IBM z13 for SAP workloads

Highlights

- IBM® z13™ offers dramatically improved system performance versus previous IBM z Systems® offerings
- With new features for SAP workloads, z13 helps organizations handle modern workloads such as cloud, analytics, mobile and security
- IBM has a strong tradition of enabling customers to get better results from SAP applications

Part 1: IBM z13 provides better results for SAP workloads

Today's businesses face a variety of challenges when it comes to SAP workloads: the amount of business data in the world is growing exponentially, businesses are more interconnected than ever before, cloud environments are replacing traditional on-premises IT environments, and security threats are growing more pervasive and sophisticated all the time. The end result of all this change is that systems and technologies that once worked fine may no longer be good enough to keep up with the new requirements.

Instead, enterprises need a new, more modern solution to help them master these changes and stay current in a new business world. This is certainly the case when it comes to SAP workloads.

In an era when gaining visibility and insight into business operations is becoming an imperative, SAP business applications provide that visibility and insight for organizations across the globe. However, SAP solutions require a solid hardware platform in order to function effectively. As enterprise technology has changed, so too must the hardware requirements for SAP solutions.

For general information about SAP solutions, please see Part 2: About SAP business solutions, and how IBM enables them.

This is where IBM z13, a new generation of processor from the IBM z Systems product line, comes into play. With a new design, new features, and new capabilities, z13 redefines what organizations can accomplish with their SAP workloads, just in time to keep up with the changes going on in the business world.

IBM z13 is well positioned to help organizations get better results with SAP applications, including new features designed specifically for SAP workloads, improved system performance and throughput when compared with previous generations of z processors, and the ability to handle modern SAP workloads better.

"We expect the combined SAP and IBM solution to significantly improve the time-to-market, development and design of our financial products and services, with optimized operations that enhance rapidity and flexibility for our various customers, giving Banco Galicia new opportunities to compete in the modern banking industry."

— Diego Revello, ITC Manager, Banco Galicia

New features for SAP workloads

SAP workloads are unique, and they therefore require special features that other workloads do not. The IBM z13 team used actual SAP hardware traces to guide the development process, meaning that z13 was designed with SAP workloads in mind. One of the outcomes of this fact is that z13 includes several new features designed specifically to optimize SAP workloads.

Simultaneous multithreading technology (SMT)

The z13 processor was designed to make it easy for organizations to capture the benefits of two-way simultaneous multithreading technology (SMT-2). With z13, SMT-2 is implemented automatically and intelligently, allowing each operating system or hypervisor to use SMT in the way that best meets its own unique requirements.

As a result, z13 helps support the best SMT-2 results possible for both IBM z Systems Integrated Information Processor (zIIP) and IBM Integrated Facility for Linux (IFL). In benchmark tests of IFL for SAP workloads z13 delivered 40 percent improved throughput core-to-core versus zEC12 using SMT-2.

Large memory

The rapid proliferation of mobile devices has coincided with a growing desire for companies to offer users direct access to information and services stored on back-end systems. For instance, while bank customers used to go through a proxy to access their financial information (the bank teller), today's customers can use mobile banking to access this information directly.

As more users begin to access back-end systems, the need for greater scalability in those systems increases as well. If these systems are open to customers, then customers must be able to access them continuously, with consistent response times.

The z13 processor features a very large memory capacity—up to 10 TB of real memory per server—which can play an important role in providing the high performance and availability needed by many modern SAP workloads. This amount of memory is three times the maximum memory capacity offered by zEC12.

With a higher memory capacity, z13 allows users to allocate more memory to DB2 buffer pools, which in turn opens up significant performance improvements for SAP workloads, especially in data-sharing environments.

A recent IBM study tested the effect of large memory for DB2 buffer pools on SAP Banking Services (SBS) Day Posting, which is a good representation of a customer online transaction processing (OLTP) workload. The study found that in data-sharing environments, dedicating more memory to buffer pools led to a 66 percent reduction in response time, as well as a 32 percent increase in throughput. Figure 1 provides a summary of the testing data.

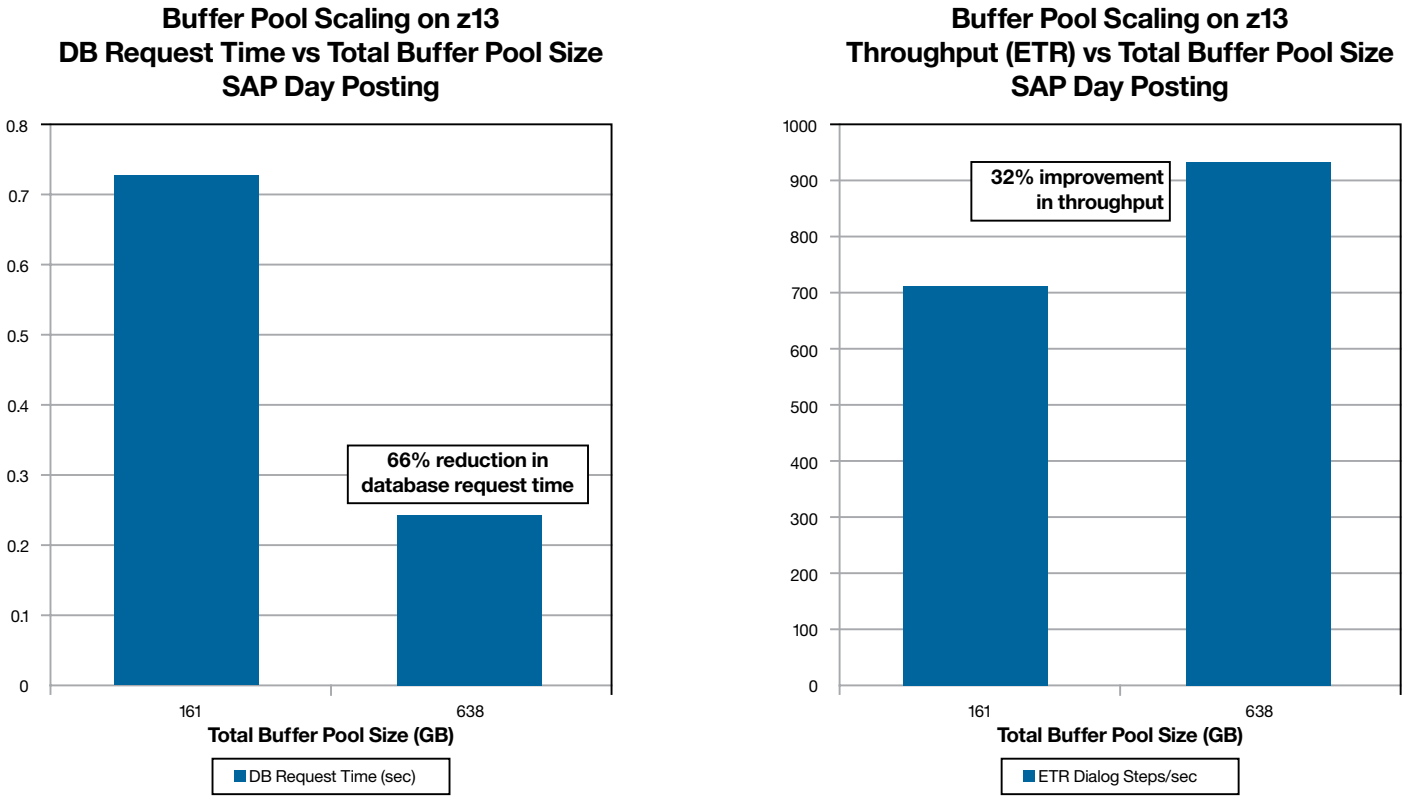

Figure 1: Test results of IBM large memory for DB2 buffer pools with SAP on z13

Improved system performance and throughput

The benefits offered by z13 for SAP workloads also include performance and capacity. z13 is powered by up to 141 of the world's most powerful microprocessors. This represents up to 40 percent more total general system processing capacity than the previous generation of z processors, IBM zEnterprise® EC12, which can only support a maximum of 101 microprocessors.

On a per-processor core level, z13 also promises better performance than previous generations of IBM z processors, particularly for SAP workloads. When compared to zEC12, z13 has 10 percent higher performance per processor core for general workloads, and 16 percent higher performance per processor core for SAP workloads.

Design improvements for greater scalability

z13 features a number of design improvements that enable improved multi-processor scaling. One example of this can be found in the redesigned cache architecture of z13.

Based on the latest in eDRAM technology, this redesigned architecture provides twice as much second-level cache as zEC12, and substantially more third-level and fourth-level caches. As a result of these larger cache sizes, z13 is in a position to support faster throughput, which helps avoid untimely swaps and time-consuming memory waits. Instead, SAP tasks that involve concurrent workloads are free to run with as little delay as possible.

The L4 caches in the z13 processor are an order of magnitude larger than the caches on any other mainstream server. The L4 cache can grow up to 3,840 MB on a single z13 system. This allows z13 to manage dozens or even hundreds of SAP databases by keeping working sets closer to the z13 engines.

The z13 processor also features a new, more efficient LPAR memory allocation scheme. By allocating memory to the same drawer as the processor, z13 is able to access data using significantly fewer cycles than if the data were stored in remote memory. This greater memory affinity helps z13 offer improved multi-processor scalability.

FICON Express16S to support I/O-intensive SAP workloads

The improved system performance levels that z13 offers are also driven by new high-speed SAN adapters. z13 includes support for FICON Express16S, the latest fiber optic channel offering from IBM. This new feature is particularly beneficial for I/O-intensive SAP workloads, including night-time batching, day-time reporting, and update-intensive transaction processing. When compared with the FICON Express8S solution running on zEC12, FICON Express16S offers a 60 percent increase in throughput for large data transfer input/output operations, as well as a 20 percent increase in throughput for small data transfer input/output operations.

The higher I/O rates of FICON Express16S are complemented by z13 itself, which provides a level of I/O bandwidth that is more than twice the amount that was offered by zEC12.

Larger coupling facility to support data-sharing workloads

The coupling facility included with the z13 processor is also designed with larger workloads and data sharing in mind, which is another reason that z13 is a good choice for SAP workloads. The z13 processor supports up to 256 coupling channel path identifiers (CHPIDs), while zEC12 only supports half that amount. In addition to supporting greater connectivity and allowing for the consolidation of multiple Parallel Sysplexes onto the same set of physical servers, this fact also means that z13 can scale to enable large cache structures, making it a natural choice for large data sharing workloads. Larger coupling facility structures help increase throughput in IBM DB2® subsystems, and therefore reduce processing overhead.

The large memory capacity is also beneficial when planning future growth. Very large Linux on z Systems application server environments can enjoy significantly more headroom on z13, delivering high levels of capacity as today's workloads continue to grow.

Better suited to today's SAP workloads

In light of rapid changes going on in the modern business environment—including exponential data growth, proliferation of mobile devices and social networks, a growing dependence on cloud systems, and new advanced security threats—relying on legacy systems simply won't work anymore. In order to handle these new data-intensive workloads and meet growing customer expectations, organizations need an IT infrastructure that's powerful, agile, open, and highly secure.

That's why right now may be the optimum time to upgrade to z13. As the newest generation of IBM z Systems processor on the market, z13 is better suited to handle modern SAP workloads than any processor that has come before it. z13 was designed and built specifically to handle cloud, analytics, mobile, social and security workloads, making it the logical choice at a point when those particular workloads are becoming increasingly important.

Better cloud performance

From a cloud standpoint, z13 supports a higher number of maximum LPARs per CEC, offering 85 LPARs while zEC12 offers only 60. This increased number of LPARs helps to facilitate better server consolidation, while at the same time increasing the number of cloud tenants that the system can host.

The I/O enhancements included in z13 also support reduced transactional latency, which can help mitigate the increases in transaction response times that adding cloud-sourced data to a workflow might introduce. This is one reason that building a mainframe-based cloud implementation may cost less than building a cloud implementation on other platforms.

Advanced features for security and resiliency

To help address modern security challenges, z13 offers on-chip cryptographic and compression coprocessors. These coprocessors provide a performance boost for DB2, as well as greater security across private networks. The z13 offering can also integrate easily with a number of advanced features designed to provide greater resiliency and availability, including IBM zAware and IBM GDPS Virtual Appliance.

IBM zAware is an analytics-based solution that makes it easier to detect anomalies in IBM z/OS® and Linux for z Systems environments, allowing IT teams to quickly investigate the anomalies and take action to prevent them from causing downtime. GDPS is an automated disaster recovery solution that allows users to perform failure recovery from a single point of control. With advanced features like these built in, z13 can help IT organizations keep their critical business applications up and running.

IBM z Systems can also serve as the bedrock for a combined IBM-SAP environment that ensures maximum availability and business continuity. This highly redundant environment can take advantage of the advanced features included in IBM z/OS and IBM DB2 for z/OS, as shown in Figure 2.

In addition, z13 is designed for Common Criteria Evaluation Assurance Level 5+ (EAL 5+) certification for security of LPARs. This means that organizations running SAP workloads on z13 will not have to worry about the possibility of an application running on one operating system image on one LPAR accessing application data running on a different operating system image on another LPAR.

More efficient analytics workloads

Businesses rely on analytics now more than ever before. As data continues to grow exponentially, those organizations that have the systems and technology in place to draw insights from that data will be at a competitive advantage. That's why z13 offers features that can drive better results for analytics workloads.

With SMT-2 for zIIP, organizations can benefit from parallel threads and higher CPU horsepower, helping them to process analytics workloads more efficiently. In fact, the zIIP offload ratio for analytical queries is often as high as 100 percent.

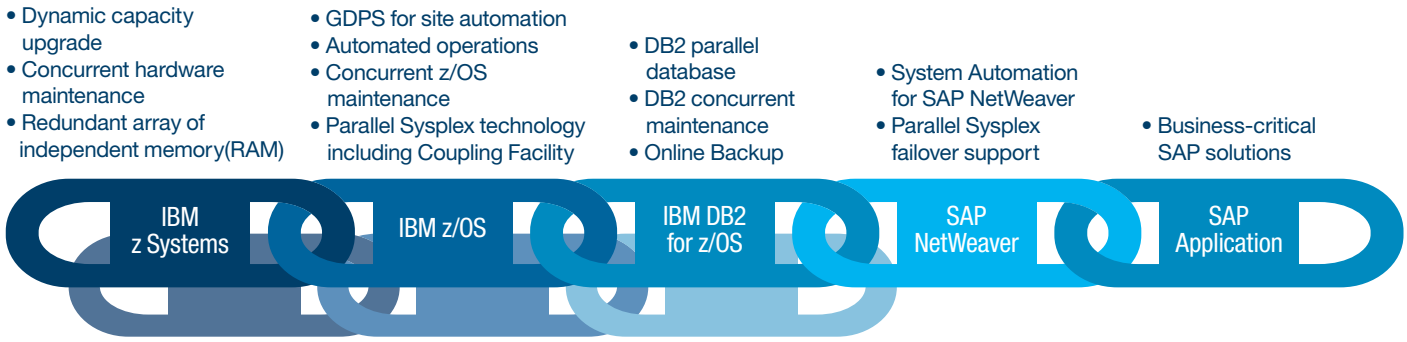

Figure 2: Together, these components form a highly available business continuity solution for SAP on IBM z Systems.

"SAP recognizes the continued investment that IBM makes in extending the capabilities of z Systems to meet the complex needs of our joint customer base. The larger memory size of z13 and its new FICON adapters will further enhance the performance of transactional and analytic SAP workloads, leading to measurable enhancements in the responsiveness of the SAP Banking Solutions. In addition, the introduction of the simultaneous multithreading technology (SMT) will help further the overall characteristics for modern applications such as SAP Banking Solutions, and other SAP applications. This, combined with the traditional strengths in continuous availability and workload management, leads to an excellent platform upon which clients can build cutting-edge SAP applications."

— Dr. Bernd Kohler, Development Manager, SAP on IBM z Systems & DB2 for z/OS, SAP

Part 2: About SAP business solutions, and how IBM enables them

The collaboration of IBM and SAP drives the development of both IBM and SAP products and services. Many IBM products have SAP-specific features and functionality built into them. Industry-specific solutions are based on best practices and business experience gained in thousands of customer engagements worldwide. IBM and SAP are committed to continuously working together to meet global customer business needs.

About the SAP Business Suite

The SAP Business Suite is a collection of applications that support key processes across the enterprise, all built on a common core application set. All of these applications help organizations get the most out of their people, data, and resources. The SAP Business Suite applications include:

- SAP Enterprise Resource Planning
- SAP Customer Relationship Management
- SAP Supplier Relationship Management
- SAP Supply Chain Management
- SAP Product Lifecycle Management

In addition, the SAP Business Suite supports and enables the SAP Industry Solutions, a set of more than 25 SAP offerings designed to meet the requirements and challenges of specific industries. SAP Industry Solutions are available for industries such as finance, public sector, retail, oil and gas, and more.

About the IBM mainframe

The IBM mainframe platform provides a premier infrastructure with tightly integrated solutions including a comprehensive database, advanced virtualization, security and a systems management portfolio. It is designed for zero downtime, which makes it an ideal platform for SAP applications. This added value makes IBM z Systems a perfect fit for globally acting clients, as business processes have to be continuously available in order to avoid lost revenue.

Several key advantages of the IBM mainframe are unmatched by other platforms. The reliability of the z Systems family of servers is renowned, and the ability to upgrade or exchange hardware and software components with all systems up and running provides an impressive demonstration of maximum availability.

IBM z Systems have the highest level of security for sensitive business-critical data available on the market today. The platform's backup and disaster recovery capabilities and near-linear scalability are both supreme, allowing it to handle big volumes of data efficiently. Contrary to popular belief, the mainframe is one of the most flexible architectures available; for instance, organizations can use the mainframe to implement new SAP applications quickly, without interrupting their existing SAP operations.

About IBM DB2 for SAP

With IBM DB2, the partnership and collaboration between IBM and SAP extends to the database level. DB2 releases are strongly influenced by the needs of SAP customers, and are often synchronized with SAP product releases. Customer requirements play a key role in the IBM solution design process, and many current IBM technologies, such as DB2 for z/OS, were directly influenced by customer requirements.

"Our business never stops, so we need continuous support from the SAP solutions. For more than three decades, we have relied on IBM DB2 for z/OS with IBM storage to deliver the required reliability, availability and performance."

— Bogdan Huczala, IT Manager, Třinecké Železárny

DB2 can run on a cluster of IBM mainframes acting together as a single system image, a configuration known as a Parallel Sysplex®. A Parallel Sysplex offers a number of benefits that capitalize on the capabilities of z Systems processors and help optimize SAP applications. These benefits include the ability to scale from the database tier, and the ability to run multiple SAP applications in parallel.

DB2 for z/OS Data Sharing, a patented IBM technology, provides key capabilities that help keep databases up and running continuously. It allows near-linear scaling of up to 32 z/OS systems, each with up to 80 user-accessible CPUs. As a result, data sharing helps keep system-to-system messaging overhead low, even as the number of computing nodes increases. With the power of Parallel Sysplex and Data Sharing, DB2 helps SAP workloads run with greater availability and speed, while also supporting modern business intelligence initiatives.

The business value of SAP on IBM z Systems

IBM z Systems is the most available, efficient, scalable and integrated infrastructure for SAP workloads in the market today. IBM z Systems can provide the following points of business value for SAP users:

- **Availability**: Maintain and upgrade systems without interruption; avoid both planned and unplanned downtime.
- **Efficiency**: Consolidate, automate and virtualize the IT infrastructure for savings on energy, labor, and hardware/software.
- **Scalability**: Handle business peaks and grow capacity along with the growth of the business.
- **Integration**: Manage SAP applications across platforms in a single integrated system.
- **Security**: Protect business-critical data from a variety of threats.

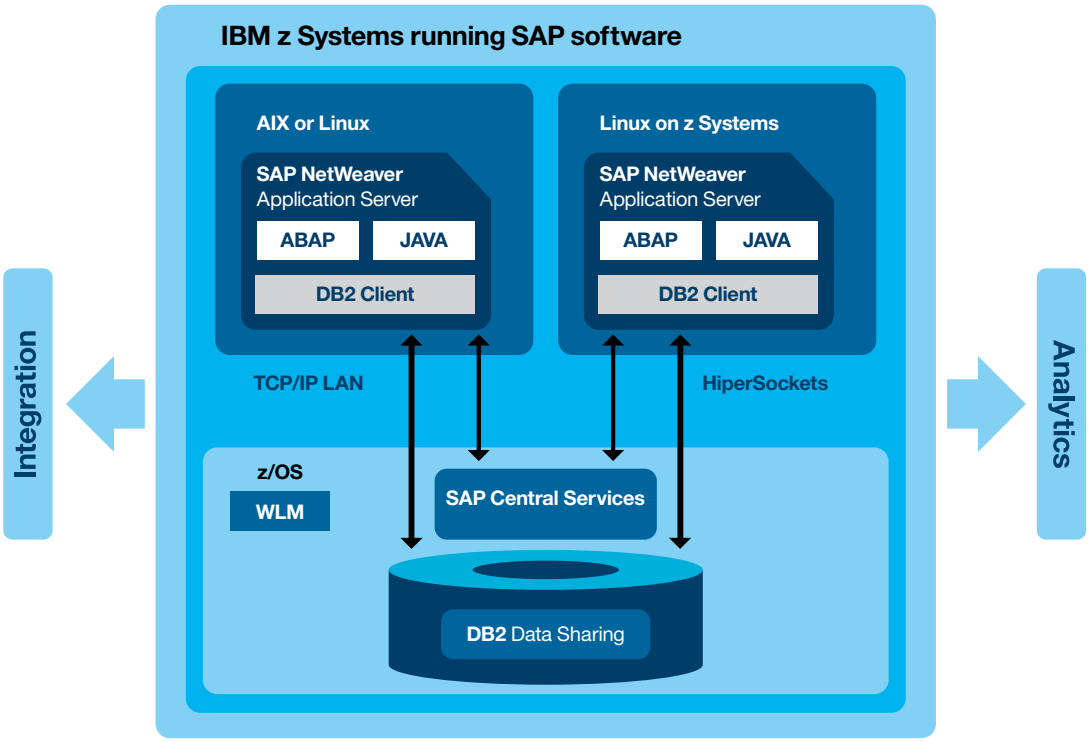

Figure 3: IBM z Systems brings together different platforms under a single management umbrella.

SAP Core Data Services and DB2 for z/OS

SAP has introduced Core Data Services to provide a common abstraction data layer that unifies the different data models present in SAP platforms. CDS helps enable new and performance-optimized applications that merge analytical and transactional functionality. IBM is determined to implement the required capabilities for DB2 for z/OS, which already fully supports SAP Core Data Services. SAP and IBM are working jointly to enable more innovations on z Systems and DB2 for z/OS.

One example of this optimization is the CDS-based performance optimization of the SAP Rapid Replenishment Planning application, from the Retail industry solution. The core processes of the Rapid Replenishment Planning application can be accelerated by multiple factors with the CDS-based implementation on DB2 for z/OS, when compared with earlier implementations. In addition, CDS enables SAP to provide the optimizations they create for SAP HANA to customers using other databases, such as DB2.

New reference architectures: SAP for Banking on IBM z Systems and SAP for Insurance on IBM z Systems

Two examples of how IBM z Systems can enable SAP success in large, demanding environments can be found in the banking and insurance industries.

SAP has published reference architectures for these two industries, showing how to run SAP solutions on IBM z Systems to keep up with demanding requirements for quality of service. These reference architectures are based on real-world experience gained from high-end SAP implementations at top banks and insurance companies from across the globe.

For many of these companies, SAP business solutions are used at the core of their business processes. This means that these solutions pose extremely high requirements on the underlying infrastructure, based on the interplay of servers, operating system, database, and storage. The reference architectures detail how a tightly integrated IBM infrastructure, based on z Systems hardware, z/OS operating system, and DB2 for z/OS provide the level of performance needed for these demanding workloads, while also enabling the sophisticated features of SAP NetWeaver and the SAP business applications themselves.

Read the two reference architectures to learn more:

- New SAP for Banking on System z Reference Architecture
- New SAP for Insurance on System z Reference Architecture

For more information

To learn more about IBM z13, visit **ibm.com**/systems/z/hardware/z13.html.

To learn more about SAP on z Systems, talk to your IBM salesperson, or visit the following websites:

- **ibm.com**/systems/z/os/zos/features/sap
- **ibm.com**/systems/z/solutions/sap.html

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Produced in the United States of America
April 2015

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ZSS03124-USEN-00