




Installing Black Duck using OpenShift

Version 4.8.2



This edition of the *Installing Black Duck using OpenShift* refers to version 4.8.2 of Black Duck.

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Please send your comments and suggestions to:

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Black Duck documentation

The documentation for Black Duck consists of online help and these documents:

Title	File	Description
Release Notes	release_notes.pdf	Contains information about the new and improved features, resolved issues, and known issues in the current and previous releases.
Installing Black Duck using Docker Compose	install_compose.pdf	Contains information about installing and upgrading Black Duck using Docker Compose.
Installing Black Duck using Docker Swarm	install_swarm.pdf	Contains information about installing and upgrading Black Duck using Docker Swarm.
Installing Black Duck using Kubernetes	install_kubernetes.pdf	Contains information about installing and upgrading Black Duck using Kubernetes.
Installing Black Duck using OpenShift	install_openshift.pdf	Contains information about installing and upgrading Black Duck using OpenShift.
Getting Started	getting_started.pdf	Provides first-time users with information on using Black Duck.
Scanning Best Practices	scanning_best_practices.pdf	Provides best practices for scanning.
Getting Started with the SDK	getting_started_sdk.pdf	Contains overview information and a sample use case.

Title	File	Description
Report Database	report_db.pdf	Contains information on using the report database.
User Guide	user_guide.pdf	Contains information on using Black Duck's UI.

Black Duck integration documentation can be found on [Confluence](#).

Training

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- Learn – Insights and best practices from other Black Duck product users to allow you to learn valuable lessons from a diverse group of industry leading companies. In addition, the Customer Hub puts all the latest product news and updates from Black Duck at your fingertips, helping you to better utilize our products and services to maximize the value of open source within your organization.
- Solve – Quickly and easily get the answers you're seeking with the access to rich content and product knowledge from Black Duck experts and our Knowledgebase.
- Share – Collaborate and connect with Black Duck staff and other customers to crowdsource solutions and share your thoughts on product direction.

[Access the Customer Success Community](#). If you do not have an account or have trouble accessing the

system, please send an email to communityfeedback@blackducksoftware.com or call us at +1 781.891.5100 ext. 5.

To see all the ways you can interact with Black Duck Support, visit:
<https://www.blackducksoftware.com/support/contact-support>.

OpenShift™ is an orchestration tool from Red Hat used for managing cloud workloads through containers.

This document provides instructions for installing Black Duck on OpenShift.

Black Duck Architecture

Black Duck is deployed as a set of Docker containers so that third-party orchestration tools such as OpenShift can be leveraged to manage individual Black Duck services.

This architecture brings these significant improvements to Black Duck over monolithic deployments:

- Improved performance
- Easier installation and updates
- Scalability
- Product component orchestration and stability

See [containers](#) for more information on the Docker containers that comprise the Black Duck application.

Visit the Red Hat OpenShift website: <https://www.openshift.com> for more information.

Components hosted on Black Duck servers

The following remote Black Duck services are leveraged by Black Duck:

- Registration server: Used to validate Black Duck's license.
- Black Duck KnowledgeBase server: The Black Duck KnowledgeBase (KB) is the industry's most comprehensive database of open source project, license, and security information. Leveraging the Black Duck KB in the cloud ensures that Black Duck can display the most up-to-date information about open source software (OSS) without requiring regular updates to your Black Duck installation.

Chapter 2: Installation planning

This chapter describes the pre-installation planning and configuration that must be performed before you can install Black Duck.

Getting started

The process for installing Black Duck depends on whether you are installing Black Duck for the first time or upgrading from a previous version of Black Duck.

New installations

For new installation of Black Duck:

1. Read this planning chapter to review all requirements.
2. After ensuring that you meet all requirements, go to [Chapter 3](#) for installation instructions.
3. Review [Chapter 4](#) for any administrative tasks.

Upgrading from a previous version of Black Duck

1. Read this planning chapter to review all requirements,
2. After ensuring that you meet all requirements, go to [Chapter 5](#) for upgrade instructions.
3. Review [Chapter 4](#) for any administrative tasks.

Hardware requirements

The following is the minimum hardware that is needed to run a single instance of all containers:

- 5 CPU cores
- 20 GB RAM
- 250 GB of free disk space for the database and other Black Duck containers
- Commensurate space for database backups

Each [container description](#) provides the container's requirements, including if running on a different machine or if more than one instance of a container will be running (currently only supported for the Job Runner and Scan containers).

Note: The amount of required disk space is dependent on the number of projects being managed, so individual requirements can vary. Consider that each project requires approximately 200 MB.

To avoid underlying hardware resource exhaustion by Black Duck, ensure that your OpenShift system administrator has put enterprise-level metrics and logging in place to identify unhealthy nodes on the cluster.

OpenShift requirements

Black Duck supports OpenShift Enterprise versions 3.7 through 3.9 on Amazon Web Services (AWS) EC2. The following restriction applies when using Black Duck on OpenShift:

- The hub-webapp and the hub-logstash services must run on the same pod for proper log integration.

This is required so that the hub-webapp service can access the logs that need to be downloaded.

Operating systems

The Dockerized Black Duck is supported on any OpenShift cluster that passes the standards for OpenShift cluster Conformance. (Click [here](#) for more on OpenShift and Kubernetes conformance.) Platforms that support OpenShift include, but are not limited to:

- CentOS 7.3
- Red Hat Enterprise Linux server 7.3
- Ubuntu 16.04.x
- SUSE Linux Enterprise server version 12.x (64-bit)
- Oracle Enterprise Linux 7.3

Windows operating system is currently not supported.

Software requirements

Black Duck is a web application that has an HTML interface. You access the application via a web browser. The following web browser versions have been tested with Black Duck:

- Chrome 67.0.3396.99 (Official Build) (64-bit)
- Firefox 61.0.1 (64-bit)
- Internet Explorer 11.1155.15063.0
- Microsoft Edge 40.15063.674.0
- Microsoft EdgeHTML 15.15063
- Safari 11.1.2 (13605.3.8)

Note that Black Duck does not support compatibility mode.

Note: These browser versions are the currently-released versions on which Black Duck Software has tested Black Duck. Newer browser versions may be available after Black Duck is released, and may or may not work as expected. Older browser versions may work as expected, but have not been tested and may not be supported.

Network requirements

Black Duck requires the following ports to be externally accessible:

- Port 443 – Web server HTTPS port for Black Duck via NGiNX
- Port 5432 – Read-only database port from PostgreSQL for reporting (or an equivalent exposable port for PostgreSQL read-only)

If your corporate security policy requires registration of specific URLs, connectivity from your Black Duck installation to Black Duck hosted servers is limited to communications via HTTPS/TCP on port 443 with the following servers:

- updates.suite.blackducksoftware.com (to register your software)
- kb.blackducksoftware.com (access the Black Duck KB data)

Note: If you are using a network proxy, these URLs must be configured as destinations in your proxy configuration.

Additional port information

The following list of ports cannot be blocked by firewall rules or by your Docker configuration. Examples of how these ports may be blocked include:

- The `iptables` configuration on the host machine.
- A `firewalld` configuration on the host machine.
- External firewall configurations on another router/server on the network.
- Special Docker networking rules applied above and beyond what Docker creates by default, and also what Black Duck creates by default.

The complete list of ports that must remain unblocked is:

- 443
- 8443
- 8000
- 8888
- 8983
- 16543
- 17543
- 16545
- 16544
- 55436

Database requirements

Black Duck uses the PostgreSQL object-relational database to store data.

For Black Duck version 4.8.2, you must use PostgreSQL version 9.6.x for compatibility with Black Duck version

4.8.2. Refer to [Upgrading Black Duck](#) for database migration instructions if upgrading from a pre-4.2.0 version of Black Duck.

Prior to installing Black Duck, determine whether you want to run PostgreSQL inside a container in a cluster or as an external PostgreSQL instance (for example, [Amazon Relational Database Service \(RDS\)](#)).

Understanding PostgreSQL's security configuration

PostgreSQL security is derived from CFSSL, which runs as a service inside your cluster.

For your Black Duck database to be secure, ensure that:

1. The namespace you are running PostgreSQL in is secure.
2. You have control over the users starting containers in that namespace.
3. The node which was labeled for PostgreSQL is protected from SSH by untrusted users.

Proxy server requirements

Black Duck supports:

- No Authentication
- Digest
- Basic
- NTLM

If you are going to make proxy requests to Black Duck, work with the proxy server administrator to get the following required information:

- The protocol used by proxy server host (http or https).
- The name of the proxy server host
- The port on which the proxy server host is listening.

Configuring your NGiNX server to work with Black Duck

Given that OpenShift manages load balancing, there is no need to configure an NGiNX reverse proxy outside the OpenShift Container Platform router.

Amazon services

You can:

- Install Black Duck on Amazon Web Services (AWS)
Refer to your [AWS documentation](#) for more information on AWS.
- Use Amazon Relational Database Service (RDS) for the PostgreSQL database that is used by Black Duck.

Refer to your [Amazon Relational Database Service documentation](#) for more information on Amazon RDS.

Currently Black Duck requires PostgreSQL version 9.6.x.

Chapter 3: Installing Black Duck

Prior to installing Black Duck, ensure that you meet the following requirements:

Black Duck Installation Requirements	
Hardware requirements	
<input type="checkbox"/>	You have ensured that your hardware meets the minimum hardware requirements .
OpenShift requirements	
<input type="checkbox"/>	You have ensured that your system meets the OpenShift requirements .
Software requirements	
<input type="checkbox"/>	You have ensured that your system and potential clients meet the software requirements .
Network requirements	
<input type="checkbox"/>	<p>You have ensured that your network meets the network requirements. Specifically:</p> <ul style="list-style-type: none">• Ports 443 and port 5432 are externally accessible.• The server has access to updates.suite.blackducksoftware.com which is used to validate the Black Duck license.
Database requirements	
<input type="checkbox"/>	You have selected your database configuration .
Proxy requirements	
<input type="checkbox"/>	You have ensured that your network meets the proxy requirements .
Web server requirements	
<input type="checkbox"/>	Configure web server settings before or after installing Black Duck.

Obtaining the orchestration files

The installation files are available on Github (<https://github.com/blackducksoftware/hub>).

From your OpenShift bastion host (host with access to the Internet and the OpenShift cluster) with oc installed, download the orchestration files. As part of the install/upgrade process, these orchestration files pull down the

necessary Docker images.

Note that although the filename of the `tar.gz` differs depending on how you access the file, the content is the same.

Download from the GitHub page

1. Select the link to download the `.tar.gz` file from the GitHub page:
<https://github.com/blackducksoftware/hub>.

2. Uncompress the Black Duck `.gz` file:

```
gunzip hub-4.8.2.tar.gz
```

3. Unpack the Black Duck `.tar` file:

```
tar xvf hub-4.8.2.tar
```

Download using the wget command

1. Run the following command:

```
wget https://github.com/blackducksoftware/hub/archive/v4.8.2.tar.gz
```

2. Uncompress the Black Duck `.gz` file:

```
gunzip v4.8.2.tar.gz
```

3. Unpack the Black Duck `.tar` file:

```
tar xvf v4.8.2.tar
```

Distributions

The following is a list of files in the distribution:

- `external-postgres-init.pgsql`
- `3-hub.yml`
- `2-postgres-db-internal.yml`
- `2-postgres-db-external.yml`
- `1-cm-hub.yml`
- `1-cfssl.yml`

From the `bin` directory in the distribution:

- `hub_reportdb_changepassword.sh`: Script used to set and change the report database password.
- `hub_db_migrate.sh`: Script used to migrate the PostgreSQL database when using the database container provided by Black Duck.

Using persistent volumes

Both Black Duck's PostgreSQL database and various Black Duck components have data that must be stored.

The default configuration files in the Black Duck installation media specify using `emptyDir` for storage, which provides temporary storage of data. This minimizes complexity, but could result in data loss if Black Duck containers are restarted and rescheduled.

For demonstrations and evaluations, using `emptyDir` is acceptable. In production environments, it is essential to modify Black Duck configuration to use [persistent volume claims](#).

Setting up persistent volumes

Before Black Duck can be configured to use a persistent volume claim, you must first arrange for persistent volumes to be available in your cluster. A full discussion of the myriad ways to implement persistent storage (NFS, Gluster, and others) in a cluster environment is beyond the scope of this guide. Refer to the Red Hat OpenShift documentation on persistent volumes and persistent storage for more information. Consult your system administrator for assistance with storage in your cluster.

After persistent volumes are available, you can modify Black Duck configuration files to create persistent volume claims against the volumes. Do not proceed with a production Black Duck installation until persistent volumes are available in your cluster.

Note: PostgreSQL is known to have problems running in a container when writing to Gluster-based persistent volumes. If you are using Gluster for your underlying file system, Black Duck Software recommends using an external database. For additional information, refer to [this documentation](#).

Creating a namespace

Create a virtual cluster, or namespace, (in OpenShift, also called a “project”), for running Black Duck containers.

Any valid namespace will work, so long as it does not already exist on your cluster and you do not plan on running other applications in it: the namespace must be unique to Black Duck, in order to ensure proper service resolution.

For example:

```
oc new-project my-ns
```

The namespace ensures that all containers, spanning multiple nodes, within the namespace have the same DNS, config maps, and so on.

Note: If you later want to remove Black Duck installation, you can do so with the following command:

```
oc delete project my-ns
```

Customizing your Black Duck configuration files

There are configuration files that must be customized before you can begin the installation of Black Duck.

The following steps refer to configuration files in the installation media you previously transferred to your bastion host.

Use the text editor of your choice to modify your configuration files in the following processes.

Certificates

If this is a production Black Duck installation, then it is highly recommended that you configure your Black Duck to leverage persistent volume claims for persistent storage. To do so, refer to the [Adding a persistent volume claim to a Black Duck service](#). Then, make edits to `1-cfssl.yml` file with the data:

Service	CLAIM_NAME	STORAGE_SIZE	VOLUME_NAME
cfssl	pvclaim-bd-hub-cfssl	1Mi	dir-cfssl

Installing a PostgreSQL database inside a container within the cluster

Black Duck requires a PostgreSQL 9.6 database for all the Black Duck's data storage requirements. If installing the PostgreSQL database inside a container within the cluster:

1. The default database configuration references passwords in a secret called `db-creds`. You must now create that secret now. The command is:

```
oc create secret generic db-creds --from-literal=blackduck=<admin_password> --from-literal=blackduck_user=<user_password> -n <namespace>
```

replace `<admin_password>` and `<user_password>` with passwords of your choice.

2. If this is a production Black Duck installation, you must configure the database to use a persistent volume claim. To do so, refer to [Adding a persistent volume claim to a Black Duck service](#). Then, make edits to the `2-postgres-db-external.yml` file using the following values:

Service	CLAIM_NAME	STORAGE_SIZE	VOLUME_NAME
postgres	pvclaim-bd-hub-postgres	250Gi	postgres-persistent-vol

General Black Duck configuration

1. If this is a production installation, Black Duck Software highly recommends that you configure your Black Duck to leverage persistent volume claims for persistent storage. If this is a non-production Black Duck, this step can be skipped. There are several Black Duck services that must be configured. To do so, refer to [Adding a persistent volume claim to a Black Duck service](#). Then, make edits to the `3-hub.yml` file for each row in the table:

Service	CLAIM_NAME	STORAGE_SIZE	VOLUME_NAME
webapp	pvclaim-bd-hub-webapp	1Gi	dir-webapp
logstash	pvclaim-bd-hub-logstash	50Gi	dir-logstash
webserver	pvclaim-bd-hub-webserver	1Gi	dir-webserver
registration	pvclaim-bd-hub-registration	100Mi	dir-registration
zookeeper	pvclaim-bd-hub-zookeeper	1Gi	dir-zookeeper

Service	CLAIM_NAME	STORAGE_SIZE	VOLUME_NAME
scan	pvclaim-bd-hub-scan	100Mi	dir-scan
authentication	pvclaim-bd-hub-authentication	100Mi	dir-authentication

2. If you are using a network proxy:

- a. These Black Duck services installed in the project (Authentication, Registration, Jobrunner, Webapp and Scan) must be configured to access the following URLs:
 - <https://updates.suite.blackducksoftware.com>
 - <https://kb.blackducksoftware.com>
- b. You must add the proxy environment variables into the `1-cm-hub.yml` file. The variables are:
 - `HUB_PROXY_HOST`. Name of the proxy server host.
 - `HUB_PROXY_PORT`. The port on which the proxy server host is listening.
 - `HUB_PROXY_SCHEME`. Protocol to use to connect to the proxy server.
 - `HUB_PROXY_USER`. Username to access the proxy server.

For NTLM proxies, the variables are:

- `HUB_PROXY_WORKSTATION`. The workstation the authentication request is originating from. Essentially, the computer name for this machine.
- `HUB_PROXY_DOMAIN`. The domain to authenticate within.

Installing Black Duck

Now that your configuration files are customized to your environment, you can start the Black Duck deployment. The following commands must be run from the bastion host containing your configuration files.

Before you begin

Black Duck Software recommends that you make a backup copy of the configuration files that you previously edited. Using a version-control system is ideal, but other mechanisms are possible. Additionally, you may want to run your edited configuration files through a YML syntax-verifier; for example, [YAML Lint](#), to verify that you have not introduced syntax errors into the files.

Creating the service account, certificate service, and configuration map

Only users installing PostgreSQL inside a container within the cluster should create the service account:

```
oc create serviceaccount postgresapp
```

All users need to create the certificate service and configuration map:

```
oc create -f 1-cfssl.yml -n <namespace>
```

```
oc create -f 1-cm-hub.yml -n <namespace>
```

Installing PostgreSQL inside a container

Go to the next section, [Using an external PostgreSQL database](#), if using an external database with Black Duck. Otherwise, to install PostgreSQL inside a container within the cluster, run the command:

```
oc create -f 2-postgres-db-external.yml -n <namespace>
```

You now have a fresh deployment of PostgreSQL in your cluster. You can see the pod you created using the command:

```
oc get pods -n <namespace>
```

Initializing PostgreSQL for use with Black Duck

Now that PostgreSQL is installed, it must be initialized with Black Duck-specific data. This section describes that initialization process.

1. Open the `external-postgres-init.pgsql` file in an editor.
2. Immediately after the line:

```
CREATE USER blackduck_reporter;
```

Add the following two lines:

```
ALTER USER blackduck_user WITH password '<my_postgresql_password>';
```

```
ALTER USER blackduck WITH password '<my_postgresql_admin_password>';
```

3. Save and exit the file.

Verify that the `blackduck_user` password matches the `POSTGRESQL_PASSWORD` set in the file `2-postgres-db-external.yml`. Also, the `blackduck` password must match the `POSTGRESQL_ADMIN_PASSWORD` in the file `2-postgres-db-external.yml`.

4. Run the command:

```
oc get pods -n <namespace>
```

to find the pod name for the PostgreSQL database pod. For example:

NAME	READY	STATUS	RESTARTS	AGE
postgres-z846t	1/1	Running	0	57m

5. Copy the `external-postgres-init.pgsql` file into the database pod using the command:

```
oc cp ./external-postgres-init.pgsql <namespace>/<pod-name>:external-postgres-init.pgsql
```

6. Run the command:

```
oc exec -t -i <pod id> -n <namespace> -- /bin/sh
```

to shell into the database container.

7. In the shell, run the command:

```
psql -a -f external-postgres-init.pgsql
```

8. Exit the container by typing:

```
exit
```

At this point, your database is initialized, and you are ready to install Black Duck.

Note: To use the reporting database in Black Duck, you must set the password for `blackduck_reporter` to enable that account. Use the same `ALTER USER` commands as previously described.

Using an external PostgreSQL database

Run the following commands only if using an external PostgreSQL database.

1. Run the following command:

```
oc create secret generic db-creds --from-literal=blackduck=<my_postgresql_admin_password> --from-literal=blackduck_user=<my_postgresql_password> -n <namespace>
```

2. On your external database, run these commands:

```
psql -a -f /tmp/external-postgres-init.pgsql
```

```
psql -c "ALTER USER blackduck_user WITH password '<my_postgresql_password>'"
```

```
psql -c "ALTER USER blackduck WITH password '<my_postgresql_admin_password>'"
```

Creating Black Duck containers

Now that your PostgreSQL database is configured, you can create Black Duck containers. To do so, run the command:

```
oc create -f 3-hub.yml -n <namespace>
```

It will take several minutes for all the pods to start. At any time, you can see the progress of the pod creation using the command:

```
oc get pods -n <namespace>
```

If, after several minutes, all pods show a status of 'Running', then Black Duck is installed.

Setting up an OpenShift route

Immediately after the installation of Black Duck in OpenShift, the IP addresses of the containers are internal (10.x), and are not visible or routable to the Internet. To make Black Duck services, such as the Web UI, externally available, you must create an OpenShift route.

You can do this either using the OpenShift Master URL to launch the OpenShift UI, or, you can use the `oc`

command line.

Using the OpenShift UI

1. Select your project/namespace.
2. Navigate to **Applications > Routes**.
3. Click **Create Route** and provide the following:
 - a. Route name.
 - b. For Black Duck versions 4.5.0 and higher, select **webserver** as the service.
 - c. Click **secure route**.
 - d. Select **Passthrough for TLS termination**.
 - e. Optionally, select **Redirect for Insecure Traffic**.

The value of the resulting host name field is the URL to Black Duck.

Using the Command Line

Use this command to create a route:

```
oc create route passthrough --service=webserver --hostname=<master URL IP Address>.xip.io
```

Starting over

If you need to edit the `3-hub.yml` file and re-create Black Duck, the best course of action is to delete the pods created by the `3-hub.yml` file, and then recreate them by running the command:

```
oc delete -f 3-hub.yml -n <namespace>
```

Followed by the command:

```
oc create -f 3-hub.yml -n <namespace>
```

Connecting to Black Duck

Once all of the containers for Black Duck are up, the web application will be exposed on port 443 to the Docker host. Be sure that you have [configured the hostname](#) and then you can access Black Duck.

Access Black Duck, for example, at either:

- `https://my-company-openshift/hub`
- `https://${external-ip}.xip.io/hub`

For example, `128.100.200.300.xip.io`, if you have a router running on an exposed IP at `128.100.200.300`.

The first time you access Black Duck, the Registration & End User License Agreement appears. You must accept the terms and conditions to use Black Duck.

Enter the registration key provided to you to access Black Duck.

Note: If you need to reregister, you must accept the terms and conditions of the End User License Agreement again.

Chapter 4: Administrative tasks

This section describes these administrative tasks:

- [Understanding the default sysadmin user.](#)
- [Configuring web server settings](#), such as configuring the [hostname](#), [host port](#), or [disabling IPv6](#).
- [Configuring proxy settings.](#)
- [Replacing the existing self-signed certificate for the Web Server with a custom certificate.](#)
- [Scaling job runner and scan containers.](#)
- [Configuring the report database password.](#)
- [Providing access to the API documentation through a proxy server.](#)
- [Providing access to the REST APIs from a non-Black Duck server.](#)
- [Configuring secure LDAP.](#)
- [Configuring Single Sign-On \(SSO\).](#)
- [Enabling the hierarchical BOM.](#)
- [Including ignored components in reports.](#)
- [Backing up Postgres volumes.](#)

Understanding the default sysadmin user

When you install Black Duck, there is a default system administrator (sysadmin) account already configured. The default sysadmin user has all roles and permissions associated with it.

Tip: As a best practice, you should use the default sysadmin account for your initial log in and then immediately change the default password—blackduck—so that the server is secure. To change your password, select **My Profile** from your username/user profile icon in the upper right corner of the Black Duck UI.

Environment variables

Several environment variables can be set to customize your Black Duck installation in an OpenShift environment.

Note: If you wish to modify an environment variable setting *before* you install Black Duck, simply edit the `1-cm-hub.yml` file appropriately, then run the “oc create” command. But if you wish to modify an environment variable *after* you have installed Black Duck, it is best to use the “oc edit” command as shown below:

Run the following command and replace “<my_ns>” with the name of your namespace:


```
oc edit cm hub-config -n <my_ns> -o yaml
```

Running this command displays the config map in a "vi" editor. Add the environment variable you wish to change.

Note: To edit the value, press "i" to edit, modify the field accordingly, then press ":wq" to save the config map and exit.

Web server settings

The following sections describe the required web server settings for a OpenShift environment.

Host name modification

When the web server starts up, if it does not have certificates configured, a self-signed certificate is generated. To ensure that the hostname on the self-signed certificate matches the hostname actually used to reach the web server, you must set the web server hostname. Otherwise, the certificate uses the service name as the hostname, and SSL handshake errors could result.

To inform the webserver of the hostname used to reach it, edit the `1-cm-hub.yaml` file to update the desired host name value.

`PUBLIC_HUB_WEBSERVER_HOST=LOCALHOST` value

Port modification

In an OpenShift environment, it is common to leverage an OpenShift Route to forward network requests to nodes. In a Black Duck installation in OpenShift, this OpenShift Route will forward web traffic to Black Duck's NGiNX proxy server, which sends traffic along to Black Duck's webapp.

If you want to change either the port that external users use to connect to the web server (for example, a web browser connecting to Black Duck's web UI), or, the port that the NGiNX proxy server listens on from the External Load Balancer (ELB), you need to edit the `1-cm-hub.yaml` file.

To change the publicly-exposed web server port, edit `PUBLIC_HUB_WEBSERVER_PORT` from its default value of 443.

To change the port that the NGiNX listens to from the ELB, edit `HUB_WEBSERVER_PORT` from its default value of 8443.

Disabling IPv6

By default, NGiNX listens on IPv4 and IPv6. If IPv6 is disabled on a host machine, change the value of the `IPV4_ONLY` value in the HUB WEBSERVER SECTION in the `1-cm-hub.yaml` file to 1.

Proxy settings

There are currently four services requiring access to services hosted by Black Duck Software:

- Authentication
- Registration

- Jobrunner
- Webapp
- Scan

If a proxy is required for external internet access, you must configure it.

⚙ To configure the proxy for external internet access:

1. Add the required parameters for your proxy setup to the `1-cm-hub.yml` file.

Proxy environment variables are:

- `HUB_PROXY_HOST`. Name of the proxy server host.
- `HUB_PROXY_PORT`. The port on which the proxy server host is listening.
- `HUB_PROXY_SCHEME`. Protocol to use to connect to the proxy server.
- `HUB_PROXY_USER`. Username to access the proxy server.

The environment variables for NTLM proxies are:

- `HUB_PROXY_WORKSTATION`. The workstation the authentication request is originating from. Essentially, the computer name for this machine.
- `HUB_PROXY_DOMAIN`. The domain to authenticate within.

Proxy password

In the `1-cm-hub.yml` file specify the proxy password by entering it as the `HUB_PROXY_PASSWORD` value. Note that it must be a base64 encoded password.

```
# If you are using a proxy password, creation of this stanza will fail.
# that is ok.
- apiVersion: v1
  kind: Secret
  metadata:
    name: hub-proxy-pass
  data:
    HUB_PROXY_PASSWORD: "ZHVtbXkK"
```

Managing certificates

By default, Black Duck uses an HTTPS connection. The default certificate used to run HTTPS is a self-signed certificate which means that it was created locally and was not signed by a recognized Certificate Authority (CA).

If you use this default certificate, you will need to make a security exception to log in to Black Duck's UI, as your browser does not recognize the issuer of the certificate, so it is not accepted by default.

You will also receive a message regarding the certificate when connecting to the Black Duck server when scanning as the Black Duck Scanner cannot verify the certificate because it is a self-signed and is not issued by a CA. Note that the Black Duck Scanner Desktop does provide an option that allows you to connect to a Black Duck instance with a self-signed certificate.

You can obtain a signed SSL certificate from a Certificate Authority of your choice. To obtain a signed SSL certificate, create a Certificate Signing Request (CSR), which the CA then uses to create a certificate that will identify the server running your Black Duck instance as "secure". After you receive your signed SSL certificate from the CA, you can replace the self-signed certificate.

⚙️ To create an SSL certificate keystore

1. At the command line, to generate your SSL key and a CSR, type:

```
openssl genrsa -out <keyfile> <keystrength>
openssl req -new -key <keyfile> -out <CSRfile>
```

where:

- **<keyfile>** is <your company's server name>.key
- **<keystrength>** is the size of your site's public encryption key
- **<CSRfile>** is <your company's server name>.csr

Note: It is important that the name entered for your company's server be the full hostname that your SSL server will reside on, and that the organization name be identical to what is in the 'whois' record for the domain.

For example:

```
openssl genrsa -out server.company.com.key 1024
openssl req -new -key server.company.com.key -out server.company.com.csr
```

This example creates a CSR for server.company.com to get a certificate from the CA.

2. Send the CSR to the CA by their preferred method (usually through a web portal).
3. Indicate that you need a certificate for an Apache web server.
4. Provide any requested information about your company to the CA. This information must match your domain registry information.
5. Once you receive your certificate from the CA, use the instructions in the next section to upload the certificate into a Black Duck instance.

Using a custom web server certificate-key pair

You can use your own web server certificate-key pairs for establishing secure socket layer (SSL) connections to the Black Duck's web server.

1. To use a custom certificate, create two OpenShift secrets called `WEBSERVER_CUSTOM_CERT_FILE` and `WEBSERVER_CUSTOM_KEY_FILE` with the custom certificate and custom key, respectively, in your namespace:

```
oc secret create WEBSERVER_CUSTOM_CERT_FILE --from-file=<certificate file>
oc secret create WEBSERVER_CUSTOM_KEY_FILE --from-file=<key file>
```

2. In the `3-hub.yml` file, find the commented section for the webserver certificate ("Uncomment this line to add a custom TLS Certificate for the web server.") and uncomment the lines:

```
spec:
  volumes:
    - name: dir-webserver
      emptyDir: {}
    # Uncomment this line to add a custom TLS Certificate for the web server.
    # - name: nginx-certs
    #   secret:
    #     secretName: nginx-certs
    #   items:
    #     - key: WEBSERVER_CUSTOM_CERT_FILE
    #       path: WEBSERVER_CUSTOM_CERT_FILE
    #     - key: WEBSERVER_CUSTOM_KEY_FILE
    #       path: WEBSERVER_CUSTOM_KEY_FILE
```

Scaling job runner and scan containers and setting memory

The job runner and scan containers can be scaled.

Scaling job runner containers

Job runners can be scaled up or down.

This example adds a second jobrunner container:

```
oc scale rc jobrunner --replicas=2
```

You can remove a job runner container by specifying a lower number than the current number of job runners. The following example scales back the job runner container to a single container:

```
oc scale rc jobrunner --replicas=1
```

Scaling scan containers

This example adds a second scan container:

```
oc scale rc scan --replicas=2
```

You can remove a scan container by specifying a lower number than the current number of scan containers. The following example scales back the scan container to a single container:

```
oc scale rc scan --replicas=1
```

Setting Memory

The default memory assigned to a job runner is 4 GB. Depending on the velocity of data, more memory might need to be allocated (12 GB or more, depending on circumstances).

The default memory assigned to Web App is 2 GB. Depending on circumstances, more memory might need to

be allocated (10GB or more).

Work with your authorized support representative to determine the right amount of memory for Job Runner and Web App for your environment.

Configuring the report database password

A PostgreSQL report database provides access to Black Duck data for reporting purposes. The database port is exposed to the OpenShift network for connections to the report user and report database.

Note the following:

- Exposed port: 5432.
- Username: `blackduck_reporter`. This user has read-only access to the database.
- Reporting database name: `bds_hub_report`
- Reporting user password. Not initially set.

To change the `blackduck_reporter` password, use the following command, which in this example, sets the password to `blackduck`:

```
ALTER USER blackduck_reporter WITH password 'blackduck'
```

After the password is set, you can connect to the reporting database.

Note that if you create a headless service such that your external database is expressed through a PostgreSQL endpoint (this is not common), then you can use the following commands to obtain information about the internal and external IP address for your PostgreSQL service:

```
oc get service postgres -o wide
```

The command displays information such as the following:

NAME	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
postgres	1.2.3.4	<none>	5432/TCP	9d

Since your PostgreSQL client is outside the cluster in an OpenShift installation, take the external IP address and run the following command to open an interactive Postgres terminal to the remote database:

```
psql -U blackduck_reporter -p 5432 -h $external_ip_from_above -W bds_hub_report
```

Accessing the API documentation through a proxy server

If you are using a reverse proxy and that reverse proxy has Black Duck under a subpath, configure the `BLACKDUCK_SWAGGER_PROXY_PREFIX` property so that you can access the API documentation. The value of `BLACKDUCK_SWAGGER_PROXY_PREFIX` is the Black Duck path. For example, if you have Black Duck being accessed under `'https://customer.companyname.com/hub'` then the value of `BLACKDUCK_SWAGGER_PROXY_PREFIX` would be `'hub'`.

Specify the values in the `hub-nginx` image stanza in the `3-hub.yml` file. Specify the values in the `hub-nginx`

image stanza in the `3-hub.yml` file.

Accessing the REST APIs from a non-Black Duck server

You may wish to access Black Duck REST APIs from a web page that was served from a non-Black Duck server.

To enable this feature, Cross Origin Resource Sharing (CORS) must be enabled.

The properties used to enable and configure CORS for Black Duck installations are:

Property	Description
BLACKDUCK_HUB_CORS_ENABLED	Required. Defines whether CORS is enabled; "true" indicates CORS is enabled.
BLACKDUCK_CORS_ALLOWED_ORIGINS_PROP_NAME	<p>Required. Allowed origins for CORS.</p> <p>The browser sends an origin header when it makes a cross-origin request. This is the origin that must be listed in the <code>blackduck_hub_cors_allowedOrigins/BLACKDUCK_CORS_ALLOWED_ORIGINS_PROP_NAME</code> property.</p> <p>For example, if you are running a server that serves a page from <code>http:///123.34.5.67:8080</code>, then the browser should set this as the origin, and this value should be added to the property.</p> <p>Note that the protocol, host, and port must match. Use a comma-separated list to specify more than one base origin URL.</p>
BLACKDUCK_CORS_ALLOWED_HEADERS_PROP_NAME	Optional. Headers that can be used to make the requests.
BLACKDUCK_CORS_EXPOSED_HEADERS_PROP_NAME	Optional. Headers that can be accessed by the browser requesting CORS.

Specify the values in the `hub-nginx` image stanza in the `3-hub.yml` file.

Configuring secure LDAP

If you see certificate issues when connecting your secure LDAP server to Black Duck, the most likely reason is that Black Duck server has not set up a trust connection to the secure LDAP server. This usually occurs if you are using a self-signed certificate.

To set up a trust connection to the secure LDAP server, import the server certificate into the local Black Duck LDAP truststore by:

1. Obtaining your LDAP information.
2. Using the Black Duck UI to import the server certificate.

Obtaining your LDAP information

Contact your LDAP administrator and gather the following information:

LDAP Server Details

This is the information that Black Duck uses to connect to the directory server.

- (required) The host name or IP address of the directory server, including the protocol scheme and port, on which the instance is listening.

Example: `ldaps://<server_name>.<domain_name>.com:339`

- (optional) If your organization does not use anonymous authentication, and requires credentials for LDAP access, the password and either the LDAP name or the absolute LDAP distinguished name (DN) of a user that has permission to read the directory server.

Example of an absolute LDAP DN: `uid=ldapmanager,ou=employees,dc=company,dc=com`

Example of an LDAP name: `jdoe`

- (optional) If credentials are required for LDAP access, the authentication type to use: simple or digest-MD5.

LDAP Users Attributes

This is the information that Black Duck uses to locate users in the directory server:

- (required) The absolute base DN under which users can be located.

Example: `dc=example,dc=com`

- (required) The attribute used to match a specific, unique user. The value of this attribute personalizes the user profile icon with the name of the user.


Example: `uid={0}`

Test Username and Password

- (required) The user credentials to test the connection to the directory server.

Importing the server certificate

⚙ To import the server certificate

1. Log in to Black Duck as a system administrator.
2. Click the expanding menu icon () and select **Administration**.
The Administration page appears.
3. Select **LDAP integration** to display the LDAP Integration page.

The screenshot shows the 'LDAP Integration' administration page. It is divided into several sections: 'LDAP Server Details', 'LDAP User Attributes', 'LDAP Attribute Mappings', 'LDAP Groups', and 'Test Connection, User Authentication and Field Mapping'. The 'LDAP Server Details' section has a toggle for 'Enable LDAP' (checked), a 'Server URL' field, an 'Authentication Type' dropdown (set to 'Nothing Selected'), and 'Manager DN' and 'Manager Password' fields. The 'LDAP User Attributes' section has 'User Search Base', 'User Search Filter', and 'User DN Pattern' fields. The 'LDAP Attribute Mappings' section has 'First Name', 'Last Name', and 'Email' fields. The 'LDAP Groups' section has a toggle for 'Synchronize LDAP groups' (checked), and 'Group search base', 'Group filter', and 'Group name attribute' fields. A 'Save' button is located at the bottom right of the 'LDAP Groups' section. The 'Test Connection, User Authentication and Field Mapping' section has 'Test Username' and 'Test Password' fields, and a 'Test Connection' button with a lock icon.

Administration
LDAP Integration

LDAP Server Details

Enable LDAP ☒ Enable LDAP

Server URL

Authentication Type

Manager DN

Manager Password

LDAP User Attributes

User Search Base

User Search Filter

User DN Pattern

LDAP Attribute Mappings

First Name

Last Name

Email

LDAP Groups

Synchronize LDAP groups ☒ Synchronize LDAP groups

Group search base

Group filter

Group name attribute

Save

Test Connection, User Authentication and Field Mapping

Tests ability to connect. Also tests ability to authenticate test-user and shows result of mapping test-user's meta-data. Note: test-user credentials are not saved.

Test Username

Test Password

Test Connection

4. Select the **Enable LDAP** option and complete the information in the **LDAP Server Details** and **LDAP User Attributes** sections, as described above. In the **Server URL** field, ensure that you have configured the secure LDAP server: the protocol scheme is `ldaps://`.
5. Enter the user credentials in the **Test Connection, User Authentication and Field Mapping** section and click **Test Connection**.

- If there are no issues with the certificate, it is automatically imported and the "Connection Test Succeeded" message appears:

Test Connection, User Authentication and Field Mapping

Tests ability to connect. Also tests ability to authenticate test-user and shows result of mapping test-user's meta-data. Note: test-user credentials are not saved.

Test Username * flast

Test Password *

Test Connection

✓ First Name	First
✓ Last Name	Last
✓ Email	flast@company.com

- If there is an issue with the certificate, a dialog box listing details about the certificate appears:

Certificate Problem

Details about the certificates are below. If you'd like to accept this certificate, press "Save".

Certificate Details	
Issuer	CN=www.blackducksoftware.com, OU=Engineering, O=Black Duck Software, Inc., L=Burlington, ST=Massachusetts, C=US
Subject	CN=www.blackducksoftware.com, OU=Engineering, O=Black Duck Software, Inc., L=Burlington, ST=Massachusetts, C=US
Alt Subjects	blackducksoftware.com, ldap.blackducksoftware.com, sknb, *.updates.blackducksoftware.com
Begins On	Jun 19, 2017
Expires On	Jun 19, 2019
Algorithm	SHA1withRSA

Cancel Save

Do one of the following:

- Click **Cancel** to fix the certificate issues.

Once fixed, retest the connection to verify that the certificate issues have been fixed and the certificate has been imported. If successful, the "Connection Test Succeeded" message appears.

- Click **Save** to import this certificate.

Verify that the certificate has been imported by clicking **Test Connection**. If successful, the "Connection Test Succeeded" message appears.

LDAP trust store password

For assistance in modifying an LDAP trust store password in a OpenShift environment, contact your authorized Black Duck support representative.

Configuring SAML for Single Sign-On

Security Assertion Markup Language (SAML) is an XML-based, open-standard data format for exchanging authentication and authorization data between parties. For example, between an identity provider and a service provider. Black Duck's SAML implementation provides single sign-on (SSO) functionality, enabling Black Duck users to be automatically signed-in to Black Duck when SAML is enabled. Enabling SAML applies to all your Black Duck users, and cannot be selectively applied to individual users.

To enable or disable SAML functionality, you must be a user with the system administrator role.

For additional SAML information:

- Assertion Consumer Service (ACS): <https://host/saml/SSO>
- Recommended Service Provider Entity ID: **https://host** where *host* is your Black Duck server location.

Note the following:

- Black Duck is able to synchronize and obtain an external user's information (Name, FirstName, LastName and Email) if the information is provided in attribute statements. Note that the first and last name values are case-sensitive.

Black Duck is also able to synchronize an external user's group information if you enable group synchronization in Black Duck.

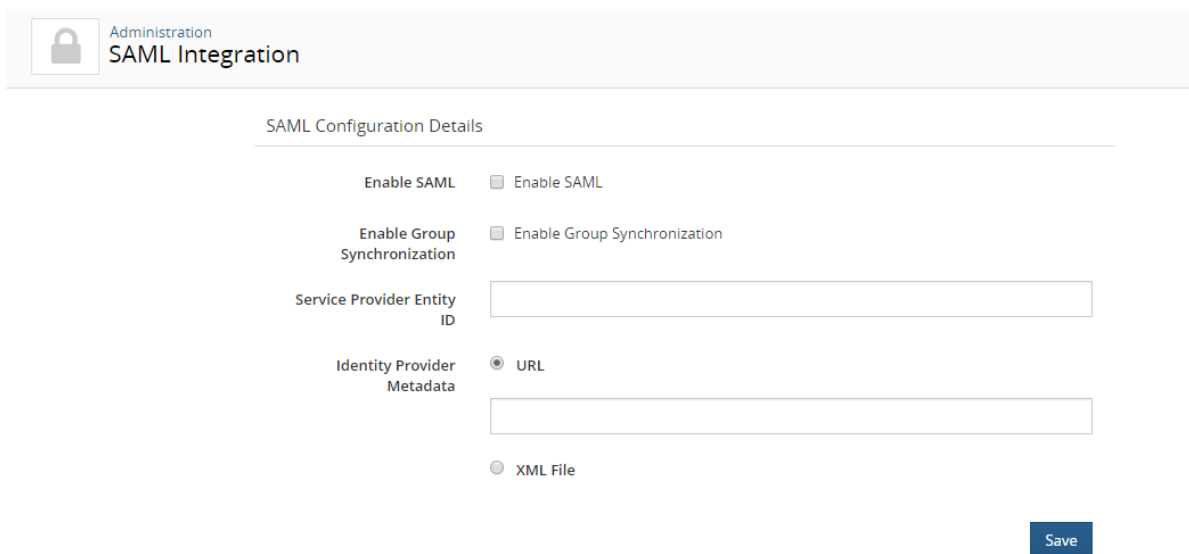
- When logging in with SAML enabled, you are re-directed to your identity provider's login page, not Black Duck's login page.
- When SSO users log out of Black Duck, a logout page now appears notifying them that they successfully logged out of Black Duck. This logout page includes a link to log back into Black Duck; users may not need to provide their credentials to successfully log back in to Black Duck.
- If there are issues with the SSO system and you need to disable the SSO configuration, you can enter the following URL: *Black Duck servername/sso/login* to log in to Black Duck.

⚙️ To enable single sign-on using SAML

1. Click the expanding menu icon () and select **Administration**.

The Administration page appears.

2. Select **SAML Integration** to display the SAML Integration page.



Administration
SAML Integration

SAML Configuration Details

Enable SAML ☐ Enable SAML

Enable Group Synchronization ☐ Enable Group Synchronization

Service Provider Entity ID

Identity Provider Metadata ☒ URL ☐ XML File


Save

3. In the **SAML Configuration Details** settings, complete the following:
 - a. Select the **Enable SAML** check box.
 - b. Optionally, select the **Enable Group Synchronization** check box. If this option is enabled, upon login, groups from IDP are created in Black Duck and users will be assigned to those groups. Note that you must configure IDP to send groups in attribute statements with the attribute name of 'Groups'.
 - c. **Service Provider Entity ID** field. Enter the information for the Black Duck server in your environment in the format **https://host** where *host* is your Black Duck server.
 - d. **Identity Provider Metadata**. Select one of the following:
 - **URL** and enter the URL for your identity provider.
 - **XML File** and either drop the file or click in the area shown to open a dialog box from which you can select the XML file.
4. Click **Save**.
5. Add the `HUB_SAML_EXTERNAL_URL` to your `hub-proxy.env` file (for Docker Swarm or Docker Compose) or the `3-hub.yml` file (for Kubernetes or OpenShift). The value is the public URL of the Black Duck server. For example:

```
HUB_SAML_EXTERNAL_URL=https://blackduck-docker01.dc1.lan
```

Note: You must restart Black Duck for your configuration changes to take effect.

⚙ To disable single sign-on using SAML

1. Click the expanding menu icon () and select **Administration**.
2. Select **SAML Integration** to display the SAML Integration page.
3. In the **SAML Configuration Details** settings, clear the **Enable SAML** check box.
4. Click **Save**.

Note: You must restart Black Duck for your configuration changes to take effect.

Enabling the hierarchical BOM

By default, the hierarchical BOM is disabled. To enable this feature, add the `HUB_HIERARCHICAL_BOM` environment variable. Set the value to "true", for example, `HUB_HIERARCHICAL_BOM=true`.

Resetting the value to "false" disables the feature.

Including ignored components in reports

By default, ignored components and vulnerabilities associated with those ignored components are excluded from the Vulnerability Status report, Vulnerability Update report, Vulnerability Remediation report and the

Project Version report. To include ignored components, set the value of the BLACKDUCK_REPORT_IGNORED_COMPONENTS environment variable to "true".

Resetting the value of the BLACKDUCK_REPORT_IGNORED_COMPONENTS to "false" excludes ignored components.

Backing up PostgreSQL volumes

Ensure that the volumes you use for PostgreSQL data storage are backed up on a regular basis. Consult your OpenShift/Docker/PostgreSQL system administrator for information on how to back up PostgreSQL data volumes.

Chapter 5: Upgrading Black Duck

This chapter describes how to upgrade an existing Black Duck on OpenShift to a newer version of Black Duck on OpenShift.

Note: Upgrading Black Duck from a non-OpenShift Black Duck installation (for example, AppMgr Black Duck) to OpenShift is simply a fresh Black Duck install on OpenShift plus a data migration. See [Chapter 3](#) for information on fresh Black Duck installs.

Upgrading Black Duck

OpenShift applications can be upgraded using native OpenShift image update commands. As such, upgrading Black Duck on OpenShift is basically Black Duck's deployments (pods, essentially).

Backing up the PostgreSQL database

Black Duck Software recommends completing a PostgreSQL database backup prior to upgrading Black Duck.

This section describes the process of backing up and restoring Black Duck database data. It covers backing up AppMgr Black Duck data (for migration purposes).

Backing up a PostgreSQL database from an AppMgr architecture

If you have a version of Black Duck using AppMgr whose data you want to migrate to a new OpenShift PostgreSQL node, follow these steps to back up the data:

⚙ To back up the original PostgreSQL database

1. Log in to Black Duck server as the **blackduck** user.

Note: This is the user that owns Black Duck database and installation directory.

2. Run the following commands to dump to a compressed file.

```
export PATH=$PATH:/opt/blackduck/hub/postgresql/bin
export PGPORT=5432
pg_dump -Fc -f /tmp/bds_hub.dump bds_hub
```

Tip: Ensure that you dump the database to a location with sufficient free space. This example uses /tmp.

This command puts the information from the `bds_hub` database into a file called `bds_hub.dump` in the `/tmp` directory. It ignores several scratch tables that do not need to be backed up.

3. Save the `bds_hub.dump` file on another system or offline.

Tip: If you find that dumping the database takes too long, you can greatly increase the speed by dumping it to an uncompressed file. The trade-off is that while the dump is completed up to 3 times faster, the resulting file may be 4 times larger. To experiment with this on your system, add the `--compress=0` parameter to your `pg_dump` command.

To migrate this backed-up data to your external relational database system, contact your relational database administrator.

Upgrading Black Duck

Note: Black Duck Software recommends that no scans be active/initiated and that users remained logged off of Black Duck web UI while the upgrade is occurring.

There are two steps to upgrading Black Duck in OpenShift:

1. Upgrade the config map.
2. Upgrade the containers.

Note: If you are upgrading from a pre-4.8.0 version to 4.8.0 or later, and you use the default Postgres database in a container, then before proceeding, backup your database using the instructions in the previous section.

Upgrading the config map

1. To upgrade the config map, run the "oc edit" command to edit the config map in YAML format. Replace "`<my_ns>`" with the name of your namespace:

```
oc edit cm hub-config -n <my_ns> -o yaml
```

Running this command brings up the config map in a "vi" editor.

2. Search for "HUB_VERSION", and change the value to the version of Black Duck you are upgrading to.

Note: To edit the value, press "i" to edit, modify the version field accordingly, then press ":wq" to save the config map and exit.

Upgrading the containers

The command to upgrade a container in OpenShift is:

```
oc set image <image> container_name=hub-image:version -n <my_ns>
```

The following Black Duck containers each needs to be individually updated:

- `hub-cfssl`
- `hub-documentation`

- hub-postgres
- hub-jobrunner
- hub-webapp
- hub-webserver
- hub-logstash
- hub-registration
- hub-solr
- hub-zookeeper
- hub-scan
- hub-authentication

For example, here are the specific commands that must be run to upgrade to Black Duck 4.8.2:

```
oc set image deployment/cfssl cfssl=docker.io/blackducksoftware/hub-  
cfssl:4.8.2 -n <my_ns>  
  
oc set deployment/documentation  
documentation=docker.io/blackducksoftware/hub-documentation:4.8.2 -n <my_  
ns>  
  
oc set image deployment/jobrunner  
jobrunner=docker.io/blackducksoftware/hub-jobrunner:4.8.2 -n <my_ns>  
  
oc set image deployment/postgres postgres=docker.io/blackducksoftware/hub-  
postgres:4.8.2 -n <my_ns>
```

Note: This postgres command can be skipped if you use an external database.

```
oc set image deployment/webapp-logstash  
webapp=docker.io/blackducksoftware/hub-webapp:4.8.2 -n <my_ns>  
  
oc set image deployment/webapp-logstash  
logstash=docker.io/blackducksoftware/hub-logstash:4.8.2 -n <my_ns>  
  
oc set image deployment/webserver  
webserver=docker.io/blackducksoftware/hub-nginx:4.8.2 -n <my_ns>  
  
oc set image deployment/registration  
registration=docker.io/blackducksoftware/hub-registration:4.8.2 -n <my_ns>  
  
oc set image deployment/solr solr=docker.io/blackducksoftware/hub-  
solr:4.8.2 -n <my_ns>  
  
oc set image deployment/zookeeper  
zookeeper=docker.io/blackducksoftware/hub-zookeeper:4.8.2 -n <my_ns>  
  
oc set deployment/scan scan=docker.io/blackducksoftware/hub-can:4.8.2 -n  
<my_ns>  
  
oc set image deployment/authentication
```



```
authentication=docker.io/blackducksoftware/hub-authentication:4.8.2 -n <my_
ns>
```

Note: If you are upgrading from a pre-4.8.0 version to 4.8.0 or later, and you use the default Postgres database in a container, then as a final step, restore your database backup using the procedures described in the previous section "Restoring/migrating database data".

Appendix A: Adding a persistent volume claim to a service

This appendix describes how to request persistent storage for a particular Black Duck service using a Persistent Volume Claim.

Note: Before following these instructions, your cluster must have persistent volumes available against which to make claims. Click [here](#) for more information.

Prior to executing this procedure, you must know the following information:

- The name of the configuration file you are editing, for example, `1-cfssl.yml`.
- The name of the service whose stanza you are editing; for example, `cfssl`.

You must also know the following values, which you must substitute into the configuration file:

- `CLAIM_NAME`: The name of the persistent volume claim; for example, `pvclaim-bd-hub-cfssl`.
- `STORAGE_SIZE`: The amount of storage to request from the persistent volume; for example, `1Mi`.
- `VOLUME_NAME`: The name of the persistent volume inside the pod; for example, `pv-bd-hub-cfssl`.

Do not proceed with these instructions until you have the required information.

Creating a persistent volume claim for a service

1. A separate persistent volume and persistent volume claim is required for each service for which you want to set up persistent storage. Assuming you have already created the persistent volume for a service, its corresponding persistent volume claim must have the following base form:

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: CLAIM_NAME
  annotations:
    volume.beta.kubernetes.io/storage-class: ""
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: STORAGE_SIZE
```

Note: Your `accessMode` may be different, depending on your setup. Refer to the previous section for replacement values for `CLAIM_NAME` and `STORAGE_SIZE`.

2. After you have saved and created your persistent volume claim, double-check that the persistent volume claim is bound to the correct persistent volume. For example, the persistent volume claim for the cfssl service must be bound to the persistent volume for the cfssl service. If it is not, this must be addressed before continuing. A method for ensuring this is by utilizing volume and claim pre-binding. Refer to your OpenShift documentation for more information.

Editing a configuration file for a service

1. In the configuration file for the service for which you are setting up persistent storage, search for the stanza corresponding to that service. For example, if you are editing the cfssl service, then search for cfssl. Inside the service's stanza, there should be a volume reference with an `emptyDir` specification of the form:

```
volumes:
- emptyDir: {}
  name: VOLUME_NAME
```

Replace `emptyDir: {}` with the persistent volume claim information. The resulting stanza should have the form:

```
volumes:
- persistentVolumeClaim:
    claimName: CLAIM_NAME
  name: VOLUME_NAME
```

Refer to the previous section for replacement values for `VOLUME_NAME` and `CLAIM_NAME`.

2. In this same service stanza in your configuration file, there should be a volume mount stanza of the form:

```
volumeMounts:  
- mountPath: /xxxx/yyyy/zzzz  
  name: VOLUME_NAME
```

Ensure that the `VOLUME_NAME` in the volume mount section matches the `VOLUME_NAME` in the previous step. These values must match, as it is this common `VOLUME_NAME` that associates the claim with the mount.

Note: Do not change the `mountPath`. Each Black Duck service expects a particular mount path and is it already correctly specified.

3. Save and close the configuration file.

Appendix B: Debugging a running deployment

This chapter provides information on debugging Black Duck on OpenShift deployment. The procedures can help you determine whether your OpenShift cluster is working properly.

Viewing running pods

Use the following command to see which pods are running:

```
oc get pods
```

You should see output similar to the following:

NAME	READY	STATUS	RESTARTS	AGE
cfssl-258485687-m3szc	1/1	Running	0	3h
jobrunner-1397244634-xgcn2	1/1	Running	2	26m
nginx-webapp-logstash-2564656559-6fbq8	3/3	Running	0	26m
postgres-1794201949-tt4gj	1/1	Running	0	3h
registration-2718034894-7brjv	1/1	Running	0	26m
solr-1180309881-sscs1	1/1	Running	0	26m
zookeeper-3368690434-rnz3m	1/1	Running	0	26m

In the above example, there are pods containing a single container each (cfssl, jobrunner, postgres, registration, solr, and zookeeper) and a pod containing three containers (nginx, webapp, logstash).

Troubleshooting

If a particular Black Duck pod fails to start, you can investigate the cause with the following command:

```
oc describe pod <pod-name> --namespace=<namespace-name>
```

View the **Events** section of the output. Causes and messages display; for example, a reason such as 'FailedScheduling', along with a message such as Insufficient memory. In the case of insufficient resources, you can diagnose the issue by running the commands:

```
oc get nodes
```

and

```
oc describe node <node address>
```

These commands display the requests being made of the cluster by the node.

Executing Docker commands and viewing container log files

You can use the “oc exec” command to execute a Docker command inside a Docker container inside a pod. This is especially helpful in viewing log files. The generic syntax is:

```
oc exec -t -i <pod_name> -c <container name> <Docker command>
```

For example, to view the log file of the load balancer shown in the previous example, the command is:

```
oc exec -t -i nginx-webapp-logstash-2564656559-6fbq8 -c nginx cat
/var/log/nginx/nginx-access.log
```

The command displays the following output:

```
192.168.21.128 - - [12/Jul/2017:18:13:12 +0000] "GET /api/v1/registrations?summary=true&_=1499883191824 HTTP/1.1" 200 7634
192.168.21.128 - - [12/Jul/2017:18:13:12 +0000] "GET /api/internal/logo.png HTTP/1.1" 200 7634 "https://a0145b939671c10.0.25.32 - - [12/Jul/2017:18:25:42 +0000] "GET / HTTP/1.1" 200 21384 "-" "curl/7.47.0" "-"
```

In another example, use the “oc logs” command to view the Docker log files (from standard out) for Black Duck’s Webapp container:

```
oc logs nginx-webapp-logstash-2564656559-6fbq8 -c webapp
```

Which displays the following information:

```
2017-07-12 18:13:12,064 [http-nio-8080-exec-4] INFO com.blackducksoftware.core.regupdate.impl.RegistrationApi - Exec
2017-07-12 18:13:12,071 [http-nio-8080-exec-4] ERROR com.blackducksoftware.core.regupdate.impl.RegistrationApi - Unat
2017-07-12 18:25:42,596 [http-nio-8080-exec-1] INFO com.blackducksoftware.usermgmt.sso.impl.BdsSAMLEntryPoint - Sing
2017-07-12 18:27:52,670 [scanProcessorTaskScheduler-1] INFO com.blackducksoftware.scan.bom.scheduler.ScanPurgeJobMor
2017-07-12 18:30:00,059 [job.engine-0] WARN com.blackducksoftware.job.integration.handler.KbCacheUpdater - KB projec
```

This shows all standard output from Webapp (the Black Duck’s web server). Although a full description of the content of these log files is beyond the scope of this chapter, a large time period without log message would suggest an issue with the Webapp.

Accessing log files

You may need to troubleshoot an issue or provide log files to Customer Support.

Users with the System Administrator role can download a zipped file that contains the current log files.

⚙ To download the log files from Black Duck UI

1. Log in to Black Duck with the System Administrator role.

2. Click the expanding menu icon () and select **Administration**.

The Administration page appears.

3. Select **System Settings**.

The System Settings page appears.

4. Click **Download Logs (.zip)**.

It may take a few minutes to prepare the log files.

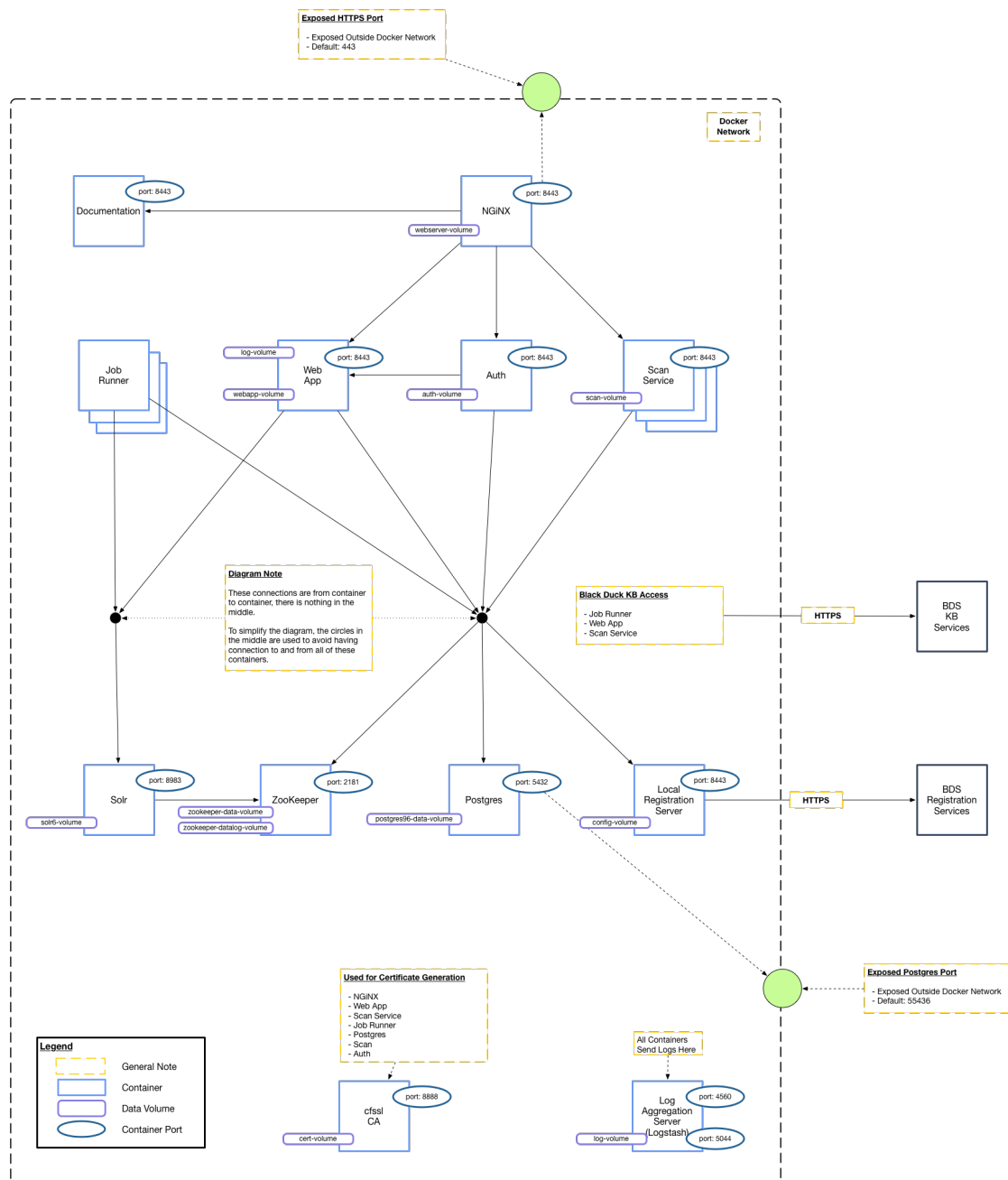
These are the containers within the Docker network that comprise Black Duck application:

1. Web App
2. Authentication
3. Scan
4. Job Runner
5. Solr
6. Registration
7. DB

Note: This container is not included in Black Duck application if you use an external Postgres instance.

8. Documentation
9. WebServer
10. Zookeeper
11. LogStash
12. CA

The following diagram shows the basic relationships among the containers and which ports are exposed outside of the Docker network.



The following tables provide more information on each container.

Web App container

Container Name: Web App	
Image Name	blackducksoftware/hub-webapp:4.8.2
Description	The Web App container is the container that all Web/UI/API requests are made against. It also processes any UI requests. In the diagram, the ports for the Web App are not exposed outside of the Docker network. There is an NGiNX reverse proxy (as described in the WebServer container) that is exposed outside of the Docker network instead.
Scalability	There should only be a single instance of this container. It should not be scaled.
Links/Ports	<p>The Web App container needs to connect to these containers/services:</p> <ul style="list-style-type: none"> • postgres • solr • zookeeper • registration • logstash • cfssl <p>The container needs to expose port 8443 to other containers that will link to it.</p>
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that it is useful to have host names set for these containers that are not the default that Docker Compose or Docker Swarm use. These environment variables can be set to override the default host names:</p> <ul style="list-style-type: none"> • postgres: \$HUB_POSTGRES_HOST • solr: This should be taken care of by ZooKeeper. • zookeeper: \$HUB_ZOOKEEPER_HOST • registration: \$HUB_REGISTRATION_HOST • logstash: \$HUB_LOGSTASH_HOST • cfssl: \$HUB_CFSSL_HOST
Constraints	<ul style="list-style-type: none"> • Default max Java heap size: 2GB • Container memory: 2.5GB • Container CPU: 1 CPU
Volumes	<p>log-volume:/opt/blackduck/hub/logs</p> <p>webapp-volume:/opt/blackduck/hub/hub-webapp/security</p>

Authentication container

Container Name: hub-authentication	
Image Name	blackducksoftware/hub-authentication:4.8.2
Description	The Black Duck authentication service is the container that all authentication-related requests are made against.
Scalability	There should only be a single instance of this container. It currently cannot be scaled.
Links/Ports	<p>Nothing external (8443 internally). This container will need to connect to these other containers/services:</p> <ul style="list-style-type: none"> • postgres • cfssl • logstash • registration • zookeeper • webapp <p>The container needs to expose 8443 to other containers that will link to it.</p>
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that it is useful to have host names set for these containers that are not the default that Docker Compose or Docker Swarm use. These environment variables can be set to override the default host names:</p> <ul style="list-style-type: none"> • postgres - \$HUB_POSTGRES_HOST • cfssl - \$HUB_CFSSL_HOST • logstash - \$HUB_LOGSTASH_HOST • registration - \$HUB_REGISTRATION_HOST • zookeeper - \$HUB_ZOOKEEPER_HOST • webapp - \$HUB_WEBAPP_HOST
Constraints	<ul style="list-style-type: none"> • Default max Java heap size: 512MB • Container memory: 1GB • Container CPU: 1 CPU
Volumes	authentication-volume: /opt/blackduck/hub/hub-authentication/security

Scan container

Container Name: Scan	
Image Name	blackducksoftware/hub-scan:4.8.2
Description	Black Duck scan service is the container that all scan data requests are made against.
Scalability	This container can be scaled.
Links/Ports	<p>The Scan container needs to connect to these containers/services:</p> <ul style="list-style-type: none"> • postgres • zookeeper • registration • logstash • cfssl <p>The container needs to expose port 8443 to other containers that will link to it.</p>
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that it is useful to have host names set for these containers that are not the default that Docker Compose or Docker Swarm use. These environment variables can be set to override the default host names:</p> <ul style="list-style-type: none"> • postgres: \$HUB_POSTGRES_HOST • zookeeper: \$HUB_ZOOKEEPER_HOST • registration: \$HUB_REGISTRATION_HOST • logstash: \$HUB_LOGSTASH_HOST • cfssl: \$HUB_CFSSL_HOST
Constraints	<ul style="list-style-type: none"> • Default max Java heap size: 2GB • Container memory: 2.5GB • Container CPU: 1 CPU
Volumes	<p>log-volume:/opt/blackduck/hub/logs</p> <p>scan-volume:/opt/blackduck/hub/hub-scan/security</p>

Job runner container

Container Name: Job Runner	
Image Name	blackducksoftware/hub-jobrunner:4.8.2
Description	The Job Runner container is the container that is responsible for running all Black Duck jobs. This includes matching, BOM building, reports, data updates, and so on. This container does not have any exposed ports.
Scalability	This container can be scaled.
Links/Ports	<p>The Job Runner container needs to connect to these containers/services:</p> <ul style="list-style-type: none"> • postgres • solr • zookeeper • registration • logstash • cfssl
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that any individual service name may be different. For example, you may have an external PostgreSQL endpoint which is resolved through a different service name. To support such use cases, these environment variables can be set to override the default host names:</p> <ul style="list-style-type: none"> • postgres: \$HUB_POSTGRES_HOST • solr: This should be taken care of by ZooKeeper. • zookeeper: \$HUB_ZOOKEEPER_HOST • registration: \$HUB_REGISTRATION_HOST • logstash: \$HUB_LOGSTASH_HOST • cfssl: \$HUB_CFSSL_HOST
Constraints	<ul style="list-style-type: none"> • Default max Java heap size: 4GB • Container memory: 4GB • Container CPU: 1 CPU
Volumes	N/A

Solr container

Container Name: Solr	
Image Name	blackducksoftware/hub-solr:4.8.2
Description	<p>Solr is an open source enterprise search platform. Black Duck uses Solr as its search server for project data.</p> <p>This container has Apache Solr running within it. There is only a single instance of this container. The Solr container exposes ports internally to the Docker network, but not outside of the Docker network.</p>
Scalability	This container should not be scaled.
Links/Ports	<p>The Solr container needs to connect to these containers/services:</p> <ul style="list-style-type: none"> • zookeeper • logstash <p>The container needs to expose port 8443 to other containers that will link to it.</p>
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that it is useful to have host names set for these containers that are not the default that Docker Compose or Docker Swarm use. These environment variables can be set to override the default host names:</p> <ul style="list-style-type: none"> • zookeeper: \$HUB_ZOOKEEPER_HOST • logstash: \$HUB_LOGSTASH_HOST
Constraints	<ul style="list-style-type: none"> • Default max Java heap size: 512MB • Container memory: 512MB • Container CPU: Unspecified
Volumes	solr6-volume:/opt/blackduck/hub/solr/cores.data

Registration container

Container Name: Registration	
Image Name	blackducksoftware/hub-registration:4.8.2
Description	<p>The container is a small service that handles registration requests from the other containers. At periodic intervals, this container connects to the Black Duck Registration Service and obtains registration updates.</p>
Scalability	The container should not be scaled.

Container Name: Registration	
Links/Ports	<p>The Registration container needs to connect to this containers/services:</p> <ul style="list-style-type: none"> • logstash <p>The container needs to expose port 8443 to other containers that link to it.</p>
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that it is useful to have host names set for these containers that are not the default that Docker Compose or Docker Swarm use. These environment variables can be set to override the default host names:</p> <ul style="list-style-type: none"> • logstash: \$HUB_LOGSTASH_HOST
Constraints	<ul style="list-style-type: none"> • Default max Java heap size: 256MB • Container memory: 256MB • Container CPU: Unspecified
Volumes	config-volume:/opt/blackduck/hub/registration/config

DB container

Note: This container is not included in the Black Duck application if you use an external Postgres instance.

Container Name: DB	
Image Name	blackducksoftware/hub-postgres:4.8.2
Description	<p>The DB container holds the PostgreSQL database which is an open source object-relational database system. Black Duck uses the PostgreSQL database to store data.</p> <p>There is a single instance of this container. This is where all Black Duck data is stored. There are two sets of ports for Postgres. One port will be exposed to containers within the Docker network. This is the connection that the Black Duck App, Job Runner, and potentially other containers use. This port is secured via certificate authentication. A second port is exposed outside of the Docker network. This allows a read-only user to connect via a password set using the <code>hub_reportdb_changepassword.sh</code> script. This port and user can be used for reporting and data extraction.</p> <p>Refer to the <i>Report Database</i> guide for more information on the report database.</p>
Scalability	There should only be a single instance of this container. It should not be scaled.

Container Name: DB	
Links/Ports	<p>The DB container needs to connect to these containers/services:</p> <ul style="list-style-type: none"> • logstash • cfssl <p>The container needs to expose port 5432 to other containers that will link to it within the Docker network.</p> <p>This container exposes port 55436 outside of the Docker network for database reporting.</p>
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that it is useful to have host names set for these containers that are not the default that Docker Compose or Docker Swarm use. These environment variables can be set to override the default host names:</p> <ul style="list-style-type: none"> • logstash: \$HUB_LOGSTASH_HOST • cfssl: \$HUB_CFSSL_HOST
Constraints	<ul style="list-style-type: none"> • Default max Java heap size: N/A • Container memory: 3GB • Container CPU: 1 CPU
Volumes	postgres96-data-volume:/var/lib/postgresql/data

Documentation container

Container Name: Documentation	
Image Name	blackducksoftware/hub-documentation:4.8.2
Description	The Documentation container supplies documentation for Black Duck.
Scalability	There is a single instance of this container. It should not be scaled.
Links/Ports	<p>This container must connect to these other containers/services:</p> <ul style="list-style-type: none"> ■ logstash <p>The documentation container must expose port 8443 to other containers that link to it.</p>
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that it is useful to have host names set for these containers that are not the default that Docker Compose or Docker Swarm use. These environment variables can be set to override the default host names:</p>

Container Name: Documentation	
	<ul style="list-style-type: none"> logstash: \$HUB_LOGSTASH_HOST
Constraints	<ul style="list-style-type: none"> Default Max Java Heap Size: 512MB Container Memory: 512MB Container CPU: unspecified
Volumes	N/A

WebServer container

Container Name: WebServer	
Image Name	blackducksoftware/hub-nginx:4.8.2
Description	The WebServer container is a reverse proxy for the Black Duck Web App. It has a port exposed outside of the Docker network. This is the container configured for HTTPS. There are config volumes here for configuration of HTTPS.
Scalability	The container should not be scaled.
Links/Ports	<p>The Web App container needs to connect to these containers/services:</p> <ul style="list-style-type: none"> webapp cfssl documentation scan authentication <p>This container exposes port 443 outside of the Docker network.</p>
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that it is useful to have host names set for these containers that are not the default that Docker Compose or Docker Swarm use. These environment variables can be set to override the default host names:</p> <ul style="list-style-type: none"> webapp: \$HUB_WEBAPP_HOST cfssl: \$HUB_CFSSL_HOST scan: \$HUB_SCAN_HOST documentation: \$HUB_DOC_HOST authentication: \$HUB_AUTHENTICATION_HOST

Container Name: WebServer	
Constraints	<ul style="list-style-type: none"> • Default max Java heap size: N/A • Container memory: 512MB • Container CPU: Unspecified
Volumes	webserver-volume:/opt/blackduck/hub/webserver/security

ZooKeeper container

Container Name: Zookeeper	
Image Name	blackducksoftware/hub-zookeeper:4.8.2
Description	This container stores data for the Black Duck App, Job Runners, Solr, and potentially other containers. It exposes ports within the Docker network, but not outside the Docker network.
Scalability	This container should not be scaled.
Links/Ports	<p>The Zookeeper container needs to connect to this container/service:</p> <ul style="list-style-type: none"> • logstash <p>The container needs to expose port 2181 within the Docker network to other containers that will link to it.</p>
Alternate Host Name Environment Variables	<p>There are times when running in other types of orchestrations that it is useful to have host names set for these containers that are not the default that Docker Compose or Docker Swarm use. These environment variables can be set to override the default host names:</p> <ul style="list-style-type: none"> • logstash: \$HUB_LOGSTASH_HOST
Constraints	<ul style="list-style-type: none"> • Default max Java heap size: 256MB • Container memory: 256MB • Container CPU: Unspecified
Volumes	N/A

LogStash container

Container Name: LogStash	
Image Name	blackducksoftware/hub-logstash:4.8.2
Description	The LogStash container collects and store logs for all containers.
Scalability	There should only be a single instance of this container. It should not be scaled.

Container Name: LogStash	
Links/Ports	The container needs to expose port 5044 within the Docker network to other containers/services that will link to it.
Constraints	<ul style="list-style-type: none">• Default max Java heap size: 1GB• Container memory: 1GB• Container CPU: Unspecified
Volumes	log-volume:/var/lib/logstash/data

CA container

Container Name: CA	
Image Name	blackducksoftware/hub-cfssl:4.8.2
Description	The CA container uses CFSSL which is used for certificate generation for PostgreSQL, NGiNX, and clients that need to authenticate to Postgres.
Scalability	There should only be a single instance of this container. It should not be scaled.
Links/Ports	The container needs to expose port 8888 within the Docker network to other containers/services that link to it.
Constraints	<ul style="list-style-type: none">• Default max Java heap size: N/A• Container memory: 512MB• Container CPU: Unspecified
Volumes	cert-volume:/etc/cfssl