

# 2000 OSI Software Users' Conference

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POLIMERI EUROPA

AN ENICHEM | UNION CARBIDE VENTURE

# *Taking SAP to the Factory Floor*

## *One Year of Success*

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**Dott. Massimo Galli, SYNAPSIS**

# Agenda

- Company and Program Opera Overview
- Taking SAP to the Factory Floor
- One Year of Success
- First Release Follow-ups
- Solutions
- End-Users Participation
- Standardization
- Conclusion

# Company and Program Opera Overview

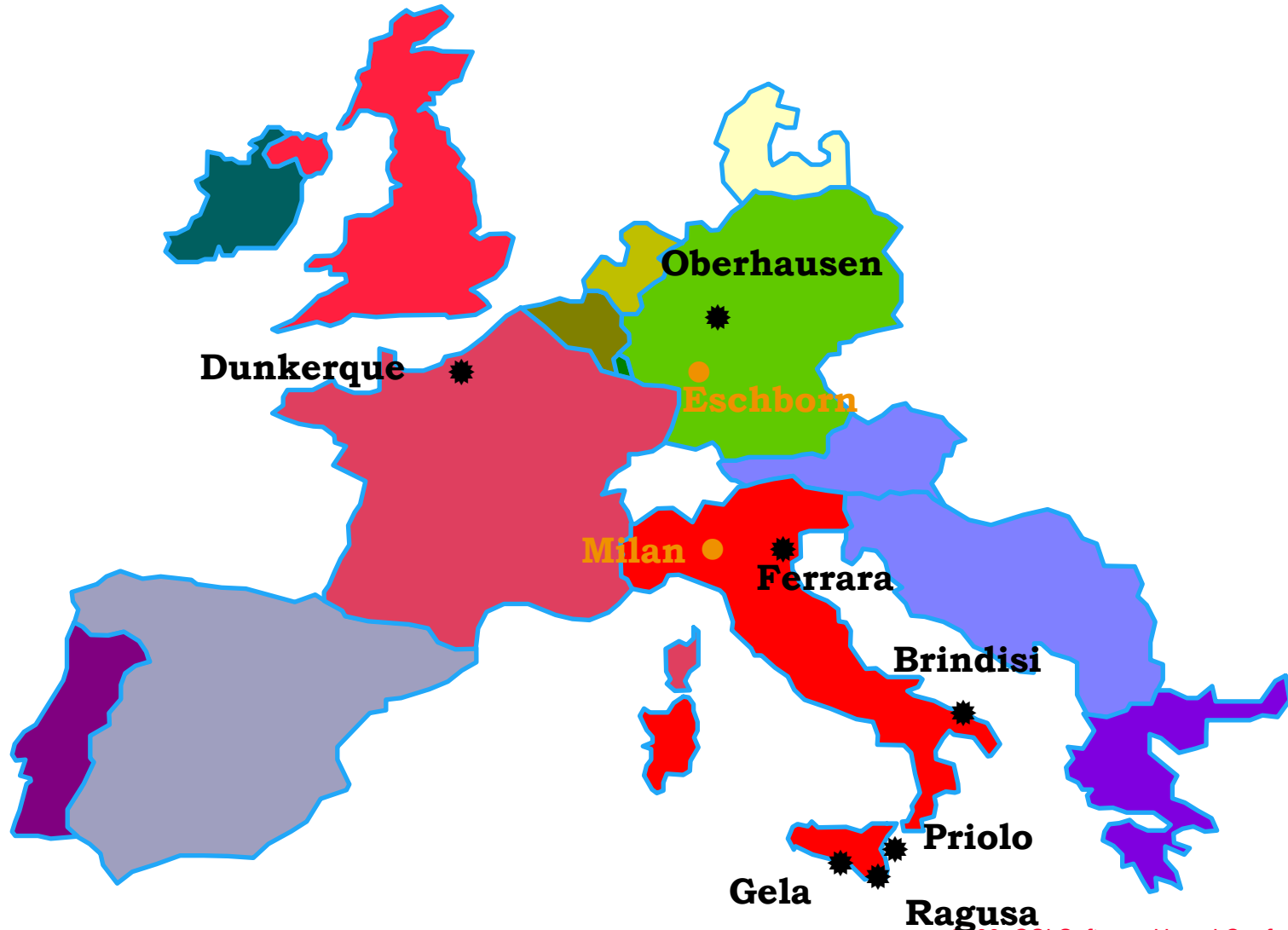
## Polimeri Europa s.r.l.

- Formed in April, 1995, Polimeri Europa is a 50:50 Enichem/Union Carbide venture for the development, production, marketing, and sale of polyethylene and olefins in the European market.

### Year 1999

- |                  |       |                  |
|------------------|-------|------------------|
| • Sales Revenue  | 1.6   | Billion USD      |
| • Total Capacity | 1,600 | Polyethylene kty |
|                  | 700   | Ethylene kty     |
| • Employees      | 1,571 |                  |

# Polimeri Europa Principal Manufacturing Facilities



# Opera

# Program Opera Objectives

- *Create Business Value by:*

- improve customer service
- improve efficiency and effectiveness of company operations
- improve flexibility and response time to satisfy emerging business needs

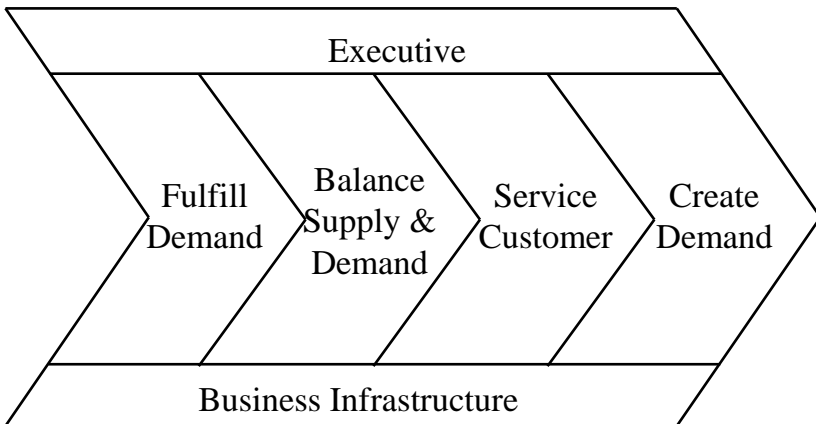
- *Using a Program Approach that incorporates:*

- business process redesign
- implementation of a core information system (SAP) and integrated scientific systems (RTDB)
- training and personnel development



# Program Scope

□ **Process**



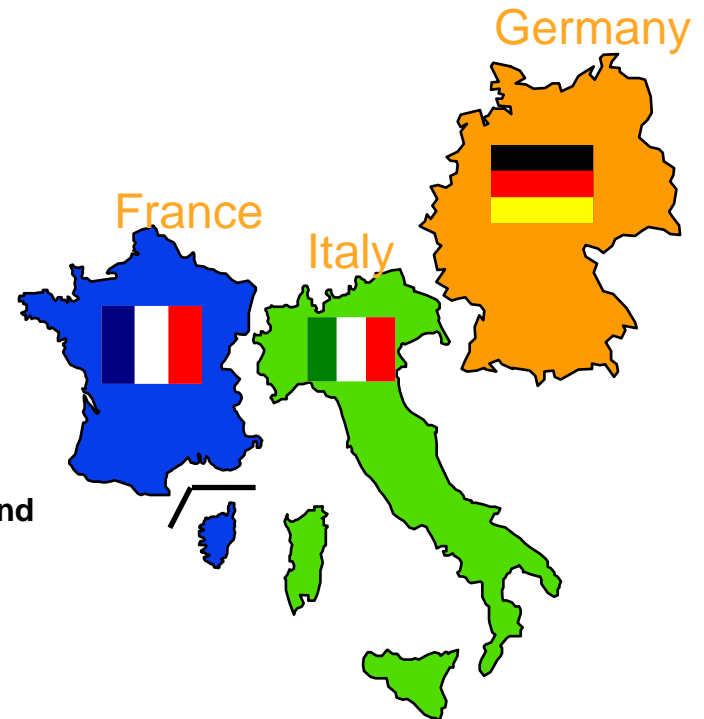
□ **Application Solution**

SAP R/3 Standard 3.1

- FI
- QM
- PS
- TR
- WM
- SD
- IM
- PP-PI
- EIS
- CO/CCA
- PM
- HR
- AA
- SD SHP
- MM
- LC

- Scientific Systems and Niche Applications**
- RTDB
  - LIMS
  - SCM
  - Transportation

□ **Geography**



# Taking SAP to the Factory Floor

# Management Challenge Assessment of Current Situation (Starting Point Fall 1996)

- Work Processes
  - Complex, Not Well Integrated Across Functions Or Locations.
  - Real Time Information Not Available For Rapid Decision Making.
  - Require High Levels Of Personal Experience.
  - Require Significant Duplication Of Effort And Reentry Of Data.

# Technology Challenge

## Assessment of Current Situation (Starting Point Fall 1996)

- Systems
  - Slow Response Time and Some Information Not Accurate or Up to Date.
  - Little Integration of Applications Between Plant Sites and French and German Affiliates.
  - Very Difficult to Modify Applications to Meet Emerging New Needs.
  - Limited Access and Experience with Process Control and Data Collection Applications.

# Company Key Decisions

- Implement common work processes throughout Polimeri Europa.
- Utilize integrated business software (SAP) installed without modifications (standard).
- Use of a Managing General Contractor (Ernst & Young) to deliver project results.
- Implement the project as rapidly as possible to minimize business risk.
- Use standard scientific applications at all sites with certified SAP interfaces.

# Overall Considerations for the Implementation

- No duplication of SAP - scientific system data input activities in the Control Room during normal shift operations.
- Warehouse inventory data must be available real time and updated automatically.
- Production Planning is compiled at headquarters with detail execution at the plants.
- Plant operators have one and only one interface for data input.
- Standard solution through the different DCS vendors.

# SAP Configuration Design Parameters

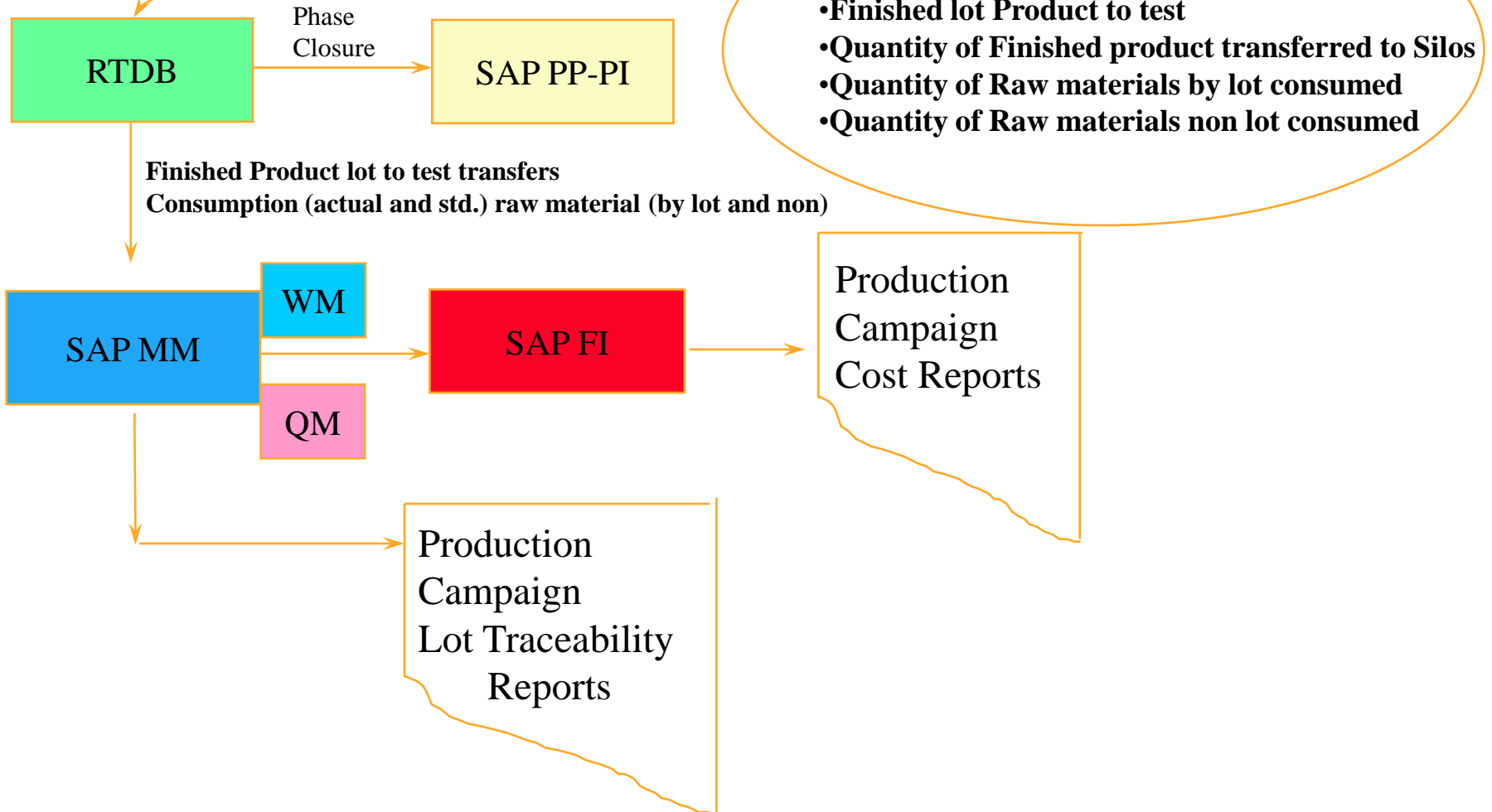
- In SAP plants are modeled as batch units.
- For costing purposes, batches of finished product are aggregated into production campaigns.
- A plant production campaign is represented in SAP as a Production Order.
- Plants are represented in a simplified form in SAP as macro operations.
- A plant production cycle is divided in logical SAP Phases.

## Framework Used in Developing the Integrated Manufacturing Solution Model

- Production managed as campaigns: materials consumed and resources utilized for each finished product.
- Economic analysis (cost summaries, and efficiency analysis versus plan) by single campaign and by unit line (on a monthly basis).
- Verification of material and resource availability relative to production orders.
- Advancement of production interfaced with RTDB.
- Available to Promise (ATP) updated in real time.
- Raw material to finished product lot testing traceability.
- Finished product lot to lot test traceability.

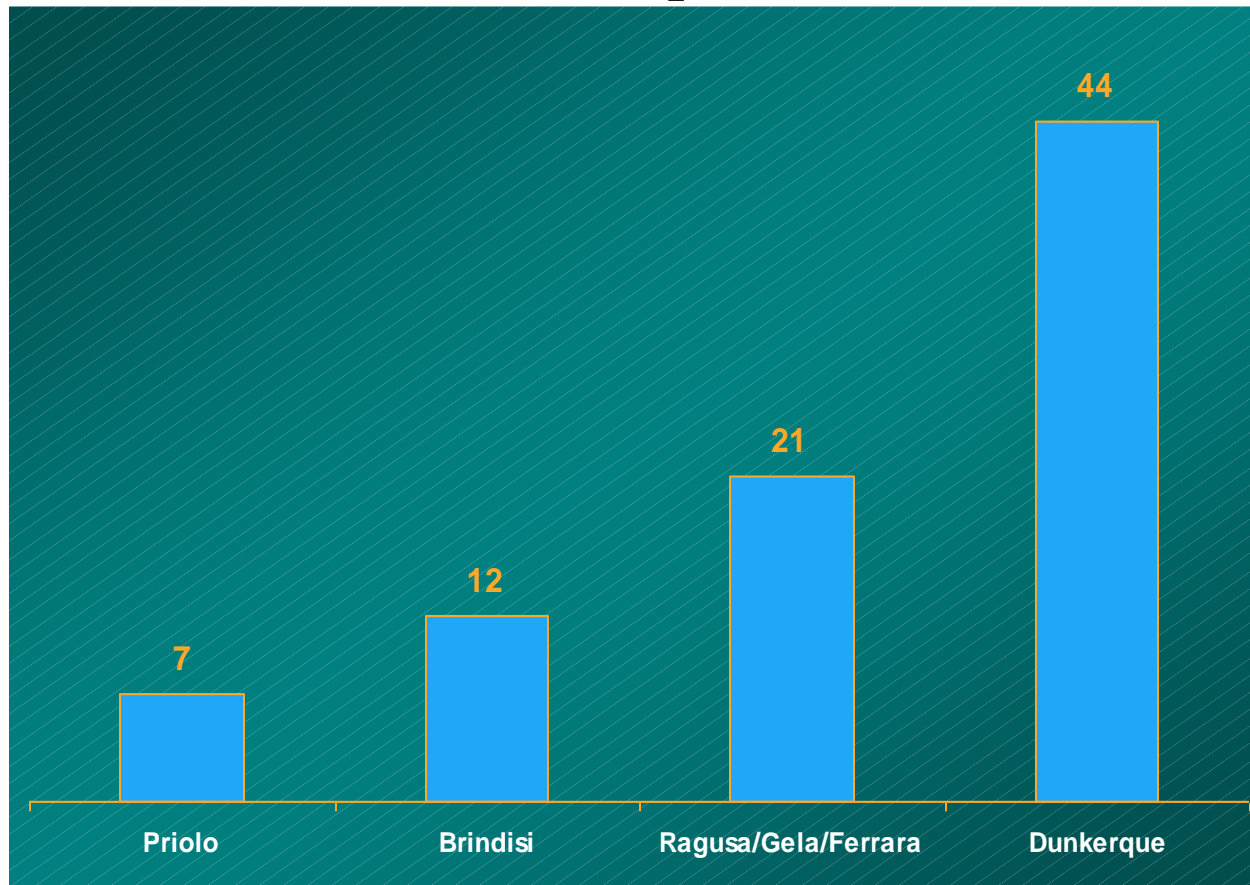


# Production Advancement Tracking Using the PI - SAP Integrated Application Solution

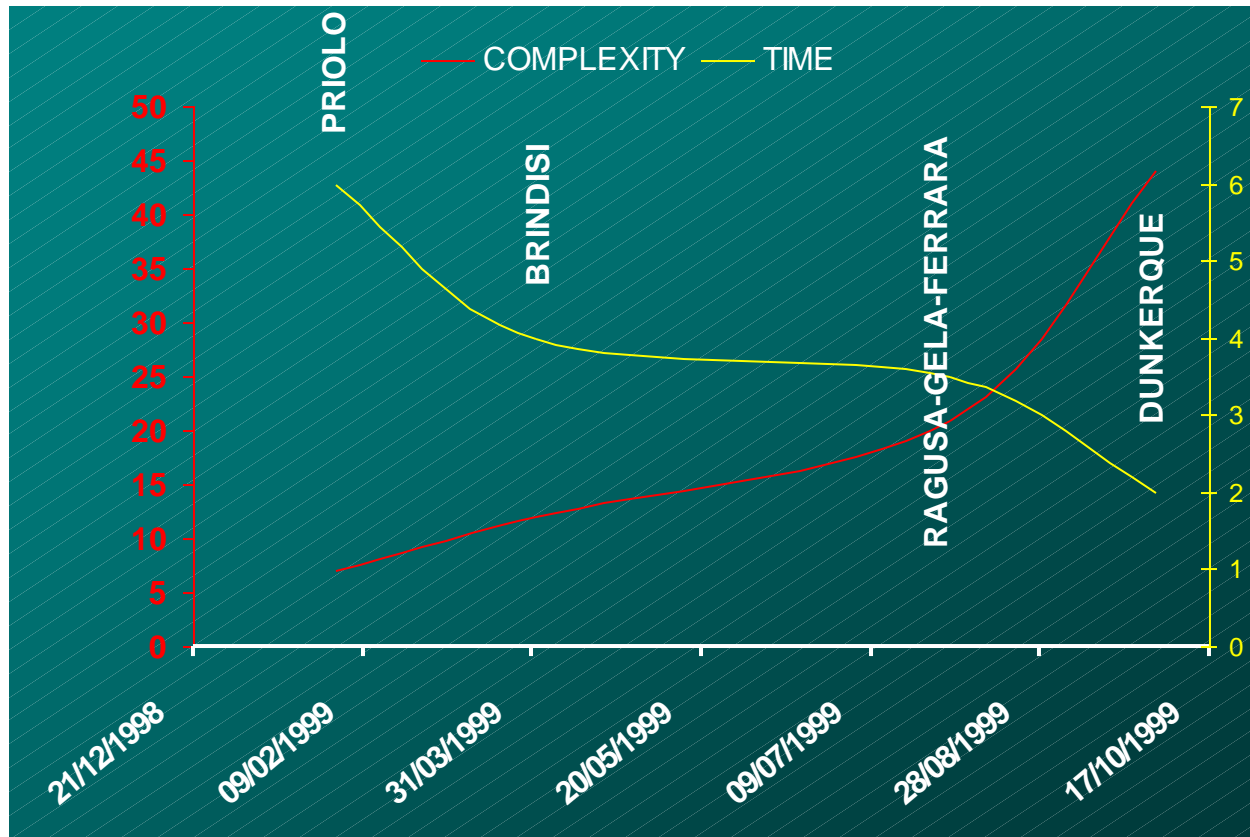


# One Year of Success

# Delivery Complexity (Resource Implemented)



# Project Time vs Complexity



# First Release Follow-ups

- *One month of user comments*
- *Risk factors:*
  - Detailed Plant Model not necessary to SAP
  - Hardware Architecture (same server for more plants)
  - Difficult Correlation between Plant Information and SAP Configuration
- *Program director's statement:*

***NEVER TO BE LATE***

# Solutions

## *Significant End-users Participation*

- plant model
- business needs definition
- information gathering

## *Standardization*

- plant model
- information gathering
- architecture HW/SW



# End-users Participation

# *Plant Model*

- Participation of 1<sup>st</sup> plant end-users to the knowledge transfer to new end-users
- The 1<sup>st</sup> plant details were not applicable to the next plants: from detailed model to general model
- All the next plants to be implemented were managed in a similar way

# *Business Needs Definition*

- The 1<sup>st</sup> plant requirements were common to all the next plants
- Real-time material consumption
- Quality assurance requires finished product / raw materials relationship
- Warehouse allocation transferred to SAP
- Product quality classification

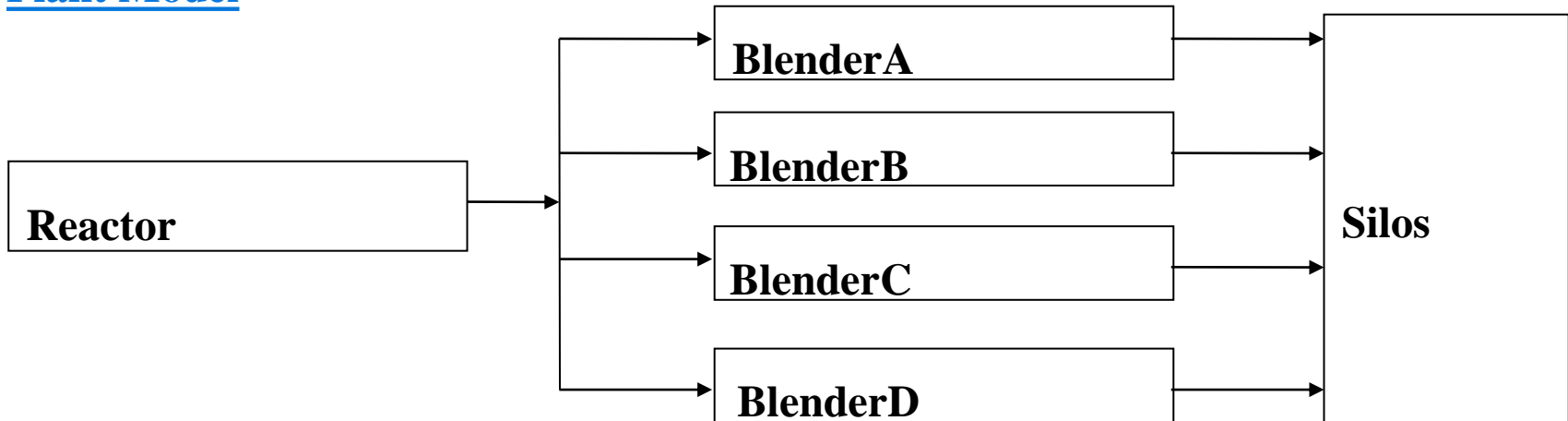
# *Information gathering*

- Specific training on relationship between business and process database configurations
- Technologist + IT personnel: SAP recipes
- Technologist + Process experts: plant process data

# Standardization

## PRIOLO MODEL – PLANT SPECIFIC

### Plant Model



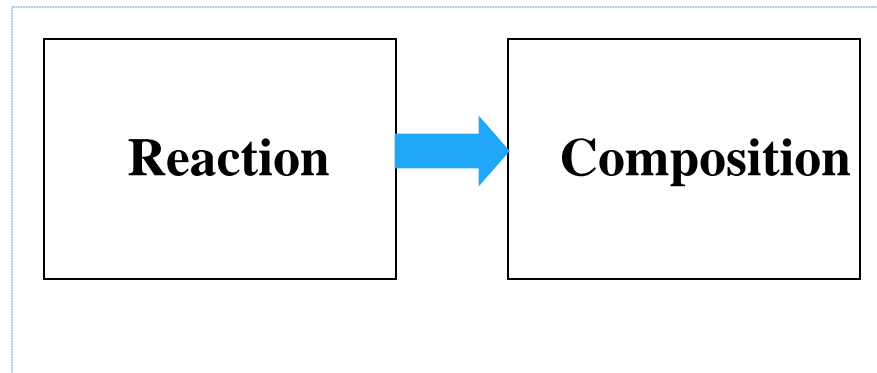
- Model Geometry was Specific to this Plant
- Unique Ending Phase was only a SAP requirement
- Finished Product Lot could not be composed by Discontinuous Reaction Periods

# *Plant model*

Identification of a general model :

- To give answer to the business needs
  - Applicable to all plants
- two phases plant model  
real-time + transactional

# *Plant model*



<b>Reaction</b>	Real-time	Conversion of continuous process to discrete by means of orders and batches
<b>Composition</b>	Transactional	Composition of reactor batches into finished product batches



SAP Process Order  
Information  
**PLANT SUITE**

# Plant model

The screenshot shows the SAP Plant Suite interface for a production order. The window title is "Facteur - Ligne 51 [Read Only]\*". The interface is divided into several sections:

- Ordre de production précédent:** RIBLENE FL 24, RI1FL24\*\*\*\*\*DKBULK, 000120000146, 100000000000010660, 09/03/2000 23:00:00, 250, Inizio: 13-Mar-00 12:16:14.
- Ordre de production actuel:** RIBLENE FM 23, RI1FM23\*\*\*\*\*DKBULK, 000120000147, 100000000000010661, 10/03/2000 06:00:00, 250, Inizio: 13-Mar-00 23:00:31.
- Liste des ordres de production:**

000120000105	RI1MY0*****DKBL	RIBLE
000120000106	RI1MV1*****DKBL	RIBLE
000120000147	RI1FM23*****DKBU	RIBLE
- Liste des lots de fabrication:** 000120000147, 100000000000010661.
- Numéro lot en cours:** 70030530.
- Table of production lots:**

70030526	RI1FM23*****DKBU	13-Mar-00 23:00:31	13-Mar-00 23:32:27
70030527	RI1FM23*****DKBU	13-Mar-00 23:32:29	14-Mar-00 06:21:14
70030528	RI1FM23*****DKBU	14-Mar-00 06:21:16	14-Mar-00 08:37:01

Buttons include "Actualise", "Homogénéisation", and "Passé par lot".

Process Information  
**PI**

## Reaction Phase

# Plant model

PI - ProcessBook - [Homogénéisation - Ligne 52 [Read Only]\*]

File Edit View Insert Tools Draw Arrange Window Help

production 000121000137

Données générales relatives à l'ordre

FLEXIRENE FG 30	FL1FG300000000000010462
000121000137	1000000000000010462
04/03/2000 07:00:00	250

Composition du lot d'intramaterial produit

Lots en réaction pas encore attribués		Lots déclarés	
80035554	28.384	80035553	7.464
		80035555	216.686
		Total 224.150 T.	

Niveau de qualité: Premier choix

Numéro du lot: 3720210

Q. tot. d'intra: 225 T.

Code du silo: Dégazage XC

Confirmation declaration

Réacteur Détails des lots commerciaux Saisie par lot

## CompositionPhase

# Plant model

Order data

Finished product batches

[Détail des lots commerciaux - Ligne 52 [Read Only]\*]

Insert Tools Draw Arrange Window Help

100%

Ordre de production actuel

FLEXIRENE FG 30	FL1FG30◇◇◇◇DKBULK
000121000137	100000000000010462
04/03/2000 07:00:00	250
Inizio: 13-Mar-00 20:59:31	

Ordres de production

000121000086	FL1CL10◇◇◇◇DKBU	FLE:
000121000095	CL1FG80◇◇◇◇DKBL	CLE
000121000116	CL1MQ80◇◇◇◇DKBI	CLE
000121000122	FL1MR50◇◇◇◇DKBL	FLE:
000121000128	FL1MT40◇◇◇◇DKBL	FLE:
000121000137	FL1FG30◇◇◇◇DKBU	FLE:

Visualise les ordres déjà produits Actualise

Reacteur

Homogénéisation

Saisie par lot

Lots produits pour la campagne

80015355	000121000095	15-Jan-00 02:06:54	15-Jan-00 02:06:57	10000000000
3720134	000121000095	15-Jan-00 10:02:26	15-Jan-00 10:02:31	10000000000

Tous les silos Tous les choix Actualise

Détail des lots commerciaux

80015356	CL1FG80◇◇◇◇DKBULK	14-Jan-00 10:31:26	14-Jan-00 17:28:58
80015358	CL1FG80◇◇◇◇DKBULK	14-Jan-00 19:28:48	14-Jan-00 21:29:48
80015359	CL1FG80◇◇◇◇DKBULK	14-Jan-00 21:29:50	15-Jan-00 09:10:24

NUM

Reactor batches

## Production history

# *Information gathering*

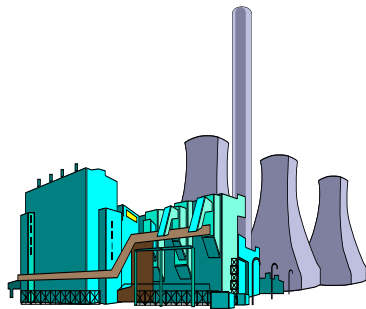
- Collect information from different sources (business and process) according to the identified plant model
- Use this information to configure the infrastructure components
- **Standard Data Template:** to collect and organize information for plant description
- **Configuration Process:** to configure PI and PS-RLINK starting from the retrieved data

# *Information gathering*

## *Data sources*

### **Process Data:**

- Campaign signal
- Phase signals
- Instruments of Measure



### **SAP Data:**

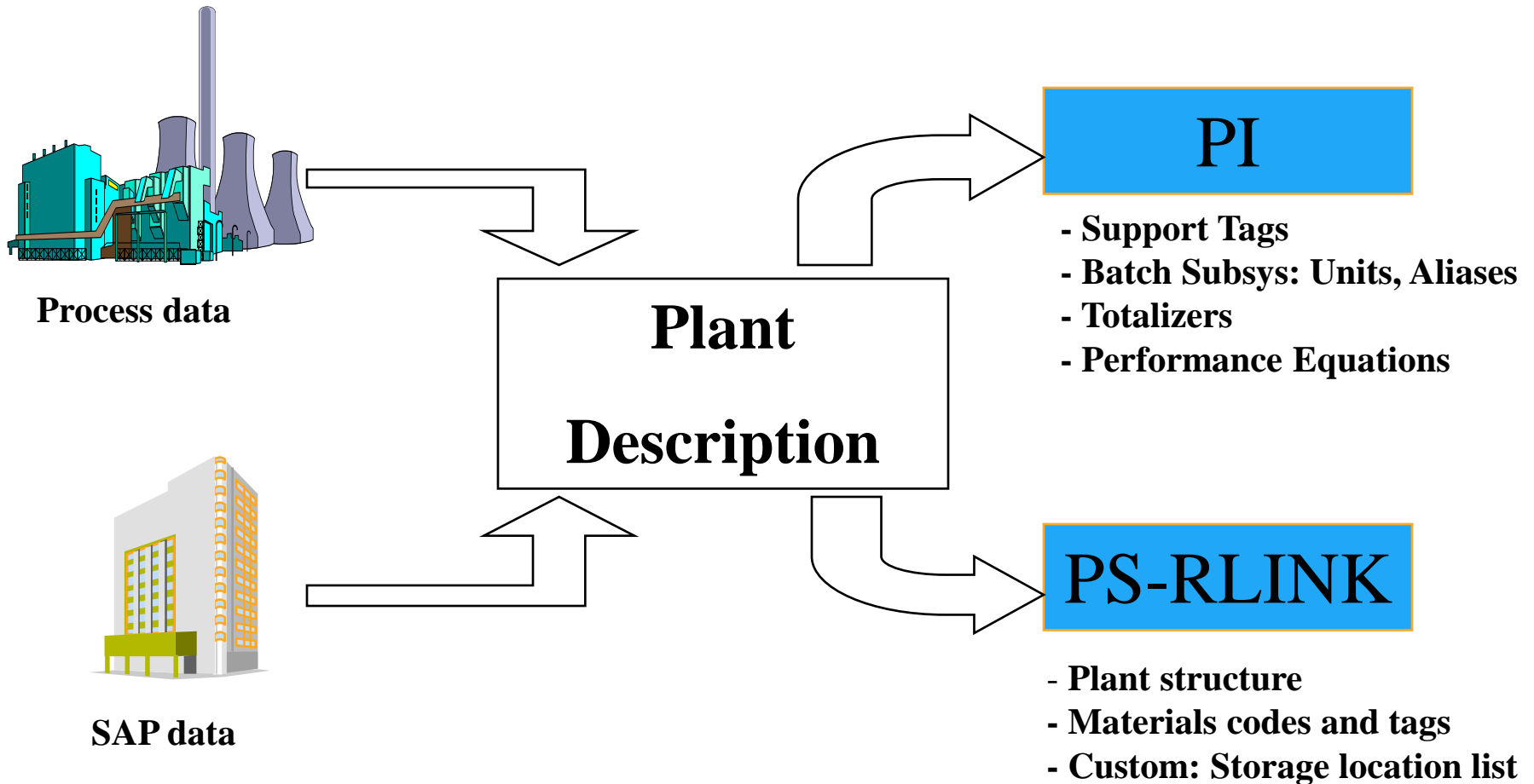
- Plant and resources/phases codes
- Bill of materials: code, description
- List of storage locations



# *Information gathering Infrastructure components*

- *PI 3.2* Real Time Plant Information System
- *PS-RLINK* PI system gateway to SAP R/3  
PP-PI module
- *PI-ProcessBook* Graphical representations and  
*PI-BatchView* management of:
  - Process data (PI)
  - Process Order (SAP Recipe)

# *Information gathering Configuration process*



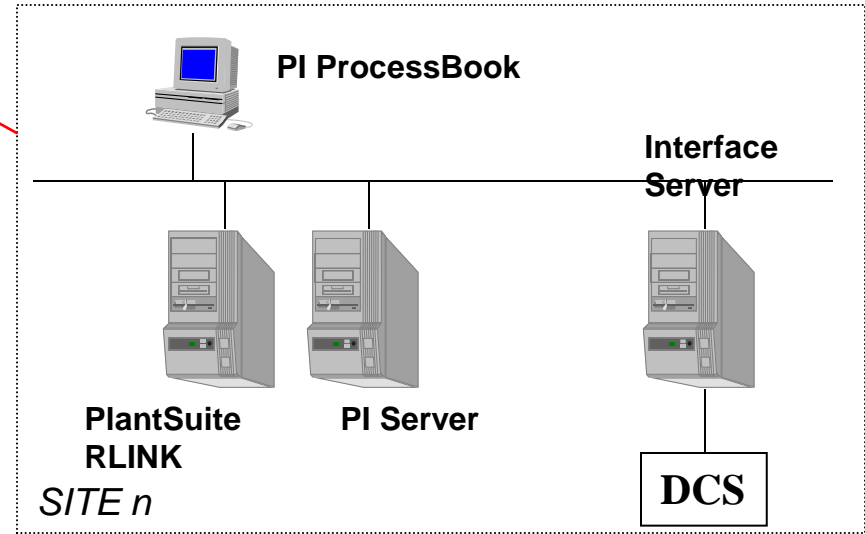
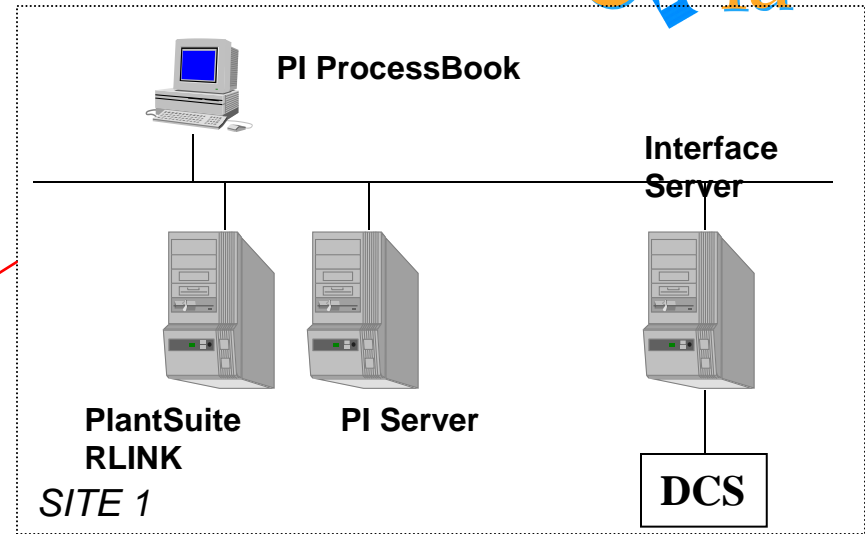
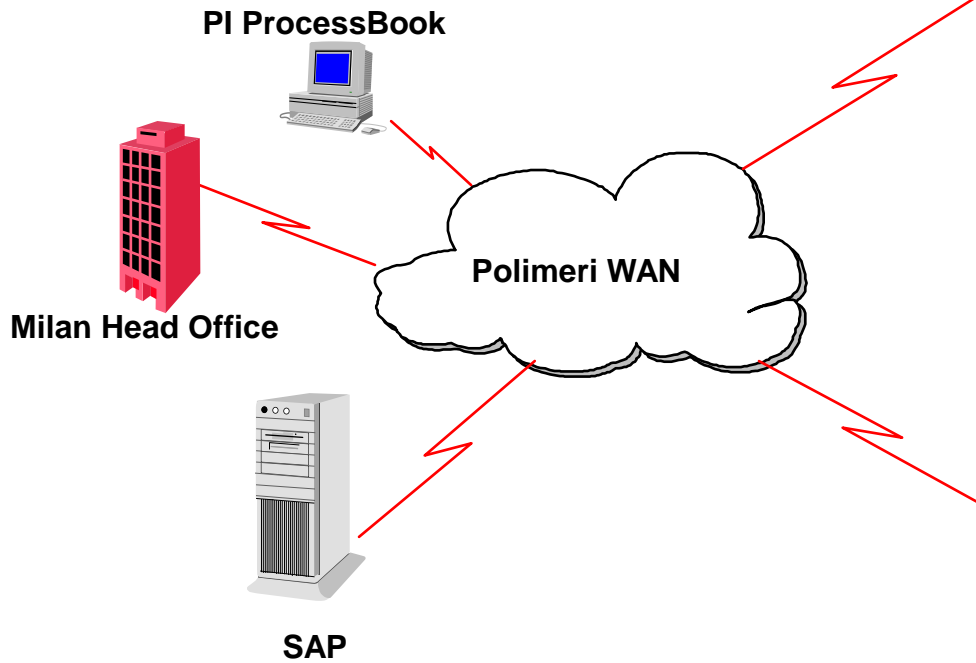
# *System architecture*

- New installations should not affect operations on the existing ones
  - Improve availability
  - Easier maintenance operations
- 
- **Modularity:** same configuration for each site
  - **Clustering:** two clustered CPUs running PI and PS-RLINK logical servers



# System architecture

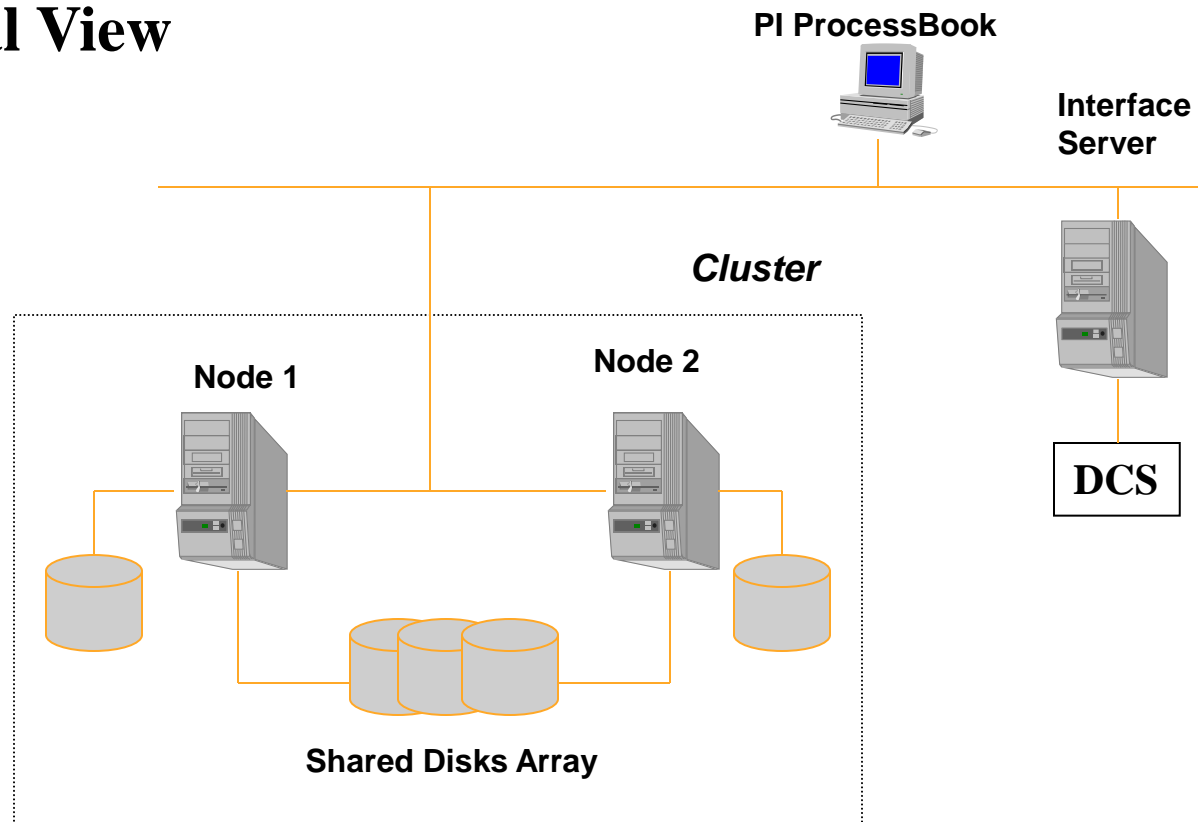
## Modularity



# System architecture

## Clustering

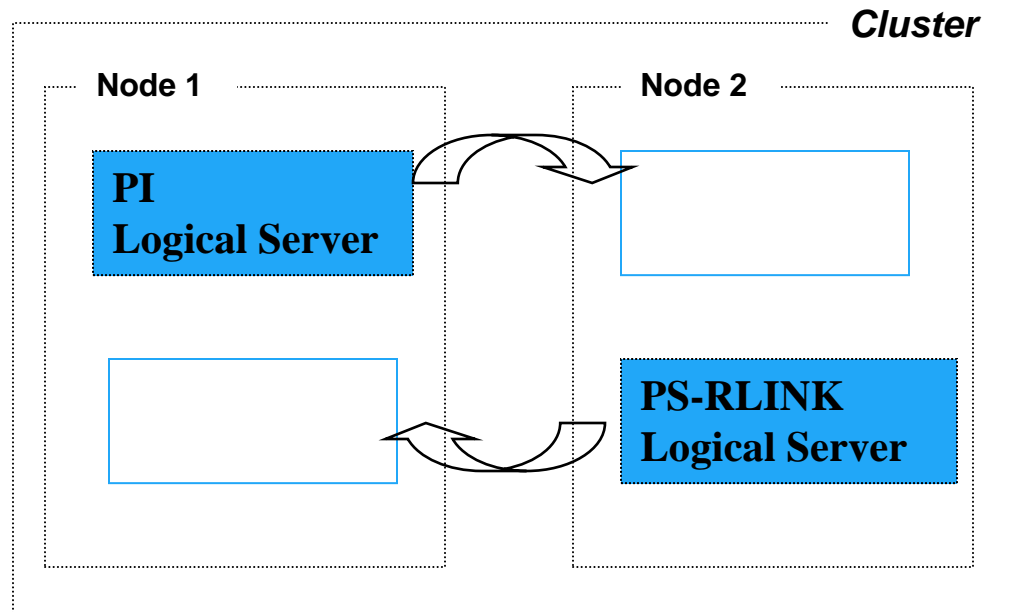
### Physical View



# *System architecture*

## *Clustering*

- Application  $\equiv$  Logical Server  $\equiv$  Cluster Group
- Services, Disks, Network Name and IP Address
- Cold Fail-over



# Conclusions

- Program objectives reached on time
- Solution reliability
- Easy on-going systems administration
- Consolidation of one-model to be improved in the next years
- Billed costs vs. Measured costs (required custom SAP program for cost deviation distribution across orders )

# Management Point of View

## Factory Floor Integrated Systems are a Starting Point

The implementation of the the new plant model and the efforts involved in Program Opera are a *starting point* for Polimeri Europa

- The new infrastructure, systems, and tools open new opportunities for process improvements and operational efficiencies that previously could not be achieved
- However, these opportunities are not a “default” result of implementing systems. Rather, the key to improvement lies in the careful attention to continuous improvement of business processes
- The new systems facilitates the realization of such benefits, but it is up to the business leaders of Polimeri Europa to seek out opportunities and to leverage the power of the system through improved processes

# Management Point of View

## What Can now be Done?

The implementation path is “broad but not deep”

- Many system applications were implemented across the company in a short period of implementation which precluded delving deeply into the details to extract the highest benefit from them

Significant opportunities can be realized

- A careful critique of current processes to identify and implement improvements will produce opportunities for increased financial results both for the project and for the company. Areas to focus future efforts:

- *Plant operations*
- *Cash management*
- *Inventory management*
- *Marketing analysis*
- *Invoice processing*
- *Profitability analysis*
- *Distribution management*
- *Production planning*

## What They said about Factory Floor Integration ...

... despite heavy investment in the latest manufacturing process technology, in 1996 Polimeri management was not able to maximize the efficiency of its manufacturing operations. Real-time information about the process and finished product was simply not available at the business management level. Significant duplication of effort and re-entry of data existed across the plant. Moreover, there was heavy dependence on a few highly experienced individuals ...

... in 1999, Polimeri Europa achieved full integration of its SAP planning system and its real-time plant operation systems. Achieving cultural integration, however, was the major challenge ...

... Polimeri's experience confirms that enterprises in the process industries can extend the operational effectiveness of their business-driven ERP systems by installing automated interfaces to the manufacturing world of process control systems and laboratory information systems ...

... beyond the technology implementation, real success requires absolute teamwork across the cultural divide of IT and manufacturing ...

**“CIO Update: Taking SAP to the Factory Floor” - Gartner Group - July 1999**