ENRI International Workshop on ATM/CNS 2013

[EN-015]

Voice over IP for Air Traffic Management ready for deployment in Europe

L. Popescu
Directorate Network Management
European Organisation for the Safety of Air Navigation, EUROCONTROL
Brussels, Belgium
liviu.popescu@eurocontrol.int

1. INTRODUCTION

Voice ATM communications are mainly used for coordination by planning air traffic controllers located in adjacent air traffic service (ATS) units and also for ATS control between the executive air traffic controllers and pilots.

In the latter case, the use of VoIP technology is provided on the ground segment of this communication chain. The ground segment provides the connection between the voice communication switch located in the air traffic control (ATC) centre and the ground radio station – most of the time situated in a very remote location.

Until now, inter-centre voice ATM communications in Europe were mainly based on analogue (ATS-R2) and digital (ATS-QSIG) protocols. For the ground component of the air-ground communication there was no common standard defined, as all communications between ATC centres and ground radio stations were point to point and no network was needed.

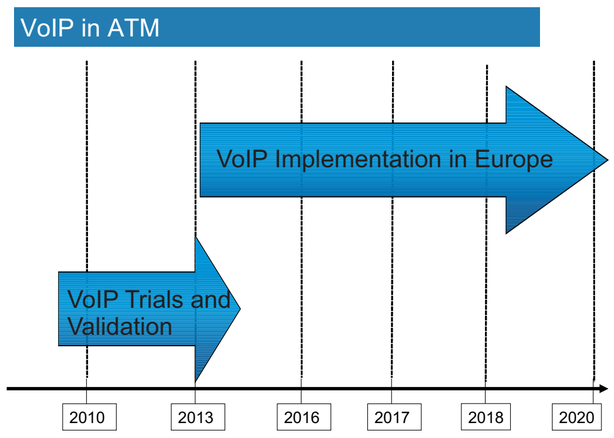

Figure 3 – VoIP in ATM planned implementation in Europe

7. IMPLEMENTATION PLAN

The 'European Single Sky ImPlementation' (ESSIP) Plan defines the common implementation actions required to improve the European ATM network over a short/medium term.
For VoIP in ATM, the European deployment is planned to be initiated in January 2013. (Fig.3). For inter-centre telephony it is planned to be finalised by December 2018. For the ground segment of the air-ground voice communications it is planned to be finalised by December 2020.

6. READY FOR DEPLOYMENT

In Europe, SESAR, the Single European Sky ATM Research programme partners are working to validate and verify VoIP in ATM standards over the pan-European network service (PENS). The work is planned to be completed during the first half of 2013.
PENS is a joint EUROCONTROL and European Air Navigation Service Providers (ANSPs) led initiative to provide a common IP based managed network service across Europe.
VoIP in ATM is one of the applications that are taking benefit of the European rollout of PENS in providing efficient support to operational ATM data and voice communications (Fig. 2)

2. CURRENT SITUATION

The Single European Sky package II (SES II), enforced by the European Parliament and the European Council on 4 December 2009, requires a more efficient operational concept based on functional airspace blocks (FABs). Within an FAB, there is a need to effectively deliver capacity to airspace volumes when required. To do this, airspace and sector structures must have the ability to adapt to predicted traffic flows and workload without delay or restriction. Furthermore, adjacent units must know the sector configuration of all the surrounding FAB partners. Dynamic sectorisation is required to support this new concept.

To achieve dynamic sectorisation, new flexible technical solutions are needed for which interoperability is an essential ingredient. The VoIP in ATM standard is the ideal solution to provide interoperability, particularly for the air-ground component where a ground radio station will be shared by several adjacent ATC centres belonging to different air navigation service providers (ANSPs).

Furthermore, a number of European telecommunication service providers (TELCOs) are planning to, or are already phasing out, analogue and digital 64k circuits. These circuits are currently providing the supporting infrastructure on which the ATM voice services are based.

This situation in the TELCO market is affecting both civil and military ANSPs. A replacement of current analogue and digital ATM voice services with a common standard is therefore urgently needed at the European level. VoIP in ATM is able to provide the right replacement at the right time.

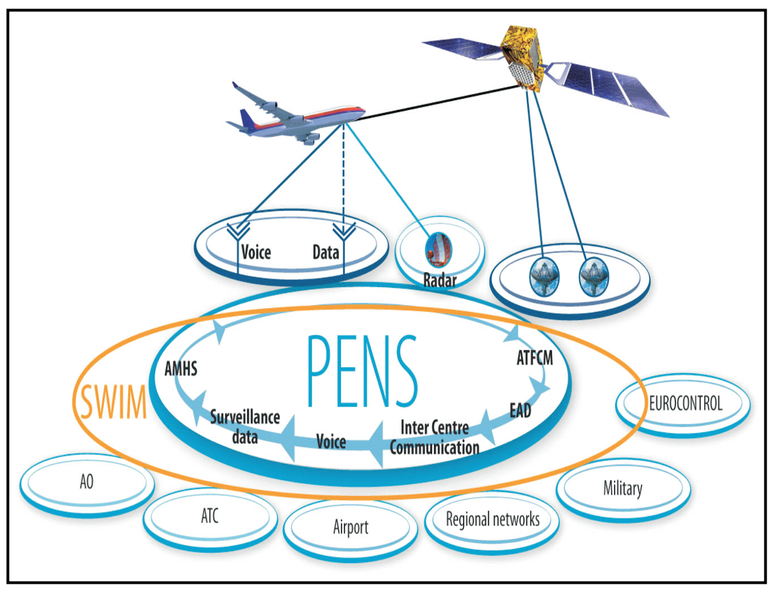

Figure 2 – PENS current and future IP infrastructure

5. ADDRESS SPACE COORDINATION

Being an IP service, VoIP in ATM requires as a prerequisite the deployment of an IP infrastructure. Furthermore the Network Requirements and Performances for VoIP ATM Systems, ED138 requires the use of IP version 6 to support VoIP in ATM services.

The IPv6 addresses are globally coordinated by the Internet Assigned Numbers Authority (IANA) through the Regional Internet Registries. The European Regional Internet Registry (RIPE) is managing the Internet address space within Europe. In order to co-ordinate the management of address space to the users a Local Internet Registry (LIR) is required.

November 2004, EUROCONTROL submitted a request to RIPE (the Regional Internet Registry covering Europe) to become a LIR. This was accepted in December 2004 and in January 2005, EUROCONTROL requested its first IPv6 allocation and received a standard LIR /32 allocation.

In 2005, EUROCONTROL and its stakeholders defined an IPv6 addressing and BGP Autonomous System Number (ASN) scheme in sub-allocating the IPv6 LIR /32 allocation.

As LIR, EUROCONTROL applies the above scheme for the IPv6 address space sub-allocation to its stakeholders (Fig 1). All IPv6 coordinated sub-allocations are registered by EUROCONTROL in the European Regional Internet Registry (RIPE) database.

In particular for VoIP in ATM, the IPv6 assignments to End User Systems as Voice Switching Systems (VCS), Ground Radio Stations (GRS) are then integrated by each Stakeholder in the ATM Ground Voice Network (AGVN) database developed by EUROCONTROL.

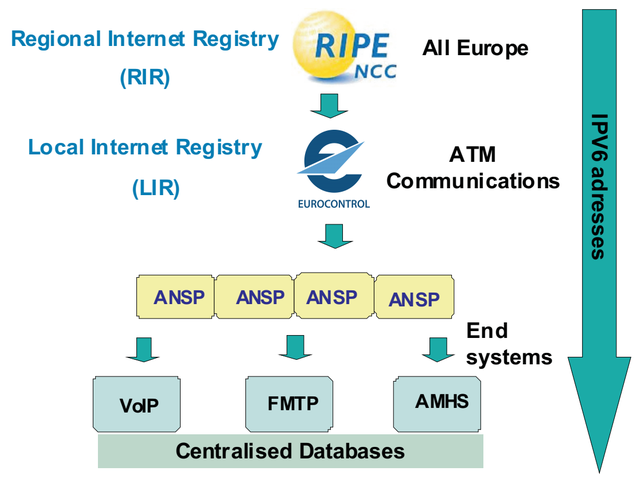

Figure 1 – IPv6 address coordination in Europe for VoIP in ATM

3. STANDARDISATION

EUROCAE WG-67, with cooperation from EUROCONTROL, European industry, and ANSPs, developed the first VoIP in ATM standard .

The standard was issued in February 2009 as a set of documents (ED136, ED137, ED138) defining the operational voice concept, the interoperability solutions and the network-associated requirements.

The interoperability solution standard further evolved and in January 2012 EUROCAE released version ED137B. ED137B has the following structure:
VOL1 – Radio
VOL 2 – Telephone
VOL 3 – European Legacy Telephone Interworking
VOL 4 – Recording
VOL 5 – Supervision

The ICAO Aeronautical Communication Panel WGI supported the referencing of ED137B VOL 1 and VOL 2 by the edition 2 of the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Manual (ICAO DOC 9896) . ICAO WGI was tasked for the development of the ICAO Aeronautical Telecommunication Network (ATN), to be based on Internet Protocol Suite (IPS) standards,

WGI current assignment is the development of implementation guidance for ATN/IPS. The following subjects of interest for VoIP in ATM deployment are currently addressed by the group: IPv6 addressing, IPv6 transition, Domain Name System (DNS) structure and implementation, IPS Security consistent implementation.

4. TEST SPECIFICATIONS AND TOOLS

Implementations of ED137B standard are supported by the EUROCONTROL VoIP in ATM Test Specifications and by the EUROCONTROL VoIP in ATM Test Suite Software tool called VOTER.

The EUROCONTROL VoIP in ATM Test Case specification consists in a set of inter-related documents which scope covers VoIP interoperability between various End User Systems as Voice Switching Systems (VCS), Ground Radio Stations (GRS) and Recorders (REC). The set contains an overall cross reference matrix:
1. VoIP in ATM Cross-Reference Matrix
3 Interoperability test case specifications:
2. VoIP in ATM Radio Test case specification
3. VoIP in ATM Telephony Test case specification
4. Recorder Test case specification
and 2 Interworking specifications for European legacy voice systems:
5. SIP v ATS-QSIG gateway interworking test specification
6. SIP v ATS-R2 gateway interworking test specification
All the above test specifications are being aligned with the latest version of the standard.

VOTER software test tool had been released in February 2012. VOTER distribution it is subject to a license agreement with EUROCONTROL.

VOTER is being aligned to the latest version of the standard.

The VOIP in ATM Test Case specification and the VOTER software test tool are the result of the collaborative effort provided in the last couple of years by more then 100 experts brought together by the VoIP task Force of EUROCONTROL called VOTE.

REFERENCES

[1] EUROCAE ED-136: “Operational and Technical Requirements”, February 2009
[2] EUROCAE ED-137B “Interoperability Standards for VoIP ATM components, VOL 1 : Radio”, January 2012
[3] EUROCAE ED-137B “Interoperability Standards for VoIP ATM components, VOL 2 : Telephone”, January 2012.
[4] EUROCAE ED-137B “Interoperability Standards for VoIP ATM components, VOL 3 : Telephone Legacy Interworking – January 2012
[5] EUROCAE ED-137B “Interoperability Standards for VoIP ATM components, VOL4 : Recording”, January 2012
[6] EUROCAE ED-137B “Interoperability Standards for VoIP ATM components, VOL 5 : Supervision”, January 2012
[7] EUROCAE ED-138: “Network Requirement and Performance for VoIP ATM systems Part 1: Network Specification”, February 2009
[8] EUROCONTROL: “VoIP in ATM cross-reference matrix”, edition 1.0, September 2011
[9] EUROCONTROL: “Telephone Test case specification for VoIP in ATM”, edition 1.1, September 2011
[10] EUROCONTROL: “Radio Test case specification for VoIP in ATM”, edition 1.1, September 2011
[11] EUROCONTROL: “Recorder Test case specification for VoIP in ATM”, edition 0.3, September 2011
[12] EUROCONTROL: “SIP v ATS-QSIG”, Interworking Gateway specification, edition 1.2, September 2011
EUROCONTROL: “SIP v ATS-R2”, Interworking Gateway specification, edition 1.2, September 2011

EUROCONTROL