AAI Program Review

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February 9, 1995

Objectives

- Characterize the performance of AAI.
- Evaluate the efficacy of congestion management techniques for large (distance & speed) ATM networks.

Approach

- Develop and implement test and measurement techniques for AAI.
- Instrument AAI applications.
- Characterize the performance of the AAI.
- Deploy and evaluate flow control and congestion management techniques on the AAI.

Approach

- Develop simulation models of the AAI to refine our understanding of the network operation through a comparison of simulation and measurement based performance estimates.

Status

Measurements

- Developed and applied measurement tools
  - Probe points in both the sender and receiver
    - Application
    - TCP
    - AAL5
    - ATM Cell

Status

Measurements

- QoS Metrics
  - Throughput
    - Instantaneous
    - Average
  - Inter-event times
  - Delay variations
  - PDU Lengths
  - PDU Error Events

Status

Measurements

- Tools
  - ATMtimes
    - Collects AAL5 interevent times
  - ATMstat
    - Collects number of ATM cells/time unit
    - Collects number of AAL5 PDU's/time unit
  - TTCPtimes
    - Collects tcp throughput and interevent times

NetSpec

Measurements

- Specifications
  - Physical process lay-out.
    - Remote control of the actual measurement processes.
    - One controlling process should control multiple measurement processes.
    - The controlling process should be driven by a command language.
    - One report process should collect all information from the measurement processes.

NetSpec

Measurements

NetSpec

Measurements

- Scheduling of Experiments
  - Start/stop time
  - Number of bytes collected
  - Multiple runs
- Traffic generation
  - Burst
  - CBR

NetSpec

Measurements

- Measurements
  - Transmit and receive rates.
  - Delays, one way and round trip.
  - Number of hops.
  - Interarrival times of IP packets.
  - CPU load in percentage.
  - CPU time spend in system calls.
  - CPU time spend in user code.
  - Time spend per i/o calls.
  - Total time spend doing i/o calls.
  - Number of i/o calls per second.
  - Total amount of bytes transferred.

Status

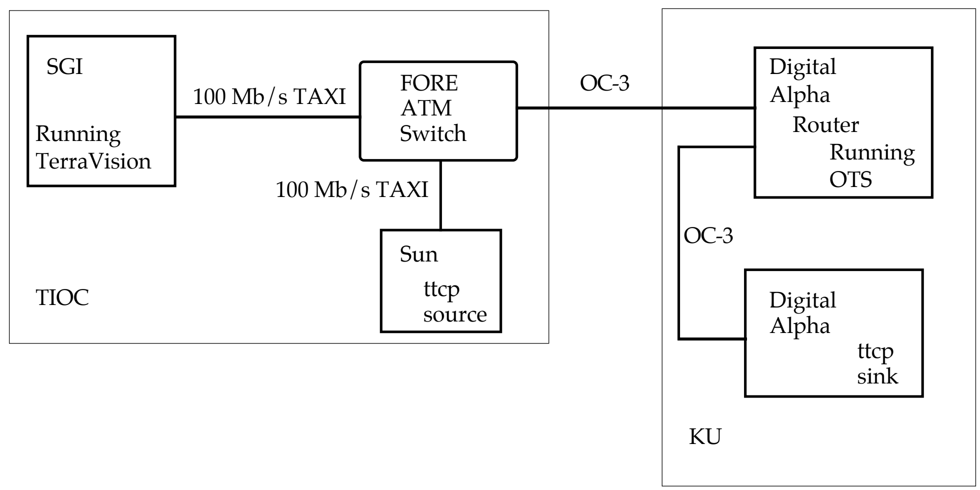
Measurements

- Instrumented applications code
  - Over-the-Shoulder application
- Netalyze; a systems for analysis of this network data

Status

Measurements

- Example



Status

Analysis

- Determined Limitations of IP over ATM for WAN's

latency T (ms)	input rate Ri (Mb/s)	output rate Ro (Mb/s)	queue size Q (cells)
18	622	155	4322
18	622	100	3111
18	155	100	1320
18	155	45	1139
18	100	45	904
100	622	155	24011
100	622	100	17281
100	155	100	7336
100	155	45	6330
100	100	45	5022
500	622	155	120054
500	622	100	86406
500	622	1.5	1792
500	155	100	36680
500	155	45	31651
500	155	1.5	1777
500	100	45	25108

Status

Simulation

- Conducting research on ‘new’ approaches to predicting the performance of large ATM networks, e.g., AAI.
  - Simulation
    - Premise: Cell-by-cell modeling is needed to capture the effects of network controls.
    - Premise: The control events of interest occur rarely.
    - Compose streams of ATM cells into large blocks including summary information about the ATM cells in each block.
    - Perform simple checks on each block to determine if an event of interest *may* occur.
    - Process only those blocks that where an event of interest *may* occur.

Plans for 95

DELIVERABLES	DATE
• Define the QoS metrics and the test procedure	1/30/95
• Demonstrate the measurement scenario	3/15/95
• Perform test procedures on application - KU-Sprint-NRL	5/15/95
• Characterize application running on AAI between sites	8/15/95