5G Edge Computing Exploration and Practice from Tencent

Wei Chen
Tencent
Edge Computing enables 5G, IoT and AI for industries

**Scenarios**
- Cloud Gaming
- Smart Office
- Connected Car
- Intelligent Medical
- AR/VR
- Live Broadcasting
- HD Video

**Problems & Requirements**
- Higher network bandwidth and lower latency to enable service into edge cloud
- Reduce the device and bandwidth cost, e.g., cloud gaming
- High network connectivity

**Technologies**
- Edge computing
- Security
- AI in Edge
- IoT capability enhancement
- 5G acceleration: Slice/QoS
5G Smart Edge Computing Enables E2E infrastructure

- **Cloud Gaming**
- **AR/VR**
- **Connected Vehicles**
- **Security Surveillance**
- **Smart home**
- **IoT Equipment**
- **On-premise Computing**
- **Local AI Computing**
- **Edge Computing on-premise**
  - 5G IoT Gateway
  - 5G SDWAN CPE

**Smart Connectivity Between Edge-Edge/Edge-Cloud**

- **Access**
- **Core**
- **Cloud Edge (ECM)**

**Computing in Terminal move to cloud**

- Move to cloud
- Smart Connectivity
- Local AI Computing
- Computing in Terminal move to cloud

**On-premise Computing**

- Computing on-premise
- Edge Computing
- Access
- Core

**Central Cloud**

- Computing in Cloud Moving to Edge
- Computing at Central Cloud

**5G Smart Edge Computing Enables E2E infrastructure**

- <2ms
- <10ms
- <50ms

- IoT Equipment
- On-premise Computing
- Computing at Cloud Edge
- Computing at Central Cloud
ECM build Cloud Edge infrastructure

Scenarios of Edge Computing

- Smart Industry
- Smart Energy
- Smart Agriculture
- Medical
- Smart City
- Live Broadcasting
- Cloud Gaming
- Cloud VR
- Cloud Office
- Live Education

ECM: Edge Computing Machine

- Low Cost
- Cloud-Edge Collaboration, Consistent Experience
- Low Latency

Mobile User Access (4G/5G)
Fixed/WIFI Access

Edge Module

- Edge VM
- Edge Container
- Edge Bare Metal
- Virtualization
- Computing
- GPU
- TSAC
- Network
- Storage
TSAC+ECM: Providing 5G Edge Capability of "Computing" and "Connecting"

Edge Cloud and Service

- Live Broadcasting
- Cloud Gaming
- Live Education
- Smart City
- Edge VM
- Edge Container
- Edge Bear Mental GPU Server
- Virtualization
- Computing
- Storage
- Edge Node1/Edge Node2...Edge Node n
- Edge Computing Machine (ECM) of Tencent Cloud

Center Cloud and Service

- Internet
- 5G Core UPF
- 5G Edge UPF

Offloading Traffic

5G Network Acceleration

TSAC: Tencent Smart Access Connector

- Low Latency
  - 5G User Connecting to the edge Service
    - Network delay reduced by 20%~50%
    - Traffic offloading based on IP address or DNS domain name

- Network Acceleration
  - Testing result in case of 5G network congestion:
    - Without Slice: Frame-Rate 30 FPS, RTT 41ms, Bit-Rate 4.5Mbps
    - With Slice: Frame-Rate 60 FPS, RTT 20ms, Bit-Rate 12.7Mbps

Live Broadcasting
Cloud Gaming
Live Education
Smart City
on-premise Edge Computing: IoT Edge Computing Platform (IECP)

Central Cloud
- Custom Application
- SCF
- TI Matrix

Management & Control Center of Edge Node in Cloud
- Edge Manager
  - Node Manager
  - Equipment Manager
  - APP Manager
  - Model Store
  - Image Manager
- Edge O&M
  - Log Service
  - Remote Management
  - Security Management
  - Monitoring & Alert
- Monitoring & Scheduling
  - Resource State
  - Node State
  - Application State
  - Equipment State

Edge Node
- EdgeCore
  - Time Series Storage
  - Streaming Data Analytics
  - Security Monitoring
  - AI Engine
  - Access Components
  - Route
  - Function as a Service
  - Thing Model
- SuperEdge
  - Edge Autonomy
  - Weak Network Adaptation
  - Mixed Management
  - Heterogenous Compliance
- EdgeOS
  - Security Baseline
  - Network Optimization
  - Device Driver
  - Trusted Computing
- Edge Gateway
- AIoT Box
- Edge Server
Practice 1: Tencent 5G Edge Computing Center is officially Opened at Binhai
Practice 1 (Cont.): Cloud Gaming, 4K Live Interaction

**Central Cloud Node**

- Game Server
- Render
- Stream Push
- Control Command

**Edge Node at Binhai**

- Video Stream
- Control Command

**Binhai**

- Cloud Game
  - Nearest rendering, low latency, large bandwidth, low bandwidth cost

**Provincial Capital**

- 5G Core Network
- 5G Edge UPF
- Edge Computing Approach
- offload Acceleration

**City**

- 4K Live

**Cloud Live Interactive Platform**

Tencent Cloud Interactive Live Broadcasting Platform and Solutions
Practice 2: Boosting the Soil Transformation of Alashan Desert and Restoring the Ecological Environment

Tencent Cloud

Plant Growth Monitoring

Desert Monitoring

AIoT Gateway LoRa

Machine Room Monitoring

Nano TB

T-Box

Compute

Storage

Network

Zhiwei Platform

Device Management

Alert Management

Asset Management

Work Order Management

Security Management

Fire Management

Compute Platform

Data Storage

Data Analysis

Data Modeling

Finite Element Analysis

AIoT Gateway

LoRa

Mini Program, APP

Smart Agriculture Management Platform
Practice 3: Smart Water Conservancy

1. out-of-the-box experience
2. Cloud edge collaboration with the powerful capability of AI reasoning and AI training
Thanks!