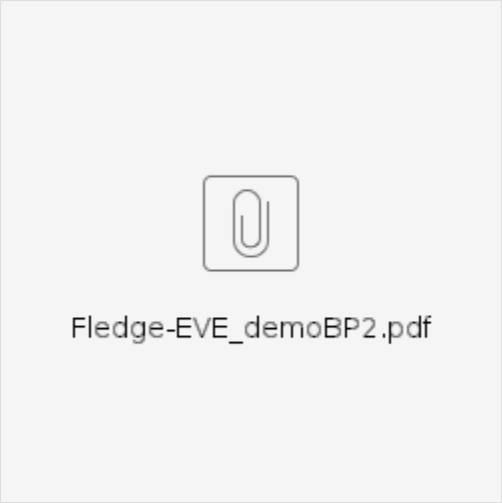
Predictive Maintenance (with a Thermal Imaging Camera, vibration sensors, etc.)

need to fill out these templates: Documentation Sub-committee

PTL- Vladimir Suvorov - 17 September 2020 through 17 September 2021

Use Case Details:

<add in the taxonomy image from the white paper>



Use Case - Predictive Maintenance using a Thermal Imaging Camera

Attributes	Description	Informational
Type	New	New
Industry Sector	IoT Device Edge	
Business driver	Predictive Maintenance	

Business use cases	Many devices give off hints that they will need to have maintenance earlier than their scheduled maintenance. Through Machine Learning (ML), we can create models that will allow us to know that a device will soon need maintenance. For many machines, we can gain a great deal of information on the health of the device by looking at the temperature of the device. This requires collecting the data and then sending it to a Historian or similar device. These data points can be sent to the cloud to be modeled.
	
	Other requirements
	
	• Need to take the current temperature of the device and react in near real-time to rising temperature
	  ○ Example: If over 150 C- send out a warning to an email list, show warning on a UI
	  if over 180 C trigger light or horn
	  if over 200 C trigger shutdown process
	
	Other variations:
	
	Monitoring restricted spaces
	
	• If a human enters in a space,
	  ○ first level of restriction- sound an alarm and turn on lights
	  ○ second level- start the shutdown process
		Predictive maintenance: There are many different types of models. For example, many models do not need to be done in real-time. Thus, the data can be sent to the Cloud and processed. The data is not time critical, so if there is a delay in sending/receiving data, the data will need to be stored and then sent when the network is available.
		
		Yet, there are many scenarios, where real-time or near real-time is required. An example of this would be a machine reaching a maximum temperature. As it approaches this, we would want to send out a warning and then if it reached this critical temperature, the device needs to be shut down.
		
		For this type of scenario, there needs to be a server or space on the IoT gateway that can process the data in real-time.

Business Cost - Initial Build Cost Target Objective	Cost is only for the hardware-	
Business Cost – Target Operational Objective	varies widely depending on accessories. The IoT Gateway can be under $500 to over $5,000	
Security need	Because of the remoteness of the devices, need the ability to control ports (turn on /off)	
Regulations	Varies depending on local regulations	
Other restrictions		
Additional details		

Family- IoT Device Edge-

Use Case Attributes	Description	Informational
Type	New	
Blueprint Family - Proposed Name	IoT-Device Edge	There are many possible UCs that would be IIoT, so these only are designed to handle Predictive Maintenance UCs
Use Case	Predictive Maintenance using a FLIR Camera	See below

Blueprint proposed	Predictive Maintenance- Using FLIR Camera	
Initial POD Cost (capex)	Varies widely depending on the Blueprint	
Scale of Servers	one at the User Edge	this is the IoT Gateway
Applications (Edge Virtual Network Functions)	EVE	
Power Restrictions	None/Varies	▪ none for the FLIR, but another blueprint might need it
Preferred Infrastructure orchestration	Docker/K8 - Container Orchestration OS - Linux	
Additional Details		

BluePrint (Species) - Predictive Maintenance- with a Thermal Imaging Camera

Case Attributes	Description	Informational
Type	New	
Blueprint Family - Proposed Name	IoT Device Edge	IIoT == Industrial Internet of Things PM == Predictive Maintenance
Use Case	Any Predictive Maintenance UC that is on the shop floor	With a few modifications, it is possible to change this blueprint to meet many similar Use Cases
Blueprint proposed Name	Predictive Maintenance using a FLIR Camera	
Initial POD Cost (capex)	Under $20k FLIR Camera- IoT Gateway- Advantech- Model UNO LFEdge's Adam or similar Fledge	This is the set up for the FLIR Fledge/EVE demo ▪ the demo uses ZEDEDA instead of LF Edge's Adam
Scale & Type of Server	1 IoT Gateway, a server on the edge is not needed	This is on the customer edge, thus there is no server. The IoT Gateway will handle the connection to the internet.
Applications	Fledge, Ubuntu, code for the demo	
Power Restrictions	NA	none of the devices require power that is outside of a normal wall socket
Infrastructure orchestration	EVE VM- Ubuntu	EVE acts as the OS and will have a containerized version of Ubuntu and Fledge on it
SDN (Software Defined Networking)	None	
Workload Type	• Containers (Tensoflow, Keras containers) • VM- Ubuntu	
Additional Details		

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