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 5: Updates on the assigned tasks by task leads/contributors, including progress report and issues
e) Information Services

METHODS FOR IMPLEMENTING FF-ICE SERVICES USING REQUEST/REPLY MESSAGE EXCHANGE PATTERN

(Presented by SIPG, presenter ROK)

SUMMARY

This paper describes scenarios for implementing the FF-ICE services using a Request/Reply message exchange pattern. In particular, the paper includes data flow diagrams and considerations for each scenario.

1. INTRODUCTION

1.1 At the 9th APAC SWIM TF, WP/16 - *"Proposed Business Functionality of APAC Common SWIM Information Services"* proposed the global SWIM services to be implemented in the APAC region. And this had been circulated and reviewed in meetings such as AAITF, ATFM SG, FF-ICE Ad-hoc Group, MET/IE WG, SURSG, MET SG, AOP SG, and ATM SG.

1.2 At the 2nd APAC FF-ICE Ad-hoc Meeting and Workshop, Thailand presented APAC common SWIM information services related to FF-ICE as follows:

- GUFI Service (Request/Reply)
- ATFM/A-CDM Integrated Service (Pub/Sub)
- FF-ICE Filing/Planning Service (Request/Reply, Pub/Sub)
- FF-ICE Data Publication Service (Pub/Sub)
- FF-ICE Trial Service (Request/Reply)
- FF-ICE Flight Data Request Service (Request/Reply)
- FF-ICE Notification Service (Request/Reply, Pub/Sub)
- Traffic Flow Status Service (Pub/Sub)

1.3 In the APAC region, there have been multiple demonstrations and trials related to FF-ICE, most of which were based on the Publish/Subscribe (Pub/Sub) Message Exchange Pattern (MEP) (hereinafter referred to as "messaging service"). Additionally, the SIPG has been focusing on implementing the regional SWIM prototype architecture, which supports messaging services based on the Pub/Sub MEP. But regional implementation considerations for the Request/Reply MEP have been limited. Furthermore, no discussions have been held regarding approaches to implementing the Request/Reply MEP.

1.4 Therefore, this paper describes scenarios for implementing FF-ICE services using the Request/Reply Message Exchange Pattern (MEP). It also briefly explains Eurocontrol's implementation case of an FF-ICE service with the Request/Reply MEP using a web service. In particular, this paper

illustrates web service-based FF-ICE service implementation scenarios with data flow diagrams and highlights key considerations for each scenario.

2. DISCUSSION

Methods for Implementation of Request/Reply MEP

2.1 There are couples of methods to implement Request/Reply MEP as follows:

Methods	Description	Implementation
Web Service (synchronous)	A client sends an HTTP Request, and a server returns an HTTP Response. ** In the context of SWIM (or FF-ICE) implemented in the other region, SOAP-based WS-* standards are often used.	REST API SOAP
Message Broker (asynchronous)	A client sends a request to the broker and receives a response via a separate queue or topic.	JMS, AMQP
WebSocket (asynchronous)	Request/Reply MEP is conducted with maintaining the connection. Request/Reply is enabled by matching request and reply using a request ID	Request/Response Sequence Management
gRPC (asynchronous)	A Request is sent and a Response is immediately received using the Unary RPC method of gRPC. ** Compared to WebSocket, as gRPC is based on HTTP/2, it has more structured manner to enable Request/Reply MEP.	HTTP/2 based Bi-directional Streaming

2.2 In the ICT industry, the typical method for implementing the MEP is through web services, and OpenAPI could be the best practice as an representative example. However, since some SWIM implementation cases in other regions use Simple Object Access Protocol (SOAP) to web service, this paper briefly describes Eurocontrol's implementation case of SWIM service for FF-ICE.

Eurocontrol's FF-ICE Service Implementation Case

2.3 In case of Eurocontrol, FF-ICE service could be discovered through European SWIM Registry [https://eur-registry.swim.aero/services/eurocontrol-nm-filingservice-270]

2.4 In the case of Eurocontrol's FF-ICE Filing Service, both supports Pub/Sub and synchronous Request/Reply MEP.

2.5 Synchronous Request/Reply MEP is enabled by using SOAP based web service [https://www.eurocontrol.int/service/network-manager-business-business-b2b-web-services]

Implementation of Synchronous Request/Reply MEP using SOAP in APAC region

2.6 At the SWIM/TF 9, Revision of APAC SWIM Technical Infrastructure Profiles (WP/09) was presented, and in the Appendix B "APAC SWIM Technical Infrastructure Profiles", SOAP is described in the 3.3.3.2 - *As most users have not applied SOAP to current web applications, **this standard is not recommended for the development of SWIM services**. The following table makes reference to SOAP related standards and specifications required for supporting the service bindings of SOAP application (…).*

2.7 Considering this background, the European region has implemented the SOAP-based web services for Request/Reply MEP, whereas the APAC region is expected to adopt a technical profile

that does not recommend the use of the SOAP approach (Working Draft as of SWIM TF/9). Accordingly, this document presents an implementation approach for the Request/Reply MEP using HTTP API-based web services (hereinafter referred to as "web service")., which are widely adopted and commonly used in the ICT industry.

Methods for Implementing FF-ICE Services Using Web Service based Request/Reply MEP

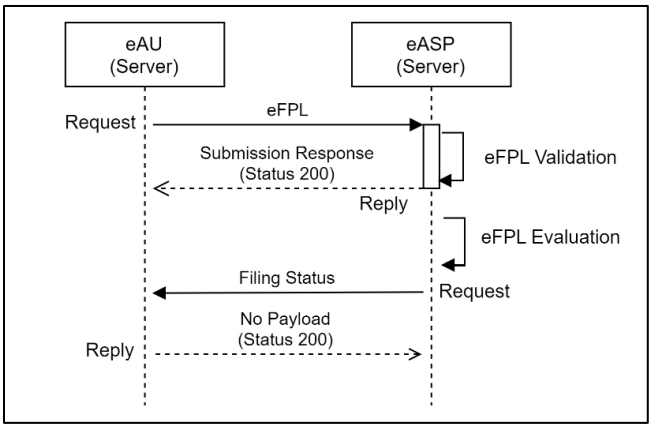
2.8 For message exchange in support of FF-ICE service using a web service, two approaches have been considered:

- Exclusive use of a web service; and
- Hybrid approach combines both web service and messaging service.

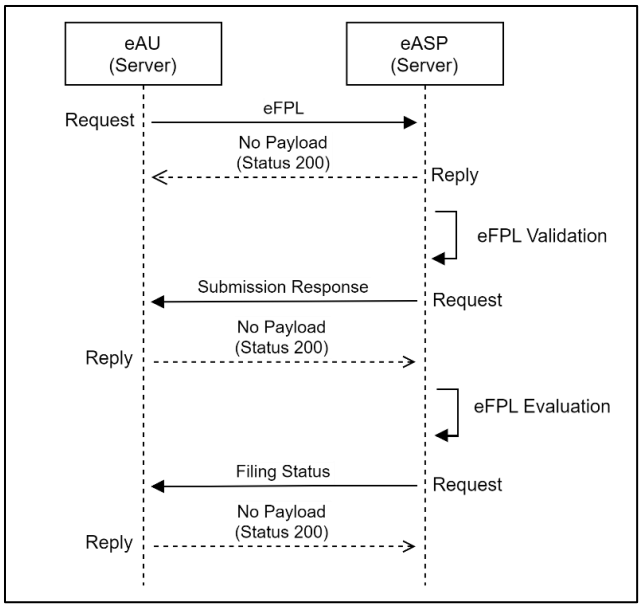
2.9 Several methods have been considered within the two approaches, and the following individual scenarios have been developed based on the FF-ICE Filing Service. These scenarios assume that the initial step of FF-ICE Filing Service (i.e., submission of eFPL message) begins with a web service. eAU and eASP operate in a server-to-server context rather than a client-server model, and as the polling mechanism is deemed inefficient (i.e., in this case, it is better to use a messaging service) and is therefore excluded from consideration.

2.10 The scenarios for the exclusive use of a web service are as follows:

Case #1 Submission Response is included in the return payload upon eFPL submission

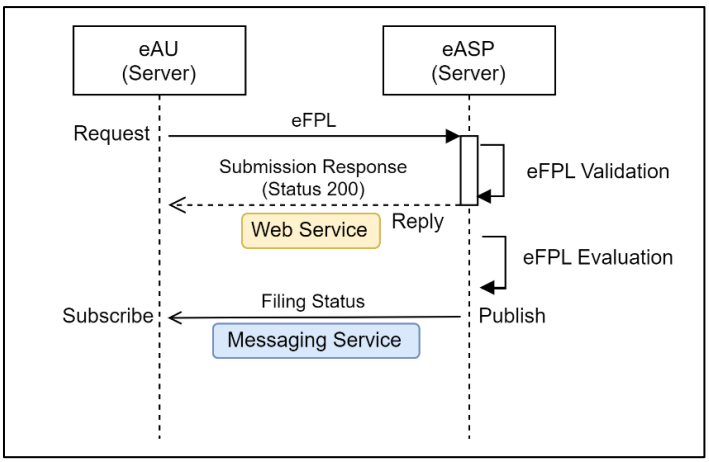


Case #2 Submission Response isn't included in the return payload upon eFPL submission

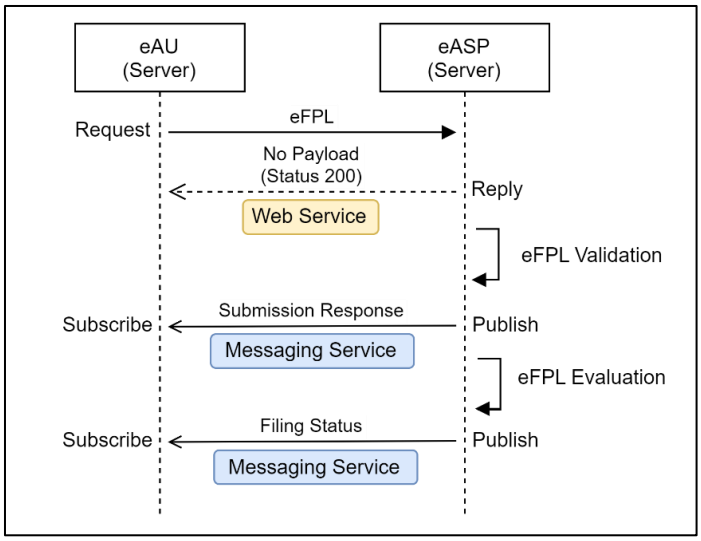


2.11 The scenarios for the hybrid approach that combines both web service and messaging service are as follows:

Case #3 Submission Response is included in the return payload upon eFPL submission



Case #4 Submission Response isn't included in the return payload upon eFPL submission



2.12 The cases mentioned in 2.4 are based on the earlier assumption that the initial step of FF-ICE Filing Service begins with a web service. However, the opposite case where the initial step of FF-ICE Filing Service begins with a messaging service may also be considered.

CONCLUSION

2.13 This paper has explored various scenarios for FF-ICE service implementation using a web service, as well as a hybrid approach that combines both web service and messaging service. These scenarios aim to reduce ambiguity and support better planning and implementation of global FF-ICE services in the APAC region.

2.14 Although Eurocontrol's FF-ICE implementation, as the only existing operational case as of 2025, could provide a valuable reference for the implementation of FF-ICE, but it is not possible to direct "copy" Eurocontrol's FF-ICE implementation and "paste" to the APAC region.

2.15 Given the current emphasis on the regional SWIM prototype architecture using an Enterprise Messaging System (EMS), which the SIPG is developing in the APAC region, the primary issue to be discussed is whether the FF-ICE service will be provided solely through the Pub/Sub MEP or whether it will also support the Request/Reply MEP.

2.16 If a decision is made to support the Request/Reply MEP, it will also be important to discuss how the Request/Reply MEP should be implemented. It is also recommended that future trials and implementations explore both MEP in parallel, to assess their operational suitability and technical feasibility.

2.17 Finally, collaborative engagement among regional FF-ICE implementors (e.g., SWIM TF, SIPG and FF-ICE Ad-hoc Group) is essential to refine the architecture and messaging strategies for FF-ICE implementation in the APAC region.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;
b) deliberate on scenarios for implementing the FF-ICE services using a Request/Reply message exchange pattern; and

c) discuss any relevant matter as appropriate

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