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**Thirty Seventh MEVA Technical Management Group Meeting
(MEVA/TMG/37)**
Mexico City, Mexico, 8 to 10 August 2022

Agenda Item 3:   CANSNET Project

CANSNET INTERCONNECTION REQUIREMENTS WITH SAM STATES

(Presented by the Secretariat)

EXECUTIVE SUMMARY
This working paper presents a proposal to enable the interconnection of the future CANSNET network with the Digital Network of the SAM Region (REDDIG), through the telecommunications providers of the respective networks.

Action:	The suggested actions are presented in Section 4
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• Annex 10 Volume III • Doc 9896 - Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols

1.   Introduction

1.1   The concept of the Aeronautical Telecommunication Network, defined in Annex 10 Volume III, is of a global internetwork architecture that allows ground, air-ground and avionic data subnetworks to exchange digital data for the safety of air navigation and for the regular, efficient and economic operation of air traffic services.

1.2   The interconnection of terrestrial networks consists of the connection of national, regional and interregional networks.

1.3   Regardless of the contractual model, whether unified or by region, the NAM/CAR/SAM States have chosen to implement networks based on the Internet Protocol Suite (ATN/IPS) architecture, as presented in Figure 1.
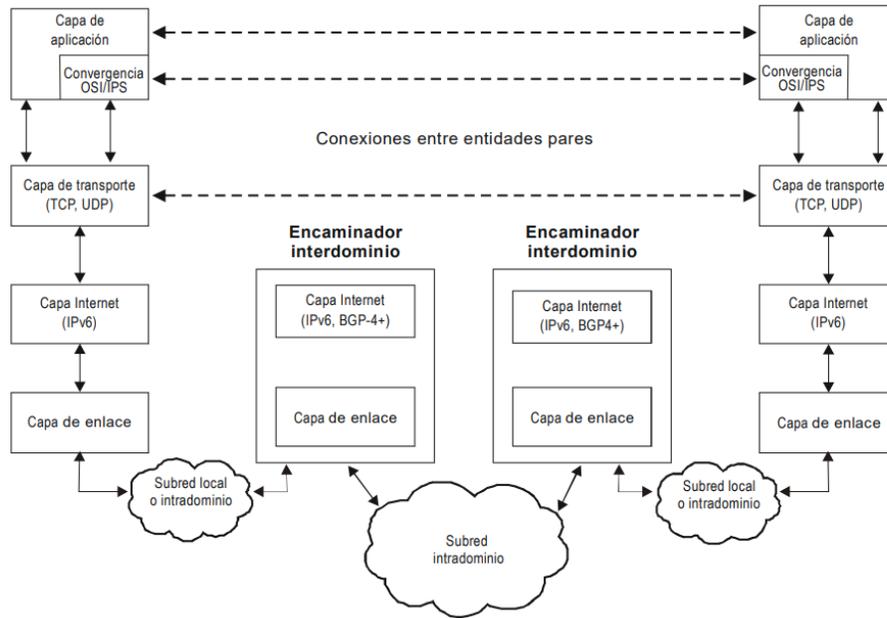
Figure 1 – ATN/IPS protocol architecture

1.4   The central infrastructure in cloud format represents the abstraction of one or more networks that provides the connection of the final systems, at the right and left ends of Figure 1. For example, it can be a large area network (WAN) of a State connecting two nationally deployed systems. On the other hand, it can represent the connection of two final systems in different States, consisting of the central infrastructure of one or more regional/national networks.

1.5   In this regard, it is paramount to ensure that ATN/IPS Regional IP Networks provide interconnection in a transparent manner for end-users.

2.   Red Digital de la Región SAM

2.1   The SAM Region Digital Network (REDDIG II) is a fully meshed IP network, composed of two segments (terrestrial and satellite) that provides a communication infrastructure in accordance with the ATN/IPS concept. Figure 2 illustrates the topology of REDDIG II, with the two network segments.

2.2   The terrestrial segment consists of a network deployed through a communication service provider (CSP) that provides a Multiprotocol Label Switching (MPLS) Virtual Private Network (VPN) service.

2.3   MPLS technology replaced traditional IP networks due to some drawbacks of the latter technology, such as:

        a)   Routing protocols are used on all devices to distribute routing information;

b)   Regardless of the routing protocol, routers always forward packets based on the destination IP address only; and

c)   Routing lookups are performed on every router in such way that each router in the IP cloud makes an independent decision when forwarding packets.
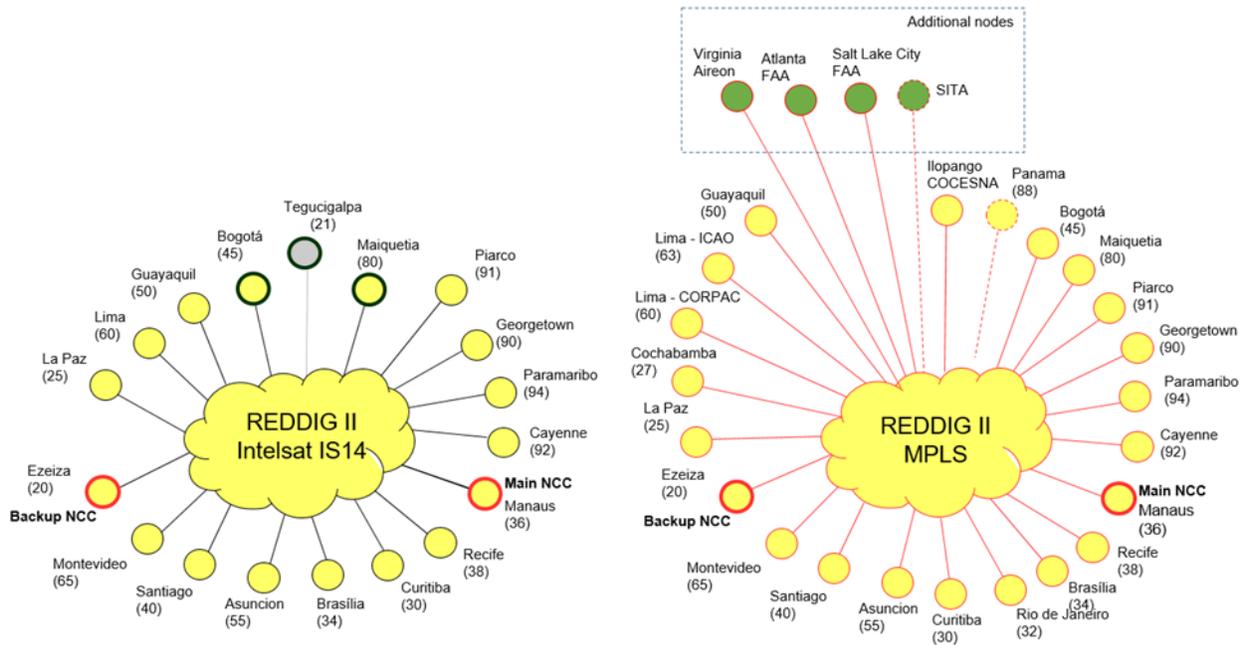
Figure 2 – REDDIG II Topology

2.4   The main advantage of MPLS is the reduction of routing lookups, avoiding the need to run a particular routing protocol on all devices (routers). When MPLS was firstly envisioned, the main objective was to provide less delay and a decrease in packet loss, when compared to legacy IP networks.

2.5   In short, MPLS is a forwarding mechanism in which packets are forwarded based on labels. These labels may correspond to IP destination networks (equal to traditional IP forwarding) and can, also, correspond to other parameters, such as Quality of Service (QoS) or source IP address. MPLS was designed to support forwarding of other protocols as well, such as Point-to-Point Protocol (PPP) and Asynchronous Transfer Mode (ATM).

2.6   The basic difference between MPLS and traditional IP forwarding packets is that MPLS uses a 32-bit label encapsulation field that is inserted between Layer 2 and Layer 3 headers (frame-mode). So, MPLS is defined by the Request for Comments (RFC) 3031 and operates between layers 2 and 3 of the Open Systems Interconnection (OSI) model from International Organization for Standardization (ISO).

3.   Interconexión CANSNET – REDDIG II

3.1   If the future CANSNET network is also implemented as an MPLS VPN, interconnection with other similar regional IP networks can be easily achieved through Network-to-Network Interface (NNI).

MPLS Network-to-Network Interface

3.2   Sometimes it is necessary to extend the capillarity of the network in order to reach (and be reached) by clients using different CSPs. In this case, the concept of MPLS NNI is applied and the CSPs involved with the different customers establish agreements in order to coherently interconnect their own infrastructure. The Figure 3 shows an idea of the MPLS-NNI topology.
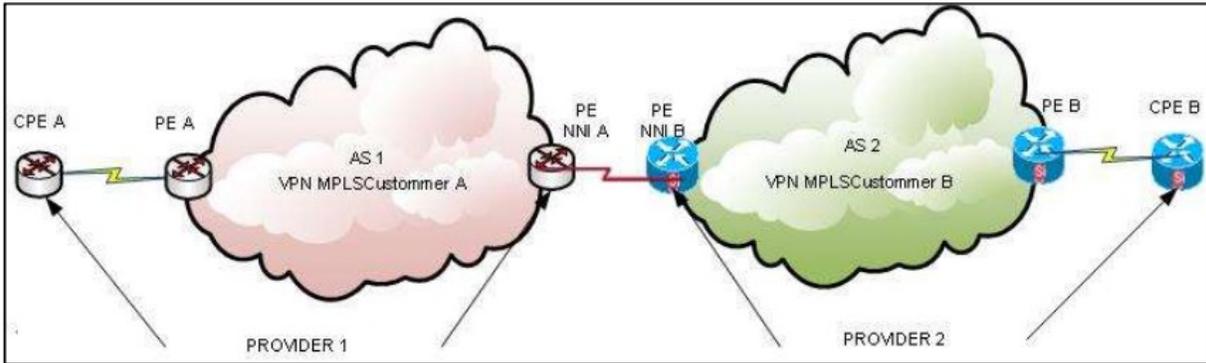

Figure 3 – MPLS NNI Toplogy

3.3   The MPLS-NNI is a bi-directional IP-MPLS between an Autonomous System (AS) in one CSP and a different AS from other Provider infrastructure. A PE NNI is a router that is connected by using more than one routing protocol and that exchanges routing information with routers in other autonomous systems. They typically also run an exterior BGP (EBGP), static routes, or both. A PE NNI is used to distribute routes received from other external AS throughout its own autonomous system.

3.4   Other cross-connect arrangements can also be implemented by the communication service providers of regional IP networks, with the aim of ensuring interconnection between networks.

3.5   In this sense, it is essential that in the elaboration of the technical requirements of the future CANSNET network, the Interconnection with the other regional aeronautical IP networks, such as the Digital Network of the SAM Region, is ensured through the MPLS VPN service providers.

4.   Suggested actions

4.1   The Meeting is invited to:

   a) review the information presented in this working paper; and
   b) discuss its content to take appropriate measures regarding ensuring the
      interconnection of CANSNET with the SAM Region Digital Network (REDDIG II).

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