



UNIVERSIDAD  
**AUSTRAL**

Facultad de Ingeniería



**Tenaris**

# Real Time Information

Jornadas de Data Mining & Business Intelligence  
11° Edición

Carlos Duplaá – Esteban Capocchetti  
Buenos Aires – October 2016



# Real Time Information

## Agenda

- ✓ Tenaris overview
- ✓ Business context
- ✓ Real Time Drivers & Main characteristics
- ✓ Demo Video & Tools
- ✓ Information Flow
- ✓ Key figures at runtime
- ✓ Architectural Drivers
- ✓ Main architectural Layers
- ✓ Exadata Landscape
- ✓ Technical architecture

# Real Time Information

## Tenaris Company Overview



Tenaris is a leading supplier of tubes and related services for the world's energy industry and certain other industrial applications. **Our mission is to deliver value to our customers through product development, manufacturing excellence, and supply chain management.**

We seek to minimize risk for our customers and help them reduce costs, increase flexibility and improve time-to-market.

Tenaris employees around the world are committed to continuous improvement by sharing knowledge across a single global organization.

Paolo Rocca  
Chairman & Chief Executive Officer

# Real Time Information

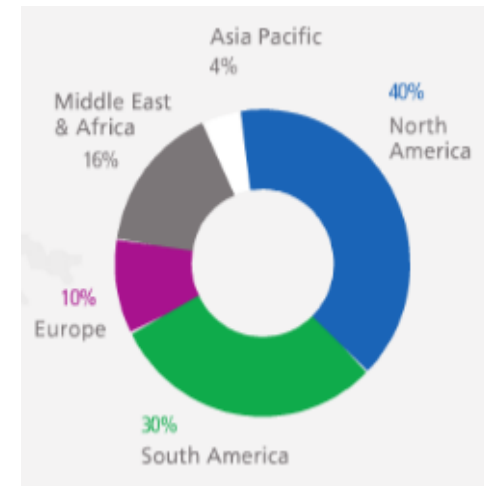
## Tenaris in numbers



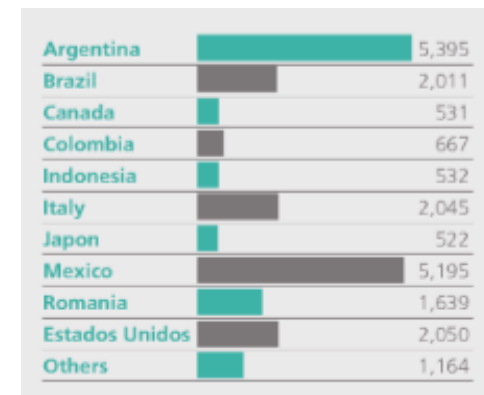
- **Net Sales** in 2015 (millions of US dollars): **7.101**
  - Tubes 6.444
  - Others 657
- **Tubes Sales** in 2015 (thousands of Tons) **2.633**
  - Seamless 2.028
  - Welded 605

- Service and Distribution Network in **30 countries**
- Stock Exchange listing in **4 countries**  
(New York, Bs. As., Italy, Mexico)
- **Employees: 21.741** (as of December 31, 2015)

### Sales by Region



### Employees by Nationality



# Real Time Information Worldwide Operations



**Challenge:** Multiple locations, multiple sources of Information, multiple time zones.

# Real Time Information

## Business Context

### WTI Crude Oil



Source: Bloomberg

### Rig Direct™

#### Benefits to our customers

Our experts in pipe materials and performance, material supply, inventory management and preparation for use, and subsequent running in the field are helping customers to achieve safer and more efficient operations.



**Reduce**  
the total cost of operations



**Improve**  
product reliability and efficiency



**Maximize**  
operational safety



**Minimize**  
environmental impact



**Optimize**  
the use and extend the service life of materials

#### RIG DIRECT™ PILLARS



**Technical consulting services**



**Pipe management services**



**Field services**

# Real Time Information Drivers



## Business

- ✓ Get a **consolidated view** of Inventory Information (material on Ground and In Transit) to support Rig Direct™
- ✓ **Pipe by pipe traceability** thru industrial and logistics processes
- ✓ Provide Inventory **Information to Tenaris Customers**

## IT

- ✓ Make **Information** of transactional systems **available** in real time to other applications and easy integration of information
- ✓ Aggregate of data to build real time **advanced analytics**: e.g. supply planning optimization
- ✓ **Consistency and Integrity** of Information across Tenaris

# Real Time Information

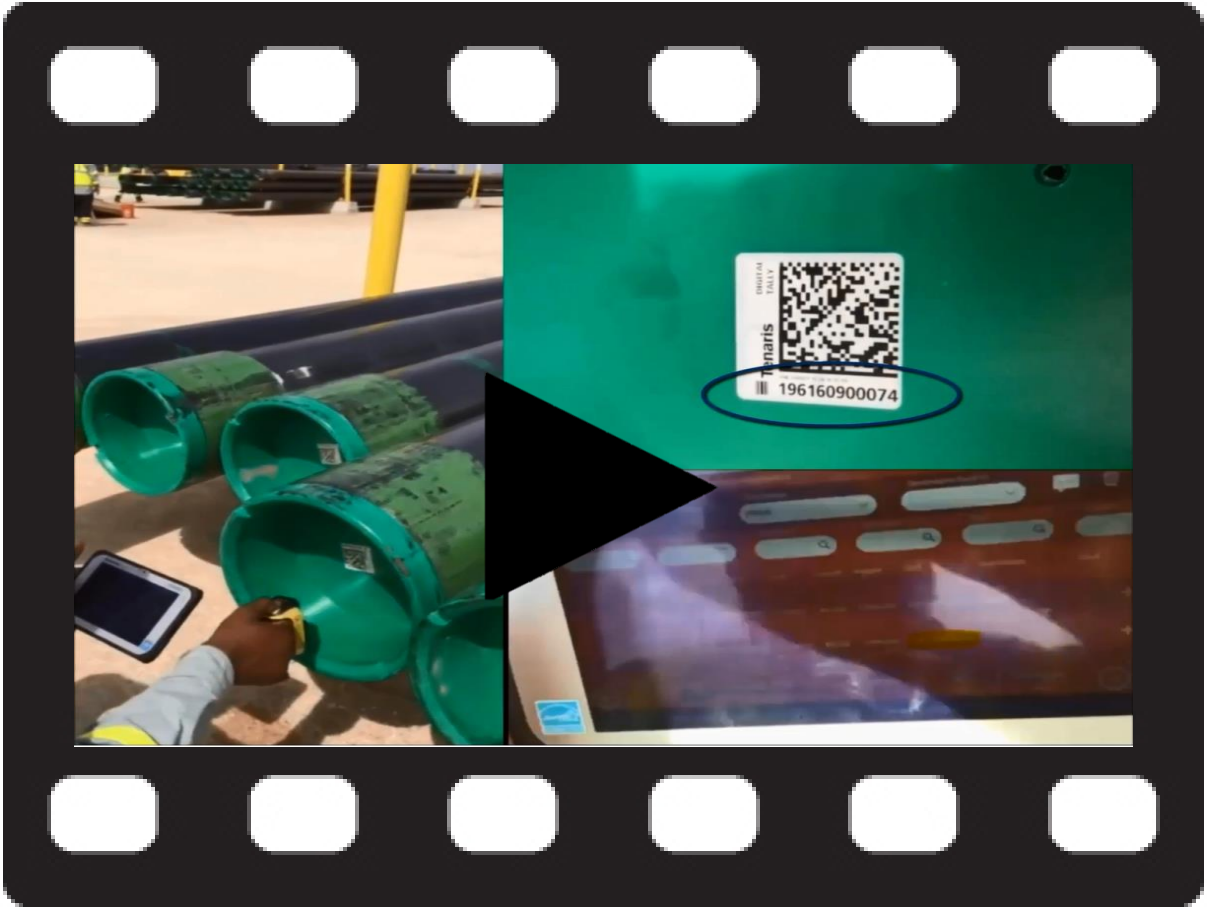
## Main characteristics

- ✓ **Capture Business Events** in near real time: receptions, dispatches, stock movements, invoicing, and commercial documents updates.
- ✓ TTDB database is prepared to **receive information from different lines** from our Industrial System.
- ✓ Combined with external traceability: **Tags** (RFID or Datamatrix) to **identify uniquely** pipe by pipe **our systems and customers** can read the **latest tube information**.
- ✓ **Unique interface** with transactional with one **centralized model** to **support different needs**: managerial, analytical and operative tools.
- ✓ RT is a **Technicality** to ensure that the **information is coherent** allowing to make a consolidate analysis when needed without the necessity of align the operations.
- ✓ **Enhance infrastructure** with **in-memory databases** to allow to process and deliver information faster.



# Real Time Information

## Video



# Real Time Information

## Other Tools with RT Information

### Tenaris US Logistics and Execution Dashboard

Tn - STn | Monthly | YTD | Weekly Evol | Monthly Evol | Custom

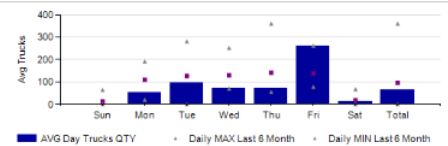
Display: Month - Period Oct 2016 - BU: All - Sub BU: All - Customer: All - Location: All | Execution Date: 10/11/2016

Business Type: All - Movement Type: All

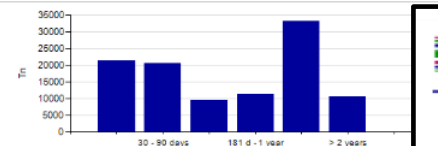
Dispatches				
Tn	Ft	Pc	Trucks	Avg payload Tn / Truck
11,335	1,482,638	60,731	620	18.3

RFD Inventories		
Tn	Ft	Pc
106,158	17,819,556	949,298

Dispatches - Average number of trucks per day



RFD Inventories by aging



Dispatches of...		Serviced...	
Sale Order	144	Customers	40
Sale Order Items	228	Wells	19
Unique Products	141		

Receptions			
Tn	Ft	Pc	Trucks

\* Please select location to show data.

BI Reports: Dispatches - Inventories - Receptions - Rig Returns - Yard Services


## Demand Sync™ Inventory View

### Tenaris DemandSync™ Inventory View

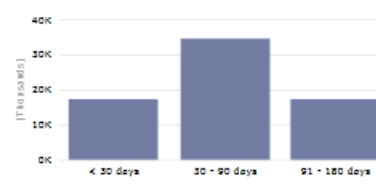
Last Updated on 2016-10-12 08:02 AM (GMT-6)

Location

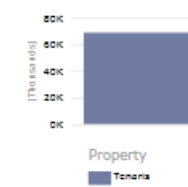
- Sanghita Tr
- Wells Locati



Joints by Aging Range



Joints by Property



Product Type	OD in	Weight ppf	Grade	Connection	Range	Joints	Feet	Tons	Meters
CASING PIPE	7	29.00	L80 TYPE 1	TSH MS XT/XC	RANGE 3 (SPECIAL)	26,413	1,157,589	15,233	352,833
CASING PIPE	9.625	40.00	L80 TYPE 1	BTC	RANGE 3 (SPECIAL)	4,220	186,281	3,372	56,778
OCTG COUPLING	2.875	6.40	L80 CR13	TSH MS	NOT INFORMED	250	148	1	45
OCTG COUPLING	2.875	6.40	L80 TYPE 1	TSH MS	NOT INFORMED	149	85	0	26
OCTG COUPLING	3.5	9.20	L80 TYPE 1	TSH MS XT/XC	NOT INFORMED	50	33	0	10
OCTG COUPLING	7	29.00	L80 TYPE 1	TSH MS XT/XC	NOT INFORMED	39	34	1	10
TUBING PIPE	2.875	6.40	L80 CR13	TSH MS	RANGE 3 (SPECIAL)	13,016	568,638	1,657	173,321
TUBING PIPE	2.875	6.40	L80 TYPE 1	TSH MS	RANGE 3 (SPECIAL)	23,369	1,034,661	2,910	315,365
TUBING PIPE	3.5	9.20	L80 TYPE 1	TSH MS XT/XC	RANGE 3 (SPECIAL)	1,672	74,160	299	22,604
<b>Total</b>						<b>69,178</b>	<b>3,021,629</b>	<b>23,472</b>	<b>920,993</b>

View Report

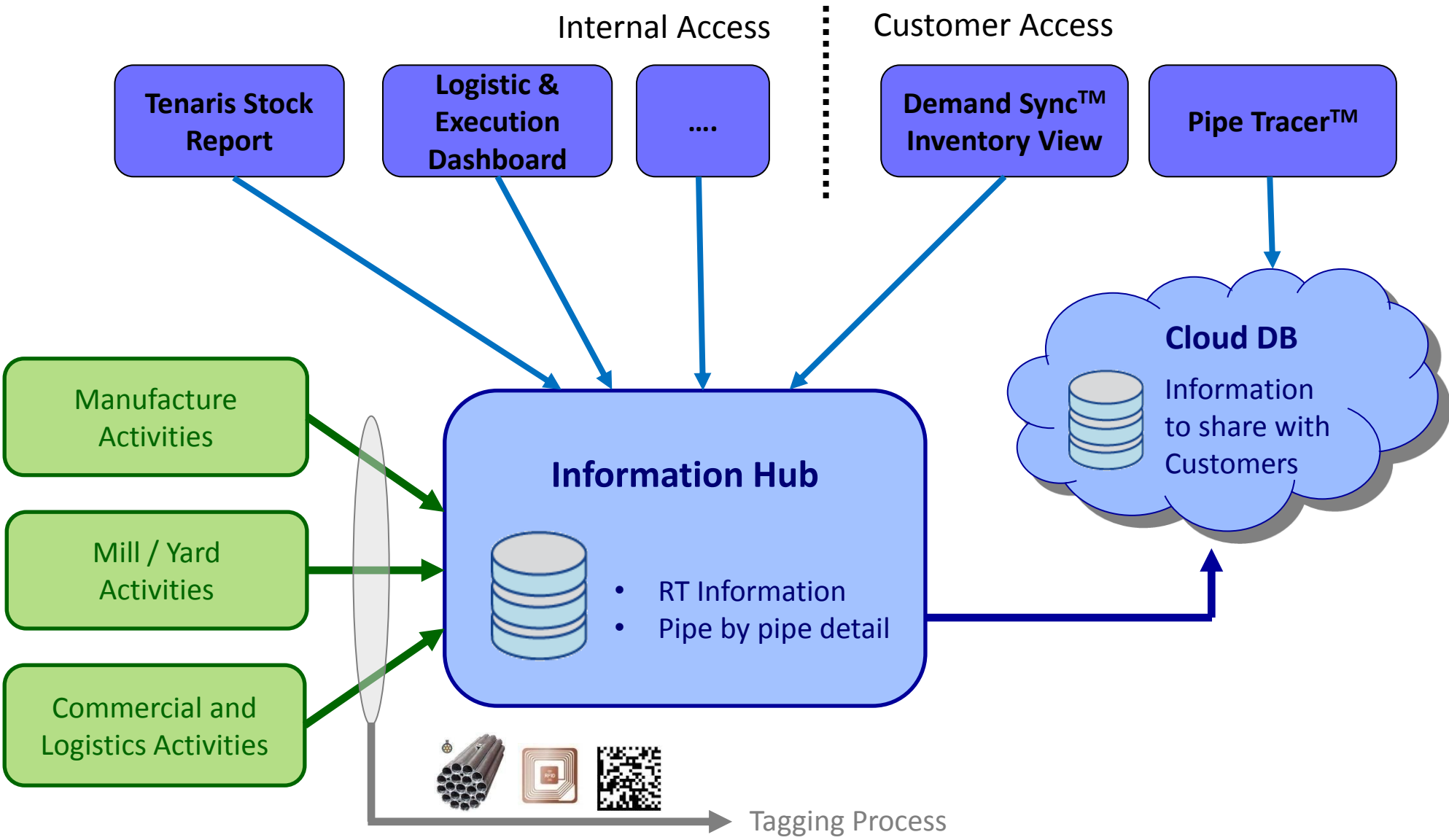
Custom Reports

Tutorial

## Logistic and Execution Dashboard

# Real Time Information

## Information Flow & Usage

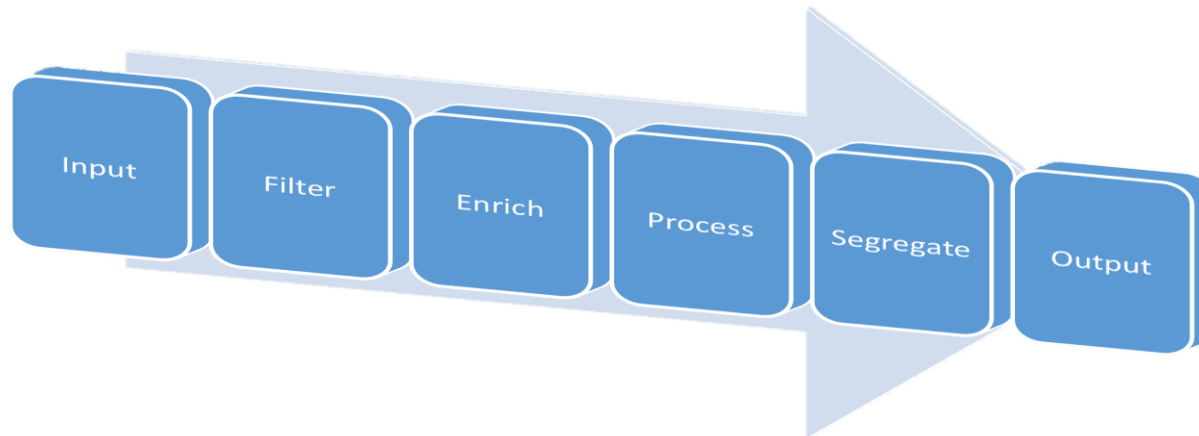


# Real Time Information

## Key figures at runtime



- ✓ **Legacy source table events ingestion** – about **2 millions daily**.
- ✓ **Information Hub updates** – near **1 million updates / deletes / inserts daily**.
- ✓ **Reach cloud servers (Pipe Tracer™)** about **50 thousands** (2,5 % vs. Legacy).
- ✓ **50 events processed per second** during working hours.
- ✓ **Max latency in the whole path: 30 seconds (SLA)**.



- ✓ In addition: the infrastructure installed improved the batch processing capabilities to **reduce about 50% the batch processing window**

# Real Time Information

## Architectural Drivers

- ✓ **Capture Events in Transactional Systems**
  - Deal with different Storage techs. and Integration techs.
  - Detect relevant data for Business
- ✓ **Transform Data from Transactional Systems into a Common Model**
  - Handle transactional models and convert into a common model
  - Validate information
- ✓ **Receive high volume of data in continuous flow**
  - Handle continuous processing of different data (vs. planned ETLs)
- ✓ **Store in a common model**
  - Invalid data should be stored also to reflect invalid data.
- ✓ **Guarantee integrity, coherence, synchronization check**
  - Associate data from different Systems (e.g. Dispatches, Stock Movements)
  - Provide re-initialization and automatic synchronization. Avoid manual resync. Processes
- ✓ **Monitorable by design**
  - Must be easily monitorable at any stage of the information flow.

# Real Time Information

## Information Hub – Main architectural layers



### DECISION SUPPORT SYSTEMS

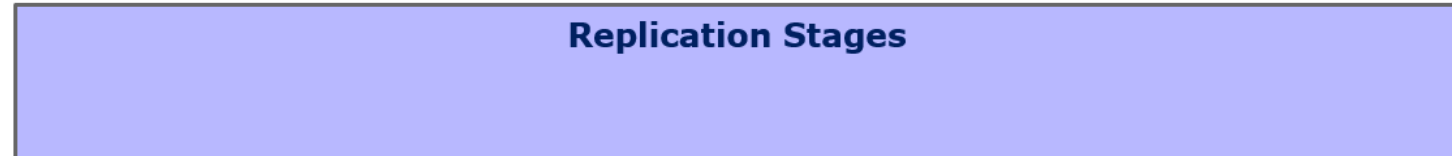
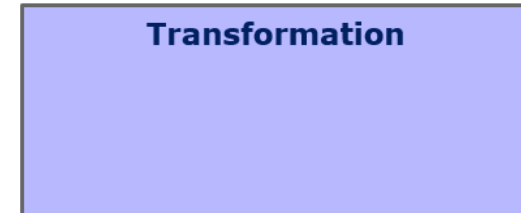
Provide facilitating Services to access data from different devices (Web, BI Tools, Mobile)

Consolidate Tenaris Information needed for BI in a Common Model

Provide Transformation Tools to build the Common Model

Build a Replication Copy to avoid surcharging TX Systems

Capture Changes in Transactional Databases to avoid having to change al TX Systems



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### TRANSACTIONAL SYSTEMS

# Real Time Information

## Information Hub – Main architectural layers

### DECISION SUPPORT SYSTEMS

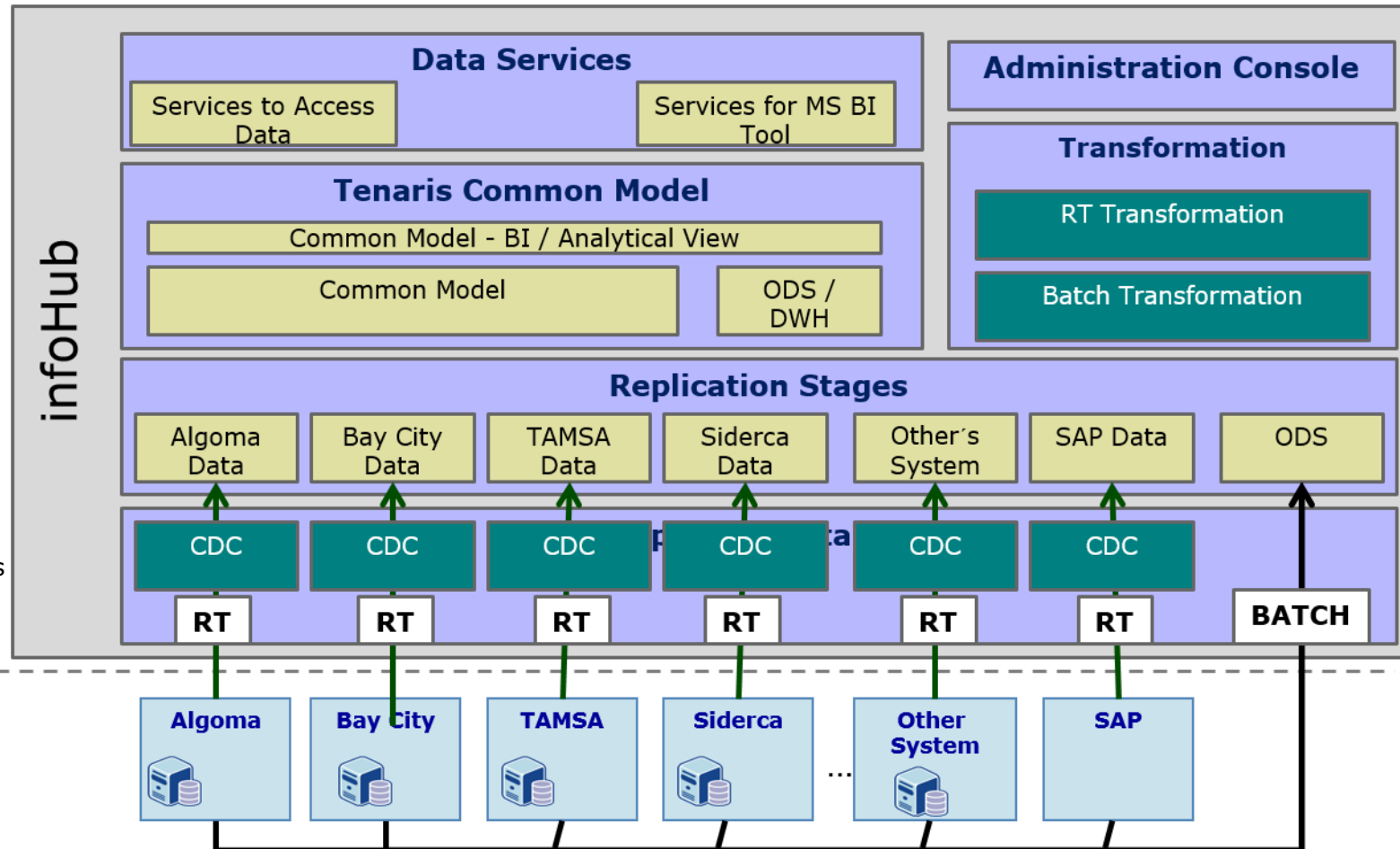
**The Common Model BI / Analytical View** holds data organized for reporting and dashboards

**Transformation Components** transform data into a Common Tenaris Model and then into BI and Analytical Models

**Replication Stage:** Holds a copy of Transactional Data AS-IS in TX System

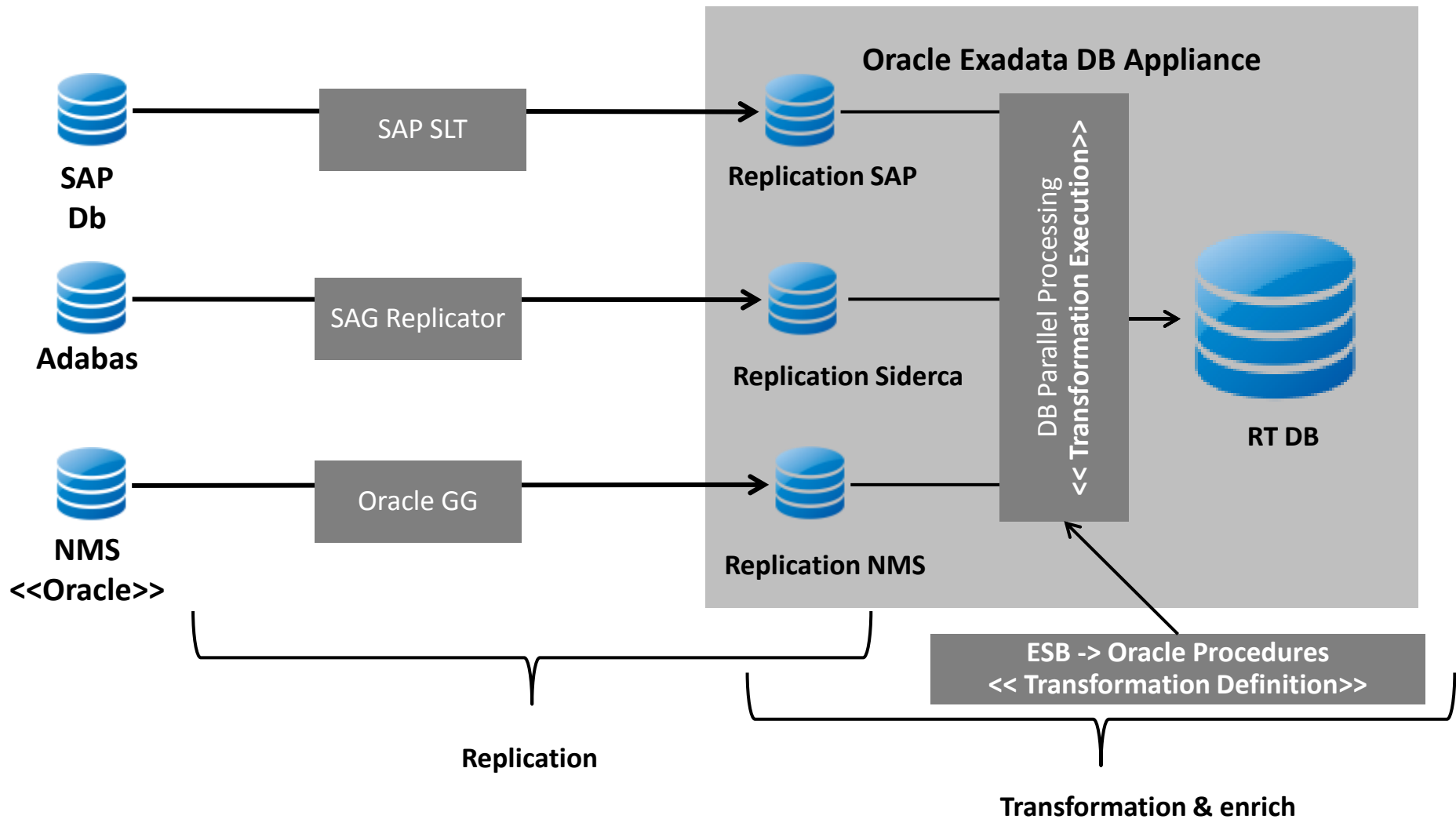
**Change Data Capture Tools** replicate data from TX Systems into Replication Stage in Real Time with NO Transformation

### TRANSACTIONAL SYSTEMS



# Real Time Information

## Information Hub - Technical Architecture at a glance

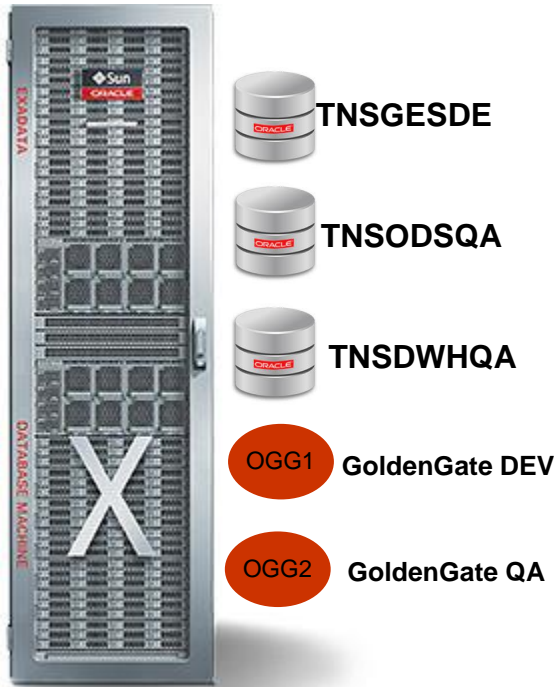




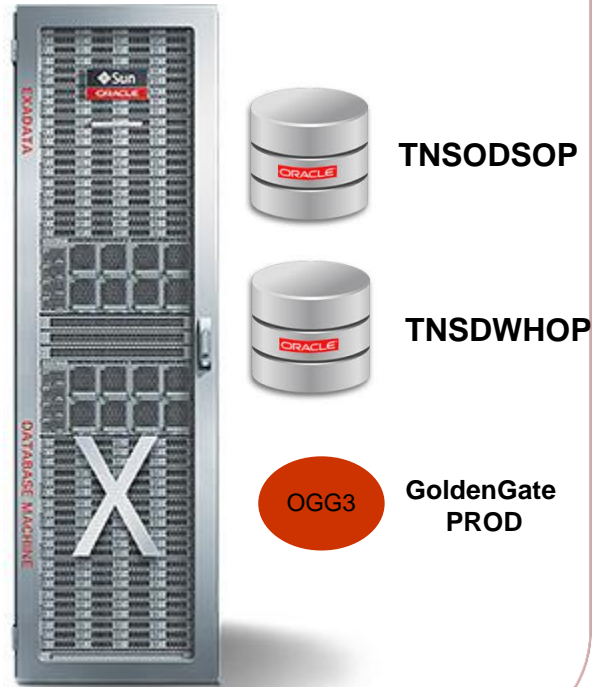
# Real Time Information

## Exadata Landscape

### Exadata – CNA Dev & QA



### Exadata – MTZ Production



### Applications

MANAGEMENT CONTROL &  
I-NET SYSTEMS

ODS, BCP, TMC  
DWT

- COMMERCIAL BUDGET
  - OFERTAS
- PRODUCTION ORDERS
- PURCHASE ORDERS
  - SALES ORDERS

BI and ETL Technologies

- QlikView Reports
- Microstrategy Reports
- SQL Analysis Services OLAP cubes
  - Datstage
- Batch Unix and Windows
  - MS Excel & Access

- RT – InfoHub

1 Rack – 2 blades DB (28 cores, 512 gigas per blade) - Oracle real application cluster  
Database Oracle 12C, on Oracle Linux 6.2  
3 blades Storage (triple redundancy) with 28 teras

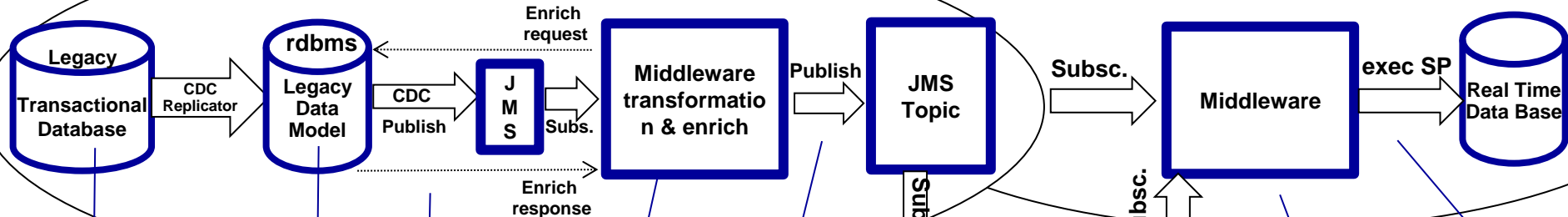
# Real Time Information

## Information Hub - Technical Architecture



### Event Generation Process

### Event consumption Process



The functional analysts team defines the group of tables to be replicated ( not trivial )

CDC tool configuration in order to generates the replicas ( config. task )

GoldenGate for the rdbms tables, also configures the output Queues ( config task )

Data2Infor transformation, enrichment. Middleware development

Defining an useful and meaningful Topic is a challenging task.

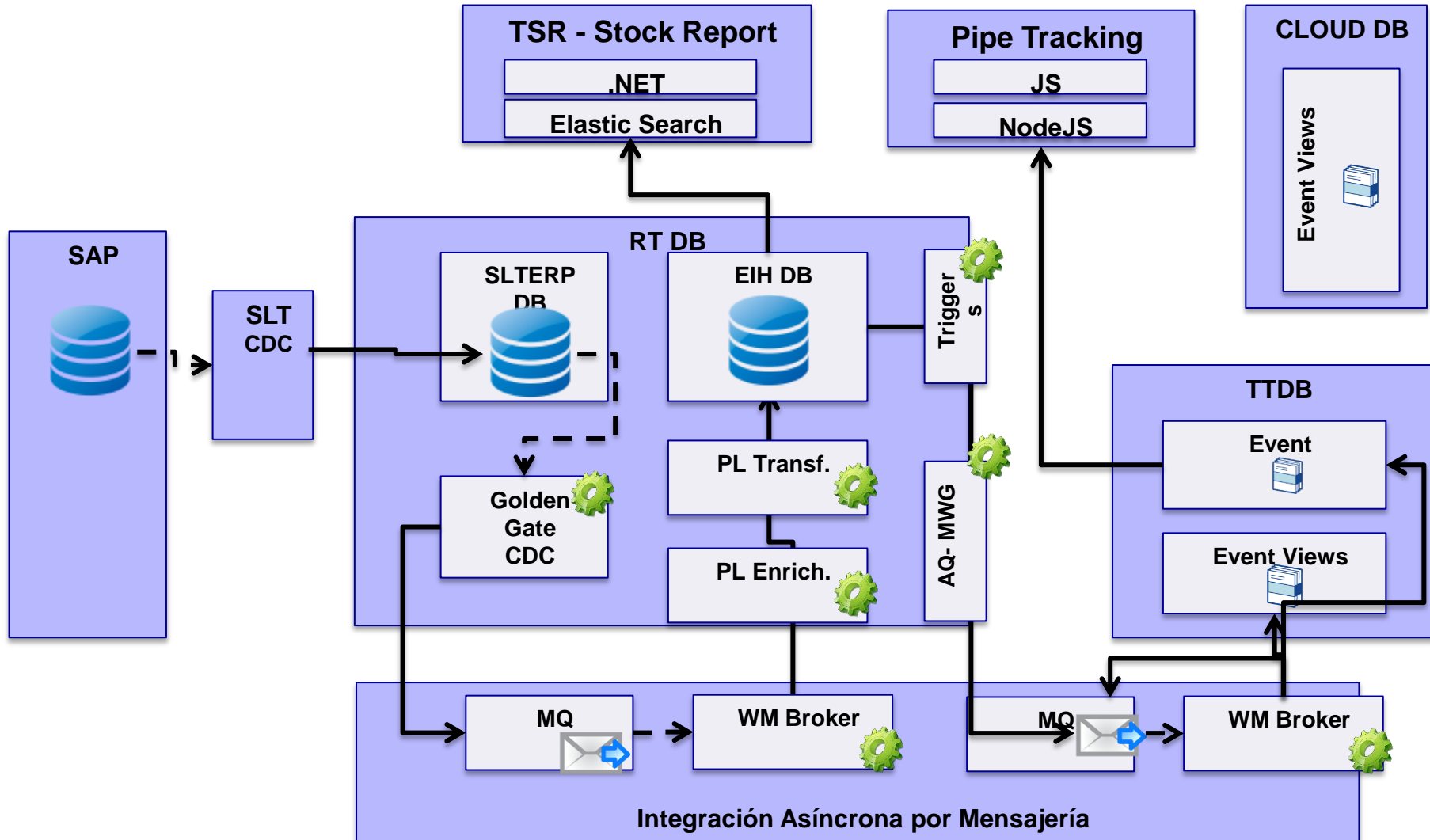
CEP -Optional Process Detecting a new event based on different topics might be useful. Ex. Commercial order events vs industrial order events ( shown in last meeting )

Only mapping from topic information to Stored Procedure

Stored Procedures development that finally impacts the Real Time Database Tables

# Real Time Information

## Information Hub - Technical Architecture & Systems





## Questions?



## Thank you!!