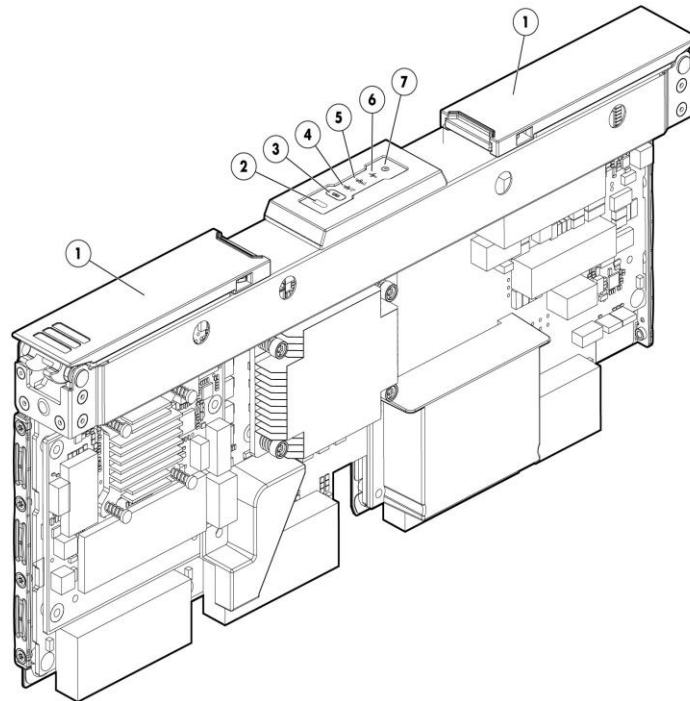


### Overview

### Moonshot-45XGc Switch Module

The HP Moonshot-45XGc Switch Module is designed to provide high speed, low-latency connectivity while dramatically reducing cost and complexity of deploying solutions at scale. The 45XGc Switch Module, together with the HP Moonshot-4QSFP+ Uplink Module, provides 10GbE network connections to cartridges within the HP Moonshot 1500 chassis and 40Gb/10Gb connectivity external to the chassis. Up to two switch modules are supported in each chassis. IRF may be used to eliminate the cost of TOR switches and provide failover in the event of a switch or uplink failure.



**Figure 1 HP Moonshot-45XGc Switch Module**

- |                               |                      |
|-------------------------------|----------------------|
| 1. Release Latch              | 6. Health Status LED |
| 2. Access Panel Sensor        | 7. Power LED         |
| 3. Unit ID (UID) LED / Button |                      |
| 4. Downlink Activity LED      |                      |
| 5. Uplink Activity LED        |                      |

### Models

HP Moonshot 45XGc Switch Module Kit

704654-B21

**NOTE:** Must order one each of the Switch Module Kit per chassis.

**NOTE:** For ordering the HP Moonshot-45XGc Switch Module, please see Step 1 of the Configuration to Order section of the HP Moonshot System QuickSpecs: [http://h18000.www1.hp.com/products/quickspecs/14527\\_na/14527\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14527_na/14527_na.html)

### Standard Features

#### Performance

- 160Gb uplink bandwidth / 450Gb available server side bandwidth
- Non-blocking architecture
- Wire-speed switching and IPv4/IPv6 routing on all ports
- Combine up to 4 switches into a single virtual switch
- QSFP+ ports support 4 x 10Gb with optional breakout cable
- Any uplink port can be used for IRF connections
- Cut-through switching
- Hardware-based wire-speed access control lists (ACLs)
- Data Center Bridging (DCBX)
- Support for VEPA (IEEE 802.1Qbg)

#### Management

- Remote configuration and management CLI
- Standards-based SNMP management via SNMPv1, v2c and v3
- Out of band management via iLO Chassis Manager
- HP IMC (Intelligent Management Center)
- SDN with OpenFlow 1.3
- RJ45 console port
- sFlow
- Manager and operator privilege levels
- Command authorization via RADIUS
- Complete session logging for problem resolution
- LLDP Discovery protocol
- IPv6 management
- Multiple flash images
- Multiple configuration files
- Syslog
- Network Time Protocol (NTP)
- IEEE 1588v2 Precision Time Protocol (PTP)

#### Security

- IEEE 802.1X user authentication
- MAC-based authentication with RADIUS server
- Access Control Lists (ACLs)
- Secure FTP
- STP Root Guard
- DHCP Protection from unauthorized DHCP servers
- IP Source Guard
- Dynamic ARP protection to prevent eavesdropping
- Endpoint Admission Defense (EAD)
- RADIUS/TACACS+
- Secure management via SSHv2 and SNMPv3
- Unicast Reverse Path Forwarding (URPF)
- Monitor link and Smart link
- IPsec
- IKE (Internet Key Exchange)
- Disable password recovery

#### Level 2 Switching

- 128K MAC addresses
- 4094 VLANs
- IEEE 802.1ad QinQ VLANs
- Per VLAN Spanning Tree (PVST+)
- Private VLANs (PVLAN)

### Standard Features

- Multicast VLAN Registration Protocol (MVRP)
- Jumbo frame support
- Port Aggregation
- Spanning Tree Protocol, MSTP, RSTP, STP Root Guard
- IP Multicast Snooping and data-driven IGMP
- Transparent Interconnect of Lots of Links (TRILL)
- Shortest Path Bridging (SPB)
- Multiple Label Switching (MPLS)
- Virtual Private LAN Service (VPLS)□

### Level 3 Routing

- IPv4 routing protocols - static routes, RIP, OSPF and BGP
- IPv6 routing protocols - static routes, RIPng, OSPFv3 and BGP+
- IPv6 tunneling
- IP Multicast - PIM-SSM, PIM-DM, PIM-SM, IGMP for IPv4 and IPv6
- Equal-Cost Multipath (ECMP)
- Policy-based routing
- DHCP and DHCPv6 client
- VRRP□

### Quality of Service (QoS)

- Advanced classifier-based QoS (with eight queues) - classifies traffic using multiple match criteria
- based on Layer 2, 3 and 4 information and applies QoS policies such as priority level and rate limit to selected traffic on a per-port or per-VLAN basis
- 
- Traffic policing - supports Committed Access Rate (CAR) and line rate
- Powerful QoS feature - creates traffic classes based on access control lists (ACL), IEEE 802.1p precedence, IP, DSCP or Type of Service (ToS) precedence; supports filter, redirect, mirror or remark; supports the following congestion actions: strict priority (SP) queuing, weighted round robin (WRR), weighted fair queuing (WFQ), and weighted random early discard (WRED)
- Storm restraint - allows limitation of broadcast, multicast, and unknown unicast traffic rate to cut down on unwanted broadcast traffic on the network□

### Resiliency and High Availability□

- Intelligent Resilient Framework (IRF) - Creates virtual resilient switching fabrics, up to four Moonshot-45XGc switch modules acting as a single Layer 2/3 switch; Switches do not have to be co-located and can be part of a disaster recovery system; Servers or switches can be attached using standard LACP for automatic load balancing and high availability; Simplifies network operation by eliminating Spanning Tree, ECMP and VRRP; IRF supports up to four members in a group.
- Device Link Detection Protocol (DLDP) - Monitors Link connectivity and shuts down ports at both ends if unidirectional traffic is detected
- Virtual Router Redundancy Protocol (VRRP)

### Monitoring and Diagnostics□

- OAM (802.3ah) - Detects data link layer problems in the "last mile"; monitors link status between two devices
- CFD (802.1ag) - Connectivity Fault Detection (CFD) provides L2 link OAM mechanism used for link connectivity detection and fault location
- Mirroring - Port mirroring enables traffic on a port to be simultaneously sent to a network analyzer for monitoring; Flow-based mirroring

Compatibility

Chassis	HP Moonshot 1500 Chassis
HP ProLiant Servers	HP ProLiant m400 Server HP ProLiant m710 Server
HP Moonshot Uplink Modules	HP Moonshot-4QSFP+ Uplink Module

### Service and Support

#### Service and Support

##### HP Technology Services for Moonshot

Capitalizing on the Moonshot 1500 System requires a service partner who understands your increasingly complex business technology environment. That's why it makes sense to team up with the people who know HP infrastructure hardware and software best - the experienced professionals at HP Technology Services.

HP is pleased to include full software support for Ubuntu Linux as part of your Moonshot chassis purchase. For chassis supporting revenue-generating or production level workloads, consider purchasing a level of support that matches your requirements.

##### Protect your business beyond warranty with HP Care Pack Services

HP sells support in easy-to-buy, preconfigured packages with the combination of services, coverage and duration to fit your needs and budget. With Moonshot, we are introducing a new, simpler set of services. Simply choose the service level that best fits the criticality of your hardware.

##### HP Foundation Care

HP introduces new Foundation Care services for HP Moonshot and software. The Moonshot 1500 Care Pack services cover the Moonshot 1500 Chassis and the Moonshot servers with one single Care Pack SKU. Entitlement of support requires the customer to provide the 1500 chassis serial number. All HP components structured to the Moonshot System are covered by Care Pack services inclusive of switches, power supplies, and fans. HP Foundation Care services include hardware support, basic software support and collaborative call handling for software questions related to industry leading operating systems and software. For a complete list of software products covered, refer to [www.hp.com/services/collaborativesupport](http://www.hp.com/services/collaborativesupport).

Full software support, including call management and ownership thru to resolution is available for select third party software. As stated earlier, support for Ubuntu software is included in the purchase of your Moonshot chassis.

##### HP Datacenter Care

HP Datacenter Care offers you a flexible, tailored, relationship-based approach to support the most demanding data centers handling the demands of hyperscale computing. This is an environment level service, purchased once to support your Moonshot environment. Other equipment may be included in this agreement for holistic datacenter coverage. With HP Datacenter Care, you still have the choice of HP Foundation Care reactive support which you purchase with each chassis.

HP Datacenter Care is flexible enough to deliver exactly what you need in one relationship. All Datacenter Care support is tailored to your needs, based on our experience with hyperscale customers:

- Assigned account team, led by an account support manager (ASM) who knows your business and your IT environment and is responsible for the quality service delivery and experience.
- Enhanced call handling for the best call experience with rapid escalation and incident resolution through the HP Hyperscale Center of Excellence
- Proactive and reactive support, configured to deliver the level of support needed by the different data center components and meeting both service-level agreement (SLA) and cost targets

Then add on other services that are tailored to your specific needs, including:

**HP Self-Service Spares Service** answers the question: What do you do when you need parts? We can set it up so that you get spare parts onsite through our automated self-service spares. You simply go

### Service and Support

to the part of your data center where the parts live, scan them out, scan in the broken one, and you're done. We maintain your inventory of good spares, so that what you need is ready to go when you need it. And we provide monthly service excellence reports illustrating onsite inventory performance.

To obtain further information or to order HP Datacenter Care Service as described above, contact a local HP sales representative. Please see the Additional Options section of this QuickSpecs for additional information.

#### HP Moonshot Installation & Startup Service

HP Installation and Startup Service for the Moonshot System provides for the installation of one system and its associated Moonshot servers and network switches, as well as operating system deployment and basic configuration of OS network parameters to establish network connectivity

In response to the needs of the majority of HP Moonshot System customers, this fixed-price/fixed deliverable service targets new hardware installation and software deployments for the 1500 infrastructure. For more advanced installation, configuration, and integration requirements, custom deployments are available through a customized Statement of Work. Please see the Additional Options section of this QuickSpecs for additional information.

For more information on HP Services, contact any of our worldwide sales offices or visit one of the following websites:

HP support services: [www.hp.com/services/always-on](http://www.hp.com/services/always-on)

HP Care Pack services: [www.hp.com/services/carepack](http://www.hp.com/services/carepack)

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#### Recommended HP Care Pack Services for your HP product

##### Optimized Care

##### 3-Year HP Next Business Day with Collaborative Support

This is HP's highest level of reactive support giving you our commitment to have the hardware operational within six hours of opening the call with us. This service level includes hardware coverage plus software diagnosis support with collaborative call management for a broad spectrum of third party software products including O/S and hypervisors.

<http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA4-8877ENW.pdf>

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##### Standard Care

##### 3-Year HP Foundation Care 24x7

This service level provides consistent, reliable reactive support with the broadest coverage window which is recommended when maintenance must be performed outside business hours. Calls may be opened 24x7. Should an onsite visit be needed, our commitment is to respond onsite within four hours. Software call back commitment is two hours.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA4-8877ENW.pdf>

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##### Basic Care

##### 3-Year HP Foundation Care Next Business Day

This service level provides the most economical support coverage and is designed for non-revenue impacting systems. Calls may be opened 24x7. Should an onsite visit be needed, our commitment is to respond onsite the next business day. Software call back commitment is two hours, during regular business hours.

For more information on HP Care Pack services, contact any of our worldwide sales offices or resellers or visit our website at: [www.hp.com/go/carepack](http://www.hp.com/go/carepack)

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##### Defective Media Retention (DMR) and Comprehensive Defective Material Retention

If your business deals with sensitive or legally protected data, you know that it's not a simple matter to return a defective hardware component, but keeping it conflicts with the terms and conditions of many standard warranty agreements. If you don't return the component, you'll be charged for the replacement part.

### Service and Support

HP Foundation Care services are available with defective media retention of failed hard drives and comprehensive defective material retention of those other data-retentive components, such as memory, switches, processors and more. This may be purchased as an optional add-on to your HP Foundation Care service purchase. This service is critical for customers who:

- Need to control and secure their classified, proprietary and confidential data.
- Are subject to current data privacy regulations.
- Want a simpler, more cost-effective solution when choosing not to return a malfunctioning disk drive or other data retentive component.

For more information on our data privacy services, see [www.hp.com/services/dataprivacy](http://www.hp.com/services/dataprivacy).

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#### HP Support Center

HP provides several tools that make it simpler to get help from HP:

HP Support Center is personalized online support portal with access to information, tools and experts to support HP business products. Submit support cases online, chat with HP experts, access support resources or collaborate with peers. Learn more: <http://www.hp.com/go/hpsc>

HP's Support Center Mobile App allows you to resolve issues yourself or quickly connect to an agent for live support. Now, you can get access to personalize IT support anywhere, anytime. HP Support Center are available at no additional cost with a HP warranty, HP Care Pack or HP contractual support agreement.

**NOTE:** HP Support Center Mobile App is subject to local availability.

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#### For more information

To learn more on HP Moonshot System, please contact your HP sales representative.

### Technical Specifications

<b>Product Specifications</b> <b>Hardware</b>	<b>Ports</b>	Forty-five (45) 10 Gb Ethernet downlink ports Four (4) 40 Gb Ethernet uplink ports One (1) serial console interface accessible through the uplink module One (1) internal serial interfaces to iLO Chassis Manager for use through the Virtual Serial Port (VSP)	
	<b>Performance</b>	<b>Throughput</b>	14.8 million pps per 10G port; 59.2 million pps per 40G port
<b>Memory</b> <b>Indicators / Switch</b>		<b>Switching Capacity</b>	640 Gbps
			2 GB SDRAM; 128 MB flash; 9 MB packet buffer
<b>Physical Characteristics</b>			Module power, green/amber
			Module health, red/amber/green
			Module locator (UID), blue (LED & push button switch)
			Aggregated Uplink ports link/activity, green
			Aggregated Downlink ports link/activity, green
<b>Environmental Ranges</b>	<b>Length</b>		14.82 in (376 mm)
	<b>Width</b>		6.75 in (141 mm)
	<b>Height</b>		1.44 in (37 mm)
	<b>Weight</b>		1.707 kg (3.76 lbs)
<b>Power Consumption</b>	<b>Temperature Range</b>		
	Operating		50° to 95° F (10° to 35° C)
	Non-operating		-22° to 140° F (-30° to 60° C)
	<b>Relative Humidity</b> (non-condensing)		
	Operating		10% to 90%
	Non-operating		5% to 95%
	<b>Altitude</b>		
	Operating		10,000 ft. (3048 m)
	Non-operating		30,000 ft. (9144 m)
	<b>Typical</b>		60W
	<b>Maximum</b>		100W

### Standards Support

#### General Protocols

IEEE 802.1ag Service Layer OAM  
 IEEE 802.1D MAC Bridges  
 IEEE 802.1p Priority  
 IEEE 802.1Q VLANs  
 IEEE 802.1Qbg Virtual Edge Bridging  
 IEEE 802.1s (MSTP)  
 IEEE 802.1v VLAN classification by Protocol and Port  
 IEEE 802.1w Rapid Reconfiguration of Spanning Tree  
 IEEE 802.1X PAE  
 IEEE 802.1AX / 802.3ad Link Aggregation Control Protocol (LACP)  
 IEEE 802.3ae 10 Gigabit Ethernet  
 IEEE 1588 v2 Precision Time Protocol (PTP)  
 RFC 768 UDP  
 RFC 792 ICMP  
 RFC 793 TCP  
 RFC 826 ARP  
 RFC 854 TELNET  
 RFC 925 Multi-LAN Address Resolution  
 RFC 951 BOOTP



### Technical Specifications

RFC 1058 RIPv1  
RFC 1350 TFTP Protocol (revision 2)  
RFC 1519 CIDR  
RFC 1542 BOOTP Extensions  
RFC 2131 DHCP  
RFC 2453 RIPv2  
RFC 3768 VRRP  
RFC 4675 RADIUS VLAN & Priority  
802.1r GARP Proprietary Attribute Registration Protocol (GPRP)

#### **DCB**

802.1Qaz DCBx  
802.1Qaz ETS  
802.1Qbb PFC

#### **IP Multicast**

RFC 2934 Protocol Independent Multicast MIB for IPv4  
RFC 3376 IGMPv3 (host joins only)  
RFC 3618 Multicast Source Discovery Protocol (MSDP)  
RFC 4601 PIM Sparse Mode

#### **IPv6**

RFC 4443 ICMPv6  
RFC 4541 IGMP & MLD Snooping Switch  
RFC 4861 IPv6 Neighbor Discovery  
RFC 4862 IPv6 Stateless Address Auto-configuration

#### **Layer 3**

Static routes  
RIP / RIPv2  
OSPF / OSPFv3  
BGP / BGP+  
IPv6 tunneling  
PIM-SM  
PIM-SSM  
PIM-DM  
IGMP  
ECMP  
Policy-based routing  
DHCP and DHCPv6 client

#### **MIBs**

IEEE 8021ag CFM-MIB  
IEEE 8021Q CFM-MIBv2  
IEEE 8021AB LLDP-MIB  
IEEE 8021AB LLDP-EXT-DOT1-MIB  
IEEE 8021AB LLDP-EXT-DOT3-MIB  
ANSI/TAA 1057 LLDP-EXT-MED-MIB  
IEEE 8023 LAG-MIB  
RFC 1213 MIB  
RFC 1493 BRIDGE-MIB  
RFC 2096 IP-FORWARD-MIB  
RFC 2233 IF-MIB  
RFC 2273 SNMP-NOTIFICATION-MIB  
RFC 2571 SNMP-FRAMEWORK-MIB  
RFC 2572 SNMP-MPD-MIB

### Technical Specifications

RFC 2573 SNMP-TARGET-MIB  
 RFC 2674 P-BRIDGE-MIB  
 RFC 2674 Q-BRIDGE-MIB  
 RFC 3414 SNMP-USER-BASED-SM-MIB  
 RFC 3415 SNMP-VIEW-BASED-ACM-MIB  
 RFC 3417 SNMPv2-TM-MIB  
 RFC 3418 SNMPv2-MIB  
 RFC 3826 SNMP-USM-AES-MIB  
 RFC 4022 TCP-MIB  
 RFC 4044 FC-MGMT-MIB  
 RFC 4113 UDP-MIB  
 RFC 4133 ENTITY-MIB  
 RFC 4273 BGP4-MIB  
 RFC 4747 T11-FC-VIRTUAL-FABRIC-MIB  
 RFC 4750 OSPF-MIB  
 RFC 4750 OSPF-TRAP-MIB  
 RFC 4936 T11-FC-ZONE-SERVER-MIB  
 SFLOW-MIB (V5)

#### Safety and Compliance Safety Certifications

Complies with UL 60950-1, CAN/CSA C22.2 No. 60950-1 and EN 60950-1. UL certified.  
 CE Marking  
 RoHS 6/6 compliant

#### Emissions Classifications (EMC)

Class A

#### Environment-friendly Products and Approach

#### End-of-life Management and Recycling

Hewlett-Packard offers end-of-life HP product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: <http://www.hp.com/go/green>. To recycle your product, please go to: <http://www.hp.com/go/green> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <http://www.hp.com/go/green>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

## Technical Specifications

	<u>Version History</u>	<u>Action</u>	<u>Description of Change:</u>
<u>29-Sept-2014</u>	<u>Version 1</u>	<u>Created</u>	<u>Create QS for the Moonshot-45XGc Switch Module</u>

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