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EDUCATION

FAN – An Architecture for Scalable, Service-Oriented Data Management

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FAN - An Architecture for Scalable Service-Oriented Data Management

- In most organizations, large and small, file-based storage has become the pervasive means for managing business data, however until very recently, a unified file management strategy was not available.
- Today, enterprises have a tool at their disposal that leverages file virtualization, network-based policy enforcement, and globally distributed access, in an inclusive and open approach that not only “allows” but “calls for” multiple vendor technologies to interoperate.
- This approach is called the File Area Network or FAN.
- FAN is analogous to the changes that started in the 1990’s as Storage Area Networks (SAN) became the popular means to improve storage management for heterogeneous block storage.

This tutorial introduces the concept of a FAN and what challenges it can address. It also provides examples of FAN technology and describes the capabilities of both basic and advanced storage services.

Agenda

- What is a FAN and why should you care ?
- Compare FAN with SAN and Storage Grid
- Fundamental approaches to building a FAN
- Basic FAN applications
- Advanced FAN applications
- Summary

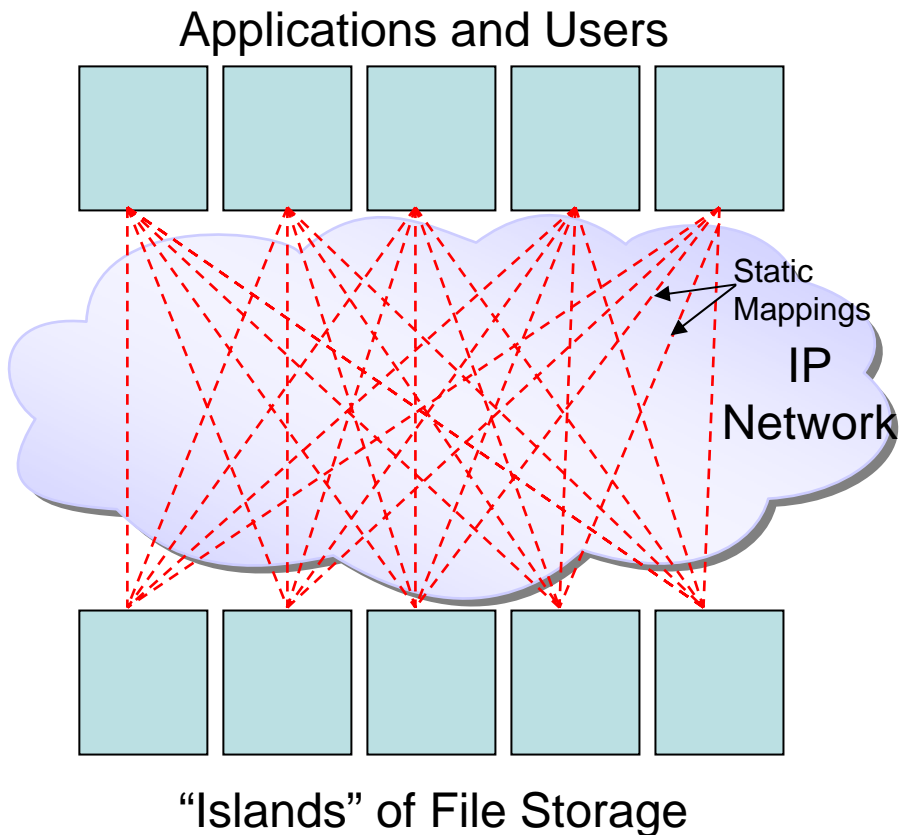
- Q&A

FAN = File Area Network

Working Definition

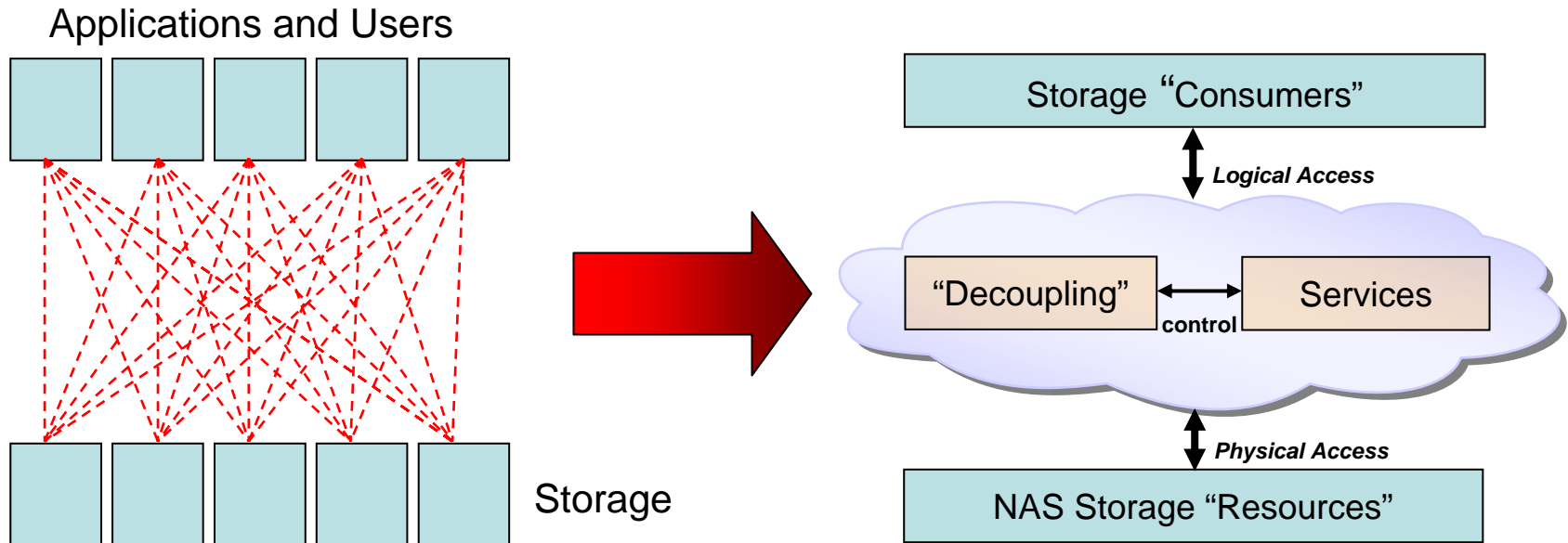
- A FAN enhances standard network infrastructure with the addition of technology that provides **centralized**, **heterogeneous**, and **enterprise-wide** network file management and control.
- This technology includes a **decoupling** layer that separates logical file access from physical file locations and a variety of value-added file **services**.
- This technology may consist of software or software+hardware combinations.

IT Challenges / Business Needs



- Large portion of enterprise storage
- Highest growth rate
- Growing complexity
 - Mixed vendors, platforms, file systems
 - Increased application demands
 - Increased availability requirements
 - Enterprise-wide scope
 - This complexity is hampering the deployment of advanced file management services

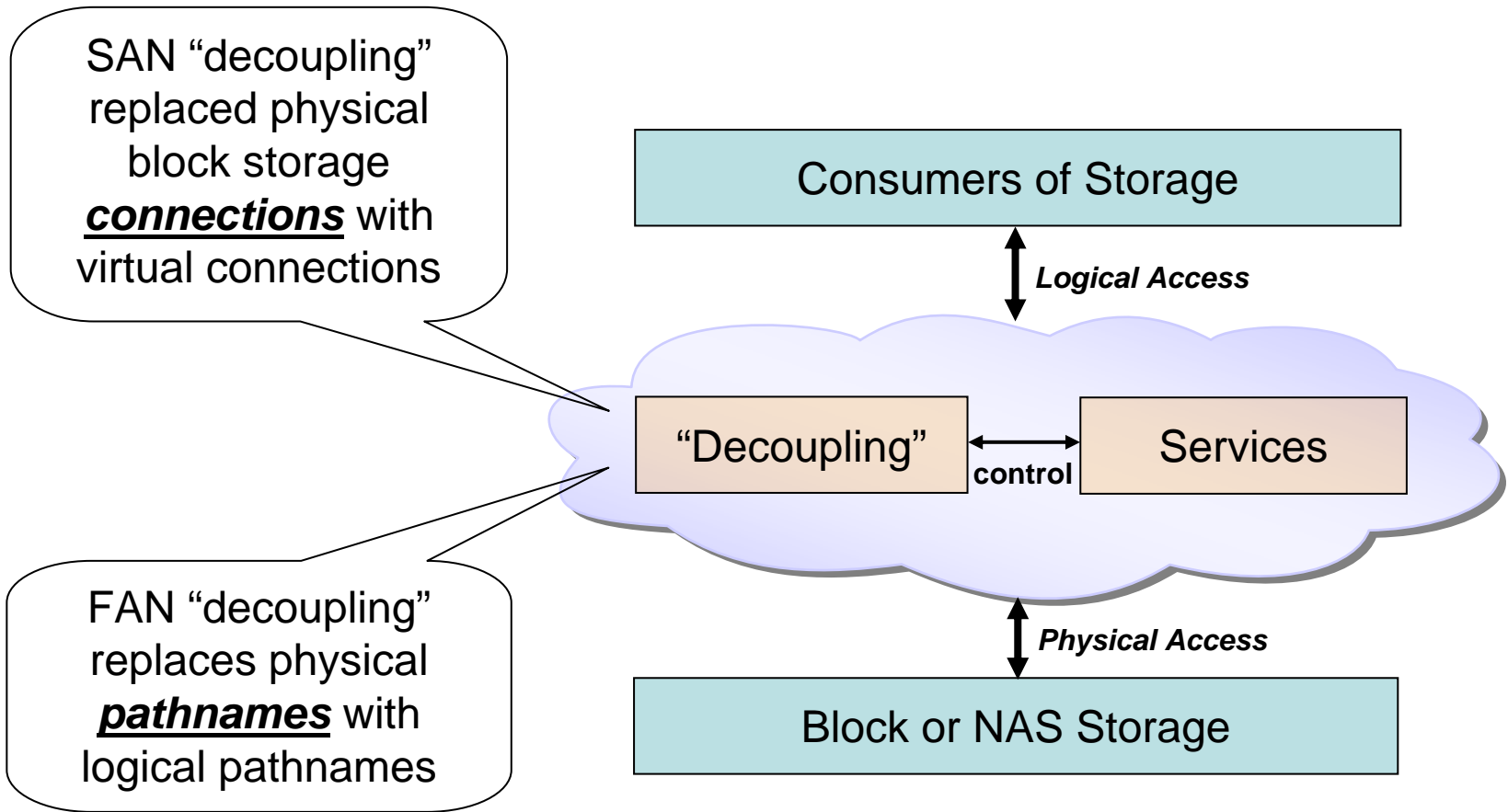
FAN Targets These Challenges



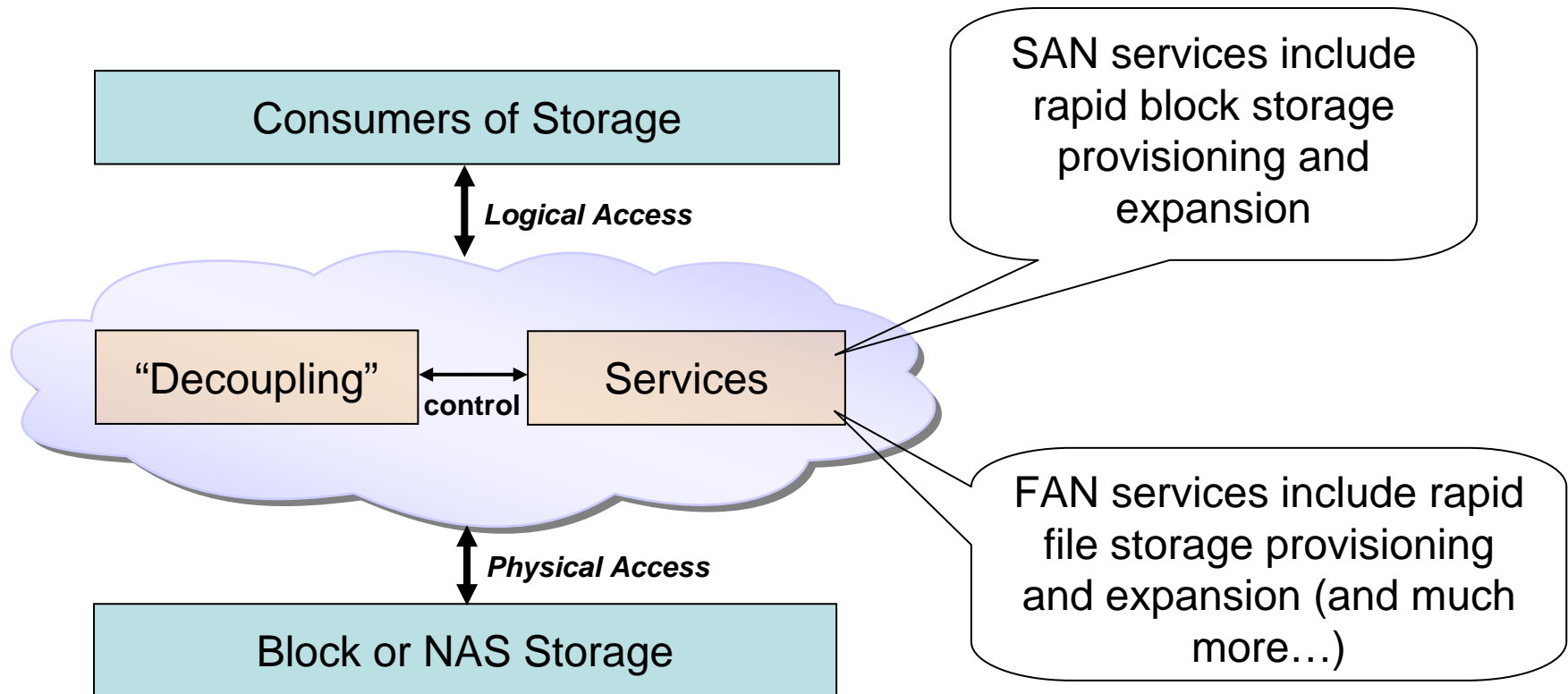
- The Problem:
 - The tight bindings between applications and storage are preventing the evolution of storage management
- The Solution:
 - A FAN “decouples” these relationships
 - This enables both basic and advanced storage management services

Quick Comparison of FAN, SAN, and Storage Grid

SAN and FAN “Decoupling”



SAN and FAN “Services”



Storage Grid and FAN

- Philosophically compatible
 - Share a similar view of challenges, needs, & solutions
- Storage Grid is primarily focused on broadly unifying all storage in the future
- FAN is primarily focused on unifying existing and emerging file storage infrastructure today
 - FAN uses many of the principals of Storage Grid (service-oriented, heterogeneous, centrally managed...)
- Bottom line...FAN can move your infrastructure in a direction compatible with Storage Grid and ultimately can be part of a Storage Grid



Overview of FAN Approaches

FAN Approaches

- There are many ways to implement a FAN
 - Each has its own unique set of benefits and considerations
- In this section, three fundamental approaches to decoupling will be described
 - Decoupling is a foundation FAN technology that removes the direct binding between logical access and physical location
- In the following section, these approaches will be characterized as platforms for various FAN services
- Please note:
 - The approaches and capabilities that are described in this section are intended to provide a perspective on the different technologies that can be used to implement a FAN. They are not intended to reflect actual product offerings in the market today.

Decoupling Approaches

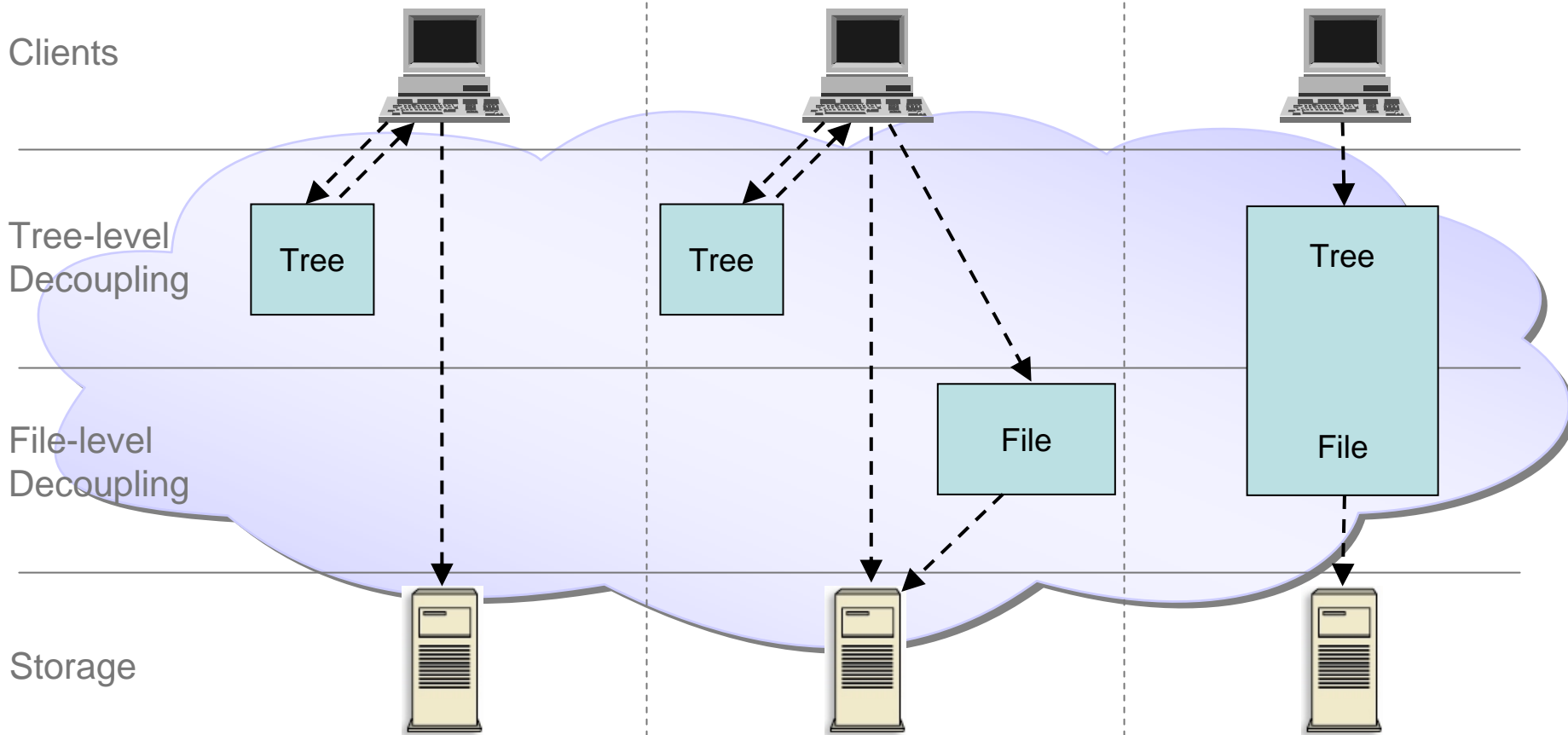
- Client-based (out-of-band)
 - OS service or agent loaded on client system
 - Tree-level granularity with asynchronous updates
 - NAS-protocol specific
- Hybrid (dual-band)
 - Combines client-based and network-based
- Network-based (in-band)
 - Continuous network-resident decoupling
 - File-level granularity and synchronous updates
 - Support for all NAS protocols

Decoupling Approaches

Client-based

Hybrid

Network-based



Decoupling Approaches

Approach	Benefits	Considerations
<p>Client-based <i>[Out-of-band]</i></p>	<ul style="list-style-type: none"> • Leverages standard platform software capabilities • Does not require new hardware 	<ul style="list-style-type: none"> • Data access is disrupted during operations like migration • Decoupling control is at directory tree level (not file)
<p>Hybrid <i>[Dual-band]</i></p>	<ul style="list-style-type: none"> • Data access is not disrupted during operations like migration 	<ul style="list-style-type: none"> • Disruption still occurs in the setup for operations like migration • Scale and availability for migration traffic • Overall decoupling control at directory tree level (not file) • Requires additional hardware
<p>Network-based <i>[In-band]</i></p>	<ul style="list-style-type: none"> • Data access is not disrupted during any operations • Offers continuous control with file level granularity 	<ul style="list-style-type: none"> • Scale and availability associated with handling all traffic flows • Disruption associated with one-time cut-in • Requires additional hardware

WAFS and FAN

- WAFS (Wide-Area File System) is a technology focused on optimizing file access performance across a distributed Enterprise
 - “WAN-optimization” is a related category
- In the FAN world, WAFS can best be thought of as an extension to the decoupling layer
 - WAFS implements “decoupling” with the goal to isolate access performance from the characteristics of the path to the physical storage
 - WAFS decoupling can be used in conjunction with any of the (logical to physical) decoupling methods previously described



“Basic” FAN Services

“Basic” FAN Services

- Global Namespace
 - Organize storage in an overlay namespace
- Migration
 - Move files from one server to another
- Tiering / ILM
 - Move files via policy to the “best” storage
- Load Balancing
 - Move files to better distribute capacity or load
- Replication
 - Replicate files to support failover

Global Namespace

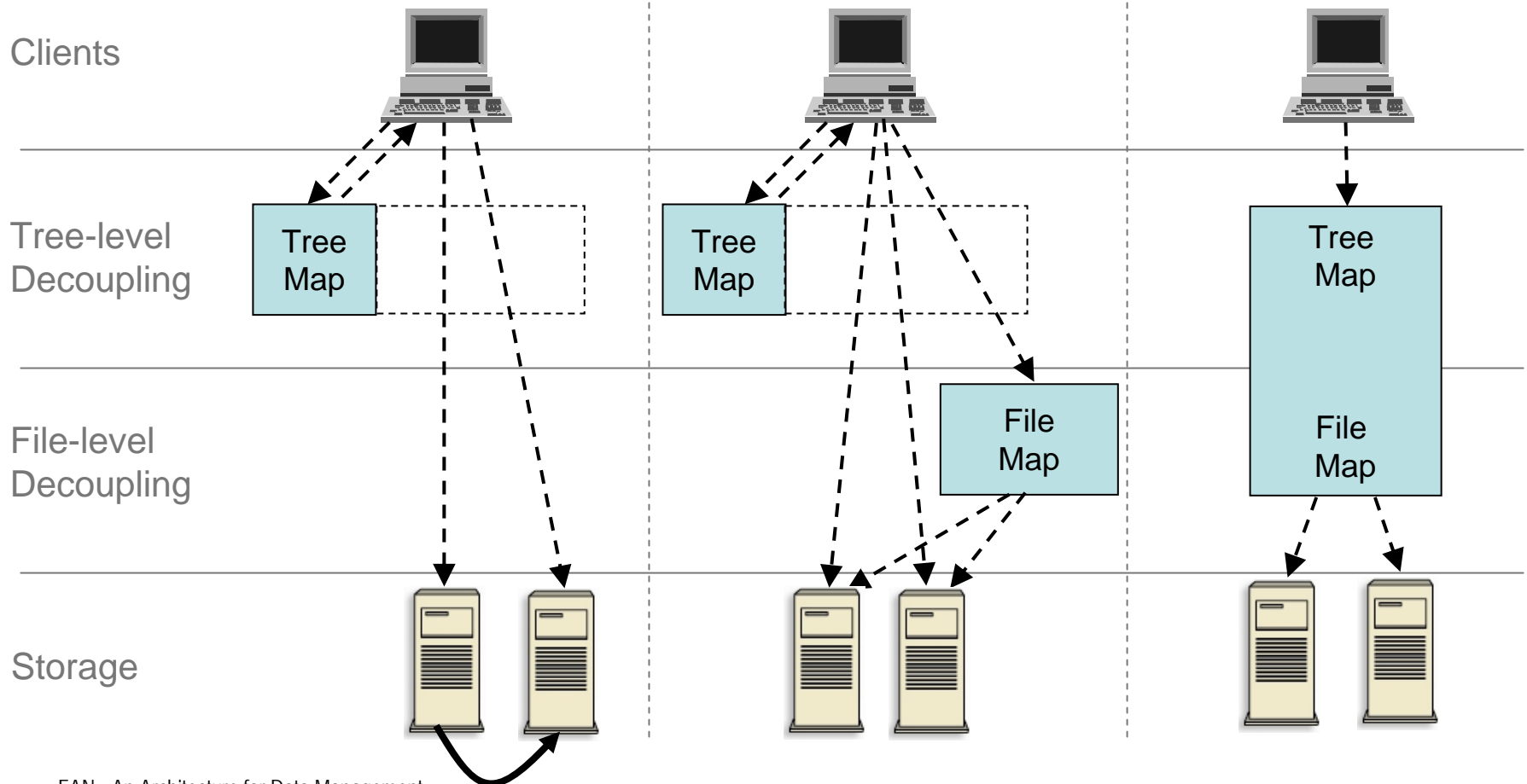
Approach	Client Configuration Transparency	Data Access Transparency	Unit of Connection to Global Namespace
Client-based	Yes	Yes	Directory tree
Hybrid	Yes	Yes	Directory tree
Network-based	Yes	Yes	Directory tree or File

Simplified Migration Flows

Client-based

Hybrid

Network-based



Migration

Approach	Client Configuration Transparency	Data Access Transparency	Unit of Migration
Client-based	Yes	No	Directory tree
Hybrid	Yes	Partial	Directory tree
Network-based	Yes	Yes	File

Tiering / ILM

Approach	Client Configuration Transparency	Data Access Transparency	Unit of Tiering
Client-based	Yes	Yes (with NAS “stubs”)	File (with NAS “stubs”)
Hybrid	Yes	Yes (with NAS “stubs”)	File (with NAS “stubs”)
Network-based	Yes	Yes	File

Load Balancing

Approach	Client Configuration Transparency	Data Access Transparency	Unit of Load Balancing
Client-based	Yes	No	Directory tree
Hybrid	Yes	Partial	Directory tree
Network-based	Yes	Yes	File

Replication

Approach	Replication Capability	Transparent Failover to Replica	Unit of Replication
Client-based	Async	No	Directory tree
Hybrid	Async (entire space) Async, Sync, CDP (subset)	Yes (subset)	Directory tree
Network-based	Async, Sync, CDP	Yes	File

Selected “Advanced” FAN Services

Advanced Services

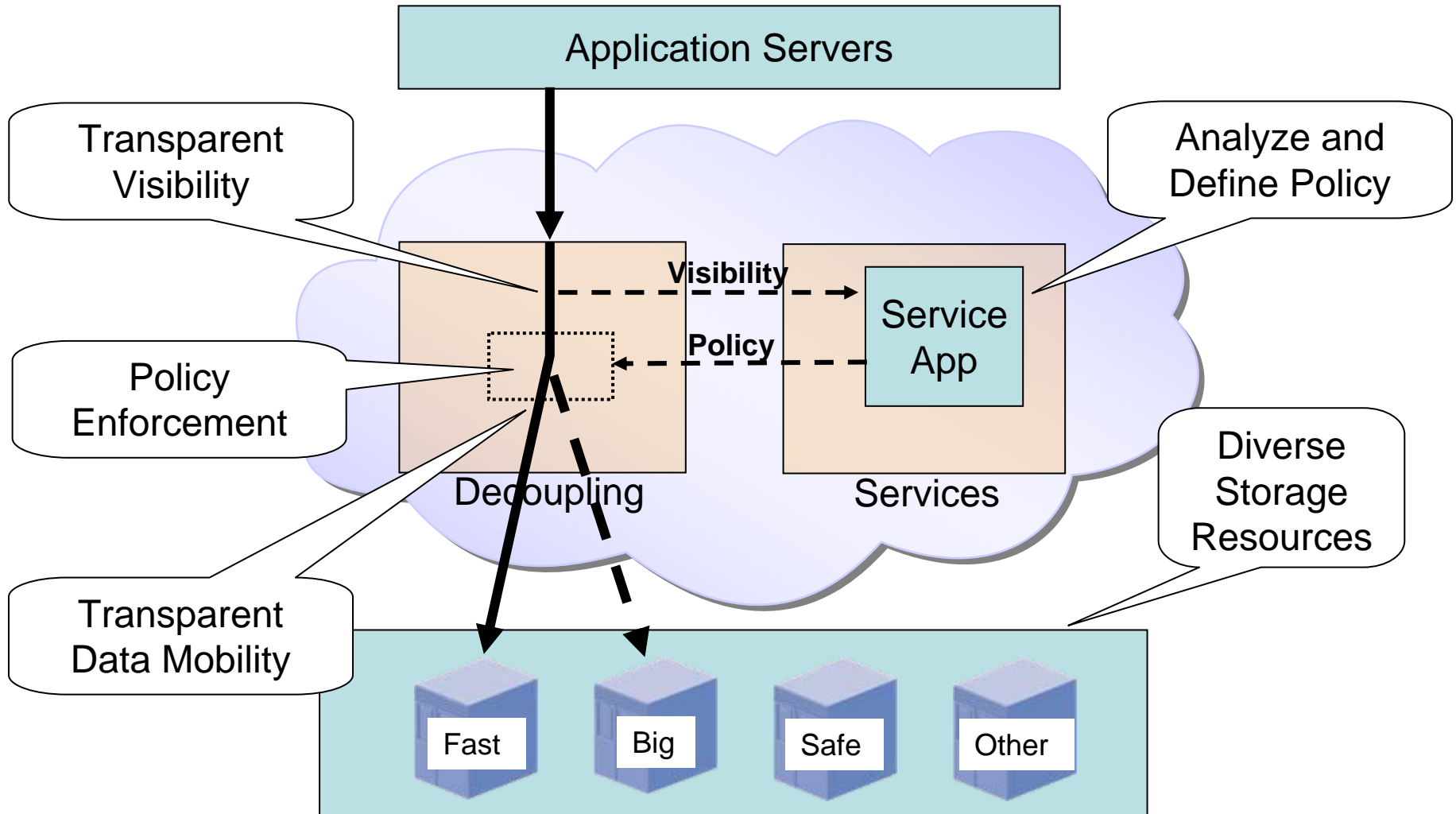
- A FAN supporting the basic services previously described is very useful
 - It supplies a set of services (in a heterogeneous context...) that address many of the day to day issues faced by storage administrators in every Enterprise
- A FAN can also enable a wide-range of advanced services that extend storage management to new levels
- In this section, we will explore three of these new applications and show how they can be enabled by a FAN

- **Data Classification and Optimized Placement**
 - Service designed to optimize the alignment between storage characteristics and business needs
- **Application Acceleration**
 - Service designed to optimize the performance of critical applications
- **Access Control and Auditing**
 - Service designed to unify the control and visibility into file access

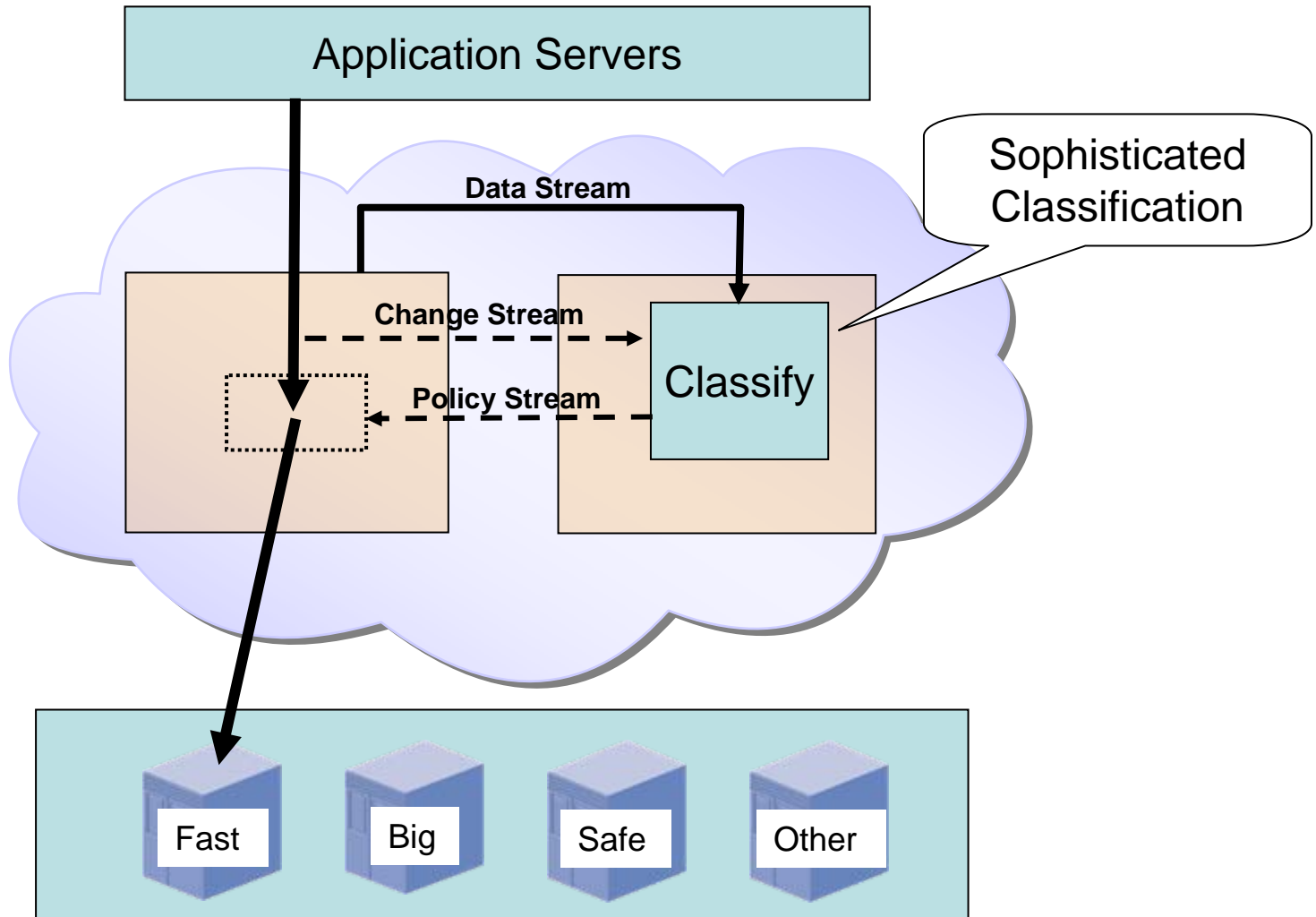
Components of “Eco-System” for Advanced Services

- Diverse storage pool
 - The ability to support a single storage pool that includes all forms of optimized storage needed to match business needs
- Transparent data mobility
 - The ability to move data between storage devices at any time without affecting client access
- Transparent access visibility
 - The ability to track all forms of data access at all times without affecting client access

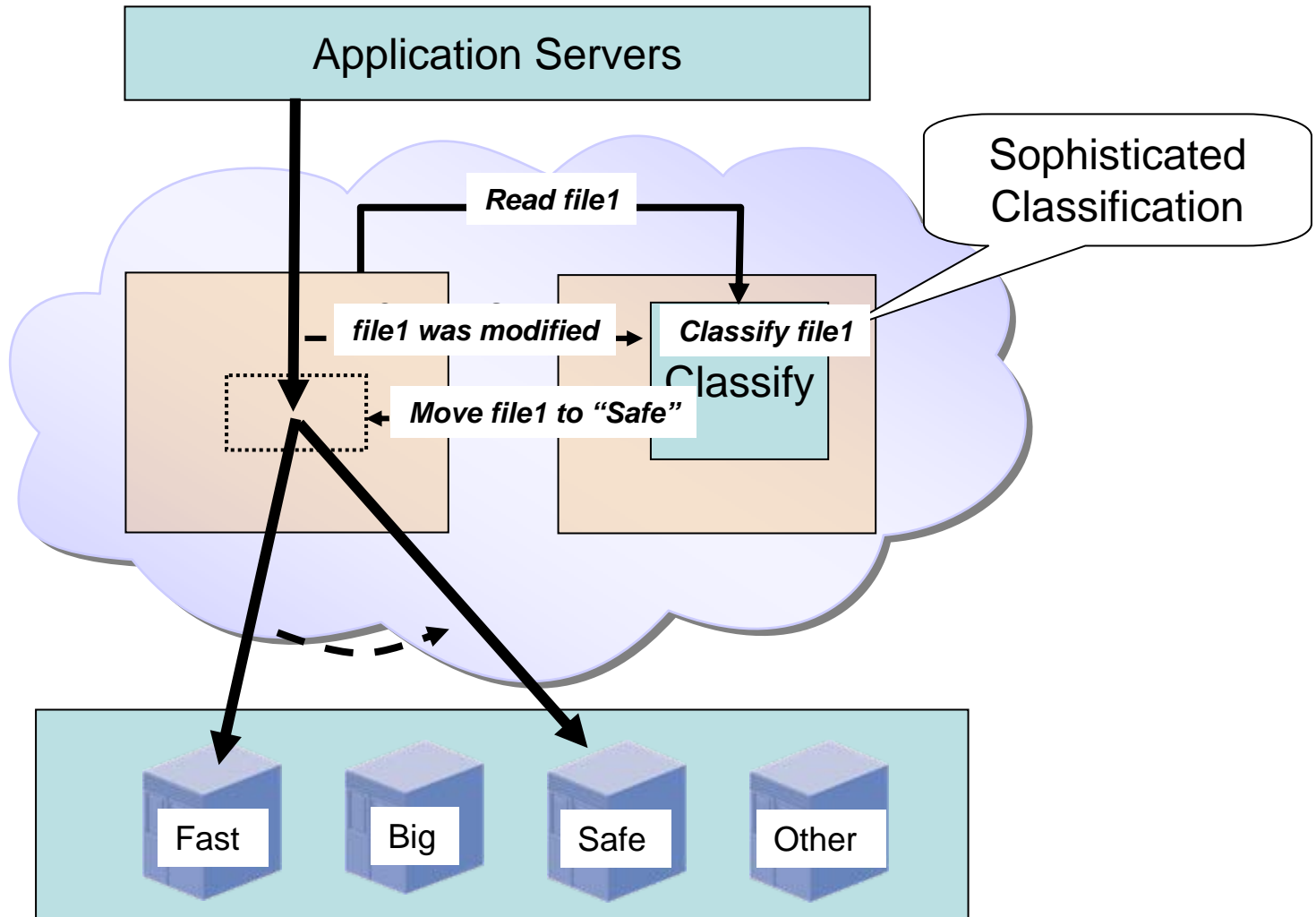
A FAN "Eco-System"



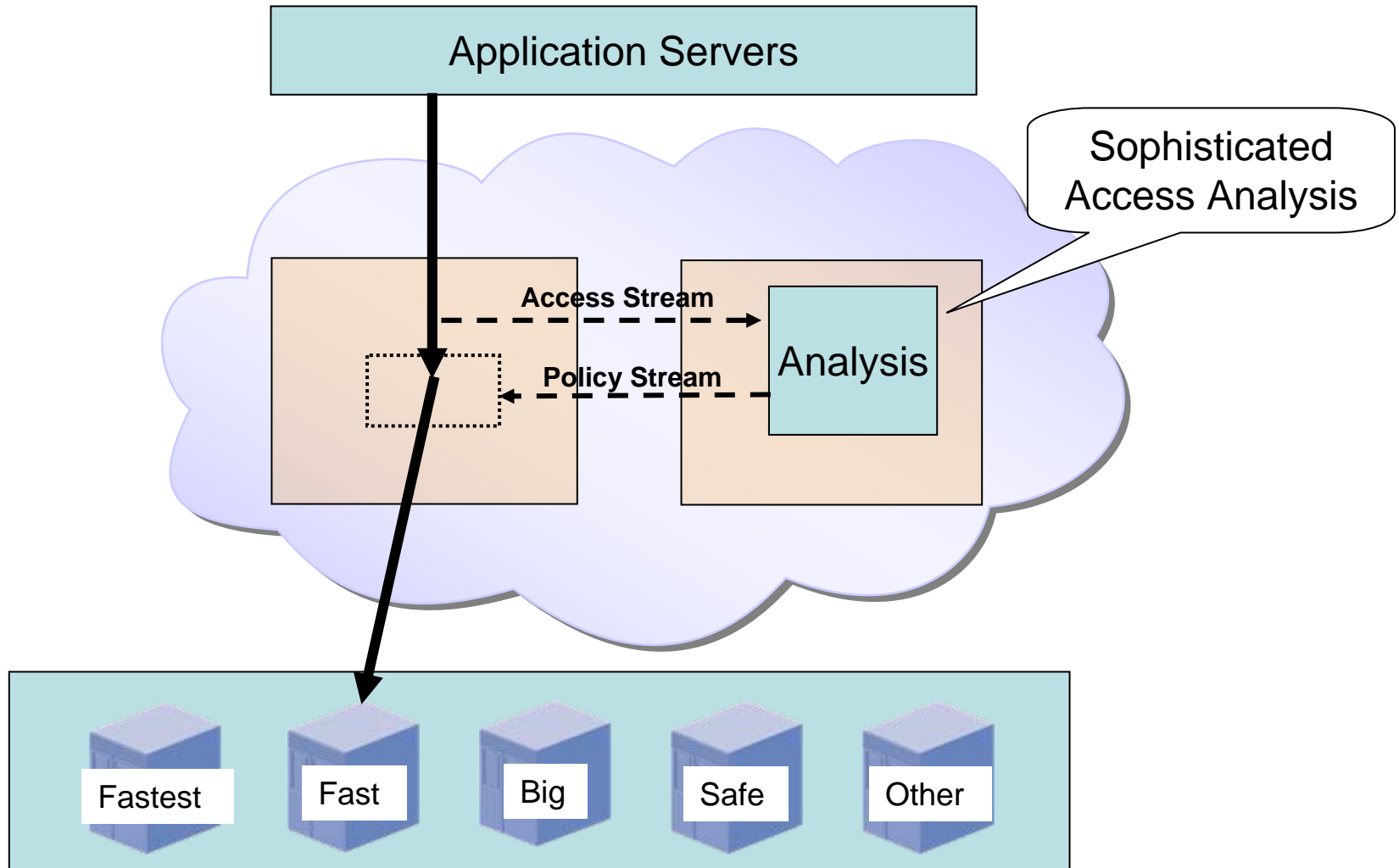
Classify and Optimize Flow



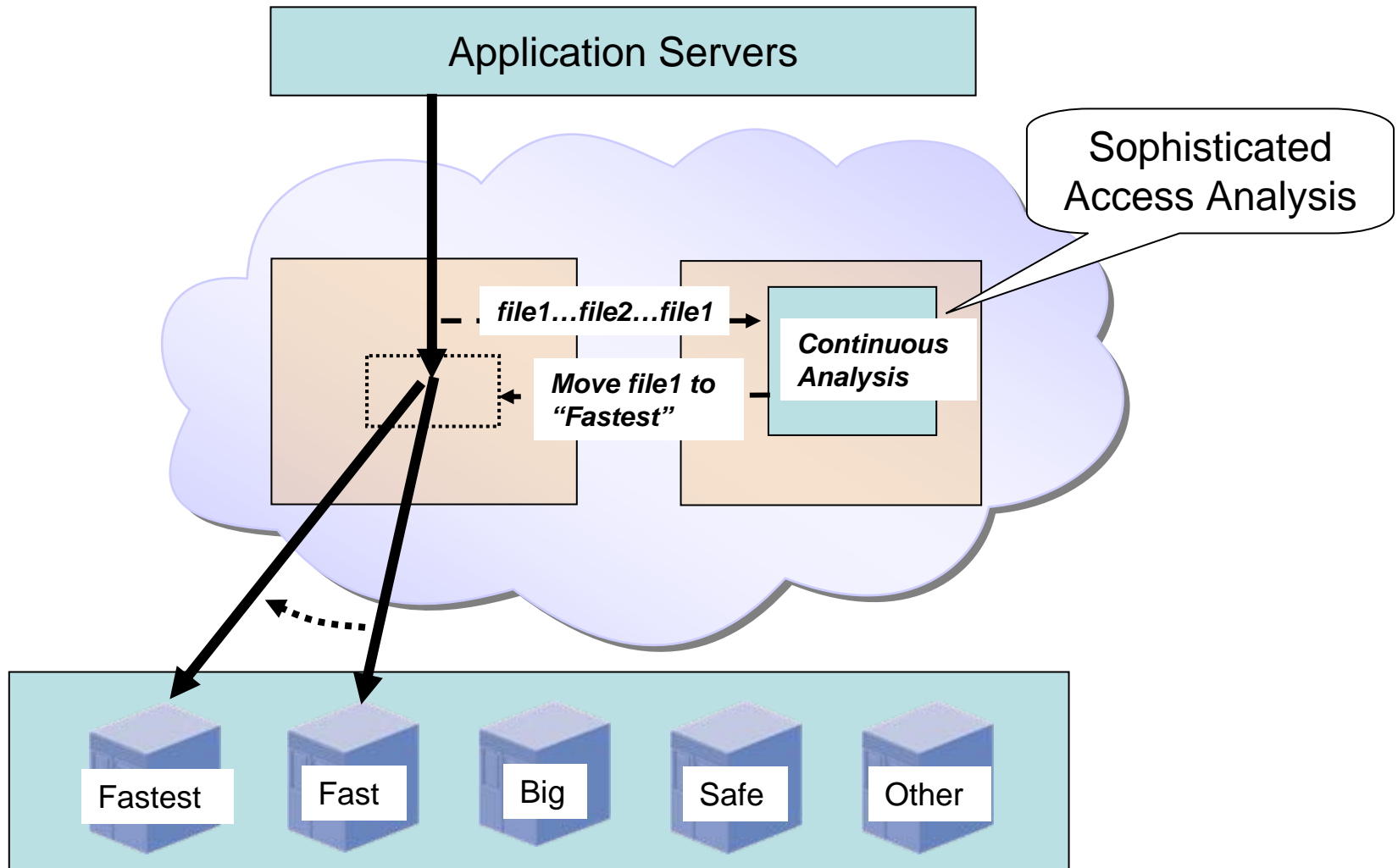
Classify and Optimize Example



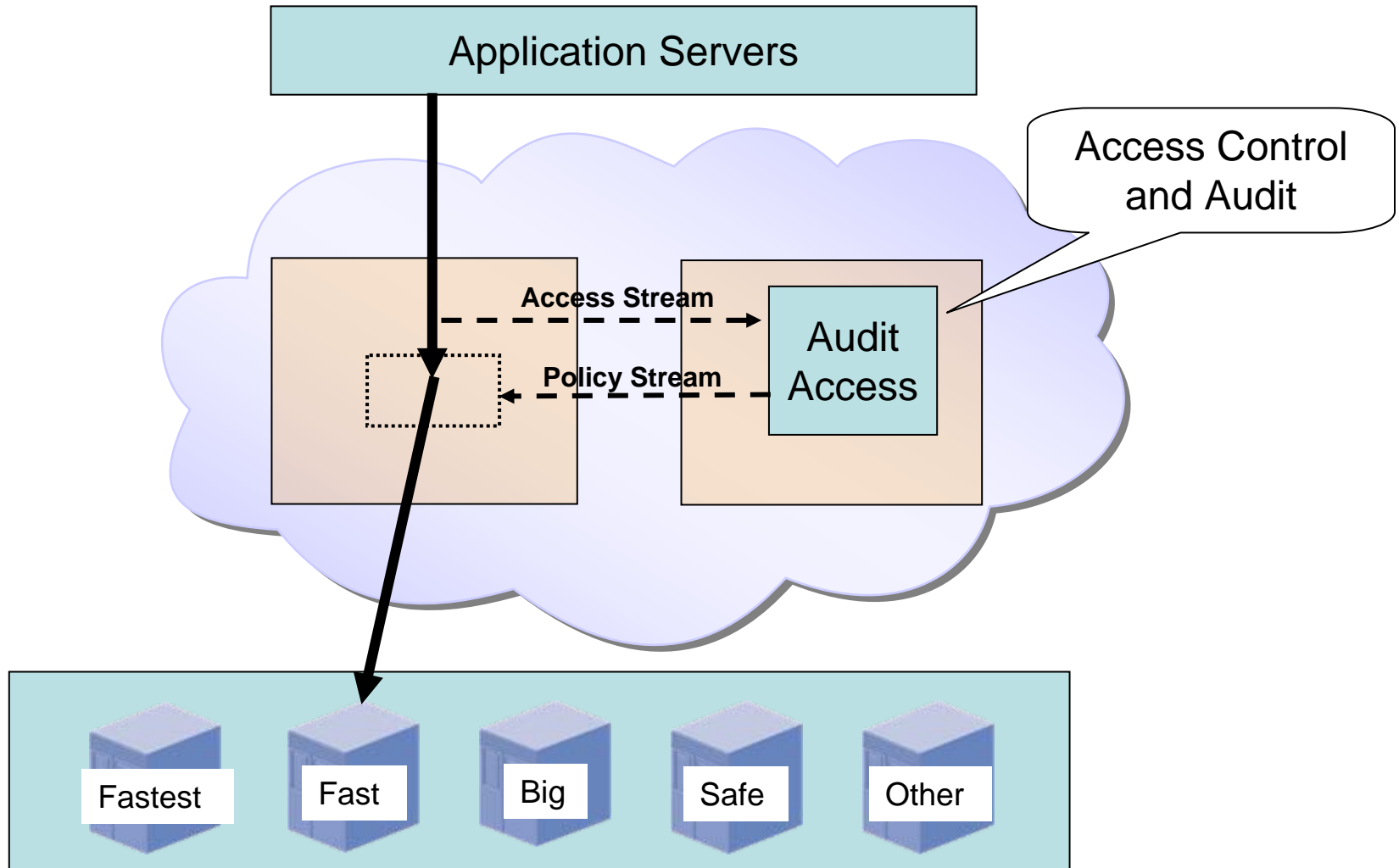
Application Acceleration Flow



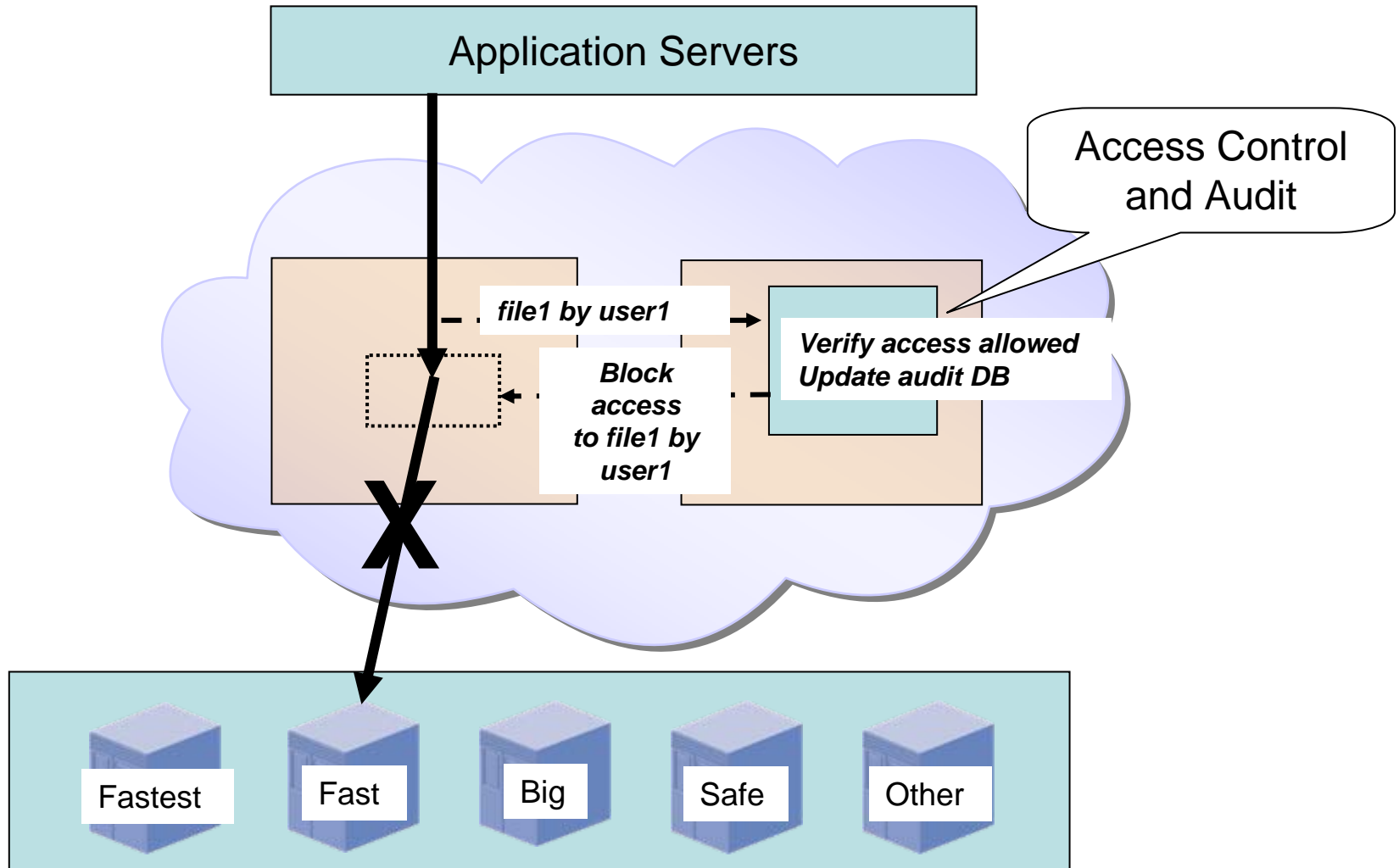
Application Acceleration Example



Audit & Access Control Flow



Audit & Access Control Example



Summary

Summary

- FAN is a term used to describe a more formal approach to architecting a heterogeneous, enterprise-wide, service-oriented file storage infrastructure
- FAN implements a set of powerful foundation technologies that support both basic and advanced storage management services
- FAN could turn out to be as revolutionary for files (and down the road for objects...) as SAN was for block storage

Q&A / Feedback

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

**Many thanks to the following individuals
for their contributions to this tutorial.**

SNIA Education Committee

Matthew Brisse

Nigel Burmeister

Philippe Nicolas

Robert Peglar

Abbott Schindler

David Thiel

Kirby Wadsworth

Cheng Wu

All members of the recently formed SNIA FAN Task Force