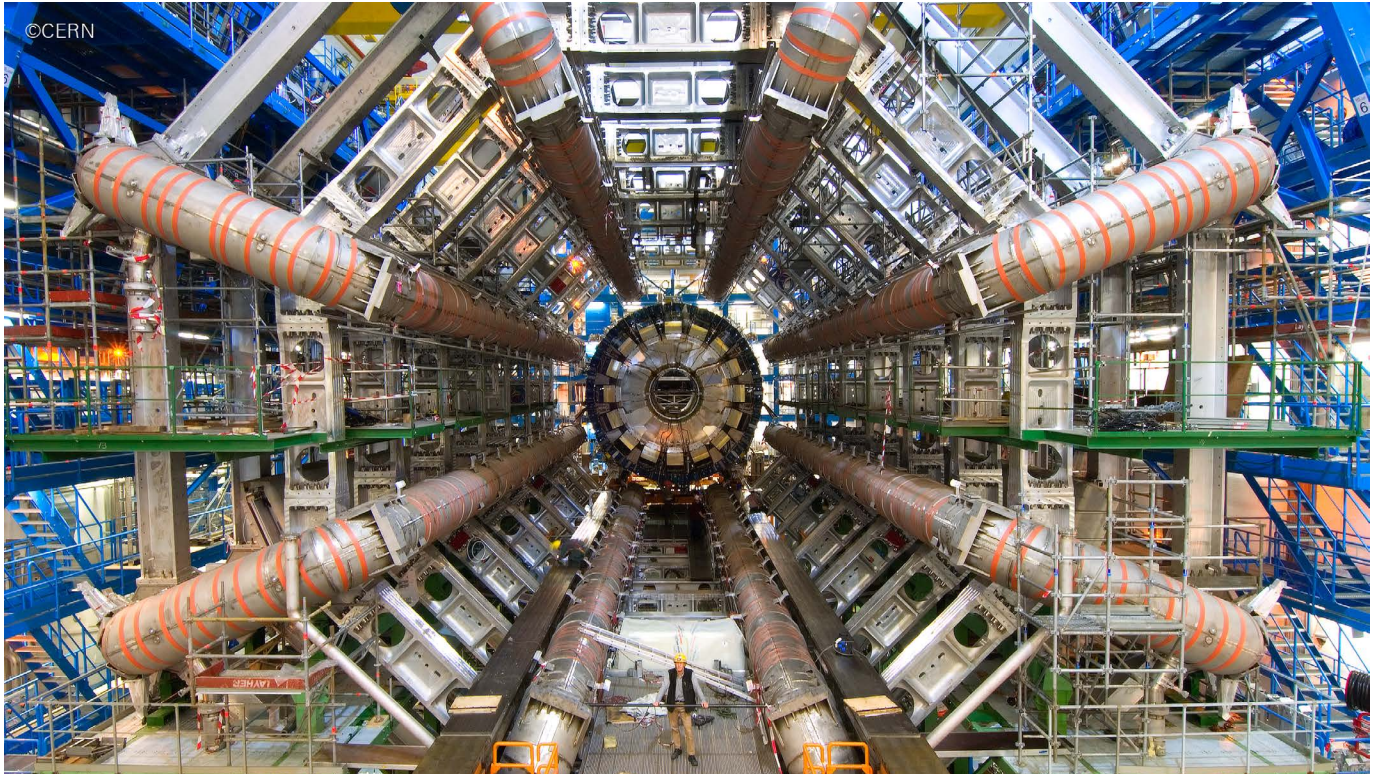


Large-scale, 24/7 mobile quality monitoring and service level verification



View of ATLAS, the largest detector of the Large Hadron Collider (construction phase). CERN runs an area-wide mobile network that also covers this cavern 100 meters underground.

At a glance

At CERN, the European Organization for Nuclear Research, physicists and engineers probe the fundamental structure of the universe. CERN's flagship, the Large Hadron Collider (LHC), has a massive underground infrastructure that consists of a 27-kilometer ring of superconducting magnets at an average depth of 100 meters. A mobile network designed for CERN's needs, with a mix of above-ground and underground infrastructure, ensures area-wide communications. To monitor and measure communications services in line with service level agreements (SLA), an extensive network of SwissQual's QualiPoc Remote Control network probes has been installed below and above ground.

Executive summary

- **Customer:** [CERN](#) (European Organization for Nuclear Research), Geneva, Switzerland
- **Task:** Large-scale monitoring system for SLA verification
- **Challenge:** Remotely controlled, 24/7 wide-spread network monitoring below and above ground
- **Solution:** SwissQual QualiPoc Remote Control, NetQual suite
- **Key benefits:** Fully compliant with specifications, cost-efficient, highly reliable

Use case details

The European Organization for Nuclear Research (CERN), financed by 21 Member States ([CERN convention](#)), is located outside Geneva, Switzerland, and operates the largest particle physics laboratory worldwide. The most important and impressive part of the lab is "invisible", located some 100 meters underground. A circular tunnel system with a circumference of 27 kilometers includes a particle accelerator ring called the Large Hadron Collider, which is considered the largest and most complex machine in the world. Thousands of scientists, researchers and engineers work in this sprawling area and must be reachable by mobile phone 24/7, also when they are underground.

CERN commissioned a leading Swiss mobile network operator to provide infrastructure and services to run a mobile network specifically designed to meet CERN's needs. It comprises several surface radio base stations and 46 underground repeater sites. To offer mobile telephony and data services in underground tunnels and caverns, CERN set up a leaky feeder infrastructure covering 60 km to support 2G/3G/4G technologies. To monitor realtime service quality (QoS/QoE) in line with SLAs, CERN selected the QualiPoc Remote Control from SwissQual, a Rohde&Schwarz subsidiary.

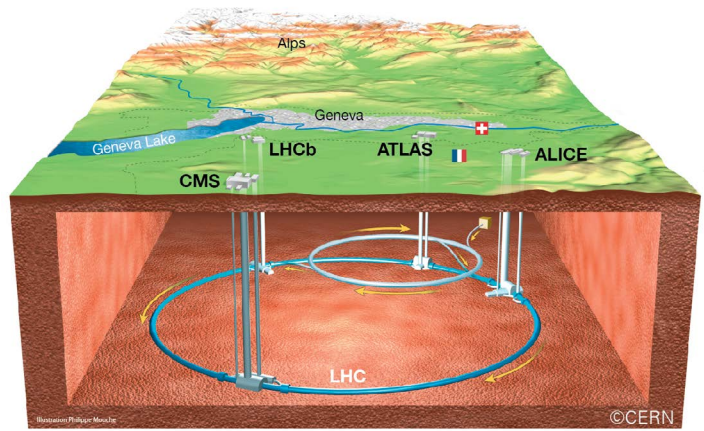
Solution

CERN evaluated QualiPoc Remote Control based on comprehensive technical specifications. The solution won the competitive call for tenders and met CERN's stringent criteria in terms of compactness, reliability, energy consumption, flexibility and cost.

QualiPoc Remote Control use-case-specific benefits:

- Standard smartphone-based network probe enabling economical, remotely controlled, large-scale deployments
- Compact, robust hardware offers active ventilation, backup battery and wall-mounting options
- Supports all mobile network technologies used worldwide and provides information about the full network status – from the application layer down to layer 1
- Provides extensive test functions for voice (incl. voice and video MOS), data, video streaming and messaging tests to assess and reflect the real QoS/QoE end-user experience
- Fully featured backend application for remote configuration, realtime monitoring and alarming, post-processing and reporting

"QualiPoc Remote Control meets our technical requirements and offers the most flexible and cost-effective solution" Frederic Chapron, CERN



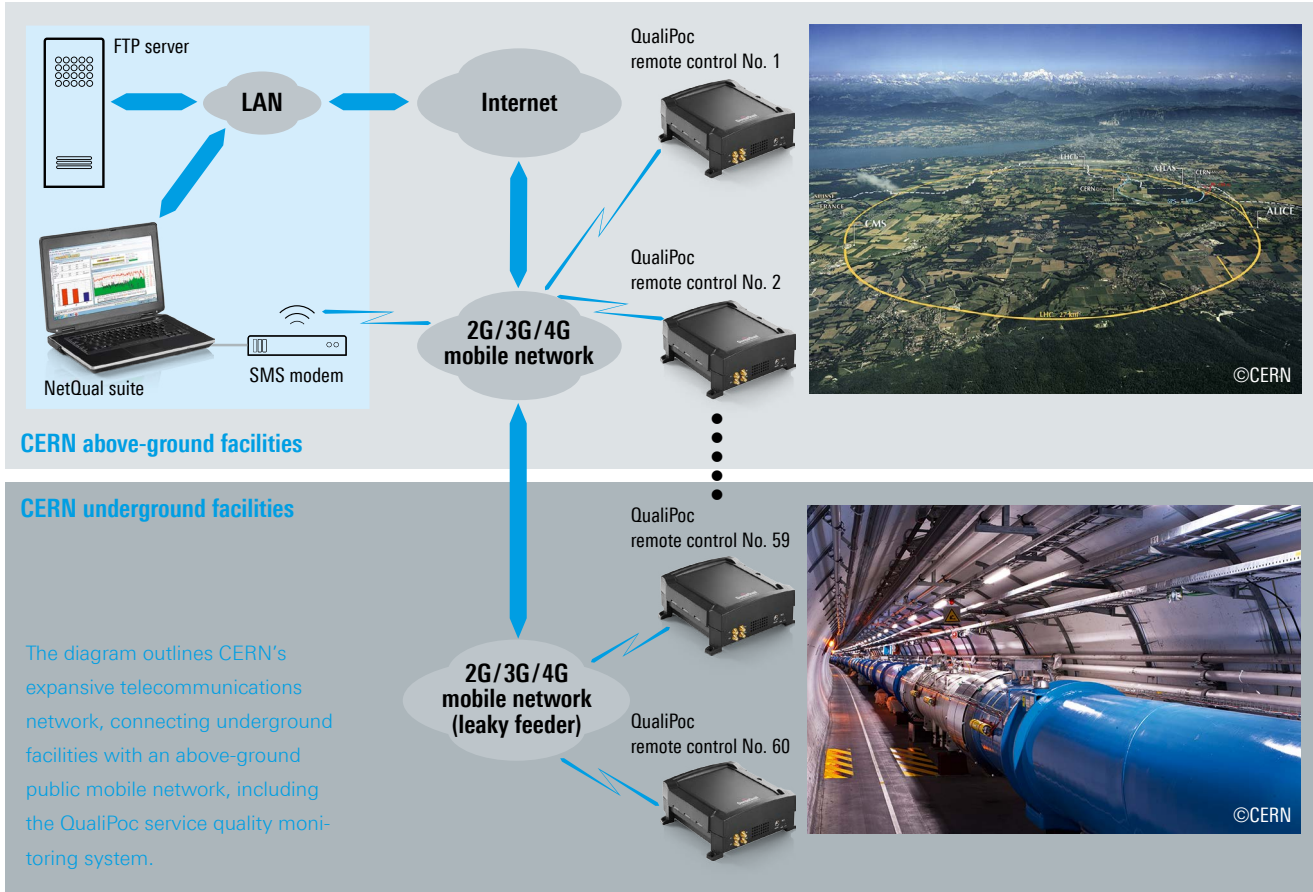
Tunnel system hosting the Large Hadron Collider (LHC), located some 100 meters underground.



SwissQual network monitoring solution QualiPoc Remote Control probe.

The 60 probes deployed networkwide continuously measure multiple RF parameters (KPIs, signaling, layer 3) and run scheduled QoS/QoE tests to verify SLAs and monitor communications services. The data is reported to a central server unit via http/ftp. A fully featured backend provides a realtime network overview and allows remote configuration, alarming, data analysis and reporting.

CERN telecommunications infrastructure



CERN above-ground facilities

CERN underground facilities

The diagram outlines CERN's expansive telecommunications network, connecting underground facilities with an above-ground public mobile network, including the QualiPoc service quality monitoring system.

QualiPoc Remote Control probe

The smart and simple product concept is based on standard Android-based smartphones and equipped with extra safety features (backup battery, automatic reset, ventilation) to maximize system stability. Power is only needed for remote control and configuration.



GUI of NQWeb System Inspector backend application

The web-based, customizable interface displays the entire network status in realtime, enables remote control and configuration, and displays alarms. The NetQual suite offers additional applications for data management and analysis.



Service that adds value

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

About Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. Founded more than 80 years ago, this independent company has an extensive sales and service network and is present in more than 70 countries. The electronics group is among the world market leaders in its established business fields. The company is headquartered in Munich, Germany. It also has regional headquarters in Singapore and Columbia, Maryland, USA, to manage its operations in these regions.

Mobile Network Testing

Rohde & Schwarz is a leading global supplier of mobile network testing solutions. The company's extensive and diverse product portfolio provides sophisticated, cost-effective test solutions for mobile operators, infrastructure vendors, testing service providers, installation companies and government regulators. The products address every test scenario in the network lifecycle – from base station installation to network acceptance and network benchmarking; from optimization and troubleshooting to interference hunting and spectrum analysis; from IP application awareness to QoS and QoE of voice, data, video and app-based services. Rohde & Schwarz mobile network testing solutions provide all the hardware, software and resources that the industry needs to efficiently deliver better services with higher quality for customers while enabling suppliers to increase the value of their networks and products.

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