

CTI Products

RadioPro™

by CTI Products, Inc.

System Planner

for Motorola MOTOTRBO



For Version 9 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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Disclaimer

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SYSTEM OVERVIEW

RadioPro™ is a licensed managed communication product, which allows remote access to RF 2-way radios systems over IP Networks. This “Dispatch over IP” (DoIP) solution consists of Windows® PC-based software, which allows voice and data communications between Client PC users and 2-way radio subscribers. Communications with radio subscribers is also possible for remote mobile device users on Android and iOS platforms. A functional RadioPro system must have at least one, of ALL the following components:

- One Server (**RadioPro IP Gateway device**),
- One Client (**Dispatch™, Solo™, or RadioPro Talk application**)
- Ethernet access to connect the RadioPro IP Gateway to a LAN or WAN.
- One connection license (for each required Dispatch or Solo client)

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 between the mobile radio (Control Station) and an IP network. The RadioPro Gateway is:
 - the IP Translator for the ‘Control Station Radio’
 - the Server for the ‘Remote Clients’ that seek to connect.



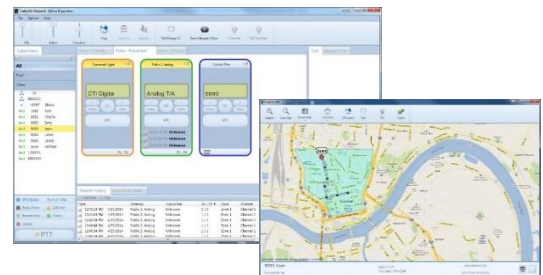
One IP Gateway is required for each control station radio used for Voice.

System components, such as IP Gateways and clients, may be located together or separated geographically but connected via a Wide Area Network (WAN) or Virtual Private Network (VPN). Optional license must be purchased, to allow client connections using Solo, Talk, and/or Talk for Mobile applications, to connect to the Gateway and use the two-way radio system. Each IP Gateway requires a static IP address.

For more information about the Gateway Kit see the following links or documents:

- [RadioPro IP Gateway Installation Guide](#)
- [RadioPro IP Gateway Installation Guide for **Motorola MOTOTRBO**](#)
- [RadioPro IP Gateway Installation Guide for **Motorola APX 4500**](#)
- [RadioPro IP Gateway Installation Guide for **Kenwood NEXEDGE NX-7xx-8xx 37xx-38xx**](#)
- [RadioPro IP Gateway Installation Guide for **Kenwood NEXEDGE NX-57xx-58xx**](#)
- [RadioPro IP Gateway Data Sheet](#)
- [RadioPro Family of Products](#)

- **RadioPro Dispatch Client** (CTI Part #s S1-61770 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 of multiple simultaneous radio channels or talk groups, as well as GPS/AVL, Telemetry, Text Messaging, and Voice Logging. The Windows 10 or 8.1 operating system is required. This solution is compatible for use with either Motorola MOTOTRBO or Kenwood NEXEDGE radio systems.



System components, such as Dispatch clients and IP Gateways, may be located together or separated geographically but connected via a Wide Area Network (WAN) or Virtual Private Network (VPN).

For more information, see the following links or documents:

- [RadioPro Dispatch Installation and Configuration Guide](#)
- [RadioPro Dispatch User Guide](#)
- [RadioPro Dispatch Data Sheet](#)
- [RadioPro System Accessories](#)

- **Solo™ Client** is a software application that provides remote radio operation of a single radio channel or talk group using PCs and notebooks. It is designed for use with Motorola MOTOTRBO and Kenwood NEXEDGE radio systems. It features a virtual radio head, which duplicates the full functionality of compatible control station radios that are connected. Features include:
 - Channel Steering,
 - 24-hour Voice logging,
 - Subscriber contact listing and
 - Text Messaging.



The Client application requires the Windows 10 or 8.1 operating system. The use of this application requires an optional license to be installed on the IP Gateway. The license determines the number of simultaneous persistent Solo and RadioPro Talk mobile users that can be connected to the radio system at one time. System components, such as clients and IP Gateways, may be located together or separated geographically, but connected via a Wide Area Network (WAN) or Virtual Private Network (VPN).

For more information, see the following links or documents:

[RadioPro Solo Client Installation Guide](#)

[RadioPro Solo User Guide](#)

[RadioPro Solo Data Sheet](#)

- **RadioPro Talk™** is a mobile app for Android and iOS that provides portable remote operation of a 2-way radio system:
 - for voice communications,
 - text messaging, and
 - locating another user.

This application can be used with either Motorola MOTOTRBO or Kenwood NEXEDGE radio systems. The Mobile app can connect using cellular or Wi-Fi, to maintain access to Radio systems when you are on-the-go inside or outside the coverage area, but still need to communicate on your radio system. This application requires a license to be installed on the IP Gateway for the clients to operate. The license uses the same pool of licenses as the RadioPro Solo software listed above.

For more information about RadioPro Talk, see the following documents:

[RadioPro Talk for Mobile Devices How-to-Guide](#)

[RadioPro Talk for Mobile Devices Data Sheet](#)



- **Control Station Radio** - A control station radio (CSR) **must** be used for the interface to the radio system, which then connects to a RadioPro IP Gateway using the rear accessory/communications port. Each CSR used for voice requires one IP Gateway. Simultaneous channel monitoring will require one CSR per channel. Compatible CSR Radio models that support full radio functionality from a RadioPro client include:

- **Motorola MOTOTRBO:** XPR 2500
XPR 5550/5550e (5000/5000e Series)
XPR 5550e (5000e Series)
- **Motorola P25:** APX 4500 (Intercom Only)
- **Kenwood NEXEDGE:** NX-700 / NX-800
NX-720 / NX-820
NX-3720 / NX-3820
NX-5700 / NX-5800

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

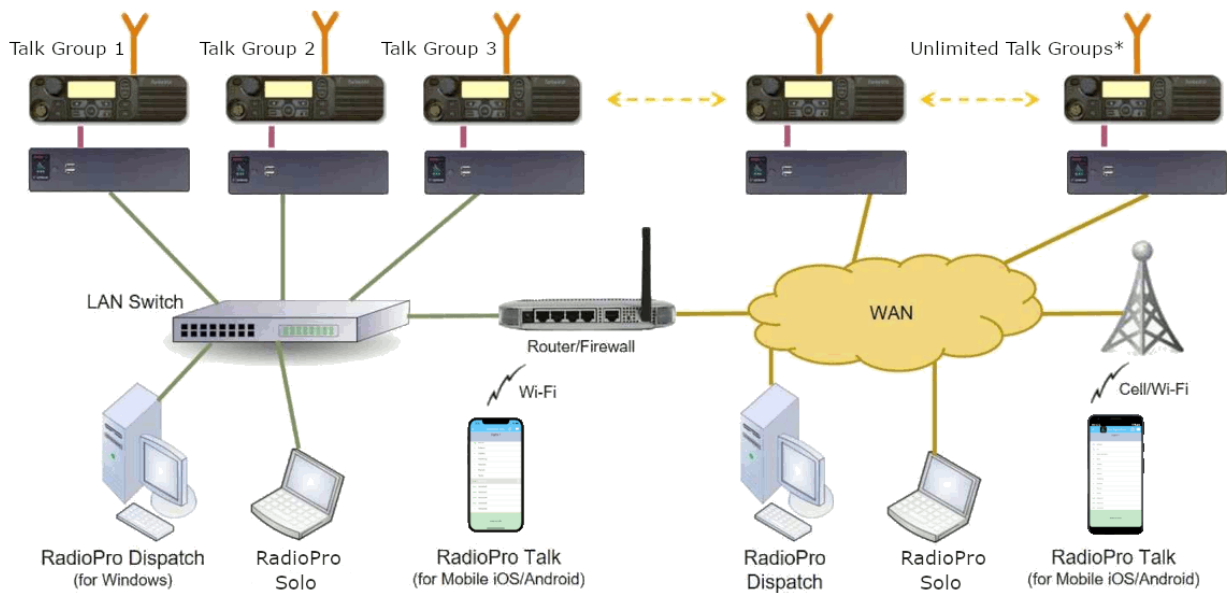
ARCHITECTURE

The IP Gateway interfaces the radio system to an IP network. One IP Gateway is required for each control station radio used for voice. However, 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.

As a rule, one IP Gateway is required for each control station radio used for voice. Similarly, one control station system is required for each channel or talk group that needs to be accessed and used concurrently on a multi-channel system.

Each RadioPro IP Gateway acts as a Network Interface for the Control Station Radio connected to it, and allows easy wide-area deployment. Additionally, each RadioPro IP Gateway also functions as a server for the remote clients seeking to establish a connection and use the radio system.

Systems may have a mixture of RadioPro Dispatch, Solo, and Talk clients for PCs, as well as RadioPro Talk for 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.



* Max 80 Clients connected to 1 Gateway. Max 70 Gateways connected to 1 Dispatch Client.

Diagram 1

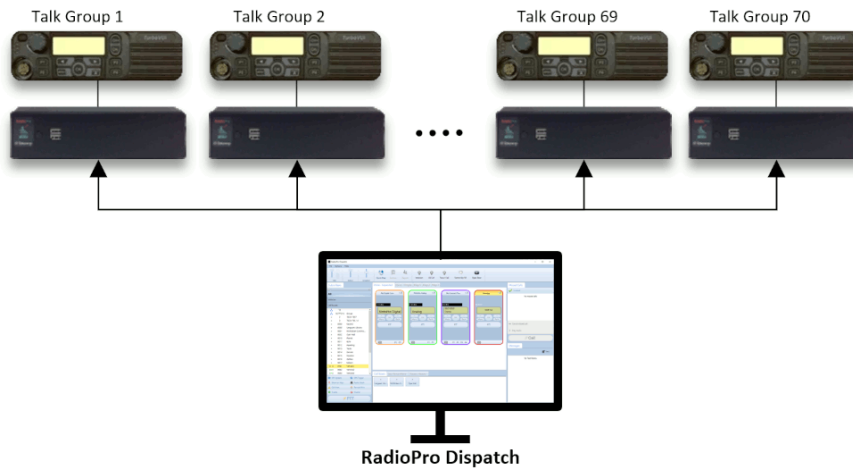
System Component Limits

The RadioPro solution was tested and verified to operate up to the maximum number of components listed below.

Maximum of 80 Clients per IP Gateway



Maximum of 70 IP Gateways per Dispatch Client



SYSTEM CONSIDERATIONS

System Planner Template

The System Planner Template can be found at the end of this document and can be used during the “Planning Phase” of a project to record IP addresses, usernames, passwords, serial numbers, and device names.

Version Compatibility

RadioPro Dispatch clients and IP Gateway versions must be matched in order to communicate with each other. Compatibility can be assured when the first two (Major) digits of the version number are the same. (The third digit indicates a minor revision and will not present a compatibility issue if not matched.)

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

LICENSING

RadioPro Dispatch Clients

The RadioPro Dispatch is a multilinking client software, capable of making several simultaneous connections to multiple RadioPro gateways at once. Each PC requires Windows OS to install the Dispatch client but also needs a unique factory supplied software license key to be imported to the PC to customize it for use.

The Dispatch (multilink) license key file specifies the number of IP Gateways that a RadioPro Dispatch console can be configured for connection and use. It also determines availability for GPS, Text Messaging and other purchasable options.

Additional features and Gateway connections (up to the Component Limits) can be purchased and added to an existing license file at any time.

Note: License upgrade components may be added, but not removed from existing license files.

RadioPro Solo for PC, and RadioPro Talk for iOS and Android

These are Uni-linking client options, which can connect to a single RadioPro IP Gateway for a single session; but with the advantage of running on different platforms and or devices. Though limited by comparison to the Multilink Dispatch option, they still provide an affordable and compact set of features for radio control operations.

The single-link client applications also require a separate license file, to be installed on the IP Gateway, to manage connections from Solo (for PCs and Notebooks) and RadioPro Talk for mobile devices (for Android and iOS). Licenses for the latter may be acquired when the IP Gateway is originally purchased, but can also be easily upgraded and added post installation, to a RadioPro IP Gateway.

The serial number label located on the bottom of the IP Gateway indicates the number of Solo and RadioPro Talk connection licenses installed on the IP Gateway at the initial factory setup.

The number stated for the Solo, and Talk for Mobile licenses, indicates the maximum number of persisting simultaneous connections that will be maintained by the Gateway, when multiple client applications want to connect and use the Radio system.

However, upgraded license quantities in the gateway may not be reflected accurately if changes were made after purchase. Therefore, the ICU.exe utility should **always** be used to confirm or determine the number of client connection licenses presently installed on the gateway.

OTHER ITEMS NEEDED

RADIO INTERFACE CABLE

A radio interface cable must be ordered for each IP Gateway from the following table:

<i>Control Station Radio</i>	<i>Cable Part #</i>
Motorola XPR5550/5550e/5350,	S2-61431
Motorola XPR2500	S2-61916
Kenwood NEXEDGE NX-700/800/5700/5800	S2-61769
Kenwood NEXEDGE NX-720/820/3720/3820	S2-61890

Other cables are available to connect a dedicated data revert cable. Contact CTI for more information.

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**. Motorola's CPS (Customer Programming Software) or Kenwood's FPU (Field Programming Unit) software will be needed to configure the control station radio.

<i>Control Station Radio</i>	<i>Minimum Version</i>	<i>CPS or FPU</i>
Motorola MOTOTRBO in Conventional, IPSC, Cap+, or LCP	1.08.0	CPS
Motorola MOTOTRBO in Connect Plus mode	2.2.0	CPS
Motorola MOTOTRBO Connect Plus Option Board	1.3.0	CPS
Kenwood NEXEDGE NX-700/800 or NX-720/820	3.21.00	KPG-111DN
Kenwood NEXEDGE NX-5700/5800	2.31.00	KPG-D1N

RADIO PROGRAMMING CABLE

Either the Motorola programming cable or the RadioPro Gateway cable may be used with the CPS software 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 through the Rear Accessory Connector.

WARNING: Remove any other cable from the front microphone connector before attempting to connect and use the RadioPro IP Gateway or a programming PC on the rear accessory connector. The front and rear ports cannot be engaged at the same time.

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. However, the same application PC may be used for this operation.

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	RadioPro IP Gateway Installation Guide for: <ul style="list-style-type: none"> • Motorola MOTOTRBO • Motorola APX 4500 • Kenwood NEXEDGE NX-7xx-8xx 37xx-38xx • Kenwood NEXEDGE NX-57xx-58xx
1b	Configure Control Station Radio(s) used for Data	
1c	Configure MOTOTRBO Connect Plus Option Board	
1d	Configure Subscriber Radios for ARS, GPS, and TMS	
1e	Configure MOTOTRBO repeater(s) for Enhanced GPS option	
2	Connect the RadioPro IP Gateway to a Control Station Radio	RadioPro IP Gateway Installation Guide
3a	Configure radio specific settings on the RadioPro IP Gateway(s) using the ICU.exe utility	
3b	Configure the remaining settings in the RadioPro IP Gateway(s) using the ICU.exe utility	
4	Connect the RadioPro IP Gateway to an IP Network	RadioPro IP Gateway Installation Guide
5	Configure Port Forwarding on Firewalls/Routers	
6a	Install RadioPro Solo Clients (optional)	RadioPro Solo Client Installation Guide
6b	Install RadioPro Dispatch Clients (optional)	RadioPro Dispatch Installation and Configuration Guide
6c	Install RadioPro Talk on iOS and Android (optional)	RadioPro Talk for mobile devices How-to 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 “*ARS Subscriber Refresh Rate*”. The “*ARS Subscriber Refresh Rate*” 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 Motorola’s 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 Motorola’s MOTOTRBO System Planner and the diagrams in this document for additional details.

CPS CONFIGURATION

For additional setup details for Control Station radios and Subscriber radios, See:

[RadioPro IP Gateway Installation Guide for Motorola MOTOTRBO](#)

[RadioPro IP Gateway Installation Guide for Motorola APX 4500](#)

[RadioPro IP Gateway Installation Guide for Kenwood NX-7xx-8xx 37xx-38xx](#)

[RadioPro IP Gateway Installation Guide for Kenwood NX-57xx-58xx](#)

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.

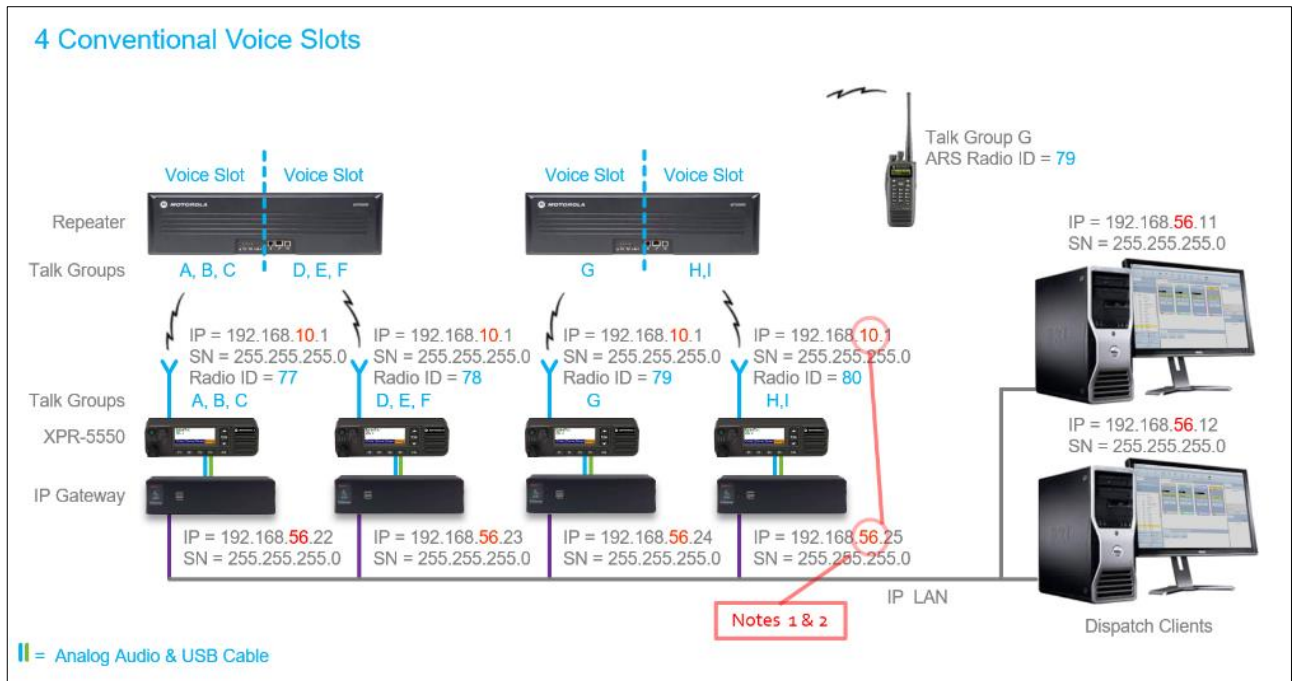


Diagram 2a

Use the following notes when assigning IP Addresses and Radio IDs for components in the **Diagram 2a** system above:

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 **Diagram 2b** below, 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.

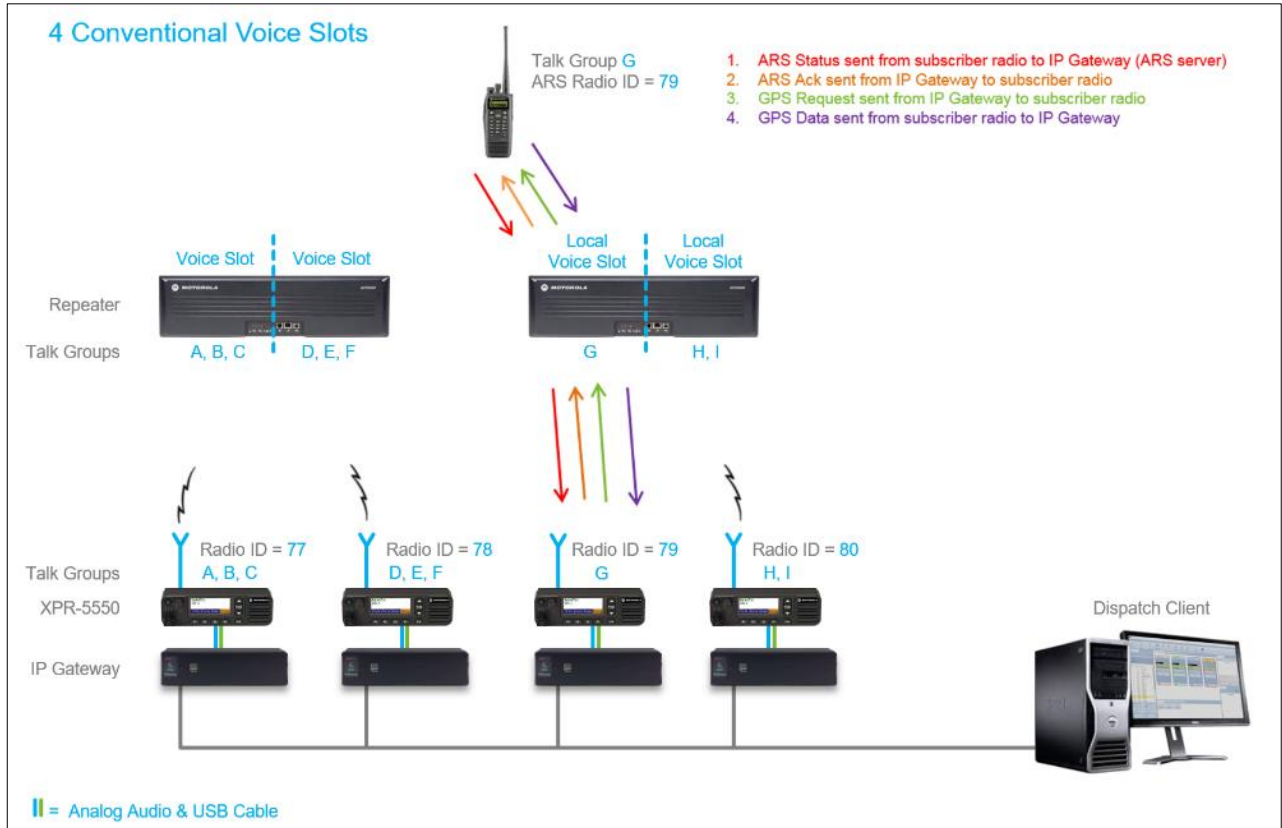


Diagram 2b

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.

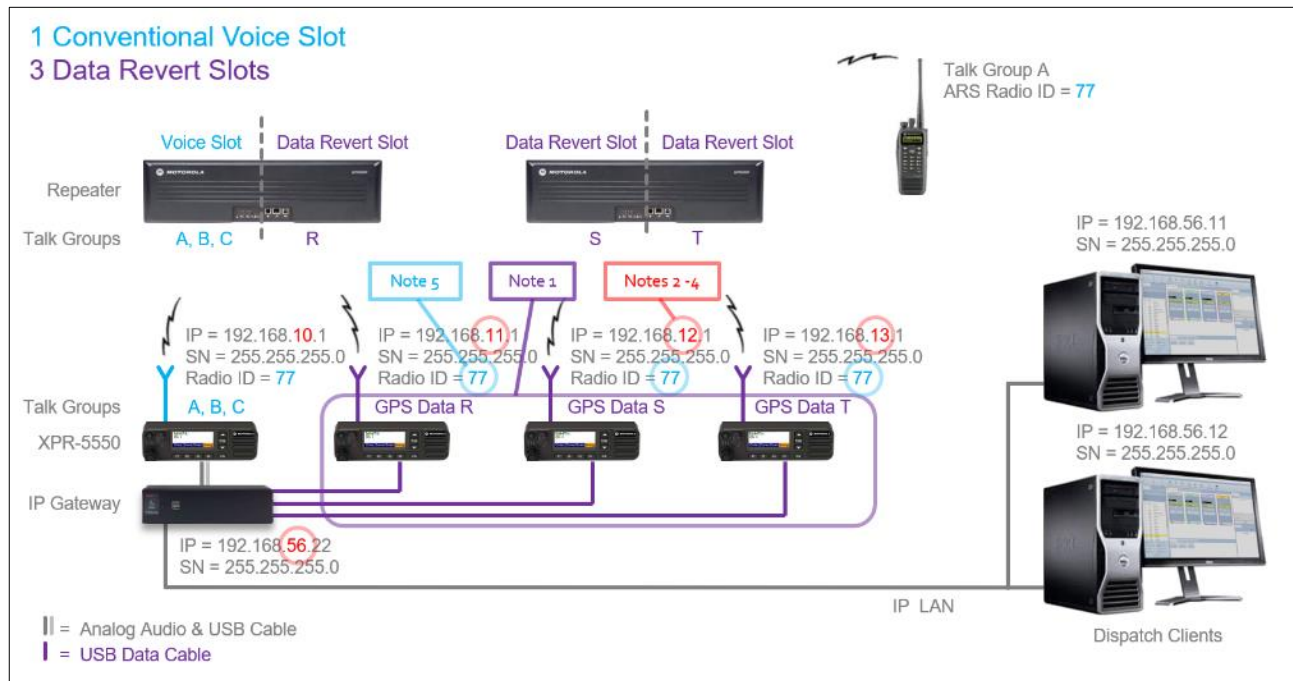


Diagram 3a

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.

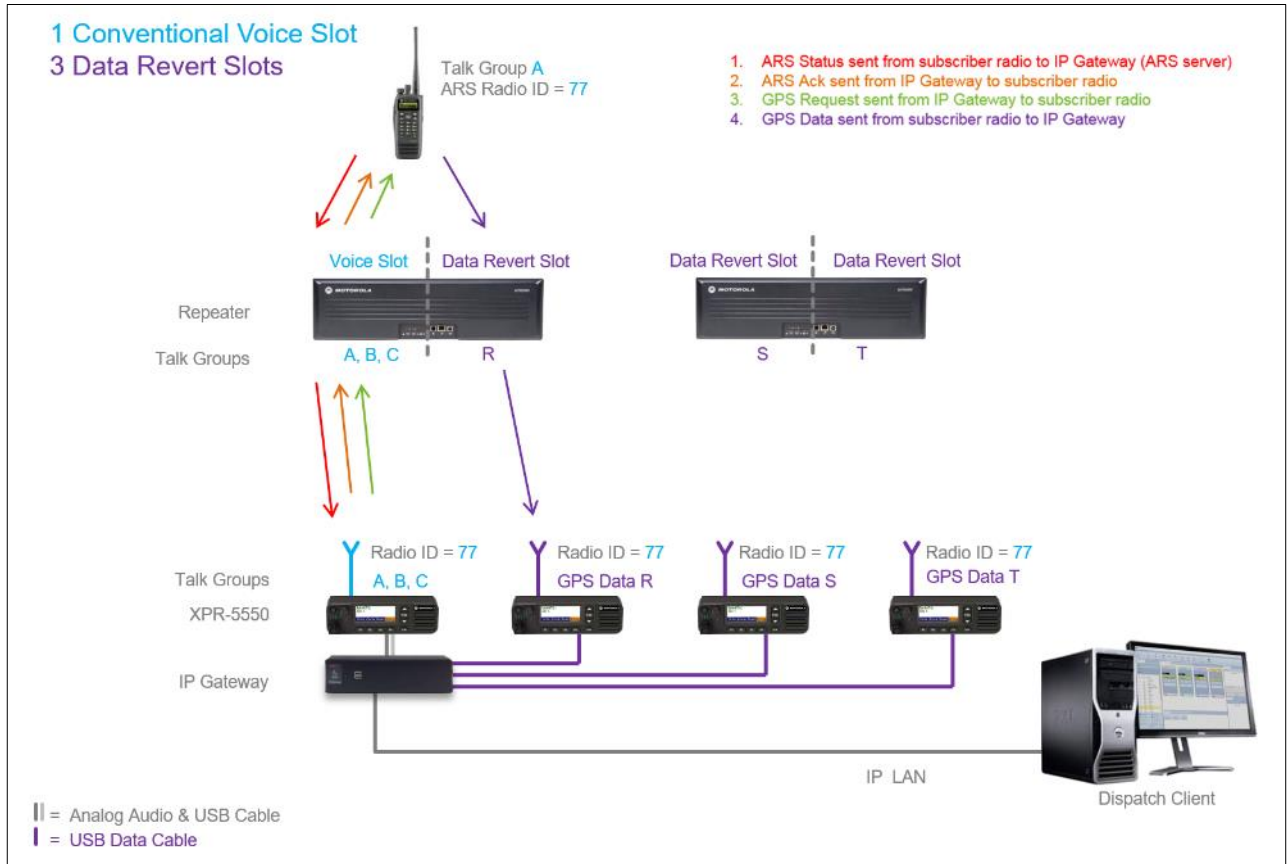


Diagram 3b

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 XPR5550 Control Station radio and RadioPro IP Gateway as indicated in the diagram below. One RadioPro IP Gateway and XPR5550 Control Station Radio is required for each Local (non-IP Site Connect) slot. In addition, one RadioPro IP Gateway and XPR5550 Control Station Radio is required for each wide area (IP Site Connect) “channel”. The RadioPro IP Gateway and XPR5550 Control Station Radio supporting a wide area “channel” can be located at any site.

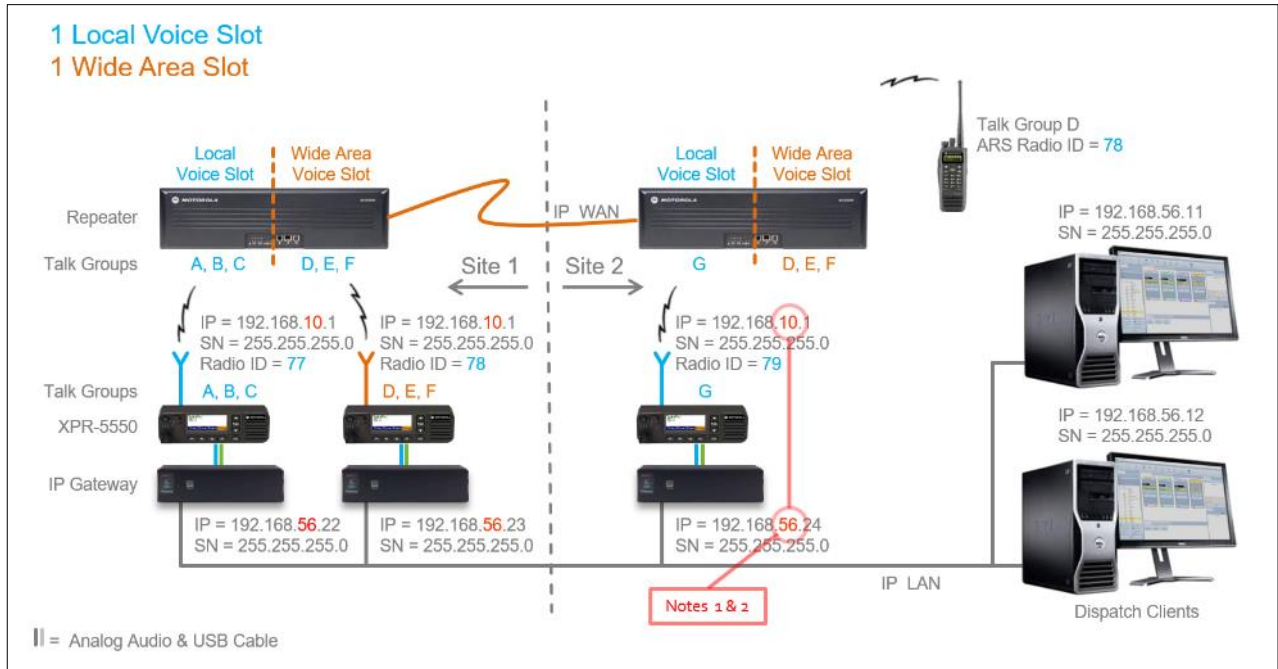


Diagram 4a

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.

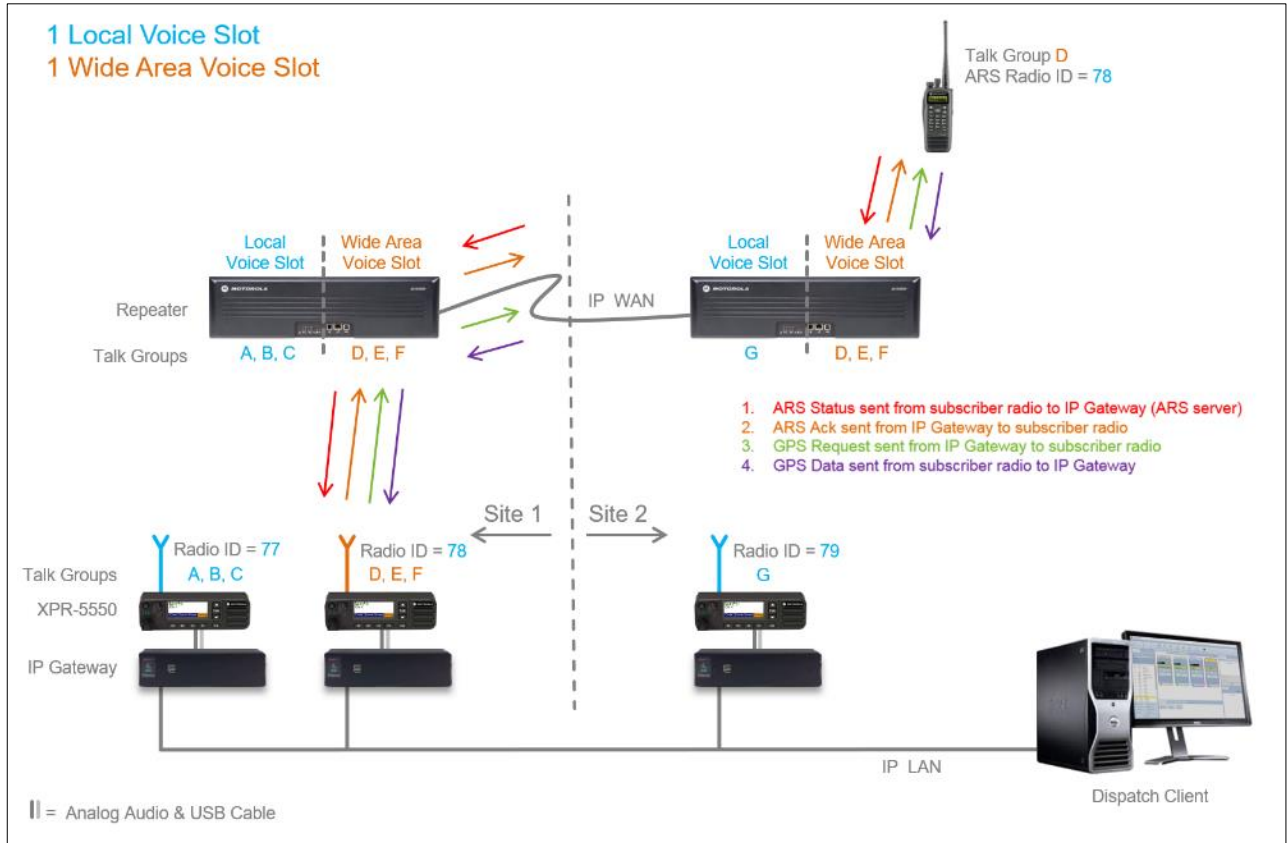


Diagram 4b

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 XPR5550 Control Station Radio is required for each Local (non-IP Site Connect) slot. In addition, one RadioPro IP Gateway and XPR5550 Control Station Radio is required for each wide area (IP Site Connect) “channel”. The RadioPro IP Gateway and XPR5550 Control Station Radio supporting a wide area (IP Site Connect) “channel” can be located at any site.

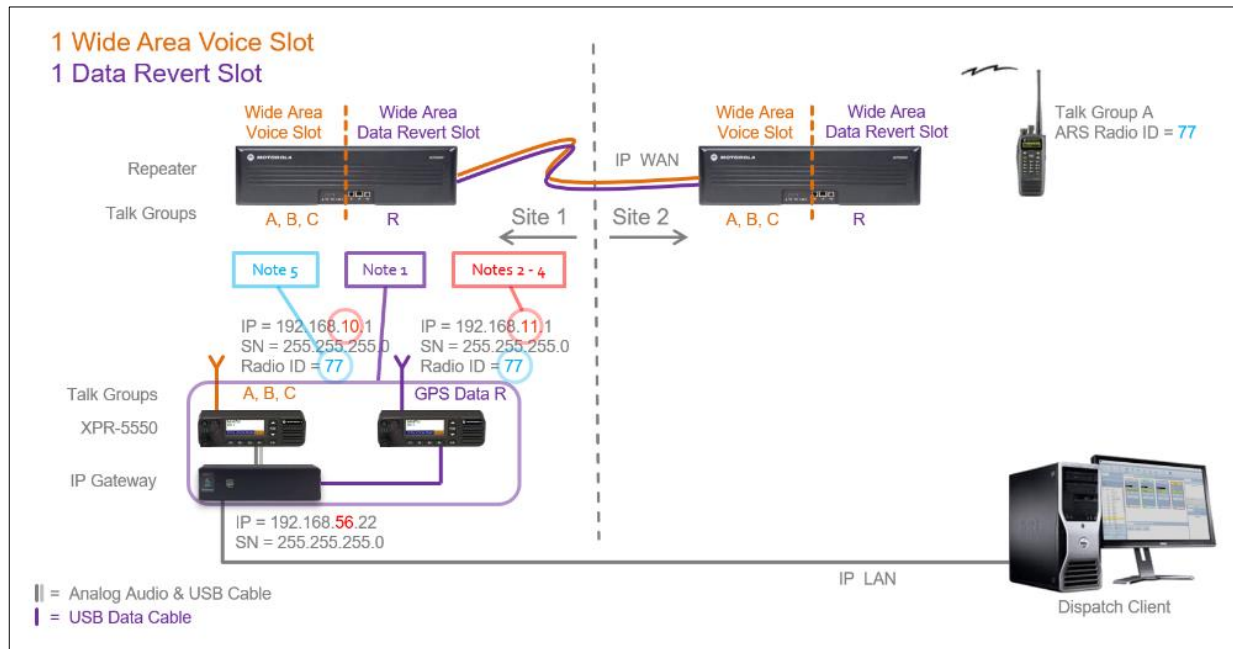


Diagram 5a

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.

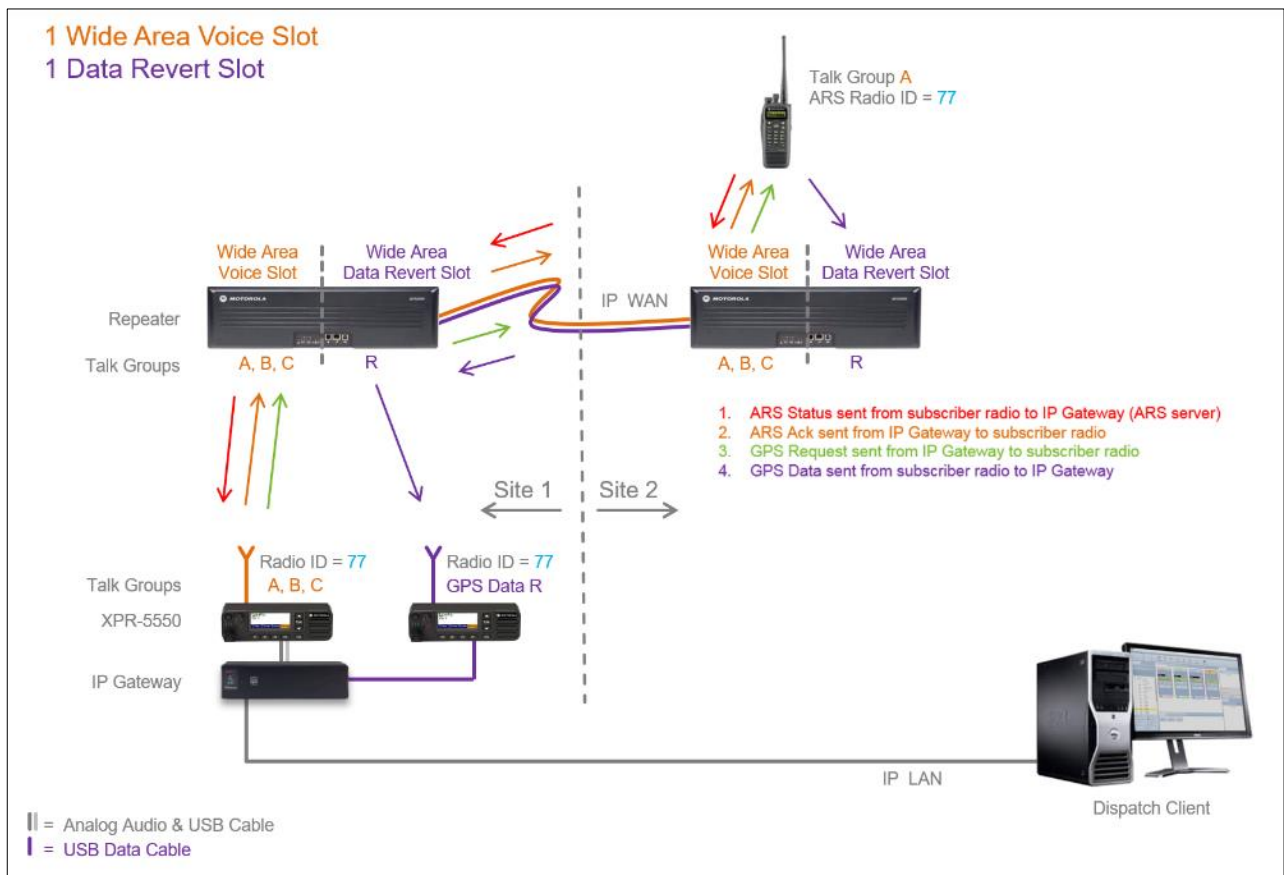


Diagram 5b

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.

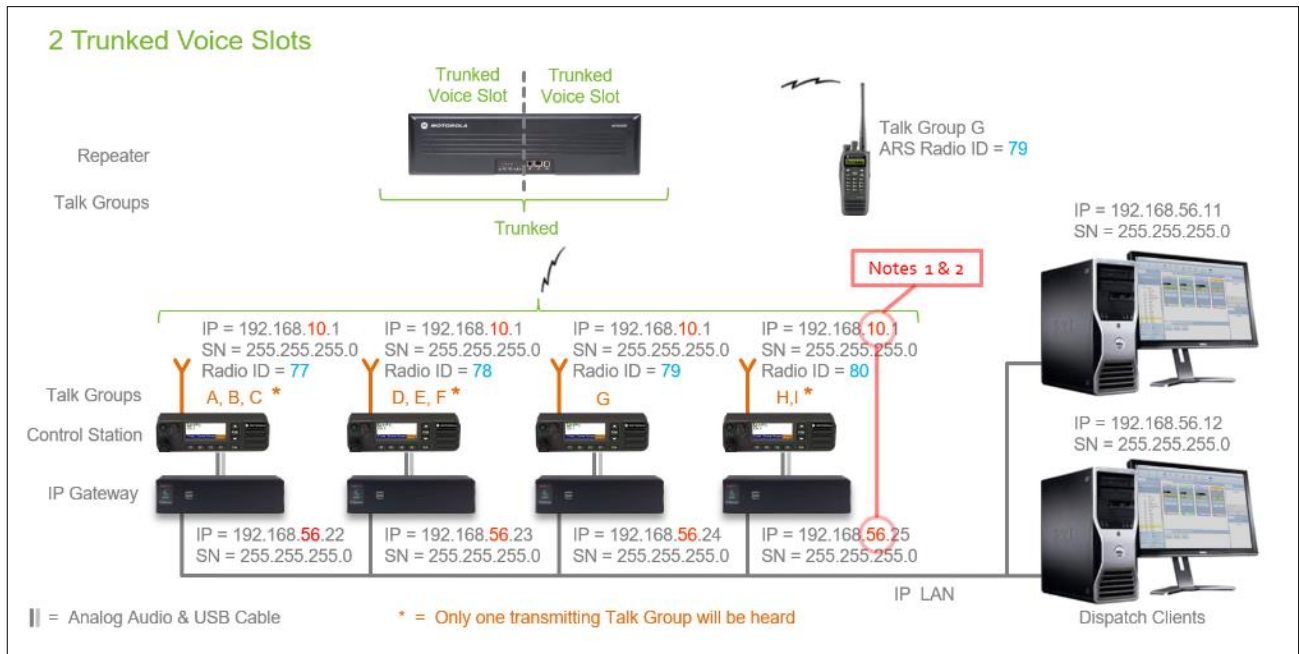


Diagram 6a

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 Diagram 6b below, 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.

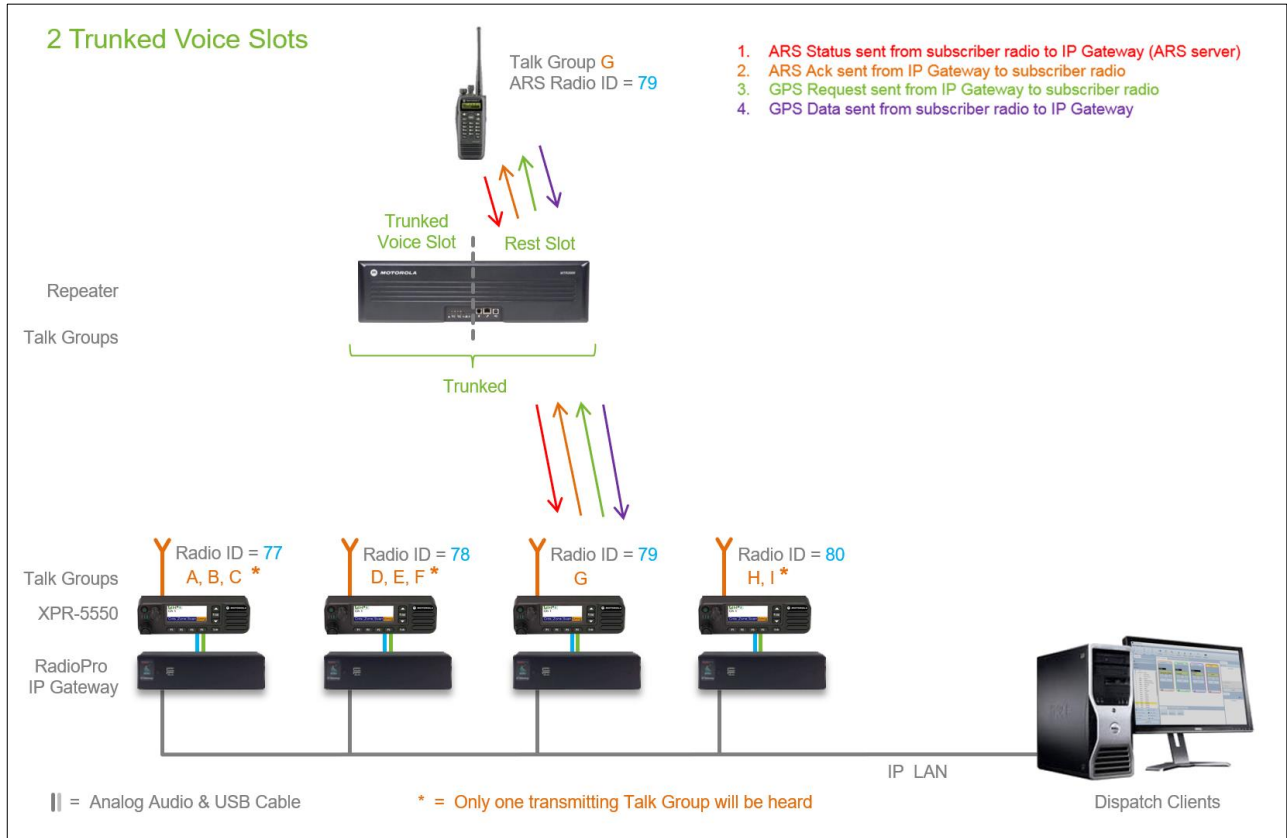


Diagram 6b

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 repeater slots as indicated in the Diagram 7a 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.

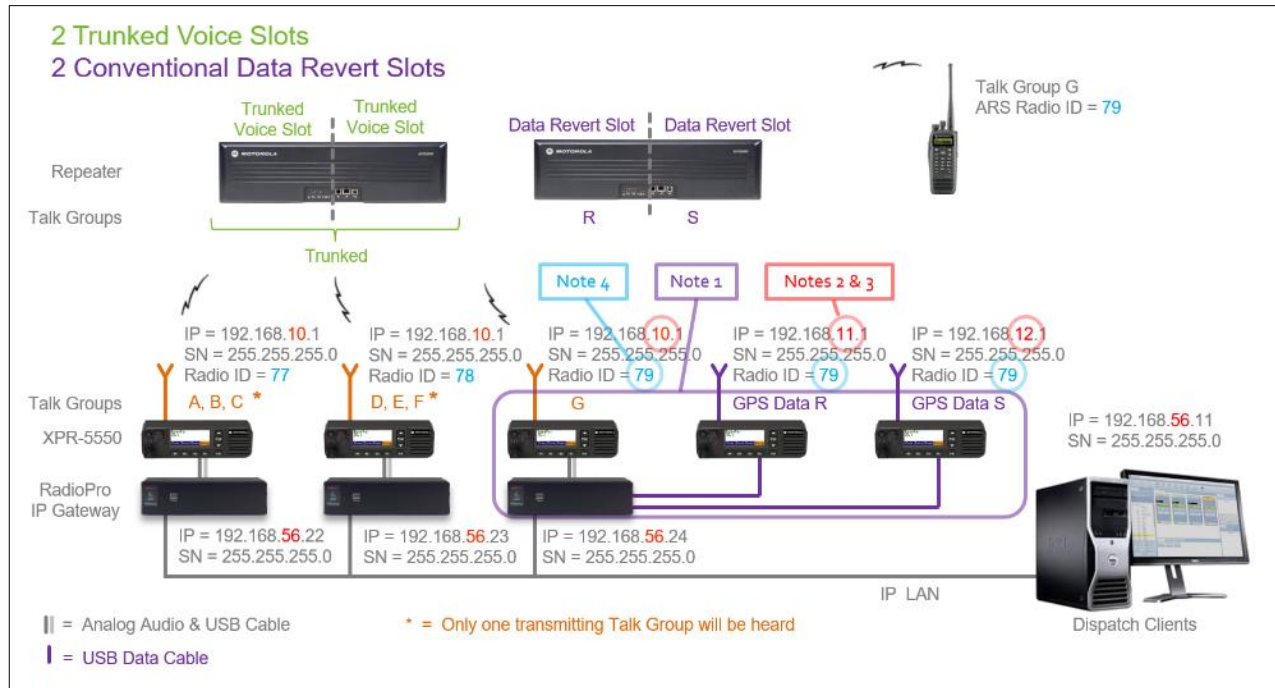


Diagram 7a

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.

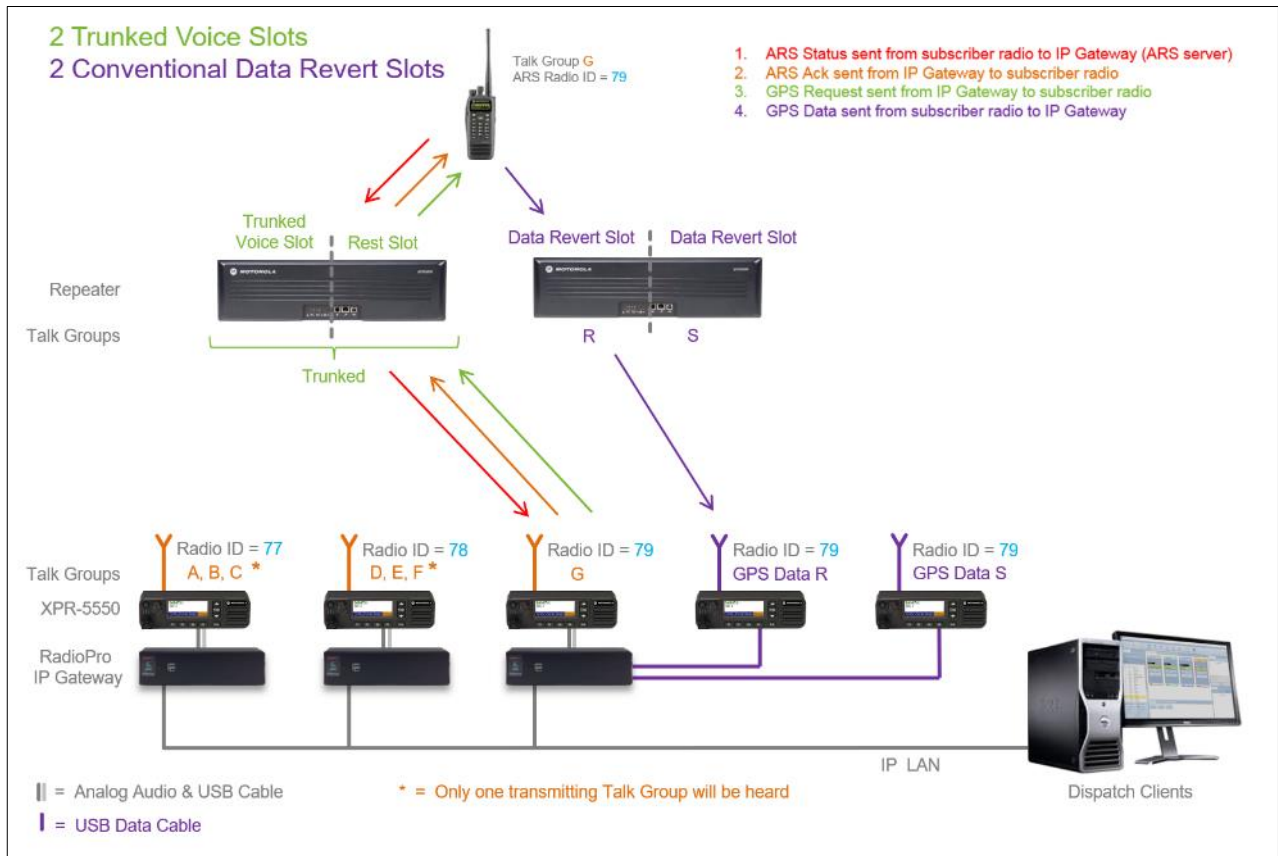


Diagram 8

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 “Enhanced GPS” 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.

<i>Enhanced GPS Option?</i>	<i>Data Reliability</i>	<i>Required Data Revert Repeater Slots</i>	<i>Required Data Revert Repeaters</i>
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 “time slices”. When a subscriber radio is powered on, the repeater synchronizes its time clock with the subscriber radio, and then assigns a unique “time slice” for that subscriber radio. The subscriber radio reports GPS data when it’s assigned “time slice” 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

<i>Window Reservation</i>	<i>90%</i>	<i>75%</i>	<i>60%</i>	<i>45%</i>
<i>Update Interval</i>				
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

<i>Window Reservation</i>	<i>90%</i>	<i>75%</i>	<i>60%</i>	<i>45%</i>
<i>Update Interval</i>				
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

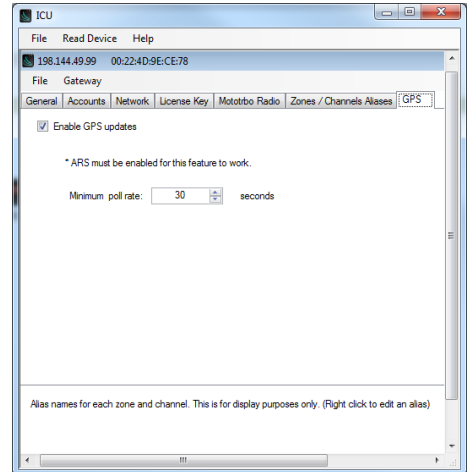
CONFIGURATION REQUIREMENTS

RadioPro IP Gateways, MOTOTRBO™ repeaters, and subscriber radios must be configured to correctly use the “Enhanced GPS” 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 “Enable GPS Polling”.
- Specify a “Minimum poll rate” of 30, 60, 120, 240, or 480 seconds. These are the only values that are supported by the “Enhanced GPS” option.



MOTOTRBO™ Repeaters

The MOTOTRBO™ repeaters used for Data Revert channels must have the “Enhanced Repeater” 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:	8.25"W x 2.5"H x 11.5"D
Weight:	3 lbs.
Temperature Range:	0-50 °C
Humidity:	10-95% non-condensing

Electrical

AC Input (with included Power Adapter):	100–240Vac, 200mA max, 50-60Hz
DC Input:	11.5-12.5Vdc, 2A max

Miscellaneous

Transmit/Receive Impedance	600 ohms
Clients Supported	80 Solo 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 network's 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 Cisco's *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:

	<i>IP Gateway Version</i>	
	v9.3.1	v8.3.1
<i>Dispatch Client for PC</i>		
Dispatch v9.3.x (Windows 10 Pro)	Yes	
Dispatch v8.3.x (Windows 10 Pro)		Yes
<i>RadioPro Talk or Solo Clients</i>		
RadioPro Solo (Windows 10 and 8.1 Pro)	Yes	Yes
RadioPro Talk for iOS and Android	Yes	Yes

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

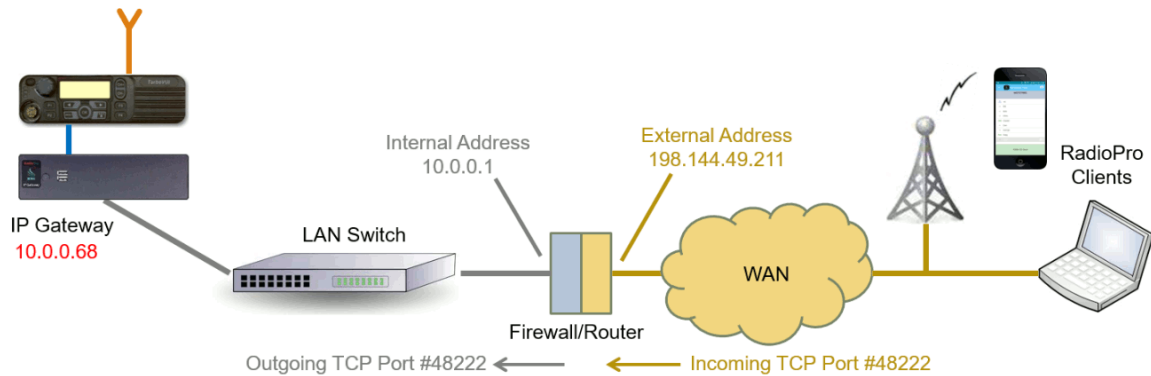


DIAGRAM 9

If RadioPro clients (such as Dispatch, Solo, 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 <https://portforward.com/router.htm> for detailed instructions for the specific router in use at your site.

APPENDIX – RACK MOUNTING

Rack Shelf

A rack shelf can be used to hold the RadioPro IP Gateway and XPR-5550 Control Station Radio in a standard 19" 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 12":

Rack Shelf 2RU x 15", CTI Products # S2-61548, also available as Cable Organizer # QES0319-0215:

XPR5550 Fixed Mounting

The XPR5550 Control Station radio may be mounted using a Rack Frame Kit and Mounting Plate:

Motorola Rack Frame Kit, 2 RU, CTI Products # 99-12323, also available online as part **#BR-19FP-TRBO:**

<http://www.westmobilemounts.com/Rack-Mount-p/br19fptrbo.htm>

Mounting Plate for XPR5550, CTI Products # 99-12324

XPR5550 is mounted using side swivel-mount screws.

SYSTEM PLANNER TEMPLATE **PAGE 1 OF 2**

RadioPro IP Gateways

See [RadioPro IP Gateway Installation Guide](#), [Motorola MOTOTRBO](#), or [Kenwood NEXEDGE](#) for more information.

Parameters Common to all IP Gateways

<i>ICU.exe Admin Password</i> <small>for ICU.exe, default is "admin"</small>	<i>Dispatch Client Password</i> <small>for Dispatch client connections default is "user"</small>	<i>NTP Server IP Address</i> <small>Network Time Protocol</small>

Parameters Unique to Each IP Gateway

GPS = GPS Data Revert.
Each IP Gateway supports 1
Voice & 1 GPS Data Radio.

	<i>Name</i> <small>IP Gateway name has max 2 lines, 24 chars per line</small>	<i>Serial #</i>	<i>IP Address</i>	<i>Subnet Mask</i>	<i>Default Gateway</i>
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

SYSTEM PLANNER TEMPLATE	PAGE 2 OF 2
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RadioPro Dispatch Clients

See the [RadioPro Dispatch Installation and Configuration Guide](#) for more information.

Parameters Common to all Dispatch clients

Administrator Password <small>for Edit Mode</small>

Parameters Unique to all Dispatch clients

PC Name	IP Address	License Serial #	Licensed IP Gateway Connections

RadioPro Solo and RadioPro Talk for iOS and Android

See [RadioPro Solo Client Installation Guide](#) or the [RadioPro Talk for mobile devices How-to Guide](#) for more information.

Parameters Common to all Talk Clients

Administrator Login Name <small>Not Editable</small>	Administrator Password <small>default is "admin"</small>
admin	

User Login Name <small>default is "user"</small>	User Password <small>default is "user"</small>

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