

Major Programme 3: Communications

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The main task of Major Programme 3 is to ensure the transport of data from the IMS facilities to the IDC, and to provide access to IMS data and IDC products to States Signatories, using the Global Communications Infrastructure (GCI).

GCI MANAGEMENT

The year 2004 will be remembered as the year for proving the viability of the GCI in transporting IMS data to the IDC in both CD (continuous data) and AutoDRM (Automatic Data Request Manager) formats, and for supporting station operator command and control using a mixture of very small aperture satellite terminal (VSAT), terrestrial line and virtual private network (VPN) technologies. This lent confidence to the preparation of technical specifications for the next generation of the GCI, which was started in 2004. Despite occasional problems caused by growing network usage, CD stations transmitted well over the GCI. The performance was confirmed during phase I of SPT1. Major enhancements to the GCI network management system (NMS), the firewall and VPN infrastructure improved the control and oversight of network usage. To support the growing network, initiatives to improve coordination both within the PTS and between the PTS and the GCI contractor and station operators were taken, with positive results.

PROCUREMENT OF THE NEXT GENERATION OF THE GCI

The current contract for the GCI will expire in 2008. To ensure continuity of GCI services, the PTS worked with a group of experts of States Signatories, established by WGB, to define future GCI performance requirements and technology options. Following the submission of the report and recommendations of the expert group at the Twenty-Third Session of WGB, the PTS prepared terms of reference and other documents to invite suppliers to provide an expression of interest. The invitations were formally released in December 2004, with a deadline of 1 March 2005 for replies. The responses from suppliers will be reviewed in order to refine the terms of reference and generate a shortlist of vendors to be invited to bid for the continuation of GCI services.

GCI IMPLEMENTATION

VSAT Installations

GCI coverage continued to expand throughout 2004, with 29 new VSATs installed. As of 31 December, 30 GCI site surveys had been completed. Seventeen radio frequency licences, including several which had been outstanding for a long time, were obtained. Of the total planned number of 248 VSATs, GCI site surveys had been completed for 234 (94.3%); 187 (75.4%) VSATs had been installed at IMS, NDC and development sites; and 186 (75.9%) licences had been obtained in 63 of 91 countries (69.2%). Four VSATs had to be turned off because they did not have a licence.

New connections to the polar regions were achieved using customized configurations for each location. Infrasound station IS27 (Georg von Neumayer, Antarctica) was connected using a hybrid of both satellite and VPN technologies. Connectivity was also established in a similar manner to primary seismic stations PS5 (Mawson) and PS50 (Vanda) and to auxiliary seismic stations AS35 (SANAE Station) and AS114 (South Pole) in Antarctica. With these five additional sites a total of seven sites are now connected in the polar regions.

VPN Connections and System Upgrade

VPN services were upgraded in 2004 to increase the capability of static connections from 20 to more than 100 connections, to provide enhanced back-up and reliability, and to add remote access using a dynamic VPN solution integrated with the existing PTS one time password infrastructure.

VPN servers were added to support secure connection to the GCI network over the Internet after VPN technologies were accepted as a viable solution. This was done to allow CD transfer and email on an exceptional basis, as was recommended by the Twenty-First Session of WGB in September 2003. VPN connections are now functioning as regular links in the GCI network to connect IMS stations for which no other medium is currently available, or to enable station operators and NDCs to connect to the GCI without using a VSAT. VPN technologies have been fully integrated into the PTS network management and performance measurement system. In 2004, a combined NDC and primary seismic station site was temporarily connected by VPN while waiting for a licence for the permanent VSAT installation. The performance characteristics of these connections have been shown, in many cases, to exceed the GCI criteria used to benchmark the performance of VSAT connections. By the end of 2004, 12 dedicated VPN circuits were installed and operating, an increase of 2 during the year. Fifty-three non-dedicated remote access VPN accounts were issued to station operators, network managers and PTS staff for the first time in 2004.



RN68/HA9/IS49, Tristan da Cunha, United Kingdom.



N126, Niamey, Niger.



AS47, Shushtar, Iran (Islamic Republic of).

Network Management System

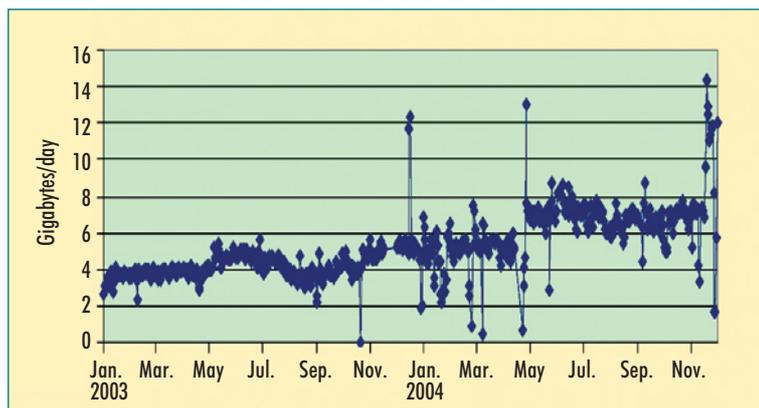
The NMS was upgraded in hardware and software in time to be used during SPT1. The upgrade has significantly improved the monitoring capabilities of the NMS. It provides a Web portal called the Unified Reporting Interface, from which PTS staff, network operators and NDC operators can check the status of their GCI link. Users can observe whether a link is up or down, read the start and end times of an outage, and generate reports on past response times and carried traffic. The Unified Reporting Interface is available to users connected by both GCI VSAT and Internet VPN. Training in the use of the interface was given to station operators and NDC managers at the O&M workshop in Baden in October, when the use of the Web portal was announced for the first time. This system is one of the most advanced satellite communications management systems ever built.

Security and Networking

A new firewall was installed as part of the security upgrade recommended in the security audit performed in 2003, and is now operating to control access between GCI remote sites and the IDC, and among groups of GCI remote sites. Work is continuing to complete the firewall configuration. It will now be possible to selectively grant access by station operators to their respective stations. These improvements were funded as planned by making savings in GCI contract costs, which were achieved through discussions with the GCI contractor in 2003.

Email over the GCI

The GCI mail servers supporting auxiliary seismic and radionuclide stations and radionuclide laboratories were upgraded in the last quarter to improve the flow of outgoing and incoming emails over the GCI. This removed transmission difficulties experienced by auxiliary seismic stations that send large data volumes. About 22 000 messages with over 1 gigabyte of content traverse the GCI each day.



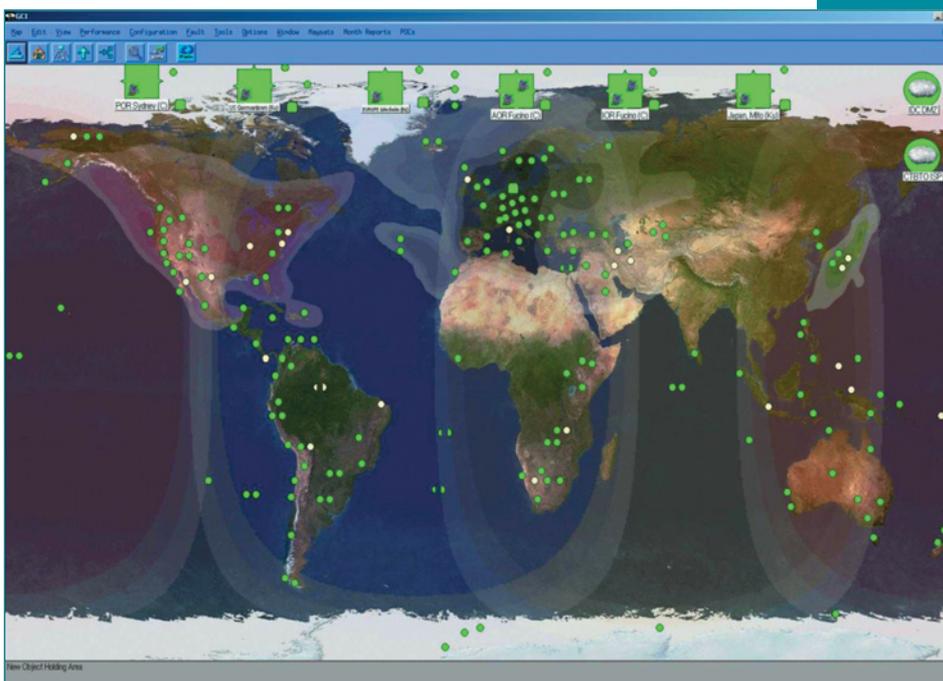
Increase in volume of IMS station data transmitted over the GCI during 2003–2004.

OPERATION AND MAINTENANCE

At the end of 2004, 177 GCI links managed by the PTS were operating and passing traffic in 73 countries around the world, as well as the Antarctic region. In addition, more than 40 links in nine independent subnetworks contributed to the network coverage. Traffic passing over the GCI increased by 45% in 2004 to nearly 8 gigabytes per day. In the whole year, the equivalent of 3000 CD-ROMs passed over the GCI.

Communications between the PTS and station operators were rationalized with shared email formats, common points of contact and a system-wide common naming terminology. The PTS worked with the GCI contractor to adjust operating procedures to make them consistent with the local working hours of station operators and NDC managers. In 2004, efforts were made to combine trouble ticket recording systems into a single shared facility. These efforts should bear fruit in 2005. PTS staff and the GCI contractor handled 3829 GCI trouble tickets in the year. Subcontractors of Hughes Network Systems (HNS) made a total of 60 repair visits to 47 remote sites in 23 countries, an indication of the effort needed to keep the network running.

In April, Intelsat advised the GCI contractor that it had to move one of its satellites used by the GCI to cover the Pacific Ocean Region (POR) to a new orbit. As a consequence, all 29 VSATs installed in the POR were reprogrammed to a new satellite located at 180°. Five teams from the GCI contractor worked simultaneously to complete this transition in less than one month, visiting each of the sites in 12 countries. The project was completed smoothly by August with no loss of IMS data.



The network management system shows the state of health of the GCI and is an essential tool for the O&M of the GCI. All GCI links to IMS facilities and NDCs are monitored in near real time. The colour green indicates a healthy link. Visual alarms and colour changes alert operators to potential anomalies.

MAJOR PROGRAMME 3: COMMUNICATIONS

The performance of the PTS Internet links was consistent during 2004, with an availability of greater than 99.9%. The two diverse links share normal Internet traffic as well as VPN traffic for the GCI. In June, one of the lines was upgraded to 4 megabits per second. The PTS issued a contract to upgrade the second line to the same speed in 2005. A service to monitor the usage and load sharing of the PTS Internet lines partly using the new NMS and partly using commercially available Internet monitoring services is in the advanced stages of negotiation with the GCI contractor. This will be of benefit to users of VPN links.