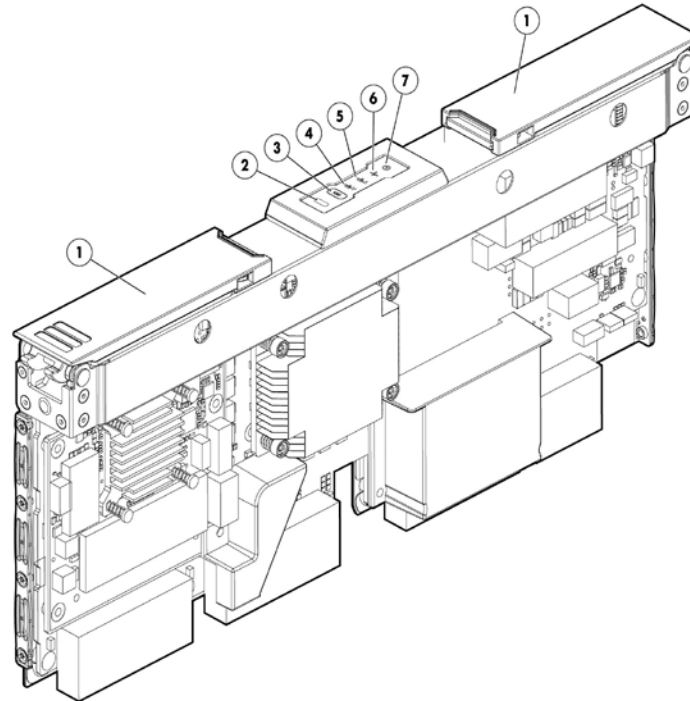


### Overview

### HPE Moonshot-45G Switch Module

The HPE Moonshot-45G Switch Module is designed to provide high speed, low-latency connectivity while dramatically reducing cost and complexity of deploying solutions at scale. The 45G Switch Module, together with the HPE Moonshot-6SFP Uplink Module, provide 1GbE network connections to cartridges within the HPE Moonshot 1500 chassis. Up to two switch modules are supported in each chassis. Multiple modules can be stacked to eliminate the cost of TOR switches and provide failover in the event of a switch or uplink failure.



**Figure 1 HPE Moonshot-45G 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

HPE Moonshot-45G Switch Module Kit

704644-B21

## Standard Features

### Performance

- Non-blocking architecture
- Wire speed switching and IPv4 routing on all ports
- SFP+ ports support either 1Gb or 10Gb depending on module inserted
- Store and Forward Switching
- Hardware-based wire-speed access control lists (ACLs)

### Management

- Dual Software Images
- TACACS+
- Management Port Access Control
- Password Management (history)
- DoS Attack Prevention (Network and CPU)
- Configurable Management VLAN
- SSL 3.0 and TLS 1.0
  - RFC 2246 - The TLS Protocol, Version 1.0
  - RFC 2346 - AES Ciphersuites for Transport Layer Security
  - RFC 2818 - HTTP over TLS
- SSH 1.5 and 2.0
  - Draft-ietf-secsh-transport-16 - SSH Transport Layer Protocol
  - Draft-ietf-secsh-userauth-17 - SSH Authentication Protocol
  - Draft-ietf-secsh-connect-17 - SSH Connection Protocol
  - Draft-ietf-secsh-architecture-14 - SSH Protocol Architecture
  - Draft-ietf-secsh-publickeyfile-03 - SECSH Public Key File Format
  - Draft-ietf-secsh-dh-group-exchange-04 - Diffie-Hellman Group Exchange for the SSH Transport Layer Protocol
- HTML 4.0 Specification - December, 1997
- Java and Java Script 1.3
- Advanced Management Features:
  - Industry Standard CLI with the following features: scripting capability, command completion, context sensitive help
  - Optional User Password Encryption
  - Multi-session Telnet Server

### Stacking

- Redundant Management Unit support
- Single IP Address Management
- Non Stop Forwarding on loss of management control unit
- Automation Election of Management Control Unit
- Distribution of Code and Configuration throughout Stack
- Hot-Plug Support: Optional Modules & Stack Units
- Offline Configuration of Modules and Stack Units

### Switching

- AutoInstall
- Broadcast/Multicast/Unicast Storm Recovery
- Cable Test
- CPU/Memory Utilization
- DHCP Filtering
- DHCP Snooping
- DHCPv6 Client Support
- DNS Client
- Double VLAN/vMAN Tagging
- Dynamic ARP Inspection

## Standard Features

- Event and Error Logging Facility
- Flow-Based Port Mirroring
- Friendly Port Naming
- GARP - Generic Attribute Registration Protocol
- GMRP - Dynamic L2 Multicast Registration
- GVRP - Dynamic VLAN Registration
- IGMP Snooping Querier
- IGMP/MLD Snooping
- IP Source Guard
- IP subnet-based VLANs
- iSCSI Flow Acceleration
- ISDP (CDP-interoperability)
- Jumbo Ethernet Frames
- Network and Host DoS protection
- Ping Utility
- Port MAC Locking
- Port Mirroring
- Protected Port
- Protocol, MAC & IP Subnet Based VLANs
- IP Address Conflict Notification
- Email Alerts
- SNTP over IPv6
- Selectable LAG Hashing algorithm
- Service Aware Flow Control (SAFC) on Stacking Links
- sFlow
- STP Root Guard/BPDU Guard/TCN Guard/LoopGuard/BPDUFilter/BPDUFlood
- TACACS+
- VLAN Assignment [RFC 3580]
- VLAN Guest
- VLAN Private Edge
- VLAN Unauthenticated
- VLAN Voice
- Internal 802.1x Authentication Server
- 802.1x Monitor Mode
- RADIUS based Dynamic VLAN Assignment

## Routing

- DNS Client
- ECMP
- ICMP Throttling
- Loopback
- Multinetting
- Multiple Helper IPs
- OSPF point-to-point links
- OSPF virtual links
- Proxy ARP
- Route Redistribution across RIP, OSPF and BGP
- Routing Enhancements
  - Clear ip(v7) ospf
  - Display of route timestamp
  - NDP aging fix
- Static routing
- Traceroute
- UDP Relay/IP Helper
- VLAN and Port based Routing
- VRRP Route Interface tracking

## Standard Features

- Pingable VRRP Virtual Addresses
- Configurable Routing Limits
- Enhanced ECMP Hashing Algorithm

## Quality of Service (QoS) & DiffServ Module

- Access Control Lists (ACLs)
  - ACL Logging
  - ACL Mirroring
  - Permit/ Deny actions for Inbound or Outbound IP traffic classification based on:
    - Type of Service (TOS) or Differentiated Services (DS) DSCP field
    - Source/Destination IP Address
    - TCP / UDP Source/Destination Port
    - IP Protocol Number
  - Permit/Deny actions for Inbound or Outbound Layer 2 traffic classification based on:
    - Source/Destination MAC Address
    - Ethertype
    - 802.1p user priority (outer and/or inner VLAN tag)
    - VLAN identifier value or range (outer and/or inner VLAN tag)
  - Class of Service (CoS) Module
  - Direct user configuration of the following:
    - IP Precedence to traffic class mapping
    - IP DSCP to traffic class mapping
    - Interface trust mode: 802.1p, IP Precedence, IP DSCP, or untrusted
    - Interface traffic shaping rate
    - Minimum and maximum bandwidth per queue
    - Strict priority versus weighted (WRR/WFQ) scheduling per queue
    - Tail drop versus weighted random early detection (WRED) queue depth management
  - Egress DiffServ
  - Egress ACLs
  - Named Access Lists
  - Time Based ACLs
  - Policy Dynamic Slice Sizing

## Compatibility

### HPE Interconnect modules

**NOTE:** Up to two identical pairs of Switch and Uplink modules are supported in the Moonshot 1500 Chassis. Dual switch modules are required for network redundancy, regardless of cartridge configuration.

**NOTE:** Check Compatibility matrix below for supported switch and uplink modules

**NOTE:** For information HPE Moonshot Cartridges and Uplink Modules, please see the following:

#### Cartridge:

HPE ProLiant m300 Server Cartridge

<https://www.hpe.com/h20195/v2/GetHtml.aspx?docname=c04111351>

HPE ProLiant m400 Server Cartridge

<https://www.hpe.com/h20195/v2/GetHtml.aspx?docname=c04384048>

HPE ProLiant m710 Server Cartridge

<https://www.hpe.com/h20195/v2/GetHtml.aspx?docname=c04384063>

#### Uplink

HPE Moonshot-6SFP+ Uplink Module

<https://www.hpe.com/h20195/v2/gethtml.aspx?docname=c04111341>

Switch	Speed	CARTRIDGES							Uplink		
		m300	m350	m400	M700	M710	M710p	M800	Moonshot 6SFP+ Uplink	Moonshot 16SFP+ Uplink	Moonshot 4QSFP+ Uplink
FASTPAST SWITCHES											
Moonshot 45G Switch	1Gb	X		X 1Gb speed only		X 1Gb speed only	X 1Gb speed only		X		
Moonshot 180G Switch	1Gb	X	X	X 1Gb speed only	X	X 1Gb speed only	X 1Gb speed only	X		X	X
COMWARE SWITCHES											
Moonshot 45Gc Switch	1Gb	X		X 1Gb speed only		X 1Gb speed only	X 1Gb speed only		X		
Moonshot 45XGc Switch	1Gb	X		X 1Gb speed only		X 1Gb speed only	X 1Gb speed only			X	X
	10 Gb			X		X	X			X	X

## Service and Support

### Service and Support Recommended HPE Care Pack Services for your HPE product

(4 and 5 year Service offerings are also available)

HPE Technology Services

HPE Technology Services delivers confidence, reduces risk and helps customers realize agility and stability. Connect to Hewlett Packard Enterprise to help prevent problems and solve issues faster. Our support technology lets you to tap into the knowledge of millions of devices and thousands of experts to stay informed and in control, anywhere, any time.

Protect your business beyond warranty with HPE Care Pack Services

HPE Care Pack Services enable you to order the right service level, length of coverage and response time as you purchase your new server, giving you full entitlement for the selected support.

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

(4 and 5 year Service offerings are also available)

#### Optimized Care

#### Foundation Care 24x7, three-year Care Pack Service

HPE Foundation Care 24x7 connects you to Hewlett Packard Enterprise 24 hours a day, seven days a week for assistance on resolving issues. Hardware onsite response within four hours if needed; collaborative software included in this Care Pack service provides troubleshooting assistance on industry leading software running on your HPE server. Simplify your support experience and make Hewlett Packard Enterprise your first call for hardware or software questions.

<https://www.hpe.com/h20195/V2/GetDocument.aspx?docname=4AA4-8876ENW&cc=us&lc=en>

#### Standard Care

#### Foundation Care NBD, three-year Care Pack Service

HPE Foundation Care Next Business Day connects you to Hewlett Packard Enterprise during business hours for assistance on resolving issues – features next business day hardware onsite response if needed and software call back within two hours. Collaborative software support is included and provides troubleshooting assistance on industry leading software running on your server. Simplify your support experience and make Hewlett Packard Enterprise your first call for hardware or software questions.

<https://www.hpe.com/h20195/V2/GetDocument.aspx?docname=4AA4-8876ENW&cc=us&lc=en>

#### Related Services

#### HPE Moonshot Installation & Startup Service

HPE 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

#### HPE Datacenter Care service

HPE Datacenter Care helps you improve IT stability and security, increase the value of IT, and enable agility and innovation. It is a structured framework of repeatable, tested, and globally available services “building blocks.” You can deploy, operate, and evolve your datacenter wherever you are on your IT journey. With HPE Datacenter Care, you benefit from a personalized relationship with Hewlett Packard Enterprise via a single point of accountability for Hewlett Packard Enterprise and others’ products. For more information, visit <http://www.hp.com/services/datacentercare>

**HPE 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 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.

## Service and Support

**Connect your devices to HPE** Unlock all of the benefits of your technology investment by connecting your products to Hewlett Packard Enterprise. Achieve up to 77%<sup>1</sup> reduction in down time, near 100%<sup>2</sup> diagnostic accuracy and a single consolidated view of your environment. By connecting, you will receive 24x7 monitoring, pre-failure alerts, automatic call logging, and automatic parts dispatch. HPE Proactive Care Service and HPE Datacenter Care Service customers will also benefit from proactive activities to help prevent issues and increase optimization. All of these benefits are already available to you with your server storage and networking products, securely connected to Hewlett Packard Enterprise support.

### **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.

HPE 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 HPE 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 <http://www.hp.com/services/dataprivacy>.

### **HPE Support Center**

Hewlett Packard Enterprise provides several tools that make it simpler to get help from HPE:

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

The HPE 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. HPE Support Center are available at no additional cost with a Hewlett Packard Enterprise warranty, HPE Care Pack or Hewlett Packard Enterprise contractual support agreement.

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

### **For more information**

To learn more on HPE Moonshot System, please contact your Hewlett Packard Enterprise sales representative.

## Technical Specifications

<b>Product Specifications</b>	<b>Ports</b>	Forty-five (45) 1 Gb Ethernet downlink ports Six (6) 10 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>Hardware</b>	
	<b>Performance</b>	<b>Throughput</b> 1.5 million pps (64-byte packets) per 1G port; 14.8 million pps per 10G port
		<b>Switching Capacity</b> 480 Gbps
	<b>Memory</b>	2 GB SDRAM; 128 MB flash; 9 MB packet buffer
	<b>Indicators / Switch</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>Physical Characteristics</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>Environmental Ranges</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>Power Consumption</b>	<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

<b>Standards Support</b>	<b>Switching</b> IEEE 802.1AB (network discovery) with MED IEEE 802.1D - Spanning Tree IEEE 802.1p - Ethernet Priority with User Provisioning & Mapping IEEE 802.1Q - Virtual LANs w/ Port based VLANs Strong Passwords IEEE 802.1S - Multiple Spanning Tree IEEE 802.1v - Protocol-based VLANs IEEE 802.1W - Rapid Spanning Tree IEEE 802.1X - Port Based Authentication IEEE 802.1X Port-based vs. MAC-based authentication IEEE 802.3ac - VLAN Tagging IEEE 802.3ad - Link Aggregation IEEE 802.3ae - 10 GigE IEEE 802.3x - Flow Control RFC 768 - UDP RFC 783 - TFTP
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## Technical Specifications

RFC 791 - IP  
RFC 792 - ICMP  
RFC 793 - TCP  
RFC 826 - ARP  
RFC 951 - BootP  
RFC 1321 - Message Digest Algorithm  
RFC 1534 - Interop. between BootP & DHCP  
RFC 2030 - Simple Network Time Protocol (SNTP) V4 for IPv4, IPv6, and OSI  
RFC 2131 - DHCP Client/Server  
RFC 2132 - DHCP Options & BootP Vendor Extensions  
RFC 2865 - RADIUS Client  
RFC 2866 - RADIUS Accounting  
RFC 2868 - RADIUS Attributes for Tunnel Protocol Support  
RFC 2869 - RADIUS Extensions  
RFC 3164 - The BSD Syslog Protocol  
RFC 3579 - RADIUS Support for EAP  
RFC 3580 - 802.1X RADIUS  
RFC 3580 - Multi-user VLAN assignment & Filter-ID support  
VLAN Assignment [RFC 3580]  
VLAN Guest  
VLAN Private Edge  
VLAN Unauthenticated  
VLAN Voice  
Internal 802.1x Authentication Server  
802.1x Monitor Mode

### Routing

RFC 1058 - RIP v1  
RFC 1256 - ICMP Router Discovery Messages  
RFC 1321 - Message Digest Algorithm  
RFC 1519 - CIDR  
RFC 1765 - OSPF Database Overflow  
RFC 1812 - Requirements for IP Version 4 Routers  
RFC 2082 - RIP-2 MD5 Authentication  
RFC 2131 - DHCP Relay  
RFC 2328 - OSPF v2  
RFC 2453 - RIP v2  
RFC 3046 - DHCP/BootP Relay  
RFC 3101 - The OSPF "Not So Stubby Area" (NSSA) Option  
RFC 3768 - VRRP - Virtual Router Redundancy Protocol  
RFC 826 - Ethernet ARP  
RFC 894 - Transmission of IP Datagrams over Ethernet Networks  
RFC 896 - Congestion Control in IP/TCP Networks Quality of Service & DiffServ Module  
RFC 2474 - Definition of the Differentiated Services Field (DS Field) in the IPv4 & IPv6 Headers  
RFC 2475 - An Architecture for Differentiated Services  
RFC 2597 - Assured Forwarding PHB Group  
RFC 3246 - An Expedited Forwarding PHB (Per-Hop Behavior)  
RFC 3260 - New Terminology and Clarifications for DiffServ

### Management

RFC 854 - Telnet  
RFC 855 - Telnet Option  
RFC 1155 - SMI v1  
RFC 1157 - SNMP  
RFC 1212 - Concise MIB Definitions  
RFC 1867 - HTML/2.0 Forms with file upload extensions

## Technical Specifications

RFC 1901 - Community based SNMP v2  
 RFC 1908 - Coexistence between SNMP v1 & SNMP v2  
 RFC 2246 - The TLS Protocol, Version 1.0  
 RFC 2271 - SNMP Framework MIB  
 RFC 2295 - Transparent Content Negotiation  
 RFC 2296 - Remote Variant Selection; RSVP/1.0 State Management "cookies" - draft-ietf-http-state-mgmt-05  
 RFC 2346 - AES Ciphersuites for Transport Layer Security  
 RFC 2576 - Coexistence between SNMP v1, v2 & v3  
 RFC 2578 - SMI v2  
 RFC 2579 - Textual Conventions for SMI v2  
 RFC 2580 - Conformance statements for SMI v2  
 RFC 3410 - Introduction and Applicability Statements for Internet-Standard Management Framework  
 RFC 3411 - An Architecture for Describing SNMP Management Frameworks  
 RFC 3412 - Message Processing & Dispatching for SNMP  
 RFC 3413 - SNMP v3 Applications  
 RFC 3414 - User Based Security Model for SNMP v3  
 RFC 3415 - View-based Access Control Model for SNMP  
 RFC 3416 - Protocol Operations for SNMP v2  
 RFC 3417 - Transport Mappings for SNMP  
 RFC 3418 - Management Information Base for SNMP

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

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**Emissions Classifications (EMC)** Class A

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**Environment-friendly Products and Approach** **End-of-life Management and Recycling** Hewlett Packard Enterprise offers end-of-life Hewlett Packard Enterprise 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 Hewlett Packard Enterprise sales office. Products returned to Hewlett Packard Enterprise 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 Enterprise web site at: <http://www.hp.com/go/green>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HPE OEM customers who integrate and re-sell Hewlett Packard Enterprise equipment.

## Summary of Changes

Date	Version History	Action	Description of Change
21-Oct-2016	From version 4 to 5	Update	Update for Rebranding
28-Sept-2015	From version 3 to 4	Update	Update the configurations section
17-Aug-2015	From version 2 to 3	Updated	Updates made throughout the QS
03-Oct-2014	From version 1 to 2	Changed	Changes made throughout the
11-Dec-2013	Version 1	Created	Create QS for HPE Moonshot-45G Switch Module



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