

Microsoft – A Comprehensive Platform for SAP

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Executive Summary

For more than 20 years, Microsoft and SAP have collaborated to ensure that customers running SAP on the Microsoft platform have a familiar, robust, and enterprise-ready system. SAP customers can benefit from this close partnership by using the Microsoft platform to achieve the optimal solution for their SAP systems.

The partnership includes teams from each company that work together early in the development cycle of each product to ensure compatibility and performance. Before new versions of Windows Server or Microsoft SQL Server are released to the public, they must run the Microsoft/SAP ERP system successfully. With the latest releases of Microsoft Windows Server and SQL Server, enterprises can deploy their mission-critical SAP systems on the Microsoft platform with confidence and achieve significant cost savings without sacrificing performance, availability, flexibility, and scalability. This is because more SAP customers choose to run SAP on SQL Server than any other database platform.

Microsoft offers a complete platform for running SAP—from operating system to database solution to Business Intelligence (BI) tools to cloud. By providing robust and familiar technologies that integrate seamlessly with SAP, Microsoft virtually eliminates the need to acquire expensive and unproven technologies to achieve the same functionality. Microsoft delivers the stability and performance necessary to run mission-critical transactional applications, as well as a unified platform for analytics, while requiring no specialized hardware. Beginning with SQL Server 2012, Microsoft unleashed in-memory performance using the In-Memory Columnstore to speed up query performance for SAP Business Warehouse in the order of 10 – 100X. SQL Server 2014 improves performance by adding In-memory OLTP to speed up transaction performance for database applications. Additionally, Microsoft and SAP have teamed up to offer customers the ability to quickly deploy SAP solutions in the Microsoft Azure cloud, enabling customers to take advantage of on-demand resources in the cloud and maximize the value of their Microsoft and SAP investments.

Essential for any successful enterprise is the ability to use data to create reports and analyze the business. Simply stated, even the best data is of no use if there is no coherent way to view and analyze it. However, relatively few users are familiar with navigating the SAP ERP ecosystem. To get the most out of their SAP systems, customers can take advantage of the BI tools offered as part of Microsoft SQL Server, SharePoint, and Office. Microsoft BI tools provide a complete and intuitive set of reporting and analysis options for SAP customers. Microsoft Excel is the most widely used analytics tool in the world, including for SAP customers. The familiar and powerful features of these tools can help to increase productivity and reduce training costs associated with other BI offerings. Additionally, Microsoft and SAP improved interoperability between data from SAP applications and Microsoft Office, including general availability of connectivity between SAP BusinessObjects BI solutions and Microsoft's Power BI offering.

This paper focuses on how SAP customers can get optimal results by using Microsoft technologies to gain reliability, scalability, and cost savings. The paper also discusses several benefits of running Microsoft technologies for SAP analytics, including a familiar platform for BI professionals, as well as flexible configuration and efficient performance, which help to reduce costs.

Who should read this white paper

This white paper is intended for business decision makers and IT decision makers who are looking for a complete and comprehensive platform, including an operating system, database solution, and analytics to

run their SAP applications on. In addition, this white paper helps business decision makers and IT decision makers evaluate the Microsoft platform for SAP systems.

Benefits of SAP on the Microsoft Platform

Using the Microsoft platform for SAP environments is a popular solution for enterprise customers for several reasons, stemming from the partnership of Microsoft and SAP. Microsoft offers a complete platform for running SAP, so there is no need to involve different vendors for different workloads to achieve the same functionality that Microsoft delivers. Microsoft offers robust and familiar technologies that integrate with SAP and provide unique advantages in specific areas, including usability, performance, end-user access, reduced costs, and hardware flexibility.

Usability

Windows Server and SQL Server is one of the most recognized operating systems and database platforms in the world. For Windows Server, there are not a lot of configuration changes needed to run SAP applications. In fact, some of these attributes are set automatically when you install SAP. Similarly, the installation of SAP products does not require SQL Server to be configured in a special way.

A major advantage of Microsoft BI tools for SAP systems is IT workers' and analysts' familiarity with the applications. More than one billion people use Microsoft Office, and because it is so widely used, most workers are already familiar with the BI tools and interfaces, which can help to speed adoption and reduce training costs. Additionally, many workers may not be familiar with SAP BI tools. By using the more familiar Microsoft applications, enterprises can more easily find and train analysts for the business.

The Microsoft applications interact seamlessly with SAP installations to deliver targeted solutions for BI needs. Because the same set of tools is used for data analysis and presentation, complexity is reduced, and users benefit from a shorter learning curve than with other, less familiar solutions.

In-Memory Performance

Since SAP makes a lot of noise around one of their products, most people likely know what a columnstore is. In-Memory Columnstore index was first shipped in SQL Server 2012 and many customers are using it in production. With an In-Memory Columnstore index, SQL Server offers exceptional performance advantages when used with SAP BW as data warehouse query performance can be increased by 10 to 100 times. Moreover, no special or proprietary hardware is needed to realize the advantages of In-Memory Columnstore, which can be a major cost saving. An In-Memory Columnstore can be used with any commodity hardware—including that which is currently running an SAP analytics system—so an expensive upgrade is not necessary. Further, there are no additional cost or installation issues because an In-Memory Columnstore is part of SQL Server. This means that customers do not need to hire a team of dedicated experts to take advantage of the technology. Enterprises are already capitalizing on these benefits, with more than 1.5 million units of Microsoft in-memory technologies currently in customers' hands.

Additionally, SAP fully supports SQL Server page compression that results in space reduction by a factor of 4-5 with many customers. Finally, both Windows Server and SQL Server can fully utilize the latest version of hardware that make use of the NUMA (Non-Uniform Memory Access) platform. There is no configuration necessary for Windows Server and SQL Server to take advantage of increased performance provided by the NUMA platform.

End-User Access

Ready access to information is an important aspect of any current BI solution. End users want access to data to create their own reports and models, but IT departments are not always easily able to respond to hundreds of requests for data or custom views, cubes, and reports. Moreover, Gartner reports that only 28 percent of workers are actually using their company's BI platform. Using Microsoft Office and SQL Server with SAP, end users can interact with data and create reports and models without having to involve the IT department. To do so, these end users need instant access to data—independent of IT—to create views, charts, reports, and dashboards that analyze the business; they then must be able to quickly share the data in a professional-looking presentation format. The self-service reporting capability of SSRS allows users to create presentation-ready reports in minutes instead of hours using the Power View and Report Builder features. Likewise, with the Excel PowerPivot interface, users can quickly create sophisticated reports from SAP data—all on their own. Moreover, Power BI allows customers to deploy Microsoft BI solution easier and more effectively in the cloud or on the go.

Similarly, SSAS offers out-of-the-box data mining and modeling tools that work with Excel and SharePoint to create and share data models. SSAS offers three ways to model data: multidimensional, tabular, and formulated through PowerPivot. In a multidimensional model, SSAS uses SAP data to create the online analytical processing (OLAP) cubes that are used to perform complex business analysis. The tabular model is a newer, in-memory solution that uses compression and the multithreaded query processor In-Memory Columnstore to deliver data to reports that can be viewed in Excel and Power View. PowerPivot is Excel-based and uses SharePoint to provide a managed self-service BI experience; it also is based on In-Memory Columnstore technologies, providing unmatched analytical performance.

Reduced Costs

The Microsoft platform provides numerous capabilities to optimize SAP operations for a more secure, efficient, and flexible service. SQL Server is an optimal database for enabling mission-critical environments, offering availability and performance at a low total cost of ownership (TCO) for SAP installations of all sizes. The Microsoft platform can help organizations lower TCO through increased flexibility with configuration and architecture; higher database administrator productivity; increased hardware utilization; minimized surface area attacks for improved security; and key feature enhancements, such as higher compression and faster failover time.

Through new product features and enhancements in Windows Server such as failover clustering, live migration, and network virtualization, organizations can realize upfront and ongoing cost savings. Organizations can also expect to reduce their administrative labor costs through full automation with Windows Server. Organizations can also benefit from significant cost savings from virtualization, which reduces the number of servers and thus cuts down the number of licenses required to support the hypervisor platform.

Ultimately, with the new features and enhancements in Windows Server, organizations can expect to realize upfront and ongoing cost savings across the key areas outlined in Figure 1 below:

	Administration Labor Cost Savings	<ul style="list-style-type: none"> • Approximately U.S.\$220,000 in labor cost savings per year for the IT department
	Hardware and Infrastructure Cost Savings from Virtualization	<ul style="list-style-type: none"> • Average 80% improvement in workload density • Average 44% reduction in server hardware and associated annual utility and real estate costs • 20% - 40% reduction in storage space
	Business Benefits	<ul style="list-style-type: none"> • <i>Availability:</i> Average 52% reduction in planned downtime; average 23% reduction in unplanned downtime • <i>Time-to-Market:</i> Approximately 41% reduction in workload deployment time • <i>Productivity:</i> Approximately 15 hours per employee per year recovered in end-user productive time

Figure 1. Microsoft and SAP Partnership (Source: "Windows Server 2012 Rapid Deployment Program: TCO Study Whitepaper"¹)

Additionally, a single-vendor approach for the infrastructure platform keeps training costs for IT departments low. All tools are designed to work together, and there is no need to learn different approaches from multiple vendors to achieve the same results from the platform. Because the SQL Server interface is the same whether customers use SQL Server running on an appliance or commodity hardware, the IT department can more easily scale the SAP system up or down as needed, without having to retrain staff on a standalone system. SQL Server behaves as "just another SQL Server instance," regardless of the size of the system being used. Furthermore, customers now have a new option to deploy SAP in Microsoft Azure that is elastic and highly performance but at the same time saving the costs of acquiring, maintaining, and upgrading hardware to run SAP applications.

Flexibility

Customers can run SAP on any size of hardware using the Microsoft platform. There is no need to purchase an expensive, proprietary appliance to get the benefits of the system. Hardware can be upgraded when needed, not as an entry requirement to the solution. This allows customers to use less expensive or existing hardware if it is not necessary to upgrade to a full appliance solution. It also provides an easy migration path if an upgrade becomes desirable in the future. Further, using SAP on the Microsoft platform, customers gain access to the latest in-memory technologies developed by Microsoft for both transactional and analytical workloads. These technologies are delivered as a built-in feature and do not require enterprises to upgrade databases, retrain personnel, or purchase additional software licenses.

Additionally, customers can run SAP on Windows Server Hyper-V platform that provides extensive virtualization capability and benefits without sacrificing performance. Finally, Microsoft and SAP allow customers to take advantage of on-demand resources in the cloud and maximize the value of your Microsoft and SAP investments through Microsoft Azure. Azure is fully certified for SAP products including SAP Business Suite, SAP NetWeaver, and SAP HANA Developer Edition.

Microsoft and SAP – Innovating for Your Success

Microsoft offers an unparalleled breadth of solutions—spanning consumer and business technology and extending from the data center to the desktop to a variety of other devices and into the cloud.

Furthermore, Microsoft gives organizations the flexibility to use the technology that is right for the business and delivers optimal technology to help people innovate, compete, and grow.

For more than 20 years, SAP and Microsoft have enjoyed a strong partnership with one unified goal: create customer value. This close collaboration has led to the development of joint solutions, such as Duet Enterprise, and the continued optimization of Windows and SQL Server platforms for SAP. Today, thousands of companies around the world depend on these SAP and Microsoft solutions to effectively run their businesses. Microsoft has grown to be the platform of choice for new SAP customers with around 65,000 SAP installations on Windows Server and 35,000 SAP installations on SQL Server². This is part of the long-term trend of organizations choosing the Microsoft platform for its reliability in running the workloads outlined in Figure 2.

	1993-1998	1999-2004	2005-2010	2011-beyond
Client Interoperability	<ul style="list-style-type: none"> SAPGUI on Windows® SAPGUI Desktop Office Interop 	<ul style="list-style-type: none"> mySAP CRM Mobile Client on Tablet PC mySAP.com Solutions on Pocket PC 	<ul style="list-style-type: none"> BYD users Silverlight as front end renderer Project Mendocino Ships as Duet™ Office announced as a native SAP UI (along with Web, SmartClient, and Mobile) 	<ul style="list-style-type: none"> Duet Enterprise Support for mobile apps in Windows and Windows Phone 8.1
Applications and Services	<ul style="list-style-type: none"> Integration with Exchange Server SQL Server 6.0 SQL Server 7.0 RFC SDK 	<ul style="list-style-type: none"> DCOM Connector SQL Server 2000 Portal Development Kit .NET SAP .NET Connector 	<ul style="list-style-type: none"> SQL Server 2005 SQL Server 2008 SQL Server 2008 R2 Joint Commitment to Advanced Web Services SAP Enterprise Services Explorer for Microsoft.NET 	<ul style="list-style-type: none"> SQL Server 2012 SQL Server 2014 Connectivity between SAP BusinessObjects BI Universes and Power BI (Power Query)
Applications Infrastructure	<ul style="list-style-type: none"> SAP R/3 on SQL Server™ SAP R/3 on Windows NT 	<ul style="list-style-type: none"> Windows Server 2000 SAP 64-Bit Windows (for Itanium) SAP is Windows® 2000 Launch Partner Windows Server 2003 	<ul style="list-style-type: none"> Windows Server 2008 Windows Server 2008 R2 	<ul style="list-style-type: none"> Windows Server 2012 Windows Server 2012 R2 SAP on Microsoft Azure
Business Alliance	<ul style="list-style-type: none"> Microsoft Becomes SAP Customer Agreement Between Bill Gates and Hasso Plattner 	<ul style="list-style-type: none"> mySAP SCM for Xbox Manufacturing SAP NetWeaver and Microsoft.NET Announcement 	<ul style="list-style-type: none"> Mendocino Business Alliance SAP and Microsoft sign new agreement covering and communicate plans for next three versions of Duet 	<ul style="list-style-type: none"> SAP-Microsoft Unite Partner Connection

Figure 1, Microsoft and SAP Partnership (Source: Microsoft and SAP timeline³)

Microsoft and SAP have partnered to ensure that the Microsoft platform and SAP solutions work well together for enterprise applications. The SAP certification of Windows Server and SQL Server is the technical stamp of approval of the joint effort from Microsoft and SAP. Choosing a Microsoft platform for SAP fulfills a series of requirements. Firstly, it helps to reduce the number of vendors needed to deploy an SAP system. Secondly, it fits smoothly into a homogeneous Microsoft system landscape. Thirdly, it reduces skill requirements as the heterogeneous infrastructure can also be managed using a single management system such as Microsoft System Center.

Mission-critical confidence through SQL Server

Microsoft provides a comprehensive solution suite of technologies to help enable an interoperable, end-to-end infrastructure for SAP. This helps IT departments to maximize ROI and enable mission-critical environments at a low TCO. For instance, Microsoft conducted a benchmark test of Redknee Turnkey Converged Billing running on SQL Server, Windows Server, and Intel Xeon-based Servers⁴, which executed a 250 million-subscriber test that exceeded performance objectives. With the Microsoft data platform and other Microsoft products, KAS BANK⁵ has been able to process approximately 100 million transactions per day. Similarly, another customer, Choice Hotels International, reported⁶ that the average response time for queries is less than 200 milliseconds for the end user.⁷

Enterprises that run SAP applications need around-the-clock availability and performance. SQL Server is an optimal database for enabling mission-critical environments, offering availability and performance at a low TCO for SAP installations of all sizes. According to the SAP SD (Sales & Distribution) Standard Application benchmark results for a two-tier Internet configuration⁸, a single server running Windows and SQL Server can support 47,500 concurrent users with 259,680 SAPS (SAP Application Performance Standard). The SAP SD three-tier Internet configuration⁹ demonstrated that SQL Server can support 93,000 concurrent users.

In-Memory OLTP

In-memory technology for SQL Server 2014 dramatically improves the throughput and latency of SQL Server online transaction processing (OLTP) capabilities. It is designed to meet the requirements of the most demanding transaction processing applications and Microsoft has worked closely with a number of companies to prove these gains. In-memory OLTP is designed on the following architectural principles:

- Optimize for main memory data access: Storage-optimized engines (such as the current OLTP engine in SQL Server) will retain hot data in a main memory buffer pool based on frequency of access. The data access and modification capabilities, however, are built on the viewpoint that data may be paged in or paged out to disk at any point. With In-memory OLTP, you place tables used in the extreme transaction processing portion of an application into memory-optimized main-memory structures. The remaining application tables, such as reference data details or historical data, are left in traditional storage-optimized structures. This approach lets you optimize hotspots for memory use without having to manage multiple data engines. Main memory structures for In-Memory OLTP eliminate the overhead and indirection of the storage-optimized view while still providing the full atomicity, consistency, isolation, and durability (ACID) properties you expect of a database system.
- Analyze, Migrate, Report (AMR) Tool: To identify the appropriate tables to take advantage of In-Memory OLTP, the new AMR (Analyze, Migrate, Report) Tool is integrated into the SQL Server 2014 Management Studio to assist in transition to In-Memory OLTP. It consists of a set of data collectors, leveraging the existing Data Collection framework in SQL Server, as well as a set of Management Data Warehouse analysis reports. The reports will provide a set of recommended tables or stored procedures for In-memory OLTP to speed the overall performance.
- Accelerate business-logic processing: With In-memory OLTP, queries and procedural logic in procedures that are stored in T-SQL are compiled directly into machine code through aggressive

optimizations that are applied at compilation time. Consequently, the stored procedure can be executed at the speed of native code.

- Provide frictionless scale-up: In-memory OLTP implements a highly scalable concurrency control mechanism and uses a series of lock-free data structures to eliminate traditional locks and latches while guaranteeing the correct transactional semantics that ensure data consistency.
- Built into SQL Server: The most impressive thing about In-memory OLTP is that it achieves breakthrough improvement in transactional processing capabilities without requiring a separate data-management product or a new programming model. It is still SQL Server!

In-Memory Columnstore

SQL Server 2012 introduced a new data warehouse query acceleration feature based on a new type of index called an In-Memory Columnstore index. This new index, combined with enhanced query processing features, improved data warehouse query performance. According to the Microsoft benchmark performance report from April 2012¹⁰, complex data warehousing queries running with and without column-store indexes on a one-terabyte database showed elapsed time speed ups of 8–20 times for many queries, with some improving by as much as 100–500 times. For more information on using the SQL Server Column-Store with SAP BW, please see

<http://blogs.msdn.com/b/saponsqlserver/archive/2014/05/08/sql-server-2012-column-store-deployment-accelerates-bw-queries-and-improves-storage-efficiency.aspx>

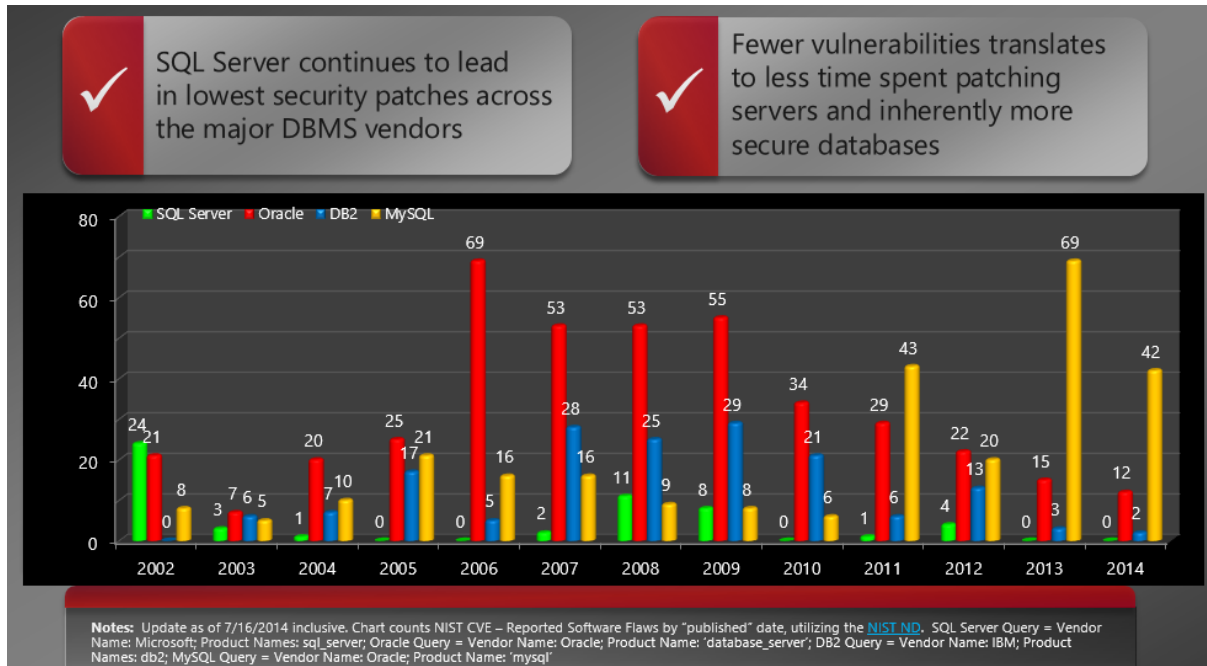
The In-Memory Columnstore index is a second-generation, in-memory technology that was initially developed for SSAS, and is an integrated part of SQL Server. Used both for reporting tools and on the server side, the In-Memory Columnstore technology enables the scanning of billions of rows of data per second, bringing incredible performance to the entire BI platform. This results in two major performance improvements: First, by using the in-memory columnstore, only the columns that are needed are read—meaning that the system does not read through many rows of unnecessary data just to find the desired data in the needed columns. Second, most indexes or pre-aggregated result sets—which previously were used to accelerate reporting against data cubes—are now unnecessary due to the performance of the index, which saves space on storage. In particular, the E-Fact cubes used by SAP NetWeaver are indexed by the In-Memory Columnstore, which reduces the need to go through many aggregate cubes before getting to the data in the primary E-Fact cube.

The release of SQL Server 2014 adds In-Memory OLTP for transaction performance boost, hybrid cloud features, and additional functionality to the In-Memory Columnstore where the index is updateable to support insert, update, and delete operations. Additionally, a brand new archival data compression further compresses the specified partitions of a columnstore index.

Security - Least Vulnerable Database

Microsoft's ongoing Trustworthy Computing Initiative has resulted in tangible gains in the security and overall reliability and performance of its products – most notably two of its core platforms: SQL Server and Windows Server. The enhanced security and strong synergies between the underlying Windows Server 2008 Operating System and the SQL Server database platform provides organizations with arguably the most reliable and secure operating environment in the history of these solutions. Since 2002, Microsoft's SQL Server has compiled an enviable record. It is the most secure of any of the major database platforms. SQL Server has recorded the fewest number of reported vulnerabilities of any major database. These statistics were compiled independently by the National Institute of Standards and Technology (NIST), the

government agency that monitors security vulnerabilities by technology, vendor, and product (shown below).



Security - Transparent data encryption

With transparent data encryption, SAP customers can encrypt an entire database, data files, and log files without the need for application changes. Transparent data encryption includes encryption of application databases and backup of encrypted SAP databases. While local security certificates can be used, Extensible Key Management (EKM) can be used for SAP database to ensure extra security. New in SQL Server 2014 is encryption for database backups that support several encryption algorithm including AES 128, AES 192, AES 256, and Triple DES. This will allow SAP database backup to be encrypted without turning on Transparent Data Encryption.

Security - Auditing

SQL Server provides enhanced flexibility and usability for auditing SAP applications across the SQL Server environment. Key capabilities include audit resilience, filtering, and user-defined audits to support regulation compliance. SQL Server Audit functionality can help to address the compliance and auditing concerns in situations where users who are not SAP users are accessing the database directly through means other than one of the SAP applications. Activities of certain person/login perform on the database by accessing the database directly can be easily detected using audit filtering. SQL Server also helps to ensure security-enhanced deployments and minimize surface area attacks by enabling only required services through System Center Configuration Manager.

AlwaysOn

Disaster recovery encompasses both high-level planning for what to do during an outage as well as specific steps to be taken when a failure occurs. High availability is used to prevent unexpected downtime and to minimize the impact of expected downtime, such as for patching and hardware upgrades. These

technologies provide exceptional flexibility for architecture choices for the entire system, while still maintaining around-the-clock availability.

AlwaysOn technology combines the high availability and disaster recovery functionalities of SQL Server, which provides greater flexibility when managing SAP configuration and architecture. AlwaysOn provides one primary and eight secondaries, with up to two secondaries synchronously aligned with the primary. Reporting and backup operations can be performed on the secondaries. This approach can dramatically improve high availability because there is no single point of failure and maintenance can be performed offline during normal work hours without affecting the production of SAP instances. BMW¹¹, a Microsoft customer, stated that AlwaysOn can easily meet its 99.999 percent availability requirement.

AlwaysOn is a combination of several technologies for ensuring the proper database uptime required for a mission-critical system like SAP NetWeaver. Most notable are the disaster recovery and high availability functions, which combine key design principles such as mirroring, clustering, and log shipping into a single, easy-to-use solution. Using a simple wizard, customers can configure AlwaysOn through a series of dashboards that monitor off-site backups and failover clusters, making it easier for enterprise systems to maintain the required 9s of uptime.

It is important to note that unlike other new engines on the market, SQL Server AlwaysOn does not require specific, expensive storage hardware to enable certain disaster recovery and high availability functionality. Instead, SQL Server handles the replication of data between independent nodes in different locations.

Support for Windows Server core deployments

Core installation is an important method of reducing patches and reboots triggered by patching. Organizations can reduce management and maintenance efforts, minimize disk space requirements, and decrease operating system patching by as much as 50 to 60 percent¹². These improvements mean that SAP applications can run more quickly and efficiently on SQL Server 2012.

Online indexing

All index maintenance operations can be performed online in any kind of SAP system. Incremental re-indexing with read-consistent scans and lock handling helps to enhance SAP performance. In SQL Server 2014, a new option can be applied during index maintenance operations that permits database administrators to specify how long the process should wait for the locks and allow termination of the blocking processes if necessary.

Database compression for all SAP products

Data in tables and indexes can be compressed, in addition to data at the row and page levels. Row-level compression reduces database size without additional resource consumption. Page-level compression, which is now a default compression type in SAP, reduces the size of a typical SAP ERP database by up to a factor of 4, helping to improve overall response time and reduce storage costs in a dramatic way. According to an SAP document - Using SQL Server Database Compression with SAP NetWeaver¹³, around 50% space savings was noticed after applying row compression on an SAP ERP Unicode system on SQL Server and around 75% space savings when using page compression.

Page compression uses several compression algorithms. In particular, it benefits from Page Dictionary compression, specifically designed by Microsoft to work on SQL Server 2008 (and higher) and SAP NetWeaver 7.0 (and higher) applications. Page Dictionary is highly efficient: Customers have reported that they can reduce database volume in excess of 50 percent when compared to using no compression. Page

Dictionary compression offers many advantages, most notably the more efficient use of disk space and ease of implementation.

With more efficient use of disk space, memory input/output (I/O) is reduced significantly due to the smaller volumes of data to be cached in memory. This allows better response times for systems with the same amount of memory when compared to an uncompressed database. Customers also can benefit from enhanced performance due to a higher cache hit ratio, resulting in less disk I/O. Page compression applies to all non-clustered indexed structures as well as data, which provides further disk space savings. As another benefit of compression, backup and restore operations are faster because of the smaller volume to be backed up. Page Dictionary compression is easy to implement using existing tooling in SAP NetWeaver and SQL Server. Once a table is compressed, any newly inserted data is automatically compressed, without the need to run the compression steps again.

15,000 partitions

SAP NetWeaver BW customers who perform daily loads can benefit from the increase in table partitions from 1,000–15,000.

Automatic memory tuning

Highly sophisticated algorithms adapt memory and cache sizes to changing workload conditions to deliver optimal performance to SAP applications. SQL Server 2012 introduced dynamic threshold percentage rates for updating statistics. The higher the number of rows in a table, the lower the threshold becomes to trigger a statistics update.

Dynamic management views

Added dynamic management views offer greater transparency and visibility into the SQL Server database engine, as well as better processing for SAP DBA Cockpit.

Cloud Deployment with Azure, Windows Server and System Center

Through Microsoft Azure, System Center, and Windows Server Hyper-V technology, customers can gain the benefits of greater agility, flexibility, and choice. These connected offerings enable SAP customers to easily scale their deployments in their own data centers or expand through partner-offered private clouds or Microsoft Azure cloud. For example, if a workload needs to scale on-demand periodically (such as in the case of a paycheck or employee performance review application), required resources can be added automatically. Hyper-V is fully certified by SAP for the Windows Server and SQL Server platform.

The latest version of Windows Server offers many improvements and new features to improve operations, performance, and scalability for SAP solutions.



90 percent of the applicable respondents plan to deploy Windows Server 2012 within 24 months. Other results from the research showed that for respondents familiar with Windows Server 2012, 51 percent found server virtualization to be an important product capability, while 49 percent cited private cloud enablement as another capability.

–Microsoft, Virtualization & Private Cloud Trends¹⁴

SAP Applications on Microsoft Azure

Microsoft and SAP have worked together to certify SAP on Microsoft Azure, ensuring performance and reliability. Customers who have SAP licenses can use them to deploy SAP software in Microsoft Azure. This enables them to maximize the value of their Microsoft and SAP investments and take advantage of on-demand resources in the cloud. Customers can quickly address changing business needs and enjoy the benefits of simplified infrastructure management, improved time to market and reduced costs. They can deploy virtual machines to create the infrastructure needed for SAP solutions in just a few minutes. Currently, customers can deploy SAP Business Suite, SAP Business All-in-One, SAP Netweaver Application Server ABAP, and SAP HANA Developer Edition with full support from Microsoft and SAP.

This partnership represents Microsoft's ongoing commitment to support the applications and services our customers use to run their business on Azure, and provide a robust enterprise-ready platform for customers looking to leverage the power of the cloud. Standard purchase models, pricing and terms are applicable for underlying Azure services and customers will consume and pay for these services as with any other deployment.

Windows Server Hyper-V Virtualization enhancements

Windows Server Hyper-V provides a low-cost, scalable, and highly available platform for server consolidation of SAP solutions. Whether the solution comprises components of an SAP ERP system or solutions such as SAP BW, SAP Enterprise Portal, SAP Process Infrastructure, SAP Master Data Management, or SAP Mobile Infrastructure, the resource utilization of the SAP infrastructure's physical servers can be optimized by moving the components into virtual environments. With Windows Server Hyper-V, Microsoft delivers capabilities such as the ability to host 320 logical processors or four terabytes of physical memory and support 2,048 virtual CPUs and 1,024 active virtual machines per host to meet the most demanding IT needs. There are many other new features within Windows Server Hyper-V to support the needs and challenges of SAP customers.

Hyper-V Network Virtualization

Hyper-V Network Virtualization extends the concept of server virtualization to permit multiple virtual networks, potentially with overlapping IP addresses, to be deployed on the same physical network. With Hyper-V Network Virtualization, SAP customers can set policies that isolate traffic in their dedicated virtual network independently of the physical infrastructure for fully secure and isolated multi-tenancy.

Shared-nothing live migration

Shared-nothing live migration in Windows Server enables virtual machine mobility by moving a running virtual machine without downtime to another Hyper-V host with no clustering or no shared storage but with only a network connection. Organizations can move virtual machines among clusters without the need to stop, export, and import them. They can also move virtual machines among Hyper-V servers

anywhere in the organization, and even migrate virtual machines to service providers or the cloud without any downtime.

Cluster enhancements

Windows Server Hyper-V has many new enhancements for clustering, including support for guest clustering via Fiber Channel, enhanced live migrations to use more available network bandwidth, encrypted cluster volumes, Hyper-V application monitoring, and virtual machine failover prioritization.

Hardware offloading

Windows Server Hyper-V takes advantage of many new hardware offloading features that are supported in Windows Server, including support for SAN-based offloaded data transfer (ODX), IP offloading, and Single Root I/O Virtualization (SR-IOV) through support for SR-IOV networking devices.

Guest NUMA support

Windows Server Hyper-V now supports Non-Uniform Memory Access (NUMA) in a virtual machine. NUMA refers to computer architecture in multiprocessor systems in which the required time for a processor to access memory depends on the memory's location relative to the processor.

Runtime memory configuration

The dynamic memory improvements to Hyper-V in Windows Server help SAP customers reach higher consolidation numbers with improved reliability of Hyper-V operations. They can make memory configuration changes for your virtual machines without shutting down the virtual machines.

Hyper-V Network Switch

The Hyper-V Extensible Switch in Windows Server is a layer-2 virtual network switch that provides programmatically managed and extensible capabilities to connect SAP virtual machines to the physical network. The Hyper-V Extensible Switch is an open platform that enables multiple vendors to provide extensions that are written to standard Windows API frameworks.

Windows PowerShell 3.0

Windows Server provides a comprehensive management platform for all aspects of the data center, including servers, network, and storage. In Windows PowerShell 3.0, sessions on remote servers are resilient and can withstand various types of interruptions. In addition, learning Windows PowerShell is now easier than ever through improved cmdlet discovery and simplified, consistent syntax across all cmdlets.

Private cloud offerings

Virtualization reduces the number of physical servers. It does not, however, inherently mean a reduction in the number of virtual servers. While one of the virtues of virtualization is the ability to provide a number of virtual servers on short notice, it carries with it the challenge of managing an increased count of virtual servers. Fujitsu, with its strategic partners Microsoft and SAP, has developed a solution known as FlexFrame. FlexFrame on Windows for SAP is a dynamic infrastructure solution from Fujitsu for running

[Microsoft – A Comprehensive Platform for SAP](#)

SAP applications in Windows environments. It also provides an ideal foundation for cloud computing environments, since it meets the key cloud requirements of system flexibility, efficiency, and reliability. It delivers savings of up to 60 percent in the TCO of infrastructure running SAP solutions (FlexFrame on Windows for SAP¹⁵).

Microsoft System Center Operation Manager integration with SAP

Through third-party solutions, SAP customers can fully integrate Microsoft System Center Operations Manager (SCOM) with SAP NetWeaver. SAP customers can also take advantage of the SDK for SCOM and a corresponding SDK for SAP. Third-party solutions provide the ability to compile all relevant monitoring data from various SAP systems and to transmit it to SCOM without any deviations. These tools can provide a one-stop view of an organization's IT components to ensure the smooth execution of business processes. These solutions enable SCOM to display important messages from SAP systems in real time. Third-party tools include cmWatcher by Connmove and others.

Automatic virtual machine provisioning through System Center

Organizations can use new service templates in Virtual Machine Manager to dynamically add application servers to an existing SAP landscape. To implement the SAP dialog instance sample, two components of the System Center suite are used:

- **Virtual Machine Manager:** Virtual Machine Manager is a management solution for a virtualized data center, enabling organizations to configure and manage virtualization host, networking, and storage resources to create and deploy virtual machines and services to private clouds. More information is available at <http://technet.microsoft.com/en-us/library/gg610610.aspx>.
- **Orchestrator:** Orchestrator is a workflow management solution for the data centre. Orchestrator enables organizations to automate the creation, monitoring, and deployment of resources in their environment. More information is available at <http://technet.microsoft.com/en-us/library/hh237242.aspx>.

SQL Server and SAP Connectivity

It is important for enterprises to consider how to connect SAP and Microsoft applications to achieve the best results for the analytics landscape. Through Microsoft technologies or third-party connectivity solutions, users can achieve a level of functionality that makes expensive, proprietary data warehouse systems unnecessary.

For many users, interacting with SAP data for reporting and analytics can be particularly difficult. As with many ERP systems, the SAP ERP system is optimized for transacting and capturing data, but not for reporting and analysis. Therefore, it is usually helpful to extract the data to a more familiar and approachable system to ease the reporting process. This section discusses four common scenarios that employ Microsoft and third-party connectivity solutions to transform SAP data for use in PowerPivot and SSRS solutions.

Scenario 1: Accessing BI Directly from SAP Business Suite

As shown in Figure 3, this scenario involves accessing BI from a landscape that has SAP Business Suite. Here, customers can conduct self-service reporting and analysis directly from SAP Business Suite data using Microsoft Office (Excel), Office 365, and SharePoint. This system uses a data warehouse that does not need to be an expensive, proprietary in-memory system. Instead, it can be a standard warehouse that uses common commodity hardware. The data warehouse supplies data to Excel (Power Pivot, Power Query, Power View, and Power Map) to create the necessary reports and conduct analysis. The results can then be shared and collaborated on through SharePoint or Power BI for Office 365.

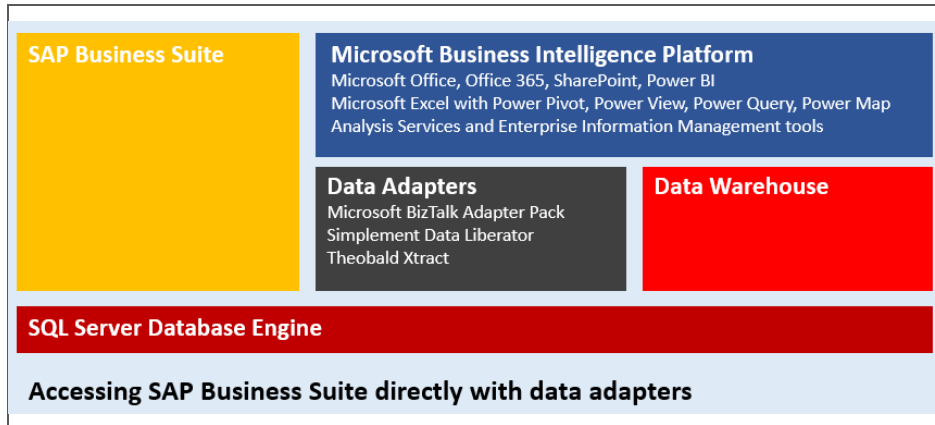


Figure 3: Accessing BI data directly from SAP Business Suite

In this scenario, there are different ways to connect to either the SAP Business Suite application or the database underneath it to enable customers to implement a Microsoft analytics solution:

- Using the Data Provider for SAP (part of the Microsoft BizTalk Adapter Pack), which allows reading data directly from SAP tables and Business Application Programming Interface (BAPI) methods and packaging it into a SQL Server data warehouse.
- Using SAP Netweaver Gateway, a newer technology from SAP, originally designed to facilitate access to SAP data for people-centric mobile and web applications. SAP NetWeaver Gateway is based on open standards and uses the OData protocol to enable access to business data. OData can be easily consumed by various client applications, including Excel with Power Query and Power Pivot in BI scenarios.
- Using third-party adapters:
 - Simplement Data Liberator makes SAP data continuously available in real time and optimizes analysis—with no batch-load windows or additional demands on the production SAP system. To see how Simplement helped the Charles Machine Works improve its analytics capabilities on top of its SAP data, see http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?CaseStudyID=710000001943.
 - Theobald Xtract extracts data from any of nine objects found in SAP Business Suite or NetWeaver BI modules and loads it into SQL Server Integration Services (SSIS), where it is then accessible to the data warehouse. To learn more about Theobald solutions, see <http://www.theobald-software.com/en/index.htm>.

Customers should focus on the factors important to their business landscape, including performance of different connectors, where the data logic lives, potential cost of licenses, and involvement of third-party solutions, to choose the best option. *For a more detailed view of what the different connectors are and how they work, see the [Microsoft BI and SAP white paper](#) from Microsoft (May 2014).*

Scenario 2: Complementing an Existing SAP Business Warehouse

As shown in Figure 4, the second scenario involves using SAP Business Suite as well as SAP Business Warehouse. Here, customers want to combine their SAP data with other non-SAP data (such as text files, .csv files, or Excel files) to achieve a more complete BI solution and make data more valuable.

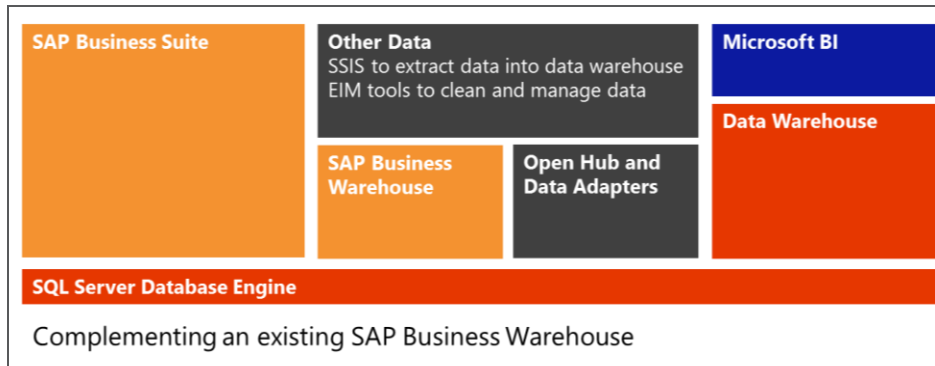


Figure 4: Merging SAP and non-SAP data

In this scenario, data is extracted into SSIS in order to merge the SAP and non-SAP data. Different options that are available for this process include:

- Using ODBC provider for SAP HANA. SAP HANA has a supported ODBC interface which provides database access for third-party tools. Using SQL Server Integration Services, data can be extracted from an SAP HANA database, transformed and loaded into a SQL Server Data Warehouse.
- Using the Microsoft Connector for SAP BI, which connects with the Open Hub Services interface in SAP Business Warehouse and allows for consumption by the Microsoft BI stack.
- Using the Simplement Data Liberator, which allows the near real-time extraction of data from the database underneath SAP Business Suite directly into a SQL Server data warehouse.
- Using Theobald Xtract IS, which connects with virtually any SAP object in SAP Business Suite and can be used to connect SAP Business Warehouse with a SQL Server data warehouse.

Customers should focus on the methods desired for extracting data through SSIS into the SQL Server data warehouse, performance of third-party connectors, security needs of the BI solution, and cost of associated licenses, to choose the best option. *For a more detailed view of what the different connectors are and how they work, see the [Microsoft BI and SAP white paper](#) from Microsoft (May 2014).*

Scenario 3: Extending SAP Business Warehouse with Microsoft BI

As shown in Figure 5, the third scenario involves using front-end Microsoft BI tools to create and share reports directly from SAP Business Warehouse data, without using an intermediate data warehouse. Here, customers typically want to use their existing investments in SAP Business Warehouse and have no need to connect to other sources of data. This scenario allows customers to use simple, powerful, and familiar tools like Excel-based Power Pivot, Power View, and Power Map to implement a highly effective front end for their BI solution.

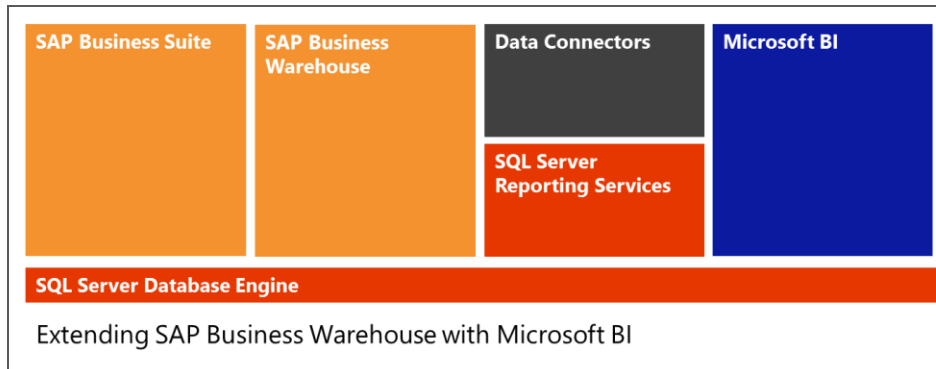


Figure 5: Using Microsoft BI tools to create reports directly from SAP Business Warehouse data

There are three main ways to connect the Microsoft BI stack to the SAP environment:

- Using the Microsoft .NET Data Provider and Query Designer, available out of the box with SSRS, which extract data directly from SAP Business Warehouse and allow reporting directly from SSRS or a client. SSRS uses SAP Business Warehouse as the data source and creates a dataset for designing and publishing a report. Once the SSRS report is created, PowerPivot can extract data from SAP Business Warehouse to generate and publish the report.
- Using SAP ODBO connector for SAP BW (on HANA or non-HANA platform), end-user can connect an Excel PivotTable directly to an SAP BW system via the SAP ODBO Provider. This method enables direct consumption of SAP BW cubes and queries in Excel. The Excel user can select from available cubes and queries in SAP BW and work with SAP data in PivotTable reports or PivotCharts. For SAP HANA based systems, an ODBC driver is available which can be used to connect Excel to the SAP HANA database, and using SQL statements query the data. The recommended approach by SAP is to use the ODBO (MDX) connector, because it takes advantage of the metadata in the HANA repository.
- Using Theobald Xtract RS, which extracts data directly from SAP Business Warehouse into PowerPivot through logic similar to that of the .NET Data Provider and Query Designer. The Theobald solution, while requiring extra software, allows users to bypass SSRS using a process that transforms data into a format that PowerPivot can consume.

Customers in this scenario are bypassing the SQL Server data warehouse, and so should focus on the cost of third-party licenses, limitations on reporting and analysis, and desired types of client reporting. *For a more detailed view of what the different connectors are and how they work, see the [Microsoft BI and SAP white paper](#) from Microsoft (May 2014).*

Scenario 4: Power Query Connectivity to SAP BusinessObjects BI Universes

End users can also directly connect to SAP BusinessObjects to discover business data using Power Query for Excel. SAP data and metadata is made available through the semantic layer (Universe) in SAP BusinessObjects BI. This connectivity provides metadata and data from dimensional, sometimes called common, semantic layer Universes which have a UNX file extension. This solution was jointly developed by Microsoft and SAP. SAP data can be loaded directly into a worksheet or a Power Pivot model. From there, the end user can combine, analyze, visualize and share business data using Power BI (shown in Figure 6 below).



Figure 6: Using Microsoft BI tools to create reports directly from SAP Business Warehouse data

There are many advantages to connect Power Query to the SAP BusinessObjects BI environment:

- Excel users have seamless and direct access to SAP data exposed via SAP BusinessObjects BI Universes
- Excel is a familiar front-end tool, no need to learn complex new tool set or skills
- Semantic layer of SAP BusinessObjects BI Universes hides the complexity of the underlying SAP data source
- Customers can leverage existing investments in Microsoft and SAP BI technologies
- SAP data can be loaded into Excel table or Power Pivot data model

Customers in this scenario connect directly to SAP BusinessObjects and can perform many functions using Excel such as navigate the SAP BusinessObjects BI Universes using Power Query Navigator, design custom query against SAP BusinessObjects BI Universes using Power Query Editor, and convert SAP BusinessObjects BI Universes into Power Pivot data model. *For a more detailed view of what the different connectors are and how they work, see the [Microsoft BI and SAP white paper](#) from Microsoft (May 2014).*

One consistent platform for on-premises and off-premises solutions

The future lies in the hybrid cloud, where organizations will be able to take advantage of Windows Server and SQL Server to manage increased workloads in physical and virtual environments. Today's SAP customers are using—or are planning for—a combination of on-premises and off-premises IT resources and tools, resulting in hybrid environments that comprise on-premises and cloud environments. With Windows Server, SQL Server, System Center, and Azure, SAP customers can protect their existing investment in on-premises applications as they begin to move to the cloud, and can take a unified approach to managing their applications and data. The following capabilities in Windows Server, System Center, and Azure help provide the flexibility to build and deploy hybrid applications on-premises and in the cloud:

- **Programming symmetry** provides the ability to use the same development model across Windows Server and Azure, including common development tools that offer a more complete environment to build cloud and on-premises applications.
- **Cross-premises connectivity for hybrid scenarios** enables enterprises to connect to private subnetworks in a hosted cloud network. It allows for VPN site-to-site functionality in remote

access, and provides cross-premises connectivity between enterprises and hosting service providers.

- **Virtual machine portability** offers the ability to provision, manage, and move virtual machine images across Windows Server and Azure.
- A “**single pane of glass**” for managing virtual machines with System Center empowers SAP customers to manage and run applications across private and public cloud environments, offering full visibility and control to deploy, manage, and consume applications.

Additional Benefits

Organizations that take advantage of SAP on Microsoft with Windows Server and SQL Server can experience the following benefits:

- The SAP on Microsoft platform enables organizations to take advantage of Microsoft’s extensive productivity applications to extend SAP business processes beyond the core ERP system.
- Duet Enterprise, a product jointly developed by SAP and Microsoft, combines the collaboration and productivity supported by Microsoft SharePoint with the business data and business processing functionality of SAP applications.
- The SAP on Microsoft platform also enables productivity gains by providing the analytical power of Microsoft Excel. The Microsoft platform provides familiar experiences for rapid data exploration and discovery with Excel.
- Microsoft provides common development toolsets, such as .NET, which help ensure synergies between the productivity space and the platform. Common tools help improve an organization’s time-to-solution and reduce the overhead of multiple development tools.
- Microsoft and SAP solutions help organizations to integrate new technologies, like social analytics and Big Data, using customer data to make better decisions.

Conclusion

The long-standing partnership between Microsoft and SAP has enabled the excellent integration of their systems. This partnership means that customers currently can take advantage of an optimal Microsoft platform in their SAP environments—and that the benefits promise to continue into the future. Today, thousands of companies around the world use SAP and Microsoft solutions to run their essential systems. Looking ahead, as enterprises move away from expensive proprietary hardware solutions, the ability to use commodity hardware for mission-critical environments and leverage SAP workloads in the cloud will be increasingly important and will continue to drive the adoption of Microsoft as the solution of choice for SAP systems.

Resources

The following resources provide additional information about Microsoft and SAP solutions and their benefits:

- SAP Community Network: SAP on SQL Server
<http://www.sdn.sap.com/irj/sdn/mss>
- Microsoft and SAP Alliance
<http://www.microsoft.com/isv/sap/technology/platform/sql.aspx>
- MSDN: Running SAP Applications on SQL Server Blog
<http://blogs.msdn.com/saponsqlserver/>
- TechNet: Virtualization Blog
<http://blogs.technet.com/virtualization/>
- Server and Cloud Platform
<http://www.microsoft.com/en-us/server-cloud/windows-server/default.aspx>
- SQL Server 2012 Mission Critical Confidence
<http://www.microsoft.com/sqlserver/en/us/solutions-technologies/SQL-Server-2012-mission-critical-confidence.aspx>
- Microsoft SQL Server 2014
<http://www.microsoft.com/en-us/sqlserver/sql-server-2014.aspx>
- Microsoft SQL Server Home Page
<http://www.microsoft.com/en-us/sqlserver/default.aspx>
- Microsoft SQL Server Business Intelligence
<http://www.microsoft.com/en-us/sqlserver/solutions-technologies/business-intelligence.aspx>
- Microsoft BI Interoperability with SAP (White Paper)
http://download.microsoft.com/download/A/9/9/A9971C42-ECB6-4059-BA60-7E7B5B98BD40/Microsoft_BI_Interoperability_with_SAP_White_Paper.pdf

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- ³ "Microsoft and SAP – a 20-Year Partnership." http://www.microsoft.com/global/enterprise/PublishingImages/partners/Timeline_Image.png
- ⁴ "Benchmark Results: Redknee TCB Running on SQL Server 2012 and Intel-Based Servers Scales to 250 Million Subscribers." Microsoft. http://blogs.technet.com/cfs-file.ashx/_key/communityserver-blogs-components-weblogfiles/00-00-00-85-48-WhitePapers/8228.Redknee-Benchmark-Solution-Brief-with-XIO-NEC-INTEL.pdf
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