

Enabling IOT with off the shelf hardware

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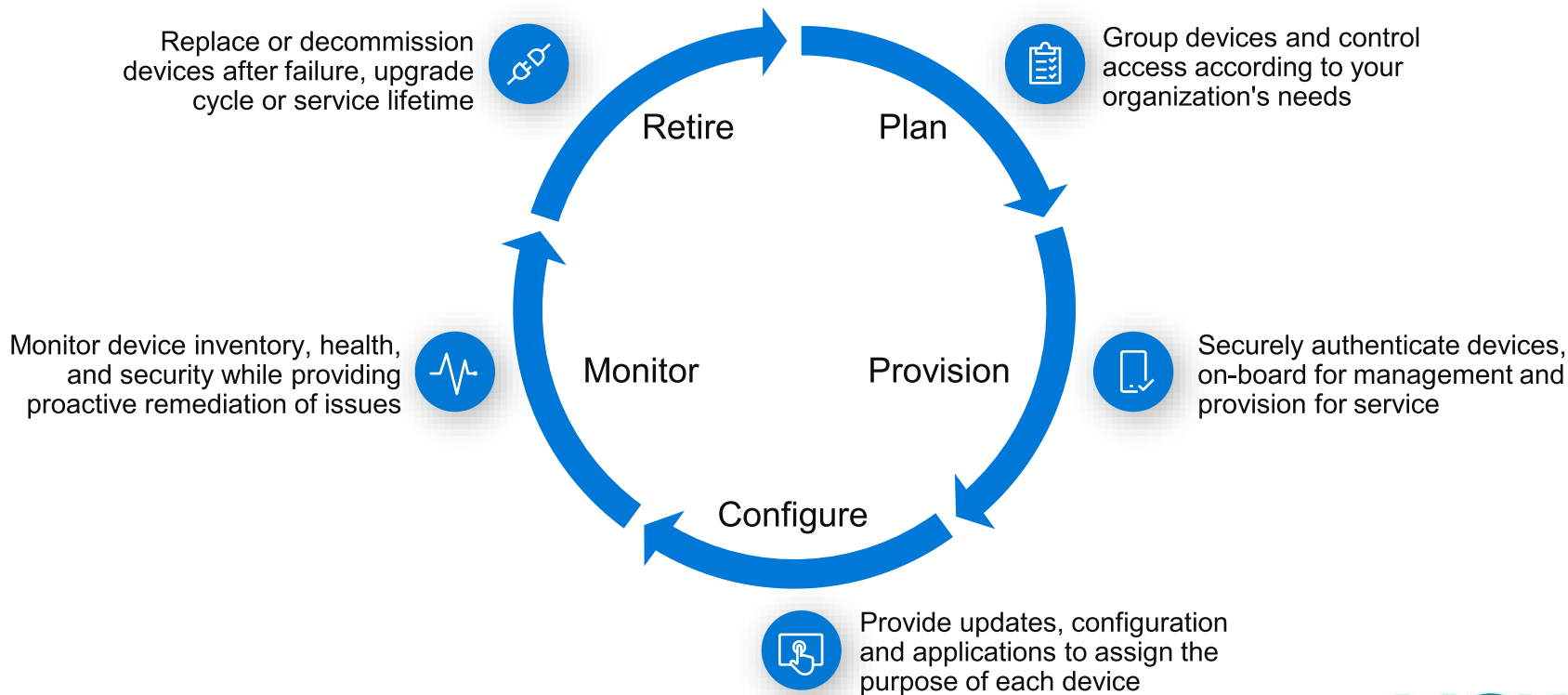
Moxa Europe

February 2020

Agenda

- **The 7 Principles of Device Lifecycle Management**
- **Demo**

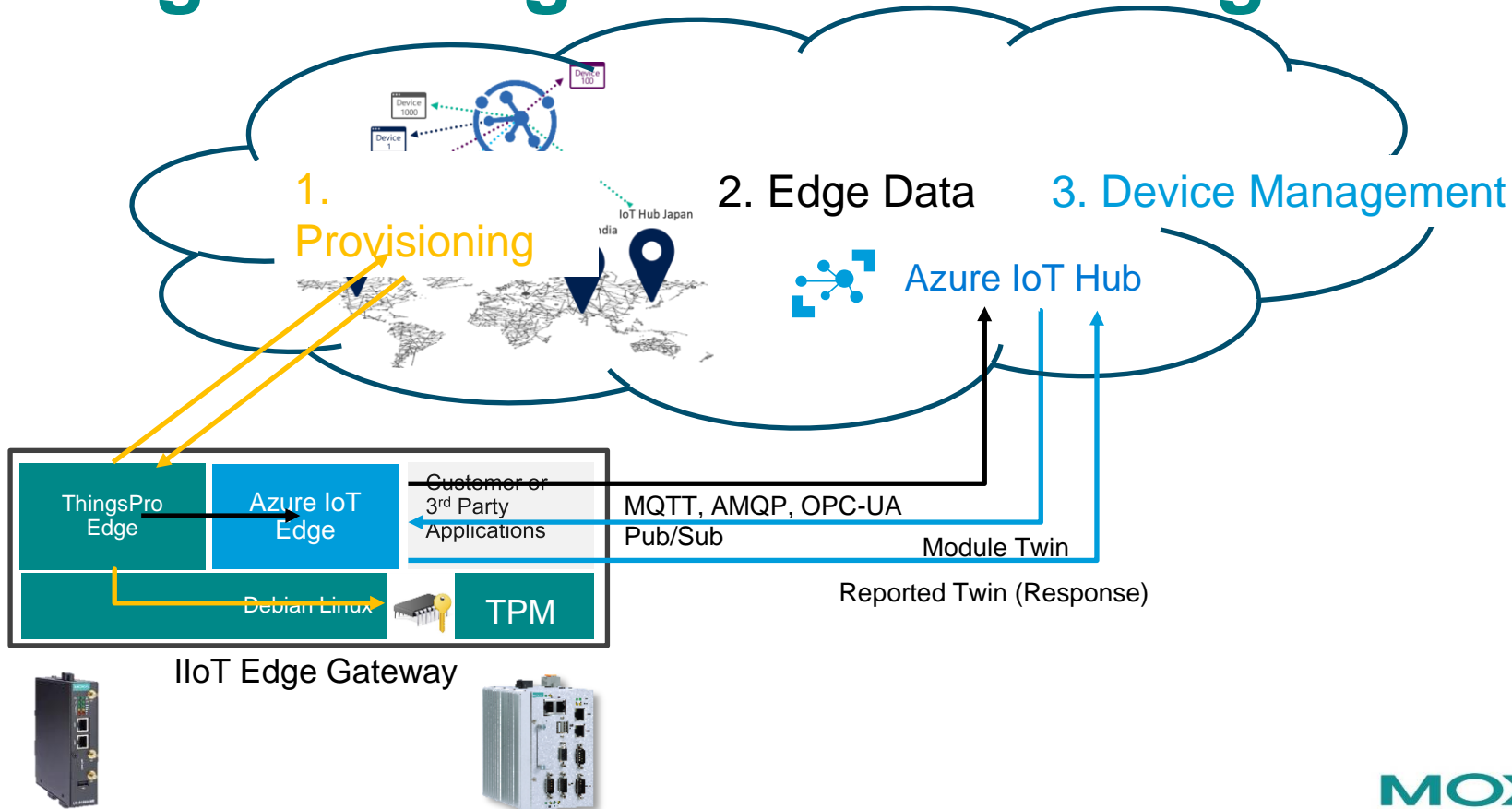
IoT Device Lifecycle Management



Seven Principles of Device Lifecycle Management (DLM)

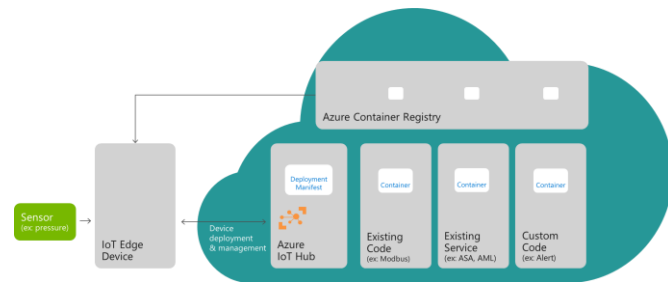
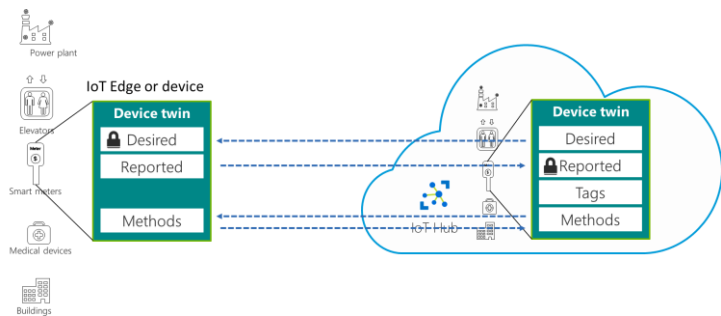
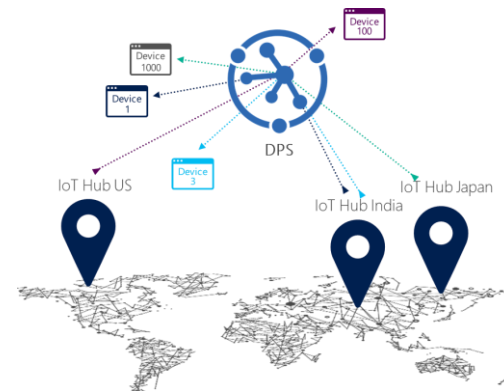
- ➡ 1. Provisioning – DPS
- 2. Commissioning
- 3. Remote Software Updates (Containers)
- ➡ 4. Device Management (IP, Cellular, and other hardware Settings)
- 5. Remote Security Patches
- ➡ 6. Updates to “Edge” Software
- 7. Updates to OS Kernel

ThingsPro Edge and Azure Integration



Three key concepts to support device provisioning at scale (with minimal 'touch')

- **Device Provisioning Service**
- **Device Twins**
- **Deployment Manifest**
 - **Device Twin**
 - **Edge Software**



Device Management



Device Management

Configuration

- Ethernet, Cellular, GPS, Serial, Console port
- DHCP, Route, Time, DNS, Firewall
- HTTP, SSH, Certificates

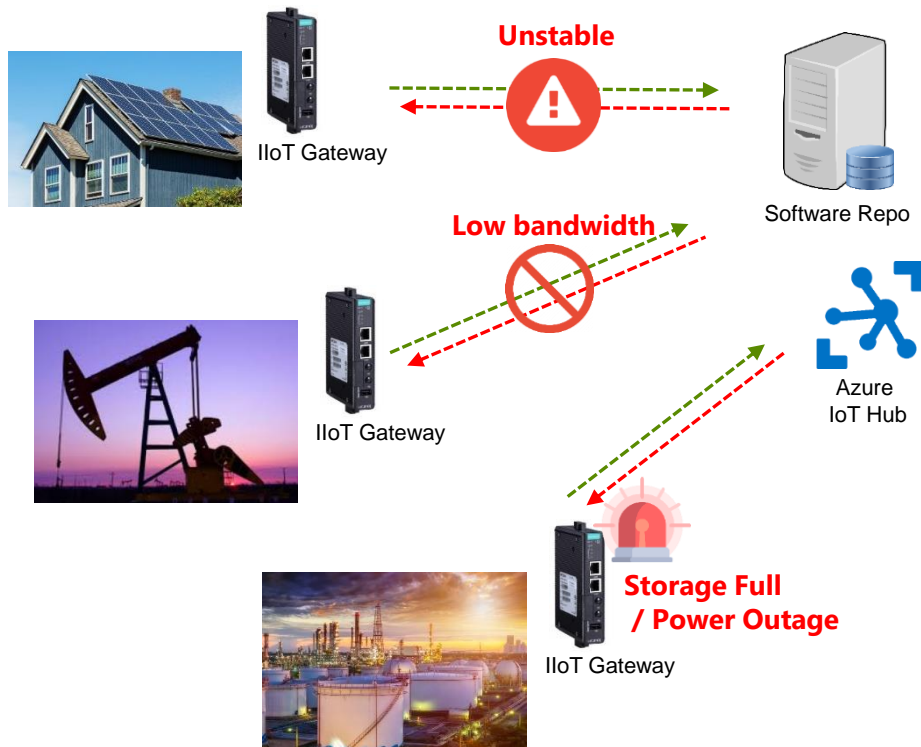
Operation

- Reboot
- Application start/stop/restart
- Application (Over-the-air) OTA upgrade

Management from Azure

* In roadmap

IIoT Grade OTA Software Upgrade



OTA Features

Robust AND Intelligent process

- Resume download from last break point
- Intelligence to confirm upgrade AND ensure download
- Redundant BIOS and Linux Kernel w/ Auto roll-back

Security

- SAS or X.509 certificate
- Hardware-level (with TPM)

Management from Azure IoT Hub

Seven Principles of Device Lifecycle Management (DLM)

1. Provisioning
2. Commissioning
3. Remote Software Updates (Containers)
4. Device Management
5. Remote Security Patches
6. Updates to “Edge” Software
7. Updates to OS Kernel



Azure IoT Edge



ThingsPro Edge

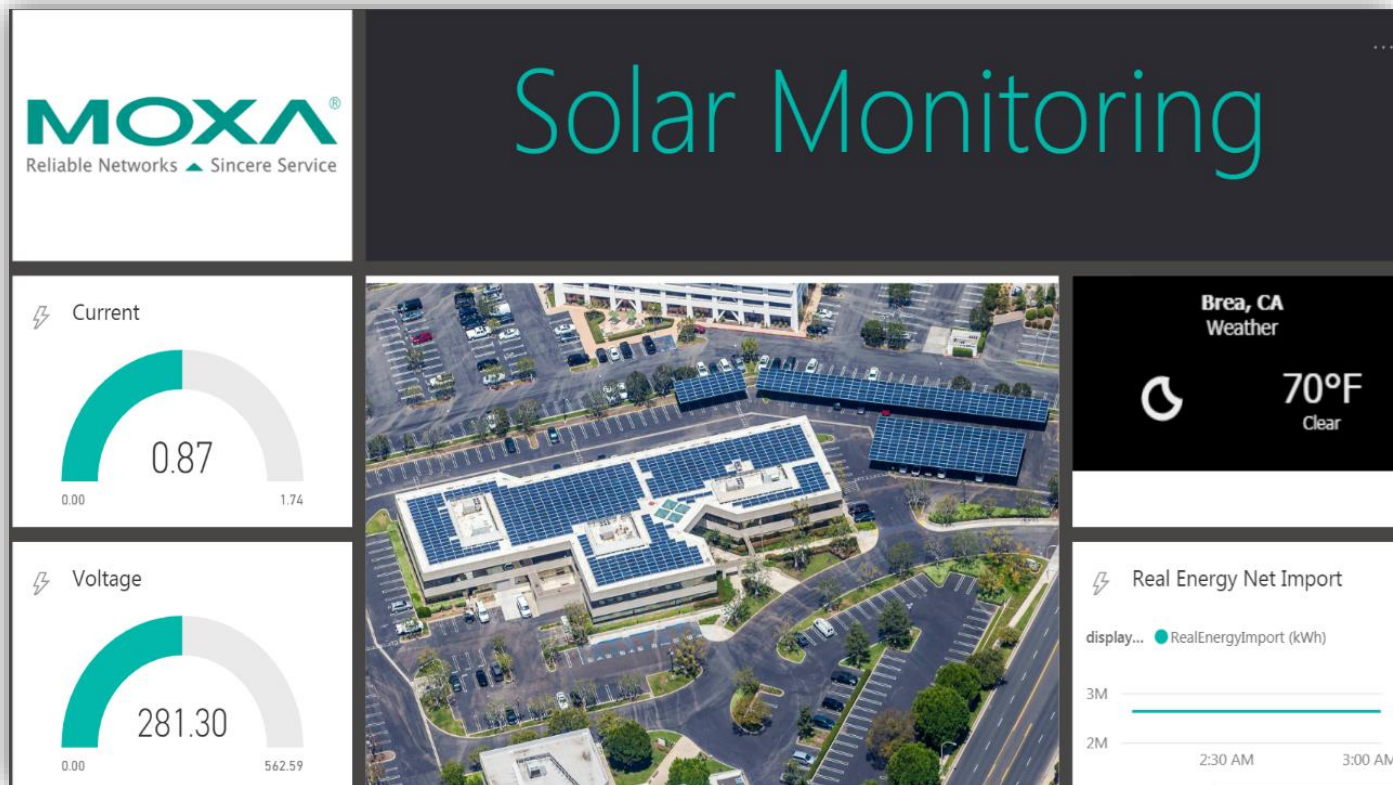
IIoT Software with Azure Cloud Connectivity

Demo

Device Management in practice

- **Example Dashboard: Moxa US Office Solar Monitoring**
- **Moxa Device Provisioning (reference software)**
- **ThingsPro Edge Device Management in Azure Portal**
- **ThingsPro Edge Local GUI**
- **ThingsPro Edge web-based user manual (optional)**
- **ThingsPro Cloud Device Management (reference)**

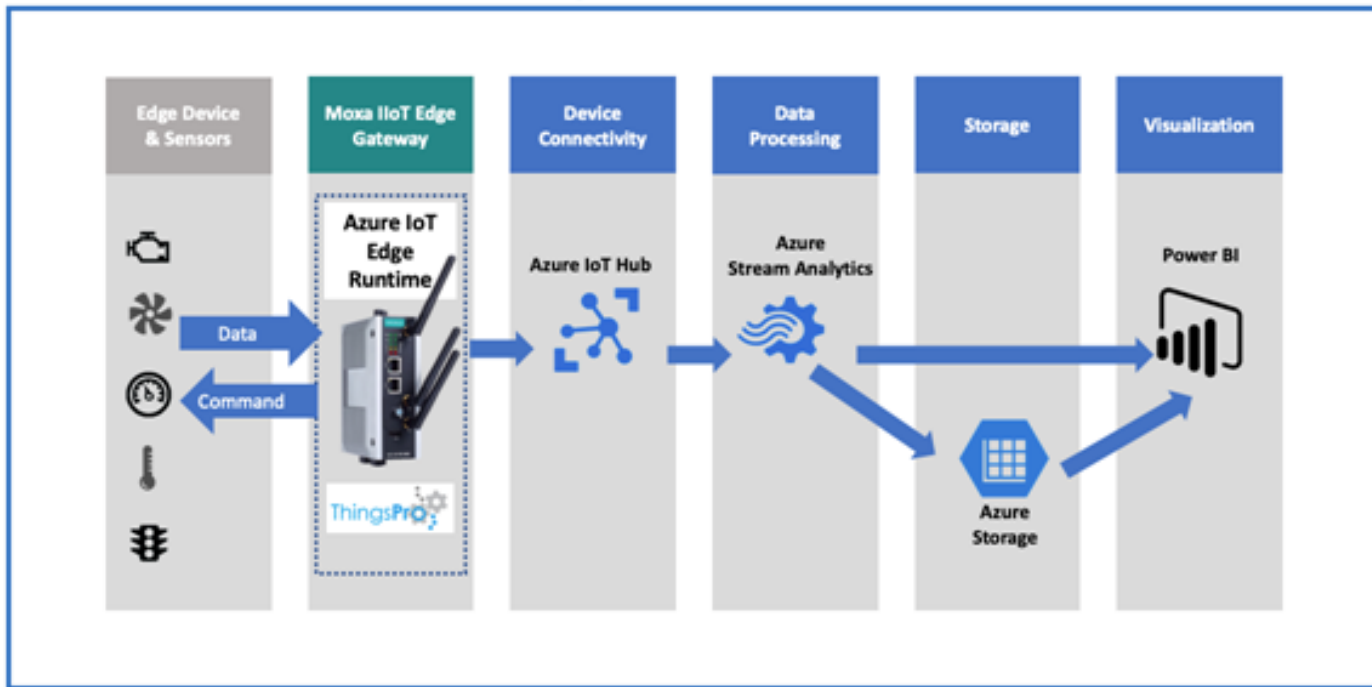
Example Dashboard: Moxa US Office Solar Monitoring



<https://app.powerbi.com/groups/me/dashboards/077670cb-5208-4bf5-b06e-53fa052b4d6c>

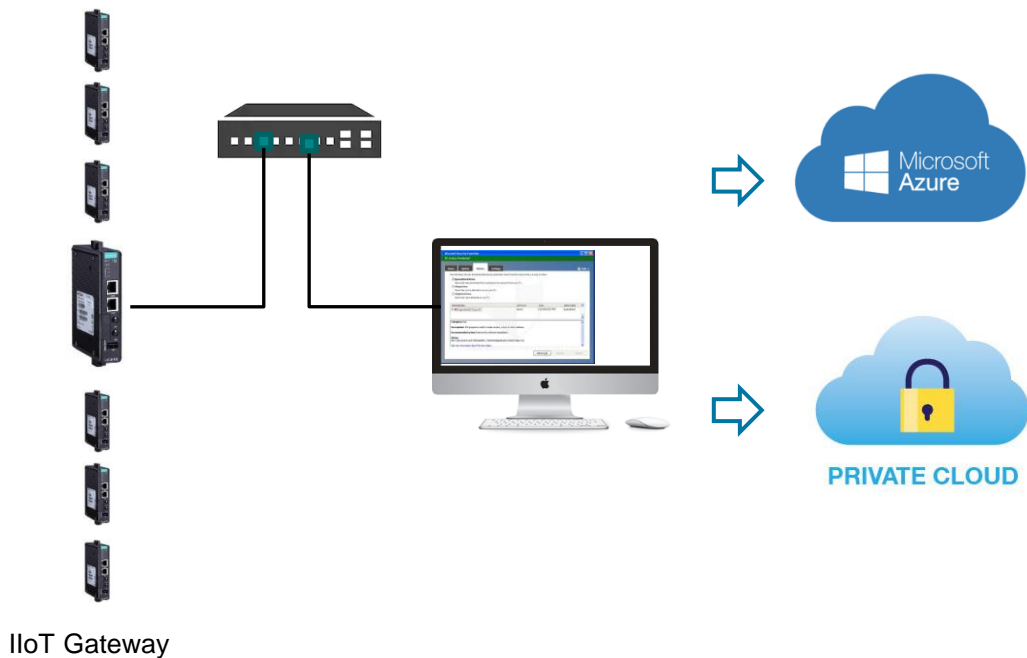
Example Dashboard: Moxa US Office Solar Monitoring

Reference Architecture Design



Moxa Device Provisioning Tool

ThingsPro Edge provision APIs allows SI to register devices to customer's backend application in secure, mass and easy.



ThingsPro Edge Provision API

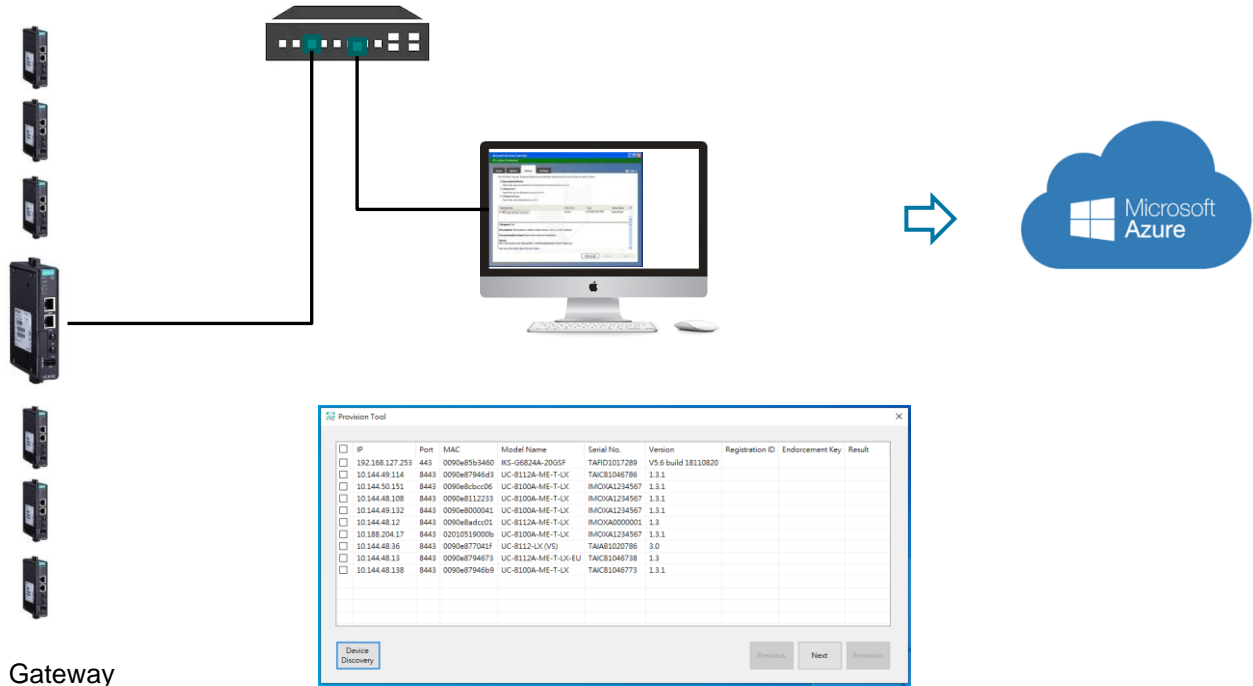
- Retrieve TPM EK and Registration ID
- Apply Azure DPS configuration
- Enable/Disable H/W interface (lock console port ...)
- Enable/Disable S/W service (disable SSH ...)
- Start/Stop Application (start Azure IoT Edge ...)
- Change default password ...

Support Cloud

- Azure IoT Hub
- Azure DPS
- MQTT Service (Private Cloud) *

* In roadmap

Demo Provisioning Tool



Moxa Device Provisioning

reference software

The screenshot displays the Moxa Provision Tool interface. The main window is titled 'Provision Tool' and shows a list of devices on the left. The 'Provision Destination' window is open, showing the following settings:

Azure DPS Settings

- Service Endpoint:
- ID Scope:
- Shared Access Policy:
- Shared Access Key:
- IoT Hub Host Name:

Initial Tags of Device Twin

Key	Value
project	demo

Advance Setting

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

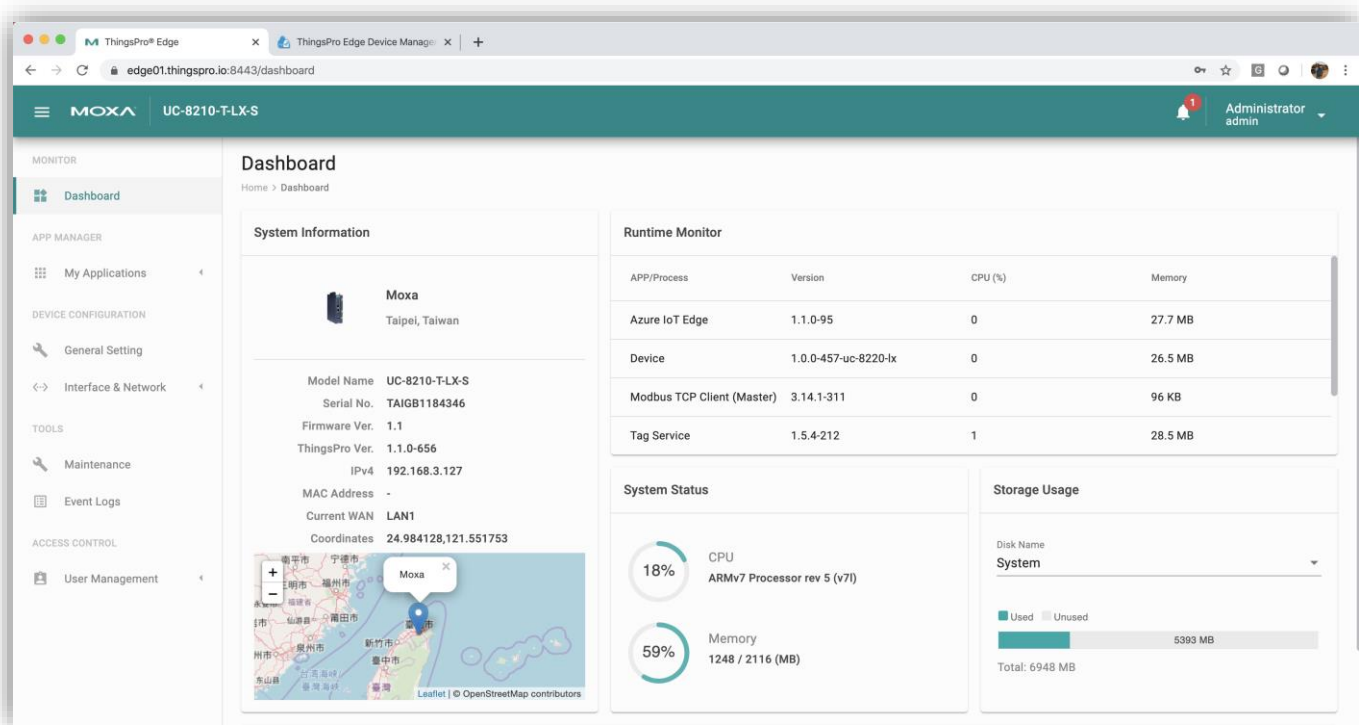
Buttons: Device Discovery, Use My DPS, Previous, Next, Provision.

ThingsPro Edge Device Management in Azure Portal (Module Identity Twin/JSON)

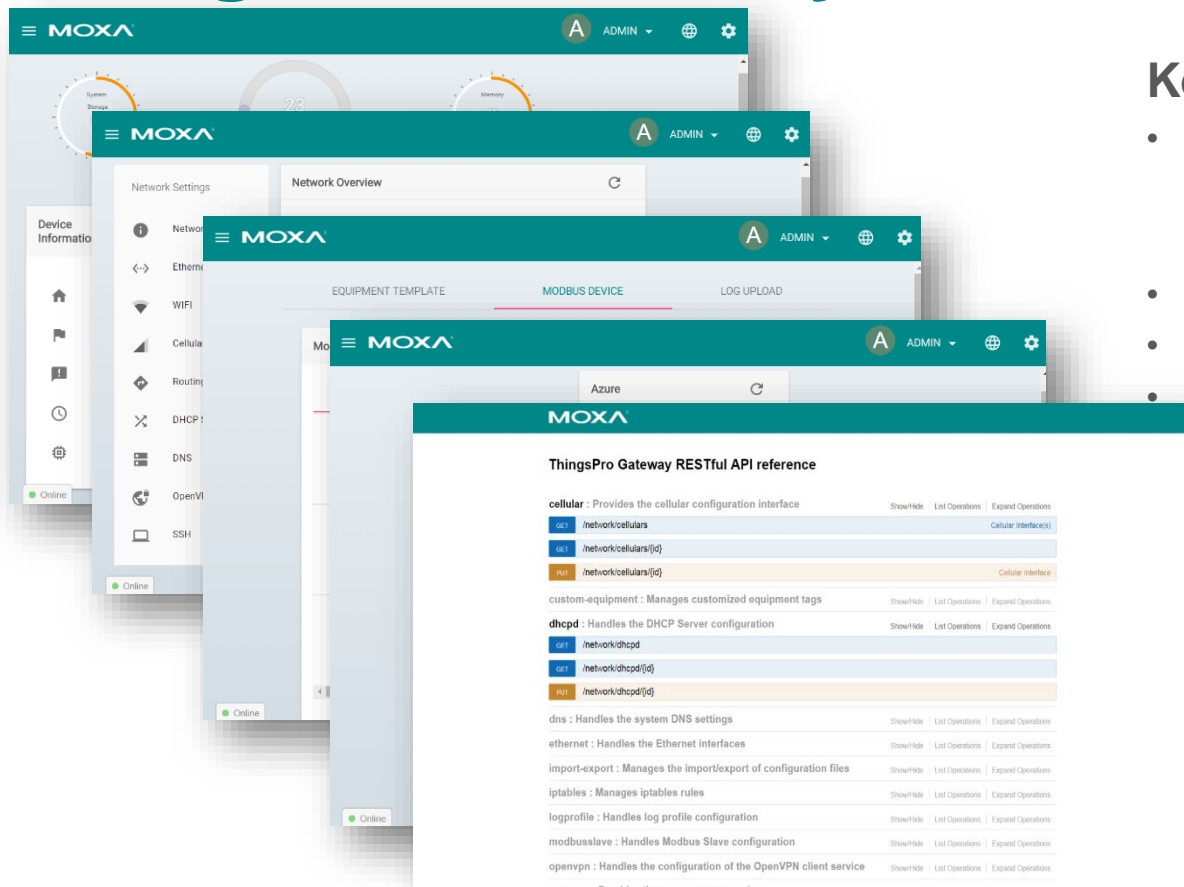
The screenshot displays the Azure portal interface for managing a Module Identity Twin. The breadcrumb navigation shows the path: Home > Moxa-GMKT-IoTHub - IoT Edge > TAICB1046750 > IoT Edge Module Details > Module Identity Twin. The page title is 'Module Identity Twin' for the module 'thingspro-agent'. A 'Save' button is visible. An information banner states: 'The module twin for 'thingspro-agent' is shown below. You can add tags and desired properties to your module twin here. To remove a tag or desired property, set the value of the item to be removed to 'null'.'

```
1 {
2   "deviceId": "TAICB1046750",
3   "moduleId": "thingspro-agent",
4   "etag": "AAAAAAAAAA=",
5   "deviceEtag": "NDgyOTIwOTE3",
6   "status": "enabled",
7   "statusUpdateTime": "0001-01-01T00:00:00Z",
8   "connectionState": "Disconnected",
9   "lastActivityTime": "2019-10-19T00:06:09.3968425Z",
10  "cloudToDeviceMessageCount": 0,
11  "authenticationType": "sas",
12  "x509Thumbprint": {
13    "primaryThumbprint": null,
14    "secondaryThumbprint": null
15  },
16  "version": 1000,
17  "properties": {
18    "desired": {
19      "general": {
20        "hostName": "TAICB1046750",
21        "deviceName": "TAICB1046750"
22      },
23      "$metadata": {
24        "$lastUpdated": "2019-11-24T19:22:49.873421Z",
25        "$lastUpdatedVersion": 6,
```

ThingsPro Edge Local GUI



ThingsPro Gateway Local GUI



Key Features

- Device Configuration:
 - Networking and System settings
 - Cellular Configuration
- Industrial Protocol Gateway
- Cloud and SCADA Connectors
- RESTful API

ThingsPro Edge Restful API Doc

<https://thingspro-edge.moxa.online/>

The screenshot displays the Moxa ThingsPro Edge Restful API documentation. The top navigation bar includes the Moxa logo and links for OAPI, ThingsPro Agent, and Bugs/Feedback. A search bar is located on the left. A sidebar menu on the left lists various API endpoints: general, time, zoneinfo, dns, route, network, ethernets (expanded), and serials. The main content area shows the details for the PATCH endpoint /device/ethernets/{id}. It includes a 'Request samples' section with a 'Payload' button and a 'Response samples' section with a '200' button. Both sections show the content type as application/json and provide an example payload and response body. The example payload is a JSON object with 'enable', 'enableDhcp', and 'wan' fields. The example response is a 200 status code with an application/json content type.

MOXA OAPI ThingsPro Agent Bugs/Feedback

Search...

general >

time >

zoneinfo >

dns >

route >

network >

ethernets ▾

GET Get ethernet interfaces configuration.

PATCH Update ethernet interfaces configuration.

GET Get ethernet interface configuration.

PATCH Update ethernet interface configuration.

serials >

PATCH /device/ethernets/{id}

Request samples

Payload

Content type
application/json

Example
dhcp

Copy Expand all Collapse all

```
{
  "enable": true,
  "enableDhcp": true,
  "wan": true
}
```

Response samples

200

Content type
application/json

Example
dhcp

ThingsPro Cloud Device Management

<http://training.thingspro.io:8080/>

ThingsPro Cloud DM Demo
Author : Kevin Kao | Date : 2019-10

Moxa IIoT Gateway List

Show 10 entries Search:

No	Edge Name	Host Name	Status	Telemetry	Firmware Version	ThingsPro Version	Uplink	IP Address
1	ThingsProEdge001	Moxa	Connected	-	3.0	1.1.0-315	LAN1	10.144.48.128
2	ThingsProEdge002	-	-	-	-	-	-	-

Showing 1 to 2 of 2 entries

Previous 1 Next

Configure

Device Type : gateway WAN Interface : LAN1 NTP Enable : false Host Name : Moxa

Model Name : UC-8112-LX (VS) IP Address : 10.144.48.128 NTP Server : pool.ntp.org Description :

Thank You

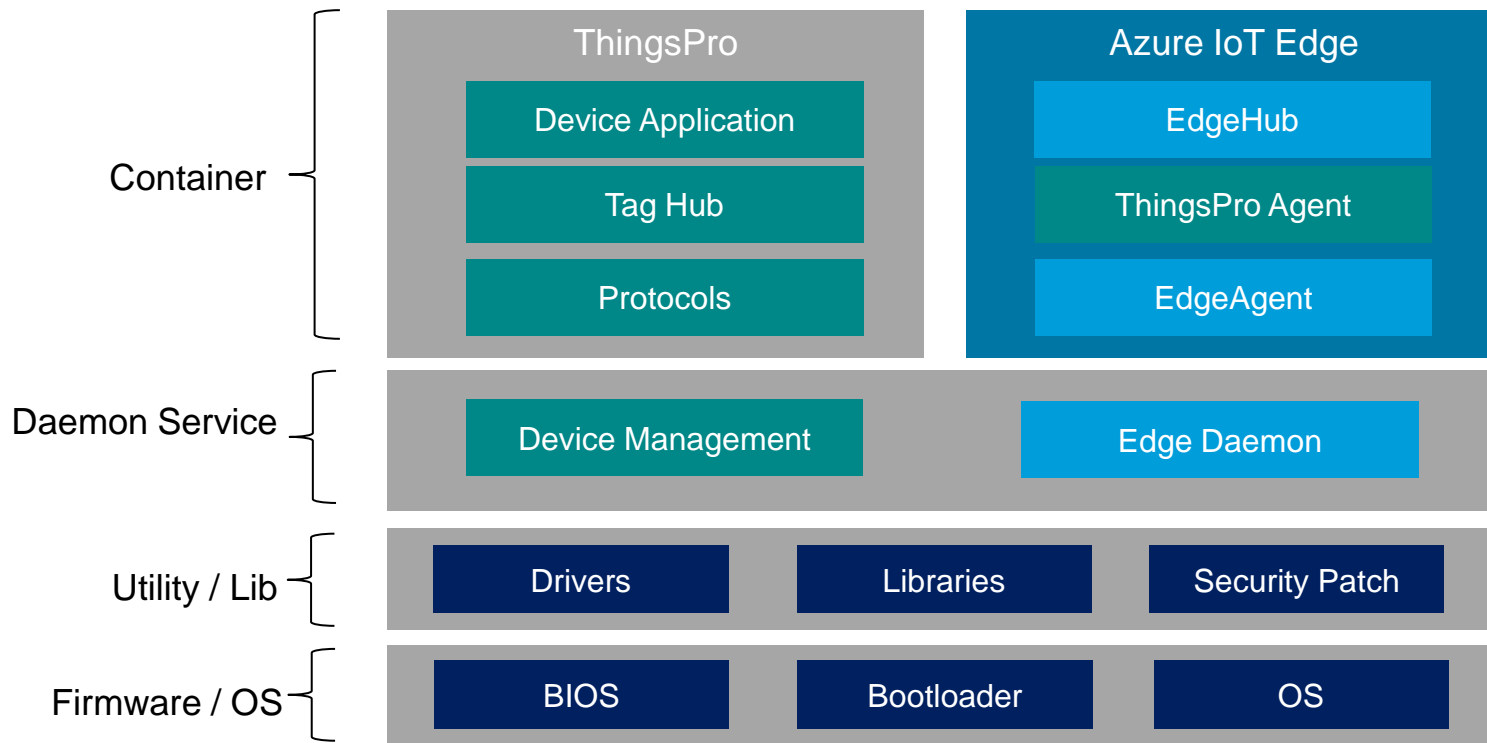


Backup Slides

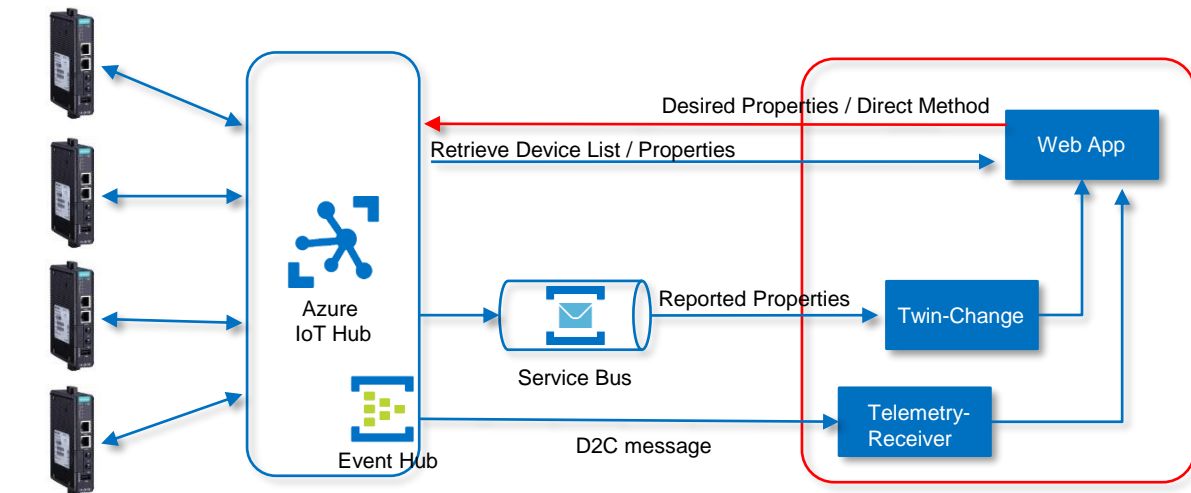
- **ThingsPro Edge Architecture Overview**
- **Cloud Application Reference Architecture**

Architecture Overview

■ Microsoft
■ Moxa



Cloud Application Reference Architecture



IIoT Gateway

Config message route to Service Bus

- Twin Change
- Device Lifecycle

IoT Hub service SDK or Restful API

- Retrieve Edge devices from IoT Hub
- Retrieve Reported Properties
- Apply Desired Properties
- Invoke Direct Method

Azure Service Bus SDK

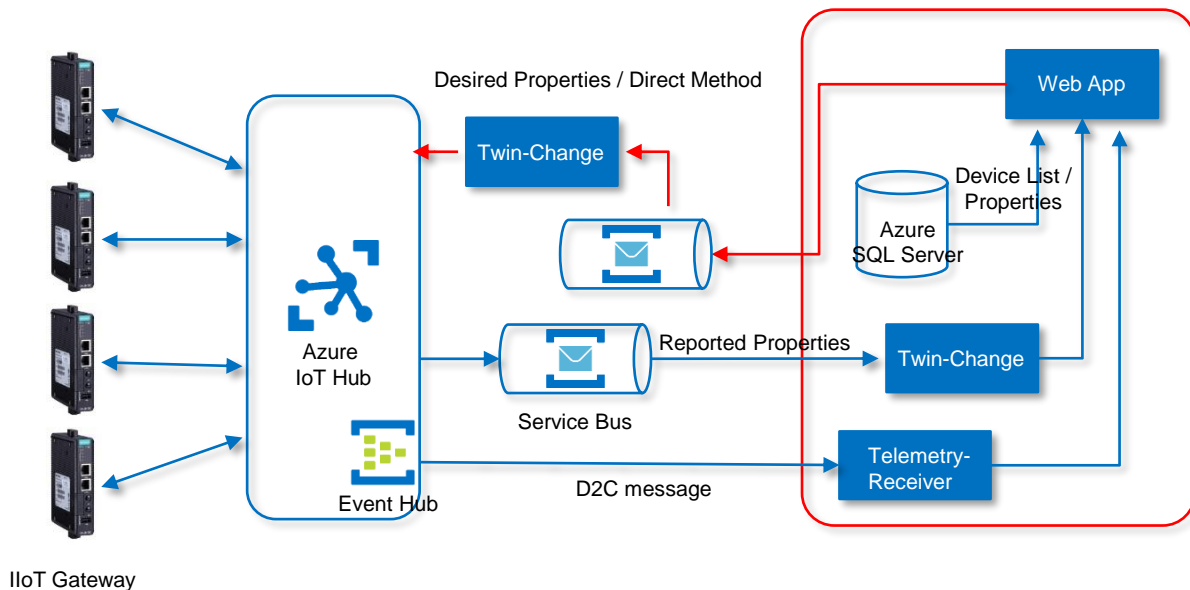
- Receive message from Queue
- Push message to Web App

Azure Event Hub SDK

- Receive D2C message from Event Hub
- Push message to Web App

Cloud Application Reference Architecture

Better Architecture



Azure SQL Server

- Store Device meta data
- Connection Status
- Reported Properties

Queue and Microservice

- Apply Desired Properties
- Invoke Direct Method
- Invoke Direct Method when device online

Links

- **Github for ThingsPro installation:**
- <https://github.com/FrankSHLi/ThingsProDoc/blob/master/ModbusToCloudFromScratch.md#provision-tool>
-
- **Github for the ThingsPro Edge Cloud Reference Application**
- <https://github.com/MOXA-ISD/cloud-dm-demo>
-