

A decorative graphic consisting of multiple overlapping, wavy lines in shades of purple, blue, orange, and green, flowing from the left side of the slide towards the right.

# What's old is New Again – Storage Tiering

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# About the SNIA DPCO Committee

- 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
  - ◆ Online DPCO Knowledge Base: [www.snia.org/dpco/knowledge](http://www.snia.org/dpco/knowledge)
  - ◆ Online Product Selection Guide: <http://sniadataprotectionguide.org>
- 2013 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

## ➤ Storage Tiering

- ◆ Physical tiering of storage has been possible for decades, but has seen limited adoption
- ◆ New interest in tiering has arisen due to new techniques and technologies that automate the movement of “hot” data to high performance storage tiers and “cool” data to low-cost tiers
- ◆ Other factors that influence tiering include: performance, capacity optimization, availability, economics and compliance
- ◆ This session will include:
  - › Fundamentals of storage tiering
  - › The use of the cloud as a tier(s)
  - › Recent innovations in tiering techniques

*“It’s almost impossible to conduct a conversation with a storage vendor without raising the topic of “storage tiering” ... While there is tremendous user value to be gained from employing storage tiering, there is also at times a lack of clarity and of semantic accuracy in the market”*

**Mark Peters**

**Enterprise Strategy Group**

**July 12, 2011**

# What is Storage Tiering?



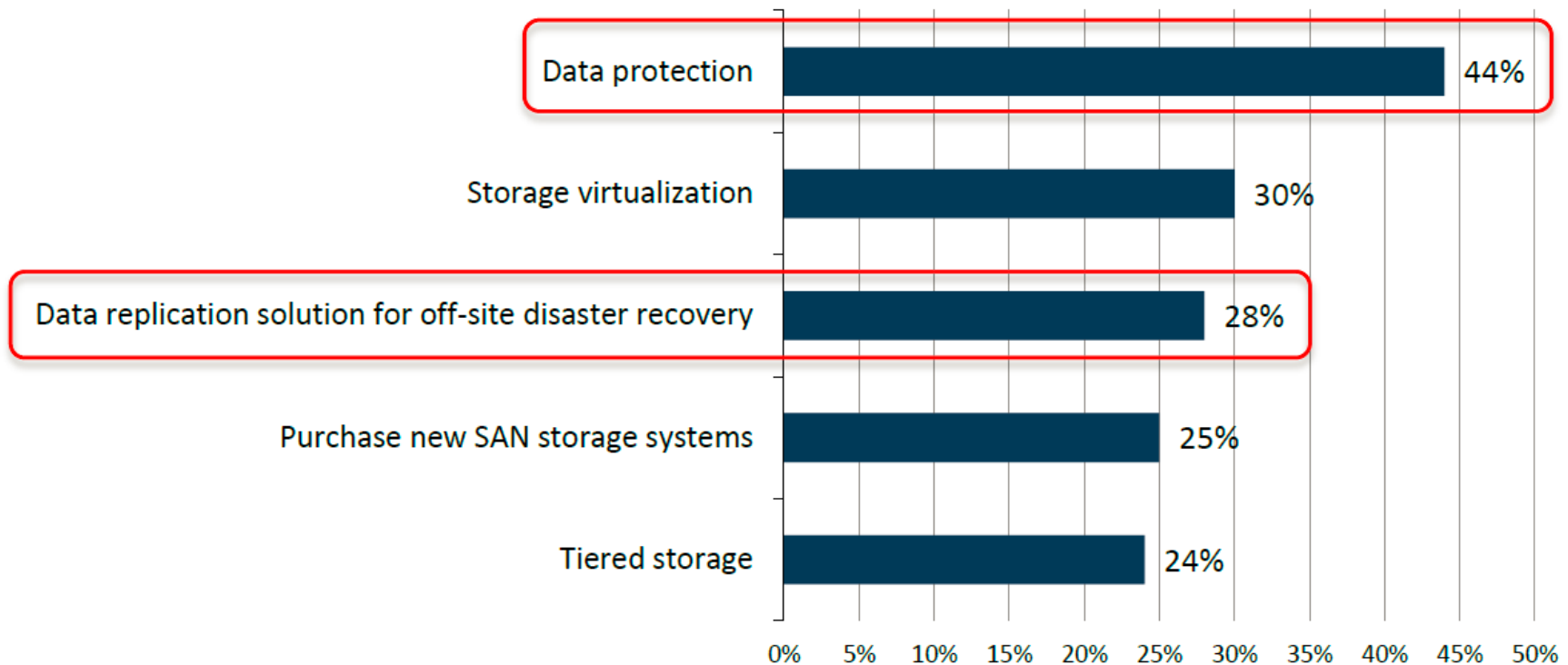
## From the SNIA Dictionary:

- ▶ **Tiered storage [*storage System*]:** Storage that is physically partitioned into multiple distinct classes based on price, performance, or other attributes.

Data may be dynamically moved among classes within a tiered storage implementation based on access activity or other considerations.

# Storage Infrastructure Spending

In which of the following data storage infrastructure areas will your organization make the most significant investments over the next 12 months?  
(Percent of respondents, N=296)



Source: Enterprise Strategy Group, 2013.

## ➤ Class by Storage Technology

- ◆ Nand FLASH or DRAM for SSDs
- ◆ High Performance HDDs
- ◆ High Capacity HDDs
- ◆ High Capacity Magnetic Tape or Optical Media

## ➤ Class by Data Criticality

- ◆ Mission Critical
- ◆ “Hot” (warm) Data
- ◆ “Cool” Data



# The Storage Hierarchy

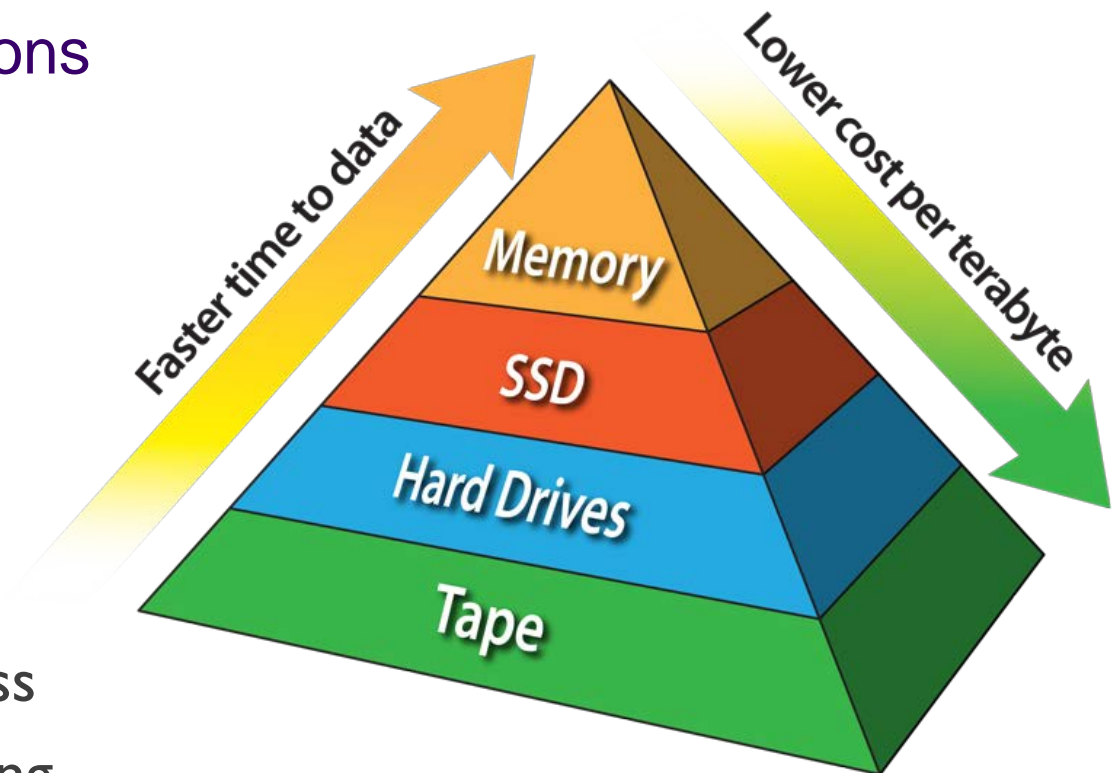
## ➤ Price / Performance tradeoffs

## ➤ Other Considerations

- ◆ Persistence
- ◆ Access Method
- ◆ Capacity
- ◆ Data Endurance

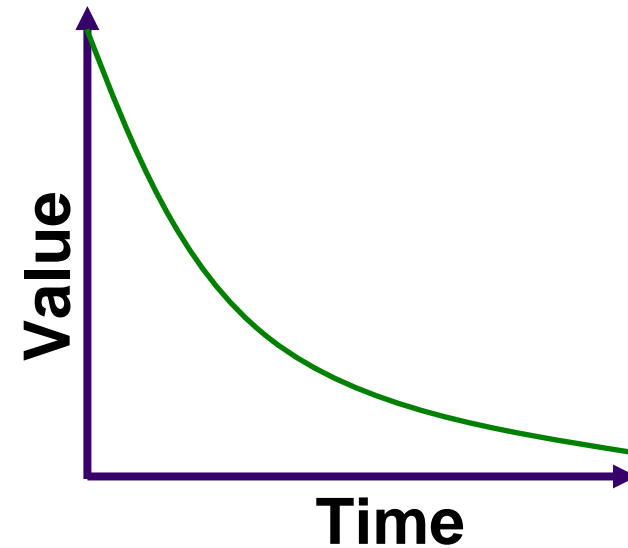
## ➤ Data Access

- ◆ In-memory access
- ◆ Caching / buffering
- ◆ Local / cloud tiering



# Why is Tiering Important?

- All data is not created equal
  - ◆ Data structure and access profiles differ
- Data's value is dynamic over time
  - ◆ New data often loses value quickly
  - ◆ Older data may suddenly have high demand
- Data growth isn't showing signs of slowing down
  - ◆ One of the top IT pressures is meeting the increasing demands for storage
  - ◆ A "one-size-fits-all" data storage strategy will not scale long-term



# Tiering Considerations

## ➤ Users

- ◆ Want everything on Tier 1 with the highest performance
- ◆ Don't typically pay for the storage they consume

## ➤ Business owners

- ◆ Want the data on the lowest tier for cost savings (if paying...)
- ◆ Often don't understand the performance difference between tiers

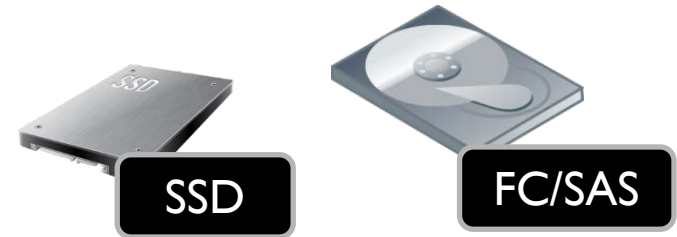
## ➤ SLAs – between business owners/IT and users

- ◆ Why not compromise and put everything on Tier 2 or 3?
  - ◆ Would be easier to administer, but...
  - ◆ The storage may not meet the needs of the data (applications)
  
- ◆ Data isn't always predictable
  - ◆ Some traditionally "Tier 1" data can reside on Tier 2 storage
  - ◆ Data generally drops tiers as it ages, but may become relevant again

# Tiering Choices (Examples)

## ➤ Tier 1

- ◆ SSDs (sometimes called “Tier 0”)
- ◆ 10K & 15K RPM FC/SAS disk drives
- ◆ Mostly RAID 10 and some RAID 5



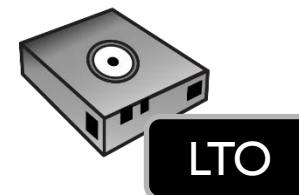
## ➤ Tier 2

- ◆ 7.2K RPM SATA/SAS disk drives
- ◆ RAID 5 and RAID 6



## ➤ Tier 3

- ◆ Automated tape storage
- ◆ Predominantly LTO today



## ➤ Public/Private cloud

- ◆ Outsourced off-site storage of “cool” data



# Quick History of Storage Tiering

## ➤ 1980s

- ◆ Mainframe DFHSM (Data Facility Hierarchical Manager)
  - Online disk was cost prohibitive
  - Automatic staging and retrieval from tape

## ➤ 1990s

- ◆ HSM (Hierarchical Storage Management)
  - Files migrated to dedicated HSM server
  - Policy engine determined what files were migrated



## ➤ 2000s

- ◆ ILM (Information Lifecycle Management)
  - Concept instead of product
  - Included compliance concerns

# Tiering: Generations over Time

- Each generation built on the ones before
  
- Some common items across generations:
  - ◆ Freeing up more expensive storage
  - ◆ Returning data to original tier when used
  - ◆ Performance and availability considerations

## ➤ Automated tiering

- ◆ File and sub-file migration performed transparently between tiers
- ◆ Policies and/or predictive analysis governed migration

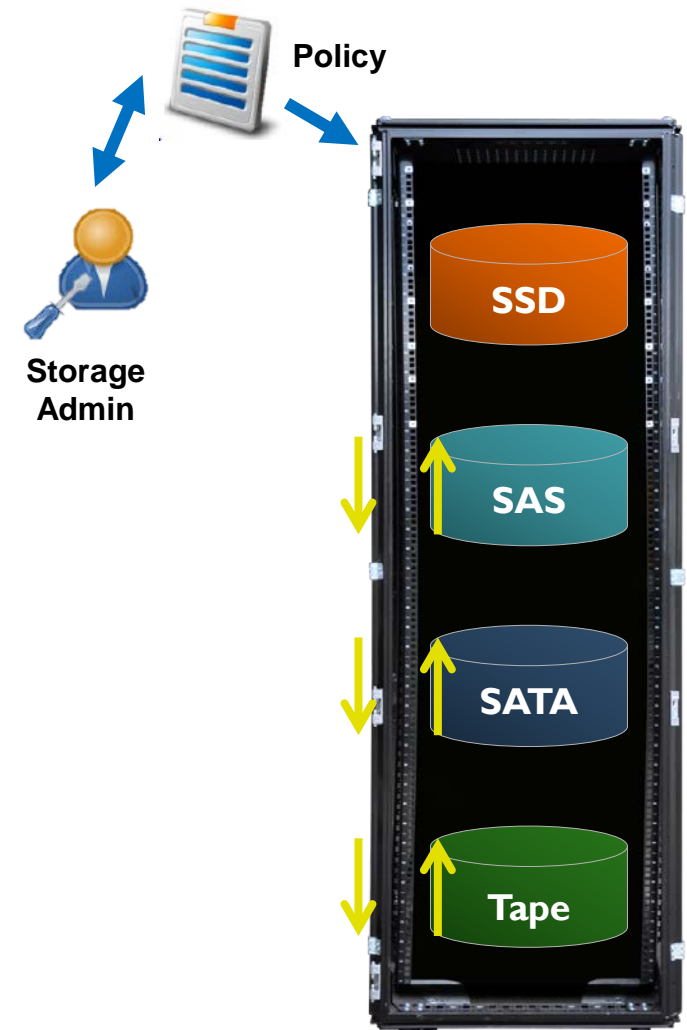
## ➤ Cloud tiering

- ◆ Pushes cool data to the cloud
- ◆ Can use public cloud as a backup tier



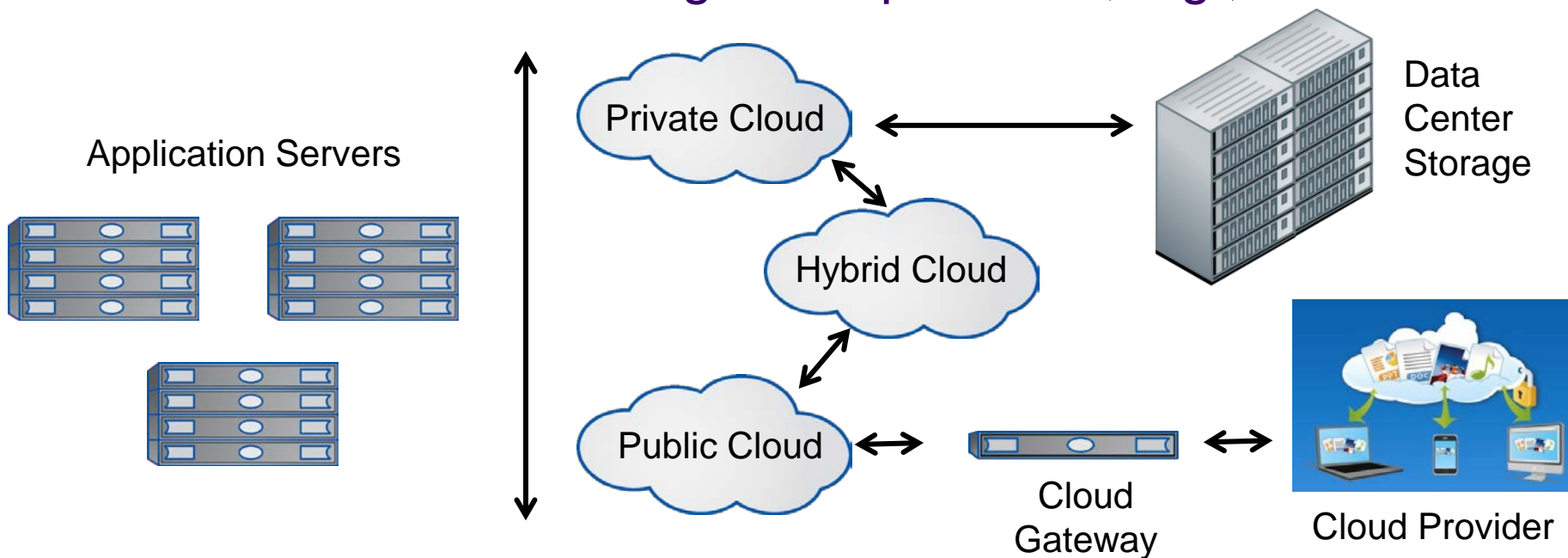
# Automatic Tiering

- Data is migrated between tiers based on policy due to data usage patterns, e.g., time-based or file type
- Tiering can be on a single system or across multiple dissimilar systems
- Makes it more economical to deploy SSD storage
- Will high performance HDDs still be needed?



# Cloud Tiering

- Cloud gateways are available for direct block and file access
- Cloud is being used for offsite backup and archive tiers
- Hybrid Clouds combine public & private clouds using a common set of data management protocols, e.g., CDMI



# Cloud Tiering: Pros & Cons

## ➤ Pros

- ◆ “Unlimited” scale
- ◆ Reduced data center foot print
- ◆ No physical storage management

## ➤ Cons

- ◆ Large data sets and bandwidth
- ◆ Security concerns
- ◆ Exit and migration

# Questions to Ask During Selection

## ❖ Tiering Scale and Granularity

- ◆ Is data tiered within a storage system – or across systems?
- ◆ Is data tiered at the file or sub-file/block level?

## ❖ Tiering Policies and Methods

- ◆ Reactive, Predictive or Realtime?
- ◆ How often is the data re-tiered?
- ◆ Can the Tiering policy be adjusted?

## ❖ Tiering Costs

- ◆ Total Software and Hardware costs?
  - › Purchase
  - › Implementation
  - › On going costs; operating costs, support
- ◆ Future Scaling costs?

- Today's tiering technologies are built on prior generations
  - ◆ Adopting concepts from HSM and ILM
  - ◆ But with significant differences
  
- New technologies and storage systems are bringing new capabilities
  
- Knowing your objective and what questions to ask will make a tiered storage deployment more successful



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**Protecting Data in a Big Data World**

**The Changing Role of Data Protection in a Virtual World**

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## Authorship History

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