

ThingsPro Edge + Zero Touch Provisioning via Azure DPS

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Note: - This note is written for the audience who wants auto-provision of UC-8112A IIoT gateway at scale running **ThingsPro Edge V1.1.0** to Azure IoT Hub using Moxa Provision tool.

UC-8112A model default settings

- username/password: moxa/moxa
- IP LAN1 192.168.3.127
- IP LAN2 192.168.4.127

This document lists the following steps:

1. Preparation
2. Download and install ThingsPro Edge V1.1.0
3. Verifying Endorsement key on ThingsPro Edge RESTful Web API
4. Verifying TPM status on ThingsPro Edge command line
5. Discover and enroll IIoT devices on designated Azure IoT Hub using Moxa Provision Tool

1. Preparation

- Get the device with TPM capability (TPM written on the device)
- Get all tools (Console with UPort, network cable, Power supply 24vdc). Please follow the QIG on the link below.
<https://moxa.com/getmedia/e8a7cc08-cff3-49ce-b5d3-836e2c8e7fde/moxa-uc-8100a-me-t-series-qig-v2.0.pdf>
- Login device via Serial (baud rate 115200) or SSH via LAN2 (ssh moxa@192.168.4.127)
- Reset to factory default (sudo mx-set-def)
 - o **Note:** Reset not required if using it for first time.
- Enable dhcp LAN1 (cd /etc/network)
 - o **Note:** Required only when install ThingsPro Edge from internet
- Reboot the device to get the IP address from DHCP server.
- Check the internet connection (e.g. ping google.com)

2. Download and Install ThingsPro Edge V1.1.0

- Download the debian package ThingsPro Edge software from the internet on UC-8112A.

```
wget
```

```
https://thingspro.blob.core.windows.net/software/edge/V1.1.0/update\_1.1.0-898-uc-8112a-me\_armhf.deb
```

```
sudo dpkg -i update_1.1.0-898-uc-8112a-me_armhf.deb
```

- Update Installation process

```
sudo journalctl -u update -f
```

- Waiting for installation to end

```
journalctl -u update -f

Moxa update[1355]: level=info msg="device: 3/4 78%" origin=http
Moxa update[1355]: level=info msg="device: 3/4 81%" origin=http
Moxa update[1355]: level=info msg="device: 3/4 87%" origin=http

Moxa update[1355]: level=info msg="device: 4/4 0%" origin=http
Moxa update[1355]: level=info msg="device: 4/4 0%" origin=http
Moxa update[1355]: level=info msg="device: 4/4 0%" origin=http
Moxa update[1355]: level=info msg="device: 4/4 0%" origin=http
Moxa update[1355]: level=info msg="device: starting running" origin=http

Moxa update[1355]: level=info msg="stop appman" origin=http
Moxa update[1355]: level=info msg="stop update" origin=http
Moxa update[1355]: level=info msg="shutdown Server ..." origin=init
Moxa systemd[1]: Stopping MOXA ThingsPro Updater...
Moxa update[1355]: level=info msg="bye bye" origin=init
Moxa systemd[1]: Stopped MOXA ThingsPro Updater.
```

Note: The entire process will take about ~11 minutes (depends on the hardware/model). When it shows "**Stopped MOXA ThingsPro Updater.**", you can reboot the device by command **sudo reboot**

3. Verifying Endorsement key on ThingsPro Edge RESTful Web API

- Open the web browser <https://192.168.4.127:8443> using LAN2 or login IloT gateway via serial and get the IP address of LAN1 (eth0) assigned by DHCP server.
- Press F12 to enter in debug mode

The screenshot displays the Moxa UC-8112A-ME-T-LX (TPM) web interface. The top navigation bar shows the Moxa logo, the device name, a notification bell with 5 alerts, and the user 'Administrator admin'. The left sidebar contains a 'MONITOR' section with a 'Dashboard' link and an 'APP MANAGER' section with links to 'My Applications', 'Azure IoT Edge', 'Azure IoT Device', 'MQTT Client', and 'Modbus Master'. The 'My Applications' link is highlighted with a red box. The main content area shows the 'Azure IoT Edge' configuration page, which includes a toggle switch for 'Azure IoT Edge' (currently on) and a table with the following data:

Service Name	Status
Azure IoT Edge Version: 1.0.9~rc4	Running

Below the table are tabs for 'Module List', 'Device Management', and 'Telemetry Message'. The 'Module List' tab is active. The bottom of the interface shows the browser's developer tools with the 'Network' tab selected. The 'Network' tab displays a list of requests, with 'azure-iotedge' selected. The 'Preview' tab shows the response data, which includes the 'endorsementKey' highlighted with a red box:

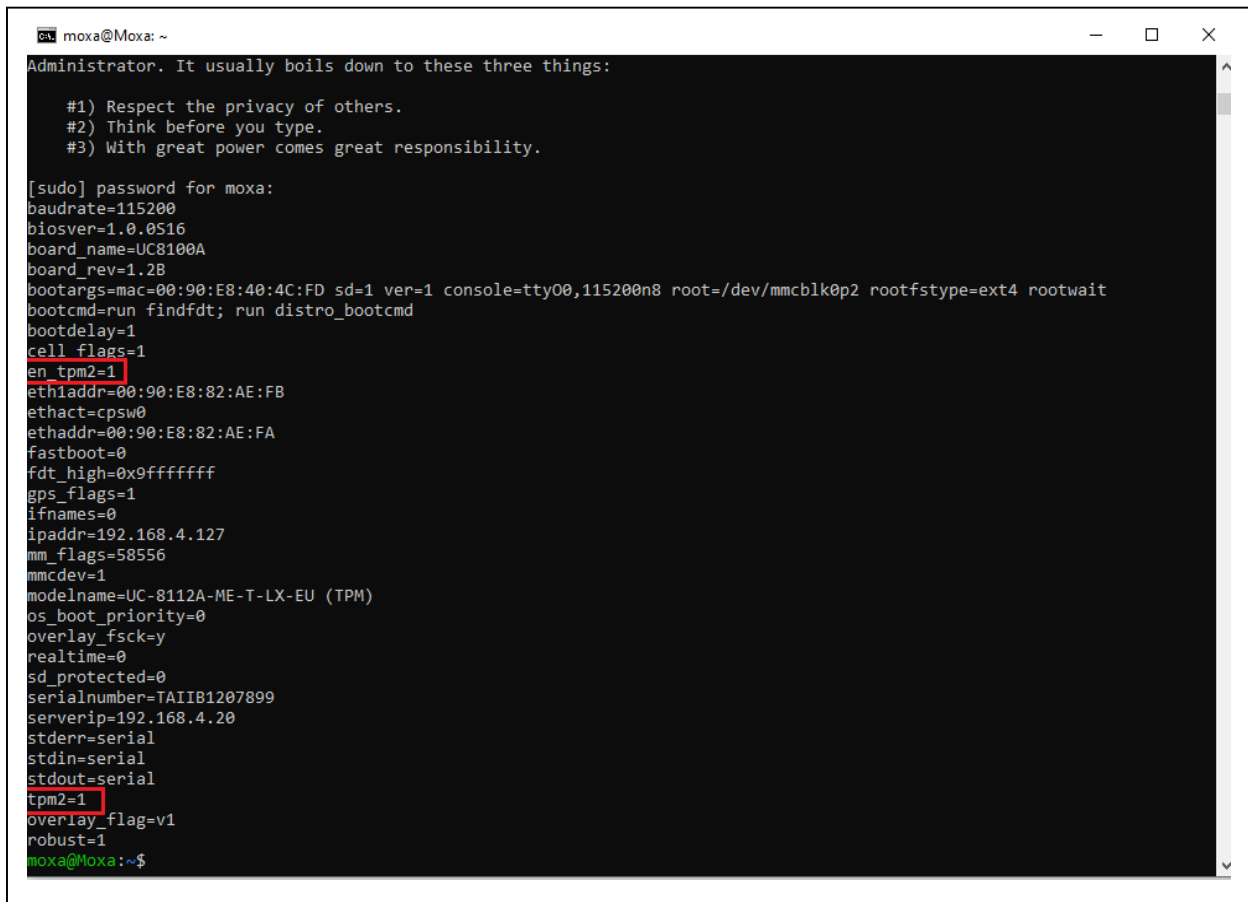
```
{data: {provisioning: {enable: true, supportTwin: true, source: "dps", method: "tpm",...},...}}
{data: {provisioning: {enable: true, supportTwin: true, source: "dps", method: "tpm",...},...}}
  provisioning: {enable: true, supportTwin: true, source: "dps", method: "tpm",...}
    enable: true
    supportTwin: true
    source: "dps"
    method: "tpm"
    globalEndpoint: "https://global.azure-devices-provisioning.net"
    connectionString: ""
    scopeId: "0ne000C978B"
    endorsementKey: "AToAAQALAAmAgAgg3GXZ0SEs/gakMyNRqXXJP1S124GUgtk8qHaGzMUaaoABgCAAEMAEAgAAAAAAAE1Psb1iiv9xC"
    symmetricKey: ""
    registrationId: "tailb1015962"
    downstreamCerts: {mode: "moxa", caCertFile: "iotEdge_moxa.crt", caPkFile: "iotEdge_moxa.key",...}
    iotedge: {version: "1.0.9~rc4", status: "running", since: "Thu 2020-03-05 18:26:40 CST",...}
```

4. Verifying TPM status on ThingsPro Edge command line (optional)

- Check TPM status from command line

```
sudo fw_printenv
```

- Make sure both flags (en_tpm2=1 & tpm2=1)



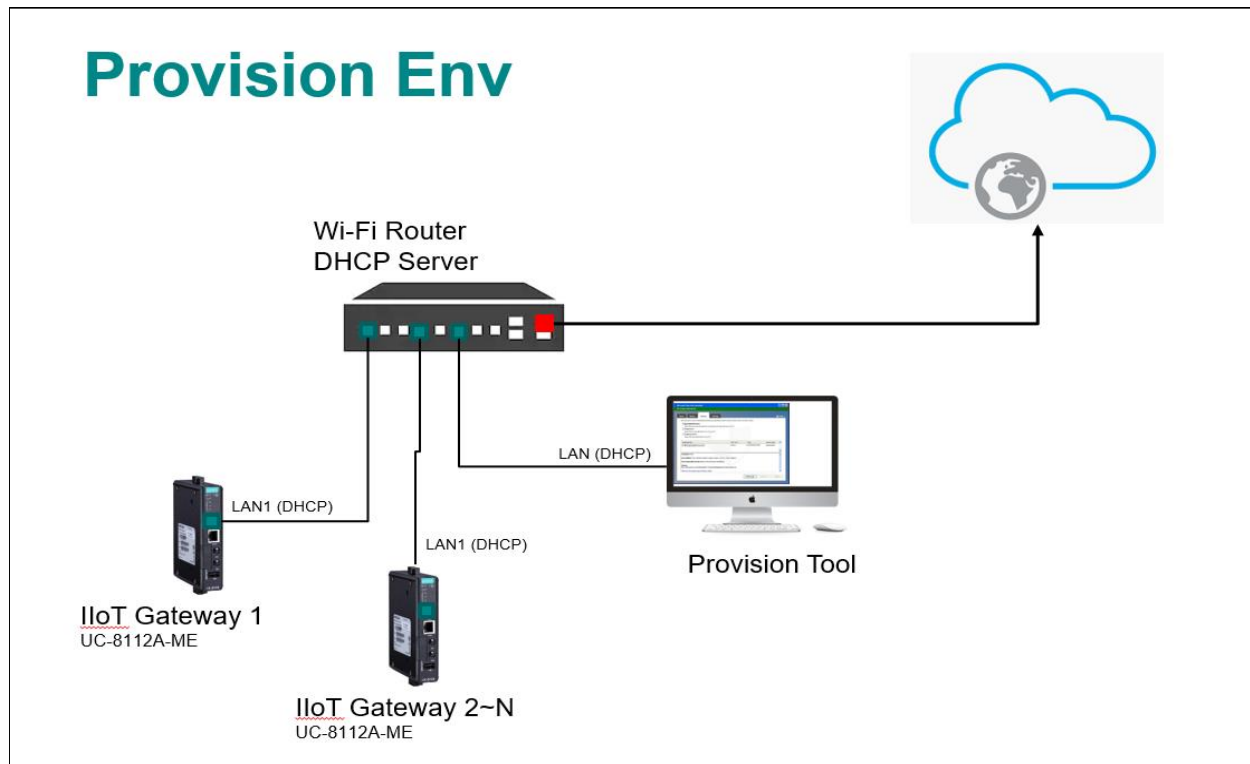
A terminal window titled 'moxa@moxa: ~' showing the output of the 'fw_printenv' command. The output lists various environment variables. Two variables, 'en_tpm2=1' and 'tpm2=1', are highlighted with red boxes. The terminal also shows a password prompt and a list of three administrator guidelines.

```
moxa@moxa: ~  
Administrator. It usually boils down to these three things:  
  
#1) Respect the privacy of others.  
#2) Think before you type.  
#3) With great power comes great responsibility.  
  
[sudo] password for moxa:  
baudrate=115200  
biosver=1.0.0516  
board_name=UC8100A  
board_rev=1.28  
bootargs=mac=00:90:E8:40:4C:FD sd=1 ver=1 console=tty00,115200n8 root=/dev/mmcblk0p2 rootfstype=ext4 rootwait  
bootcmd=run findfdt; run distro_bootcmd  
bootdelay=1  
cell_flags=1  
en_tpm2=1  
eth1addr=00:90:E8:82:AE:FB  
ethact=cpsw0  
ethaddr=00:90:E8:82:AE:FA  
fastboot=0  
fdt_high=0x9fffffff  
gps_flags=1  
ifnames=0  
ipaddr=192.168.4.127  
mm_flags=58556  
mmcdev=1  
modelname=UC-8112A-ME-T-LX-EU (TPM)  
os_boot_priority=0  
overlay_fsck=y  
realtime=0  
sd_protected=0  
serialnumber=TAIIB1207899  
serverip=192.168.4.20  
stderr=serial  
stdin=serial  
stdout=serial  
tpm2=1  
overlay_flag=v1  
robust=1  
moxa@moxa:~$
```

Note: Enable TPM from bootloader if above conditions are not fulfilled.

- Enable TPM from bootloader (login via serial console press DEL or Backspace)

5. Discover and enroll IIoT devices on designated Azure IoT Hub using Moxa Provision Tool



Step 1: Modified the config file with your IoT Hub and DPS information

```
config - Notepad
File Edit Format View Help
// dev, stage, production
Environment: stage
// Azure, dlm, all
Target: Azure
// Azure DPS settings
ScopeID: 0ne000C97BB
DPSHostName: DPS-West-EU.azure-devices-provisioning.net
DPSKeyName: provisioning-serviceowner
DPSKey: rbYks9RseYadtMhNXYesZg6Ub0ZavEcXA0fdYArmdw=
// Azure IoT Hub Settings
IoTHubHostName: IoT-Hub-West-EU.azure-devices.net
IoTHubKeyName: iothubowner
IoTHubKey: apq7FqgKobQ/Oe5oRW6atz870LXpdzTuqAtQ1nyAHZg=
```

Step 2: Discover IIOT devices on LAN1 and select the device from the given list to be enrolled on the designated IoT Hub

The screenshot shows the "Provision Tool" window. At the bottom left, there are three buttons: "Device Discovery" (labeled 1), "Next" (labeled 3), and "Previous". The main area contains a table with the following columns: IP, Port, MAC, Model Name, Serial No., Version, Registration ID, Enforcement Key, and Result. Two rows are highlighted with red boxes:

<input type="checkbox"/>	IP	Port	MAC	Model Name	Serial No.	Version	Registration ID	Enforcement Key	Result
<input type="checkbox"/>	192.168.32.217	8443	0090e8841596	UC-8112A-ME-T-LX (TPM)	TAILB1015962	1.3			
<input type="checkbox"/>	192.168.32.239	8443	0090e88415a4	UC-8112A-ME-T-LX (TPM)	TAILB1015969	1.3			

A red box labeled 2 highlights the first two rows of the table. A red box labeled 3 highlights the "Next" button at the bottom right.

Note: Make sure that notebook is on same the local network. The discovery service works only on LAN1 on UC-8112A IIoT gateway

Step 3: Select the provision method (Default: Azure DPS + TPM)

Provision Tool

Device Default Credential

Login ID:

Password:

admin/admin@123

Provision Destination

☒ Azure DPS + TPM

☐ Azure DPS + Symmetric Key

☐ Azure DPS + X.509

☐ Azure IoT Hub + Symmetric Key

☐ Azure IoT Hub + X.509

Device Discovery **Next** Provision

Step 4: The provision tool retrieves the DPS and IoT Hub information from the config file

The screenshot shows the 'Provision Tool' window. The 'Azure DPS Settings' section is highlighted with a red box. It contains the following fields:

- Service Endpoint: DPS-West-EU.azure-devices-provisioning.net
- ID Scope: One000C97BB
- Shared Access Policy: provisioning-service-owner
- Shared Access Key: [Redacted]
- IoT Hub Host Name: iot-hub-west-eu.azure-devices.net

Below these settings, the 'Use My DPS' button is highlighted with a red box. Red text instructions state: 'Press button the Azure DPS Settings will retrieved from the config file.' A red note at the bottom says: 'Note: verify information'.

The 'Initial Tags of Device Twin' section shows a table with 5 rows and 2 columns: Key and Value.

The 'Advance Setting' section has two checked options:

- ☒ Generate Downstream Certificate
- ☒ Enable Azure IoT Edge Service

At the bottom, there are three buttons: 'Device Discovery', 'Previous', and 'Provision'. The 'Provision' button is highlighted with a red box.

Step 5: The provision tool automatically retrieves the **Registration ID** (SN of the device) and **Endorsement key** of UC-8112A gateway.

[illegible]

Step6: Verifying the device enrollment on Azure DPS on your Microsoft subscription.

DPS-West-EU - Manage enrollments
Device Provisioning Service

Search (Ctrl+/) << + Add enrollment group + Add individual enrollment Refresh Delete

Overview
Activity log
Access control (IAM)
Tags
Diagnose and solve problems

Settings
Quick Start
Shared access policies
Linked IoT hubs
Certificates
Manage enrollments

You can add or remove individual device enrollments and/or enrollment groups from this page

Enrollment Groups **Individual Enrollments**

Filter enrollments

REGISTRATION ID

<input checked="" type="checkbox"/> tailb1015969	Serial number UC-8112A
<input type="checkbox"/> ubuntu-vm-iot-edge	

Step7: Verifying the registration status of the device (takes 4-5 minutes) on Azure DPS Web GUI

Dashboard > DPS-West-EU - Manage enrollments > tailb1015969

tailb1015969
Enrollment Details

Save Refresh

You can view and update the enrollment details for an individual enrollment or remove the registration record for a previously provisioned device

Registration Status

Status: assigned

Assigned hub: **iot-Hub-North-EU.azure-devices.net**

Device ID: tailb1015969

Last assigned: Mon Mar 02 2020 15:26:39 GMT+0100 (Central European Standard Time)

Delete Registration

Authentication Type
Mechanism: TPM

Step8: Verifying the device registration on Azure IoT Hub (Device ID is the serial number of the IIoT gateway)

The screenshot displays the Azure IoT Hub management interface for 'IoT-Hub-North-EU - IoT Edge'. The left-hand navigation pane includes sections for 'Explorers' and 'Automatic Device Management'. The 'IoT Edge' option under 'Automatic Device Management' is highlighted with a red box. The main content area features a top toolbar with actions like 'Add an IoT Edge device', 'Create Deployment', and 'Create Layered Deployment'. Below this, a message states: 'Deploy Azure services and solution-specific code to on-premises devices. Use IoT Edge devices to perform compute and analytics tasks on data.' The 'IoT Edge devices' tab is active, showing a search bar and a 'Query devices' button. A query builder interface is visible with fields for 'Field', 'Operator', and 'Value'. Below the query builder, a table lists IoT Edge devices. The first device is 'tailb1015969', which is highlighted with a red box. The table has columns for 'Device ID', 'Runtime Response', and 'IoT Edge Module Count'.

Device ID	Runtime Response	IoT Edge Module Count
<input type="checkbox"/> tailb1015969	417 - The device's deployment configuration is not ...	1