

Tech Trends 2014

In-memory revolution

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An answer to big data

As in-memory technologies move from analytical to transactional systems, the potential to fundamentally reshape business processes grows. Technical upgrades of analytics and ERP engines may offer total cost of ownership improvements, but potential also lies in using in-memory technologies to solve tough business problems. CIOs can help the business identify new opportunities and provide the platform for the resulting process transformation.

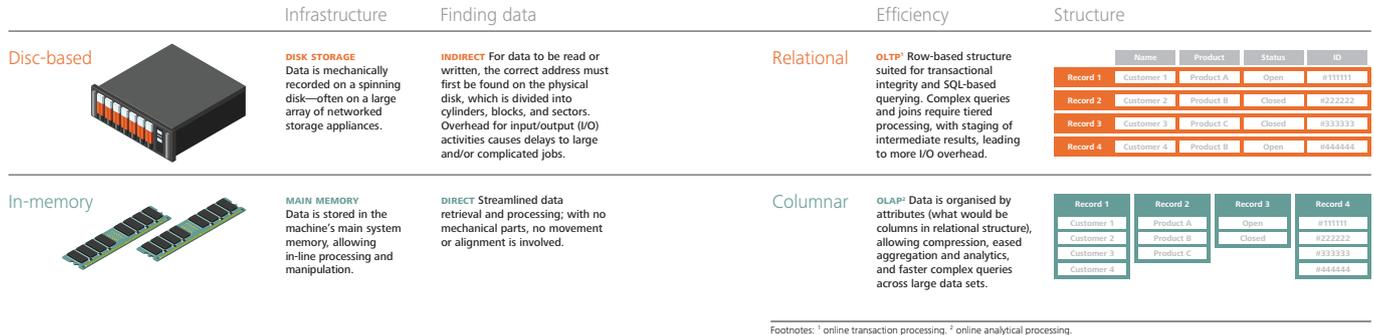
DATA is exploding in size – with incredible volumes of varying forms and structure – and coming from inside and outside of your company’s walls. No matter what the application – on-premises or cloud, package or custom, transactional or analytical – data is at its core. Any foundational change in how data is stored, processed, and put to use is a big deal. Welcome to the in-memory revolution.

With in-memory, companies can crunch massive amounts of data, in real time, to improve relationships with their customers – to generate add-on sales and to price based on demand. And it goes beyond customers: The marketing team wants real-time modelling of changes to sales campaigns. Operations wants to adjust fulfillment and supply chain priorities on the fly. Internal audit wants real-time fraud and threat detection. Human resources wants to continuously understand employee retention risks. And there will likely be a lot more as we learn how lightning-fast data analysis can change how we operate.

An evolution of data’s backbone

Traditionally, data has been stored on spinning discs – magnetic, optical, electronic, or other media – well suited for structured, largely homogeneous information requiring ACID¹ transaction processing. In-memory technologies are changing that core architecture – replacing spinning discs with random access memory (RAM) and fueling a shift from row-based to column-based data storage. By removing the overhead of disc I/O, performance can be immediately enhanced. Vendor claims vary from thousand-fold improvement in query response times² to transaction processing speed increases of 20,000 times.³ Beyond delivering raw speed, in-memory responses are also more predictable, able to handle large volumes and a mix of structured, semi-structured, and unstructured data. Column-based storage allows for massive amounts of data of varying structures to be promptly manipulated, preventing redundant data elements from being stored.

While the concept of in-memory is decades old, the falling price of RAM and growing use cases have led to a new focus on the technology. CIOs can reduce total cost of ownership because the shift from physical to logical reduces the hardware footprint, allowing more than



40 times the data to be stored in the same finite space. That means racks and spindles can be retired, data centre costs can be reduced, and energy use can be slashed by up to 80 percent.⁴ Operating costs can also be cut both by reducing maintenance needs and by streamlining the performance of employees using the technology.⁵ In addition, cloud options provide the possibility of pivoting from fixed to variable expenses. The bigger story, though, is how in-memory technology shakes up business processes.

Beyond the technology

CIOs should short-circuit market hype and determine which areas of their business can take advantage of in-memory technology. In last year's *Tech Trends* report, our "Reinventing the ERP Engine"⁶ chapter asked a specific question: What would you do differently if you could close your books in seven seconds instead of seven days? Today, with advances in in-memory technology, that "what if" has become a reality that is driving companies to consider both the costs of ERP upgrades and the breakthrough benefits of real-time operations.

Operational reporting and data warehousing are easy targets for in-memory, especially those with large (billion-plus-record) datasets, complex joins, ad hoc querying needs, and predictive analytics. Core processes with long batch windows are also strong candidates: planning and optimisation jobs for pricing and promotions, material requirements planning (MRP), and sales forecasting.

The sweet spot is where massive amounts of data, complex operations, and business challenges demanding real-time support collide. Functions where the availability of instantaneous information can improve decision quality – telecommunications, network management, point-of-sale solutions – are good candidates for an in-memory solution. Over the next 24 months, some of the more important conversations you'll have will likely be about in-memory technologies.

Not every workload will be affected equally, and the transition period will see a hearty mix of old and new technologies. We're still in the early stages of businesses rewiring their processes to take advantage of the new engine. Analytics will continue to see the lion's share of investment, with in-memory – fueled insights layered on top of existing legacy processes. Point technical upgrades will offer incremental benefits without the complexity of another round of process transformation. And ERP vendors are still in the midst of rewriting their applications to exploit the in-memory revolution.

And while benefits exist today, even more compelling scenarios are coming soon. The holy grail is in sight: a single data store supporting transactions and analytics. This is great news for CIOs looking to simplify the complexity of back-end integration and data management. It's even better news for end users, with new experiences made possible by the simplified, unified landscape.

Communicating at light-speed

In the telecommunications industry, the customer experience has historically been defined through a series of disconnected, transactional-based interactions with either a call centre or retail store representative. Customers have likely witnessed frustrating experiences such as service call transfers that require repeated explanations of the problem at hand; retail store interactions conducted with little understanding of their needs; and inconsistency of products and offers across different channels. While some companies may see this as a challenge, T-Mobile US, Inc. recognised an opportunity to innovate its customer experience.

The challenge many companies face is a “siloe” view of customer interactions across traditional marketing, sales, and service channels, as well as across emerging channels such as mobile devices and social media. T-Mobile recognised the potential in connecting the dots across these interactions and creating a unified customer experience across its channels, both traditional and emerging. By shifting its customer engagement model from reactive to proactive, T-Mobile could understand, predict, and mitigate potential customer issues before they occur and drive offers based on an individual’s personal history (i.e., product usage, service issues, and buying potential). This was certainly a tall order, but it was a compelling vision.

T-Mobile’s approach was to create a single view of customer interactions across channels. Each time a customer interacts with T-Mobile, the company records a “touch,” and each time T-Mobile corresponds with a customer, the company also records that as a touch – creating a series of touches that, over time, resemble a conversation. The next time that T-Mobile and a customer interact, there are no awkward exchanges: The conversation starts where it left off. And the collection of touches can be used in real time to drive personalised pricing and promotions – through the web, on a mobile device, or while talking to a call centre agent.

The situation T-Mobile faced when getting started: Two terabytes of customer data, created just in the last three months, stored in 15 separate systems with 50 different data types. Producing a single, consumable view of a customer’s interaction history with the company’s existing systems was likely impossible. Add the desire to perform advanced analytics, and it was clear the existing systems could not support the effort. To address these technical limitations, T-Mobile implemented an in-memory system that integrates multichannel sales, service, network, and social media data. The powerful data engine, combined with a service-oriented architecture, allows T-Mobile to capture customer interactions in a dynamic in-memory data model that accommodates the ever-changing business and customer landscape. The in-memory capabilities enable the integration of advanced customer analytics with a real-time decision engine to generate personalised experiences such as a discount for purchasing a new device the customer is researching or an account credit resulting from network issues impacting the customer.

T-Mobile’s multichannel customer view takes the guesswork out of providing “the next best action” or “the next best offer” to customers. Data integration across traditional and emerging channels allows T-Mobile to see the full picture of a customer’s experience so its employees can proactively engage customers with the appropriate message at the appropriate time. The importance of the customer experience has never been greater, and T-Mobile is shaking up the wireless industry by eliminating customer pain points. Customers can take advantage of its no-annual-service-contract Simple Choice Plan, an industry-leading device upgrade program, as well as unlimited global data at no extra charge. By implementing an in-memory platform to better understand its customers, T-Mobile continues to extend its competitive advantage with its differentiated customer experience.

Where do you start?

VENDORS are making strategic bets in the in-memory space. IBM and Microsoft have built in-memory into DB2 and SQL Server. A host of dedicated in-memory products have emerged, from open source platforms such as Hazelcast to Software AG's BigMemory to VMWare's SQLFire.

But for many CIOs, the beachhead for in-memory will come from ERP providers. SAP continues to heavily invest in HANA, moving from analytics applications to its core transactional systems with Business Suite on HANA. SAP is also creating an ecosystem for developers to build adjacent applications on its technology, suggesting that SAP's HANA stack may increase over the next few years.⁷

Oracle is likely making a similar bet on its latest database, 12c, which adds in-memory as an option to its traditional disc-based, relational platform.⁸ While there will be disruption and transition expenses, the resulting systems will likely have a lower total cost of ownership (TCO) and much higher performance than today's technology offers.

In addition, Oracle and SAP are pressing forward to create extensive ecosystems of related and compatible technologies. From captive company-built applications to licensed solutions from third parties, the future will be full of breakout opportunities. Continuous audits in finance. Real-time supply chain performance management. Constant tracking of employee satisfaction. Advanced point-of-sale solutions in retail. Fraud and threat detection. Sales campaign effectiveness. Predictive workforce analytics. And more. Functions that can benefit from processing crazy amounts of data in real time can likely benefit from in-memory solutions.

Vendors are pitching the benefits of the technology infrastructure, with an emphasis on real-time performance and TCO. That's a significant start, but the value can be so much more. The true advantage of an in-memory

ecosystem is the new capabilities that can be created across a wide range of functions. That's where businesses come in. Vendors are still on the front end of product development, so now is the time to make your requirements known.

- **Start by understanding what you've already bought.** In-memory is an attractive and invasive technology – a more effective way of doing things. You may already have instances where you're using it. Assess the current benefits and determine what more you may need to spend to capitalise on its real-time benefits.
- **Push the vendors.** Leading ERP vendors are driving for breakthrough examples of in-memory performance – and are looking for killer applications across different industries and process areas. Talk with your sales reps. Get them thinking about – and investing in – solutions you can use.
- **Ask for roadmaps.** Move past sales reps to senior product development people at vendors and systems integrators. Ask them to help create detailed roadmaps you can use to guide the future.
- **First stop: analytics.** You'll likely find more immediate opportunities around your information agenda – fueling advanced analytics. In-memory can be used to detect correlations and patterns in very large data sets in seconds, not days or weeks. This allows for more iterations to be run, drives “fast failing,” and leads to additional insights and refined models, increasing the quality of the analysis. These techniques used to be reserved for PhD-level statisticians – but not anymore.

- **Focus on one or two high-potential capabilities.** No company wants to conduct open-heart surgery on its core ERP system. Instead, pick a few priority functions for your business to gain buy-in. Your colleagues need to see the potential upside before they'll appreciate what a big deal this is. Analytics is a good starting point because it's fairly contained. Customer relationship management (CRM) is another good match, with its focus on pricing agility and promotion. After that, consider supply chain and manufacturing.
- **Watch competitors.** Experimentation will take place in many areas over the next two years. If a competitor develops new capabilities with demonstrated value in a particular area, the dam will break and the adoption curve will take off. Be ready for it.

Bottom line

Some technology trends explode onto the scene in a big way, rapidly disrupting business as usual and triggering an avalanche of change. Others quietly emerge from the shadows, signaling a small shift that builds over time. The in-memory revolution represents both. On the one hand, the technology enables significant gains in speed, with analytics number-crunching and large-scale transaction processing able to run concurrently. At the same time, this shift has opened the door to real-time operations, with analytics insights informing transactional decisions at the individual level in a virtuous cycle. The result? Opportunities for continuous performance improvement are emerging in many business functions.

Authors

Mike Brown, principal, Deloitte Consulting LLP

Doug Krauss, specialist leader, Deloitte Consulting LLP

1. ACID is an acronym for four rules for database transactional integrity: Atomic (ability to guarantee either the completion of a unit of work, or roll back the system upon failure), Consistent (ensure updates are applied everywhere—without violating any constraints or dependencies), Isolated (transactions execute independently without interference), Durable (transactions are persistent once committed).
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5. Oracle, "San Diego Unified School District harnesses attendance, procurement, and operational data with Oracle Exalytics, generating \$4.4 million in savings," <http://www.oracle.com/us/corporate/customers/san-diego-usd-1-exalytics-cs-1865766.pdf>, accessed January 2, 2014.
6. Deloitte Consulting LLP, *Tech Trends 2013: Elements of postdigital*, 2013, chapter 8.
7. Chris Preimesberger, "SAP moving all products to in-memory HANA database," *eWeek*, January 10, 2013, <http://www.eweek.com/enterprise-apps/sap-moving-all-products-to-in-memory-hana-database/>, accessed January 6, 2014; James Governor, "SAP consigns everything pre-HANA to history. In-memory first development," October 28, 2013, <http://redmonk.com/jgovernor/2013/10/28/4031/#ixzz2peS4OhMa>, accessed January 6, 2014.
8. Alexander Wolfe, "Ellison unfurls in-memory database & big memory machine at Oracle OpenWorld," *Forbes*, September 23, 2013, <http://www.forbes.com/sites/oracle/2013/09/23/ellison-unfurls-in-memory-database-big-memory-machine-at-oracle-openworld/>, accessed January 6, 2014.

Contacts



Keith Blair
Partner, SAP Lead
Deloitte MCS Limited
020 7007 8253
keiblair@deloitte.co.uk



Kevin Walsh
Head of Technology Consulting
Deloitte MCS Limited
020 7303 7059
kwalsh@deloitte.co.uk

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