PRIVATE 5G - REAL TIME ASSET TRACKING

ENGAGING WITH CUSTOMERS

REAL TIME ASSET TRACKING FOR SMART ENTERPRISE

Asset Tracking Use Cases

- Vehicle tracking on airside on airports
- Fork Lifts, Trolleys, Equipment tracking in large industrial complex
- Yard containers and pickup truck tracking for quick turnaround time for finding containers in large scale yards
- Airline Cargo tracing and tracking

2. Industry Vertical

- Port/Logistics
- Warehouses
- Industrial Complex
- Smart cities

3. Pilot Use case – Video AI based Traffic Vehicle Counting & Density

Problem addressed

- Inability to track and provide timely response to request for information for cargo
- Lack of visibility of operational in-efficiencies in Cargo movement
- Patchy wifi and mobile networks hampering smooth operations

Use case Description

- Real time tracking of baggage movement on airport

Why 5G?

- Seamless airside connectivity for uninterrupted data upload to application for real time processing

Benefits

- Improved connectivity with 5G private network
- Real time information visibility and monitoring of cargo movement
- Operational insights into potential bottlenecks even before they happen

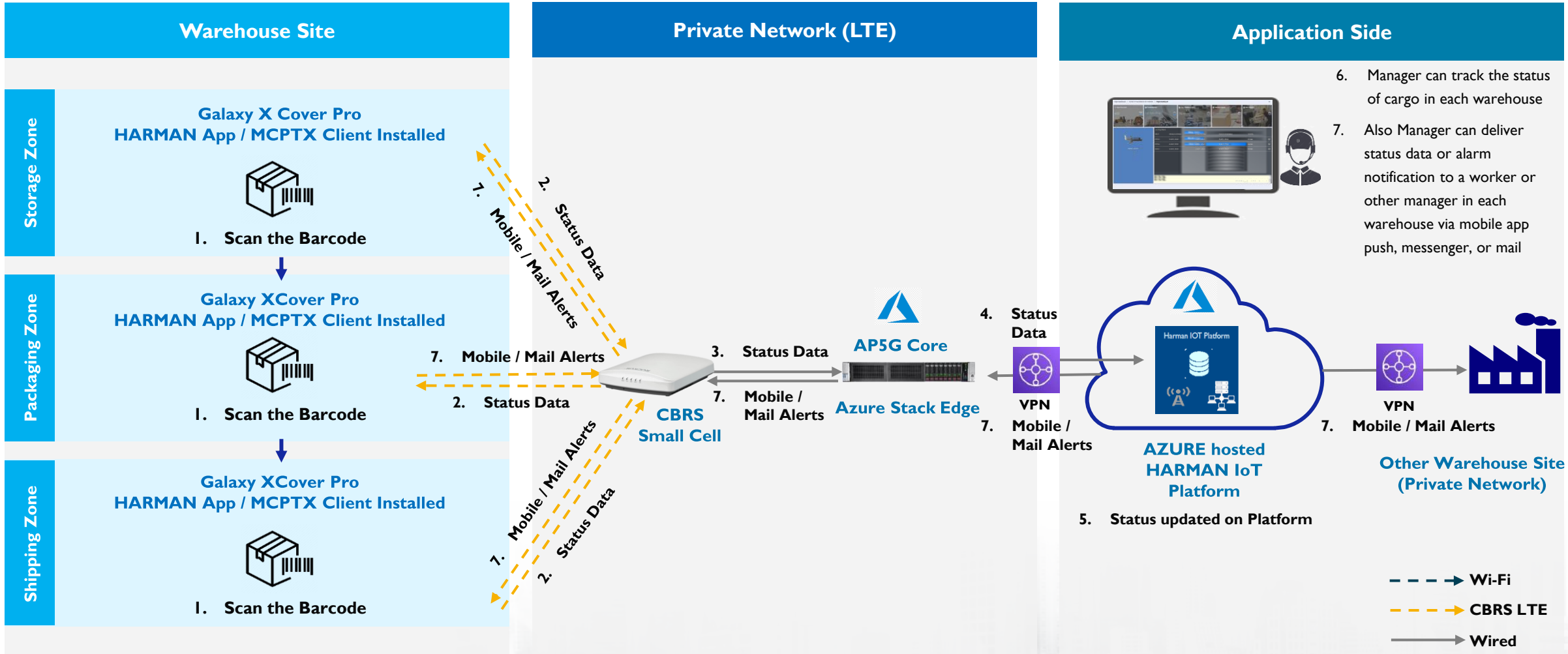
Partner

Why IoT?

- Enables real-time high-volume data capture from video AI system and ease of creating data visualization with built-in capabilities, with incident notification and reporting in field

CARGO TRACKING – USE CASE DEMO SCENARIO

Management of The Warehouse Cargo-In & Out Process with Private Network



* Status Data: Cargo Name, Barcode number, Location Status (Process), Departure, Arrive, Receiver, Sender

THANK YOU

REAL TIME VIDEO ANALYTICS FOR SMART LOGISTICS & TRANSPORTTION

1.Real Time Video Analytics Use Cases

- Vehicle counting, density monitoring
- Container damage detection
- Warehouse safety by identifying dangerously placed stacks
- Vehicle-package loading analytics
- Safety helmet, vest etc compliance enforcement and monitoring

2. Industry Vertical

- Port/Logistics
- Warehouse
- Construction
- Smart transportation / municipalities

3. Pilot Use case – Video AI based Traffic Vehicle Counting & Density

Problem Addressed

- Data is vital tool to deal with a high traffic level. Keeping abreast with changes in traffic behavior or form can help analysts better manage future traffic requirement.

Use Case Description

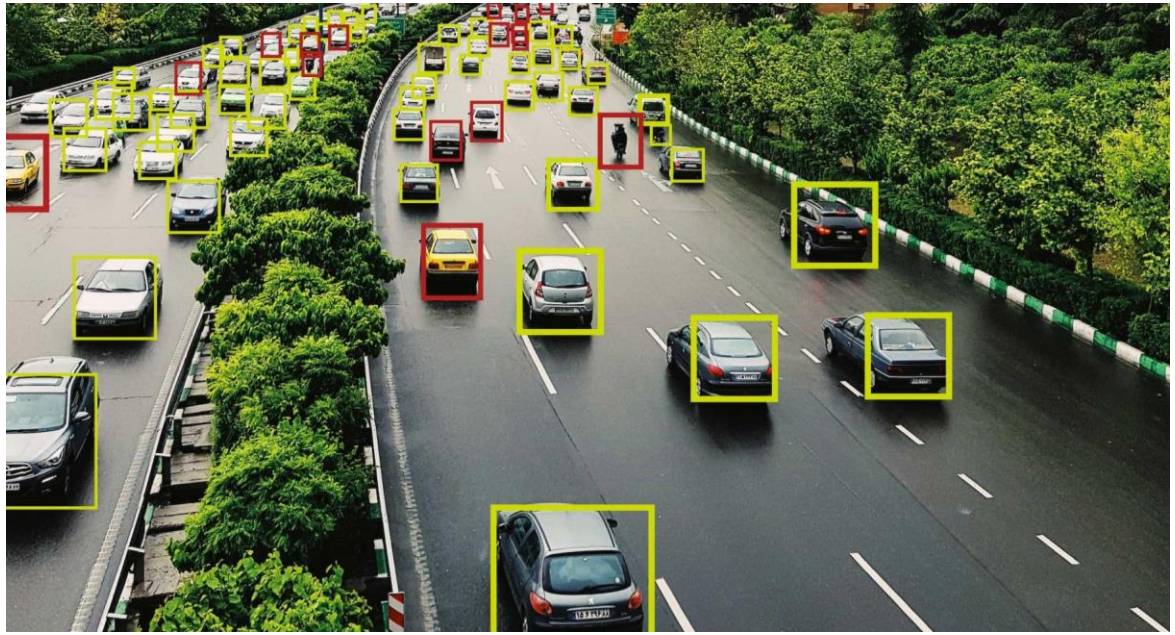
- Real time Video AI based traffic vehicle counting and density tracking

Why 5G?

- High BW Video analytics for Real time Insights generation

Why IoT?

- Enables real-time high-volume data capture from video AI system and ease of creating data visualization with built-in capabilities, with incident notification and reporting in field



Benefits

- Improved traffic movement insights enabling advanced planning
- Still and Video footage for law enforcement
- Less manned surveillance

Partner

- NA

VIDEO AI BASED TRAFFIC AND DENSITY TRACKING - USE CASE SCENARIO

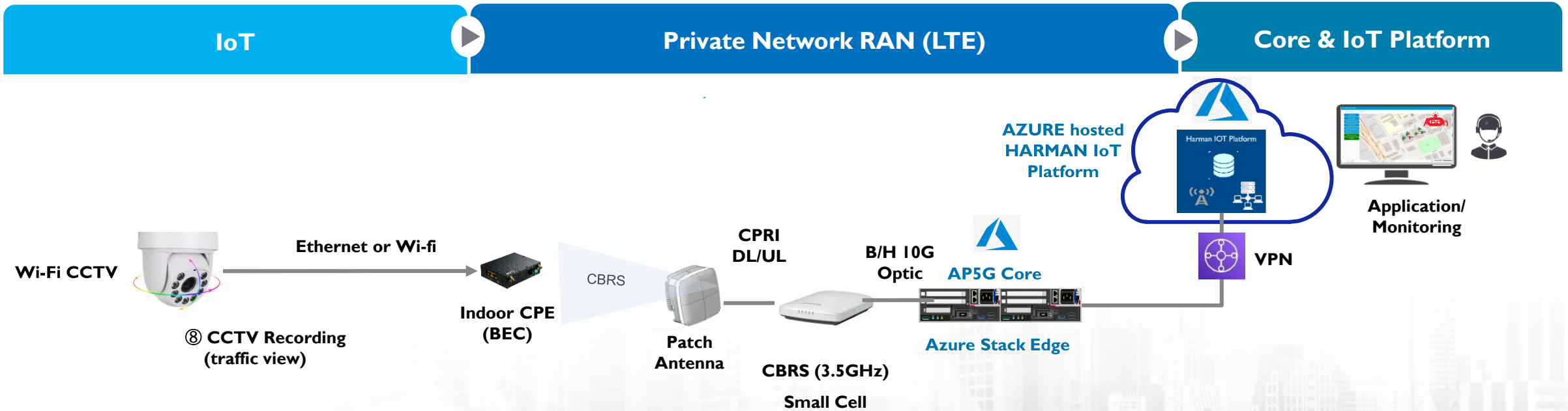
E2E Network Configuration

Configuration Detail

- **Frequency : 3.5GHz** (US CBRS, B48 (3.55-3.7GHz))
- **Radio : LTE -** CBRS Small Cell
- **Core : PN Core (4G/5G Support)**

Other Components Detail

- **Sensor Type : Video Camera**
- **IoT G/W : NA**
- **CPE : BEC Indoor CPE (MX 240)**



DIGITAL TRANSFORMATION SOLUTIONS

5G USE CASES FOR HEALTHCARE

USE CASE 1 – MATERNITY CARE (OBSTETRICS)

HIGH-QUALITY TRANSMISSION OF CARDIOTOCOGRAM AND FETAL INFORMATION USING A 5G SYSTEM

Description:

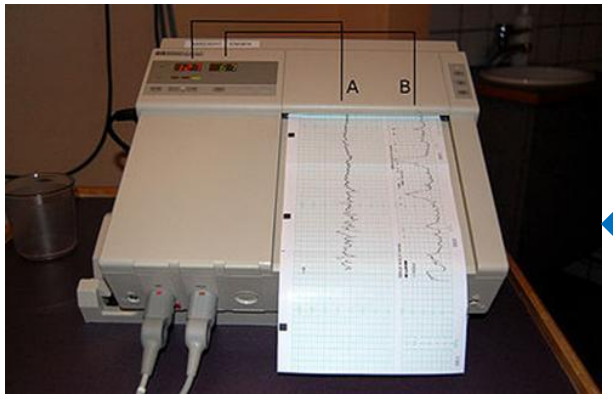
- To make accurate diagnoses in emergencies, smartphones are used to take videos transmitted in real time to consultants located at a central hospital who then can assess the situation.
- One such emergency is to estimate in real time the status of a fetus in utero through a cardiotocogram (CTG).
- However, it is used in medical care clinics only, and there are few reports attempting to send CTG data via a mobile network from home or from an ambulance to a medical institution.
- With the deployment of 5G this solution could be implemented. The solution will concomitantly transmit not only CTG but also real time fetus US videos as well with excellent results.

Expected outcome:

- Home monitoring as well as ambulatory monitoring of a fetus with the 5G system can be proved useful application, which could create a new future for obstetric care.

USE CASE 1 – HIGH LEVEL SOLUTION

At Home or in Ambulatory Van



CTG + Video

5G

5G IOT Gateway

HARMAN RCP

Microsoft Azure

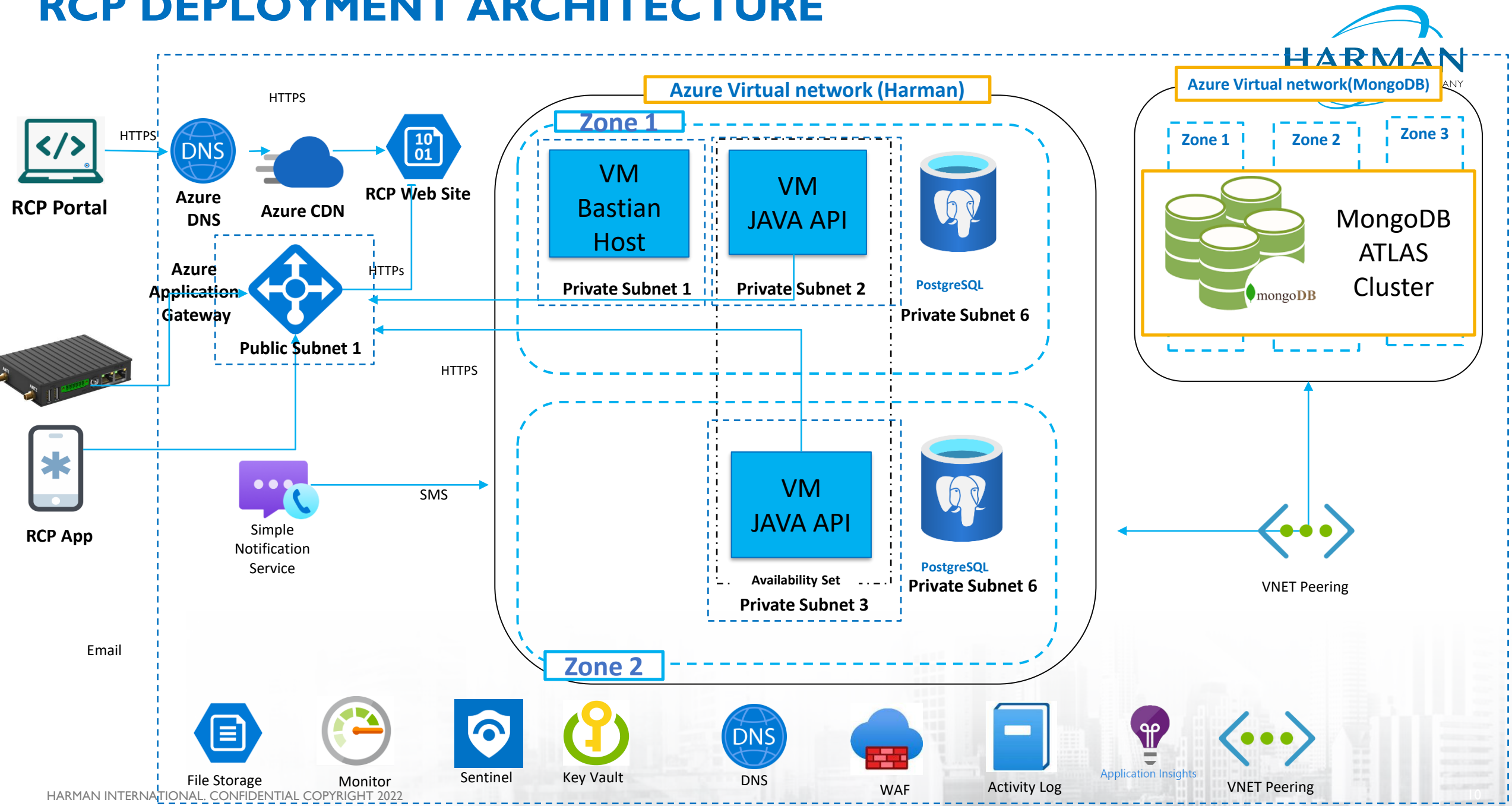
Cardiotocography (CTG)

Real-time monitoring

RCP App – Monitoring, Video calling

RCP Portal - Remote analysis - Basal frequency (predominating),Variability and short-term changes (accelerations and decelerations)

RCP DEPLOYMENT ARCHITECTURE



HARMAN DTS - INDUSTRIAL - IOT SOLUTIONS

INDUSTRIAL SOLUTIONS LANDSCAPE

Xperience

Operate

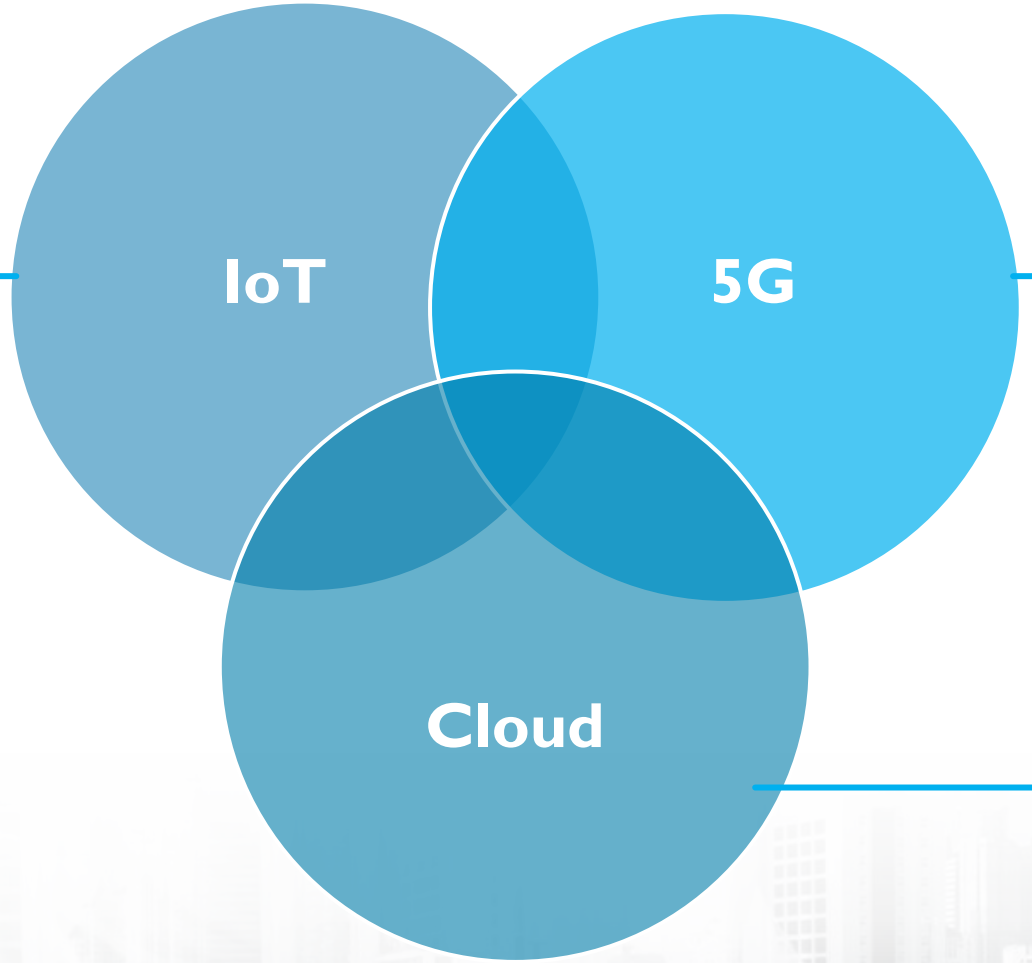
Manage

Capture

Sense

CONVERGING TECHNOLOGY STARTED

Strong growth but fragmented landscape



Technology evolution enabling new use cases

Intelligence is moving closer to edge

COMMON QS CAME ACROSS

Which IoT cloud?

How to integrate?
At cloud? At edge?

Communication performance

Without internet will it work?
Not easy to manage..

Complex to integrate..
Proprietary tech stack..

What to analyze?

This sounds interesting!!

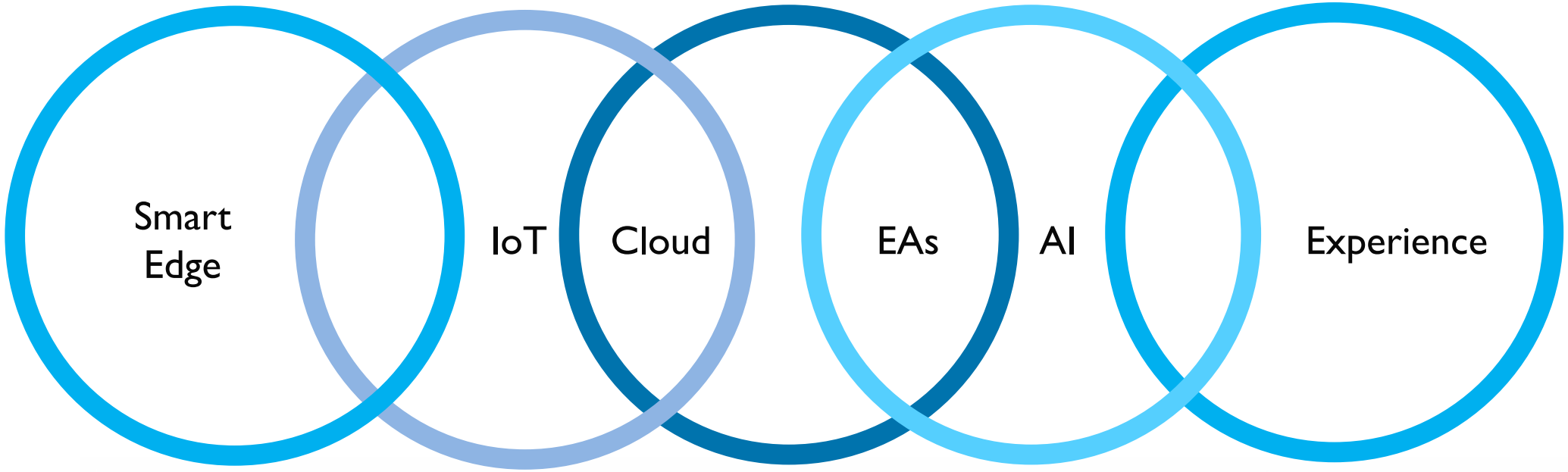
Is twin a reality?

This is something we need..

No smart assets.. Is it secured to connect?

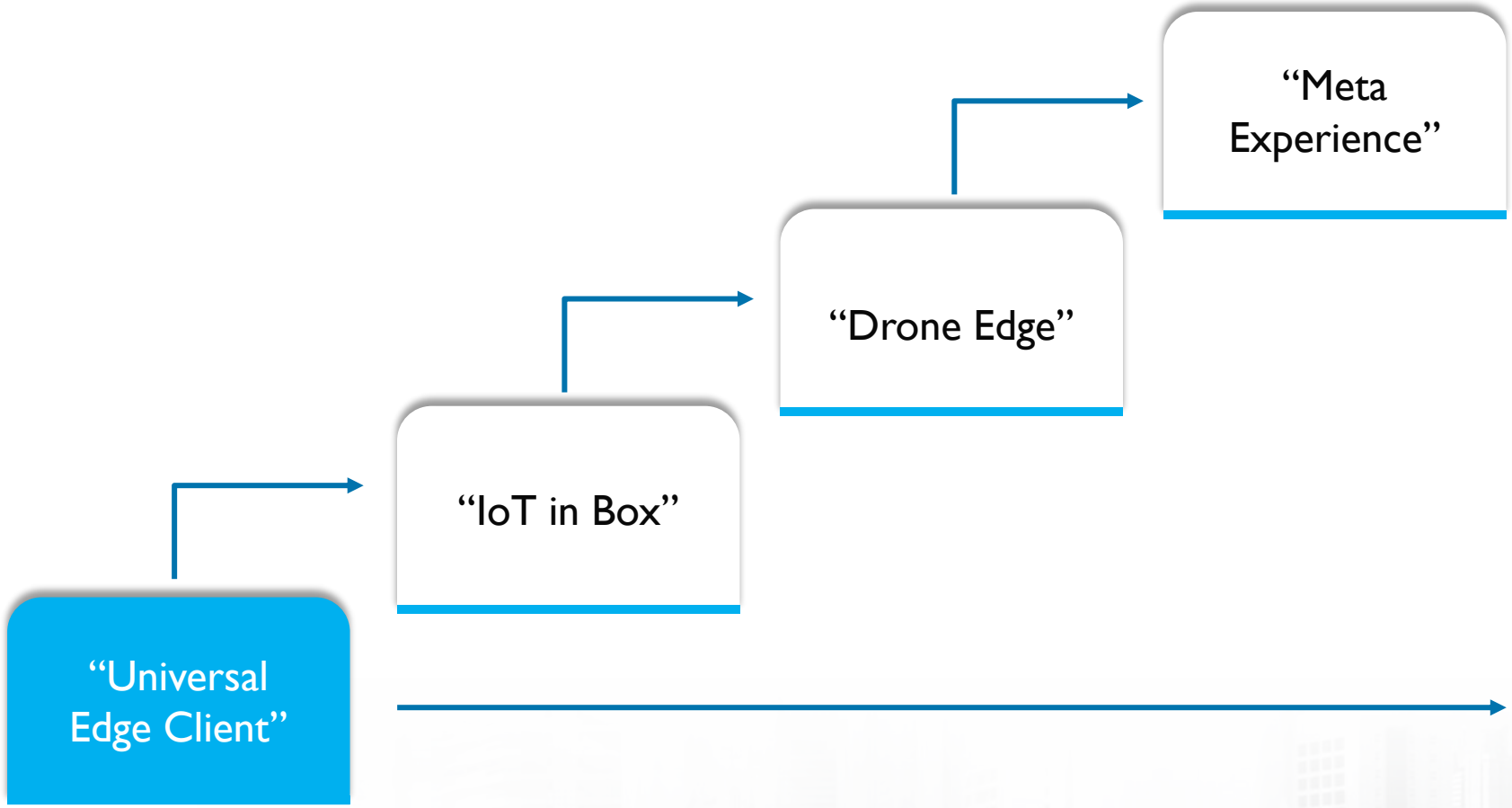
VALUE BASED CONVERGENCE

Disrupting value chains and enabling new business models



Disrupting value chains and enabling new business models

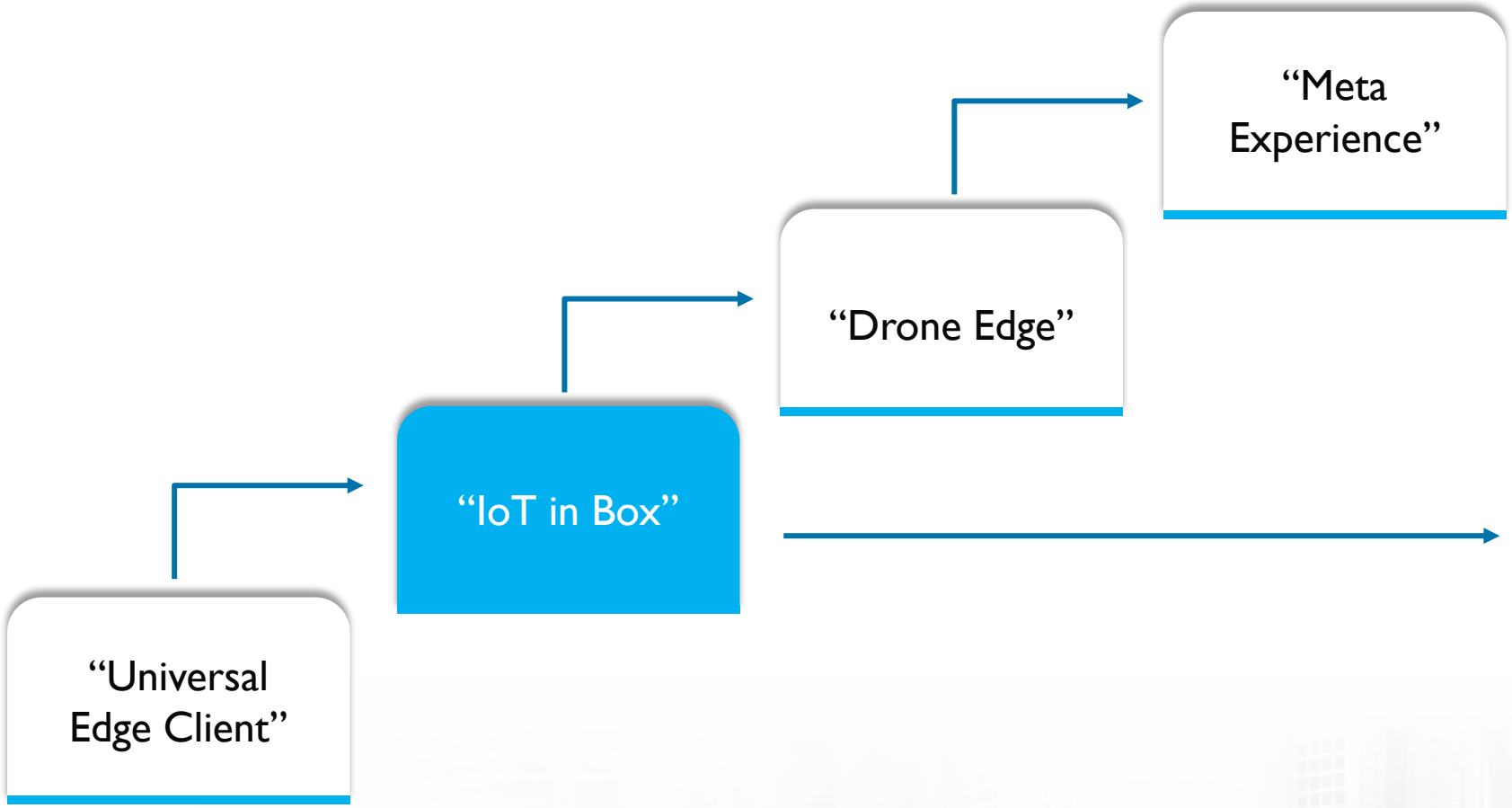
HARMAN OFFERINGS PLANS



- Built-in all industrial protocol clients (OPC/MODBUS/HART & many other)
- Master orchestrator client
- Connect with any cloud
- OS agnostic & containerized
- In built command manager & test automation harness
- Event based decision orchestration (edge analytics)

Let's create DO IT YOURSELF Offerings

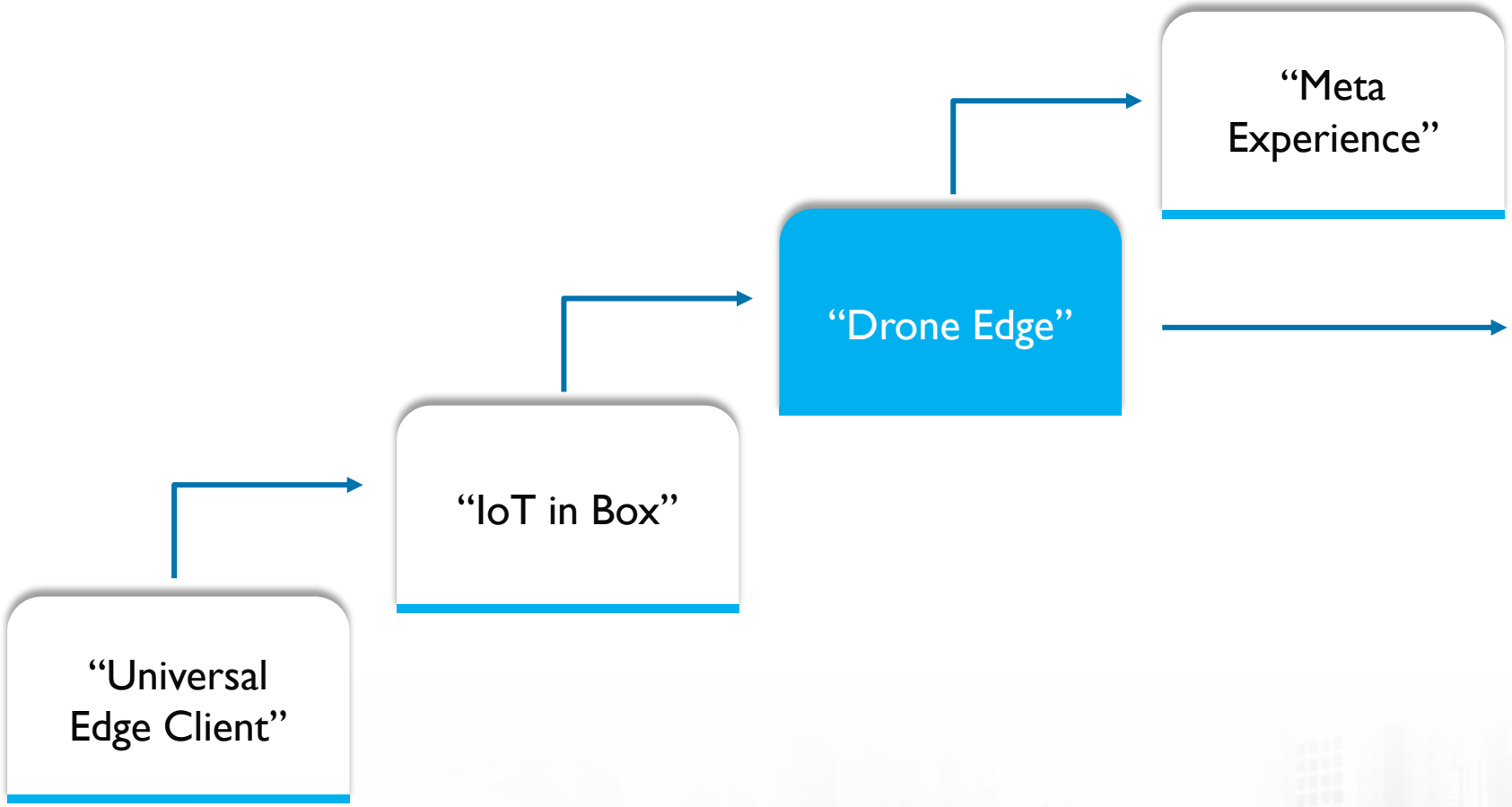
HARMAN OFFERINGS PLANS



- End to end GUI based IoT platform
- Create your own ontology & IoT templates
- Live IoT canvas
- Cloud agnostic
- Seamless extension to universal edge client

Let's create DO IT YOURSELF Offerings

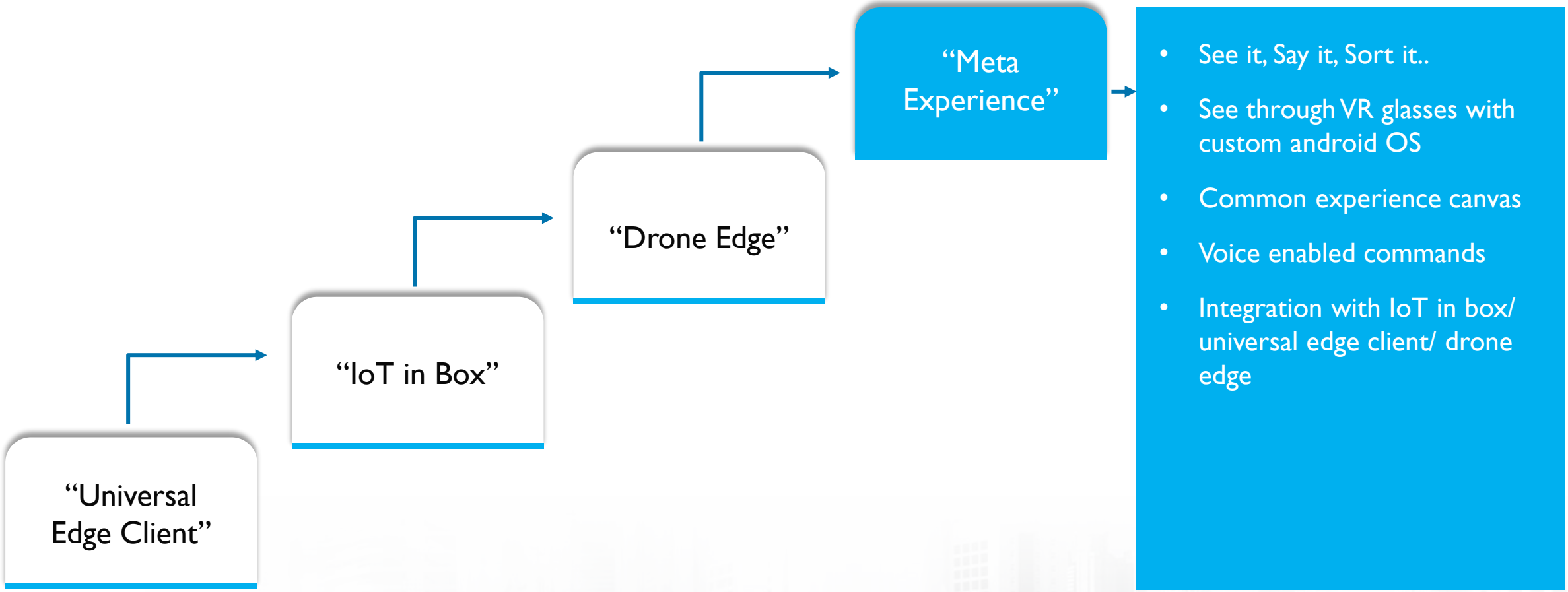
HARMAN OFFERINGS PLANS



- Advance version of universal edge client
- Give your own fly map (indoor/outdoor)
- Image & video capture & streaming
- Analog meters smart capture
- Handshake with universal edge client & cloud

Let's create DO IT YOURSELF Offerings

HARMAN OFFERINGS PLANS



Let's create DO IT YOURSELF Offerings

UNIVERSAL IOT EDGE CLIENT

Use Case : Universal Gateway App

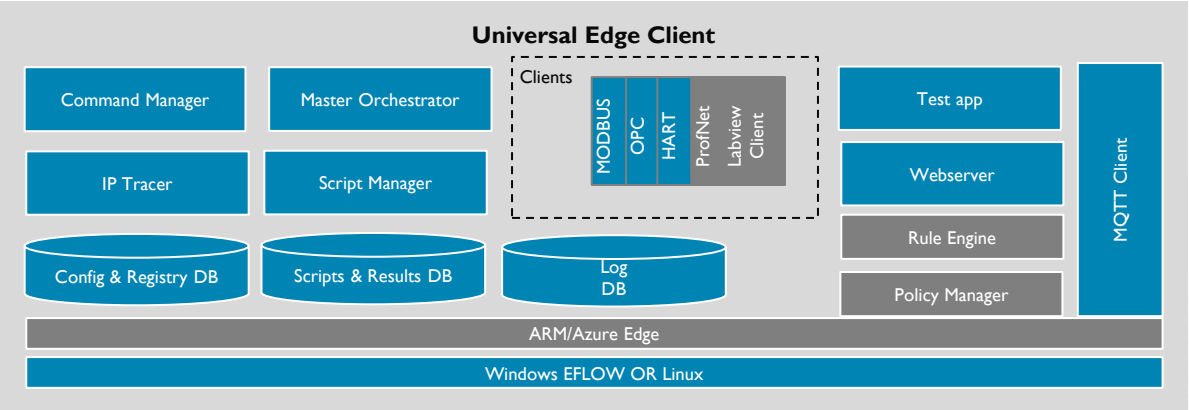
Problem Statement:

- In any IoT application, edge (gateway) needs to be integrated with different PLCs/Controllers to fetch the data or to give bi-directional commands by using different industrial communication protocols.
- Usually, every such edge application is a point solution but in Principle the characteristics of application remains same, however if edge application gets developed as point solution, it's not scalable and very difficult in terms of OTA updates, Edge analytics and other scalable asks.
- Industry expects Edge application by using Azure IoT edge to create **Universal Edge Client (EGC),** which would be configurable and scalable

Applicability :

All verticals including Industrial, Health care

Solution Visualization and Advantage 5G

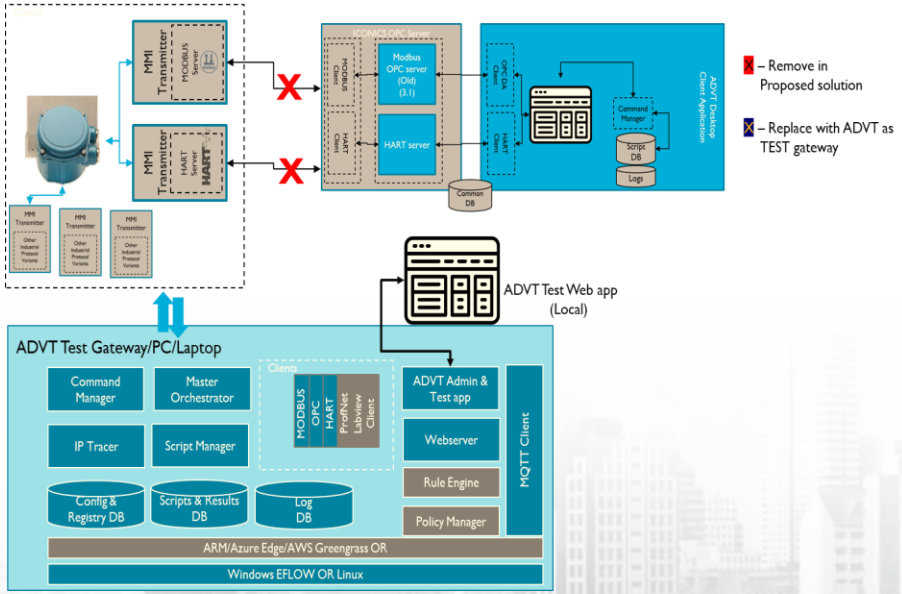


Time to develop and Investment required for MVP version: 4 months & 50 K USD

Benefits

- Container based architecture at Edge
- Auto search of OT assets
- Plug n Play integration with any PLCs/Controllers
- Due to 5G module, Edge analytics can talk to cloud to get updates
- Edge analytics in easy way
- No tech skills dependency
- Device Agnostic
- Industrial acceptance would be in easy manner or point solutions can be developed easily on top of base platform
- This can be treated as Hardware in Loop based IoT test harness

Partner : Emerson : Solution is proposed for Emerson requirements



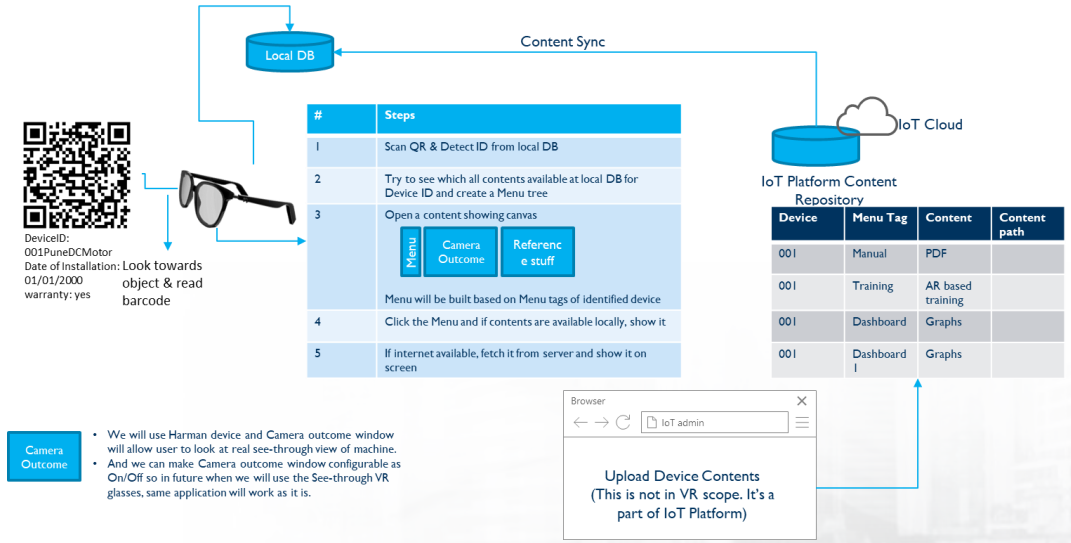
META EXPERIENCE (EYES OF IOT)

Use Case : Eyes of IoT

Problem Statement:

- In Engineering maintenance field, there is always a need of access to knowledge, guidance and historical data of machines to solve problems
- And there is always a challenge to carry this data in terms of paper documents or laptops due to size and internet problems.
- Industry expects VR based solution which can free the hands of support engineer and use the VR to render the contents in front of eyes
- It should work with or without internet

Applicability : All verticals including Industrial



Benefits

- Productivity of Site Engineer
- Local knowledge base on device itself
- With 5G, trained knowledge can continuously be sourced to VR glasses
- Handsfree support

- Probable partner: Schlumberger
- Time to develop and Investment required for MVP version:
  Hardware development : 4 months (We already have)
- Software Development (MVP) : 6 months & 110 K USD

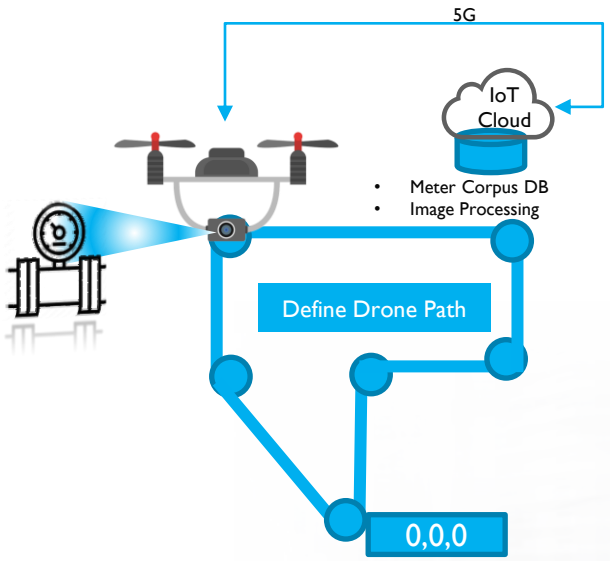
DRONE EDGE

Use Case : Drone Edge

Problem Statement:

- In many of the industries, Visual observations are very critical such as Analog Meter readings, Leakage observations, Safety measures and many other such cases where applying human based solution is practically not possible but can not be 100% automated as well so it requires Eyes of Iot kind
of solution

Applicability : All verticals including Industrial



Benefits

- Productivity of Site Engineer
- Local knowledge base on device itself
- With 5G, trained knowledge can continuously be sourced to VR glasses
- Handsfree support

- Probable partner: Schlumberger
- Time to develop and Investment required for MVP version:
Hardware development: Custom drone with UEC (Universal edge client)
- Software Development (MVP) :
4 months & 80 K USD
- This solution is scalability of Universal Edge client