International Civil Aviation Organization

First Meeting of the Surveillance Study Group (SURSG/1)

(Video Teleconference, 20– 22 April 2021)

Agenda Item 4: Issues in surveillance data sharing

PROPOSED SOLUTIONS FOR SHARING OF SURVILLANCE DATA

(Presented by Singapore)

SUMMARY

This paper proposes solutions for States to share surveillance data and will list the pros and cons of the solutions.

1. INTRODUCTION

1.1. Surveillance data sharing enables States to enhance their surveillance coverage, enhance surveillance data availability by providing additional layers of surveillance services, and implement advanced Air Traffic Management (ATM) tools such as Air Traffic Flow Management (ATFM). As technology matures, more alternatives are available to share surveillance data (for example, using CRV and SWIM).

1.2. This paper proposes solutions for States to share surveillance data and will list the pros and cons of the solutions. This paper was last presented at SURICG/5 following the Conclusion CNS SG/23/10 (SURICG/4/1) - ADS-B and Flow Management, there is a need to share surveillance data to provide surveillance from "departure to destination". This paper hence illustrates the SWIM (renamed as "Distributed solution" in this paper) and Central Data Base solutions proposed in para 3.7.

2. SUMMARY OF THE DATA SHARING MODEL

2.1. There are 3 models which can potentially be used for the implementation of the data sharing:

a. Distributed solution – States will establish their own subscription to the CRV and implement their own SWIM services to share and receive the data with/from other subscribers of the CRV who are also equipped with SWIM capability.

b. Central database – A data collector can be established to collect and re-distribute the data to the participating States. States can choose to agree that all the subscribers receive the same kind of information or a limited information based on the type of agreements established. However, there will be a need to decide on the ownership issue of the data collector (whether if it should be owned by State(s), commercial operator, ICAO or other non-profit organisations).

c. Hybrid model – Combination of the distributed and central database solution

3. DISCUSSION ON THE DIFFERENT MODELS

Distributed Solution

3.1. This solution works best when States are subscribed to the CRV and have access to the CRV to send and receive data. It is proposed that surveillance data be shared by creating surveillance information services based on SWIM principles.

3.2. The services should use internationally recognised formats (such as ASTERIX) for the surveillance data. Each participating State will need to implement a surveillance SWIM service using the agreed data formats to publish its surveillance data for others to use. The SWIM service is a software application that collects the State's surveillance data and makes them available for subscription by other entities.

3.3. Each State that participates in this sharing of the surveillance data will need to create the above service and allow selected, if not, all participants to subscribe and receive the surveillance data in accordance with the SWIM governance rules.

3.4. Using SWIM over CRV to distribute surveillance data ensures that any participant within the SWIM-CRV network will be able to access the data once given the permission to do so.

3.5. This proposed solution simplifies the integration using agreed standard data formats and a standard, open communication protocol.

3.6. The drawback of this solution is that every State will need to approve every other participant who wants to receive the State's surveillance data as illustrated in the **Error! Reference source not found.** below.

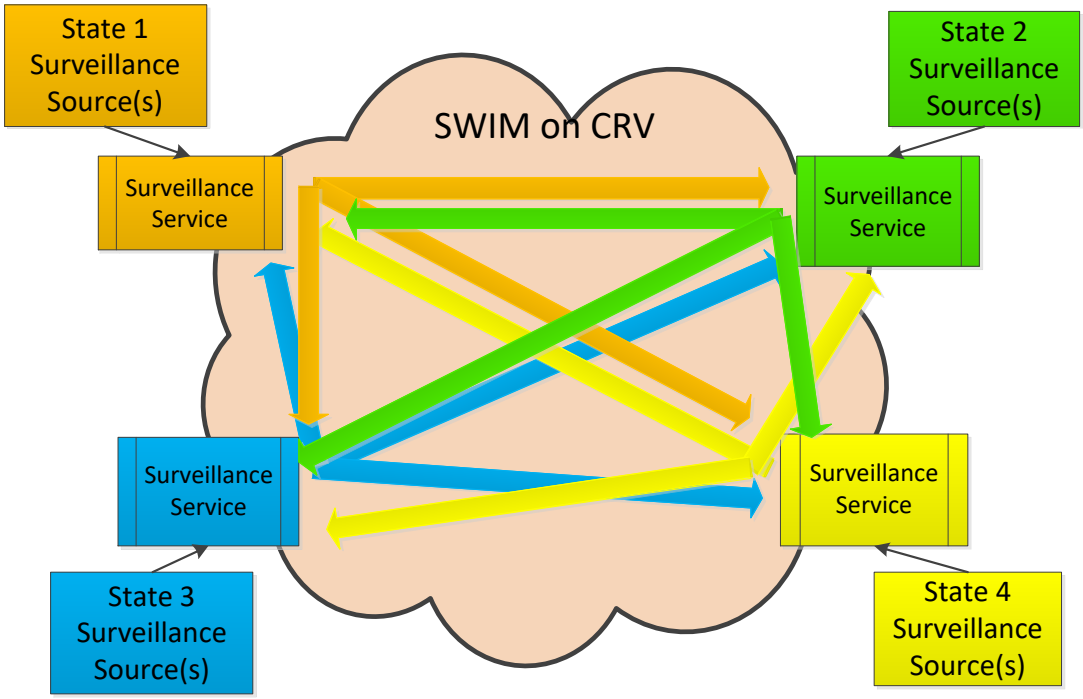

Figure 1: Flow of Surveillance Data Between States:

Central Database Solution

3.7. To mitigate the need for any State to manage many requests for surveillance data, a common, central, surveillance data collector could be used.

3.8. The data collector will be responsible for subscribing to all the surveillance services from the participating States.

3.9. The data collector will store the surveillance data received and perhaps even perform some fusion of the surveillance data to present a single surveillance picture. **Error! Reference source not found.** below illustrates the flow of the surveillance data with a central data collector.

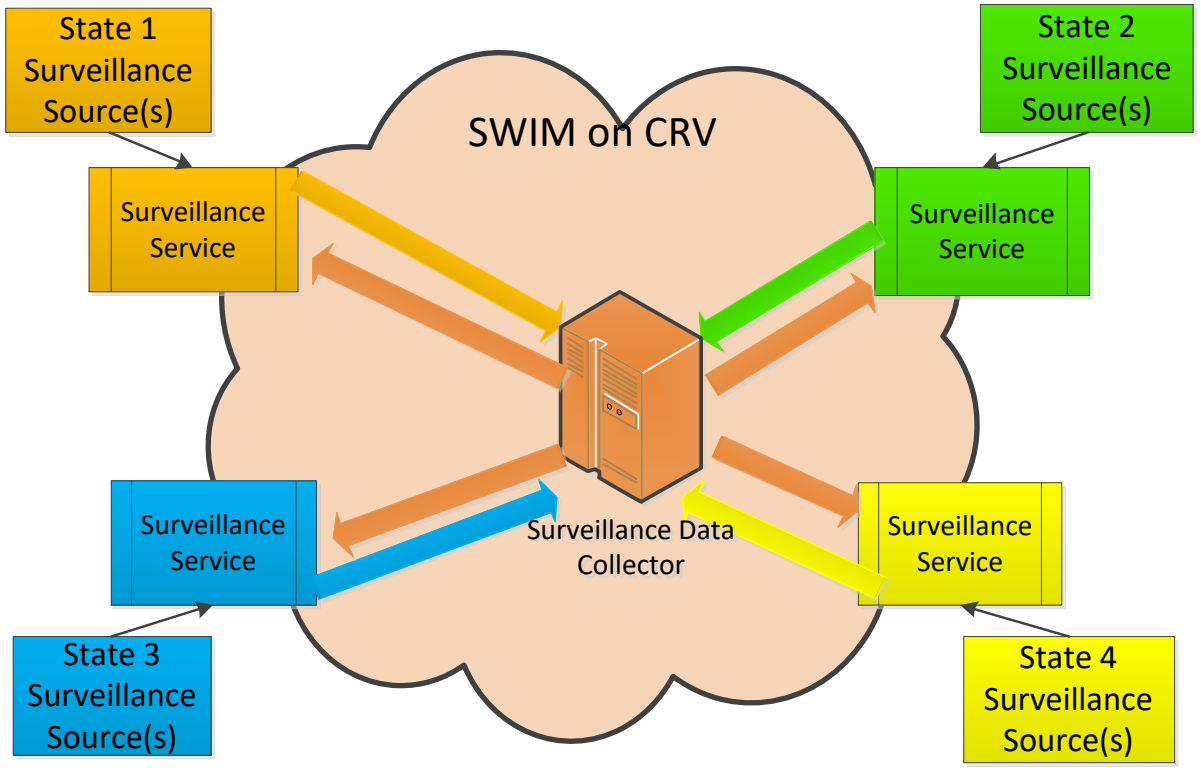

Figure 2:Flow of Surveillance data with a central data collector

3.10. The data collector can then publish its own surveillance service that gives its subscribers access to the consolidated surveillance picture or other subscribed surveillance data in accordance with the data government rules, which may impose constraints on the data that each individual subscriber could access.

3.11. This frees the participating States from having to manage multiple subscribers and only manage the subscription from the data collector.

3.12. Having the data collector, establishes the single source of truth. Each State then only needs to subscribe to the data collector for the selected surveillance data or the consolidated surveillance picture after data fusion, that it could access. Nevertheless, if all subscribers agree, it could also be the same information received by all subscribers. Another advantage of this solution is the potential reduction in the

required network bandwidth as it is possible for some of the information published (e.g. ADS-B) to be fused from various sensors, which could eliminate repeat data and result in cost saving.

3.13. The drawback of this solution is that there will be increased latency in receiving the surveillance information as the data collector first needs to collect data from all the subscribers before processing and publishing at fixed interval(s). However, for many applications, subscribers may be able to use the received data without further fusion. In this case, the overall latency may be comparable to that of the Distributed Solution.

3.14. The other consideration is that the data collector needs to be operationalized and managed by a single entity and this will require some consensus about who is best suited to do this work. If the supporting ATM functions or other applications required real-time or quasi-real-time surveillance data, or high service availability, then there may be a need to have dual or multiple data collectors to back up each other and provide geographical redundancy.

3.15. Agreements between different States/subscribers will also be required to address concerns on the type of surveillance data to share, confidentiality of information, limitation of use and liabilities, as well as areas on responsibilities and works required to be done by each party in order to achieve the data sharing.

Hybrid Solution

3.16. A third possible solution is one that combines the first two solutions, where States can decide if they prefer to send and receive surveillance data from a central surveillance data collector or if they prefer to subscribe directly to the other States for surveillance data. The diagram below shows how the data flows could work.

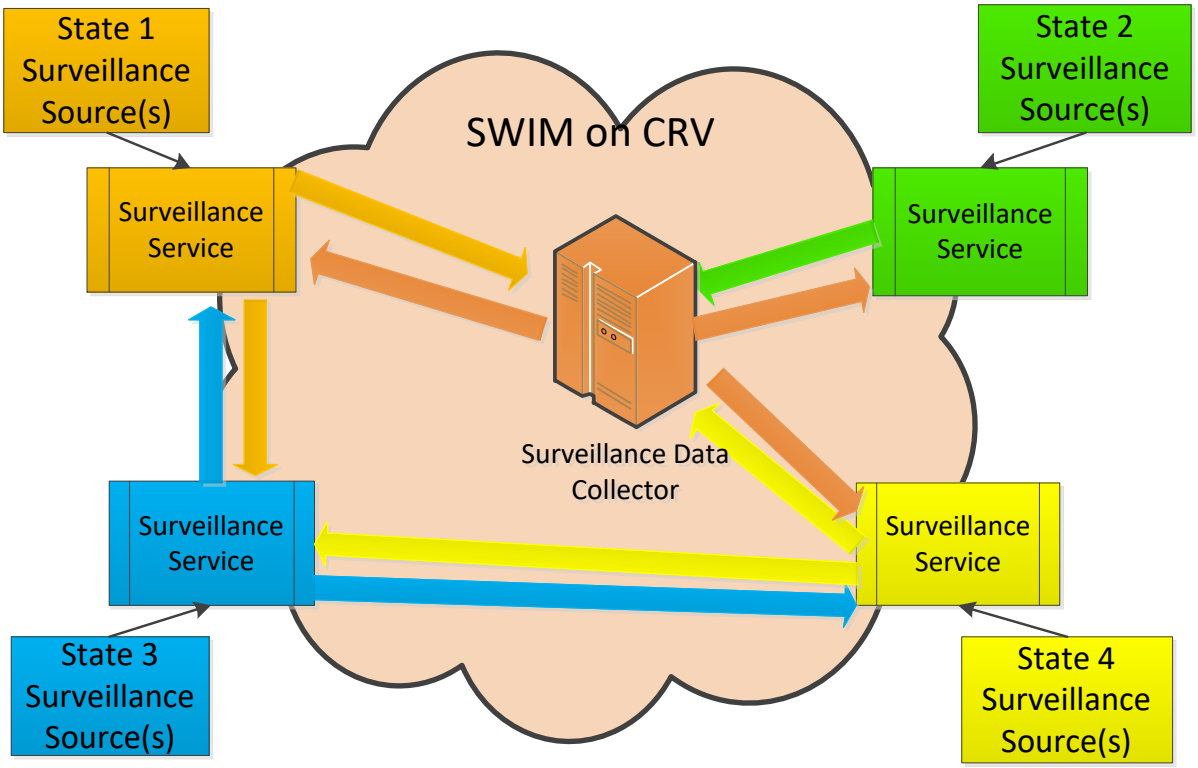

Figure 3:Flow of surveillance data in a hybrid solution

3.17. This solution offers States the freedom to choose the implementation that best suits them. However, it contains the drawbacks of both solutions.

3.18. It is worthwhile to discuss the solutions in detail as there would be many issues to iron out. It is hence proposed that a project team be set up the explore the above solutions as well as any other solutions that may be presented.

Interested parties who are non CRV subscribers or without SWIM capability

3.19 There may be some interested parties who are not subscribed to CRV or without SWIM capabilities, but are keen to share their surveillance data with other States. Adjustment to the models will be required to accommodate these parties. One possible solution could be for these parties to connect directly to one or more of the centralized service data collectors, if available.

4. ACTION BY THE MEETING

4.1. The meeting is invited to:

a. note the information contained in this paper; and

b. discuss and consider the 3 presented solutions for surveillance data sharing amongst the APAC region States; considering the potential issues/challenges with each solution.

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