



Server Consolidation

A Management White Paper

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April 2003

Introduction

The aim of this document is to identify a more complete approach to server consolidation, examining the system architecture, application deployment and the resulting business benefits, both financial and operational.

The objective for server consolidation is driven by a reduction in numbers, with the attendant savings in capital, maintenance and operational costs; it is possible to achieve more with less.

Manufacturer-led server consolidation

The design and development of servers from all manufacturers is based on the principal of more for less; more power, more speed, more storage, less cost, less space. This approach to server consolidation can:

- Facilitate a reduction in the total number of servers by allowing multiple applications to be hosted on a given server, with or without the use of virtual machines.
- Reduce maintenance costs, as old servers are generally more expensive to maintain than new ones.
- Reduce server management costs by reducing the number of servers.
- Reduce the recognised problems of space in the computer room by racking a number of servers into a single footprint.

The business benefits are real, but as a strategy to server consolidation it ignores wider implications:

- Hosting multiple applications on a single server increases the dependency on a single server, impacting on IT availability and increasing business risk.
- Multiple applications will also increase the frequency for up grades to the software through enhancements and patch levels as well as hardware. The increase in change management will be reflected in downtime.
- Backup onto tape becomes more testing as data volumes increase and reduced backup windows in line with the number of applications.

In summary, although server consolidation has several important business benefits, it has a number of potential drawbacks that must be addressed. It should not be underestimated that it is in the interest of manufacturers to sell more, not less, driven by replacing old for new, consolidation at this point can take an expensive turn. If these problems are dealt with in the right way, the final solution generates additional important benefits.

Consolidation

In order to consolidate servers, the traditional direct attach storage (DAS), is inappropriate, or more to the point will only deliver a fraction of the potential benefits achievable with a shared storage device. The two mechanisms to share storage are via storage area networks (SAN) or network-attach storage (NAS) and, whilst this document focuses on SAN, a comparison is attached as an appendix. Both environments can co-exist together on the same storage and, whilst NAS is best suited to delivering user partitions to desktops, server consolidation predominantly emanates from RDMS based applications, for which SAN derives its strengths.

The advent of storage area networks (SAN) has allowed system architecture to be adapted to address the drawbacks of server consolidation, and to provide real business benefits.

What benefits does a SAN bring?

A SAN provides a high-speed data infrastructure for servers (currently operating at up to 2Gbytes per second) connecting clusters of servers to clusters of storage, both disk and tape. Note that a SAN is independent of the users' Ethernet-based network.

Server Consolidation

A SAN facilitates the consolidation of storage, which can be purchased strategically and more often cost effectively than discreetly as it is at present, offering increased utilisation, greater functionality, performance and operational support. Consolidated storage facilitates the use of clustered servers by allowing multiple high-speed connections. This is essential for high availability, load balancing and fail-over / fault tolerance. A further benefit is the ability to perform data backup to tape libraries via the SAN, rather than across the normal network. This allows for reduced backup windows and consolidation of tape libraries.

In summary, SAN based architecture can:

- Reduce business risk by increasing service availability through clusters of servers.
- Reduce costs by allowing consolidated disk storage.
- Rising disk utilisation from 30% to 60%.
- Offers centralised storage management.
- Reduce backup windows by offering increased performance.
- Reduce costs further by allowing tape libraries to be consolidated.

Operational benefits of SAN based to server consolidation

Deploying SAN based architecture will bring about a sustainable business benefit and increased return on investment. It takes the benefits of server consolidation and delivers against the potential drawbacks to enhance the final solution - availability is the business advantage.

- Storage management in dynamic RDBMS environments is a major overhead, monitoring this on multiple DAS based servers multiplies this. The business impact can be immediate. For example, a full table will halt the application; adding more storage takes time to order and install. This demonstrates the business case for monitoring, however, monitoring alerts to symptoms; the treatment is the delivery of centralised storage with dynamic space management.
- On-line file and data duplication in synchronous mode does not impact on the service performance, can be completed automatically and offered to many servers simultaneously.
- Clustering provides the ultimate in local resilience, for which a SAN is essential, automatic and rapid fail over, transparent to users.
- In host A / host B fault tolerant environments half the servers are not delivering, data transfer is cumbersome, and re-synchronisation after a failure can take a long time. Consolidated storage and a SAN address this too, with mirrored, and even snapped copies for rapid roll back.
- To avoid the clustering complexity, but retain many of the benefits, a single host B can be connected to the SAN with many host As; a manual fail over, but the data is already present, and with a common corporate RDMS application suite, downtime can be reduced to a few moments, re-synchronisation is easy and consolidation is achieved.
- Reduced back up windows can take advantage of the SANs performance, harnessing the increase streaming capabilities of new tape technologies, which in LAN based scenarios only offer greater tape "shoe shining". More importantly, recovery and back to service times, should data be corrupted, can be improved significantly.
- Downtime due to change can be managed seamlessly to the users, by failing over to the secondary server. In addition to providing the 7 by 24 availability, as a by-product continues to test the fail over process.
- Systems monitoring always has great operational and business benefit when high availability is the objective, but the foresight to predict a change requirement, and schedule it at a convenient time, can take advantage of the resilience found in the SAN based server consolidation.

Business benefits

The business benefits of this thorough approach to server consolidation are as follows: -

- Availability, hence business continuity, is improved through clustering of servers.
- Increased service availability. With the reliability of modern hardware and the pace of new technology, planned work can cause more service downtime than unplanned outages. Clustering allows individual servers to be repaired or upgraded without loss of service.
- Clustering is not mandatory, often complex to manage, a host A / host B approach is adopted to deliver a robust environment. Consolidation has a role here too by offering a single or reduced number of host B's, accessing the live data at the point of fail over by mirroring on the single storage shared by all, or onto a duplicate RAID system, which need not be of the same design and thereby cost as the primary storage solution. This indeed lends itself to hierarchical storage management – archiving, putting data on the correct storage reflecting its business value, and operational objectives.
- Efficient resource utilisation. Consolidated storage and clustered servers is the required architecture for load balancing of applications and users. In a secure and resilient environment this technology will further utilise server resources and reduce investment in new systems. This is a mini server consolidation in its own right and, therefore, has the same business benefits.
- Fewer servers. Additional compute power can facilitate a reduction in the total number of servers by allowing multiple applications to be served by a given server, but with the added resilience provided by clustering, the previous business risk is removed.
- A reduction in cost comes from many areas: fewer servers; the ability to easily and safely replace old servers with their high maintenance costs, storage consolidation for disks and tape libraries, strategic purchasing of centralised storage.
- Reduced space requirements in the computer room. This comes from server consolidation, disk consolidation and tape library consolidation.

Evolution not revolution

The target of the server consolidation project should not be the re-architecting of the whole IT infrastructure, as this causes many stresses in the form of change management, business risk and organisational impact. For example, some older, less strategic servers will only provide a modest return on investment. Therefore, they would warrant only a similar level of investment. As a result there is a need for careful and pragmatic analysis followed by a migration process.

- Establish the performance and workload cycles of the servers under review; users will only accept an improved quality of service QoS. These metrics need to be analysed; moving of a batch process to a different time can help to flatten the workload, making better use of the resource.
- Establish that this architecture will be used for the design of all new systems.
- A detailed audit of servers and applications needs to be made that includes age and expected longevity - don't change something that will be phased out soon, but focus on older environments where support charges and QoS can deliver a better ROI.
- An actual business value has to be assigned to determine the services that each server provides at present.
- Careful analysis of this data is required to examine the most cost-effective approach to server consolidation.
- Future requirements must be taken into account; users, applications, storage and disaster recovery plans.

Server Consolidation

All major manufacturers of server or storage systems support SAN for all elements supplied and supported by themselves. Storage systems, with a direct fibre connection, can be integrated into a SAN environment through directors and switches, in a similar topology to normal Ethernet networks. This technology also facilitates SCSI connectivity, allowing the simple expediency of migrating existing storage systems into a SAN/fibre environment without their wholesale replacement.

T360

T360 is an innovative solutions provider that assists organisations to transition IT from being a necessary component to a strategic collaborator within the business.

'Aligning IT to the business is a Process not a Product'

Based upon best of breed ITIL solutions, T360 enable customers to achieve an end to end visualisation of their business services delivered by IT through the areas of:-

- Business Service Management
- Business Activity Monitoring
- Customer Experience Management

T360's philosophy is simple; we listen, understand and deliver. Our customers trust us because we provide innovation, expertise and commitment.

APPENDIX 1 – NAS SAN Comparison

Network Attached Storage (NAS)

Network attached storage (NAS) is a file based storage system that is accessible to users on the network, e.g. for a users home directory. NAS systems are effective for low to medium performance requirements such as general-purpose file storing.

NAS has the following characteristics:

- + Moderate performance
- + Simple set-up and configuration
- + Low cost of implementation (no additional equipment is required)
- + Well suited to storage consolidation and file serving
- + Allows file sharing between heterogeneous operating systems
- + Suited to multiple small file transactions

- Ideal in general office and business environments
- Database vendors do not support their product on a NAS; these include Oracle, Sybase, Microsoft SQL and Exchange
- Performance dependent upon LAN bandwidth and design
- Degradation in performance as number of users increases
- Not suitable for large data / file transaction

Storage Area Network (SAN)

A SAN provides high performance, high bandwidth access to disk storage for data centric and database applications. SANs are effective for performance critical applications, which typically require low-level access to data, rather than 'file-level'.

A SAN has the following characteristics:

- + High performance storage supporting performance critical systems
- + Well suited to storage consolidation for high performance systems, server consolidation and clustering
- + Database vendors support their product on a SAN, these include Oracle, Sybase, Microsoft SQL and Exchange
- + High bandwidth, independent on LAN architecture
- + Independent of number of users
- + Scales extremely well
- + Ideal in data centre environments

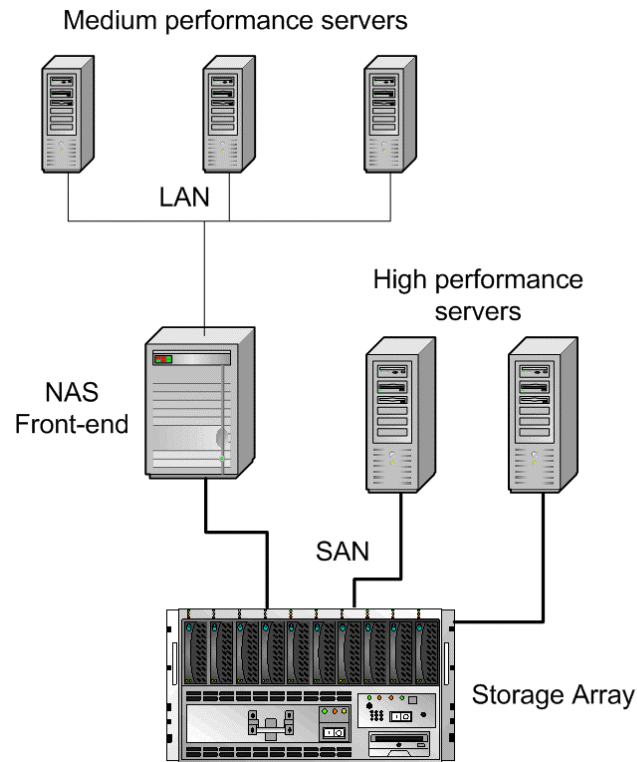
- Additional hardware required for each server
- Skilled configuration required
- Does not facilitate file sharing
- Not best suited to many small file transactions

NAS and SAN

NAS is superior for quick and easy access to data, where performance isn't critical, but where file sharing it is. SAN is imperative for high performance data access such as databases and transaction processing. Most organisations have a requirement for both types of storage connectivity, but have often been forced to compromise. This is no longer the case.

Server Consolidation

It is now possible to combine both NAS and SAN within the same solution. Databases can be stored on a high performance SAN and by deploying a dedicated NAS front-end that connects directly into the SAN storage, enabling a general-purpose file store to heterogeneous clients, the best of both worlds can be achieved – storage without compromise.



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The NAS front-end connects over the SAN to the storage in the same way as the high performance servers. The NAS front-end then makes this storage available to the medium performance servers on the LAN. Additional servers can be added to the LAN and assigned storage, making medium performance access to the storage low in cost and easy to deploy.