



ICAO

International Civil Aviation Organization

**THE FIFTEENTH MEETING OF THE COMMON
AERONAUTICAL VIRTUAL PRIVATE
NETWORK OPERATIONS GROUP (CRV OG/15)**

Mumbai, India, 15-19 June 2026

Agenda Item 10: MPLS/IP based inter-regional connection

MPLS/IP BASED INTER-REGIONAL CONNECTION

(Presented by ICAO Secretariat)

SUMMARY

This paper provides an update on the discussion on the potential interconnection of CRV and REDDIG III, and CRV and New PENS. The paper recalled the past discussion, including the final technical proposal from 2022 for the interconnection of CRV and REDDIG II, along with various business models for the way forward, discussed in past ACSICG meetings. It also requests APAC member states to deliberate on the way forward for the interconnection of the CRV with other regional networks, such as REDDIG II / New PENS.

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 use the concept of convergence are 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 is a 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 the CRV for APAC/MID, the New Pan-European Network Service (New PENS) for EUR/NAT, and the SAM Region Digital Network (REDDIG III) for SAM. Currently, the communication services providers for these networks are PCCW Global (CRV), British Telecom (New PENS) and Cirium (REDDIG II) respectively.

1.3. The paper discusses the status of the discussion being held for the 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 of telecommunications. To enhance global connectivity among states from different regions, it was suggested that States connected to the CRV also connect to

other regional networks, such as REDDIG and New PENS.

2.2 There are potentially further benefits to implementing interconnections to regional networks, such as efficiency in the connection services, such as SWIM and 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 for enhancing air navigation capacity and efficiency.

CRV and REDDIG II Interconnection

2.3 There were communications requirements between Asia Pacific (APAC) ANSPs and South American (SAM) ANSPs. It was previously discussed that the regional IP networks' interconnection, CRV and REDDIG II, may serve as a potential solution to establish the AMHS P1 connection between AMHS COM Centers in Christchurch (New Zealand) and Santiago (Chile).

2.4 Noting these requirements, early discussion among regional network service providers for CRV and REDDIG II and the CRV OG was initiated. It was also important to discuss inter-regional network connectivity with the Data Communications Infrastructure Working Group of the Communications Panel to align the implementation of this concept with this working group's directions.

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 shared in 2021-2022.

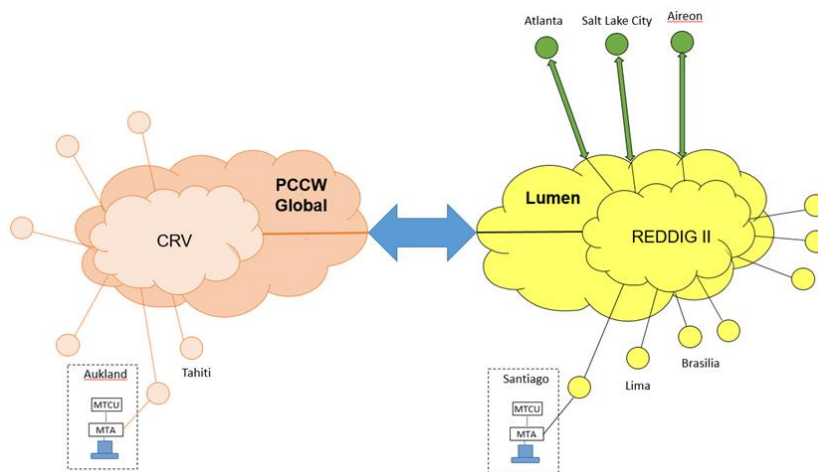


Figure 1 Basic communication requirement

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 II node in New Zealand: **Solution-1***

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

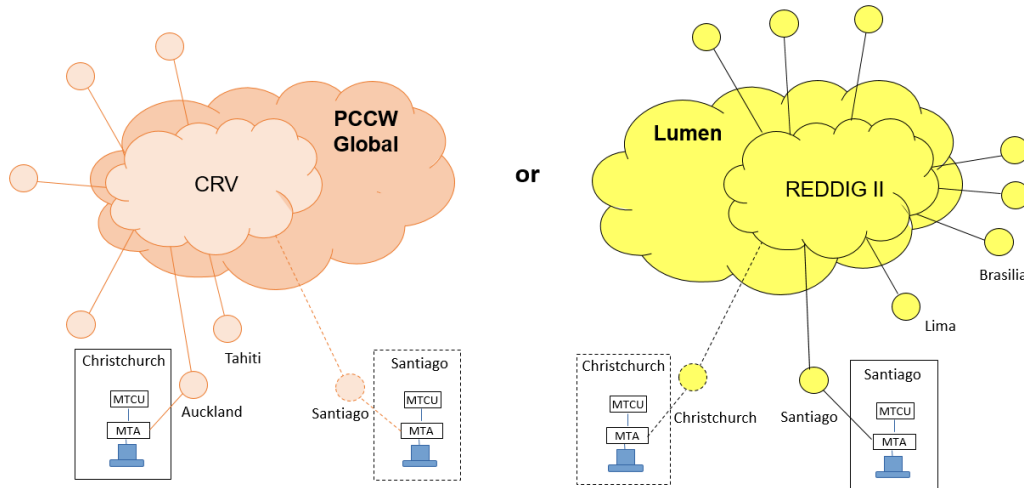


Figure 2 Installing a CRV node in Chile or a REDDIG II node in New Zealand

*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) deployed nodes of the two networks (CRV and REDDIG II). It can be configured to redirect packets from one network to another. **Figure 3** depicts this possibility.

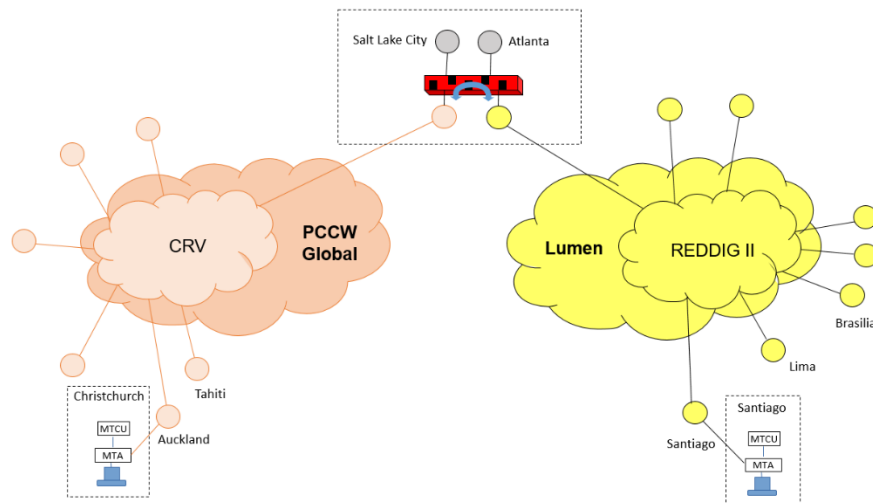


Figure 3- Using FAA nodes (CRV and REDDIG II) to redirect packets between the two networks

MPLS NNI between CRV and REDDIG II Service Providers- Solution-3

2.9 The Regional IP Networks interconnection by means of MPLS Network-to-Network Interface (NNI) was considered the most classical approach to adopt as a solution to interconnect CRV and REDDIG. **Figure 4** depicts this possibility.

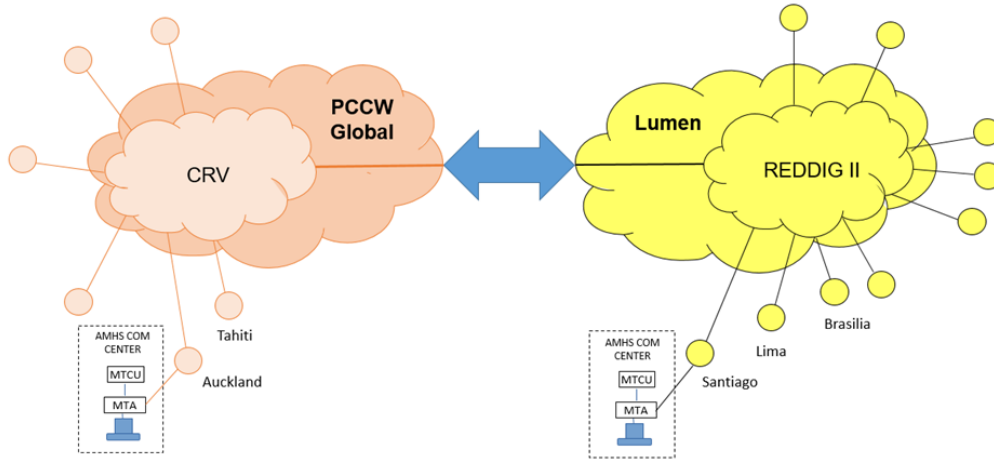


Figure 4 MPLS NNI between Lumen and PCCW Global connecting CRV and REDDIG II

2.10 After further discussion, the interesting 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 was done on **3 November 2021** by teleconference. A Lumen representative informed that the first agreed solution of implementing an MPLS NNI using the infrastructure of both CSPs in the United States resulted in 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.

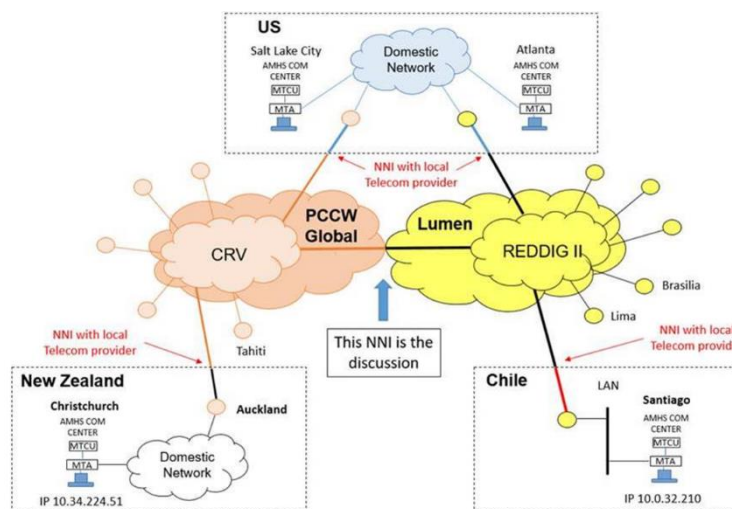


Figure 5 – First proposed solution

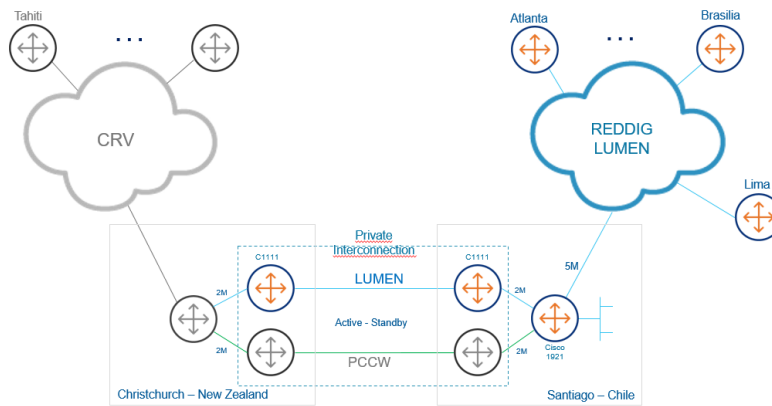


Figure 6 – Lumen’s proposal

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 advantage of the **co-located Data Centers** of both telecommunication providers.

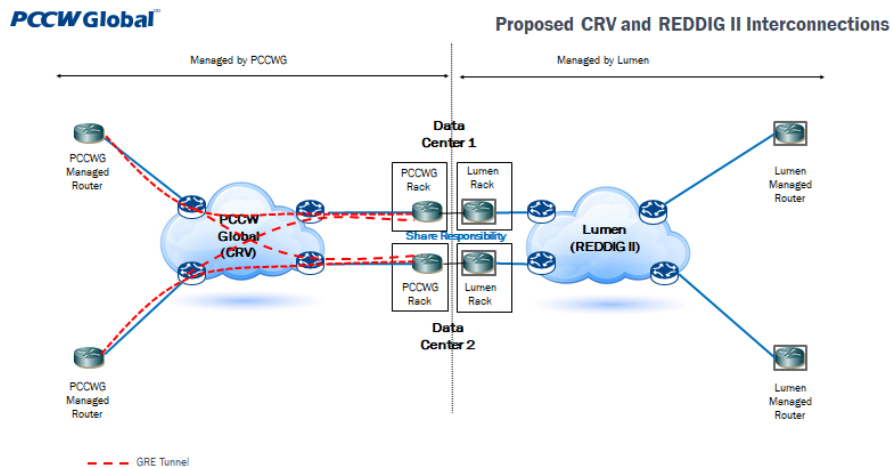


Figure 7 – PCCW Global’s proposal

2.14 This proposal allowed 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 present a document, not later than December 15th, 2021, for analysis 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 the 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 the Interconnection Link for CRV and REDDIG II will be connected between the PCCWG-provided router and the Lumen-provided router. This link will be shared responsibility between PCCWG and Lumen. In case of any fault issue, States in the CRV Network will report to PCCWG and States in the REDDIG II Network will report to Lumen, respectively. PCCWG invited the CRV OG/9 meeting to confirm which States will require communication between the CRV Network and REDDIG II Network to determine 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 cost for interconnection would be shared by all member States or by the member state that would like to connect to REDDIG II nodes.

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

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

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

2.23 ACISCG/9 Meeting shared that PCCWG and Lumen should prepare an estimate for the **infrastructure cost** for the interconnection. It was also required to provide **a potential revised package/monthly recurring cost for New Zealand and Chile by the 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**, the following options were proposed to explore further:

Option -1

2.25 The infrastructure cost will be shared **equally** between PCCWG and Lumen. Based on the revised recurring charges and assuming no one-time charges, both service providers would calculate and submit the **payback period**. Based on the 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**. For example, 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. However, it was just a proposal to discuss cost-sharing options.

2.27 It was added that in this option, 40% of the cost may be shared by:
– All APAC and SAM States equally

- Only by the 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 that are immediately interested in joining the interconnection services, the member who would contribute will get some concessional discount in the future once they wish to avail interconnection services.

2.29 Other options for cost sharing were invited to be discussed in the ACSICG/9 Meeting.

2.30 [The ACSICG/9 meeting](#) was invited to **create an ad-hoc group** to discuss potential options for business cases to move forward with the proposal. It was suggested that the ad-hoc group may be composed of volunteer member states from the APAC and SAM regions, along with both service providers and the ICAO Secretariat.

2.31 The ACSICG/9 meeting deliberated the necessity for forming an Ad-Hoc group and advised that all member states having interregional connections in the APAC region should be members of the Ad-Hoc group. However, other interested members were invited to the Ad-Hoc group as well. No other Member States than having interregional connections shared their interest in joining the group.

2.32 The ACSICG/9 meeting agreed to form an Ad-Hoc group comprised of APAC Member States having interregional connections, CRV OG Chairs, CRV and REDDIG II service providers, interested states of the SAM region, and the ICAO Secretariat under CRV OG. It was agreed that the ICAO Secretariat will coordinate with relevant APAC member states to nominate focal points for the Ad-Hoc group and coordinate with the ICAO SAM Office to get nominations from interested SAM member states for this task.

2.33 In the Twenty Eighth Meeting of the REDDIG II Coordination Committee (RCC/28) held in Lima, Peru from 2 to 4 May 2022, a representative of Lumen reported that they were going to propose to PCCW Global a **new, simpler interconnection scheme**, using a **Lumen data center in Santiago, Chile**, where PCCW Global uses infrastructure as a Lumen customer. According to the Lumen representative, the proposal was more economical and faster to implement, and would be discussed with PCCW Global representatives for approval and implementation.

2.34 The ICAO SAM Secretariat requested the representatives of Lumen to contact the representatives of PCCW Global as soon as possible to make possible the interconnection of the networks, informing the REDDIG Administration of the progress made.

2.35 As per the updates in 2023, Lumen LATAM (Latin America) was sold to **Cirion Technologies**. Therefore, the ICAO contract for the provision of the terrestrial segment of REDDIG II (MPLS) was with Cirion Technologies, which modified the solution within the new company's infrastructure.

Additionally, PCCW Global was a client of Cirion Technologies in Chile, which created the possibility of implementing an interconnection using existing infrastructure in Santiago. A proposal was presented by Cirion Technologies in September 2022 (**Appendix A**). Based on this approach, the ICAO SAM Secretariat requested that the proposal be further discussed with PCCW Global and formally presented to the RCC for consideration.

2.36 Following a preliminary technical review, it was observed that the proposed solution was based on a service provider extension model rather than a full MPLS Network-to-Network Interface (NNI) between CRV and REDDIG networks. While technically feasible from a connectivity standpoint, this approach did not fully correspond to the expected interconnection model in terms of end-to-end

service management, operational responsibility, resilience, and governance between regional networks. CRV and REDDIG experts continued to discuss various topics of common interest, including the interconnection of CRV and REDDIG, and took the example of REDDIG governance in improving CRV governance.

2.37 In addition, REDDIG operates under a centralized governance framework through the REDDIG Coordination Committee (RCC) and the ICAO Technical Cooperation Project RLA/03/901. Therefore, any interconnection with external networks requires formal agreement by participating States, as well as alignment with network management, security policies, and service level requirements.

2.38 Meanwhile, the preparation of the REDDIG III RFP (Request for Proposals) started around 2023, with initial technical discussions beginning regarding the future evolution and replacement of REDDIG II services. A dedicated technical team was established to support this process. This team was formed as an Ad-hoc Group composed of specialists nominated by the participating States, who contributed their expertise to the preparation and review of the technical requirements of the RFP. Considering these aspects, and noting that the REDDIG III procurement process had already been initiated, it was agreed that further progress on the interconnection should be deferred until the future network architecture, service provider, and technical framework were clearly defined.

2.39 As a result, no implementation action was pursued at that stage, and the matter remained under consideration pending the outcome of the REDDIG III procurement process and further interregional coordination.

2.40 Due to the RFP process, the discussion on the interconnection of CRV and REDDIG was kept on hold until the information about the new service provider of REDDIG III was available.

2.41 ICAO APAC Office and ICAO SAM Office have initiated further discussions on this topic. It is expected to conduct a joint workshop for CRV and REDDIG experts in Q4 of 2026, if funding is received, to discuss the way forward for the interconnection of both networks and to further work on CRV governance.

2.42 Therefore, while previous technical proposals have been developed and reviewed, there is currently no agreed or validated technical solution for the interconnection of CRV and REDDIG III. Further progress is expected once the REDDIG III service provider is established and the corresponding technical and governance framework is defined. This situation has directly influenced the timing of interconnection discussions, as any future implementation must be aligned with the architecture, contractual framework, and operational model of REDDIG III.

CRV and New PENS

2.43 The ACSICG/9 Meeting noted that 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, and adopted the 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 the methods for interconnection of the regional networks, with the involvement of appropriate responsible groups (i.e., PSB).

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

2.45 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 its interest in working on the regional interconnection with PCCWG. However, as the British telecom contracting party is EUROCONTROL, the need for an initial discussion among British Telecom, EUROCONTROL and the respective ANSPs to determine the intentions of EUR/NAT ANSPs to connect to APAC Member States ANSPs was raised.

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

2.47 It was recommended by the ACSICG/9 meeting that the financial model being prepared for CRV-REDDIG II Interconnection may be utilized for CRV-New PENS interconnection with required modifications.

2.48 In 2023, the ICAO EUR/NAT Office initiated coordination with AST TF PG, ICAO HQ, APAC and SAM at the level of **the Communication Panel (CP) – WG-I**. The WG-I agreed to hold a brainstorming session involving ICAO HQ, APAC, EUR/NAT and SAM to explore possible ways forward.

2.49 The AST TF meeting was presented with the recent exchange of IWXXM data between the EUR/NAT and APAC Regions. The meeting noted that **the UK and Singapore**, as Interregional AFS Gateways and Interregional OPMET Gateways between EUR/NAT and APAC, had the requirement to exchange IWXXM on an interregional level since IWXXM became an ICAO standard in November 2020. It was noted that the United Kingdom, in conjunction with Singapore, established an IWXXM exchange between the EUR/NAT and APAC. To maintain the flow of IWXXM traffic, an alternate path capable of transferring FTBP was required. The introduction of the operational AMHS connection between LIII and VTBB in Q1 provided this FTBP with a capable alternate path and procedures were agreed with LSSS, LIII, VTBB and WSSS COM Centers.

2.50 The AST TF meeting acknowledged that the connection established with APAC was an important step to improve the interregional exchange of IWXXM information in line with the EASPG Conclusion 3/15. However, connections with other neighboring Regions (NACC, SAM and AFI) would be needed. The meeting noted that the UK was in the planning phase of IWXXM exchange with NACC and SAM Regions.

2.51 The AST TF meeting adopted the following **Conclusion: AST TF 03/02 - *Coordination on Interregional AFS Gateways***

That, a) the Operations Group (OG) is tasked to:

- monitor implementation of improvements to the existing system of Interregional AFS Gateways and propose further improvements; and
- review the EUR AMRD and prepare proposal for amendment, as needed, with regard to the current interregional connections.

b) **the Planning Group (PG)** is tasked to:

- with the support of the ICAO EUR/NAT Office, **follow-up on the actions on the EASPG Conclusion 3/15, part b)**; and

- in coordination with the OG, discuss in the longer term how Com Centers should exchange with and connect to the Com Centers in other Regions, under the prism of interconnecting the regional IP networks

2.52 The Sixth Meeting of the AFS to SWIM Transition Task Force (AST TF/06) was held in the ICAO EUR/NAT Office in Paris, France, from 5 to 7 May 2025. The meeting discussed follow-up on **EASPG Conclusion 3/15 – Coordination on the Interregional AFS Gateways**. It was recalled that some initial actions were taken in response to the EASPG Conclusion 3/15, however, this action could not be completed at the time.

2.53 Eurocontrol stated that their position is like before. **The role and responsibilities of the interregional AFS coordination team must first be defined**, and then Eurocontrol will decide accordingly. The meeting agreed that the OG would define the terms of reference for the interregional AFS coordination team before establishing it. The interregional AFS coordination team should be composed of the Interregional Gateways Representatives of EUR/NAT and other ICAO Regions, including Canada and the United States, COM Centres connected to SITA, the EUR AMC Operator and the AMC Product Manager, ICAO Regional Offices (other COM Centres as designated by the ICAO Regional Offices).

2.54 The AST TF/06 meeting noted that, as one of the actions under the interregional AFS coordination, the relevant States (Interregional AFS Gateways) from other Regions may be invited to the next AST TF meeting in order to discuss several issues observed in the interregional connectivity.

2.55 The Seventh Meeting of the EUR AFS to SWIM Transition Task Force (AST TF/07) was held from 21 to 24 April 2026. The Meeting reviewed the draft Terms of Reference (ToR) for an interregional AFS gateway team. The key contents of ToR address operational problems in the AFS network, including routing loops, asymmetric routing, address inconsistencies, message loss and coordination difficulties with COM Centres outside the EUR/NAT Regions. In addition, the meeting received a proposal to establish a list of Regional AMC focal points to improve coordination and address AMC issues worldwide. Both proposals were submitted to the parent group of the AST TF (EASPG PCG) for discussion and decision. Once the proposals are approved, the ICAO EUR/NAT Office will contact other ICAO Regional Offices regarding them.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) discuss the cost-sharing model and business case of the interconnection of CRV with other regional networks;
- c) deliberate on the way forward for the interconnection between CRV and REDDIG III and CRV and New PENS, taking into account technical feasibility, governance frameworks, cost-sharing models, and alignment with ongoing regional network modernization processes;
- d) discuss any relevant matter as appropriate;



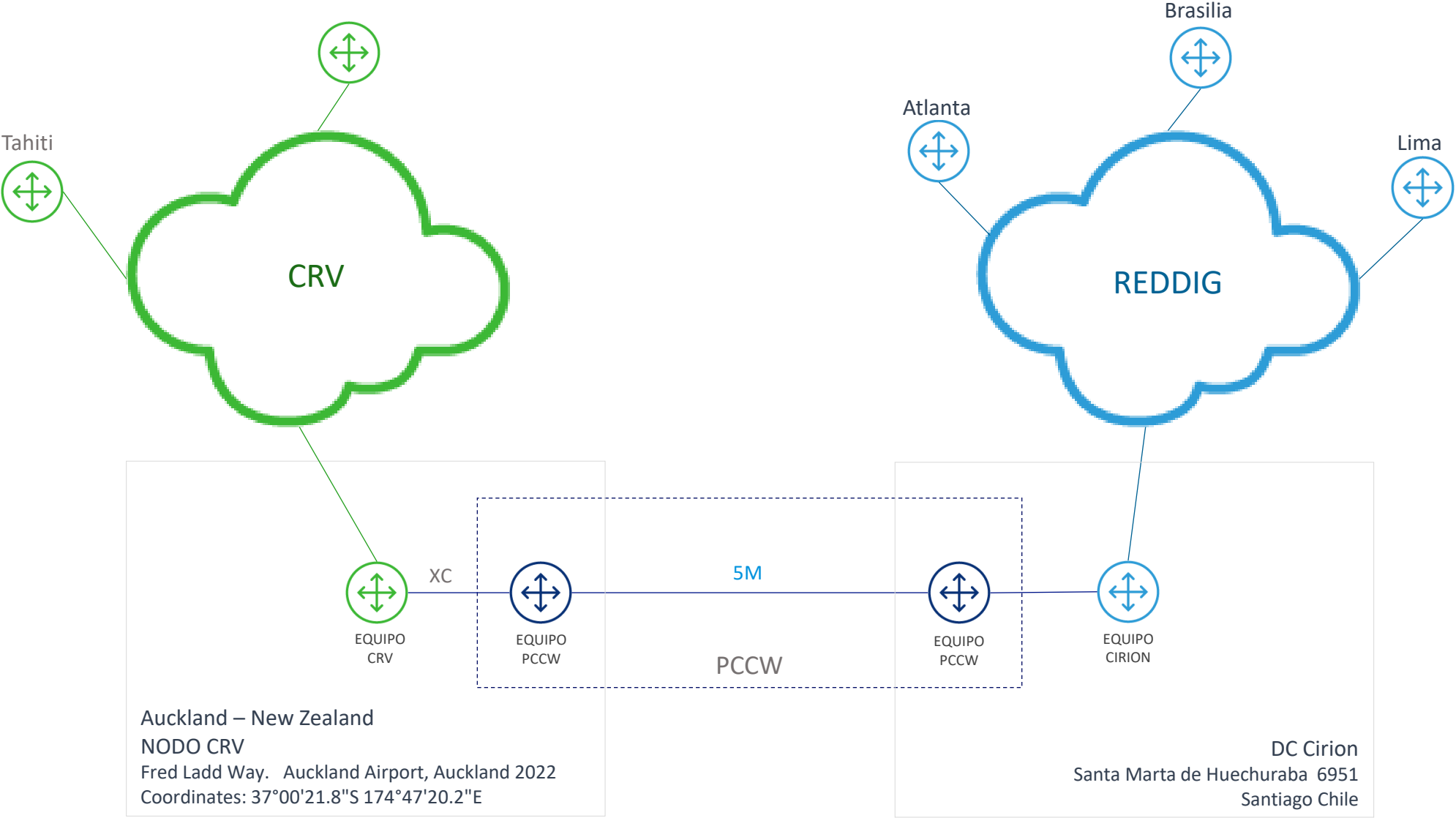
Conexión MPLS a New Zealand

CRV

Propuesta Técnica

- CRV requiere conectarse a la red de ICAO (REDDIG), desde nueva Zelanda.
- Para esto se implementará un enlace desde Auckland – Nueva Zelanda (Nodo CRV) hasta el DataCenter de Cirion en Chile a través de PCCW.
- CRV se interconectará en su nodo en Auckland con PCCW. CRV debe proporcionar espacio y energía para los equipos de PCCW.
- PCCW tiene presencia dentro del Data Center de Cirion en Chile y aquí se interconectará con la red de ICAO (REDDIG)

Topología de Red



Propuesta Económica 1

Sede	Dirección	Servicio	Ancho de Banda	Contrato por 12 meses
Chile	Santa Marta de Huechuraba 6951, Santiago/Chile	VPN	5 Mbps	Abono Mensual: USD 1,900
New Zealand	Fred Ladd Way. Auckland Airport, Auckland 2022. Coordinates: 37°00'21.8"S 174°47'20.2"E	VPN	5 Mbps	Costo de Instalación: USD 1,000

Consideraciones:

- Precios expresados en dólares y no incluyen impuestos.
- No incluye crossconexión o derechos de paso en el lado de New Zealand.
- Incluye crossconexión en el lado de Chile
- Sujeto a factibilidad.

Propuesta Económica 2

Sede	Dirección	Servicio	Ancho de Banda	Contrato por 12 meses
Chile	Santa Marta de Huechuraba 6951, Santiago/Chile	VPN	10 Mbps	Abono Mensual: USD 3,280
New Zealand	Fred Ladd Way. Auckland Airport, Auckland 2022. Coordinates: 37°00'21.8"S 174°47'20.2"E	VPN	10 Mbps	Costo de Instalación: USD 1,000

Consideraciones:

- Precios expresados en dólares y no incluyen impuestos.
- No incluye crossconexión o derechos de paso en el lado de New Zealand.
- Incluye crossconexión en el lado de Chile
- Sujeto a factibilidad.

Thank you!

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