



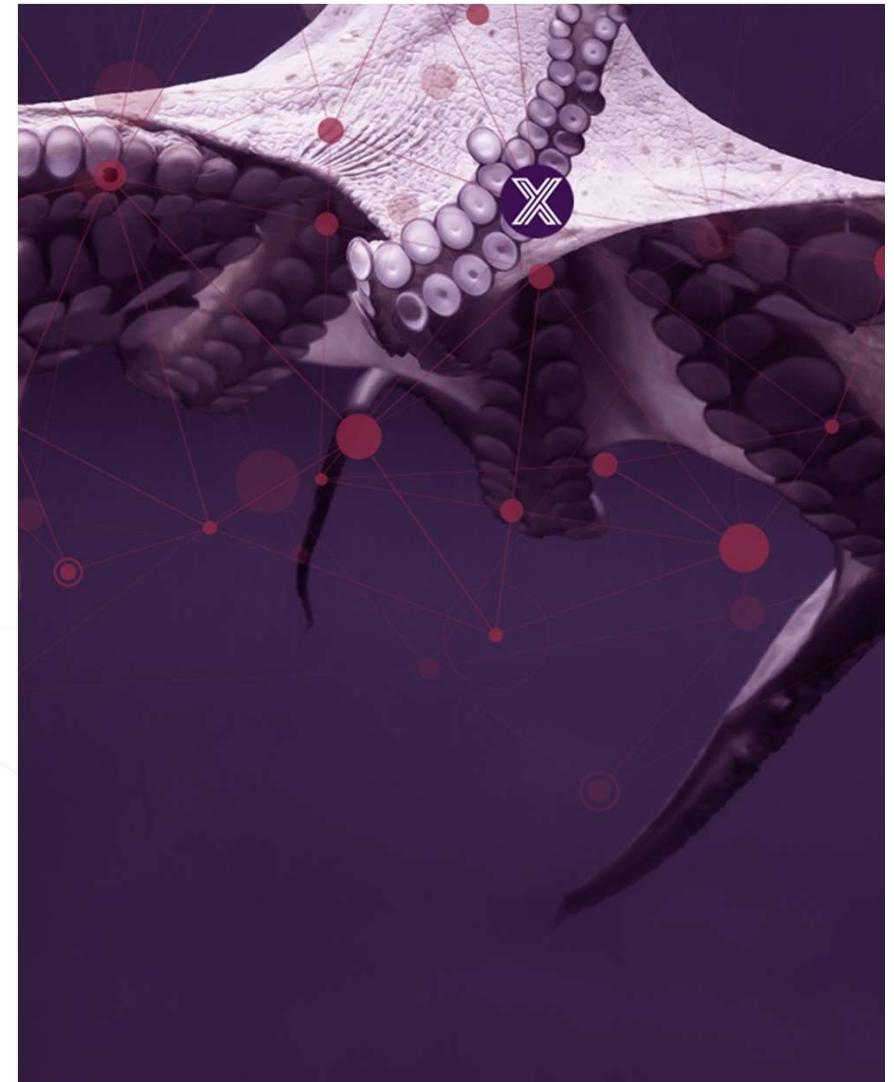
Vertical Solutions Working Group

July 14, 2020

Co-chairs:

Camilo Dennis (Intel) – camilo.a.dennis@intel.com

Henry Lau (HP) – henry.lau@hp.com



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Agenda

ThunderSoft, a product and solutions provider based in Beijing China, to present their IoT efforts and platform including their use of EdgeX.

Meeting recording & slides to be posted to:

<https://wiki.edgexfoundry.org/display/FA/Vertical+Solutions+Working+Group>

ThunderSoft in Edge Computing

2020.7

Content

- ❖ ThunderSoft Overview
- ❖ ThunderSoft & EdgeX
- ❖ Edge Computing Verticals

ThunderSoft Overview

ThunderSoft Overview



7/1

Company Profile

- Smart System Tech. Provider
- Founded in 2008
- IPO in 2015
- 6300+ Employees
- 90% Engineers
- Serves 1000+ Global Customers
- 20+ Cities Worldwide



Core Business

- Smart Business Units
 - Smart Mobile
 - Smart IoT
 - Smart Automotive
 - Smart Vision & AI
- Full System Coverage
 - Device – OS, Camera, Security, AI, Connectivity, Audio, Graphics...
 - Edge – Microservices, Docker...
 - Cloud – FOTA, MDM, MAM ...



Tech & Products

- Vision** Tuning, ISP, Camera Stack Customization, Algorithm, Depth Camera, Multi-camera, HDR ...
- SoM** TurboX 895, TurboX 625, TurboX 410, TurboX 9206, AI Kit, IP Camera
- AI** Model Design, Algorithm Optimization, Data Training, Data Labeling, Benchmarking
- Security** TEE, Authentication, Encryption, System Hardening, FOTA, Device Management,

Global Presence

- Business Cooperation
- Technology Collaboration
- Global Tech. Centers

U.S.	Korea	Japan	India
Malaysia			
Finland	Bulgaria		

Where are we from?

Smart System Service & Technology Provider



中科創達



Global Carrier



AI & Vision

Smart IoT



Smart Vehicle

Smart System



2008	2009	2010	2011	2013	2014	2015	2016	2017	2018
founded	Japan branch	Qualcomm Smartbook	Qualcomm Joint Lab	Intel/MS Joint Lab	JV with Intel	JV with ARM	JV with Qualcomm	TurboX SoM & OS	Iot Scaling AI Dev Kit



Smart Phone Business Overview



Global Customers

- OEM, ODM, Carriers, Internet Vendors, Startups
- Serves customers worldwide
- Flexible business and development model



One Stop Services

- Joint Lab with Qualcomm
- System Bring-up, Customization, Upgrading, Tuning & Optimization
- Kernel/Driver/FW/App/Cloud Development, System Validation



Turn-key Solutions

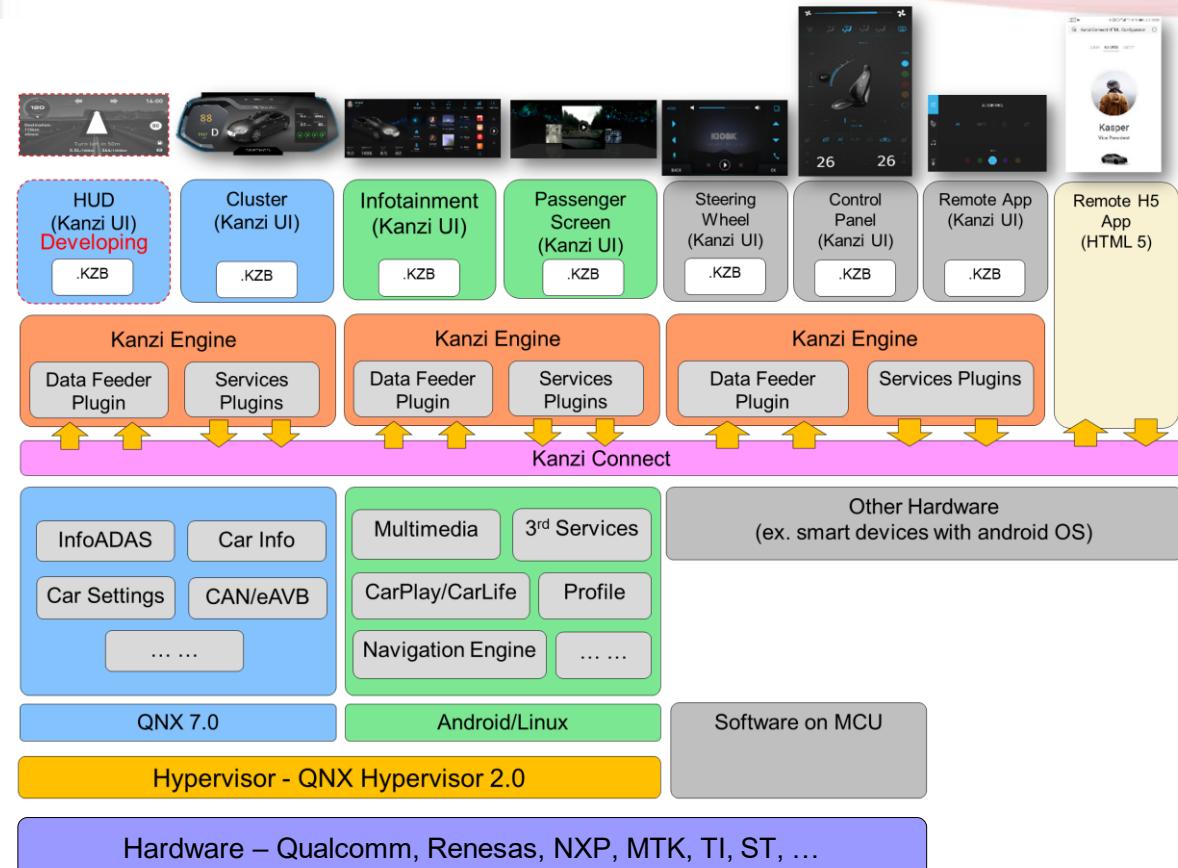
- 1st Tablet & QRD for Qualcomm
- Solution Smartphone, Tablet, Feature Phone
- Turn-key Solution for Camera, Security, Carrier Certification, Auto Test Tools



Differentiation Technology

- Dual-screen Phone, Secure Phone, Industrial Tablet, Module Phone...
- Optimization, Algorithms, Security, Linux OS, Multi-camera

Smart Automotive Overview



车厂



Tier-1



芯片



合作伙伴



Smart IoT Business Overview



TurboX 835



TurboX 845



TurboX 801



TurboX 821



TurboX 410



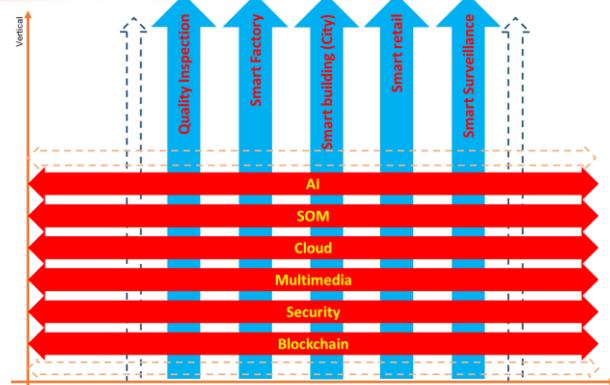
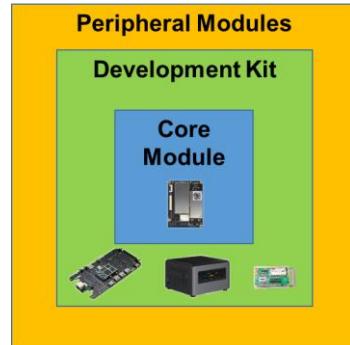
TurboX 625



TurboX 9206



TurboX 210



IMMEREX

FLEXTRONICS

HISCENE

ANTVR

暴风魔镜

SENS 凌感



Polycom

Honeywell

SK telecom

Panasonic

MAGIC VISION

Ssolaborate

PERFANT

Magik Vision

360 FLY

microp



iRobot

Horizon Robotics

三个爸爸

ALPHA

SISUN 新松

JuneYao 均瑶

microp



零零无限

MOLA

ProDrone

UBSAN

Brisk

瞬动科技



ALCATEL onetouch

TCL

BLOCKS

Haier

ThunderSoft & EdgeX

Edge Product & Technology Overview

Edge Product & Solution



Solution



Semtech and Ubiquiti Light Up the Streets with LoRa

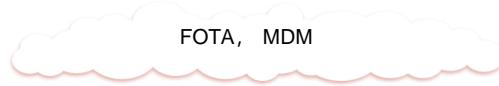


Face Recognition



Smart Automobile

Edge Technology



FOTA, MDM



Device



Smart Industry

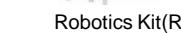


Smart City



Smart Retail

Cloud



SOM

Device



Smart Automobile

AI on Device

Face Detection, Face Recognition, Motion Detection.....

Middleware

Device Virtualization , Microservices, Edge Streaming Framework

OS



Global Customers

Edge Box Product



Carrier

Cloud

Device

Integrator

Device

E2E Solution



Smart Home



Distribution Station



Distribution Station

Cambricon oppo

Street Light

Smart Home

Ecosystem

Edge Ecosystem With Cloud Vendor



阿里云



Microsoft Azure



aws



百度智能云

Edge Ecosystem With Open Source Organization

EDGE X FOUNDRY™



AI/Edge Kit



TurboX AI Kit



AI Algorithms

Azure IoT 认证设备目录

浏览设备

认证设备和初学者套件

TurboX

成为合作伙伴 了解详细信息

2 找到的结果 用于 "TurboX"

- ▶ IoT Plug and Play
- ▶ Microsoft Azure IoT 初学者套件
- ▶ Azure IoT Edge
- ▶ 芯片制造商
- ▶ 云协议
- ▶ 流媒体

Thundercomm TurboX AI KIT
By: Thunder Software Technology Co., Ltd.

TurboX Edge Kit
By: Thunder Software Technology Co., Ltd.



AI Devices



Cloud Ready



OS Support



Powerful On-device AI Performance



Full Camera Stack



Rich AI Tools



AI Solutions

Ready to enter your project?

PULL REQUESTS

Flock Early Warning System lab308

Multimedia system with artificial intelligence lab308

WORK IN PROGRESS 全景拍照 mist prince

WORK IN PROGRESS 基于轻量化网络的人体检测 TSILAB

基于AI的R-CNN Head Detection TSILAB

智能家庭助手机器人 TSILAB

模拟面试 Stay TSILAB

相机测试 Stay TSILAB

AI Powered Bionic Arm Manan Thanuja

PROTIP! AI env-Protector: Spots, Pollution, and Reports visibility 3 members

语音识别的护士 - 使用“青春守护卫士”来更好的护理病人 青春守护的护士

WORK IN PROGRESS ADDRESS Safer Homes and Offices Through Facial Recognition Team Q965

AI Based Safety Detection Using Deep Learning Algorithm By: programer_11 27 271

公共交通人脸识别系统 城市 26

Object Count Application 四海 36

WORK IN PROGRESS The Most Precise Elevator Scheduling Strategy Based on AI Deep Learning 1 82

Super Commando Sucam Heman Jeevan Meiyappan and Rathneesh Krishnan 31

Using machine learning algorithm to help indoor laundry machines租房 smart city monitoring system serviente 33

AI Powered Cold Wallet for Digital Assets ggsonic 70

WORK IN PROGRESS ThunderSoft AI KIT 134

AI Community

TurboX Edge Platform based on EdgeX

Key Features:

Cross Platform

Support Android, Linux.

Microservices

Based on containerized technology to be more manageable, extensible, and portable.

Real-time Processing

Optimization for multi-camera real-time video processing.

Security

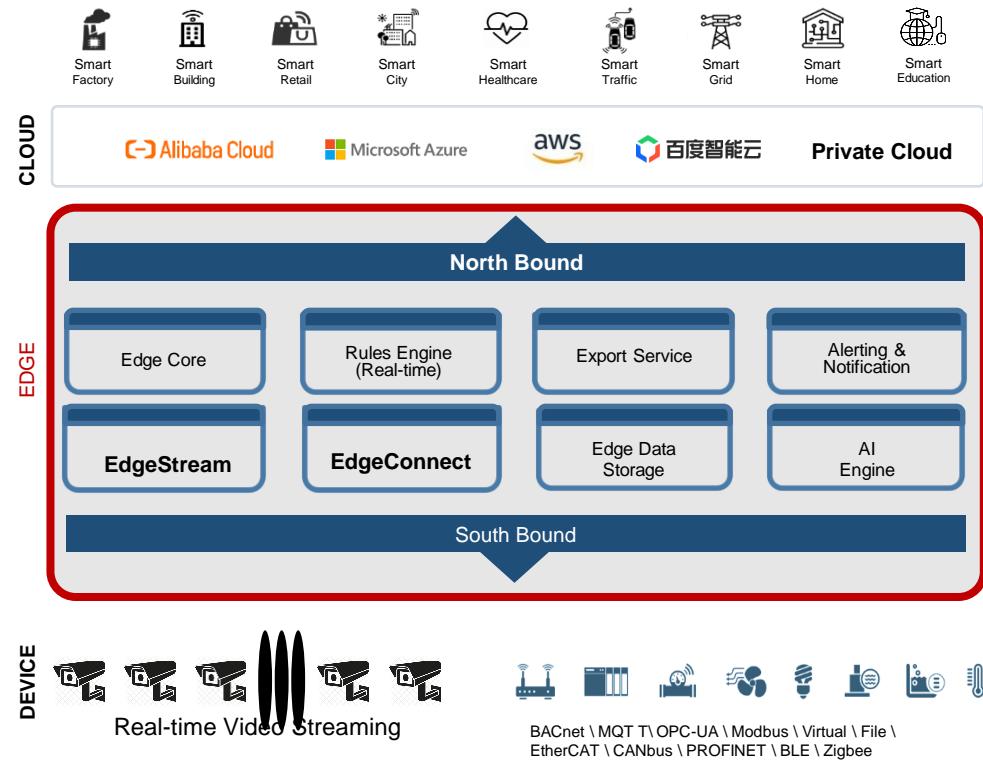
Provide system isolation, full -disk encryption, code protection functions.

Integrating Mainstream Cloud Services

AWS/MS Azure/Ali Yun/Baidu.

E2E Solution

Provide multiple Edge-Cloud solutions such as device management, FOTA, container management, etc.



EdgeX Engagements

- EdgeX Feature Enhancements
 - ROS support
 - ONVIF support
 - More sensor/protocol support
 - Cloud support
 - Pre-integrated cloud service SDK, including AWS Greengrass, MS Azure IoT, Ali Yun linkvision.
 - Support private deployment
 - Data caching on the edge side.
 - Device Virtualization
- Ecosystem Engagement & Support



EdgeX Challenges Contest



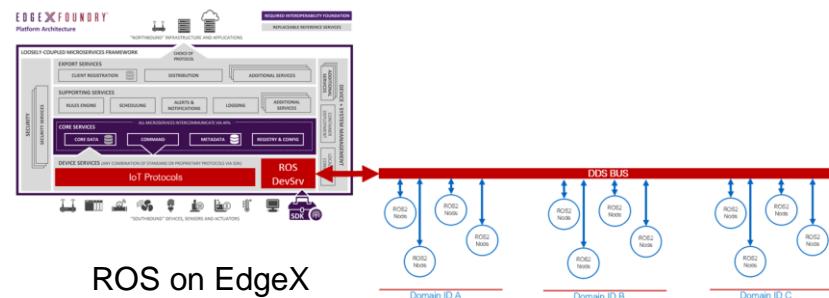
EdgeX China Project



Edge Kits



ROS PoC & Solutions



ROS on EdgeX

Future Collaboration Areas

- ❖ Feature Enhancements
 - ▶ More sensor/protocol support
- ❖ Middleware Integration
 - ▶ ROS support
 - ▶ ONVIF support
- ❖ New Middleware Feature
 - ▶ Device Virtualization
 - ▶ Multimedia Framework support
- ❖ Cloud support
 - ▶ Pre-integrated cloud service SDK, including AWS Greengrass, MS Azure IoT, Ali Yun linkvision.
 - ▶ Support private deployment
 - ▶ Data caching on the edge side.
- ❖ “EdgeX+” Programs



EdgeX Development Kit



Enabling Vertical Adoptions

Edge Computing Verticals



>\$5 Trillion¹

Global economic output in 2035 enabled
by 5G in the following five categories



Manufacturing

\$3,364B



Transport

\$659B



Construction

\$742B



Utilities

\$273B



Mining

\$249B

1. "The 5G economy: How 5G technology will contribute to the global economy" by IHS Economics / IHS Technology

Perspective of the Edge Computing Market

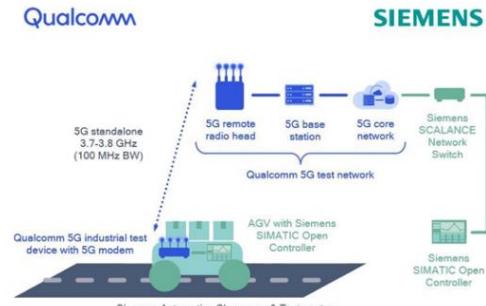
- ❖ Edge market is emerging.
 - ▶ Smart city, Industrial, Automotive, Robotics are the leading verticals.
 - ▶ More PoCs in smart home, smart office, healthcare, etc.
- ❖ Edge computing standardization process accelerates.
 - ▶ All (Alliance of Industrial Internet) is leading the effort with EdgeCross
- ❖ Both SoC and cloud companies are taking actions on Edge
- ❖ End2End Solution is something must-have for Edge.
 - ▶ Edge Technology => Edge Solution



of number of papers: Edge vs. AI



Adoptions driven by 5G, AI.



Transboundary Collaborations

Retail

China Shop Event DEMO

Challenge

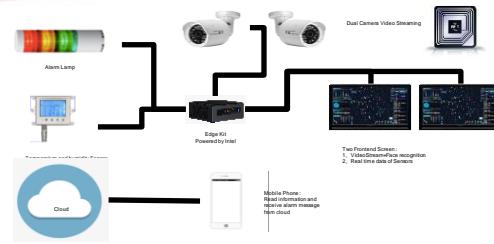
- The end-device fragmentation
- engineering capability and delivery ability of traditional SI are weak.
- The Edge-X original open source still requires a lot of R&D work and maintenance work from commercial deployment.

Solution

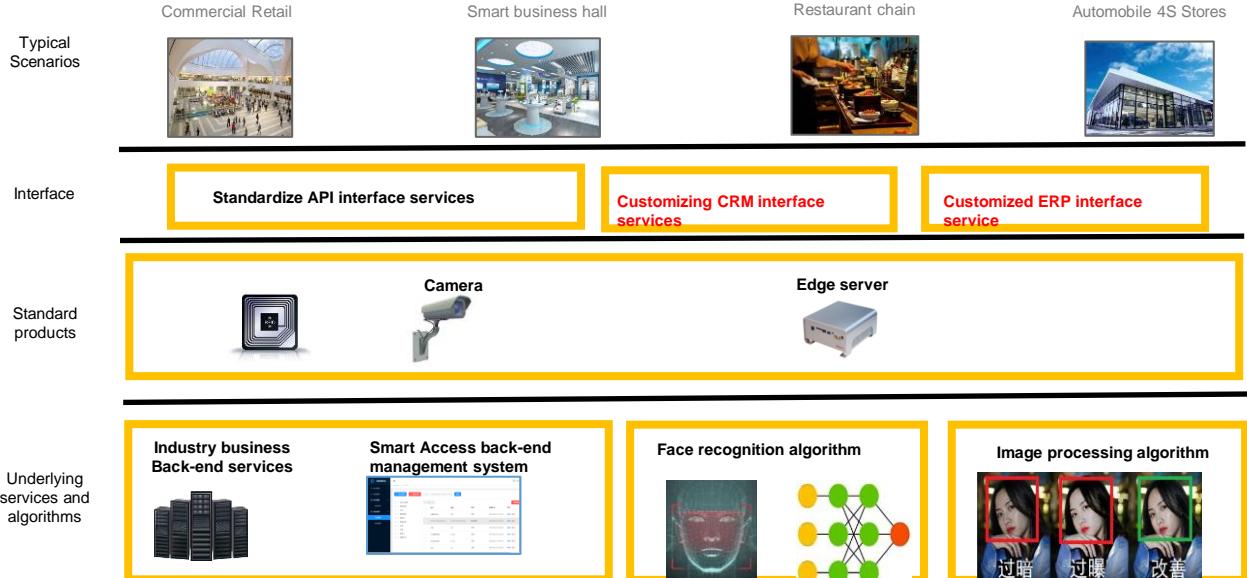
- AI enabled Rule Engine of Edge-X.Commercial Face ID Algorithm and VIP Management.
- On the South Bound, support 4channels 1080P@60fps decode.
- On the North Bound, support data access with mainstreaming cloud vendors, including Ali Yun, AWS, MS Azure, etc.
- Software-hardware integration end-to-end security solution, dual-validation device access mechanism.
- MDM (Mobile Device Management) and OTA services are added. Version management service for container mirroring is provided, based on Docker Compose.

Result

- Before ChinaShop Event, It took us just 1 day to connect to third-party vendors RFID sensor on Intel core i5 Platform.



Smart Access Solution



Power Grid - Distribution Room Monitoring System

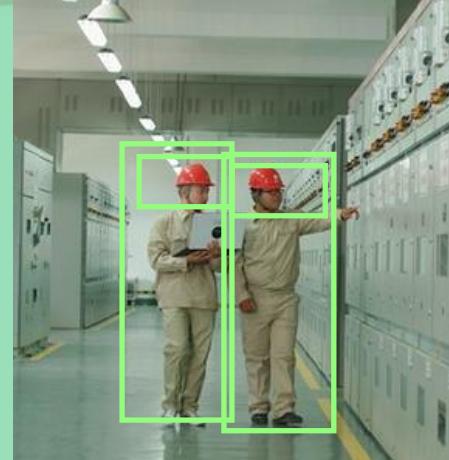
Use Case Description

Design an edge computing device in the power distribution room, with AI computing power, and multi-channel video processing capabilities, including authentication of the operator's identity and behavior Supervision, environmental awareness, illegal intrusion, etc. At the same time, the device collects data from other IoT sensors and devices in the power distribution room, and performs real-time monitoring and predictive maintenance.



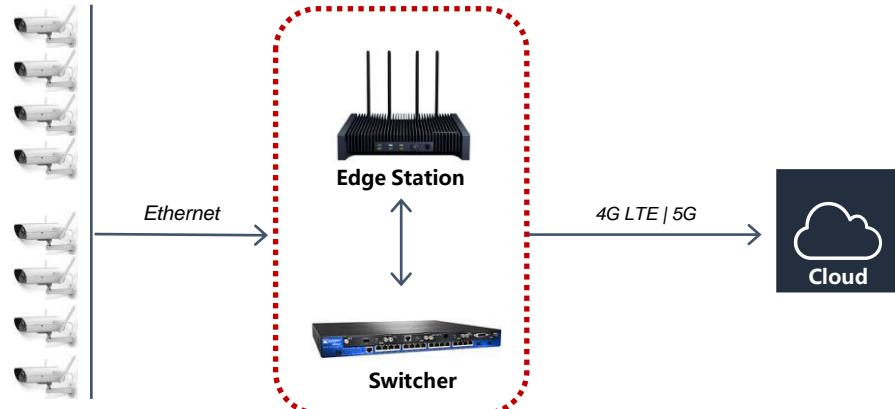
Application at Edge

- **Face recognition** -authentication of operators entering the power distribution room.
- **Human detection** - According to the requirements of the distribution room operation manual, two operators must be present at the operation site. One person operates, and the other person checks the operation process to ensure safety.
- **Safety helmet detection** - Operators must wear helmets and safety clothing when entering the distribution room
- **Distance detection**-the operator should keep a safe distance from the equipment during operation



Requirement

- With multi-channel video (16 ways) real-time analysis capabilities
- Support mainstream AI engine inference computing
- With multi-wired connectivity, Ethernet, industrial field bus, GPIO, etc.
- With 4G LTE / 5G network access.
- Meet the EMC standard of distribution room equipment



Smart Manufacturing

Challenge

- Efficiently improve the level of application intelligence in the industry

Solution

- Provide full-stack services such as devices, systems, algorithms, and optimizations.
- Simple solution, excellent performance, high reliability, high availability, high security, and scalability.

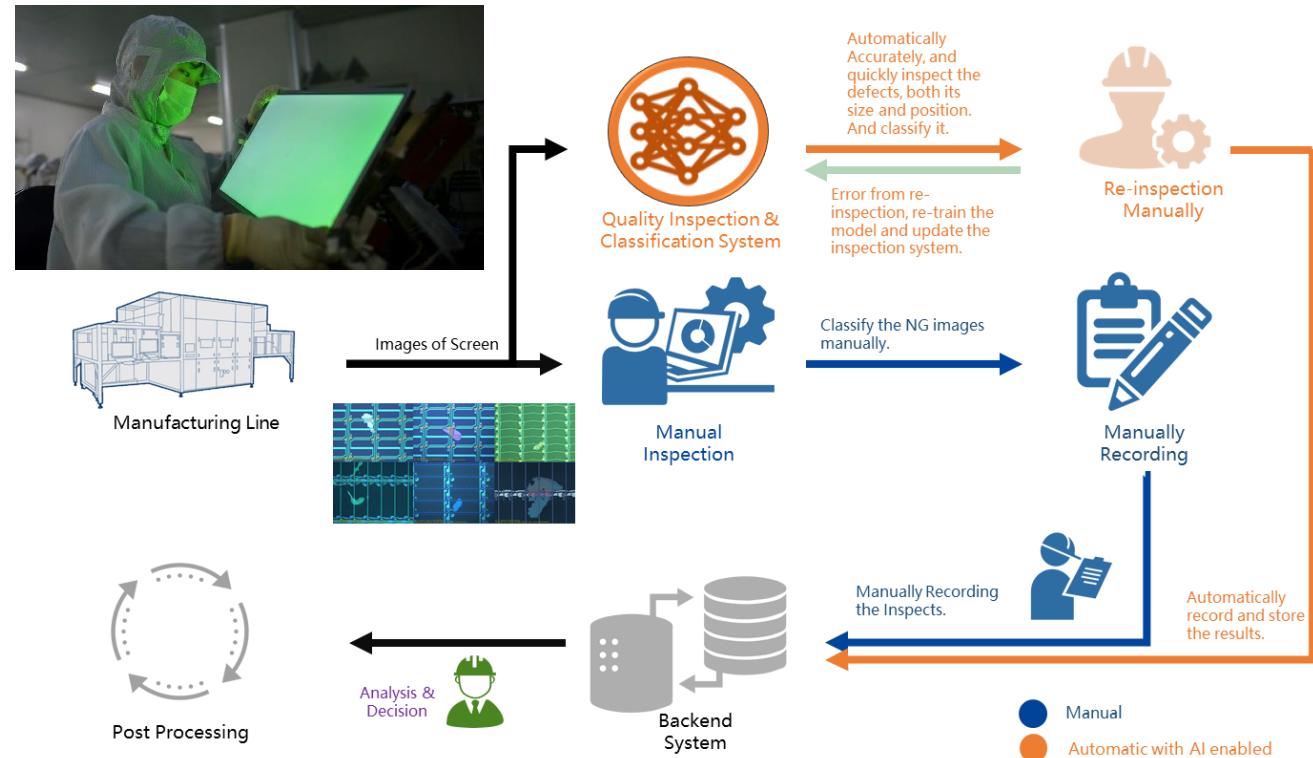
Result

- Detection time 1s/piece => 0.1s/piece.
- Detection accuracy 85% => 95%.

Retrospect

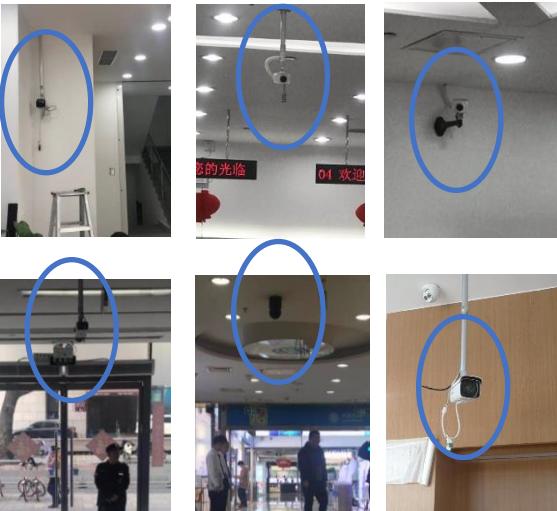
- Technology is not the key factor.
- The industry side cooperates with the technical side to establish a long-term and stable relationship.
- Iterative improvement.
- Intelligence Application is a system engineering.

All cloud or device side doesn't work, need hybrid.



Smart City/Office

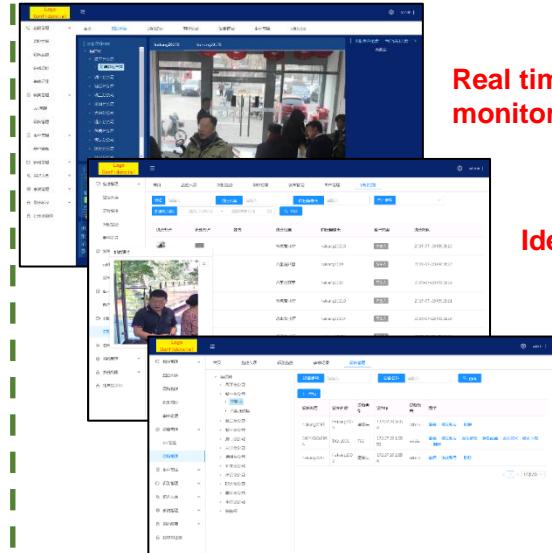
- Connect to traditional IP Camera through Edge Kit for face detection, face recognition, VIP management and other applications.



Recognition result
Pushed to the sales man's App

Customer details And recommended packages

Sales man client



Real time monitoring

Identification record

Device Management

Background management system

Smart Street Light

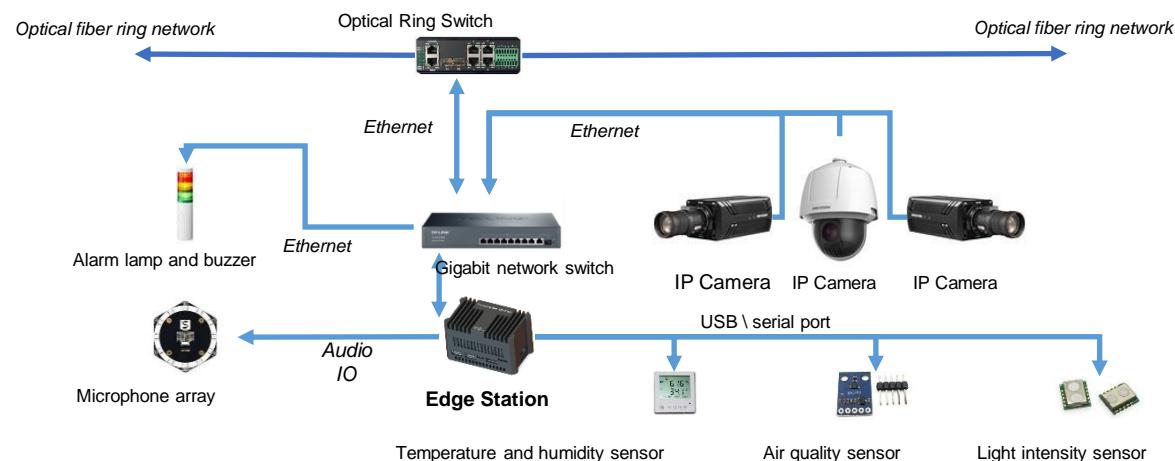
Use Case Description



The smart kit is installed on the 5G smart street lamp pole in a plug-in or embedded manner. Deployed on urban expressways, main roads, urban auxiliary roads and non-motor vehicle lanes. The Smart Kit can interoperate with industrial routers, smart gateway devices, fisheye panoramic cameras, high-definition fixed-focus cameras, smart lighting devices, and environmental sensors. With multi-channel video encoding and decoding and AI algorithm inferencing capabilities, it can realize the traffic status, surrounding events and road conditions.

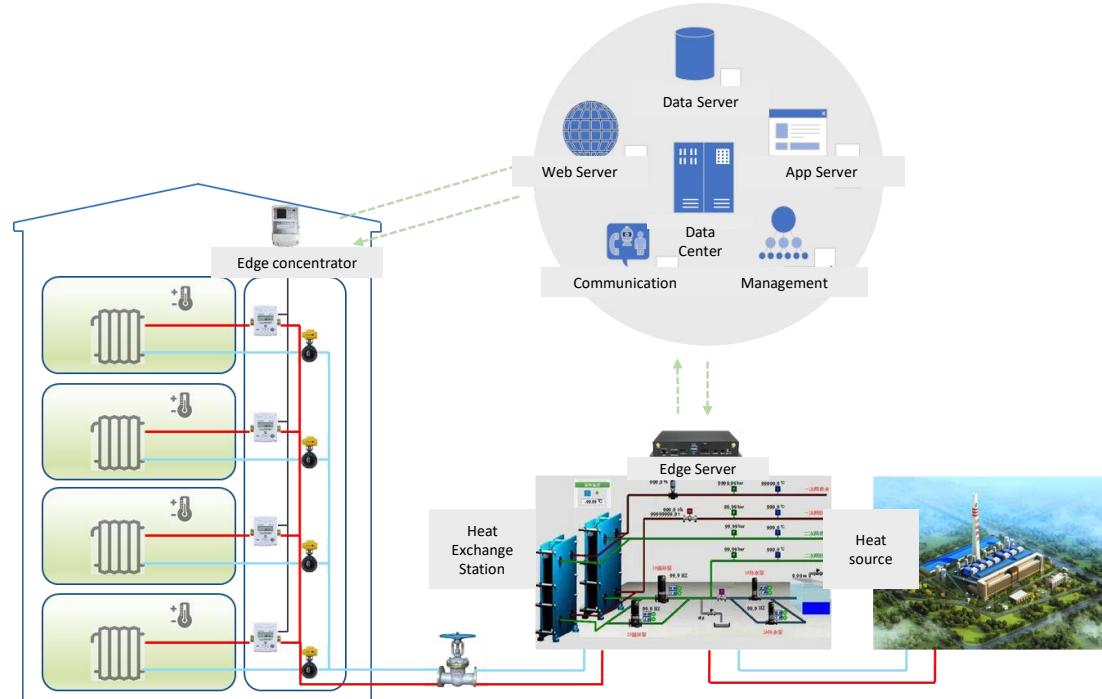
Application at Edge

- Face recognition
- Flow statistics
- Traffic statistics
- License Plate Recognition
- Road condition recognition



Smart Central Heating System

- ❖ TurboX Edge Platform
 - ▶ Support Container
 - ▶ Support Edge Middleware
 - ▶ Support Real-time processing
 - ▶ Support AI Inferencing
- ❖ Through the real-time collection, computing, and processing of heat exchange data to realize heat balance between heat station and user house.
 - ▶ Real-time monitoring of temperature, flow and, heat.
 - ▶ Flow and heat monitoring of buildings or units.
 - ▶ Heat balance algorithm for small flow, large temperature difference, and flow control.
 - ▶ Big data analysis of digital diagnosis information such as water supply pipeline blockage, household water loss, pipe network aging, etc.



Robotics

- ❖ Sensor fusion
- ❖ SLAM
- ❖ AI camera
- ❖ 3D sensing



Robot is the Pearl
of Edge Computing



Deliver Food
Sharship, Marvel, 云迹, Ali



Commercial Cleaning
Braincorp, Softbank



Service Robot
Ubttech Cruzr



Inventory Scanning
Fellow, Bossa Nova



Industrial Robot
FANUC, ABB



Logistics/Warehouse
Amazon, Ali, JD,



Companion

Sony Aibo, LG, Samsung,
Jibo, MIT



Home Robot

Amazon, iRobot,

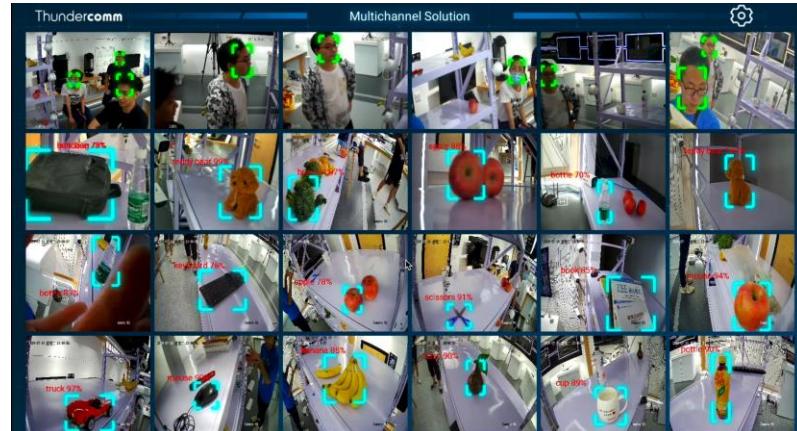


Toy

Ubtech Alpha, ...

Smart Vehicle

- ❖ DMS
- ❖ ADAS
- ❖ True Surround View
- ❖ Multi-camera processing
- ❖ Functional safety



Edge Intelligence Conference

边缘智能大会

邀请函
Invitation

⌚ 12.06.2019
Dec.6.2019

📍 北京维景国际大酒店
Grand Metropark Hotel Beijing

- Distributed Computing
- Real-time Processing
- Large Data Handling
- Board Ecosystem

Edge Computing

Thanks!

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EDGE X FOUNDRY™

Thank you