Micro Focus
Container Deployment Foundation

Software Version: 2019.05

Planning Guide

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Support Web Site	https://softwaresupport.softwaregrp.com/
Micro Focus Product Documentation	https://community.softwaregrp.com/t5/ArcSight-Product-Documentation/ct-p/productdocs

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Overview

This CDF Planning Guide will provide instructions on preparing your infrastructure environment for security products installed using Micro Focus' Container Deployment Foundation (CDF).

CDF enables customers to install pre-integrated application capabilities. The distribution unit for software delivery is the container, leveraging the speed and format of the containerized environment. By bundling an orchestration layer to bootstrap and manage the life-cycle of many suite-related containers, CDF supports standardized deployment, built-in upgrades and patching, seamless scaling, and rollbacks.

Several Micro Focus security products run on the CDF platform as a suite of applications. These applications include:

- Transformation Hub
- ArcSight Investigate
- Identity Intelligence
- Analytics (a prerequisite for ArcSight Investigate and Identity Intelligence)

For more information about a product's compatibility with this version of the CDF installer (version 2019.05), consult the product's Release Notes, available from the Micro Focus support community.

Note: The hardware recommendations described in this document are general guidelines that may be superseded or extended by requirements specific to each container-based application installed on CDF. You should refer to each container-based application's documentation for any additional requirements.

Chapter 1: Choosing a Deployment Infrastructure

All container-based products and capabilities run within the Container Deployment Foundation (CDF) infrastructure, which comprises Kubernetes and Docker container foundational management. After successfully preparing host system prerequisites as described in this guide, you will be ready to launch the CDF Installer. The CDF Installer deploys and manages upgrades and configurations of container-based security products.

The CDF Installer will validate minimum infrastructure requirements and then configure, install and start the services associated with the security products chosen during the installation process. You can install the security products as a **sudo** user, or optionally, as a root user. (For information on granting permissions for installing as a **sudo** user, see Appendix B.)

There are 2 primary deployment configurations, each of which depends on whether the deployment requires high availability or not. While it is recommended that all deployments be highly available, you may decide that development or testing environments don't necessarily require redundancy and failover.

The number of host systems required will depend on the architecture chosen, types of which are described below.

Note: Appendix A includes a checklist for your use to track your progress implementing your preparation.

About Master Nodes

The Kubernetes Master Nodes control the cluster, manage its workload and direct communication across the system.

In order to ensure high availability of cluster services, 3 Master Nodes must be deployed. Deployment of multiple Master Nodes is strongly recommended for all environments, and required for highly available environments. When deployed in this manner, the cluster will survive a failure of one Master Node.

Should a single Master Node be deployed instead of the recommended 3 Master Nodes, failure of the single Master Node could cause the entire cluster to become unrecoverable, requiring a complete reinstall and reconfiguration.

Always run the cluster with three master nodes. If only two master nodes are used, and the primary Master Node is taken offline for maintenance or upgrade, there will only be a single Master Node available, creating a single point of failure. A failure of the available Master Node will result in the entire cluster failing, with consequences as described for the failure of a single Master Node deployment, above.

Adding Master Nodes after the cluster has been initially deployed is not supported. You must decide before deploying the cluster whether multiple Master Nodes will be initially deployed.

About Worker Nodes

The Worker Nodes run the application components and perform the work in the cluster. A minimum of 3 dedicated Worker Nodes are recommended for all highly available deployment configurations.

Worker Nodes can be added or removed from the cluster as needed. Scaling the cluster to perform more work requires additional Worker Nodes, all of which are managed by the Master Nodes.

Use of Kubernetes and Docker

Kubernetes automates deployment, scaling, maintenance and management of containerized applications across a cluster of host systems.

Applications running in Kubernetes are defined as “pods”, which groups containerized components. Clusters use Docker Containers as these components. A pod consists of one or more containers that are guaranteed to be co-located on the host server and can share resources. Each pod in Kubernetes is assigned a unique IP address within the cluster, allowing applications to use ports without the risk of conflict. Persistent services for a pod can be defined as a volume, such as a local disk directory or a network disk, and exposed by Kubernetes to the containers in the pod to use. A cluster relies upon an external Network File System (NFS) as its shared persistent storage.

Use of Kafka

Kafka is a messaging system to which producers publish messages for subscribers to consume on its scalable platform, built to run on servers. It is commonly referred to as a message broker.

This middleware is used to decouple data streams from processing, translate and enrich event data, and to buffer unsent messages. Kafka improves on traditional message brokers through advances in throughput, built-in partitioning, replication, latency and reliability.

Deployment Architectures

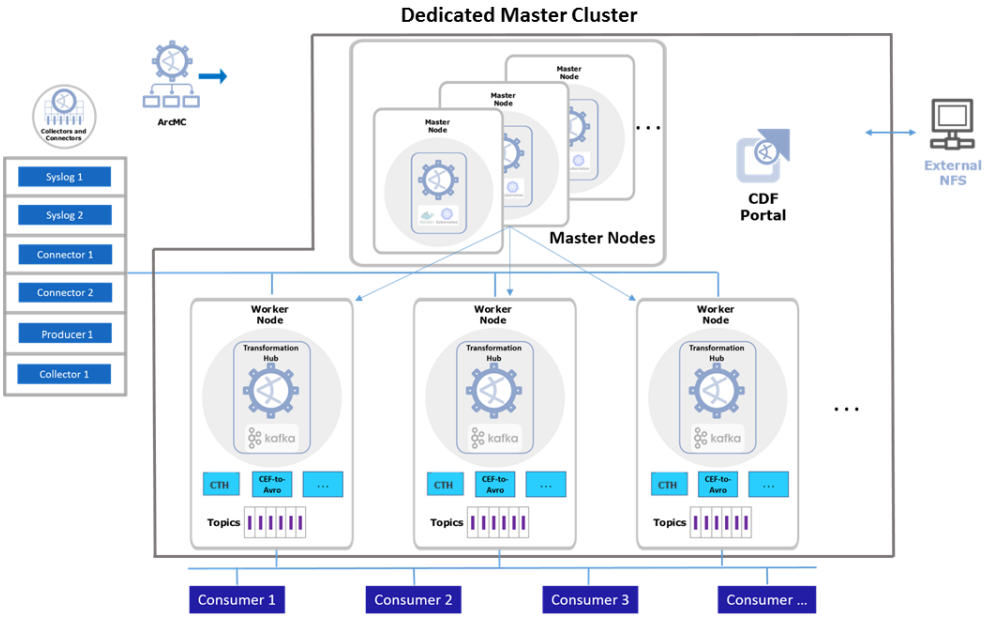
CDF installation supports the following deployment architectures, which are detailed in the following sections:

- Multiple Master and Multiple Worker Nodes
- Single Master and Multiple Worker Nodes
- Shared Master and Worker Node

Multiple Master and Multiple Worker Deployment

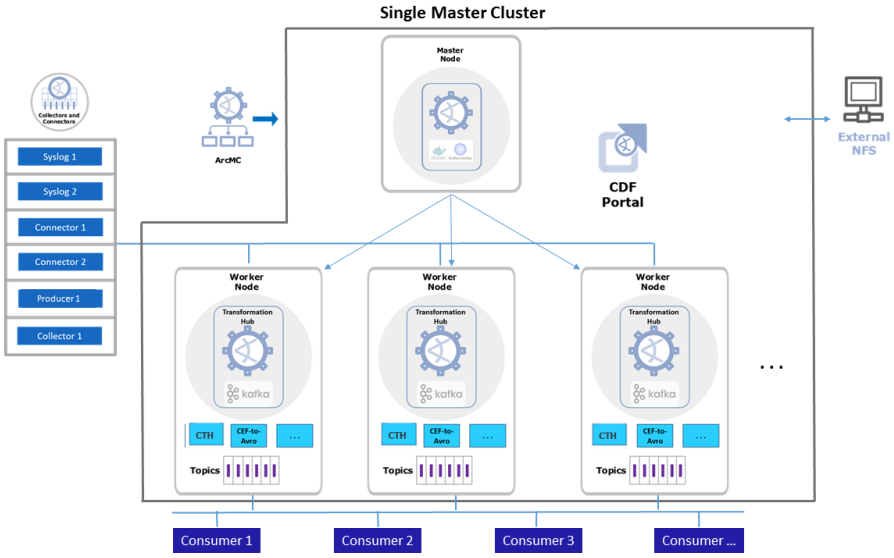
In this deployment, Master and Worker Nodes are dedicated to a specific OS instance. This configuration can be run in development and testing, and it is the recommended configuration for highly available environments. Events are processed by the Worker Nodes, with failover to another Worker Node in the event of a Worker failure. There are no single points of failure.

A minimum of 6 physical or VM environments are needed (3 dedicated Master Nodes and 3 or more dedicated Worker Nodes), plus a customer-provisioned NFS server, referred to in this documentation as External NFS.



Single Master and Multiple Worker Node Deployment

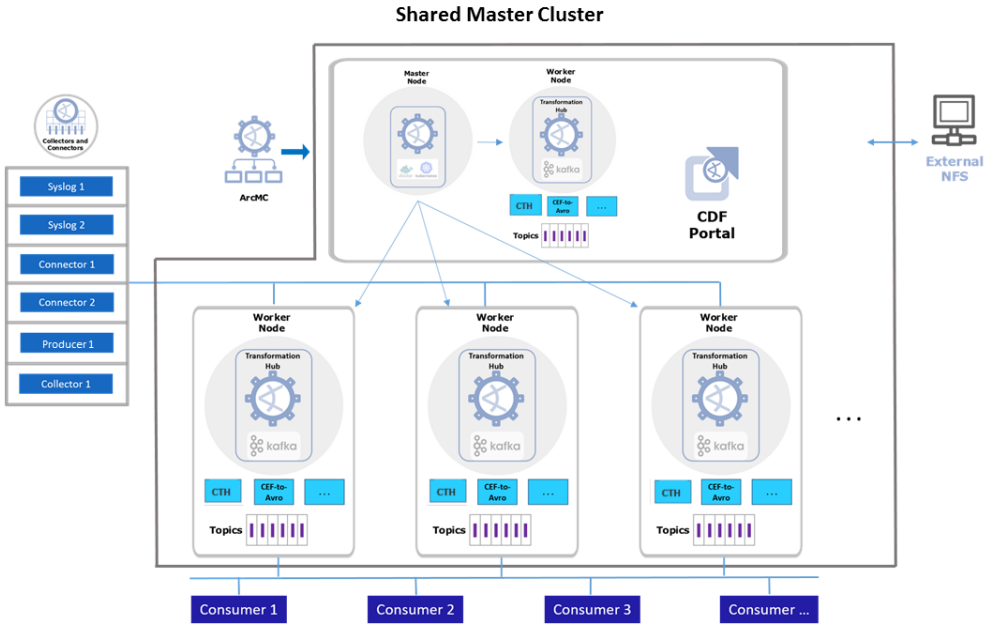
In this deployment, a single Master Node connects to 3 or more Worker Nodes. The Master and the Worker Nodes are dedicated to a specific OS instance. Events are processed by the Worker Nodes, with failover to another Worker Node in the event of a Worker failure.



Note: The single Master Node is a single point of failure, and as a result, this configuration is not recommended for highly available environments (see "About Master Nodes" on page 7).

Shared Master and Worker Node

In this configuration, the Master Node and one of the Worker Nodes are co-located on the same host, while supporting additional Worker Nodes on different hosts.



Note: The single Master Node is a single point of failure, and as a result, this configuration is not recommended for highly available environments.

Chapter 2: Prepare Infrastructure for Deployment

The actual installation of container-based applications on properly configured infrastructure, as described later in the product Deployment Guides, will be quick and straightforward. The most complex part of the installation process is the preparation of the hosts, storage, and networking infrastructure, which is described in this chapter.

The installation process includes several milestones, and each milestone comprises several interdependent steps. The installation process will validate the infrastructure environment before performing application installation, as well as after the installation has completed.

Note: Appendix A includes a checklist for your use to track your preparations.

This chapter contains the following sections:

Implementation Roles and Responsibilities

Your installation will require specific administration skills, and coordination with corporate IT departments, including the following:

- Linux operating system administration (including applying OS updates, and configuring networks, firewalls, ports, user access, and other tasks)
- Familiarity with editing configuration files
- Running commands and scripts on one or more operating systems
- Familiarity with Micro Focus components
- Familiarity with Kafka processing and configuration

The following roles and responsibilities will be needed to properly configure the infrastructure environment.

Role	Responsibility
Application admin	The person in this role must ensure successful execution of the entire installation including verification and post-installation tasks. This person must have a good understanding of the entire installation process, request support from other appropriate roles as needed, and complete the installation once the environment is ready for installation.
IT admin	The person in this role prepares physical or virtual machines as requested by the application administrator.
Network admin	The person in this role manages network-related configuration for your organization. This person needs to perform network configuration tasks as requested by the Application administrator.
Storage admin	The person in this role plans and deploys all types of storage for your organization. This person needs to set up one or more NFS servers required by CDF installation.

Deployment Considerations and Best Practices

Before starting the installation process, there are several decisions to be made to plan and prepare your infrastructure. Listed below are the considerations on which you will need to decide, and an outline of steps you will follow during this planning and preparation process. Details are explained in later sections of this guide.

Consideration	Best Practices

Host Systems	• Provision cluster Master and Worker Node host systems and operating environments : OS, storage, network, VIP if needed for high availability (HA), and so on. You will need the IP addresses and FQDNs for these systems during product deployment.
	• The cluster may be installed using a `sudo` USER with sufficient privileges, or, alternatively, may be installed using the `root` USERID.
	For more information on granting permissions for installing as a `sudo` user, see Appendix B.
	• Systems must not only meet minimum requirements for CPU cores, memory and disk storage capacity, but also meet anticipated end-to-end EPS processing throughput requirements.
	• Master and Worker Nodes can be deployed on virtual machines.
	• Since most of the processing occurs on Worker Nodes, if possible, you should deploy Worker Nodes on physical servers.
	• All Master Nodes should use the same hardware configuration, and all Worker Nodes should use the same hardware configuration (which is likely to be different from that of the Master Nodes).
	• When using virtual environments, please ensure:
	  ◦ Resources are reserved and not shared.
	  ◦ The UUID and MAC addresses are static and do not change after a reboot or a VM move. Dynamic IP addresses will cause the Kubernetes cluster to fail.
	• All Master and Worker Nodes must be installed in the same subnet.
	• Adding more Worker Nodes is typically more effective than installing bigger and faster hardware. Using more Worker Nodes also enables you to perform maintenance on your cluster nodes with minimal impact to your production environment. Adding more nodes also helps with predicting costs due to new hardware.
	• For high availability (HA) of Master Nodes on a multi-master installation, you must create a Virtual IP (VIP) that is shared by all Master Nodes. Prior to installation, a VIP must not respond when pinged.
	• If a Master and Worker are sharing a node, then follow the higher-capacity Worker Node sizing guidelines.

Storage	• Available from the Micro Focus software community, the CDF Deployment Disk Size Calculator spreadsheet will enable you to determine your recommended disk storage requirements and other configuration settings based on throughput requirements. Download the spreadsheet to help determine your storage needs. • Create or use a preexisting external NFS storage environment with sufficient capacity for the throughput needed. Guidelines are provided below. • Determine the size and total throughput requirements of your environment using total EPS. For example, if there are 50K EPS inbound, and 100K EPS consumed, then size for 150K EPS. (Note: This does not apply to the Identity Intelligence (IDI) product, because IDI measures the number of identities and transactions per day.) • Data compression is performed using GZIP on the producer (for example, a Smart Connector). Transformation Hub does not compress data.
Network	• Although event data containing IPv6 content is supported, the cluster infrastructure is not supported on IPv6-only systems.

Consideration	Best Practices
Security	• Determine a security mode (FIPS, TLS, Client Authentication) for communication between components. **Note:** Changing the security mode after installation may require downtime for uninstalling and re-installing the Transformation Hub.
Performance	• Kafka processing settings for Leader Acknowledgement (ACK) and TLS settings have a significant effect on throughput through the system. If ACK and TLS are enabled, throughput performance may be degraded by a factor of 10 or more, requiring more Worker Nodes to account for the processing overhead. • If CEF events are being transformed to Avro events and being stored in Vertica, consider the potential performance effects of the CEF-to-Avro data transformation, and allow a 20% increase in CPU utilization. This will generally only have a large impact with very high EPS (250K+) rates.
Downloads and Licensing	• Ensure you have access to the Micro Focus software download location. You will download installation packages to the Initial Master Node in the cluster. • Ensure you have a valid Micro Focus license key for the software being installed.

Provision and Prepare the Master and Worker Nodes

Provision and then configure the Master and Worker Node operating systems, and ensure that the images meet the operating standards for your enterprise.

- Plan for and request Red Hat or CentOS operating systems for your expected Development, Test and Production environment implementations. Master and Worker Nodes must meet minimum disk, CPU, memory, network and redundant node requirements based on the expected Events per Second (EPS).
- Deploy Master and Worker Nodes on a minimal Red Hat or CentOS OS instance, plus the additional packages that are specified below.

Supported Operating Systems

The Master Node and Worker Node hosts must use the same operating system. The following operating systems are supported.

Operating System	Architecture Type	Versions
Red Hat Enterprise Linux	x64	7.6, 7.7
CentOS	x64	7.6, 7.7

Supported File Systems

- EXT4
- XFS
- EMC2 (Supported, but not certified)

Network Identification

• IPv4 (hostnames must also resolve to IPv4 addresses).

• Direct layer 2 connectivity between nodes is required.

• **Static IP addresses:** each node must have a static IP address.

CDF Databases

• PostgreSQL from 9.4.x to 10.6.x

Minimum Master Node Sizing Requirements

If the External NFS server is running on a single master node deployment, the Master Node disk storage is used for storing images and persistent data shared between nodes.

Expected Total EPS (Production + Consumption)	Disk Storage 10K+ RPM SAS SSD (RAID 10)	CPUs/Cores Per CPU	RAM (GB)	Network
All EPS rates	Recommended 256 GB.	2/2 (4 cores in total), 2.3 GHz minimum	16	1 GbE

Note: Disk size excludes NFS disk requirements. A minimum of 200 GB for NFS is required.

Minimum Worker Node Requirements

Worker Node disk storage is used for:

- Product-related data located under installation directory's Kubernetes (abbreviated k8s) `k8s-hostpath` directory

Note: Since all events pushed to Kafka are stored in log files on a Kafka broker disk, we recommend you create alerts on disk usage to avoid any interruptions to Kafka service.

- Thinpool used by Docker to run container file systems
- Any activities requiring local storage by Containers runtime processing

Note: The values in the table below assume Leader ACKs and TLS are enabled in Kafka.

The following table shows the recommended size requirements for Worker Nodes based on the expected EPS throughput of the cluster.

Refer to the Deployment Sizing Calculator for total disk requirements across Worker Nodes.

Expected Total EPS (Production + Consumption)	Disk Type 10K+ RPM SAS or SSD (RAID 10)	CPUs/Cores Per CPU 2.3GHz minimum	RAM (GB)	Network	Required Worker Nodes
Up to 10k	Dependent on EPS and retention needs	2/2 (4 cores in total)	16	10GbE	3 or more
10k - 50k	Dependent on EPS and retention needs	2/4 (8 cores in total)	32	10GbE	3 or more
50k-100k	Dependent on EPS and retention needs	2/12 (24 cores in total)	64	10GbE	3 or more
100-250k	Dependent on EPS and retention needs	2/12 (24 cores in total)	128	10GbE	5 or more
250k – 500k	Dependent on EPS and retention needs	2/12 (24 cores in total)	256	10GbE	5 or more
500k or more	Dependent on EPS and retention needs	2/12 (24 cores in total)	256	10GbE	7 or more

Note: Disk size excludes NFS disk requirements. A minimum of 200 GB for NFS is required.

Secure Communication Between Micro Focus Components

Determine which security mode you want for communication between infrastructure components. The security mode of connected producers and consumers must be the same across all components. Set up the other Micro Focus components with the security mode you intend to use before connecting them.

Note: The secure communication described here applies only in the context of the components that relate to the Micro Focus container-based application you are using, which is specified in that application's documentation.

Changing the security mode after the deployment will require system downtime. If you do need to change the security mode after deployment, refer to the appropriate Administrator's Guide for the affected component.

The following table lists Micro Focus products, preparations needed for secure communication with components, ports and security modes, and where to find more information on the product. (**Note:** product documentation is available for download from the Micro Focus support community.)

Product	Preparations needed...	Ports	Protocol	Supported security modes
Management Center (ArcMC) version 2.92 or later	Install ArcMC before Transformation Hub installation. See also ArcMC Administrator's Guide.	443, 38080	TCP	• TLS • FIPS • Client Authentication
SmartConnectors and Collectors	SmartConnectors and ArcMC onboard connectors can be installed and running prior to installing Transformation Hub, or installed after the Transformation Hub has been deployed. See also ***SmartConnector User Guide, ArcMC Administrator's Guide*** • FIPS mode setup is not supported between SmartConnector v7.5 and Transformation Hub. Only TLS and Client Authentication are supported. • FIPS mode ***is*** supported between Connectors v7.6 and above and Transformation Hub.	9092, 9093	TCP	• TLS • FIPS (SC 7.6+ only) • Client Authentication • Plain text
ArcSight ESM	ESM can be installed and running prior to installing Transformation Hub. See also ***ESM Administrator's Guide.*** Note that changing ESM from FIPS to TLS mode (or vice versa) requires a redeployment of ESM. Refer to the ESM documentation for more information.	9093	TCP	• TLS • FIPS • Client Authentication
ArcSight Logger	Logger can be installed and run prior to installing Transformation Hub. See also ***Logger Administrator's Guide***	9092, 9093	TCP	• TLS • FIPS • Client Authentication • Plain text

Leader Acknowledgement ("ACK") and TLS Enablement: In general, enabling leader ACKs and TLS results in significantly slower throughput rates, but greater fidelity in ensuring events are received by Subscribers. Micro Focus has seen results over 800% slower when both Leader ACK and TLS are enabled, versus when both were not active. For more information on Leader Acknowledgements, TLS enablement, and their effects on processing throughput, refer to the Kafka documentation.

Network File System (NFS) Requirements

The CDF Installer platform and some components require a customer-provisioned NFS server, referred to in this documentation as an ***External NFS server.*** External NFS server configuration guidelines can be found here.

Supported NFS Server Versions

- NFSv3
- NFSv4

On your NFS server, run the command **`nfsstat -s`** to determine the version of NFS you are running.

Supported NFS types

- Linux-based NFS
- NetApp
- HPE 3PAR File Persona
- Amazon EFS

Supported Browsers

- Google Chrome version 71
- Mozilla Firefox version 60, 60 ESR

Note: Browsers should not use a proxy to access CDF ports 5443 or 3000 applications, because this may result in inaccessible web pages.

Supported Screen Resolutions

- 1600x900
- 1280x1024
- 1920x1200
- Higher resolutions are also supported.

Supported Languages

The CDF Management Portal UI will inherit the local language from your browser. The following languages are supported.

- English (US + UK)
- French
- German

- Japanese
- Spanish

Note: Products installed using CDF may or may not support these same languages. Consult the product's release notes for details on its supported languages.

File System Requirements

The following table provides a reference of the directories that are required on each of the servers, and the space that is needed. Ensure you use the absolute path for the equivalent directory.

File system/device	Master Node Minimum*	Master Node Recommended*	Worker Node Minimum	Description
$K8S_HOME	8 GB	8 GB		This directory is for the CDF installation. *To specify a customized directory*, run the following command: `./ install.sh --k8s-home`

$K8S_HOME
(same as $RUNTIME_CDFDATA_HOME)
	30 GB	200 GB; Make sure the used disk size plus 200 GB is no more than 80% of the whole system disk space.		This directory is for the Kubernetes server, CDF Installer, and containers. The `$K8S_HOME` and `$RUNTIME_CDFDATA_HOME` are the same directory.
				To specify a customized file system, run the following commands:
				`./ install.sh --k8s-home`
				`./ install.sh --runtime-home`

/var	5 GB	20 GB	20 GB	This directory is for the CDF build.

File system/device	Master Node Minimum*	Master Node Recommended*	Worker Node Minimum	Description
/tmp	5 GB	N/A	5 GB	This directory is for the CDF build. To specify an alternate `tmp` folder, during installation, run the following command: `./ install.sh --tmp-folder`
/var/opt/kubernetes	2 GB+ suite image size	N/A		This directory includes the CDF images and all suite images. The `/offline/suite_images` subdirectory can be removed after uploading suite images.
Main Docker thinpool directory defined in parameter THINPOOL_DEVICE	20 GB	N/A		This device is for main Docker thinpool. To specify the device, during installation, run the following command: `./ install.sh --thinpool-device` For more information on Docker thinpool configuration, see here.

Note: An asterisk (*) in the column header indicates that this value does not include NFS server space.

Set System Parameters (Network Bridging)

You must make sure the `br_netfilter` module is installed on all Master and Worker Nodes before changing system settings. Perform the following steps on all the Master and Worker Nodes:

1. Log in to the node.
2. Run the following command to check whether the br_netfilter module is enabled:
   `lsmod |grep br_netfilter`
3. If there is no return value, the `br_netfilter` module is not installed, and you must run the following commands to install it:

```
modprobe br_netfilter
echo "br_netfilter" > /etc/modules-load.d/br_netfilter.conf
```

4. Open the `/etc/sysctl.conf` file in a supported text editor.
5. Ensure the following system parameters are set:

```
net.bridge.bridge-nf-call-iptables=1
net.bridge.bridge-nf-call-ip6tables=1
net.ipv4.ip_forward = 1
```

```
net.ipv4.tcp_tw_recycle = 0
kernel.sem=50100 128256000 50100 2560
```

6. Save the `/etc/sysctl.conf` file.
7. Run the following command to apply the updates to the node:

```
/sbin/sysctl -p
```

Check MAC and Cipher Algorithms

Ensure the `/etc/ssh/sshd_config` files on each and every Master and Worker Nodes are configured with at least one of the following values, which lists all supported algorithms. Add only the algorithms that meet the security policy of your organization.

- For MAC algorithms: hmac-sha1,hmac-sha2-256,hmac-sha2-512,hmac-sha1-96
- For Cipher algorithms: 3des-cbc,aes128-cbc,aes192-cbc,aes256-cbc,aes128-ctr,aes192-ctr,aes256-ctr,arcfour128,arcfour256,blowfish-cbc

For example, you could add the following lines to the `/etc/ssh/sshd_config` files on all Master and Worker Nodes:

```
MACs hmac-sha2-256,hmac-sha2-512
Ciphers aes128-cbc,aes192-cbc,aes256-cbc,aes128-ctr,aes192-ctr,aes256-ctr
```

Check Password Authentication Settings

If you will use a user name and password authentication for adding cluster nodes during the installation, make sure the PasswordAuthentication parameter in the `/etc/ssh/sshd_config` file is set to "yes". There is no need to check the password authentication setting when you add the cluster nodes using a user name and key authentication.

To ensure the password authentication is enabled, perform the following steps on every Master and Worker Node:

1. Log on to the cluster node.
2. Open the `/etc/ssh/sshd_config` file.
3. Check if the parameter `PasswordAuthentication` is set to yes. If not, set the parameter to yes as below.

```
PasswordAuthentication yes
```

4. Run the following command to restart the sshd service:

```
systemctl restart sshd.service
```

Ensure Required OS Packages Are Installed

The packages listed in the following table must be installed on the hosts listed in the **Host Systems Affected** column. These packages are available in the standard `yum` repositories.

Package Name	Required by Master Nodes?	Required by Worker Nodes?	Required by NFS Server?
`device-mapper-libs`	Yes	Yes	No
`java-1.8.0-openjdk`	Yes	No	No
`libgcrypt`	Yes	Yes	No
`libseccomp`	Yes	Yes	No
`libtool-ltdl`	Yes	Yes	No
`net-tools`	Yes	Yes	No
`nfs-utils`	Yes	Yes	No
`rpcbind`	Yes	Yes	Yes
`systemd-libs` (version >= 219)	Yes	Yes	No
`unzip`	Yes	Yes	No
`httpd-tools`	Yes	Yes	No
`conntrack-tools`	Yes	Yes	No
`lvm2`	Yes	Yes	No
`curl`	Yes	Yes	No
`libtool-libs`	Yes	Yes	No

To check for one of these packages, setup the `yum`repository on your server and run this command:

```
yum list installed <package name>
```

This command returns an exit status code where:

- `0` indicates the package is installed
- `1` indicates the package is not installed (does not check whether the package is valid)

To install a required package, run the following command:

```
yum -y install <package name>
```

Remove Libraries

Remove libraries that will prevent Ingress from starting using the following command, and confirm the removal when prompted:

```
yum remove rsh rsh-server vsftpd
```

System Clock

A network time server must be available. `chrony` implements this protocol and is installed by default on some versions of RHEL and CentOS. `chrony` must be installed on every node. Verify the `chrony` configuration by using the command:

```
chronyc tracking
```

To install `chrony`, then start the `chrony` daemon and verify operation with these commands:

1. `yum install chrony`
2. `systemctl start chronyd`
3. `systemctl enable chronyd`
4. `chronyc tracking`

Open Port Requirements

The following firewall ports will be opened during the installation process and must be available.

The default policy of INPUT chain must be set to "ACCEPT" to open the firewall or to add required iptables rules. If it is not set to "ACCEPT", contact your IT system administrator to change the policy.

To check the default policy of the INPUT chain, run the following command:

```
iptables -S | grep -- '-P INPUT'
```

To check whether a port is in use, run the following command:

```
netstat -antp | grep :<port_number_to_check>
```

Used by	Port	Notes
CDF Management Portal	3000, 5443, 5444	
Kubernetes	2379, 2380, 3000, 4001, 4194, 5000, 8080, 8088, 8200, 8201, 8285, 8443, 8472, 10250, 10251, 10252, 10256	
NFS	111, 2049, 20048	
Transformation Hub	2181, 9092, 9093, 38080, 39000, 39093, 32181	• Port 9092 is an insecure (plain-text) port. • Port 9093 is used by Kafka and is TLS-enabled. All customer data is secured by TLS.
Transformation Hub Kafka Manager	9999, 10000	The Transformation Hub Kafka Manager uses port 9999 and 10000 to monitor Kafka. These ports must be mutually reachable between all Transformation Hub nodes.
CTH (Connector in Transformation Hub)	39001-39050	ArcSight Management Center communicates with CTH on ports 39001-39050.

By default, ZooKeepers do not use TLS or FIPS to communicate with each other. This communication is internal-only, and does not include customer data.

Firewall Settings

Ensure that the `firewalld.service` is enabled and running on all nodes.

Enable masquerade setting in firewall

You must enable the masquerade settings only when the firewall is enabled. Run the following command on all Master and Workers Nodes to check whether the masquerade setting is enabled:

```
firewall-cmd --query-masquerade
```

If the returned value is "yes", then the masquerade setting is enabled.

If the returned value is "no", run the following commands to enable the masquerade setting in the firewall.

```
firewall-cmd --add-masquerade --permanent
```

```
firewall-cmd --reload
```

Proxy Settings

The cluster should have no access to the Internet and proxy settings (`http_proxy, https_proxy` and `no_proxy`) are not set. However, if a connection with the Internet is needed and you already specified a proxy server for http and https connection, then you must correctly configure `no_proxy`.

If you have the `http_proxy` or `https_proxy set`, then `no_proxy` definitions must contain at least the following values:

```
no_proxy=localhost, 127.0.0.1, <all Master and Worker cluster node IP addresses>,<all Master and Worker cluster node FQDNs>,<HA virtual IP Address>,<FQDN for the HA Virtual IP address>
```

Note: Incorrect configuration of proxy settings has proven to be a frequent installation troubleshooting problem. To verify that proxy settings are configured properly, on all Master and Worker Nodes, run the following command and ensure the output corresponds to the recommendations.

```
echo $http_proxy, $https_proxy, $no_proxy
```

If the firewall is turned off, the install process will generate a warning. To prevent getting this warning, the CDF Install parameter `--auto-configure-firewall` should be set to true.

Proxy Settings Examples

Note: Although the text here is displayed with line breaks due to page limitations, there should be no line breaks in your actual proxy settings.

Example 1:

```
export http_proxy="http://web-proxy.example.net:8080"
```

```
export https_proxy="http://web-proxy.example.net:8080"
```

```
export no_
proxy="localhost,127.0.0.1,node1.swinfra.net,10.94.235.231,node2.swinfra.net,
10.94.235.232,node3.swinfra.net,10.94.235.233,node3.swinfra.net,10.94.235.233
,node4.swinfra.net,10.94.235.234,node5.swinfra.net,10.94.235.235,node6.swinfr
a.net,10.94.235.236,ha.swinfra.net 10.94.235.200"
```

Example 2:

```
export http_proxy="http://web-proxy.eu.example.net:8080"
```

```
export https_proxy=
"localhost,127.0.0.1,swinfra.net,10.94.235.231,10.94.235.232,10.94.235.233,10
.94.235.233,10.94.235.234,10.94.235.235,10.94.235.236,10.94.235.200"
```

DNS Configuration

Ensure host name resolution through Domain Name Services (DNS) is working across all nodes in the cluster, including correct forward and reverse DNS lookups.

> **Note:** Host name resolution **must not be** performed through `/etc/hosts` file settings.

All Master and Worker Nodes must be configured with a Fully Qualified Domain Name (FQDN), and must be in the same subnet. Transformation Hub uses the host system FQDN as its Kafka `advertised.host.name`. If the FQDN resolves successfully in the Network Address Translation (NAT) environment, then Producers and Consumers will function correctly. If there are network-specific issues resolving FQDN through NAT, then DNS will need to be updated to resolve these issues.

Configuration Notes:

- Transformation Hub supports ingestion of event data that contains both IPv4 and IPv6 addresses. However, its infrastructure cannot be installed into an IPv6-only network.
- `localhost` must **not** resolve to an IPv6 address, for example, "`::1`". The install process expects only IPv4 resolution to IP address 127.0.0.1. Any `::1` reference must be commented out in the `etc/hosts` file.
- The Initial Master Node host name must not resolve to multiple IPv4 addresses, and this includes lookup in `/etc/hosts`.

Test Forward and Reverse DNS Lookup

Test that the forward and reverse lookup records for all servers were properly configured.

To test the forward lookup, run the commands on every Master and Worker Node in the cluster and on every producer and consumer host system, including:

- All Master Nodes: $master_1$.yourcompany.com, ..., $master_n$.yourcompany.com
- All Worker Nodes: $worker_1$.yourcompany.com, ..., $worker_n$.yourcompany.com
- Your ArcMC nodes: $arcmc_1$.yourcompany.com, ..., $arcmc_n$.yourcompany.com
- Your Logger node: $logger_1$.yourcompany.com, ... ,$logger_n$.yourcompany.com
- Your ESM nodes: esm_1.yourcompany.com, ... , esm_n.yourcompany.com

Use the `nslookup` or `host` commands to verify your DNS configuration. (**Note:** Do not use the `ping` command.) You must run the `nslookup` commands on every server specified in your

/`etc/resolv.conf` file. Every server must be able to perform forward and reverse lookup properly and return the exact same results.

If you have a public DNS server specified in your `/etc/resolv.conf` file (such as the Google public DNS servers 8.8.8.8 or 8.8.4.4), you must remove this from your DNS configuration.

Run the commands as follows. Expected sample output is shown below each command.

```
 hostname
```

```
master1
```

```
 hostname -s
```

```
master1
```

```
hostname -f
```

```
master1.yourcompany.com
```

```
hostname -d
```

```
yourcompany.com
```

```
nslookup master1.yourcompany.com
```

```
Server: 192.168.0.53
Address: 192.168.0.53#53
Address: 192.168.0.1
Name: master1.example.com
```

```
nslookup master1
```

```
Server: 192.168.0.53
Address: 192.168.0.53#53
Name: master1.example.com
Address: 192.168.0.1
```

```
nslookup 192.168.0.1
```

```
Server: 192.168.0.53
Address: 192.168.0.53#53
1.0.168.192.in-addr.arpa name = master1.example.com.
```

Kubernetes Network Subnet Settings

The Kubernetes network subnet is controlled by the `--POD_CIDR` and `–SERVICE_CIDR` parameters to the CDF Installer.

The `--POD_CIDR` parameter specifies the network address range for Kubernetes pods. The address range specified in the `--POD_CIDR` parameter must not overlap with the IP range assigned for Kubernetes services (which is specified in the `–SERVICE_CIDR` parameter). The expected value is a Classless Inter-Domain Routing (CIDR) format IP address. CIDR notation comprises an IP address, a slash ('/') character, and a network prefix (a decimal number). The minimum useful network prefix is /24 and the maximum useful network prefix is /8. The default value is 172.16.0.0/16. For example:

```
POD_CIDR=172.16.0.0/16
```

The `CIDR_SUBNETLEN` parameter specifies the size of the subnet allocated to each host for Kubernetes pod network addresses. The default value is dependent on the value of the `POD_CIDR` parameter, as described in the following table.

POD_CIDR Prefix	POD_CIDR_SUBNETLEN defaults	POD_CIDR_SUBNETLEN allowed values
/8 to /21	/24	/(POD_CIDR prefix + 3) to /27
/22 to /24	/(POD_CIDR prefix + 3)	/(POD_CIDR prefix + 3) to /27

Smaller prefix values indicate a larger number of available addresses. The minimum useful network prefix is /27 and the maximum useful network prefix is /12. The default value is 172.17.17.0/24.

Change the default `POD_CIDR` or `CIDR_SUBNETLEN` values only when your network configuration requires you to do so. You must also ensure that you have sufficient understanding of the flannel network fabric configuration requirements before you make any changes.

Configure the NFS Server Environment

NFS storage is used by all nodes in the cluster to maintain state information about the infrastructure and to store other pertinent data. In the case of a Dedicated Master deployment having a minimum of 3 Master Nodes, NFS must run on a highly-available external server.

Note: For optimal security, secure all NFS settings to allow only required hosts to connect to the NFS server.

NFS Prerequisites

1. Make certain that the following ports are open on your external NFS server: 111, 2049, and 20048
2. Enable the required packages (`rpcbind` and `nfs-server`) by running the following commands on your NFS server

```
systemctl enable rpcbind

systemctl start rpcbind

systemctl enable nfs-server

systemctl start nfs-server
```

3. The following table lists the minimum required sizes for each of the NFS installation directories.

Directory	Minimum Size	Description
`<NFS_ROOT_DIRECTORY>/itom/itom_vol`	130GB	This is the CDF NFS root folder, which contains the CDF database and files. The disk usage will grow gradually.
`<NFS_ROOT_DIRECTORY>/itom/db`	Depends, but start with 10GB	This volume is only available when you did not choose PostgreSQL High Availability (HA) for CDF database setting. It is for CDF database. During the install you will not choose the Postgres database HA option.
`<NFS_ROOT_DIRECTORY>/itom/db_backup`	Depends, but start with 10GB	This volume is used for backup and restore of the CDF Postgres database. Its sizing is dependent on the implementation's processing requirements and data volumes.
`<NFS_ROOT_DIRECTORY>/itom/logging`	Depends, but start with 40GB	This volume stores the log output files of CDF components. The required size depends on how long the log will be kept.
`<NFS_ROOT_DIRECTORY>/arcsight`	10GB	This volume stores the component installation packages.

Note: 1GB = 1024 * 1024 * 1024 bytes

NFS Directory Structure

To create the NFS directory structure:

1. Login to your NFS server and create the following:
   - A GROUP named **`arcsight`**, with a GID of 1999
   - A USER named **`arcsight`** with a UID of 1999
   - An NFS Root directory at **`/opt/arcsight/nfs/volumes`**

Note: If you have previously installed any version of CDF, you must remove all NFS shared directories before you proceed. To do this, run the following command for each directory:
`rm -rf <path to shared directory>`

2. For each directory listed in the table below, run the following command to create each NFS shared directory:

```
mkdir -p <path to shared directory>
```

For example: `mkdir -p /opt/arcsight/nfs/volumes/itom/itom_vol`

Directory	Mount Point Example
<NFS_ROOT_DIRECTORY>/itom/itom_vol	/opt/arcsight/nfs/volumes/itom/itom_vol
<NFS_ROOT_DIRECTORY>/itom/db	/opt/arcsight/nfs/volumes/itom/db
<NFS_ROOT_DIRECTORY>/itom/db_backup	/opt/arcsight/nfs/volumes/itom/db_backup
<NFS_ROOT_DIRECTORY>/itom/logging	/opt/arcsight/nfs/volumes/itom/logging
<NFS_ROOT_DIRECTORY>/arcsight	/opt/arcsight/nfs/volumes/arcsight

3. The permission setting of each directory must be recursively set to 755. If it is not, run the following command to update the permissions:

   ```
   chmod -R 755 <path to shared directory>
   ```

For example: `chmod -R 755 /opt/arcsight/nfs/volumes/itom/itom_vol`

4. Set the ownership in this structure to UID 1999 and GID 1999. Change the directory to `/opt`, and then run the following command:

   ```
   chown -R 1999:1999 <NFS_ROOT_DIRECTORY>/arcsight
   ```

Note: if you use a UID/GID different than 1999/1999, then provide it during the CDF installation in the install script arguments`--system-group-id and --system-user-id`.

Export the NFS Configuration

For every NFS volume, run the following set of commands on the External NFS server based on the IP address. You will need to export the NFS configuration with appropriate IPs in order for the NFS mount to work properly. For every node in the cluster, you must update the configuration to grant the node access to the NFS volume shares. On the NFS server, edit the `etc/exports` file and add all the shared volumes to the file.

Here is a sample `etc/exports` file entry for IP address 192.168.1.0, for all of the volumes:

```
/opt/arcsight/nfs/volumes/arcsight 192.168.1.0/24
   (rw,sync,anonuid=1999,anongid=1999,all_squash)

/opt/arcsight/nfs/volumes/itom/itom_vol 192.168.1.0/24
   (rw,sync,anonuid=1999,anongid=1999,all_squash)

/opt/arcsight/nfs/volumes/itom/db 192.168.1.0/24
   (rw,sync,anonuid=1999,anongid=1999,all_squash)
```

```
/opt/arcsight/nfs/volumes/itom/logging 192.168.1.0/24
   (rw,sync,anonuid=1999,anongid=1999,all_squash)
   /opt/arcsight/nfs/volumes/itom/db_backup 192.168.1.0/24
   (rw,sync,anonuid=1999,anongid=1999,all_squash)
```

Save the `/etc/exports` file, and then run the following command:

```
exportfs -ra
```

Synchronize the time on the NFS server and the time on the other servers in the cluster.

If you add more NFS shared directories later, you must restart the NFS service.

Testing NFS

1. Create a test directory under `/mnt.`
2. From the command prompt attempt to mount the `nfs`directory on your local system, to `/mnt/nfs`, using the sample commands below (for NFS v3 and v4).

- NFS v3 Test: `mount -t nfs 192.168.1.25:/opt/arcsight/nfs/volumes/arcsight /mnt/nfs`
- NFS v4 Test: `mount -t nfs4 192.168.1.25:/opt/arcsight/nfs/volumes/arcsight /mnt/nfs`

After creating all 5 volumes, run the following commands on the NFS server:

```
exportfs -ra
systemctl restart rpcbind
systemctl enable rpcbind
systemctl restart nfs-server
systemctl enable nfs-server
```

NFS Setup Using a Script

For non-high-availability, single-node shared Master and Worker Node environments only, NFS may be configured with the script `setupNFS.sh,` which is located on the Initial Master Node in `/<ArcsightRootFolder>/kubernetes/scripts` folder.

To run the script:

1. Copy `setupNFS.sh` to the NFS server.
2. Do one of the following:

- If using the default UID/GID run : `sh setupNFS.sh /path_to_volumes/volumes/itom/volume_name`
- If using a non-default UID/GID run: `sh setupNFS.sh /path_to_volumes/volumes/itom/volume_name true <uid> <gid>`

3. Run the following command to restart the NFS service:
   ```
   systemctl restart nfs
   ```

Disable Swap Space

Complete this task on all Master and Worker nodes.

To disable swap space:

1. Log on to the node.
2. Run the following command to disable the swap process:

   ```
   swapoff -a
   ```

3. Open the `/etc/fstab` file in a supported editor, and then comment out the lines that display "swap" as the disk type. Then save the file.
   For example:

   ```
   #/dev/mapper/centos_shcentos72x64-swap swap
   ```

Create a CDF Installation Directory

For highly available environments, we recommend that you create a CDF installation directory, and then mount a logical volume to the installation directory. The CDF Installer will copy all installation packages to the `/tmp` directory on all Master and Worker Nodes in the cluster.

Before proceeding, ensure there is sufficient disk space for this directory, or override the default directory using the `-tmp-folder` parameter in the CDF Installer command line. Perform these steps on each Master and Worker Node:

1. Run the following command to create the CDF installation directory:

   ```
   mkdir -p /opt/kubernetes
   ```

2. Add a new hard disk to the host server, and then restart the server.
3. Run the following command to check the disk partition and display the newly added disk:

   ```
   fdisk –l
   ```

4. Run the following command to format the disk:

   ```
   fdisk <new disk device name>
   ```

For example, run the following command:
```
fdisk /dev/sdb
```

5. Enter `n` to create a new partition, and then enter the partition number, sector, and size.
6. Run the following command to create a physical volume:

```
pvcreate <physical device name>
```

For example, run the following command:

```
pvcreate /dev/sdb
```

7. Run the following command to create a volume group. (Note: do not use a hyphen '-' in the volume group name, but use an underscore '_' instead.)

```
vgcreate <volume group name> <physical volume name>
```

For example, run the following command:

```
vgcreate coretech /dev/sdb
```

8. Run the following command to create a logical volume for the Platform installation. (Note: do not use a hyphen '-' in the volume group name, use an underscore '_' instead.)

```
lvcreate -l 100%FREE -n <logical volume name> <volume group name>
```

For example, to use 100% of the volume group, run the following command:

```
lvcreate -l 100%FREE -n coretech_lv coretech
```

9. Run the following command to activate the volume group:

```
vgchange -a y <volume group name>
```

For example, run the following command:

```
vgchange -a y coretech
```

10. Run the following command to format the file system:

```
mkfs -t xfs [logical volume path]
```

For example, run the following command:

```
mkfs -t xfs /dev/coretech/coretech_lv
```

11. Run the following command to mount the volumes under the directory in which you will install CDF:

```
mount <logical volume path> <CDF installation directory>
```

For example, run the following command:

```
mount /dev/coretech/coretech_lv /opt/Kubernetes
```

12. Configure the `K8S_HOME` parameter in the `install.properties` file to use your installation path. The default value is `/opt/kubernetes`.

Create Docker Thinpools (optional)

Optionally, to improve performance of Docker processing, set up a thinpool on each Master and Worker Node. Before setting up a thinpool on each node, create a single disk partition on the node, as explained below.

For the thinpool device for Docker (for example, `sdb`): the minimum physical volume size is 30GB.

To create a new partition on a node:

1. `fdisk <name of the new disk device that was added>`

For example:
```
# fdisk /dev/sdb
```

2. Enter `n` to create a new partition.
3. Enter `p` to add a primary partition.
4. When prompted, enter partition number, sector, type (`Linux LVM`), and size for the first partition. To select Linux LVM partition type:
   - Enter `t` to change the default partition type to Linux LVM
   - Type `L` to list the supported partition types
   - Type `8e` to select Linux LVM type
5. When prompted, enter partition number, sector, type (Linux LVM), and size for the second partition.
6. Type `p` to view the partition table.
7. Type `w` to save the partition table to disk.
8. Type `partprobe`.

To set up a thinpool for Docker on a node:

1. Create a physical volume with the following command:

   ```
   # pvcreate [physical device name]
   ```

For example:
```
# pvcreate /dev/sdb
```

2. Create a volume group with the following command:

   ```
   # vgcreate [volume group name] [logical volume name]
   ```

For example:
```
# vgcreate docker /dev/sdb
```

3. Create a logical volume (LV) for the thinpool and bootstrap with the following command:

```
# lvcreate [logical volume name] [volume group name]
```

For example: the data LV is 95% of the 'Docker' volume group size (leaving free space allows for automatic expanding of either the data or metadata if space is running low, as a temporary stopgap):

```
# lvcreate --wipesignatures y -n thinpool docker -l 95%VG
# lvcreate --wipesignatures y -n thinpoolmeta docker -l 1%VG
```

4. Convert the pool to a thinpool with the following command:

```
# lvconvert -y --zero n -c 512K --thinpool docker/thinpool --poolmetadata docker/thinpoolmeta
```

Note: Any warning may be ignored if the disk is dedicated to thinpool.

Optionally, you can configure the auto-extension of thinpools using an lvm profile.

1. Open the lvm profile (in `/etc/lvm/profile/docker-thinpool.profile`) with a text editor.
2. Specify values for the parameters `thin_pool_autoextend_threshold`, and `thin_pool_autoextend_percent`. Values each represent a numerical percentage of the space used.

For example:

```
activation {
thin_pool_autoextend_threshold=80
thin_pool_autoextend_percent=20
}
```

3. Apply the lvm profile with the following command:

```
# lvchange --metadataprofile docker-thinpool docker/thinpool
```

4. Verify that the lvm profile is monitored with the following command:

```
# lvs -o+seg_monitor
```

5. Clear the graph driver directory with the following command, if Docker was previously started:

```
# rm -rf /var/lib/docker/*
```

6. Monitor the thinpool and volume group free space with the following commands:

```
# lvs
# lvs -a
# vgs
```

7. Check logs to see the auto-extension of the thinpool when it hits the threshold:

```
# journalctl -fu dm-event.service
```

Next Steps

With your preparation complete, you are now ready to install the CDF Installer and then use it to deploy container-based applications. Such applications may include one or more of the following:

- Transformation Hub
- ArcSight Investigate
- Identity Intelligence

For deployment information, see the Micro Focus Deployment Guide corresponding to your product of choice.

Appendix A: CDF Planning Checklist

Refer to the checklist below to set up your hosts, network, storage, and other prerequisites for installation of CDF. Check off each task as it is verified and completed.

Prerequisite	Description	Completed
Meet system requirements	Memory, CPU, disk space and network connectivity for the expected EPS throughput rates. Download the CDF Planning Disk Sizing Calculator spreadsheet from the Micro Focus software community and compute your requirements.	
DNS connectivity	Ensure DNS connectivity between cluster nodes (Master Nodes and Worker Nodes).	
Validate cluster security configuration	Ensure that security protocols are enabled and configured properly for communication between all cluster nodes. The security mode of Producers and Consumers must be the same across the infrastructure. Options are TLS, FIPS and Client Authentication. Changing the security mode after the infrastructure has been deployed will require system down time.	
Create a sudo user	(Optional) Assign permissions to a `sudo` user if the install will use a non-root USER.	
Meet file system requirements	Ensure file systems have sufficient disk space.	
Set system parameters	Ensure that network bridging is installed.	
Check MAC and cipher algorithms	Ensure that MAC and cipher minimum requirements are met.	
Check password authentication	If using a USER and password authentication, ensure the PasswordAuthentication parameter is enabled.	
Ensure OS packages are installed	Ensure that all required packages are installed on Master and Worker Nodes and the NFS server. Remove libraries that will cause conflicts.	
Ensure system clocks are in sync	Ensure that the system clock of each cluster Master and Worker node remains continuously in sync. A network time server must be available (for example, chrony).	
Disable swap space	Optional. For the best performance, disable disk swap space.	
Create CDF installation directory	(Optional) In highly available environments, create a CDF installation directory..	
Set up Docker thinpools	(Optional.) For the best performance, set up Docker thinpools.	

Prerequisite	Description	Completed
Configure network settings	Ensure host name resolution through DNS across all nodes in the cluster. Infrastructure does not support being installed on IPv6-only networks.	
Configure Kubernetes network subnet	Configure the network subnet for the Kubernetes cluster.	
Configure firewall settings	Ensure that the firewalld.service is enabled on all Master and Worker Nodes in the cluster.	
Configure proxy settings	Should you require internet access, ensure that your proxy and no-proxy settings are properly configured and tested.	
Configure NFS server settings	Ensure that the external NFS server is properly configured and available. NFS utilities must be installed.	
Validate Virtual IP address and FQDN	**Note:** Configuration of a virtual IP address (VIP) applies to multi-master installations only. A single-master installation does not require a VIP. Verify that the VIP address and FQDN shared by all Master Nodes in the cluster are accessible. The VIP provides high availability for Master Nodes. The Installation process will test and ping the VIP and try to resolve the FQDN, which is specified with the `-ha-virtual-ip` parameter in the CDF Installer. Should a Master Node fail, another Master Node takes over the VIP and responds to requests sent to the VIP.	

Appendix B: Enabling Installation Permissions for a **sudo** User

If you choose to install the Installer as a **sudo** user, the root user must grant non-root (**sudo**) users installation permission before they can perform the installation. Please make sure the provided user has permission to execute scripts under temporary directory **/tmp** on all Master and Worker Nodes.

There are two distinct file edits that need to be performed: first on the Initial Master Node only, and then on all remaining Master and Worker Nodes. These file edits are detailed below.

In addition, prior to CDF installation, the script **CDF-updateRE-.sh** must be modified in order to install CDF as a **sudo** user.

Edit the **sudoers** File on the **Initial Master Node (only)**

Note: Make the following modifications only **on the Initial Master Node.**

First, log on to the Initial Master Node as the root user. Then, using **visudo**, edit the **/etc/sudoers** file and add or modify the following lines.

Warning: In the following commands you must ensure there is, at most, a single space character after each comma that delimits parameters. Otherwise, you may get an error similar to this when you attempt to save the file.
>>> /etc/sudoers: syntax error near line nn <<<

1. Add the following **Cmnd_Alias** line to the **command aliases** group in the **sudoers** file.

```
Cmnd_Alias CDFINSTALL = <CDF_installation_package_directory>/scripts/pre-
check.sh, <CDF_installation_package_directory>/install, <K8S_
HOME>/uninstall.sh, /usr/bin/kubectl, /usr/bin/docker, /usr/bin/mkdir,
/bin/rm, /bin/su, /bin/chmod, /bin/tar, <K8S_HOME>/scripts/uploadimages.sh,
<K8S_HOME>/scripts/uploadimages.sh, <K8S_HOME>/scripts/cdf-updateRE.sh, <K8S_
HOME>/bin/kube-status.sh, <K8S_HOME>/bin/kube-stop.sh, <K8S_HOME>/bin/kube-
start.sh, <K8S_HOME>/bin/kube-restart.sh, <K8S_HOME>/bin/env.sh, <K8S_
HOME>/bin/kube-common.sh, <K8S_HOME>/bin/kubelet-umount-action.sh, /bin/chown
```

Note: If you will be specifying an alternate **tmp** folder using the **--tmp-folder** parameter, be sure to specify the correct path to **<tmp path>/scripts/pre-check.sh** in the **Cmnd_Alias** line.

- Replace **<C DF_installation_package_directory>**with the directory where you unzipped the installation package. For example, **/tmp/cdf-2019.05.0xxx**.
- Replace **<K8S_HOME>** with the value defined from a command line. By default, **<K8S_HOME>** is **/opt/arcsight/kubernetes.**

2. Add the following lines to the **wheel users** group, replacing `<username>`with your `sudo` user password:

```
%wheel ALL=(ALL) ALL

cdfuser ALL=NOPASSWD: CDFINSTALL

Defaults: <username>!requiretty

Defaults: root !requiretty
```

3. Locate the `secure_path` line in the `sudoers` file and ensure the following paths are present:

```
Defaults secure_path = /sbin:/bin:/usr/sbin:/usr/bin
```

By doing this, the `sudo` user can execute the `showmount, curl, ifconfig`and `unzip`commands when installing the CDF Installer.

4. Save the file.

Edit the `sudoers` File on the **Remaining Master and Worker Nodes**

Note: Make the following modifications only **on the remaining Master and Worker Nodes.**

Log in to each Master and Worker Node. Then, using `visudo`, edit the `/etc/sudoers` file and add or modify the following lines.

Warning: In the following commands you must ensure there is, at most, a single space character after each comma that delimits parameters. Otherwise, you may get an error similar to this when you attempt to save the file.
`>>> /etc/sudoers: syntax error near line nn <<<`

1. Add the following `Cmnd_Alias` line to the **command aliases** group in the sudoers file.

```
Cmnd_Alias CDFINSTALL = /tmp/pre-check.sh, /tmp/<ITOM_Suite_Foundation_
Node>/install, <K8S_HOME>/uninstall.sh, /usr/bin/kubectl, /usr/bin/docker,
/usr/bin/mkdir, /bin/rm, /bin/su, /bin/chmod, /bin/tar, <K8S_
HOME>/scripts/uploadimages.sh, <K8S_HOME>/scripts/uploadimages.sh, <K8S_
HOME>/scripts/cdf-updateRE.sh, <K8S_HOME>/bin/kube-status.sh, <K8S_
HOME>/bin/kube-stop.sh, <K8S_HOME>/bin/kube-start.sh, <K8S_HOME>/bin/kube-
restart.sh, <K8S_HOME>/bin/env.sh,<K8S_HOME>/bin/kube-common.sh, <K8S_
HOME>/bin/kubelet-umount-action.sh, <K8S_HOME>/scripts/uploadimages.sh,
/bin/chown
```

Note: If you will be specifying an alternate `tmp` folder using the `--tmp-folder` parameter, be sure to specify the correct path to `<tmp path>/scripts/pre-check.sh` in the `Cmnd_Alias` line.

- Replace `<K8S_HOME>` which will be used from the command line. By default, `<K8S_HOME>` is `/opt/arcsight/kubernetes`.

2. Add the following lines to the **wheel users** group, replacing `<username>`with your `sudo` user password:

```
%wheel ALL=(ALL) ALL

cdfuser ALL=NOPASSWD: CDFINSTALL

Defaults: <username>!requiretty

Defaults: root !requiretty
```

3. Locate the `secure_path` line in the sudoers file and ensure the following paths are present:

```
Defaults secure_path = /sbin:/bin:/usr/sbin:/usr/bin
```

By doing this, the sudo user can execute the `showmount, curl, ifconfig` and `unzip` commands when installing the CDF Installer.

4. Save the file.

Repeat the process for each remaining Master and Worker Node.

Modify the `cdf-updateRE.sh` Script

In addition to the steps listed above, the following additional step is required for `sudo` user installation of CDF.

The `cdf-updateRE.sh` script is used in installation and other utility operations in CDF and CDF-based products (such as Transformation Hub). In order to install CDF, the script must be modified before you install CDF, as follows:

1. In the location where you unzip the installer archive, modify the script `<unzipped CDF directory>/scripts/cdf-updateRE.sh` file in a text editor as follows:
   - Comment out the line containing the text `exit 1`
   - Add the following line inside the `if` block:
     `export K8S_HOME=<install directory>`

Example:

```
if [[ -z "${K8S_HOME}" ]]; then

echo "K8S_HOME not set. If running on fresh installation, please use new
shell session"

# exit 1
```

```
export K8S_HOME=/opt/arcsight/kubernetes

fi;
```

2. Save the file and then proceed to CDF installation as a **sudo** user.

Installing Transformation Hub Using the **sudo** User

After completing the modifications to the **sudoers** files as described above, perform the following steps.

1. Log in to the Initial Master Node as the non-root **sudo** user to perform the installation.
2. Download the installer files to a directory where the non-root **sudo** user has write permissions.
3. Run the CDF installer using the **sudo** command (for more details, refer to the product's Deployment Guide, available from the Micro Focus community).

Glossary

A

ArcMC

The ArcSight central management console.

Avro

Avro is a row-oriented remote procedure call and data serialization framework developed within Apache's Hadoop project. It uses JSON for defining data types and protocols, and serializes data in a compact binary format.

C

Cluster

A group of nodes, pods, or hosts.

Common Event Format (CEF)

CEF is an open log management standard that simplifies log management, letting third parties create their own device schemas that are compatible with a standard that is used industry-wide for normalizing security events. Technology companies and customers can use the standardized CEF format to facilitate data collection and aggregation, for later analysis by an enterprise management system.

Connectors in Transformation Hub (CTH)

CTH features enable the enriching, normalizing and sending of syslog data and routing it to Kafka topics.

Consumer

A consumer of Transformation Hub event data. Consumers may be Micro Focus products such as Logger or ESM, third-party products like Hadoop, or can be made by customers for their own use.

Container Deployment Foundation (CDF)

CDF is the container-based delivery and management model built on Docker containers managed by Kubernetes, which standardizes distribution, installation, upgrade, and operation of Micro Focus products and product suites.

Containerization

Application containerization is an OS-level virtualization method used to deploy and run distributed applications without launching an entire virtual machine (VM) for each app. Multiple isolated applications or services run on a single host and access the same OS kernel.

CTH

Connector in Transformation Hub (CTH). A feature where SmartConnector technology operates directly in Transformation Hub to collect data.

D

Dedicated Master Node

A node dedicated to running the Kubernetes control plane functionality only.

Destination

In Micro Focus products, a forwarding location for event data. A Transformation Hub topic is one example of a destination.

Docker Container

A Docker container is portable application package running on the Docker software development platform. Containers are portable among any system running the Linux operating system.

F

flannel

flannel (spelled with a lower-case f) is a virtual network that gives a subnet to each host for use with container runtimes. Platforms like Google's Kubernetes assume that each container (pod) has a unique, routable IP inside the cluster. The advantage of this model is that it reduces the complexity of doing port mapping.

Fully Qualified Domain Name (FQDN)

A fully qualified domain name (FQDN) is the complete domain name for a specific computer, or host, on the internet. The FQDN consists of two parts: the hostname and the domain name. For example, an FQDN for a hypothetical mail server might be mymail.example.com. The hostname is mymail, and the host is located within the domain example.com.

I

Initial Master Node

The Master Node that has been designated as the primary Master Node in the cluster. It is from this node that you will install the cluster infrastructure.

K

Kafka

An open-source messaging system that publishes messages for subscribers to consume on its scalable platform built to run on servers. It is commonly referred to as a message broker.

kubectl

The Kubernetes command line management tool. For more information on kubectl, see https://kubernetes.io/docs/reference/kubectl/overview/

Kubernetes

Kubernetes (K8s) is an open-source system for automating deployment, scaling, and management of containerized applications. It groups containers that make up an application into logical units for easy management and discovery.

L

Labeling

Adding a Kubernetes label to a Master or Worker Node creates an affinity for the workload to the Master or Worker Node, enabling the node to run the specified workload on the labeled server.

Local Docker Registry

The Docker Registry location on the Master and Worker Nodes in the cluster. Application software is launched and managed from the Local Docker Registry.

M

Master Nodes

Master Nodes run the CDF Installer and process web services calls made to the cluster. A minimum of 1 Master Node is required for each cluster.

N

Network File System (NFS)

This is the location where the CDF Installer, Transformation Hub, and other components may store persistent data. A customer-provisioned NFS is required. This environment is referred to in this documentation as an "external" NFS. Although the CDF platform can host a CDF-provisioned NFS (Internal NFS), for high availability an External NFS service should implemented.

Node

A processing location. In CDF containerized applications, nodes come in two types: master and worker.

P

Pod

Applications running in Kubernetes are defined as “pods”, which group containerized components. CDF uses Docker Containers as these components. A pod consists of one or more containers that are guaranteed to be co-located on the host server and can share resources. Each pod in Kubernetes is assigned a unique IP address within the cluster, allowing applications to use ports without the risk of conflict.

Producer

A gatherer of event data, such as a SmartConnector or CTH. Typically data from a producer is forwarded to a destination such as a Transformation Hub topic.

R

Root Installation Folder

The root installation folder is the top-level directory that the Transformation Hub, CDF Installer, and all supporting product files will be installed into. The default setting is /opt/arcsight. It is referred to as RootFolder in this document, supporting scripts, and installation materials.

S

Shared Master and Worker Nodes

A configuration where both Master and Worker Nodes reside on the same hosts. This is not a recommended architecture for high availabillty.

SmartConnector

SmartConnectors automate the process of collecting and managing logs from any device and in any format.

T

Thinpool

Using thin provisioning in Docker, you can manage a storage pool of free space, known as a thinpool, which can be allocated to an arbitrary number of devices when needed by applications.

Transformation Hub

A Kafka-based messaging service that enriches and transforms security data from producers and routes this data to consumers.

Transformation Hub cluster

The Transformation Hub cluster consists of all Master and Worker Nodes in the TH environment.

V

Virtual IP (VIP)

To support high availability on a multi-master installation, a VIP is used as the single IP address or FQDN to connect to a dedicated Master infrastructure that contains 3 or more master Nodes. The Master Nodes manage Worker Nodes. The FQDN of the VIP can also be used to connect to the cluster's Master Nodes.

W

Worker Nodes

Worker nodes ingest, enrich and route events from event producers to event consumers. Worker nodes are automatically load-balanced by the TH infrastructure.

Z

ZooKeeper

In Kafka, a centralized service used to maintain naming and configuration data and to provide flexible and robust synchronization within distributed systems.

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