# Remote Upgrade via Mender - POC

This pages describes the upgrade of site using Mender software

## Purpose

The purpose of this POC is to show the ability to upgrade CDS and units on the site using Mender software and show pros and cons of this method

## About Mender

Initially Mender was developed to allow remote upgrade of embedded devices when system upgrade was in focus, meaning flushing images with ability to rollback to working image if new image fails to work. Later the application level upgrade was added. In this POC the application upgrade was tested, specifically installing new Debian packages from GPG file

**Mender software**

Mender software holds two main parts:

- Mender Server - hosted, meaning in cloud and managed by Mender team or on premise
- Mender Client - mainly installed as a service on embedded device

**New version deployment**

- New application version uploads to Mender Server via Web interface
- Mender Clients check periodically for new version on the Mender Server
- Once new version is available all clients download and install it

## Setup

### Mender Server

For this POC the Hosted Enterprise Edition of Mender Server was used

- Here is the pricing of various editions of Mender Server
- Here is features per Mender Server edition

#### Limitations

- Only Free & Enterprise editions maybe installed on premise

- On premise installation requires Linux operating system, so it cannot be installed on GW machine running Windows
- Main features that we want to have exist only in Enterprise edition

### Features

## Upgrade per device type

There is an option to define device type (configuration on mender client) and upgrade devices per type. For example:

- device_type=CDS
- device_type=UNIT (as same GPG file is used for IS1, IS2 and BS)

## Groups of devices

Each device has unique device identifier (managed by Mender) thus each device may be assigned to static or dynamic group. The group may represent specific site. This allows upgrade devices in specific group only.

## Deployment

Once file with new version (release) uploaded to Mender Server the new deployment maybe created. Deployment settings may be as following:

- Schedule time when upgrade should be started
- Specify device type and group the upgrade should target
- Number of retries in case of failure (up to 3)
- Split large amount of device into phases (load balance)

## Upgrade status

The progress of upgrade is presented in real time

## Mender Client

### Debian package vs Compilation

- Debian packages for some common architectures can be downloaded from here
- IS1 architecture is armel so mender client should be compiled from sources for this platform

### Configuration

Example of **/etc/mender/mender.conf** used for POC (token taking from https://hosted.mender.io/ui/#/settings/my-organization

```
{
        "UpdatePollIntervalSeconds": 60,
        "InventoryPollIntervalSeconds": 28800,
        "ServerURL": "https://hosted.mender.io",
        "TenantToken": "eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9.
eyJtZW5kZXIudGVuYW50IjoiNWYyNjZiYjU4MGI1NDE4ZmU1ZjM1ODQ5IiwiaXNzIjoiTWVu
ZGVyIiwic3ViIjoiNWYyNjZiYjU4MGI1NDE4ZmU1ZjM1ODQ5In0.
djfWLUFSEs9tE6wttrBzf-kVO5z-PdL7awhdqz6goPSFtbG1eWnhzYcN-
oPhyqeZtSm7P25O_IWitnp9AyXKq9D9R-
D2NkRGyAcvlFyOyZRMa3D0ot_5AmaEo8WiyZYHIv9PsTjB1fmVycTSWBxdKOLkCwiFe6OAbf
zvrplw1GDkivhYVGqRmeKhWmafHqRk__G4e9mX1DjT-3RtuBbkfTuALzisuyNp8IEYz-
rdcl-s4SJdx-
Le1iFdVxNHmVEclZXhvPsLQpmz1e66DUlylpOZosXu4p5dn5998gyRfqbSqJdZyIy62Vxv0Y
97Wh6JoVdLTo52CAPYlFdhmuQ9C6TAapLSKhAvOgdlLUv6qCJytYsR0HWibUpRNut1o_M6a6
PAWncp93KrQYUs-
ewt0YjROCRRimJz6l7l9XiMMdjHE7WoSxWMcZF7NBFxmxtYK7VfEVSmbXrKTPQO0yoMx9Oyt
PwvdGRmcuevX5tsxC5AVyzg6YMsja_RpgXIPDiK"
}
```

### Customization

Mender Client is a binary that runs various scripts to collect system data and user defined data for sending to Mender Server. It also responsible to entire upgrade process, for example:

- Establish secure connection with Mender Server
- Download artifact from Mender Server
- Invoke scripts with stages defined in the Mender flows

The script appropriate to this POC is **single-file** script that installs file into specific folder on the device. The BS or CDS GPG file used to upload to Mender Server as artifact and then **single-file** script was used to extract GPG file and run installation of Debian packages inside it.

Assuming GPG file as artifact was selected to be installed into /tmp folder on the device, so the following may be added to the **single-file** script under **ArtifactInstall** stage:

```
ArtifactInstall)
                # ES part
                if [ ! -f /tmp/CDS.tar.gz2.gpg ]; then
                        exit 1
                fi
                [ -d /home/earlysense/cdspkg ] || mkdir /home/earlysense
/cdspkg
                rm -f /home/earlysense/cdspkg/*
                gpg -o /home/earlysense/cdspkg/CDS.tar.gz2 /tmp/CDS.tar.
gz2.gpg
                tar xf /home/earlysense/cdspkg/CDS.tar.gz2 -C /home
/earlysense/cdspkg
                rm -f /home/earlysense/cdspkg/CDS.tar.gz
                cd /home/earlysense/cdspkg
                dpkg -i es-lang-en* es-cds_*

NeedsArtifactReboot)
        echo "Automatic"
        ;;
```

Note `NeedsArtifactReboot` that should be set to `Automatic`. This will cause Mender Client to reboot the device after `ArtifactInstall` step.

### Proxy Server

Proxy server running on the GW machine should serve two goals:

1. Allow devices (CDS and units) to access Hosted Mender Server (on cloud) from internal site network
2. Use proxy server cache to avoid downloading artifacts to each device separately, that may result in huge amount of network traffic

For this POC CCProxy was used. It was installed in Windows machine and units was configured to use it by defined environment variables

```
export HTTPS_PROXY=http://10.10.10.30:808/
export HTTP_PROXY=http://10.10.10.30:808/
iptables -F   # need to check what rule should be added to iptables
```

Note that this proxy server is not free for commercial use and has to be purchased

## Summary

### Pros

- User friendly Web interface of Mender server that allows upgrade per device type and per group
- Scheduling & Load balancing
- Visualization of upgrade process via Web interface
- Lightweight Mender Client (about 4MB)
- Rich customization options
- Full support of system upgrade (images)

### Cons

- Hosted Mender Server is not free
- Requires proxy server on GW machine (need to look for free options if available)
- Upgrade flow allows maximum 3 retries after that upgrade considered failed
- The deployment is deleted from Mender Server after all connected units upgraded or failed to upgrade
- No support for devices that were disconnected during scheduled deployment
- Each connecting device requires acceptance in Mender Server (requires constant monitoring or may be part of FTP procedure), alternatively need to look how to skip this step