

COPILOT[®] SYSTEM & THE HUB[®] SOFTWARE

IT Guide

Every detail for IT professionals including Network Map, Virtual Appliance, Operating System, Application Server, IP Traffic, and Virtual Machine specifications and recommendations.

Software that provides plant-wide data acquisition and process analysis capabilities for injection molding operations.

 **RJG MOLD SMART**

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THE HUB SOFTWARE AND COPILOT SYSTEM IT INSTALLATION CHECKLIST

Review and Confirm Data Networking Requirements

- Review "02 Data Path from the CoPilot System to The Hub Software" on page 03; ensure network policies allow the interactions required between the CoPilot system(s) and The Hub software in "The Hub Network Firewall and Routing Configuration" on page 12.

Review and Confirm Data Rate

- Calculate the estimated data that will be generated by the CoPilot system(s) and The Hub software using "Data Rate Estimation" on page 07; consult with RJG customer support.

Review and Confirm Application Server

- Review "Application Server Recommended Specifications" on page 08; size application server based on recommended specifications and calculated data rate.

Choose an Operating System (OS)

- Review "05 The Hub Operating System (OS)" on page 09, and choose an OS to fit requirements/needs.

Choose a Hypervisor

- Review "Virtual Appliance Hypervisor Options" on page 10, and choose a Hypervisor for the application server.

Confirm Required IP Addresses

- Review "IP Addresses" on page 11 for requirements and make the necessary preparations.

Review and Determine Data Backup and Archival Schema

- Review "The Hub Software Data Backup and Archival" on page 04 and "11 The Hub Data Backup and Archival Configuration" on page 30; consult with RJG customer support to configure a data backup and archival system.

Install CoPilot System(s)

- Install CoPilot systems; refer to "16 CoPilot® System Installation" on page 43 and the CoPilot® System Hardware Installation and Setup Guide.

Prepare for The Hub Software Virtual Appliance Installation

- Consult with RJG customer support, and refer to "08 The Hub Virtual Appliance Installation" on page 13 to prepare for VA import and installation.

01 COPILOT SYSTEM® AND THE HUB® SOFTWARE OVERVIEW

COPILOT SYSTEM

The CoPilot system consists of a process monitoring and control software application installed on a physical application processor mounted on or near an injection molding machine; the application processor is connected to mold and machine sensors that gather job information for the software.

THE HUB SOFTWARE

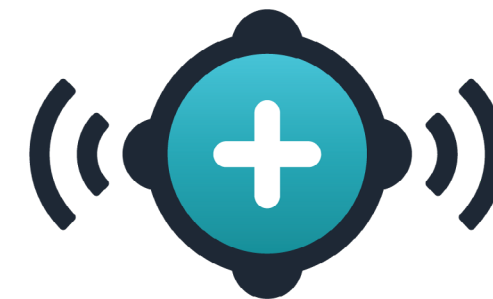
The Hub software is a data management system located on virtual machine (VM) that collects, stores, and displays data on a web browser from networked CoPilot systems located on the plant floor.

The Hub Software Virtual Appliance (VA)

The Hub software is packaged as a virtual appliance (VA). A VA is a virtual version of a hardware device that packages an operating system (OS) and software application(s), allowing a single file to be remotely installed on a virtual machine (VM) for ease of distribution and management since no locally-installed hardware is required. The Hub software VA includes the OS, database, system software, and—depending upon OS—cloud instance initialization (cloud-init, *optionally*) in a single, deployable package for installation on a VM.



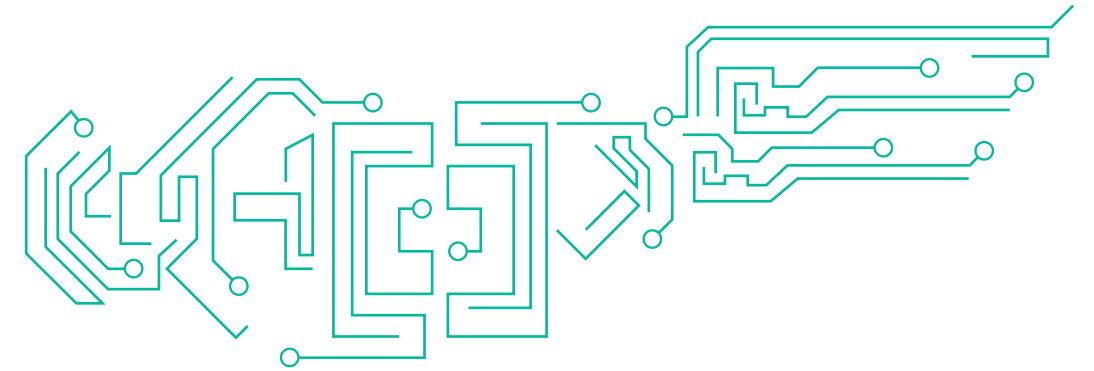
COPILOT®



THE HUB®

02 DATA PATH FROM THE COPILOT SYSTEM TO THE HUB SOFTWARE

Operators in the plant run jobs on CoPilot systems to collect data from machine and mold sensors and the molding machine. The networked CoPilot systems' data is sent to The Hub software.



THE HUB SOFTWARE DATA BACKUP AND ARCHIVAL

Data backup and archival occurs on The Hub for job data and non-job data. Job data is data collected by The Hub software from the CoPilot system when a job is started, running, and stopped. Non-job data is data associated with users, including usernames, roles, and end user license agreement (EULA) records. Both types of data are stored in the .zip format.

Data is collected by a primary data path backup, and remains on The Hub until it is removed by the system administrator (customer), or the system runs out of storage space. The data can be archived by a secondary data location (the secondary data path backup/mapped backup location) so that the data is not deleted and the system will not run out of space.



Data Backup

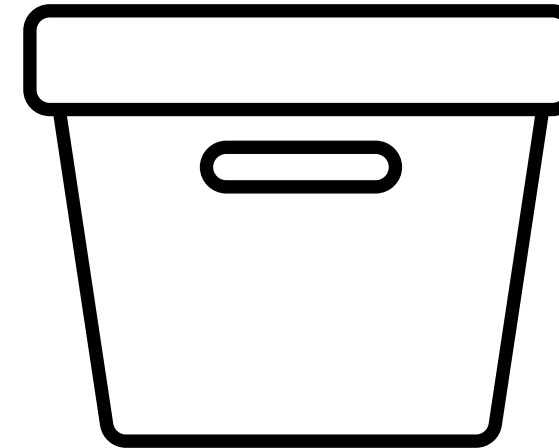
A data backup file can be imported to restore The Hub data, or used to review previously-backed-up data. When a job is complete, all relevant job data is collected and stored.

Data Archival

An archived data file is intended for long-term data retention. When a job is complete, all relevant job data is collected and stored on the mapped backup location.

DATA RETENTION AND STORAGE

There are two settings configured for data retention and storage. The data retention setting determines how long data is retained in the database after being collected by the primary data path backup, while the data storage setting determines the data storage space for the data collected by the primary data path backup on the system.



Data Retention

When job data is over the data retention date, the cycle and summary data are removed from the database and the job document is updated. Job documents are retained for future access, so job queries are unaffected by data retention settings. The data retention date is determined/set by the customer based on how long the information is needed.

Data Storage

The Hub software will delete job data files if there is not enough storage space, until there is enough storage space. The Hub software will not monitor or remove data for the secondary data location (mapped backup location), if one is configured. The customer must ensure that there is enough space to backup data. The system must be configured with enough space to store data in the database for the retention period, and to store the data files long enough for the secondary data path backup/mapped backup location to complete data archival.

The Hub Software Data Import, Export, and Access

Overview

Users are able to move data from one The Hub system (or CoPilot system) to another The Hub system to transfer data to RJG Customer Support, OEM customers, or other molding facilities (plants/mold tryouts).

File Format

Data for import, export, and backup is provided in the .zip file format. The .zip file format is space-efficient and allows random data access. From the .zip file format, data is contained in cbor data structures, making the data self-describing to some extent, while still being space-efficient and compatible with current data structures. The data structure is as follows:

- Job
- ChangeLogs
- JobAlarms
- JobLegend
- Notes
- Cycle
 - 0
 - 1
 - ...
- CycleData
 - 0
 - 1
 - ...
- SummaryData
 - SummaryVariableX
 - SummaryVariableY
 - ...
- Entities
 - Machine
 - Mold
 - Process
 - SetupSheet
 - Templates
 - EntityRevisions



Imported Data

When a job is imported, data is written to disk. The job document is inserted into the database with a reference to the job file on the disk. Job data is accessed from the file instead of reading it out of the database. Entity documents can also be optionally imported, depending on the application.

Data Access

Job documents will always be queried from the database. The only time that a job document will be read from a data file is when importing a job file. Other job data will be accessed from the data file if it is present, or from the database if it has not already been written.

If a secondary backup location has been set and the primary data file has been deleted, it will read from the secondary file instead. If the data has been removed from the database and the data file deleted, an error will be returned to notify the user to contact their network administrator to retrieve the data from the archival system. The data must then be imported to access the job data. The user will use the Data Import tool to import the data into the Hub.

The Hub Software Data Security and Network Share Using Cloud-Init

The Hub software cloud-init is a web service that enables the configuration of transport layer security (TLS (encryption)) and the addition/ configuration of network shares for data backup with The Hub directly from a web form. The Hub (NixOS deployments) uses cloud-init; cloud-init is an industry-standard third party tool for configuring cloud images.

The Hub software cloud-init web service is accessible at <https://hub-init.rjginc.com/>.

Cloud-init configuration is optional; not all customers require cloud-init.



03 The Hub Software and CoPilot System Data Rate

DATA RATE ESTIMATION

Before choosing an application server, estimate the rate of data collected by The Hub software from the CoPilot system(s).

The Hub software has primary and secondary data backup; if space on the server (primary backup) or secondary backup runs out, the oldest data is deleted to make room for more data. Estimate the data rate to size the data backups appropriately and prevent data loss.

Data Rate Estimation Requirements

The following information is required to estimate the data rate; provide this information to RJG Customer Support.

| DATA RATE ESTIMATION REQUIREMENTS | |
|---|---|
| PARAMETER | OUTPUT |
| 1 Average Cycle Time in Seconds | 1 & 2: Data in MB per CoPilot, per hour |
| 2 Number of Cavity Pressure Sensor Adapters | |
| 3 Number of CoPilot Systems | 1, 2, & 3: Data in GB per day & |
| 4 Job Run Time During 24-Hour Period (How many hours per day are jobs cycling?) | 1, 2, 3, & 4: Data in GB per year |



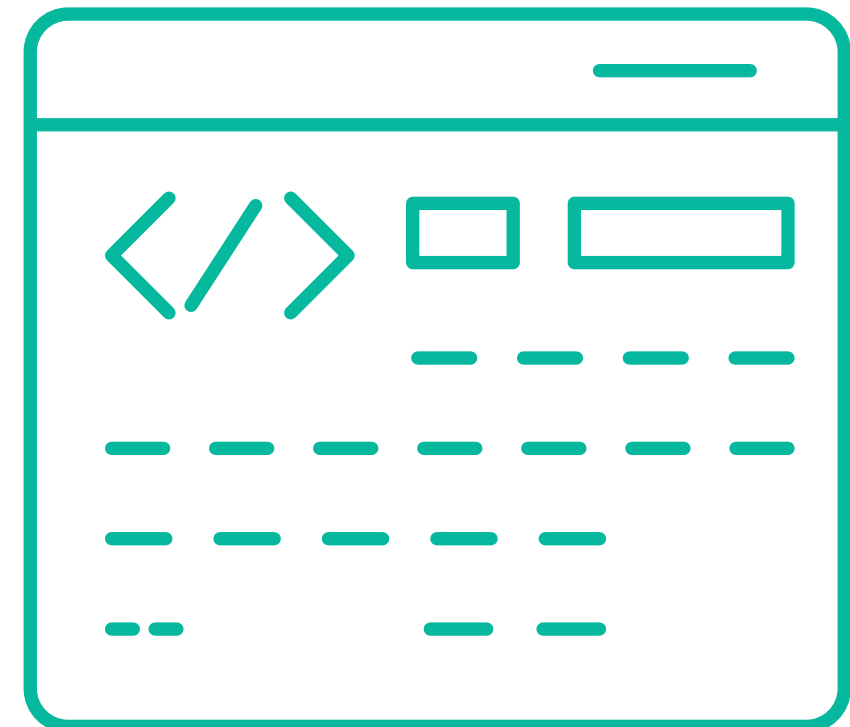
04 THE HUB SOFTWARE APPLICATION SERVER

Regardless of deployment, The Hub application requires a server with the minimum following specifications.

APPLICATION SERVER RECOMMENDED SPECIFICATIONS

The recommended specifications for the application server are provided below. The resources available should follow the recommendations, but may also be determined by consultation between RJG and the Customer.

| APPLICATION SERVER RECOMMENDED SPECIFICATIONS | | |
|---|----------------------|---------------------------|
| RESOURCE | SIZE / AMOUNT | |
| Required vCPU | 4 | |
| RAM | 16 GB, minimum | 32 GB, <i>recommended</i> |
| Hard Drive | 1 TB, <i>minimum</i> | |



05 THE HUB OPERATING SYSTEM (OS)



The Hub software can be deployed using either the Debian operating system or NixOS.

THE HUB SOFTWARE USING DEBIAN OS

RJG will install The Hub onto a customer-owned virtual machine at the customer location. The Hub software using Debian deployment includes the Linux-based operating system Debian, RJG The Hub software, and the Postgres (PostgreSQL) database.

THE HUB SOFTWARE USING NIXOS

RJG will install The Hub onto a customer-owned virtual machine at the customer location. The Hub NixOS package includes the Linux-based NixOS operating system, RJG The Hub software, Postgres (PostgreSQL) database, and cloud-init (*optionally*) for vm TLS and backup/network share configuration.



06 The Hub Software Virtual Appliance

VIRTUAL APPLIANCE HYPERVISOR OPTIONS

| HYPERVISOR OPTIONS | | |
|--------------------|--|--------|
| VENDOR | PLATFORM | FORMAT |
| Microsoft | Hyper-V (hyper-v.image) | VHDX |
| VMware | ESXi 7.0U1 (or newer (vmware.image-esxi-vmx-18)) | OVA |
| VMware | ESXi 6.7 (vmware.image-esxi-vmx-14) | OVA |



07 The Hub Application Server Network

IT CONTACT

- ✓ RJG to receive necessary local IT contact information
- ✓ One consultation is required before installation or delivery of VA
- ✓ RJG and local IT will collaborate on remote installation.

IP ADDRESSES

Completed by client IT within 2 weeks of purchase order being placed.

- ✓ Network configuration for The Hub and CoPilot systems set to DHCP
- ✓ Document The Hub IP address
- ✓ Assign a unique IP address for each CoPilot system and document the IP addresses

Required IP Traffic Accessible by Network

| PROTOCOL AND PORT | | NETWORK | PURPOSE |
|--------------------|------------|---------------------|------------------------------|
| TCP 22, 55333 | | The Hub↔CoPilot | CoPilot Data , Configuration |
| TCP 80, 8000, 443* | | The Hub↔Office | The Hub Web Access |
| TCP 443** | | The Hub→Internet | System Update |
| SSH 22 | | RJG Support→CoPilot | CoPilot Debugging |
| TLS NOT Configured | HTTP 80 | The Hub→Internet | Data Transport |
| | WS 8000 | The Hub→Internet | Data Transport |
| TLS Configured | HTTPS 443* | The Hub→Internet | Data Encryption |
| | WSS 443* | The Hub→Internet | Data Encryption |

*required if TLS support is enabled on The Hub NixOS

**accesses the following domains if using The Hub NixOS:

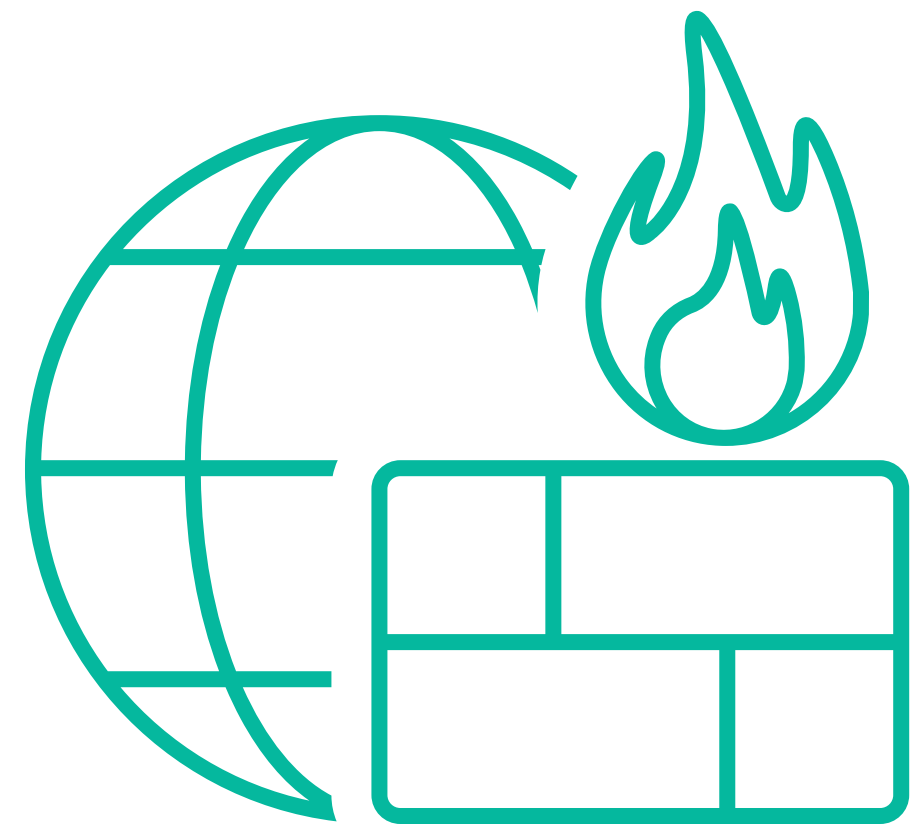
<https://rjg-release-server-pointers.s3.us-east-2.amazonaws.com>, <https://rjg-release-server-store.s3.us-east-2.amazonaws.com>, <https://releases.rjginc.com/>, and <https://cache.nixos.org>

THE HUB NETWORK FIREWALL AND ROUTING CONFIGURATION

The network firewall and routing must be set to allow the following:

- RJG SSH access to The Hub virtual machine (required at time of installation)
- Access to CoPilot system network
- Web access for users to CoPilot system and The Hub software

Network cable drops on the floor must be completed.

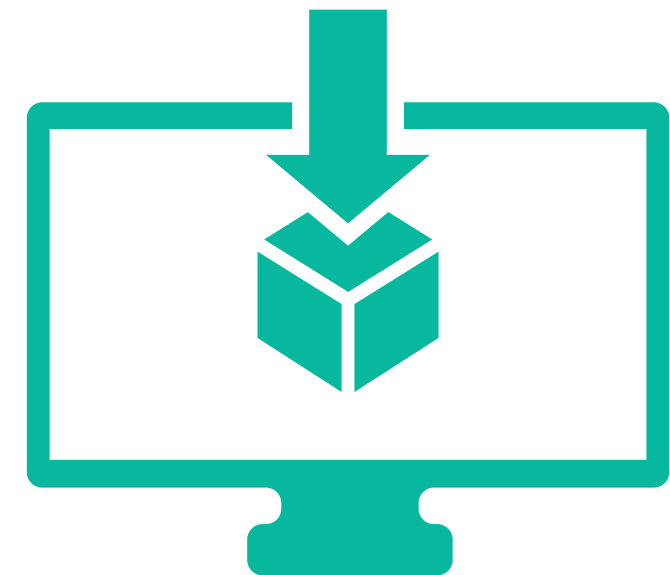


08 The Hub Virtual Appliance Installation




THE HUB VIRTUAL APPLIANCE FILE IMPORT & INSTALLATION

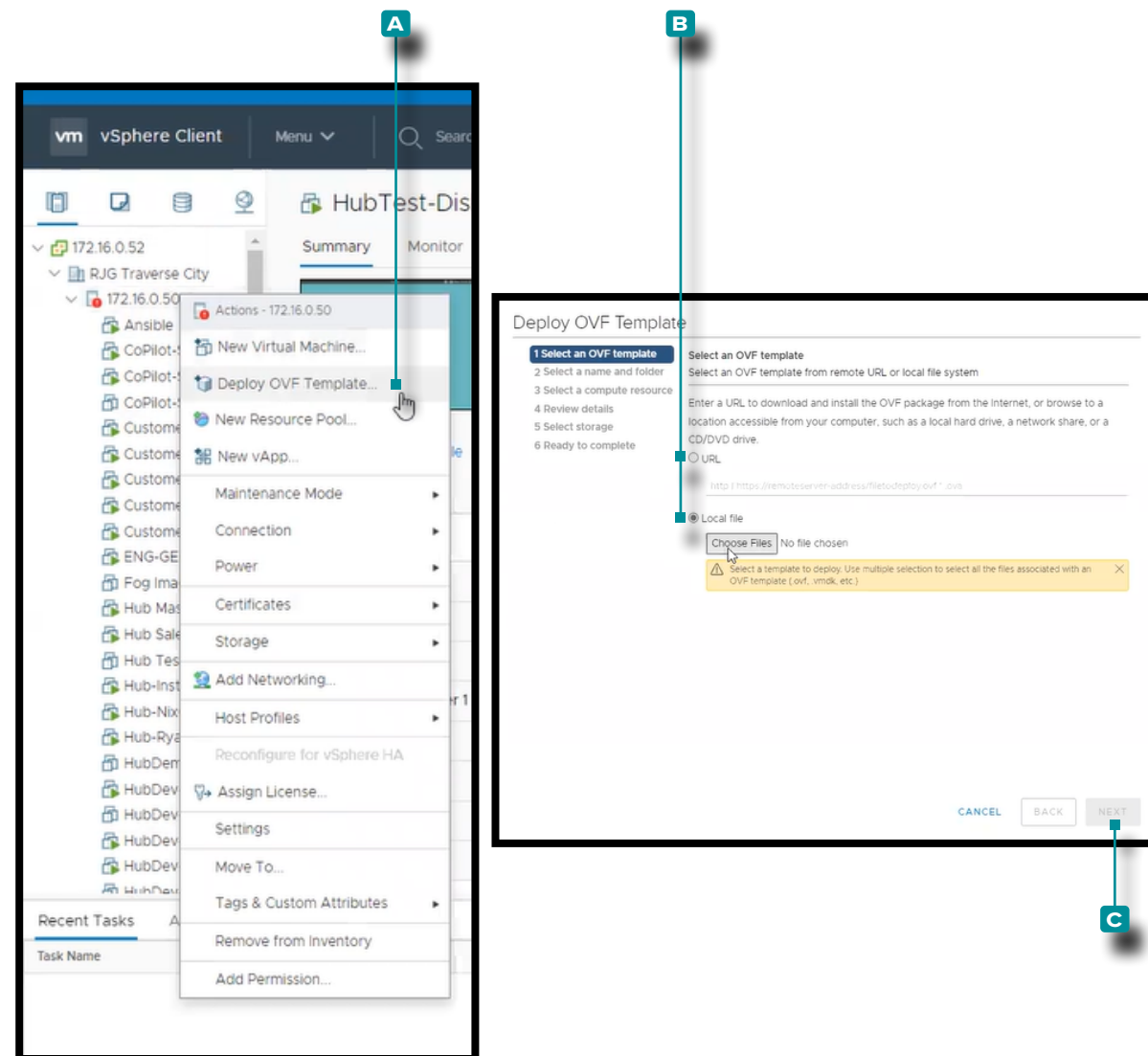
Virtual Appliance Installation Overview






1. Customer will identify Hypervisor that will be used to run The Hub VA, then notify RJG Support of choice.
 2. RJG will create The Hub VA in the pre-determined format (OVA/VHDX) and transfer the file to the customer.
 3. The customer will set up the host (hypervisor) on which to install The Hub VA, and install the VA as a new VM.
 4. The customer will confirm the disk size.
 5. The customer will configure The Hub network and allocate DHCP resources to the VA.
 6. The customer will boot up the VA.
 7. The customer will retrieve hardware IDs.
 8. RJG and the customer will administer the VA:
 - license the VA
 - set up the Admin user
 - configure The Hub timezone
 9. RJG and the customer will confirm The Hub software is running.
 10. Optionally, The Hub initialization (init) service can be configured to provide transport layer security (TLS) and data backup/network share options; refer to "The Hub INIT Service Configuration" on page 32.
- If using VMware, refer to pages 14–15.
- If using Hyper-V, refer to pages 16–18.

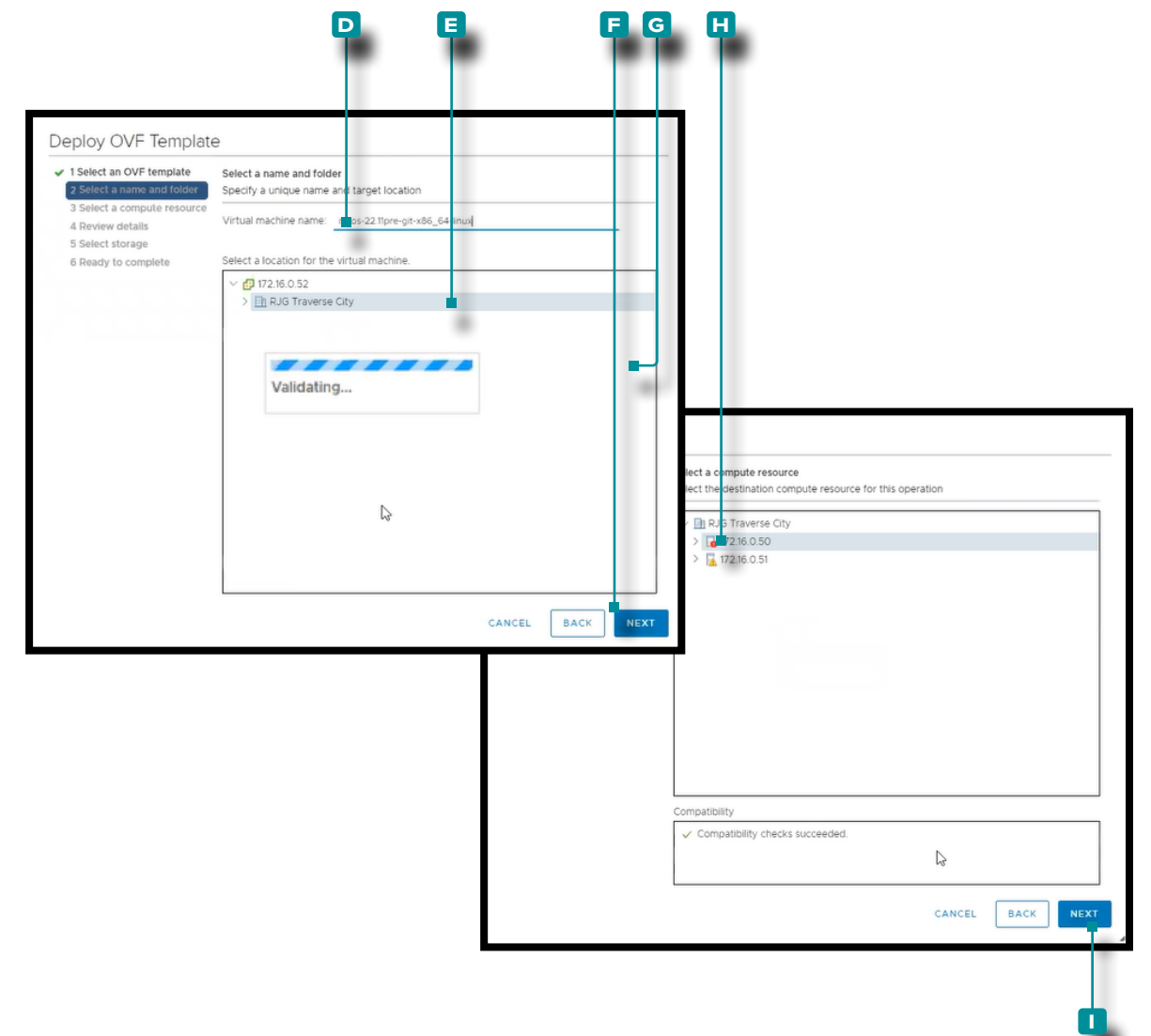


THE HUB VA INSTALLATION WITH VMWARE

1. In the vSphere client, **right click**  the selected host, then **click**  **A** Deploy OVF Template.
2. The Deploy OVF Template window will appear; select the OVF template from either a **B** URL or Local File (the .ova file format is provided for esxi or vmware; the .ova file can be deleted from the download folder after it is installed). **Click**  the **C** NEXT button.

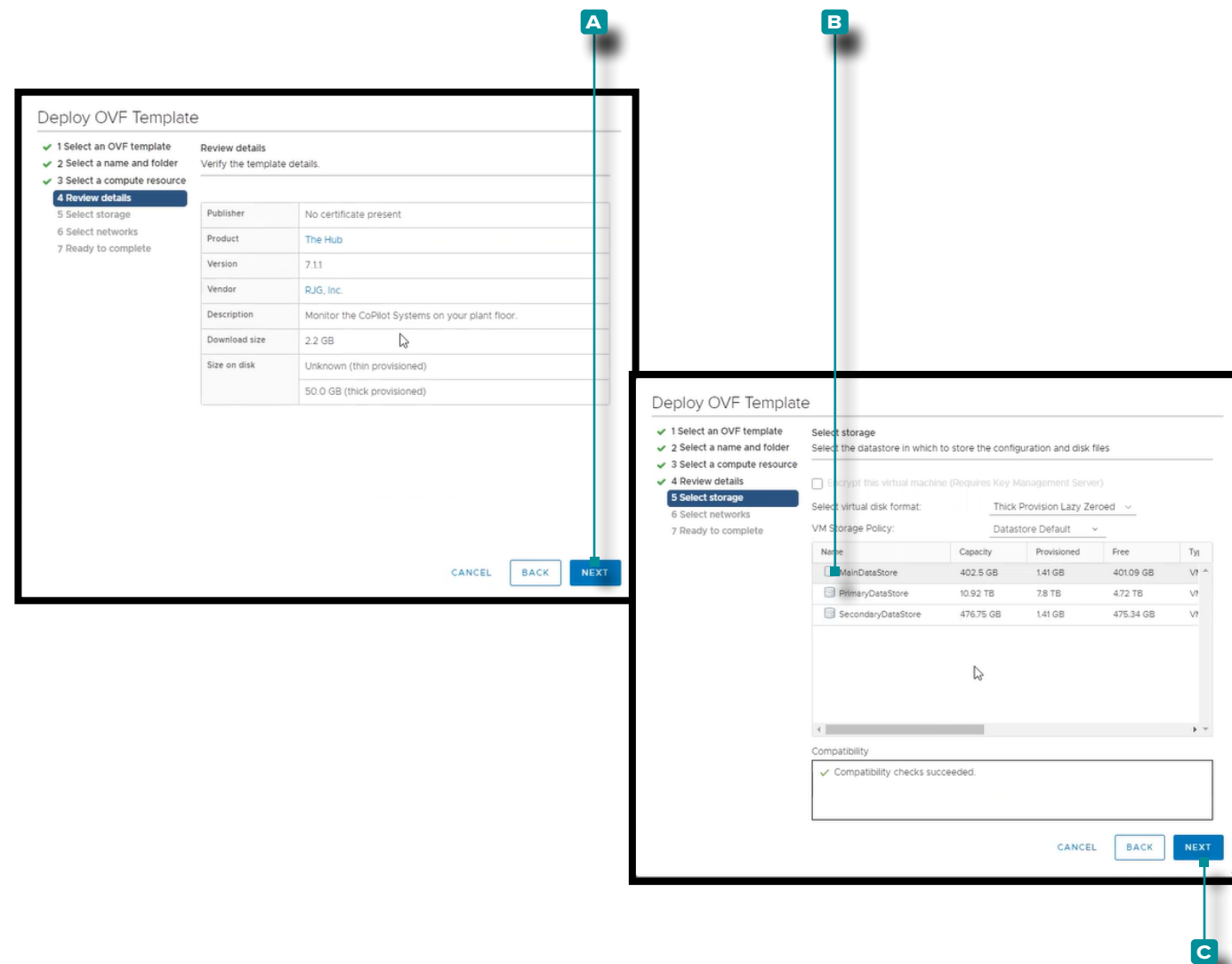


3. In the Deploy OVF Template/Select a name and folder window, **click**  the **D** field, then enter a Virtual machine name. **Click**  to select a **E** location from the box, then **click**  the **F** NEXT button. A **G** validating window may appear.
4. In the Deploy OVF Template/Select a computer resource window, **click**  the **H** destination resource from the list, then **click**  the **I** NEXT button.

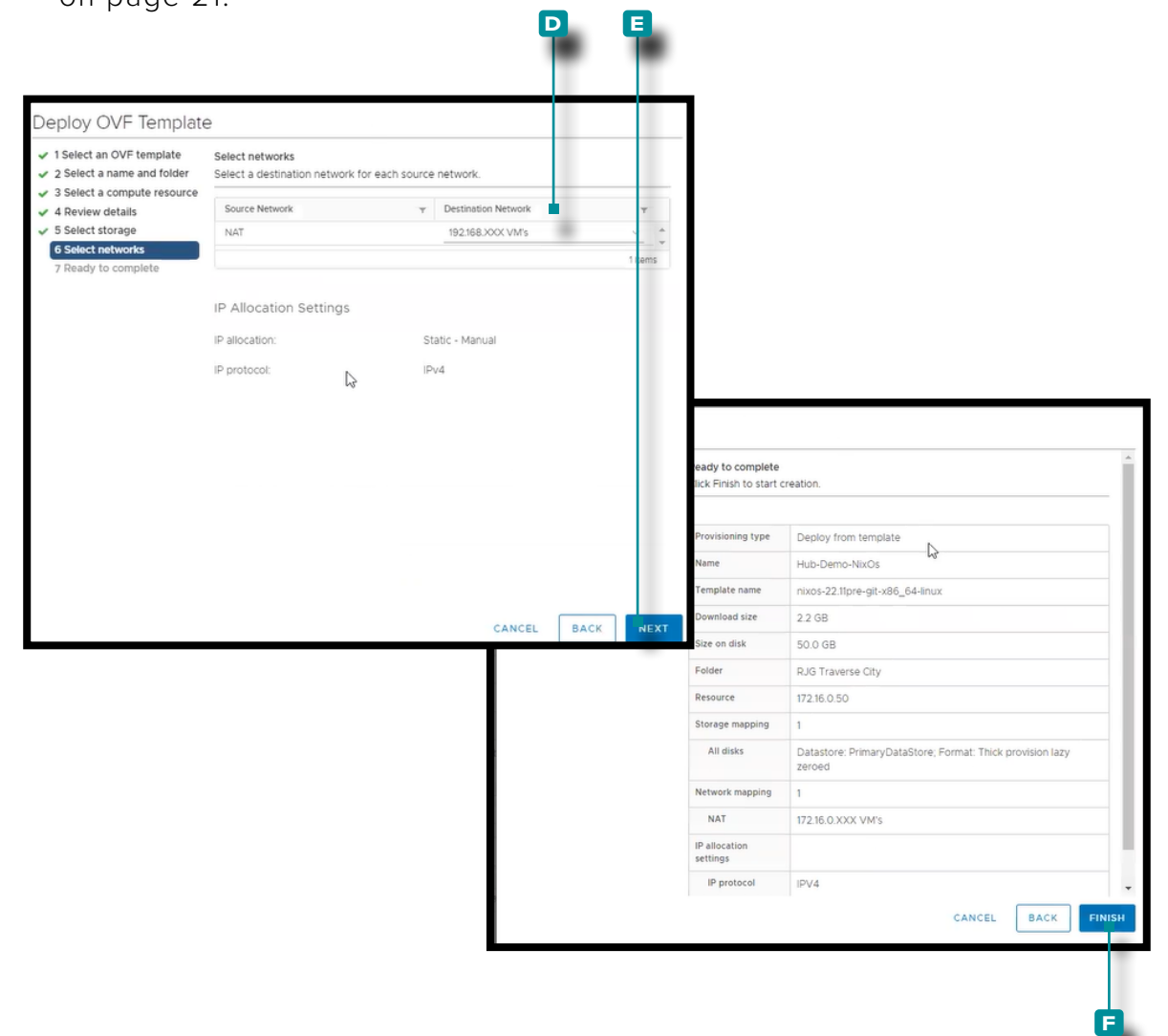


THE HUB VA INSTALLATION WITH VMWARE (continued)

- The Deploy OVF Template/Review details window displays a summary of selected settings; **click** the **A** NEXT button.
- In the Deploy OVF Template/Select storage window, **click** a **B** datastore for the configuration and disk files, then **click** the **C** NEXT button.

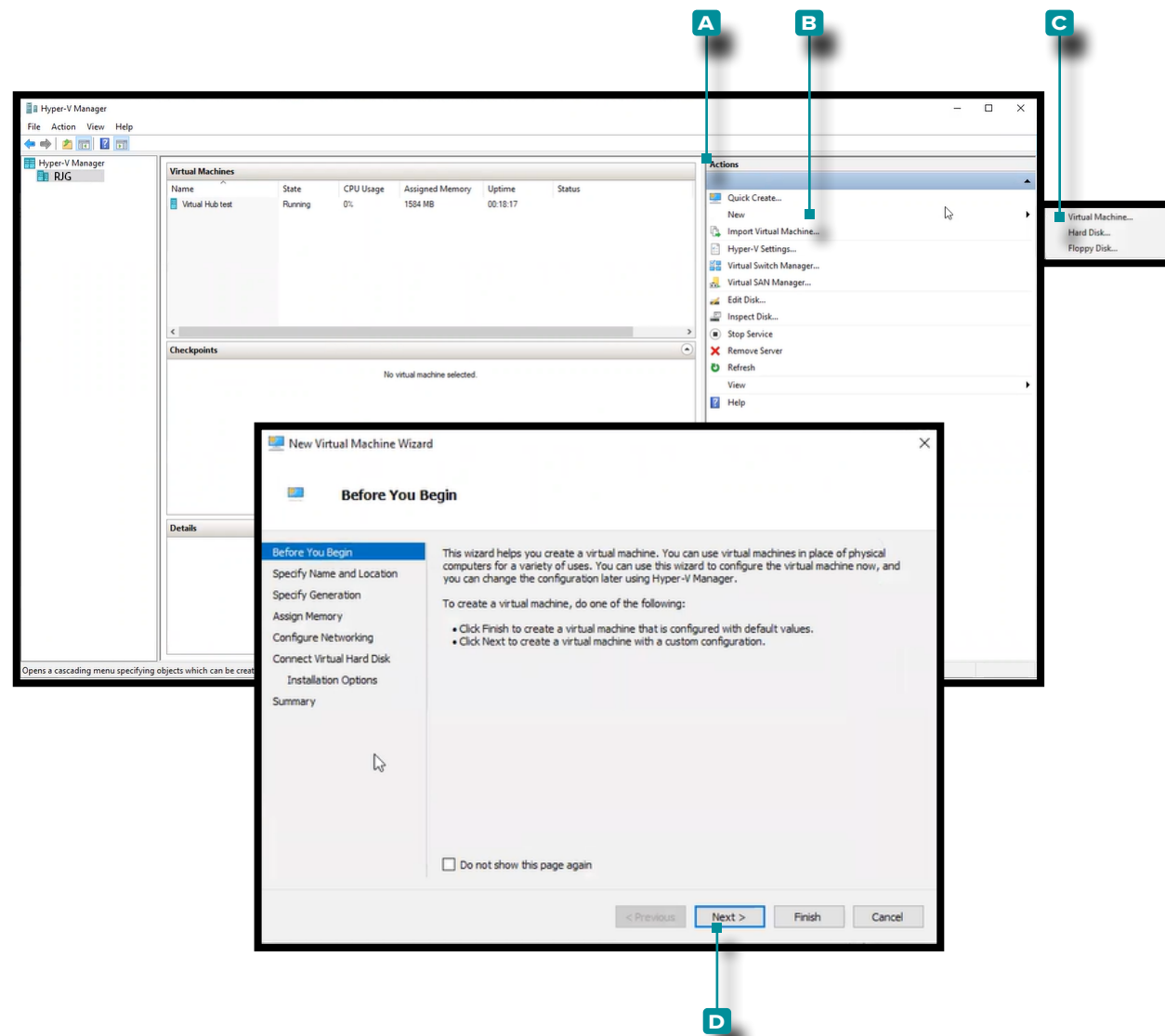


- In the Deploy OVF Template/Select networks window **click** the **D** destination network for installation, then **click** the **E** NEXT button.
- The Deploy OVF Template/Ready to complete displays another summary of selected options; the Size on Disk defaults to 50 GB, while RJG recommends 1 TB. **Click** the **F** Finish button, then resize the disk size using the instructions found in "Resizing The Hub VA Hard Drive Space" on page 21.

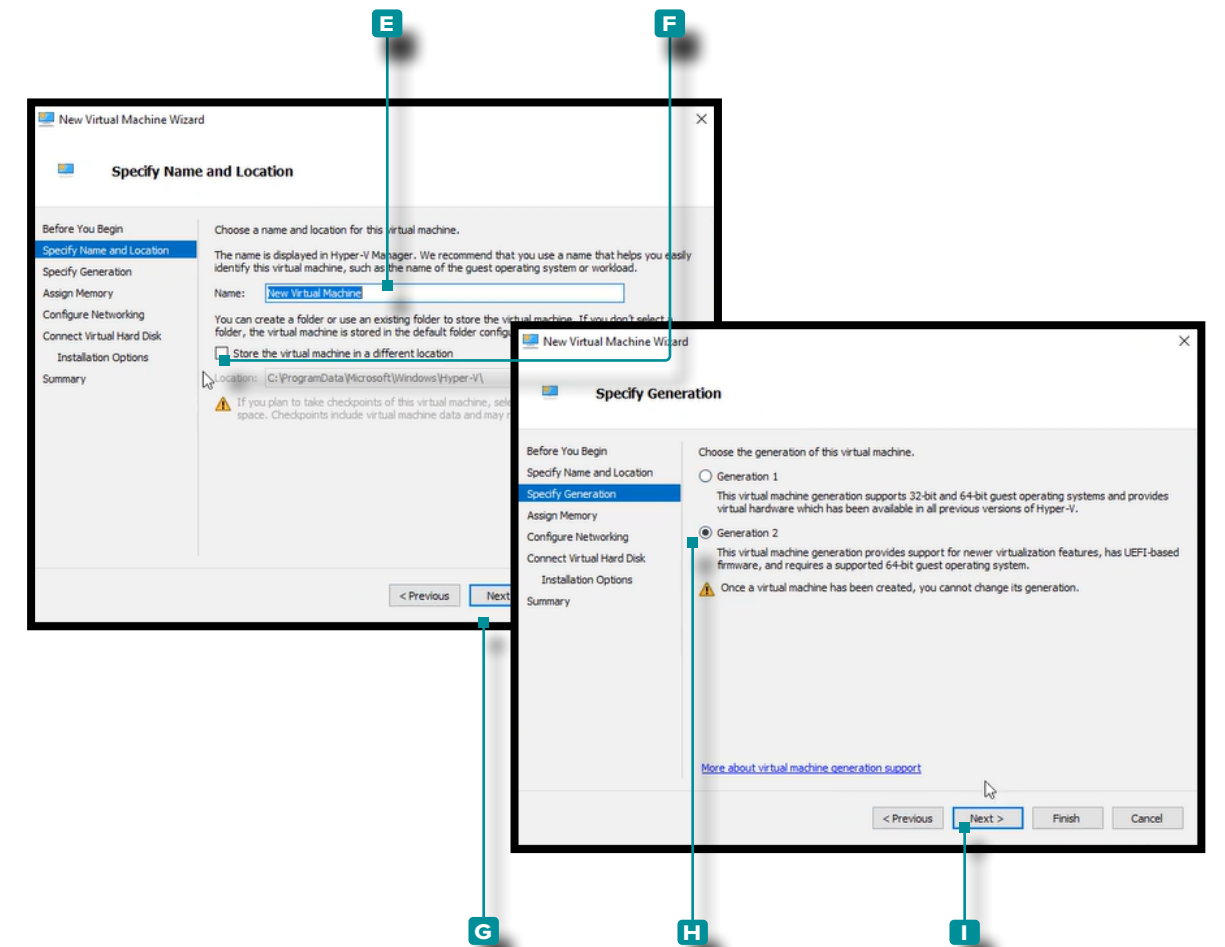


THE HUB VA INSTALLATION WITH HYPER-V

1. In the Hyper-V Manager, **click** **A** Action, **click** **B** New, then **click** **C** Virtual Machine; the New Virtual Machine Wizard will appear.
2. In the New Virtual Machine Wizard/Before you Begin window, **click** the **D** Next button.

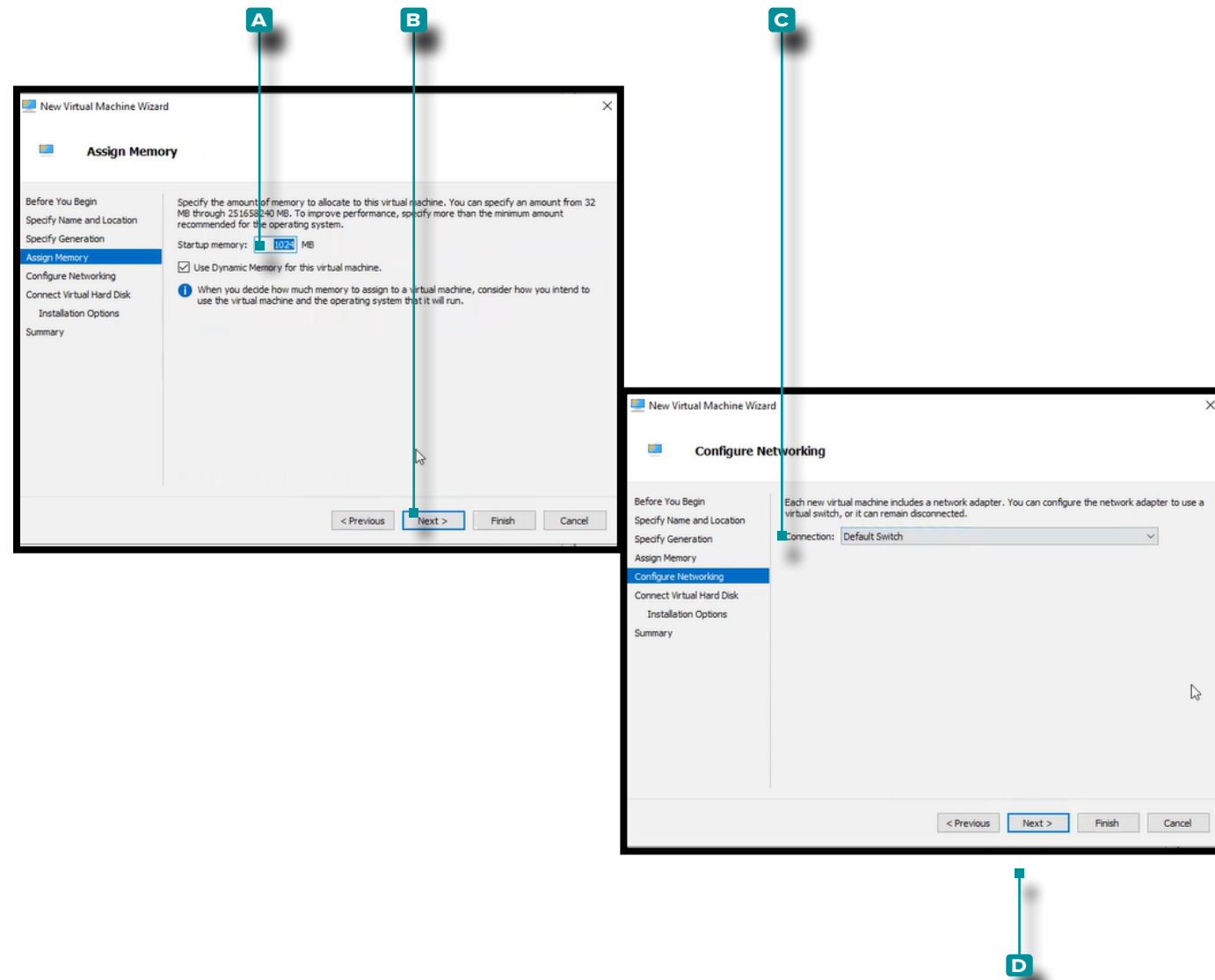


3. In the New Virtual Machine Wizard/Specify Name and Location window, **click** the **E** field and enter a Name; if desired, **click** the **F** box to select different storage location than the one present (**click** the browse button, **click** to select the location, **click** the Open button). **Click** the **G** Next button to continue.
4. In the New Virtual Machine Wizard/Specify Generation window, **click** to select **H** Generation 2 (generation 1 will not work), then **click** the **I** Next button.



THE HUB VA INSTALLATION WITH HYPER-V (continued)

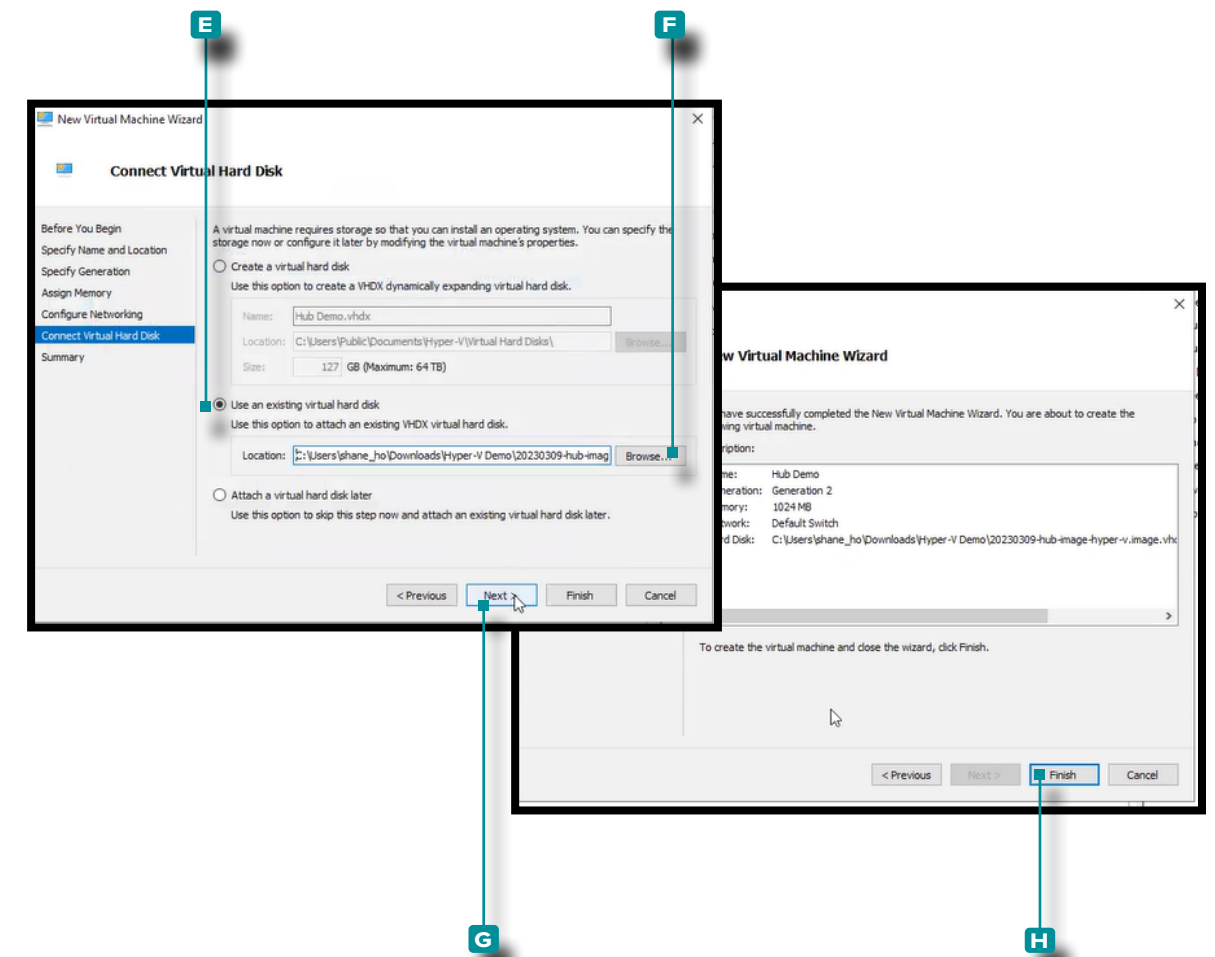
- In the New Virtual Machine Wizard/Assign Memory window, startup memory defaults to 1024 MB. **Click** the **A** field, then enter the startup memory; the startup memory must be increased to at least 16 GB, with 32 being recommended. **Click** the **B** Next button to continue.
- In the New Virtual Machine Wizard/Configure Networking window, **click** the **C** connection type “default switch” from the drop-down menu, then **click** the **D** Next button.








- In the New Virtual Machine Wizard/Connect Virtual Hard Disk/Installation Options window, **click** the **E** use an existing virtual hard disk, then **click** the **F** browse button to browse for location (this is the .vdx download file provided by RJG). **Click** the .vhdX file (~8 GB in size), **click** the Open button, then **click** the **G** Next button.

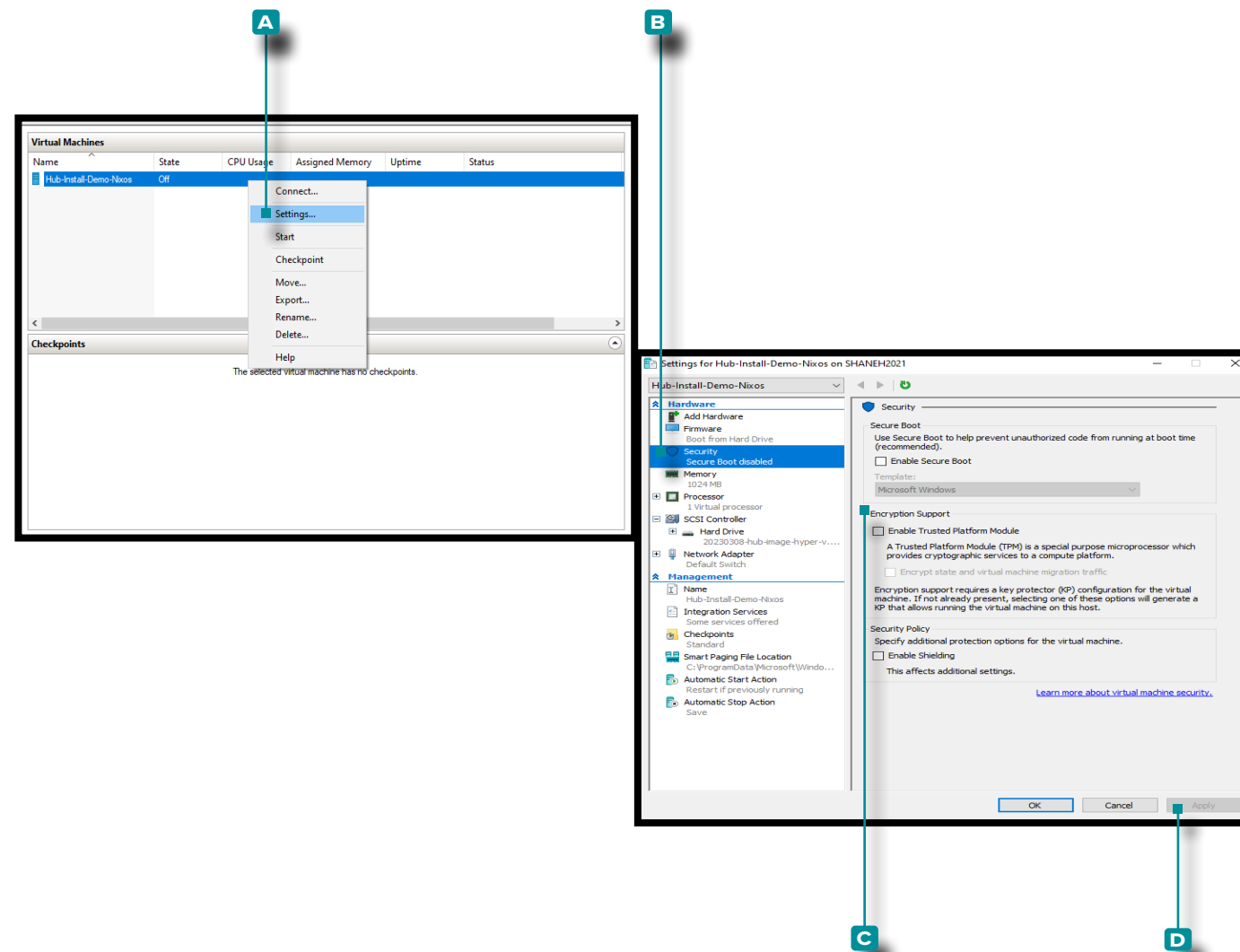
NOTES The .vhdX file must be stored on the machine and cannot be deleted.

- The New Virtual Machine Wizard/Summary window displays a summary of selected options; **click** the **H** Finish button.



THE HUB VA INSTALLATION WITH HYPER-V (continued)

9. Power off the virtual machine.
10. Right click  the VM, then click  **A** Settings; the Settings window will appear.
11. In the Settings window, click  **B** Security, click  the **C** Enable Secure Boot check box to deselect it, then click  the **D** Apply button.



VERIFY RAM AND HD SIZE

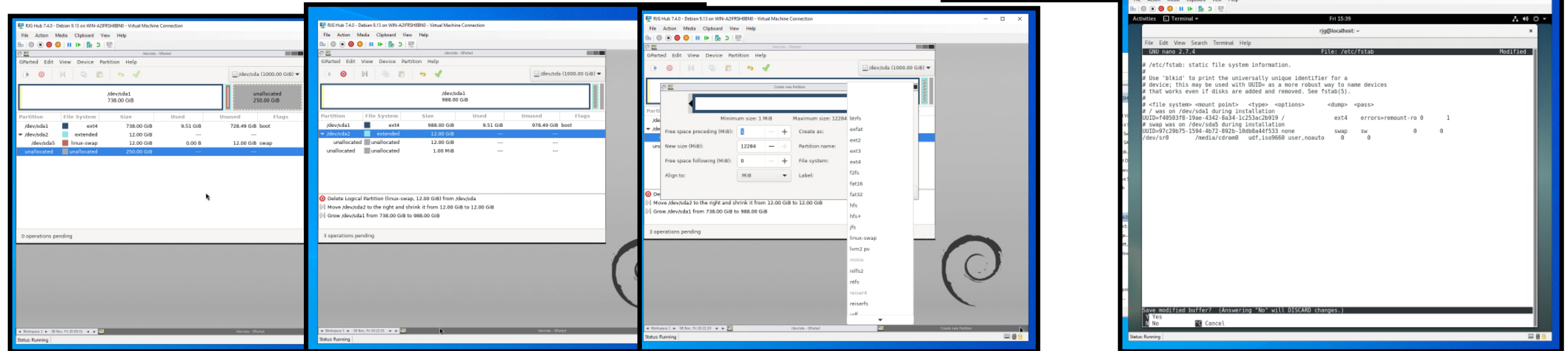
NixOS

1. Start up the Hub VM
2. log into the Terminal.
3. Type: `df -h`
4. Note: The `/dev/disk/by-label/nixos` is the drive size that was setup while going through the OVA Import Process.

```
[rjguser@TheHub:~]$ df -h
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        198M   0  198M   0% /dev
tmpfs           2.0G   8.0K  2.0G   1% /dev/shm
tmpfs           986M   7.0M  979M   1% /run
tmpfs           2.0G  384K  2.0G   1% /run/wrappers
/dev/disk/by-label/nixos  99G   7.1G   87G   8% /
tmpfs           4.0M   0   4.0M   0% /sys/fs/cgroup
tmpfs           2.0G   68K  2.0G   1% /tmp
```

Debian OS

1. Download GParted; GParted is an open-source tool designed for managing graphical disk partitions.
2. Point Hyper-V to ISO GParted file:
\$ gparted /path-to-your-device1 /path-to-your-device2
3. To view the actions supported on file systems, choose: View → File System Support.
4. To select a disk device, choose: GParted → Devices and select a device from the list.
5. Boot with third option.
6. Delete Logical Partition (linux-swap, 12.00 GiB) from /dev/sda).
7. Move /dev/sda2 to the right and shrink it accordingly.
8. Grow /dev/sda1 accordingly.
9. Make New Swap
10. nano is where the file is edited; add the new Swap into the nano, point LINUX to the new SWAP drive, and assign it to the new Swap Drive.

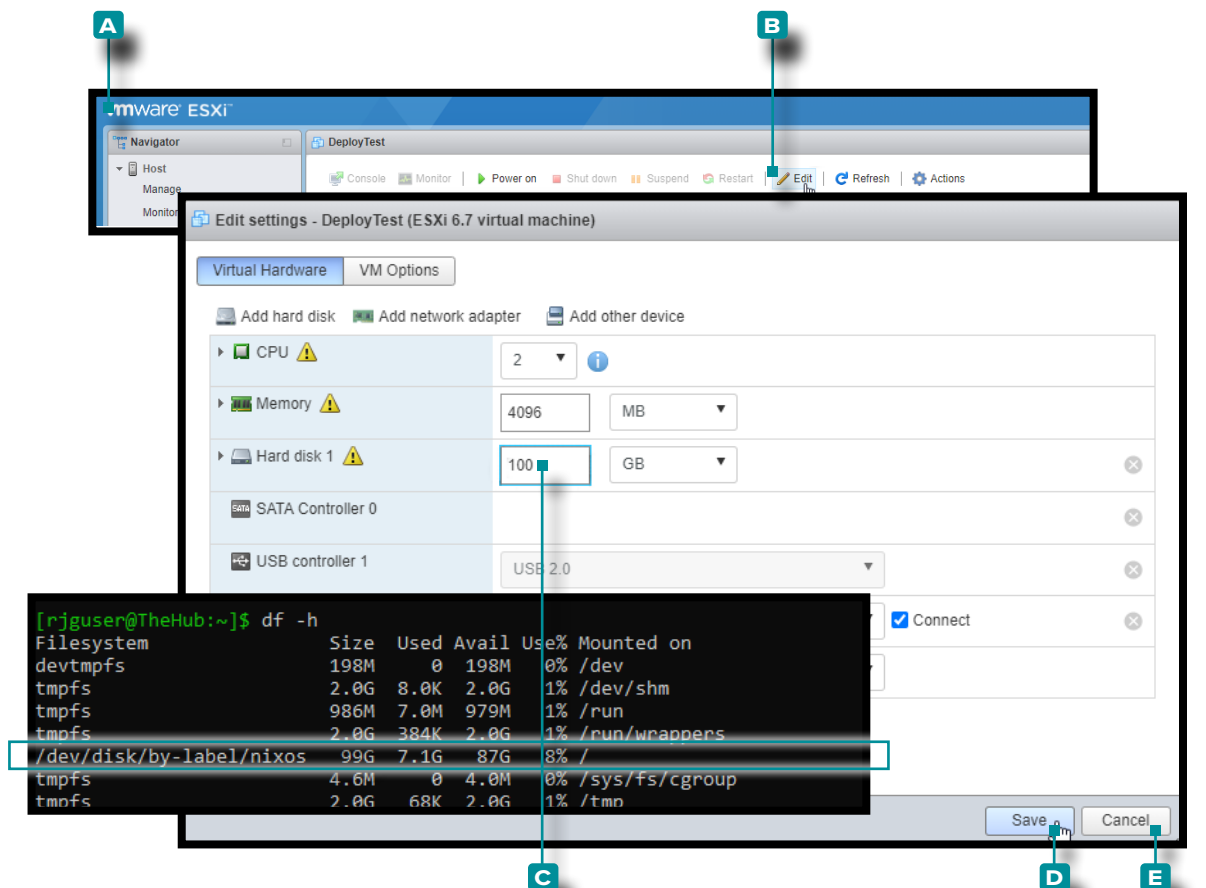


RESIZING THE HUB VA HARD DRIVE SPACE

After the virtual image is loaded onto the chosen hypervisor, it may be necessary or desired to increase the storage space on the virtual machine. Perform the following instructions to increase the storage space on the particular hypervisor.

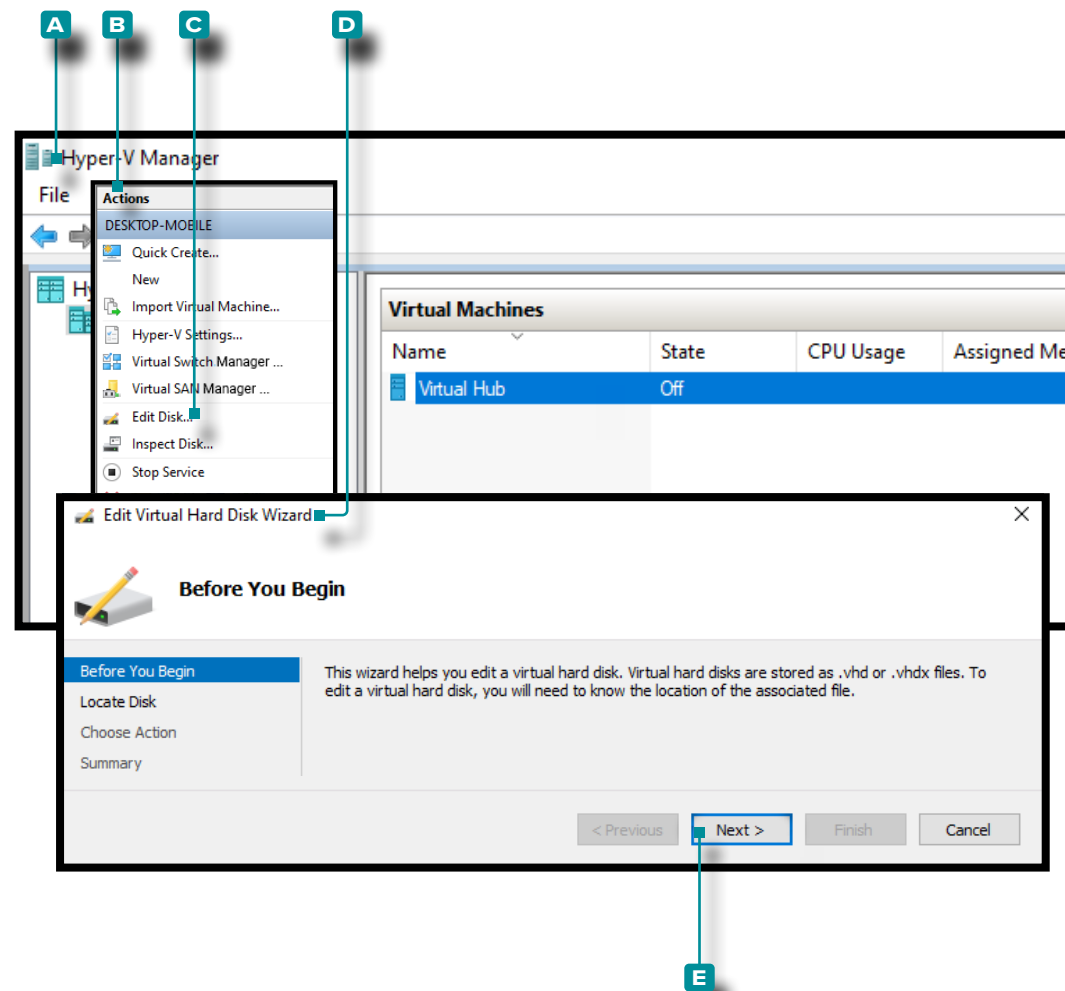
Resizing the NixOS Hard Drive Space with VMware

1. Power off the virtual machine.
2. In the **A** VMware Navigator window, ensure the machine name is highlighted.
3. Click **B** the **Edit** button in the window.
4. Click **C** and **enter** the desired amount of **C** storage in the provided field.
5. Click **D** the **Save** button to save the changes, or click **E** the **Cancel** button to cancel any changes.
6. Confirm the disk space has been upgraded once the machine is running.

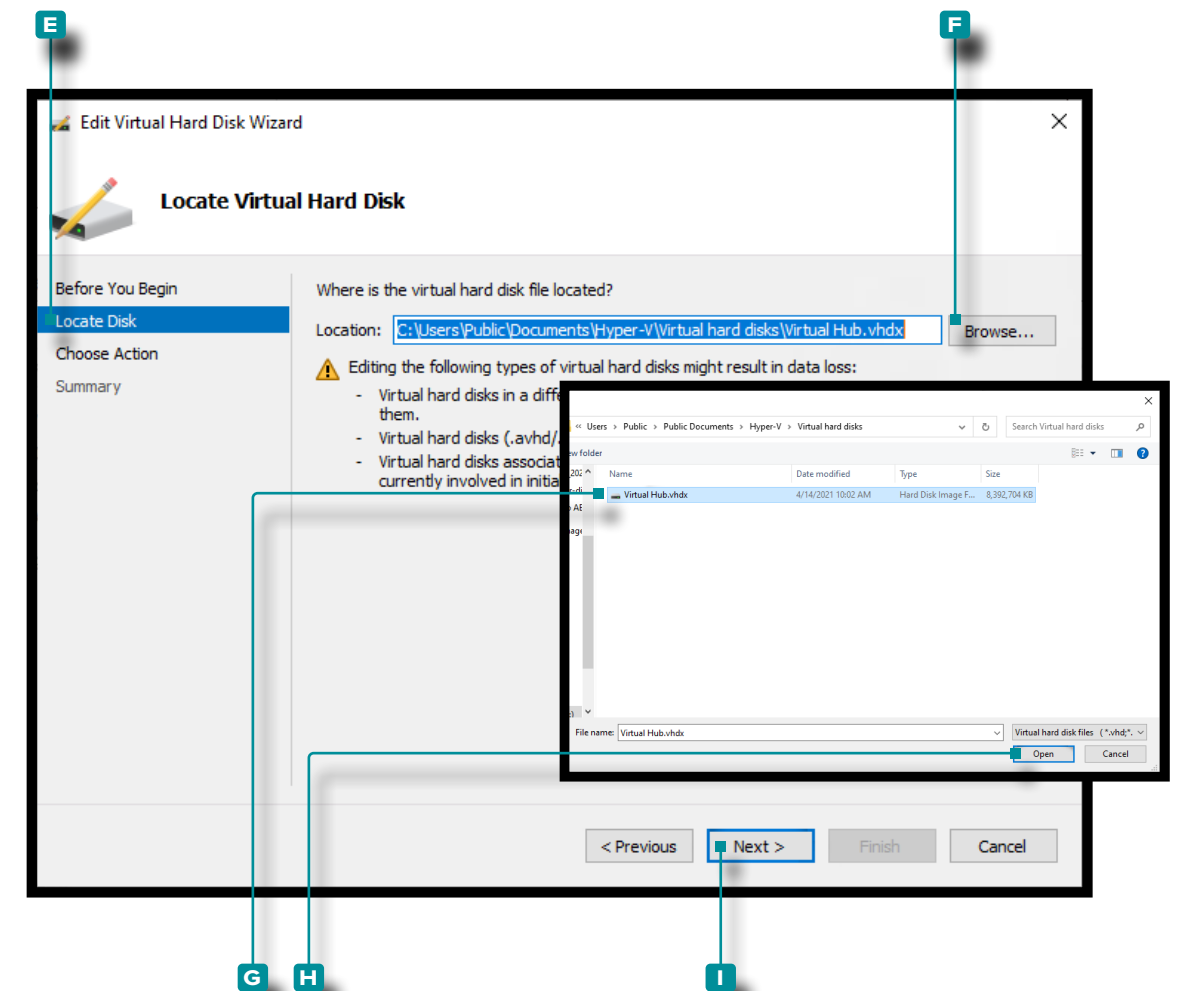


Resizing the NixOS Hard Drive Space with Hyper-V

1. Power off the virtual machine.
2. In the **A** Hyper-V Manager window, ensure the machine name is highlighted.
3. Click **B** Actions to open the drop-down window, then click **C** Edit Disk from the drop-down window; the **D** Edit Virtual Hard Disk Wizard will open.
4. Click **E** the Next button on the **D** Edit Virtual Hard Disk Wizard, Before You Begin page.

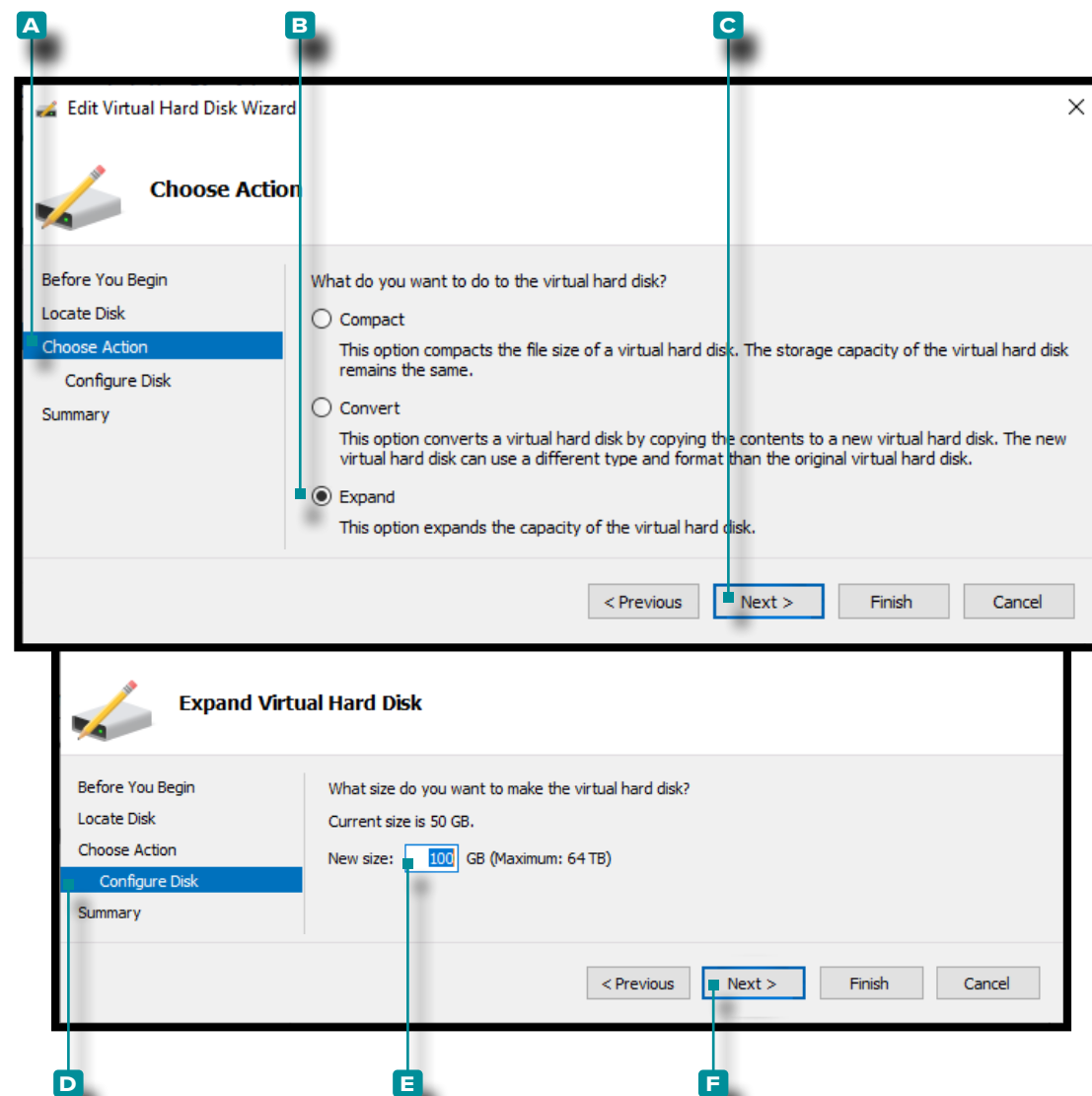


5. In the **E** Edit Virtual Hard Disk Wizard, Locate Disk page window, click **F** the Browse button. Click **G** to select the desired **H** .vhdx file in the file explorer window, then click **H** the Open button in the file explorer window.
6. Click **I** the Next button in the Edit Virtual Hard Disk Wizard, Locate Virtual Hard Disk page window.

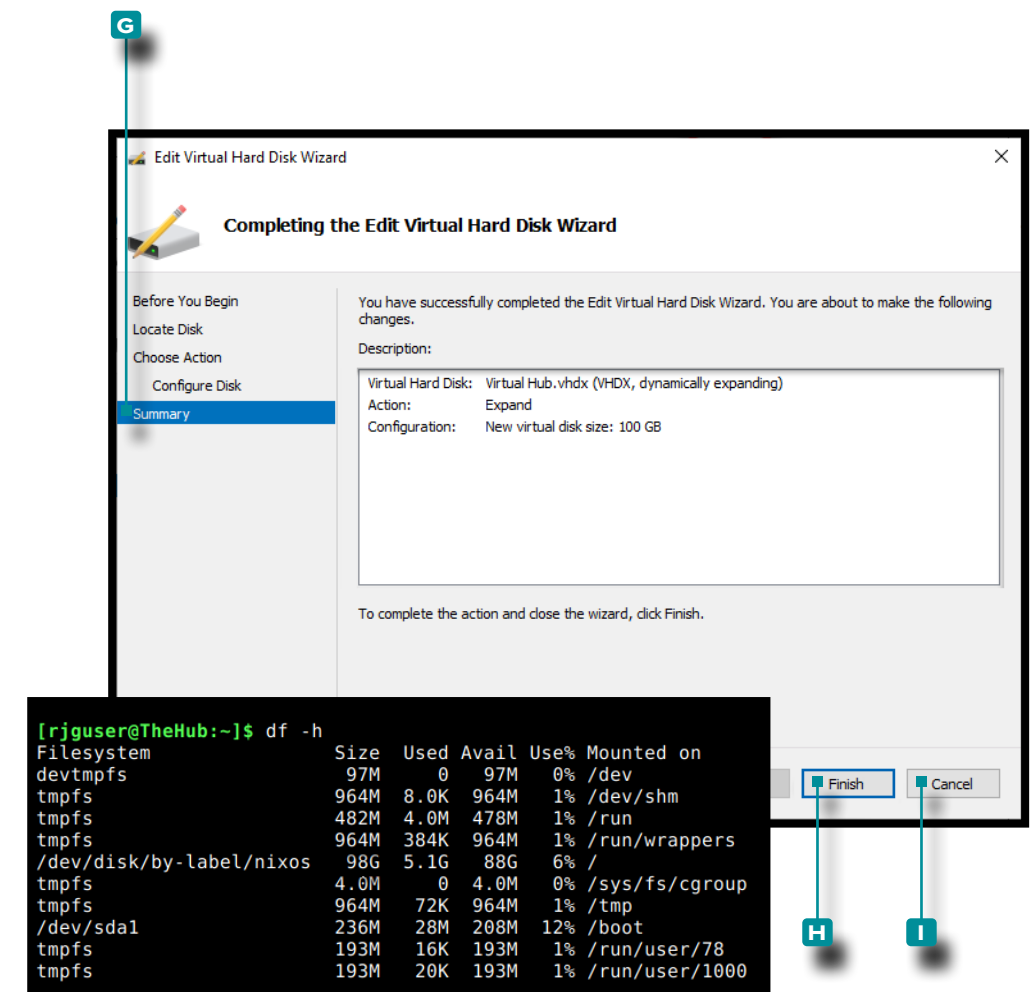


Resizing the NixOS Hard Drive Space with Hyper-V (continued)

- In the **A** Edit Virtual Hard Disk Wizard, Choose Action page window, **click** the **B** Expand option then **click** the **C** Next button.
- In the **D** Edit Virtual Hard Disk Wizard, Configure Disk page window, **click** and **enter** the **E** New Size: in the provided field in the **B** Expand option, then **click** the **F** Next button.



- In the **G** Edit Virtual Hard Disk Wizard, Summary page window, **click** the **H** Finish button in the Expand option to apply the changes or **click** the **I** cancel button to discard any changes.
- Confirm the disk space has been upgraded once the machine is running. (Open a terminal using the hypervisor to access The Hub VM; run `df -h`. Verify that `/dev/disk/by-label/nixos` is the desired size.)



Troubleshooting NixOS Virtual Hard Drive Space Resize Failure

If resizing the virtual hard drive space fails to be successful after following the steps described in "Resizing The Hub VA Hard Drive Space" on page 21, perform the following:

1. Inside the VM, Resize partition, **sudo growpart /dev/sda 1**
2. Resize file system, **sudo resize2fs /dev/sda1**

09 The Hub VA Network Configuration

THE HUB VA NETWORK CONFIGURATION REQUIREMENTS & DETAILS

Must RJG provide Shell Access to The Hub VA using SSH or hypervisor.

- Static Addresses assigned to:
 - The Hub IP
 - subnet mask
 - network gateway IP

THE HUB VA NETWORK STATUS

Use the following command to check the network status:

```
networkctl status
```



THE HUB VA NETWORK CONFIGURATION IP ADDRESS

HARDWARE ID, SET IP ADDRESS

1. Log in to the Hub appliance terminal
 - a. Connect via SSH
`ssh -l rjguser ${HUB_IP}`
 - b. Or open a terminal using the hypervisor to access The Hub VM.
2. Run `networkctl list` to find The Hub network link name

In the following example, the link `ens33` is configured.

```
1 [rjguser@TheHub:~]$ networkctl list
2 IDX LINK TYPE OPERATIONAL SETUP
3 lo loopback carrier unmanaged
4 ens33 ether routable configured
5 ens37 ether degraded configuring
6
7 3 links listed.
```

3. Navigate to the network configuration directory:
`cd / etc/systemd/network/`
4. Create a network file for the link found in step 2.
 - a. Copy the default ethernet configuration as a starting point or write a new file.
`sudo cp 99-ethernet-default-dhcp.network 1-primary-ens33.network`
 - b. The file name must end in `.network` and be in the `/etc/systemd/network/` directory.

5. Using a text editor (e.g., `nano` or `vim`), write a network file as follows
 - a. Configure the link to receive an IPv4 address by DHCP:

```
1 [Match]
2 Name=ens33
3
4 [Network]
5 DHCP=ipv4
```

- b. To configure the link with a static address, let's use an example network with
 - iii. 24-bit netmask
 - iv. desired The Hub host IP: `172.16.0.42`
 - v. Network Gateway IP: `172.16.0.1`

```
1 [Match]
2 Name=ens33
3
4 [Network]
5 Address=172.16.0.42/24
6 Gateway=172.16.0.1
```

6. Reload the network configuration file:

```
networkctl reload
```

Find the complete list of `[Network]` options here: [https://freedesktop.org/software/systemd/man/systemd.network.html#\[Network\] Section Options](https://freedesktop.org/software/systemd/man/systemd.network.html#[Network] Section Options)

① **NOTES** *Not all settings may be supported in the appliance.*

UPDATE THE HUB TIMEZONE

1. Access The Hub terminal:

```
ssh rjguser@hub-ip-address
```

2. In the Hub Terminal, view the list of available time zones:

```
timedatectl list-timezones
```

- ① **NOTES** Press the [Page Down] or [Enter Key] on the keyboard to scroll down the list; record the desired timezone for use.

3. Press [CTRL + C] to exit the timezone list.

4. Change the timezone, using the example below where the desired timezone is America/New_York:

```
sudo timedatectl set-timezone <America/New_York>
```

- ① **NOTES** Password for sudo is evintea.

5. Confirm the timezone change:

```
timedatectl
```

6. Restart Hub services:

```
sudo systemctl restart esm-collector esm-jetty [Restart esm-collector and esm-jetty services]
```

7. Restart The Hub collector service:

```
sudo systemctl restart esm-collector
```



10 The Hub Software Licensing

A software license from RJG is required for The Hub software to operate after installation. The licensed provided will allow access to the software features purchased.

1. Start The Hub VM. Ensure that The Hub has an assigned static IPv4 address via DHCP lease as described in "The Hub VA Network Configuration Requirements & Details" on page 26.
2. Login to The Hub terminal.
2. Acquire the system license information by performing the following steps:
 - in the shell, execute 'run_licenser'
 - send the output to RJG Support representative
 - (RJG) take pre-license information to the license machine and generate a license; relay license information to customer.
 - SSH into the Hub or access the command line if remoted in directly:

```
cd /usr/local/bin/License4J
bash run_licenser.sh
```
 - It will output a block with four IDs in it—copy and paste.
3. From a web browser, navigate to The Hub.

4. Create The Hub RJG administrator user account:

NixOS Default OS Username: rjguser
NixOS Default OS Password: evintea
5. Refresh page, login using RJG Admin username and password.
6. Click to accept the EULA agreement.
7. Enter license information in The Hub setup page.
8. Optionally, create additional users at this time.
9. Confirm that CoPilot system is connected and showing in Devices list.

11 The Hub Data Backup and Archival Configuration

There are multiple configurations that users can implement data backup and archival depending on infrastructure.

BACKGROUND AND DEFAULT CONFIGURATION

During installation of The Hub, the ESM Jetty directory produces the `app.properties` file; this is where the default Postgres database is mapped, data backup configuration is automatically generated, and historical job data is stored.

ESM Jetty directory:

```
/opt/rjg/esm-jetty/config/app.properties
```

The default backup location is where the job data is stored in .zip format, allowing the Postgres database to be maintained without increasing its size.

Default backup location:

```
/opt/rjg/datafiles
```

The following is an example of the default Postgres database and backup configuration:

```
1 postgres.address=127.0.0.1
2 postgres.port=5432
3 postgres.user=postgres
4 postgres.password=postgres
5
6 #backup.primaryPath=/mnt/sdb
7 #backup.secondaryPath=/mnt/nfs
8 #backup.reserveSpace=1000000000 #1GB of file space
9 #backup.databaseExpire=180 #180 days
```

The **backup.primaryPath** is the configurable primary data backup storage location, and replaces the default `/opt/rjg/datafiles` location when configured.

The **backup.secondaryPath** is the configurable secondary, or archive, data backup storage location. The `primaryPath` copies the data to the `secondaryPath`.

The **backup.reserveSpace** is the configurable space reserved, in bytes, for updates and running data to be allocated on the system—the default is 1GB of data.

The **backup.databaseExpire** is the configurable number of days before job data is removed from the database—the default is 180 days.

CONFIGURE DATA BACKUP AND ARCHIVAL

For NixOS users, refer to "Data Backup & Network Share Configuration" on page 35 to use the Hub init for configuration of data backup on a network share.

To configure the data backup settings, uncomment and modify the `backup.primaryPath`, `backup.secondaryPath`, `backup.reserveSpace`, and `backup.databaseExpire` configurations in the default file.

```
10 postgres.address=127.0.0.1
11 postgres.port=5432
12 postgres.user=postgres
13 postgres.password=postgres
14
15 #backup.primaryPath=/mnt/sdb
16 #backup.secondaryPath=/mnt/nfs
17 #backup.reserveSpace=1000000000
18 #backup.databaseExpire=180
```

If the user specifies the `secondaryPath`, the data will be defaulted to `/opt/rjg/datafiles` while the `/opt/rjg/esm-jetty/config/app.properties` `secondaryPath` mapped location will receive the backed-up copy *when no other configurations are made*.

When the `primaryPath` and `secondaryPath` are set, the data inside of the `primaryPath` is automatically copied to the `secondaryPath` location.

When the `backup.reserveSpace` is exceeded, the system will delete the oldest files first.



12 The Hub Cloud INIT Configuration for NIX OS

THE HUB INIT SERVICE CONFIGURATION

THIS CONFIGURATION IS OPTIONAL; NOT ALL CUSTOMERS REQUIRE CLOUD INIT CONFIGURATION.

CAUTION Any changes to The Hub INIT requires the form to be completed in its entirety; for example, if TLS has already been enabled and configured, and a network share is being added at a later time, the TLS information must also be completed with the data backup and network share information.

The Hub Instance ID

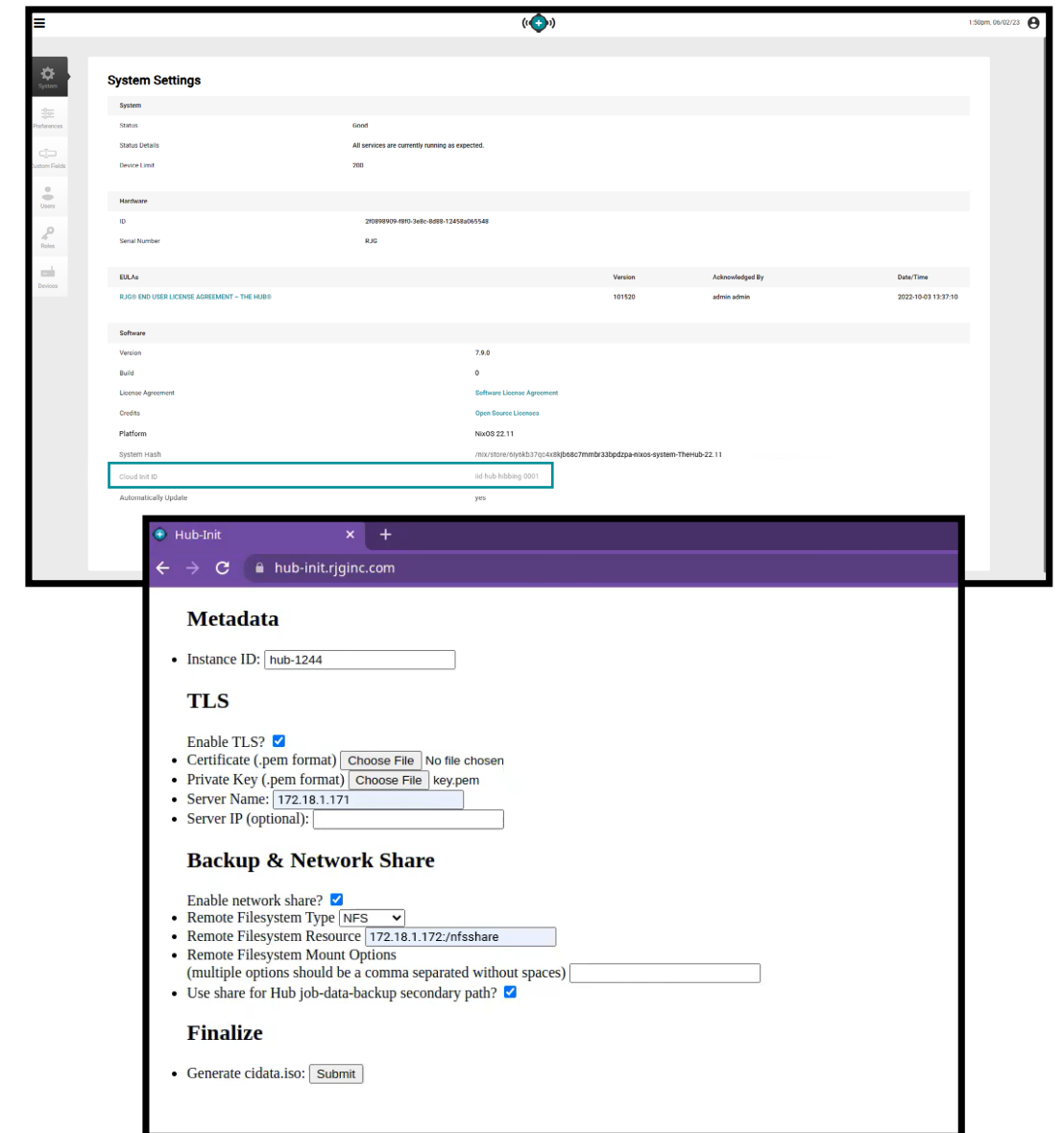
The instance ID applies the saved configurations each time The Hub VA boots, and is included in each hub-init configuration file. The Hub instance ID is required to complete TLS and data backup/network share configuration. A typical format is iid-hub-{site}-{NNNN}, where 'NNNN' is a number increment when changes are made to The Hub init settings. Define a strategy for managing the instance ID as configuration changes are made over time.

Locating The Hub Instance ID

The Hub instance ID can be located on The Hub/Settings/System Settings page, or by using the terminal, issuing the command cloud-init query instance-id.

TRANSPORT LAYER SECURITY (TLS) OVERVIEW AND CONFIGURATION

Transport layer security (TLS) is a data encryption of information sent between applications over the internet, often displayed as the padlock icon displayed on web browsers. TLS prevents private or sensitive information that is transmitted from being hacked. Transport Layer Security (TLS) can be configured on The Hub VA system using the hub-init service.



TRANSPORT LAYER SECURITY (TLS) OVERVIEW AND CONFIGURATION (continued)

Requirements

- Certificate and Private Key Files in PKCS#7 Format
- Current cloud-init Instance ID (if any)
- Intended The Hub Server (Domain) Name

Extracting PKCS#7 Certificate and Private Key Files from PKCS#12 (optional)

Extract and convert certificate and private key files into the required format if using the `.pfx` file.

```
1 #Extracting the client certificates:
2 openssl pkcs12 -in [yourfile.pfx] -clcerts -nokeys -out [cert.pem]
3
4 #Extracting the private key:
5 openssl pkcs12 -in [yourfile.pfx] -nocerts -nodes -out [key.pem]
```

Certificate Chains

If using certificate chains, bag attributes must not be present in the certificate. Also, if using a chain, the main certificate must be first, followed by the remaining bundle.

TRANSPORT LAYER SECURITY (TLS) OVERVIEW AND CONFIGURATION (continued)

TLS Configuration

CAUTION Any changes to The Hub init requires the form to be completed in its entirety; for example, if TLS has already been enabled and configured, and a network share is being added at a later time, the TLS information must also be completed with the data backup and network share information.

1. Navigate to **A** <https://hub-init.rjginc.com/>
2. Enter **B** a new cloud-init instance ID in the **B** Instance ID field:
 - a. A typical format is iid-hub-{site}-{NNN} , where "NNN" is an increment number when cloud-init settings are changed.
3. Click **C** to select the **C** box next to "Enable TLS?".
4. Select the PKCS#7 **D** certificate and **E** key files from the file system.
5. Enter **F** The Hub **F** server name.
6. Click **G** the **G** Submit button generate a hub-init.iso file.
7. Attach the ISO file to The Hub. A virtual CD-ROM drive may be required if one does not exist.
8. Reboot The Hub.

The screenshot shows a web browser at hub-init.rjginc.com. The form is divided into sections: Metadata, TLS, Network Share, and Finalize. Callouts A through G point to specific elements: A points to the browser address bar, B to the Instance ID field (containing 'hub-1244'), C to the 'Enable TLS?' checkbox (checked), D to the 'Certificate (.pem format)' 'Choose File' button, E to the 'Private Key (.pem format)' 'Choose File' button (with 'key.pem' selected), F to the 'Server Name' field (containing '172.18.1.171'), and G to the 'Submit' button in the Finalize section. The Network Share section is partially visible, showing 'Remote Filesystem Type' set to 'NFS' and 'Remote Filesystem Resource' set to '172.18.1.172:/nfsshare'.

Data Backup & Network Share Configuration

CAUTION Any changes to The Hub init requires the form to be completed in its entirety; for example, if TLS has already been enabled and configured, and a network share is being added at a later time, the TLS information must also be completed with the data backup and network share information.

Requirements

- Existing network share (CIFS or NFS)
- Network share resource details (IP address)
- Current Instance ID
 - Navigate to **A** <https://hub-init.rjginc.com/>
 - Enter** the cloud-init instance ID in the **B** Instance ID field.
 - Click** to select the **C** box next to "Enable Network Share?".
 - Click** to select the **D** Filesystem Type (NFS OR CIFS) from the dropdown menu.
 - Enter** the **E** Filesystem Resource name.
 - Enter** any desired **F** Filesystem Mount Options, separated by a comma without spaces.
 - Click** the **G** box to select the network share for The Hub job-data-backup as a secondary path.
 - Click** the **H** Submit button generate a `hub-init.iso` file.
 - Attach the ISO file to The Hub. A virtual CD-ROM drive may be required if one does not exist.
 - Reboot The Hub.

The screenshot shows a web browser window with the URL `hub-init.rjginc.com`. The form is titled "Hub-Init" and is divided into several sections: "Metadata", "TLS", "Backup & Network Share", and "Finalize".

- Metadata:** Instance ID: `hub-1244` (Callout A points to the label, B to the input field).
- TLS:** Enable TLS? (Callout C points to the checkbox). Certificate (.pem format) No file chosen. Private Key (.pem format) key.pem. Server Name: `172.18.1.171` (Callout D points to the input field). Server IP (optional): (Callout E points to the input field).
- Backup & Network Share:** Enable network share? (Callout F points to the checkbox). Remote Filesystem Type: `NFS` (Callout G points to the dropdown menu). Remote Filesystem Resource: `172.18.1.172:/nfsshare` (Callout H points to the input field). Remote Filesystem Mount Options (multiple options should be a comma separated without spaces) . Use share for Hub job-data-backup secondary path? (Callout I points to the checkbox).
- Finalize:** Generate cidata.iso: (Callout J points to the button).

Job Backup File Confirmation

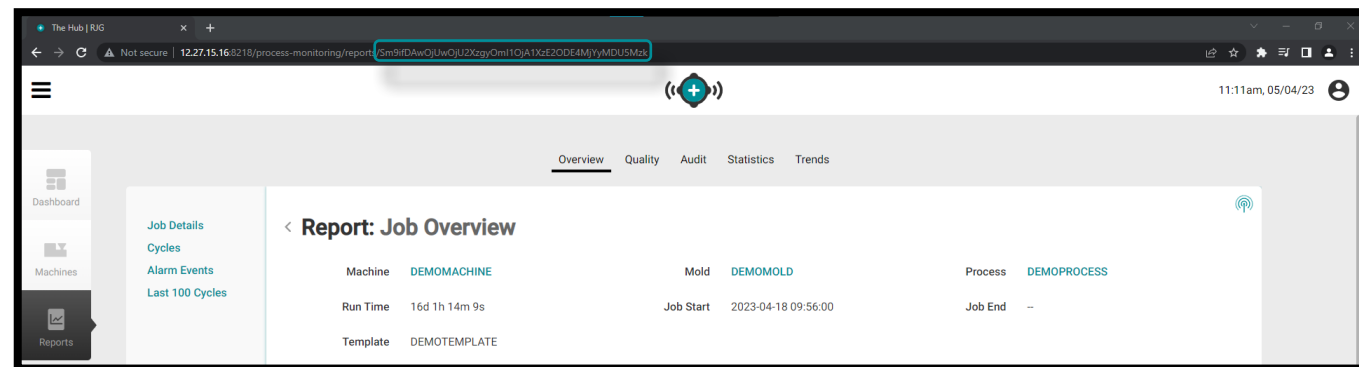
This test creates a job backup file to verify the job is backed up to the network share configured in "Data Backup & Network Share Configuration" on page 35.

NOTES A CoPilot system must be connected to The Hub software.

1. Start a job on the CoPilot system.
2. Verify the job is visible on The Hub software.
3. On the The Hub for Process Monitoring software, navigate to the Reports view and locate the job (the most-recently started job will be at the top of the list). **The 'Job End' time should be empty.**
4. Stop the job on the CoPilot system. Verify the job has a 'Job End' time on the The Hub for Process Monitoring software Reports view.

NOTES Cycles are not required for this test.

5. Locate the Job ID on the The Hub for Process Monitoring software Reports view, and **click** on the Job to open the Job Overview Report. The Job ID is the right-most text segment in the browser URL after the last forward slash.



6 `Sm9ifDAw0jUw0jU2Xzgy0jMy0jc1XzE20DIwMTU1NDA3NzA`

6. Log in to the console of The Hub software using a hypervisor or a terminal client. Search for the Job ID found in the previous step in the terminal using the following command:

1 `fd jobID /mnt/backup/`

7. The job backup file should be located on the network share; if the job backup file is not located on the network share, refer to "Troubleshooting the Network Share" on page 37.

Non-Job Backup File Confirmation

This test creates a non-job backup file to verify the file is backed up to the network share configured in "Data Backup & Network Share Configuration" on page 35.

1. Log in to The Hub software console using a hypervisor or terminal client.
2. In the terminal, issue the command:

```
s start backup-hub-non-job-data.service
```

3. Verify that a non-job backup file exists on The Hub software network share by issuing the following command:

```
1 fd hub-non-job-backup /mnt/backup/
```

The job backup file should be located on the network share; if the job backup file is not located on the network share, refer to "Troubleshooting the Network Share" on page 37.

13 The Hub Software Virtual Appliance (VA) Configuration Troubleshooting

TROUBLESHOOTING THE NETWORK SHARE

Use the following to troubleshoot the network share and The Hub software network share and backup settings if job backup or non-job backup files are not located on the network share during the tests on page 36 and page 36.

Locate Network Share Files

1. Verify whether the files can be located on the mounted share by issuing the following command in the terminal:

```
1 ls /mnt/backup/
```

A listing of files should be displayed in the top level of the mounted network share; see the following example:

```
2 [rjguser@TheHub:~]$ ls /mnt/backup/  
3 myfile    foo    bar    anotherfile    reallylongfilename  
4 myfile2    moo
```

2. If no files are present but it is known that the share contains files, or an error message such as “No such file or directory” is displayed, contact RJG Support or continue to the following troubleshooting steps. If the network share is not mounted as expected, RJG Support will assist in configuring the network share.

Troubleshooting the Network Share Mount

Perform the following steps to determine why the network share is not mounted.

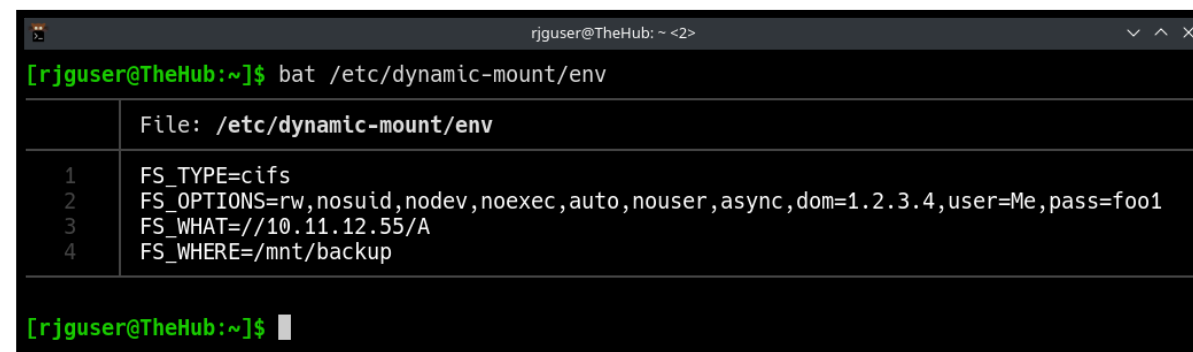
CAUTION These steps may require consultation with RJG Support to interpret and prevent any potential data loss.

Testing the Environment File

The Hub VA mounts the network share based on data configured in an environment file. The entries should be able to be related back to the settings entered on the hub-init service.

View the env file to check for spelling mistakes or anything unexpected by issuing the following terminal command:

```
1 bat /etc/dynamic-mount/env
```



```
rjguser@TheHub: ~ <2>
[rjguser@TheHub:~]$ bat /etc/dynamic-mount/env
File: /etc/dynamic-mount/env
1 FS_TYPE=cifs
2 FS_OPTIONS=rw,nosuid,nodev,noexec,auto,nouser,async,dm=1.2.3.4,user=Me,pass=foo1
3 FS_WHAT=//10.11.12.55/A
4 FS_WHERE=/mnt/backup
[rjguser@TheHub:~]$
```

Service

The **dynamic-mount.service** is responsible for mounting the network share.

In the terminal, issue the command:

```
1 s is-active dynamic-mount.service
```

The desired status is 'active':

```
1 [rjguser@TheHub:~]$ s is-active dynamic-mount.service
2 active
```

Other possible states are possible; refer to the Systemd Unit State Table below:

| SYSTEMD UNIT STATE | MEANING |
|--------------------|--|
| active | running, started, bound (depends on the unit type) |
| inactive | not running, stopped, unbound |
| activating | in the process of being activated (started) |
| deactivating | in the process of being deactivated (stopping) |
| failed | the process returned an error code, crashed, timed-out, etc. |

Testing the Mount

The mounting of the network filesystem (in coordination with the Linux kernel) is achieved via systemd-mount; check for the mount by name using the systemd naming scheme.

In the terminal, issue the command: `s is-active mnt-backup.mount`

The desired status is 'active':

```
1 [rjguser@TheHub:~]$ s is-active mnt-backup.mount
2 active
```

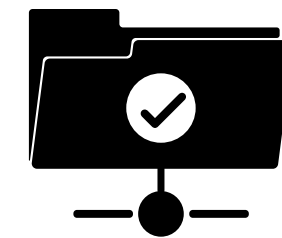
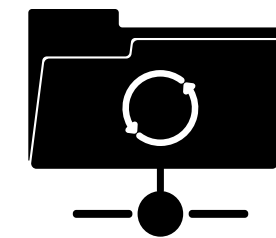
Testing Connectivity

Check the network connectivity between The Hub software and the network share host.

In the terminal, ping the IP address of your network share:

```
1 ping 10.11.12.55
```

If all of the above options have been exhausted, and it could not be verified that the network share is mounted, please contact RJG Support.



```
rjguser@TheHub: ~
[rjguser@TheHub:~]$ ping 10.11.12.55
PING 10.11.12.55 (10.11.12.55) 56(84) bytes of data:
64 bytes from 10.11.12.55: icmp_seq=1 ttl=64 time=0.391 ms
64 bytes from 10.11.12.55: icmp_seq=2 ttl=64 time=0.395 ms
64 bytes from 10.11.12.55: icmp_seq=3 ttl=64 time=0.364 ms
64 bytes from 10.11.12.55: icmp_seq=4 ttl=64 time=0.355 ms
64 bytes from 10.11.12.55: icmp_seq=5 ttl=64 time=0.343 ms
64 bytes from 10.11.12.55: icmp_seq=6 ttl=64 time=0.366 ms
64 bytes from 10.11.12.55: icmp_seq=7 ttl=64 time=0.420 ms
^C
--- 10.11.12.55 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6122ms
rtt min/avg/max/mdev = 0.343/0.376/0.420/0.024 ms
[rjguser@TheHub:~]$
```

14 The Hub Software Virtual Appliance (VA) Restoring Data

RESTORING DATA

The preferred way to restore job data is via the network share.

If job data zip files are retained on a network share, and follow the above steps to create a new The Hub VA instance, The Hub will automatically begin importing the job backups after rebooting in step 2.c.

Restore Job Data from a Network Share (Preferred Method)

Backups will automatically begin importing when the following conditions are met:

1. Job backup files reside on the network share and
2. The network share is configured on the new The Hub VA instance.

Restore Job Data by Upload (Alternate Method)

Restore the job .zip files may be restored by copying the files into The Hub data backup primary path.

1. Copy job data backups using Secure copy protocol (SCP). (For example, use the 'WinSCP' implementation on Microsoft Windows.)
2. Connect the SCP program to The Hub (details vary).
3. Upload the job data zip files to The Hub: move the files into `/opt/rjg/datafiles`

Backups will automatically begin importing after a short time.

It may be necessary to restart The Hub service to trigger the import. This can be achieved with the following command:

```
systemctl restart esm-jetty
```

RESTORING DATA (continued)

Restore Non-Job Data

Use the terminal and `pg_restore` to recover the non-job data (Users, Roles, EULA acknowledgments.)

1. Move the `hub-non-job-backup_date.zip` file to The Hub software. Use one of the two methods described in "Restore Job Data from a Network Share (Preferred Method)" or "Restore Job Data by Upload (Alternate Method)" on page 40.
2. Stop The Hub software application services:

```
1 s stop esm-jetty esm-collector
```

3. Create a folder to work in:

```
1 [rjguser@TheHub:~]$ mkdir /tmp/restore
2
3 [rjguser@TheHub:~]$ cd /tmp/restore
4
5 [rjguser@TheHub:/tmp/restore]$
```

4. Unpack the `hub-non-job-backup_date.zip` file:

(this is just an example; reference the full path to your actual hub-non-job-backup file)

```
1 [rjguser@TheHub:/tmp/restore]$ unzip /mnt/backup/hub-non-job-backup_2023-04-20__19-41-57_-0400.zip
```

5. Import the non-job data:

```
1 pg_restore -Upostgres -d postgres /tmp/restore
```

CAUTION Please note an error message will be displayed; this should be ignored. The error is displayed below for reference.

```
1 pg_restore: error: COPY failed for table "documents_role":
  ERROR:  duplicate key value violates unique constraint
  "documents_role_pkey"
```

6. Restart the Hub services:

```
1 s start esm-collector esm-jetty
```

15 The Hub NixOS Shell Commands Quick Guide

Check Server for Update

Checks update server for update

```
s start autoupdater
```

Check Hardware ID

Outputs the hardware ID

```
run_licenser
```

Check Current The Hub Software Version

Outputs current version of Hub Software

```
rjg-debug-info
```

Check Network IP

Shows network IP information

```
ifconfig
```

Check, Configure, and Troubleshoot Network Links

Display Network Links

Network links tool—similar to systemctl—that displays network links.

```
networkctl
```

Display Network Interfaces

Shows network interfaces

```
networkctl list
```

Refresh Network Interfaces

Refreshes the network interfaces (applies changes)

```
networkctl reload
```

Locate Network Configuration File

Locates network configuration file; files that ends with *.network will be displayed.

```
/etc/systemd/network
```

Standard format:

```
1 [Match]
2 Name=*interface name
3 [Network]
4 Address=*static ip address
5 Gateway=*ip gateway
```

16 CoPilot® System Installation

COPILOT SYSTEM HARDWARE INSTALLATION

Refer to CoPilot System Hardware Installation Guide www.rjginc.com.

COPILOT SYSTEM NETWORKING

Cables

Connect Cables between CoPilot systems and network switches.

- Use CAT5e or CAT6 ethernet cables
- Ethernet cables *and* connectors must be shielded
- one single, continuous ethernet cable *per CoPilot system* to connect to the network switch
 - Longest cable between CoPilot System and The Hub network less than 300 ft (91 m)
- Cables clear of any EMI sources including high voltage, solenoids, electric/servo motors, and/or any static-generating devices
- Test each cable with an ethernet cable tester to verify integrity of cable

CoPilot System Network Settings

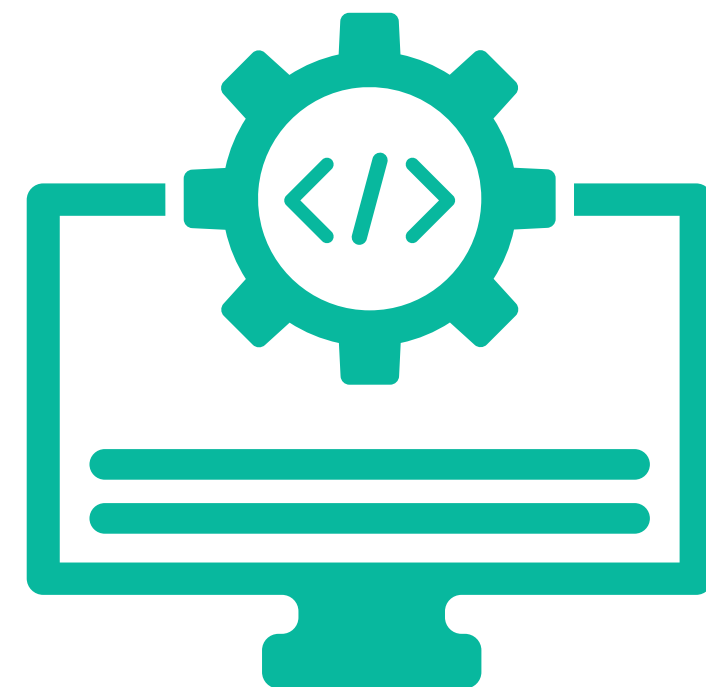
On each CoPilot System access the network settings card

1. Select the network configuration DHCP
2. Enter The Hub software network address
3. Start job on each CoPilot system to verify that the CoPilot systems are displayed on The Hub software Machines page.

17 The Hub[®] Software Representational State Transfer (REST) Application Program Interface (API)

The Hub's REST API is accessible through the same domain as the web interface. For example, if The Hub and API are accessible from a network location.

① **NOTES** *This information is current and applicable as dated 12/08/2021; RJG makes no guarantee that this information is or will be applicable to future release(s) of this product.*



REQUEST ENDPOINT FOR JOBS

Use the endpoint to get additional details for a specific job.

Response Properties

| PROPERTY | TYPE | DESCRIPTION |
|--------------|---------|---|
| id | String | The ID used for referencing the job. |
| machineName | String | The name of the machine. |
| moldName | String | The name of the mold. |
| processName | String | The name of the process. |
| startTime | Integer | The starting timestamp for the job (in milliseconds). |
| endTime | Integer | The ending timestamp for the job (in milliseconds). |
| runTime | Integer | The total duration for the job (in milliseconds). |
| downTime | Integer | The total down time for the job (in milliseconds). |
| machineState | String | The last machine state for the job; possible values are "Running", "Stopped", "Down", or "Syncing". |

| PROPERTY | TYPE | DESCRIPTION |
|----------------------|---------|--|
| sortState | String | The last sorting state for the job; possible values are "Good" or "Reject". |
| alarmState | String | The last alarm state for the job; possible values are "Good", "Warning", "Alarm", "No Alarms Set", or "No Alarm Tool". |
| machineMatch | String | The last machine match value for the job; possible values are "Good", "Warning", "Alarm", or "No Match". |
| materialMatch | String | The last material match value for the job; possible values are "Good", "Warning", "Alarm", or "No Match". |
| moldMatch | String | The last mold match value for the job; possible values are "Good", "Warning", "Alarm", or "No Match". |
| connected | Boolean | Indicates whether the machine is currently connected or disconnected. |
| processCurrent | Boolean | Indicates if the current machine, mold, and process for the job matches the current CoPilot configuration. |
| excessiveRejectCount | Integer | The total number of times that an excessive reject output was triggered. |
| sortingDisabledCount | Integer | The total number of cycles that ran while sorting was disabled. |

| PROPERTY | TYPE | DESCRIPTION |
|--------------------|---------|---|
| secondaryVpCount | Integer | The total number of times that V→P has fired off a secondary control. |
| currentTemplatedId | String | The ID used for referencing the currently configured template. |
| rejectPercent | Float | The percentage of reject cycles when compared to total cycles. |
| downTimePercent | Float | The percentage of down time when compared to the total run time. |
| totalCycles | Integer | The total number of cycles that the job has completed. |
| goodCycles | Integer | The number of cycles in the job that were flagged as "Good". |
| rejectCycles | Integer | The number of cycles in the job that were flagged as "Reject". |
| alarmCycles | Integer | The number of cycles that triggered an alarm state. |
| alarms | Array | A list of Alarm Objects (see below). |

ALARM OBJECTS

| PROPERTY | TYPE | DESCRIPTION |
|-----------------|---------|--|
| name | String | The name of the alarm. |
| alarmCountAbove | Integer | The number of cycles during which the named value was above the alarm limit. |
| alarmCountBelow | Integer | The number of cycles during which the named value was below the alarm limit. |



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