Storage Consolidation and the Sun ZFS Storage Appliance

Datacenter sprawl is one of the larger challenges faced today by datacenter managers. Over time application and storage demand can cause diverse application and storage architectures in an information technology infrastructure. This introduces complexity, increases cost and can compromise business critical application performance and availability. By consolidating applications and storage using the Sun ZFS Storage Appliance key elements in sustaining an information technology are simplified, decreasing costs for both capital and labor and can improve mission critical application availability.

Storage Consolidation – It’s about the Application

What data center managers are finding out today is that the underlying driver for storage and server sprawl today is really application sprawl. Typically the way the scenario works is that applications may be added to an infrastructure and rather than utilizing existing and available computing or storage resources, additional servers and storage are unnecessarily purchased to meet the requirement. Worse yet, another way this might work is that existing applications already deployed within the infrastructure often run short on computing or storage resources with the typical solution being to purchase more servers and/or storage and augment their existing deployment for the particular application. This all works together to over-utilize data center resources in the form of space, increase costs associated with cooling and power, introduce risk into sustaining mission critical application availability as well as raise a significant burden on sustaining the ever-growing infrastructure with notably scarce system, network and storage administrators.

It’s about Application Consolidation

To effectively consolidate server and storage resources it begins with consolidating...
applications. The objectives for the data center manager are often the following as illustrated in the table below.

<table>
<thead>
<tr>
<th>Consolidation Initiative</th>
<th>Return on Investment</th>
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<tbody>
<tr>
<td>Reclaim Data Center Space</td>
<td>• Improve Space efficiency and Reserve data center space for strategic growth</td>
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<tr>
<td>Reduce the number of application servers</td>
<td>• Improve cooling and power costs</td>
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<tr>
<td>Simply the application infrastructure</td>
<td>• Reduce the risk to mission critical application availability</td>
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<tr>
<td>Consolidate server processing resources</td>
<td>• Improve the efficacy of system administration</td>
</tr>
<tr>
<td>Consolidate storage</td>
<td>• Improve Data Protection through reliable backup/restore and disaster recovery planning</td>
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2 The advantages of an Application Consolidation Initiative

Figure 1 illustrates at a high level the process by which a data center can experience the advantages of a consolidation initiative. The return on investment can be substantial depending on the degree of application and it’s associated server/storage sprawl. The effects of virtualization on the IT architecture have been extremely beneficial in that among other advantages, the first step of a virtualization initiative is to also execute this very same process of application consolidation. Figure 3 illustrates how applications consolidate for example into Virtual Machines onto a Oracle Server platform with Oracle VM. In this way, compute resources are utilized efficiently as well as the benefits of storage consolidation being realized to protect data in ways that otherwise were not possible in an application sprawl scenario.

3 Application Consolidation during a Virtualization Initiative

Application Consolidation and the Sun ZFS Storage Appliance

The ZFS Storage appliance is an ideal platform to deploy a application consolidation solution because it includes powerful data protection and storage efficiency features. Key data protection features such as Snapshots and Clones provide instant backup and recovery that dramatically improve storage administrator response time when files are accidentally deleted while also providing a consistent point in time copy of data that can be used simultaneously for long-term backup and recovery.
Disaster Recovery planning and test can be improved and implemented using the Replication feature. This feature empowers the data center manager to perform disaster recovery planning, testing and execution non-intrusively and at minimal expense. Note, that this feature can not only be used for disaster recovery but also for application file distribution as it provides replication featuring several scenarios which include one-to-one, one-to-many, many-to-one and with minimal set up time, cascade mirroring as well.

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Return on Investment</th>
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| Instant Backup and Recovery through Snapshots and Clones | • Rapid recovery of data accidentally lost or deleted  
• Improves B/R Reliability  
• Improved application availability |
| Disaster Recovery features through the use of Replication | • Ability to plan and test and demonstrate Disaster Recovery Plans  
• Ease of use in implementation of data replication and recovery |
| Storage efficiency features such as Compression, De-Duplication and Thin Provisioning | • Preserves storage capacity extending the effective life of storage  
• Avoids over-allocation of storage through Thin Provisioning  
• Removes the effect of duplicate data through In-Line De-Duplication |
| Reduces the amount of storage devices | • Power and Cooling cost reduction  
• Improves B/R Reliability  
• Reduction in Capital Outlay |

4 Advantages of Application Storage Consolidation and the Sun ZFS Storage Appliance

Storage efficiency is a critical element in an application consolidation effort. As mentioned before one of the principle reasons for application sprawl was due to lack of additional storage resources as application requirements such as capacity, data protection and storage efficiency evolved. Key storage efficiency features included with the Sun ZFS Storage Appliance such as thin-provisioning, compression and de-duplication work to efficiently utilize storage capacity through removing duplicate data blocks, compressing data and allocating the amount of storage being consumed by users rather then over-allocation. These storage efficiency features avoid the waste of valuable storage capacity that would otherwise increase capital costs and complicate system and storage administration.

**Application Storage Observability**

DTrace Storage analytics software provides the industry’s only comprehensive and intuitive analytics environment. Administrators are

5 dTrace Storage Analytics Display
provided with tools to quickly and intuitively diagnose storage workload performance issues, and are provided valuable input for making strategic decisions through capacity planning. Application storage workloads are easily managed with unprecedented visibility to bottlenecks and other issues that might exist in the application storage infrastructure. Application storage workloads can be observed instantly and a drill down feature can be used to see exactly where issues might be hindering application productivity such as over taxed disks and files, an offending data base client, real time disk capacity and CPU utilization along with numerous other metrics. Storage and System administrators can conduct application storage workload studies in real time and instantly observe application storage workloads in action all the while recording the results for future analysis and playback.

**Flexibility, Speed and Performance**

Storage performance with the Sun ZFS Storage Appliance is provided by a breakthrough technology known as the Hybrid Storage Pool, which is enabled by Flash SSD and the ZFS File System. Sophisticated file system algorithms enhance client read performance by pre-staging data into in-memory cache or DRAM as well as Flash based Read-SSD, which can further improve application read performance. Storage clients that utilize synchronous Write I/O can automatically benefit from Write Flash SSD to enhance write performance. Application storage workload performance can be further improved by striping as well as mirroring Flash SSD, which also works to enhance data protection for data in flight.

**Speed to Deployment with Minimal Risk**

During an application consolidation effort, consolidating data can be a task fraught with risk. Accelerating deployment is all about moving data from islands of data to one or more Sun ZFS Unified Storage platforms quickly, confidently and with minimal risk. Shadow Migration is a feature built-in to provide automated migration of referenced data from application storage islands to the Sun ZFS Storage Appliance. When Shadow Migration was utilized at Oracle to migrate client data an Oracle OnDemand IT Manager described the experience as “migrating a client as fast as the (data) share can be created” which spoke to the ease of use and performance of the migration tool. Performance and throughput of course depends on the size of the data to be migrated.

**A Cost Effective Application Storage Consolidation Solution**

Application Storage Consolidation has the end game of reducing costs dramatically. Operational expenditures are reduced because after consolidation is completed on the Sun
ZFS Storage appliance, advanced data protection and storage efficiency features reduce system and storage administration dramatically while at the same time, reducing costs associated with power, cooling and space. Capital expenditures in the form of acquisition costs are reduced dramatically because most of the features on the Sun ZFS Storage Appliance have no licenses fees attached to them. In addition, storage efficiency features extend the capacity of the Sun ZFS Storage Appliance through the use of thin provisioning, compression and in-line de-duplication. This has the benefit of utilizing storage efficiently, minimizing wasted allocation and duplicate data, which can extend the effective life of storage while reducing and quite possibly postponing the storage purchase moving forward. In addition, this all works together to help resolve issues for the data center manager such as applications being under-capacity while others which would otherwise be over-capacity, among others thereby avoiding unnecessary capital storage costs.

To learn more about the Sun ZFS Storage Appliance and Storage Consolidation contact Oracle and visit the following web sites.

- For more information regarding Sun ZFS Storage Appliance visit:
  Under White Papers click “Bringing Storage Efficiency to a New Level with Oracle’s Unified Storage”.

- For more information regarding Data Protection and Storage Efficiency visit:

- For more information regarding the Sun ZFS Storage Appliance Simulator visit:
  Under Downloads, click, “Download Oracle’s Sun Unified Storage Simulator” and follow the directions.

Contact Us
For more information about Sun ZFS Unified Storage, visit oracle.com or call +1.800.ORACLE1 to speak to an Oracle representative.