International Civil Aviation Organization

Fifth Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (APAC ATMAS TF/5)

Chengdu, China, 5 – 7 June 2024

Agenda Item 4: ATM Automation System Implementation Experience by States

4.5 Development of New Technology

INTRODUCTION TO THE IMPLEMENTATION OF CROSS REGION ATFM COLLABORATIVE PLATFORM

(Presented by China)

SUMMARY

This article briefly introduces the implementation of Cross Region ATFM Collaborative Platform.

1. INTRODUCTION

1.1 In 2014, China, Japan, and Republic of Korea (ROK) established the Northeast Asia Region Air Traffic Flow Management Harmonization Group (NARAHG) to collaborate on managing the increasing air traffic in Northeast Asia.

1.2 In October 2015, during the third NARAHG meeting in Shanghai, ATMB of CAAC proposed data sharing to ensure an efficient and seamless ATFM/CDM process. Aligned with the strategic vision of creating a client-based data exchange platform for traffic management, the Cross-Region ATFM Collaborative Platform (CRACP), NARAHG members developed unified operational procedures and data exchange interface protocols through joint experiments.

1.3 On July 31, 2020, China, Japan, and ROK successfully completed a data connection test on the platform. This established a direct data connection between the traffic management systems of the three parties through the data interface protocol.

1.4 Currently, NARAHG members exchange the ATFM Daily Plan (ADP) through the CRACP client and test the collaborative capabilities of cross-regional ATFM.

2. DISCUSSION

Development and testing of CRACP

2.1 The development and testing of CRACP lay the groundwork for cross-regional ATFM collaboration. NARAHG segmented the development and testing of CRACP into four phases:

- 2015-2017: Preparation Phase — NARAHG members enhanced communication, gleaned insights from each other, and collectively drafted a roadmap for cooperation.
- 2018-2020: Fixed Operational Information Exchange Phase — NARAHG members used CRACP to exchange ADP and ATFM/CDN via the Internet.

- 2020-2021: Cross-regional Flight Operation Coordination Phase — NARAHG members experimented with other functions for cross-border ATFM operations using CRACP via the Internet.
- 2021- : Information Exchange and Backup Phase — NARAHG members utilized the same Interface Control Document (ICD) to conduct cross-regional ATFM operations using their respective ATFM systems through the Asia Pacific Common Regional Virtual Private Network (CRV) line.

2.2 By the end of March 2021, after months of preparation, China and Japan successfully established the CRV connection and conducted a four-day joint test. Both parties engaged in joint debugging of communication and application layer messages, demonstrating the feasibility and stability of the communication protocol on the CRV network. They confirmed the consistency of the message definition.

2.3 From June 14 to 15, 2021, leveraging the CRV network, China and Japan conducted a test connection using the system to verify the actual impact of business docking at the message and system levels.

Fixm application

2.4 In 2017, China and Japan began discussions on communication scenarios and necessary exchanges in CRACP. Through various means such as video conferencing, email, and face-to-face meetings, the fundamental framework for future data interaction between China, Japan, and ROK was elucidated, with protocol design based on the Flight Information Exchange Model (FIXM).

2.5 By January 2019, China, Japan, and ROK officially released the CRACP_ICD (V1.0), consisting of ControlMessage and OperationalMessage parts. ControlMessage describes the model and regulations of information communication, ensuring end-to-end communication between programs. OperationalMessage specifies the format of business layer messages, prescribing the business type and specific format of communication.

2.6 ControlMessage mandates the use of TCP for message transmission. Each party must implement two TCP Sockets, including a TCPClient for message transmission and a TCPServer for message reception. ControlMessage standardizes the process of connection establishment, message transmission, message reception, retransmission, heartbeat mechanism, connection termination, and exception handling. Messages are dispatched using a 32-byte header specifying the message length, type, confirmation requirement, sequence number, sending timestamp, and compression necessity. The sender may transmit regular, acknowledgment-required, compressed, and compressed acknowledgment-required messages. Upon receiving a message requiring acknowledgment, the recipient automatically dispatches an acknowledgment. Upon receiving a compressed message, the recipient decompresses it per the protocol and submits it to the application layer.

2.7 OperationalMessage, as an application layer interface, extends business functionalities based on FIXM 4.1.0 in accordance with CRACP's requirements, using XML as the message format. The document categorizes CRACP business messages into 12 types and defines the business fields involved, enabling both parties to understand how to encapsulate and parse the messages of the agreed 12 business types. Nine new XML_Schema documents extend FIXM to meet specific business requirements.

Achievements and prospects

2.8 On September 17, 2021, the ATFM systems of China and Japan were officially interconnected, marking the operational debut of the cross-regional system encompassing China, Japan, and ROK. China can now share real-time data on inter-regional flights with Japan in its East China CDM system and Japan's ATFM system. This allows both parties to ascertain the crossing time of each other's flights at the handover point, SADLI, six hours in advance, enabling real-time adjustments. With the sharing of Flight Position Messages (FPM), both parties can access positional information of each other's non-sensitive flights scheduled to traverse the handover point. The GUI interface of the CDM

system now displays flights up to SADLI from approximately 165°E. China can share the ADP with Japan's ATFM system via CRACP, and ROK can also share ADP through the CRACP client.

2.9 In 2024, flights in Northeast Asia continue to operate at a heightened level, averaging 893 flights per day and peaking at 937 flights per day. This increases the operational efficiency of cross-border flights, mitigates flight delays, and enhances the quality of passenger services.

2.10 With evolving business needs, the functionalities of CRACP among China, Japan, and ROK require further refinement. ADP serves as the primary function utilized by controllers, and the system must furnish more targeted functionalities to aid controllers in adjusting cross-regional traffic flow.

2.11 In the Phase II project, three categories of interactive data for negotiating flight transit times: Assigned Coordination Time Request Message (ACT), Assigned Coordination Time Reply Message (ACR), and Assigned Coordination Time Cancel Message (ACC), along with three categories for negotiating flow control measures: Tactical Flow Coordination Message (TFC), Tactical Flow Coordination Reply Message (TFR), and Tactical Flow Management Message (TFM), will enhance the collaborative function of cross-regional ATFM.

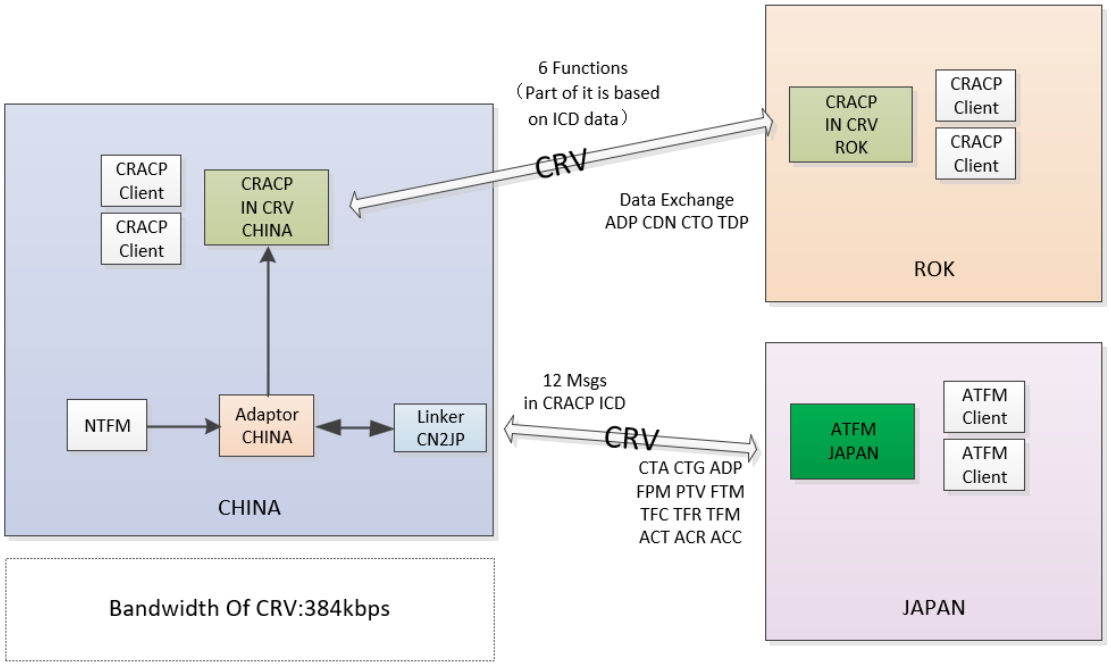

Figure 1 Phase II project data interaction

2.12 In the Phase II project, CRACP will incorporate the Typhoon Detour Procedure (TDP) function, facilitating access to pre-flight plan data regarding typhoon detours from the Civil Aviation Pre-Flight Plan Management System via a standardized data interface. Consequently, flow control measures pertinent to typhoon detour flights can be disseminated through CRACP, empowering users to better evaluate flight execution during the typhoon season and ensuring airspace capacity and flow balance.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate.

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