



Education

ADVANCED DEDUPLICATION CONCEPTS

Thomas Rivera, BlueArc
Gene Nagle, Exar

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- This tutorial has been developed, reviewed and approved by members of the Data Protection and Capacity Optimization (DPCO) Committee which any SNIA member can join for free
- The mission of the DPCO is to foster the growth and success of the market for data protection and capacity optimization technologies
- 2011 goals include educating the vendor and user communities, market outreach, and advocacy and support of any technical work associated with data protection and capacity optimization



Check out these **SNIA Tutorials**:

- **Understanding Data Deduplication**
- **Deduplication's Role in Disaster Recovery**

Hands-On
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Since arriving on the scene 10 years ago, the adoption of data deduplication has become widespread throughout the storage and data protection community. This tutorial assumes a basic understanding of deduplication and covers topics that attendees will find helpful in understanding today's expanded use of this technology.

Topics will include:

- Trends in vendor deduplication design
- Practical deduplication of primary storage
- Using deduplication to reduce storage network traffic
- Pervasive deduplication across storage tiers
- Deduplication implications with storage array cache and SSD's
- Integration of data compression and deduplication

Capacity Optimization Methods [Storage System]

Methods which reduce the consumption of space required to store a data set, such as compression, data deduplication, thin provisioning, and delta snapshots

Data Deduplication [Storage System]

The replacement of multiple copies of data—at variable levels of granularity—with references to a shared copy in order to save storage space and/or bandwidth.

Compression [General]

The process of encoding data to reduce its size. Lossy compression (i.e., compression using a technique in which a portion of the original information is lost) is acceptable for some forms of data (e.g., digital images) in some applications, but for most IT applications, lossless compression (i.e., compression using a technique that preserves the entire content of the original data, and from which the original data can be reconstructed exactly) is required.

- Original value and justification has not changed:
 - ◆ Satisfy ROI/TCO requirements
 - ◆ Manage data growth
 - ◆ Increase efficiency of storage and backup
 - ◆ Reduce overall cost of storage
 - ◆ Reduce network bandwidth
 - ◆ Reduce operational costs including:
 - › Infrastructure costs required space, power and cooling
 - › Movement toward a greener data center
 - ◆ Reduce administrative costs

The scope of deduplication is broadening:

▶ **Primary Storage**

- ◆ Reduced physical capacity for storage of active data

▶ **Replication**

- ◆ Reduced capacity for disaster recovery and business continuity

▶ **Data Protection**

- ◆ Reduced capacity for backup with longer retention periods

▶ **Archivals**

- ◆ Reduced capacity for data retention and preservation

▶ **Movement/Migration of data**

- ◆ Reduced bandwidth requirements for data-in-transit

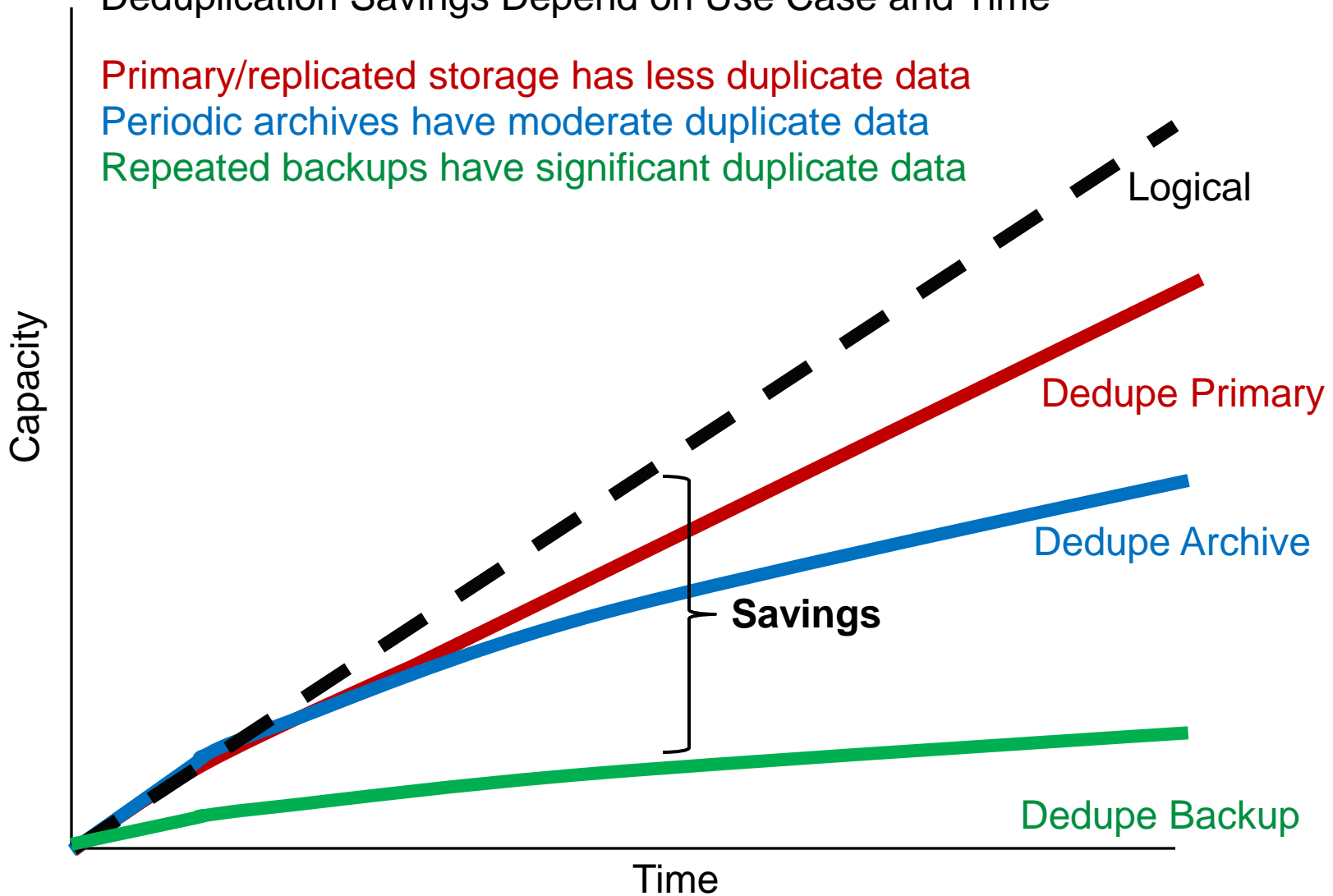
Deduplication Savings Expectation

Deduplication Savings Depend on Use Case and Time

Primary/replicated storage has less duplicate data

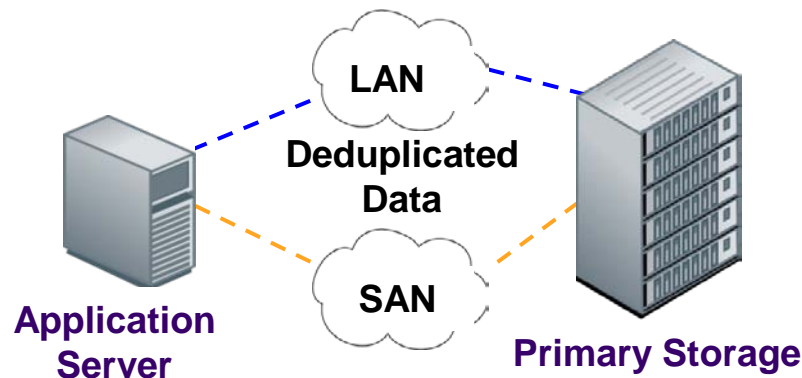
Periodic archives have moderate duplicate data

Repeated backups have significant duplicate data



Effective for specific workloads

- ◆ Acceptable performance
 - ◆ Post-processing
 - ◆ Inline ingestion
- ◆ Primary storage applications with high data redundancy
 - ◆ Virtual servers and desktops
 - ◆ Collaborative file “sharing”
 - ◆ Email (Software SIS replacement)



➤ Array Cache

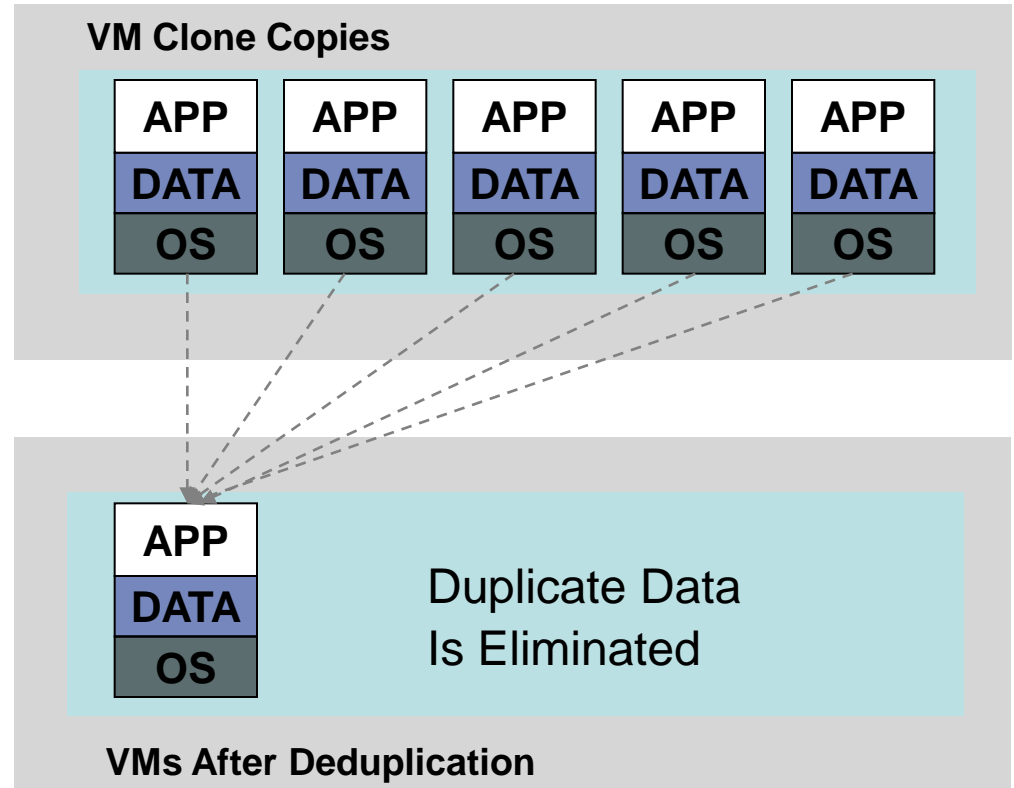
- ◆ Intelligent cache can be “dedupe-aware”
- ◆ Hot data is cached with dedupe attributes
- ◆ Reduces rotating media latencies
- ◆ Virtual Desktop “boot storms” is one example

➤ Solid State Drives

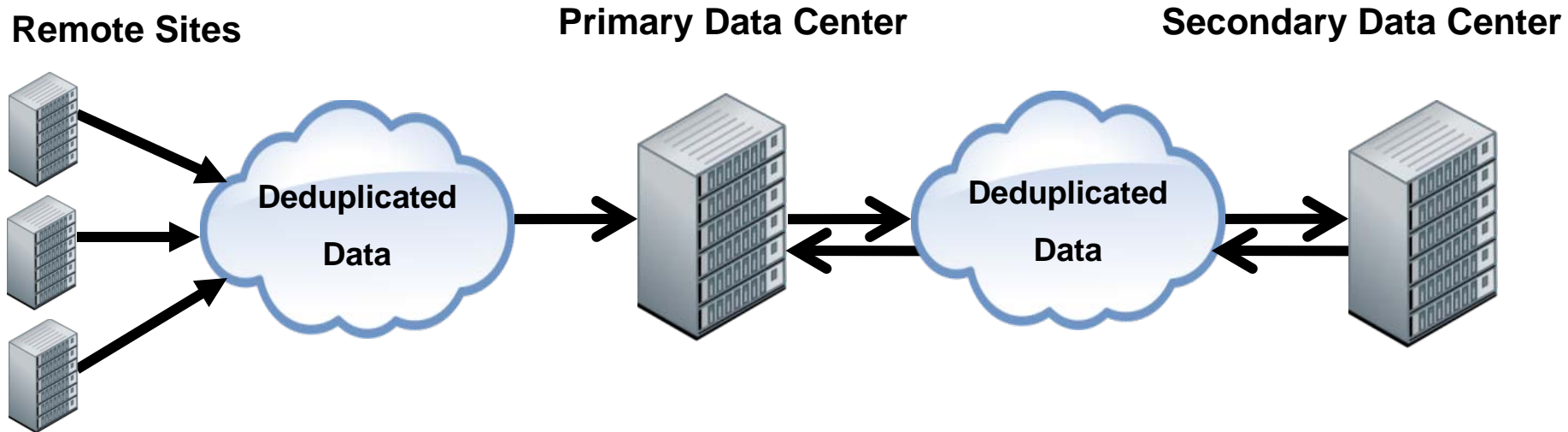
- ◆ Deduplication helps offset the higher cost/GB of SSD's
- ◆ High performance applications with highly redundant data will benefit
- ◆ Random nature of deduplicated data I/O a good match to SSD

Primary Storage Considerations

- Balance the tradeoff between cost savings and performance impact
- Walk before you run
 - ◆ Use estimation tools
 - ◆ Perform POCs
 - ◆ Implement one workload at a time



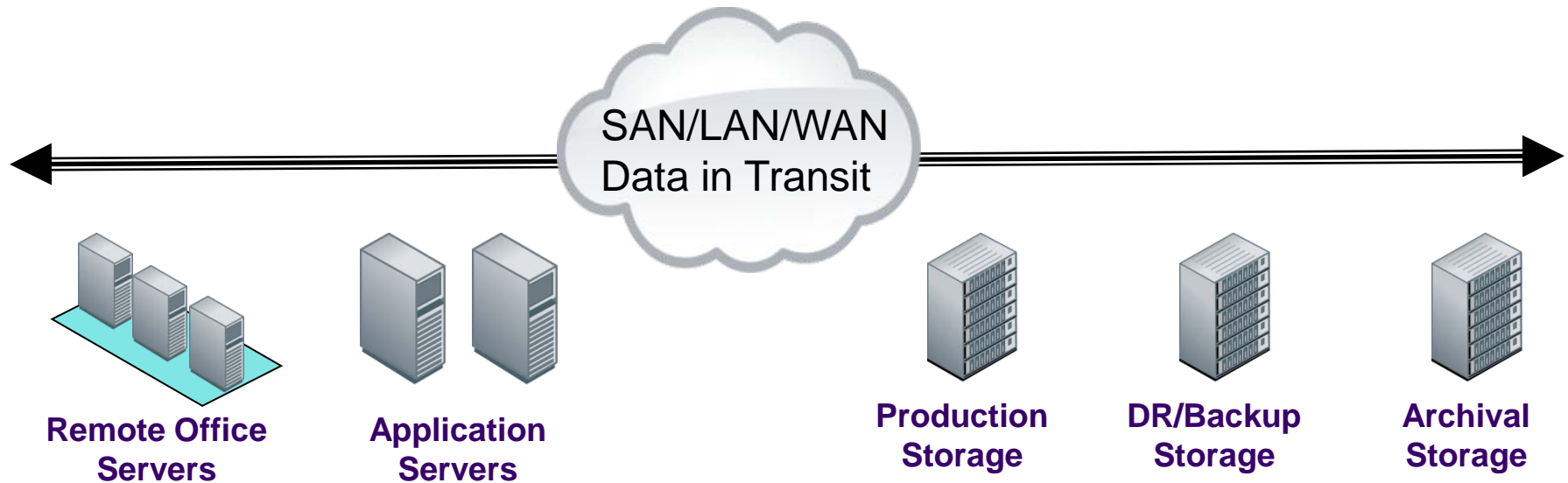
Deduplication and Replication



- Can be one-way, two-way, multi-node, or multi-hop
- Deduplication location(s) can be determined by Users
- Deduplication makes replication more affordable
- Deduplication enables replication on constrained networks

- Focus on your Service Level Agreements (SLAs) first
 - ◆ Needs to meet window for *Replication*
 - ◆ Needs to meet SLA for *System Recovery or Data Restore*

- Is it Necessary to Dedupe All Data?
 - ◆ Mission-critical applications
 - ◆ May have regulatory issues for some data
 - ◆ Some data types not conducive to deduplication
 - ◆ Replicate incremental changes only, without dedupe



➤ Increased SAN/LAN/WAN Efficiency

- ◆ Transfer data references instead of data objects
- ◆ Shorten data transfer times by sending less data
- ◆ Increasing WAN efficiency
 - › More applications per pipe

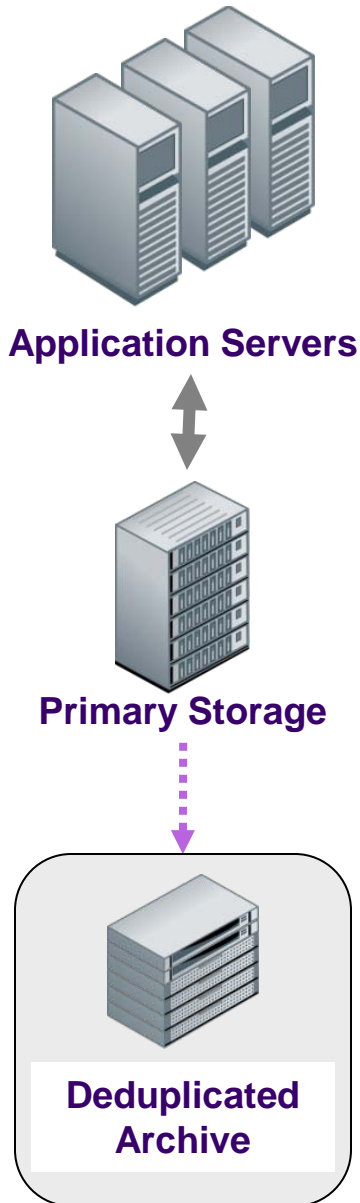
The Original Promise

- Faster data recovery from disk
- Reduction in D2D cost per terabyte stored
- Reduction in D2D backup storage footprint
- Less network bandwidth required for D2D backups

What's New?

- Wide use as part of backup software
- Scalability of deduplication appliances
- Deduplication across appliances
- Deduplication to tape

- Hardware or software deduplication?
 - Source or target deduplication?
 - Variable or fixed-length deduplication?
 - File or sub-file deduplication?
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- Answers depend on the problem you are trying to solve



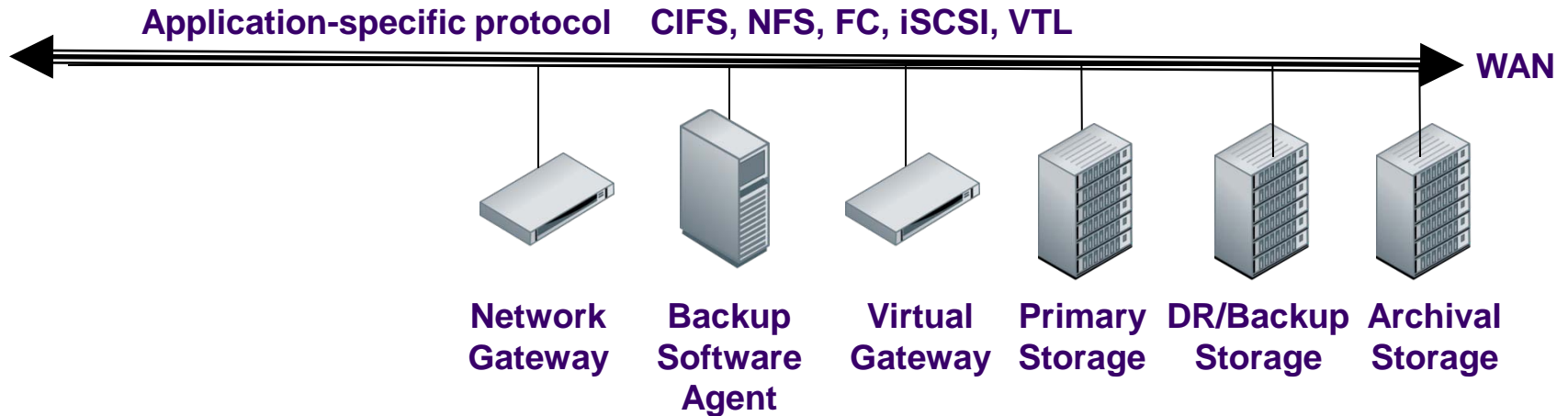
- Deduplication can reduce the cost of online archive repositories
- These repositories are often required for regulatory compliance
- No standard exists today for “approved” use of data reduction techniques with regulatory data
- Vendors should provide assurances that the ability to retrieve data in its original form is not impaired

- Dedupe and compression are similar
 - ◆ Both are dependant on data patterns
 - ◆ Both consume system resources
 - ◆ Both can optimize required storage capacity

- Dedupe and compression are different
 - ◆ Some data can only be optimized via dedupe
 - ◆ Some data can only be optimized via compression
 - ◆ Some data can be optimized via dedupe **and** compression
 - ◆ Some data cannot be optimized at all

- Dedupe and compression are complementary
 - ◆ But some knowledge about the data pattern is required

Consideration Matrix for Dedupe Location



Reduce Network Traffic	✗	✗	✗		✗	
Reduce Physical Capacity		✗		✗	✗	✗
Reduce Backup Time		✗				
Reduce Recovery Time		✗			✗	
Reduce Replication Time	✗		✗	✗		
Reduce Media Latency				✗		

- The primary value of deduplication is in reducing costs and helping manage data growth
- The scope of deduplication is broadening
 - All storage tiers
 - Bandwidth reduction
 - Data subject to regulatory rules
- New use cases and new technologies bring new challenges
 - And new opportunities

- Please send any questions or comments on this presentation to SNIA: tracktutorials@snia.org

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- SNIA Education Committee

Data Protection and Capacity Optimization (DPCO) Committee:

**Mike Dutch
Larry Freeman
Gene Nagle**

**Tom Pearce
Thomas Rivera
Tom Sas**



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