

# HANA on Intel:

Three steps to reinvent your enterprise as a digital disrupter

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Enterprises today are experiencing an unprecedented flood of data arriving at ever-increasing velocity from an ever-growing array of sources. By harnessing these rich flows of data from mobile devices, machine sensors, websites and social media, they can get far better insight into customers and markets. This knowledge can help them develop individually tailored offers, create new services, and measure the bottom-line effects of business transformation in real time.

However, this mass of data also poses critical challenges. Enterprises need to match the accelerated speed and volume of incoming data with their ability to process it—otherwise, bottlenecks can appear that prevent them from quickly exploiting this data. Time to decision can be greatly delayed, which impacts the potential outcomes they can deliver. Anticipating and preventing these bottlenecks is now a key challenge for every enterprise in the digital era.

# A single source of data truth for the enterprise

Businesses are struggling to deliver a seamless experience and present the brand consistently to customers across multiple channels. Disparate legacy systems with isolated information silos make it almost impossible to create and act on a total view of the customer, and to leverage this information across all processes and channels in real time. Research suggests that organizational stovepiping and complexity has contributed to the top 200 global companies collectively losing 10 percent of their annual profits—some €237 billion<sup>1</sup>. One reason for this, the research suggests, is that businesses currently analyze and act on less than 1 percent of the data that they have within their organization. Yet customers expect their needs and preferences to be understood—even anticipated—by the business, and they want an experience that's relevant and satisfying.

Delivering on this customer expectation can only happen if the enterprise has a 'single source of data truth' about its customers—and if this view is deployed in real time. This capability is critical as it ensures that a business can meet customer needs at every stage of their journey. Enabling this capability is technically challenging, however—and nearly impossible using today's legacy ERP systems.

## Next-generation ERP technology is necessary

As if that were not enough, enterprises now face new competition from disruptive digital-native businesses unconstrained by outdated legacy systems. These disruptors are winning market share by offering consumers highly targeted, high-value niche services with a flexibility and agility that most incumbents can't match.

As research firm IDC said in a note published to clients in late 2015<sup>2</sup>: "Every organization is facing the challenge of disruption due to greater competitiveness from challengers leveraging a wealth of relevant data to execute more effectively. At the same time, this new data, combined with underutilized existing data within the enterprise, presents new opportunities for operational excellence."

Market-leading players are now embedding automated analytics into their business processes and into their transactional technologies to produce new customer experiences in real time, creating real differentiation. For example, a sales executive using embedded analytics in a sales application can see in real time the impact of offering a discount to a consumer during the sales process, and can quickly modify offers to help their organization meet targets for sales and profitability.

**Analytics is no longer something deployed after the event to spot trends and produce insight for the next time around. Rather, analytics now sits within a business process to support and drive real-time decision making that directly improves business performance.**



## Traditional ERP is no longer fit for purpose

Traditional ERP systems simply cannot compete with the speed of information, analysis and real-time decision-making required for enterprises to stay competitive in the digital era. Replacing these outdated systems must be a top priority for enterprises.

By moving to next-generation ERP architecture, enterprises can accelerate the cycle from data creation to data-based business insight that prompts actions that themselves create new data—the 'virtuous circle of insight'. Realistically, for today's organizations, this means prioritizing the migration of existing ERP systems to the next generation of 'in-memory computing' (IMC), and new architectures that support transaction-heavy software (see box for details). Without in-memory technology, that virtuous circle of insight cannot realistically be achieved.

For SAP\* customers, this next-generation processing platform is SAP HANA running on multi-core Intel® Xeon® processor-based servers.

## SAP HANA on Intel is the ERP of the future for SAP customers

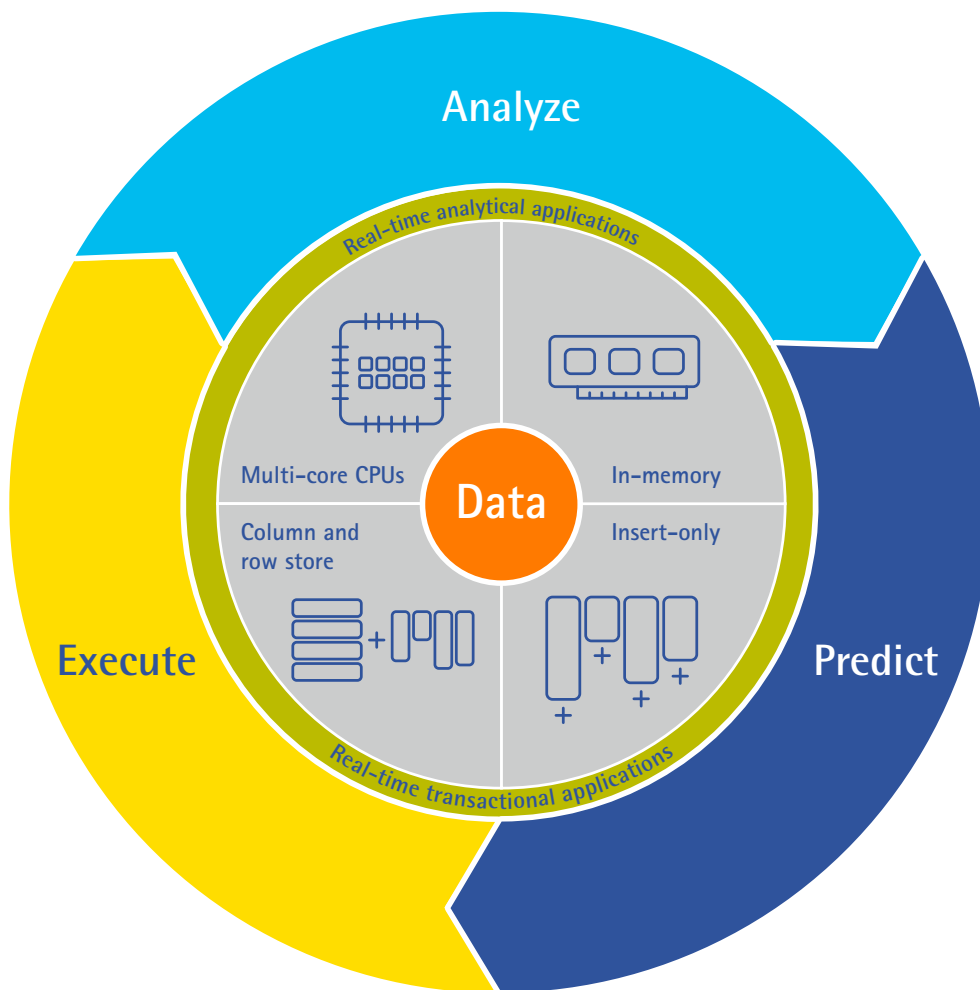
Because it is based on in-memory technology running on ever-more powerful multi-core servers, SAP HANA is able to combine transactional and analytical processing in real time using one 'single source of truth' for enterprise data. That means the ability to support management decisions far closer to real time than ever before, based on up-to-the-moment information, advanced analytics and predictive calculations (see Figure 1).

### What is in-memory computing (IMC)?

In-memory computing processes data on a server's RAM, rather than holding it on separate disks and transferring data between the RAM and the disk for processing. Disks are cheaper than RAM for storage, but processing data on disks can be hundreds of times slower than processing data in RAM.

- Using in-memory databases can therefore enable far faster data processing, so ERP systems process more data at faster speeds. This enables more applications to process data simultaneously and allows more powerful (and more memory-hungry) generations of applications to be deployed.
- By leveraging IMC, more insightful analysis of business events can occur in or near real time, giving enterprises more power to react to or predict customers' actions and to understand and serve customers better, driving up the enterprise's revenues and profitability.

Figure 1: Enterprise Performance In-Memory Circle<sup>3</sup>



The data platform required to support such enhanced decision-making must have a number of distinct qualities far superior to those of traditional databases. It must be:

**Open**—so that data from different applications are analyzed simultaneously.

**Relevant**—so analytics are executed on the latest operational data.

**Flexible**—so it serves different users who define exactly what they need.

**Reliable**—so there's minimal data redundancy and a 'single source of data truth'.

**Predictive**—so it allows powerful 'what-if' scenario analyses.

**Integrated with Big Data**—so it makes sense of diverse forms and sources of data.

## HANA is about business, not technology

HANA is often wrongly portrayed in purely technology terms as 'just' an in-memory database that's faster and more powerful than its predecessors. In fact, its real significance lies in business, not technology.

HANA was originally presented by SAP in 2011 as a breakthrough in database technology, but since then it has evolved from an in-memory DBMS into a full application development and integration platform that supports real-time analytics and business applications. It has multiple business-focused use cases including core ERP, analytics, business intelligence and data warehousing applications.

Since 2013 SAP has been steadily migrating its core ERP software suite to HANA. In early 2015, it announced Business Suite 4 SAP HANA (S/4HANA), the fourth generation of its core ERP suite, and the biggest step-change to its ERP offerings in more than 20 years. The S/4HANA ERP suite runs on the latest-generation Intel processor-based servers in both on-premise and cloud-based computing models.

As Saugatuck Technology, an ISG business, said at the time of the announcement<sup>4</sup>: "If SAP delivers on everything as promised, it will have created a simplified, relatively frictionless path from traditional SAP environments to Cloud-assisted, then Cloud-first environments. This is part of SAP's continuing, well-articulated, and logical response to the Cloud-first trend among its customers and partners."

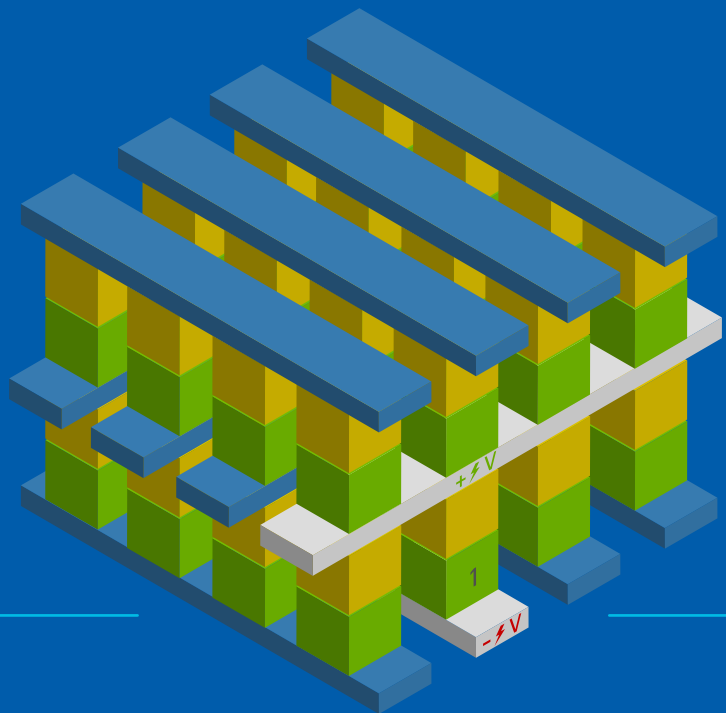
Accenture clients have found that when deploying SAP HANA on current generation Intel processor-based servers, they are able to massively accelerate the performance of data-intensive applications because processing of the data is performed directly on the platform. In turn, this deployment transforms their business agility.

HANA running on Intel processor-based servers can, for example, reduce the risk and complexity for an enterprise implementing new services by adding application functionality incrementally. These are real business benefits that accrue by moving ERP to in-memory platforms.

Research conducted and described in the book "In-Memory Data Management—Technology and Applications"<sup>5</sup> by Hasso Plattner and Alexander Zeier found that traditional data processing in an ERP environment requires up to 90percent of the runtime to be spent on the transfer of data between the database on disk and application running in memory. HANA removes this bottleneck by minimizing data transfer between the database and the application that is running on the server, executing calculations in a parallelized mode. In Accenture's experience, running SAP HANA on Intel multi-core processor-based server architecture results in significant acceleration of data processing—up to a factor of one million in the case of a major global confectionary manufacturer deploying COPA profitability reporting on SAP HANA.

And there are many more step-changes on the way. For example, in mid-2015 Intel and Micron announced 3D XPoint™ technology, a next-generation non-volatile memory technology that is up to 1,000 times faster with greater endurance than today's 30-year-old NAND flash technology<sup>6</sup>. 3D XPoint™ technology is an important breakthrough that will drive potentially game-changing improvements to the speed and volume of data processing in enterprises, multiplying the effects of migration to in-memory computing and significantly expanding the size of the in-memory platform in the future.

The new 3D Xpoint™ technology uses a stackable cross point design with a selector and memory cell to store the data. The cross-point design allows for perpendicular wires to connect the submicroscopic columns of the selector and memory cell. The Selector enables the memory cell to be written or read without the use of a transistor. Each memory cell stores a single bit of data and does so even when powered off. This allows for the first time an inexpensive and non-volatile memory technology. This combination allows for this technology to serve as system memory or system storage due to the non-volatile nature. It provides up to 8-10x greater density to DRAM and will transform the current memory hierarchy (storage and DRAM).



## HANA can drive business breakthroughs

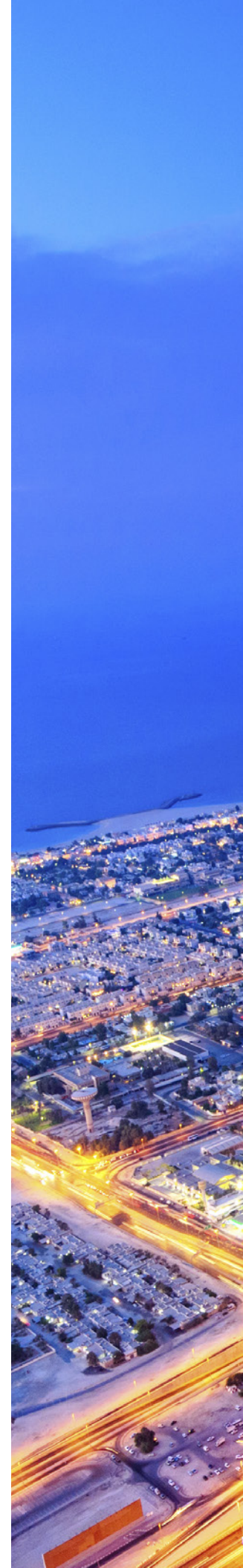
This increase in processing speed, of course, allows existing applications to perform faster. But it could also allow the development of an entirely new set of application categories to emerge, allowing businesses to continue driving growth, profitability and differentiation.

One area of strong potential for HANA-based applications is in driving step-change improvements to the customer experience (CX) that consumers and businesses have when interacting with an organization. Independent research firm Forrester Research\* stated in a report published in mid 2015<sup>7</sup> that "SAP Hana has the potential to revolutionize CX through real-time analytics and faster business processes, including: improved product planning and inventory availability, better interactions between customer service representatives and customers, and faster processing times in areas such as loan origination." Forrester added that HANA promises to help enterprises to achieve better product relevance and product availability, improved customer service, faster customer acquisition, and to innovate new products and services.

Organizations are already experiencing HANA's ability to achieve breakthrough results and performance improvements in reporting and analysis. For example:

- Accenture\* has helped a multinational engineering and construction company to migrate its SAP ERP to Business Suite on HANA in two global regions. Advantages achieved with Accenture's help include a huge increase of speed of reporting, with some reports for end users now produced in 3 seconds—up to 44,900 percent faster than previously. Usability is now far better, and this is driving deeper business Insights and better decision-making. Tasks previously considered purely operational can now be simulated multiple times by business scenario.
- Accenture is working with a chemical company to implement a global SAP instance using S/4HANA. The benefits will include real-time pricing, predictive asset maintenance, DSO optimization, cost reduction for M&A projects, inventory reduction and lowered IT running costs, projected to save the company \$14 - \$25m a year.
- Accenture has helped an aerospace manufacturer to use HANA to accelerate its financial closing processes, and to provide vastly superior visibility of production data. Production information is now available to the shop floor, which enables effective decision making to optimize the supply chain close to real time.

As more organizations harness the power of SAP HANA to achieve results like these, they will move beyond improving and reinventing their core processes and ultimately to reinventing their business models.





## SAP and the Intel® Xeon® Processor E7 v3 Family

Intel and SAP have been working together to deliver excellent performance in the "in-memory compute" even before the inception of HANA. The first version of SAP HANA was launched in 2011 on the Intel® Xeon® Processor X7560. Since then, Intel and SAP have continued to deliver improved customer value. SAP HANA SP9 and the Intel® Xeon® Processor E7v3 deliver 2.7x more transactions per minute (TPM) than previous generation platforms. Intel® Transactional Synchronization Extensions (Intel® TSX) enables additional performance gains. This capability provides a set of extensions that allow programmers to code for transactional synchronization. Programmers can use these extensions to achieve the performance of fine-grain locking while actually programming using coarse-grain locks. This allows SAP to allocate and manage the level of processor concurrency and serialization that best meets their code needs. By adding Intel TSX, HANA/Intel platforms see an increase of up to 6x TPM.<sup>8</sup>











## Three steps using HANA to create the future architecture for your enterprise

If your organization uses SAP Business Suite and you are not already migrating to HANA on multi-core Intel Xeon processor-based servers, you are strongly advised to start investigating how you would benefit in business terms from migration, and to start planning your roadmap to a HANA-based future for enterprise software. We suggest three steps:

**1. Migration:** The first step on the journey for most organizations is to migrate SAP ERP to the HANA platform to exploit the power of in-memory computing on a multi-core platform. This will allow leveraging significant improvements of more than 800 important transactions available when classical SAP ERP is migrated to the HANA platform. Benefits include faster financial closing, faster and more flexible MRP, and better sales & operational planning. This could significantly improve decision making for the business by leveraging HANA's powerful capabilities for operational real-time reporting (HANA Live) and for advanced analytics such as customer segmentation.

**2. Business Process Transformation:** The second phase begins with the implementation of redesigned and leaner processes using S/4HANA: simplifying, improving, or redesigning business processes e.g. with Simple Finance. With better and leaner processes implemented leveraging HANA's capabilities, the enterprise is ready to transform the products and services that it offers its customers—or to develop entirely new ones by offering customers smarter products and services. For instance, optimization of production using IT-OT Integration, or predictive maintenance services that exploit the powerful analytical capabilities of HANA.

**3. Business Model Disruption:** The third phase is potentially the most exciting. Using the leaner processes and the capabilities to create smarter products developed on the platform of S/4HANA on Intel, the enterprise can target new customers and new markets by creating not just new offerings, but new and potentially disruptive business models. For example, capital goods manufacturers could move from selling to renting machinery to their customers—charging by usage or by the hour. The shift, made possible by HANA's powerful predictive analytic capabilities, would generate more predictable revenues for the manufacturers, avoiding the peaks and troughs of today's business cycles dependent of occasional large deals. By shifting from Capex to Opex payment models for capital goods, customers would have less need to borrow to fund future investments and would track their capital-goods spend more directly to their needs rather than having to 'pre-invest' large sums to buy machinery before its needed.

Whichever roadmap you choose to take you to the future, there is no doubt that for SAP ERP users the future lies with HANA-based ERP running on multi-core Intel processor-based servers. With the demand of the digital era becoming more pressing every day, the time to start planning the roadmap is now.

## References

- <sup>1</sup> Markus Schwarz: A Digital Core for the Digital Age (SAP Community Network, 1<sup>st</sup> September 2015).
- <sup>2</sup> IDC: SAP HANA Announcements, Tools to Accelerate Transformation, doc no 259097, (September 2015).
- <sup>3</sup> Plattner, Hasso; Zeier, Alexander: In-Memory Data Management—Technology and Applications, 2<sup>nd</sup> edition, Springer-Verlag Berlin (2012).
- <sup>4</sup> Saugatuck Technology, an ISG business: SAP S/4HANA is More Core Business Re-invention (Lens360 blog, 4<sup>th</sup> February 2015).
- <sup>5</sup> Plattner, Hasso; Zeier, Alexander: In-Memory Data Management—Technology and Applications, 2<sup>nd</sup> edition, Springer-Verlag Berlin (2012).
- <sup>6</sup> Results based on write cycling metrics recorded on published specifications of in-market memory products against internal Intel specifications. Intel press release: Intel and Micron Produce Breakthrough Memory Technology (28<sup>th</sup> July 2015).
- <sup>7</sup> Forrester: SAP Hana Promises To Revolutionize CX—But Clients Struggle To Find The Right Partner (9<sup>th</sup> June 2015).
- <sup>8</sup> Up to 6x performance improvement for transactional workloads with new Intel® Transactional Synchronization Extensions (TSX) claim based on SAP\* OLTP internal insert and select tests measuring transactions per minute (tpm) on SuSE\* LINUX Enterprise Server 11 SP3. Configurations: a. Baseline 1.0: 4S Intel Xeon processor E7-4890 v2, 512 GB memory, SuSE\* LINUX Enterprise Server 11 SP3, SAP HANA\* 1 SP8 scoring 14,327 tpm; b. Up to 2.7x more tpm: 4S Intel Xeon processor E7-8890 v3, 512 GB memory, SuSE\* LINUX Enterprise Server 11 SP3, SAP HANA\* 1 SP9 – Intel TSX disabled scoring 39,330 tpm; c. Up to 6x more tpm: 4S Intel Xeon processor E7-8890 v3, 512 GB memory, SuSE\* LINUX Enterprise Server 11 SP3, SAP HANA\* 1 SP9 – Intel TSX enabled scoring 89,619 tpm. For more complete information visit <http://www.intel.com/performance/datacenter>

## Intel's technical appendix

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