Overview

HPE Synergy 4-port Frame Link Module (FLM)

The HPE Synergy 4-port Frame Link Module (FLM) is a 'frame manager' designed for Composable Infrastructure. The FLM efficiently manages the operations of a Synergy Frame in conjunction with HPE Composer, which is powered by HPE OneView.

Key functions of the HPE Synergy Frame Link Module include:

- Scaling the environment by linking Synergy Frames together in a management ring (single management domain),
- **Separation of the data & management networks** for management performance and resilience against Denial of Service (DoS) attacks,
- Auto-discovery of resources by collecting asset and inventory info of components in linked frames,
- Control and monitoring of the thermal and power infrastructure resources in an HPE Synergy Frame,
- Provides out-of-band management interface to HPE OneView to configure and manage interconnect modules.
- Reporting the health status for each component installed in a frame, and
- Hosting the HPE Synergy Console user interface.

The HPE Synergy 4-port FLM provides enhanced security in Synergy systems by implementing:

- **Secure Start** to validate the firmware to prevent tampering,
- Hardware Root of Trust tied to the FLM CPU for further firmware validation, and
- File Encryption using Trusted Platform Module (TPM) functionality.

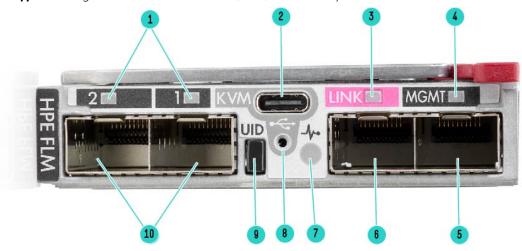


Figure 1: HPE Synergy 4-port Frame Link Module (FLM)

- 1. Appliance port connectivity LEDs
- 2. USB-C (KVM connection)¹
- 3. LINK port activity LED
- 4. MGMT port activity LED
- 5. MGMT port [SFP+]^{5, 6}

- 6. LINK port [SFP+]⁴
- 7. Health LED
- 8. USB adapter thumb screw connection
- 9. UID LED button
- 10. Appliance ports $[SFP+]^{2,3}$

NOTE¹: Support for USB-C storage devices at the USB 2.0 level.

NOTE²: Provides a direct network connection to an appliance in bay 2. Reserved for future use.

NOTE³: Provides a direct network connection to an appliance in bay 1. Reserved for future use.

NOTE⁴: Use 10GbE transceivers and cables for LINK port connections.

NOTE⁵: 10GbE or 1GbE based on the cable or transceiver used.

NOTE⁶: The transceiver or cable used must match the port speed of the switch used for management network connectivity.



Overview

NOTE: HPE Synergy 4-Port FLMs require supported SFP+ DAC cables or SFP+ transceivers for cabling.

What's New

The HPE Synergy Frame Link Module (FLM) is a 'frame manager' designed for Composable Infrastructure. The FLM efficiently manages the operations of a Synergy Frame in conjunction with HPE Composer, which is powered by HPE OneView.

HPE Synergy 4-port FLM is a new product version which implements enhancements for Synergy users.

Enhanced security for Synergy systems is implemented in the HPE Synergy 4-port FLM:

- Secure Start to validate the firmware to prevent tampering,
- Hardware Root of Trust tied to the FLM CPU for further firmware validation, and
- **File Encryption** using Trusted Platform Module (TPM) functionality.

Additional capabilities in the HPE Synergy 4-port Frame Link Module (FLM) include:

- SFP+ ports to enable optical connections for reaching distant frames or remote subnets in a datacenter,
- Two additional direct-to-the-appliance bay ports which are reserved for future use, and
- USB-C connector (USB 2.0) for DisplayPort connectivity via a dongle.

NOTE: HPE Synergy FLMs (both 2-port and 4-port versions) are compatible with existing applications and workloads.

Standard Features

Product Features Performance

- Management (MGMT) uplink connections can operate at 10 GbE to support multiple users or administrators and to provide faster downloading of virtual media for firmware/software updates.
- Management (MGMT) port connections on the FLM are able to auto-negotiate down to 1 GbE to mate with ToR switches.
- Management rings connect multiple Synergy Frames using 10 GbE (LINK) connections
- HPE Synergy 4-port Frame Link Modules have SFP+ ports which enable connections to distant frames and remote subnets

Management

- HPE Synergy FLMs are 'frame managers' which operate under HPE Composer (powered by HPE OneView) management control.
- An out-of-band management interface to HPE OneView is provided by HPE Synergy FLMs to configure and manage interconnect modules.
- User Interface for the Synergy FLM includes USB-C (supported to the USB 2.0 level), Health LED, User ID (UID), and DisplayPort (via USB Adapter cable).
- Firmware for managing the HPE Synergy Frame Link Module is included in every HPE Synergy Custom SPP release, as part of HPE Synergy Software Releases.
- HPE Synergy Software Releases provide users with tested sets of firmware, drivers, and related
 updates to keep systems up-and-running as stable operating environments. For more information,
 see HPE Synergy Software Releases Overview.

Security

All Synergy Frame Link Modules operate in FIPS (Federal Information Processing Standard) security mode. If HPE Synergy Composer (powered by HPE OneView) is put into CNSA (Commercial National Security Algorithm) mode, then HPE Composer will put the FLM into CNSA mode also.

Security enhancements which are unique to the HPE Synergy 4-Port Frame Link Module include:

- Management data stored on the frame link module is encrypted by default. The encryption is rooted
 in the integrated Trusted Platform Module (TPM) on the hardware device,
- Hardware Root of Trust (related to NIST SP800-193) which ensures that only firmware signed by Hewlett Packard Enterprise can be used to boot the frame link module,
- Secure Start (related to NIST SP800-193) which provides secure firmware updates,
- Firmware Resiliency prevents modification of the current running firmware image which increases reliability and by ensuring a good firmware image is always available, and
- Hardware-enforced write protection protects the frame link module from unauthorized changes.

Security features which are common to all HPE Synergy Frame Link Modules include:

- Separation of the production ('data') network from the management (or 'control') network, which protects against Denial of Service (DoS) attacks,
- Audit logging,
- Verification of certificates for Transport Layer Security (TLS),
- Secure protocols and certifications such as:
 - FIPS (Federal Information Processing Standard) 140-2 Level 1,
 - PCI-DSS compliance.
 - Commercial National Security Algorithm (CNSA) Suite B, and
 - General Data Protection Regulation (GDPR),
- Verified boot and Authenticated updates,
- Centralized platform security policies with Certificate management,
- No clear text passwords.
- Scope based access control (SBAC), and
- Secure out-of-the-box experience with Secure Erase of user data.

Service and Support

HPE Pointnext operational and Warranty Information

HPE Pointnext Operational Services

Protect your business beyond warranty with HPE Pointnext Operational Service.

HPE Pointnext provides a comprehensive portfolio including Advisory and Transformational, Professional, and Operational Services to help accelerate your digital transformation. From the onset of your transformation journey, Advisory and Transformational Services focus on designing the transformation and creating a solution roadmap. Professional Services specializes in creative configurations with flawless and on-time implementation, and on-budget execution. Finally, operational services provides innovative new approaches like Flexible Capacity and Datacenter Care, to keep your business at peak performance. HPE is ready to bring together all the pieces of the puzzle for you, with an eye on the future, and make the complex simple.

Choose from services aligned to our product offerings and lifecycle. From proactive onsite services to innovative support when your products are connected to Hewlett Packard Enterprise, you choose the precise level of attention and support your business demands.

HPE Technology Services for HPE Synergy

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 Support Services

HPE support services offer complete care and support expertise with committed response choices that are designed to meet your IT and business needs.

HPE Foundation Care services offer scalable reactive support-packages for HPE Synergy and software. You choose the type and level of service that is most suitable for your IT and business needs.

HPE Proactive Care keeps your system stable and reliable helping to prevent problems and reduce outages through proactive service management and enhanced technical response.

Connect your devices

Unlock all of the benefits of your technology investment by connecting your products to Hewlett Packard Enterprise. Reduce down time and increase diagnostic accuracy using 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 also benefit from proactive activities to prevent issues and increase optimization. All of these benefits are already available to you with your server storage and networking products, securely connected to HPE support. Learn more about getting connected at http://www.hpe.com/services/getconnected.

Services

HPE Proactive Care HPE Proactive Care Advanced - 24x7 coverage, three year Support Service

This service helps achieve a higher return on your product investment with personalized support from a local assigned Account Support Manager who will share best practice advice and personalized recommendations designed to help improve availability and performance to increase stability and reduce unplanned downtime. Leverage your system's ability to connect to HPE for pre-failure alerts, automatic call logging and parts dispatch. For business critical incidents, this service offers critical event management to reduce mean time to resolution. This recommendation provides 24x7 coverage with four-hour response for hardware and Basic Software Support, and Collaborative Call Management for selected non-HPE software that offers twohour callback for supported software issues.

See https://www.hpe.com/h20195/v2/getdocument.aspx?docname=4AA5-3259ENW.

Service and Support

HPE Proactive Care with 24x7 coverage, three year Support Service

HPE Proactive Care gives customers an enhanced call experience with rapid access to Advanced Solution Center specialists. When your products are connected to HPE, Proactive Care helps prevent problems and maintains IT stability by utilizing personalized proactive reports with recommendations and advice. This Service combines three years proactive reporting and advice with our 24x7 coverage, four hour hardware response time for hardware and Basic Software Support, and Collaborative Call Management for selected non-HPE software that offers two-hour callback for supported software issues.

See https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA3-8855ENW.pdf

NOTE: HPE Proactive Care and HPE Proactive Care Advanced require that the customer connect their devices to make the most of these services and receive all the deliverables. Some devices and configurations may not be supported by the technologies. In these instances, Hewlett Packard Enterprise will provide a report with the most current recommended firmware and/or software releases for the devices without data collections if there are published downloads for the corresponding product numbers.

HPE Service Credits offer flexible services and technical skills to meet your changing IT demands. With a menu of service that is tailored to suit your needs, you get additional resources and specialist skills to help you maintain peak performance of your IT. Offered as annual credits, you can plan your budgets while proactively responding to your dynamic business.

HPE Datacenter Care Services

HPE Datacenter Care helps 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 HPE via a single point of accountability for HPE and others' products. For more information, visit http://www.hpe.com/services/datacentercare.

With **HPE GreenLake Flex Capacity**, you get the speed, scalability, and economics of the public cloud in the privacy of your data center. Gain the advantages of the public cloud—consumption-based payment, rapid scalability without worrying about capacity constraints. Reduce the "heavy lifting" needed to operate a data center and retain the advantages that IT provides the business (i.e., control, security). Deliver the right user experience, choose the right technology for the business, manage privacy and compliance, manage the cost of IT, and you have the option to use the public cloud when needed.

Deploy and integrate

HPE Synergy First Frame Installation and Startup - Provides for hardware installation (HPE Synergy compute modules, Storage Modules, Virtual Connect modules, Interconnect Link Modules, Frame Link Modules, HPE Image Streamer, and HPE Synergy D3940 Storage Modules) and basic software startup for the first frame of your HPE Synergy deployment. Additional frames can be added using the HPE Synergy Additional Frame Installation and Startup Service.

HPE Synergy Additional Frame Installation and Startup Service - Add additional frames to your HPE Synergy First Frame Startup service or expand your existing HPE Synergy Infrastructure.

HPE Factory Express Initial Frame Service for Synergy

Factory Express allows a customers' configurations to be pre-configured in the HPE Integration center with an implementation project manager to manage the deployment end to end. The project manager will act as a single point of contact to coordinate the build, delivery and onsite installation and commissioning of the solution. In addition to the configuration and deployment activities, your HPE Synergy configuration goes through comprehensive testing and a detailed documentation package on the configuration and settings of the delivered solution will be provided.

HPE Factory Express Synergy Additional Frame Service for Synergy

Add additional frames to your HPE Synergy Factory Express Initial Frame Service.

HPE Add Image Streamer Installation and Startup Service

HPE Add Image Streamer Installation and Startup Service provides the installation and basic software configuration for one pair of HPE Synergy Image Streamers into an existing HPE Synergy environment. This

Service and Support

service can be purchased to introduce a pair of HPE Synergy Image Streamers to an existing HPE Synergy environment that does not currently have Image Streamer installed or to expand an existing HPE Synergy Image Streamer environment.

HPE Education

Keep your IT staff trained making sure they have the right skills to deliver on your business outcomes. Book on a class today and learn how to get the most from your technology investment. See http://www.hpe.com/ww/learn.

HPE Support Center The HPE Support Center is a personalized online support portal with access to information, tools and experts to support HPE business products. Submit support cases online, chat with HPE experts, access support resources or collaborate with peers. Learn more http://www.hpe.com/support/hpesc.

> 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 personalized IT support anywhere, anytime.

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

HPE Insight Remote Support and HPE Support Center are available at no additional cost with a HPE warranty, HPE Support Service or HPE contractual support agreement.

Parts and Materials Hewlett Packard Enterprise will provide HPE-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements.

> Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product quick-specs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services.

The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by Hewlett Packard Enterprise due to malfunction.

For more information

More information on HPE services can be found at http://www.hpe.com/services.

Configuration Information

Models

HPE Synergy 4-port Frame Link Module

876852-B21

NOTE: HIGHLY RECOMMENDED that a second HPE Synergy FLM be added into each Synergy Frame for

redundancy.

NOTE: Single FLM unit per SKU.

CAUTION: Both FLM units of a redundant pair in a Synergy Frame must be of the same generation.

HPE Synergy 4-port Frame Link Module

876852-B21

NOTE: USB Adapter ('dongle') required for DisplayPort access to the rear of the HPE Synergy Frame (USB-C

to DisplayPort).

Compatibility

HPE Synergy 4-port Frame Link Module supports the following hardware.

HPE Synergy Frames

• HPE Synergy 12000 Frame

HPE Synergy Interconnects

- HPE Virtual Connect SE 100GB F32 Module for HPE Synergy
- HPE Synergy 100Gb F32 Switch Module
- HPE Virtual Connect SE 40GB F8 Module for HPE Synergy
- HPE Synergy 40Gb F8 Switch Module

HPE Cables and Transceivers

• See the 'Related Options' section of this document

CAUTION: Cable type and transceivers determine the distance limit of connections.

Active DAC cables @ 10Gbps = 15 meters (max)

Passive DAC cables = ~5 meters

AOC cable use with SR transceivers = 300m (max) AOC cable use with LR transceivers = 10km (max) AOC cable use with ER transceivers = 40km (max)

Configuration Information

Supported Configurations



Figure 2: HPE Synergy 12000 Frame - Rear View (Frame Link Modules shown partially extended)

- 1. Frame Link Module #1
- 2. Frame Link Module #2

HPE Synergy Frame Link Modules install into one of two frame link module bays in the rear of the frame.

NOTE: HIGHLY RECOMMENDED that a second Synergy FLM be added into each Synergy Frame for redundancy.

CAUTION: Both FLM units of a redundant pair in a Synergy Frame must be of the same generation

CAUTION: Use caution when installing a Synergy FLM into the Synergy Frame to avoid damage to the connector. Installing a Synergy FLM with a damaged connector can result in damage to the Synergy Frame midplane.

Related Options

Copper Cables (DAC)

DAC Cables connect SFP+ ports using copper cable with built-in transceivers.

NOTE: For use between Synergy 4-port FLMs, and for connecting management uplinks to other SFP+ network connections.

NOTE: Direct Attach Cables (DAC) use copper cables with built-in transceivers on each end.

CAUTION: Cable type determines the distance limit of connections.

Active DAC cables @ 10Gbps = 15 meters (max)

Passive DAC cables = ~5 meters

HPE BladeSystem c-Class 10GbE SFP+ to SFP+ 3m Direct Attach Copper Cable 487655-B21
HPE BladeSystem c-Class 10GbE SFP+ to SFP+ 5m Direct Attach Copper Cable 537963-B21

Fibre Cables (AOC)

AOC Cables connect SFP+ ports using fibre cables with transceivers.

NOTE: For use connecting between Synergy 4-port FLMs and for connecting management uplinks to other SFP+ network connections.

NOTE: HPE Synergy 4-port FLMs have SFP+ 10Gbps 2-fibre ports.

NOTE: Active Optical Cable (AOC) solutions can be created by using either OM3 or OM4 fibre cables with transceivers on each end.

NOTE: For distances over 50m, fibre cables are typically purchased from other suppliers.

CAUTION: Cable type and transceivers determine the distance limit of connections.

AOC cable use with SR transceivers = 300m (max)

AOC cable use with LR transceivers = 10km (max)

AOC cable use with ER transceivers = 40km (max)

OM3 Fibre Cables

HPE LC to LC Multi-mode OM3 2-Fiber 0.5m 1-Pack Fiber Optic Cable	AJ833A
HPE LC to LC Multi-mode OM3 2-Fiber 1.0m 1-Pack Fiber Optic Cable	AJ834A
HPE LC to LC Multi-mode OM3 2-Fiber 2.0m 1-Pack Fiber Optic Cable	AJ835A
HPE LC to LC Multi-mode OM3 2-Fiber 5.0m 1-Pack Fiber Optic Cable	AJ836A
HPE LC to LC Multi-mode OM3 2-Fiber 15.0m 1-Pack Fiber Optic Cable	AJ837A
HPE LC to LC Multi-mode OM3 2-Fiber 30.0m 1-Pack Fiber Optic Cable	AJ838A
HPE LC to LC Multi-mode OM3 2-Fiber 50.0m 1-Pack Fiber Optic Cable	AJ839A

OM4 Fibre Cables

HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable	QK732A
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable	QK733A
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable	QK734A
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable	QK735A
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable	QK736A
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable	QK737A

Transceivers

Transceiver use should consider bandwidth, port types, and port counts.

Transceivers (10 Gbps) for connecting SFP+ ports using AOC fibre cables.

HPE BladeSystem c-Class 10Gb SFP+ SR Transceiver 455883-B21

NOTE: Typical transceiver for use with single-mode fibre cable (short range).

HPE BladeSystem c-Class 10Gb SFP+ LR Transceiver 455886-B21

NOTE: Typical transceiver for use with single-mode fibre cable (long range).

Transceivers (10 Gbps) for connecting SFP+ ports to RJ45 ports using CAT6A cables.

Related Options

HPE 10GBase-T SFP+ Transceiver

813874-B21

NOTE: Typical 10GbE transceiver for connecting CAT6A cables to SFP+ ports on the HPE Synergy 4-port FLM.

- 861412-B21 HPE CAT6A 4-foot Cable
- 861413-B21 HPE CAT6A 10-foot Cable
- 861414-B21 HPE CAT6A 21-foot Cable

Transceivers (1 Gbps) for connecting SFP+ ports (for use with MGMT ports only).

HPE BladeSystem c-Class Virtual Connect 1G SFP SX Transceiver 453151-B21

NOTE: Typical 1Gb transceiver for use with fibre cable (<100m).

HPE BladeSystem c-Class Virtual Connect 1G SFP RJ-45 Transceiver

453154-B21

NOTE: Typical 1Gb transceiver for connecting CAT cables to SFP+ ports on the HPE Synergy 4-port FLM.

HPE Synergy Services

Deployment/Installation & Start-up Services

HPE Factory Express Synergy Initial Frame Package 4 Service
HPE Factory Express Synergy Add-on Frame Package 4 Service
HPE Synergy First Frame Startup Service
HPE Synergy Additional Frame Startup Service
U8JM3E
HPE Synergy Additional Frame Startup Service
U8JM4E

Technical Specifications

HPE Synergy Frame Shipping Link Module

Dimensions

18.50 in (469.9 mm) Length Width 10.13 in (257.3 mm)

Height 2.00 in (50.8 mm) 2.13 lbs (0.97 kg)

Shipping Weight Product Hardware Indicators

Specifications

Health LED **UID LED**

MGMT & LINK Port Activity LEDs Appliance Port Connectivity LEDs

Environmental Ranges

Temperature Range

10° to 35°C Operating

(50° to 95°F)

Non-Operating -30°C to 60°C

(-22°F to 140°F)

Relative Humidity (non-condensing)

Operating 10% to 90% relative humidity (Rh),

28°C (82.4°F) maximum wet bulb

Temperature, non-condensing.

Shipping 5% to 95% relative humidity (Rh),

38.7°C (101.7°F) maximum wet bulb

Temperature, non-condensing.

NOTE: Operating temperature has an altitude derating of 1.8° F (1° C) per 1,000 ft (304.8 m). No direct sunlight allowed. Upper operating limit is 10,000 ft (3,048 m) or 70Kpa/10.1 psia. Upper non-operating limit is 30,000 ft (9,144 m) or 30.3 KPa/4.4 psia. **NOTE:** Storage maximum humidity of 95% is based on a maximum temperature of 113° F (45° C). Altitude maximum for storage is 70 KPa.

Power

12V @ 4.2A (50 W max)

Specification

Electromagnetic

FCC Part 15 Class A

Emissions

EN 55032 Class A (CISPR32 Class A)

Certifications FCC Part 15 Class A

VCCI Class A CE Marking

FCC

ICES (Canada) VCCI (Japan)

RCM (Australia/NZ)

KCC (Korea) BSMI (Taiwan)

Environmentalfriendly 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.hpe.com/info/recycle To recycle your product, please go

Technical Specifications

to: http://www.hpe.com/info/recycle 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.hpe.com/info/recycle. These instructions may be used by recyclers and other WEEE treatment facilities as well as Hewlett Packard Enterprise OEM customers who integrate and re-sell Hewlett Packard Enterprise equipment.

Summary of Changes

Date	Version History	Action	Description of Change
03-Sept-2019	Version 1	Created	New QuickSpecs



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