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Storage Scalability in Hybrid Cloud and Multicloud Environments

Live Webcast

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Today's Presenters

Pekon Gupta
Solutions Architect
SMART Modular

Rob Cone
Senior Principal Engineer
Intel

Piyush Chaudhary
Senior Technical Staff Member
IBM

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SNIA-At-A-Glance

185
industry leading
organizations

2,000
active contributing
members

50,000
IT end users & storage
pros worldwide

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What We Do

Educate vendors and users on cloud storage, data services and orchestration

Support & promote business models and architectures: OpenStack, Software Defined Storage, Kubernetes, Object Storage

Understand Hyperscaler requirements Incorporate them into standards and programs

Collaborate with other industry associations

Agenda

- Hybrid Cloud Multicloud Environments
  - Different ways to leverage the cloud
  - Data placement across multiple clouds
  - Examples of Microservices in the cloud
- Hybrid Cloud Multicloud Storage Requirement
  - Multi-cloud storage scaling
  - Security and data protection
  - Managing complexity
  - Data virtualization

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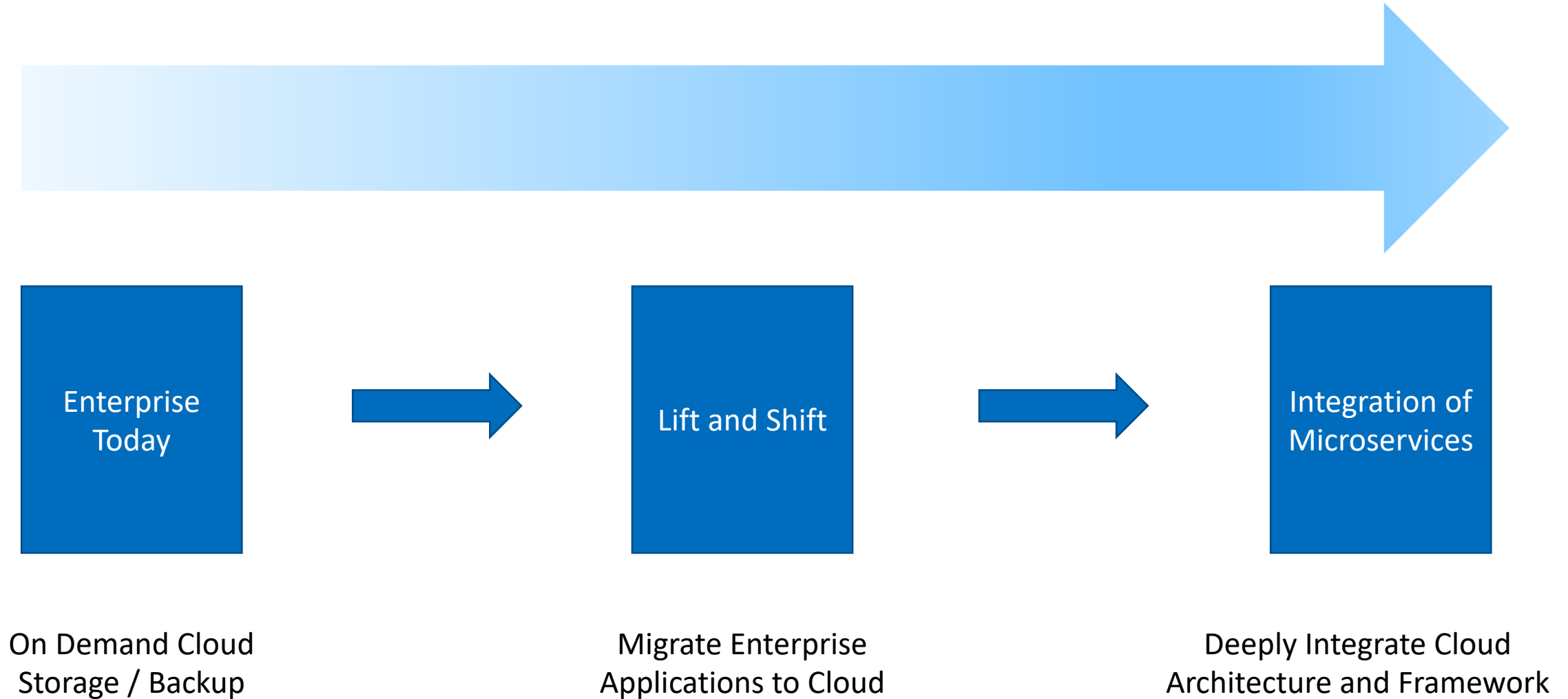
Digitally Transform - Today

60%

of global GDP will be digitized by 2022, with growth in every industry driven by digitally enhanced offerings[1]
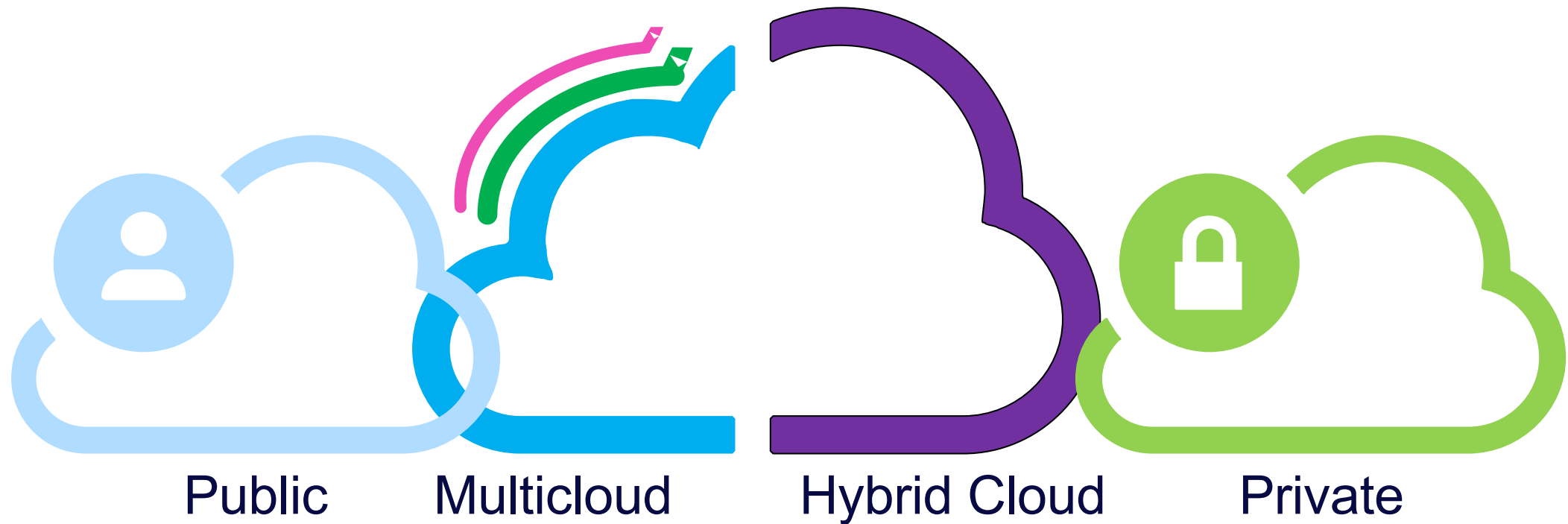
Rapid, disruptive change is the new normal. Laying a modern foundation is critical and storage is a major part of this transition

1. IDC 2019 Predictions (https://www.forbes.com/sites/louiscolumbus/2018/11/04/idc-top-10-predictions-for-worldwide-it-2019/#6773bf767b96),

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Different Ways to Leverage Cloud

Enterprise Today		Lift and Shift		Integration of Microservices
On Demand Cloud Storage / Backup		Migrate Enterprise Applications to Cloud		Deeply Integrate Cloud Architecture and Framework

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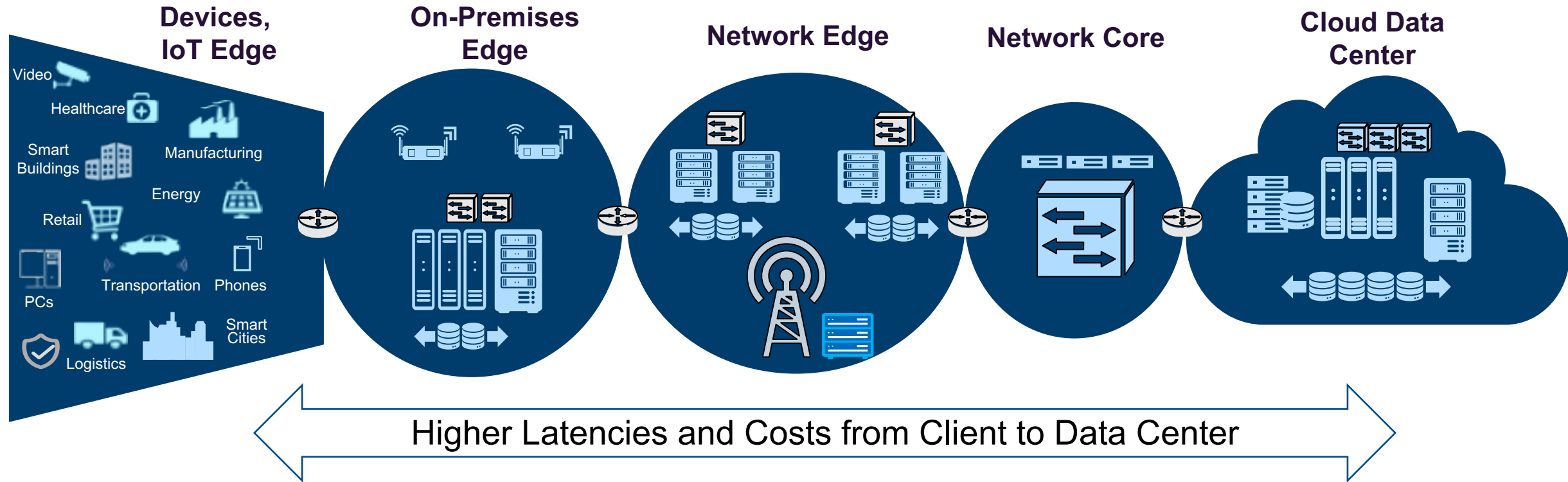
Multiple Clouds Drive Business Success

Public · Multicloud · Hybrid Cloud · Private

Cloud architecture is the most efficient and agile computing solution, regardless of where it is deployed.

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Applications are Being Re-Architected

Devices, IoT Edge — Video, Healthcare, Smart Buildings, Manufacturing, Energy, Retail, Transportation, Phones, PCs, Logistics, Smart Cities

On-Premises Edge

Network Edge

Network Core

Cloud Data Center

Higher Latencies and Costs from Client to Data Center

The cost of data movement, latency and functionality determines where data is placed

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Hybrid/Multicloud Overview

How do I manage this complexity?

Running Web Apps

Running CRM

Running ERP

Running Inference
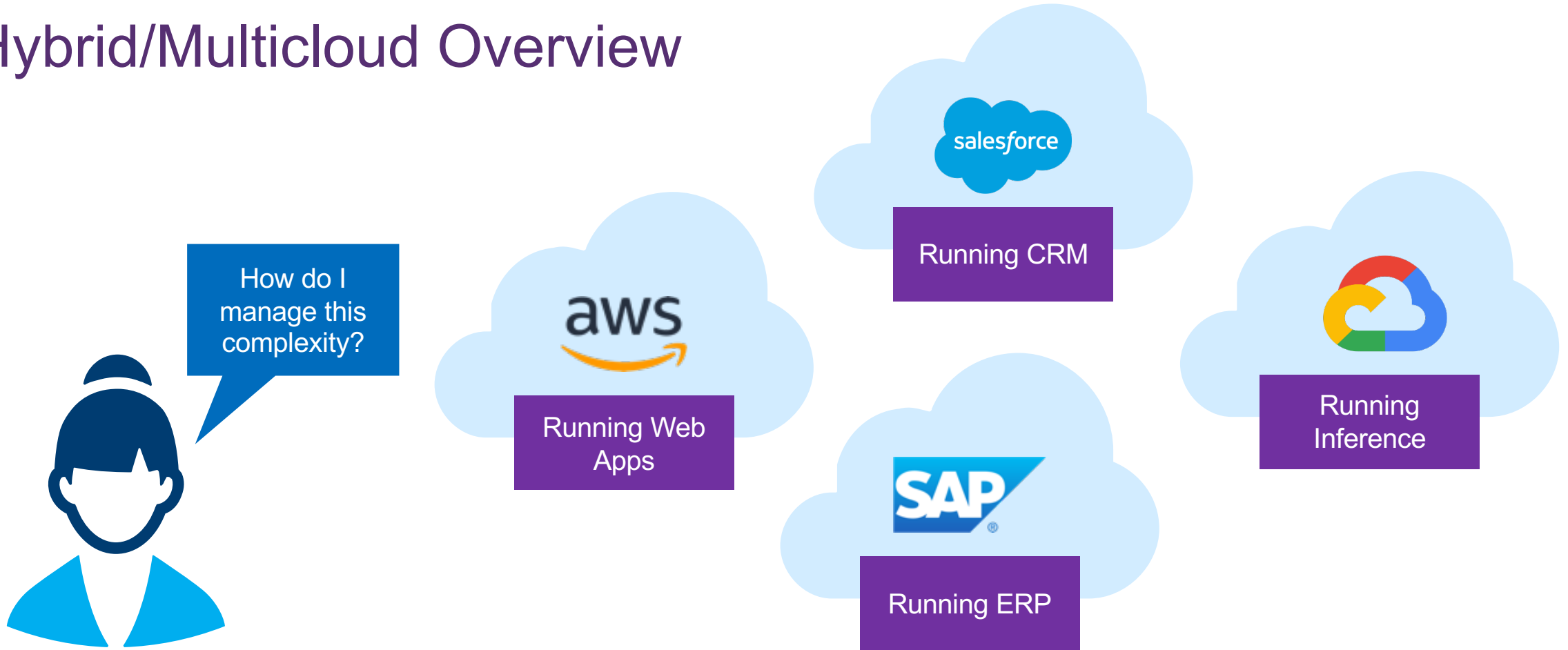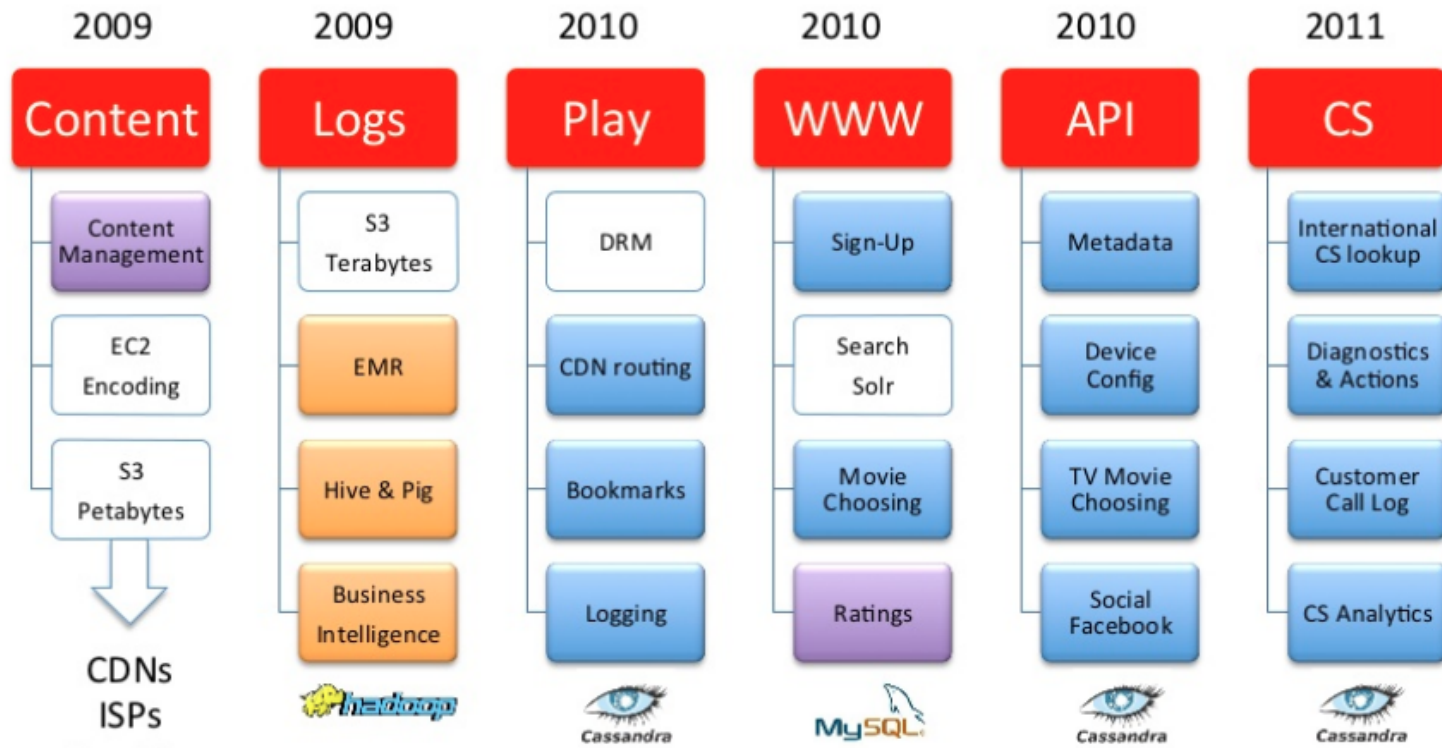
The ability to use multiple CSP can help further optimize enterprise solutions, but at a cost of complexity

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Netflix Transition from Optical Disk to Largest Hybrid Cloud

Netflix Apps

Content Cache

Content Management and Netflix Studios

https://openconnect.netflix.com/Open-Connect-Overview.pdf
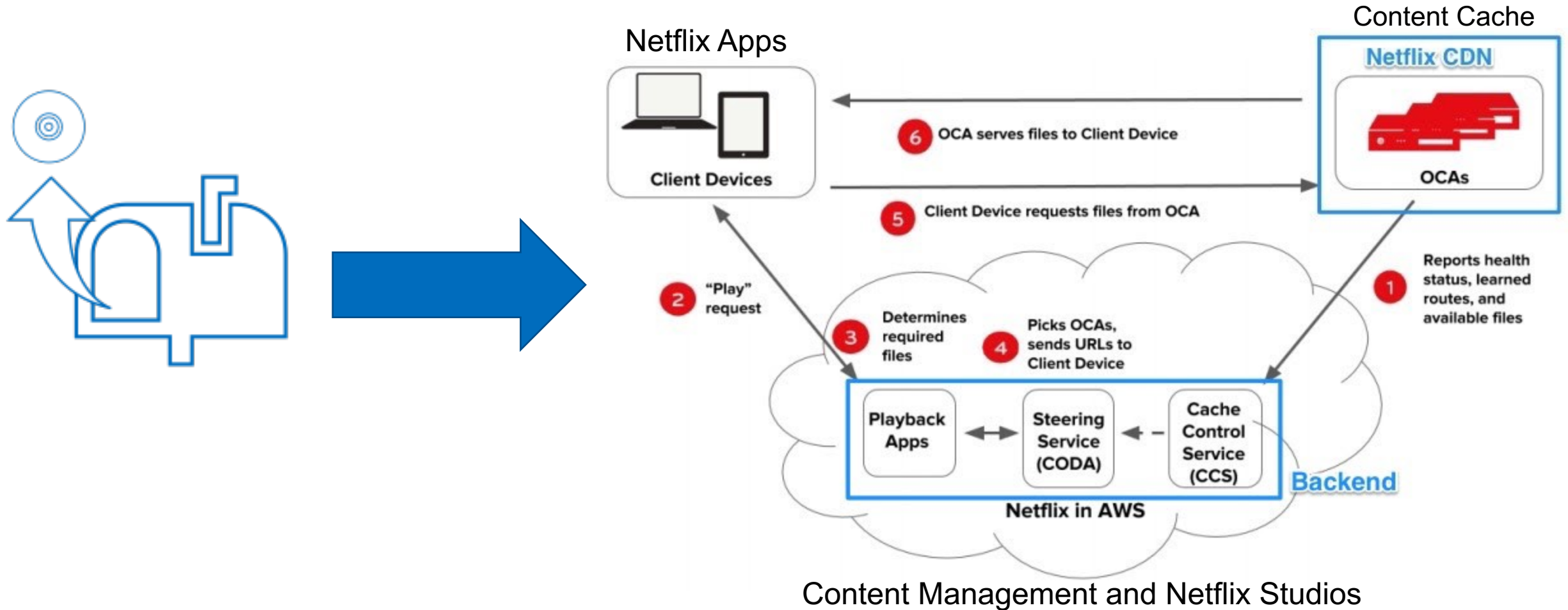
Netflix Use of Hybrid SW Evolution

2009 Content
- Content Management
- EC2 Encoding
- S3 Petabytes
- CDNs ISPs

2009 Logs
- S3 Terabytes
- EMR
- Hive & Pig
- Business Intelligence
- hadoop

2010 Play
- DRM
- CDN routing
- Bookmarks
- Logging
- Cassandra

2010 WWW
- Sign-Up
- Search Solr
- Movie Choosing
- Ratings
- MySQL

2010 API
- Metadata
- Device Config
- TV Movie Choosing
- Social Facebook
- Cassandra

2011 CS
- International CS lookup
- Diagnostics & Actions
- Customer Call Log
- CS Analytics
- Cassandra
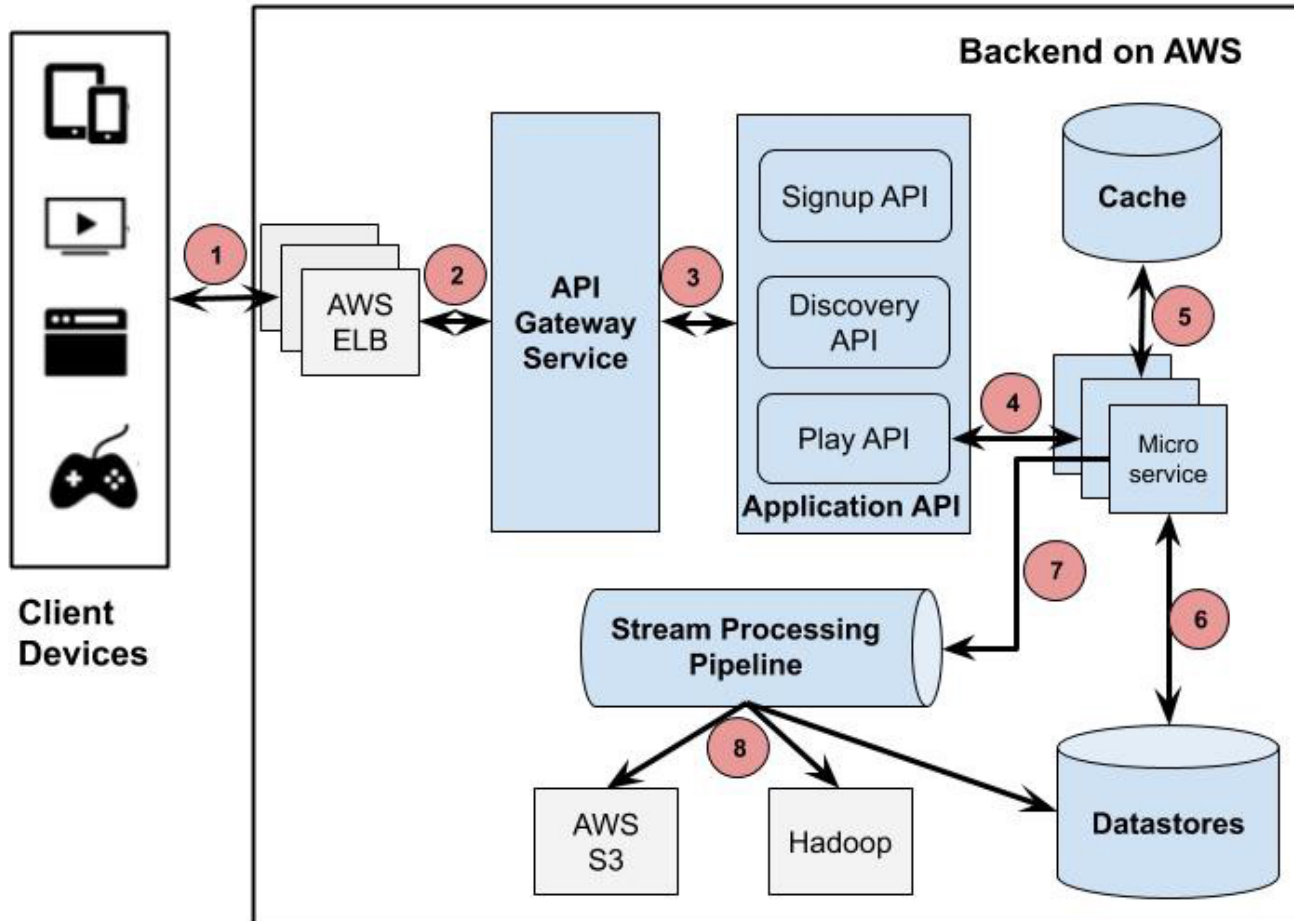
Multiple Years to rewrite their SW and fully migrate to cloud

Built on microservices to allow them independent development

https://netflixtechblog.com/tagged/cloud-architecture

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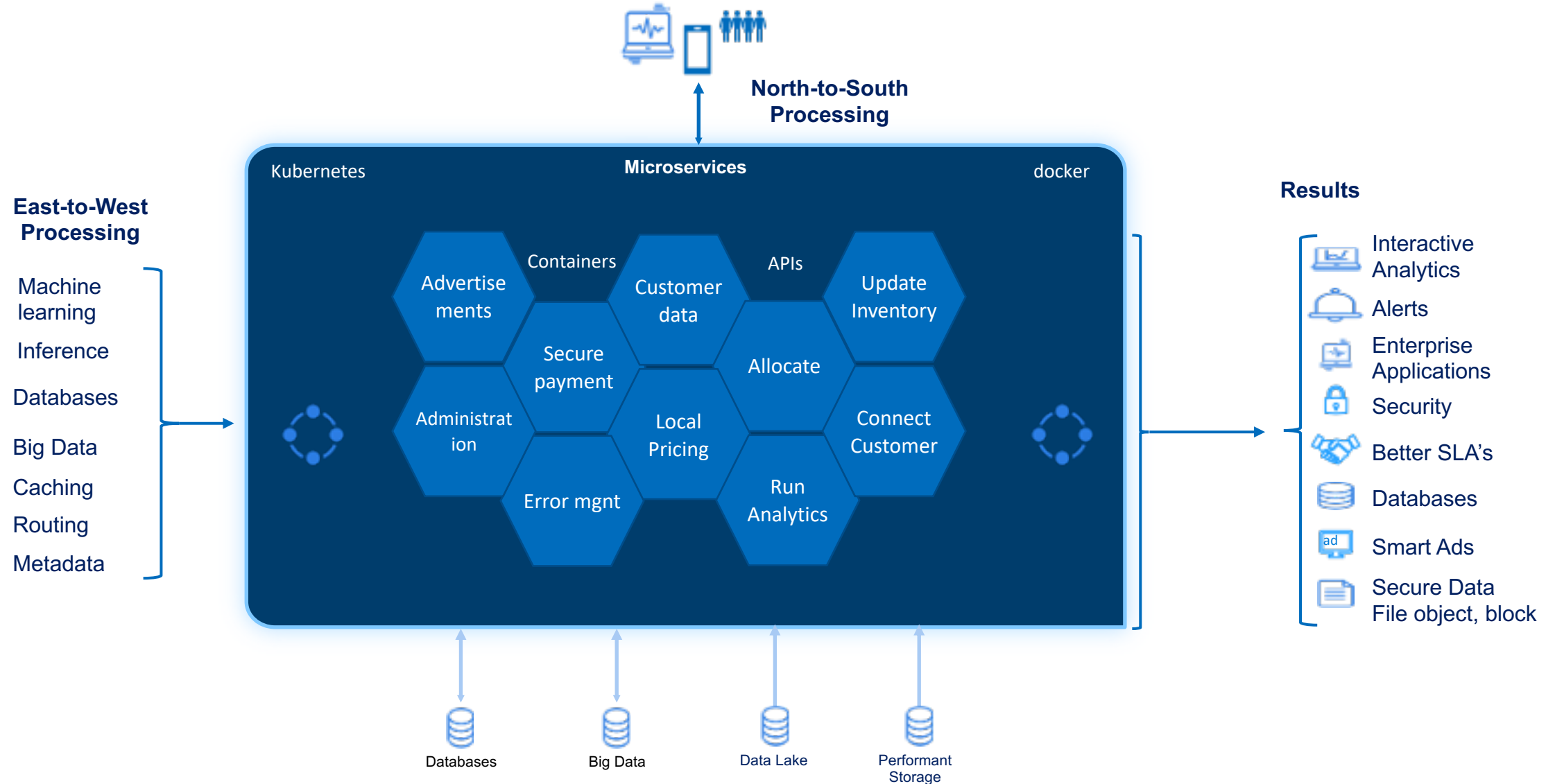# Netflix Hybrid Built on Microservices

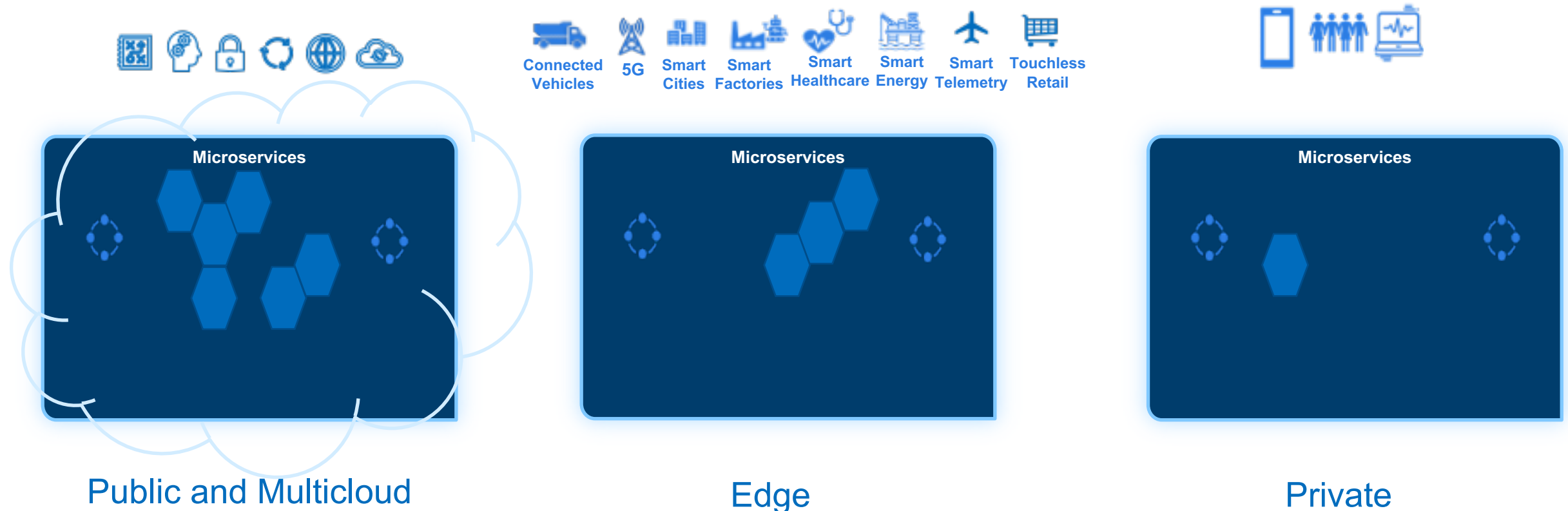Purpose built API's allow Microservices to change without effecting each other.

Each microservices access and uses data in a variety of mechanism
- S3, Hadoop, Rocksdb, etc

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Generic Example - Microservices Building Blocks

North-to-South Processing

Microservices

Kubernetes

docker

East-to-West Processing

- Machine learning
- Inference
- Databases
- Big Data
- Caching
- Routing
- Metadata

Containers

APIs

- Advertisements
- Customer data
- Update Inventory
- Secure payment
- Allocate
- Administration
- Local Pricing
- Connect Customer
- Error mgnt
- Run Analytics

Results

- Interactive Analytics
- Alerts
- Enterprise Applications
- Security
- Better SLA's
- Databases
- Smart Ads
- Secure Data File object, block

Databases

Big Data

Data Lake

Performant Storage

https://developer.ibm.com/tutorials/cl-ibm-cloud-microservices-in-action-part-1-trs/

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Generic Example - Multicloud Architecture with Microservices

Connected Vehicles · **5G** · **Smart Cities** · **Smart Factories** · **Smart Healthcare** · **Smart Energy** · **Smart Telemetry** · **Touchless Retail**

Microservices

Microservices

Microservices

Public and Multicloud

Edge

Private

Modularity allows for better placement and efficiency of microservices to provide better SLA's

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Multi-cloud storage scaling

API driven deployments improve speed and developer productivity

Reduces time-to-solution and allows for rapid innovation

As storage capacity scales so does the need for performance

Applications need hundreds of GB/s and millions of IOPs of filesystem performance

Public clouds can provide on-demand nearly unlimited scaling

Customers already need Exabyte+ capacity and 1+ million volumes

Cloud deployments provide infrastructure agility

Allows rapid deployment, scaling and de-commissioning of storage

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Enterprise Applications Need an Ecosystem

Native encryption & secure erase

Agile deployment & elasticity

Backup & archive

Movement of data

Enterprise Applications

Authentication, authorization & audit

Data ingest & egress

Regulatory compliance

Compute & data workflows

Data privacy

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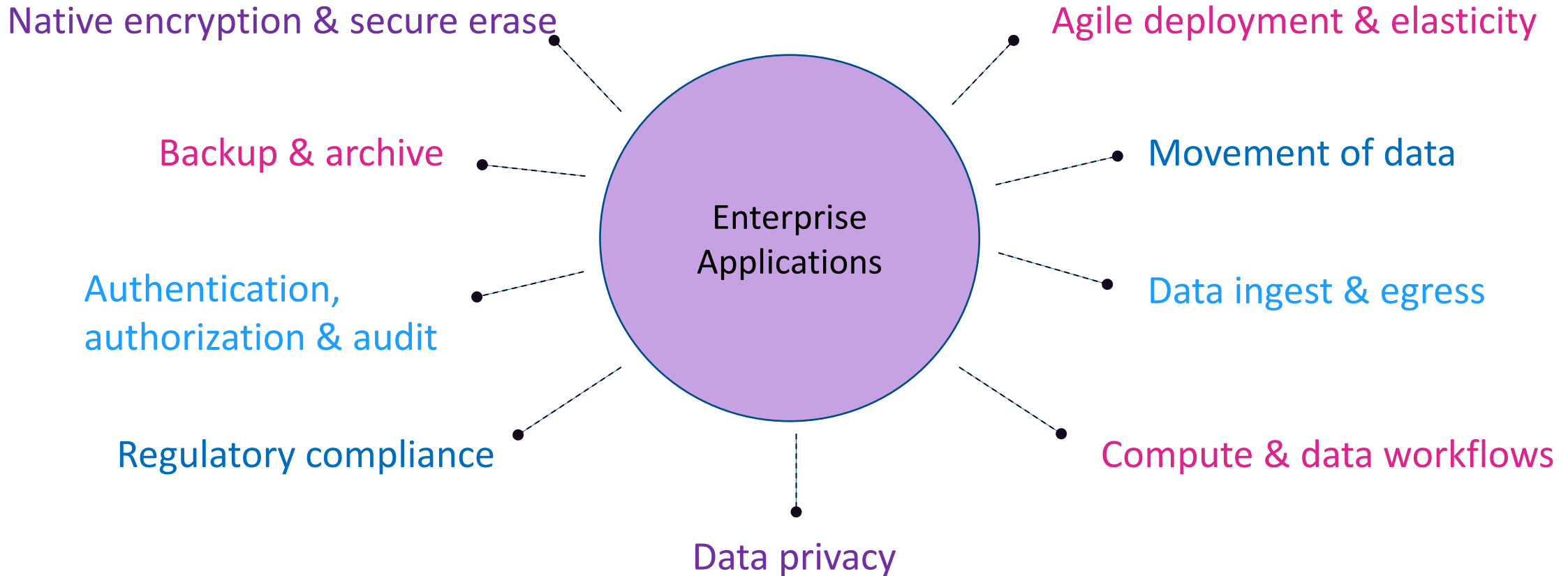
Storage Requirements in a Hybrid Multicloud

- Security
  - Authentication
  - Authorization
  - Audit

- Data Protection
  - Data-at-rest
  - Data-in-motion
  - Secure erase

There is a need to extend trust beyond the confines of a single application or data center. Guaranteeing security and data protection in a hybrid multi-cloud needs strong open standards and collaboration.

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Storage Requirements in a Hybrid Multicloud

- **Data Privacy**
  - European General Data Protection Regulation (GDPR)
  - California Consumer Privacy Act (CCPA)

- **Backup & Archive**
  - Replication is **not** backup
  - Needs to address regulatory requirements
  - Immutability and WORM

Data privacy cannot be an afterthought anymore. Its at the forefront of customers' requirements and CSPs and storage solutions need to address this urgently.

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Data Workflow Automation for Hybrid Multiclouds

- **Deploy an enterprise data plane across the hybrid multicloud infrastructure**
  - Ensure requisite data is available when needed with appropriate security
  - Apply enterprise policies across all storage infrastructure

- **Need to automate the movement of data between on-premises and clouds**
  - Must account for data gravity
  - Proper safeguards needed for security and egress costs

- **Needs to be integrated into compute workflows**
  - Simulation, HPC, technical computing
  - Analytics, artificial intelligence

How to Manage All this Complexity?

- **Service catalogs**
  - Curated services and APIs approved for use within an enterprise
  - Ensures security and compliance requirements are met while improving agility
  - Hides complexity and delegates authority to business units

- **CSI & storage operators**
  - Enterprises are adopting container platforms aggressively
  - Container Storage Interface (CSI) provides a unified storage interface for various Container Orchestrator Systems (COs)
  - Storage operators can automate the deployment and interaction with the CSI drivers
  - Automate the provisioning, backup, cloning, snapshots, grow and shrink volumes, etc.

Data Virtualization

Data virtualization is an approach to data management that allows an application to retrieve and manipulate data without requiring technical details about the data, such as how it is formatted at source, or where it is physically located, and can provide a single customer view (or single view of any other entity) of the overall data. -- Wikipedia (link)

- Data gravity dictates that data isn't moved if possible
- Composable applications are given access to data as needed
- Workload is pushed to where data is stored
- Minimizes data copies and the resulting entropy
- Preserves a single "source-of-truth" for the enterprise

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Summary

- Cloud infrastructure provides the agility, flexibility and scaling needed to meet the explosive storage growth requirements
- Data security, data privacy and data protection concerns are inhibiting the adoption of hybrid multicloud deployments by enterprise applications
- Extension of the enterprise on-premises data plane to the multicloud should eliminate barriers for broader adoption of hybrid multicloud infrastructure by complex enterprise workflows
- Service catalogs and data virtualization can be key tools to deal with the complexity of hybrid multicloud infrastructure
- Investing in microservices can help optimize workloads, gain better efficiency in a multicloud environment.

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SNIA Resources

- Webcasts:
- [Kubernetes in the Cloud (Part 1)](#)
- [Kubernetes in the Cloud (Part 2)](#)
- [Kubernetes in the Cloud (Part 3) Stateful Kubernetes](#)

- Upcoming Webcast: June 23, 2020: [A Multi-tenant Multi-cluster Kubernetes Datapocalypse is Coming](#)

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Thank you!

Q & A

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