ATM WAN Experiences with Command and Control & High-Performance Computing Applications at NCCOSC RDT&E Div

DARPA Workshop on Wide-Area ATM Performance
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AAI Applications at NCCOSC

- Command and Control
- High Performance Computing
- Distributed Simulation

Command and Control Applications

- **Satellite Imagery Transfers from EDC**
  - JWID 94
  - JWID 95
- **Videoconferencing**
  - PictureWindow/NCSA Collage (JWID 94)
  - Communique/MMslide (GETS demo)
  - Communique between NCCOSC/ARPA (3/95)
  - Mbone Tunnels between NCCOSC and ARL
  - AT&T EMMI
    - Initial test (3/95)
    - NCCOSC to DARPA VTC's and demos (1/96 -)

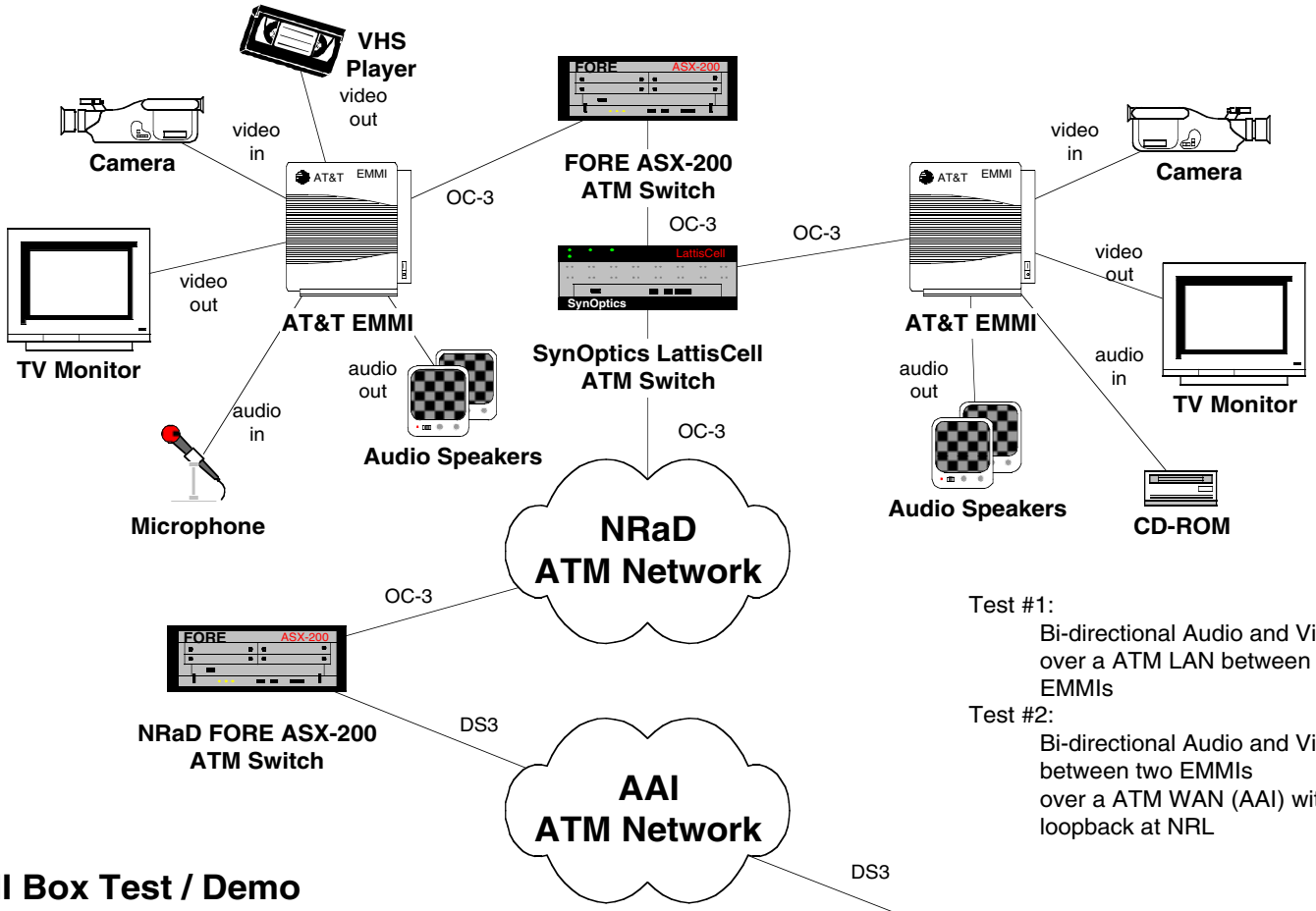
Satellite Imagery Transfers from EROS Data Center

- **JWID 94**
  - PVC's between NCCOSC, NRL, EDC
  - NCCOSC host : Sparc 10 running SunOS
  - Maximum data rate (ftp) ~ 1.8 Mbps NCCOSC - EDC
    - vs. local ftp transfers of 22-25 Mbps
    - FTP via open Internet still took much longer, however still much room for improvement.
  - TCP window size limited transfer speed.
- **JWID 95**
  - Limited to running image viewer remotely using X protocol

Videoconferencing

- **Video over TCP/IP**
  - BBN PictureWindow (< 1 Mbps)
    - NRaD to NRL for JWID 94
  - Insoft Communique (~ 1Mbps)
    - GETS demo (Oct 94)
    - NRaD to ARPA trials
  - Throughput limited by workstations, not network
- **Multicast IP**
  - Limited to “tunnels due to lack of multicast support in RFC 1577
- **Native ATM (AT&T EMMI)**
  - Throughput is network-limited, can overdrive DS-3

AT&T EMMI TEST (3/95)



Test #1:
Bi-directional Audio and Video over a ATM LAN between two EMMIs

Test #2:
Bi-directional Audio and Video between two EMMIs over a ATM WAN (AAI) with a loopback at NRL

EMMI Box Test / Demo

NRaD Code 41 Advanced Network Technology Group

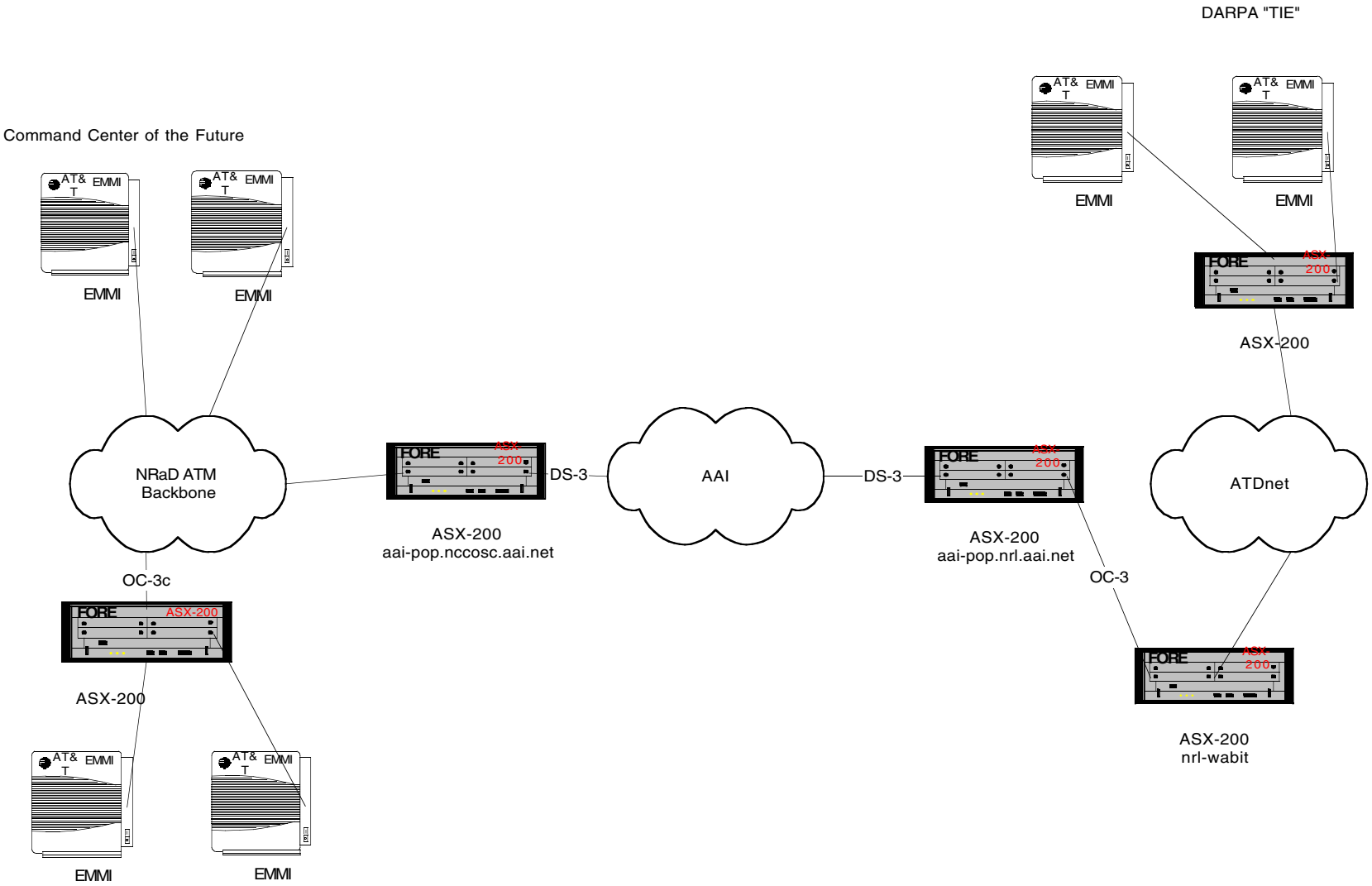
AT&T

Thursday, 2 March 95

Ken Boyd (NRaD 4121)
Mark Ganzer (NRaD 4123)
Marc Beacken (AT&T)

DS3 = 45 Mbps
OC-3 = 155 Mbps

NRaD - DARPA EMMI Configuration



EMMI Performance

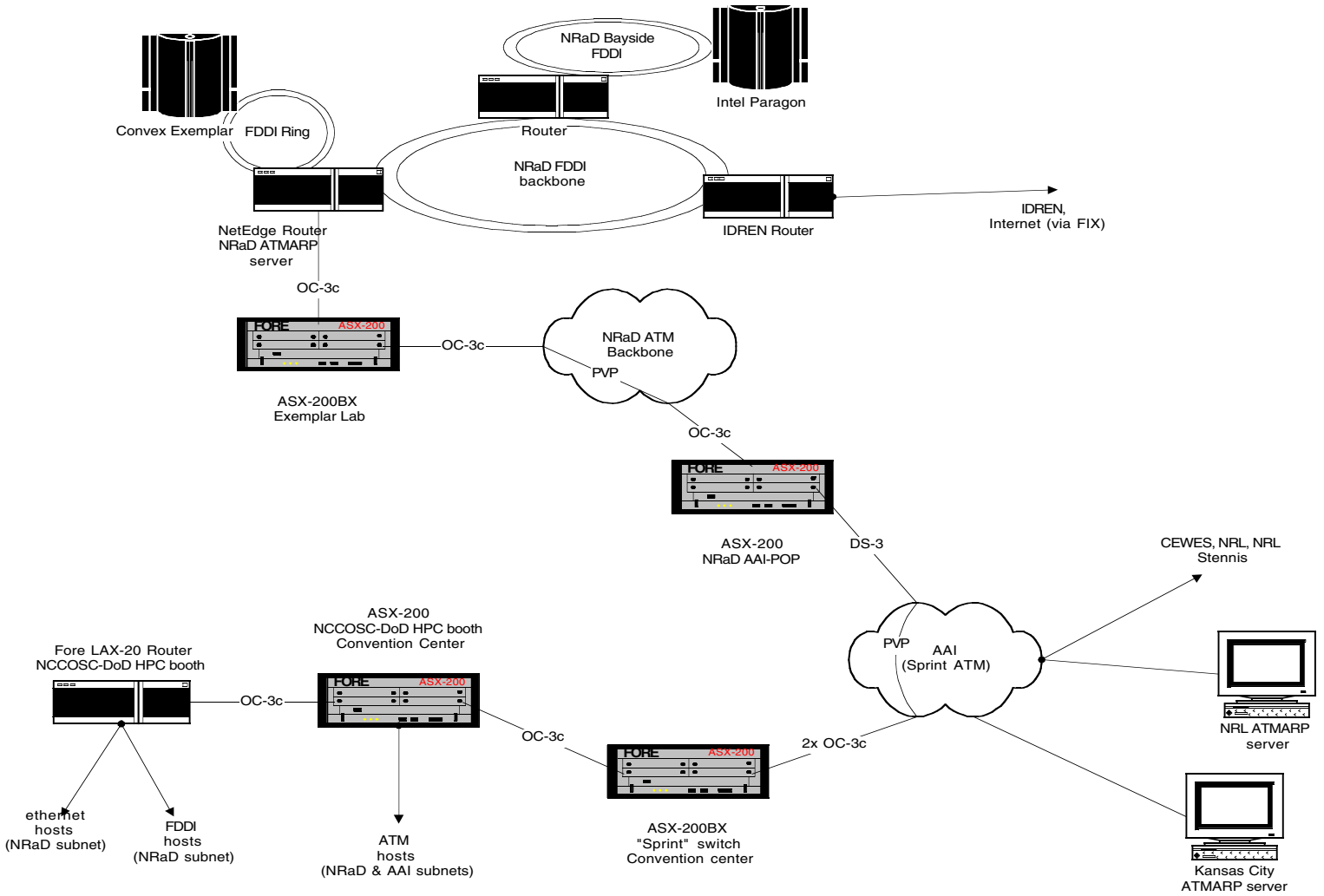
- **Video is over AAL 5. Bandwidth determined by JPEG compression factor and complexity of original image**
  - ~ 12 Mbps for 75% compression
- **Audio is over AAL 1 (44 khz 16 bit sampling).**
  - Constant 1.85 Mbps
- **Observations:**
  - Keeping PVC's up between sessions has been problem
  - Can easily over-run DS-3 circuit
  - Still only point-to-point conferencing

High-Performance Computing

- **NRaD HPC machines**
  - Unclassified - Convex Exemplar
    - Not yet reachable via AAI due to lack of necessary hardware
  - Classified node - Intel Paragon
- **Supercomputing '95**
  - Extended virtual LAN from NRaD to provide access to Exemplar, Paragon (running unclassified), and general internet access via IDREN
  - AAI access for DoD HPC booth demos to NRL, CEWES, ARL
  - Attempted to monitor network traffic using ForeView

Supercomputing ‘95

NCCOSC - DoD HPC Exhibit Connectivity



Supercomputing ‘95 - Observations

- Most time spent dealing with network connectivity issues, so WAN optimization of TCP/IP on workstations did not happen.

- ForeView was useful for observing network traffic in real-time, however it has no decent way to capture this data for later analysis.

Performance Issues to Date

- **TCP/IP on Workstations not Optimized for "Long Fat Networks"**
  - SunOS lack "large" TCP windows
  - Solaris 2.4 LFN patch, SGI config not documented
  - No LFN patch yet for Solaris 2.5
  - HP workstation capability?
  - Too much effort/skill required for this optimization
  - WAN performance optimizations could have adverse affect on LAN performance (?)
- **Native ATM videoconferencing using AT&T EMMI has been extremely useful. However:**
  - Wants to have QOS capability for audio PVC
  - PVC management across WAN is an issue. Still not as simple as "dialing the telephone"
  - Future: SVC's with QOS