INTERNATIONAL CIVIL AVIATION ORGANIZATION
THIRTEENTH MEETING OF THE NAFISAT SUPERVISORY BOARD
(NAFISAT-SVB/13)
(DAR-ES-SALAAM, TANZANIA, 7 – 8 NOVEMBER 2018)

Agenda Item 4: NAFISAT – Value Added Services

(Presented by ATNS)

SUMMARY

This working paper discusses the possibilities of implementing additional services over the SADC VSAT II and NAFISAT network.

1. **Background**

1.1 The SADC VSAT2 and NAFISAT networks were established in 2007 to address ground/ground communication (ATS/DS and AFTN) deficiencies in the SADC region.

1.2 In terms of article 2 of the new MoU the network should support the provision of a variety of aeronautical telecommunication services including the mandated ATS/DS and AFTN, for which the network was built as well as the migrating of these to the modern equivalent ATN applications of ATS Message Handling System (AMHS), ATS Inter-facility Data Communications (AIDC) and Voice over Internet Protocol (VoIP).

1.3 Additionally, the network should support the provision of the following added services:

1.3.1 Computer-to-computer data exchanges between ATS flight data processing systems (FDPS);

1.3.2 Operational meteorological data exchanges;

1.3.3 Operational aeronautical information services exchanges;

1.3.4 Aeronautical administrative support;

1.3.5 ADS-B and Radar data exchanges; and

1.3.6 VHF Extended range.

2. Discussion

2.1 The network upgrade has been practically completed, with the exception of 2 sites, namely Jeddah and Sana'a. Progress and current status on these outstanding installations is provided in WPxx.

2.2 ATNS has conducted a technical feasibility study as part of the network design of the upgrade and the current network, once optimized, will be able to support the mandated services of AFTN/AMHS and ATS/DS, AIDC and VoIP without significant changes to the current configuration (hardware, software, bandwidth etc).

2.3 The current financial model, of USD 9.90 per FIR crossing covers the costs of these mandated services and is expected to do so until the end of the current contract period.

2.4 The technical feasibility study showed that the upgraded network is technically capable of supporting the added services, however these services will require additional bandwidth and in some cases hardware and software. Additionally these added services may increase the burden on current maintenance resources and administrative processes.

2.5 The network providers are in the initial stages of discussing and investigating a financial model under which the added services will be managed. This is however still in its infancy.

3. Proof of Concept

3.1 Introduction

3.2 The VSAT supervisory board has tasked ATNS to compile a detailed report on Value added Services (VaS) for the network and to assess the impact of these services on the network. The ATNS team has found it prudent to conduct these tests and provide information and feedback to the NAFISAT supervisory board.

3.3 Seychelles CAA (SCAA) had agreed to be part of a Proof of Concept to allow ATNS to run tests with SCAA for IP based Space Based ADS-B data, and the AIM system over the NAFISAT network, using only test platforms available in both organisations.

3.4 The spectrum used for the tests was the Bit Error Rate Test (BERT) Spectrum that the VSAT technical team uses for the testing of the network hence there was no impact on the operational Spectrum currently utilised by the network.

The following were the test objectives of the PoC.

Objective 1:

Conduct Space based ADS-B tests with SCAA by using the radar analysis tool in Seychelles and giving SCAA visibility of the data in Seychelles.

Objective: 2

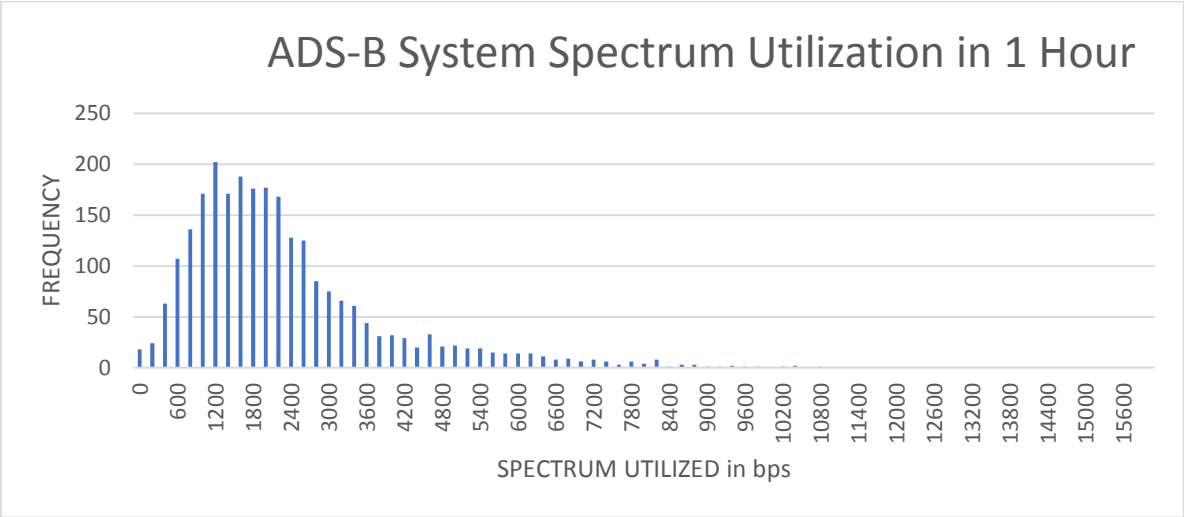
Conducting trials of the AIM test environment workstation, which closely matches the operational AIM environment, in order for SCAA to use the system and evaluate the performance of such IP based applications on the NAFISAT network.

3.2 POC Test Outcomes and Analyses

3.2.1 The outcomes of the above 2 objectives has been collated and the technical results of these tests are reflected below with the following in mind.

1) Satellite Spectrum Usage analysis
2) Impact on existing services
3) Latency in Transmission and it impact on services
4)

3.2.2 Graph 1 shows a distribution of the Spectrum utilised over a one-hour period with ADS-B data being transferred over the NAFISAT network. The following are the deductions from the graph;



Graph 1:

3.2.2.1 The data reflected used for the test was for South Africa due being the Busiest airspace we have access to for Space Based ADS-B data in Asterix 21 Version 2.4

3.2.2.2 Due to the nature of the surveillance data that is being continuously transmitted (Asterix 21 V2.4) as IP Broadcast Traffic or more commonly know as User Datagram Protocol (UDP) Traffic, there are always packets transferred on the network and this would vary depending on the processed data received.

3.2.2.3 The table above is based on Spectrum used per second by the ADS-B service.

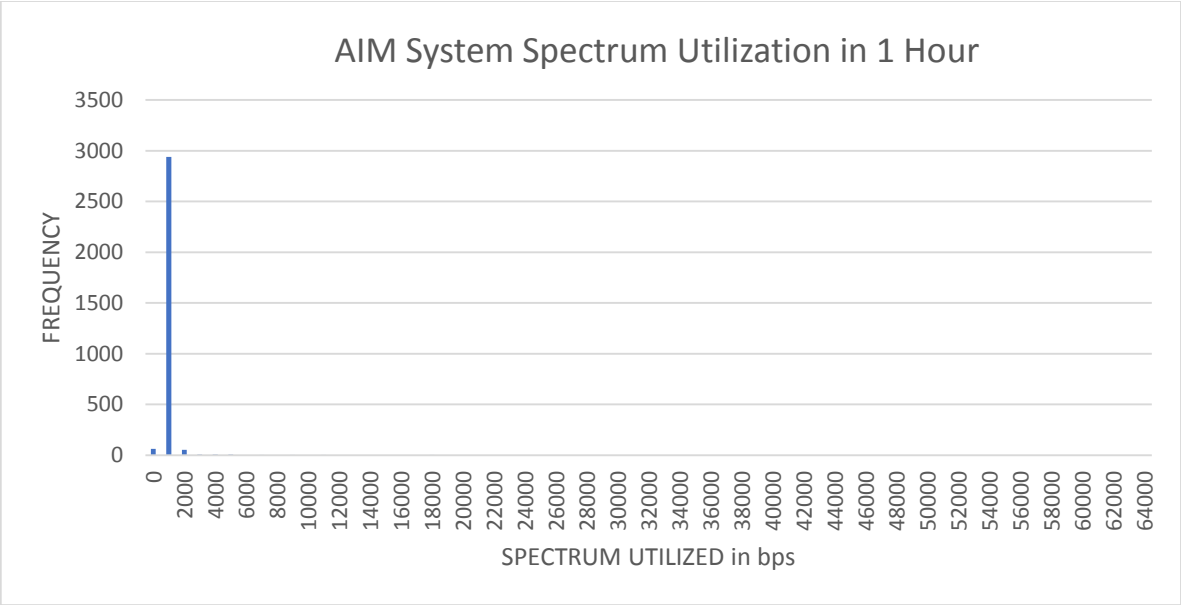
3.2.2.4 The Frequency chart shows that on 200 occurrences out of 3600 occasions 1200 bps or 1.2 kbps was utilised by the ADS-B data.

3.2.2.5 The highest recorded transfer rate per second for the hour was 10800 bps or 10.8kbps.

3.2.2.6 The latency of the NAFISAT network, for one was UDP traffic, of 250ms needs to be considered by the state using the data and this should within the transmission limits as required by the local safety regulator.

3.2.2.7 It could be deduced, based on this data that a 16 kbps line would be sufficient for any environment where traffic volumes are equal to or lower than that of South Africa for Space based ADS-B data.

3.2.3 Graph 2 shows a distribution of the Spectrum utilised over a one hour period with the AIM system data being transferred over the NAFISAT network. The following are the deductions from the graph;



Graph 2:

3.2.3.1 The data reflected is based on one user terminal accessing the system.

3.2.3.2 Due to the nature of the data that is being infrequently transmitted there is not always data being transmitted, hence the high frequency count at 1000 bps or 1kbps.

3.2.3.3 The table above is based on Spectrum used per second by the AIM database application.

3.2.3.4 The Frequency chart shows that on 2939 occurrences out of 3600 occasions 1000 bps or 1 kbps was utilised by the AIM application.

3.2.3.5 The highest recorded transfer rate per second for the hour was 17575 bps or 17.6 kbps on only one occasion (one second).

3.2.3.6 From a quality aspect the application performed as per normal considering the NAFISAT latency that is associated with applications over a satellite network.

3.2.3.7 It could be deduced, based on this data that a 64-kbps line would be sufficient for this environment taking into account that there may be more than one terminal that will access the AIM database simultaneously from the site.

3.2.4 From the above data it shows that for certain environments, based on business levels of the airspace and the number of operational AIM terminals that the country will be using, that the NAFISAT solutions are technically viable Value Add services for the network.

Future Value add services that are added to the network should be evaluated in this manner to ensure that the impact to the available spectrum is controlled.

3.3 PoC Conclusions:

3.3.1 The Value add services tests were operated independent of the spectrum from the current services running on the network and did not impact the current services.

3.3.2 It is possible to allocate a fixed spectrum to these services so that the spectrum will be dedicated to that service for that country to avoid network congestion.

3.3.3 Throughout the testing process there was no operational impact reported on the NAFISAT network.

3.3.4 Based on the results, the recommended spectrum impact of this solution for a country like Seychelles is 100 kbps which provides sufficient spectrum should data increase over the coming years.

3.3.5 The latency of the network was sufficiently low to operate the applications without major delays.

3.3.6 The costing of these Value add service should be based on a user pay principle and ATNS should operate the costing model outside of this forum.

3.3.7 For security reasons the IP traffic on the 2 VaS tested was segregate on the network so that the services were not impacted by any other IP based service.

4. SUGGESTED ACTION TO BE TAKEN BY THE MEETING

4.1 The meeting is invited to take note of the information in this paper and discuss the implications for the NAFISAT network, and

4.2 Provide the network providers with states intentions of implementing added services along with an expected time frame.