The Global Communications Infrastructure

Highlights in 2015
High GCI availability maintained
An average of 37 gigabytes of data and products transmitted per day
Teleport services consolidated

The Global Communications Infrastructure uses a combination of satellite and terrestrial communication links to enable the exchange of data by IMS facilities and States around the world with the Commission. The GCI first transports raw data from the IMS facilities in near real time to the IDC in Vienna for processing and analysis. It then distributes the analysed data to States Signatories along with reports relevant to verification of compliance with the Treaty. Increasingly, the GCI is also being used as a means for the Commission and station operators to monitor and control IMS stations remotely.

The current, second generation GCI began operation in 2007 under a new contractor. Its satellite communication links are required to operate with 99.5% availability and its terrestrial communication links with 99.95% availability. The GCI is required to send data from transmitter to receiver within seconds. It uses digital signatures and keys to ensure that the transmitted data are authentic and have not been tampered with.
Technology

IMS facilities, the IDC and States Signatories can exchange data, via their local earth stations fitted with a very small aperture terminal (VSAT), through one of six geostationary satellites. The six satellites cover all parts of the world other than those near the North and South Poles: three cover the Pacific, Atlantic and Indian Oceans and three focus on the North Pacific (Japan), North and Central America, and Europe and the Middle East. The satellites route the transmissions to hubs on the ground and the data are then sent to the IDC via terrestrial links. Complementing this network, independent subnetworks employ a variety of communications technologies to carry data from IMS facilities to a communications node connected to the GCI, from where the data are routed to the IDC.

In situations where VSATs are still not in use or are not operational, a virtual private network (VPN) can provide an alternative means of communication. A VPN uses existing telecommunications networks to transmit data privately. Most of the
VPNs for the GCI use the basic public infrastructure of the Internet together with a variety of specialized protocols to support secure encrypted communications. VPNs are also used at some sites to provide a backup communication link in case of failure of a VSAT or terrestrial link. For National Data Centres (NDCs) with a viable Internet infrastructure, a VPN is the recommended medium for receiving data and products from the IDC.

At the end of 2015 the GCI network included 217 VSAT stations (of which 25 had backup VPN links), 36 stand-alone VPN links, 5 independent subnetworks on terrestrial links using multiprotocol label switching (MPLS), a terrestrial MPLS link for US stations located in Antarctica, 2 satellite teleports (in Blåvand, Denmark, and Santa Paula, California, USA) for the 6 geostationary satellites, and a network operations centre (in Maryland, USA). All of these are managed by the GCI contractor. In addition, a total of 68 independent subnetwork links and 6 Antarctic communication links are operated by 10 States Signatories to carry IMS data to a GCI connection point. In total, the combined networks have nearly 330 different communication links to transport data to and from the IDC.

Operations

The Commission measures the compliance of the GCI contractor against the operational target of 99.5% availability in one year using a rolling 12 month adjusted availability figure. In 2015 this was above or close to 99.5% in each month. The rolling 12 month actual availability, which is a measure of the raw uptime of each GCI link over one year, was up to 2.4% lower than the adjusted availability.

Over the year, the traffic transported over the GCI from IMS facilities to the IDC and from the IDC to NDCs averaged 37 gigabytes per day. In addition, data sent to NDCs that are directly connected to the IDC averaged 11.5 gigabytes per day.

While preparations were made for the installation of a new communications link at AS112, recently relocated on Shemya Island, Alaska, United States of America, the station started to send data to the IDC over a provisional communications channel.

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Consolidation of VSAT services to two teleports began in 2014. In 2015 the satellite covering the Indian Ocean was migrated to a teleport at Blåvand, Denmark, to complete the project. This major restructuring of the GCI network is intended to improve the reliability of GCI services at no cost to the Commission.

Auxiliary seismic station AS112 on Shemya Island, Alaska (USA), the most recent IMS facility to be connected to the GCI