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China 2018

Deep Dive: CNCF Storage WG

Quinton Hoole & Xing Yang, Huawei

(based on deck prepared by Alex Chircop, Storage OS)

Storage Landscape White Paper Outline



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- Definition of the attributes of a storage system
- Definition of the layers in a storage solution with a focus on terminology and how they impact the attributes
- Definition of the data access interfaces in terms of volumes and application APIs
- Definition of the management interfaces

White Paper Authors



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Inside a storage solution ...

Storage solutions have ...

- a variety of **interfaces** suitable for different use cases
- **multiple layers** of functionality
- The different components of an overall storage solution impact the **attributes** of a storage system:
 - **Availability**
 - **Scalability**
 - **Performance**
 - **Consistency**
 - **Durability**

Storage Attributes



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Availability	Scalability	Performance	Consistency	Durability
<ul style="list-style-type: none">• Failover• Moving access between nodes• Redundancy• Data Protection	<ul style="list-style-type: none">• Clients• Operations• Throughput• Components	<ul style="list-style-type: none">• Latency• Operations• Throughput	<ul style="list-style-type: none">• Delay to access correct data after a commit• Delay between commit and data being committed to non-volatile store	<ul style="list-style-type: none">• Data protection• Redundancy• Bit-Rot

Instantiation & Deployment



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Instantiation	Description
Hardware	Deployed as hardware solution in a datacenter. This limits the portability of the application and generally means that such systems cannot be deployed in a public cloud environment
Software	Deployed as software components on commodity hardware, appliances or cloud instances. Software solutions tend to be more platform agnostic and can be installed both on-premises as well as cloud environments. Some software defined storage systems can also be deployed as a container and deployment can be automated by an orchestrator .
Cloud Services	Consumed from public cloud providers. Cloud services provide storage services in cloud environments.

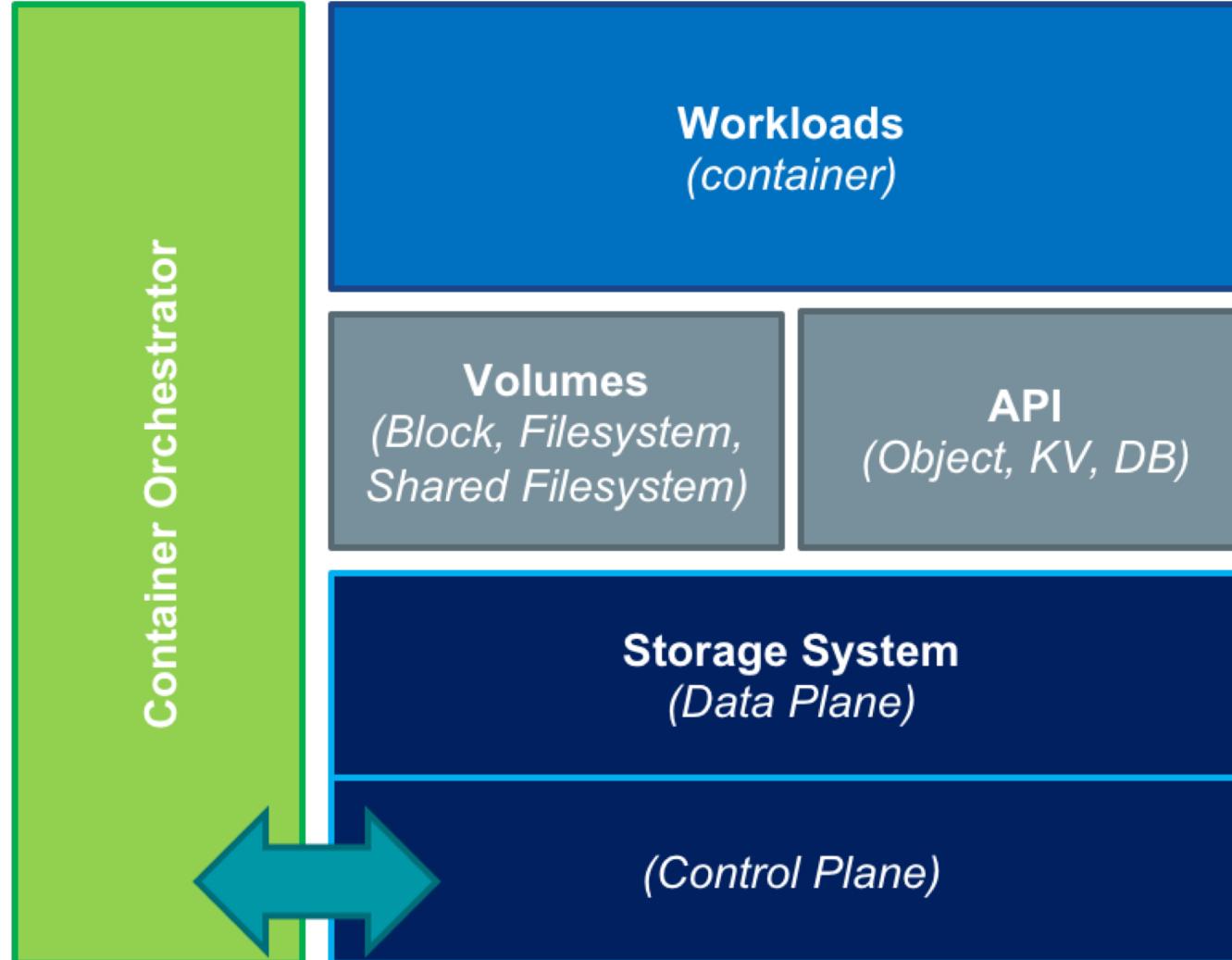
Data Access Interfaces



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Storage can be accessed via **Data Access Interfaces**:

- **Volumes** – accessed through a more traditional file interface in a **block** or **filesystem** interface
- **API** – other ways to persist data such as **object stores**, **KV stores** or **databases**

Storage Layers

Orchestrator, Host and Operating System

Storage Topology

Data Protection

Data Services

Physical and Non-Volatile Layer

Orchestrator, Host and Operating System



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Orchestrator, Host and Operating System

Layers that are overlaid on a Data Access Interface as part of orchestration

Influences

- Availability
- Scalability
- Performance

Volumes: volume managers, bind mounts, overlay filesystems

API: discovery, load balancers, meshes, ingress

Storage Topology



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Storage Topology

Architectures and Topologies of Storage Systems

Influences

- Availability
- Scalability
- Performance
- Consistency

Centralised

Distributed

Sharded

Hyperconverged

Data Protection



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Data Protection

How data is protected through redundancy

Influences

- Availability
- Scalability
- Performance
- Consistency

RAID & Mirrors

Erasure Coding

Replicas

Data Services

Data services which complement the core storage function

Influences

- Availability
- Durability
- Performance

Replication

Snapshots and Clones

Encryption

Physical and Non-Volatile Layer



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Physical and Non-Volatile Layer

Terminology that is often used in both storage products and services

Influences

- Durability
- Performance

Spinning Disk (e.g. SATA, SAS & SCSI)

Solid State Disk

Non Volatile Memory (e.g. NVMe)

Cache (memory & otherwise)

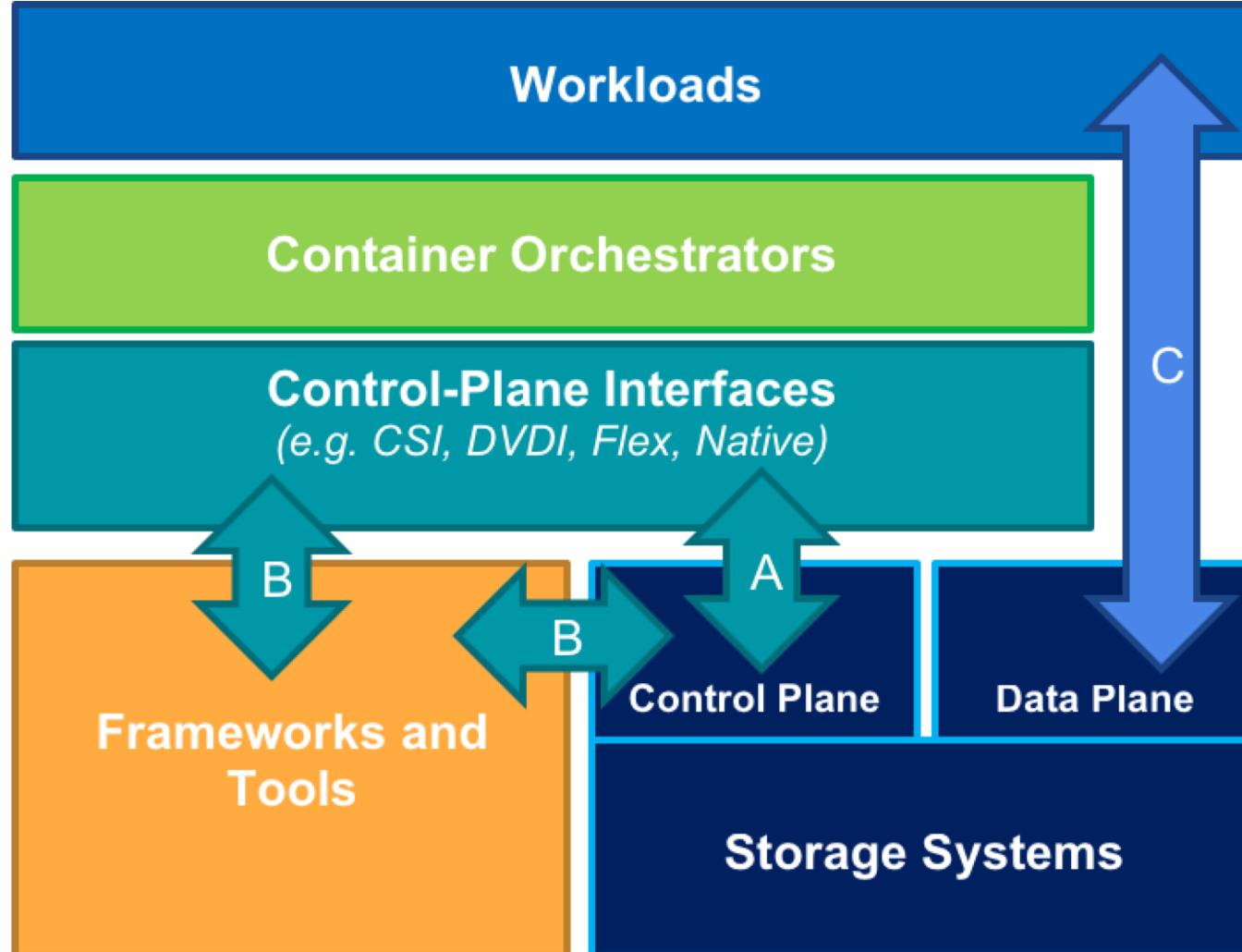
Orchestration and Management Interfaces



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Container Orchestration system (**CO**) uses an interface to interact with a storage system

The storage system can:

- **(A)** support control-plane API directly
- **(B)** interact via an API Framework layer or other Tools

Workloads consume **(C)** storage via a data access interface

Next Steps

- Identify gaps in the landscape white paper
- Final paper complete by KubeCon Seattle
- Investigate and publish case studies on how storage is used in the real world
- Solicit feedback from audience on what they want to see from this WG

Other sessions while you are at Kubecon

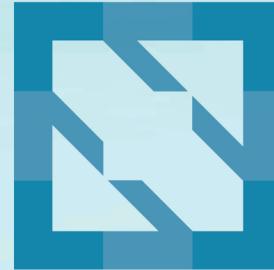


- Protecting Stateful Workloads with CSI Snapshot – Jing Xu and Xing Yang
- Intro: CNCF Storage WG – Quinton Hoole and Xing Yang
- Running Vitess on Kubernetes at Massive Scale: JD.com Case Study – Jiten Vaidya and Xin Lv
- Intro: Rook - Jared Watts
- Deep Dive: Rook - Jared Watts

Questions?



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THANK YOU

