“Network Pathology”

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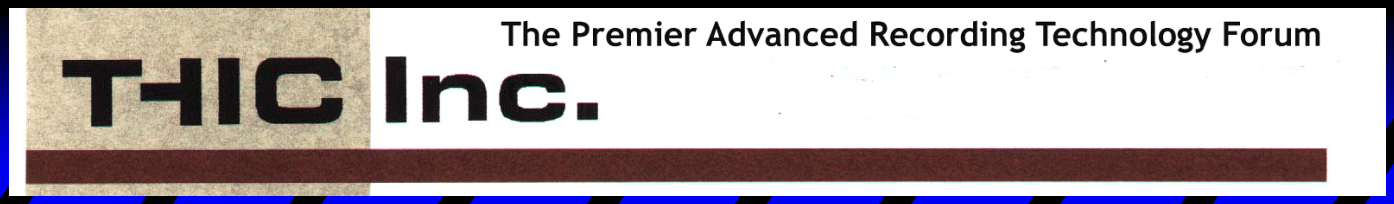

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Preface

- This presentation has been prepared for the THIC Technical Conference, January 2001 “Forensics and Data Storage”.
- The presentation’s title “Network Pathology” is in keeping with the Conference theme. A more formal title could have been: “A DTF-2 implementation of a High-Performance File Server using both Full-Fabric Fibre-Channel and Storage Area Network Technology”.

Introduction

- This presentation provides an overview of the GRADINE sub-tasks used to evaluate the maturity of the following technologies:
  - Full-Fabric Fibre-Channel (FFFC)
  - Storage Area Network (SAN)
  - Digital Tape Format-2 (DTF-2)

Goals

- While the GRADINE program has very aggressive High Performance Computing (HPC) goals, it also has some demanding "infrastructure" goals. A few of the major infrastructure requirements are:
  - Import Raw Sensor Data, 2.0 TByte/week
  - Export Processing Results, 25 GByte/week
  - On-Line Data Storage, 6 month (1 month RAID)
  - Off-Line Data Storage, 10 years

Architectural Environment

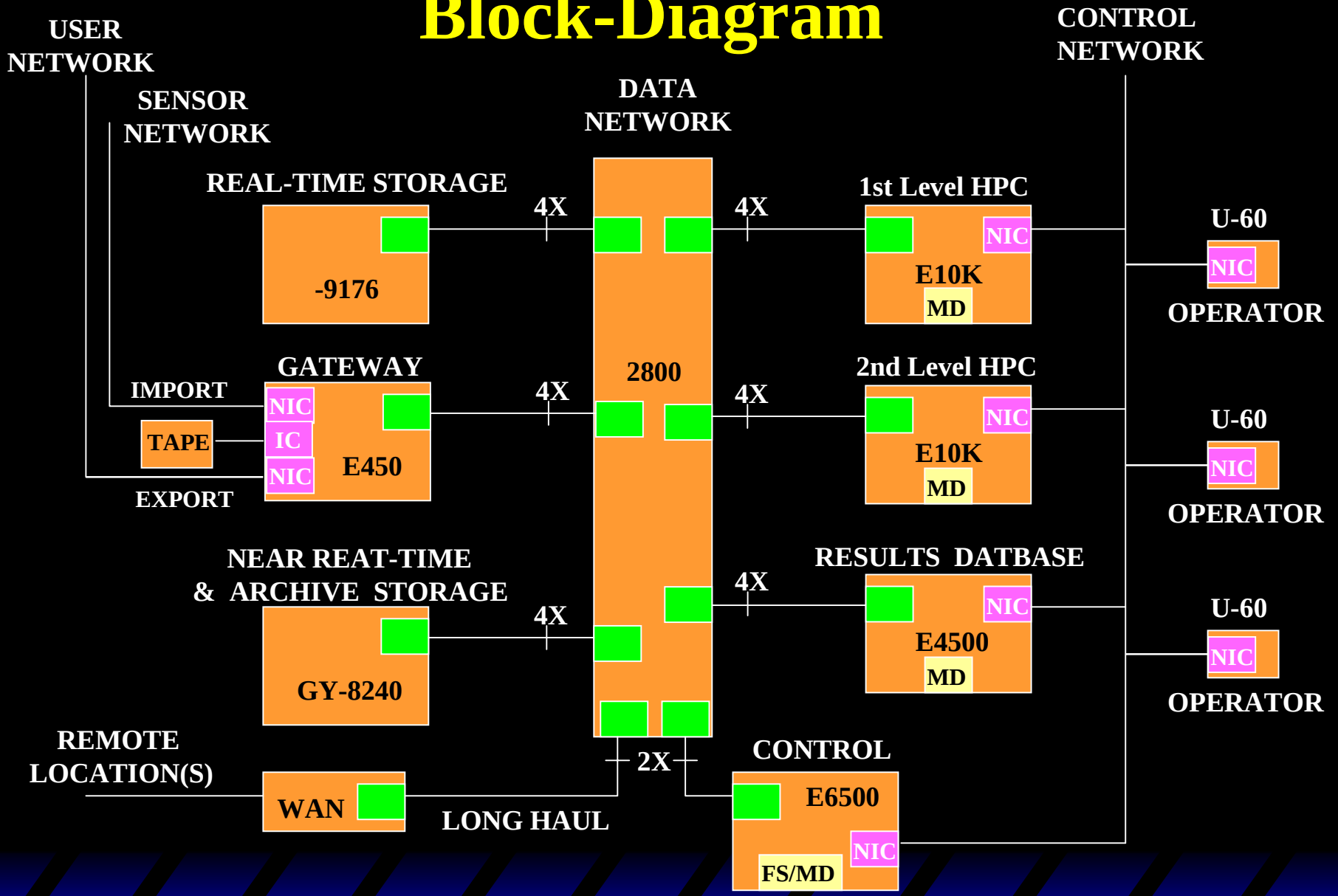
- The GRADINE architectural environment was developed to accommodate the desired technology evaluation:
  - Processing Environment, Controlled
    - "Gateway" for Import/Export
  - Processing Control, Scheduled
    - Deterministic processing "threads"
  - Processing Equipment, Homogeneous
    - "Sun Centric"

Some Useful Definitions

- **Heterogeneous**
  - consisting of dissimilar ingredients (i.e., mixed)
- **Sun + Compact + PC**

- **Homogeneous**
  - 1) of the same/similar kind
  - 2) of uniform structure
- **Sun Only**

Block-Diagram



Hardware Selection Consideration

- The lack of a single “Fibre-Channel Standard” is problematic. One mitigation of this issue is the deliberate selection and usage of a single “chip set family”:
  - Q-Logic, 2100 (direct attach only)
  - Q-Logic, 2200 (fabric-aware)
- This consideration applies mostly to the implementation of the Full-Fabric connectivity.

Software Selection Consideration

- SAN architectures have a reputation of being homogeneous. Since all of the GRADINE HPC algorithms are executed on Sun equipment (homogeneous processing), a SAN could have utility.
- Implement the highest performance Sun/SAN solution.
- Can selected non-fabric/non-SAN devices be “tricked” into joining the SAN fabric?

Performance Observations (1 of 3)

- Full-Fabric Fibre-Channel (FFFC)
  - Transfer Rate
    - 94 MB/sec for each Connection
    - 375 MB/sec per Transaction (4 Cooperative Connects)
    - 4 Cooperative 16 Port Switches (64 Ports)
  - Serviceability
    - Easy Installation/Configuration
    - Zero Failures
    - User Friendly GUI

Performance Observations (2 of 3)

- Storage Area Network (SAN)
  - Sun/Solaris 2.6
    - Migration to Solaris 2.8 Planned
  - LSC/Quick File System
    - Single File System for all Storage
    - Metadata Shared on all Computers
  - Tivoli/SANergy
    - Allows non-fabric devices to be used
  - SAM-FS

Performance Observations (3 of 3)

- Digital Tape Format-2 (DTF-2)
  - Tape Retrieve/Load
    - <2 min to restore a 1.5 GByte File, typical
  - Transfer Rate
    - 24 MByte (Sustained) per Drive (GY-8240)
  - Tape Eject/Store
    - < 20 seconds
  - Cross-Play Compatibility
    - No Failures Observed

Summary

- **Within an architecture similar to that of GRADINE, the following technologies are mature enough for operational consideration:**
  - **Full-Fabric Fibre-Channel (FFFC)**
  - **Storage Area Network (SAN)**
  - **Digital Tape Format-2 (DTF-2)**