Edge computing in 5G networks

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Any guess on what is this?
AWS datacenters globally

— Public AWS cloud datacenters all over the world
AWS datacenters globally

- Exercise: gcping.com
- Fastest ping?
  (How fast we can get the fastest ping?)
### Measuring Latency to Google Cloud Regions

<table>
<thead>
<tr>
<th>Region</th>
<th>Median Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warsaw (europe-central2)</td>
<td>28 ms</td>
</tr>
<tr>
<td>Frankfurt (europe-west3)</td>
<td>30 ms</td>
</tr>
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AWS datacenters globally

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Measure your latency to Google Cloud regions

- On local WiFi
- On VPN
- On mobile network
Value chain (high level) for Hyperscale Cloud Providers

- Consumer
- Connectivity Service Provider
- Internet
- Cloud Provider
- Enterprise

"Provides service"
Example: META

— Zuckerberg describes the metaverse, which he sees as the next generation of the internet, as a virtual environment that will allow people to be present with each other in digital spaces.

— Meta joined telekom standardization bodies to standardize the 6G ultra-low latency infrastructure.

Enterprise = Meta

Requires low latency connectivity
Delay and latency is a problem

- Consumer
- Connectivity Service Provider
- Internet
- Cloud Provider
- Enterprise

Provides service

Delay between client-server application

- User
- Mobility, Locality
- Mobile operator
- Country, Subscribers
- Global
- Economy of scale
HCPs entering the local “sites”

- Provides service
  - Enterprise
    - Cloud Provider
  - Internet
    - Connectivity Service Provider
      - Consumer

Delay between client-server application

- Disruption is to move from a global, optimized setup to an expensive, local.

User
- Mobility, Locality

Mobile operator
- Country, Subscribers

Global
- Economy of scale
Hyperscale Companies
AWS, Google, MS Azure, Meta

AWS Outposts
Run AWS infrastructure and services on premises for a truly consistent hybrid experience

Get started with AWS Outposts
Contact Sales

Anthos
Anthos unifies the management of infrastructure and applications across on-premises, edge, and in multiple public clouds with a Google Cloud-backed control plane for consistent operation at scale.

Try it free
Contact sales

— Managed, local HW with full* support of AWS services
— Managed cloud environment for private infrastructures
The complete network and cloud should be on premise, private at a factory site...

Enterprise

Consumer Enterprise

Connectivity Service Provider

Internet

Cloud Provider

Delay and more importantly security concerns

Disruption is to provide local datacenters and local networks

User

Mobile operator

Global

Economy of scale

Mobility, Locality

Country, Subscribers
Telecom moving into the cloud?

- Enterprise
- Cloud Provider
- Internet
- Connectivity Service Provider
- Consumer

Provides service

Is this also a cost saving?

Can I provide the right platform?

- User
  - Mobility, Locality
- Mobile operator
  - Country, Subscribers
- Global
  - Economy of scale

Would be a cost saving, however, not suitable for performance
Proof of Concept, Ericsson with AWS

The main activities in the POC include:

— Deployment of the **Ericsson 5G SA Core** as part of a private network and **Enterprise App(s)** on AWS Outpost

— Integration of **AWS APIs** to Ericsson orchestrator functionality

— **Exposure** of network and service APIs to Enterprise App(s)

— **Orchestration** of the end-to-end service from Enterprise management site

— E2E orchestration and exposure of the solution via Ericsson orchestrator, integrating with AWS CloudFormation API for resource management and optimized workload placement.

AWS: not primary but “partner” for the enterprise

Telecom: primary but running on AWS infrastructure
Matching?

— A: Azure IoT Edge — B: AWS Outpost — C: Google Anthos

1. Edge Application
   - Edge Cloud Platform
   - Edge Connectivity
   - Edge IaaS

2. Edge Application
   - Edge Cloud Platform
   - Edge Connectivity
   - Edge IaaS

3. Edge Application
   - Edge Cloud Platform
   - Edge Connectivity
   - Edge IaaS
Edge service discovery (4 ways)

(Getting the IP address for my edge application)

- AWS route 53*(1.)
  - Works today
  - Setup latency: e.g. gcping*(2)
- Internet Service Provider
  - Works today with well-configured devices
  - EASDF*(3)
- 3GPP SA6 critical services architecture*(4)
  - Quick discovery
  - Service continuity support
  - Heavy device impact

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Diagram:

1. User sends DNS query to DNS resolver
2. DNS resolver queries DNS met name server
3. DNS met name server returns route 53 name server
4. DNS resolver queries route 53 name server
5. Route 53 name server returns IP address
6. User connects to IP address
7. DNS set to be served by the ISP
8. 5G Core: Edge Application Server Discovery Function
9. 5G Core: Edge Exposure functions
10. Added value discovery function
Multi-cloud technologies in the cloud are developed for cost saving
- DB from AWS, AI from Google
- Portability between platforms

Operators in a country may have contract with different cloud service providers (including themselves)
- Multi-cloud technology at the operators is the ability to roam edge services within the border (e.g. airport) and countries (e.g. connected cars)

- GSMA OPG: Federated Edge Services
- Edge Cloud Continuum: EU initiative
Hyperscale cloud providers are starting to build edge computing solutions to provide local and low latency services.

Telecoms are partnering with HCPs for cost saving and testing edge platforms for 3rd party applications.

Edge computing redefines the value chain for HCP and CSP Enterprise business.

Several federation and defragmentation technology, common goals.

Key Takeaways
Thank you!
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