All Flash Array Nodes
in a Hybrid Storage Cluster

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Where Do All Flash Arrays Fit?

- AFAs are deployed today primarily for a subset of enterprise workloads
  - Random R/W requiring very low latency or high IOPS at low latency
  - But…the opportunity is much bigger

- AFAs should displace performance HDDs for all primary workloads
  - The transition has already begun at many customers
  - Performance, capacity efficiency, density, lower power, etc. have broad appeal
  - But…these attributes are not enough to satisfy enterprise storage requirements

- AFAs must be as capable as existing HDD-based enterprise storage
  - AFAs and hybrid/disk storage will co-exist in on-premise enterprise data centers, and at service provides
 - Both need to be Enterprise Grade

Enterprise Grade All Flash Storage

Enterprise Grade all flash storage has these integrated capabilities:

- Flash-optimized architecture
- Scale-out for capacity/performance
- SAN, NFS and SMB/CIFS support
- Non-disruptive operation during planned and unplanned events
- Dynamic data migration between flash and disk
- Async and sync replication
- Backup/recovery flexibility across flash, disk, and cloud (F2D2C)

- Multi-workload QoS management
- Secure multi-tenant operation
- Hypervisor support: VMware, Hyper-V, Citrix, KVM
- Application integration: Microsoft, Oracle, SAP
- CloudStack support
- Backup/data management software support: Commvault, Veritas, TSM, Veeam

Example Data ONTAP Cluster

AFF   **FAS**

HA PAIR   HA PAIR

SSDs   HDDs

Mixed Storage Data ONTAP® Cluster
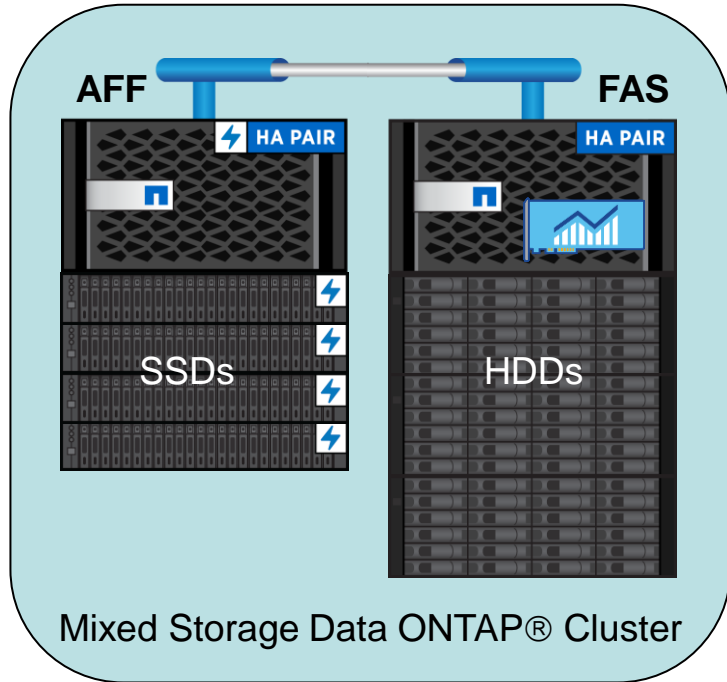
- Enterprise Grade storage

- All Flash FAS (AFF) for application workloads

- Hybrid (cache-accelerated HDDs) for secondary workloads

- All nodes in the cluster run the same storage OS
  - Nodes can be different controller models
  - SAN, NFS and CIFS/SMB flexibility
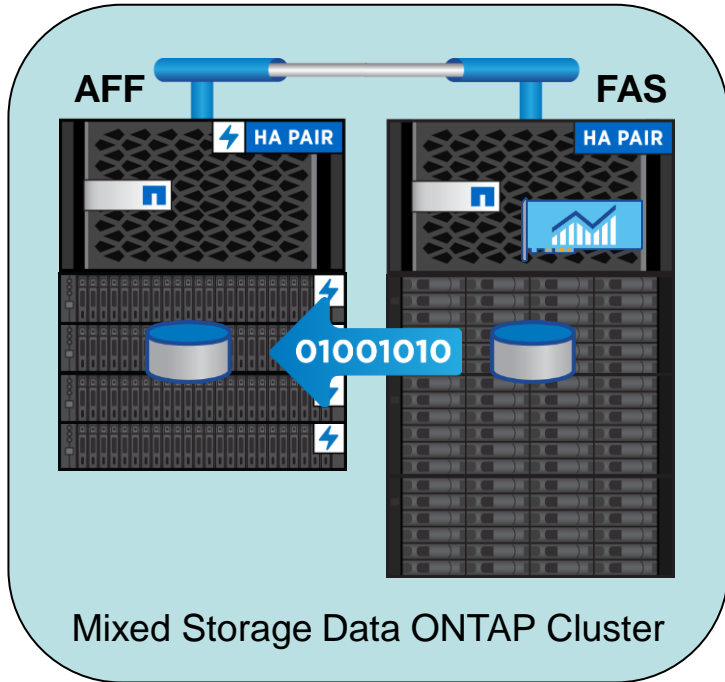 - Scale-out and scale-up flexibility

Virtual Desktop Deployment

Mixed Storage Data ONTAP Cluster
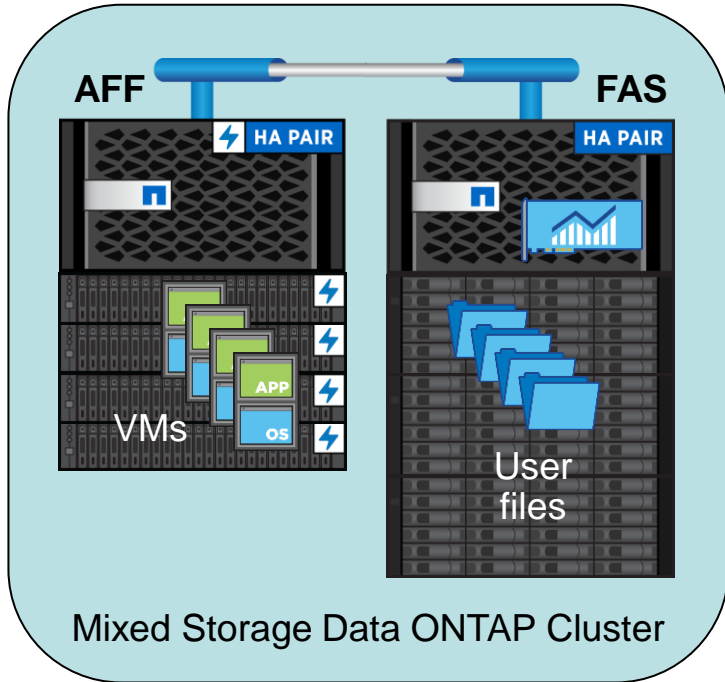
- **VMs provisioned on flash storage**
  - Consistent latency and VM density

- **User files provisioned on hybrid**
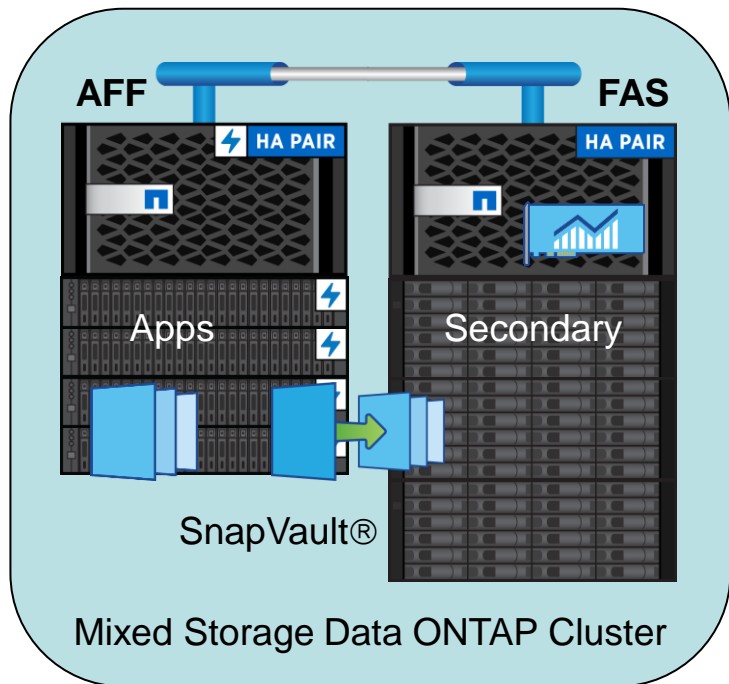 - Cost efficiency and better performance for repeat reads

Online Workload Migration

Mixed Storage Data ONTAP Cluster

- Storage performance requirements for a workload may change
  - New workload – unclear requirements
  - Workload demand changes

- LUN, VVOL or volume is migrated to storage tier that meets performance and cost needs − while workload I/O is being served

On-Premise Flash to Disk Backup/Recovery

AFF — FAS

HA PAIR — HA PAIR

Apps — Secondary

SnapVault®

Mixed Storage Data ONTAP Cluster

- Snapshots on AFF for immediate recovery

- Incremental forever backups to FAS with fast recovery
  - Lower storage cost
  - Read-only copies or writeable clones can be used for other workloads, e.g.
    - Report generation
    - Data analysis
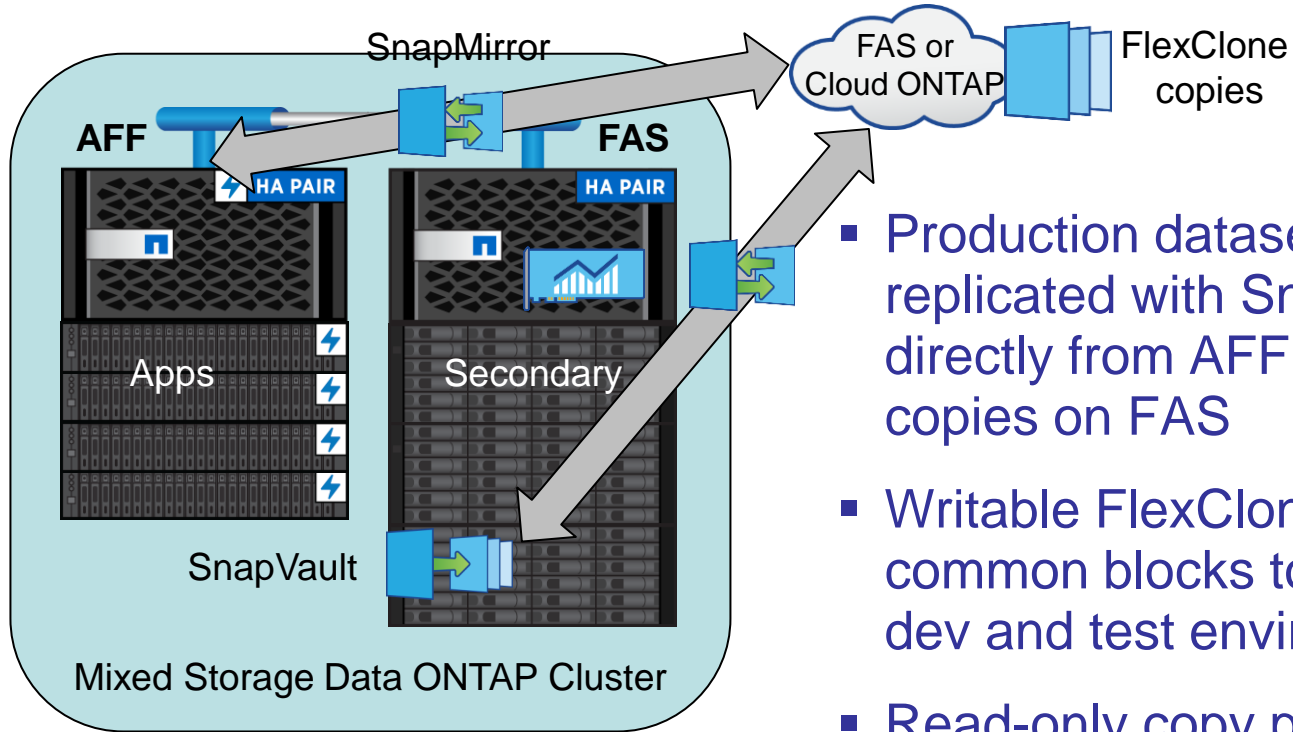
Use Case:
On-Premise App Development and Test
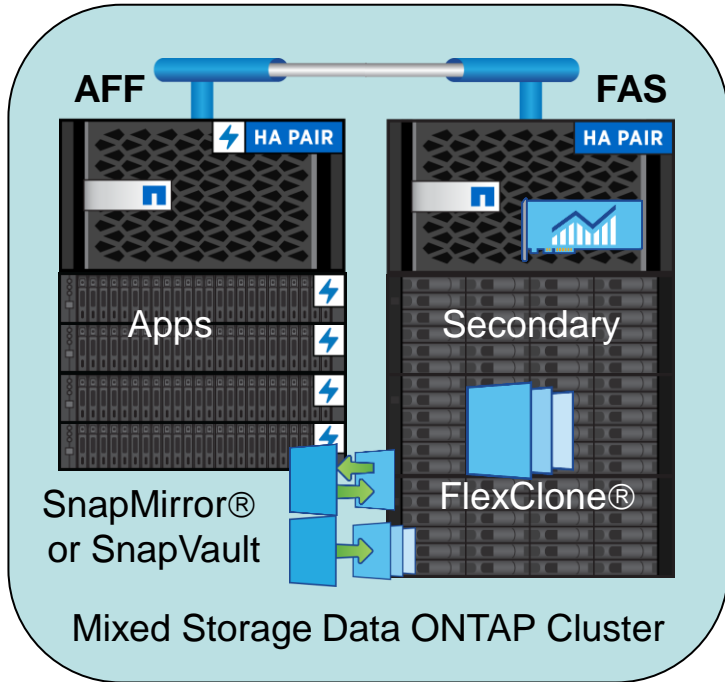
- Production datasets incrementally replicated to secondary storage

- Writable FlexClone® copies share common blocks to provide multiple dev and test environments
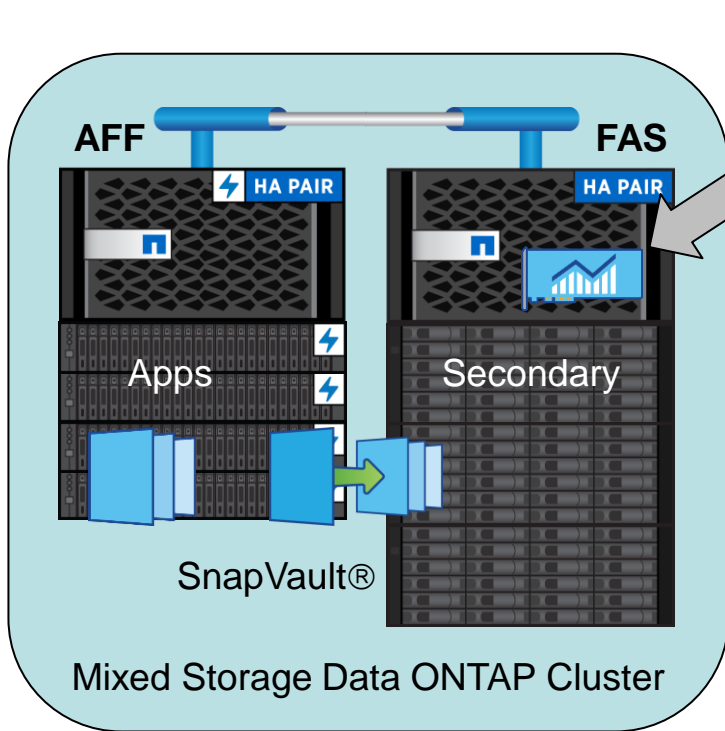
Cloud App Development and Test

- Production datasets incrementally replicated with SnapMirror to cloud directly from AFF, or from backup copies on FAS

- Writable FlexClone® copies share common blocks to provide multiple dev and test environments

- Read-only copy provides DR as well

Archive On-Premise Data to Cloud

AFF

FAS

AWS
Azure,…

- With Data ONTAP destinations (FAS system or Cloud ONTAP), use SnapMirror for incremental transfer

- For other destinations, NetApp AltaVault provides compressed, deduped, encrypted transfer

Apps

Secondary

SnapVault®

Mixed Storage Data ONTAP Cluster

Summary

- Flash and disk storage will co-exist in data centers

- Enterprise grade flash storage and hybrid disk storage − integrated into a unified infrastructure − is required to realize maximum value and benefit

- Data ONTAP clusters with All Flash FAS and hybrid FAS already do this

Thank You!