SAP NetWeaver Process Integration 7.1
Overview

SAP NetWeaver Product Management
December 2007
Benefits

This presentation enables you to:

- Understand the new functions provided with SAP NetWeaver Process Integration 7.1
- Understand the architecture of SAP NW PI 7.1
- Understand the key benefits offered by SAP NW PI 7.1
1. Introduction
2. Enterprise Services Repository and Registry
3. Additional WS Standards and High Volume Support
5. Further Functional Enhancements
6. Summary
1. **Introduction**
2. Enterprise Services Repository and Registry
3. Additional WS Standards and High Volume Support
5. Further Functional Enhancements
6. Summary
Two major product bundles: SAP NetWeaver Composition Environment and SAP NetWeaver Process Integration (incl. PI, ES Repository and Application Server ABAP and Java)

New releases end of 2007: Composition Environment 7.1 and Process Integration 7.1

The ES Repository 7.1 available with both.

Composition Environment integrates processes, information and UI into composites.

SAP NetWeaver Process Integration platform shows cross value.
A new release of SAP NetWeaver Process Integration will be shipped in December 2007. Customers who have already installed SAP NetWeaver 7.0 (usage type PI) or SAP NetWeaver 2004 (SAP Exchange Infrastructure (XI) 3.0), have the option to upgrade to SAP NetWeaver 7.1 at no additional cost.

The Process Integration release will be one of the key building blocks of the enterprise SOA technology offered by 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 is 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.
- XML schema validation, which allows you to validate the structure of a message payload against an XML schema.
- Support for asynchronous messaging based on the Web Services Standard Web Services Reliable Messaging (WS-RM) for both brokered communication and for point-to-point communication between two systems will be supported in this release.
- A lot of SOA enabling standards or WS standards are supported as part of this release again making it the core technology enabler of Enterprise SOA.

The new SAP NetWeaver Process Integration release this year will include major enhancements to the BPM offering as:

- Improved performance of the runtime (Process Engine) - message packaging, process queuing, transactional handling (logical units of work of process blocks and singular process steps - flexible hibernation)
- WS-BPEL 2.0 preview
- Further enhancements: modeling enhancements such as, e.g., step groups, BAM patterns; configurable parameters; embedded alert management (alert categories within the BPEL process definition; human interaction (generic user decision), task and workflow services for S2H scenarios (aligned with BPEL4People)

The process integration capability includes the integration server with the infrastructure services provided by the underlying application server

The process integration capability within SAP NetWeaver is laying the foundation for SOA

Standards compliant offering enterprise class integration capabilities, guaranteed delivery and quality of service
New Capabilities of SAP NW PI 7.1 – Part 2

- Reliable Messaging and Queuing
- Scalability
- High Availability
- Archiving
- Configuration
- Monitoring
- Administration
- Dynamic Routing
- Transformation
- Connectivity
- Infrastructure Services Java EE5 / ABAP
- 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

- New functions are provided with SAP NetWeaver Process Integration 7.1, all are an extension of the robust architecture based on JEE5. JEE5 promotes less memory consumption and easier installation
- The process integration capabilities within SAP NetWeaver offer the most common Enterprise Service Bus (ESB) components like

- Event provisioning and consumption for BAM
  - Local container
  - Subscription and handling of business process events
  - Milestone Monitoring

- Next steps towards central configuration and administration

- Functional Enhancements
  - XML payload validation
  - BPEL modeling enhancements

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- The process integration capabilities within SAP NetWeaver offer the most common Enterprise Service Bus (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

- 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.
Agenda

1. Introduction
2. Enterprise Services Repository and Registry
3. Additional WS Standards and High Volume Support
5. Further Functional Enhancements
6. Summary
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 - because SAP offers not only a repository from the tools side but also the content.
- Already in Dec 2006 we had the first enterprise services bundles that were shipped containing about 500 service definitions in the repository.
- The repository is open for customers and partners to also enrich this content with additional services that they need for their own use
- If you look at the ES Repository in more detail you see that there are two parts to it, one is the ES Repository and the other is 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.
  - 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

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
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| **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 |

Service Registry

WSDL

SAP 3rd party
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 is the PI based Integration Repository which is already part of SAP XI 3.0 and SAP NW 7.0 (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 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 also with SAP NetWeaver Composition Environment 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)

Governance in SOA is the key to realizing your SOA goals:
- The ES Repository includes SOA governance. Customers will see 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 is an important topic for business analysts, architects and developers building services.
- The ES Repository is designed to enable you to govern the provisioning of new services and also to promote reuse of existing services.
- Services are not developed for a single user or an application but with a view towards 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 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.
- It establishes 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

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.
Read PO Enterprise Service – Create Graphical Model
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 found in the Services Registry.
Global Data Types – Building Blocks for Service Interfaces

Global Data Types are:
- Defined company-wide based on open standards (ISO 15000-5, UN/CEFACT CCTS)
- Defined in the ES Repository
- Approved SAP-wide using the Governance process
- Reusable semantic building blocks for service interfaces and message types
- As of SAP NW PI 7.1, GDTs are based on the ES Repository types “Core DT” or “Aggregated DT”

Global Data Types (GDTs) are SAP-wide standardized and reconciled data types with business-related content as they occur in standards or would correspondingly be defined there.

The GDT Catalog collects all approved Global Data Types.

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

Key figures (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, based on 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 if the same attribute occurs in business object nodes or service interfaces, it is always described by the same or a derived GDT.
Services Registry – Concept

- Services Registry is a common pool available in a SOA platform where the services of an enterprise are shared.
- Providers publish their services in the registry.
- Consumers discover the services that need to be consumed.
- UDDI V3.0 is the standard for publishing and discovering services.
- Registries based on standards are interoperable.

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 puts services in business context.
- Registry can also come from outside (e.g. Systinet).
- This slide shows the Process Integration role in Enterprise SOA during runtime. There are two communication scenarios: P2P and brokered communication. P2P, if services within backends can directly communicate. If additional integration services are required, 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 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.
The SAP Enterprise SOA story requires that SAP delivers Enterprise Services.

- Enterprise Services are the 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
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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 PI 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.
- Other vendors like Microsoft and IBM also support WS-RM.
**Principle Propagation Based on SAML**

- Forward user context from sender to receiver
- Authorization check in receiving system based on original user

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 do not 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.
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 the XI 3.0 protocol
- Communication paths are statically configured in the following sense:
  - Sender to Integration Server: 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.
  - Integration Server 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 Integration Server:
  - 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.
- Integration Server 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
- Enables the XI 3.0 protocol and the new web service protocol (in the mediated scenario) for securely propagating the identity of the subject running in the sender/WS consumer application to the receiver/WS provider system so that the inbound proxy/web service on the receiver/WS provider system is executing under the same identity as the sender/WS consumer application.
- For NW 04/04s there is a lean/quick solution based on SAP logon ticket/SAP assertion ticket available.
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 Integration Engine 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.

- SAP assertion ticket
- Mapping of user names not supported yet
**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 – 3.0 times compared to non-packaging (depending on scenario)

![Diagram of SAP NetWeaver Process Integration 7.1 components](image)

- 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 improvement:**
- For async scenarios message packaging plus bulk processing in ccBPM improves the throughput for small messages (<100kB) by factors 4.7. This includes ccBPM improvements like transient processing of multiple steps. I. e. factor can be reached only for selected scenarios.
- Performance improvements without ccBPM: up to factor 3.0.
**High Volume Support via Advanced Adapter Engine**

**Local Processing in the Advanced Adapter Engine**
- Natural evolution of the adapter engine
- Provides mapping, routing to by-pass 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.
- The Adapter Engine (central and non-central) evolves to a “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 is up to factor 10.
- Integration Server:
  - 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 is required anymore for certain scenarios.
- Improved performance for adapter-to-adapter communication
- Central configuration and monitoring in the Integration Directory and Runtime Workbench, also of multiple “local processing engines”.
- Allows customers to distribute execution of mission-critical processes
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### 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 an 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
  - First 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
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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 an adapter (backward error handling): The validation is executed in the Adapter Engine. If the validation fails, an error will be raised and the message will not be processed.
- Validation by the Integration Engine (forward error handling): The validation is executed in the Integration Engine. If the validation fails, the message processing will be stopped in the monitoring. An administrator can decide - depending on the severity of the validation failure - whether the message should be processed including a correction of the message payload or whether the message should not be processed any further.
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 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 by the adapter (AAE & IS) only. The adapter synchronously reports back the cause of errors in case of XML syntax errors. An http based adapter sends the response code “400 Bad Request” back to the sender in case of syntax error at the adapter level.
- In the case of the Industry speak adapters, an asynchronous response is created. The message processing is stopped/completed and the sender has to re-send a new and corrected version of the message.

Forward-Error handling
- In forward error handling the sender is not informed about the syntax error, but the message is placed into error state and the administrator using the Runtime Workbench will further process this message. The administrator can resend messages and skip the validation step.
This slide shows the role of Process Integration in Enterprise SOA during runtime.

There are two communication scenarios: P2P (point-to-point) and brokered communication

- P2P - if services within backends can directly communicate
- If additional integration services are required, 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 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 SAP NetWeaver Administrator).
- The new object „Direct Connection“ is introduced.
- The backend systems need to use the Service Runtime.
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 through a middleware, performance can be improved.

- Using PI, these administration, support and maintenance activities can be centralized. In addition, centralized monitoring can also be done by SAP NetWeaver Administrator.

- If the Integration Server is not used during runtime, we cannot use functions 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 SAP NetWeaver Administrator (NWA) is the central administration and monitoring tool of SAP NetWeaver, it is a natural step to move the key functionalities of the Runtime Workbench (RWB) to SAP 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 SAP NWA are component monitoring, message monitoring, performance monitoring.
- SAP NWA allows monitoring of brokered as well as point-to-point connections.
SAP NetWeaver Administrator

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.
Major Enhancements for Mapping

Function Libraries
- Re-usable user-defined functions
- 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
- Synchronous DB RFC look-ups
  - A mapping look-up enables a function in application system to be called while a mapping program is executed. This requires the Integration Server and the application system to communicate with each other. This is achieved by an adapter, which can be accessed using the mapping program. The communication channel 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

Mapping Parameters
- Mapping Parameters
  - Specify mapping parameters at configuration time

Functions with Multiple Results
- Functions with Multiple Results
  - Look-up function returns multiple fields
  - Better flexibility in defining your mapping scenarios
  - You can feed multiple functions with the mapping results
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 the Integration Directory can be accessed, e.g. communication channels, business systems, receiver determination, interface determination, changes lists.
- Access is provided via a Web service, the WSDL files are stored in the ES 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 can 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, you can import the available configuration data using a program in the Integration Directory.
      - You can edit attributes in a large number of configuration objects at the same time.
      - If you move an object in the Repository to another namespace or to another software component version, 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

Upgrade paths to SAP NW Process Integration 7.1 will be offered from:

SAP NW ‘04 and
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 are 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. Necessary adjustments customers have to execute 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
  http://service.sap.com/pam

- SAPJVM = Java Virtual Machine provided by SAP
1. Introduction
2. Enterprise Services Repository and Registry
3. Additional WS Standards and High Volume Support
5. Further Functional Enhancements
6. Summary
Summary

You should now be able to:

- Understand the new functions provided with SAP NetWeaver Process Integration 7.1
- Understand the key benefits offered by SAP NW PI 7.1 and why customers should use this new release:
  - 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