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The Data Transport Network approach applied to remote data retrieval over satellite networks

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The Data Transport Network coordinates the collection of scientific data, instrument telemetry, and post-processing for the delivery of real-time results over the Internet from instruments located at remote field sites with limited or unreliable network connections. The system was originally developed in 1999 for the distribution of large data sets collected by the radar, lidars, and imagers at NSF's upper atmosphere research facility in Sondrestrom, Greenland. The system helped to mitigate disruptions in network connectivity while optimizing transfers over the site's low-bandwidth satellite link. A new implementation for the NSF Advanced Modular Incoherent Scatter Radar (AMISR) allows for the collection of status information from over 12,000 antenna elements and 400 control computers located at multiple locations around the globe.

The core idea behind the system is the transport of data files as attachments in Usenet messages. The messages collected by a local news server are periodically transmitted to other servers on the Internet, when link conditions permit. If the network goes down, data files continue to be stored locally and the server will periodically attempt to deliver the files for upwards of two weeks. Using this simple approach, the Data Transport Network is able to handle a large number of independent data streams from multiple instruments and computers. Each data stream is posted into a separate news group. There are no limitations to the types of data files that can be sent and the system uses standard Internet protocols for encoding, accessing and transmitting files. A common framework allows for new data collection or processing programs to be easily integrated. The two-way nature of the communications also allows for data to be delivered to the site as well, a feature used for the remote control of instruments.

Recently, the Data Transport Network has been applied to small, low-power embedded

systems. When coupled with satellite-based communications systems, these miniature Data Transport servers have found application in a number of remote instrument deployments in the Arctic. High volume magnetometer data from the MACCS array in Canada have been transported using a multi-station polled Iridium network. A StarBand satellite link at an autonomous instrument platform in Ivotuk, Alaska, provides an Internet gateway for the transport of high speed carbon flux data and for a network of hydrological stations communicating on a terrestrial packet radio network. The Data Transport Network server manages data transfers from environmental monitors, Webcams, and the site's power system. The operational performance achieved at these and other sites will be presented. Link performance and operational data from Data Transport Network-enabled sites, along with access to open-source software, is available at http://transport.sri.com.