RADIOHUB™

A COMPLETE, COMPREHENSIVE, SECURE P25 CONVENTIONAL RADIO COMMUNICATION SYSTEM

ADCOM TECHNOLOGIES

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RadioHub™

System Description

At the core RadioHub is a comprehensive P25 conventional all in one software defined network solution designed to provide a simple evolution to a digital P25 environment or as an upgrade to an existing and or network expansion. The system is scalable, simple to deploy and administrate, only requiring a commercial off the shelf central server and gateway devices linking and bridging field radio hardware.

Presently, tactical deployment of advanced radio systems has been limited to preconfigured networks in fixed configurations. The RadioHub P25 conventional software defined network solution is an enabling technology providing analog and digital voting, ROIP, call routing, disparate radio network bridging, and a host of other enhanced capabilities to tactical environments while maintaining full end-to-end encryption in secure environments.

Advanced technology allows the RadioHub voters and ROIP interfaces to operate on high-latency, high-jitter backhaul links with no reconfiguration. The system automatically monitors link latency and jitter and adjusts the voter windows and other parameters to achieve the minimum audio latency required to maintain high quality audio. Expensive microwave links and leased lines are no longer required to deploy a voted radio network.

As a pure software-based system, RadioHub stores multiple pre-validated configurations to satisfy most known tactical scenarios without requiring duplicate equipment or time-consuming field configuration. Configurations can be tested during exercises, documented using automatically generated Word™ and PDF documents and exchanged with other agencies with just a few clicks.

A Wizard based configuration tool allows for the application of new scenarios, including complex interoperability networks to be configured and designed to be deployed in minutes by non-technical staff with very basic knowledge of radios and networks. After providing very basic information, the RadioHub server loads as many voters, arbitrators, and other virtual devices as required and automatically configures all remote gateways, interoperability bridge interfaces, recording servers, radios (most manufacturers) and VPN gateways.

Fully redundant configurations are available with full online redundancy in voting, arbitration, and all other server functionality. Redundant online backhaul links between the server network and the radio gateways, as well as redundant links between the server network and dispatch stations are supported in the base product. Full online redundancy means glitch less failover for backhaul links and all server components. Up to 4 redundant servers can be online for a single RadioHub instance. Servers and backhaul links are automatically brought back online after a failure is resolved, and full telemetry is available on local or remote status consoles as well as on RadioHub tactical dispatch consoles.

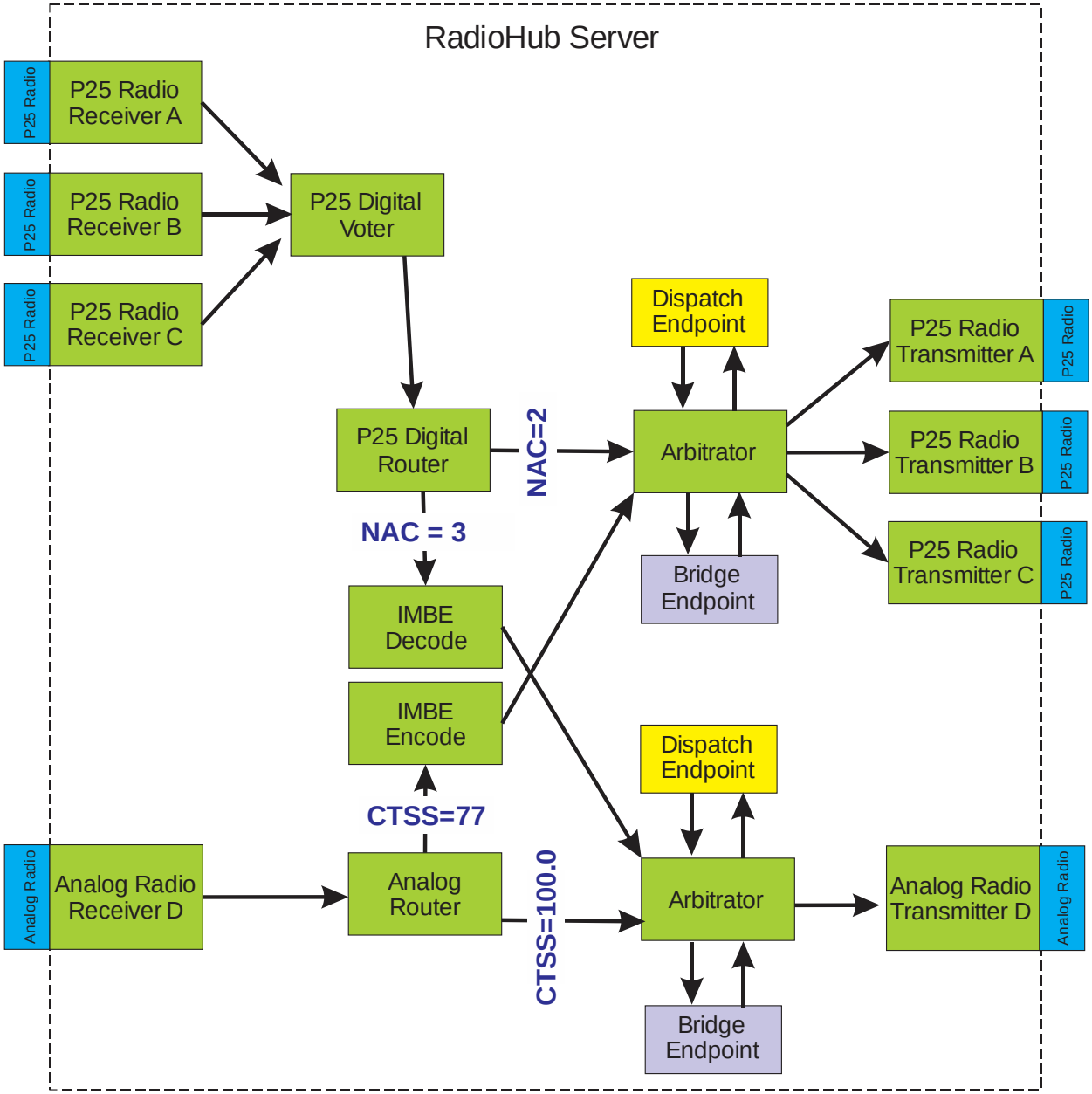
All server components can be hosted in multiple environments including cloud servers, datacenter rack servers, Windows™ based notebooks and tablets and embedded, lower power devices. All components can be used in mixed environments allowing EOC data-center based servers to be backed up by cloud server instances and on-site embedded devices (or any other combination).

Sample Scenario

Even though RadioHub servers are easy to configure, complex radio architectures can be designed and tested in *minutes*.

A field exercise requires a set of three voted P25 digital repeaters plus a separate analog repeater for communicating with NGO staff on site.

Agency handsets are programmed with 2 channels, both on the same frequency. Channel 1 will be encrypted with the NAC set to 2. Channel 2 will be clear with the NAC set to 3. NGO handsets will be programmed with two analog channels. Channel 1 will transmit with CTCSS set to 100hz, receive set for open squelch. Channel 2 will transmit with CTCSS set to 77hz and receive set for open squelch. Only leadership radios will be programmed with channel 2.



On both sets of radios, channel 1 is used for intra-agency communications. For the P25 digital repeaters, the digital stream will be repeated using the P25 transmitters with the encryption intact (end-to-end encryption).

Channel 2 is used for interagency local communication, received audio (both digital and analog) will be transmitted on both the analog and digital transmitters. The P25 digital transmissions will be made in the clear (it is possible to encrypt these transmissions if desired).

Note that if DFSI mixed mode radios are used for the repeaters (e.g. Zetron MT4E or Stratus radios) and the analog and digital communications are broadcasting on the same frequency, allowing for a single set of repeaters to be used for both analog and digital supporting voting in both modes.

Bridge Endpoints allow dynamic bridged connections to be established between RadioHub servers. ISSI endpoints can also be used to link to existing P25 infrastructure. Pre-configuration of ISSI connections is usually required as ISSI is significantly more complex to configure and deploy on the existing P25 infrastructure.

RadioHub bridge endpoints can be connected to other RadioHub servers inside the same organization, or with other organizations with an MOU registered for the customer organization. Public interoperability bridges can be created on the US national level RadioHub interoperability servers in seconds and credential keys can be shared electronically or verbally with other organizations to grant them access to the public bridges. All participants can view a complete list of connected organizations and radios, and the host agency can grant or revoke access to any other organization as needed.

Interoperability bridges can maintain end-to-end encryption across organizations if the subscriber units share the common keys. RadioHub servers can also decrypt and re-encrypt transmissions to allow use of different encryption keys without sacrificing over the air security. This does require each agency to provide their key to their RadioHub server, this key is not shared with the interoperability bridge or other agencies. The national level RadioHub servers create a separate key used for transferring data over the interoperability bridge, so all traffic is actually decrypted and then re-encrypted twice transparently.

All changes to interoperability bridge connections can be made in real-time without disrupting ongoing communications.

RadioHub Virtual Components

Server- Commercial off the shelf device core gateway supporting the RadioHub library

DFSI V1 and DFSI V2 radio interfaces with support for DFSI based base stations and repeaters and proprietary radios via RIC-M gateways devices

Digital Voter with voice and data voting capabilities and full end-to-end encryption support (voter is not keyed)

Analog Voter – required gateways and operates on high-latency, high-jitter backhaul networks without degrading audio quality

Programmable Arbitrator – prioritize transmit traffic to ensure clear communications and delivery of the highest priority traffic on busy networks

ROIP Router – route digital and analog voice data to non-voted radios for simple or complex radio interoperability networks.

P25 and Analog Voice Routers – P25 voice traffic can be routed to multiple endpoints based on NAC, talk group ID, subscriber emergency status or encryption details. Analog traffic can be routed based on CTCSS, DCS and other selective call protocols.

P25 Data Routers and Gateways – route data traffic from your subscriber units to one or more data gateways by traffic type (registration, location, OTAR, etc) with voting on inbound traffic and automatic tracking of the best radio to provide data responses from the gateways.

OTAR Gateway – proven gateways to major vendor KMF systems (including US Federal systems) for P25 subscriber units

Tactical KMF – built in FIPS compliant KMF for KVL or OTAR rekeying of radios in a tactical environment

Voice and Data Recorder – record all voice and data traffic, including voter inputs and outputs with full telemetry information to a digital recording system. Encrypted traffic is recorded in its original encrypted state without keys on the recording system preserving the integrity of secure systems.

Analog Gateway and Radio Support – small, lower power gateways devices link analog radios and gateways to the RadioHub network with support for four-wire, line level, headphone level, re-discriminator audio and a variety of signaling protocols including CTCSS, DCS and TRS.

Audio Format Conversion – convert analog audio to/from P25 digital compressed formats, as well as other industry standard codecs (G.711, G.729, OPUS, MELP and Codec2 currently).

Signal Encryption/Decryption – encryption, decrypt or re-encrypt P25 digital traffic using AES-256 encryption with internal key management and support for OTAR as well as a KVL interface.

Third Party Dispatch Interface – industry standard DFSI dispatch ports for dispatch systems including the Zetron Max consoles.

Tactical Dispatch Console – a comprehensive Windows™ based tactical dispatch console system with full support for the RadioHub system including telemetry and AES-256 encryption. Dispatch stations are automatically configured from the RadioHub wizard-based configuration data and multiple dispatch roles with separate endpoint configurations are supported.

Glossary

Arbitration-Requests system to determine multi-signal priority

CTCSS-Continuous Tone-Coded Squelch System

DFSI-Digital Fixed Station Interface

FIPS-Federal Information Process Standard

ISSI-Inter-Radio Frequency Subsystem Interface

IMBE-Improved Multi-Band Excitation

Jitter-Any deviation in, or displacement of, the signal pulses in a high-frequency digital signal

KMF-Key Management Facility

KVL-Key Variable Loader

Latency-A short period of delay (usually measured in milliseconds) between when an audio signal enters a system and when it emerges

MOU-Memorandum of Understanding

NAC-Network Access Code

NGO-Non-Government Organization

Organization(s)-Agencies, Departments for purposes of referencing interoperability

OTAR-Over the Air Re-Keying

Voting- Interprets the audio from several outlying receivers and selects picks the best signal and routes it to a single output.

Telemetry-Information/Data critical to the operation

TIA-Telecommunications Industry Standard

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