Value of the PI System Infrastructure at INEOS

Presented by

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About INEOS in Cologne

Chemistry by people

Biggest unheard-of chemical company

INEOS Group

- Privatly owned, globally leading
- 46 billion US Dollars sales volume
- 15,000 employees
- 51 production sites in 11 countries

INEOS in Cologne

- Biggest chemical company in Cologne
- 2.6 billion Euros turnover
- 2,000 employees
- 200 apprentices and dual students
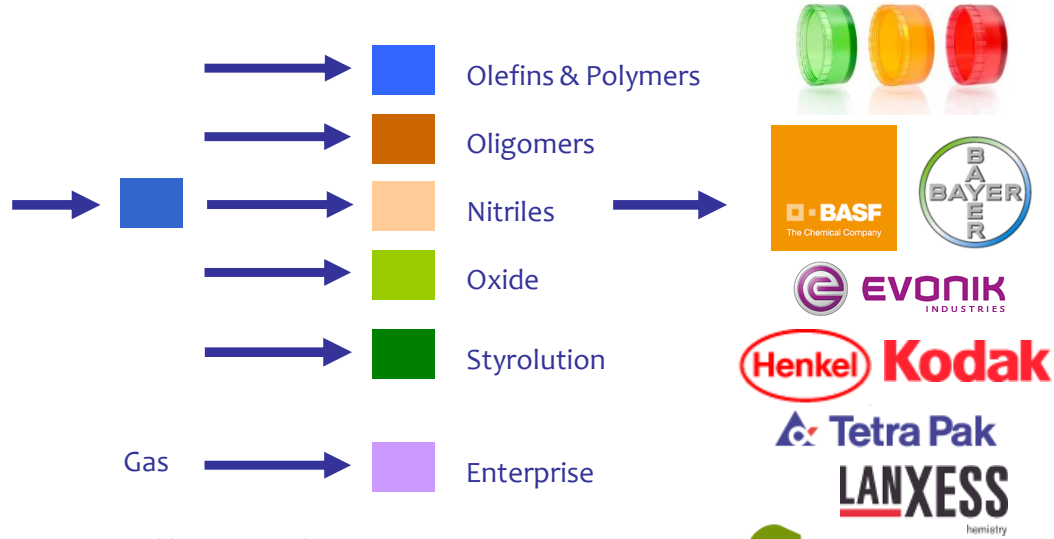
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4 names – one company

1957	Established as Erdölchemie (EC) – a JV between BP and Bayer
2001	Bayer sells its 50 per cent share to BP
2005	Innovene – a spin-off from BP Chemicals – is founded as an independent company
2005	INEOS acquires Innovene, including the Cologne site
2010	Moves HQ to Rolle, Switzerland

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Integrated production (Verbund)

Olefin plants **Derivative plants** **Customers**

Olefins & Polymers

Oligomers

Nitriles

Oxide

Styrolution

Gas → Enterprise

Highly efficient infrastructure
- Direct connection to naphtha refinery
- Power station
- Tank storage/logistics
- Integrated gas collection/flaring system

Project Drivers

Current Situation

- Current system (called „IMPAS"): proprietary and highly customized PIMS
- Distributed system, consisting of 24 independent servers
- In-house development, roots going back to the 1970ies
- Hard-/Software has reached the end of its life cycle
- Developed by a team of engineers, today IMPAS is supported by only a single person

- **IMPAS is essential, because it collects and provides crucial information for the entire site**

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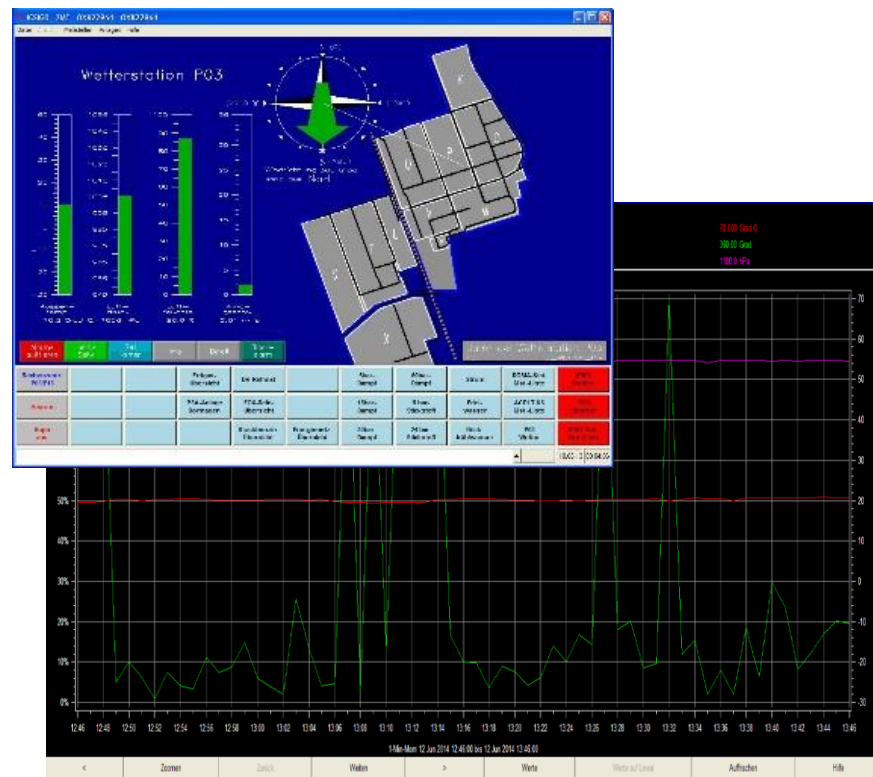
Project Scope

- Replacement of all 24 IMPAS systems with one HA OSIsoft PI System

- Use of new redundant hardware and HA storage solution.

- Development of interfaces to DCS and special INEOS process peripherals ("IPRO") under consideration of the current system landscape

- Connection to existing systems, e.g. SAP, MATLAB, CPM applications, PCS7

- Migration of data and software during PIMS operation without interruptions

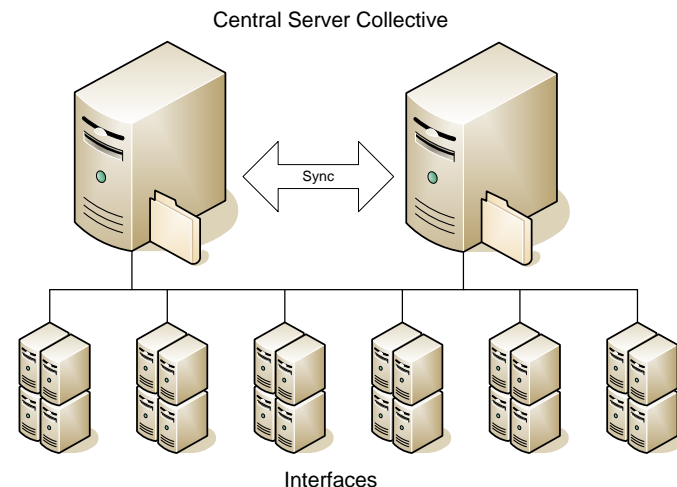- Rollout of new client software and user training
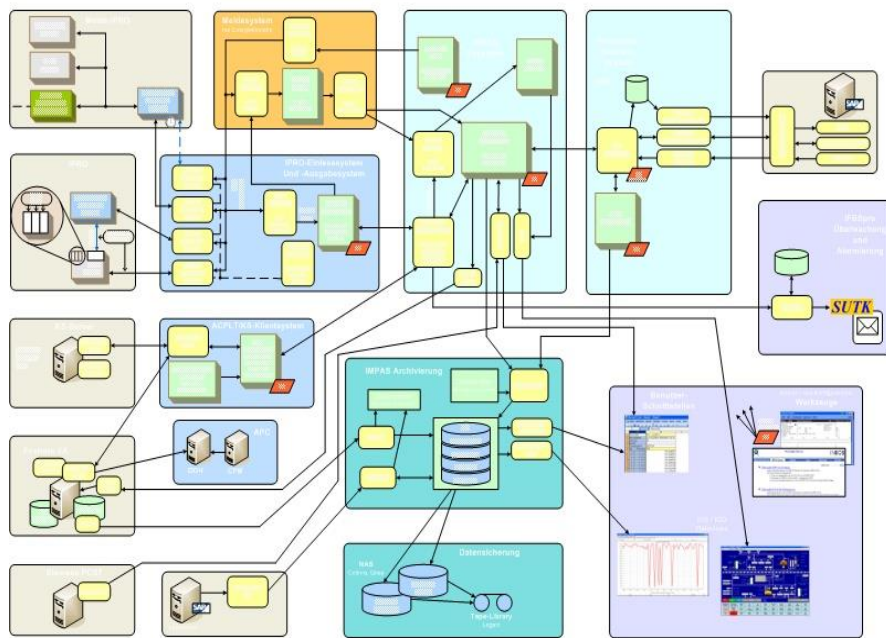
IMPAS system dependencies (simplified)
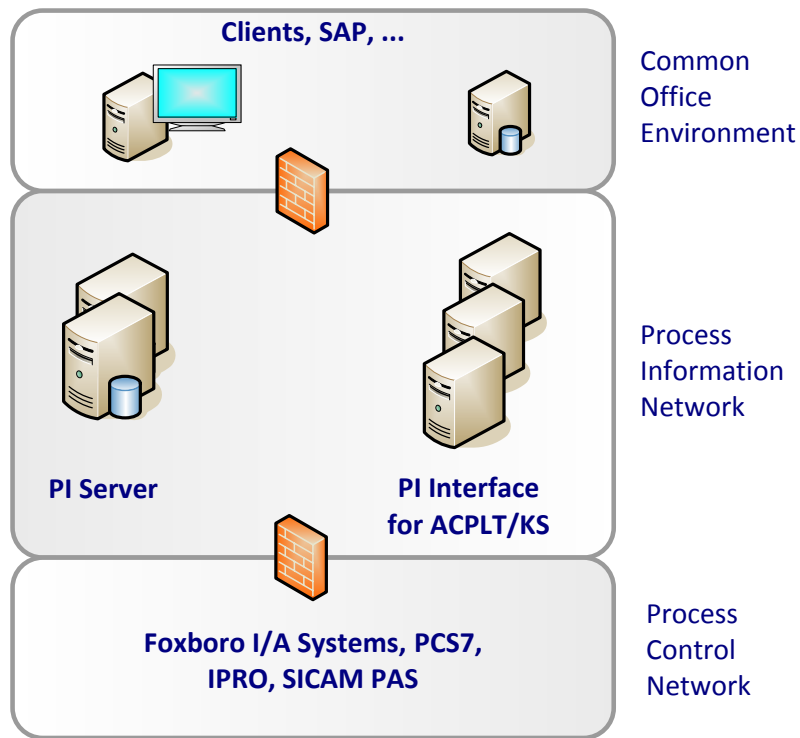
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Towards OSIsoft PI System

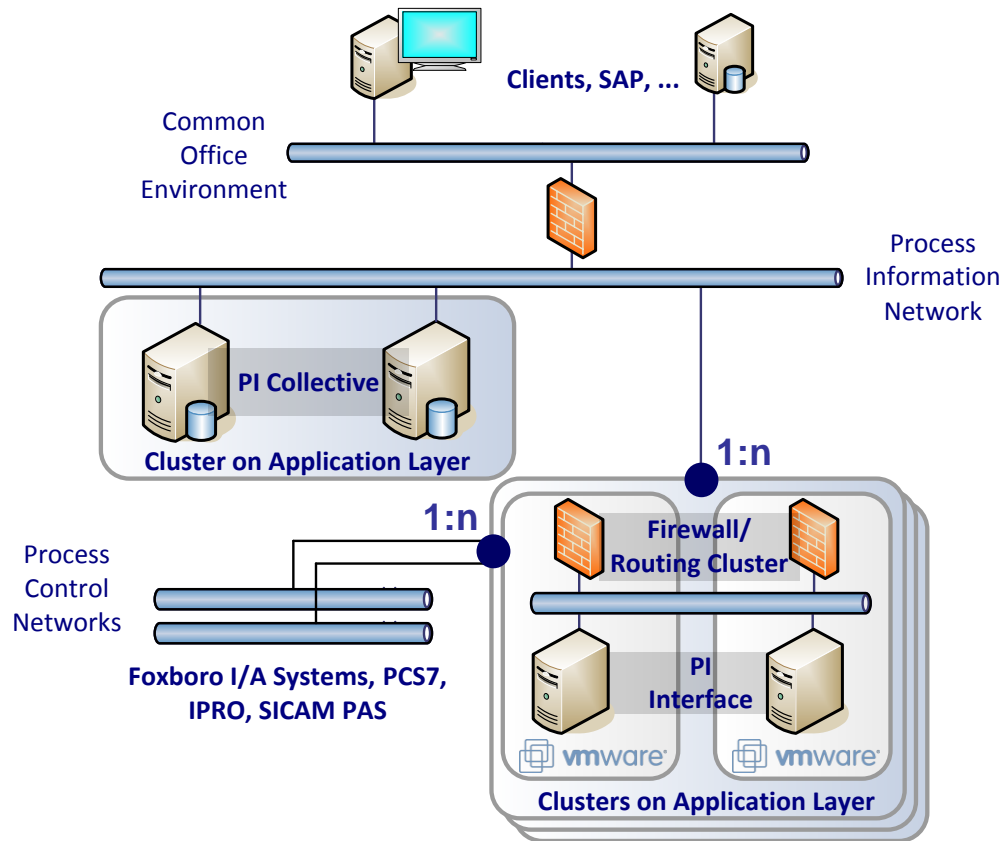# Why INEOS decided in favour of OSIsoft PI System

- ✓ System designed for large amount of data with high performance (one central system for the site with 300k tags)

- ✓ High availability to keep alive all site-wide production and logistic processes

- ✓ Wide range of standard interfaces to our DCS systems for all current and future systems to be connected

- ✓ Very good user experience at INEOS Grangemouth and Sarralbe

- ✓ Lowest risk - many references, e.g. to other INEOS sites, Bayer MaterialScience and LyondellBasell

- ✓ Open, model-based architecture for future applications (e.g. asset- or energy-management)

- ✓ PI Server as an OSIsoft core product is independent of integrated DCS products

Central Server Collective

Sync

Interfaces

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OSIsoft PI System architecture at INEOS in Cologne (abstract view)

Clients, SAP, ...

Common
Office
Environment

PI Server

**PI Interface
for ACPLT/KS**

Process
Information
Network

**Foxboro I/A Systems, PCS7,
IPRO, SICAM PAS**

Process
Control
Network

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OSIsoft PI System architecture at INEOS in Cologne (cluster/segmentation view)

Clients, SAP, …

Common Office Environment

Process Information Network

PI Collective

Cluster on Application Layer

1:n

Process Control Networks

1:n

Firewall/ Routing Cluster

PI Interface

Foxboro I/A Systems, PCS7, IPRO, SICAM PAS

vmware

vmware

Clusters on Application Layer

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OSIsoft key products used at INEOS in Cologne

- PI Collective

- PI Asset Framework (AF)

- PI Advanced Computing Engine (ACE)

- PI Interface for ACPLT/KS

- PI Interface for RDBMS
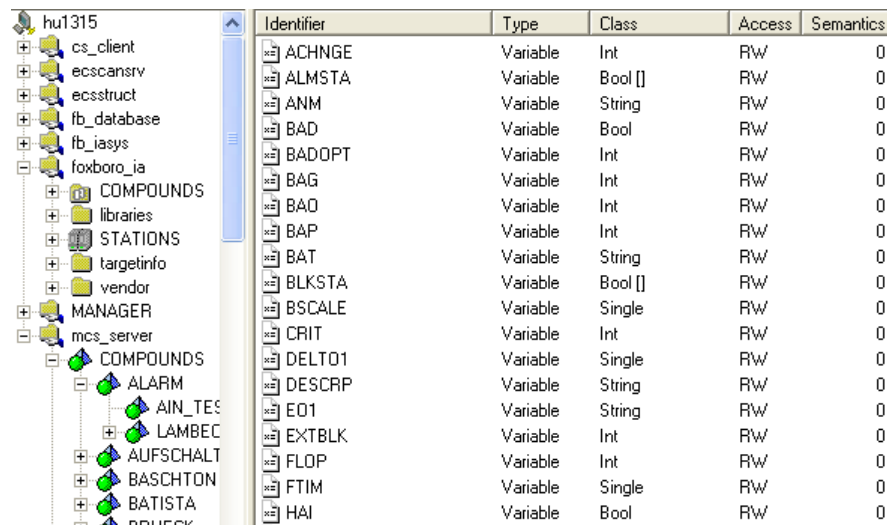
- PI ProcessBook

- PI DataLink

- In future: PI Coresight

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Specific Project Requirements

ACPLT/KS

- Highly generic model driven communication system which provides
  - data access (online, offline, parameters, archived)
  - access to system structures and meta information
  - management of system structures
- Very efficient implementation without overhead
- Open Source Artistic License
- Invensys and Siemens DCS at INEOS in Cologne already have ACPLT/KS access used by IMPAS
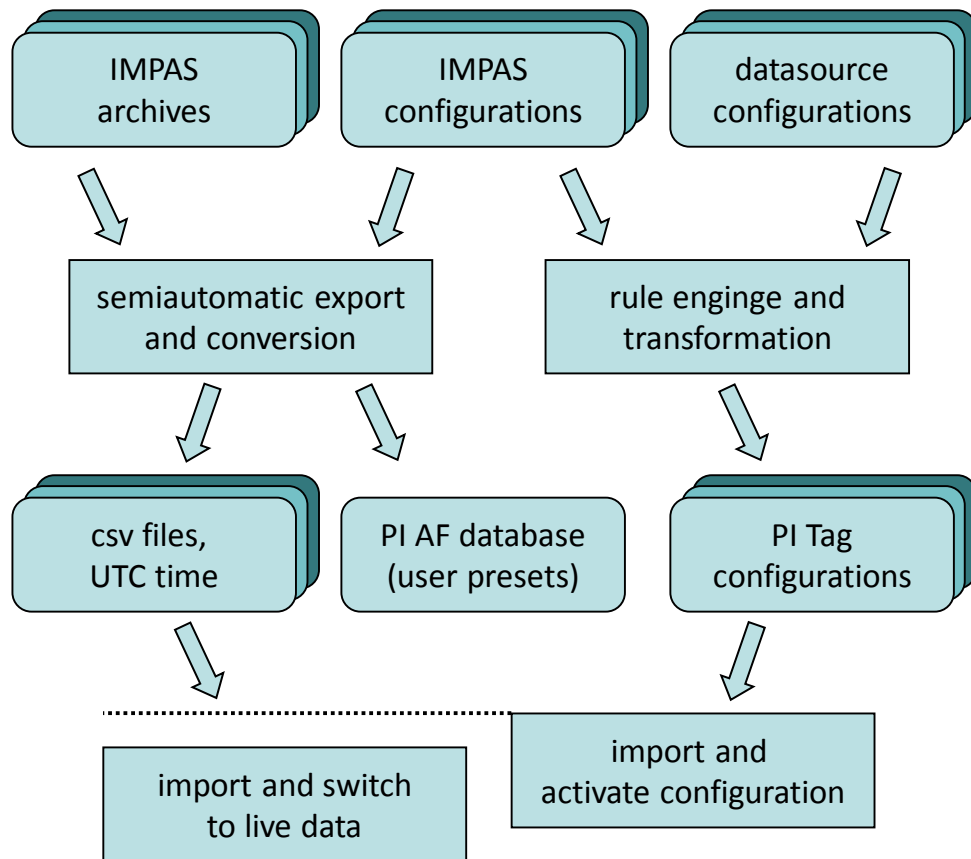
PI Interface for ACPLT/KS

- Additional types of interfaces (e.g. OPC) would significantly increase the DCS load

- PI interface for ACPLT/KS was excellently developed by OSIsoft from specification to release, now being part of the OSIsoft portfolio

- Interface provides
  – Reading live data
  – Data recovery function
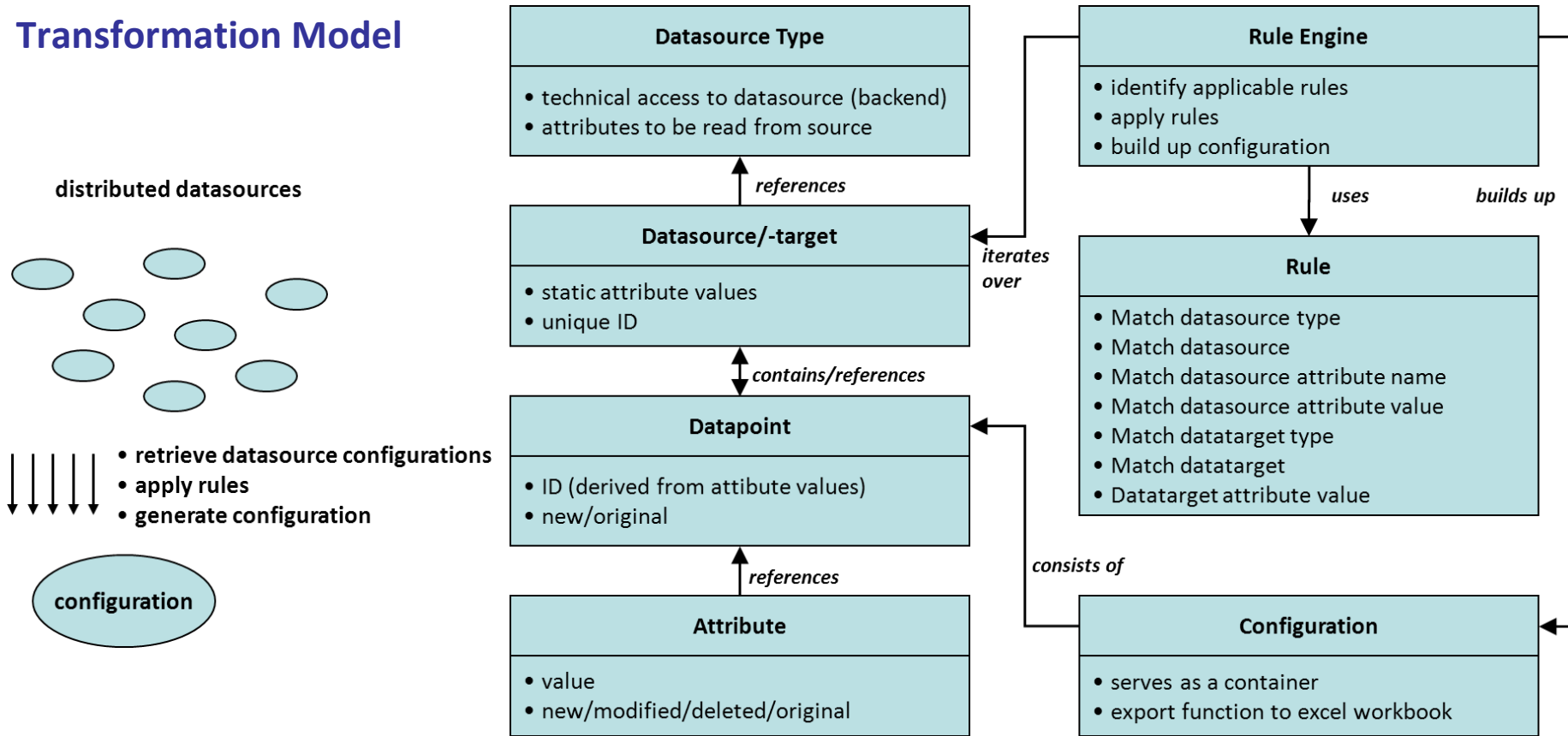 – Scaling functions for DCS raw data
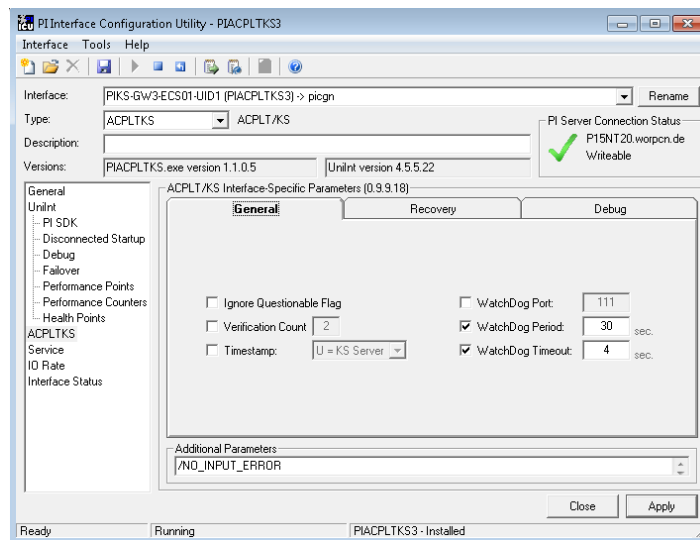
Migration steps

- Plant-wise migration, considering turnarounds and production plans
- Procedure: For each plant
  - Import 10 years of IMPAS data (at least 1-minute-values) to PI archive
  - Transform DCS and IMPAS settings to Tag attribute configuration, based on a self developed rule engine (ambiguities!)
  - Automated transformation of IMPAS trends and displays to PI Process Book displays
  - Operate IMPAS and PI System in parallel
  - Deactivate user access to IMPAS
  - Shutdown IMPAS

- Procedure to be repeatable

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Transformation Model

distributed datasources

- **retrieve datasource configurations**
- **apply rules**
- **generate configuration**

configuration

Datasource Type

- technical access to datasource (backend)
- attributes to be read from source

references

Datasource/-target

- static attribute values
- unique ID

contains/references

Datapoint

- ID (derived from attribute values)
- new/original

references

Attribute

- value
- new/modified/deleted/original

Rule Engine

- identify applicable rules
- apply rules
- build up configuration

uses   *builds up*

iterates over

Rule

- Match datasource type
- Match datasource
- Match datasource attribute name
- Match datasource attribute value
- Match datatarget type
- Match datatarget
- Datatarget attribute value

consists of

Configuration

- serves as a container
- export function to excel workbook

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Applying
PI AF and PI ACE

Scopes of PI Asset Framework

- Engineering and configuring PI ACE

- Storing IMPAS presets (trends, displays) in PI Server compatible way

- Monitoring the overall PI System landscape (servers, interfaces, data sources)

- Framework for future applications, e.g.

  – KPI and energy monitoring

  – (Automated) handling and processing of engineering data

  – Building up a uniform site hierarchy (required by several applications)

PI System Monitoring

Migrated IMPAS presets

PI ACE Engineering

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Calculations with PI ACE(1/2)

- Replaces current system based on function blocks
- Examples:
  - Compensation and balance drawing
  - Soft sensor functions
  - Ex post corrections
  - Complex conditions
  - Calculations triggered by SAP
  - → Not suitable for PI PE or PI Totalizer
- Matching from function blocks with in- and outputs to ACE modules with contexts
- Used for about 3000 tags

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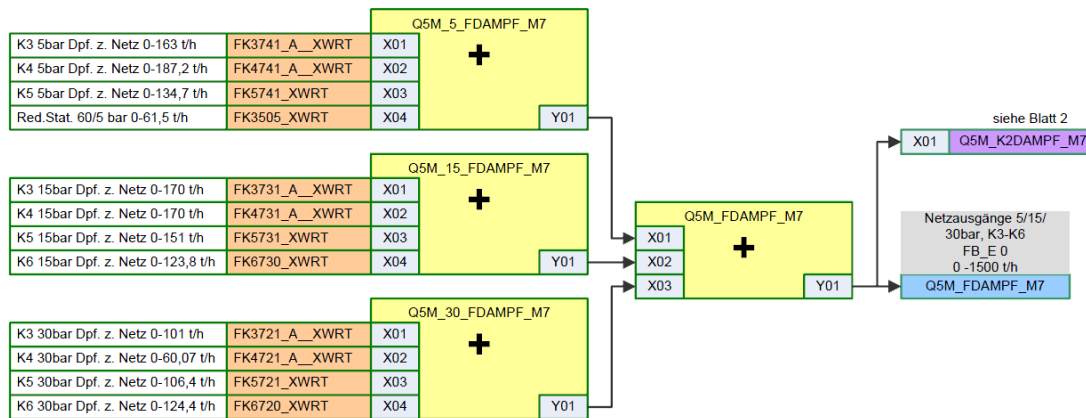
Calculations with PI ACE (2/2)

The migration to PI ACE works, however:

- Some loss of transparency (dataflow, scheduling, error handling)
- Engineering and parametrization require new tools which are not part of standard OSIsoft portfolio

PI ACE is not completely redundant:

- MDB server required at starting time
- No failover concepts as used in interfaces

We suggest to continue developing PI AF based calculations by providing

- a class- and object-based approach to calculation objects (type-instance concept), connection objects between instances and transparent tasking mechanisms
- reflection/introspection features
- unified access by using suitable communication protocols (OPC/UA, ACPLT/KS)

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Summary

- OSIsoft PI System replaces the in-house developed PIMS

- HA features of PI Server fit well into INEOS system architecture

- PI Interface for ACPLT/KS developed by OSIsoft to access datasources

- Very specific rules and transformations required to migrate the distributed system configurations into one PIMS

- PI AF used for several applications, more focus in future

- PI ACE replaces function block based calculations, some drawbacks to be challenged in future

PI System Infrastructure at INEOS

The OSIsoft PI System plays an essential role in comercial and technical processes at INEOS in Cologne. Availability and usability are mandatory features to reach this goal.
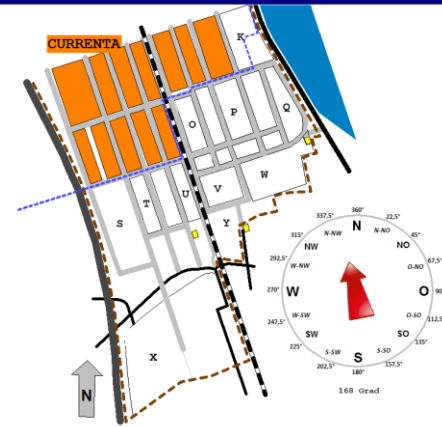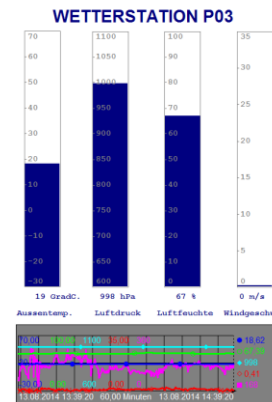
Business Challenge

- 24 in-house developed historian servers to be replaced

- Highly customized applications to be migrated to an industry standard

Solution

- Implementing OSIsoft PI System as a centralized infrastructure replacing legacy systems

- Integrating control systems by developing PI Interface for ACPLT/KS communication protocol

Results and Benefits

- PI System is much faster and more user friendly

- HA features fit well into INEOS system landscape

- PI System serves as common infrastructure for future applications

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