The background features a faint, light blue graphic of a satellite in orbit, with lines representing a network or data paths. The satellite is positioned in the upper left, and the network lines extend across the slide.

Testing TCP/IP Performance Optimizations Using NASA's Advanced Communications Technology Satellite and the ACTS Gigabit Satellite Network (GSN)

David R. Beering

Principal

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on contract to

Sterling Software

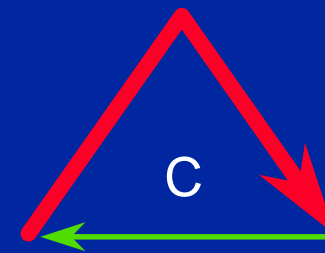
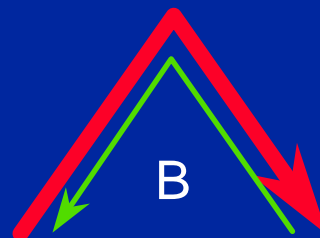
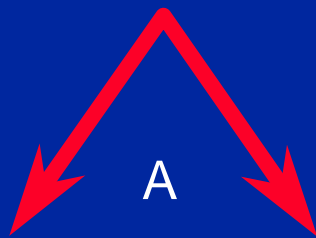
NASA Lewis Research Center

Experiment Rationale

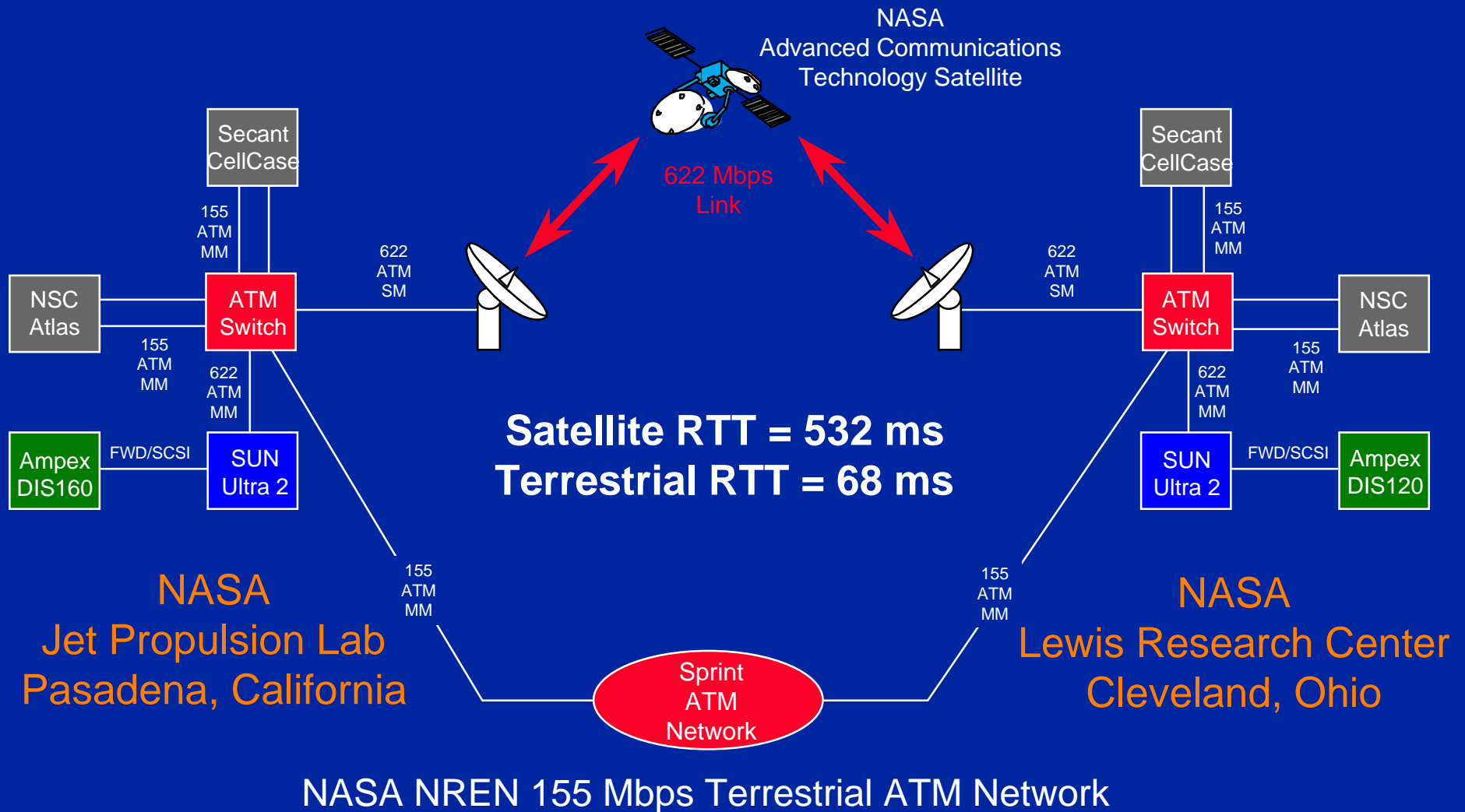
- Many organizations within the technical and scientific communities perform data transfer from remote locations to central computing and data repository locations as a core function. Satellites play a key role in enabling these applications.
 - NASA (Earth Observation)
 - Oil industry (Seismic data acquisition)
 - Medicine (Radiology, cardiology, EMS)
- TCP/IP is recognized as the unifying data communications technology, installed on more than 100 million desktops worldwide. Lowest unit cost.

Test Environment

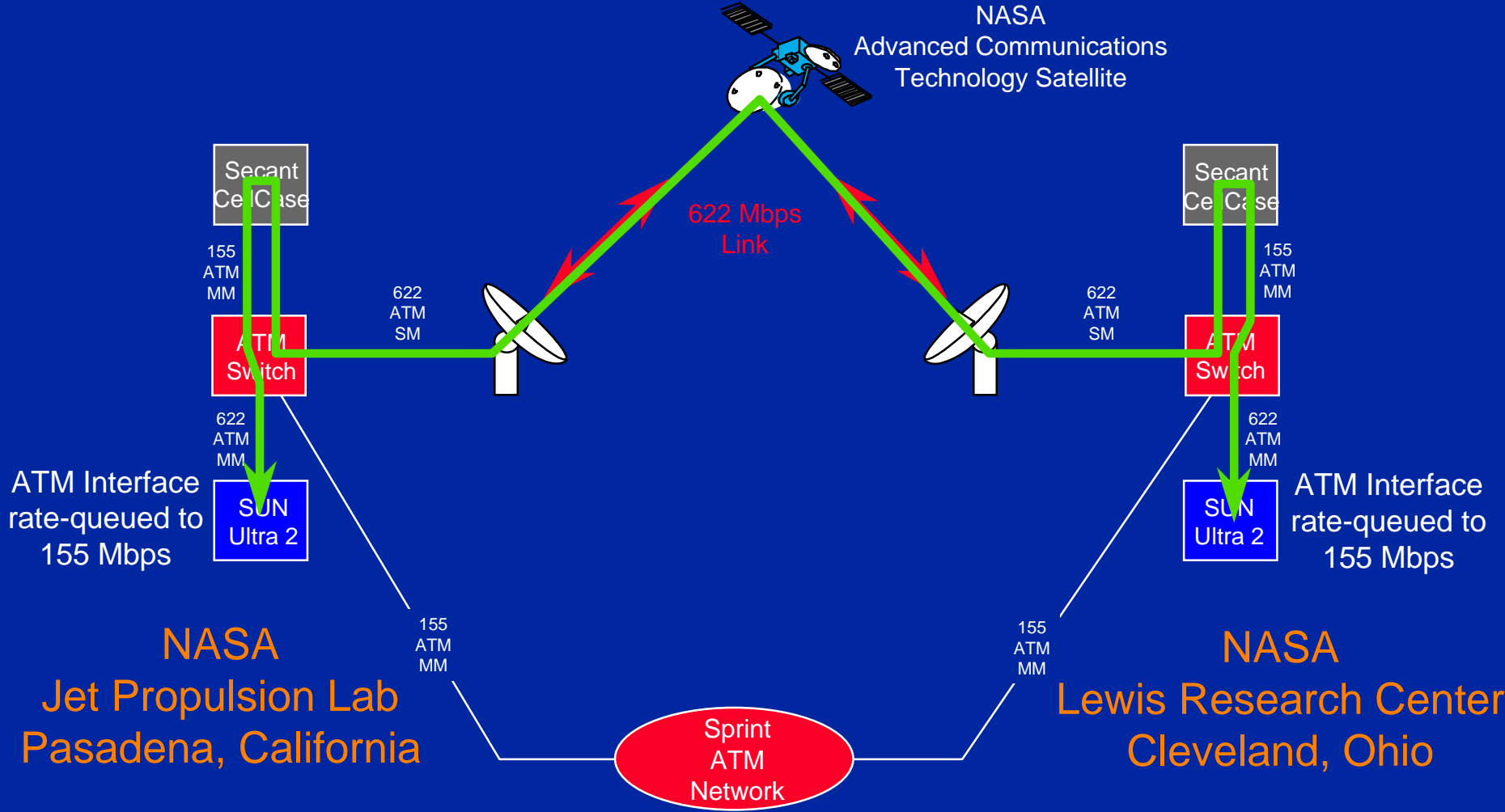
- Experiment operated from August to November, 1997
- Satellite link operated at 622 Mbps (OC-12c / STM-4) the fastest communications satellite link ever established
- Experiment included three reference configurations:
 - A 622 Mbps Communications Satellite (symmetric links)
 - B Relay Satellite 622 Mbps / 1.5 Mbps (asymmetric links)
 - C Broadcast Satellite 155 Mbps / 622 Mbps (asymmetric hybrid satellite / terrestrial network using NASA's NREN)



End-to-end Experiment Layout

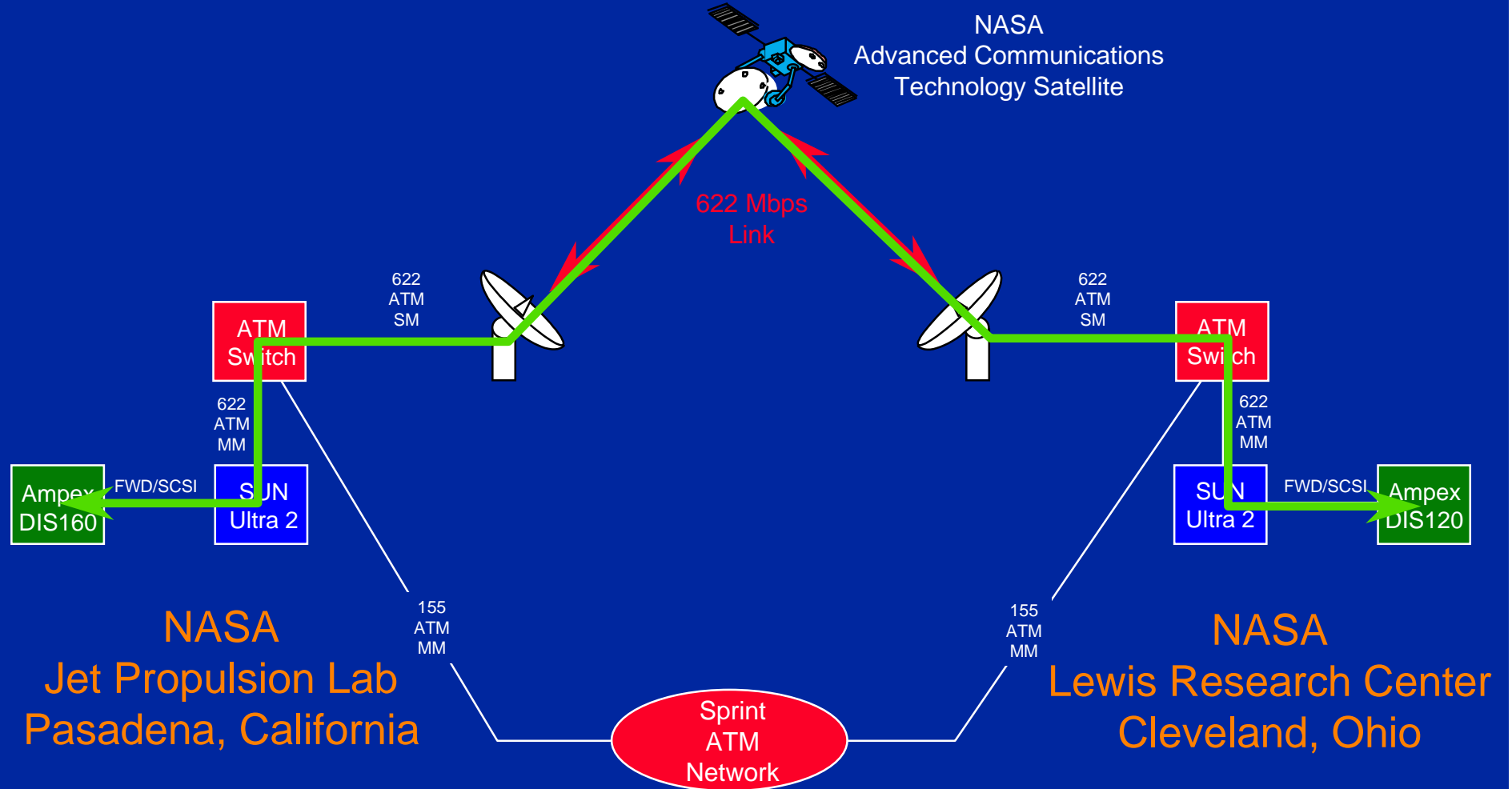


Encryption Test



NASA NREN 155 Mbps Terrestrial ATM Network

High-Speed Magnetic Tape Test



NASA NREN 155 Mbps Terrestrial ATM Network

Results

- Best sustained memory-to-memory TCP/IP single-stream transfer 520 Mbps between Ultra 2s
- Best sustained single-stream tape-to-tape transfer 14 Mbytes per second (112 Mbps)
- TCP/IP / ATM Firewall operated transparently
- Dual-key, Triple DES encryptor operated transparently
- Automatic key exchange required some tweaking and occasional manual setup