User Guide

Host OTA Instructions User Guide

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Ayla Networks

Referenced Documents

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Table of Contents

1 Introduction

This document describes Ayla's Host over-the-air (OTA) process including how to start an OTA job and upgrade the host MCU software. It also discusses the flow of operations and the communication interface between the Ayla Cloud services, Ayla module and the host MCU.

OTA is a solution to update images on both the Wi-Fi module and the product solution. This may be required due to necessary updates in the communications protocol, improvements in the transport or security service, or for product functionality improvements.

NOTE	This guide only covers OTA instructions for Host MCU Images. This guide DOES NOT cover OTA instructions for Ayla Images.

Ayla OTA update management process is supported by two separate services in the Ayla cloud; Ayla Device Service for managing image download requests, and Ayla Image Service for hosting the images.

The Ayla OEM Dashboard allows you to perform OTA management tasks, such as create, update and track all OTA images (firmware updates) in developer and field environments. This is available for module software, application MCU, and Linux firmware updates. You can typically create a group of devices and then have OTA jobs for those groups.

1.1 Audience

This document is written for all Ayla OEM administrators.

NOTE: Only OEM admins are allowed to execute OTA Host jobs.

1.2 Related Documentation

The following documents are referenced in this document; each document has a document name and a number in parenthesis. You can locate these documents at the Ayla support website using either the document name or number. If you do not find a document in your support site documents, contact your Customer Technical Lead or other Ayla support personnel.

- Host OTA Instructions App Note (AY006ATA3)
- Host MCU OTA Image Update

1.3 Glossary

- Cloud templates – Ayla Networks' predefined cloud templates that are designed to reduce the work requirement for a customer to create a product.
- Developer Portal – Ayla's Developer Portal is used to setup, register developer kits and define the details of a product

- Host MCU – The product's MCU that communicates directly with Ayla enabled Wi-Fi module.
- Properties – Cloud defined values that when aggregated define what and how product features and functionality are experienced by the end user.
- RBAC – Role Based Access Control framework is a process that establishes role-based access to users.
- Wi-Fi Module - A Wi-Fi module is a hardware component that has an MCU containing the Ayla agent and Wi-Fi component used to allow connectivity to Ayla's Cloud Services.

2 OTA Images

OTA images consist of Host MCU images.

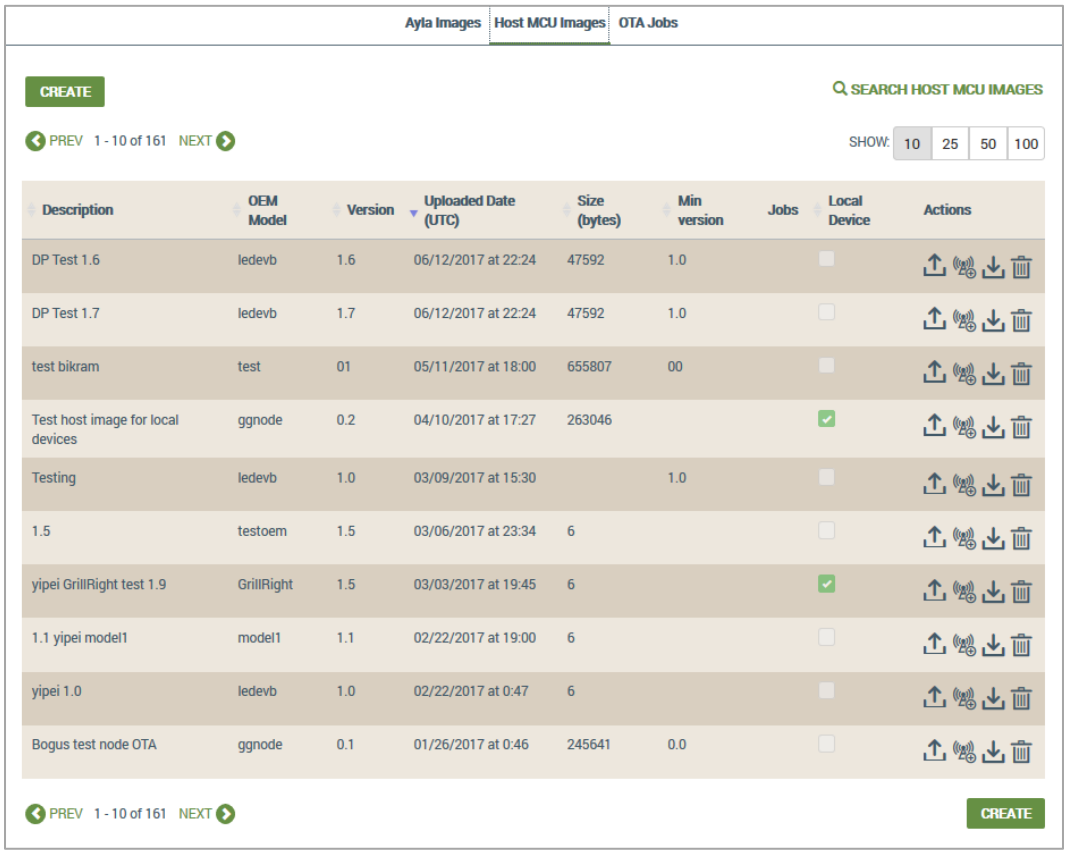
2.1 Host MCU Images

Host images are programs that run on the Host MCU and developed by or for the OEM.

To access Host MCU images, perform the following steps:

1. Launch the OEM Dashboard and select **OTA** from the menu on the left side of the screen.
2. Click the **Host MCU Images** tab located on page menu (Figure 1).

Figure 1. – OEM Dashboard – Host MCU Images



On the OEM dashboard, you can view details about the MCU Host Images, deploy images or download a MCU Host Image.

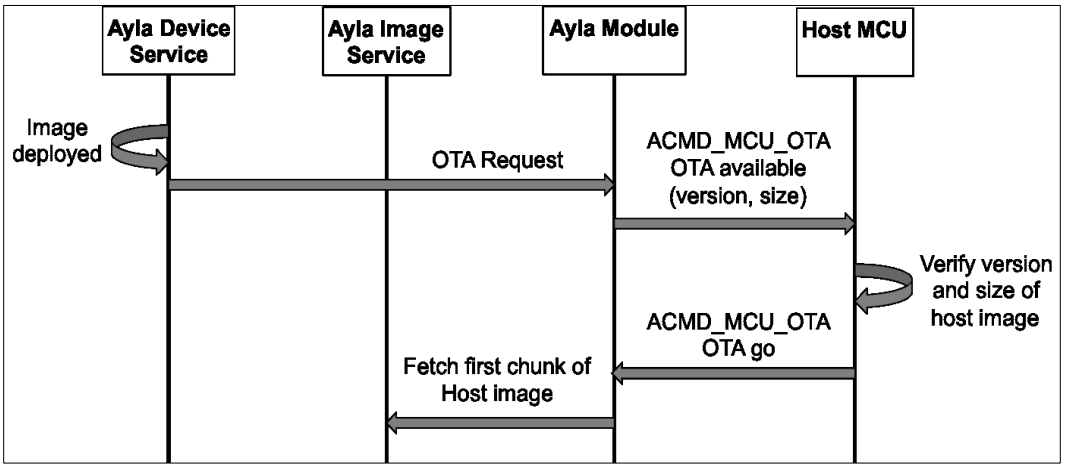
3 OTA Update Process

The following sections discuss the communications and process flows for OTA updates. The flow of messages between the Ayla Cloud services, the Ayla module and the host MCU are described in the following figures.

1. On deployment of a host image, Ayla Device Service create a pending job request for MCU download. It will keep serving this command to module, until module has reported that this job has completed.
2. Once module receives this download request, it will initiate a command to the MCU to indicate the availability of an OTA image. MCU can then either accept or reject the OTA request.

   Figure 2 is an illustration of the MCU booting to new image successfully.

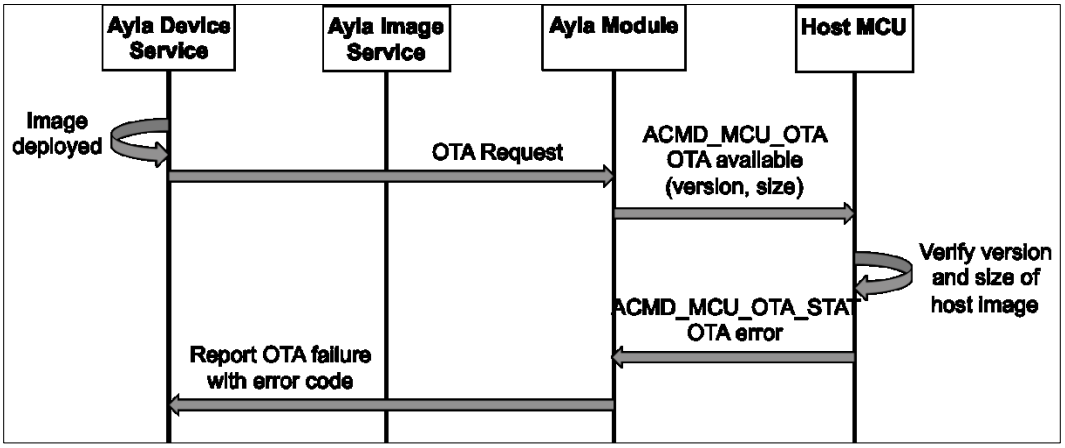
Figure 2. – Host MCU OTA Start – Success Case



   MCU can choose to reject the image for example if the size of the offered image is too large, or if the version associated with the image is older or the same as the existing version.
3. If MCU rejects the update request, module will report OTA failure to Ayla Device Service, and report job status as complete.

   Figure 3 is an illustration of the MCU booting to new image and failing.

Figure 3. – Host MCU OTA Start – Failure case with error



4. If MCU accepts the update request, image download will start. Module fetches the host image in chunks, serving these one at a time to MCU.

   Figure 4 is an illustration of a successful Host MCU OTA image download.

Figure 4. – Host MCU OTA with image download - Success Case

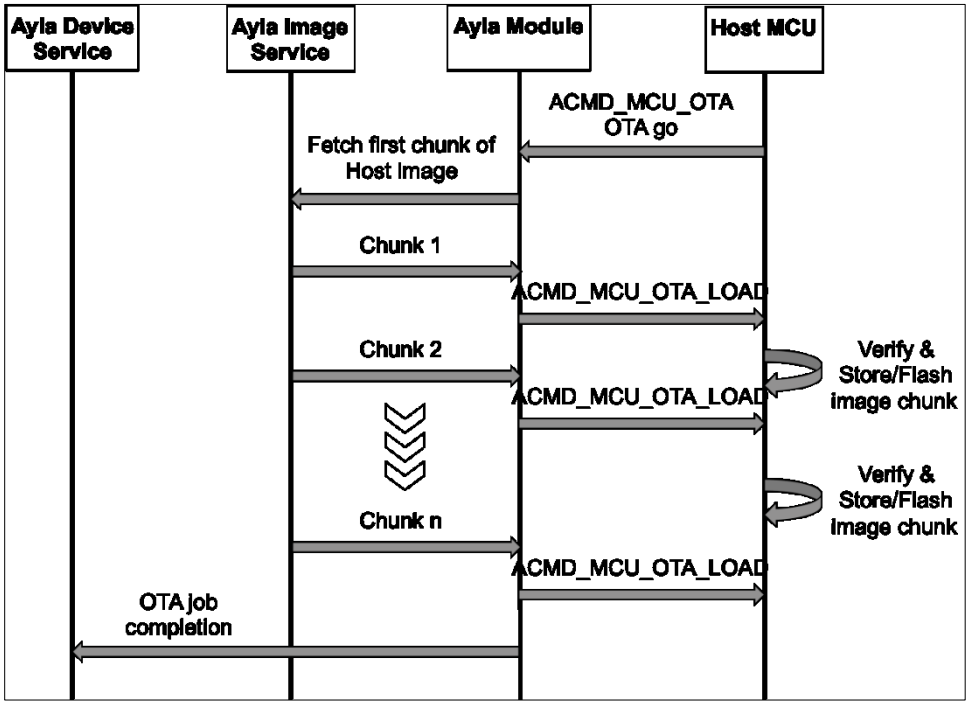
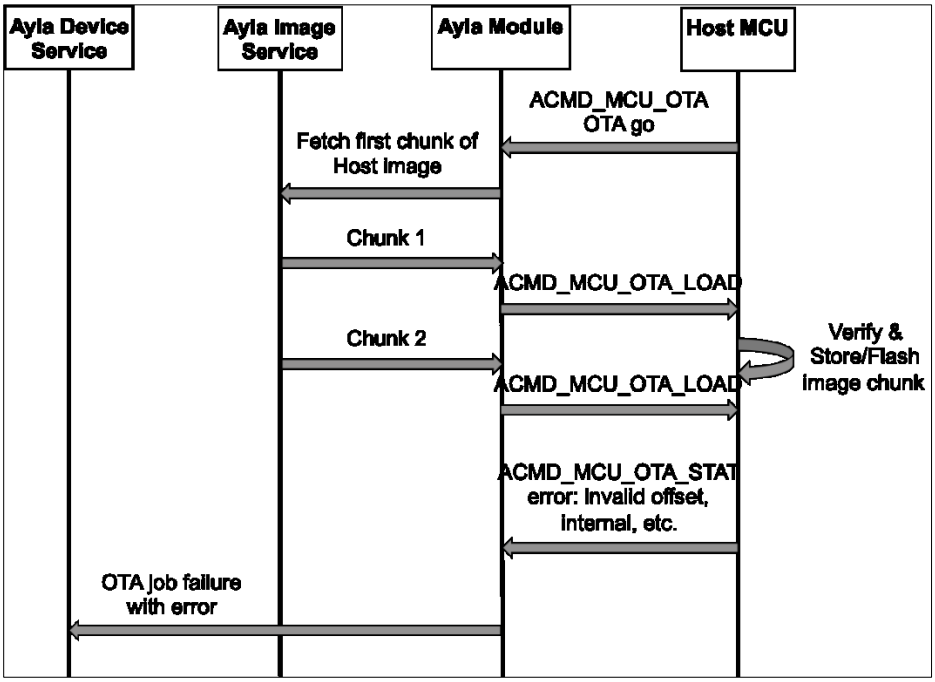


Figure 5 is an illustration of a Host MCU OTA image download that was NOT successful.

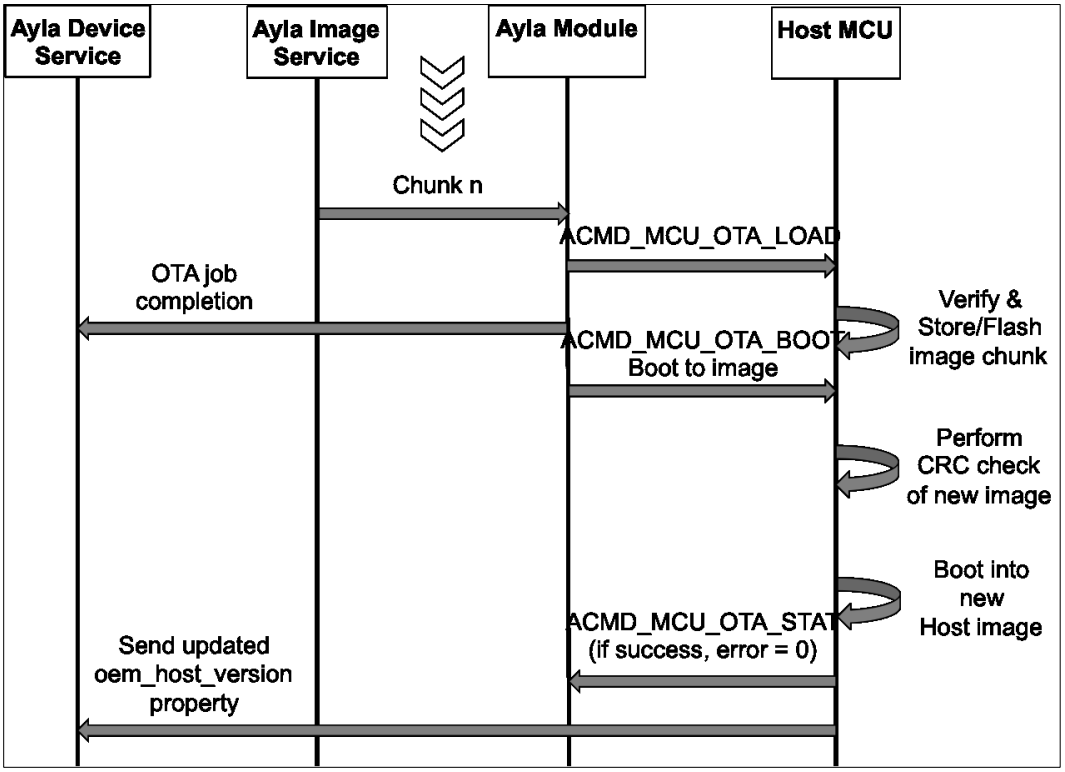
Figure 5. – Host MCU OTA with error during image download



1. If MCU rejects the update request, module will report OTA failure to Ayla Device Service, and report job status as complete.
2. If the OTA was successful, module will then send command to MCU to boot to the newly downloaded image.
3. MCU will verify the downloaded image, and then proceeds to boot to this image.

   Figure 6 is an illustration of a Host MCU OTA with a successful boot into new firmware image.

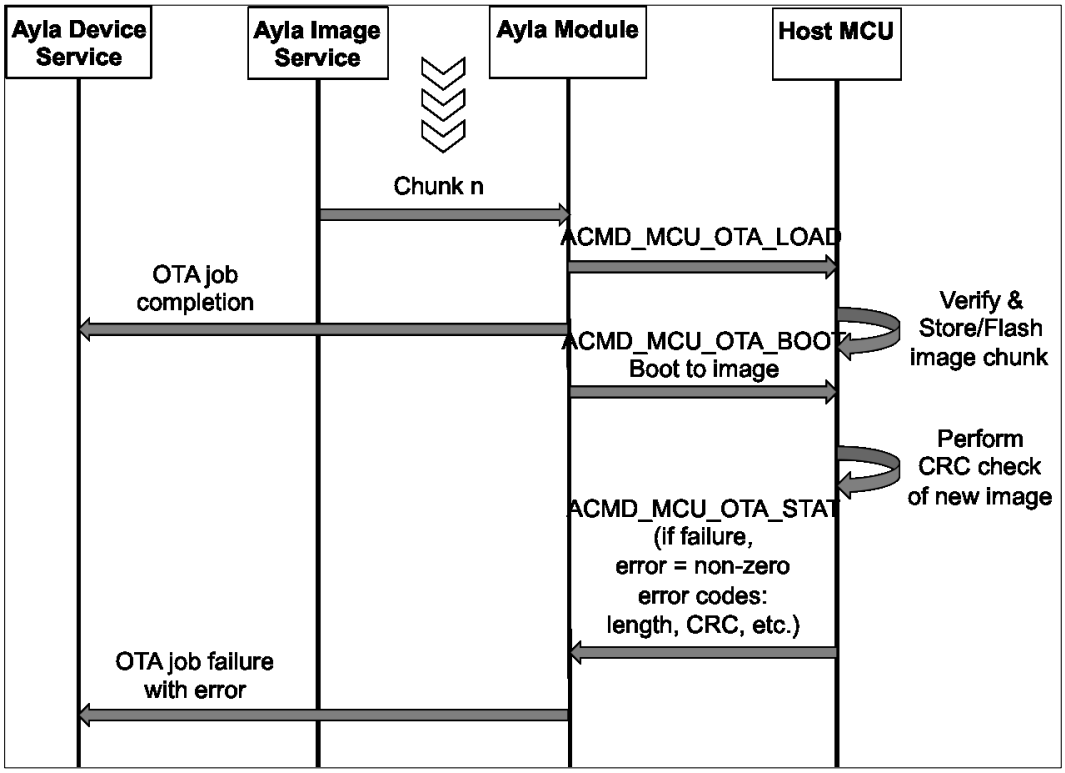
Figure 6. – Host MCU OTA with successful boot into new firmware image



4. If MCU boots to new image successfully, MCU will report the host software version associated with the new host firmware image.

   Figure 7 is an illustration of a Host MCU OTA with a non-successful boot into new firmware image.

Figure 7. – Host MCU OTA with error in downloaded firmware image



5. If MCU rejects the image at this stage due to CRC error, signature mismatch or failure to boot, it will indicate the error through a status message to the module. The module will report this as an OTA failure to Ayla Device Service.

The next sections discuss how to prepare for a host OTA update and how start your OTA job.

4 Update an Host Application

Before you can update a host application there are several steps you need to complete including preparing the host for deployment.

4.1 Prepare the Host OTA

To prepare the Host OTA, perform the following steps:

1. In the Ayla developer website (https://developer.aylanetworks.com) choose one of the following:

   Clone an existing template and update the version of the template

   - OR -

   Define a new template for your device
2. In the new/updated template, define a template property that tracks the **Host SW Version** of the device.
3. Check the flag **Host SW Version** for the property. Make sure that the property is **OEM** scope.
4. Update the **Host Application Software version** (oem_host_version) to the new version. This associates the new /updated template with the device.
5. If you have made any changes to the properties then update the **Host Application Software** as well.

4.2 Create a New Host MCU Image

To create a new MCU host image, perform the following steps:

1. Launch the OEM Dashboard and select **OTA** from the menu on the left side of the screen.
2. Click the **Host MCU Images** tab.
3. Click the **CREATE** button at the top of the screen (Figure 8).

Figure 8. – OEM Dashboard – New Host Image

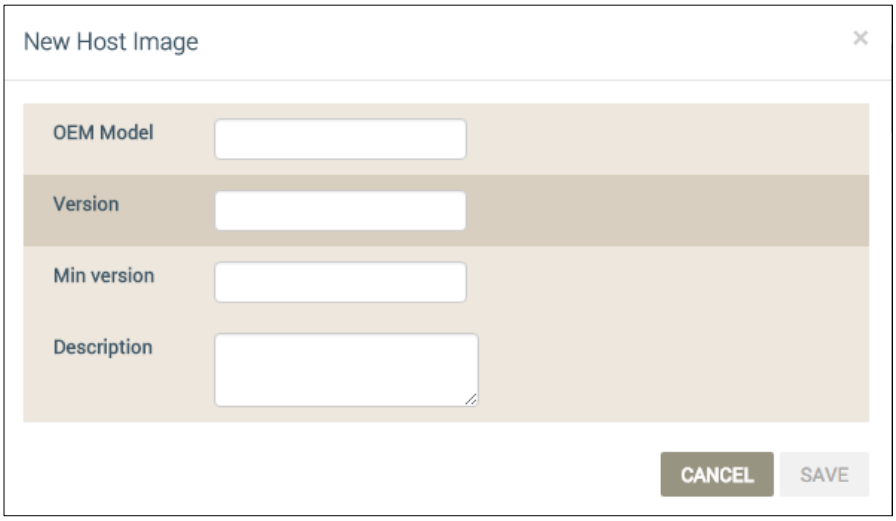


Table 1 - OEM Dashboard – New Host Image

OTA – New Host Image	Description
OEM Model	Image model number for OEM's device.
Version	The version of the number is determined by the OEM
Min Version	The minimum version is the exact version that must be currently running in order to deploy it, but that check can be overridden.
Description	A description of the host image. What it is and does.

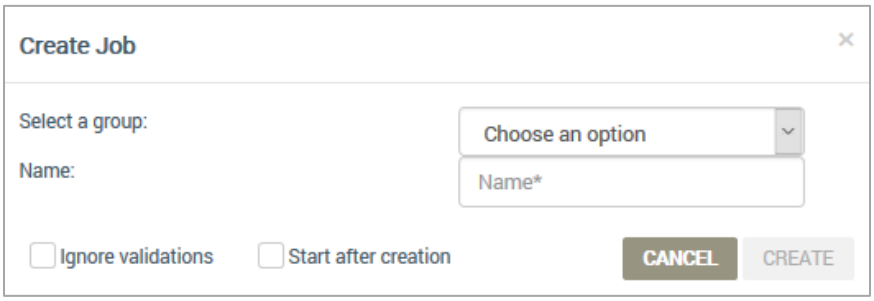
1. Enter the **OEM Model**, **version**, **min version** and **description** of the new host image you want to create in the fields provided.
2. Click the **Save** button to create the host image.

4.3 Perform the MCU OTA

To start an OTA on Host MCU Image, perform the following steps.

1. Launch the OEM Dashboard and select **OTA** from the menu on the left side of the screen.
2. Click the **Host MCU Images** tab.
3. Select the image you wish to deploy, click the **Create OTA Job** button (Figure 9).

Figure 9. Host Image – Create New Job



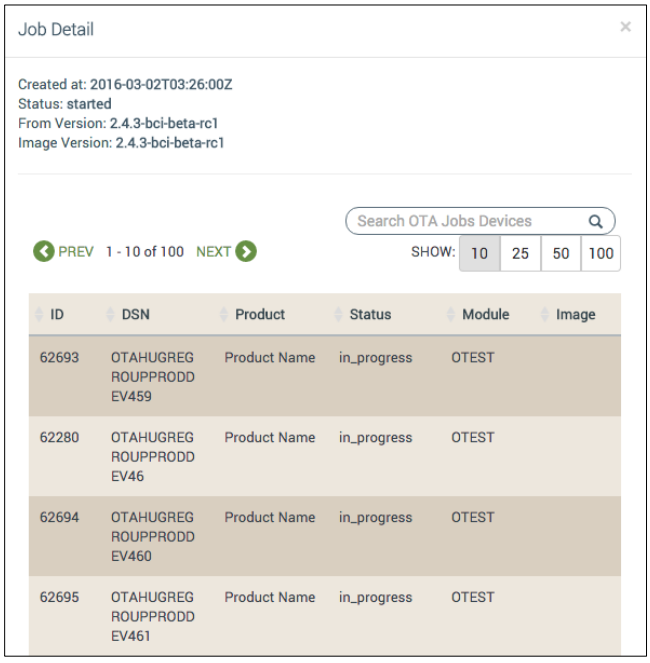
4. **Select a group** of devices from the **dropdown** list.
5. Enter a unique **Name** for this job.

   Optional:

   - Ignore validation
   - Start after creation – if selected, your job will start after the CREATE button is created.
6. Click the **CREATE** button to create the OTA job. You should see a message indicating your OTA job was successfully created.

   You can observe the process and look at the progress of individual devices in the OTA group as shown in the figure below.

Figure 10 - OTA – Job Detail



NOTE If you did not check the **Start after creation** option, then you need to select the **OTA Jobs** tab to locate the OTA job you previously created and click the **Start Job** button.

5 Commands and Error Codes

The following sections contain the SPI or UART commands used to exchanges messages between the Ayla module and the host MCU during the OTA update process along with status codes.

ACMD_MCU_OTA

The Ayla module uses this command to report the availability of a new firmware update image to the host MCU.

The host MCU uses this command to inform the Ayla module to initiate the image download process.

When the message is sent from module to MCU, it will contain 2 TLVs. The TLV of type ATLV_UTF8 contains the MCU firmware version string, and TLV of type ATLV_LEN contains the size of the image.

When this message is sent from MCU to module, it does not have any TLVs.

ACMD_MCU_OTA_LOAD

This message contains a chunk of the firmware, and is only sent from Ayla module to MCU. Ayla module will continue to send these messages until firmware download is complete.

The message contains 2 TLVs. The TLV of type ATLV_OFF contains the offset of the image data chunk. The TLV of type ATLV_BIN contains the actual firmware image data.

ACMD_MCU_OTA_STAT

This message is sent from MCU to Ayla module and is used to report status of the firmware upload operations. In case of an error condition, the MCU must send a non-zero status/error code. This status code is sent in a TLV of type ATLV_ERR.

The following error codes are defined:

```
#define AERR_LEN_ERR  0x02   /* TLV extends past end of
                                received buffer */
#define AERR_INTERNAL 0x0d   /* internal error */
#define AERR_CHECKSUM 0x0e   /* checksum error */
#define AERR_ALREADY  0x0f   /* already done */
#define AERR_BOOT            0x10   /* MCU did not boot to new image */
```

A status code of **zero** is considered success and the Ayla module does not report failure to the Ayla Device Service.

ACMD_MCU_OTA_BOOT

This message is sent from the Ayla module to the host MCU. The message indicates to the MCU to boot into the latest downloaded image.

This message is only sent after the successful completion of the firmware image download operation.

6 Best Practices

Suggested practices for moving from the Developers Portal to the OEM Dashboard are listed below:

- Test on the Developer Environment - Any new OTA firmware update needs to be tested in the developer environment. This is because the OTA process may not recover from a bad new image. It should recover from any errors in the download or interrupted downloads, but it does not recover from a bad OTA.
- Be sure to check that you can OTA from the new version as well as to it.
- Ramp up on Field Environment - Start with 5-10% of field devices with an OTA job, then wait until the job is complete and make sure all the devices, which are online, have successfully updated to new firmware version.
- Complete Deployment on Field Environment
- Update all other field devices in blocks of 100-1000 devices.
- Make sure each job is successful for each OTA job.

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