Kubernetes is Everywhere — What About Cloud Native Storage?

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Today’s Presenters

Alex McDonald
Independent Consultant
Chair, SNIA Cloud Technologies Initiative

Nick Connolly
Chief Scientist
DataCore Software

Michael St-Jean
Senior Principal Marketing Manager
Red Hat Hybrid Platforms

Pete Brey
Global Product Executive
IBM
SNIA - By the Numbers

Industry Leading Organizations: 180
Active Contributing Members: 2,500
IT End Users & Storage Pros Worldwide: 50,000
SNIA CSTI Cloud Storage Technologies

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
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Topics

- Quick Kubernetes Overview
- Quick Overview of Persistent Storage
- Discussion
Digital Transformation

- Desire for faster innovation
- There is a need for
  - Scalability
  - Flexibility
  - Consistency
- The world is becoming software defined!
  - Infrastructure modernization
  - Application modernization
  - Cloud native
Modernization

Infrastructure

- Physical Infrastructure
  - Hardware is a ‘permanent’ asset
  - Keep it running at all costs

- Virtual Infrastructure
  - Platform is a virtual machine
  - Automated deployment, snapshots

- Ephemeral Infrastructure
  - Declarative - Infrastructure as Code
  - Immutable infrastructure

Application

- Traditional environment
  - Monolithic application
  - Shared system resources

- Virtualized environment
  - Private system resources

- Containerization
  - Resource partitions
  - Microservices

- Kubernetes
Cloud Native

Cloud native technologies empower organizations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds. Containers, service meshes, microservices, immutable infrastructure, and declarative APIs exemplify this approach.

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.

Source: CNCF Cloud Native Definition v1.0
Cloud Native Storage

- **Attributes**
  - Availability, Scalability, Performance, Consistency, Durability, Deployment

- **Storage Stack**
  - Topology – Centralized, Distributed, Sharded. Hyperconverged
  - Data Protection – RAID (striping, mirrors, parity), Erasure Coding, Replicas
  - Data Services – Replication, Snapshots, Data Reduction, Encryption
  - Physical Layer – SATA/SAS, SSD, NVMe

- **Data Access**
  - Block, Filesystem, Shared Filesystem, Object, Key Value, Databases
  - Volumes, Application API

bit.ly/cncf-storage-whitepaperV2
Broad spectrum of workloads are being deployed in containers and Kubernetes\(^1\)

- **76%** Databases and data cache
- **65%** AI/ML software
- **59%** Web servers
- **58%** Logging and monitoring
- **57%** Data Ingestion, cleansing, and analytics
- **48%** Programming languages and frameworks
- **45%** Application servers
- **25%** Message broker service

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Considerations for container storage
Persistent data platform for Kubernetes

- Containers are ephemeral. Persistent storage provides state for applications
- Orchestration and management
- Static and dynamic provisioning
- Data access modes (RWX, ROX, RWO)
- Data protocols (file, block, object) – support for varied workloads
- Hybrid/multi-cloud support
- Object bucket claims, namespace buckets
- Mixed-media support
- Consistency across infrastructures – public & private cloud, VMs, bare metal
- Delivery models – edge, core, cloud, managed
Considerations for container storage
Business continuity for workloads in Kubernetes

- Data replication
- Recovering from node failures
- Support for multiple failure zones
- Snapshots and clones
- Cluster-aware backup and recovery of data in context with applications
- Disaster recovery
  - Regional failover for site disasters
  - Metro clusters for hardware system failures
- Data migration
Considerations for container storage
Confidentiality, Integrity and Accessibility

- Authentication and authorization
- Policies
- Cluster-level data encryption
- Integrates with key management services
- Volume encryption for isolation between tenants
- Immutability – write once, read many
- Auditing and Compliance
- SEC & FINRA
- GDPR
Considerations for container storage
Confidentiality, Integrity and Accessibility

- Data ingestion
- Preparation, tagging and enhancement
- Search
- Data federation
- Object caching
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Thank You!