The Global Communications Infrastructure (GCI) is designed to transport raw data from the 337 facilities of the International Monitoring System (IMS) in near real time to the International Data Centre (IDC) in Vienna for processing and analysis. The GCI is also designed to distribute to States Signatories analysed data and reports relevant to verification of compliance with the Treaty. Digital signatures and keys are used to ensure that the transmitted data are authentic and that no one has tampered with them. Increasingly, the GCI is being used as a medium of communication for the Provisional Technical Secretariat and station operators to monitor and control IMS stations remotely.

Using a combination of satellite and terrestrial communication links, this global network enables the exchange of data by IMS facilities and States in all areas of the world with the CTBTO Preparatory Commission. The GCI is required to operate with 99.5% availability for satellite communication links and 99.95% availability for terrestrial communication links, and to provide data within seconds from transmitter to receiver. The first generation GCI began provisional operation in mid-1999. In 2007, operation of the current, second generation GCI began under a new contractor.

Highlights in 2013

Maintaining GCI availability above 99.77%
Transmitting over 35 gigabytes of data and products per day
Contributing to preparations for the IFE in 2014
GCI Technology

IMS facilities and States Signatories in all but near polar areas of the world can exchange data via their local earth stations fitted with a very small aperture terminal (VSAT) through one of six geostationary satellites. The satellites route the transmissions to hubs on the ground and the data are then sent to the IDC by 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.

A virtual private network (VPN) utilizes existing telecommunications networks to conduct private data transmissions. 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. In situations where VSATs are still not in use or not operational, VPNs provide an alternative means of communication. 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 2013, the GCI network included 217 VSAT stations (of which 26 have backup VPN links), 32 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, 4 satellite teleports (2 in Norway and 2 in the USA), 6 geostationary satellites and a network operations centre in Maryland, USA. All of these are managed by the GCI contractor. The satellites cover the Pacific Ocean, North Pacific (Japan), North and Central America, Atlantic Ocean, Europe and Middle East, and Indian Ocean regions. In addition, a total of 67 independent subnetwork links and 6 Antarctic communication links are operated by 10 States Signatories to carry IMS data to a GCI connection point. In all, the combined networks have close to 330 different communication links to transport data to and from the IDC.

Expanding Global Communications

Internet backup was added to five VSAT sites to improve the reliability of communications. Two IMS station sites were converted from AC to DC power to remove their dependence on unstable commercial power sources. The overall long term impacts of these measures are expansion of the network capacity to carry data as well as further improvement of the data availability parameters.

GCI Operations

The overall rolling 12 month adjusted availability, which measures the compliance of the GCI contractor against the operational target of 99.5% availability in one year, was above 99.77% in each month of the year until September. The rolling 12 month actual availability, which is a measure of the raw uptime of each GCI link over one year, was about 1.1% lower than the adjusted availability. These performance statistics are similar to those for the calendar year 2012. Over the year, the GCI transported on aggregate 28 gigabytes per day from IMS facilities to
NDCs. In addition, about 8.7 gigabytes per day were sent to NDCs that are directly connected to the IDC.

The GCI contractor obtained its ISO 9000 certification in 2013.

Further improvements in incident management involving the GCI contractor and enhancements in network monitoring were made in 2013. Training continued for existing and new network operations centre operators, and the complement and geographical distribution of field service engineers were expanded. Moreover, the staffing of the network operations centre and expert help desk of the contractor was increased.

During 2013 the process of replacing deteriorating antenna elements continued. A survey was undertaken to determine the condition of radomes at sites with such facilities. This activity was initiated as a response to the loss of radome protection at the group of stations at Tristan da Cunha (United Kingdom) in June 2013. A process was put in place to examine and, where necessary, replace radome elements that had been weakened as a result of material deterioration.

GCI II is a primary telecommunications service to be used by the On-Site Inspection Division during the upcoming Integrated Field Exercise in Jordan in 2014. The light antenna terminal (so-called GATR terminal) purchased in 2012 was successfully deployed and its services verified throughout all build-up exercises, including during field deployment in Jordan during the experts group meeting on communications in November 2013.

In 2013 independent subnetwork contracts were signed with the Special Monitoring Service of the Ministry of Defence of the Russian Federation and with the Geophysical Survey of the Russian Academy of Sciences.

GCI availability in 2013. The actual availability indicates the raw uptime of GCI links, whereas the adjusted availability is the uptime computed after excluding outage times outside the responsibility of the GCI contractor (e.g. local power outages and downtime due to station maintenance or construction work).