CDF/D0/CD Run II Review: Network Hardware

Phil DeMar

Data Communications Group

Computing Division / Distributed Computing Dept.

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Outline:

- General Run-II Network Architecture
- CDF/D0 Run-II Network Topologies
- CDF/D0 Infrastructure (Cabling) Upgrades
- Run-II Network Switches
- Current Testing Support
- Off-Site Network Access
- DCD Design Notes on Run-II Network Support

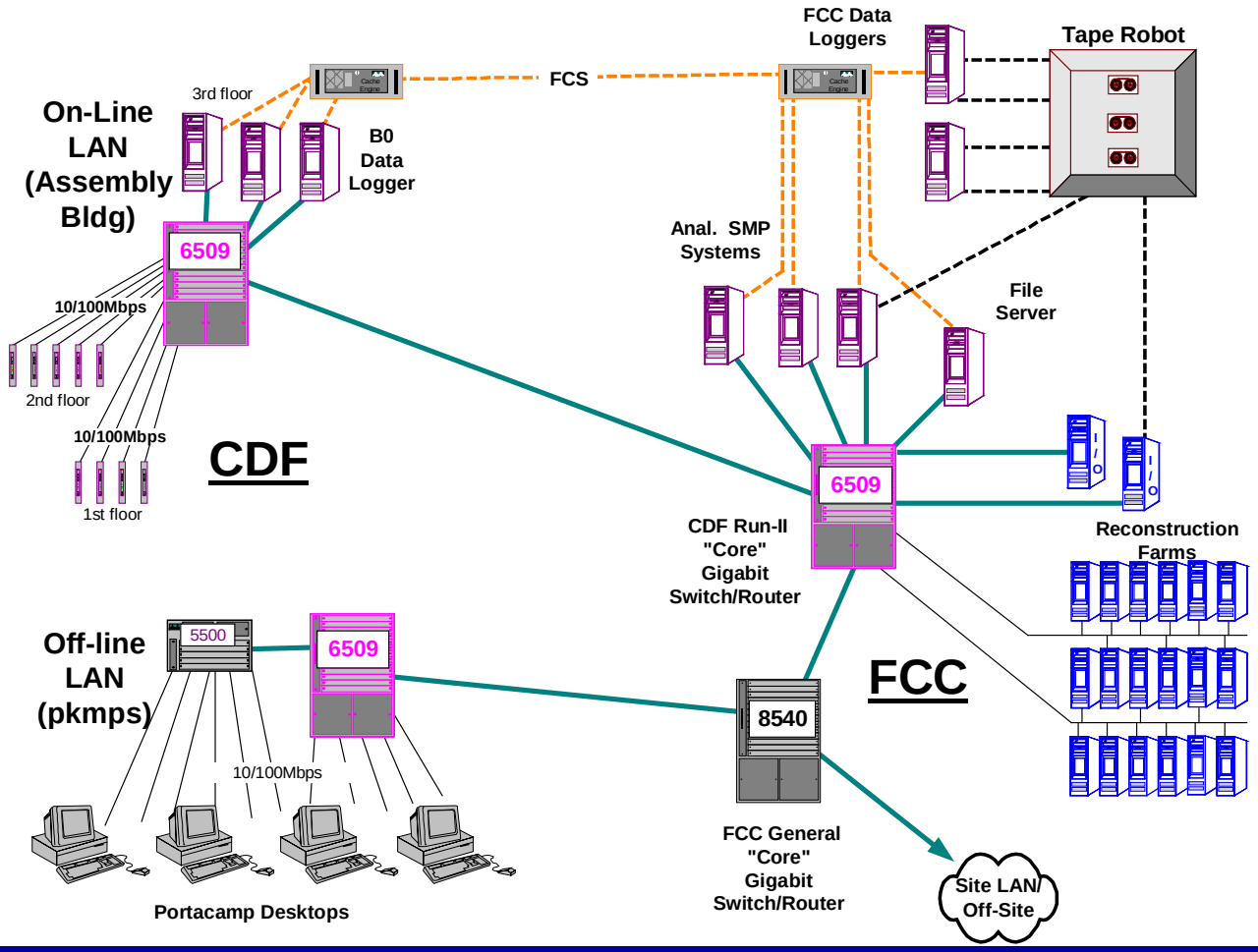
General Run-II Network Architecture:

- **Fundamental philosophy: over-engineer the network:**
  - **Equipment is cheaper than people;**
  - **Provides 'cushion' for evolving network usage.**
- **Based on high density, high performance LAN switch/routers:**
  - **Gigabit ethernet used as the default high bandwidth LAN technology;**
  - **General objective to keep related computing resources on a common switch fabric;**
  - **Routing isolation between LAN components:**
    - **Layer 3 switching to minimize latency from routing within a common switch fabric.**

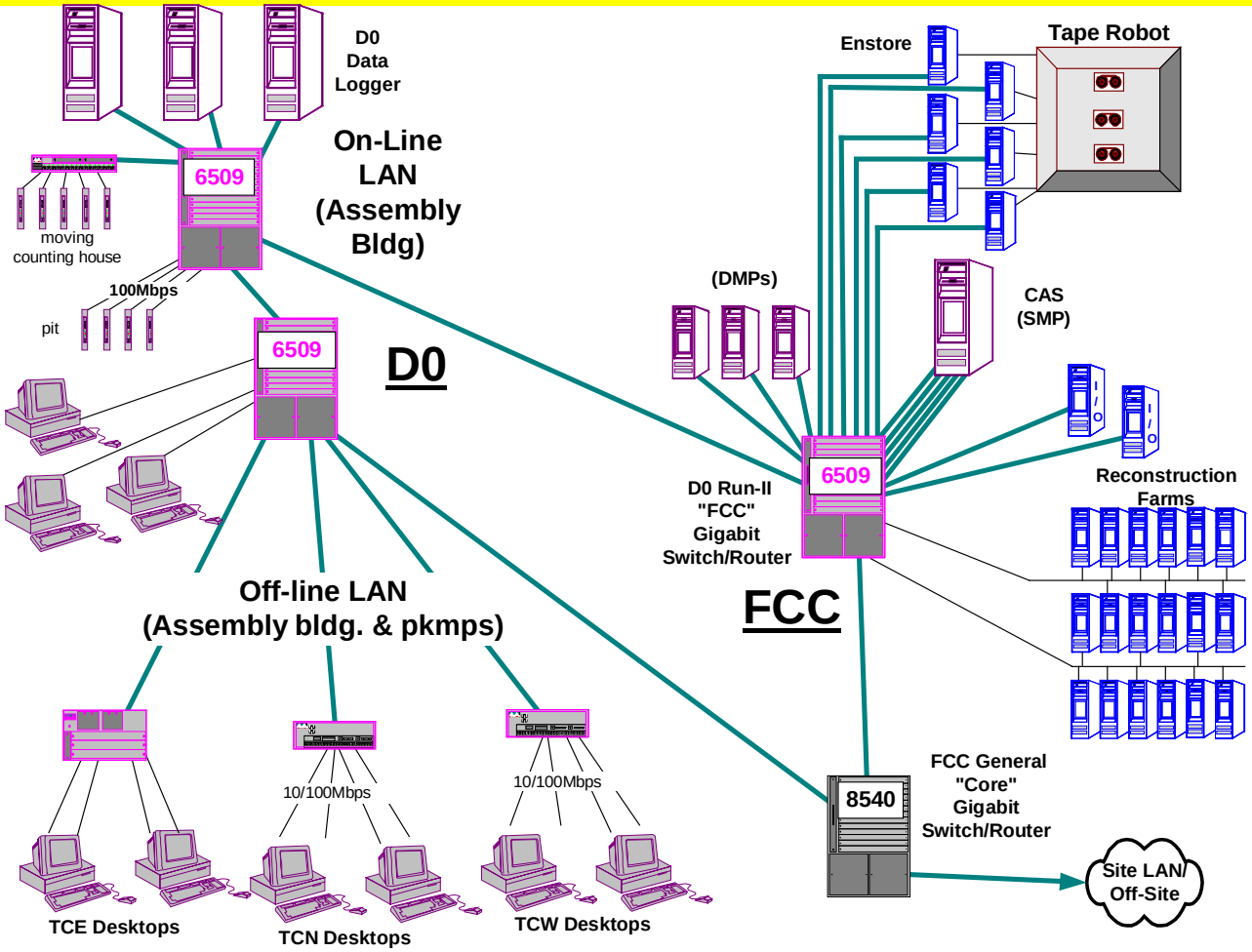
General Run-II Network Architecture (cont.):

- **Common general architecture for CDF & D0:**
  - **A high performance switch in the FCC dedicated for each experiment's computing resources located there.**
  - **An off-line network at the experiment site providing 100Mb/s support to the desktop;**
  - **A separate on-line network at the experiment site.**
- **Common network equipment for simplicity, ease of management, & spare component support.**

CDF Run-II Network(s) Topology:



D0 Run-II Network(s) Topology:



Infrastructure (Cabling) Upgrades:

- **At CDF:**
  - **New UTP Cabling needed for On-line Network Control & Computer rooms floors (Assembly Bldg. 1,2,3):**
    - **Design Note completed 3/31/99;**
    - **Bid specs completed & advanced 5/1/99;**
    - **Continental Electric is the bid winner of the contract;**
    - **Installation to start on 7/1/99, & be completed by 9/1/99.**
  - **Off-line Network (portacamps) needs 34 fiber blows & retermination of UTP cable in New portacamps to support 100Mb/s connection into every office;**
    - **Design Note in final review status**
    - **Working on specs now; est. to be ready by 6/15;**
    - **Estimated completion of work 9/15;**
    - **Assembly bldg. offices upgrade left for early next f.y.**

Infrastructure Upgrades (cont.):

- **At D0:**
  - **New UTP Cabling needed for On-line Network Control & Computer rooms floors (Assembly Bldg. 1,2):**
    - **Design Note completed 3/31/99;**
    - **Bid specs completed & advanced 5/12/99;**
    - **Comnet Midwest is winner of the contract;**
    - **Installation to start on 6/28/99, & be completed by 8/9/99.**
  - **Off-line Network (Assembly bldg. & portacamps) needs major ($200k+) tube cable, fiber, & UTP installation;**
    - **Design Note & proposed Bid Specs completed 5/20/99.**
    - **RFP issued; bids due in by 6/10;**
    - **Estimated completion of work 9/30.**

Run-II Network Switches

- **Cisco Catalyst 6509 selected as switching platform for CDF & D0 Run-II network support.**
- **Supports high port densities on a 9 slot chassis, with 8 slots usable for port modules:**

  Supervisor (central processor) module:

  - **supports two additional 1000B-SX ports**
  - **daughterboard routing module (available early Q3/99)**

  8 port 1000B-X (gigabit ethernet) module

  16-port 1000B-X module (available late Q3/99)

  48 port 10/100 module with RJ45 or RJ21 connectors

  24 port 100B-FX module

Run-II Network Switches (cont):

- **Very high switch fabric bandwidth capacity:**
  - **32 Gb/s backplane used by current modules;**
  - **128 Gb/s x-bar switch fabric will be used by next generation (Q1/00) of supervisor & port modules:**
    - **modules using the 32 Gb/s backplane will continue to work when the x-bar switch fabric is put to use.**
- **Redundant power supplies**
- **Redundant supervisor capability available:**
  - **but we currently don't plan to use it...**
- **We intend to provide in-house spare for supervisor & port modules.**

Run-II Network Switches (cont):

- Cisco Catalyst 2948G selected as small "satellite" switch to connect to 6509s, where necessary:
- A small, non-modular, relatively inexpensive switch:
  - 2 gigabit ethernet uplink ports & 48 10/100B-TX ports;
  - 24 Gb/s switch switch fabric capacity.
- 48 100Mb/s ports can obviously oversubscribe the 1000 Mb/s uplink:
  - where needed, the second gigabit uplink would be used to cut the oversubscription rate in half.

Run-II switch procurement status:

- **Req. for D0 FCC Run-II 6509 submitted:**
  - **Ordered with one 48-port 10/100B-TX & two 8-port 1000B-X modules.**
  - **one 16-port 1000B-X and routing daughter card to be ordered, when available.**
  - **chassis & modules needed in August for D0 Run-II tests.**
- **Req. for CDF FCC Run-II 6509 should follow shortly:**
  - **Will be ordered with one 48-port 10/100B-TX & one 8-port 1000B-X module;**
  - **routing daughter card to be ordered, when available.**

Run-II switch procurement status (cont):

- **Reqs & accompanying documentation for CDF & D0 off-line switches expected to submitted by 7/1:**
  - **CDF off-line (portacamps) 6509 tentatively spec'ed with:**

Module type	number	total # of ports
10/100B-TX	2	96
100B-FX	5	120
1000B-X	1	8

  - **D0 off-line (DAB) 6509 tentatively spec'ed with:**

Module type	number	total # of ports
10/100B-TX	1	48
100B-FX	1	24
1000B-X	1	8

  - **D0 off-line (portacamps) switches tentatively spec'ed at six Catalyst 2948Gs, providing 292 10/100B-TX ports.**

Run-II switch procurement status (cont):

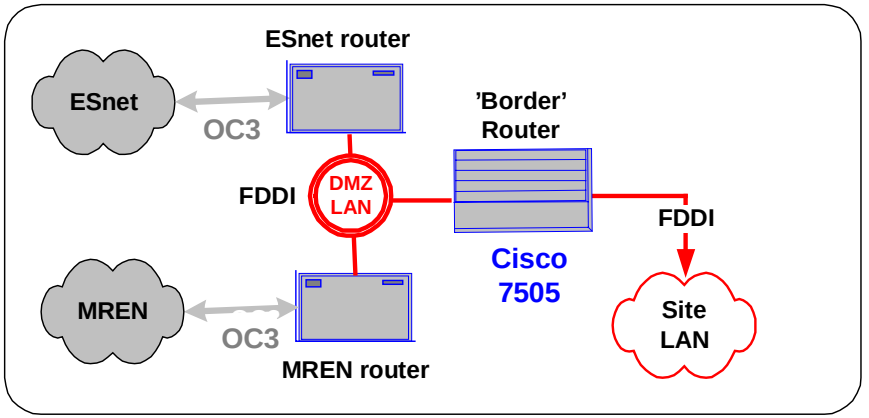
- **Working with CDF & D0 on specifications & procurement for their on-line switches.**
- **For reconstruction farms, 10/100B-TX modules will be procured in parallel with a farms acquisition.**

Temporary Run-II Network Support:

- **CDF on-line temp. network support:**
  - **3 10B-TX & 2 10/100B-TX switches on CAB 1,2,3**
- **CDF FCC temp. network support:**
  - **2 10/100B-TX switches on FCC2**
- **D0 RIP/SAM temp. network support:**
  - **1 10/100B-TX switch with 1000B-LX uplink on DAB 2**
  - **1 10/100B-TX switch with two 1000B-SX links on FCC2**
  - **FCC Cisco 8540 core switch/router on FCC2E being used as Run-II gigabit switch fabric until new switches arrive.**

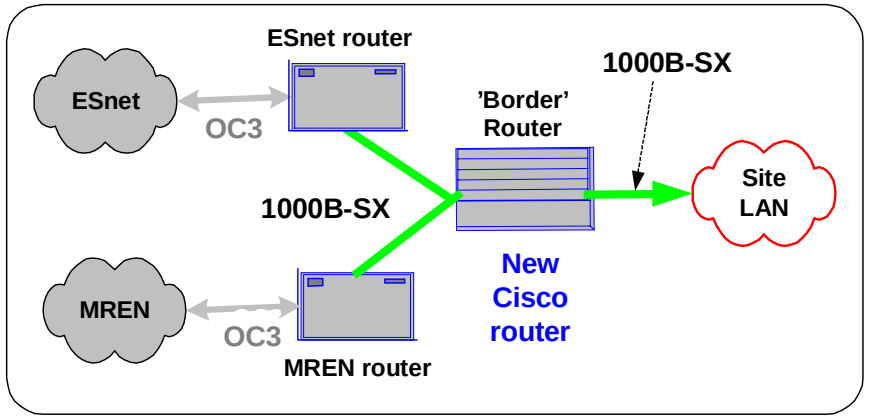
Off-Site Network Access:

- **2 high bandwidth (155Mb/s) links provide off-site access:**
  - **ESnet OC3 (155Mb/s) is our default path to the Internet:**
    - **ESnet also supports access to Abilene, one of the two Internet-2 research networks in use by HEP universities.**
  - **MREN OC3 supports specific research communities, including the vBNS, the other Internet-2 research network.**



Off-Site Network Access (cont.):

- **Currently, off-site access limited to max of 100Mb/s despite two 155Mb/s (OC3) WAN links:**
  - **off-site traffic levels are low enough that this is not currently a bottleneck.**
- **In f.y. 00, the site border router will be upgraded to 1000B-X to eliminate this bottleneck:**
  - **connections to ESnet & MREN routers will be similarly upgraded.**
  - **unclear when off-site links will be upgraded to OC12 (622Mb/s)**



DCD Design Notes for Run-II Networks:

- **DCD Design Notes describing Run-II network plans:**

127.0	D0 Site Areas Wiring	
131.0	Network Upgrade for CDF Assembly Bldg.	
135.0	D0 FCC Run-II Network	
138.0	D0 DAB On-Line Network	{wip}
139.0	D0 DAB Off-Line Network	{wip}
140.0	CDF Run-II Off-line Network Upgrade	{wip}
141.0	CDF Run-II On-line Network Upgrade	{wip}
143.0	CDF FCC Run-II Network	{wip}

- **Presently only available as hardcopy, but we should have them accessible on the web very shortly…**

{wip} = work in progress

DCD FTE Resources for Run-II Networks

- **The effort to install/upgrade the CDF & D0 Run-II networks is expected to peak over the next 9 months:**
  - **Data Communications Group: ~ 3.5 fte**

    1 fte for CDF network support (nearly all Run-II related)

    1 fte for D0 network support (nearly all Run-II related)

    0.5 fte for FCC gigabit networks (mostly Run-II at this pt.)

    0.5 fte for procurement & pre-install. testing of equipment

    0.5 fte for other misc. Run-II related activities
  - **Data Hardware Group: ~ 1.5 fte**

    1.5 fte for technician support of wiring upgrades & equipment installations