

# **The UC Berkeley-LBL HIPPI Networking Environment**

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University of California at Berkeley  
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# Synopsis

The Goals

The Network

Entities: Challenges and Problems

HIPPI Switches

Sun 4 and SparcStations

RAID II

Psitech Frame Buffer

Parallel Processors

HIPPI-XUNET Adapter (HXA)

Status Report

# Goals

## Facilities

Provide a high-speed data path between UC Berkeley (Cory and Evans Halls) and Lawrence Berkeley Laboratory.

## Research

Real-time Guarantees on a HIPPI network?

Tenet Real-Time Protocol Suite on a HIPPI network

Investigate performance of protocol suite at “gigabit speeds”

Implementation on non-traditional host architectures

## Applications

Real-time transfer of video/animation

High-bandwidth transfers to/from RAID II

# The Network

## High Performance Parallel Interface (HIPPI)

800 Mbps, 32-bit parallel, point-to-point links

Optional 64-bit parallel datapath for 1.6 Gbps

## Circuit Switching

No buffers in switches

Low latency (propagation time)

Output port blocking for connection lifetime

## Physical Limitations

25 meter maximum link length

50 meter cables available

## Serial-HIPPI

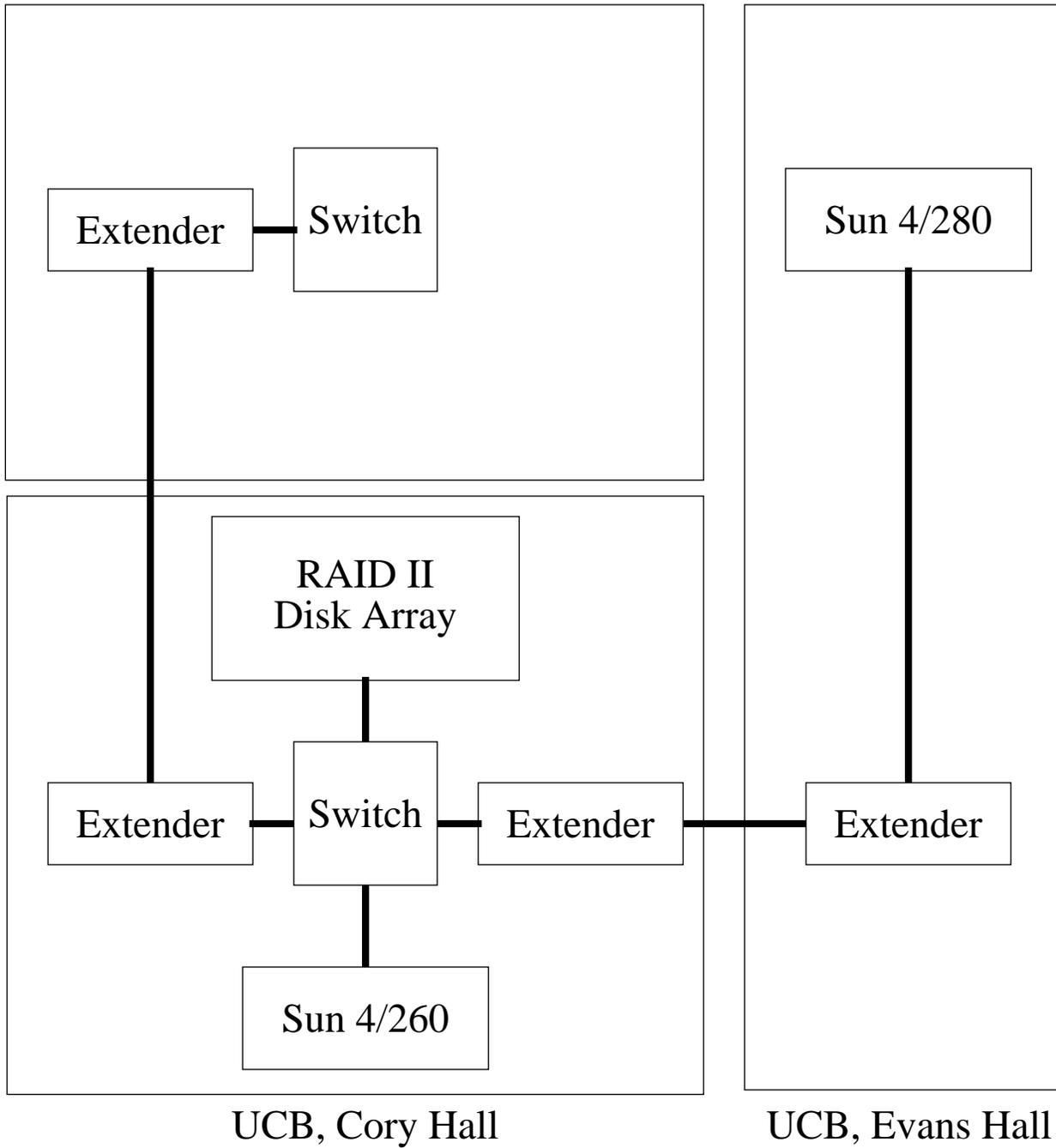
Industry-developed standard

Serial fiber or copper for long distances

# The Network

Current

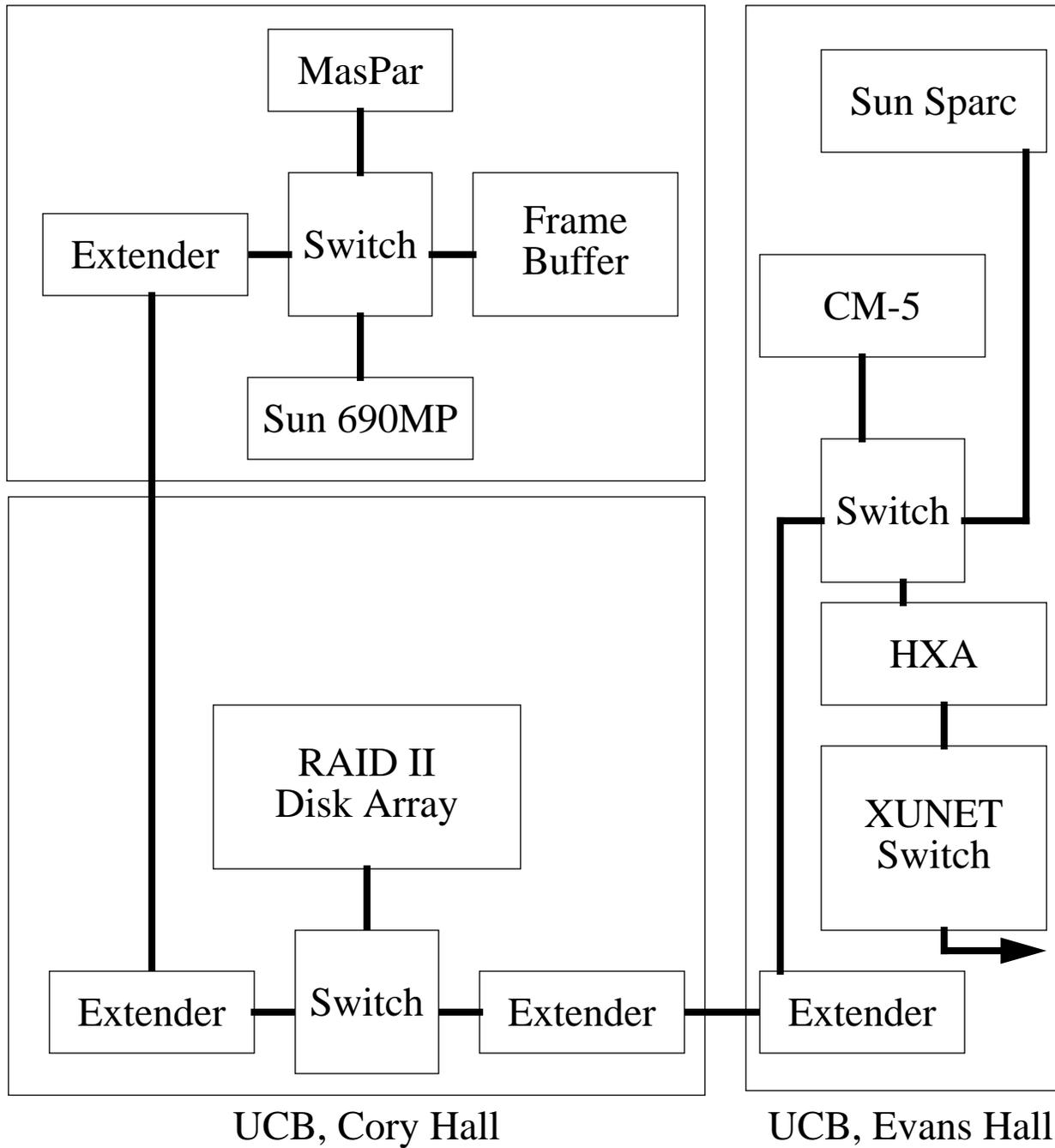
Lawrence Berkeley Laboratory



# The Network

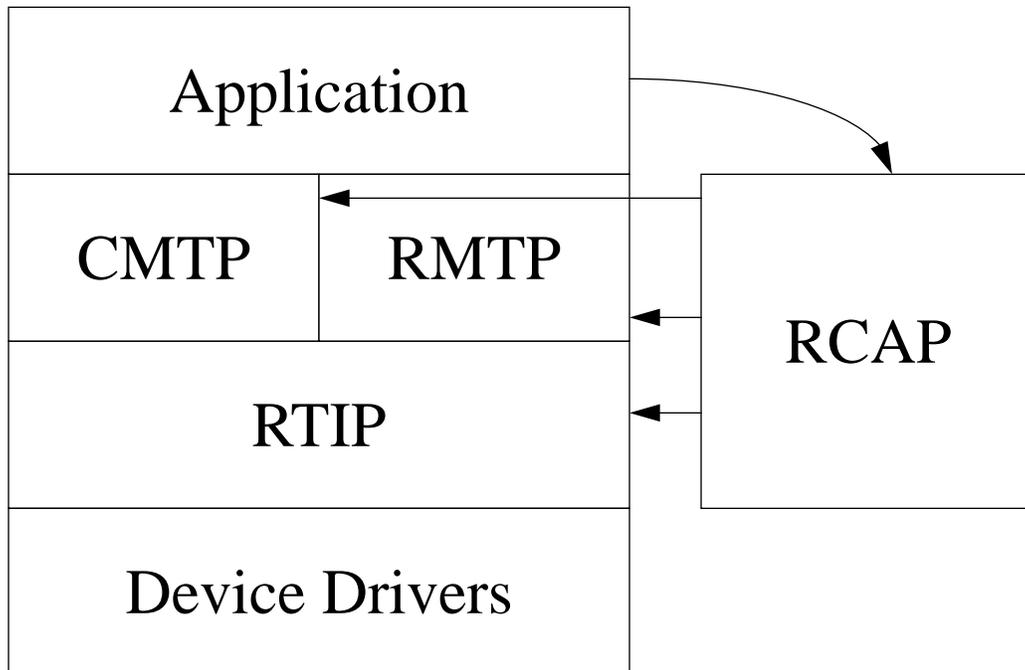
## Goal

### Lawrence Berkeley Laboratory



# The Network

## The Tenet Real-Time Protocol Suite



Continuous Media Transport Protocol (CMTP)

Real-Time Message Transport Protocol (RMTP)

Real-Time Internet Protocol (RTIP)

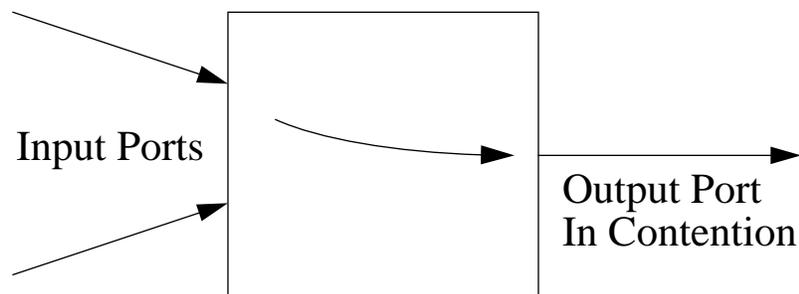
Real-Time Channel Administration Protocol (RCAP)

# Entities

Input Output Systems Corporation 4x4 HIPPI Switch

Supports full link bandwidth (800 Mbps) on all ports simultaneously

Blocking due to circuit-switching nature of HIPPI



Need to hold all links on path from source to destination

“Camp on” feature allows switch to arbitrate among contending ports

Example of HIPPI Networking: IP over HIPPI (RFC 1374)

Connection per packet

Restrictions on packet size

“Connection scheduling” in switches analagous to packet/cell scheduling in other network switches

Setting up connection per packet in large switching fabric is expensive

Real-Time Guarantees?

# Entities

Sun Microsystems Sun 4s and Sparcstations

Workstations equipped with VME and/or SBUS

Chi Systems HIPPI Interfaces (VME now, SBUS Real Soon Now)

Tenet Real-Time Protocol Suite on SunOS 4.1.3

Based on existing prototype Suite on DEC Ultrix 4.2A

Similar network subsystem structure and user environment



# Entities

## RAID II (Continued)

### Low-bandwidth datapath to host

- 16 Mbps vs. 800 Mbps

- May want to do protocol processing on HIPPI interface processors

- Minimal processing if data delivery protocols on host

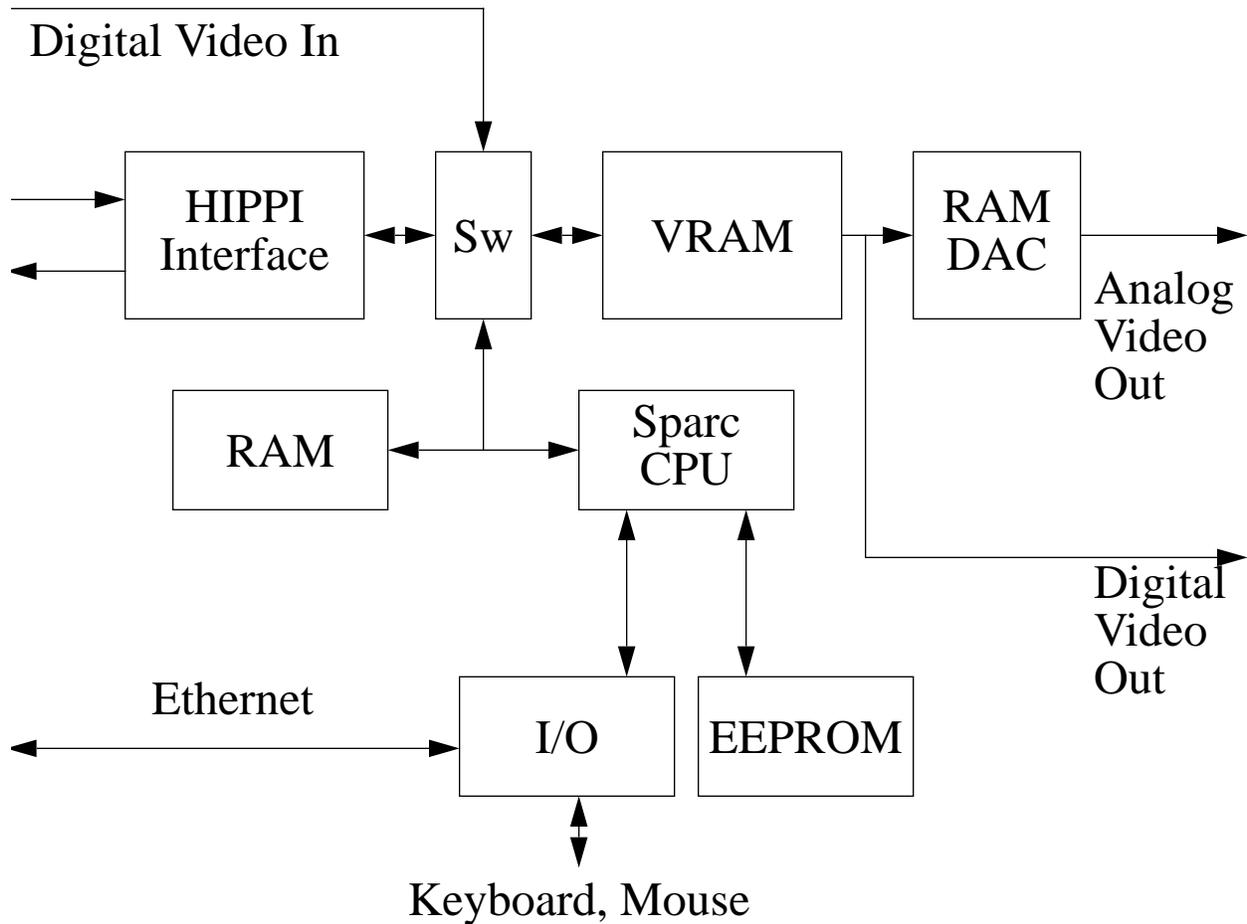
### Network support for filesystem

- Some portion of real-time protocols in Sprite kernel

- Interface to Sprite filesystem code (LFS and inter-disk striping driver)

# Entities

## Psitech Frame Buffer



Support for real-time communication to/from frame buffer

Real-Time Protocol Suite on Sparc CPU

Operating system (?)

Datapath bandwidth to and from Sparc?

# Entities

## Thinking Machines CM-5

128 Sparc processors in a “fat tree”

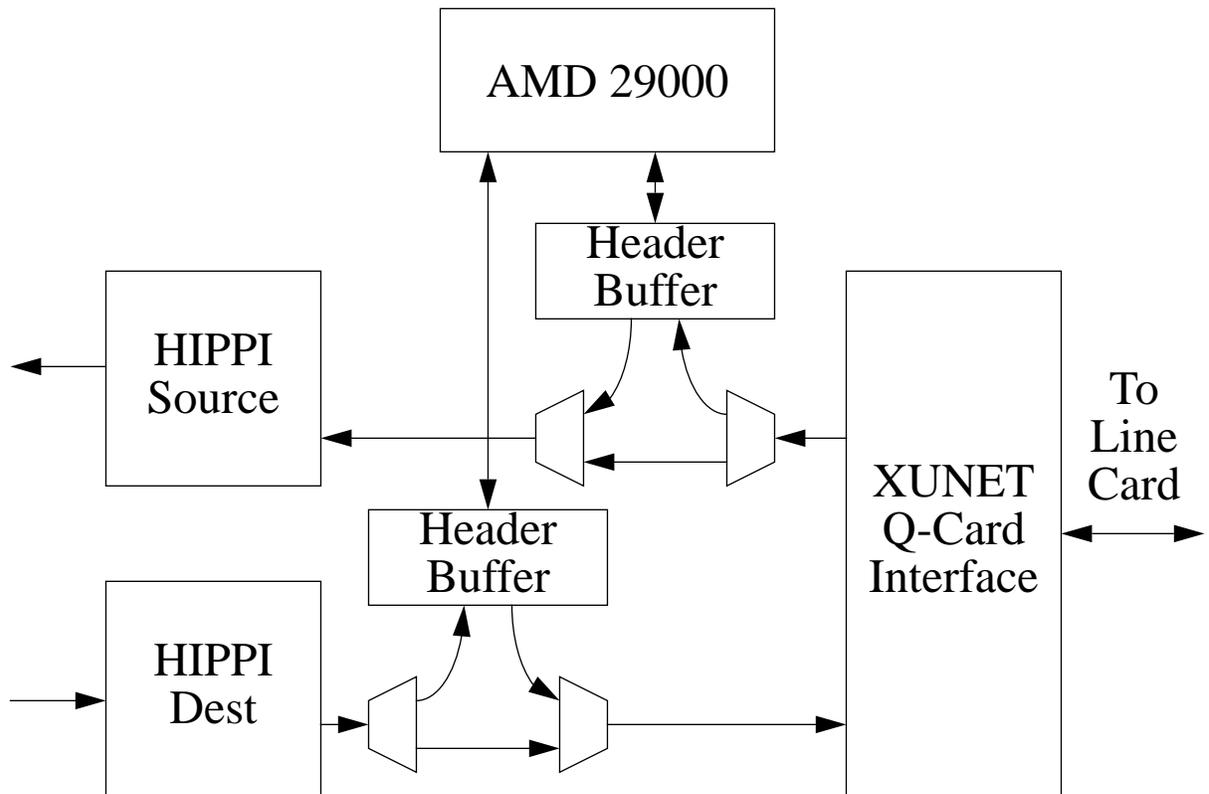
How to parallelize network protocols to beat CPU and interconnect bottlenecks?

Demultiplexing packets to various processors through interconnection network

## MasPar

# Entities

## HIPPI-XUNET Adapter (HXA)



Connects to any XUNET line card

XUNET 3 segment will use 622 Mbps line card to connect HIPPI segments of network to XUNET 2 ATM switch at UC Berkeley

Heterogeneity test for Real-Time Protocol Suite

# Status Report

## Equipment Procured

- Sparcstations

- HIPPI Switches

- HIPPI Serial Extenders

- Single- and Multi-Mode Fibers

SunOS port of RCAP completed. Sprite port of RCAP being tested.

SunOS port of RMTP/RTIP in progress, awaiting source code for current version of SunOS.

RAID II did final (non-XUNET) demo in January.

Application development in progress.

Next steps:

- Get some “numbers” on the HIPPI equipment

- RAID II and Sprite port of RMTP/RTIP.

- CM-5 port of all protocols