



# MOTOTRBO™ Capacity Max

## Capability Guide

### Introduction

Avtec's Scout VoIP Console System features support for Motorola's next-generation digital trunking solution, MOTOTRBO™ Capacity Max.

This scalable, highly secure trunked radio communication solution, built on a distributed architecture for voice and data, enables instant, reliable voice and data communication and seamless coordination across a single campus or a large-scale operation. MOTOTRBO™ Capacity Max provides customers with an easy and cost-effective migration path from existing systems.

### Capabilities-at-a-Glance

In addition to all the standard features of the Scout console, the following MOTOTRBO™ Capacity Max features are available to the dispatcher:

| Capability  | Description   |
|---|---|
| Interface Method  | Scout uses a wireline console interface through a direct IP connection from the Avtec Routing Controller (ARC) to the MOTOTRBO™ voice gateway. Scout console positions connect to Capacity Max radio systems via VPGate and the ARC.  |
| Unit Calls (Private Calls)                                      | Allows a unit to send and receive a direct voice call to and from a single unit. Units can be either dispatchers or subscribers in the system.  |
| Group Calls   | Allows a dispatcher to establish voice communication with a group of subscriber radios or consoles. All members of the group hear the conversation.   |
| Site All Calls  | Allows a dispatcher to call all subscribers in a MOTOTRBO™ site.  |
| Multi-Site All Calls  | Allows a dispatcher to call all subscribers in multiple MOTOTRBO™ sites.  |
| System All Calls  | Allows a dispatcher to establish voice communication with all subscriber units in a radio system.   |
| WAVE™ Broadband PTT   | Allows a dispatcher to conduct voice communication with MOTOTRBO WAVE™ 5000 clients/subscribers via MOTOTRBO radio interfaces.  |
| Console-over-Subscriber Resource Priority (Preemptive Priority) | Depending on how the radio system is configured, allows a dispatcher with a higher priority level to take over a transmission from a subscriber on a different talkgroup when there are no resources available, or allows a dispatcher with higher priority level to be placed higher in the queue for the next available resource. |



| Capability                    | Description  |
|-------------------------------|--|
| PTT-ID/ANI Alias              | Gives a dispatcher a visual indication of the identity associated with the last voice transmission. An identity can represent the raw subscriber unit ID (PTT-ID) or an alphanumeric string representation of it (ANI Alias). The identity can display in the Activity History and on the associated endpoint pad using the ANI pad extender. For example, a PTT ID of 2527 can be aliased to "Fire 1."  |
| Console-Controlled Encryption | Allows a dispatcher to enable encryption to prevent unauthorized listening to outbound voice communication.<br><br>The interface supports AES and Enhanced Privacy encryption. Encryption key management is handled using the Avtec Encryption Key Manager. The dispatcher can dynamically change encryption methods and keys.   |
| Encryption Key Manager        | Allows a Scout System Administrator to load multiple encryption keysets for use by VPGate endpoints.<br><br>Encryption keys can be entered manually.   |
| Tone Generation               | Allows a dispatcher to send tones or to send tone specifications when WAV files cannot produce the desired output. For example, a dispatcher could send an alert tone to announce bad weather or other alarm conditions. These tones include: <ul style="list-style-type: none"> <li>• Alert Tones</li> <li>• Paging Tones</li> <li>• Channel Marker Tones</li> <li>• Keying Tones</li> <li>• Guard Tones</li> <li>• Function Tones</li> <li>• DTMF Tones</li> </ul> |
| Channel Marker Tones          | Allows a dispatcher to send channel marker tones or to send tone specifications when WAV files cannot produce the desired output. For example, a dispatcher could send a channel marker tone to indicate the channel is in priority status and should not be used for routine transmissions.   |
| Unit Alert (Call Alert)       | Allows a unit to send or receive a request for another unit to call them back. Units can be either dispatchers or subscribers in the system.   |
| Unit Check (Radio Check)      | Allows a dispatcher to verify operational status of a subscriber.  |
| Unit Monitor (Remote Monitor) | Allows a dispatcher to hear any audio picked up by a designated subscriber's microphone. Depending on the system, there might be no indication to the subscriber that a Unit Monitor is in progress.   |
| Stun/Revive (Enable/Disable)  | Allows a dispatcher to temporarily stun a radio so that it cannot transmit, receive, or power on and off. Reviving a stunned radio returns it to an operational state.   |



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| Capability            | Description  |
|-----------------------|--|
| Emergency Calls/State | Notifies a dispatcher of an emergency situation in the field using a unique ring and visual indication. When a subscriber presses the emergency button or dials the emergency DTMF string, the endpoint generates an emergency call and activates the emergency state. Until the emergency state is cleared by the dispatcher, no further emergency calls from that subscriber can generate an Emergency Call. |

**NOTE**

Scout software must be installed on computers running Windows 10, Windows Server 2016, or Windows Server 2019.

*Connections*

A MOTOTRBO™ Capacity Max system consists of one or more MOTOTRBO™ voice gateways configured to intercommunicate. Scout registers radio IDs and group IDs through this gateway, then calls targeted to radio and group IDs route to Scout. Each voice gateway transmits RF-received voice and data packets over the IP network to all other registered gateways in the system.

The Scout console system interfaces with Capacity Max through the VPGate MOTOTRBO™ Capacity Max driver. The driver provides options for settings unique to the Capacity Max system such as:

- Type of connection for the endpoint
- Endpoint ID
- Privacy settings

VPGate connects to Capacity Max systems through the Avtec Routing Controller (ARC). The ARC registers VPGate endpoints with a particular voice gateway in the system. Arbitration is handled by this voice gateway interacting with the trunking controller. All requests are routed from the VPGate Capacity Max driver through the ARC to this single voice gateway. The voice gateway then routes requests to the appropriate sites.

The following illustrations show some typical applications for Scout with Capacity Max. Refer to Motorola's *MOTOTRBO™ System Planner* document for detailed information about different Capacity Max configurations.

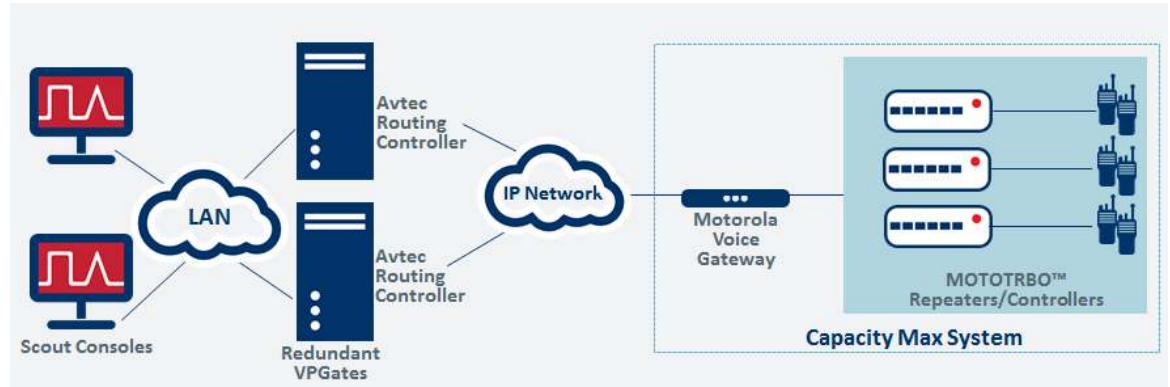
*Basic Configuration*

In a basic setup, the Scout consoles connect to VPGate, which connects to an available Avtec Routing Controller either locally or over the same Local Area Network (LAN). The Avtec Routing Controller then connects to the MOTOTRBO™ Capacity Max system through the MOTOTRBO™ voice gateway(s). Capacity Max connects to radio repeaters/controllers over IP.



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The diagram above shows a typical setup for the Scout console system along with VPGate and the Avtec Routing Controller that provides the connectivity to the MOTOTRBO™ Capacity Max system through the MOTOTRBO™ voice gateway.

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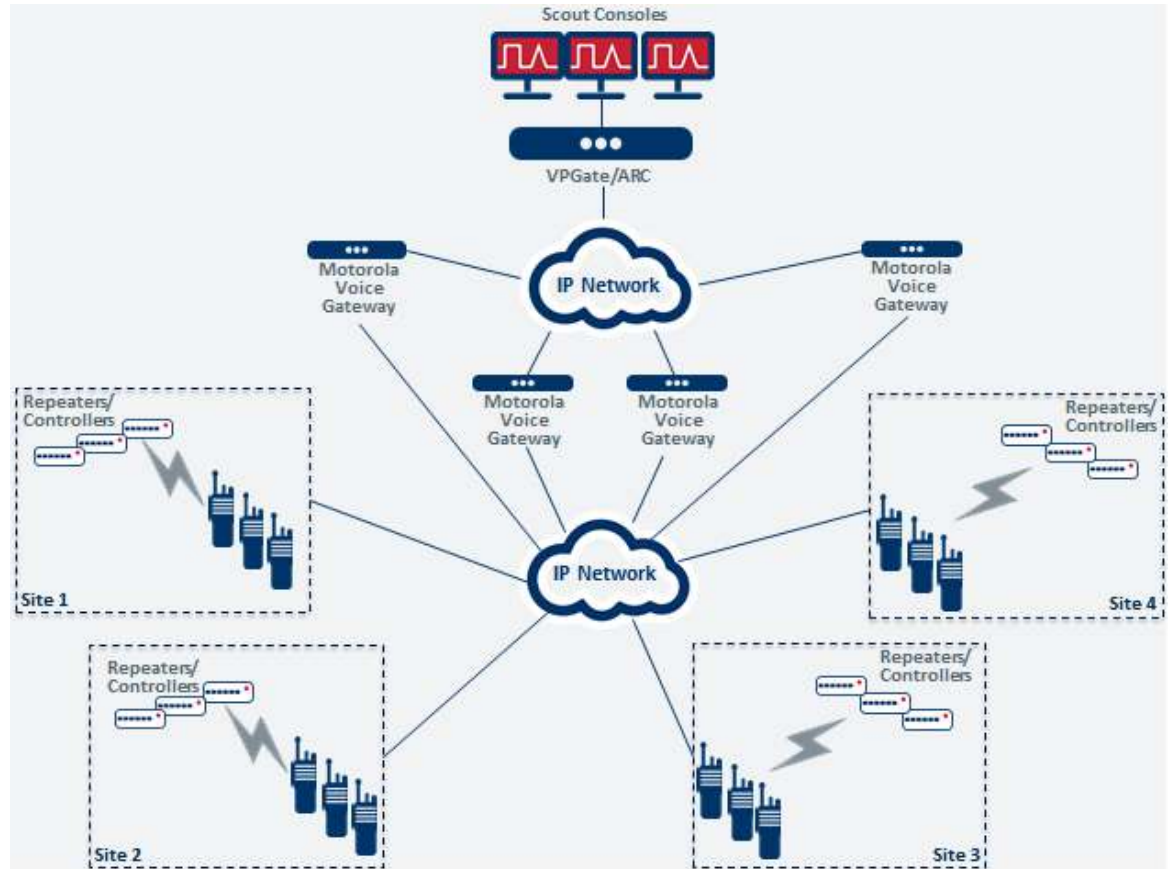


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### Geographically Distributed Sites

The MOTOTRBO™ Capacity Max solution supports a geographically distributed radio network, also called a *wide area system*, with multiple voice gateways and repeaters/controllers. With Scout consoles in a single communication center, an organization can coordinate activity in multiple remote locations.



This multi-site layout illustrates the use of VPGate's Avtec Routing Controller to connect to multiple MOTOTRBO™ Capacity Max sites.

### Scalability

The design for a Scout-MOTOTRBO™ Capacity Max system is determined by the number of endpoints required and the number of consoles that require access to those endpoints. An endpoint is an IP talkpath between the console subsystem and the radio subsystem.

The Scout-MOTOTRBO™ Capacity Max system is scalable from small, single-site systems to large, complex projects that demand greater capacity.

- A single Scout system supports up to 800 consoles and 4,000 endpoints.
- A single ARC supports 1,000 active voice talkpaths across 8 Capacity Max systems.
- Capacity Max supports up to 100 voice talkpaths per voice gateway.



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- One VPGate bundled with MOTOTRBO™ Capacity Max software license controls 24, 40, 80, or 160 total endpoints, depending on the license purchased. Of the total endpoints in the license, up to 16, 30, 60, or 100 endpoints, respectively, are MOTOTRBO™ Capacity Max endpoints.
- Each Capacity Max system supports up to 250 sites.
- Each site can support up to 15 repeaters with up to 3,000 users per site.
- Each site uses one slot as a dedicated control channel.
- Capacity Max supports up to 15 primary and 15 backup gateways per system (15 active gateways per system).
- Capacity Max supports 10 active gateways per ARC. If more active gateways are needed, you must load balance with a second ARC.

**NOTE**

Redundant gateways do not count against this 10 gateway maximum.

*Licensing*

Implementing a Scout–MOTOTRBO™ Capacity Max system requires software licensing for both the Scout console system and the MOTOTRBO™ Capacity Max system. Motorola requires two licenses for all repeaters and all controllers in the system (obtain these licenses from Motorola or an authorized vendor).

When designing a Scout–Capacity Max configuration, the desired endpoints and geographical locations for consoles determines the number and type of licenses necessary. Review the following information to understand how the various components in a Scout–MOTOTRBO™ Capacity Max system scale. Avtec licenses are sold in capacity levels detailed below.

The MOTOTRBO™ Capacity Max driver is licensed as a supplemental VPGate driver and uses a variation of the base VPGate license with the option of including Frontier. The license size represents the number of active endpoints that VPGate and MOTOTRBO™ Capacity Max control. This VPGate license is available in four sizes: 24, 40, 80, or 160 total endpoints. The following table lists the license options and the maximum number of endpoints of each type the license allows. The model numbers ending in -FTR are Frontier-enabled versions.



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| Avtec Model Number                                | Total Category A&B Endpoints | Maximum SIP Endpoints (Category B) | MOTOTRBO™ Connect Plus, MSCP, and Capacity Max Endpoints | Redundant |
|---|------------------------------|------------------------------------|--|-----------|
| SFW-VPG-MTCP-L0NR<br>SFW-VPG-MTCP-L0NR-SK         | 24                           | 12                                 | 16   | No        |
| SFW-VPG-MTCP-L0NR-FTR<br>SFW-VPG-MTCP-L0NR-FTR-SK | 24                           | 12                                 | 16   | No        |
| SFW-VPG-MTCP-L0<br>SFW-VPG-MTCP-L0-SK             | 24                           | 12                                 | 16   | Yes       |
| SFW-VPG-MTCP-L0-FTR<br>SFW-VPG-MTCP-L0-FTR-SK     | 24                           | 12                                 | 16   | Yes       |
| SFW-VPG-MTCP-L1<br>SFW-VPG-MTCP-L1-SK             | 40                           | 20                                 | 30   | Yes       |
| SFW-VPG-MTCP-L1-FTR<br>SFW-VPG-MTCP-L1-FTR-SK     | 40                           | 20                                 | 30   | Yes       |
| SFW-VPG-MTCP-L2<br>SFW-VPG-MTCP-L2-SK             | 80                           | 40                                 | 60   | Yes       |
| SFW-VPG-MTCP-L2-FTR<br>SFW-VPG-MTCP-L2-FTR-SK     | 80                           | 40                                 | 60   | Yes       |
| SFW-VPG-MTCP-L3<br>SFW-VPG-MTCP-L3-SK             | 160                          | 100                                | 100  | Yes       |
| SFW-VPG-MTCP-L3-FTR<br>SFW-VPG-MTCP-L3-FTR-SK     | 160                          | 100                                | 100  | Yes       |

**NOTE**

For each MOTOTRBO™ Capacity Max license used, a corresponding Category A license is also used. For example, if you configure 10 MOTOTRBO™ Capacity Max endpoints in your system, 10 of your Category A endpoints are allocated. SIP telephone endpoints are Category B endpoints. If you configure 10 SIP endpoints in your system, 10 of your Category B endpoints are allocated which also decreases your total endpoints by 10.

**Upgrading to Scout–MOTOTRBO™ Systems**

See the following VPGate upgrade license options to field upgrade VPGate base licenses in a non-MOTOTRBO™ Scout system to support MOTOTRBO™ radio endpoints.



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|                                       |   |
|---------------------------------------|---|
| VPG-UPG-L0-MTCP<br>VPG-UPG-L0-MTCP-SK | Upgrade Level 0 VPGate base license to enable up to 16 MOTOTRBO™ Connect Plus, Capacity Max, or Multi-Site Capacity Plus talkgroups or private call endpoints.  |
| VPG-UPG-L1-MTCP<br>VPG-UPG-L1-MTCP-SK | Upgrade Level 1 VPGate base license to enable up to 30 MOTOTRBO™ Connect Plus, Capacity Max, or Multi-Site Capacity Plus talkgroups or private call endpoints.  |
| VPG-UPG-L2-MTCP<br>VPG-UPG-L2-MTCP-SK | Upgrade Level 2 VPGate base license to enable up to 60 MOTOTRBO™ Connect Plus, Capacity Max, or Multi-Site Capacity Plus talkgroups or private call endpoints.  |
| VPG-UPG-L3-MTCP<br>VPG-UPG-L3-MTCP-SK | Upgrade Level 3 VPGate base license to enable up to 100 MOTOTRBO™ Connect Plus, Capacity Max, or Multi-Site Capacity Plus talkgroups or private call endpoints. |

Refer to the VPGate Cut Sheet or contact your Avtec sales representative for more information about licensing for Scout and MOTOTRBO™ Capacity Max endpoints.

#### Network Requirements

The MOTOTRBO™ Capacity Max network can be a local area network (LAN) or a wide area network (WAN) connection provided by an Internet Service Provider (ISP). Most customer networks are a combination of both types. Scout can connect to a Capacity Max endpoint using a Local Group, Wide Area Group, Site All Call, Multi-Site All Call, System All Call, or Unit-to-Unit slot.

Consider the following when setting up your network:

- Capacity Max does not support Network Address and Port Translation (NAPT)
- Voice gateways and data gateways must be on separate subnets
- VPGates connecting to Capacity Max infrastructure must be on a separate network than the radio infrastructure
- Static tunnels must be set up between all remote sites

#### NOTE

The network cannot use a proxy server that directs all IP devices to a home or logon page before allowing them to access the WAN.

#### Jitter

If a delay of more than 75 ms occurs, audio quality begins to degrade. Scout allows for jitter ranging from 60 milliseconds to 2.5 seconds.

#### NOTE

Packet loss and latency must be within the limits documented in the *MOTOTRBO™ System Planner* document from Motorola. The network cannot use a dial-up connection because of inadequate bandwidth. It also should not use satellite Internet access, such as a VSAT system, due to unacceptable delays during transmission and reception.

#### Bandwidth

Sufficient bandwidth must be available on the IP network. A fully populated repeater network can require more than 700 kbps.



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*Quality of Service*

VPGate supports Differentiated Services (DiffServ) values for audio and control packets from the VPGate to the MOTOTRBO™ endpoint. This allows VPGate to assign a high priority to VoIP packets and prevent unwanted network delays.

*Addresses and Ports*

A static IP address, TCP port, and UDP port for the voice gateway must be made available to all devices on the Capacity Max system.

When a gateway registers with the site controller, the network supplies the return IP address, TCP port, and UDP port of the gateway to the site controller. The IP address and ports are then made available to all other MOTOTRBO™ Capacity Max gateways on the system.

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