

Cisco Land Mobile Radio Gateway

Product Overview

The Cisco® Land Mobile Radio (LMR) Gateway solution uses Cisco integrated services routers with LMR-specific software capabilities. These gateways link to existing LMR systems and make the critical adaptation of LMR audio and signaling to IP. The standards-based IP network that interconnects the LMR gateways provides the intelligent services necessary for real-time, point-to-multipoint traffic. The flexible, cost-effective solution joins multiple LMR systems temporarily or permanently, and the scalable, distributed architecture can support a few to thousands of users over unlimited distances across a public or private network.

The LMR industry is moving to a packet-based network infrastructure to interconnect radio base stations. Solutions based on traditional technologies are expensive, vendor proprietary, not scalable, and unreliable during disaster scenarios, when radio communications are critical. The Cisco LMR-over-IP solution addresses this important market by enabling a scalable, robust, and secure network that integrates easily with commercially available radio systems. The core of the Cisco LMR solution consists of Cisco 2900 and 3900 Cisco 2800 and 3800 Series integrated services routers, which can transport LMR traffic over point-to-point or multicast voice-over-IP (VoIP) networks, enabling LMR systems to extend beyond their traditional geographic limitations imposed by transmitter signal strength.

Key Features and Benefits

- **Based on open standards:** The Cisco LMR Gateway solution runs on off-the-shelf Cisco 2900, 3900, or 2800, 3800, series routers. Because it is based on well-known, open standards protocols such as multicast VoIP and H.323 v.2, it supports innovation and the development of value-added applications. It easily integrates with open standards applications that extend LMR communications to devices such as personal digital assistants (PDAs), PCs, IP phones, and public switched telephone networks (PSTNs).
- **Interoperable with disparate LMR networks:** With its open standards IP infrastructure, the Cisco LMR solution connects disparate, multivendor radio networks without the need for manual, dispatcher intervention.
- **Offers a cost-effective and reliable replacement for dedicated leased lines:** Running Cisco LMR communications on IP infrastructure yields cost benefits and operational efficiencies and increases the robustness of existing radio systems. Converged networks provide one highly robust and flexible infrastructure for all needs, including LMR, IP telephony, and data communications.
- **Protects investments in existing radio assets:** With Cisco LMR solutions, customers can continue to use push-to-talk (PTT), carrier-operated relay (COR), and tone-controlled radio systems by interfacing with either analog ear-and-mouth (E&M) ports or digital T1/E1 ports on Cisco integrated services routers.
- **Offers enhanced LMR features:** Cisco IOS® Software enhances LMR features to manage tone-controlled radios, handle fluctuation in audio levels, and deal with faulty PTT buttons on radios.
- **Enhanced network features:** The Cisco LMR solution is based on Cisco integrated service routers, which run the industry-leading Cisco IOS Software. Cisco IOS Software enhances LMR networks by incorporating advanced features such as security, quality of service (QoS), IP telephony, and wireless (802.11).
- **Enhanced security and VPN features:** Cisco IOS Software provides a robust suite of security features, including Virtual Private Networks (VPN), firewall, and intrusion detection, to LMR networks for secure communications.

Product Architecture

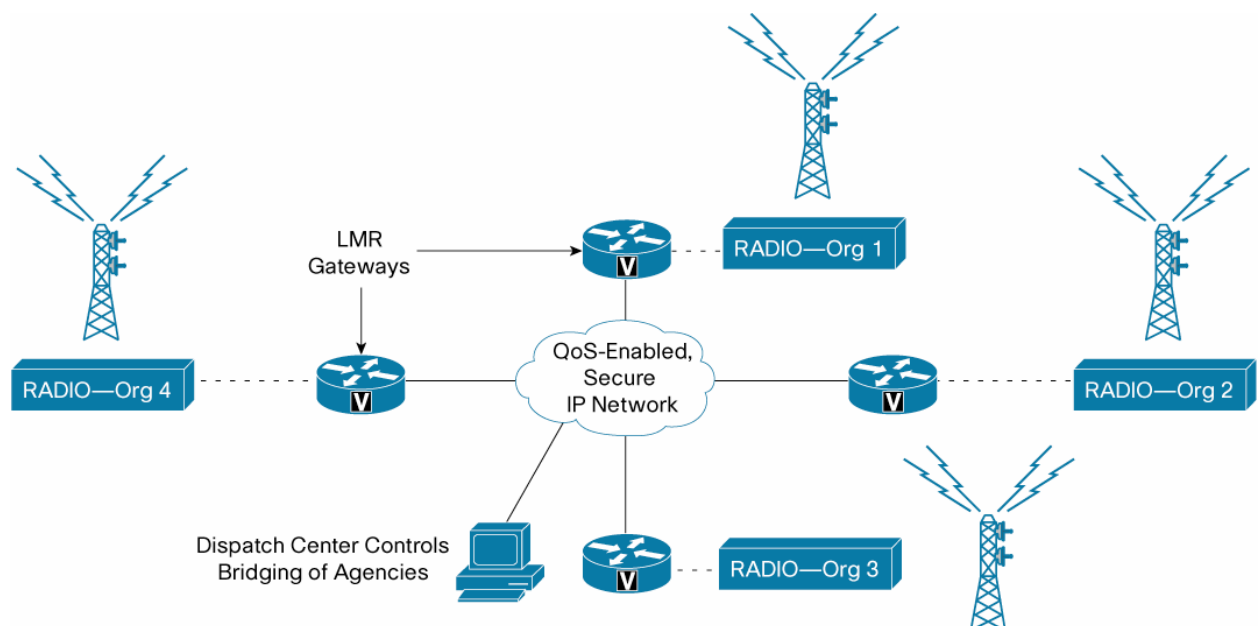
Many traditional radios are keyed using the electrical leads of PTT and COR. The Cisco LMR can tunnel the digitized audio and associated signaling across the VoIP network between two radio base stations by using the Cisco IOS Connection Trunk feature to establish a virtual tie line, which replaces a leased tie line.

The carrier-operated relay (COR) on the radio maps to the M lead on an E&M router interface. When asserted, it causes Real-Time Transport Protocol (RTP) packets to be inserted across the QoS-enabled VoIP network to the remote Cisco LMR router. Conversely, the presence of an RTP packet stream from the VoIP network causes the E-lead to be asserted on the E&M router interface, thereby asserting PTT on the radio side.

The LMR feature set comprises this function, along with thresholds and timers for tuning E- and M- lead behavior. It preserves the integrity of the electrical signaling across the VoIP network. In addition, the following enhanced Cisco IOS Software features make this interface between the radio and the router a value proposition:

- **Static tone injection:** You can configure the router to inject audio tones through the digital signal processors (DSPs) onboard for keying up or selecting the channel on the radio.
- **Notch filtering:** You can filter guard and idle tones before the audio is sent over the IP link. This helps maintain the integrity of the audio.
- **Configurable voice transmit delay:** To avoid front-end clipping, you can configure a transmit delay to make the Cisco LMR Gateway play incoming voice to the radio side with a delay of up to 1.5 seconds.
- **PTT timeout:** A faulty PTT button on a radio can severely hamper radio communication. You can configure the Cisco LMR Gateway to disable communication from a radio after a configurable PTT timeout duration.
- **Automatic gain control:** Fluctuating audio levels because of distance from the radio or disturbance in the medium can be frustrating. With automatic gain control, you can configure the audio levels on both radio and IP side to a comfortable decibel value.
- **Startup E lead off:** Traditionally the E-lead on the E&M voice card is raised when the router is in ROMMON state or reloaded. This can cause unnecessary radio key-up in the radio world. A new command has been added to turn it off in LMR mode.

Figure 1. IP-Enabled LMR Transport



The Cisco LMR on the Cisco 2900, 3900, 2800, and 3800 series routers expands IP Communications between multiple radio systems by mapping E and M leads to multicast VoIP groups.

You can develop open standards-based applications to expand connectivity to IP phones and PC clients. These applications can dynamically mix RTP streams from disparate multicast VoIP groups. In addition, these applications can mix RTP streams from multiple endpoints to serve the same function as a dispatcher in traditional LMR implementations.

Ordering Information

A feature license is required to turn on Cisco LMR Gateway functions. The feature is a configurable option or can be purchased as a spare for existing chassis.

Table 1. Ordering Information

Part Number	Price	Platforms Supported
FL-LMR	\$995.00	Cisco 2900, 3900, 2800, and 3800
FL-LMR= (spare)	\$995.00	Cisco 2900, 3900, 2800, and 3800

Feature Availability

Table 2. Feature Availability

Platform	Feature Set	Minimum Flash/DRAM	Recommended Flash/DRAM
Cisco 2900	UC Technology Package	256MB (platform default)/512 MB (platform default)	256MB (platform default)/512 MB (platform default)
Cisco 3900	UC Technology Package	256MB (platform default)/1GB (platform default)	256MB (platform default)/1GB (platform default)
Cisco 2811, 2821, and 2851	Advanced Enterprise Services	64/128 MB	64/128 MB
	SP Services	64/128 MB	64/128 MB
Cisco 3825	Advanced Enterprise Services	64/194 MB	128/256 MB
	SP Services	64/194 MB	128/256 MB
Cisco 3845	Advanced Enterprise Services	64/194 MB	128/256 MB
	SP Services	64/194 MB	128/256 MB

Product Specifications

Table 3. Product Specifications

Products	Specifications
Supported Platforms	<ul style="list-style-type: none"> • Cisco 2901, 2911, 2921, 2951 • Cisco 3925, 3945 • Cisco 2811, 2821, and 2851 • Cisco 3825 and 3845
Supported Cisco IOS Software Release	<ul style="list-style-type: none"> • 12.3(11)T SP Services and above for Cisco 2800, and 3800 series • 12.4(2)T SP Services and above for LMR feature enhancements* • 15.0(1)M and above for Cisco 2900 and 3900 series
Protocols	Multicast VoIP, Cisco Group Management Protocol (CGMP), class of service (CoS), differentiated services code point (DSCP), H.323v2, Internet Group Management Protocol Version 3 (IGMPv3), low-latency queuing (LLQ), and type of service (ToS)
Supported Network Modules	<ul style="list-style-type: none"> • Analog: Part numbers NM-HD-1V, NM-HD-2V, and NM-HD-2VE • Digital: Part number NM-HDV2 (LMR feature is supported with onboard voice interface cards (VICs) on Cisco 2800 and 3800 series, requires onboard DSPs/PVDM2 or PVDM3)

Products	Specifications
Supported Voice Interface Cards	<ul style="list-style-type: none"> Analog: Part numbers VIC3-2E/M (NM-1V or NM-2V only), VIC3-2E/M (NM-HD-1V, NM-HD-2V, or NM-HD-2VE only) Digital: Part numbers VWIC2-1MFT-T1, VWIC2-2MFT-T1, VWIC2-1MFT-E1, and VWIC2-2MFT-E1 (NM-HD-2VE only)
Features and Functions	Interconnect radio base stations using connection private line auto ringdown (PLAR), connection trunk and connection trunk-to-multicast VoIP networks; adjustable E lead, M lead parameters to control receive and transmit for COR and PTT radio systems

System Capacity

Table 4. Maximum LMR Ports

Platform	Maximum Analog Ports	Maximum Digital Channels
Cisco 2901	<ul style="list-style-type: none"> 8 total 	<ul style="list-style-type: none"> 8 T1s on board
Cisco 2911, 2921	<ul style="list-style-type: none"> 12 total 	<ul style="list-style-type: none"> 8 T1s on board 4 T1s on network module 12 total
Cisco 2951, 3925	<ul style="list-style-type: none"> 16 total 	<ul style="list-style-type: none"> 8 T1s on board 8 T1s on network module 16 total
Cisco 3945	<ul style="list-style-type: none"> 24 total 	<ul style="list-style-type: none"> 8 T1s on board 16 T1s on network module 24 total
Cisco 2811, 2821, and 2851	<ul style="list-style-type: none"> 4 on network module 6 on board 10 total 	<ul style="list-style-type: none"> 4 T1s on network module 6 T1s on board 10 total
Cisco 3825	<ul style="list-style-type: none"> 8 on network modules 8 onboard 16 total 	<ul style="list-style-type: none"> 8 T1s on network module 8 T1s onboard 16 total
Cisco 3845	<ul style="list-style-type: none"> 16 on network modules 8 onboard 24 total 	<ul style="list-style-type: none"> 16 T1s on network module 8 T1s onboard 24 total

Summary

Cisco Land Mobile Radio (LMR) Gateway is a Cisco IOS Software-based solution that runs on Cisco 2900, 3900, 2800, and 3800 series integrated services routers to integrate different radio systems over a highly scalable, robust, and secure VoIP network. The Cisco LMR solution is built on standard protocols such as multicast VoIP to integrate transparently with third-party applications to extend LMR communications to IP telephony, PSTNs, and PC-based endpoints.

Additional Information

Contact your local or regional Cisco account representative for additional information about Cisco LMR.

To Download the Software

To download Cisco IOS Software, visit the Cisco Software Center at:

http://www.cisco.com/en/US/products/sw/iosswrel/products_ios_cisco_ios_software_category_home.html

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For More Information

For more information about Cisco LMR over IP, contact your local Cisco account representative.



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