

The Data Center Evolution

Creating Critical Lasting Connections

COMMScope®



FHI IT INFRA



HET KENNISEVENT OVER COMPUTERRUIMTES, DATACENTERS EN CLOUD COMPUTING



2021

16 NOVEMBER

1931 Congrescentrum | 's-Hertogenbosch

Bandwidth Growth

“By **2022, 70%** of data will be created outside the data centre”

David Cappuccio, Gartner 2020

- New Sources of Data:

- CDN
- IoT
- 5G
- AI
- Big Data
- Cloud Service
- Automation

- Requires

- New Ways Of Thinking
- **New Architectures**
Enabled by new Switch Chip Radix

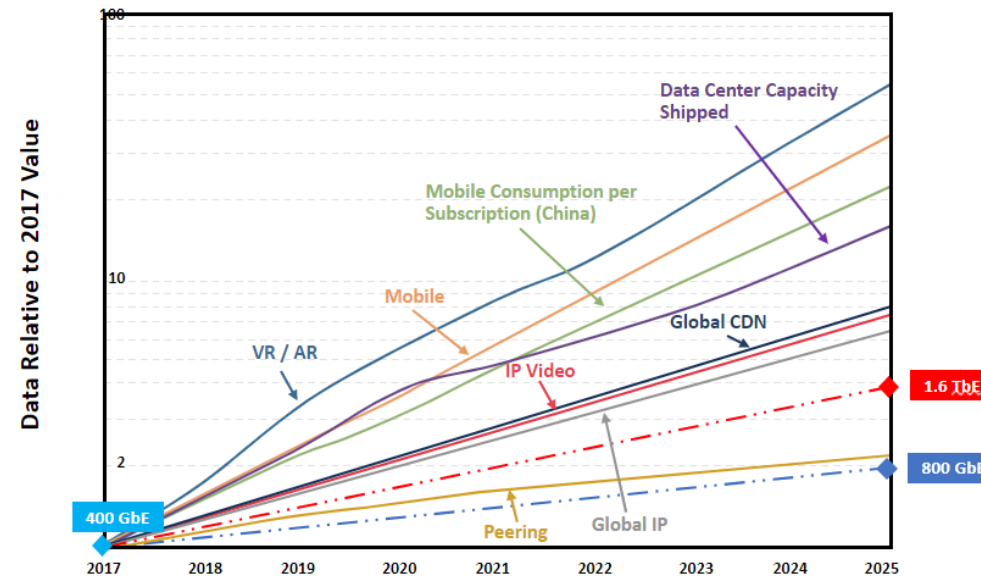


Table 12—Tabulation of Bandwidth Growth Values in 2017, 2022, and 2025

	2017	2022	2025
800GbE	1		2×
Peering Traffic	1	1.8×	2.3×
1.6TbE	1		4×
Global IP Traffic	1	3.2×	6.5×
IP Video	1	3.6×	7.6×
Global Content Delivery Network Traffic	1	3.7×	8×
Data Center Switching Capacity Shipped	1	6.4×	16.3×
Mobile Traffic Consumption Per Subscription (China)	1	7.1×	23.2×
Mobile Traffic	1	9.3×	35.7×
Virtual / Augmented Reality Traffic	1	12.3×	55.4×

COMMScope®



2021

16 NOVEMBER

WWW.FHNL.IT/INFRA

New Architectures

- New Applications Pushing Bandwidth
 - AI / VR / AR / IoT
- New Infrastructure Speeds Needed
 - 100GbE / 400GbE / 800GbE+
- New infrastructure, new connectivity types



COMMScope®



2021

16 NOVEMBER

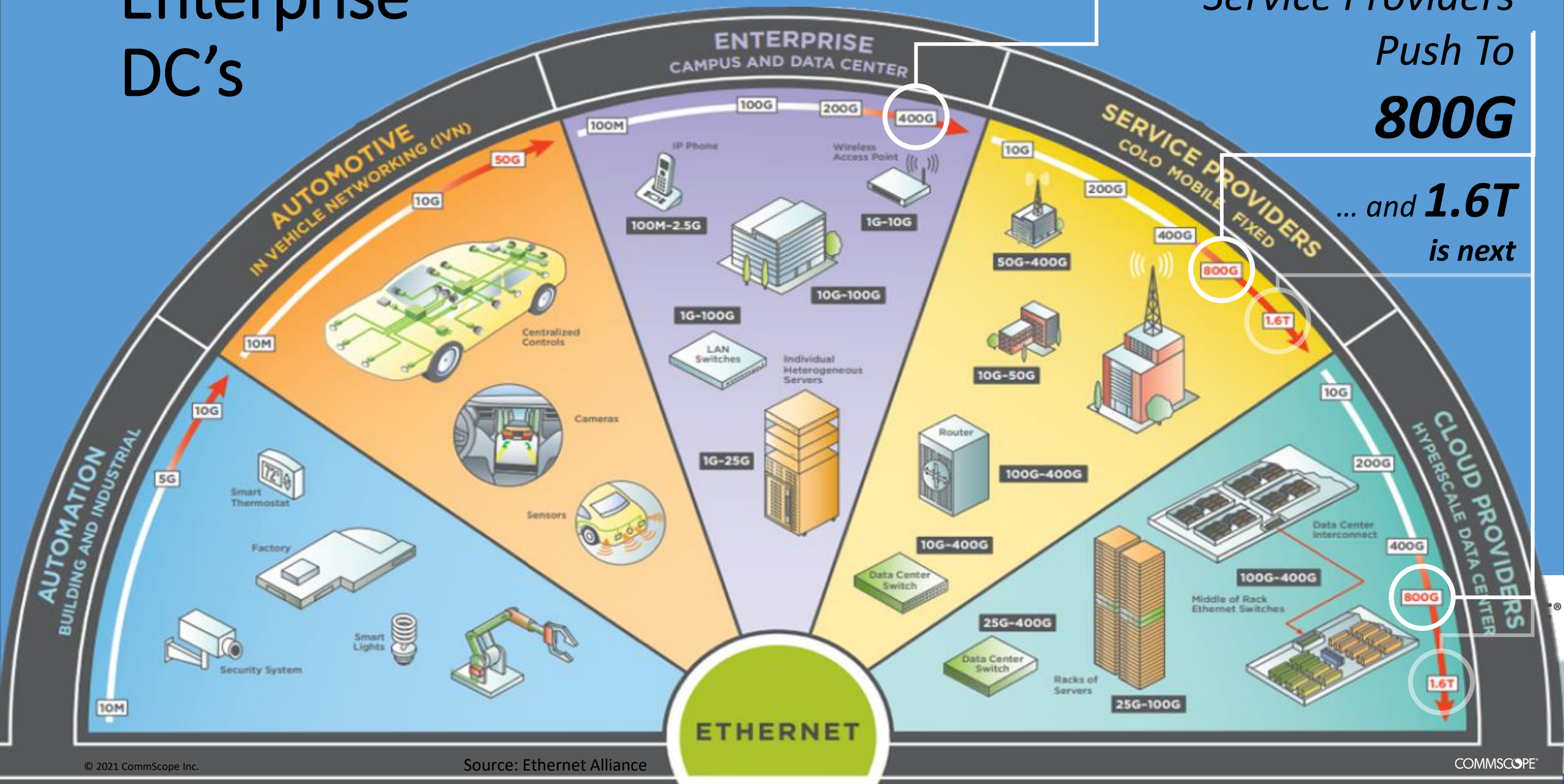
WWW.FH.NL/ITINFRA

Enterprise DC's

Pushing To **400G**

As Cloud And
Service Providers
Push To
800G

... and **1.6T**
is next





Next Steps for Fiber Infrastructure

- 400G Cabling Supports 8 lanes
16f MPOs, VSFF
- 1.6T and Beyond Will Use
8 or 16 lanes of 100G/200G

COMMScope®



2021

16 NOVEMBER

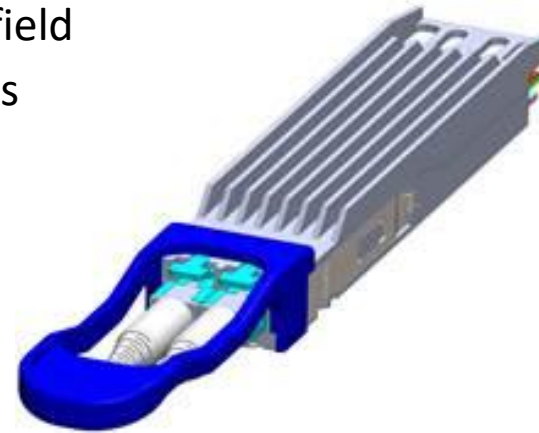
WWW.FH.NL/ITINFRA

QSFP-DD and OSFP Modules

- 8 electrical I/Os
- The only way to use ASIC capacity
- 50G and 100G electrical I/Os up to 800G (today)
- New options for
 - Up to 8-way breakouts, 4-way popular for brownfield
 - New optical connectors to enable these breakouts
 - MMF and SMF options



QSFP-DD



OSFP

COMMSCOPE®

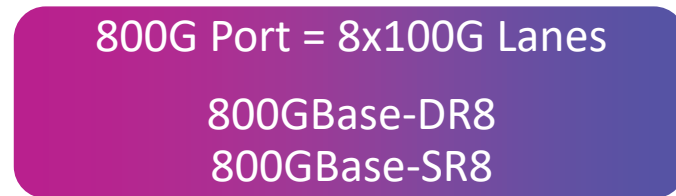
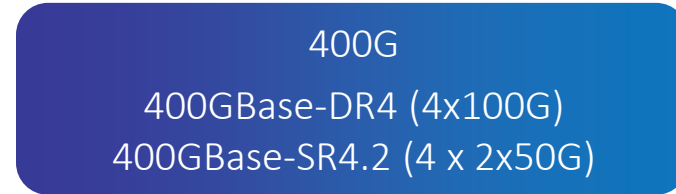


2021

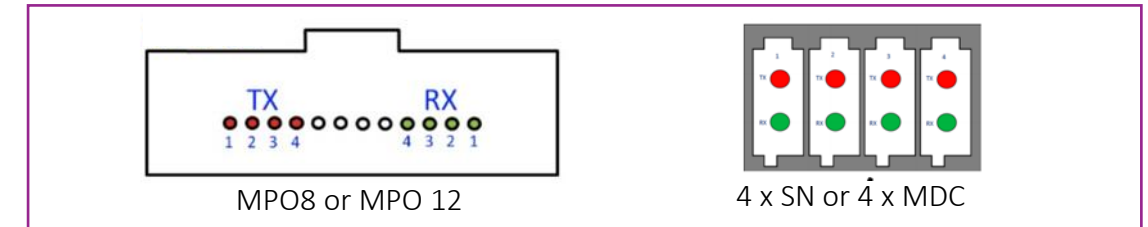
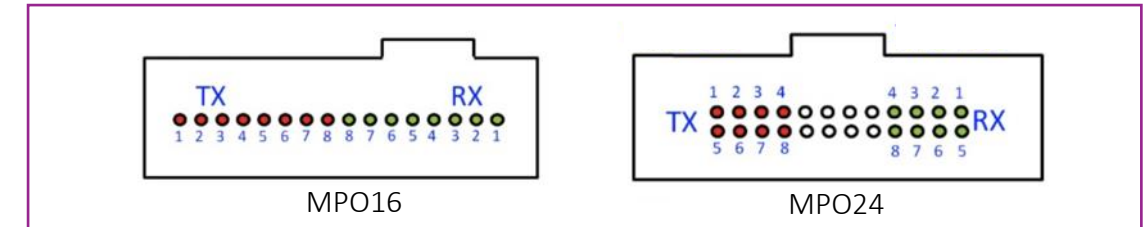
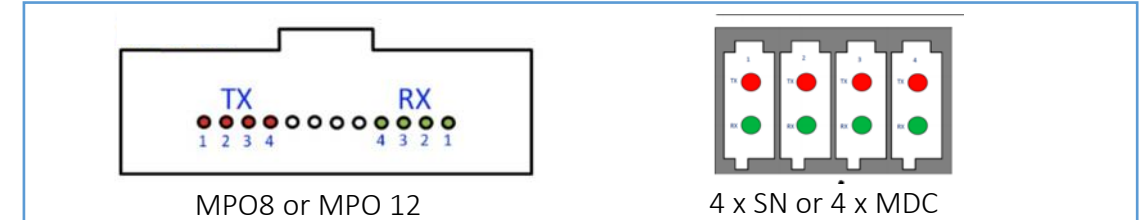
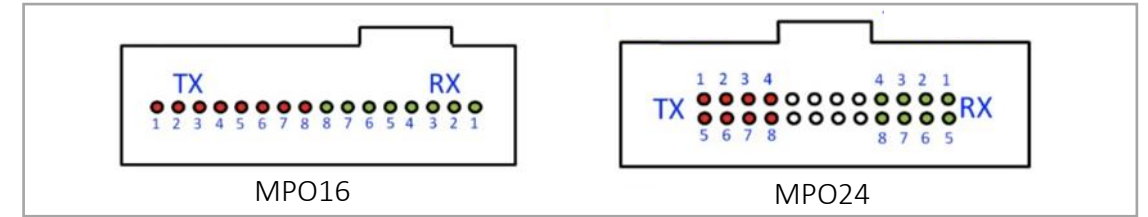
16 NOVEMBER

WWW.FH1.NL/ITINFRA

Waves of Speed Migrations



Connectivity Needs to Support



SERDES Speeds Will Drive Future Connectivity Needs

COMMScope®



2021

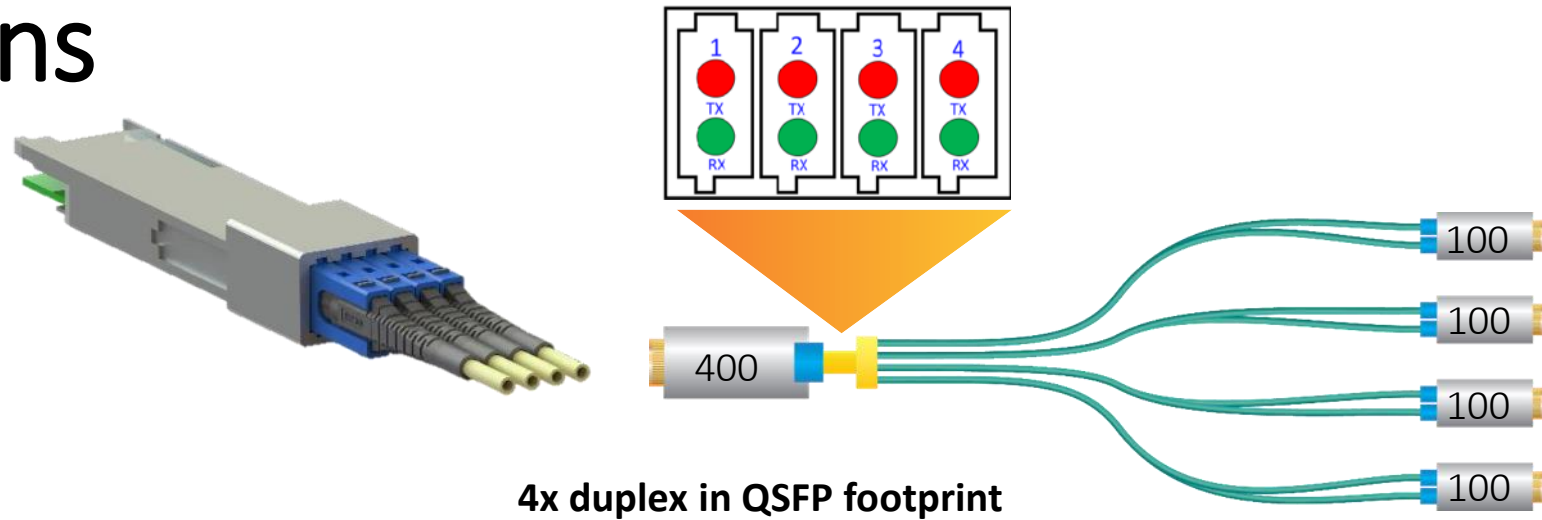
16 NOVEMBER

WWW.FH1.NL/ITINFRA

New VSFF Connector Options

- Breakout of 400G 8-lane switch ports to 100GE & 200GE Fabric (inter-switch) links
- Push pull design
- More stable performance than MT Ferrule

Leaf-Spine Cross-Connections



SN[®] Connector
CS program



MDC Connector



COMMSCOPE[®]



2021

16 NOVEMBER

WWW.FH.NL/ITINFRA

Today

- 800G MSA
Members promote next generation 100G applications
- IEEE B400G Study Group



800G Capacity QSFP-DD with 100G Electrical Lanes

Reach	Naming Scheme A	Scheme B/C	Connector
SR (50m)	QDD-2x400G-SR4	800G-SR8	MPO16/MPO24
DR (500m)	QDD-2x400G-DR4	800G-DR8	MPO16/MPO24
FR (2km)	QDD-8x100G-FR1 QDD-2x400G-FR4 QDD-800G-FR4/FR8	800G-DR8+ 800G-2xFR4 800G-FR4/FR8	MPO16/MPO24 2xCS/(2xSN) LC Duplex
LR (6km)	QDD-2x400G-LR4-6	800G-2xLR4-6	2xCS/(2xSN)
LR (10km)	QDD-8x100G-LR1 QDD-2x400G-LR4-10	800G-DR8++ 800G-2xLR4-10	MPO16/MPO24 2xCS/(2xSN)
LR (high loss)	QDD-800LR	800LR	LC Duplex
ER (30-40km)	—	—	—
ZR (80-120km)	QDD-800ZR	800ZR	LC Duplex

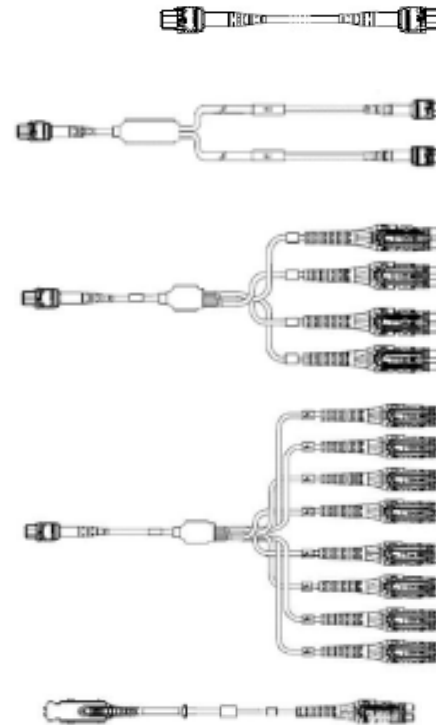


800G Capacity with 100G Electrical Lanes

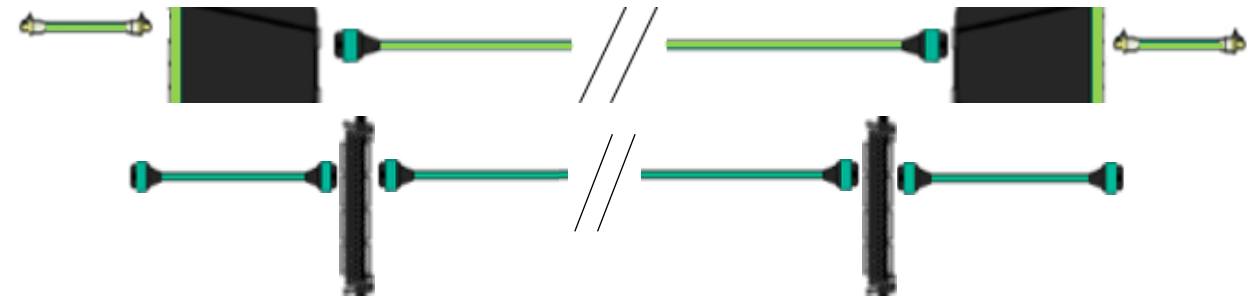
	Application			
Reach	8X100 Ethernet	4X200 Ethernet	2X400 Ethernet	800G Ethernet
SR (50m)	8X100GBASE-SR1	4X200GBASE-SR2	2X400GBASE-SR4	
DR (500m)	8X100GBASE-DR		2X400GBASE-DR4	
FR (2km)	8X100GBASE-FR1		2X400BASE-FR4	800G-FR4/FR8
LR(6km)			2X400GBASE-LR4-6	
LR (10Km)	8X100GBASE-LR1		2X400G-LR4-10	
LR (High Loss)				OIF 800G Coherent
ER (30-40km)				
ZR(80-120km)				OIF 800G Coherent

What Can You Do To Support 400G-800G?

- For **EXISTING** installations:
- Check system architecture, media, fiber count, performance and speeds
- Fiber routing between devices and panels
- Pinned vs non-pinned MPO's
- "Conversion" assemblies
- PTP, Arrays, Duplex,...
- Infrastructure and Network meeting
- Align objectives and timing



MPO12, MPO24, MPO8?



- Pinned or non-pinned trunk?
- Appropriate fiber count for applications?
- Polarity?
- Singlemode or multimode?
- Redundant cabling?
- 1:1 equipment cord vs. Array?
- IL/RL Loss considerations?
- Test and/or termination equipment
- *Infrastructure and Network Teams: Collaboration planning

What Can You Do To Plan your Cabling For 400G, 800G, 1.6T & beyond?



- For NEW installations (greenfield):
- Flatten the network:
Reduce Switch tiers
- 16f building blocks match switch:
 - Efficiency
 - Forward flexibility - backward compatible
 - Enable Duplex, 2 pr, 4pr, 8pr, 16pr applications
 - Infrastructure and Network sync
 - Align objectives and timing

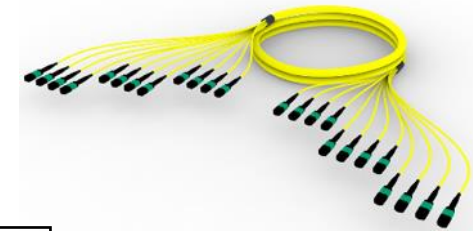
Fiber Patch
Panel

Distribution
Module

Adapter



Possible Cross-
Connect
Frame



Adapter

Fiber Patch
Panel

Distribution
Module



COMMScope®






2021

16 NOVEMBER

WWW.FH.NL/ITINFRA

Cabling Infrastructure Check list

Cable	 <ul style="list-style-type: none">• ISP, OSP, I/O, SM, MM, Rollable Ribbon(RR) (16f subunits)• SM, OM5, OM4, OM3
Connectors	 <ul style="list-style-type: none">• MPO24, 12, 8 & LC Duplex, Mini LC• MPO16 APC, SN, MDC
Cable Assemblies	 <ul style="list-style-type: none">• Trunks, RR Trunks, Equipment & Patch Cords, MPO-MPO, MPO Arrays, Conversion Arrays



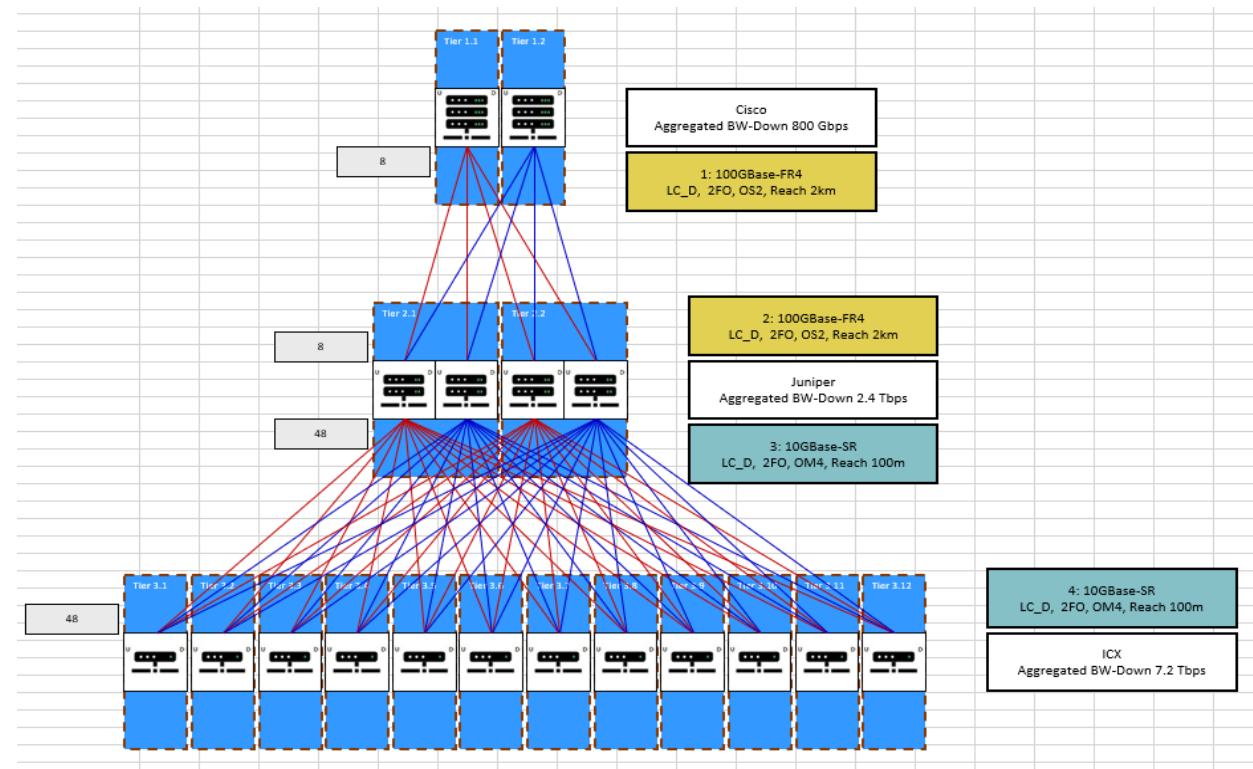
COMMScope®



2021
16 NOVEMBER

WWW.FH.NL/ITINFRA

Tools to support the increasing complexity



COMMScope®



2021

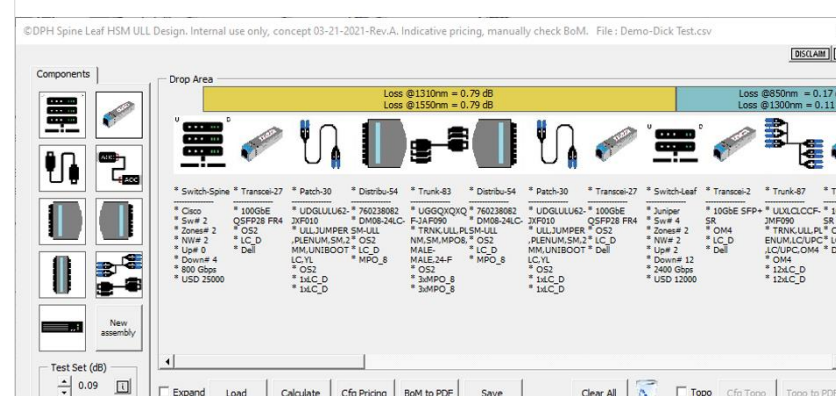
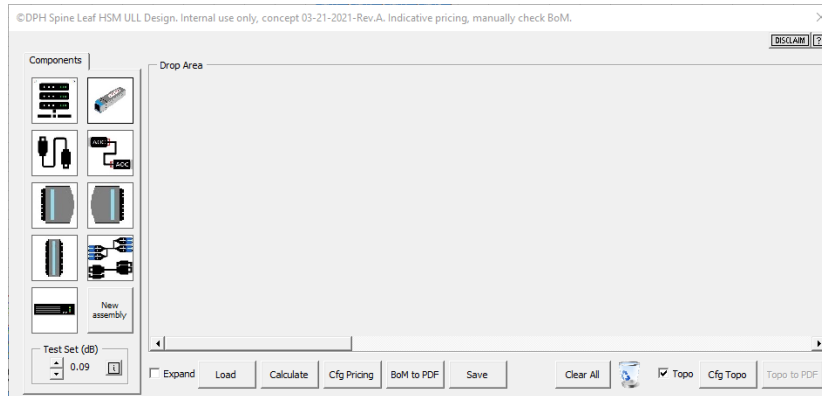
16 NOVEMBER

WWW.FH.NL/ITINFRA

Drag – Drop Design

Budget, length, design consistency

Bill of Materials in a minute



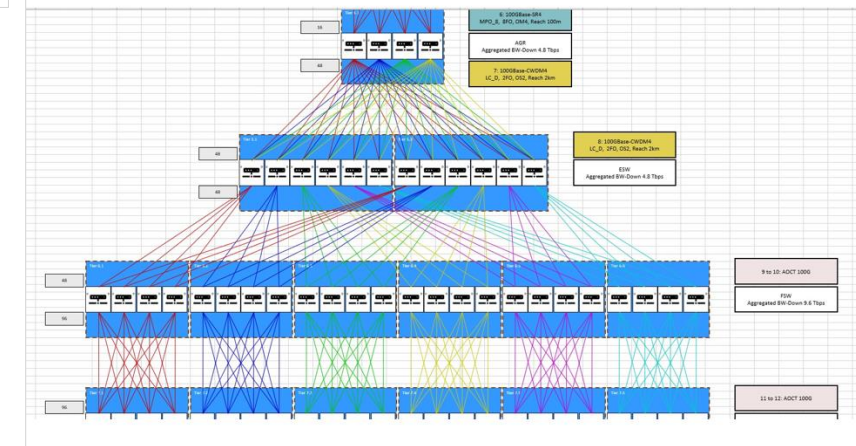
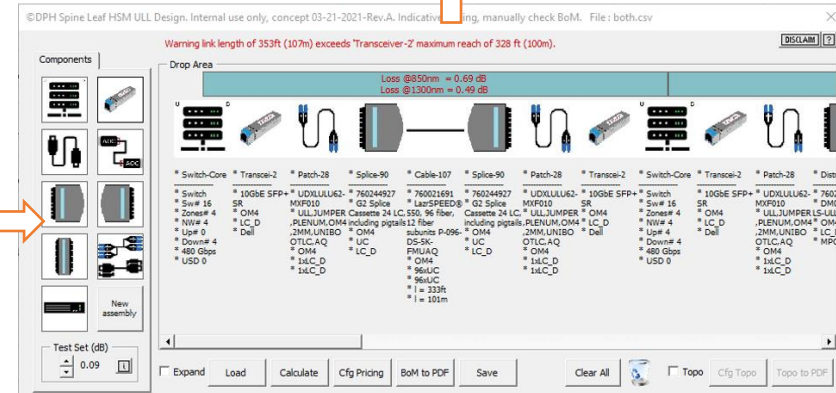
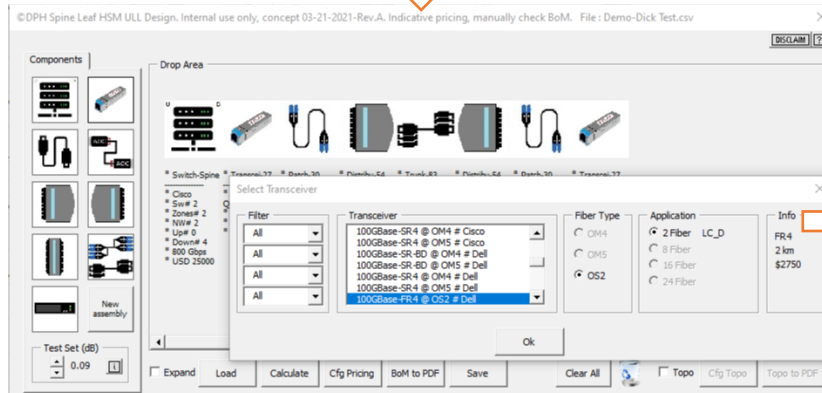
©DPH Spine Leaf HSM ULL Design. Internal use only, concept 07-07-2021-Rev.A. Indicative pricing!! Manually check BoM.

Filename: Customer-U-POP-POD-Overview.csv

Drag drop configuration

10/29/2021 12:04:24 PM

Products	Description	MID	USD	Amount	Total USD	Labor USD
Switch	Leaf		\$0.00	4	\$0.00	\$0.00
Transceiver 32	100GBase-SR4	100GBE QSFP28 SR4	\$0.00	8	\$0.00	\$0.00
Trunk 89	TRNK,ULL,PLENUM,LC/APC,LC/APC,OS2 G.657.A2	UGLALACF-JAF090	\$0.00	1	\$0.00	\$0.00
Transceiver 32	100GBase-SR4	100GBE QSFP28 SR4	\$0.00	8	\$0.00	\$0.00
Switch	Leaf	DCR	\$0.00	4	\$0.00	\$0.00
Transceiver 30	40/100GBase-SR-BD	QSFP-40/100-SRBD	\$0.00	16	\$0.00	\$0.00
Trunk 87	TRNK,ULL,PLENUM,LC/APC,LC/APC,OM4	UULKLCFC-JMF090	\$0.00	2	\$0.00	\$0.00
Transceiver 30	40/100GBase-SR-BD	QSFP-40/100-SRBD	\$0.00	16	\$0.00	\$0.00
Switch	Other	EAG	\$0.00	4	\$0.00	\$0.00
Transceiver 25	100GBase-SR4	100GBE QSFP28 SR4	\$0.00	16	\$0.00	\$0.00
Trunk 31	PC,ULL,PLENUM,OM4,MPOB,FEM-FEM,8-F	UOXQPOP8-MAF010	\$0.00	16	\$0.00	\$0.00
Panel 2	HD-1U Sliding Fiber Shelf	760209940	\$0.00	1	\$0.00	\$0.00
Adapter 3	360DP-BMPO	760107524	\$0.00	2	\$0.00	\$0.00
Trunk 78	ULLMPOB,M/M,PLENUM,OM4,24F,AQUA	UGXQXQXQF-MBF090	\$0.00	6	\$0.00	\$0.00
Panel 2	HD-1U Sliding Fiber Shelf	760209940	\$0.00	1	\$0.00	\$0.00
Adapter 3	360DP-BMPO	760107524	\$0.00	3	\$0.00	\$0.00
Patch 31	PC,ULL,PLENUM,OM4,MPOB,FEM-FEM,8-F	UOXQPOP8-MAF010	\$0.00	24	\$0.00	\$0.00
Transceiver 25	100GBase-SR4	100GBE QSFP28 SR4	\$0.00	16	\$0.00	\$0.00
Switch	Other	AGR	\$0.00	4	\$0.00	\$0.00
Transceiver 38	100GBase-CWDM4	C28-100G-CWDM4	\$0.00	48	\$0.00	\$0.00
Trunk 89	TRNK,ULL,PLENUM,LC/APC,LC/APC,OS2 G.657.A2	UGLALACF-JAF090	\$0.00	4	\$0.00	\$0.00
Transceiver 38	100GBase-CWDM4	C28-100G-CWDM4	\$0.00	48	\$0.00	\$0.00
Switch	Other	ESW	\$0.00	12	\$0.00	\$0.00
Trunk 94	Sample AOC 98FT QSFP28 FS.COM	AOCT 100G	\$0.00	48	\$0.00	\$0.00
Switch	Other	FSW	\$0.00	24	\$0.00	\$0.00
Trunk 94	Sample AOC 98FT QSFP28 FS.COM	AOCT 100G	\$0.00	96	\$0.00	\$0.00
Switch	Other	PSW	\$0.00	24	\$0.00	\$0.00



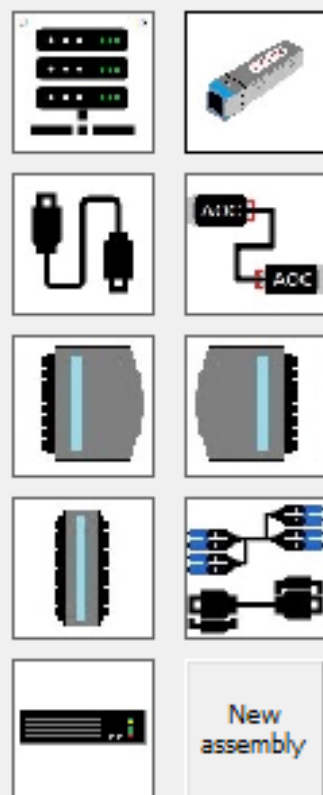


Warning link length of 353ft (107m) exceeds 'Transceiver-2' maximum reach of 328 ft (100m).

DISCLAIM



Components



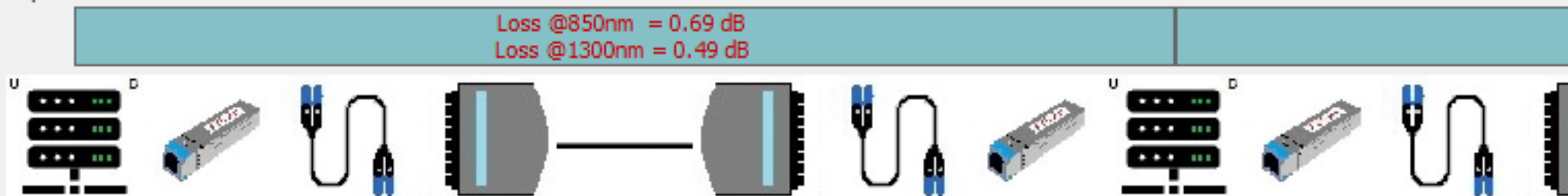
Test Set (dB)



0.09



Drop Area



* Switch-Core	* Transcei-2	* Patch-28	* Splice-90	* Cable-107	* Splice-90	* Patch-28	* Transcei-2	* Switch-Core	* Transcei-2	* Patch-28	* Distr
* Switch	* 10GbE SFP+	* UDXLULU62-	* 760244927	* 760021691	* 760244927	* UDXLULU62-	* 10GbE SFP+	* Switch	* 10GbE SFP+	* UDXLULU62-	* 7602
* Sw# 16	SR	MXF010	* G2 Splice	* LazrSPEED®	* G2 Splice	MXF010	SR	* Sw# 16	SR	MXF010	* DM0
* Zones# 4	* OM4	* ULL,JUMPER	Cassette 24 LC, 550, 96 fiber,	12 fiber	Cassette 24 LC, including pigtailed	* ULL,JUMPER	* OM4	* Zones# 4	* OM4	* ULL,JUMPER LS-ULL	* OM4
* NW# 4	* LC_D	, PLENUM, OM4	including pigtailed	subunits P-096-	including pigtailed	, PLENUM, OM4	* LC_D	* NW# 4	* LC_D	, PLENUM, OM4	* LC_I
* Up# 0	* Dell	, 2MM, UNIBO	* OM4	* UC	* OM4	, 2MM, UNIBO	* Dell	* Up# 4	* Dell	, 2MM, UNIBO	* MP0
* Down# 4		OTLC, AQ	* UC	DS-5K-	* UC	OTLC, AQ		* Down# 4		OTLC, AQ	* OM4
* 480 Gbps		* OM4	* LC_D	FMUAQ	* LC_D	* OM4		* 480 Gbps		* OM4	* 1xLC_D
* USD 0		* 1xLC_D		* OM4		* 1xLC_D		* USD 0		* 1xLC_D	
		* 1xLC_D		* 96xUC		* 1xLC_D					
				* 96xUC							
				* l = 333ft							
				* l = 101m							

☐ Expand

Load

Calculate

Cfg Pricing

BoM to PDF

Save

Clear All

☐ Topo

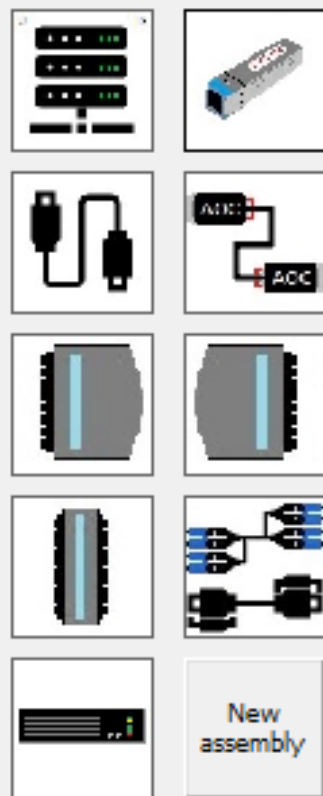
Cfg Topo

Topo to PDF

DISCLAIM



Components



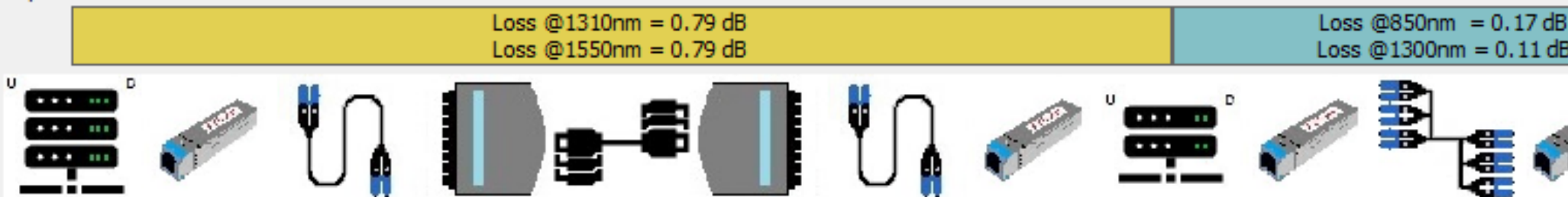
Test Set (dB)



0.09



Drop Area



Loss @1310nm = 0.79 dB

Loss @1550nm = 0.79 dB

Loss @850nm = 0.17 dB

Loss @1300nm = 0.11 dB

* Switch-Spine	* Transcei-27	* Patch-30	* Distribu-54	* Trunk-83	* Distribu-54	* Patch-30	* Transcei-27	* Switch-Leaf	* Transcei-2	* Trunk-87	* Tran
* Cisco	* 100GbE	* UDGLULU62-	* 760238082	* UGGQXQXQ	* 760238082	* UDGLULU62-	* 100GbE	* Juniper	* 10GbE SFP+	* ULLXCLCCF-	* 10G
* Sw# 2	QSFP28 FR4	JXF010	* DM08-24LC-	F-JAF090	* DM08-24LC-	JXF010	QSFP28 FR4	* Sw# 4	SR	JMF090	SR
* Zones# 2	* OS2	* ULL,JUMPER SM-ULL	* OS2	* TRNK,ULL,PLSM-ULL	* OS2	* ULL,JUMPER	* OS2	* Zones# 2	* OM4	* TRNK,ULL,PL	* OM4
* NW# 2	* LC_D	,PLENUM,SM,2	* LC_D	NM,SM,MPO8,	* LC_D	,PLENUM,SM,2	* LC_D	* NW# 2	* LC_D	ENUM,LC/UPC	* LC_D
* Up# 0	* Dell	MM,UNIBOOT	* MPO_8	MALE-	* MPO_8	MM,UNIBOOT	* Dell	* Up# 2	* Dell	,LC/UPC,OM4	* Dell
* Down# 4		LC,YL		MALE,24-F		LC,YL		* Down# 12		* OM4	
* 800 Gbps		* OS2		* OS2		* OS2		* 2400 Gbps		* 12xLC_D	
* USD 25000		* 1xLC_D		* 3xMPO_8		* 1xLC_D		* USD 12000		* 12xLC_D	
		* 1xLC_D		* 3xMPO_8		* 1xLC_D					

☐ Expand

Load

Calculate

Cfg Pricing

BoM to PDF

Save

Clear All

☐ Topo

Cfg Topo

Topo to PDF

Filename : Customer-U-POP-POD-Overview.csv

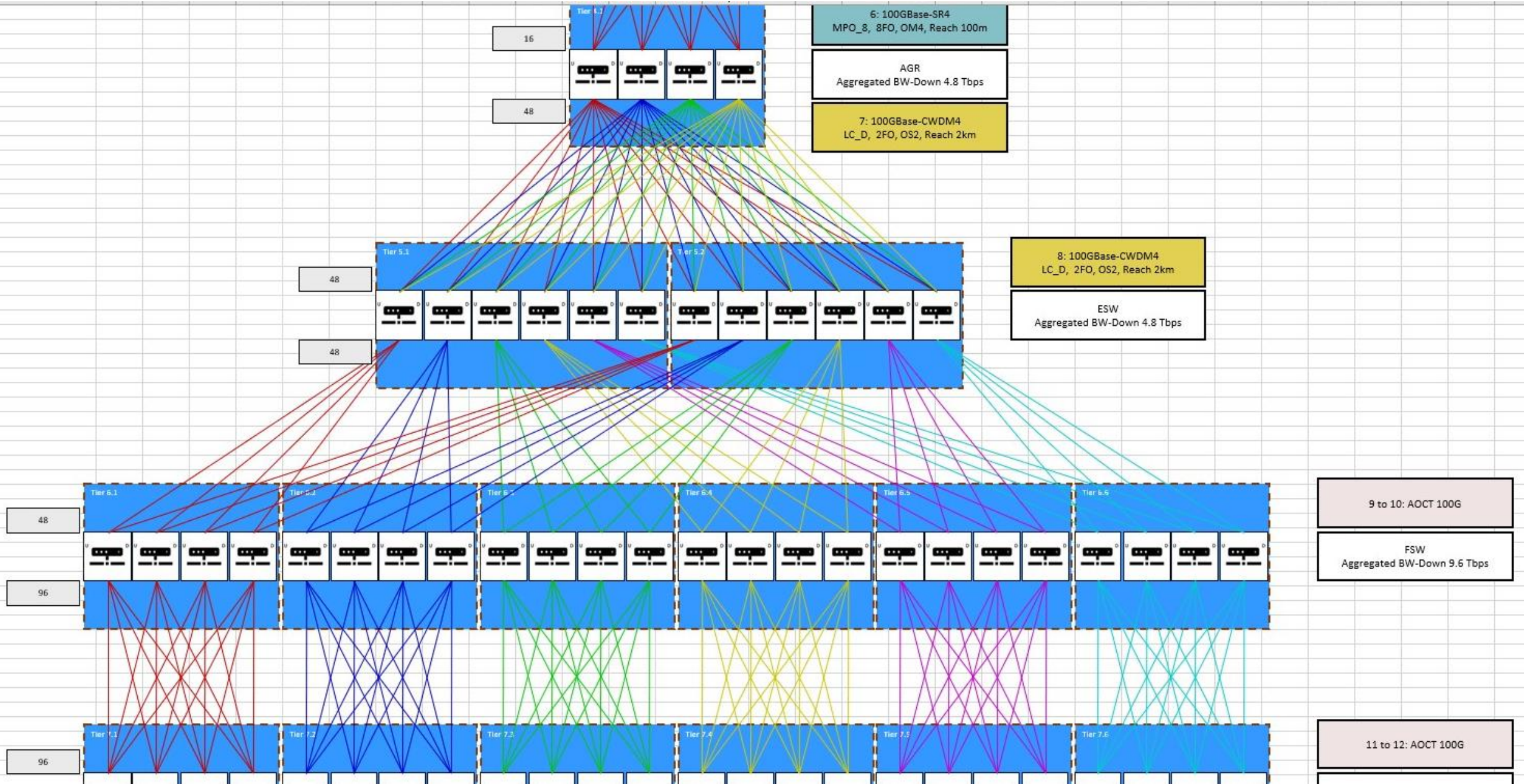
Drag drop configuration

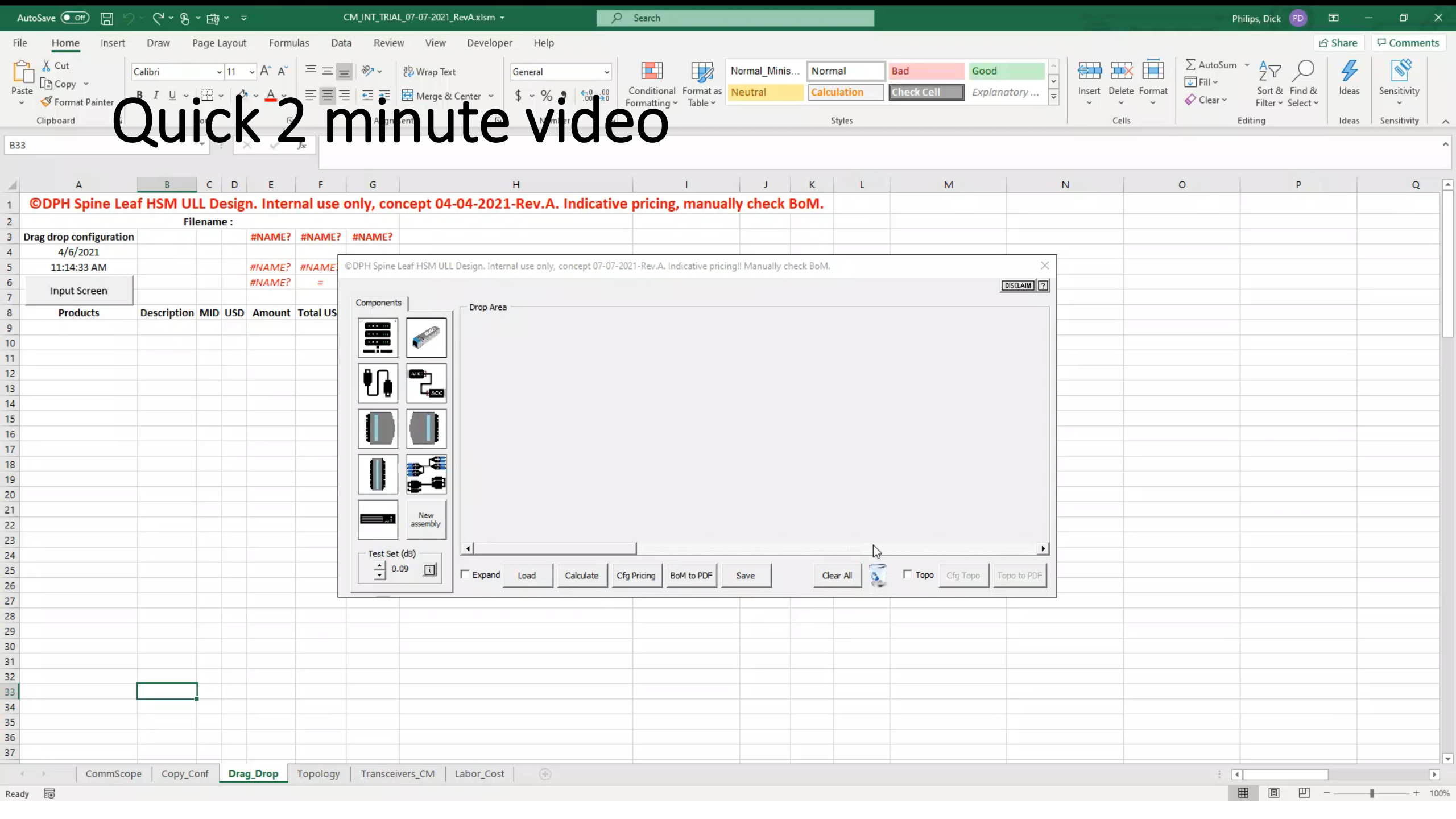
10/29/2021

12:04:24 PM

Input Screen

Products	Description	MID	USD	Amount	Total USD	Labor USD		
Switch	Leaf	POP	\$ 0.00	4	\$ 0.00	\$ 0.00		
Transceiver 32	100GBase-LR4	100GbE QSFP28 LR4	\$ 0.00	8	\$ 0.00	\$ 0.00		
Trunk 89	TRNK,ULL,PENUM,LC/APC,LC/APC,OS2 G.657.A2	ULGLALACF-JAF090	\$ 0.00	1	\$ 0.00	\$ 0.00		
Transceiver 32	100GBase-LR4	100GbE QSFP28 LR4	\$ 0.00	8	\$ 0.00	\$ 0.00		
Switch	Leaf	DCR	\$ 0.00	4	\$ 0.00	\$ 0.00		
Transceiver 30	40/100GBase-SR-BD	QSFP-40/100-SRBD	\$ 0.00	16	\$ 0.00	\$ 0.00		
Trunk 87	TRNK,ULL,PENUM,LC/UPC,LC/UPC,OM4	ULXLCLCCF-JMF090	\$ 0.00	2	\$ 0.00	\$ 0.00		
Transceiver 30	40/100GBase-SR-BD	QSFP-40/100-SRBD	\$ 0.00	16	\$ 0.00	\$ 0.00		
Switch	Other	EAG	\$ 0.00	4	\$ 0.00	\$ 0.00		
Transceiver 25	100GBase-SR4	100GbE QSFP28 SR4	\$ 0.00	16	\$ 0.00	\$ 0.00		
Patch 31	PC,ULL,PENUM,OM4,MPO8,FEM-FEM,8-F	UQXQPQPJ8-MAF010	\$ 0.00	16	\$ 0.00	\$ 0.00		
Panel 2	HD-1U Sliding Fiber Shelf	760209940	\$ 0.00	1	\$ 0.00	\$ 0.00		
Adapter 3	360DP-8MPO	760107524	\$ 0.00	2	\$ 0.00	\$ 0.00		
Trunk 78	ULL,MPO8,M/M,PENUM,OM4,24f,AQUA	UGXQXQXQF-MBF090	\$ 0.00	6	\$ 0.00	\$ 0.00		
Panel 2	HD-1U Sliding Fiber Shelf	760209940	\$ 0.00	1	\$ 0.00	\$ 0.00		
Adapter 3	360DP-8MPO	760107524	\$ 0.00	3	\$ 0.00	\$ 0.00		
Patch 31	PC,ULL,PENUM,OM4,MPO8,FEM-FEM,8-F	UQXQPQPJ8-MAF010	\$ 0.00	24	\$ 0.00	\$ 0.00		
Transceiver 25	100GBase-SR4	100GbE QSFP28 SR4	\$ 0.00	16	\$ 0.00	\$ 0.00		
Switch	Other	AGR	\$ 0.00	4	\$ 0.00	\$ 0.00		
Transceiver 38	100GBase-CWDM4	Q28-100G- CWDM4	\$ 0.00	48	\$ 0.00	\$ 0.00		
Trunk 89	TRNK,ULL,PENUM,LC/APC,LC/APC,OS2 G.657.A2	ULGLALACF-JAF090	\$ 0.00	4	\$ 0.00	\$ 0.00		
Transceiver 38	100GBase-CWDM4	Q28-100G- CWDM4	\$ 0.00	48	\$ 0.00	\$ 0.00		
Switch	Other	ESW	\$ 0.00	12	\$ 0.00	\$ 0.00		
Trunk 94	Sample AOC 98FT QSFP28 FS.COM	AOCT 100G	\$ 0.00	48	\$ 0.00	\$ 0.00		
Switch	Other	FSW	\$ 0.00	24	\$ 0.00	\$ 0.00		
Trunk 94	Sample AOC 98FT QSFP28 FS.COM	AOCT 100G	\$ 0.00	96	\$ 0.00	\$ 0.00		
Switch	Other	PSW	\$ 0.00	24	\$ 0.00	\$ 0.00		





Quick 2 minute video

©DPH Spine Leaf HSM ULL Design. Internal use only, concept 04-04-2021-Rev.A. Indicative pricing, manually check BoM.

Filename :

Drag drop configuration

4/6/2021

11:14:33 AM

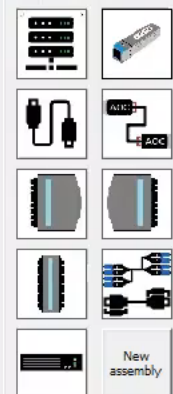
Input Screen

Products	Description	MID	USD	Amount	Total US
----------	-------------	-----	-----	--------	----------

©DPH Spine Leaf HSM ULL Design. Internal use only, concept 07-07-2021-Rev.A. Indicative pricing!! Manually check BoM.

Components

Drop Area



New assembly

Test Set (dB)

0.09

Expand

Load

Calculate

Cfg Pricing

BoM to PDF

Save

Clear All



Topo

Cfg Topo

Topo to PDF

CommScope

Copy_Conf

Drag_Drop

Topology

Transceivers_CM

Labor_Cost

Dank u

CommScope

Atlas Arena, Asia Building

Hoogoorddreef 5, Amsterdam

CommScopeNederland@commscope.com

The CommScope logo, featuring the word "COMMScope" in a bold, sans-serif font. The "O" is stylized with a circular graphic element inside it. The logo is set against a white, irregularly shaped background that resembles a torn piece of paper, which is itself on a light gray background.

FHI IT INFRA



HET KENNISEVENT OVER COMPUTERRUIMTES, DATACENTERS EN CLOUD COMPUTING



2021

16 NOVEMBER

1931 Congrescentrum | 's-Hertogenbosch