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

b) SWIM Infrastructure
- Task 2: Regional SWIM Infrastructure

RECOMMENDED TECHNICAL PERFORMANCE REQUIREMENTS FOR EMS

(Presented by Thailand)

SUMMARY

This working paper presents preliminary analysis of technical performance requirements for the Enterprise Messaging Service (EMS), a backbone module for SWIM technical infrastructure. Particularly, it presents the study on bandwidth and latency data recorded during the SWIM-over-CRV demonstration and surveillance data sharing in SWIM environment technical trial, Joint Event, conducted in May 2024.

1. INTRODUCTION

1.1 At the SWIM TF/7 meeting, the SWIM Implementation Pioneer ad-hoc Group (SIPG) was established with the mandate to implement the first or prototype version of APAC SWIM.

1.2 The SIPG has undertaken several activities aimed at progressing SWIM implementation within the Asia/Pacific region. One of the key areas identified for investigation is the establishment of recommended technical performance requirements for the Enterprise Messaging Service (EMS), a backbone module of SWIM technical infrastructure.

1.3 In May 2024, a Joint Event of the SWIM-over-CRV demonstration and surveillance data Sharing in SWIM environment technical trial was conducted in Hong Kong China. During this event, relevant performance metrics were measured to gain insights into the characteristics of data exchange over SWIM, especially bandwidth-intensive surveillance data.

2. DISCUSSION

Bandwidth Analysis

2.1 Table 1 shows the peak bandwidth observed.

Country	Max Bandwidth (kbps)
Hong Kong CAD	2,880.0
Malaysia	938.0
Singapore	2,562.8
Thailand	-

Table 1: Peak Bandwidth (kbps)

2.2 To better understand the bandwidth usage, the distribution of bandwidth data recorded by Malaysia and Singapore was analyzed as shown in Figure 1 and Figure 2, respectively. .

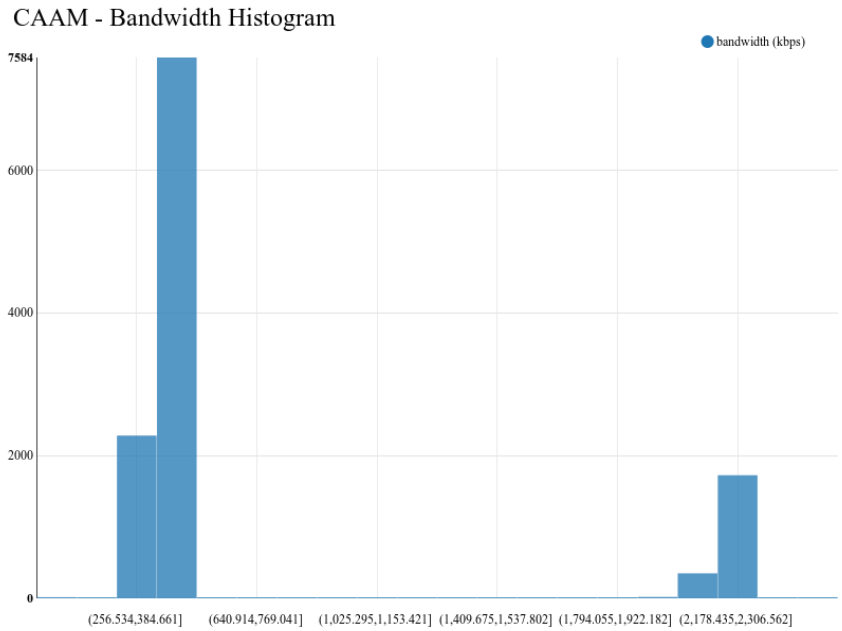

Figure 1: Histogram - Bandwidth Distribution recorded by Malaysia

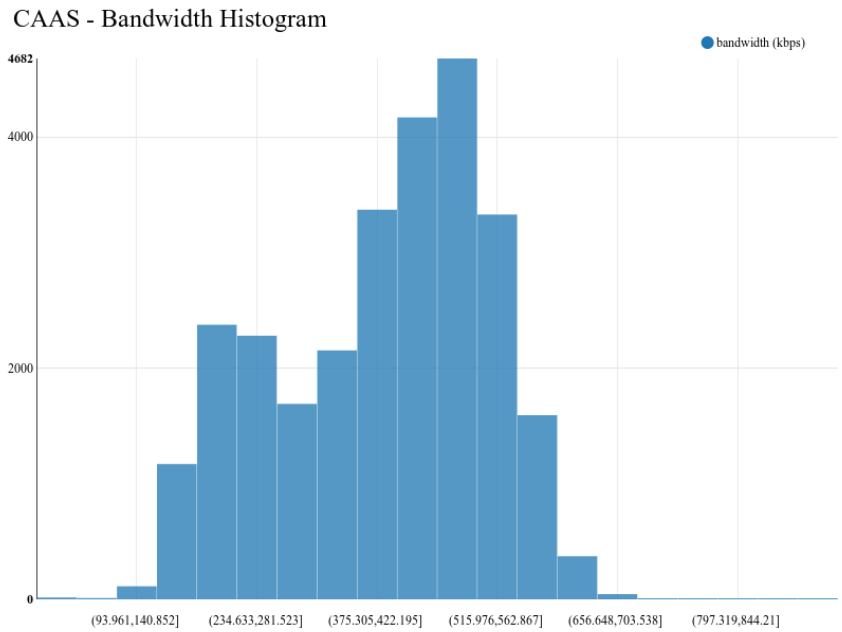

Figure 2: Histogram - Bandwidth Distribution recorded by Singapore

2.3 In an effort to provide recommendation on bandwidth requirement, the 95th percentile of the bandwidth data was calculated to provide an indication of the bandwidth required to support the majority of the observed data traffic. For the data stream from Malaysia, analysis revealed a significant difference in bandwidth values, with observations frequently clustered either below or above 500 kbps. Further examination suggested that the data could be subdivided into two distinct periods exhibiting different data volumes and potentially influenced by varying environmental conditions during the measurement. Therefore, the 95th percentile was calculated separately for these two periods:

- First Period: The 95th percentile bandwidth was 442.35 kbps.
- Second Period: The 95th percentile bandwidth was 2,275.944 kbps.

For the data stream from Singapore, the 95th percentile bandwidth was calculated as 576.741 kbps. Due to the significant variability in the results, it is not possible to draw a conclusion on the bandwidth requirement at this stage.

Latency Analysis:

2.4 Table 2 summarizes the peak and average latency observed.

Country	Peak Latency (ms)	Average Latency (ms)
Hong Kong CAD	-	-
Malaysia	19,443	733
Singapore	67,428	393
Thailand	10,081	4,600

Table 2: Peak and Average Latency (ms)

2.5 Similar to bandwidth usage, the distribution of average latency recorded by Malaysia and Singapore was analyzed as shown in Figure 3 and Figure 4, respectively.

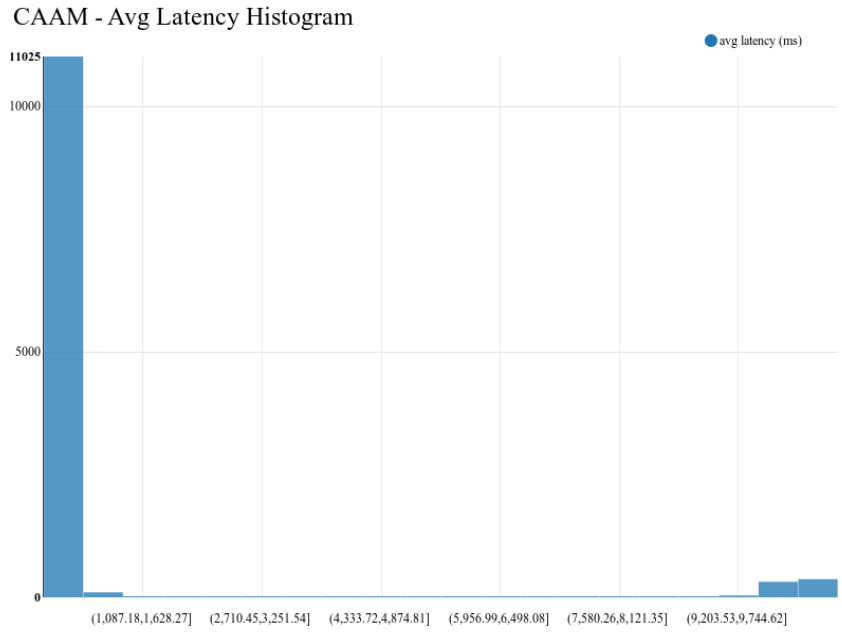

Figure 3: Histogram - Average Latency Distribution recorded by Malaysia

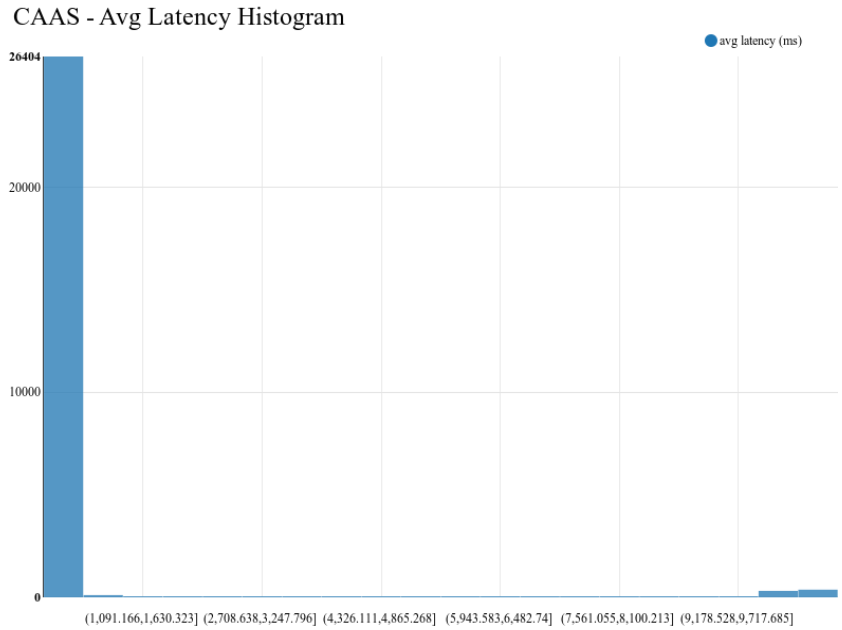

Figure 4: Histogram - Average Latency Distribution recorded by Singapore

2.6 The 95th percentile of the average latency was also calculated. Similar to the bandwidth data, analysis of the average latency data for Malaysia suggested the presence of distinct characteristics across different periods during the measurement. Consequently, the 95th percentile average latency was calculated separately for two identified periods:

- First Period: The 95th percentile average latency was 105 ms.
- Second Period: The 95th percentile average latency was 10,518 ms.

For the data stream from Singapore, the 95th percentile average latency was calculated as 235 ms. EMS performance requirement on latency cannot be concluded based on this data set due to the high variability in the results.

CONCLUSION

2.7 The data collected from the joint event provides a valuable starting point for developing recommended technical requirements for EMS. Based on the initial data recorded by Malaysia and Singapore, it may be inferred that an EMS system should support a bandwidth of at least 576.741 kbps and a latency of no more than 235 ms. However, when incorporating data observed by Thailand, the result, particularly regarding latency, exhibits significant variability. This suggests that the current data set is insufficient to form reliable, region-wide recommendations. Therefore, it is suggested that the SWIM TF/SIPG consider encouraging their members to share EMS usage and performance data for further analysis.

2.8 It is important to note that the aforementioned bandwidth and latency values are presented solely as indicative minimum technical performance requirements. The actual technical performance requirements will ultimately depend on the specific needs of SWIM users and the service level agreements established between SWIM service providers and consumers.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) encourage SWIM TF/SIPG members to share the EMS usage and performance data for further analysis; and

c) discuss any relevant matter as appropriate

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