Reenvisioning the Data Management Landscape
Road Map to the Real-Time Business

Table of Contents

What would your business look like if processes were frictionless? What could you do differently with the power of in-the-moment insight? How could you better use the time and resources you now spend on tracking down information and analyzing data? SAP believes that there is a fundamentally better way for IT organizations to manage the data that drives your business. To become a truly real-time business, you need a unified framework capable of managing your applications and business data seamlessly and more efficiently.

Executive Summary

"Real-time business" is a powerful metaphor for today's forward-thinking companies. These are businesses that have the ability to use all relevant data when and wherever needed for up-to-the-moment decision making. In today's hyperconnected business environment, the demand for faster business cycles and deeper insight is driving a tremendous wave of innovation.

Many companies are now investing in transformative new technologies to accelerate and simplify business processes. Energy companies are reinventing their service offerings through smart metering technologies. Telecommunications providers mine massive amounts of call detail records in order to target higher-margin consumers with personalized, in-the-moment cross-sell and up-sell offers. Financial services firms use real-time market data to drive advanced trading algorithms for optimizing portfolio strategies.

Consider also the many new types of companies that have emerged in recent years whose business models are based not on goods or services but on data that is delivered instantaneously. These businesses range from digital media companies who serve up real-time promotions based on in-store consumer behavior, to data aggregators who provide real-time market and financial data for investment professionals.

Companies in many industries are responding to a convergence of three key market dynamics: vast quantities of readily available data, consumers' insatiable appetite for speed and simplicity, and increasingly powerful computing and storage technologies.

Yet rarely does transformation start with a blank slate. Today's IT landscapes have become incredibly complex and expensive. One reason for this complexity is that over time, computing architectures have evolved to handle fundamentally different purposes. Online transaction processing systems (OLTP) manage the data that supports day-to-day business operations. Specialized analytical systems – data warehouses, data marts, and analytic appliances – have been developed to gain a more comprehensive view of business activities, to predict business outcomes, or to analyze what-if business scenarios. And more recently, new dedicated systems and tools are being deployed to mine unstructured data, semistructured data, and "Big Data" for business value in more expedient and practical ways.

In order to deliver desired performance levels at the right cost, these systems have been created and deployed in a highly specialized, application-specific manner. The result is silos of business functions and data that require significant synchronization and integration efforts to make data useful across the enterprise as a whole. And as business requirements evolve and change, significant effort, time, and costs are required to update the linkages between each of these specialized systems.

Based on our experience with delivering the applications that enable highly successful companies to run their businesses better, SAP recognizes the need for a radically new approach to managing data. In this paper, we reenvision the data management landscape suitable for enabling real-time businesses. We focus on the new data management mandates that are essential for next-generation business applications – those that can help companies run better and also the predictive applications needed to win and thrive in competitive new markets.

These emerging requirements are motivating SAP's technology vision for SAP® Real-Time Data Platform. This unified framework is capable of managing all forms of data used for both transactional and analytical purposes with unprecedented speed and efficiency – and offers a fundamentally new approach to data management that will help you transform your business into a real-time business.

By tying together your organization's data assets – from operational data to external feeds and Big Data – SAP Real-Time Data Platform dramatically simplifies data management landscapes for both current and next-generation business applications.
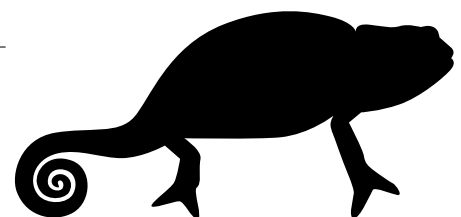
Data Trends and Opportunities

MORE DATA, BIG DATA

Across almost every industry or sector, companies are grappling with vast and growing amounts of information. Data is generated by business operations and enterprise applications. And increasingly, data is generated by many new sources. People generate vast amounts of data that companies now want to analyze and act on, such as Web-click trails, social media tweets and posts, and e-commerce behavior. Machines also generate massive data streams that can be useful for businesses – from RFID tags, mobile devices, and other embedded sensors. Data arrives in many formats – structured (for example, traditional relational tables), semistructured (documents, spreadsheets, HTML, and so on), unstructured data (audio, video, image), and, more recently, streaming data.

There is value to be found in all this data, and innovative companies are learning just how much. Analyzing tweets and social network posts for sentiment analysis helps retailers tune product development and marketing campaigns. Call detail record analysis helps telecommunications providers aim up-sell and cross-sell offers. Location-aware applications combined with customers' purchasing histories allow retailers to target real-time promotions to mobile users.

For IT, turning vast stores of data into valuable business information requires new approaches. Information governance strategies are now expanding to cover Big Data to ensure its trustworthiness for enterprise decision making. Savvy IT organizations are no longer simply creating data models to support transactional applications; they are now designing enterprise information models to orchestrate multidepartmental business processes that rely on data from a variety of sources.

Aggregating data into an enterprise data warehouse is no longer the only way that companies can gain a consolidated view of the business for confident analysis; IT organizations now take advantage of new technologies such as text analytics and Apache Hadoop to mine large volumes of unstructured data located on low-cost storage to incorporate valuable nuggets of information into business decision making. And advanced data and query federation techniques are allowing IT organizations to move data processing and analysis out to the data itself as a way to reduce data movement, duplication, and storage costs.

Harnessing large volumes and a variety of data is a worthy achievement, but it is not enough. IT organizations must also find a way to deliver it quickly to business users so that decisions can be made in time to have a real impact on productivity, profitability, and efficiency.

THE NEED FOR SPEED

The success of companies like Apple and Google has created a whole new generation of technology consumers. After experiencing sophisticated new mobile and social technologies in their personal lives, what users now expect from technology in the workplace has skyrocketed. Today's business users now demand access to relevant information as it occurs. Capital market risk officers want to perform risk management continuously, rather than at the end of each day. Utility companies want to analyze smart meter data in real time to identify customer problems. Manufacturers want to dynamically replan production if critical equipment fails.

While IT departments grapple with the complexities associated with more and new types of data, they must also address their users' insatiable appetite for faster and faster results – anytime, anywhere, on any device.

Recent innovations in technology – including in-memory computing, event stream processing, and real-time mobile solutions – offer IT organizations new ways to process and deliver insights in the ways users now expect.

Harnessing large volumes and variety of data is not enough – IT organizations must also find a way to deliver it quickly to business users so that decisions can be made in time to have a real impact on productivity, profitability, and efficiency.

Through the advantages of in-memory computing, companies can instantly explore and analyze all transactional and analytical data from virtually any source. Operational data can be captured in memory as business happens and more easily combined with other relevant data sources. Flexible visualization tools applied to these aggregated data sets can help businesses gain a broader understanding of their business, resulting in better insight at the speed of thought.

IT organizations can now take advantage of complex event processing (CEP) technology to help business users react faster to changing business events. CEP engines can process high volumes of streaming event data from a variety of data sources in milliseconds, enabling businesses to continuously discover what's happening – while it's happening. Relevant events can be captured and correlated with other data, enabling frontline workers to respond in time to address potential threats or take advantage of business opportunities.

Companies are also investing in new data management, synchronization, and exchange technologies to rapidly deploy data-driven applications across disk, mobile, or cloud environments – effectively extending business processes to any employee or point of action, anywhere.

IT MODERNIZATION

Today's data management landscapes have become incredibly costly, complex, and difficult to manage.

Exponentially larger amounts of data help explain today's IT complexity and rising costs. From now until 2020, the digital universe will about double every two years. Despite Moore's law, the investment in IT infrastructure will grow by 40% between 2012 and 2020.[1]

Data management landscapes are more complex and costly for another reason: technology evolution. Over time, multiple database management systems have been developed to compensate for inherent hardware and software constraints.

Traditionally, organizations have used transactional databases to manage the data that supports fundamental business operations. OLTP is characterized by a high frequency of short, fast transactions (insert, update, delete) from business users. Relatively standardized and simple queries reveal a snapshot of ongoing business processes. Real-time replication of operational data across multiple business systems is essential, as the data is critical to running the business.

By contrast, organizations have developed specialized analytical systems to gain a more comprehensive view of business activities, to predict business outcomes, or to analyze what-if business scenarios. Data is consolidated from a variety of transactional databases and loaded into a data warehouse via periodic, long-running batch jobs to refresh the data. Queries are often complex, involving aggregated and historical data stored in multidimensional schemas. As a result, the results for analytical processes may take hours or longer – making it difficult to quickly deliver in-the-moment insight that can help business users to improve planning, solve problems, and make more confident decisions.

Many organizations create dedicated analytical systems – data warehouses, data marts, and analytic appliances – as complements to operational systems as a way to deliver sophisticated business intelligence at acceptable performance levels. In addition, companies are now exploring and incorporating new data platforms, such as Hadoop with its Hadoop Distributed File System (HDFS) store and MapReduce processing framework, to gain new insights from large volumes of unstructured content. While specialization affords processing advantages, it also adds cost and complexity through data proliferation, redundancy, and additional administrative requirements.

As companies seek to reduce the cost and complexity of their existing IT infrastructures, while at the same time tap into new data sources for rich insights that can lead to competitive advantage, IT organizations are being forced to assess and possibly renew some of their underlying technologies. A modern data management architecture is needed – one that can address these new trends in a unified approach, using powerful in-memory technology that eliminates the need for specialized systems and disparate silos of business applications. The good news is that this modernization of IT comes at a time when rapid innovations in hardware and software result in faster performance at a lower cost, making data-driven advantages economically accessible to a wider number of organizations.

FOOTNOTE

1. IDC Digital Universe Study, sponsored by EMC, December 2012, www.emc.com/collateral/analyst-reports /idc-the-digital-universe-in-2020.pdf.

Balancing the Needs of Today and Tomorrow

As organizations look for ways to accelerate and simplify business processes to compete effectively in this new world order, they still need to provide current service levels to the business without disruption. This is also where SAP innovations provide huge benefits and create a nondisruptive road map to the real-time business paradigm.

Today, in-memory computing is dramatically changing the IT landscape. Many organizations are moving to in-memory computing, which offers performance improvements in orders of magnitude over the disk-centric architectures designed in the 1980s and 1990s.

SAP Real-Time Data Platform leverages the power of in-memory computing while supporting existing applications and business functions. It combines industry-leading data management, movement, modeling, and quality technologies and optimizes them to work together to solve modern-day information management challenges. By tying together all of your organization's data assets – from operational data to external feeds and Big Data – SAP Real-Time Data Platform makes it possible to dramatically simplify data management

landscapes for both current and next-generation business applications.

Components of SAP Real-Time Data Platform can be deployed independently or collectively to solve a broad range of business and technical requirements. With SAP Real-Time Data Platform, companies have at their disposal a range of options that can be tailored to meet unique business needs yet orchestrated to work together to minimize unnecessary data fragmentation, administrative complexity, and business disruption.

SAP Real-Time Data Platform is designed to address modern data challenges and is motivated by the following emerging requirements:

- **Real-time business processes depend on information that is contextual and relevant.** Accurate, personalized interactions between an organization and its customers and partners depend on the ability to seamlessly leverage all relevant information, both within an organization as well as from external sources.
- **Business innovation is driven at the point of action, in real time.** Shrinking business cycles and faster service delivery models mean that companies must

be able to process and deliver information from the data center to the point of action in real time, no matter the volume of information or the velocity at which that data is either created or consumed. Because business is dynamic – a customer relationship can change in a moment – companies need the ability to take the right action at precisely the right time.
- **Agile enterprises require new levels of operational efficiencies.** Efficient, effective business processes depend on IT systems that can deliver current and complete information at any time for any device in any location – and with low total cost of ownership (TCO). Operational efficiencies are needed for developing, deploying, securing, and managing information as a strategic asset of the business.

SAP Real-Time Data Platform uses groundbreaking in-memory computing to deliver information at unprecedented speeds, and a unified framework that intelligently optimizes data wherever it resides – in memory, on data center disks, on mobile devices, or in the cloud.

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Road Map to the Real-Time Business

SAP Real-Time Data Platform enables organizations to harness the value of massive data for actionable insight in the moment – so you can run your business smarter, faster, and more efficiently.

With SAP Real-Time Data Platform, all your applications – and all the associated data that drives them – are unified within a common framework for processing transactions, analyzing data, and delivering actionable information to knowledge workers around the enterprise when and where they need it. This means that you can now manage and move data throughout the enterprise, regardless of source or processing technology, and break down application and data silos to enable a 720-degree view – 360 degrees for the enterprise and 360 degrees for your enterprise's customers.

RADICAL SIMPLIFICATION

SAP Real-Time Data Platform can dissolve layers of complexity and address the challenges of data fragmentation in the enterprise.

Fragmentation is the unnecessary duplication of data and computing resources resulting in added administrative overhead and excess cost. There are several key reasons why companies fragment data, and most are directly related to measures for improving performance and uptime.

Companies that are geographically dispersed, for example, will often create local copies of data to improve performance rather than depend on network speeds over long distances. The need for faster, more complex analytics has also resulted in data fragmentation; large databases can be unwieldy, so data sets are copied to local servers for drill-down analysis and added flexibility. Or perhaps semistructured or unstructured data types require specialized tools and systems that operate apart from the core IT landscape.

The promise of SAP Real-Time Data Platform is to eliminate some of the constraints to performance and functionality that have resulted in this duplication of data and the proliferation of data management techniques. By combining powerful, in-memory database technology with other purpose-specific databases in one unified environment, SAP Real-Time Data Platform can deliver a highly optimized technology platform for a wide range of business applications and analytics.

SAP Real-Time Data Platform provides you with an adaptable, extensible, and open enterprise software platform that delivers current and comprehensive information at any time for any device – and with low TCO.

Through a unified orchestration of operational data and other valuable data (such as unstructured data, real-time external data feeds, and so on), SAP Real-Time Data Platform frees you from trade-offs in choosing the best data management platform for a particular purpose.

SAP Real-Time Data Platform also delivers a common modeling environment, giving your IT organization an enterprise-wide view of all information, regardless of where the data is physically stored. Pictorial views of the information architecture make it easier for both business users and IT to define the use of information across business processes by using a common metadata language. And common information management functions, such as data integration and data quality management, can be performed before data is moved into data stores or embedded in memory for faster processing.

Finally, the unified architecture of SAP Real-Time Data Platform includes a common administration and monitoring environment, allowing companies to simplify IT staffing, leveraging skill sets across the whole IT landscape for easier day-to-day operations and rapid iteration of enterprise application development.

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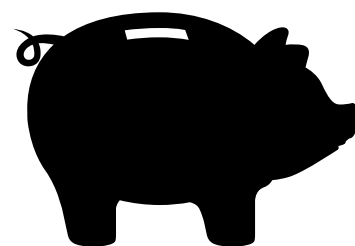
INNOVATION WITHOUT DISRUPTION

Innovation is the fuel that drives growth and competitive differentiation for most businesses, and it can occur through an evolution of continuous small changes or in dramatic leaps. Yet all forms of innovation share one thing in common: change.

Change can be disruptive. Traditional, large-scale upgrades to technologies and business processes can impact the entire enterprise and hamper productivity. With SAP Real-Time Data Platform, SAP is delivering a solution that is both evolutionary and revolutionary.

SAP Real-Time Data Platform is not simply a collection of disparate databases but a foundation for orchestrating business functions across the enterprise through reliable data movement, data security, and a common environment for modeling and administration. It supports a graceful evolutionary path that takes into account and embraces existing IT landscapes and practices. Deep integration enables continuity across the various data management styles spanning complex event processing, online transaction processing, analytics, and elastic data-caching strategies.

Based on your business requirements, you may see the advantage of a disruptive new technology, such as in-memory computing, that can deliver game-changing advantages through instantaneous access and analysis of vast volumes of business data. This level of innovation can dramatically accelerate business decision making and enable the strategic business moves that justify the investments in new technologies, practices, and skill sets.

Or you may want to make gradual changes aimed at modernizing outdated technology infrastructures, to take advantage of performance and functionality improvements, or to lower costs.

The focus of SAP Real-Time Data Platform is to accommodate a variety of business scenarios with best-in-class options, and to reduce the complexity of managing this heterogeneity through a homogeneous experience – for developers, administrators, and users alike.

FLEXIBILITY TO ADAPT TO CURRENT AND FUTURE BUSINESS DEMANDS

More and more data is being produced, and more of it is relevant to your organization. Data is now distributed across multiple systems – and sometimes across multiple organizations – resulting in a need for new systems to help consolidate it. Leveraging new sources of data, from logs and machine-generated data to unstructured data such as e-mail and tweets, is placing additional challenges on traditional IT infrastructures designed for an earlier era. Meanwhile, users bring an insatiable appetite for speed and ease of use to the workplace, based on their experiences with sophisticated new consumer technologies in their personal lives.

These rapidly changing dynamics are forcing a renewal of the technologies that support businesses today. Changes to the hardware stack deliver more power in a smaller footprint. Software advances give rise to new systems that can natively leverage the power of this new hardware. New data platforms and processing models are emerging to deal with challenges ranging from the streaming of data in real time to demands for very low latency and extreme scalability.

SAP Real-Time Data Platform is aimed at solving these types of challenges through an innovative combination of data management technologies and processing models, giving IT staff the flexibility to support day-to-day operations while building out new strategic capabilities.

SAP Real-Time Data Platform enables innovative ways of doing business to capture new market opportunities. By harnessing the value of data for actionable insight in the moment, you can run your business smarter, faster, and more efficiently.

Groundbreaking New Capabilities

Combining processing models within a unified and orchestrated framework can result in some groundbreaking new capabilities, at a lower cost and with greater efficiencies. Consider the ways that SAP customers are deploying this new approach in the following examples.

REAL-TIME OPERATIONAL REPORTING OF MISSION-CRITICAL APPLICATIONS

The SAP HANA® platform helps blur the classic boundary between the "transactional world" of OLTP and the "analytical world" of data mining and predictive analytics. It can handle OLTP and analytic loads in a single in-memory data management system. SAP HANA dramatically reduces the complexity of processing large transaction loads while at the same time makes the transactional data immediately available for analysis.

An in-memory approach to data management is a fundamental innovation that can radically simplify IT landscapes. An in-memory database management system has been designed from the ground up to efficiently manage all data in physical memory for high performance. Unlike other acceleration techniques that exploit a tiered-memory strategy to improve performance, in-memory data management that is at the heart of SAP Real-Time Data Platform gives users flexible, ad hoc data modeling functionality by providing non-materialized views directly on detailed information. This liberates users from the wait times associated with aggregating data from multiple data stores, data model changes, and database administration tasks. With in-memory data management systems, the tasks associated with overcoming I/O constraints are no longer necessary – eliminating much of the tuning and optimization efforts that can consume significant IT resources.

HANDLE EXTREME TRANSACTIONAL BUSINESS VOLUMES MORE AFFORDABLY

Running SAP Business Suite applications on the high-performance SAP Sybase® Adaptive Server® Enterprise (SAP Sybase ASE) helps companies handle data growth and extreme transactional volumes more reliably and affordably. SAP Sybase ASE is proven in the toughest mission-critical environments, including financial services, telecommunications, and healthcare. SAP Sybase ASE can help reduce operating costs through more efficient use of storage, server, and staffing resources. In addition, companies can have complete confidence that they will have highly available access to mission-critical data in the event of a disaster. SAP Sybase Replication Server offers low latency of real-time data loading while maintaining transactional integrity, enabling companies to ensure compliance with internal and external regulations.

NEW REAL-TIME BUSINESS APPLICATIONS

With the SAP HANA platform, customers can accelerate core business processes in dramatic new ways to deliver significant operational value – generating incremental revenues, lowering expenses and risk, or a combination. Transactional applications running on SAP HANA combine faster business applications with analytics, planning, predictive analysis, and sentiment analysis on a single platform in real time – without delays caused by the need to move or replicate data into a specialized analytical engine. This timely insight allows manufacturers to optimize supply chains, for example, so they can purchase raw materials at the best possible price and adjust manufacturing processes

accordingly. Or it gives retailers the ability to create highly personalized, one-to-one experiences for their customers.

These solutions are powered by SAP HANA. They include SAP Business Suite, the SAP ERP application, the SAP 360 Customer solution, SAP CO-PA Accelerator software, and the SAP Sales and Operations Planning analytic application, as well as a growing number of solutions developed on the SAP HANA platform by SAP partners.

REAL-TIME ANALYTICS OF BIG DATA

SAP HANA and SAP Sybase IQ software both offer powerful column stores for analytics. When working in concert with SAP HANA, SAP Sybase IQ – our popular column-based data management system – provides a highly cost-effective, nearline storage solution for data that is not as time sensitive and does not need to be stored in cache.

SAP HANA, SAP Sybase IQ, and SAP Data Services software can work together to help organizations gain valuable insight from unstructured data stored in Hadoop. SAP Data Services delivers a Hadoop connector that provides high-performance reading from and loading into Hadoop. SAP Data Services identifies, extracts, structures and transforms the meaningful information from Hadoop and Hive and provisions the data to SAP HANA, SAP Sybase IQ, or other data stores for deeper analysis. This allows for reliable, efficient, and optimized real-time analysis across all enterprise information assets – structured or unstructured.

REAL-TIME, EVENT-DRIVEN ANALYTICS

A continuous flow of new information streams into businesses each day about markets, customers, partners, and more. SAP Sybase Event Stream Processor (SAP Sybase ESP) enables companies to quickly analyze and act on these events as they happen. The software enables you to combine information from different sources, filter out what is irrelevant, and examine events in the context of other events to determine what is important – and do so at very high volumes and in real time. Event stream processing is a form of complex event processing and rewrites the rules by letting users define "continuous queries" in advance. As new data arrives, it flows through the queries, producing a continuous stream of insight.

SAP Sybase ESP provides high-level tools to define how events are processed and analyzed, enabling companies to reduce development time and effort by up to 75% compared to building applications from scratch, based on our customers' experience.

ACCESS TO A BROAD SPECTRUM OF DATA TYPES

SAP HANA, SAP Sybase IQ, and SAP Data Services each supports access to a broad spectrum of data types, from structured, semistructured, and unstructured data to streaming data.

Text analytics of unstructured content, alongside regular data, delivers significant insights into your business, helps identify emerging trends, and allows proactive response to opportunities or potential risks. Text-data processing can occur against files, Web logs, survey, content fields, social media, geolocation data, and more. Text-data processing can be pushed down into the Hadoop file system or performed within SAP HANA and SAP Sybase IQ, as it is natively built into these data stores.

COMMON MODELING, METADATA MANAGEMENT, AND DATA QUALITY

SAP Real-Time Data Platform can help organizations trust the quality of their data. With its rich offering of information management solutions, it helps you to understand, monitor, and improve the quality of data used across the enterprise.

SAP Sybase PowerDesigner® software can help your organization eliminate information silos with a powerful modeling tool for data, information, and enterprise architectures. It provides a pictorial representation of complex environments, helping to simplify communication between business and IT as they manage the relationships between business processes, data, metadata, and data stores.

SAP Information Steward software empowers business users to use dashboards to measure and monitor data quality, so they can drill down to understand the lineage and impact of data across systems. SAP Data Services software helps improve data quality by parsing, standardizing, cleansing, matching, and deduplicating data anywhere in the enterprise. You can also use it to enrich data with geospatial and reference information.

When used together, these information management solutions enable organizations to model, monitor, and improve data quality on today's systems and to plan appropriate changes for tomorrow.

MOVING FORWARD

To meet your current and future business needs, SAP has developed and will continue to enhance an adaptable, extensible, and open enterprise platform and infrastructure that helps deliver current and comprehensive information at any time for any device – and with a low TCO.

SAP has a proven track record of listening to our customers, understanding their needs, and delivering innovative solutions that offer outstanding functionality and unmatched business value – solutions that can help you stay ahead of the competition. In addition, we help you leverage your investment in SAP solutions by providing the right strategies and services, so you can transform your business into a real-time business. Look to SAP as your partner when it comes to leveraging groundbreaking innovations for the benefit of your business.

The Best-Run Businesses Run SAP™