



Deploying Software Using BFB

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NVIDIA® BlueField® devices support software deployment and upgrade through various BFB image types. For details on available image formats and their contents, refer to the ["Types and Methods of Updating BlueField Software Image"](#) page.

BFB Installation

BlueField software and firmware can be deployed using one of two methods:

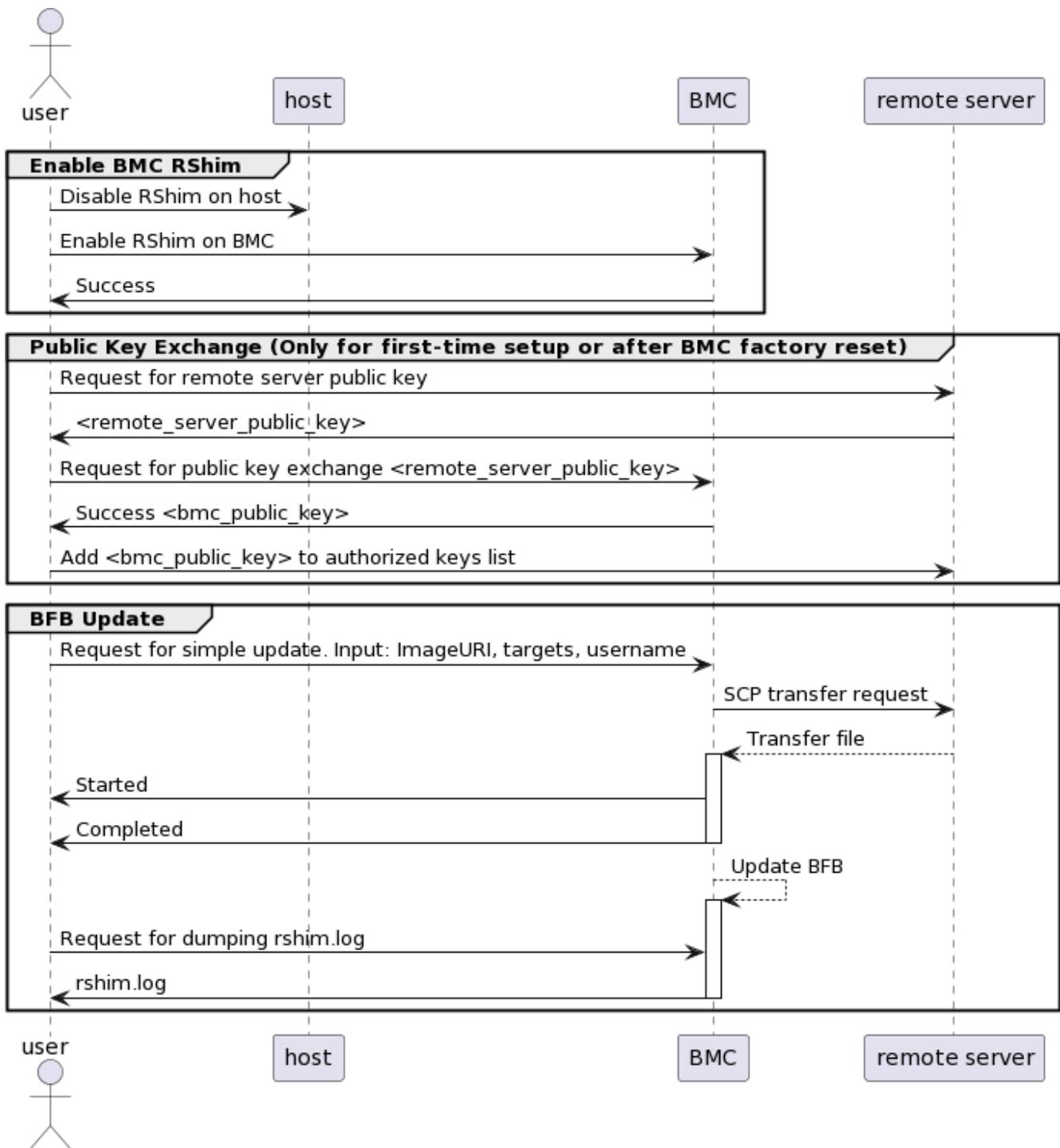
Update Flow	Description	Supported Image Types
Offline Update Flow	<p>Traditional method where the DPU or SuperNIC is taken out of service immediately when the update begins. The device reboots into maintenance mode, applies firmware, system image, and DOCA component updates, and reboots again to activate the new versions. Ensures a clean, immediate transition but involves downtime. This flow supports recovery as well.</p>	<ul style="list-style-type: none"> • BF-Bundle BFB (firmware + Arm OS + DOCA) • BF-fwBundle BFB (firmware only) • Per-SKU BF-fwBundle BFB
Deferred Update Flow	<p>BlueField-3 supports a Deferred Update Flow, which enables administrators to update firmware and DOCA components without immediate service interruption. This capability allows a DPU or SuperNIC to continue servicing workloads while a new firmware bundle and user-space/kernel DOCA components are staged in the background.</p> <p>The new versions become active only after an activation command and reset are applied, minimizing downtime in production environments.</p>	<ul style="list-style-type: none"> • Per-SKU BF-fwBundle BFB

BFB Installation Procedure

The BFB deployment process consists of these main stages:

	Stage	Description
1	Disable RShim (if applicable)	Ensure that the RShim interface is disabled on the host side where the given DPU resides to prevent interference with the BFB update process.
2	Transfer the BFB image	Initiate the image transfer using one of the supported methods: <ul style="list-style-type: none"> • Redfish interface via SCP, HTTP, or HTTPS <ul style="list-style-type: none"> ◦ When using SCP for the first time (or after a BMC factory reset), confirm the SSH identity of the BMC when connecting to the server hosting the BFB. ◦ Send the update request via the Redfish API. • Direct SCP — Transfer the BFB directly to the BMC file system using secure copy.
3	Monitor installation progress	Track the update process and verify installation status through Redfish logs, BMC console, or CLI output.
4	Apply the new version	Reboot the system to activate the new firmware and software. The specific reboot behavior depends on the selected update flow (offline or deferred).

Update Flow



Changing Default Credentials Using bf.cfg

If installing the BF-Bundle BFB with BlueField Arm OS, Ubuntu users are prompted to change the default password (ubuntu) for the default user (ubuntu) upon first login.

Logging in will not be possible even if the login prompt appears until all services are up (`DPU is ready` message appears in `/dev/rshim0/misc`).

Alternatively, Ubuntu users can provide a unique password that will be applied at the end of the BFB installation. This password must be defined in a `bf.cfg` configuration file. To set the password for the `ubuntu` user:

1. Create password hash. Run:

```
# openssl passwd -1  
Password:  
Verifying - Password:  
$1$3B0RlrfX$TlHry93NFUJzg3Nya00rE1
```

2. Add the password hash in quotes to the `bf.cfg` file:

```
# vim bf.cfg  
ubuntu_PASSWORD='$1$3B0RlrfX$TlHry93NFUJzg3Nya00rE1'
```

The `bf.cfg` file is used with the `bfb-install` script in the steps that follow.

Update Flow Image Transfer

Offline Update Flow

```
curl -k -u root:<password> -H "Content-Type: application/json" -X POST -d  
'{"TransferProtocol":"SCP", "ImageURI":"<image_uri>", "Targets":  
["redfish/v1/UpdateService/FirmwareInventory/DPU_OS"], "Username":"<username>"}'  
https://<bmc_ip>/redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate
```

(i) Note

This command initiates a soft reset on the BlueField and then pushes the boot stream. For NVIDIA-supplied BFBs, the eMMC is flashed automatically once the boot stream is pushed. Upon success, a `running` message is received.

(i) Info

After the BMC boots, it may take a few seconds (6-8 seconds for NVIDIA® BlueField®-2, and 2 seconds for BlueField-3) until the BlueField BSP (`DPU_OS`) is up.

Deferred Update Flow

(i) Note

Supported at beta level.

Deferred update flow enables upgrading DOCA components on NVIDIA® BlueField® platforms running in DPU mode while keeping services operational throughout the process. The update is applied only after a coordinated reset, minimizing downtime.

Deferred Update Flow Prerequisites

1. Download the per-SKU fw-bundle BFB from [DOCA Downloads](#) page.

(i) Note

The installed firmware must be BSP 4.13.0 (DOCA 3.2.0) or later.

2. When operating in DPU mode, credentials for DPU-BMC must be specified in `/etc/bf-upgrade.conf` on the Arm OS following the same format as `bf.cfg`. For more details, refer to "[Customizing BlueField Software Deployment](#)".
3. (Optional) To enable a coordinated BlueField reboot with the host reboot, perform the following configuration from the BlueField Arm OS:

```
m1xconfig -d /dev/mst/<device> set INT_CPU_AUTO_SHUTDOWN=1
```

Note

This must be configured in advance, as it requires a [BlueField system-level reset](#) to take effect.

Initiate Firmware Deferred Update Flow Transfer

```
curl -k -u root:<password> -H "Content-Type: application/json" -X POST -d  
{ "TransferProtocol": "HTTP", "ImageURI": "<image_uri>", "Targets":  
[ "redfish/v1/UpdateService/FirmwareInventory/DPU_OS", "Username": "<username>", "Stage": true ] }  
https://<bmc_ip>/redfish/v1/UpdateService/Actions/UpdateService.SimpleUpdate
```

Note

The parameter `Stage` is only supported when `Targets` is set to `redfish/v1/UpdateService/FirmwareInventory/DPU_OS`. Another deferred update will fail if the staging has not completed.

Example success message if the request is valid and a task is created:

```
{
  "@odata.id": "/redfish/v1/TaskService/Tasks/<task_id>",
  "@odata.type": "#Task.v1_4_3.Task", "Id": "<task_id>",
  "TaskState": "Running", "TaskStatus": "OK"
}
```

Transfer Command Parameters

- `image_uri` – contains both the remote server IP address and the full path to the `<fw-bundle-sku*>.bfb` file on the remote server, with **one slash** between the two fields (i.e., `<remote_server_ip>/<full_path_of_bfb>`).

Info

For example, if `<remote_server_ip>` is `10.10.10.10` and `<full_path_of_bfb>` is `/tmp/file.bfb` then `"ImageURI": "10.10.10.10//tmp/file.bfb"`.

- `TransferProtocol` – set to either `SCP`, `HTTP`, `HTTPS`

Note

If using HTTPS, make sure the BMC has a certificate to authenticate the HTTPS server. Or install a valid certificate to authenticate:

```
curl -c cjar -b cjar -k -u root:'<password>' -X  
POST https://$bmc/redfish/v1/Managers/Bluefield_BMC/  
Truststore/Certificates -d @CAcert.json
```

- `username` – username on the remote server (only required for SCP)
- `bmc_ip` – BMC IP address
- `Stage` – a value of `True` indicates a deferred flow, a value of `False` or omitting this parameter indicates an offline update flow

Setting Up Secure Connection

Note

Relevant only for SCP users with Redfish.

Note

The following is an example for how to generate the server public key on Ubuntu 22.04 and it may be different on other OS distributions/versions.

1. Gather the public SSH host keys of the server holding the `new.bfb` file. Run the following against the server holding the `new.bfb` file ("Remote Server"):

Info

OpenSSH is required for this step.

```
ssh-keyscan -t <key_type> <remote_server_ip>
```

Where:

- `key_type` – the type of key associated with the server storing the BFB file (e.g., ed25519)
- `remote_server_ip` – the IP address of the server hosting the BFB file

2. Retrieve the remote server's public key from the response, and send the following Redfish command to the BlueField BMC:

```
curl -k -u root:'<password>' -H "Content-Type: application/json" -X POST -d '{"RemoteServerIP": "<remote_server_ip>", "RemoteServerKeyString": "<remote_server_public_key>"}' https://<bmc_ip>/redfish/v1/UpdateService/Actions/Oem/NvidiaUp
```

Where:

- `password` – BlueField BMC password
- `remote_server_ip` – the IP address of the server hosting the BFB file
- `remote_server_public_key` – remote server's public key from the `ssh-keyscan` response, which contains both the type and the public key with **one space** between the two fields (i.e., "`<type> <public_key>`")

- `bmc_ip` – BMC IP address
3. Extract the BMC public key information (i.e., "`<type> <bmc_public_key> <username>@<hostname>`") from the `PublicKeyExchange` response and append it to the `authorized_keys` file on the remote server holding the BFB file. This enables password-less key-based authentication for users.

```
{
  "@Message.ExtendedInfo": [
    {
      "@odata.type": "#Message.v1_1_1.Message",
      "Message": "Please add the following public
key info to ~/.ssh/authorized_keys on the
remote server",
      "MessageArgs": [
        "<type> <bmc_public_key> root@dpu-bmc"
      ]
    },
    {
      "@odata.type": "#Message.v1_1_1.Message",
      "Message": "The request completed
successfully.",
      "MessageArgs": [],
      "MessageId": "Base.1.15.0.Success",
      "MessageSeverity": "OK",
      "Resolution": "None"
    }
  ]
}
```

Tracking Image Transfer Status and Progress

After receiving a success message of a valid `SimpleUpdate` request and a `running` task state. Run the following Redfish command to track image transfer status and progress:

```
curl -k -u root:'<password>' -X GET
https://<bmc_ip>/redfish/v1/TaskService/Tasks/<task_id>
```

Note

During the transfer, the `PercentComplete` value remains at 0 for offline update flow. If no errors occur, the `TaskState` is set to `Running`, and a keep-alive message is generated every 5 minutes. Once the transfer is completed, the `PercentComplete` is set to `100`, and the `TaskState` is updated to `Completed`. Upon failure, a message is generated with the relevant resolution.

Example:

```
{
  "@odata.type": "#MessageRegistry.v1_4_1.MessageRegistry",
  "Message": "Image 'new.bfb' is being transferred to '/dev/rshim0/boot'.",
  "MessageArgs": [
    "new.bfb",
    "/dev/rshim0/boot"
  ],
  "MessageId": "Update.1.0.TransferringToComponent",
  "Resolution": "Transfer started",
  "Severity": "OK"
},
...
```

```
"PercentComplete" : 60,  
"StartTime" : "2024-06-10T19:39:03+00:00",  
"TaskMonitor" : "/redfish/v1/TaskService/Tasks/1/Monitor",  
"TaskState" : "Running",  
"TaskStatus" : "OK"
```

Installation Status and Activation

Tracking Offline Update Flow Installation Status

In the Offline Update Flow, once the image transfer finishes, users can use the RShim miscellaneous messages log dump to track the installation's progress and status.

1. Initiate request for dump download:

```
sudo curl -k -u root:'<password>' -d '{"DiagnosticDataType":  
"Manager"}' -X POST  
https://<ip_address>/redfish/v1/Managers/Bluefield_BMC/LogServ
```

Where:

- `<ip-address>` – BMC IP address
- `<password>` – BMC password

2. Use the received task ID to poll for dump completion:

```
sudo curl -k -u root:'<password>' -H 'Content-Type:  
application/json' -X GET  
https://<ip_address>/redfish/v1/TaskService/Tasks/<task_id>
```

Where:

- `<ip-address>` – BMC IP address
- `<password>` – BMC password
- `<task_id>` – Task ID received from the first command

3. Once dump is complete, download and review the dump:

```
sudo curl -k -u root:'<password>' -H 'Content-Type:
application/json' -X GET
https://<ip_address>/redfish/v1/Managers/Bluefield_BMC/LogServ
--output </path/to/tar/log_dump.tar.xz>
```

Where:

- `<ip-address>` – BMC IP address
- `<password>` – BMC password
- `<entry_id>` – The entry ID of the dump in `redfish/v1/Managers/Bluefield_BMC/LogServices/Dump/Entries`
- `</path/to/tar/log_dump.tar.xz>` – path to download the log dump `log_dump.tar.xz`

4. Untar the file to review the logs. For example:

```
tar xvfJ log_dump.tar.xz
```

5. The log is contained in the `rshim.log` file. The log displays `Reboot`, `finished`, `DPU is ready`, or `In Enhanced NIC mode` when BFB installation completes.

Note

If the downloaded log file does not contain any of these strings, keep downloading the log file until they appear.

6. When installation is complete, you may crosscheck the new BFB version against the version provided to verify a successful upgrade:

```
curl -k -u root:"<PASSWORD>" -H "Content-Type: application/json" -X GET https://<bmc_ip>/redfish/v1/UpdateService/FirmwareInventory/DPU
```

Example response:

```
"@odata.id":  
"/redfish/v1/UpdateService/FirmwareInventory/DPU_OS",  
"@odata.type":  
"#SoftwareInventory.v1_4_0.SoftwareInventory",  
"Description": "Host image",  
"Id": "DPU_OS",  
"Members@odata.count": 1,  
"Name": "Software Inventory",  
"RelatedItem": [  
  {  
    "@odata.id": "/redfish/v1/Systems/Bluefield/Bios"  
  }  
],  
"SoftwareId": "",  
"Status": {  
  "Conditions": [],  
  "Health": "OK",  
  "HealthRollup": "OK",  
  "State": "Enabled"  
},
```

```
"Updateable": true,  
"Version": "DOCA_2.2.0_BSP_4.2.1_Ubuntu_22.04-8.23-07"
```

Deferred Update Flow

Checking Staging Status

Check the staging status after the transfer (i.e., the `SimpleUpdate` task) is completed successfully. A successful result of the staging procedure will be `com.nvidia.BF.Rshim.Status.Completed` after staging completes.

```
curl -k -u root:<password> -H "Content-Type: application/json" -X GET  
https://<bmc_ip>/redfish/v1/Managers/Bluefield_BMC/Actions/Oem/NvidiaManager.GetUpdateStatus  
{  
  "UpdateStatus": "com.nvidia.BF.Rshim.Status.Completed"  
}
```

Note

The `UpdateStatus` can be:

- `'com.nvidia.BF.Rshim.Status.Invalid'`
`0000019a-a294-d3f6-abda-b29fa6a40000`
- `'com.nvidia.BF.Rshim.Status.Idle'`
- `'com.nvidia.BF.Rshim.Status.InProgress'`
- `'com.nvidia.BF.Rshim.Status.Completed'`
- `'com.nvidia.BF.Rshim.Status.Failed'`

The default status is `com.nvidia.BF.Rshim.Status.Idle` and it take a while to update the status from `com.nvidia.BF.Rshim.Status.Idle` to `com.nvidia.BF.Rshim.Status.InProgress` after the `SimpleUpdate` command is sent. The final status should be `com.nvidia.BF.Rshim.Status.Completed` or `com.nvidia.BF.Rshim.Status.Failed`.

Activate the Firmware Components

Once staging is completed successfully, issue the `Activate` command. Activation is required to apply the new staged components:

```
curl -k -u root:'<password>' \  
      -H "Content-Type: application/json" \  
      -X POST \  
      https://<bmc_ip>/redfish/v1/Managers/Bluefield_BMC/Actions/Oem/NvidiaManager.Activate
```

Notes on BMC firmware activation:

- Regular BFB bundle – BMC firmware is updated without needing this manual activation command.
- PLDM BFB bundle – This activation command is required to apply the new BMC firmware.

DOCA Components Update

To complete an update to a new GA release, the DOCA Components on the Arm OS are to be updated as well. User may SSH into the DPU Arm OS and use standard Linux tools to update the DOCA components. See section "Upgrading BlueField Using Standard Linux Tools" in [DOCA documentation](#) for more details.

Applying New BFB Image

The following are different options for applying the new version:

Reset Type	Mode of Operation	Applying Reset Steps	Notes
Cold Boot (AC/DC Power Cycle)	<ul style="list-style-type: none"> DPU Mode NIC Mode 	<ol style="list-style-type: none"> (DPU Mode only) Gracefully shut down the BlueField Arm OS. Perform a full server power cycle. 	<ul style="list-style-type: none"> The firmware update is applied automatically during power-up. DPU Mode only: The BlueField Arm OS must be manually shut down before the reboot; otherwise, the update will not apply.
Standard Warm Reboot	<ul style="list-style-type: none"> DPU Mode NIC Mode 	<ol style="list-style-type: none"> (DPU Mode only) Gracefully shut down the BlueField Arm OS. Perform a server warm reboot. 	<ul style="list-style-type: none"> Updates firmware and software after reboot. DPU Mode only: The BlueField Arm OS must be manually shut down before the reboot; otherwise, the update will not apply.

Reset Type	Mode of Operation	Applying Reset Steps	Notes
Coordinated Reset (Server + DPU)	DPU Mode	<p>1. When the administrator has completed all update flows, the DPU must be armed for the coordinated reset. Run the following command from the BlueField Arm OS. This sets a firmware trigger (<code>MFRL[reset_trigger]=0x48</code>) that instructs the DPU and its DPU-BMC to automatically reset in sync with the next host server reboot. This coordinated reset is required to apply the new firmware and software versions.</p> <pre> mlxreg -d /dev/mst/<device> -y --set "reset_trigger=c" -- reg_name="MFRL" </pre> <p>2. Perform a server warm reboot.</p>	<ul style="list-style-type: none"> • Relevant to Deferred Update Flow only. • The next warm reboot will: <ul style="list-style-type: none"> ◦ Gracefully shut down BlueField Arm cores ◦ Reset the NIC, Arm Complex, and BMC ◦ Boot from the new firmware image

Verify New Components are Running

After DPU reboots, check that the components have been updated:

```

curl -k -u root:'<Password>' -X GET https://<bmc ip>/redfish/v1/UpdateService/FirmwareInventory/DPU_NIC
curl -k -u root:'<Password>' -X GET https://<bmc ip>/redfish/v1/UpdateService/FirmwareInventory/DPU_ATF
curl -k -u root:'<Password>' -X GET https://<bmc ip>/redfish/v1/UpdateService/FirmwareInventory/DPU_UEFI

```

Troubleshooting Scenarios

- If RShim is disabled:

```
{
  "error": {
    "@Message.ExtendedInfo": [
      {
        "@odata.type": "#Message.v1_1_1.Message",
        "Message": "The requested resource of type Target
named '/dev/rshim0/boot' was not found.",
        "MessageArgs": [
          "Target",
          "/dev/rshim0/boot"
        ],
        "MessageId": "Base.1.15.0.ResourceNotFound",
        "MessageSeverity": "Critical",
        "Resolution": "Provide a valid resource identifier
and resubmit the request."
      }
    ],
    "code": "Base.1.15.0.ResourceNotFound",
    "message": "The requested resource of type Target named
'/dev/rshim0/boot' was not found."
  }
}
```

- If a username or any other required field is missing:

```
{
  "Username@Message.ExtendedInfo": [
    {
      "@odata.type": "#Message.v1_1_1.Message",
```

```

    "Message": "The create operation failed because the
required property Username was missing from the request.",
    "MessageArgs": [
        "Username"
    ],
    "MessageId":
"Base.1.15.0.CreateFailedMissingReqProperties",
    "MessageSeverity": "Critical",
    "Resolution": "Correct the body to include the required
property with a valid value and resubmit the request if the
operation failed."
    }
]
}

```

- If host identity is not confirmed or the provided host key is wrong:

```

{
    "@odata.type":
"#MessageRegistry.v1_4_1.MessageRegistry",
    "Message": "Transfer of image '<file_name>' to
'/dev/rshim0/boot' failed.",
    "MessageArgs": [
        "<file_name>",
        "/dev/rshim0/boot"
    ],
    "MessageId": "Update.1.0.TransferFailed",
    "Resolution": " Unknown Host: Please provide server's
public key using PublicKeyExchange ",
    "Severity": "Critical"
}
...
"PercentComplete": 0,
"StartTime": "<start_time>",

```

```
"TaskMonitor":  
"/redfish/v1/TaskService/Tasks/<task_id>/Monitor",  
"TaskState": "Exception",  
"TaskStatus": "Critical"
```

i Info

In this case, revoke the remote server key using the following Redfish command:

```
curl -k -u root:'<password>' -H "Content-  
Type: application/json" -X POST -d  
'{"RemoteServerIP": "<remote_server_ip>"}'  
https://<bmc_ip>/redfish/v1/UpdateService/Actions/Oem/Nvi
```

Where:

- `remote_server_ip` – remote server's IP address
- `bmc_ip` – BMC IP address

Then repeat the following steps:

1. [Preparing Secure Access for Image Transfer](#).
2. [Offline Update Flow](#).

- If the BMC identity is not confirmed:

```
{  
  "@odata.type":  
  "#MessageRegistry.v1_4_1.MessageRegistry",
```

```

    "Message": "Transfer of image '<file_name>' to
'/dev/rshim0/boot' failed.",
    "MessageArgs": [
        "<file_name>",
        "/dev/rshim0/boot"
    ],
    "MessageId": "Update.1.0.TransferFailed",
    "Resolution": "Unauthorized Client: Please use the
PublicKeyExchange action to receive the system's public key
and add it as an authorized key on the remote server",
    "Severity": "Critical"
}
...
"PercentComplete": 0,
"StartTime": "<start_time>",
"TaskMonitor":
"/redfish/v1/TaskService/Tasks/<task_id>/Monitor",
"TaskState": "Exception",
"TaskStatus": "Critical"

```

Info

In this case, verify that the BMC key has been added correctly to the `authorized_key` file on the remote server.

- If SCP fails:

```

{
    "@odata.type":
"#MessageRegistry.v1_4_1.MessageRegistry",
    "Message": "Transfer of image '<file_name>' to
'/dev/rshim0/boot' failed.",

```

```
    "MessageArgs": [
      "<file_name>",
      "/dev/rshim0/boot"
    ],
    "MessageId": "Update.1.0.TransferFailed",
    "Resolution": "Failed to launch SCP",
    "Severity": "Critical"
  }
...
  "PercentComplete": 0,
  "StartTime": "<start_time>",
  "TaskMonitor":
"/redfish/v1/TaskService/Tasks/<task_id>/Monitor",
  "TaskState": "Exception",
  "TaskStatus": "Critical"
```

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