Optimizing Manufacturing Performance through 5G Edge Computing and Machine Vision
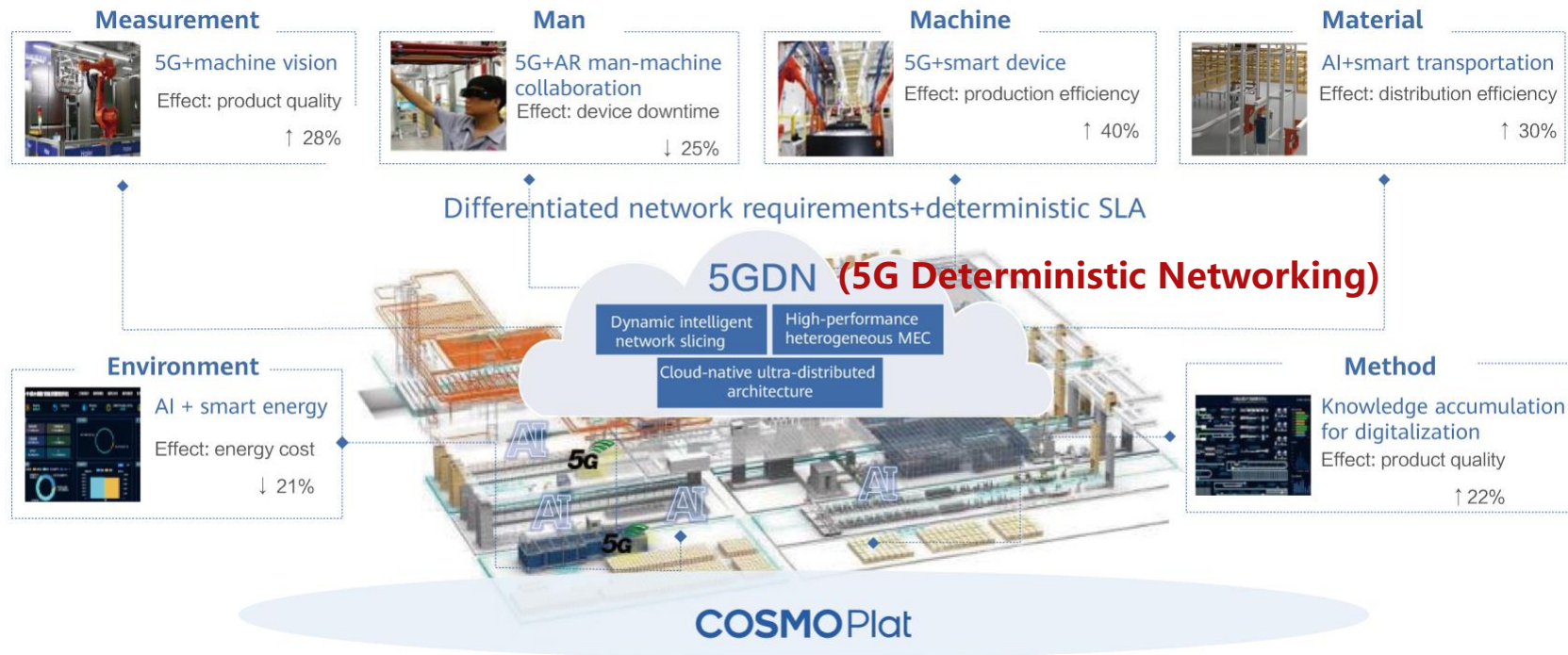
- Haier Intelligent Factory MEC Project

Measurement

5G+machine vision

Effect: product quality

↑ 28%

Man

5G+AR man-machine collaboration

Effect: device downtime

↓ 25%

Machine

5G+smart device

Effect: production efficiency

↑ 40%

Material

AI+smart transportation

Effect: distribution efficiency

↑ 30%

Differentiated network requirements+deterministic SLA

5GDN (5G Deterministic Networking)

Dynamic intelligent network slicing

High-performance heterogeneous MEC

Cloud-native ultra-distributed architecture

Environment

AI + smart energy

Effect: energy cost

↓ 21%

Method

Knowledge accumulation for digitalization

Effect: product quality

↑ 22%

COSMOPlat

- Officially launched in July 2019, the world's first AI+5G interconnected factory leverages 5GDN for implementing complex scenarios, such as 5GDN+machine vision, 5GDN+smart devices, and 5GDN+AR man-machine collaboration, etc.

5GDNA

(5G Deterministic Networking Alliance)

Building deterministic networks

Building win-win ecology

Accelerating commercial launch

5GDNA

Deterministic Networking Alliance

确 定 性 网 络 产 业 联 盟

Founded on June 26, 2019, "**5G Deterministic Networking Alliance**", is with an English abbreviation of "**5GDNA**".

The 5GDN is based on a cloud-native hyper-distributed architecture. Key technologies:

- **Super-performance heterogeneous MEC**
- **Dynamic intelligent network slicing**
- **Cloud is used to meet the differentiated network requirements and deterministic SLAs**

Connectivity + Computing + X:
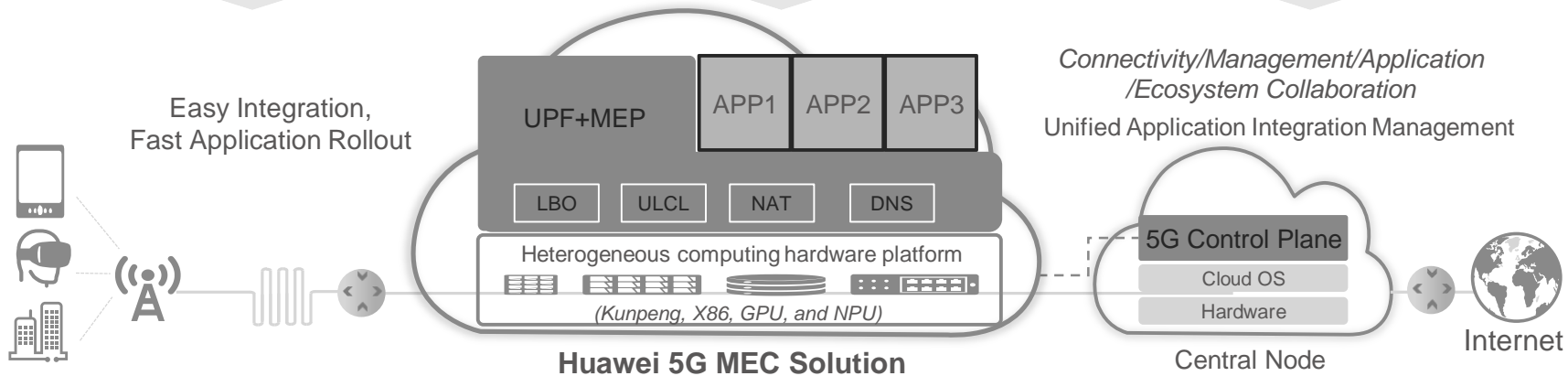## Build Next Generation MEC Solution

Ubiquitous Connectivity

- On-demand Service Continuity
- Policy Based Traffic Distribution: ULCL, IPv6 Multi-homing(BP), and LADN
- Layered protection, building secure and trusted connections
- Edge UPF is deployed with one-off installation and plug-and-play

Ultra-high Performance and **Heterogeneous** Computing

- High Integration, High Performance E9000H
- Heterogeneous Hardware Computing
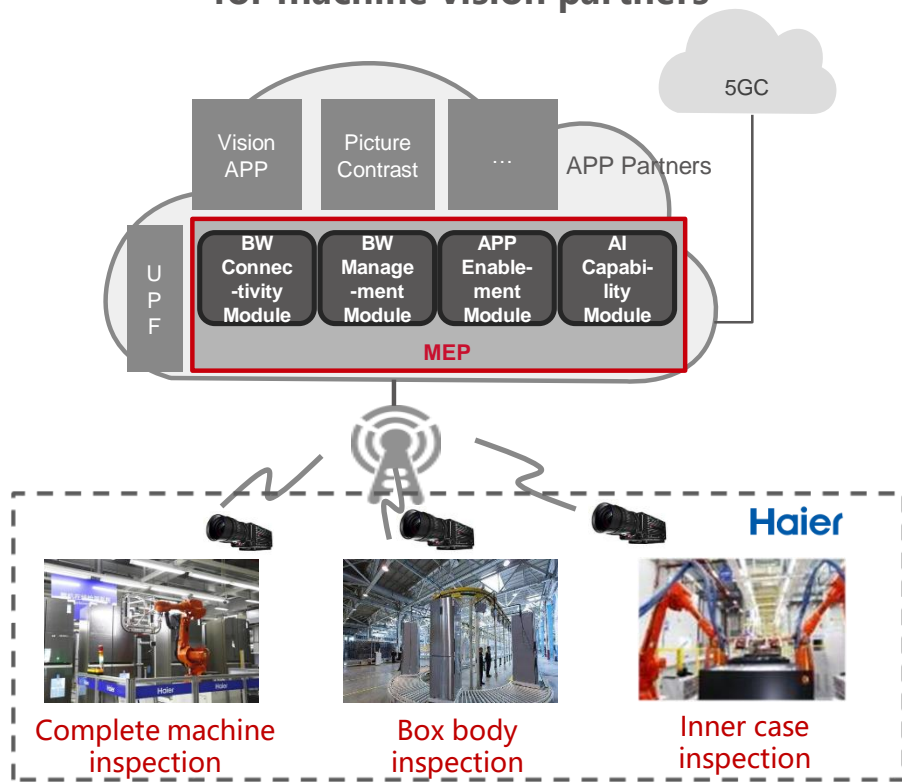- Simplified Networking, Free Of Switch

Innovation (+X) in **Anytime** and **Anywhere**

- Open platform and fast provision for 3rd applications
- Central/edge synergy, one-site innovation, network-wide replication
- Build industry ecosystem and promote commercial launch

Easy Integration, Fast Application Rollout

UPF+MEP

APP1 APP2 APP3

LBO ULCL NAT DNS

Heterogeneous computing hardware platform

(Kunpeng, X86, GPU, and NPU)

Huawei 5G MEC Solution

Connectivity/Management/Application /Ecosystem Collaboration

Unified Application Integration Management

5G Control Plane

Cloud OS

Hardware

Central Node

Internet

Capabilities of 5G MEC to Satisfy Haier Machine Vision Requirements

Huawei 5G MEC opens up powerful capabilities for machine vision partners

Vision APP

Picture Contrast

...

APP Partners

5GC

UPF

BW Connec-tivity Module

BW Manage-ment Module

APP Enable-ment Module

AI Capabi-lity Module

MEP

Haier

Complete machine inspection

Box body inspection

Inner case inspection

BW Connectivity

- Support high bandwidth capability of 5G, with single user bandwidth of Gbps level

BW Management

- Real-time bandwidth mgmt ensures stable terminal bandwidth and continuous transmission of a large number of high-definition pictures

APP Enablement

- Support rapid launch of apps, life cycle management, and unified operation and maintenance

AI Capability

- Service identification, intelligent service management and experience enhancement based on AI capabilities

Advantages of 5G MEC+Machine Vision Solution to Tackle Pain-points

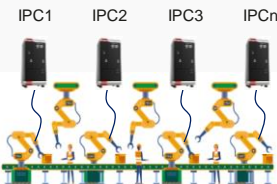- **Long deployment cycle**：**>1Month**

- **Limited cable length**：**<30m**

Industrial cameras and IPCs are connected by **wired cables**

IPC1　IPC2　IPC3　IPCn

One-to-one deployment of inspection points and industrial computers

- **Large space taking**：**2-4㎡ /IPC**

- **Limited processing power**：**4GPU/IPC**

- **Complex O&M, heavy workload**

- **Application updates are not flexible**

Industrial computers need updated **one by one**

Industrial cameras and MEC nodes are connected **via 5G**

MEC

Unified control and management of the MEC node

5G MEC

Unified automatic update by MEC nodes

- **Fast deployment: day level**

- **No distance limitation**

- **"0"　IPC space taking**

- **Cloud-based processing capabilities**

- **Automated unified operation and maintenance**

- **More flexible application updates**

China Mobile "Pioneer 300" Action

In MWC 2019, China Mobile launched the "Pioneer 300" Action

100+ nodes deploying edge computing
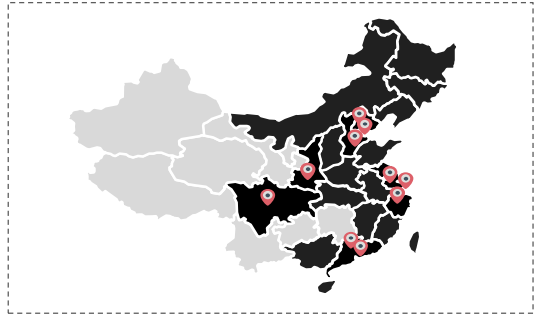
100+ edge computing API

Smart Manufactory	Live Games	smart city	Internet of Vehicles
Data Collection	Video acceleration	Smart building	V2X
Protocol Conversio	AR/VR	Smart Light Pole	Assisted driving
Tsn	Native codec	Smart Store	Smart parking

100+ Partners of Edge Computing Open Laboratory

intel TRIDIUM HUAWEI NXP
Alibaba Group Bai 百度
lenovo Tencent 腾讯
inspur 浪潮 赛特斯 CertusNet
ADVANTECH 研华科技
中国科学院 沈阳自动化研究所 DeepMotion 中国建筑
中国移动边缘计算开放实验室

China Mobile Edge Computing Open Laboratory

Relying on the China Mobile Edge Computing Open Laboratory to cooperate with partners such as Haier.

Partner Expansion

◆ 108 Partners of Edge Computing Open Laboratory：
◆ Conduct overall technical cooperation with 8 partners, test bed cooperation with 20 partners, product integration cooperation with 8 partners.

MEC Deployment Trials

◆ Established 62 MEC deployment Trials in 12 provinces，including the Haier Smart Factory Project

Industrial activity

◆ "Haier Smart Factory project successfully applied for GSMA POC
◆ Hosted MEC Development Competition

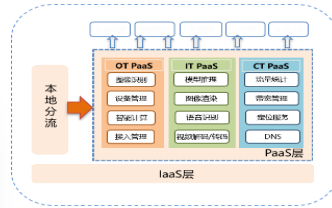# China Mobile Edge Computing Development Strategy

Develop A Full-stack Edge Computing System

Edge Computing Technology System Framework of China Mobile

Application Ecology of Intelligent Industrial Integration

Open and Harmonized Cloud-network Integration Platform

Heterogeneous Integration Infrastructure

OICT Industrial Innovation Application

| CPU | GPU | FPGA | ASIC |

NFVO+/Cloud Management(CM)	ECM
UPF	ECP
BNG	ECI

local traffic diversion
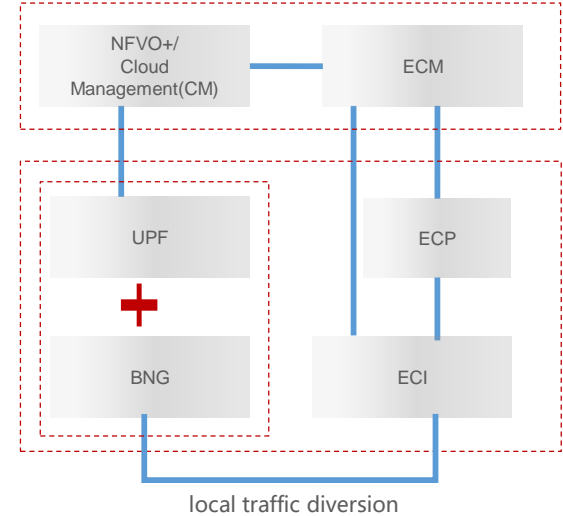
◆ NFVO+/CM：   **unified resource management**

◆ ECM：   **unified operation**

◆ ECP + ECI：   **unified structure**

China Mobile to launch Edge Computing Open Beta Test in 2020

5 first cities buliding open beta test zone

local traffic diversion

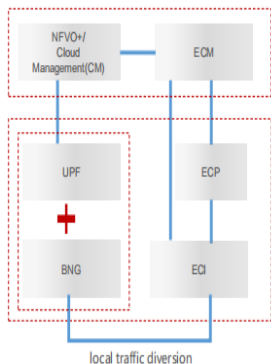**Based on framework of China Mobile**

Components of Open Beta launch

- Network： ULCL/DNN/ Slicing
- ECM: API/APP/Resource management
- ECP: 100+ API
- ECI: Virtual Machine/Container/GPU..

The Goal of this Open Beta Test

- Invite developers and other third parties to rapidly test and innovate with us
- Find the right services and the right busines value in this ecosystem
- Explore potential business models for developers and other third parties

How to apply ?

- The registeration system will go live in Q3
- It's open to any developers or 3rd parties
- *Places are limited*

5G MEC+Machine Vision Deployment Milestones and Achievements

World's first AI+5G Interconnected factory launched

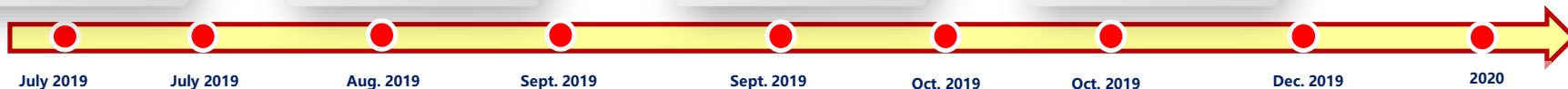Machine vision solution confirmed and MEC deployed

World's first "5G MEC+machine vision" solution published

MEC smart factory panels in MBBF

Deploy in Haier factory Phase II and replicate in other factories......

July 2019   July 2019   Aug. 2019   Sept. 2019   Sept. 2019   Oct. 2019   Oct. 2019   Dec. 2019   2020

5G base-station installed

Industrial camera installed

MIIT 2nd "Zhanfang Cup " 5G application contest first prize

Won the "MEC best case award 2019" of ICT dragon and tiger list

Thank you.

把数字世界带入每个人、每个家庭、每个组织，构建万物互联的智能世界。

Bring digital to every person, home, and organization for a fully connected, intelligent world.

HUAWEI