RadioPro!

by CTI Products, Inc.

System Planner

for Motorola MOTOTRBO

Document # S2-61645-802

For Version 8 Software

Contact Us
Support, replacement part ordering, and service may be arranged by contacting our Cincinnati office. Parts for service can be returned following request of a Return Material Authorization.

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SYSTEM OVERVIEW

RadioPro™ provides remote access to 2-way radios via IP Networks. This "Dispatch over IP" (DoIP) solution consists of PC-based software allowing voice and data communications between PC users and 2-way radio subscribers. Communications with radio subscribers is also possible for remote mobile users using Android or iOS devices. A RadioPro system consists of at least one RadioPro IP Gateway (server) and at least one client (Dispatch™, Talk™, or Mobile™) with an IP network connecting the RadioPro components.

1.1 SYSTEM COMPONENTS

CTI's Dispatch over IP system is based on Server-Client architecture. System components are described below:

- **RadioPro IP Gateway Kit** (CTI Part # S2-61815) is the hardware interface that connects a mobile radio (control station) to an IP network. The IP Gateway is the *Server* for the control station radio connected to it. Each control station radio used for voice requires one IP Gateway. System components, such as IP Gateways and clients, may be located together or separated geographically and connected via a Wide Area Network (WAN) or Virtual Private Network (VPN). Each IP Gateway requires a static IP address. Each IP Gateway includes a cable to connect it to the Control Station radio. For more information, see the following documents:
  RadioPro IP Gateway - Installation and Configuration Manual, Document # S2-61781
  RadioPro IP Gateway Data Sheet
  RadioPro System Brochure

- **RadioPro Dispatch Client** (CTI Part #s S1-617700 Core, S1-61771 Voice Module, S1-61772 GPS Module, S1-61773 Telemetry Module, S1-61774 Text Messaging Module) is a dispatch console for PCs that provides voice dispatching to multiple simultaneous radio channels or talk groups, as well as GPS/AVL, Telemetry, Text Messaging, and Voice Logging. Windows 8 Pro or Windows 7 Pro operating system is required. System components, such as Dispatch clients and IP Gateways, may be located together or separated geographically and connected via a Wide Area Network (WAN) or Virtual Private Network (VPN). For more information, see the following information:
  RadioPro Dispatch Client Installation and Configuration Guide, Document # S2-61785
  RadioPro Dispatch Client User Guide, Document # S2-61786
  RadioPro Dispatch Client Data Sheet
  RadioPro System Brochure
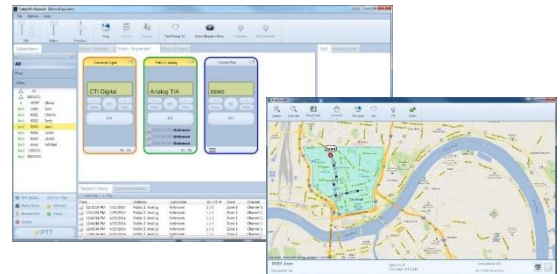
- **Talk™ for Windows PC** is a software application for PCs and laptops that provides voice dispatching to a single radio channel or talk group. Other features include Voice Logging for 24 hours, Text Messaging, and channel steering. Windows 8 or Windows 7 operating system is required. System components, such as Talk Clients and IP Gateways, may be located together or separated geographically and connected via a Wide Area Network (WAN) or Virtual Private Network (VPN). For more information, see the following documents:
  RadioPro Talk Client User Guide (embedded in product)
  RadioPro Talk for PC Data Sheet
  RadioPro System Brochure
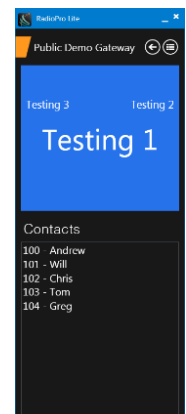
- **TurboVUi SoloÎ   Client** is the legacy software application for PCs that provides voice dispatching to a single radio channel or talk group. It requires Windows 10, 8, 7, or XP operating system. The virtual radio head duplicates the full functionality of a control station, including channel steering. Other features include Texting and Voice Logging for 24 hours. For more information, see the following documents:
    TurboVUi Solo Client ó Installation Guide, Document # S2-61568
    TurboVUi Solo Client ó User Guide, Document # S2-61432
    TurboVUi Solo Client ó Data Sheet

- **TalkÎ   for mobile devices** is a mobile app for AndroidÎ   and iPhoneÎ /iPadÎ   that provides remote access to a 2-way radio system for voice communications. This app is especially beneficial in trunked radio systems where there may be many talk groups. The Mobile app is useful over cellular or Wi-Fi networks when you are on-the-go and outside the coverage of your radio system, yet still need radio communications. For more information, see the following documents:
    RadioPro Talk for Mobile Devices Data Sheet
    RadioPro Talk for Mobile Devices How-to-Guide
    RadioPro System Brochure
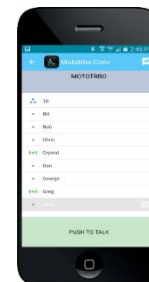
- **Control Station Radio** - A control station radio must be used as the interface to the radio system, and connects to a RadioPro IP Gateway using the rear accessory/communications port. Each control station radio used for voice requires one IP Gateway. Radio models that can be used for a Control Station radio and provide full radio functionality from a RadioPro client include:
    - Kenwood NEXEDGE: NX-800
    - Motorola MOTOTRBO: XPR4550, XPR5550 (North America)
                                            DGM5500, DGM8500 (Latin America)
                                            DM4000 (Europe)
                                            XiR M8260 (Asia Pacific)

- **Personal Computer or Workstation** is required to host the RadioPro Dispatch, RadioPro Solo, or RadioPro Talk clients. Console accessories may include microphone and speakers (or headset), Push-to-Talk footswitch, and touch screen monitor.

ARCHITECTURE

The IP Gateways interface the radio system to an IP network. One IP Gateway is required for each control station radio used for voice. The IP Gateways and control station radios can be centrally located or scattered among different locations using a Virtual Private Network (VPN) or Wide Area Network (WAN) such as the Internet.

Each IP Gateway in a RadioPro system acts as the server for the Control Station Radio connected to it, and ensures easy wide-area deployment. Since there is not a server PC, the architecture reduces õsingle point-of-failureö concerns.

A system may have a mixture of RadioPro Dispatch and RadioPro Talk/Solo Clients, as well as RadioPro Mobile apps running on mobile devices. These Clients may be centrally located or scattered among different locations using a Virtual Private Network (VPN) or Wide Area Network (WAN) such as the Internet.
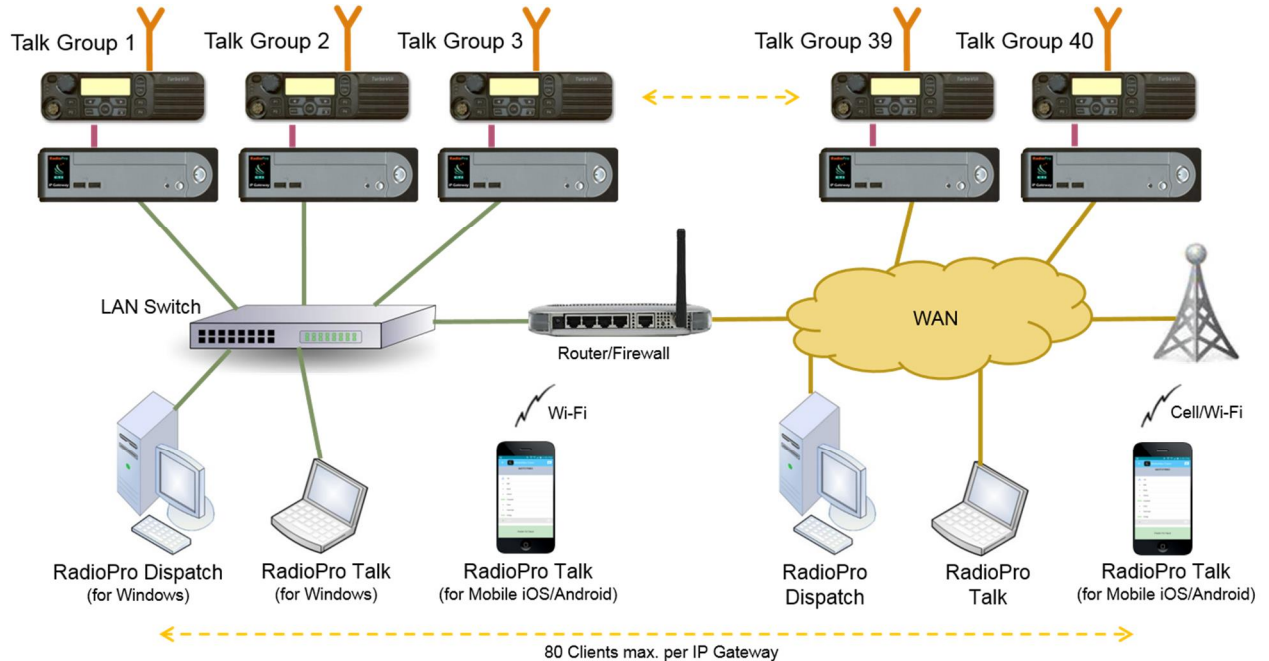
System Maximum Build-out

A RadioPro system may have maximum components listed below.

System Component	Maximum
Dispatchï Clients	20
Simultaneous Talkï client connections per IP Gateway	80
IP Gateways	50

SYSTEM CONSIDERATIONS

System Planner Template

The System Planner Template can be found at the end of this document, and can be used in the planning phase of a project to record IP addresses, usernames, passwords, serial numbers, and device names.

Version Match

RadioPro Dispatch clients and IP Gateways must have compatible versions in order to communicate with each other. Compatibility can be ensured when the first two digits of the version match. (The third digit indicates a minor revision, and does not need to match.)

In addition, the license file for a RadioPro Dispatch client must be at the same major revision level. In other words, a RadioPro Dispatch software license key for version 8 is required to run RadioPro Dispatch version 8. (A version 7 license key will not be able to run RadioPro Dispatch version 8.)

LICENSING

RadioPro Dispatch Clients

Each PC that runs the RadioPro Dispatch client requires a unique software license file. Installation of a valid software license allows the following:
- Connection to a number of RadioPro IP Gateways.
- Proper operation of software modules such as Voice, GPS, Text, and Telemetry.

CD Part Number S2-61792 contains this license file. Connections for additional IP Gateways and additional modules can be purchased and added to the license file at any time.

RadioPro Dispatch can be run in õDemo Modeö without the use of a software license. In Demo Mode, a RadioPro Dispatch client can connect only to CTIøs demo radio system in Cincinnati.

RadioPro Solo, Talk, and Talk for Mobile Clients

For client types other than RadioPro Dispatch, a license file is factory-installed on the IP Gateway, and allows Client Connections from Talk and Solo clients (for PCs and Notebooks) and Talk for Mobile apps (for AndroidÎ and iPhoneÎ /iPadÎ). Client Connections can be purchased when the IP Gateway is purchased, and can easily be added to an IP Gateway that is already installed. The number of Client Connections on the license file is the maximum number of simultaneous users of Talk, Solo, and Talk for Mobile Devices.

The number of connections installed on the license file is indicated on the serial number label located on the bottom of the IP Gateway. The number of installed connections can also be determined from a connected RadioPro Solo client if logged in using the õadminö username using the following steps:

1. From the **Settings** menu, choose **Gateway**.

2. In the **RadioPro Gateway Settings** window, click the **Admin** tab. The õClient Licensesö parameter will show the number of purchased connections.

OTHER ITEMS NEEDED

RADIO INTERFACE CABLE

A radio interface cable must be ordered from the following table:

Control Station Radio	Cable Part #
Motorola XPR4550/5550, DGM5500/8500, DM4000, XiR M8260	S2-61431
Kenwood NEXEDGE NX-700/800	S2-61769

CONTROL STATION RADIO

Each Control Station radio used for voice requires one IP Gateway.

The control station radio connected to the IP Gateway **must at least have the minimum firmware version listed below**.

Control Station Radio	Minimum Version
Motorola MOTOTRBO in Conventional, IPSC, Cap+, or LCP	1.08.0
Motorola MOTOTRBO in Connect Plus mode	2.2.0
Motorola MOTOTRBO Connect Plus Option Board	1.3.0
Kenwood NEXEDGE NX-700/800	3.21.00

RADIO PROGRAMMING CABLE

A radio programming cable is required to configure the Control Station radio.

Note: A programming cable connected to the front microphone connector on the Control Station radio may prevent communications to a RadioPro IP Gateway from the Rear Accessory Connector. **Therefore, when a cable is connected to the Rear Accessory Connector to connect a RadioPro IP Gateway or a PC (during programming), ensure that the programming cable has been disconnected from the front microphone connector.**

RADIO PROGRAMMING SOFTWARE

Motorola's CPS (Customer Programming Software) utility or Kenwood's KPG-111DN FPU (Field Programming Unit software) is required to configure the Control Station radio for various RadioPro functions.

LAPTOP OR PC

A laptop or PC will be needed to run the ICU.exe utility mentioned in the previous section.

CONFIGURATION AND INSTALLATION STEPS

Use the steps in the following table to install a RadioPro System.

Step #	Description	Where
1a	Configure Control Station Radio(s) used for Voice	S2-61781, IP Gateway Installation Guide
1b	Configure Control Station Radio(s) used for Data	S2-61781, IP Gateway Installation Guide
1c	Configure MOTOTRBO Connect Plus Option Board	S2-61781, IP Gateway Installation Guide
1d	Configure Subscriber Radios for ARS, GPS, and TMS	S2-61781, IP Gateway Installation Guide
1e	Configure MOTOTRBO repeater(s) for Enhanced GPS option	S2-61781, IP Gateway Installation Guide
2	Connect RadioPro IP Gateway to Control Station Radio	S2-61781, IP Gateway Installation Guide
3	Configure RadioPro IP Gateway(s) using ICU.exe	S2-61781, IP Gateway Installation Guide
4	Connect RadioPro IP Gateway to IP Network	S2-61781, IP Gateway Installation Guide
5	Configure Port Forwarding on Firewalls/Routers	S2-61781, IP Gateway Installation Guide
6a	Install and configure RadioPro Solo and/or Talk Clients (optional)	S2-61568 Solo Client Installation Guide
6b	Install and configure RadioPro Dispatch Clients (optional)	S2-61785 Dispatch Client Installation Guide
6c	Install and configure RadioPro Talk for Mobile apps (optional)	S2-61787 Talk for Mobile App Installation Guide

SYSTEM EXAMPLES

The System Example diagrams in this section represent some of the configuration options for RadioPro. Two diagrams are presented for each MOTOTRBO system type:
- IP Addresses and Radio IDs
- ARS and GPS Signaling

ARS SIGNALING

Applications such as RadioPro often need to know the status of subscriber radios in a system. In order to satisfy this requirement, subscriber radios can be required to register with the application using *Automatic Registration Service (ARS)* messaging. The *ARS Status* message is reported by subscriber radios on a periodic basis to an application referred to as the *ARS Server*. If the subscriber radio does not receive an *ARS Acknowledgement* message from the *ARS Server* application, the subscriber radio will repeatedly resend the *ARS Status* message, flooding the channel with data message traffic. A RadioPro IP Gateway performs the *ARS Server* function and will respond to the *ARS Status* message with an *ARS Acknowledgement* message. The *ARS Acknowledgement* message sent from the RadioPro IP Gateway includes an õ*ARS Subscriber Refresh Rate*ö. The õ*ARS Subscriber Refresh Rate*ö tells the subscriber radios how often to resend *ARS Status* updates to the *ARS Server*, and is configured in the **MOTOTRBO Radio** tab of the ICU.exe. See Motorolaøs MOTOTRBO System Planner (Section 3.1.3.2 *Presence Notifier*) and the following diagrams for additional details.

GPS SIGNALING

A LRRP (Location Request Response Protocol) request for GPS (Global Positioning System) status is initiated by a RadioPro IP Gateway. The target subscriber radio will respond with its GPS position data, which may also include speed, time, and other parameters. The target subscriber radio can be requested to provide a response to either an *Immediate Location Request* or a *Triggered Location Request*. An *Immediate Location Request* is answered by a subscriber radio with a single GPS status message. A *Triggered Location Request* is answered by a subscriber radio with periodic GPS status updates based on a time interval or an event such as radio key-up. *Triggered Location Request* configuration parameters can be found in the **GPS** tab of the ICU.exe. See Motorolaøs MOTOTRBO System Planner and the following diagrams for additional details.

CPS CONFIGURATION

See *RadioPro IP Gateway Installation Guide* for additional setup details for Control Station radios and Subscriber radios.

CONVENTIONAL DIGITAL OR ANALOG SYSTEM WITHOUT DATA REVERT, OR CONNECT PLUS (VOICE ONLY)

IP Addresses and Radio IDs

For Conventional Digital or Analog MOTOTRBO systems without Data Revert slots, each **repeater voice slot** must have an associated XPR5550 Control Station radio and RadioPro IP Gateway as indicated in the diagram below.

Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. IP Gateways must have a static IP Address. See Notes 1 & 2 indicated in system diagram.

2. An IP Gateway and all radios connected to it must have unique subnets. See Notes 1 & 2 indicated in system diagram.

See ***RadioPro IP Gateway Installation Guide*** for additional setup details for Control Station radios and Subscriber radios.

ARS and GPS Signaling (Conventional)

In the following diagram, there are no dedicated **Data Revert** slots. In this case, all data request and status messages for *ARS* and *GPS* use the same **Voice** repeater slot and **Voice** radio channel.
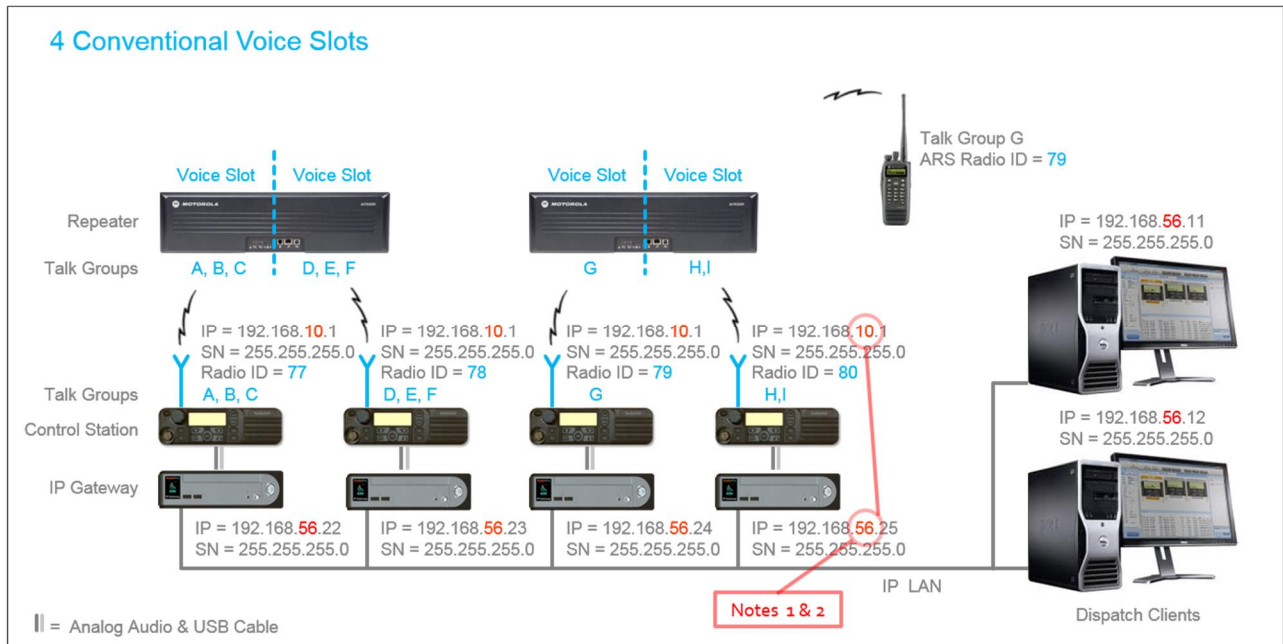

See ***RadioPro IP Gateway Installation Guide*** for additional setup details for Control Station radios and Subscriber radios.

CONVENTIONAL DIGITAL SYSTEM WITH DATA REVERT

IP Addresses and Radio IDs

For Conventional Digital systems with Data Revert slots, one RadioPro IP Gateway can support one Voice Control Station Radio as well as three additional Data Revert Radios. The RadioPro IP Gateway must have software version 5.1.5 or later.

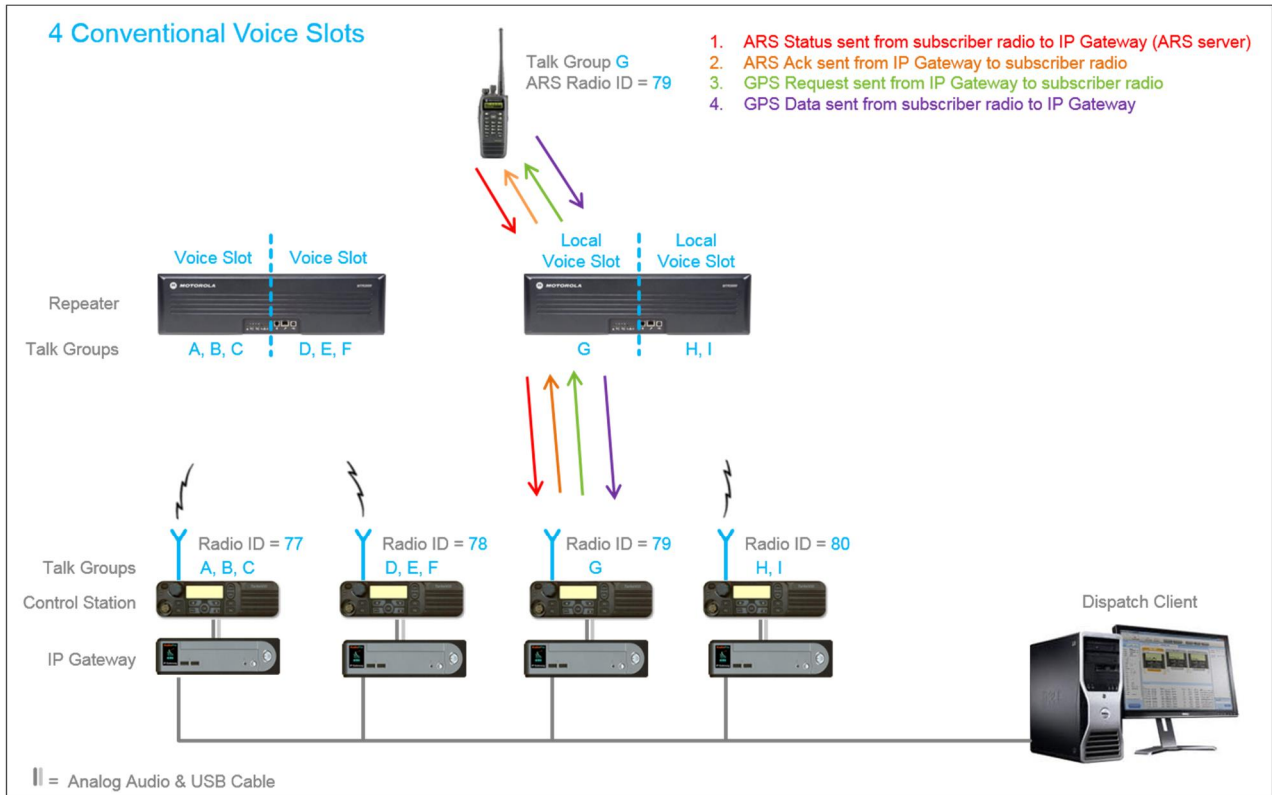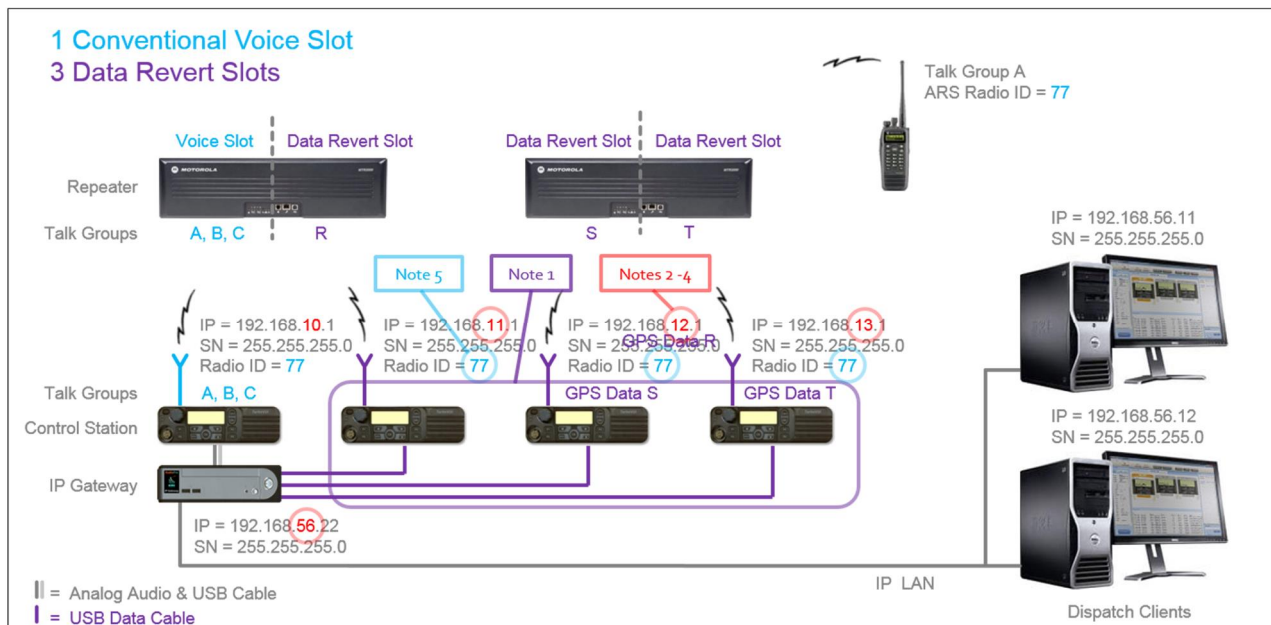

Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. An IP Gateway can support one Voice Radio and three Data Revert Radios. See [Note 1] indicated in system diagram.

2. IP Gateways must have a fixed IP Address. See [Notes 2 - 4] indicated in system diagram.

3. An IP Gateway and all radios connected to it must have unique subnets. See [Notes 2 - 4] indicated in system diagram.

4. For radios sharing an IP Gateway, the IP address of the Voice Radio must be lower than the IP addresses of the Data Revert Radios. See [Notes 2 - 4] indicated in system diagram.

5. All radios that share an IP Gateway must have the same Radio ID. See [Note 5] indicated in system diagram.

See ***RadioPro IP Gateway Installation Guide*** for additional setup details for Control Station radios and Subscriber radios.

ARS and GPS Signaling (Conventional with Data Revert)

For Conventional Digital systems with **Data Revert** slots, one RadioPro IP Gateway can support one **Voice** Control Station Radio as well as three additional **Data Revert** Radios. The RadioPro IP Gateway must have software version 5.1.5 or later.

When **Data Revert** slots are used in a system, only *GPS Data* status messages from the subscriber radios use the Data Revert repeater slot. All other data (such as *GPS Request* messages from the RadioPro IP Gateway, *ARS Status* messages from a subscriber radio, and the *ARS Acknowledge* messages from the RadioPro IP Gateway) use a **Voice** radio and **Voice** repeater slot.
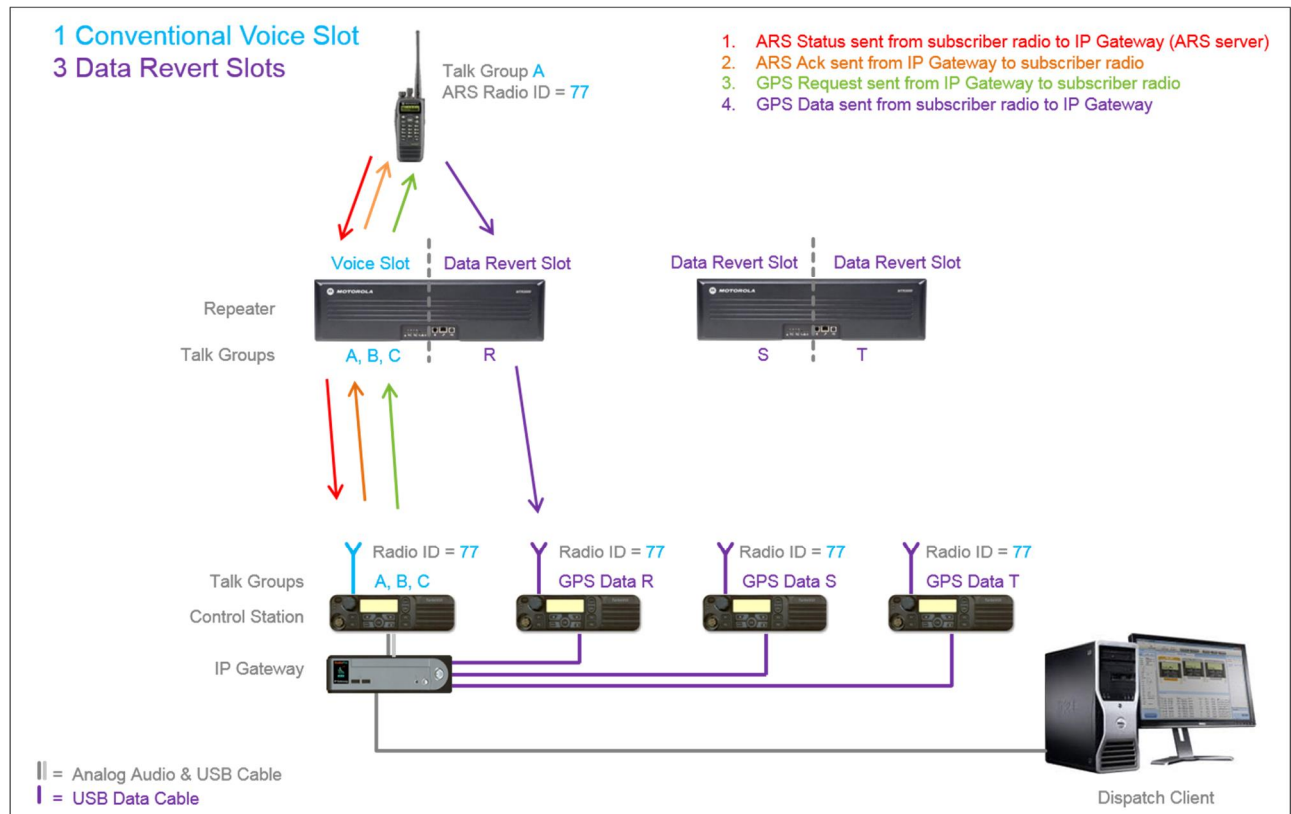
See *RadioPro IP Gateway Installation Guide* for additional setup details for Control Station radios and Subscriber radios.

IP SITE CONNECT SYSTEM WITHOUT DATA REVERT

IP Addresses and Radio IDs

For IP Site Connect systems without Data Revert slots, each **repeater voice slot** must have an associated XPR4550 Control Station radio and RadioPro IP Gateway as indicated in the diagram below. One RadioPro IP Gateway and XPR4550 Control Station Radio is required for each Local (non-IP Site Connect) slot. In addition, one RadioPro IP Gateway and XPR4550 Control Station Radio is required for each wide area (IP Site Connect) õchannelö. The RadioPro IP Gateway and XPR4550 Control Station Radio supporting a wide area õchannelö can be located at any site.

Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. IP Gateways must have a fixed IP Address. See Notes 1 & 2 indicated in system diagram.

2. An IP Gateway and all radios connected to it must have unique subnets. See Notes 1 & 2 indicated in system diagram.

See *RadioPro IP Gateway Installation Guide* for additional setup details for Control Station radios and Subscriber radios.

ARS and GPS Signaling (IP Site Connect)

In the following diagram, there are no dedicated **Data Revert** slots. In this case, all data request and status messages for *ARS* and *GPS* use the same **Voice** repeater slot and **Voice** radio channel.
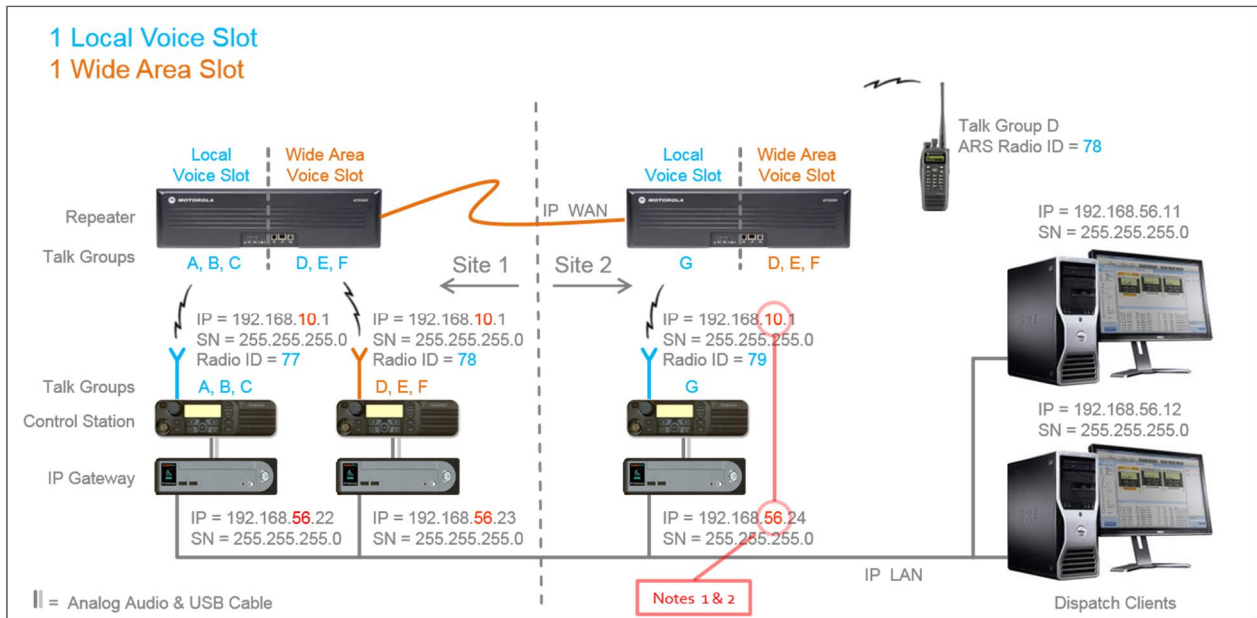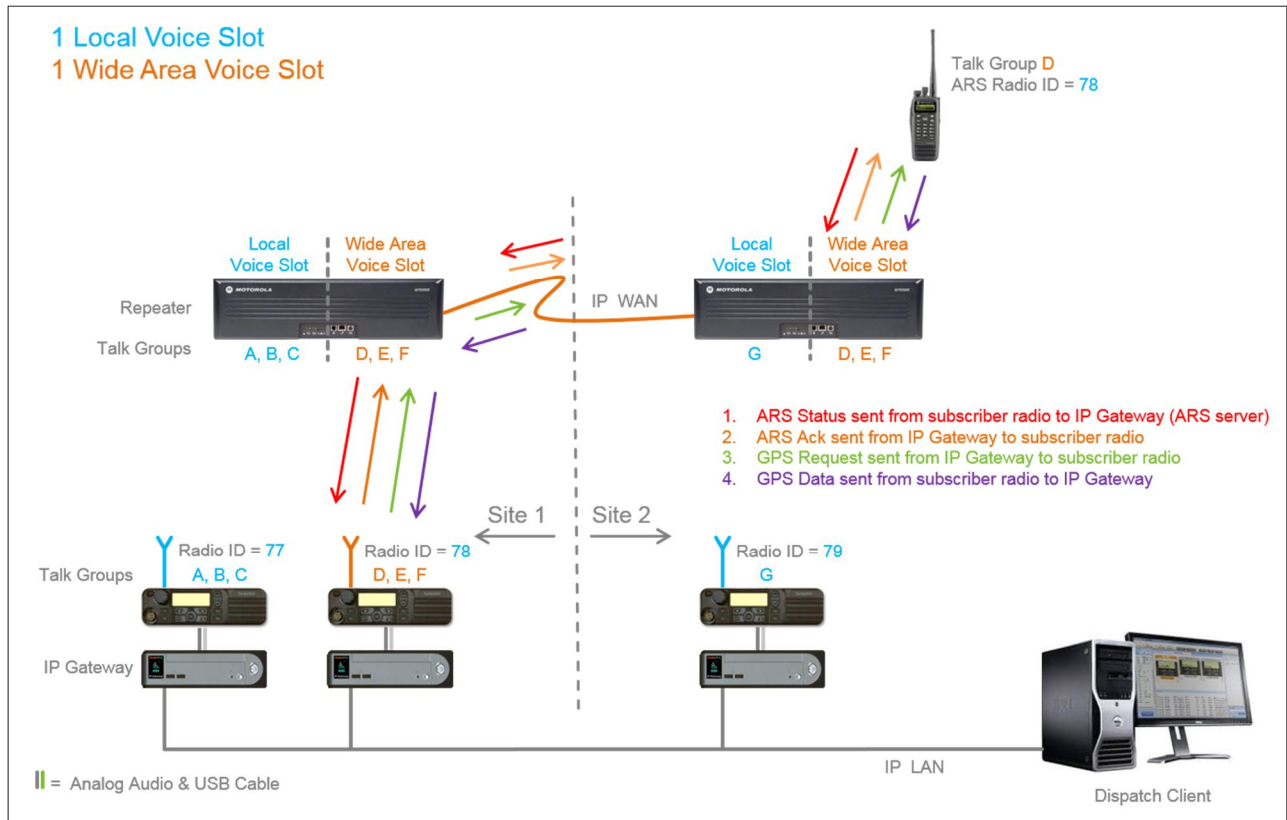

See *RadioPro IP Gateway Installation Guide* for additional setup details for Control Station radios and Subscriber radios.

IP SITE CONNECT SYSTEM WITH DATA REVERT

IP Addresses and Radio IDs

For IP Site Connect systems with Data Revert slots, one RadioPro IP Gateway can support one Voice Control Station Radio as well as three additional Data Revert Radios. The RadioPro IP Gateway must have software version 5.1.5 or later. One RadioPro IP Gateway and XPR4550 Control Station Radio is required for each Local (non-IP Site Connect) slot . In addition, one RadioPro IP Gateway and XPR4550 Control Station Radio is required for each wide area (IP Site Connect) õchannelö. The RadioPro IP Gateway and XPR4550 Control Station Radio supporting a wide area (IP Site Connect) õchannelö can be located at any site.
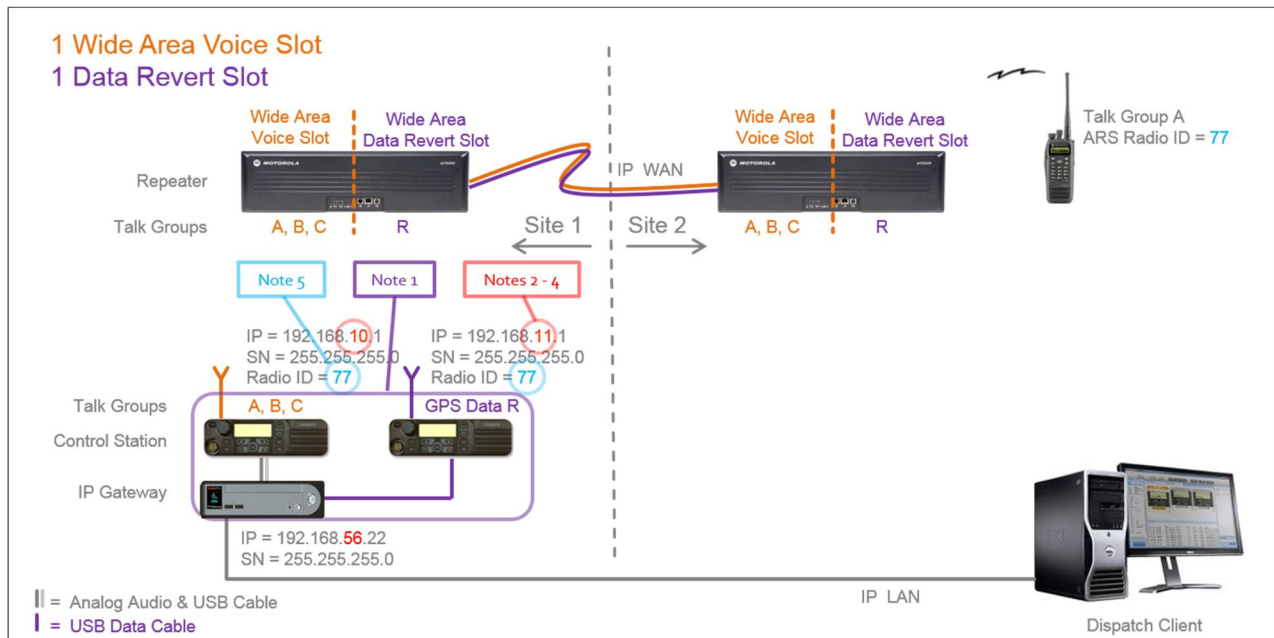

Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. An IP Gateway can support one Voice Radio and three Data Revert Radios. See Note 1 indicated in system diagram.

2. IP Gateways must have a fixed IP Address. See Notes 2 - 4 indicated in system diagram.

3. An IP Gateway and all radios connected to it must have unique subnets. See Notes 2 - 4 indicated in system diagram.

4. For radios sharing an IP Gateway, the IP address of the Voice Radio must be lower than the IP addresses of the Data Revert Radios. See Notes 2 - 4 indicated in system diagram.

5. All radios that share an IP Gateway must have the same Radio ID. See Note 5 indicated in system diagram.

See **RadioPro IP Gateway Installation Guide** for additional setup details for Control Station radios and Subscriber radios.

ARS and GPS Signaling (IP Site Connect with Data Revert)

For IP Site Connect systems with **Data Revert** slots, one RadioPro IP Gateway can support one **Voice** Control Station Radio as well as three additional **Data Revert** Radios. The RadioPro IP Gateway must have software version 5.1.5 or later.

When **Data Revert** slots are used in a system, data messages from a RadioPro IP Gateway are sent using a **Voice** radio and **Voice** repeater slot. On the other hand, data messages from a subscriber radio are sent using a **Data Revert** repeater slot and a **Data** radio.

Specifically, a *GPS Request* message from the RadioPro IP Gateway is sent using a **Voice** radio and repeater slot. The corresponding *GPS Data* status message from the subscriber radio is sent using a **Data Revert** repeater slot and radio.

Likewise, an *ARS Status* message from a subscriber radio is sent using a **Data Revert** repeater slot and radio. The corresponding *ARS Acknowledge* message from the RadioPro IP Gateway is sent using a **Voice** radio and repeater slot.
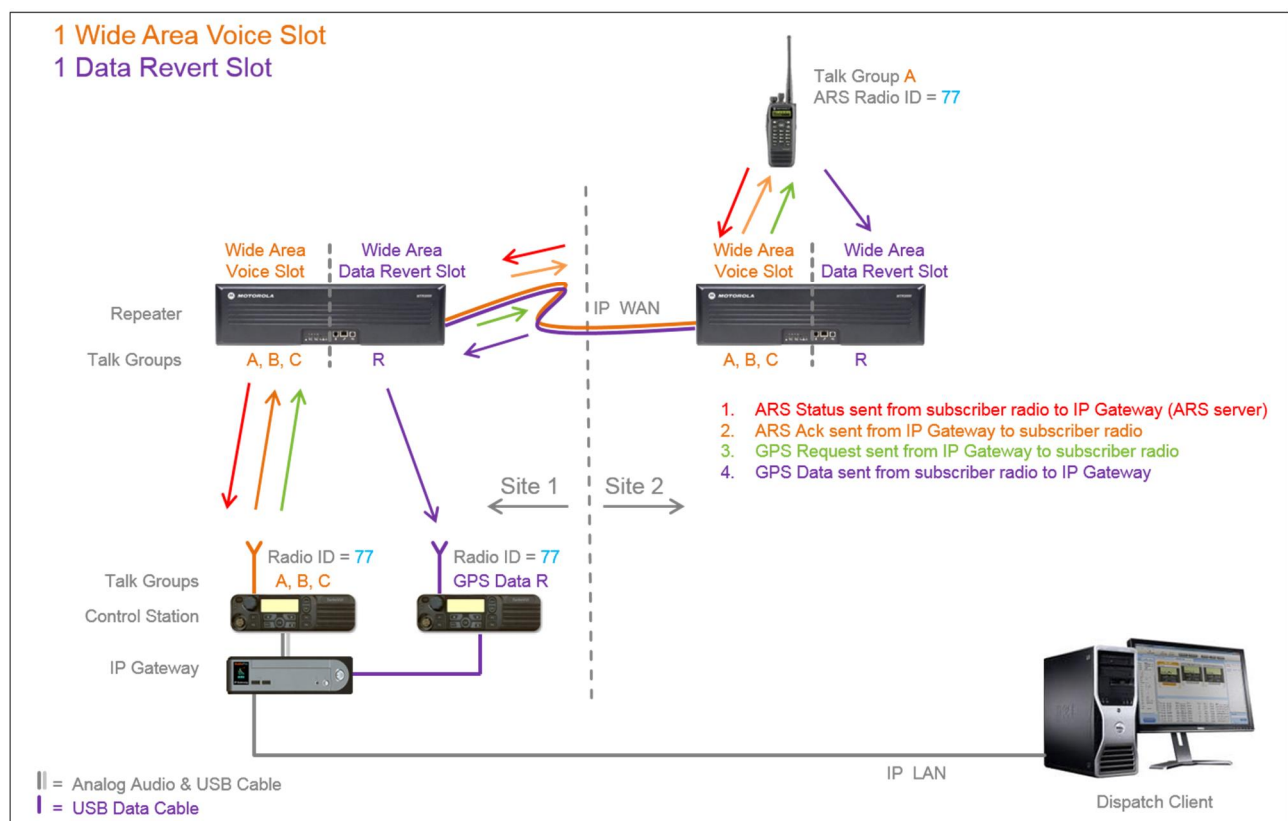
See *RadioPro IP Gateway Installation Guide* for additional setup details for Control Station radios and Subscriber radios.

CAPACITY PLUS SYSTEM WITHOUT DATA REVERT

IP Addresses and Radio IDs

For Capacity Plus systems without Data Revert slots, multiple RadioPro IP Gateway and Control Station Radio pairs may utilize a smaller number of trunked repeater slots as indicated in the diagram below.

Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. IP Gateways must have a fixed IP Address. See Notes 1 & 2 indicated in system diagram.

2. An IP Gateway and all radios connected to it must have unique subnets. See Notes 1 & 2 indicated in system diagram.

See **RadioPro IP Gateway Installation Guide** for additional setup details for Control Station radios and Subscriber radios.

ARS and GPS Signaling (Capacity Plus)

In the following diagram, there are no dedicated Data Revert slots. In this case, the *GPS Request* message from the RadioPro IP Gateway and the *GPS Data* status message from the subscriber radio use the same **Voice** repeater slot and **Voice** radio channel.   On the other hand, the *ARS Status* message from the subscriber radio and the *ARS Acknowledgement* message from the RadioPro IP Gateway use the **Rest** repeater slot and same **Voice** radio channel.
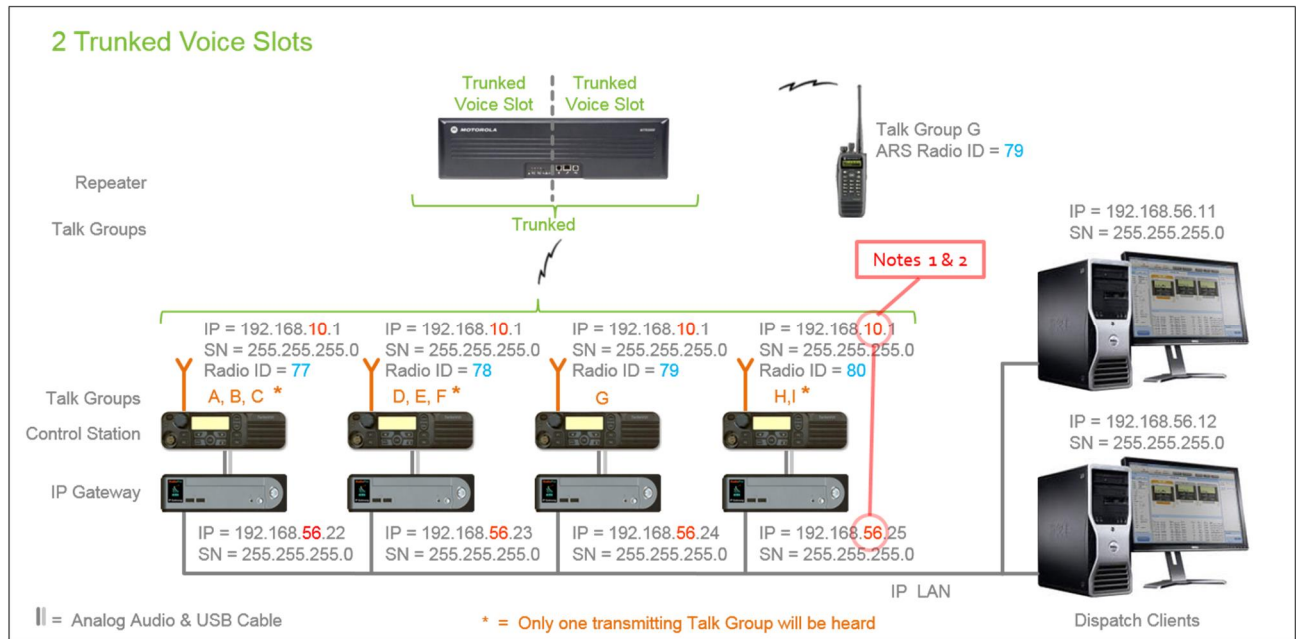

See *RadioPro IP Gateway Installation Guide* for additional setup details for Control Station radios and Subscriber radios.

CAPACITY PLUS SYSTEM WITH DATA REVERT

IP Addresses and Radio IDs

For Capacity Plus systems with Data Revert slots, multiple RadioPro IP Gateway and Control Station Radio pairs may utilize a smaller number of trunked repea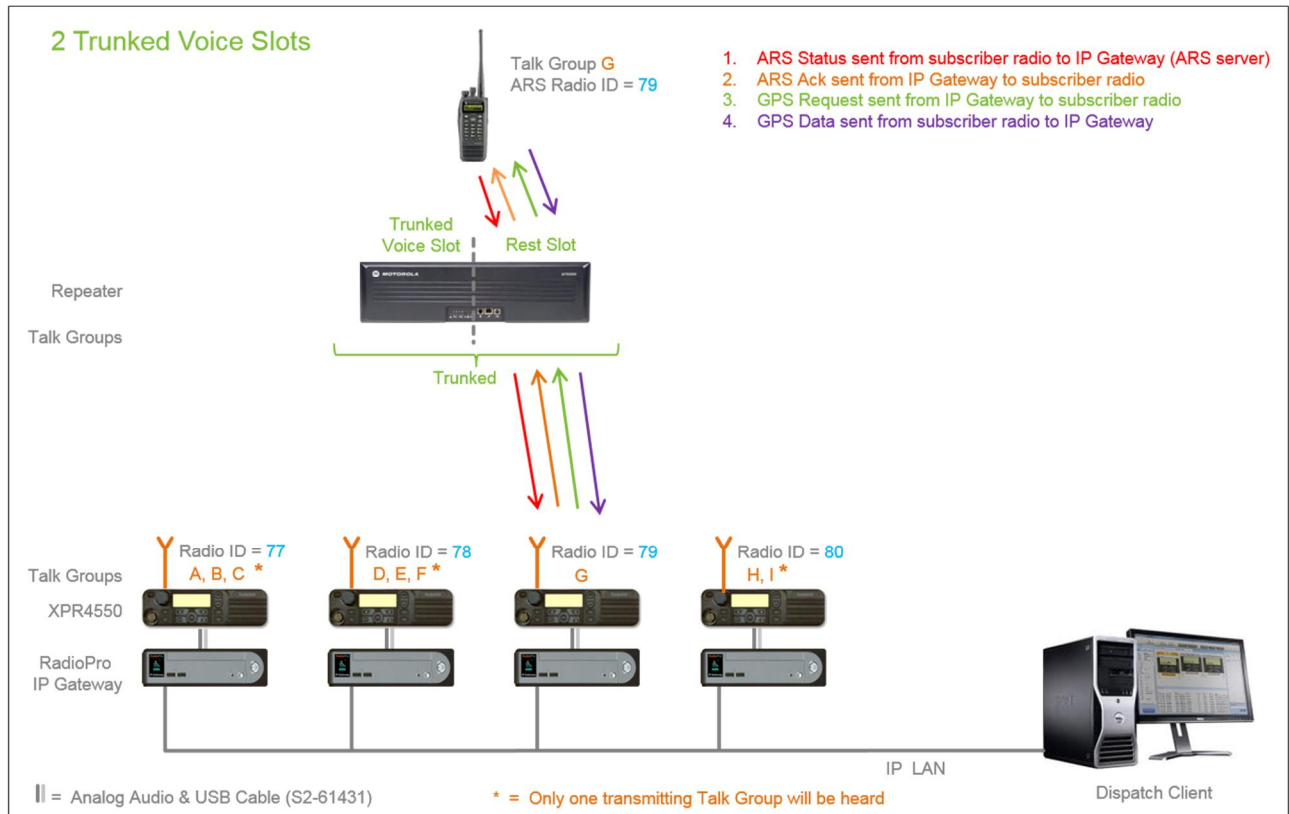ter slots as indicated in the diagram below. In addition, one RadioPro IP Gateway can support one Voice Control Station Radio as well as three additional Data Revert Radios. The RadioPro IP Gateway must have software version 5.1.5 or later.

Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. An IP Gateway can support one Voice Radio and three Data Revert Radios. See Note 1 indicated in system diagram.

2. IP Gateways must have a fixed IP Address. See Notes 2 - 4 indicated in system diagram.

3. An IP Gateway and all radios connected to it must have unique subnets. See Notes 2 - 4 indicated in system diagram.

4. For radios sharing an IP Gateway, the IP address of the Voice Radio must be lower than the IP addresses of the Data Revert Radios. See Notes 2 - 4 indicated in system diagram.

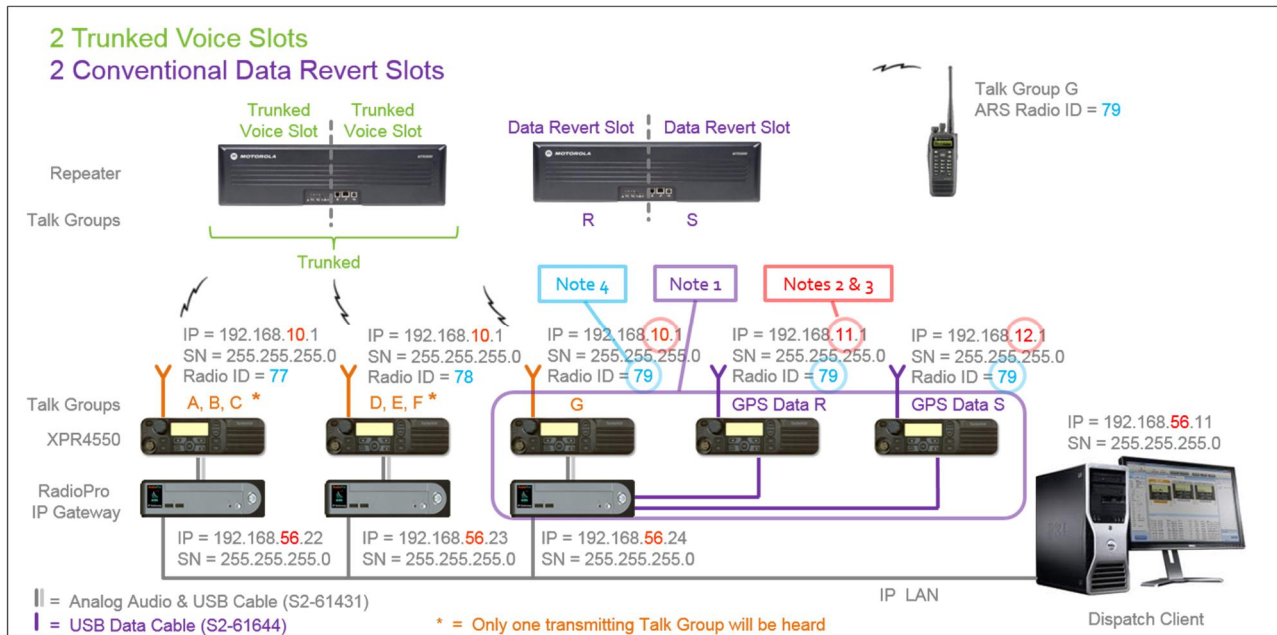5. All radios that share an IP Gateway must have the same Radio ID. See Note 5 indicated in system diagram.

See *RadioPro IP Gateway Installation Guide* for additional setup details for Control Station radios and Subscriber radios.

ARS and GPS Signaling (Capacity Plus with Data Revert)

For Capacity Plus systems with **Data Revert** slots, one RadioPro IP Gateway can support one **Voice** Control Station Radio as well as three additional **Data Revert** Radios. The RadioPro IP Gateway must have software version 5.1.5 or later.

When **Data Revert** slots are used in a Capacity Plus system, data messages from a RadioPro IP Gateway are sent using a **Voice** radio and one of the trunked **Voice** repeater slots. On the other hand, data messages from a subscriber radio are sent using a **Data Revert** repeater slot and a **Data** radio.

Specifically, a *GPS Request* message from the RadioPro IP Gateway is sent using a **Voice** radio and one of the trunked **Voice** repeater slots. The corresponding *GPS Data* status message from the subscriber radio is sent using a **Data Revert** repeater slot and **Data** radio.

Likewise, an *ARS Status* message from a subscriber radio is sent using a **Data Revert** repeater slot and **Data** radio. The corresponding *ARS Acknowledge* message from the RadioPro IP Gateway is sent using a **Voice** radio and one of the trunked **Voice** repeater slots.

See *RadioPro IP Gateway Installation Guide* for additional setup details for Control Station radios and Subscriber radios.

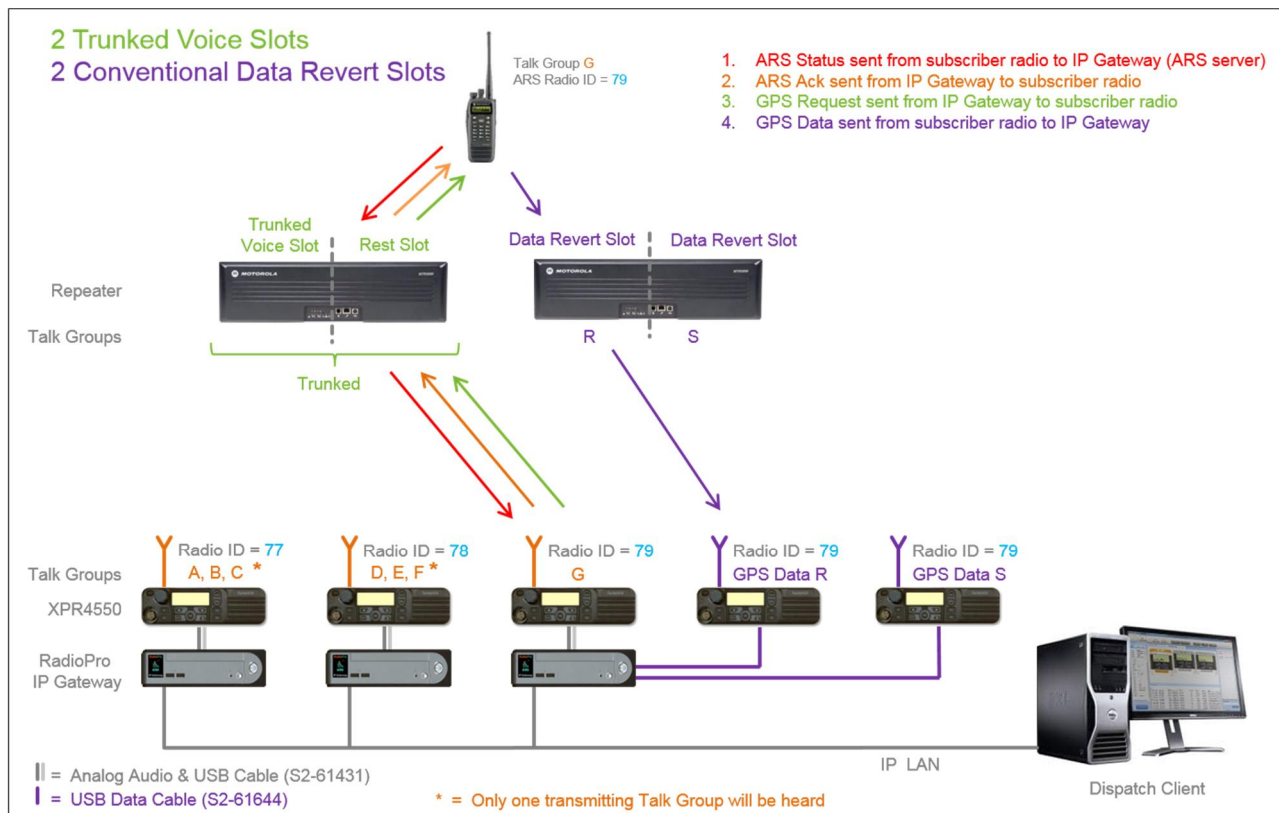# MOTOROLA ENHANCED GPS REPEATER OPTION

COMPARISON WITH STANDARD DATA REVERT

The õEnhanced GPSö repeater option available from Motorola is an inexpensive way to dramatically improve GPS data throughput in a system with Data Revert repeater slots. The license for this option is purchasable from Motorola for either new repeaters or an upgrade to existing repeaters. For the XPR8K repeaters, order Motorola # HKVN4048. The following table compares two systems, each with a requirement to update 225 radio subscribers once every minute. Each system has data revert slots for transferring the GPS data from subscriber radios.

Enhanced GPS Option?	Data Reliability	Required Data Revert Repeater Slots	Required Data Revert Repeaters
No	100%	12	6
Yes	100%	2	1

The Enhanced GPS repeater option achieves this increase in efficiency by dividing the target update rate (30s, 1min, 2min, 4min, or 8min) into multiple õtime slicesö. When a subscriber radio is powered on, the repeater synchronizes its time clock with the subscriber radio, and then assigns a unique õtime sliceö for that subscriber radio. The subscriber radio reports GPS data when itøs assigned õtime sliceö reoccurs. Using this method, data collisions are eliminated, and the efficiency of data reporting is improved as indicated in the table above.

RADIO UPDATES VS. WINDOW SIZE

In the following *Radio Update Tables*, the number of radio GPS updates is indicated based on selection criteria of Update Interval and Window Reservation.

Window Size = 5, Privacy Type must be **None** or **Basic**

Window Reservation / Update Interval	90%	75%	60%	45%
30 sec	90	75	60	45
1 min	180	150	120	90
2 min	360	200	240	18
4 min	720	600	480	360
8 min	1440	1200	960	720

Window Size = 6, Privacy Type is **Enhanced**

Window Reservation / Update Interval	90%	75%	60%	45%
30 sec	74	62	49	37
1 min	148	124	98	74
2 min	296	248	196	148
4 min	592	496	392	296
8 min	1184	992	784	92

CONFIGURATION REQUIREMENTS

RadioPro IP Gateways, MOTOTRBOÎ repeaters, and subscriber radios must be configured to correctly use the õEnhanced GPSö repeater option.

RadioPro IP Gateways

The ICU.exe utility must be used to configure the settings in the GPS tab as shown at right.

- ✓ Place a check in the box for õEnable GPS Pollingö.

- ✓ Specify a õMinimum poll rateö of 30, 60, 120, 240, or 480 seconds. These are the only values that are supported by the õEnhanced GPSö option.
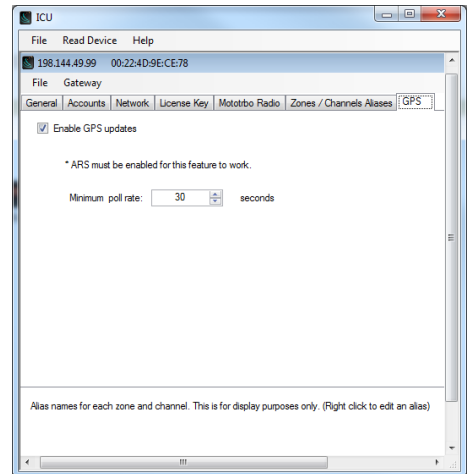
MOTOTRBO¦ Repeaters

The MOTOTRBOÎ repeaters used for Data Revert channels must have the õEnhanced Repeaterö option enabled. Contact Motorola for ordering information.

Conventional and IP Site Connect

For Conventional or IP Site Connect radio systems, one slot in a repeater can be used for voice, while the other is used for data revert.

Capacity Plus and Linked Capacity Plus

For Capacity Plus and LCP systems, repeaters used for data revert are standalone, and are not part of the trunked system.

SYSTEM DESIGN RESOURCES

MOTOTRBO SYSTEM DESIGN TOOLS

Motorola has created a toolset to help in estimating system resources in the following areas:

- Capacity Plus System Estimator

- Connect Plus System Estimator (Note: RadioPro will not function in Connect Plus systems until Motorola releases Version 1.3 for the radios.)

- Conventional Loading Calculator

- Enhanced GPS Calculator

- Connect Plus Site Link Bandwidth Calculator (Note: RadioPro will not function in Connect Plus systems until Motorola releases Version 1.3 for the radios.)

- IP Site Connect Bandwidth Calculator

The above Tool Set is available on the MOL (Motorola On-Line) site using the following folder path in the *Resource Center* tab:

Resource Center tab
>> **> Software**
>>> **> Two-Way**
>>>> **> MOTOTRBO**
>>>>> **> Data Applications**
>>>>>> **> MOTOTRBO System Design Tools**

Some System Design Tools use unrealistic parameter values in their calculation, especially for Motorola's Enhanced GPS option. For example, the Capacity Plus System Estimator uses a Window Size of 5, and GPS Update Allocation of 100%. Results obtained using these values yields a capacity of 128 GPS updates per minute per repeater slot, however this is not a practical number.

A more realistic system would have a Window Size of 8, and GPS Update Allocation of 90%. Using these input parameter values, the more practical capacity is 113 GPS updates per minute per repeater slot. This is still about six times improvement over a system without the "Enhanced GPS" repeater option, so is much more efficient use of repeater slots.

RADIOPRO SYSTEM PLANNER TEMPLATE

Use the System Planner Template at the end of this document to record device names, passwords, and IP addresses.

APPENDIX

APPENDIX - RADIOPRO IP GATEWAY SPECIFICATIONS

Mechanical and Environmental

Dimensions:	8.25öw x 2.5öh x 11.5öd
Weight:	3 lbs.
Temperature Range:	0-50 ^{o}C
Humidity:	10-95% non-condensing

Electrical

AC Input (with included Power Adapter):	100ó240Vac, 200mA max, 50-60Hz
DC Input, SNs before 3154:	11.5-12.5Vdc, 2A max (Normally)
DC Input, SNs after 3154:	12 -32Vdc, 2A max (optional PS upgrade required)

Note: In order to accommodate a higher voltage and/or a wider range, a different Power Supply option is required. The option is compatible with gateways produced after the Serial number 3154. This upgrade option needs to be specifically ordered for new gateways, whereas existing gateways may still be upgradable post sale, through the CTI RMA process, if supplies are available.

Miscellaneous

MOTOTRBO interface	DE-9 Female & USB (use cable S2-61431)
NEXEDGE interface	DB-25 Female (use cable S2-61769)
Transmit/Receive Impedance	600 ohms
Clients Supported	80 Solo, Talk, or Talk for Mobile, plus 12 Dispatch
Power-On	Auto
Network Bandwidth (for each connected client)	2.2k Bytes per Second with audio compression enabled
	22k Bytes per Second without audio compression
Port Forwarding (for Firewall Configuration)	TCP Port 48222 (default)

APPENDIX - IP ADDRESSING

Normally, the factory default IP Address programmed into the Control Station radio **should not be changed**. However, it must be on a different subnet than the RadioPro IP Gateway that is connected to it via the Rear Accessory Connector.

For example, if the networkøs Subnet Mask is 255.255.255.0, then at least one of the first three octets of the MOTOTRBO radio IP address must be different than the RadioPro IP Gateway module IP address.

The following **IS NOT** a valid IP addressing scheme since both devices are on the **SAME** subnet:

	Control Station Radio	RadioPro IP Gateway
IP Address:	192.168.12.2	192.168.12.3
Subnet Mask:	255.255.255.0	255.255.255.0

The following **IS** a valid IP addressing scheme since the devices are on **DIFFERENT** subnets:

	Control Station Radio	RadioPro IP Gateway
IP Address:	192.168.12.2	192.168.10.3
Subnet Mask:	255.255.255.0	255.255.255.0

For additional information see Ciscoøs *IP Addressing and Subnetting for New Users*, Document ID 13788, located at:

SYSTEM COMPATIBILITY CONSIDERATIONS

Use the following table to determine compatibility between RadioPro or TurboVUi IP Gateway and software clients:

	IP Gateway				
Dispatch Client for PC	**v8.0.x**	**v7.0.x**	**v6.0.x**	**v5.1.x**	**v5.0.x**
Dispatch v8.0.x (Windows 7 or 8)	Yes				
Dispatch v7.0.x (Windows 7 or 8)		Yes	Yes ❶		
Dispatch v6.0.x (Windows XP or 7)		Yes	Yes		
Dispatch v5.1.x (Windows XP or 7)		Yes	Yes	Yes	
Dispatch v5.0.x (Windows XP or 7)					Yes
Talk or Solo Client for PC					
RadioPro Talk (Windows 7 or 8)	Yes	Yes ❷			
TurboVUi Solo (Windows XP or 7)	Yes ❸	Yes ❸	Yes	Yes	Yes
Mobile App for iOS and Android					
RadioPro Talk for Mobile (4th generation)	Yes				

Notes: ❶ Channel-to-channel patching in RadioPro Dispatch is only available when both IP Gateway and Dispatch software are v7.0.x (or higher).
❷ RadioPro Talk requires minimum IP Gateway v7.0.10.
❸ TurboVUi Solo will show accurate radio display information ONLY if connected to an XPR4550 radio and the system is NOT Connect Plus.
❹ IP Gateway v8.0.6 is not compatible with TurboVUi Pocket. Other versions (older and newer) of IP Gateway are compatible.

When upgrading to a new version where RadioPro Clients and IP Gateways are being upgraded, it is usually better to upgrade the IP Gateways before upgrading the Clients.

APPENDIX - CONFIGURING PORT FORWARDING ON ROUTERS
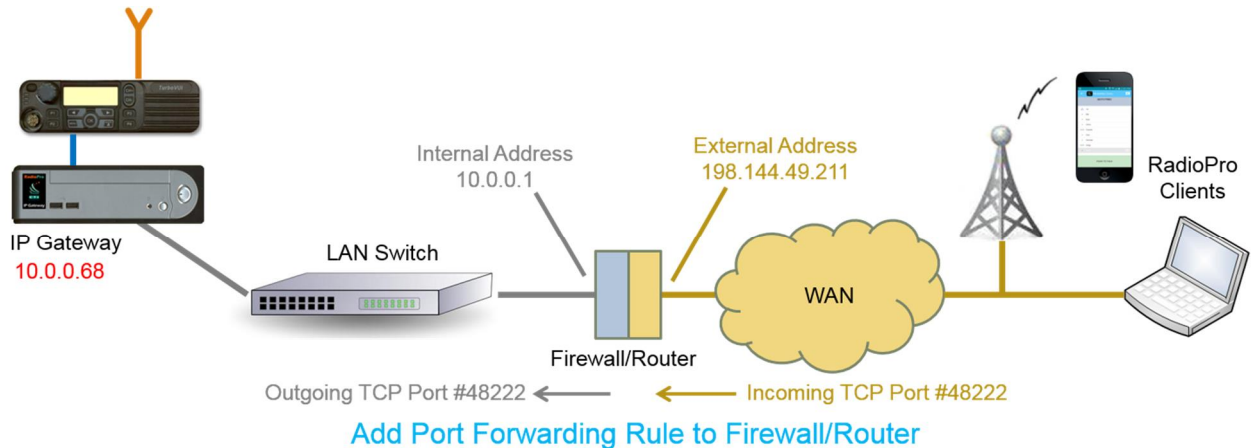
If RadioPro clients (such as Dispatch, Solo, Talk, or Talk for Mobile) will access an IP Gateway from a different IP network, then the IT Administrator must configure *port forwarding* within the firewall or router that separates the RadioPro IP Gateway from RadioPro clients. This is also true when one or more of the clients listed above connects to a RadioPro IP Gateway from the Internet.

The default IP port used by a RadioPro IP Gateway is **TCP Port 48222**. However, this may be changed using ICU.exe on the **Network** tab.

The default IP port used by RadioPro clients is TCP Port 48222. However, any other port may be specified during the login from any RadioPro client by specifying this port number as follows:

> 100.100.100.33:7777
>
> where:
> 100.100.100.33   is the external or wide-area address of the firewall or router.
>
> 7777   is the external port of that firewall used for RadioPro IP Gateway.

If multiple RadioPro IP Gateways are located behind a firewall, they will each need a Port Forwarding rule. In this case, the external port numbers specified for each rule must be unique.

See www.portforwarding.com for detailed instructions for the specific router in use at your site.

APPENDIX Ë RACK MOUNTING

Rack Shelf

A rack shelf can be used to hold the RadioPro IP Gateway and XPR4550 Control Station Radio in a standard 19ö wide rack. The two devices can be located next to each other on the same shelf. The following rack shelf is recommended, but others may be used that have a depth of at least 12ö:

    Rack Shelf 2RU x 15ö, CTI Products # S2-61548,

            also available as Cable Organizer # QES0319-0215:

            http://www.cableorganizer.com/computer-cabinets/rack-shelves/single-side-non-vented-shelves.html

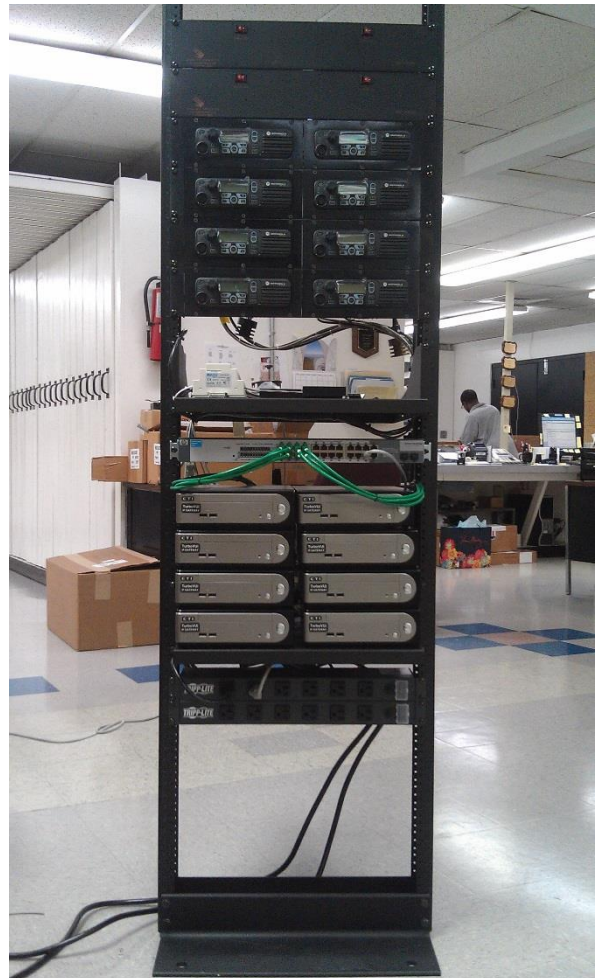## *XPR4550 Fixed Mounting*

The XPR4550 Control Station radio may be mounted using a Rack Frame Kit and Mounting Plate:

    Rack Frame Kit, 2 RU, CTI Products # 99-12323,

            also available as Middle Atlantic Products # FK2:

            www.middleatlantic.com/rackac/ucp/custom.htm

    Mounting Plate for XPR4550, CTI Products # 99-12324

        XPR4550 is mounted using side swivel-mount screws.

SYSTEM PLANNER TEMPLATE	**PAGE 1 OF 2**

RadioPro IP Gateways

See RadioPro IP Gateway Installation Guide, document # S2-61781 for more information.

Parameters Common to all IP Gateways

ICU.exe Admin Password *for ICU.exe, default is Î adminÎ*	Dispatch Client Password *for Dispatch client connections default is Î userÎ*	NTP Server IP Address *Network Time Protocol*

Parameters Unique to Each IP Gateway

GPS = GPS Data Revert. *Each IP Gateway supports 1 Voice & 1 GPS Data Radio.*	Name *IP Gateway name has max 2 lines, 24 chars per line*	Serial #	IP Address	Subnet Mask	Default Gateway
IP Gateway A	Example Gateway Name	1234	192.168.56.22	255.255.255.0	192.168.56.1
Voice Radio A0	Example Radio VR A0		192.168.10.1	255.255.255.0	
GPS Radio A1	Example Radio GPS A1		192.168.11.1	255.255.255.0	
IP Gateway B					
Voice Radio B0					
GPS Radio B1					
IP Gateway C					
Voice Radio C0					
GPS Radio C1					
IP Gateway D					
Voice Radio D0					
GPS Radio D1					
IP Gateway E					
Voice Radio D0					
GPS Radio D1					
IP Gateway F					
Voice Radio D0					
GPS Radio D1					
IP Gateway G					
Voice Radio D0					
GPS Radio D1					
IP Gateway H					
Voice Radio D0					
GPS Radio D1					
IP Gateway J					
Voice Radio E0					
GPS Radio E1					

If additional IP Gateways are needed, copy this page.

See next page for System Planner Template Page 2 of 2

RadioPro Dispatch Clients

See RadioPro Dispatch Installation and Configuration Guide, document # S2-61785 for more information.

*Parameters Common
to all Dispatch clients*

*Parameters Unique
to all Dispatch clients*

Administrator Password for Edit Mode

PC Name	IP Address	License Serial #	Licensed IP Gateway Connections

RadioPro Talk and Mobile Clients

See RadioPro Talk Quick-Start Guide, document # S2-61783 for more information.

Parameters Common to all Talk Clients

Administrator Login Name Not Editable	Administrator Password default is Í adminÎ
admin	

User Login Name default is Í userÎ	User Password default is Í userÎ

If additional Talk or Mobile client logins are needed, copy this page.