

## State of Ohio IT Best Practice

Storage Virtualization

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### Technology Best Practice ITG-PLF-05

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**Endorsed By:** Enterprise Technical Architecture Subcommittee (ETS SC);  
 Leadership Management Committee of the MAC (LMC)  
**Approved By:** H. Samuel Orth III, State CIO

#### 1.0 Purpose

This document details a set of industry best practices to consider when virtualizing storage.

#### 2.0 Background

These best practices were developed by the Server/Storage Virtualization and Consolidation Work Group (SSVC WG). The SSVC WG was formed by the Multi-Agency CIO Advisory Council (MAC) Enterprise Technical Architecture Subcommittee (ETA SC) to develop enterprise technical architecture and best practice recommendations for server and storage virtualization and consolidation.

#### 3.0 Best Practices

Practice	Rationale
Keep complexity within your environment to a minimum.	Every variation in storage hardware requires an extra level of expertise to manage, configure and provision. Try to purchase storage resources from no more than two vendors (this also gives an advantage in price negotiation). Complexity in storage deployment should be driven only by function; try to keep to standardized deployments based on storage tier, connectivity (SAN, iSCSI, NAS) and specialty applications (archiving, WORM).

Practice	
Periodically determine the total and available capacity of the storage environment.	Keeping track of available and used storage capacity allows timely and planned deployment, and it also illustrates possible consolidation opportunities. The purchase of a Storage Resources Management (SRM) tool is extremely useful for this purpose. SRM tool purchases negotiated at the same time as storage can result in considerable discounts. Also consider the reporting capability that may be present in the native storage administration interface.
Control storage sprawl.	Manage storage as a utility. In a virtualized storage environment, dedicating storage hardware to a particular application makes little sense; it places constraints on moving data based on performance requirements and hampers consolidation efforts. Select storage with inherent data mobility features, allowing data to move between different tiers of disk within the unit.
Select storage incorporating an easy-to-use GUI.	Select a storage solution that has an easy-to-use, intuitive interface for storage administration. Using the administration interface should not require extensive training or considerable storage management experience. The interface should clearly present storage in terms of capacity used and capacity available.
Select storage that delivers a high measure of disk virtualization.	Storage systems that implement virtualization as an internal feature, or virtualizing physical disk drives behind a virtualization appliance, should not require the administrator to be concerned with individual hard disk drives beyond initial system configuration. The administrator should be able to create volumes out of generic pools of disk storage without regard to the location or designation of specific drives.
When virtualizing heterogeneous storage, choose one virtualization technique and corresponding vendor for your environment.	Heterogeneous, or external, storage virtualization is an appliance, notably used in larger IT environments and/or those with a variety of different manufacturers' or various models of disk resources with different performance characteristics. It presents a view to a host server of a single disk storage array from one or more physical disk arrays. Choose one virtualization appliance and corresponding vendor for your environment.
Avoid re-branded storage products.	Unless the re-branded storage can be purchased at a considerable discount or a unique vendor relationship exists, try to avoid purchasing re-branded storage products. Agencies have had a number of bad experiences with re-branded storage where the support has not been as comprehensive or timely as support from the original manufacturer.

Practice	Rationale
Look for storage array features that economize on disk space.	Two features that provide some measure of disk economy are thin provisioning and deduplication. Thin provisioning allocates the exact amount of storage being used by an application. This allows storage utilization close to or exceeding 90 percent, compared to conventional storage utilization rates of 40 to 60 percent. Deduplication saves particular files or blocks of data only once, not multiple times, also providing dramatic savings in allocated disk space. All vendors' products recommended by the Server/Storage WG have one or both of these features.
Use external storage technologies such as a Storage Area Network (SAN) or Network Attached Storage (NAS) to store virtual machine files whenever possible.	The benefit of hosting several server instances on a single physical server with internal storage can become a detriment if the hardware becomes inaccessible. The use of dedicated attached storage along with virtual machine management technologies allows moving virtual machines quickly among additional virtual hosts, thereby mitigating the impact of a host failure.
Purchase units with at least dual disk controllers, where applicable.	Dual disk controllers in storage units not only provide an important layer of redundancy, but in most cases, also allow for non-intrusive firmware upgrades. Single controllers will save money, but should only be used to host applications where hours of downtime for repairs or code upgrades would not be a problem.
Purchase all storage software options that may be needed at the same time as the hardware, even if they're not immediately used.	Waiting to purchase options later (for example, replication and cloning technology, database snapshot software, iSCSI or NFS connectivity) could result in paying a higher price. Vendors will be more open to negotiation for this software if it's part of the initial purchase package.
Recommended Storage Segmentation	Don't put all environments on the same storage/SAN solution. Separate test/development and production if possible to eliminate any chance of resource contention. Every host should be able to trace at least two data paths to a storage unit, through separate switches and storage device channels to eliminate single points of failure.
Consider Network Data Management Protocol (NDMP) for backing up NAS storage.	NDMP backups are "serverless," fiber-based and eliminate network contention. They are considerably faster than conventional, over-the-network backups.

### 3.1 Revisions to These Best Practices

The Enterprise IT Architecture and Policy group of the Office of Information Technology will conduct a biannual review of these best practices and related technologies. Changes will be published in these best practices.

#### 4.0 References

Section 125.18 of the Ohio Revised Code (ORC) provides the State Chief Information Officer the authority to coordinate and superintend statewide efforts to promote common use and development of technology by state agencies.

#### 5.0 Procurement Guidance

None

#### 6.0 Definitions

None

#### 7.0 Related Resources

None

#### 8.0 Inquiries

Direct inquiries about this document to:

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Ohio IT Best Practices can be found on the Internet at: [www.ohio.gov/itp](http://www.ohio.gov/itp).

#### 9.0 Document Revisions

Date	Description
August 2010	Original version of the Storage Best Practices

#### 10.0 Attachments

None