

ACTS Gigabit Satellite Network

The ACTS Gigabit Satellite Network was a pioneering, highspeed communications satellite network in the years 1993-2004, created as a prototype system to explore high-speed networking of digital endpoints.^{[1][2]} The system was jointly sponsored by <u>NASA</u> and <u>ARPA</u>, implemented by <u>BBN Technologies</u> and <u>Motorola</u>, and was inducted into the <u>Space Technology Hall of Fame</u> in April 1997.

The Advanced Communications Technology Satellite (ACTS) network was designed to provide fiber-compatible <u>SONET</u> service to remote nodes and networks through a wideband satellite system, and provided long-haul, point-to-point and point-tomultipoint full-duplex SONET services, at rates up to 622 Mbit/s, over NASA's Advanced Communication Technology Satellite (ACTS).^[3]



Diagram of the ACTS Gigabit Satellite Network within a larger context

The Advanced Communications Technology Satellite itself, built and operated by Lockheed Martin, was launched on <u>STS-51</u> on September 12, 1993, by the <u>Space Shuttle Discovery</u>, and occupied a geostationary orbit at 100° west longitude.^[4] It was the first <u>communication satellite</u> to operate in the 20–30 GHz frequency band (\underline{K}_a band), with 30 GHz uplink and 20 GHz downlink signals.^[5] The satellite incorporated advanced on-board switching and multiple dynamically-hopping <u>spot-beam</u> antennas for selected areas of the United States including Hawaii. Up to 3 uplink and 3 downlink antenna beams could be active simultaneously.^[6]

The ACTS network ground terminals were transportable Gigabit Earth Stations (GES) with fiber-optic SONET interfaces (OC-3 and OC-12), which also supported the <u>Asynchronous Transfer Mode</u> (ATM) protocol suite.^[7] The network control and management functions are distributed in the various Gigabit Earth Stations, with the operator's interface being centralized in a Network Management Terminal (NMT), which could be collocated at a GES, or anywhere in the Internet.^[8]

The system was operational and used for experiments for 127 months, instead of the originally planned 24–48 months. In all, 53 terminals were built and used by more than 100 experimenters to test ACTS abilities.^[9] In Nov. 1997 a record data rate of 520 Mbit/s <u>TCP/IP</u> throughput was achieved using ATM between several ground stations via ACTS. On May 31, 2000 the ACTS experiments program officially came to a close, but the system continued to support experiments until it was deactivated on April 28, 2004.^{[10][11]}

References

^{1.} Bergamo, M. A., "ACTS Gigabit Satellite Network Study - Satellite Beam Switched TDMA Networking and Support of SONET Interfaces," BBN Report No. 7574, March 29, 1991

- <u>ACTS Technology Description and Results</u> (https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.go v/20000021417.pdf), Richard T. Gedner, Ronald Shertler, and Frank Gargione, NASA Report CR-2000-209806, February 2000.
- 3. Douglas Hoder and Marcos Bergamo, "Gigabit Satellite Network for NASA's Advanced Communication Technology Satellite (ACTS)", *International Journal of Satellite Communications and Networking*, May 1996.
- 4. NASA Glenn Research Center: The Advanced Communications Technology Satellite (ACTS) (http s://www.nasa.gov/centers/glenn/about/fs13grc.html)
- 5. R.J. Acosta, R. Bauer, R.J. Krawczyk, R.C. Reinhart, M.J. Zernic and F. Gargione, "Advanced Communications Technology Satellite (ACTS): four-year system performance", *IEEE Journal on Selected Areas in Communications*, 17, 2, (193), (1999).
- 6. The ACTS Satellite (http://www.astro.caltech.edu/~pls/papers/acts-report/node4.html)
- 7. Marcos Bergamo and Doug Hoder, "Gigabit Satellite Network Using NASA's Advanced Communications Technology Satellite (ACTS): Features, Capabilities, and Operations", *International Journal of Satellite Communications*, Vol 14, No 3
- Doug Hoder and B. Kearney, "Design and Performance of the Acts Gigabit Satellite Network High Data-Rate Ground Station", *AIAA 16th International Communications Satellite Systems Conference*, 25 February 1996 - 29 February 1996.
- 9. NASA Glenn Research Center, *ibid*.
- 10. ACTS (Advanced Communications Technology Satellite) (https://directory.eoportal.org/web/eoport al/satellite-missions/a/acts)
- Dwayne A. Day, "Footnotes of shuttle history: the Advanced Communications Technology Satellite", *The Space Review*, January 17, 2011. [1] (http://www.thespacereview.com/article/1757/ 1)

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Operational from ACTS satellite deployment in September 1993.