

# Technology and Architecture Considerations Retail Case Study including SAP HANA

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Internal



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# Agenda

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## **1** Technical Architecture Modelling

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## **2** Introduce SAP HANA Platform

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## **3** Architecture Case Study

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## **1** Technical Architecture Modelling

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**Methods to exchange the knowledge  
about software-intensive systems.**

## **2** Introduce SAP HANA Platform

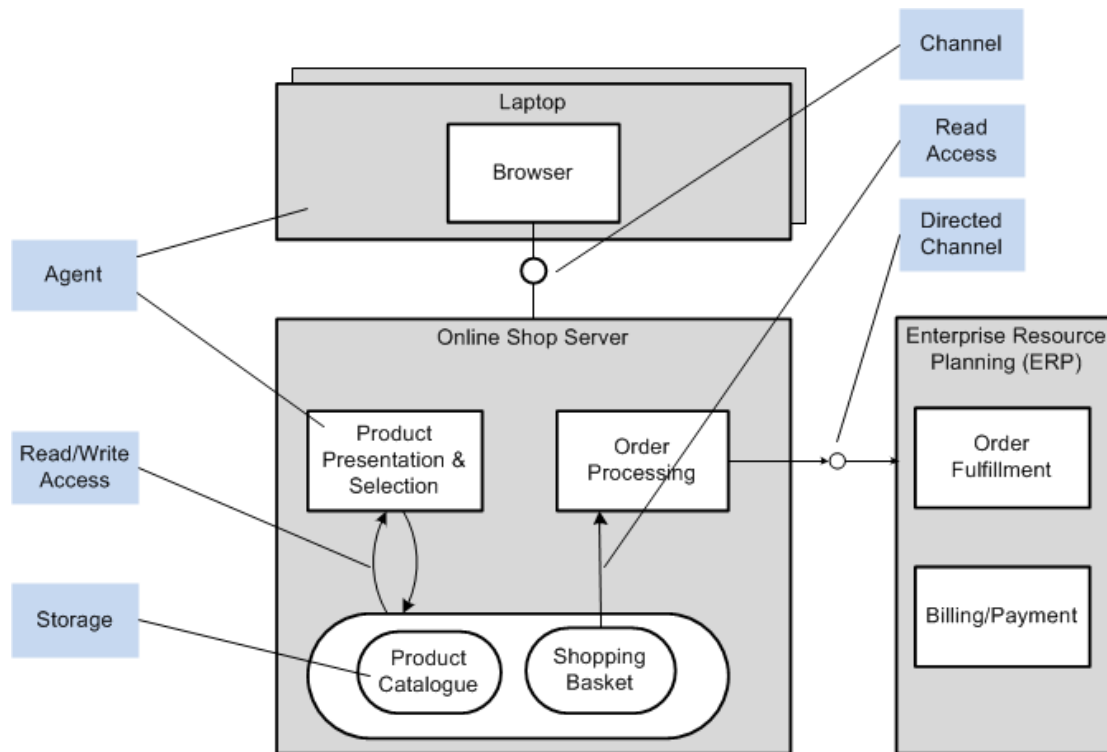
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## **3** Architecture Case Study

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## Technical Architecture Model – Simplified Block Diagram

Snapshot view of a system on instance level



**Agent:** *Who does something?*

- perform operations
- read and write data
- communicate with other agents

**Storage:** *Where is the data?*

- are passive
- hold data that is accessed by agents
- arrows indicate direction of data flow

**Channel:** *What data and which requests do agents exchange?*

- used by agents to communicate with each other
- arrows indicate the direction of data flow

See: <http://www.fmc-modeling.org/home>

# Agenda

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## 1 Technical Architecture Modelling

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## 2 Introduce SAP HANA Platform

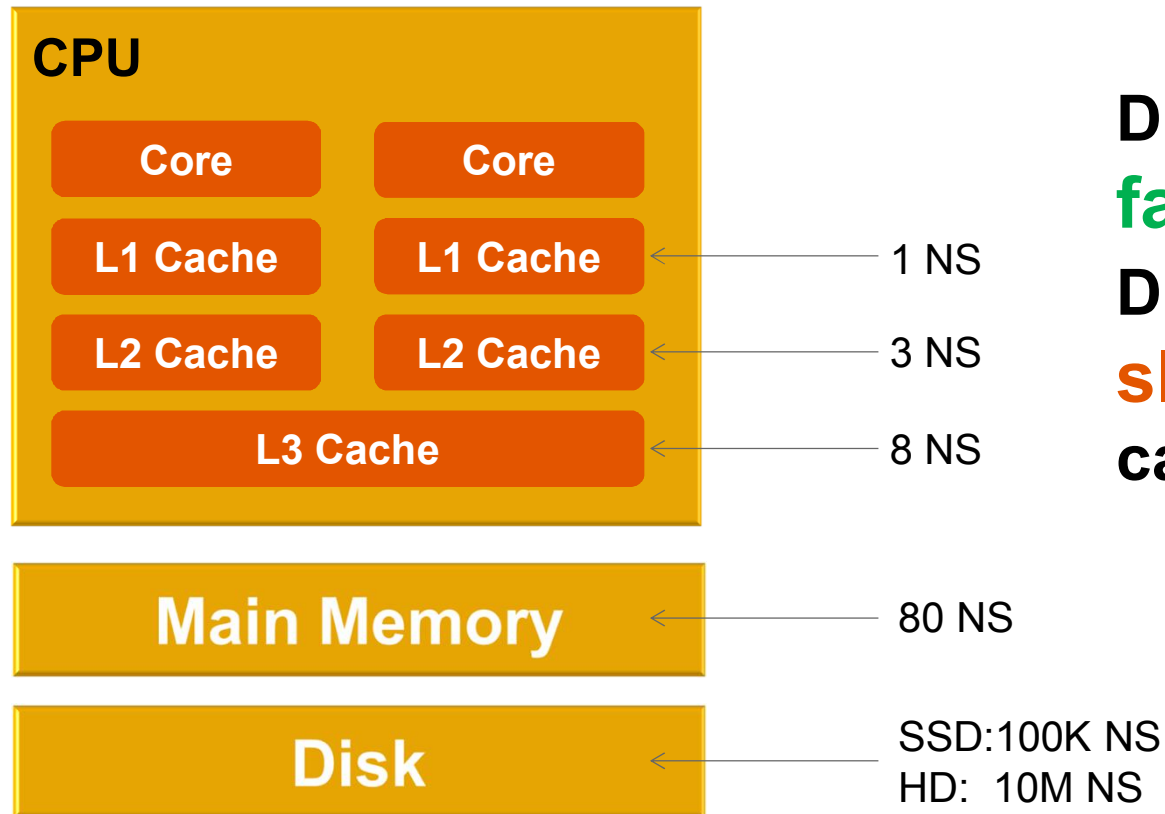
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**SAP HANA is a modern, in-memory database and platform that is deployable on-premise or in the cloud.**

## 3 Architecture Case Study

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## In-Memory Computing



DRAM is **125,000 x faster** than disk, but DRAM is still **10-80 x slower** than on-chip caches



## DRAM Price/GB

Year	Price/GB
2013	\$5.50
2010	\$12.37
2005	\$189
2000	\$1,107
1995	\$30,875
1990	\$103,880
1985	\$859,375
1980	\$6,328,125

Source: <http://www.statisticbrain.com/average-historic-price-of-ram/>



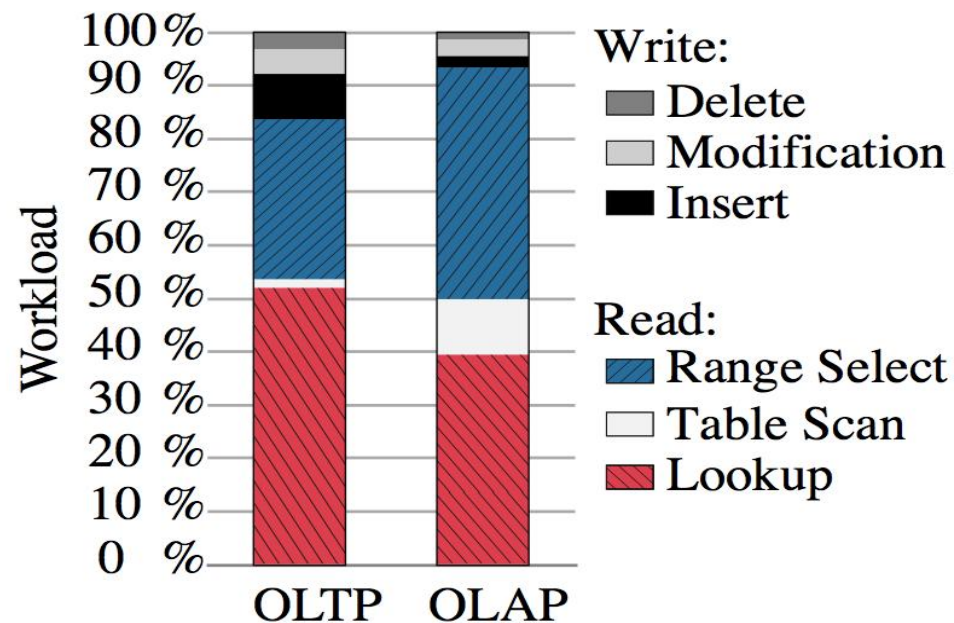
## Row store versus Column store

- ❑ Traditional RDBMS – Row store
  - ❑ Faster to select all columns for a single record

Table			Row Store		Column Store	
Country	Product	Sales				
US	Alpha	3,000	Row 1	US	Country	US
US	Beta	1,250		Alpha		US
US				3,000		JP
JP	Alpha	700	Row 2	US	Product	UK
JP	Beta			Beta		Alpha
JP				1,250		Beta
UK	Alpha	450	Row 3	JP	Sales	Alpha
UK				Alpha		Alpha
				700		3,000
			Row 4	UK		1,250
				Alpha		700
				450		450

- ❑ Column store
  - ❑ Naturally leads to (Direct access) compression via Dictionary encoding.
    - Each column is split into a dictionary & an attribute vector.
  - ❑ Faster when working on a set of columns (which is the typical use case for most business applications).

## Transactional (OLTP) vs Analytical (OLAP) – Access Pattern



Read dominates – so Column-store is better but only in-memory as we cannot be going/shouldn't go to disk for every column

## SAP HANA: Dictionary Compression

Column „Name“  
(uncompressed)

Miller
Jones
Millman
Zsuwalski
Baker
Miller
John
Miller
Johnson
Jones

Column „Name“ (dictionary compressed)

Value-ID sequence

One element for each row in column

4
1
5
N
0
4
2
4
3
1

Value IDs

point into  
dictionary

Dictionary

0	Baker
1	Jones
2	John
3	Johnson
4	Miller
5	Millman

sorted

N	Zsuwalski
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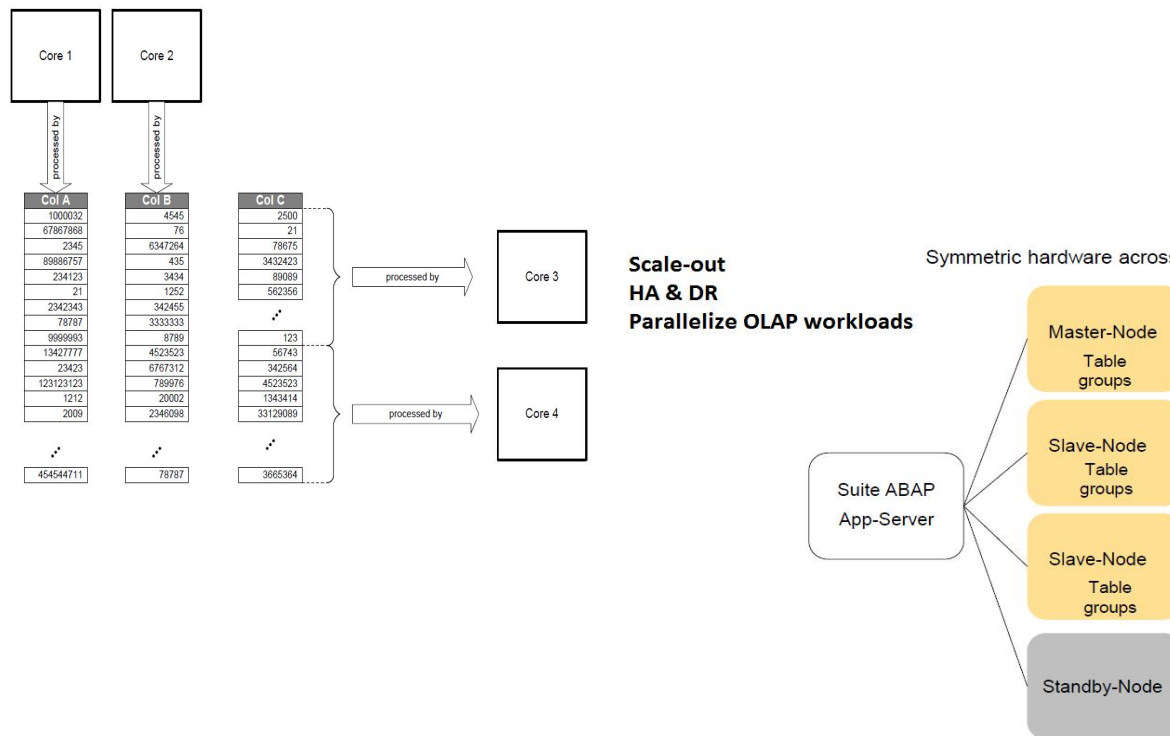
Value ID implicitly given  
by sequence in which  
values are stored

Value

- **A Dictionary and an Attribute vector to hold them all**
  - Dictionary – one set - of all unique values.
  - Attribute vector – A list of indices into the dictionary.
  - No explicit compression or decompression.
  - Allows direct access.
  - Speeds up processing with integers – at the processor level.

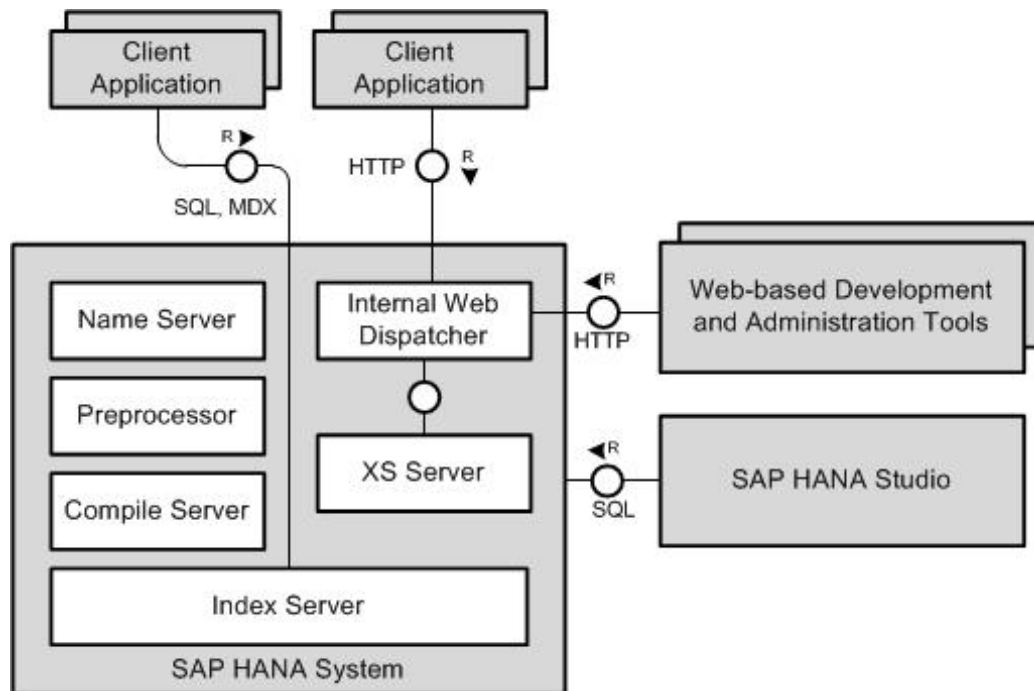
# Scalability & Parallelization

SAP HANA: Multi-Core Parallelization



- **Scale-up – Use multiple cores in a single CPU for parallelization.**
  - Cache-aware Data structures & parallel algorithms.
- **Scale-out – HANA follows “Shared-Nothing” approach**
  - Core idea: High availability and Disaster recovery.
  - Needs application knowledge – more administrative overhead.
  - OLAP applications benefit the most. Challenging for OLTP or hybrid setups.

# Overview of SAP HANA Architecture



- **Index Server**
  - actual data stores
  - engines for processing the data
- **Preprocessor**
  - used by the Index Server to analyze text data and
  - extract the information on which the text search capabilities are based.
- **Name Server**
  - owns the information about the topology of the SAP HANA system
- **SAP HANA XS**
  - SAP HANA Extended Application Services
  - provides applications and application developers access to the SAP HANA database
  - Offers a consumption model exposed via HTTP
  - host system services that are part of the SAP HANA database, for example: search services and a built-in Web server that provides access to static content.
- **Compile server**
  - compilation of stored procedures and programs, for example SQLScript procedures

Source: [http://help.sap.com/hana/SAP\\_HANA\\_Administration\\_Guide\\_en.pdf](http://help.sap.com/hana/SAP_HANA_Administration_Guide_en.pdf)

## More than just a database – SAP HANA Platform

### REAL-TIME APPLICATIONS



Consumer  
Engagement



Sense &  
Respond



Planning &  
Optimization

### REAL-TIME ANALYTICS



Operational  
Analytics



Big Data  
Warehousing



Predictive, Spatial & Text  
Analytics

### SAP HANA PLATFORM

Database &  
Data Processing  
Services



Application  
Platform Services



Integration &  
Data Virtualization  
Services



Mission-Critical  
Deployment  
Services  
(Appliance, Cloud)

# Agenda

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## 1 Technical Architecture Modelling

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## 2 Introduce SAP HANA Platform

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## 3 Architecture Case Study

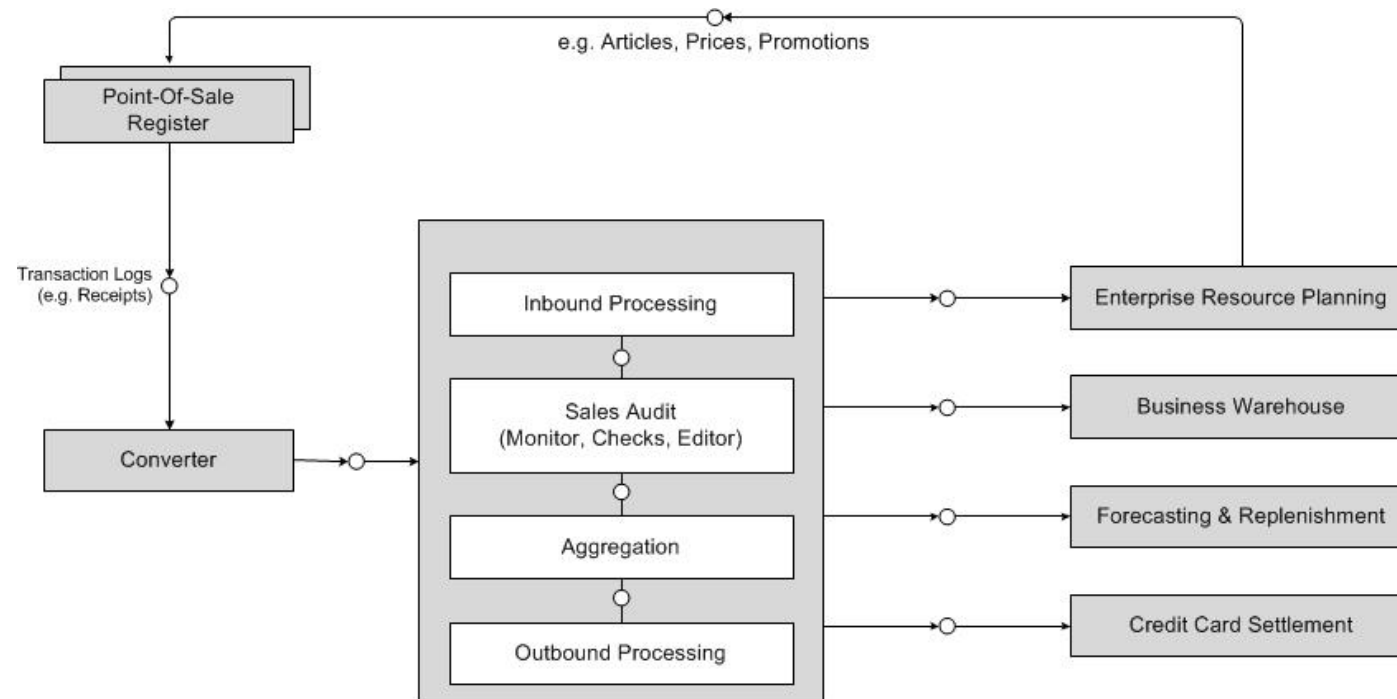
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**SAP Customer Activity Repository (SAP CAR) is a foundation that**

- **collects transactional data that were previously spread over multiple independent applications in diverse formats**
- **provides a common foundation and a harmonized multichannel transaction data model for all consuming applications.**

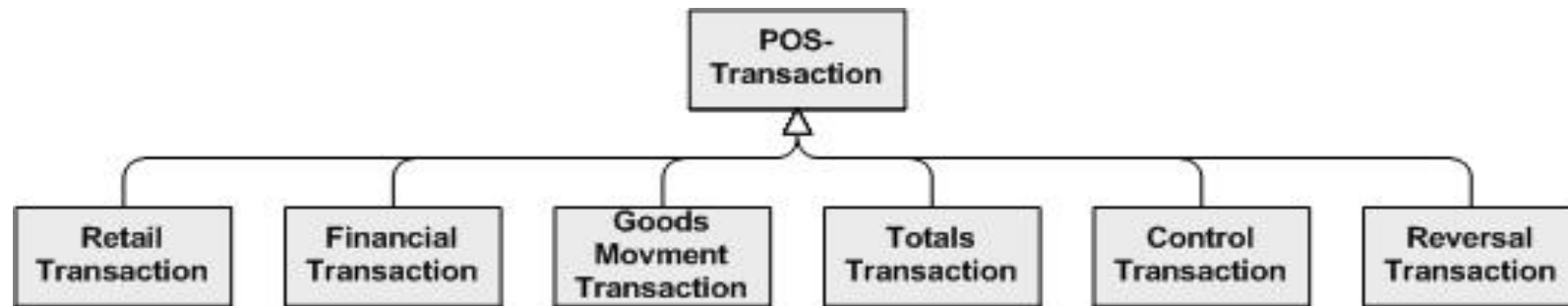


# SAP Point-Of-Sale Data Management

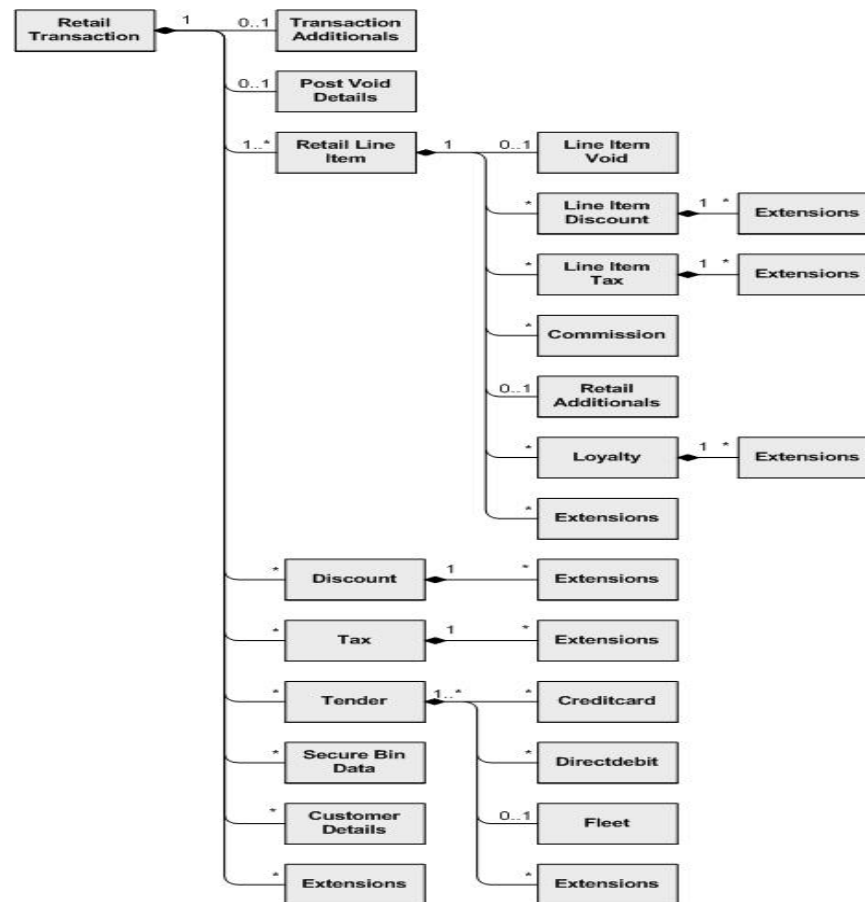


See: <http://help.sap.com/posdm>

## SAP Transaction LOG (Point-of-Sale ) Overview



## SAP Transaction LOG – Retail Transaction



## Customer Activity Repository (CAR) on HANA Vision

**To attract and retain today's shopper, retailers must deeply know their behavior real-time across channels. A differentiating consumer and demand data platform with seamless on-top analytical solutions is required by retailers.**

### Retail Data Challenges

- Volume keeps growing
- More granular detail required for transaction log analysis
- Data is not available soon enough for analysis due to data replication latency
- No data visibility across multiple sales channels

### SAP's Approach

**Provide a real-time, granular high-performing multichannel data foundation**

**Combine with real-time sales analytics applications and predictive capabilities**

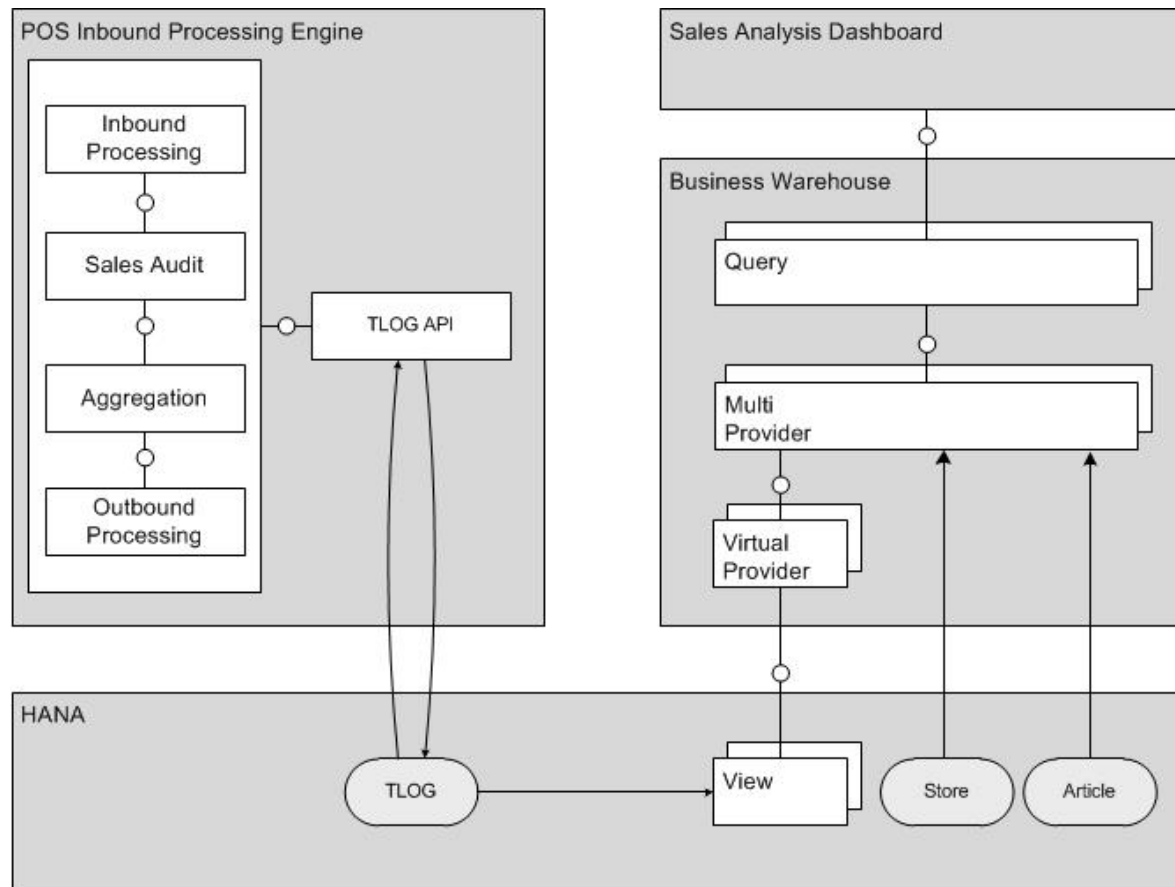
**Close the loop to optimize business processes for supply chain and shopper experience**

### Business Benefits

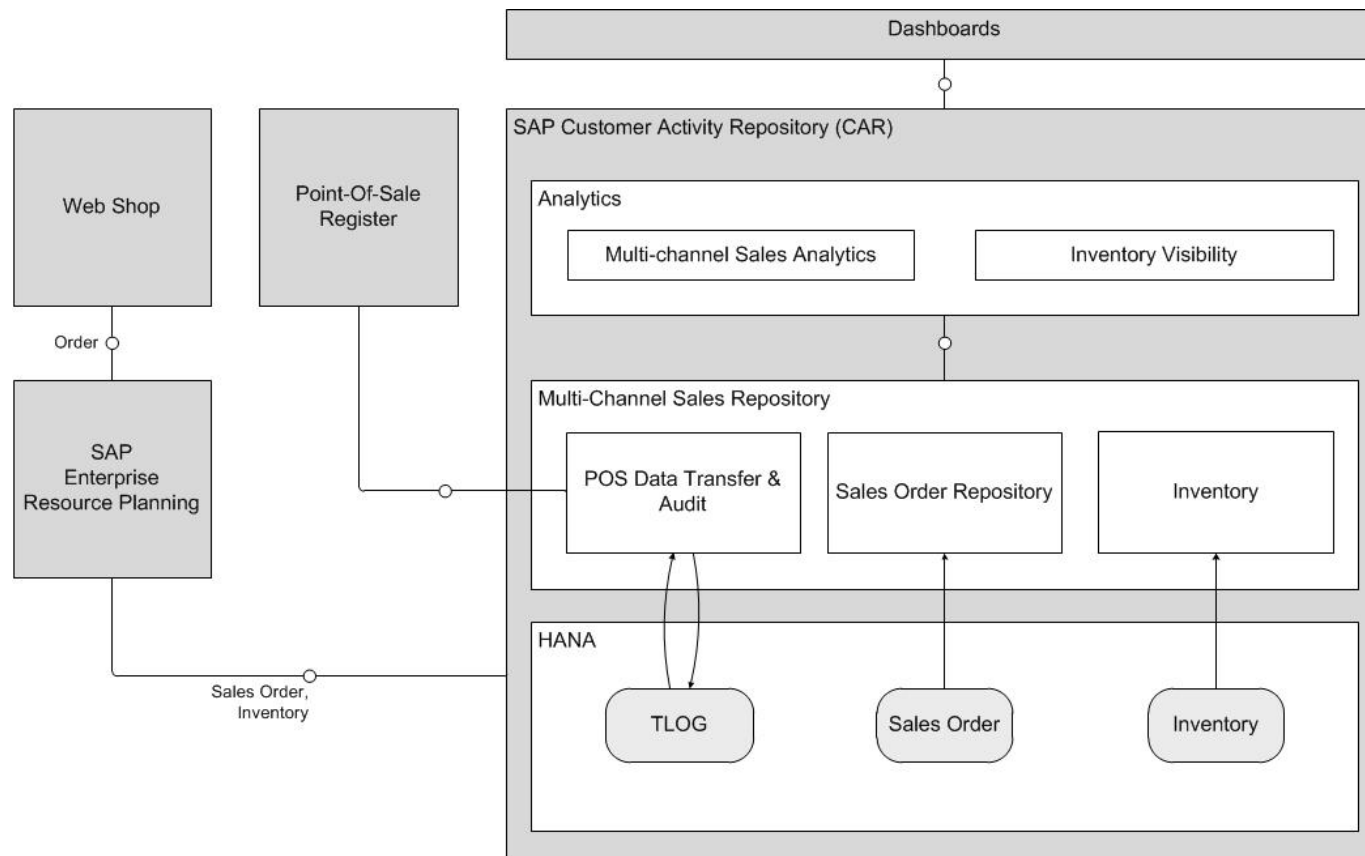
Increase sales, profitability, shopper experience and customer satisfaction by

- Detailed multichannel real-time customer insight
- Faster response to changing demand
- Consistent multichannel processes
- Support new business processes based on real-time insight like precision retailing
- Real-time data availability ensures low cost add-hoc queries

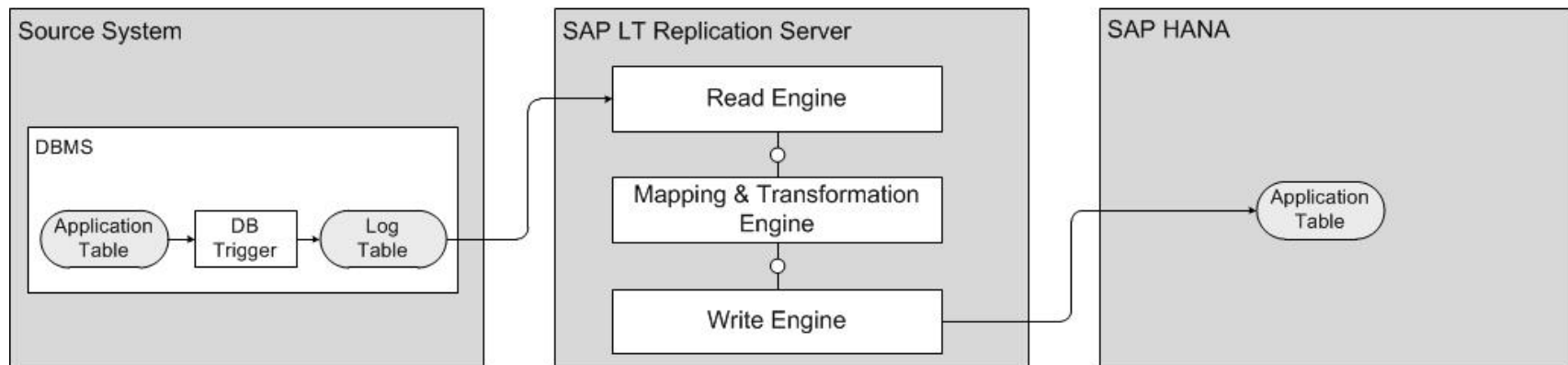
# SAP Point-Of-Sale Data Management on HANA



## Idea: Include Sales Orders to support Multi Channel Sales Analytics

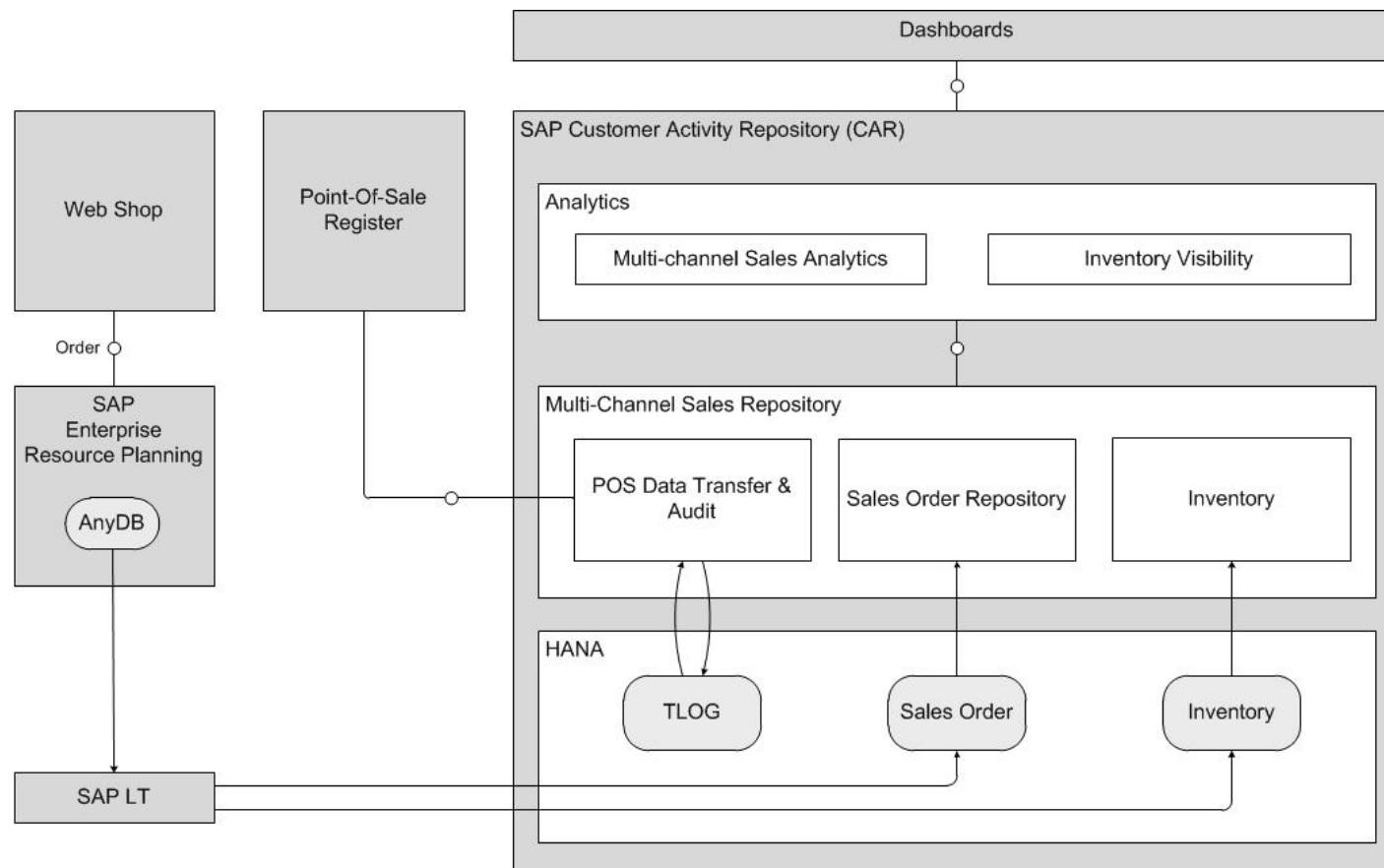


# SAP Landscape Transformation (SAP LT) Replication





## SAP CAR including Multi Channel Sales



# Demand Management

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## Demand Modeling

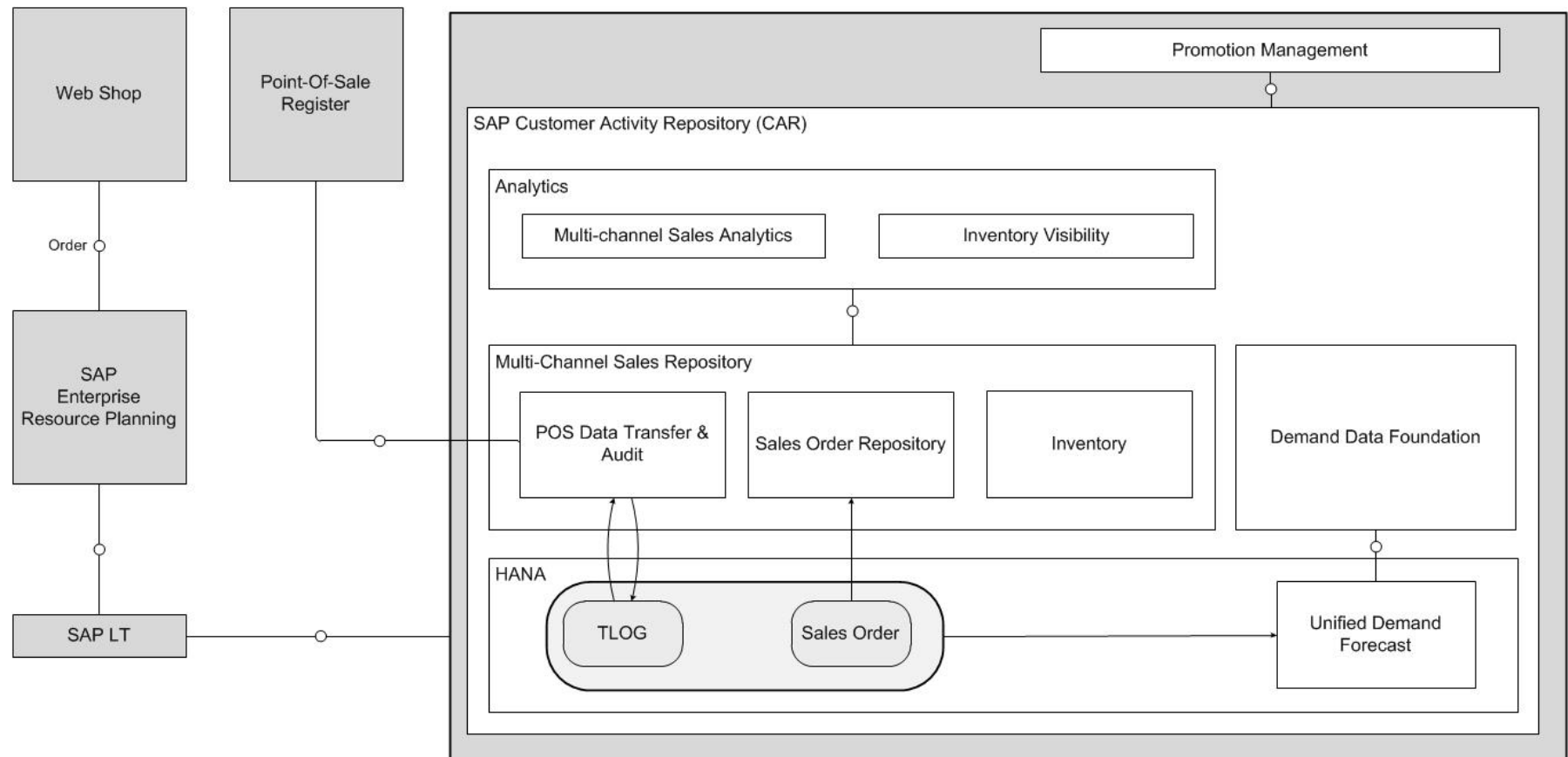
The demand model describes the historical sales behavior of a particular product in a particular location with regard to several aspects, such as price elasticity, seasonality, or promotional offers of different kinds.

## Demand Forecasting

The demand forecast provides an estimation how a particular product will sell in a particular location in the future, respecting future price changes, seasonal effects, and promotional offers.

# SAP CAR including Forecasting Capabilities

## Demand Data Foundation/Unified Demand Forecasting



Are you interested in HANA?  
<http://open.sap.com>

The screenshot displays the openSAP website interface. At the top, a dark navigation bar contains the 'openSAP' logo, links for 'Courses', 'News', and 'My openSAP', along with a search bar, language selector (EN), notification bell, and 'Log out' button. Below this, a secondary navigation bar includes 'Dashboard', 'Profile', 'Documents', and 'Settings'. The main content area is titled 'My courses' and features two course cards. The first card, 'In-Memory Data Management In a Nutshell' by Dr.-Ing. Jürgen Müller, includes a 'Self paced' badge, a description, dates (April 28 to July 16, 2013), language (English), and a 'Last visited' timestamp. It has buttons for 'Show course details' and 'Enter course'. The second card, 'Introduction to Software Development on SAP HANA' by Thomas Jung, is also 'Self paced' and includes a description. To the right, a section titled 'Next dates per course' lists four courses with their start dates: 'SAP Business Suite 4 SAP HANA in a Nutshell' (19 days), 'Build Your Own SAP Fiori App in the Cloud' (19 days), 'How the Internet of Things and Smart Services Will Change Society' (19 days), and 'SAP Screen Personas' (25 days). Below this is a 'Course Recommendations' section with a 'Starting soon' badge. A red box highlights the 'Introduction to Software Development on SAP HANA' course card and the 'Next dates per course' section.

openSAP

Courses News My openSAP

Dashboard Profile Documents Settings

My courses

**In a Nutshell**

**In-Memory Data Management In a Nutshell**

Dr.-Ing. Jürgen Müller

While the first openSAP course, Introduction to Software Development on SAP HANA, is intended as an introductory class for software developers who are new to SAP HANA, it makes sense for course participants to obtain an understanding of the fundamental concepts of in-memory data management before the course...

April 28 2013 22:00 (UTC) to July 16 2013 21:55 (UTC) English

Last visited: about 4 hours ago

Show course details Enter course

**Introduction to Software Development on SAP HANA**

Thomas Jung

SAP HANA is an in-memory data platform that is deployable as an appliance or in the cloud. At its core, it is an innovative in-memory relational database management system that makes full sense of the capabilities of current hardware

Next dates per course

SAP Business Suite 4 SAP HANA in a Nutshell

Course starts in 19 days

Build Your Own SAP Fiori App in the Cloud

Course starts in 19 days

How the Internet of Things and Smart Services Will Change Society

Course starts in 19 days

SAP Screen Personas

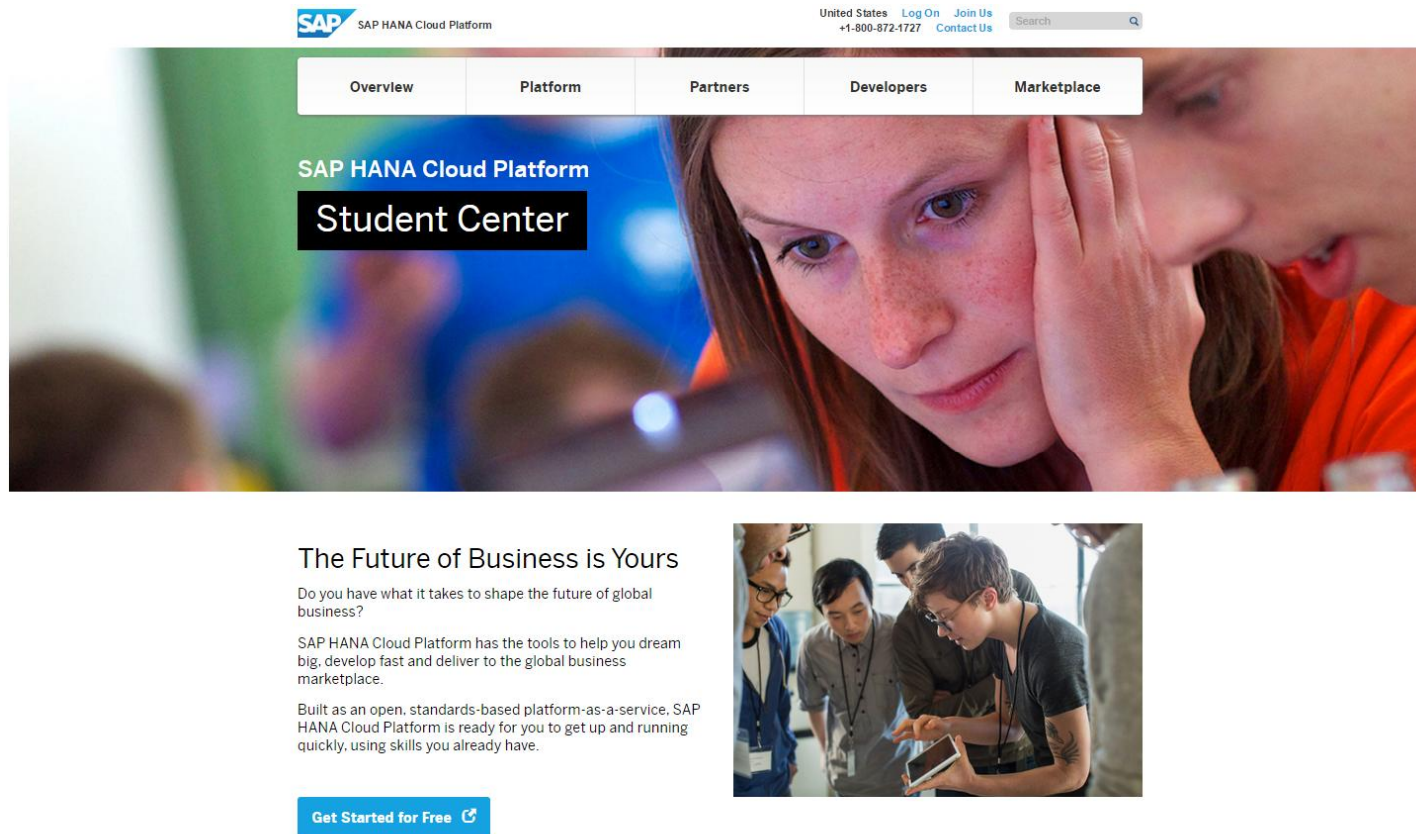
Course starts in 25 days

Course Recommendations

Starting soon

# Get your free personal HANA Cloud Platform (HCP) instance

<http://hcp.sap.com/students.html>



The screenshot shows the SAP HANA Cloud Platform Student Center website. At the top, there is a navigation bar with the SAP logo, the text "SAP HANA Cloud Platform", and links for "United States", "Log On", "Join Us", "+1-800-872-1727", and "Contact Us". A search bar is also present. Below the navigation bar, there is a main header with a large image of a woman looking at a screen. The header includes a navigation menu with "Overview", "Platform", "Partners", "Developers", and "Marketplace". The main content area features the text "SAP HANA Cloud Platform Student Center" in a large, bold font. Below this, there is a section titled "The Future of Business is Yours" with a subheading "Do you have what it takes to shape the future of global business?". The text describes the capabilities of SAP HANA Cloud Platform, stating it has the tools to help you dream big, develop fast and deliver to the global business marketplace. It also mentions that the platform is built as an open, standards-based platform-as-a-service and is ready for you to get up and running quickly, using skills you already have. A blue button labeled "Get Started for Free" with a share icon is located at the bottom of this section. To the right of the text, there is a small image of three people looking at a smartphone.

SAP HANA Cloud Platform

United States Log On Join Us  
+1-800-872-1727 Contact Us

Search

Overview Platform Partners Developers Marketplace

SAP HANA Cloud Platform  
Student Center

The Future of Business is Yours

Do you have what it takes to shape the future of global business?

SAP HANA Cloud Platform has the tools to help you dream big, develop fast and deliver to the global business marketplace.

Built as an open, standards-based platform-as-a-service, SAP HANA Cloud Platform is ready for you to get up and running quickly, using skills you already have.

Get Started for Free

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