OpenStack Swift Reference Designs

This document contains four OpenStack Swift reference designs: small, medium, large, and compute and object cloud.

The four designs have separate high level specifications and architecture diagrams but all re-use a common set of bill of materials, racking rules, and network plug suggestions.

Small	Medium	Large
Integrated Proxy. 24 object server limit.	Dedicated proxy nodes.	Dedicated proxy and dedicated meta-data nodes.

Guidelines for choosing between small and medium

Storage size:

Small is limited to a maximum of 24 object servers. If you need more storage than can fit in 24 object servers you should choose medium.

Background:

Swift small contains exactly 3 Swift proxies which run on the 3 controllers. There are no horizontal scaling guidelines going beyond 3 controllers. Given the horizontal scaling rule of thumb of 1 proxy server to 8 object servers you are limited to a maximum of 24 object servers.

Performance:

Depending on your object storage workload characteristics you may find that the proxy servers become the bottleneck due to either the workload or the sharing of controller server resources between the control plane services and the Swift proxy service. Additionally, depending on the workload you may need more than 3 proxies to handle 24 object servers. If either of these issues becomes a factor, moving to Swift medium with its dedicated Swift proxy nodes would alleviate the issue.

Guidelines for choosing between medium and large

Cost savings:

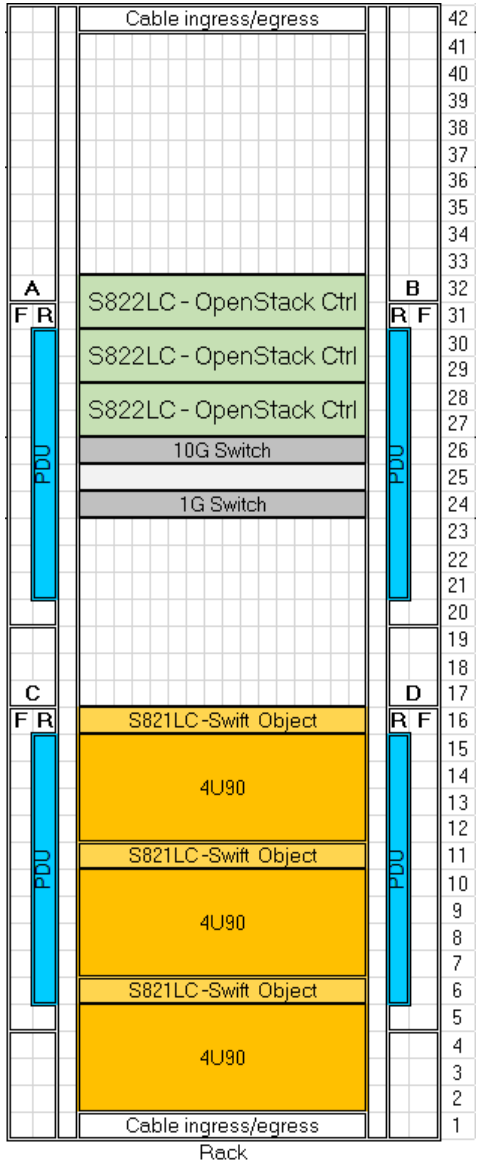
As you scale the medium architecture horizontally, given workload specifics you may begin to have under utilized SSDs which are used to hold the account and container Swift rings. At some point you hit a tipping point where it is more cost effective to host the account and container rings with their associated SSDs in dedicated metadata servers. You would then scale the metadata servers horizontally with a rule of thumb ratio of 1 metadata server to 6 object servers. The exact point you when you hit this cost savings threshold is dependent upon server and SSD pricing.

Performance:

The object storage workload specifics could favor large with its dedicated metadata servers before the cost savings threshold is hit. For example, if the workload has an extremely high number of users and containers but lower raw object storage needs, and the workload is doing a lot of account and container lookup, the large configuration with its dedicated metadata servers may be a better fit.

Small Swift Cluster

Swift Small – Base Config– High Level Specification Sheet



Rack

OpenStack Software Stack:
Ubuntu 16.04 (all nodes)
Openstack Newton

OpsMgr + Horizon DashBoard
-Nagios Core
- ELK Stack (Elasticsearch, Logstash, Kibana)

**Contact IBM for Redundant/Bonding Options

Network : (non HA) – no Bonding **
1 x Mellanox SX1410 (8831-S48)
1 x Lenovo G8052 (7120-48E)

Rack:
QTY: 1
SlimRack 7965-94Y (Standard 19" rack)
PDUs x 4: Each node should have 2 power cords cabled to two different PDUs

OpenStack Controller & Proxy:
QTY: **3**

Server Config: (Briggs 8001-22C) (2U)
20 Cores (2.92 Ghz), 128 GB,
2 x 4TB SATA HDDs
1 x 2-Port 10G NIC (Intel 10G/Mellanox)

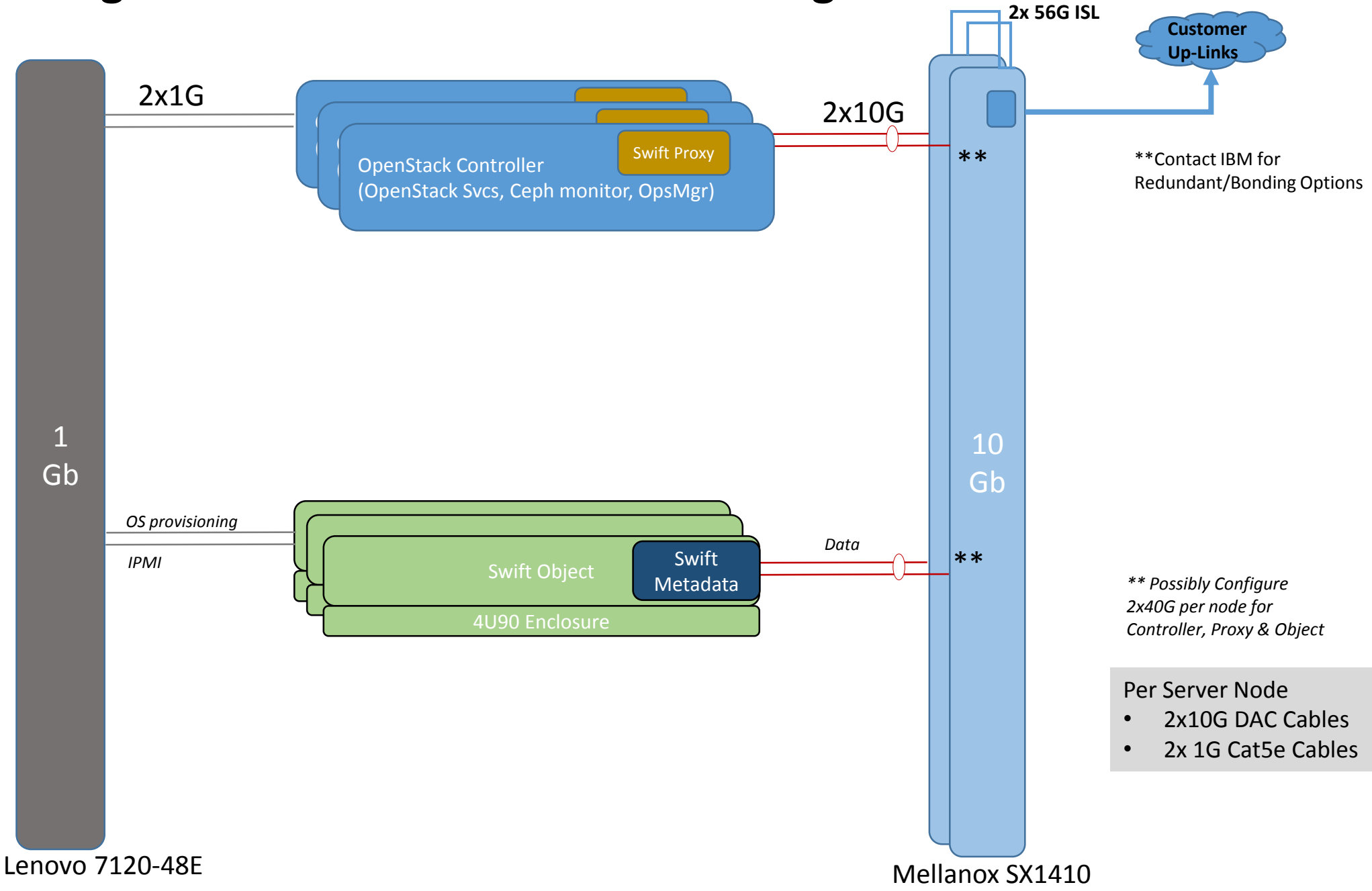
Swift Object /MetaData
QTY: **3**

Per Server Config: (Stratton 8001-12C) (1U)
16 Cores (2.3Ghz), 256GB
- (OS) 2x 128GB DOM + 4 x 240 GB SSDs
- 1 x 2-Port 10G NIC (Intel/Mellanox)
- 1 x LSI 3008 External SAS (8 port SAS3)

Expansion Drawer (4U) :
90 LFF JBOD Storage SMC PN SE-946ED-R2KJBOD
90 LFF – 2TB SAS HDDs

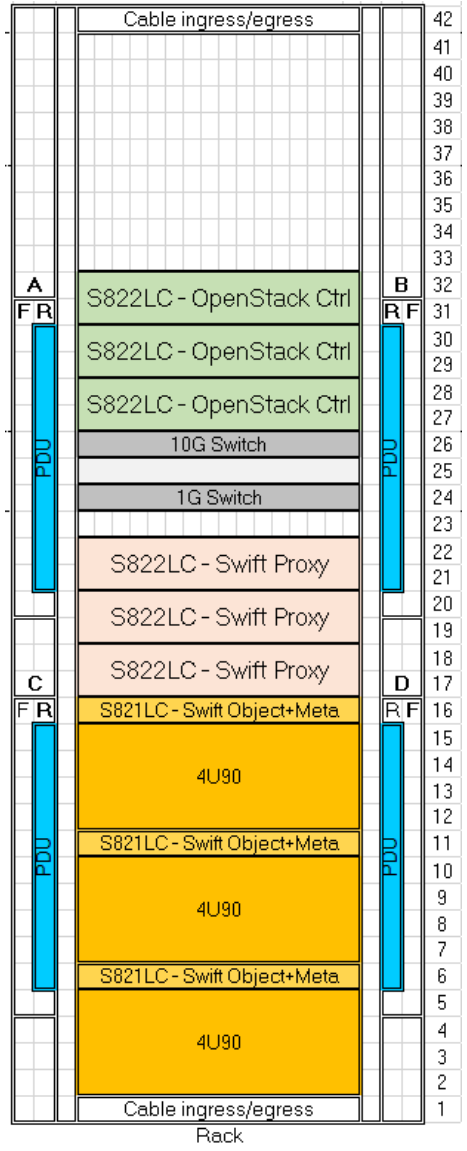
****Notes:**
a) Proc + Memory config may need to be altered based on actual performance requirements

Swift Small - High Level Network Architecture Diagram



Medium Swift Cluster

Swift Medium– Base Config– High Level Specification Sheet



OpenStack Software Stack:
Ubuntu 16.04 (all nodes)
Openstack Newton

OpsMgr + Horizon DashBoard
-Nagios Core
- ELK Stack (Elasticsearch, Logstash, Kibana)

OpenStack Controller:
QTY: 3

Server Config: (Briggs 8001-22C) (2U)
20 Cores (2.92 Ghz), 128 GB,
2 x 4TB SATA HDDs
1 x 2-Port 10G NIC (Intel 10G/Mellanox)

Swift Proxy:
QTY: 3

Per Server Config: (Briggs 8001-22C) (2U)
20 Cores (2.92Ghz), 256GB
2 x 2 TB SATA HDDs
1 x 2-Port 10G NIC (Intel 10G/Mellanox)

Swift Object /MetaData
QTY: 3

Per Server Config: (Stratton 8001-12C) (1U)
16 Cores (2.3Ghz), 256GB
- (OS) 2x 128GB DOM + 4 x 240 GB SSDs
- 1 x 2-Port 10G NIC (Intel/Mellanox)
- 1 x LSI 3008 External SAS (8 port SAS3)

Expansion Drawer (4U) :
90 LFF JBOD Storage SMC PN SE-946ED-R2KJBOD
90 LFF – 2TB SAS HDDs

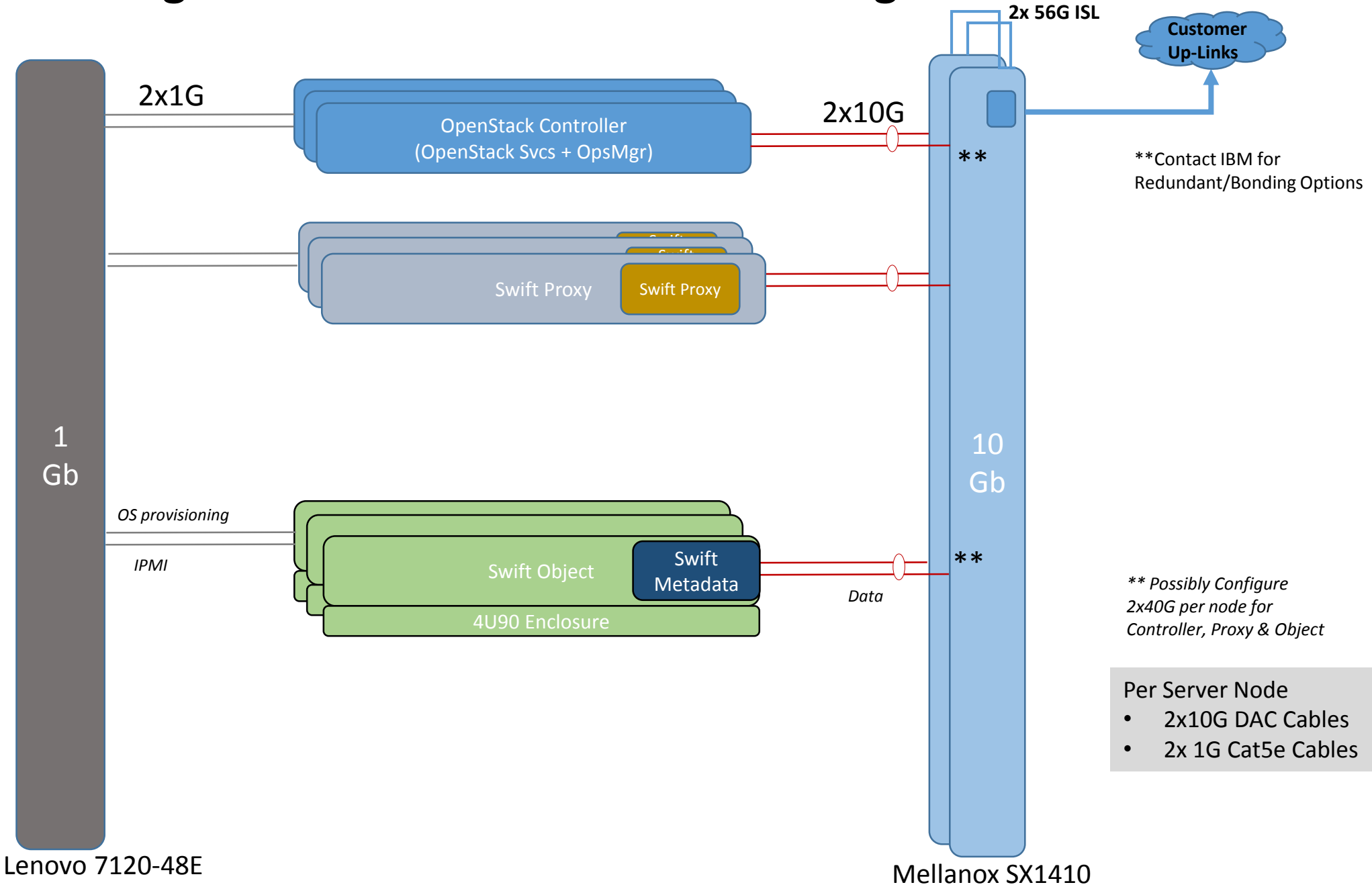
Network : (non HA) – no Bonding **
1 x Mellanox SX1410 (8831-S48)
1 x Lenovo G8052 (7120-48E)

Rack:
QTY: 1
SlimRack 7965-94Y (Standard 19” rack)
PDUs x 4: Each node should have 2 power cords cabled to two different PDUs

**Contact IBM for Redundant/Bonding Options

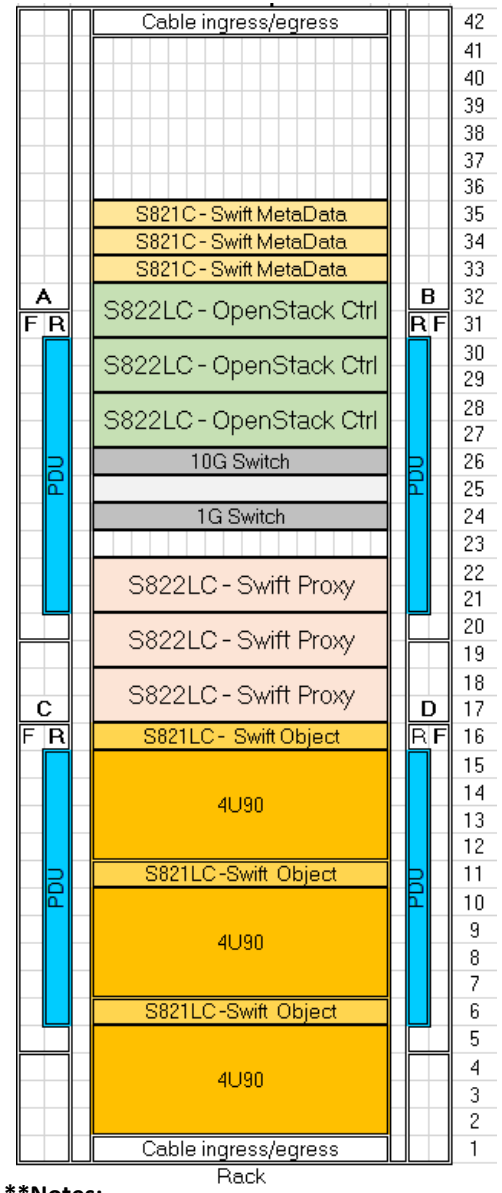
****Notes:**
a) Proc + Memory config may need to be altered based on actual performance requirements

Swift Medium - High Level Network Architecture Diagram



Large Swift Cluster

Swift Large – Base Config– High Level Specification Sheet



OpenStack Software Stack:
Ubuntu 16.04 (all nodes)
Openstack Newton

OpsMgr + Horizon DashBoard
-Nagios Core
- ELK Stack (Elasticsearch, Logstash, Kibana)

OpenStack Controller:
QTY: 3

Server Config: (Briggs 8001-22C) (2U)
20 Cores (2.92 Ghz), 128 GB,
2 x 4TB SATA HDDs
1 x 2-Port 10G NIC (Intel 10G/Mellanox)

Swift Proxy:
QTY: 3

Per Server Config: (Briggs 8001-22C) (2U)
20 Cores (2.92Ghz), 256GB
2 x 2 TB SATA HDDs
1 x 2-Port 10G NIC (Intel 10G/Mellanox)

**Notes:
a) Proc + Memory config may need to be altered based on actual performance requirements

**Contact IBM for Redundant/Bonding Options

Network : (non HA) – no Bonding **
1 x Mellanox SX1410 (8831-S48)
1 x Lenovo G8052 (7120-48E)

Rack:
QTY: 1
SlimRack 7965-94Y (Standard 19” rack)
PDUs x 4: Each node should have 2 power cords cabled to two different PDUs

Swift MetaData
QTY: 3

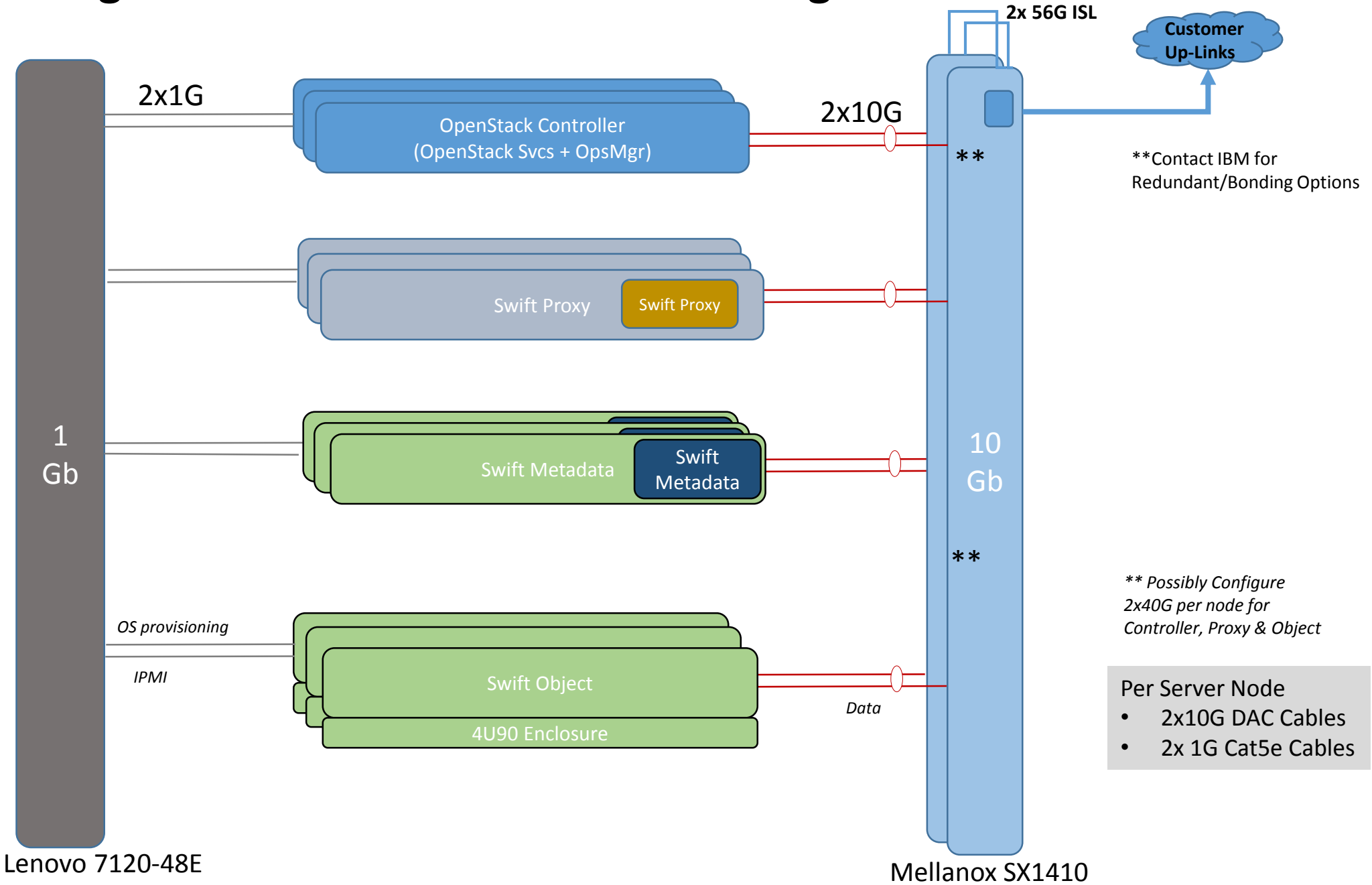
Per Server Config: (Stratton 8001-12C) (1U)
16 Cores (2.3Ghz), 256GB
- (OS) 2+ 128GB DOM + 4 x 240GB SSDs
- 1 x 2-Port 10G NIC (Intel/Mellanox)

Swift Object
QTY: 3

Per Server Config: (Stratton 8001-12C) (1U)
16 Cores (2.3Ghz), 256GB
- (OS) 2x 128GB DOM
- 1 x 2-Port 10G NIC (Intel/Mellanox)
- 1 x LSI 3008 External SAS (8 port SAS3)

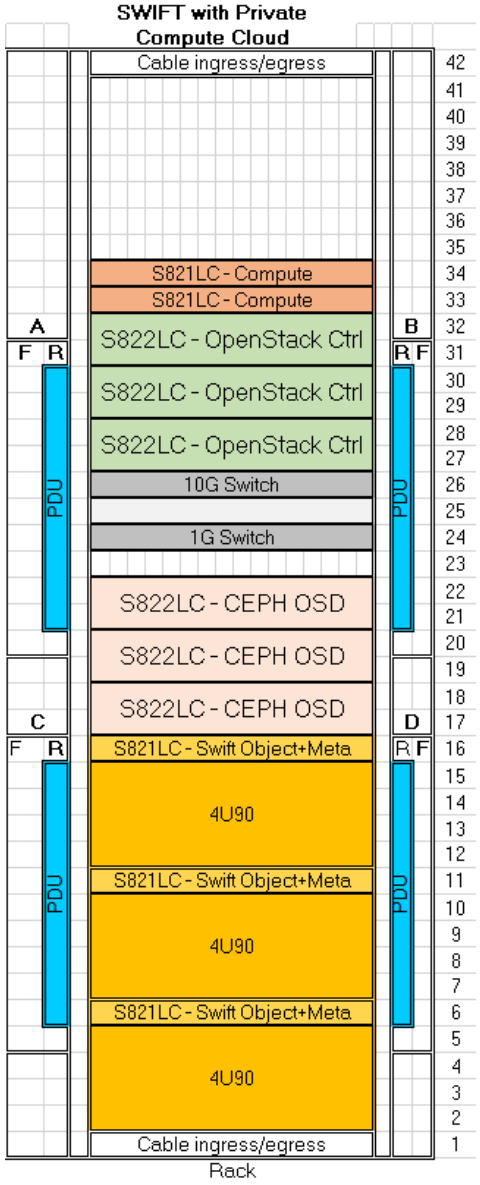
Expansion Drawer (4U) :
90 LFF JBOD Storage SMC PN SE-946ED-R2KJBOD
90 LFF – 2TB SAS HDDs

Swift Large - High Level Network Architecture Diagram



Private Cloud with Object Storage and Compute

Swift with Private Compute Cloud – Base Config– High Level Specification Sheet



OpenStack Software Stack:
Ubuntu 16.04 (all nodes)
Openstack Newten

OpsMgr + Horizon DashBoard
-Nagios Core
- ELK Stack (Elasticsearch, Logstash, Kibana)

OpenStack Controller:
QTY: 3

Server Config: (Briggs 8001-22C) (2U)
20 Cores (2.92 Ghz), 128 GB,
2 x 4TB SATA HDDs
1 x 2-Port 10G NIC (Intel 10G/Mellanox)

OpenStack Compute:
QTY: 2

Server Config: (Stratton 8001-12C) (1U)
16 Cores (2.3Ghz), 128GB ,
2 x 4TB SATA HDDs
1 x 2-Port 10G NIC (Intel 10G/Mellanox)

CEPH Config :
QTY: 3

Per Server Config: (Briggs 8001-22C) (2U)
16 Cores (3.32Ghz), 128GB
- (OS) 2x 128GB DOM + (Journal) 2x 240GB SSDs (**1.2** DWPD) + (Storage) 10 x 8TB SAS HDDs (~80TB)
- 1 x 2-Port 10G NIC (Intel/Mellanox)

**Notes:
a) Openstack & Proxy Node can be combined for fewer than 24 SWIFT Objects
b) Compute qty + Memory may need to be altered based on actual performance requirement
c) Dedicated Swift Proxy Server maybe required

**Contact IBM for Redundant/Bonding Options

Network : (non HA) – no Bonding **
1 x Mellanox SX1410 (8831-S48)
1 x Lenovo G8052 (7120-48E)

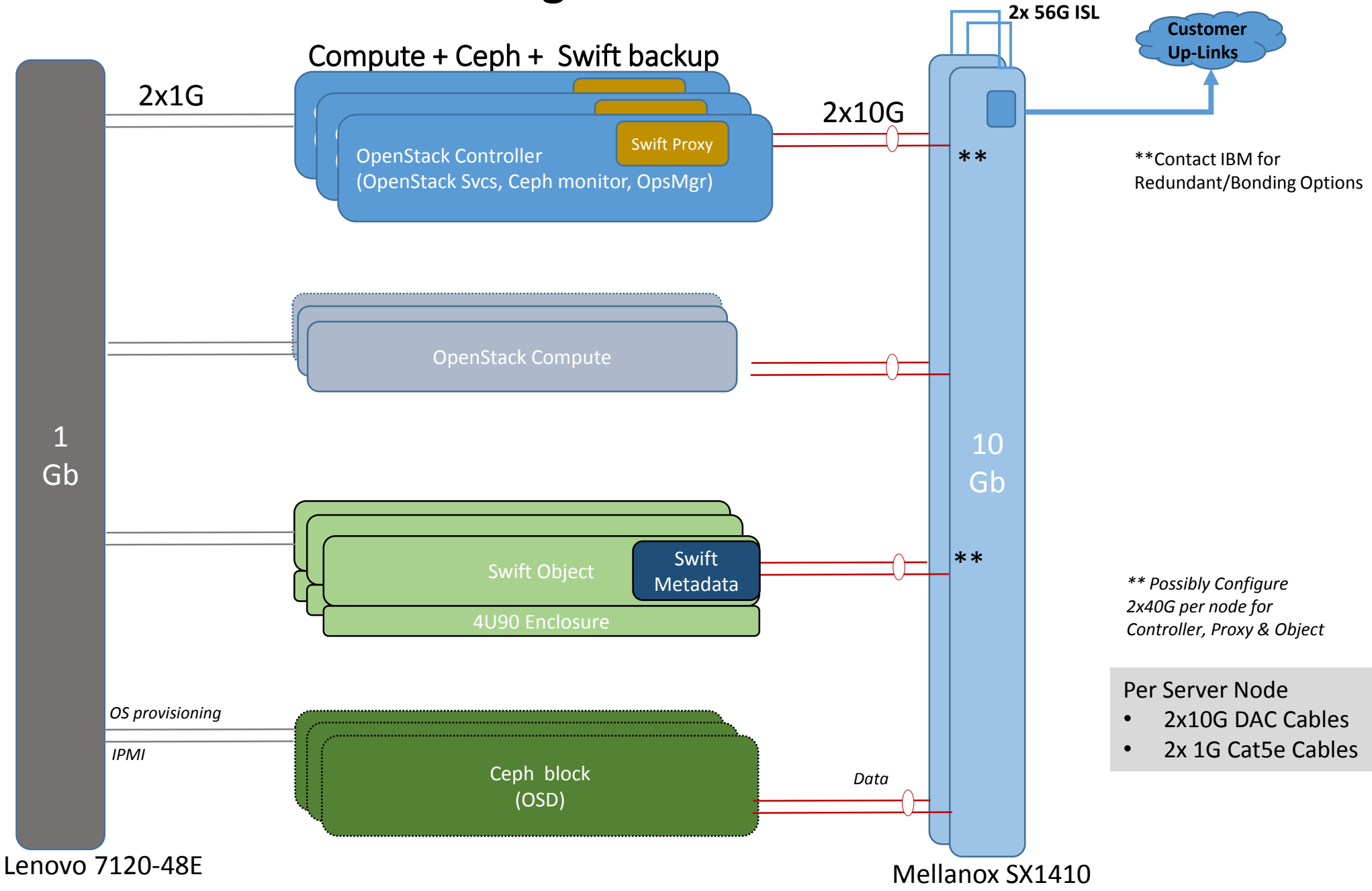
Rack:
QTY: 1
SlimRack 7965-94Y (Standard 19” rack)
PDUs x 4: Each node should have 2 power cords cabled to two different PDUs

Swift Object / Metadata
QTY: 3

Per Server Config: (Stratton 8001-12C) (1U)
16 Cores (2.3Ghz), 256GB
- (OS) 2x 128GB DOM + 4 x 240GB SSDs
- 1 x 2-Port 10G NIC (Intel/Mellanox)
- 1 x LSI 3008 External SAS (8 port SAS3)

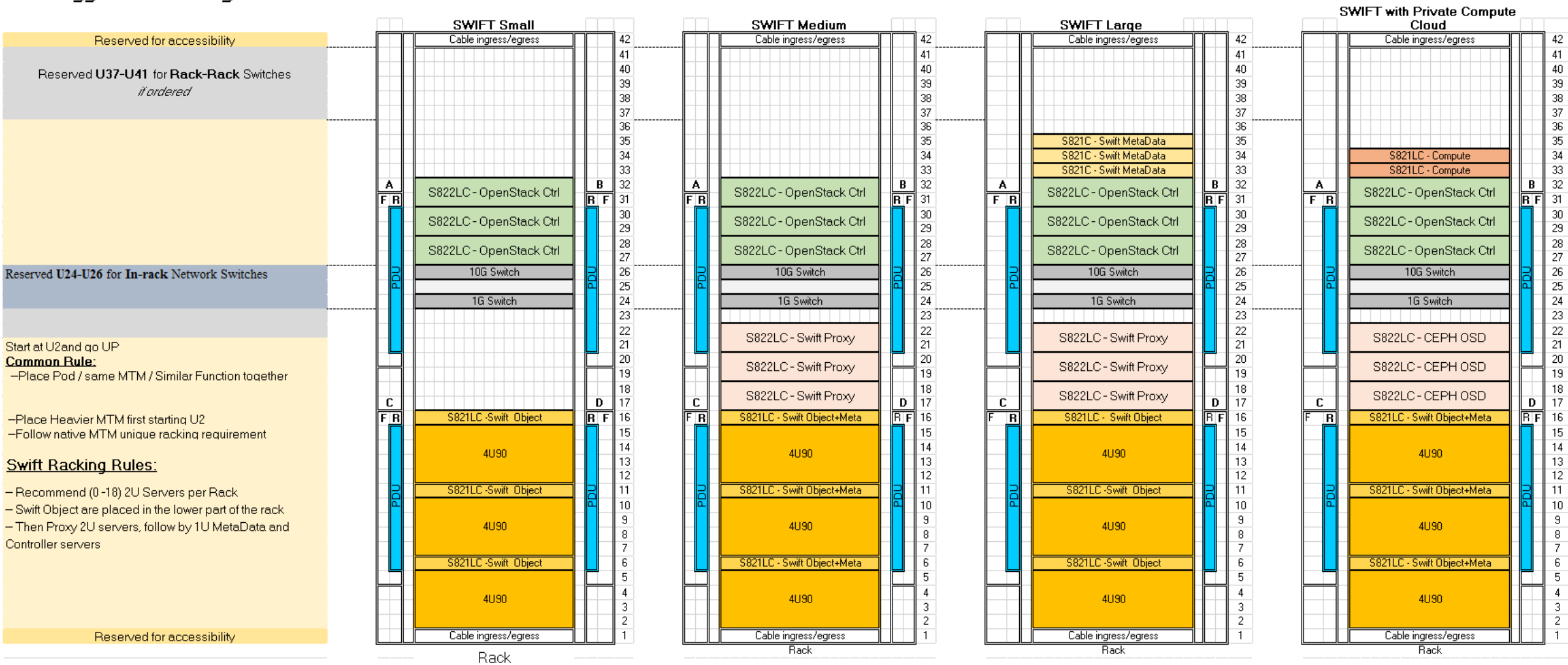
Expansion Drawer (4U) :
90 LFF JBOD Storage SMC PN SE-946ED-R2KJBOD
90 LFF – 2TB SAS HDDs

High Level Network Architecture Diagram



Common Suggested Racking Rules, Server Bill of Materials, and Networking Diagrams

Suggested Racking Rule



Swift Object and Metadata Server BOMs

	MT	Model	Description	Mfg Config #1	Min	Max	Comments
S812C Server Config: Swift Object / Metadata							
	8001	12C	S821LC (8001)	3	3	**	
		Solution ID	Solution Specify Code (for grouping only)	1	1	1	n/a
		Pod Type	Login Server Specify Code	1	1	1	n/a
		Processor	8-core POWER8 2.328 GHz	2	1	2	
		Memory	EKM2 (PS) 16GB DDR4 MEMORY DIMM	16	4	16	
		Bezel	EKB4 2S base system with LFF high-function drive midplane (NVMe d	1	1	1	
		Storage Adapter	Integrated Sata controller	1	1	1	Build-in HDDs : Integrate SATA controller + Optional SAS /RAID Controller
			EKAD Storage Adapter SAS-3 3008 Chipset 8 Ports external for 1U	1	0	1	Optional - Exteral SAS adapter for Expansion SAS drawer
		Disks	EKSK 128 GB SATA Disk on module SuperDOM	2	0	2	OS Boot Disk
			EKS1 240 GB, SFF SATA SSD; 1.2 Disk Writes Per Day (DWPD) kit	4	0	4	In the Swift Large configuration, these drives are only required on the metadata server. If SAS drive is selected, please choose Bezel Assembly to match drive size (.5" or 3.5" and SAS controller)
		NVmE PCI		0	4	2	
		GPU		0	0	1	
		HDD Drawer	90 LFF JBOD Storage 90 LFF – 2TB SAS HDDs	1	1	1	Supermicro CSE-946ED-R2KJBOD 4U Rackmount https://www.supermicro.com/products/chassis/4u/946/SC946ED-R2KJBOD
S812C Server (Base config) -- Required Inter-connect							
	Required for Mfg Genesis	Network Adapter	EKA2 PCIe3 2-port 10 GbE SFP+ Adapter, based on Intel XL710	1	1	3	**(Required) For High Speed Network**
				0	0	3	Section IO device (optional)
		Power	EKLJ (PS #6665) PWR CBL DRWR TO IBM PDU, 2.8m (9.2ft), 250V/10A, IEC320/C13, IEC320/C20	2	2	2	Select Proper Line cord if not connected to IBM PDU
		Cables	CAT5E SWITCH CABLE, BLUE (2M)	1	1	*	**(Required) For OS 1G Network (Recommended 2M length min)**
			CAT5E SWITCH CABLE, GREEN (2M)	1	1	*	**(Required) For IPMI 1G Network (Recommended 2M length min)**
			EKC1 3M- Active Twinax cable	2	2	*	**(Required) For High Speed Network (Recommended 2M length min)**
		Misc	No rack integration	1	1	1	
			Country specific FCs (keyboards, language groups) are selectable	1	1	1	User select
			Shipping and Handling	1	1	1	User select

Swift Proxy and OpenStack Controller BOMs

	MT	Model	Description	Mfg Config #1	Min	Max	Comments
S822C Server Config : Swift Proxy and OpenStack controller							
	8001	22C	ServerConfig- S822C	3	3	**	This section Defined the **Common config of the Server node** (in group servers) -- **Next Section :** Defined any unique config that you may need (Optional)
		Processor	EKP5 10-core POWER8 2.92 GHz	2	1	2	
		Memory	EKM2 (PS) 16GB DDR4 MEMORY DIMM	8	4	16	
		Bezel	EKB5 (PS) 2S BRIGGS LFF DIRECT ATTACH FAB ASSEMBLY	1	1	1	Need to Choose drive assemply to match your Disks (LFF/SFF) and Controler type (SAS)
		Storage Adapter	Integrated Sata controller	1	1	1	Build-in HDDs : Integrate SATA controller + Optional SAS /RAID Controller
				0	0	1	Optional - Exteral SAS adapter for Expansion SAS drawer
		Disks	EKDB 4TB 3.5" SATA HDD	2	0	2	OS Boot Disk
				0	0	4	If SAS drive is selected, please choose Bezel Assembly to match drive size (.5"
		NVmE PCI		0	4	2	
		GPU		0	0	1	
S822C Server (Base config) -- Required Inter-connect							
Required for Mfg Genesis		Network Adapter	EKA2 (PS) INTEL 82599ES 2-PORT SFP+ 10G GEN2 x8 STANDARD	1	1	3	**(Required) For High Speed Network**
				0	0	3	Section IO device (optional)
		Power	EKLJ (PS #6665) PWR CBL DRWR TO IBM PDU, 2.8m (9.2ft), 250V/10A, IEC320/C13, IEC320/C20	2	2	2	Select Proper Line cord if not connected to IBM PDU
		Cables	CAT5E SWITCH CABLE, BLUE (2M)	1	1	*	**(Required) For OS 1G Network (Recommended 2M length min)**
			CAT5E SWITCH CABLE, GREEN (2M)	1	1	*	**(Required) For IPMI 1G Network (Recommended 2M length min)**
			EKC1 3M- Active Twinax cable	2	2	*	**(Required) For High Speed Network (Recommended 2M length min)**
		Misc	Country specific FCs (keyboards, language groups) are selectable	1	1	1	User select
			Shipping and Handling	1	1	1	User select

Ceph OSD Server BOMs

	MT	Model	Description	Mfg Config #1	Min	Max	Comments
S822C Server Config : Ceph OSD							
	8001	22C	ServerConfig- S822C	3	3	**	This section Defined the **Common config of the Server node** (in group servers) -- **Next Section :** Defined any unique config that you may need (Optional)
		Processor	EKP4 8-core POWER8 3.32 GHz	2	1	2	
		Memory	EKM2 (PS) 16GB DDR4 MEMORY DIMM	8	4	16	
		Bezel	EKB5 (PS) 2S BRIGGS LFF DIRECT ATTACH FAB ASSEMBLY	1	1	1	Need to Choose drive assemply to match your Disks (LFF/SFF) and Controler type (SAS)
		Storage Adapter	Integrated Sata controller	1	1	1	Build-in HDDs : Integrate SATA controller + Optional SAS /RAID Controller
				0	0	1	Optional - Exteral SAS adapter for Expansion SAS drawer
		Disks	EKSK 128 GB SATA Disk on module SuperDOM	2	0	2	OS Boot Disk
			EKS1 240 GB, SFF SATA SSD; 1.2 Disk Writes Per Day (DWPD) kit	2	0	4	If SAS drive is selected, please choose Bezel Assembly to match drive size (.5"
			EKDD 8TB 3.5" SATA HDD	10	0	4	If SAS drive is selected, please choose Bezel Assembly to match drive size (.5"
		NVmE PCI		0	4	2	
		GPU		0	0	1	
S822C Server (Base config) -- Required Inter-connect							
Required for Mfg Genesis		Network Adapter	EKA2 (PS) INTEL 82599ES 2-PORT SFP+ 10G GEN2 x8 STANDARD	1	1	3	**(Required) For High Speed Network**
				0	0	3	Section IO device (optional)
		Power	EKLJ (PS #6665) PWR CBL DRWR TO IBM PDU, 2.8m (9.2ft), 250V/10A, IEC320/C13, IEC320/C20	2	2	2	Select Proper Line cord if not connected to IBM PDU
		Cables	CAT5E SWITCH CABLE, BLUE (2M)	1	1	*	**(Required) For OS 1G Network (Recommended 2M length min)**
			CAT5E SWITCH CABLE, GREEN (2M)	1	1	*	**(Required) For IPMI 1G Network (Recommended 2M length min)**
			EKC1 3M- Active Twinax cable	2	2	*	**(Required) For High Speed Network (Recommended 2M length min)**
		Misc	Country specific FCs (keyboards, language groups) are selectable	1	1	1	User select
			Shipping and Handling	1	1	1	User select

OpenStack Compute Server BOMs

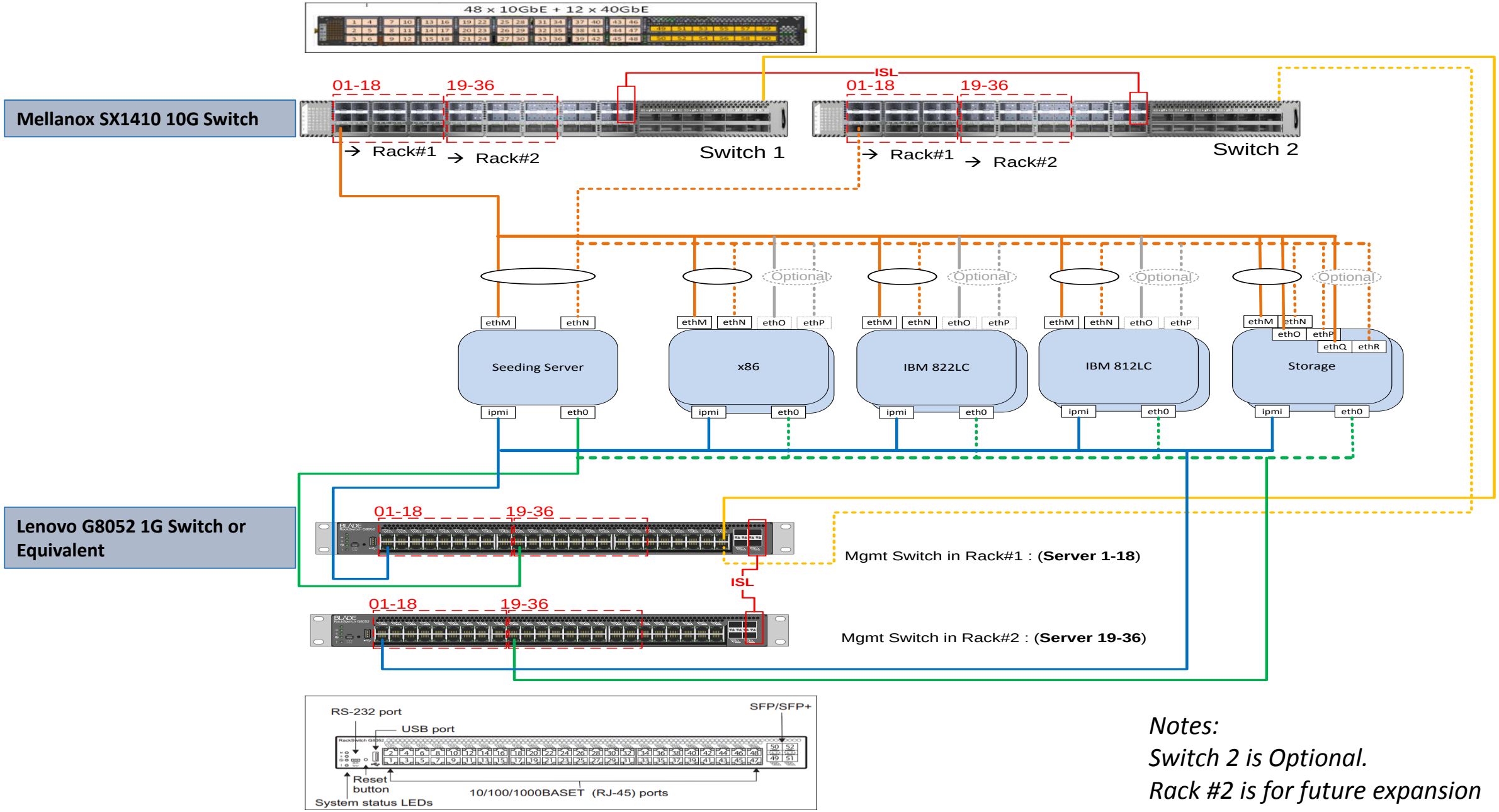
	MT	Model	Description	Mfg Config #1	Min	Max	Comments
S812C Server Config: OpenStack Compute							
	8001	12C	S821LC (8001)	**2**	**1**	**	
		Solution ID	Solution Specify Code (for grouping only)	1	1	1	n/a
		Pod Type	Login Server Specify Code	1	1	1	n/a
		Processor	8-core POWER8 2.328 GHz	2	1	2	
		Memory	EKM2 (PS) 16GB DDR4 MEMORY DIMM	8	4	16	
		Bezel	EKB4 2S base system with LFF high-function drive midplane (NVMe d	1	1	1	
		Storage Adapter	Integrated Sata controller	1	1	1	Build-in HDDs : Integrate SATA controller + Optional SAS /RAID Controller
				0	0	1	Optional - Exteral SAS adapter for Expansion SAS drawer
		Disks	EKDB 4TB 3.5" SATA HDD	2	0	2	OS Boot Disk
				0	0	4	If SAS drive is selected, please choose Bezel Assembly to match drive size (.5"
		NVmE PCI		0	4	2	
		GPU		0	0	1	
S812C Server (Base config) -- Required Inter-connect							
Required for Mfg Genesis		Network Adapter	EKA2 PCIe3 2-port 10 GbE SFP+ Adapter, based on Intel XL710	1	1	3	**(Required) For High Speed Network**
				0	0	3	Section IO device (optional)
		Power	EKLJ (PS #6665) PWR CBL DRWR TO IBM PDU, 2.8m (9.2ft), 250V/10A, IEC320/C13, IEC320/C20	2	2	2	Select Proper Line cord if not connected to IBM PDU
		Cables	CAT5E SWITCH CABLE, BLUE (2M)	1	1	*	**(Required) For OS 1G Network (Recommended 2M length min)**
			CAT5E SWITCH CABLE, GREEN (2M)	1	1	*	**(Required) For IPMI 1G Network (Recommended 2M length min)**
			EKC1 3M- Active Twinax cable	2	2	*	**(Required) For High Speed Network (Recommended 2M length min)**
		Misc	No rack integration	1	1	1	
			Country specific FCs (keyboards, language groups) are selectable	1	1	1	User select
			Shipping and Handling	1	1	1	User select

Network Switch BOMs

	MT	Model	FC	Description	
1G Mgmt (Based)	**7120**	**48E**		**Lenovo G8052 1GbE Switch (48x 10GbE ports + 4x 10GbE ports)**	**1**
			1118	CAT5E SWITCH CABLE, 3M, YELLOW	1
			6577	PWR CBL, DRWR TO IBM PDU, MFG SEL LENGTH, 200-240V/10A, IEC320/C13, IEC320/C14	2
				Include all existing FCs; except FCs 0010, 0011, 0712, 0714, EGSx, EHKx, EHLA, 4649 (Rack Integration Services), and 0456 (Customer Specified Placement); do not include these FCs.	

10G Data Network	**8831**	**S48**		**Mellanox 10GB Switch (48x10G + 12x40G)**	**1**
			EDT6	1U AIR DUCT FOR S48	1
				Include all existing FCs; except FC 4649, FC 0456 (Customer Specified Placement) and ESC1 (Shipping & Handling), do not include these FCs	1

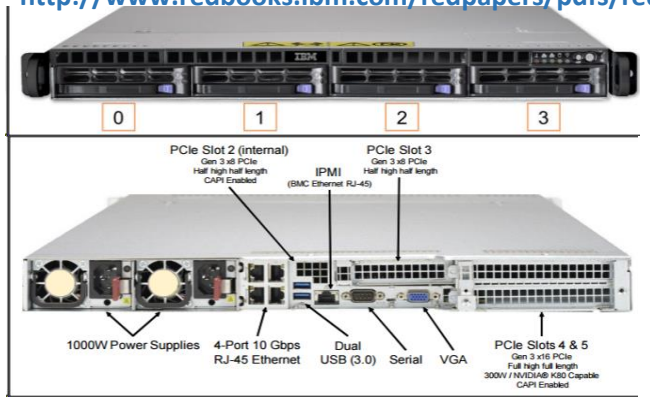
Network Plug Rule - Sample



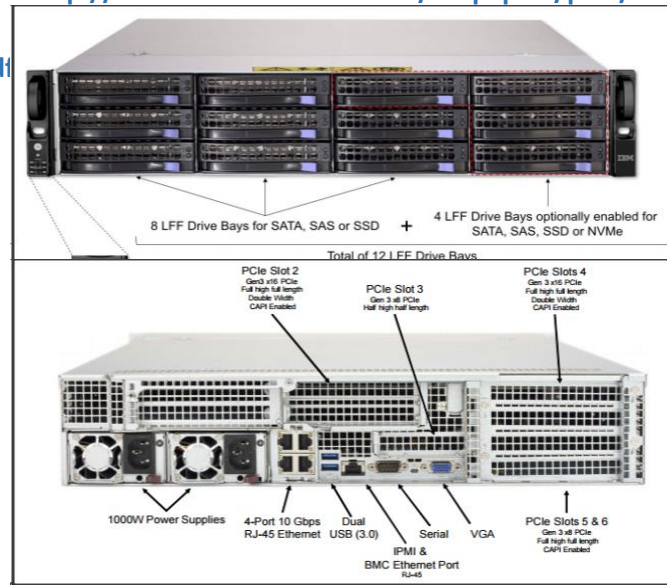
Notes:
Switch 2 is Optional.
Rack #2 is for future expansion

Network Plug P2P Label -- Sample

MTM: 8001-12C
http://www.redbooks.ibm.com/redpapers/pdfs/redp5406.pdf



MTM: 8001-22C
http://www.redbooks.ibm.com/redpapers/pdfs/redp5407.pdf



Server PCI Slot Placement				
8001-12C/22C Stratton/Briggs				
	adapter	PCI slot	Port	Cabling
Primary NIC	10GbE	slot 3	T1	yes
			T2	yes
Optional NIC	10GbE	slot 4	T1	
			T2	
Mgmt-OS	1GbE	LOM	T1	yes
BMC	1GbE	LOM	impi	yes

Cable P2P Label for H_TOR

		10GbE	10GbE	1GbE	1GbE
		H_TOR_1		M_TOR_1	M_TOR_1
Server #	Name <opt>	P2P Data network Cable Label	P2P Data network Cable Label	P2P Mgmt RJ4-5 Cable Label	P2P IPMI RJ-45 Cable Label
1		1A/SVR1/slot 3/T1 <> H_TOR_1/Port1	1A/SVR1/slot 3/T2 <> H_TOR_1/Port19	1A/SVR1/LOM/T1 <> M_TOR_1/Port1	1A/SVR1/LOM/impi <> M_TOR_1/Port19
2		1A/SVR2/slot 3/T1 <> H_TOR_1/Port2	1A/SVR2/slot 3/T2 <> H_TOR_1/Port20	1A/SVR2/LOM/T1 <> M_TOR_1/Port2	1A/SVR2/LOM/impi <> M_TOR_1/Port20
3		1A/SVR3/slot 3/T1 <> H_TOR_1/Port3	1A/SVR3/slot 3/T2 <> H_TOR_1/Port21	1A/SVR3/LOM/T1 <> M_TOR_1/Port3	1A/SVR3/LOM/impi <> M_TOR_1/Port21
4		1A/SVR4/slot 3/T1 <> H_TOR_1/Port4	1A/SVR4/slot 3/T2 <> H_TOR_1/Port22	1A/SVR4/LOM/T1 <> M_TOR_1/Port4	1A/SVR4/LOM/impi <> M_TOR_1/Port22
5		1A/SVR5/slot 3/T1 <> H_TOR_1/Port5	1A/SVR5/slot 3/T2 <> H_TOR_1/Port23	1A/SVR5/LOM/T1 <> M_TOR_1/Port5	1A/SVR5/LOM/impi <> M_TOR_1/Port23
6		1A/SVR6/slot 3/T1 <> H_TOR_1/Port6	1A/SVR6/slot 3/T2 <> H_TOR_1/Port24	1A/SVR6/LOM/T1 <> M_TOR_1/Port6	1A/SVR6/LOM/impi <> M_TOR_1/Port24
7		1A/SVR7/slot 3/T1 <> H_TOR_1/Port7	1A/SVR7/slot 3/T2 <> H_TOR_1/Port25	1A/SVR7/LOM/T1 <> M_TOR_1/Port7	1A/SVR7/LOM/impi <> M_TOR_1/Port25
8		1A/SVR8/slot 3/T1 <> H_TOR_1/Port8	1A/SVR8/slot 3/T2 <> H_TOR_1/Port26	1A/SVR8/LOM/T1 <> M_TOR_1/Port8	1A/SVR8/LOM/impi <> M_TOR_1/Port26
9		1A/SVR9/slot 3/T1 <> H_TOR_1/Port9	1A/SVR9/slot 3/T2 <> H_TOR_1/Port27	1A/SVR9/LOM/T1 <> M_TOR_1/Port9	1A/SVR9/LOM/impi <> M_TOR_1/Port27
10		1A/SVR10/slot 3/T1 <> H_TOR_1/Port10	1A/SVR10/slot 3/T2 <> H_TOR_1/Port28	1A/SVR10/LOM/T1 <> M_TOR_1/Port10	1A/SVR10/LOM/impi <> M_TOR_1/Port28
11		1A/SVR11/slot 3/T1 <> H_TOR_1/Port11	1A/SVR11/slot 3/T2 <> H_TOR_1/Port29	1A/SVR11/LOM/T1 <> M_TOR_1/Port11	1A/SVR11/LOM/impi <> M_TOR_1/Port29
12		1A/SVR12/slot 3/T1 <> H_TOR_1/Port12	1A/SVR12/slot 3/T2 <> H_TOR_1/Port30	1A/SVR12/LOM/T1 <> M_TOR_1/Port12	1A/SVR12/LOM/impi <> M_TOR_1/Port30