EXECUTIVE SUMMARY

The digital transformation wave is driving organizations of all sizes to analyze and segment the data they collect in ever more sophisticated ways, with the goal of extracting insights and triggering decisions in real time. This is true in diverse areas, ranging from fraud detection to customer behavior, from supply chain optimization to logistics planning. At the same time, the usual requirement for high availability of data remains. In fact, mission-critical workloads such as customer and product databases, key business applications, trading platforms, and customer portals are expanding by the day. Application and database downtimes of minutes or even seconds can be critical for digital businesses. IDC estimates that on average, downtimes can cost as much as €20,000 per hour in lost operating profit per 500 employees — exceeding €1 million per hour for the largest financial institutions and €500,000 for large manufacturing firms.

Without the correct foundational technologies, the promises of the brave new world — and the persisting requirements of the old world — are not achievable.

IDC believes that the correct way to address those diverging requirements is by using standard building blocks, such as advanced SQL databases and next-generation x86 platforms, embedding innovations such as in-memory database and support for hybrid cloud environments and fault-tolerance at hardware and firmware levels. More broadly, IDC advises organizations to think about their databases as information platforms combining data processing and data analytics. This would allow customers to benefit from easier workload management, achieve the correct availability levels and consolidate costs, and move forward on their information transformation journey.

IN THIS EXECUTIVE BRIEF

This IDC Executive Brief discusses how organizations can use standard database and hardware technologies to embark on an information transformation strategy, tackling availability, cost of ownership, and the need to extract value from large volumes of structured data. It also briefy describes the joint offerings of Hewlett Packard Enterprise and Microsoft, and assesses their potential in this space.
SITUATION OVERVIEW

From Digital Transformation to Information Transformation

Digital transformation continues to be a priority for both IT and business leaders across every industry. IDC defines digital transformation as the adoption of two or more 3rd Platform “pillars” (cloud, Big Data and analytics, social business, and mobility) to drive fundamental business or organizational change. Forward-thinking companies are already investing heavily in those areas. As a result, they are enhancing their customer experience, empowering their workforce, and — in some cases — even rethinking their business model.

This process relies heavily on digital information and data. Information is increasingly requested in real time for strategic executive decisions as well as tactical adjustments to operations. More disruptively, such information needs to be coherent across the entire organization, instead of being generated in silos. In digital enterprises, information and its constant availability is absolutely crucial to generate predictable business outcomes.

IDC believes organizations should follow a path to consolidate databases into a stable and easy to manage infrastructure that can grow without disruption on a cost-effective and industry-standard platform. Running analytics on distributed datasets held in a single pool needs to be quick and easy from any location. In view of these ongoing trends, the following aspects need to be considered when planning for the future:

- Existing databases that often run on decade-old mainframes and Unix machines may need to be upgraded to achieve greater efficiencies, leading to cost savings and greater flexibility, agility, and scalability.
- Larger data volumes need to be processed efficiently so that value can be extracted. In particular, large volumes of unstructured data from sources such as sensors, video cameras, and log files need to be fed into existing systems so that they can be connected to other existing data sources such as customer databases. It is crucial to bring the old and new worlds of IT together in a reliable manner that is also viable from a business perspective. IDC research (European Software Survey 2015, n = 1,451) shows that over half (51%) of respondents believe that implementing or upgrading business analytics is very important, and 45% believe that implementing Big Data initiatives is crucial.
- The difference between online transaction processing (OLTP) back ends holding operational data and online analytical processing (OLAP) environments or datawarehouse slowly fades away as customers want to analyze data in the production systems in real time. The problem is that hybrid systems see requirements for OLTP (availability at the highest levels, throughput and write performance) and OLAP (response time to query) pile up, generating a potentially explosive mix. Legacy platforms are often unable to combine the requirements of OLTP and OLAP workloads, making it harder to run real-time analytics.
- IDC's latest survey results show that 20% of European organizations see high-availability and disaster recovery capabilities as a major datacenter challenge in 2016 (Software Survey 2015, n = 1,451). Robust infrastructure, especially for mission-critical workloads with a 99.999% (“five nines”) SLA, is a must, especially in view of expectations to be able to do business at any time in any place and on any device in today’s always connected world. IDC estimates that the negative business impact resulting from the failure to provide sufficient availability levels can run into hundreds of thousands of dollars in lost revenues. Our research has shown, for example, that a 5,000-employee manufacturing organization in Europe suffers downtime costs in the region of €500,000 per hour. For this reason, it has become a major focus for both customers and vendors.
High availability is not only for OLTP workloads. According to IDC survey data (Storage Survey 2015), 30% of real-time Big Data analytics and 27% of business intelligence and datawarehousing workloads in European companies already run on high-availability or clustering solutions. The reason is that Big Data applications that turn into production mode are often becoming as mission critical as the traditional back-end systems.

Data capabilities need to be able to scale easily in a similar way to cloud service providers’ offerings to keep overcapacity at a minimum and scale as you expand, with the ability to scale back resources in a modular fashion when they are no longer required.

With some front-end workloads now sitting in the public cloud, connectivity between on-premise and off-premise environments becomes critical, which IDC defines as the hybrid cloud approach. This is especially useful in mobile applications — with the number of transactions from mobile devices growing it is becoming more important to have a strong back-end infrastructure in place that holds large volumes of crucial data. In such scenarios, the majority of this data is stored in enterprises' own datacenters for compliance reasons. However, it is also important to enable greater scalability by creating linkages to cloud service providers' platforms. Many mobile applications already run in the public cloud, so a truly hybrid approach is needed when integrating these applications. It is also crucial to have sufficient security and system management tools in place to minimize risk and complexity.

As SQL database environments become larger and more dynamic, and make use of varied combinations of flash, memory, and disks, the sizing and set-up of the hardware platforms underneath can result in long-winded, high-risk processes — particularly if the data platform is made up of many different components of varying performance and predictability.

Unrelenting pressure from compliance and regulation, especially but not exclusively in the financial sector and in consumer-facing areas where data protection is an issue.

The pressure points described above also generate large spending growth on infrastructure for Big Data and analytics. IDC forecasts that the value of Big Data-related server shipments will nearly triple from $1 billion in 2015 to $2.7 billion by 2019 in EMEA, with the Big Data storage capacity share of new shipments expected to reach 20 exabytes.

At the same time, hardware investment in itself doesn't solve the problems highlighted. For many organizations, digital transformation must also include an information transformation journey. At the end of the journey, the power of Big Data and analytics will rely on a foundation of predictable costs, improved processes, and minimized downtime.

**IDC MARKET ANALYSIS**

**An Abundance of Tools**

The good news for organizations looking to begin an information transformation journey in 2016 is that there has never been a larger toolbox of foundational technologies to source from. The risk of such abundance is that it can be distracting, resulting in a loss of focus, especially in the key areas of data security and cloud integration. The first thing IDC advises is to understand what the relevant options are. Key areas to look for include:

- **In-memory capabilities.** In-memory database technologies enable the storage of partial or full database tables in the main memory of a system, allowing much faster read and write access compared with storage (HDD or flash) repositories. This approach is becoming especially relevant for users who need real-time data analytics and look for more efficient processing once the data is loaded onto the hardware.
• **Big Data integration.** In view of integration issues relating to the volume, velocity, and variety of data, contrasting concepts such as ETL (extract-transform-load) versus ELT (extract-load-transform) need to be considered; while ETL follows the steps in the order of extract, transform, and load, ELT loads the data before it transforms it. SQL Server integration services (SSIS) follows the ETL process by reading from a data source, then performing the desired changes and finally writing to a target. In contrast, ELT is useful when the target is a high-end data engine which may be a Hadoop cluster, data appliance, or cloud platform. The capabilities of these data engines can efficiently be used to transform the data. For example, Microsoft APS can be used to manage these steps, while it is also capable of following the ETL approach. It is especially useful for mixed workloads such as hybrid transaction and analytics processing (HTAP).

• **RAS (reliability, availability, serviceability).** Traditionally a strong point of mainframe or high-end Unix servers, RAS features in the x86 world have lagged behind, making the platform difficult to implement in large scale-up systems. Architectures were based on scale out, where failure was expected and overcome by technologies such as clustering. With new technologies, RAS has improved in the x86 server market to enable large scale-up implementations to be realized. When combined with system monitoring, RAS features greatly enhance seamless operations at any time while virtually eliminating disruption. This is particularly relevant for mission-critical databases and ERP applications on which the company relies. Key RAS elements include enhanced system monitoring, fault finding and diagnostics, duplication, recoverability, automatic updating, and backup and archiving capabilities, as well as hot-swappable components from system boards and CPUs to memory, disks, and power supplies. Increasing weight is also put on the software side that provides sophisticated management and automation.

• **Partitioning technology.** For more granular scalability and resource usage efficiency, partitioning technology is gaining a lot of interest from customers. Scale-out implementations based on many small machines rely on virtualization to provide soft partitioning. Mission-critical database systems tend to be larger machines, and these require more partitioning options to isolate workloads. These can be logical or even physically partitioned hardware resources managed by the server platform itself. By using partitioning, workloads can be isolated for greater security and better access management. This can better isolate workloads for multitenant workloads, as well as significantly limiting the risk of insider threats such as misuse of data. Partitioning can also be used as an additional safety layer when using virtualization for consolidating workloads on larger systems.

• **Integrated, converged hardware platforms.** Converged systems of various types are being adopted quickly to drive business agility and as a response to the continuous need to simplify IT environments as business operations become increasingly interconnected. IDC has forecast the worldwide converged systems market to reach $17 billion by 2019. These systems include servers, storage, networking, and systems management features in a single box.

**HPE Integrity Superdome X**

When it comes to highly scalable workloads, HPE's business-critical server portfolio has seen a crucial extension with the introduction of Superdome X. Leveraging HPE's experience in supporting the most demanding workloads, Superdome X features top-end Intel Xeon enterprise server processors, based on the volume x86-64 instruction set, and is capable of running both Windows Server and Linux operating systems and workloads. In particular, in the Windows Server space, Microsoft and HPE have more recently joined forces for pretested and certified solutions to speed up time to market, including a range of middleware automation solutions such as database patching, compliance, and provisioning tools.
Superdome X was introduced in December 2014 and brings the robustness and scale-up performance to x86. Industry-standard architectures can now be used for the most mission-critical workloads that require high performance and high availability that were previously limited to mainframes and Unix-based legacy machines. HPE Superdome X running Microsoft Windows Server 2012 R2 with SQL Server 2012 has been certified by SAP SE (cert. #2015036) based on benchmarking against competing mission-critical servers as the system with the highest performance at 459,580 SAPs based on 84,000 SAP SD benchmark users.

Superdome X is positioned for performance for OLTP and OLAP workloads, and its features include higher transaction processing than legacy servers, lower consolidation costs and scalability, including memory additions of up to 24TB when running six partitions of Microsoft SQL Server 2014. This enables customers to respond more quickly to business demands and increase their competitive differentiation.

Five-nines (99.999%) single-system availability is guaranteed by HPE, and the vendor promises lower TCOs compared with mainframes and Unix machines. The system uses HPE’s nPars x86 hard partitioning technology. This provides physical separation into multiple partitions that each have separate hardware components such as mainboards and I/O. Some comparable approaches only use virtual partitioning purely through software, which does not isolate any hardware failures. By greatly increasing the reliability and in-service replacement of memory and other components, the uptime of in-memory databases can be greatly enhanced even as the capacity of memory goes up.

By using nPars technology, capacity is simply expanded by adding another blade, but ISV license costs are incurred only for cores that are included in a partition, which leads to lower TCOs compared with virtual environments – at least in the case of software vendors charging for all the cores in the system. The ability to set up and manipulate multiple electrically isolated environments in a single enclosure provides IT with greater freedom to get the most out of the system’s capabilities. Scheduled downtime can be nearly eliminated because partitions can be serviced separately without affecting each other.

Integrity Superdome X provides HPE with a great opportunity to bring the scale-up and RAS benefits of traditional high-end Unix machines to Windows customers looking to deploy x86-based mission-critical systems. It is architected with 16 sockets of Intel Xeon E7 processors that run both Windows and Linux, with a configurable memory footprint up to 24TB RAM when running six Microsoft SQL Server 2014 partitions, 4TB size each. This is especially useful for customers running large SQL databases, as massive database workloads can be handled at very low latency between all processors within this system architecture.

Customers may also value the flexibility that has been created by having independent hardware partitions that are electrically isolated and can be adjusted along with changing business needs. Outages due to hardware errors can be eliminated through integrated self-repair features, and expensive and hard to manage scale-out implementations are no longer needed since workloads can be scaled up instead, leading to easier management and fewer software licenses required. Superdome X is also targeted for Unix system replacements, OLTP and HTAP workloads, as well as scaling up and consolidation of SQL Server databases.

**Converged System 300 for Microsoft Analytics Platform System (APS)**

Converged systems have emerged as popular platforms especially for analytics workloads due to their ability to scale server, storage, and networking resources as required, with in-memory computing and storage pools directly attached to servers for lower latency.
HPE has launched a range of converged systems that also feature holistic systems management capabilities. Benefits include lower cost of ownership, greater flexibility, automation, and the breakdown of internal silos. Converged infrastructure can be deployed much faster than reference architectures and requires fewer technical staff skills to operate it.

The Converged System 300 for Microsoft Analytics Platform (APS) is a massively parallel, scale-out datawarehouse platform designed to process very large volumes of relational data. It is currently used by more than 100 enterprise customers globally and primarily focuses on structured data, but the appliance can also be connected to unstructured data so that analytics can be run on both data types. Moreover, this system enables users to scale up to a greater extent both in terms of performance and capacity compared with single server based solutions. The Converged System features direct attach storage and high-speed low-latency interconnects for real-time insight from large data volumes.

The APS-based solution is aimed primarily at the analytics space where data is collected from different sources and then centralized in one database, with access for many users to run analytics across a large dataset – a different use case to the focus area of Superdome X, which addresses classical SQL database environments.

APS can handle high concurrency and highly complex queries, is optimized for shared-nothing environments, and can scale out extensively. Its parallel execution technology is especially useful for analytics that require pattern matching such as fraud detection and customer behavior analysis. It can ingest data quickly into the system, but also launch specific analytics in a timely manner, which is crucial for real-time insight. It runs on a powerful back end and provides competitive $/TB, making it a compelling solution for large and agile data volumes.

Microsoft SQL Server 2016

Microsoft SQL Server has emerged as a major relational database system in European enterprises, used both to consolidate legacy databases and to add resources for new types of applications and data sources. Microsoft SQL Server is a data platform able to cover the full spectrum of workloads, from OLTP to OLAP, datawarehousing, and hybrid transaction and analytics processing. A proof of the success is the fact that spending on Microsoft SQL Server grew by 19.8% in EMEA in 1H15 compared with 1H14, while the overall market in this category expanded by only 10.5%.

Building on the advanced RAS and scale capabilities of Superdome X, SQL Server Enterprise 2016 offers a data platform that delivers the advanced data management capabilities required by organizations seeking to deliver a digital transformation.

Advanced in-memory OLTP and analytics technologies that fully exploit the large scale and large memory capabilities of the Superdome X platform have been implemented in the latest version. OLTP applications can see performance improvements and response time improvements for web, mobile, and internal line-of-business applications. Column-store technologies can be used to deliver faster analytics queries on very large databases and, when combined with in-memory OLTP technologies, offer customers the ability to deliver real-time analytics on operational data without causing any performance degradation in the data capture applications. SQL Server in-memory technologies offer a platform for real-time insights enabling businesses to speed up their decision-making and planning processes.

With the large memory support available, active memory management is a must. Superdome X enables Windows Server and SQL Server Enterprise 2016 to continue running with HPE’s firmware-based memory RAS improvements that can detect errors and manage hardware faults.
with the Error Analysis Engine. This keeps the system up and running and reduces downtime by 95% compared with regular x86 servers, according to HPE.

Protecting sensitive data is now a major priority for organizations both from a regulatory and compliance perspective as well as reputational risk. In addition to encrypting data at rest, SQL Server Enterprise 2016 also introduces a number of security technologies allowing for more granular protection of data as it is being processed and sent to requesting applications. Always Encrypted allows particularly sensitive data to be kept in its encrypted form during its entire journey from storage, through database processing and transmission to a trusted client application. Dynamic Data Masking and Row-Level Security enable detailed control of who can access specific rows of data, as well as masking sensitive data such as credit card or national insurance information.

In order to support advanced and predictive analytics scenarios, built-in support is provided for "R," which is one of the most widely used languages for constructing statistical and analytic algorithms. This support allows these algorithms to be operationalized and run in the high-performance environment within SQL Server, enabling organizations to deliver advanced decision support applications to both internal users and their own clients.

Together these improvements mean that SQL Server Enterprise 2016 on Superdome X can scale up to the most demanding database needs.

CHALLENGES AND OPPORTUNITIES FOR HPE AND MICROSOFT

IDC believes that the portfolio enhancements that have been developed by the partnership between HPE and Microsoft can be instrumental in helping end users be successful in their information transformation journey. It is crucial not only to look at functionality benefits in this context, but to evaluate the potential for integration with cloud platforms, and cost savings that allow for funds to be reinvested in value-adding activities such as analytics that can deliver further competitive advantage. While some challenges still need to be overcome, significant opportunities for growth are being opened up for the two suppliers:

- **Migrating workloads from legacy to x86.** There is still scope for large-scale migrations from legacy platforms such as mainframes and Unix machines to x86 on Superdome X. As many analytics applications have moved, customers are now in a position to move OLTP environments as they meet the required performance and availability levels. It is important to provide key TCO benefits in addition to greater performance, agility, and security in order to get executive backing, as CIOs do not usually prioritize these projects due to their complexity and risk, as well as more pressing issues.

- **Hybrid cloud strategies.** Customers with a hybrid focus could particularly benefit from deploying Superdome X as the edge of their hybrid cloud, taking advantage of integration of on-premise resources with the Azure cloud through Windows Server and SQL. This approach facilitates the movement of data and workloads between these resources and makes management as well as governance smoother, speeding up time to insight.

- **Advanced analytics capabilities.** By taking advantage of SQL Server R Services, intelligent applications can uncover new insights. Open source packages can create models and predictions based on data from SQL Server, and analytics is kept close to the data. APS can handle complex queries and is particularly beneficial for cases that involve pattern matching in real time at competitive $/TB costs.

- **Joint sales initiatives with Microsoft.** Superdome X is positioned as the recommended hardware by Microsoft and its partners for SQL workloads, and Converged System 300 for Microsoft APS. This joint approach could be promoted further, targeting key system

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integrators that have a strong influence over their clients' choice of systems. Marketing activities need to be scaled up through roadshows and other events to showcase solutions and start conversations around upgrading previous SQL editions and database consolidation with a focus on license cost savings.

To realize their potential, HPE and Microsoft need to overcome a number of challenges:

- **Microsoft needs a strong hardware partner.** On its own, Microsoft does not always get sufficient opportunities to point out the business-critical benefits of SQL Server to potential clients, and is in need of a partner proven in the high-end server market that will enable it to get a foot in the door with key companies.

- **Aggressive competition from IBM, Oracle, Fujitsu, Dell, and SAP.** These vendors are targeting the same workloads and have established database approaches and their own mission-critical platforms that HPE and Microsoft are facing head-on. Clear differentiation is needed in terms of reliability, functionality, and ease of management to convince users that it is worth switching to these systems and platforms.

- **Public cloud growth for analytics workloads.** An increasing number of analytics workloads are run in the public cloud as databases already reside there. IDC estimates that by 2019 more than half of Big Data-related server and storage infrastructure will be deployed in cloud service providers’ datacenters.

- **Data protection and compliance.** The EU's General Data Protection Regulation (GDPR) will have some impact on organizations' approaches toward managing risk, as fines for negligent breaches are skyrocketing. This could drive more data to mission-critical platforms but could also lead to more cautious infrastructure buildouts for Big Data and a slowdown in projects that merge different data sources.

**ESSENTIAL GUIDANCE**

IDC believes the following customers and use cases could benefit most from deploying Superdome X with SQL Server:

- Customers in need of high levels of workload flexibility. Superdome X can handle very large, random transactional workloads (OLTP) mixed with analytics workloads (OLAP), thanks to in-memory support on industry-standard x86.

- Workloads requiring scale-up performance. The largest Microsoft SQL Server 2014 applications can be supported on Superdome X with features such as 24TB total memory pool across six partitions and 16 sockets/288 cores.

- Isolation of individual applications for higher security. HPE nPars partitioning technology offers greater reliability than soft partitions with the latest encryption technology.

- Customers lacking technical skills. HPE offers a verified reference architecture, support, consulting services, and a single point of contact.

- Organizations seeking lower costs. HPE’s solution promises low TCO for mixed data workloads on x86.

- Large hybrid cloud deployments for mission-critical workloads.

- High-availability server migrations from legacy platforms to x86.

- Database migrations from Oracle/IBM to SQL Server for license cost savings.

Use of Converged System 300 with APS is advisable for:

- Queries across relational and non-relational databases.

- Shared-nothing environments and Hadoop clusters.

- Large distributed dataset as central resource for many users for analytics.
- Businesses with many branches and datacenter sites.
- Real-time analytics at edge locations from sensor data (IoT).
- Large datasets where low cost per terabyte needs to be achieved.
- Midmarket customers looking to buy prepackaged solutions reducing complexity of set-up.

CONCLUSION

IDC believes that the HPE and Microsoft partnership has resulted in the evolution of compelling solutions that bring the benefits of legacy architectures to industry-standard x86 infrastructure that provides the robustness, functionality, and linkages to the cloud needed to build out competitive advantage in the 3rd Platform era and beyond.

The growing hunger for Big Data and analytics is creating challenges for customers, especially in terms of their database infrastructure. Existing platforms that hold customer data, ERP, and other crucial data assets are in need of upgrading to a scalable, agile, and hybrid environment that is future-proof. When data volumes grow, costs for software licenses, power consumption, and cloud computing instances can easily spiral out of control, or business continuity is affected if insufficient capacity is provided. The digital transformation journey quickly needs to be bolstered by an information transformation journey that leverages the newest technologies on the market.

It is becoming more important to run OLTP and OLAP back ends in an efficient and easy-to-use manner on robust infrastructure that doesn't fail. Downtime for such business-critical platforms is no longer acceptable and can seriously impact companies' reputations.

IDC recommends that companies look to new standard technologies in the market, ultimately targeting a hybrid environment that features a robust on-premise element with mission-critical capabilities, high performance and scalability, and the ability to connect to front ends in the cloud. The OS and database management platforms that run on these systems need to be compatible with multiple cloud environments, applications, and devices while keeping license costs at predictable and manageable levels.

Convergence of systems is expected to continue in the coming years, leading to more efficient resource utilization, reduced complexity, and the ability to handle large data sets at reasonable cost. Security will remain top of CIO agendas for the near future and needs to be built into every solution, whether cloud-based, virtualized, converged, or mission critical.
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