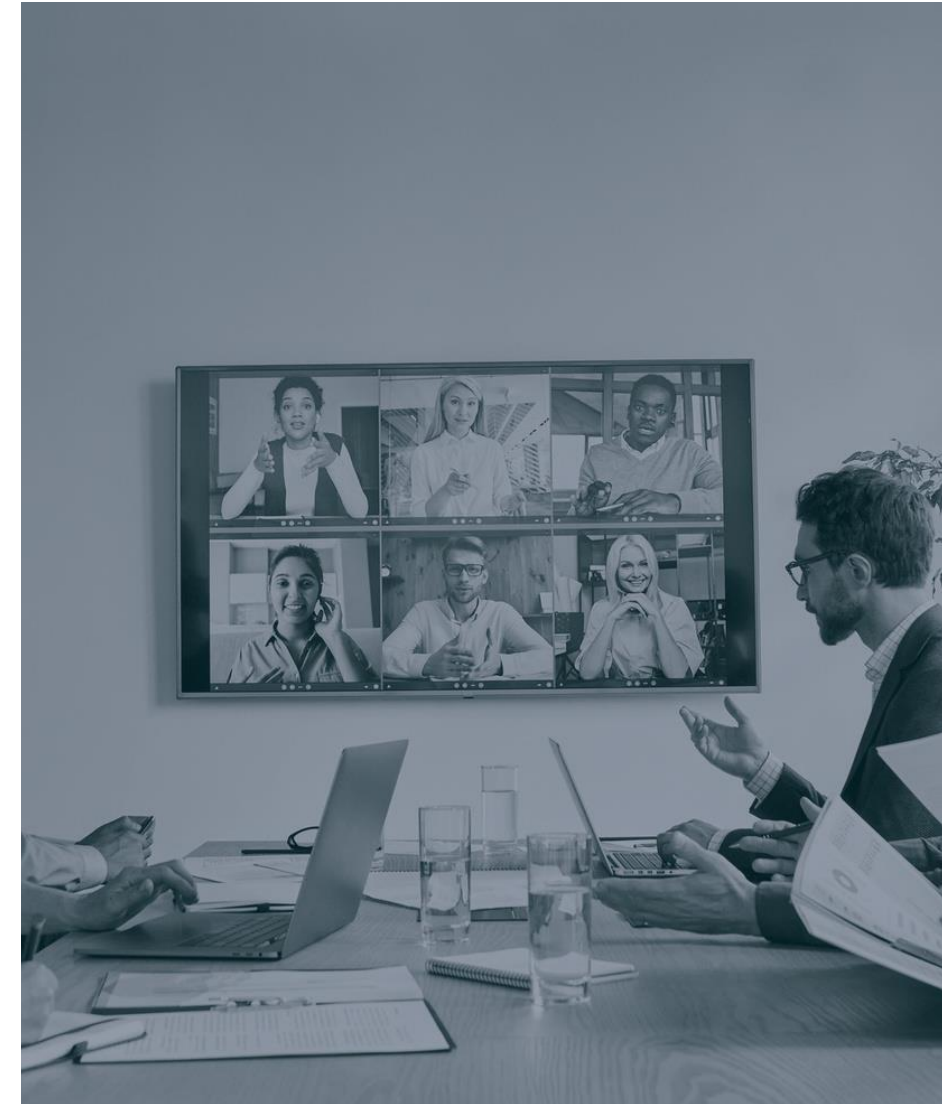# Nutanix Workshop Series

Part Two – Simplify, Scale, and Secure Your Storage with Nutanix Unified Storage

Meet Your Presenters

Mike Dent

Field CTO, Hybrid Data Center

eGroup Enabling Technologies

Phil Dunn

NUS Partner Sales Lead

Nutanix

Alex Kluger

Channel Sales Manager

Nutanix

Agenda

Goal

Gain a deep understanding of Nutanix Unified Storage and how it simplifies, secures, and scales file, block, and object storage for modern data center environments.

Agenda

01 Introduction and Test Drive Access

02 NUS Overview

03 Data Lens

04 Test Drive

Introductions and Setup

Welcome!!

Introductions

- Name & Experience with Nutanix
- Goal from Today's Session
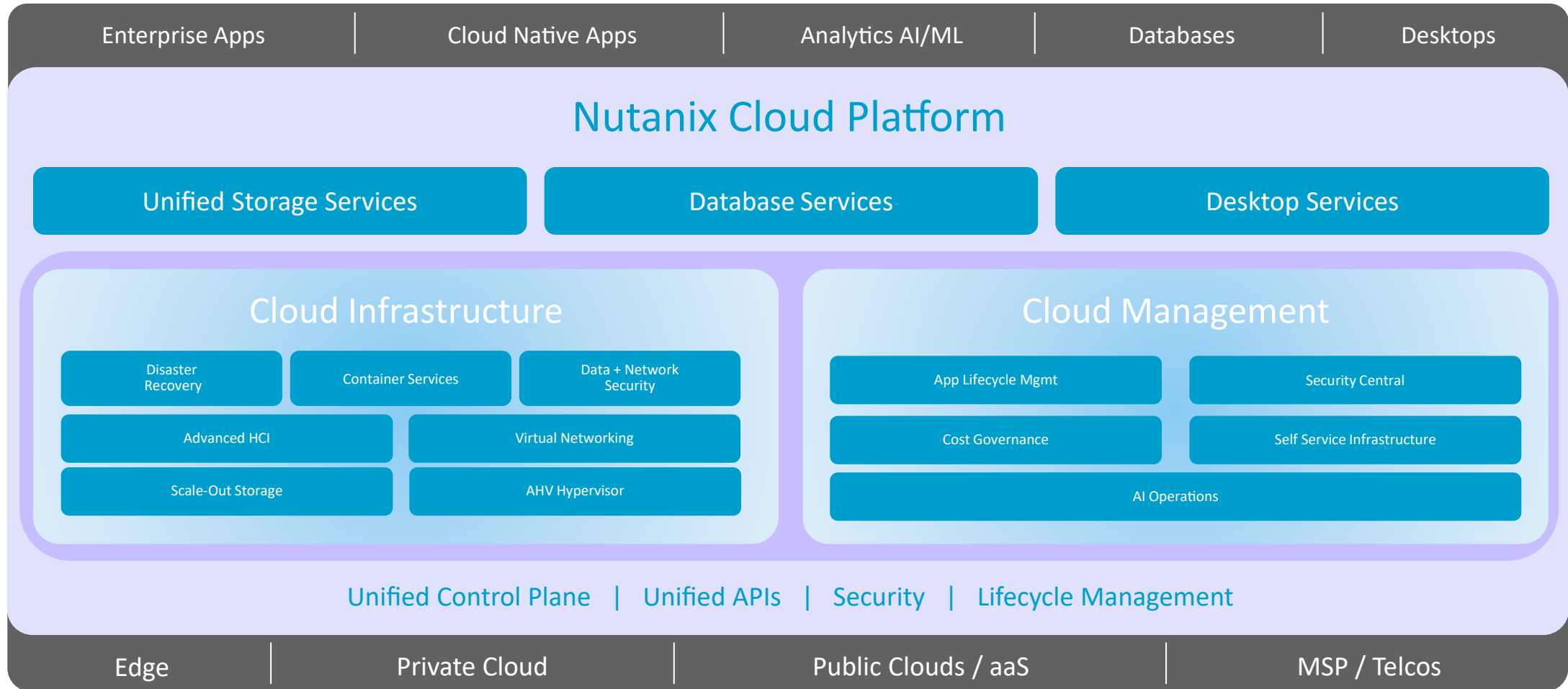
TestDrive Access

- Signing into Test Drive
  - https://www.nutanix.com/one-platform

01

Nutanix Cloud Platform

One Platform for Hybrid Multi-Cloud

| Enterprise Apps | Cloud Native Apps | Analytics AI/ML | Databases | Desktops |

Nutanix Cloud Platform

| Unified Storage Services | Database Services | Desktop Services |

Cloud Infrastructure

Disaster Recovery	Container Services	Data + Network Security
Advanced HCI	Virtual Networking	
Scale-Out Storage	AHV Hypervisor	

Cloud Management

App Lifecycle Mgmt	Security Central
Cost Governance	Self Service Infrastructure
AI Operations	

Unified Control Plane | Unified APIs | Security | Lifecycle Management

| Edge | Private Cloud | Public Clouds / aaS | MSP / Telcos |

02   Why Storage Matters

The New Normal is Data Everywhere

Edge

Core

Cloud

aws

Audio, Video, IoT, Analytics,
User-Generated Content
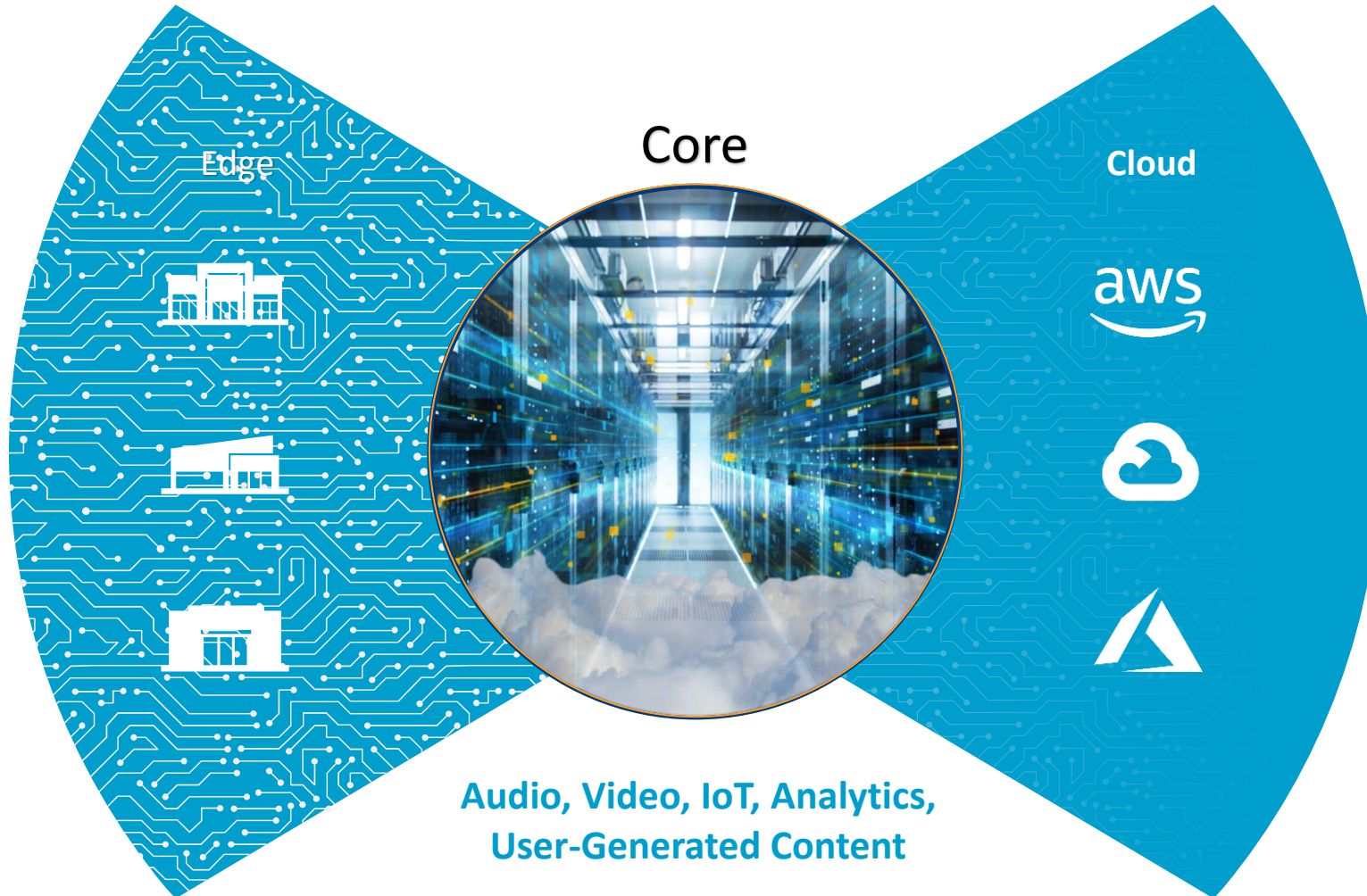
181ZB

of data created and
consumed every day

80%

of worldwide data
is unstructured

50%

of the data will be generated at
the edge

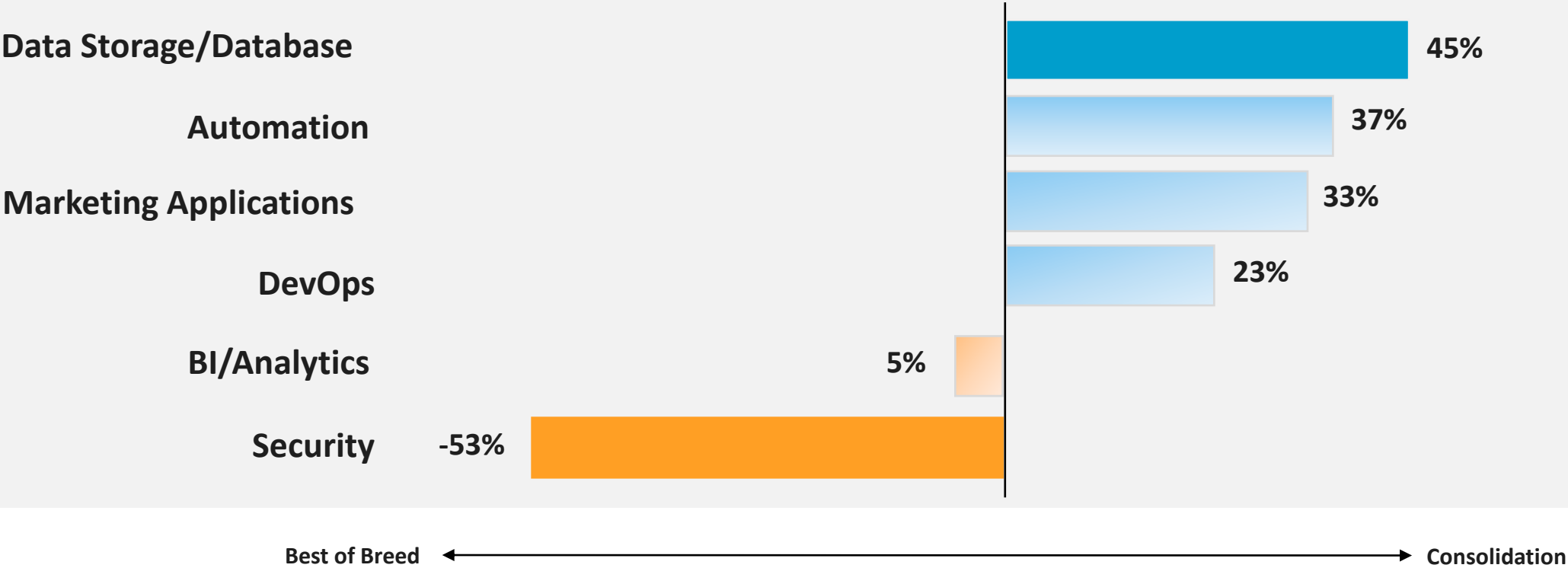IDC: Worldwide Global DataSphere and Global StorageSphere Structured and Unstructured Data Forecast, 2021–2025
https://www.statista.com/statistics/871513/worldwide-data-created/
IDC FutureScape: Worldwide IT Industry 2021 Predictions

CIOs Are Looking to Consolidate Data Storage

Tendency to Consolidate in 3 Years

Category	Value
Data Storage/Database	45%
Automation	37%
Marketing Applications	33%
DevOps	23%
BI/Analytics	5%
Security	-53%

Best of Breed ← → Consolidation

Shift to Data Services From Infrastructure Focus

Infrastructure Focus

Block

Files

Objects

DR/Backup
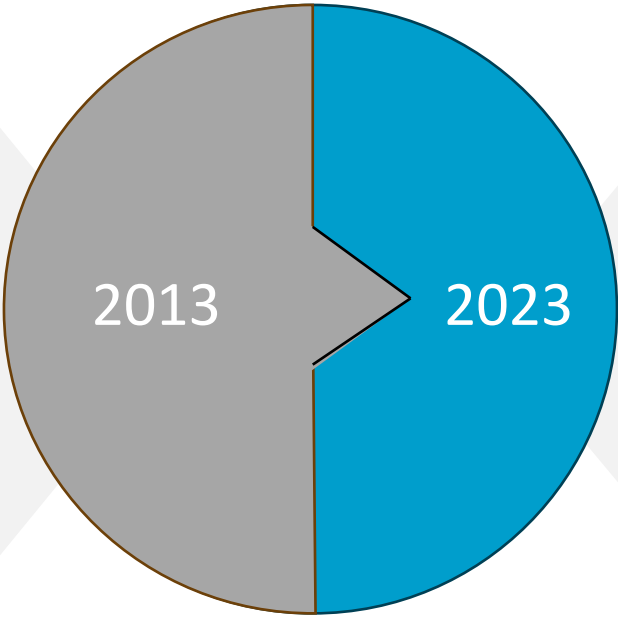
Data Services Focus

2013 | 2023

Unified Storage

Global Data

Cyber Resilience

SLA-based

Containers

Data Analytics

AI Operations

Integrated Security is Now a Top IT Goal

88%
of Board of Directors

View cybersecurity as a business risk

40%
of All Enterprises

Will require storage products with integrated Ransomware protection by 2025
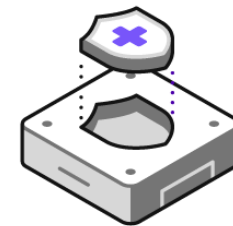
Traditional Storage Experience is Lacking

Traditional Storage Vendor

Infrastructure Silos

Purpose-built Hardware

Poor Experience

Bolt-on Security

Lack of Data Insights

Nutanix Unified Storage At-a-Glance

6000+

NUS
Customers

1 EB

Capacity
Managed

~250

New Customers
Every Quarter

48%

YoY New
ACV Growth

03 Nutanix Unified Storage

Deliver Enterprise Storage Services and Beyond

| Enterprise Apps | Cloud Native Apps | Analytics AI/ML | Databases | Desktops |

Nutanix Cloud Platform

| Unified Storage Services | Database Services | Desktop Services |

Cloud Infrastructure

Disaster Recovery	Container Services	Data + Network Security
Advanced HCI	Virtual Networking	
Scale-Out Storage	AHV Hypervisor	

Cloud Management

App Lifecycle Mgmt	Security Central
Cost Governance	Self Service Infrastructure
AI Operations	

Unified Control Plane | Unified APIs | Security | Lifecycle Management

| Edge | Private Cloud | Public Clouds / aaS | MSP / Telcos |

One Software-Defined Platform for Apps and Data

DEV

K8s
Self-service storage provisioning

Objects Browser
Self-service data management

OPS

Prism Central
Centralized infra. management

Data Lens
Auditing, analytics, ransomware protect

Deploy as hyper-converged with apps running on storage

File Services

Object Services

Volume Services

Deploy as dedicated storage with independent app servers

Nutanix Unified Storage

Nutanix Unified Storage is built on top of Nutanix Cloud Platform

Software Defined Data Services | Security-First Design | Start Small and Scale Out | Flexible Consumption

Powered By Rich Data Services

		App Owner	Security Admin	Storage Admin	Data Scientist

Application Services	AI/ML	Data Repository	Medical Apps	Cloud Native	Analytics	Backup/Archive

Data Services

Data Lifecycle	Data Protection	Data Security
Tiering / Archiving	Snapshots	Anti-Ransomware
Data Insights	Replication / Sync	Industry Certifications
Global Access	Metro Availability	Compliance
Data Governance	Disaster Recovery	Privacy

Storage Services

BLOCK < iSCSI >	FILE < NFS, SMB >	OBJECT < S3 >

Edge · · · · · Core · · · · · Cloud

04   Nutanix Files

Nutanix Files Core Architecture

\\FS-1\SMB-1
SMB Share

/FS-1/NFS-1
NFS Export

\\FS-1 Namespace

FS-1_1   FS-1_2   FS-1_3

FS-1 Storage Container – RF, Erasure Coding, Post Process Compression, DARE

Distributed Storage Fabric – Storage Pool

CVM-1   CVM-2   CVM-3   CVM-4

Hypervisor Cluster – AHV, ESXi
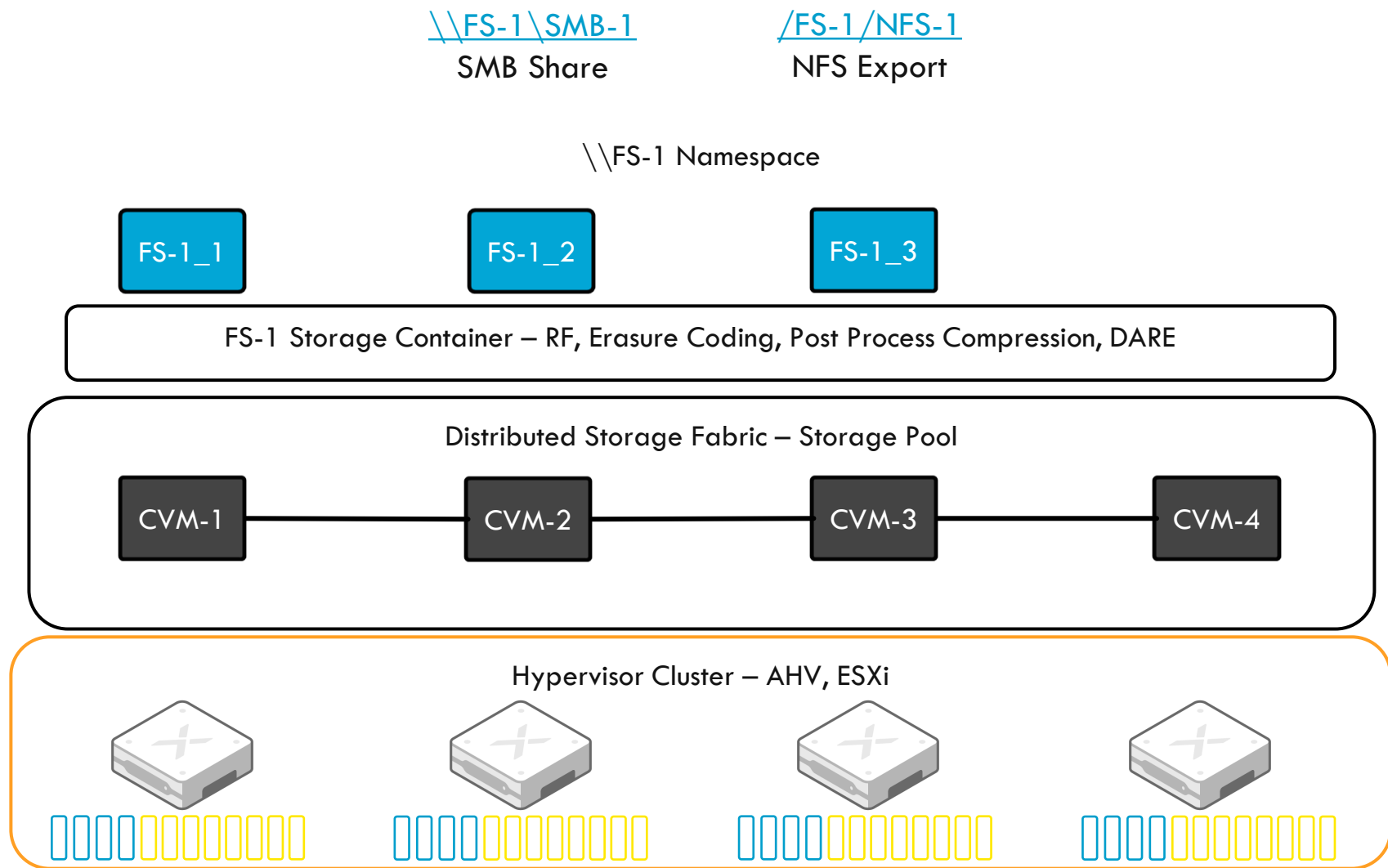
Nutanix Files: Start Small and Scale to PBs

FS-1 client

FS-1 client

FS-1_1

FS-1_2

FS-1_3
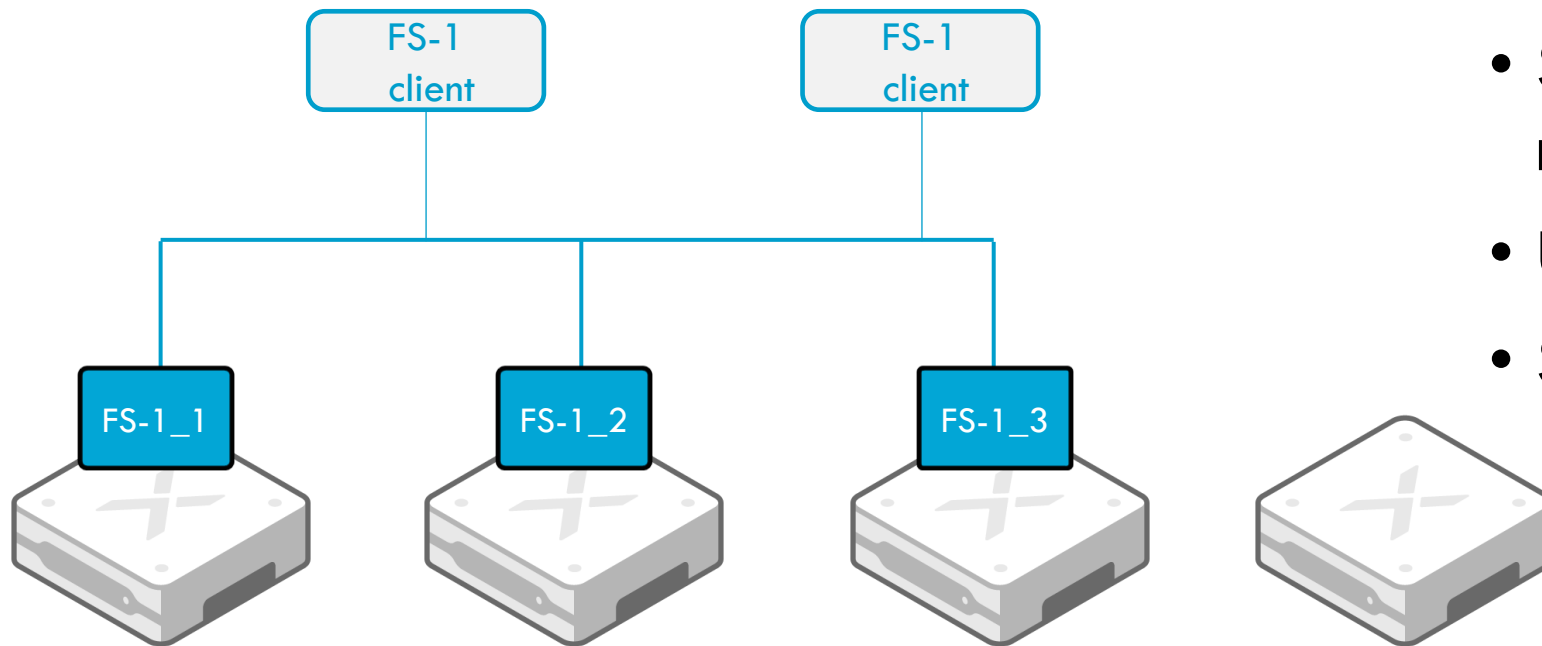
- 3 file server VMs (FSVM) to start *
- Scale to 16 FSVMs per namespace
- Up to 32 Physical nodes
- Single Namespace

* Single FSVM deployments also supported

Deployment Flexibility & Freedom to Choose

Mixed Cluster with AOS

Files Add-on + AOS License
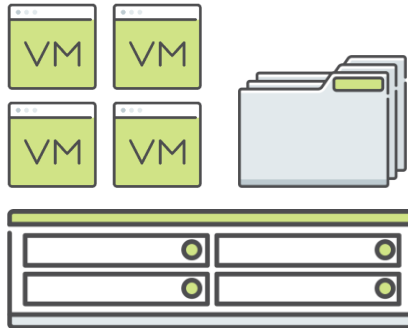
Or Create a Dedicated File Cluster (Any "decoupled" hardware)

Just buy Files Dedicated License
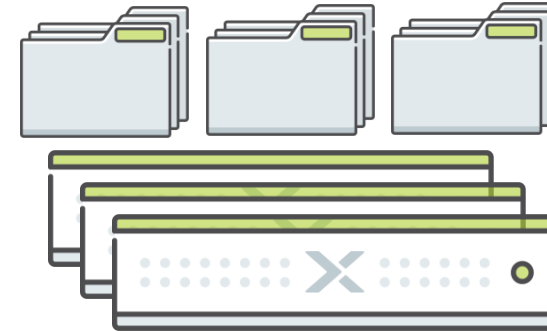
Multi-Tenancy
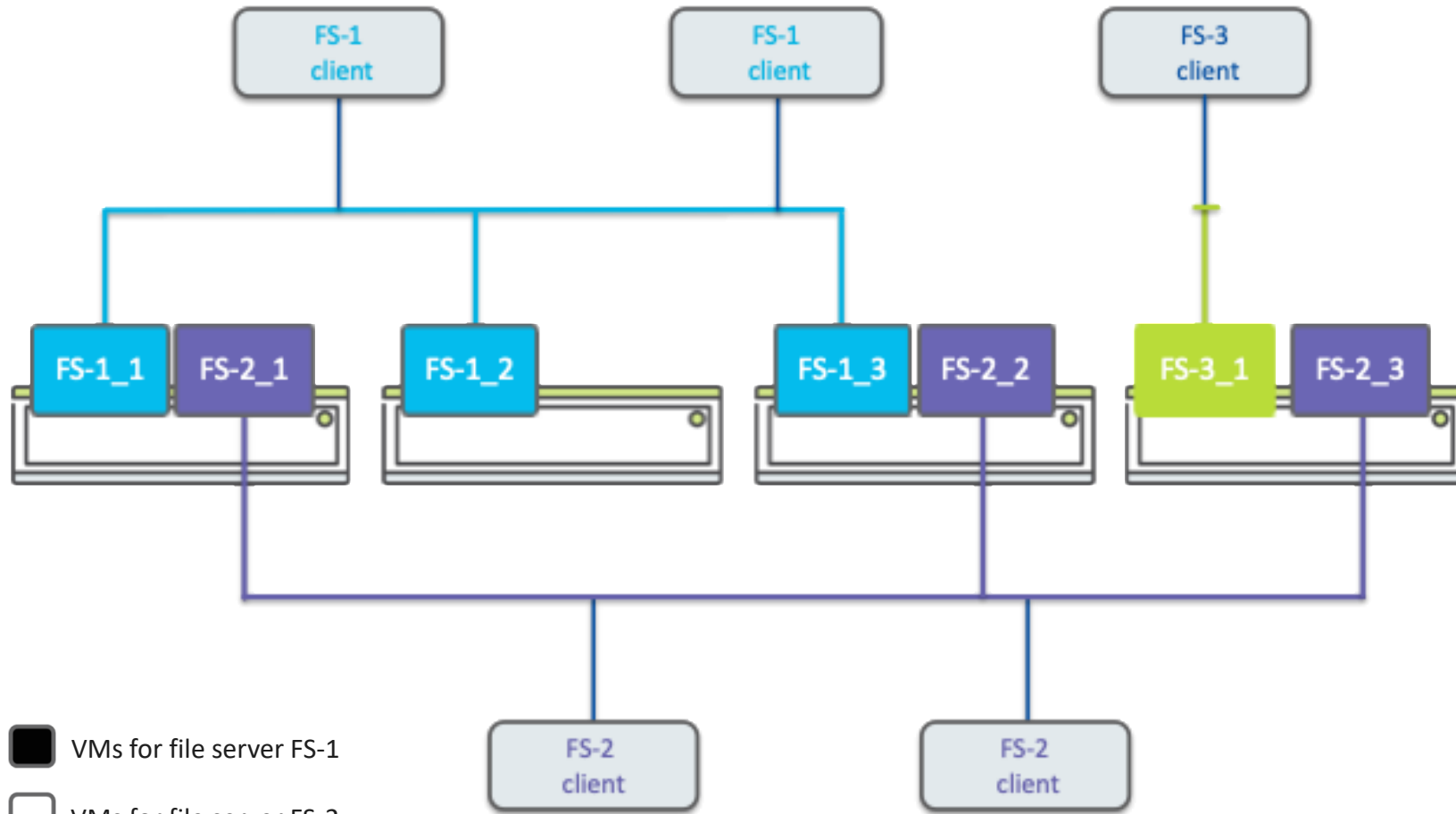
- Different replication RPOs
- Multiple untrusted domains
- Non-routed VLANs
- Tenant separation

Files High Availability

Shares   10.10.10.10   FSVM-1   Persistent   VG

Shares   10.10.10.11   FSVM-2   Persistent   VG

Shares   10.10.10.12   FSVM-3   Persistent   VG
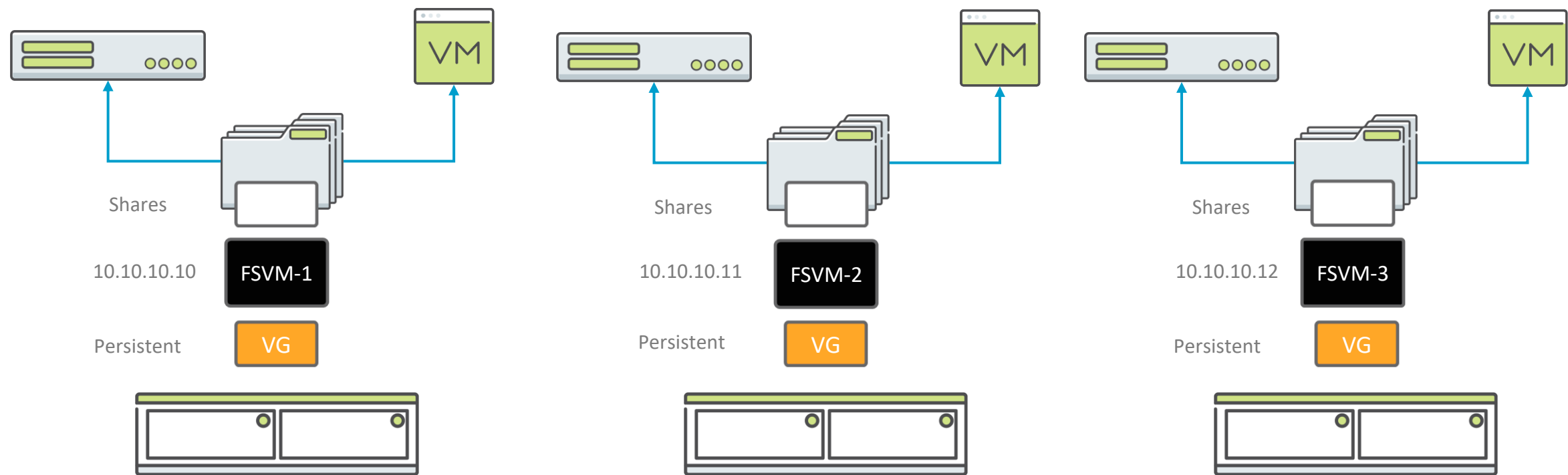
Files High Availability
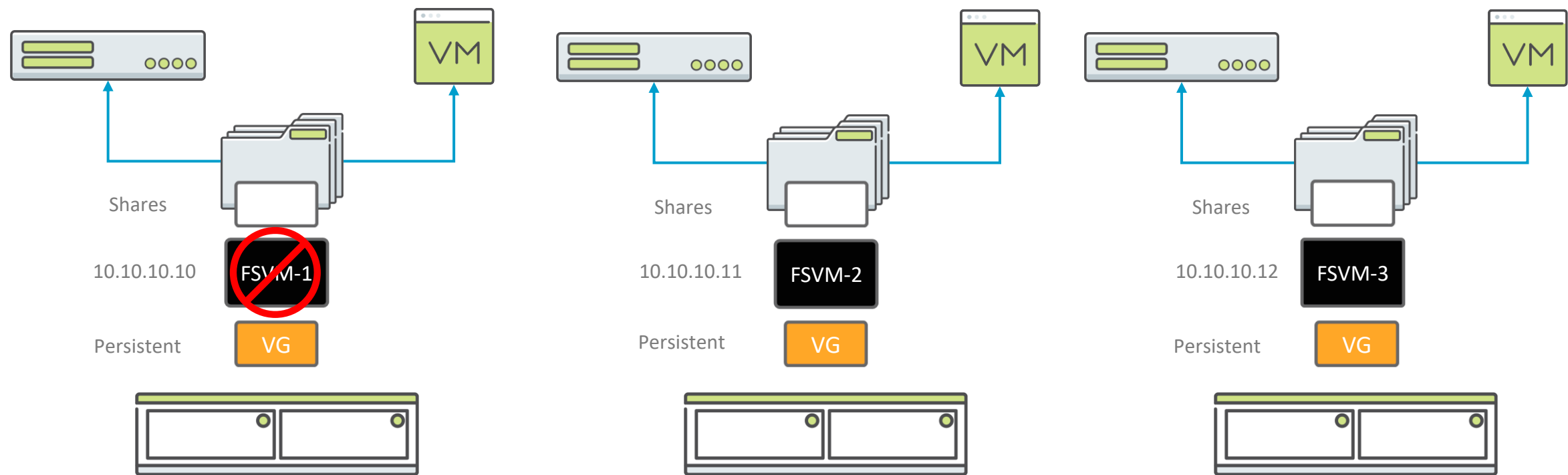
Files High Availability
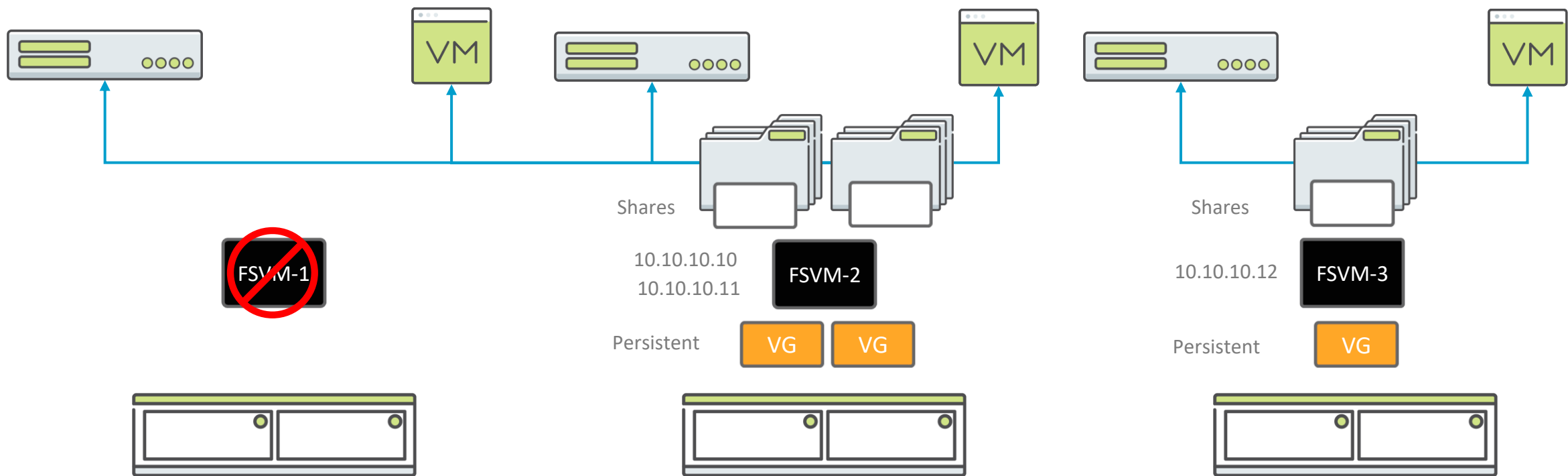
Protocol Capabilities

- Active Directory and NTACL based permissions
- SMB 2.0 +
  - Durable Handles
  - SMB signing
- SMB 3.0 +
  - In-Flight Encryption
  - Transparent Failover
    - Continuous Availability
  - Directory Leasing

- POSIX, UNIX mode bit permissions
- Unmanaged or Directory based
  - NFSv4 – AD, LDAP
  - NFSv3 – LDAP
  - No Auth, System Auth
- NFSv4 Only
  - Kerberos 5
  - Kerberos 5i (Packet Integrity)
  - Kerberos 5p (In-Flight Encryption)
- NFS v4.2 and v4.2

Multi-Protocol

- Full protocol support
    - SMB, NFSv4 and NFSv3

- Simultaneous protocol access
    - Concurrent reads
    - Exclusive write access with file locking

- Primary and Secondary protocols
    - Shares are assigned a primary protocol (SMB or NFS)
    - Permissions assigned against primary protocol
    - Secondary protocol users and groups are mapped to the primary protocol for effective permissions
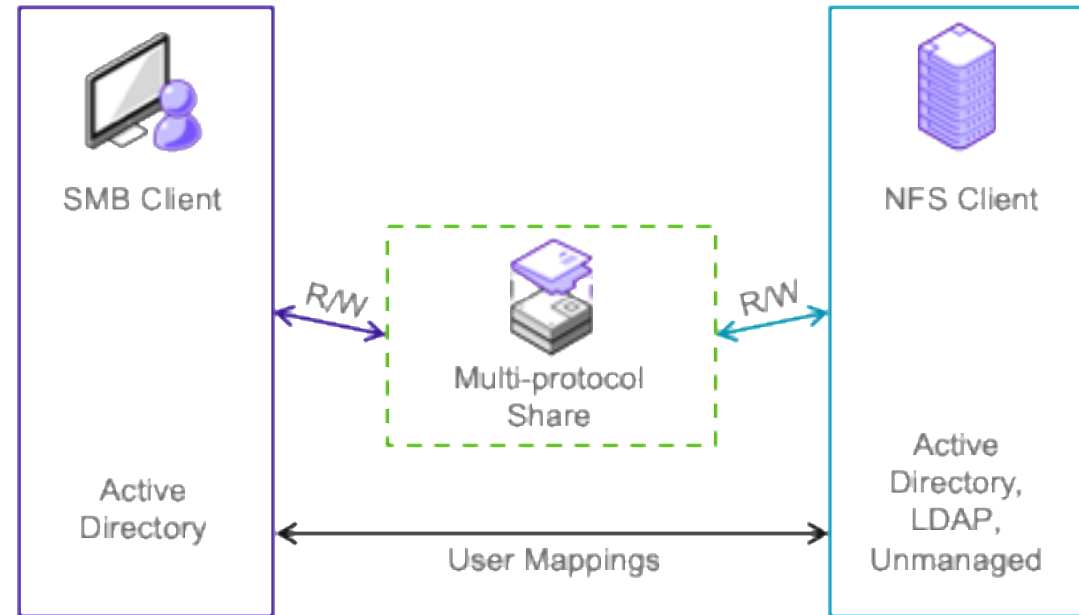
Quotas

- Limit File Server Size
  - Increase as needed online
- Limit Individual Share Size
  - Optional: can be increased online
- User and Group Quotas
  - Share level
  - Limit individual users or groups of users
  - Hard or Soft limits

Quota Policy ? ✕

Add a quota policy
Add a quota policy for a specific user or each user in a group.

🔘 User

⚪ Group (Quota will be applied to each member of group individually)

USER OR GROUP

Enter username or a group from AD

QUOTA

No quota limit   GiB

ENFORCEMENT TYPE

⚪ Hard Limit
User will be put in read only mode and will receive email notification daily until remediation.

🔘 Soft Limit
User will receive daily email notification but will not be put in read only mode.

Alert Emails
Quota alert emails are sent at 90% and 100% of quota limit.

Cancel   Save

Write Once Read Many (WORM)

- Two Types
  - Enterprise Mode
    - Privileged deletes
  - Compliance Mode
    - No privileged deletes
- Define
  - Cool off
    - File can be modified period
  - Retention
    - How long file is locked n WORM state
- Legal Hold
  - Protects expired files from deletion

Worm Share

Certification
- SEC 17a-4(f)
- FINRA 4511(c)
- CFTC 1.31(c)-(d)

File Saved → Cool Off Timer → "locked" state → "expired" state
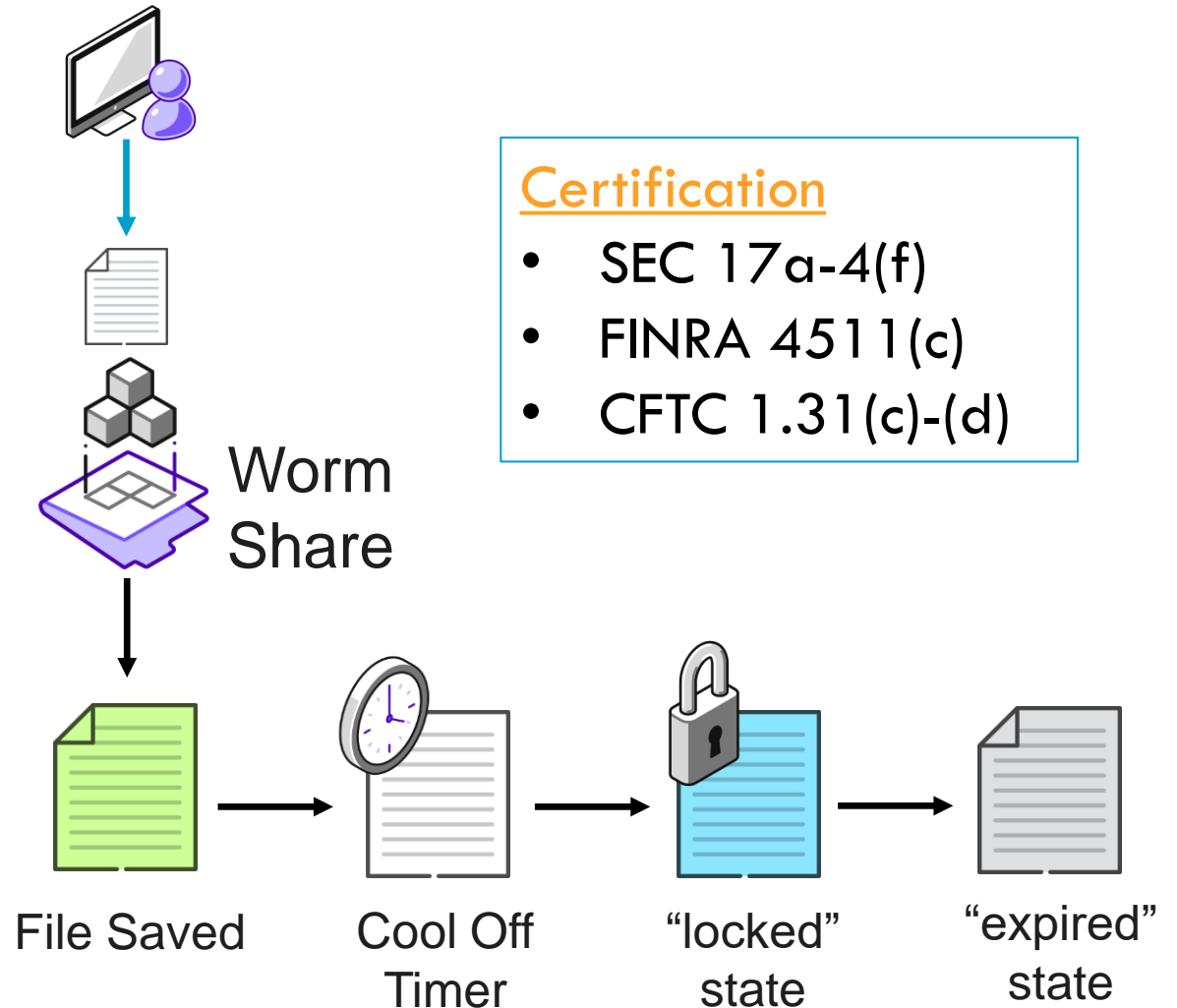
Native Migration and Move Support

- SMB and NFS migration service

- File server pulls data from source
  - No proxy machines needed = great performance

- Maintains ACLs

- CLI, API or Nutanix Move

05 Nutanix Objects

What is Object Storage?

- Manages objects rather than file systems or data blocks, objects are stored in buckets

- An "object" includes the data, metadata and unique identifier (key). Can be immediately accessed via APIs (S3) over http/https

- S3 is the industry's de-facto REST API for object access

- Uses a flat namespace, key:value pairs used to locate data

    - Flat structure allows Objects scalability to PBs versus TBs (file) or GBs/low TBs (block)
    - Complexity does not increase with scale, nor does performance degrade

- Object storage is metadata-rich, making it highly searchable

S3 client

API (PUT, GET etc.)

Object (data + metadata + key)

Bucket (stores objects)
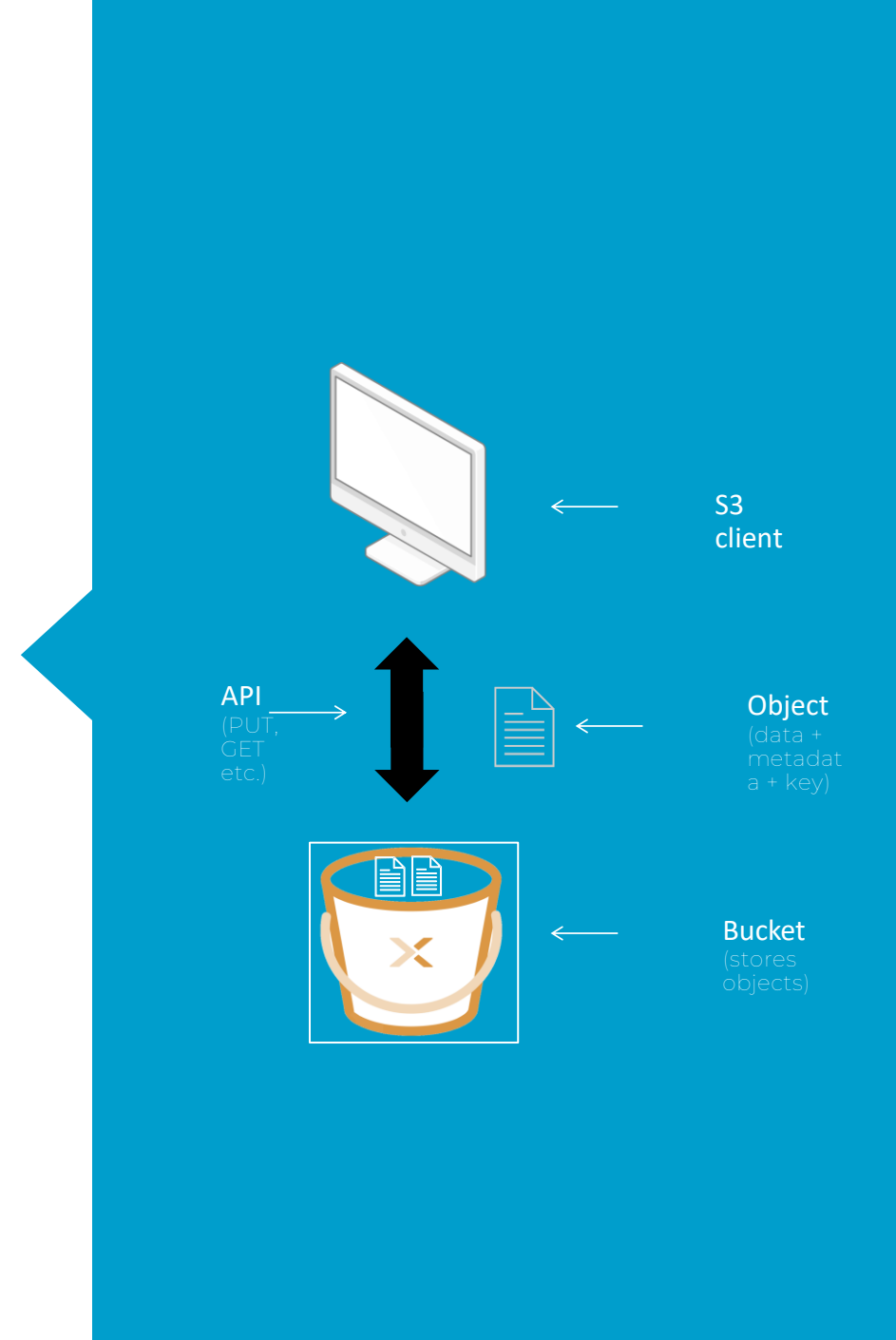
Storage Types Are Like Parking Options
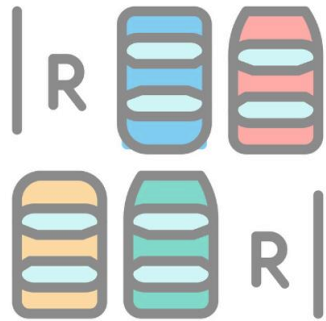
iSCSI
FC
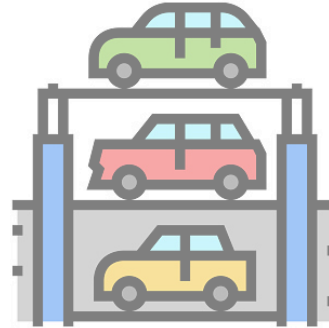
SMB/CIFS
NFS
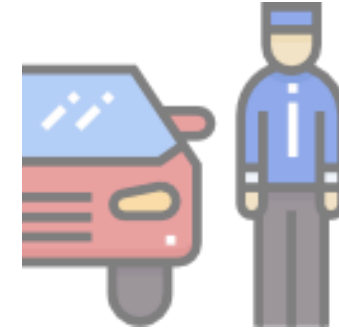
S3 API
(HTTP/S)

Block Storage

- Reserved parking
- Rigidly structured
- Pre-allocated space for specific workloads
- Databases, transactional apps

File Storage

- Multi-story parking
- Semi-structured
- Hierarchical filesystem
- User locates data
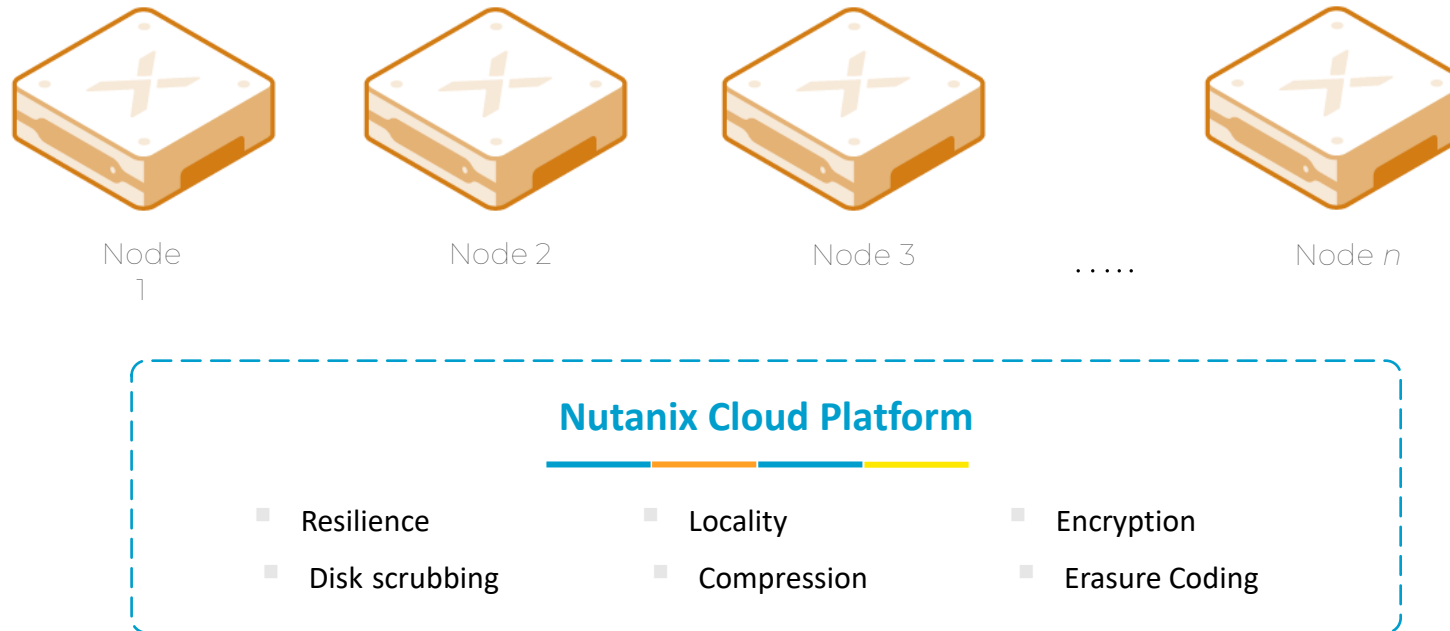- User/departmental data, graphics, medical

Object Storage

- Valet parking
- Unstructured
- Flat address space
- System locates data for user
- Backup, archive, CCTV, logs, medical, web content, IoT

Objects Architecture

Nutanix Objects is a software-defined object solution built from microservices

The underlying Nutanix Cloud Platform provides basic services, including hosting the Objects containers

Node 1   Node 2   Node 3   .....   Node n

Nutanix Cloud Platform

- Resilience
- Disk scrubbing
- Locality
- Compression
- Encryption
- Erasure Coding

Modular Components

Load Balancers

Built-in load balancer VMs ensure that client workload is evenly distributed across the worker VMs enabling dynamic scale out

Worker VMs

Worker VMs perform the actual work of providing the S3 interface, storing data / metadata and interfacing with Prism Central

Load Balancers

Workers

CVMs
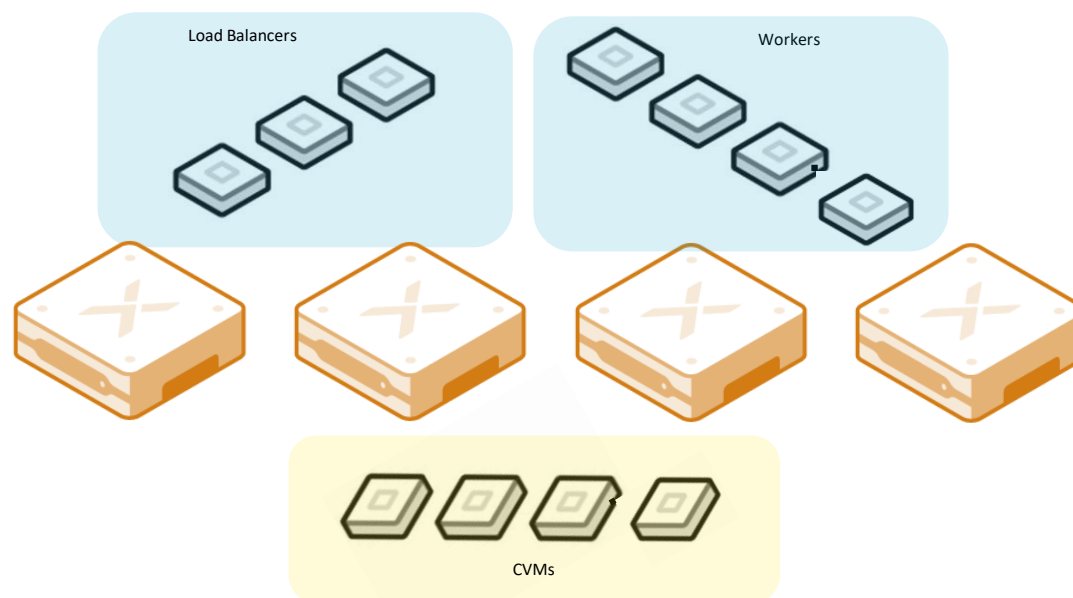
Controller VMs

The Controller VMs create the AOS cluster that provides basic data services and data protection

Objects' K8s-Orchestrated Microservices

Provides the client endpoint Implements the S3 protocol REST-API	Handles I/O Interfaces with AOS Works with metadata service	General key:value store Metadata management Partitioner	Audit Background maintenance Lifecycle management
Front-End Adapter	Object Controller	Metadata Service	Atlas

MicroServices Platform (MSP)

Worker
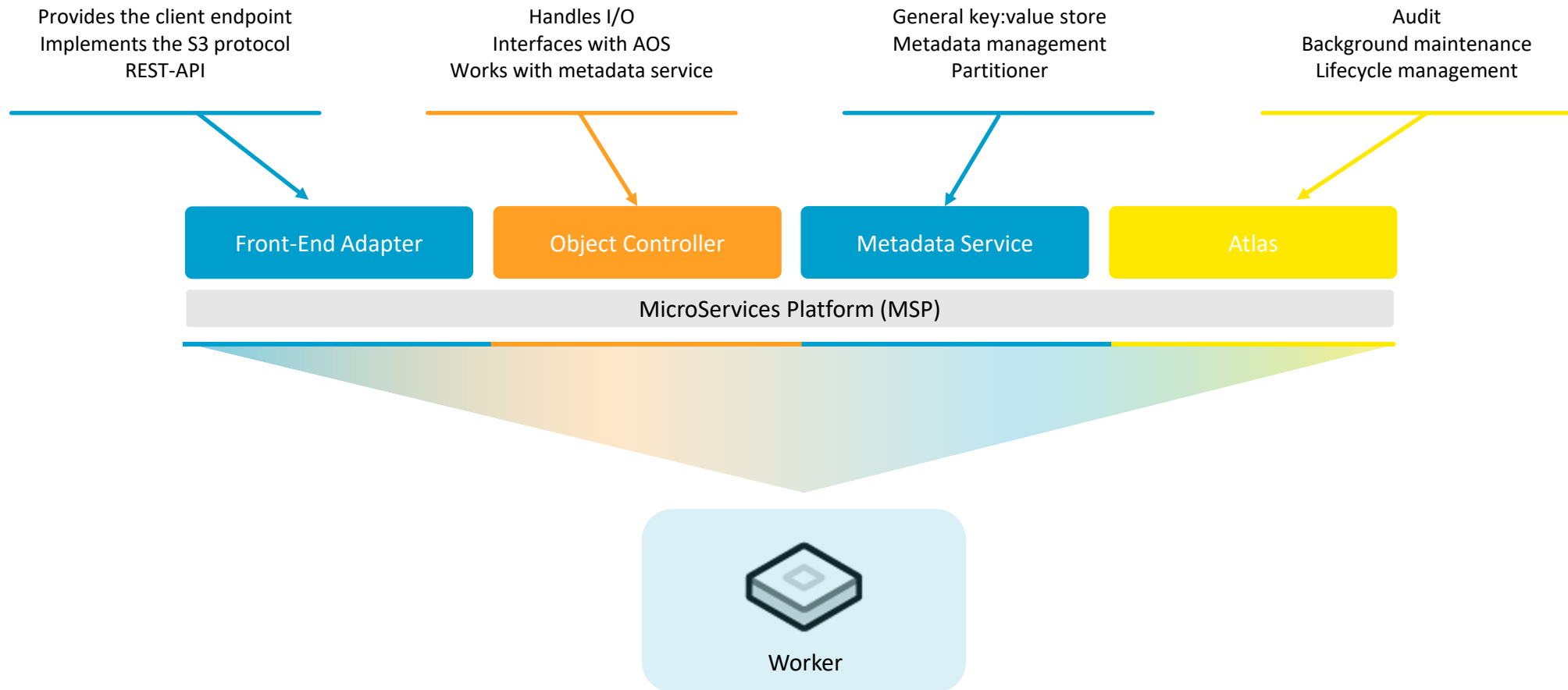
Distributed Objects Service

S3 Namespace

Objects Service

Node 1 Node 2 Node 3 . . . . . Node n

Nutanix Cloud Platform

- Resilience
- Disk scrubbing
- Locality
- Compression
- Encryption
- Erasure Coding
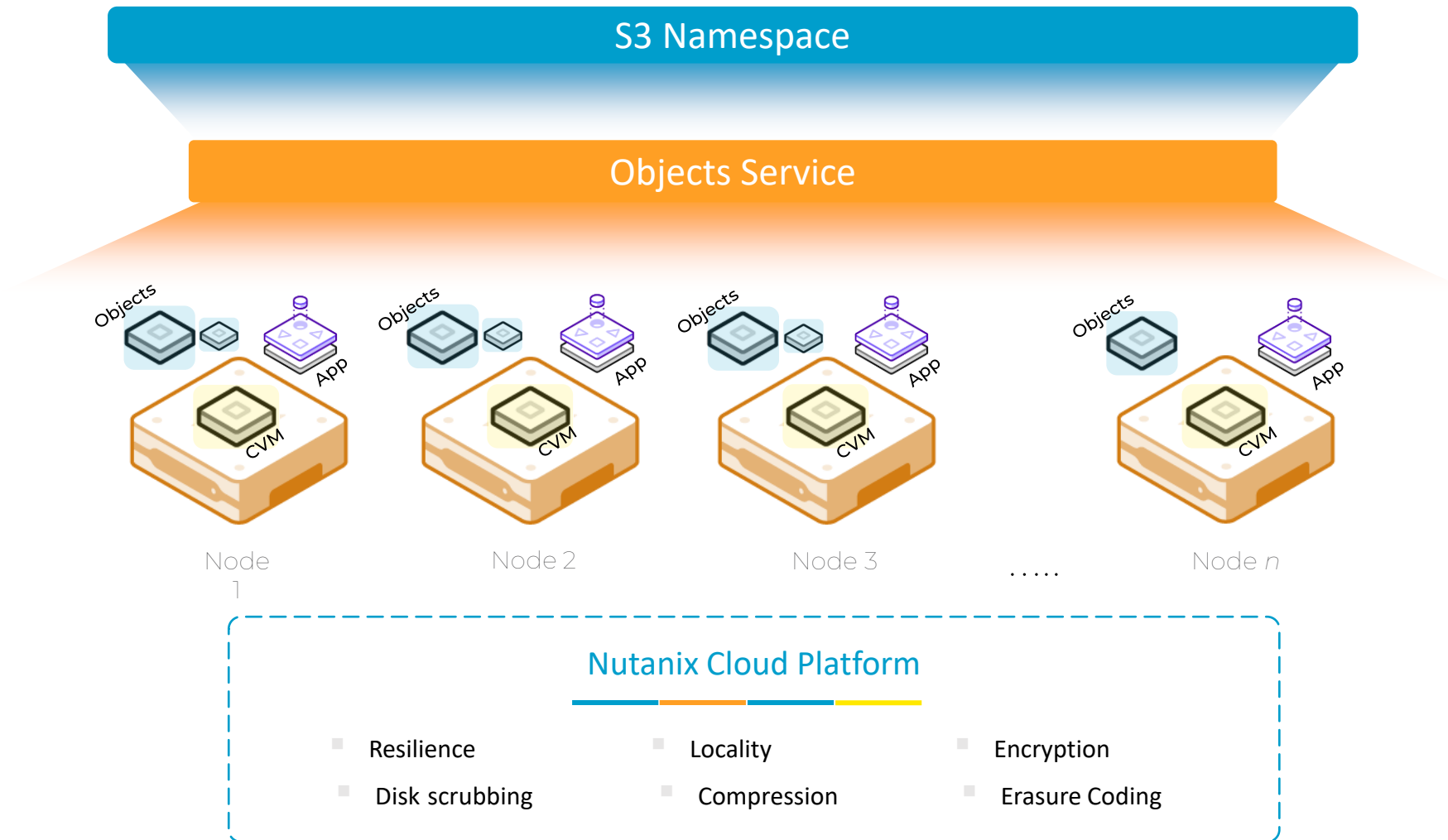
- Objects runs as a distributed service across multiple physical nodes

- S3 namespace exported for client access

- Run apps alongside Objects service (optional)

Self-Service Management

Objects Browser

- Easy to use, browser-based S3 client

- Self-service portal for tenants

- Create/delete buckets and set bucket policies

- Share buckets with other users using granular permission assignments

- Multi-part upload makes large object uploads more resilient

- Federation-aware

Object Storage Across Multiple Clusters

A single object store can leverage capacity from up to 5 AOS clusters
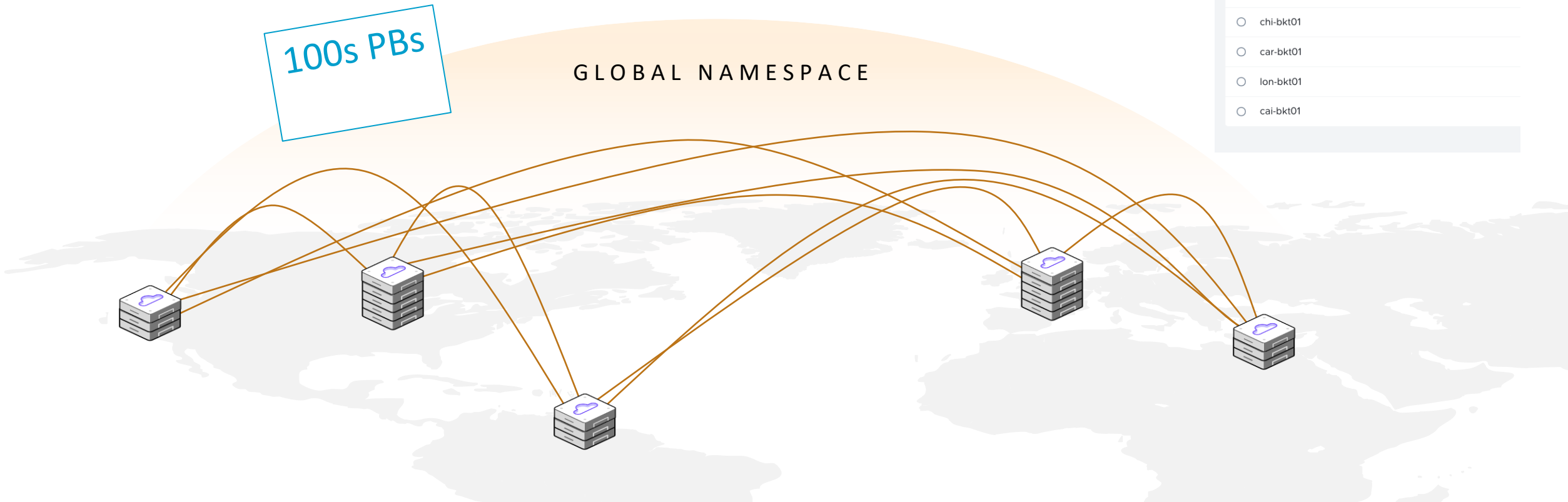
S3 Namespace
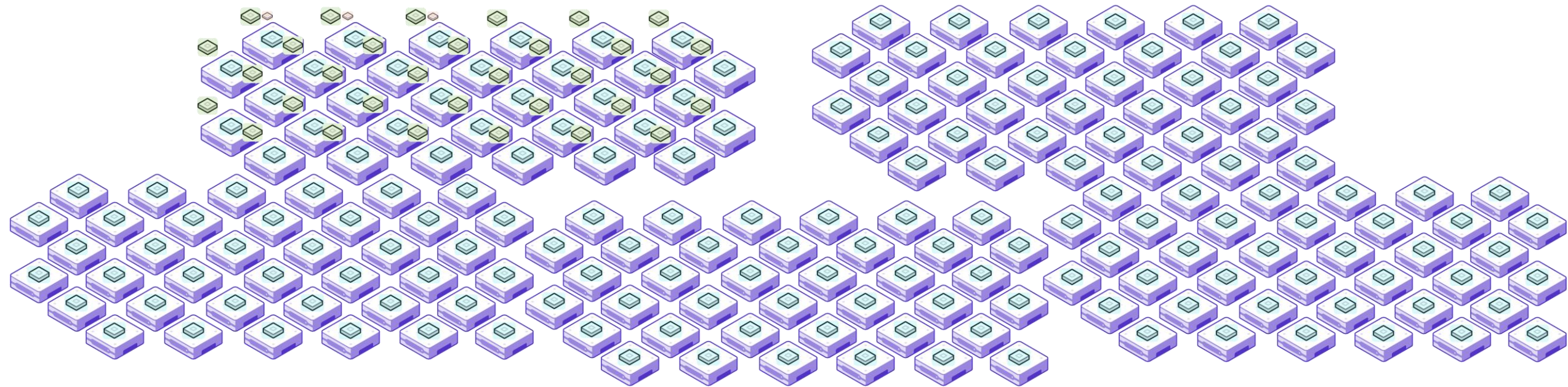
Access Data Anywhere with Federation

- Up to 128 object stores combined under a single, global namespace

- Replicate data between federation members

- Objects Browser provides a consolidated view of geo-distributed buckets
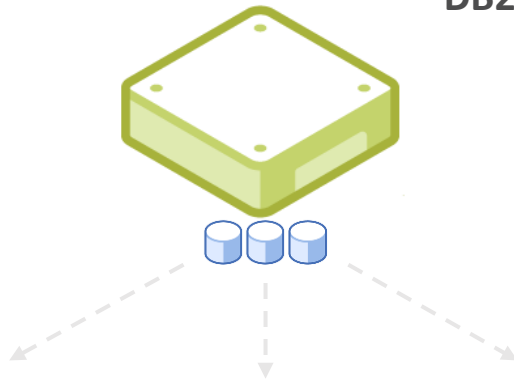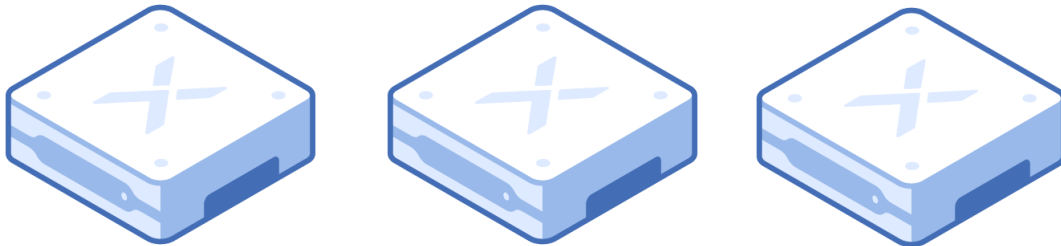
100s PBs

GLOBAL NAMESPACE

Objects

federation01   Buckets

+ Create Bucket   Refresh   Actions ⌄

Name

◯ los-bkt01

◯ los-bkt02

◯ chi-bkt01

◯ car-bkt01

◯ lon-bkt01

◯ cai-bkt01

06   Nutanix Volumes

Nutanix Volumes
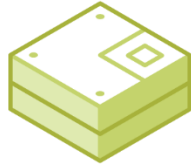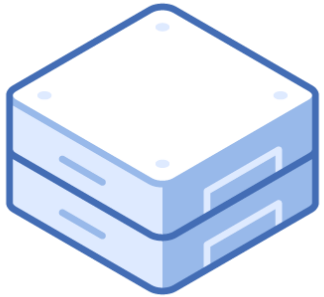

What is Volumes?

- Exposes storage through direct block-level iSCSI access

- Volumes enables high availability and clustering, scalability, and performance to external bare-metal hosts or VMs

Client Support

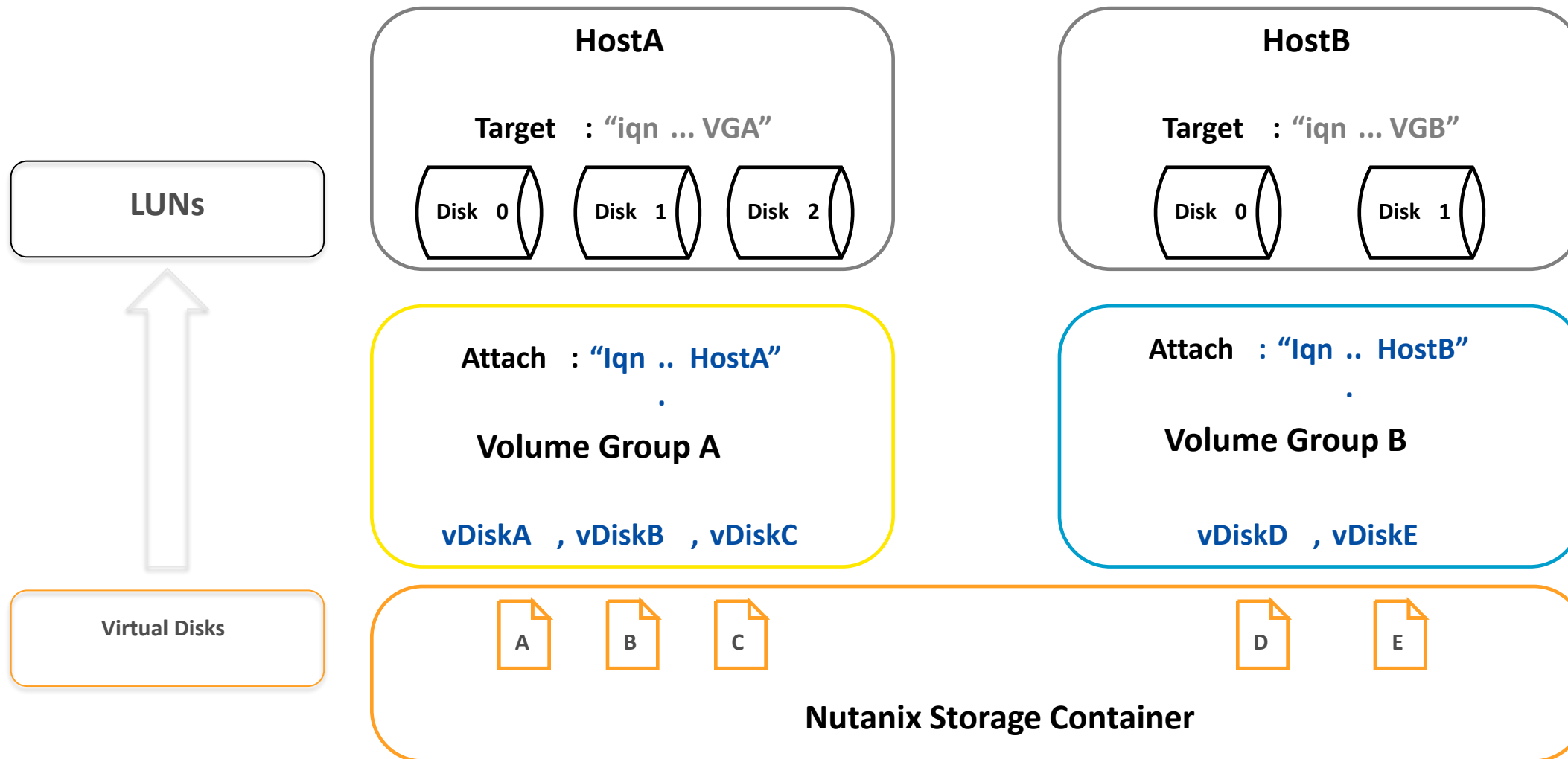**External including bare-metal or Guest VMsf**

Supported Client OS

- RHEL 6.x-9.x
- Oracle Linux 6.x, 7.x
- CentOS 7.x
- Windows 2008 R2
- Windows 2012 R2
- Windows 2016/2019/2022
- AIX 7.1, 7.2 on POWER
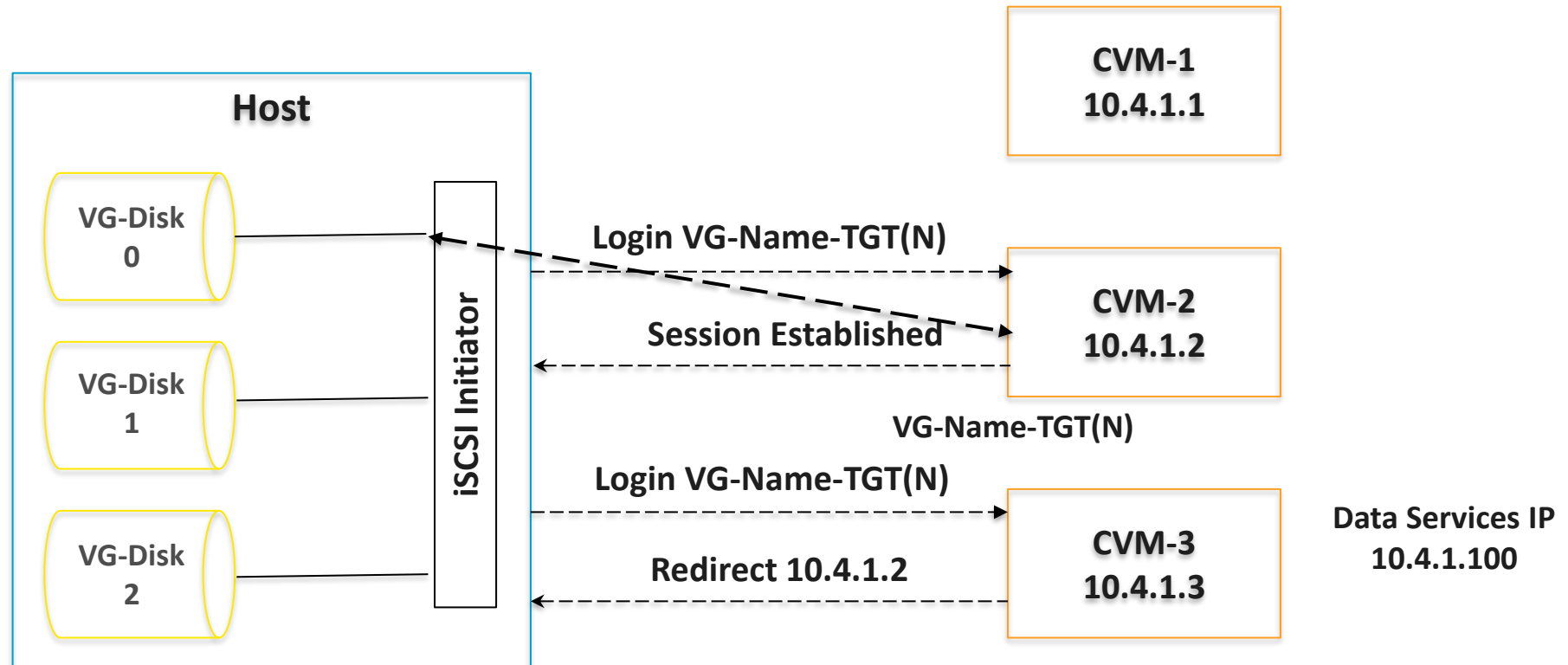- SLES 11, 12
- Solaris 11.3 on SPARC

Boot over iSCSI qualified for some clients

**No ESXi or Hyper-V Datastore Support**

Starts with Volume Groups

HostA

Target : "iqn ... VGA"

| Disk 0 | Disk 1 | Disk 2 |

HostB

Target : "iqn ... VGB"

| Disk 0 | Disk 1 |

LUNs

Attach : "Iqn .. HostA"

.

Volume Group A

vDiskA , vDiskB , vDiskC

Attach : "Iqn .. HostB"

.

Volume Group B

vDiskD , vDiskE

Virtual Disks

A B C D E

Nutanix Storage Container

Storage Presentation with Nutanix Volumes

Host

VG-Disk 0

VG-Disk 1

VG-Disk 2

iSCSI Initiator

CVM-1
10.4.1.1

Login VG-Name-TGT(N)

CVM-2
10.4.1.2

Session Established

VG-Name-TGT(N)

Login VG-Name-TGT(N)

Redirect 10.4.1.2

CVM-3
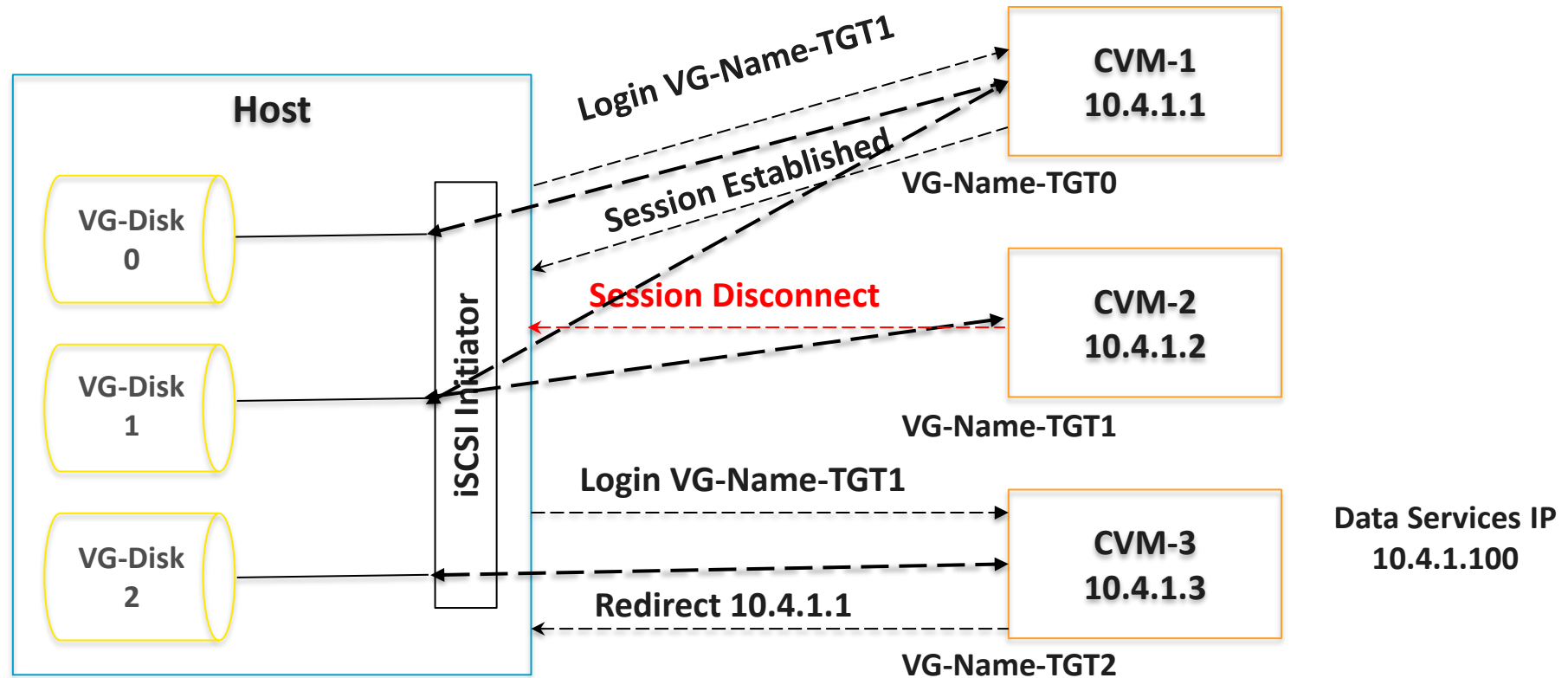**10.4.1.3**

Data Services IP
10.4.1.100

1. Configure discovery portal 10.4.1.100
2. Login to VG-Name-TGT(N) using data services IP 10.4.1.100
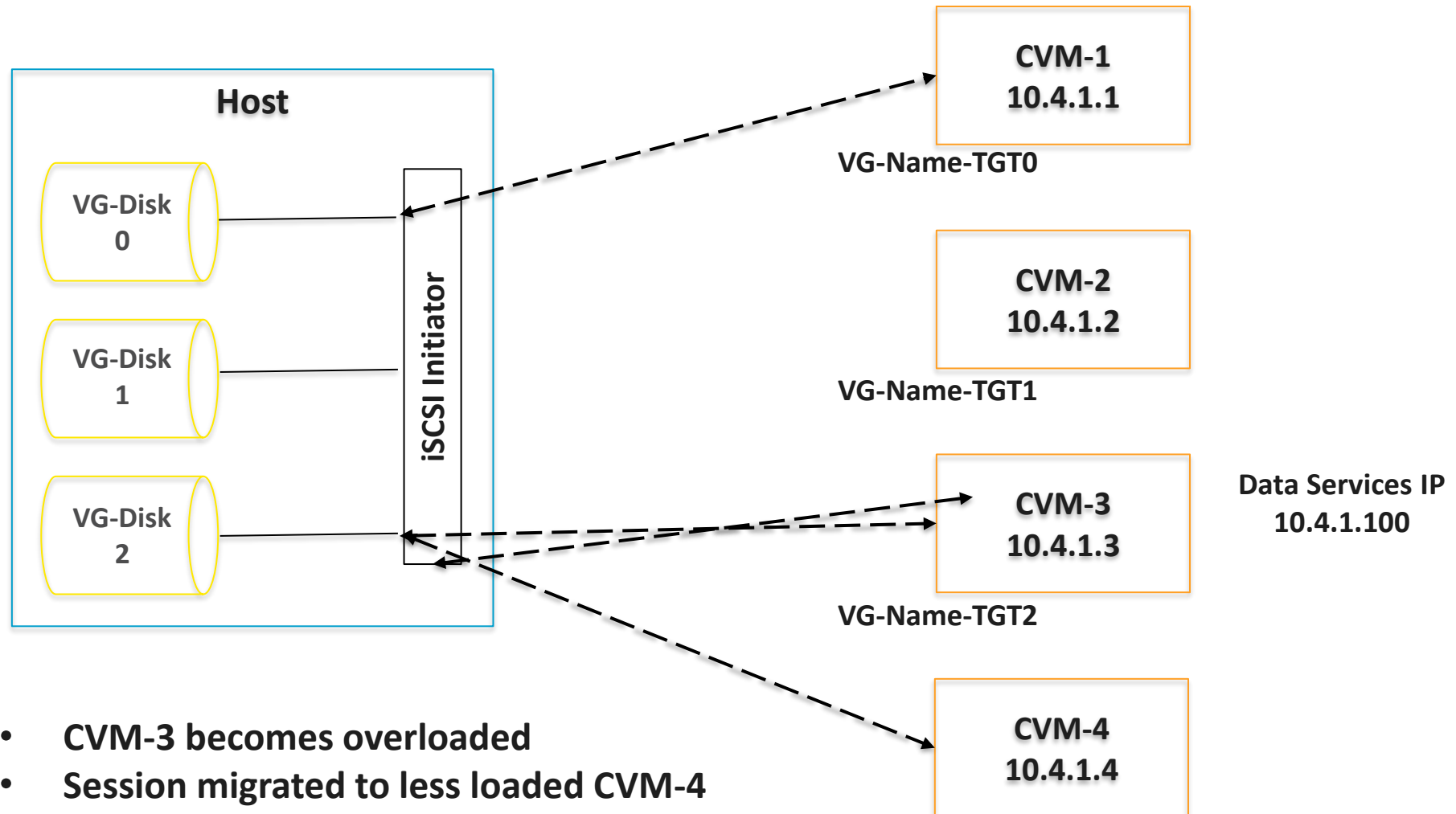
Load Distribution of Virtual Targets
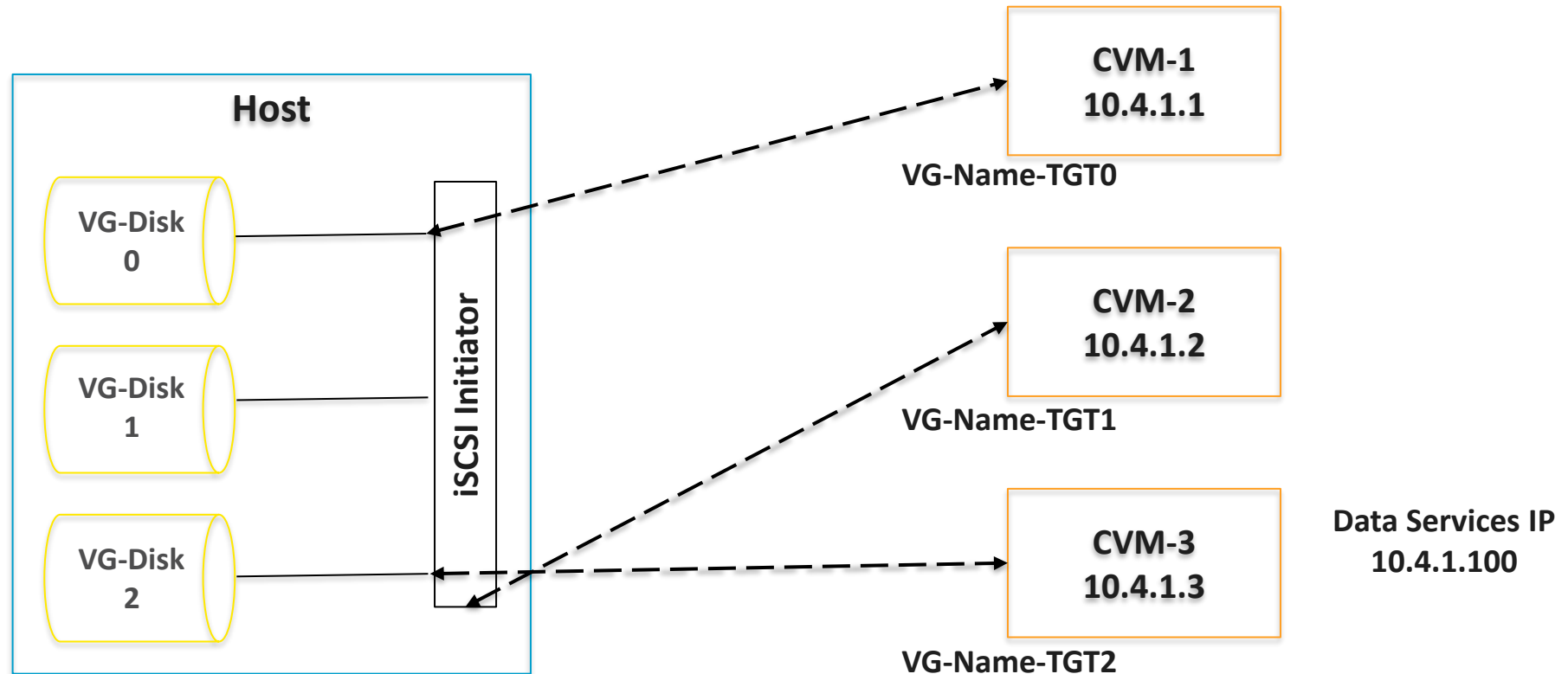
- **Single VG-Name exposed as multiple virtual iSCSI targets**
- **Each virtual target can be independently redirected to a different node**
- **Client still manages a single volume group**

Storage: High Availability

Host

VG-Disk 0

VG-Disk 1

VG-Disk 2

iSCSI Initiator

Login VG-Name-TGT1

Session Established

VG-Name-TGT0

CVM-1
10.4.1.1

Session Disconnect

CVM-2
10.4.1.2

VG-Name-TGT1

Login VG-Name-TGT1

Redirect 10.4.1.1

CVM-3
10.4.1.3

VG-Name-TGT2

Data Services IP
10.4.1.100

CVM-2 failed or brought down for maintenance

Acropolis Dynamic Scheduling (ADS)

Host

VG-Disk 0

VG-Disk 1

VG-Disk 2

iSCSI Initiator

CVM-1
10.4.1.1

VG-Name-TGT0

CVM-2
10.4.1.2

VG-Name-TGT1

CVM-3
10.4.1.3

VG-Name-TGT2

Data Services IP
10.4.1.100

CVM-4
10.4.1.4

- **CVM-3 becomes overloaded**
- **Session migrated to less loaded CVM-4**

Adopts Features of AOS

Distributed Storage Fabric (DSF)

Features

- Replication Factor

- Disk, Node, Block, Rack Redundancy

- Trim and Unmap

- Data At Rest Encryption

- Data Reduction

  - Compression

  - Erasure Coding

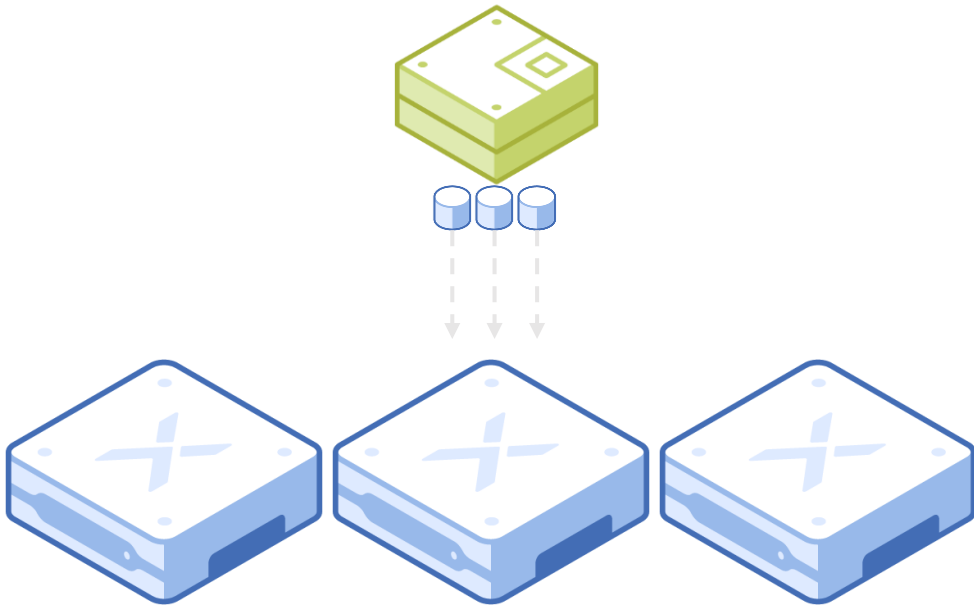 - Deduplication

- Async Data Protection

Security

Initiator

Target

One-way CHAP

Two-way CHAP
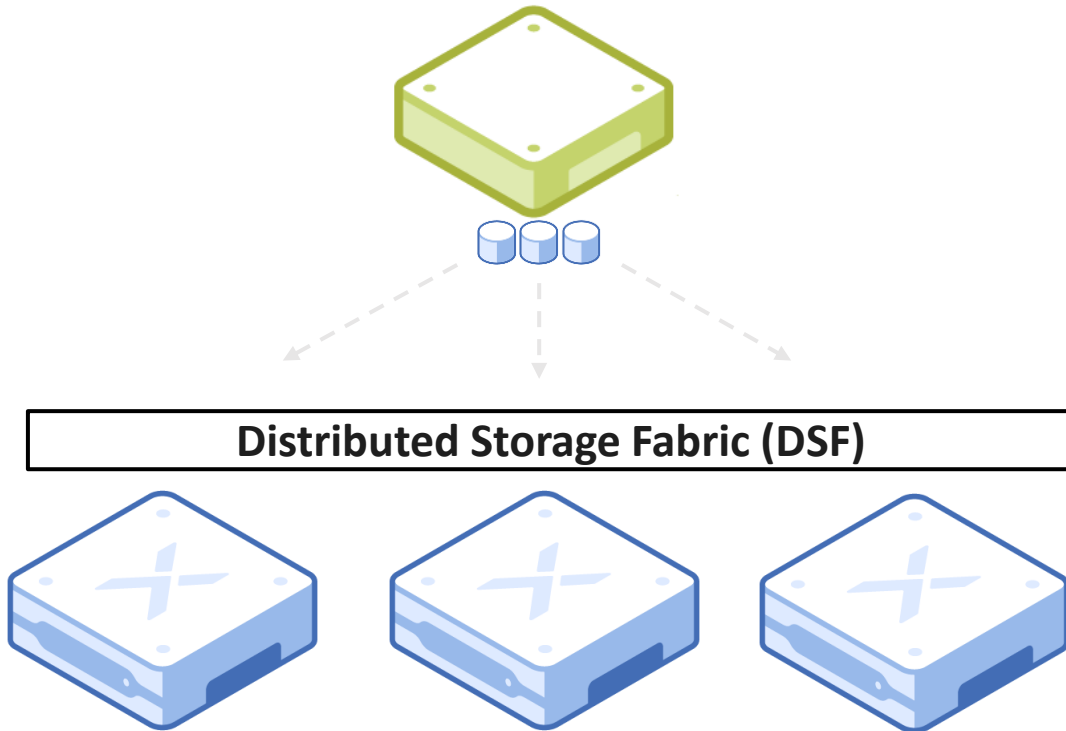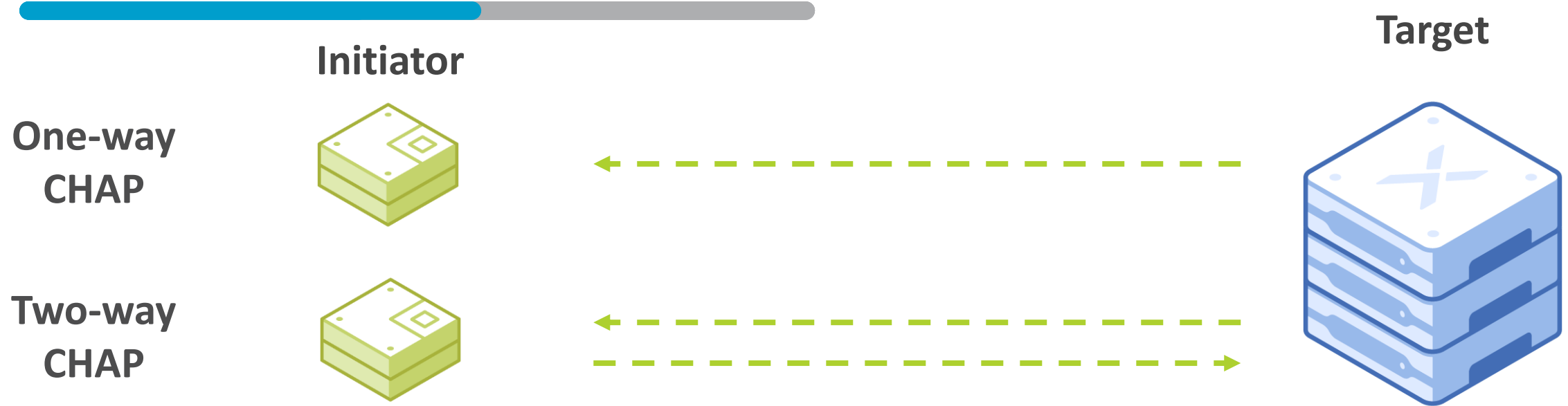
✓ **Smaller attack surface through a hardened platform**

✓ **Automated remediation with built-in STIGs**

✓ **Shipped factory secure, pen tested**

Direct Attach Volume Groups with AHV

Default

Volume Group Load Balancing
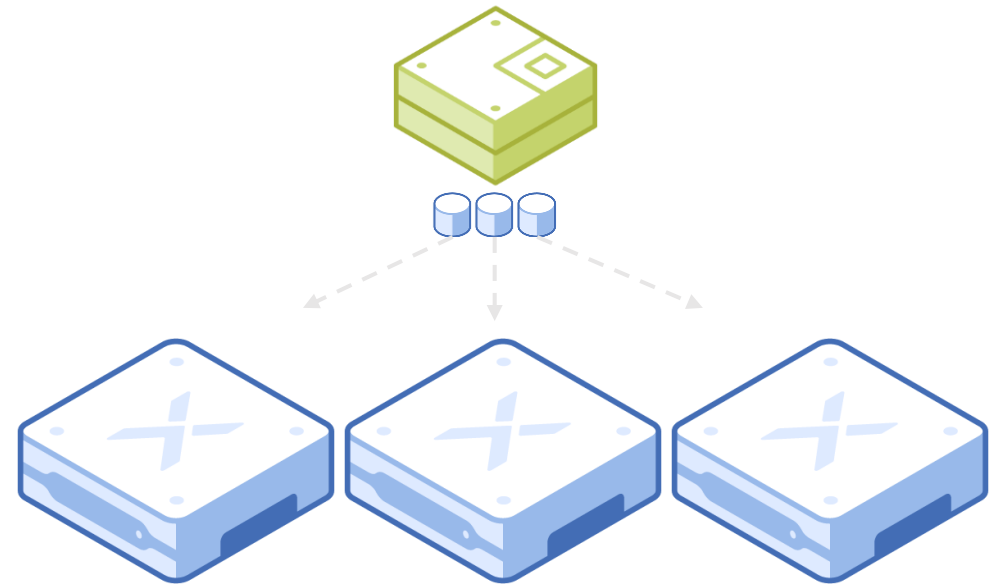
Guest Clustering Supported with AOS 5.17+

07   NUS Value Proposition

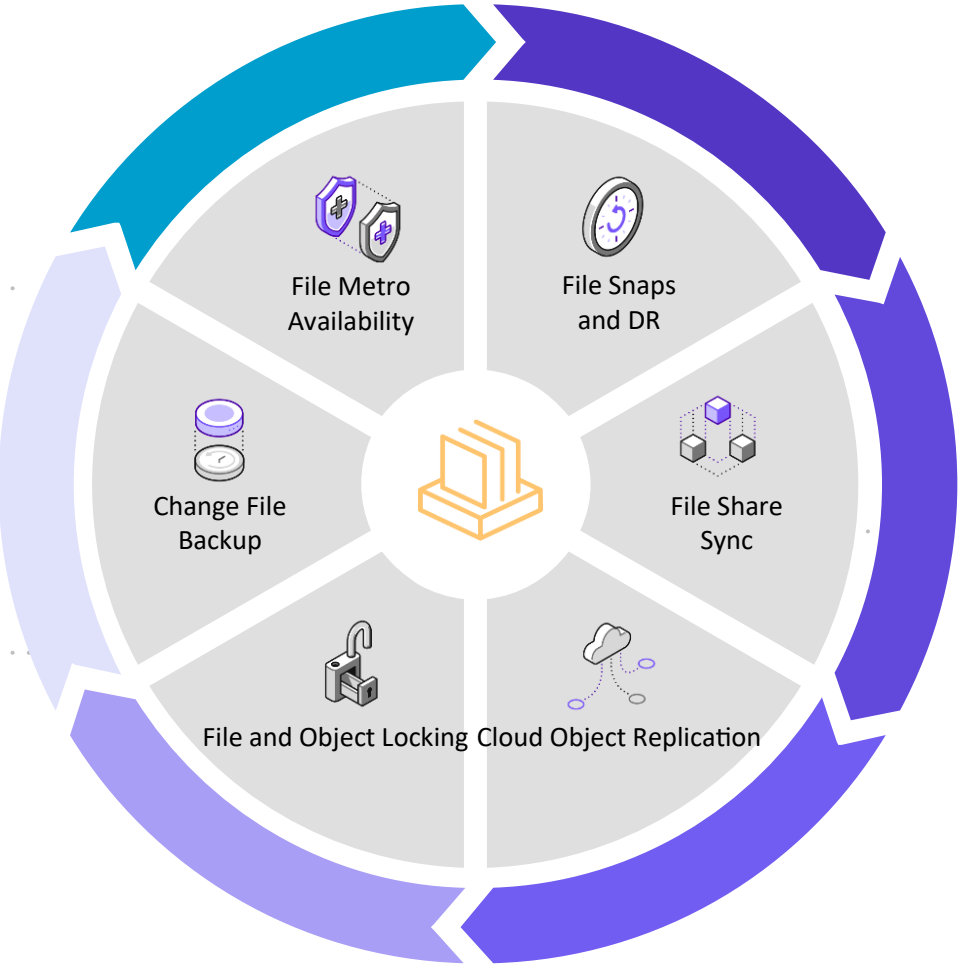# Complete SLA-Based Data Protection

File Metro Availability
Sync replication of file server and application VMs within metro for zero RPO recovery

Change File Backup
Incremental high-performance file backup based on change-tracking

File and Object Locking
File WORM and S3 object locking to ensure data once written can't be deleted

File Snaps and DR
File-share level snapshots and async replication for more granular data protection

File Share Sync
File-share consolidation and home dir / user share sync across edge, core and cloud

Cloud Object Replication
Replicate to multiple Nutanix or public cloud S3 buckets for distributed protection

File Metro Availability

File Snaps and DR

Change File Backup

File Share Sync

File and Object Locking   Cloud Object Replication

54

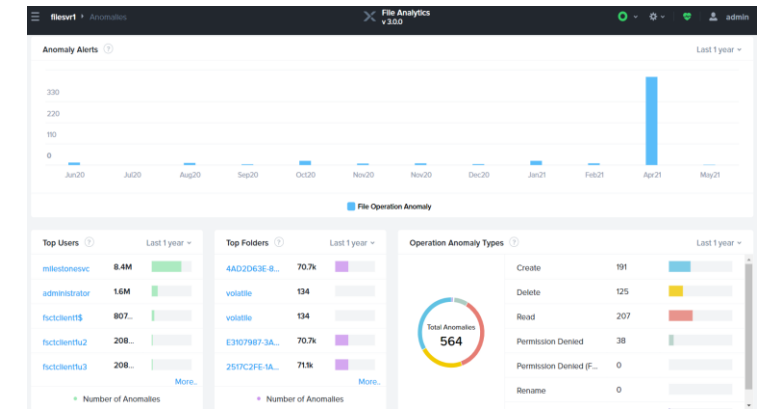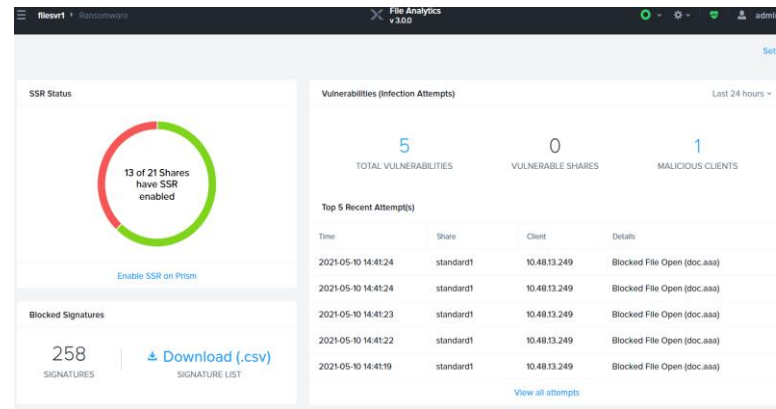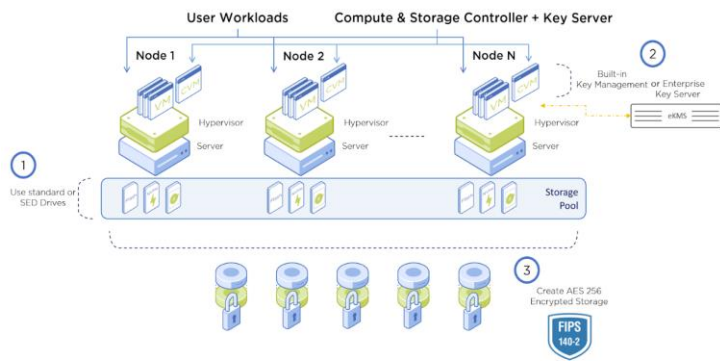# Prioritizing Security From the Ground Up

End-to-End Encryption
Data-in-flight & data-at-rest

Ransomware Defense
Real time detection & blocking

Insider Threat Detection
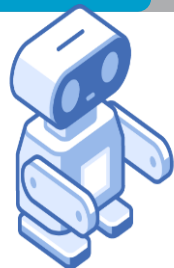Detect & analyze bulk changes

Compliance Ready	DoDIN APL	STIG / FIPS Compliance	SEC 17a-4F WORM
	Software & Hardware Encryption	Common Criteria	Internal & External Key Managers

Cloud Operating Model: Operate and Govern

Planning, Recommendations,
Alerting and Low Code Automation

Cost metering and categorization. for Files
and Objects

Create Playbook

Set Autopilot | Save & Close | ? | ✕

Trigger

🔔 Alerts Matching Criteria

Actions

▸ REST API

＋ Add Action

Alerts Matching Criteria

Change Trigger

Apply to
○ All Alert Policies   ● Specific Alert Policies

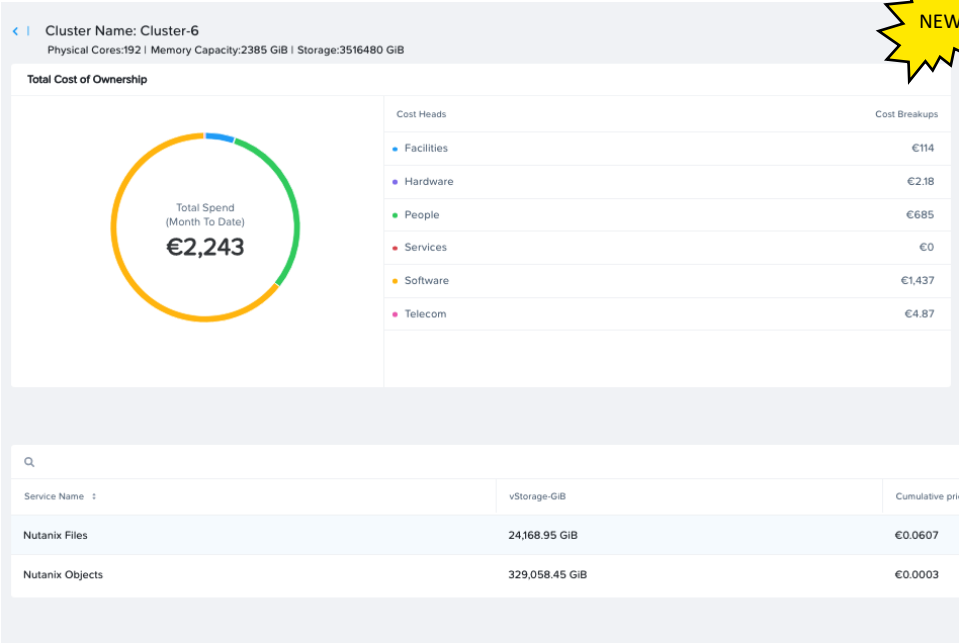Select Alert Policies
File Server Space Usage High ✕   ⇕

Severity
Any ✕   ⇕

Cluster
● All Clusters   ○ Specific Clusters

NEW

‹ | Cluster Name: Cluster-6
Physical Cores:192 | Memory Capacity:2385 GiB | Storage:3516480 GiB

Total Cost of Ownership

	Cost Heads	Cost Breakups
Total Spend (Month To Date) **€2,243**	• Facilities	€114
	• Hardware	€2.18
	• People	€685
	• Services	€0
	• Software	€1,437
	• Telecom	€4.87

| Service Name ⇕	vStorage-GiB	Cumulative pri
Nutanix Files	24,168.95 GiB	€0.0607
Nutanix Objects	329,058.45 GiB	€0.0003

Cloud Operating Model: App Marketplace

- We are uniquely positioned to offer apps and data collocated on the same storage platform

- Base unified storage license includes 1 app VM per node
  - Unbeatable TCO for backup, archive, edge and ISV solutions requiring a few VMs

- App marketplace makes it easy to discover and deploy applications

- **Future:** Expand marketplace to include more apps covering a wider range of use cases related to storage
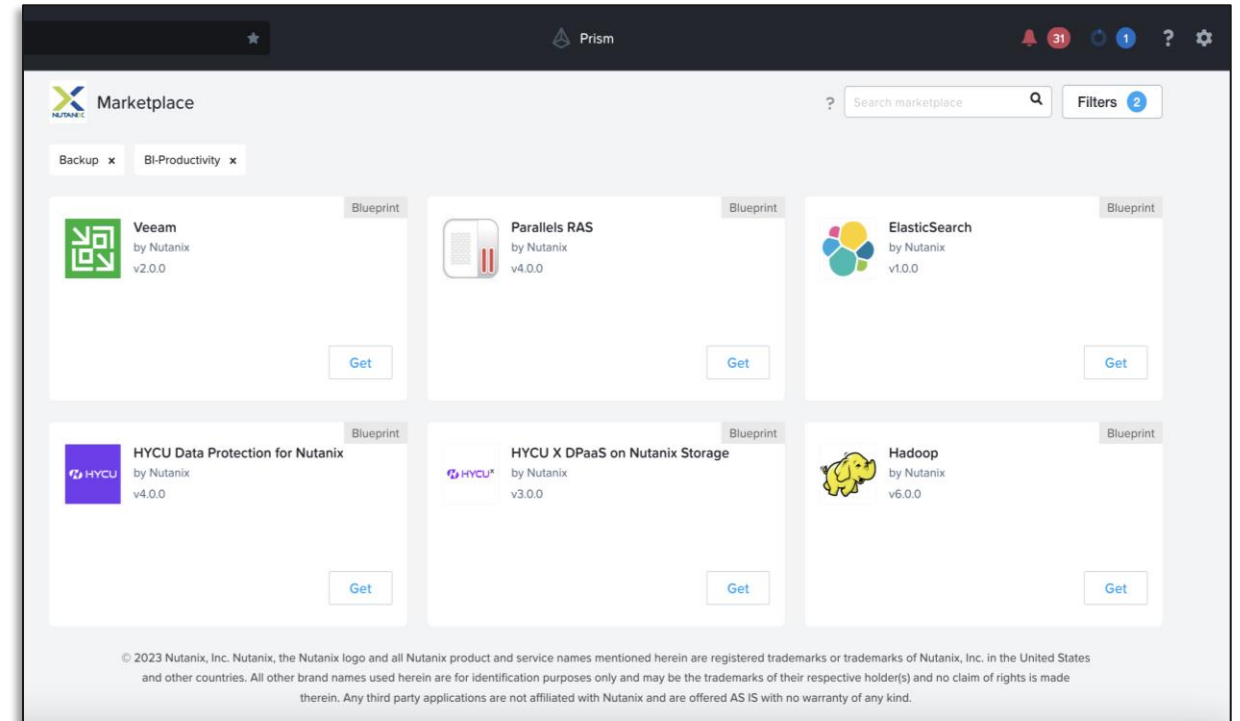
08

Nutanix Data Lens

Data Lens: Global Visibility and Front-Line Defense

Security and Protection

- Detect zero-day and signature-based ransomware threats

- Block suspicious files and activity

- Monitor and generate security alerts on anomalous activity

- Access Risk – Permissions visibility and change auditing

Data Lifecycle Management

- Analyze data storage, consumption and growth

- Increase efficiency by identifying old, infrequently used, and irrelevant data

- Tier, delete or retain data based on enterprise policies

Audit and Compliance

- Audit and review user activity

- Generate reports on activity on data

- Provide compensating and monitoring controls required by regulatory frameworks

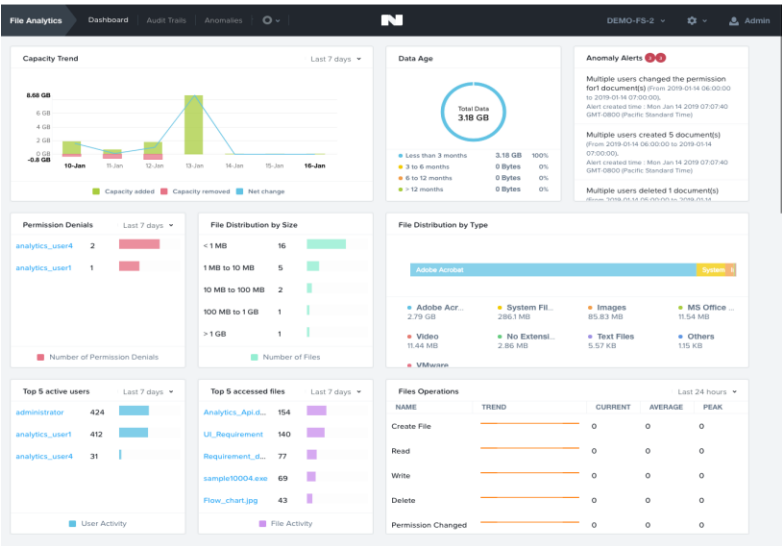- Secure platform with STIG / FIPS compliance, SEC 17a-4F WORM and Common Criteria
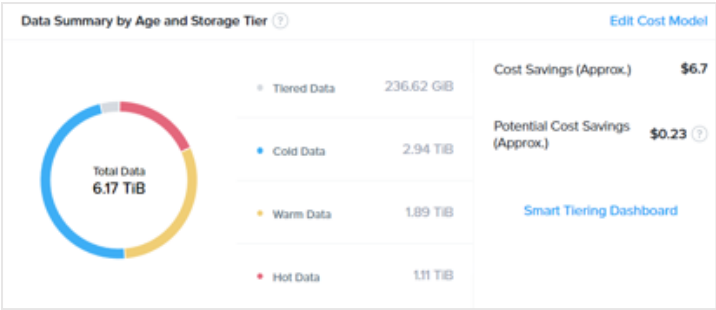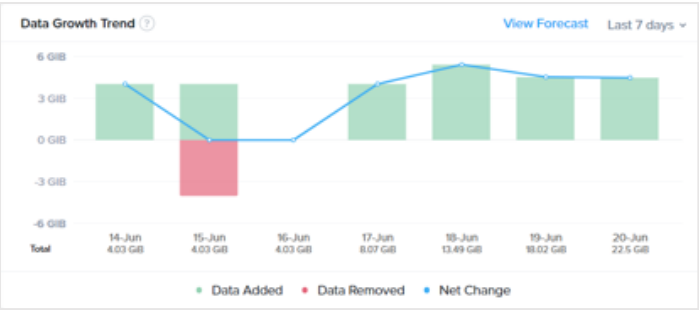
Subscription-based service – first year all services included

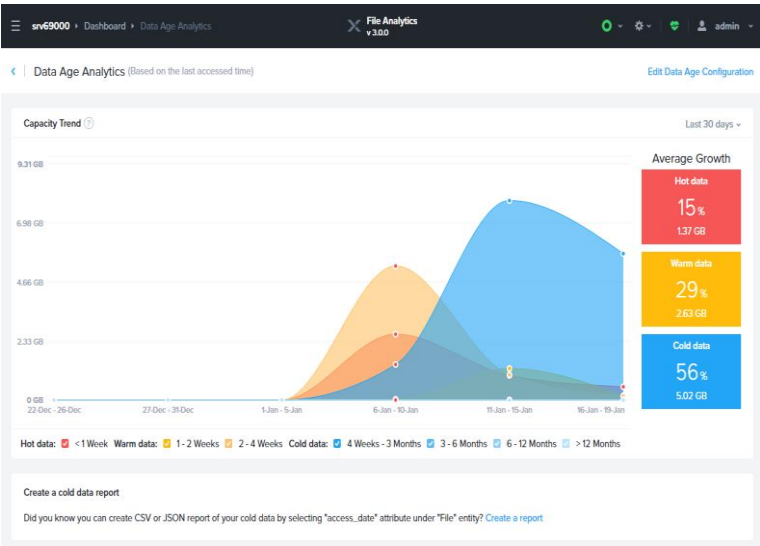# Built-in data intelligence

Usage Analytics

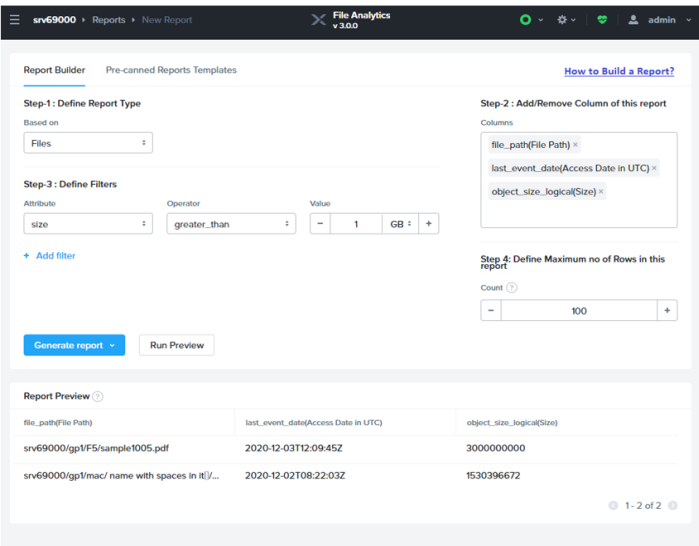Analyze how your system is consumed

Data Age Analytics

Analyze your hot, warm & cold data trends

Custom Reports

Get customized reports for deeper insights

Greater visibility and control with analytics

Data Classification ✓

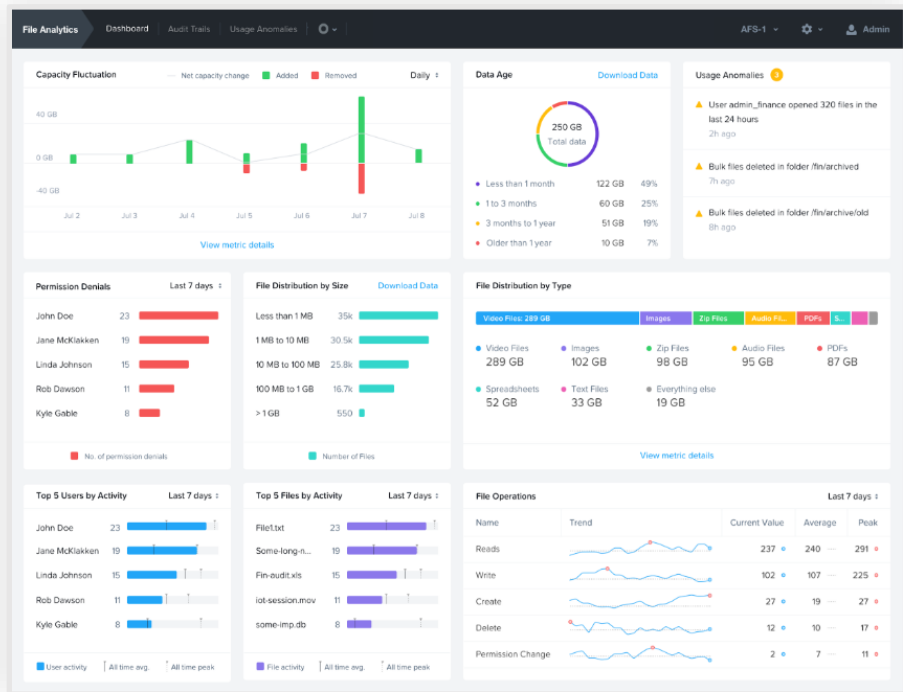Data History and Ageing ✓

Storing audit details or activity ✓

Permission Visualization ✓

Detection of malicious activity ✓

Unintended user actions ✓

09 Vroom, Vroom. Test Drive!

Nutanix Workshop Series - CTA

Join our upcoming Nutanix Workshops to explore how Nutanix Unified Storage can streamline your data management, enhance security, and optimize performance—all while reducing complexity in your environment. Register now and take the next step toward a more efficient and scalable storage strategy!

- Session 3 (March 3rd) – Automating Operations
- Session 4 (March 19th) – Security and Compliance
- Session 5 (April 9th) – Disaster Recovery
- Session 6 (April 23rd) – Database as a Service
- Session 7 (May 14th) – Multi-Cloud Strategy

THANK YOU