

IBM Intelligent Cluster / iDataPlex / NeXtScale Cabling Best Practices

This document is best viewed in color to receive the full benefits of the photos.

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Revision History

5/1/14 **13B Updates**

No product updates required

4/16/13 **13B Updates**

NeXtScale Node Cabling rack front left and right side, PDU whip cable routing through rack top in NeXtScale configurations with chassis in U35, Cable Fish Tool Usage in 1410-PRB, 1410-HPB, 1410-ERB, 1410-HEB Racks.

4/16/13 **13A Updates**

FDR 14 IB replacement notes.

10/07/12 **12C Updates**

Added Mellanox SX6518.

5/18/12 **12B Updates**

Added Mellanox SX1036, Brocade MLXe 8 and 16, Field Installing the LSI SAS6160 Switch

10/26/11 **11B Updates**

Added Mellanox SX6536, SX6036, BX5020

4/26/11 **11A Updates**

Added BNT G8124, G8050, Cisco 3750-X, 4948E, LG-Ericsson/SMC 5048XG, ES-4550G, Voltaire 4036E. All Follow the 1U switch cabling guidelines for 1410 racks and iDataPlex as supported.

11/09/10 **10B Updates**

Added IBM J48E, J08E and J16E, Mellanox IS5100 and IS5300, Voltaire 4200

05/05/10 **10A Updates**

Added Mellanox InfiniBand, Force10 E600i / E1200i

10/29/09 **9B Updates**

Added, Hyper Scale CXP Bend radius reference, Voltaire 4700 Hyper Scale cable plug reference, Voltaire 8500, IBM (Brocade) RX08, RX16 cabling reference.

7/29/09 **Fiber InfiniBand / 10 GB Ethernet Guidelines iDataPlex**

Added instructions for running fiber uplink cables from leaf switch to core switch in iDataPlex.

Planning

Understanding the cluster configuration is important in setting up your cable strategy. Please obtain the CPOM Step 3 file and review prior to installation. This Document contains Cluster rack and content image, Complete cabling to and from listing including PDU line cord power connection photos, Cluster BOM and other valuable information in planning the cluster installation.

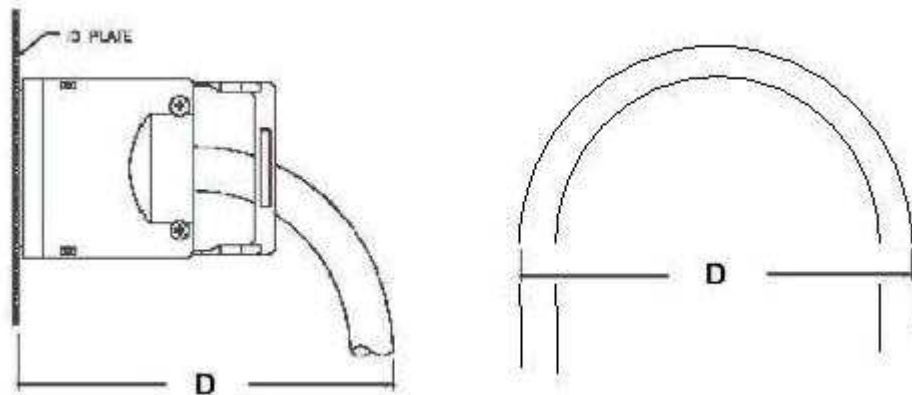
Meet your Customer so that you may clearly understand their expectations and requirements.

Cable handling is important to our customers and the performance of the product being delivered. Below are examples of cable handling and installation expectations that must be observed.

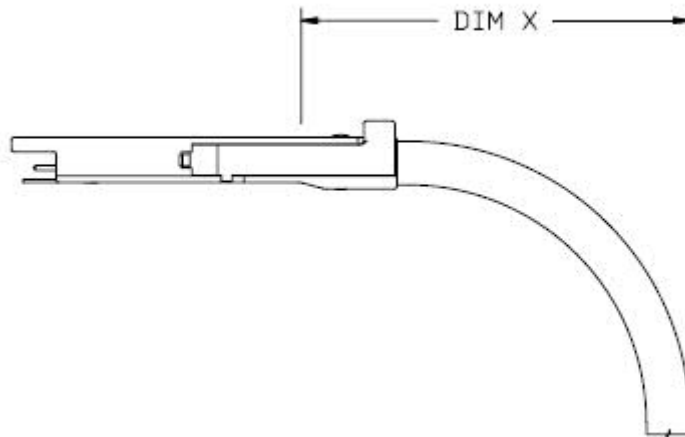
- Cable bend radius chart for quick reference.

| Cable Type | Minimum Bend Radius | Should cable management arms be used? |
|--------------------------|---------------------|---------------------------------------|
| Cat5 Ethernet | 1" or 25mm | Yes |
| LC or Myricom 10Gb Fiber | 1.2" or 30mm | Yes |
| Infiniband 26 AWG | 2.75" or 70MM | No |
| Infiniband 28 AWG | 2.28" or 58MM | No |
| InfiniBand 30 AWG | 1.98" or 50MM | No |
| 10GB SFP+ Ethernet 30AWG | 1.98" or 50MM | No |
| 10GB SFP+ Ethernet 28AWG | 2.36" or 60MM | No |

SDR and DDR Copper InfiniBand with CX4 Connector



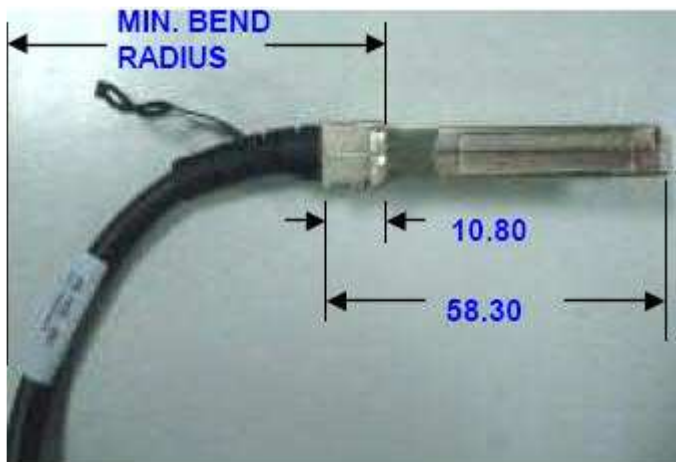
QDR Copper InfiniBand with QSFP Connector



| WIRE AWG | DIM X |
|------------|-------|
| 30 AWG | 1.98" |
| 30 AWG EXD | 2.13" |
| 28 AWG | 2.28" |
| 27 AWG EXD | 2.43" |
| 26 AWG | 2.43" |
| 26 AWG EXD | 2.71" |

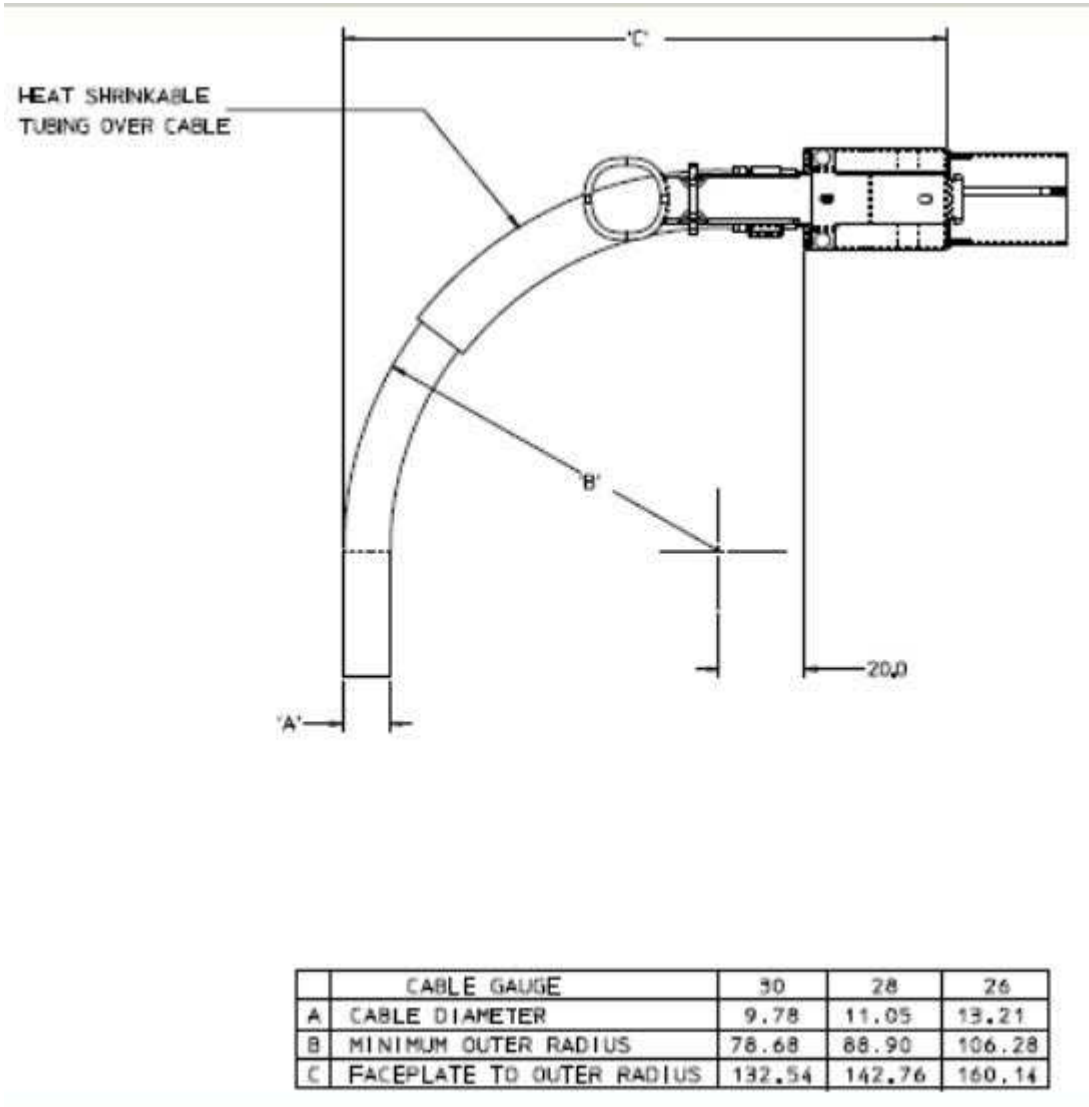
SFP+ Copper 10GB Ethernet

| | |
|--------|--|
| 24 AWG | 80MM Min Bend Radius (7M, 10M) |
| 26 AWG | 70MM Min Bend Radius |
| 28 AWG | 60MM Min Bend Radius |
| 30 AWG | 50MM Min Bend Radius (0.5m, 1M and 3M) |



- Do not kink InfiniBand or 10GB Ethernet cables.
- Do not over bend InfiniBand or 10GB Ethernet cables.
- Do not twist InfiniBand or 10GB Ethernet connectors.

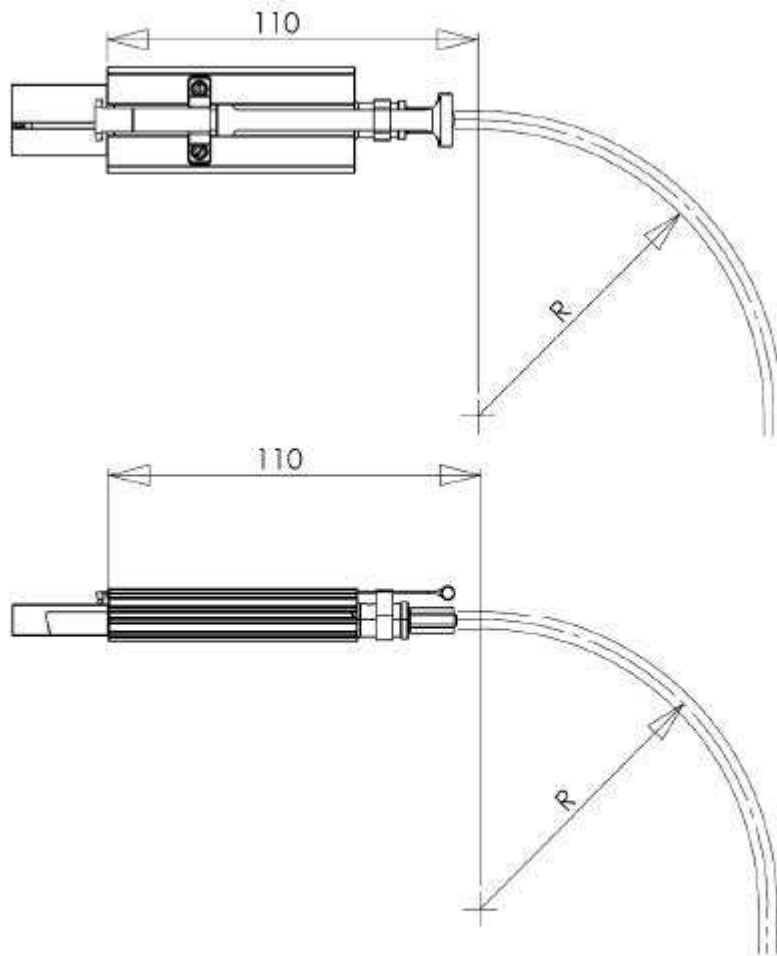
Hyper Scale CXP Copper InfiniBand Cable



- Do not kink InfiniBand or 10GB Ethernet cables.
- Do not over bend InfiniBand or 10GB Ethernet cables.
- Do not twist InfiniBand or 10GB Ethernet connectors.

Hyper Scale CXP to CXP and CXP to QSFP Fiber InfiniBand Cable

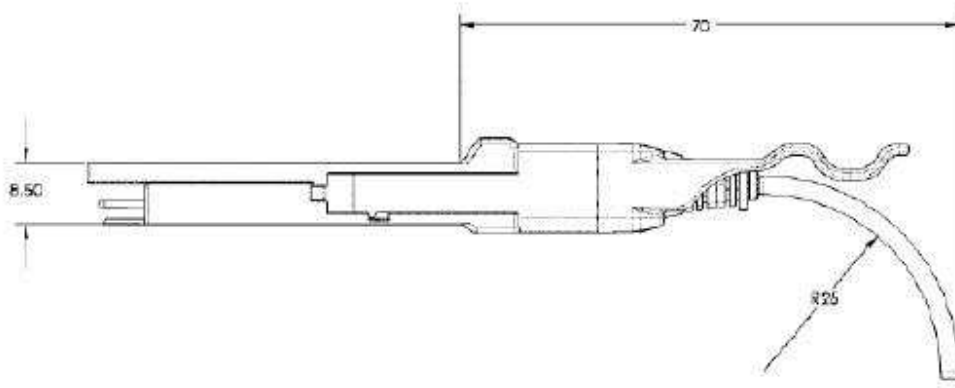
“Bending Radius” guidelines of MergeOptics AOC



| Condition | Minimum Bending Radius “R” |
|------------------------|----------------------------|
| Service / Installation | 85 mm |
| Normal Operation | 120 mm |

| IB Fiber Optic Cable Bend Radii | |
|---------------------------------|---|
| Cable Type | Bend Radius |
| Fiber Optic Standard Cable | 25 millimeters NOTE: A 50mm diameter is the smallest circle limit |

Figure 1-2 Fiber Optic Bend Radius

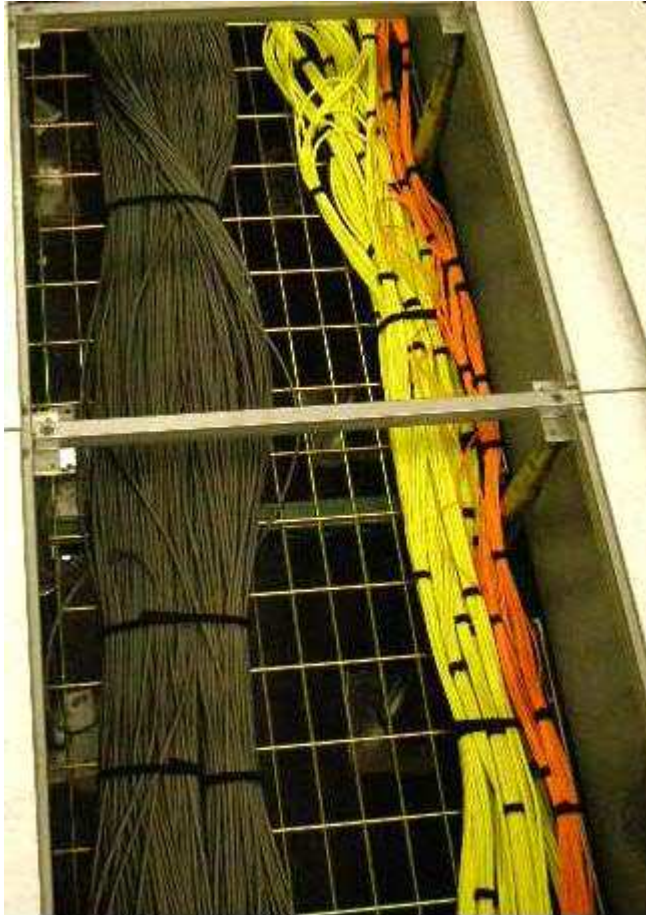


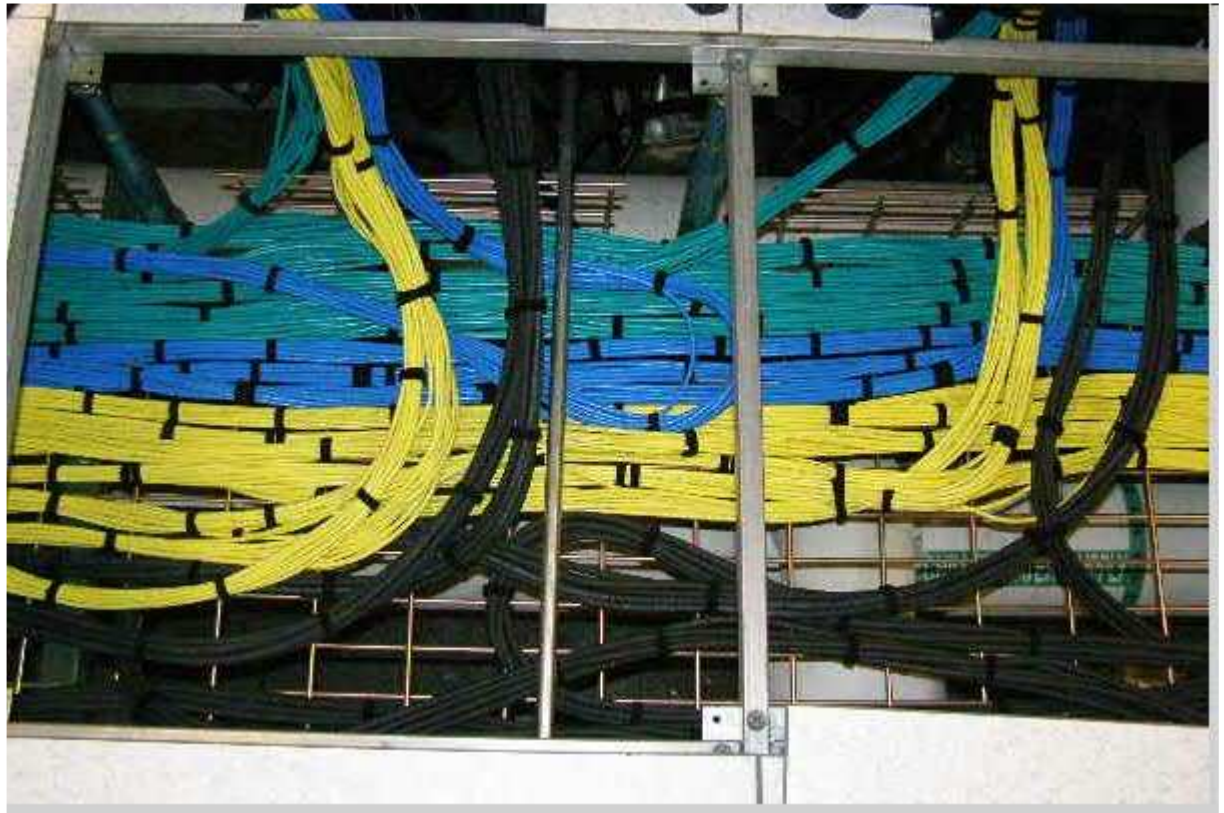
- Surplus Cable management.
Excess cable should be looped in a “U” under floor or in cable trays and not coiled in a circle.

The customer will need to supply the following:

- Floor layout so that you may become familiar with it.
- Rack configuration on raised floor.
- Raised floor and beneath raised floor environment including depth and obstacles that may need to be considered before routing cables. Trays, safety devices (smoke detectors and water sprinklers), plumbing, and existing cables are a few examples.

Examples of proper below floor cable routing and excess cable management can be seen below.





Some installations require above rack cable routing. You need to understand what obstacles are imposed here as well. Establish a specific area for InfiniBand, Cat5, and fiber cables

It is highly recommended that you route copper InfiniBand cables before the Cat5 and Fiber cables. This ensures the lighter cabling is on top of the heavier InfiniBand cables.

This also makes it easier to install the InfiniBand cables into the racks and will allow for maximum working space within rack cabling areas. It is recommended you loop cables in half and pull them under the floor by the looped end being cautious not to bend beyond cable bend limitations.

InfiniBand and SFP+ Cabling Guidelines

To avoid damage to the InfiniBand cables, follow these guidelines:

- Route cables where they will not be snagged by other devices in the rack or raised floor
- Do not over tighten the cable straps or bend the cables to a diameter smaller than 5.5 inches. (Equal to 2.5" radius). (See figure below. Distance 'D' equals 4 inches).
- Do not put excess weight on the cable at the connection point and be sure that it is well supported
- Do not leave cables on the floor where they can be damaged by carts or foot traffic.
- Provide appropriate strain relief.
- When replacing FDR14 (56Gbps) cables ensure you use a cable designated as an FDR14 replacement with the blue FDR tag as seen below. These cables are also suitable for use with lower speed FDR10 and QDR applications.



Cabling InfiniBand and 10Gb E Switch End

InfiniBand Switch Configuration

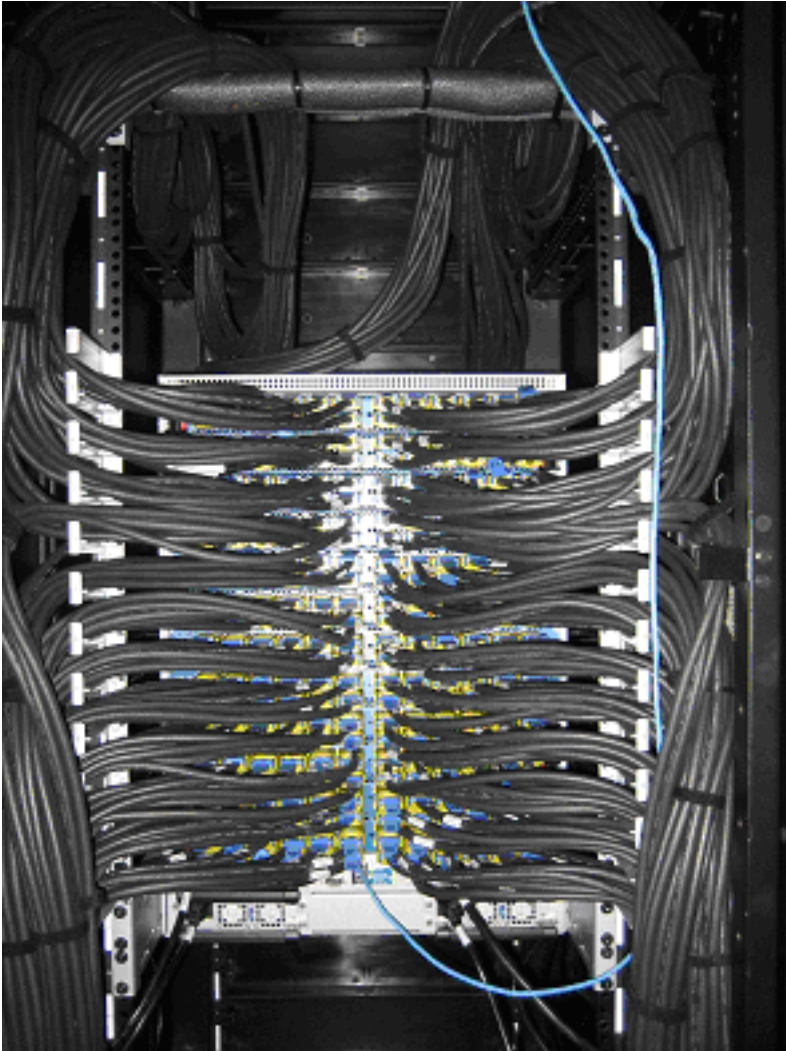
- Split the switch in half vertically down the middle and run cables between the frame and cable management brackets up left and right sides.
- Remove all cable Flag Tags from Switch end of cable. Cable InfiniBand switch from bottom slot 12 through top slot 1. Secure cables to sides of frame using Velcro. The below images demonstrate what the cables should look like when properly routed.
- With cables needing to be run at different lengths to facilitate InfiniBand line card slot port locations, loop excess beneath rack neatly considering cable bend limitations.
- Keep in mind that space will become limited as you begin to fill all pluggable locations on the switch line cards. It is recommended that you position the excess loops under floor or in tray above as far away from the switch rack as possible. Redressing the cable bundle neatly will help with limited space on fully configured switched.

Note: If more than 240 Copper InfiniBand cables are in the configuration. It is recommended you route the cables through the top of the rack to facilitate ease of serviceability. You may also want to consider less than 240 through the bottom of the switch rack depending on the customer's requirements

- It is recommended that the rack rails that overlap with the 12U of the ISR 9288 IB connectors not be used for PDU or power inlets.
- It is recommended that you install cable management brackets on the rear rail of the rack.

Cabling Core InfiniBand and 10Gb E Switches

The following photo is an example of proper cable routing and how to merge cables into the switch.



Cabling Rack Side InfiniBand

Blade Center Configuration and 1U InfiniBand Switch

- Cables should be bundled in groups of 8 or less and should run up each side of the rack to the Blade Center pass through module. Seven to eight run up left side to pass through module or 1U switch left side ports to and seven to eight up rack right side to pass through module or 1U switch right side ports working from outside towards the center ports. This eliminates excess cable lengths and reduces cable sagging over time. Start at the bottom Blade Center unit and work to the top.
- Cables should be neatly looped into place as to not apply any pressure up down or side to side on module / switch ports.
- Cable bundles should be dressed neatly and fastened to the frame sides using Velcro. When using cable of different lengths, loop excess beneath raised floor or in over head trays neatly considering cable bend limitations.



Cabling Rack Side InfiniBand

Blade Center Configuration and 1U InfiniBand Switch

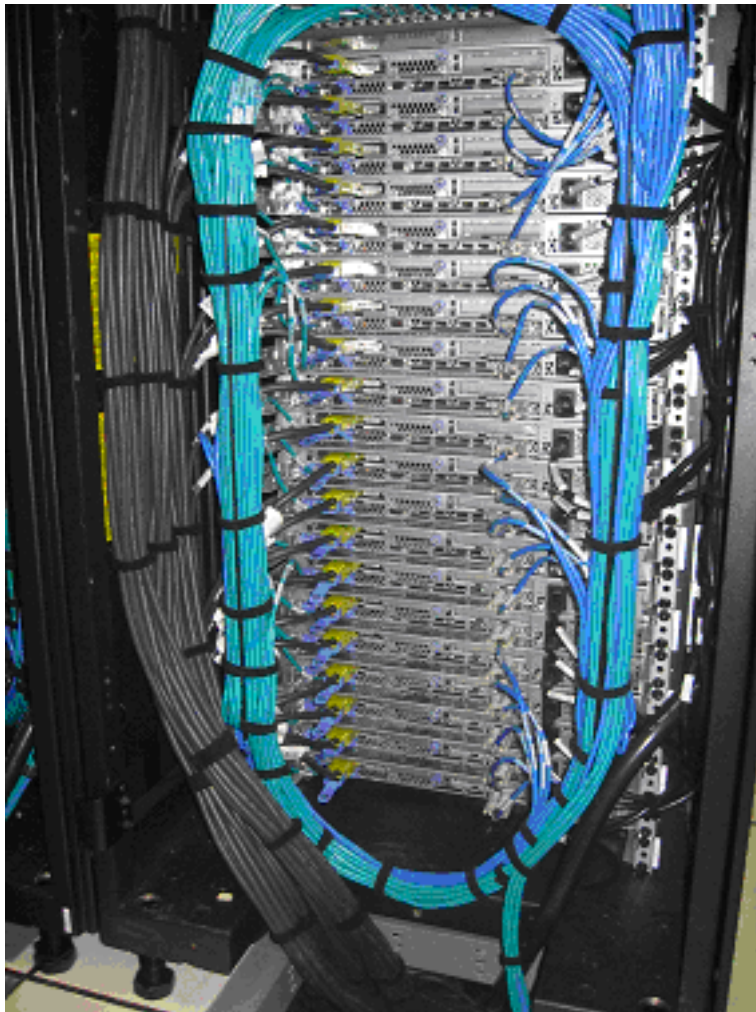


1U, 2U, and 3U Server Configuration

Server Configuration

Cables should be bundled in groups of 10 or less for easily handling. Route cable bundles up the left side of the rack through the cable retention brackets (if installed) and to the server. Plug the InfiniBand cable into the lowest port number or P1 of the server adapter card.

The cable should be routed through the cable management bracket towards the inside of the rack. Use the rack cable retention slots to fasten Velcro to maintain positive retention of cables. (See picture below.)



1U, 2U, and 3U Server Configuration

The following shows a properly cabled server configuration using cables of different lengths to facilitate plugging into each server location.

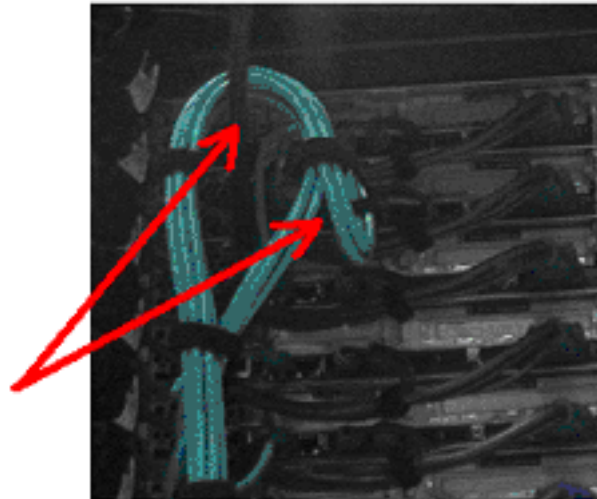


Cat5E Guidelines

To avoid damage to the Ethernet cables, follow these guidelines:

- Route the cable away from places where it can be snagged by other devices in the rack or raised floor.
- Do not over tighten the cable straps or bend the cables to a radius smaller than (1 in.).
- Do not put excess weight on the cable at the connection point and be sure that it is well supported.
- Route Ethernet cables away from power cables.

Maintain minimal 1" radius on any Ethernet cable bending

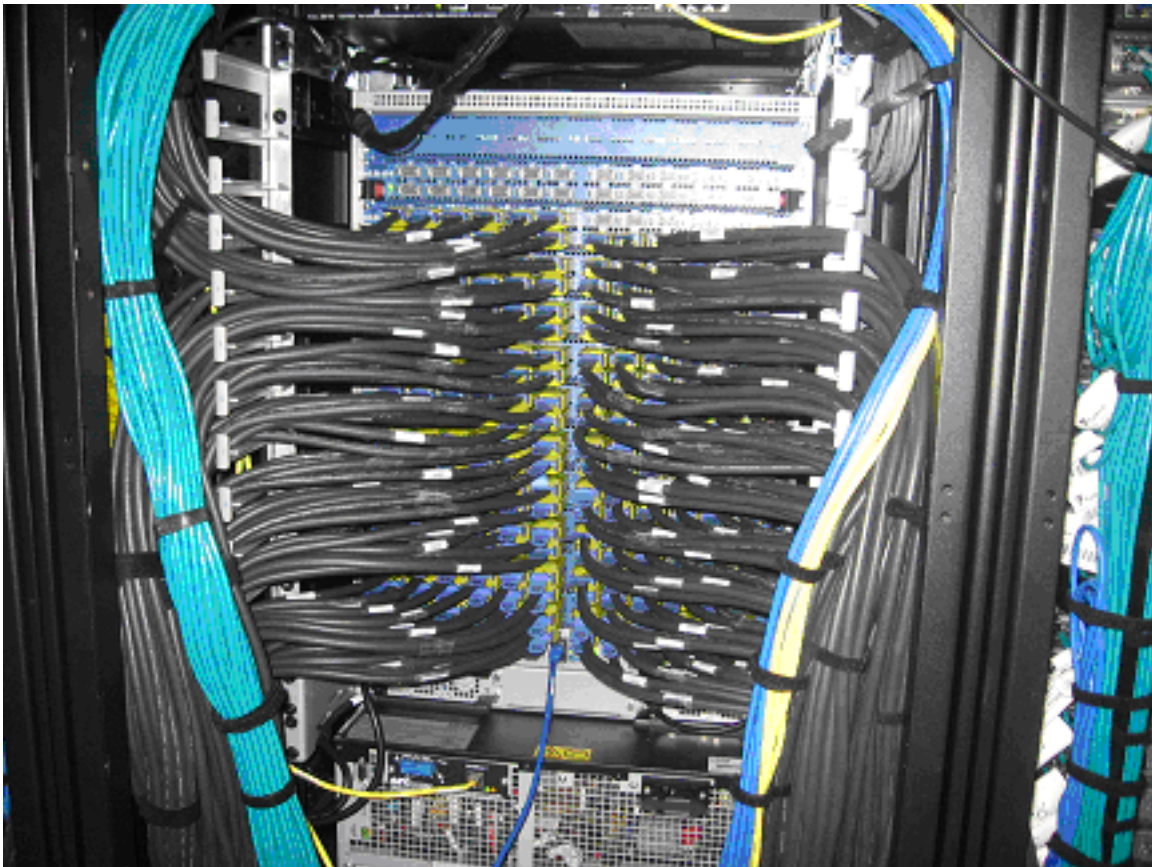


- When attaching to a device on slides, leave enough slack in the cable so that it does not bend to a radius smaller than 50 mm (2 in.) when extended or become pinched when retracted.
- Route the cable away from places where it can be snagged by other devices in the rack or raised floor.
- Do not over tighten the cable straps or bend the cables to a radius smaller than 50 mm (2 in.).
- Do not put excess weight on the cable at the connection point and be sure that it is well supported.

Routing Cat5 E Ethernet Cables

Compute rack configuration:

- Cat5 E cables from the compute rack to the network rack should be coiled in the compute rack and routed under the floor or over the racks in trays.
- It is recommended that you start with the rack furthest from and work towards the network rack.
- Loop excess cables in as large a loop as possible within the tray when routing above rack or in as large a loop as possible when below a raised floor.
- When routing cables into the network rack, it is recommended you follow the same cabling scheme as in the compute racks. Green on left, blue and yellow on right looking at the back of the rack. See photo below.



Example of proper Force10 E300 and E1200 cable routing to facilitate serviceability:

E300



E600, E600i / E1200, E1200i

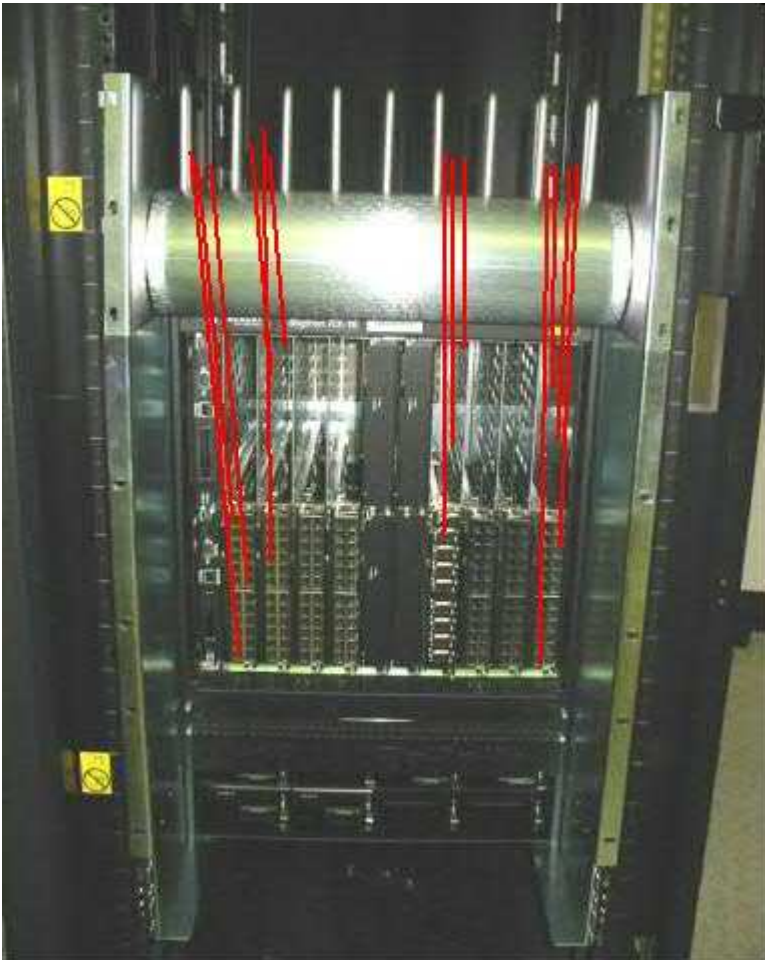


IBM Ethernet Switch B16R , MLXe 16 and MLXe 8 Switch Router

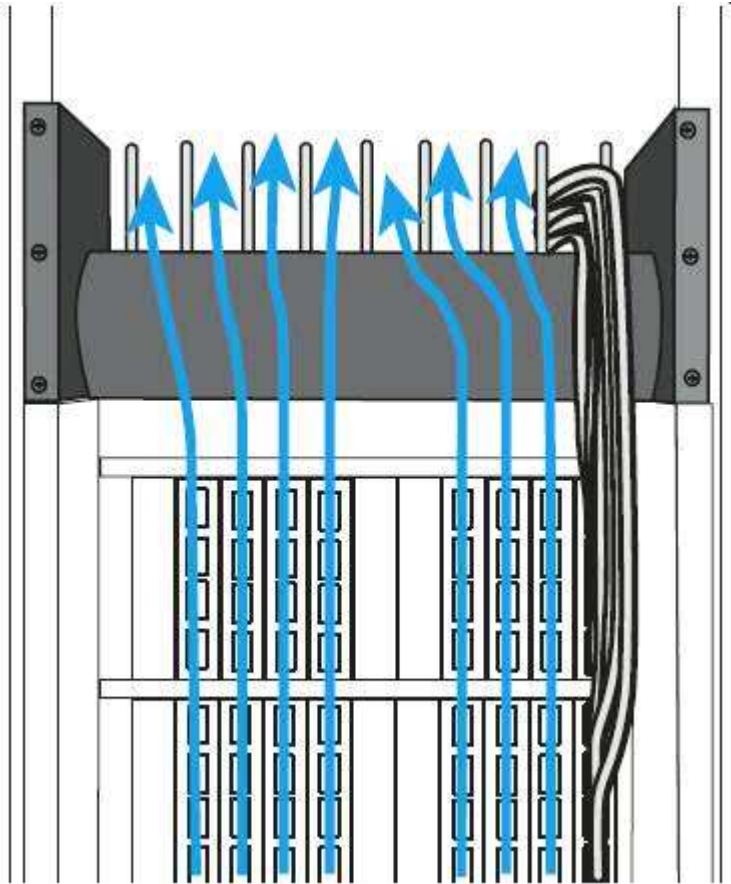
E600, E600i / E1200, E1200i

Line cards are positioned in a vertical manner with ports facing 1410 rack front (cold aisle) side and IO cables are run vertically up through and secured to cable management comb (bracket) with Velcro, over the switch chassis and then left and right fastening to the rack rear cable management loops on rack left and right sides then down through rack bottom. The MLXe 8 switch is not shown and will not employ the cable management comb. All cables that run over the switch chassis (MLXe 8 and 16) should run an "S" pattern on chassis top. This will allow cable slack to move cables to the side when servicing line cards. The IBM MRJ21 cable comes with a straight connector end and a 45 degree angles cable end. The straight cable connector end should be installed to the switch port side and the angles to the Patch panel side.

NOTE: On MLXe 16 installations the field installation team will be required to move the cable management comb from the MLXe 16 chassis / rack rear side (used as a shipping bracket during rack shipment) to the rack front side for proper cable routing.

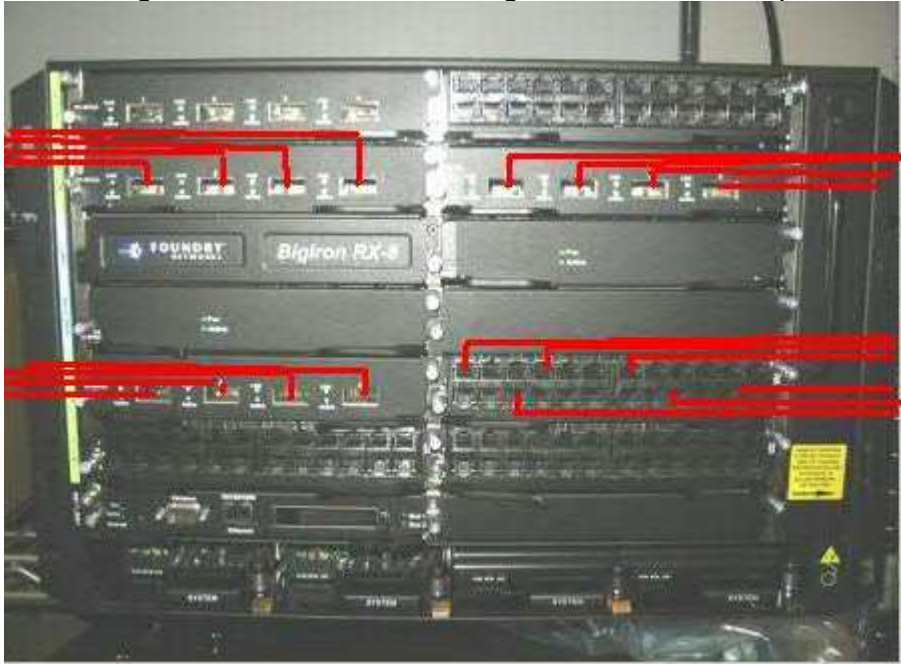


E600, E600i / E1200, E1200i



IBM Ethernet Switch B08R Switch Router

Line cards are positioned in a horizontally manner with ports facing rack rear (hot aisle) side and IO cables are left and right fastening to the rack rear cable management loops on rack left and right sides then down through rack bottom or upward through rack top.



IBM Ethernet Switch J08 and J16 Bundle (Juniper EX8208 and EX8216)

Line cards are positioned in a horizontally manner with ports facing rack rear (hot aisle) side and IO cables are left and right fastening to the rack rear cable management loops on rack left and right sides then down through rack bottom or upward through rack top.

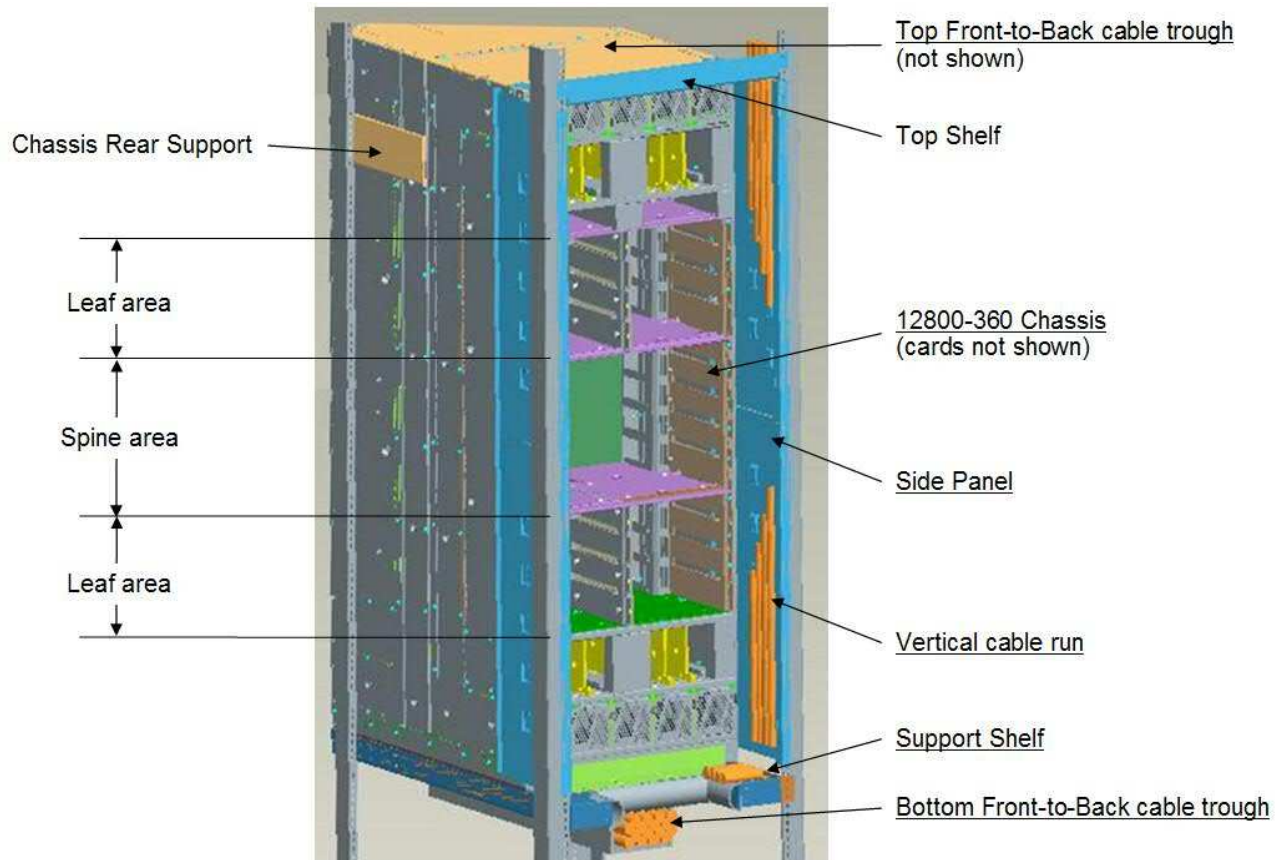


Intel 12800 360 864 Port InfiniBand Switch

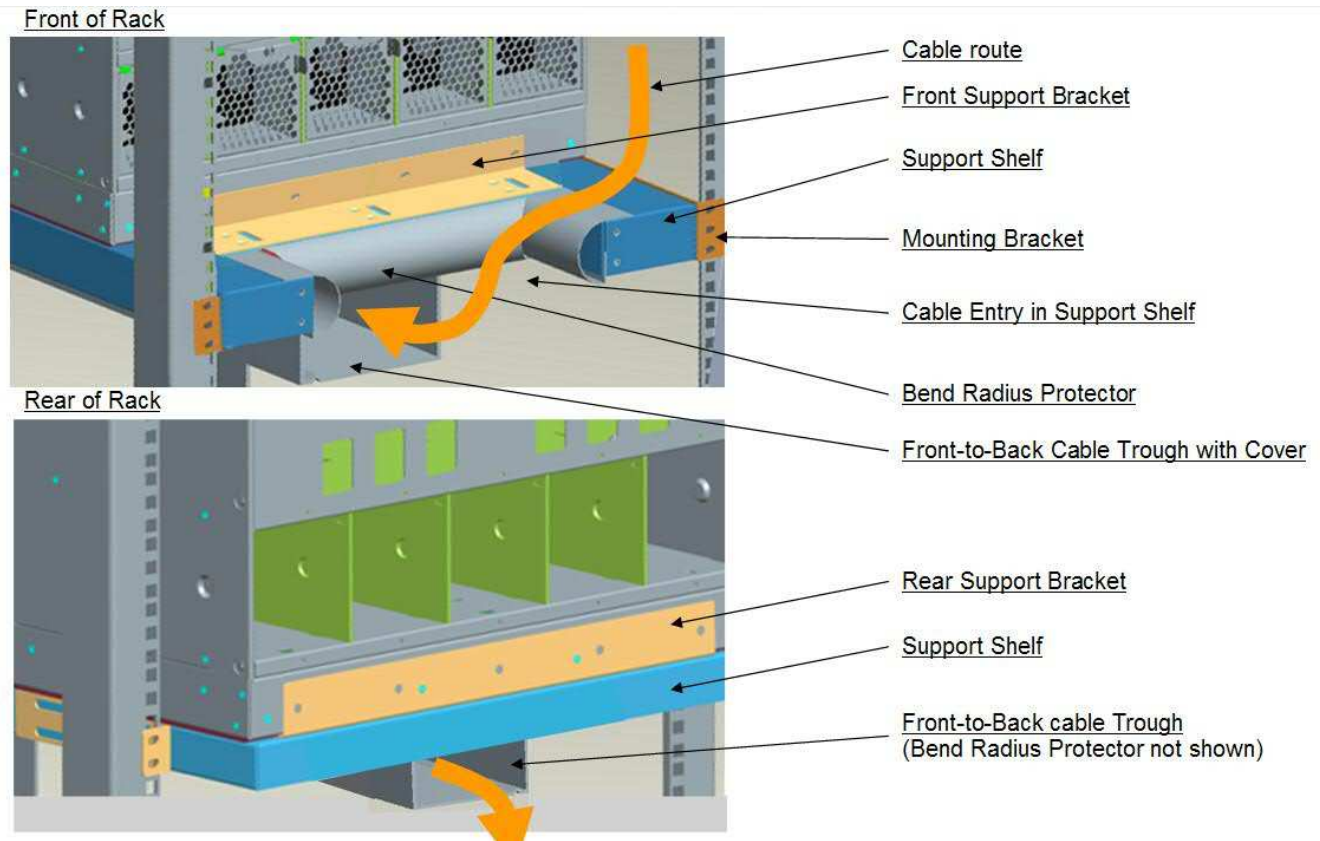
- Cables should be routed from rack / switch front side ports starting with leaf card slot L201, L203, L205, L207 down left front side , through switch bottom cable trough then to designated rack exit (Top or Bottom). Proceed to leaf slot L202, L204, L206, L208 down right front side, through switch bottom cable trough then to designated rack exit (Top or Bottom)
- Cables should be routed from rack / switch upper front side leaf card slot L219, L221 L223, L225 up left front side, over top through cable trough then up or down rack back left side to designated rack exit (Top or Bottom). Proceed to leaf slot L220, L222, L224, L226 up right front side over top through cable trough then rack back right side to designated rack exit (Top or Bottom).
- Cables should be routed from rack / switch lower rear starting with ports L102, L104, L106, L108, L110 on rack rear right side then up or down to designated rack exit (Top or Bottom). Proceed with ports L101, L103, L105, L107, L109 on rack rear left side up or down to designated rack exit (Top or Bottom).
- Cables should be routed from rack / switch upper rear starting with ports L120, L122, L124, L126, L128 to rack back right side then up or down to designated rack exit (Top or Bottom). Proceed with ports L119, L121, L123, L125, L127 on rack rear left up or down to designated rack exit (Top or Bottom).

Intel 12800 360 864 Port InfiniBand Switch

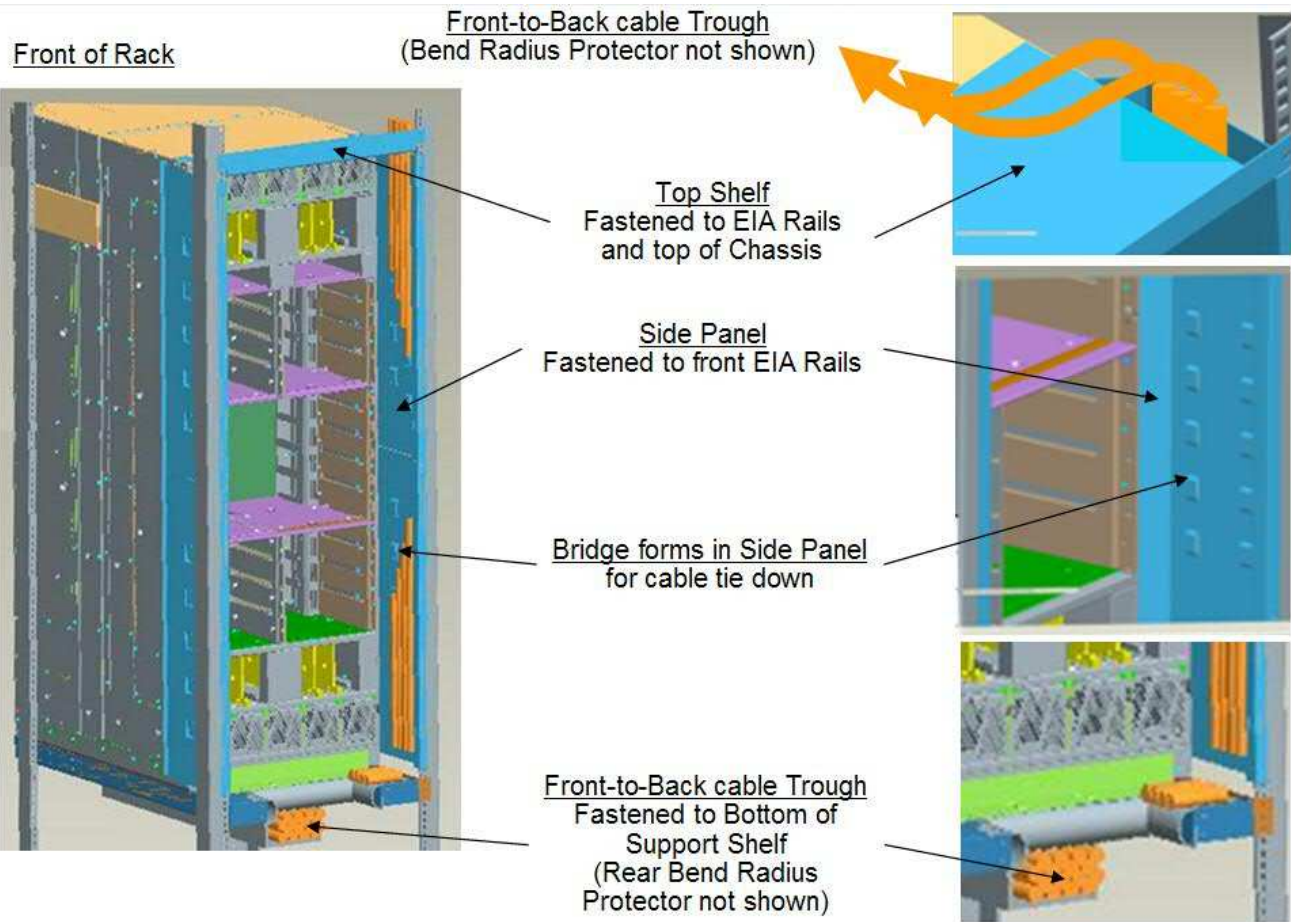
Top front



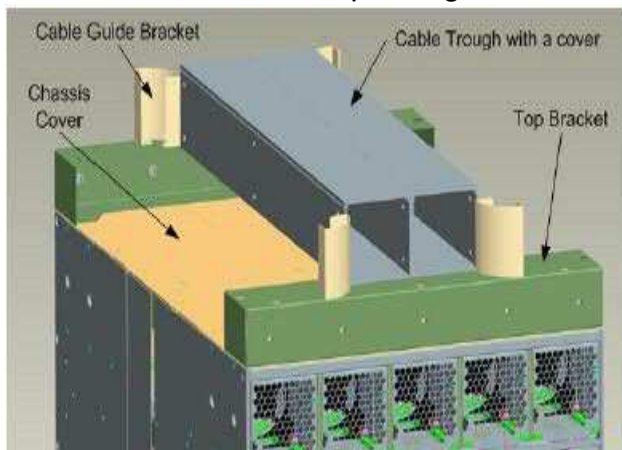
Intel 12800 360 864 Port InfiniBand Switch



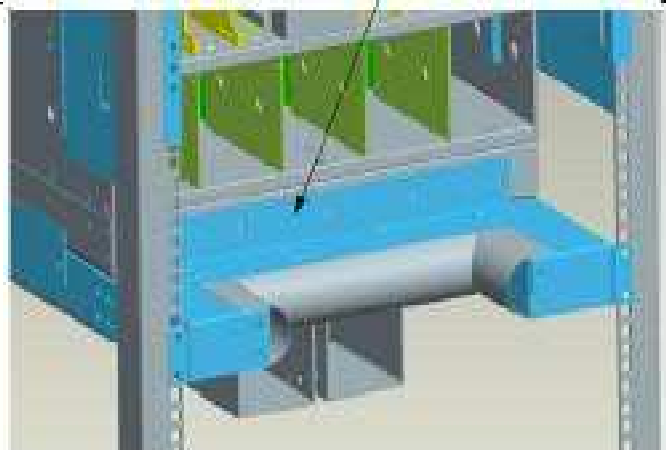
Intel 12800 360 864 Port InfiniBand Switch



Switch Top Trough



Switch Bottom Trough

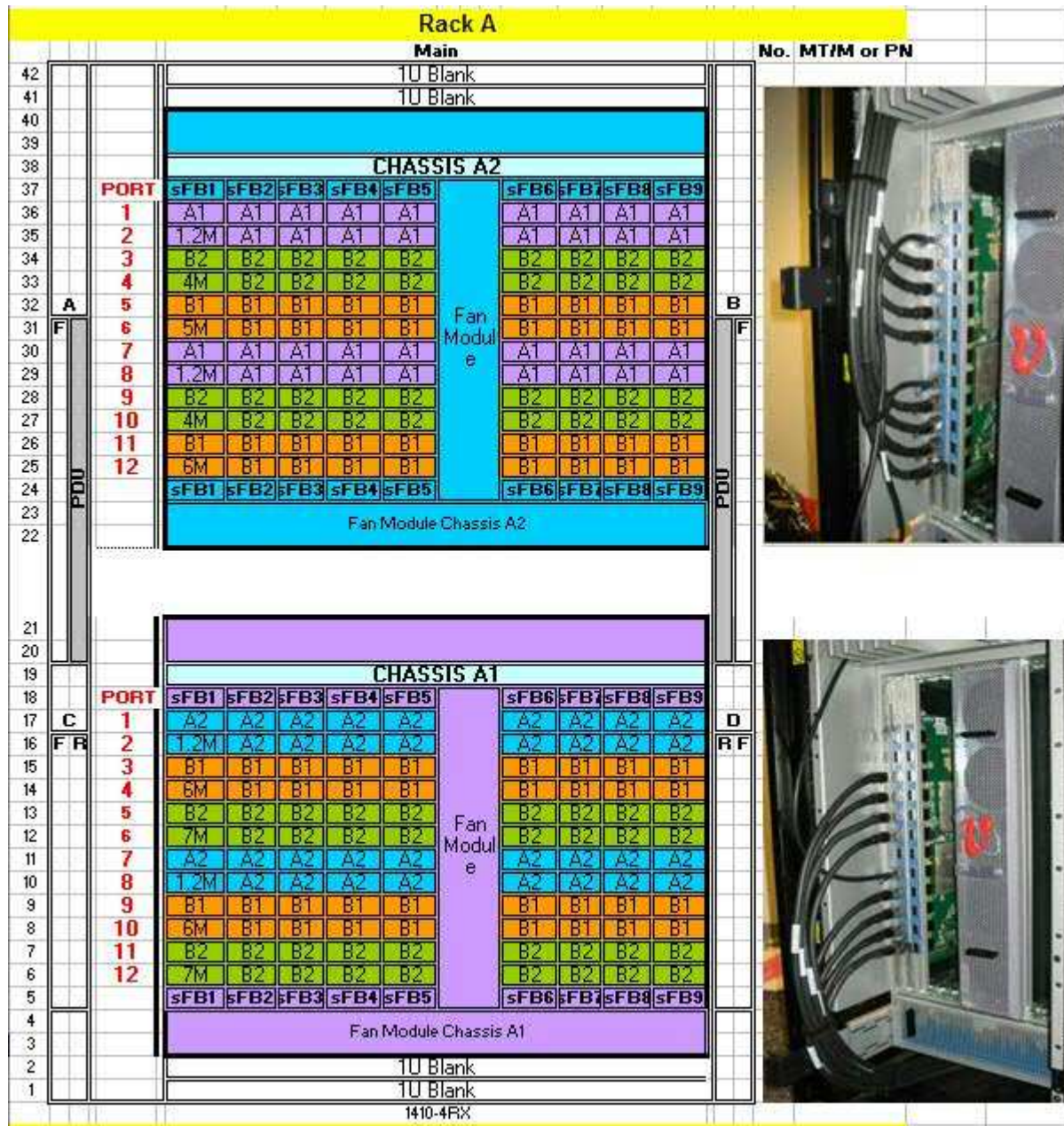


Voltaire 4200

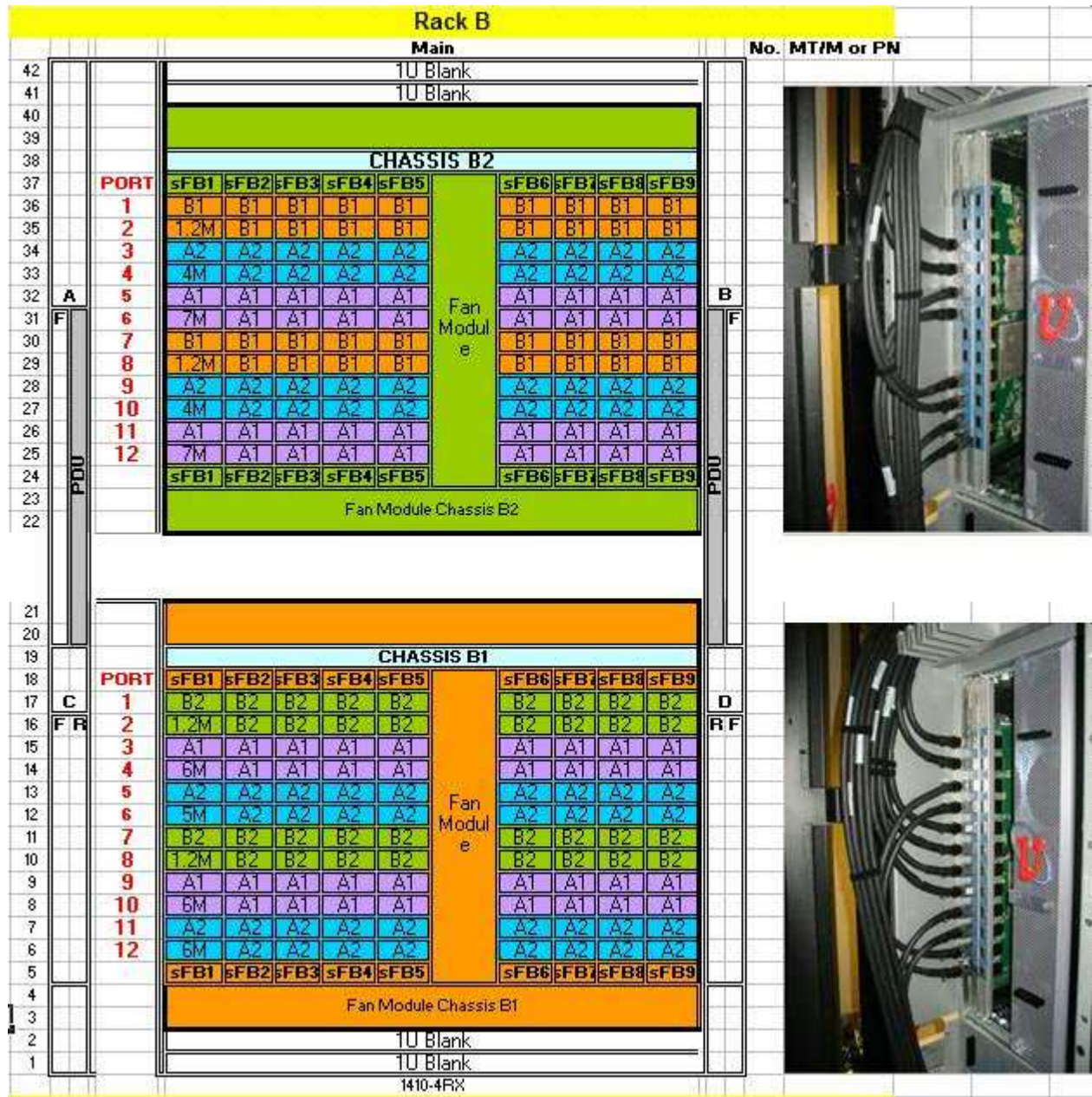
Line cards are positioned in a horizontally manner with ports facing rack rear (hot aisle) side and IO cables are left and right fastening to the rack rear cable management loops on rack left and right sides then down through rack bottom or upward through rack top.



4700 up to 4 in a single 1410 configuration.



Voltaire 4700 up to 4 in a single 1410 configuration.



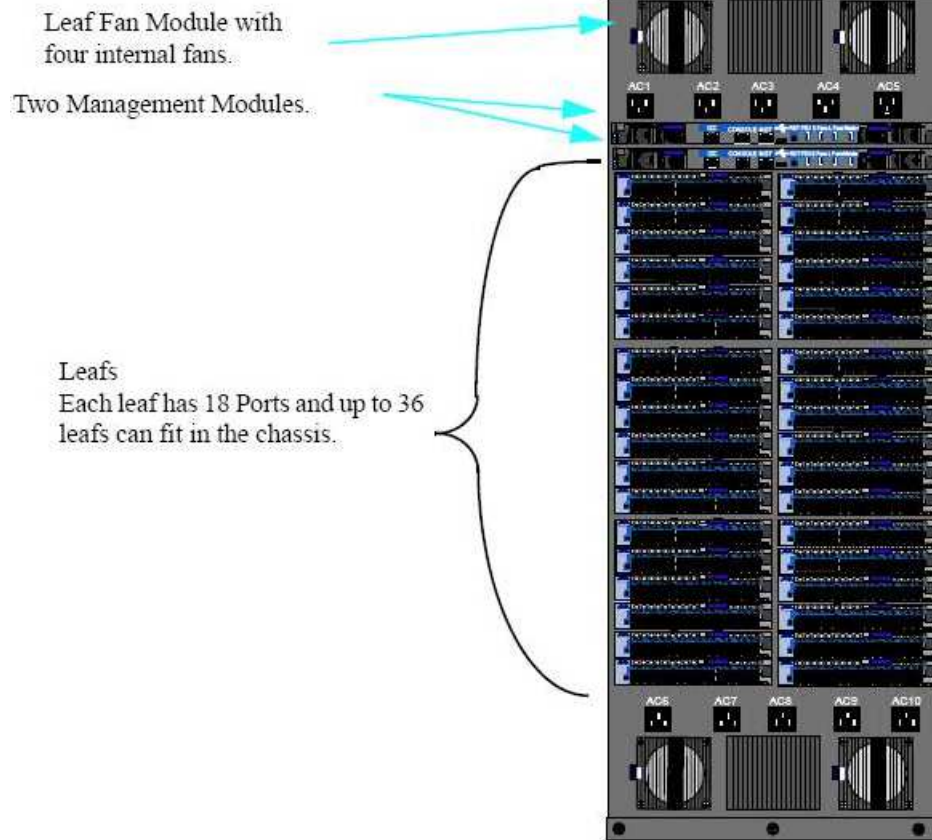
Voltaire 4700 up to 4 in a single 1410 configuration.

- First occurrence within a rack is installed in U3
- Second occurrence within a rack is installed in U22
- PDUs are installed in side pockets AR and BR.
- Rack A Chassis A1 Hyper scale Fabric Board (sFB) CXP cable from Ports 1, 2, 7 and 8 routes to same card and ports in Chassis A2. All other Fabric Board Hyper scale CXP cables from chassis A1 route from rack front under A1 chassis through U1 and U2 and exit rack via rack rear bottom exit port.
- Rack A Chassis A2 Hyper scale Fabric Board CXP cable from Ports 1,2, 7 and 8 route to same card and ports in Chassis A1. All other Hyper scale Fabric Board CXP cables from chassis A2 route from rack front over A2 chassis through U41 and U42 and exit rack via rack rear top exit port.
- Rack B Chassis B1 Hyper scale Fabric Board CXP cable from Ports 1,2, 7 and 8 route to same card and ports in Chassis B2. Hyper scale Fabric Board CXP cable from Ports 3,4,9 and 10 route from rack front under A1 chassis through U1 and U2 and exit rack via rack rear bottom exit port to rack A Chassis A1 same sFB same port. Hyper scale Fabric Board CXP cable from Ports 5,6,11 and 12 route from rack front over A2 chassis through U41 and U42 and exit rack via rack rear top exit port to rack A chassis A2 same sFB same Port on sFB.
- Rack B Chassis B2 Hyper scale Fabric Board CXP cable from Ports 1, 2, 7 and 8 routes to same sFB and ports in Chassis B1. Hyper scale Fabric Board CXP cable from Ports 5,6,11 and 12 route from rack front under A1 chassis through U1 and U2 and exit rack via rack rear bottom exit port to rack A Chassis A1 same sFB same port. Hyper scale Fabric Board CXP cable from Ports 3,4,9 and 10 route from rack front over A2 chassis through U41 and U42 and exit rack via rack rear top exit port to rack A chassis A2 same sFB same Port on sFB.

Mellanox SX 6536, SX 6518, SX 6512 IS5600, IS5300, IS5200, IS5100

- Install cables per section above titled :
Cabling Infiniband and 10Gb E switch end.
- The **IS5300, IS5200, IS5100** are smaller versions of the IS5600 and the same cabling practices will be applied.

SX6536 and IS5600



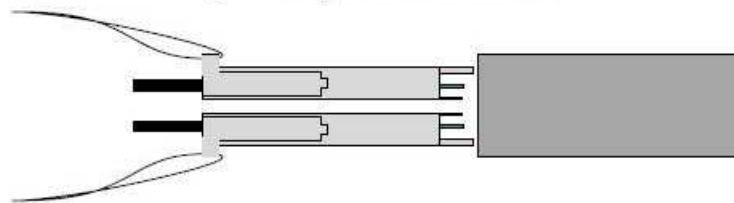
Mellanox SX 60536, Port Connector Interfaces

The Connector side of the switch has 36 leaf boards and each leaf board has 36 QSFP ports. The ports on each leaf board are placed in two rows, 18 ports to a row. The ports are labelled as shown in Figure 8. The bottom row ports are flipped from the top row. See Figure 1.

Port Numbering

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 |
| 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 |

Figure1 : Top and Bottom Ports

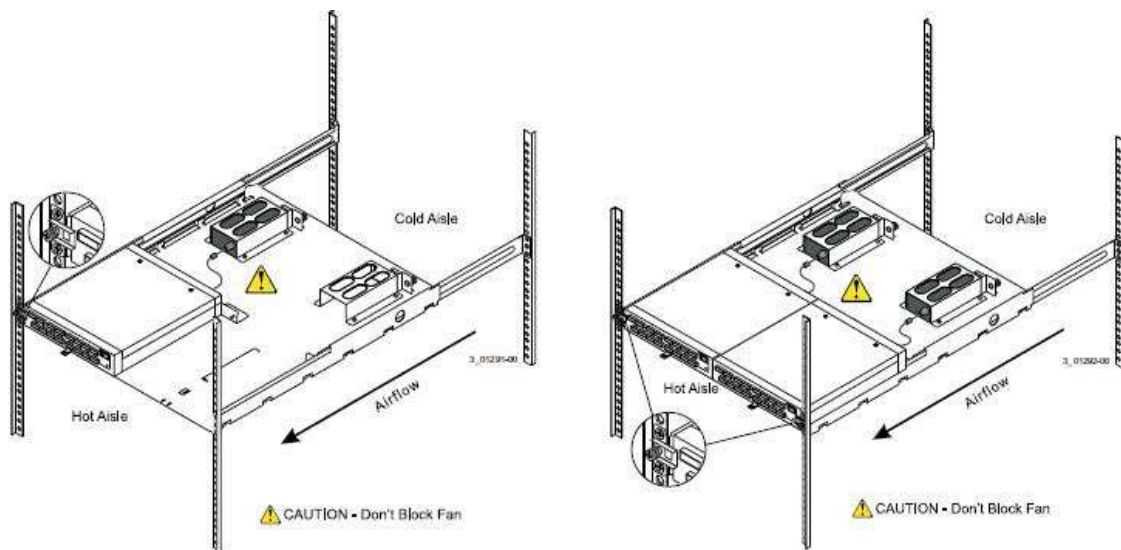


Field Installing the LSISAS6160 Switch.

For intelligent Cluster solutions the LSI SAS6160 switch will be required to be field installed. The Mounting shelf, Power brick and power cord and all I/O cabling will ship rack integrated from the factory.

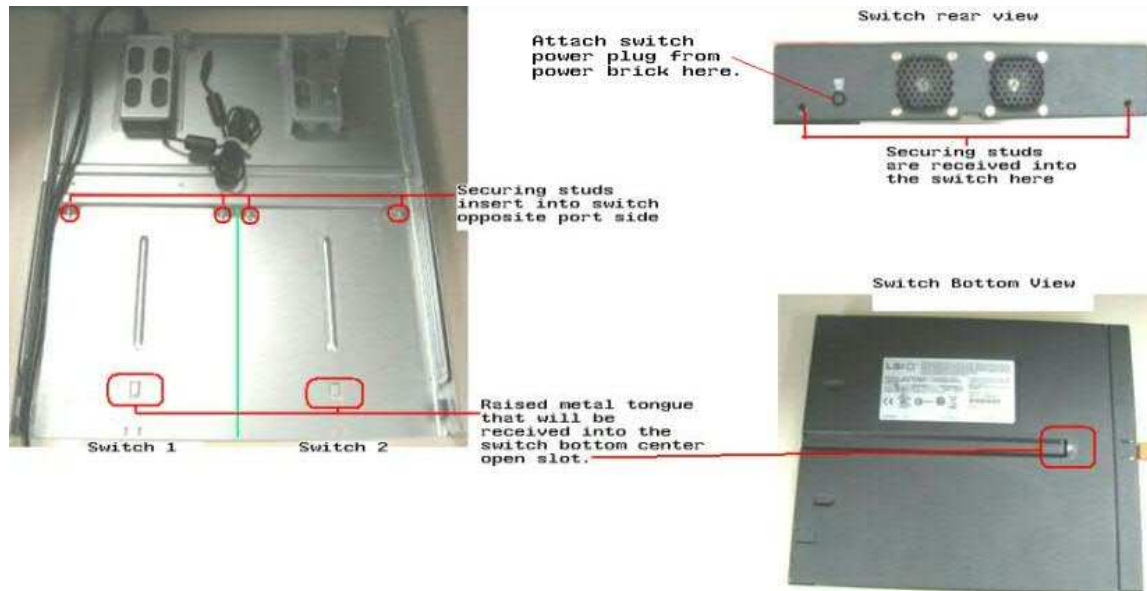
-A special shelf is available for mounting one or two LSISAS6160 switches in a standard rack. The following figure shows these options.

Figure 1 Mounting LSISAS6160 Switches on a Rack-Mounted Shelf



-The shelf comes equipped with securing studs that will insert into the rear opposite port side of the switch as well as a (switch bottom side center located) raised metal tongue that will be received into the switch. See figure 2 below.

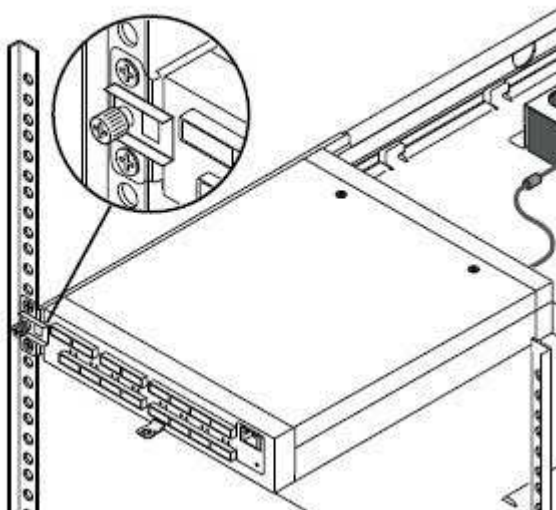
Figure 2 Mounting LSISAS6160 Switches on a Rack-Mounted Shelf



-Once the switch is properly placed on to the shelf. Attach install power plug from power brick into the switch power port. See figure 2.

-Install Securing tab as shown in figure 3 to secure switch into position. Switch 1 installs to Left side EIA rail attach point and switch 2 securing tab installs to Right side EIA rail attach point as seen in figure 3.

Figure 3 Mounting LSISAS6160 Switches on a Rack-Mounted Shelf



-Install all IO cabling to switch ports.

iDataPlex

Cat5E Guidelines

- Example of how to properly dress Cat5E / Cat 6 Ethernet cables from a Vertical Ethernet Switch location to the node locations. There should be no strain on the Ethernet plug (cable side) and the cable should intersect the switch port at a 90 degree angle plugging straight into the switch port from the cable rails.



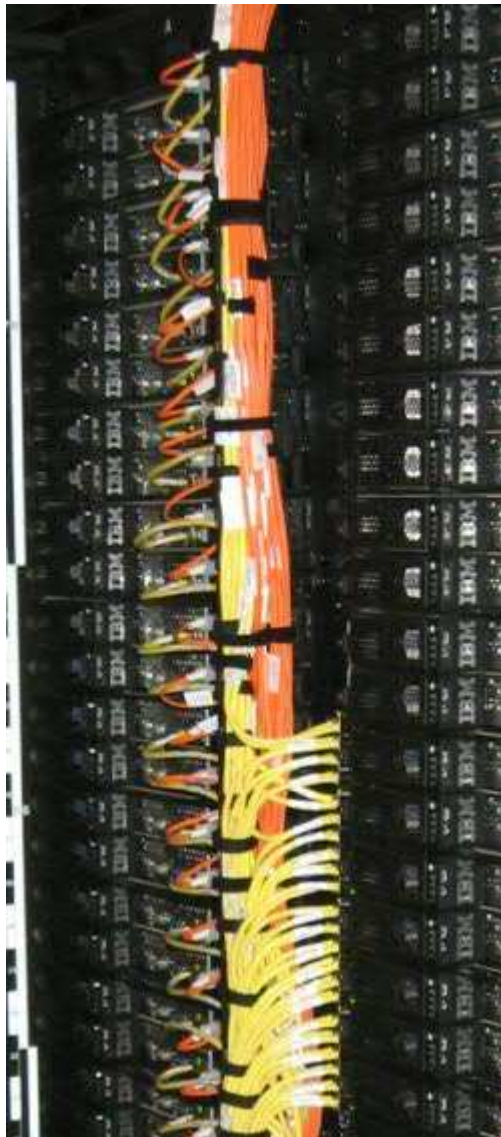
Below is an example of how the Cat5 E cables should be routed from the switch to the nodes within the rack.



Fiber InfiniBand / 10 GB Ethernet Guidelines iDataPlex

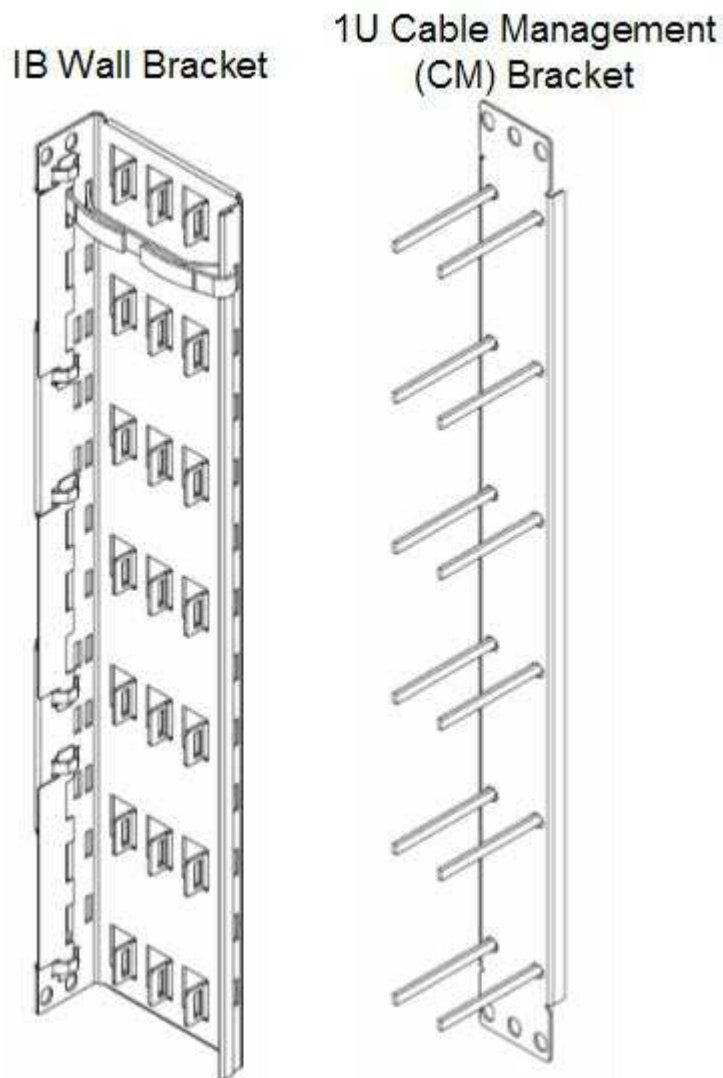
- Fiber down link cables to the servers or nodes from core switch must be run behind the Cat5E / Cat 6 cables that run from the cable management bracket to the nodes. Velcro fiber cables behind cable management bracket.
- Fiber cables to InfiniBand or 10GB Ethernet leaf switches from core switch must be run on the outside of the handle brackets and over top of the Cat 5E / Cat 6 cables and secured to the handle bracket using Velcro.
- If InfiniBand cables are entering the rack from the bottom. Route and secure cables to top nodes first working your way to the lowest node last.
- If InfiniBand cables are entering from the top. Route and secure cables from lowest node and work upward.



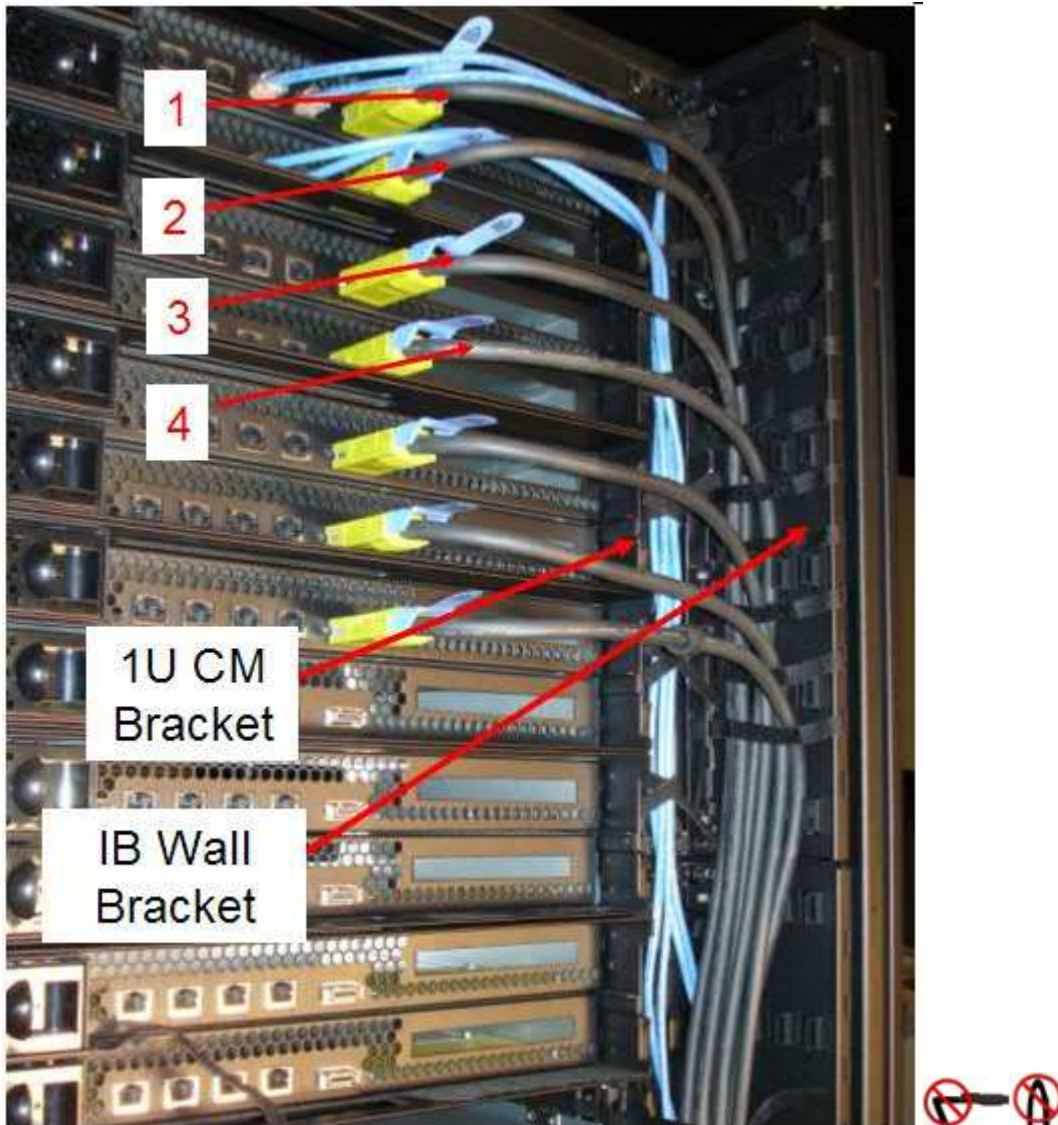


Copper InfiniBand Guidelines

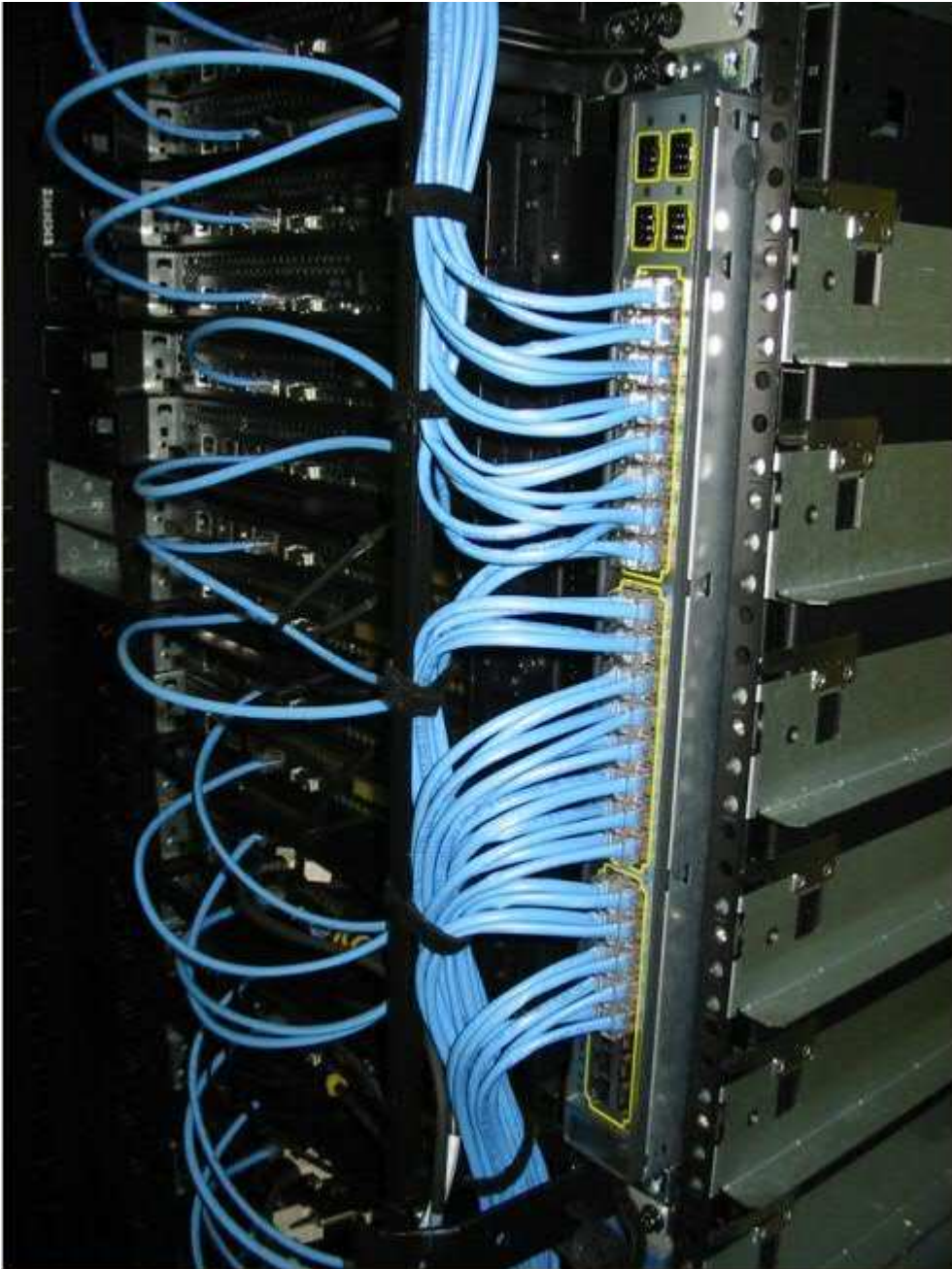
- When 26 AWG copper InfiniBand is installed in the iDataPlex rack a 1U Cable management (belt loop) bracket will be used to secure the Cat5 E / Cat 6 Ethernet cables. This bracket will be installed in all ODD slots in columns B and D.



- If DDR 26 AWG Copper InfiniBand cables are to be run in Columns B and or D. IB wall brackets may be installed in all EVEN slots.
- If InfiniBand cables are entering the rack from the bottom run and secure cables to top nodes first working your way to the lowest node last.
- If InfiniBand cables are entering from the top. Run and secure cables from lowest node and work upward.



48Port 1GB Ethernet switch cabling within iDataPlex Vertical position.

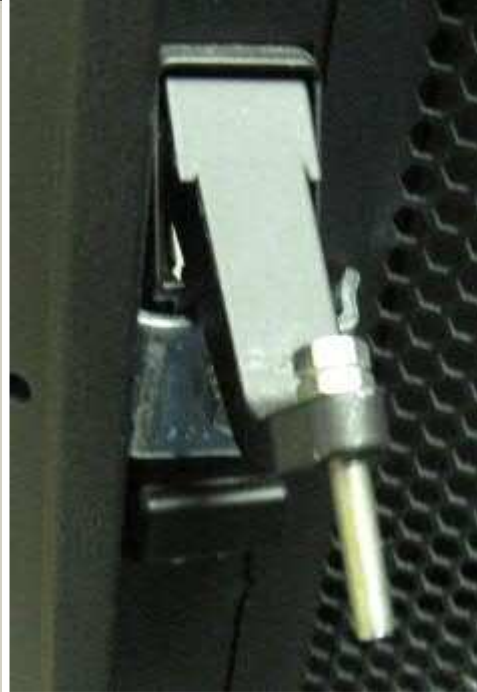


NOTE: SECURE ALL CABLES THAT ROUTE PAST FRONT DOOR LATCHING MECHANISM AS DEEP INTO THE RACK AS POSSIBLE. VERIFY THERE WILL BE NO CONTACT BY CLOSING LEFT FRONT DOOR AND CAREFULLY SECURING LATCHING MECHANISM. DOOR LATCH ADJUSTMENT BOLT WILL DAMAGE CABLES IF NOT PROPERLY ROUTED.

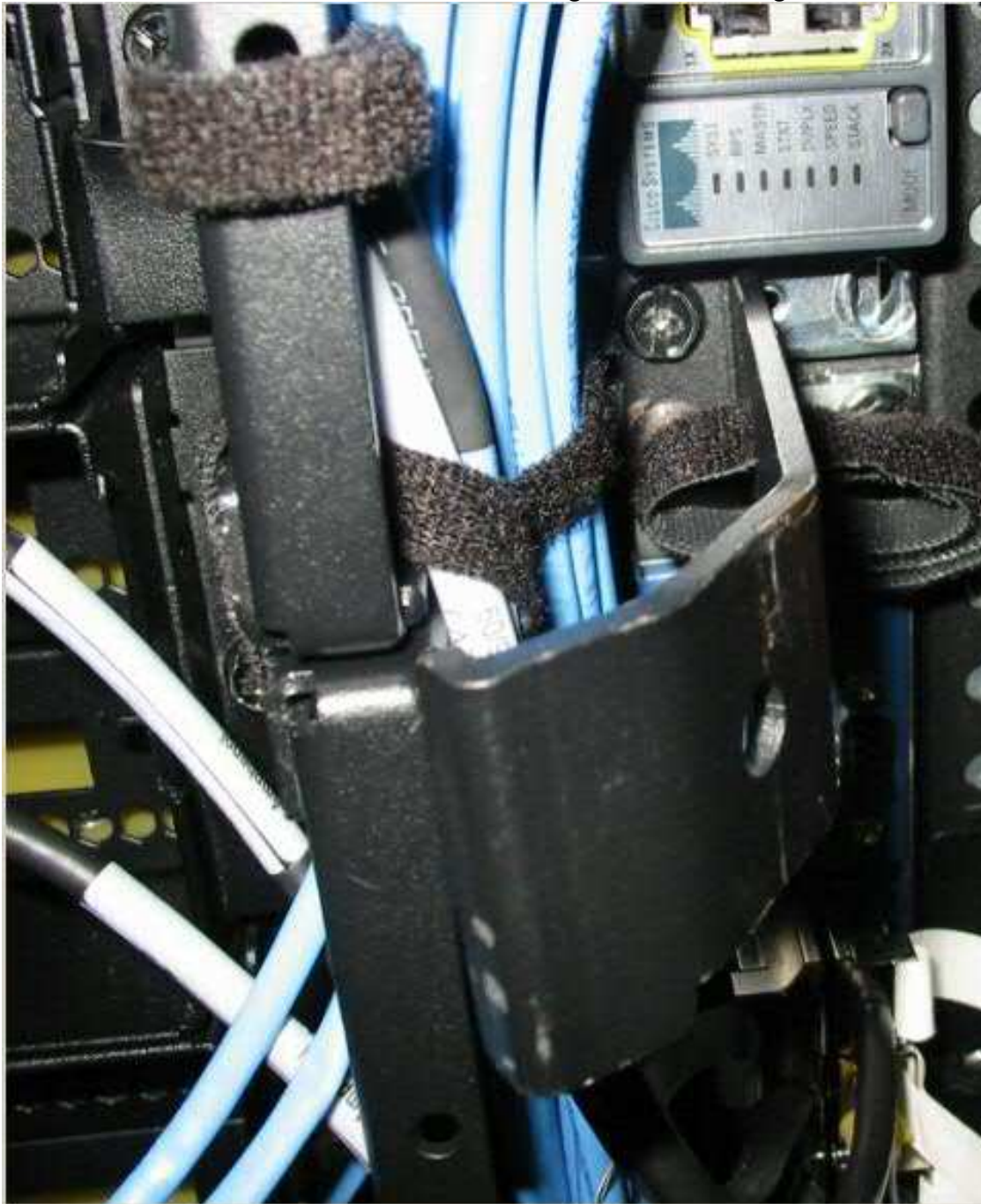
ADJUSTMENT BOLT AND CABLE BRACKET



Door Latch Assembly



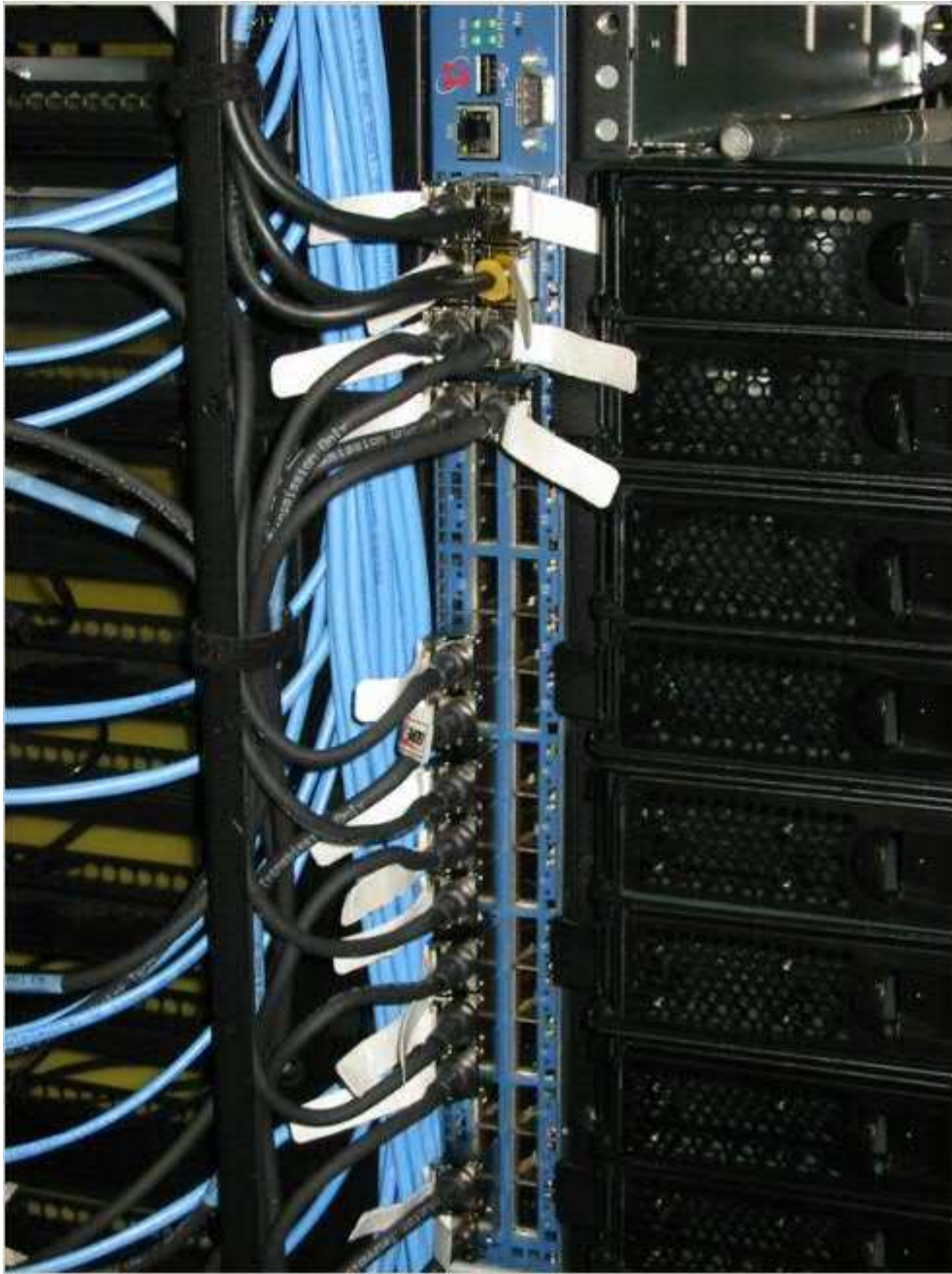
Latch bracket and cables recessed into rack making room for latching mechanism.



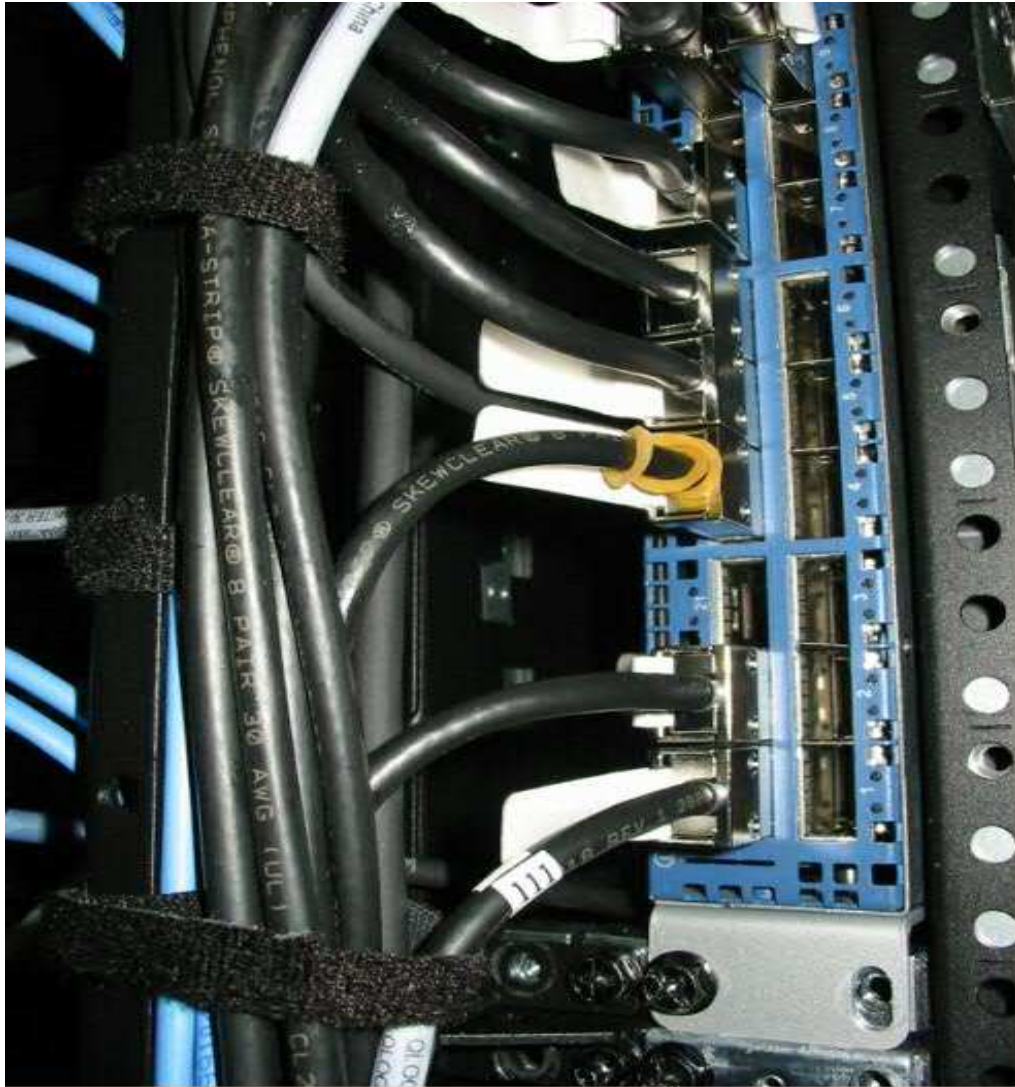
Latch bracket and cables recessed into rack making room for latching mechanism.



36Port QDR InfiniBand switch cabling within iDataPlex vertical position.
30 AWG 0.5M and 1M cables shown.



30 AWG 0.5M and 1M Cables shown.



iDataPlex Nodes in 1410 rack Guidelines

Cabling of iDataPlex Nodes in 1410 Rack

| 2 U chassis Configuration | | | |
|---------------------------|-------------------------------|--|--|
| Rack Front View | | | |
| U | U Content Description | | |
| 42 | 2U | | |
| 41 | Chassis | | |
| 40 | 2U | | |
| 39 | Chassis | | |
| 38 | 2U | | |
| 37 | Chassis | | |
| 36 | 2U | | |
| 35 | Chassis | | |
| 34 | 1U Cable Pass-through Bracket | | |
| 33 | 2U | | |
| 32 | Chassis | | |
| 31 | 2U | | |
| 30 | Chassis | | |
| 29 | 2U | | |
| 28 | Chassis | | |
| 27 | 2U | | |
| 26 | Chassis | | |
| 25 | 2U | | |
| 24 | Chassis | | |
| 23 | ENT Switch | | |
| 22 | ENT Switch or 1U Belt Loop | | |
| 21 | 2U | | |
| 20 | Chassis | | |
| 19 | 2U | | |
| 18 | Chassis | | |
| 17 | 2U | | |
| 16 | Chassis | | |
| 15 | 2U | | |
| 14 | Chassis | | |
| 13 | 2U | | |
| 12 | Chassis | | |
| 11 | 1U Cable Pass-through Bracket | | |
| 10 | 2U | | |
| 9 | Chassis | | |
| 8 | 2U | | |
| 7 | Chassis | | |
| 6 | 2U | | |
| 5 | Chassis | | |
| 4 | 2U | | |
| 3 | Chassis | | |
| 2 | 2U | | |
| 1 | Chassis | | |

| 3 U chassis Configuration | | | |
|---------------------------|-------------------------------|--|--|
| Rack Front View | | | |
| U | U Content Description | | |
| 42 | | | |
| 41 | 3U | | |
| 40 | Chassis | | |
| 39 | 3U | | |
| 38 | Chassis | | |
| 37 | 3U | | |
| 36 | Chassis | | |
| 35 | 3U | | |
| 34 | Chassis | | |
| 33 | 1U Cable Pass-through Bracket | | |
| 32 | | | |
| 31 | 3U | | |
| 30 | Chassis | | |
| 29 | 3U | | |
| 28 | Chassis | | |
| 27 | 3U | | |
| 26 | Chassis | | |
| 25 | 3U | | |
| 24 | Chassis | | |
| 23 | ENT Switch | | |
| 22 | ENT Switch or 1U Belt Loop | | |
| 21 | 2U | | |
| 20 | Chassis | | |
| 19 | 3U | | |
| 18 | Chassis | | |
| 17 | 3U | | |
| 16 | Chassis | | |
| 15 | 3U | | |
| 14 | Chassis | | |
| 13 | 1U Cable Pass-through Bracket | | |
| 12 | 3U | | |
| 11 | Chassis | | |
| 10 | 3U | | |
| 9 | Chassis | | |
| 8 | 3U | | |
| 7 | Chassis | | |
| 6 | 3U | | |
| 5 | Chassis | | |
| 4 | 3U | | |
| 3 | Chassis | | |
| 2 | 3U | | |
| 1 | Chassis | | |



Identifies to cable management bracket. **Cables actually route to right side of bracket.**

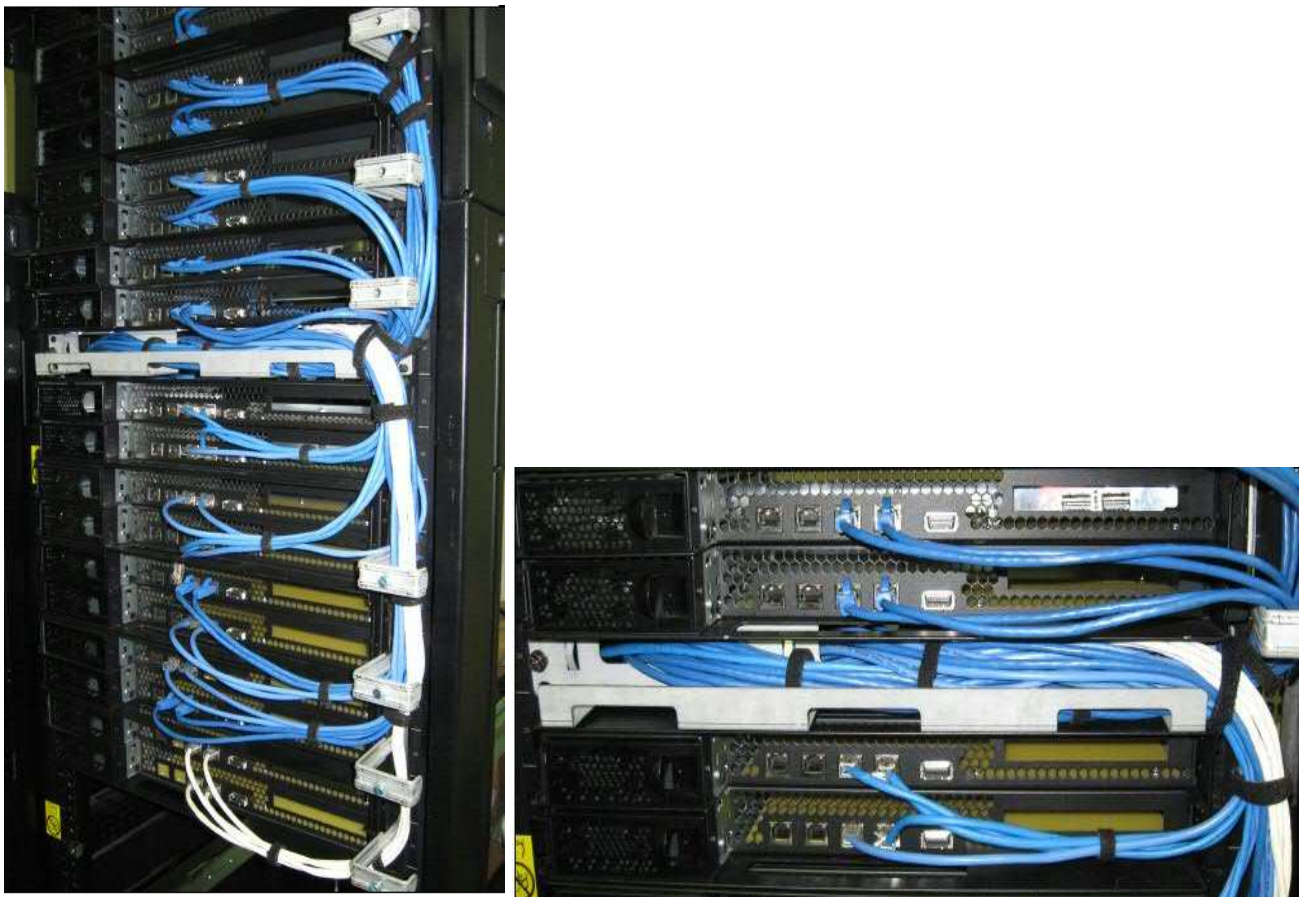


Arrows identify front of rack view and show cable routing flow Down, Up and left inward to 1U Cable pass-through Bracket. 1U Cable pass-through Bracket. Come in pairs and are installed in same U location in rack front and back.

- Install Rails, Chassis, front and rear 1U Cable pass-through Bracket and Cable management brackets.
- Install chassis as indicated by 2U AND 3U Chassis Configuration.
Other configurations can be supported however the demonstrated racking scheme should be followed. Inspect all fastening hardware to ensure components are secure in rack.
- Route 1GB Ethernet cables first from node port to right side of rack (facing rack front) over cable management bracket and upward or downward depending on location in reference to 1U cable management bracket. Cables should be routed between cable management bracket and right side frame member. Make sure to facilitate room for chassis and FRU serviceability. Route cables through rack front 1U cable pass-through bracket, through rack and out of rear 1U cable management bracket (NOT ILLUSTRATED). Neatly dress to rack rear side right and left cable management area with Velcro then on to final port destination. Neatly attach cables to cable management supports (Rack front and rear) to prevent cables from pulling downward. Bundle and dress all cables with Velcro once all cables have been completely installed.

- Route Fiber cables second from node port to right side of rack (facing rack front) over cable management bracket and upward or downward depending on location in reference to 1U cable management bracket. Cables should be routed between cable management bracket and right side frame member. Make sure to facilitate room for chassis and FRU serviceability. Route cables through rack front 1U cable pass-through bracket, through rack and out of rear 1U cable management bracket (NOT ILLUSTRATED). Neatly dress to rack rear side right and left cable management area with Velcro then on to final port destination. Neatly attach cables to cable management supports (Rack front and rear) to prevent cables from pulling downward. Bundle and dress all cables with Velcro once all cables have been completely installed.
- Inspect cable bundling to ensure neat, clean routing, dressing and serviceability requirements are met.

Rack cabling with 1U cable management bracket.



NeXtScale Rack Cabling Guidelines

Front Left and Right Side Node to Switch

- The NeXtScale server chassis occupies 6 rack U of space. There are two servers or nodes in each one U of space totaling 12 nodes per chassis. All IO ports are located on the node face which is on the rack front side. Cabling must be routed precisely and neatly to ensure ease of serviceability to the individual nodes. Maintaining the appropriate cable bend radius is CRITICAL whenever redirecting the cable in its path between node and switch or switch to switch ports. Proper bend radius for each cable type is illustrated in the Planning section of this document. Cables should be routed in the following manner.

NextScale node port to an Infiniband Leaf, 10Gb E or 1Gb switch port.

- All cables connecting to odd nodes, chassis left side (nodes 1,3,5,7,9, and 11) will route to the rack front left side. All cables connecting to even nodes, chassis right side (nodes 2,4,6,8,10 and 12) will route to the rack right side.
- The cable would then route up or down the rack right and or left vertical sides between the EIA flange and the rack left and or right sides (vertical cable channel) to the appropriate U location housing the switch. Then right or left to the appropriate switch port location as identified on the cable to and from label.

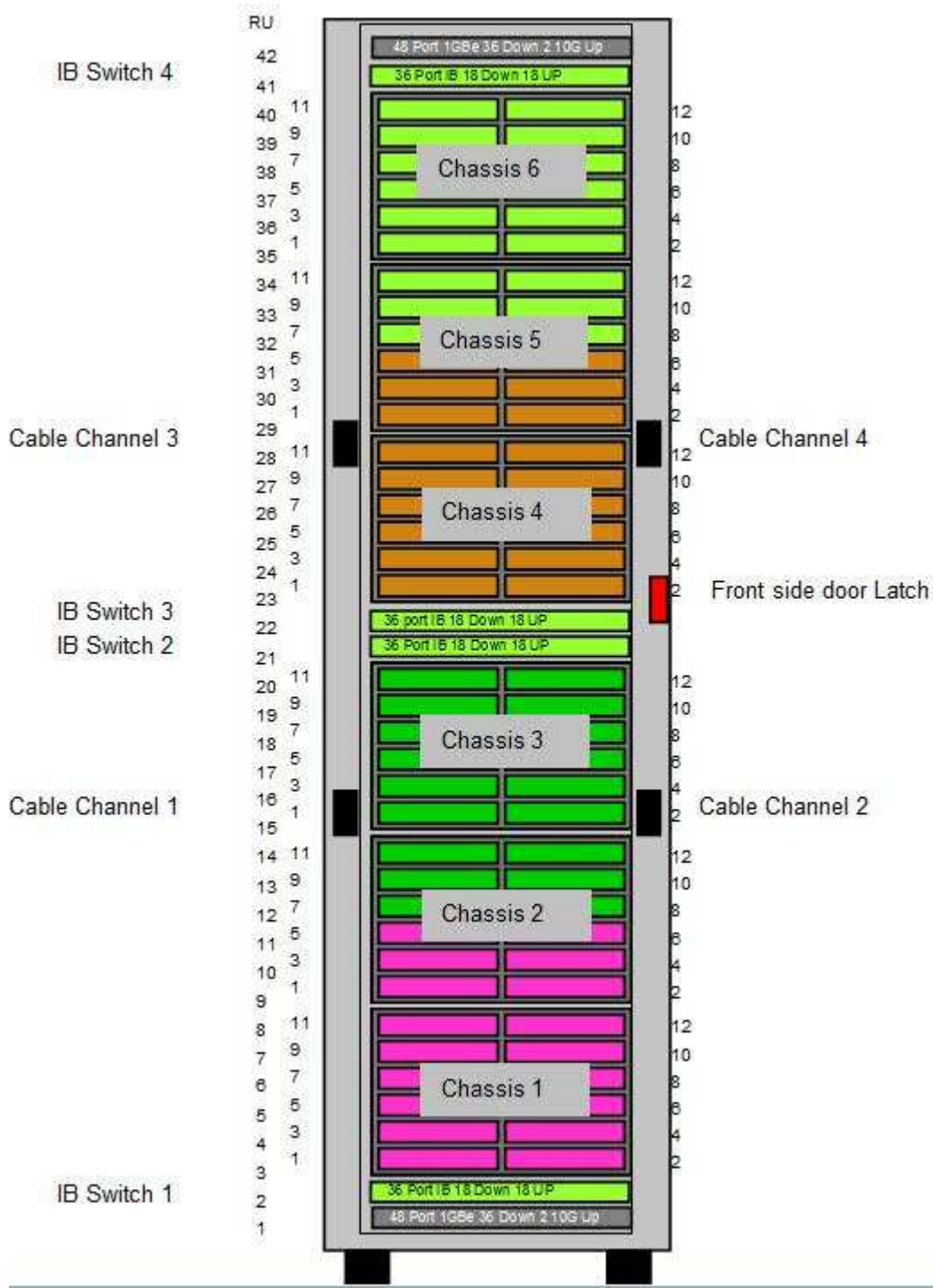
NextScale rack switch to rack switch uplink and interconnects.

- Please familiarize yourself with the rack cable channels. See NeXtScale Rack Front Side Image below for cable channel 1,2, 3 and 4 locations. It is recommended that two people perform this activity to prevent cable damage such as kinking fiber cables during passage through the cable channels. This is accomplished by using the cable Fish Tool PN 15R8270 (Image below). Attach cable or cables to be routed through cable channel from rack rear to rack front as shown in **Fish Tool Cable Attachment** image below. Be sure that the cable connector ends have protective cover installed and that the cable is facing the appropriate direction for traveling through the cable channel as illustrated. Slowly push the fish rod with cables attached through the rack rear channel to the receiving person on rack front side. Repeat until all cables have been safely routed to rack front side.

NeXtScale Rack Cabling Guidelines

- All switches in U locations U22 and above with uplink or switch to switch interconnects ports on the right side would route cables through cable channel 4 as seen in the NextScale Rack Image Front Side illustration below by following the same steps in preparing the cables for passage above.
- All switches in U locations below U22 with uplink or switch to switch interconnects ports on the left side would route cables through cable channel 1 as seen in the NeXtScale Rack Image Front Side illustration below by following the same steps in preparing the cables for passage above
- All switches in U locations below U22 with uplink or switch to switch interconnects ports on the right side would route cables through cable channel 2 as seen in the NeXtScale Rack Image Front Side illustration below by following the same steps in preparing the cables for passage above
- **NOTE UPLINK AND SWITCH TO SWITCH INTERCONNECT CABLES SHOULD NEVER BE ROUTED WHERE RACK FRONT DOOR LATCH COULD CAUSE INTERFERENCE WHEN RACK FRONT DOOR IS CLOSED AND LATCH IS ENGAGED. DAMAGE TO CABLES COULD OCCURR.**

NextScale Rack Front Side Image



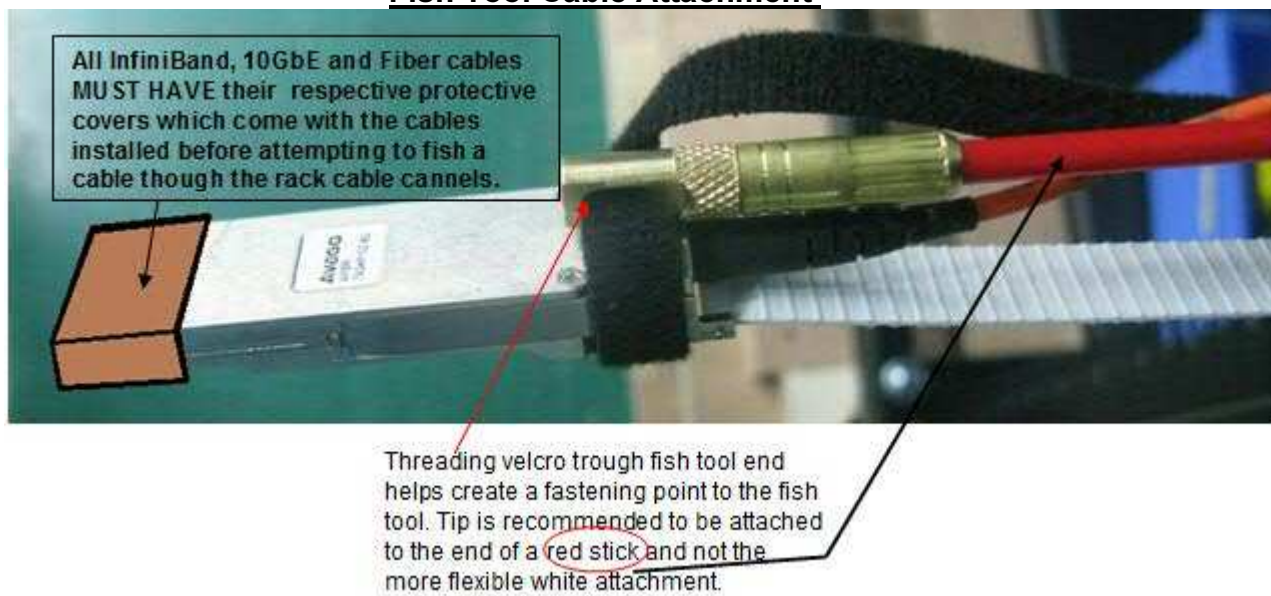
Fish Tool PN 15R8270



Fish Tool Found in Intelligent Cluster with NextScale Servers Ship group



Fish Tool Cable Attachment



Two Fiber Attached to Fish Tool



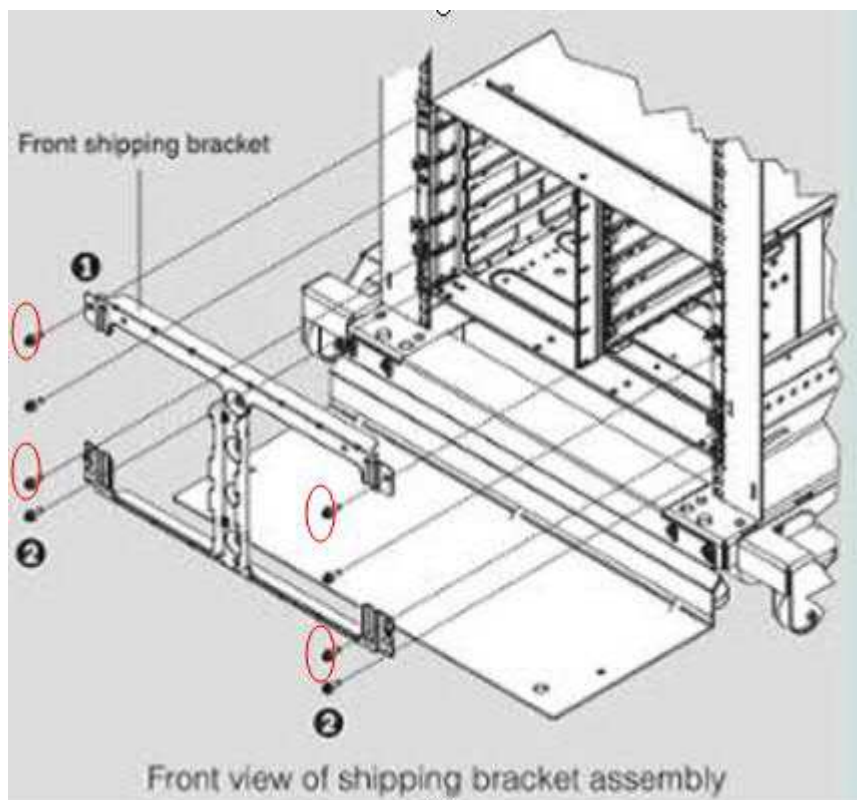
Fishing Cables Through Cable Channel #3



NeXtScale PDU Whip Rack TOP Side Exit Preparation for Single Rack with 6 Chassis

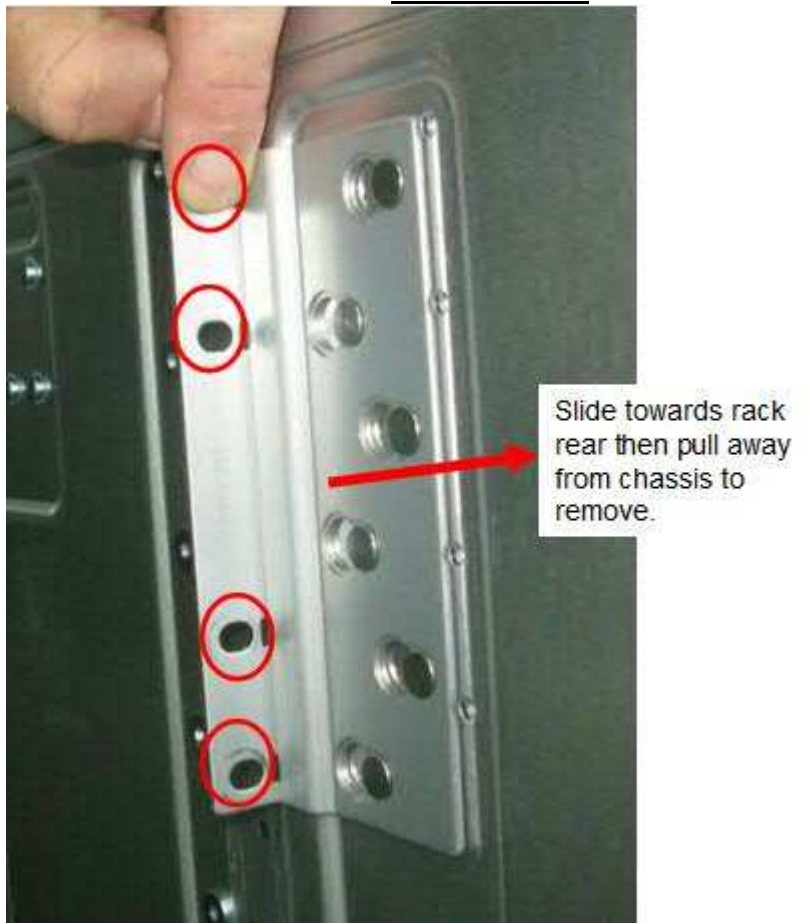
The following steps must only be performed when the rack is in its final position within the customer datacenter to ensure that the rack will have no further travel through the customer facility. The chassis in U35 will be moved out of the rack front side by no more than 2 inches or 50mm. Proper cable routing should enable this to be done without removal of any node cabling. Please ensure there is adequate slack for maintaining proper cable bend radii (properly routed cables) so that the chassis to be moved out of the rack front side the required 2 inches or 50mm without exceeding the cable bend radii.

On chassis located in U35 Remove the four M6 screws that attach the chassis front side shipping bracket from the chassis as indicated in the red circle below. Carefully remove the front side shipping bracket. Be very careful not to disturb or Damage any of the IO cabling or chassis hardware.



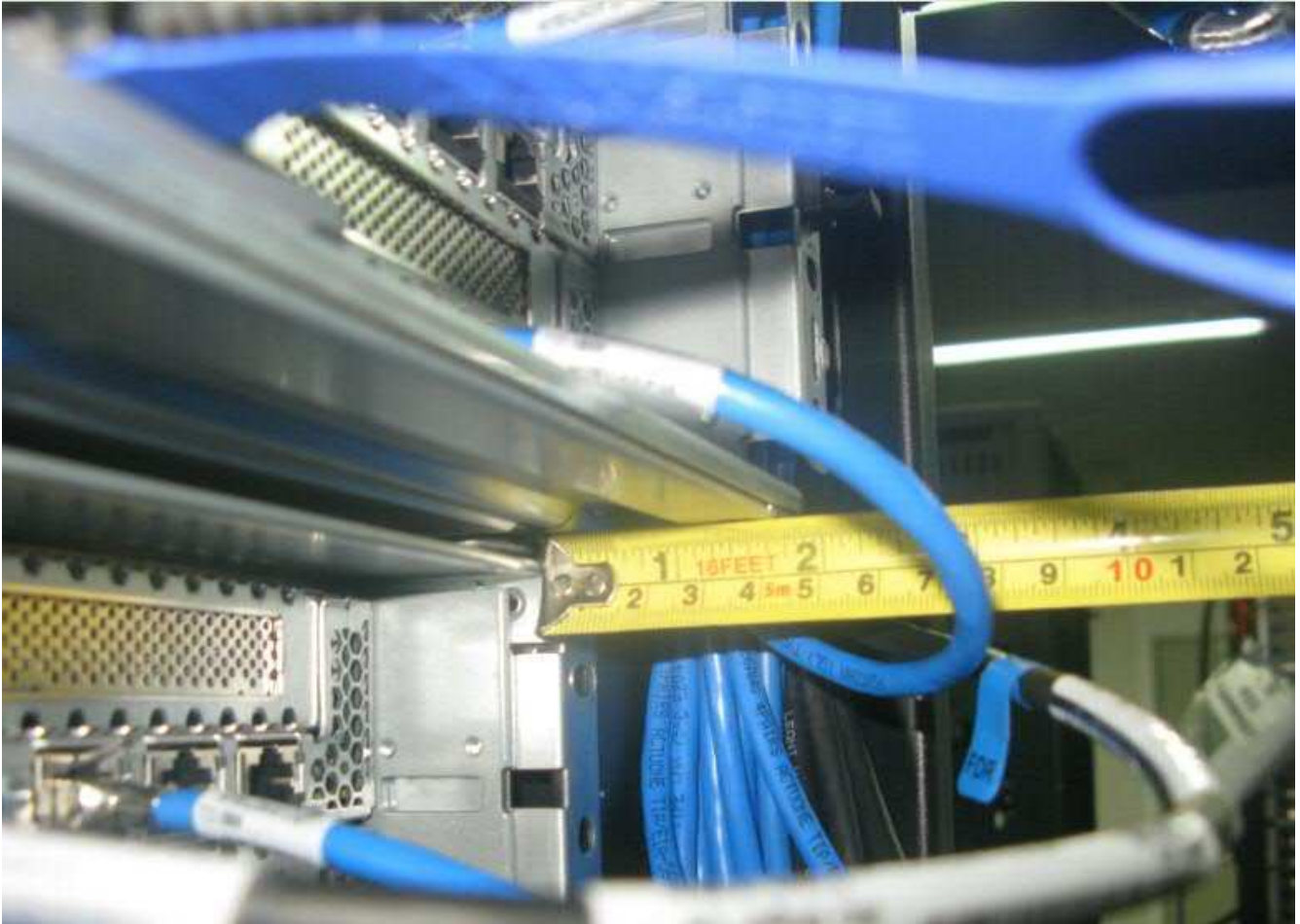
On chassis located in U35 Remove the Chassis rear brackets left and right sides located in rack Rear U37,38 and 39 by removing the four M6 bolts from EIA flange and then sliding the bracket towards rack rear then pulling outward away from chassis.

Rear Bracket



After the front shipping bracket and rear shipping brackets have been removed gently push the rear of the chassis towards rack front no more than two inches or 50mm.

Chassis front side protruding no more than 2 inches or 50mm



There should now be enough clearance on the rack rear top side to route the power whip cables through the rack top port opening.

Routing Power Whip through Rack Top Side.



Once this has completed reinstall the rack rear brackets and the front side 4 mounting screws that were removed during chassis front side shipping bracket removal. Reinstallation of these four M6 Screws is for safety purposes and consistency within the rack. Front side shipping bracket does need not need to be reinstalled at customer facility as long as rack remains in its final location within the datacenter.

