International Civil Aviation Organization

The Tenth Meeting of System Wide Information Management Task Force (SWIM TF/10)

Bangkok, Thailand, 20 – 23 May 2025

Agenda Item 3: Outcomes of relevant meetings on SWIM-related matters

Agenda Item 5: Updates on the assigned tasks by task leads/contributors, including progress report and issues

f) Validation & Demonstration

OUTCOMES OF JOINT EVENT OF SWIM OVER CRV DEMONSTRATION AND SURVEILLANCE DATA OVER SWIM TRIAL

(Presented by Hong Kong China)

SUMMARY

This paper presents the Report of Joint Event of SWIM over CRV Demonstration and Surveillance Data over SWIM Trial. The report captured the details of the Joint Event, including (i) the SWIM services developed; (ii) the SWIM infrastructure used; (iii) the development and testing process; (iv) the data format for surveillance data sharing; and (iv) the observations and lesson learnt.

1. INTRODUCTION

1.1 The Joint Event had been successfully conducted in Hong Kong China, from 28 – 29 May 2024, with the 1st day for system setup and rehearsal and the 2nd day the actual event day.

1.2 Various States/Administrations have participated in the preparation of the Joint Event including 7 States/Administrations (Hong Kong China, India, Japan, Malaysia, Republic of Korea, Singapore and Thailand) as Data Contributors and/or Consumers and 10 States/Administrations (Australia, China, Fiji, Indonesia, Laos PDR, New Zealand, Pakistan, Philippines, Sri Lanka and Vietnam) as Observers.

1.3 A total of over 100 participants from various States/Administrations, industrial leaders, airlines, data service providers, CRV provider attended the Joint Event in-person.

2. DISCUSSION

2.1 The outcomes of the Joint Event are captured in details in the report as provided in Attachment 1. The observations and lesson learnt are extracted as below.

From SWIM Perspective

2.2 Message headers/metadata, including the names of the fields and format of the contents must be properly considered and standardized to maintain interoperability, within the region and across different regions.

2.3 Some participants had expressed doubts on whether the hierarchical architecture is the appropriate architecture for the APAC region. There were several observations with this architecture identified during the preparation of the Joint Event, such as specific configuration required for different brands of EMS, potential message loop back if source and recipient checking was not implemented properly, combining byte message and text message into a single queue, single point of failure of the current architecture, etc.

2.4 There was some confusion between the use of AMQP Topics and Queues by participants which needs to be further examined for using them in a more efficient way.

2.5 The Push and Pull approach for message consumption needs to be standardized to maintain interoperability.

<u>From CRV Perspective</u>

2.6 With reference to the AMQP surveillance messages carrying both ADS-B data and FPL information, 32 data fields comprising 14 fields for message header and 18 fields for message body were the highest number of data items contained in one message. The size of such message is around 1.1K bytes, which is nominally the largest size among all types of surveillance messages.

2.7 For the network packets captured, it was observed that around 8% of network traffic was attributable to transmission overhead. With overhead included, the size required for transmitting such message increases to around 1.2K bytes.

2.8 Based on the figure observed from the messages above, further analysis was conducted with traffic level based on Hong Kong's operational environment of approximately 300 received ADS-B targets during peak hours within Hong Kong FIR. Total bandwidth required for transmission of these messages would be around 360K bytes (300x1.2K) per second, i.e. 2.88Mbps.

2.9 It should be noted that the 2Mbps bandwidth tentatively offered for each State/administration in the pseudo-CRV was not sufficient to carry surveillance data sharing with a 1s data rate for some States/Administrations depending on their FIR traffic volume and their role in sharing/consuming ADS-B surveillance data in the SWIM environment in future, necessitating subscription to a higher CRV bandwidth.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;
b) review the report and provide feedback; and
c) discuss any relevant matter as appropriate

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Attachment 1 – Report of Joint Event of SWIM over CRV Demonstration and Surveillance data over SWIM Trial

Report of Joint Event of SWIM over CRV Demonstration and Surveillance data over SWIM Trial

May 2024

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1. Introduction

1.1.Background

A System Wide Information Management (SWIM) Demonstration over Common aeRonautical Virtual Private Network (CRV) was planned to be hosted in Hong Kong, China back in 2020 to demonstrate the operational benefits of using CRV to carry SWIM data, and the corresponding services envisaged as necessary or complementary to support implementation of SWIM in APAC region, following the successful conduct of the ASEAN SWIM Demonstration [1] in Nov 2019. Due to the COVID-19 pandemic, the demonstration had been postponed. On the other hand, the Surveillance Sharing in SWIM Trial Implementation Group (S3TIG) was established under Surveillance Study Group (SURSG) with the objective to support and promote the trial implementation of surveillance data sharing based on SWIM.

Given substantial commonality between the two events, the two demonstrations would take place as a joint event ("the Joint Event") with the endorsement of SURSG/3, SWIM TF/7 and SURICG/8. A survey questionnaire prepared by SURSG/3 was shared with States/Administrations by ICAO APAC office on 12 Jun 2023 on interest in and modes of participation such as data contributor, data consumer and observer in the Joint Event.

Meanwhile, SWIM Implementation Pioneer Group (SIPG) was proposed and formed at the SWIM TF/7 to establish a regional SWIM infrastructure prototype using CRV. S3TIG has been leveraged on the SWIM architecture proposed by SIPG for preparing the Joint Event and the works was put in high gear from 26 Jun 2023. S3TIG monthly meetings had also been held with participating States/Administrations to discuss technical issues and keep track of the work progress with a total of 11 monthly meetings held before the Joint Event, which was successfully conducted in Hong Kong, China during 28 – 29 May 2024, with the 1st day (28 May) being rehearsal day and the 2nd day (29 May) being the actual event day. After the completion of the Joint Event, the demonstration setup was accessible for a period of 1-month until end June 2024 for appreciation of the SWIM environment and Human Machine Interface (HMI). With the support of the participants and PCCW Global (PCCWG), provider of the CRV connectivity for the Joint Event, the appreciation period was further extended to end Dec 2024.

A total of over 100 participants from various member states, industrial leaders, airlines, data service providers, CRV provider attended the Joint Event.

1.2.Objective of the Joint Event

The following were the main objectives of the Joint Event:

- To demonstrate SWIM data exchange over CRV and examine the bandwidth requirements for supporting APAC SWIM architecture
- To demonstrate surveillance data sharing over SWIM as a reference model for future implementation

[1] ASEAN SWIM Demonstration was a large-scale APAC demonstration event conducted on the 12th and 15th of November 2019, in Bangkok, Thailand and Singapore, respectively. There was a wide participation of aviation stakeholders in ASEAN (association of Southeast Asian Nations) and APAC region, including Civil Aviation Authorities (CAAs), Air Navigation Service Providers (ANSPs), airport operators, airlines, and international organizations such as ICAO Asia/Pacific Regional Office, IATA.

1.3. Participation Level

States/Administrations were invited to participate in the Joint Event based on the following 3 participation levels and the associated requirements for surveillance data sharing.

- Data Contributor - A Data Contributor should at least contribute ADS-B CAT 21 Version 2.1 data. It was recommended that State should have a trial or operational SWIM Enterprise Messaging Service (EMS) to route surveillance information using AMQP 1.0, with payload data generated in ASTERIX or JSON format from the original surveillance data source. State without a trial or operational SWIM EMS could further coordinate with PCCWG, the sponsor of a Pseudo-CRV for the Joint Event, on the technical feasibility in providing network-based SWIM EMS.
- Data Consumer - No specific prerequisite for a Data Consumer. It was recommended that State should have a trial or operational SWIM EMS to subscribe to surveillance information service using AMQP 1.0. State without a trial or operational SWIM EMS could further coordinate with PCCWG on the technical feasibility in providing network-based SWIM EMS.
- Observer - An Observer may interact with the HMI of the SWIM services provided by PCCWG.

Various states/Administrations have registered participation in the Joint Event including 7 States/Administrations (Hong Kong China, India, Japan, Malaysia, Republic of Korea, Singapore and Thailand) as Data Contributors and/or Consumers and 10 States/Administrations (Australia, China, Fiji, Indonesia, Laos PDR, New Zealand, Pakistan, Philippines, Sri Lanka and Vietnam) as Observers.

2. SWIM Services

2.1. Building up the required SWIM Services

To support the Joint Event, several SWIM services were constructed. S3TIG identified the following SWIM services to be demonstrated, which covered the full spectrum of existing SWIM data exchange models and the proposed surveillance data exchange model as follows:

#	Data Exchange Model	Data Version	Data Contributor
1	FIXM	FIXM_4_1_APAC	Hong Kong China, Singapore and Thailand
2	FIXM	FIXM_4_2	Japan, Malaysia and Thailand
3	IWXXM	IWXXM_2_0	Republic of Korea
4	IWXXM	IWXXM_3_0	Hong Kong China, Malaysia and Thailand
5	AIXM	AIXM_5_1	Japan
6	ASTERIX	ASTERIX_CAT021	Hong Kong China, Japan, Malaysia, Republic of Korea, Singapore and Thailand

2.2. Selected Operational Scenarios

To showcase the operational benefits brought by SWIM, S3TIG identified the following operational scenarios for demonstration, with higher probability of realization as operational SWIM use cases. The details of each scenario can be found at the ICAO APAC meeting portal (https://www.icao.int/APAC/Meetings/Pages/2024-SURSG-4.aspx).

#	Scenario	Involved Parties
1	ATFM & Surveillance Data Sharing	Hong Kong China, Singapore and Thailand
2	FF-ICE	Japan and Thailand
3	MET	Republic of Korea

3. SWIM Infrastructure

3.1. Network Infrastructure

S3TIG considered that the option to use operational CRV for the Joint Event was not preferred considering the potential bandwidth impact and cyber security risks, even if remote, on the operational CRV, which is the network carrying safety critical operation data.

Instead, a Pseudo-CRV network for the Joint Event was established by PCCWG. The Pseudo-CRV operated exactly in the same way as the operational CRV, utilizing a dedicated and segregated CRV-network with the same hardware setup. Similar to operational CRV, dedicated network interface devices were installed at site for each participant participating with an EMS.

For participants without an EMS, PCCWG provided SIM cards for mobile connection through its Console Connect platform, which allows users to gain access to the simulated SWIM environment in the Joint Event to publish/subscribe data services and interact with the HMI of the SWIM services provided by PCCWG. The network infrastructure used in the Joint Event is illustrated in Figure 1 below.

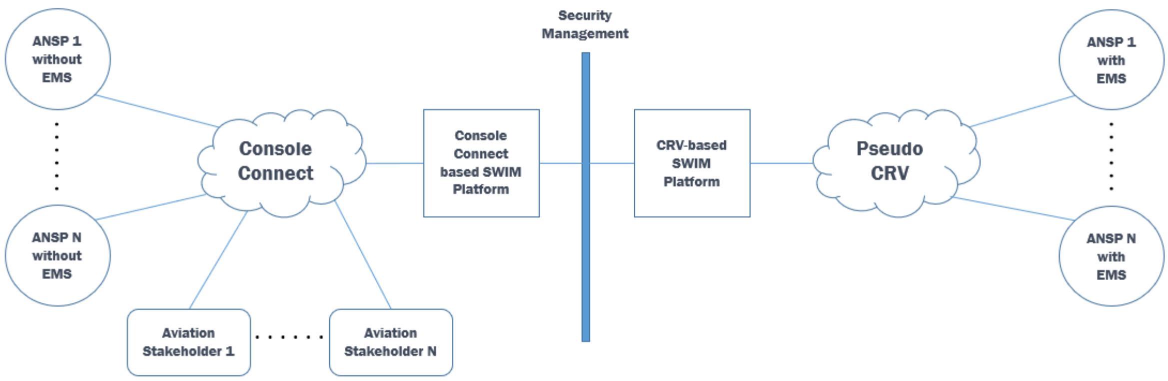


Figure 1 – Network Infrastructure for the Joint Event

3.2. EMS Architecture

When setting up the EMS architecture for the Joint Event, SIPG noted that a GRE tunnel would have to be established between each communication pair under the CRV provision. This approach would put restrictions on the future SWIM implementation as lots of GRE tunnels have to be constructed for any-to-any connections. To mitigate the impact of such restriction, a 2-tier hierarchical architecture was proposed by SIPG and was adopted for the Joint Event. In the hierarchical architecture, participants were divided into sub-communities and one representative from each sub-community would act as the gateway for message exchange among all sub-communities ("the Gateway EMS"). Participants under each sub-community with EMS provision would act as the EMS provider ("the Edge EMS") for their local downstream users. This approach could effectively reduce the number of GRE tunnels required. For participants without EMS, PCCWG would act as the 3rd party EMS provider to provide network-based EMS services for them. Figure 2 below shows a schematic diagram of such EMS architecture.

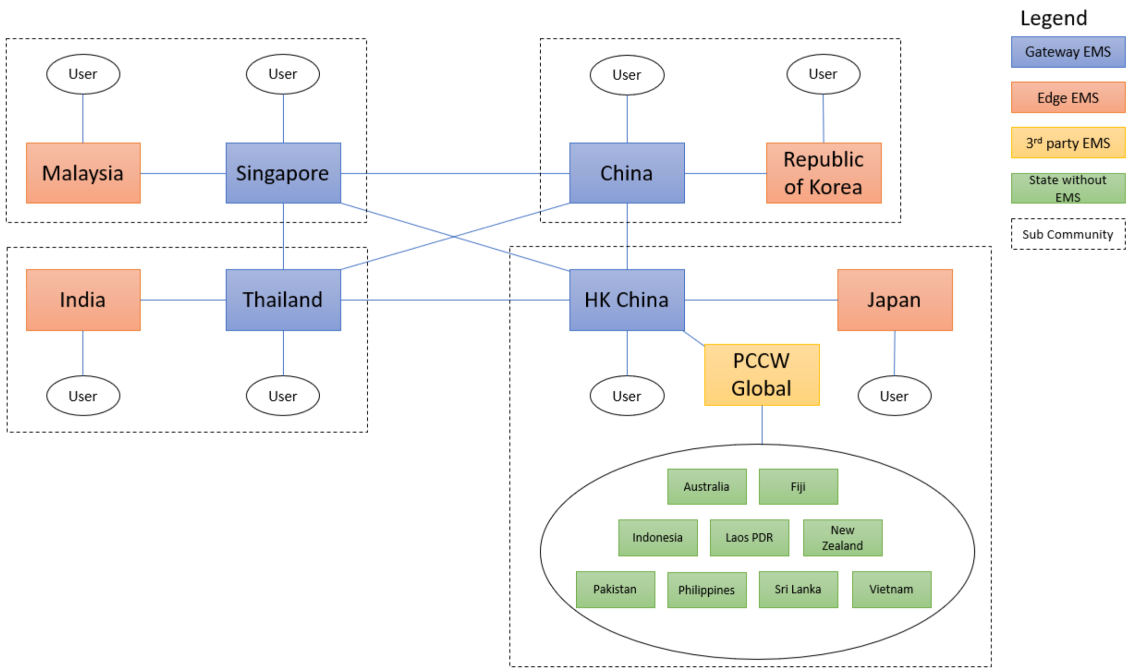


Figure 2 – EMS Infrastructure for the Joint Event

3.3. Messaging Protocol

The same messaging protocol used in ASEAN SWIM Demonstration was applied in the Joint Event and the detailed technical setup listed below:

- Messaging Protocol: Advanced Message Queuing Protocol (AMQP)
- Version: 1.0
- Exchange Pattern: Queues
- Message Consumption: Pull Approach
- Message Routing: Based on message headers

3.4. Message Headers and Data Structure

Message headers used in ASEAN SWIM Demonstration was revisited and modified during the preparation of the Joint Event, with an aim to enhancing efficiency of data transmission by maintaining only the minimum set of fields for message exchange. The finalized message headers can be found in Annex 1.

Data exchange models as mentioned in paragraph 2.1 were used in the Joint Event. The data structures of FIXM, AIXM and IWXXM were well defined whereas data structure for ASTERIX, for demonstration of surveillance sharing in SWIM was not available. S3TIG therefore proposed a data structure based on the ADS-B CAT 21 Version 2.1 as recommended by the SURSG Study report (https://www.icao.int/APAC/Meetings/2022%20SURSG2/WP05_HK%20AI.3%20_Progress_repor t and study report.pdf). Such data structure could serve as a reference model for future surveillance sharing implementation in SWIM. Two message payloads (i.e. ASTERIX and JSON) were tested in accordance with the survey results collected from respondents (See Paragraph 1.1). The finalized data structure can be found in Annex 2.

4. Development Process

4.1.Scenario Development

Involved parties for each scenario as mentioned in paragraph 2.2 had designed detailed steps to be conducted in the demonstration through the following design tools:

- Data Flow Diagrams to capture the sender/receiver responsibility, the time for data transmission and the data content to be transmitted for each demonstration step. Such graphical representation can allow the software developer to have a better understanding of the scenario.
- Data Scripts to capture the details for each message to be sent, including message header values, message format, field values to be included, etc. to provide clear information for the software developer to implement the message exchange.
- Demo Scripts to capture the rundown of the demonstration, including the page of the power point presentation to be used, the projector to be used, the time elapsed, etc. for each single step, to facilitate the presenter and the system operator to have a smooth and well-practised demonstration.

4.2.Comprehensive Test

After the completion of Pseudo CRV network infrastructure setup, the EMS architecture setup and the SWIM information services development, involved parties had conducted a series of testing to ensure all the required components could support the Joint Event as designed. The tests are listed below:

- Network Connectivity Test (Network Layer)
- Gateway EMS to Gateway EMS Connectivity and Edge EMS to Gateway EMS Connectivity (SWIM Infrastructure Layer)
- Message exchange test, including data flow between Gateway EMS and Gateway EMS, and between Edge EMS to Edge EMS (Information Services Layer)
- HMI to HMI scenario test (Application Layer)

5. Observations and Lessons Learnt

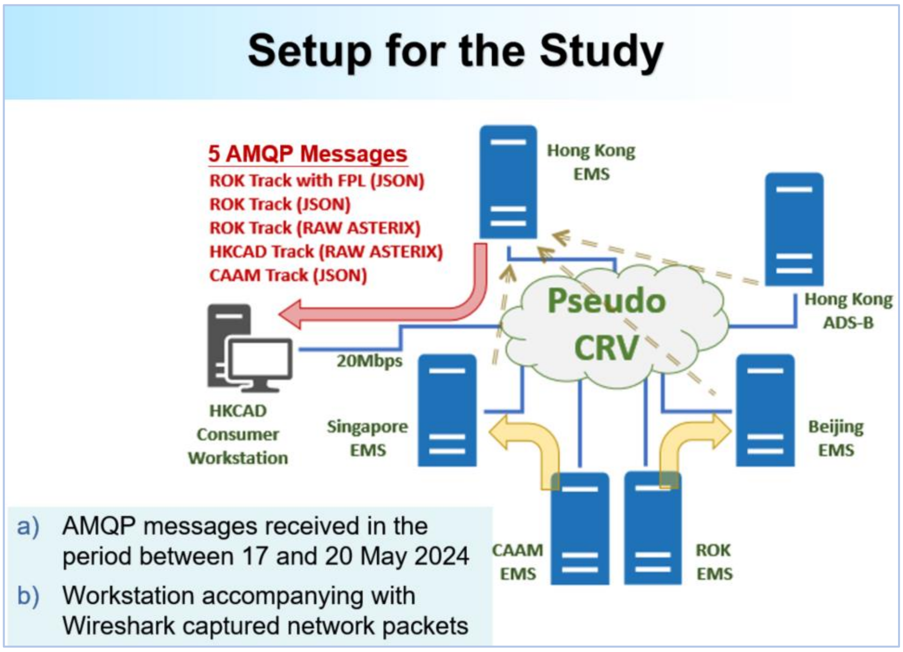
With the objectives to (i) verify the feasibility and examine the network requirement to carry SWIM data over CRV; and (ii) show the possible way in sharing surveillance data using SWIM, the observations and lessons learnt from SWIM and CRV perspectives were recorded during the development life cycle in the Joint Event and summarized below:

<u>From SWIM Perspective</u>

- Message headers/metadata, including the names of the fields and format of the contents must be properly considered and standardized to maintain interoperability, within the region and across different regions.
- Some participants had expressed doubts on whether the hierarchical architecture is the appropriate architecture for the APAC region. There were several observations with this architecture identified during the preparation of the Joint Event, such as specific configuration required for different brands of EMS, potential message loop back if source and recipient checking was not implemented properly, combining byte message and text message into a single queue, single point of failure of the current architecture, etc.
- There was some confusion between the use of AMQP Topics and Queues by participants which needs to be further examined for using them in a more efficient way.
- The Push and Pull approach for message consumption needs to be standardized to maintain interoperability.
- The existing CRV bandwidth of 2Mbps that has largely adopted for each State would not be sufficient to support surveillance data sharing given an update rate of 1 report per second for busy FIRs. A more detailed analysis of the bandwidth requirements as collected from the Joint Event is provided in the following section.

<u>From CRV Perspective</u>

- Seizing the opportunity accorded by the Joint Event, Hong Kong, China set up a consumer workstation to receive various AMQP messages from different EMSes so as to conduct a study on the bandwidth requirements, as illustrated below.



- With reference to Republic of Korea's (ROK's) AMQP messages carrying both ADS-B data and FPL information, 32 data fields comprising of 14 fields for message header and 18 fields for message body were the highest number of data items contained in one message (refer to Annex 2). The size of such message is around 1.1K bytes, which is nominally the largest size among all messages.
- During the study, network packets were also captured, where it was observed that around 8% of network traffic was attributable to transmission overhead. With overhead included, the size required for transmitting such message increases to around 1.2K bytes.
- Based on the figure observed from ROK's messages above, further analysis was conducted with traffic level based on Hong Kong's operational environment of approximately 300 received ADS-B targets during peak hours within Hong Kong FIR. Total bandwidth required for transmission of these messages would be around 360K bytes (300x1.2K) per second, i.e. 2.88Mbps.
- Since Hong Kong is one of the busiest FIRs in the region, this figure should offer additional insights to the bandwidth demand in such a stringent operational scenario.

Annexes 1 - 2

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6. Annexes

6.1.Annex 1 – Message Headers for the Joint Event

Header Name	Values	Descriptions	Mandatory / Optional	Data Type
APAC_SOURCE	VH_HKCAD	Hongkong ASP (Contibutor & Consumer)	Mandatory	String
	RJ_JCAB	Japan ASP (Contibutor & Consumer)		
	WM_CAAM	Malaysia ASP (Contibutor & Consumer)		
	RK_KAC	ROK ASP (Contibutor & Consumer)		
	WS_CAAS	Singapore ASP (Contibutor & Consumer)		
	VT_AEROTHAI	Thailand ASP (Contibutor & Consumer)		
	VA_AAI	India (Contributor & Consumer)		
	RJ_JAL	Japan Airlines		
	VH_PCCW	PCCW		
APAC_RECIPIENT_LIST	ZB_ATMB	China ASP (Observer)	Mandatory	String
	VH_HKCAD	Hongkong ASP (Contibutor & Consumer)		
	RJ_JCAB	Japan ASP (Contibutor & Consumer)		
	WM_CAAM	Malaysia ASP (Contibutor & Consumer)		
	RK_KAC	ROK ASP (Contibutor & Consumer)		
	WS_CAAS	Singapore ASP (Contibutor & Consumer)		
	VT_AEROTHAI	Thailand ASP (Contibutor & Consumer)		
	VA_AAI	India (Contributor & Consumer)		
	WI_CAI	Indonesia ASP (Observer)		

Header Name	Values	Descriptions	Mandatory / Optional	Data Type
	VL_LPDR	Laos ASP (Observer)		
	NZ_AIRWAYS	NZ ASP (Observer)		
	OP_CAAPK	Pakistan ASP (Observer)		
	RP_CAAP	Philippines ASP (Observer)		
	YM_ASA	Australia (Consumer)		
	NF_FIJI	Fiji (Consumer)		
	RJ_JAL	Japan Airlines		
	VH_PCCW	PCCW		
APAC_CATEGORY	FIXM	All FIXM Messages	Mandatory	String
	AIXM	All AIXM Messages		
	IWXXM	All IWXXM Messages		
	ASTERIX	Surveillance Messages		
	GEOJSON	Meteorological Report Messages		
	JSON	Surveillance Messages in JSON Format		
APAC_CATEGORY_VERSION	FIXM_4_1	FIXM v4.1.0	Mandatory	String
	FIXM_4_1_APAC	FIXM v4.1.0 APAC Extension		
	FIXM_4_2	FIXM v4.2.0		
	FIXM_4_2_FF_ICE	FIXM v4.2.0 (for FF-ICE R1 and R2)		
	FIXM_4_2_APAC	FIXM v4.2.0 APAC Extension		
	AIXM_5_1	AIXM v5.1		
	IWXXM_2_0	IWXXM v2.0		

Header Name	Values	Descriptions		Mandatory / Optional	Data Type
	IWXXM_3_0	IWXXM v3.0			
	ASTERIX _CAT021	ASTERIX ADS-B Data Category			
	GEOJSON_4	GEOJSON v4.0			
	JSON_1	JSON v1.0			
APAC_MESSAGE_TYPE	**Values**	**Descriptions**	**Format**	Mandatory	String
	PRELIMINARY_FLIGHT_PLAN	Preliminary Flight Plan	FIXM_FF-ICE R1		
	FILED_FLIGHT_PLAN	Filed Flight Plan	FIXM_FF-ICE R1		
	SUBMISSION_RESPONSE	Submission Response	FIXM_FF-ICE R1		
	FILING_STATUS	Filing Status	FIXM_FF-ICE R1		
	PLANNING_STATUS	Planning Status	FIXM_FF-ICE R1		
	FLIGHT_PLAN_UPDATE	Flight Plan Update	FIXM_FF-ICE R1		
	FLIGHT_ARRIVAL	Arrival	FIXM_FF-ICE R1		
	FLIGHT_DEPARTURE	Departure	FIXM_FF-ICE R1		
	FLIGHT_CANCELLATION	Flight Plan Cancel	FIXM_FF-ICE R1		
	TRIAL_REQUEST	Trial Request	FIXM_FF-ICE R1		
	TRIAL_RESPONSE	Trial Response	FIXM_FF-ICE R1		
	FLIGHT_DATA_REQUEST	Flight Data Request	FIXM_FF-ICE R1		
	FLIGHT_DATA_RESPONSE	Flight Data Response	FIXM_FF-ICE R1		
	TRACK_RAW	Track Raw Data	ASTERIX Binary Data		
	TRACK_JSON	Track JSON Message	ASTERIX JSON Data		
	TRACK	Track Message	FIXM APAC Extension		
	CTOT	Calculated Take Of Time	FIXM APAC Extension		
	NOTAM	Notices to Airmen	AIXM		
	SAA	Special Activity Airspace	AIXM		

Header Name	Values	Descriptions		Mandatory / Optional	Data Type
	METAR	Aviation Routine Weather Report	IWXXM		
	SPECI	Special weather report	IWXXM		
	TAF	Terminal Area Forecast	IWXXM		
	SIGMET	Significant Meteorological information	IWXXM		
	AIRMET	Meteorological Information	IWXXM		
	VAA	Volcanic Ash Advisory	IWXXM		
DEP_AIRPORT	4 Letter ICAO Code	Departure Airport (used for flight identification)		Optional	String
ARR_AIRPORT	4 Letter ICAO Code	Arrival Airport (used for flight identification)		Optional	String
AIRLINE	Use ICAO Airline	Name of Airline		Optional	String
ACID	FIXM-defined format for ACID	Aircraft Identification (Mandatory for Tracks and Flight Plans)		Conditional Mandatory	String
GUFI	GUFI from message	Globally Unique Flight Identifier		Optional	String
EOBT	EOBT from message	Estimated off-block time (used for flight identification)		Optional	String
FFICE_PHASE	PRELIM	Preliminary phase of FF-ICE		Optional	String
	FILED	Filed phase of FF-ICE (Filed Flight Plan has been sent)		Optional	String
APAC_TIMESTAMP	epoch time	Timestamp of the message out or in the system. The time is to be appended to this field whenever the message is posted into a message queue. This field is delimited with commas E.g. JAL_OUT:1675213637251, JCAB_IN: 1675213638200 Comma delimited string of 64-bit signed integer representing the number milliseconds since Jan 1, 1970 00:00:00.000 UTC		Mandatory	String

6.2. Annex 2 – Data Structure of Surveillance Data for the Joint Event

6.2.1. JSON Structures for Surveillance Data with Flight Plan Information

Field Name	Type	CAT21 Data Item Reference	Values	Descriptions
GUFI	String	N/A	0248982c-4384-49f4-bdb3-7956bd553383	Globally Unique Flight Identifier
ACID	String	N/A	TLM912	Aircraft Identification
ADEP	String	N/A	VTBS	Departure Aerodrome
ADES	String	N/A	ZGGG	Destination Aerodrome
ARCTYPE	String	N/A	A339	Aircraft Type
WKTRC	String	N/A	H	Wake Turbulence Category
LAT	Double	I021/130 or I021/131	18.6701799113899	Latitude (Degree) Use I021/131. If I021/131 does not exist, use I021/130
LONG	Double	I021/130 or I021/131	103.180853652939	Longitude (Degree) Use I021/131. If I021/131 does not exist, use I021/130
FL	Double	I021/145	310	Flight Level
GS	Double	I021/160	498	Ground Speed (Knot) Use I021/160 x 3600 because I021/160 provides Ground Speed in NM/s
HEADING	Double	I021/152 or I021/160	34.2773437344	Heading (Degree) Use I021/152 If I021/152 does not exist, use I021/160 null, if both not exist.
ARCADDR	String	I021/080	883031	Aircraft Address

Field Name	Type	CAT21 Data Item Reference	Values	Descriptions
SSRCODE	String	I021/070	5035	Mode 3A Code
DT	String	I021/071 or I021/073 or I021/075	2022-09-13T15:41:3	Date and Time (Date from server date and Time from packet) Use I021/073 If I021/073 does not exist, use I021/075 If I021/075 does not exist, use I021/071 I021/071, I021/073 and I021/075 are time only value. Publishers have to add date themselves.
QITYPE	String	I021/090	NUCp or NIC	NUCp = Navigational Uncertainty Category for Position NIC = Navigational Integrity Category
QI	Integer	I021/090	6	Range is 0-11 for NIC and 0-9 for NUCp
SAC	Integer	I021/010	78	Data Source Identification (SAC)
SIC	Integer	I021/010	29	Data Source Identification (SIC)

6.2.2. JSON Structures for Surveillance Data only

Field Name	Type	CAT21 Data Item Reference	Values	Descriptions
LAT	Double	I021/130 or I021/131	18.6701799113899	Latitude (Degree) Use I021/131. If I021/131 does not exist, use I021/130
LONG	Double	I021/130 or I021/131	103.180853652939	Longitude (Degree) Use I021/131. If I021/131 does not exist, use I021/130
FL	Double	I021/145	310	Flight Level

Field Name	Type	CAT21 Data Item Reference	Values	Descriptions
GS	Double	I021/160	498	Ground Speed (Knot) Use I021/160 x 3600 because I021/160 provides Ground Speed in NM/s
HEADING	Double	I021/152 or I021/160	34.2773437344	Heading (Degree) Use I021/152 If I021/152 does not exist, use I021/160 null, if both not exist.
ARCADDR	String	I021/080	883031	Aircraft Address
SSRCODE	String	I021/070	5035	Mode 3A Code
DT	String	I021/071 or I021/073 or I021/075	2022-09-13T15:41:3	Date and Time (Date from server date and Time from packet) Use I021/073 If I021/073 does not exist, use I021/075 If I021/075 does not exist, use I021/071 I021/071, I021/073 and I021/075 are time only value. Publishers have to add date themselves.
QITYPE	String	I021/090	NUCp or NIC	NUCp = Navigational Uncertainty Category for Position NIC = Navigational Integrity Category
QI	Integer	I021/090	6	Range is 0-11 for NIC and 0-9 for NUCp
SAC	Integer	I021/010	78	Data Source Identification (SAC)
SIC	Integer	I021/010	29	Data Source Identification (SIC)

6.2.3. Message Header for Surveillance Data with Flight Plan Information

Header Name	**Values**	**Descriptions**
APAC_SOURCE	RJ_JCAB	Name of message publisher
APAC_RECIPIENT_LIST	RJ_JAL,VT_AEROTHAI	Name list of recipients (comma delimited)
APAC_CATEGORY	ASTERIX	Name of information exchange model (ASTERIX)
APAC_CATEGORY_VERSION	ASTERIX _CAT021	Version of information exchange model (Data Category of ASTERIX)
APAC_MESSAGE_TYPE	TRACK_RAW or TRACK_JSON	Message type of information exchange model • TRACK_RAW for binary data • TRACK_JSON for JSON data
DEP_AIRPORT	RJAA	Departure Airport
ARR_AIRPORT	VTBS	Arrival Airport
AIRLINE	JAL	Name of Airline
ACID	JAL707X	Aircraft Identification
GUFI	0248982c-4384-49f4-bdb3-7956bd553383	Globally Unique Flight Identifier
EOBT	2023-02-01T03:00:00Z	Estimated Off-Block Time
APAC_TIMESTAMP	JCAB_OUT:1675213637251	Timestamp of the message out or in the system

6.2.4. Message Header for Surveillance Data Only

Header Name	Values	Descriptions
APAC_SOURCE	RJ_JCAB	Name of message publisher
APAC_RECIPIENT_LIST	RJ_JAL,VT_AEROTHAI	Name list of recipients (comma delimited)
APAC_CATEGORY	ASTERIX	Name of information exchange model (ASTERIX)
APAC_CATEGORY_VERSION	ASTERIX _CAT021	Version of information exchange model (Data Category of ASTERIX)
APAC_MESSAGE_TYPE	TRACK_RAW or TRACK_JSON	Message type of information exchange model • TRACK_RAW for binary data • TRACK_JSON for JSON data
ACID	JAL707X	Aircraft Identification
APAC_TIMESTAMP	JCAB_OUT:1675213637251	Timestamp of the message out or in the system