Process Integration with SAP NetWeaver

SAP NetWeaver – SOA Middleware
Product Management, SAP AG
October 2007

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Introduction & Customer Usage Scenarios

Reduce Complexity

Stay in the “Buy Model”

Enable Complete Business Process Lifecycle

Pave the Way to an Enterprise SOA

Roadmap

Summary and Further Information
Customer Challenges

Complex heterogeneity
- Siloed, non integrated and inflexible processes
- Diverse options for technical connectivity
- Handling requirements around semantic integration

Reduced business agility
- Lack of near real time visibility into automated IT systems
- Long development cycles in hooking up value networks
- Recurring themes, but low re-use when developing new composites

High Operational Costs
- Multiple point to point connections
- Multiple interfaces to build, operate and upgrade
- Multiple skill sets needed
**Why Process Integration?**

This is an introduction slide that should emphasize the general need for process integration.

- It depicts a real life customer scenario (All systems and connections required to execute an order to invoice process)

- The complexity to implement and operate processes in an heterogeneous system landscape leads to …
  - High costs
  - Low transparency (no overview of end-to-end process)
  - Reduced flexibility (IT cannot adapt to business process changes)
End-to-End Process Integration

PROCESS AUTOMATION THAT INVOLVES SYSTEMS AND HUMANS

- Unified modeling approach from process design to process execution
- Pre-integrated process templates, pre-integrated into SAP applications
- Support for A2A and B2B scenarios, RFID integration
- Enterprise Services Repository capturing all scenarios and processes, down to Enterprise Services and “technical” Web services
- Coexist with your messaging layers
- Gradually consolidate and retire other process integration technology

End-to-End Process Integration powered by SAP NetWeaver capabilities

- Process Integration
- Business Process Management
- Business Event Management
- Event and Task Management
- Interoperability

1. What is it?
2. What are the benefits?
3. How does NetWeaver fit in an existing environment?
4. Featuring components?
5. Who’s using it?
6. How does it bring the customer closer to ESA?
BUSINESS PROCESS INNOVATION WITH FLEXIBILITY AND PRODUCTIVITY

- Merge SAP’s enterprise application content with the open composition platform SAP NetWeaver to enable flexible business processes by SAP, partners and customers
- Service-enabling the applications and linking the applications using Web services
- Reusing existing application functionality for the task of automating enterprise-scale business scenarios
- One infrastructure for uniform service definition, implementation, and usage based on Web services standards
- Based on open Web services standards
- Automated process to convert transactions to Web services

Enterprise Service Oriented Architecture powered by SAP NetWeaver capabilities

- Application Server
- Enterprise Service Management
- Process and Application Composition
- Process Integration
- Business Process Management
- Event and Task Management

1. What is it?
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Simplify Technical Integration
Open Standards Based A2A and B2B Integration

- **Connect**
  - Natively to SAP applications and other SAP NW capabilities
  - Via adapters to non SAP systems and 3rd party middleware
  - Through open partner certification program (220+ certified solutions)

- **Orchestrate**
  - Message transformation
  - Message routing
  - Integration process (BPEL)

- **Extend**
  - Adapters and business packages for B2B integration (EDI, AS2, SWIFT, RosettaNet, CIDX, …)

- **Standards support**
  - XML, Web Services, UN/CEFACT, …
Independencies with other products and technical prerequisites

**Status:**

- Two major product bundles: Composition Environment and Process Integration (incl. PI, ES Repository and AS)
- New releases end of 2007: Composition Environment 7.1 and Process Integration 7.1
- ES Repository 7.1 available with both
- Composition Environment integrates processes, information and UI into composites
- SAP NetWeaver platform shows cross value
### SAP NetWeaver Process Integration – Adoption

#### Active Installations
- Red: Active Installations
- Blue: Licensed non-SAP integration

#### Licensed non-SAP integration
- 80% automate processes with BPEL
- 75% integrate with business partners
- 70% replace & migrate other middleware
  - Homegrown technology
  - SAP Business Connector
  - webMethods
  - Vitria
  - SeeBeyond

#### Interoperation with
- Microsoft
- IBM
- Tibco

#### SAP Exchange Infrastructure 2.0
- BPEL processes
- JCA adapter engine
- Enhanced B2B
- ...

#### SAP NetWeaver 2004 Exchange Infrastructure 3.0
- Local proc. integration
- JCA adapter engine
- Enhanced mapping, adapter, monitoring, ...

#### SAP NetWeaver 7.0 Process Integration Usage Type
- ES Repository
- SOA Infrastructure
- BAM infrastructure
- Performance

#### SAP NetWeaver Process Integration 7.1
- Expansion of processes
- Conversion Agent
- Enhanced mapping and adapter, monitoring, ...

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* SAP NW PI adoption survey 4Q06

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<tbody>
<tr>
<td>SAP Exchange Infrastructure 2.0</td>
<td>SAP NetWeaver 2004 Exchange Infrastructure 3.0</td>
<td>SAP NetWeaver 7.0 Process Integration Usage Type</td>
<td>SAP NetWeaver Process Integration 7.1</td>
<td></td>
</tr>
</tbody>
</table>

Ramp-up starts 12/14/07

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### Usage Types With SAP NetWeaver 7.0 (2004s)

#### Previous NetWeaver 'components' providing certain capabilities

<table>
<thead>
<tr>
<th>Usage Type with SAP NetWeaver 7.0 (2004s)</th>
<th>Short name*</th>
<th>Required Stacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Intelligence</td>
<td>BI</td>
<td>ABAP</td>
</tr>
<tr>
<td>BI Java Components</td>
<td>BI Java</td>
<td>Java</td>
</tr>
<tr>
<td>Development Infrastructure</td>
<td>DI</td>
<td>Java</td>
</tr>
<tr>
<td>Mobile Infrastructure</td>
<td>MI</td>
<td>ABAP + Java</td>
</tr>
<tr>
<td>Enterprise Portal</td>
<td>EP</td>
<td>Java</td>
</tr>
<tr>
<td>Process Integration</td>
<td>PI</td>
<td>ABAP+Java</td>
</tr>
<tr>
<td>Application Server ABAP</td>
<td>AS ABAP</td>
<td>ABAP</td>
</tr>
<tr>
<td>Application Server Java</td>
<td>AS Java</td>
<td>Java</td>
</tr>
</tbody>
</table>

Please remember that usage types are building blocks and in some cases, more than one usage type may need to be installed and configured to implement an IT Scenario:

Example: “Enterprise, Query & Reporting” can require usage types BI, BI Java, EP, AS ABAP & AS Java.
Customer Scenario – Whirlpool

Current deployment
- EDI Connectivity
- Data Integration
  - Internal: Maytag integration with and excluding SAP NetWeaver MDM
  - External: GDS synchronization
- Global Data Management – chart of accounts
- Order Processing – web services; multiple origination points

Future strategy
- Web Services – global leverage of solutions
- AS2 / XML Penetration – middle 1/3 of trade customers and suppliers
- EDI Conversions – consolidate all EDI transactions to SAP NetWeaver PI

Why SAP NetWeaver PI
- Simple, common, integrated
  - Significant TCO reduction from legacy EAI product
- Speed to market/innovation
  - Live in 6 months
  - Quickly deliver web services vs. only interfacing data
Customer Scenario – Unilever

Current deployment
- Unilever Private Exchange Infrastructure (UPXI)
- Worldwide B2B infrastructure

Future strategy
- Worldwide A2A integration hubs

Why SAP NetWeaver PI
- Implements integration architecture
- Aligns with the SAP ERP footprint
- One platform for SAP and non-SAP
Customer Scenario – Bayer
Multi-Vendor Service Backbone

- SAP NetWeaver Process Integration in heterogeneous environments
- Processes are managed by the originating infrastructure
- Standards allow seamless interoperability
Customer Scenario – Bayer
Master Data Distribution Process – Push
Customer Scenario – Bayer
Master Data Distribution Process – Pull
Customer Scenario – AXA/Winterthur
Enterprise Service Bus

Integration Platform (SAP NetWeaver PI)

J2EE Components (SAP NetWeaver Application Server)

- Integration of feeder systems via standardised blueprints
- Mapping of feeder-specific data structures to the canonical data model
- Defined service contracts
- Configurable central services
- Unified error handling

- Improved data quality due to high standardisation and harmonisation
- Synergies through re-use of central services
- Fast implementation of feeder-specific requirements via configuration of services
- Efficient operation due to central monitoring

Integration Process

Structure Mapping

Call of services and error handling

Duplicate Check
Mapping
Structuring
Aggregation

New GL
Introduction & Customer Usage Scenarios

Reduce Complexity

Stay in the “Buy Model”

Enable Complete Business Process Lifecycle

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Roadmap

Summary and Further Information
The mission of PI is to provide ONE integration platform for all types of integration scenarios (SAP and non-SAP, A2A, B2B, BPM, …)

- SAP/non SAP: PI is based on open standards (like WSDL, XSD, BPEL, …) – one integration platform for SAP and non-SAP systems
- A2A/B2B: PI can be used for integration scenarios running within the company’s boundaries (A2A) as well as for business to business (B2B) scenarios. Within the area of B2B PI supports many industry standards – enabling an out of the box communication with suppliers, customers or partners.
- PI is based on open, web service enabled standards and works fluidly within your service oriented architecture.
- With the support of Business Process Management, PI enables model-driven process flexibility and automation within and across systems.
- Benefits:
  - Save operation costs maintaining a heterogeneous IT landscape
  - Reduce time to adapt to changing business processes
  - Make the data exchange between applications transparent
  - Enabling an easy integration of applications and business partners with independent IT landscapes
  - Automate inter-company processes and streamline supply chain performance
  - Secure connectivity to authenticate senders and insure data integrity
- By using open standards we can lower the total cost of ownership and leverage existing investments. The purpose of PI is not to reinvent, but to leverage the investments you made into your existing integration landscape and arrive at your new integration landscape in an evolutionary manner.
- A2A integration is the message- and standard-based integration of intra-company processes by seamlessly connecting SAP and non-SAP applications.
- B2B integration is the message- and industry-standards-based integration of inter-company processes by offering various communication channels
- BPM enables model-driven process flexibility and automation within and across systems.
SAP NW PI consists of the following components:

**Design Time / Configuration Time**
- The Integration Builder: A client-server framework for accessing and editing two stores of Shared Collaboration Knowledge:
  - The Integration Repository: For the design and development of Interface, Process, and Mapping objects that are used to implement Integration Scenarios.
  - The Integration Directory: For configuring scenarios from the Integration Repository in the concrete customer landscape.
  - By separating design time activities from configuration time activities, SAP can ship content for the Integration Repository, which each customer can implement for their specific landscape in the Integration Directory. As far as possible the goal is to reduce the problem of developing interfaces to the simpler task of configuring interfaces.

**Runtime**
- The Integration Server: The central processing engine of the PI. All messages, whether SAP or non-SAP, A2A or B2B, regardless of backend technology or vendor, are processed in a consistent way.
- Central Monitoring: To give a comprehensive and focused view of all components and processes at runtime.

**SLD**
- The System Landscape Directory: a central repository of information about your system landscape and software components. This data is required during design- and runtime.
During Design time the “system-landscape independent” objects like Interfaces, Mappings, Integration Processes or Integration Scenarios are defined. The Integration Builder provides the editors for each object type in the Integration Repository.

All PI objects are described using web standards: Web Services Description Language (WSDL) for interfaces, XML Schema Definition Language (XSD) for messages and data types, XPath for “slicing and dicing” data in XML documents, and Business Process Execution Language (BPEL) for Integration Processes (Business Processes).
Once Integration content has been created in the Integration Repository, scenarios are configured in the Integration Directory. In the directory we specify the actual systems that will be exchanging messages, and configure the details of the message exchange (security, transport protocol, etc.)

Collaboration Profile includes Party. A Party is a unique identifier for a company. There can be several ways to uniquely identify a company among many companies. One example is use of the DUNS number. In the Party definition you define all the possible ways to uniquely identify this company. In the Collaboration Agreement/Profile, you say I’m going to use this specific Party to identify this company.

◆ Note: Besides DUNS numbers you can also use GLN (Global Location Number) or SCAC (Standard Carrier Alpha Code - used in Freight Industry).

A service is an abstract way to address senders/receivers of messages. It is useful to use business services when configuring cross-company processes. Usually, the interface descriptions of the business partners involved are made publicly available. However, the system landscape of those involved is normally unknown, or only partly known, and cannot therefore be entered in the SLD. As a result, you cannot address business systems as the senders or receivers of messages in logical routing.

Channels contains specific information for the message protocol, transport protocol, URL, logon data and adapter specific configuration. (For example, CIDX file, CIDX http).
Process Integration – Architecture

Enterprise Services Repository / Integration Directory / System Landscape Directory

Integration Server

- Business Process Engine
- Integration Engine

- Central (Advanced) Adapter Engine
  - Adapter Framework
  - Messaging
  - Queuing
  - Security Handling

- Optional non-central (Adv.) Adapter Engine
  - Adapter FW
  - Messaging
  - Queuing
  - Security Handling

Partner Connectivity Kit
- PCK Configuration and Monitoring

Plain J2SE Adapter Engine
- HTTP/Doc Adapter

SAP & Non-SAP System
- File/DB/JMS
- SOAP


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PI Connectivity developed by SAP

Technical Connectivity
- File/FTP (File Systems / FTP Servers)
- JDBC (RDBMS systems)
- JMS (Messaging systems, e.g. MQSeries, SonicMQ)
- SOAP (Web Services based on SOAP)
- WS-RM (Web Services based on WS-RM)
- Plain HTTP
- Mail (Mail Servers via SMTP, IMAP4, POP3)
- SAP Business Connector (SAP BC)
- Marketplace (SAP Marketplaces)

Application Connectivity
- RFC
- IDoc
- Proxy (ABAP and Java)

Industry Standard Connectivity
- RNIF 2.0 (RosettaNet)
- RNIF 1.1 (RosettaNet)
- CIDX (RNIF 1.1)
Partner Eco System

SAP relies on a system of partners to provide connectivity solutions for other applications and certain industry standards

Connectivity Reseller Agreements with
- Seeburger AG
- iWay Software
- Informatica

3rd-Party solutions are sold and delivered through SAP

Technical support for partner solutions via the SAP Support Portal, 24x7
PI Adapters by Seeburger (1)

Technical EDI Adapters

◆ AS2 (EDIINT/HTTP(S))
  Protocol: AS2

◆ OFTP
  Protocol: OFTP/ISDN, OFTP/TCPIP

◆ VAN Access
  Protocol: P7 / X.400, VAN FTP

Business EDI Adapters

◆ Generic EDI
  Protocol: OFTP/ISDN or P7 / X.400, VAN FTP
  EDI Converter: ANSI X.12, EDIFACT
  Mapping Templates: Purchase order, Order confirmation, Dispatch advice, Invoice

◆ Payment (Financial Service Providers)
  Protocol: OFTP/ISDN, P7 / X.400, VAN FTP
  EDI Converter: EDIFACT, SWIFT
  Mapping Templates: Payment orders, Debit advice, Credit advice, Account Statement
Industry Specific EDI Adapters

- Aerospace and Defense
- Chemicals
- High-Tech
- Pharmaceutical
- Automotive
- Consumer Products
- Paper
- Retail

Communication Protocols

- OFTP/ISDN, P7 / X.400, VAN FTP

EDI Converter (EDI <-> XML)

- AECMA/SPEC 2000, ANSI X.12, CHEM eStandards, EDIFACT, GALIA, ODETTE, TRADACOM, VDA

Mapping Templates within Integration Repository

- Delivery forecast, Dispatch advise, Invoice, Purchase order, Order confirmation

Message Library for Integration Repository

- Huge message catalog with EDI XML schema definitions
### PI Adapters by iWay Software

#### Application Adapters
- Ariba
- Clarify
- i2
- Manugistics
- QAD MFG Pro
- Baan
- JDE One World XE
- Lawson
- Oracle Applications
- Siebel
- Broadvision
- JDE World
- Microsoft CRM
- Peoplesoft
- Vantive

#### Industry Standard Adapters
- Swift
- Transora
- UCCnet

#### Technical Adapters
- AS1 (EDIINT/SMTP)
- AS2 (EDIINT/HTTP(S))
- COM+/DCOM
- Corba
- Tibco Rendezvous
- BEA WLI
- Lotus Notes

#### Mainframe/transaction Adapters
- CICS
- TMS/IMS
- Telnet (5250)
- Telnet (3270)
- Tuxedo

Optionally further adapters can be added from a list of 160 iWay adapters, e.g. AS3 (EDIINT/FTP), HL7
SAP Conversion Agent by Informatica

Seamlessly integrated into SAP NW PI

- Bi-directional conversion of unstructured and semi structured data from / to XML
- Transformation on message payload
- Protocol support via SAP’s technical adapter (PI adapter framework)
- Transformations integrated via PI AF module

The CA delivery includes adapter framework modules that enable the usage of CA transformations based on all (java based) SAP technical adapter within SAP NW PI

CA transformations are used for payload transformations; adapters take care of protocol layer
### Supported Data Formats by Informatica (partial list)

**... using SAP technical adapter and Conversion Agent:**

#### UNSTRUCTURED
- Microsoft Word
- Microsoft Excel
- PowerPoint
- PDF
- Star Office
- Word Perfect
- ASCII reports
- HTML
- EBCDIC
- Undocumented binaries
- Flat files
- RPG
- ANSI

#### SEMI-STRUCTURED
- HL7
- HIPAA
- ASTM
- ANSI–X12
- EDIFACT
- COBOL
- FIX
- Cargo IMP
- MVR
- SWIFT

#### PRINT STREAMS
- AFP
- Post Script
- DJDE

#### OTHER STANDARDS
- LegalXML
- IFX
- cXML
- ebXML
- HL7 V3.0
- ACORD (AL3, XML)

- These are the data formats supported by SAP Conversion Agent by Informatica.
- Based on SAP adapter technology for transport protocol support
  Conversion Agent enables bi-directional transformation from/to these formats
## Conversion Agent vs. 3rd Party Adapters

<table>
<thead>
<tr>
<th>Conversion Agent</th>
<th>3rd Party Adapters</th>
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</thead>
<tbody>
<tr>
<td>■ Bi-directional conversion of unstructured and semi structured formats from/to XML</td>
<td>■ Bi-directional conversion of one dedicated data format (e.g. SWIFT, ANSI-X12, …) from/to XML</td>
</tr>
<tr>
<td>■ Linked through PI adapter framework module based on SAP’s technical adapter – no transport protocol, manipulates payload information</td>
<td>■ Runs within PI adapter framework - support payload transformation and transport protocol</td>
</tr>
<tr>
<td>■ SAP NetWeaver-wide use (via Java EE library)</td>
<td>■ Per adapter dedicated use within one SAP NetWeaver component</td>
</tr>
</tbody>
</table>
Connectivity Info on SAP Service Marketplace

SAP Service Marketplace: [http://service.sap.com/xi](http://service.sap.com/xi) → SAP XI in Detail → Connectivity → Connectivity SAP NW 7.0 / '04
Certification Programs for Process Integration

PI Based Certification Programs

* http://www.sdn.sap.com ➔ Partners and ISVs ➔ Integration and Certification ➔ Exchange Infrastructure
SAP NW PI Performance Customer Case Study 1
SAP NW PI Performance Customer Case Study 2
SAP NW PI Performance Benchmarks
Customer Case Study 1 – Introduction

- One of the largest producers of energy in United States

- Operates in more than 20 states

- Produces natural gas and power

This is one of the nation's largest producers of energy. The company's asset portfolio consists of:

- 26,500 megawatts of power generation
- 6,000 miles of electric transmission
- 6.3 trillion cubic feet equivalent of proved natural gas reserves
- 7,800 miles of natural gas pipeline
- The nation's largest natural gas storage system, with about 950 billion cubic feet of storage capacity
Their landscape includes various Work Management systems, Inbuilt systems, legacy systems and some SAP applications. They just started B2B with a few suppliers.

Work Management Systems include Maximo, PASSPORT by Indus, ARM by LogicaCMG and EMPAC by Indus (2 different versions because of acquisitions).

Legacy Systems include Mainframe and LDAP (AD).

They have some in-built systems (which they use to run the directory services scenarios) from which they can retrieve personal data, employee telephone number, etc.

SAP applications include ERP (for Vendor Management and Inventory and Purchase Order scenarios), SRM (Purchase Orders scenarios) and BI

For B2B they use Perfect Commerce Marketplace and Chase Bank (Treasury and AP).

Some of their scenarios include:

- **Treasury Payments**: IDOC to PI. In this scenario they collect IDOCs in PI and send them out. (Collection is done with ccBPM) With their bank (Chase Bank), the agreement is by how many connections, not by how much they transfer, so they collect and periodically send. This is a high risk process because these are billion dollar transactions. They do not use an adapter for the 820 documents, they use ABAP mapping and BPM to collect. Goes via the FTP adapter to Chase Bank.

- **Purchase Order Processing**: SRM shopping cart gets approved, goes to R/3 as a PO. Goes out of R/3 to PI to the marketplace. We also spit out normal PO from SRM directly using proxy framework. Goes to marketplace, comes back to R/3 instead of SRM.

- **Work order management systems**: They have a system called Maximo. This is a full-blown work order management system. For them, a message is a line item for an IDOC segment, basically a message for each change pointer. So, they split the IDOC using http/SOAP adapter (simulate message split from http adapter) and convert 1 IDOC to 500 line items (this is done without ccBPM). SAP gets 1 message for each IDOC, so they split this for Maximo.

- **Standard PO Process**: A PO is sent from SAP ERP to PI and this is routed to the supplier (similar to other scenarios).
They have 5 different work management systems. From these work management systems they get a reservation during the night. The reservation is sent to SAP NW PI as RFC calls. The reservation could be an:

- Orders
- Change Orders
- Order Request
- Order Response
- Advance Shipment Notice

These reservations are sent to SAP ERP, and the MRP creates the planning schedule. The schedule is sent back to SAP NW PI via the IDOC adapter. This creates an xCBL document and is sent to the marketplace adapter.

The marketplace adapter translates the XCBL document into MML and sends it to their marketplace (Perfect Commerce).

Perfect commerce then sends it to the vendor.

The vendor creates an SO and sends back an order request (MML - Marketplace-xCBL- PI - R/3).

The order is created, change order is created, and it goes back out to match up their SO and our PO.

In this process, they use ASN (advance shipping notifications). This is used for goods receipt and invoice posting.
# Customer Case Study 1 – Performance

| Message Volume      | 44,000 messages per hour from 11 AM – 2.30 PM  
| 528,000 messages per day |
|---------------------|------------------------------------------------|
| Adapters Used       | IDOC  
| RFC  
| Marketplace         |
| Type of Mapping     | XSLT  
| ABAP                |
| Routing             | Content based routing                         |
SAP NW PI Performance Customer Case Study 1
SAP NW PI Performance Customer Case Study 2
SAP NW PI Performance Benchmarks
Customer Case Study 2 – Introduction

- One of the largest producers of steel in Asia
- Operates from 3 different locations
- Manufactures:
  - Heavy steel plates
  - Deformed bars
  - Sections
The company has production plants in 3 different locations. The main products include heavy steel plates produced in location 1, deformed bars produced in location 2 and sections produced in location 3.

At every location, all the systems are integrated via SAP NetWeaver Process Integration. Each module in MES system also interacts with each other via PI.

All the locations are also integrated via SAP NetWeaver Process Integration.

The landscape includes SAP applications, Legacy Systems and some Third Party systems.

SAP Applications include:
- SAP ERP
- SAP SCM
- SAP Enterprise Portal (Order Management System)

Third Party systems include:
- MES (Manufacturing Execution System)
- APS
The whole process starts from the sales order created in the OMS (company's internal portal). The sales orders are transferred to APS system (1) and the fixed planned order are created accordingly (2). The planned orders are then transferred to SAP SCM system via SAP NW PI and this results in the creation of fixed planned orders in SAP SCM (3). The data volume across SAP NW PI is around 300 planned orders per day.

Demand Planning (DP) and Supply Network Planning (SNP) are carried out in SAP SCM weekly (4) (5). After the SNP run, the result is sent to the APS system to perform detail scheduling (6). The detail scheduling result is sent back to SAP SCM again for the second SNP run, to finalize the weekly plan. This information is updated to APS via SAP NW PI.

The detail scheduling is run daily. Based on these results, the fixed production plan is obtained, which is a kind of "production orders" created in APS system for finished product (7). Once the "production orders" are created, they are transferred to MES system via SAP NW PI. There are around 5000-6000 "production orders" created/transferred per day.

Manufacturing is carried out in MES system. Once a semi-finished/finished product comes up, the production information is sent to SAP ERP system via SAP NW PI (9). The data volume is around 20,000 items per day. In SAP ERP system the messages from SAP NW PI are stored in customer developed interface table first, and then the production order is created using job ZBP0010 (10). Subsequently the goods issue, confirmation, batch determination, goods receipt are performed mainly calling SAP standard functions (13)-(16). If there is by-product, the goods receipt is also carried out (17).

As the SAP ERP system and SAP SCM system are closely integrated by CIF (Core Interface), once the production orders are created in SAP ERP and the stock information is changed due to GI/GR, the corresponding information is updated to SAP SCM in real-time (12), (18).

After each operation is completed, there is production message transferred from the MES system to the APS system via SAP NW PI (22), (11). It is said that the data volume of this production information from MES to APS via SAP NW PI is around 3 times larger than the data transferred from MES to SAP ERP. Therefore the estimated data volume is around 60,000 items per day.

The error check for semi-finished/finished product is performed in SAP ERP (19) and the error message in sent to MES system where the quality control is done (20).

At last, the production order settlement is carried out and the further CO process continues.
## Customer Case Study 2 – Performance

### Message Volume
- Head quarters (Location 1) : 104,859 / Day
- Location 2 : 433,730 / Day
- Location 3 : 38,150 / Day
  - Total : **576,739** messages / Day

### Adapters Used
- IDOC
- HTTP
- FILE
- JDBC
- RFC

### Type of Mapping
- JAVA
- ABAP
- XSLT

### Routing
- Sender based routing
- Content based routing
SAP NW PI Performance Customer Case Study 1
SAP NW PI Performance Customer Case Study 2
SAP NW PI Performance Benchmarks
High Volume Support via Message Packaging

Message Packaging

- Process a bulk of messages in one service call (mapping, routing, ...)
- Reduce context switches, enable mass operations on database
- For asynchronous scenarios
- Throughput gains: 1.5 – 3.5 times compared to non-packaging (depending on scenario)

Customers require high-volume throughput.

A bulk of messages can be processed in one service call and thus context switches for mapping, routing, reading message header etc. can be reduced and mass operations on the database are possible. This feature can be used in async scenarios only.

Performance improvements:

- For async scenarios message packaging plus bulk processing in ccBPM improves throughput for small messages (<100kB) by factors 2-10. This includes ccBPM improvements like transient processing of multiple steps. I. e. factor 10 can be reached only for selected scenarios.
- Performance improvements without ccBPM: up to factor 3.5.
### Message Packaging: Scenario: IDoc ⇒ PI ⇒ Flat File

<table>
<thead>
<tr>
<th>Message size</th>
<th>11 KB</th>
<th>32 KB</th>
<th>245 KB</th>
<th>2.37 MB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corresponding number of line items</td>
<td>2</td>
<td>10</td>
<td>100</td>
<td>1000</td>
</tr>
</tbody>
</table>
| Expected number of messages with 66% system usage (as calculated by Quicksizer) | 200,000  
  ~ 56 m/s | 180,000  
  ~ 50 m/s | 110,000  
  ~ 31 m/s | 21,500  
  ~ 6 m/s |
| Calculated possible number of messages with 100% usage (without message packaging) | 300,000  
  ~84 m/s | 270,000  
  ~75 m/s | 155,000  
  ~66 m/s | 32,000  
  ~9 m/s |
| Number of messages with message packaging set on Integration Server to 10 seconds, 100 messages, and 1 MB maximum package size | 790,000  
  = 220 m/s  
  = 8.7 GB/h | 630,000  
  = 175 m/s  
  = 20.2 GB/h | 207,000  
  = 58 m/s  
  = 50.7 GB/h | Up to 33,000  
  = 9 m/s  
  = 78 GB/h |
| Number of messages with message packaging set on Integration Server to 10 seconds, 100 messages, and 5 MB maximum package size | | | | Up to 33,000  
  = 9 m/s  
  = 78 GB/h |
| Improvement factor with message packaging compared to expected values from Quicksizer | 2.6 | 2.33 | 1.34 |

**HW: 16 CPU Itanium/2; SW: SAP NW PI 7.0 SP12**

#### Detailed Use Case Description

- Application data from an SAP ECC system is sent in IDoc format and must be transferred to a third-party system working with comma-separated files (CSV).
- The SAP ECC system sends the IDoc to the Integration Server as IDoc packages. The Integration Server sends a technical commit to the ECC system and transforms the IDoc to PI messages (IDoc-XML). A third-party business system is determined as receiver and the message is therefore forwarded to the Adapter Engine. The Adapter Engine drops the XML structure and puts the CSV to the file system. Further processing is done by the receiving business system.

#### Lessons Learned

- Acknowledgments are not to be used on the Integration Server, unless they are really needed. They are usually not needed for a file receiver.
- For large hardware, which normally processes queues quickly, the wait time of message packaging should be extended from 0 to 10 or 20 seconds in order to obtain larger packages. This increases throughput and decreases CPU and DB usage.
- This increases the average runtime of single messages.
- For large hardware and larger message sizes, the message size of message packaging should be increased. This makes message packaging more efficient.
Message Packaging: ccBPM Collect Scenario

<table>
<thead>
<tr>
<th>Messages per collection (totally 11.6 KB)</th>
<th>10</th>
<th>50</th>
<th>100</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected number of messages with 66% system usage (as calculated by Quicksizer)</td>
<td>90,000 in and 9,000 with 61.3 KB out</td>
<td>100,000 in and 2,000 with 281 KB out</td>
<td>100,000 in and 1,000 with 555 KB out</td>
<td>100,000 in and 1,000 with 555 KB out</td>
</tr>
<tr>
<td>Outgoing messages with 100% usage</td>
<td>13,500</td>
<td>3,000</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td>Number of messages with message packaging (25 messages per package), parallel queues (up to 25), and new ccBPM transaction handling</td>
<td>400,000 in and 40,000 with 61.3 KB out</td>
<td>700,000 in and 14,000 with 281 KB out</td>
<td>600,000 in and 6,000 with 555 KB out</td>
<td>700,000 in and 7,000 with 555 KB out with 5 MB package size</td>
</tr>
<tr>
<td>GB per hour</td>
<td>2.5</td>
<td>3.94</td>
<td>3.3</td>
<td>3.88</td>
</tr>
<tr>
<td>Improvement factor with message packaging compared to expected values from Quicksizer</td>
<td>3</td>
<td>4.7</td>
<td>4</td>
<td>4.7</td>
</tr>
</tbody>
</table>

HW: 16 CPU Itanium/2; SW: SAP NW PI 7.0 SP12

- **Scenario: Business Process Management**
- Business Process Execution Language (BPEL) is used to correlate the message exchange between an SAP business system and a third-party warehouse management system.

- **Detailed Use Case Description**
- A warehouse (or other) application system creates a large number of small messages that have to be collected and combined. In this scenario, a certain number of messages (10, 50, 100) were collected for the same order identification. As soon as this number of messages is reached, ccBPM merges the messages into a package and sends it to a receiving business system. There, the content of the message package is transferred to the application.
- The business benefit of this scenario is that many small messages, which semantically belong together, are not processed one by one, but are together transferred to, and handled by, the application system.

- **Lessons Learned**
- On larger hardware, to create reasonable packages also in outbound processing, the maximum package size must be increased from 1 MB to 5 MB.
- To benefit throughput, the maximum number of messages for message packaging must not be too high.
Local Processing in the Advanced Adapter Engine

- Natural evolution of the adapter engine
- Provides mapping, routing to bypass the Integration Server
- Adapter-to-adapter communication
- For synchronous and asynchronous scenarios
- Gain of throughput and reduction of latency time up to factor 10 (depending on scenario)

Customers require high-volume throughput.

- Evolve Adapter Engine (central and non-central) to “local processing engine” -> non-disruptive evolution, can be used like a non-central adapter engine, -> natural extension of PI.

- It provides mapping, routing etc., and allows to bypass the Integration Server -> performance improvement up to factor 5.

- IS pain points:
  - One-side access only via XI-protocol
  - Adapter to Adapter communication always goes through IS
  - Mapping always executed on central IS

- Reduced TCO as no double-stack required anymore for certain scenarios

- Improved performance for adapter-to-adapter communication

- Central configuration and monitoring through Integration Directory and Runtime Workbench, also of multiple “local processing engines”

- Allows customers to distribute execution of mission-critical processes
Hardware: 4 x Opteron 2.6 GHz
Scenario without Mapping and without Packaging for IS;
Mapping reduces comparison factor from 10 to 7-8
Audit Log Memory Cache enabled for AAE processing
Response times depend on backend service performance, additional used PI services (e.g. content-based routing, mapping) and underlying hardware.

Advanced Adapter Engine local processing can reduce response times to <100 ms.
General Performance Improvement Methods

In accordance with the preliminary performance tests:

- Packaging is boosting performance up to 300% (3x) best case.
- AAE local processing performance boost up to 1000% (10x).

For scenarios where local processing in the AAE is supported, it is the best choice!

* Refer to analysis scope slide

- Considering the preliminary testing, local processing in the AAE is able to boost performance up to 10 times, while packaging just 3 times, so local processing in the AAE should be the natural choice.
Introduction & Customer Usage Scenarios
Reduce Complexity
Stay in the “Buy Model”
Enable Complete Business Process Lifecycle
Pave the Way to an Enterprise SOA
Roadmap
Summary and Further Information
Supporting Standards to Improve Processes

Industries involved in Industry Standards Support

- High Tech
- Chemical
- Agrichemical
- Oil and Gas
- Automotive
- Aerospace and Defense
- Consumer Products
- Mill Products
- Financial
- Others...

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■ From Borealis to Logistics Site
  ◆ Book transport and get transport booking confirmation
  ◆ Inform the Logistics Site of the planned transport
  ◆ At dispatch send ‘loaded volume’ to Carrier (later used for self-billing)
  ◆ At arrival at the Logistics Site, Borealis SAP inventory is updated.
A customer gets the SAP adapters together with PI „out of the box“

- Technical connectivity to other backend systems can be established by installing the iWay adapter afterwards.
  - Separate installation step, but fully integrated into SAP Service Marketplace processes
  - Separate license fees

- But at the end the customer would like to integrate applications. To achieve this content (interface definition, mappings, eventually business processes) must be built.
Overview: PI based solutions

SAP Business Suite

- ERP
  - Catalog Content Management
  - Financials (Electronic Tax Return (Elster), Credit Management, Bundled pricing, Treasury Management)
  - Campus Management
  - Human Capital Management (E-Recruiting, New Hire, External Learning Services)
  - Travel Management (Travel Expenses, Travel Planning)
  - ...

- Supply Chain Management (SCM)
  - Forecasting & replenishment
  - Demand influencing factors transfer
  - Auto-ID enabling
  - Inventory collaboration hub (ICH)
  - Responsive replenishment
  - Supply Network Collaboration
  - ...

- Supplier Relationship Management (SRM)
  - Plan driven procurement with supplier enablement
  - Service procurement with supplier enablement
  - Spend analysis and reporting
  - Purchase Order Reporting
  - ...

Industry specific applications

- ANSI/ISA-95
  - Production Schedule
  - Production Performance
  - Maintenance Workorder
  - Maintenance Response

- Automotive
  - STAR

- Chemicals
  - CIDX Business Package for ERP: Order to Invoice

- Consumer Products
  - Global Data Synchronisation (GDS): UCCnet Register Scenario and Transora Messages Flow

- High Tech
  - RosettaNet Business Packages for ERP and CRM: Order to Invoice

- Oil and Gas
  - Production and Revenue Accounting

- Retail
  - Merchandise and Assortment Planning

Generic applications

- HCM
  - Elster: Submission of employees tax data to tax authorities
  - E-Filing GB: E-Filing consists of two parts.
    a. Submission of employees tax data to tax authorities at the tax year end.
    b. Employees’ tax codes are updated by tax authorities. The employees and the new tax codes are put into a mailbox to be retrieved by the employer.
  - Loonaangifte: electronic submission of tax declaration for dutch payroll
  - Learning Solution:
    create and delete participations in an external training system
    start a training content in an external training system
    distribute learning progress data between two Learning systems
  - E-Recruiting
    New Hire Interface to Personal Administration
    External Job Board Integration
  - Travel Management
    PI Integration for Hotel reservation systems, Low Cost Carrier and Credit Card Clearing Providers
  - Campus Management
    Universities in UK deal with a central agency called UCAS for receiving applications, admission of students and ongoing change in student status. This project aims to develop PI based interfaces to comply with protocols that enable the universities to communicate

Industry specific applications

- Industry Speak uses standards (like RosettaNet) for automating business processes and scenarios between collaborating enterprises within a community of interest.
- Banking: Bundle Pricing: give special prices for a group of bank accounts; exchange of Bank Account Balance Records
- Telecommunications: With the Scenario Contract and Order Management an open interface will be delivered to interact with every billing system in order to maintain directly all billing relevant data for contract and service changes.
Content from SAP

Content delivered by SAP can be classified within two categories:

SAP Application Content (Generic integration content provided by SAP applications)

**BENEFITS**
- Out-of-the-box integration scenarios
- Harmonized application and integration logic
- Simplified upgrade of end-to-end scenarios

SAP Business Packages (Integration Content focusing on vertical industry standards e.g. RosettaNet; CIDX, S95, …)

**BENEFITS**
- Enable seamless B2B communication
- … based on Industry Standards
- Easy mapping of industry standards to SAP applications

Content from SAP Partners

Many partners are providing integration content that extends the content offering of SAP (for A2A / B2B scenarios)

- Certified integration scenarios (For details on the certification programs please see: http://sdn.sap.com ➔ Partners and ISVs ➔ Integration and Certification ➔ Exchange Infrastructure)
- Filling white spaces in SAP’s content offering
- Around 150 partners certified/in certification on integration scenarios
- Check out the PI content catalog on your own (link within slide)
- It contains content offerings from SAP as well as from certified partners
RosettaNet
CIDX
PIDX
EDI
Enterprise Services Bundles
<table>
<thead>
<tr>
<th>RosettaNet</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIDX</td>
</tr>
<tr>
<td>PIDX</td>
</tr>
<tr>
<td>EDI</td>
</tr>
<tr>
<td>Enterprise Services Bundles</td>
</tr>
</tbody>
</table>
Business Packages include scenario descriptions, business processes, message interfaces, message types, mappings, adapter etc.

- SAP Business Package for RosettaNet offers a comprehensive solution that addresses RosettaNet standards – not just tools.
- Dedicated, prebuilt, out-of-the-box message and process mappings between the application interfaces and business logic of various SAP solutions and RosettaNet PIP payloads are delivered with the Business Package.
- NO other company delivers all 3 – most just deliver the Adaptor & use consulting to build the mappings.
- SAP is developing SAP Business Packages for the High tech as well as the chemical and Oil & Gas industry.
Enterprise Services Repository – RosettaNet Content

- Two main software components in the repository
- RosettaNet software component contains the standard content
- RosettaNet_ERP software component contains the integration content
Example
RosettaNet PIP* 3A4 as Integration Scenario

* PIP = Partner Interface Processes

External Definitions
DTDs describing RosettaNet PIPs

Mappings
PIP standard to application standard
RosettaNet PIPs - out of the box
Pre-defined Configuration

- Configuration templates for PIPs are delivered as part of the content
  - Enables ease of configuration
  - Used during the configuration of the RNIF adapter in the PI Directory.
  - Templates refer to the business activity performance controls of the RosettaNet Standard

- Configuration Wizard
  - Guides through configuration process
  - Specific settings for B2B config
  - Speeds up process to set up new BP-connections
**RosettaNet Scenario**

**RosettaNet Partner Interface Process 3A4:**

- **Buyer** sends a purchase order request action to SAP NW PI via RNIF adapter. RNIF Adapter transforms the message protocol into a message protocol that is understood by the SAP NW PI and sends the message to the Integration Server of SAP NW PI for further processing.

- **SAP NW PI** receives the message and sends a receipt acknowledgement via RNIF Adapter to Buyer.

- **SAP NW PI** transforms the PIP3A4 RosettaNet Standard message to the SAP message (IDOC ORDERS05) and sends the message to the backend R/3 system via IDOC adapter for further processing.

- **Backend R/3** processes the IDOC and creates a Sales Order in the system and sends the Order confirmation message (ORDERSP IDOC) back to the waiting SAP NW PI process.

- **SAP NW PI** transforms the received confirmation IDOC to PIP3A4 Purchase Order Confirmation message format.

- The RNIF Adapter accepts the message from the Integration Server, transforms the message protocol from XI to PIP message protocol, and sends the message to the RosettaNet-compliant system.

- **Buyer** sends the receipt acknowledgement for the received confirmation message.
RosettaNet
CIDX
PIDX
EDI
Enterprise Services Bundles
Configure Landscape and Install Business Package – Process In Detail

Enabling SAP Business Package for

- Download SAP Business Package from Service Marketplace
- Define SLD-objects (Product; Software Component, …)
- Import Business Package (tpz file) into repository

Further Information

- CIDX Scenario Description / Configuration Guide, …
  https://service.sap.com/ibc --> Industry Solutions --> SAP for Chemicals → Order to Invoice
- SAP help portal
  → Enabling A2A → Config of UT PI → Template Based Basic Config → Importing PI Content

- Model Integration Scenarios
- Define Integration Processes as process bridge between processes running in applications
- Define Interfaces, Message Types and Data Types.
- Import DTD, WSDL and XSD and reuse as interfaces
- Define Mapping using the mapping editor or import your mappings and reuse.
CIDX Business Package – Repository Objects

Definition of process flows + Chem eStandard messages + Mapping to ERP backend via ...

Integration Scenarios

External Definitions

Message interfaces

Message Mappings

Mapping Templates
Configuring SAP Business Package for CIDX

- Configure communication profile to set up new BP-communication
  - Party = New BP
  - Service = Chem eStandard Message
  - Channel = CIDX adapter (RNIF 1.1)

- Set up secure communication following CIDX security standards (non-repudiation, ...)

- Speed up configuration
  - Configuration Templates
  - Integration Scenario Configurator

Model Integration Scenarios

- Define Integration Processes as process bridge between processes running in applications
- Define Interfaces, Message Types and Data Types.
- Import DTD, WSDL and XSD and reuse as interfaces
- Define Mapping using the mapping editor or import your mappings and reuse.
<table>
<thead>
<tr>
<th>RosettaNet</th>
<th>CIDX</th>
<th>PIDX</th>
<th>EDI</th>
<th>Enterprise Services Bundles</th>
</tr>
</thead>
</table>

THE BEST-RUN BUSINESSES RUN SAP
### PIDX Content in Enterprise Services Repository

<table>
<thead>
<tr>
<th>PIDX</th>
<th>1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://sap.com/bdp/PIDX/1.0">http://sap.com/bdp/PIDX/1.0</a></td>
<td></td>
</tr>
</tbody>
</table>

#### Integration Scenarios & Integration Processes

#### Interface Objects

- **Message interfaces**
  - Message Types
  - Fault Message Types
- **Data Types**
  - Data Type Enhancements
- **Content Objects**
  - AdvancedShipNotice
  - CementingTemplate
  - CustomerTicket
  - Exception
  - FieldTicket
  - FieldTicketResponse
  - Invoice
  - InvoiceResponse
  - OrderChange
  - OrderCreate
  - OrderResponse
  - OrderStatusRequest
  - OrderStatusResponse
  - PIDXCodeLists
  - PIDXLib
  - PipelineNominationChange
  - PipelineNominationCreate
  - PipelineNominationResponse
  - PipelineSchedule
  - Quote
  - QuoteNotification
  - QuoteRequest
  - Receipt

- **PIDX software component in the Enterprise Services Repository**
- **PIDX software component contains the standard content**
- **All the Order-to-Invoice PIDX message types are delivered as external definitions**
- **PIDX over RNIF 2.0**
Configuration using the Scenario Configurator

- Transfer scenario from repository
- Assign Party & Service
- Assign Commun.-Channel
- Generate Configuration
RosettaNet
CIDX
PIDX
EDI
Enterprise Services Bundles
Electronic Data Interchange (EDI)
- Computer-to-computer exchange of structured information
- Agreed message standards
- From one computer application to another by electronic means
- Minimum of human intervention

History of EDI
- Originated in the 60’s/70’s
- Several industries invented their own sets of standardized data formats including TDCC – 1960
- ANSI ASC X12 – 1979
  - Over 300 transactions sets in a single version
- UN/EDIFACT – 1985
  - Almost 200 transactions sets in a single version
- Other EDI standards
  - HL7, ODETTE, TRADACOM, SWIFT etc.
Seeburger’s B2B and Industry-specific content in the Integration Repository includes

- Mappings, message descriptions, Adapter metadata, partner master data, Integration scenarios and processes
- Seeburger EDI and B2B technology suite in the Adapter framework includes conversion, communication and components
- Seeburger Adapters includes industry-standard protocols such as AS1, AS2 and other EDI-specific adapters
Example: Message Mapping of EDI to IDoc
Example: Configuration of an OFTP-Sender-Channel
Example: EDIFACT->XML-EDIFACT
RosettaNet
CIDX
PIDX
EDI
Enterprise Services Bundles
Enterprise Services - Meaning

An Enterprise Service is a web service adhering to the following criteria:

- based on open standards (WSDL, SOAP, UDDI)
- provides business functionality
- is structured according to a harmonized enterprise model based on global data types (GDTs), process components, and business objects
- published in the Enterprise Services Repository
- is well documented
- following architectural Guidelines and Standards

→ Ensured Governance and Reuse
Process for Developing Enterprise Services at SAP

1. Identify
   - Define Business context

2. Standardize
   - Identify the Global Data Types (GDT) to be used
   - Define new GDT’s and the service signatures
   - Standardize via governance process

3. Implement
   - Model interface in repository
   - Generate proxy
   - Implement proxy class
   - Implement functionality
   - Service-enable functionality

SAP NetWeaver Tools

Enterprise Service Community
From Definition to Consumption

The provisioning and consuming of an Enterprise Service consists of the following steps:

- Create Graphical Model
- Model Service Interface
- Generate / Implement Proxy
- Publish to Services Registry
- Search ES Workplace
- Create Consuming Application

Providing the Service

Consuming the Service

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Read Purchase Order Enterprise Service

Definition on ES Workplace:

„A request to and response from Purchase Order Processing to provide the data of a purchase order. The inbound operation Read Purchase Order By ID is used by the buyer to display a purchase order.“

Part of PC Purchase Order Processing:

Definition

Process component Purchase Order Processing covers the creation and processing of purchase orders.

Use

The process component Purchase Order Processing enables the provision of applications that a buyer can use to create, display, and change purchase orders.

Interface Manage PO:

Group of operations that enable the processing of purchase orders.

The inbound service interface Manage Purchase Order contains the operations that the buyer can use to display, create, and change purchase orders.
Context of Read Purchase Order Enterprise Service

Process Component „Purchase Order Processing“:
- Process component Purchase Order Processing covers the creation and processing of purchase orders.
- The process component Purchase Order Processing enables the provision of applications that a buyer can use to create, display, and change purchase orders.

Interface „Manage Purchase Order“:
- Group of operations that enable the processing of purchase orders.
- The inbound service interface Manage Purchase Order contains the operations that the buyer can use to display, create, and change purchase orders.

From Solution Map: Home > SAP ERP > Procurement and Logistics Execution > Procurement > Purchase Request Processing

Part of PC Purchase Order Processing:

Definition
- Process component Purchase Order Processing covers the creation and processing of purchase orders.

Use
- The process component Purchase Order Processing enables the provision of applications that a buyer can use to create, display, and change purchase orders.

Interface Manage PO:

Group of operations that enable the processing of purchase orders.

The inbound service interface Manage Purchase Order contains the operations that the buyer can use to display, create, and change purchase orders.
SAP’s Approach to SOA for More Flexibility and Speed of Change

Enterprise SOA enriches industry-standard service-oriented architectures with productized services as well as business semantics in a unified repository to ensure business process integrity for enterprises and deliver advanced business process flexibility.

It increases scalability, reusability, and governance in SOA-based architectures to reduce TCO, enhance responsiveness, and accelerate business process change and innovation.
**Introducing Enterprise Services Bundles**

Make the value of Enterprise SOA “consumption ready”

<table>
<thead>
<tr>
<th>Enterprise Services:</th>
<th>Benefits of Enterprise Services Bundles:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly integrated Web services combined with business logic and semantics that can be accessed and used repeatedly to support a particular business process</td>
<td>Deliver high-impact business capability</td>
</tr>
<tr>
<td><strong>Enterprise Services Bundles:</strong></td>
<td>Easy to implement</td>
</tr>
<tr>
<td>- Group-relevant enterprise services for a specific business scenario</td>
<td>Provide “quick wins” for the business</td>
</tr>
<tr>
<td>- Cross-industry bundles</td>
<td></td>
</tr>
<tr>
<td>- Industry-specific bundles</td>
<td></td>
</tr>
</tbody>
</table>

Enterprise services and bundles can be explored and tested at SAP’s Enterprise Services Workplace:

https://www.sdn.sap.com/irj/sdn/esworkplace
Governance for Enterprise Services

**Semantics/Taxonomy**
- **Business semantics consistency:** same understanding between service consumers and service providers
- **Technical**
  (Transport protocols, security standards, formats ...)

**Global Data Types**
- Company-wide defined data types based on international standards
- Semantic building blocks for interfaces

**SERVICE DEFINITION**
- Decision on service cut
- Raw design
- Elements/data types
- Final design
- Enter in ESR

**Architectural Guidelines and Standards**
Common modeling and implementation guidelines proven by SAP development are the basis for every (new) service development

**Enterprise Services Repository**
The enterprise services repository is the central repository in which service interfaces and enterprise services are modeled and the corresponding metadata is managed throughout the life cycle

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### Bundles of Enterprise Services

#### Order to Cash
- Customer Fact Sheet v2
- Electronic Bill Presentment and Payment v2
- Order to Cash
- Bank Relationship Management
- External Cash Desk

#### Mid-Year Shipments 2007
- Asset Configuration
- Maintenance Processing
- Maintenance Service Collaboration

#### Hire to Retire
- Absence Employee Time Request (Duet)
- Benefits and Compensation (Duet)
- Organizational Management (Duet)
- Personnel Admin (Duet)
- Travel Management

#### Logistics Execution
- Inventory Lookup
- Handling of Business Events
- Yard and Storage Management Processes
- Customer Collaboration for the Supply Chain
- Supply Network and Production Planning Processes
- Transportation Collaboration and Subcontracting
- Kanban Processing
- Manage Devices Through Enterprise Services
- Management of Tag IDs and Tag Observations

#### Idea to Product
- Technical Document Management Connectivity v2

#### Enterprise Asset Management
- Asset Configuration
- Maintenance Processing
- Maintenance Service Collaboration

#### Service for Customer
- Customer Service Execution
- Internal Service Request (Duet)
- Advanced Meter Infrastructure (Utilities)

#### Trading Industries
- Trade and Commodity Management
- Demand Management v2

---

**www.sdn.sap.com** ➔ Enterprise SOA ➔ Explore Enterprise Services (➔ ES Workplace / ➔ ES Wiki)

*Disclaimer:* SAP reserves the right to change the ES bundles listed without prior notice.

**Some of the bundles listed on this page can be previewed in the ES Wiki.**

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Bundles of Enterprise Services
Year-end shipments 2007 – PREVIEW*

Order to Cash
- Order to Cash v2 (incl. B2B)
- Quote to Order for Configuration Products
- Fin. SSC – Interco. Processing
- Real Estate Reservation
- Availability Issue Resolution and Back-Order Processing

Public Sector
- Public Sector Budget Management
- Reserve and Commit Budget
- Multi-Channel Tax and Revenue Management

Year-End Shipments 2007

Banking and Insurance
- Accounting Integration
- FS Business Partner Maintenance v2
- ISV Integration with Analytical Banking
- Loans Management Bus. Operations v2
- Insurance Billing and Payment
- Insurance Extension Claims Investigation
- Insurance Extension Reporting
- Insurance Document Vendor
- Insurance Credentialing

Manufacturing
- Batch Traceability and Analytics v2

Healthcare
- Patient Administration
- Resource Planning and Scheduling
- Med. Activities, Patient Billing, and Invoice
- Medical Documentation and Coding
- Medication and Materials Management
- Collaborative Health Network
- Supply Chain Healthcare Providers

Trading Industries
- Merchandise and Assortment Planning Int.
- Chargeback Management
- POS Integration
- Retail Unified Demand Forecast
- Trade and Commodity Management v2
- Trade Price–Specific Contract

Enterprise Asset Mgmt
- Asset Configuration v2
- Maintenance Processing v2
- Maintenance Service Collaboration v2
- Project System

Hire to Retire
- HCM Master Data
- HCM Time Management
- HCM Org Management
- HCM Learning Solution

Service for Customer
- Customer Service Execution v2

And more . . .
- Advertising Management (Media)
- Compliance Relevant Data Exchange – eLogbook (Defense)
- Information Integr. Systems (GIS) (Defense)
- Environment, Health, and Safety (EH&S) Services
- Integration of Learning Management Systems
- Subscription Management (Media)

* Disclaimer: As the roll-in for the winter edition is not completely finalized, the list of enterprise services bundles shown here is subject to change by SAP without prior notice. Not all scenarios and industries are listed here.

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Credibility for our Enterprise SOA story requires that SAP delivers Enterprise Services

- Enterprise Services are key to differentiate SOA from Enterprise SOA

Enterprise SOA is not just about web services, enterprise services address business issues

- Enterprise Services require a business perspective by displaying them in the context of a solution map, a consumer model
- Enterprise Services in contrast to Web services are modeled and fully harmonized

It is not sufficient to talk about quantity and delivery date, service consumers need to know which specific enterprise service is available and what it can do
Introduction & Customer Usage Scenarios

- Reduce Complexity
- Stay in the “Buy Model”
- **Enable Complete Business Process Lifecycle**
- Pave the Way to an Enterprise SOA

Roadmap

Summary and Further Information
Which Business Problems Can You Solve Today?

Manage Business Tasks Across Applications
Manage and resolve business tasks centrally in one work list

Business Process Integration / Automation
Integrate SAP and Non SAP business applications and automate the message flow between systems with an executable process model

Involve Business Users in Automated Processes
Manage by exception
- Alerting in case of exceptions (technical and business)
- Approval of the state of an integration process with a human call-out
- Trigger a production workflow within your SAP application

Application Workflow Management
Manage production workflows within the context of your SAP application

Which Business Problems can you solve today?

The need to manage business tasks from automated business processes, whether they stem from standard application core processes or workflows extending the application brought up the development of central task lists that enable business users to work on their daily tasks as well as receive notifications and alerts in one unified task environment. Extensibility towards other systems as, e.g., homegrown or 3rd party solutions needs to be supported to manage not only SAP application tasks but also other task types.

Integrate and automate the message flow between business applications in A2A and B2B scenarios is the basic requirement that led to extensions of standard middleware products in the application integration realm to support process integration. Standards like Business Process Execution Language (BPEL) evolved to support message-based Web service orchestration to automate how different business systems could be integrated with the help of an executable flow model. As only a limited number of business processes can be completely automated without any human interaction before, after or in-between, basic human interaction patterns (as, e.g., approve, alert, compensate) need to be supported even in these system-centric integration processes.

Therefore, “manage by exception” is the requirement to involve business users in automated processes. The human interaction is primarily focused on technical or business alerting of critical process exceptions. The next pattern is concerned with human approval of the state of business data in an automated process instance (e.g., approve the merged data of sales orders in a multiple sales order
Process Automation with Human Call-Outs

How we solve these business problems today:

Cross-Component BPM (delivered with SAP NetWeaver Process Integration) handles processes where the message flow between different business applications is dependent on several messages or on time and business actions or reactions. Interdependencies can be defined using an internal state derived from content of incoming messages. Messages belonging to one process instance are identified by correlations as common denominators on the basis of message content (e.g. a Purchase Order, an ASN, a Confirmation and an Invoice in a procurement process via the Order ID in combination with the business partner ID and/or the company code). ccBPM also supports handling of system exceptions and alerting.

SAP Business Workflow has been embedded in the heart of the SAP solutions, so that SAP applications (including CRM, SRM and ERP) are built on it to incorporate workflow features directly in their application. Integration with Organizational Management and with standard SAP reporting tools allow to reuse the investment that customers have made in SAP solutions.

Universal Worklist (UWL): a work-item inbox/task list is the watering hole where users access their workflow “to-do” lists. Work items that appear in these inboxes can span a range of business activities, from administrative processes like a vacation request to more in-depth processes like the evaluation of a sales opportunity.

A task list must be simple enough for an employee who periodically uses it to, say, approve a vacation request. But specialist users have very different needs: their inboxes must be able to handle perhaps 100 work items a day for a particular business process. They need advanced capabilities, like viewing the process audit trail (showing who did what, and when), creating attachments (explaining why a particular decision was made), or adding information for participants downstream. Sorting, resubmitting, and grouping work items also helps in prioritizing processes for faster information flow.

For each business process, you could deploy different inboxes for these different
Definition – What Is a Business Process?

Key tenets
- Business Process Management needs to take into account different sub-process types
- Packaged processes as application core build the centre of gravity for process standardization.
- Composition and integration provide competitive differentiation by composing new processes/applications and integrating them with business partners and legacy systems.

Definitions

Application Core Process
- Pre-packaged, configurable core processes
- SAP Business Suite and Solutions
- Provides process insight through reference content on different levels of abstraction
- Design of eSOA process components in the ES Repository

Composite Business Process
- Human-centric Process
  - Collaborative, across business systems and organizations
  - Needs ad-hoc extensions to manage pockets of flexibility
  - Defined by functional business requirements
- System-centric Process
  - Integration across business systems and services
  - Integrates with human-centric processes
  - Defined by technical specifications based on functional business requirements

Compose
Standardize
Integrate

Definitions of sub-process types

While technically a business process is defined as “set of linked activities that creates value by transforming an input into a more valuable output” (http://en.wikipedia.org/wiki/Business_process), SAP differentiates a business process further into two basic sub-process types:

- Application Core Processes
- Composite Business Process

Application core processes are delivered via SAP’s business application as part of the SAP Business Suite. These processes are pre-defined, packaged and can be customized in applications such as SAP ERP, PLM, SCM, CRM or SRM. By nature, these processes represent the core business functionality that “runs the business” operations: from financials, controlling, human resources to materials management, procurement and sales order management to supply chain and customer relationship management. These packaged processes are exposed as reference content in ES Repository and SAP Solution Manager to provide process insight and transparency into what is covered within business applications (discover and design) and how this can be used to extend the core set of highly standardized business operations for reasons of process efficiency, innovation and differentiation (extensibility). Embedded collaborative process steps are usually implemented in SAP Business Workflow and therefore seamlessly integrated.

Striving towards a certain degree of process standardization, most organizations...
As mentioned above, the layers of integration process, embedded workflow and task list can be seamlessly integrated to cover **process automation with human call-outs** as well as application embedded workflow automation.

### Building Blocks of SAP NetWeaver BPM Capabilities

- Based on the key findings and tenets described above, SAP introduces a new building block of BPM capabilities that will at first integrate with the existing capabilities in a seamless manner.
- The **composite business process manager** will support a standards-based modeling environment (BPMN, Business Process Modeling Notation), process design collaboration, semantic integration with SAP's application core processes, human interaction management that provides task management, rule and responsibility assignments and business event resolution mechanisms.

- The **Enterprise Services Repository** (ES Repository) is shipped in 2007 with SAP NetWeaver Process Integration 7.1 and SAP NetWeaver Composition Environment 7.1. As an evolution of the SAP NetWeaver Exchange Infrastructure Integration Builder, it does not only contain enterprise services (service interfaces, service operations) and data types but also tools to cover the integration needs of a SOA middleware (e.g., a mapping editor, a BPEL integration process editor) Apart from this, the ES Repository is used as the central place for **process component architecture** modeling with SAP modeling methods and content for Enterprise SOA.

- The **Integration Process** capability (ccBPM) has been further enhanced with improved processing performance, transactional handling as well as covering the needs of customers to facilitate simple user interactions as generic user decisions (S2H call-outs) from an automated process context. SAP NetWeaver PI is also used to complement the SAP NetWeaver BAM (Business Activity Monitoring) infrastructure to support message-based event correlation. This enables escalation of critical business events across business applications to the attention of business users in time and with the right context.
Introduction & Customer Usage Scenarios
Reduce Complexity
Stay in the “Buy Model”
Enable Complete Business Process Lifecycle
Pave the Way to an Enterprise SOA
Roadmap
Summary and Further Information
Continuous Improvement

SAP NW PI 7.1
Continuous Improvement
SAP NW PI 7.1
### Support Package Stack Matrix SAP NW `04 – SAP NW 7.0 (2004s)

<table>
<thead>
<tr>
<th>NW 04 stack</th>
<th>RTC</th>
<th>NW 7.0 (2004s) stack</th>
<th>RTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP17</td>
<td>30.05.2006</td>
<td>SP08</td>
<td>27.06.2006</td>
</tr>
<tr>
<td>SP18</td>
<td>22.08.2006</td>
<td>SP09</td>
<td>05.09.2006</td>
</tr>
<tr>
<td>SP19</td>
<td>21.11.2006</td>
<td>SP10</td>
<td>21.11.2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SP11</td>
<td>06.03.2007</td>
</tr>
<tr>
<td>SP20</td>
<td>17.04.2007</td>
<td>SP12</td>
<td>08.05.2007</td>
</tr>
</tbody>
</table>

**Release schedule for SAP NetWeaver '04 SPs and SAP NW 7.0 (2004s)**  
SPs: [http://service.sap.com/sp-stacks](http://service.sap.com/sp-stacks) -> SP Stack Information -> SP Stack Schedule

- 2 SPs in 04 in 2007
- And 4 SPs in NW 7.0 (2004s) in 2007 (SP11 is identical to SP10 as it mainly contains bug fixing. The new features are only in SP12)
Many new features in each SP

- Detailed information can be found in the release notes

SP upgrade takes quite long especially because of all the new functionality it is not only bug fixes that are available in each SP release

- Average time of an upgrade is about 4 hours in NW04 XI 3.0
- There are lot of enhancements in the upgrade time for NW04s – customers have already started verifying this statement – we will provide figures
- Note: customers talk about MQ series upgrades which takes only few minutes (zero downtime) – but here the explanation is that MQ has been out there for more than 10 years and it is quite a stable product and the upgrades are normally only minor bug fixes
A condensed form of the release notes can be found on the SMP and also the feature and function roadmap.

And overall PI roadmap in addition.

All these documents are regularly updated and will soon find their home on SDN.
Administration and Monitoring
Performance
Functional Enhancements
## Administration and Monitoring

<table>
<thead>
<tr>
<th>Customer Requirement</th>
<th>SAP Solution</th>
<th>Prov. w. NW '04</th>
<th>Prov. w. NW 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass change of communication channel configurations</td>
<td>Directory API allows access to all objects in Integration Directory</td>
<td>SP20 pilot, SP21 unrestricted availability</td>
<td>SP12 pilot, SP13 unrestricted availability</td>
</tr>
<tr>
<td>Simple overview of all messages, mass restart of messages</td>
<td>Message Monitoring – Message status overview and simple restart of messages</td>
<td>SP20</td>
<td>SP12</td>
</tr>
<tr>
<td>Critical alerts must be raised for adapters, e. g. if JDBC adapter can't connect to database</td>
<td>Raise critical alerts for all adapters</td>
<td>SP20</td>
<td>SP12</td>
</tr>
<tr>
<td>Modules must be part of channel templates, not to be entered manually</td>
<td>Modules can be defined in a channel template</td>
<td>SP20</td>
<td>SP12</td>
</tr>
</tbody>
</table>

- **Directory API**: ALL objects of Integration Directory can be accessed, e. g. communication channels, business systems, receiver determination, interface determination, changes lists. Access is via Web Service, the WSDL files are stored in the Integration Repository as external definitions. The Directory API allows to create, update, delete, read, search etc. objects in Integration Directory. Mass changes of attributes, e. g. names of objects, are supported. Furthermore, the content of the Integration Directory can be read by the API and use this input for any kind of representation, e. g. statistics.

- **Message status overview**: Provides an aggregated overview in form of a table about the status of ALL messages (Java adapters + ABAP adapters + ABAP & Java proxies). The table lists the number of messages in the different status (With Errors, Scheduled, Successful, Canceled with errors). Via click on a particular line users can navigate to all the messages in this particular filter combination. Furthermore a mass restart of erroneous messages is possible. The message status overview can be access via the message monitoring. The message status overview allows to filter on all message headers (incl. interface) and additionally direction (send or receive).

- **Critical alerts on Adapter Engine**: In the CCMS alert monitor for PI it can be displayed how many messages are located in a processing backlog on the Adapter Engine for each defined service. It can be defined corresponding threshold values for generating alerts, and, in case a threshold is exceeded, alerts will be raised. Furthermore, when defining alert rules, it can be decided whether or not the alerts to be generated are to be linked to a message.

- **Adapter modules**: It is possible to carry out definitions in a communication channel
Introduction of tabs: To make entering parameters easier, the parameters for adapters with a large number of parameters are grouped on tab pages. The functions of the adapters remain the same. The following adapters have tab pages for grouping parameters: RFC, File/FTP, JDBC, JMS, Mail, SOAP, CIDX, and RNIF (1.1 and 2.0).

Archived messages can be selected and displayed in the Integration Engine. This function allows to search for all messages that were received or sent in the Integration Server (Integration Engine and central Adapter Engine), and all messages where errors occurred during processing.

Channel monitoring and administration in RWB: Additionally a scheduled starting and stopping of communication channels by defining availability times or externally by using an HTTP request (http(s)://host:port/AdapterFramework/ChannelAdminServlet?party=party&service=service&channel=channel&action=action (action = start, stop or status)) is supported. The user must have the corresponding authorizations. The scheduler works on a calendar basis, exceptions of availability times can be configured.

Configuration of retries per communication channel: Better control of individual communication channels, finer granularity to administer. Settings can be configured for each receiver channel defining how many attempts are to be made to resend messages to a receiver, and the retry interval.
Administration and Monitoring

Performance

Functional Enhancements
## Performance

<table>
<thead>
<tr>
<th>Customer Requirement</th>
<th>SAP Solution</th>
<th>Prov. w. NW ’04</th>
<th>Prov. w. NW 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimize processing</td>
<td>Message packaging to process bulks of messages in one service call</td>
<td>Not available</td>
<td>SP12 pilot, SP13 unrestricted availability</td>
</tr>
<tr>
<td>Less down time when importing a support package</td>
<td>Reduced down time, new functions, bug fixes</td>
<td>Not available</td>
<td>Available</td>
</tr>
<tr>
<td>File and JDBC receiver adapter: Configure maximum concurrency</td>
<td>Maximum concurrency can be defined in receiver adapters</td>
<td>SP20</td>
<td>SP12</td>
</tr>
<tr>
<td>Optimize thread usage</td>
<td>Reuse of spare threads from SAP J2EE engine instead of new ones by JMS adapter</td>
<td>SP20</td>
<td>SP12</td>
</tr>
</tbody>
</table>

- **Message packaging**: A bulk of messages can be processed in one service call and thus context switches for mapping, routing, reading message header etc. can be reduced and mass operations on the database are possible. This feature can be used in async scenarios only.

- **Configuration of maximum number of messages to be processed in parallel**: The maximum number of messages that should be processed by the receiver file adapter in one cluster node can be configured.
## Functional Enhancements

<table>
<thead>
<tr>
<th>Customer Requirement</th>
<th>SAP Solution</th>
<th>Prov. w. NW '04</th>
<th>Prov. w. NW 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport using the Change and Transport System (CTS)</td>
<td>Transport PI objects from CTS in one transport request</td>
<td>Not available</td>
<td>SP13 / SP14</td>
</tr>
<tr>
<td>Extend SOAP adapter usage, e. g. full support of SOAP headers, SOAP 1.2</td>
<td>Optionally Axis Framework can be used, provides e. g. several encryption methods</td>
<td>SP20</td>
<td>SP12</td>
</tr>
<tr>
<td>Huge files must not cause file adapter to be out of memory</td>
<td>Parameters in file adapter check and limit memory usage</td>
<td>SP20</td>
<td>SP12</td>
</tr>
</tbody>
</table>

Transports using the CTS: You can include the following SAP NetWeaver PI objects in one Change and Transport System (CTS) transport request and transport them together:

- Integration Repository design objects
- Integration Directory configuration objects
- ABAP Mappings

This also enables you to use some of the advantages of CTS that were previously not supported when transporting SAP NetWeaver PI objects, for example the modeling of complex transport landscapes.

SOAP adapter: Axis Framework: The Axis Framework can be used optionally in order to enhance the capabilities of the adapter by the use of Axis handlers. With this more flexibility is offered for providing and consuming SOAP messages, e. g. more message protocols, encryption and authentication methods.

Configuration of maximum file size to be processed: The maximum file size (in Byte), that should be processed by the sender file adapter, can be configured. For files that are bigger an error would be raised.

File Adapter: It can be set how empty files (length 0 bytes) are to be handled in the sender adapter, and how PI messages with an empty main payload are to be handled in the receiver adapter.

---

**Sender Adapter:**

- Do Not Create Message: No PI messages are created from empty files. The files are processed according to the selected Processing Mode. For example, if the processing mode is Delete, empty files are deleted in the source directory.
- Process Empty Files: PI messages are created with an empty main payload. The files are processed according to the selected Processing Mode.
- Skip Empty Files: No PI messages are created from empty files. Empty files are skipped and remain in the source directory.

---

**Receiver Adapter:**

- Write Empty File: An empty file (length 0 bytes) is put in the target directory.
- Ignore: No file is put in the target directory.

JDBC Adapter: To remove empty tags from the XML document, users can set the "Remove Empty Tags" indicator in the sender JDBC adapter. This allows users to reduce the size of the XML document.
A new release of SAP NetWeaver Process Integration will be shipped in September 2007. This will be called SAP NetWeaver Process Integration 7.1. Customers who have already installed SAP NetWeaver 7.0 (usage type PI) or SAP NetWeaver 2004 (XI 3.0), have the option to upgrade to SAP NetWeaver 7.1 Process Integration at no additional cost.

The Process Integration release will be one of the key building blocks of the enterprise SOA technology from SAP NetWeaver. We believe that the Process Integration capabilities will clearly be the cornerstone of customers' SOA strategy. These capabilities will continue to be used heavily for middleware consolidation in customer landscapes, and become the SOA backbone. The release will mainly leverage functionalities for service enablement and service and process orchestration.

**Highlights include:**

- The **Enterprise Services Repository containing the design time ES Repository and the UDDI Services Registry.**
- **SAP NetWeaver Process Integration 7.1 includes significant performance enhancements.** In particular, high-volume message processing is supported by message packaging where a bulk of messages are processed in a single service call.
- Additional **functional enhancements**, such as principle propagation based on open standards SAML, allows you to forward user credentials from the sender to the receiver system.
A lot of great new functionality is provided with SAP NetWeaver Process Integration 7.1, but all are an extension of the robust architecture based on JEE5. And JEE5 promotes less memory consumption and easier installation.

The process integration capabilities within SAP NetWeaver offer the most common ESB components like:
- Communication infrastructure (messaging and connectivity)
- Request routing and version resolution
- Transformation and mapping
- Service orchestration
- Process and transaction management
- Security
- Quality of service
- Services registry and metadata management
- Monitoring and management
- Support of Standards (WS RM, WS Security, SAML, BPEL, UDDI, etc.)
- Distributed deployment and execution
- Publish Subscribe (not covered today)

These ESB components are not packaged as a standalone product from SAP but as a set of capabilities. Customers using the process integration functionality can leverage all or parts of these capabilities.

More aspects to consider:
- SAP Java EE5 engine as runtime environment, but no development tools provided
- Local event infrastructure provided in SAP systems

WS Security: The main update is the support of SAML for the credential propagation. Furthermore, with WS-RM authentication via X.509 certificates as well as encryption are also supported.

WS Policy: W3C WS Policy 1.2 - Framework (WS-Policy) and Attachment (WS-PolicyAttachment) are supported.

To summarize these two slides the main message is that the most important reasons to use the benefits of the SAP NetWeaver PI 7.1 release are:
- Use Process Integration as an SOA backbone
- Establish ES Repository as the central SOA repository in customer landscapes
- Leverage support of additional WS standards like UDDI, WS-BPEL and tasks, WS-RM etc.
- Enable high volume and mission critical integration scenarios
- Benefit from new functionalities like principal propagation, XML payload validation and BAM capabilities
Enterprise Services Repository & Registry
Additional WS Standards
High Volume Support
Business Process Management
Central Configuration and Administration
XML Payload Validation
Further Functional Enhancements
Enterprise Services Repository & Registry

Additional WS Standards

High Volume Support

Business Process Management

Central Configuration and Administration

XML Payload Validation

Further Functional Enhancements
The Enterprise Services Repository and Registry is the central repository in which service interfaces and enterprise services are modeled and their metadata is stored. It is an integral part of SAP NetWeaver and is made up of:

**ES Repository**
- Definition of processes and services
- Service metadata
- Central modeling and design environment

**Services Registry**
- Yellow pages of services
- Deployment information (i.e. endpoint)
- Services management
- Ease of consumption: Browse, discover, and use services.

In many ways the ES Repository is at the heart of Enterprise SOA

- With the ES Repository, SAP’s approach to SOA can be seen as dramatically different from its competitors - why because SAP offers not only a repository from the tools side but also the content
- Already in Dec 2006 we have the first enterprise services bundles that were shipped that contained around 500 service definitions shipped in the repository
- And plus the repository is also open for customers and partners to also enrich this content with additional services that they would need for their own use
- So if you look at the ES Repository in some more detail you see that there are two parts to it, one is the ES Repository and the other being the Services Registry
- The ES Repository is really the master data repository of service objects for Enterprise SOA
- What do we mean by a design time repository?
  - This refers to the process of designing services
  - and the ES Repository supports the whole process around contract first or the well known outside in way of developing services
  - It provides you with a central modeling and design environment which provides you with all the tools and editors that enable you to go through this process of service definition
  - It provides you with the infrastructure to store, manage and version service metadata
- Besides service definition the ES Repository also provides you with a central point for finding and managing service metadata from different sources, including application deployments, this is where the Services Registry comes in. The Services Registry is the UDDI part of the ES Repository which enables service consumers to find services
- Once these two components are in place – visibility is controlled, versions are managed, proposed changes are analyzed and communicated, usage is monitored and other parts of the SOA foundation can access service metadata
Enterprise Services Repository and Registry Usage Scenarios

1) Process Visibility and Design Governance
- Enabling SOA design governance
  - Process Component architecture models in ES Repository
  - Drill down to standards based service interface design

2) Service Provisioning
- Providing Service Metadata
  - Model Message Interface / Service Interface based on GDTs
  - Store service metadata in one central repository

3) Process Integration
- Enabling A2A and B2B processes
  - Use services defined in ES Repository for consumption in A2A and B2B scenarios

4) Composition
- Developing Composite Applications
  - Consumer applications query Services Registry for services that were designed in the ES Repository
The SAP NW PI Integration Repository used by process integration has become the basis of the central Enterprise Services Repository: powering Enterprise SOA and Service Enablement.

The first version of the ES Repository for customers will be the PI based Integration Repository which is already part of SAP XI 3.0 and SAP NW 2004s.

Customers can be assured that their investments in the Repository are protected because there will be an upgrade possibility from the existing repository to the Enterprise Services Repository.

The ES Repository is of course enhanced with new objects that are needed for defining SAP process component modeling methodology.

The ES Repository in the new release will be available with SAP NetWeaver Process Integration 7.1 and probably also with CE available in the same time frame.

The ES Repository is open for customers to create their own objects and extend SAP delivered objects.
The ES Repository enables service design lifecycle and governance

To enforce design time governance:

- Objects are organized by software component versions and namespaces
- Dependencies are defined on SWCs to enable reuse of objects
- Consistent naming conventions ensure better management
- Interface designs are in WSDL
- Open standards are supported (WS, CCTS)

Governess in SOA is key to realizing your actual SOA goals

Proper SOA governance assures an organization will realize the important benefits of SOA—increased business agility, protection of IT investments, and greater business and IT alignment.

The ES Repository is built to promote design time governance which means rules for governing the definition and creation of enterprise services

Design time governance will be of most concern to business analysts, architects and developers building services

The ES Repository is designed in such a way that it enables you to govern the provisioning of new services and also to promote reuse

It is required because services are not being developed for a single user or an application but with a view toward broad reuse across the organization

The ES Repository provides central visibility for services and their supporting artifacts

In the ES Repository every business object, data type and service interface has an attribute that describes its release status. The release status informs the user of the current stage in the life cycle of the object. It describes the validity of the object and has the purpose of informing of possible restrictions that apply to its use. The status of objects defined by SAP cannot be changed by customers.

Possible values: Not released, released with restrictions, released, deprecated, revoked.
The ES Repository provides a comprehensive metadata repository that can be used for SOA provisioning.

Objects in the ES Repository include:

- Integration Scenarios
- Process Component Models
- Service Interfaces (Enterprise Services)
- Global Data Types (CCTS based)
- Interface Mappings
- Executable Integration Processes (BPEL)

The objects in the ES Repository enable you to go ahead with your service definition process based on a harmonized enterprise model.

All services that are implemented and delivered by SAP are based on this common model.

The harmonized enterprise model is based on a process component architecture modeling methodology.

SAP leverages ARIS tooling capabilities in the ES Repository to enhance the ES Repository with enterprise service modeling. Built on this integrated tooling SAP has developed its own specific way of process component architecture modeling methodology for service enabled business applications.

In addition to this the standard integration objects are in the ES Repository and have been enhanced.

- The ES Repository supports SAP Methodology
- Establish a de-facto standard for Enterprise Service Definitions
Modeling Environment in the ES Repository

- Model-driven development of services is an important aim of service development in Enterprise SOA

- Enterprise Services Builder (ES Builder) offers a modeling environment to create various models in the Enterprise Services Repository (ES Repository)

- A model-driven service development provides the following advantages:
  - Services of new applications are adapted in cooperation with other development departments
  - Workout the necessary design objects ES Repository for the application
  - Interface patterns ensure aligned naming and definition of services
  - Models document the whole process of an application and relieve the need to enhance software later
Process Component Model (SAP ProComp model):
- Describes which operations and service interfaces are used by the process component
- Shows which operations are used to access other process components data
- Model the data using one or multiple Business Objects (BOs). A Business Object belongs to exactly one process component.

References to
- Integration Scenario Models
- Process Components
- Business Objects
- Service Interfaces
- Global Data Types

The next level would be the process component models
- The process component architecture models enable SOA governance and help to understand the business semantics of enterprise services in the business process platform
- The SAP methodology addresses the need for service-based reference models. Therefore, the ES Repository supports the drill down to standards based service interface design (WSDL) and SAP’s global data type library.
- Customers may use the integrated modeling capability of the ES Repository to specify their own enterprise services. Reference content in the ES Repository is planned to be exported to ARIS for SAP NetWeaver for alignment to business level models and planning (read-mode). The ES Repository will not support common ARIS methods as, e.g. Value Chain Diagrams, Event-Driven Process Chains. Business analysts working on enterprise process model level leverage export from the ES Repository in the modeling tools for model alignment and requirement definition.

DEMO

Example of the ReadPurchaseOrder enterprise service, already available on ES Workplace. You will see every perspective of that ES during this session. Start with its PC model → SI → MT → DT
Integration Scenario Model (SAP integration scenario model):

- Shows all the deployment units and process components involved in an end-to-end scenario
- Gives a better understanding of the whole process
- Displays which interactions are necessary between the process components involved
Process Components Interaction Model (SAP ProComp interaction model):
- Describes the message exchange between two process components in detail
- The service interfaces here are the same as those that are modeled in the process components model
- Only for an enterprise service interaction a Process Components Interaction Model is possible
Service Interfaces
- Are built out of GDTs and Message Types
- Specify the operations of a service
- Are abstract and language-independent design time representations of services

Interface Patterns
- Describe the type of communication that is to be executed on the message

- Service interfaces are the metadata description of messages and operations used at runtime.
- In SAP NW 7.0 (2004s) and SAP NW ’04, service interfaces have one operation per service. In SAP NW PI 7.1 the Enterprise Services Repository will offer multiple operations per service.
- Service interfaces have a direction attribute that defines them as outbound, inbound, or abstract (a category used for business processes or canonical interfaces).
- A service interface represents a large part of what makes up a WSDL document (it will get its binding and address data at runtime). As such, the service interface is completely independent of the language the service is implemented in and of the platform it runs on.
- The WSDL for a service interface is shown in the screen shot. The exported WSDL document can be published either to a UDDI server (whether to a public UDDI server on the Internet or to a private UDDI server running on SAP NetWeaver Application Server) or exchanged with partners in another way (such as HTTPS or encrypted email). This design time WSDL can also be seen in the services registry.
Global Data Types (GDTs) are SAP-wide normed and reconciled data types with business-related content as they occur in standards or would correspondingly be defined there.

The GDT Catalog collects all PIC approved Global Data Types.

Individual GDT documents can be accessed based on their PIC approval status.

Keyfigures (as of December 2006): 2070 GDTs including 960 codes and 470 identifier.

For SAP it is crucial to support open standards when defining business objects and service interfaces, with the basis being Global Data Types (GDTs). GDTs represent a set of data types with clear business semantics mandatory for all SAP applications. GDTs have the following characteristics:

- Re-usable data types for service interfaces and business object nodes
- Development based on the data type development methodology described in the international
- Standards ISO 15000-5 and UN/CEFACT CCTS (Core Component Technical Specification)
- Defined in ES Repository using Extensible Markup Language (XML) schema
- Approved SAP-wide by the Governance Process for Business Content (advanced by Process Integration Council (PIC))
- Development methodology designed for composing a consistent data type model out of a predefined and controlled semantic vocabulary and predefined XML fragments within a community

Within SAP, it is mandatory to use GDTs to define business object attributes and service interface parameters (also called signatures). This approach ensures that...
Modeling of Service Interfaces takes place in the ES Repository

It consists of the following sub-steps:
- Define data type or reuse GDT
- Define Message Type
- Define Service Interface and operations

Two approaches are available: top-down or bottom-up definition
A registry is usually identified as one of the first requirements of SOA adoption and registries play an important role in governance. In simple terms, a registry is a catalog or index that acts as the “system of record” for the services within an SOA. A registry is not designed to store the services themselves; rather, it indicates their location by reference.

Having a centralized catalog of services is significant from an organizational perspective because it enables the easy discovery, reuse, and management of services.

A robust registry is an important component of any SOA governance solution.

Registry capability adds location information to ES Repository necessary for consumption (UDDI standard)

Single source for discovery, enables simple mass configuration and runtime governance

Taxonomy put services in business context

Registry can also come from outside (e.g., Systinet)

This slide also shows the role of process integration within Enterprise SOA during runtime

- There are two communication scenarios: P2P and brokered communication
  - P2P if services within backends can directly communicate than the P2P communication variant is used
  - If additional integration services are required than the brokered communication via the PI Runtime (Integration Server) is used
  - For all service related communications the same Service Runtime is used

Another important factor is the interoperability of the registry with other components of the SOA infrastructure. OASIS provides a platform-independent standard for registry interoperability known as UDDI (Universal Description, Discovery, and Integration). UDDI defines a Web services-based programming interface that allows different consumer applications, tools, and run-time systems to query the registry, discover services, and interact as required to provide management and governance capabilities.

UDDI is the most commonly adopted standard and ensures the greatest degree of compatibility with other products in the environment.
Service Registry in Detail

- Service Registry is comprised of 2 major components
  - UDDI V3.0 server (OASIS Standard)
  - Classification Service (SAP Standard)
- Available over SOAP as web service

An SOA registry typically fulfills the following functions:

- Stores service descriptions, information about their end-points (the network resource where the service functionality is implemented), and other technical details that a consumer requires in order to invoke the service, such as protocol bindings and message formats
- Allows services to be categorized and organized
- Allows users to publish new services into the registry and to browse and search for existing services
- Maintains service history, allowing users to see when a service was published or changed

The Services Registry also offers design-time governance which includes fine-grained access control over assets in the registry, so that only authorized users are able to publish, search, and view services. In addition, the ability to label services and classify providers and consumers makes it possible to have some services visible to certain classes of service consumers and not others, a feature that is particularly important for partitioning access in a shared services model.
Consuming Enterprise Services with SAP NetWeaver Composition Environment

Organizations, including independent software vendors (ISVs) and partners, can use the SAP NetWeaver Composition Environment tools to make use of the enterprise services that are shipped by SAP.

The Services Registry allows easy browsing and discovering of enterprise services WSDLs.

Convenient access to the Services Registry from out of the Composition Environment Developer Studio enables ISVs and customers to create consuming applications including composite applications based on these enterprise services.
<table>
<thead>
<tr>
<th>Two Use Cases</th>
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<tbody>
<tr>
<td><strong>Consume services from the ES Workplace</strong></td>
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<tr>
<td>■ ISVs or customers make use of the hosted system landscape on ES Workplace</td>
</tr>
<tr>
<td>■ They have no backends in their landscape</td>
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<tr>
<td>■ The “leanest” possible use case for service consuming with CE</td>
</tr>
<tr>
<td><strong>Consume services from own Services Registry</strong></td>
</tr>
<tr>
<td>■ ISVs or customers have own backend systems and their own CE Services Registry</td>
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<tr>
<td>■ They consume the services out of their own Services Registry</td>
</tr>
<tr>
<td>■ Enhanced use case for service consuming with CE</td>
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</tbody>
</table>
Credibility for our Enterprise SOA story requires that SAP delivers Enterprise Services

Enterprise Services are key to differentiate SOA from Enterprise SOA

Enterprise SOA is not just about web services, enterprise services address business issues

Enterprise Services require a business perspective by displaying them in the context of a solution map, a consumer model

Enterprise Services in contrast to Web services are modeled and fully harmonized

It is not sufficient to talk about quantity and delivery date, service consumers need to know which specific enterprise service is available and what it can do
Enterprise Services Delivery

Browse
- Enterprise Services
- Collaborate via SDN
- ES packages

Test-drive
- Consume enterprise services
- SAP Business Suite 2005
- Enterprise Services Repository

Use
- Easy access to implement required pieces

www.sdn.sap.com ➔ Enterprise SOA ➔ Explore Enterprise Services

- Credibility for our Enterprise SOA story requires that SAP delivers Enterprise Services
  ◆ Enterprise Services are key to differentiate SOA from Enterprise SOA
- Enterprise SOA is not just about web services, enterprise services address business issues
  ◆ Enterprise Services require a business perspective by displaying them in the context of a solution map, a consumer model
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<td>XML Payload Validation</td>
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<td>Further Functional Enhancements</td>
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</tbody>
</table>
**Web Services Reliable Messaging (WS-RM)**

- Asynchronous messaging (EO, EOIO) based on open WS standard
- Native support through Integration Engine (without adapter)

---

**The purpose of WS-RM** is “… to create a generic and open model for ensuring reliable message delivery for Web services.” (OASIS)

WS-RM is an open WS standard for asynchronous messaging (EO, EOIO). The SOAP adapter as of today supports already asynchronous messaging, however with proprietary means since there was no standard available before.

WS-RM is supported via an own entry in the integration engine (implemented in ABAP) and not the adapter engine. The XI 3.0 and XI 2.0 protocol will still be supported as well.

Other vendors like Microsoft and IBM will also support WS-RM.
Principle propagation allows to forward the user credentials (user name, password) from the sender to the receiver according to the single-sign-on principle. With this the user credentials don’t have to be configured in the receiver adapter, but can be dynamically forwarded from the sender. An authorization check in the receiving system based on original user is performed.

The implementation of this feature is based on the open standard SAML and can be used with backend systems that support the SAML technology.

This feature uses the WS-RM protocol.

Principle propagation based on SAP logon tickets as introduced with the previous PI releases (SP19 / SP10) will be still supported in SAP NW PI 7.1.
Benefits of Security Assertions Markup Language (SAML)

- Interoperable security solution to allow systems integration with great ease and minimal resources
- SAML is a protocol for encoding security related information (assertions) into XML and exchanging this information in a request/response fashion
- Provides standard based mechanisms to exchange security information using SOAP, HTTP(s)
- SAML is an OASIS standard

Within a single company SAP Logon Tickets may be used for Single-Sign-On
But if SSO between different companies is needed (Authentication over „Domain Boundaries“) the use of SAP Logon Tickets is not practical any more.

Security Assertion Markup Language (SAML) addresses the problem of Authentication and Authorization across „Domain Boundaries“

SAML is a standard that defines a language to exchange security information between partners. The SAML standard is driven by the Organization for the Advancement of Structured Information Standards (OASIS). SAML uses assertions that contain statements about a subject, authentication, authorization and attributes.

Benefits of SAML

- Platform neutrality – SAML abstracts the security framework away from platform architectures and particular vendor implementations. Making security more independent of application logic is an important tenet of Service-Oriented Architecture.
- Loose coupling of directories – SAML does not require user information to be maintained and synchronized between directories.
- Improved online experience for end users – SAML enables single sign-on by allowing users to authenticate at an identity provider and then access service providers without additional authentication. In addition, identity federation (linking of multiple identities) with SAML allows for a better-customized user experience at each service while promoting privacy.
- Reduced administrative costs for service providers – Using SAML to “reuse” a single act of authentication (such as logging in with a username and password) multiple times across multiple services can reduce the cost of maintaining account information. This burden is transferred to the identity provider.
- Risk transference – SAML can act to push responsibility for proper management of identities to the identity provider, which is more often compatible with its business model than that of a service provider.
Overview WS Security

Relationship between WS-Security, SAML, XML Signatures and XML Encryption

- **Profiles**
  - Technical descriptions of particular flows of assertions and protocol messages that define how SAML can be used for a particular purpose

- **Bindings**
  - Mapping of SAML protocols onto standard messaging and messaging protocols

- **Protocols**
  - Request/Response pairs for processing assertions

- **Assertions**
  - Authentication, Attribute and Authorization Information

- **SAML Confirmation method**

- **OASIS**

- **W3C**
  - XML - Signatures
  - XML - Encryption

- **WS-Security**
  - SAML Token Profile

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SAML Assertion

SAML authorities produce “assertions” in response to client requests.

An assertion can consist of
- **Authentication Statement**: piece of data that represents an act of authentication performed on a subject (user) by the authority
- **Authorization Statement, Attribute Statement**

- An assertion consists of one and more statements. For SSO, typically a SAML assertion will contain a single authentication statement and possibly a single attribute statement.
- SAP NetWeaver does not support Authorization and Attribute Statements.
Sender-Vouches

- SAML Identity Provider provides SAML assertion to WS Consumer
- WS Consumer adds SAML assertion to WS request
- The requester signs both the SAML assertion and the message body using its private key
- Prerequisite: The WS Consumer is able to vouch for integrity of assertion and message body because a trust relationship between WS Provider and WS Consumer is established

Sender-vouches subject confirmation method

- The subject confirmation method enables SSO for Web services by forwarding authentication information of a previous login using SAML assertions.
- In this scenario, the basis of trust is the WS Consumer's certificate. The WS Consumer's private key is used to sign both the SAML Assertion and the message Body. The WS Provider relies on the WS Consumer, who vouches for the contents of the User message and the SAML Assertion. Essentially, here the message sender "vouches" for the identity of a subject.

This scenario defines three different entities: WS Consumer, SAML Identity Provider, and WS Provider system. The sender-vouches confirmation method specifies a single sign-on scenario with an WS Consumer that has a trust relationship with the WS Provider.

- The WS Consumer sends a request to the SAML Identity Provider. This request can be of any kind but must contain valid authentication information to log the WS Consumer on to the SAML Identity Provider. The SAML Identity Provider authenticates the WS Consumer.
- To forward the WS Consumer's authentication, the SAML Identity Provider needs to add a SAML assertion to the request. This assertion will be provided by the issuer of the SAML Identity Provider. To get it the SAML Identity Provider needs to forward all necessary login information to the issuer, which in return creates the SAML assertion.
- The assertion will now be added to the Web Service request. To vouch for the integrity of the SAML assertion and the payload of the Web Service request both will be signed by the SAML Identity Provider using a digital signature. The SAML Identity Provider is able to vouch for the SAML assertion only because there is an explicit trust relationship between the WS Provider and the WS Consumer, which enables the WS Provider to verify the digital signature.
- The Web Service request containing the SAML assertion is now sent to the WS Provider.
- The WS Provider tries to verify the SAML assertion. Besides checking the correctness of the SAML assertion, the WS Provider also verifies that the WS Consumer is trusted and there is an existing trust relationship between WS Consumer and the WS Provider. After successful verification the WS Consumer will be logged on to the system and the request will be processed.
- The WS Provider sends a response to the WS Consumer.

Glossary:

- Attester: The attester vouches for the correctness of the SAML assertion. The attester has a predefined trust relationship with the WS Provider. A SAML assertion can only be regarded as valid, if the attester has signed it.
- Issuer: The issuer actually issues the SAML assertion. The issuer is known to the WS Provider and regarded as trustworthy. In this scenario issuer and attester can be regarded as one entity, the SAML Identity Provider.
WS Security is an OASIS standard based on an IBM and Microsoft proposal providing message level security for SOAP messages by using existing standards:

- Confidentiality and integrity using XML Signature and XML Encryption.

WS Security extends a SOAP message by one or more wsse:Security headers which contains security information for each recipient.

Single sign on is provided by using e.g. SAML Security Tokens.

Security implementations for Web Services are negotiated in standards such as WS Security

The standard describes the standard XML syntax to negotiate security in the XML based WS calls

WS Security is an OASIS standard based on an IBM and Microsoft proposal providing message level security for SOAP messages by using existing standards:

- Confidentiality and integrity using XML Signature and XML Encryption.

WS Security extends a SOAP message by one or more wsse:Security headers which contains security information for each recipient.

WS Security provides end-to-end security for SOAP and SOAP with attachment messages. Single sign on is provided by using e.g. SAML Security Tokens.
Using WS-Security offers “value added” features that actually facilitate new ways to interact with business partners at the system level:

- For example “encapsulating” encrypted SOAP messages and transparently transporting them through intermediaries to a partner
- “Encapsulating” in SOAP envelopes encrypted messages and transparently transporting them to a partner with security that is attached to the document

SSL builds only a security context between two adjacent network hops (e.g. server, router, firewall, reverse proxy) – “Point-to-Point Security”. Therefore data must be decrypted and encrypted for transfer to the next network hop.

WS Security builds an security context between WS Consumer and WS Provider – “End-to-End Security”. This is independent from involved network hops. The network hop operates on the transport layer and therefore must not decrypt and encrypt the message data.
SAML Token Profiles are used for Web Services authentication at the SOAP message level.

SAP NetWeaver use sender vouches Subject Confirmation method to confirm a subject with SAML token profile authentication.

The WS Consumer’s private key is used to sign both the SAML Assertion and the SOAP message Body.

SAML Token Profile is developed by the OASIS Web Services Security (WS Security) Technical Committee as a standard to integrate and use SAML for Web Services Security.

The WS request contains a sender-vouches SAML assertion. The assertion and the body elements are signed. A reference to the certificate used to verify the signature is provided in the header. The response does not contain a security header.
**Principal Propagation Concept**

**Goal:**
- Securely pass the identity of user U across SAP PI to receiver system
- Run the receiver application under the same identity as the sender application

**Benefits:**
- Dynamic configuration at the PI receiver channel
- Permissions of the receiver application are checked against the original user
- User can be audited in receiver system

**Principal Propagation Concept**

Authentication as of today, exemplarily shown with XI 3.0 protocol

- Communication paths are statically configured in the following sense:
  - Sender to IS: For Java proxies, a PI internally configured connection is always used. For ABAP proxies, the communication path is configured globally as an SM59 HTTP destination where the credentials (user/password or certificate) are usually stored within the destination. Nevertheless, it is possible to configure the destination as using the actual application user for logging into the IS.
  - IS to receiver: In the PI directory, a set of receiver channels with static connection attributes and user credentials similar to SM59 destinations are configured. However, in each channel user credentials must be defined for logging into the receiver system. On message execution, a certain channel is dynamically selected from this set depending on the actual message properties and the configuration rules.

- This configuration model bears the following weaknesses with respect to user credentials:
  - Sender to IS:
    Individual applications or individual messages cannot use separately configured users for logging into the IS, but depend on the globally configured connection (Java proxies) or destination (ABAP proxies) in the sender system.
    When application users are propagated to the IS (ABAP proxies only), each application user must be maintained with the corresponding execution rights in the IS.
  - IS to receiver:
    Application users from the sender application can never be propagated by the IS to the receiver application as the users for logging into the receiver system are statically configured in the IS’ receiver channels.

**Principal propagation** means the ability to forward the user context of a message unchanged from the sender to the receiver. It enables authentication of a message in the receiver system with the same user that issued the message in the corresponding sender system. Thus, the receiver application is virtually part of the sender application, and the permissions and audit functions of the receiver application can be applied to the original user of the sender application.

**Principal propagation** is supported by the following adapters:
- PI (for both ABAP and Java proxies)
- SOAP
- RFC
- WS-RM

**Benefit of Principal Propagation**
Principal Propagation for SAP NW PI 7.1

User to be propagated must exist at IE system as a service user with appropriate roles for message processing

Principal Propagation for BPM not supported yet

SAP assertion ticket
- Authentication on transport level
- Mapping of user names not supported yet

SAML assertion
- Identity is described by a structured XML element (SAML tag AuthenticationStatement) with following components
  - principal name
  - SAML issuer/attester (SAML Identity Provider)
  - user store (e.g. SAP system name, and SAP client)

- User to be propagated must exist at the IE system as a service user with the appropriate roles to execute the message processing.

- SOAP/Web Services
  - Inbound: Any authentication mechanism possible
  - Outbound: only SAP assertion ticket possible

- RFC
  - When a sender system sends a message to the RFC adapter, it must use a type-T destination with the option "use SAP Logon ticket" switched on. Then RFC adapter of the Adapter Engine running on the J2EE WebAS must be configured to accept SAP Logon tickets and the user of the sender application would be impersonated.
  - On the receiver side, the adapter must either use destination services with the option "use SAP Logon ticket" switched on. Furthermore, the RFC receiver adapter could support the sending of a SAP assertion ticket directly.

- WS-RM based on SAML
  - SAML (Security Assertion Markup Language) is an XML standard that defines a language to exchange security information between partners. The SAML standard is driven by the OASIS (Organization for the Advancement of Structured Information Standards). SAML uses assertions that contain statements about a subject, authentication, authorization and attributes. As its name suggests, SAML allows business entities to make assertions regarding the identity, attributes, and entitlements of a subject (an entity that is often a human user) to other entities, such as a partner company or another enterprise application.
  - Although both the SAML token profile and SAML browser artifact use the SAML standard for transferring security information, they are used for different authentication purposes:
    - SAML browser artifacts are used for authenticating Web-based access from a Web browser.
    - SAML token profiles are used for WS access authentication at the SOAP message level.
  - SAML Token Profile is developed by the OASIS Web Services Security (WS Security) Technical Committee as a standard to integrate and use SAML for Web Services Security. SAML token profiles are used for WS access authentication at the SOAP message level.
  - SAP NetWeaver enables you to use the Sender Vouches Subject Confirmation method to confirm a subject with SAML token profile authentication. For this subject confirmation method, the WS intermediary system acts also as a SAML assertion issuer. The WS intermediary authenticates the client and forwards to the back-end WS provider the authentication information for the WS consumer using a SAML token profile. The WS provider, in turn, authenticates access based on its trust relationship with the intermediary system.
Enterprise Services Repository & Registry
Additional WS Standards
High Volume Support
Business Process Management
Central Configuration and Administration
XML Payload Validation
Further Functional Enhancements
Customers require high-volume throughput.

A bulk of messages can be processed in one service call and thus context switches for mapping, routing, reading message header etc. can be reduced and mass operations on the database are possible. This feature can be used in async scenarios only.

Performance improvements:

- For async scenarios message packaging plus bulk processing in ccBPM improves throughput for small messages (<100kB) by factors 2-10. This includes ccBPM improvements like transient processing of multiple steps. I. e. factor 10 can be reached only for selected scenarios.
- Performance improvements without ccBPM: up to factor 3.5.
Customers require high-volume throughput.

Evolve Adapter Engine (central and non-central) to “local processing engine” -> non-disruptive evolution, can be used like a non-central adapter engine, -> natural extension of PI.

It provides mapping, routing etc., and allows to by-pass the Integration Server -> performance improvement up to factor 5.

IS pain points:

- One-side access only via XI-protocol
- Adapter to Adapter communication always goes through IS
- Mapping always executed on central IS

Reduced TCO as no double-stack required anymore for certain scenarios

Improved performance for adapter-to-adapter communication

Central configuration and monitoring through Integration Directory and Runtime Workbench, also of multiple “local processing engines”

Allows customers to distribute execution of mission-critical processes
Enterprise Services Repository & Registry
Additional WS Standards
High Volume Support
Business Process Management
Central Configuration and Administration
XML Payload Validation
Further Functional Enhancements
Major Enhancements for Process Automation

- Simple user decision steps can be modeled in business process editor
- UI texts are available in multiple language, and can be configured using variables
- Integration paradigm (design/configuration)
- Step groups allow faster modeling
- Configurable parameters
- BPEL4WS 1.1
- WS-BPEL 2.0 Preview and implementation
- BPEL4People planned

Simple user defined functions can be configured directly in the process
Event Provisioning and Consumption for BAM

Event Correlation
- Subscribe to and handle business process events
- Define milestones for monitoring processes

Embedded Event Infrastructure
- Collect, pre-filter and publish events across SAP and non-SAP systems

Local Event Infrastructure (Event Provisioning)
- Part of the SAP application (SAP Business Suite) – available via AS ABAP usage type (down to basis 6.20)
- Raise business events (Business Object Repository events, transactional events)
- Transaction SWF_BAM for event filtering via filter rules and event handling
- Event handling: cast the local event to an event proxy to send out event messages to event consumers
- At design time, event proxy is created in the ES Repository and generated into the SAP application

Event Correlation
- SAP NetWeaver Process Integration subscribes to and handles business process events via ccBPM
- Correlation of event messages into a BAM milestone monitoring process instance
- Milestone monitoring process captures event messages, and can look-up data from BI at runtime
- Integrated Alert Management in process definition (to create BAM alert categories)
- Raise alerts based on business rules (conditions).
Example: Multi-backbone Order Handling

- Example “Multi-backbone Order Handling”
- Multiple possible event providers (SAP, Non-SAP, PI itself)
  - Business process runs across multiple backends: Order, Order Confirmation, Order Delivery, Invoice
  - Each process milestone propagates the events (create) to the monitoring process
  - 1st business rule: track time between order and order confirmation, after 24h deadline is exceeded and an alert is raised to event resolution
  - KPI look-up from BI: process evaluates data and raises alert, if customer, e.g., customer has a negative complaints history
Example of a milestone monitoring process definition
Language Dependent Texts

- Definition of language-specific texts in Integration Processes
- Define alerts or describe steps and translate these texts

Language depend texts supports describing processes in native language.

Define the original language in the software component version and also the target language for the translations.

After designing the process, change the display language and get the description of process elements in the defined language.
Configurable Parameters enable the configuring of the values of a parameter in the Integration Process component and in the Integration Directory.

Thereby, if the value must be changed later on, the process definition has not to be changed.

Also it is possible to create multiple configurations for one process and define different values for a configurable parameter in each process.
Step Groups

- Step groups enable creation of reusable templates
- Design time artifact – speeds up modeling
- Pre-setting of some simple properties
- Global availability
- Set to changeable / not changeable

Steps groups speed up process modeling, as it is possible to define templates or typical process patterns which can be reused at design time.

While defining a step group some simple properties can be predefined and than later on adapted to the current process design.

The change of the properties can also be prohibited if necessary and only the preset properties can be used in the process.

An advantage of the step groups is their global availability. Which means that once defined, a step group can be used in the whole repository.

When using a defined step group at process design the group itself can be expanded or collapsed.
Alert Categories

- Creating of alert categories directly in the Integration Process
- Design of Integration Process and alert at the same time

Another new feature is the creation of alert categories directly in the Integration Process.

Previously it was necessary to use transaction code ALRTCATDEF and define the alert, then use this definition in the Integration Process.

Now create an object of type “Alert Category” and use this in the Integration Process. After creating the alert, recipients are determined in ALRTCATDEF.
Extended Conditions and Expressions

- Define conditions to control processing depending on the result of the condition
- The condition editor supports the definition of the condition
- Insert comments to ensure that conditions remain clear and easy to understand

With the help of conditions you are able to control the flow of a process. Depending on the result of the defined condition, the process will be executed in the defined way.

Use the step type “Switch” and use “Condition” in the properties.

In the integrated Condition Editor you can formulate logical conditions.
Use the new step type “User Decision” to enable a user to decide which branch of a process flow should be executed.

For each decision option a branch is entered.

At runtime the user will be notified by a dialog work item in the workflow inbox.

To define the text, which will be displayed for the user, it is possible to use local variables. At runtime these variables will be replaced with the current data from the process.

Within “User Decision” you will use the introduced “Configurable Parameters” to determine which user should be notified at runtime. Therefore you use the configurable parameter type “Agent”.

Generic user decision during the execution of an Integration Process

- Deadline occurs, or an alert is thrown, option needed to directly interact
- Provides decision gateway and outcomes of the user decision, and uses the Integration Directory for responsibility determination
- Uses container elements type “agent” from the configurable parameters
- Language dependent texts for end-user display enriched with variables
BPEL 2.0 and BPEL4People

Standard Support

- BPEL4WS 1.1 (specification / already adopted)
- WS-BPEL 2.0 (specification / preview / implementation)
- Plans to support BPEL4People

SAP is

- A leader in BPEL-Standard adoption
- A driver of the BPEL-Standard
  - SAP was one of the proposers of the OASIS WS-BPEL Technical Committee
  - SAP works together with IBM on BPEL standard extensions

SAP joined the BPEL initiative in March 2003 and it is
- Co-author of the BPEL4WS 1.1 specification
- Early adopter of BPEL4WS 1.1
- SAP NetWeaver customers are live and in production with BPEL4WS 1.1
- Co-author of the WS-BPEL 2.0 proposal

SAP was one of the proposers of the OASIS WS-BPEL Technical Committee

SAP actively participates in the OASIS WS-BPEL Technical Committee

SAP works together with IBM on two significant BPEL Extensions:
- How people interacts with BPEL processes (people interaction patterns go beyond simple Web services calls)
- Modularization and reuse in WS-BPEL
New Runtime Behavior of the BPE

- Delivery Mode
  - Delivery of messages to receive steps to running process instances
- Queue Assignment
  - Parallelization of process execution
- Flexible Hibernation / Transaction Handling
  - Block-oriented handling of persistency within the transactional concept
- BPE Message Bulking

Following parameters to configure the BPE runtime behavior have been introduced:

- Delivery Mode: governs the delivery of messages to receive steps to running process instances
- Queue Assignment: permits a parallelization of process execution
- Transaction Handling: defines the sync-points with the database
- BPE Message Bulking: provides a mass delivery of messages to receive steps

Those parameters and their impact on the process design and the process runtime (BPE) will discussed in detail.
Transaction Handling

Adjustable transaction handling

So far:
- Pessimistic assumption regarding transactional behavior
- Required numerous creation of workitems and execution DB actions

Now:
- Developer decides whether
  - a step creates new transaction
  or
  - The steps are executed synchronously
- Configurable DB sync points

◆ Developer decides whether
  - a step creates new transaction
  or
  - The steps are executed synchronously
◆ Configurable DB sync points
Enterprise Services Repository & Registry
Additional WS Standards
High Volume Support
Business Process Management
Central Configuration and Administration
XML Payload Validation
Further Functional Enhancements
XML Payload Validation

- Validate incoming/outgoing messages against XML schema
- Forward/Backward error handling

The payload of incoming and outgoing messages can be validated against an XML schema.

Three modes are supported:

- No validation
- Validation by Adapter (backward error handling): The validation is carried out on the Adapter Engine. If the validation fails an error will be raised and the message won’t be processed.
- Validation by Integration Engine (forward error handling): The validation is carried out on the Integration Engine. If the validation fails the message processing will be stopped in the monitoring. An administrator etc. can decide depending on the severity of the validation failure whether the message should be processed anyway incl. e.g. correction of the message payload or whether the message should not be processed any further.
XML Validation can be performed at 3 different points in the PI message processing.

- In the Inbound processing message is validated at the Advanced Adapter Engine or at the Integration Engine.
- Validation at the Advanced Adapter Engine: When the inbound message enters the adapter (AAE & IS), the adapter converts the adapter specific wire format into a PI message. The payload of this message can be validated against the configured schema.
- Validation in Integration Engine: In the inbound processing the message is validated in the IE as a new step in the pipeline. The syntax validator will check the payload against the configured schema
- In the outbound processing the message is validated in the IE as a new step in the pipeline. The syntax validator will check the payload against the configured schema.
The data types that are used for validation come from the Enterprise Services Repository. The schemas for validation are exported from the Enterprise Services Repository and are saved in the file system in the PI Root.

**Validation in the sender adapter**

If the sender adapter has created the PI message, you can then perform the validation of the PI payload. If the structure of the payload differs from the definition of the data type provided for comparison, message processing is stopped. The adapter sends a synchronous response to the sender of the message, informing it about the structure error. The industry-specific adapters inform the sender asynchronously, as required by the RNIF protocol and the CIDX protocol.

All sender adapters (including non-SAP adapters) can perform this validation.

**Validation in the Integration Engine**

In inbound and outbound processing, validation of the PI message payload takes place as a pipeline step of the Integration Engine. If the structure of the message payload does not match the saved definition of the data type, an error description is generated. The error description contains status information and a list of all structure errors. Message processing is stopped. The message is set to error status and an error report is saved.
Syntax Validation

Asynchronous messages
- Outbound Validation (Sender)
  - Validation in the Advanced Adapter Engine
  - Validation in the Integration Engine

- Inbound Validation (Receiver)
  - Validation in the Integration Engine

Synchronous messages
- Both request and response payloads can be validated against syntax
- Validation is done in the Advanced Adapter Engine for Outbound (Sender)
- Validation is done in the Integration Engine for Inbound (Receiver)

- In case of Asynchronous messages the inbound validation of the PI message payload is done at the Advanced Adapter Engine or at the Integration Engine.
- The outbound validation of asynchronous messages is done in the Integration Engine.
- Synchronous messages consist of a request and a response payload, which are processed in a synchronous call. Both payloads can only be validated together.
Syntax Validation: Advanced Adapter Engine

Validation at the Adapter

The data types that are used for validation come from the Enterprise Services Repository.

When the inbound message enters the adapter (AAE & IS), the adapter converts the adapter specific wire format into an XI message. The payload of this message can be validated against the configured schema.

If syntax validation is configured at the agreement, The AAE and the IS will call at a single central place a syntax validation component, which calls an XML schema validator.

In case of errors an exception is raised and the adapter stops processing and informs the sender via a synchronous response informing about the syntax errors. The industry-specific adapters inform the sender asynchronously, as required by the RNIF protocol and the CIDX protocol.
Validation at Integration Engine

The data types that are used for validation come from the Enterprise Services Repository.

In inbound and outbound processing, validation of the PI message payload takes place as a pipeline step of the Integration Engine. If the structure of the message payload does not match the saved definition of the data type, an error description is generated.

The error description contains status information and a list of all structure errors. Message processing is stopped. The message is set to error status and an error report is saved.

If validation takes place in the Integration Engine, the sender of the message is not automatically informed of the structure error. The message is set to error status and an administrator can process the message further using the Runtime Workbench.
The configuration of the PI message validation takes place in the respective collaboration agreement.

In a sender agreement, you can choose between validation in the sender adapter or validation in the Integration Engine.

If validation takes place in the adapter, a synchronous response is sent to the sender when an error occurs.

If validation takes place in the Integration Server, the message is set to error status and can be processed by the administrator in the Runtime Workbench in the case of an error.

In the receiver agreement, you can configure the validation in the Integration Engine.
Error Handling

Backward-Error handling
- The sender is directly informed (adapter dependent)
- The message is not persisted
- An alert can be raised

Forward-Error handling (at the Integration Server Pipeline)
- The message is set into an error-state
- The sender is not directly informed
- The message is persisted
- The message can be re-started
- An alert can be raised

Two different ways of xml syntax validation error handling strategies are supported.

Backward-Error handling
- The backward error handling is performed at the adapter (AAE & IS) only. The adapter will be enabled to synchronously report back the cause of errors in case of XML syntax errors. An http based adapter the response code of “400 Bad Request” is sent back to the sender in case of syntax error at the adapter level.
- In case of the Industry speak adapters an asynchronous response is created. Processing of the message is stopped/completed and the sender has to re-send a new and corrected version of the message.

Forward-Error handling
- In the forward error handling the sender is not informed about the syntax error, but the message is placed into the error state and the administrator with help of the RWB will further process this message. The administrator can resend messages and skip the validation step.
Message Monitoring can be done in
- Runtime Workbench / SAP NWA
- SXMB_MONI

Messages that have error status
- Can be processed further by an Administrator in the RWB
- Messages can be resent skipping the validation step

Monitoring and administration takes place in message monitoring of the Runtime Workbench / SAP NWA and in the Integration Engine.

Messages that have error status following validation can be processed further by an administrator in the Runtime Workbench. The administrator can resend messages and skip the validation step.
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This slide shows the role of process integration within Enterprise SOA during runtime.

- There are two communication scenarios: P2P and brokered communication
  - P2P if services within backends can directly communicate then the P2P communication variant is used
  - If additional integration services are required then the brokered communication via the PI Runtime (Integration Server) is used
- For all service related communications the same Service Runtime is used
Centralized Configuration of Services

Centralized Configuration of Point-to-Point Connections

- Optimize message processing through de-centralized runtime
- … but keep control through centralized configuration

- Point-to-point connections can be centrally configured via the Integration Directory (besides NWA).
- The new object „Direct Connection“ is introduced.
- The backend systems need to use the Service Runtime.
WS Direct Connection – Overview

The figure shows direct communication and communication using the Integration Server.

**Direct Connection:**

One system calls another system directly without using the Integration Server as a central instance. Communication takes place using the Web services runtime.

- In direct communication, one system calls another system directly without using the Integration Server as a central instance. Communication takes place using the Web services runtime.
- The figure shows direct communication and communication using the Integration Server.
- For two business systems to be able to communicate directly with one another using the Web service runtime, the receiver system must be configured as the Web service provider and the sender system as the Web service client.
- You can make the necessary configuration settings *centrally* in the Integration Directory rather than having to make them locally in the involved back-end systems.
- Since no Integration Server is involved in the communication as a "broker", you must make sure that the required configuration information is available at runtime in the involved back-end systems. To ensure this, the configuration settings made in the Integration Directory are propagated to the back-end systems using cache notifications.
WS Direct Connection – Overview

Why Use Direct Connection?
- Increased performance by eliminating message processing by a middleware software

Why use SAP Netweaver Process Integration for Direct Connection?
- Central administration and support of direct connection design and configuration
- Central monitoring of message processing

What do we loose by using Direct Connection?
- Dynamic receiver determination
- Mapping and transformation
- ccBPM
- All functionalities provided by the Integration Server (e.g. content-based routing and sending 1 message to multiple receivers)

When one system can communicate with another system, without going thru a middleware, much performance can be gained. However, the drawback is the continued maintenance and support of the point-to-point connections.

By using PI, these administration, support and maintenance activities can be centralized. In addition, centralized monitoring can also be done thru the SAP NetWeaver Administrator.

Of course, by not going thru an Integration Server during the runtime, we will loose functionalities and services provided by the Integration Server, e.g. ccBPM, mappings, dynamic receiver determinations, sending 1 message to multiple systems, etc.
First Steps Towards Centralized Monitoring

Unified Monitoring
- Key monitoring functionalities integrated in SAP NW Administrator
  - further steps required after SAP NW PI 7.1
- One place to monitor and administrate SAP NetWeaver
- Optional for SAP NW PI 7.1, old tools are still there

Features
- Channel Monitoring and Administration in RWB
- Message Status overview
- Payload editing for forward error handling

Since NWA is the central administration and monitoring tool of SAP NetWeaver, it is a natural step to move the key functionalities of the RWB into NWA.

With this step the number of different monitoring and administration tools will be reduced.

The RWB will be phased out only slowly, i.e. in the first SPs the RWB can be used in parallel to NWA.

The first RWB functions that are available in NWA are component monitoring, message monitoring, performance monitoring.

The NWA allows monitoring of brokered as well as point-to-point connections.
SAP NetWeaver Administrator (SAP NWA) is a Web-based tool for administration and monitoring, offering a single entry point to configure, administer, and monitor your SAP NetWeaver system, its components, and the applications running on top of it.

- A single, central tool for administration, troubleshooting, and problem analysis of your SAP NetWeaver system.
- An easy-to-use, task-oriented interface.
- A Web-based tool. Therefore, you do not need to have a local installation to manage remote systems.
- The interface allows seamless navigation to other SAP NetWeaver administration tools (for example, User Management Engine).
- The SAP NWA represents the crossover from various expert tools to an integrated, simple, and clear solution. The SAP NWA also completes the integration of the data sources for monitoring.

A single, central tool for administration, troubleshooting, and problem analysis of your SAP NetWeaver system. You can perform administration tasks, such as, starting and stopping instances, checking and modifying configuration settings, analyzing logs and traces, ensuring the error-free functioning of all system components by continuous system monitoring.
SAP NetWeaver Administrator

SAP NetWeaver Administrator (NWA) can be selected from the default home page of the server.

Or, by entering: http://<host>:<port>/nwa, where:

- **<host>** is the host where the SAP NetWeaver Application Server Java is installed.
- **<port>** is the HTTP port of the ICM. It consists of 5<instance_number>00. For example, if the instance number of the Java instance is 60, the HTTP port is 56000.
The management functions included in the SAP NWA are grouped in work centers according to the type of functionality that they provide. The following work centers are available:

- Operations Management
- Configuration Management
- Availability and Performance Management
- Problem Management
- SOA Management
The operations management section of the SAP NetWeaver Administrator includes the following administration options:

- Viewing system information
- Starting and Stopping Java Instances
- Starting and Stopping AS Java Services
- Starting and Stopping Java Applications
- User Management Engine and Identity Management

- Viewing system information - You can see general information about instances in the current system – the database, the central services, and the Java instances. To access this information, choose Problem Management → Infrastructure Management → System Info.

- User Management Engine and Identity Management - As an administrator, you control who has access to applications by creating users and providing these users with a means of authenticating themselves to an application.
The configuration management includes the following options for configuring your system:

- **Virtual Host Configuration**
- **Managing Login Modules**
- **Managing Authentication Policy for AS Java**
- **JMS Server Configuration**
- **Java System Properties**
- **Viewing Application Modules’ Configuration**
- **Application Resources Management**
- **UDDI Server Configuration**
- **Web Services Configuration**

- **Virtual Host Configuration** - This function enables you to create new virtual hosts and configure existing ones for your system.
- **Managing Login Modules**
- **Managing Authentication Policy for AS Java**
- **JMS Server Configuration** - This function enables you to view and manage JMS provider server configurations.
- **Java System Properties** - Using this option, you can view the system properties. The information is organized in a tree view containing all the important configuration data for the selected systems, such as the VM settings and services configuration. This is an informative view only. To change a system’s configuration, use the local configuration tool.
- **Viewing Application Modules’ Configuration** - This is a solution that contains details of the deployed applications as well as several types of modules (such as Web and EJB modules) where configuration settings can be viewed and altered.
- **Application Resources Management** - This allows applications to make use of external resources. Application resources can be configured as well as created and deleted by the administrator.
- **UDDI Server Configuration**
- **Web Services Configuration** - Contains more information about the configuration of Web services and Web service clients.
In the Availability and Performance Management section in the SAP NetWeaver Administrator (NWA), you can monitor different parameters of the system operation.

- **Java System Reports**
- **Log Viewer**
- **Locks**

Java System Reports - When a user needs to compare and contrast reports, he/she may evaluate them using graphical charts or tables that display capacity planning, resource consumption, and error statistics. Evaluation time periods can be adapted by choosing a predefined period or setting a personal date and time. Other reports show requests, components, and user activities based on the Java Application Response-Time Measurement (JARM). A local monitor browser and a table of currently processed requests are provided as well.

Log Viewer - Using the Log Viewer plug-in you can gather information about system problems and monitor all log records logged by applications or servers. Careful monitoring of logs can help you to predict and identify the sources of system problems. Use predefined perspectives and right filters to speed up the process of gathering desire information.

Locks - Using Locks plug-in you can monitor and manage all locks, created on a monitored Java EE system.
The problem management section of the SAP NetWeaver Administrator includes the following administration options:

- Java Class Loader Viewer
- JNDI Browser
- Log Viewer
- Log Configuration
- Web Services Logging & Tracing

- **Java Class Loader Viewer** - Using this function you can monitor the references between the class loaders in the Application Server Java.

- **JNDI Browser** - You can use this function to access the system naming tree of the application server.

- **Log Viewer** - Using the Log Viewer you can gather information about system problems and monitor all log records logged by applications or servers. Careful monitoring of logs can help you to predict and identify the sources of system problems. Use predefined perspectives and right filters to speed up the process of gathering the desired information.

- **Log Configuration** - The Log Configuration provides functionality for viewing the log configuration, changing the severity of log controllers and resetting the current log configuration to the default one.

- **Web Services Logging & Tracing** - This function allows you to analyze the logs of the Web Services infrastructure.
SOA Management provides various tasks in the area of configuration, administration and monitoring as relate to messaging involving various scenarios:

- **Technical Configuration** – configure provider service destinations, registry and profiles.
- **Business Administration** – to perform mass configurations and webservices configurations.
- **Log and Traces** – to analyze logs of webservices
- **Monitoring** – to monitor various components in Process Integration.

- **Technical Configuration**
  - Destination Template Management - Plug in that manages all provider systems that will be used by this system.
  - Services Registry Configuration - Services Registry Configuration Application for SAP NetWeaver Administrator.
  - Profile Management - Plug in for creating profiles that can be used access provider systems.
  - System Global Settings - Plug in for configuration of the global settings of a system such as HTTP proxy.

- **Business Administration**
  - Mass Configuration - Plug in for configuration of multiple objects (Services, Consumer Groups and Proxies)
  - Web Services Administration - Provides functions for administration and configuration of both ABAP and Java Web services and Web service clients. For each Web service, you can create one or more service endpoints and apply specific run-time configuration such as security, reliable messaging, logging/tracing severities, etc. In addition you can see the list of its WSDL URLs as well as start the WSNavigator for testing it. For each Web service client, you can create one or more logical port, view and change its run-time configuration such as service endpoint URL, security settings, timeouts, HTTP Proxies, etc.

- **Log and Traces**
  - Web Services Logging & Tracing - The Web Services Logging & Tracing plug-in allows you to analyze logs of the Web Services infrastructure.

- **Monitoring**
  - PI Adapter Monitoring - Adapter Monitoring for Communication channels is used to call information about communication channels that are set up for the selected Adapter Engine, and to administrate these channels.
  - PI Message Monitoring - Message Monitoring application in local SAP NetWeaver Administrator can be used for querying messages and corresponding details available on the current Java Web AS.
  - PI - Use this application to schedule jobs for various background processing tasks such as archiving messages that have been processed successfully or edited, deleting messages that are not to be archived, restart messages with errors and rescheduling lost messages
  - Sequence Monitoring - Shows details of the logical and technical sequence details.
**SAP NWA: PI Monitor Overview**

**SAP NWA:**
- Provides configurations for the overall system
- Monitors the overall system

**SAP NWA PI Monitoring:**

However, SAP NW PI has special requirements specifically for the process and integration environment, e.g. messages, adapters, etc.

It is a central monitoring tool in the SAP NWA to monitor the integration landscape.

To start it: http://server:port/nwapi
SAP NWA: PI Monitoring

- Key functionalities of PI Runtime Workbench (RWB) are being made available in SAP NetWeaver Administrator (SAP NWA) as part of the new release of SAP NetWeaver PI 7.1

- The following are the main functionalities available in SAP NWA for Process Integration Monitoring tasks:
  - Message Monitoring
  - Performance Monitoring
  - Cache Monitoring
  - Alert Inbox/Rules
  - End to End Monitoring
  - Adapter Monitoring
  - Communication Channel Monitoring (Adapter Engine)
  - Sequence Monitoring
  - Web Service Logging and Tracing
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<td><strong>Further Functional Enhancements</strong></td>
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</table>
Major Enhancements for Mapping

Function Libraries
- Re-usable user-defined functions

Synchronous DB/RFC Look-ups
- Use graphical UI to model look-ups

Mapping Parameters
- Specify mapping parameters at configuration time

Functions with Multiple Results
- Look-up function returns multiple fields

Function Libraries
- The Repository saves the user defined functions you create in a message mapping or a mapping template in a local function library belonging to a mapping object
- To use a user defined function in more than one message mapping or mapping template you can create the user defined functions in function libraries
- The user interface is the same for local function libraries and function libraries that are independent of a message mapping or mapping template.

Synchronous DB RFC look-ups
- A mapping look-up enables a function in application system to be called while a mapping program is being executed. This therefore requires the Integration Server and the application system to communicate with each other. This is achieved by using an adapter, which can be accessed by using the mapping program. In this way, the channel for communication is visible in the Integration Directory.
- You could use these mapping look-ups in a Java program, XSLT program, in a message mapping as well as through JDBC and RFC look-ups

Parameterizable mappings
- Define parameters in the mapping and configure the same in the integration directory – for example which database you can look-up

Functions with multiple results
- Better flexibility in defining your mapping scenarios
- You can feed multiple functions with the results of the mapping
Mass changes via Integration Directory API

Integration Directory API

- Application Programming Interface (API) allows to access, edit, activate objects in Integration Directory
  - Examples: Communication channels, business systems, receiver determination, interface determination, changes lists
- API Access via Web Service
  - WSDL files are stored in Enterprise Services Repository as external definitions
- API allows to create, update, delete, read, search etc. objects in Integration Directory
- API is particularly suitable to perform mass changes
- Content of Integration Directory can be read by API in order to use this input for defining own views, statistics etc.

- ALL objects of Integration Directory can be accessed, e. g. communication channels, business systems, receiver determination, interface determination, changes lists.
- Access is via Web Service, the WSDL files are stored in the Integration Repository as external definitions.
- The Directory API allows to create, update, delete, read, search etc. objects in Integration Directory.
- Mass changes of attributes, e. g. names of objects, are supported. Furthermore, the content of the Integration Directory can be read by the API and use this input for any kind of representation, e. g. statistics.
- Examples:
    - Using the programming interface you can make mass changes in the Integration Directory which you would not otherwise be able to do using the user interface, or at least only with a very time-consuming manual procedure. You can realize the following possible applications:
      - If you have newly installed SAP NetWeaver Process Integration and would like to fill the Integration Directory with your existing configuration data then you can import the available configuration data using a program in the Integration Directory.
      - You can edit the same attributes in a large number of configuration objects at the same time.
      - If you move an object in the Integration Repository to another namespace or to another software component version, then you need to update the object reference for the configuration object concerned accordingly. You can do this for multiple configuration objects by using the programming interface.
  - Individually Presenting the Contents of the Integration Directory
    - You can retrieve and individually present the contents of the Integration Directory. You can create your own views of the contents of the Integration Directory, for example for the purpose of statistics.
Upgrade paths to SAP NW Process Integration 7.1 will be offered from:

- SAP NW '04
- SAP NW 7.0 (2004s)

Upgrade paths to SAP NW PI 7.1 will be supported from SAP NW '04 as well as SAP NW 7.0 (2004s).

- Migration is also an option, however no particular migration guides will be provided.
- Existing investments is leveraged, i.e. most of the objects stored in XI 3.0 or PI NW 7.0 (2004s) will be available after an upgrade to SAP NW PI 7.1. However, necessary adjustments that customers would have to do will be published.
Upgrade Overview

- Only inplace upgrade supported
- Content Copy (like XI 2.0 -> 3.0 Migration) is not supported
- 32 bit OS is not supported
  -> Migrate to 64 bit OS before upgrade
- SAP JVM is installed during upgrade
  (other JDK’s are not supported)
- Check the Product Availability Matrix

- SAPJVM = Java Virtual Machine provided by SAP
Upgrade Steps

1. Migrate Operating System, if necessary
2. Upgrade Database, if necessary (see PAM)
3. Upgrade to SAP NW PI 7.1
4. New HA setup, if necessary
# Upgrade Documentation

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**Roadmap**

**Summary and Further Information**
## Technology Map 2007: Topic Areas and Topics/Capabilities

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### SOA Middleware Roadmap

#### Focus areas up to 2010

- **Simplified Integration for Composition**
- **Lean Deployment**
- **SOA Backbone for the Enterprise**
- **Standards & Architecture**

#### Further deliver on SOA technology

- Common service programming model in CE
- Service technology for Suite based on WS Standards
- Packaged integration scenarios for A2A and B2B
- PI 7.1 ESR for design time governance
- Service enabling and connectivity to legacy
- First SOA monitoring UIs integrated in central administrator tool
- High volume and reduced sizing for integration hub
- WS-RM, Policy and Security standards

#### Simplified integration

- Automated WS configuration for composites
- Asynchronous notification for composites (based on WS-RM)
- JEE-only SOA MW option (w/o BPM capabilities)
- Enhanced ESR for design time governance
- Basic SOA Management and Runtime Governance (incl. AmberPoint integr.)
- Enhanced Monitoring and EDI operations
- Minimized downtime for upgrade
- Enhanced standards for WS RM, Policy and Security

#### Best-in-class process integration

- Service Bus in CE incl. pluggable integration logic and non-WS connectivity via SCA
- Publish & Subscribe
- Full JEE-only SOA MW incl. BPM capabilities
- Very lean non-WS connectivity
- Federated Service Bus & ESR (incl. integrated identity management)
- Central SOA management (incl. Governance)*
- Continuous availability
- Common Eclipse based ESR & tooling environment
- Shape SOA Management Standards

#### Market availability

- **2007**
- **2008/9**
- **2009 and beyond**


#### Plug & Play of technical connectivity for composites

- Delivery for eSOA on Suite with CE 2.0
- Delivery for AP/A1S probably only in 2009

#### Single-stack SOA middleware option with Galaxy*


#### Full SOA management

- SLA support
- Policy support beyond WS policies and legacy connectivity
- Support end to end monitoring of business processes (cooperation with Galaxy)
- Change management for services
- End to end tests of SOA scenarios

#### Integration with identity Management

- Auto- configure all applications used in composites for the required user roles / users

#### Automated WS configuration for composites

#### Asynchronous notification for composites (based on WS-RM)

#### JEE-only SOA MW option (w/o BPM capabilities)

#### Enhanced ES Repository for design time governance

#### Basic SOA management and runtime governance (incl. AmberPoint integration)

#### Enhanced monitoring and EDI operations

- PI Integration Directory: Improved search functions:
### SOA Middleware Roadmap

#### Focus areas up to 2010

- **Simplified Integration for Composition**
  - Further deliver on SOA technology
    - Common service programming model in SAP NW CE
    - Service technology for Business Suite based on WS Standards
  - Lean Deployment
    - Package integration scenarios for A2A and B2B
  - SOA Backbone for the Enterprise
    - SAP NW PI 7.1
    - ES Repository for design time governance
    - Service enabling and connectivity to legacy
    - First SOA monitoring UIs integrated in central administration tool
  - Standards & Architecture
    - High volume and reduced sizing for integration hub
    - WS-RM, policy and security standards

#### Simplified integration

- **Automated WS configuration for composites**
- **Asynchronous notification for composites (based on WS-RM)**
- **JEE-only SOA MW option (w/o BPM capabilities)**
- **Enhanced ES Repository for design time governance**
- **Basic SOA management and runtime governance (incl. AmberPoint integration)**
- **Enhanced monitoring and EDI operations**
  - Minimized downtime for upgrade
  - Enhanced standards for WS-RM, policy and security

#### Best-in-class process integration

- **Service Bus in SAP NW CE** (incl. pluggable integration logic and non-WS connectivity via SCA)
  - Publish & Subscribe
  - **Full JEE-only SOA MW incl. BPM capabilities**
  - Very lean non-WS connectivity
  - Federated service bus & ES Repository (incl. integrated identity management)
  - Central SOA management (incl. governance)
  - Continuous availability
  - Common Eclipse based ES Repository & tooling environment
  - Shape SOA Management Standards

**Market availability**

- **2007**
  - 2007: ship as 7.1 EhP3 or new codeline
- **2008/9**
  - SAP AG 2007, SAP NetWeaver – SOA Middleware, SAP NetWeaver Product Management

**Notes**

- **“*” = in discussion**
- **“** = internal delivery in H2 2009, ship as 7.1 EhP3 or new codeline

- **2008 - WS Standards interoperability (w/MSFT BizTalk):**
  - WS-RM 1.1, WS Policy 1.2, WSDL 1.1, WS RM Policy 1.1, WS-MetadataExchange 1.1

- **Plug & Play of technical connectivity for composites**
  - **Delivery for eSOA on Suite with CE 2.0**
  - **Delivery for AP/A1S probably only in 2009**

- **Packaged integration**
  - **Open: integration of A1S / Suite side by side scenarios**

- **Single-stack SOA middleware option with Galaxy**

- **Full SOA management**
  - SLA support
  - Policy support beyond WS policies and legacy connectivity
  - Support end to end monitoring of business processes (cooperation with Galaxy)
  - Change management for services
  - End to end tests of SOA scenarios

- **Integration with identity Management**
  - Auto- configure all applications used in composites for the required user roles / users

- **Automated WS configuration for composites**

- **Asynchronous notification for composites (based on WS-RM)**

- **JEE-only SOA MW option (w/o BPM capabilities)**

- **Enhanced ES Repository for design time governance**

- **Basic SOA management and runtime governance (incl. AmberPoint integration)**

- **Enhanced monitoring and EDI operations**
  - PI Integration Directory: Improved search functions:
    - Search within content based routing, e.g. for partner (could be more than 1000 EDI business partners), service, XPath expressions (currently un-sorted list)
    - Search repeat (next result)
    - Search for values within communication channels for arbitrary adapter types, e.g. ISDN number in VAN adapter, SSID in OFTP adapter, directory name in file adapter
    - Search across multiple instances
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**EVOlUTION OF SAP NetWeaver Process Integration**

**EVOLUTION PATH**

- **Goals**
  - SOA Middleware = evolve SAP NW PI to Service Bus
    - Seamlessly connect business systems
    - Enable enterprise wide overview of the system communication
  - Enterprise Services Repository & Registry
  - Flexible deployment options
    - Support of IT footprints from small to enterprise scale

**VALUE PROPOSITION**

- **Value of SAP NetWeaver to Business Suite**
  - ES Repository for harmonization of service definitions
    - Openness also for non-SAP content
    - Easy access to enterprise services and events
  - Out-of-the-box integration
    - Extended Business Packages
    - Plug/Play of communication for composites on BPP
  - Easy SOA management for small up to very large landscapes
Why use SAP NetWeaver Process Integration 7.1?

5 Reasons for using SAP NetWeaver Process Integration 7.1

- Use Process Integration as the SOA backbone
- Establish ES Repository as the central SOA repository in customer landscapes
- Leverage support of additional WS standards such as UDDI, WS-BPEL and tasks, WS-RM
- Enable high-volume and mission-critical integration scenarios
- Benefit from new functionality, such as principal propagation, XML validation, and BAM capabilities
Process Integration with SAP NetWeaver pays off TODAY

Reduce Complexity and save operational costs
Stay in the „buy-model“ using predefined content
Provides BPM to enable complete business process lifecycle

... and paves the way to an Enterprise SOA
### Further Information

#### Public Web

- [http://www.sdn.sap.com](http://www.sdn.sap.com) ➔ Enterprise SOA, SAP NetWeaver, Partners and ISVs, Forums

#### SAP Service Marketplace

- [http://service.sap.com/xi](http://service.sap.com/xi)
- [http://service.sap.com/esa](http://service.sap.com/esa)
- [http://service.sap.com/swdc](http://service.sap.com/swdc)
- [http://service.sap.com/netweaver](http://service.sap.com/netweaver)
- [http://service.sap.com/bpms](http://service.sap.com/bpms)
- [http://service.sap.com/icc](http://service.sap.com/icc)

#### Training [http://service.sap.com/education](http://service.sap.com/education)

- BIT400 (SAP XI)
- BIT450 (SAP XI ABAP Proxy Development)
- BIT409 (EDI Fundamentals for B2B Processes)
- BIT410 (B2B Scenarios with SAP XI and SEEBURGER Adapters)
- BIT430 (SAP XI – ccBPM)
- BIT460 (SAP XI Mapping)