



LMR All-IP Core Networks

Scalable, secure all-IP core networks for TETRA, APCO 25, DMR, dPMR and analogue wide area communications. Etherstack's complete voice plus data solution customizes the latest cellular soft-switch technology for swift PTT call setup, group calls and end-to-end encryption.

- SIP soft-switching
- RTP for real-time voice and data
- Multi-protocol, multi-network support
- Secure: end-to-end encryption and rekeying
- Reliable: self-learning, self-healing, fault tolerant
- Scalable: local, regional, national
- Fast PTT set-up
- Used in the field NOW



LMR All-IP Core Network

Etherstack's Land Mobile Radio (LMR) All-IP Core Network is a full software solution purpose built for APCO 25, TETRA, DMR, dPMR and analogue communications. It also supports inter-working between these standards, allowing manufacturers and system integrators to converge network products into a single set of equipment and offer a range of unique options for technology migration and interoperability.

The network architecture is designed for scalability and redundancy and does not restrict underlying linking infrastructure, network capacity or geographical span. It can be used with a VPN, a dedicated IP network or digital RF backhaul. The number of sites, channels and subscribers is extended via software reconfiguration and functionality can be reused and reorganized easily.

Network Features

Exceptional Flexibility

Etherstack's All-IP Core Network suits a wide variety of typical and unusual deployments – including the use of mixed backhaul that might include RF or satellite links. Network components are highly modular and network interfaces well defined so that components and sub-components can be co-located, customized or delivered separately if required.

Interoperability and Open Interfaces

Etherstack is committed to using open standards wherever possible and a number of LMR equipment manufacturers use Etherstack's technology at the heart of their products. The use of common technology, interfaces and standards dramatically increases the interoperability and flexibility of mission critical communications.

Lower Capital Cost

Etherstack's network solution lowers the capital cost of network equipment as much as possible by using off-the-shelf Linux industrial computers and minimizing the amount of custom hardware required.

Etherstack also offers a unique product called the Channel Controller which can be introduced at an existing site to convert legacy analogue repeaters into APCO 25 and DMR digital base stations.

Security

The LMR All-IP Core Network prioritizes security. The solution can be deployed on secure components and supports end-to-end encryption from a transmitting terminal to all terminals and subscriber end-points in the network. Over-the-air and over-the-network rekeying functions are also provided to ensure straightforward execution of regular security updates.

Network Components

Radio System Network Controller (RNC)

Etherstack's RNC coordinates calls, traffic and roaming by providing a single point of contact for all subscribers in the system. Mobility management and call control is achieved using air interface protocol specific SIP messaging and floor control is co-coordinated using RTP. The RNC communicates with the NLR to manage subscribers.

Network Location Register (NLR)

The NLR contains a central repository of authorized subscriber profiles and tracks the location of mobile subscribers through the network. It updates its database with information provided by the RNC and interacts with other RNCs to support roaming of non-homed mobiles. The NLR's secure management interface allows it to add, remove and modify authorized subscribers to and from the network in a secure manner.

Base Station Controller (BSC)

The BSC configures, controls and manages transceivers to enable subscriber services at a site. All interfaces are IP-based so that no special cables or hardware are required. The BSC supports the following four configurations:

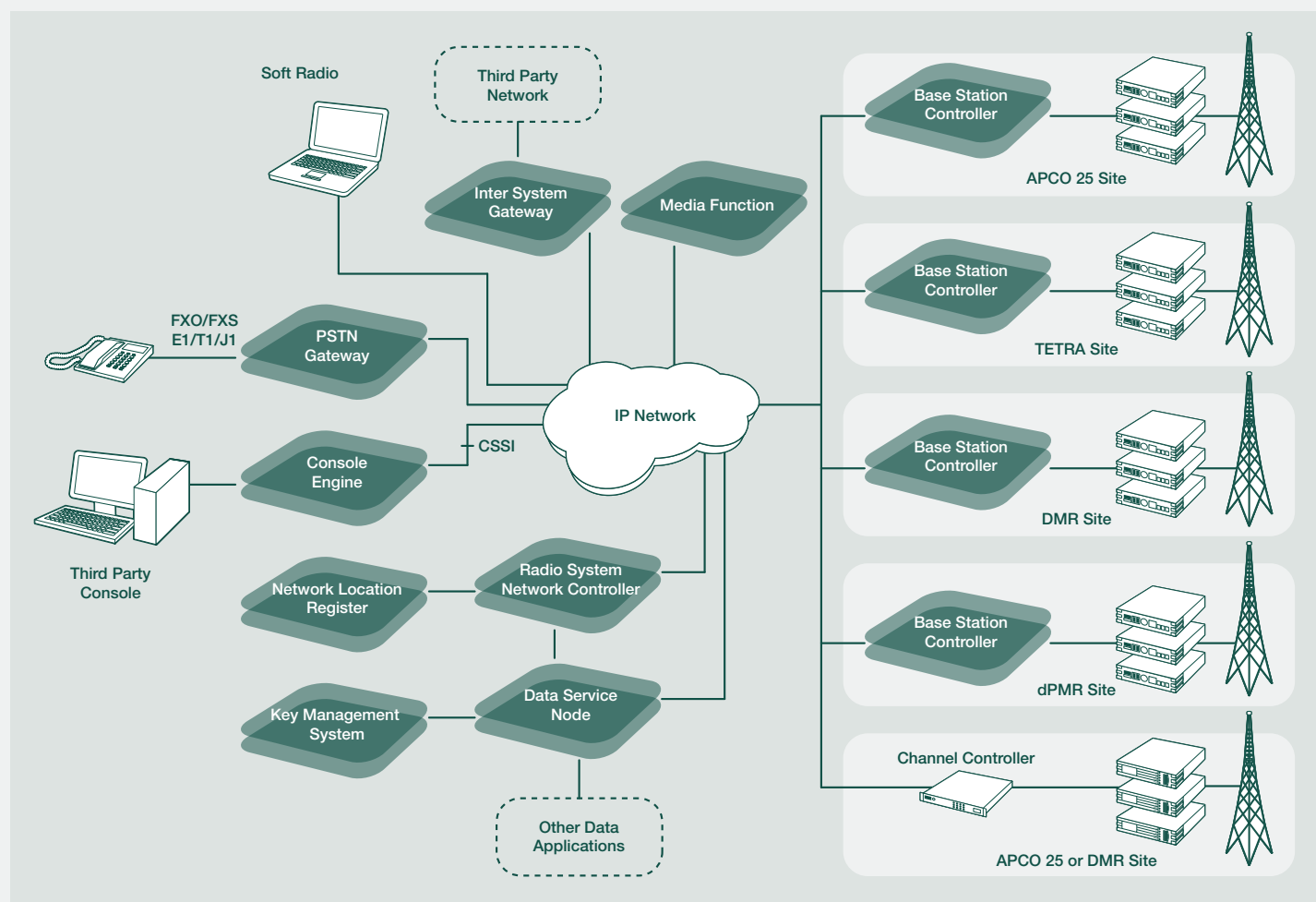
1. Single site conventional and analogue
2. Single-site trunked, conventional and analogue
3. Multi-site conventional and analogue
4. Multi-site trunked, conventional and analogue

In a multi-site system the BSC connects to and communicates with the RNC.

Data Service Node (DSN)

The DSN provides the functionality required to support packet data services to network subscribers. As the packet data equivalent of the RNC it contains an NLR stack for authentication and authorization with the NLR and an IP Stack for data transfer to public or private packet data networks.

The DSN can be configured to act as: a serving node, providing session management to a service area; a gateway node, acting as the interface to the public or private data networks; or a combined node, providing the functions of both serving and gateway nodes.



Key Management System (KMS)

Etherstack's KMS supports the secure distribution and management of cryptographic keys to units in the field and subscriber end-points in the network. This scalable platform can be provided with one seat or multiple access points depending on operational requirements.

Media Function (MF)

Etherstack's LMR All-IP Core Network allows voice transcoding and decryption to be executed either at subscriber end-points (for end-to-end encryption) or centralized at the Media Function. This flexible configuration means that key management and processor load can be distributed to suit the security and capacity requirements of a specific network.

The MF is therefore an optional high security component that executes centralized transcoding and decryption/encryption for all air interface protocols supported in the network.

PSTN Gateway (PSTNG)

The PSTNG provides telephone and PABX interconnectivity with the all-IP switching network. It is responsible for translating ISUP or E&M signaling to and from the appropriate SIP messages as well as transcoding RTP voice packets onto the PSTN.

Inter System Gateway (ISG)

The ISG provides a seamless interface between Etherstack's network and other vendor IP, IMS, OMA PoC, TETRA, DMR and APCO 25 network equipment. It appears to the Etherstack All-IP Core Network as another Etherstack radio system using SIP and RTP.

Console Engine (CE)

Etherstack's Console Engine (CE) enables third party console manufacturers to access Etherstack's all-IP core. It allows console operators to initiate, control and be party to any and all calls on the network, as well as facilitating patching of unit and group calls and all appropriate supplementary services.

P25 and DMR Channel Controllers (CC)

Etherstack's Channel Controllers are unique devices that convert unmodified analogue repeaters into digital P25 and DMR Base Stations without degradation in digital functionality or service. They essentially add digital capability and connectivity into the wide-area network to existing RF infrastructure. The existing RF infrastructure can also continue to be used in its original analogue function. Channel Controllers lower the cost of equipment and enable gradual migration from analogue to digital communications.

Soft Radio (SR)

All Etherstack networks include a PC-based Soft Radio. This provides full subscriber functionality into the network via a computer user interface that has the look and feel of a physical terminal. This application is useful where, for example, users in a secure building have to leave their radio equipment at the door.

Network Management and Dispatch

Etherstack supports the ISO Telecommunications Management Network model for network management with its SNMP based FCAPS management facility. Dispatch within the network is similarly standardized via use of the APCO 25 Console Sub-System Interface (CSSI). The use of standards for network management and dispatch maximizes the range of third party products that can be used with the network.

Resilience

RNC Duplication

A fundamental failure mechanism is duplication of RNCs. An active RNC maintains call state for multi-site calls and sends heartbeat messages to a second standby RNC, which is waiting to take over if the active RNC fails. Because each RNC presents a single IP address to the network the fail-over is transparent to other network elements.

Fallback

If the BSC loses connection with the network it will continue to provide full trunking, conventional and analogue services at a site.

If the BSC loses connection with the transceivers or is otherwise unavailable, the transceivers will continue to provide conventional and analogue operation (if configured to do so).

Scalability

Etherstack's All-IP Core Network components can introduce digital capability and network connectivity at a single site or across an entire nation. The architecture is structured so that additional components are added as the network grows from a site (transceivers plus BSC) to a wide area network (introduce further sites and an RNC) through to a multi-site, multi-network configuration whose geographical span is unlimited.

Fault Tolerant Server Package (FTSP)

The FTSP comprises a High Availability Cluster (HAC) and a Disaster Recovery Node (DRN). Together these ensure the continuity of service required by mission critical communications in the event of network equipment failures or catastrophic failure at an operational centre. When a FTSP node fails or cannot perform its primary function a backup node takes over the operations of the failed node to minimize the period of system outage.

The FTSP's High Availability Cluster (HAC) consists of primary and secondary nodes that both are typically located at a Network Operations Center. The HAC's main function is to prevent loss of service as a result of hardware, software or power failures such as power supply unit (PSU) failure, hard drive failure, cable and IP link failures, and operating system failure.

The Disaster Recovery Node (DRN) is located at a site remote from the HAC. The DRN's role is to take over the HAC's operations in the event of catastrophic damage to buildings, equipment and computer infrastructure or extended power outage.

About Etherstack

Etherstack engineers specialise in radio communications software.

With fourteen years experience and an international client base, Etherstack combines wireless protocol software design with all-IP soft switching expertise derived across professional mobile radio, military and cellular communications.

We work closely with our customers to achieve technical excellence, successful delivery at fixed price, ongoing support and software that can be reused.

Other Products

- APCO 25 (I / II) Air Interface Protocol Stacks
- TETRA / TEDS Air Interface Protocol Stacks
- DMR / dPMR / NXDN Air Interface Protocol Stacks
- APCO 25 CSSI, FSI and ISSI Gateway Solutions
- Nexus Transceiver Reference Designs