Hewlett Packard Enterprise

HPE Cray EX System Software Getting Started Guide S-8000 22.07

Abstract

This publication describes high level information about installing the HPE Cray EX system software 22.07 using Cray System Management (CSM) and other products that compose the HPE EX system software. This publication is intended for system installers, system administrators, and network administrators of the system.

Part Number: S-8000
Published: July 2022
Edition: 4

Notices

Acknowledgments

Revision history

Part number	Publication date	Edition	Summary of changes
S-8000	July 2022	4.0	This is the fourth *HPE Cray EX System Software Getting Started Guide* for the HPE Cray EX software. It provides an overview of product installation, operations, and upgrade. It also serves as a tool to navigate the various HPE Cray EX product guides during installation and upgrade.
S-8000	April 2022	3.0	This is the third *HPE Cray EX System Software Getting Started Guide* for the HPE Cray EX software. It provides an overview of product installation, operations, and upgrade. It also serves as a tool to navigate the various HPE Cray EX product guides during installation and upgrade.
S-8000	February 2022	2.0	This is the second *HPE Cray EX System Software Getting Started Guide* for the HPE Cray EX software. It provides an overview of product installation, operations, and upgrade. It also serves as a tool to navigate the various HPE Cray EX product guides during installation and upgrade.

Contents

HPE Cray EX System Software Getting Started Guide

Scope and Audience

The *HPE Cray EX System Software Getting Started Guide*:

- provides product versioning, compatibility, and dependencies
- contains third-party software versions and documentation links
- includes documentation links for the individual EX products
- provides installation, operations, and upgrade workflows for all product streams
- offers installation and upgrade workflow diagrams and instructions to help installers navigate between the product guides

This publication is intended to provide general guidance for system installers, system administrators, and network administrators who will be installing, performing operations, or upgrading the EX system software. The documentation in the associated product guides assumes familiarity with standard Linux and open source tools, such as zypper, Ansible, and YAML/JSON.

Typographic Conventions in the Product Guide Documentation

Refer to the individual product guides for typographic conventions.

CSM Software Compatibility Matrix Version 22.07

Beginning with the HPE Cray EX System Software 22.02 release, a summary is provided of all components tested together on prescribed hardware.

To view historical compatibility matrices, refer to the **HPE Cray EX CSM Software Compatibility Matrixes Guide (S-8042)** located on the **HPE Support Center (HPESC)**. To search for this guide, type the publication number, S-8042, into the search bar.

- **Extended Support Software Recipe Releases**
  - Biannual releases (every 6 months)
  - Offers new major and minor features
  - Product support for an Extended Support release extends one month beyond the next Extended Support release that is installed.
- **Software Recipe Releases**
  - Monthly maintenance releases (if software updates support this frequency)
  - Contain product updates and, potentially, smaller features

NOTE: For the actual order of product installation and upgrade, refer to this figure **HPE Cray EX Software Initial Installation Workflow** and this figure **HPE Cray EX Software Upgrade Workflow**.

In order to successfully upgrade to 22.07, the previous product recipes must be installed as displayed in **Table 1: CSM Software Compatibility Matrix Version 22.07** and must include the left to right application of product versions. Only upgrades from release 22.03 to release 22.07 are supported.

To upgrade to the HPE Cray EX 22.07 recipe release:

1. apply any product interim updates
2. upgrade to the 22.07 recipe

Table 1: CSM Software Compatibility Matrix Version 22.07

HPE Cray EX Software Product	Product version 22.03	Interim Updates	Product version for 22.07 release
COS - Cray Operating System	2.2.101	2.2.103	2.3.101
CPE - Cray Programming Environment (WLMs)	22.03	22.04, 22.05	22.06.6
CSM - Cray System Management	1.0.11	N/A	1.2.0
CSM Diags - Cray System Management Diagnostics	1.0.19	N/A	1.2.18
HFP - HPC Firmware Pack	22.03	22.04	22.05.7
SAT - System Admin Toolkit	2.2.16	N/A	2.3.4
SDU - System Diagnostic Utility	1.2.9	N/A	2.0.0
SLE OS - SUSE Linux Enterprise Operating System	22.02.1	N/A	22.03.0
Slingshot (including Slingshot Host Software)	1.7.1	1.7.2	1.7.3
UAN - User Access Node	2.3.2	N/A	2.4.3
Analytics	1.1.24	N/A	1.2.22
System Monitoring Application - SMA	1.5.29	N/A	1.6.22

Table 2: Supported Hardware for HPE Cray EX System Software Version 22.07

Hardware Models	Rome SS10	Milan SS10	Rome SS11	Milan SS11	Trento SS11	Sapphire Rapids SS11
Apollo 6500/ XL645d Gen10 Plus NVIDIA A100	not tested	not tested	not tested	not tested	N/A	N/A
Apollo 6500/ XL645d Gen10 Plus AMD MI100	not tested	not tested	not tested	not tested	N/A	N/A
Apollo 6500/ XL675d Gen10 Plus NVIDIA A40 GPU	not tested	not tested	Y	not tested	N/A	N/A
Apollo 6500/ XL675d Gen10 Plus NVIDIA SXM4 A100 40GB	not tested	not tested	not tested	not tested	N/A	N/A
DL325 Gen10 Plus	Y	not supported	Y	not supported	N/A	N/A
DL385 Gen10 Plus	Y	not tested	Y	not tested	N/A	N/A
DL385 Gen10 Plus NVIDIA A100	not tested	not tested	not tested	not tested	N/A	N/A
DL385 Gen10 Plus NVIDIA A40	not tested	Y	not tested	Y	N/A	N/A
DL385 Gen10 Plus AMD MI100	not tested	not tested	not tested	not tested	N/A	N/A
EX235a	N/A	N/A	N/A	N/A	Y	N/A
EX235n	N/A	Y	N/A	Y	N/A	N/A
EX420 DDR	N/A	N/A	N/A	N/A	N/A	Y
EX425	Y	not tested	Y	not tested	N/A	N/A
Gigabyte H262-Z61	Y	not supported	Y	not supported	N/A	N/A
Gigabyte H262-Z63	Y	not supported	Y	not supported	N/A	N/A
Gigabyte R272-Z230	Y	not supported	Y	not supported	N/A	N/A

HPE Slingshot Configurations

HPE Slingshot components include the HPE Slingshot switch and the NIC running on the nodes.

Slingshot 10

Slingshot 10 refers to either one of the following combinations:

Slingshot switch and NVIDIA® Mellanox® ConnectX®-5 100GB NIC PCIe card (air-cooled)

Slingshot switch and NVIDIA® Mellanox® ConnectX®-5 100GB NIC mezzanine card (liquid-cooled)

Slingshot 11

Slingshot 11 refers to either one of the following combinations:

HPE Slingshot switch and HPE Slingshot SA210S Ethernet 200GB 1-port PCIe NIC (air-cooled)

HPE Slingshot switch and HPE Slingshot SA220M Ethernet 200GB NIC mezzanine card (NMC) (liquid-cooled)

Differences from previous release

The following are some differences from the previous release. To learn differences for each product, refer to the individual product documentation.

Key Features

- Bifurcated CAN
  - The bifurcated CAN includes support for NCN access via the High Speed Network on systems that include a supported edge switch.
  - Separates customer user access from site management services.
  - Adds Slingshot as an option for user access on systems that include a supported edge switch.
- Slingshot 11 support for software solutions
  - Upgrades
- See **Table 2: Supported Hardware for HPE Cray EX System Software Version 22.07** for supported Slingshot hardware details.

Third-party software documentation

Many products and components of the system are from the open source community and are well documented by members of that community. The following table lists some of the more prominent third-party products and components, the version used in the system, and links to relevant documentation.

Table 3: Third-party software products and components

Third-Party Software	Version	Documentation Source
Ansible	2.9.13	**https://docs.ansible.com/**
Apache Kafka	2.8.1	**https://kafka.apache.org/**

Table Continued

Third-Party Software	Version	Documentation Source
Ceph	15.2.14-84-gb6e5642e260	**https://docs.ceph.com/en/latest/releases/octopus/**
containerd	1.5.7	**https://containerd.io/docs/**
CoreDNS	1.7.0	**https://coredns.io/**
dnsmasq	2.78	**https://thekelleys.org.uk/dnsmasq/doc.html**
Etcd	3.5.0 is the etcd version running on the Kubernetes master nodes. 3.3.22 is the etcd version running on the pods for the etcd clusters.	General documentation: **https://github.com/etcd-io/etcd** Documentation about `etcdct`, the `etcd` command line client which is useful for troubleshooting: **https://github.com/etcd-io/etcd/tree/master/etcdctl** Documentation about the particular version used in the system: **https://github.com/etcd-io/etcd/releases/tag/v3.4.3**
Gitea	1.15.3	**https://docs.gitea.io/en-us/**
Grafana	7.03	**https://grafana.com/**
Helm/Tiller	3.2.4	
iPXE	1.9.3	**https://ipxe.org/docs**
Istio	1.8.6	**https://istio.io/v1.8/docs/**
Kea	0.10.10	**https://www.isc.org/kea/**
Keepalived	2.0.19	
Keycloak	9.0.0	**https://www.keycloak.org/documentation.html**
Kiali	1.28.1	**https://kiali.io/docs/**
Kibana	7.8.1	**https://www.elastic.co/products/kibana**
Kubernetes	1.20.13	**https://kubernetes.io/docs/concepts/overview/components/**
LDMS	4.2.0	**https://github.com/ovis-hpc/ovis-wiki/wiki**
Macvlan	0.3.0	**https://docs.docker.com/network/macvlan**
MariaDB	10.3.15	**https://mariadb.com/kb/en/**

Table Continued

Third-Party Software	Version	Documentation Source
Mellanox OFED	5.5-1.0.3.2	**https://buildservice.us.cray.com/package/binaries/shs:master:shasta:cn/mellanox-ofed?repository=COS_2_3_SLE_15_SP3**
MetalLB	0.11.0	**https://metallb.universe.tf/**
Multus	3.7	**https://kubernetes.io/docs**
PBS Professional	2021.1.0	**https://www.altair.com/pbs-professional/**
podman	2.1.1	**https://docs.podman.io/en/latest/**
PostgreSQL	12.11	**https://www.postgresql.org/docs/**
Prometheus	2.18.1	
PyTorch	1.0.0	**https://pytorch.org**
Redfish API	N/A	**https://www.dmtf.org/standards/redfish**
Slurm	21.08.6	**https://slurm.schedmd.com/**
Strimzi Operator	0.27.1	
SUSE Linux Enterprise (SLES)	SLE 15 SP3	**https://www.suse.com/documentation/**
TFTP	5.2	**https://github.com/taskinen/tftp** - Docker based on Alpine.
TimescaleDB	0.10.0-pg10	**https://github.com/timescale/timescaledb**
Vault	1.5.5	
Vault Operator	1.8.0	
Weave	2.8.1	**https://github.com/weaveworks/weave**
ZooKeeper	3.5.9-83df9301aa5c2a5d284a9940177808c01bc35cef	**https://github.com/apache/zookeeper/**

Command prompt conventions

Host name and account in command prompts

The host name in a command prompt indicates where the command must be run. The account that must run the command is also indicated in the prompt.

- The root or super-user account always has the # character at the end of the prompt.
- Any non-`root` account is indicated with `account@hostname>`. A user account that is neither `root` nor `crayadm` is referred to as `user`.

Node abbreviations

The following list contains node abbreviations.

- CN - Compute Nodes
- NCN - Non-compute Nodes
- AN - Application Node (special type of NCN)
- UAN - User Access Node (special type of AN)
- PIT - Pre-install Toolkit (initial node used as the inception node during software installation booted from the LiveCD)

Table 4: Command Prompt Conventions

Prompt	Description
ncn#	Run the command as `root` on any NCN, except an NCN which is functioning as an Application Node (AN) such as a UAN.
ncn-m#	Run the command as `root` on any NCN-M (NCN which is a Kubernetes master node).
ncn-m002#	Run the command as `root` on the specific NCN-M (NCN which is a Kubernetes master node) which has this hostname (ncn-m002).
ncn-w#	Run the command as `root` on any NCN-W (NCN which is a Kubernetes worker node).
ncn-w001#	Run the command as `root` on the specific NCN-W (NCN which is a Kubernetes worker node) which has this hostname (ncn-w001).
ncn-s#	Run the command as `root` on any NCN-S (NCN which is a Utility Storage node).
ncn-s003#	Run the command as `root` on the specific NCN-S (NCN which is a Utility Storage node) which has this hostname (ncn-s003).
pit#	Run the command as `root` on the PIT node.
linux#	Run the command as `root` on a Linux host.
uan#	Run the command as `root` on any UAN.
uan01#	Run the command on a specific UAN.
user@uan>	Run the command as any non-`root` user on any UAN.
cn#	Run the command as `root` on any CN. Note that a CN will have a hostname of the form nid123456, that is “nid” and a six digit, zero padded number.
hostname#	Run the command as `root` on the specified hostname.
user@hostname	Run the command as any non-`root` user on the specified hostname.

Command prompt inside chroot

If the **`chroot`** command is used, the prompt changes to indicate that it is inside a chroot environment on the system.

```
hostname# chroot /path/to/chroot
chroot-hostname#
```

Command prompt inside Kubernetes pod

If executing a shell inside a container of a Kubernetes pod where the pod name is $podName, the prompt changes to indicate that it is inside the pod. Not all shells are available within every pod, this is an example using a commonly available shell.

```
ncn# kubectl exec -it $podName /bin/sh
pod#
```

Command prompt inside image customization session

If using SSH during an image customization session, the prompt changes to indicate that it is inside the image customization environment (pod). This example uses $PORT and $HOST as environment variables with specific settings. When using chroot in this context the prompt will be different than the above chroot example.

```
hostname# ssh -p $PORT root@$HOST
root@POD# chroot /mnt/image/image-root
:/#
```

Directory path in command prompt

Example prompts do not include the directory path, because long paths can reduce the clarity of examples. Most of the time, the command can be executed from any directory. When it matters which directory the command is invoked within, the cd command is used to change into the directory, and the directory is referenced with a period (.) to indicate the current directory.

Examples of prompts as they appear on the system:

```
hostname:~ # cd /etc
hostname:/etc# cd /var/tmp
hostname:/var/tmp# ls ./file
hostname:/var/temp# su - user
user@hostname:~> cd /usr/bin
user hostname:/usr/bin> ./command
```

Examples of prompts as they appear in the product publications:

```
hostname # cd /etc
hostname # cd /var/tmp
hostname # ls ./file
hostname # su - user
user@hostname > cd /usr/bin
user hostname > ./command
```

Command prompts for network switch configuration

The prompts when doing network switch configuration can vary widely depending on which vendor switch is being configured and the context of the item being configured on that switch. There may be two levels of user privilege which have different commands available and a special command to enter configuration mode.

Example of prompts as they appear in this publication:

Enter “setup” mode for the switch make and model, for example:

```
remote# ssh admin@sw-leaf-001
sw-leaf-001> enable
sw-leaf-001# configure terminal
sw-leaf-001(conf)#
```

Refer to the switch vendor OEM documentation and the, "Configure <switch name> switch" topics in the **HPE Cray System Management Documentation** for more information about configuring a specific switch.

HPE Cray EX System Software Documentation

The following topics provide information about referencing products within the guides, different guide formats (e.g., PDF, HTML), and how to locate the guides.

HPE Cray EX software product acronyms

The table below displays the list of products and their acronyms/abbreviations, which will assist when navigating documentation.

Table 5: Products and product acronyms

Product	Product Acronyms
Analytics	N/A
Cray Operating System	COS
Cray Programming Environment	CPE
Cray System Management	CSM
Cray System Management Diagnostics	CSM Diags
HPC Firmware Pack	HFP
Slingshot	N/A
Slingshot Host Software	SHS
System Admin Toolkit	SAT
System Diagnostic Utility	SDU
System Monitoring Application	SMA
SUSE Linux Enterprise Operating System	SLE OS
User Access Node	UAN
Workload Manager	WLM

Locating HPE Cray EX system software documentation

The following table lists the HPE Cray EX system software guides used during product installation. The product versions described in the documentation and the documentation publication numbers, formats, and locations are also listed.

To access the HPE Cray EX system software documentation in PDF format online:

1. Locate the Guide Publication Number from the following table.

   To access only the guide for a specific release, also locate the Product Version from the following table.

2. Click here to view the manuals and guides for **HPE Cray EX Supercomputers** on the HPE Support Center (HPESC).
3. Type the Guide Publication Number in the search field for manuals and guides (e.g., **S-8000**).

   To access only the guide for a specific release, also type the Product Version from the following table (e.g., **S-8000 22.07**).

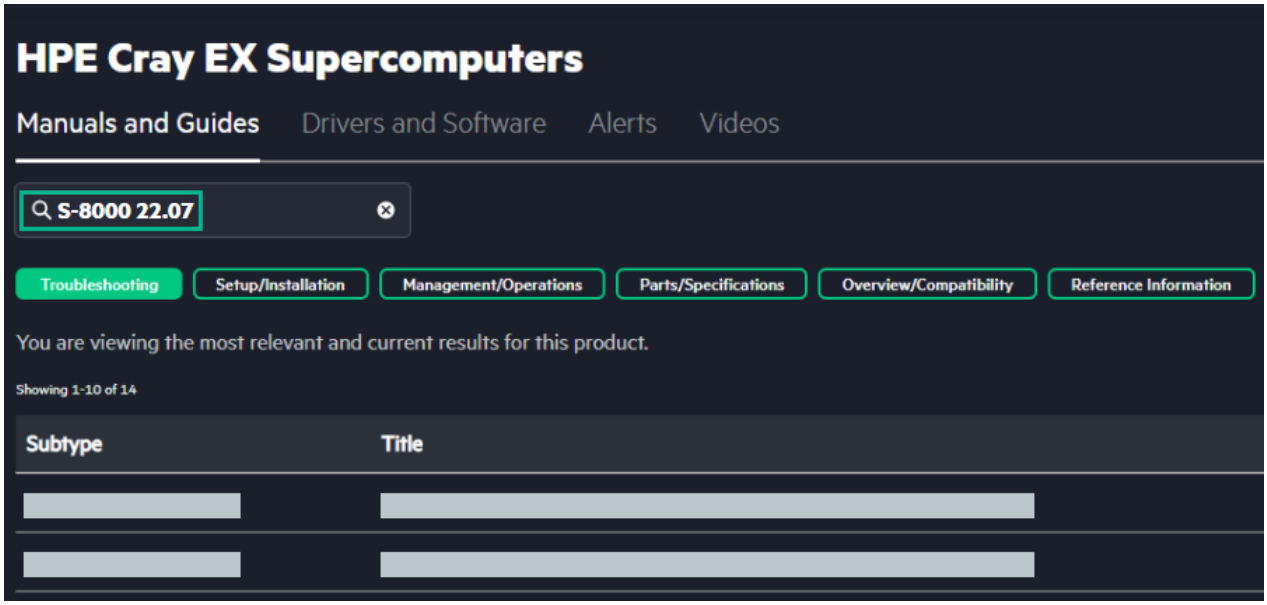


Table 6: Guide formats and locations for current release

Guide Title	Guide Publication Number	Product Version	Formats - Locations
22.07 HPE Cray EX System Software Getting Started Guide (S-8000)	S-8000	22.07	PDF: Documentation Tar File PDF, HTML: **HPESC**
HPE Cray System Management Documentation		1.2.0	Markdown: **CSM GitHub Repo** HTML: **Cray System Management Documentation**
HPE Cray EX HPC Firmware Pack Installation Guide (S-8037)	S-8037	22.05.7	Markdown, PDF, HTML: Documentation Tar File PDF: HPESC
HPE SUSE Linux Enterprise Operating System 15 SP3 Installation Guide: CSM on HPE Cray EX Systems (S-8043)	S-8043	22.03.0	Markdown, PDF, HTML: Documentation Tar File PDF: HPESC
HPE Cray EX System Monitoring Application Installation Guide (S-8030) **HPE Cray EX System Monitoring Application Administration Guide (S-8029)**	S-8030 S-8029	1.6.22	Markdown, PDF, HTML: Documentation Tar File PDF: HPESC
HPE Cray EX System Admin Toolkit (SAT) Guide (S-8031)	S-8031	2.3.4	Markdown: **SAT GitHub Repo** HTML: **HTML: HPE Cray EX System Admin Toolkit (SAT) Guide**

Table Continued

Guide Title	Guide Publication Number	Product Version	Formats - Locations
HPE Cray EX System Diagnostic Utility Installation Guide (S-8034) **HPE Cray EX System Diagnostic Utility Administration Guide (S-8035)**	S-8034 S-8035	2.0.0	Markdown, PDF, HTML: Documentation Tar File PDF: HPESC
Slingshot Operations Guide Includes Slingshot Host Software content		1.7.3	PDF: Documentation Tar File **Please contact your Support Representative to access this documentation.**
HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems S-8025 **HPE Cray Operating System Administration Guide: CSM on HPE Cray EX Systems S-8024**	S-8025 S-8024	2.3.101	Markdown, PDF, HTML: Documentation Tar File PDF: HPESC
HPE Cray User Access Node Software Installation Guide (S-8032) **HPE Cray User Access Node Software Administration Guide (S-8033)**	S-8032 S-8033	2.4.3	Markdown, PDF, HTML: Documentation Tar File PDF: HPESC
HPE Cray Programming Environment Installation Guide: CSM on HPE Cray EX Systems (S-8003) Includes WLM content	S-8003	22.06.6	Markdown, PDF, HTML: Documentation Tar File: *CPE-EX-Systems-YY.MM-DOCS.tar* PDF: HPESC
HPE Cray EX Analytics Applications Guide (S-8045)	S-8045	1.2.22	Markdown, PDF, HTML: Documentation Tar File PDF: HPESC
WLM - See the **HPE Cray Programming Environment Installation Guide: CSM on HPE Cray EX Systems (S-8003)**	S-8003	22.06.6	Markdown, PDF: Documentation Tar File PDF: HPESC
Slingshot Host Software Included in the **Slingshot Operations Guide**		1.7.3	PDF: Documentation Tar File **Please contact your Support Representative to access this documentation.**
HPE Cray EX Cray System Management Diagnostics Guide (S-8038)	S-8038	1.2.18	PDF, HTML: Documentation Tar File PDF: HPESC

EX software products

HPE Cray EX system software product information

The following table lists the HPE Cray EX system software product names and product descriptions for this release.

Table 7: HPE Cray EX System Software Products

Full Name	Description
Cray System Management - CSM	The Cray System Management ecosystem includes hardware, software, network, and access to these system services and components. The CSM installation prepares and deploys a distributed system across a group of management nodes organized into a Kubernetes cluster which uses Ceph for utility storage.
HPC Firmware Pack - HFP	The HPC Firmware Pack provides the firmware used for this release.
SUSE Linux Enterprise Operating System - SLE OS	The HPE Cray EX system software product operating system.
System Monitoring Application - SMA	SMA utilizes the System Monitoring Framework (SMF) to provide multiple monitoring and analysis tools including custom graphs and tables, a CLI for non-GUI work flows, as well as notifications and alarms via email. SMA serves as the user interface and data access layer for SMF and is responsible for enforcing authentication and authorization of users for data stream access.
System Admin Toolkit - SAT	The primary component of the System Admin Toolkit (SAT) is a command-line utility run from Kubernetes manager nodes. It assists administrators with troubleshooting and querying information about the EX System.
System Diagnostic Utility - SDU	SDU is a tool for collecting important system data, such as logs, core files, register dumps, and more. Once data is collected with SDU, the output can be packaged with tar so that any useful system triage or inventory information can be shared with system administrators and customer support.
Slingshot	Slingshot provides the network backbone and offers features to connect supercomputing and data centers.
Cray Operating System - COS	HPE Cray OS is based on SUSE Linux Enterprise Server (SLES) with enhancements for high performance computing.
User Access Node - UAN	User Access Nodes are servers in the HPE Cray EX system available for end user logins. They provide the environment for users to develop, compile, launch jobs on compute nodes, and analyze the results.
Cray Programming Environment - CPE	CPE provides tools to maximize developer productivity, application scalability, and code performance. It includes compilers, analyzers, optimized libraries, debuggers, and a variety of parallel programming models that provide user flexibility based on their applications. Users access CPE through User Access Instances (UAI) and User Access Nodes (UAN). The use of CPE is subject to product license.

Table Continued

Full Name	Description
Analytics	Urika analytics and AI components provide applications to perform big data and deep learning tasks.
Workload Manager - WLM	The Workload Manager is built into a new compute image during installation of either Slurm or PBS Professional. The WLM serves as a job scheduler that balances requests based on the available resources. The WLM manages access to compute nodes through queues. Both Slurm and PBS Professional WLMs have a central server that runs on the NCN Kubernetes cluster, and other components that run on compute nodes. The use of PBS Professional is subject to product license.
Slingshot Host Software	The Slingshot Host Software package provides networking drivers and other software to allow hosts on the system to integrate with the Slingshot network.
Cray System Management Diagnostics - CSM Diags	CSM Diags provides a set of diagnostic tools to perform various node level and cluster wide tests on various cluster components on compute nodes. It provides insight on cluster health and tests components such as CPU, memory, disk, GPU, interconnect, etc.

HPE Cray EX system software product dependencies

The following table lists dependencies for each product.

Table 8: HPE Cray EX System Software Product Dependencies

Product	Dependency	Install / Operational	Reason
Analytics	CPE	operational	AI packages use the module command, Chapel uses CPE compiler/libs
	CSM	install, operational	General installation and system management capabilities
	WLM	operational	Chapel/capsules use WLM for execution
COS	CSM	install	General installation and system management capabilities
	CSM	operational	The COS compute image recipe references a CSM repository stored in Nexus
	SAT	install, operational	SAT commands are referenced in the install and admin guides
	SLE OS	operational	The COS compute image recipe references SLE OS Nexus repos
	Slingshot Host Software	operational	Requires SHS layer on COS compute configuration in CFS. SHS must be installed before image build begins. Requires SHS layer on NCN configuration in CFS.
CPE	COS	operational	Deploying CPE images requires S3, CPS, DVS
	CSM	install	Installing CPE images requires CSM and Nexus

Table Continued

Product	Dependency	Install / Operational	Reason
	WLM for UAIs	operational	Enabling CPE for UAIs requires compute image with WLM built-in
CSM	Hardware	install, operational	The hardware is connected according to specification and working as expected
CSM Diags	COS	operational	GPU tests require COS/GPU configuration
	CPE	operational	MPI tests require CPE MPI libraries on compute nodes
	CSM	install	Installing CSM Diags requires CSM and Nexus
	Shared File System	operational	Workers nodes and compute nodes should have the same shared file system location
	Slingshot Host Software	operational	Many tests require functioning HSN
	WLM	operational	CSM Diags uses WLM for execution of tests on compute nodes
HPC Firmware Pack	CSM	install, operational	General installation and system management capabilities, FAS
SAT	COS	operational	Refer to the topic, SAT Dependencies in the HPE Cray EX System Admin Toolkit (SAT) Guide
	CSM	install, operational	Install: require Nexus, cray-product-catalog Operational: Refer to the topic, SAT Dependencies in the HPE Cray EX System Admin Toolkit (SAT) Guide
	CSM Diags	operational	Refer to the topic, SAT Dependencies in the HPE Cray EX System Admin Toolkit (SAT) Guide
	Slingshot	operational	Refer to the topic, SAT Dependencies in the HPE Cray EX System Admin Toolkit (SAT) Guide
	SMA	operational	Refer to the topic, SAT Dependencies in the HPE Cray EX System Admin Toolkit (SAT) Guide
SDU	CSM	install, operational	Requires Nexus to be functional
	SAT	install, operational	Common information, i.e. serial number Utilizes SAT for many collection methods
SLE OS	CSM	install, operational	Requires Nexus to be functional
Slingshot	CSM	operational	DNS and management network connectivity between FMN and switches
Slingshot Host Software (SHS)	COS	operational	SHS must be installed before image build begins.
	CSM	install, operational	Requires SHS layer on NCN configuration in CFS. SHS software is currently shipped in packer for MTL layer.

Table Continued

Product	Dependency	Install / Operational	Reason
	SMA	operational	Requires SMA layer before SHS in all CFS configurations. SMA layer to be replaced by SLE layer at a future date.
	UAN	operational	Requires SHS layer on UAN configuration in CFS. SHS must be installed before image build begins
SMA	COS	operational	Need COS configuration in CFS to include SMA layer (rsyslog and LDMS)
	CSM	install, operational	General installation and system management CFS and BOS required for personalization
	SLE	install, operational	The SMA image recipes reference SLE OS Nexus repos
	UAN	operational	Need UAN configuration in CFS to include SMA layer (rsyslog and LDMS)
UAN	COS	operational	Requires that COS and its dependencies are installed and operational. UAN uses the COS recipe to build UAN images based on COS.
	CSM	operational	General installation and system management capabilities
	SAT	operational	SAT commands are referenced in the install and admin guides
	SLE OS	install	The UAN compute image recipe references SLE OS Nexus repos
	Slingshot Host Software	operational	The UAN compute image recipe references a Slingshot Host Software Nexus repo
WLM	COS	operational	WLM content gets added to the COS image
	CSM	install, operational	Direct use of VCS, HSM, CFS, BOS, S3
	SLE OS	install, operational	Require SLE OS content for WLM dependencies (munge, hwloc, etc)
	UAN	operational	WLM content gets added to the UAN image

Configuration Framework Service

Multiple steps in the initial installation and upgrade involve configuring images and nodes. This capability is managed by CFS. This section provides a brief overview of CFS and the recommended order for compute CFS layers as well as NCN layers.

For more detail about CFS, refer to section, **Configuration Management** in the *Cray System Management Documentation*.

CFS is used to fully configure or reconfigure booted nodes in a scalable way to add the required settings.

- This includes nodes available in the Hardware State Manager (HSM) inventory (compute, non-compute, application, and user access nodes), and boot images hosted by the Image Management Service (IMS).
- Product configuration is supplied by JSON files which specify the per-product Ansible code to be executed when customizing images and/or nodes with CFS. The configuration is applied in the order specified in the JSON file. Multiple products are typically listed in a single JSON file and each entry is referred to as a CFS configuration layer.
    - See section, **Example Configuration JSON File**
- During the early part of a first-time installation, CSM is the only product added to the CFS JSON configuration file.
- As additional software product streams are installed, new configuration layers will be added to the CFS JSON file.

All configuration content is stored in a Version Control Service (VCS) and is managed by authorized system administrators.

NCN Personalization

NCN Personalization applies post-boot configuration for each product to the NCNs. Products which include configuration content to be applied to the management NCNs must be installed. These products include those which configure management functionality, such as CSM, SAT, SMA , and COS and optional functionality to enable user productivity, such as CPE, Analytics, and Customer layers.

A high-level view of NCN Personalization workflow

1. Create and upload to CFS a CFS JSON configuration file for the NCNs. This file lists the Ansible playbooks and associated VCS metadata required to configure each NCN.

    a. All products to be configured on the NCNs must have a corresponding layer in the CFS JSON file used for NCN Personalization. For example, adding a configuration layer for COS will install software to NCN worker nodes needed for DVS and LNet to function properly.

2. Set the desired configuration in CFS for each NCN that requires post-boot configuration. This directs CFS to apply the configuration automatically to each NCN.

Order of NCN configuration layers

Due to changes in product packaging, **the SHS layer must be before the SMA layer** in the NCN Personalization CFS configuration. Failure to do this can result in incorrect dependencies being installed.

1. SHS
2. SMA
3. CSM

4. SAT
5. COS
6. CPE (optional; required on systems hosting UAIs)
7. Analytics (optional; required on systems hosting UAIs)
8. CSM (when CHN is enabled)
9. COS ncn_final
10. Customer (optional; additional customer specified ansible logic for NCNs)

The above ordering corresponds to the NCN Personalization boxes in **Figure: EX Software Initial Installation Workflow**.

Example CFS Configuration JSON File

The following is an example of a CFS configuration JSON file used for NCN Personalization.

```
{
   "layers": [
     {
       "cloneUrl": "https://api-gw-service-nmn.local/vcs/cray/slingshot-host-software-config-management.git",
       "commit": "1202f7e6ae2755b5620255c0d402a757fa9fd121",
       "name": "shs-integration-1.7.3",
       "playbook": "shs_mellanox_install.yml"
     },
     {
       "cloneUrl": "https://api-gw-service-nmn.local/vcs/cray/sma-config-management.git",
       "commit": "49de95c289d1a65ad6bdfc8ac8bd74adf42e30a2",
       "name": "sma-base-config",
       "playbook": "sma-base-config.yml"
     },
     {
       "cloneUrl": "https://api-gw-service-nmn.local/vcs/cray/sma-config-management.git",
       "commit": "49de95c289d1a65ad6bdfc8ac8bd74adf42e30a2",
       "name": "sma-ldms-ncn",
       "playbook": "sma-ldms-ncn.yml"
     },
     {
       "cloneUrl": "https://api-gw-service-nmn.local/vcs/cray/csm-config-management.git",
       "commit": "8c09c934b3b7e3a4b085c50575442226a133eba7",
       "name": "csm-ncn-1.2",
       "playbook": "site.yml"
     },
     {
       "cloneUrl": "https://api-gw-service-nmn.local/vcs/cray/sat-config-management.git",
       "commit": "8c26f6e2f38f7e1aedbcfcd0c46a868cc6b4b3c7",
       "name": "sat-2.3.4",
       "playbook": "sat-ncn.yml"
     },
     {
       "cloneUrl": "https://api-gw-service-nmn.local/vcs/cray/cos-config-management.git",
       "commit": "786d842c8fcd629c915ac635842263bb1f02f866",
       "name": "cos-integration-2.3.92",
       "playbook": "ncn.yml"
     },
     {
       "cloneUrl": "https://api-gw-service-nmn.local/vcs/cray/analytics-config-management.git",
       "commit": "f2417a91dc7ec7cebe460597be5e83a8087e5efc",
       "name": "analytics-integration-1.2.22",
       "playbook": "site.yml"
     },
     {
       "cloneUrl": "https://api-gw-service-nmn.local/vcs/cray/cos-config-management.git",
       "commit": "786d842c8fcd629c915ac635842263bb1f02f866",
       "name": "cos-integration-final-2.3.92",
       "playbook": "ncn-final.yml"
     }
   ]
}
```

Order of compute configuration layers

With this release, **`sat bootprep`** is available to manage the compute CFS layers, BOS session templates, and image builds. The following section focuses on CFS layer ordering. **`sat bootprep`** is described in **COS and UAN Activities** which is part of section, **HPE Cray EX system software initial installation workflow**. Also refer to, **SAT Bootprep**, in the SAT documentation.

The recommended order for compute image CFS layers is:

1. SHS
2. COS Compute
3. SMA
4. CPE
5. WLM (either Slurm or PBS Professional)
6. Analytics
7. COS - Compute Last

The ordering above corresponds to the compute image configuration boxes in figure **EX Software Initial Installation Workflow**

HPE Cray EX system software initial installation workflow

The following workflow diagram outlines the recommended order for a typical HPE Cray EX 22.07 installation. Installing the products in this sequence ensures tools are available to aid the system installer or administrator early in the installation process. For example, tools that are part of the System Monitoring Application (SMA), the System Admin Toolkit (SAT), and the System Diagnostic Utility (SDU) products offer essential operational commands, monitoring, and logging to assist with installing the remaining products.

See the topic, **Locating HPE Cray EX software documentation**, for links to the various product installation and administration (operational) guides which contain procedures for installing the EX products. Health checks and troubleshooting procedures follow some of the installation procedures.

See this section for more information: **CSM Software Compatibility Matrix Version 22.07**

HPE Cray EX also offers an upgrade option. See the section, **HPE Cray EX software upgrade workflow** to upgrade a system running HPE Cray EX 22.03 to the latest recipe release. For additional information, see **Figure: HPE Cray EX Software Upgrade Workflow**.

Table 9: Important Tips for Navigating the Installation Workflow

Follow the recommended order of installation displayed in Figure: HPE Cray EX Software Initial Installation Workflow
All product prerequisites and installs need to be completed first before any of the UAN and Compute image configuration is done.
Vertically stacked products should be installed in order from top to bottom.
The two-tier workflow also contains Operational Activities (administrative tasks) that must be run in order to complete a successful installation.

Where is the installation starting point?

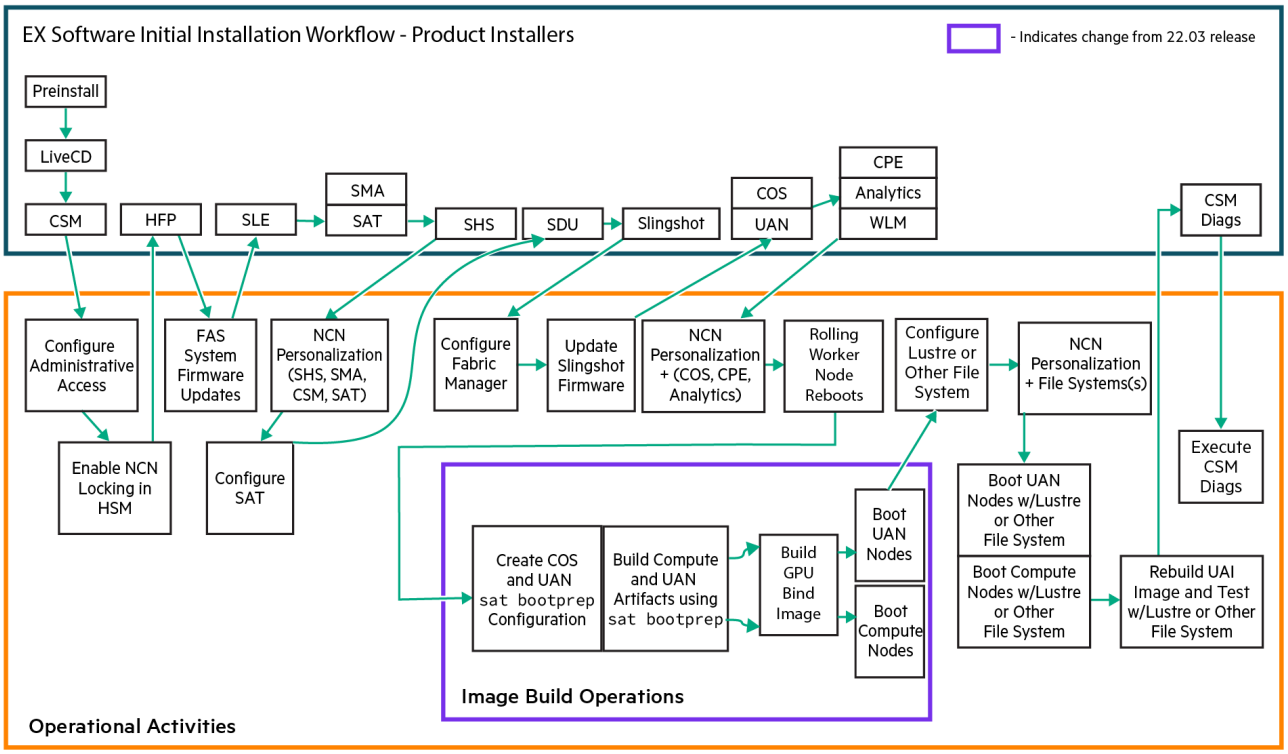
Reference the HPE Cray EX Software Initial Installation Workflow diagram, but follow the installation instructions that are written below the diagram to navigate to the correct product documentation topics and then back to the *HPE Cray EX System Software Getting Started Guide*. Continue following this flow using the arrows in the diagram and the flow of the installation instructions to complete all installation steps and operational activities.

1. Locate the **Preinstall** box in the **Figure: HPE Cray EX Software Initial Installation Workflow** diagram. It is in the Product Installers area. This is the first step of the installation process.
2. Below the diagram, locate the **EX Installation - Introduction** instructions and follow the details to navigate to the needed procedures.
3. After Preinstall is complete, the CSM documentation refers back to the *HPE Cray EX System Software Getting Started Guide* and the **Figure: HPE Cray EX Software Initial Installation Workflow** diagram.
4. Locate the **LiveCD** box which is the next installation step indicated by the arrow on the **Preinstall** box.
5. Continue following this flow throughout the installation process.
6. The next few steps after LiveCD are:
    a. CSM (Product Installer)
    b. Configure Administrative Access (Operational Activity)

c. Enable NCN Locking in HSM (Operational Activity)

d. HFP (Product Installer), etc.

Figure 1: HPE Cray EX Software Initial Installation Workflow



EX Installation - Introduction

The following describes the software initial installation workflow as shown in **Figure: HPE Cray EX Software Initial Installation Workflow**.

Cray System Management (CSM)

CAUTION: In CSM 1.2, (HPE Cray EX System Software 22.07 release), running a kernel dump (`kdump` command) may hang and fail on NCNs. A hotfix is applied during the installation and upgrade to fix this issue.

The impacted procedures are listed below.

ADMINISTRATIVE

Rebuild NCNs

INSTALLATION

Deploy Final NCN

Deployment Management Nodes

UPGRADE

CSM 1.0.0 or later to 1.2.0 Upgrade Process

CRAY SYSTEM MANAGEMENT (CSM) INSTALLATION

Preinstallation

Boot the Pre-Install Toolkit (PIT). The Pre-Install Toolkit is installed onto the initial node which is used as the inception node during software installation which is booted from a LiveCD. The node running the Pre-Install Toolkit is known as the PIT node during the installation process until it reboots from a normal management node image like the other master nodes. There are two methods available to bootstrap the PIT node; a remotely mounted ISO (the RemoteISO) or a bootable USB drive. The recommended media is the RemoteISO since it does not require any physical media to prepare. However, remotely mounting an ISO on a BMC (Baseboard Management Controller) does not work smoothly for nodes from all vendors. It is recommended to try the RemoteISO first.

CSM Preinstallation Documentation:

Refer to the following preinstallation topics in the **HPE Cray System Management Documentation** for more information on Preinstallation tasks.

Topic: **Validate Management Network Cabling**

Topic: **Prepare Configuration Payload**

Topic: **Prepare Management Nodes**

LiveCD

The two procedures available to bootstrap the PIT node with the LiveCD are the **LiveCD Remote ISO** (recommended method) and **LiveCD from USB** (fallback method). Generate the LiveCD for the system and boot from it using instructions provided in the CSM documentation topics that follow.

Topic: **Bootstrap Pit Node from LiveCD Remote ISO**

Topic: **Bootstrap Pit Node from LiveCD USB**

CSM Installation

Following the boot of the Pre-Install Toolkit (PIT), refer to the following topic in the **HPE Cray System Management Documentation** to continue the CSM installation procedure.

Topic: **Install CSM**

OPERATIONAL ACTIVITY - Configure Administrative Access

The following operational activity **must** be completed as part of the CSM installation.

Topic: **Configure Administrative Access**

Once the CSM installation is complete, the PIT node is rebooted to the on-disk file system with ncn-m001 running as a Kubernetes management node.

OPERATIONAL ACTIVITY - Enable NCN Locking in HSM

After configuring administrative access, refer to the following section and topic in the HPE Cray System Management Documentation for instructions on locking and unlocking management nodes.

- Section: **Hardware State Manager (HSM)**
  - Topic: **Lock and Unlock Management Nodes**

NOTE: By default CSM services, such as CAPMC and FAS, can act on non-compute nodes (NCNs) like any other hardware. To avoid unexpected interactions by CSM services, locking must be enabled on NCNs to prevent unwanted actions from occurring on those nodes.

HPC Firmware Pack (HFP)

HFP provides most of the firmware required on a HPE Cray EX system. Firmware is uploaded to the Firmware Action Service (FAS) provided by CSM. FAS is used to install and update firmware on the system components.

To install HFP, refer to the following topics in the *HPE Cray EX HPC Firmware Pack Installation Guide*.

Topic: **Install HPC Firmware Pack**

Topic: **Install HPC Firmware Pack from PIT or LiveCD**

OPERATIONAL ACTIVITY - FAS System Firmware Updates

The following topic includes the operational activity required after HFP installation, FAS System Firmware Updates. It must be done in the order shown in the Operations section of the **HPE Cray System Management Documentation**.

Topic: **Update Firmware with FAS**

NOTE: Additional action may be required based on what compute hardware is being used. See the following topic in the **HPE Cray System Management Documentation** to determine if completion of this activity is needed.

Topic: **Prepare Compute Nodes**

SUSE Linux Enterprise Operating System (SLE OS)

Install the SLE OS media for the release using the provided product instructions.

For SLE OS installation documentation, refer to the following topic in the *HPE SUSE Linux Enterprise Operating System 15 SP3 Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Install or Upgrade SLE OS for HPE Cray EX**

System Monitoring Application (SMA)

To install SMA, refer to the following topic in the *HPE Cray EX System Monitoring Application Installation Guide*.

Topic: **Install the System Monitoring Application Product Stream**

System Admin Toolkit (SAT)

For SAT installation instructions, refer to the following topic in the *HPE Cray EX System Admin Toolkit (SAT) Guide*.

Topic: **SAT Installation**

Slingshot Host Software (SHS)

Install the Slingshot Host Software product using the product instructions.

For installation instructions, refer to the following topic in the *Slingshot Operations Guide*.

Topic: **Install Slingshot Host Software**

OPERATIONAL ACTIVITY - NCN Personalization

When performing a fresh install, NCN Personalization must be configured on all management, worker and storage nodes to ensure the appropriate CFS layers are applied. This step involves adding SHS, SMA, CSM, and SAT layers to the CFS configuration and then configuring each host to use that configuration.

The following operational activities must be completed **after** SHS, SMA, CSM, and SAT are installed.

NOTE: When multiple layers are present, the expected order for NCN CFS layers at this point is:

- SHS
- SMA
- CSM
- SAT

Although the CFS NCN Personalization layer is updated once, review each product's Perform NCN Personalization topic to determine if any specific instructions are needed for that product.

For specific SHS NCN Personalization instructions, refer to the following topic in the *Slingshot Operations Guide*.

Topic: **Perform NCN Personalization**

For specific SMA NCN Personalization instructions, refer to the following topic in the *HPE Cray EX System Monitoring Application Administration Guide*.

Topic: **Perform NCN Personalization**

For specific instructions on CSM CFS Configuration and performing NCN Personalization, refer to the following topics in the Operations section of the **HPE Cray System Management Documentation**.

- Topic: **Configure Non-compute Nodes with CFS**
- Topic: **Perform NCN Personalization**

For specific instructions on how to perform NCN Personalization for SAT, refer to the following topic in the *HPE Cray EX System Admin Toolkit (SAT) Guide*.

Topic: **Perform NCN Personalization**

OPERATIONAL ACTIVITY - Configure SAT

To configure SAT, refer to the following section and topics in the *HPE Cray EX System Admin Toolkit (SAT) Guide*.

- Section: **SAT Setup**
  - Topic: **SAT Authentication**
  - Topic: **Generate SAT S3 Credentials**
  - Topic: **Run `sat setrev` to Set System Information**

System Diagnostic Utility (SDU)

To install the SDU product, refer to the following topic in the *HPE Cray EX System Diagnostic Utility Installation Guide*.

Topic: **Install**

Slingshot

Install the Slingshot product using the product instructions.

For Slingshot installation, refer to the following topic in the *Slingshot Operations Guide*.

Topic: **Slingshot Installation in a Kubernetes Orchestrated Container Environment**

OPERATIONAL ACTIVITY - Configure Fabric Manager

For specific instructions, refer to the following topic in the *Slingshot Operations Guide*.

Topic: **Configure Fabric Manager**

For system with Cassini NICs, also run the steps listed in,

Topic: **Fabric Configuration for Cassini**

OPERATIONAL ACTIVITY - Update Slingshot Firmware

For specific instructions, refer to the following topic in the *Slingshot Operations Guide*.

Topic: **Upgrade Slingshot Switch Firmware on HPE Cray EX**

Cray Operating System (COS)

Install the COS product using the provided product instructions.

For COS installation instructions, refer to the following topic in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Install or Upgrade COS**

User Access Nodes (UAN)

Installing the User Access Nodes (UAN) product allows for the creation of UAN boot images.

For UAN installation instructions, refer to the following topic in the *HPE Cray User Access Node (UAN) Software Installation Guide*.

Topic: **Install the UAN Product**

Cray Programming Environment (CPE)

Install the Cray Programming Environment package using the provided product instructions.

For CPE installation documentation, refer to the following topic in the *HPE Cray Programming Environment Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Install or Upgrade CPE**

Analytics

Install the Analytics product using the provided product instructions.

For Analytics installation instructions, refer to the following topic in the *HPE Cray EX Urika Analytics Applications Guide*.

Topic: **Install Analytics**

Workload Manager (WLM)

Install either the SLURM or PBS Professional packages following the product instructions.

For WLM installation documentation, refer to the following topics in the *HPE Cray Programming Environment Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Install a Slurm Workload Manager**

Topic: **Install PBS Pro Workload Manager**

OPERATIONAL ACTIVITY - NCN Personalization for COS, CPE, and Analytics

This activity involves using CFS to provide post-boot configuration to product NCNs.

The following operational activity must be completed **after** COS, CPE, and Analytics are installed.

NOTE: The expected order for NCN CFS layers at this point is:

- SHS (completed earlier)
- SMA (completed earlier)
- CSM (completed earlier)
- SAT (completed earlier)
- COS
- CPE
- Analytics

COS: For specific COS NCN Personalization instructions, refer to the following sections and topics in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

- Section: **Configure COS - VCS Content**
  - Topic: **VCS Configuration**
- Section: **Configure COS - NCN Content**
  - Topic: **Perform NCN Personalization**

CPE: For specific CPE NCN Personalization instructions, refer to the following topic in the *HPE Cray Programming Environment Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Configure CPE Using CFS**

NOTE: CPE is included on all NCN Worker Nodes after reboots. See this topic, **Configure Non-Compute Nodes with CFS**, in the Operations section of the **HPE Cray System Management Documentation** for details.

Analytics: For specific Analytics NCN Personalization instructions, refer to the following topic in the *HPE Cray EX Urika Analytics Applications Guide*.

Topic: **Perform NCN Personalization**

OPERATIONAL ACTIVITY - Rolling Worker Node Reboots

NCN worker nodes will need to be rebooted to facilitate Mellanox or Cassini firmware updates. If using the HSN, confirm it is up and that DVS is functional. If HSN NIC firmware is already at the correct level in the SHS release, rolling reboots are not necessary.

Use the following procedure for each worker node:

- If HSN NIC firmware updates have not previously been performed, update them following the procedure in topic, **Upgrade Slingshot Switch Firmware on HPE Cray EX** in the *Slingshot Operations Guide*.
- Follow the **Reboot of NCNs** procedure for each individual worker node performing the operations under "NCN Worker Nodes" only. Reference: **Reboot NCNs**.
- Confirm the NIC firmware is at the appropriate levels and that CFS configuration has been applied before continuing to the next host.
- Note that the o2ib LND (Lustre Network Driver) is not supported for Cassini based systems.

COS and UAN ACTIVITIES

`sat bootprep` Details

A new SAT command feature in this release is **`sat bootprep`**.

This command makes it easier to build images with IMS, apply CFS configurations to images, and create BOS session templates. As a result, using `sat bootprep` will expedite the installation process.

To view an example `sat bootprep` file, see **Appendix B**.

22.07 Image Build Operations

If you choose not to use `sat bootprep` to build images, see **Appendix A** to build images as described in the 22.03 instructions.

OPERATIONAL ACTIVITY - Create COS and UAN `sat bootprep` Configuration

For instructions, refer to the following topic in each HPE Cray EX product guide.

`sat bootprep` Usage

OPERATIONAL ACTIVITY - Build Compute and UAN Artifacts Using `sat bootprep`

For instructions, refer to the following topic in each HPE Cray EX product guide.

`sat bootprep` Usage

OPERATIONAL ACTIVITY - Build GPU Bind Image

If the system being installed contains GPUs, refer to the following topic in the *HPE Cray Operating System Administration Guide: CSM on HPE Cray EX Systems* for details on how to configure them.

- Topic: **GPU Support: Create a New CPS Bind Image**
- Topic: **Enable GPU Support**

OPERATIONAL ACTIVITY - Boot UAN Nodes

NOTE: Ensure the previous operational activity has completed and an image has successfully built and been customized before proceeding.

For instructions on how to boot UAN nodes, refer to the following topic in the *HPE Cray User Access Node (UAN) Administration Guide*.

Topic: **Boot UANs**

OPERATIONAL ACTIVITY - Boot Compute Nodes

For instructions on how to boot compute nodes, refer to the following topic in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Boot COS**

LUSTRE or OTHER FILE SYSTEM ACTIVITIES

OPERATIONAL ACTIVITY - Configure Lustre or Other File System

Configuration of a ClusterStor device is assumed to have already been completed for this procedure. If this has not been completed, refer to the ClusterStor product documentation.

Configuration of Lustre file systems for use on a Slingshot based system can involve adjusting the port policies set by the Slingshot Fabric Manager. The required adjustments vary depending on how the Lustre file system is attached to the Slingshot network.

For direct attached E1000 file systems, refer to the following topic in the *Slingshot Operations Guide*.

Topic: **Slingshot Integration with E1000 Storage**

For Lustre attached via Arista switches attached via LAG, refer to the following topic in the *Slingshot Operations Guide*.

Topic: **Configure a LAG for Redundant Arista Switches and Slingshot Fabric**

For instructions on how to configure Lustre or other file systems, refer to the following topic in the *HPE Cray Operating System Administration Guide: CSM on HPE Cray EX Systems*. This information will assist with configuring and enabling a Lustre file system on compute nodes or User Access Node (UANs) using Git and Ansible.

Topic: **Configure Lustre**

OPERATIONAL ACTIVITY - NCN Personalization File System(s)

Refer to the following topic, located in the *HPE Cray Operating System Administration Guide: CSM on HPE Cray EX Systems*.

Topic: **Configure Lustre**

NOTE: The use of UAIs and CSM Diags require that a shared file system (such as Lustre) be mounted on the worker NCNs hosting those services. NCN Personalization is used to enable the configuration of such file systems.

OPERATIONAL ACTIVITY - Boot UAN Nodes with Lustre or Other File System

For instructions on how to boot UAN nodes, refer to the following topic in the *HPE Cray User Access Node (UAN) Administration Guide*.

Topic: **Boot UANs**

OPERATIONAL ACTIVITY - Boot Compute Nodes with Lustre or Other File System

For instructions on how to boot compute nodes, refer to the follow section in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Boot COS**

OPERATIONAL ACTIVITY - Rebuild UAI Image and Test with Lustre or Other File System

Refer to the following Operations topic, located in the **HPE Cray System Management Documentation**.

Topic: **Customize End-User UAI Images**

Cray System Management Diagnostics (CSM Diags)

Slurm and PBS Pro are supported in this release. To install CSM Diags, refer to the following topic in the *HPE Cray System Management Diagnostics Installation Guide*.

Topic: **Install CSM Diags**

OPERATIONAL ACTIVITY - Execute CSM Diags

For instructions to execute CSM Diags, refer to the following topics in the *HPE Cray System Management Diagnostics Installation Guide*.

Topic: **Prerequisite - Perform sanity checks prior to running CSM Diags**

Topic: **Steps to run the CSM Diags**

Installation of the HPE Cray EX software is complete.

HPE Cray EX software upgrade workflow

The following workflow diagram outlines the recommended order for a typical HPE Cray EX software product upgrade. This involves product stream installs, rebuilding the compute and UAN images, and updating the Slingshot software. The **minimum EX product versions** are required for an update.

Important Tips for Navigating the Upgrade Workflow

- Follow the recommended order of installation displayed in figure **HPE Cray EX Software Upgrade Workflow**.
- All product prerequisites and installs need to be completed first before any of the UAN and Compute image build configuration is done.
- Vertically stacked products should be installed in order from top to bottom.
- The two-tier workflow also contains Operational Activities (administrative tasks) that must be run in order to complete a successful installation.

Where is the upgrade starting point?

1. Locate the *Start Here* text and arrow that point to stacked product boxes. Start the upgrade by upgrading the **SLE** product first.
2. Below the upgrade workflow diagram, locate the documentation details to navigate to the needed procedures in the SLE documentation.
3. After the **SLE** upgrade is complete, the SLE documentation refers back to the *HPE Cray EX System Software Getting Started Guide* and **Figure: HPE Cray EX Software Upgrade Workflow**. Continue upgrading the products stacked in boxes below SLE: SHS, COS preinstall, and HFP. Refer to the instructions below the upgrade diagram to learn which topics to reference in the product guides.
4. Following the upgrades for those products, follow the arrow to the Operational Activity, **FAS System Firmware Updates (NCN Only, Do Not Reboot)**. Again, locate the instructions in the text below the diagram to learn which product guide and topic to reference.
5. Continue navigating through the upgrade diagram and the instructions to complete the HPE Cray EX software upgrade.

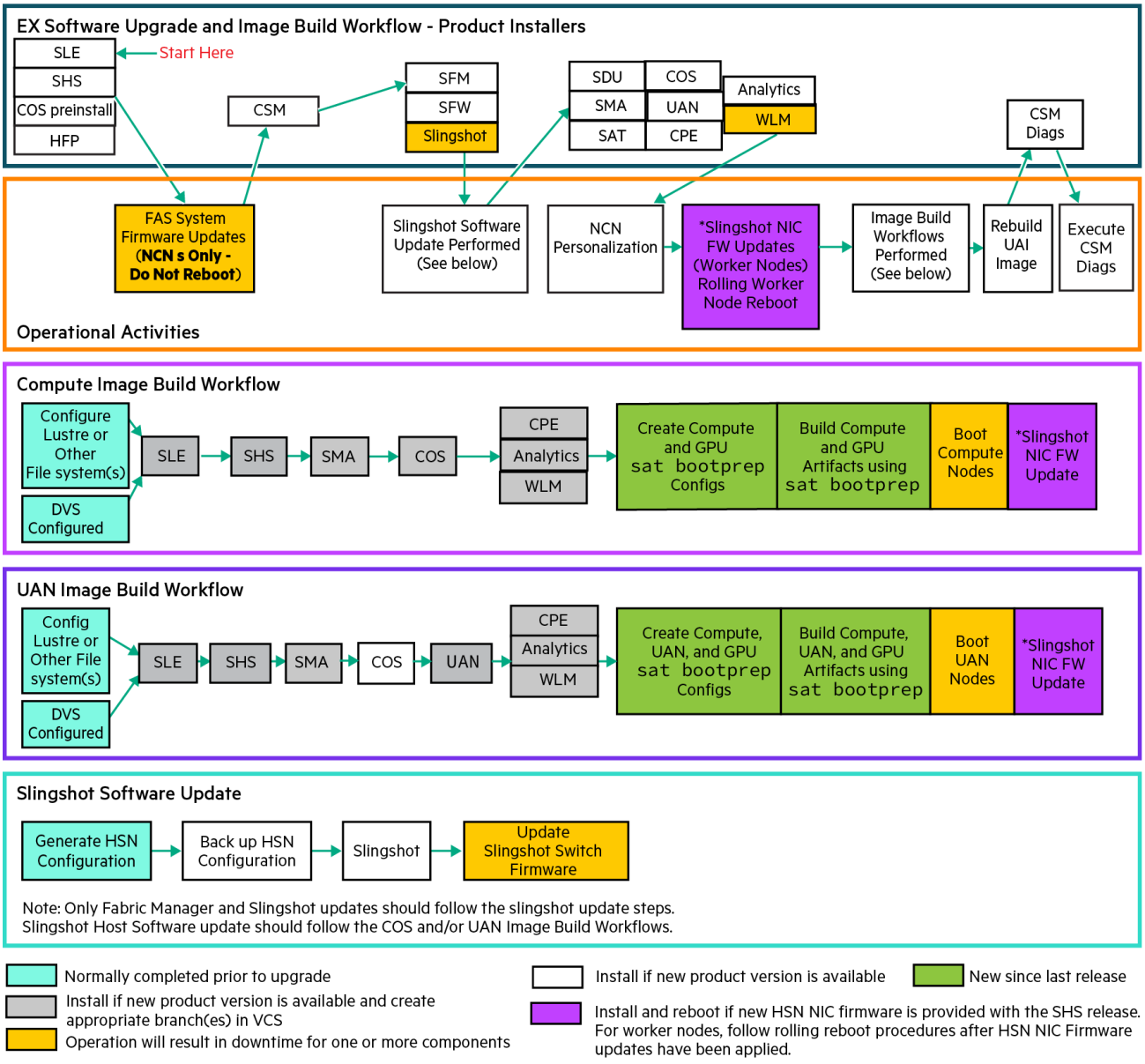


Figure 2: HPE Cray EX Software Upgrade Workflow

IMPACT OF UPGRADE ON SYSTEM CAPABILITIES

There are several known issues which can impact service availability during a live update of CSM (i.e., with users actively using the system).

- Systems running COS-2.1.x during a live update may encounter an interoperability issue with DVS that requires the creation of the file `/etc/dvs_exports.yml` on each upgraded worker node. For further details refer to this topic, **Allowing Client Access to DVS Server File Systems** in the *HPE Cray Operating System Administration Guide: CSM on HPE Cray EX SystemsCOS-2.3* documentation. This workaround is not required for systems running COS-2.2.x from the 22.03 Recipe.
- It is recommended to create a backup of the fabric manager and save it prior to starting the CSM upgrade. Refer to the topic, **Backup of a Fabric Manager Configuration** in the *Slingshot Operations Guide for Customers*.
- SLURM and PBS Pro services can be interrupted during worker node upgrades due to changes in the naming convention used for system network interfaces. See "Record of Revision" in the *HPE Cray Programming Environment Installation Guide: CSM on HPE Cray EX Systems (22.06 Rev A) S-8003* for the workaround for this issue.

- SAT commands are unavailable on master nodes after CSM is upgraded and until the SAT upgrade is completed.
- Rebooting computes causes job disruption unless no jobs are running or the system administrator has drained compute nodes jobs prior to rebooting.
- The WLM upgrade causes job disruption. WLM upgrades can cause brief WLM server outages for state backup and container upgrades. In addition, they involve rebooting compute nodes with a new image, which has the same outage issues as any compute node reboot.
- It may be difficult to submit new jobs when UAN, UAI, and compute nodes are upgraded in a staggered fashion. For example, if a subset of compute nodes are upgraded to a new major version of COS and Slingshot, launching jobs from a UAN based or an older version of COS and Slingshot may encounter problems due to network stack incompatibilities between the two environments. It is preferable to use UANs and UAIs built from similar software sources when operating in a heterogeneous software environment.
- Most firmware updates require hosts to be rebooted for the firmware update to be completed.
- SMA Grafana is not accessible until the SMA upgrade completes.

SUSE Linux Enterprise Operating System (SLE OS)

For SLE OS SP3 upgrade instructions, refer to the following topic in the *HPE SUSE Linux Enterprise Operating System 15 SP3 Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Install or Upgrade SLE OS for HPE Cray EX**

NOTE: Product upgrades must include the SLE OS content, which is needed to deploy new RPMs. The SLE OS software is consumed by other products as they are deployed.

Slingshot Host Software

For upgrade instructions, refer to the following section and topic in the *Slingshot Operations Guide*.

- Section: **Upgrade or Downgrade in a Kubernetes Orchestrated Container Environment**
  - Topic: **Upgrade Slingshot Host Software**

    NOTE: The upgrade process for Slingshot Host Software includes upgrading the Slingshot Network Drivers.

COS Preinstallation

For COS pre-install instructions, refer to the following section and topic in *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*

Topic: **Install COS NCN SP3 rpms**

HPC Firmware Pack (HFP)

To upgrade the HPC Firmware Pack, refer to the following topic in the *HPE Cray EX HPC Firmware Pack Installation Guide*. The HFP upgrade follows the same instructions used for installing the product.

Topic: **Install HPC Firmware Pack**

OPERATIONAL ACTIVITY - FAS System Firmware Updates (NCNs Only - Do Not Reboot)

To perform FAS system firmware updates, follow the same instructions used for installing the product. Refer to the following topic in the **HPE Cray System Management Documentation**.

Topic: **Update Firmware with FAS**

Cray System Management (CSM)

NOTE: CSM 1.0.0 or higher is required in order to upgrade to CSM 1.2.0.

CAUTION: In CSM 1.2, (HPE Cray EX System Software 22.07 release), running a kernel dump (`kdump` command) may hang and fail on NCNs. A hotfix is applied during the installation and upgrade to fix this issue.

The impacted procedures are listed below.

ADMINISTRATIVE

Rebuild NCNs

INSTALLATION

Deploy Final NCN

Deployment Management Nodes

UPGRADE

CSM 1.0.0 or later to 1.2.0 Upgrade Process

CAUTION: Upgrading CSM will wipe the rootfs of every management Non-compute Node and install a new OS version. The current CSM upgrade will unset the "CFS component desired configuration" (e.g., ncn-personalization) for each NCN. To keep services active, apply this manual process on worker nodes during the CSM upgrade.

MANUAL PROCESS ON WORKER NODES

Create a new CFS configuration for the NCN worker nodes, but do not make it active on any NCNs. The NCN upgrade process resets the CFS component desired configuration for non-compute nodes. This new CFS configuration is used later in the upgrade process to restore the NCN configuration.

1. Copy the existing CFS configuration for NCNs (typically called ncn-personalization) to a new configuration, for example ncn-personalization-update.
2. Remove the SMA layer (to avoid installing SLES 15 SP2 on SLES 15 SP3).
3. Update the SHS CFS layer in ncn-personalization-upgrade to use the new CFS layer created as part of the SHS upgrade process.
4. Leave the COS CFS layer unaltered in ncn-personalization-upgrade.
5. Remove the CSM layer from the ncn-personalization-upgrade config. The CSM 1.2 CFS configuration layer will not be available until CSM 1.2 services have been deployed.

CAUTION: During the CSM 1.2 upgrade, the management network switches are updated. This update modifies the VLAN number of the CAN interface causing the CAN network configuration on the switches to conflict with the CAN interface configuration on the UAN and UAI nodes. The result of this configuration conflict is that CAN connectivity on the UAN and UAI nodes stop working until the UAI and UAN servers are rebuilt with their new UAN 2.4.* images and CFS configuration.

For more information refer to, **Plan and coordinate network upgrade**, in the CSM documentation.

To upgrade CSM, refer to these topics in the CSM documentation.

Topics: **Prepare for Upgrade**

Topic: CSM **1.0.0 or later to 1.2.0 Upgrade Process**

Topic: **Upgrade CSM**

Slingshot

For upgrade instructions, refer to the following section and topics in the *Slingshot Operations Guide*.

NOTE: Performing a Slingshot upgrade will result in system downtime.

- Section: **Upgrade or Downgrade in a Kubernetes Orchestrated Container Environment**
  - Topic: **Upgrade Slingshot software on HPE Cray EX**
    - Subtopic: **Upgrade Slingshot Fabric Manager**
    - Subtopic: **Upgrade Slingshot Switch Firmware on HPE Cray EX**

OPERATIONAL ACTIVITY - Slingshot Software Update Performed

GENERATE HSN CONFIGURATION

NOTE: Upgrade of the slingshot fabric manager does not require the HSN Configuration to be regenerated unless there were changes made to the system network configuration (e.g., adding additional cabinets or new hosts to the system). Regeneration and reloading of the fabric template will reset port policies and configuration options. **It should only be redone when required**.

Refer to the following section and topic in the *Slingshot Operations Guide*.

- Section: **Slingshot Installation in a Kubernetes Orchestrated Container Environment**
  - Topic: **Configure Fabric Manager**

BACK UP HSN CONFIGURATION

Refer to the following section and topic in the *Slingshot Operations Guide*.

- Section: **Container Environment Management**

- Topic: **Backup and Restore Operation of Fabric Configuration**

SLINGSHOT

Refer to the following section and topic in the *Slingshot Operations Guide*.

- Section: **Upgrade or Downgrade in a Kubernetes Orchestrated Container Environment**
  - Topic: **Upgrade Slingshot Software on HPE Cray EX**
    - Subtopic: Upgrade Slingshot Fabric Manager

UPDATE SLINGSHOT SWITCH FIRMWARE

Refer to the following section and topic in the *Slingshot Operations Guide*.

- Section: **Slingshot Installation in a Kubernetes Orchestrated Container Environment**
  - Topic: **Upgrade Slingshot Switch Firmware on HPE Cray EX**

System Diagnostic Utility (SDU)

To upgrade SDU, refer to the following topics in the *HPE Cray EX System Diagnostic Utility Installation Guide*.

NOTE: There are no procedural differences between an installation and an upgrade.

Topic: **Install**

System Monitoring Application (SMA)

For upgrade instructions, refer to the following topic in the *HPE Cray EX System Monitoring Application Installation Guide*.

Topic: **Upgrade System Monitoring Application (SMA)**

System Admin Toolkit (SAT)

For SAT upgrade instructions, refer to the following topic in the *HPE Cray EX System Admin Toolkit (SAT) Guide*.

Topic: **SAT Installation**

For SAT post-upgrade instructions, refer to the following topic in the *HPE Cray EX System Admin Toolkit (SAT) Guide*.

- Topic: **Remove obsolete configuration file section**
- Topic: **SAT Logging**

Cray Operating System (COS)

For upgrade instructions, refer to the following topic in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Install or Upgrade COS**

User Access Node (UAN)

For upgrade instructions, refer to the following topic in the *HPE Cray User Access Node (UAN) Software Installation Guide*.

Topic: **Upgrade the UAN Product**

Cray Programming Environment (CPE)

For upgrade instructions, refer to the following topic in the *HPE Cray Programming Environment Installation Guide: CSM on Cray EX Systems*.

Topic: **Install or Upgrade CPE**

The same instructions are followed whether the administrator is installing CPE for the first time or upgrading CPE on a previously installed system.

Analytics

For upgrade instructions, refer to the following topic in the *HPE Cray EX Urika Analytics Applications Guide*.

Topic: **Upgrade the Analytics Product Stream**

Workload Manager (WLM)

NOTE: Performing a WLM upgrade can result in system downtime.

For upgrade instructions, refer to the following section and topics in the *HPE Cray Programming Environment Installation Guide: CSM on Cray EX Systems*.

- Section: **Install a Workload Manager**
  - Topic: **Upgrade the Slurm Workload Manager**
  - Topic: **Upgrade the PBS Workload Manager**

OPERATIONAL ACTIVITY - NCN Personalization (SMA, SHS, CSM, SAT, COS, CPE, Analytics)

The following procedures will generate the NCN personalization configuration for the SMA, SHS, CSM, SAT, COS, CPE, and Analytics product layers

SMA: For SMA NCN Personalization instructions, refer to the following topic in the *HPE Cray EX System Monitoring Application Administration Guide*.

Topic: **Perform NCN Personalization**

SHS: For SHS NCN Personalization instructions, refer to the following section and topic in the *Slingshot Operations Guide*

- Section: **Install Slingshot Host Software**
  - Topic: **Non-compute node configuration**

CSM: For specific instructions on CSM CFS Configuration and general instructions on performing NCN Personalization, refer to the following topics in the Operations section of the **HPE Cray System Management Documentation**.

Topic: **Configure Non-compute Nodes with CFS**

Topic: **Perform NCN Personalization**

SAT: For specific instructions on how to perform NCN Personalization for SAT, refer to the following topic in the *HPE Cray EX System Admin Toolkit (SAT) Guide*.

Topic: **Perform NCN Personalization**

COS: For specific COS NCN Personalization instructions, refer to the following sections and topics in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

- Section: **Configure COS - VCS Content**
  - Topic: **VCS Configuration**
- Section: **Configure COS - NCN Content**
  - Topic: **Perform NCN Personalization**

CPE: For specific CPE NCN Personalization instructions, refer to the following topic in the *HPE Cray Programming Environment Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Configure CPE Using CFS**

Analytics: For specific Analytics NCN Personalization instructions, refer to the following topic in the *HPE Cray EX Urika Analytics Applications Guide*.

Topic: **Perform NCN Personalization**

OPERATIONAL ACTIVITY - Slingshot NIC Firmware Updates (Worker Nodes) Rolling Worker Node Reboot

Install and reboot if new NIC firmware is provided with the SHS release.

Refer to the following topic found in the *Slingshot Operations Guide*.

Topic: **Upgrade Slingshot Switch Firmware on HPE Cray EX**

OPERATIONAL ACTIVITY - Image Build Workflows Performed

COMPUTE IMAGE BUILD WORKFLOW

The compute image build workflow (**See this figure**) shows product installer dependencies along with operational steps. The product installation steps will have normally occurred in the course of an upgrade prior to starting these steps. The product dependencies are shown to exhibit which component changes may require the compute image to be rebuilt.

PRODUCT INSTALLER DEPENDENCIES LIST

- Configure Lustre or Other File System(s)
- DVS Configured
- SLE OS
- SHS

- SMA
- COS
- CPE
- Analytics
- WLM

Create COS `sat bootprep` Configuration

`sat bootprep` Details

A new SAT command feature in this release is **`sat bootprep`**.

This command makes it easier to build images with IMS, apply CFS configurations to images, and create BOS session templates. As a result, using `sat bootprep` will expedite the installation process.

For instructions on how to create the **compute CFS configuration**, refer to the following topic in the product guides.

Section: **`sat bootprep` Usage** or **`sat bootprep`**

Build Compute Artifacts using `sat bootprep`

For instructions on how to build a compute image, refer to the following topic in the product guides.

Topic: **`sat bootprep` Usage** or **`sat bootprep`**

OPERATIONAL ACTIVITY - Build GPU Bind Image

If the system being installed contains Nvidia and/or AMD RoCM GPUs, refer to the following topic in the *HPE Cray Operating System Administration Guide: CSM on HPE Cray EX Systems* for details on how to configure them.

- Topic: **GPU Support: Create a New CPS Bind Image**
- Topic: **Enable GPU Support**

Boot Compute Nodes

NOTE: Booting compute nodes can result in system downtime.

For instructions on how to boot compute nodes, refer to the following topic in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Boot COS**

OPERATIONAL ACTIVITY - Slingshot NIC FW Update

Refer to the following topic found in the *Slingshot Operations Guide*.

Topic: **Upgrade Slingshot Switch Firmware on HPE Cray EX**

UAN Image Build Workflow

The UAN image build workflow (see Figure: **HPE Cray EX Software Upgrade Workflow**) shows product installer dependencies along with operational steps. The product installation steps will have normally occurred prior to starting these

upgrade steps. The product dependencies are shown to exhibit which component changes may require the UAN image to be rebuilt.

PRODUCT INSTALLER DEPENDENCIES LIST

- Configure Lustre or Other File System(s)
- DVS Configured
- SLE OS
- SHS
- SMA
- COS
- UAN
- CPE
- Analytics
- WLM

Create UAN `sat bootprep` Configuration

Refer to the following section and topic in the *HPE Cray Operating System Administration Guide: CSM on HPE Cray EX Systems* and the *HPE Cray User Access Node (UAN) Administration Guide*.

Section: **`sat bootprep` Usage** or **`sat bootprep`**

Optional: For UAN Administration and Operations documentation, refer to the *HPE Cray User Access Node (UAN) Administration Guide* and the following section and topic.

- Section: **Administrative Tasks**
- Topic: **Configure Interfaces on UANs**

Build UAN Artifacts using `sat bootprep`

Refer to the following section and topic in the *HPE Cray Operating System Administration Guide: CSM on HPE Cray EX Systems* and the *HPE Cray User Access Node (UAN) Administration Guide*.

Section: **`sat bootprep` Usage** or **`sat bootprep`**

Boot UAN Nodes

NOTE: Booting UAN nodes will result in system downtime.

For instructions on how to boot UAN nodes, refer to the following topic in the *HPE Cray User Access Node (UAN) Administration Guide*.

Topic: **Boot UAN Nodes**

Slingshot NIC FW Update

NOTE: Rebooting will result in system downtime.

If the SHS release contains a new NIC Firmware version, the updated firmware can be installed following the first reboot of the new UAN image.

Refer to the following topic found in the *Slingshot Operations Guide*.

Topic: **Upgrade Slingshot Switch Firmware on HPE Cray EX**

OPERATIONAL ACTIVITY - Rebuild UAI Image

Refer to the following section and topic **HPE Cray System Management Documentation**.

- Section: **User Access Service UAS**
    - Topic: **Customize End-User UAI Images**

Cray System Management Diagnostics (CSM Diags)

OPERATIONAL ACTIVITY - Execute CSM Diags

For instructions to execute CSM Diags, refer to the following topics in the *HPE Cray System Management Diagnostics Installation Guide*.

- Topic: **Prerequisite - Perform sanity checks prior to running CSM Diags**
- Topic: **Steps to run the CSM Diags**

Documentation markdown viewer tools

Suggested markdown tools for viewing documentation in .md format

For this release, some of the documentation is in markdown format (.md file format). Most of the document content can be viewed with a basic text editor. More complex content may need to be rendered with a markdown tool. Because the various markdown tools each offer different capabilities for viewing images, link navigation, viewing font sizes and formatting, it is recommended that users research and acquire the markdown viewer tool(s) that best serves their needs.

Some examples of markdown viewer tools are listed below. Note that some browsers offer extensions that support the markdown format.

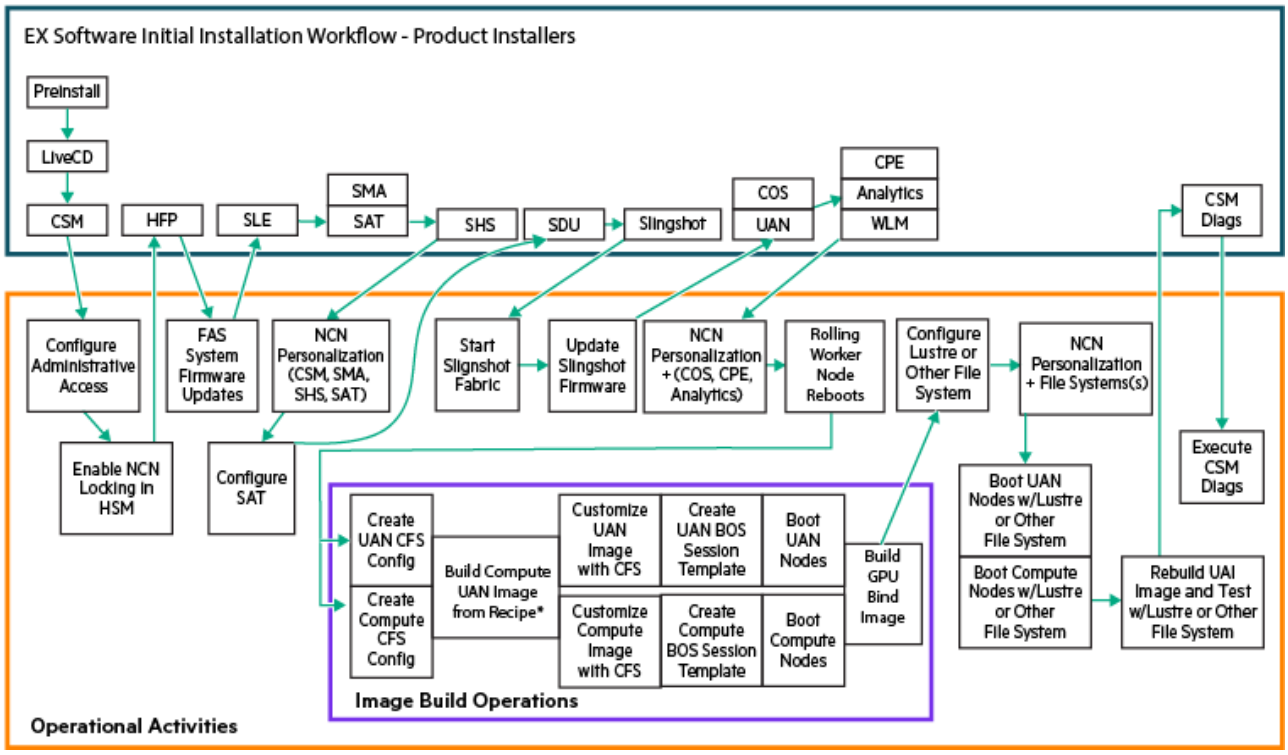
- VScodium
- Macdown
- Typora

Appendix A

The **Image Build Operations** section in this appendix is the method used in HPE Cray EX System software release 22.03. It may be used in place of these `sat bootprep` image build operations which are new in release 22.07, but the `sat bootprep` method is more efficient.

- Create COS and UAN `sat bootprep` Configuration
- Build Compute and UAN Artifacts Using `sat bootprep`

22.03 Image Build Operations



OPERATIONAL ACTIVITY - Create UAN CFS Config

NOTE: The following sections from the *HPE Cray User Access Node (UAN) Administration Guide* instruct to reboot after each activity, but if the activities are being run consecutively in order to perform a fresh EX 1.5 installation, one reboot could be run at the end of the UAN activities to offer more efficiency.

It can be helpful to reboot the host after an activity to verify all changes made are functional.

Refer to the following section and topic in the *HPE Cray User Access Node (UAN) Software Administration Guide*.

- Section: **Manage UAN Boot Images**
  - Topic: **Create UAN Boot Images**

Optional: For UAN Administration and Operations documentation, refer to the *HPE Cray User Access Node (UAN) Software Administration Guide* and the following section and topic:

- Section: **Administrative Tasks**
  - Topic: **Configure Interfaces on UANs**

Optional Activity - Configure Pluggable Authentication Modules (PAM) on UANs

Configuring PAM is an optional procedure. For configuration instructions, refer to the *HPE Cray User Access Node (UAN) Software Administration Guide* and the following section and topic.

- Section: **Administrative Tasks**
  - Topic: **Configure Pluggable Authentication Modules (PAM) on UANs**

OPERATIONAL ACTIVITY - Build Compute UAN Image from Recipe

For UAN 2.3.0+ the UAN makes use of the recipe provided with the COS release.

For instructions on how to build a UAN Compute image, refer to the following section and topic in the *HPE Cray User Access Node (UAN) Administration Guide*.

- Section: **Manage UAN Boot Images**
  - Topic: **Build a New UAN Image Using the Default Recipe**

For instructions on how to build a compute image, refer to the following section and topic in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*

Topic: **Configure COS - Customize a COS Compute Image**

OPERATIONAL ACTIVITY - Customize UAN Image With CFS

For instructions on how to customize a UAN image with CFS, refer to the following section, topic, and the following heading, Configure UAN Images, in the *HPE Cray User Access Node (UAN) Administration Guide*.

- Section: **Manage UAN Boot Images**
  - Topic: **Create UAN Boot Images**
    - Subtopic: **Configure UAN Images**

OPERATIONAL ACTIVITY - Create UAN BOS Session Template

For instructions on how to create a UAN BOS session template, refer to the *HPE Cray User Access Node (UAN) Administration Guide* and follow the instructions in the following topic.

Topic: **Boot UAN Nodes**

OPERATIONAL ACTIVITY - Boot UAN Nodes

or instructions on how to boot UAN nodes, refer to the following topic in the *HPE Cray User Access Node (UAN) Administration Guide*.

Topic: Boot UANs

OPERATIONAL ACTIVITY - Create Compute CFS Config

For instructions on how to create the compute CFS configuration, refer to the following section in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Configure COS - Compute Content**

OPERATIONAL ACTIVITY - Customize Compute Image with CFS

For instructions on how to customize a compute image with CFS, refer to the following topic in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Configure COS - Customize a COS Compute Image**

NOTE: Image customization is necessary because it applies the pre-boot image configuration.

OPERATIONAL ACTIVITY - Create Compute BOS Session Template

For instructions on how to create a compute BOS session template, refer to the following topic in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Boot COS**

OPERATIONAL ACTIVITY - Boot Compute Nodes

For instructions on how to boot compute nodes, refer to the following topic in the *HPE Cray Operating System Installation Guide: CSM on HPE Cray EX Systems*.

Topic: **Boot COS**

OPERATIONAL ACTIVITY - Build GPU Bind Image

If the system being installed contains Nvidia GPUs, refer to the following topic in the *HPE Cray Operating System Administration Guide: CSM on HPE Cray EX Systems* for details on how to configure them.

Topic: **Enable Nvidia GPU Support**

Appendix B

This example file is for **`sat bootprep`**. which builds both COS and UAN images.

```
configurations:
- name: cos-config-22.06
  layers:
  - name: shs-integration-1.7.3
    playbook: shs_mellanox_install.yml
    product:
      name: slingshot-host-software
      version: 1.7.3-45-1.0.26
      branch: integration

  - name: cos-compute-integration-2.3.79
    playbook: cos-compute.yml
    product:
      name: cos
      version: 2.3.79
      branch: integration

  - name: sma-ldms-compute
    playbook: sma-ldms-compute.yml
    product:
      name: sma
      version: 1.6.1

  - name: cpe-22.05-integration
    playbook: pe_deploy.yml
    product:
      name: cpe
      version: 22.5.3
      branch: cpe-22.05-integration

  - name: analytics-1.2.18-integration
    playbook: site.yml
    product:
      name: analytics
      version: 1.2.18
      branch: integration

  - name: slurm-master-1.1.9-20220525181300-a86973f
    playbook: site.yml
    product:
      name: slurm
      version: 1.1.9-20220525181300-a86973f

  - name: cos-compute-last-integration-2.3.79
    playbook: cos-compute-last.yml
    product:
      name: cos
      version: 2.3.79
      branch: integration

- name: uan-config-22.06
  layers:
  - name: shs-integration-1.7.3
    playbook: shs_mellanox_install.yml
    product:
      name: slingshot-host-software
      version: 1.7.3-45-1.0.26
      branch: integration
#  - name: sma-ldms-compute
#    playbook: sma-ldms-compute.yml
#    product:
#      name: sma
#      version: 1.6.1

  - name: uan
    playbook: site.yml
    product:
      name: uan
      version: 2.4.0
      branch: integration
```

```
  - name: cos-compute-last-integration-2.3.79
    playbook: cos-compute-last.yml
    product:
      name: cos
      version: 2.3.79
      branch: integration

- name: uan-config-22.06
  layers:
  - name: shs-integration-1.7.3
    playbook: shs_mellanox_install.yml
    product:
      name: slingshot-host-software
      version: 1.7.3-45-1.0.26
      branch: integration

#  - name: sma-ldms-compute
#    playbook: sma-ldms-compute.yml
#    product:
#      name: sma
#      version: 1.6.1

  - name: uan
    playbook: site.yml
    product:
      name: uan
      version: 2.4.0
      branch: integration

  - name: cpe-22.05-integration
    playbook: pe_deploy.yml
    product:
      name: cpe
      version: 22.5.3
      branch: cpe-22.05-integration

  - name: analytics-1.2.18-integration
    playbook: site.yml
    product:
      name: analytics
      version: 1.2.18
      branch: integration

  - name: slurm-master-1.1.9-20220525181300-a86973f
    playbook: site.yml
    product:
      name: slurm
      version: 1.1.9-20220525181300-a86973f
```

```
#########################
images:
- name: cray-shasta-compute-sles15sp3.x86_64-2.3.32
  ims:
    is_recipe: true
    name: cray-shasta-compute-sles15sp3.x86_64-2.3.32
  configuration: cos-config-22.06
  configuration_group_names:
  - Compute

- name: cray-shasta-uan-sles15sp3.x86_64-2.3.32
  ims:
    is_recipe: true
    name: cray-shasta-compute-sles15sp3.x86_64-2.3.32
  configuration: uan-config-22.06
  configuration_group_names:
  - Application
  - Application_UAN

#########################
session_templates:
- name: cray-shasta-compute-sles15sp3.x86_64-2.3.32
  image: cray-shasta-compute-sles15sp3.x86_64-2.3.32
  configuration: cos-config-22.06
  bos_parameters:
    boot_sets:
      compute:
        kernel_parameters: ip=dhcp quiet
spire_join_token=${SPIRE_JOIN_TOKEN}
        node_roles_groups:
        - Compute
        rootfs_provider_passthrough:  "dvs:api-gw-service-
        nmn.local:300:hsn0,nmn0:0"

- name: uan-2.4.0
  image: cray-shasta-uan-sles15sp3.x86_64-2.3.32
  configuration:  uan-config-22.06
  bos_parameters:
    boot_sets:
      uan:
        kernel_parameters: spire_join_token=${SPIRE_JOIN_TOKEN}
        node_roles_groups:
        - Application_UAN
        rootfs_provider_passthrough: "dvs:api-gw-service-
nmn.local:300:hsn0,nmn0:0"
```

Websites

General websites

Single Point of Connectivity Knowledge (SPOCK) Storage compatibility matrix

https://www.hpe.com/storage/spock

Storage white papers and analyst reports

https://www.hpe.com/storage/whitepapers

For additional websites, see **Support and other resources**.

Support and other resources

Accessing Hewlett Packard Enterprise Support

- For live assistance, go to the Contact Hewlett Packard Enterprise Worldwide website:

  https://www.hpe.com/info/assistance

- To access documentation and support services, go to the Hewlett Packard Enterprise Support Center website:

  https://www.hpe.com/support/hpesc

Information to collect

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Accessing updates

- Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.
- To download product updates:

  Hewlett Packard Enterprise Support Center

  https://www.hpe.com/support/hpesc

  Hewlett Packard Enterprise Support Center: Software downloads

  https://www.hpe.com/support/downloads

  My HPE Software Center

  https://www.hpe.com/software/hpesoftwarecenter

- To subscribe to eNewsletters and alerts:

  https://www.hpe.com/support/e-updates

- To view and update your entitlements, and to link your contracts and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:

  https://www.hpe.com/support/AccessToSupportMaterials

IMPORTANT: Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HPE Passport set up with relevant entitlements.

Remote support

Remote support is available with supported devices as part of your warranty or contractual support agreement. It provides intelligent event diagnosis, and automatic, secure submission of hardware event notifications to Hewlett Packard Enterprise, which initiates a fast and accurate resolution based on the service level of your product. Hewlett Packard Enterprise strongly recommends that you register your device for remote support.

If your product includes additional remote support details, use search to locate that information.

HPE Get Connected

https://www.hpe.com/services/getconnected

HPE Pointnext Tech Care

https://www.hpe.com/services/techcare

HPE Datacenter Care

https://www.hpe.com/services/datacentercare

Warranty information

To view the warranty information for your product, see the links provided below:

HPE ProLiant and IA-32 Servers and Options

https://www.hpe.com/support/ProLiantServers-Warranties

HPE Enterprise and Cloudline Servers

https://www.hpe.com/support/EnterpriseServers-Warranties

HPE Storage Products

https://www.hpe.com/support/Storage-Warranties

HPE Networking Products

https://www.hpe.com/support/Networking-Warranties

Regulatory information

To view the regulatory information for your product, view the *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products*, available at the Hewlett Packard Enterprise Support Center:

https://www.hpe.com/support/Safety-Compliance-EnterpriseProducts

Additional regulatory information

Hewlett Packard Enterprise is committed to providing our customers with information about the chemical substances in our products as needed to comply with legal requirements such as REACH (Regulation EC No 1907/2006 of the European Parliament and the Council). A chemical information report for this product can be found at:

https://www.hpe.com/info/reach

For Hewlett Packard Enterprise product environmental and safety information and compliance data, including RoHS and REACH, see:

https://www.hpe.com/info/ecodata

For Hewlett Packard Enterprise environmental information, including company programs, product recycling, and energy efficiency, see:

https://www.hpe.com/info/environment

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