INTERNATIONAL CIVIL AVIATION ORGANIZATION

Seventh Meeting of the APIRG Infrastructure and Information Management Sub-Group (IIM/SG7)

Dakar, Senegal, 5 - 8 August 2024

Agenda Item 3: Achievements in Infrastructure and Information Management

3.3. Implementation of ASBU elements and achievements of IIM Projects

WP3.3D Progress report of APIRG IIM Project 4

(Presented by PTC COM4)

SUMMARY
This working paper outlines the progress status of IIM SG COM 4 project "Implementation of an Integrated Aeronautical Telecommunications Infrastructure", updates on the project milestones and highlights the challenges encountered.
Action by the meeting in paragraph 3
REFRENCE(S):
- Global Air Navigation Plan (GANP)   - APIRG/25 Report   - Manual for the ATN using IPS Standards and Protocols (Doc 9896)   - Doc 7474   - Report of APIRG IIM/SG
Related ICAO Strategic Objective(s): *A – Safety, B – Air Navigation Capacity and Efficiency*

1. **INTRODUCTION**

1.1   The IIM COM 4 project aims to support the implementation of a seamless telecommunications infrastructure across the AFI region to ensure and complete global interoperability of CNS/ATM systems and services.

1.2   The main objective of the project is to:

  a)   Achieve interoperability among the AFI aeronautical VSAT networks.

  b)   Develop and implement AFI ATN backbone.

  c)   Provide a common IP based managed network service across the AFI region.

  d)   Deploy when it is possible IP VPN connectivity as backup of VSAT and main infrastructure for applications based on digital data management (AFS, AIM and MET field).

2. DISCUSSIONS

Key achievements

2.1 Development of the project document including the objectives, strategy, scope, deliverables, and tasks

2.2 Description of the project organization detailing the meeting program, project schedule, the project deliverables

2.3 The identification of the links between the IIM SG COM 4 project and the other projects.

2.4 Review and update of the project document to include some key evolutions and experience from other regions,

2.5 Development and finalization of the Project COM 4 questionnaire

2.6 Update project documents.

2.7 Update project coasting in accordance with the project documents.

2.8 Carry out an assessment of AFI VSAT networks and infrastructures, and also the outcome of relevant reengineering project in the region in terms of compliance with current and future requirements with a view to their future seamless integration of AFI VSAT networks.

Ongoing actions

2.9 Realized a GAP Analysis in order to determine the level of compliance to be achieve between AFI VSAT networks aim to tackle level 3 of interoperability of existing VSAT networks (AFISNET, SADC/NAFISAT) and their interface with adjacent regions.

2.10 Circulation of documentations related to common telecommunication infrastructure.

2.11 Develop guidance materials for the use of IP VPN point to point connectivity as backup of VSAT and also point to multipoint connectivity in order to access regional database for AIM and MET operation in the AFI region.

Status of implementation of ASBU elements in the scope of the project

2.12 The project benefits all ESAF and WACAF States and covers the implementation of the following ASBU elements:

- COM1/B1/1 - Ground-Ground Aeronautical Telecommunication Network/Internet Protocol suite (ATN/IPS) – The migration from ATN/OSI to ATN/IPS is advanced in SADC2/NAFISAT network, and ongoing in AFISNET, which is still largely under the Frame Relay protocol, with many asynchronous bilateral links at a low speed of 19.2Kbits/s.

  - *In summary, it can be said that the current status of ASBU implementation applicable in the AFI region is compliant to COM1/B0/2 - Aeronautical Telecommunication Network/Open System Interconnection (ATN/OSI) This status allow to Support basic Flight Plans, NOTAMs and OPMET Exchange as well as A/G COM, This makes it difficult to seamlessly exchange high-volume data in digital formats (FF-ICE, digital NOTAM, IWXXM, etc.)*

- Other related ASBU A modules:

- COM1/B2/1- Air-Ground ATN/IPS, CPDLC is compliant where implemented.

- COMS/B0/1- CPDLC (FANS 1/A & ATN B1) for domestic and procedural airspace, is compliant.

- COMS/B1/1- PBCS approved CPDLC (FANS 1/A +) for domestic and procedural airspace, is ongoing implementation.

Implementation challenges

2.13 The project is now well launched and even if the participation of all registered members is not effective, the group has started to work around a core of members, and the recent commitment of ATNS and ASECNA experts supporting the COM4 project activities, is a catalyst for the advancement of the project's work program, given that ATNS and ASECNA are the main operators for the States in the region AFI on VSAT telecoms infrastructure for all of the ESAF and WACAF members States; and then relevant and applicable deliverables as guidance materials enabling the networks in the region to converge towards an interoperable and seamless network to the ATN IPS standard tackle level 3 are expected later.

2.14 Review and update of the project document to include some key elements in order to ensure the alignment of the Projects to the 6th Edition of the GANP, particularly, the ASBU applicable elements in CNS area, and holding disparities in architecture and architecture convergence in future projects.

2.15 The level of implementation of the ASBU modules of the global air navigation plan (GANP) associated with CNS/ATM & MET equipment in the AFI region is heterogeneous and does not enable the objectives of implementing the vision of the African ANS Master Plan to be met.

2.16 Operational data exchanges between adjacent centers are essentially carried out on the VSAT network with moderately low data rates. The implementation of futuristic technologies and solutions to meet the vision of the Pan-African Master Strategy Plan will require a considerable VSAT bandwidth increase, which is not economically tenable, justifiable and would explode the budgets of the ANSPs. The only solution would be to adopt ATN/IPS solutions using fibre optic media as in neighboring regions of the AFI zone.

2.17 AFI States and ANSPs pursue the deployment of their respective Networks in the Neighboring States without taking into consideration the interoperability issue. Each AFI Networks uses its own Satellite Access Method (TDMA – Time Division Multiple Access and FDAM – Frequency Division Multiple Access) while they operate on the same satellite (INTESAT) and utilizes common components. Moreover, it's also recognized that the forthcoming implementation of CNS/ATM components with time critical or sensitive applications (Enhanced ATM Tool, Enhanced FDP, Airspace Management System, Complexity Management Tools, System Wide Information Management, Flight & Flow Information in Collaborative Environment (FF-ICE) will require the modernization and bandwidth increase of current VSAT Networks. However, a deployment of new VSAT networks and satellites is considerably more expensive.

2.18 The proliferation of new VSAT networks and satellites should be avoided because of its cost implications, especially where the existing ones, both national and international, can be expanded to serve new areas. Interoperability between AFI VSAT Networks must be achieved in order to avoid the duplication of aeronautical VSAT networks.

2.19 To provide for a more modern, more efficient, cost-effective, and robust data communications network infrastructure, ATN/IPS shall be seriously considered by the AFI Region. ATN/IPS enables the efficient integration of technologies with improved integrity to support future air to ground and ground-ground aeronautical safety services and regularity of flight communications.

2.20 The ATN/IPS internetwork consists of IPS nodes and networks operating in a multinational environment in support of Air Traffic Service communication (ATSC) as well as Aeronautical Industry Service Communication (AINSC), such as Aeronautical Administrative Communications (AAC) and Aeronautical Operational Communications. This evolution will support enhanced civil-military cooperation and coordination functions, if interoperability and military information security aspects are considered. An IPS node is a device that implements IPv6. There are two types of IPS nodes:

- An IPS router is an IPS node that forwards Internet Protocol (IP) packets not explicitly addressed to itself.

- An IPS host is an IPS node that is not a router.

2.21 Discussions on the roadmaps for the operational implementation of air-ground ATN/IPS based communication services have recently taken place and have made apparent that there are divergences of views among experts of the Aeronautical Communication Community on the preferred approach and timeline to initiate a transition toward the use of ATN/IPS for future aeronautical communications. Roughly, two different ATN/IPS implementation timeline strategies are considered:

2.22 ASBU Block 1/2 implementation of ATN/IPS – in synchronization with the implementation of Baseline 2 operational services

- ASBU Block 2/3 implementation of ATN/IPS – in synchronization with the implementation of a future communication infrastructure (notably LDACS).

2.23 From a routing perspective, inter-domain routing protocols are used to exchange routing information between Autonomous Systems (AS), where an AS is a connected group of one or more IP address prefixes. The routing information exchanged includes IP address prefixes of differing lengths. For example, an IP address prefix exchanged between ICAO regions may have a shorter length than an IP address prefix exchanged between individual States within a particular region. Administrative Domains should coordinate their policy for carrying transit traffic with their counter parts.

2.24 The Aeronautical Telecommunications Network over IP (ATN/IPS) will be the new standard for the future ATM infrastructure. It will enable more efficient use of data link communications, which will become a major means of communication in the coming decades. This future communications infrastructure (FCI) aims to provide a flexible and secure means of transferring critical data and voice communications over digital links. To meet this requirement, new functionalities in terms of mobility, security and quality of service (QoS) need to be defined, given the particularities of the aeronautical environment.

2.25 ATN/IPS mobility is based on IPv6 mobility standards, operated by Mobility Service Providers (MSP). The ICAO Global Air Navigation Plan (GANP) calls for a transition from FANS 1/A and OSI ATN to ATN IPS.

2.26 The International Civil Aviation Organization (ICAO) is currently working on this aspect but has not defined yet the solutions. Proposals have been made such as Ground Locator/Identifier Separation Protocol (G-LISP), Proxy Mobile IPv6 (PMIPv6) and Asymmetric Extended Route Optimization (AERO). All these solutions resolve only partial mobility issues. PMIPv6 and AERO are intra-domain mobility solutions, whereas Ground-LISP defines a solution to cope with the inter-domain mobility issue. The mobility solution also has to take into consideration multilink properties, which are required by the operating concept defined in SESAR.

2.27 The FCI will be the interconnection of all subnetworks and hence securing an IP end-to-end communication between all the aeronautical stakeholders. The FCI is represented in the Figure 1, in which we illustrate the fact that there should be more than one CSP providing one type of link technology.
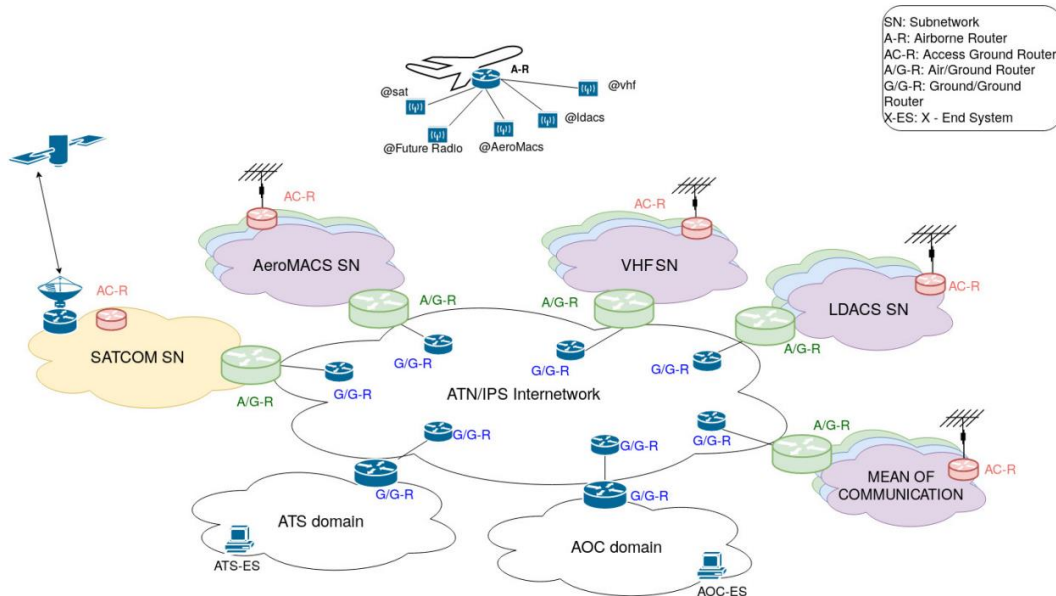

Fig. 1. The Future Communication Infrastructure

2.28 Have a clear vision of the ongoing developments in the ATM, AIM, MET related projects particularly in volumetry and topology of current and further data exchanges in the AIM, MET and ATM domains, in order to be well aware of the impact of the change in environment from message switching to data management and the need of implementation of new service environments based on new standards of data management (such as SWIM concept).

2.29 Considering the emergence of IP VPN through internet solutions and the associated security constraints.

3. ACTIONS BY THE MEETING

3.1 The meeting is invited to:

   a) Take note of the information contained in this working note.

   b) To make recommendations for the smooth running of the project.

3.2 **Draft IIM/SG7 Conclusion /Decision 7/xx : Title of Conclusion/Decision**

That;

To provide the COM04 project with the necessary budget so that it can carry out its activities in the best possible conditions, States and organizations, in particular ATNS, ASECNA, NAMA, GCAA and Roberts FIR, are requested to provide substantial support to the activities of the project to achieve the objective of interoperability at level 3, through the integration of intermediate routers and end routers into the AFI region's baseband networks, with appropriate security and governance provisions.

----- END -----