



Structured Cabling Design for Large IT/Service Provider Data Centres

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Technical Sales manager, CDCE



Structured Cabling Design for Large IT/Service Provider DCs

Outline

Section		Key areas
<i>Industry Terms and Definitions</i>	▶	<ul style="list-style-type: none">• Cloud Grows at the Expense of Enterprise• Types of Facilities• ANSI/TIA-942-A
<i>Fiber Count... Cause and Effect</i>	▶	<ul style="list-style-type: none">• Network Speeds• Network Architectures• Oversubscription• Switch Configuration
<i>Deployment Methods</i>	▶	<ul style="list-style-type: none">• Data Centre Cabling Areas• Cabling Choices – High Fiber Count Trunks
<i>Example</i>	▶	<ul style="list-style-type: none">• Design Parameters• Determine Fiber Count• Mapping Logical Architecture - Structured Cabling Options• Value – Cable Tray• Value – “Would You Rather...”

Structured Cabling Design for Large IT/Service Provider DCs

Outline

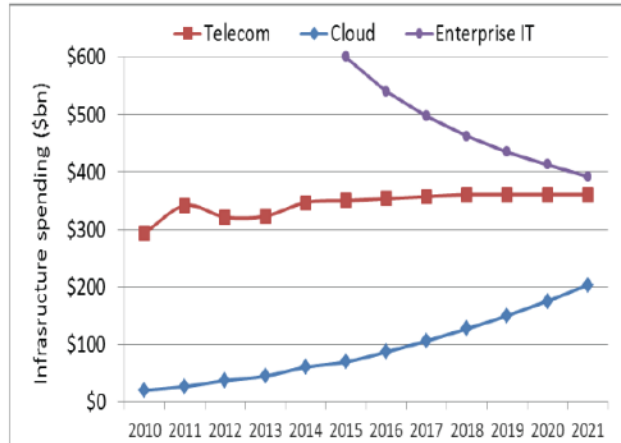
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Industry Terms and Definitions

Cloud Grows at the Expense of Enterprise

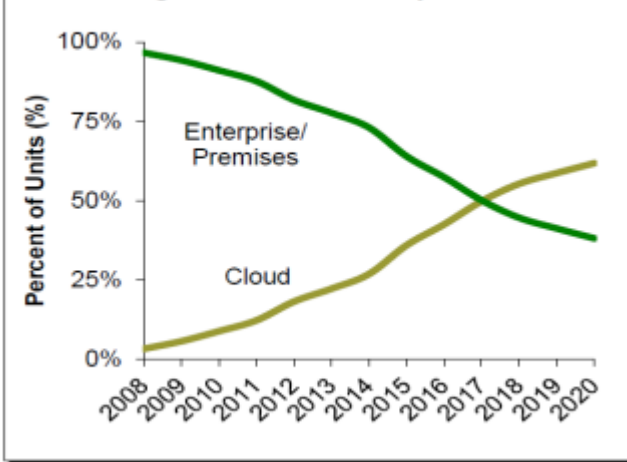
Equilibrium is Maintained

Figure 1-4: Projected growth of infrastructure spending by segment



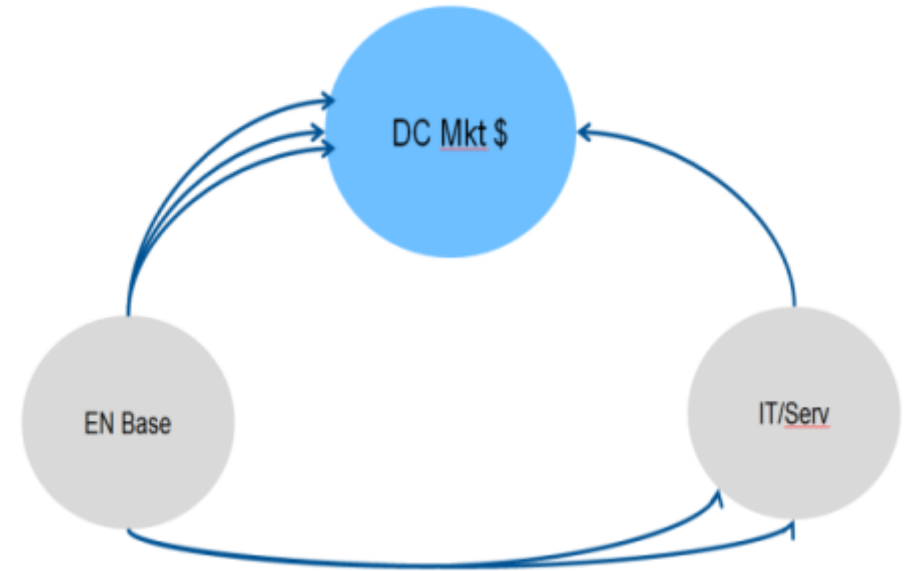
Source: LightCounting and Forbes

Figure 3: Server Shipments



Light
Counting

Dell Oro



Thoughts







Less Data Centres

Bigger Data Centres

Structured cabling requirements will change

Industry Terms and Definitions

Types of Facilities

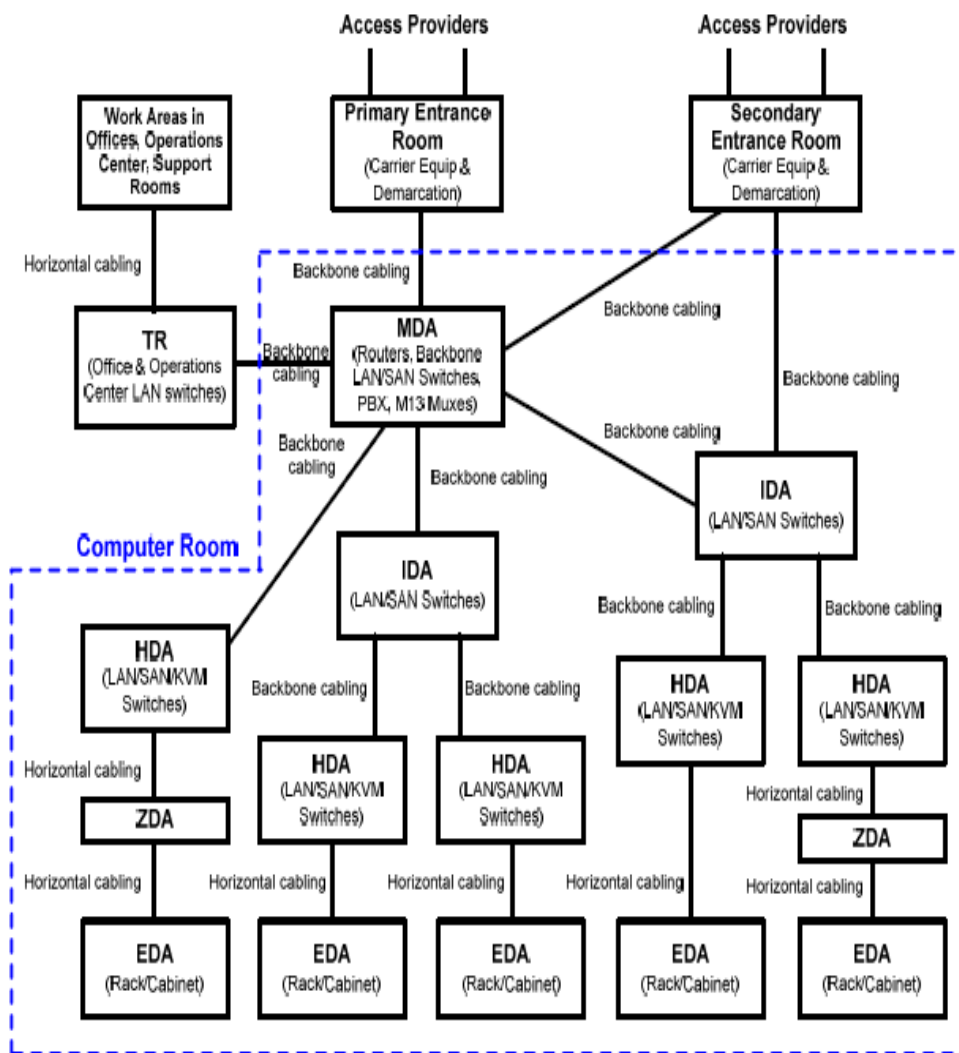
	DC Types		Description	Notes
IT/Service Provider	In-House (Enterprise)		<ul style="list-style-type: none"> Private Ownership Enterprise Large Organizations 	Design, build and operate their own facilities
	Colocation		<ul style="list-style-type: none"> Customers Own Hardware Outsource facility and internal systems maintenance 	A multi-tenant data centre, colocation space can be sold to enterprises by the rack, cabinet or cage
	Wholesale Data Centre		<ul style="list-style-type: none"> Sell Large Space Supplies Facilities Maintenance 	Sell data centre space in larger capacities vs. Colo
	Dedicated Hosting		<ul style="list-style-type: none"> Servers are NOT Shared Customer Controls Server 	The provider operates and/or rents server capacity to single customers
	Managed Hosting		<ul style="list-style-type: none"> Hardware Owned by Customer or Provider Many Services Provided 	The provider operates servers and storage for its customers
	Shared Hosting		<ul style="list-style-type: none"> Multi-tenant Applications 	Customers share server capacity

Industry Terms and Definitions



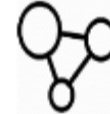


ANSI/TIA-942-A

ANSI/TIA-942-A

Telecommunications Infrastructure Standard for Data Centre



Source ANSI/TIA

	Key Areas	Insight
	Architecture	<ul style="list-style-type: none"> • Recommends a star topology architecture
	Cross Connect vs. Interconnect	<ul style="list-style-type: none"> • MDA, IDA, HDA, ZDA, EDA
	Redundancy Definitions	<ul style="list-style-type: none"> • Tiers (1-4)
	Zone Architectures	<ul style="list-style-type: none"> • Reduced topologies and consolidation points
	Energy efficiency	<ul style="list-style-type: none"> • Examples of routing cables and air flow contention

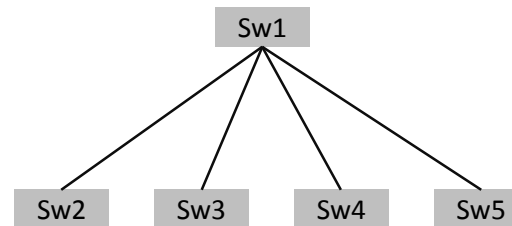
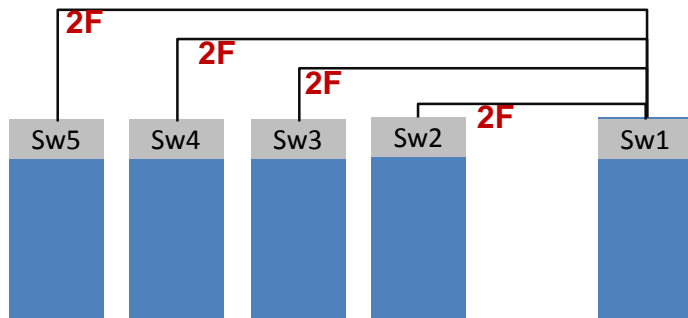
Structured Cabling Design for Large IT/Service Provider DCs

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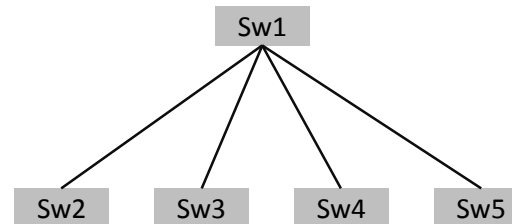
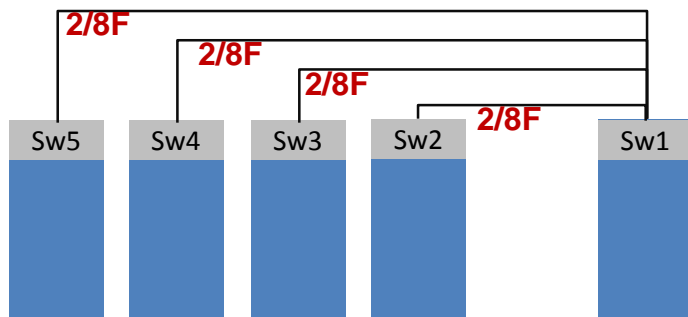
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Fiber Count... Cause and Effect Network Speeds

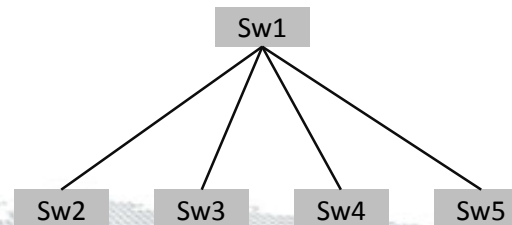
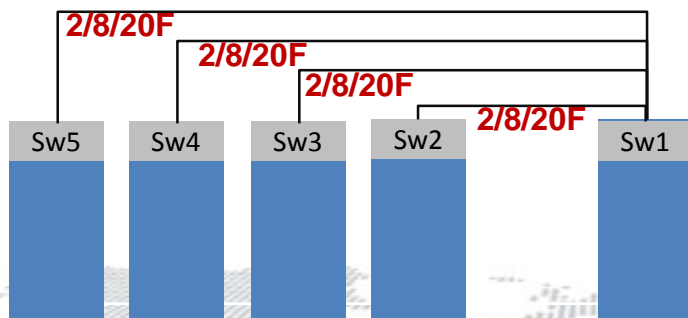
Physical	Logical	Speed
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10G



40G



100G

Thoughts

Network speeds affect Fiber counts

Check IEEE roadmaps for Ethernet

Check ANSI roadmaps for Fiber Channel

Fiber Count... Cause and Effect Network Architectures

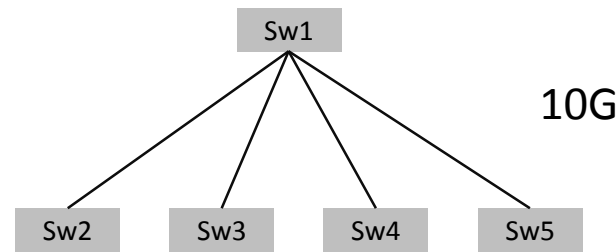
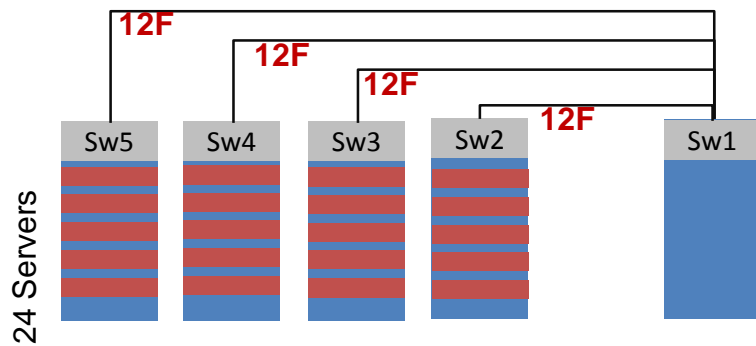
Physical	Logical	Speed
	<p>Pt to Pt</p>	<p>40G 8F</p>
	<p>Full Mesh</p>	<p>40G 8f</p>
	<p>Spine + Leaf</p>	<p>40G 8F</p>

Thoughts

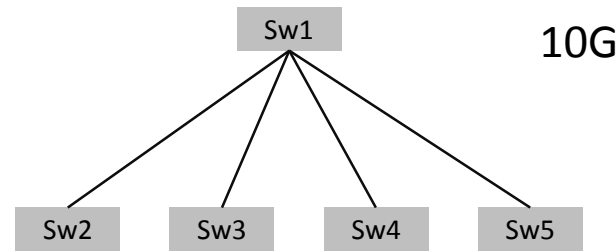
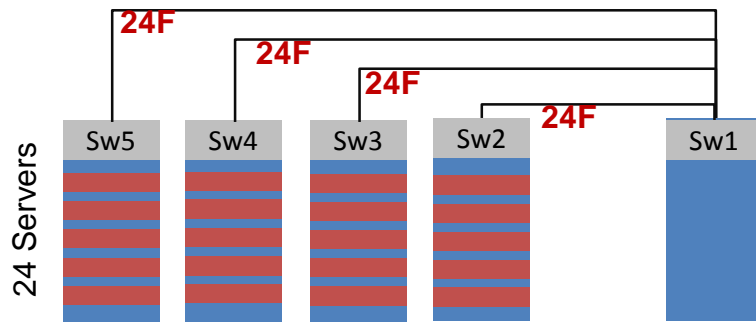
Redundancy increases
Fiber count

Fiber Count... Cause and Effect Oversubscription

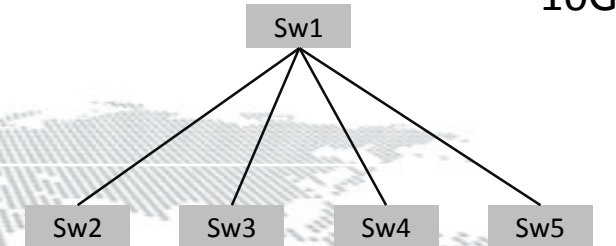
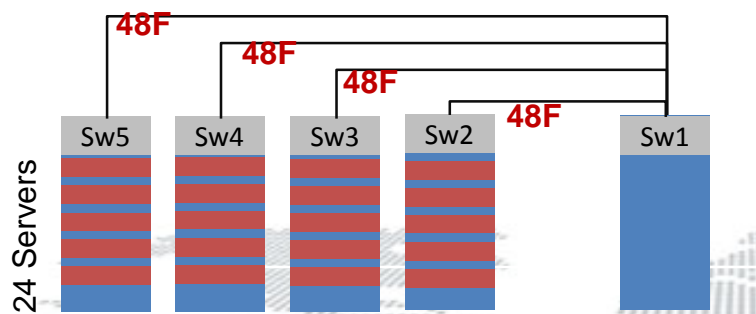
Physical	Logical	Speed	Over
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4:1
6 out
Sw1
24 in



2:1
12 out
Sw1
24 in
1:1



24 out
Sw1
24 in

Thoughts

The lower the oversubscription ratio...the higher the Fiber count

Driven by network traffic requirements

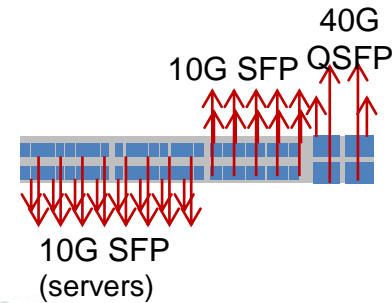
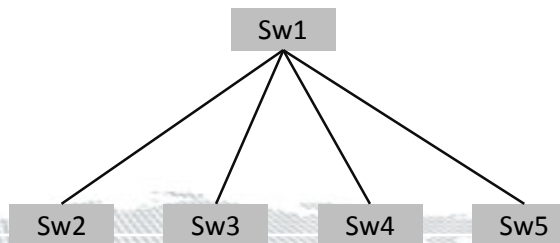
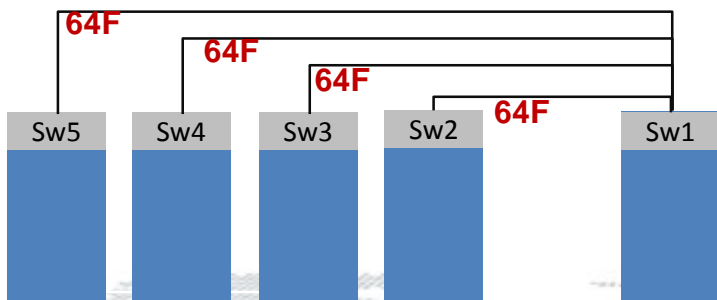
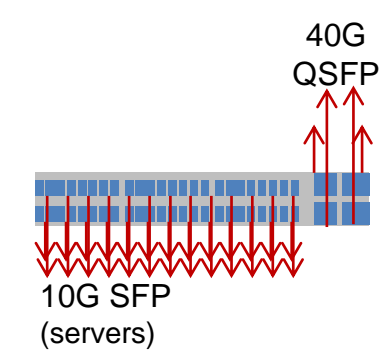
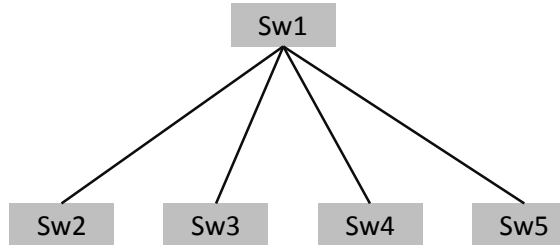
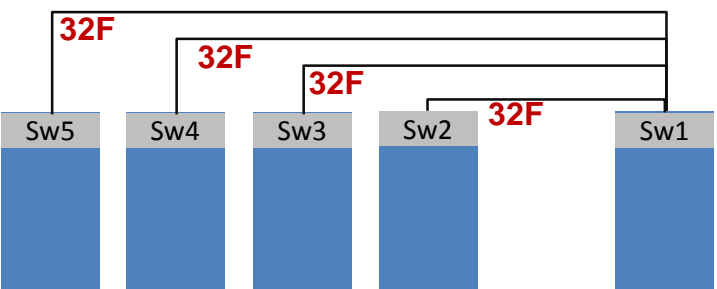
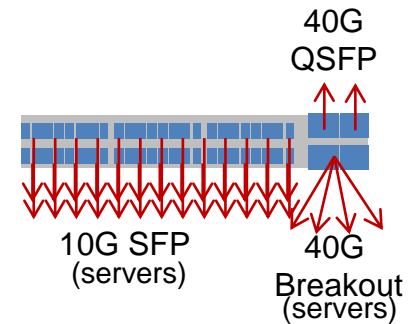
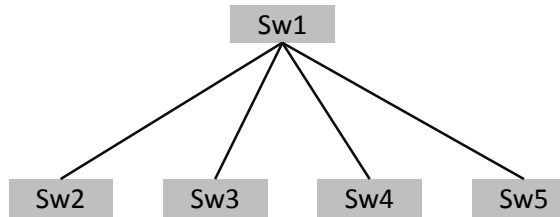
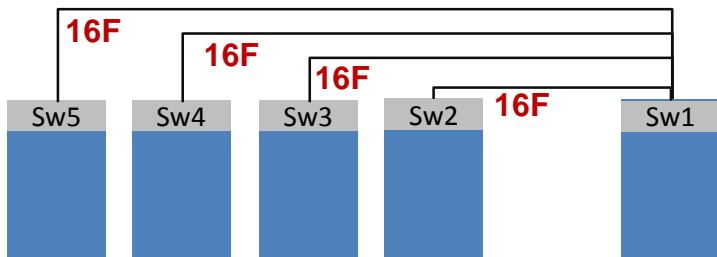
Fiber Count... Cause and Effect

Switch Configuration

Physical

Logical

Sw Config



Thoughts

Check Switch Config

Check Mfg Recommended Procedures

Understand Connector Form Factor

CORNING

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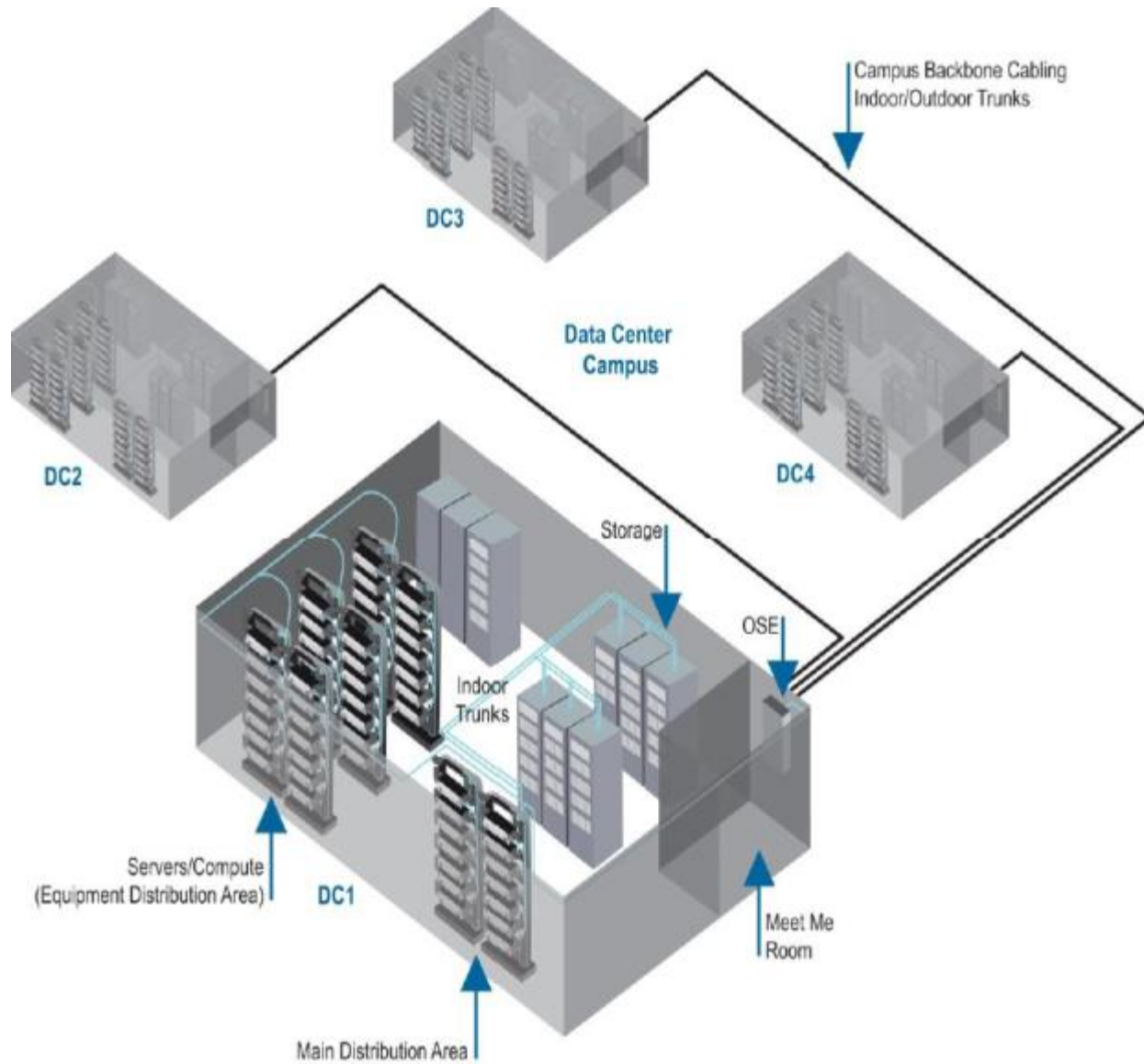
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Deployment Methods

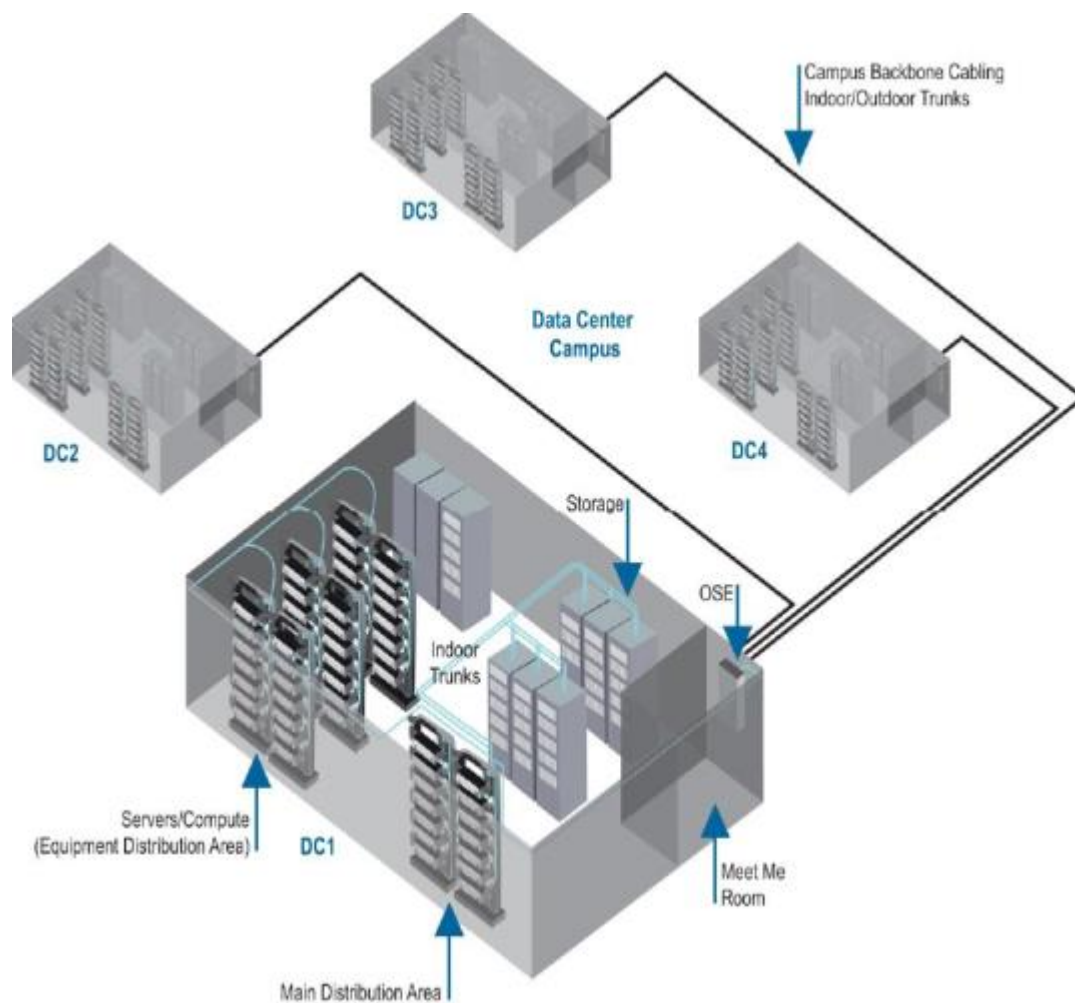
Data Centre Cabling Areas

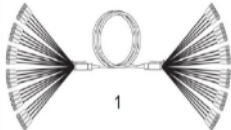
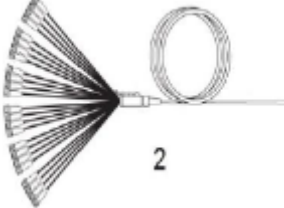



	Key Areas	Insight
	Meet Me Room	<ul style="list-style-type: none"> • Demarcation • X-Connect
	Main Distribution Area	<ul style="list-style-type: none"> • Racks/Cabinets • X-Connect
	Indoor Cabling	<ul style="list-style-type: none"> • Plenum Rated
	Indoor/Outdoor Cabling	<ul style="list-style-type: none"> • Plenum/Riser • Armored Cable
	OSE (Optical Splice Enclosures)	<ul style="list-style-type: none"> • Transition from Indoor to Outdoor Cables

Deployment Methods

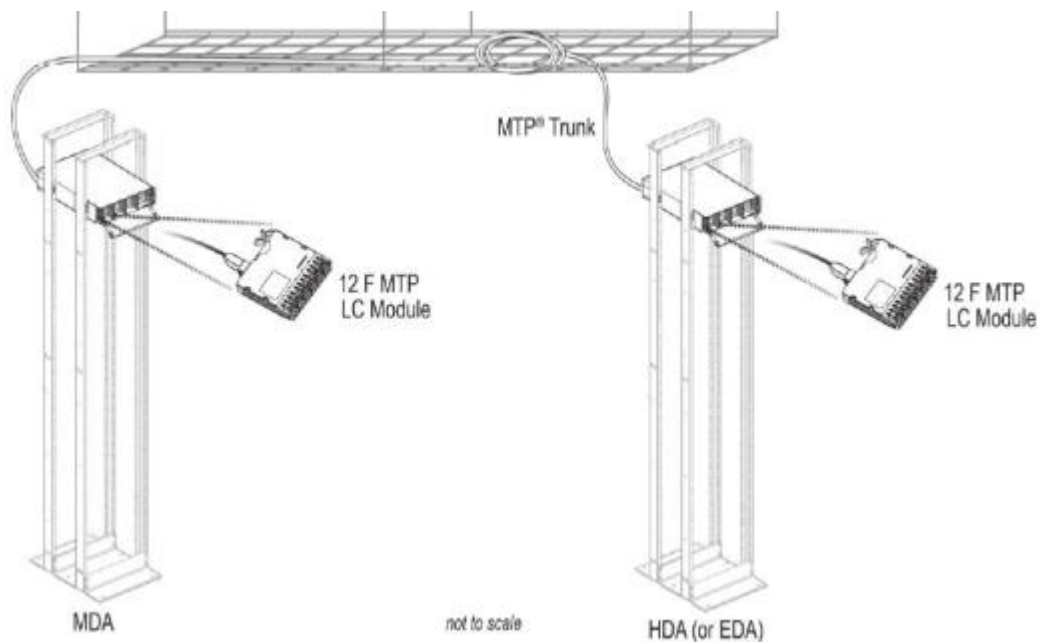
Cabling Choices – High Fiber Count Trunks

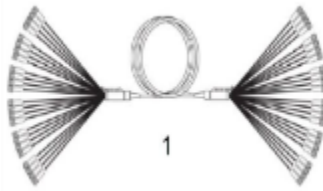


	Method	Insight
	Preterm Cables	<ul style="list-style-type: none"> Cables that are factory-terminated on both ends with MTP connectors (MTP Trunk Assemblies)
	Pigtail Cables	<ul style="list-style-type: none"> Cables that are factory terminated on one end with MTP connectors Field terminated at the blunt cable end
	Bulk Cable	<ul style="list-style-type: none"> Field terminated on both ends with MTP Splice-On Connectors

Deployment Methods

Cabling Choices – High Fiber Count Trunks

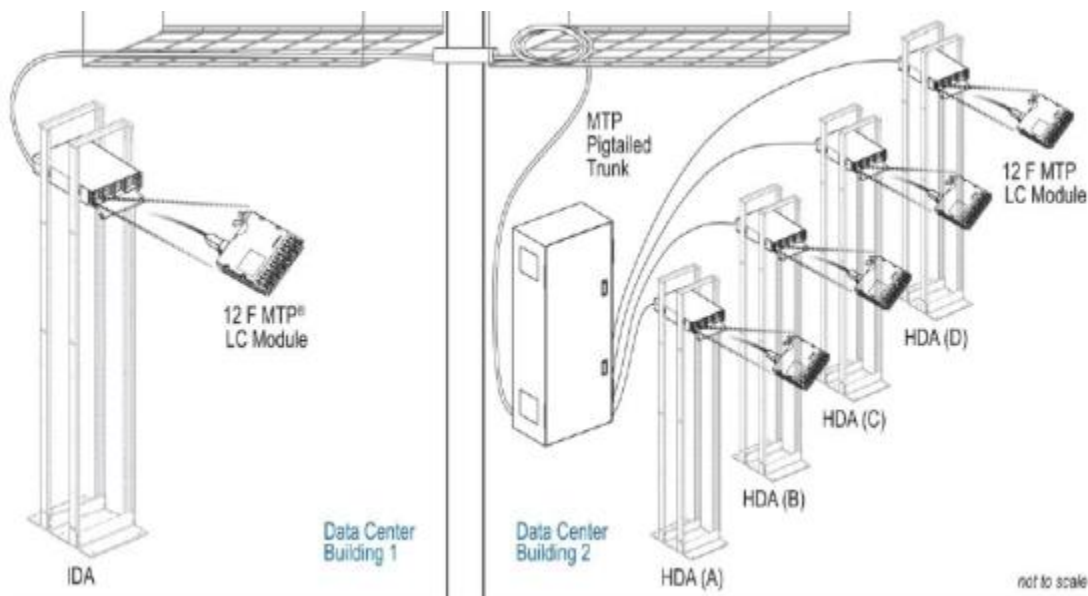


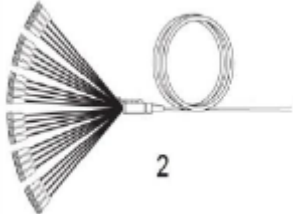
	Method	Insight
	Preterm Cables	<ul style="list-style-type: none">• Cables that are factory-terminated on both ends with MTP connectors• (MTP Trunk Assemblies)

- MTP Trunk Assemblies are used where the entire Fiber count is being deployed at a single location at each end of the link.
- Main Distribution Area (MDA) to the Horizontal Distribution Area (HDA) or to the Equipment Distribution Area (EDA).
- Typical deployment for indoor cabling

Deployment Methods

Cabling Choices – High Fiber Count Trunks

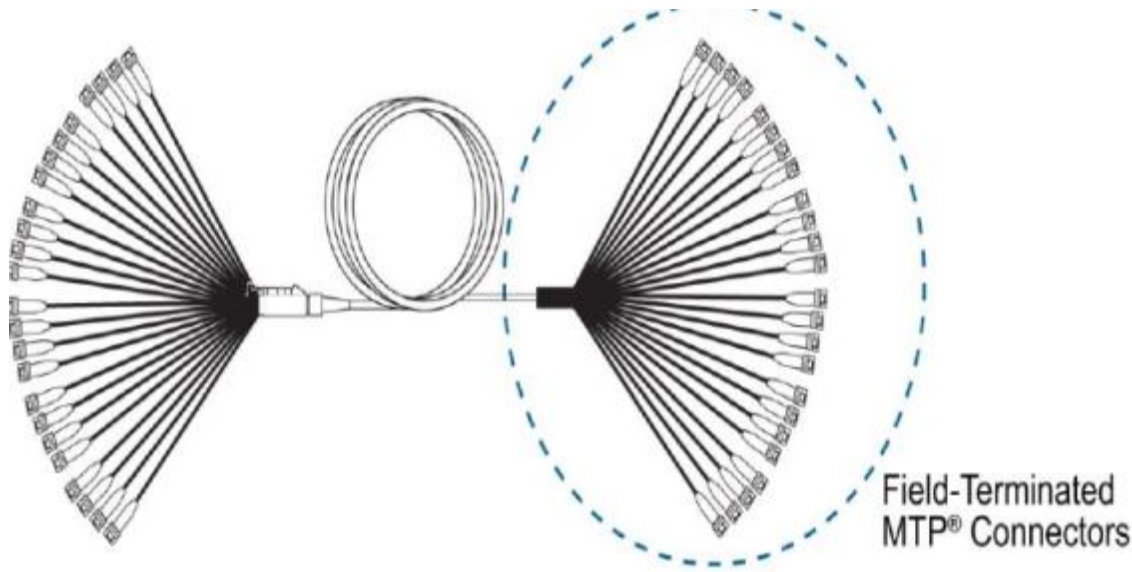


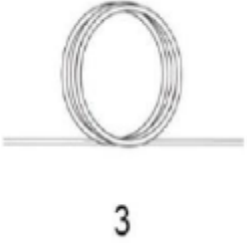
	Method	Insight
	Pigtail Cables	<ul style="list-style-type: none">• Cables that are factory terminated on one end with MTP connectors• Field terminated at the blunt cable end

- Environments where the pathway will not allow for a pre-terminated end with a pulling grip to fit through, such as a small conduit space
- Environments where high Fiber count assembly is deployed to consolidate inter-building Fiber connectivity
- Deployments when the exact pathway or route is not fully known prior to ordering of the assembly.

Deployment Methods

Cabling Choices – High Fiber Count Trunks

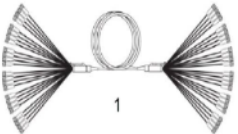
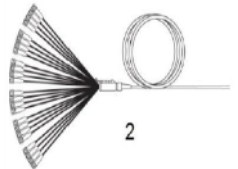

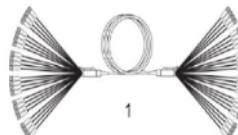
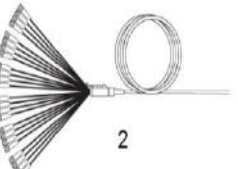




	Method	Insight
	Bulk Cable	<ul style="list-style-type: none">Field terminated on both ends with MTP Splice-On Connectors

- Field terminated solutions where cable designs require extremely high Fiber counts, such as 1728 Fibers
- Deployments where a centre-pull cable installation is required, bulk cable may be needed in order to meet pathway installation challenges

Deployment Methods

Cabling Choices – High Fiber Count Trunks

	Method	Envir	Connector	Counts	Trunk Type	Fiber Type
	Preterm Cables	Indoor	• MTP - MTP	<ul style="list-style-type: none"> • 144 • 192 • 216 • 288 • 432 • 576 	• Non-Armored	<ul style="list-style-type: none"> • MMF • SMF
	Pigtail Cable					
	Preterm Cables	Indoor/ Outdoor	• MTP - Fiber	<ul style="list-style-type: none"> • 144 • 216 • 288 • 432 • 576 • 864 	<ul style="list-style-type: none"> • Armored • Non-Armored 	<ul style="list-style-type: none"> • MMF • SMF
	Pigtail Cable					
	Bulk Cable	All	• Fiber - Fiber	• 144 to 1728	<ul style="list-style-type: none"> • Armored • Non-Armored 	<ul style="list-style-type: none"> • MMF • SMF

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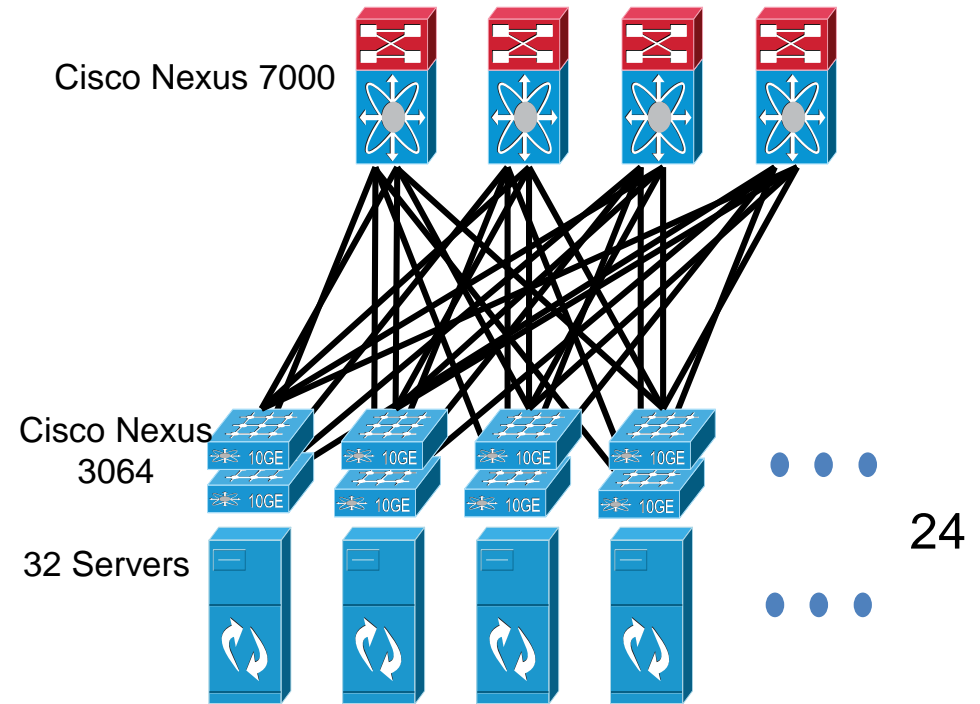
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Example Design Parameters

Cisco Spine Configuration/Device Count	4-way Spine
Number of Nexus 70xx Spine Switches	4x 7009 or 4x 7010
Number of N7K-F248XP-25 Blades per Chassis	7009: 7 7010: 8
Number of Ports Used for Leaf Switches per Chassis	7009: 336 7010: 384
Number of Nexus 3064 Leaf Switches	48
Number of Nexus 3064 Ports Facing Fabric	32
Number of Nexus 3064 Ports Facing Servers	32

Logical Architecture



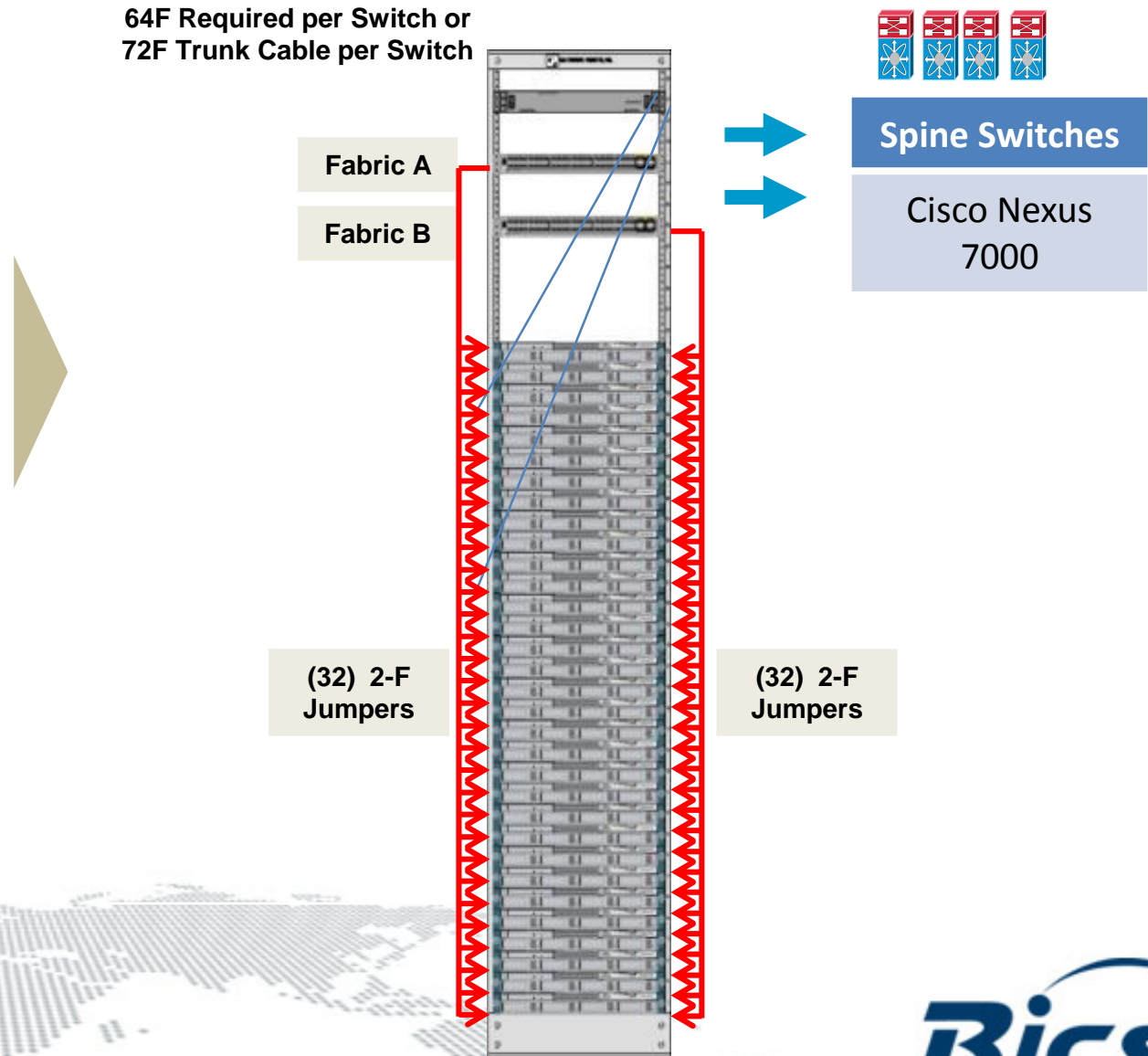
Example

Determine Fiber Count

Fiber Count Variables	Details
Cisco S+L Rules	4 Spine SW 48 Leaf SW
Cisco Leaf Rules	32 Fabric 32 Server
Architecture	S+L A + B Fabrics
Network Speed	10G
Oversubscription	1:1
Standard Fiber Counts	12F Div

Fiber Count / Rack

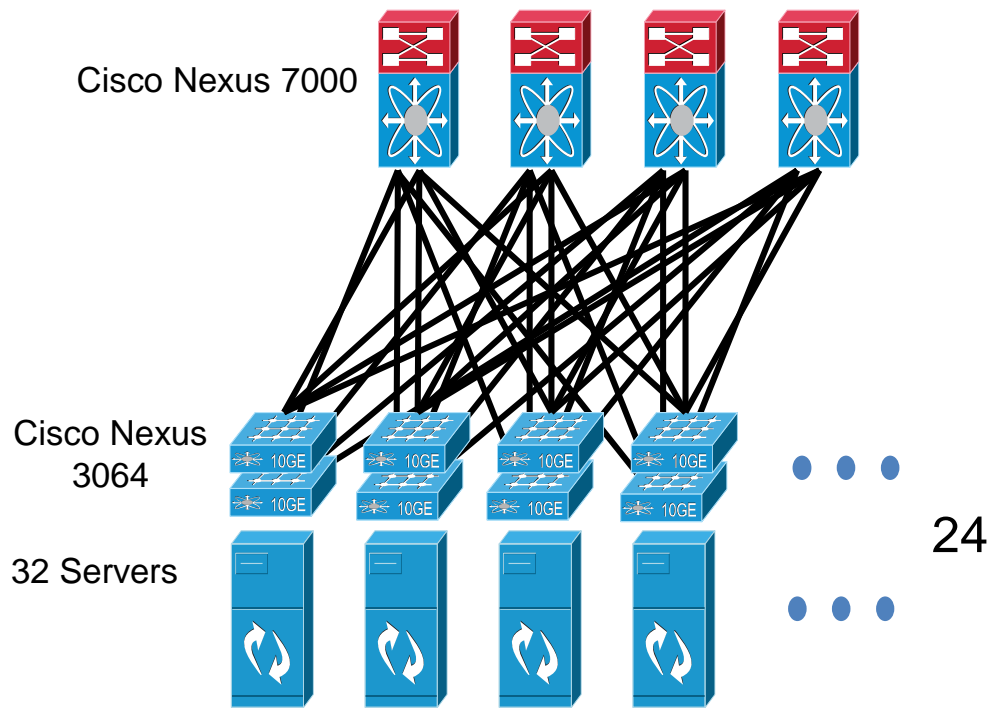
64F Required per Switch or
72F Trunk Cable per Switch



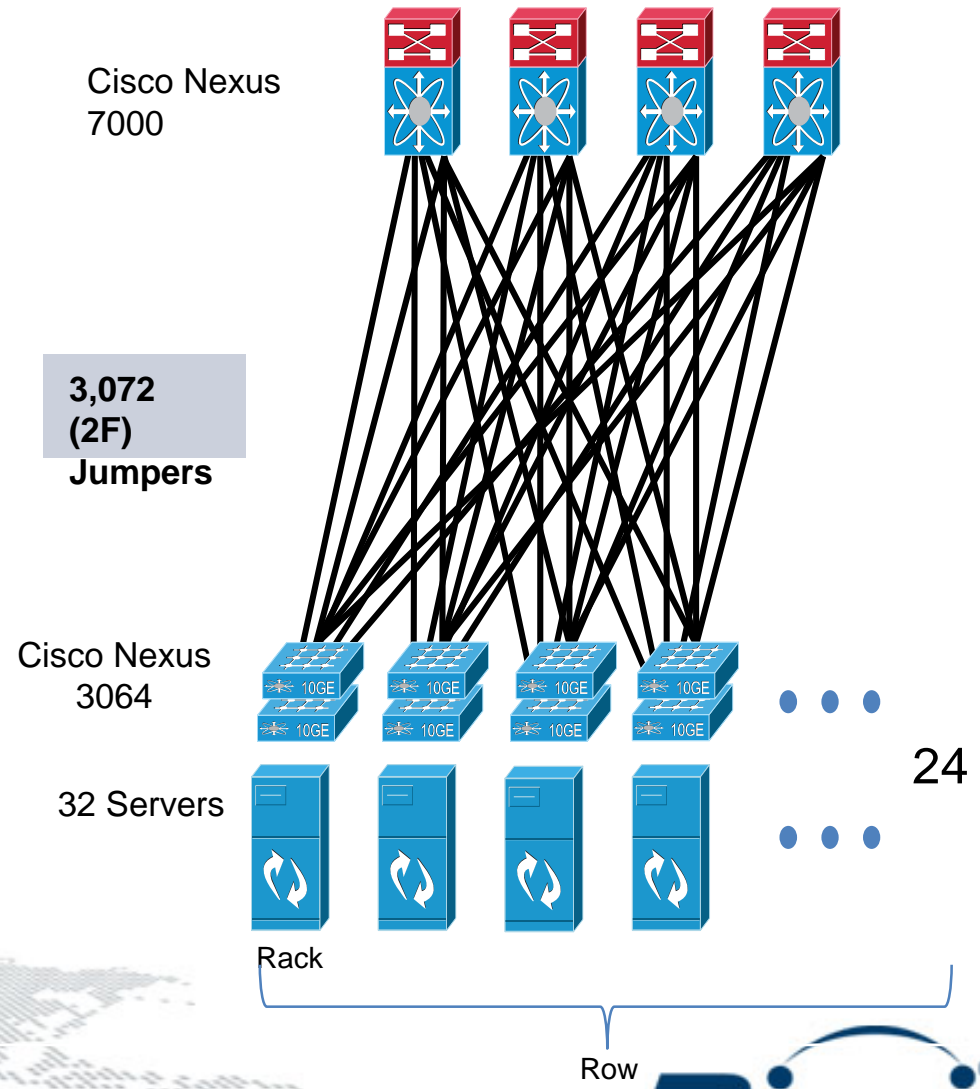
Example

Mapping Logical Architecture - Structured Cabling Options

Logical Architecture



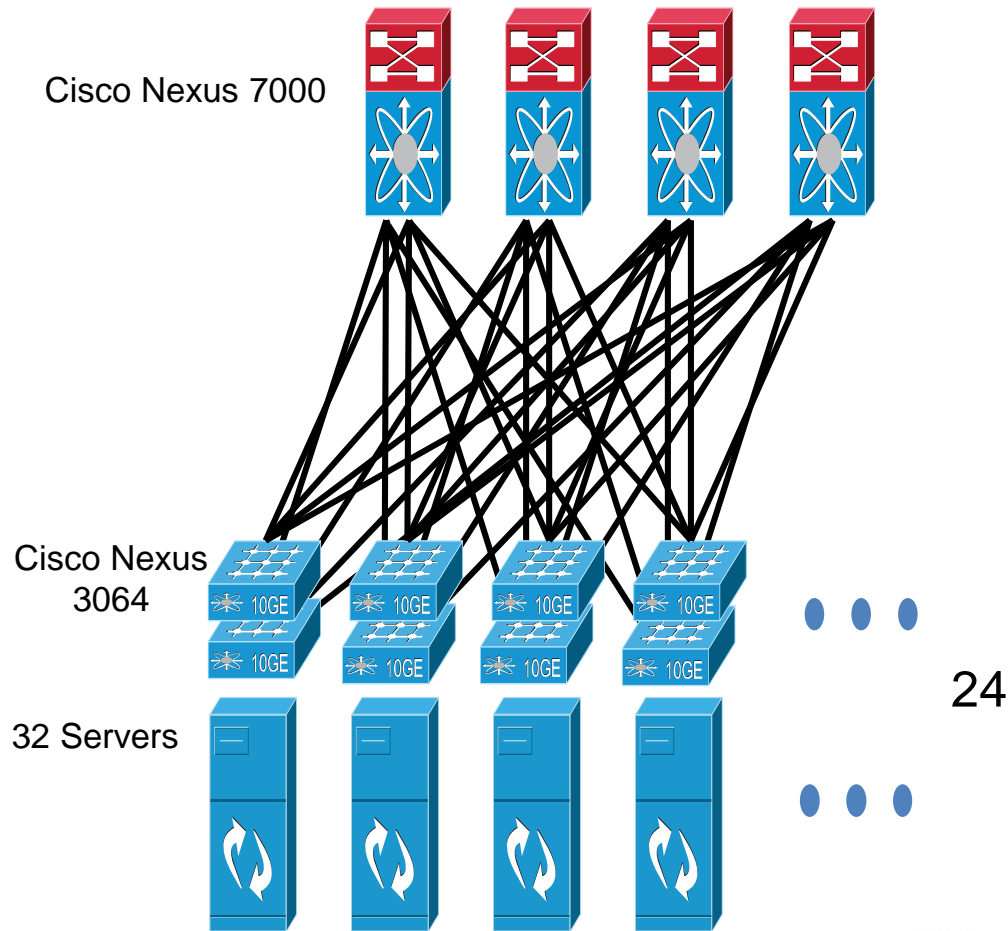
Cabling Option (1)



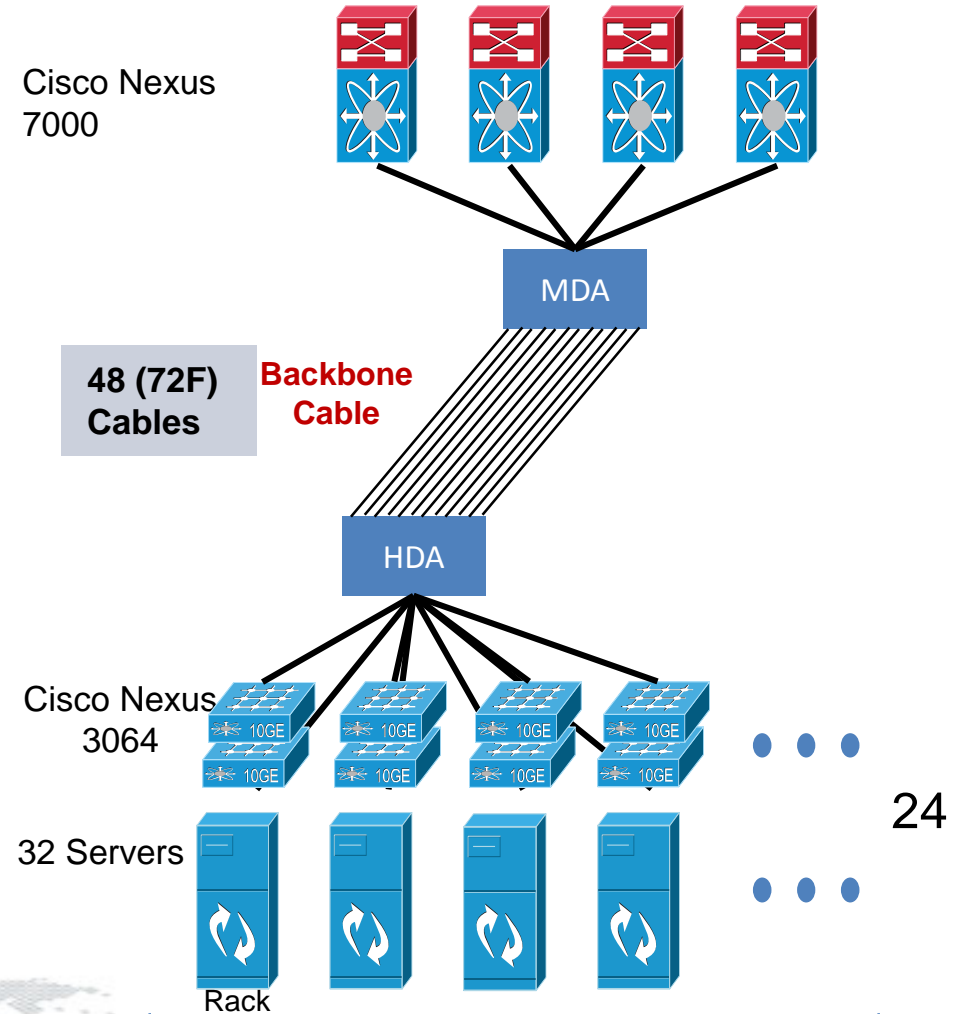
Example

Mapping Logical Architecture - Structured Cabling Options

Logical Architecture



Cabling Option (2)



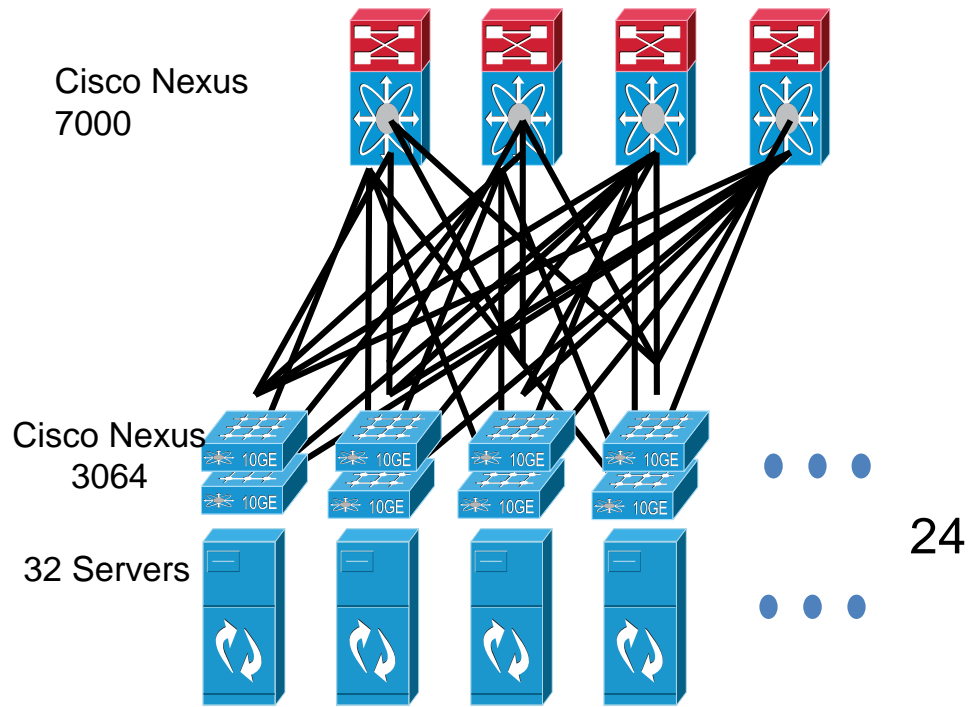
CORNING

Row **Bicsi**

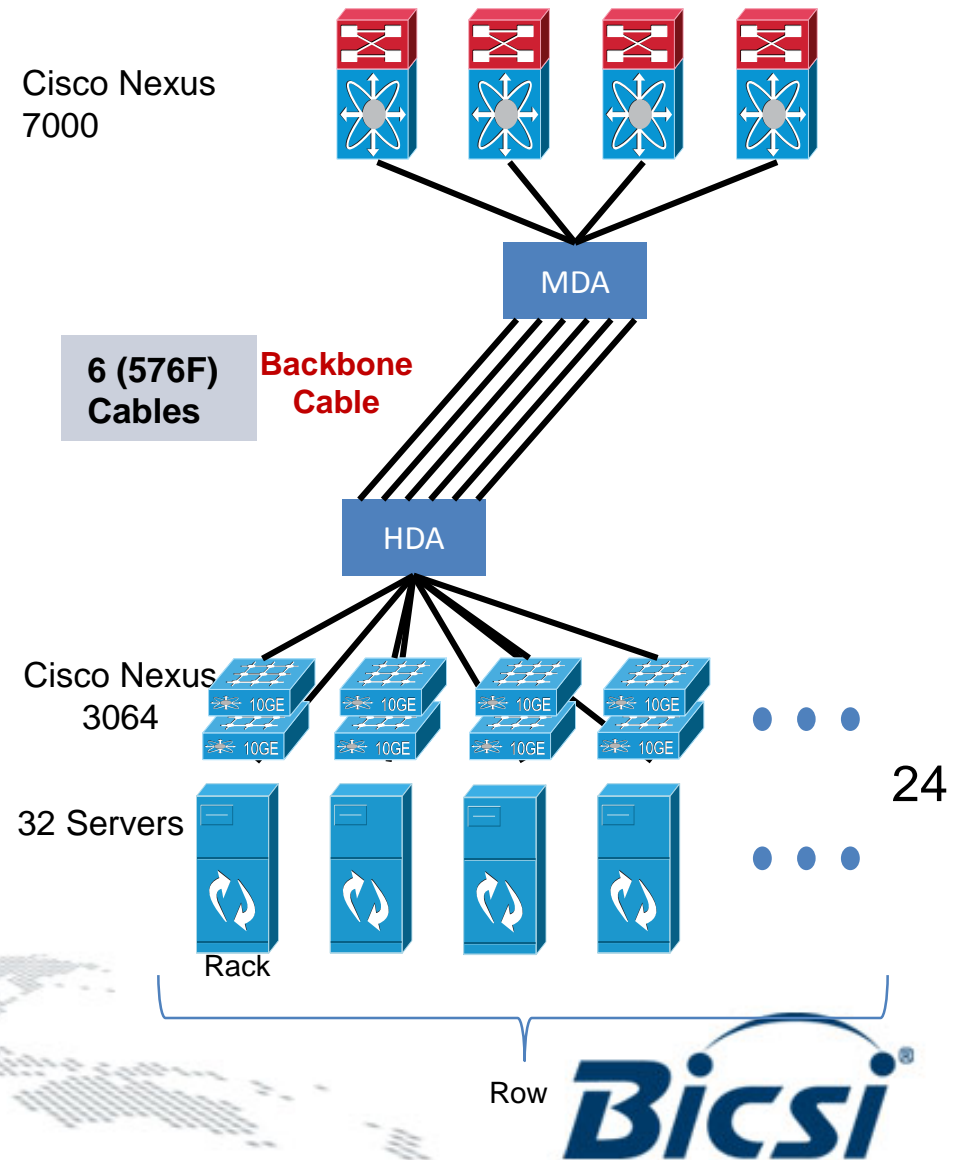
Example

Mapping Logical Architecture - Structured Cabling Options

Logical Architecture



Cabling Option (3)



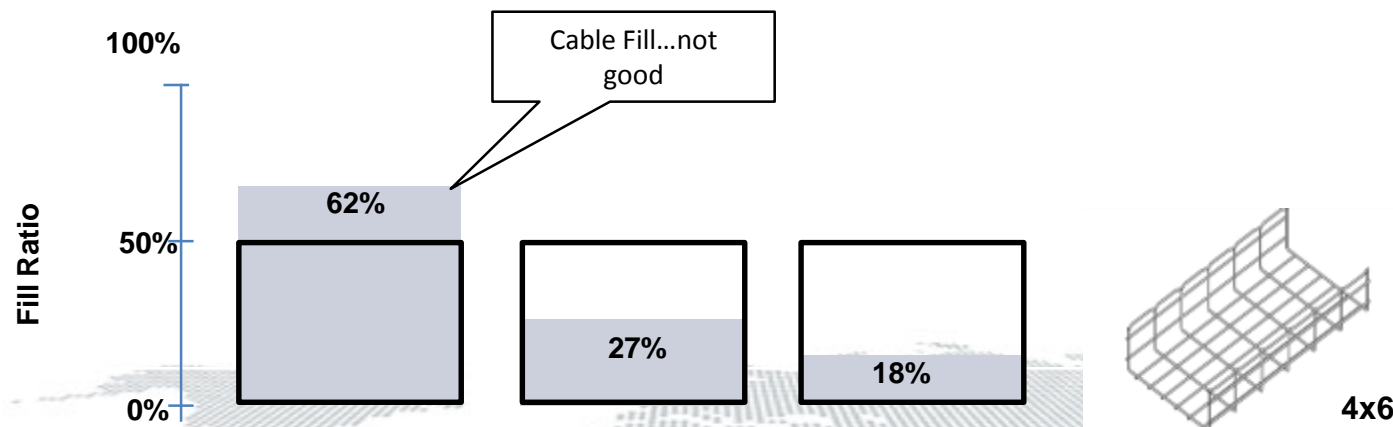
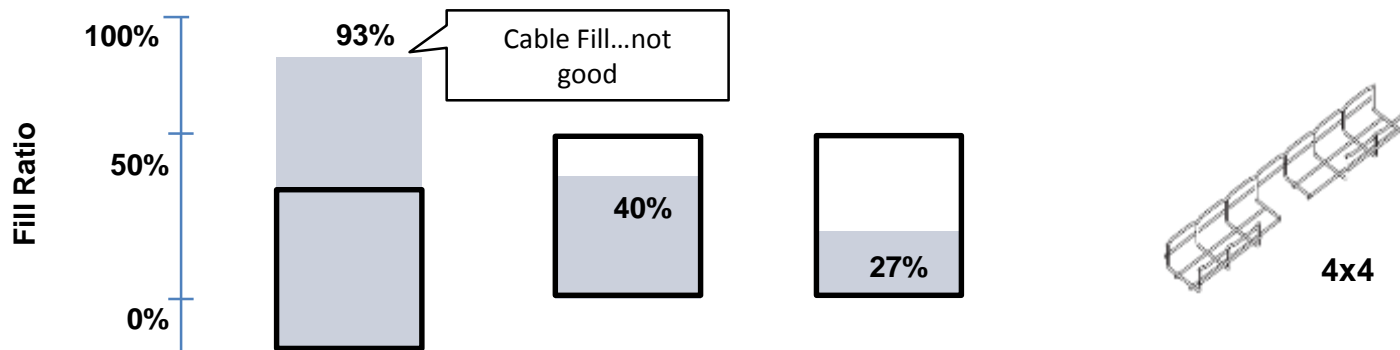
Example

Value – Cable Tray

Fill Ratio	Option 1 3,072 (2F Jumpers)	Option 2 48 (72F Trunks)	Option 3 6 (576F Trunks)	Tray Size
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TIA 569

- Planned for initial max calculated fill ratio of 25%
- A calculated fill ratio of 50% for 4-pair & similar cable will physically fill entire tray due to spaces between cables



Example

Value – “Would You Rather...”

Would You Rather...	Option 1 3,072 (2F Jumpers)	Option 2 48 (72F Trunks)	Option 3 6 (576F Trunks)
Test and Clean	6,144 (2F) Duplex LC Connectors	576 (12F) MTP Connectors	576 (12F) MTP Connectors
Document and Label	3,072 Jumpers + 6,144 Connectors	48 Trunks + 576 Connectors	6 Trunks + 576 Connectors
Pull and Install	3,072 Jumpers (Both Ends)	48 Trunks (Both Ends)	6 Trunks (Both Ends)
Purchase	3,072 Jumpers	48 (72F Trunks)	6 (576F Trunks)
Troubleshoot	3,072 Links, >6000 Connectors	48 Links, 576 Connectors	6 Links, 576 Connectors
Move, Add or Change	1 Jumper at a Time. Pt-Pt Config	Create Cross-connect, use short jumper	Create Cross-connect, use short jumper



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Section		Key areas
<i>Industry Terms and Definitions</i>	▶	<ul style="list-style-type: none">• Cloud Grows at the Expense of Enterprise• Types of Facilities• ANSI/TIA-942-A
<i>Fiber Count...Cause and Effect</i>	▶	<ul style="list-style-type: none">• Network Speeds• Network Architectures• Oversubscription• Switch Configuration
<i>Deployment Methods</i>	▶	<ul style="list-style-type: none">• Data Centre Cabling Areas• Cabling Choices – High Fiber Count Trunks
<i>Example</i>	▶	<ul style="list-style-type: none">• Design Parameters• Determine Fiber Count• Mapping Logical Architecture - Structured Cabling Options• Value – Cable Tray• Value – “Would You Rather...”