

R&S®M4ACS AIRDOMAIN COMMUNICATIONS SYSTEM

Trusted communications for safe
air traffic control and air defense



Product Brochure
Version 01.00

ROHDE & SCHWARZ
Make ideas real



AT A GLANCE

The R&S®M4ACS is a future-proof communications solution for fixed and deployable military command centers and air bases. It offers certified separation of classified and unclassified communications via a trusted audio switch that automatically manages the correct security level of incoming and outgoing calls to simplify the air traffic controller's work.

The R&S®M4ACS is an innovative fully IP based voice communications system combining rich functionality with excellent usability for seamless airspace operations. It utilizes all the advantages of IP technology and provides strong security and innovative resilience while also supporting crypto pooling. All communications can be operated from a single screen without any compromises on security.

The R&S®M4ACS provides clear separation between the red/secure and black/unsecured domains, allowing the operator to simultaneously access two security domains at the same time using the same audio accessories in combination with clear audio routing principles.

The separation between the two security domains is achieved by deploying a TEMPEST Level A, Common Criteria BSI certified trusted audio switch from Rohde&Schwarz.

Each security domain is equipped with independent core equipment and provides access to the specific legacy and IP interfaces by using distinct demarcation equipment.

Thanks to the high level of versatility, the R&S®M4ACS could accommodate different installation scenarios such as fixed, deployable (transit cases) and mobile systems (vehicular installation or shelter installation), based on usage of COTS/MOTS products as well as mission-specific equipment from Rohde&Schwarz.

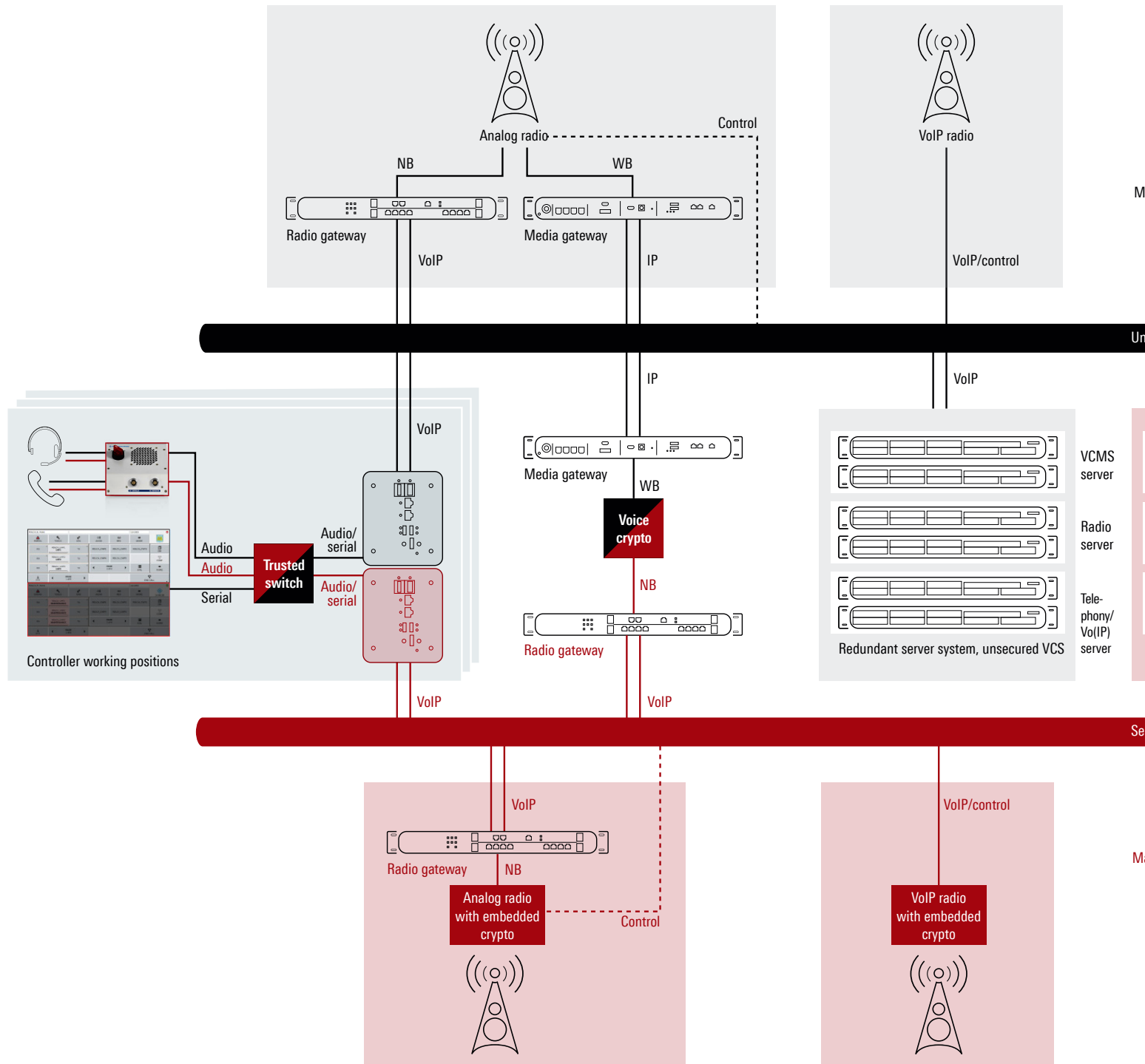
The R&S®M4ACS is a field-proven solution ensuring reliable operation of critical communications infrastructures. The intrinsically secure R&S®M4ACS is hardened from the software and hardware perspective and can be further enhanced with IP security mechanisms such as firewalls, session border controllers and traffic encryption.



User-friendly, intuitive operational interface for red and black domains.

SYSTEM OVERVIEW

The R&S®M4ACS communications system consists of various components such as VHF, UHF and HF radios, encryption boxes, gateways, phones, local area network/wide area network (LAN/WAN) infrastructure, application servers and controller working positions (CWP), including the trusted audio switch and touch entry display. The latter elements are the most prominent ones as they represent the human-machine interface to the system.



OPERATION

Ease of operation

The system provides trusted and reliable access to secured and non-secured communications environments by using a single operator panel (touch entry device) and a single set of audio accessories (headset, footswitch, microphone). The clear, well-structured user interface simplifies the work of the air traffic controller. The screen of the touch entry device is divided into multiple functional areas, making operation intuitive. Multiple colors inform the controller about the status of the radio resources, number of controllers connected to the same resources, receive signal strength indicator (RSSI) information and best signal selection (BSS). With the help of the human-machine interface (HMI), the controller can directly obtain detailed information on the radio, reconfigure radio frequencies and manage audio settings.

Customized user preferences, such as persistent per role audio selection, are saved and recalled upon system login. Moreover, the system allows dynamic reconfiguration of the HMI. Based on the role the controller selects, either via HMI menu or from a C&C application (e.g. via single sign-on), the HMI will allow or disallow access to certain radio and voice resources. This role change can happen on the fly during live operation and ensures a quick and secure handover during ad-hoc events.

With the R&S®M4ACS system, the users can enable crypto pooling mechanisms, allowing effective and secure encryption device allocation to radio resources. This not only saves money but also increases crypto availability by flexibly mapping voice flows to encryption devices. The HMI allows very fast cross-connections between air-to-ground and ground-to-ground calls. This saves precious time in both routine and emergency operations. Furthermore, being IP based, the system is open for integration with data applications like video streaming and IP sensing. Those applications are presented at the HMI and improve the situational awareness of the controller.

Security

The R&S®M4ACS system offers true integrated and secure communications in a multi-level secure environment with the help of IP technology. Voice and data services can run over the same WAN infrastructure. Media gateways for telephony and radio ensure connectivity to available non-IP services, and wideband gateways enable connectivity to encryption devices and allow crypto pooling. With its distributed and redundant architecture, the system can withstand multiple failures and still provide essential services even in case of a natural disaster or other irregularities.

Flexibility

The R&S®M4ACS features maximum flexibility and optimal resource utilization. Any operator at any center is given the possibility to connect to any radio anywhere at any time. System expansion is easy: when added to the system, new CWP, radios and gateways will learn about all available communications endpoints and become addressable endpoints themselves. Hence, the system scales along with the number of elements from small installations to nationwide deployments.

Compliance with industry standards

The R&S®M4ACS supports the ED-137 standard to ensure safe and secure ATC voice communications. From the security perspective, the trusted audio switch has been certified by the German Federal Office for Information Security (BSI) according to Common Criteria EAL4. It also complies with NATO TEMPEST Level A (SDIP-27 standard).

International best practice

The R&S®M4ACS utilizes state-of-the-art field-proven VoIP technology from Rohde&Schwarz. VCS gateways, application servers and CWPs are deployed in hundreds of systems around the world. The trusted audio switch has been accredited by NATO member states.

Future-ready

The system can easily adapt to new technologies as it is flexible and upgradeable. Application servers run on commercial off-the-shelf (COTS) hardware and software functions allow integration with other applications such as video feeds, telemetry services and logging systems.

High availability

The R&S®M4ACS makes use of all the advantages of IP technology such as high resilience, security and flexibility. Its innovative architectural model features redundancy on several layers (equipment level, subsystem level, system level and operational level). As a trusted partner, Rohde&Schwarz ensures the highest system availability for the entire project lifecycle.

BENEFITS

Powerful, certified system

The R&S®M4ACS is a powerful system that offers control of voice connections, control of remote radios (UHF, HF, VHF), access to crypto devices, support for crypto pooling and access to internal and external telephony lines. It offers clear separation of classified and unclassified communications via the trusted audio switch that automatically manages the security level of incoming and outgoing communications. This traffic separation has been certified according to NATO TEMPEST Level A (SDIP-27 standard) as well as Common Criteria EAL4 by the German Federal Office for Information Security (BSI).

Operational ease for air operation controllers

Classified and unclassified communications domains are accessible from one single screen and one single headset. The system automatically manages audio routing and crypto device usage depending on the communications endpoints selected by the operator. Additionally, an ongoing secure call will be indicated by a sound or light signal to raise attention for operators and personnel in the close vicinity.

Cost-efficient and flexible IP architecture

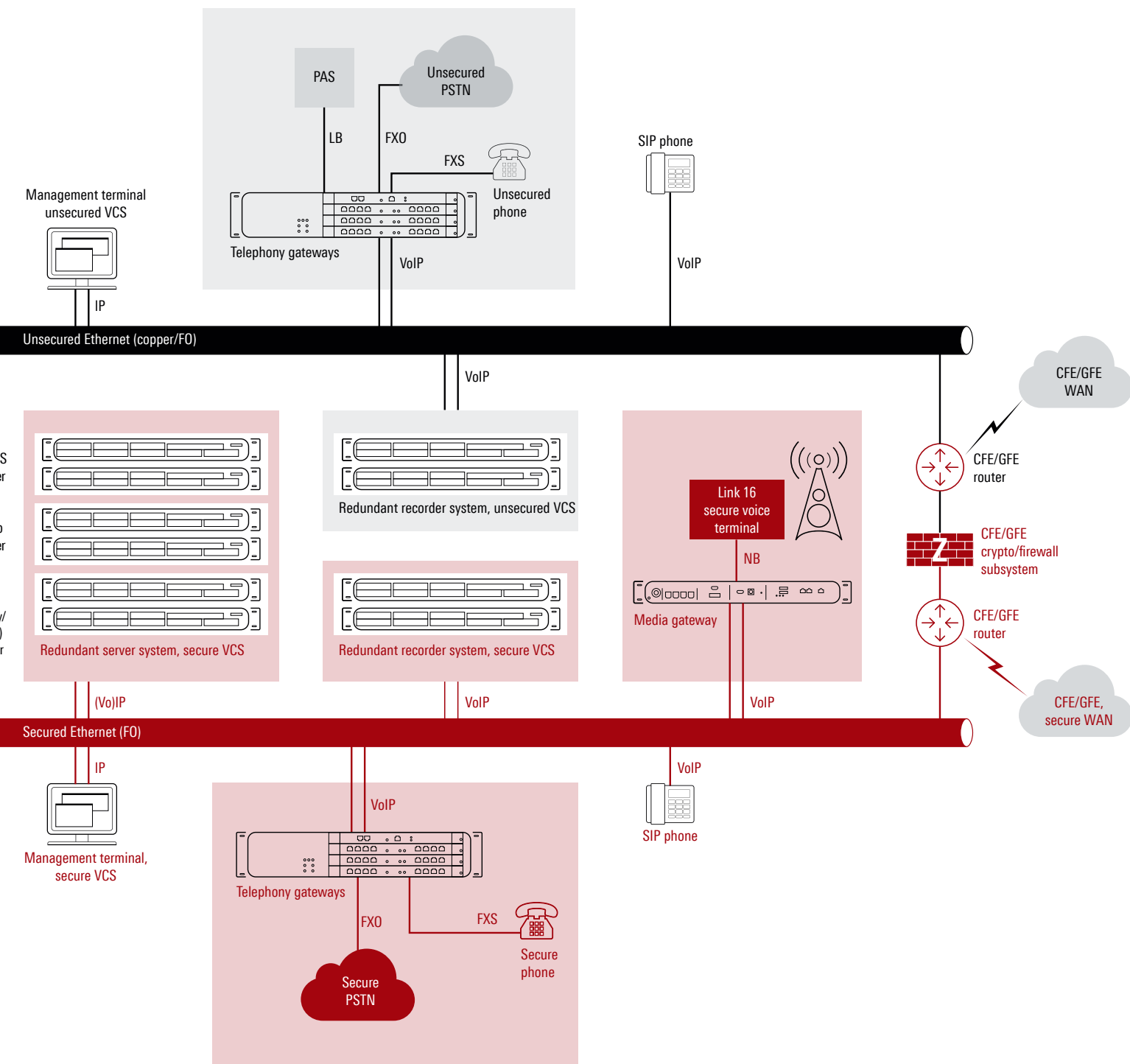
The R&S®M4ACS is a cost-efficient and flexible system. It uses COTS components (servers, switches, routers) and hot-pluggable interface cards, and integrates seamlessly into existing customer IT infrastructures. It is compliant to EUROCAE ED-137 standards, allowing military customers to benefit from technological advancements in VoIP based civil ATC.

Investment protection and customization

The solution offers a big variety of gateways for connecting legacy, non-IP equipment and crypto devices. Project-specific adaptation can also be provided. The working position HMI can be customized.

High level of resilience and availability

The system features distributed intelligence avoiding critical outages at single central points. Any controller working position has direct access to any radio and voice resource in the network. All components are equipped with redundant power supplies and two parallel Ethernet connections supporting backup routes to backup servers and radios.



SYSTEM COMPONENTS

R&S®GB5470S trusted audio switch (TAS)



The TAS is the key component of the voice communications system. It enables the operator to access both communications domains (red and black networks) from a single HMI. The trusted audio switch strictly separates the different security levels such that they are only combined at the controller headset. Furthermore, it provides data output to the distinct mini-CWP processing units. This trusted audio switch is designed to meet the highest security standards. It has been evaluated and certified by the German Federal Office for Information Security (BSI) according to Common Criteria EAL4. It also complies with NATO TEMPEST Level A (SDIP-27 standard).

R&S®GB5400T touch entry device (TED)



The TED is the HMI of the controller working position. It facilitates the operation of two separate networks by means of a split screen. One display half is dedicated to voice and radio resources of the encrypted domain, while the other half is dedicated to voice and radio resources of the unencrypted domain. Thanks to this intuitive user interface, the controller can easily handle the security levels per communications endpoint. The HMI also offers layout flexibility: the size of the buttons, color schemes, fonts, icons and layout are freely definable by the system administrator.

R&S®GB5470 mini-controller working position (mini-CWP)



The mini-CWP handles all of the processing of voice media and voice signaling traffic. One mini-CWP is required per communications domain, ensuring physical separation when connecting to voice and radio resources in that domain. Each mini-CWP unit connects to the corresponding domain via fiber-optic links.

R&S®GA54xx recommended extras

Rohde & Schwarz offers a variety of extras such as headsets, handsets, microphones, footswitches and loudspeakers. In addition, a sound or light indicator is available that notifies neighboring operators about an ongoing secure call. Any of these elements can be connected to the trusted audio switch.

R&S®GW54xx gateways



Rohde & Schwarz offers a variety of gateways that are used to connect non-IP equipment to the corresponding IP communications domain:

- ▶ Radio gateways for connection of analog radios to the IP network
- ▶ Wideband media gateways for connection of encryption devices to the IP network
- ▶ Telephony gateways for connection of legacy phones (e.g. ISDN or analog) to the IP network

Application servers



The solution's applications run on COTS servers. Multiple services are hosted on the application servers:

- ▶ A management system to configure the solution components as well as to handle alarming, monitoring and logging: the entire communications matrix is stored in a system database
- ▶ A radio control and remote monitoring system for VoIP radios
- ▶ A radio server that saves bandwidth and signaling load when accessing remote radio sites and provides advanced services such as climax or best signal selection
- ▶ A SIP registrar and SIP proxy server for integration of IETF VoIP phones and PBXs and interconnection with other VoIP systems
- ▶ Session border controller functionality to protect the VoIP infrastructure and intelligently distribute incoming and outgoing voice traffic

Ethernet switches

Ethernet switches are used to create the LAN/WAN infrastructure. A variety of COTS switches have been tested and verified for the R&S®M4ACS focusing on high availability and quick failure recovery.