Storage Life on the Edge: Managing Data from the Edge to the Cloud and Back

Live Webcast
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Today’s Presenters

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SNIA-at-a-Glance

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2,500
active contributing members

50,000
IT end users & storage pros worldwide

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Technologies We Cover

Ethernet, Fibre Channel, InfiniBand®
iSCSI, NVMe-oF™, NFS, SMB

Virtualized, HCI, Software-defined Storage

Storage Protocols (block, file, object)

Securing Data
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Agenda

- Data and compute pressure points: aggregation, near & far Edge
- Supporting Edge Workloads
- Analytics and AI considerations
- Understanding data lifecycle to generate insights
- Governance, security & privacy overview
Data and Compute Pressure Points Supporting Edge Workloads

Dan Cummins
Data Drivers Making Edge Necessary

Edge requires a move from Centralized to Massively distributed architectures

- **Data Intensity**
- **Time to Insight**
- **Control Actuation**
- **Data Security**
- **System Autonomy**

Latency <25ms

Latency 50 – 300ms
Edge Taxonomy

<table>
<thead>
<tr>
<th>Location</th>
<th>Public cloud</th>
<th>Core DC</th>
<th>Local DC Hosted PoP</th>
<th>Factory, Warehouse, Point-of-Sale, military base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure Owner</td>
<td>Cloud provider</td>
<td>Enterprise</td>
<td>Enterprise</td>
<td>Enterprise</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distance</th>
<th>500-1500 km</th>
<th>50-1000 km</th>
<th>5-20 km</th>
<th>0 – 5 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response Time</td>
<td>&gt;50-150 ms</td>
<td>&gt;20-60 ms</td>
<td>&lt;10-25 ms</td>
<td>&lt;2 ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environment</th>
<th>Traditional IT</th>
<th>Constrained Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000's of racks</td>
<td>Cloud</td>
<td>Far Edge</td>
</tr>
<tr>
<td>100's of racks</td>
<td>Core</td>
<td>Functional Edge</td>
</tr>
<tr>
<td>&lt;10 of racks</td>
<td>Near Edge</td>
<td></td>
</tr>
<tr>
<td>&lt;0.5 of racks</td>
<td>Data sources</td>
<td></td>
</tr>
<tr>
<td>Modular form factor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Use case</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Constrained Environment:
- Data sources: Factory, Warehouse, Point-of-Sale, military base
- Infrastructure Owner: Cloud provider
- Enterprise

Traditional IT:
- Cloud: 1000's of racks
- Core: 100's of racks
- Near Edge: <10 of racks
- Far Edge: <0.5 of racks
- Functional Edge: Modular form factor, Single Use case

Distance:
- Cloud: 500-1500 km
- Core: 50-1000 km
- Near Edge: 5-20 km
- Far Edge: 0 – 5 km
- Functional Edge: <0.5 km

Response Time:
- Cloud: >50-150 ms
- Core: >20-60 ms
- Near Edge: <10-25 ms
- Far Edge: <2 ms
- Functional Edge: < 2 ms
Edge Locations and Distributed Workloads
Workloads

OT Network
FAR EDGE
Data Ingestion, streaming, production control, HMI, local feedback and control.

Edge Workloads
Unstructured (Video & Telemetry)

Streaming Workloads

Safety, security, environmental constraints

IT Network
NEAR EDGE
Plant level management
Batch processing, inferencing

Mix
IT / Edge Workloads
Structured and Unstructured

Streaming Workloads
Batch Workloads
Data Reduction

Cloud/DC
Cloud/DC
Multi-Site management, Monitoring, Analytics, Deep Learning, BI

Mix
IT / Cloud Workloads
Structured and Unstructured

Streaming Workloads
Batch Workloads

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Analytics and AI Considerations

John Kim
Traditional Analytics and AI

- All data collected and processed in the data center or cloud
- Compute power, storage, analytics all centralized
- High bandwidth, low latency, straightforward security

![Diagram showing data collection from devices, external data, other data centers, and cloud to the core data center with analytics, insight, results, and output users. The diagram includes a firewall and edge data sources.]
The Challenge of the Edge for AI and Analytics

- More data generated or collected
- People/devices need to use that data at the Edge
- Latency to send data to core, process it, and send back
- Greater security risks/exposure
Analytics and AI Considerations

- Move compute/storage at Edge
  - Move compute closer to data sources/users
  - Pre-process data to send less of it
- Updated AI paradigm is Distributed
  - Train models in the core or the cloud
  - Deploy updated models at the edge
  - Inference at near, far or functional edge
- Other Solutions at the Edge
  - Accelerators
  - Computational storage
Governance, Security & Privacy Overview

David McIntyre
Governance, Security and Privacy: The Current Threat Landscape

- Social Engineering
- Advanced Persistent Threat (APT)
- Ransomware/Malware
- Unpatched/Updated Systems
- Security Misconfiguration
- Denial of Service
- Sensitive Data Exposure
- Injection Flaws
- Cryptojacking
- Cyber Physical Attacks
- Broken Authentication
- Broken Access Control
- Third Party (Supplier)
- Insider Theft
- Mobile Malware
- Physical Loss of Devices
- Cross-site Scripting (XSS)
- Man-in-the-Middle Attacks
- IoT Weaponization
Common Threat Actors

- Cyber Terrorists
- Government-sponsored/State-sponsored Actors
- Organized Crime/Cybercriminals
- Hacktivists
- Insiders
- Script Kiddies
- Internal User Errors

Common Motivations

- Political, Economic, Technical, and Military Agendas
- Profit/Financial Gain
- Notoriety
- Revenge
- Multiple/Ov

Security is a People Problem!
Expanding Regulations for Security and Privacy

**Privacy:**
- Collection Limitations
- Data Quality, Purpose
- Specification, Use
- Limitation, Security
- Safeguards, Openness
- Individual Participation
- Accountability

**Personal Data Protection**
- Safeguards applying under various laws and regulations to personal data (PII, PHI, etc.) about individuals that organizations collect, store, use and disclose

**Ethics**
- Moral principles that govern Person’s behavior or the conducting of an activity

**Information Security**
- Ensures Confidentiality, Integrity, and Availability (CIA) of information

**Cybersecurity**
- Confidentiality, Integrity, and Availability of data; Identify, Protect, Detect, Respond, Recover
Security Considerations by Cloud Service Providers

- Notable Cloud Service Provider Security Policy Categories
  - Data-in-flight
  - Processing requirements in data handling
  - Buffering and caching
  - Data-at-rest policies
  - Containers
  - Virtualization
  - Multi-tenant
  - Edge deployments with computational storage processing
Computational Storage and Security

- Computational Storage provides improved application performance but with new security challenges
  - Data at rest
  - Processed data
  - CSD to host data

- Cloud Service Provider data security policies need to be supported
- Hybrid cloud deployments need to address security concerns
  - On-premise with CSP
- SNIA is defining a computational storage architecture specification with security in mind.
- Join the SNIA Computational Storage TWG and a support a secure CS solutions ecosystem!
Summary and Q&A

- Location - Latency & Data Integration Points
- Processing - Data Reduction Points
- Security - Many Overlapping / Competing Priorities
Storage Life on the Edge is a Series!

“Storage Life on the Edge: Edge Storage Use Cases”

March 22, 2022
10:00 am PT / 1:00 pm ET

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