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# Virtualization and Scale up Storage Architecture

April 13, 2010

**Hubert Yoshida**

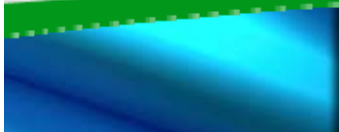
**Chief Technology Officer**



**Hitachi Data Systems**



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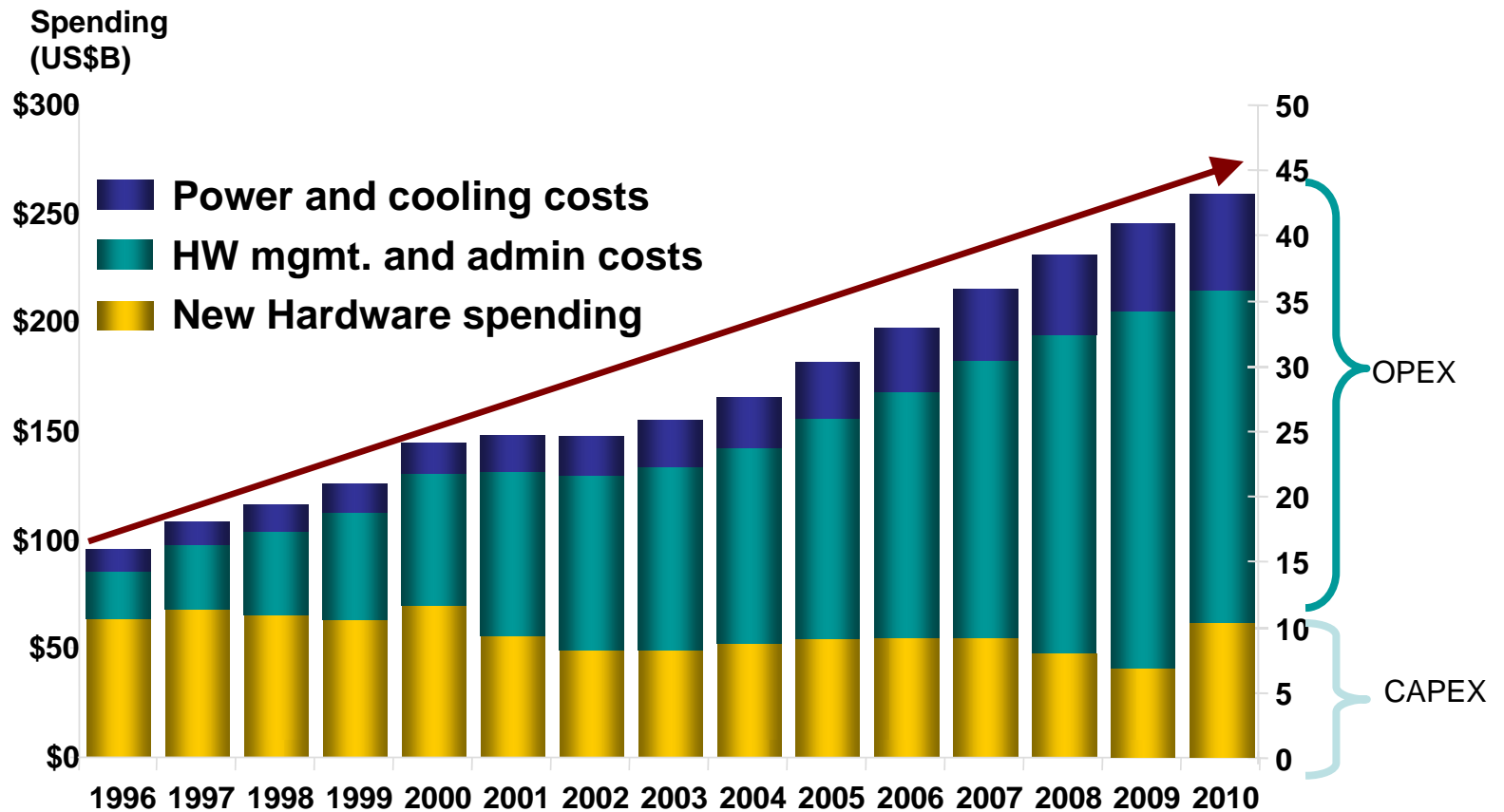
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# IDC World Wide IT Spend on CAPEX vs OPEX

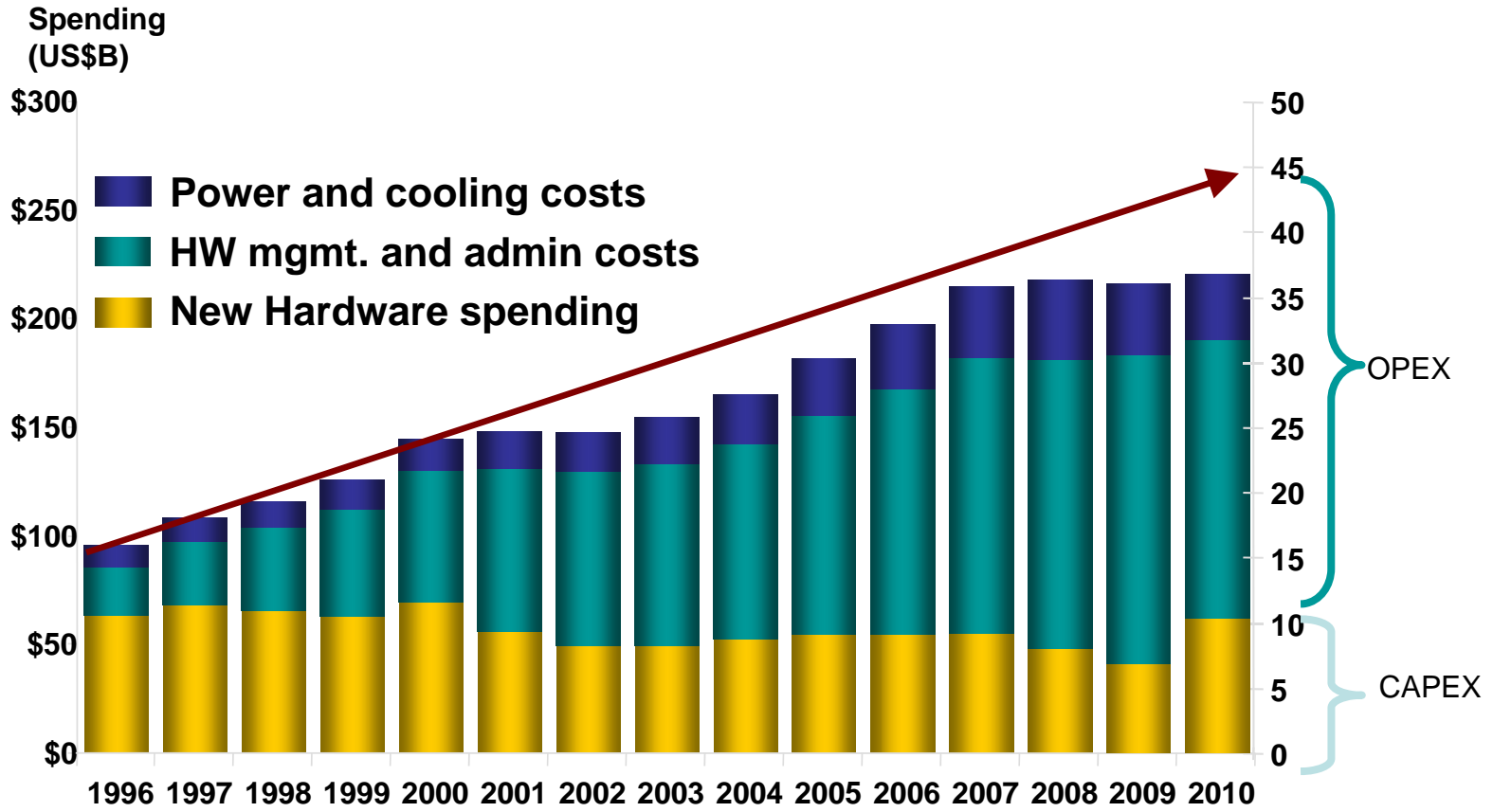
CAPEX spending has remained flat while overall costs continue to increase due to OPEX




  

  
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# A Sustainable Future

Apply Technologies to Reduce Operational costs



**Virtualization, dynamic provisioning, archive address operational costs**

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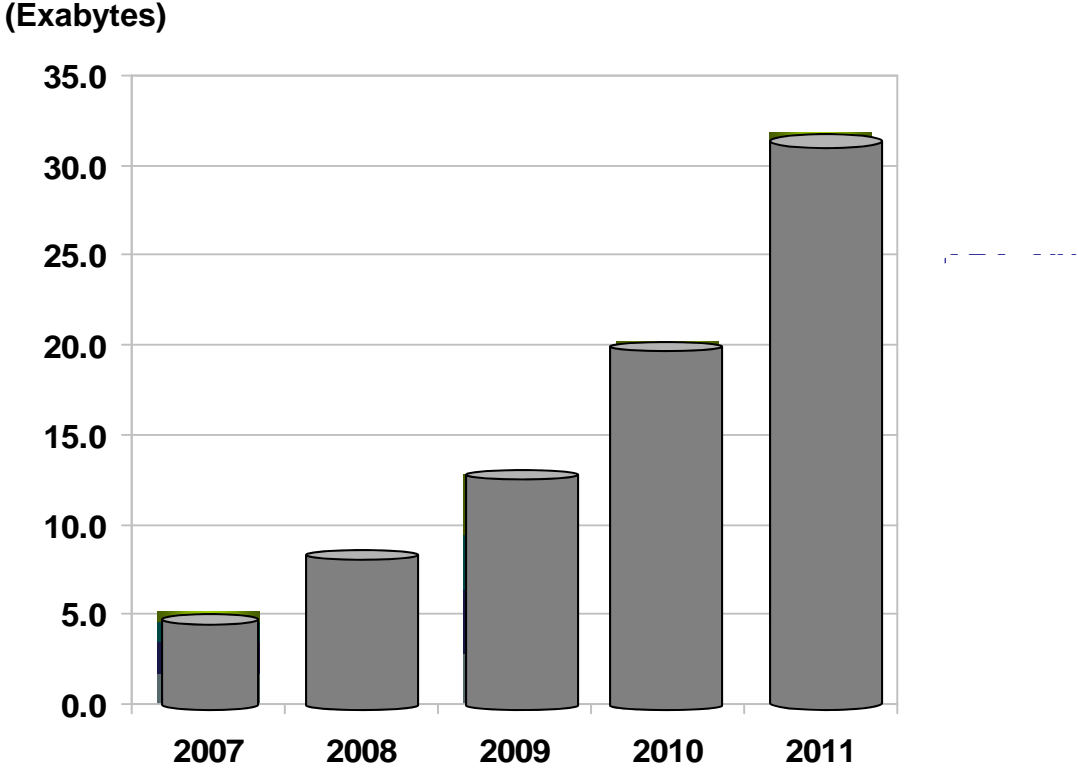
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# Exploding Data Growth


**Compounded Annual Growth Rate of 66%**



**Understanding the types of data will help to address costs**

Source: IDC 2008

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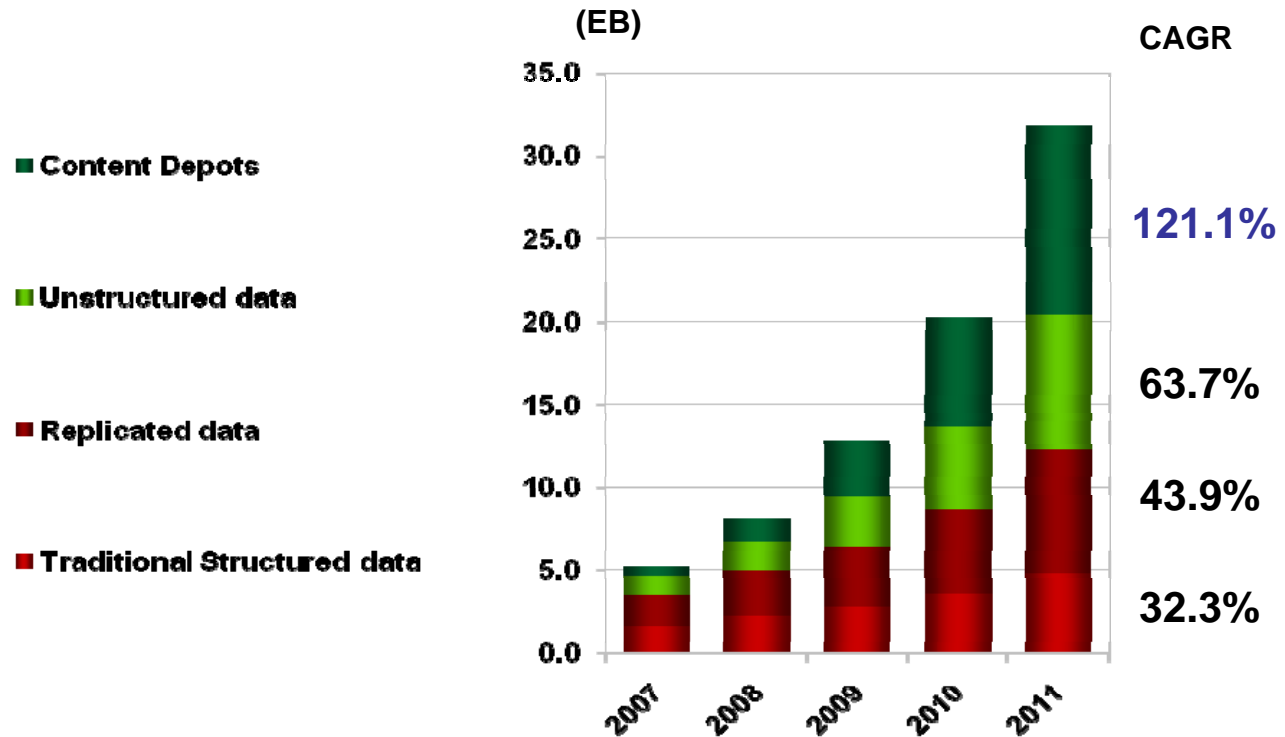
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# What We Are Keeping: Changing Enterprise Data Profile

Consumption of Enterprise Disk Capacity by Type



- Content data and Unstructured data are growing the fastest
- Replicas of data do not have to be on the same tier of storage as primary data
- Majority of the data does not need tier 1 storage
- Tiering of data and archive will play a major role in controlling cost

Source: IDC 2008

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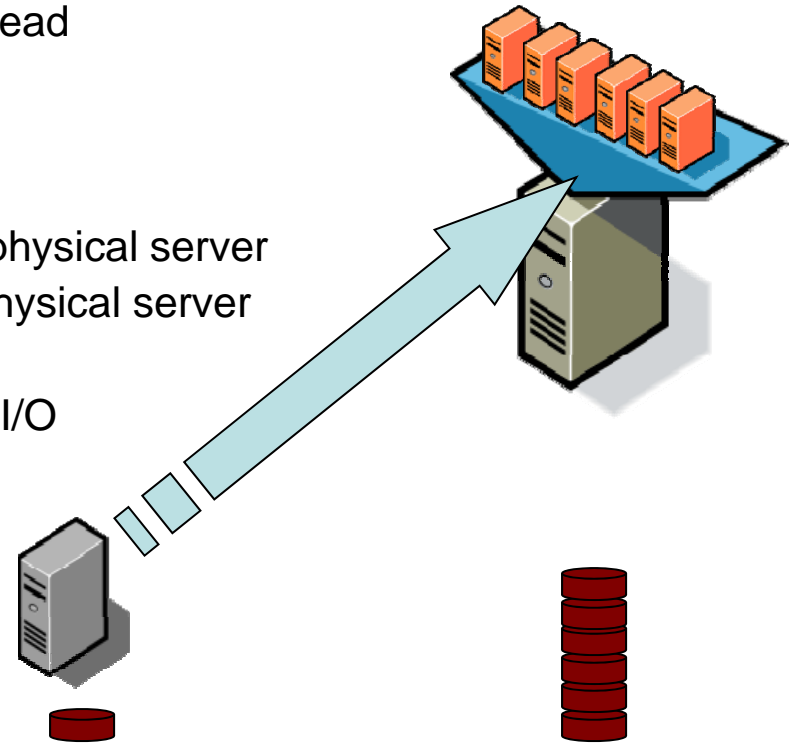


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## Servers and Networks Are Scaling Up

- Processor technology is scaling up
  - Multi-core – Dual, Quad, 8 way
  - SMT – Simultaneous Multi Thread
  - L1, L2, L3 cache
- Virtual Servers and hypervisors
  - Multiple Virtual Machines per physical server
  - Multiple VM I/O streams per physical server
    - Increasing I/O load
    - Increasing randomness of I/O
- Network bandwidth is increasing
  - FC 4Gbs going to 8Gbs
  - FCoE 10 Gbs to 40 Gbs to 100 Gbs



**Scale-up Storage is required to support virtual servers and networks**

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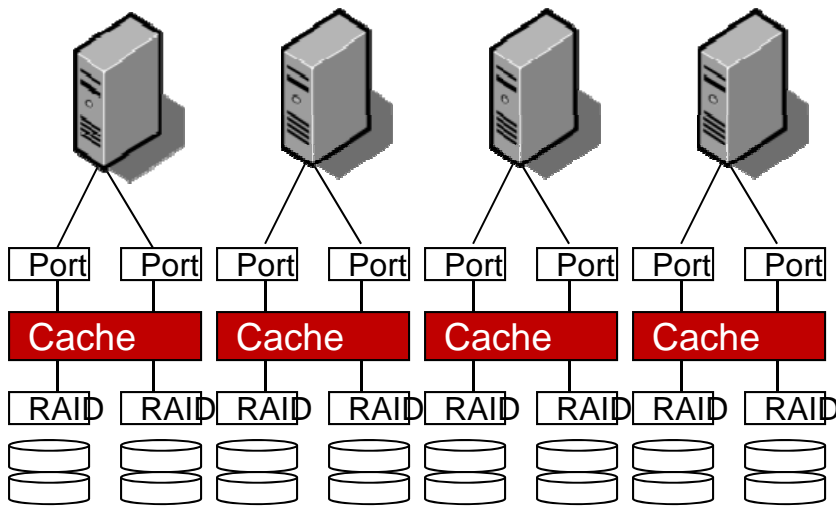


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## Scale Out Storage



- **Scale out is loose coupling with external Switches**
- **Resources in one node can not be used to increase the resources in another node**
  - **Additional management required to distribute workload**
  - **Availability comes from active/passive redundancy**



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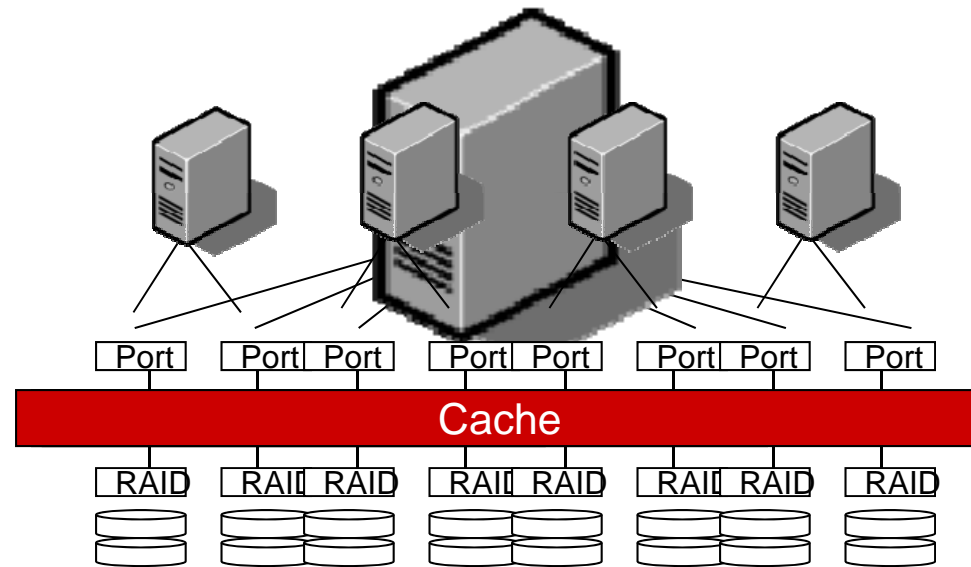


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## Scale Up Storage

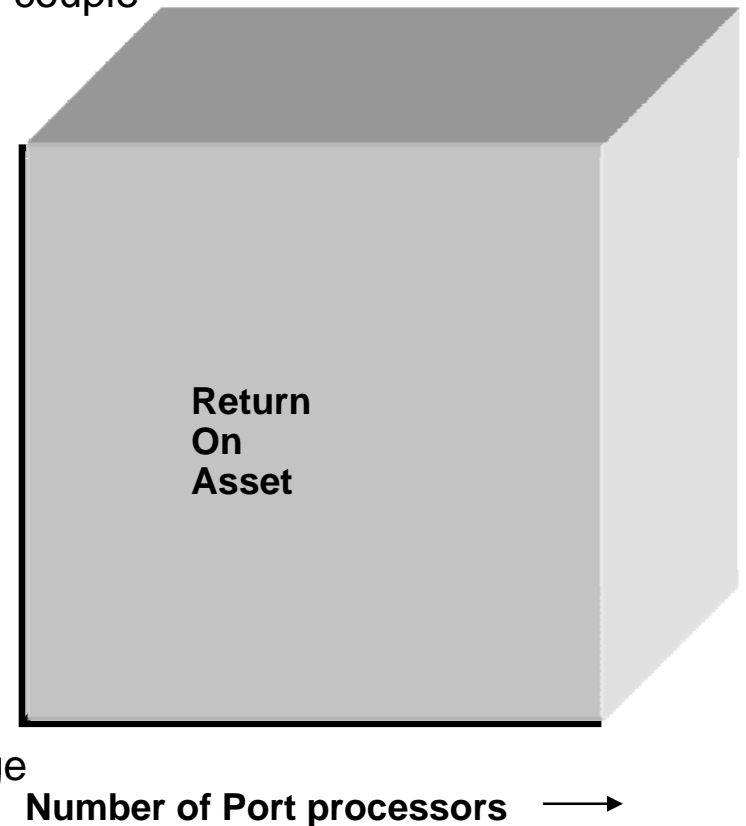


- **Scale Up is tight coupling through a Global Cache**
  - Resources can be pooled together to give maximum performance and capacity
  - Scale up can be partitioned to work like scale out




# Cartesian Scaling

- **Two Dimensional scaling**
  - Increase the number of port processors to scale out
  - Increase Global cache to tightly couple port processors
  - Return on Investment



- **Three Dimensional Scaling**
  - Virtualization of External Storage
  - Return on Asset

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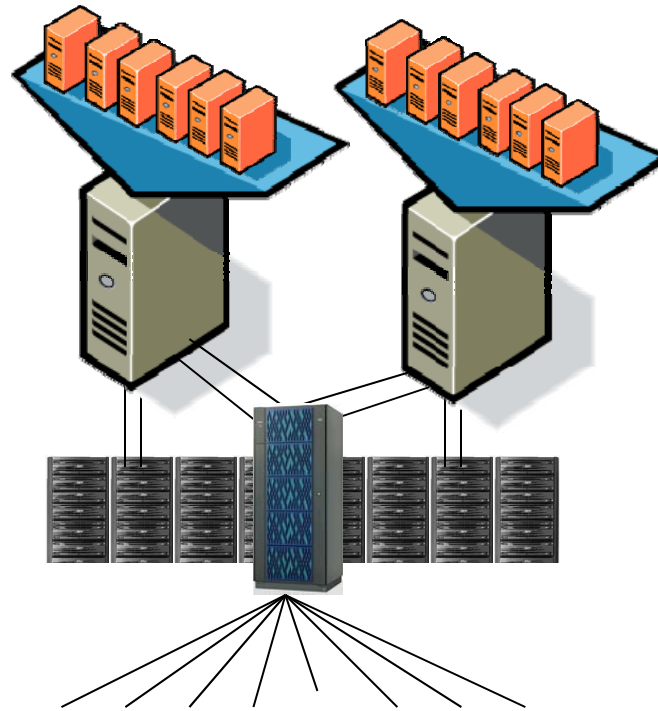
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# Scale Up Existing Storage With USP V

## Consolidation with Virtual servers

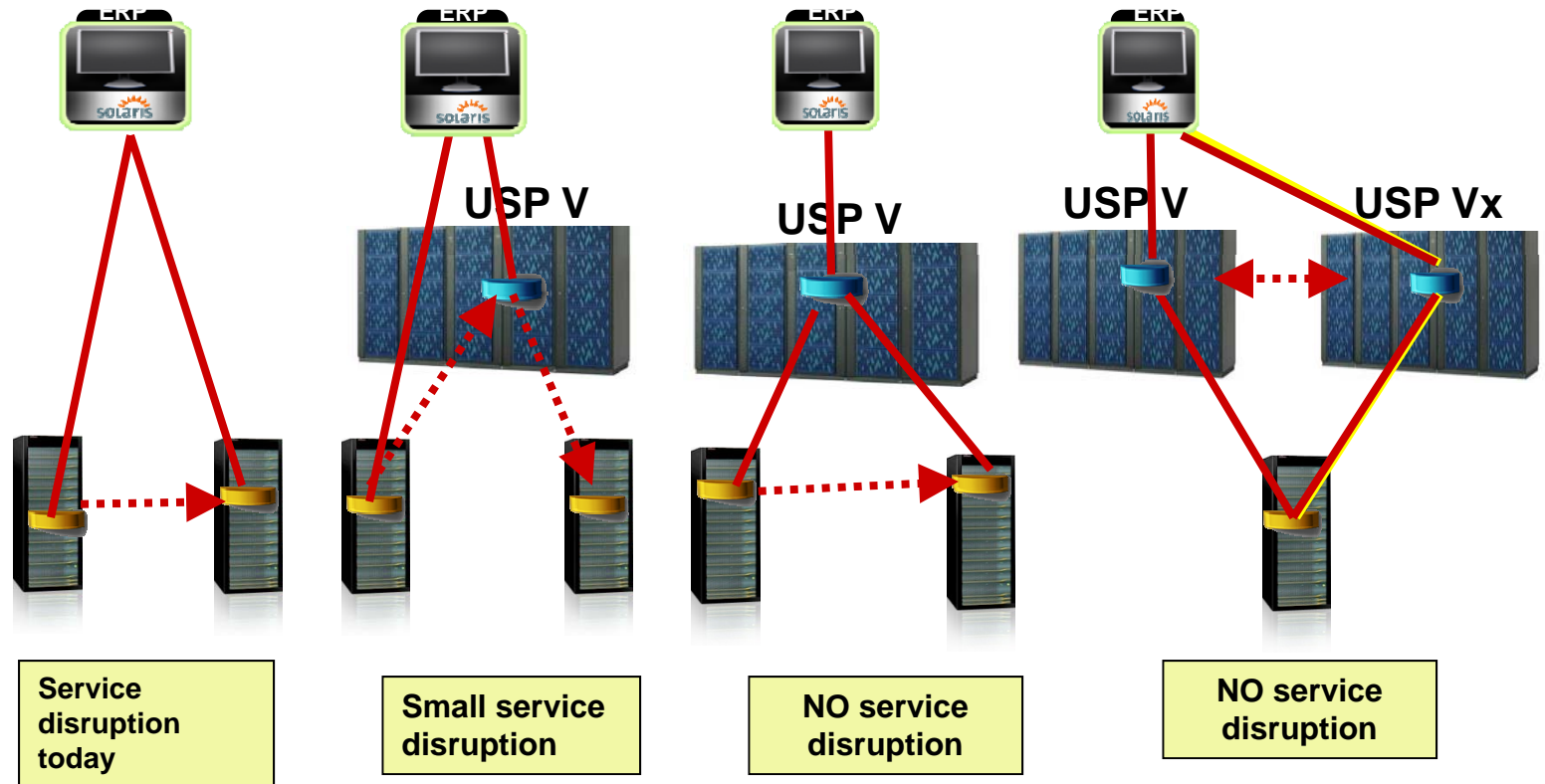


**Virtual Servers become the new Mainframe  
Scale up Storage is required**


  

  
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# Scale Out For Data Migration

*No more messy data migrations and painful "downtime"*



**The USP V Can Scale out with Virtualization and Loose Coupling**




## SNIA Definition of Storage Virtualization

<http://www.snia.org/education/dictionary/v/>

*The act of abstracting, hiding, or isolating the internal functions of a storage system or service from the application, host computer, or general network resources, for the purpose of **enabling application and network independent management of storage or data.***

*The application of virtualization to storage services or devices for the purposes of aggregating functions or devices, hiding complexity, or **adding new capabilities to lower level storage resources.***

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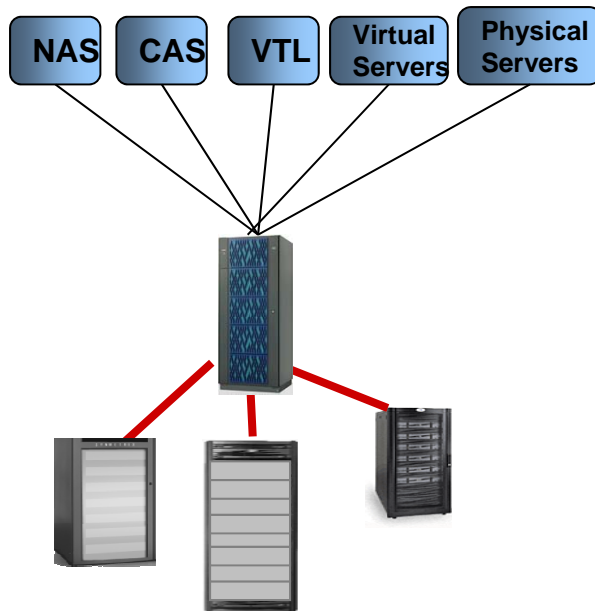
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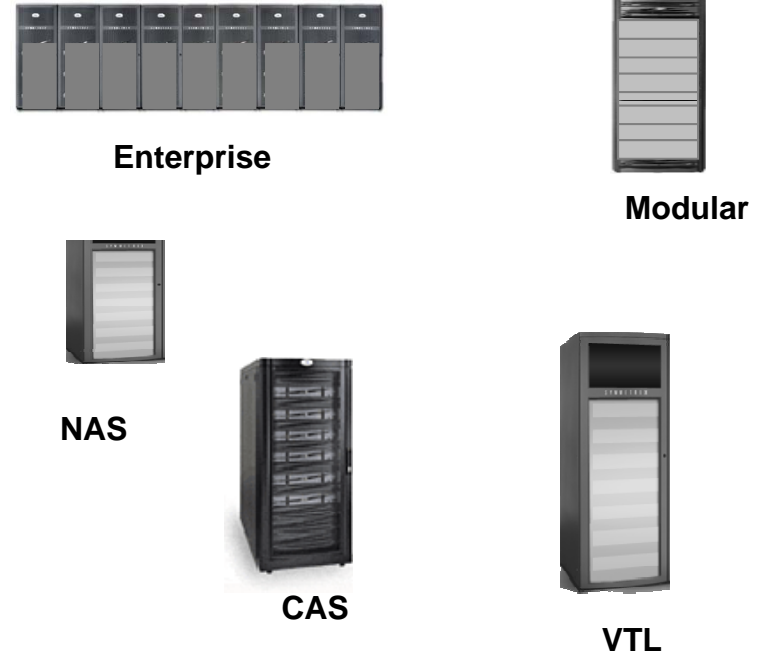
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# Virtualized vs Non-Virtualized Storage Services


## Virtualized Storage Services



## Non-Virtualized Storage services



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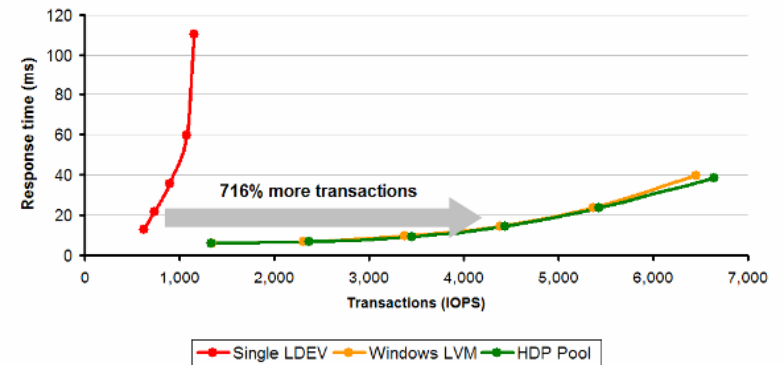
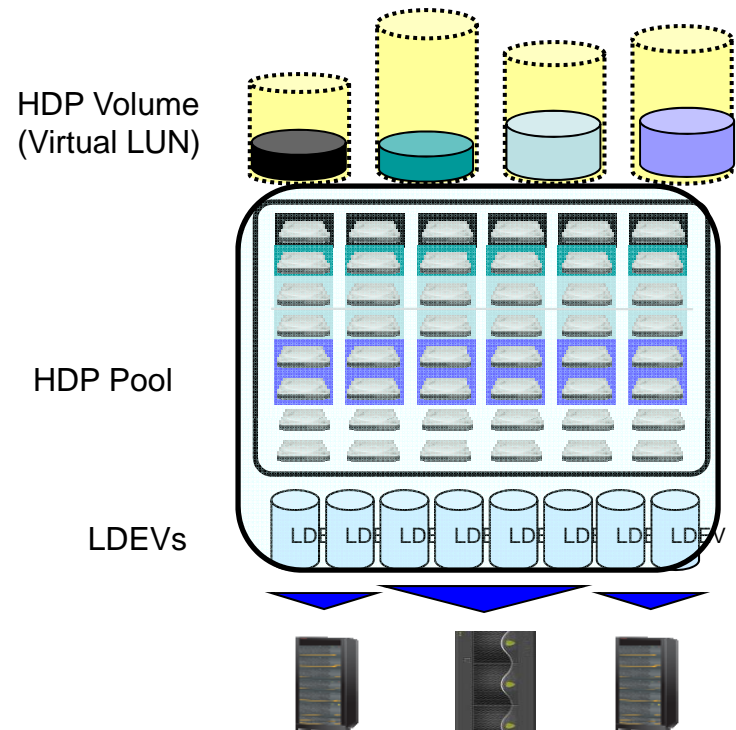
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# Dynamic Provisioning

- **Virtualize Devices into a pool of capacity and allocate by pages**
- **Eliminate allocated but unused waste by allocating only the pages that are used**
- **Dynamically provision new servers in seconds**
- **Extend Dynamic Provisioning to external virtualized storage**
- **Convert Fat volumes into thin volumes by moving them into the pool**
- **Optimize Storage performance by spreading the I/O across more arms**



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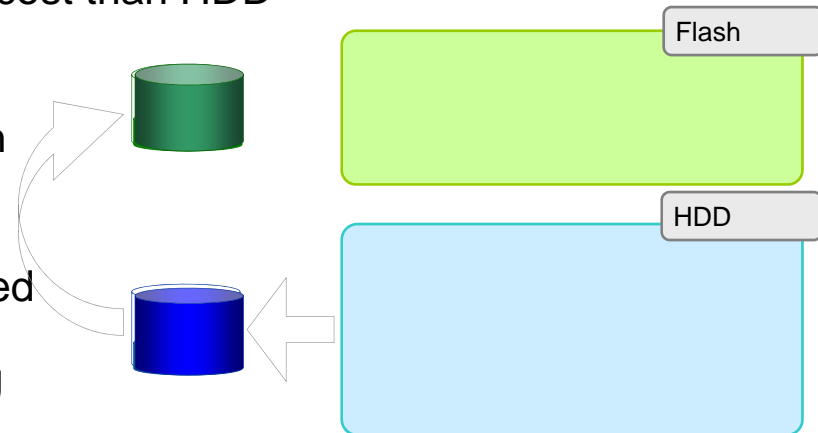
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# Flash Disks

- Very High Performance for Critical applications
  - 70x random reads, 14x random writes
- 50% reduction in power and cooling
- Enterprise SLC Flash has 100,000 Write/Format cycles
  - Wear leveling, error recovery, spares
- Currently 10 times higher cost than HDD
- Optimize use of Flash with dynamic tiering
- Eliminate waste of allocated unused Flash capacity with Dynamic Provisioning





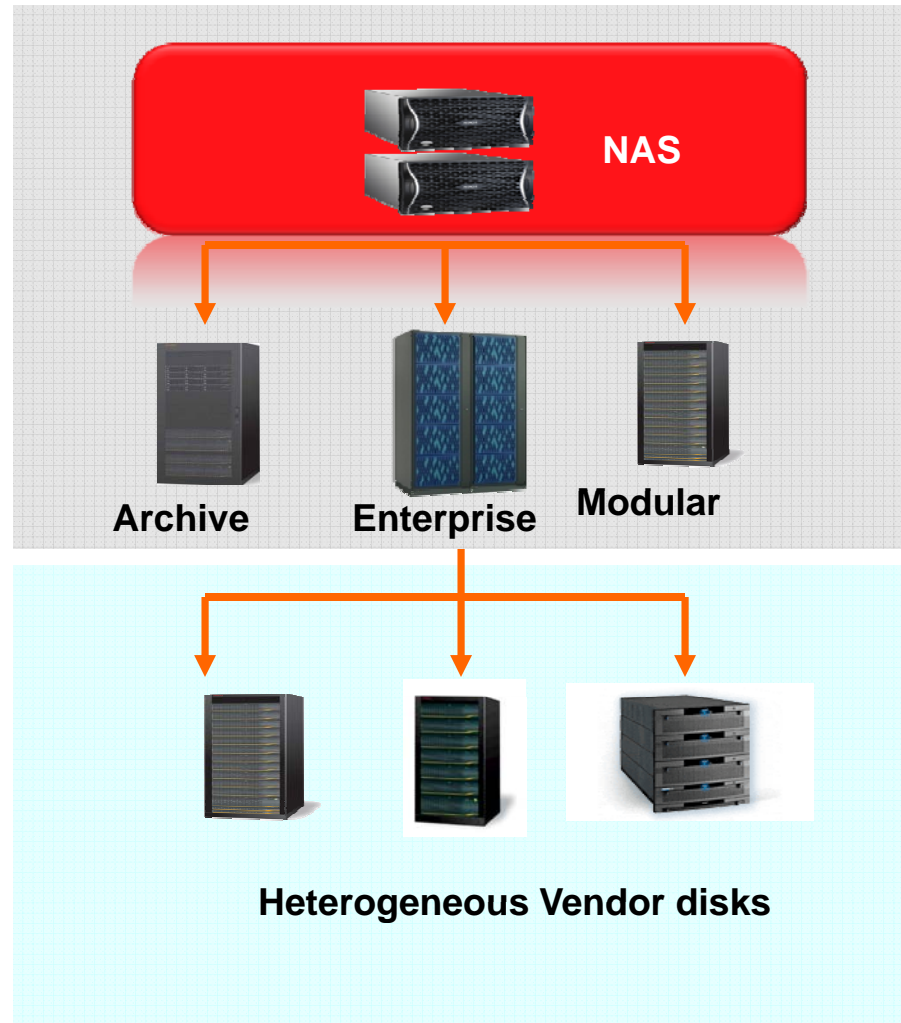

  

  
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# Convergence of File, Content and Block Virtualization

File/content Services Leverage Advanced Block Services Architecture

- **Global Name Space**
- **Intelligent Tiering Management**
- **Push files down to a content archive**
- **Tiering Through Virtualization**

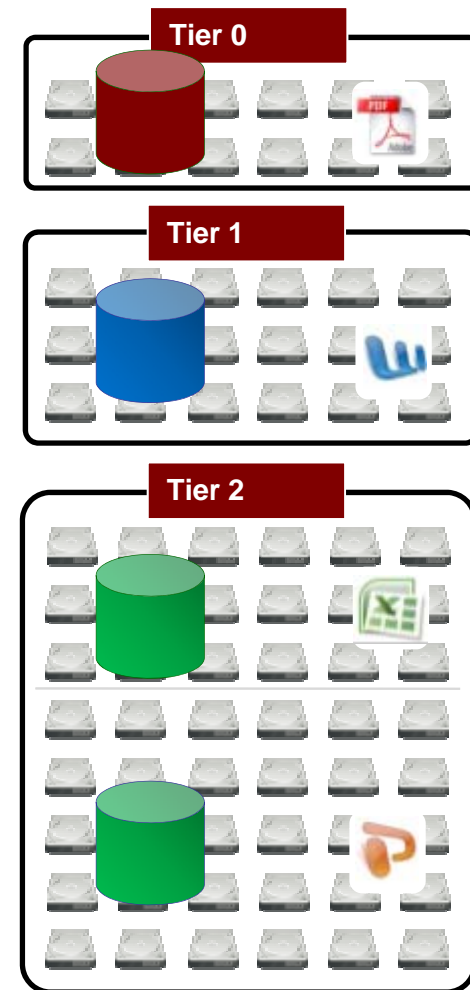




# Automated Data Mobility

- **Two layers of data mobility**
  - Infrastructure layer / block level
  - Object layer / file level
- **Use virtualization and data mobility tools to move (or re-provision) the volume without disruption to any other pool or tier based on**
  - Promotion or demotion
  - Consolidation or migration
  - SLO, performance or cost change
- **Automated with policy based management**
  - Based upon pre-set SLAs

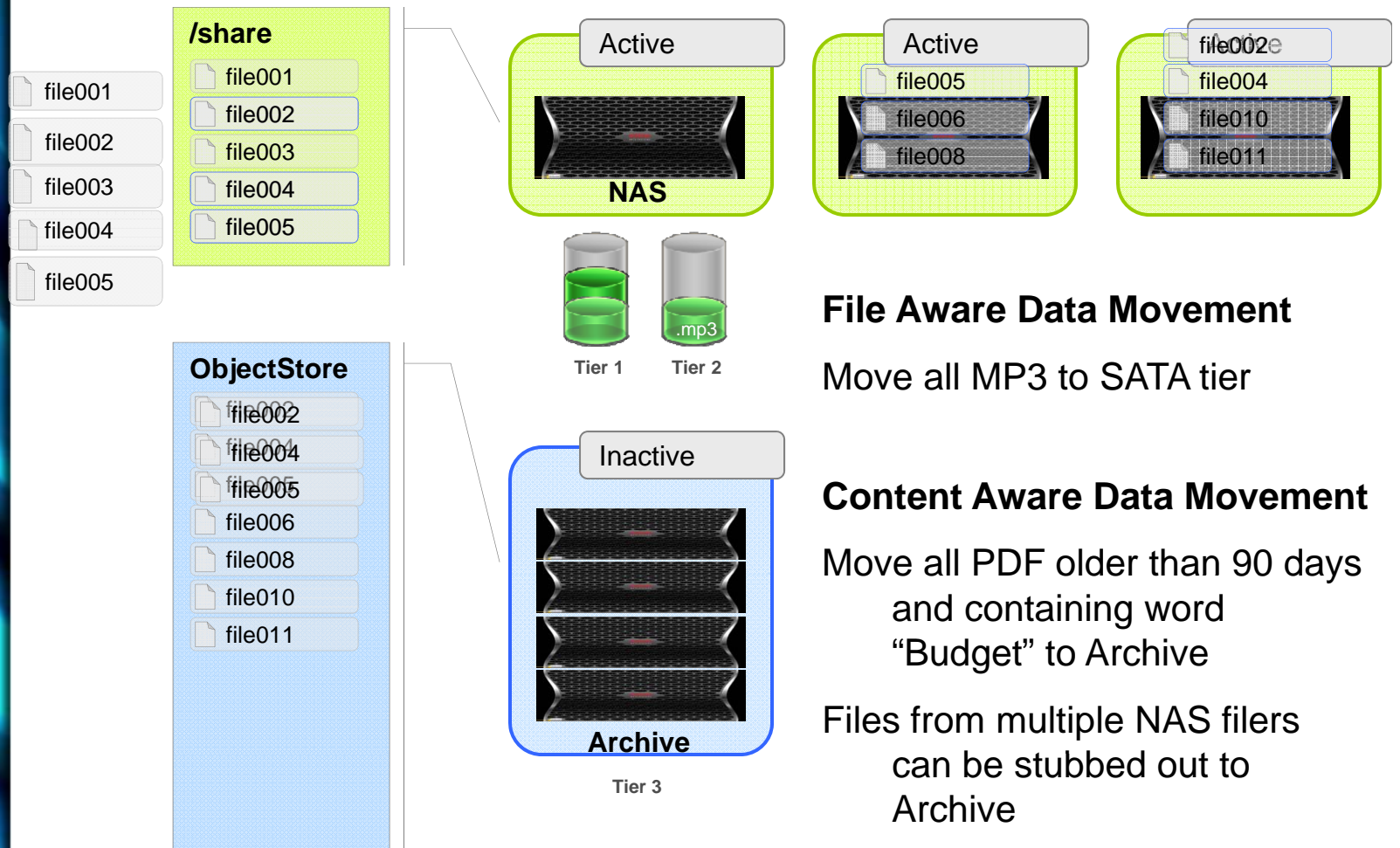
Infrastructure  
/block level



Object  
/file level

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# Data Management General Use Case: File HSM (ILM)





# Virtualization is a Key Enabler for the Cloud

**“Cloud is a way of using technology, not a technology in itself – it’s a self-service, on-demand pay-per-use model. Consolidation, virtualization and automation strategies will be the catalysts behind Cloud adoption.”**

**– The 451 Group**


**Key characteristics of the Cloud are:**

- **The ability to scale and provision dynamically in a cost efficient way**
- **The ability to make the most of that power without having to manage the complexity of the underlying technology**

**“The Cloud architecture can be private (hosted within an organization’s firewall) or public (hosted on the internet).”**

**– Open Cloud Manifesto**

**Cloud architectures have public, private and hybrid use cases**



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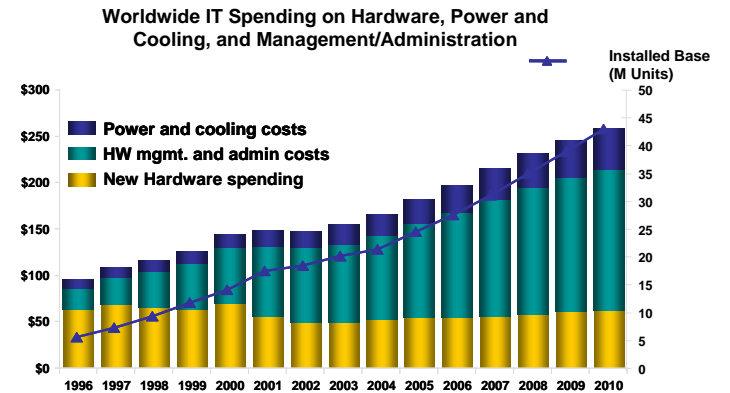
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# Summary

- While hardware costs remain flat, IT costs are escalating due to operational costs



IDC 2008  
Vernon Turner

- Virtualization can address operational costs through virtualization and scale up architectures





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