Data Center Design Considerations

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Contributors:

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- **William Baxter, Telecommunications Practice Leader**
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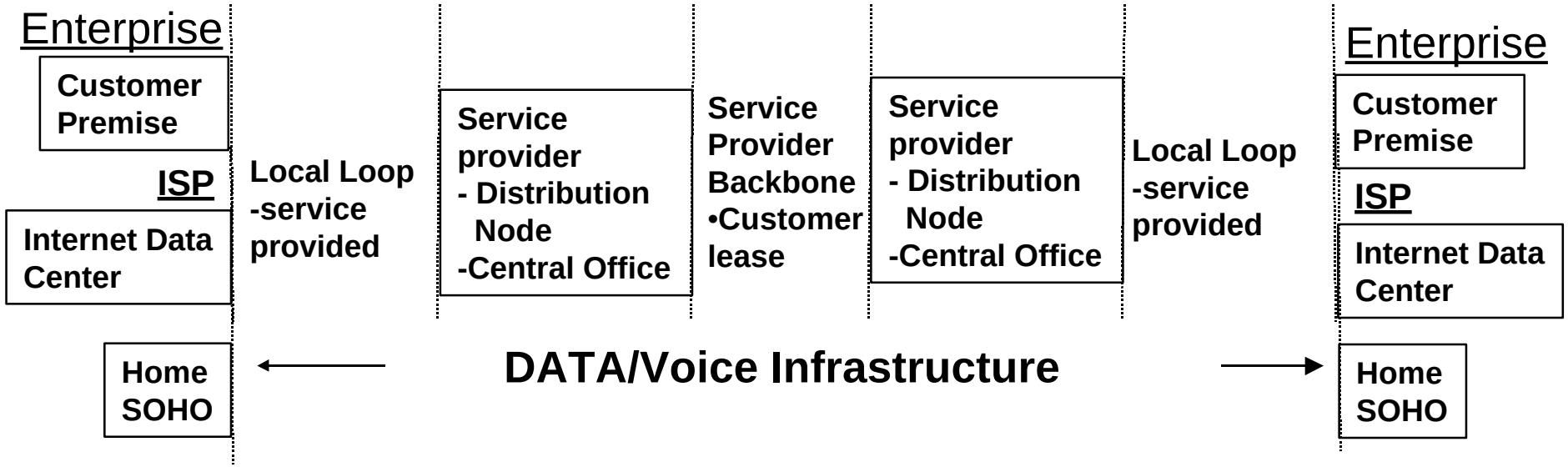
Telecommunication Infrastructure



- **Data Center**
- **EFM- Access Networks**

Campus Network: California State University Data Center -80's

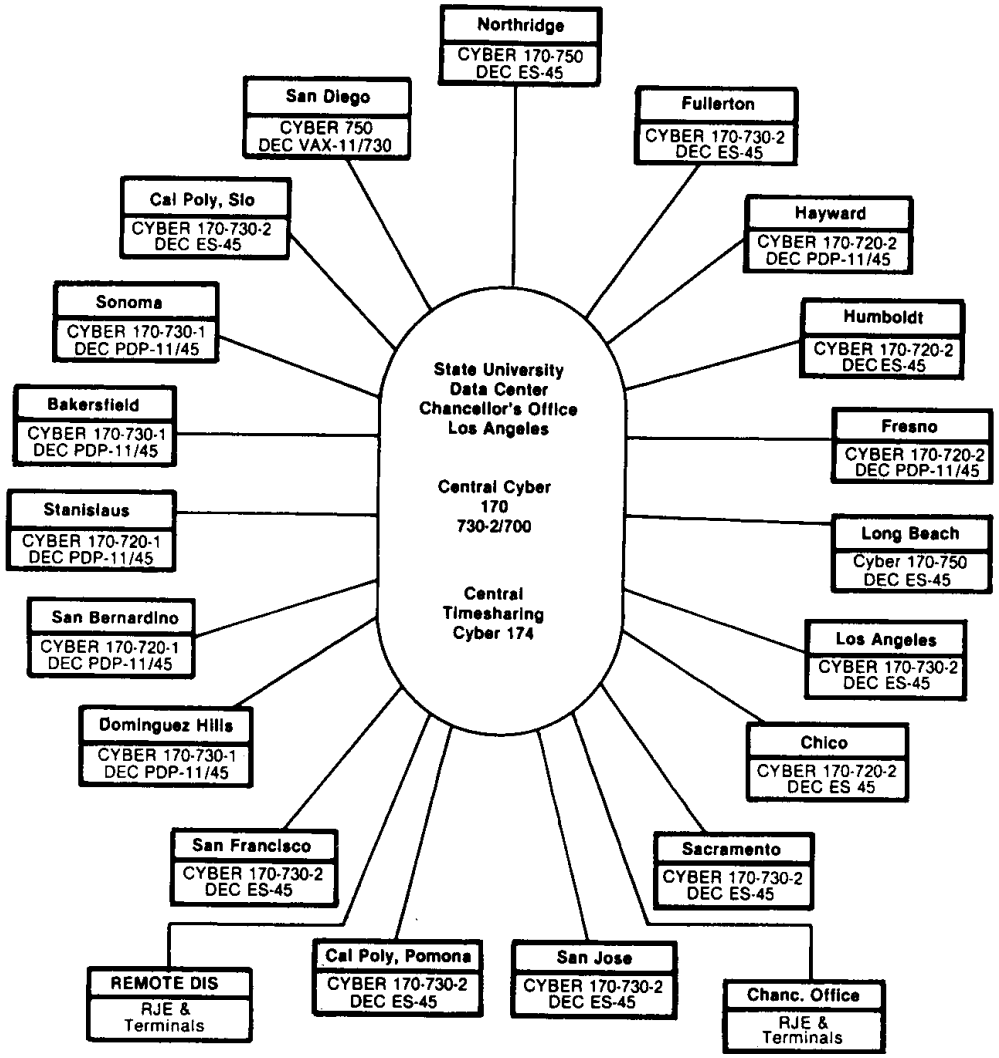
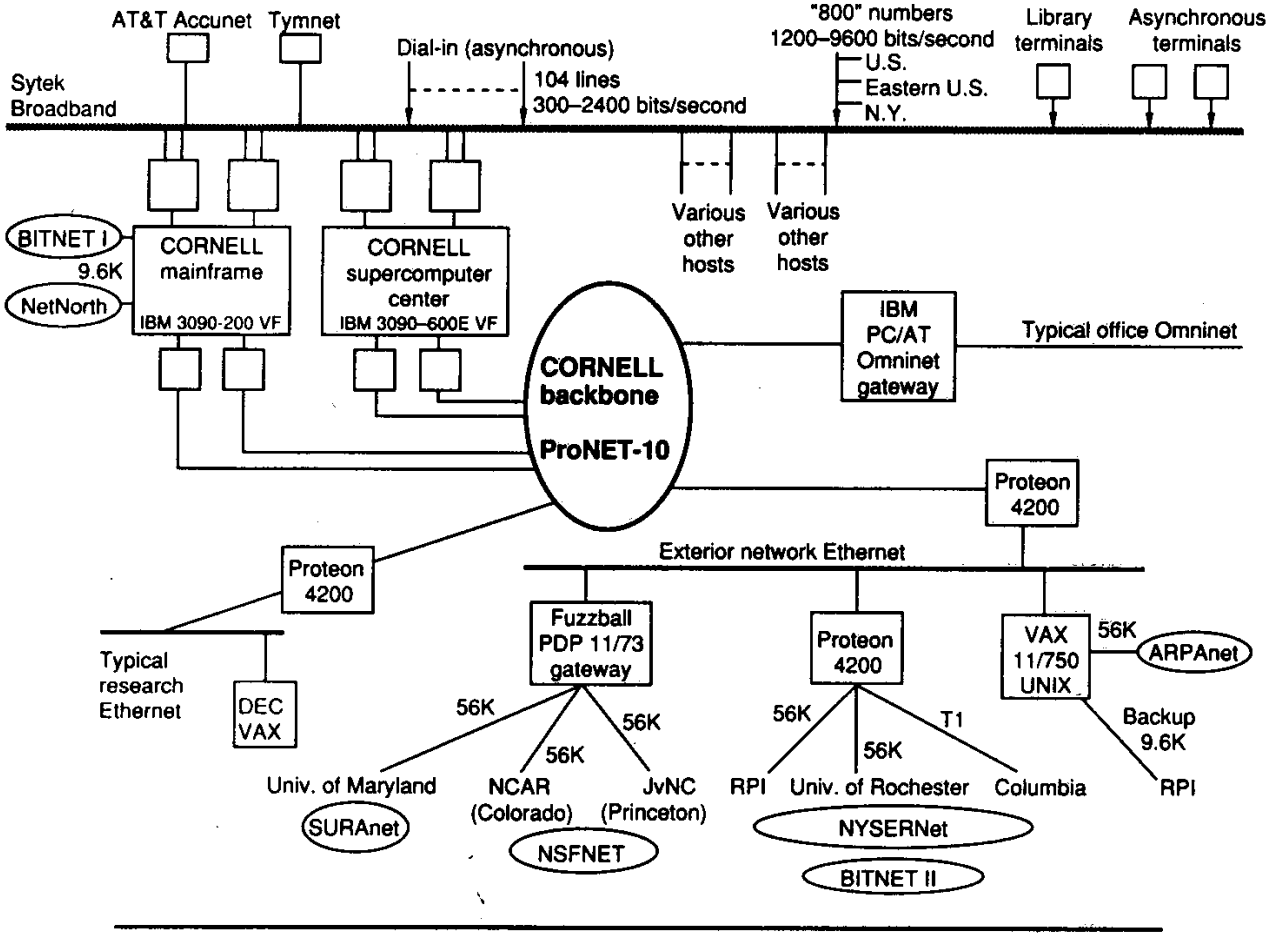


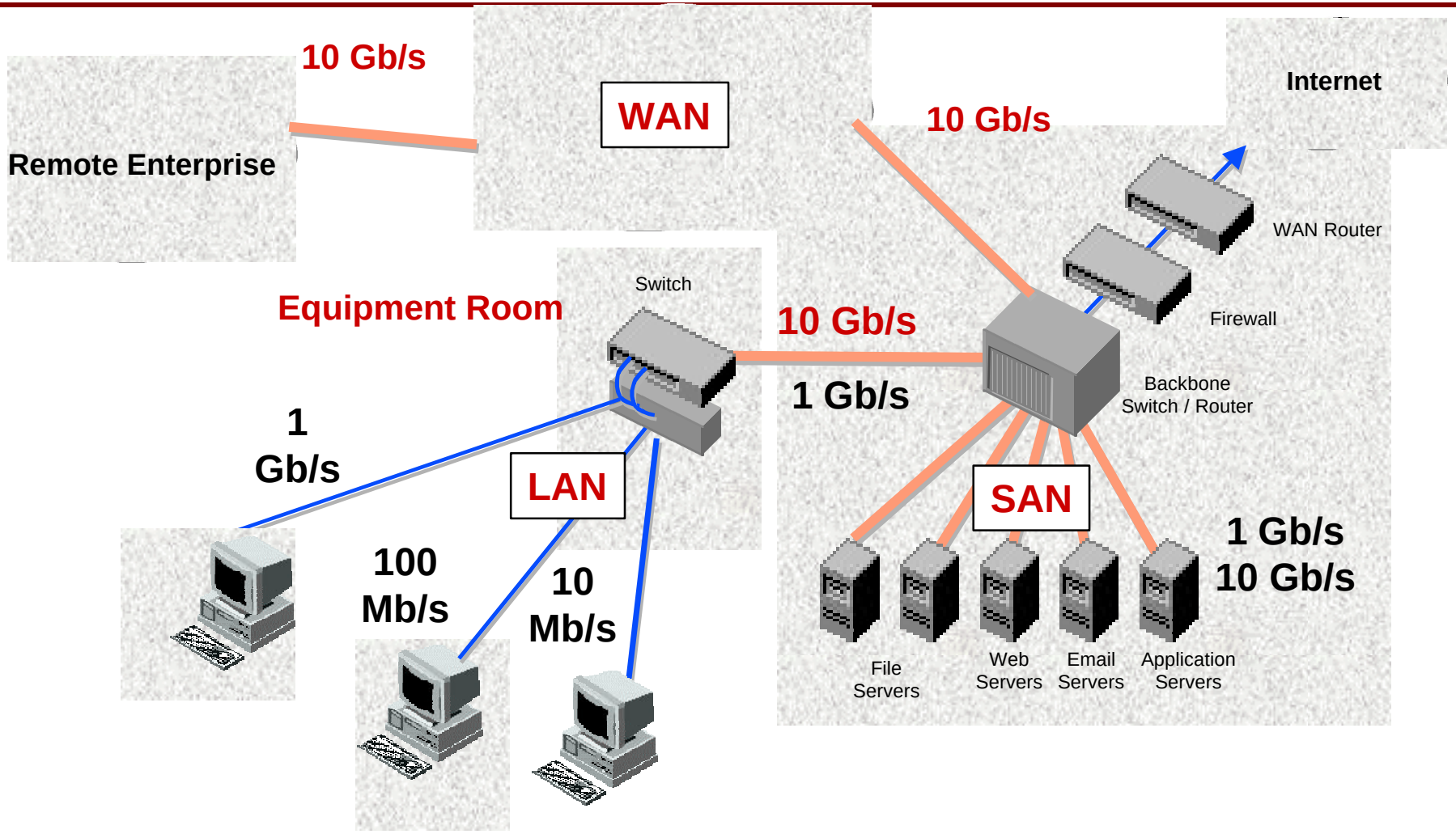
Figure 4. *The California State University System computing network.*

Cornell Campus Network, -87



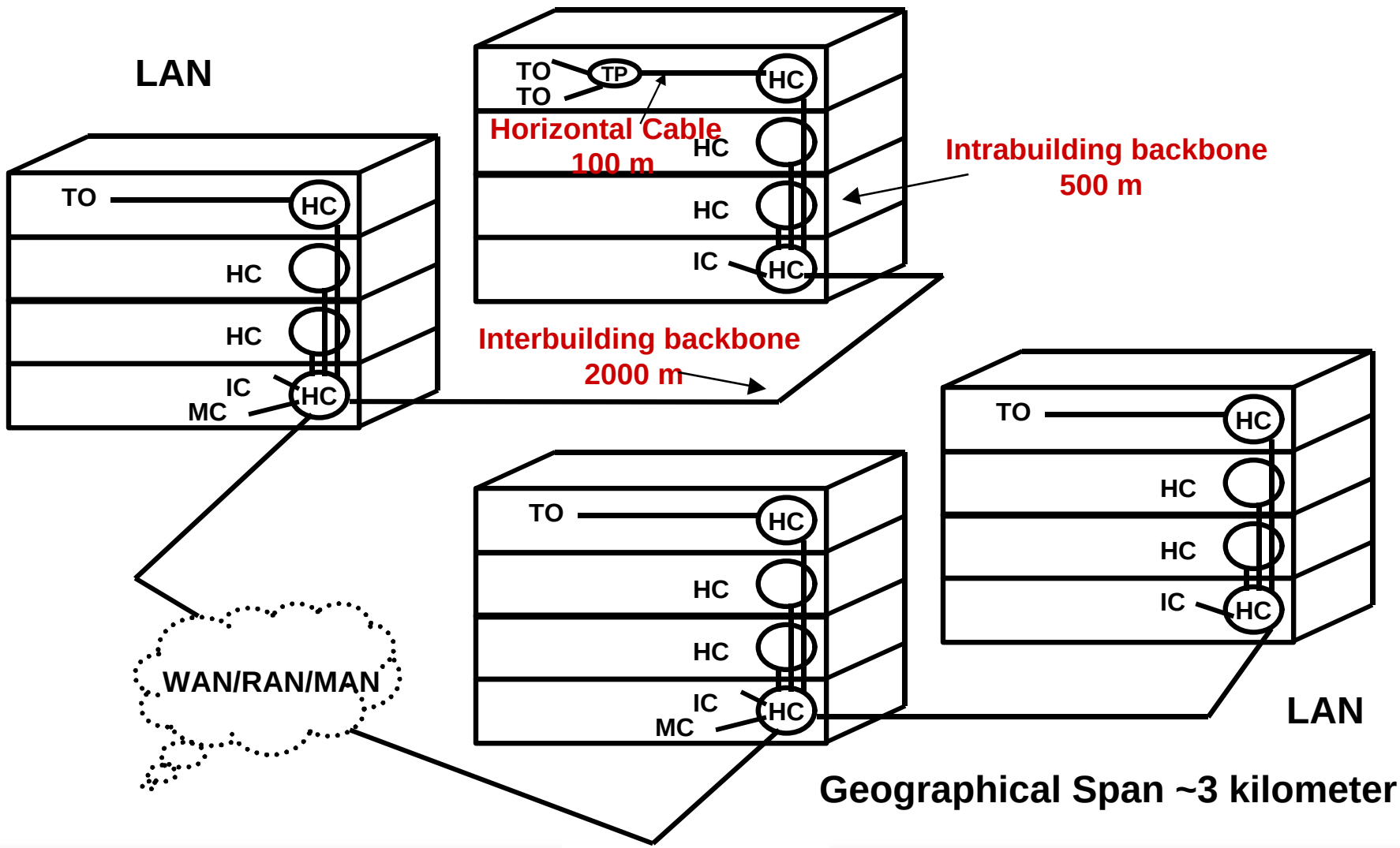
The Cornell campus network in September, 1987.

Ethernet Networking -LAN/WAN/SAN



10GBASE-T

Generic Cabling - ISO/IEC 11801 - TIA/EIA-568

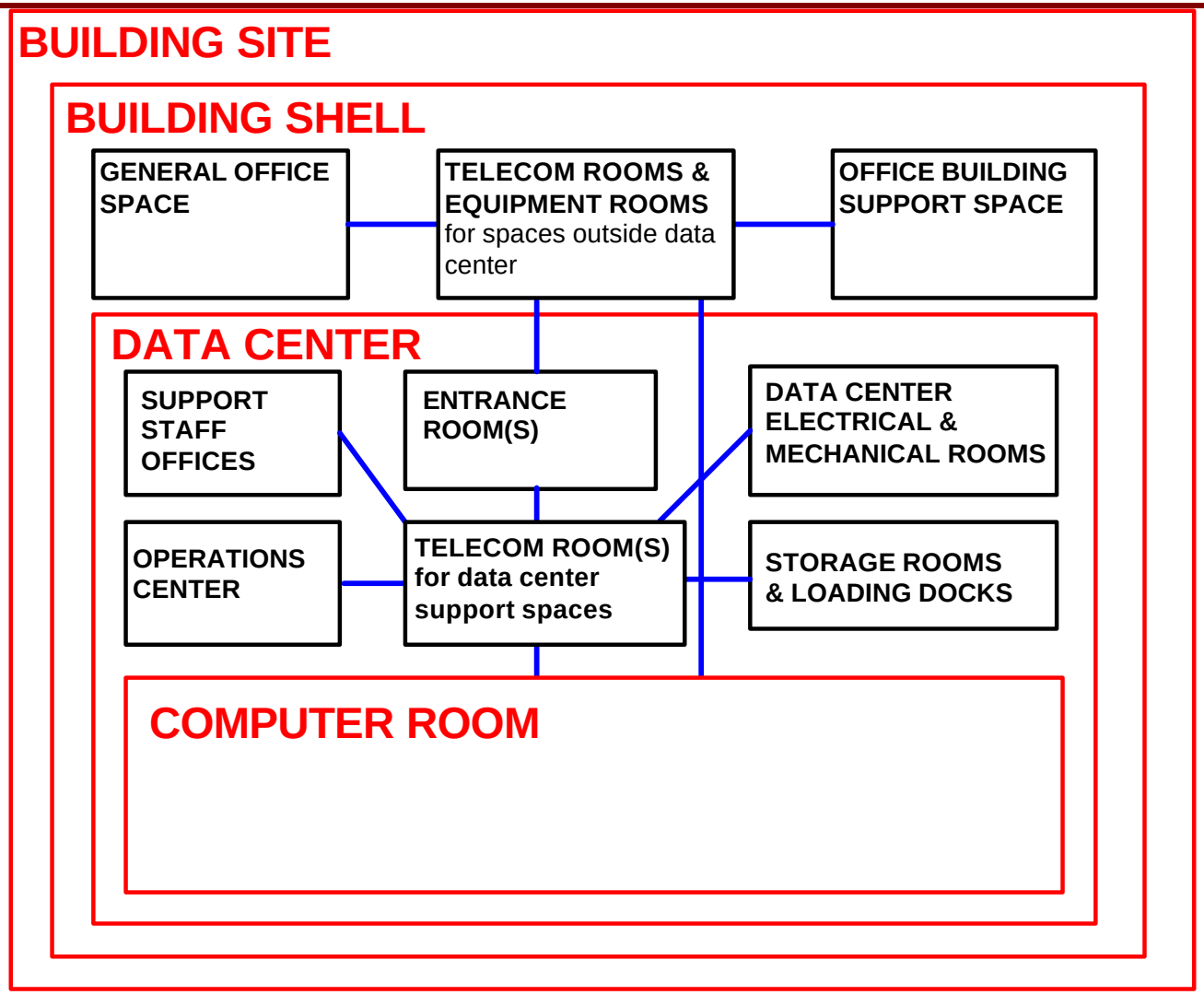


10GBASE-T

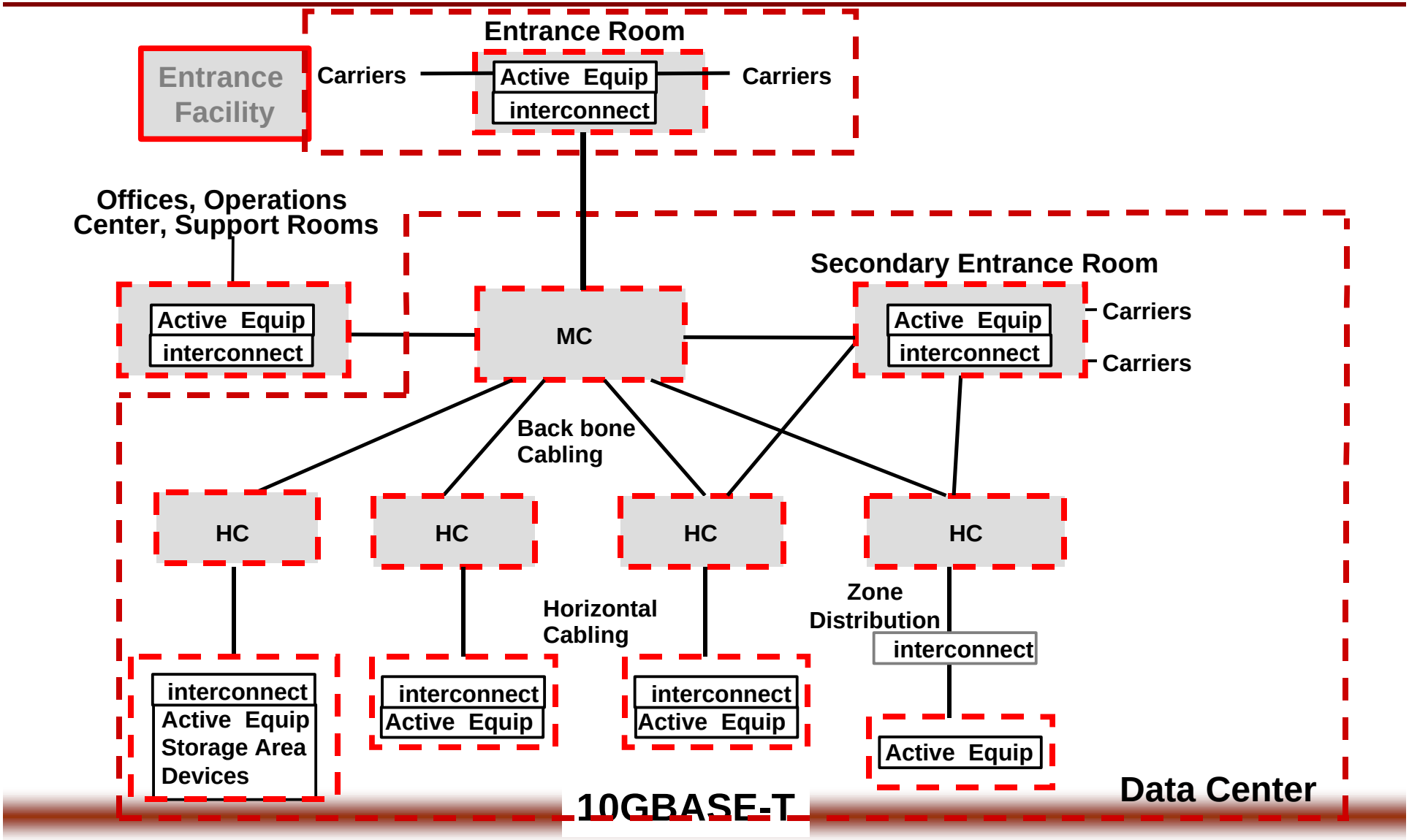
TIA-942-Data Center Standard

- The standard is being developed by the TIA/TR42
- Engineering Committee - subcommittee-TR-42.1.1 Network Distribution Nodes - Project No. 3-0092
- Participants include:
  - Architecture & Engineering Firms
  - Consultants
  - End Users
  - Manufacturers
- The standard will become TIA-942
- To be submitted for approval by ANSI and CSA
- Draft 3.0 - expected to be issued by TIA end of November
- Anticipated ballot closure early January

Data Center- Relationship of Spaces

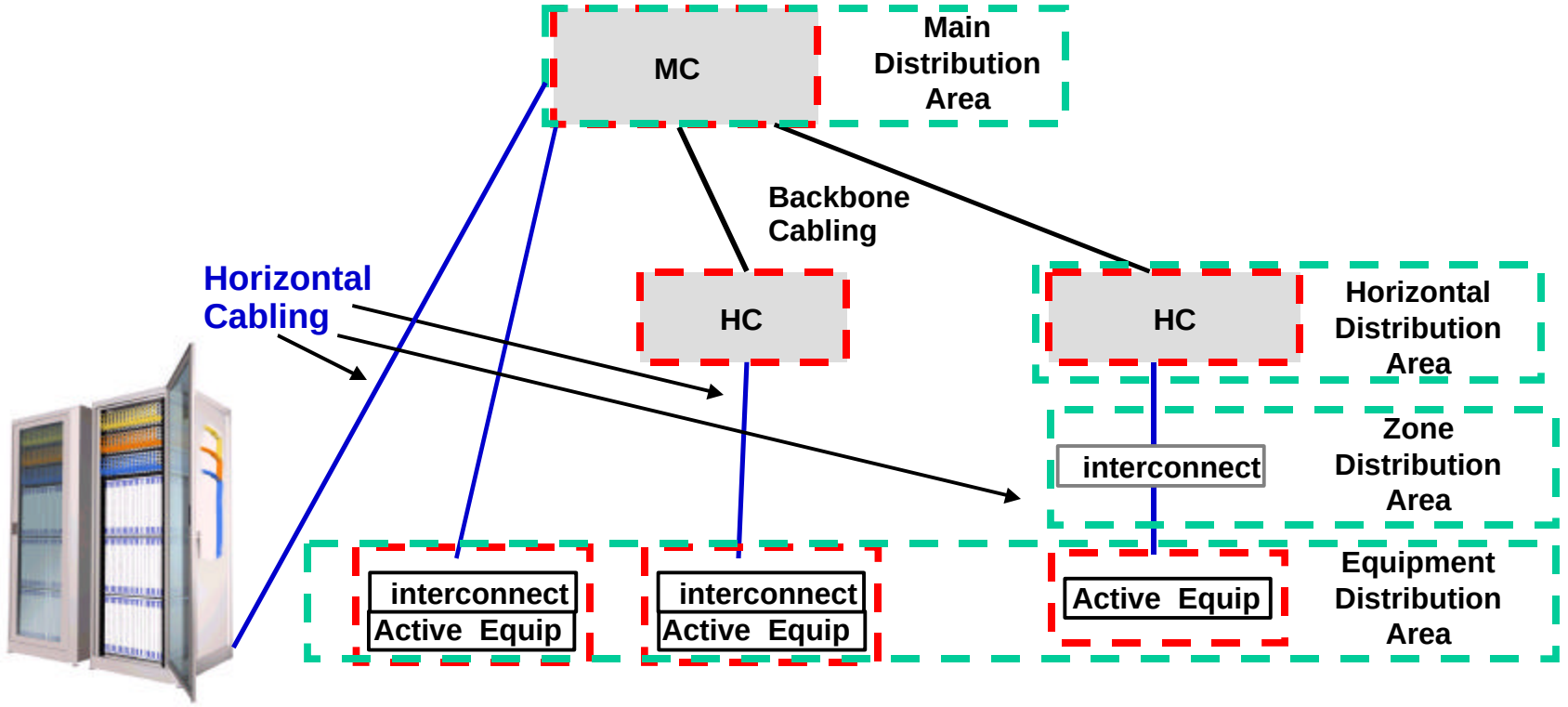


Data Center Topology



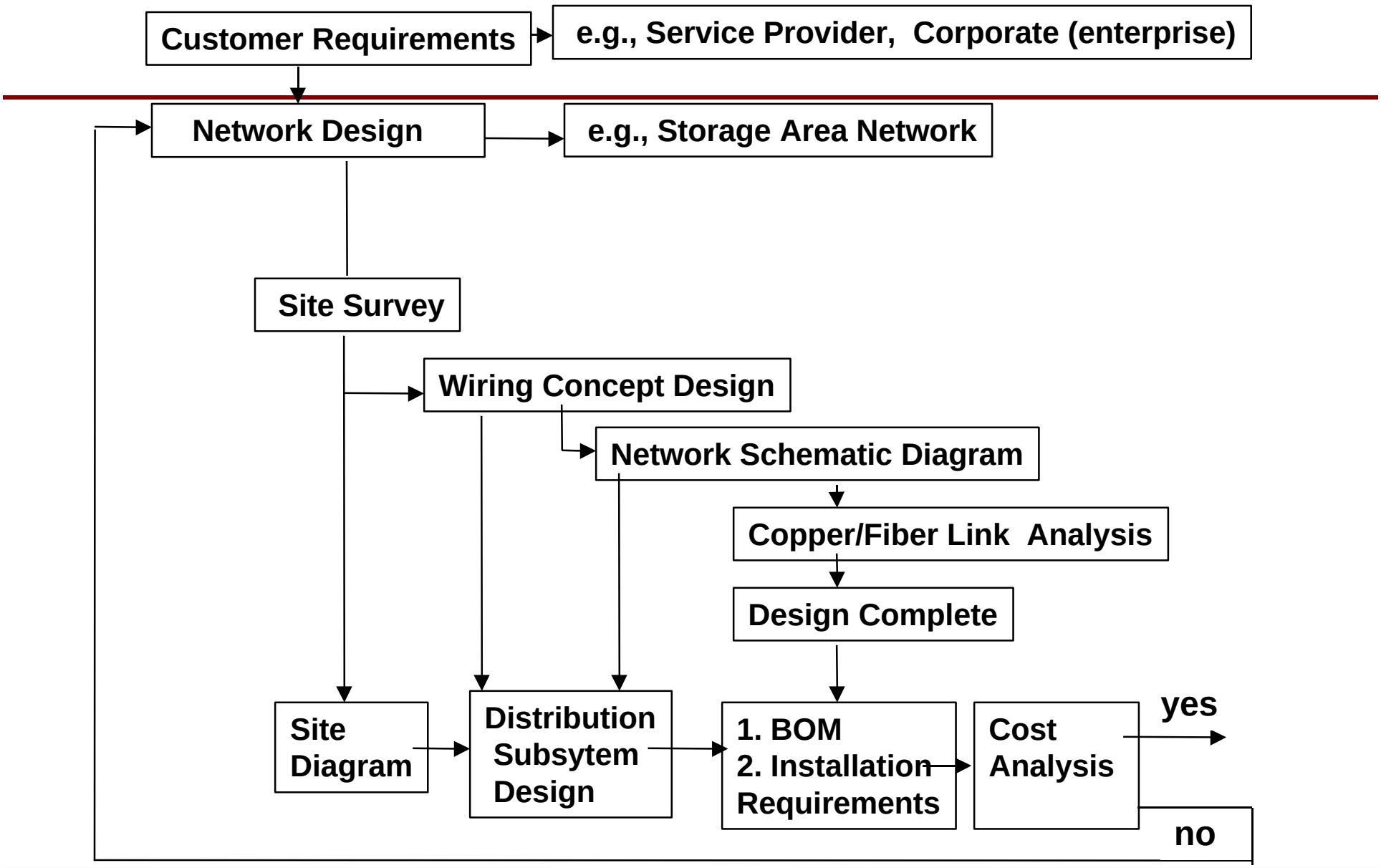
Data Center Horizontal cable distance

In a data center, horizontal cabling is the cabling from the horizontal cross-connect (in the main distribution area or horizontal distribution area) to the outlet in the equipment distribution area or zone distribution area.



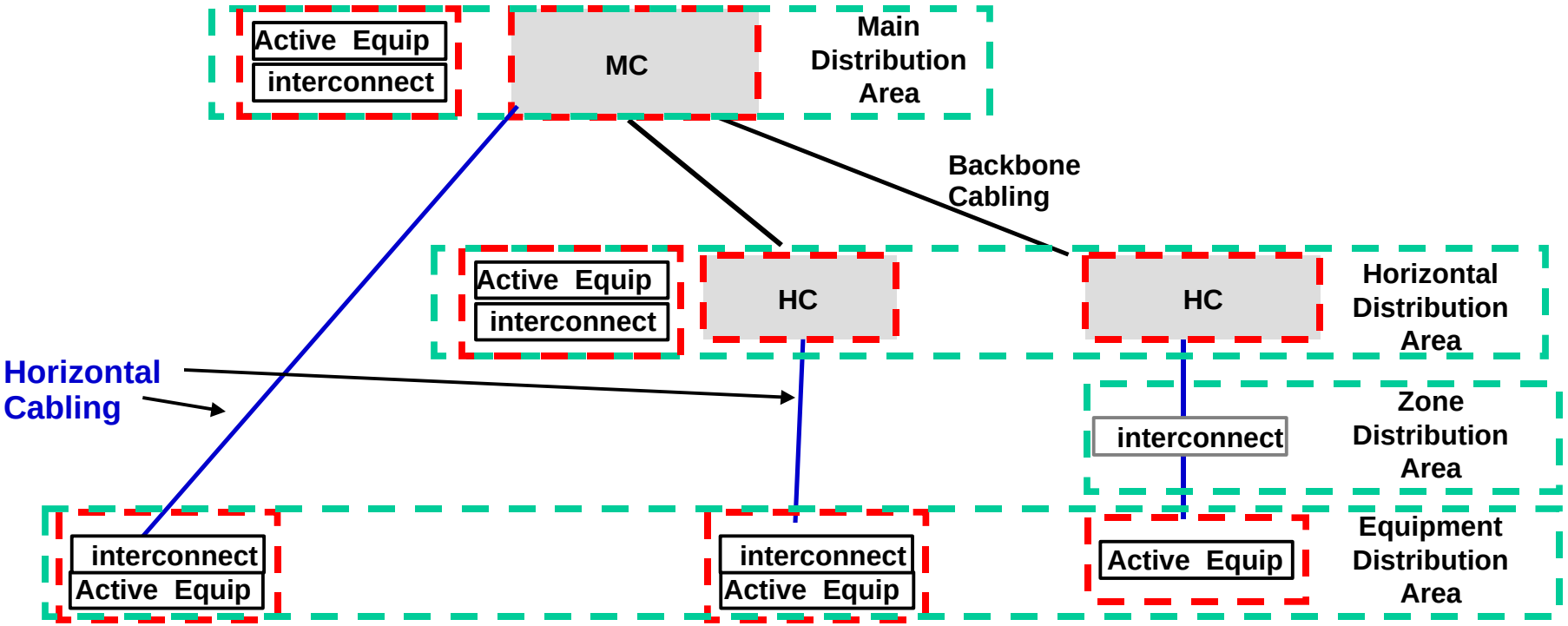
Physical Layer Design Considerations:

- **Active Equipment -**
  - Network topology, including operating distances and numbers of connectors
  - PMD types
    - + copper
    - + optics, mode conditioning patch cords
  - Equipment densities per linear rack unit .
- **Cabling**
  - Cabling components: cable, connectors, patch cords
  - installation: connecterization
  - cabling density
  - Field testing
- **Compatibility with existing (installed Network)**
- **Total Network Cost**


Customer Requirements
e.g., Service Provider, Corporate (enterprise)
Network Design
e.g., Storage Area Network
Site Survey
Wiring Concept Design
Network Schematic Diagram
Copper/Fiber Link Analysis
Design Complete
Site Diagram
Distribution Subsytem Design
1. BOM
2. Installation Requirements
Cost Analysis
yes
no

Data Center: Network Cabling Design Considerations

- **Placement of active equipment and usage of interconnect versus cross-connects:**



Data Center: Horizontal Cabling Length: J&M Consultants (Engineering Firm)

- Data centers recently built by (J&M) type and size
  - 93% of data center horizontal cables are <= 45m
  - 99% of data center horizontal cables are <= 55m

Data Center Type	Data Center Size (sq ft)	0-30 m	31-45 m	46-55m	56-75m	76-100m
Corporate	5000	100%	0%	0%	0%	0%
Corporate	8000	90%	10%	0%	0%	0%
Govt	10000	70%	20%	10%	0%	0%
Corporate	20000	70%	25%	5%	0%	0%
Corporate	20000	90%	9%	1%	0%	0%
Internet	40000	60%	35%	5%	0%	0%
Corporate	45000	65%	25%	8%	1%	1%
Internet	60000	35%	48%	15%	1%	1%
Internet	60000	55%	35%	8%	1%	1%
Internet	80000	55%	35%	8%	1%	1%
Internet	100000	55%	35%	8%	1%	1%
Average		67.7%	25.2%	6.2%	0.5%	0.5%

Source: Jonathan Jew, J&M Consultants, Co-chair TR42.1.1- Data Center Standard

Data Center: Horizontal Cabling Length: Mazzetti & Associates (Engineering Firm)

- Data centers recently built by (M&A) type and size
  - 83% of data center horizontal cables are <= 45m
  - 94% of data center horizontal cables are <= 55m

Data Center Type	Data Center Size (sq ft)	0-30 m	31-45 m	46-55m	56-75m	76-100m
Corporate	5000	100%	0%	0%	0%	0%
Corporate	10000	8%	23%	38%	31%	0%
Financial	25000	74%	19%	6%	1%	0%
Corporate	30000	99%	1%	0%	0%	0%
Internet	60000	47%	46%	5%	1%	1%
Internet	75000	44%	50%	4%	1%	1%
Internet	120000	35%	32%	27%	5%	1%
Average		58.1%	24.4%	11.4%	5.6%	0.4%

Source: Phil Isaak, Associate, Senior Communications Engineer,
Mazzetti & Associates (Engineering Firm)

Data Center: size versus percentage built

Data Center Size (sq ft)	Size Category	Percentage built
</= 5000	small	50%
</=15000	midrange	30%
>15000	large	20%

- 80% of data centers recently built by (J&M) are ≤ 15000 sq ft

Source: Jonathan Jew, J&M consultants, Engineering Firm

Data Center Size (sq ft)	Size Category	Percentage built
</=5,000	small	30%
</=15,000	midrange	45%
>15,000	large	25%

- 75% of data centers recently built by (M&A) are ≤ 15000 sq ft

Source: Phil Isaak, Associate, Senior Communications Engineer,
Mazzetti & Associates (Engineering Firm)

Data Center Cabling by Category: Percentage Usage (avg.)

Category	1999	2000	2001	2002	2003
Category 5	10.00	1.67	0.33	0.33	0.33
Category 5e	66.67	60.00	55.00	46.67	35.00
Category 6	23.33	38.33	44.67	53.00	64.67

Source:

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Data Center Cabling: Pathways and Spaces

Under Floor Space

Overhead Cable Tray

Example of Wire Basket Cable Trays For Cabling Under Raised Floor