SAP HANA
Power of In-Memory Computing

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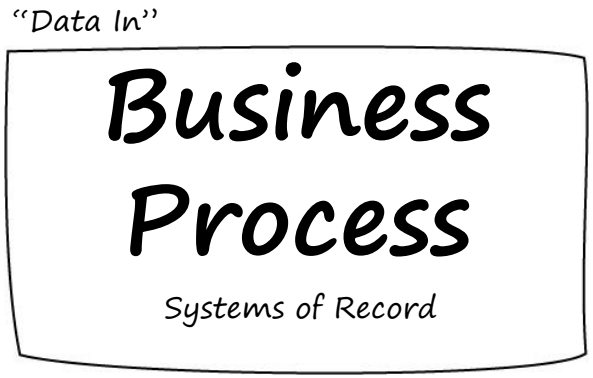
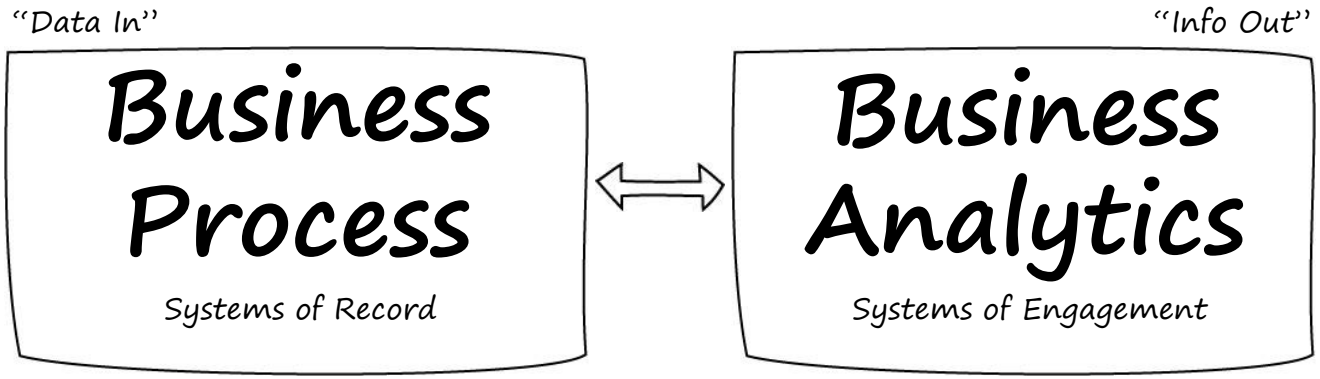
Reality: Information Explosion

Gartner - Enterprise data will grow 650% over the next five years, with 80% of that data unstructured …meaning that the data explosion spans both traditional sources (point of sale, shipment tracking records, etc) as well non-traditional (e-mail, Web content, documents, etc) performance.

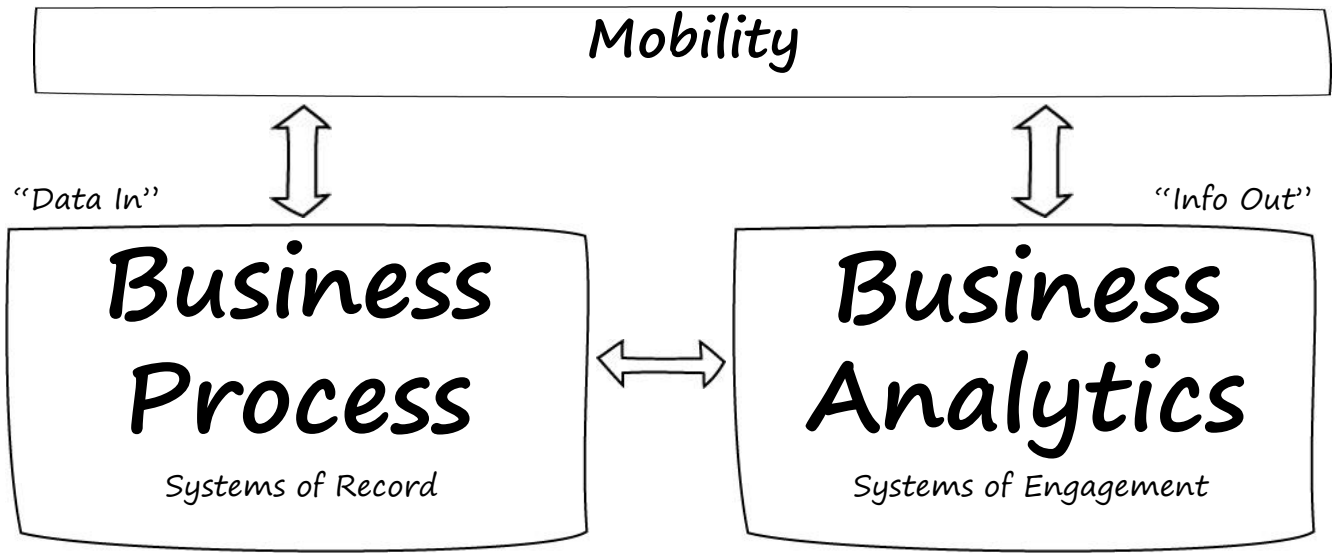
SAP driving innovation: PROCESSES



SAP driving innovation: INFORMATION

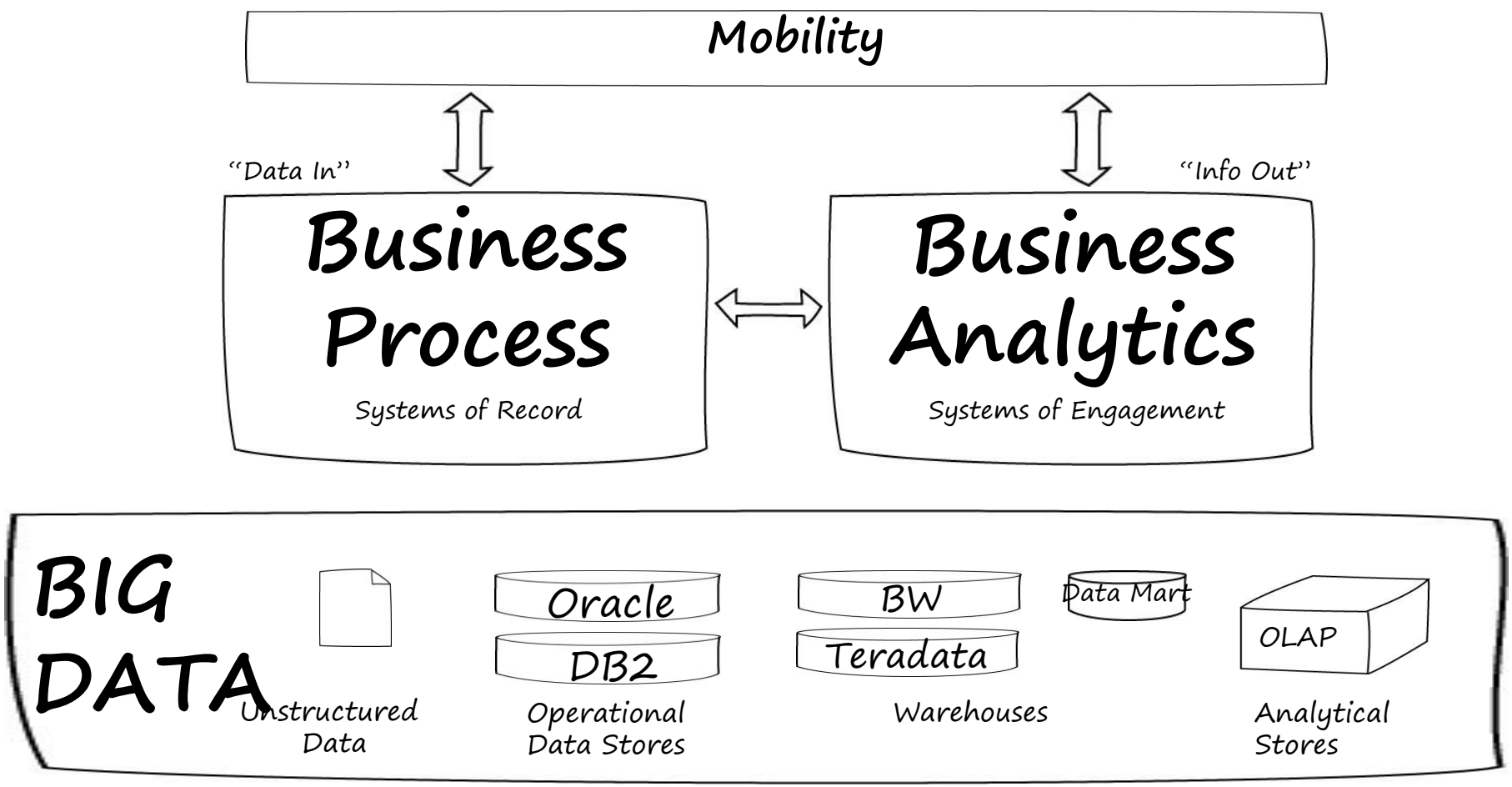


SAP driving innovation: CONSUMPTION



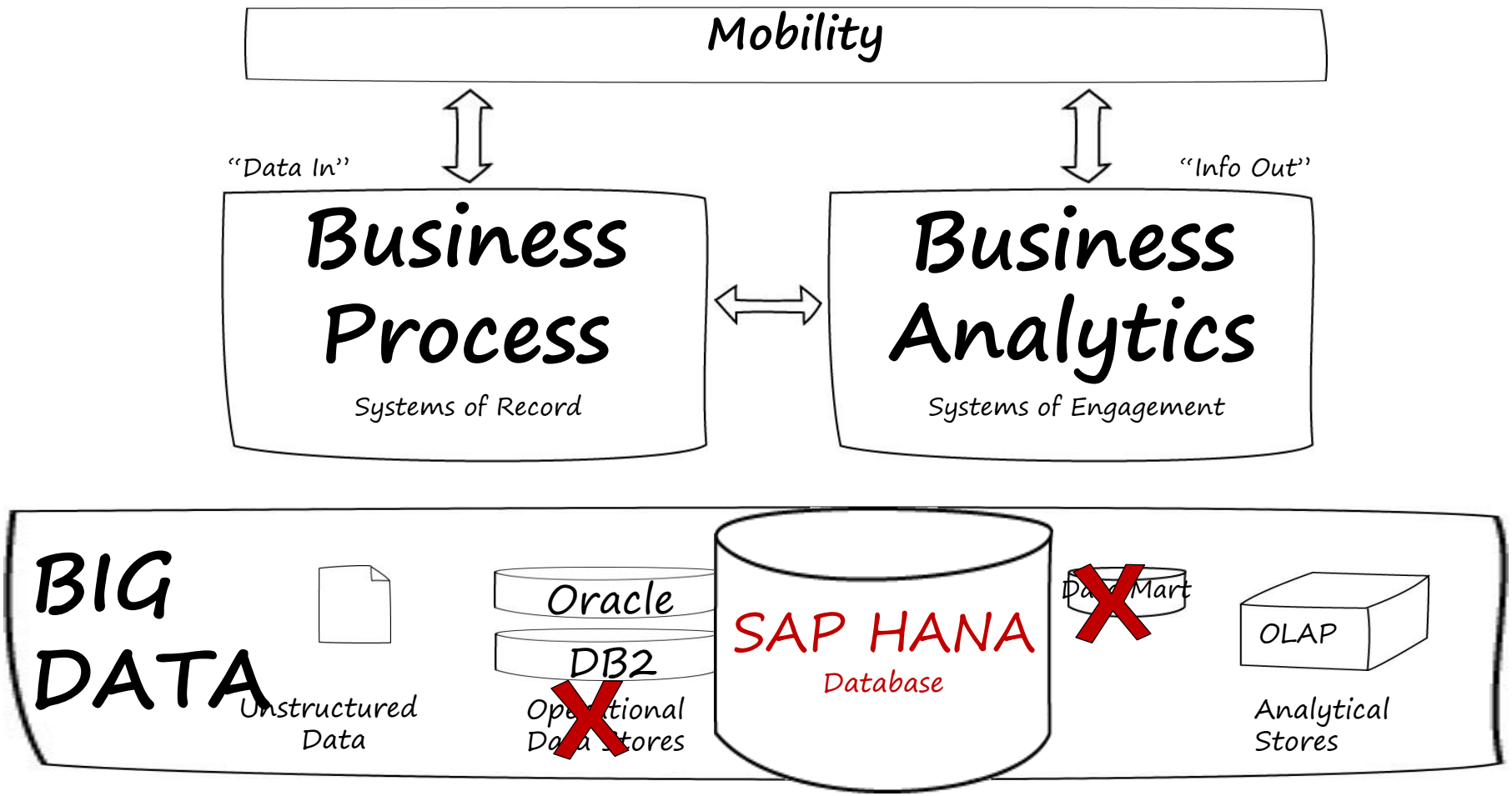
Data – current state

Issues: latency, high cost, complexity



Data – future state

Benefits: speed, low cost, simplicity




How SAP can help Enterprise move faster
Big Data.
Real-time.
Achieve faster Result
In-Memory Computing
Technology that allows the processing of
1. Massive quantities of data in real-time
2. In the main memory of the server
3. To provide immediate results for analyses and decision making
SAP

In-Memory Computing

Conventional Databases

Disk Read

5 milliseconds

1 Million Times Faster Than Disk

In-Memory Databases

Disk Read

5 nanoseconds

BI Applications Benefit From In-Memory Technology Improvements

Gartner RAS Core Research Note G00141540, Kurt Schlegel, Mark A. Beyer, Andreas Bitterer, Bill Hostmann, 2 October 2006 R2037 4/19/2007

Demand for fast queries against big datasets, coupled with lower-priced 64-bit computing, will increase the use of in-memory technology. Loading detailed data into memory for reporting and analysis reduces the need for aggregate data structures — a key part of most business intelligence deployments.

WHAT YOU NEED TO KNOW

Organizations will incorporate in-memory technology into their business intelligence (BI) applications to optimize performance and flexibility. In particular, in-memory technology will be applied to BI applications that require analyzing large amounts of detailed data, such as Web analytics, point of sale and radio frequency identification. As more BI and database vendors embrace this approach, organizations will find it easier to convert BI applications based on traditional disk aggregation techniques.

STRATEGIC PLANNING ASSUMPTION(S)

By 2012, 70% of Global 1000 organizations will load detailed data into memory as the primary method to optimize BI application performance (0.7 probability).

ANALYSIS

Although it is possible to write ad hoc reports that query the detailed level of the data warehouse (or even a mirrored copy of an operational database), this practice runs the risk of poor query performance. To remedy this problem, IT organizations typically build a data layer optimized for query performance. This performance layer typically takes one of two forms: denormalized star schemas or multidimensional online analytical programming (OLAP) cubes. The key ingredient in either approach is to build a specialized data structure that improves performance by aggregating information and performing calculations in advance. IT organizations have invested enormous amounts of time to build this performance layer. At the same time, BI platform vendors have devoted significant resources to ensure that their tools can facilitate both approaches.

These efforts are usually successful at improving performance; however, they create other challenges:

- The requirement of building an aggregate layer in advance diminishes the promise of self-service BI. Users must wait for their IT organizations to build the performance layer before analyzing the data. In addition, users are limited to explore only the specialized data structures if they expect to maintain good query performance.
- The aggregate layer must be re-calculated with updated data. IT organizations frequently complain that this process can take several hours and, therefore, diminishes the freshness of the information.
- Building and maintaining the aggregate layer takes a significant amount of IT resources that could be applied to more-productive activities.

To avoid these problems, some organizations have embraced a different architecture to optimize BI application performance. Instead of building an aggregate layer, detailed data is loaded into memory where calculations are performed "on the fly" at query time. Our research indicates that query performance using this in-memory method is often just as fast as or faster than traditional aggregate-based architectures. In-memory technology not only retrieves the data faster, but it also performs calculations on the query results much faster than disk-based approaches. Therefore, with in-memory technology, users can freely explore detailed data in an unfettered manner without the limitations of a cube or aggregate table to receive good performance.

Until recently, in-memory technology has mostly been a tactical, seldom-used approach because of numerous constraints. As these constraints are removed, in-memory technology in BI applications will become more widely adopted. By 2012, 70% of Global 1000 organizations will load detailed data into

Gartner

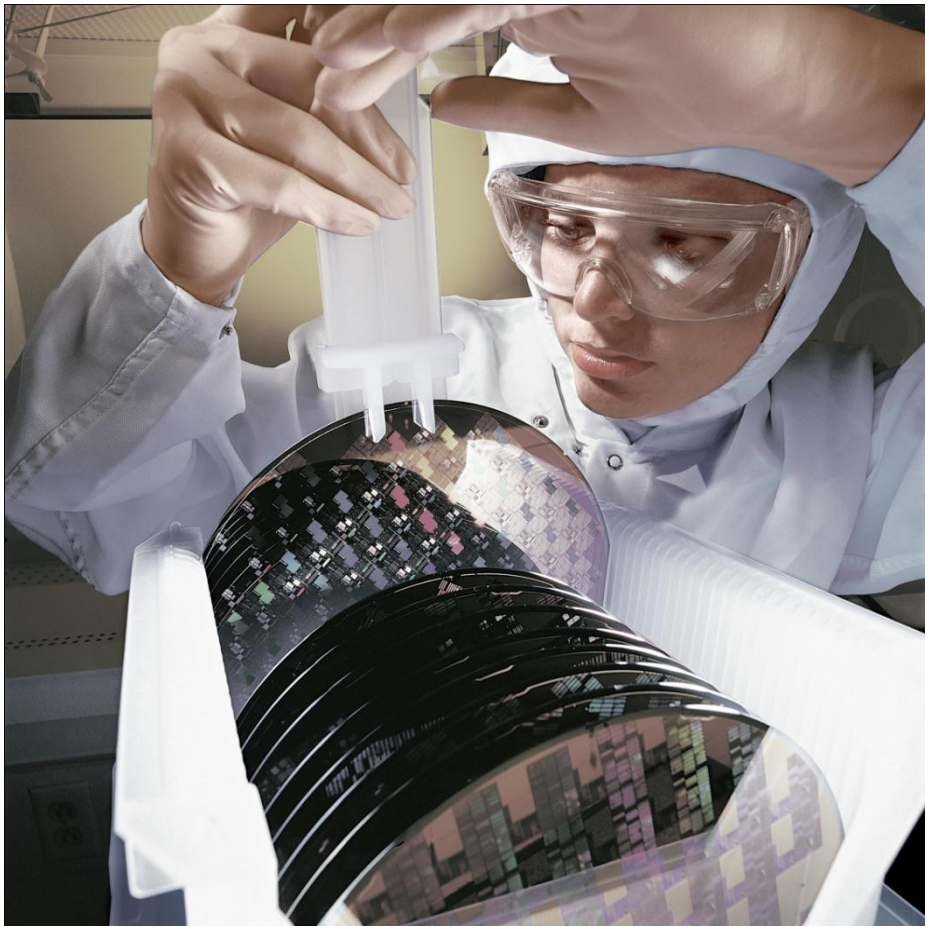
"By 2012, 70% of Global 1000 organizations will load detailed data into memory as the primary method to optimize BI application performance."

- Gartner

A Shift of Frontiers in Computer Science

Freely Adapted from Jim Gray, Turing Award Winner 1998

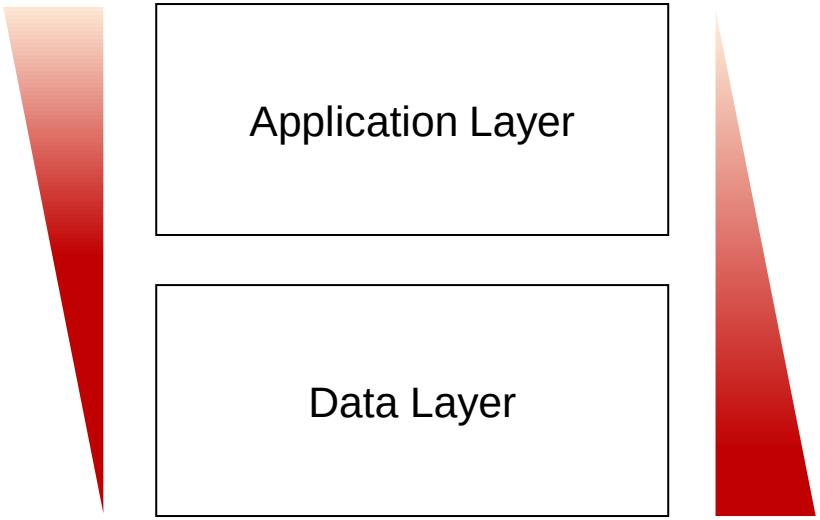
- **Tape is Dead**
- **Disk is Tape**
- **Flash is Disk**
- **RAM Locality is King**



Thinking In-Memory

Delegation of data intense operations to the in-memory computing

Today‘s applications execute many data intense operations in the application layer



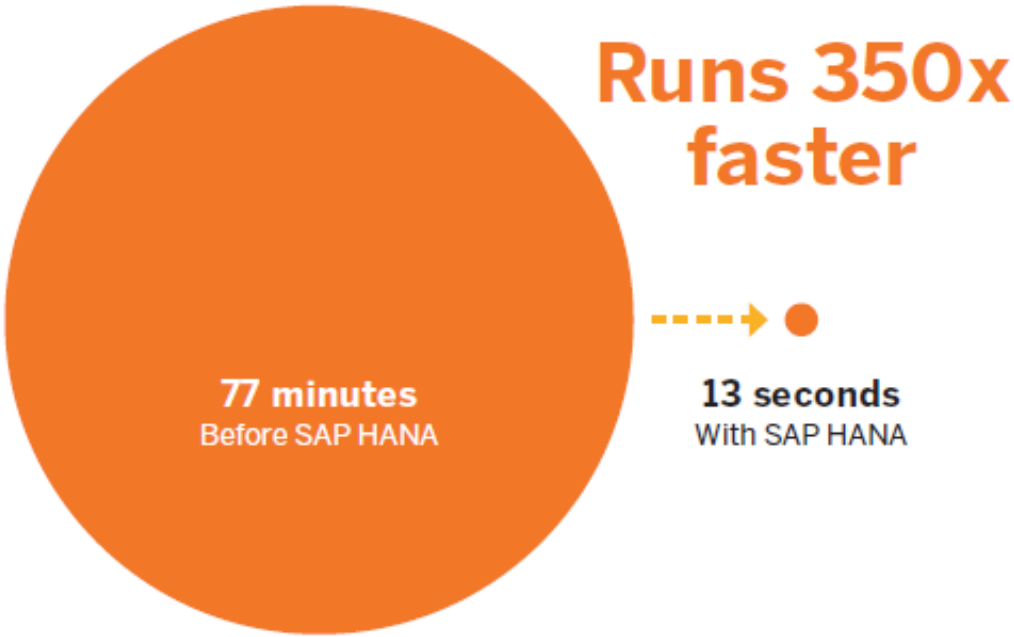
High performant apps delegate data intense operations to the in-memory computing

In-Memory Computing Imperative - **Avoid movement of detailed data**
- Calculate first, then move results

Speed-up Existing Work

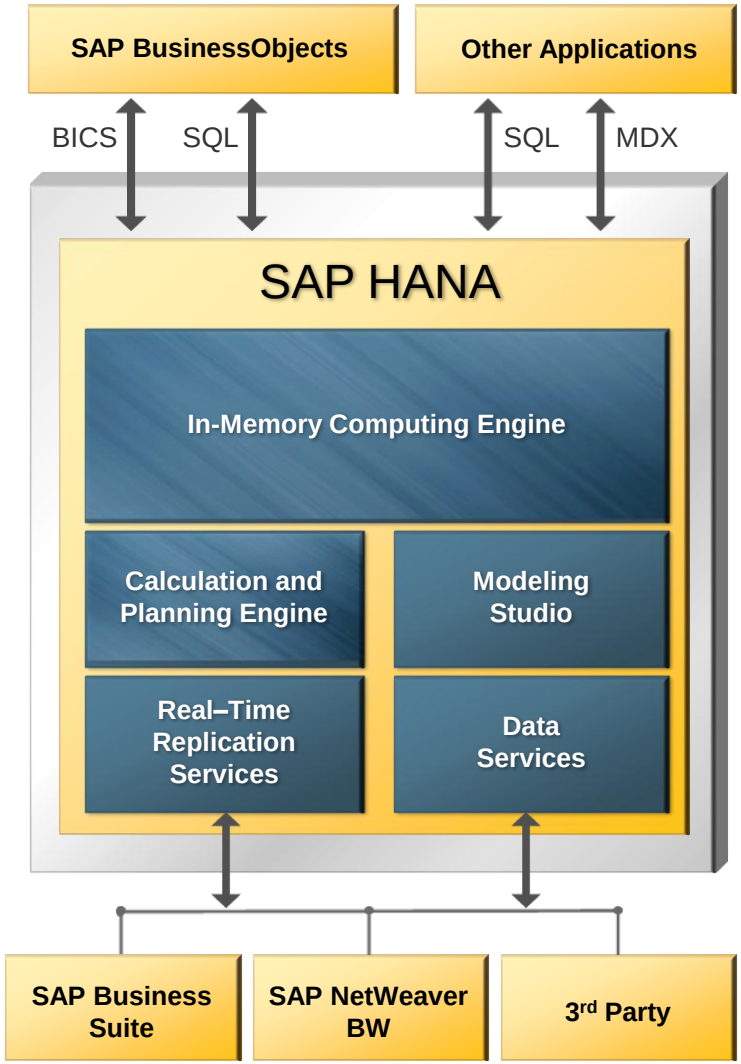
SAP High Performance Analytic Appliance (SAP HANA)

SAP HANA is the engine of the real-time enterprise. It provides a foundation on which to build a new generation of applications, enabling customers to analyze large quantities of data from virtually any source, in real time. The example below showcases actual customer performance of a core reporting process.



SAP In-Memory Appliance (SAP HANA™)

SAP High-Performance Analytic Appliance



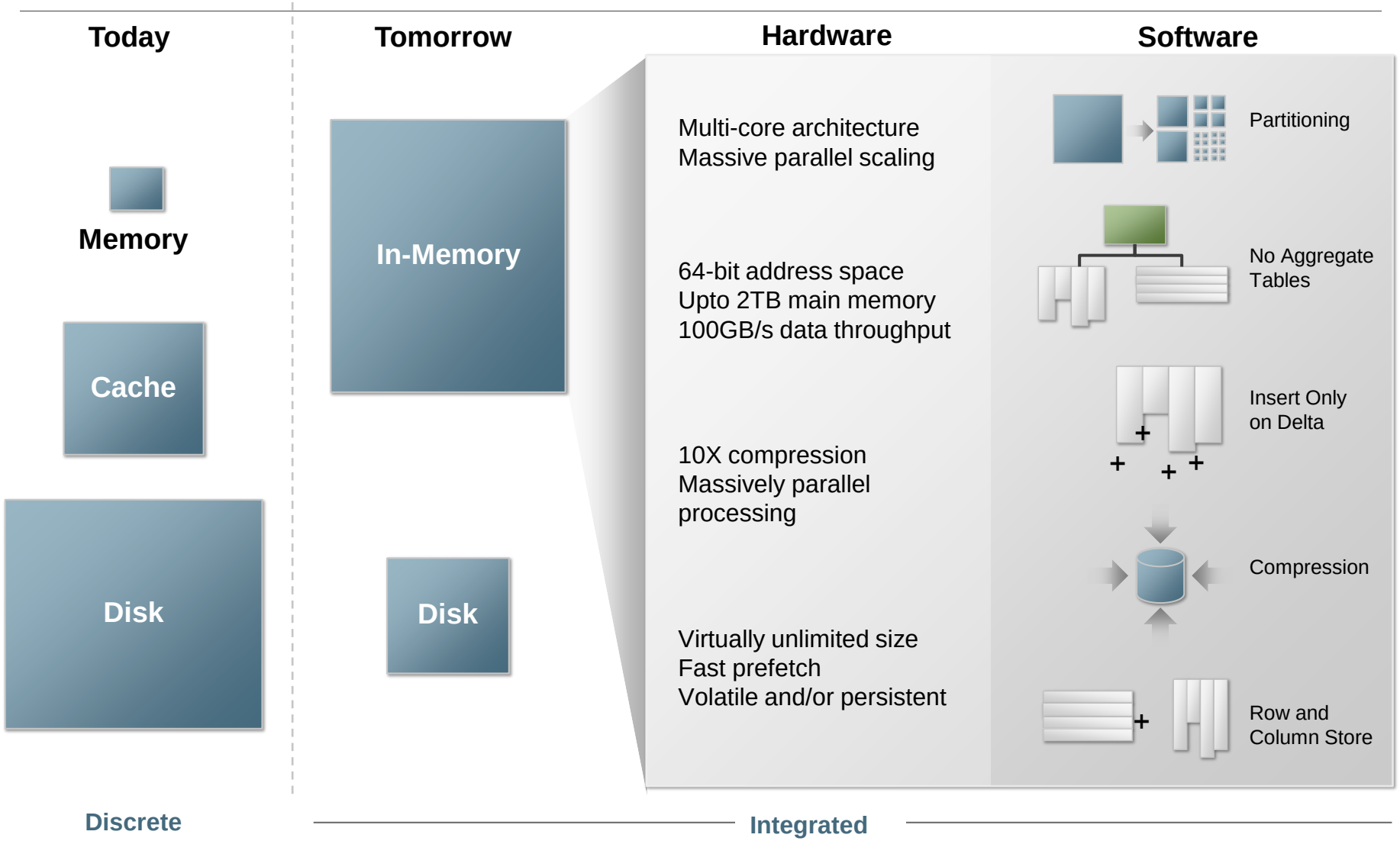
SAP HANA™

- In-Memory software + hardware
- Data Modeling and Data Management
- Real-time Data Replication
- SAP BusinessObjects Data Services for ETL capabilities from SAP Business Suite, SAP NetWeaver Business Warehouse (SAP NetWeaver BW), and 3rd Party Systems

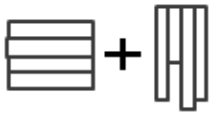
Capabilities Enabled

- **Analyze information in real-time** at unprecedented speeds on large volumes of non-aggregated data
- **Create flexible analytic models** based on real-time and historic business data
- **Foundation for new category of applications** (e.g., planning, simulation) to significantly outperform current applications in category
- **Minimize data duplication**

The Inflection Point
In-Memory Computing

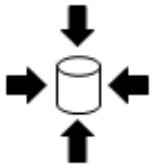


SAP SW Technology Innovations



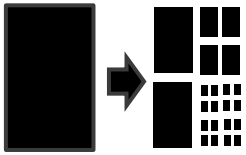
In-Memory
Row and Column Store

Column = Fast Queries



Compression

5 – 20x

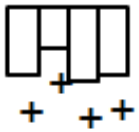


Partitioning
In-Database Computing

Analyze Large Data Sets
Complex Computations

No Aggregate Tables

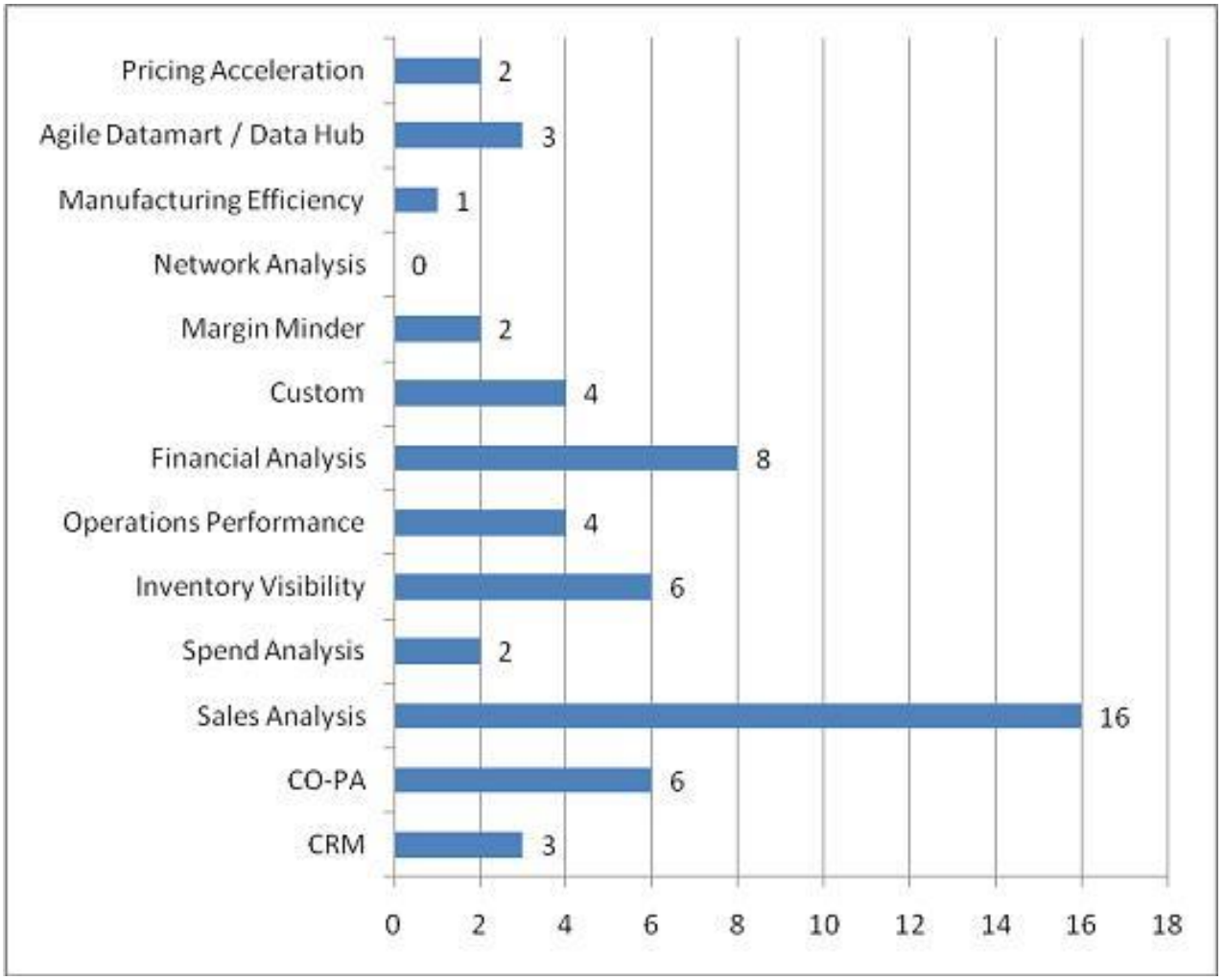
Flexible Modeling
No Data Duplication



Real-Time Replication
Insert Only on Delta

Fast Data Loads

What Are Customers Doing with In-Memory?



Speed of thought Demo

3.XBillon

rows of data

SAP HANA Customer Testimonials

Highlighting Value and Benefits

Customer	Link	Customer Story	Solutions
Adobe	Click Here	Adobe is using SAP HANA to analyze a large volume of complex data to gain business insights into software piracy, and to develop preventive strategies and explore significant revenue recovery opportunities.	**SAP HANA** **SAP Business Objects BI**
Infosys	Click Here	Infosys utilizes SAP HANA to understand profitability by project, conduct "what-if" analysis on the fly with granular revenue and cost data. The company was able to explore and interact with key variables that affected a project's profitability at all levels within the company.	**SAP HANA**
BASF	Click Here	BASF, a German-based chemical company, uses SAP HANA to speed response times from minutes to seconds, and improve data reliability to optimize their business	**SAP HANA** **SAP BWA**
Bosch Siemens	Click Here	BSH is using SAP HANA to better adapt to customer needs. BSH, with SAP In-Memory Computing, can now perform simulations and create business forecasts in seconds rather than days.	**SAP HANA**
Centrica	Click Here	Centrica supplies gas and electricity to millions of homes and businesses and offers a wide range of energy services. Centrica uses SAP HANA to process and analyze vast amounts of data generated by its smart meter technology.	**SAP HANA**

SAP HANA Customer Testimonials

Highlighting Value and Benefits

Customer	Link	Customer Story	Solutions
INTEL 	Click Here	SAP and Intel's co-innovation efforts with In-Memory Computing on Intel processors, is a game changing technology. SAP HANA reduces database query time from 77 minutes to 13 seconds, a 355x improvement in performance, when run on the Intel Xeon processor 7500.	**SAP HANA**
Lenovo 	Click Here	Lenovo uses SAP CRM today and plans to use SAP HANA to process 1.8 million contract records with multiple attributes in less than a second, simplifying IT and reducing TCO.	**SAP HANA** **SAP Business Objects BI**
Medidata 	Click Here	SAP HANA helps Medidata improve the way their clients manage clinical trials process to have real-time analytics available immediately, bringing value to every level within the clinical trial management process.	**SAP HANA**
Nomura Research Institute (NRI) 	Click Here	NRI, a research and consulting services provider, is able to use SAP HANA to analyze traffic information in Tokyo, and gained the ability to search through 360 million data records approximately 1 second	**SAP HANA**
T-Mobile 	Click Here	T-Mobile plans to use Strategic Workforce Planning application on the HANA platform to make real-time decisions very quickly—66 million calculations and returned the results in seconds to allow for immediate business decisions.	**SAP HANA** **SAP Strategic Workforce Planning**

SAP HANA Customer Testimonials

Highlighting Value and Benefits

Customer	Link	Customer Story	Solutions
CISCO	Click Here	SAP and Cisco are working together give customers the ability to make better decisions faster. With in-memory technology, and specifically SAP HANA, users have the ability to simplify the effective delivery of high-value information to business decision makers	**SAP HANA SAP Business Objects BI SAP BWA**
Colgate	Click Here	Colgate uses SAP HANA in their Mexico branch to manage their sales profitability and analysis reporting, where now sales reps can run reports with real-time results up to 100-300 times faster driving immediate business impact.	**SAP HANA**
Deloitte	Click Here	Deloitte is gaining clear and immediate insight into its current liquidity and cash flow information using SAP HANA.	**SAP HANA**
Hilti	Click Here	HILTI is leveraging SAP HANA, to provide better flexibility and performance for reporting and analysis across multiple areas of the business based on millions of rows of data.	**SAP HANA**
P&G	Click Here	P&G, the world's largest consumer product company, will use SAP HANA to build the next generation of financial planning and reporting applications, with speed that completely transforms what is possible today.	**SAP HANA**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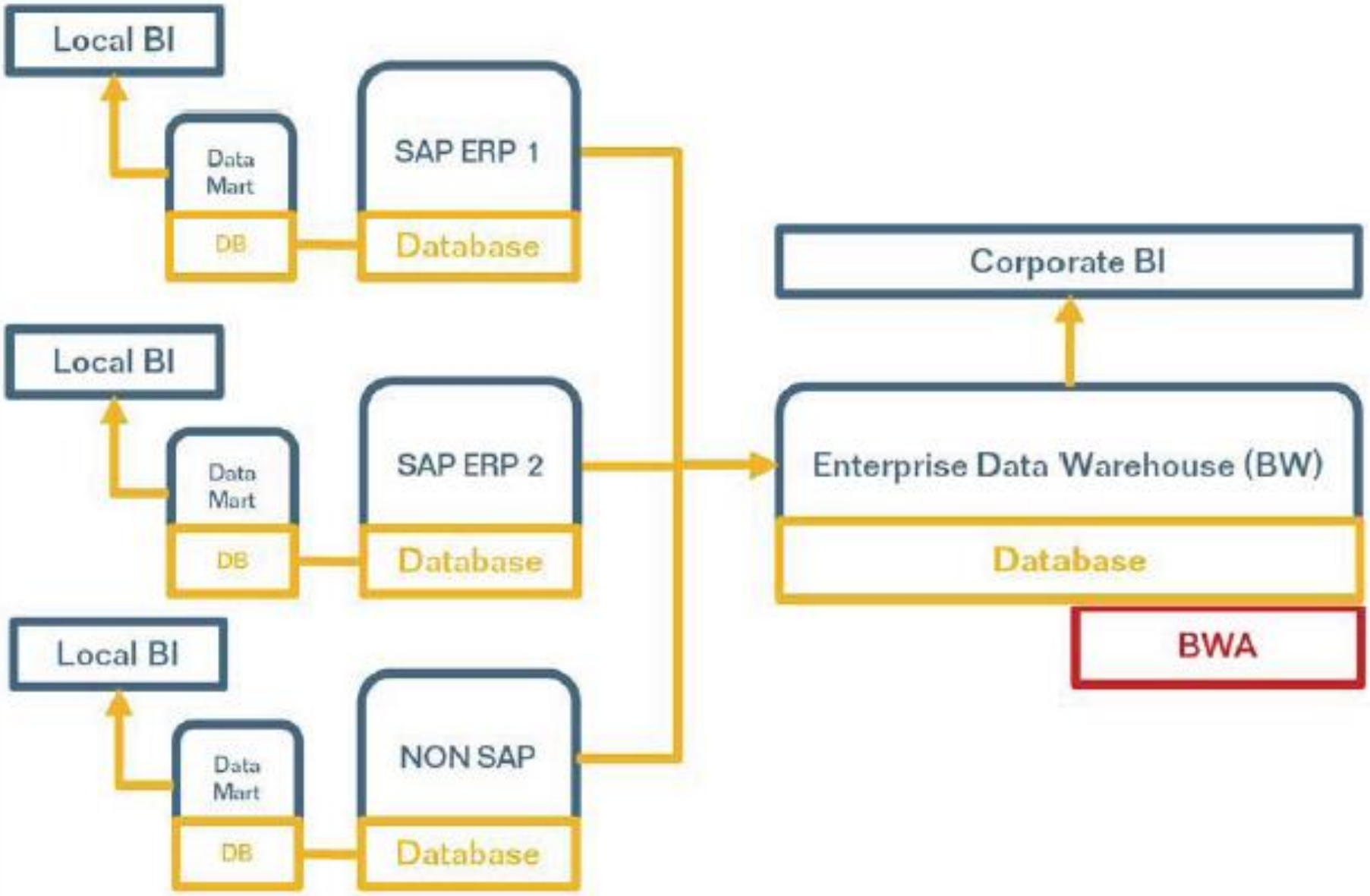
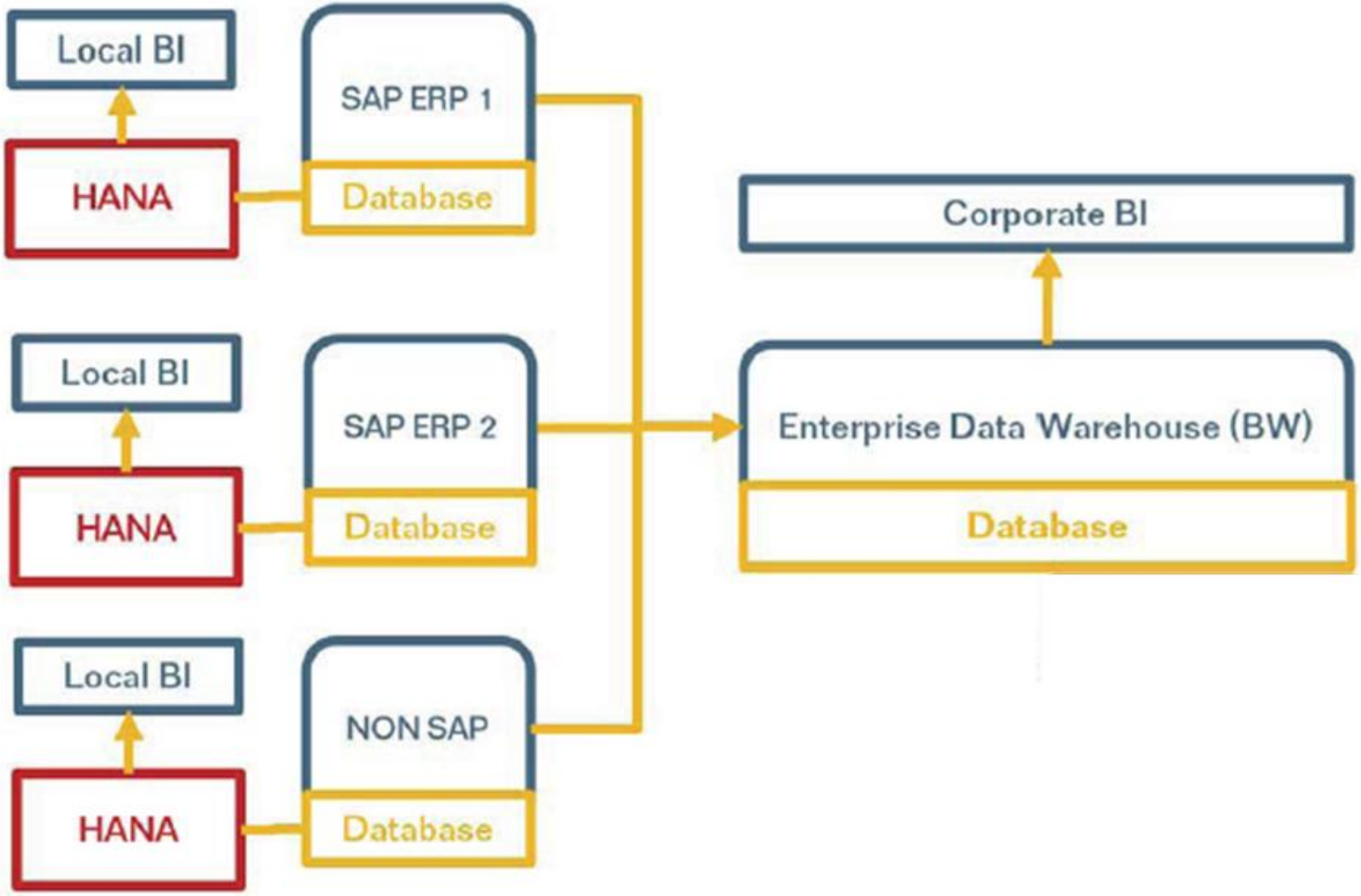
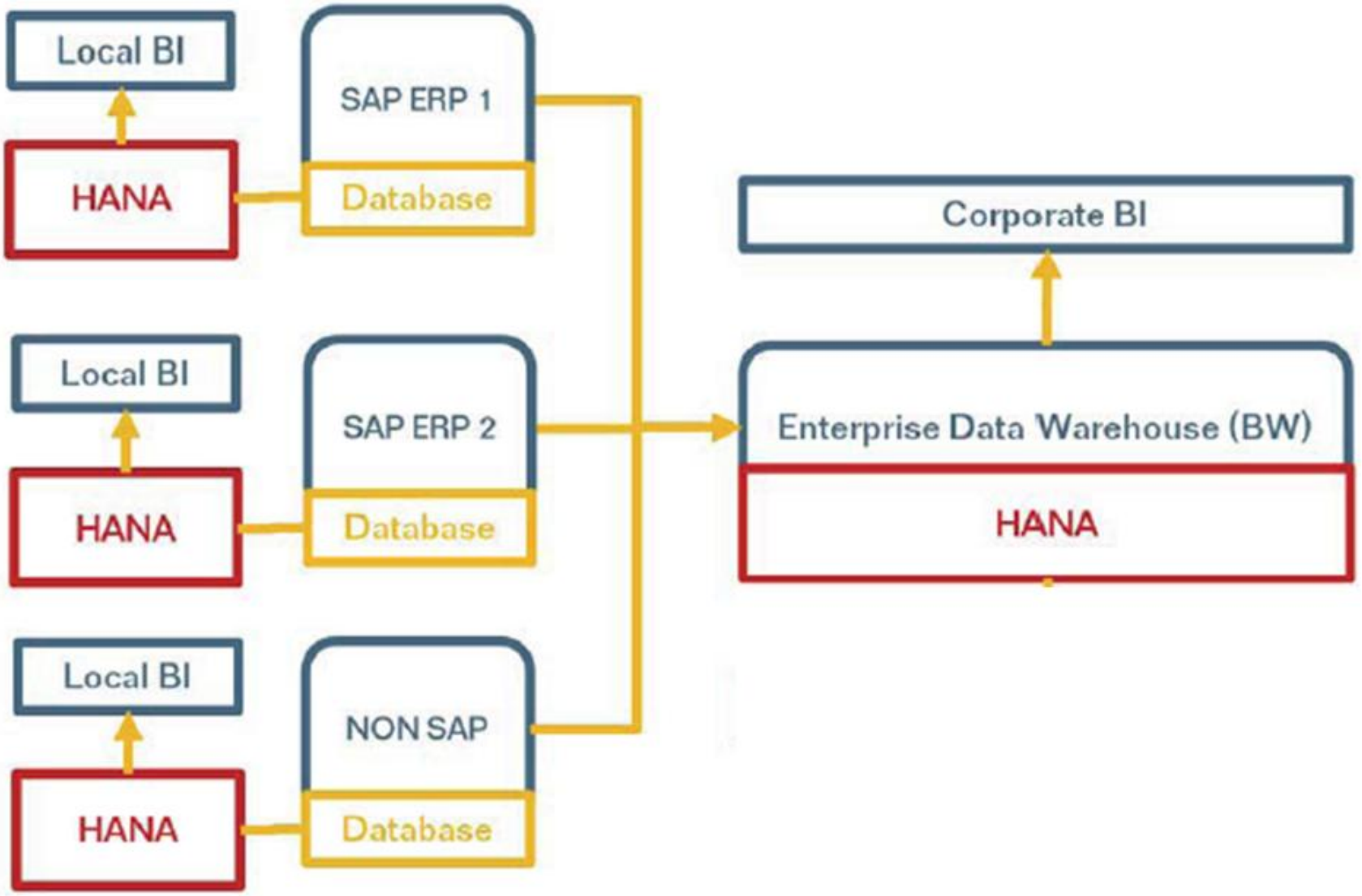
LAk
312.5 mi
32.4 MPH

TODAY'S SITUATION – CLASSICAL EDW




Local BI
HANA
SAP ERP 1
Database
Local BI
HANA
SAP ERP 2
Database
Local BI
HANA
NON SAP
Database
Corporate BI
Enterprise Data Warehouse (BW)
Database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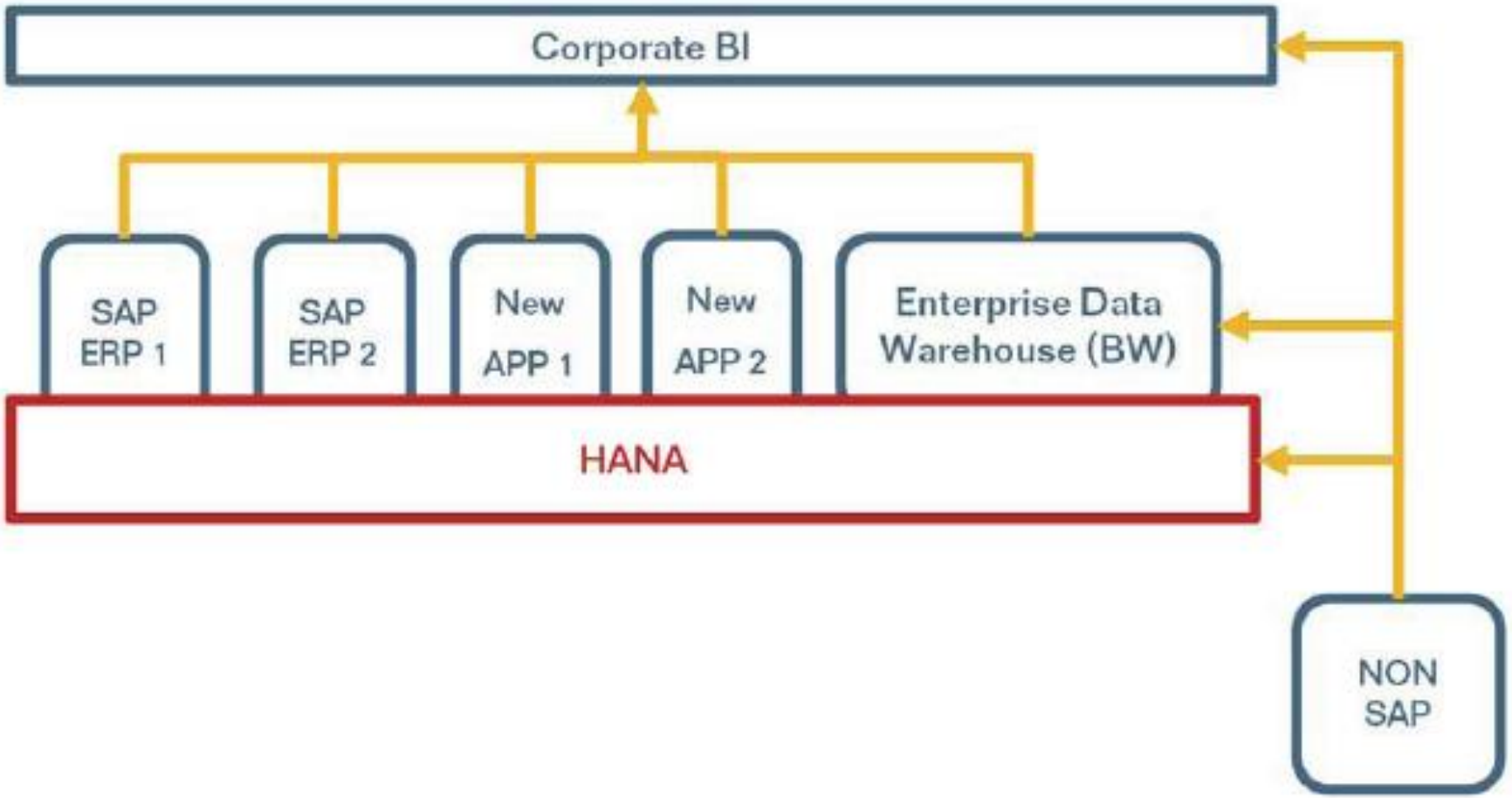
Enterprise Data Warehouse (BW)
HANA

VISION – IN MEMORY AS DATA LAYER




Big Data.
Real-time.
To Empower Your Organization…
…plan smarter
…run faster
…perform better
➔ Next wave of technology innovation
➔ Combined in-memory analytics & transactional applications
➔ Available today, delivered without disruption
➔ Continuous real-time link between insight, foresight and action

Best Fit.

Thank You

Boonchu Chumsantivut
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