CERTIUM
Analysis

R&S®AVQA ATC voice quality assurance system

Product Brochure
Version 02.00

ROHDE&SCHWARZ
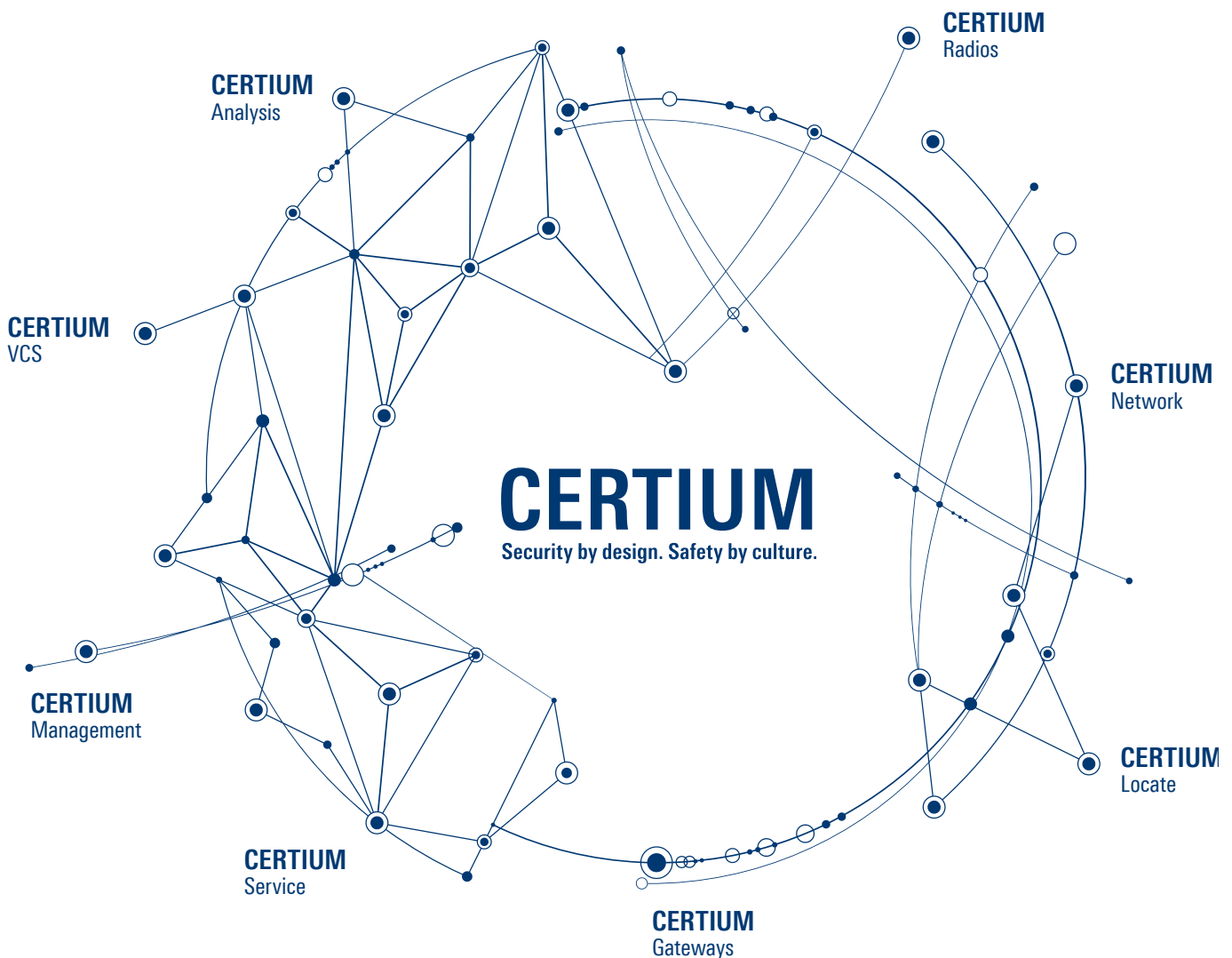
Make ideas real

AT A GLANCE

Air traffic control communications networks require comprehensive and accurate monitoring to take full advantage of the potential brought about by highly integrated IP based architectures. The R&S®AVQA advanced voice quality assurance system, a non-intrusive IP and RF monitoring and analytics tool, provides insightful analytics that enable in-depth monitoring, efficient management and the early detection and precise localization of technical failures.

IP-ready, future-proof solution

Modern ATC systems are evolving toward flexible and scalable IP architectures based on EUROCAE ED-136 and ED-137 standardized network elements. CERTIUM components utilize all the advantages of IP technology, such as high flexibility and network resilience. R&S®AVQA is a dedicated analysis system that monitors every single link within the system and makes sure every link is fully functional. The solution relies on passive mid-point data flow analysis. Individual IP links are tapped, the mirrored traffic is evaluated and results are sent to a central manager.

Key metrics for essential applications

R&S®AVQA monitors a set of key performance indicators (KPI) of an IP based ATC network to interpret its performance and status in real time. The relevant metrics include, but are not limited to, jitter and detailed packet interarrival time histograms, packet loss, burst loss data and loss density, round trip delay as well as transport policy data, e.g. VLANs and DSCP code fields. Based on this data, R&S®AVQA autonomously determines and indicates the root cause of various issues related to IP devices, networks and radios.

CERTIUM Radios
CERTIUM Analysis
CERTIUM VCS
CERTIUM Network
CERTIUM Management
CERTIUM Locate
CERTIUM Service
CERTIUM Gateways

CERTIUM
Security by design. Safety by culture.

Management oversight

By providing remote and split-site operation, IP connectivity enables geographically versatile network layouts. This opens the door to flexible network planning that suits the application and utilizes resources as efficiently as possible. R&S®AVQA channels this potential to present the network manager with a powerful tool that helps them oversee system processes on a broader scale.

Cost-effective solution

Effective monitoring paves the way for efficient utilization of resources, both directly in terms of the communications system itself, and indirectly by minimizing maintenance time and effort. R&S®AVQA effectively reduces costs – on the one hand by providing an overview of loads across the system and monitoring frequency utilization, which helps avoid bottlenecks and overloading, thereby maximizing capacity. On the other hand, should a failure occur, it can be directly pinpointed, isolated and addressed immediately.

Meeting quality standards

Voice is generally difficult to send over a packet based architecture such as IP due to its high sensitivity to latency. However, R&S®AVQA allows an ANSP to take on this challenge. The mean opinion score (MOS) is an industry standard quantitative measure of a phone call's perceived quality. R&S®AVQA continuously keeps track of every air-to-ground and ground-to-ground calls' quality of speech and then stores this information for future reference or analysis. Along with other KPIs, the MOS score helps provide an unambiguous and comprehensible quantitative measurement of voice transmission capabilities.

Integrated in the CERTIUM ecosystem

CERTIUM is an advanced ATC communications suite from a single source that increases safety and efficiency beyond existing standards. Every component within the suite has a defined role and all of the components are designed to work together to offer you a truly balanced solution that is ready for any situation.

BENEFITS

VoIP UNDER CONTROL

Voice over IP (VoIP) is the backbone of any modern ATC communications network, CERTIUM included. As a valuable but demanding resource, it requires proper management to ensure flawless operation.

Identifying bottlenecks

Voice over IP paves the way for a new standard of communications by integrating a multitude of additional, previously unavailable features. However, the technology also introduces new challenges. Call quality, for example, can fluctuate due to the increased sensitivity to other components in a generally more complex system. To combat this and other performance issues, R&S®AVQA pinpoints root causes early on for quick resolution and maximum availability.

ATC call details

Available for both air-to-ground and ground-to-ground calls, this is a summary of a voice call's key metrics in a single window. The intuitive graphic interface provides a compact overview to give you quick insights into overall system performance and allows you to effortlessly navigate to a specific aspect for further investigation.


R&S®AVQA A/G call details that summarize a voice call.

Insightful analytics

What makes VoIP for ATC even more challenging, besides the sensitive nature of VoIP itself, is how critical and demanding the application is in its own right. Parameters such as latency and jitter are paramount for voice transmission consistency. By keeping track of a wide spectrum of metrics over a long period of time, R&S®AVQA can compare specific deviations to an established pattern.

Quality assurance

The customer expects uncompromising, end-to-end quality. To ensure this, however, the provider has to make sure that every single link in the chain is fully functional all of the time. To provide such accurate and selective monitoring, R&S®AVQA uses probes to capture raw data at multiple network nodes and then aggregates it for analysis, interpretation and trend recognition.

R&S®AVQA quality data collection within an ANSP network.
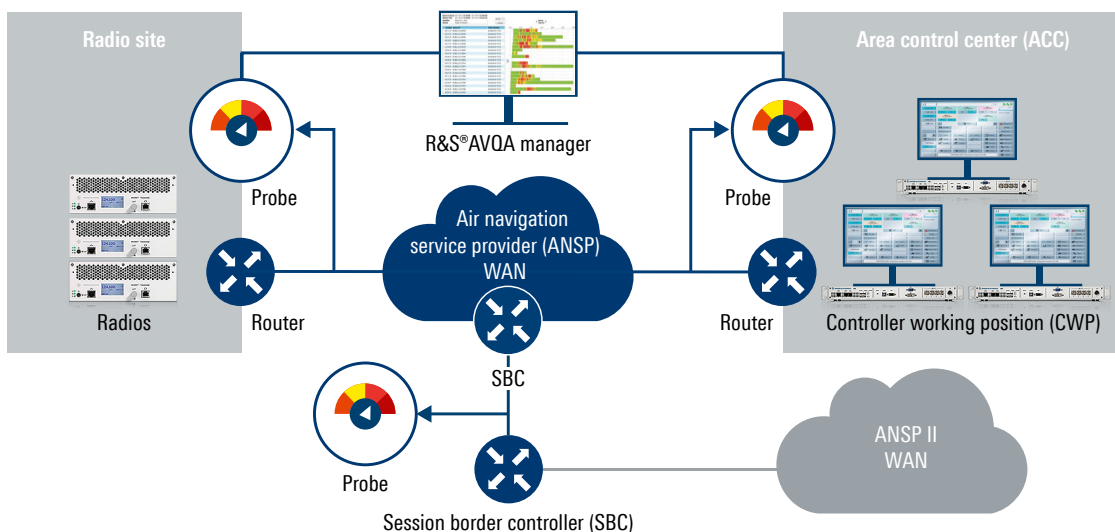
RSSI MONITORING

RSSI level measurement is a metric that provides deep insights and transcends the usual scope of VoIP monitoring by providing analysis of RF performance and behavior.

Centrally managed

R&S®AVQA provides passive centralized RSSI monitoring of an entire system. Thanks to its scalable architecture, the monitoring service can adapt to the size of the communications system – from a single airport to an ANSP's nationwide network. The central RSSI monitoring functionality is compatible with any ED-137 radio.

Radio performance

RSSI stands for received signal strength indicator. As the name suggests, it is a measurement of the signal power at the receiver. RSSI is a viable marker to evaluate radio link performance. Common situations with RF-related problems include misaligned antennas severed cables and loose connections. The R&S®AVQA RSSI monitor summarizes aggregated data over long time periods to provide quantitative measures and show qualitative performance trends for specific devices, locations, frequency channels and time periods.

R&S®AVQA passive centralized RSSI monitoring of a nationwide system.
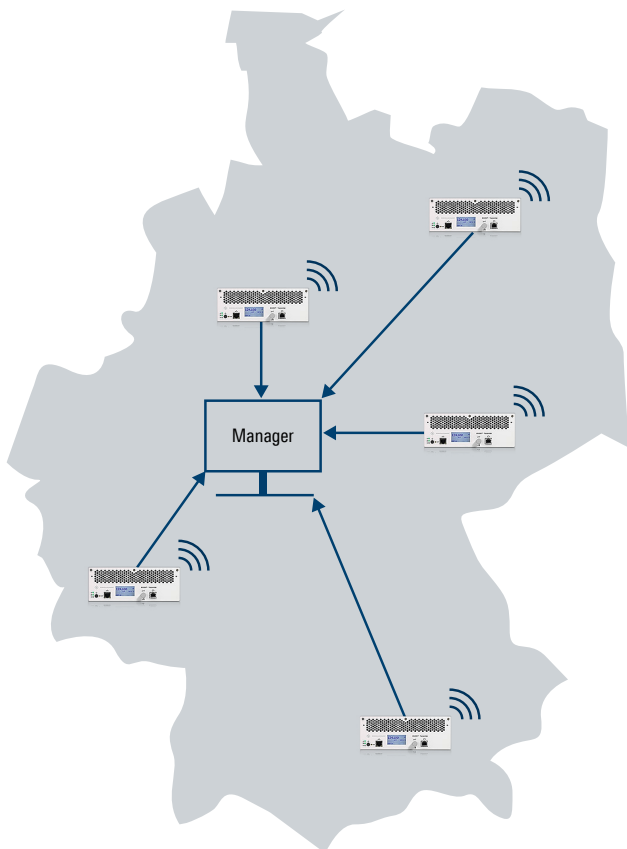
The R&S®AVQA RSSI monitor provides RSSI data from the probes.

FREQUENCY MONITORING

As with most types of radio communications, the frequency spectrum is your primary resource, which you have to manage as efficiently and smoothly as possible. Monitoring frequency utilization allows operator allocation to be optimized, which increases productivity.

## Stratified approach (multiplane)

The CERTIUM system focuses on ensuring end-to-end service quality. R&S®AVQA plays a particular role in this, since it oversees the integrated communications path throughout its various stages. With this stratified approach, R&S®AVQA can monitor key parameters on multiple levels simultaneously and assess system performance accordingly.

On the control plane, R&S®AVQA provides a rich set of service quality metrics and KPIs, i.e. for SIP based signaling. Most of these KPIs, such as the session establishment effectiveness ratio (SEER), are based on IETF RFC 6076.

For the voice plane, R&S®AVQA analyzes each RTP stream in real time and assigns mean opinion scores (MOS) to every 5-second segment of a stream. This suits the nature of ATC calls, where traditional averaging would not give relevant insights.

Intersectional projection (cross-correlation)

With the high degree of integration between individual modules comes the need for central management to ensure the harmonic coordination of the communications system's various links. As in the example of RSSI monitoring, where R&S®AVQA ensures alignment between RF and IP, other interconnected links can also be investigated or monitored to provide seamless overall integration. With this big-data style of measurement, many previously unsuspected synergies or disparity between individual components can be discovered and taken advantage of or improved.
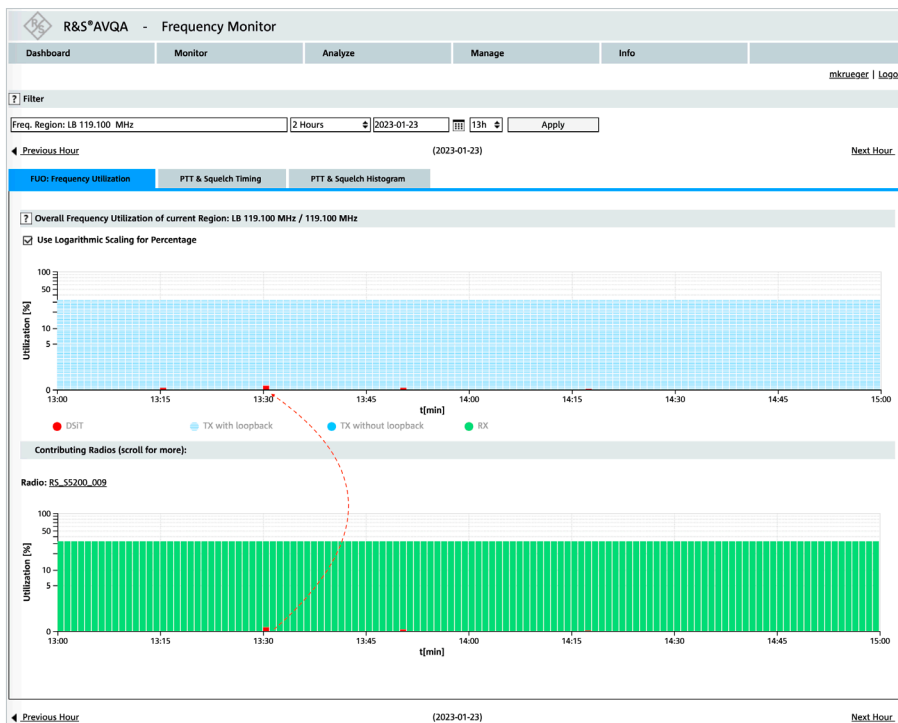
R&S®AVQA frequency monitor.

DASHBOARD AND KPI OVERVIEW

The high degree of integration between individual modules requires central management to ensure the proper operation of the entire system. With the dashboard functionality, R&S®AVQA monitors key parameters and assesses the system's status.

Comprehensive overview

The dashboard is a comprehensive, user-friendly graphic overview to help you manage your network. Designed like a control panel, it gives you quick access to your system's hardware, its analytics and aggregated statistics.

Key markers

The R&S®AVQA's insightful air-to-ground KPI monitor goes hand in hand with the dashboard, giving you another way to view your network's analytics. The monitor gives you a summarized view of an individual radio's basic performance metrics and their development over a given period of time.

Raising a flag

Another feature of the dashboard is its ability to raise an alarm and flag, e.g. if a collision or other type of overload occurs. The operator can then reconfigure the frequency allocation plan to resolve the collision. Moreover, the alarm is forwarded up the monitoring hierarchy so the root of the problem can be retraced quickly with the management overview.
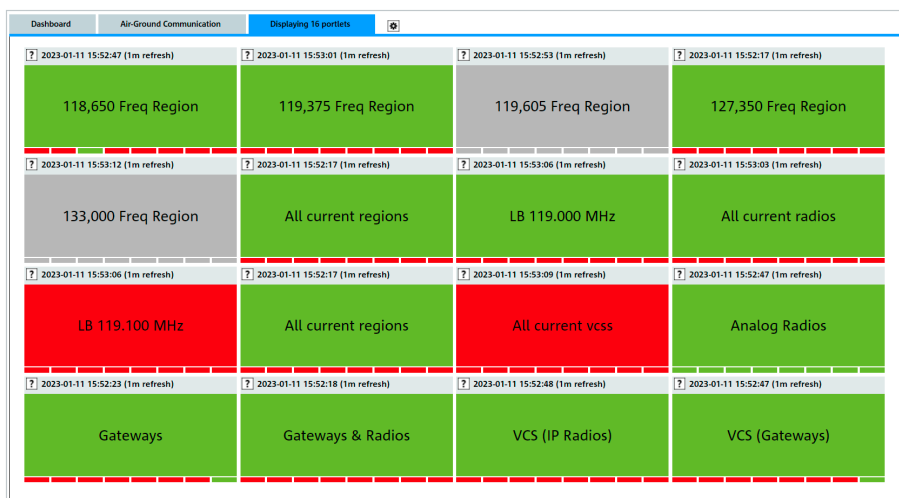
R&S®AVQA dashboard overview.
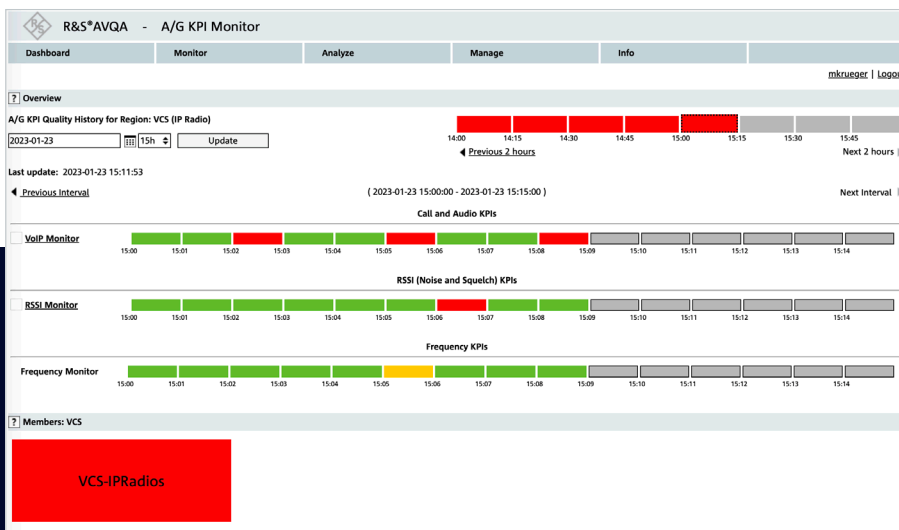
R&S®AVQA A/G KPI monitor.

LOOPBACK MONITORING

The loopback monitor is a particularly clever integrated feature of the R&S®AVQA suite that takes advantage of existing infrastructure for the regular test and measurement of radio equipment, thereby eliminating the need for dedicated measurement flights.

In the loop

The loopback monitor uses the system's own transceiver and receiver radios to measure one another. This leads to a full mesh, any-to-any test scenario with a multitude of individual links. Although directly narrowing a potential problem down to an individual device is not part of the system's operation per se, the large number of monitored radio links provides an extensive reference basis against which to reference a particular link under test. Then, based on exclusion, the most likely point of underperformance or failure can be suggested and, if necessary, investigated.

Optimizing resources

The ability to perform self-tests allows the operator to limit dedicated measurement flights to only the most complicated of cases where they are strictly required. In the long run, this ties in with the central concept of the R&S®AVQA suite: to save resources and effort.

Relevant KPIs

This type of monitoring allows R&S®AVQA to continuously estimate RSSI values at receivers as well as reception delay and keep track of the related statistics. On a more abstract note, this timeline provides yet another dimension against which to reference a particular measurement to assess the potential likelihood of failure. On the graphic below, the vertical red lines mark a drop in RSSI against a stable trend.

R&S®AVQA loopback monitor displays data related to air-ground communications.

R&S®AVQA loopback monitor overview
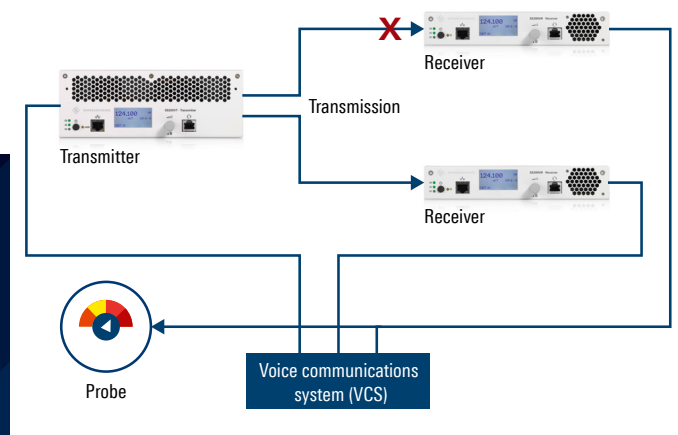
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