Welcome

Edge Computing in Perspective

1. The Landscape
2. Implications
3. Complications
4. Solutions

Don Duet
President, Vapor.io
Former Partner, Head of Technology, Goldman Sachs
What is the state of today’s internet and edge? What are the forces driving change?
Billions of Devices

More Devices than People

The number of devices connected to IP networks will be more than three times the global population by 2020.

Some researchers predict 50 billion connected devices delivering data from a trillion connected sensors in the next decade.
Zettabytes of Data

80 Zettabytes of Data Generated

Global Datasphere

Source: IDC’s Data Age 2025 study

4 Zettabytes of Data Shipped

Global IP Traffic

Source: Cisco VIN 2017

The Landscape
New Generation Applications are Driving Demand

01 Autonomous vehicles demand low-latency V2X for real-time decision support, data offloading, and routing.

02 Real-time connectivity and low-latency edge processing supports factory robotics and management.

03 Edge-enabled 5G virtualization, 5G-as-a-service and post-5G applications (e.g., dynamic route optimized gaming).

04 The Kinetic Edge spans an entire city and supports smart city applications.

05 Low-latency server-side edge rendering makes lightweight, tetherless AR/VR possible.
The Interface Shift

The new ‘Power User’ of the Mobile Network

Edge Market Growth Forecast to reach 19.4BN from 3.7BN by 2023
What are the strategic implications of Edge and the secular shift of Mass Distributed Machine to Machine interfaces?
Critical Infrastructure services need to adapt...

Round-trip latency from an endpoint to a centralized data center is often in the 100-200ms range.

Centralized Data Centers have exponentially more outbound data than incoming data.

Implications
Regional POPs see slightly larger inbound data but are still dominated by outbound core to edge traffic.

75-100ms of Latency

Round-trip latency from an endpoint to a regional POP (Point of Presence) is often in the 75-100ms range

..expanding upon the investments of today...
The Intelligent Edge represents data centers at the extreme edge of the network, one hop from the last-mile network. The Intelligent Edge is expected to transport at least as much inbound data as outbound data. Round-trip latency from an endpoint to a location should be less than 10 milliseconds. The Intelligent Edge enables peering and information transfer in an open architecture across wireless and wired networks. … to enable innovation and support the new interface for tomorrow.
Applications of Tomorrow Require a New Internet

Implications

Today’s Internet
- Voice Recognition
- Home Sensors
- Web browsing
- 360° HD Video

The Internet We Need to Build
- Autonomous Vehicles
- Intelligent Cities
- Cloud-assisted Driving
- AR/VR
- V2X/X2V
- Cloud RAN
- 5G Network Slicing

Time:
- 10s
- 1s
- 100ms
- 10ms
- 1ms
Complications

“We’ve got a long way to go and a short time to get there”
Complications

Wireline and Wireless Backbones Aren’t United

Internet backbone

Verizon Network
A large carrier would have to deploy $20 billion in capital to upgrade 50 percent of their wireless footprint. Four times that ($80 billion) if sites for the top US carriers are single-tenant. Long haul fiber is quickly being replaced by dense local metro fiber. The edge requires a carrier neutral, cloud neutral, and colo neutral platform. Physical interconnections are being virtualized by SD-WAN / NFV. Physical and logical security needs to adapt to massive increase in surface area.
Application Architectures need to evolve

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<th>Legacy Applications</th>
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<tr>
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Legend

✅. Yes
✔️. Some
What makes this all possible, how will we get there?
Solutions

5G Mobile Architecture

Massive change in underlying architecture, design, capabilities

Evolved Packet Core enables One Hop Connections to Radio Access Network

- Directly connect to RAN equipment
- Licensed and unlicensed spectrum
- Crosshaul and multi-tower mesh
- Direct fiber backhaul
- Real-time congestion & latency telemetry
Community Led

Infrastructure Computing Standards and Interoperability

Application frameworks and management solutions
A new Edge Ecosystem (Economy)

Traditional Players

- Verizon
- AT&T
- T-Mobile
- Sprint

New Edge Economy

- Microsoft
- Facebook
- LinkedIn
- Hangar
- Flex
- AWS
- Google
- Micron
- Packet
- Cloudflare
- Heptio
- Saguna
- Intel
- Packetfabric
- Mesosphere
- Vapour
Questions

Thank You

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