EDGE GALLERY

EdgeGallery 5G Open Source and its Application in IIoT
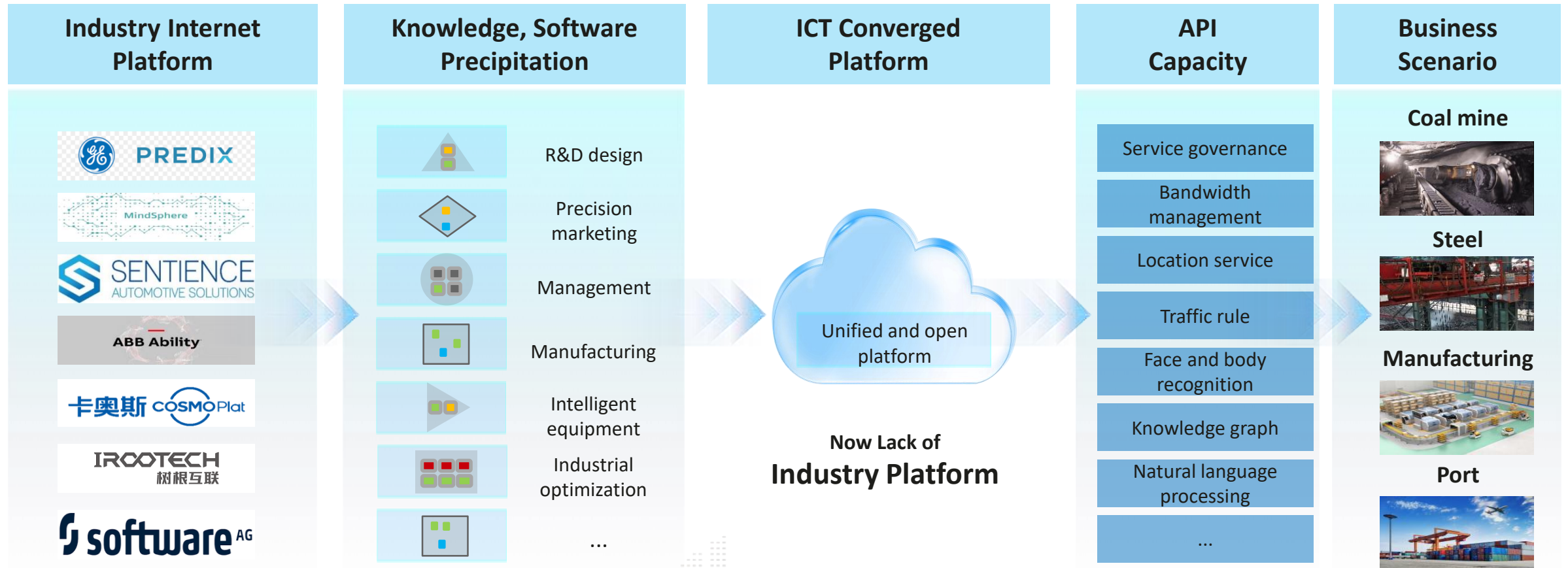
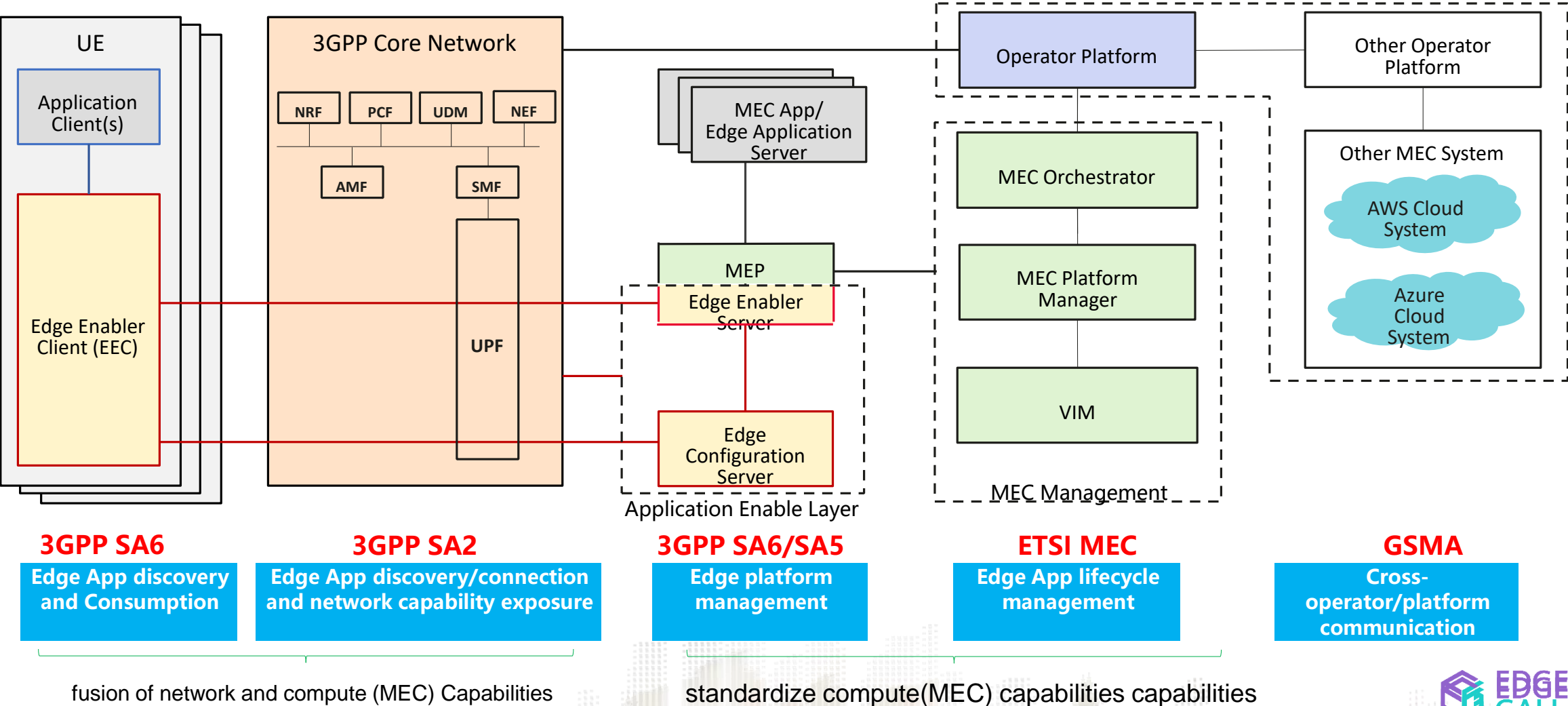Yang (Gabriel) Yu
2021-04

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◆EdgeGallery Architecture and Applications in IIoT

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5G 2B Eco-system: Lack of a unified platform to build a unified eco-system for enterprise digital transformation to accelerate knowledge transformation.

Industry Internet Platform	Knowledge, Software Precipitation	ICT Converged Platform	API Capacity	Business Scenario

Industry Internet Platform
- GE PREDIX
- MindSphere
- SENTIENCE AUTOMOTIVE SOLUTIONS
- ABB Ability
- 卡奥斯 COSMOPlat
- IROOTECH 树根互联
- software AG

Knowledge, Software Precipitation
- R&D design
- Precision marketing
- Management
- Manufacturing
- Intelligent equipment
- Industrial optimization
- ...

ICT Converged Platform
- Unified and open platform
- Now Lack of **Industry Platform**

API Capacity
- Service governance
- Bandwidth management
- Location service
- Traffic rule
- Face and body recognition
- Knowledge graph
- Natural language processing
- ...

Business Scenario
- Coal mine
- Steel
- Manufacturing
- Port

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5G ToB Ecosystem Depends on MEC Industry Application Ecosystem Prosperity

UE

Application Client(s)

Edge Enabler Client (EEC)

3GPP Core Network

NRF | PCF | UDM | NEF

AMF | SMF

UPF

MEC App/ Edge Application Server

MEP

Edge Enabler Server

Edge Configuration Server

Application Enable Layer

Operator Platform

MEC Orchestrator

MEC Platform Manager

VIM

MEC Management

Other Operator Platform

Other MEC System

AWS Cloud System

Azure Cloud System

3GPP SA6
Edge App discovery and Consumption

3GPP SA2
Edge App discovery/connection and network capability exposure

3GPP SA6/SA5
Edge platform management

ETSI MEC
Edge App lifecycle management

GSMA
Cross-operator/platform communication

fusion of network and compute (MEC) Capabilities

standardize compute(MEC) capabilities capabilities

EDGE GALLERY

EdgeGallery Positioning and Scope: Build a Unified MEC Ecosystem and Accelerate the Commercial Use of MEC

Project Positioning

- ☐ Carrier-led edge computing architecture and capability openness de facto standards
- ☐ Lower the threshold for enterprise application deployment, build a scale, and build a 2B business ecosystem.

Open Source Scope

Common platform of carrier MEC:

① **MEP running state: supports heterogeneous hardware and virtual computing platforms, unified application and service management, unified network capability openness APIs, and unified MEP management interfaces.**

② **MEC management orchestration: unified application lifecycle management and resource and application monitoring**

③ **App Store Federation: Unified App Repository and Smooth Interconnection with Commercial App Markets**

④ **MEC application development tool: provides code integration of standard MEP APIs to package and test applications.**

EdgeGallery Intro Video

App Store Federation ③

Application Development ④

MEC Application Orchestration and Management (MEAO/M) ②

APP   APP

MEP ①

Software capabilities such as UPF and AI

Hardware and Virtualization

Terminal

Network connection

Carrier edge

Build an open-source edge computing project that is most compatible with "connection + computing" in the telecom industry.
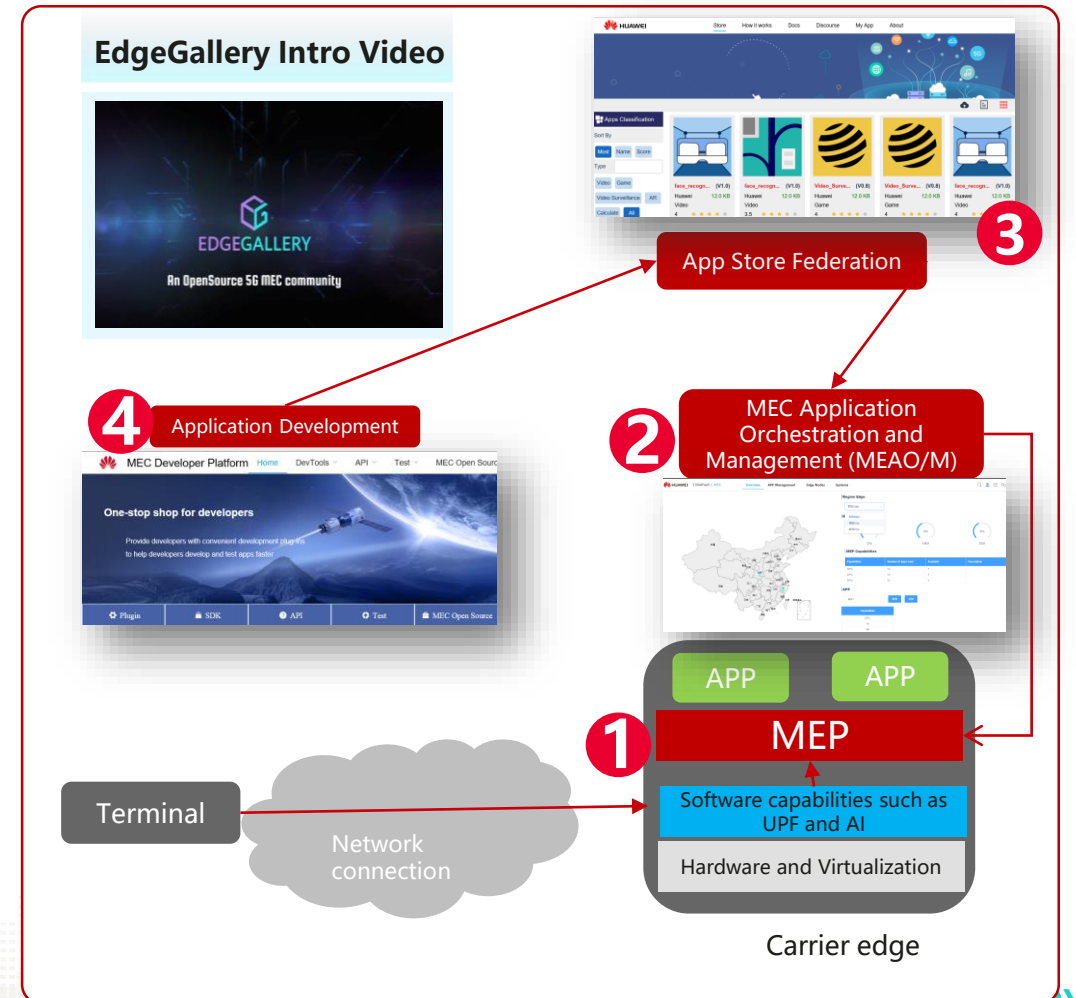
EdgeGallery Actively Expands Community Members and Aggregates Industry Applications

8 Premium members

17 At-Large members

Data as of February 2021, some partners are applying to join

80+ Applications

categorization	Quantity	Scenario
• B2B enterprise	• 30 +	• Security, categorize, traffic, robot
• B2C consumers	• 30 +	• Game, VR

EdgeGallery Implementation: Deployment of 15+ Innovation Incubation Bases

Intelligent manufacturing
Smart Venues
Live video
Security robot
Smart port
...

CAICT · Lantin g · Nanjing · Xi'an electrons · North Post · Zhejia ng Mobile · Yuanli an · 21 CN · Guang dong Unico m

Huawei's commercial version focuses on industries such as industrial manufacturing, port mining, and pan-media, 120+ commercial deployment and 30+ POC verification
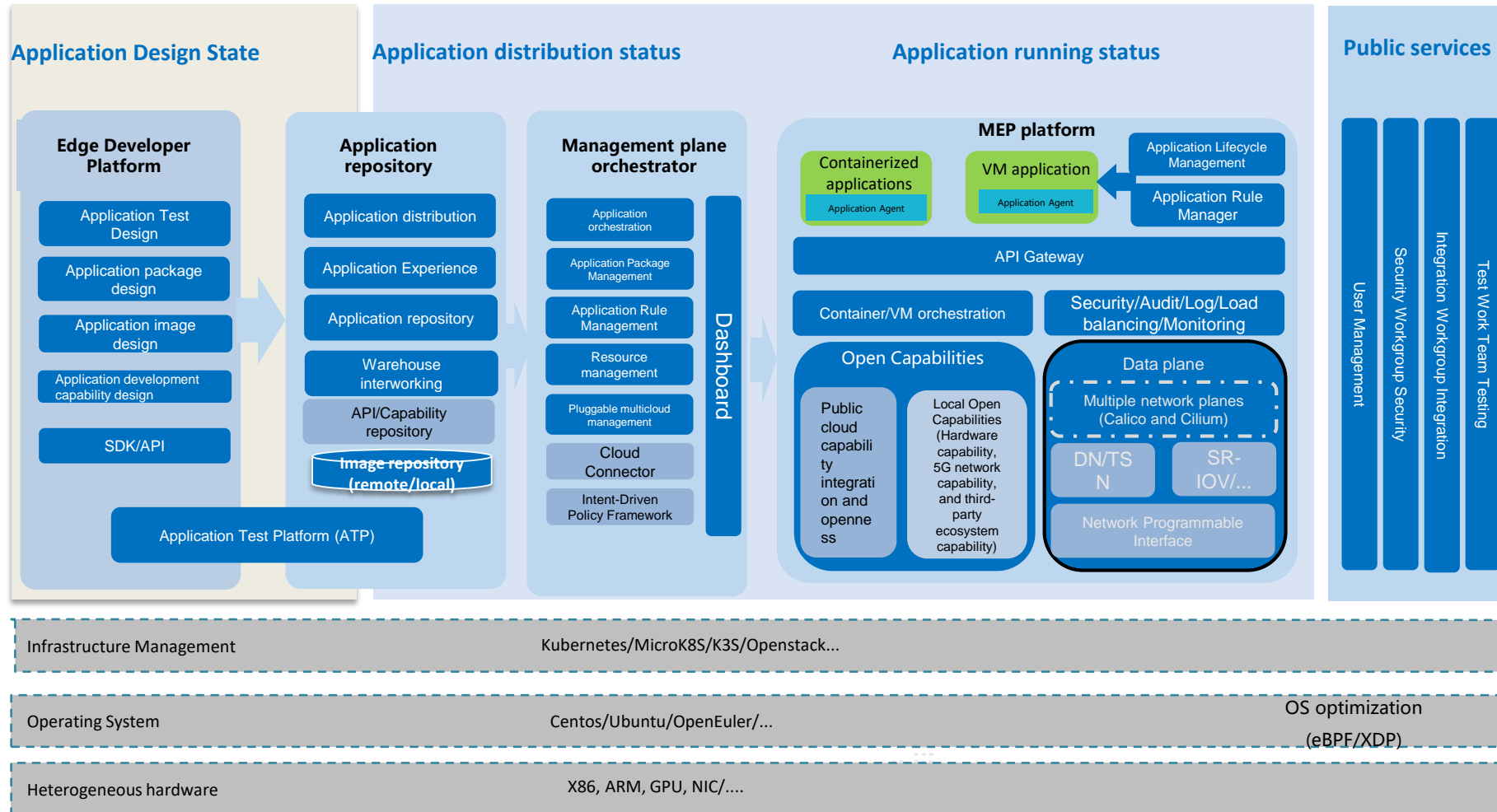
Developer participation

组织参与情况
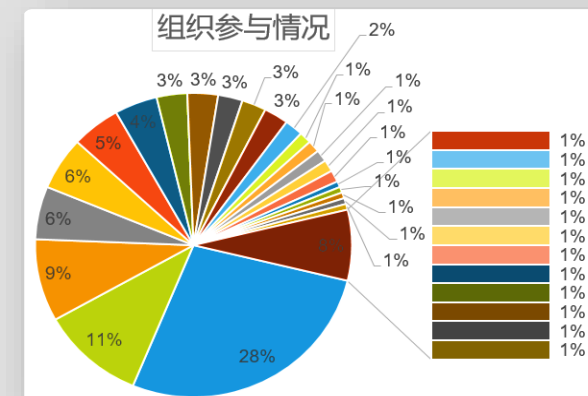
- **42 organizations, 280+ people involved in the community**
- Initiate more than 470 topics through the mailing list.
- **25 repositories are open-sourced, and 6 repositories are open-sourced.**
- Create 1500+ PRs and about 200 issue tasks.
- 20,000 visitors to the official website, with a total of 5000+ visitors; Distributed in 34 countries and regions, covering 33 provinces and cities in China

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EdgeGallery Edge Native Architecture

Application Design State

Edge Developer Platform
- Application Test Design
- Application package design
- Application image design
- Application development capability design
- SDK/API

Application Test Platform (ATP)

Application distribution status

Application repository
- Application distribution
- Application Experience
- Application repository
- Warehouse interworking
- API/Capability repository
- Image repository (remote/local)

Management plane orchestrator
- Application orchestration
- Application Package Management
- Application Rule Management
- Resource management
- Pluggable multicloud management
- Cloud Connector
- Intent-Driven Policy Framework

Dashboard

Application running status

MEP platform

Containerized applications — Application Agent

VM application — Application Agent

Application Lifecycle Management

Application Rule Manager

API Gateway

Container/VM orchestration

Security/Audit/Log/Load balancing/Monitoring

Open Capabilities

Public cloud capability integration and openness

Local Open Capabilities (Hardware capability, 5G network capability, and third-party ecosystem capability)

Data plane

Multiple network planes (Calico and Cilium)

DN/TSN

SR-IOV/...

Network Programmable Interface

Public services
- User Management
- Security Workgroup Security
- Integration Workgroup Integration
- Test Work Team Testing

Infrastructure Management	Kubernetes/MicroK8S/K3S/Openstack...
Operating System	Centos/Ubuntu/OpenEuler/... OS optimization (eBPF/XDP)
Heterogeneous hardware	X86, ARM, GPU, NIC/....

Chocolate Release

Public cloud/ Local development environment — Private cloud/ Enterprise DC — Edge node

Architecture Design Principles

Industry-friendly: Model-driven, scenario-specific, and code-free/low-code applications...
> > Troubleshooting Application Replication

Developer-friendly: full-journey design for developer experience, including development design, deployment and commissioning, and installation and rollout
> > Addressing high development barriers

Business-friendly: unified authentication, distributed federation, and integrated DevSecOps edge security development and O M
> > Resolve the problem of difficult commercial monetization

User-friendly deployment: Infrastructure independent, modular design, on-demand deployment, meeting different application scenarios
> > Addressing Industry Deployment Diversification

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EdgeGallery in Lighthouse Factory

EdgeGallery MECM
CLoud

EdgeGallery MECM
On Premises

Internet · OPC UA/ MQTT / REST

OT

Edge

IT · Cloud Connector

OPC UA/ MQTT / REST

SCADA / MES

EdgeGallery MEP /Edge Gateway

Local DC / Analyse **EdgeGallery MEP**

OPC UA / MQTT / REST

Control / PLC / DCS

5G

Modbus / Profinet / PLC / OPC / etc.

OPC UA MQTT

5G

Modbus / Fieldbus / OPC / etc.

Industrial connector

ERP, CRM Logistics, Support

Field

5G

Modbus / Profinet / Serial / etc. I/O

Applications:
Advanced Analytics
Processes digitalization
Agile Innovation

Applications:
Advanced Analytics
Synchronized operations
Collaborative

Applications:
Predictive Maintenance
Augmented Reality
Operational Intelligence

Applications:
Data aggregation
M2M, Quality Control
Collaborative Processes

EDGE GALLERY

EdgeGallery in Industrial Vision System

3C Electronic Product
Quality Inspection

Appearance inspection of
household appliances

Steel plate
surface quality inspection

Service capability	Key Indicators
Bandwidth	Uplink bandwidth: 80 Mbit/s to 500 Mbit/s per terminal Downlink bandwidth: 500 kbit/s to 1 Mbit/s per terminal (control)
Latency	Uplink delay: 1s Downlink delay: < 20 ms
AI computing power	High-density computing power: 64 TOPS/INT8 per card
lossless compression	3–6x lossless compression, compression delay < 100 ms

Industrial Vision Solutions

Industrial Camera Compression
Upstream

(Industrial camera built-in
compression SDK)

Compressing SDKs

(Industrial camera plus
compression box)

Indoor distribution

5GC   Management
EG MECM

APP O&M

UPF

EG MEP
(decompression service)

Visual analysis
app

NFVI (including AI cards)

MES+

■ Huawei ■ partnering
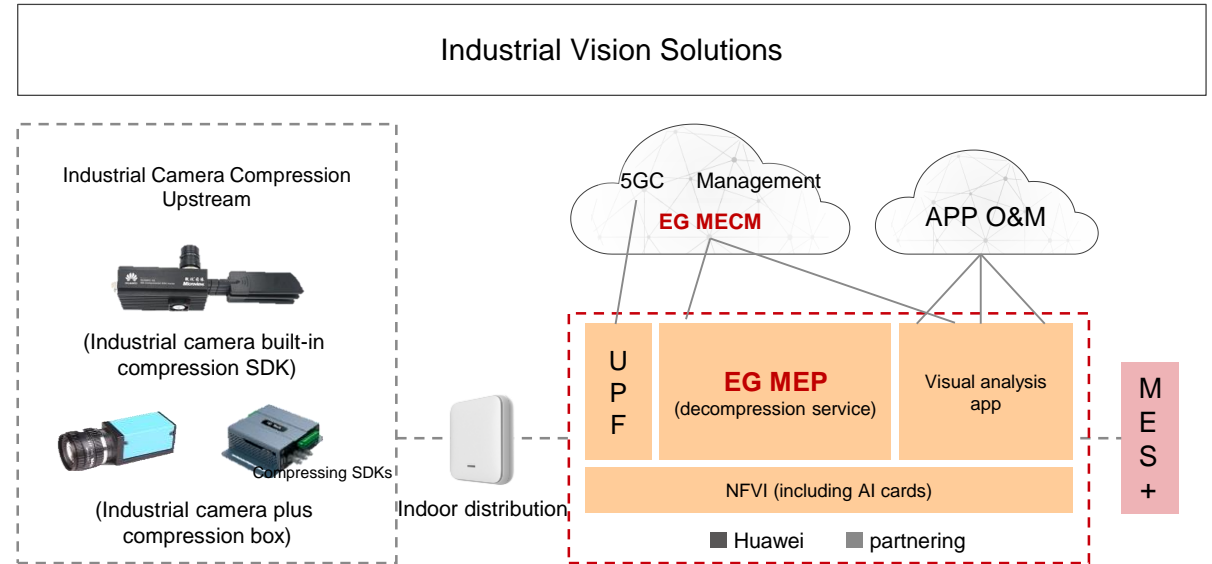
1. Elastic lossless compression: The combination of software and hardware (secondary coding residual result) and controllable quantization matrix (different from human eye input and meeting machine input) accurately controls the high-frequency information of the original image (all details are reserved). The compression ratio is 3 to 6 times.

2. Cell-level centralized bandwidth scheduling: Improves the overall cell bandwidth utilization, avoids congestion during proactive scheduling, and improves production efficiency by 10% to 20%.

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Accelerating IIoT Application Development Integration and Rollout
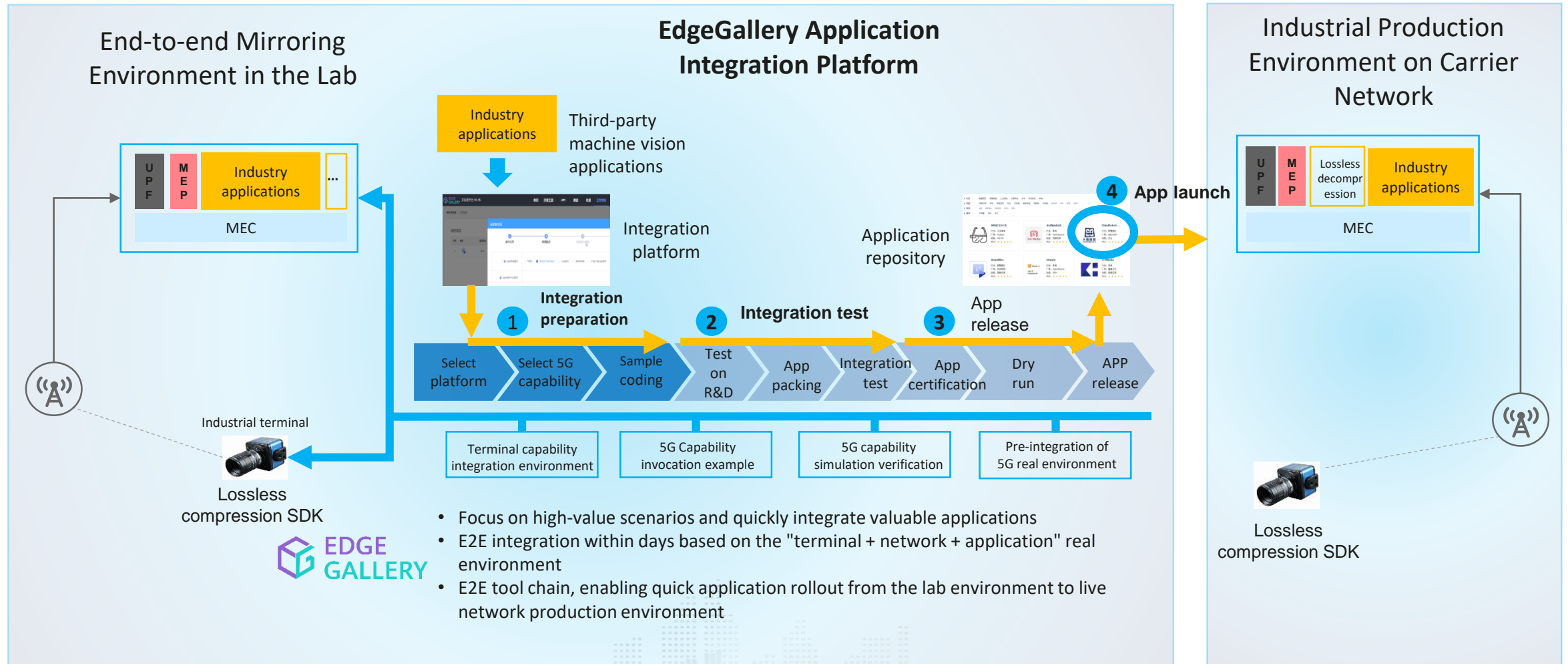
EdgeGallery works extensively with upstream and downstream industry organizations.

- Huawei/CMCC/Tecent/ARM lead Akraino 5G MEC BP family
- Aim to run as a LF Edge project later this year

- As Operator Platform Telco Edge Computing reference implementation
- Joint define OP -MEC resource manager Interface

- Architecture align with ETSI MEC standards.
- Implement ETSI API (location/bandwidth/RNIS...)

- Jointly build 5G field innovation network for application developers
- Manage MEC by EdgeGallery

- Jointly setup EdgeGallery community labs.
- Future Networking Research projects

- EdgeGallery as 5GNDA innovation test lab
- 5G DNA Deterministic Network feature implimentation

EdgeGallery Websites and Communication Platforms

Catagory	URL
Website	www.edgegallery.org
Mail-list	https://groups.io/g/edgegallery
Codes	https://github.com/EdgeGallery https://gitee.com/EdgeGallery
Video	https://www.youtube.com/watch?v=CovSM57JUyc
Offline Installation	https://release.edgegallery.org/
Demo	https://gitee.com/edgegallery/community/blob/master/TSC/Release/v0.9/EdgeGallery%20Demo%20Recording.mp4
Document	http://docs.edgegallery.org/zh_CN/latest/
Developer Portal	https://developer.edgegallery.org/
APP Store	https://appstore.edgegallery.org/
MECM	https://mecm.edgegallery.org/

WeChat Assistant

Book Links

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Thank you.