



## **Prepare for the Quantum Leap in Real-Time Analytics**

How in-memory analytics is going to change everything about your enterprise

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Sometimes a seemingly unassuming shift in technology poises a revolutionary change. In an age where massive quantities of data is accelerating in volume, variety and velocity, we need a data acceleration solution that is disruptive, game-changing, and transformative.

Enter high-performance, massive capacity in-memory analytics, representing massive, game-changing increases in computing speed and the ability to analyze massive data sets in real-time, fundamentally able to change how business leaders will view their processes, decisions, and business models. Just like the printing press, the combustion engine, the transistor, e-commerce, the smartphone, or other revolutionary inventions, simply describing attributes of the technology itself doesn't even begin to describe the

changes that in-memory analytics will enable.

In-memory analytics will be able to remove latency in data, enabling real-time use of operational or transactional information instantly accessible for analytics for decision makers to view the current reality of their operations. It means that entire tracts of data analytics practices and systems will fundamentally change and shift to in-memory computing. People will get to use the entirety of the enterprise data, at the moment of its creation, without ever moving it, cubing it, ETL-ing it, replicating it, etc. They just get to use it right then and there. According to Gartner Group, *"By 2012, 70% of Global 1000 organizations will load detailed data into memory as the primary method to optimize BI application performance."*<sup>1</sup>

This new enabler has the potential to change enormous and diverse aspects of business: it will super-charge time-to-value in decision-making capabilities, it will enable the creation of new business models, it will change how processes are optimized, and it will fundamentally change the way organizations will leverage their enterprise applications for analytics and real-time decision making. It has massive potential to significantly change how line of business executives (such as COO, CFO, CMO, etc. as well

as their supporting inventory planners, financial forecasters, campaign analysts, etc.) plan and operate their businesses and will have wide-spread effects across almost every industry in the world, be it banking, retail, manufacturing, public services, distribution, life sciences, etc. No industry will be untouched.

It's big news for the CIO too. Unlike most disruptive change, in-memory doesn't require actual disruption to an enterprise's IT environment. These

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### **In-memory analytics in action: Large retailer**

A large consumer products retail company wanted to analyze all their point-of-sale (POS) data to predict demand, especially during promotions where inventory levels can be unexpectedly and suddenly diminished (or not).

Ideally, they wished to target restocking shelves with 48-hour turn-around. The data set they needed to analyze each cycle was 460 Billion records (or 40 Terabytes), a set of data that was unworkable with any real speed using their current database platform.

The company chose to employ a high performing analytics solution to work in concert with their existing system. They achieved 20 times faster analysis with 200 times better price and performance. Most importantly, they moved from five days down to two days for shelf turnaround and took great leaps to eliminate out of stock situations during promotions.<sup>3</sup>

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technologies work side-by-side with existing systems and require no painful integration or replacement of existing systems. It's relatively inexpensive and helps enable companies to tackle their biggest problems first - to test, to learn, and adapt.

The moment to seize the opportunity is upon us now. In five years from now, we will likely see significant shifts from disc memory to in-memory for many analytics applications. The smart money is moving fast and moving now, and the leaders that figure out their in-memory play today will be the ones who ride the front wave going forward.

### The rise of in-memory computing and the explosion of data

Neither in-memory computing nor the need for faster analytics are new developments, but both of these factors have had recent major advances that, when considered together, create the opportunity for explosive change. The biggest is the incredibly significant jump in scale and volume in-memory can now handle, thanks to years of recent

investment and discovery by some key technology firms.

In simple, laymen terms, in-memory computing is the ability to perform computer operations in RAM that were traditionally performed on a hard drive. If you think about your personal computer, you typically perform some active activity in memory (such as work on a single spreadsheet) and you store the hundreds or thousands of files you aren't actually using at the moment on your hard drive. While working on the spreadsheet is pretty fast, accessing another file on your hard drive takes time to find, activate, and finally open. And if opening one file seems slow, imagine how slow opening ALL of your files would be simultaneously. This is where in-memory analytics offers a major shift. Instead of using hard drives to store hundreds of terabytes of enterprise data, we can do it in the memory where we actually work and manipulate the data (not just store) at potential speeds 1,000 times faster than conventional systems.

Simultaneously, we are experiencing an explosion in the amount of data



enterprises and markets are generating. Every day, 15 petabytes of new information are being generated. This is eight times more than the information in all U.S. libraries. 80% of new data growth is unstructured content.<sup>2</sup> Data sensors on objects such as machines, trucks, shelves, and inventories are accelerating the volume of data. Plus, the base traditional data in transactional and ERP systems is also growing rapidly.

As most business leaders know, there is incredible intelligence locked in this massive amount of data, and the best and brightest leaders know that they can vastly improve their decision-making if they can access and use the insights in this data. Marketers could better target customers using sentiment analysis over Twitter. Sales and service people could offer the perfect product offers at the best time. Procurement officers could make strategic purchases when prices and demand are optimal. Logistics experts could super-target inventories based on real-time demand signals. Finance could make smarter decisions about budgeting or avoiding risk. And so on. Enterprises will have

integrated analytics within many more of their processes. Almost every actor in the enterprise could wildly benefit from getting more and faster intelligence from his or her data.

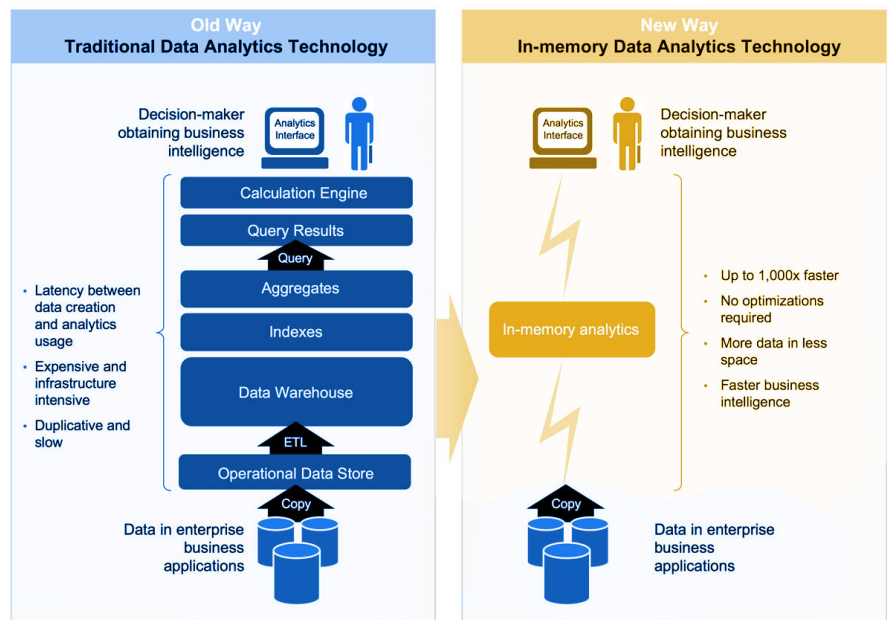
### **New way vs. old way**

Traditionally, this has been the disciplines of *business intelligence, analytics, data warehousing, data marts, reporting, master data management*, and a host of other activities aimed at extracting the intelligence from these sources of business data. The traditional data warehousing process is now well known: at some time interval (day, week month) an engineer or piece of software makes a giant copy of the data in the transactional and planning systems to an operational data store. It then moves it through a transformation process to make it suitable for analytics (called extract-transform-load), and loads it into a data warehouse. The data then must be further processed with indexes, aggregates, queries, and calculations, done ahead of user interaction to deal with its volume and processing requirements. It can then

be accessed by analytics tools to make reports, generate insights, and potentially more local data marts. Only now is the business user ready for insights, decision-making, and business action.

In this process, the business user is constrained to only view data from the past, and only compiles it relatively slowly and in limited formations. While his or her daily operations whizzes by at the speed of business, they are stuck depending on data views of the past. Now imagine, with in-memory analytics, they didn't have to go through the data warehousing process? Instead of waiting, they used the transactional

data that was being created right now. Instead of any latency, they access it immediately. Analysis that would take hours of processing time may potentially now take seconds. This is what the new reality of in-memory computing is. In simple terms, organizations can cut latency, enable access, and quicken discovery. Looking through a wider lens, we fundamentally have transformed how decisions can be made, and have leveraged the physical data warehouse with a "logical enterprise warehouse", an actual *non*-warehouse that pulls data from virtually anywhere at anytime on demand.



In-memory analytics technologies also have the capability to capture data from traditional disk-based databases by efficiently replicating it into memory in near real-time. Companies can combine both data sources to seamlessly support demanding business needs for real-time reporting based on the latest available data with unmatched administrative effort.

In short, we go from complex to simple, from slow to fast, and from unviable to vital.

The development of in-memory technology is no accident. Leading firms in the technology and ERP space made heavy investments for many years to make this happen, knowing all the time the profound and transformative implications of the invention. Working to get the right economy of memory

production, piloting new software, and building new hardware, were all in grand design to fulfill massive, revolutionary, game-changing business transformation.

### The in-memory transformation opportunity

The opportunities for in-memory analytics transformations are exciting for both business leaders (such as CFOs, CMOs, supply chain leadership, HR leadership, etc.) and technologists. This paper will primarily discuss these trends in *business terms* and will only go into technical opportunities as they are aligned specifically with achieving business goals and helping to mitigate deployment risk. Technologists can be comforted that there is no shortage of technical specs and documents available on this topic available under separate cover.

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### Imagine this...

A consumer products company using in-memory analytics analyzes 600 million records in 2.9 seconds enabling the analyst to drill-down in detail instantly and analyze any SKU, product family region, or time period *instantly*.<sup>3</sup>

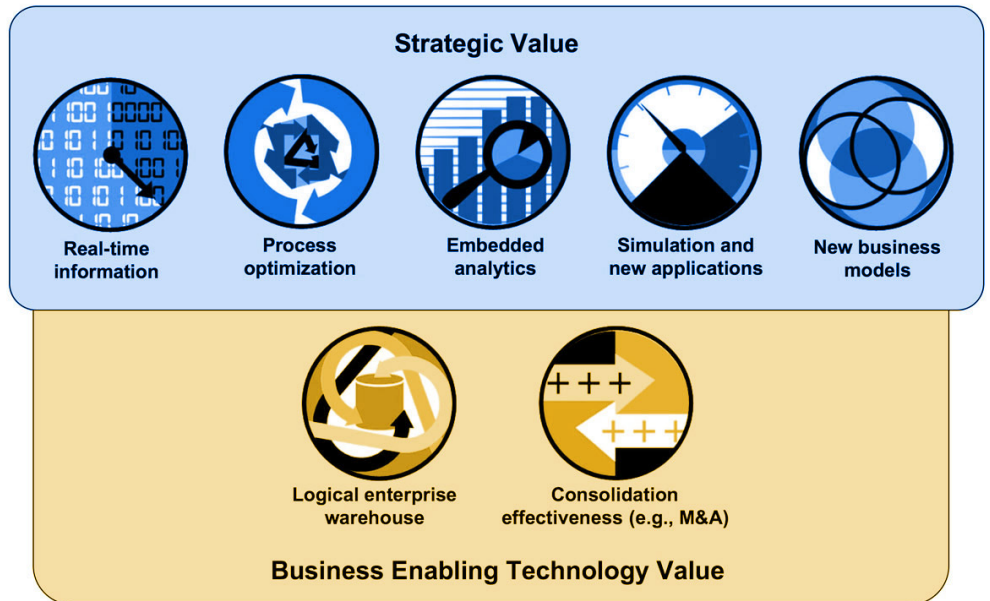
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**The scope of strategic value that we can envision within enterprise-class businesses that use in-memory analytics**

In-memory analytics should generate a lot of excitement with business leaders across lines of business and departments. As business leaders contemplate changes, they will need to take themselves out of the space of traditional thought on business analytics and decision-making. It is natural for people to try to imagine “what they do now” but perhaps just faster or with

less frustration. This is all good, but the real opportunities will come as business leaders re-imagine their jobs and work-group function, think about how they can reinvent their core operating models, change how they view the present and the future, and rebuild processes in ways previously unimaginable.

Listed below are seven prime areas that business leaders and technologists may rethink as they explore and discuss in-memory analytics with their colleagues and trusted advisors:







### Real-time information and speeding time-to-value in business activities

Perhaps the biggest change will be in using real-time data and analysis vs. traditional data analytics that has problems of latency, replication, and potentially a misrepresentation of reality. With real-time information pulled directly from the source, business leaders would be able to speed time-to-value in all business activities, meaning that the decisions they made would be more immediate and their effects (be they positive or negative) would happen much faster.

In the new state, business people experience decisions such as:

- A marketer could monitor the performance of a campaign as the messages are delivered to prospects and change, on the fly, the parameters (spend, message, offer, etc.) of the campaign to juice the results.
- A service manager could identify peaks or trends in call types and activate additional resources or change tactics to deal with the actual demands of customers.
- A retailer could monitor the inventory on their smart shelves as items were purchased and restock them quickly, potentially cutting turns from weeks to days.
- A manufacturer could continually track the productivity of equipment, assets, and source materials and sense equipment breakdowns and assembly line bottlenecks as they occur.
- A sustainability manager could monitor water usage or waste production and perform cost/environment trade-off analysis in real-time to help minimize harmful environmental effects.
- A financial risk manager could monitor capital markets in synch with their own capital needs in real-

time to help know optimal times to borrow and repay debt.

- An HR manager could monitor the utilization efficiency of employees on an hourly or daily basis as they work to make staffing and deployment decisions.



### Process optimization

Today, when we think of fixing business processes, we often try to drive efficiency by streamlining or removing wasteful

parts of an existing process. Even when designing new processes, we are often hampered by our habituated knowledge of how things were done in the past.

With real-time information, many business leaders may find themselves exiting out of traditional incremental process design and discovering that they may need to reinvent how they think of the process altogether. Imagine a finance manager who traditionally performed budgeting and forecasting on monthly or quarterly basis. In the traditional method, he or she may attempt to tweak the process to use fewer analysts or produce better reports. With the

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### Incredible: Large Euro bank overdrives customer contact data management

CRMers in a large Euro bank realized 6.3x data compression and 369x average query speed-up using in-memory analytics. In their old method, they could only store 30 days of information because of its size - and just to get reports the processing could run eight hours. In-memory analytics was applied to all inbound and outbound customer contact data and was analyzed by a large number of groups within the bank. Better yet, no significant changes were needed, including no schema changes - they used the same data and the same SQL, but now got their benefits immediately.<sup>3</sup>

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possibility of in-memory analytics, they may shift their vision to having core plans updated every day.



### Embedded analytics

With in-memory analytics, organizations may find powerful new opportunities to use embedded analytics where sophisticated, real-time analysis of events is performed at the point of interaction and then specific and unique business action is taken in response to improve an outcome or performance. We can imagine potential embedded analytics applications that may include:

- During a customer service technical support call, the agent is able to offer the customer new solutions based on analysis of the customer's voice responses, emotional indicators, and profile data.
- A certain combination of selling medical devices from inventory

prompts an inventory replenishment action in real-time.

- A malfunctioning pressure valve in an oil rig sends an alarm to the right repair personnel who is closest to the incident and provides them with the repair solution and parts that are needed.
- A trade promotion management system analyzes a purchase at a retail location and prompts the proper add-on sales opportunities such as warranty and service contracts.
- A sensor measures traffic on a busy highway and changes toll rates to regulate traffic flows and capacities in real-time.

These are all real examples of embedded analytics being used today. As with other, older applications of analytics, the latency required to execute these kinds of programs in any significantly massive scale would prohibit real-time action. With in-memory analytics, these types

of actions don't just become possible -- they become pervasive.

customer impact, and ecological impact to create compelling and advantageous manufacturing processes.

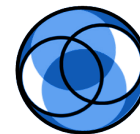


**New applications such as simulations**

In-memory analytics will help enable businesses to develop and utilize entire new applications that previously didn't exist or required too much time (both in terms of usage and latency) to perform. New applications may arise, such as using simulations that may enable someone to analyze data such as:

- Model and predict crime rates in major cities so that emergency and police personnel can be staffed and deployed to help improve social order.
- Simulate multiple customer loyalty scenarios based on interactions, attitudes, demographics, and other profile criteria to optimize churn rates.

- Simulate shipping and inventory routes based on weather conditions, fuel prices, and other dimensions to determine optimal inventory packing and shipping routes.
- Model the trade-offs between different aspects of manufacturing design in terms of financial impact,



**New business models**

Ultimately some companies will actually change how their business is structured and operates, how they will re-distribute accountability and power, how risk profiles will change with increased

speed, and how roles will change with real-time data. Some companies may find themselves getting “skinnier” or “fatter” as they put decision-making into different hands. Companies will change how people collaborate with each other as entirely new swaths of information is delivered at the point of need.

These types of changes represent new business models and is perhaps the most intriguing, provocative, and exciting aspect of the potential for in-memory analytics. Once the habit of incremental change is shed and leaders realize the true opportunities, we may see wild change that is difficult to project right now, only limited to the innovations and imaginations of creative leaders taking some bold new steps with analytics.

#### **The scope of business enabling technology for in-memory computing**

The value of in-memory computing for technologists in their drive to support business users is also compelling.



#### **Emergence of the “logical enterprise warehouse”**

In-memory analytics works by accessing information from their existing stores in real-time as opposed to requiring the processes and infrastructure of traditional data warehousing. This will change the fundamentals of IT architecture beginning now and into the future, having a profound impact on how technologists think about deploying analytics and applications. Some call this the “logical enterprise warehouse” where the analytics processes and infrastructure is logical but doesn’t exist physically.

Some are predicting that there will be significant shifts from hard discs to in-memory for specific applications, especially analytics. With this transformation, we could imagine “logical enterprise warehouse” to be a transitory term that has relevance vis-à-

vis traditional physical data warehouses. As adoption of in-memory computing continues, we could expect many new technological concepts and terms to likely emerge.



### New view of consolidation and integration

Many businesses have a perpetual and pervasive challenge in standardizing and integrating systems. New mergers or acquisitions almost always require a painful reconciliation of multiple ERP instances. Multi-national companies who operate in many markets, those with many Strategic Business Units (SBUs), holding companies with subsidiaries, etc., often have similar diverse and disparate portfolios of systems that need to be integrated and coordinated. These types of efforts keep entire IT organizations occupied for years. With the emergence of in-memory analytics and the “logical enterprise warehouse”

these types of integrations will be simpler and faster. Because the data is pulled in real-time, achieving analytics capabilities won’t require much rip-and-replace type integration, it will provide flexibility in how quickly systems must be physically integrated, and will help drive change to the cost/value equation for integration overall.

### Other technology benefits: Help drive lower risk, lower TCO, more flexibility

While this paper mostly expounds on the value of in-memory analytics to business leadership, the technology implications are huge. New high performance analytics technologies are being brought to market that help to significantly reduce the risk of making these changes while driving a lower total cost of ownership and providing new flexibility for changes going forward. These technologies help address implementation risk through aspects such as:

- **Side-by-side deployment:**  
Systems can be deployed and tested ‘side-by-side’ with existing



systems, providing no business or IT disruption, which allows for flexibility in adoption speeds, and is easily reversible.

- **No trade-offs:** Most system changes require a migration or wholesale change in functionality that leads to making trade-offs between the benefits of one system over the other. With in-memory analytics, the effect is incremental in value to the existing systems and feature/value trade-offs are possibly unneeded.
- **Non-destruction of existing investments:** With the technology's side-by-side and incremental deployment, existing investments in ERP and other systems remain intact and still functioning.
- **Gradual change approach and prioritization of change:** Because of the technology's flexibility, organizations can change at the rate they feel comfortable with, test

new operations safely, and prioritize areas they find important. Again, unlike migrating to a new system, no monolithic changes are required.

A fully articulated technology discussion is not presented here. This said, both the business leadership and IT leadership can certainly justify a more thorough and purposeful conversation and exploration of in-memory computing based on these aspects alone, and should be encouraged to “dive in deep” to explore the opportunities in-memory analytics can provide.

## Conclusion

For many business leaders staring at the immense opportunity for radical, disruptive change through in-memory analytics, the response may be one of excitement, advocacy, and unbridled enthusiasm for the future. For others, it may come with apprehension, fear, disbelief, or uneasiness towards change. Regardless of your particular posture, the smart company needs to get

ahead of the in-memory conversation, dive deeply into understanding how it works and what it presents, and craft a purposeful strategy and roadmap for their in-memory future.

The shift to in-memory analytics will make time-to-value in countless business decisions accelerate. It will change the pace of adoption and integrated analytics within the enterprise. It will change total cost of ownership for IT. It will create an entirely new path to value that most companies have not experienced before.

Like most emerging mega-trends, success or failure with in-memory analytics will come with the speed of adoption. Early adopters will have the most opportunities to create new competitive advantages as well as suffer through the most mistakes. Late adopters may have to play “catch-up” as their competitors lap them analytically. The worst action here is inaction, and those who are prepared intellectually for the change will be best suited to plan

their futures and act upon opportunity successfully. The fast movers will be positioning for a new economy, becoming ‘analytics competitors’ that out-think and out-act their competition like rarely seen before.

For more information about IBM, go to [www.ibm-sap.com/hana](http://www.ibm-sap.com/hana)

For more information about SAP, go to [www.sap.com/platform/in-memory-computing](http://www.sap.com/platform/in-memory-computing)





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