ELVAC

Case study

Air Navigation Services of the Czech Republic, state enterprise

Monitoring of Radio Navigations

Air Navigation Services of the Czech Republic

Situation

Air Navigation Services of the Czech Republic, state enterprise (ANS CR, www.ans.cz) is currently a modern and recognized Czech company that ranks among the European elite in the provision of safe and cost-effective air traffic services.

When landing, the flight crew cannot only rely on air traffic controllers, but also on the radio navigation systems. The radio navigation systems serve the flight crews in determining their position during the flight, and to assist them in their landing approach. The radio navigation systems are classified according to their purpose as the airport equipment and en route facilities. Some devices (depending on location) perform both tasks.

Airport systems

The airport radio navigation systems help the pilots to guide the aircraft on landing. Depending on the type of approach, a non-directional beacon NDB (Non Direction Beacon), omnidirectional beacon VOR (Very-High-Frequency Omnidirectional Range) or a precision approach system ILS (Instrument Landing System) is used. All this combined with the distance measurement equipment DME.

En route systems

The en route radio navigation systems allow the pilot to determine his position during the flight. The facilities are located so as to ensure a coverage of radio navigation signals across the whole airspace of the Czech Republic. They are mostly placed on the important points of airways. The non-directional beacons (NDB), VHF omnidirectional radio beacons (VOR) and distance measuring equipment (DME) are considered as en route facilities.

In the Czech Republic are located approximately 60 radio navigation facilities, mainly around the major airports (Prague, Ostrava, Brno, Karlovy Vary). These facilities are concentrated in 37 technological objects, of which in 11 cases there is no cable connection.

The original solution used a special communication concentrator for every 8 devices, the concentrators were placed in the control center. For the connection with objects without a cable connection were used the leased connection via radio modems, which does not allow the simultaneous transparent connection to more points and had the certain limitations for longer service relations. Due to the topology some devices were accessible only indirectly

Business objectives

The main objective of deploying a new monitoring and control system of the radio navigation devices was the replacement of the previously used transmission routes, eliminating the need for special communication concentrators which limit the number of connected devices and integration of unified interface into the monitoring and control system used in the technical halls. Due to the new selected local topology is also required the direct accessibility of communication with some devices that were previously hidden behind a communication barrier comprised of more superior elements.

Key requirements of the investor:

- Displaying data via CitectSCADA
- System users access rights
- Requirement for HW and SW system configuration
- Ability of time synchronization via NTP protocol
- Redundant system configuratio
- Transparent mode for en route facilities
- Continuous monitoring of communication routes
- Data exchange with CMOS system (Central monitoring and control system, www.elvac.eu)
- Data exchange with AMS system (Airport Monitoring System of the company Transcon, www.transcon.cz)
- Data provision to WALDO system (Information system of the company ICC Ltd.)
- Monitoring and control of airport facilities via RCSE THALES (www.thalesgroup.com)
- Monitoring and control of en route facilites via RTU units ELVAC (www.rtu.cz)

Solution

The monitoring and control system of radio navigation devices RCMS NAVSYS is based on SCADA software CitectSCADA (www.citect.schneider-electric.com), which is a product from the portfolio of the company Schneider Electric (www.schneider-electric.com). The RCMS NAVSYS system is located in Prague and is designed for support of the personnel in technical halls during the monitoring and control of radio navigation devices used within ANS CR.

Since its inception, it is designed as a redundant system for 24-Hour operation. The communication with various en route radio navigation devices is implemented via the RTU units, which receive the data from connected navigation devices and consequently are transmitted to the superior RCMS NAVSYS system. The RCMS NAVSYS system supports the communication with RCSE THALES, which provides the control and monitoring of airport radio navigation devices.

The RCMS NAVSYS system transmits the processed data to the CMOS, AMS and WALDO system. The system is built on the client/server architecture. The server part is composed of two independent functionally identical units, respectively dedicated redundant hardware. Each of the system modules (data collection, alarm evaluation, compilation of trends and reports) is fully operated redundantly. Due to this full redundancy fundamentally built on parallel processing, the uniformity of distributed data between the connected clients with added benefit of the load distribution possibility is guaranteed. The system is deployed in four geographic locations that mutually exchange the data.

Across the whole system is used the clear color signaling/textual representation, identifying the basic operating modes. All these states are archived in Microsoft SQL database and can be played using a special application NAVIEW that graphically presents the given situation at the chosen time.

The use of COTS HW platform from the company THALES with industry standards application and with using the standard communication protocols then allows future seamless supervision and implementation of perspective functionalities.

The operational safety is primarily ensured by the exclusive use of standardized network protocol ETHERNET standardized according to ISO 8802-3.

Within the solution was necessary to develop the special communication CitectSCADA drivers, which are briefly described in the following table.

DRIVER	PROTOCOL	DESCRIPTION
AMS	internal TPC/IP	The driver ensures the data exchange between the RCMS NAVSYS and AMS systems. It allows to the aerodrome system a remote control of radio navigation equipment.
CTPING	ICMP	The driver ensures the availability monitoring of network devices through ICMP protocol.
RTUCOM	ELVAC RTUCOM Protocol (TCP/IP)	The driver provides the communication between the RCMS NAVSYS and ELVAC RTU communication center.
THALES	THALES RCSE Runway Control Protocol (TCP/IP)	The driver provides the communication between RCMS NAVSYS and RCSE THALES.

Source: www.ans.cz

The functional capabilities of the RCMS NAVSYS system are listed in the following table.

SYSTEM / DEVICE	TYPE
Radio navigation device DME	Alcatel FSD 40/45
	Thales DME 415/435
Radio navigation device VOR	CVOR 431
	DVOR 432
Radio navigation device LLZ	Thales LZZ 421
	Alcatel SN 411
	Airsys
Radio navigation device GP	Thales GP 422
	Alcatel SN 412
	Airsys
Radio navigation device MM, OM	Thales SN 413
Radio navigation device FFM	Thales SN 414
Monitoring device	Thales RCSE 443

Benefits

- Comprehensive availability of information on a device status.
- Monitored data are accessible anytime and anywhere. The only condition is network connectivity.
- Open network architecture.
- Use of communication standards enables simple expansion of the system according to the actual needs of the user.
- Accessibility of distant points via GSM.
- For monitoring of places which are not within the reach of data network, GPRS technology was used.
- Prediction of fault conditions.
- Uniform user interface for all monitored values.
- Emulation of remote connections via a "cable" with all facilities.
- For connection to end devices can be used the existing software tools.
- Integrated authorization of access to particular interfaces.
- Intelligent methods to maintain the connections on slow lines (GPRS).
- High system reliability.
- Possibility of archived data playback.

Products and technologies

- CitectSCADA
- THALES driver
- RTUCOM driver
- CTPING driver
- SNMP driver
- AMS driver
- MS SQL
- .NET

Statistics in focus

Tags	6 000
Servers	8
Clients	6
Alarms	800
Pages	30
Drivers	AMS, AMSII, CTPING, RTUCOM, SNMP, THALES

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