



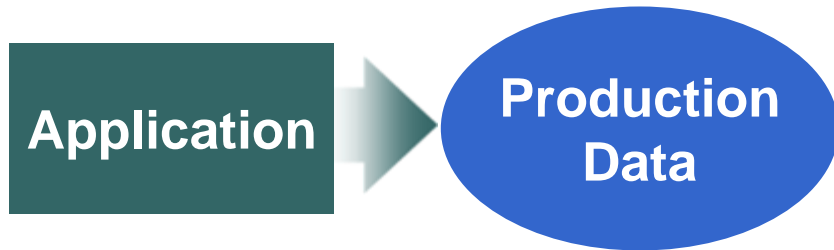
Enterprise storage architecture for Vietnam commercial banks - Doing More with Less

Francis Wang

**Sales Director, Emerging Countries
(ASEAN)**

The Data Proliferation Problem

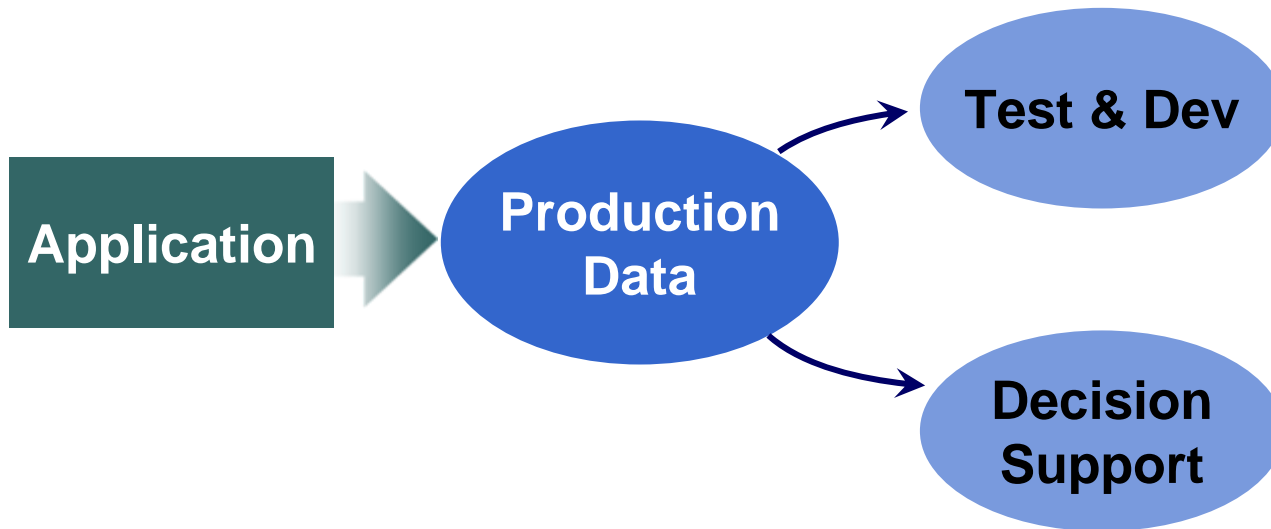
Original Data



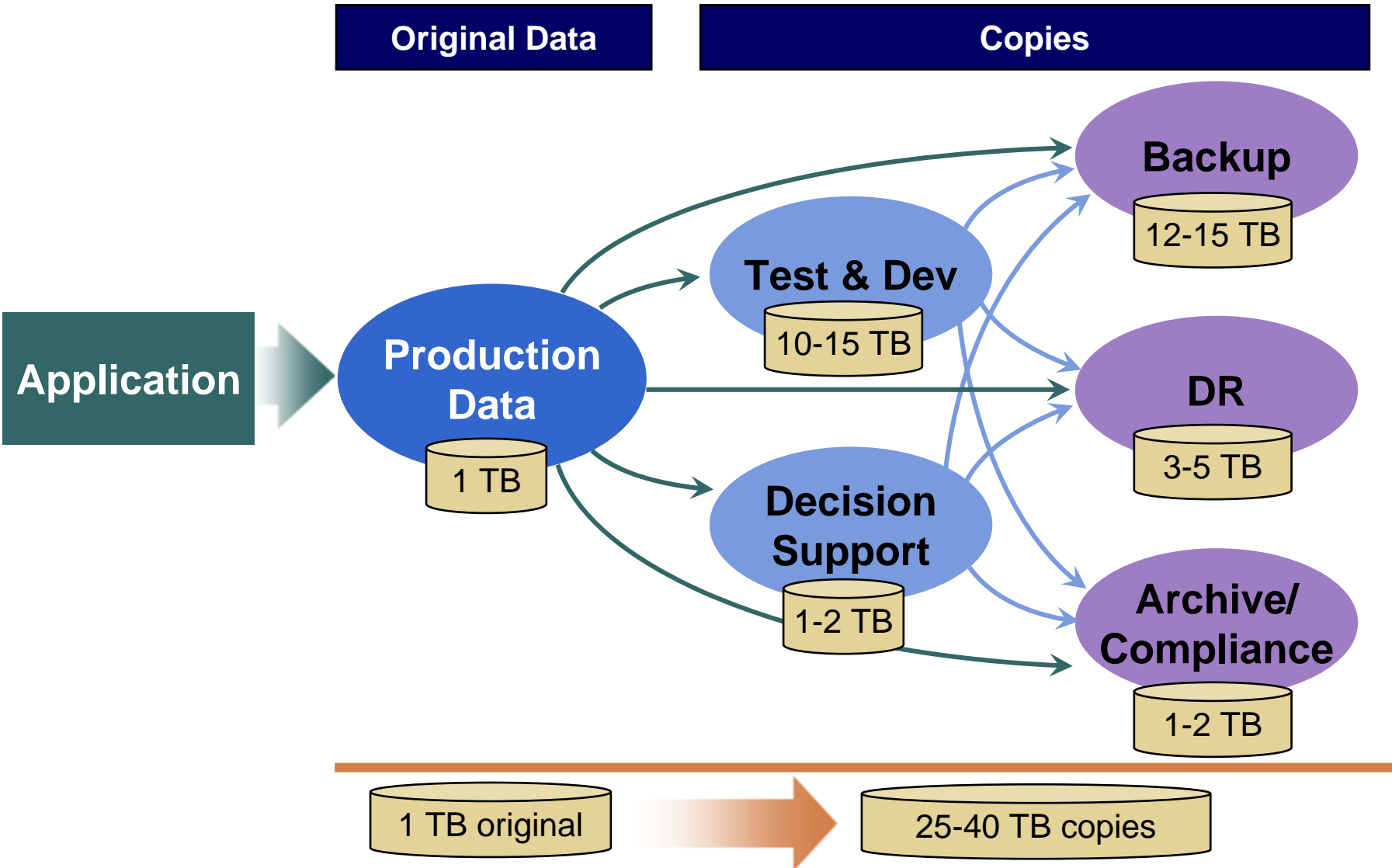
The Data Proliferation Problem

Original Data

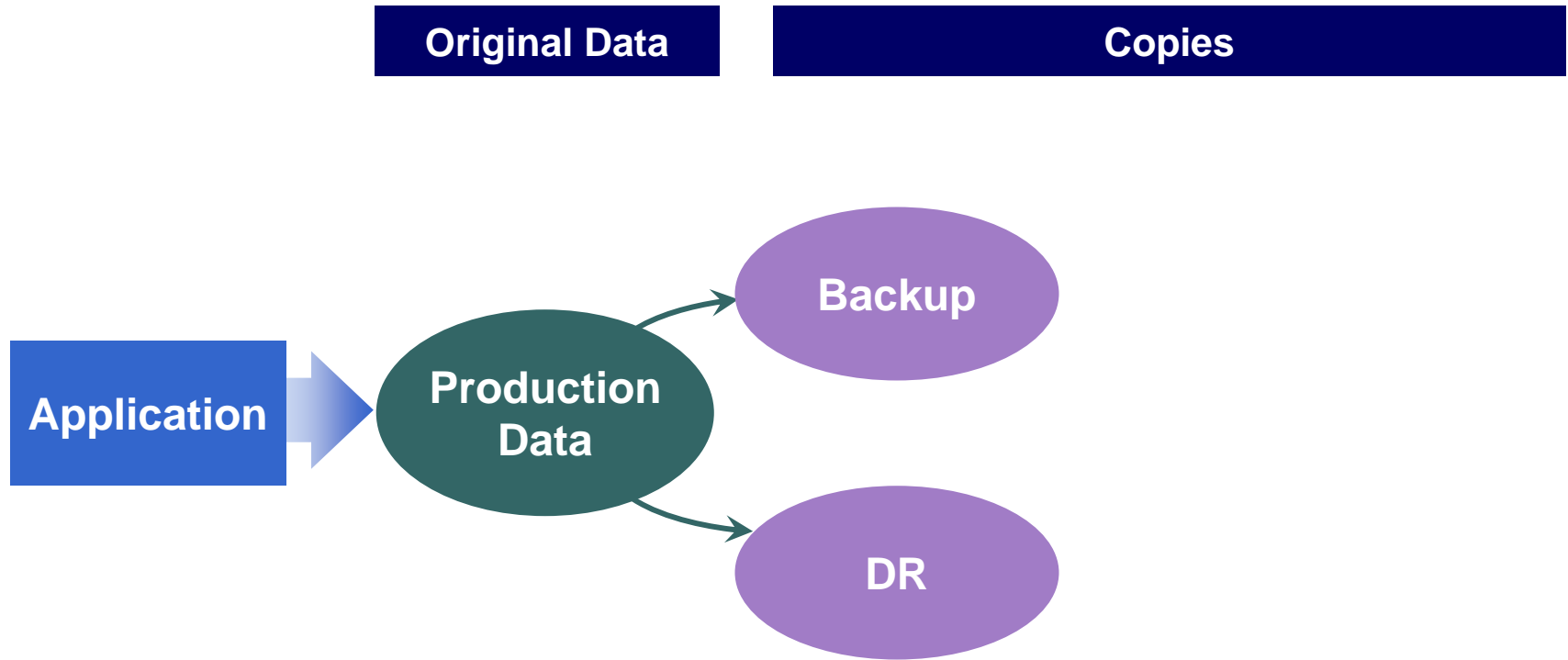
Copies



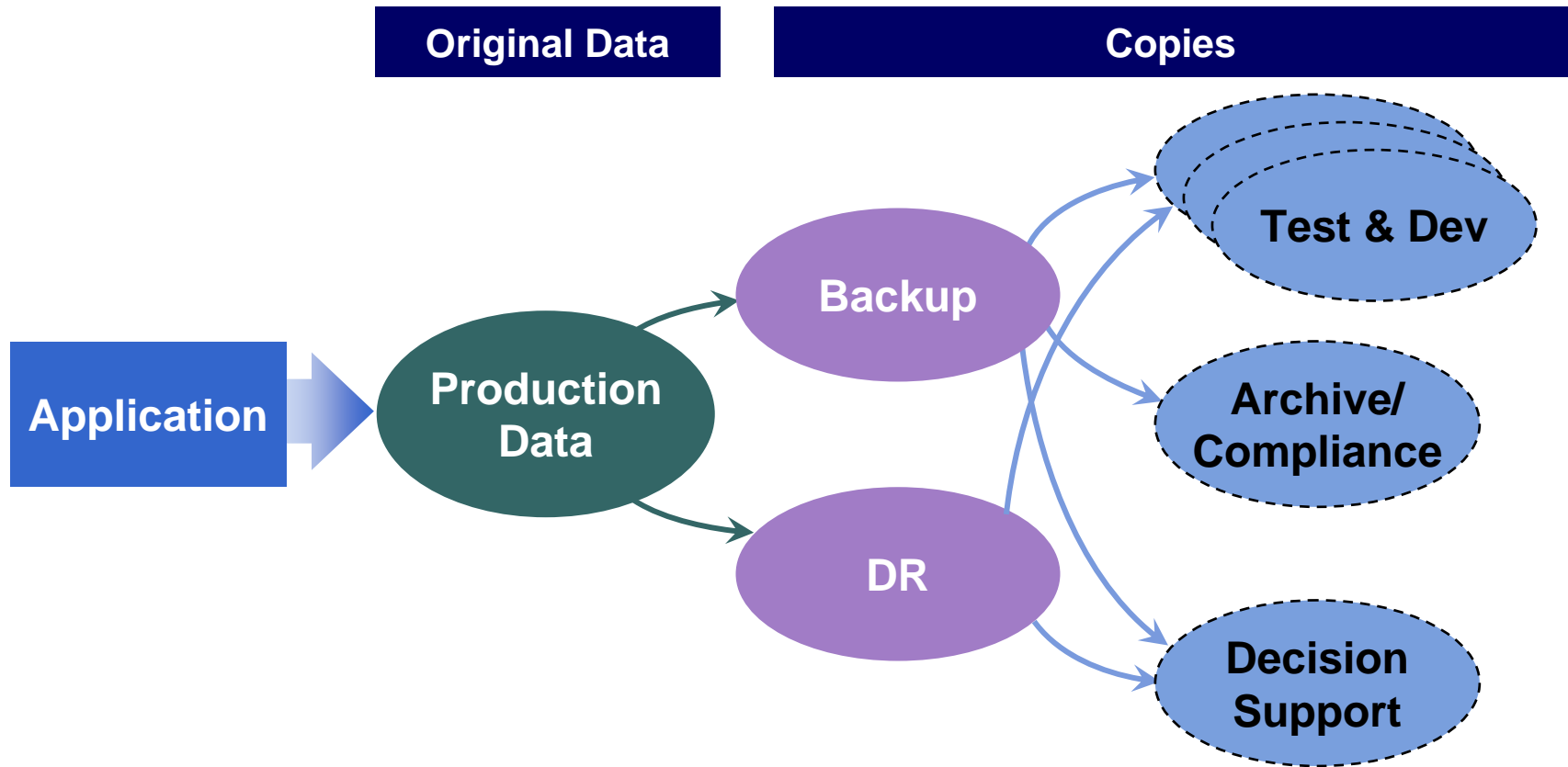
The Data Proliferation Problem



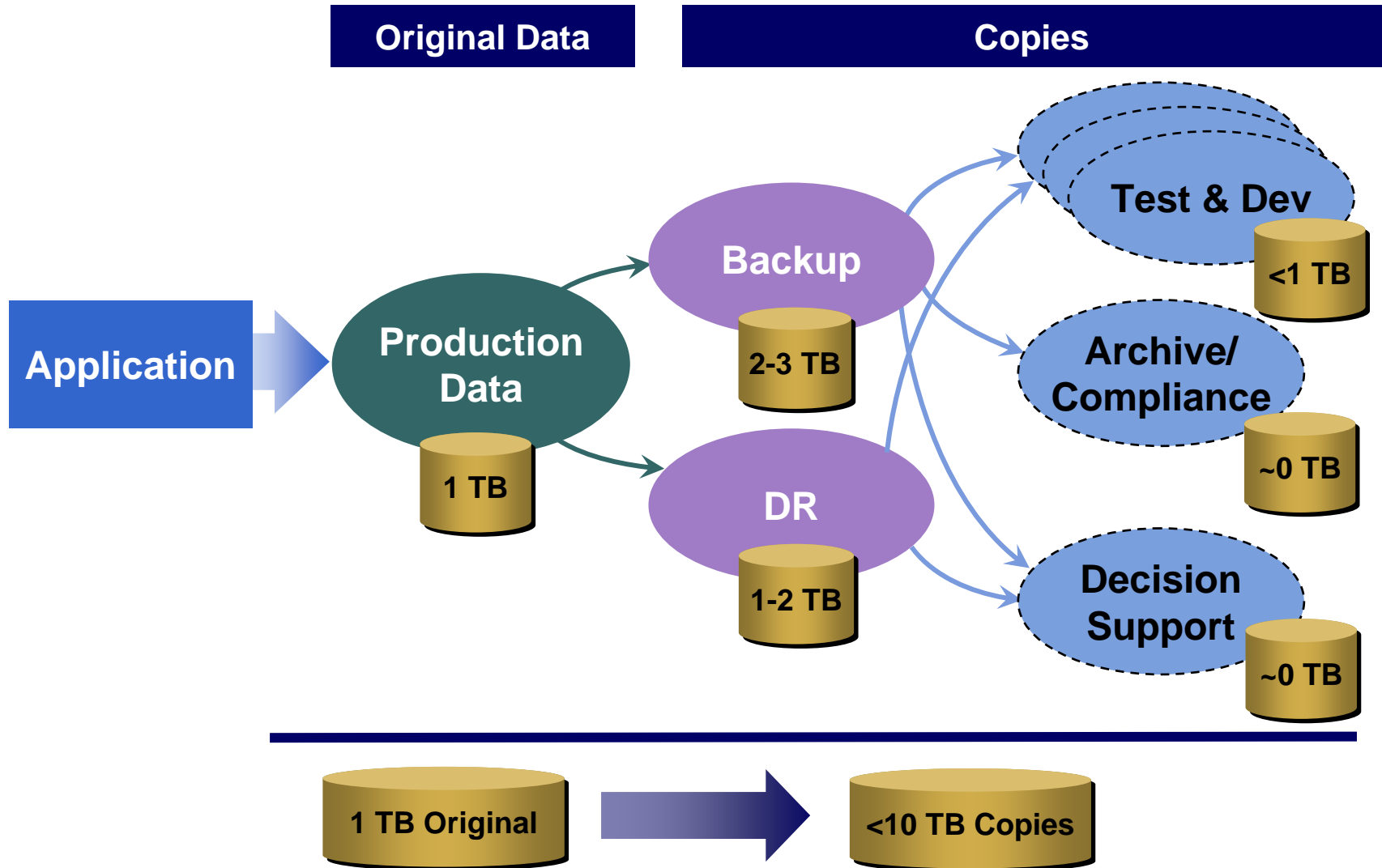
NetApp's Data Protection Aim



NetApp's Data Protection Aim



NetApp's Data Protection Vision



NetApp's Data Protection Aim

Original Data

Copies

**“With NetApp, we cut the cost of raw disk by 5x.
Less copies also resulted in significant
administrative and management savings.”**



Data

1 TB

DR

Compliance

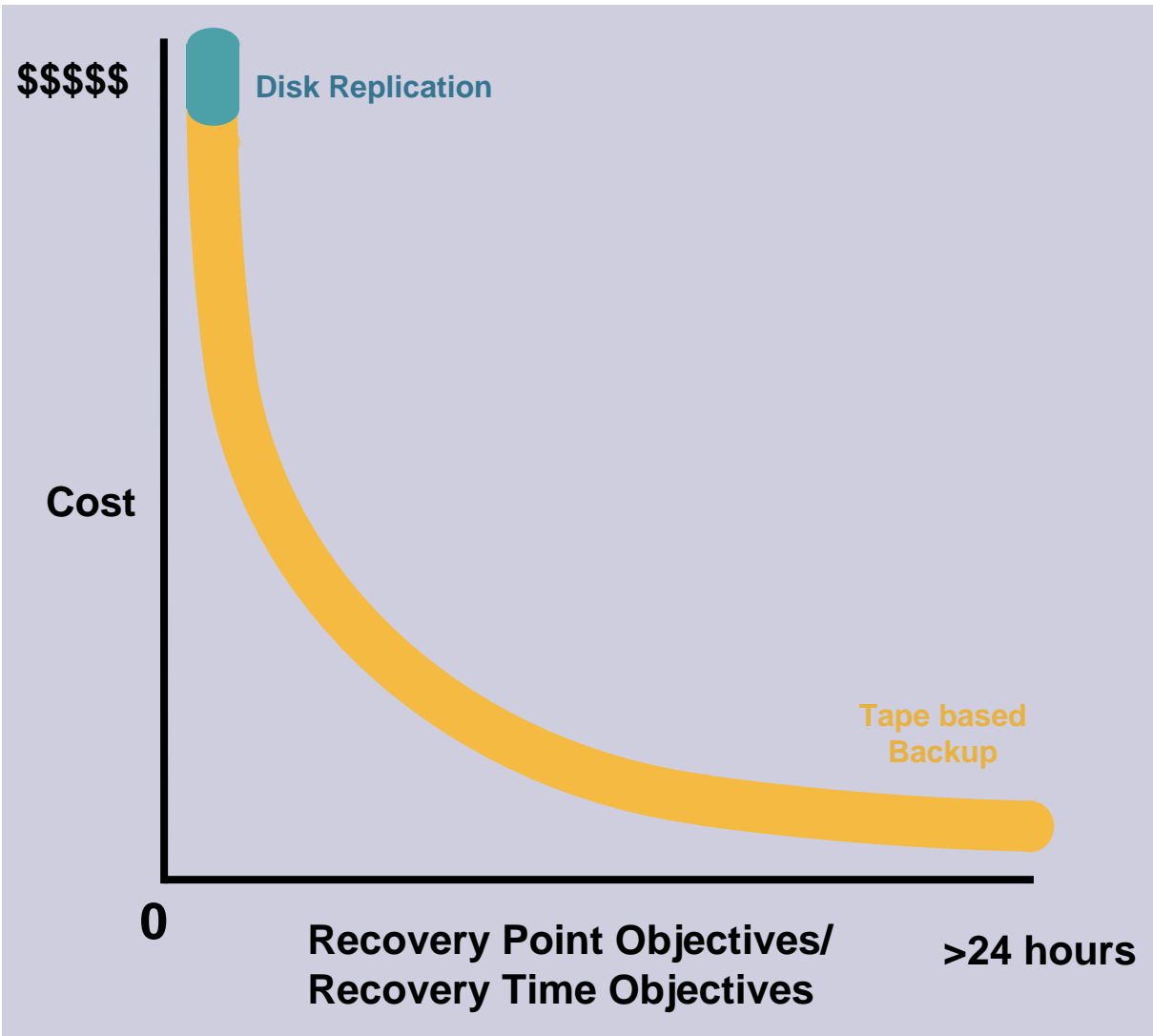
~0 TB

**NetApp enables you to
protect more of information, utilize it,
and dramatically simplify and
lower the cost of managing it.**

1 TB Original

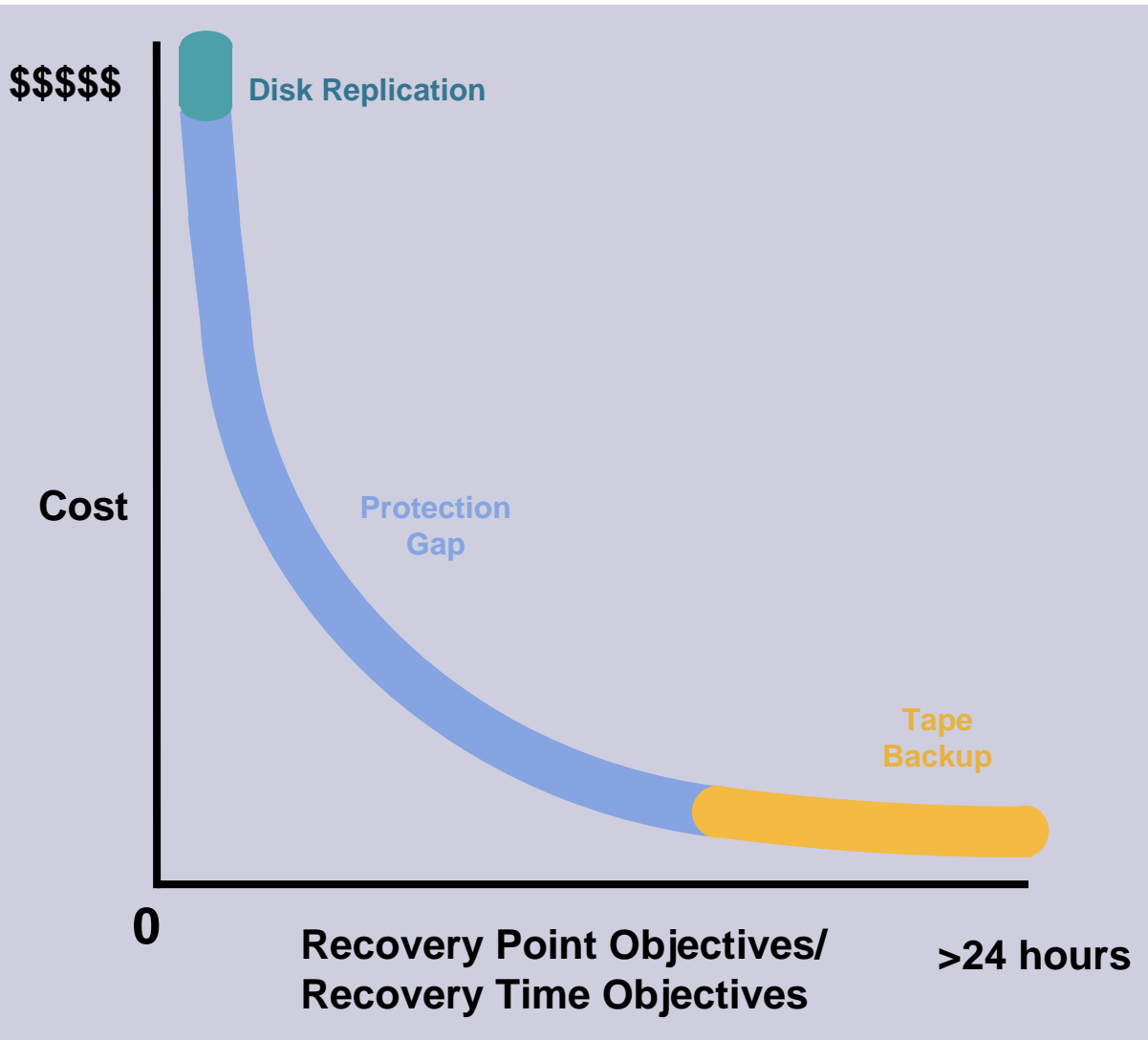
3-4 TB Copies

Business Continuity Options



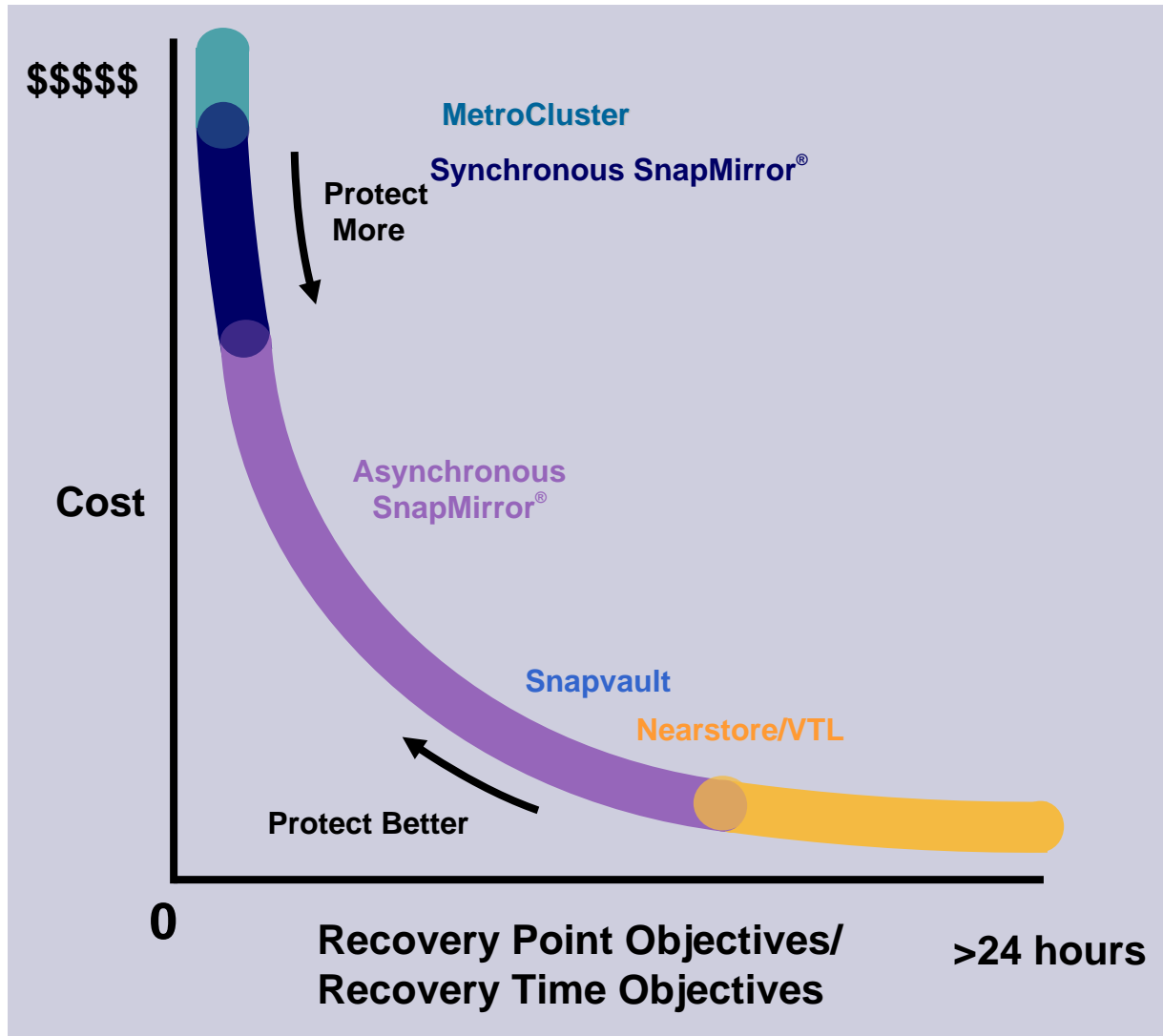
► Only two alternatives

Business Continuity Options



- ▶ Only two alternatives
- ▶ Most requirements unmet with tape

NetApp Business Continuity Continuum



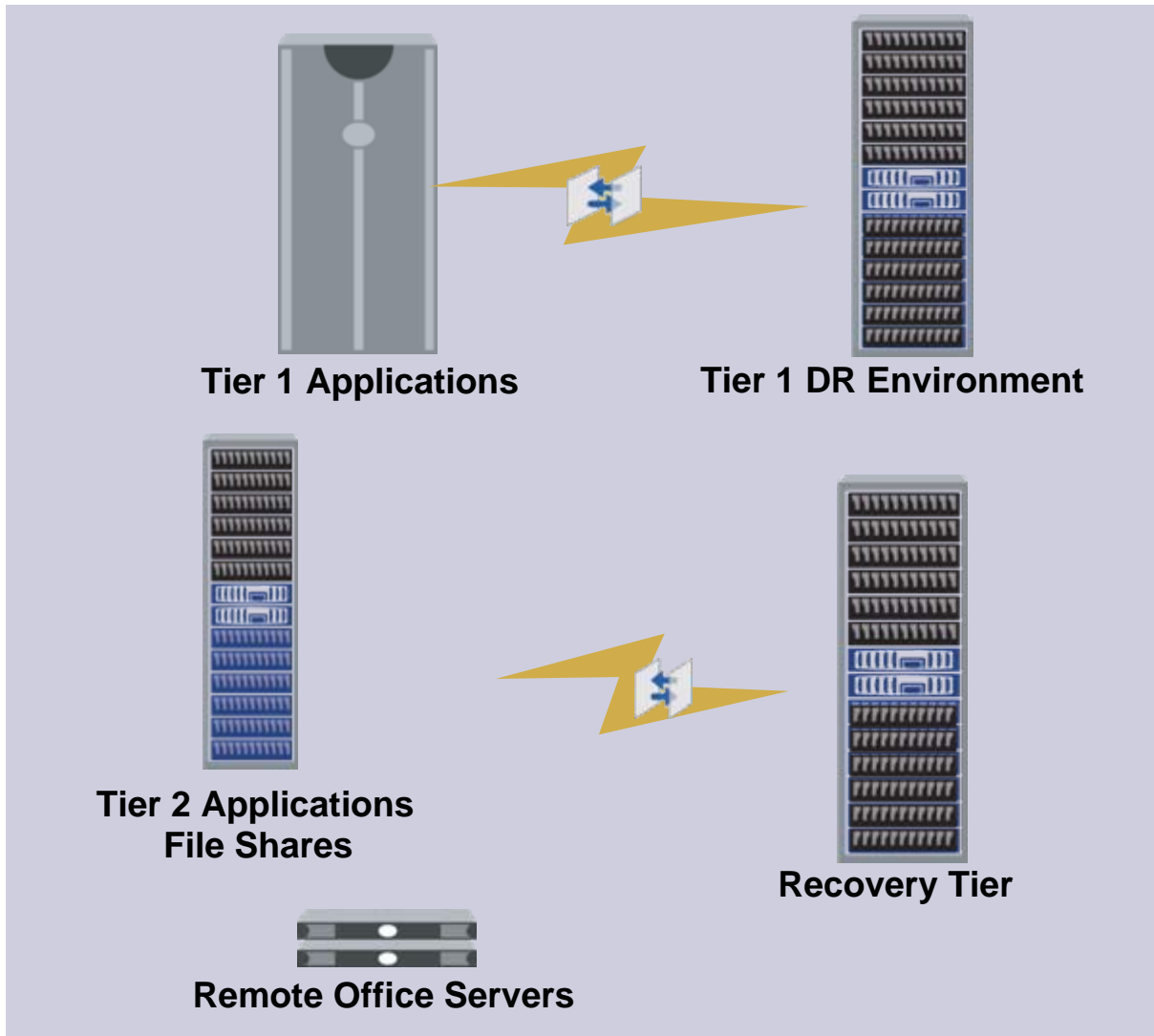
✓ **Improve Operations**

- Rapid recovery
- Single architecture
- App. integration
- Enterprise manageability

✓ **Reduce Costs**

- Affordable options
- Any-any replication
- FC-to-SATA
- Bandwidth efficient
- Smart copies

Extends to Other Primary Environments



► Consolidate

- Support for other vendor environments
- Any-any replication

► Utilize

- Clone for development & test operations
- Smart copies

Business Continuity Achieved



“NetApp and Datacore save us millions of dollars a year by helping ensure nonstop production for manufacturing facilities.”

– Ford Otosan



“Previously it was only cost-effective to protect the most critical information. With NetApp we now have almost every process protected.”

– First American

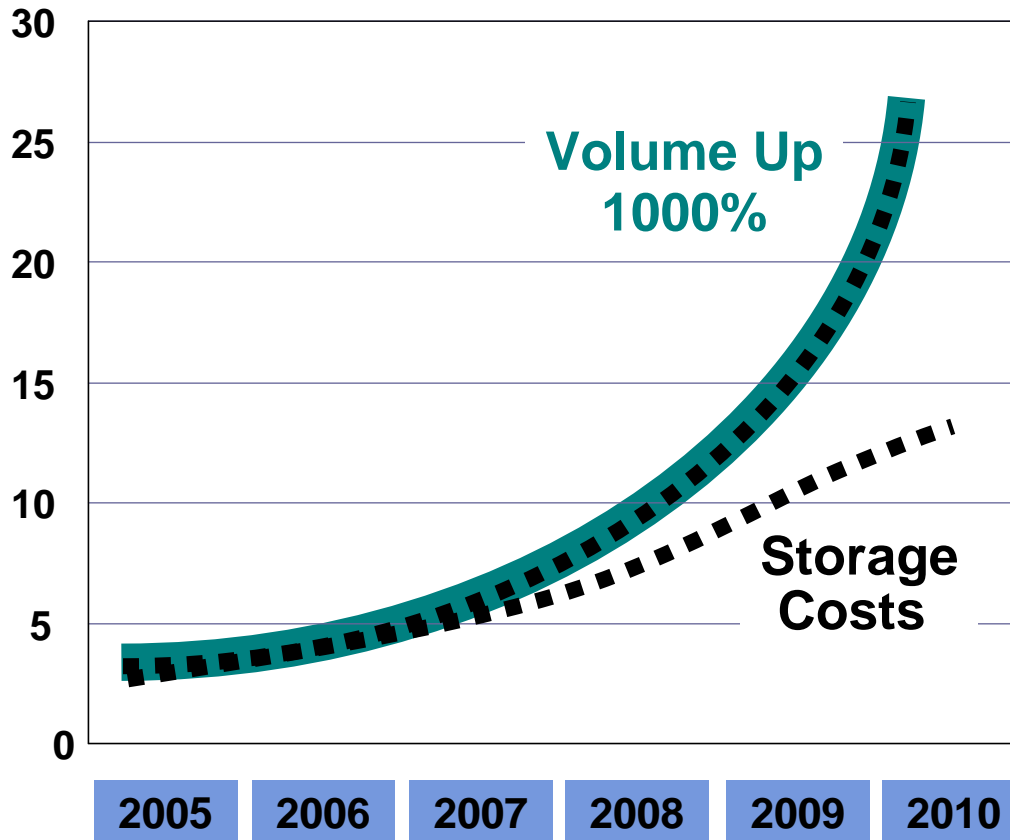


“NetApp offered a significantly more robust and flexible solution for a capital expenditure that was 38% lower than that of the main alternative solution.”

– Telstra Mobile

Storage Efficiency

Total Worldwide Digital Capacity



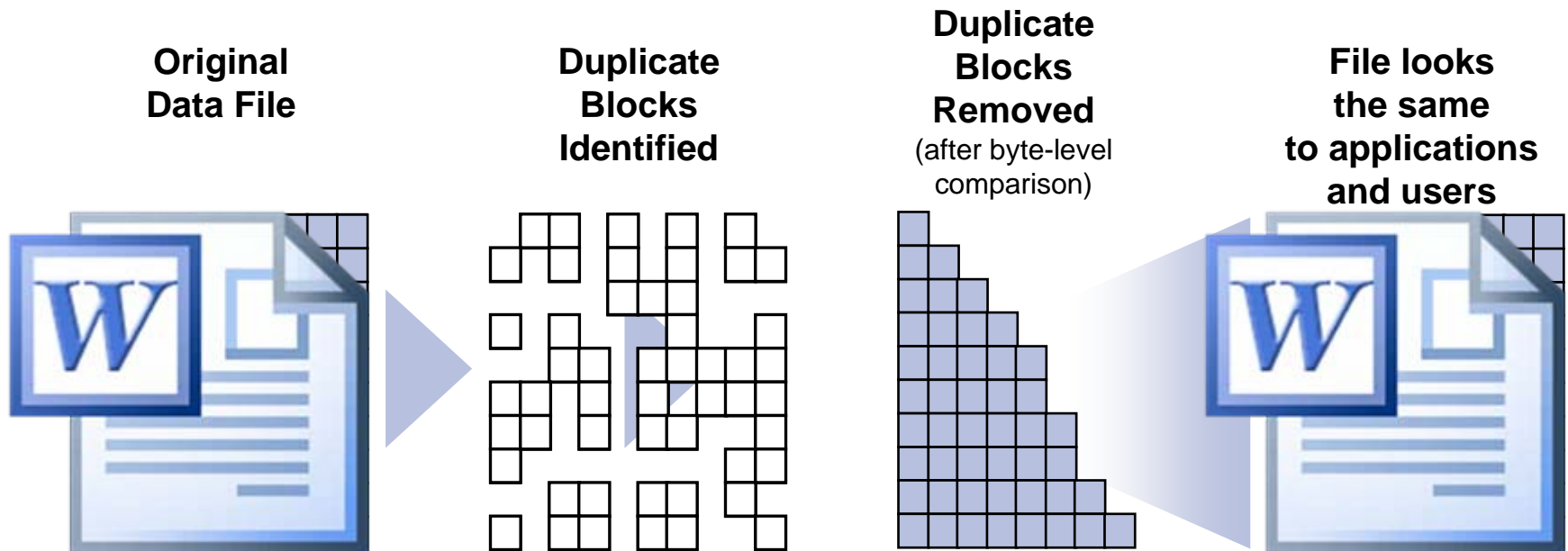
- ▶ Managing cost by using storage tiers?
- ▶ Tape is increasingly unable to cope with the rate of growth of data
- ▶ Disk is frequently adopted as part of the backup infrastructure in improve SLA
- ▶ But disk cost is inherently higher than tapes
- ▶ Balancing act between retrieval and storage costs



Data De-duplication

Longer Retention on Disk

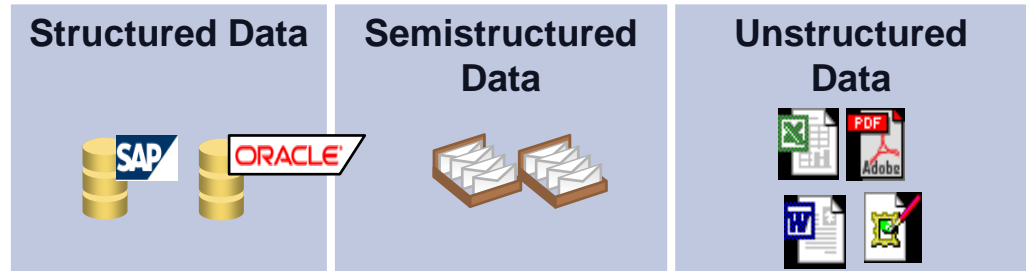
What is Data De-duplication



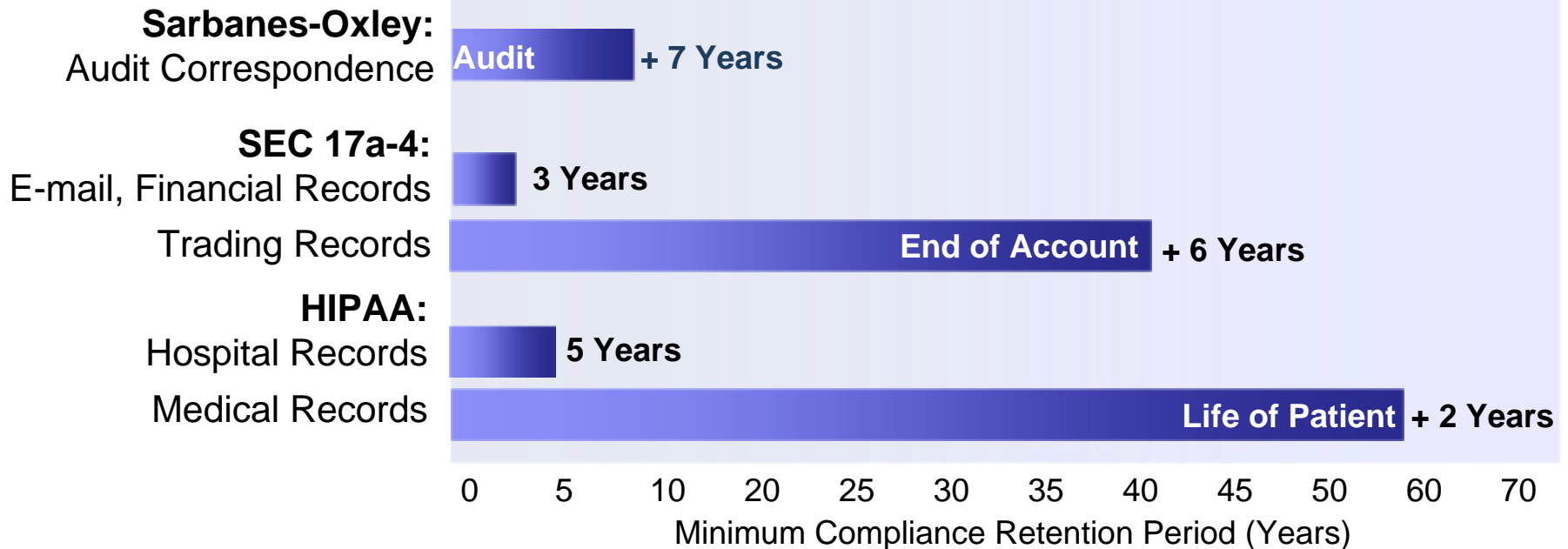
- ▶ **Significant capacity savings for:**
 - Backup data
 - Archived data
 - “Light Use” primary data
- ▶ **Many are still only talking about such technologies**
- ▶ **NetApp A-SIS De-duplication**

Regulated Data Growth Exploding

▶ **More data under regulatory purview**



▶ **Long retention times**



▶ **Costs of noncompliance are high**

- High fines
- Damage to company reputation



▶ **Need rapid information access and retrieval**

- Fines for slow recovery
- Need quick response in legal discovery
- Retrieving data from offline storage is expensive

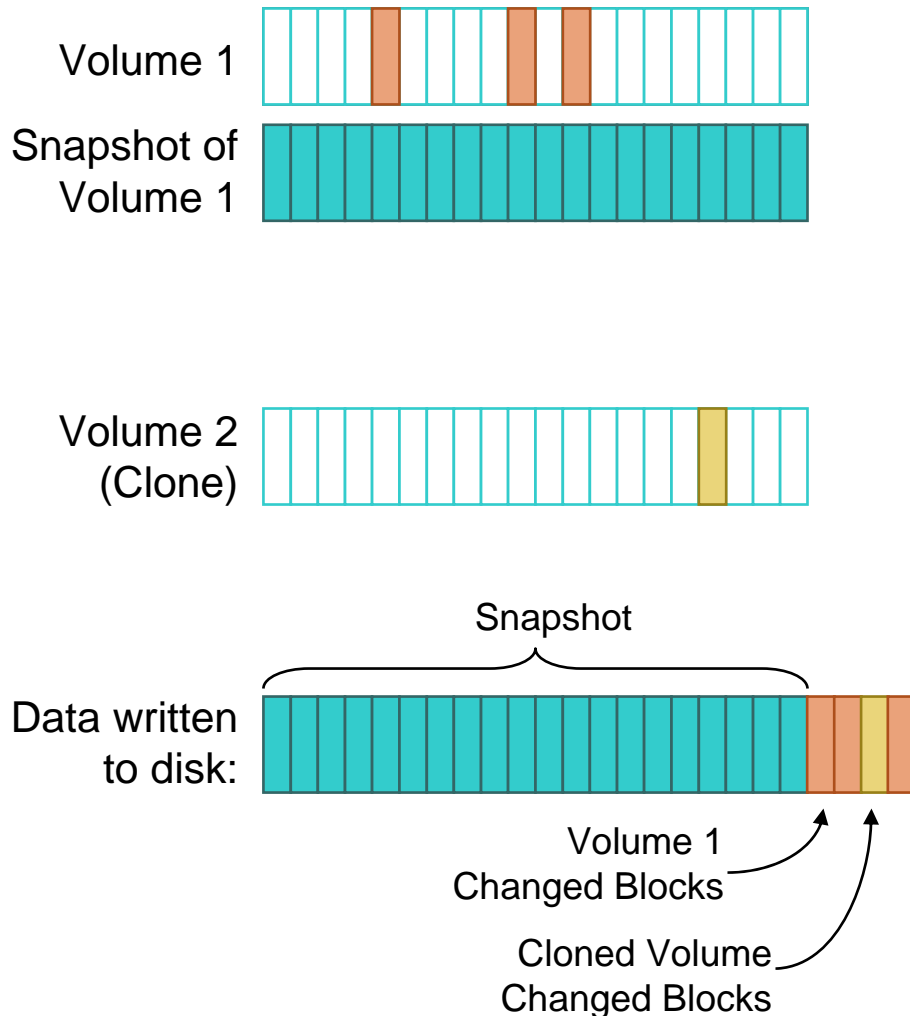




Creating Efficient Copies

Protect Data More Effectively

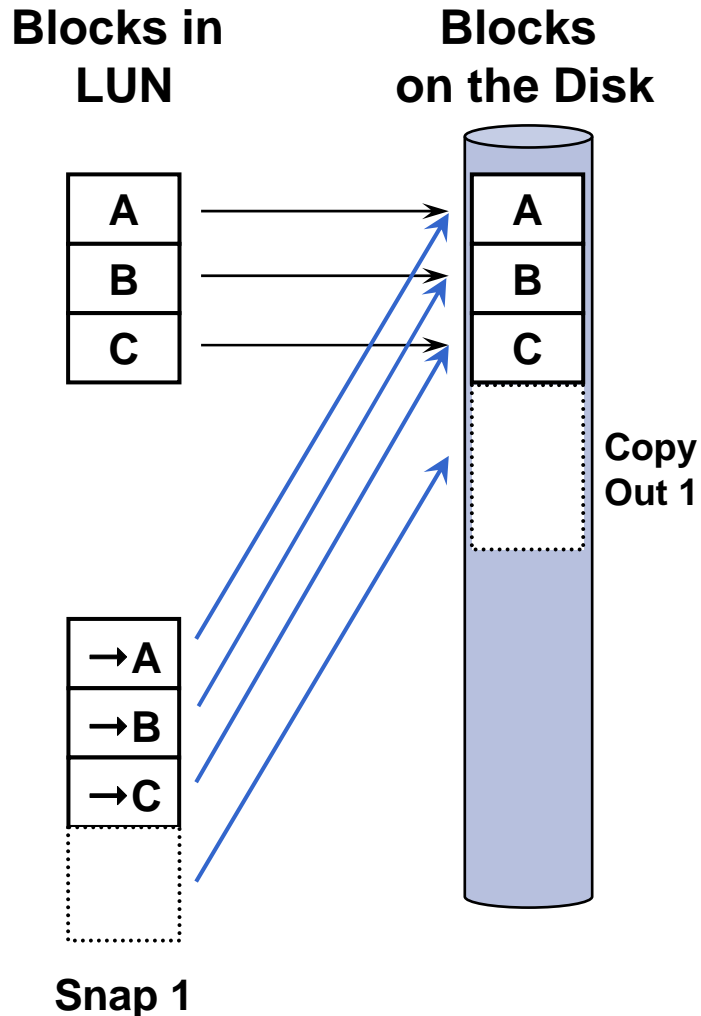
Creating Independent SMART Copies – FlexClone™



- ▶ **Start with a volume**
- ▶ **Take a Snapshot™**
- ▶ **Create a clone**
(a new volume based on the snapshot)
- ▶ **Modify the original vol**
- ▶ **Modify the cloned vol**

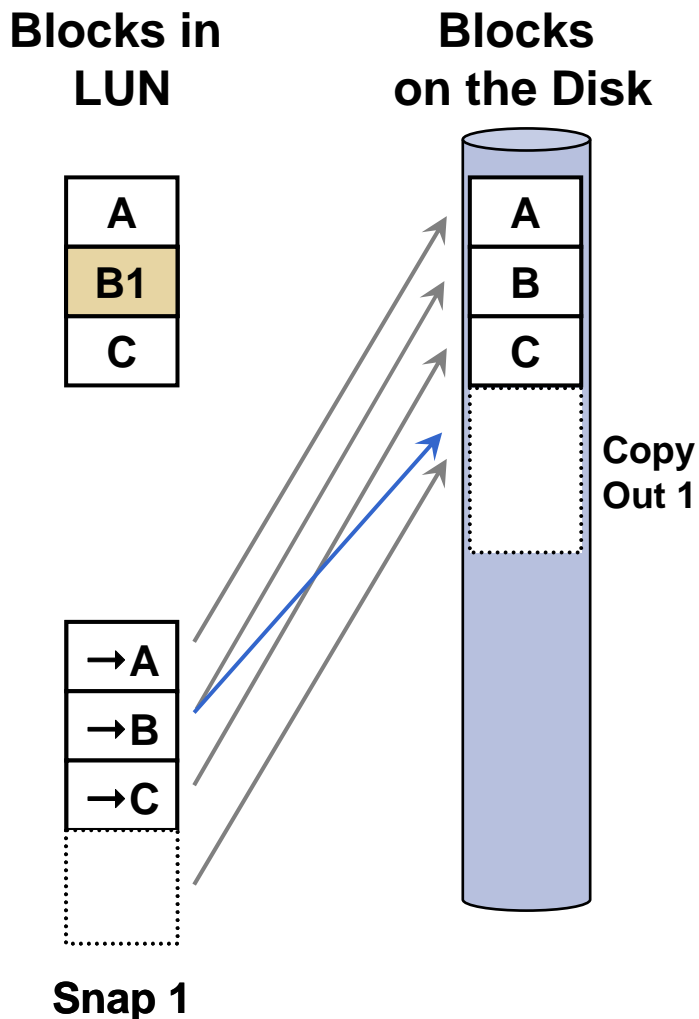
Result:
independent volume copies, efficiently stored

Competing Technology: Inefficient Copy-on-write Technology



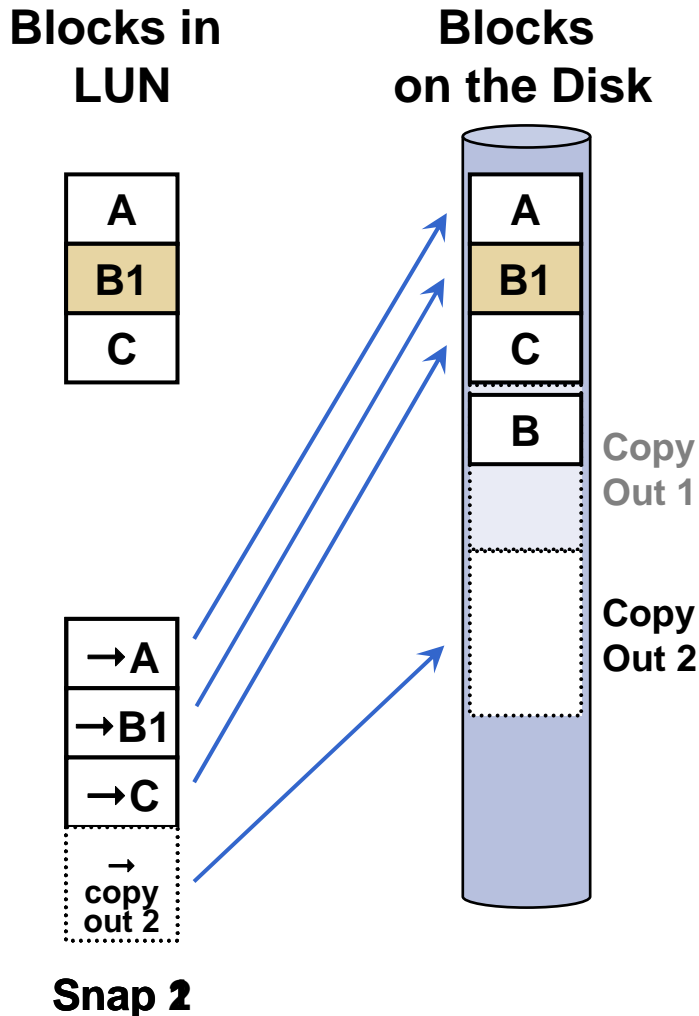
- ▶ **Take snapshot 1:**
 - Create copy out region 1
 - Create pointers to old blocks and copy out

Competing Technology: Inefficient Copy-on-write Technology



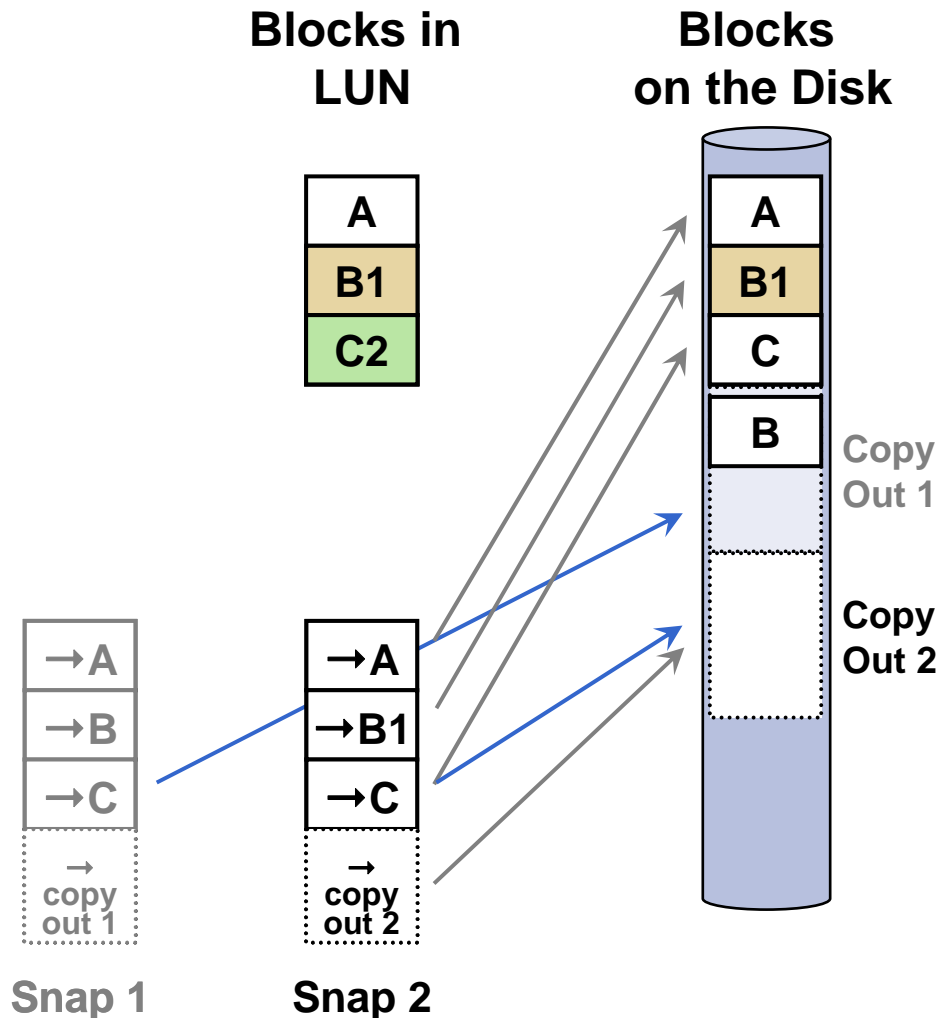
- ▶ **Take snapshot 1**
- ▶ **Continue writing data**
 - Block changes
 - Read old block; write to copy out region
 - Update snap pointer to copy out region
 - Update block on disk
- ▶ **One write requires:**
 - 1 read (old data)
 - 1 write (old data)
 - 1 write (new data)
- ▶ **3x overhead**

Competing Technology: Inefficient Copy-on-write Technology



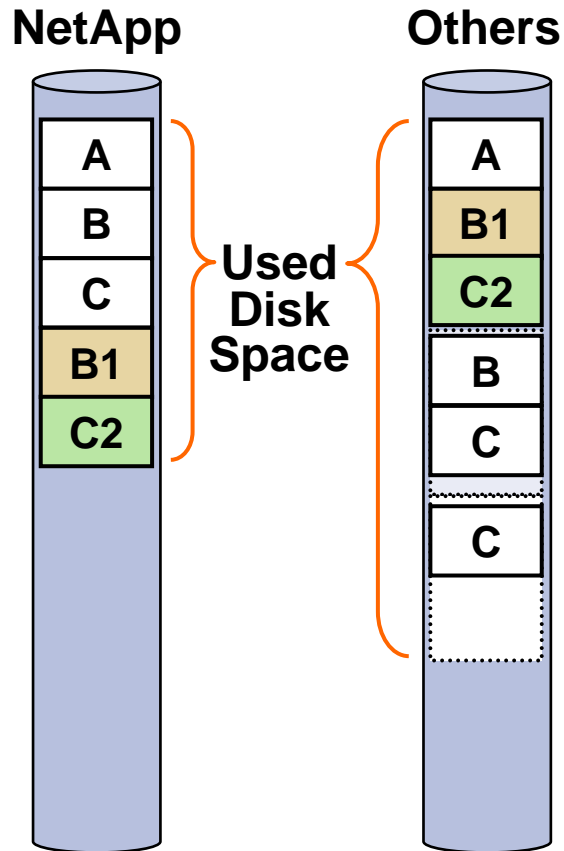
- ▶ **Take snapshot 1**
- ▶ **Continue writing data**
- ▶ **Take snapshot 2:**
 - Create copy out region 2
 - Create pointers to old blocks and copy out

Competing Technology: Inefficient Copy-on-write Technology



- ▶ Take snapshot 1
- ▶ Continue writing data
- ▶ Take snapshot 2
- ▶ Continue writing data:
 - Block changes
 - Old block written to all copy out regions
 - Update all snap pointers to copy out regions
 - Update block on disk
- ▶ One write requires:
 - 1 read
 - 3 writes

Competing Technology: Inefficient Copy-on-write Technology



Side-by-side comparison
after two snapshots

The NetApp approach:

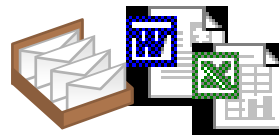
- ▶ **Absolute minimum overhead**
 - Guarantees disk space efficiency
 - ▶ **No data movement**
 - Guarantees disk performance
 - Enables more snapshots
- ▶ **Space on disk is better**
 - ▶ **Performance is better**
 - ▶ **# of snapshots is better**

▶ Different needs for each dataset



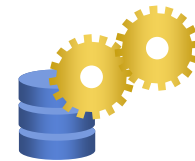
Databases

Snapshots: **weekly**
 Backup: **weekly**
 Restore: **yes**
 Mirroring: **daily**



Home Dirs

Snapshots: **daily**
 Backup: **weekly**
 Restore: **yes**
 Mirroring: **weekly**



Test Data

Snapshots: **multiple**
 Backup: **none**
 Restore: **Yes**
 Mirroring: **none**



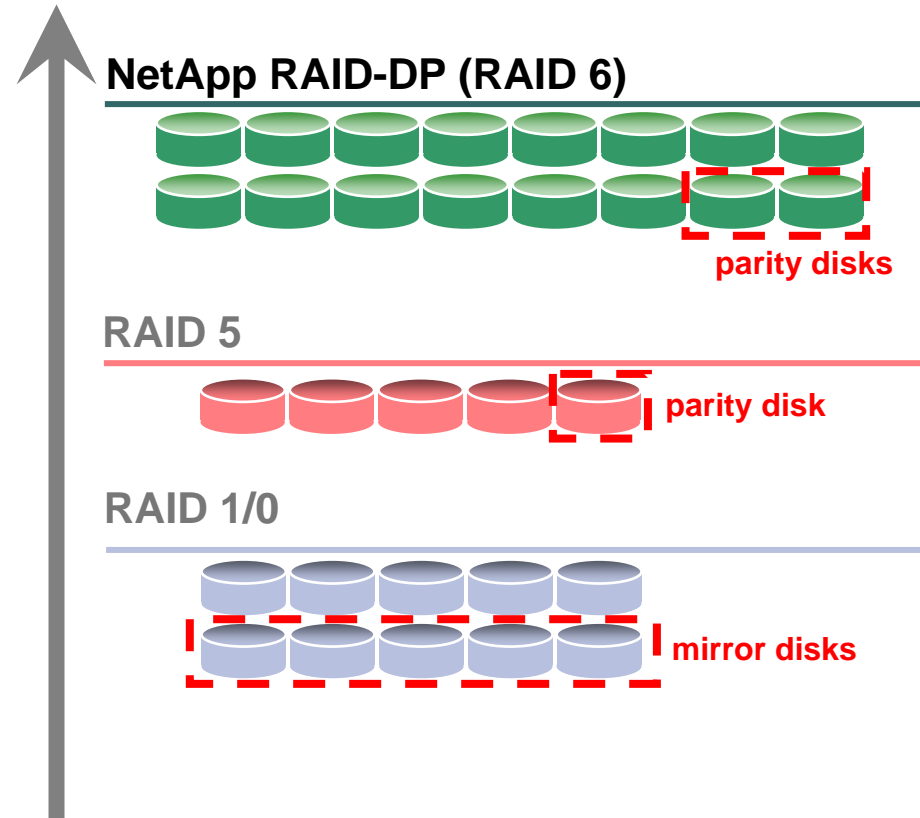
Thin Provisioning and RAID

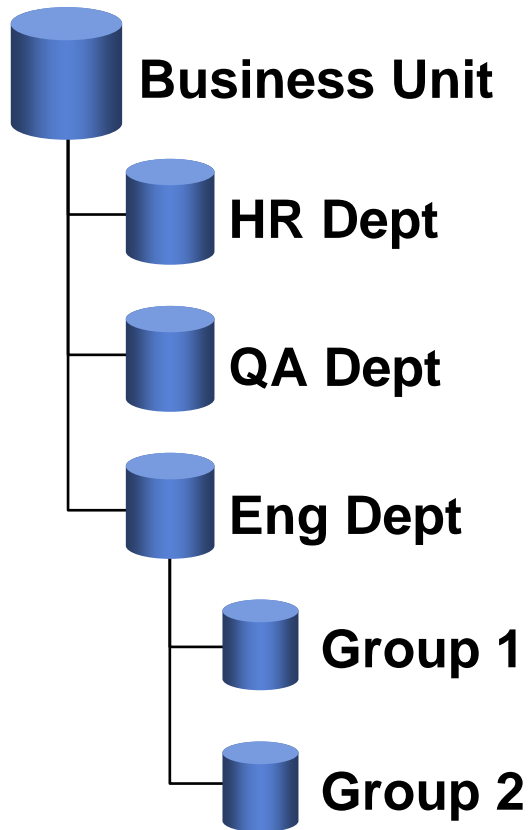
**Key to Unlocking Under-
utilized storage**

RAID-DP – Highest Capacity Utilization

NetApp Maximizes Usable RAID-Protected Capacity

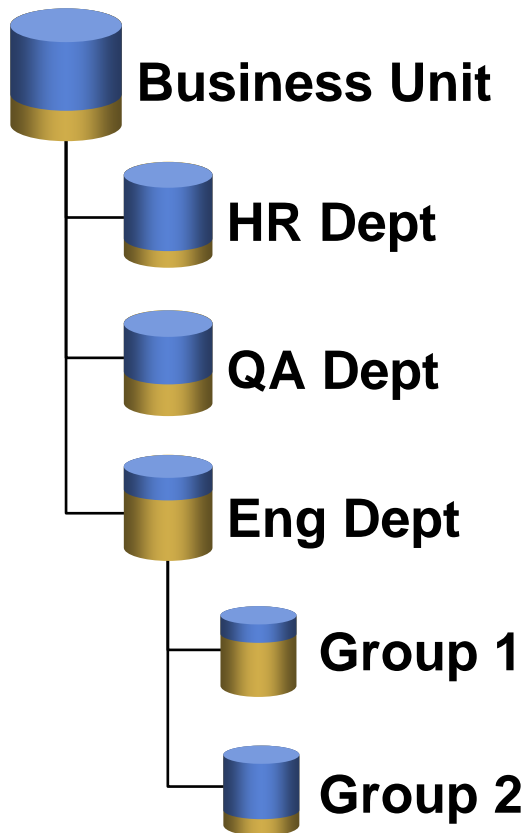
- ▶ **RAID-DP (14D + 2P) offers**
88% Efficiency / 12% Dual Parity
- ▶ **RAID5 (4D + 1P) offers**
80% Efficiency / 20% Parity
- ▶ **RAID10 (5D + 5M) offers**
50% Efficiency / 50% Mirror
- ❖ “RAID Efficiency” = Usable ratio AFTER parity and/or mirroring + dedicated spares overhead





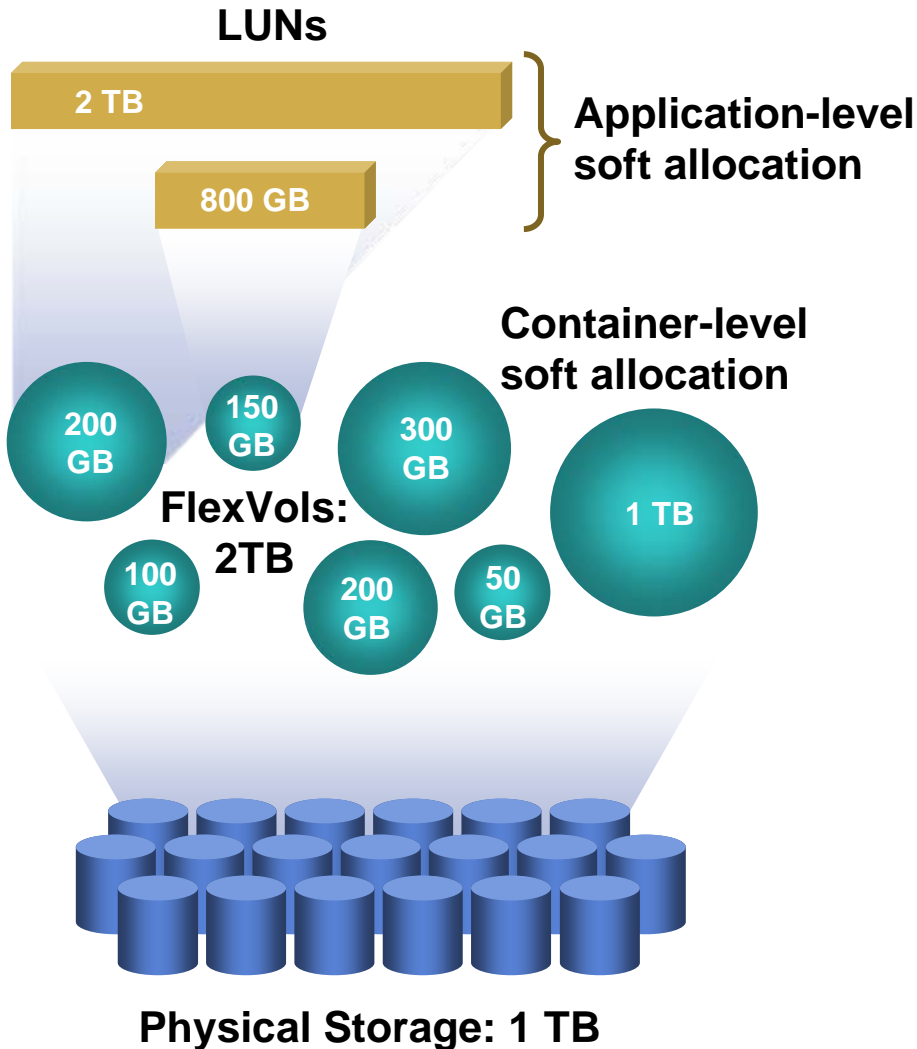
- ▶ **Need to specify storage capacity at various levels in org structure**
- ▶ **Space utilization and allocation affects efficiency and cost**

Result: Inflexible



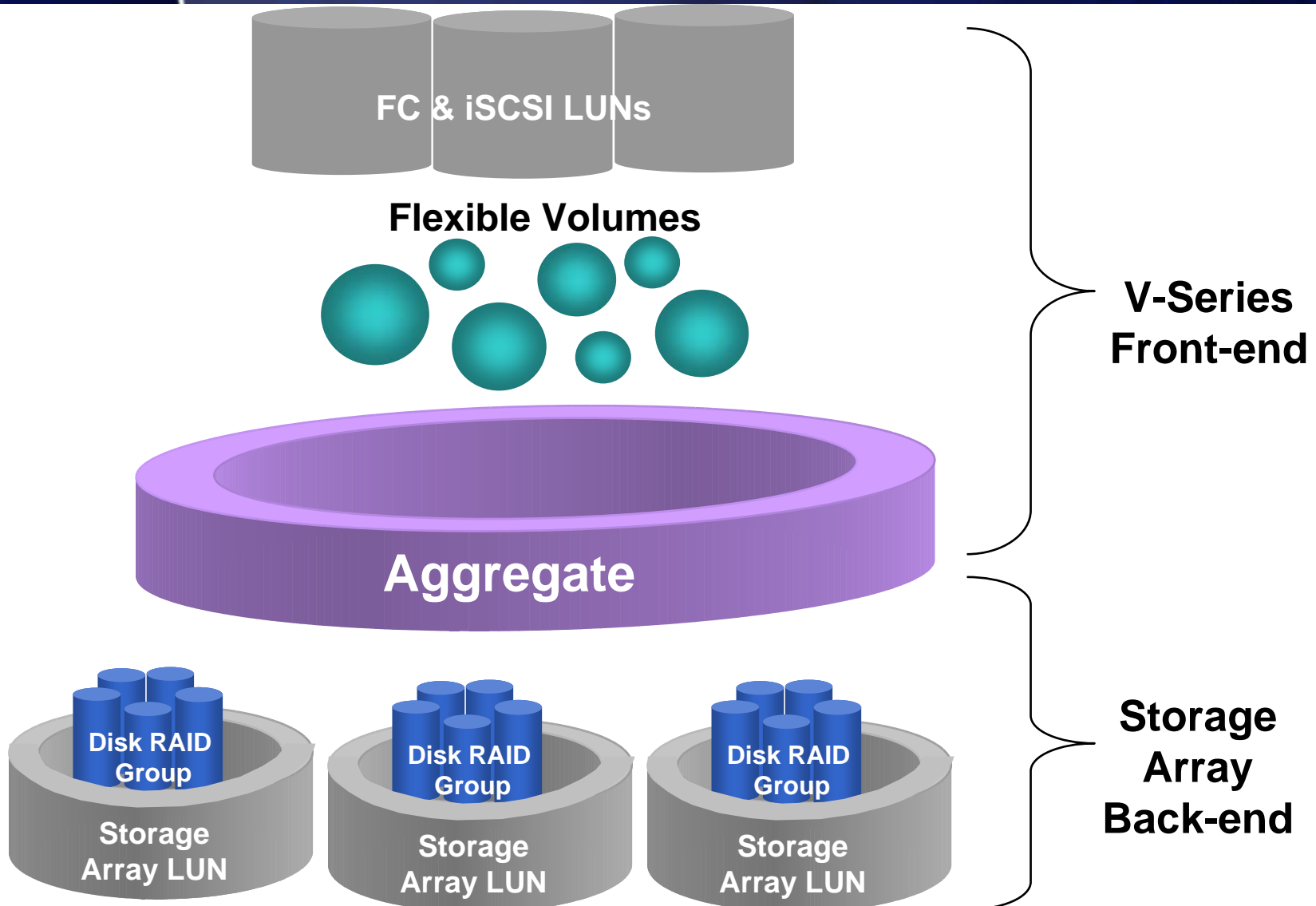
- ▶ **Space allocation and provisioning are tied together**
- ▶ **Space allocation is static and final**

Thin Provisioning for Storage: FlexVol



- ▶ **Improves Storage Utilization**
- ▶ **Increases control of space allocation**
- ▶ **Delays purchase of storage until when it is needed**
- ▶ **Watermark warning**

V-Series – Extending OnTap™ to Non-NetApp Storage



Storage array LUNs can be constructed from partial, complete or multiple RAID groups

“NetApp space saving technologies like de-duplication, RAID-DP™, Snapshot™, Thin provisioning, and storage free clones not only help customers save by reducing the amount of disk that needs to be purchased, but helps drive down other costs like datacentre real-estate costs, power and cooling, and administration by reducing complexity and increasing the customer’s ability to protect critical information and digital assets”



Business Continuity

- #2 in replication market
- 50% of systems replicated

Backup & Recovery

- 1,500 disk-to-disk backup customers
- 35,000 remote office servers protected

Archive & Compliance

- Over 2,000 customers
- Over 250 petabytes shipped



Thank You

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