Global Communications Infrastructure

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Introduction

The Global Communications Infrastructure (GCI) is designed to transmit data in near real time from the 337 facilities of the IMS to the IDC in Vienna for processing and analysis. The GCI is also used to distribute to States Signatories data and reports relevant to verification of compliance with the Treaty. Digital signatures and keys are employed to ensure that the transmitted data are authentic and have not been tampered with.

The GCI is the first global satellite communications network based on very small aperture terminal (VSAT) technology. IMS facilities and States Signatories in all but near-polar areas of the world can exchange data via their local VSAT earth stations through one of three geosynchronous satellites. The satellites route the transmissions to hubs on the ground and the data are then sent to the IDC by terrestrial links. The GCI uses two additional satellites for more economical coverage of North America and Europe. Upon request from States hosting IMS stations, their data may be routed through national communication nodes before being routed into the GCI. The GCI is designed to be cost effective, to operate with 99.5% availability and to provide data within seconds from origin to final destination. It became functional in mid-1999.

HIGHLIGHTS OF ACTIVITIES IN 2006

GCI coverage continued to expand, with nine VSATSs being installed in 2006. By the end of December, 208 VSATs (83.8%) had been installed at IMS stations, National Data Centres (NDCs) and development sites, and 216 licences (87.1%) had been obtained in 74 of 91 countries.

The volume of traffic carried by the GCI and special links to the IDC increased during the year from about 7500 to slightly over 8300 megabytes per day. The average GCI virtual circuit availability in 2006 was 97.85%, representing a significant improvement over the previous calendar year.

CURRENT GCI

Implementation

The year was marked by installation in July of the 200th VSAT at auxiliary seismic station AS103 in Uganda. Dual VSATs were installed on Wake Island (USA) to support the three IMS stations collocated there. One GCI link connecting AS107 (Tuckaleechee Caverns, Tennessee, USA) was relocated to a new station connection point; at the same time the VSAT equipment was changed.

GCI coverage continued to expand throughout 2006, with 9 new VSATs installed. At the end of the year, 208 VSATs had been installed out of 248 planned for the GCI network. The number of planned GCI VSATs has been reduced owing to conversion of some sites to an independent subnetwork topology or because the sites (mostly NDCs) were provided with a connection through a virtual private network.

As of 31 December 2006, eight additional GCI site surveys had been completed. Six radio frequency licences, including some which had been outstanding for a long time, were obtained. GCI site surveys had been completed for 240 VSATs (96.7% of the total number planned); 208 VSATs (83.8%) had been installed at IMS stations, NDCs and development sites; and 216 licences (87.1%) had been obtained in 74 of 91 countries. To support the testing at tsunami warning centres, three connections by means of virtual private networks were established between the IDC and each centre.

The volume of traffic carried by the GCI and special links to the IDC increased during the year from about 7500 to slightly over 8300 megabytes per day. In the other direction, almost 6800 megabytes per day were transported from the IDC to remote sites.

The average GCI virtual circuit availability in 2006 was 97.85%, representing a significant improvement over the previous calendar year. It included all outages in the GCI VSAT and terrestrial circuits. With only the outages counted against the GCI contractor taken into account, the adjusted average GCI virtual circuit availability was 99.55%.

Topology

Discussions continued on how to increase the coverage of auxiliary seismic station AS114 at the South Pole, which was available for only 12 hours a day. A solution utilizing an Iridium satellite was developed and tested during 2006 in conjunction with the US National Science Foundation, and was to be implemented in early 2007 to add the other 12 hours of coverage.

Space segment capacity was increased by an average of 28% in all VSAT regions in response to the growth of traffic over the GCI. This increase was expected to be sufficient until the end of the current GCI contract.

NEXT GCI

In the framework of the procurement of the next GCI, and following the issuance of a request for proposals at the end of 2005, proposals were received in March 2006. Thereafter, the PTS began the technical and financial evaluation process, which was concluded with clarification visits in August.

The PTS requested selected bidders to begin the design phase of the next GCI, moving the whole process forward by three months and providing more time for the subsequent phases. The preliminary design phase was completed in December 2006. The next GCI will be a hybrid system using both terrestrial and satellite connections (as before) based on an Internet Protocol (IP) network with end to end quality of service.

Above left: VSAT installations at hydroacoustic station HA11, Wake Island, USA.

Above: Satellite radome for auxiliary seismic station AS114, South Pole, Antarctica (USA).

Centre: Radio frequency transmitter.

Bottom: Exercise on the roof of the Vienna International Centre to set up the VSAT that was later used during the OSI directed exercise (DE06) in Croatia.