International Civil Aviation Organization

Ninth Meeting of the Aeronautical Communication Services Implementation Coordination Group (ACSICG/9))

Video Teleconference, 19 – 21 April 2022

Agenda Item 7: Inter-regional AFS connection

MPLS/IP BASED INTER-REGIONAL CONNECTION

(Presented by ICAO Secretariat)

SUMMARY

This paper provides current status of discussion being done for potential interconnection of CRV and REDDIG II and CRV and New PENS. The paper presents the final technical proposal for interconnection of CRV and REDDIG II and propose various business model to way forward. It also requests APAC member states to record their interest, willingness, or need for interconnection of the CRV with other regional networks such as REDDIG II / New PENS with the ICAO secretariat.

1. INTRODUCTION

1.1. The Air Traffic Services (ATS) relies on an infrastructure (Aeronautical Telecommunication Network - ATN) to transmit both air-to-ground and ground-to-ground applications. Currently the most common networks that uses the concept of convergence is based on the Internet Protocol Suite (IPS). The International Civil Aviation Organization (ICAO) has developed the Standard and Recommended Practices (SARPS) based on the referred concept which are framework to support the implementation of the System Wide Information Management (SWIM).

1.2. For providing services to the Air Navigation Providers (ANSPs), almost all Communication Service Providers (CSP) use the Multiprotocol Label Switching (MPLS) infrastructure to deliver IP applications. MPLS services are used to implement regional IP networks such as CRV for APAC/MID, New Pan-European Network Service (New PENS) for EUR/NAT and SAM Region Digital Network (REDDIG II) for SAM. Currently, the communication services providers for these networks are PCCW Global (CRV), British Telecom (New PENS) and Lumen (REDDIG II) respectively.

1.3. The paper discuss status of discussion being held for potential interconnection of CRV and REDDIG II and CRV and New PENS.

2 DISCUSSION

2.1 The Common aeRonautical Virtual Private Network (CRV) was developed to improve regional connectivity and to help reduce the cost on telecommunications. In order to enhanced global connectivity among states of different regions, it was suggested to States that connect to the CRV should

also connect to other regional networks such as REDDIG and New PENS.

2.2 There are potentially further benefits with implementing interconnections to regional networks such as efficiency in the connection services such as SWIM, reducing costs for states that connect to other regional networks. Some states had already expressed an interest in a connection to other regional networks such as New Zealand to REDDIG II and Singapore to New PENS. Therefore, interconnection among regional networks may be very important to enhanced air navigation capacity and efficiency.

CRV and REDDIG II Interconnection

2.3 There are communications requirements between Asia Pacific (APAC) ANSPs and South American (SAM) ANSPs. The regional IP networks' interconnection, CRV and REDDIG II, may act as a potential solution in order to set up the AMHS P1 connection between AMHS COM Centers of Christchurch (New Zealand) and Santiago (Chile).

2.4 Noting these requirements, early discussion among regional networks service providers for CRV and REDDIG II and the CRV OG has been initiated. It felt that it is also important to discuss the inter regional network connectivity with the Data Communications Infrastructure Working Group of the Communications Panel to align the implementation of this concept with the directions of the this working group.

Requirements for interconnecting AMHS COM Centers of Christchurch (New Zealand) and Santiago (Chile)

2.5 Chile and New Zealand have adjacent oceanic FIRs and plan to implement AIDC for Air Traffic coordination between the oceanic control centers (ACCs). The automation of coordination tasks using AIDC between adjacent sectors improves the quality of information on traffic transiting between sectors and makes it more predictable, thereby allowing reduced separation minima, decreased workload, increased capacity, more efficient flight operations, and enhanced safety. To guarantee an effective AIDC connection, it is also important to have a direct AMHS P1 connection between the two AMHS COM Centers providing message service to the involved oceanic centers. **Figure 1** depicts the basic communication requirement as a reference for the discussion.

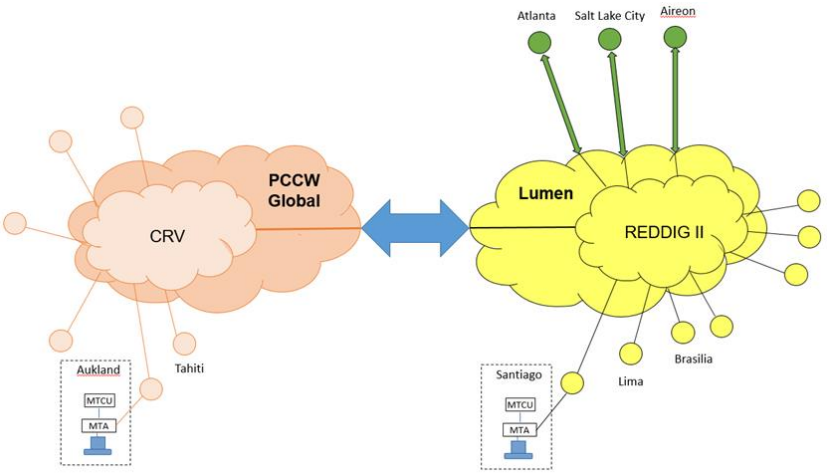

Figure 1 Basic communication requirement

Proposed Solutions

2.6 **Three possible** solutions were envisaged to connect the AMHS COM Centers of Santiago (Chile) and Christchurch (New Zealand):

Installing a CRV node in Chile or a REDDIG node in New Zealand: ***Solution-1***

2.7 This solution implies in buying service from one of the two providers (Lumen or PCCW Global). **Figure 2** depicts this possibility.

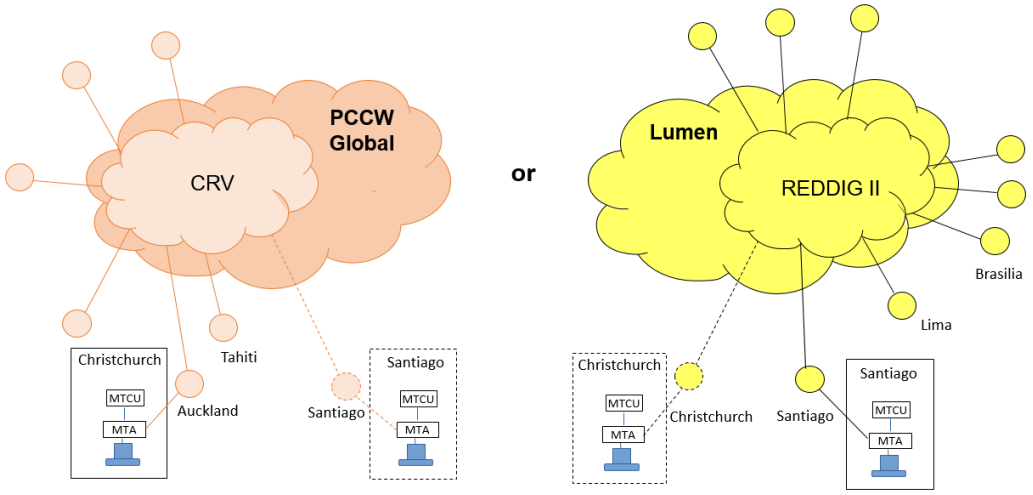

Figure 2 Installing a CRV node in Chile or a REDDIG II node in New Zealand

Using the FAA nodes (CRV and REDDIG II) to redirect packets between the two networks: ***Solution-2***

2.8 The Federal Aviation Agency (United States of America) has deployed nodes of the two networks (CRV and REDDIG II). It can be configured to redirect packets from one network to the other. **Figure 3** depicts this possibility.

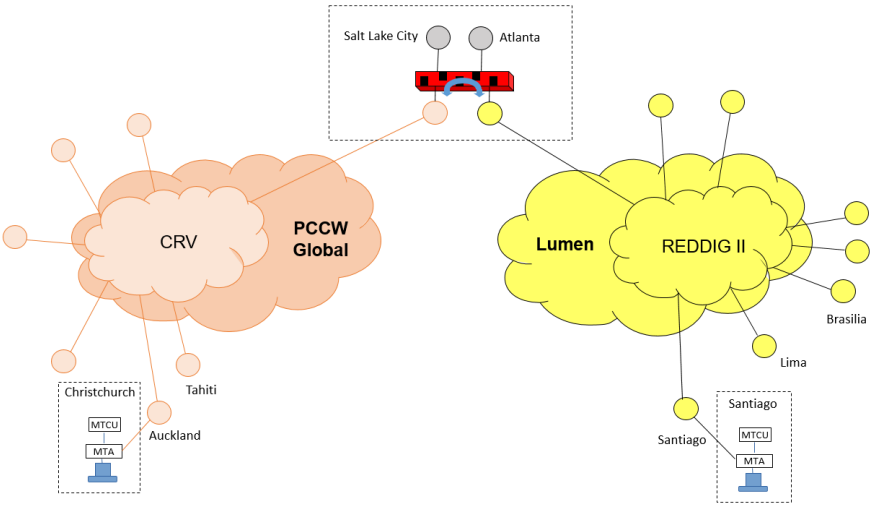

Figure 3- Using FAA nodes (CRV and REDDIG II) to redirect packets between the two networks

2.9 The Regional IP Networks interconnection by means of MPLS Network-to-Network

Interface (NNI) is considered the most classical approach to adopt as solution to interconnect CRV and REDDIG. **Figure 4** depicts this possibility.

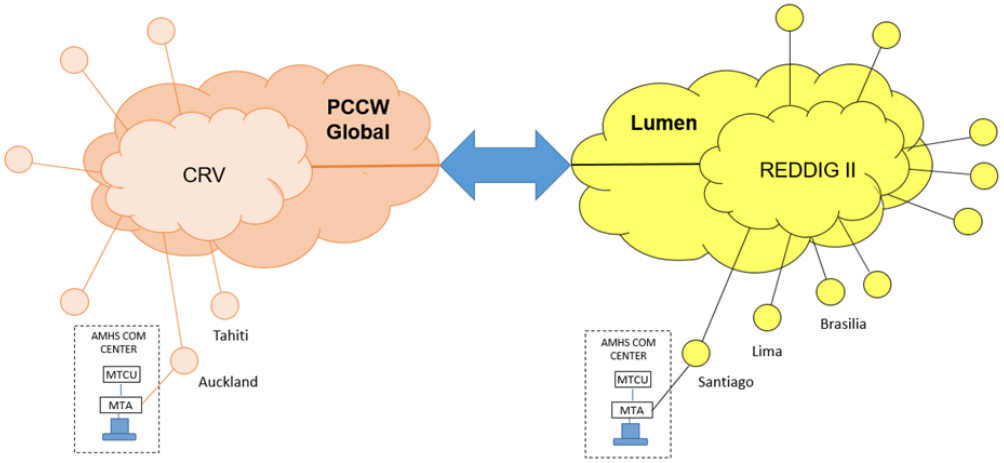

Figure 4 MPLS NNI between Lumen and PCCW Global connecting CRV and REDDIG II

2.10 After further discussion, the interested proposal was ***Solution-3***.

Advance Discussion

2.11 Further discussion on the administrative and technical aspects to establish the required aeronautical communications between APAC and SAM ANSPs through MPLS NNI were done on **3 November 2021** by teleconference. A Lumen representative informed that the first agreed solution of implementing a MPLS NNI using the infrastructure of both CSP in United States resulted as a not feasible proposal (see **Figure 5).** Another proposal was presented with a different approach. **Figure 6** depicts the new Lumen solution to implement interconnection between CRV and REDDIG II users.

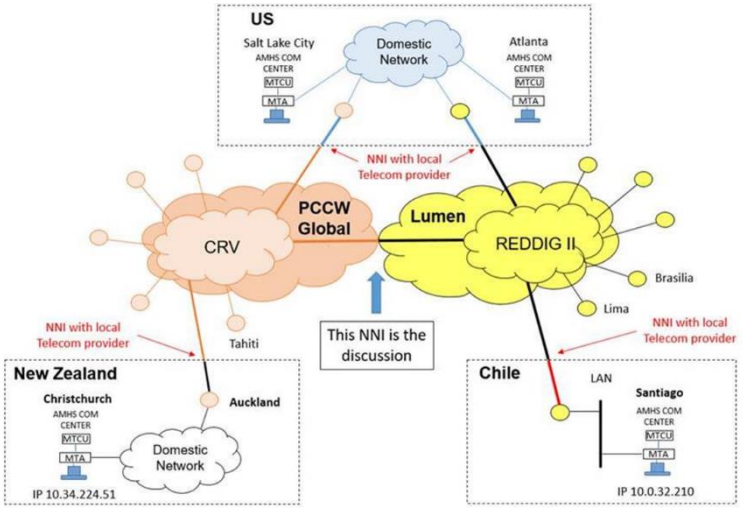

Figure 5 – First proposed solution

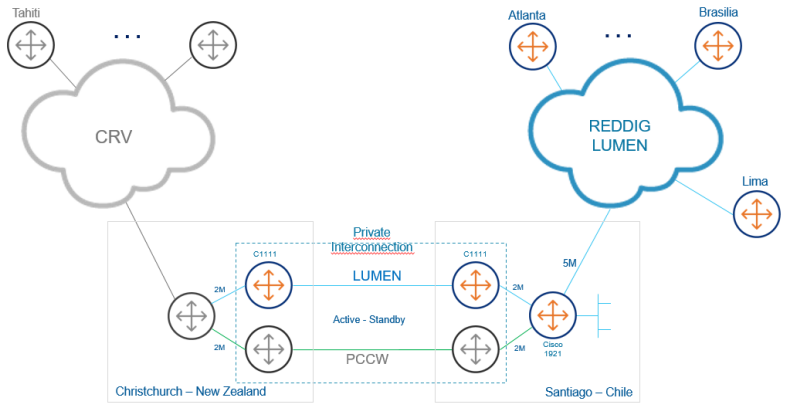

Figure 6 – Lumen´s proposal

2.12 Basically, the proposal consisted of setting up **two direct connections** between Christchurch and Santiago, provided by the **two telecommunication providers**, by means of different paths, allowing an **Active - Standby redundant interconnection** for the two AMHS COM Centers.

2.13 PCCW Global representative also presented a proposal, depicted in **Figure 7**, that takes the advantage of the existence **co-located Data Centers** of both telecommunication providers.

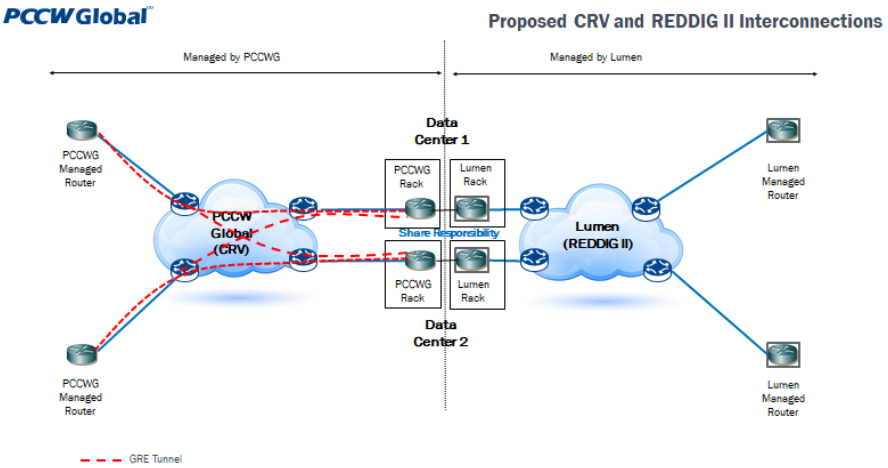

Figure 7 – PCCW Global´ s proposal

2.14 This proposal allows the implementation of communications (voice and/or data) with other States/Organizations participating in any of both networks (CRV and REDDIG II), which have communication requirements due to Flight Information Regions adjacencies.

2.15 The teleconference participants agreed **that the proposal presented by PCCW Global would be more adequate** and should be better elaborated by the telecommunication providers, in order to present a definitive proposal for analysis of the CRV and REDDIG II participants. It was agreed that Lumen and PCCW Global will work on the proposal and will present a document, not later than December 15th 2021, in order to be analyzed by the Board/Committee of both networks (CRV and REDDIG II).

2.16 It was also recommended that in the document detailing the proposal, the telecommunication providers must provide all necessary information and aspects involved in the implementation of the CRV- REDDIG II Interconnection proposed, allowing a decision by the CRV and REDDIG II participants, interested in the interconnection.

2.17 PCCWG submitted **final technical proposal agreed by Lumen on 15th December 2021**. The proposal was presented by PCCWG by WP/07 in CRV OG/9.

2.18 The CRV OG/9 meeting was informed that Interconnection Link for CRV and REDDIG II will be connected between PCCWG provided Router and Lumen provided Router. This link will be **shared responsibility between PCCWG and Lumen**. In case of any fault issue, States in CRV Network will report to PCCWG and States in REDDIG II Network will report to Lumen respectively. PCCWG invited the CRV OG/9 meeting to confirm which States will require communication between CRV Network and REDDIG II Network to determinate the sizing and cost of the interconnection solution.

2.19 PCCWG added that the CRV OG/9 meeting also needs to discuss if **the additional resources cost for interconnection** would be shared by all member States or by the Member State which would like to connect to REDDIG II nodes.

2.20 The meeting did not receive any immediate request and interest from Member States to connect to REDDIG II network. However, France informed that in future France is interested to interconnect with REDDIG II as well as with New PENS.

2.21 As the technical proposal for interconnection of CRV and REDDIG II is ready, it is required to think about the **way forward for the business case for the proposed interconnection** along with next course of action for PCCWG and Lumen for this interconnection requirements.

2.22 With aforementioned, the following potential business solutions are proposed by ICAO Secretariat for meeting consideration.

2.23 PCCWG and Lumen should prepare an **estimate for the infrastructure cost** for the interconnection. It is also required to provide **potential revised package/monthly recurring cost** for New Zealand and Chile by respective service provider assuming both will subscribe to the services and assuming that PCCWG and Lumen will revise charges in case both states wish to avail interregional connection services.

2.24 With information about **approximately infrastructure cost and revised recurring charges**, following options can be explored

Option -1

2.25 The infrastructure cost will be shared **equally** among PCCWG and Lumen. Based on the revised recurring charges and assuming no one time charges, both service providers would calculate and submit **payback period**. Based on payback period, the way forward with this option may be discussed.

Option -2

2.26 The infrastructure cost would be **shared** between **service providers and member states**. 60% of the cost would be shared by both service providers and 40 % of the cost would be shared by APAC and SAM Member States.

2.27 In this option, 40% of the cost may be shared by:

- All APAC and SAM States equally
- Only by BBIS States of both regions

- Only by future potential consumers of services from both regions
- By Volunteer Member States of both regions

2.28 Apart from member states who are immediately interested to join the interconnection services, the member who would contribute will get some concessional discount in future once the wish to avail interconnection services.

2.29 Other options for cost sharing may be discussed.

2.30 The meeting is invited to **create an ad-hoc group** to discuss potential options for business cases to move forward with the proposal. The ad-hoc group may be composed of volunteer member states from APAC and SAM region along with both service providers and ICAO Secretariat.

CRV and New PENS

2.31 The Third Meeting of the **European Aviation System Planning Group (EASPG)** took place in the ICAO EUR/NAT premises in a hybrid format from *30 November to 2 December 2021* adopted following conclusion:

EASPG Conclusion 3/15 – Coordination on the Interregional AFS Gateways

That, the ICAO Regional Director, Europe and North Atlantic, to initiate necessary interregional coordination with other Regions (i.e. APAC, SAM) **in order to support the AFS to SWIM Transition Task Force (AST TF) to**:

a) Develop proposals for the existing system to improve the interregional AFS Gateways (e.g. in terms of bandwidth, capabilities, etc.); and

b) Discuss and propose **on the methods for inter-connection of the Regional networks, with the involvement of appropriate responsible groups (i.e. PSB).**

2.32 In response ICAO APAC Office and ICAO EUR/NAT Office coordinated internally as well as with the service providers of regional network in respective region.

2.33 PCCWG, the CRV service provider, and British telecom, the New PENS service provider, had a discussion on **1 March 2022** on the matter. In the meeting, British telecom shared their interest to work on the regional interconnection with PCCWG. However, as the British telecom contracting party is EUROCONTROL, the need of initial discussion among British Telecom, EUROCONTROL and respective ANSPs to request for the intention of EUR/NAT ANSPs to connect to APAC Member States ANSPs were raised.

2.34 The internal meeting of British Telecom, EUROCONTROL and ANSPs was held recently. The meeting requested which states in APAC would connect to European countries now and in future and what will be financial model for the interconnection benefits.

2.35 The financial model being prepared for CRV-REDDIG II Interconnection may be utilized for CRV-New PENS interconnection with required modifications.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) provide need/willingness/interest to join other regional networks;

c) deliberate the way forward for the business case for the proposed interconnection between CRV and REDDIG II; and

d) discuss any relevant matter as appropriate;

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