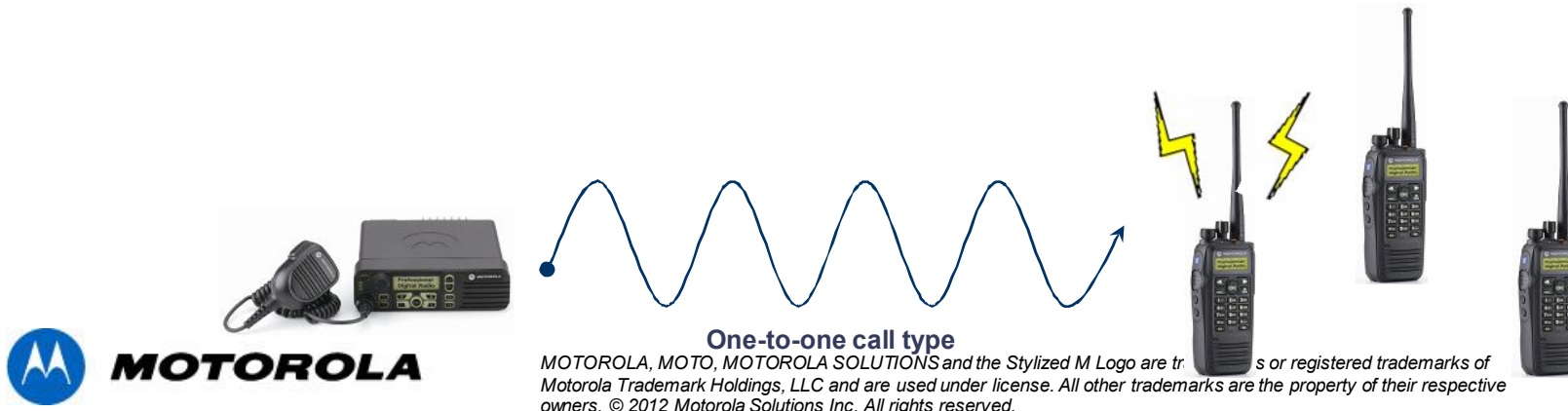
- *Digital Group Call is a way of enabling groups to share a channel without distracting and disrupting other radio users.*
- *Both transmitting and receiving radios must be on the same logical channel (frequency and timeslot) and Talkgroup.*



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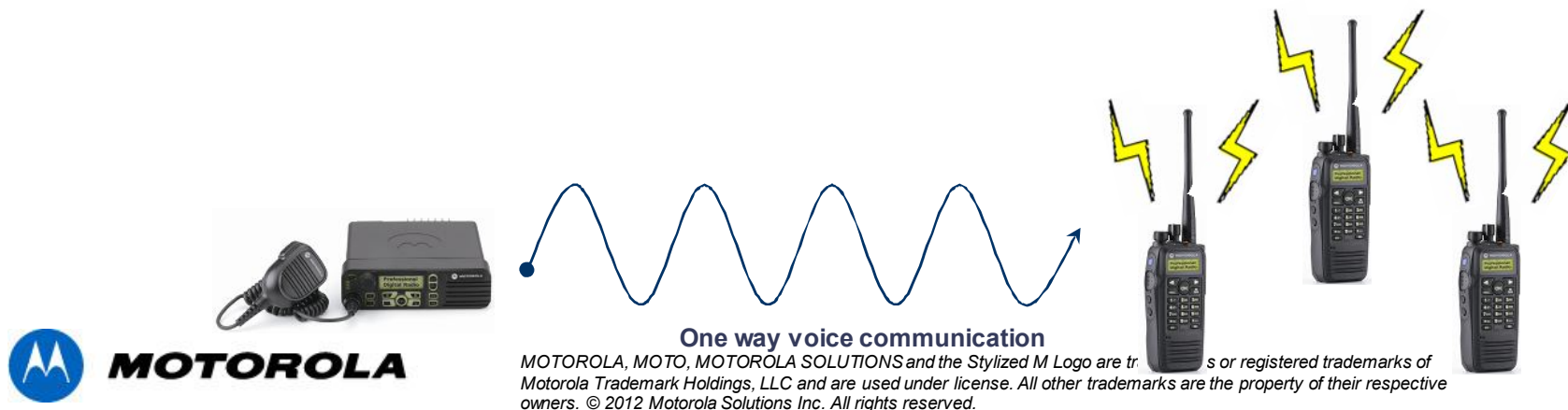
PRIVATE CALL

- *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.*
- *This feature is particularly useful when a supervisor needs to communicate to all radios within the same logical channel (frequency and timeslot) rather than individual groups or users.*
- *All Call follows the admit criteria of the selected channel.*

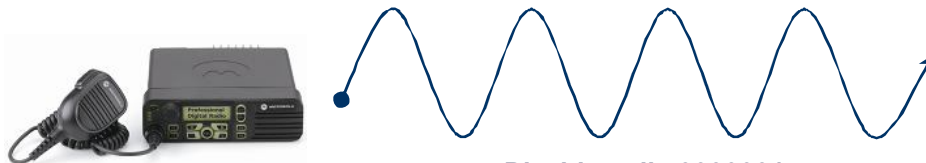


RADIO DISABLE

- *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 from another supervisor radio, on condition that the radio is within coverage of the site at which it was disabled.*
- *This feature can be used to stop any inappropriate use of radio, or to stop stolen radio from functioning.*



MOTOROLA



Disable radio 0000001

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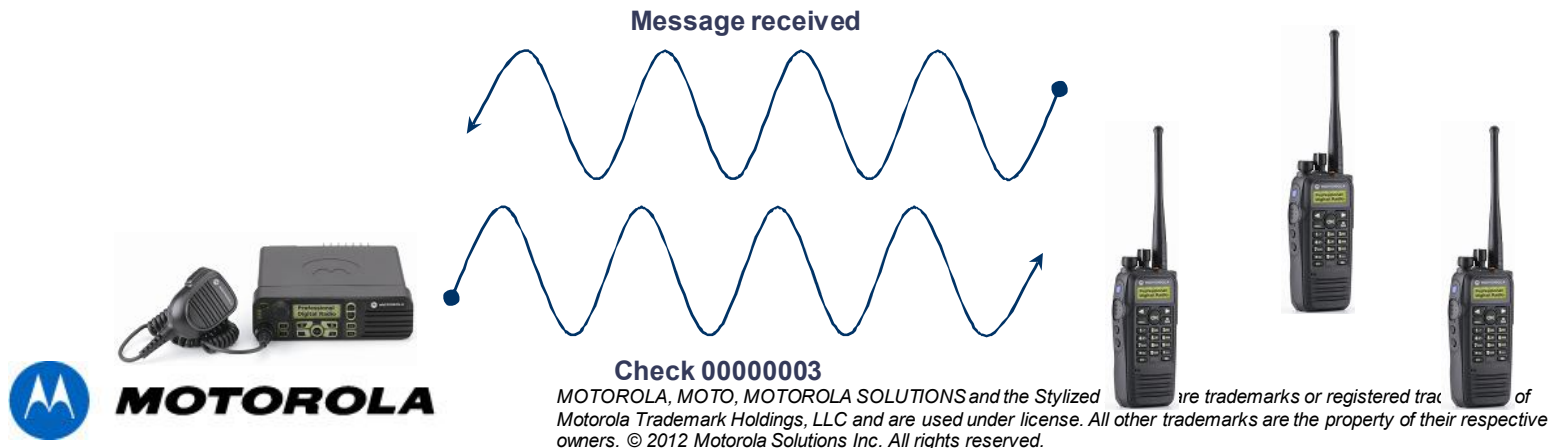
CALL ALERT

- *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.*



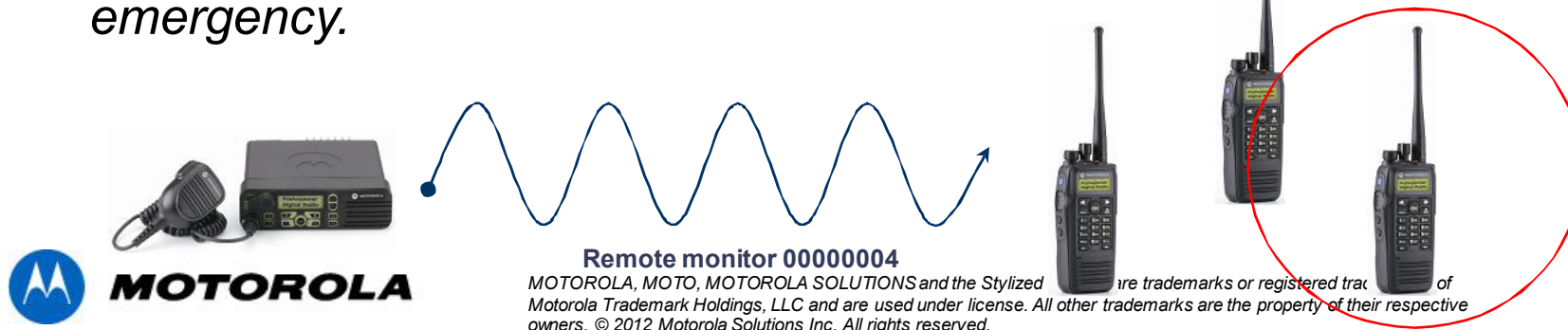
RADIO CHECK

- *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.*
- *Used in situations such as theft, incapacity of the radio user or allowing the initiator of an emergency call to communicate hands-free in an emergency.*



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.*
- *The emergency can be sent on a separate channel known as the revert channel.*
- *For IP Site Connect systems, Manual Site Roam is supported while in an emergency.*



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EMERGENCY

- *The way in which the radio acts when the emergency is pressed can be configured in the CPS.*
- *When radio enters emergency state, it will attempt to transmit emergency location response if the radio is a GPS model.*



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LONE WORKER

- *Lone Worker provides a way to monitor if a radio user has stopped activity:*
 - *If there has been no user activity for the predefined Response Time period, the radio sounds a warning tone.*
 - *If there is still no user activity for the predefined Reminder Time period after the warning tone, the radio immediately raises an Emergency.*
- *Response Time and Reminder Time are programmable via CPS.*
- *This feature is also available in Analog (MDC) mode.*
- *Useful in cases where the user is working alone, operating machinery, or carrying out a security patrol.*



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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.*



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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.*



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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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TRANSMIT INTERRUPT

- *Allows a radio to de-key an ongoing interruptible voice transmission from another radio and applies to all call types.*
 - *Emergency Voice Interrupt allows the radio to break an ongoing call to allow it's own emergency call.*
 - *Remote Voice Dekey can be sent to a radio which is blocking the channel.*
 - *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



- Emergency clear-down
- Supervisory clear-down
- Voice interrupt



ENHANCED GPS

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



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ARS INITIALIZATION DELAY

- *ARS Initialization Delay reduces Presence Notifier message collisions by producing a random wait time before the ARS notification is sent after power up.*



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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.*
- *Older hardware with 8Mb memory can be upgraded but will not support IP Repeater Programming.*



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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.*



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DIGITAL PHONE PATCH



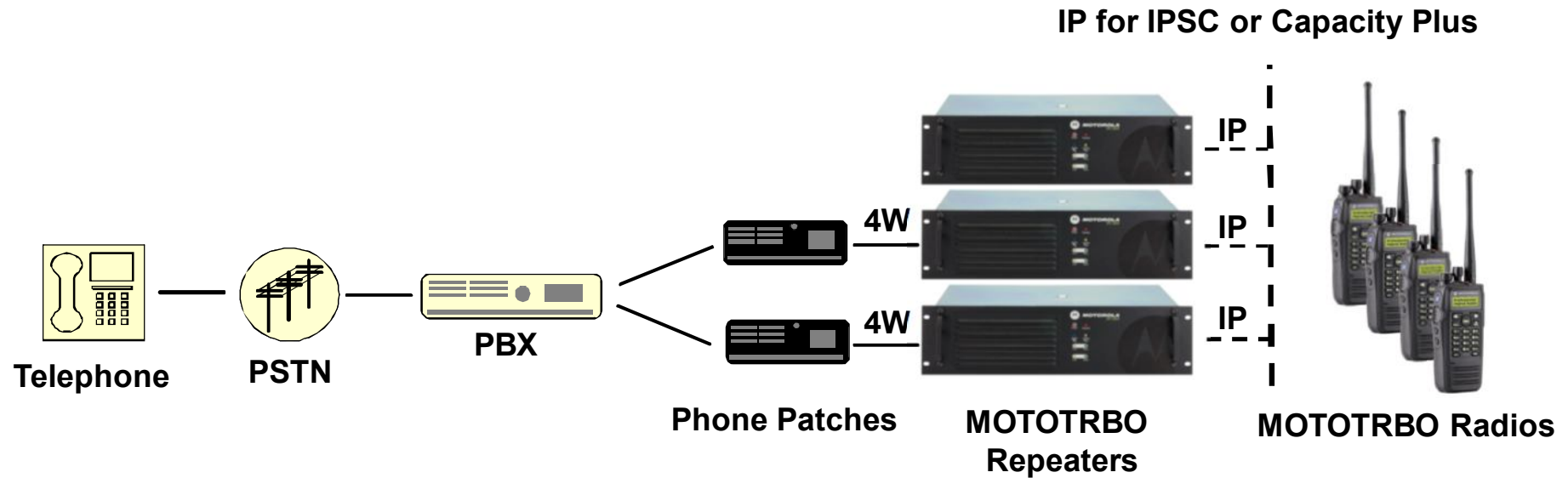
DIGITAL TELEPHONE PATCH

- *This enables MOTOTRBO digital system users to place and receive telephone calls which are routed via a gateway between a landline telephone network and MOTOTRBO radio system.*



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DIGITAL TELEPHONE PATCH



- *Utilises existing 3rd-party analogue phone patch devices*
- *Telephone-to-Talkgroup, Telephone-to-Radio and Radio-to-Telephone calls*
- *Single site repeater, IP Site Connect and Capacity Plus configurations*

DIGITAL TELEPHONE PATCH

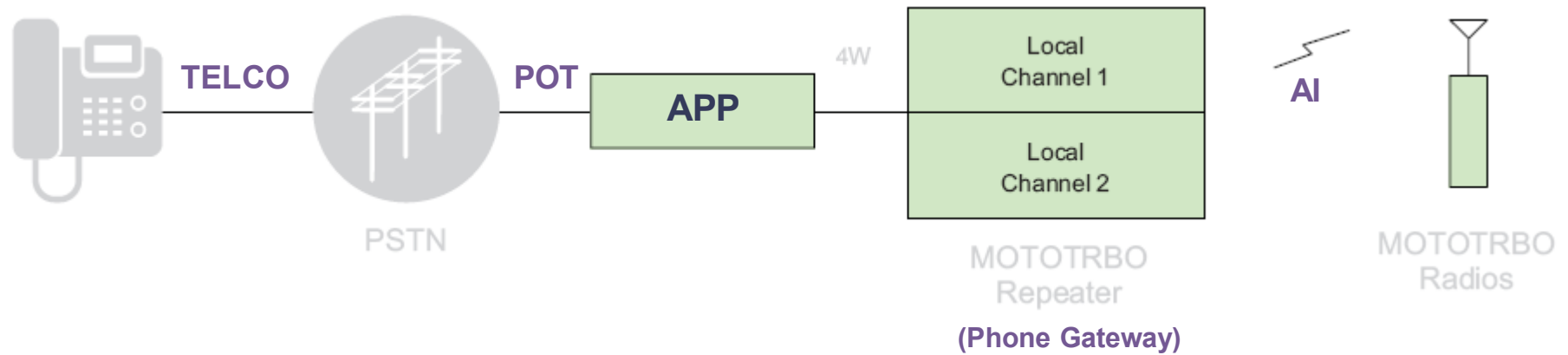
- *Telephone users can call individual MOTOTRBO radios and MOTOTRBO talkgroups.*
- *MOTOTRBO radios can call individual telephones. This feature is supported both by the DR 3000 and the MTR3000 repeater.*
- *IP Site Connect and Capacity Plus systems are supported.*



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DIGITAL TELEPHONE PATCH

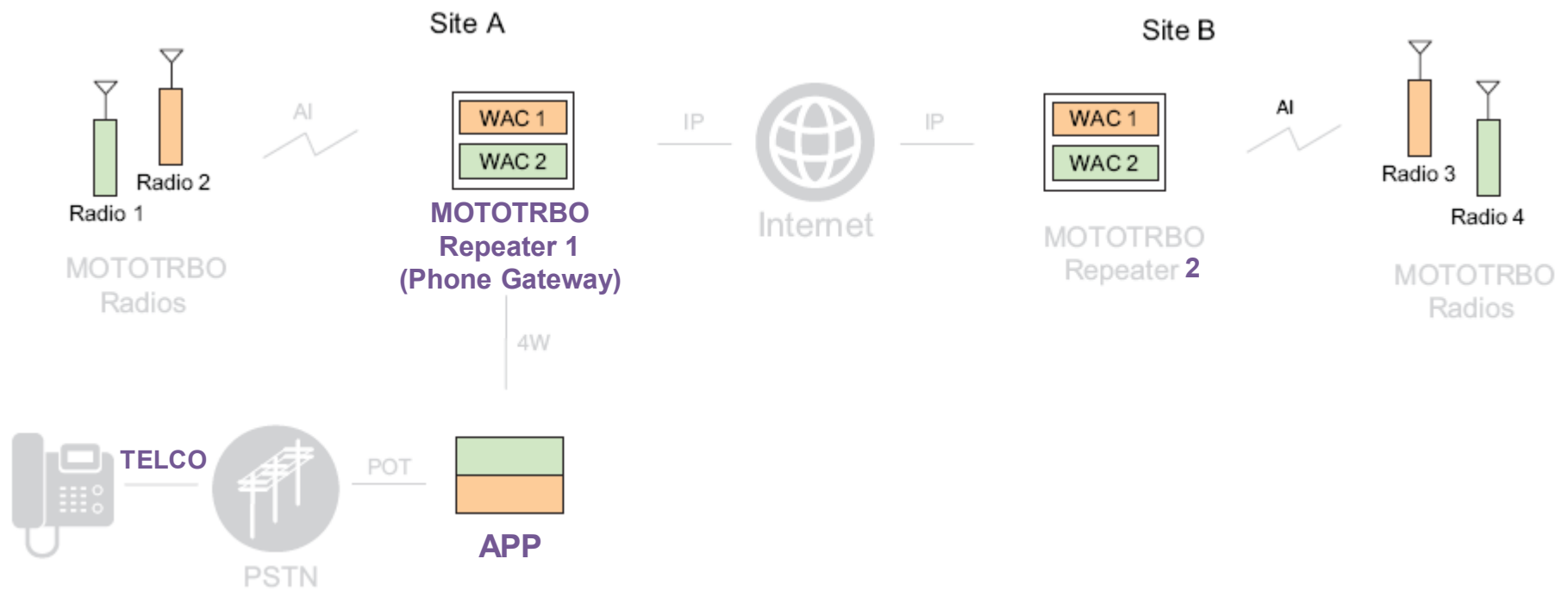
Single Repeater Example



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DIGITAL TELEPHONE PATCH

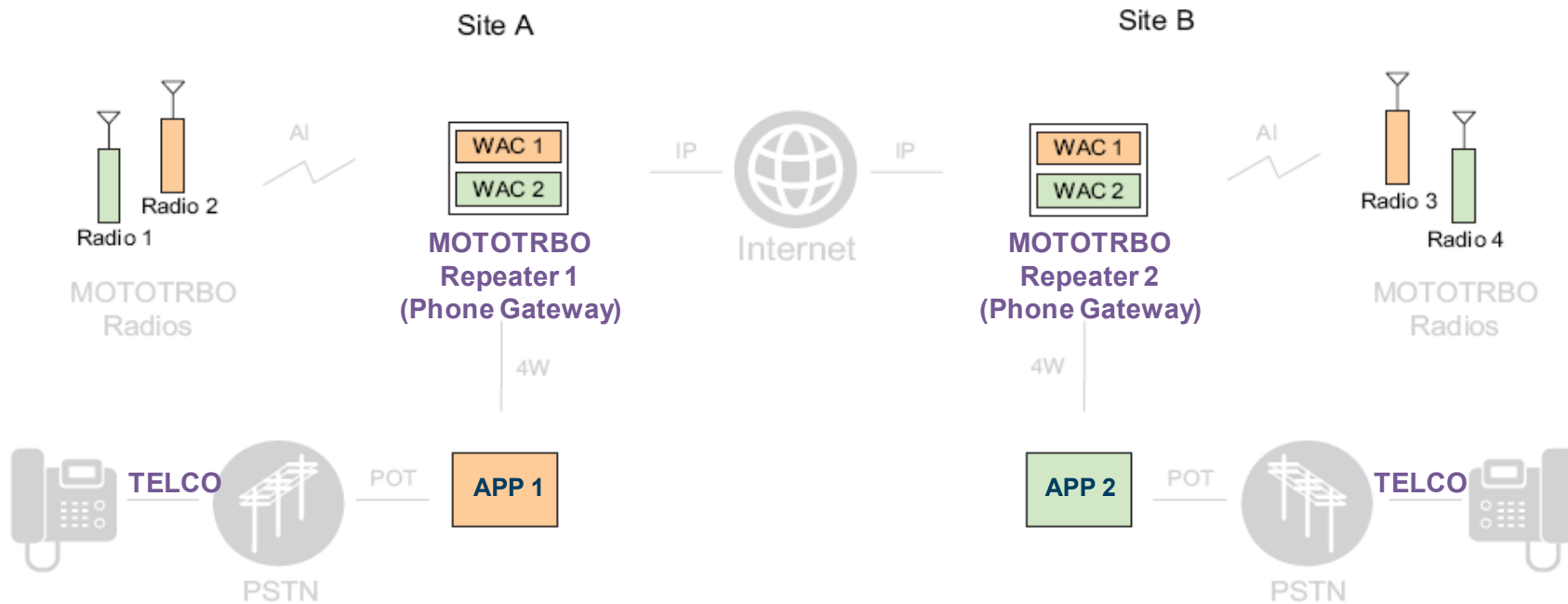
IP Site Connect Example 1



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DIGITAL TELEPHONE PATCH

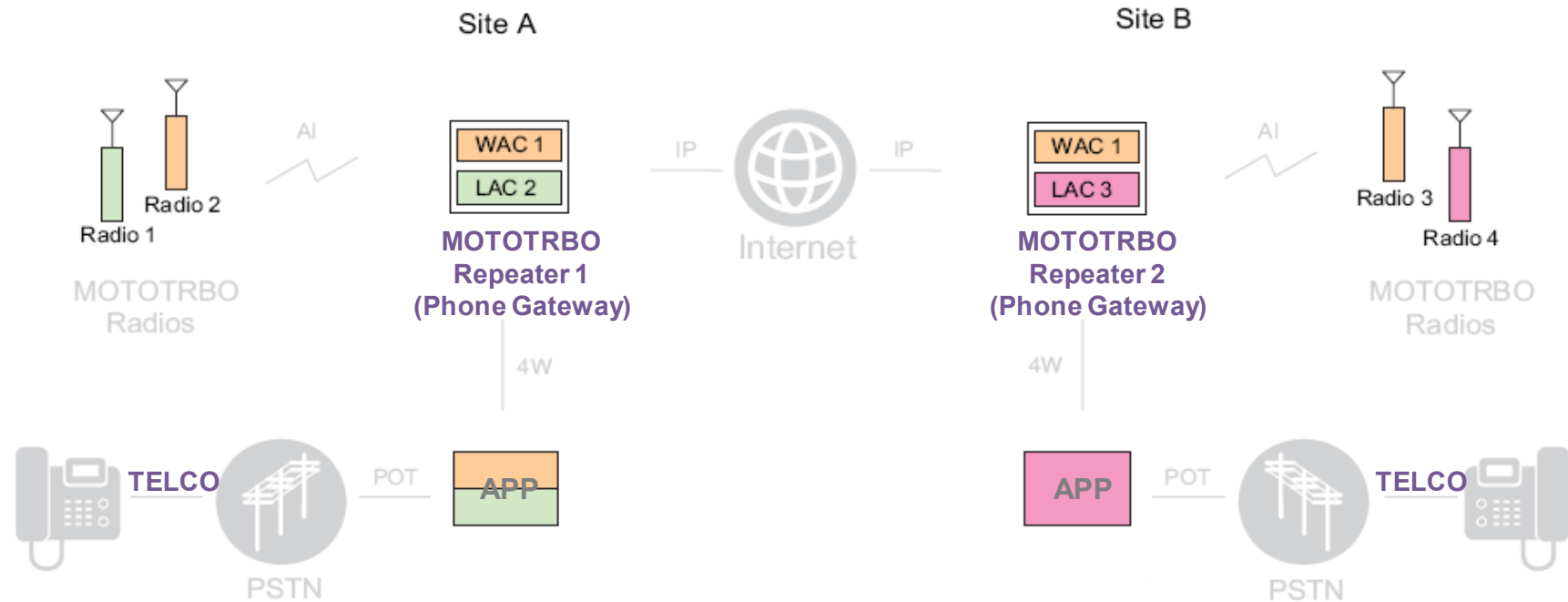
IP Site Connect Example 2



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DIGITAL TELEPHONE PATCH

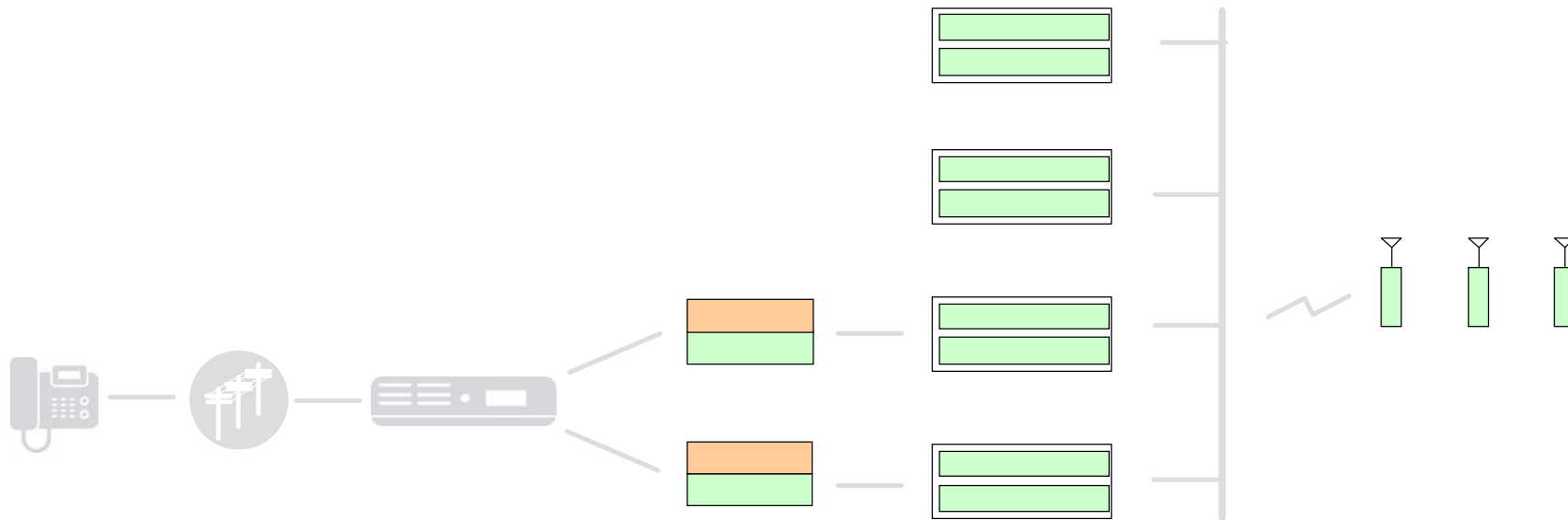
IP Site Connect Example 3



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DIGITAL TELEPHONE PATCH

Capacity Plus Example 1



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DIGITAL FEATURES

- *Phone User to Radio User Call*
- *Radio User to Phone User Call*
- *Phone User to Talkgroup Call*
- *Phone to All Call*



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DIGITAL FEATURES

- *Radio Over-Dial Capability*
- *Phone User Target Selection*
- *Radio system reservation during Phone Call*



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PHONE PATCH DEVICE FEATURES

- *Connection to PSTN or PBX*
- *Restrict Outbound Radio User Access*
- *Block/Allow Radio from Performing Call Type (International, Long Distance, Toll, Local, 911, etc...) per Access Code*
- *Inbound Restrictions (Restrict Phone User Access)*
- *Phone Usage Time Out Timer*



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UNSUPPORTED FEATURES

- *Talkgroup to Phone User Call*
- *(Phone) Caller ID displayed to Radio User*
- *Missed Phone Call Log in Radio*
- *Radio system logging of Phone Calls*
- *Custom Ringing Tones*



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UNSUPPORTED FEATURES

- *No Transmit Interrupt of a Phone Call*
- *No Enhanced or Basic Privacy Phone Calls*
- *No Priority Sampling while in a Phone Call*
- *No Concept of Emergency Phone Call, but may Emergency Revert out of a Phone Call.*



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ANALOGUE FEATURES

ANALOGUE FEATURES

- To facilitate a smooth digital migration from legacy analogue systems, MOTOTRBO also supports analog operation.
- MOTOTRBO portable and mobile radios are able to switch between analog and digital operation either via user selection (i.e. channel selector) or automatically (i.e. dual mode scan).



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ANALOGUE FEATURES

- **MOTOTRBO repeater is configured either for analog; digital or dynamic mixed mode operation.**
- **In analog mode, MOTOTRBO portable and mobile radios are able to operate in either repeater or direct / talk around mode.**
- **In analog mode, MOTOTRBO utilizes traditional FM technology (both 12.5, 20kHz and 25kHz channel bandwidth supported).**



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ANALOGUE FEATURES

- In analogue mode, MOTOTRBO supports a limited MDC signaling feature set (i.e. Emergency Signaling, PTT-ID and Call Alert).
- Additionally, a 3rd-party 5-tone option board is available for MOTOTRBO.



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DYNAMIC MIXED MODE

- **Dynamic Mixed Mode (DMM) is a repeater-only configuration**
- **Allows a mix of legacy Analog radios and Digital MOTOTRBO radios to share the same repeater.**
- **The repeater will:**
 - **Dynamically switch between analog and digital modes based on the current call received.**
 - **Transmit one analog call at a time, or 2 digital calls at a time (one on each logical channel).**



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DYNAMIC MIXED MODE

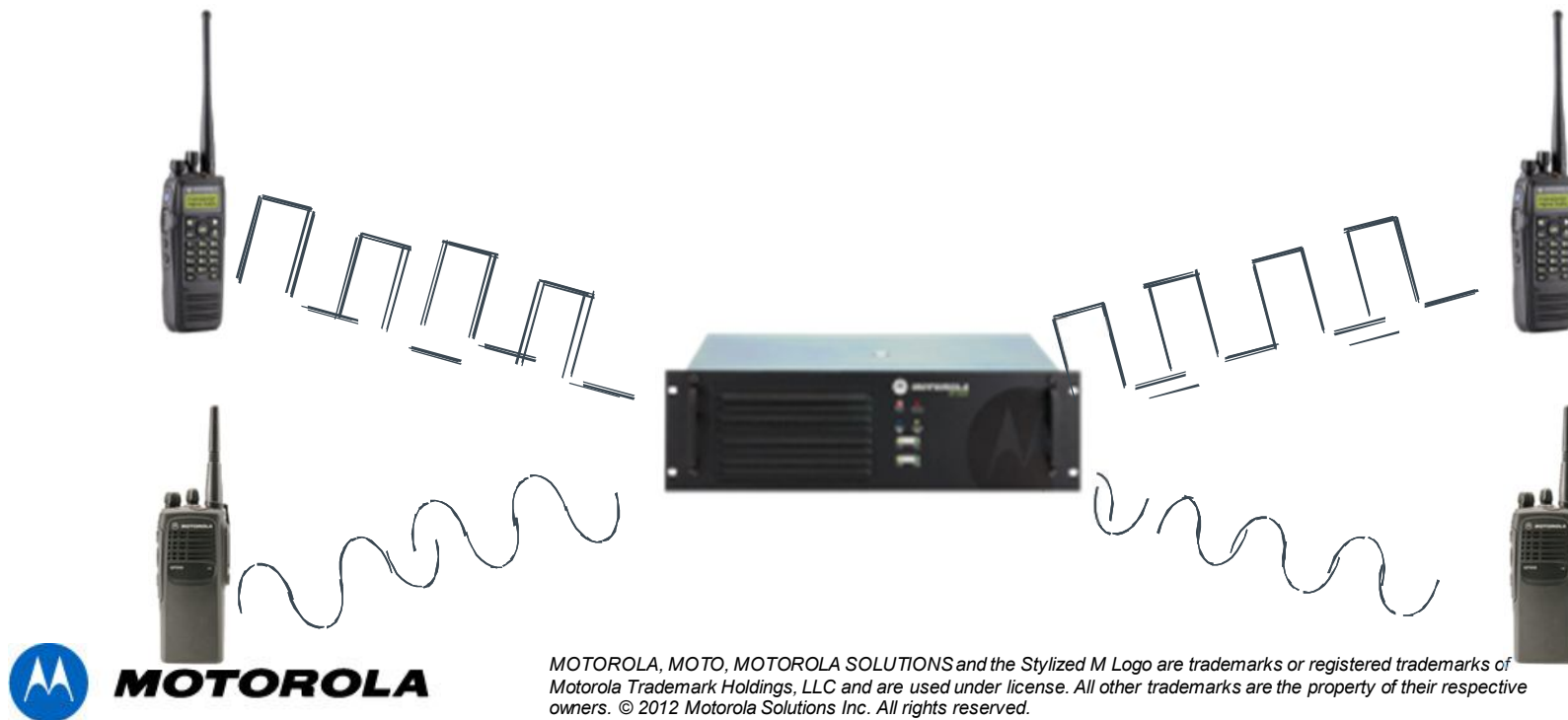
- In dynamic mixed mode the repeater will not support: IP Site Connect configurations, Capacity Plus configurations; TXI, RDAC over IP, Repeater Knockdown or Antenna relay.
- A receive PL or DPL is required on the analogue channel to allow the repeater to switch back to digital mode when a digital transmission is received.



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EASY MIGRATION

- *Mixed mode analogue/digital radios*
- *Repeater automatically switches mode*
- *Enables smooth, cost-effective migration*



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INVESTMENT PROTECTION



MOTOTRBO™
Shift into digital.

Open standard

Smooth migration

Drop-in deployment

A central image of a man in a uniform holding a radio, surrounded by three circular icons: an open door, a binary code with a sine wave, and a puzzle piece.

BETTER BASICS



MOTOTRBO™ SECURITY



Basic Privacy

- *Non-cryptographic algorithm to protect voice and data*
- *16 bit keys are used to scramble and unscramble voice and data*

Enhanced Privacy

- *Cryptographic algorithm to protect voice and data*
- *Well-known ARC4 ("Alleged RC4") algorithm*
- *40-bit keys are used to encrypt and decrypt voice and data*
- *Approximately 1 trillion key combinations*
- *A radio can store up to 16 keys*

MOTOTRBO™ ACCESSORIES



Remote Speaker Mics



Energy



Carry Cases



Earpieces



Headsets

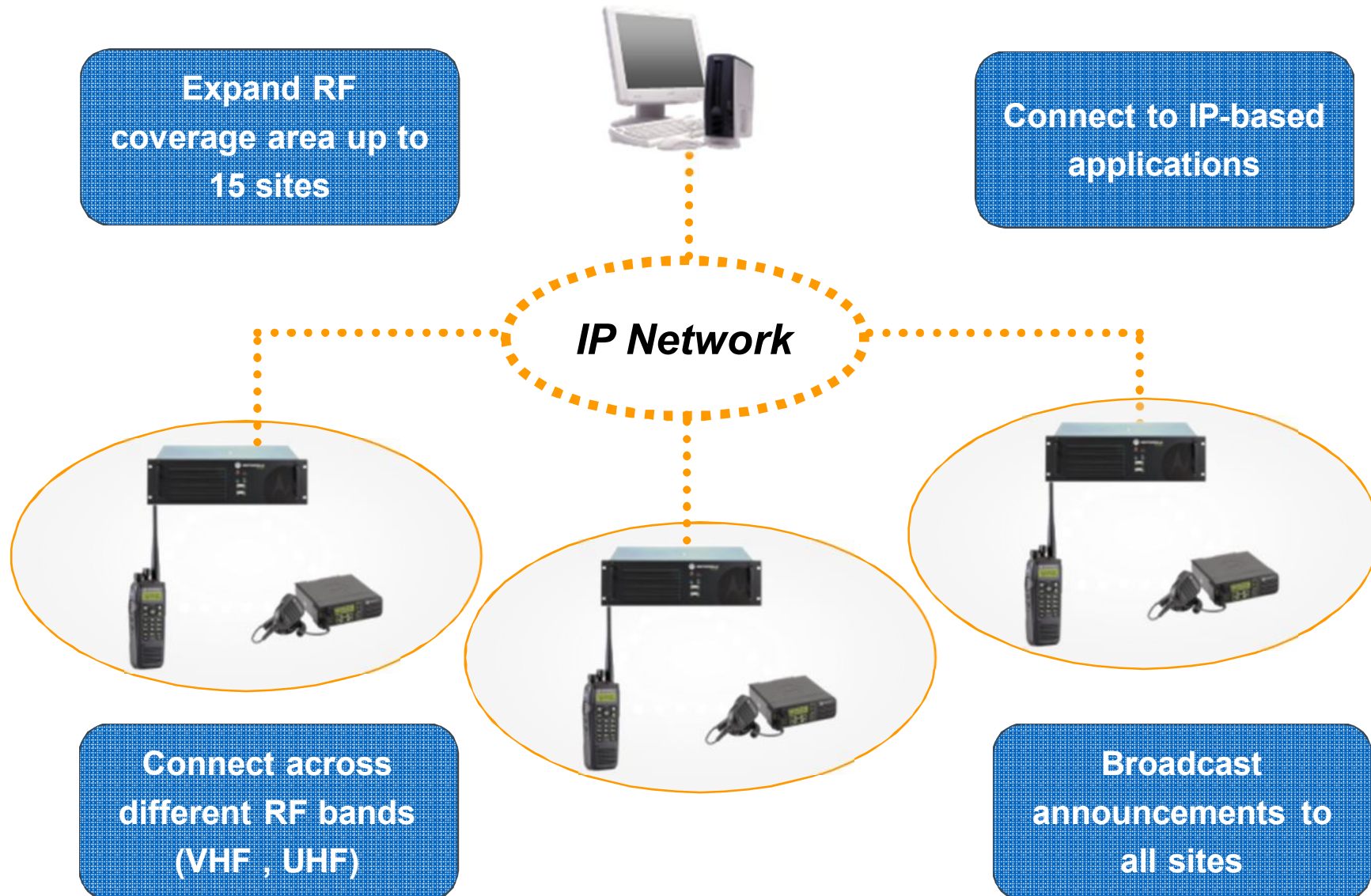
ADVANCED FUNCTIONALITY





MOTOTRBO SYSTEM CONFIGURATIONS

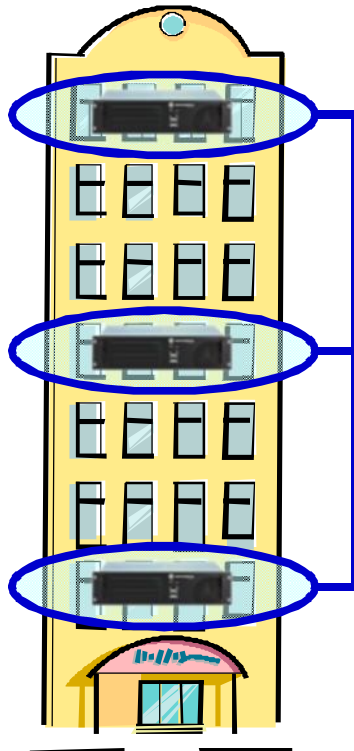
IP SITE CONNECT



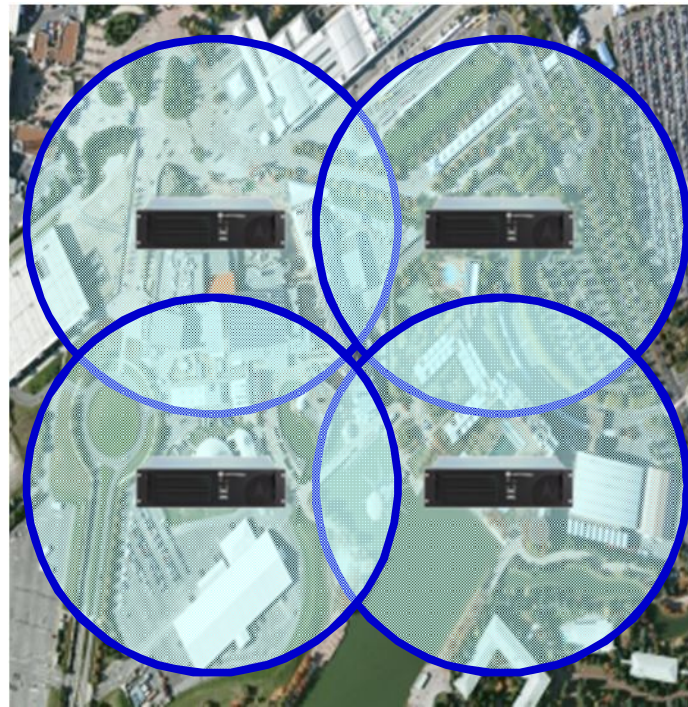
IP SITE CONNECT



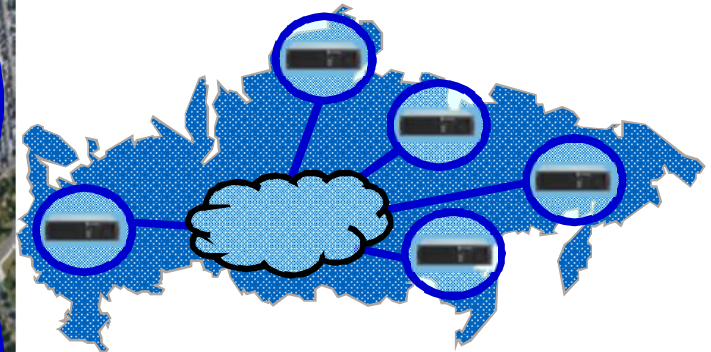
Extending **coverage** to 15 sites



Single Location



Large Campus



Dispersed Sites



What is IP site connect

The ability to connect the MOTOTRBO repeater to an IPv4 network to create a wide area system.

There are three main applications of this mode:

- *To increase the RF coverage area*
- *Enable voice and data communication between two or more MOTOTRBO single site systems in different locations*
- *Enable voice and data between two or more single sites with different bands, i.e. UHF & VHF (Cross connect)*

What it will allow you to do



Increase system coverage

Link up to 15 infrastructure devices in a single system

Receive diagnostics and alarms remotely and locally

Provides a mechanism for radios to roam from site to site seamlessly

Utilize a combination of local and wide area channels

Re-use previously purchased hardware and data applications

What it will not do



It does not increase system capacity (i.e. number of user per channel).

All connected wide area channels act as one logical channel with the same upper limits as a standard MOTOTRBO channel.

It is not a simulcast system rather it is a multicast system across different frequencies.

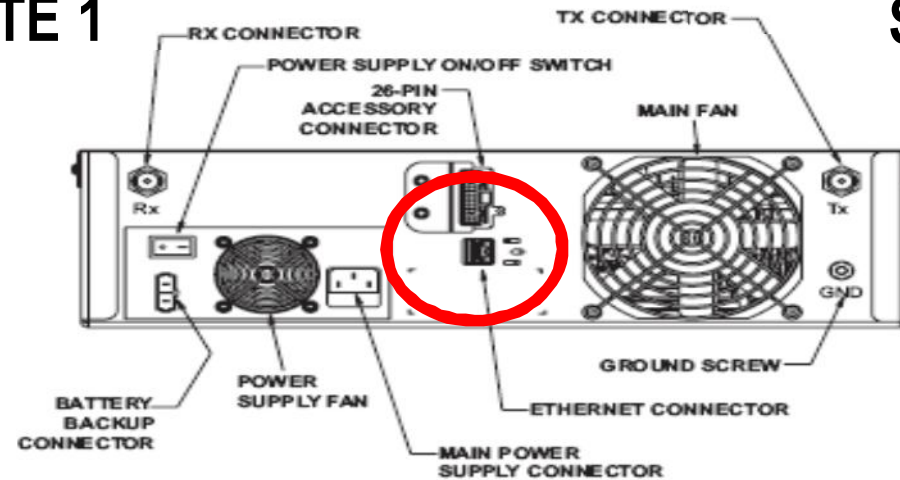
IP Site Connect is not a trunked system, it does not “pool channels” nor does it utilize a control channel.

IP Site Connect Hardware



SITE 1

SITE 2



How it works



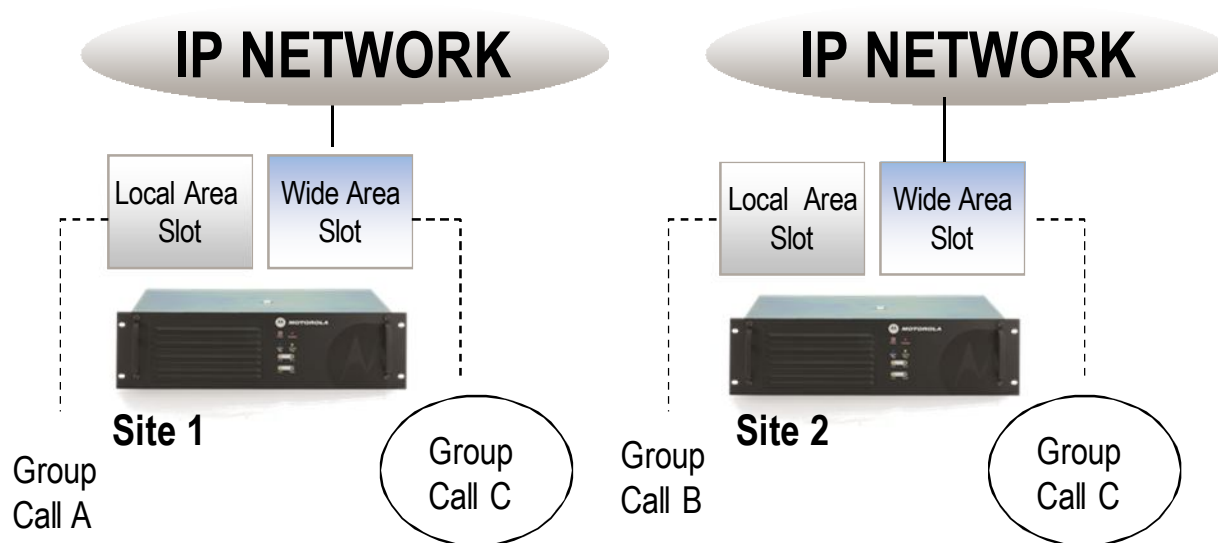
There are two types of channels in the IP Site Connect System:

- *Wide Area*
- *Local Area*

It is possible for the same repeater to have both a wide area and a local channel slot.

This allows users to communicate both “on site” or over a wide area.

Local Area Channels



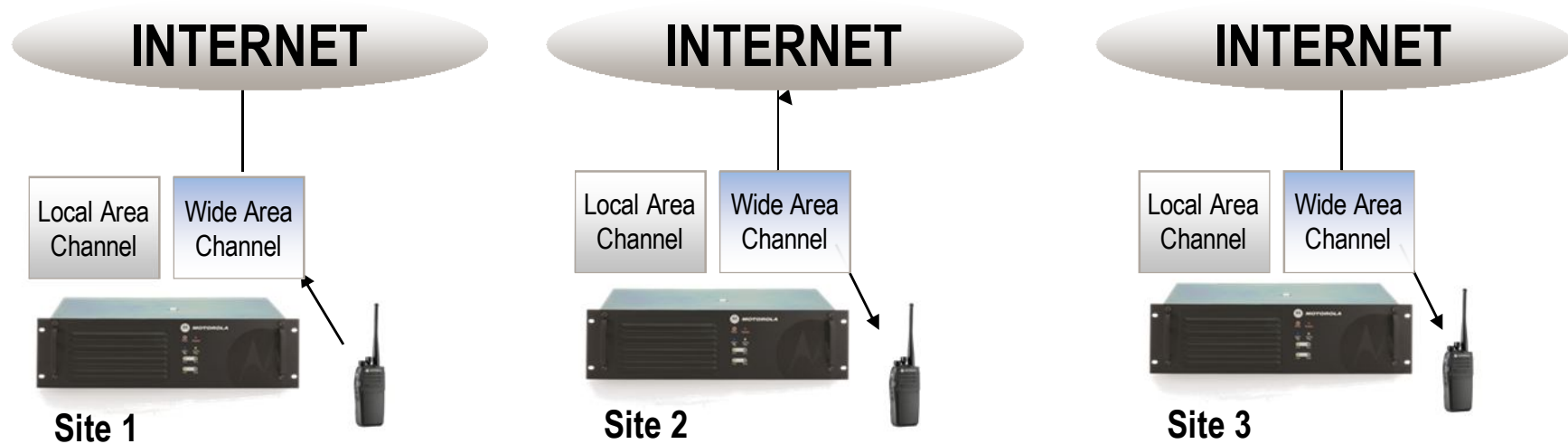
Group Call A and Group Call B function the same as MOTOTRBO does today.

Group Call C is on the wide area slot, so if anyone in Group C presses PTT all repeaters that are connected transmit the call.



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Wide Area Channel

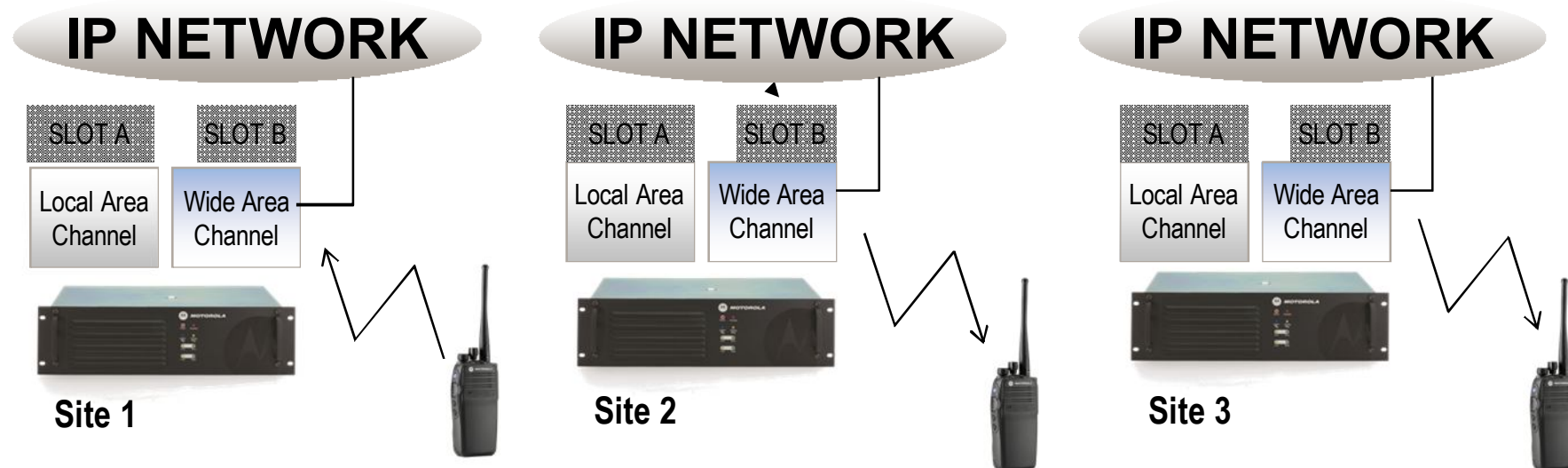


- *A Wide Area Channel is the sum of all wide area slots that are tied together in the IP Site Connect Network.*
- *When a new call starts on one of the wide area channels of a repeater, the repeater sends the call to all the other repeaters in the wide area system that are connected.*
- *This allows a radio in the coverage area of any repeater to participate in the call.*

Wide Area Channel



When a PTT is made on a wide area channel, the call is repeated across all wide area channels that are linked together – all sites transmit at the same time.

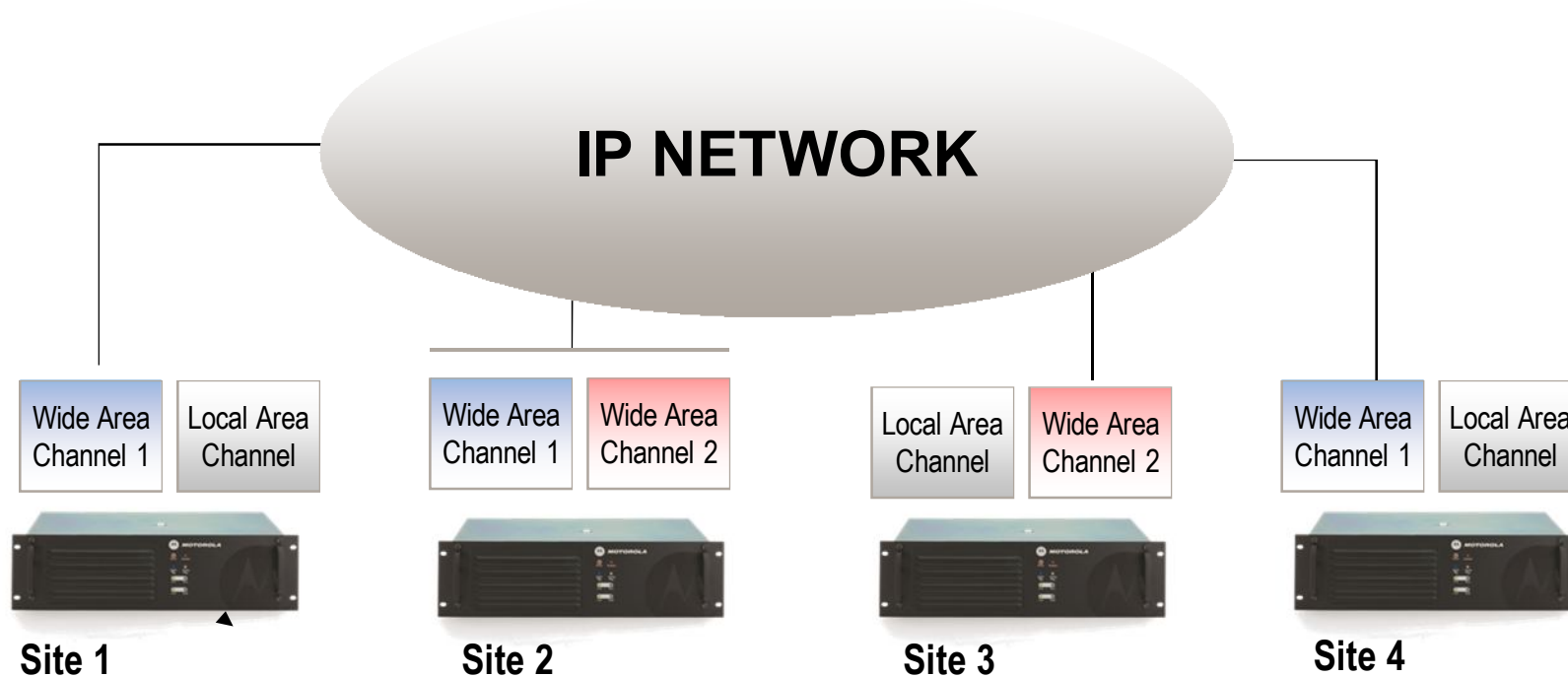


Multiple Wide Area Channels



It is possible to have up to two wide area channels in the same IP Site Connect system.

Multiple IP Site Connect systems can share the same IP Network.



Master Repeater



In all IP Site Connect systems one repeater must be configured as the Master repeater

This repeater is responsible for the following:

- *Registering new repeaters to the system*
- *Notifying all other repeaters in the network of IP address changes of IP Site Connect devices.*

All repeaters in an IP Site Connect system maintain a table of the latest IPv4 addresses of other IP Site Connect devices and use the table to send IPv4/UDP messages to other IP Site Connect devices.

Peer Repeater or Device

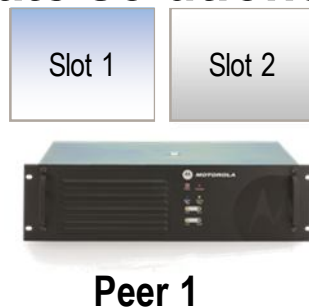


A peer is any IP Site Connect device that is connected to the network (including the Master)

An IP Site Connect system can accommodate up to 15 peers

This includes repeaters and up to 5 RDAC enabled PCs (explained in a later section)

Peer types can expand in the future as 3rd party application providers create solutions



IP Protocol



MOTOTRBO uses the UDP protocol

Allows individual packets to be dropped (not retried)

Allows packets to be received in a different order than sent

Reduces the hardware overhead (simpler networking equipment)

IP Site Connect and Firewalls



Repeater can be behind a firewall or router.

Router/firewall connected to the master will need to have a port opened to receive messages from other repeaters.

RDAC will function inside a firewall, there is no unique configuration for this application

Bandwidth Considerations

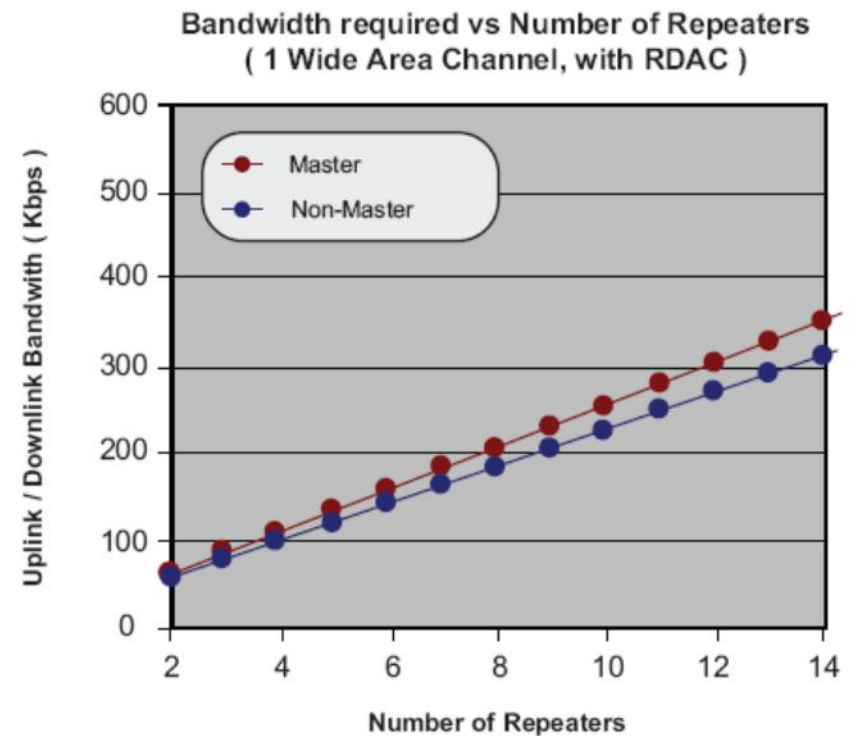
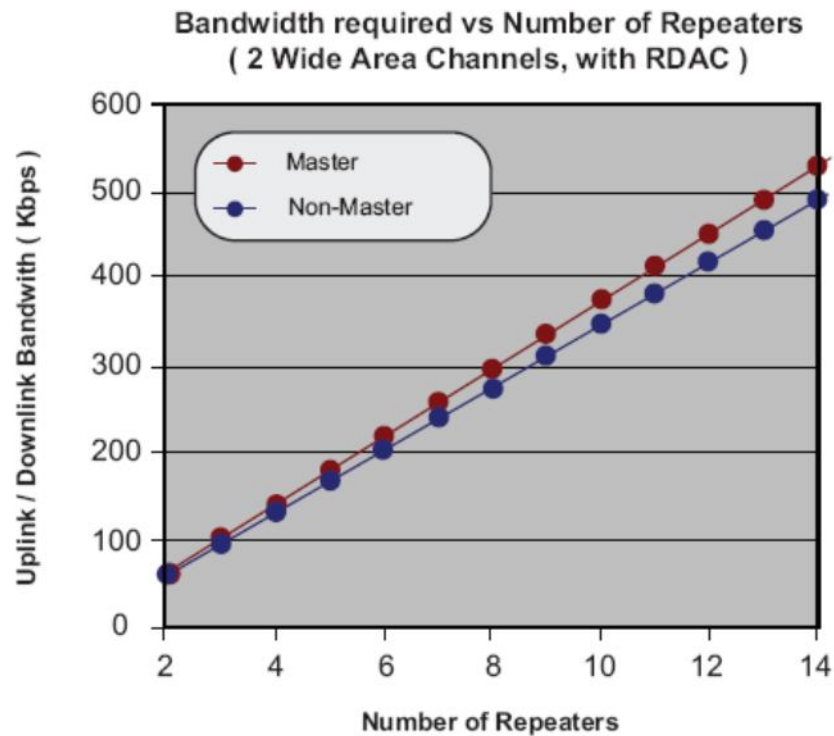


The number of IP Site Connect devices behind a single wide area connection (i.e. behind one router) affects the consumption of bandwidth.

Traffic from one repeater is sent to every repeater, therefore bandwidth is a function of how many other sites are in the system.

Adding a repeater at one site will increase the required bandwidth at all sites.

Bandwidth Considerations



Site Roaming



A radio needs to roam to ensure that the site with the strongest signal is used for communications.

It frees the user from having to physically change channels and means that the user does not have to know which site they are on to roam.

Radios are configured with a roam list (list of channels)

Each channel equals one site (one repeater) of a wide area system

Two types of Site Roam include Passive and Active

The radio can not roam while in a call

Repeater Beacons



Passive Site Search works well if the repeater is transmitting, but what if it isn't?

If there is no activity, a repeater can be configured to transmit a beacon (a periodic short transmission when there is no traffic)

This allows the subscriber to sample the signal strength of the channel

Manual Site Roam



The radio also has the ability to manually search for a new site

Manual Site Roam is engaged when Passive Roaming cannot find a site or by manually activating it from the radio

Manually searching for a site, engages the *active site search* function of the radio

Active Site Search sends a wake up message to every repeater in its roam list (sequentially) until it finds a site



CAPACITY PLUS



CAPACITY PLUS



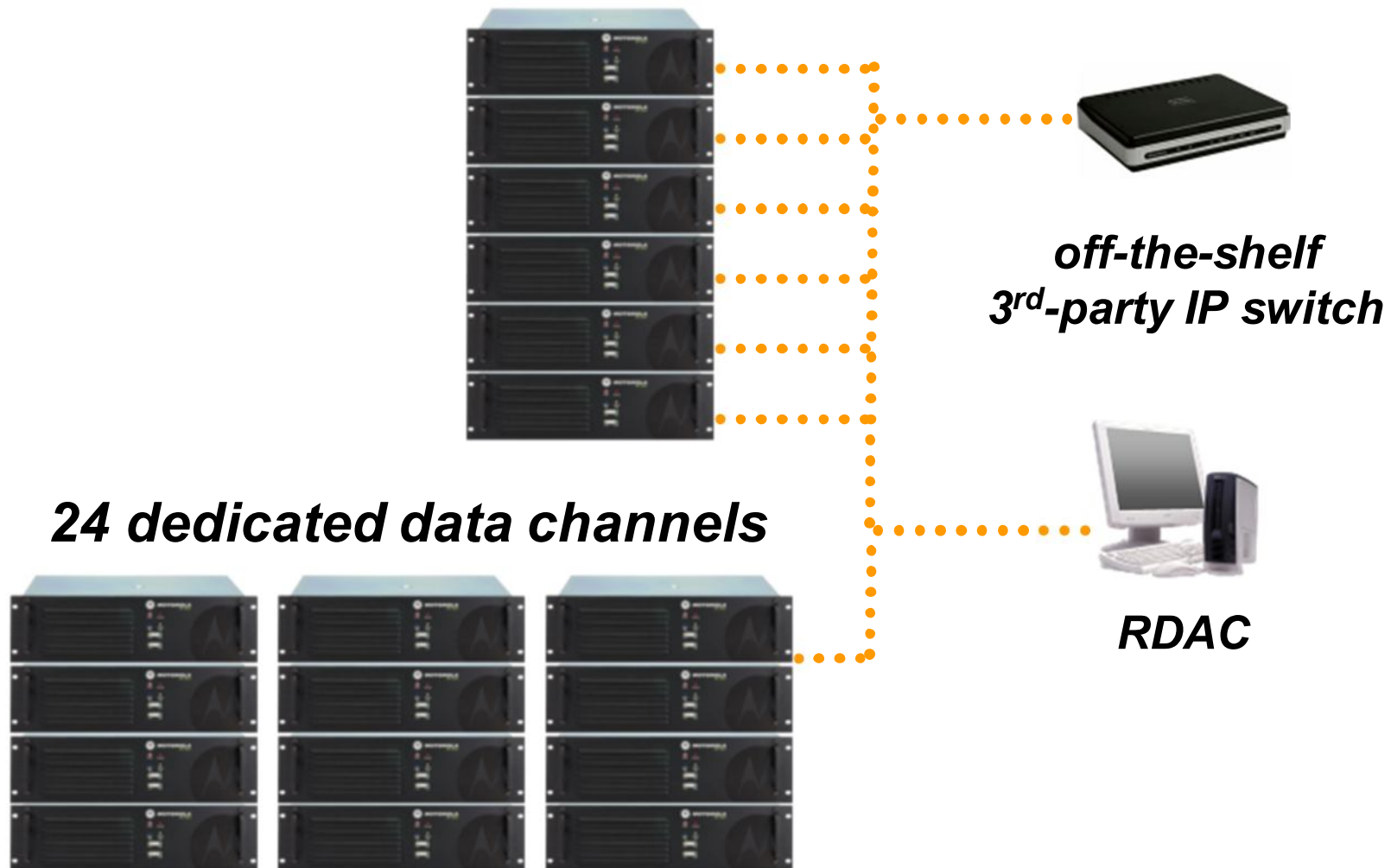
Expanding **capacity** to 1,200 users on a single site

- *Single-site trunking solution*
- *Digital voice & data communications*
 - *Up to 12 voice/data channels*
 - *Plus up to 24 dedicated data channels*
- *Software upgrade to existing hardware*
 - *Online software licence process*

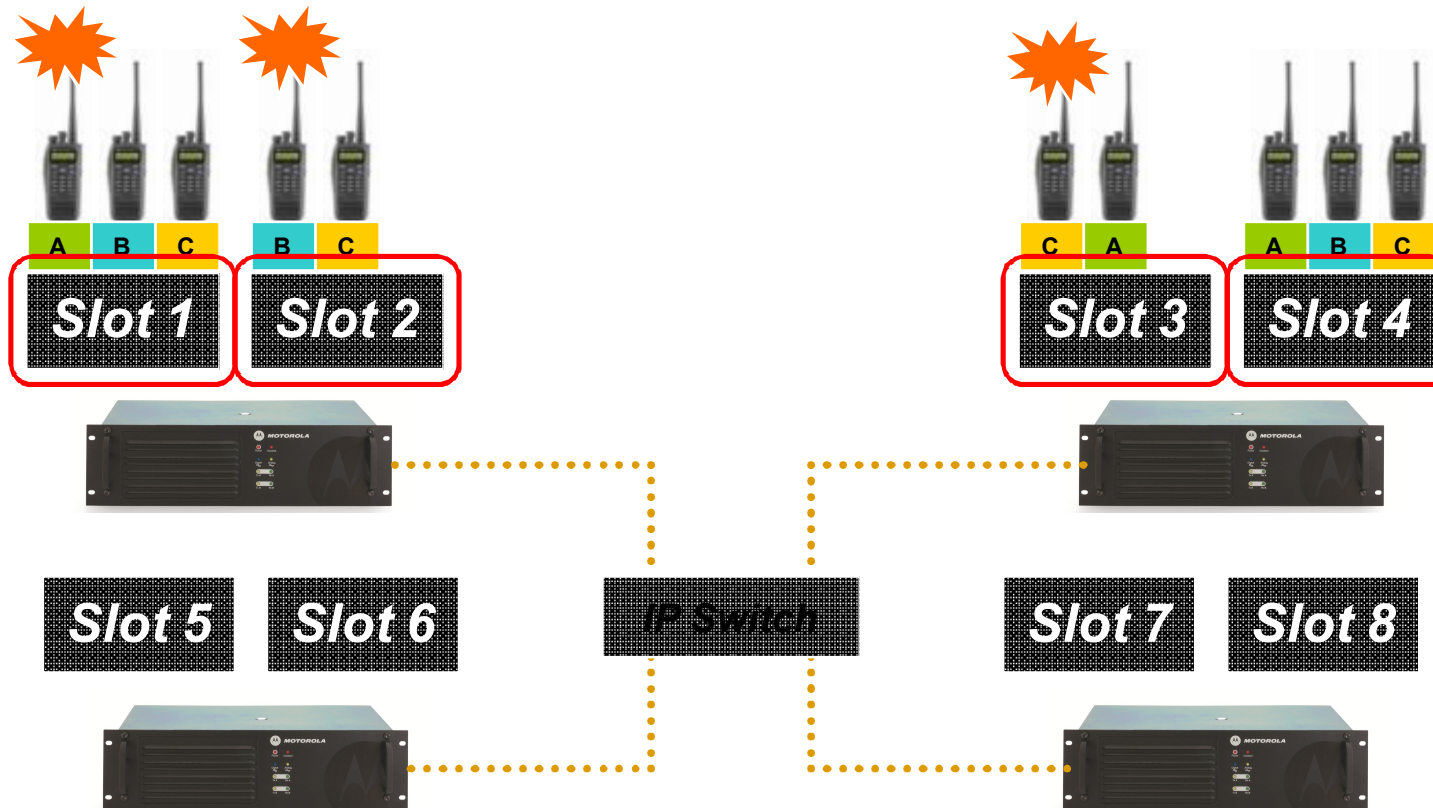
CAPACITY PLUS



12 dynamic voice/data channels



CAPACITY PLUS



- *Quick call set-up – intelligence in repeater*
- *Optimal channel efficiency – no dedicated control channel*

CAPACITY PLUS

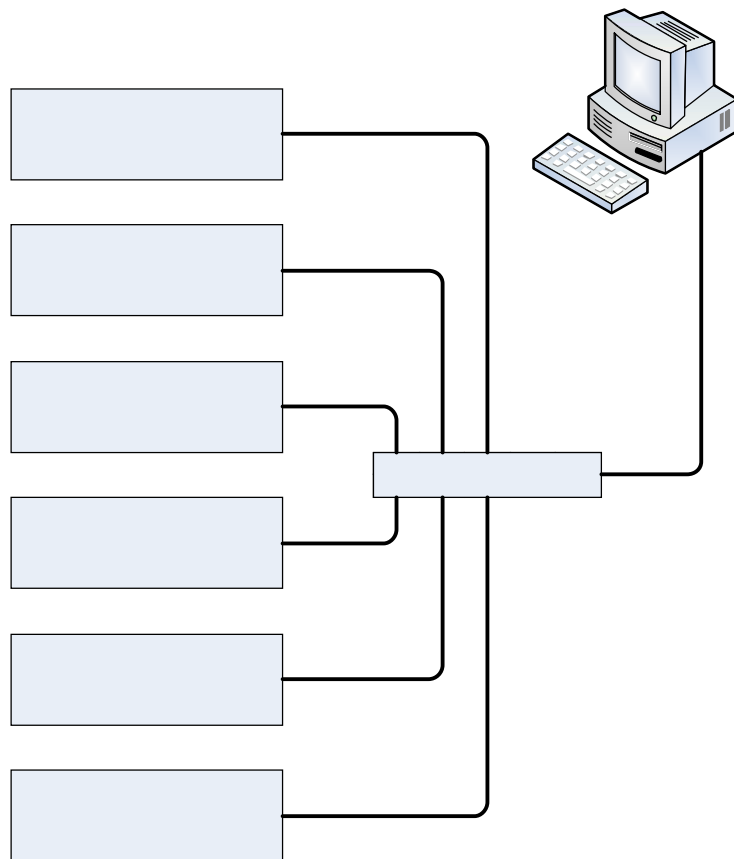
- *Increase system capacity to ~1200 users*
- *Up to 6 dynamic voice/data channels*
- *1 to 6 repeaters = 1 to 6 RF channels = 2 to 12 virtual channels*
- *Plus dedicated data channels (up to 12 repeaters)*
- *Single-site multiple channel management*
- *Quick call set-up*
- *Optimal channel utilisation*
- *Distributed as pay-for repeater software upgrade*



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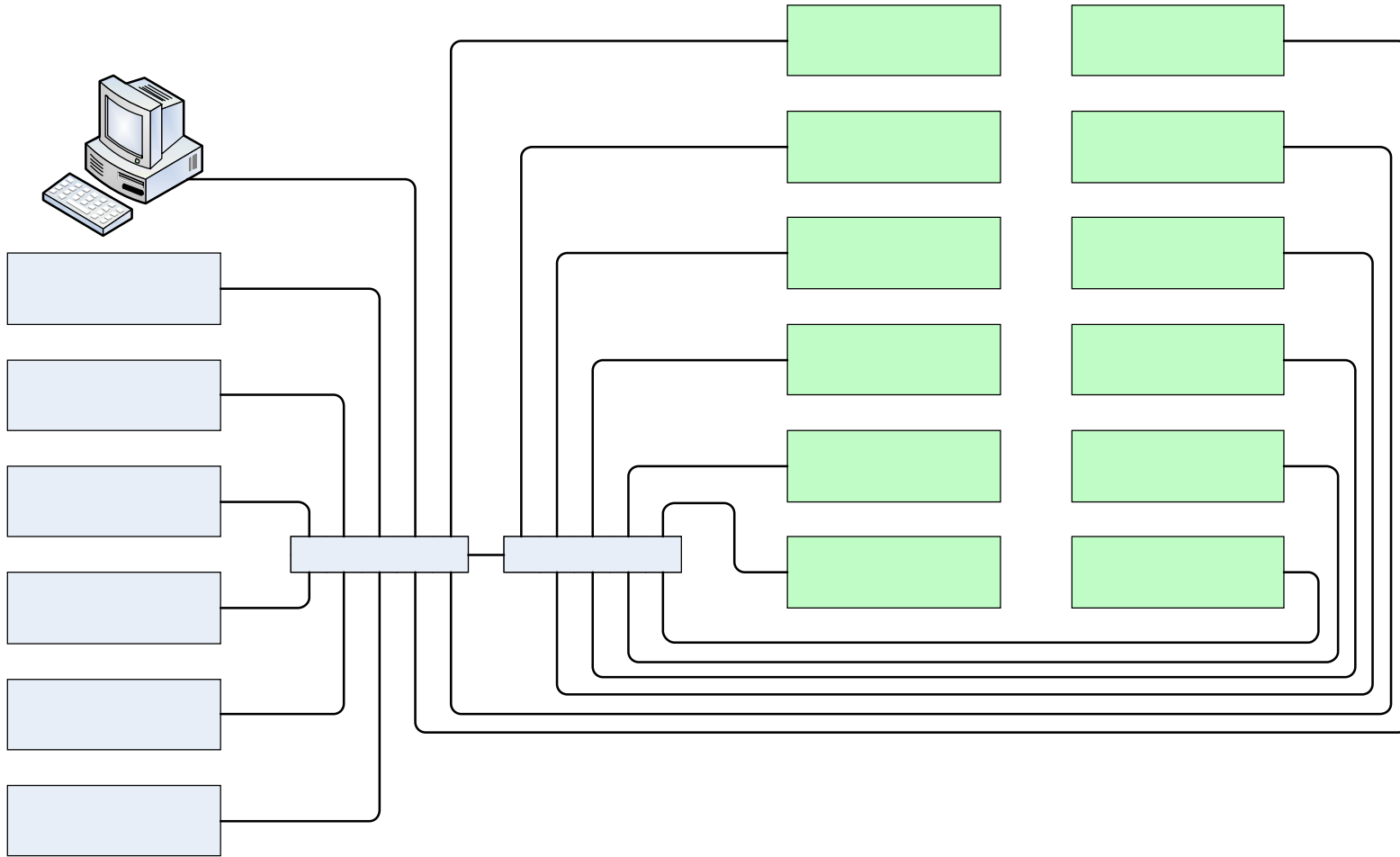
CAPACITY PLUS



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CAPACITY PLUS

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CAPACITY PLUS OPERATION

- *All new voice calls always start on the Rest Channel*
- *When a call starts, the rest channel:*
 - *Selects an idle channel to be the new Rest Channel*
 - *Informs all idle subscribers to move to it*
 - *Converts itself to a traffic channel*
 - *Begins repeating audio to radios*
- *When a call ends on the channel:*
 - *The repeater informs the radios of the new rest channel or channels of interest*
 - *The radios then move to those new channels*



DATA REVERT CHANNELS

- *Offload data onto non-voice channels*
 - *Up to 16 data channels*
- *Subscribers will search for Data Revert channels*
 - *Search list programmed into each radio*
 - *Radios will search through channels to find a free channel*
- *Greatly increases channel efficiency*
 - *Voice calls do not disrupt data*
 - *More data can be offloaded on system*
 - *Example: Faster GPS update periods*



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CAPACITY PLUS CALL TYPES

- *Capacity Plus supports all features available in IPSC and single site conventional – private call; group call etc.*
- *Radio ID is limited to a maximum of 65535 and group ID is limited to a maximum of 254.*



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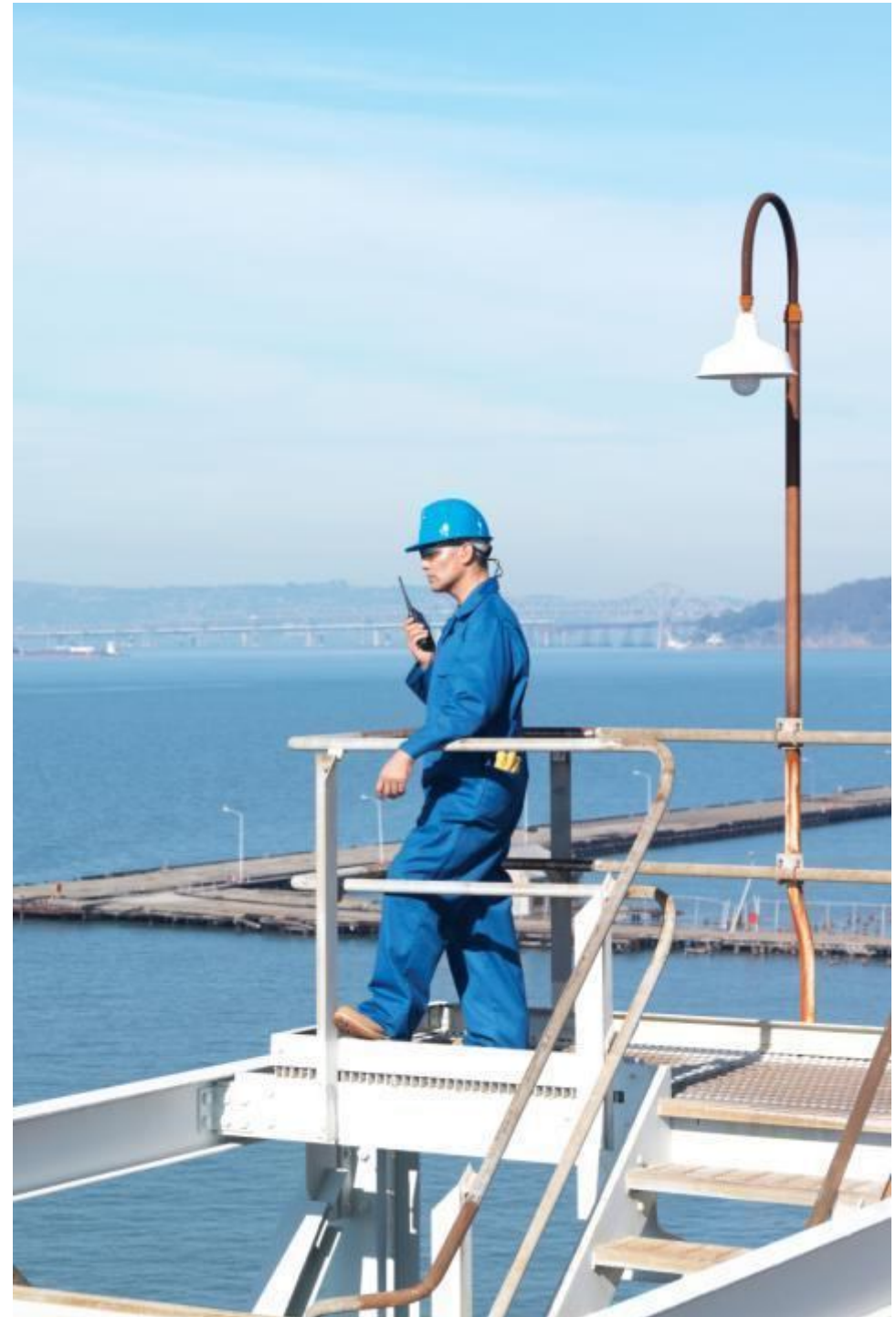
NEW CONCEPTS

Name	Description
<i>Rest Channel</i>	<i>The idle voice channel that hosts all radios that are not participating in a call.</i>
<i>Beacon</i>	<i>Periodic short transmissions indicating the Rest Channel.</i>
<i>Voice Channels</i>	<i>Channels for voice and data calls.</i>
<i>Data Channels</i>	<i>Channels for data calls, except radio-to-radio text messaging.</i>
<i>Voice List</i>	<i>List of all available Capacity Plus Voice Channels to be used by the Capacity Plus system.</i>
<i>Data List</i>	<i>A list of all available Capacity Plus Data Channels to be used by the Capacity Plus system.</i>
<i>Back-end Network</i>	<i>The connection for Repeaters in the system to communicate with each other.</i>



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MOTOTRBO LINKED CAPACITY PLUS



LINKED CAPACITY PLUS OVERVIEW



- **Combines the benefits of Capacity Plus channel management with IP Site Connect connectivity**
- **Trunked multi-site, multi-channel configuration**
 - *Adds CAPACITY to existing IP Site Connect systems*
 - *Adds COVERAGE to existing Capacity Plus systems*
- **Repeaters and sites connected via an IPv4 based network in the same way as IP Site Connect**
- **Requires only radio & repeater software upgrade**
 - *No central controller needed – uses distributed logic*
 - *Uses all channels for voice/data traffic – no control channel required*
- **Compatible with all MOTOTRBO radios**

LINKED CAPACITY PLUS OVERVIEW

CONNECT MORE PEOPLE, IN MORE LOCATIONS, FOR LESS

- **Multi-site Trunking Solution**
 - *Scalable, easy to use system*
- **Wide Area Coverage**
 - *Links adjoining single sites across an IP network*
- **High Capacity**
 - *Digital communication using up to 12 voice paths per site across 5 sites*
- **Cost Effective**
 - *Does not require additional hardware*

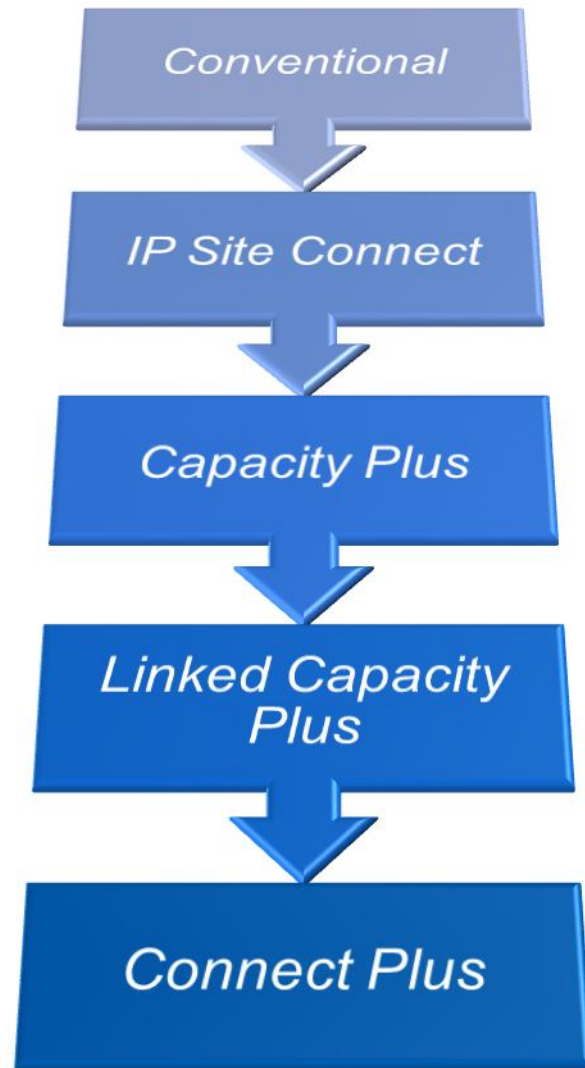


LINKED CAPACITY PLUS OVERVIEW

- **Supports up to 5 sites**
 - *Up to 6 trunked (voice and data) & 3 data revert repeaters per site*
 - *Not necessary to have same number of repeaters on each site*
- **Individual calls**
 - *Only two sites active*
- **Up to 254 local & wide-area talkgroups**
 - *Local talkgroup calls set up on local site only*
 - *Wide Area Talkgroup ID is associated with a set of sites*
- **Two types of data revert channels**
 - *Enhanced GPS*
 - *Normal Data Revert*



LCP POSITIONING



One channel to one or more groups of user.

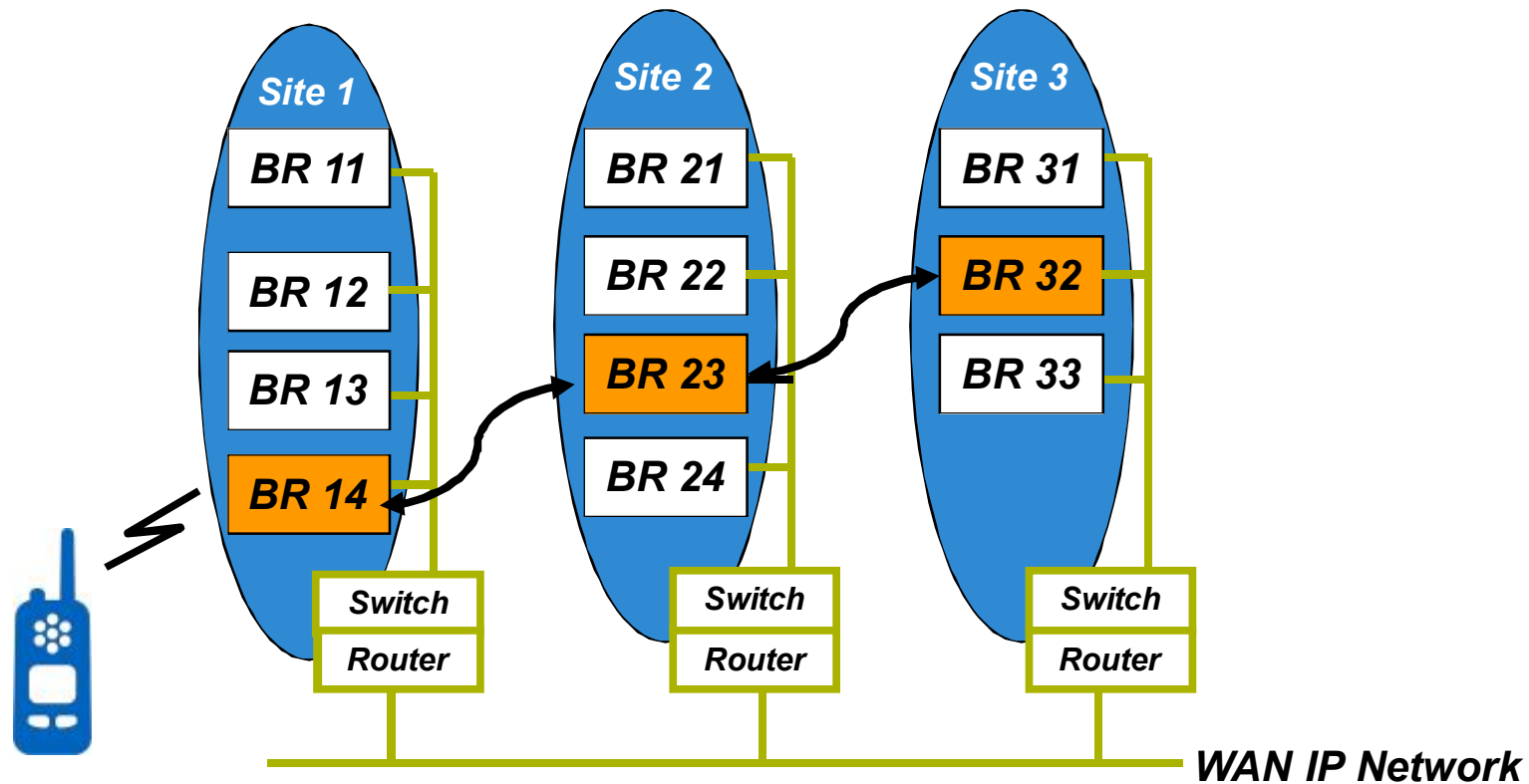
Enable voice & data communication between upto 15 MOTOTRBO single site systems over an IP network.

Increased subscriber capacity for a single site trunking solution which requires software only as no dedicated controller is required.

Add capacity to IP site connect. Add coverage to capacity plus. Software only trunking solution requiring no dedicated controller.

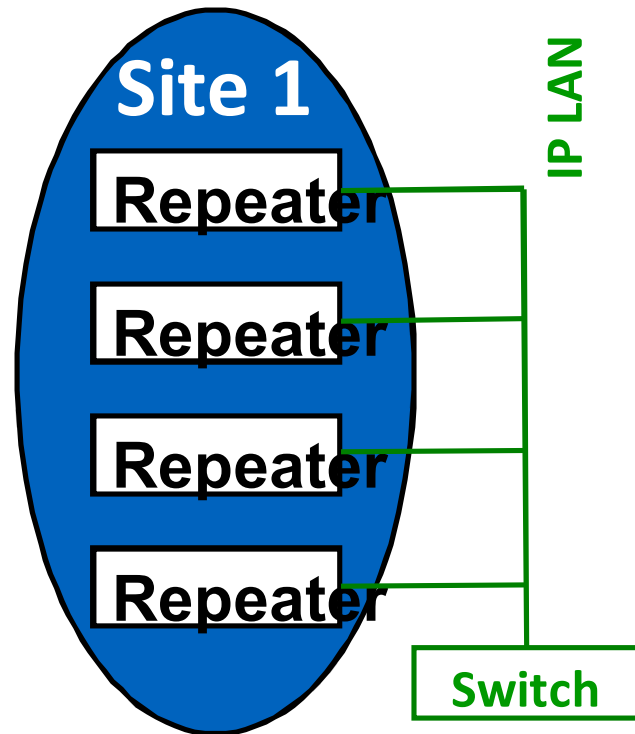
Multi site trunking solution with dedicated per site controller based architecture.

LCP – HOW IT WORKS



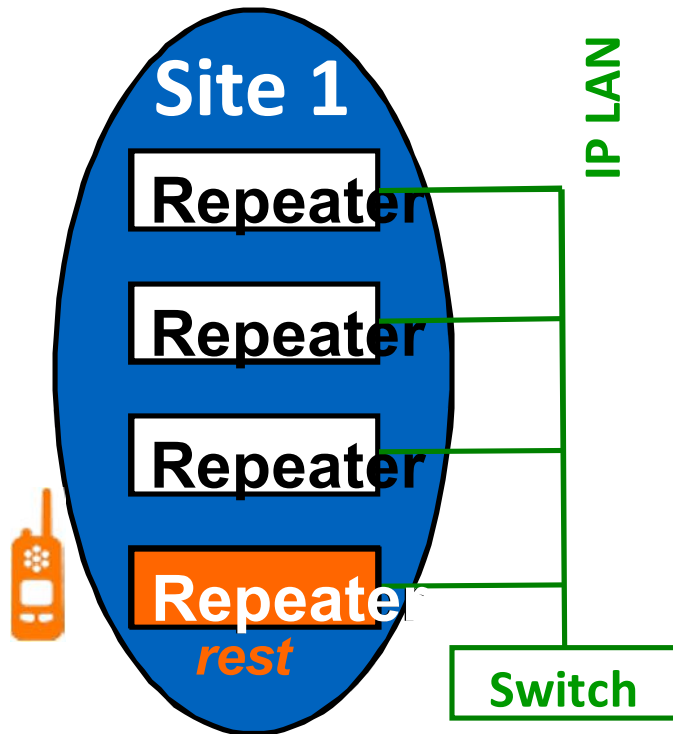
- Dynamic IP Site Connect system created for duration of call
- Direct route from source to site rest channels established

LCP – HOW IT WORKS



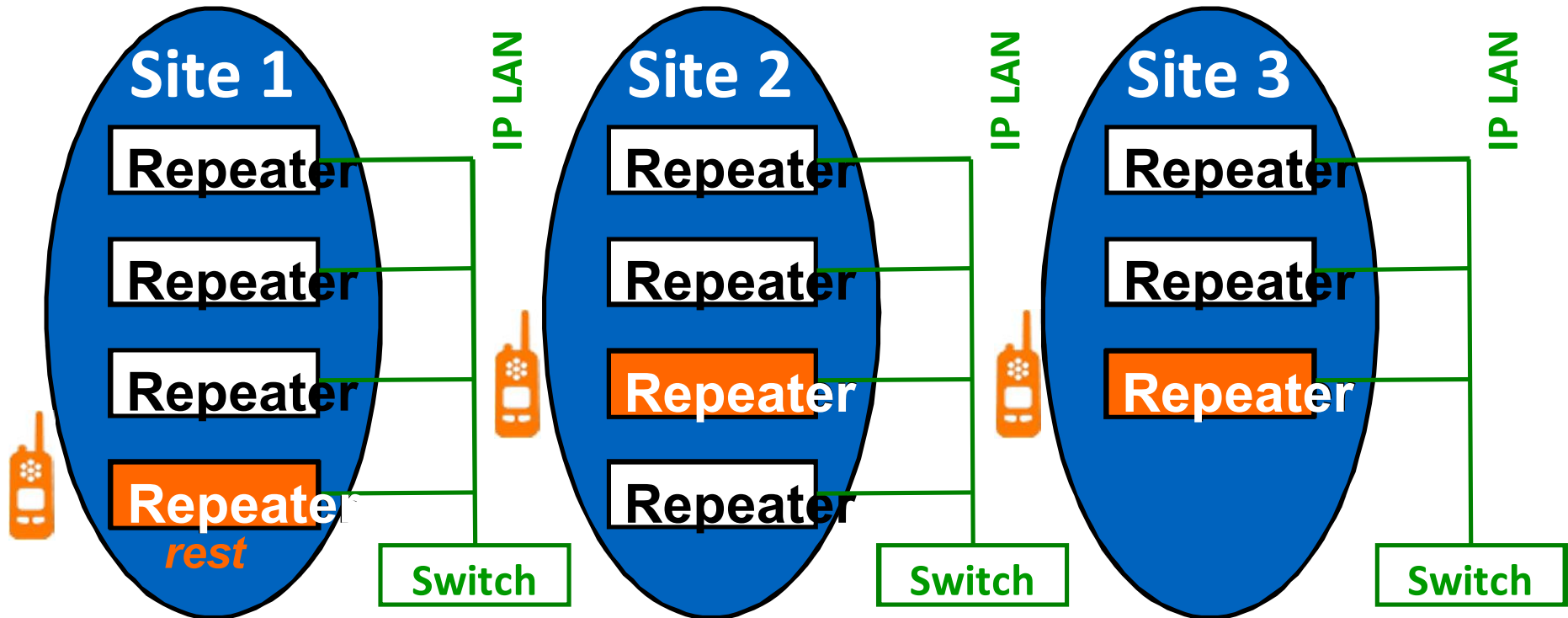
- Repeaters on site connected through IP Local Area Network (LAN)

LCP – HOW IT WORKS



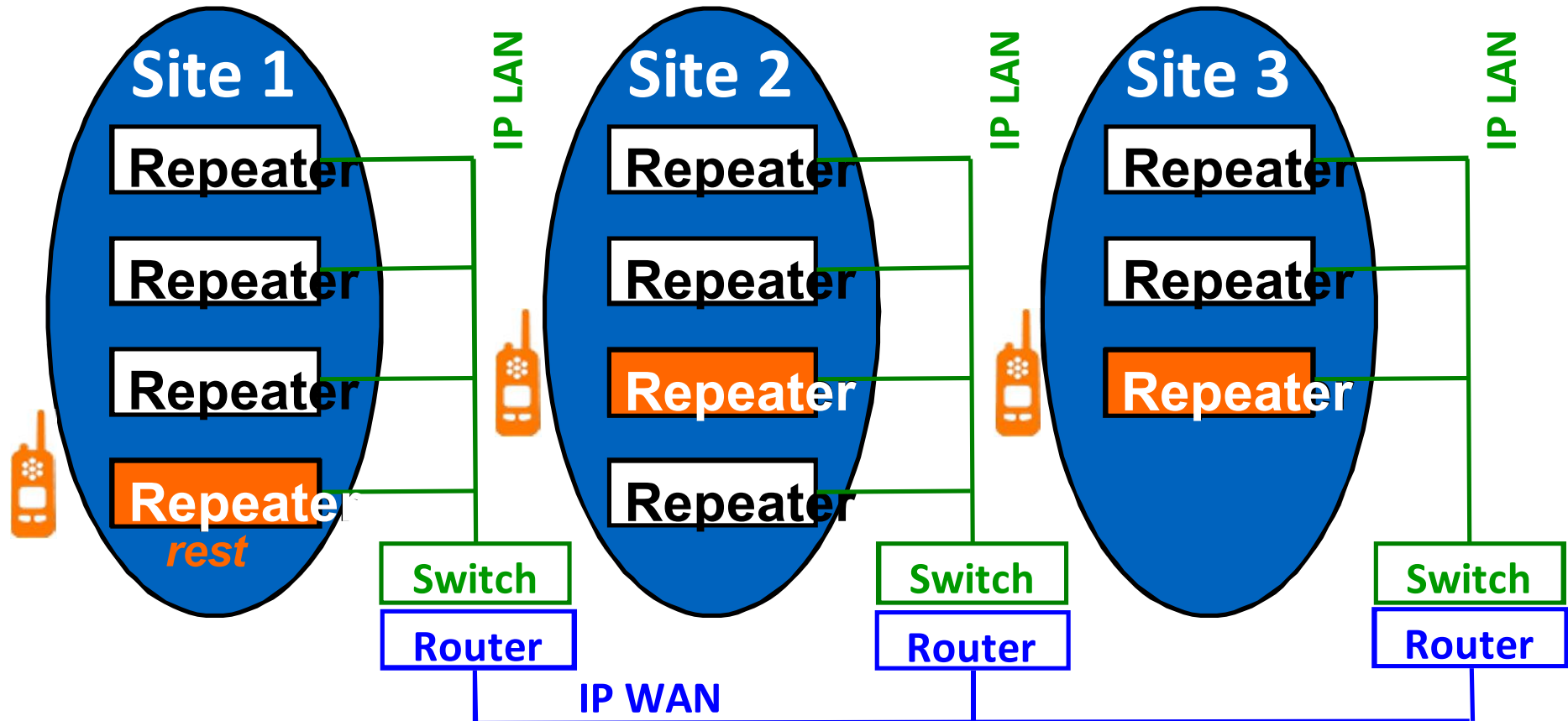
- System assigns Rest Channel
- Radios not involved in calls move to Rest Channel

LCP – HOW IT WORKS



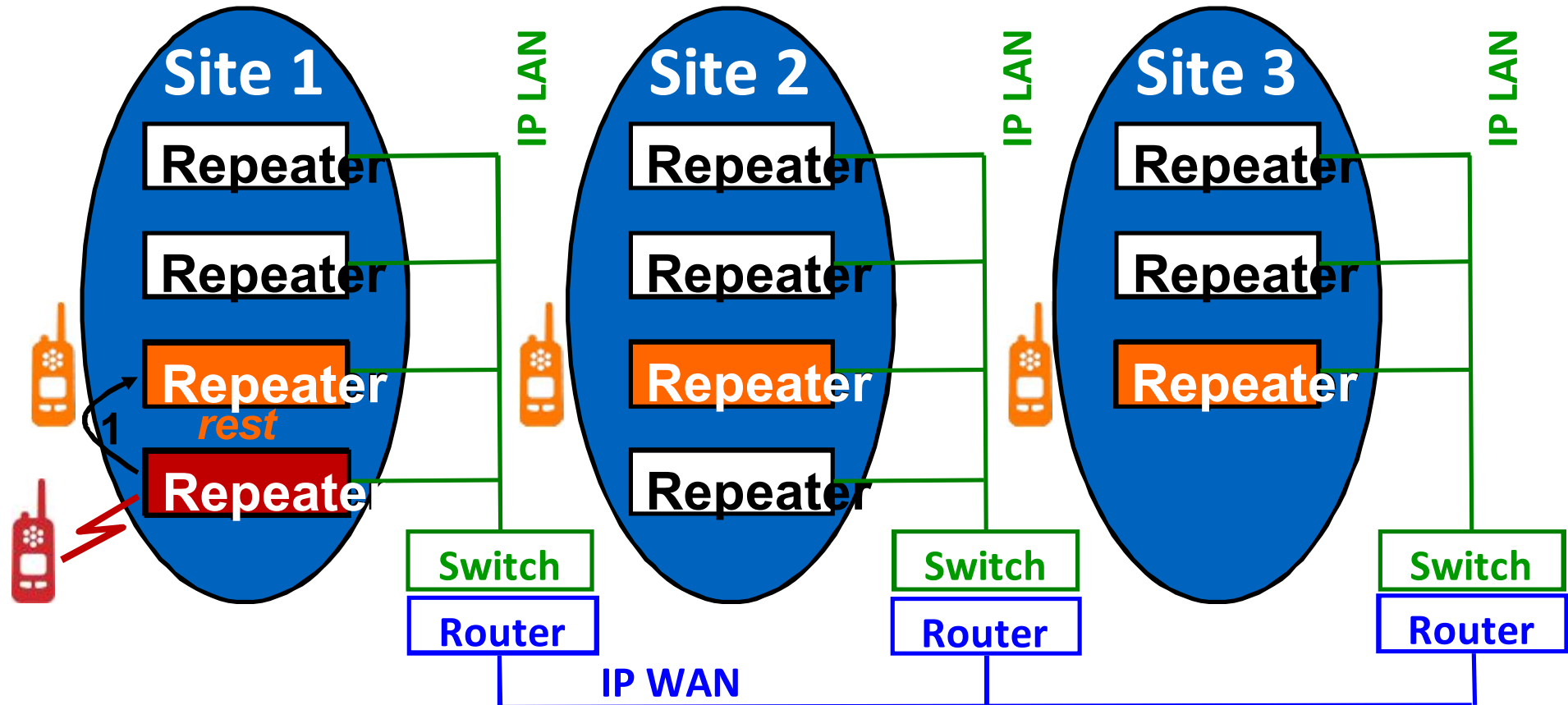
- Similar systems on each site
- Number of repeaters can be different on each site

LCP – HOW IT WORKS



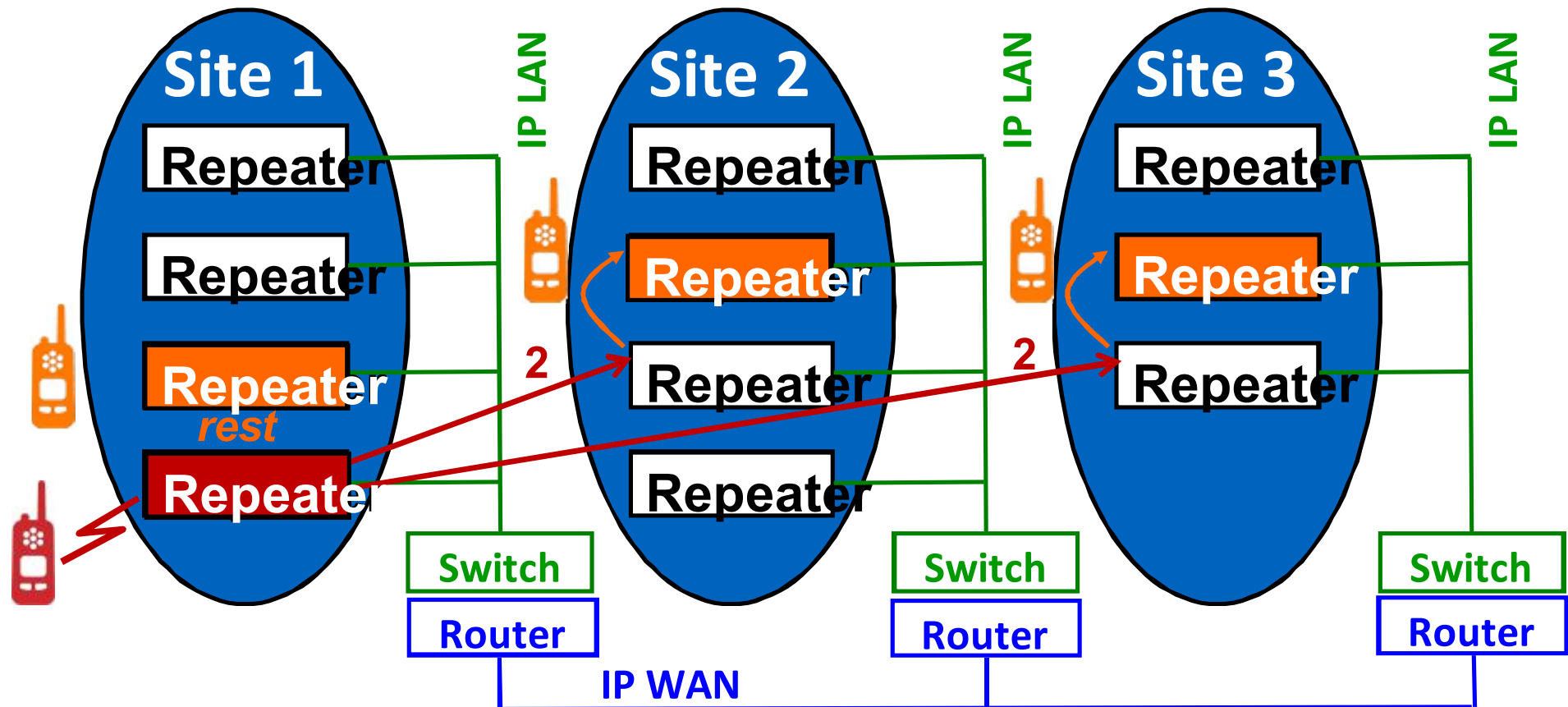
- Sites connected through IP Wide Area Network (WAN)

WIDE AREA GROUP VOICE CALL



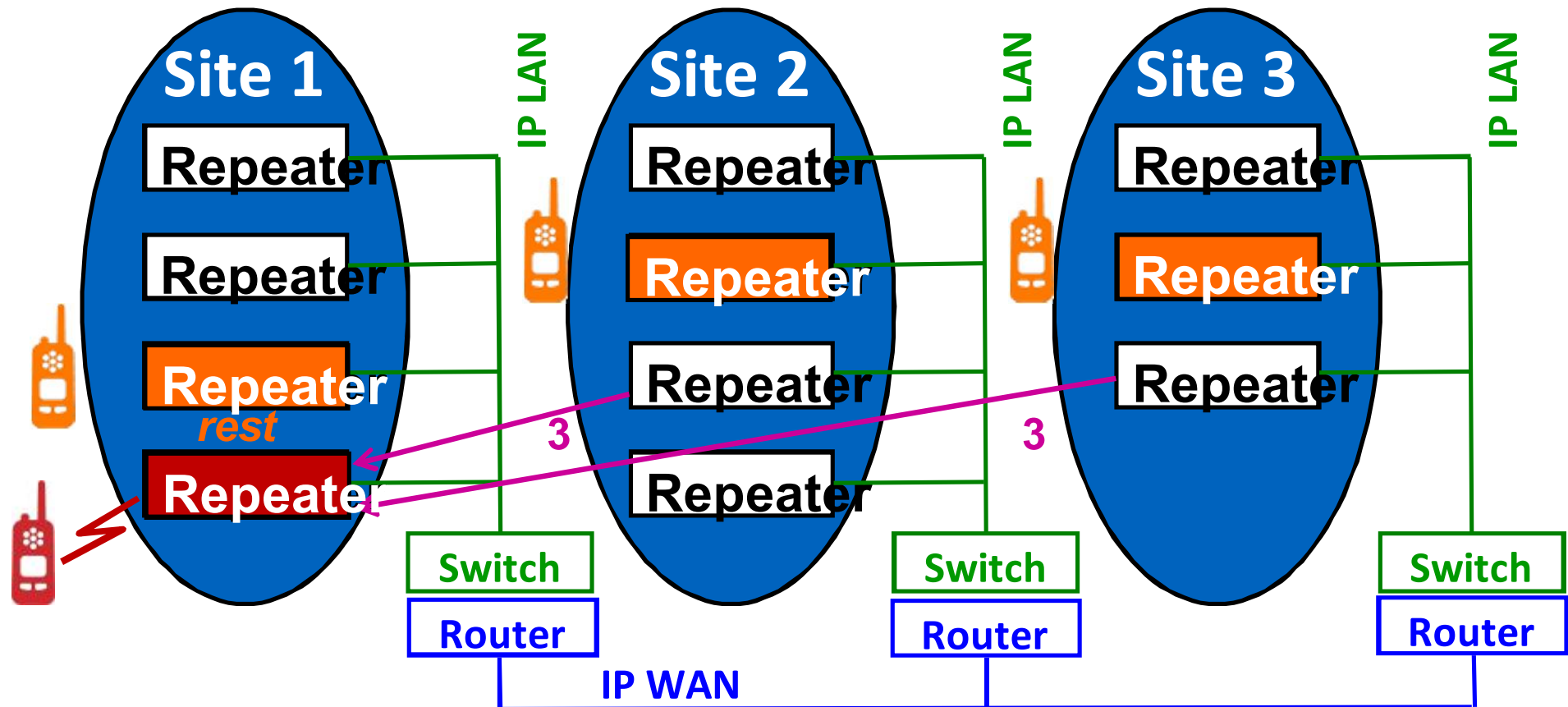
1. Call starts on Rest Channel, new Rest Channel established

WIDE AREA GROUP VOICE CALL



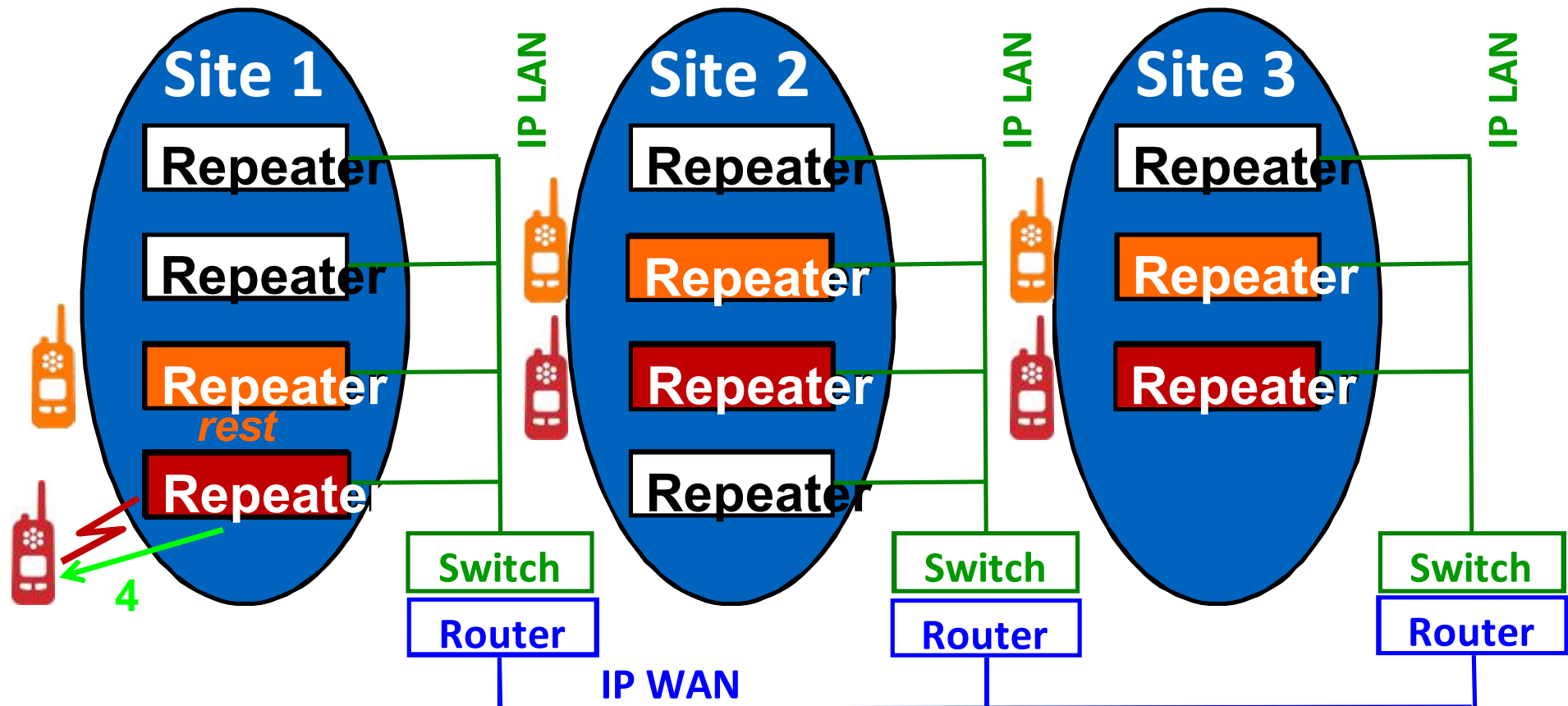
2. Source repeater communicates directly with rest repeaters at other sites

WIDE AREA GROUP VOICE CALL



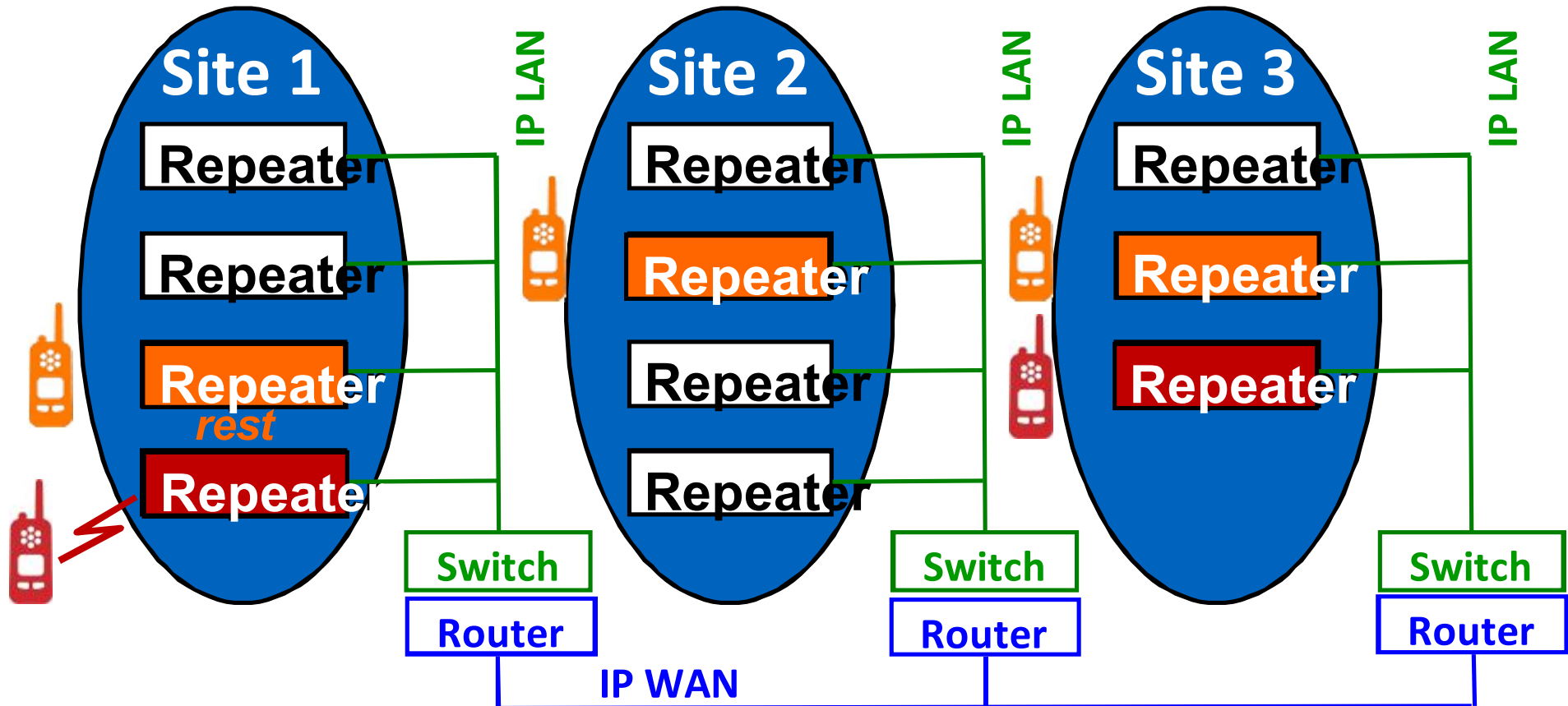
3. High-speed hand-shaking similar to Capacity Plus TRT and IPSC arbitration occurs to establish required channels

WIDE AREA GROUP VOICE CALL



4. Calling user receives "OK" and call proceeds

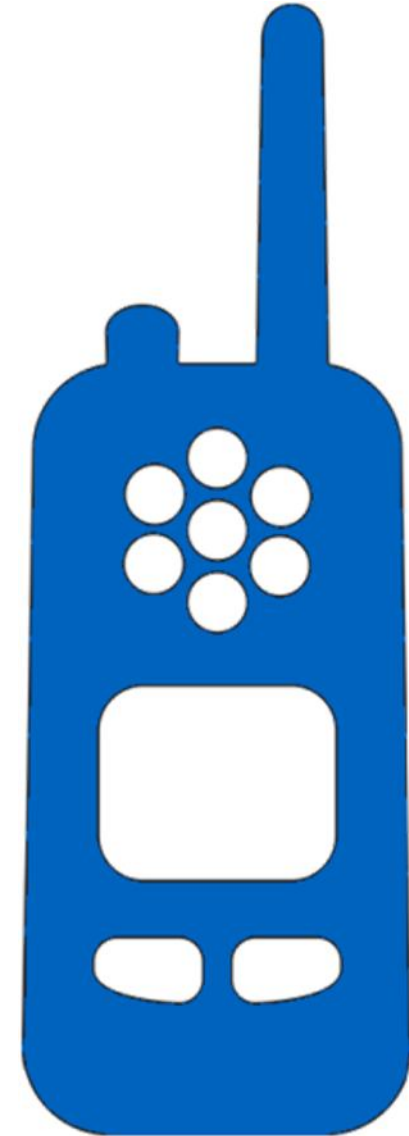
SELECTIVE SITE LIGHT-UP



- Dynamic for individual calls – controlled by repeaters
- Static for talkgroup calls – defined during programming

LINKED CAPACITY PLUS OVERVIEW

- **Supports MOTOTRBO features:**
 - *Enhanced privacy*
 - *Transmit Interrupt*
 - *Digital telephone patch*
 - *GPS (including enhanced)*
 - *RDAC*
- **Includes the following trunking system features**
 - *Selective site light-up:*
 - *Dynamic for individual calls*
 - *Static for talkgroup calls*
 - *Automatic subscriber roaming*
 - *Site restriction*

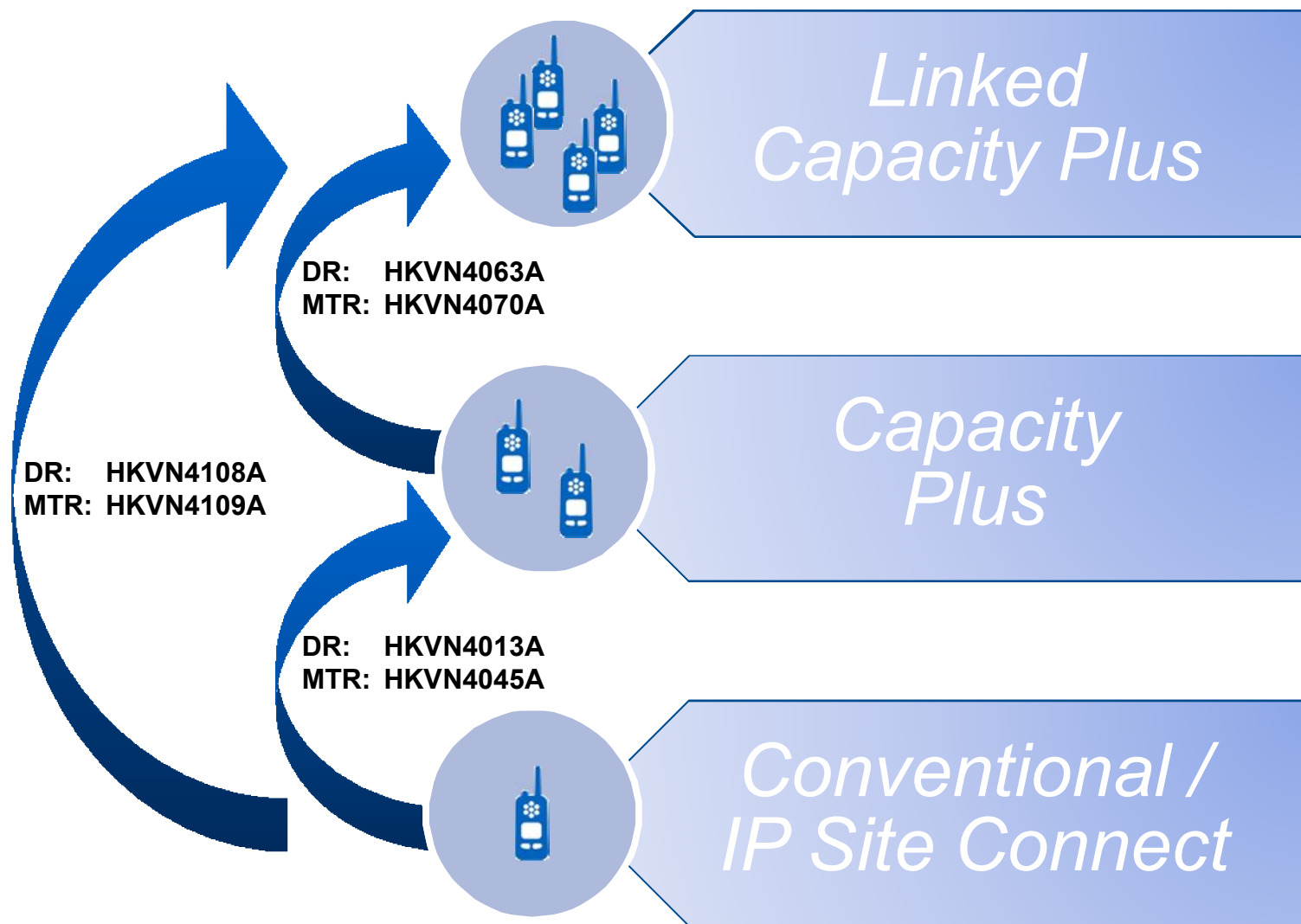


LINKED CAPACITY PLUS COMPONENTS



- **Compatible with all MOTOTRBO radios**
 - *DP/DM 3000 Series, SL Series, DM4000 Series*
- **Requires a software upgrade of radios and repeaters**
 - *DR 3000 repeaters must have 32MB of flash memory*
 - *Compatible with current and next generation MOTOTRBO radios*
- **New LCP compatible version of RDAC available**
 - *GMVN5520F RDAC CD*
- **Requires software licence for each repeater**
 - *HKVN4108A DR 3000 Full license key*
 - *HKVN4063A DR 3000 Incremental license key (from Capacity Plus)*
 - *HKVN4109A MTR3000 Full license key*
 - *HKVN4070A MTR3000 Incremental license key (from Capacity Plus)*

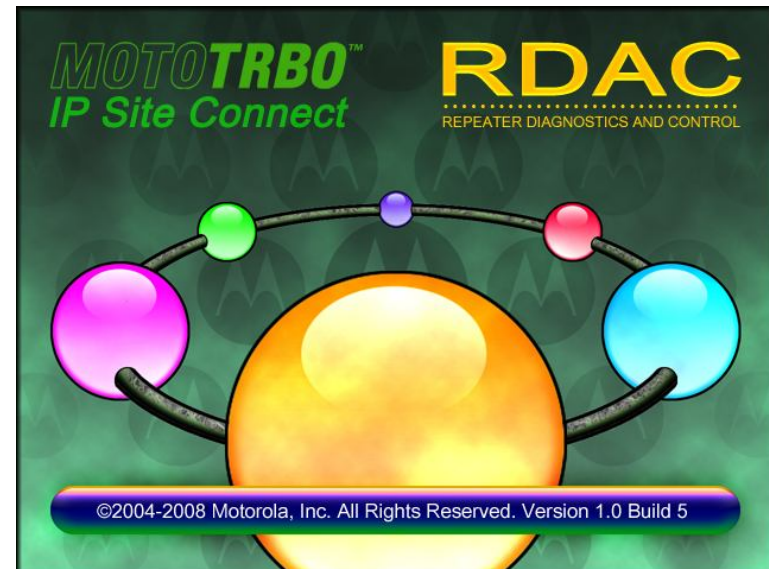
LINKED CAPACITY PLUS LICENCES FULL OR INCREMENTAL



RDAC – *Repeater Diagnostic And Control*



Motorola provides a software application that allows a system administrator the ability to monitor and control repeaters within the system





MOTOTRBO RDAC

RDACrepeater diagnostics and control

System Options RDAC Log 10.193.92.205 50000 Connect Help

	Alarms	IP	Radio Name	Service	State	Channel Name	Channel Type	RX Alarm	TX Alarm	Temp Alarm	Power Alarm	Fan Alarm
		10.193.92.205	RDAC-IR	Master	Enabled	Channel1	Digital					
		10.193.92.166	MOTOTRBO-R...	Peer	Enabled	Channel2	Analog					
		10.193.90.213	Essen's341 40.20	Peer	Enabled	Channel1	Digital					
▶		10.193.225.131	Zhengwu IR	Peer	Enabled	Channel1	Digital					
		10.193.225.137		Peer	Enabled	a b c d a s	Digital					
		10.193.92.169	Motorola-CDC	Peer	Enabled	Channel1	Digital					
		10.193.92.167	MotoA	Peer	Enabled	Channel1	Digital					
		10.193.90.113	Essen's361 40.20	Peer	Enabled	Channel1	Digital					
		10.193.225.130	LTD-CPS Peer	Peer	Enabled	Channel1	Digital					

Diagnostics

RSSI Slot 1: -119.515625 RSSI Slot 2: -119.515625

Repeater Log

Name	Type	State	Time (sec)
Fan Alarm	Minor	Detected	3
Fan Alarm	Minor	Detected	3
Fan Alarm	Minor	Detected	3
Fan Alarm	Minor	Detected	3

Peer 300 Connected.

Control

Current Channel: Channel1

TX Power: High

State: Enabled

Knockdown: Knockdown

Clicking Write or Reset will reset the repeater not be available for 8-10 secs.

System

Connection Mode

☒ IP Site Mode ☐ Local Mode

IP Site Settings

☐ Connect at Startup

Controller IP Address: 0 . 0 . 0 . 0

Controller UDP: 50000

RDAC ID: 1

RDAC UDP: 50000

Authentication Key: 0

Firewall Open Timer (sec): 6

Controller Retry Timer (sec): 30



FEATURE ENHANCEMENTS (FUTURE RELEASES)

R2.1: OTAP

(AVAILABLE Q3 2012)



Over-The-Air Programming (OTAP)

Writes and reads radio configurations over the air

Initial wired programming necessary

Manages up to 5,000 radio configurations

Voice priority while transferring

Utilizes existing over-the-air encryption

Scheduling of over-the-air operations - unmanned batch processing

Session logging and historical reporting

Multi-customer and system capable

System architectures supported:

Direct Mode (12.5 and 6.25e)

Single-site repeater

IP Site Connect

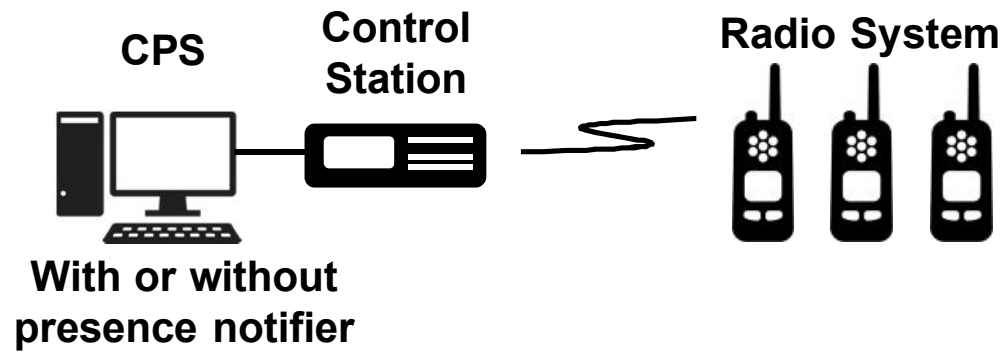
Capacity Plus

Linked Capacity Plus

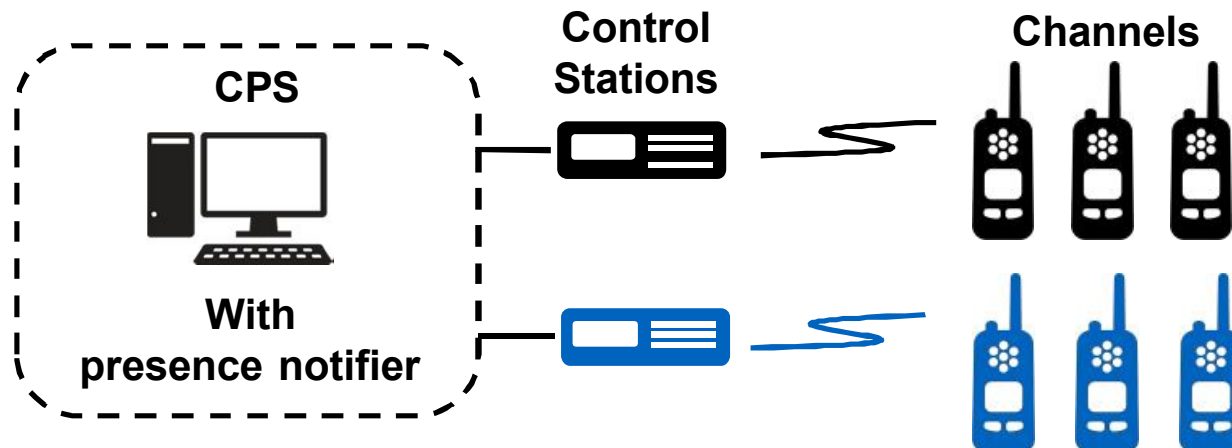
R2.1: OTAP



LOCAL SINGLE-CHANNEL



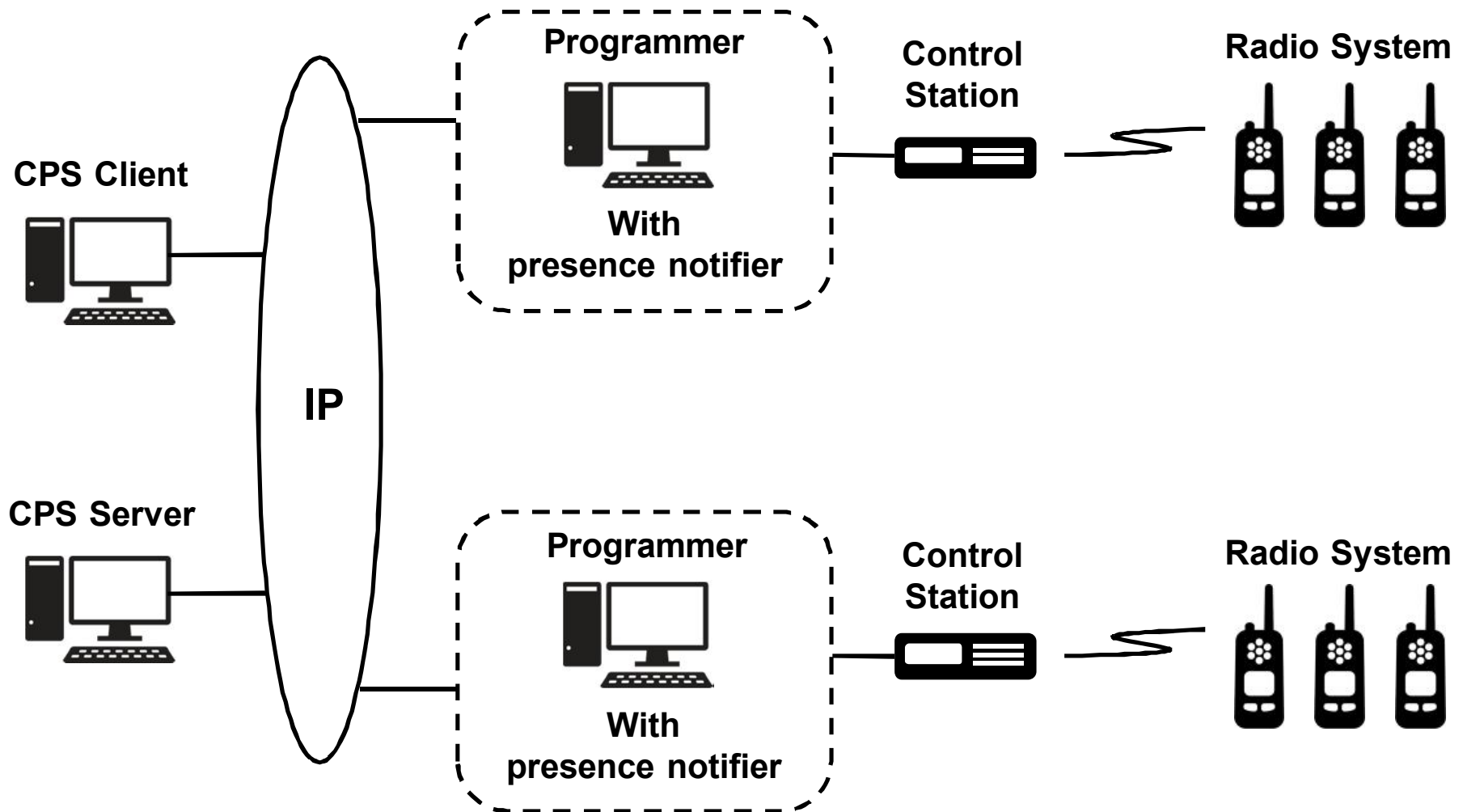
LOCAL MULTI-CHANNEL



R2.1: OTAP



REMOTE CPS CLIENT



R2.1: 6.25e DIRECT MODE

(AVAILABLE Q3 2012)



6.25e in Direct Mode

Two timeslots used independently without repeater

Radios synchronise themselves

Synchronisation propagated across entire system

Transparent to radio user



R2.2: RAS

(AVAILABLE Q4 2012)



Restricted Access to System (RAS)

Prevents unauthorised radios from using a repeater

Two methods can be used together or alone to protect system

- *RAS ID method*
- *SUID range-checking method*

Supported in following MOTOTRBO system architectures:

- *Conventional single-site (including Dynamic Mixed Mode)*
- *IP Site Connect*
- *Capacity Plus*
- *Linked Capacity Plus*

Repeater software upgrade licence

- *8MB and 32MB DR3000 repeaters*
- *MTR3000 repeaters*

RAS METHOD 1



RAS ID Verification

- *RAS ID programmed into radios and repeaters via CPS.*
- *Radio RAS ID verified at the repeaters.*
- *If radio does not have the valid RAS ID call not repeated*

Three modes:

- 1.RAS disabled – all incoming calls repeated**
- 2.RAS migration – RAS and non-RAS calls repeated**
- 3.RAS enabled – only valid RAS calls repeated**

RAS METHOD 2



SUID range-checking

All radios on system programmed with a unique SUID (via CPS)

Radio only allowed to use repeater if SUID within permitted range

Up to 64 ranges supported per repeater

Easy management of community repeaters

R2.2: REPEATER INTERFACE



Enhanced repeater IP interface

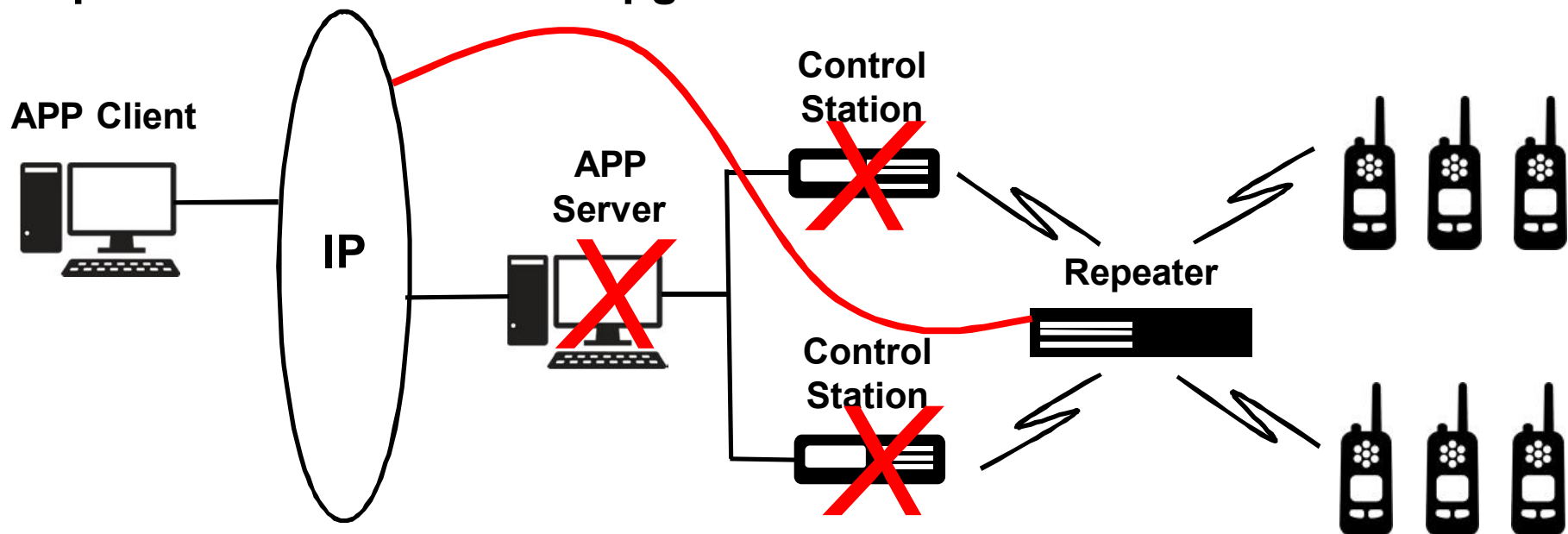
Voice interface (DVSI vocoder format)

Data interface

Command & Control interface

Simplified application architecture and reduced hardware costs

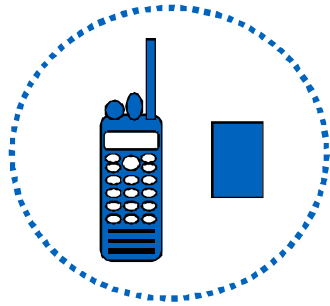
Repeater software licence upgrade



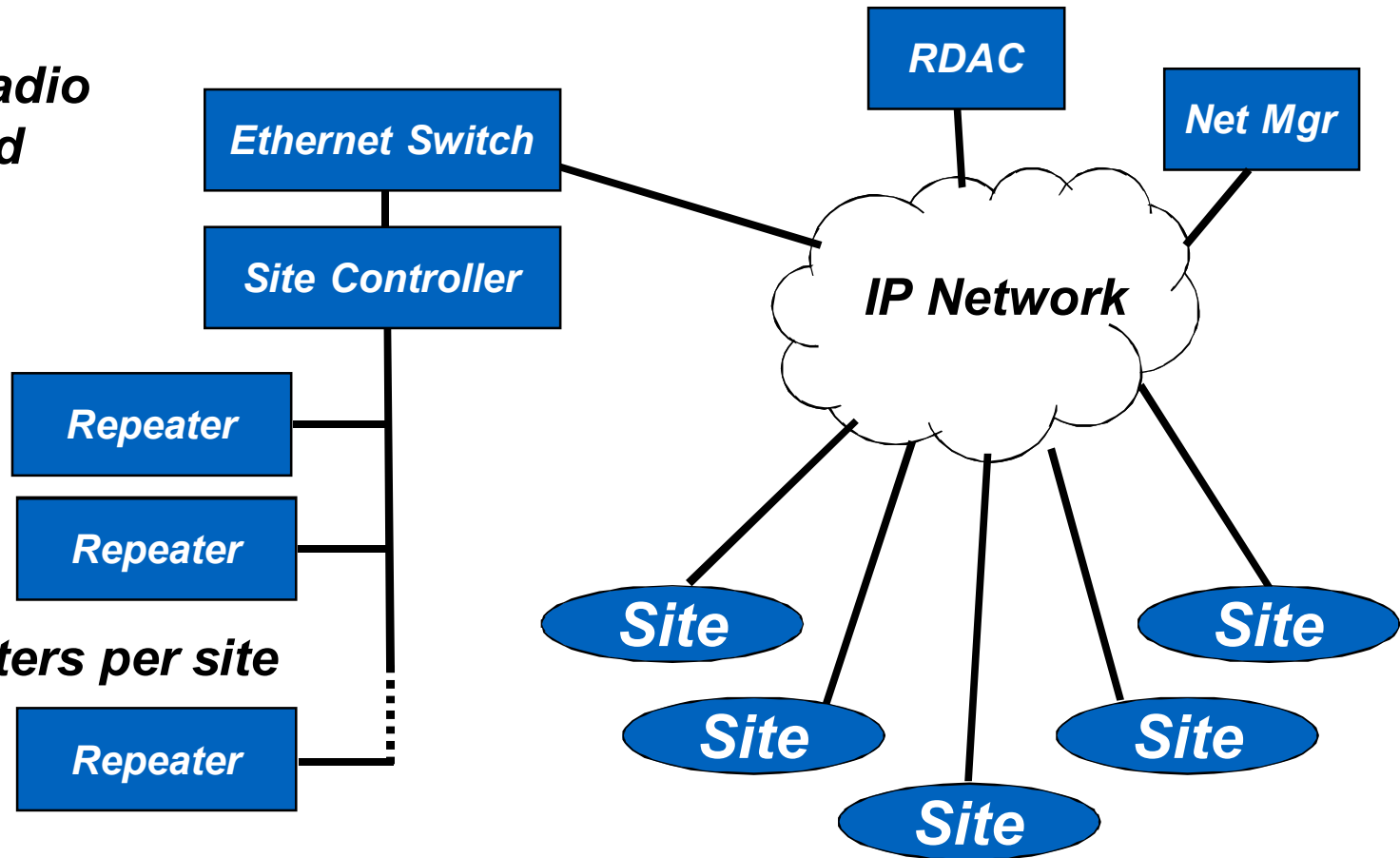
CONNECT PLUS



**MOTOTRBO radio
+ Option Board**



Up to 15 repeaters per site



CONNECT PLUS



High Level Features

- *Leverages all Matrix 1.5/1.6 Features (Digital only)*
- *Dedicated Control Channel*
- *Single site and multi-site (up to 20 sites)*
- *Support up to 29 logical channels per site (15 repeaters)*
- *Frequency Bands: UHF B1 / UHF B2 / VHF*

Key Features

- *Authentication*
- *PTT ID*
- *Automatic retry*
- *Call Queuing and Priority levels (8)*
- *Talkgroup, Individual/Private, All calls*
- *Call Alert*
- *Radio Check/Interrogation*
- *Remote Monitor*
- *Selective Radio Inhibit*
- *Talkgroup Scan (single site only)*

Data-specific Features

- *GPS*
- *Text Messaging – individual and group*
- *IP Packet Data Services*

MOTOTRBO™ TRUNKING

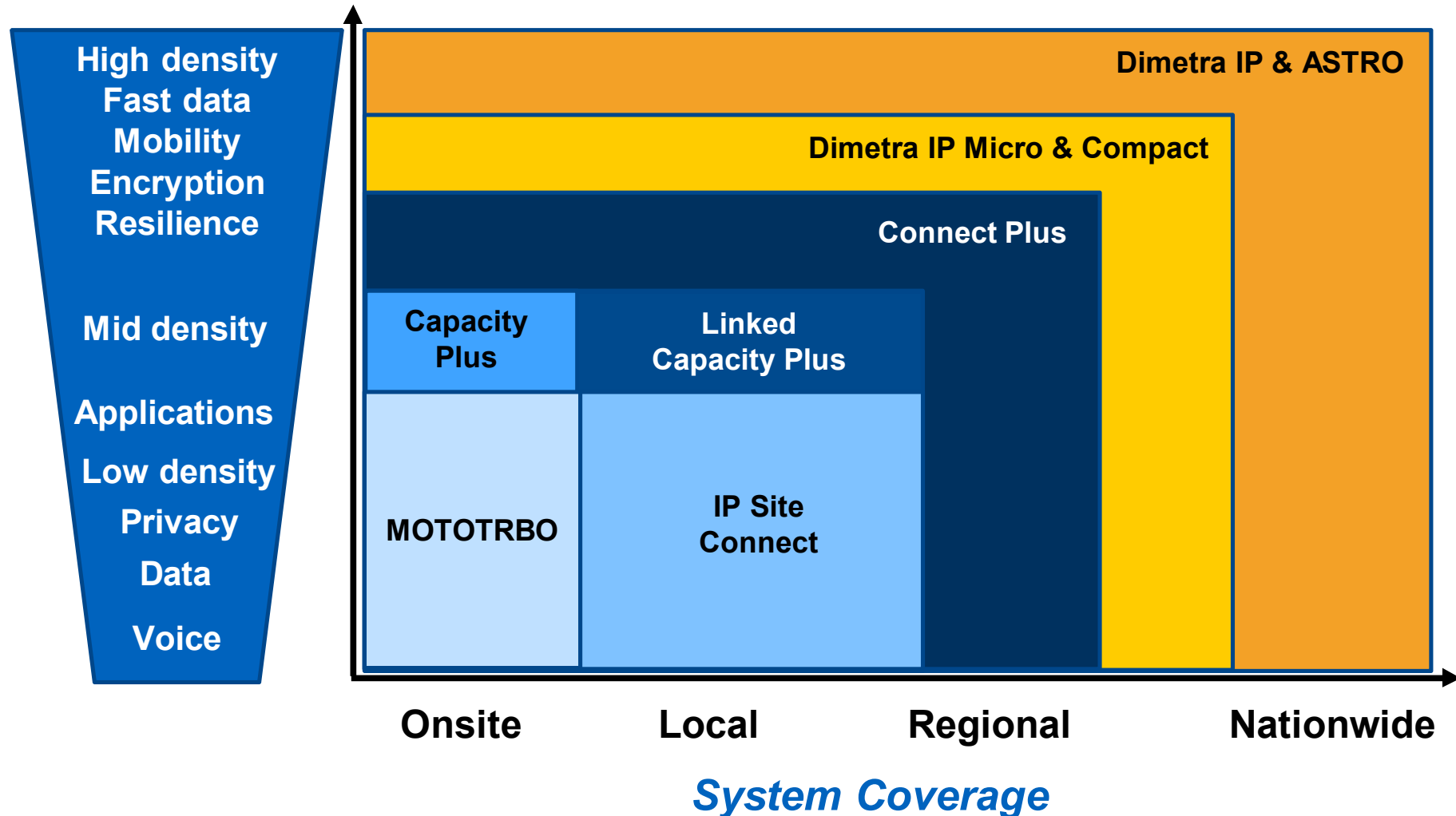


	CAPACITY PLUS	LINKED CAPACITY PLUS	CONNECT PLUS
Sites	1	5	20 (future 100+)
Channels per site	12 Voice & Data 24 data revert	12 Voice & Data 6 data revert	29 trunked 1 control
Controller required	NO	NO	YES
Option board required	NO	NO	YES
GENERIC FEATURES			
Enhanced Privacy (40-bit encryption)	YES	YES	NO (future)
GPS Data support	YES	YES	YES
Application support	YES	YES	YES
Transmitter Interrupt	YES	YES	NO
Digital telephone patch	YES	YES	NO (future)
Message store-and-forward	NO	NO	YES
TRUNKING SYSTEM FEATURES			
Busy call queuing	NO	NO	YES
Priority call levels	NO	NO	YES
Dynamic site assignment	NO	NO	YES
Selective site light-up	N/A	STATIC	DYNAMIC
Site restriction	N/A	YES	YES
Subscriber Access Control	NO (future)	NO (future)	YES

DIGITAL RADIO SYSTEMS



System Capability



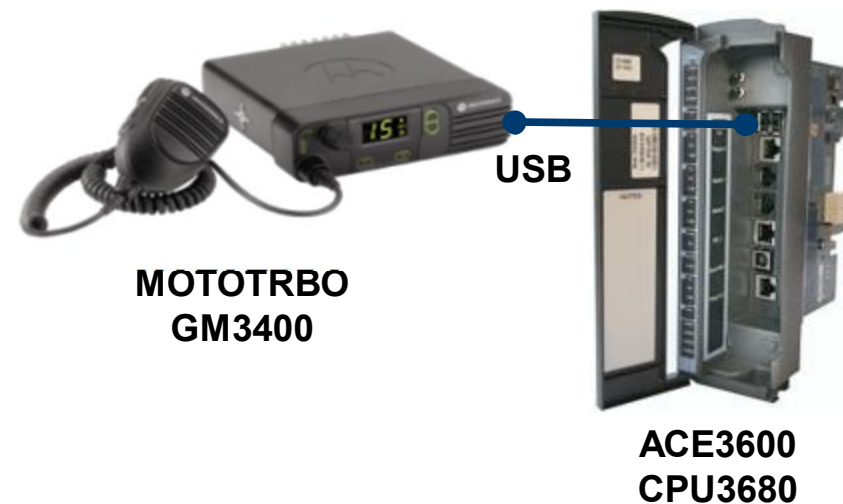
SCADA CONNECTIVITY



MOTOTRBO certified for use with ACE3600 RTU

Complementary sales to utilities, oil & gas, flood control

Incremental revenues & stronger relationships



MOTOTRBO™ ADVANTAGE



Proven technology and products

Smooth migration from analogue

Better voice, enhanced data

Diverse range of multi-vendor applications

Continuous product innovation

MOTOTRBO™
Professional Digital Two-Way Radio System



A graphic on a blue background. On the left is a white silhouette of a mobile phone with a long antenna. To its right, the text 'MOTO TRBO' is written in a bold, italicized font, with 'MOTO' in blue and 'TRBO' in black. Below this, the text 'TRUSTED BY' is in white, followed by '1,000,000' in large black numbers, and 'USERS' in large white numbers. Overlaid on the right side of the graphic are large, red, 3D-style numbers '1,500,000'.



THANK YOU...

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