

# DMR TIER III SYSTEMS

starcomm  
wireless

Hytera

## Hytera DMR Tier III Trunking Systems

DMR Tier III Trunking is the pinnacle technology of radio communications systems and was developed using the ETSI DMR open standard and is designed for the most complex communications operations in large organizations. Hytera was a founding member of the DMR Association and was the first company to deploy a fully DMR Standard compliant Tier III system.

Since it is based on an open industry standard, multiple manufacturers provide Tier III compliant systems and radios. DMR Tier III is an IP-based digital trunking system designed to provide high-capacity individual and group calling, dispatching, and radio management capabilities across wide geographic areas.

Tier III trunked radio systems optimize voice or data traffic through a limited number of frequencies, maximizing the available resources for a large group of users, and utilizes repeater technology with a dedicated control channel, managed by servers.



**DMR**  
DIGITAL MOBILE RADIO ASSOCIATION

# KEY BENEFITS OF DMR TIER III TRUNKING SYSTEMS

## Maximum Efficiency and Capacity

DMR Tier III trunking systems increase channel usage efficiencies by dynamically managing their allocation for high traffic calling applications. DMR provides two communication pathways in one 12.5KHz channel. So, combining the efficiencies of trunking technology with the advantages of DMR results in a highly efficient wide area solution. DMR Tier III is designed for applications with high individual calling traffic with many users making radio-to-radio calls, and it always knows where the radio is and can find the most efficient (singular talk path) instead of using all the talk paths on the whole system. All devices are based on IP architecture to ensure flexible networking and system expansion.

## Leverages the Full Features of DMR

DMR Tier III systems also support all the features of conventional systems as defined in the DMR industry standard. Calling Features: Group call, all call/broadcast, individual calling, priority calling. Digital Features: integrated GPS, secure encryption, and text messaging (free form and preconfigured). Safety features: emergency calling, man down, lone worker, priority interrupt, remote monitor, and stun and revive.

## Versatile Services

In addition to the standard DMR voice and data services, Tier III supports priority, late entry, call back, recording, Public Switched Telephone Network (PSTN) calling. DMR Tier III also supports advanced services like call preemption and call queuing, dynamic site light up, and dynamic group allocation, late entry into a group call, ambience listening, interrupt/override, dynamic group number assignment, voice recording, and group patching.

## System Interoperability

Like DMR Tier II systems, DMR Tier III systems support interconnection gateways to PSTN/SIP/PBX/VoIP phone systems, analog conventional systems, MPT, DMR conventional, etc. DMR Tier III also features an open Application Programming Interface (API) that enables further development based on different customer needs, such as billing systems, e-mail gateways, etc.

## Enhanced Security

Like most DMR radio systems, Tier III supports standard and advanced (256 bit with AES and ARC4 algorithm) encryption for radio communications, but Tier III adds Electronic Serial Number authentication (ESN Check) that provides security control over system access by confirming the serial number of an individual radio before granting communications access.

## User Management and Calling Priority

Large organizations organize users into many levels of access required for different types of communication. DMR Tier III Systems offer a multitude of different management services to allow radios to interact with the network. Radios are registered on the network for identification and can be configured with subscriber area restrictions and control channel reselection. DMR Tier III systems also support different call priority levels to ensure calls from supervisors, security, and emergency response, get priority through the system for guaranteed communications in critical situations during heavy call traffic.

## Radio Registration Service

Radios register with Tier III systems for access control. This gives the network operator control over who can connect and talk on the system and provides users with registered access levels that enable granular control of call groups, call types, and calling priority.

## Mission Critical Resiliency and Redundancy

DMR Trunking combines optimal radio coverage with intelligent redundancy design, so the availability of the overall system is ensured even on the failure of individual components. DMR Tier III systems have several redundancy mechanisms available to ensure guaranteed operation and service availability. With the MSO at the heart of the system, it supports local and geographical backup and triple failover redundancy to ensure continuous wide-area operation. Other controller hardware can also be used in redundant configurations with several failsafe modes. All these configurations are scalable and can be adjusted at any time during the lifecycle of the system. So, systems can start small, and redundancy can be added as the system grows.

## Over The Air Programming

DMR Tier III supports reliable and robust Over the Air Programming (OTAP) that enables centralized control of each radio on the system and provides a very convenient method to automatically upgrade and reconfigure radios in the field. OTAP saves many hours of time compared to the standard benchtop configuration of radios that requires plugging each radio into a computer and manually programming them.

## Powerful Software Applications

Tier III systems include network management, dispatching, and voice recording applications to provide a comprehensive and professional DMR Trunking solution with centralized management and remote maintenance of large radio systems.

# HOW DMR TIER III WORKS

DMR Tier III is an IP-based system with a centralized networking approach to intelligently manage resources. The DMR Tier III Trunking System consists of a central controller called a Mobile Switching Office (MSO), a Base Station Controller Unit (BSCU) server at each radio repeater site, multiple repeaters to carry the traffic, and a wide area network that connects all the different pieces together. Like IP Connect, IP network connectivity is provided by a variety of third-party internet, LAN, or VPN network operators. All the radio sites connect to the MSO, which provides the routing functions, the gateways to telephone networks and other systems, as well as managing the trunking of calls across the system. The MSO offers high availability standby, while multi-level fallback options can be deployed to ensure high reliability.

DMR Tier III requires a dedicated FCC FB8 frequency control channel that is always available for radios to register and request service from the network. The remaining channels in the system are allocated to the radio as they are needed and are therefore a shared or trunked resource called a traffic channel. As soon as a traffic channel is available, a user will be assigned to use the channel, without having to wait for a specific channel to become available.

DMR Tier III MSO systems are available as preconfigured and integrated solutions within a network cabinet. They include several radio network components, including repeaters, servers, switches, network gateways, and redundant power

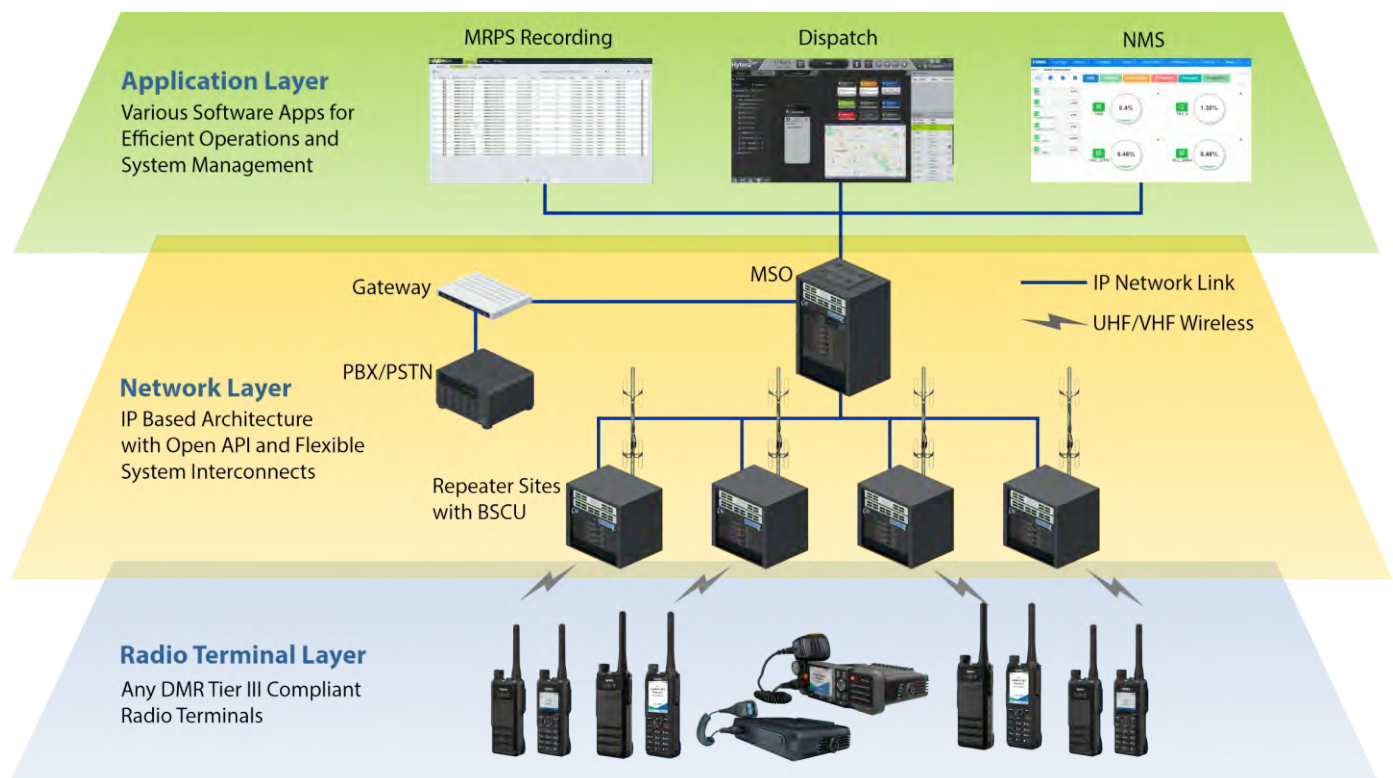
supplies. The repeaters are available as standard 19" repeaters or blade servers with triple failover redundancy for mission critical applications. In addition, the MSO can include a server that functions as a Key Distribution Management Center (KDMC) that is used to manage all the access rights to the network, and a Media Translation Unit (MTU) that converts the digital data to analog voice signals.

The system consists of three layers: the application layer, the network layer, and the radio terminal layer.

The application layer includes the dispatching software for centralized communications control and GPS location tracking, network management software for monitoring and configuring the radio network, and Multimedia Recording and Playback System (MRPS), which is a logging recorder system collecting data from radio systems to maintain the integrity of incident data and archiving of communications to reduce liability and improve accountability.

The network layer is typically deployed as a hub-and-spoke IP network topology with the MSO at the center hub with gateway connectivity to other systems like PBX/PSTN telephones.

The radio layer includes the handheld and mobile radio terminals. Because DMR is an established industry standard, any DMR Tier III compliant radio from any manufacturer can be deployed on the system.

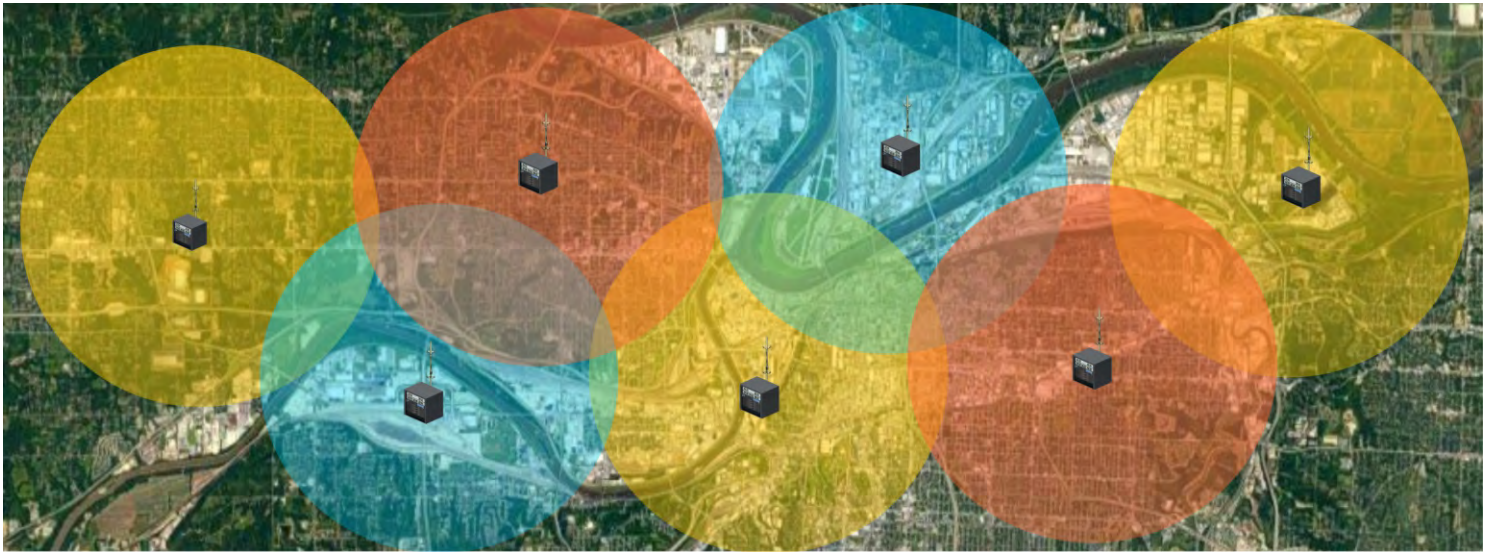


# SMR RADIO NETWORKS

DMR Tier III systems are often deployed as Specialized Mobile Radio (SMR) networks. Operators of SMR networks lease radios and wide-area network access. SMR operators are typically larger two-way radio dealers that have a considerable investment in FCC frequency licenses and building out the SMR network that covers cities, counties, and even entire states. SMR network customers include municipal and county agencies, schools and universities, utilities, hospitals and ambulance companies, tow truck companies, and other organizations that require reliable and cost-effective wide-area radio communications.

DMR Tier III is often used in SMR networks because of the wide area scalability and roaming capabilities, the capacity for thousands of radio users, the mission critical reliability and security, and the ability to have granular control over the radios and their access to the network.

There are virtually no limitations on the capacity, coverage, and capabilities of DMR Tier III systems, especially with multiple frequencies over a wide area. Once Tier III systems are installed and operational, they are the most reliable and enduring communications systems available, and are often “the last man standing” after natural disasters.



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