The PI System and SAP HANA: Operating at the Speed of Business

Trusted Analytics in near Real-Time

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Why

With the reduced commodity prices, its critical for E&Ps to operate in a more efficient way. By identifying issues, prioritizing and understanding the root-cause of an impending event, we can reduce asset downtime and get the best return on investment. To enable this, it is critical to have surveillance tools, access to real-time data, and improve the decision making process.
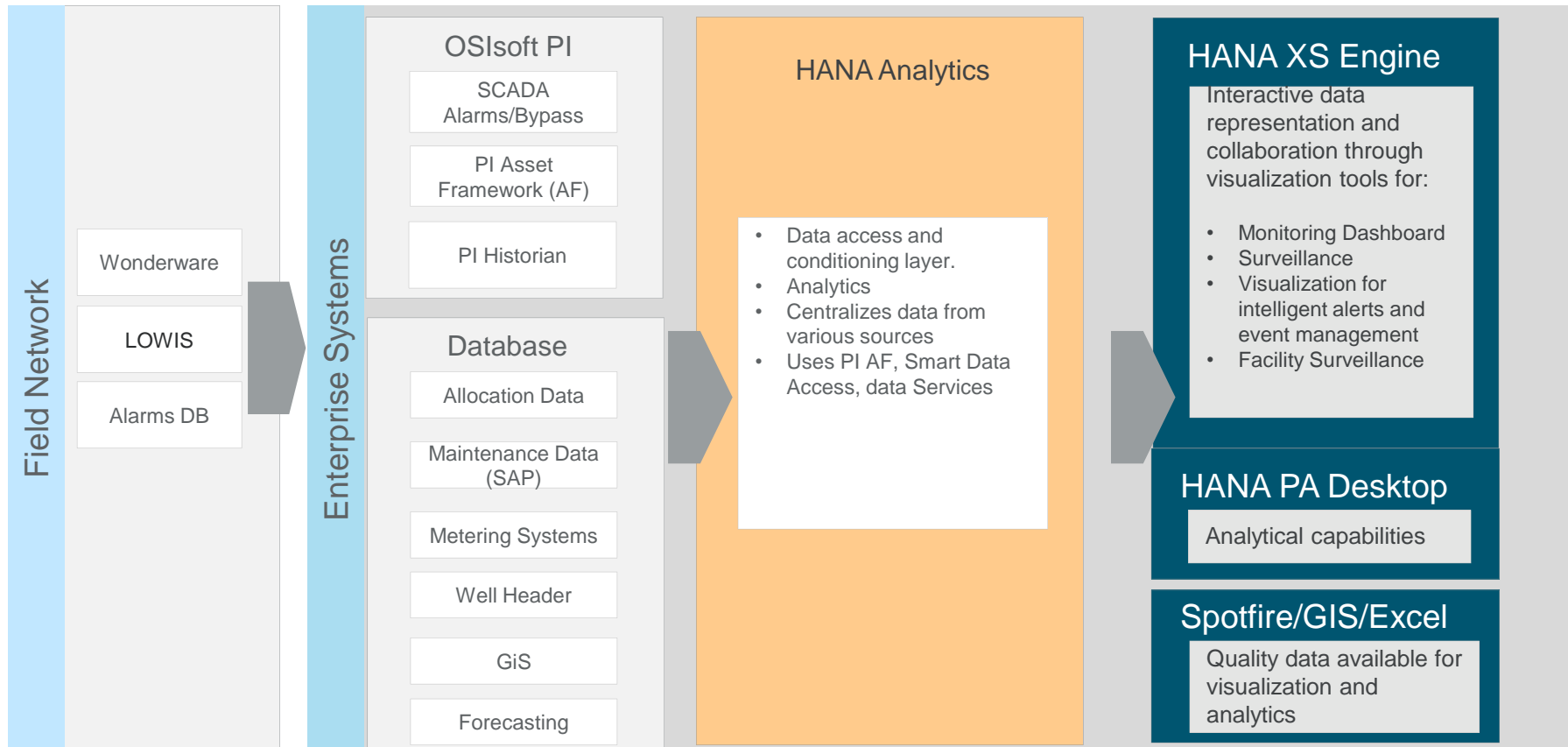
What I'll Cover

- The Challenge
  - Business
  - Technical
- Flow of Information
- The Result
- Principles followed
- Output
- Technology
- Timelines

The Business Challenge …

- Need to do more with less, especially resources (common trend across the industry)
- Latent Information and lack of detail analysis
- Access to production data (pressures, volumes, etc.) from multiple systems in a timely fashion
- Time and effort spent collecting allocated volumes, downtime information, well status and other field equipment
- Limited means to make decisions based on information, trust and business logic
- Productivity losses due to chasing data
- Collaboration across physical and organizational boundaries
- Data in different technical and business domains

- Bulk of operational data is sensor data which is Time series, has High volume and high velocity
- Sensor data usually not evenly spaced, has data quality issues

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Flow of Information

Field Network

Wonderware

LOWIS

Alarms DB

Enterprise Systems

OSIsoft PI

SCADA Alarms/Bypass

PI Asset Framework (AF)

PI Historian

Database

Allocation Data

Maintenance Data (SAP)

Metering Systems

Well Header

GiS

Forecasting

HANA Analytics

- Data access and conditioning layer.
- Analytics
- Centralizes data from various sources
- Uses PI AF, Smart Data Access, data Services

HANA XS Engine

Interactive data representation and collaboration through visualization tools for:

- Monitoring Dashboard
- Surveillance
- Visualization for intelligent alerts and event management
- Facility Surveillance

HANA PA Desktop

Analytical capabilities

Spotfire/GIS/Excel

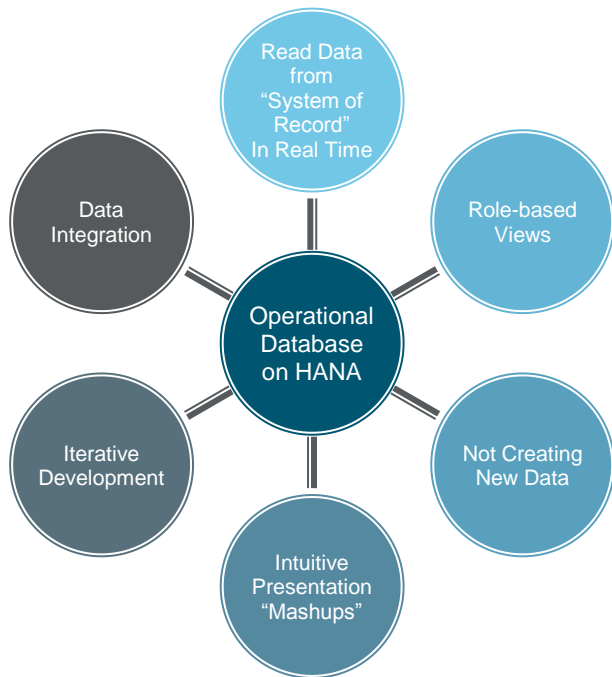Quality data available for visualization and analytics

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The Result

- With DOF/Production Surveillance solution on the HANA platform, business users can view real time information and perform analytics at the speed of business.
- Increase production efficiency /decrease unplanned well downtime.
  - Information and advanced capability provides the ability to focus on tackling well issues, assess the business value, and reduce downtime.
  - A platform to build different views with different technology
- Provide cleansed and trustworthy data to the business users for analytics and a single source of the truth.
- Ability to generate mini apps for different business needs.
- Improve staff efficiency - eliminate redundancies and automate manual processes.
- Develop the environment and tools to facilitate the use of advanced analytics.
- Provide consistent database and visualization tools environment across assets.

Principles Followed

Operational Database on HANA
- Read Data from "System of Record" In Real Time
- Role-based Views
- Not Creating New Data
- Intuitive Presentation "Mashups"
- Iterative Development
- Data Integration

Real Time
Allocation
SAP
Wonderware
PI Asset Framework
ACM
GIS
Drilling
Metering
System of Record

Output: Production Surveillance/Mini Apps

- Monitoring and Surveillance
  - Asset/Field level summaries of real time and allocated data
  - Well surveillance
  - Facility Surveillance
  - Operations View – Priorities
  - Impact of planned work in areas
  - Engineering view with historical high frequency data & tools to visualize
  - Events generation based on analytics

- Mini Apps
  - Chemical Management - capture chemical consumption information
  - Tracking jobs not tracked elsewhere

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Example Output

Monitoring

Analytics

Mini Apps

Technology

- OSIsoft PI

  - Bring real time data to enterprise

  - Deliver the data to SAP HANA

- SAP HANA

  - Sourcing from PI and other systems

  - Analytics

  - Presentation and Visualizations

PI Overall System Architecture

PI System Infrastructure

PI Interfaces & PI Connectors

PI Notifications

PI Event Frames

Analytics

PI Asset Framework

PI Data Archive

PI Server

PI System Access

PI Integrators

PI Cloud Services

PI Visualization Suite

Database like SQL/Oracle

ERP like SAP

Reporting tools like SpotFire

Business Analytics

PI Cloud Connect

PI Manual Logger

PI Coresight

PI ProcessBook

PI DataLink

PI WebParts

PI Data Archive

- ~700K data points collected

- Scan frequency between 1~15 seconds

- 1400 Updates Per Second

- PI System users consuming PI data using variety of client tools for visualization such as PI Datalink, PI ProcessBook, PI Coresight and Tibco Spotfire.

PI AF

- The power to turn data into information

- Pivot the data into information related to an object

- Template with 90 attributes per facility

- A combination of data and database driven fields

PI Web API

- Used the web API to dynamically create the PI AF templates

- No manual work needed in PI system to create new elements in the templates

- Overrides the tag names if the name does not follow naming convention

- Update the template with new attributes

- Web API connector written in JavaScript running on HANA XS engine

PI Web API

The PI Web API is a RESTful interface to the PI system. It gives client applications read and write access to their AF and PI data over HTTPS. Use the links on the left to learn about the PI Web API in more detail:
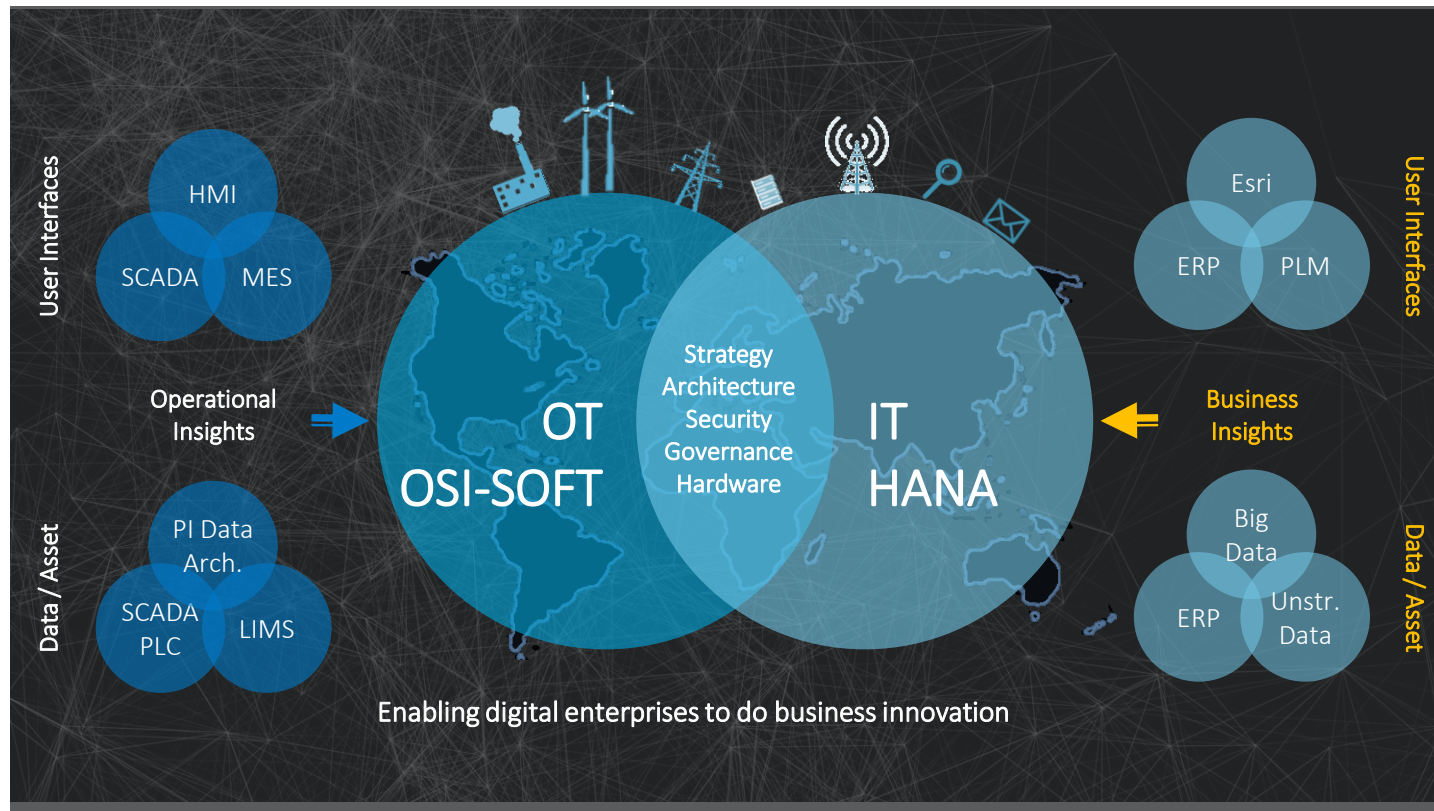
The **Getting Started** section introduces the concepts of a RESTful service in the context of the PI Web API and describes some important general constructs and principles found throughout the API. It concludes with a tutorial demonstrating a simple HTML/CSS/JavaScript client that uses the PI Web API.

The **Controllers** section lists the top-level endpoints provided by the service. Each controller's detail page provides links to the methods exposed by the controller. Use these pages as a reference when programming client applications.
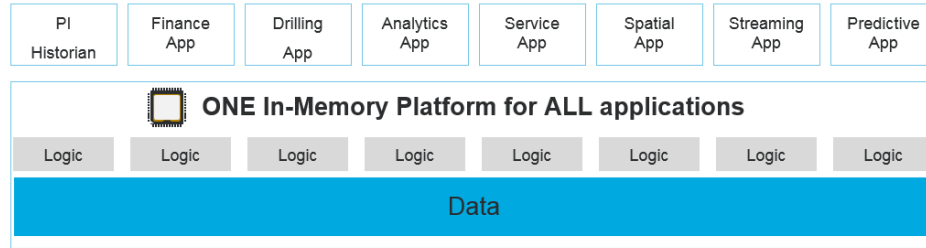
The **Topics** section provides links to detailed specifications of options and features that appear throughout the PI Web API. For example, several methods use time strings for input, output, and query filtering. The Time Strings topic describes the use and formatting of these strings.

The **Changelog** describes the incremental changes included in each release of the PI Web API.

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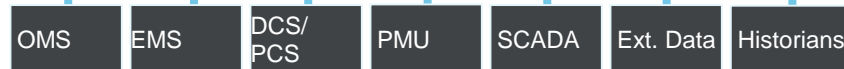# The Convergence of Information and Operational Technology

User Interfaces

HMI
SCADA   MES

Operational Insights

Data / Asset

PI Data Arch.
SCADA PLC   LIMS

OT
OSI-SOFT

Strategy
Architecture
Security
Governance
Hardware

IT
HANA

Esri
ERP   PLM

User Interfaces

Business Insights

Big Data
ERP   Unstr. Data

Data / Asset

Enabling digital enterprises to do business innovation

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SAP HANA IoT Integrator by OSIsoft

PI Historian	Finance App	Drilling App	Analytics App	Service App	Spatial App	Streaming App	Predictive App

ONE In-Memory Platform for ALL applications

Logic	Logic	Logic	Logic	Logic	Logic	Logic	Logic

Data

No waiting for data access and processing	All application logic (OLTP & OLAP) processed in one system	All data types processed in one system	Speed Simplicity Innovation

SAP HANA

IoT Integrator by OSIsoft

Operational Data

OSIsoft PI
Real Time Event Infrastructure

OSIsoft.

Data Sources

OMS	EMS	DCS/PCS	PMU	SCADA	Ext. Data	Historians

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SAP HANA IoT Integrator by OSIsoft

- Needed about 100K data points transferred to HANA every 5 mins.

- PI AF templates

- Need data to flow smoothly

- Ability to replicate/sync fixed data

- Event generations on fly

- ****Currently in testing*****

- Currently using a home grown connector to send data to HANA

The solution is only possible with in-memory data management

PI Historian	Finance App	Drilling App	Analytics App	Service App	Spatial App	Streaming App	Predictive App

ONE In-Memory Platform for ALL applications

Logic	Logic	Logic	Logic	Logic	Logic	Logic	Logic

Data

No waiting for data access and processing

All application logic (OLTP & OLAP) processed in one system

All data types processed in one system

Speed Simplicity Innovation

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Technology – Sourcing of Data
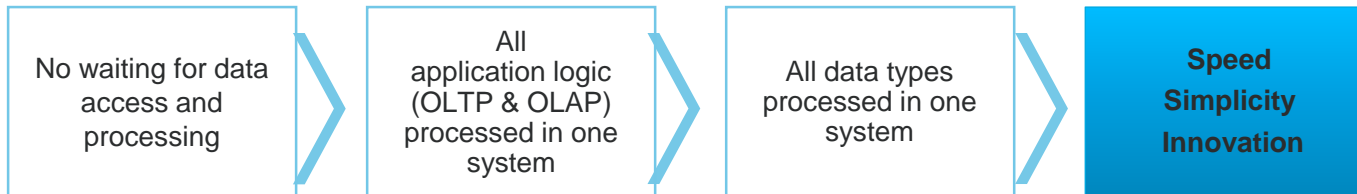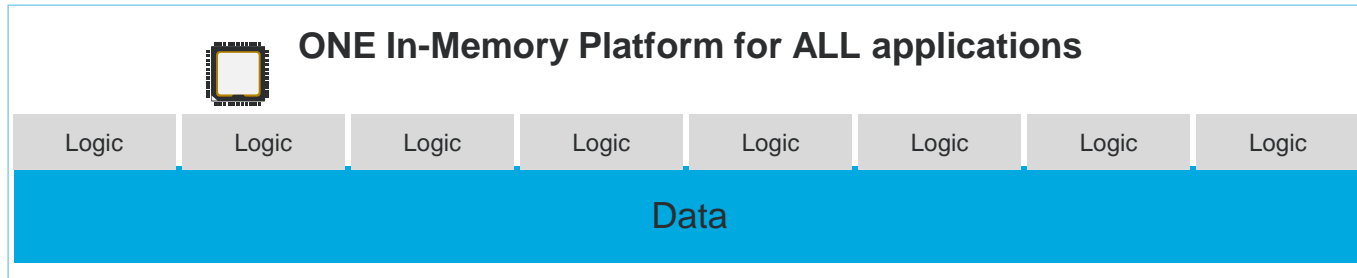
- Smart Data Access
  - Drilling Information
  - Well Header
  - Allocation Information
  - Real time data
  - SAP BW
- Data Services
  - SAP
- SAP PI
  - Third party data sourcing
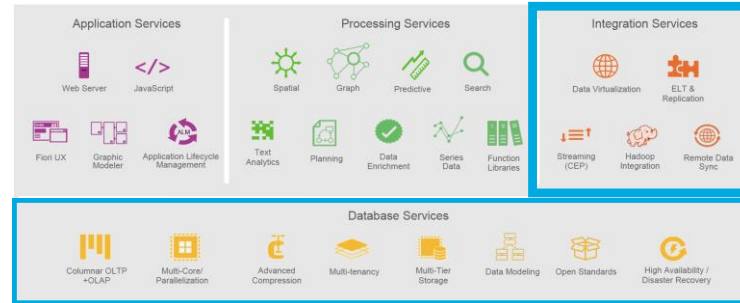
Speed and Frequency matters
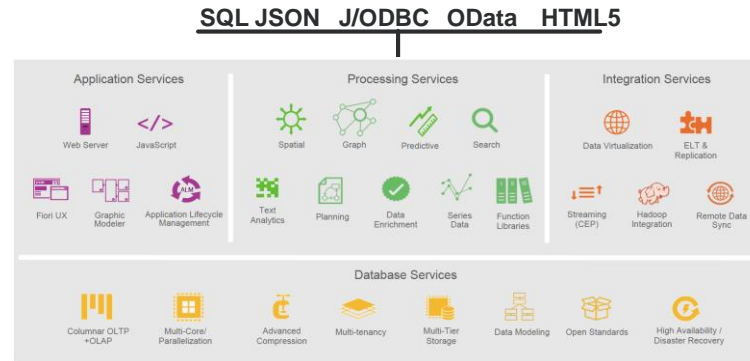
Technology - Analytics

- Cleaning and conditioning

- Aggregation and Analytics

- Analytical views – primary calculation views

- PAL functions like smoothing, anomaly detection and various others

- Text analytics

- All Analytics projects need cleansed and quality data

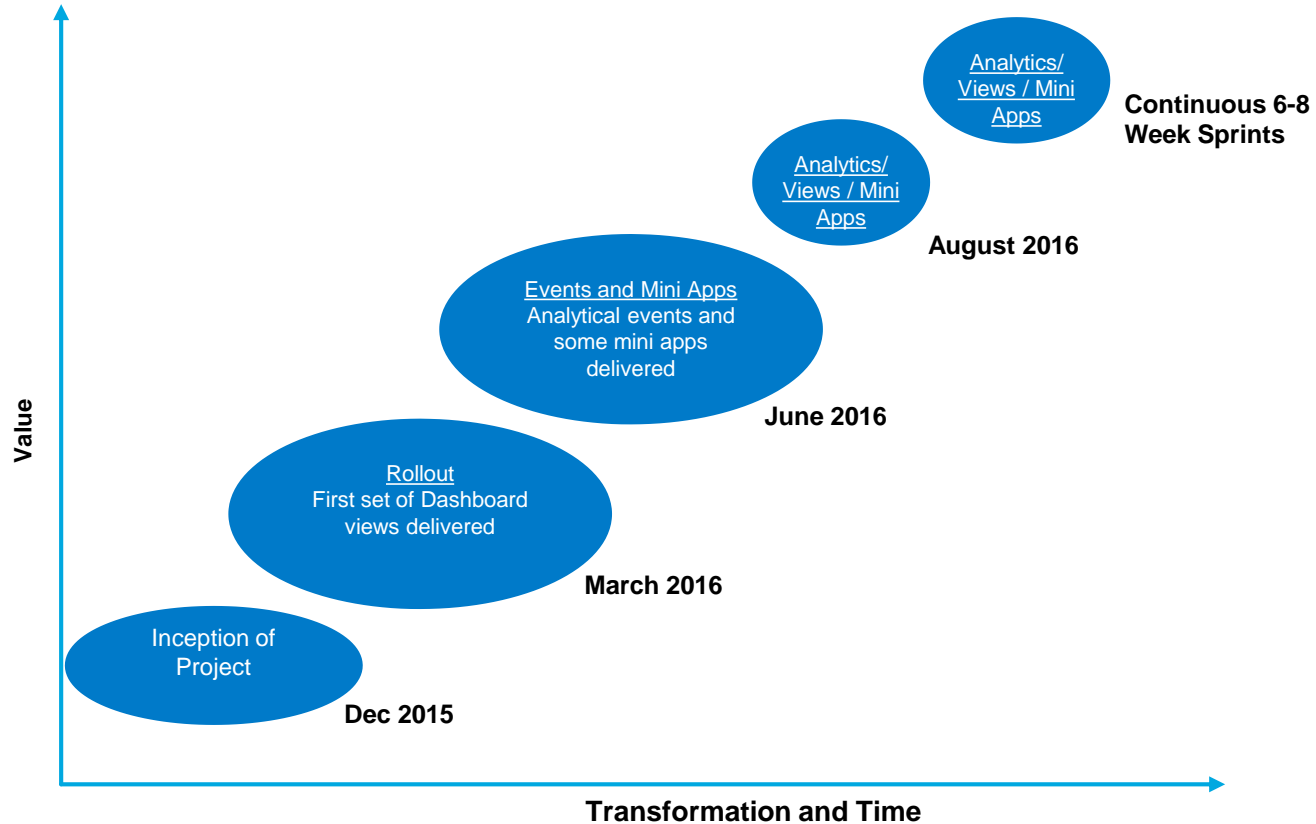# Technology – Presentation/Consumption
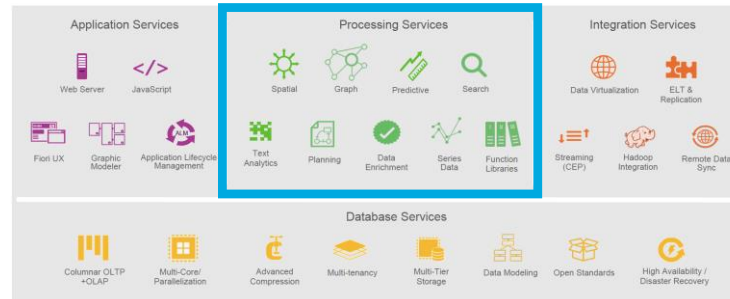
- HANA XS engine
  - XSJS Services
  - App Server
  - Job Scheduling
  - AFL
  - Server Side Javascript
  - HTML5
  - oData
- Sportfire connected to HANA
- Excel Plugins

SQL JSON   J/ODBC   OData   HTML5

Timelines

Value

Analytics/ Views / Mini Apps

Continuous 6-8 Week Sprints

Analytics/ Views / Mini Apps

August 2016

Events and Mini Apps
Analytical events and some mini apps delivered

June 2016

Rollout
First set of Dashboard views delivered

March 2016

Inception of Project

Dec 2015

Transformation and Time

Use Case 1 – Surveillance and Monitoring

Business Context: With the reduced commodity prices, it's critical for E&Ps to operate in an efficient way. By identifying issues, prioritizing and understanding the root-cause of an impending event, we can reduce asset downtime and get the best return on investment. To enable this, it is critical to get surveillance tools, access to real-time data and improve the decision making process.

Latent Information and lack of detail analysis

- Access to production data, pressures/volumes etc. from multiple systems in a timely fashion
- Various systems connected via SDA provide quick access to information stored in various systems
- Time and effort in collecting allocated volumes, downtime information, status of well and other field equipment.
- Limited means to make decisions based on information, trust and business logic

Near Real Time Detail Analysis

- With DOF/Production Surveillance solution on the HANA platform business users can view real time information and perform analytics at the speed of business.
- Information and advanced capability provides the ability to focus priorities on tackling well issues, to assess business value and reduce downtime.

SAP HANA Impact

Reduce downtime

Increase production

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Use Case 2 – Operational data store

Business Context: Data available in various business and technical domains. For any type of AppDev needs, developers have to pull data from various resources and join together using unreliable methods. This can be a time consuming and unreliable process.

Latent Information and process to collect

- Access to production data (pressures, volumes, etc.) from multiple systems in a timely fashion
- Various systems connected via SDA provide quick access to information stored in various systems
- Time and effort in collecting allocated volumes, downtime information, status of well and other field equipment.
- Limited means to make decisions based on information, trust and business logic

One stop shop

- Provide cleansed and trustworthy data to the business users for analytics and a single source of truth
- Platform to build different views with different technology
- Ability to generate mini apps for different business needs

SAP HANA Impact

Increase IT & Business user productivity

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Use Case 3 – Analytics (Future)

Business Context: Analytics projects start with finding, cleansing and conditioning data. HANA data store gives them a jump start.

Latent Information and lack of detail analysis

- Access to production data (pressures, volumes, etc.) from multiple systems in a timely fashion
- Time and effort in collecting allocated volumes, downtime information, status of well and other field equipment.
- Limited means to make decisions based on information, trust and business logic

Quick turnaround to Analytics

- Cleaned/Cleansed and conditioned data ready to be a source for analytics projects
- Analytical/Aggregation functions available to use
- Tools available for some Analytics (PA Desktop) and data available to be consumed in other Analytic tools.
- Runtime implementation of models available in a platform which also provides visualization of the results

SAP HANA Impact

Quick turnaround to Analytics projects