

# IoTEdge Configuration Manager – IoTEdgeCTL

AN APPROACH TO MANAGING  
CONFIGURATIONS FOR A FLEET OF  
IOTEDGE



## AGENDA

- State of Edge Computing
- Problem Statement
- Approaches to Scale Edge Deployment
  - Layered Deployment
  - IoT Edge Configuration Manager

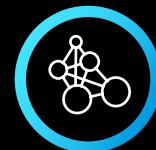
# STATE OF EDGE COMPUTING

- Most **everything** on the Planet will be Connected and Intelligent
- Distributed Intelligence is the new frontier
- Distributed Intelligence is powered by Edge Computing

**"41 billion connected devices by 2027"<sup>1</sup>**



**\$1.6 trillion**  
Global market for IoT solutions by 2025<sup>2</sup>



**152,200 IoT devices**  
connected every minute by 2025<sup>3</sup>

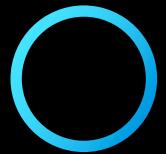


**3.5 billion**  
Cellular IoT connections by 2023<sup>4</sup>

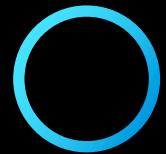


**800 zettabytes**  
Volume of data generated by IoT devices by the end of 2021<sup>5</sup>

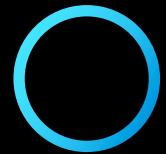
## “Intelligent Edge Examples”



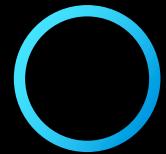
Microcontrollers



IoT Devices



Edge Devices



Edge Appliances

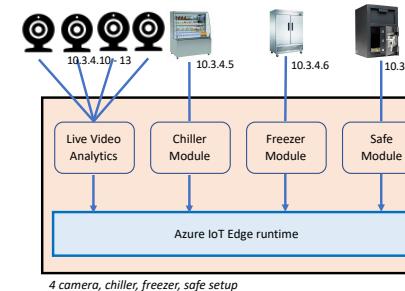


Hybrid Cloud

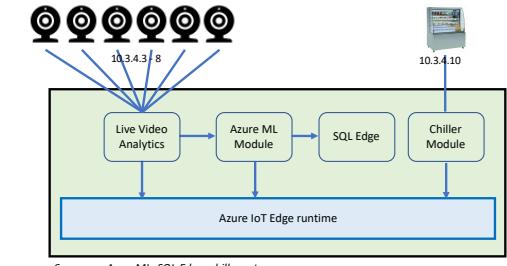


# EDGE DEPLOYMENTS AT SCALE – VOLUME & VARIETY

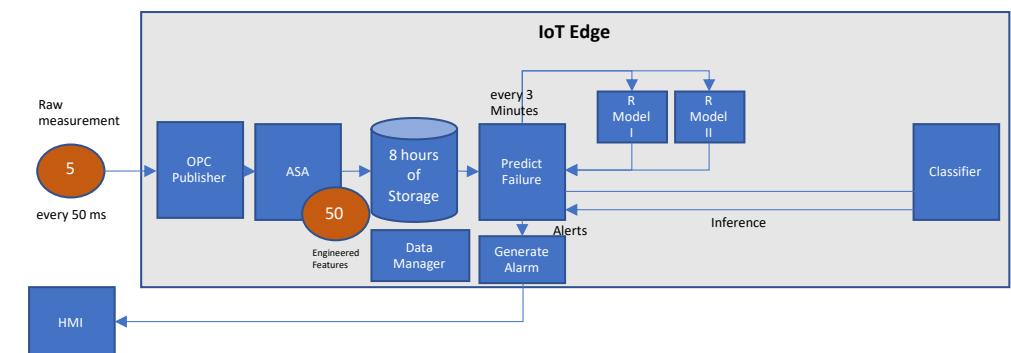
- IoTEdge deployments are increasing in **volume**
  - Edge(s) at each Factory/Production Line/Equipment/oil well/etc.
  - Edge(s) at each Retail Store/Pharmacy
- IoTEdge workload configuration often **vary** by Location
  - ML Models by Production Line/Equipment
  - Network and Device configuration by Retail Store/Pharmacy
- IoTEdge workload auditing
  - What workloads were deployed
  - When should deployments happen
  - For how long, etc...



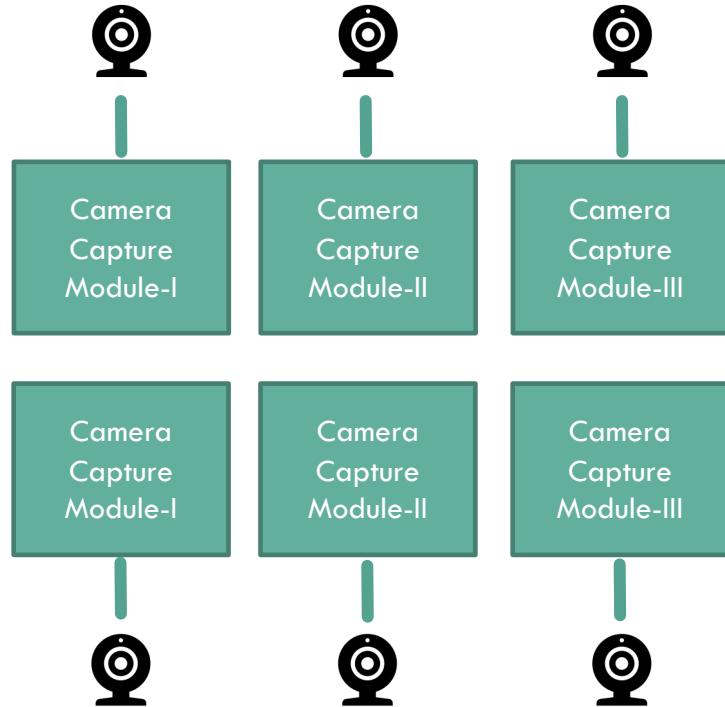
4 camera, chiller, freezer, safe setup



6 camera, AzureML, SQL Edge, chiller setup



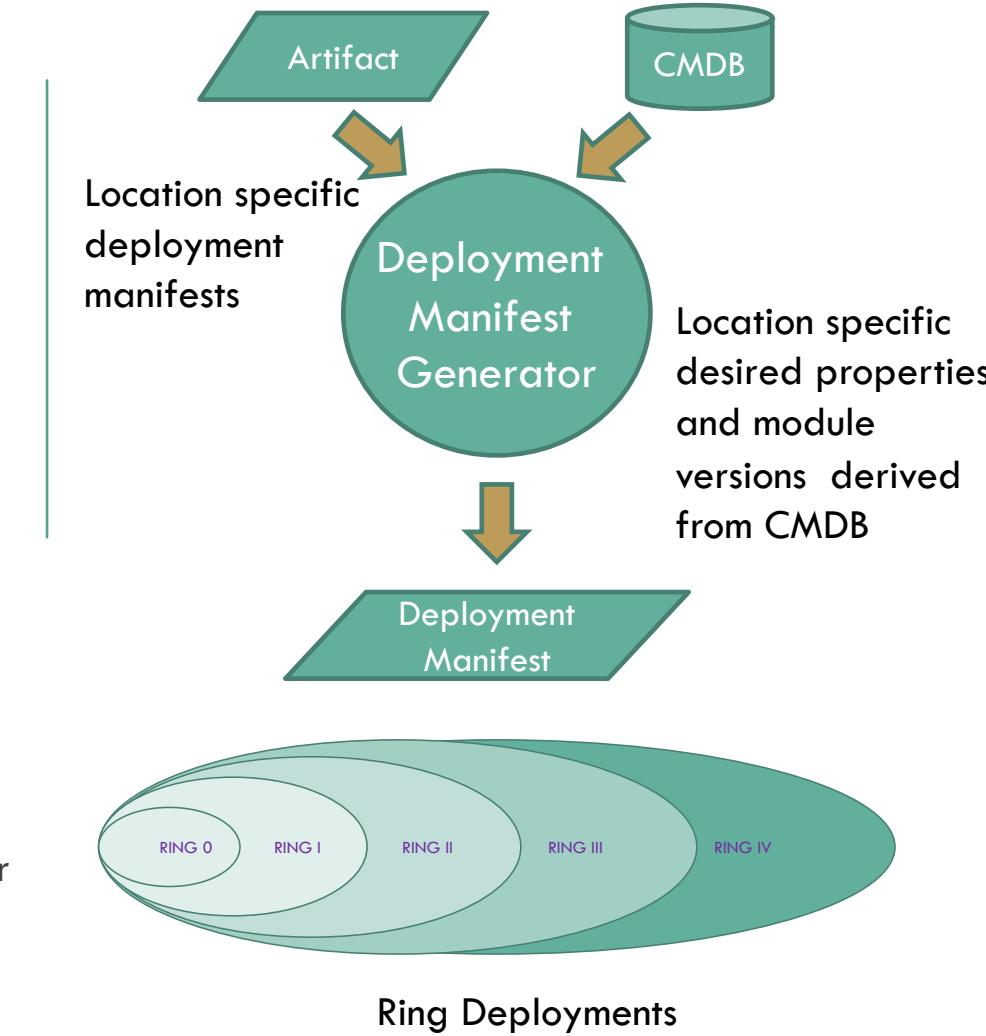
# SOLVING FOR EDGE VOLUME & MODULE VARIETY

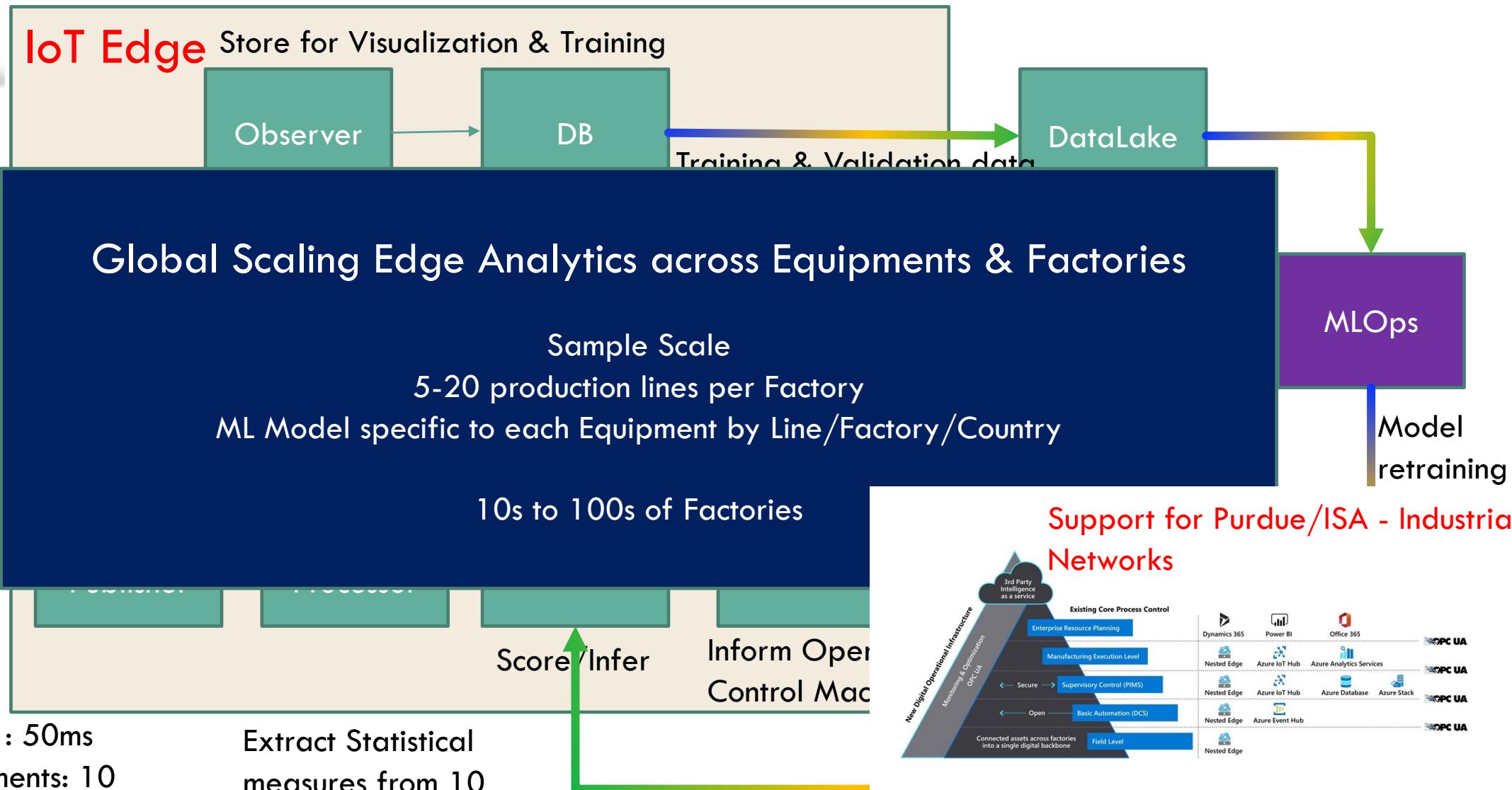


- Each Camera requires a single IoTEdge Module - Camera : Module::1:1
- Each Camera module has distinct desired properties, specific to the store and camera



- In current state, each store is different in camera configuration
- Need to be able to provision the number of cameras or devices per store at ease

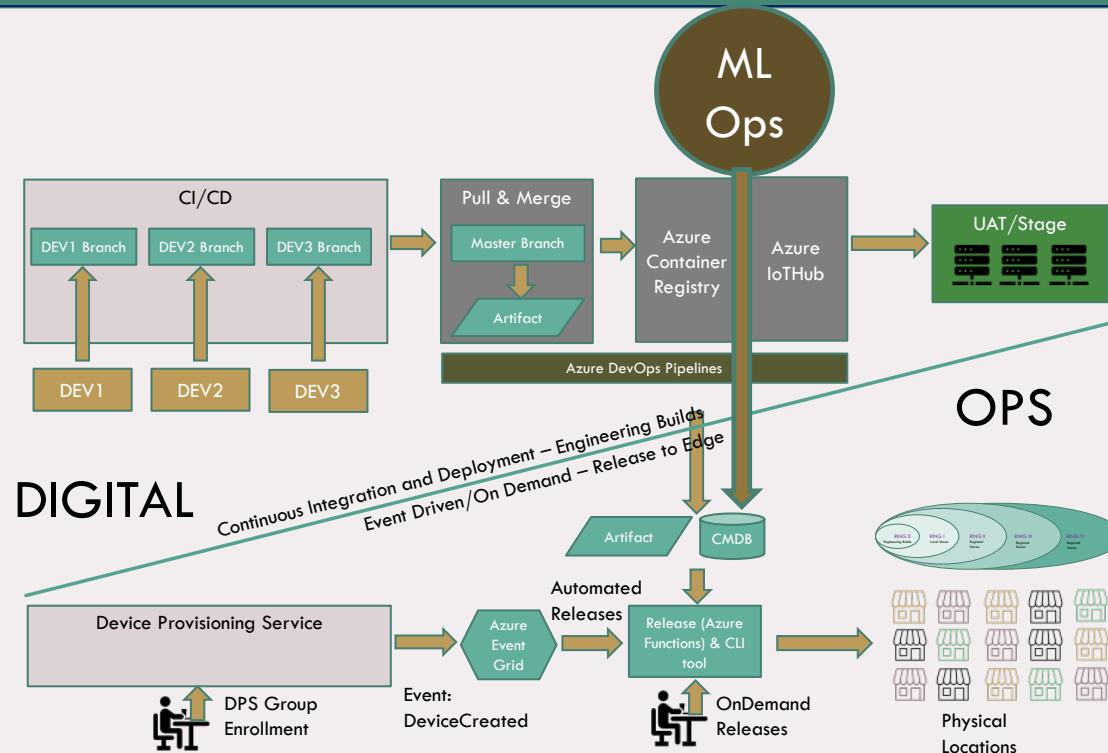




# NEED FOR TOOLING TO SUPPORT VOLUME & VARIETY

## Pipelines for CI/CD

Code -> Container Registry -> IoTEdge

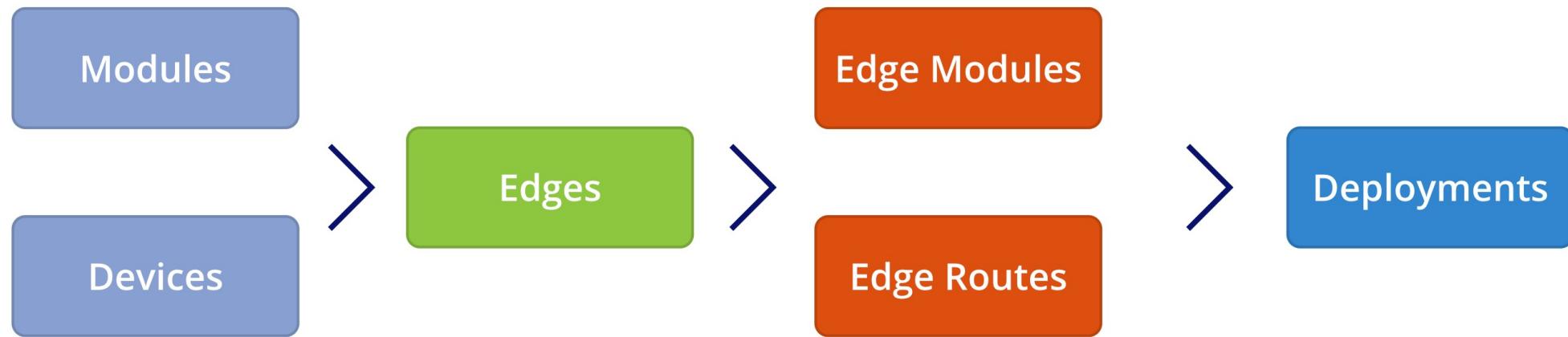


## Empowering Customer Organizations to Manage a Fleet of IoTEdge across Personas

### MythicalIoT - Add Edge Deployment

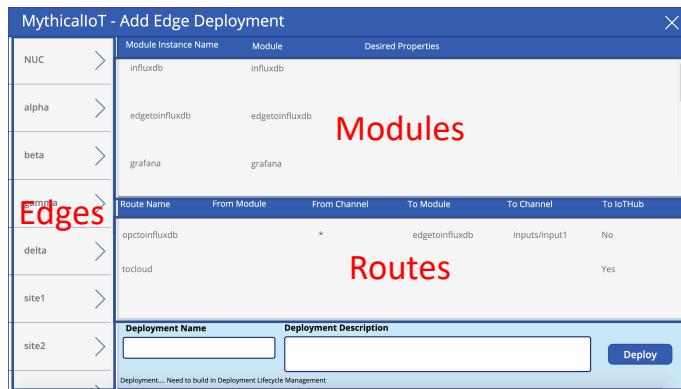
Module Instance Name	Module	Desired Properties			
NUC					
alpha					
<b>List of IoT Edges</b>					
beta					
influxdb					
gamma					
Route Name	From Module	From Channel	To Module	To Channel	To IoTHub
opctoinfluxdb			edgetoinfluxdb	inputs/input1	No
delta					
tocloud					Yes
site1					
site2					
Deployment Name	Deployment Description				
		Deployment... Need to build in Deployment Lifecycle Management			
					<b>Deploy</b>

# DEMO



# SOLUTION ARCHITECTURE

## PowerTools4IoTEdge



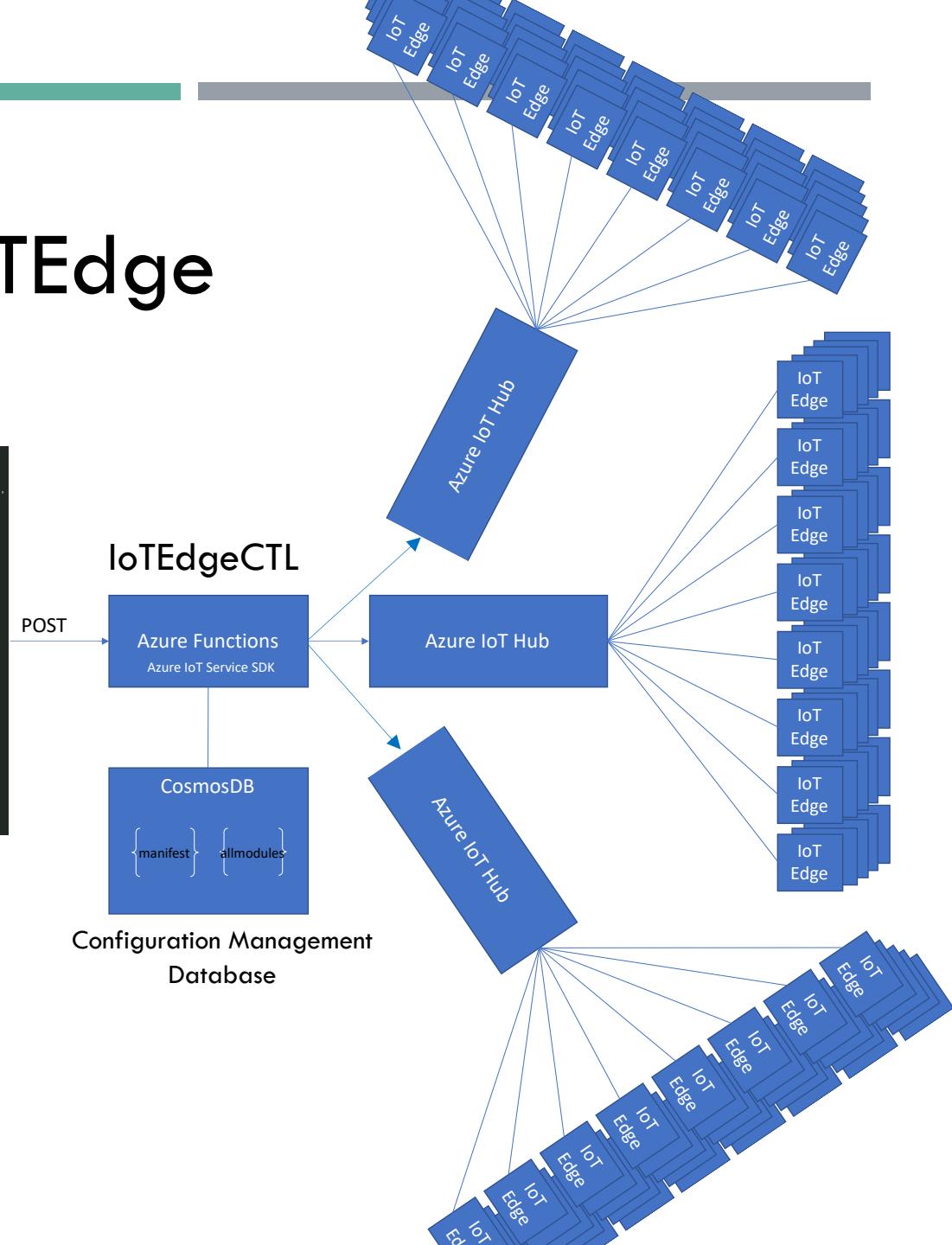
### PowerAutomate for IoTEdgeCTL

Power Automate

```
[{"RouteInstanceName": "TempSensor", "Module": "SimulatedTemperatureSensor", "DesiredProperties": [{"name": "tempSensor"}]}, {"Route": [{"RouteInstanceName": "TempSensorToIoTHub", "FromModule": "SimulatedTemperatureSensor", "ToModule": null, "FromChannel": "tempout", "ToChannel": "tempout", "ToIoHub": true}, {"RouteInstanceName": "TempSensorToPySend", "FromModule": "SimulatedTemperatureSensor", "ToModule": "PySendModule", "FromChannel": "tempout", "ToChannel": "tempout", "ToIoHub": false}], "DesiredProperties": [{"name": "pysender"}]}, {"ModuleInstanceName": "PySend", "Module": "PySendModule", "DesiredProperties": [{"name": "pysender"}]}, {"Routes": [{"RouteInstanceName": "PySenderToIoTHub", "FromModule": "PySendModule", "ToModule": null, "FromChannel": "triggerout", "ToChannel": "tempout", "ToIoHub": true}]}]
```

### PowerApps4IoTEdge – An Interface for:

- Operators
- Data Scientists
- Edge Support Engineers
- Others



# THE BIG PICTURE

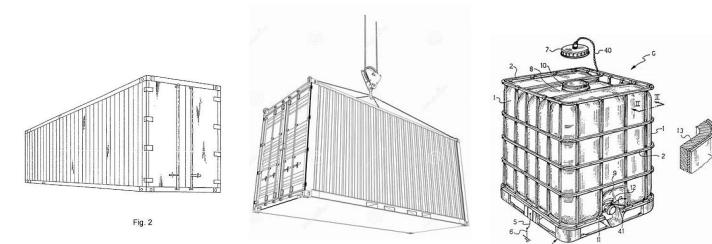
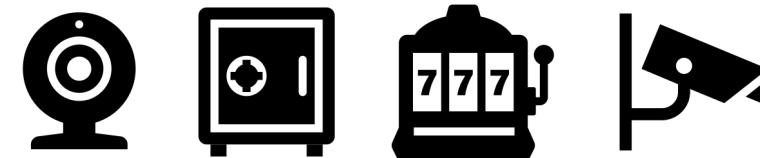
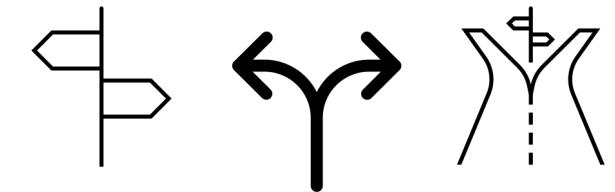
## EDGES



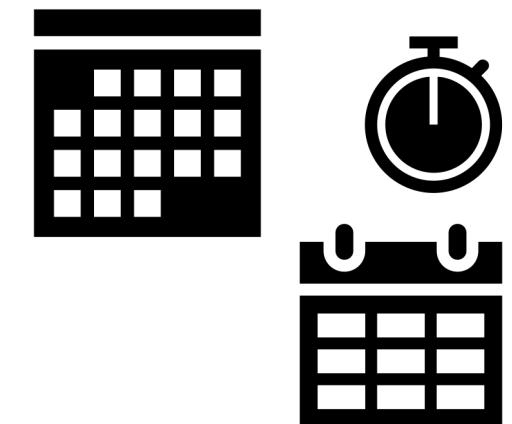
## DEVICES & MODULES



## ROUTES



## RELEASE SCHEDULES



# A SAMPLE

https://github.com/AzureIoTGBB/iot-edge-configuration-manager

## Solution goals

The idea for this solution stems from a customer need to deploy varying workloads to a fleet of IoT Edge at various locations (retail stores/factories/oil wells/etc.). Each IoT Edge runs workloads specific to the location.

For example, consider a retail store with multiple IoT devices such as Chillers, Refrigerators, HVAC, Cameras, Safe and other devices connected to IoT Edge. Each of these IoT devices has one or more modules in IoT Edge with location specific configurations such as IP address of the device, environment variables and desired properties.

As the number of locations increases and the variability in number of devices per location, such as number of camera, configuration for each camera (IP address, camera type, etc.), the management and deployment of the workloads will tend to get complex and does not readily fit into IoT edge [Automatic Deployment for single devices or at scale](#). Considering each IoT Edge is different and has variability in configurations by workload, a single deployment manifest for the entire fleet will not meet the needs of all Edges.

This solution demonstrates the ability to configure heterogeneous edge workloads for needs of the kind illustrated in the following picture:

The image contains four separate diagrams, each showing an 'Azure IoT Edge runtime' box with various modules connected to it. The top-left diagram shows a '4 camera, chiller, freezer, safe setup' with four cameras (IPs 10.3.4.10-13), a Chiller Module (IP 10.3.4.5), a Freezer Module (IP 10.3.4.6), and a Safe Module (IP 10.3.4.8). The top-right diagram shows a '6 camera, AzureML, SQL Edge, chiller setup' with six cameras (IPs 10.3.4.3-8), an Azure ML Module, a SQL Edge module, and a Chiller Module (IP 10.3.4.10). The bottom-left diagram shows a '3 camera, AzureML, chiller, printer setup' with three cameras (IPs 10.4.4.3-5), a Chiller Module, and a BLE Printer Module. The bottom-right diagram shows a '6 camera, 2 chiller, printer setup' with six cameras (IPs 10.4.4.10-13), two Chillers (IPs 10.3.4.21 and 10.3.4.20), and a BLE Printer Module (IP 10.3.4.22). Each diagram shows the modules connected to the 'Azure IoT Edge runtime' box.

Empower every organization on the Planet to operate IoT Edge at ease.

- Contributions
- Use Cases
- Customers