

# PC Farms & Central Data Recording

ATLAS Trigger/DAQ Workshop  
Chamonix, October 20, 1998

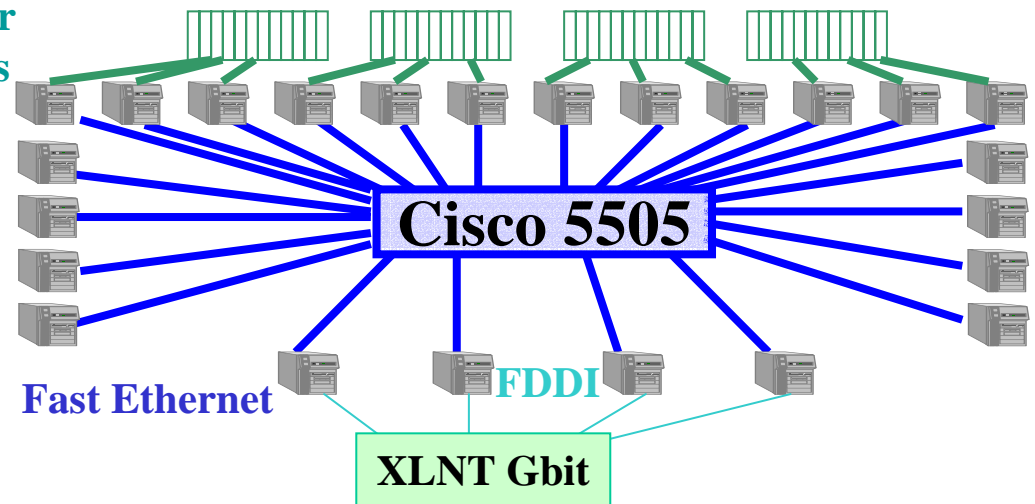
Frédéric HEMMER - CERN/IT

# Overview

- NA48 Data Recording
- NA45 Data Recording in Objectivity
- NA57 Data Recording in HPSS
- Summary

# NA48 Central Data Recording

Sub detector  
VME crates



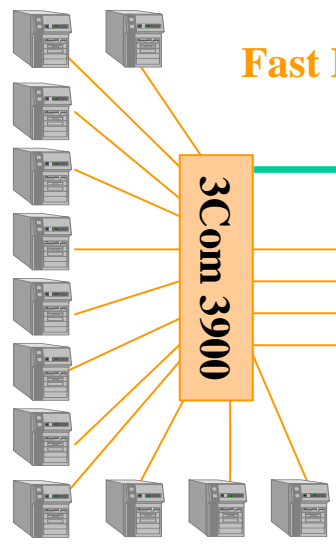
Event Builder  
Online PC Farm

SUN E450  
500 GB Disk space

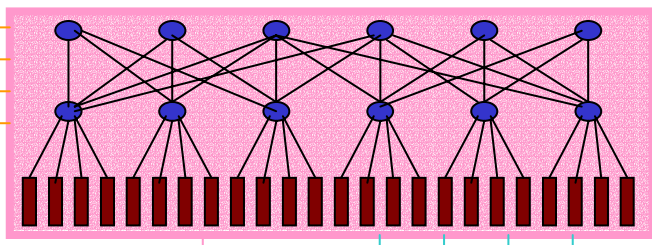
Fast Ethernet

7 KM

Gigabit Ethernet

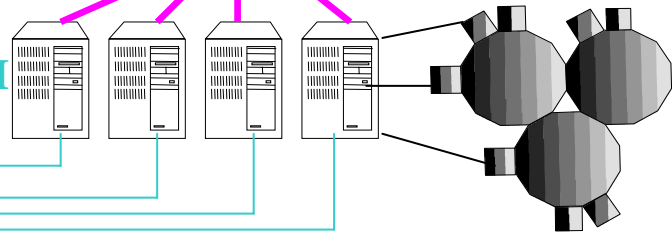


**3Com 9300**



FDDI

HiPPI



# NA 48 Data Recording in 98

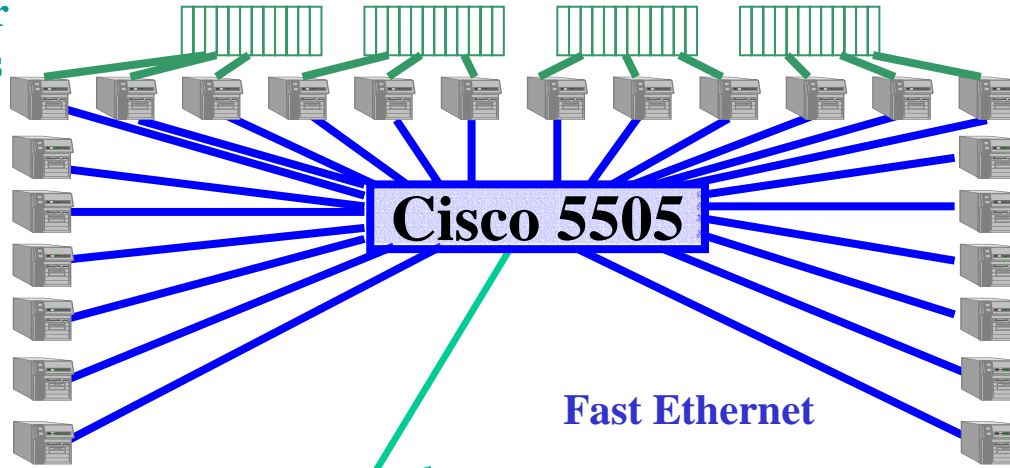
- May ↖ September 1998
- Raw Data on Tape
  - 68 TB (1450 tapes, mainly 50 GB tapes)
  - 12.5 TB Selected Reconstructed Data
  - Total with 97 data : 96 TB
- Average Data Rate : 18 MB/s (peaks @ 23 MB/s)
- CDR system can do 40-50 MB/s; limitation is CPU Time available
- Data recorded as files (4 million)

# NA48 On Line Farm

- 11 Subdetector PC's (dual PII-266, 128 MB)
- 8 Event Building PC's (dual PII-266, 128 MB, 18 GB SCSI)
- 4 CDR routing PC's (dual PII-266, 64 MB, FDDI)
- All running Linux
- Software event building in the interburst gap
- Optional Software Filter (tags data)
- Send data to computer center (local disk buffers : 144 GB , 2 hours)
- On CS/2 : L3 Filtering and tape writing

# NA48 Plans for 1999

Sub detector  
VME crates



Event  
Builder

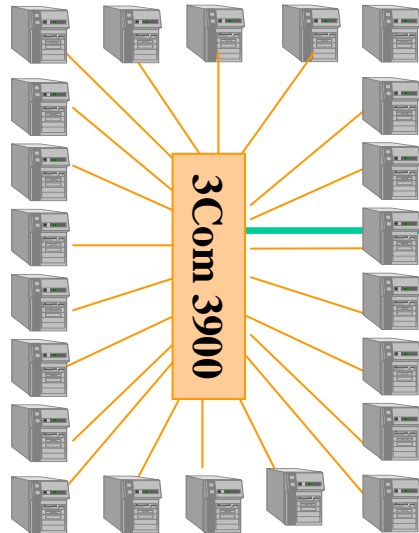
Fast Ethernet

Gigabit Ethernet

7 KM

4 \* SUN E450  
4.5 TB Disk space

Fast Ethernet



3Com 3900

3Com 9300

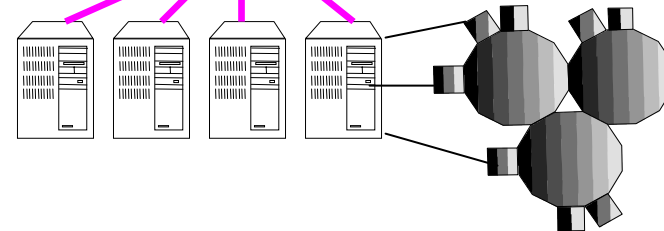
Gigabit Ethernet

On/Offline  
PC Farm

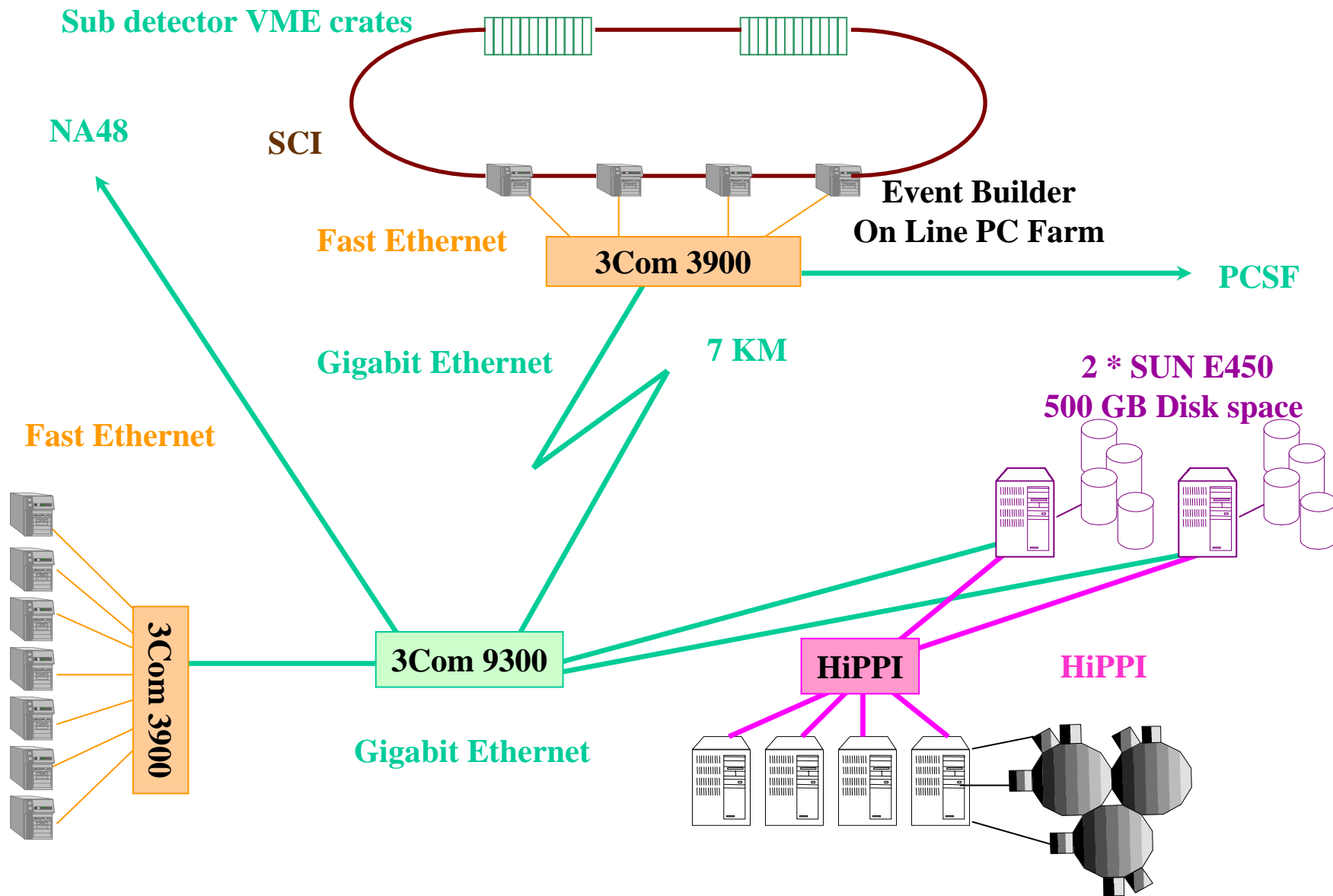


HiPPI

HiPPI



# NA45 Data Recording



# NA45 Raw Data recording in Objectivity

- October 98 ; November 98
- Estimated bandwidth : 15 MB/s
- Processes translate Raw Data format to Objectivity
- Database files (1.5 GB) are closed, then written on tape
- Steering done using a set of perl scripts on the disk servers
- On line filtering/reconstruction/calibration possible
- Farm is running Windows NT
- Reconstruction can use PCSF



# PCSF Configuration (1)

- Server running NT 4.0 Server SP3
  - 1 dual capable Ppro @ 200 MHz, 96 MB, with 9 GB data disk (with mirroring). LSF central queues.
- Server running NT Terminal Server Beta 2
  - 1 dual Ppro @ 200 MHz, 128 MB, with 4 GB data disk. Runs IIS 3.0 and is accessible from outside CERN. It also host the asp's for Web access
- Servers running NT 4.0 Workstation SP3
  - 9 dual Ppro's @ 200 MHz, 64 MB, 2\*4GB
  - 25 dual PII's @ 300 MHz, 128 MB, 2\*4GB

All equipped with boot proms

# PCSF Configuration (2)

- Machines interconnected with 4 3com 3000 100BaseT switch
- Display/Keyboard/Mouse connected to a Raritan multiplexor
- PC Duo for remote admin access
- ↖ There were problems with other products
- All running LSF 3.0.
- ↖ LSF 3.2 does not work, support weak
- Completely integrated with NICE

# Racking evolution

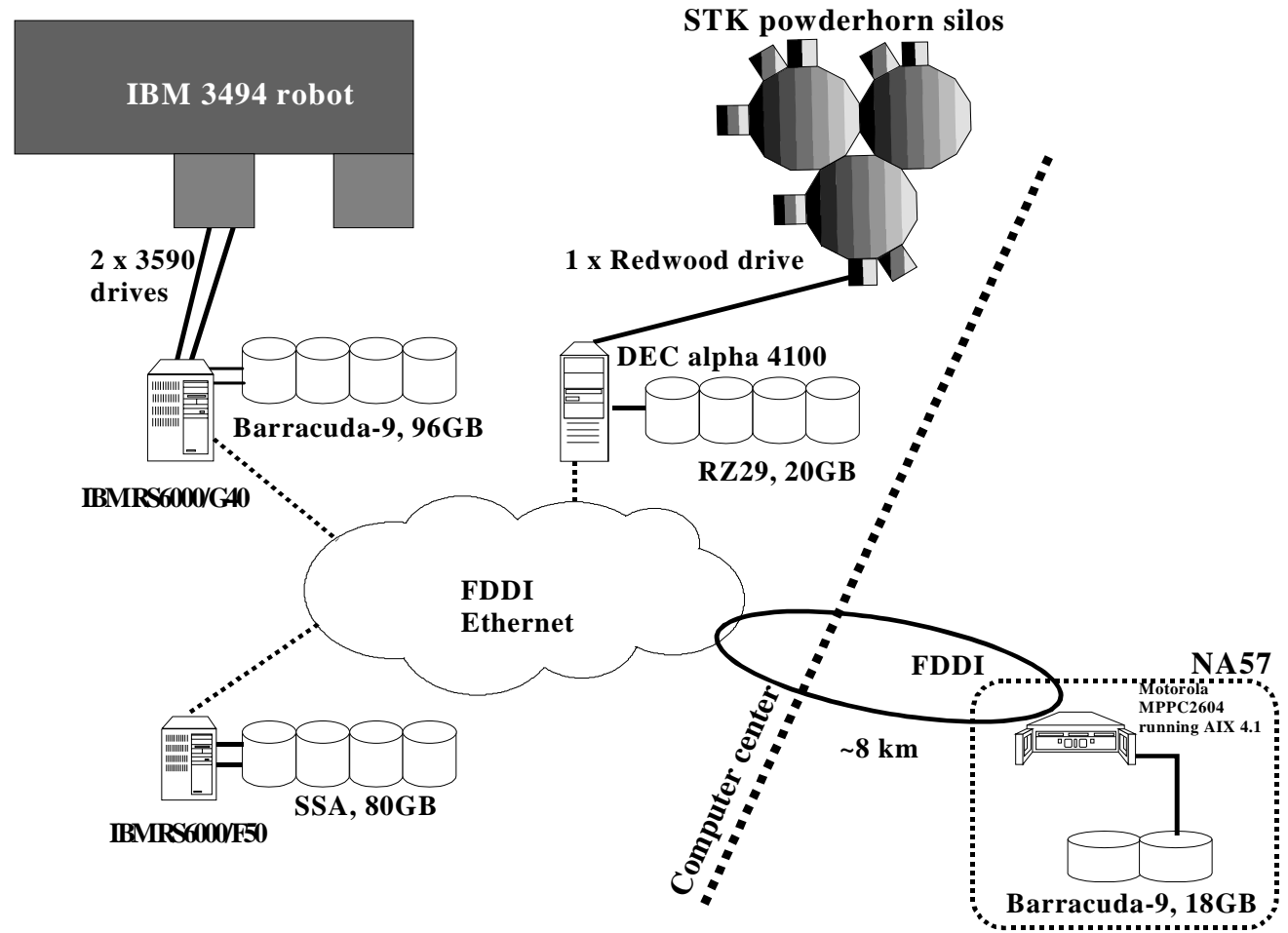
**1997**



**1998**



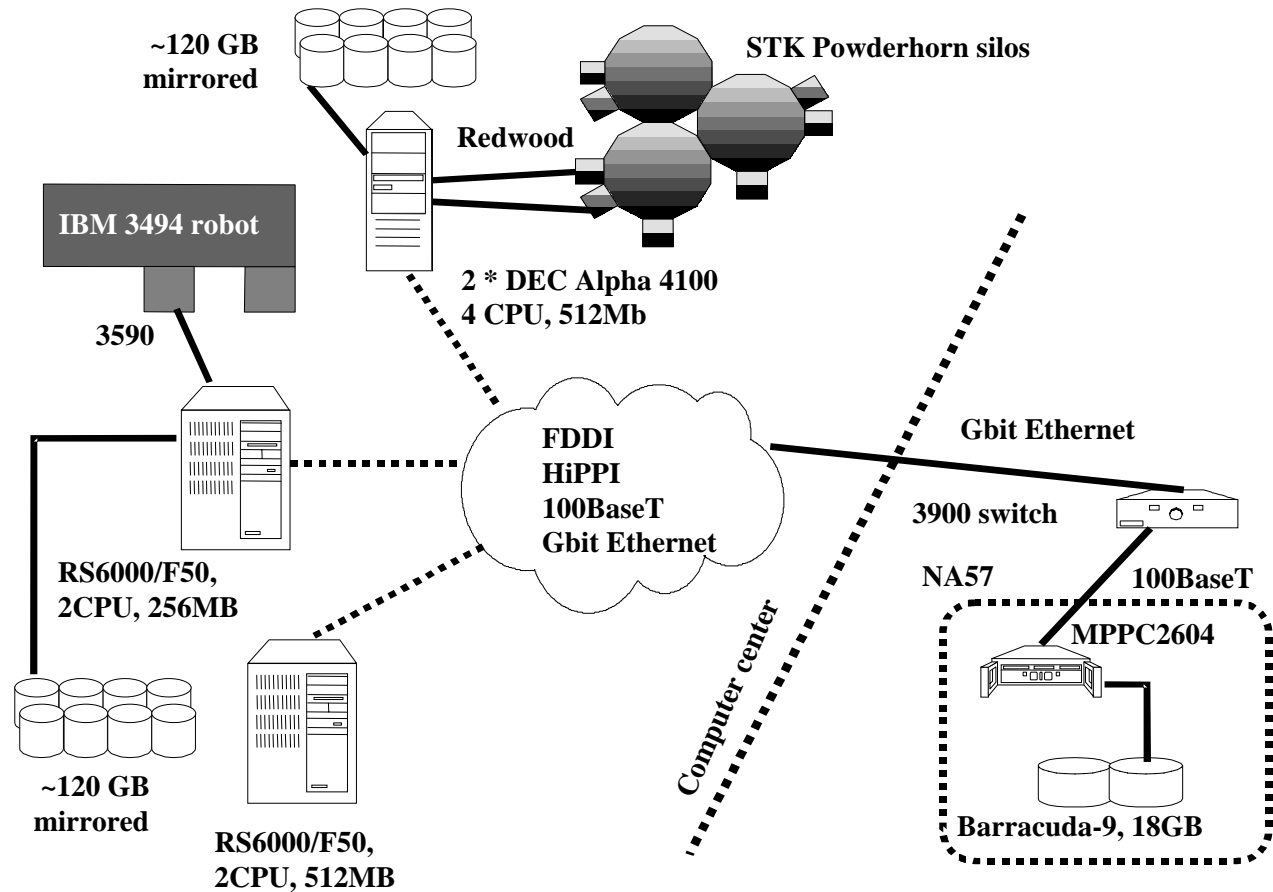
# HPSS test system



# HPSS Tests results (NA57)

- Disk to disk transfers without tape migration:
  - *sustained*: 5 - 6MB/s (1GB files) 4-5MB/s (200MB files)
  - *average*: ~5.5MB/s
  - *peak*: 6.5MB/s
- With disk to tape migration:
  - *sustained*: 2 - 3MB/s (200MB files)
  - *average*: 3 - 5MB/s
  - *peak*: 5.5 - 6.5MB/s
- Disk @ DAQ limited to 7 MB/s read !

# Production system



# Current & Future Data rates

Year	Experiments	Bandwidth MB/s	Raw Data TB/year	Processing SPECInt95
1990- 2000	LEP	0.5	1	100
1997- 2000	SPS	15-20	30-70	500
2000- 2008	SPS	35	300	2000
2004-	LHC	100-1000	3000	50000

# Summary

- On line PC farms are being used to record data at sensible rates (Linux)
- Off line PC farms are being used for reconstruction/filtering/analysis (Linux/NT)
- New paradigms of recording data are explored (Objectivity/HPSS)
- Still a lot to do on scalable farm management, global steering, CDR monitoring, etc..