Solution Brief

Enhancing Database Environments with NetApp Storage

Date: November 2014   **Author:** Nik Rouda, Senior Analyst

Abstract: _Organizations of all kinds rely on their relational databases for both transaction processing (OLTP) and analytics (OLAP), but many still have challenges in meeting their goals of high availability, security, and performance. Whether planning for a major upgrade of existing databases or considering a net new project, IT solution architects should realize that the storage capabilities will matter. NetApp's product portfolio offers a number of advantages as a foundation for better operational results._

The Choice of Storage Platform Will Impact Database Service Quality

Many organizations divide their IT staff into distinct working groups by discipline, like storage teams or database administrators, which works well for domain-specific efforts but can sometimes miss opportunities for significant gains through collaboration. One such over-looked area is the selection of a storage foundation for databases, which can have a profound effect on overall solution outcomes including:

- **High Availability** – Customers, workers, and automated applications all need uninterrupted 24x7x365 access to the databases underlying their activities and interactions. Storage systems must have not only redundancy, but also consistency, recoverability, and non-intrusive maintenance activities.
- **Performance at Scale** – Just being online is inadequate; a database must also be able to handle all operations without introducing any delay. The storage characteristics will directly influence the ability to read and write data at high speeds even as the total capacity continues to increase exponentially.
- **Flexibility** – More and more databases are subjected to hybrid workloads of both OLTP and OLAP. While analytics are increasingly popular, transactions remain critical to operations, and the storage platform should be able to efficiently serve these mixed requirements.
- **Security –** As databases expand, they naturally encompass ever more sensitive information. Storage of data at rest requires multiple security protocols, including authentication, access controls, and strong encryption, complementing related methods for servers, networks, and applications.

Individual databases will have specific requirements for each of these operational quality requirements, but storage and database teams should work together with IT architects to ensure that the right capabilities are built into both net new and upgrade projects.
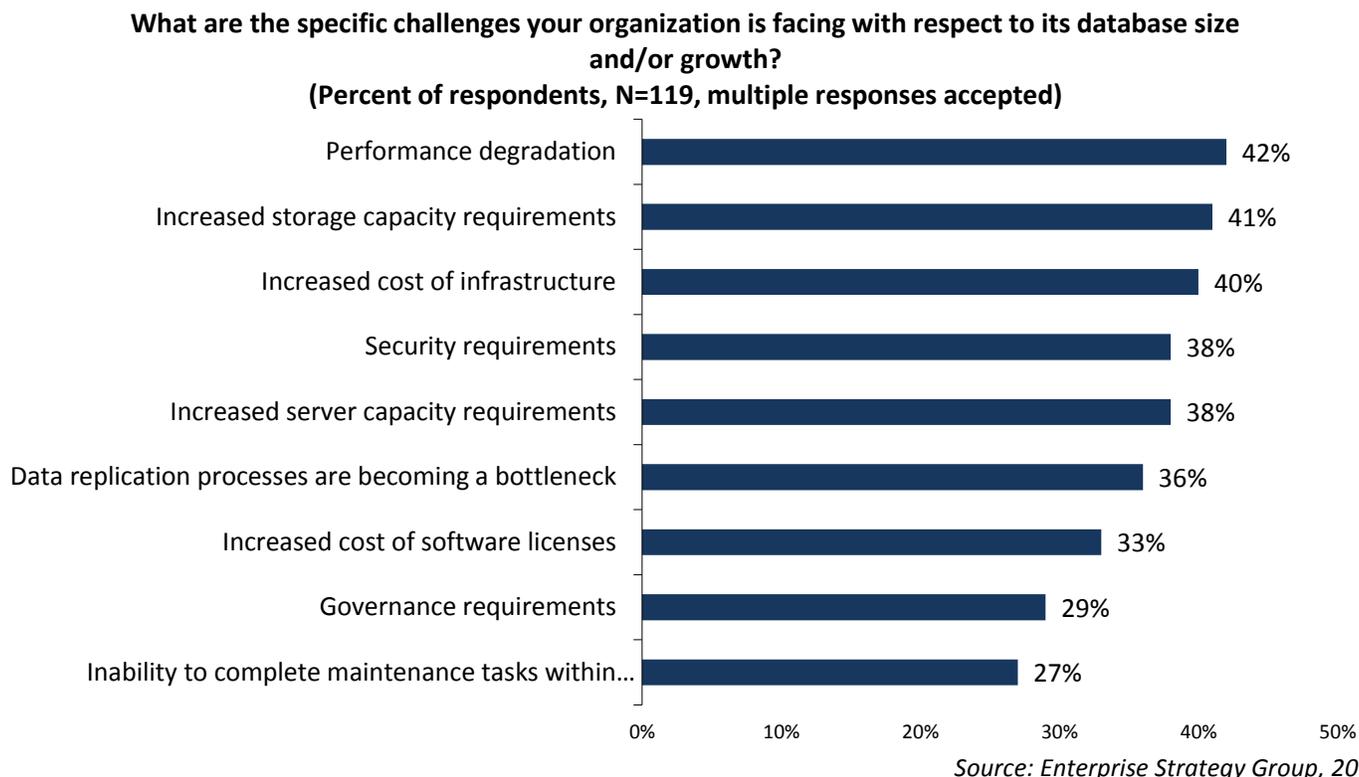
Database Proliferation and Growth Cause Challenges

Two of the biggest issues with managing databases are related to the inexorable growth, both in number and size, which seems predominant in most organizations. ESG research identified the impacts that this unchecked expansion can have on enterprises, as cited by those responsible for their organizations' database, business intelligence, and analytics strategy, including decreased performance (42%), increased storage capacity needs (41%), security and governance issues (38% and 29%, respectively), and more, as shown in Figure 1.[1]

Many database vendors are responding to these issues with their software, and major releases of new versions have functionality that is attractive to DBAs. Two extremely popular, if not ubiquitous, examples are Oracle DB 12c and Microsoft SQL Server 2014, each with its own compelling new features such as in-memory analytics to tackle performance bottlenecks for large data sets and to enable companies to deliver rapid insight and decision making to their business. Yet swifter software and clever use of server memory can only address part of the problem: Ultimately, all of the data will need to be committed to more persistent locations in the technology stack, and likely that same data also will be queried later, possibly much later, on demand from this repository.

---

[1] Source: ESG Research Report, _Enterprise Database Trends in a Big Data World_, July 2014.

Figure 1. Common Challenges Stemming from Database Size and/or Growth

What are the specific challenges your organization is facing with respect to its database size and/or growth?
(Percent of respondents, N=119, multiple responses accepted)

Challenge	Percent
Performance degradation	42%
Increased storage capacity requirements	41%
Increased cost of infrastructure	40%
Security requirements	38%
Increased server capacity requirements	38%
Data replication processes are becoming a bottleneck	36%
Increased cost of software licenses	33%
Governance requirements	29%
Inability to complete maintenance tasks within…	27%

Source: Enterprise Strategy Group, 2014.

Consider Upgrading Infrastructure during Database Upgrades and Net New Deployments

As organizations then look to address the issues of more databases on a bigger scale, they must take a more comprehensive view, and common inflection points to do so are when planning a major database upgrade or designing a new deployment. Both scenarios are sufficiently large undertakings that provide an excellent opportunity to reexamine all components of the system, including the fundamental infrastructure.
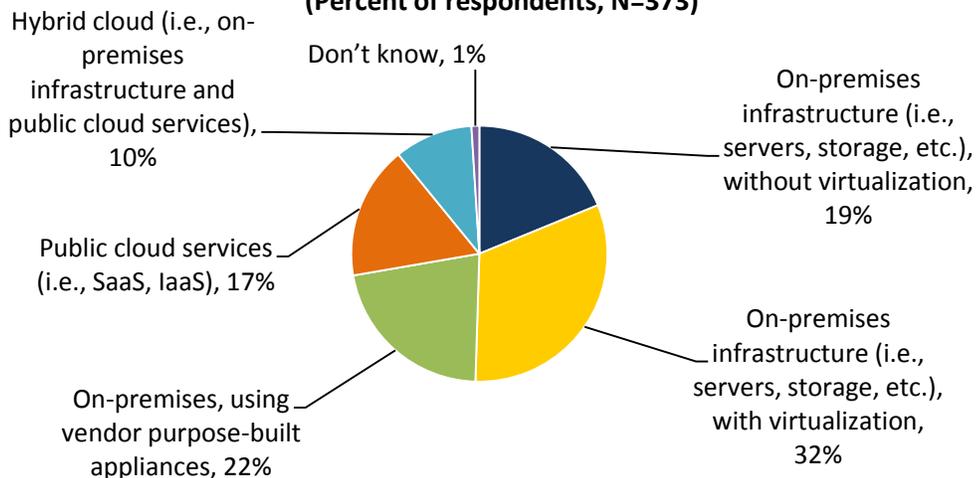
Indeed, a number of choices are available today, and ESG research reflects the relative preferences of respondents in Figure 2.[2] A large majority will select to deploy their new databases primarily on-premises, while about half will do so by building their own environments from best-of-breed options, with or without a virtualization layer. A smaller, but still significant 27% are exploring public or hybrid cloud approaches. Some 22% like the idea of pre-configured, integrated appliances for their databases.

Just as upgrading software alone won't resolve all of these problems, simply changing deployment models is no panacea either, often bringing difficult tradeoffs. For example, public cloud infrastructure may offer ready storage capacity, but might do so at an unacceptable operating cost increase, could perhaps negatively affect control of security and governance, or could slow replication to and from the remote hosting facility. An appliance may have more server horsepower for performance and tightly embedded security capabilities, but may entail higher software licensing costs. Certainly increasing resources in terms of servers, networking, or storage capacity will directly help with scale and performance, but may not address the challenges of optimizing for mixed workloads or improved availability. These are generalizations, but they help illustrate that the new architecture will indeed affect the outcomes. The relative choices should be decided by priorities related to the overall service qualities desired for the database, plus, of course, the desired cost model for consumption.

---

[2] Source: Ibid.

Figure 2. Preferences of Various Deployment Models for New Databases

In terms of net-new database deployments, which of the following best describes the primary deployment strategy your organization will likely use going forward? (Percent of respondents, N=373)

Hybrid cloud (i.e., on-premises infrastructure and public cloud services), 10%

Don't know, 1%

On-premises infrastructure (i.e., servers, storage, etc.), without virtualization, 19%

Public cloud services (i.e., SaaS, IaaS), 17%

On-premises infrastructure (i.e., servers, storage, etc.), with virtualization, 32%

On-premises, using vendor purpose-built appliances, 22%

Source: Enterprise Strategy Group, 2014.

NetApp's Portfolio Meets the High Demands of Modern Databases

Even for that majority who want to run some or all new and upgraded databases on-premises, there are still decisions to be made. A particular database may need to support high speed operations, where flash storage would be preferred for its significantly faster I/O performance. Another might require huge volumes of storage space, but have relatively rare access after creation, and cost per terabyte is a better metric. Some may need extreme high availability. These requirements may also change over time. As a result, architects, DBAs, and storage teams should define current and future goals and then select the vendor that can best satisfy those criteria.

NetApp has a lot to offer all stakeholders, with a broad range of products and differentiated features, including:

- **An optimized portfolio capable of meeting enterprise database performance requirements.** Those needing high performance with very low latency for their OLTP or data warehouse environments while requiring application-driven data management features from the database should consider the E and EF-series with SANtricity, a SAN proven platform which offers both all-flash and hybrid array solutions that are both performance optimized and application aware. Those requiring a unified approach optimized for shared workloads across either NAS or SAN environments should consider using the industry's leading scale-out platform, Clustered Data ONTAP. Clustered Data ONTAP makes it easier to accommodate the inevitable growth of databases while still offering high performance for multiple application workloads with QoS prioritization.

  NetApp storage systems deliver the performance needed for intense database transactional and analytics workloads with an excellent range of options to suit the particular application profile. And they come with NetApp's experience in helping thousands of customers to store and manage their business-critical information.

- **Extreme high availability features** including Clustered Data ONTAP's Non-Disruptive Operations feature to enable changes to the underlying storage infrastructure without disruption to the database or application team, and a robust SnapCreator framework to protect the database storage environment and preserve consistency during live upgrades of active databases in case something goes wrong during the process. SnapManager for Oracle and for SQL Server provides application consistent management and the tighter integration with database features such as Oracle DB's RMAN or SQL Server's AlwaysOn Availability Groups will simplify administration and decrease risk. Efficient SnapMirror replication provides local or remote

disaster recovery as well. For database environments requiring application consistent management, NetApp's E and EF-series arrays provide extremely high application uptime and availability.

- **Complete flexibility** to utilize multi-vendor storage means migrating data to newer systems without disrupting active database usage, and the ability to move data to the type of storage that best matches the application profile and access patterns. With fabric-attached storage (FAS), both block and file database storage can coexist on the same multipurpose array. Both scale-up and scale-out requirements can be met with OnCommand's non-disruptive management of virtualized storage across heterogeneous arrays (with FlexArray), even across distributed locations. ONTAP's OnCommand open API and SDK and SANTricity's API allow for tighter integration with the database to support data lifecycle management and application self-service. Alternately, the FlexPod can fill the bill for an integrated appliance, tuned to the purpose. Taken together, the broad NetApp storage portfolio should handily satisfy any common use case.

- **Integrated security** with user access controls can be aligned to various Oracle or Microsoft administrator or developer roles, allowing each to do her job without exposing sensitive information. NetApp also enables Enterprise business to mask sensitive data as part of an overall software development cycle. Links to standard authentication frameworks and built-in encryption of the storage provide a deeper degree of protection to avoid nasty breaches and demonstrate compliance with industry and government regulations.

The Bigger Truth

Many times, databases are implemented by a DBA who, working alone, may have too limited visibility of the underlying infrastructure to architect the ideal technology stack. Yet what starts out as a prototype for testing and development of an application can rapidly become essential for parts of the enterprise to operate successfully. This organic approach may fit well with increasingly popular DevOps approaches, but can lead to unforeseen limitations and problems down the road. Similarly, while there are gains to be made through direct performance tuning of the database and applications, selecting optimized storage will have a profound effect on the overall results for transactions and analytics.

Storage teams already know the advantages NetApp has to offer for general purpose usage, but may wish to further explore some of the unique characteristics that will specifically aid database performance, availability, security, and flexibility for changing workloads. There is a lot to be gained by engaging the DBA at the right time in a new project or major version upgrade. A better method is to engage all the various stakeholders who have domain-specific expertise to help design a stronger foundation for the databases.