Cloud & Virtualization

Considerations for Moving Your Access Network to the Cloud (and Back)

Eric Heaton
Platform Solutions Architect
Intel Corporation – Network Platforms Group
Contributors

• Mike O’Hanlon (Intel)
• Brendan Ryan (Intel)
• Randy Levensalor (CableLabs)
• Richard Walsh (Intel)
• David Coyle (Intel)
• Pavel Belitskiy (Intel)
• Subhiksha Ravisundar (Intel)
The Appeal of the Cloud for Comms Service Providers

- Scale and Cost Efficiency
- New Monetization Options
- It’s the “Easy Button”

Approx. 35% of Telcos have partnered with Hyperscalers

40% of enterprises will use CSPs by 2022 (Gartner)

Edge network market is forecasted to reach $43.4B by 2027 with a CAGR of 37.4%.

- Global Mobile Edge Cloud
- Apigee API management
- Anthos - Edge Compute
- Data Analytics

- AWS Wavelength - Mobile Edge Compute
- AWS Outposts - on-premise ITaaS platform/hybrid cloud

- Azure Private Edge Zones, Azure Stack Edge
- 5G, AI, Cloud Solutions
- Office 365
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Putting the Access Network in the Cloud
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Definition and Architecture of an “Instance”

<table>
<thead>
<tr>
<th>Model</th>
<th>vCPU</th>
<th>Memory (GB)</th>
<th>Network Max Interfaces</th>
<th>Network Max Queues</th>
<th>Network Bandwidth (Gbps)</th>
<th>Network Shared or Exclusive</th>
<th>Number of Instances per Server</th>
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</table>
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Optimizing Test Setup for Cloud Deployments

On-Premise Test Setup

AWS Test Setup
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Variability of Performance Across Instances

- Cloud performance is not deterministic across instance types or test runs
- Best c5n instance is 11% worse than on-premise solution per SG
- Each SG requires only a portion of instance resources - 3 vCPUs and 2 network virtual interfaces
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Limits to Scaling Within Instances

1. Can exceed pps limits per interface

2. Easy to run out of network interfaces
Breaking Through Bottlenecks

Example – Cost Equivalent Deployments

All instance types are constrained by the networking subsystem... but in different ways

Can multiple c5n instances achieve better performance and/or make better use of resources?

NOTES:
1. All data-plane cores can be accurately NUMA aligned on c5n.metal.

NOTES:
1. Instances are not guaranteed to be co-located on the same server unless using a Dedicated Host (DH).
2. Instances not on a DH will have unknown co-resident instances on the same server and will have unknown I/O NUMA alignment.
3. For DH - 2 x Instances will not be NUMA aligned wrt to I/O
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Optimizing Resource Utilization in the Cloud

- Using multiple smaller instances yielded a 30% improvement to total max throughput
- Makes better use of cloud resources being paid for
  - 75% vCPUs unused in single c5n.metal instance
  - 43% vCPUs unused with four c5n.4xlarge instances
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Is the Cloud Ready for the Access Network?

• Answer: “It Depends”
• Also: Possibilities are evolving quickly!

NFV + SDN Orchestration

Analytics + Cloud Native

10G
Thank You!

Eric Heaton
Platform Solutions Architect
Intel Corporation – Network Platforms Group
Email: eric.d.heaton@intel.com