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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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industry leading
organizations

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

STORAGE LIFE ON THE EDGE

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Data and Compute Pressure Points Supporting Edge Workloads

Dan Cummins

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Data Drivers Making Edge <u>Necessary</u>

Data intensity

Time to insight

Control actuation
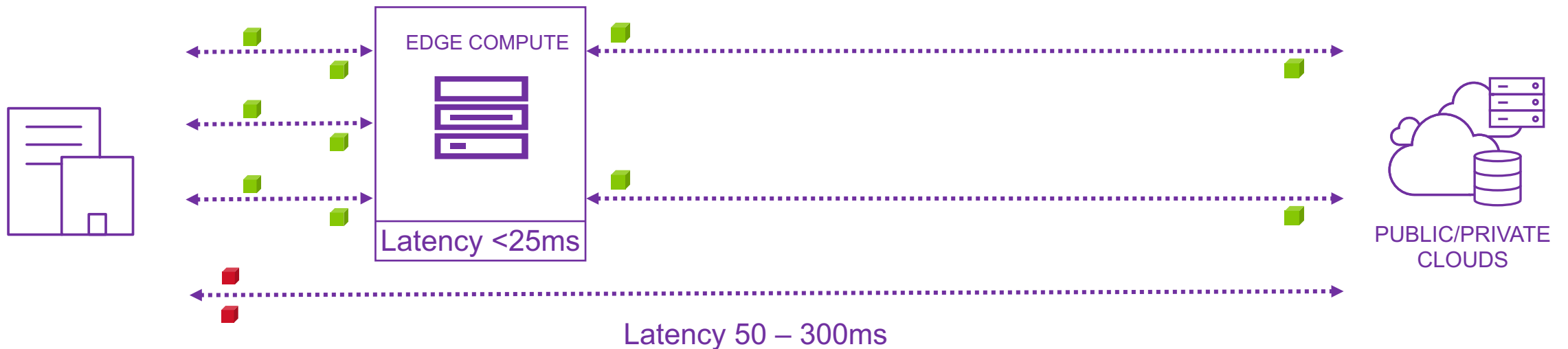
Data security

System autonomy
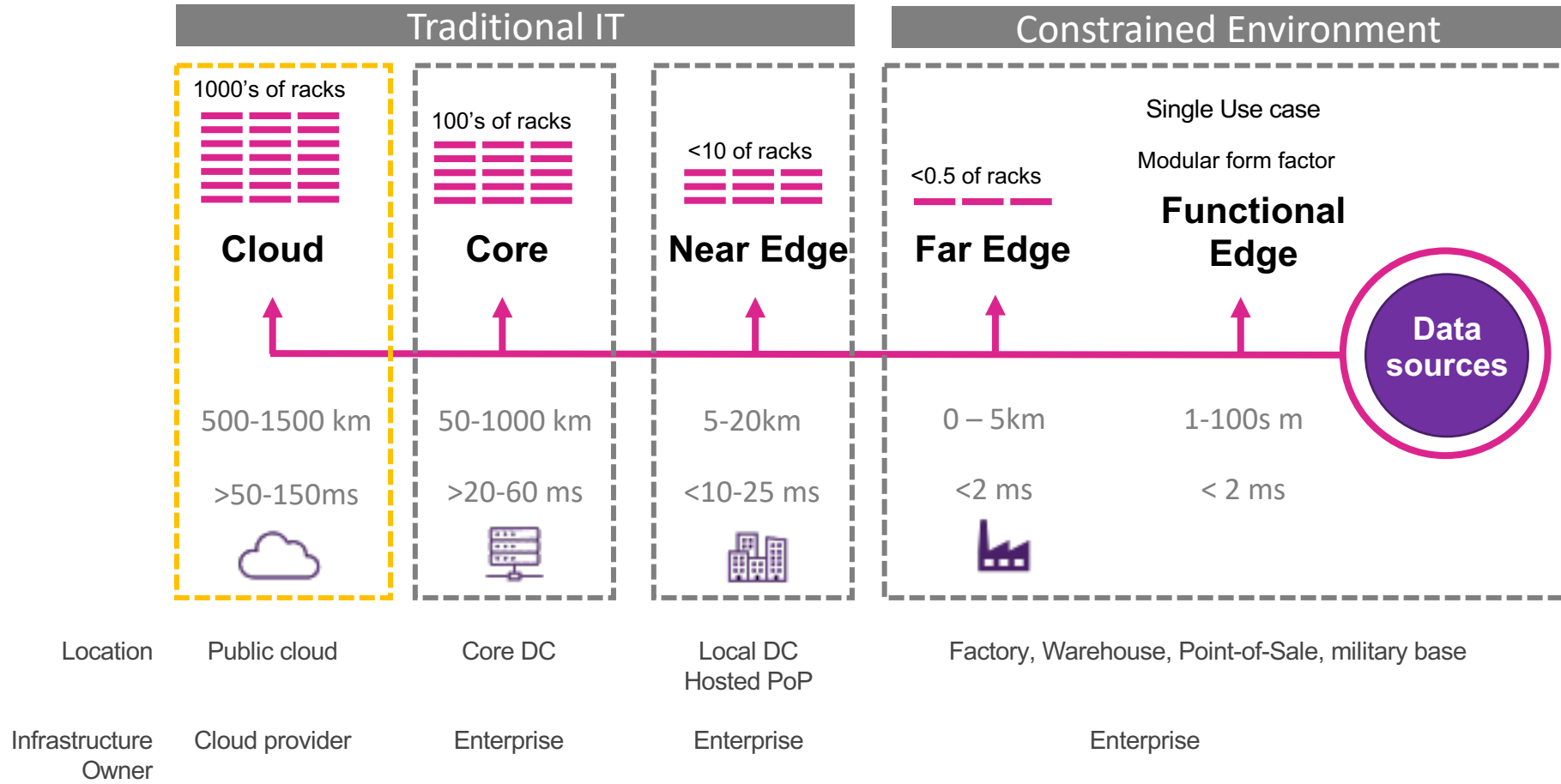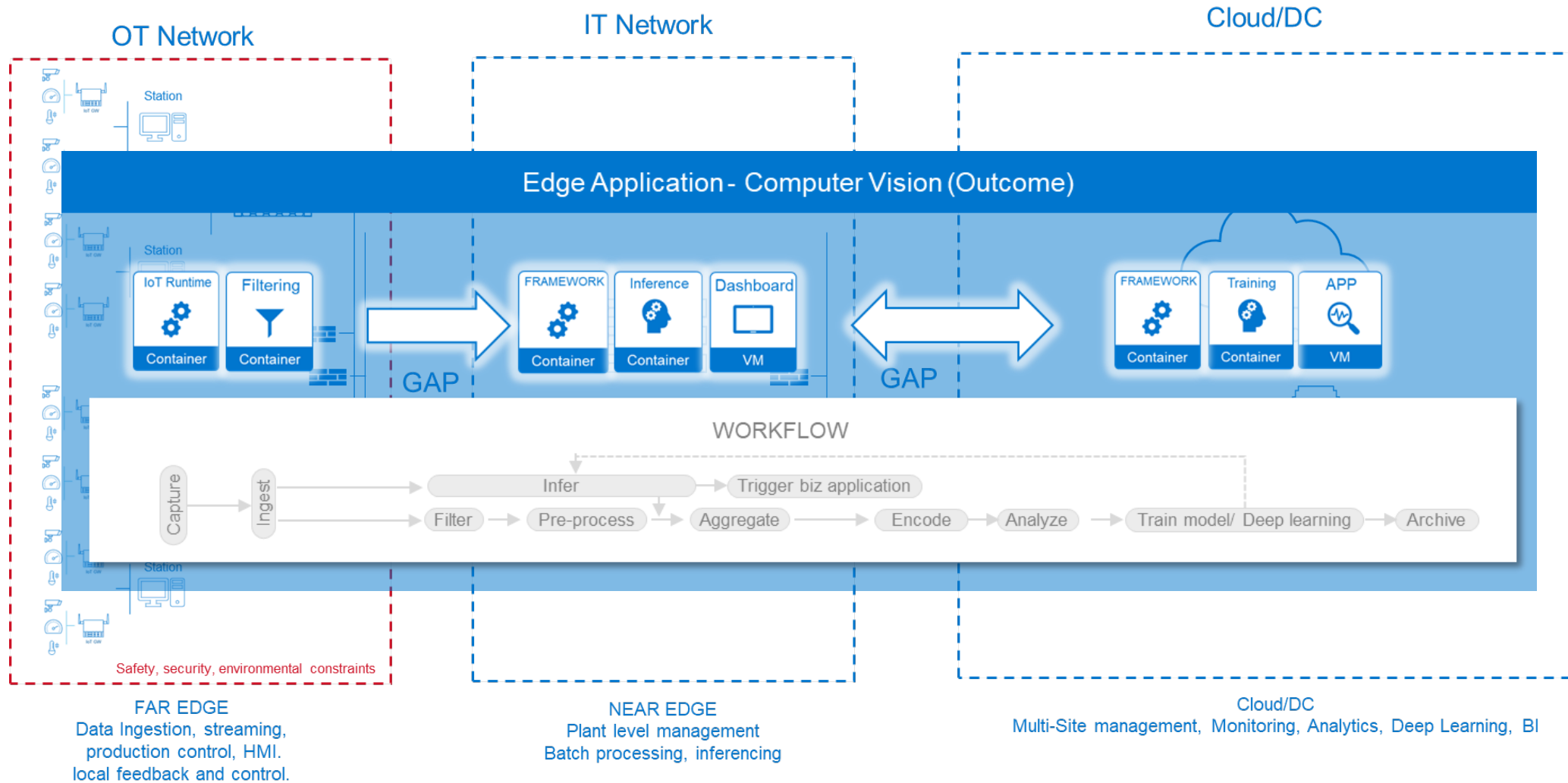
Edge requires a move from Centralized to Massively distributed architectures

EDGE COMPUTE

Latency <25ms

PUBLIC/PRIVATE CLOUDS

Latency 50 – 300ms

Edge Taxonomy

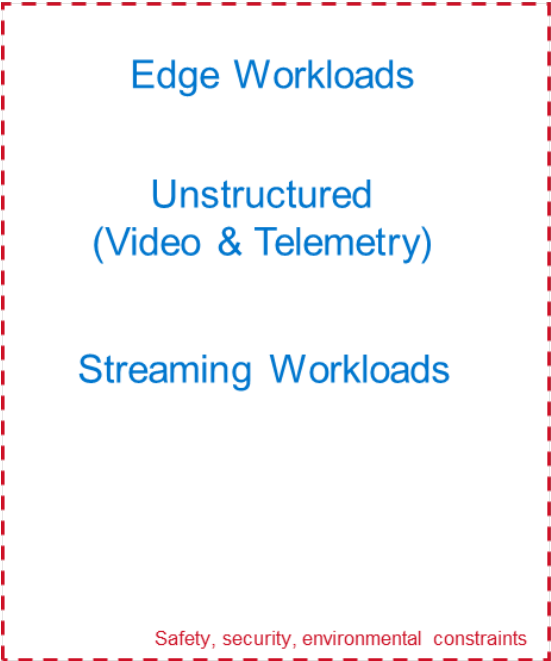|	Traditional IT			Constrained Environment	
	1000's of racks	100's of racks	<10 of racks	<0.5 of racks	Single Use case / Modular form factor
	Cloud	**Core**	**Near Edge**	**Far Edge**	**Functional Edge**
	500-1500 km	50-1000 km	5-20km	0 – 5km	1-100s m
	>50-150ms	>20-60 ms	<10-25 ms	<2 ms	< 2 ms
Location	Public cloud	Core DC	Local DC Hosted PoP	Factory, Warehouse, Point-of-Sale, military base	
Infrastructure Owner	Cloud provider	Enterprise	Enterprise	Enterprise	

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Edge Locations and Distributed Workloads

Workloads

OT Network

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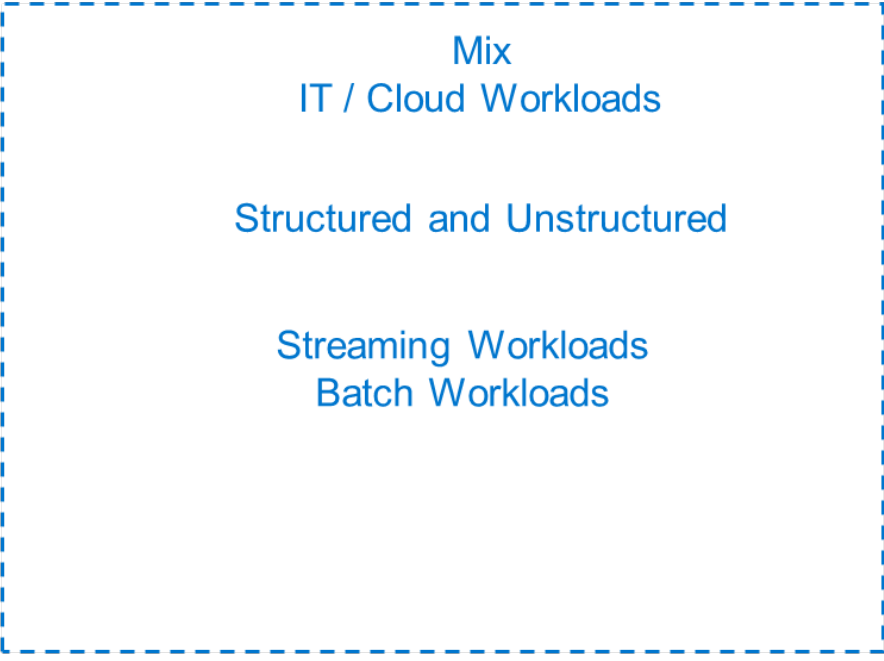local feedback and control.

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
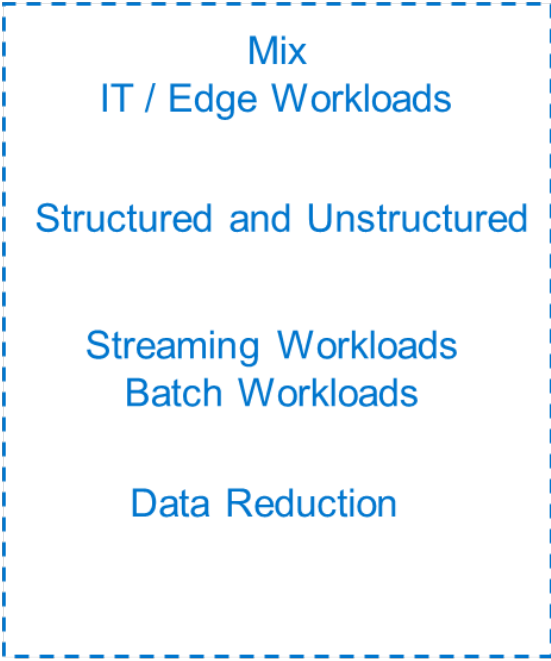
Cloud/DC

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

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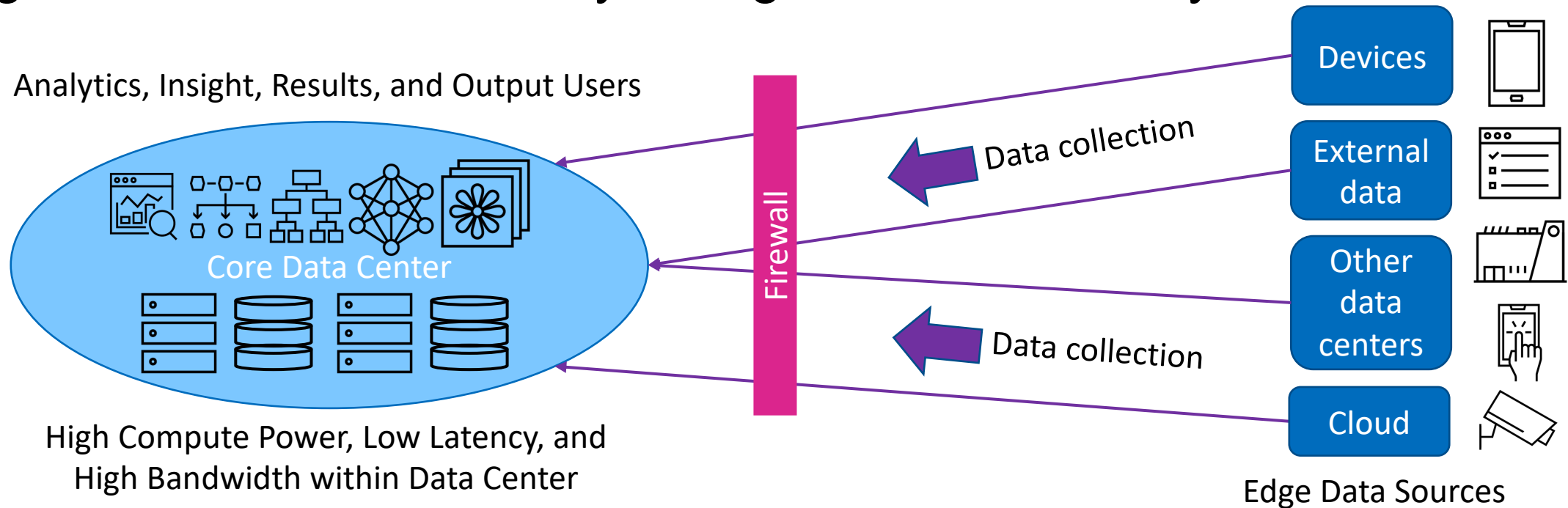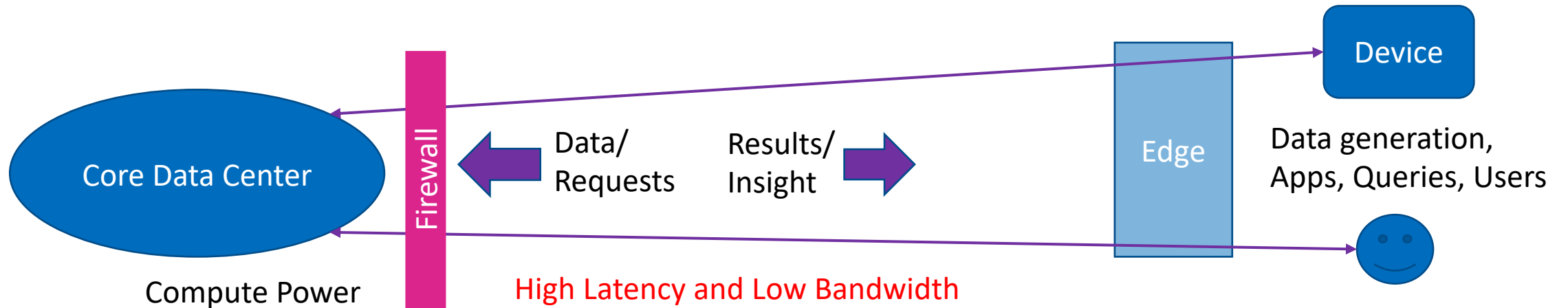
Traditional Analytics and AI

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

Analytics, Insight, Results, and Output Users

Core Data Center

Firewall

Data collection

Data collection

Devices

External data

Other data centers

Cloud

Edge Data Sources

High Compute Power, Low Latency, and High Bandwidth within Data Center
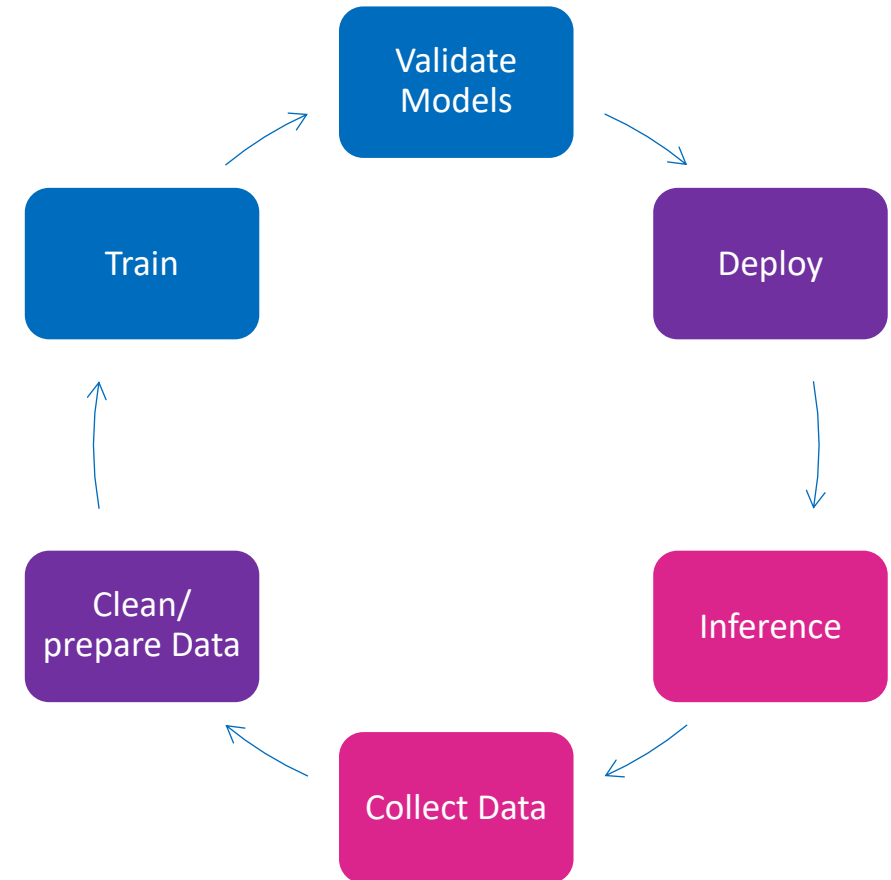
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The Challenge of the Edge for AI and Analytics

- 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

Core Data Center

Firewall

Data/Requests ← Results/Insight →

Edge

Device

Data generation, Apps, Queries, Users

Compute Power

High Latency and Low Bandwidth

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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

Validate Models → Deploy → Inference → Collect Data → Clean/prepare Data → Train → Validate Models

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Governance, Security & Privacy Overview

David McIntyre

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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

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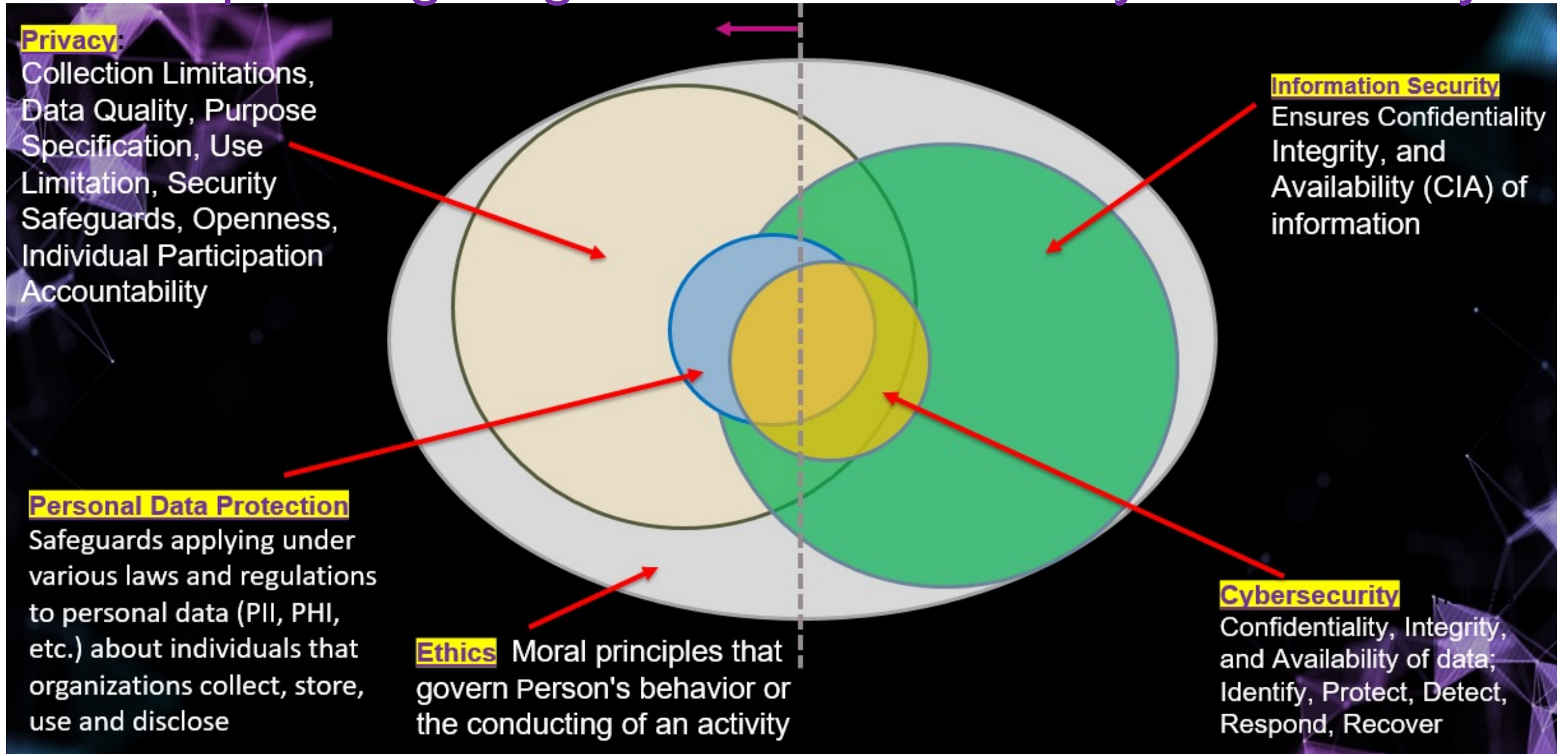
Common Threat Actors

- 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!

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Expanding Regulations for Security and Privacy

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

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

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

Cybersecurity Confidentiality, Integrity, and Availability of data; Identify, Protect, Detect, Respond, Recover

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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

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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

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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

Register here: https://bit.ly/SNIAEdgePanel

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Thank You

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