

**55th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS**

*Denarau Island, Nadi, Fiji
22 — 26 October 2018*

**AGENDA ITEM 8: TECHNICAL AND REGIONAL
 COOPERATION**

**APPLICATION OF GAGAN MESSAGING SERVICE (GMS)
IN DISASTER MANAGEMENT**

Presented by India

INFORMATION PAPER

SUMMARY

This paper describes the initiative taken by Airports Authority of India (AAI) in coordination with Indian National Centre for Ocean Information Services (INCOIS) to utilize GAGAN Signal-In-Space (SIS) for sending short service messages without affecting or change in standard GAGAN message structure.

This paper also describes the GMS architecture and SBAS Message Type 63 data structure to be used for transmission of early warnings, Alerts, Search & Rescue etc. through GAGAN system and application of GMS in Disaster Management.

APPLICATION OF GAGAN MESSAGING SERVICE (GMS) IN DISASTER MANAGEMENT

1. INTRODUCTION

1.1 Timely provision of effective information allows people exposed to hazard to take appropriate action to avoid or reduce the risk and prepare better for effective response. The current early warning systems use Sirens, Public Displays, TV and radio broadcast, Public address systems, Public fix telephone, Public mobile telephone (SMS broadcast), Private radio/ paging, Internet/e-mail, etc. as communication methods to broadcast the alert messages. These conventional methods have certain limitations such as Non-availability of Warning and location information with the same system, No guarantee for timely service, Limited coverage area, Last mile communication problem etc.

1.2 Airports Authority of India (AAI) is in the process of implementing Alert Message Service through **GAGAN Message Service (GMS)** as an additional feature of GAGAN system. The requirement of adding this feature was considered after receiving requests from various Indian Government agencies like Indian National Centre for Ocean Information Services (INCOIS), National Disaster Management Authority (NDMA), Indian Meteorology Department (IMD) and Snow & Avalanche Study Establishment (SASE) to explore the possibility of sending messages to fishermen, Farmers, and common people on the occurrence of natural disasters, calamities, dangers for the safety of life within GAGAN coverage area.

1.3 Applications of GAGAN to various users are enabled through GAGAN messages sent via GAGAN GEO satellites (GSAT-8, GSAT-10 and GSAT15). Existing GAGAN system hardware is planned to be utilized for sending short service messages with suitable changes in the message structure. The availability of free bandwidth enables GAGAN system to broadcast short text messages in addition to SBAS messages. These broadcast messages could be,

- Early Warning messages on the occurrence of natural disasters, calamities, dangers for the safety of life within GAGAN coverage area
- Search and Rescue Messages
- Relief and mitigation related messages
- Meteorological information
- Other uses.

2. DISCUSSION

2.1 GAGAN presents a unique and efficient solution to the delivery of one-to-many messages. In order to reach the maximum number of people in the target area with a reliable information service, a specific technical solution is in the process of development using GAGAN satellites. GAGAN provides a robust inter-operability framework for the delivery of digital alerting messages received from various Indian government alert message generating agencies like INCOIS, NDMA, IMD, SASE and able to work with the highest number of current and possibly future communication system.

2.2 The GMS is a service through existing certified GAGAN system that introduce various message like disaster management, fishing information, oceanic information, weather information, etc. These messages are introduced into GAGAN system through message type 63, which is null message. The architecture of GMS is shown in figure 2.

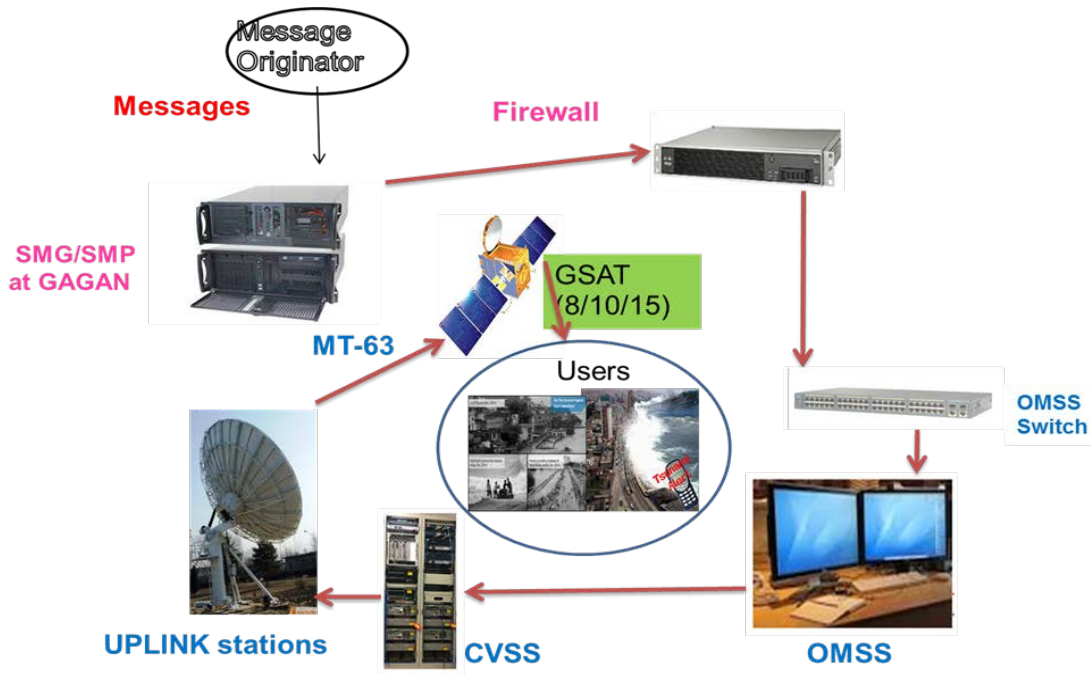


Figure 2: Architecture of GMS

2.3 As shown in figure 2 above, the message from various message originators arrives at SMG (Short Message Generator). The SMG then sends the message to SMP. From SMP, the message is transferred to the GAGAN system through OMSS. The SMG and SMP will be on same processor/hardware. The GAGAN system includes Master control station (OMSS, CVSS, and SMSS), uplink stations, and Reference stations. The message gets uplinked to GSAT through uplink stations of the GAGAN system. From GSAT, user gets the message. Major tasks of each blocks is summarized in the later sections.

2.4 For the purpose of verification of message, the data from the reference station is used in the INMCC are verified by the BMV software. This can be seen in figure 3 below

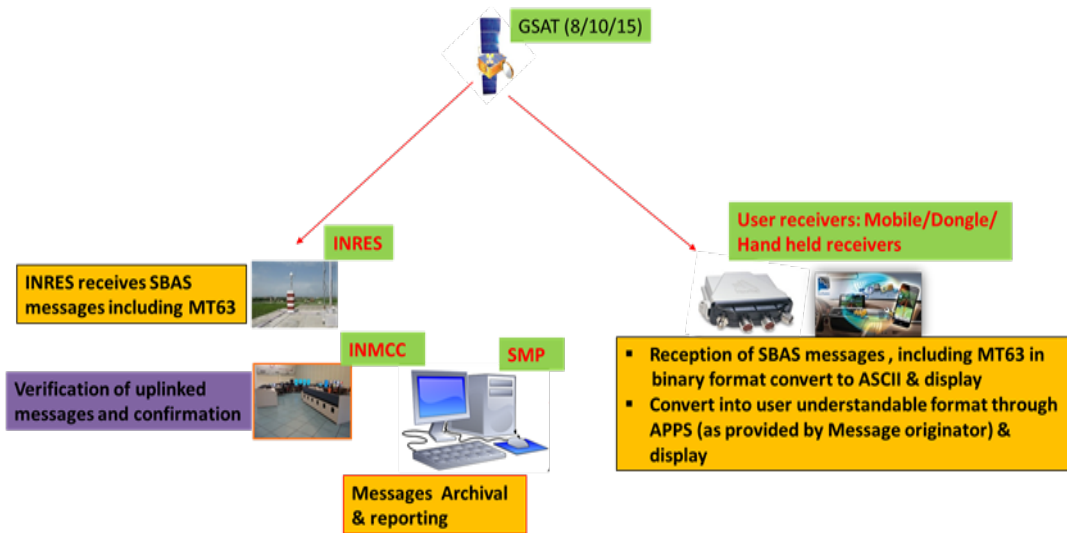


Figure 3: message downlink and archival

2.5 SBAS messages that are being uplinked through GAGAN. The message type 63 is a null message and is broadcast via GAGAN geo-satellites, whenever no other messages are being transmitted. The occurrence of this message is typically about 13540 seconds out of 86400 seconds in a day. GMS will make use of the unused bandwidth to send additional text messages that could cater to broadcasting alert/early warning messages like occurrence of natural disasters, calamities, dangers for the safety of life within GAGAN coverage area. The Search and Rescue Messages and associated relief and mitigation related messages, Meteorological information, Alert messages about storms, avalanche etc. could be broadcast through GMS.

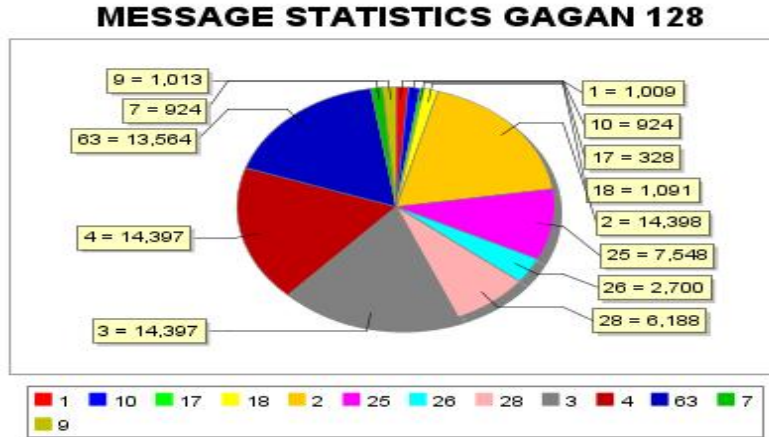


Figure 4: Frequency of various SBAS messages

2.6 GMS implementation will utilize 250 bits of SBAS message type 63. There are primarily two parts of the messages 1). Fixed part and 2). Flexible part. The fixed part will have MSG ID, Frame Index, Frame Count, Alert bit, Expiration Week and Seconds of the Week, Country Code, Zone Indicator, Message Originator Indicator, Type of Service, Priority bit, Test bit, Text/Image and Message Format Indicator. The flexible part will have Latitude, longitude, height, radius of effective area, Header length and total bytes (characters) count, Date of issue of the header and Bulletin Number.

2.7 The 250 bits of SBAS MT63 will contain Preamble 8 bits, MT Identifier 6 bits, Short Message ID 10 bits, Frame Index 10 bits, Short Message Frame 192 bits and CRC 24 bits.

2.8 The testing of the GAGAN Message Service was conducted on 11th May 2018 by sending a sample text message and the same was validated at Indian Master Control Centre at Bengaluru. Some other related tests such as demonstration of GAGAN Message Service to Indian Meteorological Department (IMD), Snow and Avalanche Study Establishment (SASE), National Disaster Management Authority (NDMA) with User Receiver & APP, Policy paper for use of GAGAN Message Service, and Integration of Message originators are under its completion stage.

2.9 The GAGAN Message service broadcasts Early Warning/ Alert messages through GAGAN GEO Satellites on the occurrence of natural disasters, calamities, dangers for the safety of life within GAGAN coverage area.

2.10 The final GAGAN Messages service is available to the users since August 2018 and can be utilized by Fishermen, Farmers, Coast Guard, Ships, Road transport, Disaster Alert and Mitigation etc. with a suitable receiver.



3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to note the initiative taken by India for implementation of GAGAN Message Service for broadcast of alert / warning messages over wider area within short time which will save life and reduce loss of property due to occurrence of natural disasters, calamities, dangers for the safety of life within GAGAN coverage area.

— END —