Advanced Communications Technology Satellite

NASA Lewis Research Center
Cleveland, Ohio

ACTS
Experiment 118x

Where WDM, SONET, ATM, TCP/IP, and satellite technology come together

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What is 118x?

- 118x is the latest in a series of “118” experiments, designed to study the optimization of TCP/IP and ATM protocols over geostationary distances across multiple operating environments using NASA’s Advanced Communications Technology Satellite (ACTS)
- Experiment 118j ran from August to November, 1997 using and focused on Sun’s Solaris 2.6 TCP/IP implementation
- Experiment 118x operates during May-September, 1998
- The satellite link operates at 622 Mbps (OC-12c) between Livermore, CA and Cleveland, OH

118x Experiment Goal

- To develop a recognized, interoperable, high-performance TCP/IP implementation across multiple computing / operating platforms working in partnership with the computer industry
- To work with the satellite industry to answer outstanding questions regarding the use of standards (TCP/IP and ATM) for the delivery of advanced data services, and for use in spacecraft architectures

118x Experiment Participants

Government Laboratories

- NASA Lewis Research Center
- NASA Johnson Space Center (SOMO)
- NASA Jet Propulsion Laboratory
- Lawrence Livermore National Laboratory
  National Transparent Optical Networking Consortium Lead
- Naval Research Laboratory

118x Experiment Participants

Communications Industry

- Ampex Data Systems (DIS-160 Tape Systems)
- Cisco Systems (LS-1010 ATM Switches)
- FORE Systems (ASX-1000 ATM Switches)
- Sprint (Laboratory space, terrestrial network)

118x Experiment Participants

Computer Industry

- Sun Microsystems (Solaris 2.7, Ultra workstations)
- Microsoft (NT 4.0, NT 5.0)
- Digital Equipment (DEC Unix 4.3, DEC Alphas)
- Pittsburgh Supercomputing Center (Integration)
- Intel (Pentium II Development Systems)
- FTP Software (Win95 and Win98 support)

118x Experiment Participants

Satellite Industry

- Hughes Space & Communications
- Lockheed Martin Corporation
- Space Systems / LORAL
- Spectrum Astro

Introducing NASA's Advanced Communications Technology Satellite

The world's best satellite system simulator!

Communications Satellite Model

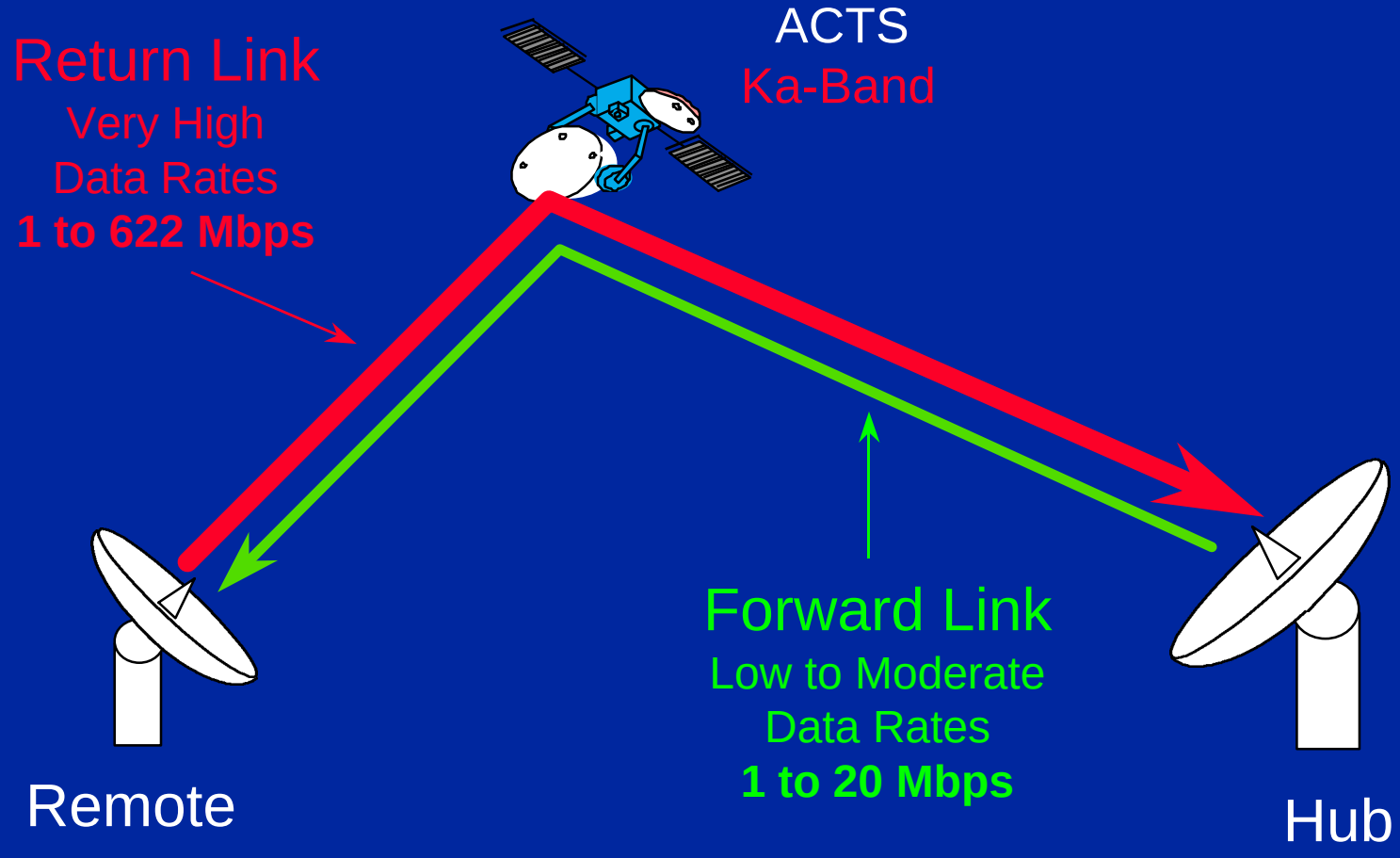
ACTS
Ka-Band

Balanced Link
High
Data Rates
155/622 Mbps
Any aggregate rate

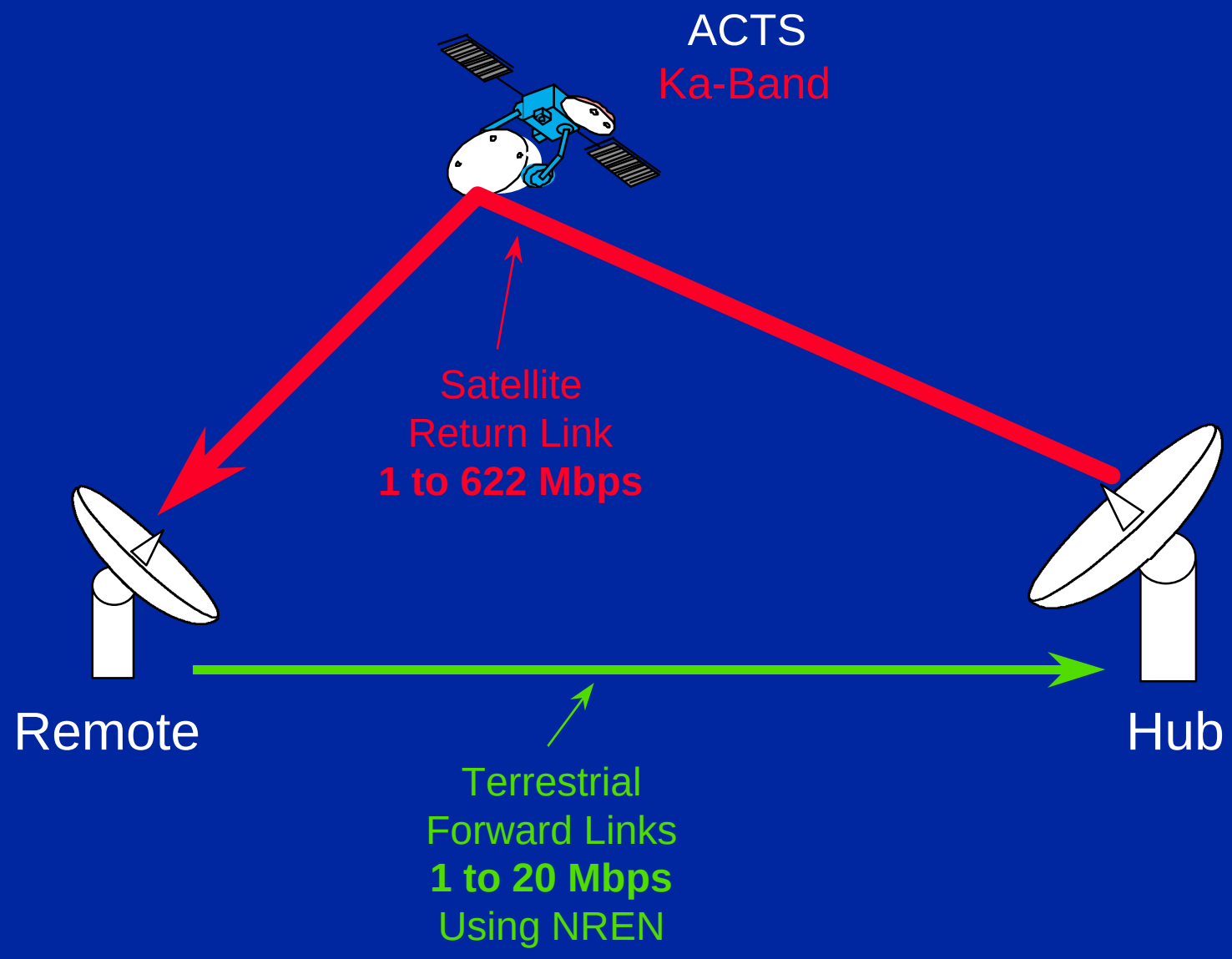
Remote

Hub or
Remote
(Hubless)

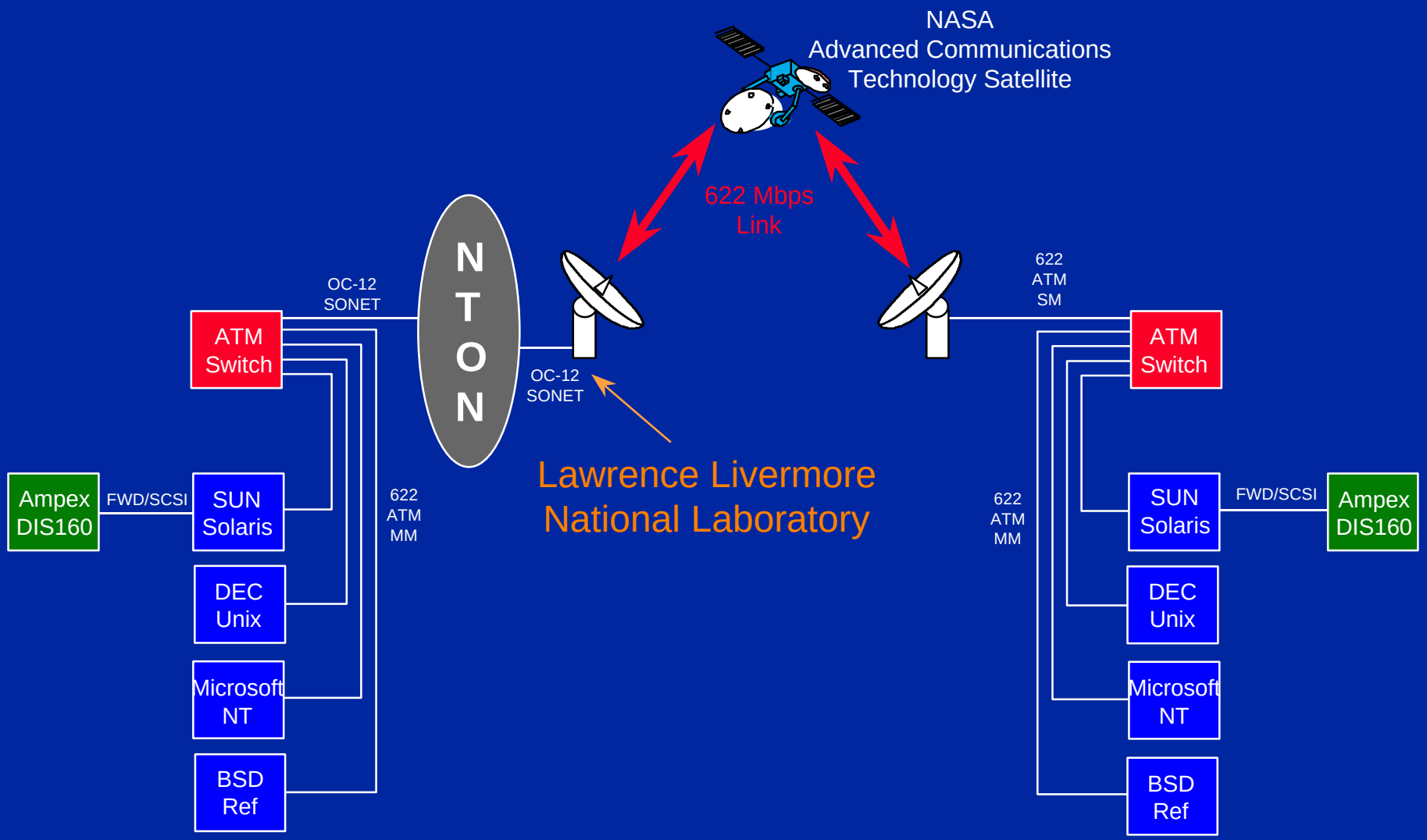
Relay Satellite Model



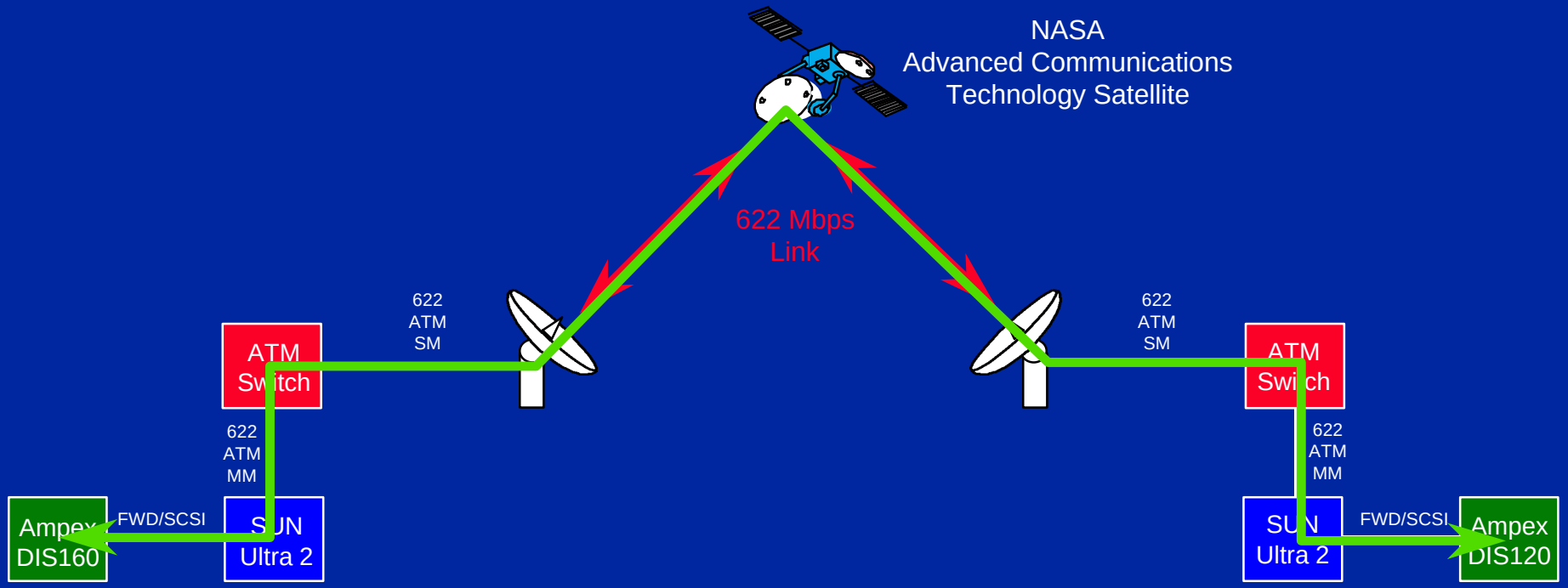
Digital Broadcast Satellite (DBS) Model



118x End-to-end Network Layout



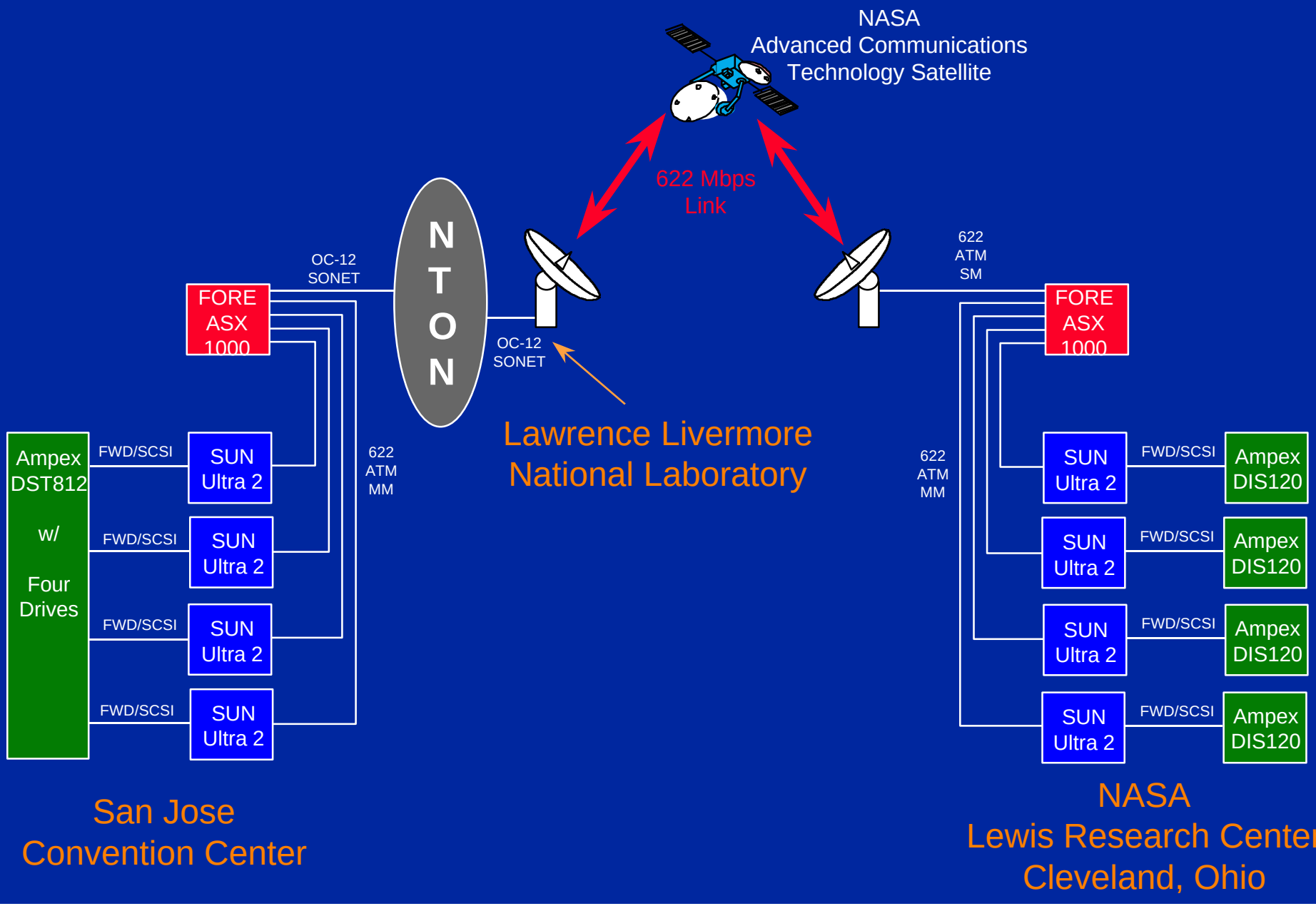
High-Speed Magnetic Tape Test



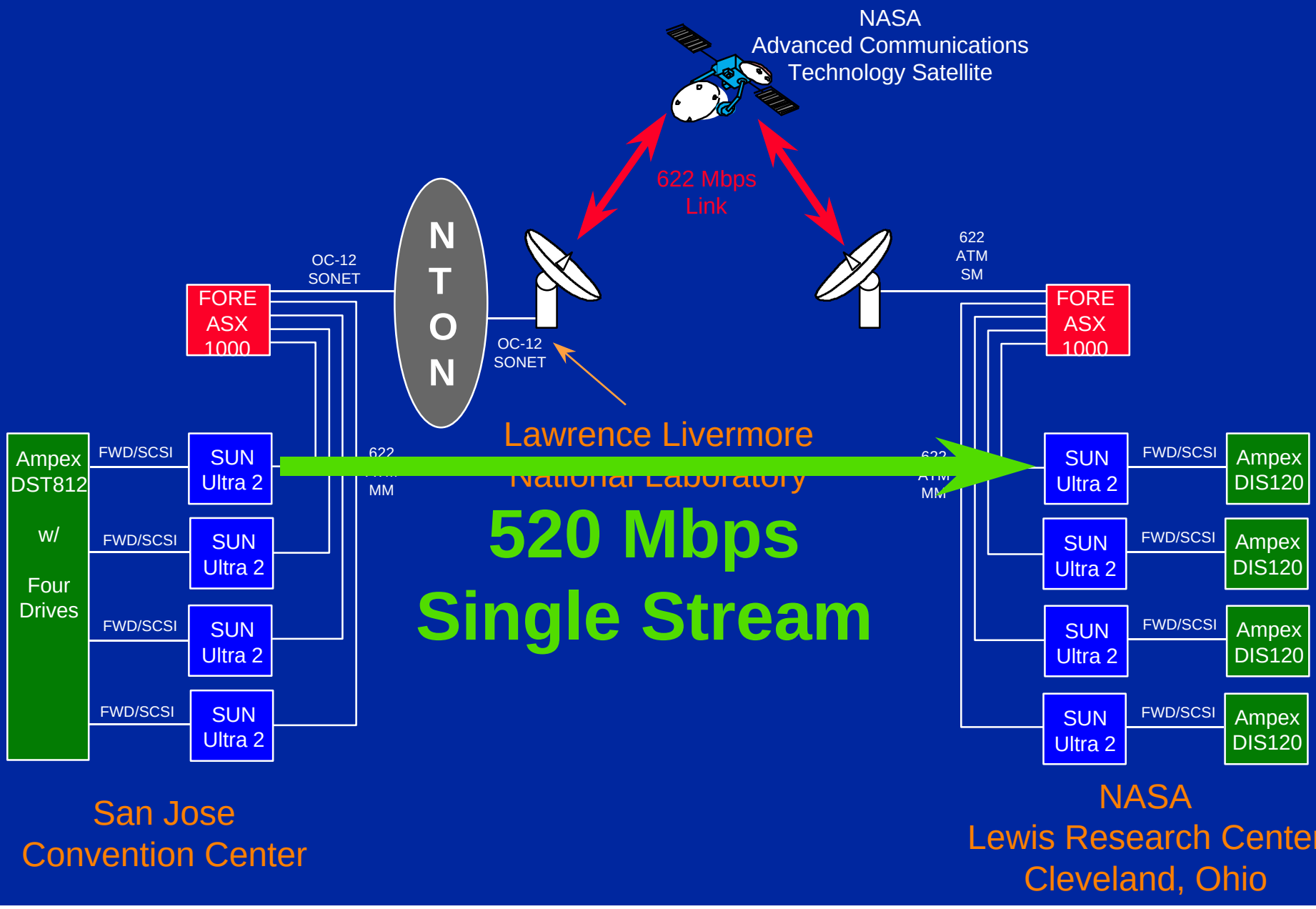
Sprint
Advanced Technology Lab
Burlingame, CA

NASA
Lewis Research Center
Cleveland, Ohio

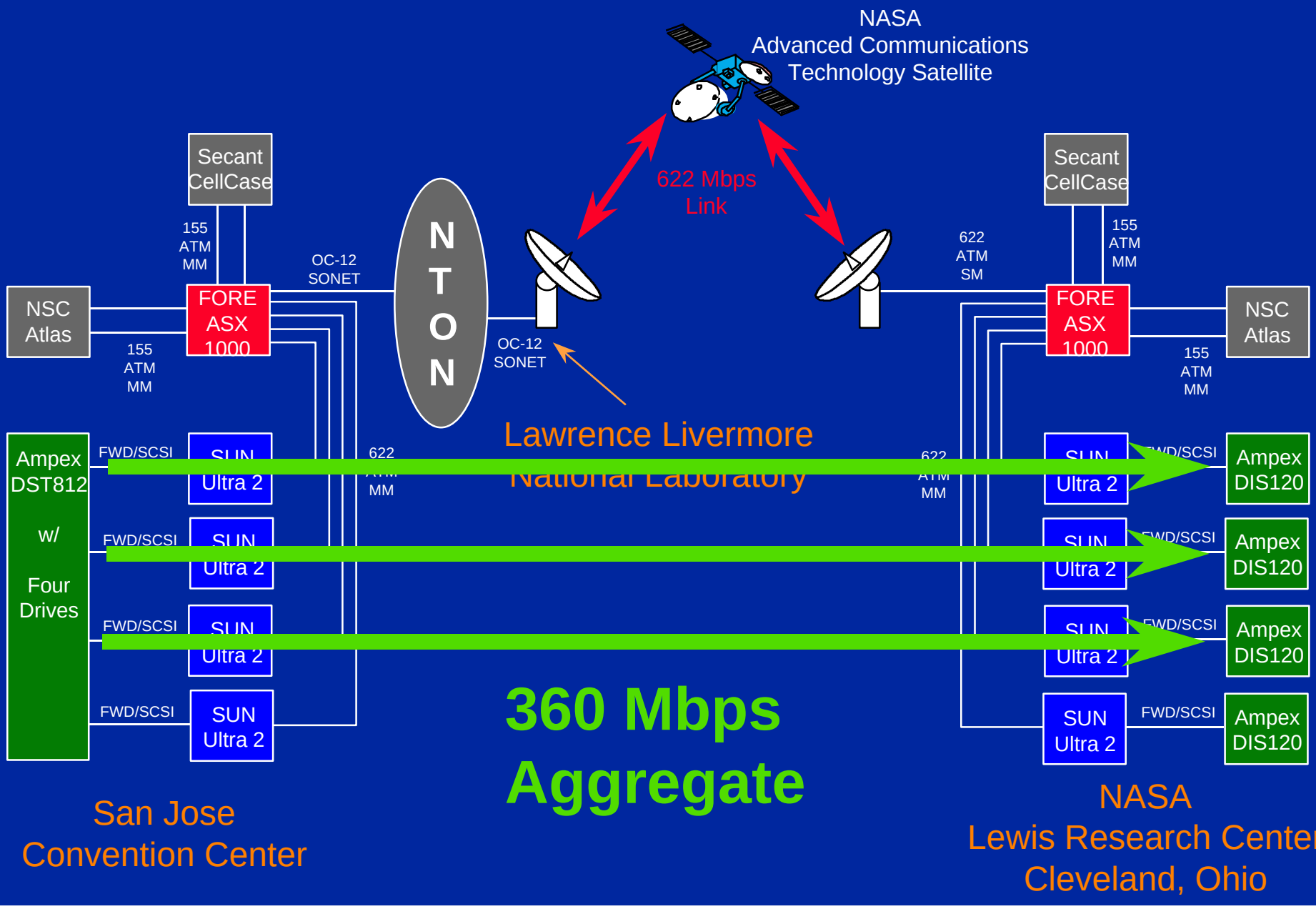
End-to-end Demonstration Layout at SC97



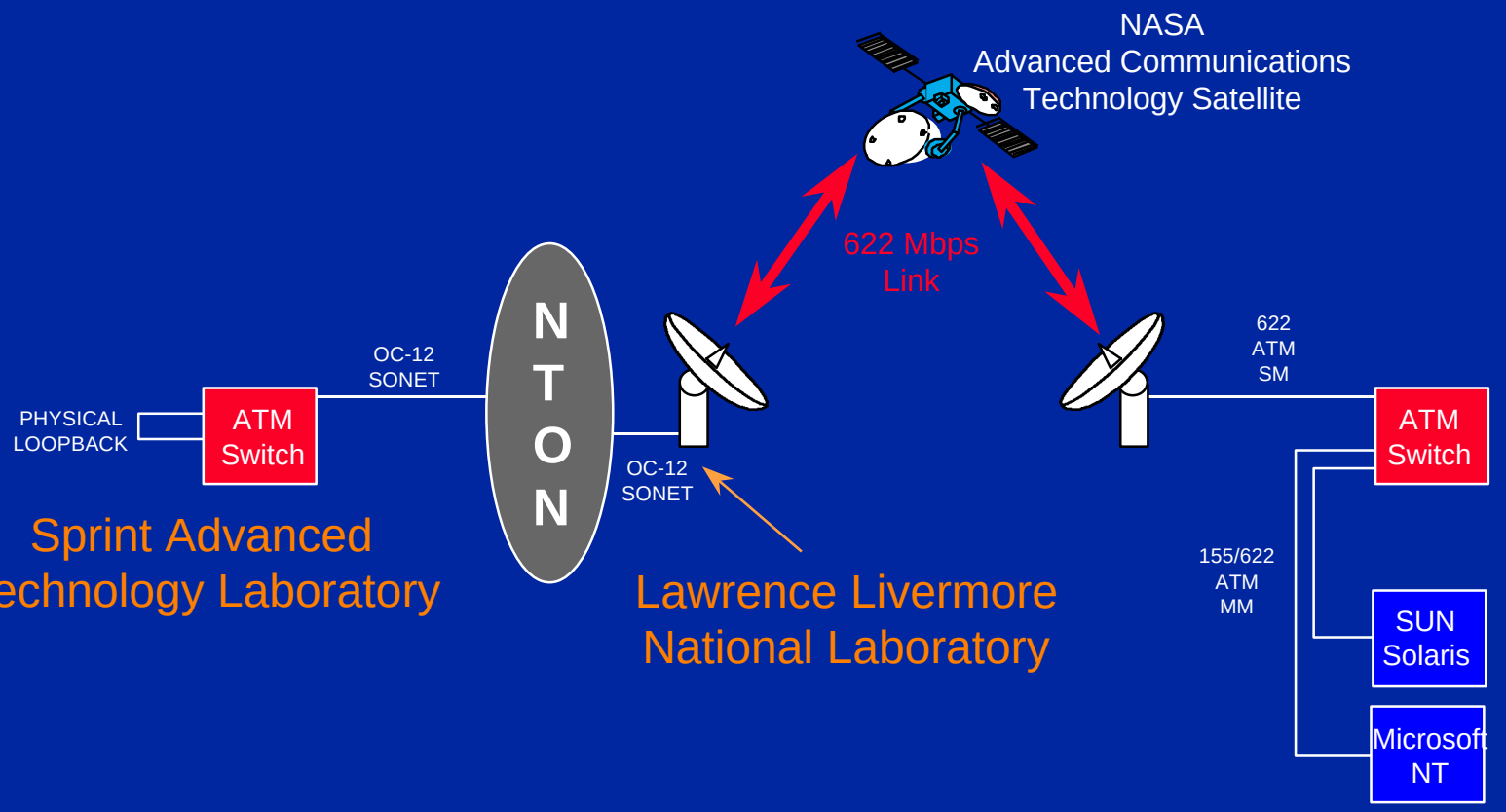
End-to-end Demonstration Layout at SC97



End-to-end Demonstration Layout at SC97

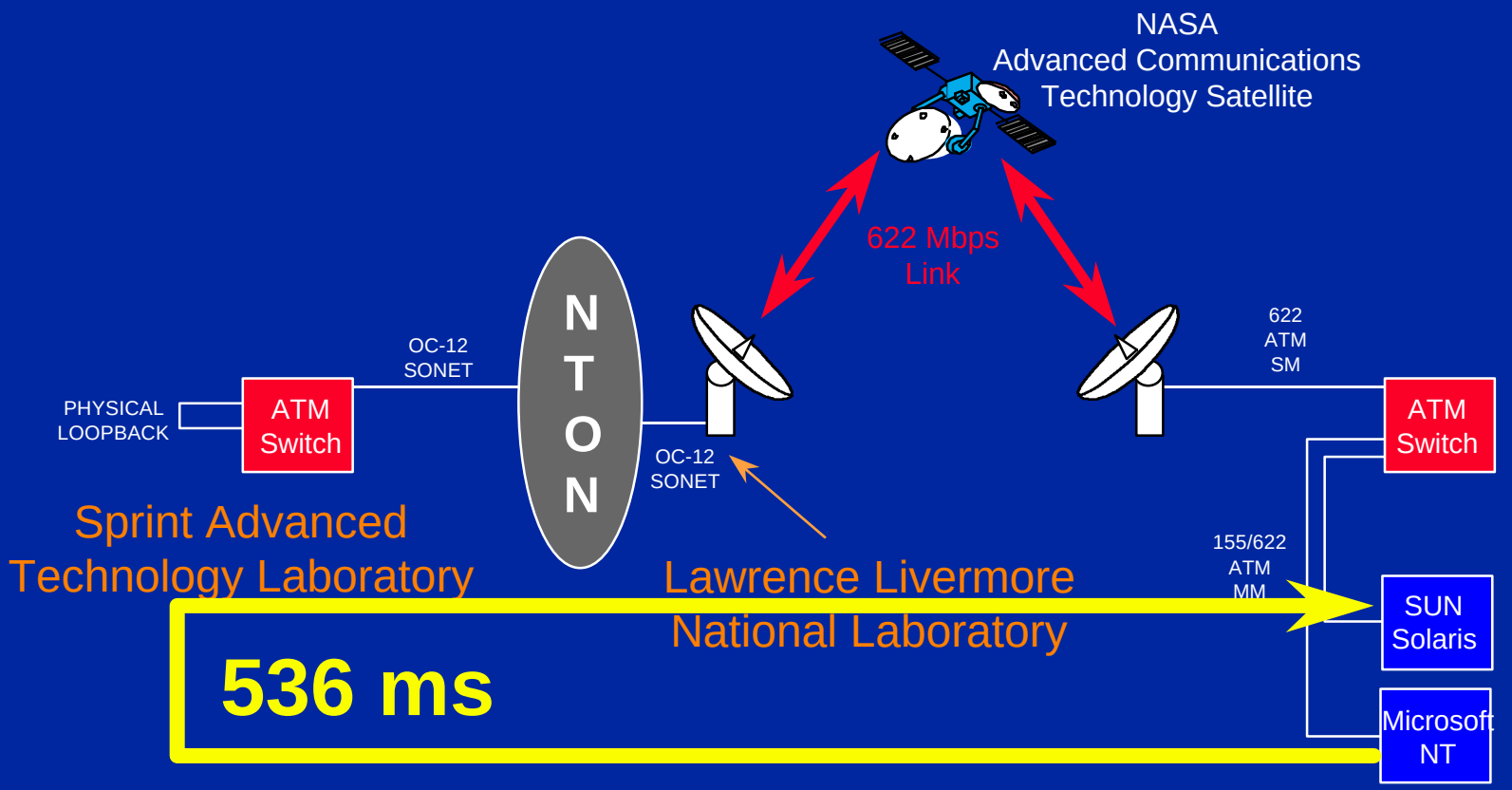


118x Double-Hop End-to-end Network Layout



Two devices at NASA LeRC communicate with each other through a physical loopback at the far end. This has the effect of doubling the roundtrip delay between them

118x Double-Hop End-to-end Network Layout



Two devices at NASA LeRC communicate with each other through the physical loopback at Sprint. This has the effect of doubling the roundtrip delay between them

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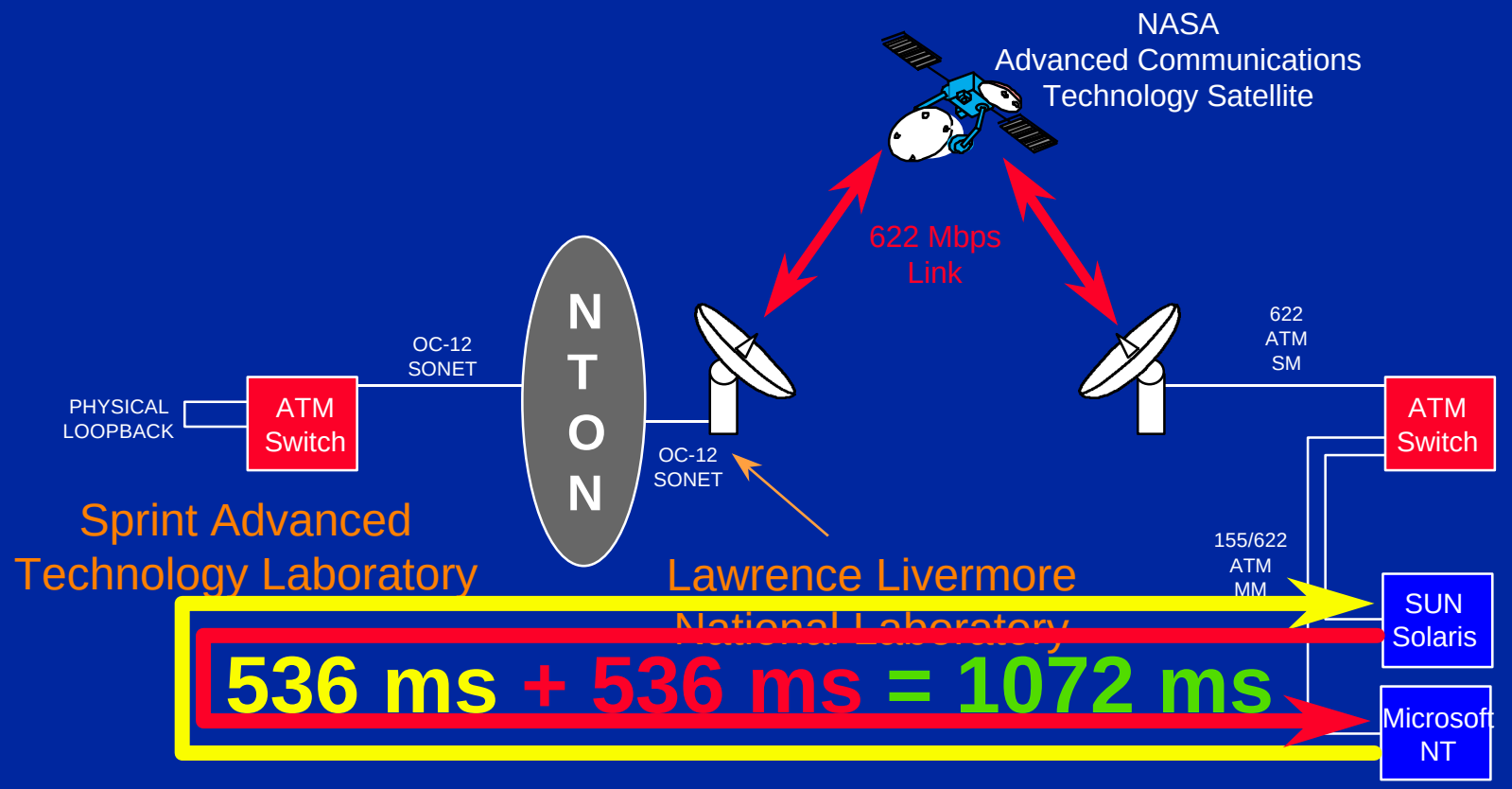
Cleveland, Ohio

118x Double-Hop End-to-end Network Layout



Sprint Advanced
Technology Laboratory

Lawrence Livermore
National Laboratory

NASA
Lewis Research Center
Cleveland, Ohio

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118x Plans

- Complete first phase workplan by end of September, 1998
- Demonstrate - demonstrate - demonstrate
- Leverage relationships and technology base to further the state-of-the-art in high-speed satellite applications using standard protocols
- Apply the technology to NASA’s unique data handling problems using TDRSS
- Leverage the architecture for space commercialization

Industry Challenges

- Incorporate error-recovery techniques (like those found in SCPS) into TCP/IP
- Demonstrate these capabilities to broader audiences
- Implement the technology to lower the cost of building and delivering advanced applications