NLC Global Controls Cost Reductions: Network

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Ideas

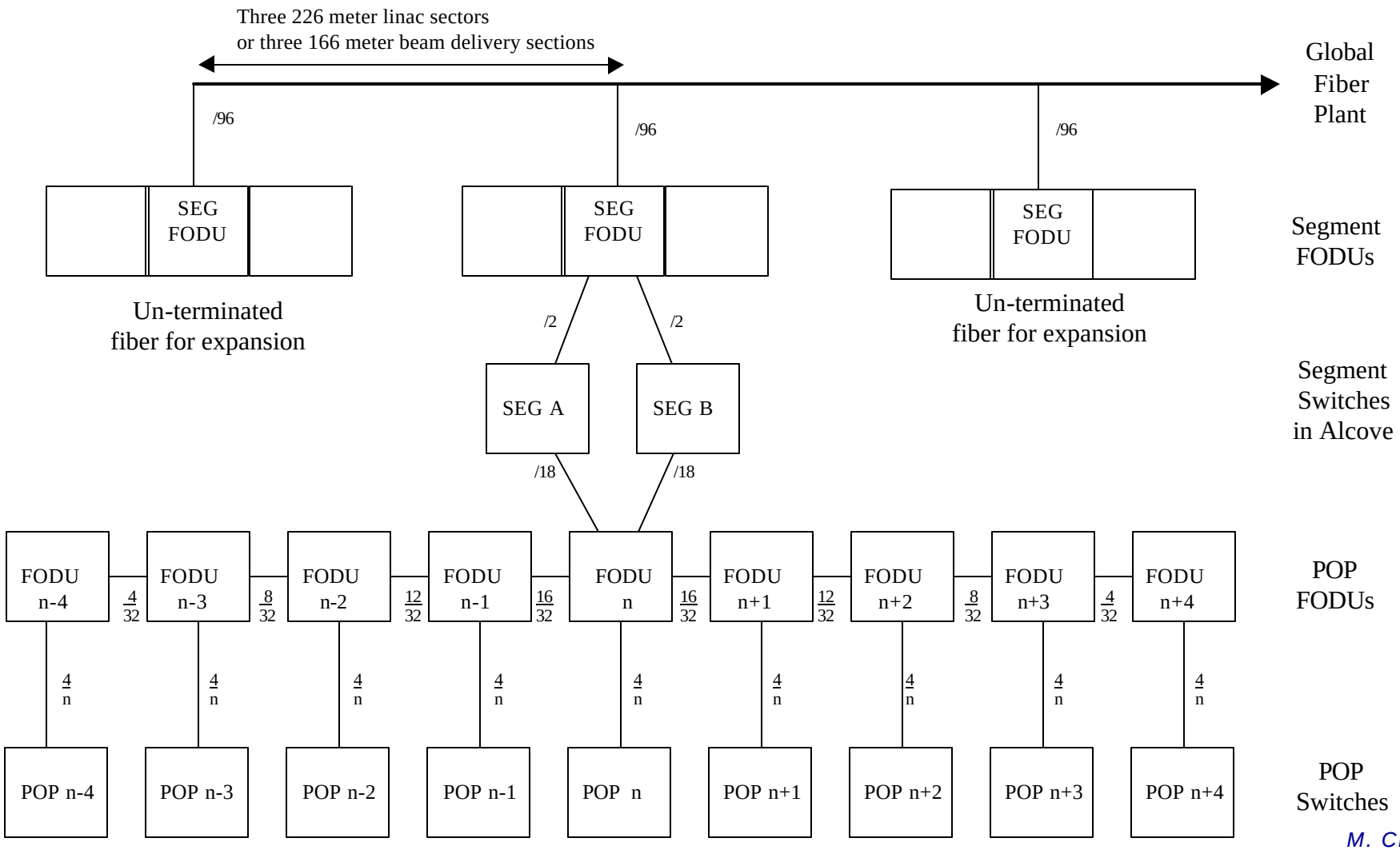
- Eliminate redundant fiber plant
  - $2.5M Reduced capacity for future expansion
- Eliminate redundant router(s)
  - $74K normal traffic and 120 Hz on one cable. No failover capability.
- Service more sectors with a single router
  - $700K (1 per 12 IOC instead of 8) Throughput, reliability?
- Reduce IOC count
  - $5M (1500 reduced to 1000) Reliability of overloaded IOC?

Ideas Revisited

- Eliminate redundant fiber plant
  - only 4 fibers to every third sector for “open” design
  - TRIO requires 2 (or 4) fibers to every TRIO box (how many?)
  - Sector-to-Sector fiber plant still required

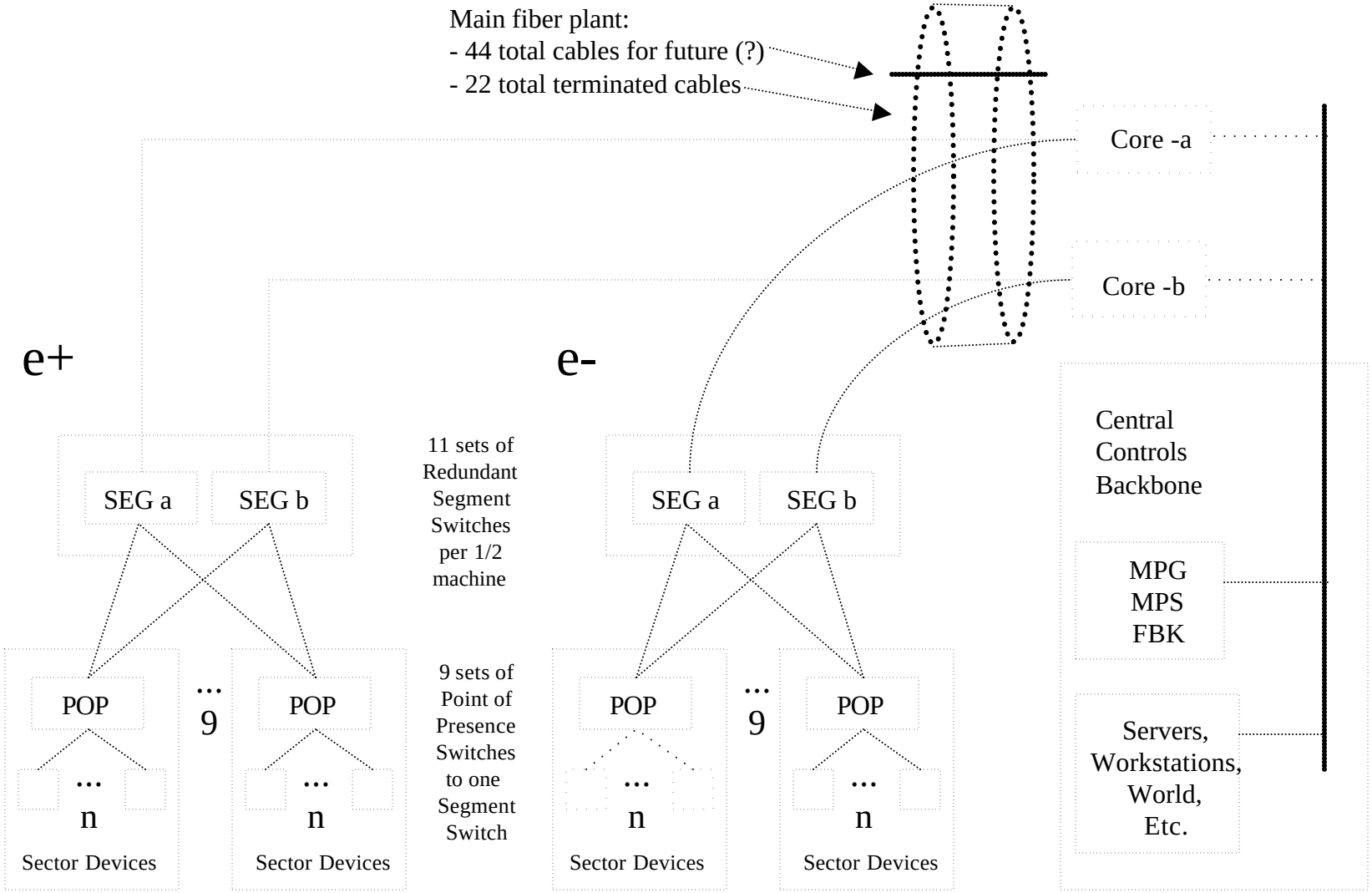
- Eliminate redundant switches(s)
  - OK if switching fabric bandwidth can handle full load
  - add hot swap power supplies and extra controller for reliability
    - 22 * $50K = $1.1 M vs. $1.54 M for 44 redundant switches

Distributed Backbone



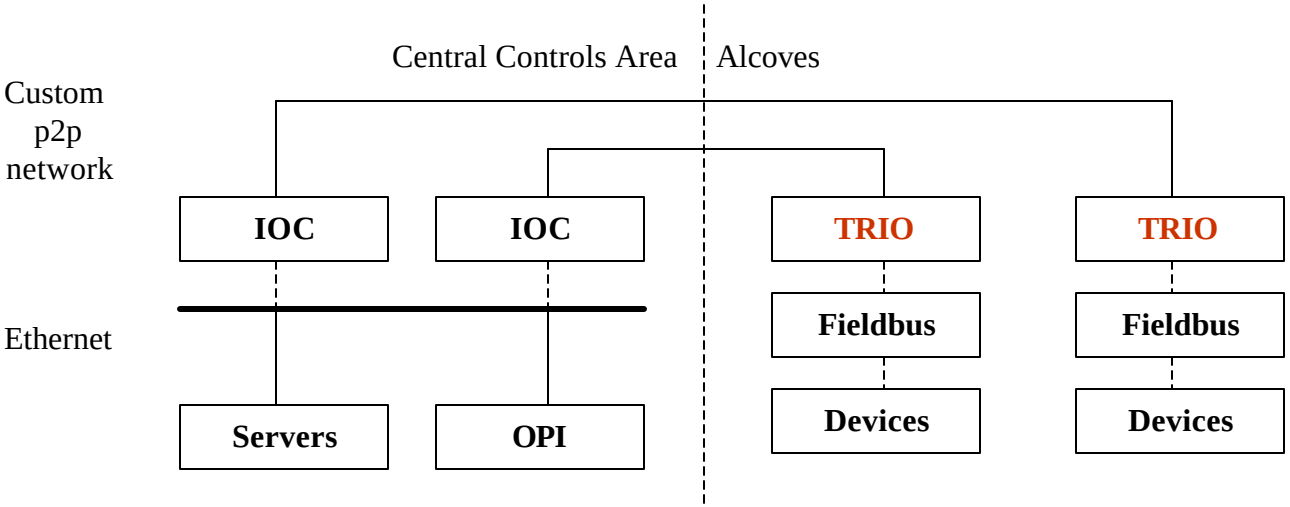
Numbers are required fiber count (no spares)

Distributed Backbone



Trio Architecture

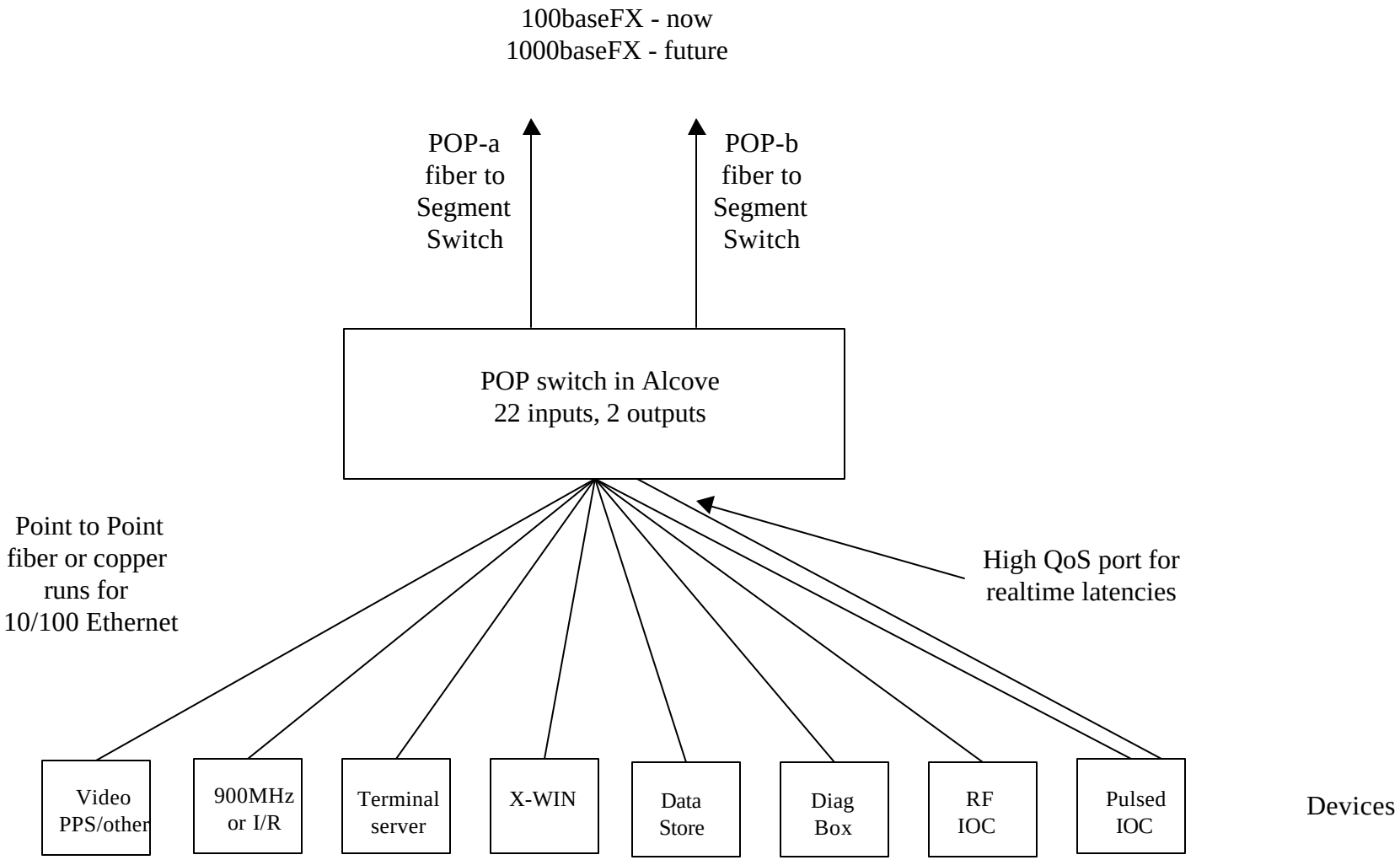
- Remember: there is a point to point fiber link between every remote TRIO assembly and it's MCC located IOC.



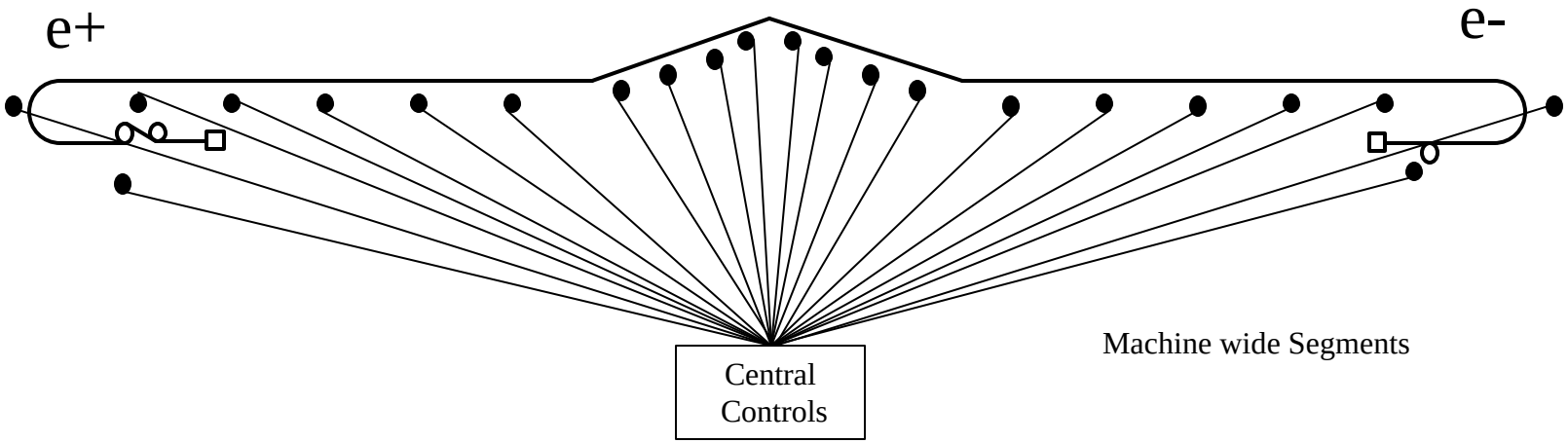
Ideas Revisited

- Service more sectors with a single switch
  - 9 sectors is stretching Gigabit Ethernet already
  - Beam Delivery layout was selected by power and environment
- Reduce IOC count
  - double count of LLRF crates (IOCs) is 230 or about $2.35M
- More Information Required:
  - Actual TRIO costs
  - Closer study of central area server hardware, counts, and costs

More Sectors per Switch



Distributed Backbone

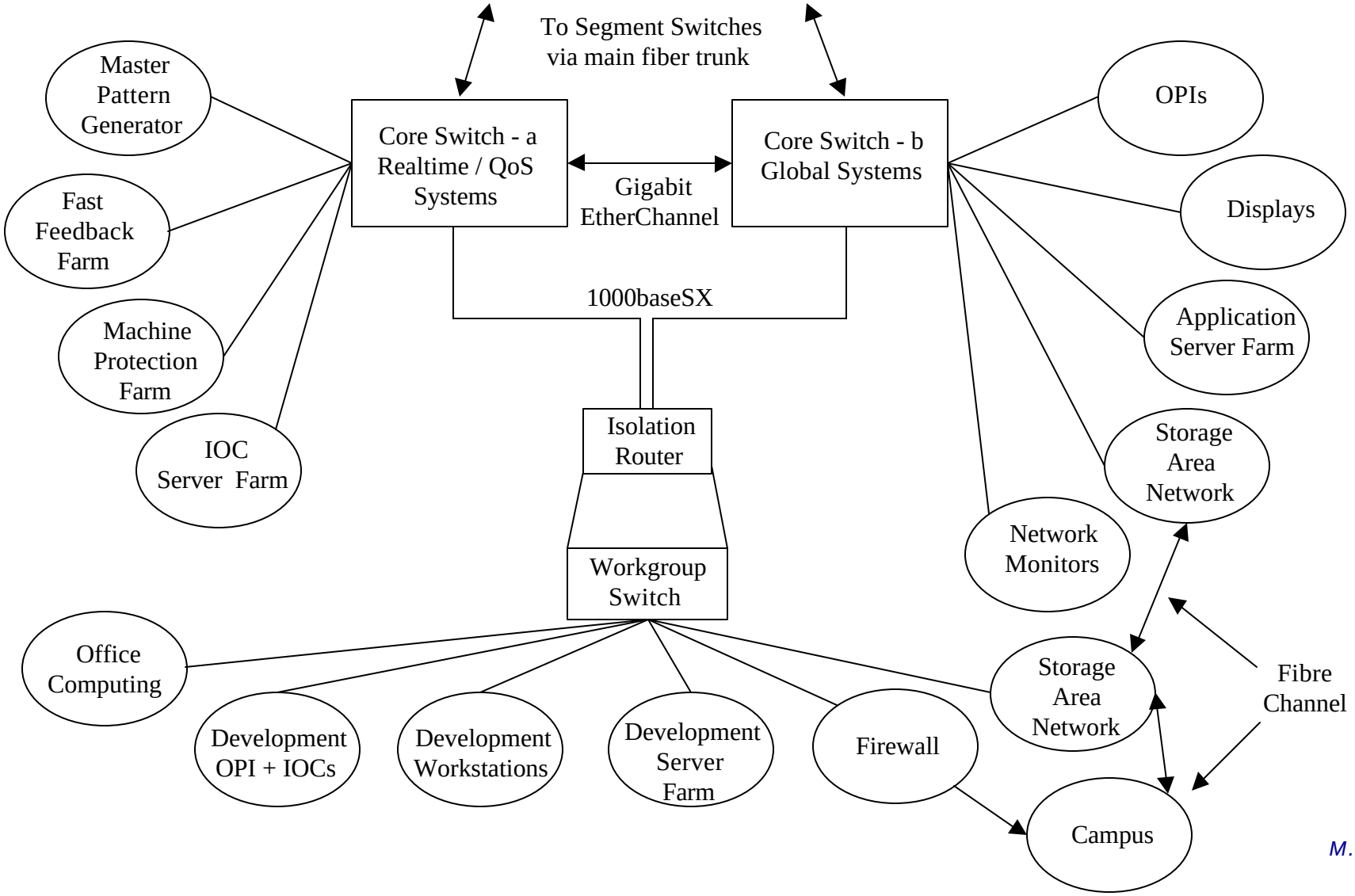


NLC Network Device Scale

- See additional slide for $2.35M double costing

- 380 Pulsed Control System IOCs (282 linac + 98 other)
- 192 Slow Control System IOCs
  - Actual IOC count depends on exact local I/O counts
- 828 Linac RF IOCs (pulsed) (oops! Used 46 RF sectors!)
- 60 Special purpose IOCs (some pulsed)
  - Damping rings, diagnostic sections, Master Pattern Generator, Feedback, Machine Protection System
- Total ≅ 1500 IOCs
- More detailed method comes up with 1200 non-RF IOCs
  - abut 10 per sector and 2 in each of the 100 other areas

Central Controls Area



POP Switch Costs

POP Switch (189)

10/100bTX: $4280 each = $809K

100bFX: $10,280 each = $1.9 million

WS-C2924MF-XL Catalyst 2924MF XL, 12 port 100bFX Port Switch with two module slots $8000

WS-C2924M-XL-EN Catalyst 2924M XL, 24 port 10/100 Switch with two modules slots (Enterprise Edition) $4000

WS-C2924M-XL- Catalyst 2924M XL, 24 port 10/100 Switch with two modules slots $3000

WS-X2922-XL-V Catalyst 2900 XL 2-port 100bFX Switch Uplink Module. ISL/802.1Q capable- MTBF 602,722 hours $1000

WS-X29??-XL-V Catalyst 2900 XL 1-port 1000bFX Switch Uplink Module. ISL/802.1Q capable $1000

CON-SNT-PKG4 Catalyst 2900 Series XL SMARTnet Maintenance $280

3.46 x 17.5 x 12 in - Operating temperature: 32 to 122° F (0 to 50° C)

MTBF 188,350 hours (21 years)

Power consumption (with modules): 170W maximum; 580 BTU per hour

http://www.cisco.com/warp/public/729/c2900xl/2912_ds.htm

http://www.cisco.com/warp/public/729/c2900xl/literature.shtml

Segment Switch Costs

- Segment Switch (44)
  - Summary: 44 @ $35030 each = $1.54 million
  - WS-C5505 - Switch mainframe $1500
  - WS-C5008B - Catalyst 5000/5505 AC Power Supply $1250
  - WS-X5530-E1 - 5002/5000/5500 Sup Engine III w/out Uplink Module $14000
  - WS-U5536-GELX -2-port 1000Base-LX SMF Uplink Mod For Supvr Engine III $6000
  - WS-X5201R -12-port 100bFX Backbone Switching Module $10000
  - WS-C5599 - Catalyst 5500 Rack Mount Kit $80
  - CON-SNT-PKG13 - Catalyst 5000 and 5505 SMARTnet Maintenance $2200
  - No cost added here for redundant power supplies or redundant supervisor modules
  - 1000BASE-LX/LH 10km - 9/10um Singlemode
  - Operating temperature: 32 to 104° F (0 to 40° C)- 10.4 x 17.21 x 18.14 in
  - 8.0A @ 100 VAC 60 Hz - Power consumption: 376 watts
  - http://www.cisco.com/warp/public/729/c5000/literature.shtml

Core Switch Costs

- Core Switch (2)
  - Summary: 2 @ $72,000 each + switch fabric upgrade $? + ZX 10Km (24*2K? = 48K) + extra interfaces ?$ = $288K
  - WS-C6509 Catalyst 6509 chassis (9-slot) (only in bundle with P/S and supervisor) $24,000
  - WS-CAC1300W/2 (spare) $4000
  - WS-X6K-SUP1-2GE Supervisor Engine 1, dual-port 1000BaseX uplinks spare $10,000
  - WS-X6408-GBIC 8-port Gigabit Ethernet module (16 port Q2/99) $10,000
    - WS-G5486 GBIC adapter Long wavelength/long haul 1000BaseLX/LH 10Km $1500
    - WS-G5487 GBIC adapter 1000BaseZX 70Km (availability not yet set 3/99) wag = $2000
      - 10 Km minimum with -8 db pads at either end
      - maximum of 12 ZX GBICs are supported in a switch chassis (and no redundant power)
  - WS-X6248-RJ-45 48-port 10/100 RJ-45 $13,000
  - WS-X6224-100FX-MT 24-port 100FX Multimode MT-RJ $15,000
  - WS-G5484 GBIC adapter Shortwave 1000BaseSX 200 to 550 meters $500
  - WS-F6020 Layer 2 Switching Feature Card ? - Software SFC6K-SUP-5.1.1-CSX ?
  - Supports 128 GE ports per switch using all eight module slots (plus 2 on supervisor)
  - 25.2 x 17.2 x 18.1 in. - 1800W - System heat dissipation 6140 Btus/hr
  - http://www.cisco.com/univercd/cc/td/doc/pcat/120.htm
  - http://www.cisco.com/warp/public/729/c6000/
  - http://www.cisco.com/univercd/cc/td/doc/product/lan/cat6000/6000hw/supereng/install/02instal.htm
  - http://www.cisco.com/univercd/cc/td/doc/product/lan/cat6000/6000hw/supereng/install/01oview.htm