

R&S® ATC-SBC ATC SESSION BORDER CONTROLLER

CERTIUM
Security by design. Safety by culture.

Secure voice interconnection
for safe airspace operation

The screenshot displays the R&S ATC-SBC web interface. At the top, there is a search bar and navigation tabs for SETTINGS, DATABASES, SYSTEM, PROFILES, GROUPS, MONITORING, and CONNECT. Below the navigation, there is a table titled "Classes" with columns for ID, Name, Type, Equipment, Transcoding (In, Out, Ign, Max, ANI), DNS (In, Max), RTP Proxy (In, Out, Recording), Host, Port, and Actions. The table contains 9 entries, each with a checkbox and a "New entry" button. The bottom of the interface shows a "Total results 9 Entries" summary and another search bar.

ID	Name	Type	Equipment	Transcoding					DNS		RTP Proxy			Host	Port	Actions
				In	Out	Ign	Max	ANI	In	Max	In	Out	Recording			
1	IP_DEST	IP	- Not Used	Not Used	Not Used	0	60	0	60	Not Used	Not Used	Recording				
3	Users	Users	- Not Used	Not Used	Not Used	0	60	0	60	Not Used	Not Used	Disabled				
7	FROM_10X	IP	- Not Used	Not Used	Not Used	0	60	0	60	Not Used	Not Used	Disabled				
11	FROM_11X	IP	SBC	Not Used	Not Used	0	60	0	60	Always Used	Always Used	Disabled				
39	FROM_IPv6	IP	SBC	Not Used	Not Used	0	60	0	60	Always Used	Always Used	Disabled				
41	TO_IPv6	IP	SBC	Not Used	Not Used	0	60	0	60	Always Used	Always Used	Disabled				
43	TO_10X	IP	SBC	Not Used	Not Used	0	60	0	60	Always Used	Always Used	Disabled				
45	TO_11X_VCS1	IP	SBC	Not Used	Not Used	0	60	0	60	Always Used	Always Used	Disabled	1666-117	5980		
49	TO_11X_VCS2	IP	SBC	Not Used	Not Used	0	60	0	60	Always Used	Always Used	Disabled	172.21.210.13	5980		

Product Brochure
Version 01.00

ROHDE & SCHWARZ
Make ideas real



AT A GLANCE

Strong cybersecurity and resilience is key for seamless airspace operations. The R&S®ATC-SBC ATC session border controller provides secure voice network separation and smart routing for secure, high availability voice networks.

Ready for future IP communications solutions

ATC systems are evolving toward flexible and scalable IP based network elements. CERTIUM® components have all the advantages IP technology provides, such as high resilience, security and flexibility. R&S®ATC-SBC provides functionality unique on the market for a secure, high availability interconnection between multiple IP VCSs.

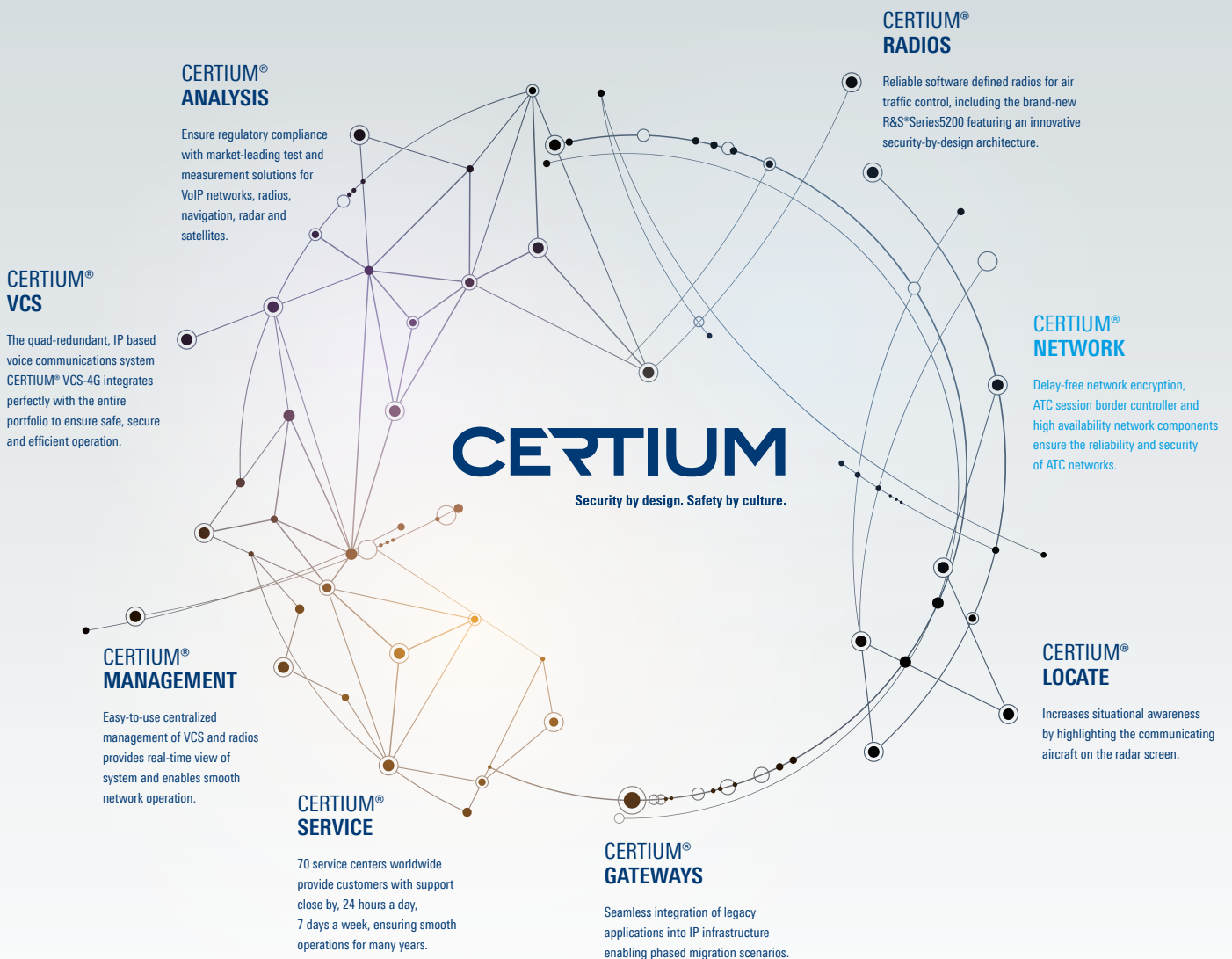
ATC grade redundancy

System availability is paramount for ATC operations. R&S®ATC-SBC uses ATC grade technologies such as georedundancy, smart routing and link sharing to seamlessly deliver calls even in case of multiple obstacles.

Security by design

During the development of all components of the CERTIUM® ecosystem, Rohde&Schwarz focused strongly on security to ensure reliable operation of the ANSP's critical communications infrastructures.

The R&S®ATC-SBC secure session border controller (SBC) provides state-of-the-art security mechanisms to protect internal networks against multiple threats.



Ready for IP interconnection

R&S®ATC-SBC is designed for the direct IP interconnection of the ANSP's VCSs via dedicated IP links or using the NewPENS network. The SBC provides all necessary security and availability features required by ANSPs for safe and secure interconnections. Any IP VCSs compliant with the ED-137 standard can be securely interconnected with each other and maintain the required rich functionality. The unique redundancy features of R&S®ATC-SBC ensure far superior interconnection availability compared to existing analog and TDM solutions.

Part of the CERTIUM® ecosystem

CERTIUM® is an advanced ATC communications suite from a single source that surpasses existing safety and efficiency standards.

All CERTIUM® products are seamlessly integrated into a single portfolio. Although R&S®ATC-SBC can be used on its own, users benefit the most by combining it with other CERTIUM® products.

Combining R&S®ATC-SBC with CERTIUM® VCS, CERTIUM® RADIOS and CERTIUM® GATEWAYS significantly improves system integration and enables easy centralized monitoring and management.

R&S®ATC-SBC is a component of CERTIUM® NETWORK and is harmonized and extensively tested within the CERTIUM® environment, which maximizes operational safety and security.

The monitoring and service capabilities of CERTIUM® ANALYSIS and CERTIUM® SERVICE make system operation more straightforward and efficient.

BENEFITS

Strong security and high availability solution for voice interconnection in critical infrastructures

Strong security for critical infrastructures

- ▶ Network separation
- ▶ ED-137 compatibility
- ▶ Call admission control
- ▶ Encryption (optional)
- ▶ Topology hiding
- ▶ Rogue and malformed packet protection
- ▶ Authentication and IP limitation

ATC grade architecture

- ▶ Georedundancy
- ▶ Active call handovers
- ▶ Smart call routing
- ▶ Double link interconnection
- ▶ Call admission control
- ▶ Software assurance
- ▶ Protocol transformation
- ▶ Central management

Serviceability

- ▶ Methods for implementing good operational security
- ▶ ATC grade logging
- ▶ ED-137 based legal recording

STRONG SECURITY FOR CRITICAL INFRASTRUCTURES

Supports ATC standards and developed in line with strict ATC safety requirements

Critical infrastructures

ANSP networks and services are very important for air traffic control. Issues when providing services may result in airspace closure or even cause safety incidents. In many countries, ANSP infrastructures are considered critical infrastructure by law and have to be protected accordingly.

The ANSP voice infrastructure is one of the most sensitive parts of the infrastructure since air traffic control is primarily performed verbally and the voice infrastructure is widely distributed and connected to another ANSPs and systems.

This interconnection with other systems makes the voice infrastructure susceptible to both intended and unintended attacks.

Manipulated or wrongly formatted packets may cause the VCS to break down. Wrongly configured or hacked partner VCSs may create a huge number of calls and overload air traffic control.

Network separation

The session border controller uses state-of-the-art technology to protect voice infrastructures. It is commonly used in enterprise and carrier networks as a border element between two security domains.

The SBC acts like two phones connected via an audio cable. It terminates the call on one side and creates a completely new call on the other side. All the relevant information is passed on and all unnecessary data is removed. All information sent to other side is reviewed. The complete separation maximizes security and mitigates the risk of manipulated or wrongly formatted packets.

ED-137 compatibility

The ATC voice networks use EUROCAE ED-137 enhancement of the standard SIP/RTP protocols to support ATC specific features such as PTT, emergency PTT and SQL. The session border controllers (SBCs) available on the market do not support the ED-137 enhancement and may refuse the packets. If manually configured, they could forward the ED-137 enhancements without analyzing them, which significantly reduces the security.

R&S®ATC-SBC is fully compatible with ED-137. The SBC analyzes all the ATC specific headers and decides which information should be passed on. This functionality is very important to provide the ATC specific functions without compromising security.

Call admission control

R&S®ATC-SBC uses call admission control, which reduces the risk of denial of service attacks on the VCS infrastructure.

The SBC can limit the number of calls per SIP trunk and the call rate (number of new calls per second). It can also whitelist and blacklist other parties.

Encryption

R&S®ATC-SBC optionally supports authentication and encryption of the SIP signaling (Secure SIP) and payload (Secure RTP). The use of authentication and encryption significantly reduces the risk that unauthorized calls connect to the ANSPs.

R&S®ATC-SBC supports encryption even if the internal VCS or gateway does not support it. The internal network may stay unencrypted and R&S®ATC-SBC manages the encryption of the external connection.



Topology hiding

The SIP and RTP packets carry sensitive internal information about the structure of the network. R&S®ATC-SBC removes this information from the packets and replaces the internal information with its own IP address. This significantly reduces the risk of the internal topology being leaked.

Rogue and malformed packet protection

Both intentionally and unintentionally sent malformed packets may cause failure of the VCS. R&S®ATC-SBC repacks the RTP voice data, makes sure that all headers are correct and ensures compatibility with the internal VCS.

Authentication and IP limitation

Only authorized peers are allowed to connect to the ATC infrastructure. R&S®ATC-SBC uses SIP trunk digest authentication, which only allows traffic from authorized sources to undergo further processing.

Another highly effective security measure is the internal firewall of R&S®ATC-SBC. It limits the traffic based on the source and destination IPs. This easily mitigates any denial of service attacks on the server. At the application level, the source can also be restricted to specific IP addresses.

ATC GRADE ARCHITECTURE

Extreme resilience and ATC specific features

Georedundancy

Continuous airspace operation is paramount for ANSPs. Safety critical systems have to provide the highest possible availability to ensure seamless operation. R&S®ATC-SBC uses unique georedundant deployment to satisfy these strict ATC requirements.

Two pairs of nodes back up each other to achieve georedundancy. Each of the four nodes may be deployed in geographically distributed data centers. This protects the system against component and link failure but also against disasters such as earthquakes and flooding.

Active call handovers

R&S®ATC-SBC provides active redundancy with active call handovers. In case one node fails, the other node immediately takes over and all the active calls remain. Users do not notice any interruption during the switchover.

Smart call routing

R&S®ATC-SBC monitors the status of the neighboring components using SIP OPTION¹⁾ pings. Based on the availability information of the next hop, R&S®ATC-SBC decides how to optimally deliver the call to the other party.

Active monitoring of the next hop allows R&S®ATC-SBC to deliver the call without prolonging the call setup time. Air traffic controllers do not notice the process taking place.

¹⁾ SIP OPTION available from Release 14.

Double link interconnection

In addition to link bonding and smart routing, R&S®ATC-SBC uses the parallel redundancy protocol (PRP) to provide very high availability between two systems. PRP delivers the same data using two independent but similar networks. In case the packet on one network is not delivered, the packet from the other is used. The handover between the two networks is completely delay free, which provides maximum resilience and the best voice quality, even if both networks have minor quality issues. R&S®ATC-SBC can use this technology on the interface between the VCS and the SBC and also between two R&S®ATC-SBC devices.

Use of PRP over two independent layer 2 links significantly increase the availability of the interconnection between two ANSPs. In combination with smart call routing and active call handovers, R&S®ATC-SBC achieves an availability of over 99.9999% for the interconnection.

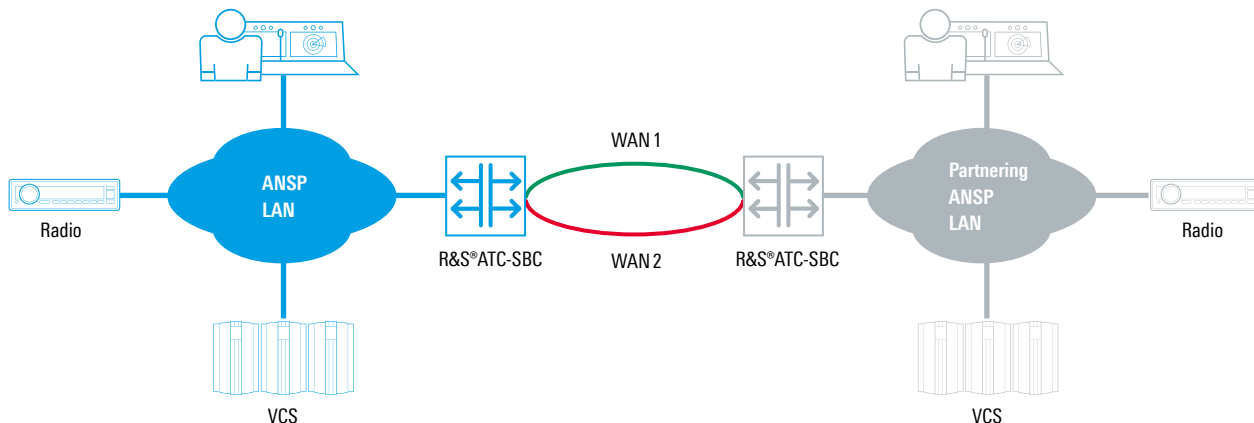
Call admission control

R&S®ATC-SBC monitors the number of calls in each SIP trunk. To maintain high call quality in case the SIP trunk reaches its maximum number of calls, the SBC denies the additional call or redirects the call via an alternative route.

Software assurance

Software quality is key for SBC operations. R&S®ATC-SBC was developed in line with strict aeronautical software assurance level requirements. The entire software development process follows the EUROCAE ED-153 software assurance model.

Double link interconnection



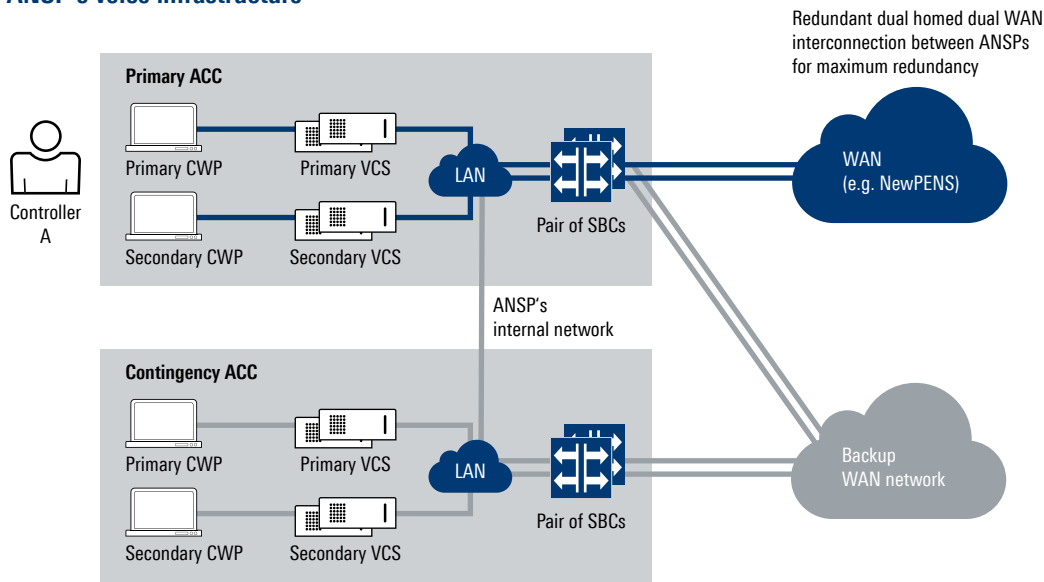
Protocol transformation

Both the IPv4 and IPv6 protocols may be used in ATC networks for signaling and RTP, and R&S®ATC-SBC supports the two protocols. If the internal network uses IPv4 and an interconnection is required using IPv6, the SBC transforms from one protocol to the other. If the systems do not support IP prioritization, R&S®ATC-SBC marks all packets with expedited forwarding (EF) to inform the network about the priority of the delivery.

Central management

The ANSP usually operates multiple R&S®ATC-SBC devices. For simplified management and operation, Rohde&Schwarz offers a central management system. The device monitoring, logging and software management are all performed centrally.

ANSP's voice infrastructure



SERVICEABILITY

Seamless operation in the ATC environment

Operational security

Use of multiple configuration sets significantly increases the operational security of ATC systems. R&S®ATC-SBC supports two completely independent configuration sets, which can be quickly switched over. New configurations can be prepared and reviewed in the non-active environment and then switched over to the productive environment. In case of configuration issues, administrators can easily switch back to the existing configuration.

Logging

R&S®ATC-SBC provides extensive logging tools to monitor the number of calls, destinations, error codes, etc. The SBC uses CDR logs and can activate packet recording to get low-level information for troubleshooting. R&S®ATC-SBC also uses an SNMP interface to provide operational information to umbrella systems or neighboring systems.

Legal recording

In case of safety relevant events, legal recording is an important tool to analyze a communications exchange. The use of a border element for recording is very important, as it is the demarcation between the responsibilities of two ANSPs. R&S®ATC-SBC simplifies the implementation as it supports the ED-137 Volume 4 recorder interface. The VCS and radio recorder can be used for the recording of R&S®ATC-SBC traffic.

Service that adds value

- ▶ Worldwide
- ▶ Local und personalized
- ▶ Customized and flexible
- ▶ Uncompromising quality
- ▶ Long-term dependability

Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

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- ▶ Energy efficiency and low emissions
- ▶ Longevity and optimized total cost of ownership

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