



P25 CSSI Capability Guide

Scout's Wireline Console Subsystem Interface for P25 Trunked Systems

Introduction

Scout's support for Project 25 trunking underscores Avtec's commitment to public safety and government agency communications.

Project 25 standards meet current and future communication needs by establishing mutually agreeable migration paths for multi-vendor, interoperable communication systems. The Scout true VoIP console system supports the P25 Console Subsystem Interface (CSSI) standard to provide connectivity with Phase 1 (12.5 kHz FDMA) and Phase 2 (6.25 kHz TDMA) trunked radio networks.

Scout's P25 CSSI interface is qualified to operate with the following radio systems:

- Etherstack P25 Phase 1
- Codan P25 Phase 1
- Motorola P25 Phase 1 & 2
- Motorola ASTRO®25 Phase 1 & 2
- TaitNET P25 Phase 1 & 2
- Airbus P25 Phase 1
- Harris P25 Phase 1 & 2
- Harris EDACS
- Harris OpenSky

NOTE

The following products are required when interfacing a radio system to the Scout console using CSSI:

- Harris EDACS—VIDA Core with CSSI gateway and EDACS Migration Gateway (EMG)
- Harris OpenSky—VIDA Core with CSSI gateway
- Motorola ASTRO®—CSSI gateway

Capabilities-at-a-Glance Refer to the *Avtec Scout Consoles Capability Guide* for capabilities common to the Scout system.

Capability	Description
Interface Method (TIA-102.BACA)	Scout supports a VoIP connection between the Scout IP console subsystem and the P25 radio subsystem infrastructure as defined in TIA-102.BACA, <i>Project 25 (P25): Inter-RF Subsystem Interface Messages and Procedures for Voice Services</i> .
Interface Method P25 Phase 1 (Full-Rate 12.5 kHz)	Scout supports Phase 1 radio systems operating at 12.5 kHz using FDMA.
Interface Method P25 Phase 2 (Half-Rate 6.25 kHz)	Scout supports Phase 2 radio systems operating at 6.25 kHz using two-slot TDMA or at 12.5 kHz using FDMA.
Unit Calls (Private Calls) (Individual 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.
Announcement Calls (Broadcast Calls) (Multi-Group Calls)	Allows a dispatcher to establish voice communication with multiple groups of subscriber radios.
System All Calls	Allows a dispatcher to establish voice communication with all subscriber units in a radio system.
Console-over-Console Transmit Interrupt	Allows a dispatcher with a higher priority level to take over a transmission from another console subsystem on the same talkgroup.
Console-over-Subscriber Transmit Interrupt	<p>Allows a dispatcher to take over a transmission from a subscriber on the same talkgroup. The Scout System Administrator can select either Impolite or Dynamic Interrupt as the type of interruption the endpoint uses when a dispatcher interrupts a transmission.</p> <p>Impolite Interrupt: The dispatcher takes over the transmission without notifying the subscriber who was transmitting.</p> <p>Dynamic Interrupt: When the transmission is interruptible, the dispatcher takes over the transmission using Transmit Interrupt, which allows the dispatcher to politely interrupt an ongoing voice transmission on the same talkgroup. When the transmission is uninterruptible, the dispatcher takes over the transmission using Impolite Interrupt.</p>

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."
Over The Air Aliasing (OTAA) (per the P25 standard)	Gives the dispatcher a visual indication of the identity associated with the last voice transmission without requiring use of an ANI alias table.
Console-Controlled Encryption	<p>Allows a dispatcher to enable encryption to prevent unauthorized listening to outbound voice communication.</p> <p>The interface supports AES and DES encryption. Encryption key management is handled using the Avtec Encryption Key Manager. The dispatcher can dynamically change encryption methods and keys.</p>
Encryption Key Manager	<p>Allows a Scout System Administrator to load multiple encryption keysets for use by VPGate endpoints.</p> <p>The Scout System Administrator can manually enter encryption keys for multiple encryption methods, and can also load encryption keys into the Avtec Encryption Key Manager using supported Key Fill Devices.</p>
Short Data Message	Allows a third-party application to send and receive short data messages to and from subscribers via a CAD interface or data forwarding driver. Short Data Messages are typically used as a non-voice form of communication or for signaling. Short Data Messages could be used to generate an inbound call, to signal a subscriber to change frequencies for an upcoming announcement, or to send a pre-defined text message.
Status Message	Allows a third-party application to send and receive status messages to and from subscribers via a CAD interface or data forwarding driver. Status messages are typically used as a non-voice form of communication. Status messages could be used to signify personnel coming on or off shift, availability, or if they are experiencing an emergency.
Console Directed Call-Ins via Status Message	Allows a Scout System Administrator to configure console call-in codes that direct inbound calls to specific consoles.

Capability	Description
Low Speed Data	Allows a third-party application to accept Low Speed Data from the radio infrastructure using the Data Forwarding Driver. For example, when a public safety official transmits, the subscriber could send low-speed data to relay its GPS location to a mapping system.
P25 Failsoft	In P25 trunking applications, P25 Failsoft allows a dispatcher to continue voice communication during degraded P25 system operation. When a site fails, designated repeaters enter the Failsoft state which allows the console and affected radios to continue communicating using Failsoft channels in conventional mode. Failsoft operation supports Conventional Group Calls, PTT ID/ANI Alias, Emergency Calls/State, Late Entry, Call Alert, and Console-Controlled Encryption. Endpoints can be configured to generate a call using a distinctive ringtone to announce Failsoft operation, and an ANI text string can also be configured to provide a customized visual notification. Endpoints can also be configured to generate an alarm to DMS when they enter the Failsoft state.
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 (Radio 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 (Disable/Enable)	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.
Emergency Calls/State	Emergency Calls notify 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.
Late Entry	When an endpoint registers or changes a channel, allows a dispatcher to join an ongoing conversation without having to wait for the next transmission or call.

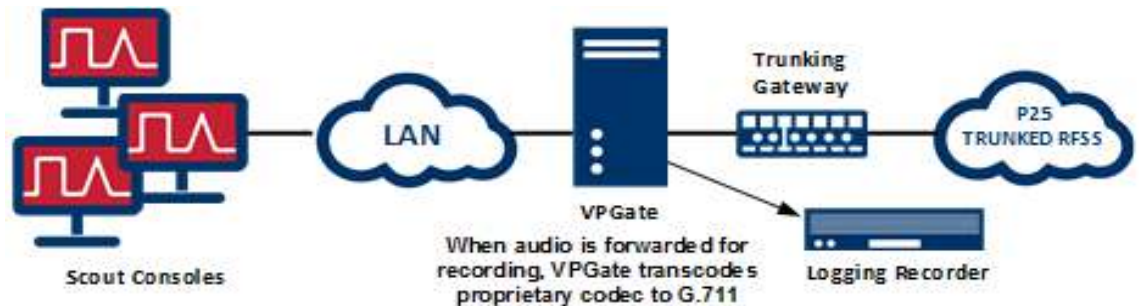
Connections

Project 25 established the P25 CSSI standard for connecting a console subsystem such as Scout to a trunked radio frequency subsystem (RFSS). Setting up the connection in the Scout console system includes configuring the P25 CSSI driver and Scout Trunking Gateway.

The P25 CSSI driver, which is included in VPGate, connects to the Scout Trunking Gateway. The P25 CSSI driver and Scout Trunking Gateway provide the connection to a P25 Phase 1 or Phase 2 trunked radio system. Phase 1 systems operate at 12.5 kHz using FDMA. Phase 2 systems operate at 6.25 kHz using two-slot TDMA or at 12.5 kHz using FDMA.

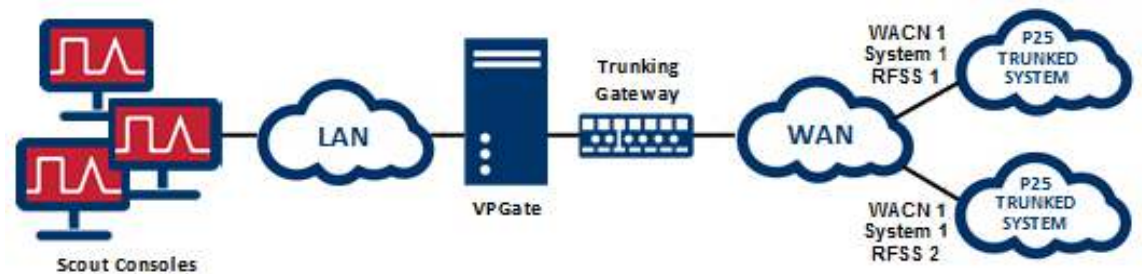
The P25 CSSI driver and Scout Trunking Gateway provide a VoIP connection between Scout consoles and the trunked radio system as defined by the TIA-102.BACA standard. The connection from the VPGate to the P25 RFSS uses a standard IP transport requiring no external controllers or vocoders. Scout uses the latest AMBE+2 vocoder with improved forward error correction (FEC) and noise reduction for excellent audio quality.

Basic System Setup



This diagram shows the basic setup between a Scout console subsystem and a P25 trunked radio subsystem. Scout's VPGate software and Trunking Gateway software run with redundancy to ensure connectivity. The P25 Trunked RFSS represents the entire trunked radio system including the trunking radio controller, base radios, and subscriber units.

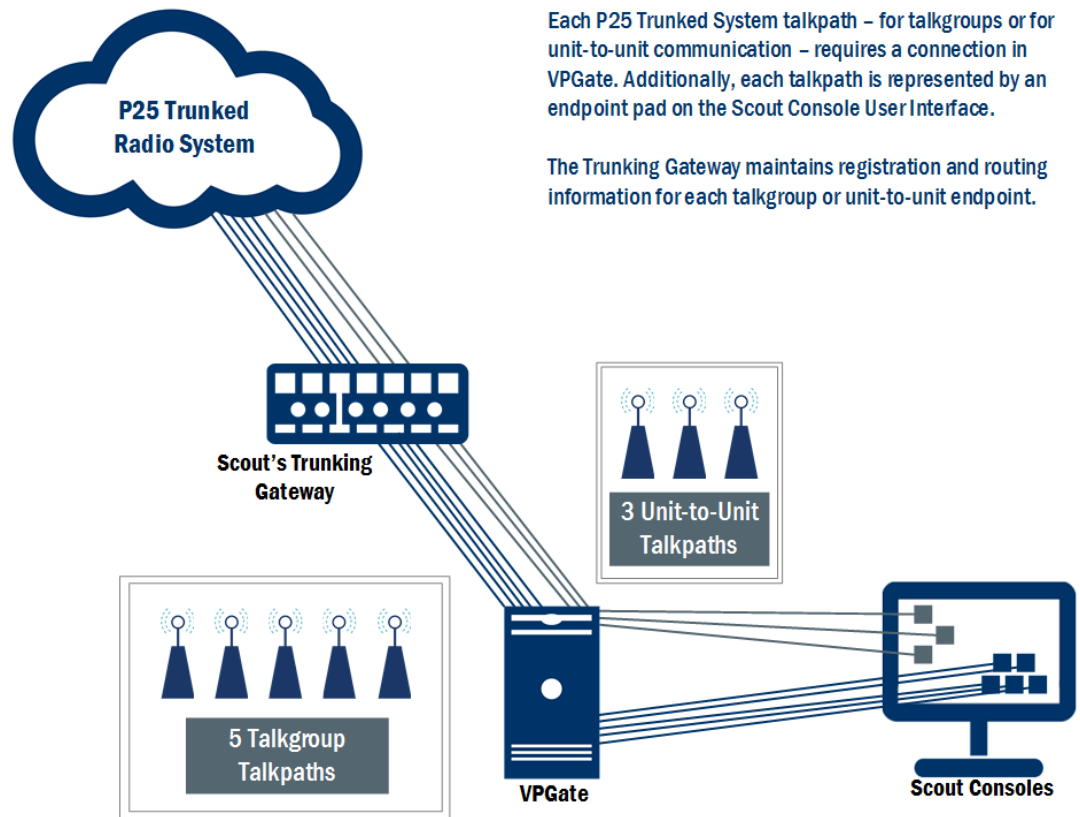
Multiple RFSS Setup



This diagram shows a Scout console subsystem connecting to a P25 Wide Area Communication Network (WACN) system including two separate radio frequency subsystems, RFSS1 and RFSS2.

Licensing

The direct IP interface between a Scout VoIP console subsystem and a P25 trunked radio system is controlled by Avtec software licensing. Each P25 endpoint requires a separate licensed connection between the P25 trunked radio system and Scout. Each endpoint, whether a talkgroup or unit-to-unit, is represented by an endpoint icon on the Scout console user interface. Each Scout console that holds a seat license for P25 can be configured to access any or all P25 endpoints. Review the following information to learn more about required licenses.



This diagram shows the number of licensed connections required from a P25 trunked radio system to VPGate and Scout consoles to support five talkgroup endpoints and three unit-to-unit endpoints. With respect to the Scout console subsystem, an endpoint is a licensed connection that can be used by the console positions to establish voice communication with P25 subscriber units through the P25 infrastructure.

To interface with a P25 trunked radio system, Avtec requires three licenses:

- Base VPGate License
- VPGate P25 Supplemental License
- P25 Seat License

The **Base VPGate License** size represents the maximum number of endpoints that can be active at any one time on a single VPGate. Each P25 endpoint, whether a talkgroup or unit-to-unit, uses one Type A license. As shown in the following table, the base license is available for 24, 40, 80, or 160 endpoints. Additional VPGate licenses would be required to use more endpoints.

VPGate License	Total Category A&B Endpoints	Maximum Category B SIP Endpoints	Redundant
SFW-VPG-L0-NR SFW-VPG-L0-NR-SK	24	12	No
SFW-VPG-L0 SFW-VPG-L0-SK	24	12	Yes
SFW-VPG-L1 SFW-VPG-L1-SK	40	20	Yes
SFW-VPG-L2 SFW-VPG-L2-SK	80	40	Yes
SFW-VPG-L3 SFW-VPG-L3-SK	160	100	Yes

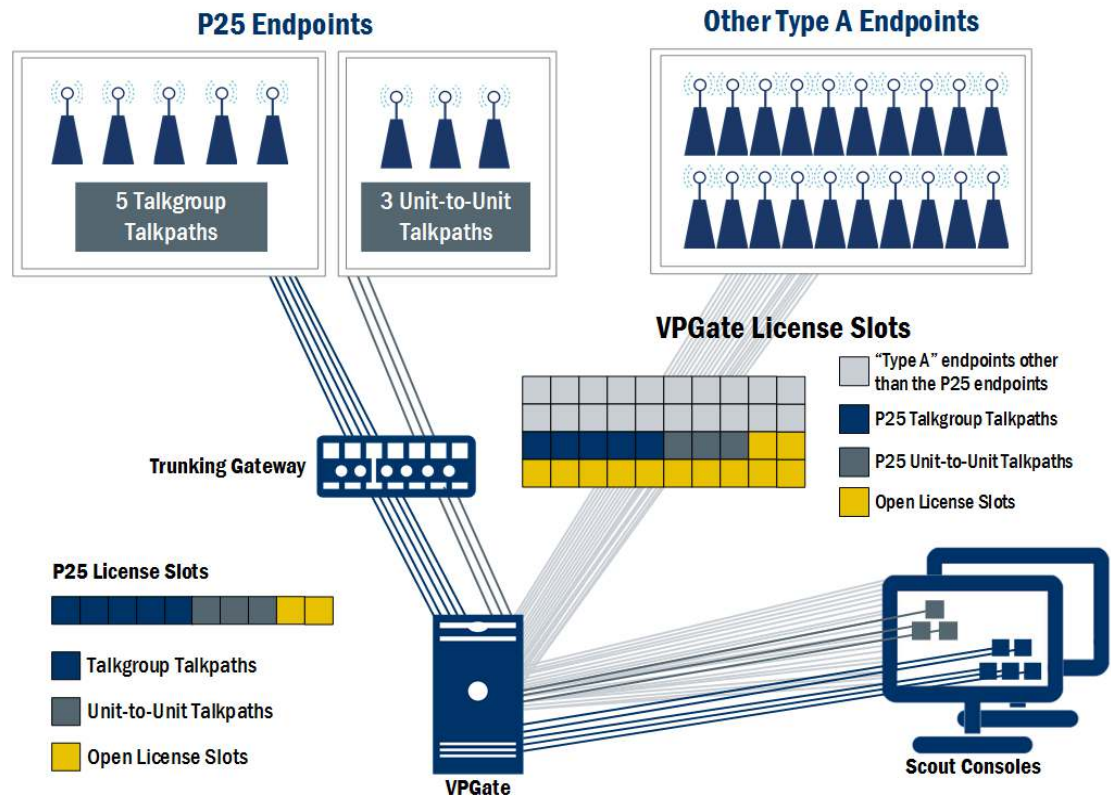
Each P25 endpoint requires one **VPGate P25 Supplemental License**. Every endpoint available on the console must be configured as a dedicated endpoint license. As shown in the following table, supplemental licenses are available for 10, 30, 60, or 100 endpoints.

VPGate P25 Supplemental License	Maximum P25 Endpoints
SFW-VPG-P25-10 SFW-VPG-P25-10-SK	10
SFW-VPG-P25-30 SFW-VPG-P25-30-SK	30
SFW-VPG-P25-60 SFW-VPG-P25-60-SK	60
SFW-VPG-P25-100 SFW-VPG-P25-100-SK	100

Each console position must hold a **P25 Seat License** as shown in the following table.

P25 Seat License	Maximum Licenses per System
SFW-SCOUT-P25	100

Licensing Example



This diagram shows example licensing for a company that uses P25 endpoints in addition to other endpoints. A P25 endpoint uses one Type A license slot from the Base VPGate license as well as one license slot from the VPGate P25 Supplemental license.

The example depicts a company with eight P25 endpoints and 20 other Type A endpoints that do not require supplemental licenses, for a total of 28 endpoints.

- A 40-endpoint base VPGate license (SFW-VPG-L1 or SFW-VPG-L1-SK) provides enough licensing for all 28 endpoints, which includes the eight P25 endpoints and the 20 other Type A endpoints
- A 10-endpoint VPGate P25 Supplemental license (SFW-VPG-P25-10 or SFW-VPG-P25-10-SK) provides coverage for the eight P25 endpoints
 - Five license slots cover the talkgroup talkpaths
 - Three license slots cover the unit-to-unit talkpaths
 - Two license slots remain open for additional P25 endpoints

- The Base VPGate license has 12 unallocated endpoints. The customer in this example would be able to add up to two more P25 endpoints. The VPGate P25 Supplemental License includes 10 endpoints, eight of which are used.
- The company would also require a P25 Seat License for every Scout console that accesses P25 endpoints.

Network Requirements

To configure the network requirements for a Scout system with P25 endpoints, consider the following:

- P25 Endpoint—Calls between a Scout console and a P25 radio subsystem (talkgroup or unit) require a 44 kbs bandwidth. Calls from a P25 radio subsystem to a Scout console require a 35 kbs bandwidth.
- Jitter—Scout allows jitter ranging from 60 milliseconds to 2.5 seconds.
- QoS—Scout supports separate Differentiated Services (DiffServ) values for audio and control packets between the console subsystem and the radio subsystem. This allows the network administrator to provision the Ethernet network that ties the console subsystem to the radio subsystem to give priority to the voice communication packets to reduce latency and provide an excellent Quality of Service.
- Scout software does not natively handle SIP messaging across NAT environments. Special equipment and expertise are required to implement. A network administrator should be consulted before delivering SIP signaling over NATs.

For more information, refer to the *Architecture and Networking Design Considerations* reference guide, available on Avtec Connect.

