PRANET – PANSA RADAR NETWORK

A comprehensive Surveillance Infrastructure
based on the network node RMCDE
INTRODUCTION

The Polish Air Navigation Service Agency (PANSA) reports about 700,000 annual air traffic movements and is a gateway to the East for en-route traffic from central and northern Europe. Poland borders with six countries and PANSA employs around 400 air traffic controllers at one main and four regional Air Traffic Control Centres. PANSA’s key ATC centre is located in the country’s capital Warsaw, offering the complete set of services to airlines and operators while strategically handling the major percentage of flights in the Polish FIR. While the ever increasing number of flights is densifying airspace more and more, computer supported surveillance and guidance of aircraft are proving invaluable in order to provide for an adequate safety level.

Up to 2004 the Polish air navigation service provider had operated within a centralised surveillance infrastructure topology using analogue point-to-point connections between the radar sites and the ATC centres. There was no central processing node for incoming radar data or radar front-end system. With an increasing amount of locally deployed and externally connected radar sources, the necessity to deploy such a central processing unit gained momentum. Hence, PANSA commissioned their first RMCDE (Radar Massage Conversion and Distribution Equipment) for Warsaw in 2004, predominantly to handle the exchange of surveillance data with neighbouring data providers such as Lithuania, the Slovak Republic and Germany. By that time PANSA’s domestic radar sources were still directly linked to the operational ATM system in Warsaw.

Although the implementation of their first RMCDE was a major leap ahead in terms of processing capacity, the availability of a full set of radar data was still only possible for Warsaw, leaving the remaining sites with limited surveillance information. Recognising the invaluable asset of commonly available radar data at any centre of the country, plus the inherent safety benefits of a fully redundant data distribution, the introduction of a modern and flexible surveillance infrastructure based on a field-proven system came into focus as an immediate objective for PANSA.
RMCDE

PANSA ultimately opted for a system solution based on the cornerstone RMCDE in consideration of two cardinal advantages:

- RMCDE is a state-of-the-art system, initially developed by COMSOFT on behalf of EUROCONTROL and their member states.
- PANSA staff had already gathered convincing first experience with their stand-alone version of the powerful surveillance data front-end processor.

Consequently, PANSA entrusted COMSOFT the well-known German surveillance expert with the planning, modelling and implementation of this country-spanning project. COMSOFT cannot only draw on experience with the EUROCONTROL RADNET, but on numerous similar projects such as the Swedish SENDNET, the UK-RADNET, the central European states network CERAN or the military version MiRADNET for the German Air Force.

Right from the beginning of the PRANET project, the RMCDE concept could prove clearly its long-term investment security in terms of seamless integration capabilities by accepting the existing single, stand-alone version of RMCDE into the evolving PRANET concept.

PANSA’s Surveillance Infrastructure – Initial Situation

Besides the main ATC centre in Warsaw handling en-route, tower and approach traffic, PANSA operates four regional centres in Katowice, Gdańsk and Poznań. Technical equipment at each site was as uniform as the radar formats they received. In Warsaw and Poznań, older ATM systems were operationally used, whereas a new ATM system was meanwhile under development in the scope of the Polish Enhanced new-Generation ATM System for Unified Solutions for the 21st Century (PEGASUS 21) project in Katowice and Gdańsk. The new PEGASUS 21 system should ultimately prepare Poland for the introduction of SES/SESAR and should cater to the challenge imposed by the growing air traffic.

Prior to PRANET all of PANSA’s own and externally shared radar sources were connected directly to the existing ATM system via duplicated analog point-to-point connections. Additionally, some of them were connected to the regionally deployed ATM systems via additional duplicated analog point-to-point connections.
PRANET – A SOPHISTICATED SOLUTION

Recognising the need to overcome the safety deficiencies and thriving for a more consistent and stable communication infrastructure, PRANET was brought to life. For contingency reasons PRANET was designed to feature two distinct networks, a red and a green one. For the sake of high availability both networks are fully meshed. The pivotal element and cornerstone of PRANET is the powerful communication engine RMCDE. The network’s individual systems are interconnected via a TCP/IP backbone, allowing any user in the network to access any operationally used data of Warsaw’s FIR. The two networks each consist of five nodes which are located at the four ATC centres throughout the country. Warsaw operates two redundant systems as their traffic load and interfaces to external sources outnumber all other sites. However, the configuration of every system is identical both in terms of the software and the number of available interfaces allowing for any regional centre to take over Warsaw’s principal role.

In the unlikely case of catastrophic failures and in order to avoid data loss the radars are linked to both a green and a red PRANET node, which per se are located at different sites. This safety concept prevents not only radar data from being lost at a particular site, but also ensures that a full set of radar data feeds is available to the PRANET in general independent of the operational availability of a particular site.
**PROJECT EXECUTION**

Given such a complex project the realisation phase was impressively short. Less than half a year elapsed between contract signature in February 2008 and completion of the first two decisive stages whereas the overall project was split into five consecutive phases. Phases one and two concentrated on the upgrade of the existing RMCDE in Warsaw achieving replicas for the sake of commonalities throughout the network. Upon completion, all radars – both PANSA’s as well as the foreign ones – were connected via RMCDE.

Another milestone at this stage was achieved by implementing further COMSOFT products, namely RRR (Radar Recording & Replay system), RMD (Radar Monitoring Display) and CRMCS (Central RADNET Monitoring and Control System) which were connected to PRANET via the Warsaw nodes. RRR is a recording platform that records and archives the radar data travelling through the entire network. RMD serves as a versatile display to observe live data and to visualise the information recorded by RRR. Finally, CRMCS provides evidence of the performance and status of both networks, the attached systems components and radar sources, and also allows direct control of any PRANET node.

The subsequent steps covered the installation and integration of the systems for Gdańsk, Poznań and Katowice as well as the training sessions for its new users.

The fifth and final stage was completed as early as in February 2009. With its completion the Polish ANSP was propelled to the frontline of technology, now operating a reliable and future proof surveillance data management system.

**Integrated Components**

**CRMCS – Network Management System**

The CRMCS (COMSOFT Surveillance Network Monitoring & Control System) is PRANET’s network management component with agents at all nodes. CRMCS’ diagnostic information helps the central network managers to identify bottlenecks in system behaviour, to track erroneous situations and to perform continuous automated delay time measurements between any two points in the network. Generally, all information is managed centrally and graphically visualised. Colour and blinking display attributes support the fast and unambiguous localisation of problems. A set of CRMCS’ remote control functions enables a fast reaction by reconfiguring the network, resetting a node or modifying the load control parameters of a radar link.
Each dedicated PRANET network is linked to a recording platform of the type RRR. Both the traffic of the green as well as of the red network is continuously recorded by independent units. For PANSA, the RRR was made up as a medium-size platform allowing for retrieval of recorded data up to one year.

The RRR is based on forefront mass storage technology and can be adapted to the individual needs of any ATC environment. It allows the simultaneous and synchronised recording and replay of a multitude of radar data channels. Furthermore RRR is highly scalable, e.g., in terms of the number of recording/replay channels, operator working positions or storage volumes.

RMD - Radar Monitoring Display

Both networks of the PRANET infrastructure feature an RMD which are primarily used as means to depict the recorded data later on and to visualise the output of both integrated tracker – ARTAS and Indra’s.

For PANSA RMD’s analysing and short term statistical features were of particular interest. RMD supports the tracing of depicted target information down to the binary level and all along the chain of processing. Furthermore the installed RMD system is connected to SASS-C, the unique analysis workbench for ATC Radar Plot Analysis and Tracker Performance Measurements. SASS-C is able to provide quality statistics analysis for radars.

ARTAS

ARTAS (ATM SuRveillance Tracker and Server) not being an integral part of the PRANET project but deployed later on, today represents one of the most advanced surveillance data processing and distribution systems in the world.

PANSA opted for an ARTAS as part of their new PEGASUS air traffic management system which shall gradually replace the current ATC system. ARTAS was initially planned as fallback tracker, but its outstanding technical features have prompted its users to assign it a key role in their surveillance environment.
Appreciating the advantages of the versatile RAPS since 2006 when PANSA procured the first tool, they opted for an additional RAPS to better meet the needs of the growing infrastructure. After substantial training sessions the local staff was optimally prepared to conduct tests on their own and analyse the conveyed data. The tool also played a significant role for commissioning and final acceptance of the network.

The RAPS product is a powerful toolset for the testing, analysis, validation as well as the simulation of surveillance data. The system allows multichannel recording and replay of a wide range of formats and protocols. It provides highly sophisticated and flexible functions for filtering, format-sensitive evaluation, visualisation, transformation of data and the generation of test data.

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Von: Robert Parys
Gesendet: Montag, 20. April 2009 09:57
An: Stefan Wenzel
Cc: Stefan Hermann
Betreff: PRANET project summary

Dear Manfred,

As PRANET project seems to be finished, I would like thank you for Comsoft's professionalism. I find the Comsoft company as one of the best I've ever work with, being professional and customer oriented. Especially I would like to thank Hermann, Wenzel and Andreas, whose personal involvement in the project was undisputed. Thanks to their experience, knowledge and very often also a good will, project was running smoothly and without major problems. Knowing that PANSA will get any support from Comsoft also in the future, wish you further successful projects in the ATM/CNS business.

Kind regards,
Robert Parys
Project Manager