EDGEXFOUNDRY™

ReCAP
of

EdgeX Challenge China 2021

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Agenda

- Collaborators
- Event / Teams
- Judge Stats
- Team Examples
- Winners 1st place Summary / Application Overviews
- Conclusion

EdgeX Challenge China 2021 Event Collaborators

- Host: Linux Foundation (LF) Edge, EdgeX Community, government bodies in Shanghai & Beijing

- Collaborators / Sponsors: Alibaba Cloud, Baidu Cloud, EMQ, Intel, InnoSpace, IOTech, ThunderSoft, Ubuntu, VMWare, ZiZhu ET Incubator, …

Event and Teams

- The whole challenge event was kicked off in July, ended with awarding ceremony in November.

- Two tracks: Commercial track and Industrial track

    - Commercial track: **25** teams in the first stage, comes down to 12 teams in the final stage

    - Industrial track: **30** teams in the first stage, comes down to 14 teams in the final stage

- This teams are split into three difference places and simultaneously taken places in 3 tier-1 cities(Beijing, Shanghai, and Shenzhen) in PRC, 60% developer population in the country.

80 Teams
55 Proposals
26 POCs
15 Winners

5 verticals

Industrial Healthcare
Retail Logistics Smart City

Commercial Track - Examples

Supermarket AI intelligent management	Sports rehabilitation AI detection	Smart Community Total Solutions	Covid medicine screening via image recognition	Yangtze River water conservancy AI management
Patronizable Ads display kiosk	Fire detection and prevention	Mobile medical device vehicles detection and tracking	Smart medical care bed	Fatigue driving detection system

Industrial Track - Examples

Unmanned factory monitoring	Building automation and smart park	Thingsboard traffic light control	Smart water AI management	Data acquisition and analysis for smart campus	Smart building and smart community	Industrial manufacturing scene, to achieve unattended site operations and monitoring
Preventive op-maintenance of the automotive production workshop	IDC room air conditioning energy saving and emission reduction	Logistics 5G Auto-Guided Vehicles	5G industrial navigation AGV	Fire detection based on CV using temperature and humidity sensors	Smart AI garbage sorting and collecting	Unattended AI weighing

Commercial Track Winner 1st place

凡米智能超级战队 (Shanghai): Smart Community Total Solutions

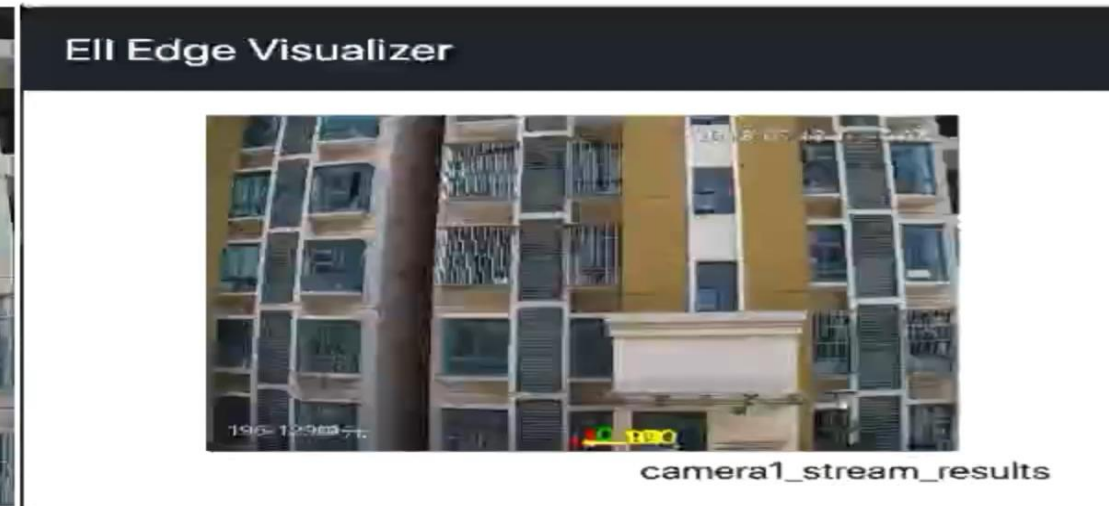3 scenarios they provide:

• Detection and tracking of object throwing from upper room of the community

• Detection and tracking of garbage littering by a person of the community

• Detection of unsafe vehicles into elevator in the community

1. Demo Video for monitoring and detecting throwing garbage from upper high room

高空抛物监控原视频

经过EII处理后web端呈现视频

Courtesy of applicant's presentation materials

2. Detection of garbage littering / stacking by a person

When a resident of community throws garbage outside the prescribed time or does not put the garbage in the prescribed area, the application service's camera will catch the face, and then confirm that there is no resident in the neighborhood.

Subsequently, the purpose of restricting residents' behavior can be achieved by locking the door or giving a verbal warning.

Courtesy of applicant's presentation materials

**3. Detection of unsafe vehicles in the elevator**

When the camera device detects some pre-defined unsafe vehicles such as electric vehicles entering the elevator, the model can recognize that there are unsafe vehicles in the elevator, and then can control the elevator to stop running.

Courtesy of applicant's presentation materials

Smart Community Total Solutions: Architecture Diagram
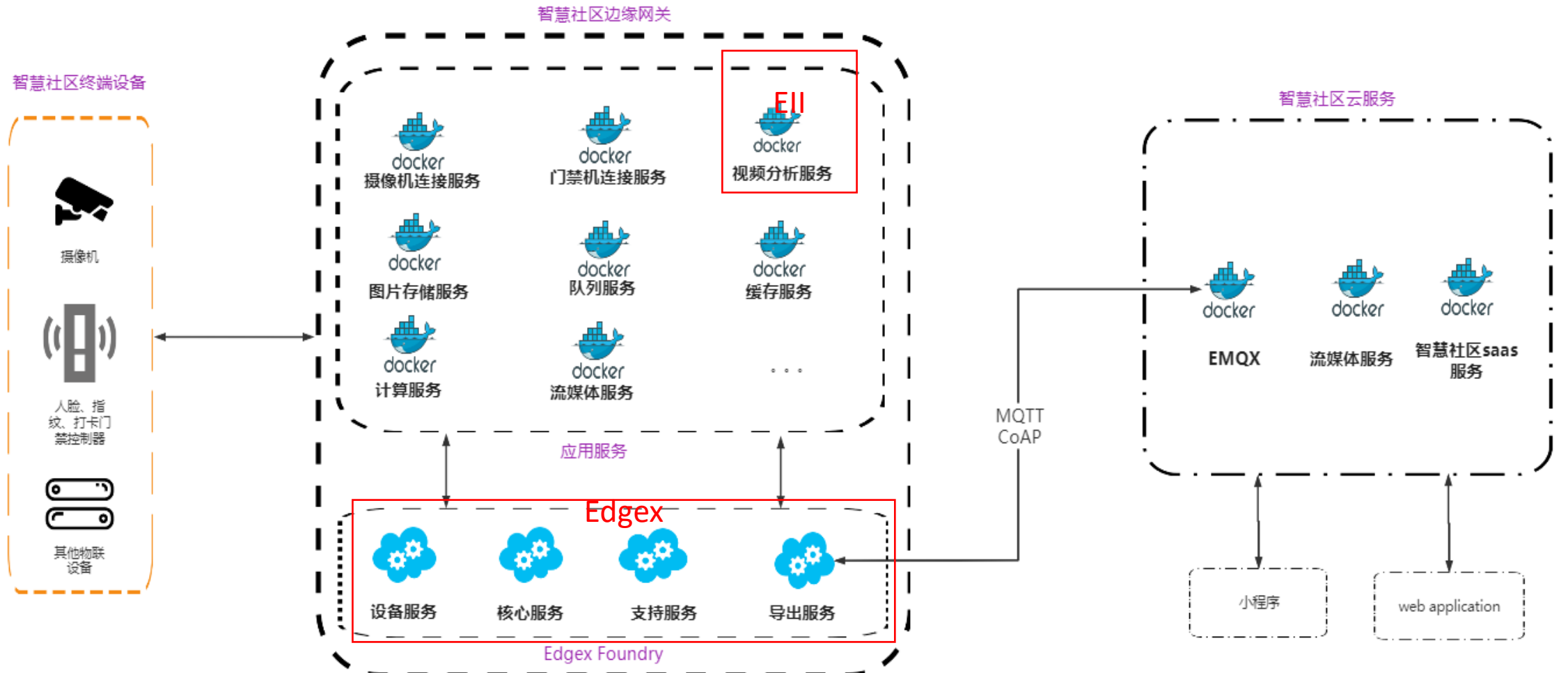
Industrial Track Winner 1st place

- **Keep A+X战队 (Beijing): Smart Water AI Management**
- **中兴通讯AGV产品团队 (Beijing): 5G industrial navigation AGV**

Co-winner 1st place for both and main objectives:

- Smart water AI management system is trying to address the problems of manually operations of industrial water pumps for the existing industrial drainage system

- 5G industrial nav. AGV demonstrates the capabilities of AIoT applied in autonomous guided vehicle via integration of EdgeX framework and their fog / cloud systems.
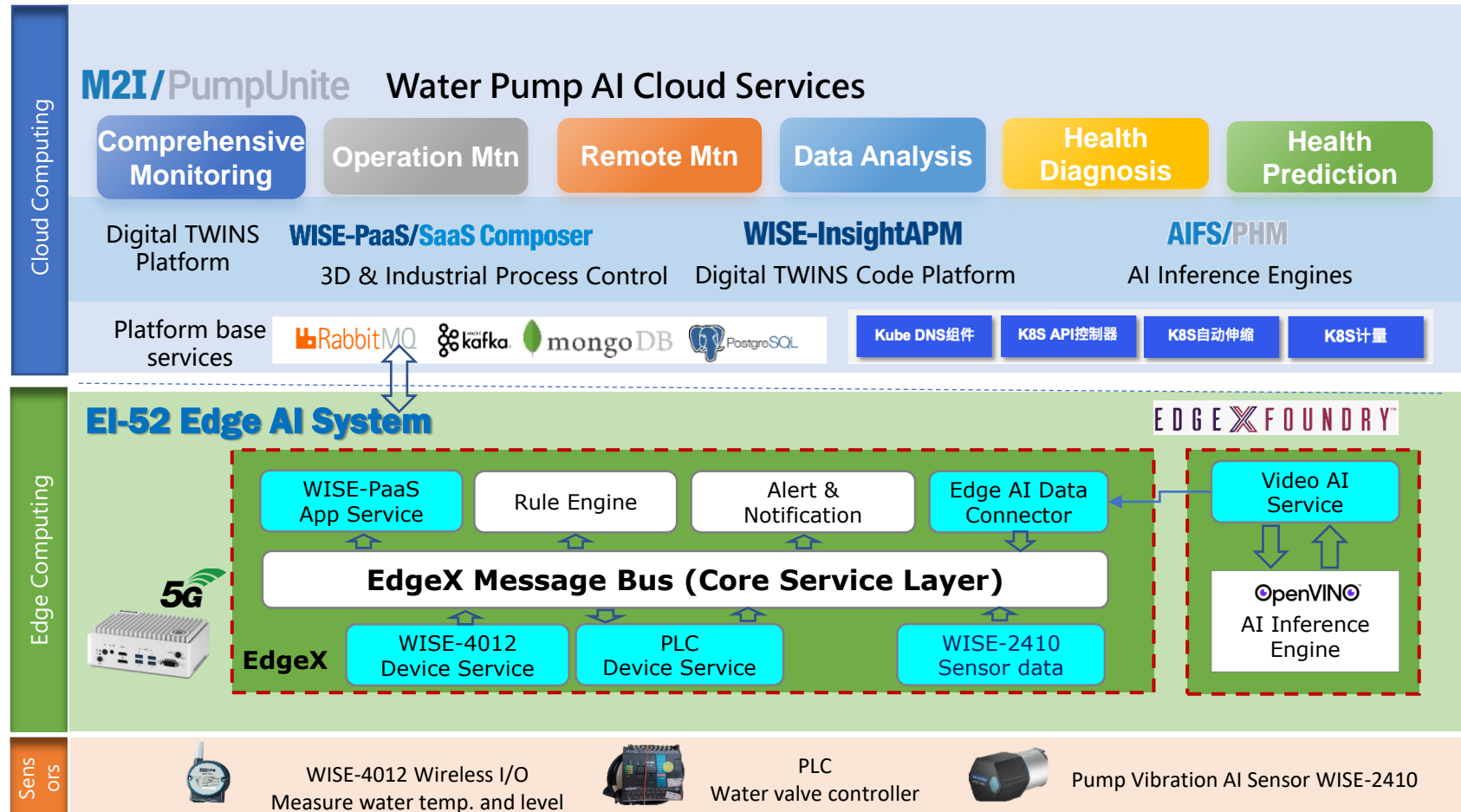
Smart Water AI Management

Objectives of Water pump AIoT solutions
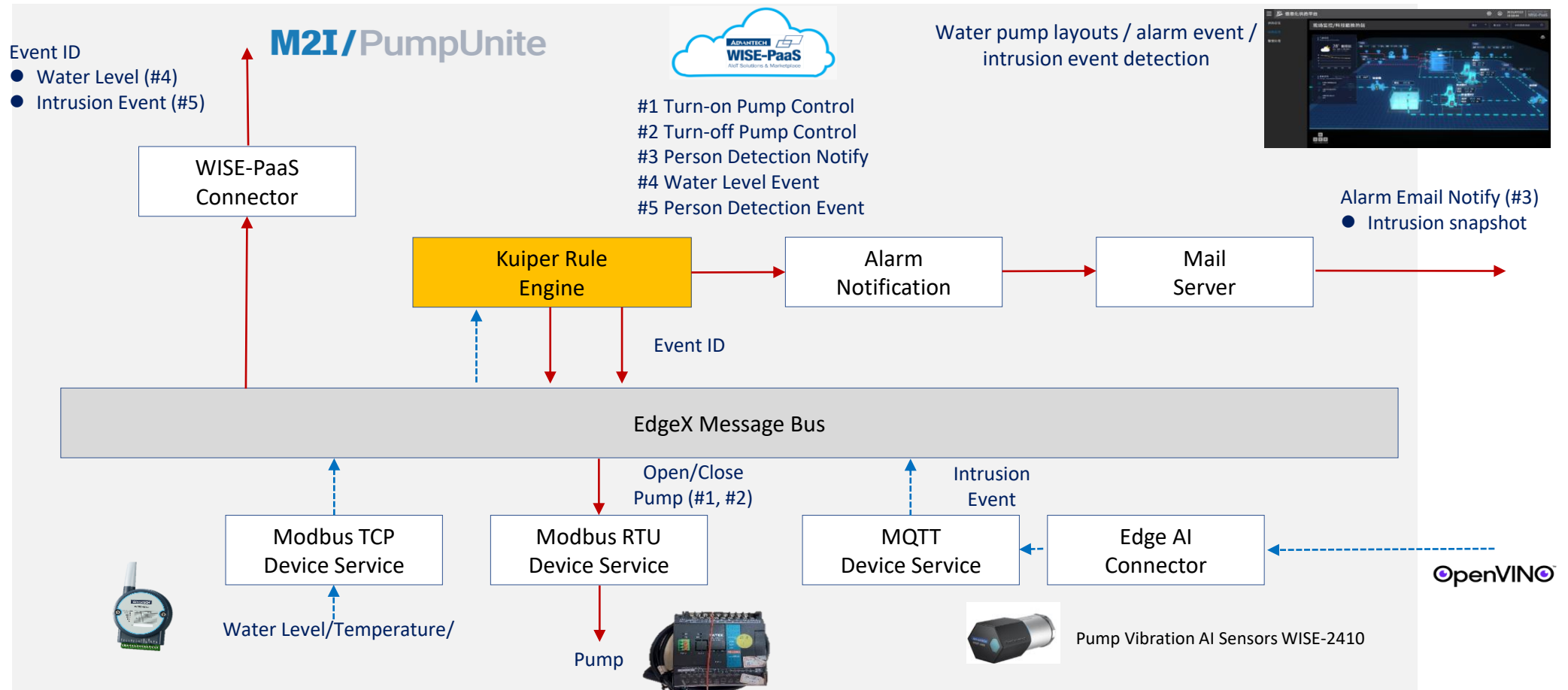

EI-52 & M2I/Pump Unite

- Water pump health monitoring
- Water pump health prediction
- Safety guard of water pump status areas
- Intrusion detection and notification
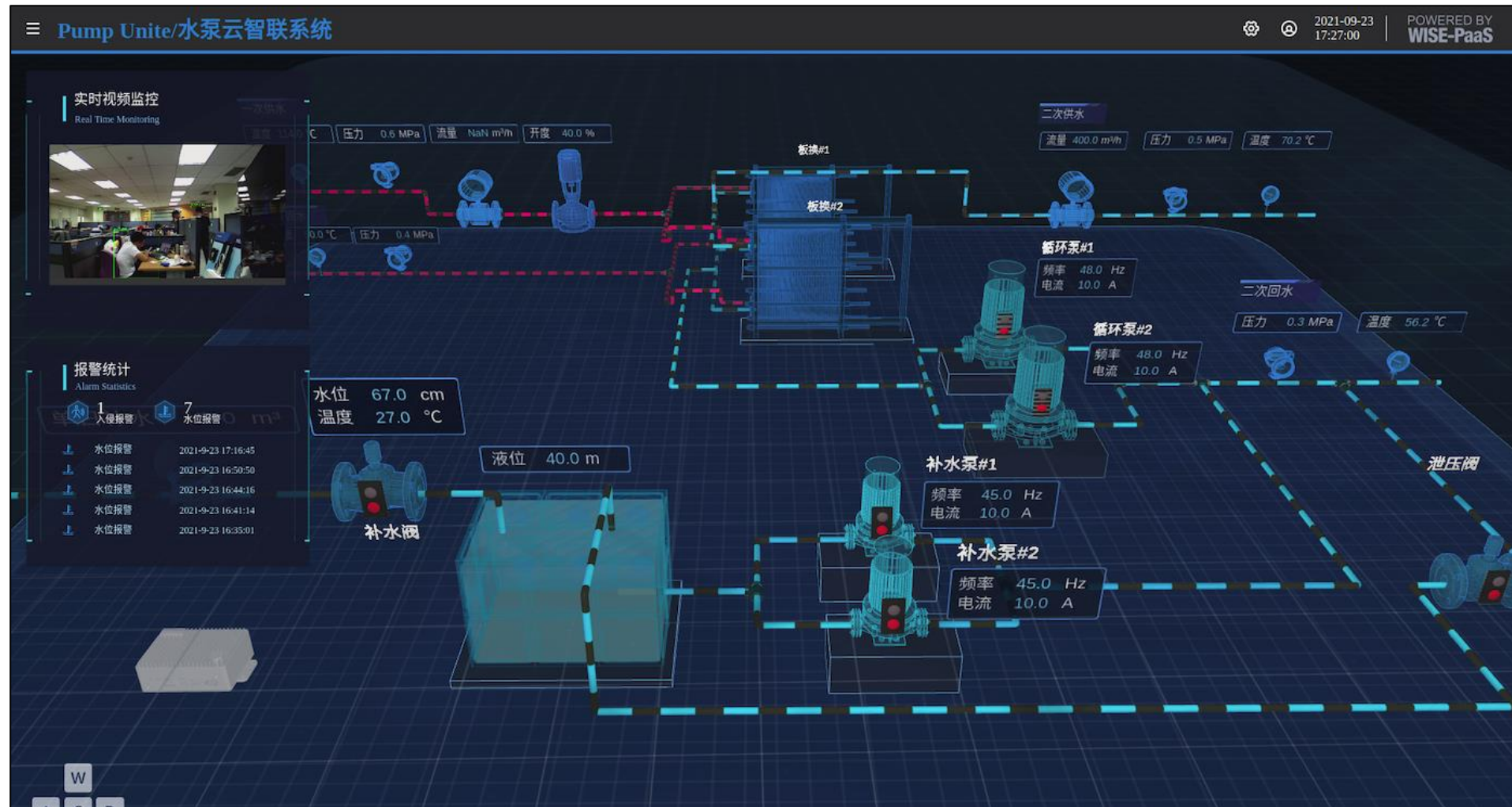
Smart Water AI Management: Architecture Diagram

EDGE X FOUNDRY™

Cloud Computing

M2I/PumpUnite Water Pump AI Cloud Services

| Comprehensive Monitoring | Operation Mtn | Remote Mtn | Data Analysis | Health Diagnosis | Health Prediction |

Digital TWINS Platform

WISE-PaaS/SaaS Composer
3D & Industrial Process Control

WISE-InsightAPM
Digital TWINS Code Platform

AIFS/PHM
AI Inference Engines

Platform base services

RabbitMQ kafka mongoDB PostgreSQL

| Kube DNS组件 | K8S API控制器 | K8S自动伸缩 | K8S计量 |

Edge Computing

EI-52 Edge AI System

EDGE X FOUNDRY™

5G

| WISE-PaaS App Service | Rule Engine | Alert & Notification | Edge AI Data Connector | | Video AI Service |

EdgeX Message Bus (Core Service Layer)

EdgeX

| WISE-4012 Device Service | PLC Device Service | WISE-2410 Sensor data |

OpenVINO™
AI Inference Engine

Sensors

WISE-4012 Wireless I/O
Measure water temp. and level

PLC
Water valve controller

Pump Vibration AI Sensor WISE-2410

Courtesy of applicant's presentation materials

Edge Computing Services – Health Analysis + Intrusion Detection / Notification

M2I/PumpUnite

WISE-PaaS

Water pump layouts / alarm event / intrusion event detection

Event ID
- Water Level (#4)
- Intrusion Event (#5)

#1 Turn-on Pump Control
#2 Turn-off Pump Control
#3 Person Detection Notify
#4 Water Level Event
#5 Person Detection Event

Alarm Email Notify (#3)
- Intrusion snapshot

| WISE-PaaS Connector |

| Kuiper Rule Engine | → | Alarm Notification | → | Mail Server |

Event ID

| EdgeX Message Bus |

Open/Close Pump (#1, #2)

Intrusion Event

| Modbus TCP Device Service | | Modbus RTU Device Service | | MQTT Device Service | | Edge AI Connector |

Water Level/Temperature/

Pump

OpenVINO

Pump Vibration AI Sensors WISE-2410

*Courtesy of applicant's presentation materials

Smart Water AI Management: Cloud AI System / Layout GUI
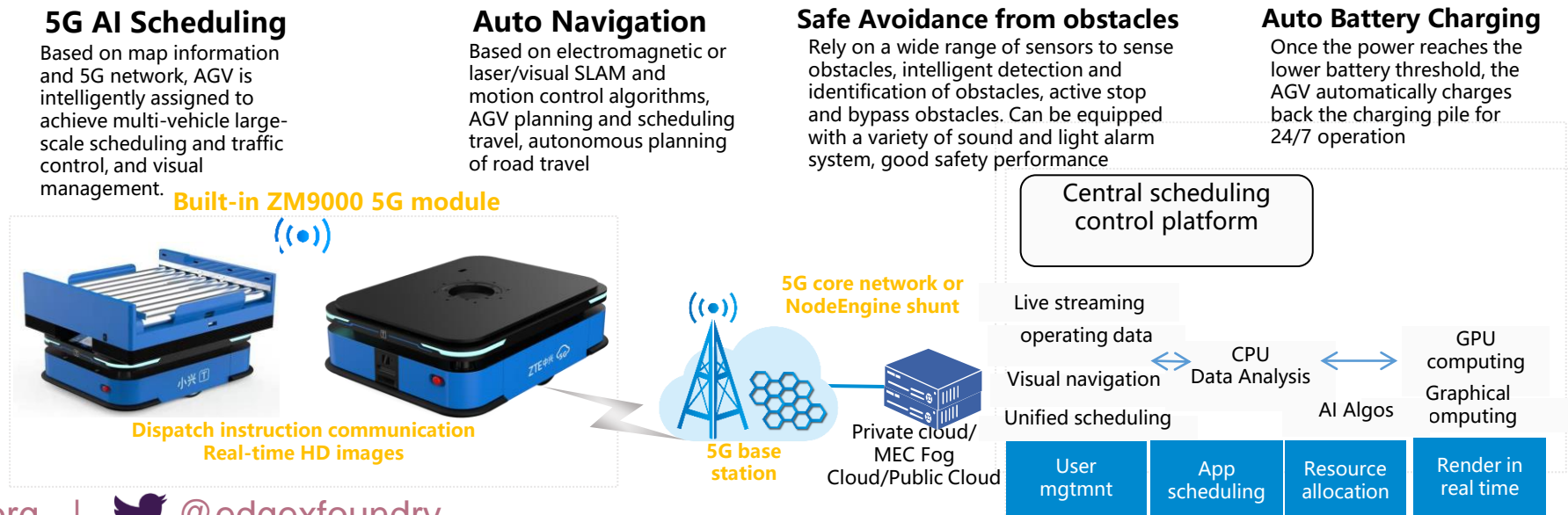
Courtesy of applicant's presentation materials

Smart Water AI Management: Cloud AI System / Health Prediction

- **Big data analysis on cloud computing to give health diagnosis and prediction**
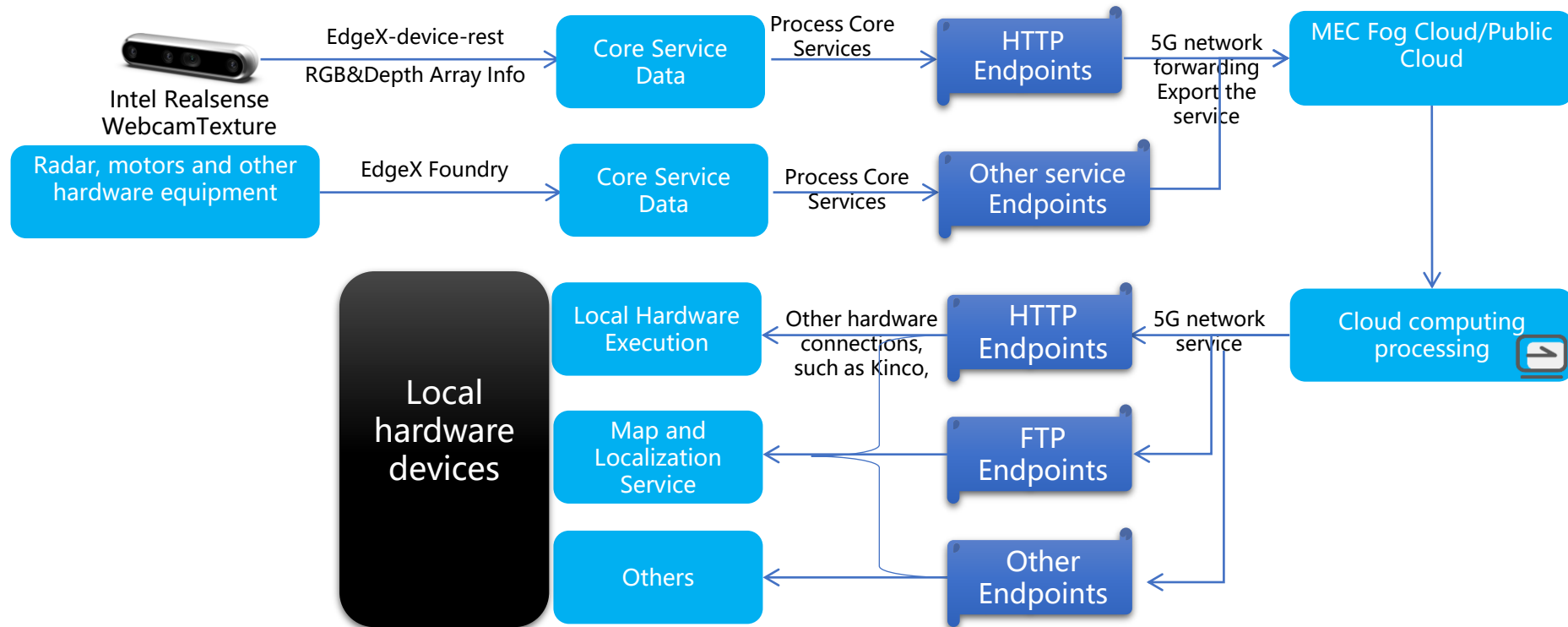
Courtesy of applicant's presentation materials

5G Industrial Navigation AGV Overviews

- Integrated 5G modules in robots
- Use of autonomous navigation technology, to achieve autonomous barrier-avoidance function to save the cost of site deployment.
- Robot scheduling platform: MES system, 3rd party manufacturing systems can be connected to the unmanned handling of production materials, saving labor costs for industrial manufacturing customers, and improving cargo turnovers

5G AI Scheduling
Based on map information and 5G network, AGV is intelligently assigned to achieve multi-vehicle large-scale scheduling and traffic control, and visual management.

Auto Navigation
Based on electromagnetic or laser/visual SLAM and motion control algorithms, AGV planning and scheduling travel, autonomous planning of road travel

Safe Avoidance from obstacles
Rely on a wide range of sensors to sense obstacles, intelligent detection and identification of obstacles, active stop and bypass obstacles. Can be equipped with a variety of sound and light alarm system, good safety performance

Auto Battery Charging
Once the power reaches the lower battery threshold, the AGV automatically charges back the charging pile for 24/7 operation

Built-in ZM9000 5G module

**Dispatch instruction communication
Real-time HD images**

**5G core network or
NodeEngine shunt**

5G base station

Private cloud/
MEC Fog
Cloud/Public Cloud

Central scheduling control platform

Live streaming
operating data

Visual navigation

Unified scheduling

CPU
Data Analysis

AI Algos

GPU computing

Graphical omputing

| User mgtmnt | App scheduling | Resource allocation | Render in real time |

Courtesy of applicant's presentation materials

5G Industrial Navigation AGV Architecture

EdgeX application ideas and practices

Intel Realsense WebcamTexture

EdgeX-device-rest

RGB&Depth Array Info

Radar, motors and other hardware equipment

EdgeX Foundry

Core Service Data

Core Service Data

Process Core Services

Process Core Services

HTTP Endpoints

Other service Endpoints

5G network forwarding Export the service

MEC Fog Cloud/Public Cloud

Cloud computing processing

Local hardware devices

Local Hardware Execution

Map and Localization Service

Others

Other hardware connections, such as Kinco,

HTTP Endpoints

FTP Endpoints

Other Endpoints

5G network service

Courtesy of applicant's presentation materials

5G Industrial Navigation AGV EdgeX Integration Demo Snapshot

Courtesy of applicant's presentation materials

Conclusion: Key Takeaways

- AI and 5G are definitely gaining very popular ground and usage for the edge side, hence AIoT applications growing fast and vast booming in China's market/industry

- Lots of applications from this time have highly integration software stacks between Cloud and Edge as "Hybrid" architecture, making business model broader in that aspect.

- Quite a few teams to utilize the EdgeX's framework to give export data to clouds and device command control for devices and notification services

Thank You!