INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT OF

THIRTEENTH MEETING OF THE COMMON AERONAUTICAL VIRTUAL PRIVATE NETWORK OPERATIONS GROUP (CRV OG/13)

Wellington, New Zealand
(5-8 March 2025)

The views expressed in this Report should be taken as those of the Meeting and not the Organization.

Approved by the Meeting and published by the ICAO Asia and Pacific Office, Bangkok

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SUMMARY OF DISCUSSIONS

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1. Introduction

1.1 The Thirteenth Meeting of the Common aeRonautical Virtual Private Network Operations Group of APANPIRG (CRV OG/13) was held *from 5 to 8 March 2025* in Wellington, New Zealand.

2. Attendance

2.1 The Meeting was attended by **59** participants from **24** Member States/Administrations, **2** International Organizations and **1** telecommunication provider, namely Australia, China, Hong Kong China, Macao China, Cook Islands, Fiji, French Polynesia, India, Indonesia, Japan, Kiribati, Malaysia, New Zealand, Pakistan, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Island, Sri Lanka, Thailand, Tonga, USA, Vanuatu, ICAO, AIREON and PCCW Global. The list of participants is provided in **Attachment 1**.

3. Opening of the Meeting

3.1 The Meeting was opened by Mr. Vaughan Hickford, Manager Enterprise Architecture and Network, Airways New Zealand, CRV OG Co-Chair (Asia) and Mr. Kelepi Dainaki, General Manager Assets & Infrastructure, Fiji Airport Limited, CRV OG Co-Chair (Pacific). Mr. Vaughan Hickford welcomed all participants and recalled the achievements made in past CRV OG Meetings and the main tasks that need to be dealt with by the CRV OG/13. He reminded CRV of the importance of facilitating AMHS and other ground-to-ground communication for safe flight operations and acknowledged that 25 APAC States had joined CRV. Mr. Kelepi Dainaki also extended a warm welcome to all participants and expressed deep appreciation and gratitude for the efforts of all parties for the great achievements made in the progress of CRV implementation.

3.2 Dr. Soniya Nibhani, Regional Officer, ANS (CNS) Implementation, highlighted the value of CRV implementation in the region and its role in SWIM Implementation. She extended a warm welcome to all participants and expressed deep appreciation and gratitude for the efforts of Co-Chairs and all parties in supporting the setting up of this CRV OG/13 Meeting.

4. Officers and Secretariat

4.1 Mr. Vaughan Hickford, Manager Enterprise Architecture & Networks, Airways New Zealand, and Mr. Kelepi Dainaki, General Manager, Asset and Infrastructure, Fiji Airport Limited, Co-Chair (Pacific), co-chaired the Meeting.

4.2 Dr. Soniya Nibhani, Regional Officer ANS (CNS) Implementation, acted as the Secretary of the Meeting with the support of Ms. Xu Jian, Associate Programme Officer (CNS) Implementation and Ms. Varapan Meefuengsart, the Programme Assistant from ICAO Asia and Pacific Regional Office.

5. Organization, Working Arrangements and Language

5.1 The CRV OG/13 met as a single body during the Meeting. The working language for the Meeting was English, and it included all documentation and this report. The Meeting considered **Thirty-seven (37)** Working Papers, **Four (4)** Information Papers, and **Five (5)** Presentations under its fifteen agenda items. A List of Working Papers, Information Papers, and other resources is provided in **Attachment 2**.

6. Conclusions/Decisions - Definition

6.1 The CRV OG of APANPIRG records its actions in the form of Draft Conclusions, Draft Decisions, and Decisions with the following significance:

a) **Draft Conclusions** deal with matters which, in accordance with the Sub-Group's Terms of Reference, require the attention of States/Organization or actions by ICAO in accordance with established procedures;

b) **Draft Decisions** relate solely to matters dealing with the internal working arrangements of APANPIRG and its contributory bodies; and

c) **Decisions** relate solely to matters dealing with the internal working arrangement of the CRV OG.

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Agenda Item 1: Adoption of Agenda

Adoption of Agenda - Sec (WP/01)

1.1 The tentative agenda items presented in WP/01 were adopted as the agenda for the Meeting.

Agenda Item 2: Election of Co-Chair

2.1 Singapore shared the list of achievements that have been made by CRV OG under the leadership of Mr. Vaughan Hickford, Manager Enterprise Architecture & Networks, Airways New Zealand, in the last four years and nominated Mr. Vaughan Hickford as a candidate for CRV OG Co-Chair (Asia). The proposed nomination was seconded by Fiji, Hong Kong China and USA. No other nomination was proposed by any other member state for Meeting consideration. With the aforementioned, Mr. Vaughan Hickford was unanimously re-elected as the CRV OG Co-Chair (Asia).

2.2 Mr. Vaughan Hickford shared his appreciation to the Meeting for proposing and supporting his nomination. He recalled working on the CRV network from its inception till its implementation for more than a decade and relationships built over several years with all CRV OG members.

Agenda Item 3: Review outcomes of relevant Meetings

Review of Relevant Meetings - Sec (WP/02)

3.1 The paper summarized relevant information and updates with the highlight on the reviewed outcomes of the CRV OG/12, ACSICG/11, SWIM TF/8, SWIM TF/9, SURSG/4, and relevant discussions of other Meetings, including the CNS SG/28 and the APANPIRG/35.

3.2 The Meeting noted that the CNS SG/28 Meeting adopted **Four (4)** Conclusions and **Two (2)** Decisions. In addition, based on the outcome of discussions on various agenda items, the CNS SG/28 Meeting developed **Four (4)** Draft Conclusions and **One (1)** Draft Decision for consideration by the APANPIRG/35, which was adopted by the APANPIRG/35 Meeting. The Meeting noted the Conclusions/Decisions adopted by the CNS SG/28 and the APANPIRG/35 and discussed the follow-up.

3.3 Singapore requested the ICAO Secretariat to prepare a list of regional IP networks in various ICAO regions, their service provider, and contract duration for working on harmonizing these dates in the future so that interconnection of regional networks can be planned strategically. The ICAO Secretariat prepared the following list in coordination with other regional offices:

SN	Region	Regional IP Network name	Service Provider	Contract start year	Contract end year
1.	APAC	CRV	PCCW Global	2017	2028
2.	MID	In process	NA	NA	NA
3.	WACAF/ESAF	No dedicated IP network AFISNET NAFISAT	 ASECNA ATNS and IATA	NA	NA

		SADC networks	ATNS and IATA		
4.	SAM	REDDIG II	Cirion/Intelsat	2015	2025
5.	NACC	MEVA III	FREQUENTIS AG	2015	March 2026
		CARSNET	Contract process ongoing	2026	2036
6.	EUR/NAT	New PENS	British Telecom	2018	2028

3.4 Some details of AFI networks were as follows:

1. **AFISNET**: The AFI Satellite Telecommunications Network covers Central and Western African States as well as Southern African and Indian Ocean States (ASECNA Member States).
2. **SADC VSAT/2**: A network launched by the Southern African Development Community (SADC) States in 2008.
3. **NAFISAT**: A network designed for the North-Eastern African States.
4. **CAFSAT:** The Central Atlantic FIRs Satellite Telecommunications Network, which involves African, European, and South American States

Note: AFISNET, SADC VSAT/2 and NAFISAT are capable of IP technology. Upgrades are still undergoing for CAFSAT for the integration of IP-based services.

3.5 CARSNET is the Caribbean Air Navigation Services Network, which is the replacement contract for MEVA. CARSNET will be a combination of dual networks, a primary one MPLS and a satellite network as a backup.

Outcomes of ICAO APAC-MID CRV Workshop – Sec (WP/03)

3.6 The paper presented the key outcomes of the ICAO APAC-MID CRV Workshop held in Jeddah, Saudi Arabia, from 20-23 October 2024. The Workshop noted the benefits of implementing an IP Network for voice and Data, recalled past ICAO MID Meetings and related decisions relevant to CRV implementation and discussed the roadblocks for CRV implementation efforts from MID States from 2017-2019. It was noted that price was one of the critical factors in the decision-making process. ICAO Secretariat shared various reasons for initiating another effort to motivate MID States to join CRV and explained potential reasons for MID States to consider joining CRV along with associated benefits.

3.7 PCCWG shared information about the company and CRV network along with a description of each Package available in the CRV contract. PCCWG explained technical solutions for MID States for CRV implementation and a price summary for various packages compared to the price quoted in 2018. Lastly, PCCWG presented a special promotion offer for MID States to join CRV for Package D and Package D+.

3.8 In response to a question about cyber security provisions in CRV, it was stated that the security of the CRV network is the responsibility of the States contracting CRV along with the CRV service provider. PCCWG shared the concept of GRE tunneling utilized in CRV to make it a secure network and added that CRV is a Closed private network that is unreachable & invisible from the Internet. The Meeting noted that PCCWG is certified by ISO 27001: Information Security Management. ICAO Secretariat shared information about previous discussions in CRV OG Meetings to mandate the firewall, conduct cyber security assessments, and request that CRV users define minimum security requirements to comply with CRV users. The ICAO Secretariat informed that CRV OG is waiting for

global provisions to be published by the Trust Framework Panel. Once the global provisions are published, all regional communication service providers and States will be obliged to implement them in the regional network implementation.

3.9 The Meeting noted that the CRV contract mandates States to join CRV for an initial term of a minimum of 5 years. However, as the current CRV contract is expiring on 31 December 2028, a special exception has been provided to MID States in the offer presented by PCCWG. The Meeting noted that the presented price includes the rental price of a minimum number of NIDs required to support the selected packages and preventive and corrective maintenance costs.

3.10 Most MID States shared their interest in Package A and requested a promotional offer from PCCWG for Package A. It was agreed that MID States would initiate individual contact with PCCWG and discuss a way forward and further negotiation if required. Once MID States decide on further plans and decisions to implement CRV, they can coordinate with the CNS section of the ICAO MID office for additional support and updates as required. The ICAO APAC Office will coordinate with the ICAO MID Office in a timely manner to share updates on the decision of MID States.

3.11 Pakistan shared its firm intention and need to connect with the MID States on CRV. It informed that if Iran and Oman joined CRV, the interregional connection between Pakistan and these states would improve reliability, resulting in enhanced safety and efficiency. Pakistan also shared the importance of Afghanistan joining the CRV network and shared its willingness and support in coordinating with MID States if it can support these States in CRV implementation.

3.12 India supported Pakistan’s position and informed that India is also connected to Oman. If Oman joins CRV, it will be beneficial for India as well as for Oman.

3.13 It was informed that Oman had initiated contact with PCCW Global. PCCW Global has clarified all doubts and responded to all questions Oman has requested. Currently, PCCW Global is waiting for a further response from Oman. The Meeting discussed the way forward for the next action from CRV OG, which can motivate MID States to implement CRV. It was suggested that Pakistan and India connect with their interconnected MID States point of contact to initiate a conversation on this matter. In case of need, CRV OG Co-Chairs and ICAO Secretariat can support further engagement and dialogue through online Meetings. Pakistan agreed to take the lead on this task. Pakistan will coordinate with Oman focal points on communication matters and initiate discussion on implementing CRV in Oman and providing necessary support if required. **ACTION ITEM 13-1**

3.14 The Meeting suggested that India and Pakistan share letters from their higher authorities to motivate Oman's higher authorities to join CRV. It was suggested that in the letter, both states share their experience of successful CRV implementation and the benefits to both States to encourage Oman to progress on this task.

3.15 It was also suggested that a group similar to the CRV Task Force could be formed in the MID region, which was formed in the APAC region, to study the CRV network, its benefits, and the implementation plan. CRV OG Co-Chair (Asia) informed that the initiative of formulation of CRV TF in the MID region was proposed in 2019 by the Regional Officer CNS in the MID Region. In addition, in the past, CRV Meetings were organized in Egypt to discuss this matter. However, the matter did not progress further.

3.16 China informed that it is planning for an AMHS connection with Kuwait and requested point of contact information on this matter. ICAO Secretariat will share information about the focal point from Kuwait with China. **ACTION ITEM 13-2**

Outcomes of SIPG WS/1 - Sec (WP/04)

3.17 The Meeting reviewed the outcomes of the First Working Session of the SWIM Implementation Pioneer Ad-Hoc Group (SIPG WS/1) held **from 14 to 17 January 2025** in the ICAO Asia Pacific Regional Office, Bangkok, Thailand. The session was attended by **51** Participants from **13** States/Administrations and **2** International Organizations. The Working Session report and presentations can be accessed at:
https://www/icao.int/APAC/Meetings/Pages/2025-SWIM-SIPG-Working-Session.aspx.

3.18 A total of **13 action items** were raised during the discussions. These items include proposals for implementing Public Key Infrastructure (PKI), exploration of self-signed certificates, and SWIM architecture implementing various aspects of SWIM traffic and transition plans, etc.

3.19 The Meeting noted that for *Action WS-1-3: Singapore to prepare a paper for the CRV OG/13 to inform the CRV OG of the ACCP document and the SWIM TF's need for PKI*, WP/27 is presented by Singapore in the Meeting.

3.20 The Meeting shared the concern of routing to be done by EMS in the proposed SWIM architecture. It was agreed that such architecture would not meet the purpose of SWIM implementation as routing will need to be done at the EMS/application level, which is not recommended.

3.21 For the three possible options to establish the APAC regional SWIM over CRV and the Internet, the Meeting deliberated the proposal mentioned in the SIPG WS/1 report from sections 3.12 to 3.13. The Meeting shared that a third proposed option is not possible, so it cannot be considered. In addition, it was informed that the two proposed options have flaws as there are misunderstandings about how SWIM EMS will be connected over CRV and the internet. It was agreed that there is a need for further discussion among CRV and SWIM experts to clarify the shortcomings of proposed options and make SWIM experts understand the integration of SWIM with CRV. This matter will be further discussed in CRV OG Ad-hoc Experts and SWIM TF Task Leads Online Meeting on 13 March 2025. If required, an in-person Meeting of SWIM and CRV experts will be arranged to finalize ICAO APAC SWIM architecture. **ACTION ITEM 13-3**

Agenda Item 4: CRV OG Reference documents

Outcomes of CRV Ad-hoc Experts Group Meetings - New Zealand (WP/05)

4.1 The paper summarized the outcomes of the CRV OG Ad-Hoc Expert Group discussions. The Meeting noted three Ad-hoc virtual Meetings were held between CRV OG/12 and CRV OG/13 via Microsoft TEAMS. In addition, the ad-hoc group met with SWIM TF TLs quarterly. It was informed that the outcomes of Joint CRV OG Ad-hoc Expert and SWIM TF TLs Meetings, CRV OG Ad-hoc Governance Group, and other significant outcomes are being discussed by various papers in this Meeting. The Meeting noted the work of the Ad Hoc Expert Group continues to be extremely valuable, appreciated the ongoing contribution, and invited participation to the Ad-hoc group Meetings.

SN	Expert Group Name	Volunteered Member	Group leader
1	Service Strategy	Singapore, USA, India	New Zealand/Fiji
2	Service Design	Singapore, USA, Hong Kong China	New Zealand/Fiji
3	Service Transition	China, Singapore	New Zealand/Fiji
4	Service Operations	Australia, China, Singapore, India	New Zealand/Fiji

4.2 Singapore shared that in the CRV OG/08 Meeting in 2021, four expert groups within CRV OG along the lines of Strategy, Design, Transition and Operations were formed with the following details:

4.3 However, the four groups were working as a single group due to a limited number of members and contributions from APAC States/Administrations. In addition, joint Meetings of CRV OG Ad-hoc Group and SWIM experts are being conducted quarterly along with CRV OG Ad-hoc Governance Group. It was suggested that some of these Meetings could be merged together to save time for common members. The Meeting agreed that due to the different types of discussion involved, joint Meetings of CRV and SWIM experts will continue to be organized separately. However, CRV governance can be added to the agenda items of the CRV ad-hoc expert group. ICAO Secretariat will take necessary action to follow revised working arrangements. **ACTION ITEM 13-4**

Outcomes of Joint CRV OG Ad-hoc Expert and SWIM TF TLs Meetings - New Zealand (WP/06)

4.4 The paper presented an update on the Meetings between the CRV OG Experts and the SWIM Taskforce Team Leads. The joint CRV OG experts and SWIM TF TLs Meetings occurred three times in 2024, on 7 March, 12 June, and 12 November 2024 via TEAMs. The outcomes of the discussions regarding the SWIM principally over CRV, new CRV specifications accommodating SWIM needs, PCCWG Console Connect Aviation Platform, support of CRV OG for SIPG work, and CRV Governance were introduced. The Meeting requested more States/Administrations to contribute to the CRV OG Ad-hoc Governance/Experts Group.

Proposed SOP for Dispute Resolution on CRV Matters – Fiji (WP/07)

4.5 Fiji presented the Proposed Standard Operating Procedure (SOP) for Dispute Resolution on CRV Matters to be adopted in the CRV Operations Manual. It was recalled that in the CRV OG/11 Meeting, Nepal suggested incorporating relevant guidance in the form of Process and Procedures into the CRV OG OM, clarifying that Member States can request support from the ICAO Secretariat and CRV OG for dispute resolution matters or other significant issues if arises. It was agreed in that Meeting that the CRV OG Ad-hoc Expert Group would discuss the possibility of adding such provisions and draft relevant clauses to add in CRV OG OM, resulting in ACTION ITEM 11-3.

4.6 Fiji was tasked to develop the SOP for dispute resolution as guidelines for Member States to request support from the ICAO Secretariat and CRV OG for dispute resolution matters or other significant issues if they arise. It was reiterated that this dispute resolution is separate from the service agreement contract that States signed with PCCWG, the CRV service provider. The draft SOP formulated by Fiji with the support of its legal team was further reviewed, modified, and endorsed in the CRV OG Ad-hoc Expert Group and presented in the CRV OG/13 for adoption in the CRV Operations Manual.

4.7 The CRV OG/13 Meeting reviewed and modified the proposed SOP for dispute resolution on CRV matters, and the final SOP was endorsed by the Meeting by the following decision. It was informed that SOP has been incorporated in CRV OG Operations Manual v1.4, adopted by CRV OG/13 by Decision CRV OG/13/02.

Conclusion CRV OG/13/01- Standard Operating Procedures (SOP) for Dispute Resolution on CRV Matters	
What: The proposed Standard Operating Procedures (SOP) in **Appendix A** for Dispute Resolution on CRV Matters in the CRV Operations Manual be adopted.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental

		☒ Ops/Technical
Why: To guide States on any dispute resolutions on CRV matters.	Follow-up:	☐Required from States
When: 8-Mar-25	Status:	Adopted by CRV OG
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other: CRV OG		

Criteria to add a new service in the Operations Manual – New Zealand (WP/08)

4.8 The paper presented a procedure to connect **a non-ANSP system** to the CRV for data communication. It was recalled that the CRV OG/12 Meeting shared the need to develop a procedure to support a generic new non-ANSP system connection to the CRV in addition to the existing AMHS and VoIP services. It was informed that any new non-ANSP system connecting to the CRV should provide information in direct support of air traffic movements managed by ANSPs. In addition, any proposed non-ANSP system user should be sponsored by an existing CRV member, who will be the first customer to receive the non-ANSP system's services. It was informed that the role of the CRV OG should be to review the new service(s) being provided as a suitable use of the CRV, specifically including an evaluation of the cyber-security risk posed by the new system connection. If the review of the new system is satisfactory, the CRV-OG should establish an MOU/LOA with the new non-ANSP system, with the sponsoring ANSP being the first user. Subsequent ANSP users will be additional signees to this MOU/LOA.

4.9 The proposed procedure was summarized as follows:

a) Develop a security assessment of the new non-ANSP system.
b) Determine if alternative routing or diversity is required.
c) Determine the criteria for alternative routing and diversity (application versus network).
d) Coordinate with respective CRV members to ensure bandwidth sufficiency if alternative routing or diversity is required.
e) Sponsoring ANSP is required to establish a GRE tunnel with the new non-ANSP system.
f) Update GRE tunnels for the respective users if alternative routing is required.
g) Increase the sponsoring ANSP's access bandwidth, as required (peak and off-peak times): coordinate requirements from the new non-ANSP system.
h) Determine the new system IP address, either from the system owner or by using the private IPv4 addresses that have been assigned by ICAO for the region.
i) Provide the CRV vendor with each user's new system IP address subnet(s) to be advertised through the GRE tunnel.
j) Perform an operational acceptance test between sponsoring ANSP with the sponsored new data system, which should include, but not be limited to, a ping test, application (the new non-ANSP system) test, and bandwidth test, including other GRE tunnels if required.
k) The sponsoring ASNP is responsible for accepting the new service if it has performed satisfactorily for a minimum of 24 hours.
l) The CRV vendor should update the respective SEPs.
m) Inform ICAO, CRV OG, and respective ICAO groups of new routing to be recorded in various documents (e.g., Telecommunication Infrastructure Routing, etc.)

4.10 It was recommended that this proposed procedure be incorporated into the CRV OG Operations Manual if accepted at this Meeting. It was also recommended that when a new data system joins the CRV, an Interface Control Document be developed by the new non-ANSP system with input from CRV OG experts to support the sections' requirements.

4.11 The Meeting noted that CRV OG will allocate the IP address to the new non-ANSP from the dedicated address block for other service providers.

4.12 The Meeting deliberated the proposed procedure and adopted it to incorporate it into the CRV OG Operations Manual. The procedure is incorporated in CRV OG Operations Manual v1.4, adopted by CRV OG/13 by Decision CRV OG/13/02.

4.13 In response to drafting the procedure for adding SWIM services over CRV, it was informed that the procedure could be defined once the APAC SWIM architecture is finalized and other details required for SWIM implementation are available. The ICAO Secretariat will share this information with SWIM experts. **ACTION ITEM 13-5**

CRV OG Operations Manual Status - New Zealand (WP/09)

4.14 New Zealand presented the status of the CRV OG Operations Manual. The Meeting noted that since the publication of the CRV OG Operations Manual in April 2022, there have been many updates, mostly from discussions from the various Ad Hoc groups. The Meeting was informed that the current DRAFT version of the Operations Manual is ready for publication with various modifications, which were presented at the Meeting. It was announced that the latest version of the CRV OG Operational Manual will be published on ICAO APAC e-docs under CNS, ICAO APAC CRV Secure portal, and on the CRV portal hosted by Airways New Zealand. The Meeting reviewed the draft CRV OG Operations Manual and adopted the following Decision:

<table>
<tr><td colspan="3">Decision CRV OG/13/02 - Publish the updated APAC CRV Operations Manual</td></tr>
<tr><td colspan="2">What: The APAC CRV Operations Manual provided in Appendix B is ready for publication as CRV OG OM v1.4 following updates from the Ad Hoc groups.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: Ongoing improvements to the documentation supporting the APAC CRV network</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 8-Mar-25</td><td colspan="2">Status: Adopted by CRV OG</td></tr>
<tr><td colspan="3">Who: ☐Sub groups ☐APAC States ☐ICAO APAC RO ☐ICAO HQ ☒Other: CRV OG</td></tr>
</table>

Update to the CRV Implementation Plan - Singapore (WP/10)

4.15 Singapore presented the proposed updates, editorial changes, and formatting adjustments to the CRV Implementation Plan. The Meeting was informed that the CRV OG/12 Meeting tasked the CRV Ad-hoc Expert group to update the CRV Implementation Plan to refine the roles of the National and Local CRV Points of Contact (i.e., CRV User – State/Administration). The proposed updates to the CRV Implementation Plan, including editorial changes and formatting adjustments, were shared with the Meeting.

4.16 The Meeting reviewed the proposed updates and agreed to adopt the following Decision.

<table>
<tr><td colspan="2">Decision CRV OG/13/03 – Update to the CRV Implementation Plan v2.3</td></tr>
<tr><td>What: That the CRV Implementation Plan v2.3 provided in Appendix C is adopted:

a) Formatting adjustment to paragraph 2.2.2 - Roadmap to</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic</td></tr>
</table>

CRV; b) Editorial changes to paragraph 2.3.1 - AMHS; c) Formatting adjustment to paragraph 2.3.2 - AFTN, Option 3, Migrate from XoT to XoT; d) Editorial changes to paragraph 2.4.2 – IP Addressing, iii; e) Formatting adjustment to paragraph 2.4.3 – Interface; f) Proposed updates to paragraph 3.2 – Implementation Team; g) Proposed updates to paragraph 3.2.1 – CRV-OG; h) Proposed updates to paragraph 3.2.2 – National CRV Points of Contact; i) Proposed updates to paragraph 3.2.2 – National CRV Points of Contact, i; j) Proposed updates to paragraph 3.2.2 – National CRV Points of Contact, x; and k) Proposed updates to paragraph 3.2.3 – Local CRV Points of Contact.	☐ Environmental ☒ Ops/Technical

Why:	To include different types of CRV Users supporting the APAC CRV network	Follow-up:	☐Required from States
When:	8-Mar-25	Status:	Adopted by CRV OG
Who:	☐Sub groups ☐APAC States ☐ICAO APAC RO ☐ICAO HQ ☒Other: CRV OG		

Common Package Update - New Zealand (WP/11)

4.17 New Zealand presented an update to the Common Package document naming convention. It was recalled that at the awarding of the Tender for the Asia Pacific Common aeRonautical Virtual Private Network (APAC CRV), it was decided to adopt several documents used and referred to when joining and operating the network. The Common Package contains **essential documents** for an order/contract (Blue documents) and **general/common documents** that assist with the design, implementation and operation (Orange documents). A Change Control record lists the blue and orange documents. It was reported that the current naming convention for the documents in the Common Package is mixed.

4.18 The Meeting noted that as discussed at the APAC CRV Ad Hoc Expert Meeting on 12 December 2024, it was proposed to standardize the document naming, with each document being prefixed with an Owner number followed by a Document number. The proposed Owner numbers were 1. ICAO, 2. CRV OG and 3. PCCWG.

4.19 The Meeting reviewed the common package and agreed to adopt a revised common package. The revised common package can be accessed on the New Zealand-hosted CRV Portal.

Agenda Item 5: CRV Governance

Outcomes of Fifth Ad-Hoc Governance Meetings

5.1 The Meeting recalled that the third CRV OG Ad-hoc governance group Meeting was conducted on 24 January 2024 with the CRV OG/12 Meeting in January 2024. The Meeting observed that after the second Ad-hoc Governance Meeting, States/Administrations were requested to share a list of daily, weekly, monthly, annual, or any other periodic tasks related to CRV performed in their States/Administrations. Only five states/administrations shared their responses. Based on the response analysis, the problem statement was revised. However, information from other States/Administrations must be taken into consideration for further analysis. Therefore, the CRV OG/12 Meeting requested

that all States/Administrations that have not submitted the response should submit the response on priority.

5.2 The fourth Meeting of the CRV OG Ad-hoc governance group was conducted on 3 May 2024 using the Microsoft team. The Meeting reviewed a total of 15 responses received from China, Hong Kong China, Fiji, India, Indonesia, Japan, Malaysia, New Zealand, Pakistan, Philippines, ROK, Singapore, Sri Lanka, Thailand, and the USA for CRV's daily, weekly, and annual tasks. The Meeting noted that many States utilizing CRV had not shared their responses. The ICAO Secretariat and CRV co-chairs were requested to analyze the responses and prepare a consolidated list of tasks to gauge the effort States put into CRV management. Further Meetings of the CRV OG Ad-hoc governance group could not be conducted due to extensive work being done for the CRV II RFI.

5.3 The Fifth Meeting of the CRV OG Ad-hoc governance group was conducted on 5 March 2025. The Meeting further reviewed the list of tasks and problem statement. It was observed that based on a list of tasks provided, there is not much of a workload on CRV Users for operations and management of the CRV network. However, many tasks such as CRV documentation, contract-related documents, and further work required to improve future CRV performance are not being done at the State level but by the CRV OG Ad-hoc Expert Group. In addition, a regular Meeting with CRV service providers must be conducted by States as a standard practice to manage the operations of a network, which is being done by the CRV OG Co-Chair (Asia) on behalf of CRV OG Member States. Therefore, it was concluded that various tasks related to regular operations of the CRV network could be done.

5.4 The Meeting discussed the New PENS and REDDIG II model of governance and agreed that the REDDIG II model most suits the needs of the APAC region. It was informed that REDDIG manages its MPLS network. In addition, costs are shared equally among member states. After further deliberations, it was realized that CRV OG would like to know more information about REDDIG operations. The ICAO Secretariat was requested to organize a Meeting with REDDIG network administration members to discuss and understand the current structure and governance model. The ICAO Secretariat will coordinate with the ICAO SAM Office to schedule an online Meeting in Q4 2025. **ACTION ITEM 13-6**

5.5 The Meeting realized the need to know the total amount APAC States/Administrations pay for CRV contracts. It was agreed that CRV users would share their monthly CRV contract price with the ICAO Secretariat. It was stated that the ICAO Secretariat will share the total price for the region in a future forum for discussion. No individual data shared by each State will be disclosed with other States/Administrations**. ACTION ITEM 13-7**

5.6 Another suggestion was to send a state letter from the ICAO APAC Office to Member States to provide subject matter experts to support CRV OG in the management of various tasks**.** However, it was agreed that, firstly, more information related to the future CRV governance model should be collected before taking further steps to arrange additional experts to support CRV OG**.**

Agenda Item 6: New Zealand hosted CRV Portal management

New Zealand hosted CRV Portal Content Update - New Zealand (WP/12)

6.1 New Zealand shared information about the New Zealand hosted CRV Portal. It was informed that New Zealand hosted CRV Portal provides a common platform to compile all necessary information related to CRV, such as the Operations Manual, Transition Plan and Common Package for all CRV Users. Having this portal provides the flexibility of updating the various documents and providing access to these under the control of the CRV Operations Group. It was noted that the contents of the portal remain reasonably stable, with the main updates being to the Operations Manual, Common Package items, and the Implementation Progress updates from PCCWG. Recent additions to the portal

were shared and described. It was added that future enhancements include the provision of a sitemap and a history and timeline of the CRV being developed.

Agenda Item 7: Review and update the APAC CRV Implementation Table

Review and update the APAC CRV Implementation Table and Telecommunication Infrastructure Table - Sec (WP/13)

7.1 The latest updates presented on the planning and implementation status of CRV were as follows:

- **Under Operation**
  Australia, Bhutan, Cambodia, China, Hong Kong China, Fiji, French Polynesia, India, Indonesia, Japan, Macau China, Malaysia, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, PNG, Republic of Korea, Singapore, Sri Lanka, Thailand, USA and Vietnam

- **Under Provisioning**
  New Caledonia and Maldives

- **Hot Prospects in 2025**
  Bangladesh, Brunei, Cook Island, Lao PDR, Oman, Niue, Samoa and Tonga

- **Not joined yet**
  Afghanistan, DPRK, Kiribati, Marshal Islands, Micronesia, Nauru, Palau, Solomon Islands, Timor Leste, Tuvalu, Vanuatu, Russia, ICAO MID States

7.2 The Meeting reviewed the APAC CRV Implementation Table and agreed that after the Telecommunication Infrastructure Table, CRV Implementation Table updates are not required. The meeting updated the Telecommunication Infrastructure Table, which can be accessed on the New Zealand-hosted CRV Portal.

Review of CRV Information in TABLE CNS II-2 Required ATN Infrastructure Routing Plan In e-ANP Vol II - Sec (WP/14)

7.3 ICAO Secretariat summarized the need for review and update to the **TABLE CNS II-2**- *REQUIRED ATN INFRASTRUCTURE ROUTING PLAN* specified in ICAO APAC e-ANP Vol II by APAC States/Administrations. It reminded States/Administrations to review the data affecting their administration and provide feedback to ICAO on the data's accuracy in the requisite format to update the relevant CNS requirements in all volumes of e-ANP.

7.4 The Meeting was requested to deliberate on **three options** and choose the appropriate one: 1) the need to change the template of TABLE CNS II-2 of e-ANP Vol II as per the agreed revised ATN Infrastructure Table, 2) add a table to incorporate CRV under specific regional requirements or 3) utilize the existing template of TABLE CNS II-2 of e-ANP Vol II to incorporate CRV at the appropriate place. The pros and cons of all three options were explained at the Meeting. After discussion, the Meeting agreed on **option three** and suggested that **CRV information be added to column number 7**.

7.5 ICAO Secretariat added that the current CNS-related table in ICAO APAC e-ANP is outdated and has not been updated by States/Administrations for many years. Therefore, it is essential that the tables be updated.

7.6 The Meeting urged states to verify and update **the TABLE CNS II-2- REQUIRED ATN INFRASTRUCTURE ROUTING PLAN** of e-ANP Vol II following the PfA process, as data provided in e-ANP must be up-to-date. It was suggested that data updated in the Telecommunication Infrastructure Table on the New Zealand-hosted CRV Portal can be utilized to update the required information.

7.7 The ICAO Secretariat informed that **all CNS tables in the Word file** mentioned in ICAO APAC e-ANP Vol II are uploaded to the ICAO APAC ANP Webpage with instructions on how to file a PfA.

7.8 With the abovementioned, the following draft conclusion was proposed, which was endorsed by the Meeting for CNS SG/29 adoption.

<table>
<tr><td colspan="3">Draft Conclusion CRV OG/13/04- Update the TABLE CNS II-2- REQUIRED ATN INFRASTRUCTURE ROUTING PLAN</td></tr>
<tr><td colspan="2">What: The current TABLE CNS II-2- REQUIRED ATN INFRASTRUCTURE ROUTING PLAN of ICAO APAC e-ANP Vol II is outdated and requires immediate updates.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: to update e-ANP Vol II</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 08 March 2025</td><td colspan="2">Status: Draft to be adopted by Sub-group</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: ACSICG/CRV OG</td></tr>
</table>

Update of CRV National and Local Focal Points - Sec (WP/28)

7.9 This paper shared information about CRV's National and local points of contact (PoC) roles and responsibilities. The Meeting requested States/Administrations update National and local PoC information in case of any changes.

7.10 The updated list of national and local points of contact will be uploaded to the ICAO APAC CRV Secure portal under the CRV OG/13 folder.

Agenda Item 8: CRV contract management

8.1 Due to the confidentiality of the CRV contract management process, the report under this agenda is published on the ICAO APAC CRV Secure portal under the CRV group.

Agenda Item 9: CRV operational performance report

CRV Additions in AMC – Sec (WP/20)

9.1 This paper presented information about ongoing work on the addition of CRV Implementation status in AMC by Eurocontrol.

9.2 During the Joint Meeting of CRV OG Experts and SWIM TF TLs on 12 November 2024, it was noted that the COM chart from the AMC portal shows interconnections between various ANSPs in the APAC region but does not specify the type of network used. It was recalled that the ATN Infrastructure table on the CRV portal contains CRV interconnection details, while the AMC COM

chart includes New PENS interconnection information. CRV and SWIM experts recommended that the ICAO Secretariat coordinate with AMC to explore adding CRV network information to the AMC portal.

9.3 The ICAO Secretariat shared the request of CRV and SWIM experts with the Eurocontrol point of contact for AMC portal management. In response, Eurocontrol informed that they had considered the request and decided to update the AMC application to take into account the pan-regional networks for each of the ICAO regions. Concerning the data entry, the Supplier field in the Network Inventory/Connections has to be populated with "CRV" by all applicable states. Eurocontrol intends to update the AMC application to align with the same PENS approach in March 2025. Eurocontrol will inform ICAO when the work is completed. Further progress on this request will be shared at future CRV OG and ACSICG meetings.

9.4 In response to a question about the purpose of the upcoming AMC Workshop. It was informed that a half-day AMC Workshop on 25 March 2025 at the ICAO APAC Office will support AMC users in refreshing their knowledge about the standard procedure for using the AMC tool, which provides support for AMHS operation, address management, and user capabilities management. The Workshop will draft, review, and finalize the Standard Operating Procedure (SOP) of using the AMC tool for APAC states/administrations to manage and ensure proper coordination between COM centers, an essential requirement to ensure the overall quality of service for ATS Messaging.

9.5 Indonesia queried about updates required in the COM chart as Indonesia has been migrated to AMHS while the COM chart reflects it as an AFTN connection. ICAO Secretariat informed that the Indonesia focal point for AMC should contact the regional focal point of AMC (Aerothai) to coordinate on this matter.

Future Bandwidth Requirements Based on Outcomes of Joint Event - Hong Kong China (WP/22)

9.6 Hong Kong China presented a study on the bandwidth used for the ADS-B data transmitted over the SWIM/CRV environment and analyzed outcomes. The Meeting noted that during various CRV OG Meetings, there was a recognized need to review and analyze the bandwidth usage of CRV in each State/Administration. Such analysis was crucial to the proactive planning of upgrades and accommodating future applications, ensuring necessary actions will be taken in a timely manner. Hong Kong China added that since bandwidth in CRV is considered a crucial resource, especially for States/Administrations with higher bandwidth demand due to a higher number of applications and States that are geographically remote and understandably have higher bandwidth costs. This study offered insights into the bandwidth requirements of surveillance data on SWIM so that CRV experts could consider incorporating them into the tendering process for improved support of new applications.

9.7 Hong Kong China explained the system setup used for Joint events and various scenarios considered, along with records of analysis results based on the size of an AMQP message received from different EMSes. It was concluded that in Hong Kong China's operational environment, during peak hours, the Hong Kong ADS-B system detects approximately 300 targets within Hong Kong FIR and partial Mainland China FIR. Assuming that ADS-B data associated with Flight Plan information for all these 300 targets are sent in 1 second in the SWIM environment with each target of size of 1.2K bytes (refer to ROK track), a total of 360K bytes per second is necessary (i.e., 2.88Mbps). As Hong Kong is one of the busiest FIRs in the region, this figure should offer additional insights into the bandwidth demand, which may be capped at this level in the worst scenario. The Meeting was requested to encourage States/Administrations using SWIM/CRV to share their experience in conducting similar monitoring and analysis. It was concluded that the bandwidth requirement highly depends on different use cases. Several aspects, particularly the frequency of data sent, should be considered by different States/Administrations when calculating the bandwidth requirements.

9.8 The Meeting appreciated the study done by Hong Kong China and agreed that it is beneficial to the Meeting and that the formula used to calculate bandwidth would be helpful for CRV

Users to evaluate the bandwidth requirements for ADS-B data. Hong Kong China would work on deriving a formula based on analysis to compute the bandwidth required for surveillance data sharing and suggest it to the CRV OG Ad-hoc Expert Group to incorporate it into the CRV OG Operations Manual. **ACTION ITEM 13-23**

Package D+ For PSIDS/Small ANSPS – Fiji (WP/23)

9.9 Fiji proposed CRV SLA Package D+ for PSIDS and small ANSPs in the APAC region for implementation for CRV. The Meeting recalled that in CRV OG/08, Fiji presented WP/13 titled *Revisit the CRV solution for small Pacific Islands and small ANSPs in APAC* using CRV Package D. APANPIRG/34 endorsed Draft Conclusion CRV/08/02 proposed by this WP as **Conclusion APANPIRG/32/07**- *Implementation of CRV for small Pacific Island and small ANSP in the region using CRV Solution, PCCWG SLA Package D.*

9.10 The decision to upgrade from CRV Package D to Package D+ relates to the high reliability required for the services from PSID States, noting the availability of flights and lead time to send a spare NID in the event of the operational NID fail for Package D+. In addition to the lead time that may take 6 weeks, PCCWG has confirmed that one of the critical points affecting the replacement time is that the PCCWG partner requires some time to settle the import license and clearance before delivering to the customer site. It was added that while the cost is expected to increase with an additional NID with the cold standby NID, the reliability of the services is crucial for ANSP and the CRV Package D+ was the recommended CRV SLA. In addition, the PSIDS States, that have signed the CRV service order with PCCW has preferred CRV Package D+.

9.11 Fiji informed that CRV Package D+ was formalized and incorporated in the CRV Operations manual. CRV Package D+ was presented to the Meeting as the preferred CRV Package for the PSIDS and small ANSP Member States in the APAC region through the following Draft Conclusion. It was informed the proposed draft conclusion would **supersede** Conclusion APANPIRG/32/07- *Implementation of CRV for small Pacific Island and small ANSP in the region using CRV Solution, PCCWG SLA Package D* if adopted by APANPIRG/36 in 2025. The Meeting endorsed the proposed draft conclusion for APANPIRG/36 adoption through CNS SG/29.

<table>
<tr><td colspan="3">Draft Conclusion CRV OG/13/06 - Implementation of CRV for small Pacific Island and small ANSP in the region using CRV Solution, PCCWG SLA Package D+.</td></tr>
<tr><td colspan="2">What: That, the CRV OG agreed to the following to assist small Pacific Islands & small ANSPs in APAC in the implementation of CRV:
a) CRV SLA Package D+ is reliable and addresses lead time for acquiring spares and PCCWG to import licenses and clearance for customer sites
b) Small Pacific Island and small ANSP in the region to consider using CRV SLA package D+ as the CRV solution to implement CRV for the exchange of voice & AMHS services
c) With a target date to implement CRV by 2025, it was recommended that the CRV OG work closely with the small Pacific Islands, small ANSP in the region and PCCWG on a cost-effective CRV solution to implement CRV.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☒ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To facilitate the implementation of CRV for the small Pacific Island & small ANSP in the region</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 8-Mar-25</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other: XXXX</td></tr>
</table>

CRV Operational performance report- PCCWG (SP/01)

9.12 PCCW Global presented the CRV Operational Performance Report, which analyzed the reliability and overall performance of the CRV network in 2024. The Meeting was informed that the CRV network consists of 68 circuits across 38 locations, supported by various service packages. Two service providers currently support the network, and four new circuits are under implementation, targeting New Caledonia, the Maldives, and two locations in Hong Kong, with completion expected in 2025. Additionally, eight new member states are expected to join the CRV network in 2025, including Bangladesh, Brunei, the Cook Islands, Laos PDR, Niue, Oman, Samoa, and Tonga. The Meeting noted the service inventory and site availability details, which highlighted high service reliability across various administrations. It also took note of ongoing contract negotiations with prospective member states.

9.13 The Meeting discussed various incidents that resulted in unserviceability in various APAC States/Administrations and their impact on the operational environment. The Meeting suggested that PCCW Global provide an analysis of various incidents in all APAC States/Administrations that have severely impacted SLA. **ACTION ITEM 13-24**

Analysis of APAC CRV Bandwidth Utilization – PCCWG (SP/02)

9.14 The paper presented the bandwidth utilization of each member State in 2024, providing a comprehensive understanding of how network bandwidth is utilized within the organization. PCCWG informed that the reporting tool captured and recorded the average traffic value from the NID interface at 5-minute intervals and averaged the collected data to generate the monthly traffic report. The Meeting reviewed the monthly traffic report and it was observed that the average utilization rate cannot share peak bandwidth utilization. Member States/Administrations were requested to make additional efforts to measure and monitor CRV network performance and share it with CRV OG regularly.

CRV Post Implementation issues in Sri Lanka (WP/31)

9.15 Sri Lanka informed that the CRV circuit for Sri Lanka was interrupted by two major service failures. During the restoration efforts and coordination with the CRV provider, several areas for improvement were identified on the provider's part. Sri Lanka presented it to discuss further to retain the guaranteed availability of Package D. A summary of the incidents was presented. The Meeting was informed about issues concerning the serviceability of Sri Lanka's CRV circuit, which experienced approximately 99.32 hours of unavailability since its commissioning in April 2024. During the resolution process, notable improvements were observed on the PCCW side, which could help to retain the guaranteed serviceability of Package D. Furthermore, Sri Lanka recommended having a contingency plan in place when using Package D. Based on Sri Lanka's experience, suggestions were shared to improve fault resolution processes and optimize maintenance windows.

9.16 The Meeting deliberated on the root cause of the two incidents and the issues Sri Lanka faced in resolving them. It was advised that PCCW Global should notify their support desk staff to respond to filed tickets promptly and clearly make them understand the responsibilities for managing the serviceability of Package D, where PCCW Global and ISP of States are responsible for maintaining operational performance required for the CRV network. PCCW Global informed that they have initiated an educational process for their customer support staff to enhance service and improve communication.

9.17 It was also advised that the maintenance window should be agreed upon between PCCW Global and the State, considering the need to avoid peak traffic periods. It was added that the CRV OG Operations Manual describes the maintenance notification process, which should be referenced.

9.18 Regarding the suggestion to define a maintenance window at the sub-regional level in the APAC region, it was agreed that more deliberations are needed. The discussion will be added to the CRV OG Ad-hoc Expert group discussion. **ACTION ITEM 13-25**

Proposed CRV Connections to the Cloud – Singapore (SP/03)

9.19 Singapore highlighted that a cloud platform offers scalability, cost efficiency, performance optimization, and reliability for handling workloads. It was added that Singapore will implement some of its next-generation systems on a cloud platform. Scaling Singapore's on-premises infrastructure to match the scalability of the cloud platform can be difficult. However, there was currently no connectivity between cloud providers and the CRV. Singapore presented *CAAS SWIM - CRV Cloud Platform Use - Case (w/o connectivity between cloud providers and the CRV – illustration by this diagram*:

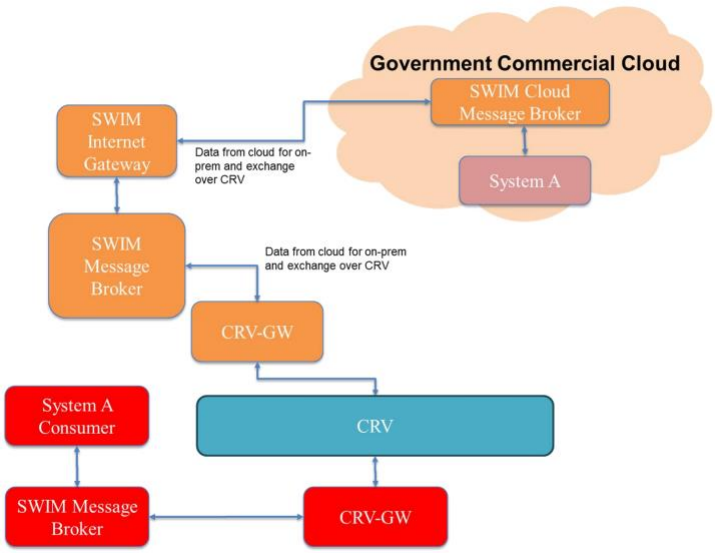

Figure 1-CAAS SWIM - CRV Cloud Platform Use - Case (w/o connectivity between cloud providers and the CRV – illustration

9.20 Another CAAS SWIM - CRV Cloud Platform Use - Case (proposed connectivity between cloud providers and the CRV – illustration) was presented for Meeting consideration.

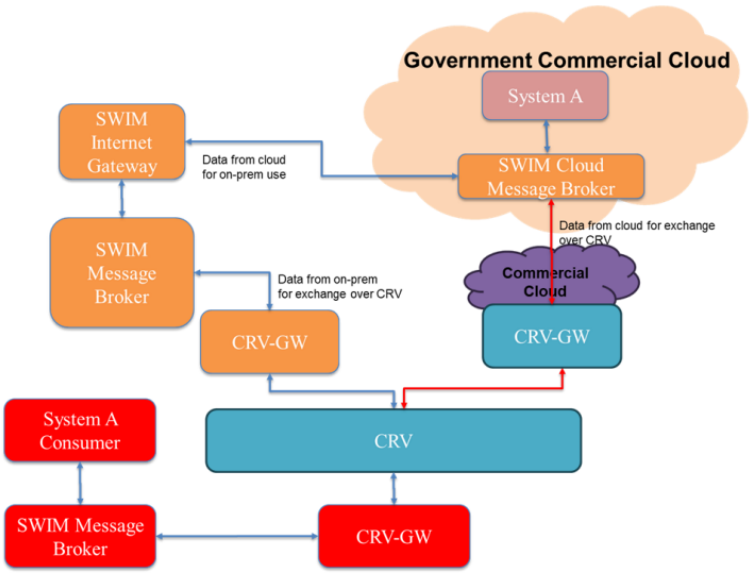

Figure 2- CAAS SWIM - CRV Cloud Platform Use - Case (proposed connectivity between cloud providers and the CRV – illustration)

9.21 It was proposed that the CRV service provider establish interconnectivity between Government Commercial Cloud and Commercial Cloud platforms with the CRV. The proposed

solution would enable direct data exchange over the CRV, bypassing the limitations of on-premises systems. This approach was expected to deliver benefits such as improved scalability to meet consumer demand, enhanced cost-effectiveness, and better system performance.

9.22 The meeting agreed that there are some complexities in the implementation of the cloud within the CRV network and integration of it with another cloud network. PCCW Global stated that it is technically feasible, but security concerns must be addressed while implementing it in current or future CRV networks. It was agreed that there is a need to understand various options for this implementation and recommend a path with the support of cloud service providers such as Microsoft, AWS, Azure, etc. It was agreed that New Zealand will facilitate this discussion with the cloud service provider to progress on this matter. **ACTION ITEM 13-26**

Space-based ADS-B on CRV – Aireon (SP/04)

9.23 Aireon explained the concept of Space-based ADS-B, its Technical Performance Metrics and Service Delivery Point (SDP). It was informed that in 2019, Aireon signed a contract with NSPL to provide ADS-B services for Papua New Guinea (PNG) for the complete PNG FIR. The initial architecture included 2x MPLS connections from the USA to PNG, which involved expensive and unreliable MPLS connections. To enhance reliability and cost-efficiency, Aireon collaborated with NSPL and PCCW to leverage the CRV Network, establishing dual tunnels connecting the US to Hong Kong and ultimately improving service delivery. The CRV Network allowed existing Asia-Pacific Air Navigation Service Providers (ANSPs) to utilize their established connections, offering significant cost savings and reduced deployment time compared to dedicated MPLS lines. Key performance metrics demonstrated that the system can maintain availability of over 99.9% and deliver reports with a latency of 1.5 seconds. The Meeting was informed that leveraging the CRV Network can expedite connectivity, achieve cost efficiencies and improve reliability.

9.24 The Meeting queried various questions related to the technical architecture of the space-based ADS-B system, and Aireon shared the response.

9.25 Aireon informed that its vision is to utilize CRV as part of its network to share space-based ADS-B data. For PNG, both networks are CRV: one using MPLS and another using VSAT. The Meeting agreed that CRV capability and reliability can be measured by the fact that prestigious industries are considering providing their services on CRV.

9.26 The Meeting noted that ground-based ADS-B and space-based ADS-B are equally vulnerable to GNSS RFI and spoofing. However, space-based ADS-B services provided by Aireon have the capability to detect unauthenticated GNSS signals.

9.27 The Meeting requested documentation on the process to follow if they want to utilize CRV for space-based ADS-B data transmission. Aireon suggested that the Philippines initially draft the document based on their recent experience of contracting space-based ADS-B services over CRV. Aireon will provide further addition to the process, adding coordination required between Aireon and the CRV service provider. The Philippines will draft the procedure and present it at the next CRV OG Ad-hoc Expert Group Meeting, which is planned for **12 June 2025**. **ACTION ITEM 13-27**

Com Chart update based on the Asia-Pac ATN Infrastructure Routing Plan- New Zealand (WP/33)

9.28 New Zealand informed that during the 12 November 2024 APAC CRV Ad-Hoc Experts and SWIM Taskforce Team Leaders Meeting, the SWIM Taskforce leads raised the concept of updating the COM Chart to show the use of CRV to deliver the relevant services to aid their understanding of the connectivity. It was informed that using the AMC, CNS II-2 required ATN infrastructure routing plan, the COM Chart was updated to show the CRV connections in two formats:

a) Retaining the current COM Chart layout and replacing the link speed with CRV and b) Retaining the COM Chart layout and adding all of the sites and GRE tunnels. It was informed that using the COM chart in this way allows the visual representation of the connectivity based on the AMC CNS II-2 required ATN infrastructure routing plan and the Implementation Updates provided by PCCWG.

9.29 The Meeting appreciated the task completed by New Zealand. It was added that after CRV display integration into AMC, it will be easier for States to download the latest and updated chart from the AMC portal.

Agenda Item 10: States CRV Implementation

Japan's support for PSIDS and international collaboration – Japan (WP/30)

10.1 Japan presented its efforts to enhance ATS network capacity and build sustainable capacity in the Pacific Small Island Developing States (PSIDS). Japan informed that for analysis of the ATS network in PSIDS, the Japanese survey team visited Samoa and Tonga from 13-15 November 2024 to assess ATS networks and ANS systems and shared their observations from this visit. It was added that Japan is conducting a questionnaire survey for the PSIDS to gather further data, including information identified as critical during the PSIDS Meeting held in September 2024 for sharing with the CRV OG. Several issues were identified through the survey analysis, including barriers to CRV Introduction, insufficient understanding of new initiatives, aging PASNET and human resource development. To address these issues, Japan suggested that it is essential that each State actively support and cooperate to support the PSIDS based on "ICAO's No Country Left Behind' initiative. It was suggested that major ANSPs could share costs or secure external funding to support the implementation of CRV in the PSIDS, advance discussions on cost-sharing or securing external funding for CRV implementation, and plan to conduct further surveys in other PSIDS.

10.2 Japan added that as part of Japan's efforts toward human resource development for the PSIDS, Japan invited operational and technical personnel designated by the PSIDS to participate in training programs in Japan (with costs covered by Japan) in December 2024. The training included a session on CRV, as well as a session to share information about the challenges faced by the PSIDS, which revealed that common issues include staff shortages, budget constraints, and the need for human resource development, emphasizing the necessity of support from other states to address these challenges. Japan suggested that participants discuss possible support for PSIDS further to enhance ATS network capacity and build sustainable capacity for the PSIDS.

10.3 Japan proposed to host a PSIDS capacity-building workshop along with Special Session- CRV OG/14 on 27 October 2025 week. They informed that they will cover the cost of PSIDS to attend the workshop along with Special Session- CRV OG/14. The Meeting appreciated the offer of Japan and shared their support to the workshop. Further discussion on this was done under agenda item 15.

CRV Status Implementation in Indonesia (IP/03)

10.4 The paper provided an update on the current status of CRV implementation in Indonesia. The Meeting was informed that Indonesia signed a contract with PCCW Global in the first quarter of 2022 for CRV services, subscribing to a Connection Package-C with 3 Mbps bandwidth at two sites. The first connection was established in the first quarter of 2023. Key implementation activities include finalizing bilateral agreements, establishing connections, conducting trial operations, and monitoring performance. As of February 2025, several applications, including AMHS, are operational, while voice testing is ongoing with various adjacent states. Plans include establishing direct voice communication with Chennai and Colombo, with a contract renewal anticipated by November 2025.

Status of CRV Implementation in Malaysia (IP/04)

10.5 Malaysia informed that the official commencement date for CRV services in Malaysia started in November 2021 and the CRV Contract Agreement between PCCWG and CAAM on behalf of the Government of Malaysia was signed in Sept 2022. It was reported that Malaysia currently subscribes to package A with 2Mbps, which connects both CRV routers located in the Kuala Lumpur Air Traffic Control Center (KLATCC) to the CRV network. Various connections showing the status of CRV Implementation between Kuala Lumpur Air Traffic Control Centre (KLATCC) and neighboring CRV States, along with bandwidth utilization, were shared with the Meeting. Lastly, Malaysia shared that the involvement and technical assistance provided by the PCCWG representative in the initial preparations before carrying out the AMHS test activities between Malaysia-Singapore and Malaysia-Thailand was very helpful and facilitated.

Implementation Status of Pan India AHMS and CRV network in India (IP/05)

10.6 India informed that India has a legacy AMHS system in Mumbai, which is connected to various BBIS and BIS states in the APAC region & other regions for exchanging AFTN/AMHS data and Voice services. The process for replacement of existing legacy AMHS at Mumbai, IP-AMSS, legacy AMSS, and AMSS Remote workstations (RWS) installed at various cities in India is in progress with installation and testing of new Pan-India AMHS systems for 80+ Airports across the country. Presently, the Site Acceptance Test (SAT) is in progress, and the new AMHS is likely to be operationalized by May 2025. It was added that the new Frequentis (FCO) Pan-India AMHS system has a DC (Data Center) system in Mumbai, while the DR (Disaster Recovery) system is installed in Delhi. In addition, the new PAN India AMHS system will also support Digital NOTAM services using AIXM 5.1.1 data format, email to SMS gateway, centralized ATS and NOTAM database, the pilot portal for filing of FPLs, ADC/FIC & YA application and other applications.

10.7 The meeting noted that India had signed the service contract with PCCW Global for the provision of CRV services on 15th March 2022 using Package-B+ with 1 Mbps bandwidth. The CRV services at Mumbai commenced w.e.f 16.12.2022, and seven International AMHS data circuits and five speech circuits have been migrated on the CRV network to date. The hiring of the 2nd CRV node at New Delhi for the AMHS DR site in Package C using 2 MBPS bandwidth is being processed. A list of states for which International Private Leased Circuit (IPLC) has been replaced with CRV Network and their performance were shared with the meeting. It was added that India has also initiated action to upgrade the existing CRV Bandwidth at Mumbai from 1 M (1024 Kbps) to 2 M (2048 Kbps) in Package B+. After the upgrade of CRV bandwidth in Mumbai, the migration plan of various circuits on the CRV network, subject to readiness from the concerned state, was shared.

10.8 India urged BBIS/BIS states having AMHS/AFTN/DSC connectivity with India to migrate to the CRV network at the earliest and requested the ICAO Secretariat to urge MID region states, particularly Oman, to join the CRV network at the earliest.

10.9 The meeting noted that India already has a national IP network named FTI (Futuristic Telecommunications Infrastructure) to support FF-ICE FPL in the future.

Agenda Item 11: Review the requirement of CRV for SWIM

- **Subscriber**
- **GEMS**
- **ANSP**

Outcomes of the ICAO Workshop for the preparation of new CRV requirements and specifications for future System Wide Information Management (SWIM)/other aviation services – New Zealand (WP/24)

11.1 New Zealand presented a summary of the *Outcomes of the ICAO Workshop for the preparation of new CRV requirements and specifications for future System Wide Information Management (SWIM)/other aviation services*. This detailed information can be found in the Report of the Meeting.

Retention of Pseudo CRV for SIPG- New Zealand (WP/32)

11.2 New Zealand informed that to support the SWIM TF, the SWIM Implementation Pioneer Group (SIPG) and the Surveillance Sharing in SWIM Trial Implementation Group (S3TIG) with trials and demonstrations of SWIM, PCCWG built a version of the CRV called Pseudo CRV. The Pseudo CRV used Package D connections with 2MBps bandwidth. The SWIM TF has found the Pseudo CRV useful for their testing and has its use extended twice until 30 March 2024.

11.3 It was added that during the 12 November 2024 APAC CRV Ad-Hoc Experts and SWIM Taskforce Team Leaders Meeting, the SWIM TF Task leads requested the possibility of retaining the Pseudo CRV for continued testing which requires agreement from either all or some of the currently connected states of Thailand, Singapore, China, Malaysia, India, Republic of Korea, Japan and Hong Kong China, or any states wishing to contribute to this connectivity. PCCWG was asked by CRV OG for indicative pricing, and PCCWG provided two further options for the current pricing of Package D.

a) USD500/month per connection with no SLA.
b) USD900/month with a limited SLA

11.4 Both options were deliberated in the Meeting. Some States observed that the proposed cost is very high considering that testing will be done only a few times a year; however, States will need to pay for each month USD 500 without utilizing the Pseudo CRV Network. Various other options were deliberated to continue providing support to SWIM TF and SIPG in continuing their testing. It was noted that SIPG WS/1 agreed that using operational CRV residual bandwidth will not be feasible for many States. In addition, moving to the internet will consume a lot of time and effort for SIPG members. The best way to move forward was to find a way to keep Pseudo CRV till needed.

11.5 One option proposed was that equipment used for Pseudo CRV is bought by States, and States can request PCCW Global to utilize Pseudo CRV in case of need, and payment can be done accordingly. PCCW Global shared their support to SIPG members to keep Pseudo CRV. They informed that as there is no SLA, the contract process is easy. However, they would like to know up to what period the setup would be required by SIPG/SWIM TF. In addition, PCCW Global informed that they are open to negotiating the proposed prices with each State/administration that needs Pseudo CRV. It was also informed that PCCW Global will provide support to new members if they wish to join the Pseudo CRV network. It was agreed that CRV OG will discuss with SWIM TF the expected timelines for the setup and future plans. **ACTION ITEM 13-28** PCCW Global shared their willingness to extend Pseudo CRV **till June 2025** to facilitate CRV OG to conduct discussions with SWIM TF.

11.6 In response to a question about the procedure mentioned in the CRV OG Operations Manual on how to utilize CRV residual bandwidth for testing, the CRV OG Co-Chair (Asia) informed that currently, there is no procedure mentioned. However, as per his view, the procedure should be that States first conduct risk assessment, share outcomes of risk assessment with respective peer states if it can affect peer States, and inform peer states in advance when conducting the testing. It was agreed that the procedure would be incorporated into the CRV OG Operations Manual after discussion in the CRV OG Ad-hoc Expert Group. **ACTION ITEM 13-29**

11.7 Japan shared a request with PCCW Global to prepare a document explaining the configuration of Pseudo CRV to make States understand this network along with the procedure to request connection to this network. It was agreed that this document would be beneficial for States. PCCW Global will draft the document and share it in the next CRV OG Ad-hoc Group meeting on 12 June 2025. **ACTION ITEM 13-30**

11.8 The meeting noted that Hong Kong China uses residual bandwidth to conduct testing on CRV.

Agenda Item 12: MPLS/IP based inter-regional connection

Use of L2 VPN channels to support interaction between AMHS centers of the Russian Federation and APAC Region – Russia (WP/21)

12.1 The paper discussed the possibility of L2 VPN (MPLS/IP-based) channels to facilitate AMHS interaction between the COM centers of the Russian Federation and the ICAO APAC region Member States. Russia informed that pursuant to the ICAO EUR/NAT Office State letter (EUR/NAT 22-003.TEC (NIA/HOI) dated 01/10/2022), certain progress was achieved in the transition to the real traffic exchange using AMHS procedures between the COM centers of the Russian Federation and the ICAO Asia-Pacific region.

12.2 The meeting noted that the most challenging situation involved the transition to AMHS between the Moscow and Fukuoka communication centers. The X.25 equipment currently used to support the exchange via the AFTN/X.25 protocol has reached the end of its service life and cannot be replaced, as it is no longer manufactured or supported by the manufacturers. In the event of equipment failure and the inability to recover it, the Moscow-Fukuoka channel will have to be temporarily closed. If this occurs, it will be necessary to reconsider the routing between the Russian Federation and ICAO Asia-Pacific communication centers. Under the current circumstances, prompt coordination of routing changes will be essential to avoid message transmission delays.

12.3 Japan informed that it is continuing to commit to the implementation of AMHS with Russia. Japan will share progress on this matter in the upcoming ACSICG/12 Meeting planned to be held from 25-27 March 2025 in the ICAO APAC Office, Bangkok, Thailand. The meeting requested Russia to present the paper in the ACSICG/12 meeting and requested that the issues be resolved on priority.

Agenda Item 13: Using the rest of CRV Pioneer State Contribution to the ICAO Managed Service Agreement (MSA)

Updates on Using the Rest of CRV Pioneer State Contribution to the ICAO Managed Service Agreement (MSA) – Sec (WP/25)

13.1 ICAO Secretariat shared information about the recent development of using the balance fund of the MSA. The Meeting was informed that to follow up on Conclusion ACSICG/10/02 (CRV OG/11/03) – *Selection of Security Review Options 2 and 5 and Develop a ToR*, for utilization of remaining money from CRV Project, the draft ToR was prepared by the CRV OG Ad-hoc Expert Group, which was reviewed by the ACSICG/10 Meeting and endorsed as Conclusion ACSICG/10/03 – *Adoption of ToR for CRV Security Review using Options 2 and/or 5*. Based on the adopted ToR, CRV OG Ad-hoc Expert Group invited quotations from different vendors to prepare cost estimates for the work.

13.2 It was recalled that in the CRV OG/12 Meeting (2024), the CRV OG Co-chair (Asia) presented an update on the proposed Cyber Security Review. The Meeting noted that the two cybersecurity organizations specializing in cybersecurity provided quotations. The CRV OG/12

Meeting discussed the option to split the task between two vendors, which provided the lowest quotation for each task. However, the ICAO Secretariat informed that it has coordinated with ICAO HQ CDI to share the formal process of transferring the 16 pioneer states' money to the third-party supplier. It was also informed to HQ that all 16 pioneer States would follow the standard procedure to request ICAO CDI to transfer the funds to the third party approved by CRV OG for the CRV security assessment task. In response, CDI has informed that they understand the request. However, this could be seen as a way to use funds from an ICAO project to solo-source, thus circumventing ICAO regulations on procuring goods and services. ICAO CDI cannot proceed this way, and the funds must agree with ICAO provisions, as described in the MSA/Project Document. ICAO CDI suggested that as it is a Regional project, the best way to do this would be for the CRV OG to take the resolution to close the project, conclude that all objectives have been reached within this project, and advise the project management of ICAO APAC Regional Office.

13.3 The CRV OG/12 Meeting acknowledged the significance of CRV's security assessment task, an APAC regional network. Given that the timeline to utilize the remaining funds is five years, from December 2022 to December 2027, the Meeting suggested not using MSA's remaining money for security assessment work. As the security assessment of CRV is essential and crucial for determining the security and trust of the APAC regional network, the Meeting agreed to incorporate this task in the new CRV contract management process.

13.4 During CRV OG ad-hoc expert group Meetings held after CRV OG/12 in 2024, further discussion was held on utilizing the remaining money for the CRV II Request for Proposal (RFP) process if it will be done in the future. Some CRV experts shared an example of a recent Caribbean Air Navigation Services Network (CANSNET) RFP project executed in support of ICAO CDI and the high service fee charged by ICAO CDI based on tender value. CRV Ad-hoc expert group shared concerns about following similar practices for CRV II RFP and its impact on CRV users as CRV RFP value may go up to millions of dollars.

13.5 CRV OG Ad-hoc Expert Group recommended that ICAO CDI follow a similar process for supporting the CRV II RFP as was used in 2014 for the initial CRV RFP. Since the MSA was signed in 2014 and the revised project document was attached to the same MSA, the ICAO Secretariat was requested to coordinate with ICAO CDI to apply the same terms and conditions for the CRV II RFP using the remaining funds.

13.6 The Meeting was informed that ICAO CDI will support the implementation of RAS14801 Rev B. It informed that the document has been approved and signed, and ICAO CDI considers that the implementation is ongoing under APAC management. ICAO CDI will support any request for the recruitment and deployment of experts (budget of 46,000 USD) and the purchase of equipment and/or services (budget of 30,000 USD). ICAO’s overhead will be applied accordingly, as agreed in the approved budget (BL 53.001). In addition, if the project wants to implement the budget in one year, there will be no problem.

Agenda Item 14: Cyber-safety/security and resilience

Cyber-safety/security and resilience – Review of the CANSO Cyber Security Guide – New Zealand (WP/26)

14.1 New Zealand informed that during the 12 December 2024 Ad Hoc Experts Group Meeting, it was suggested that the CANSO Standard of Excellence in Cyber Security could be a good document for the CRV OG to review and potentially adopt. It informed that the CANSO Standard of Excellence in Cyber Security is a document freely available from the CANSO website. It was added that the Standard of Excellence (SoE) contained the cybersecurity maturity model to enable an Air Navigation Service Provider (ANSP) to assess its own as well as their suppliers’ cybersecurity maturity.

It was informed that the maturity model comprised thirteen elements based on six functions that would be expected in an organization with an effective approach to cybersecurity. Each element was described in detail in the maturity model, with five different levels of maturity ranging from having informal arrangements in place to an optimized approach. The assessment against each element was conducted using a scoring form containing probing questions, which enables an organization and its supply chain to identify their current level of maturity.

14.2 Some document references and an example output were described in detailed. The idea was to first agree a maturity level that is acceptable and then to carry out the maturity assessment. Once the assessment has been carried out, a plan is created to improve any score that is below the agreed acceptable level. Using CANSO Standard of Excellence in Cyber Security to assess the CRV, the result was as follows:

	CRV OG CANSO SoE Maturity Assessment	Target Score	Assessed Score
	Element		
LEAD AND GOVERN	Leadership and Governance	C	A
	Information Security Management System (ISMS)	C	A
IDENTIFY	Risk Assessment	C	A
	Information sharing	C	A
	Supply Chain Risk Management	C	A
PROTECT	Identity Management and Access Control	C	B
	Human Centred Security	C	A
	Protective Technology	C	B
DETECT	Anomalies and Events	C	B
RESPOND	Response Planning	C	B
	Mitigation	C	A
RECOVER	Recovery Planning	C	A

14.3 With the aforementioned, the following draft conclusion was proposed for Meeting adoption, which was endorsed by the Meeting for CNS SG/29 adoption:

Draft Conclusion CRV OG/13/07- Adopt the CANSO Standard of Excellence in Cyber Security	
What: The CRV OG recommends the CANSO Standard of Excellence in Cyber Security and: a) Prefers an acceptable maturity level of Target Score 'C'. b) Carries out the maturity assessment on the CRV. c) Request that PCCWG also carry out the maturity assessment. d) Request each state to carry out the maturity assessment.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical

e) Create a plan to address the gaps in the maturity score for the CRV.	
Why: To have a standard Cyber Security maturity applied to the CRV.	Follow-up: ☒Required from States
When: 8-Mar-25	Status: Draft to be adopted by Subgroup
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other: XXXX	

14.4 The Meeting noted that many States/Administrations have their own cybersecurity framework and standards to follow. However, it was agreed that the proposed maturity assessment on the CRV is not time-consuming and challenging, and it is recommended that all CRV users do it.

Doc 10169: ACCP Development Update and SWIM TF's need for PKI- (WP/27) Singapore

14.5 The paper presented the development of the ICAO Document 10169: Aviation Common Certificate Policy (ACCP) and the need for a Trust Framework Instance (TFI) for the Asia and Pacific SWIM Implementation.

14.6 During the First Working Session of the SWIM Implementation Pioneer Ad-hoc Group (SIPG WS/1), the need to establish a TFI to support SWIM implementation in the APAC region was raised. However, it was emphasized that SWIM is just one of several use cases requiring the establishment of TFI and that PKI is needed for all TFIs within APAC, not only for SWIM. Other use cases identified by the TFP include Controller Pilot Data Link Communication (CPDLC), Satellite Based Augmentation System (SBAS), Electronic Personal Licenses, etc. This suggested that PKI implementation should not be the sole responsibility of the SWIM TF.

14.7 While the implementation approach for PKI within the APAC region is still under discussion, SIPG WS/1 raised that, as the contributory body responsible for the APAC regional common network, the CRV OG should be informed of the development progress of the ACCP and the need for TFI for the Asia and Pacific SWIM implementation.

14.8 CRV OG shared that it already has a lot of responsibilities as per the agreed ToR. CRV OG can't support the implementation of provisions mentioned in various documents such as the Manual of the Public Key Infrastructure (PKI) Policy for Aeronautical Communications (Doc 10095), EPL Technical Specifications for Implementation and Verification (Doc 10190), Aviation Common Certificate Policy (Doc 10169), Manual on Aviation Information Security (Doc 10204) or Manual on Trust Frameworks. CRV OG recommended that there is a need for additional contributory bodies to support APAC States for the imperfection of various provisions arising from these documents for various areas of CNS. It was requested that the ICAO Secretariat share this concern with the ACSICG/12 meeting for further discussion. **ACTION ITEM 13-31**

14.9 On the request of a meeting, New Zealand agreed to prepare a working paper to propose the need for dedicated contributory bodies to implement cybersecurity provisions arising from the Trust Framework Panel and Communication Panel for CNS SG/29 consideration. The meeting was informed that **CNS SG/29 is planned for 16-20 June 2025. ACTION ITEM 13-32**

CRV Security Evolutions in AMHS- (WP/35)- France

14.10 France informed that DSNA had presented different papers in previous CRV-OG Meetings to address the security issue in the CRV context to be in line with its safety requirements, to protect its assets against potential cyber-attacks, and to meet the national regulations. It was added that an SAR (Security Risk Assessment) was released to interconnect the French Polynesia and New

Caledonia network infrastructures as a basis for the CRV to exchange AMHS and Voice communication with its counterparts. In the SAR, the security has been analyzed under the spectrum of the main items relevant to security: Availability, Integrity and Confidentiality (Authentication and Non-repudiation have not been considered). Consequently, the primary outcome of the SAR lies in the recommendation to set up encryption, which could be achieved without deploying a complex global PKI thanks to network capabilities like the use of the IPSec protocols.

14.11 France informed that the use of cryptography protocols at a network level (Like IPSec) between end-to-end systems above the ICAO Regional IP network represents significant progress in increasing security and in Meeting the data encryption requirements derived from a SAR. Nevertheless, in the case of aeronautical AMHS message handling systems like MTA (Message Transfer Agent), UA (User Agent) or AFTN/AMHS gateway, it would be more suitable to use security capabilities already available in the OSI/ITU-T standards at the application level embedded in the AMHS protocol and being standardized at the ICAO level.

14.12 France added that the first set of AMHS security specifications was specified a long time ago in Doc 9880 Edition 2, but they were never implemented operationally, notably due to a lack of a common PKI and trust framework. ICAO technical groups developed a significant set of AMHS security enhancements for proposed inclusion in Doc 9880 by the ICAO Montreal Communications Panel that was adopted by CP/DCIWG (Communication Panel/ Data Communication Working Group) and integrated into the recently published (End of 2024) Doc 9880 Edition 3 Part II.

14.13 The Meeting was informed that “AMHS Security” in Doc 9880 Part II refers to X.400 security functionalities implemented in the application layer. They implemented “above” network security (IPSec, for example) and transport security (TLS, for example). AMHS Security is independent of network security and transport security and relies upon asymmetric cryptography (digital signatures) and public key certificates (X.509). It was added that the majority of AMHS messages are actually the result of conversion of AFTN messages at an AFTN/AMHS gateway. Thus, this excludes the application of any kind of AMHS security protocol fields and rules, thereby creating a significant gap in the capability to implement a secure AMHS. In addition, UA-to-MTA and MTA-to-MTA connections are poorly protected (only the password).

14.14 The Meeting noted that **three major security upgrades are introduced in Doc 9880 Edition 3**: Introduction of strong authentication from UA to MTA and MTA to MTA (use a cryptographic “Bind-token” instead of the current password in clear); Message origin authentication and content integrity for messages generated by AFTN/AMHS Gateways (MTCU: Message Transfer and Control Unit), so as to cover 99% of the AMHS traffic; and Update of cryptographic algorithms: Doc 9880 Edition 2 cryptographic settings were 20+ years old, they are replaced with state-of-the-art cryptographic algorithms.

14.15 It was concluded that X.400-based AMHS Security requires the provisioning of trustworthy public key certificates delivered by a commonly trusted PKI, and it will considerably enhance Cybersecurity in the AMHS environment when implemented. It was reiterated that cybersecurity in the AMHS environment is not only “AMHS Security” but also a PKI deployment, which is a prerequisite to deploying AMHS security to meet the ICAO standards.

14.16 France recommended that the implementation of security at the application level or at least with end-to-end network encryption mechanism aside from the ICAO Regional IP network should be given the level of priority corresponding to the level of threat against organization integrity and air traffic control safety. Security might have a substantial impact on safety. It was added that the standardization is available in the ICAO Doc 9880 to provide a high level of security for AMHS, and a PKI deployment is a prerequisite to deploying AMHS security to meet the ICAO standards. The meeting appreciated France for such vital information and requested that this information be shared with the ACSICG/12 Meeting. **ACTION ITEM 13-33**

Review of the CANSO Cyber Security Risk Assessment Guide- New Zealand (WP/37)

14.17 New Zealand informed that at the CRV OG/12 in Denarau Island, Fiji, from 23-26 January 2024, it was suggested that the CANSO cyber security risk assessment guide could be a good document for the CRV OG to review and potentially adopt. It was recalled that CRV OG had captured some risks in the past using the Airways New Zealand Risk Assessment Framework. However, this is very specific to New Zealand operations. The meeting noted that the CANSO cyber security risk assessment guide is freely available on the CANSO website.

14.18 It was informed that whilst the cyber security risk assessment guide focused on cybersecurity risk, the concepts in this document could be used to provide a risk assessment framework for the CRV. The meeting noted that the guide guides risk assessment scope, risk assessment, risk mitigation and monitoring, risk acceptance, and risk communication and consultation. In addition, the risk assessment matrix focuses on whether the risk is Unacceptable, Tolerable or acceptable. It was added that whilst the ICAO Doc 9859 - Safety Management Manual (SMM) covers the same concepts, it is possible to use the CANSO framework to create a CRV Risk assessment and associated process and procedure at an acceptable level for the CRV.

Agenda Item 15: Review ToR and update Action Items of CRV OG

Review CRV OG ToR and Action Items - Sec (WP/29)

15.1 The Meeting reviewed the ToR of CRV OG and further updated the Action Items for CRV OG. There were no updates in the ToR of CRV OG. The list of action items is provided in **Appendix E** of this report.

Agenda Item 16: Next Meetings and any other business

PCCWG Re-organization – Sec (IP/02)

16.1 The Meeting shared noted that PCCW Global informed the ICAO APAC Office that as part of internal reorganization, with effect from 1 April 2024, HKT Global (Singapore) Pte. Ltd. and PCCW Global Limited have novated, assigned and transferred to PCCW Global Limited and HKT Global Operation (HK) Limited respectively the relevant services agreements (the "Agreements") signed with the local civil aviation authorities were shared. ICAO APAC Office shared this information with APAC States by ICAO APAC State Letter Ref.: T 8/2.15 – AP141/24 (CNS) dated 3 December 2024 titled CRV Service Provider- PCCW Global Group Re-organization. The letter is provided in **Appendix F**.

16.2 Some States shared their concerns about the current approach of information sharing by PCCW Global about the PCCW Global reorganization to the States only a few weeks before the next billing cycle, resulting in several legal issues within the States. The meeting agreed that such changes must be discussed bilaterally rather than directly informing the states to avoid problems in the contract. PCCW Global shared that they will enhance communication with States and do advance coordination for any organizational changes that affect States in the future.

Date and Venue for the Next Meeting

16.3 The Meeting agreed on the need to organize the **Special Session- CRV OG/14** as an In-Person Meeting for **5 days** to progress to the next stage of the CRV contract management process from **27-31 October 2025**.

16.4 Japan offered to host the **Special Session- CRV OG/14** in Tokyo, Japan, along with the PSIDS capacity-building workshop planned from 23-24 October 2025. It was noted that Japan will organize and manage the PSIDS capacity-building workshop. Japan added that it would also support

the cost for one member from each PSIDS to attend the workshop and *Special Session- CRV OG/14* in Tokyo, Japan.

16.5 The ICAO Secretariat will coordinate with Japan to make further arrangements to organize the CRV OG/14 Meeting in Tokyo, Japan.

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Standard Operating Procedure (SOP) for Engaging Support from ICAO Secretariat & CRV Operations Group (CRV OG) in Dispute Resolution

1. Introduction

This SOP provides a structured process for Member States to engage the support of the ICAO Secretariat and CRV Operations Group (CRV OG) before executing the terms and conditions for dispute resolution, mediation, and arbitration.

The ICAO Secretariat and CRV OG act as third-party advisors to assist Member States in navigating complex disputes, ensuring that all actions taken are in compliance with international standards and best practices.

2. Purpose

The purpose of this SOP is to ensure that member States are adequately supported by the ICAO Secretariat and CRV OG before entering into formal dispute resolution mechanisms. This support is designed to provide expert guidance, facilitate discussions, and offer recommendations that may prevent the escalation of disputes.

3. Applicability

This SOP applies to all Member States engaged in disputes related to the CRV, where the States have agreed in writing to seek guidance from the ICAO Secretariat and CRV OG before initiating formal dispute resolution processes such as mediation or arbitration.

4. Process for Engaging Support

4.1 Request for Support

i. **Initiation:** Any member State involved in a dispute may initiate a request for support from the ICAO Secretariat and CRV OG. The request should be made in writing and should include a brief description of the dispute, the specific issues requiring guidance, and any relevant documentation.
ii. **Submission:** The written request should be submitted to the designated contact point within the ICAO Secretariat and CRV OG.

4.2 Evaluation of Request

i. **Review:** Upon receipt of the request, the ICAO Secretariat and CRV OG will review the details of the dispute and determine the appropriate level of support required.
ii. **Assignment of Advisors:** If necessary, the ICAO Secretariat and CRV OG will assign subject matter experts to assist the Member State. These experts may include legal advisors, technical specialists, or other relevant professionals.

4.3 Provision of Support

Guidance and Recommendations: The assigned advisors will provide the member State with guidance and recommendations based on the specific issues raised.

This may include:

1. **Legal Guidance**: Advising on the interpretation of contractual terms and conditions, relevant laws, and international regulations.
2. **Dispute Avoidance Strategies:** Recommending strategies to prevent the escalation of the dispute and encourage amicable resolution.
3. **Facilitation of Discussions:** Assisting in the facilitation of discussions between the disputing parties to achieve a mutual understanding and potentially avoid formal dispute resolution processes.
4. **Documentation:** All guidance and recommendations provided by the ICAO Secretariat and CRV OG will be documented and shared with the requesting member State.

4.4 Follow-Up and Feedback

i. **Monitoring:** The ICAO Secretariat and CRV OG will monitor the progress of the dispute following the provision of support. The Member State may be required to provide updates on the status of the dispute and the effectiveness of the guidance received.
ii. **Feedback:** The Member State will be asked to provide feedback on the support received, which will be used to improve future assistance provided by the ICAO Secretariat and CRV OG.

4.5 Facilitation and Advisory Support in Negotiation

i. **Facilitation Role:** While ICAO and CRV-OG will not directly act as negotiators, they may facilitate negotiations by providing logistical support, organizing discussions, and offering technical and legal guidance as needed.
ii. **Advisory Support:** ICAO and CRV-OG will remain available to offer expert advice during negotiations, ensuring that all parties have access to the information required to make informed decisions. This support will be provided in a manner that maintains their neutrality and impartiality.

5. Confidentiality

i. **Confidentiality Assurance:** All communications and documents shared during the support process will be treated as confidential. Both the ICAO Secretariat and CRV OG, as well as the member State, are required to adhere to strict confidentiality protocols.
ii. **Non-Disclosure Agreements (NDAs):** All parties involved in the support process, including any advisors assigned by the ICAO Secretariat and CRV OG, shall sign an NDA to ensure that all information remains confidential.

6. Escalation and Settlement of Dispute

i. **Settlement of Dispute:** In cases where the dispute is resolved through the support process or formal dispute resolution, the settlement should be documented in a written agreement. This settlement should include:

   a) **Resolution Terms**: A clear outline of the terms agreed upon by the parties involved, including any actions to be taken or changes to be implemented.
   b) **Implementation Plan**: A plan for implementing the agreed-upon terms, including timelines and responsibilities for each party.
   c) **Monitoring and Compliance:** Procedures for monitoring compliance with the settlement terms and resolving any issues that may arise during implementation.
   d) **Confidentiality and Non-Disclosure:** Assurance that all aspects of the settlement and related documents remain confidential, with appropriate non-disclosure agreements in place.

   The settlement should be signed by all parties involved and shared with the ICAO Secretariat and CRV OG for record-keeping and oversight purposes.

ii. **Escalation Process:** If the dispute remains unresolved after the support provided by the ICAO Secretariat and CRV OG, the Member State may escalate the matter to the next stage of formal dispute resolution, including mediation or arbitration.

7. Conclusion

This SOP ensures that Member States have access to expert guidance and support from the ICAO Secretariat and CRV OG before engaging in formal dispute-resolution processes. By following this procedure, States can make informed decisions that align with international standards, reduce the likelihood of disputes escalating, and preserve relationships between parties.

Common aeRonautical Virtual Private Network (CRV) Operations Group

(OG) of Asia/Pacific Air Navigation Planning and

Implementation Regional Group (APANPIRG) (APANPIRG CRV OG)

OPERATIONS MANUAL

Edition v1.4 - February 2025

Record of Amendment

A/L No	Date	Entered By	A/L No	Date	Entered By
1.0	1/12/2020	Vaughan Hickford			
1.1	29/04/2022	Vaughan Hickford			
1.2	30/01/2023	Vaughan Hickford			
1.3	26/01/2024	Vaughan Hickford			
1.4	20/02/2025	Vaughan Hickford			

Contents

1 PART I: FOREWORD

1.1 Introduction

a. The Common aeRonautical Virtual Private Network Operations Group (CRV OG) Operations Manual is an informal publication prepared by the CRV Task Force, CRV OG intended to provide, for easy reference of interested parties, a consolidation of material, particularly of a procedural nature, about the work of the CRV OG and its contributory bodies. It contains the Terms of Reference of the CRV OG established by the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) (Decision 27/34). It also contains the working arrangements and internal instructions developed by the Group for the practical application of its Terms of Reference.

b. The document describes; Terms of Reference; Composition; Position within ICAO; Working Arrangements; Rules of Procedure and Practices governing the Conduct of Business.

c. The framework of Part and Sections headings in addition to the page numbering has been devised to provide flexibility and the facilitation of the revision of additional or new material. Each Part includes an Introduction giving its purpose and status. A Table of Contents is also provided which serves also as a subject index and as a check list for the current pages.

d. All pages bear the date of issuance. Replacement pages will be issued as necessary and any portion of a page that has been revised will be identified by a vertical line in the margin. Additional arterial will be incorporated in the existing Sections or will be the subject of new Sections, as required.

e. Changes to text will be identified by a vertical line in the margin in the following manner;

   i. N for new or revised text;
   ii. E for editorial modification that do not alter the substance or meaning of the text;
   iii. D for deleted text

   iv. For practical reasons, this shall not be applied to title pages or to the routine insertion and deletion of Conclusions and Decisions. The absence of change bars, when data or page numbers have changed, will signify reissue of the section concerned or rearrangement of text (e.g., following an insertion or deletion with no other changes).

f. The Operations Manual will be distributed to Members and Observers of APANPIRG, the ICAO Secretariat, and to other States and international organizations participating in meetings, contributing to, or having interest in the work of the CRV OG and/or its Contributory Bodies.

2 PART II: TERMS OF REFERENCE, COMPOSITION AND POSITION IN ICAO OF THE CRV OG

2.1 Background

The establishment of APANPIRG CRV OG was proposed during the deliberations of the CRV Task Force (TF) as a dedicated group to provide oversight of the CRV operations and the performance of the CRV Service Provider. The APANPIRG CRV OG is formally established by APANPIRG Decision 27/34.

2.2 Terms of Reference

The Common Regional Virtual Private Network (VPN) Operations Group (OG) will provide oversight of the function and performance of the CRV and the performance of the Service Provider. The following are the activities to be performed:

a. Oversee the implementation of the CRV post Contract Award;
b. Manage issues arising from the transition with CRV TF, if any;
c. Co-ordinate and standardize the establishment or upgrade of CRV services as required;
d. Co-ordinate activities with other ICAO CRV OGs, if any, to make sure that decision making and communication with CRV Service Provider is consistent and timely;
e. Oversee the performance of the CRV Service Provider, including customer service;
f. Oversee the performance of the CRV network;
g. Oversee the escalation and solving by the CRV Service Provider of issues associated with the provision of the CRV, including safety and security related issues;
h. Assist with the resolution of issues associated with the provision of the CRV among the CRV Users as required, including safety and security related issues;
i. Assist with the migration of Aeronautical Fixed Services (AFS) onto the CRV, in line with the GANP and seamless ATM plan;
j. Maintain CRV OG documentation associated with the function, performance and management of the CRV, including the CRV OG Operations Manual, a list of CRV users and a record of variations to the common tender package;
k. Accept deliverables from the CRV Service Provider on behalf of the CRV Users as required;
l. Promote the use of CRV; and
m. Perform any other activity as required by CRV operations.

2.3 Reporting

The CRV OG will report to Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) through ACSICG and CNS SG.

2.4 Participation

The CRV OG will include all APAC Member States/Administrations, and any other organization as needed.

2.5 Conduct of the work

It is anticipated that the CRV OG will conduct its work primarily by Web Conferences, teleconferences and other electronic means of communications. Face to Face meetings of CRV OG may be required on an annual basis. The ICAO APAC Regional Office will provide secretariat support for the CRV OG.

2.6 Rapporteur

There will be two Co-Chairpersons of the CRV OG, one primarily responsible for Asia coordination and the other for Pacific coordination.

2.7 Position within ICAO

a) CRV OG shall be the guiding and co-ordinating organ for all activities conducted within ICAO concerning the Common aeRonautical VPN for the Asia and Pacific Regions. However, it shall not assume authority vested in other ICAO bodies, except where such bodies have specifically delegated their authority to the Group. The activities of the Group shall be subject to review by the APANPIRG.

b) The work of groups established, and meetings held within the framework of ICAO, concerned with the Asia and Pacific CRV shall be coordinated with the CRV OG to ensure full harmonization with all regional activities regarding the development and operation of the Asia/Pacific system.

3 PART II: WORKING ARRANGEMENTS

3.1 APANPIRG Procedural Handbook

The CRV OG shall be guided by the APANPIRG Procedural Handbook to ensure that work arrangements are consistent with its parent body.

3.2 Administration of the CRV OG

c) The CRV OG shall be administered as follows:

   i. by two (2) Chairpersons, one elected from the Representatives designated by member States of the Group from ASIA Region and one from the PACIFIC region; and

   ii. by ICAO Regional Officer, Asia and Pacific Office designated as Secretary CRV OG by the Regional Director of ICAO. In the execution of duties, the Secretary will be supported by the Asia and Pacific Regional Office.

d) The Chairpersons, in close co-ordination with the Secretary, shall arrange for the most efficient working of the Group. The Group shall always work with a minimum of formality and paperwork.

e) Between meetings of the CRV OG, some subjects may be dealt with by correspondence among appointed Representatives of Member States through the Secretary of the CRV OG. However, if States are to be consulted this should be done through the ICAO Regional Director, Asia and Pacific Office.

Service Strategy

- Strategy Management
- Service Portfolio Management
- Financial Management
- Business Relationship Management
- Demand Management

Service Design

- Service Catalogue Management
- Availability Management
- Capacity Management
- IT Service Continuity Management
- Service level Management
- Design Co-ordination
- Information Security Management
- Supplier Management

Service Transition

- Transition Planning and Support
- Change Management
- Service Asset & Configuration Management
- Release and Deployment Management
- Service Validation and Testing Management
- Change Evaluation
- Knowledge Management

Service Operation

- Event Management
- Incident Management
- Request Fulfilment
- Problem Management
- Access Management

Continual Service Improvement

- Service Review
- Process Evaluation
- Definition of CSI Initiatives
- Monitoring CSI Initiatives

4 PART III: SERVICE STRATEGY

4.1 Strategy Management

Process Objective: To assess the service provider's offerings, capabilities, competitors as well as current and potential market spaces in order to develop a strategy to serve customers. Once the strategy has been defined, Strategy Management for IT Services is also responsible for ensuring the implementation of the strategy.

a) Reduce telecommunication costs in most cases (to be confirmed by local CBA)
b) Enable integration in the aeronautical infrastructure and enhanced services (GANP, regional objectives)
c) Enhance information security
d) Provide a standardized interface for AFS (instead of multiple protocols, some of which are obsolescent)
e) Rationalize coordination for network management and enhancement
f) Respond to Air Traffic requirements in a timely and standardized manner
g) Coordination with Other Regional Private Networks
h) Promote the use of CRV

4.2 Service Portfolio Management

Process Objective: To manage the service portfolio. Service Portfolio Management ensures that the service provider has the right mix of services to meet required business outcomes at an appropriate level of investment.

- Criteria for services to be added to CRV.
- POC of new services.

4.3 Financial Management

Process Objective: To manage the service provider's budgeting, accounting and charging requirements.

4.4 Business Relationship Management

Process Objective: To maintain a positive relationship with customers. Business Relationship Management identifies the needs of existing and potential customers and ensures that appropriate services are developed to meet those needs.

4.4.1 **CRV Contract**

The CRV contract, as selected by the ICAO TCB and ratified by CRV Task Force Members, was established to begin on 31st December 2017.

The terms of the contract with the CRV SERVICE PROVIDER are set for an initial Five Years with additional One-year, Two year or Three year contract additions until 31st December 2028.

Note: *The terms of the contract with the CRV SERVICE PROVIDER were set for an initial Five Years with Five additional One-year contract additions totalling a Ten-year contractual agreement until 31st December 2027*.

APANPIRG/33/7 approved a contract extension of one year.

CRV Users are expected to establish contracts directly with CRV SERVICE PROVIDER Global utilizing the CRV Common Package or their own contract terms.

As new CRV Users join the CRV, they should align their service terms to end on 31st December 2028, in alignment with existing CRV members.

For example, States that join on 31st December 2022 can exercise a Five-Year contract with a single One-year extension. ANSPs that join later will have a shorter contractual term to end on 31st December 2028.

A contract shorter than Five-year contract would result in higher cost, per contract agreement.

If the new “Package” contract is less than 5-year term, the new monthly charge will be confirmed once a formal request is submitted.

Contract period	
5 years	Quotation is based on "price sheet_6 Package"
4 years	budgetary 10% increase loading under on "price sheet_6 Package"
3 years	budgetary 20% increase loading under on "price sheet_6 Package"
2 years	budgetary 30% increase loading under on "price sheet_6 Package"
1 year	budgetary 40% increase loading under on "price sheet_6 Package"

4.4.1.1 Signing the contract

When signing the contract with the Service Provider the Authority only needs to complete and sign the Service Order and complete the details in the Terms and Conditions.

The Service Order form is governed by:

(a) Terms and Conditions between PCCW Global and CRV Authority [Ref (_____)]

(b) The CRV Terms of Reference (including all annexes)

(c) Specific Terms for MPLS VPN Service, Specific Terms for Managed Router Service and Specific Terms for Satellite VSAT Services (the “Specific Terms”)

(d) Addendum to the Specific Terms.

(e) The price schedule in their latest applicable version.

(f) The Project Management Plan in its latest applicable version

(g) The CRV implementation plan in its latest applicable version.

Your legal team may want to:

(a) Add a signature block to the Terms and Conditions

(b) View the above-mentioned documentation

(c) View the Common Package

4.4.1.2 Upgrade/downgrade of CRV circuits subscribed

Refer to ADDEDUM TO TERMS AND CONDITIONS.

4.4.1.3 Addition of new sites and services in the

Refer to ADDEDUM TO TERMS AND CONDITIONS.

4.4.2 Common Package

The Common Package is the common set of documents required to be used to join and operate the CRV Network.

The documents and how they relate to the stages in the Design and Implementation document flow is detailed below.

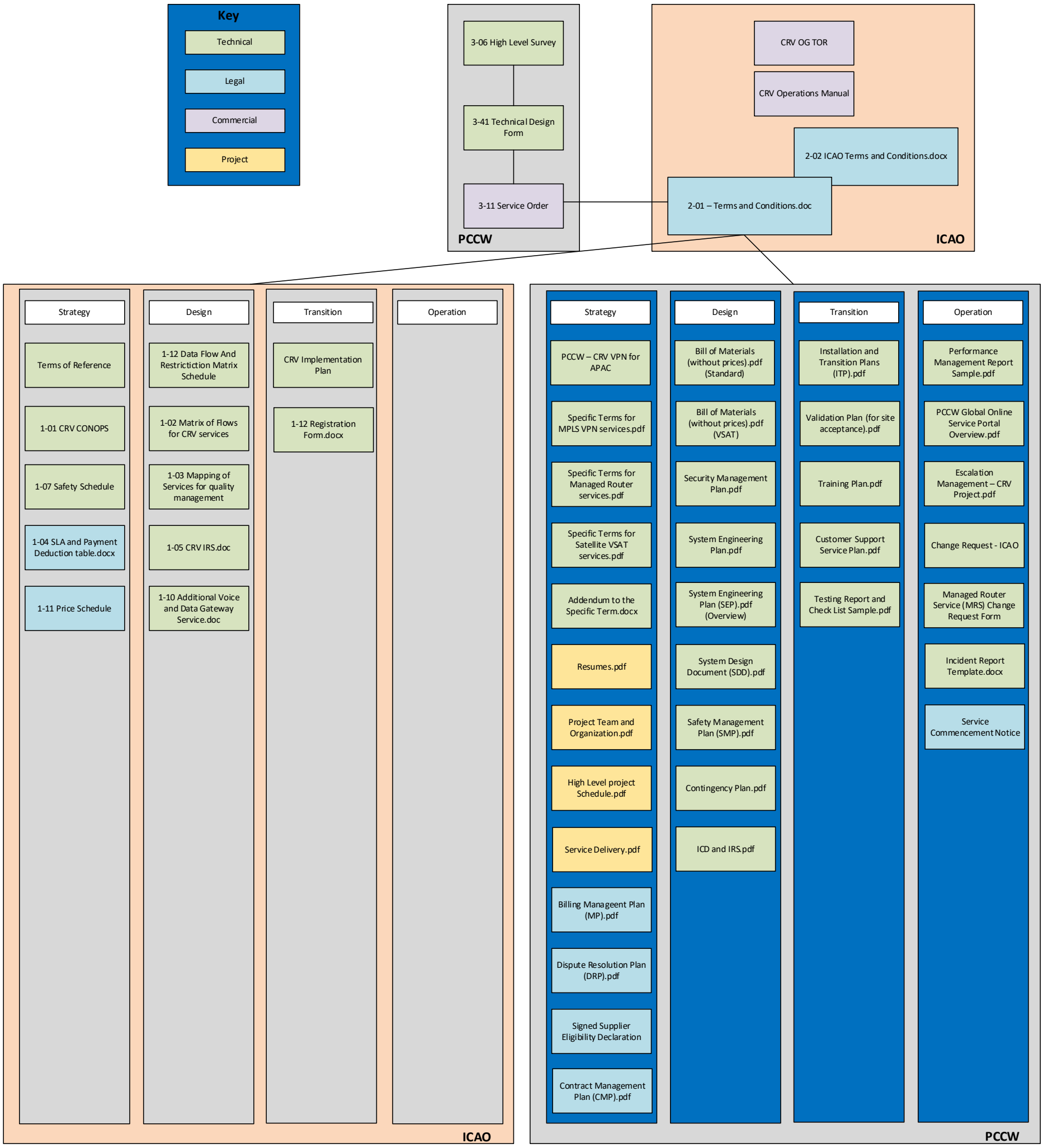
The Common Package contains documents that are essential for an order/contract (Blue documents) and general/common documents that assist with the design, implementation and

operation (Orange documents). The Common Package Change Control record lists the blue and orange documents.

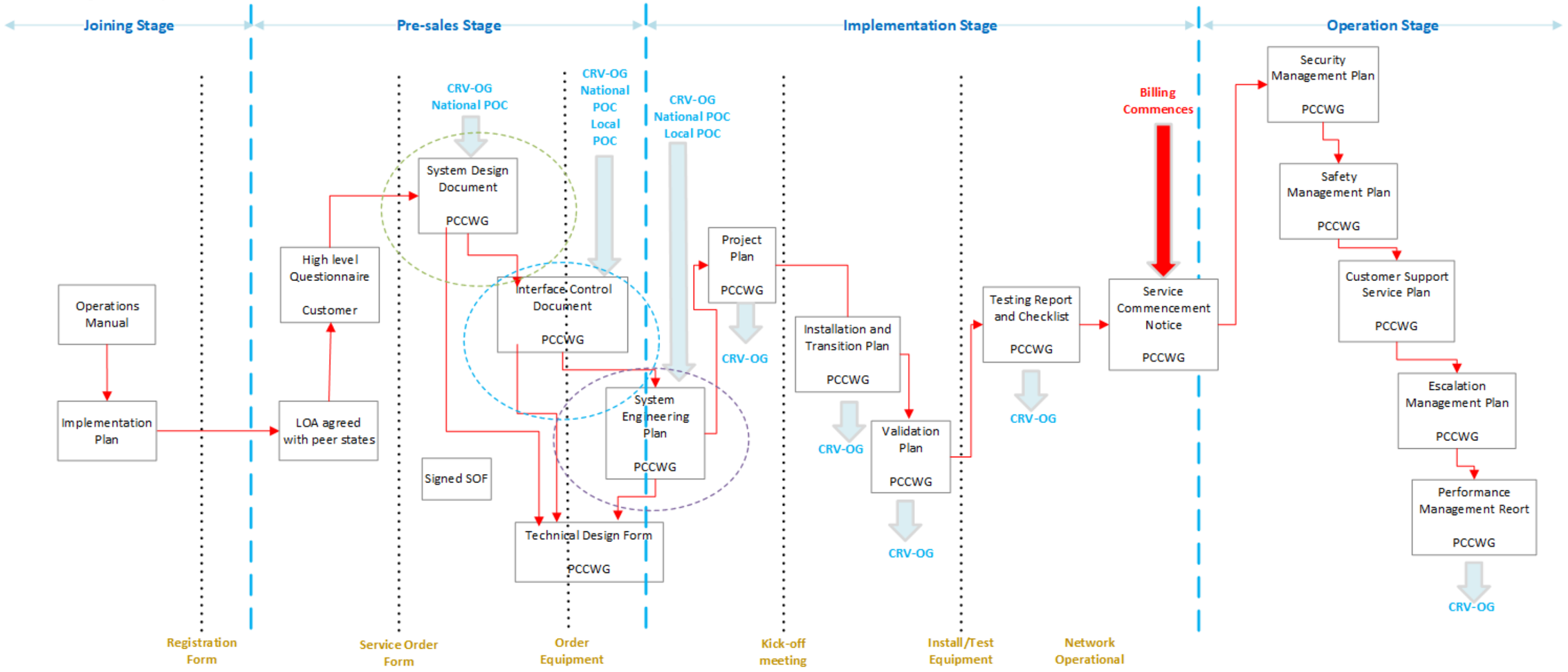
This is located on the CRV Users Portal here: Common Package.

4.4.2.1 Legal Documentation

The list below shows the precedence of the legal documents that pertains to CRV.



4.4.3 Design and Implementation document flow



4.4.3.1 Joining Stage

a. Operations Manual

This provides the Policies, Processes and Procedures for the Strategy, Design, Transition and Operation of the CRV network.

b. Implementation Plan

The purpose of this Implementation Plan is to provide guidance for all States/ Administrations on the operation requirements for implementing the Common aeRonautical Virtual Private Network (CRV) used in Asia/ Pacific (APAC) Region and the roadmap for implementation.

It contains information on Points of Contacts for each State, Allocated IP addressing for States and Service Providers, proposed implementation dates and suggested tests.

IP Addressing is also listed on the APAC CRV Portal.

c. Registration Form

Provides the information required to connect to CRV as an ANSP.

Example of the Registration Form

4.4.3.2 Pre-Sales Stage

a. LOA agreed with peer states

Before signing with CRV SERVICE PROVIDER, members should agree an LOA with peer states to ensure alignment with each other for connectivity with CRV SERVICE PROVIDER and services expected to be shared between states.

The LOA should consider the following:

I. The Scope of Services between states
II. System Operations
III. First Level Support
IV. Escalated Support
V. Re-affirm performance goals
VI. Security
VII. Constraints
VIII. Maintenance Procedures/Schedules/Notifications
IX. Points of Contact
X. Terms of the agreement
XI. Go Live Date for each State
XII. CRV service commissioning tests
XIII. ANSP Service tests

NOTE: Ensure that the dates agreed between states for the connectivity is also agreed with the CRV Service Provider to ensure the 3-day window is achievable.

b. High Level Questionnaire

This provides the high level information to CRV SERVICE PROVIDER to be able to provide the Service Order Form (SOF) for signing.

Example of the High Level Questionnaire

c. Service Order Form

Provides the information to CRV SERVICE PROVIDER to provide the connection and initiate billing.

Example of the Service Order Form.

d. System Design Document

This is the over-arching Design Document for the CRV Network.

Example of System Design Document

e. Interface Control Document

Example of Interface Control Document

f. Technical Design Form

Example Technical Design Form

g. System Engineering Plan

This is a living document covering the technical aspects of the CRV implementation. Any changes can be updated by the User or CRV SERVICE PROVIDER.

Example of a System Engineering Plan

4.4.3.3 Implementation Stage

a. System Engineering Plan

This is a living document covering the technical aspects of the CRV implementation. Any changes can be updated by the User or CRV SERVICE PROVIDER.

Example of a System Engineering Plan

b. Project Plan

Provided to each state post signing of the Contract and is only relevant to that state. It is updated regularly by the CRV SERVICE PROVIDER Project manager

Example of a Project Plan

c. Installation and Transition Plan

Example of an Installation and Transition Plan

d. Validation Plan

This is CRV SERVICE PROVIDER's testing plan post implementation of the Managed Service

Example of a Validation Plan

e. Testing and Report Checklist

This is the result of CRV SERVICE PROVIDER's Testing plan post implementation of the Managed Service and is accompanied by the Service Commencement Notice (SCN).

The Testing, Report Checklist and the 3-day test window only applies to any new physical install by the CRV Service Provider, that is the circuit, LL and NID.

There is no need to carry out the testing that was carried out during the Proof of Concept (POC) as this would impact current CRV network connections.

At the point the following occurs:

CRV Member led 3-day Test Window (3 working days)

The 3-day test window is to be arranged after the validation plan (CRV SERVICE PROVIDER's testing plan post implementation of the Managed Service) is reviewed and agreed by CRV users and CRV SERVICE PROVIDER.

Ensure that the dates agreed for testing are reflected in the LOA and agreed with the CRV Service Provider.

- Perform a connectivity test (ping or traceroute) between endpoints.

The 3-day test window can be extended PROVIDED that the issue is due to CRV SERVICE PROVIDER (e.g. local loop fault, NID fault, network configuration problem, etc.), or if the implementation of one state is delayed and impacts the implementation of another state, providing the following is met:

1. The peering states have agreed the implementation dates.
2. The CRV Service Provider is advised of the implementation dates and agrees.
3. Any slippage of the agreed dates by the CRV Service Provider does not impact the Authority's ability to carry out the 3-day test before billing commences.

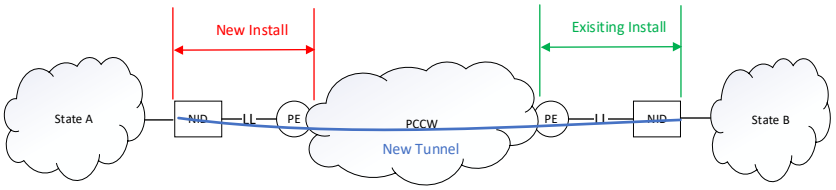
If the issue is due to CRV user (e.g. equipment not ready, counter-part not available, etc.), then the CRV Service Provider will still commence the billing after the 3-day test window.

The 3-day test only applies to new connections to CRV being delivered by the CRV Service Provider.

Example of a Testing and Report Checklist

Examples of when to test.

1. **New circuit install single state**.

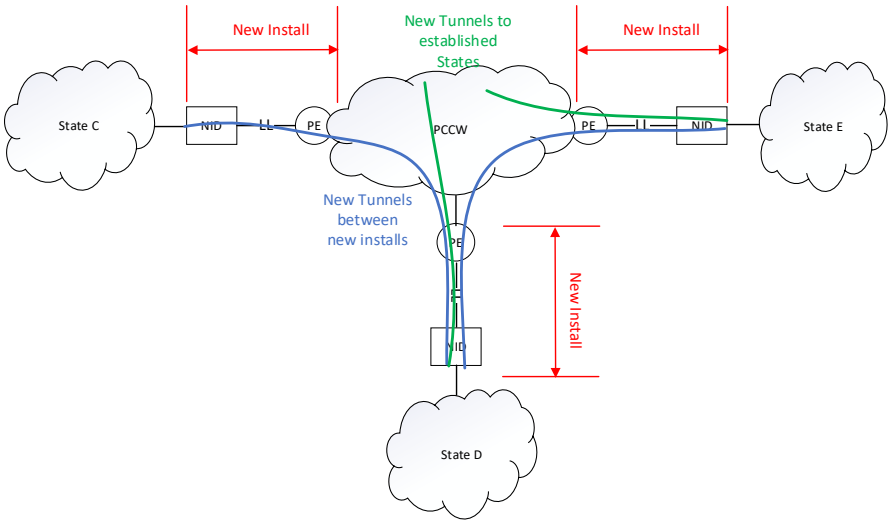


State A is having a CRV circuit installed wither as their first install or an additional site. State A is peering with State B, but State B has an established CRV network connection.

The LOA between the States, details the testing and commissioning dates.

Upon receipt of the Testing and Report Checklist and the Service Commencement Notice from the CRV Service Provider, State A initiates the 3-day testing of connectivity tests with State B.

2. **New circuit install multiple states with delay and test windows.**



State C, State D and State E are all joining CRV and have circuit installs to be completed.

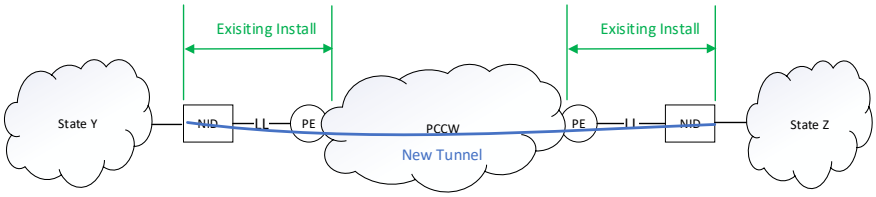
State C is peering with State D only, State D and State E also have a peering with each other and with other established States.

The LOA between the States, details the testing and commissioning dates as they will all have a 3-day test window.

During the installation phase an issue, the install for State D is delayed due to last mile delays, but the installs for States C and E are on track. This will have an impact on the 3-day test windows for the States. Potentially States D and E can continue with the 3-day test window when their circuits have been installed as they have peering's with other States, however State C is impacted because State D is delayed.

All States should now discuss with the CRV Service Provider the need to delay the 3-day test window and billing.

3. **Addition of a tunnel between States.**



State Y and State Z have decided to have a CRV connection between each other. Both States already have an established CRV circuit and tunnels to other States.

The LOA between the States, details the testing and commissioning dates.

The addition of a GRE tunnel between states does not formally initiate the need for the 3-day Test Window, however it is suggested the connectivity test is carried out prior to application testing.

f. Service Commencement Notice

At this point billing will commence. The Service Commencement Notice is accompanied with the Test Report.

4.4.3.4 Operation Stage

a. Security Management Plan

Example of the Security Management Plan

b. Safety Management Plan

Example of a Safety Management Plan

c. Customer Support Service Plan

This details the contact details for any Problems or Incidents that the State may encounter.

Example of a Customer Support Service Plan

d. Escalation Management Plan

This details the contact details if the need arises to escalate any Tickets. It also details the escalation criteria

Example of an Escalation Management Plan

e. Performance Management Report

Example of a Performance Management Report

4.4.4 Engaging Support from ICAO Secretariat & CRV Operations Group (CRV OG) in Dispute Resolution

This SOP provides a structured process for Member States to engage the support of the ICAO Secretariat and CRV Operations Group (CRV OG) before executing the terms and conditions for dispute resolution, mediation, and arbitration.

The ICAO Secretariat and CRV OG act as third-party advisors to assist Member States in navigating complex disputes, ensuring that all actions taken are in compliance with international standards and best practices.

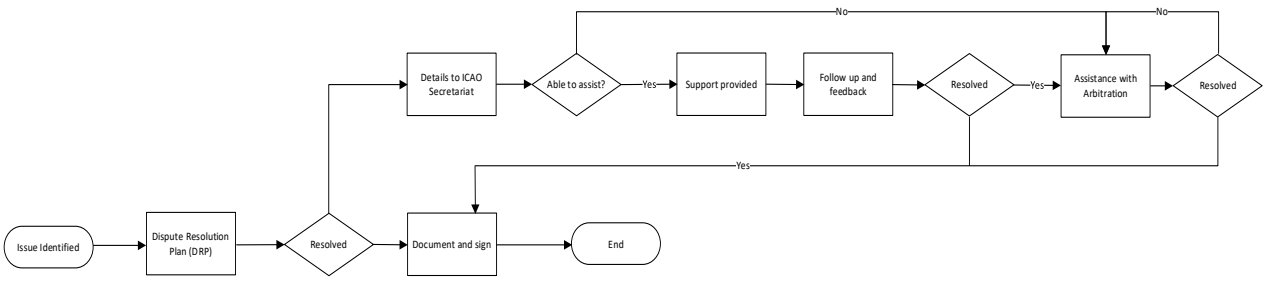
a. Purpose

The purpose of this SOP is to ensure that member States are adequately supported by the ICAO Secretariat and CRV OG before entering into formal dispute resolution mechanisms. This support is designed to provide expert guidance, facilitate discussions, and offer recommendations that may prevent the escalation of disputes.

b. Applicability

This SOP applies to all Member States engaged in disputes related to the CRV, where the States have agreed in writing to seek guidance from the ICAO Secretariat and CRV OG before initiating formal dispute resolution processes such as mediation or arbitration.

c. Process for Engaging Support



i. Request for Support

1. **Initiation:** Any member State involved in a dispute may initiate a request for support from the ICAO Secretariat and CRV OG. The request should be made in writing and should include a brief description of the dispute, the specific issues requiring guidance, and any relevant documentation.
2. **Submission:** The written request should be submitted to the ICAO Secretariat and CRV OG.

ii. Evaluation of Request

1. **Review:** Upon receipt of the request, the ICAO Secretariat and CRV OG will review the details of the dispute and determine the appropriate level of support required.
2. **Assignment of Advisors:** If necessary, the ICAO Secretariat and CRV OG will assign subject matter experts to assist the Member State. These experts may include legal advisors, technical specialists, or other relevant professionals.

iii. Provision of Support

Guidance and Recommendations: The assigned advisors will provide the member State with guidance and recommendations based on the specific issues raised.

This may include:

1. **Legal Guidance**: Advising on the interpretation of contractual terms and conditions, relevant laws, and international regulations.
2. **Dispute Avoidance Strategies:** Recommending strategies to prevent the escalation of the dispute and encourage amicable resolution.
3. **Facilitation of Discussions:** Assisting in the facilitation of discussions between the disputing parties to achieve a mutual understanding and potentially avoid formal dispute resolution processes.
4. **Documentation:** All guidance and recommendations provided by the ICAO Secretariat and **C**RV OG will be documented and shared with the requesting member State.

iv. Follow-Up and Feedback

1. **Monitoring:** The ICAO Secretariat and CRV OG will monitor the progress of the dispute following the provision of support. The Member State may be required to provide updates on the status of the dispute and the effectiveness of the guidance received.
2. **Feedback:** The Member State will be asked to provide feedback on the support received, which will be used to improve future assistance provided by the ICAO Secretariat and CRV OG.

v. Facilitation and Advisory Support in Negotiation

1. **Facilitation Role:** While ICAO and CRV-OG will not directly act as negotiators, they may facilitate negotiations by providing logistical support, organizing discussions, and offering technical and legal guidance as needed.
2. **Advisory Support:** ICAO and CRV-OG will remain available to offer expert advice during negotiations, ensuring that all parties have access to the information required to make informed decisions. This support will be provided in a manner that maintains their neutrality and impartiality.

vi. Confidentiality

1. **Confidentiality Assurance:** All communications and documents shared during the support process will be treated as confidential. Both the ICAO Secretariat and CRV OG, as well as the member State, are required to adhere to strict confidentiality protocols.
2. **Non-Disclosure Agreements (NDAs):** All parties involved in the support process, including any advisors assigned by the ICAO Secretariat and CRV OG, shall sign an NDA to ensure that all information remains confidential.

vii. Escalation and Settlement of Dispute

1. **Settlement of Dispute:** In cases where the dispute is resolved through the support process or formal dispute resolution, the settlement should be documented in a written agreement. This settlement should include:
   a) **Resolution Terms**: A clear outline of the terms agreed upon by the parties involved, including any actions to be taken or changes to be implemented.
   b) **Implementation Plan**: A plan for implementing the agreed-upon terms, including timelines and responsibilities for each party.
   c) **Monitoring and Compliance:** Procedures for monitoring compliance with the settlement terms and resolving any issues that may arise during implementation.
   d) **Confidentiality and Non-Disclosure:** Assurance that all aspects of the settlement and related documents remain confidential, with appropriate non-disclosure agreements in place.

The settlement should be signed by all parties involved and shared with the ICAO Secretariat and CRV OG for record-keeping and oversight purposes.

2. **Escalation Process:** If the dispute remains unresolved after the support provided by the ICAO Secretariat and CRV OG, the Member State may escalate the matter to the next stage of formal dispute resolution, including mediation or arbitration.

d. Conclusion

This SOP ensures that Member States have access to expert guidance and support from the ICAO Secretariat and CRV OG before engaging in formal dispute-resolution processes. By following this procedure, States can make informed decisions that align with international standards, reduce the likelihood of disputes escalating, and preserve relationships between parties.

4.5 Demand Management

Process Objective: To understand, anticipate and influence customer demand for services. Demand Management works with Capacity Management to ensure that the service provider has sufficient capacity to meet the required demand.

5 PART IV: SERVICE DESIGN

Service Design

- Service Catalogue Management
- Availability Management
- Capacity Management
- IT Service Continuity Management
- Service level Management
- Design Co-ordination
- Information Security Management
- Supplier Management

5.1 Service Catalog Management

5.1.1 **Process Objective: To ensure that a Service Catalogue is produced and maintained, containing accurate information on all operational services and those being prepared to be run operationally. Service Catalogue Management provides vital information for all other Service Management processes: Service details, current status and the services' interdependencies.Requirements**

a. Latency (from the ADDENDUM TO THE SPECIFIC TERMS)

Locations	**Average Round Trip Delay**
Within the cities specified in Asia (On-net/Off-net)	200ms
Within the cities specified in Oceania (On-net/Off-net)	200ms
Between the cities specified in Middle East & Europe (On-net/Off-net)	200ms
Within the cities specified in Europe (On-net/Off-net)	200ms
Other cities combination not specified above	600ms

b. Availability (from the ADDENDUM TO THE SPECIFIC TERMS)

Service Package	**Service Availability**
Package A	99.97%
Package B	99.5%
Package B+	99.95%
Package C	99.5%
Package C+	99.7%
Package D	99.5%
Package D+	99.5%

NOTE: Package D does not support analog voice connections but does support VOIP connections. Analog voice is only supported in Packages A, B and C, but this also has an increase in cost for the service.

NOTE: Package D user should consider the advice from the vendor regarding using Package D+ if there are concerns on being able to supply a replacement NID in the event of a failure.

c. Jitter (from the ADDENDUM TO THE SPECIFIC TERMS)

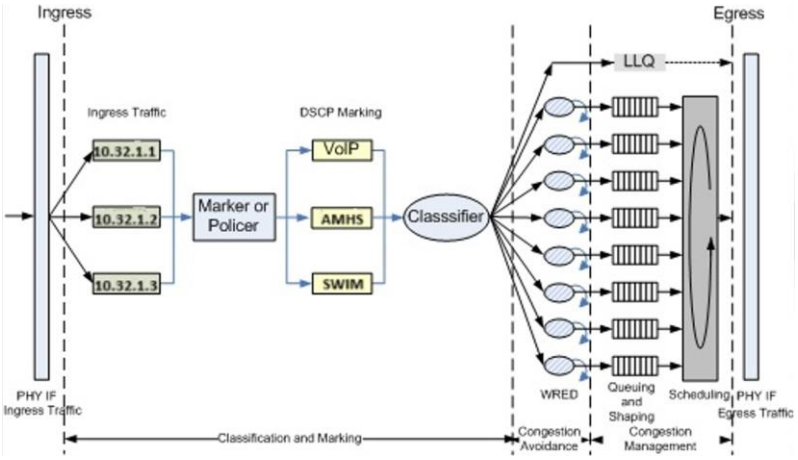
The Target Average Jitter Level for voice application and data application is 15ms and 100ms respectively.

d. Packet Loss

Target Packet Loss Level is <0.5%

e. QoS/DSCP markings

Service class name	DSCP Name
Border Gateway Protocol (BGP)	CS6
Voice	EF
Voice Signalling	CS5 (preferred) EF (if CS5 is not possible)
ADS-B	CS4
AFTN, ATN.	AF21
SWIM	TBD
All traffic not otherwise defined.	DF (CS0)



f. Security

Security is the responsibility of each of the ANSPs. Basic security is provided by CRV SERVICE PROVIDER utilising Route Filtering and GRE tunnels between ANSP sites.

g. Voice

Voice over the CRV network has some specific requirements. This can be found in the Voice ICD.

5.1.2 Criteria to add a new service.

a. Considerations

i. Connecting a Service Provider / Service Consumer (SPSC) to the CRV can be initiated by any party that identifies a need for an SPSC to connect to it. The following should be considered by the SPSC and the CRV-Member state.

ii. The SPSC should be referred to CRV SERVICE PROVIDER to enable an initial discussion with them to assess the feasibility of connecting to the CRV. During this discussion the SPSC should clarify:

a. Interfaces

b. Data transfer rates

c. DSCP marking

d. Bandwidth

e. Jitter

f. Latency

g. Packet Loss

h. Connections

i. One to One
ii. One to Many
iii. Many to Many
iv. Any to Any
v. Unicast or Multicast

iii. It is recommended that Service Providers use public ip addressing for the delivery their services.

iv. It is recommended that Service Consumers are provided with a 10.x.x.x ip addressing from the CRV Member State where the CRV SERVICE PROVIDER NID is installed.

v. SPSCs will NOT be a member of the CRV Operations Group (OG). The OG may establish a CRV user group that could facilitate discussion on the use of the CRV by SPSCs.

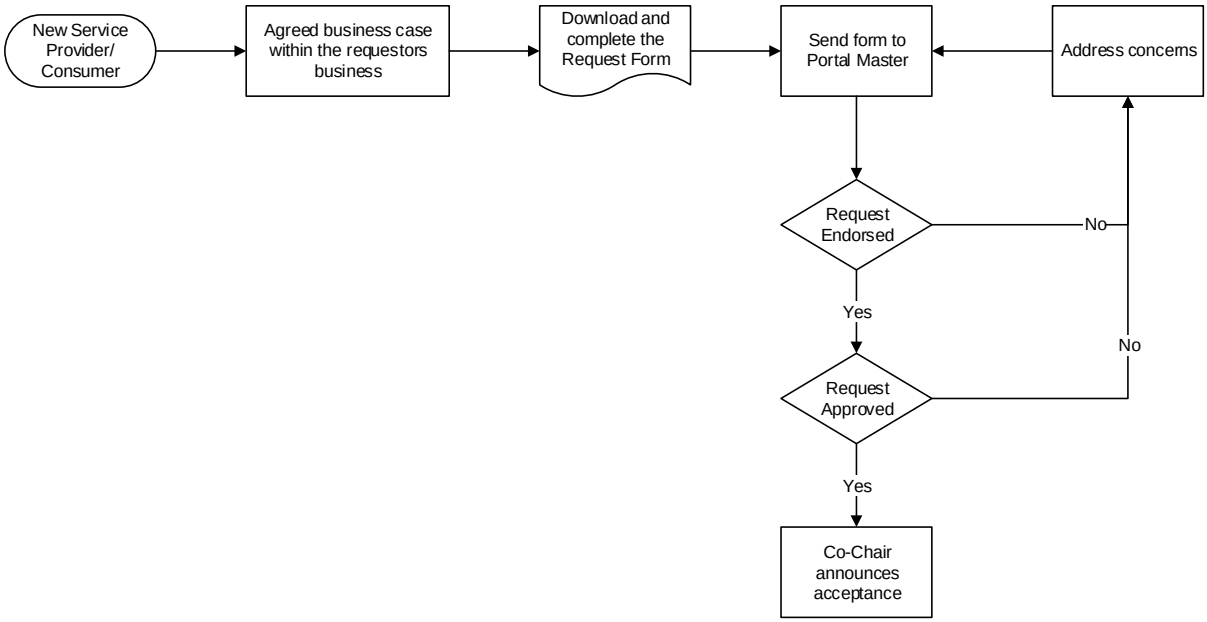
vi. SPSCs will need to adhere to the Common Regional VPN (CRV): System Design Document (SDD). Substantive changes to the SDD MUST be endorsed by the CRV OG.

vii. CRV member states should consider ICAO Doc 9855 AN/459 Guidelines on the Use of the Public Internet for Aeronautical Applications as guidance when they are the Primary sponsor.

viii. The CRV OG is NOT responsible for the accreditation/certification/validation of a Service Provider but must ensure that all reasonable steps have been taken to ensure that the Service Provider has sufficient systems and process in place to provide their service over the CRV.

ix. Service Consumers and CRV members SHOULD ensure that when obtaining a Service from a Service Provider that the service meets their operational service requirements.

b. Process



1. Procedure.

   i. The information required in the connection request, should be presented in English and in a clear and logical format. The following process will be used for an SPSC to obtain approval connect to the CRV:

   ii. Provide a business justification including Benefits Realization for joining the CRV.

   iii. For a Service Provider:

      a. Provide a documentation using Section 2.3 ACCREDITATION OF AN IASP in ICAO Doc 9855 AN/459 as a guide including a cyber-security plan.

   iv. For a Service Consumer; at a minimum:
      a. Develop a security assessment of the new non-ANSP system
      b. Determine if alternative routing or diversity is required
      c. Determine the criteria for alternative routing and diversity (application versus network)
      d. An Interface Control Document

   v. Obtain a Primary CRV member state to sponsor their connection to the CRV.

   vi. Obtain business justification from Primary Sponsor to support their request.

   vii. Obtain a Secondary CRV member state to sponsor their connection to the CRV based on the information above.

   viii. The information provided above, will be provided to the CRV OG via the APAC CRV portal.

   ix. CRV OG members will be notified and have 25 business days to review and address any concerns that they may have with the request.

   x. After the 25 days, if the majority of reviews by CRV OG members are endorsed, the CRV OG chairs will review the request.

xi. For the request to be approved, both CRV OG C-Chairs need to approve the request.

xii. A Document/Certificate will be provided to the primary sponsor that can used to verify that the SPSC is approved to connect the CRV.

xiii. The on boarding of Service Provider / Service Consumer will be supported by the Airways New Zealand provided APAC CRV SharePoint portal. There will be word forms to facilitate the information and these forms will be migrated to an automated SharePoint Workflow as soon as practical.

2. Service Provider / Service Consumer will be required to undertake the following:

Provide a business justification including Benefits Realisation for joining the CRV

Provide a High-Level System Design on how their Service could potentially connect to the CRV.

Service Providers to use Public IP Addressing

Service Consumers to use the ICAO allocated IP addresses as provided by

the Sponsoring ANSP

Interfaces

Data transfer rates

DSCP marking

Implementation

a) Sponsoring ANSP is required to establish a GRE tunnel with the new non-ANSP system
b) Update GRE tunnels to respective users if alternative routing is required
c) Increase the sponsoring ANSP's access bandwidth, as required, (peak and off-peak times): coordinate requirement from the new non-ANSP system
d) Determine the new system IP address either from the system owner or using the private IPv4 addresses that have been assigned by ICAO for the region
e) Provide the CRV vendor with each user's new system IP address subnet(s), to be advertised through the GRE tunnel
f) Perform an operational acceptance test between sponsoring ANSP with the sponsored new data system which should include, but not limited to ping test, application (the new non-ANSP system) test, bandwidth test including other GRE tunnels if required
g) The sponsoring ASNP is responsible for accepting the new service if it has performed satisfactorily for a minimum of 24 hours
h) CRV vendor should update the respective SEPs
i) Inform ICAO, CRV OG, and respective ICAO groups of new routing to be recorded in various documents (e.g., Telecommunication Infrastructure Routing, etc.)

5.2 Availability Management

Process Objective: To define, analyse, plan, measure and improve all aspects of the availability of IT services. Availability Management is responsible for ensuring that all IT infrastructure, processes, tools, roles etc. are appropriate for the agreed availability targets.

5.2.1 Monthly Performance Management Reports

Provided by CRV SERVICE PROVIDER to each State that has joined CRV covering:

- Router report
- Interface report
- QoS report
- Traffic report

(More SLA data is available from the CRV SERVICE PROVIDER Portal)

5.2.2 Monthly Operations Reports

Provided by CRV SERVICE PROVIDER to each State that has joined CRV covering:

- Active Service Inventory
- Site Availability (More SLA data is available from the CRV SERVICE PROVIDER Portal)
- Ticket Statistic
  - Problem Statistic
  - Incident Statistic
  - Requests
  - Maintenance
- Ticket Details
- AOB

5.2.3 Monthly meetings with CRV SERVICE PROVIDER

Conducted via Telephone conference that is hosted by CRV SERVICE PROVIDER, with each State that has joined CRV to discuss:

- States Performance Management Report (information from the Portal)
- States Operations Report (Service Report)

5.2.4 Quarterly Operations Reports

Provided by CRV SERVICE PROVIDER to the OG covering:

- Implementation progress
- Site Availability (More SLA data is available from the CRV SERVICE PROVIDER Portal)
- Ticket Statistic
  - Problem Statistic
  - Incident Statistic
  - Requests
  - Maintenance
- Ticket Details
- AOB

5.2.5 Annual OG meetings

- Implementation progress
- Site Availability (More SLA data is available from the CRV SERVICE PROVIDER Portal)
- Ticket Statistic
  - Problem Statistic
  - Incident Statistic
  - Requests
  - Maintenance
- Ticket Details
- Network Utilisation
- AOB

5.2.6 Root cause analysis reports

Provide detail post every Incident to the affected State and the APAC CRV OG. Include these in each of the Monthly, Quarterly and Annual Report.

5.2.7 Notifications of Maintenance

Ensuring that all affected parties of maintenance releases are updated as appropriate.

5.2.8 Diversity Audits

A rolling audit of States/Sites physical and logical connectivity based on the information provided in the Service Commencement Notice.

5.2.9 Testing failover

State LOA/MOU/Technical Letter for carrying out failover testing to ensure service continuity.

5.3 Capacity Management

Process Objective: To ensure that the capacity of IT services and the IT infrastructure is able to deliver the agreed service level targets in a cost effective and timely manner. Capacity Management considers all resources required to deliver the IT service, and plans for short-, medium- and long-term business requirements.

Co-ordinate and standardize the establishment or upgrade of CRV services as required

Oversee the performance of the CRV network;

5.4 IT Service Continuity Management

Process Objective: To manage risks that could seriously impact IT services. ITSCM ensures that the IT service provider can always provide minimum agreed Service Levels, by reducing the risk from disaster events to an acceptable level and planning for the recovery of IT services. ITSCM should be designed to support Business Continuity Management.

a) CRV Contingency Operations

from CRV TF/6 report there is this report:

The meeting discussed again the contingency plan in relation to the safety case. To mitigate the risk of a total or major failure (such as IT disaster that would affect the whole CRV), two layers of process would have to be articulated:

- *the procedures and measures planned and implemented by CRV SERVICE PROVIDER; and*
- *consistently, the procedures and measures planned and implemented by the CRV Users, as part of their contingency plan required by ICAO SARPS.*

Furthermore, the meeting agreed that procedures to mitigate the total failure of CRV should be discussed by CRV OG as part of the contingency planning.

b) CRV Network overview
CRV SERVICE PROVIDER maintains a drawing showing the overall connectivity of the CRV Users sites to the various CRV SERVICE PROVIDER POPs. This is a high-level drawing which is available here.

5.5 Service Level Management

Process Objective: To negotiate Service Level Agreements with the customers and to design services in accordance with the agreed service level targets. Service Level Management is also responsible for ensuring that all Operational Level Agreements and Underpinning Contracts are appropriate, and to monitor and report on service levels.

5.6 Design Co-ordination

Process Objective: To coordinate all service design activities, processes and resources. Design coordination ensures the consistent and effective design of new or changed IT services, service management information systems, architectures, technology, processes, information and metrics.

Change Requests

Engineering Package

Legal Documents

Dial Plan

The CRV Dial Plan is an important document detailing the endpoint dialling information for the Ground-to-Ground voice communications over the CRV Network. The current version is available here.

5.7 Information Security Management

Process Objective: To ensure the confidentiality, integrity and availability of an organization's information, data and IT services. Information Security Management usually forms part of an organizational approach to security management which has a wider scope than the IT Service Provider.

Security is the responsibility for the implementation of security controls to ensure the integrity of services.

As a minimum the connectivity between states is via GE Tunnels.

Other methods of ensuring the security of the connectivity are:

a. Utilising as small an IP Address range as possible.
b. Only advertising relevant IP addresses.
c. Only accepting verified IP Routes when required.
d. Utilising firewalls.
e. Utilising NAT.
f. Utilising Intrusion Protection Software (IPS)

It is recommended that external security advice is sought.

5.8 Supplier Management

Process Objective: To ensure that all contracts with suppliers support the needs of the business, and that all suppliers meet their contractual commitments.

a) Oversee the performance of the CRV Service Provider, including customer service.

b) Oversee the escalation and solving by the CRV Service Provider of issues associated with the provision of the CRV, including safety and security related issues

6 PART V: SERVICE TRANSITION

Service Transition

- Transition Planning and Support
- Change Management
- Service Asset & Configuration Management
- Release and Deployment Management
- Service Validation and Testing Management
- Change Evaluation
- Knowledge Management

6.1 Transition Planning and Support

Process Objective: To plan and coordinate the resources to deploy a major Release within the predicted cost, time and quality estimates.

a) Covered by the Implementation Plan

6.2 Change Management

Process Objective: To control the lifecycle of all Changes. The primary objective of Change Management is to enable beneficial Changes to be made, with minimum disruption to IT services.

a) All changes are to be conveyed to CRV SERVICE PROVIDER via their Change Request Form.and covered by the Change Management Process as found in the Common Package.

6.3 Service Asset and Configuration Management

Process Objective: To maintain information about Configuration Items required to deliver an IT service, including their relationships.

a) Maintain CRV OG documentation associated with the function, performance and management of the CRV, including the CRV OG Operations Manual, a list of CRV users and a record of variations to the common tender package.

This information is collated in the following ways:

CRV Operations Manual – APAC Portal
A list of CRV users – Registrations page on the APAC portal
Record of Variations is found in the APAC CRV Portal in the Common Package Folder

6.4 Release and Deployment Management

Process Objective: To plan, schedule and control the movement of releases to test and live environments. The primary goal of Release Management is to ensure that the integrity of the live environment is protected and that the correct components are released.

a) Oversee the implementation of the CRV post Contract Award;

b) Manage issues arising from the transition with CRV TF, if any

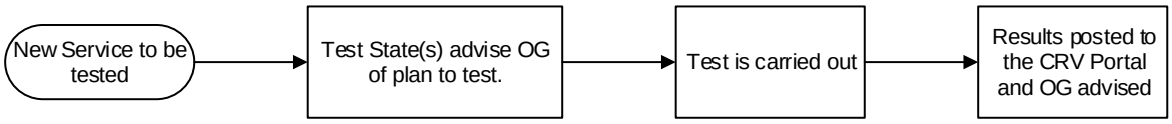
6.5 Service Validation and Testing Management

Process Objective: To ensure that deployed Releases and the resulting services meet customer expectations, and to verify that IT operations is able to support the new service.

a) Accept deliverables from the CRV Service Provider on behalf of the CRV Users as required;

b) Refer to the CRV Implementation Plan

c) New Services



New services being tested by any state,
Notifies OG intention to test as soon as practical.
Advises CRV OG and CRV SERVICE PROVIDER 48hrs prior to testing

Testing is to be carried out with a DSCP marking of DF so as to avoid impacting other services.

The results of the tests are to be posted on the CRV portal and the OG advised of the posting.

6.6 Change Evaluation

Process Objective: To assess major Changes, like the introduction of a new service or a substantial change to an existing service, before those Changes are allowed to proceed to the next phase in their lifecycle.

6.7 Knowledge Management

Process Objective: To gather, analyse, store and share knowledge and information within an organization. The primary purpose of Knowledge Management is to improve efficiency by reducing the need to rediscover knowledge.

a) All information relating to the ongoing operation of the network shall be retained in the APAC CRV Portal

There will be a link to the portal from the ICAO APAC page.

b) To add items to the portal.

c) To Workflow a document.

7 PART VI: SERVICE OPERATION

Service Operation

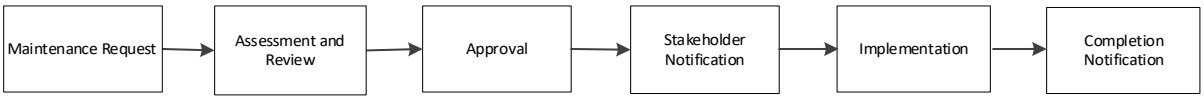
- Event Management
- Incident Management
- Request Fulfilment
- Problem Management
- Access Management

7.1 Event Management

Process Objective: To make sure CIs and services are constantly monitored, and to filter and categorize Events in order to decide on appropriate actions.

- Overview

  In order to prevent loss of service and reduce impact of service on member states, planned and unplanned event management activities shall follow the below event management process. Any concerns about the change event can be raised by the member state at the stakeholder notification stage.



a) Managed by CRV SERVICE PROVIDER.

CRV SERVICE PROVIDER have in place an Event Management Process that meets the above. Upon receipt of a maintenance or event notification from CRV SERVICE PROVIDER, States operating a single site, single connection model (Package B, C or D), can request their circuit be groomed to another node during the maintenance/event window.

If a CRV User has any concerns about the activity, email the Service Provider to follow up, ensuring to express the safety concern/traffic or ANSP impact as a result of the window as part of the change request.

The Service provider will examine the inquiry and offer the best workaround possible, if that is available.

NOTE: To increase service resiliency, the Service Provider encourages member states to consider service packages with higher network redundancy.

In view of different network environment and service subscription criteria among member states, the Service provider could work with the CRV Users network architect for appropriate solution design.

CRV SERVICE PROVIDER will provide notification of maintenance as per the Customer Support Service Plan.

An example of Planned Outage Notification

An example of Urgent Maintenance Notification

b) Managed by CRV Users

The objective of this process is to prevent uncontrolled removal or degradation of a service by maintenance or project activities due to a planned event by a partner ANSP. Member states are to provide impacted stakeholders at least 14 days notification prior to the event. Other notification periods are by agreement from stakeholders.

The following diagram details this process.

The Notification template is available from the APAC CRV OG Portal

7.2 Incident Management

Process Objective: To manage the lifecycle of all Incidents. The primary objective of Incident Management is to return the IT service to users as quickly as possible.

a) Managed by CRV SERVICE PROVIDER

After an incident, an incident report (IR) can be provided upon request.

Under normal circumstances, an IR would be ready in 3 working days.

An IR Form template is provided in the Common Package.

An example of an Incident Ticket creation notification. An example of Incident Progress update notification.

b) Managed by CRV User

This would apply the services between CRV Users for the purposes of operations, ie Voice, AMHS, Surveillance etc.

Affected CRV Users would be able to request a CRV User IR for more clarity/explanation.

The Incident template is available from the APAC CRV OG Portal

7.3 Request Fulfilment

Process Objective: To fulfil Service Requests, which in covers the lifecycle of the change, linking to other processes such as Design and Change Management.

The objectives of the request fulfilment process are to：

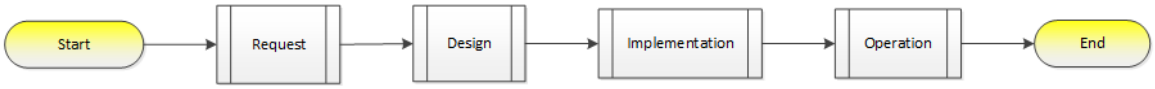
- Maintain user satisfaction through efficient and professional handling of all service requests.
- Provide a channel for users to request and receive standard services for which a predefined authorization and qualification process exists.
- Provide information to users about the availability of services and the procedure for obtaining them.
- Source and deliver the components of requested standard services (e.g. licences and software media)

a) General Request Fulfilment as managed by CRV SERVICE PROVIDER

The general service fulfilment is the process of managing the lifecycle of CRV user service requests from initial request to fulfilment using separate request fulfilment records/tables to record and track their status by CRV SERVICE PROVIDER. Service requests handle all other interactions between CRV SERVICE PROVIDER and CRV users that are not service disruptions. Examples of service requests might include the solicitation of assistance with the acquisition of a service, guidance on how to use CRV service, request for a password change, adding a connection, or moving a user NID. The general service fulfilment is managed by CRV SERVICE PROVIDER. Follow CRV SERVICE PROVIDER's standard process for service fulfilment.

b) Specific Request Fulfilment as managed by CRV OG

- Process

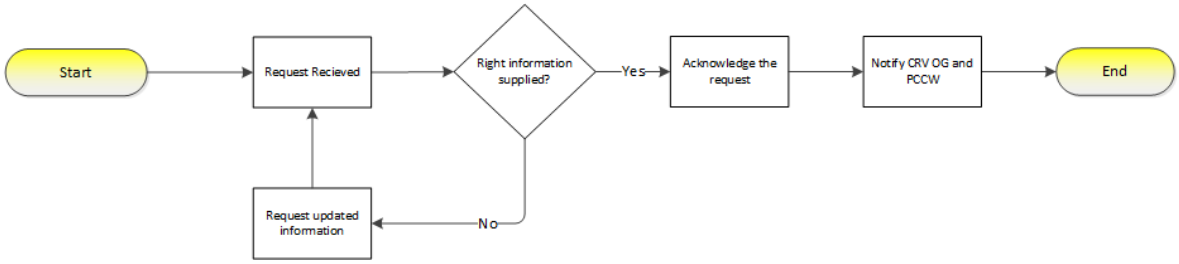


- Procedure
  - Request

There are four types of requests:

1. Request to join CRV as a user.
2. Request to change
3. Request to add a new service
4. Request to terminate the CRV connection

- Process



- Procedure

1. Request Received

   Details on how to join CRV are posted on the ICAO APAC and ICAO MID pages.

   An initial request is sent to the APAC CRV Portal Administrator requesting to join, leave or add a new connection to CRV.

2. Right information Supplied

   Upon receipt of the request to join, leave or add new connection to CRV, a registration form is provided.

   Upon receipt of the registration form to join or leave, check the content is complete:

   a. ANSP Making the Request
   b. Technical Point of Contact
   c. State(s) connecting to.
   d. Proposed services between ANSPs
   e. Proposed go live/removal date

   If complete, acknowledge the request with a link to the Common Package, the Operations Group Manual and the Implementation Plan and the CRV Portal.

   If not complete, request updated information.

3. Acknowledge request

   All relevant information relating to the request must be logged by CRV Portal Administrator so that a full historical record is maintained – and so that if the request has to be referred to other process or procedure, they will have all relevant information to hand to assist them.

4. Notify the CRV OG and CRV SERVICE PROVIDER.
5. Update the Registrations List.

- Design
  - Go to Design Co-ordination
- Implementation
  - Go to Change Management
- Operation
  - Go to Service Operation

7.4 Problem Management

Process Objective: To manage the lifecycle of all Problems. The primary objectives of Problem Management are to prevent Incidents from happening, and to minimize the impact of incidents that cannot be prevented. Proactive Problem Management Analyses Incident Records, and uses data collected by other IT Service Management processes to identify trends or significant Problems.

a) CRV SERVICE PROVIDER Initiated – Follow the Customer Support Service Plan

b) Authority Initiated

   a. Troubleshoot local connectivity

   b. Polling the NID. On the ANSP NID provided by CRV SERVICE PROVIDER, a loop back IP will be configured using a specified IP address from the allocated range of IP addressing. This will be called the troubleshooting IP address.

   c. Troubleshoot with peers

   d. Fault with CRV SERVICE PROVIDER following the Customer Support Service Plan

7.5 Access Management

Process Objective: To grant authorized users the right to use a service, while preventing access to non-authorized users. The Access Management processes essentially execute policies defined in Information Security Management. Access Management is sometimes also referred to as Rights Management or Identity Management.

a) Physical Access Control

   i. The Cabinet for Core Routers are locked

   ii. The network main PoP sites are under 7x24 CCTV monitoring and recording

b) Remote Network Access Control

   i. The remote access of Cores and CE routers are controlled by access-list ACL that is only allow authorized terminal of management systems.

   ii. The TACACS is deployed to allow the authorized persons of CRV SERVICE PROVIDERG to access Core Routers or CE routers as AAA clients.

c) Portal Access

   Review member's access annually.

8 PART VII: CONTINUAL SERVICE IMPROVEMENT

Continual Service Improvement

- Service Review
- Process Evaluation
- Definition of CSI Initiatives
- Monitoring CSI Initiatives

8.1 Service Review

Process Objective: To review business services and infrastructure services on a regular basis. The aim of this process is to improve service quality where necessary, and to identify more economical ways of providing a service where possible.

Expert Group Name	Volunteered Member	Group leader
Service Strategy	Singapore, USA, India	New Zealand/Fiji
Service Design	Singapore, USA, Hong Kong China	New Zealand/Fiji
Service Transition	China, Singapore	New Zealand/Fiji
Service Operations	Australia, China, Singapore, India	New Zealand/Fiji

8.2 Process Evaluation

Process Objective: To evaluate processes on a regular basis. This includes identifying areas where the targeted process metrics are not reached, and holding regular bench markings, audits, maturity assessments and reviews.

8.3 Definition of CSI Initiatives

Process Objective: To define specific initiatives aimed at improving services and processes, based on the results of service reviews and process evaluations. The resulting initiatives are either internal initiatives pursued by the service provider on his own behalf, or initiatives which require the customer's cooperation.

8.4 Monitoring CSI Initiatives

Process Objective: To verify if improvement initiatives are proceeding according to plan, and to introduce corrective measures where necessary.

9 PART VIII
DEFINITIONS

9.1 Definitions

CRV USER – State/Administration

An entity officially designated by the State to provide the air traffic or air navigation services the State is obligated to provide according to the ICAO provisions.

E.g. Air Navigation Service Provider (ANSP)

CRV USER – Industry

An entity not officially designated by the State but authorised by the State to provide aviation or related services commercially.

Incident - An Incident is defined as an unplanned interruption or reduction in quality of an IT service (a Service Interruption).

E.g. A link has been flapping in the network causing reroutes.

Problem - A cause of one or more Incidents. The cause is not usually known at the time a Problem Record is created.

E.g. Link flaps have been caused by unplanned work by a third party.

Service - Any service provided over the CRV supporting Meteorological Service for International Air Navigation or Air Traffic Control Services.

Service Provider (SP) is defined as a company that provides aeronautical service using the CRV as the means of communication.

Service Consumer (SC) is defined as a company or organisation that consumes aeronautical information using the CRV as the means of communication.

10 PART IX
DOCUMENTATION MANAGEMENT

10.1 Common Package

Documents in the Common Package can be updated by both CRV SERVICE PROVIDER and the APAC CRV OG

10.1.1 APAC CRV OG

When an APAC CRV OG controlled document is required to be updated, it will need to be copied from the Current Version folder to the Draft Versions folder.

Once the Draft is ready to be published it is moved from the Current Version folder and saved in the Previous Versions folder. The new version is then copied from the Draft Versions folder to the Current Version folder.

10.1.2 CRV SERVICE PROVIDER

When CRV SERVICE PROVIDER send an updated document, the current version is moved from the Current Version folder and saved in the Previous Version folder. The new version is then saved to the Current Version folder.

10.1.3 Change Control

The Common package – change control document will need to be updated and saved with a new version number.

Documents that are essential for an order/contract (Blue documents) and the other documents (Orange documents) that are general/common documents (Orange Documents), shall be noted as such in the Change Control document.

10.2 Dial Plan

This is an APAC CRV OG document and is maintained by the nominated representative of the OG. Currently the USA.

When this document is updated, the current version is moved from the Current Version folder and saved in the Previous Versions folder. The new version is then saved to the Current Version folder.

10.3 Implementation Plan

This is an APAC CRV OG document and is maintained by the nominated representative of the OG. Currently Singapore.

When this document is updated, the current version is moved from the Current Version folder and saved in the Previous Version folder. The new version is then saved to the Current Version folder.

The updated version is also saved in the ICAO APAC Electronic Documents portal.

CRV SERVICE PROVIDER will also send and Excel file called CRV Network Implementation Progress Report. This is saved in the Implementation Plan folder.

10.4 Operations Manual

This is an APAC CRV OG document and is maintained by the nominated representative of the OG. Currently New Zealand with the support of an Ad Hoc group.

When an the Operations Manual is required to be updated, the current version will need to be copied from the Current Version folder to the Draft Versions folder.

Once the Draft is ready to be published it is moved from the Current Version folder and saved in the Previous Versions folder. The new version is then copied from the Draft Versions folder to the Current Version folder.

10.5 Overview drawing for CRV from CRV SERVICE PROVIDER

This is a CRV Service Provider document and is maintained by the CRV Service Provider

When this document is updated, the current version is moved from the Current Version folder and saved in the Previous Versions folder. The new version is then saved to the Current Version folder.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

COMMON AERONAUTICAL VPN (CRV) IMPLEMENTATION PLAN

Version 2.3

08 MAR 2025

Table of Contents

ABBREVIATIONS

ABBREVIATION	DESCRIPTION
AFTN	Aeronautical Fixed Telecommunication Network
AIDC	ATS Inter-facility Data Exchange
AMHS	Air Traffic Service Message Handling System
ANSP	Air Navigation Service Provider
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
APAC	Asia/Pacific
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
BBIS	Backbone Boundary Intermediate System
BIS	Boundary Intermediate System
CAA	Civil Aviation Authority
CAR	Caribbean Region
CBA	Cost Benefit Analysis
CNS	Communications, Navigation and Surveillance
ConOps	Concept of Operations
CRV	Common aeRonautical Virtual Private Network
DSCP	Differentiated Services Code Point
EUR	European Region
FIXM	Flight Information Exchange Model
FPL	Flight Plan
ICAO	International Civil Aviation Organization
IP	Internet Protocol
IPS	Internet Protocol Suite
IWXXM	ICAO Weather Information Exchange Model
MET	Meteorological
MPLS	Multi-Protocol Label Switching
NAT	Network Address Translation
NID	Network Interface Device
OH	Operational Hazard
OG	Operation Group
OSI	Open Systems Interconnections
PoC	Point of Contact
QoS	Quality of Service
RFI	Request for Information
RFP	Request for Proposal
SARP	Standards and Recommended Practices
SAT	Site Acceptance Test
SIP	Session Initiation Protocol
SME	Subject Matter Expert
SOP	Standard Operating Procedures
ST	Sealed Tender
SWIM	System-Wide Information Management

ABBREVIATION	DESCRIPTION
TF	Task Force
WXXM	Weather Information Exchange Model (based on XML)
UC	Use Case
VoIP	Voice Over Internet Protocol
VPN	Virtual Private Network
XML	Extensible Markup Language

1.0 INTRODUCTION

1.1 Purpose

The purpose of this Implementation Plan is to provide guidance for all States/ Administrations on the operation requirements for the Common aeRonautical Virtual Private Network (CRV) used in Asia/ Pacific (APAC) Region.

The details include in Table 1, Table 2 , a list of all States/ Administrations concerned, and for each State/ Administration include the:

i. National Points of Contact; and

ii. Local Points of Contact.

The information contained in this document was first adopted by the 1st Meeting of CRV Operations Group (CRV OG/1). It is intended that this Implementation Plan shall be used as the means to:

i. identify all actions required to implement CRV;

ii. ensure a harmonized approach for the APAC Region;

iii. monitor and report on progress; and

iv. identify any issues, risks or problems which may arise.

1.2 Overview of the CRV

Currently, aeronautical ground-ground communications in the ICAO Asia/Pacific Region, and in particular Aeronautical Fixed Telecommunication Network (AFTN) and AMHS services, operate over point-to-point international leased circuits. However, this network configuration exhibits a number of limitations such as the inability to switch to new protocols like Voice over IP (VoIP) or System Wide Information Management (SWIM) efficiently, high cost for every connection and limited flexibility for increase in bandwidth.

A CRV Task Force (TF) was formally established in accordance with APANPIRG Decision (24/32), (Bangkok, Thailand, 24-26 June 2013). The concept of CRV was taken from other common network that has already implemented in other regions such as Pan-European Network Services (PENS) and FAA Telecommunication Infrastructure (FTI).

The CRV is a dedicated multiprotocol label switching (MPLS) Internet Protocol (IP) based Virtual Private Network (VPN) communication network provided by a common network service provider and support all Aeronautical Fixed Service (AFS) in the APAC region. Telecommunication costs are reduced as States/ Administrations will only require minimal connections to a far reaching network instead of individual connections to each neighboring State/ Administration. The CRV service provider provides the service to allow CRV members to exchange voice and data information with each other.

Each CRV member should determine the amount of bandwidth require for each Quality of Service (QoS) sub queue. In addition, each CRV member should also determine the total access bandwidth that they need to subscribe.

2.0 IMPLEMENTATION OVERVIEW AND PROCESSES

2.1 General Description of Implementation

States/ Administrations should refer to the CRV implementation roadmap to take note of the estimated CRV implementation date provided by other States/ Administrations that they wish to exchange data/ voice via the CRV.

The implementation date, type of data, voice, bandwidth and QoS between the two States/ Administrations shall be negotiated and agreed bilaterally and supported by the CRV service provider.

CRV service provider is to put up individual service contracts for the two connecting States/ Administrations.

The work processes and CRV implementation roadmap in Para. 2.2 provides a breakdown of the estimated schedule and serve as a guide.

2.2 Implementation Schedule/ Roadmap

The planned project timeline for each States/ Administrations to implement CRV could be based on the estimated work processes schedule and roadmap for CRV.

2.2.1 Work Processes

The projected activities and schedule to implement the services includes the following:

S/No.	Subject	Projected Activities	Projected Schedule
1	Technical requirements and SOW	1. Respective ANSPs develop their associated requirements and Statement of Work (SOW) that specify performance, interface, conversion, operational procedure, acceptance test procedure 2. Present to Vendor for comment and response 3. To seek CRV-OG concurrence on deviation from CRV common package 4. Finalize requirements	6 to 9 months
2	Negotiation and agreement between two connecting States/ Administrations	1. To decide the type of data or voice to be exchanged via CRC, QoS for each type of applications and the required bandwidth 2. CRV Contractor to comment and response to the agreed requirements 3. Agree to implementation schedule	6 to 9 months
3	CRV Contractor proposes Contract to ANSP	4. Contractual and Legal review 5. Technical and operational review 6. Finalize contract 7. Establish contract and payment system	6 to 9 months
4	Site preparation	Site preparation and implementation of the service	1 to 3 months

S/No.	Subject	Projected Activities	Projected Schedule
5	Test and evaluation	1. Perform acceptance test with associated applications 2. Perform acceptance test with respective ANSPs	3 to 6 months
6	Service acceptance	Service acceptance	1 week

2.2.2 Roadmap for CRV

The roadmap for CRV implementation in the APAC Region will be updated by the CRV Operations Group and is available on the ICAO APAC CRV Secure Portal and New Zealand host CRV portal.

2.3 Application Transition Schemes

This paragraph provides States/ Administrations the recommended transition scheme for each application (e.g. AMHS, ATFM, ADS-B, Voice, etc.) targeted to be implemented or migrated from the existing communication link/ network.

2.3.1 AMHS

Being IP, it should be possible to reroute the existing connection at the IP layer either by an address translation or by pointing the LA at a new IP address in the AMHS system. However, the recommended approach will be to setup a parallel connection using the CRV that can be thoroughly tested to the satisfaction of both ANPS's. Once the stability of the CRV has been verified, the cutover would be conducted by the respective com-centers at the AMHS system level. The actual approach taken will require a negotiation between each pair of ANSPs.

2.3.2 AFTN

Depending on the existing AFTN connection there are a number of migration strategies available.

Option 1. Migration to AMHS

Setting up a new AMHS link over the CRV as per ICAO grand master plan *xyz.123* would be the preferred option for migration of AFTN. It would allow the new connection to be setup and tested independently.

Option 2. Migrate from native X.25 to XoT

Where the existing connection is a native X.25 connection end to end, and migration to AMHS is not possible, then XoT is the next preferred option. It is recommended that a new LA be setup that uses the XoT over CRV path. Once the XoT connection has been verified and tested by each ANSP then actual migration of AFTN would be performed by the respective com centers similar to AMHS in 2.3.1 above. If PCCW are not able to provide serial interfaces on their CE routers then it would be incumbent on the ANSP to deliver the AFTN traffic as a XoT connection.

Option 3. Migrate from XoT to XoT

Where the AFTN connection between two ANSP's is already using XoT, and if the trust in the performance of the CRV is high, then the cutover from the legacy link to the CRV could be as simple as an X25 route change on each ANSP's respective XoT routers. Alternatively, a new LA could be setup and tested before being cutover at the system level by the respective ANSP's com-centers.

2.3.3 ADS-B

To deliver their stream to the PCCW gateway, likewise at the other end it would be up to the partner ANSP to ensure that that there is a multicast path available from the CRV egress to their flight data management system. Being multicast, it is possible for the same information to traverse the same two endpoints via multiple network paths simultaneously, however some ANSPs may decide to setup new multicast groups via the CRV so that the performance of the CRV can be measured against the legacy link. Alternatively, ANSPs may decide to replace the multicast stream with unicast data flows that operate via an ADS-B filter.

PCCW could implement Generic Routing Encapsulation (GRE) tunnel solution (NID to NID) between States/ Administrations who are agreeable to have direct connection for routing control over the any to any MPLS layer 3 backbone.

2.3.4 Voice

The specific strategy used to migrate the voice services will vary depending on the existing setup, the proposed voice interface between the ANSP and PCCW (E&M / ISDN / VoIP), how the partner ANSP is setup and their intended connection to PCCW. Despite this there are two main options.

Option 1 – New buttons on the operator consoles - Preferred

This option involves setting up new buttons on the operator consoles at each end. The new buttons are configured from the outset to route via the CRV. This strategy allows the new service to be configured and tested with minimal disruption to operators and also allows for an almost seamless cutover (pressing a different button). Another great advantage of this strategy is to ability to do a practical test of the voice quality by allowing the same pair of controllers test both paths within a few seconds of each other.

Option 2 – Reconfigure existing connections to use the CRV

Where Option 1 is not possible, the only other alternative is to reconfigure the existing connection. This will involve increased coordination between the two ANSP's and PCCW as well as potentially multiple technical groups within an ANSP as it is likely that multiple systems will need to be reconfigured at the same time. E.g. Voice switches, networking devices etc. This option would also involve a lengthy outage and interruption to operational staff.

2.4 Technical Specifications of CRV (for applications reference)

CRV envisaged in the ICAO CNS/ ATM concept via through two backbones (one Multiprotocol Label Switching (MPLS), based on a terrestrial, satellite, or both networks, and one based on a secured Virtual Private Network over the public internet.

i. It will be a homogeneous and generalized application of the IP protocol in the transport network for voice and data aeronautical communications;

ii. It will establish an appropriate Quality of Service (QoS) quality requirements;

iii. It will have a centralized and common network management;

iv. It will have a homogeneous and standardized interface, consisting Network Interface Device(s) (NID(s)) linked to the existing local switches, satellite and/or terrestrial links based on the Multiprotocol Label Switching (MPLS) technology, as well as ground services, based on a Virtual Private Network (VPN) over the public internet;

v. It will have voice and data gateway service by the Service Provider; and

vi. For IT security, individual ANSPs may implement an authentication service based on a cooperative public key infrastructure (PKI) including IPSec for IPv4 and IPv6 and digital certificates management for public IP links between ANSPs.

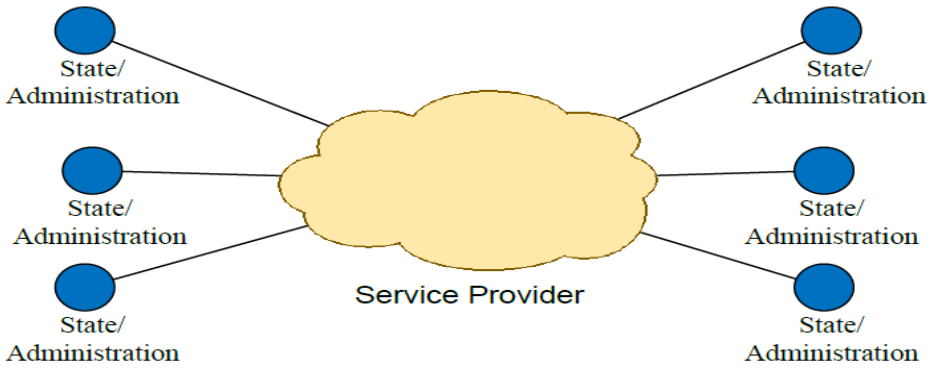


Figure 1: High level system overview of CRV

2.4.1 Service Level Agreement & Quality of Service

i. QoS are implemented using guidance from IETF RFC 4594 Configuration Guidelines for Different Service Classes. The routing protocol, voice, voice signaling, real-time interactive and standard data types shall all be given separate QoS bandwidth;

ii. Differentiated Services Code Point (DSCP) QoS markings to traffic will be used before it enters the network; and

iii. SLAs are based on States/ Administrations' requirements (i.e. Packages A, B, B+, C, C+ and D offered by CRV contractor).

2.4.2 IP Addressing

i. CRV supports IPv4 and IPv6 addressing. The overall IP addressing plan will be centrally managed by the CRV contractor and will be known as the CRV IP address plan;

ii. An IPv4 plan, appended as Appendix A, was agreed in the APAC region and was concluded through Conclusion 21/22 - Asia/Pacific ATN Interim Addressing Plan and each State/Administration is assigned one /19 IP address block. State's Air Navigation Service Provider will assign IP addresses to its CRV User – State/Administration.

iii. In the development of the IPv4 plan, a flexible margin has been designated to allow future growth or change. Through Conclusion CNS SG/25/01 ***(****Conclusion CRV OG/8/01),* using one vacant /19 IP address block "10.46.0.1 to 10.46.255.254", each CRV User – Industry (e.g. AIREON LLC providing Automatic Dependent Surveillance - Broadcast data over CRV) is assigned 254, 510, 764 or 1022 usable Network addresses (depending on Service Providers' technical requirements) which require sponsorship by States/ Administrations; and

iv. The Middle East Regional (MID) region IPv4 plan is appended as Appendix B of this document.

2.4.3 Interface

i. The interface type provided by the NID to the CRV User is the Ethernet IEEE 802.3ab (1000 Base-T).

2.4.4 Routing Restrictions

i. Route advertisements will be restricted so that each CRV User which interacts with the CRV routing protocol can only advertise subnets which are allowed in the CRV IP Address Plan.

ii. When peering with the CRV Contractors network, it is permissible to use the CRV User's own Public IP addressing and ASN, and the CRV Contractor will use a Public AS.

2.4.5 Packet Loss Rate:

i. Packet loss rate of less than 0.1% for all the SLA-Voice; and

ii. Packet loss rate of less than 0.5% for all the SLA-Data.

2.4.6 For VoIP Transport (ED-137)

i. The VoIP Transport shall provide a maximum jitter of 40ms;

ii. The VoIP Transport shall provide a maximum packet loss of 0.1%;

iii. The VoIP Transport shall provide an availability greater than 99.9%; and

iv. The CRV shall use the high priority tags in the VPN packet headers to ensure that VoIP traffic is given high priority and minimal delay. An appropriate level of priority will be given to ED-137 SIP signaling.

2.4.7 Standards used

i. SNMP and MIB-II management protocols, implemented in accordance with RFC 1157 and RFC 1213;

ii. Implementation of the RTP/RTCP and RTP "header compression" protocols, in accordance with RFC 2508;

iii. The multiservice IP network permit the creation of VPNs using MPLS, in accordance with RFC 2547 and RFC 3031, and QoS configuration over MPLS/VPN, in accordance with RFC 3270 and RFC 2983;

iv. QoS is implemented using guidance from IETF RFC 4594. (Covered under QoS); and

v. The CRV provide transport for the ED-137 VoIP.

*Note: If at the time of the publication of this document the specific rules and standards mentioned in any of the other Sections have been revoked, superseded or updated, the new rules or standards shall be deemed as applicable.

2.5 Use Cases

Use Case 1 – ANSPs Interconnect AMHS

Summary of Situation
ANSP 'A' and ANSP 'B' wish to have a direct connection between their AMHS. Both ANSPs decide that the AMHS application shall be built upon the Aeronautical Telecommunication Network (ATN). The ATN will in turn use the CRV.

User Response
Each ANSP already has a connection to the CRV. Each ANSP:
1. Notifies the CRV-OG Coordinator of their intention to establish the new facility.
2. Determines if their existing access speed is sufficient. If it is not the ANSP will arrange with the CRV Service Provider to increase their bandwidth.
3. Negotiates bi-laterally with the other ANSP to determine what IT security arrangements are required. In this User Case they decide to implement an IPSec VPN.
4. Negotiates bi-laterally with the other ANSP to determine what testing, acceptance and commissioning procedures are required.
5. Notify CRV-OG on completion of the implementation to update records.
Operational Needs

UC1.1 The CRV link must meet the reliability and availability needs of AMHS.
UC1.2 The CRV link must provide IP version 4 transport for the ATN.
UC1.3 The CRV link must provide IP version 6 transport for the ATN.
UC1.4 The CRV link must allow the ANSPs to implement IPSec VPN tunnels.
UC1.5 The CRV link must allow for bandwidth changes.

Use Case 2 – ANSPs Implement ATC Voice over Internet Protocol Circuits

Summary of Situation
ANSPs 'A' and 'B' wish to build upon the success of their AMHS implementation and have identified four Voice over Internet Protocol (VoIP) voice circuits which should be moved to the CRV.

User Response
Each ANSP already has a connection to the CRV. Each ANSP:
1. Notifies the CRV-OG Coordinator of their intention to establish the new facility.
2. Determines if their existing access bandwidth is sufficient. If it is not, the ANSP will arrange with the Service Provider to increase their bandwidth.
3. Negotiates bi-laterally with the other ANSP to determine what IT security arrangements are required. In this Case they decide to implement an IPSec VPN to provide secure end-to-end transport between ANSPs.
4. Negotiates bi-laterally with the other ANSP to determine what testing, acceptance and commissioning procedures are required.
5. Tags the VPN traffic containing the Voice over Internet Protocol (VoIP) Real-time Transport Protocol (RTP) and Session Initiation Protocol (SIP) data with appropriate priority markings to allow the CRV Service Provider to identify the voice traffic.
Operational Needs

UC2.1 The CRV link must meet the reliability and availability needs of ATC voice.
UC2.2 The CRV link must provide an IP version 4 VPN tunnel to transport IP version 4 VoIP and SIP signaling.
UC2.3 The CRV link must provide an IP version 6 VPN tunnel to transport IP version 6 VoIP and SIP signaling.

UC2.4 The CRV link will use the high priority tags in the VPN packet headers to ensure that VoIP traffic is given high priority and minimal delay.

Use Case 3 – ANSPs Implement Automatic Ring-down Circuits

Summary of Situation
ANSPs 'A' and 'B' wish to build upon the success of their AMHS implementation and have identified an Automatic Ring-down (ARD) analog voice circuit which should be moved to the CRV.

User Response
Each ANSP already has a connection to the CRV. Each ANSP:
1. Notifies the CRV-OG Coordinator of their intention to establish the new facility.
2. Determines if their existing access bandwidth is sufficient. If it is not, the ANSP will arrange with the Service Provider to increase their bandwidth.
3. Negotiates bi-laterally with the other ANSP to determine what voice quality Mean Opinion Score (MOS) is required. Perceptual Evaluation of Speech Quality (PESQ) ITU-T Rec. P.862 may be used to measure the effects of distortions (e.g. errors, packet loss, delay, etc.) to provide the MOS score.
4. Negotiates bi-laterally with the other ANSP to determine what testing, acceptance and commissioning procedures are required.

UC3.1 The CRV link must meet the reliability and availability needs of ATC voice.
UC3.2 The CRV link must provide conversion from analog voice to VoIP.
UC3.3 The CRV link must provide appropriate SIP signaling to support the ARD functionality.
UC3.4 The CRV link must provide IP version 4 transport for the VoIP.
UC3.5 The CRV link must provide IP version 6 transport for the VoIP.
UC3.6 The CRV link will use the high priority tags in the packet headers to ensure that VoIP traffic is given high priority and minimal delay. The CRV must give an appropriate level of priority to SIP.
UC3.7 The CRV link must deliver voice so that it is clearly understood with minimal delay.

Use Case 4 – ANSPs Implement Analog Voice Circuits

Summary of Situation
ANSPs 'A' and 'B' wish to build upon the success of their AMHS implementation and have identified four analog voice circuits which should be moved to the CRV.

User Response
Each ANSP already has a connection to the CRV. Each ANSP:
1. Notifies the CRV-OG Coordinator of their intention to establish the new facility.
2. Determines if their existing access bandwidth is sufficient. If it is not, the ANSP will arrange with the Service Provider to increase their bandwidth.
3. Negotiates bi-laterally with the other ANSP to determine what voice quality Mean Opinion Score (MOS) is required. In this Case they decide a MOS of 4.0 is required so they select a CRV service level that provides the required voice quality.
4. Negotiates bi-laterally with the other ANSP to determine what testing, acceptance and commissioning procedures are required.
Operational Needs

UC4.1 The CRV link must meet the reliability and availability needs of ATC voice.
UC4.2 The CRV link must provide conversion from analog voice to VoIP.
UC4.3 The CRV link must detect analog signaling and provide appropriate SIP signaling and vice versa.
UC4.4 The CRV link must provide IP version 4 transport for the VoIP.
UC4.5 The CRV link must provide IP version 6 transport for the VoIP.
UC4.6 The CRV link will use the high priority tags in the packet headers to ensure that VoIP traffic is given high priority and minimal delay. The CRV must give an appropriate level of priority to SIP.
UC4.7 The CRV link must deliver voice so that it is clearly understood with minimal delay.

3.0 IMPLEMENTATION SUPPORT

3.1 Introduction

The aim of the transition is to be interruption less. But as the services must migrate from the current network infrastructure to the CRV, an interruption time due to disconnection and reconnection, is mandatory and the team involved (CRV-OG, CRV Members and Contractor) will be of utmost importance to the overall process.

This chapter comprises the basic teams involved in the implementation of the CRV infrastructure, the roles of each professional and the main coordination steps and stakeholders including the CRV-OG.

These responsibilities come in addition to those stated in the Terms and Conditions and Terms of Reference.

Figure 3 describes the relevant entities for the CRV implementation.

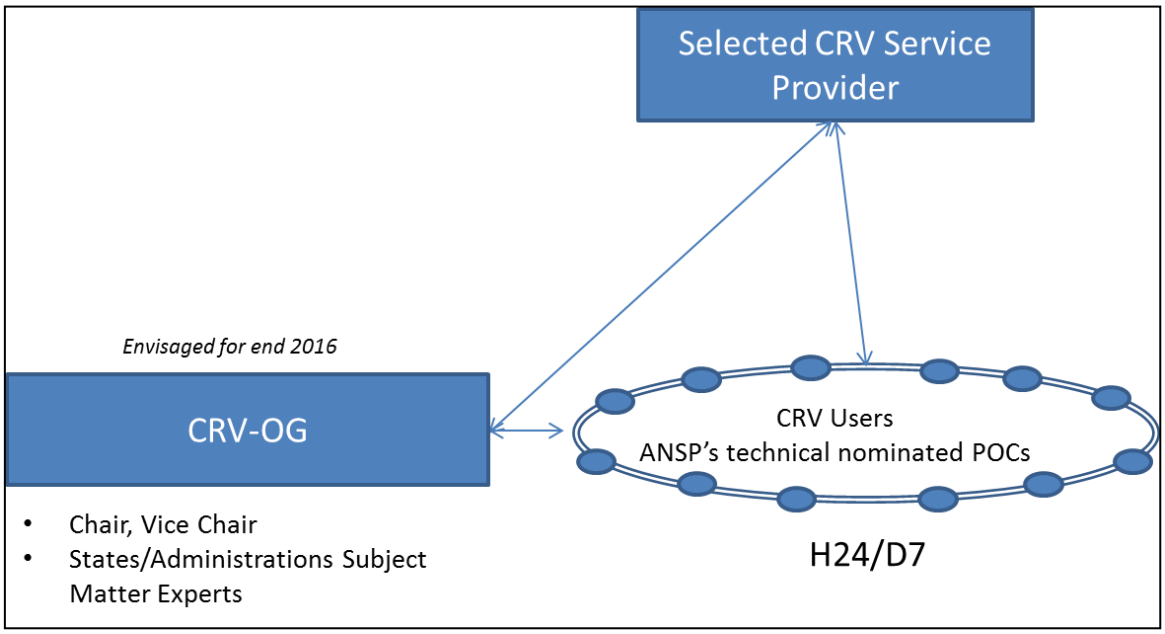


Figure 3: Relevant Entities to this Project.
(Source: CRV Tender doc - Att II - Terms of Reference_v3)

3.2 Implementation Team

The implementation team compose of the CRV-OG, the National Points of Contact , Local Points of Contact and the CRV Contractor Team, as described in the following sections.

3.2.1 CRV-OG

The CRV Operations Group (OG) will provide oversight of the function and performance of the CRV. Besides, it will be involved in the oversight of the implementation of the CRV post Contract Award.

The main activities and roles applied to the CRV-OG during the implementation of the CRV infrastructure are:

i. Develop close coordination with the National CRV POC and Contractor for the complete implementation of the CRV node;

ii. Provide the CRV IP Addressing Scheme (Plan) to the Contractor, in close coordination with the National CRV POC; and

iii. Provide the classification and marking scheme for the prioritization of traffic for the QoS to be used by the aeronautical applications in the CRV network.

Note: When applying QoS, the end-to-end configuration needs to be observed (LAN- layer 2 switches and WAN- Layer 3 routers devices). So, this activity will involve close coordination with the National CRV POC and Contractor, taking into consideration the tender document Att II - Annex b - Matrix of Flows for CRV services_v2), SLA, and the tender document Att II - Annex c - Mapping of services for quality management_v2.

3.2.2 National CRV Points of Contact

Each State/ ANSP is to designate one (1) National CRV Point of Contact. The National CRV Point of Contact represents their State and organization, and all CRV users in that State, including industry users (i.e. CRV User – Industry), at CRV-OG meeting. Table 1 contains details of the National CRV Points of Contact who are designated by their State/ ANSP. The National CRV Points of Contact are also in charge of the whole process in each CRV User – State/Administration, independently if the State involved has more than one node.

The main activities and roles of the National CRV Points of Contact are:

i. Develop close coordination with the CRV-OG, Contractor and Local CRV POC for the complete implementation of the CRV node;

ii. Receive the requests for site surveys from the Contractor, coordinating the actions with the Local CRV POC;

iii. Participate and/or Coordinate the participation of the Local CRV POC and Local Staff in the implementation meetings with the Contractor;

iv. Participate and/or Coordinate the participation of the Local CRV POC and Local Staff in the training package (online, on site, initial and refresh) as defined in the Section 3.12 (Training) of the Terms of Reference (TOR) document;

v. Coordinate the actions and instruct the Local CRV Points of Contact regarding all activities

involved in the implementation phase;

vi. Review and approve the System Design Document (SDD), System Engineering plan (SEP) and other documents, part of the tender package, prepared by the Contractor upon the contract award and signature;

vii. Review and approve the Validation Plan, including the Site Acceptance Test (SAT), prepared by the Contractor;

viii. Oversee if the Contractor is following the national laws and procedures concerning the assignment of frequencies with the radio regulator authorities in each country (case of microwave and satellite equipment);

ix. Update the ICAO CNS Regional Officer (ICAO Asia and Pacific Regional Office) with regard to the timeframe, situation, difficulties and other topics deemed necessary for the implementation of the CRV node(s);

x. Provide the local CRV IP Addressing Scheme - Plan to the Contractor in close coordination with the CRV-OG.

xi. Provide the current numbering plan for the ATS Switched Voice Circuits to the Contractor;

xii. Provide the current direct hotline Voice Circuits configuration to the Contractor;

xiii. Provide the classification and marking scheme for the prioritization of traffic for the QoS to be used by the aeronautical applications in the CRV network (See note in the paragraph 3.2.1.3);

xiv. Receive the requests for site surveys from the Contractor and coordinate the activities with the Local CRV POC; and

xv. Approve the implementation planning.

Table 1: National CRV Points of Contact

Asia Pacific Region:

State/ Administration	ANSP/ CAA	National CRV Point of Contact (POC)	Job Title	E-mail	Telephone/FAX	Address
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**						

MID Region (CRV) Focal Points (updated in December 2017 at CRV OG/3 meeting):

State	Name/Title	Contact Details (Tel./Fax/Mobile/Email)
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**		

3.2.3 Local CRV Points of Contact

Table 2 contains details of the Local Points of Contact and there might be multiple Local Points of Contact for each State/ ANSP. The professionals nominated and listed in the Table 2 are in charge of the oversight of the Contractor´s team in each site. They will report directly to their National Point of Contact. The main activities and roles for the Local CRV Points of Contact are:

i. Instruct and coordinate the actions with all the local staff involved in the CRV implementation;

ii. Develop close coordination with the National CRV POC and the Contractor´s site staff for the complete implementation of the CRV node;

iii. Coordinate the actions for the site surveys with the National CRV POC;

iv. Participate in the implementation meetings with the Contractor (if decided by the National Point of Contact);

v. Participate to the elaboration of the implementation planning;

vi. Participate in the Training Package and nominate, to the National CRV POC, the Local staff there will participate in the referred events;

vii. Report, give feedback and update the National CRV POC regarding all aspects concerning the implementation of the CRV node;

viii. Assist the National POC in the revision and approval of the SDD, SEP and other implementation documents, prepared by the Contractor;

ix. Assist the National POC in the revision and approval of the Validation Plan including the SAT, prepared by the Contractor;

x. Oversee the installation in order to ensure that the Contractor team is keeping the working area clean and free from fire hazards and if after installation, all excess material is duly removed;

xi. Make sure that the local safety rules are observed by the Contractor in terms of intervention on operational systems;

xii. Oversee the installation in order to ensure that the Contractor is following what is described in the TOR, item 3.3.2.9, concerning the Electromagnetic compatibility/ grounding;

xiii. Oversee if the QoS configuration is duly performed by the Contractor, as defined by the CRV-OG representatives and the National CRV POC;

xiv. Oversee if the CRV IP Addressing Scheme (Plan) is duly performed by the Contractor, as defined by the CRV-OG representatives and the National CRV POC;

xv. Oversee if the configuration of current numbering plan for the ATS Switched Voice is duly performed by the Contractor, as defined by the CRV-OG representatives and the National CRV POC;

xvi. Oversee if the configuration of the current Direct Circuits (DIR) is duly performed by the Contractor, as defined by the CRV-OG representatives and the National CRV POC;

xvii. Coordinate the actions for the site surveys and assist the Contractor´s personnel during the visits; and

xviii. Hold meetings with the Contractor as deemed necessary and report to National POC.

Local CRV Points of Contact (installation and oversight of the Contractor´s team on each site)

State	State/ANSP	Site	Local CRV Points of Contact	Email	Telephone / Fax	Service installation
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**						

3.2.4 CRV Contractor

The Contractor shall nominate all the staff involved in the implementation of the CRV node, mainly the Program Manager for the CRV program. The Contractor will follow all the steps described in the tender documentation, specially the TOR and Instructions to Tenderers, for the implementation of the CRV node. The main activities to be carried out by the Contractor during the implementation are:

i. Submit the updated SDD and the SEP to the CRV-OG, to the CNS Officer for the Asia/Pacific Regional Office and to the National CRV POC;

ii. Submit the requests for site surveys to the National CRV POC following the procedures described in the paragraph 4.1.2.2;

iii. Update and submit the Installation Transition Plan to the CRV-OG, to the CNS Officer for the Asia/Pacific Regional Office and to the National CRV POC;

iv. Be responsible for the supply, transport, installation, start-up and operation of all CRV equipment especially designed for a given CRV node;

v. Be dealing with customs and transport company about shipping and introducing the equipment in the Country;

vi. The interconnection (to be provided by CRV users) of the Network Interface Device (NID) to the Local Area Network (LAN) switches and other local equipment, including Voice Communication System (VCS), will be confirmed during the site survey;

vii. Demonstrate before the final validation of the SDD and through a test bed that the main characteristics of the intended design of the network will meet the performance requirements, SLA, safety, security and contingency requirements;

viii. Implement the CRV IP Addressing Scheme (Plan), following the information provided by the CRV-OG and/or the National CRV POC;

ix. Implement the classification and marking scheme for the prioritization of the traffic and Quality of Services (QoS), as described in the document Att II - Annex c - Mapping of services for quality management_v2 and in coordination with the CRV-OG and the National and Local CRV POCs (See note in the paragraph 3.2.1.3);

x. The Contractor shall measure the established parameters during circuit implementation (in accordance with ITU-T), and shall also monitor them for 24 hours to show compliance with the established specifications;

xi. Implement the configuration of current numbering plan for the ATS Switched Voice, as defined by the CRV-OG representatives and the National CRV POC, and taking into account the tender document Att II - Annex b - Matrix of Flows for CRV services_v2;

xii. Implement the configuration of the current Direct Circuits (DIR), as defined by the CRV-OG representatives and the National CRV POC and taking into account the tender document Att II - Annex b - Matrix of Flows for CRV services_v2;

xiii. Submit, in details, the escalation process to be followed for the implementation in each CRV node;

xiv. Submit, to the CRV National POC, the documentation for the training of the CRV technicians;

xv. Contractor Representative shall record the minutes of the meeting and distribute the minutes within three (3) Business Days of the meeting date;

xvi. The Contractor shall propose a planning chart that includes all the actions, steps, milestones, meetings, after negotiations with CRV Local and National POC and respect it once approved by the CRV User Representative or amend it in coordination with CRV User representatives; and

xvii. The Contractor shall help the CRV User in the uptake of responsibility before commissioning the equipment by accompanying the CRV User technicians in charge of the equipment.

4.0 BASIC SITE IMPLEMENTATION REQUIREMENTS

Chapter 4 describes the site and facilities requirements envisaged in the implementation phased for the CRV infrastructure, divided into CRV User´s and Contractor´s responsibilities, and also the main hardware and software for the proof of concept and implementation of the WAN links, LAN protocols, applications and main equipment.

These responsibilities come in addition to those stated in the Terms and Conditions and Terms of Reference.

4.1 Site/ Facilities Requirements

4.1.1 CRV User Responsibility

i. The CRV User shall provide the physical space for the installation of cabinets and equipment;

ii. The CRV User shall deliver to the premises the electric power required to feed the equipment to be provided by the Contractor;

iii. The CRV User shall provide access to the equipment to be connected to the CRV NID and to analog/ digital voice gateway;

iv. The CRV User shall accompany and assist the Contractor during the whole operation;

v. The CRV User shall provide room for storing the equipment, received before its installation; and

vi. The CRV User shall inform the Contractor about the local safety rules and procedures and produce suited documents as deemed necessary.

4.1.2 Contractor Responsibility

i. The Project Manager, on behalf of the Contractor, shall nominate and introduce all the staff involved in the site surveys and in the implementation of a CRV node. The list with the staff nominated will be submitted to the National and Local CRV POCs with the formal requests for the site survey and beginning of the very implementation of the CRV equipment and following the

procedures described in the paragraph 4.1.2.4;

ii. The Contractor shall identify the exact locations of the equipment during the site survey;

iii. The Contractor will be responsible for providing the accessories, switches, cables, connections between the main distribution panel and the NID;

iv. The Contractor shall be responsible for the installation of the CRV network equipment, accessories and the provision of the tools, testing equipment and software for the Site Acceptance Tests (SAT);

v. The procedures to the Contractor for the site surveys aiming the installation of the equipment are as follows:

a) Send a formal request to the national CRV POC, with an anticipation of 20 days for the required coordination with the local CRV POC, sending the names of the staff to be involved with the visit;
b) If authorized, the Contractor shall proceed to the site survey in the date and time indicated by the national CRV POC;
c) If the Contractor fails to comply with the survey in the exact date, the national POC will cancel the visit and the Contractor will have to restart the whole site survey process; and
d) The Contractor will provide all of the instruments and tools deemed necessary for the site survey.

vi. The Contractor shall be held liable for any damage to existing property in each CRV User facilities caused to the facilities by its staff and/or its sub-contractors';

vii. The Contractor shall comply with the site safety rules especially during critical phases such as commissioning or interferences with operational systems by following CRV User staff indications in charge of technical safety and not take personal initiatives that could have an impact on operational systems;

viii. The Contractor shall be responsible for storing the equipment before its installation;

ix. The Contractor may be asked to sign additional documents in order to follow local safety rules;

x. The Contractor shall keep the working area clean and free from fire hazards. After installation, all excess material shall be removed;

xi. The Contractor shall identify the exact locations for the installation of cabinets and equipment during the site survey;

xii. The Contractor shall provide the CRV equipment grounding in each node;

xiii. If necessary, the Contractor shall install protection against atmospheric discharges for all the equipment to be implemented for the provision of the CRV infrastructure in each node;

Note: The Contractor will be responsible for reviewing the characteristics of any existing devices that might be available as long as it is allowed the usage by the CRV representative;

xiv. The Contractor shall be responsible for the connection to the power supply in the installation site, including electrical wiring between the power outlet and the equipment rack of the Contractor, including the respective circuit breakers and devices to protect against surges and atmospheric

discharges;

xv. The Contractor shall be running simulations over a period that has to be determined before commissioning the equipment. CRV User representatives shall be involved in the setting and execution of these simulations; and

xvi. The Contractor shall procure the results of the tests.

4.2 Hardware and Software Requirements

4.2.1 General Topics

i. For the installation of the equipment to be provided, the Contractor shall follow and consider all the tender documents, especially the TOR, the Att II - Annex e - CRV IRS_v2 and the Att II - Annex f - Additional Voice and Data Gateway Service_v3.

ii. Although the Contractor operates MPLS data transport solutions, it is fully committed to the perfect operations of the applications and shall follow the initial end-to-end applications trials.

4.2.2 Hardware Requirements

i. For the satellite equipment, the Contractor shall install the indoor and outdoor units.

ii. Where Applicable, the basic satellite equipment to be provided and checked is: Block Up Converters (BUC), Low Noise Block (LNB) down converters and Satellite Modems and VSAT Network management sub-system.

iii. Where Applicable, the basic ground/terrestrial equipment to be provided will comprise: routing system of the IP VPN Internet (with the needed interfaces), the basic ground voice and data gateway (with the needed interfaces), the NID (with the needed interfaces), switches (with the needed interfaces), A/B baseband switch (with the needed interfaces), Multiprotocol Label Switching (MPLS) for the Wide Area Network (WAN) (optical and/or microwave) links equipment.

iv. Before connecting the NID and the analog/digital, if needed, the contractor´s team shall install the new racks and prepare the transition cables, such as junction coaxial cables, junction sub-d cables or RJ based cables.

v. All the test and measurement tools shall be provided by the Contractor. No testing and measurement equipment will be provided by the CRV User representatives.

vi. All the needed equipment must be shipped and acknowledge by the CRV-User before the installation phase with sufficient delay. The Provider have to take the customs procedure delay into account.

vii. All the received items must be inventoried and tested before the beginning of installation in order to avoid dispute.

4.2.3 Software Requirements

Where applicable, the basic software to be provided and/or used in each site is: Network Management Systems (NMS) software, if the SDD indicates that one or more CRV nodes will be selected to manage the CRV network in parallel with the Contractor´s Network Operations Center (NOC), software for BUC, Satellite Modems, NID, Voice/Data Gateway and switches.

4.2.3.1 Documentation Requirements

The needed documentation for the uptake of the equipment shall be provided to CRV User on its demand as deemed necessary.

5.0 TESTING AND EVALUATION.

The tests for the acceptance of the implemented equipment in each CRV node will be performed using simulations of the applications and, eventually, the real application tests that will follow the operational requirements as described in the tender documents, mainly, but not restricted to:

i. Att II - Annex a - CRV CONOPS_v2;

ii. Att II - Annex b - Matrix of Flows for CRV services_v2;

iii. CRV Implementation plan (Chapter 5); and

iv. Validation Plan including the Site Acceptance Test (SAT) protocols (prepared by the Contractor).

The main testing and measurement equipment and tools that shall be used by the Contractor are:

i. Spectrum Analyzer;

ii. cable analyzer;

iii. audio analyzer/generator;

iv. Multi-meters;

v. LAN/Network protocol analyzer; and

vi. Telephones.

Note: This paragraph doesn´t exhaust all the testing and measurement equipment to be used during the implementation phase, and the Contractor shall describe all of them in the documentation to be provided after the contract signature.

The Contractor shall test its backbone (end-to-end) and the connection to its Network Operating Center (NOC). The links will be tested using computers for asynchronous and IP flows for example, and analogical phones.

An example of asynchronous test is opening a HyperTerminal session and send characters and a Bit Error Rate Test using a software such as WinSSD.

The requirements for the test procedures will be reflected in the Chapter 5 (Testing and Evaluation). Notwithstanding this fact, the tests procedures will need some software for the applications as reflected in the following paragraphs.
Note: The following paragraphs don´t exhaust all the software and the Contractor shall describe all of them in the documentation to be provided after the contract signature.

For AFTN simulation: The simulation will consist of connecting a PC to the AFTN port at the back of the rack (with the right rate described in the document Att II - Annex b - Matrix of Flows for CRV services_v2) and close the serial interface at the other end of the circuit (loop). With the PC launch the *winssd* program (or other similar) and start the Bit Error Rate (BER) test. Run the test for 5 minutes and check that there are only a few errors.

For AMHS simulation: AMHS service is over IP (see the document Att II - Annex b - Matrix of Flows for CRV services_v2. To simulate it:

i. ping any remote equipment in the network according to the following cross matrix; and

ii. Verify that the end user is exchanging information correctly.

IP based RADAR and Asterix: The simulation will consist in selecting two sites, configuring sufficient bandwidth and multicast an IP flow.

ATS/DS Circuits: All ATS/DS calls are auto-dialed. The communication is established after the user picks up the phone. The simulation will consist of connecting a telephone on the desired line at the back of the rack, pick-up the phone make the call to the other end of the circuit. For E1 based circuits, to be connected to a VCS, this cannot be simulated.

ATS Switched Circuits: ATS switched calls are dialed. The communication is established after the user picks up the phone and dials the remote dial number. The simulation will consist of connecting a telephone on the desired line at the back of the rack, pick-up the phone and dial a remote number in order to call the other end of the circuit. For E1 based circuits, connected to a VCS, this cannot be simulated.

6.0 CONTINGENCY PLAN/ BACK-OFF PLAN

6.1 Purpose

CRV Users - State/ Administration are to establish contingency plan, with the CRV contractor in case of the following scenario:

i. CRV total failure;

ii. CRV partial failure (e.g. voice channel failure);

iii. Provider Edge (PE) to Customer Edge (CE) link failure (e.g. ANSP1 lose connectivity to CRV); and

iv. PE to PE failure (e.g. ANSP1 and ANSP2 unable to exchange data/ or voice).

6.2 Harmonized Contingency Plan

CRV Users - State/ Administration could also bilaterally/ multilaterally setup additional IPLC(s) as a contingency. This contingency plan could be harmonized in the APAC region to reduce costs.

7.0 MIXED OPERATING ENVIRONMENT

7.1 Routing of AFTN/ AMHS messages to non-CRV States/ Administrations

During the initial phase of the CRV implementation, States/ Administrations who have joined CRV are to ensure the routing of AFTN/ AMHS messages to States/ Administrations who have not joined CRV.

7.2 Inter-Region common network connectivity

It is envisaged for common networks (e.g. PEN, FTI and CRV) in different Regions to be inter-connected.

Appendix A

1 Introduction

1.1 Objective

This document is meant to describe the addressing plan for IPv4 addresses throughout the Asia/Pacific Region. This document defines the recommended address format for IPv4 addresses. The IPv4 network is to be used within region.

1.2 References

[1]	ICAO Doc 9705-AN/956	Manual of Technical Provisions for the ATN
[2]	ICAO Doc 9896	Manual for the ATN using IPS Standards and Protocols
[3]	ICAO Doc 7910	ICAO Location Indicators
[4]	RFC 1518	An Architecture for IP Address Allocation with CIDR
[5]	RFC 1918	Address Allocation for Private Internets
[6]	RFC 2050	BGP-4 Internet Registry IP Allocation Guidelines
[7]	RFC 3330	Special-Use IPv4 Addresses
[8]	RFC 4271	BGP-4 Specification

1.3 Terms Used

Administrative Domain	–	An administrative entity in the ATN/IPS. An Administrative Domain can be an individual State, a group of States, an Aeronautical Industry Organization (e.g., an Air-Ground Service Provider), or an Air Navigation Service Provider (ANSP) that manages ATN/IPS network resources and services. From a routing perspective, an Administrative Domain includes one or more Autonomous Systems.
Autonomous System	–	A connected group of one or more IP prefixes, run by one or more network operators, which has a single, clearly defined routing policy.

Intra-domain (interior gateway) routing protocol	–	Protocols for exchanging routing information between routers within an AS.
Inter-domain (exterior gateway) routing protocol	–	Protocols for exchanging routing information between Autonomous Systems. They may in some cases be used between routers within an AS, but they primarily deal with exchanging information between Autonomous Systems.
Local Internet Registry	–	A Local Internet Registry (LIR) is an IR that primarily assigns address space to users of the network services it provides. LIRs are generally ISPs, whose customers are primarily end users and possibly other ISPs. [LACNIC]

1.4 Acronyms

AMHS	–	ATN Message Handling System
ARP	–	Address Resolution Protocol
ATN	–	Aeronautical Telecommunications Network
BGP	–	Border Gateway Protocol
DNS	–	Domain Name Service
IANA	–	Internet Assigned Numbers Authority
ICS	–	ATN Internet Communication Service
IP	–	Internet Protocol
IPv4	–	Internet Protocol Version 4
IPv6	–	Internet Protocol Version 6
IPS	–	Internet Protocol suite
LACNIC	–	Latin American and Caribbean Internet Address Registry
LIR	–	Local Internet Registry
OSPF	–	Open Shortest Path First
RIR	–	Regional Internet Registry

1.5 Overview of Addressing Issues

The following subsections present issues that affect the completion of the addressing plan for operating the IPS-based AMHS network.

1.5.1 Public or Private Address

An important decision for the region is whether to use private or public addresses. Private addresses can be used if coordinated by all participating States and Organization; however, it is possible that existing networks already use addresses in the private block ranges. Public addresses must be obtained from a Regional Internet Registry (RIR). The Internet Assigned Numbers Authority (IANA) has delegated responsibility for administration of Internet numbering to the Latin American and Caribbean Internet Address Registry (LACNIC).

1.5.2 Address of Systems in External Regions

Systems in external regions could be assigned an address from the APAC address space rather than use an address in their regional address block. Note however that this must be coordinated with private addresses so as to avoid collisions.

2 IPv4 Addressing Overview and Fundamentals

In the Internet Protocol a distinction is made between names, addresses, and routes. A name indicates what we seek. An address indicates where it is. A route indicates how to get there. The Internet protocol deals primarily with addresses. Its main task is to forward data to a particular destination address. It is the task of higher-level protocols to make the mapping from names to addresses, for example using a domain name service (DNS). The Internet protocol forwards packet data units (PDU) to a destination address using routing tables maintained by a routing protocol. The routing tables contain the address of the next hop along the route to the destination. There are in general two classes of routing protocols: inter-domain or exterior routing protocols such as the Border Gateway Protocol (BGP) and intra-domain or interior routing protocols such as the Open Shortest Path First (OSPF) protocol. In order to forward PDUs to the next hop address, there must be a mapping from this address to the link level address, for example, an Ethernet address. This mapping is maintained by an address discovery protocol such as the Address Resolution Protocol (ARP).

An IPv4 address consists of four bytes (32 bits). These bytes are also known as octets. For readability purposes, humans typically work with IP addresses in a notation called dotted decimal. This notation places periods between each of the four numbers (octets) that comprise an IP address. For example, an IP address that a computer sees as

00001010 00000000 00000000 00000001

is written in dotted decimal as

10.0.0.1

Because each byte contains 8 bits, each octet in an IP address ranges in value from a minimum of 0 to a maximum of 255. Therefore, the full range of IP addresses is from 0.0.0.0 through 255.255.255.255. That represents a total of 4,294,967,296 possible IP addresses.

A network may be set up with IP addresses to form a private or public network. On a private network a single organization controls address assignment for all nodes. On a public network there must be some conventions to assure that organizations do not use overlapping addresses. In the Internet this function is performed by the Internet Assigned Numbers Authority (IANA), which delegates authority to Regional Internet Registries (RIR). For the CAR/SAM Region the RIR is the Latin American and Caribbean Internet Address Registry (LACNIC).

IPv4 Addresses are a fixed length of four octets (32 bits). An address begins with a Network ID, followed by a Host ID as depicted in Figure 2-1.

Figure 2-1. IPv4 Address Format

The original IP addressing scheme divided the Network ID from the Host ID is in a several octet boundaries. In this scheme the main classes of addresses were differentiated based on how many octets were used for the Network ID. This method is called classful addressing. Classful addressing was by convention further modified so that the Host ID could be split into subnet ID and sub host ID. This is typically accomplished using a subnet mask and is called classful addressing with subnetting. This eventually evolved into classless addressing where the division between the Network ID and Host ID can occur at an arbitrary point, not just on octet boundaries. With classless addressing the dividing point is indicated by a slash (/) followed the number of bits used for the Network ID. This value is called the prefix length of the address and the address value up to that point is called the network prefix.

Private Addressing is defined in RFC 1918. IANA has reserved the following three blocks of the IP address space for private Internets:

10.0.0.0 - 10.255.255.255 (10/8 prefix)
172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
192.168.0.0 - 192.168.255.255 (192.168/16 prefix)

Because of the number of bits available to users, these blocks are referred to as a "24-bit block", a "20-bit block", and a "16-bit" block. An enterprise that decides to use IP addresses out of the private address space defined by RFC 1918, can do so without any

coordination with IANA or an Internet registry. Addresses within this private address space will only be unique within an enterprise or a group of enterprises (e.g., an ICAO region), which chose to cooperate over this space so they may communicate with each other in their own private Internet.

3 IPv4 Addressing

3.1 Overview CAR/SAM

3.1.1 During the fourth meeting of ATN/TF4 (Santo Domingo, Dominican Republic, 27 to 28 June 2008) the group analyzed different alternatives for the implementation of the TCP/IP in the CAR/SAM Regions identifying the available options that would facilitate this implementation in the AMHS Service and future applications. This was reviewed in accordance with Document 9880 Part IIB of the ICAO. In this respect the Meeting decided two viable options for the implantation the TCP/IP:

a) AMHS using the RFC1006 on Guiders TCP/IP (IPv4) to allow AMHS to directly interface with IPv4 Guiders for the intra-regional connections.

b) Configurating AMHS, as specified in a) with capacity for IPv4 conversion to IPv6 through the implementation of a function of IP router as gateway for the interregional connections.

3.1.2 The Sixth Meeting of Committee ATM/CNS (ATM/CNS/6) (Santo Domingo, Dominican Republic, 30 June to the 04 July 2008) analyzed this Plan of IP Addressing for CAR/SAM Regions and considered that such a plan would be sent to the ICAO for revision.

3.1.3 During the ACP/WG/I/8 (Montreal, Canada, 25 to 29 August 2008) it was concluded that it is possible to consider a regional scheme of IPv4 addressing. Taking into consideration that the private sector would be using the propose addressing scheme in other applications, the Meeting considered nonviable to apply the IP addressing scheme at a global level.

3.1.4 The Third Meeting of the Group of Regional Implementation SAM/IG/3 (Lima, Peru, 20 to 24 April 2009) considered that, taking into account specified in Table CNS 1Bb from the FASID, the AMHS system to be installed in the SAM Region will use IP protocol and will initially use the IPv4 version. The block of used IPv4 addresses will follow the format established during the ATM/CNS/SG/6 Meeting.

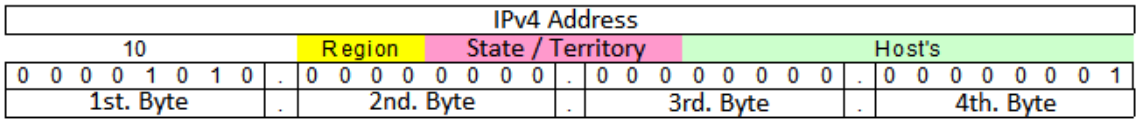
3.2 IP Addressing Plan

When we began to work on the plan of IP addressing, we once again reviewed the scheme that was originally proposed, analyzed the amount of States/Territories by

Region, the amount of addressing that each State/Territory could use and the amount of addressing reserved for the interconnection between States/Territories. The result of this study concluded that:

3.2.1 1 bit would be reduced to State/Territory level. This means the transfer of 256 States to 128 States by region. In the EUR/NAT Region, which is most numerous, has 53 States/Territories, means that there are many vacant numbers.

3.2.2 1 bit at Host's level would be added. This would allow the transfer from 4096 to 8190 hosts per State/Territory. This was considered due to the amount of future applications that would be implemented, mainly in the more developed States, and could cause the amount of directions not to be sufficient. The structure is shown below:



3.2.3 It should be noted the networks assigned to each State are private networks (RFC 1918). The first Bytes that integrate the assigned address will always maintain a decimal value of 10. Whereas the other three Bytes are used to distribute, in hierarchic form, the blocks of directions corresponding to each State.

3.2.4 The first four bits of the second Byte (4 bits) will be used to identify the regions in around which the States/Territories of the world are grouped:

- 0000 => SAM: South American Office.
- 0001 =>. NACC: North American, American Power station and Caribbean Office.
- **0010 => APAC: Asia and Pacific Office.**
- 0011 => MID: Middle East Office.
- 0100 => WACAF: Western and Central African Office.
- 0101 => ESAF: Eastern and Southern African Office.
- 0110 => EUR/NAT: European and North Atlantic Office.

3.2.5 On the other hand, the last four bits of the second Byte, and the first three bits of the third Byte (7 bits) will be used to identify the States/Territories of each region.

3.2.6 Whereas the last five bits of the third Byte and the eight bits that compose the fourth Byte (13 bits) will be used by each one of the States/Territories to assign addressing to their terminals/servers

3.2.7 The IPv4 address allocation scheme will be able to cover:

- 16 Regions.

- 128 States/Territories by each Region.
- 8190 Host' s for each State/Territory

3.2.8 The IPv4 addressing plan would allow each State/Territory to be able to make use of the block of directions assigned as needed.

a) Each State has been assigned 8190 usable Network addresses, which seem to be sufficient to cover existing needs.

b) In the development of the mentioned scheme, a flexible margin has been designated so that it will allow the future growth or change in the network in the future. For example, if a region were subdivided in two or more regions, or the emerging of a new State/Territory.

c) Argentina has already implemented its ATN network with a scheme of addresses different from the proposed one, prior to the publication of this document, has placed a border devise with the intention that this devise will make the address translation between the outer directions.

3.3.1 Network Assignment for ASIA/PACIFIC

Ref	State/Administration	Network	Direction used	Decimal notation	Binary Notation	Region	State/Territory	Host's
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**								

3.3.2 Network Assignment for USA

Ref	State/Administration	Network	Direction used	Decimal notation	Binary Notation	Region	State/Territory	Host's
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**								

3.4 Using IPv4-Compatible Address Formats

In many instances, you can represent a 32-bit IPv4 address as a 128-bit IPv6 address. The transition mechanism defines the following two formats.

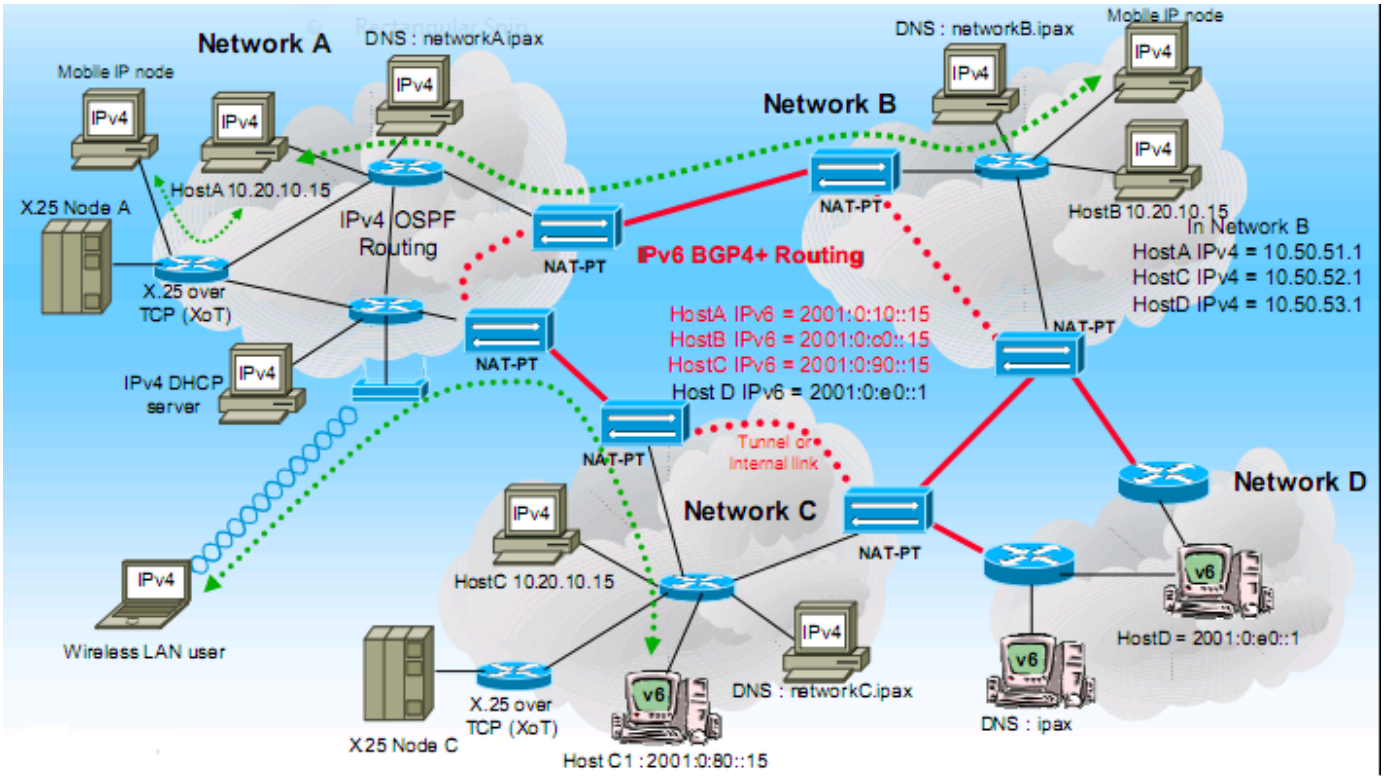
IPv4-compatible address

000 ... 000	IPv4 Address

IPv4-mapped address

000 ... 000	0xffff	IPv4 Address

The mapped address format is used to represent an IPv4 node. The only currently defined use of this address format is part of the socket API. An application can have a common address format for both IPv6 addresses and IPv4 addresses. The common address format can represent an IPv4 address as a 128-bit mapped address. However, IPv4-to-IPv6 protocol translators also allow these addresses to be used.



Appendix B

No.	State	Network IP Address	Hosts IP addresses			
			Decimal Notation	Binary Notation		
				1st Byte	Region	State	Hosts

The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal.

If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal

If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP.

To get access to ICAO Secure portal, please use group Name: **CRV**

What	Due date	Status	Completed on	Result
After inclusion by ICAO TCB of the revised budget and procurement clauses, ICAO Regional Office to send an ICAO State letter to all Pioneer States in order to propose the draft of revised annex 1 for acceptance. **CRV OG/6 made Decision OG/6/3 to develop SOW for the concrete proposal.**	20 February 2017 1/22/2022	close	The revised Annex 1 had been developed in CNS SG/21 report but no concrete proposal.	Close as it will be covered in 4-4 (CRV OG/9)
All States to complete their CBA and send to ICA	28-Apr-17	close	CRV OG/6	CBA by DSNA, Jordon, UAE, Behrain, Saudi, Egypt, Bhutan, New Caledonia, Myanmar, Fiji, Malaysia
Australia to include provisions in the CRV-OG operating manual for a small implementation team	1-Dec-17	close	CRV OG/7	
to develop the flowchart to manage change requests to the common provisions and establish agreements between counterparts on CRV and integrate those flowcharts in the CRV Operating Manual	7-Jul-17	close	CRV OG/7	CRV Operating Manual
to share the 10 key points of the validation of the pioneer implementation once they are agreed on	30-May-17	close	1-Apr-18	
to submit their comments to husnaeen@icao.int at their earliest convenience but no later than 7 July 2017	7-Jul-17	close	CRV OG/3	
to review the procedure to establish a contract with PCCW Global, Ltd and present it as a flowchart to be included in the CRV operating manual	30-May-17	close	CRV OG/3	CRV Operating Manual
to include the updated CRV Implementation schedule into the v0.5 of the implementation plan and circulate the v0.5 to all participants for acceptance	30-Aug-17	close	1-Apr-18	CRV Implementation Plan
to propose a way forward regarding the MSA	1-Dec-17	close		
Complete contract with PCCW Global by no later than 12/2020	12/31/2021 Dec 2022 (in CRV OG/9) CRV OG12	Open	on-going	
Conduct CRV OG/6 and SWIM TF currently for joint development SWIM Architecture based on construciton of CRV	8-May-19	close		
PCCW Global to reissue an updated (a)-1 Terms and Conditions on starting and ending dates of initial contract. States to note the changes and take necessary action in the contract.	1-Dec-18	close	CRV OG/7	
To investigate use the MSA funds to undertake the independent safety assessment and seek approval from Pioneer States	1/1/2022 CRV OG/11 (in CRV OG/9)	close	opted the conclusion for	Depend on final fund decision from poineer MS.
further develop and maintain an addional CRV portal for use by the APAC CRV members and provide access procedure to those members that wish to access the portal.	Apr.19	close	CRV OG/5	
Finalize the draft CRV Operations Manual	Apr.19	close	CRV OG/7	**Conclusion CNS SG/24/4 -** Publishing of CRV operational manual to provide the information and directions required for CRV OG performance and CRV operations

What	Due date	Status	Completed on	Result
Develop a WP on AMHS over IPS protocol only for BBIS	1-Jun-18	close	CRV OG/5	
Prepare a working paper for SWIM TF/3 meeting on the CRV suport for SWIM	30-Apr-19	close	SWIM TF/3	**SWIM TF/3: (7-10 May 2019)** **WP/06** - APAC Regional SWIM Implementation Options ; **WP/20** - Network Capability and Security of CRV in Carrying SWIM Data; and **WP/05** - SWIM-Enabled MET Information Services Developed by Hong Kong China;
Disribute a State Letter to inform States of POC result	15-Mar-19	close	6-Mar-19	**State Letter: Ref.: T 8/2.10 – AP025/19 (CNS), 6 March 2019,** Subject: Notification of successful result of the CRV Proof of Concept Testing and Urging earlier implementation of CRV in APAC Region
Study on use of existing VSAT infrastructure linking with CRV	Jan-22	close		
Pacific solution on inter-connection with PASNET, Feasiblity for interconnection	5/1/2022 Dec 2022 (CRV OG/9) CRV OG12 (decided in CRV OG/11)	close		No intercoonection with PASNET is possible. Close in CRV OG12
Polishing draftt First CRV Operations Manual	May-20	close		**Conclusion CNS SG/24/4** - Publishing of CRV operational manual to provide the information and directions required for CRV OG performance and CRV operations
maintain APAC dial plan and posted on CRV OG portal	Jan-22	close		
encourging member states of CRV to participate	20-Jan-22	close		State Letter Ref.: T 8/2.10: AP018/20 (CNS) Subject: 2020 APAC Aeronautical Fixed Service Safety and Protection Planning Working Group Meeting (AFSSP WG 2020), 16 January 2020.
SWIM demonstration over ~~mini-~~Pseudo CRV by HK, Singapore and Thailand	1/1/2022 CRV OG/11 (CRV OG/9) CRV OG12 (in CRV OG11)	close	Modifed in CRV OG12 **Propose to close**	HK is conducting POC with PCCWG in terms of concept for sharing surveillance data (CRV OG/9)
High level concept for inter-regional MPLS/IP co	21-Apr-20	close		**WP/09:** MPLS/IP BASED INTER-REGIONAL CONNECTION, ICAO Sec **WP/11:** HIGH LEVEL NETWORK OPTIONS TO REDDIG, PCCWG
Charging structure for an ANSP service provider on surveillance	20-Mar	close		IP/11 presented in OG/9 with solution
State letter to States to remind joining CRV	Mar-20	close		Ref.: T 8/2.10 - AP041 /20 (CNS) Subject: Reminder for implementation of Common aeRonautical VPN (CRV) in APAC Region by 2020, 2 March 2020
CRV webinar	20-Jul-21	close	20-Jul-21	The webinar was conducted successfully on 20 July 2021
Timeframe for CRV supporting SWIM	Jan-22	close		Ad-hoc group created in CRV OG/9 for this task. Under action item 9-8
Use CRV to support AMHS traffic for Bhutan	6/21/2021 June 2022 (CRV OG/9)	close		

What	Due date	Status	Completed on	Result
State Letter to inform States about the additional charges may apply to new users with billing start date later than 31 December 2022.	Jan-22	close	SL Ref.: T 8/2.10 – AP007/22(CNS) dated 12 January 2022 Subject: - To remind the target year of CRV Implementation by 31 December, 2022 in APAC Region and CRV Implementation for small Pacific Island and small ANSP in the region using CRV Solution, PCCWG SLA Package D	CRV webinar requested to extend the date by one year due to panedemic
Continue the feasibility study on inter-regional connection to support business case analysis	1/1/2022 CRV OG/11 (in CRV OG/9) CRV OG12 (in CRV OG/11)	on going	Ongoing. Technical Proposal finalized in CRV OG8 meeting was NA due to takeover of Lumen by Cirion Technologies	From: Nibhani, Soniya <SNibhani@icao.int> Sent: Monday, 29 August 2022 12:03 PM To: Hickford, Vaughan <vaughan.hickford@airways.co.nz>; Almeida, Francisco <falmeida@icao.int> Cc: fuzieda@dgac.gob.cl; cvergara@dgac.gob.cl; Luo, Yi <yluo@icao.int>; Javier Vittor <jvittor@icao.int>; Nibhani, Soniya <snibhani@icao.int> Subject: RE: CRV - REDDIG II Interconnection CAUTION: This email originated from outside of the Corporation. If you do not recognise the sender or you are not certain that the content is safe, then do not click on any links or open any attachments. Hi Vaughan, Thanks for the reply. I completely agree with the proposal. As our present contract has a long time to expire, it would be better if we initiate a formal interconnection request. Before commencing a formal request, we need to consider many other factors/points. It includes expiry of current contract of Lumen in a few years. Let's discuss it in our ad-hoc meeting on 15 September.
submit a paper to ACSICG/8	21-Jun-21	close	**Done in ACSICG/8**	**IP/06:** PRESENTATION OF PCCW NETWORK BASED IWXXM TRANSLATION AND EXCHANGE SERVICE
Cyber threats protection for CRV	Jan-22	close	Need to review this action item in CRV OG/11 **CRV OG11: Closed it now and Reopene once concret information from ICAO is available.**	ICAO Requirements proposed in WP/32 of CNS SG/25: a) ICAO needs to provide an IPv6 dedicated address block b) ICAO needs to propose a Name Space and field a DNS c) ICAO needs to deliver IATF recommendations for security including a Trust Framework for Digital Identities For the moment being there is no requirement from the TF to use a dedicated block of IPv6 addresses or a fully qualified DNS. Analysis and studies are ongoing but there is no decision for the moment being. The Trust Framework Study Group has been "upgraded" to the Trust Framework Panel and matters concerning the trust framework will be under its purview (AN Min. 220-16 refers). The ANC has already reviewed draft job cards (AN Min. 221-7 refers). In the interim, development work continues on the digital identity certificate policy, as well as the development of guidance materials for an information security framework and this work will be transferred to the panel at its first meeting. Provisions related to information security

What	Due date	Status	Completed on	Result
				Provisions related to information security as part of the new draft PANS-IM were recently discussed in the ANC in the 221st session and will be sent in a State Letter shortly (AN Min. 221-6 refers). These provisions are only applicable to SWIM for the moment being.
The Member States would take some time to take reference of the ATN/AHMS Guidance Tree to review it and to provide the suggestion for modification in the ATN/AHMS Guidance Tree along with locating the position to add different CRV reference documentation.	CRV OG/11	on going		
ICAO Implementation Plan will be continued to upload on ICAO APAC e-documents portal. However, the information contained under Table-1, Table-2 and Appendix A and B would not be provided on the public portal. Under Table-1, Table-2 and Appendix A and B, a message would be added to refer to ICAO APAC CRV Secure portal or CRV Portal hosted by New Zealand to get required information along with the instructions	Jan-22	close		Done
ICAO CRV Steering Group comprised of Fiji, India, Japan, Singapore, New Zealand, USA, and ICAO Secretariat would devise the terms and conditions for addition of new services, for upgrade/downgrade of packages along with addition of new sites by contracted states into their contract	CRV OG/10 CRV OG/11	close	**New T&C was adopted in CRV OG11**	Due date extended in CRV OG/10. Meeting scheduled on 31 March 2022 WP/03 presented to OG/10 Next Steering Group meeting on **14 July 2022** Meeting done and T&C is reday-16 Dec 2022
ICAO APAC Office would send a State Letter to APAC Member States, who have not joined/not process to share their intention to join CRV and when they intend to do so.	Feb-22	close		State letter Ref.: T 8/2.10 – AP026/22(CNS) 01 February 2022 Subject: - Request to share the intention to join CRV and its Tentative Timelines
ICAO CRV Steering Group will discuss and finalise the requirements of current CRV contract extension based on feedback received from Member States who would join CRV in next few years	Mar-22	close		Meeting held on 31 March 2022. WP/02 presented to OG/10
PCCWG is considering the current situation and will provide an official response if there is any contractual and commercial impacts for member states who sign the contract in 2022 but the installation date exceeds the standard lead time in 4 weeks to Sri Lanka, CRV OG Chairs, and ICAO Secretariat.	Feb-22	close		PCCWG agreed to consider all states on same price who will sign contract in 2022 and installation till 31 december 2023. Reply to Sri Lanka is being prepared-Updates on 14 March 2022 Sri Lanka confirmed reception of reply on 18 April 2022 by email from Mr. Vidura.
In response to WP/18, ICAO Secretariat would present a paper to SWIM TF on behalf of CRV OG to informed about the relevant discussion in CRV OG.	May-22	close	SWIM TF/6	Done Propose to close
CRV ad-hoc expert Strategy and Design group would join SWIM TF meetings to note important discussions related to CRV and to inform CRV OG about the relevant outcomes	CRV OG/11	close	Add it into next ad-hoc expert group meeting on 10 March 2022	Added into 10 March 2022 meeting and infromed to all member states of ad-hoc group. Propose to close
A specialised meeting would be organised to discuss and devise a method for non-aviation service provider's joining process to CRV. WP/17 by PCCWG for Non-aviation providers joining CRV should be also considered to discuss in the specialised meeting, which was supported by Singapore.	CRV OG/11	close	Final terms and defintions were adopted in CRV OG11	Propsoal sent for meeting from 30 May-3 June for choices by members on 21 March 2022 Final Meeting date is 2 June 2022
The meeting requested Member States to provide examples of activities under different categories provided in scope of supporting CRV Network as described in section 10.5 of draft report and scope of wor defined in revised MSA	CRV OG/11	close	WP/14 presented by New Zealand in CRV OG11	
Prepare the Terms of Reference (ToR) of Security and safety assessment of CRV	CRV OG/11	close	Replaced by AI 11-8	

What	Due date	Status	Completed on	Result
ICAO Secretariat will do necessary coordination with volunteered Member States for organising the CRV OG Ad-hoc Governance Group Meeting from 22-23 May 2023 and drafting the ToR	ACSICG/10	close	22-23 May 2023 CRV OG Ad-hoc Governance Group organised Propose to close	ToR need to be discussed in CRV OG Ad-hoc group meeting on 20 April 2023
The latest version of CRV OG Operational Manual will be published on ICAO APAC e-docs under CNS, ICAO APAC CRV Secure portal, and on CRV portal hosted by Airways New Zealand	Feb-23	close	2/24/2023 Propose to close	APAC State Letter Ref.: AP034/23 (CNS) - Publication of ICAO APAC CRV OG Operations Manual v1.2 and ICAO APAC CRV Implementation Plan v2.2 dated 24 Feb 2023
Nepal suggested to incorporate relevant guidance in the form of Process and Procedures into the CRV OG OM clarifying that Member States can request support of ICAO Secretariat and CRV OG for dispute resolution matters or other significant issues if arises. CRV OG Ad-hoc Expert Group will discuss the possibility of adding such provision and draft relevant clauses to add in CRV OG OM.	CRV OG/12 CRV OG13	close	SOP was adopted by CRV OG/13	Added into agenda item for 20 April 2023 Meeting
The latest version of CRV OG Implementation Plan without restricted information will be published on ICAO APAC e-docs under CNS Section. The latest version of CRV OG Implementation Plan will be uploaded on the ICAO CRV Secure portal, and CRV portal hosted by Airways New Zealand	Feb-23	close	2/24/2023 Propose to close	APAC State Letter Ref.: AP034/23 (CNS) - Publication of ICAO APAC CRV OG Operations Manual v1.2 and ICAO APAC CRV Implementation Plan v2.2 dated 24 Feb 2023
CRV OG Ad Hoc Expert Group will work on to modify relevant CRV documents and update the CRV OG Operations Manual to ensure that any changes within CRV consider modifications required to the ATN Documentation document tree	CRV OG/12 CRV OG/13	on going		
The ICAO Secretariat will take necessary action to update ATN Documentation Tree on the ICAO APAC Regional Implementation Projects webpage with the proposed first snapshot of the Tree that would be modified in future as more modifications would be made by ACSICG/CRV OG Meetings	CRV OG/12 CRV OG/13	close		The webpage cannot be modifed. So close. A separate word/pdf file has been created till a tool can be developed.
ATN Routing and Telecommunication table should be updated and shared with ACSICG/10 for updates.	ACSICG/10	close	Done, Propose to close	Table finalized on 17 March 2023
Modified table will be shared with APAC Member States for updates using New Zealand hosted CRV portal. The table will be updated by ACSICG/10.	ACSICG/10	close	Done, Propose to close	Email shared with CRV local POC on 17 March 2023
The Group will create ToR for security review of CRV for Option 2 and 5 presented in WP/14 in CRV OG11.	ACSICG/10	close	Done in ACSICG/8	
A dialogue about bandwidth requirements for SWIM services for CRV were initiated. Considering that the basic principle of information exchange in SWIM is publish/subscribe, the meeting requested that the ICAO Secretariat share information about any discussion planned in SWIM TF on developing a ruleset to guide or instruct users about information should be subscribed to so systems and networks are not overloaded or crashed by excessive subscription. ICAO Secretariat informed that such discussion is not being done in SWIM TF. ICAO Secretariat will share information with SWIM TF for further information/action required on this matter	CRV OG/13	Open	Not clear action item resulted from CRV PSIDS Seminar in Fiji. Propose to close.	
PCCWG will provide quarterly bandwidth utilization reports to the CRV OG Ad-hoc expert group as a periodic update	CRV OG/13	on going		Report was provided in CRV OG13. However, average BW is not correct parameter. PCCWG is working on provding peak bandwidth utlization figures.
The CRV OG Ad-hoc Expert group would review and present the revised Tree to the next CRV OG meeting for review and endorsement	CRV OG/13 CRV OG/15	Open		
The Meeting advised sharing the Tree with ACSICG for further review and modifications for AMHS and other relevant AFS sections	CRV OG/13 CRV OG/15	Open		

What	Due date	Status	Completed on	Result
The CRV OG Ad-hoc Expert group develop the process for testing new SWIM services following the procedure mentioned in Appendix A to the CRV OG/12 report	CRV OG/13	on going		
The CRV OG Ad-hoc Expert group modify the process provided in Appendix B to incorporate various discussions and suggestions shared during the Meeting : 1. To assess the feasibility of a Service Provider / Service Consumer (SPSC) connecting to the CRV, the list of parameters provided in a(ii) of the process needs to be reviewed and amended to accommodate other potential required parameters. 2. A process and procedure to test a new service on the CRV network need to be drafted. 3. Further discussion is needed for the required class of SWIM services. 4. The feasibility of testing a new SWIM service first on the test GRE tunnel and after successful testing on the test GRE tunnel, its transfer over to the operational GRE tunnel needs further deliberations. 5. The number of GRE tunnels for each SWIM service may not be feasible. 6. Further discussion is required for IP assignments and their grouping. 7. Currently, in the System Design Document (SDD), the QoS of SWIM services is not mentioned, requiring further action.	CRV OG/13 CRV OG/15	Open		Item 1, 3, 5, 6 completed. 2, 4, 7 ongoing.
The latest version of the CRV OG Operational Manual will be published on ICAO APAC e-docs under CNS, ICAO APAC CRV Secure portal, and on the CRV portal hosted by Airways New Zealand	CRV OG/13	close	Requested latest version from Vaughan on 31 Jan 2024 Uploaded on the portal on 5 Feb 2024 Propose to close	
Singapore suggested modifying the local and national point of contact responsibilities mentioned in CRV Imp Plan to accommodate the new CRV user's definition. Accordingly, the CRV Implementation plan may need further modifications to accommodate new CRV users definition. The Meeting requested that the CRV OG Ad-hoc Expert group incorporate this task into their agenda items	CRV OG/13	close		
ICAO Secretariat will share the information requested and templates of daily, weekly, annual tasks of CRV with all CRV National and local Points of contact along with CRV OG/12 participants before 2 February 2024	2-Feb-24	close	Sent email on 31 Jan. Last date to submit resposne: 29 Feb 2024 15 resposns received.	
All States/Administrations already utilizing CRV will submit the list of tasks in the requested template to the ICAO Secretariat before 31 March 2024	31-Mar-24	close	Reminder to sent on 1 March for extension date by 31 March 2024	
ICAO Secretariat will share a doodle with all CRV OG Ad-hoc governance group experts to finalize the date for 24 April or 3 May 2024	2-Feb-24	close	Email sent on 29 Jan. Doodle due on 2 Feb Final date 3 May 2024 Propose to close	
ICAO Secretariat will share the list of users having access to the CRV portal with all States/Administrations before 2 February 2024 for updates	2-Feb-24	close	Email sent on 31 Jan. Propose to close	
All States/Administration will share the updated list of a maximum of three users to get access to the portal before 29 February 2024	29-Feb-24	close	Reply awaited for 29 Feb Propose to close	
				Resulted from CRV contract management process. Only on secure portal.

What	Due date	Status	Completed on	Result
The first draft of the form will be sent to the Ad Hoc Expert Design Group before 31 January 2024 for comment and feedback (APX G)	31-Jan-24	close	Sent email on 31 Jan. Last date to submit resposne: 31 March 2024	Propose to close
The ICAO Secretariat will share the draft form with the SWIM Task Force Task Leads for filling in the form and for comment and feedback.	1-Feb-24	close	Sent email on 31 Jan. Last date to submit resposne: 31 March 2024	Propose to close
CRV OG Ad-hoc Expert Group will review the duly filled form in the April 2024 Meeting	Apr-24	close	Meeting is on 24 April 2024	Propose to close
The ICAO Secretariat will share the exact date, venue, and detailed agenda information about the “CRV data requirements for SWIM Workshop” as soon as it is finalized	ASAP	close	Proposed date: 19 August week. Will be finalized in 7 March Meeting	Propose to close
CRV OG Co-Chair (Pacific) suggested sharing the Proof of Concept test document of CRV with SWIM TF to understand CRV's performance and capabilities by SWIM TF	1-Feb-24	close	Shared with SWIM TF on 6 Feb 2024	Propose to close
The Meeting requested that the ICAO Secretariat and PCCWG continue their efforts to reach relevant parties to progress the work on CRV-REDDIG II and CRV-New PENS interconnection	CRV OG/13	Open		
During the new CRV contract management process, CRV OG will incorporate the clause of interconnection with other regional networks into the contract document	CRV OG/13	close		Propose to close
The CRV OG Ad-hoc Expert group prepare use cases for regional interconnection of CRV	CRV OG/13	Open		
Ad-hoc group continue to work to support and encourage MID states to work with PCCWG to join CRV, with the support of the ICAO APAC Secretariat and the ICAO MID office, to implement CRV in the MID region	CRV OG/13	close	Email sent to orgnaise a day event with MID AMC STG/9 to MID office on 29 Jan	Propose to close
As the security assessment of CRV is essential and crucial for determining the security and trust of the APAC regional network, the Meeting agreed to incorporate this task in the new CRV contract management process	CRV OG/13	close		Propose to close
Pakistan will coordinate with Oman focal points on communication matters and initiate discussion on implementing CRV in Oman and providing necessary support if required	CRV OG/14	Open		
China informed that it is planning for an AMHS connection with Kuwait and requested point of contact information on this matter. ICAO Secretariat will share information about the focal point from Kuwait with China	31-Mar-25	Open		
The proposed options in SIPG WS/1 have flaws as there are misunderstandings about how SWIM EMS will be connected over CRV and the internet. It was agreed that there is a need for further discussion among CRV and SWIM experts to clarify the shortcomings of proposed options and make SWIM experts understand the integration of SWIM with CRV. This matter will be further discussed in CRV OG Ad-hoc Experts and SWIM TF Task Leads Online Meeting on 13 March 2025. If required, an in-person Meeting of SWIM and CRV experts will be arranged to finalize ICAO APAC SWIM architecture	CRV OG/15	Open		
CRV governance can be added to the agenda items of the CRV ad-hoc expert group. ICAO Secretariat will take necessary action to follow revised working arrangements	12-Jun-25	Open		
4.13 In response to drafting the procedure for adding SWIM services over CRV, it was informed that the procedure could be defined once the APAC SWIM architrave is finalized and other details required for SWIM implementation are available. The ICAO Secretariat will share this information with SWIM experts	SWIM TF/10	Open		

What	Due date	Status	Completed on	Result
The ICAO Secretariat was requested to organize a Meeting with REDDIG network administration members to discuss and understand the current structure and governance model. The ICAO Secretariat will coordinate with the ICAO SAM Office to schedule an online Meeting in Q4 2025	Q4 2025	Open		
5.5 The Meeting realized the need to know the total amount APAC States/Administrations pay for CRV contracts. It was agreed that CRV users would share their monthly CRV contract price with the ICAO Secretariat. It was stated that the ICAO Secretariat will share the total price for the region in a future forum or discussion. No individual data shared by each State will be disclosed with other States/Administrations	CRV OG/15	Open		
				Resulted from CRV contract management process. Only on secure portal.
Hong Kong China would work on deriving a formula based on analysis to compute the bandwidth required for surveillance data sharing and suggest it to the CRV OG Ad-hoc Expert Group to incorporate it into the CRV OG Operations Manual	CRV OG/15	Open		
The Meeting suggested that PCCW Global provide an analysis of various incidents in all APAC States/Administrations that have severely impacted SLA	Jun-25	Open		
9.18 Regarding the suggestion to define a maintenance window at the sub-regional level in the APAC region, it was agreed that more deliberations are needed. The discussion will be added to the CRV OG Ad-hoc Expert group discussion	CRV OG/15	Open		
There is a need to understand various options for this implementation and recommend a path with the support of cloud service providers such as Microsoft, AWS, Azure, etc. It was agreed that New Zealand will facilitate this discussion with the cloud service provider to progress on this matter.	CRV OG/15	Open		
Aireon suggested that the Philippines initially draft the document based on their recent experience of contracting space-based ADS-B services over CRV. Aireon will provide further addition to the process, adding coordination required between Aireon and the CRV service provider. The Philippines will draft the procedure and present it at the next CRV OG Ad-hoc Expert Group Meeting, which is planned for 12 June 2025	CRV OG/15	Open		
CRV OG will discuss with SWIM TF the expected timelines for the setup and future plans to keep SIPG for further extension or offer for Pseudo CRV	Jun-25	Open		

What	Due date	Status	Completed on	Result
11.6 In response to a question about the procedure mentioned in the CRV OG Operations Manual on how to utilize CRV residual bandwidth for testing, the CRV OG Co-Chair (Asia) informed that currently, there is no procedure mentioned. However, as per his view, the procedure should be that States first conduct risk assessment, share outcomes of risk assessment with respective peer states if it can affect peer States, and inform peer states in advance when conducting the testing. It was agreed that the procedure would be incorporated into the CRV OG Operations Manual after discussion in the CRV OG Ad-hoc Expert Group	CRV OG/15	Open		
11.7 Japan shared a request with PCCW Global to prepare a document explaining the configuration of Pseudo CRV to make States understand this network along with the procedure to request connection to this network. It was agreed that this document would be beneficial for States. PCCW Global will draft the document and share it in the next CRV OG Ad-hoc Group meeting on 12 June 2025	12-Jun-25	Open		
There is a need for additional contributory bodies to support APAC States for the imperfection of various provisions arising from these documents for various areas of CNS. It was requested that the ICAO Secretariat share this concern with the ACSICG/12 meeting for further discussion	CNS SG/29	Open		
14.9 On the request of a meeting, New Zealand agreed to prepare a working paper to propose the need for dedicated contributory bodies to implement cybersecurity provisions arising from the Trust Framework Panel and Communication Panel for CNS SG/29 consideration. The meeting was informed that CNS SG/29 is planned for 16-20 June 2025	CNS SG/29	Open		
France by WP/35 shared that the standardization is available in the ICAO Doc 9880 to provide a high level of security for AMHS, and a PKI deployment is a prerequisite to deploying AMHS security to meet the ICAO standards. The meeting appreciated France for such vital information and requested that this information be shared with the ACSICG/12 Meeting	ACSCIG/12	Open		

International Civil Aviation Organization | Organisation de l'aviation civile internationale | Organización de Aviación Civil Internacional | Международная организация гражданской авиации | منظمة الطيران المدني الدولي | 国际民用航空组织

Ref.: T 8/2.15 – AP141/24 (CNS) 3 December 2024

Subject: CRV Service Provider- PCCW Global Group Reorganisation

Action Required: Necessary actions as appropriate

Dear Sir/Madam,

Please find for your reference the attached letter dated 28 November 2024 from PCCW Global notifying ICAO APAC Office regarding PCCW Global Group Reorganisation.

Accept, Sir/Madam, the assurances of my highest consideration.

Yours sincerely,

for Tao Ma
Regional Director

Enclosure:
Appendix A: Letter from PCCW Global for PCCW Global Group Reorganisation

Asia and Pacific Office
252/1 Vibhavadi Rangsit Road
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Thailand

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www.icao.int/apac
E-mail: apac@icao.int

consoleconnect

Date: 28 November 2024

International Civil Aviation Organization (ICAO)
United Nations Specialized Agency
Asia & Pacific Regional Office
Bangkok, Thailand

Attn.: Mr. Tao Ma,
Regional Director

Re: PCCW Global Group Reorganisation

We would like to take this opportunity to offer our thanks for your continued interaction with the PCCW Global Group.

As part of internal reorganization, with effect from 1 April 2024, HKT Global (Singapore) Pte. Ltd. and PCCW Global Limited have novated, assigned and transferred to PCCW Global Limited and HKT Global Operation (HK) Limited respectively the relevant services agreements (the "**Agreements**") signed with the local civil aviation authorities, details of which are set out as below:

	Local Contracting ICAO	Transferors	Transferees
1	Civil Aviation Authority of Singapore	HKT Global (Singapore) Pte. Ltd.	PCCW Global Servco SG Pte. Ltd.
2.	Airports Authority of India	HKT Global (Singapore) Pte. Ltd.	PCCW Global Servco SG Pte. Ltd.
3.	Pakistan Civil Aviation Authority	HKT Global (Singapore) Pte. Ltd.	PCCW Global Servco SG Pte. Ltd.
4.	NiuSky Pacific Limited	PCCW Global Limited	HKT Global Operation (HK) Limited

For clarity, the Transferors and the Transferees listed above are all affiliates wholly owned by HKT Limited (listed on The Stock Exchange of Hong Kong Limited, stock code: 6823).

Save for the above changes, the Agreements shall remain in full force and effect. We assure you the above changes have no implication in any way on our commitments and service quality.

We value the opportunity to continue working with you and look forward to an ever closer and even more fruitful cooperation following the above development.

If you have any questions regarding this notice, please feel free to contact HF Cheng Benny bennycheng2@pccwglobal.com.

PCCW Global

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Yours faithfully,

For and on behalf of
HKT Global (Singapore) Pte. Ltd.

Benney Cheng
Title: Director

Yours faithfully,

For and on behalf of
PCCW Global Servco SG Pte. Ltd.

Frederick Chui
Title: Director

Yours faithfully,

For and on behalf of
PCCW Global Limited

Frederick Chui
Title: Director

Yours faithfully,

For and on behalf of
HKT Global Operation (HK) Limited

Frederick Chui
Title: Director

PCCW Global

LIST OF PARTICIPANTS

	STATE/NAME		TITLE/ORGANIZATION	E-MAIL	WORK SHOP	CRV OG/13
1.	**AUSTRALIA (1)**					
	1.	Ms Brenda Buwu	Air Services Australia	brenda.buwu@airservicesaustralia.com;	X	X
2.	**CHINA (2)**					
	2.	Mr. Siming Cao	Senior engineer, Air Traffic Management Bureau of Civil Aviation Administration of China	caosiming@catc.net.cn;		X
	3.	Mr. Huang Zheng	operation department Manager, China/CAAC/ATMB	huangzheng@catc.net.cn;		X
3.	**HONG KONG, CHINA (4)**					
	4.	Mr. Gene KWOK	Electronics Engineer, Civil Aviation Department, Hong Kong China	gwhkwok@cad.gov.hk;	X	X
	5.	Mr. Wallace NG	Assistant Electronics Engineer, Civil Aviation Department, Hong Kong China	wkwng@cad.gov.hk;	X	X
	6.	Ms. Connie Ma	Aeronautical Communication Supervisor, Civil Aviation Department, Hong Kong China	wmma@cad.gov.hk;		X
	7.	Ms. Silvia MAK	Senior Aeronautical Communications Supervisor, Civil Aviation Department, Hong Kong, China	wymak@cad.gov.hk;		X
4.	**MACAO, CHINA (1)**					
	8.	Mr. Sio Kuong Pun	Safety Officer, Civil Aviation Authority Macao SAR	samsonpun@aacm.gov.mo;		X

		STATE/NAME	TITLE/ORGANIZATION	E-MAIL	WORK SHOP	CRV OG/13
5.		**COOK ISLANDS (1)**				
	9.	Mr. Nooroa Maui	Executive General Manager of Technology, Airport Authority Cook Islands	nmaui@airportauthority.gov.ck ;	X	X
6.		**FIJI (2)**				
	10.	Mr. Kelepi Dainaki	Co-Chair ICAO CRV OG General Manager Assets & Infrastructure FIJI AIRPORTS LIMITED	KelepiD@fijiairports.com.fj;	X	X
	11.	Mr. Sakiusa Dovibula Vakacautadra Junior	ANS Inspector - CNS, Civil Aviation Authority of Fiji	Sakiusa.Vakacautadra@caaf.org.fj;	X	X
7.		**FRENCH POLYNESIA (1)**				
	12.	Mr. Didier YVETOT	ATM Manager, French Polynesia	didier.yvetot@aviation-civile.gouv.fr;	X	X
8.		**INDIA (3)**				
	13.	Mr. C. Pattabhi	Executive Director (FIU), Airports Authority of India	cpattabhi@AAI.AERO;	X	X
	14.	Mr. Ajay Kumar	Deputy General Manager (CNS), Airports Authority of India	ajaykumarcom@aai.aero;	X	X
	15.	Mr. Hari Kishan	Deputy General Manager (CNS), Airports Authority of India	harikishan@aai.aero;	X	X
9.		**INDONESIA (5)**				
	16.	Mr. Irvan Irvan	Assistant Vice President of network system and facilities planning, AirNav Indonesia	tar.irvan@yahoo.co.id;		X
	17.	Mr. Rizwan Hasfrian	Executive vice president of information technology, AirNav Indonesia	rizwan.noor@airnavindonesia.co.id;		X

	STATE/NAME		TITLE/ORGANIZATION	E-MAIL	WORK SHOP	CRV OG/13
	18.	Mr. Said Fauzul	Information Technology, AirNav Indonesia	said.fauzul@airnavindonesia.co.id;		X
	19.	Mr. Iwan Prasetio Joko Nugroho	System and Facility Plan for Aeronautical Communication Jr. Mgr., Indonesia/ AirNav Indonesia	joko.nugroho@airnavindonesia.co.id;		X
10.		**JAPAN (3)**				
	20.	Mr. Maeda Naoki	Chief of facility 4th section, Air Navigation Services Department, Japan Civil Aviation Bureau	maeda-n10fm@mlit.go.jp;	X	X
	21.	Mr. Masahiro Nakakubo	Special Assistant to the Director, Japan Civil Aviation Bureau	nakakubo-m44ij@mlit.go.jp;	X	X
	22.	Mr. Fumio Tagawa	Senior Engineer, Japan Radio Air Navigation Systems Association (JRANSA)	tagawa-f213@jransa.or.jp;	X	X
11.		**KIRIBATI (1)**				
	23.	Ms. Aako Teikake	Chief Executive Officer, Airport Kiribati Authority	ceo@airportkiribatiauthority.com;	X	X
12.		**MALAYSIA (1)**				
	24.	Mr. Syahroni Chek Rus	Senior Assistant Director - CNS, Civil Aviation Authority of Malaysia (CAAM)	syahroni@caam.gov.my;	X	X
13.		**NEW ZEALAND (4)**				
	25.	Mr. Vaughan Hickford	Manager Enterprise Architecture & Networks, Airways New Zealand	vaughan.hickford@airways.co.nz;	X	X

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	26.	Mr. Edmund Heng	Senior Technical Specialist Aeronautical Services, Civil Aviation Authority of New Zealand	edmund.heng@caa.govt.nz;	X	X
	27.	Mr. Anthony Lister	Solution Implementation Manager, Airways New Zealand	Anthony.Lister@airways.co.nz ;	X	
	28.	Mr. Humphrey Elton	Data Analyst, METSERVICE	humphrey.elton@metservice.com;	X	
14.		**PAKISTAN (2)**				
	29.	Mr. Muhammad Usman Rasheed	Senior Deputy Director Communication Operations, Pakistan Airports Authority	usman.rasheed@caapakistan.com.pk;	X	X
	30.	Mr. Muhammad Ali Qasim	Deputy Director, PAKISTAN Civil Aviation Authority - DAAR	m.aliqasim27@gmail.com;		X (6-8 Mar25)
15.		**PAPUA NEW GUINEA (1)**				
	31.	Mr. Paita Evoapo	Manager CNS Support, niuskypacific limited	pevoapo@niuskypacific.com.pg;	X	X
16.		**PHILIPPINES (2)**				
	32.	Ms. April Rose Emmanuel	CNS Systems Officer V, Civil Aviation Authority of the Philippines	aprilroseemmanuel@gmail.com;		X
	33.	Ms. Mary Lyn Santamaria	Facility Chief, MADCC, Civil Aviation Authority of the Philippines	santamariamarylyn@yahoo.com;		X
17.		**SAMOA (1)**				
	34.	Ms. Tamara Fuimaono	Senior Operations Officer, Government	tamara.michael@mwti.gov.ws;	X	X
18.		**SINGAPORE (3)**				

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	35.	Mr. Augustine Lau	Head (Communications Systems), Civil Aviation Authority of Singapore	Augustine_lau@caas.gov.sg;	X	X
	36.	Mr. Philbert Ow	Senior Air Traffic Control Support Officer (Operations Technology Planning), Civil Aviation Authority of Signapore (CAAS)	philbert_ow@caas.gov.sg;	X	X
	37.	Ms. Goh Li Ying	Senior Engineer, CAAS		X	X
19.		**SOLOMON ISLAND (1)**				
	38.	Mr. Allen Zunia	ANS Technical Officer, Civil Aviation Authority Solomon Island	zunia_a@caasi.com.sb;	X	X (6-8 Mar25)
20.		**SRI LANKA (1)**				
	39.	Mr. Amila Samaraweera	Electronics Engineer, Airport & Aviation Services (Sri Lanka) (Pvt) Ltd	sasmitha.eane@airport.lk;		X
21.		**THAILAND (2)**				
	40.	Mr. Amornsak Thorasin	AIR TRAFFIC ENGINEERING MANAGER, Aeronautical Radio of Thailand	amornsak.th@aerothai.co.th;		X
	41.	Mr. Jatuporn Noottapong	Air Traffic Engineering Manager, AEROTHAI, Aeronautical Radio of Thailand Ltd.	jatuporn.no@aerothai.co.th;		X
22.		**TONGA (2)**				
	42.	Mr. Palu Talanoalelei	Manager Technical & Support Services, Tonga Airports Limited	ptalanoalelei@tongaairports.com;		X (6-8 Mar25)

	STATE/NAME		TITLE/ORGANIZATION	E-MAIL	WORK SHOP	CRV OG/13
	43.	Mr. Fiolo Kaloni	National Focal Point for CRV, Civil Aviation of Tonga	F_kaloni@hotmail.com;	X	X
23.	**USA (1)**					
	44.	Mr. Shayne A. Campbell	Senior Air Traffic Representative, Asia Pacific, Federal Aviation Administration Air Traffic Organization, Mission Support	shayne.a.campbell@faa.gov;	X	X
24.	**VANUATU (2)**					
	45.	Mr. Steward Moli	MATSEP Manager Air Traffic Safety Electronic Personnel, Airports Vanuatu Limited	stewardmoli@airports.vu;	X	X
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25.	**AIREON (1)**					
	47.	Mr. Adam Burford	Sales Manager, Asia Pacific, Aireon LLC	adam.burford@aireon.com;		X (Only 5 Mar)
26.	**PCCW GLOBAL (10)**					
	48.	Mr. Benny Cheng	Senior Vice President	benny.hf.cheng@pccwglobal.com;		X (5-7 Mar25)
	49.	Mr. Mak Chun-Kwong	Program Director	chun-kwong.mak@pccw.com;	X (Only 4 Mar)	X
	50.	Mr. Erickson Tucay	Customer Engineer, AVP	etucay@consoleconnect.com;	X (Only 4 Mar)	X
	51.	Mr. Santos Chan	Product Management, AVP	schan2@consoleconnect.com;		X

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	52.	Mr. Boaz Lau	Manager, Managed Network Service, PCCW Global	blau@consoleconnect.com;		X
	53.	Mr. Eddy Lee	Assistant Vice President, Presales, PCCW Global	elee@pccwglobal.com;	X (Only 4 Mar)	X
	54.	Ms. Lorraine Kwan	Head of Service Management, Strategic Accounts, PCCW Global	lwykwan@pccwglobal.com;		X
	55.	Mr. Robbert Poon	Solution Consultant, PCCW Global Limited	ryppoon@pccwglobal.com;	X (Only 4 Mar)	X
	56.	Mr. Jarryd Kung	Business Development Manager, PCCW Global Ltd	jkung@pccwglobal.com;	X (Only 4 Mar)	X
	57.	Mr. Joseph Ng	AVP, Regional Service Management	jshng1@consoleconnect.com	X (Only 4 Mar)	X
27.		**ICAO (1)**				
	58.	Ms. Soniya Nibhani	Regional Officer ANS (CNS) Implementation, International Civil Aviation Organization Asia and Pacific Office	snibhani@icao.int;	X	X

LIST OF WORKING/INFORMATION PAPERS

WP/IP No.	Agenda Item		Presented by
WORKING PAPERS			
WP/01	1	Provisional Agenda	Secretariat
WP/02	3	Review of Relevant Meetings	Secretariat
WP/03	3	Outcomes of ICAO APAC-MID CRV Workshop	Secretariat
WP/04	3	Outcomes of SIPG WS/1	Secretariat
WP/05	4	Outcomes of CRV Ad-Hoc Experts Group Meetings	New Zealand
WP/06	4	Outcomes of Joint CRV OG Ad-Hoc Expert and SWIM TF TLs Meetings	New Zealand
WP/07	4	Proposed SOP for Dispute Resolution on CRV Matters	Fiji
WP/08	4	Criteria to add a new service in the Operations Manual	New Zealand
WP/09	4	CRV OG Operations Manual Status	New Zealand
WP/10	4	Update To the CRV Implementation Plan	Singapore
WP/11	4	Common Package Update	New Zealand
WP/12	6	New Zealand hosted CRV Portal Content Update	New Zealand
WP/13	7	Review and Update the APAC CRV Implementation Table and Telecommunication Infrastructure Table	Secretariat
WP/14	7	Review of CRV Information in TABLE CNS II-2 Required ATN Infrastructure Routing Plan In E-ANP Vol II	Secretariat
WP/15	8	CRV Contractual Strategy-Selection Criteria (Secure Portal)	New Zealand
WP/16	8	Review of CRV II RFI (Present History of RFI, Comments Received with Conclusion for Adoption of CRV II RFI) (Secure Portal)	Secretariat
WP/17	8	CRV II RFI Processing Plan for 2025 (Detailed Timelines, Ad-Hoc Group, Next Review in CRV OG Meeting, Joint Meeting with SWIM TF Experts) (Secure Portal)	New Zealand
WP/18	8	Survey for CRV Users to Gauge the Performance of The CRV Network	New Zealand
WP/19	8	Need for Notifying CRV Service Providers of The CRV II Process (Secure Portal)	New Zealand
WP/20	9	CRV Additions in AMC	Secretariat
WP/21	12	Use of L2 VPN Channels to Support Interaction between AMHS Centres of the Russian Federation and APAC Region	Russia

WP/IP No.	Agenda Item		Presented by
WP/22	9	Future Bandwidth Requirements Based on Outcomes of Joint Event	Hong Kong China
WP/23	9	Package D+ For Psids/Small ANSPS	Fiji
WP/24	11	Outcomes of the ICAO Workshop for the Preparation of New CRV Requirements and Specifications for Future System Wide Information Management (SWIM)/Other Aviation Services	New Zealand
WP/25	13	Updates on Using the Rest of CRV Pioneer State Contribution to the ICAO Managed Service Agreement (MSA)	Secretariat
WP/26	14	Cyber-Safety/Security and Resilience – Review Of the CANSO Cyber Security Guide	New Zealand
WP/27	14	Doc 10169: ACCP Development Update and SWIM TF's Need for PKI	Singapore
WP/28	7	Update of CRV National and Local Focal Points	Secretariat
WP/29	15	Review CRV OG ToR and Action Items	Secretariat
WP/30	10	Japan's Support for PSIDS and International Collaboration	Japan
WP/31	9	CRV Post Implementation issues in Sri Lanka	Sri Lanka
WP/32	11	Retaintion of Pseudo CRV for SIPG	New Zealand
WP/33	9	Com Chart update based on the AsiaPac ATN Infrastructure Routing Plan	New Zealand
WP/34	4	Outcomes of Meeting with PCCWG	New Zealand
WP/35	14	CRV Security evolutions in AMHS	France
WP/36	3	Review of outcomes of the CRV Workshop for PSIDS	Secretariat
WP/37	14	Review of the Canso Cyber Security Risk Assessment Guide	New Zealand
INFORMATION PAPERS			
IP/01	-	Meeting Bulletin	Secretariat
IP/02	16	PCCWG Reorganisation	Secretariat
IP/03	10	CRV Status Implementation in Indonesia	Indonesia
IP/04	10	Status of CRV Implementation in Malaysia	Malaysia
IP/05	10	Implementation Status of PAN India AMHS and CRV Network in India	India
PRESENTATIONS			
SP/01	9	CRV Operational Performance Report	PCCWG
SP/02	9	Analysis of APAC CRV Bandwidth Utilization	PCCWG
SP/03	9	Proposed CRV Connections to the Cloud	Singapore
SP/04	9	Space-Based ADS-B on CRV	Aireon

WP/IP No.	Agenda Item		Presented by
SP/05	9	Future Bandwidth Requirements Based on Outcomes of Joint Event	Hong Kong China