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SAP integration workshop

Introduction to SAP Exchange Infrastructure



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This presentation introduces the SAP Exchange Infrastructure component as part of the SAP integration workshop.

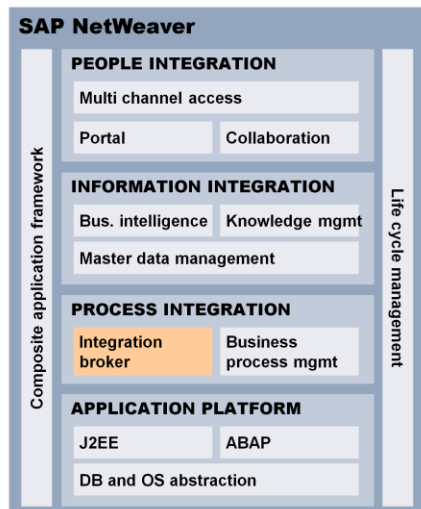
Agenda

- How does SAP XI fit in SAP NetWeaver ?
- SAP XI architecture
 - ▶ Components overview
 - ▶ SAP XI process engine
 - ▶ SAP XI adapter engine
- SAP XI usage scenarios

This presentation will first introduce how the SAP XI fits into the NetWeaver strategy over all, then highlight more specifically the SAP XI architecture in different aspects.

Finally there will be some discussion on different use scenarios with SAP XI and IBM technology.

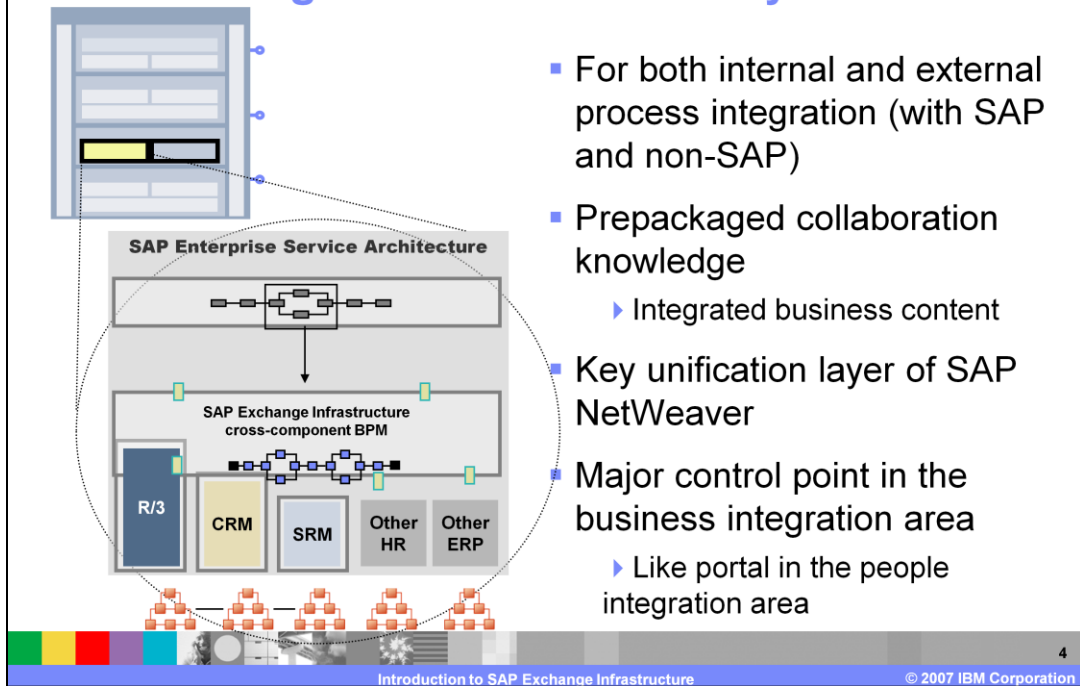
SAP NetWeaver – SAP Exchange Infrastructure



- The SAP Exchange Infrastructure is built on top of the SAP Web AS
- SAP XI is the backend unification layer of SAP NetWeaver

The SAP XI is the integration broker implementation from SAP. It is placed in this diagram as part of the process integration box. SAP XI leverages the application platform as a runtime environment.

SAP Exchange Infrastructure – Why ?



The goal of the SAP XI is to provide a platform for internal and external process integration.

It gets delivered with prepackaged collaboration knowledge and offers a major control point for business integration.

SAP's goal is to centralize cross-system integration in one place within SAP XI – in traditional SAP implementations this is achieved using ALE technology or other EAI tasks like flat file exchange.

SAP XI includes also a BPEL engine which enables not only simple message routing between systems, but also more intelligent system integration scenarios. This BPEL capability is not going to replace the existing SAP Business Workflow capabilities that are still included within any ABAP based SAP instance like CRM, SRM or R/3.

Section

SAP XI architecture: Components overview



This section on architecture is in three parts; the first covers an overview of the components

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SAP NetWeaver `04 SR1 PAM: SAP XI 3.0

<table border="1" style="font-size: 8px;"> <tr><td>X</td><td>Available for DB and APP</td></tr> <tr><td>-</td><td>Neither supported nor planned</td></tr> </table>	X	Available for DB and APP	-	Neither supported nor planned	Windows® (*8)			AIX®	HP-UX				Solaris		Linux®: SUSE SLES9, SLES 10, Red Hat EL 4, 5				i5/OS	z/OS	TRU64
	X	Available for DB and APP																			
-	Neither supported nor planned																				
	Server 2003 on IA32 32bit	Server 2003 on IA64 64bit	Server 2003 on x64 64bit	5.2, 5.3 64bit	11.11 on PA-RISC 64bit	11.23 on PA-RISC 64bit	11.31 on PA-RISC 64bit	11.23 on IA64 64bit	11.31 on IA64 64bit	9, 10 on SPARC 64bit	10 on x64 64bit	IA32 32bit	IA64 64bit	x86_64 64bit	Power 64bit	(SLES9 only on System z 64bit)	V5R3, V5R4 64bit	1.6, 1.7, 1.8 64bit			
Unicode/Non-Unicode	+/*	+/*	+/*	+/*	+/*	+/*	+/*	+/*	+/*	+/*	+/*(*16)	-/*	+/*	+/*	+/*	+/*	+/*	-/*	+/*		
Oracle 10.2 (*3)	(*12)	X	X	X	X	X	X	X	X	(*12)	X	X	X	X	X	-	-	-	-		
SQL Server® 2000	(*12)	X	(*9)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SQL Server 2005 (*10)	(*12)	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
DB2 LUW 8 (*13)	(*12)	X	X	X	X	X	-	X	-	X	-	(*12)	X	X	X	-	-	-	-		
DB2 LUW 9 (*13)	(*12)	X	X	X	-	X	-	X	(*11)	X	-	(*12)	X	X	X	-	-	-	-		
MaxDB 7.6	(*12)	X	X	X	X	X	X	X	X	X	X	(*12)	X	X	X	-	-	-	-		
DB2 for i5/OS V5R3, V5R4 (*4)	APP	-	APP	-	-	-	-	-	-	-	-	-	-	-	APP	-	X	-	-		
DB2® for z/OS® V8, V9	APP (*5)	-	APP	APP	-	-	-	-	-	-	-	-	-	APP (*6)	-	APP	-	HA(*1), DB	-		
Informix	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

APP	Not for DB server. Application server with whole SAP NetWeaver stack only.
DB	Database server only
HA	High available solution only
x64	X64 and x86_64 represent the same hardware

- SAP XI 3.0 supports Unicode platforms only
- Follow-on DB/OS releases will be released as usual
- JDK Versions are specified in the installation guides

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This slide shows the platform availability matrix.

Since SAP XI is running on top of the SAP Web Application Server 6.40 and later, it is supported on the same platforms. An SAP XI specific difference is that it is supported on Unicode platforms only.

SAP XI is one of the first new SAP middleware components that is using both personalities of an SAP Web Application Server – the Java™ and the ABAP part.

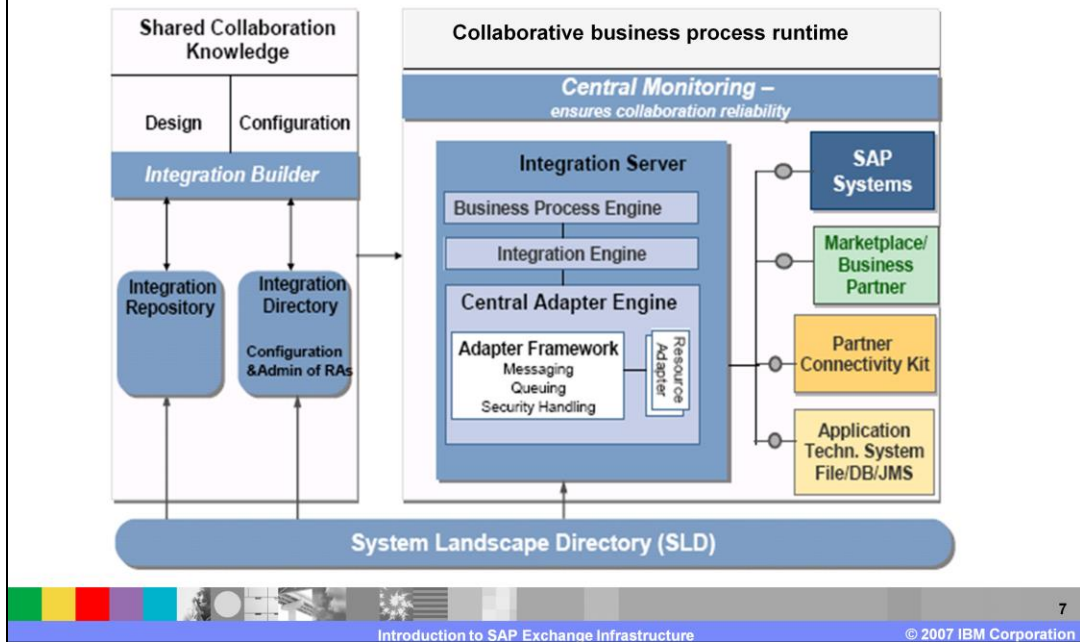
Check the attached notes for the detailed description of the legend.

Legend:

- (*1) See SAP note 821904 “Separating SCS instances for ABAP and J2EE”
- (*3) See SAP note 720886 “Oracle Database 10g: Integration in the SAP environment”. For Double-Byte code pages see SAP note 858869 “Desupport of multibyte character sets as of Oracle 10g”. All availability information applies to new installations of SAP Solution Manager 4.0 too. For Information about the upgrade to SAP Solutions Manager 4.0 please refer to <http://service.sap.com/pam>
- (*4) For upgrade start system on ASCII or Unicode required
- (*5) Non Unicode available only
- (*6) Linux SLES and Linux RHEL 5 (not RHEL 4) available.
- (*8) English version only. See SAP note 362379 “Localized Windows & MUI Support for SAP Software on Windows”.
- (*9) DB server 32-bit only
- (*10) See SAP note 905634 “Release planning for Microsoft SQL Server 2005” for more details
- (*11) Planned availability with DB2 for LUW 9 FP3
- (*12) Rapid Installer available
- (*13) DB2/UDB renamed to DB2 Linux Unix Windows (LUW)
- (*14) Planned for SAP NetWeaver SR2

(*16) Non-Unicode: Dialog Instances only

SAP XI architecture



This is the general architecture from SAP XI. As you see there are two main blocks. The “shared collaboration knowledge” area contains the business packages and business process templates.

They can be built and changed with the Integration builder. To build them, you can access data from the SLD and export it to the runtime environment.

In the “collaborative business process runtime” part, the built business processes get connected to different systems in the SLD and really runs in this environment.

Another perspective is to separate between the design, configuration and runtime environment. As you can see in this slide, the runtime environment can access other SAP systems and other systems using SAP XI adapters.

Integration builder

Integration builder:

- ▶ The integration builder can be understood as the client component that is used to connect to the “integration repository” and the “integration directory”.
- ▶ It uses Java Web Start technology and requires a Java 1.4 environment on the client machine.
- ▶ It is used during design time to develop new interfaces and mappings and during configuration time to configure services, routings and mappings.



The Integration Builder can be understood as the client component that is used to connect to the integration repository and the integration directory.

It uses Java Web Start technology and requires a Java 1.4 environment on the client machine.

It is used during design time to develop new interfaces and mappings and during configuration time to configure services, routings and mappings.

The Integration Builder is the main tool to develop integration artifacts for SAP XI Scenarios and to configure how packages are finally deployed on the SAP XI .

Integration repository

- Integration repository
 - ▶ The integration repository provides collaboration knowledge available at design time, for example, business scenarios, business processes, mappings, interfaces.
 - ▶ It is built in Java and follows Java 2 Enterprise Edition (J2EE) standards.
 - ▶ The information in the integration repository is used by the integration directory, which adds configuration-specific information that is needed for routing.

The Integration Repository provides collaboration knowledge available at design time, for example, business scenarios, business processes, mappings, interfaces.

The IR can be understood as the storage where all integration relevant artifacts are stored.

It is built in Java and follows Java 2 Enterprise Edition (J2EE) standards.

The information in the Integration Repository is used by the Integration Directory, which adds configuration-specific information that is needed for routing.

Integration directory

■ Integration directory

- ▶ The integration directory contains detailed collaboration knowledge about the current system landscape around the SAP Integration Server.
- ▶ It is built in Java and follows Java 2 Enterprise Edition (J2EE) standards.
- ▶ It is a description of routing rules (receiver and interface determinations), collaboration profiles (parties, services and channels) and collaboration agreements.
- ▶ The integration directory details the information from the integration repository that is specific to the configuration.



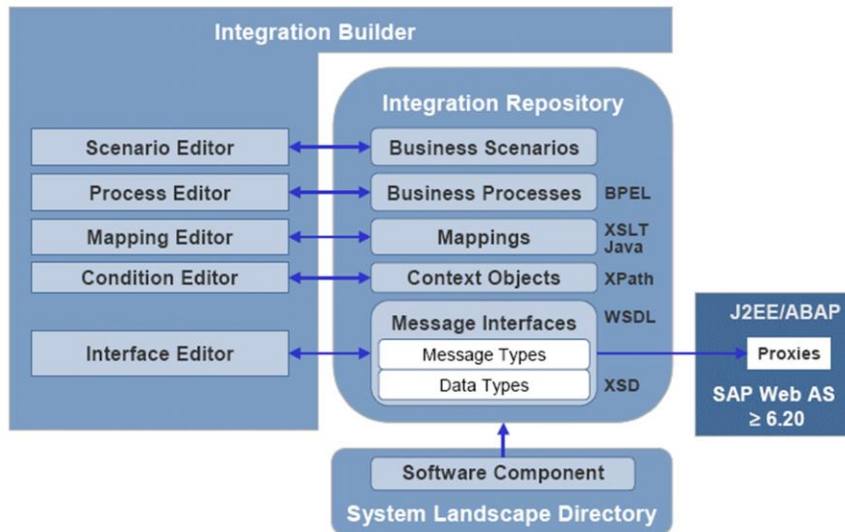
The integration directory contains detailed collaboration knowledge about the current system landscape around the SAP integration server.

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Integration builder and interface repository



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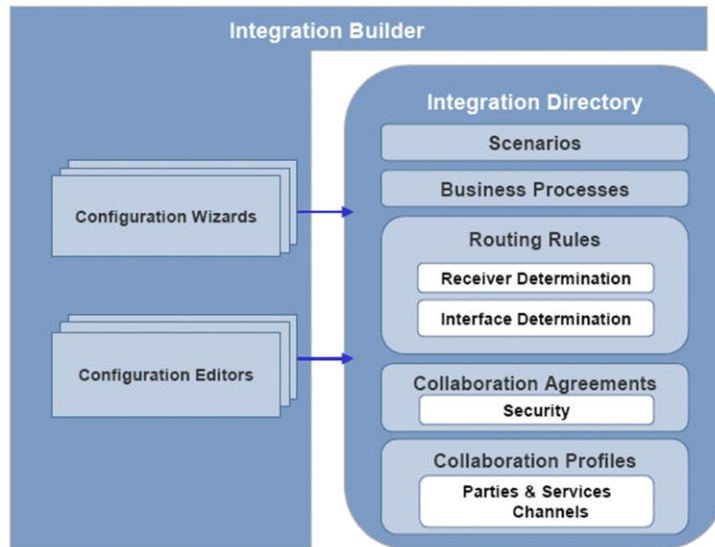
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This slide shows how the Integration Builder (IB) is used to access the Integration Repository (IR).

Within IB there are several editors which enable a developer to create and change integration artifacts like scenarios, processes, mappings and interfaces. All these artifacts are then stored within the IR in dedicated projects. The IR is also leveraging data stored in the System Landscape directory to make the development cycle easier and more meaningful.

Integration builder and interface directory



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This slide shows how the integration builder is used to access the integration directory.

The part of integration builder which is used to access the integration directory is heavily wizard driven. This means wizards are used to deploy specific integration scenarios into the existing system landscape. There are several editors that enable the administrator to adjust existing deployments by changing routing rules, collaboration agreements and profiles.

All these runtime behaviors are then stored within the integration directory and later on accessed by the Integration Server runtime to determine how the specific integration component runs.

Integration server

- Integration server
 - ▶ The integration server receives messages from the sender applications, applies routing and mapping rules to these messages and finally sends them to the receiving application.
 - ▶ Each SAP Web Application Server has the integration server software built in.
 - ▶ The specific configuration of the particular SAP WebAS activates its role as a central integration server.

The integration server receives messages from the sender applications, applies routing and mapping rules to these messages and finally sends them to the receiving application in a simple scenario. In a more enhanced scenario maybe a BPEL process is triggered which then can also trigger more enhanced tasks.

Each SAP Web Application Server has the Integration Server software built in.

The specific configuration of the particular SAP WebAS activates its role as a central Integration Server.

Integration Engine & Business Process Engine

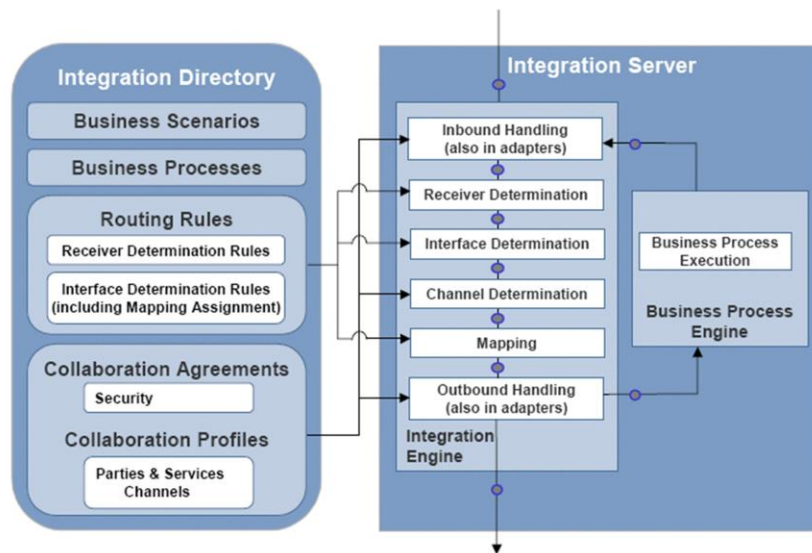
- **Integration engine**
 - ▶ One central part of the integration server
 - ▶ Offers main services for processing messages:
 - mapping and routing
 - guaranteeing quality of service like exactly-once delivery of messages
- **Business process engine**
 - ▶ To support cross component Business Process Management (ccBPM) the Integration Server of SAP XI also contains a Business Process Engine. This component takes care of the running and persistency of cross-component integration processes.

The integration engine is one central part of the integration server. It offers the main services for processing messages, like mapping and routing, and guaranteeing quality of service like exactly-once delivery of messages.

To support cross component Business Process Management, or ccBPM, the integration server of SAP XI also contains a business process engine. This component takes care of running and persistency of cross component integration processes.

The SAP Business process engine is able to run BPEL compliant process that use WS-BPEL 1.1

Integration directory and interface server



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This slide shows that the integration server is the runtime for the integration component. It uses configuration data that is stored in the integration directory.

Runtime workbench

- Runtime workbench
 - ▶ The runtime workbench is used to test and monitor the individual components of the SAP Exchange Infrastructure including business systems defined in the system landscape directory.
 - ▶ Furthermore, it tracks the processing of messages (from end to end) through all involved components of the infrastructure and helps in error analysis of faulty messages and in troubleshooting.
 - ▶ The runtime workbench provides a browser based UI which consumes BSP applications which are located on the SAP XI server.

The runtime workbench is used to test and monitor the individual components of the SAP Exchange Infrastructure, including business systems defined in the system landscape directory.

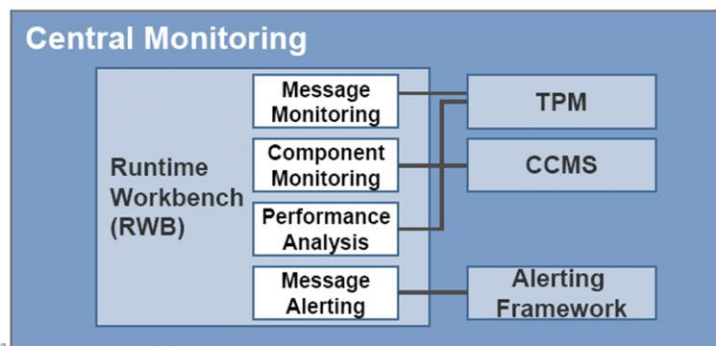
Furthermore, it tracks the processing of messages from end to end through all involved components of the infrastructure and helps in error analysis of faulty messages and in troubleshooting.

The runtime workbench provides a browser-based UI which consumes BSP applications that are located on the SAP XI server.

Central monitoring

- SAP runtime workbench provides:
 - ▶ Component monitoring
 - ▶ Message Monitoring (End-to-End monitoring)
 - ▶ Performance monitoring
 - ▶ Alert framework

No business level monitoring !



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There are different aspects in a central monitoring. The end-to-end message monitoring is the monitoring of the technical process of the message flow - monitoring the message processing on one specific component, and relevant only for message processing components.

The component monitoring has a smooth integration with CCMS, for Monitoring of ABAP and Java components and Monitoring of all XI components - including non message processing components.

Performance analysis is used to enhance performance statistics, measuring of throughput and latency, selection and aggregation of performance data by XI component and time range and message attributes.

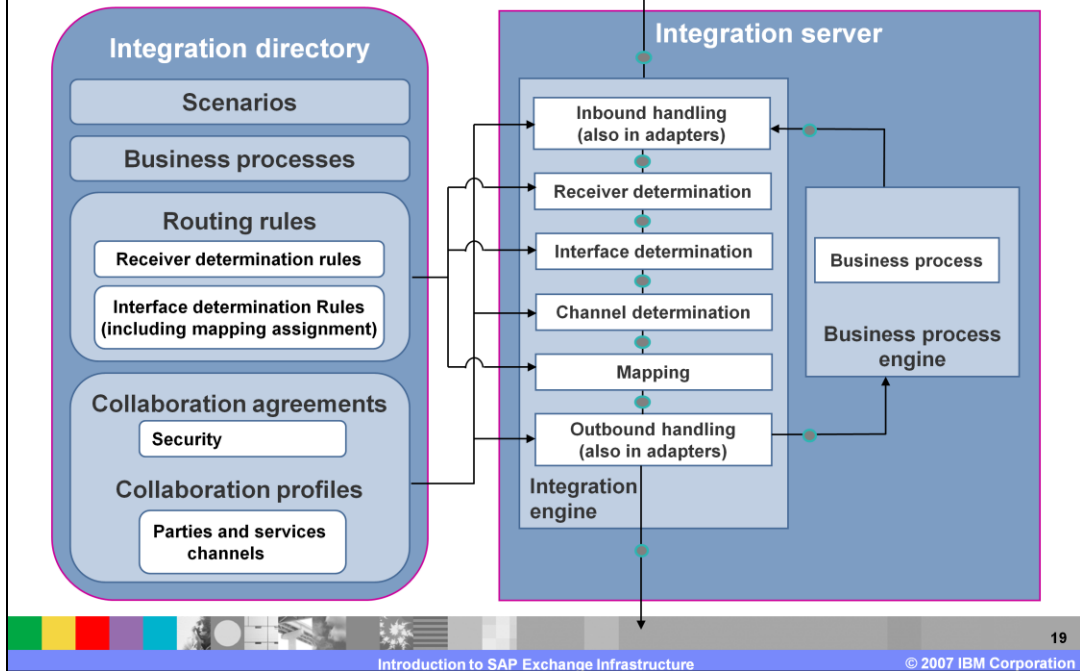
Message alerting is based on Alerting Framework. Active monitoring produces alerts being sent by e-Mail or SMS, and CCMS-alerts and message-oriented alerts

Section

SAP XI architecture: SAP XI process engine

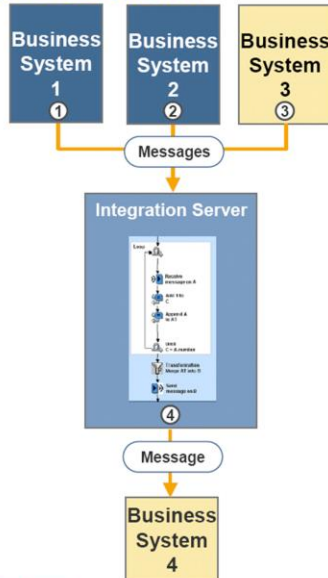
This second of three architecture sections covers the process engine.

Integration processing



The slide also shows that it is not mandatory to incorporate a BPEL process into an integration task. Currently most of SAP's prepackaged integration content consists only of native message routing and transformation, and protocol adjustment.

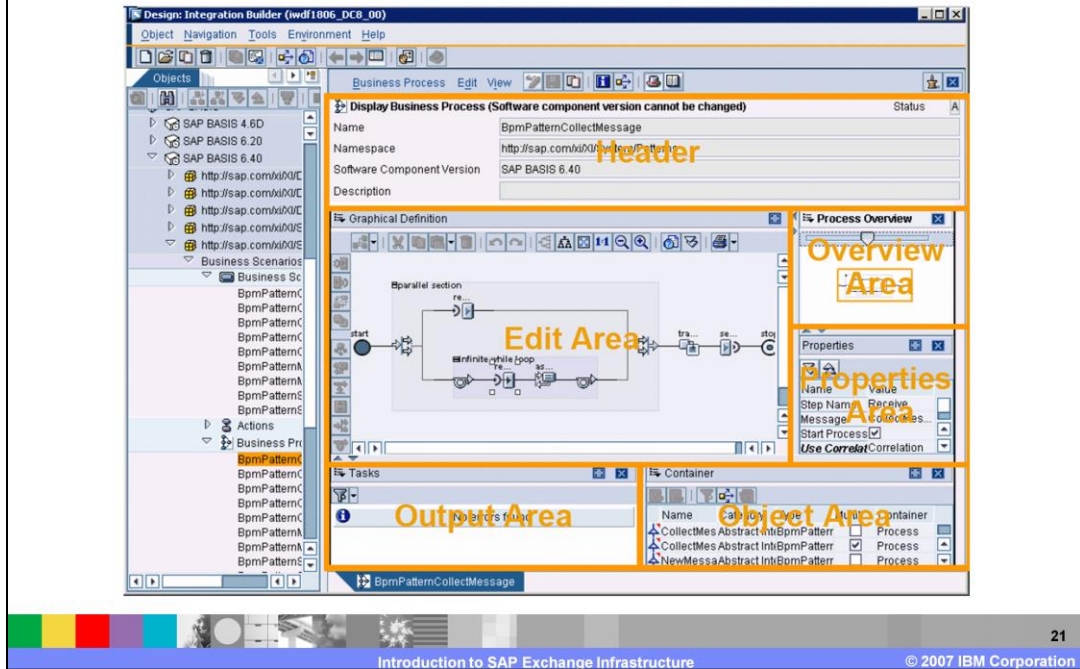
Cross component business process management



- Design, run and monitor processes across applications and systems
- Provides process control in the central technology layer
- Contains a graphical modeler
- Integral part of XI
 - Modeling enables linkage to XI design objects: interfaces, mappings ...
 - BPM runtime is embedded in the integration server runtime
- Adheres to standards
 - Industry standard support (BPEL4WS)
 - Import and export of process definitions
- Technical process monitoring
 - Integrated with general technical monitoring of XI
 - Graphical process monitoring

The business process engine is able to run WS-BPEL 1.1 processes. While the integration server is responsible to run the BPEL process, within the integration builder there is an editor available to create a BPEL process from scratch using existing interfaces that are available in the integration repository.

Integration builder – BPEL editor panes



This slide shows the BPEL editor within the integration builder.

It is the counterpart to the BPEL editor IBM offers within WebSphere Integration Developer.

SAPs editor is divided in different areas that shows information from various objects dependent upon what is selected.

ccBPM – Process step types

Messaging Relevant:



Receive



Send



Transformation



Receiver Determination

Process Flow Control Relevant:



Block



Loop



Fork



Switch



Control



Container Operation



Wait



Undefined

These are the standard nodes that can be used within a SAP BPEL process – most of these icons are borrowed from the SAP Business Workflow, which is an SAP-proprietary workflow dialect that is included within any SAP ABAP system.

SAP ccBPM

- ccBPM is integrated with the business workflow (WebFlow Engine).
- An integration process can send messages to a workflow and, conversely, messages from a workflow can be processed in an integration process.
- Can import, export and run WS-BPEL 1.1 compliant processes.

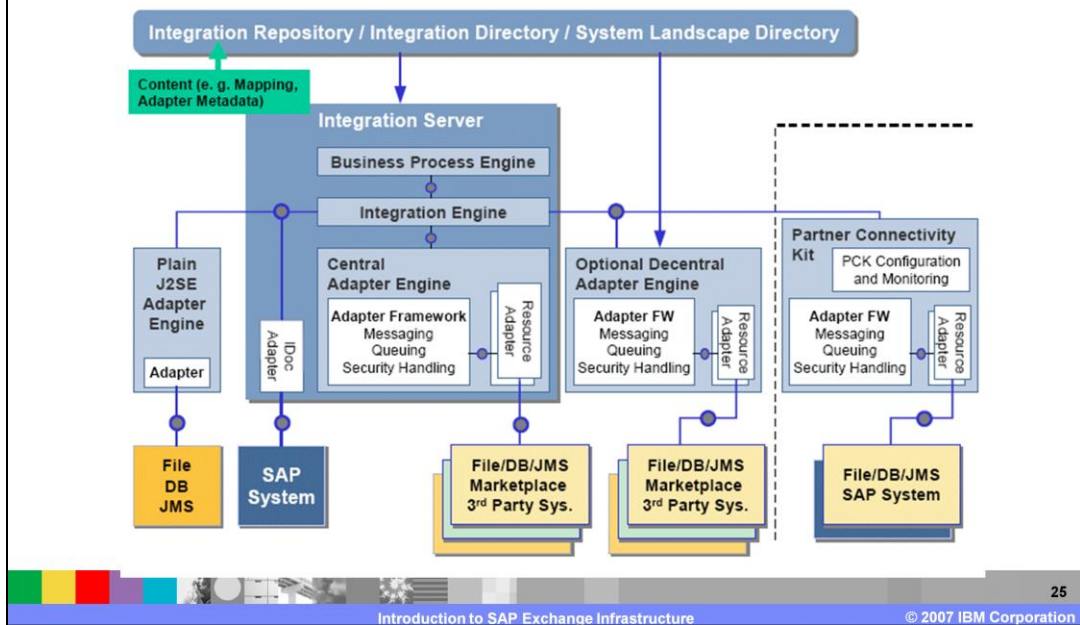
The new ccBPM capability that is a core part of SAP XI is an enhancement of the existing SAP Business Workflow, also known as the WebFlow engine.

Section

SAP XI architecture: SAP XI adapter engine

This third architectural section covers the adapter engine.

SAP adapter engine



SAP XI is using adapters to connect any backend system to the integration server. The adapter portfolio is fairly rich because SAP is partnering with major adapter development business partners like Seeburger and iWay to use their adapters together with an SAP XI broker.

The slide also highlights the capability to address scaling requirements by being able to install multiple adapter engines that work together.

If no adapter is available for a more exotic backend, the partner connectivity kit can be used to create a new custom adapter that reflects the special needs of a dedicated backend system.

SAP J2EE adapter engine

- The J2EE adapter engine is the central configuration tool for adapters used with SAP XI.
- It is based on the adapter framework, which itself is JCA-compliant and is based on the SAP J2EE engine (as part of the SAP Web Application Server).
- The adapter framework provides interfaces for configuration, management, and monitoring of adapters. It also has its own queuing and logging services.
- The adapter engine can run temporarily without a connection to the integration server and still providing guaranteed messaging to and from connected application systems.
- The configuration of the adapter engine is done centrally in the integration directory, using meta-data about the adapters stored in the integration repository.
- The adapter engine can also be monitored by the runtime workbench.

This slide lists many key attributes of the adapter engine of SAP XI.

SAP XI Adapter Engine

- The integration server comes with two built-in adapters – the IDoc and the HTTP adapter
- By default, a J2EE adapter engine is installed centrally on the integration server.
- If needed, additional adapter engines can be installed non-centrally.
- All these J2EE adapter engines are configured centrally in the integration directory of XI.
- The SAP PCK offers an easy way to exchange messages between an application system and SAP XI, without sophisticated services (like routing and cross-component BPM) and design of collaboration knowledge.
- Configuration and administration of the PCK are always done locally.

This slide also lists adapter engine attributes.

SAP XI adapters by SAP

Adapters connect the integration engine to existing SAP systems and to other systems. These adapters are developed by SAP:

- ▶ Application adapters
 - RFC Adapter
 - IDOC Adapter
- ▶ Technical adapters
 - File/FTP Adapter
 - Database (JDBC) Adapter
 - Java Messaging Service (JMS) Adapter
 - Plain HTTP Adapter
 - SOAP Adapter
 - Mail Adapter
 - SAP Business Connector Adapter
 - MarketPlace Adapter
- ▶ Industry standard adapters
 - CIDX Adapter
 - RNIF Adapter

You can see here the core adapters provided by SAP.

SAP XI adapters from other vendors

BAAN	BAAN Adapter	iWay
JD Edwards OneWorld XE	JD Edwards OneWorld XE Adapter	iWay
Oracle	Oracle Adapter	iWay
Peoplesoft	Peoplesoft Adapter	iWay
QAD MFG/PRO	QAD MFG/PRO Adapter	iWay
Siebel	Siebel Adapter	iWay
CICS	CICS Adapter	iWay
IMS/TM	IMS/TM Adapter	iWay
Telnet (3270)	Telnet (3270) Adapter	iWay
EDI standards in the automotive industry	Automotive Industry Adapter	SEEBURGER
EDI standards in the consumer products industry	Consumer Products Industry Adapter	SEEBURGER
EDI standards in the high tech industry	High Tech Industry Adapter	SEEBURGER
EDI standards in the pharmaceutical industry	Pharmaceutical Industry Adapter	SEEBURGER
EDI standards in the pharmaceutical industry	Retail Industry Adapter	SEEBURGER
EDI standards in the chemical industry	Chemical Industry Adapter	SEEBURGER
EDI standards in the paper industry	Paper Industry Adapter	SEEBURGER
EDI standards in the Aerospace & Defense industry	Aerospace & Defense Industry Adapter	SEEBURGER
UCCnet	UCCnet Adapter	iWay
Transora	Transora Adapter	iWay

These are some of the major adapters SAP is leveraging from their two key partners in the adapter area, Seeburger and iWay.

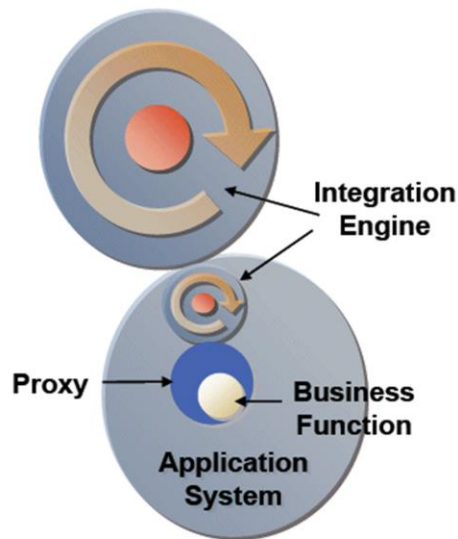
SAP XI adapter by SAP

Adapter	Message Protocol	Transport Protocol	Target System	Located in
Native XI message protocol	XI 2.0, XI 3.0	HTTP/S	SAP System, Business Partner	Integration Server
Plain HTTP	HTTP	HTTP/S	3 rd Party System	Integration Server
IDoc	IDoc	IDoc	SAP System	Integration Server
RFC	RFC (RFC-XML)	RFC	SAP System, EDI Subsystem	Adapter Engine (J2EE)
SOAP	SOAP	HTTP/S	3 rd Party System	Adapter Engine (J2EE)
File	File, File/Context C.	File	File-System	Adapter Engine (J2EE, J2SE)
FTP	File, File/Context C.	FTP	FTP-Server	Adapter Engine (J2EE, J2SE)
JDBC	JDBC 2.0	JDBC 2.0	DB-System	Adapter Engine (J2EE, J2SE)
JMS	JMS	Various JMS-Providers (e.g. SonicMQ, MQSeries, WebMethodsMQ)	Queuing-System	Adapter Engine (J2EE, J2SE)
Marketplace	MML	HTTP/S, JMS	Marketplaces	Adapter Engine (J2EE)
RosettaNet	RNIF 2.0	HTTP/S, SMTP	Business Partner	Adapter Engine (J2EE)

The table on this slide highlights various technical details of the most popular SAP XI adapters.

Proxy generation and proxy runtime

- The proxy generation allows to generate proxies (classes) into application systems for communication.
- An application program can only exchange messages using these proxies if the proxy runtime is installed in the application system.
- Proxies connect to the Integration Server using the SOAP-based XI message protocol.
- The XI message protocol is based on SOAP with attachments communication, using HTTP or HTTPS as transport protocol.
- The proxy generation supports target languages ABAP and Java.



Between SAP XI and new SAP business systems that have an SAP Web Application Server runtime of release 6.40 and higher, a new communication style is supported.

SAP enabled these new business systems to be connected with an SAP XI system, and to use existing interface definitions to generate ABAP or JAVA based proxy objects in the target business system. This proxy can then be used by the business system to send data or by the integration server to send data to the business system depending if it is an inbound or outbound proxy.

The protocol used to do this is SOAP/HTTP with custom SAP SOAP headers which are used to run enhanced logic on top of this carried control information.

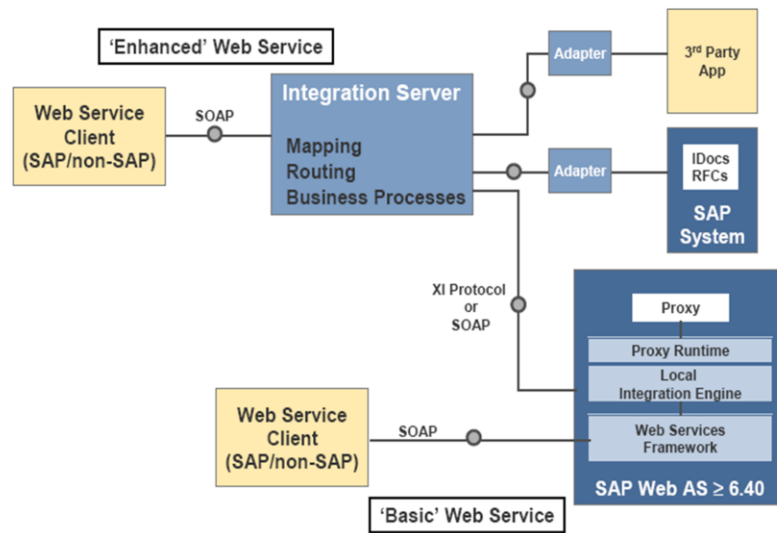
This proxy approach hides the real business function from the connecting integration broker and delivers therefore an abstraction layer to decouple integration logic from business logic.

Section

SAP XI usage scenarios

This last section discusses two usage scenarios for the SAP XI software.

Adapter based backend integration



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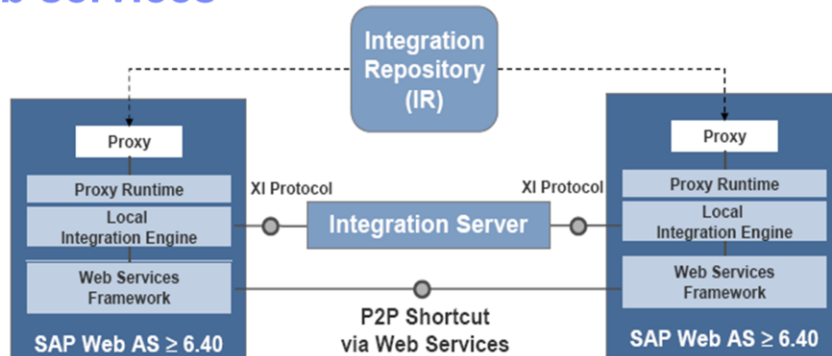
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This slide shows how the integration server can be used to access any backend using adapters and to provide to the external world a so-called enhanced Web Service. This means more intelligent integration logic is run in between.

The lower layer shows that also any Web service client can be used to call using SOAP/HTTP business functions directly in any SAP business system that already has the new Web Services Framework included. This framework is from the SAP Web Application Server 6.40 and higher. This is then named "basic" Web service.

Synchronous peer-to-peer shortcut in XI using Web services



- Without routing, mapping, business process management capabilities
- Joint use of Web Services Framework of SAP XI and SAP Web AS
 - Synchronous XI inbound proxies can be used natively as Web services in SAP Web AS like Remote Function Modules
 - Unified programming model and proxy generation for XI and Web services in SAP Web AS

Finally this slide shows that new business systems can do native peer-to-peer communication using their existing Web service capabilities. Whenever more extensive communication is required, a broker based integration needs to be evaluated. SAP created a dedicated XI protocol that can be used to leverage an SAP XI instance in the communication. This special protocol is SOAP/HTTP Web services but with additional SAP specific headers; for example, for routing information.

References

- Web

- ▶ SAP Exchange Infrastructure <http://www.sap.com/xi>

For more information on the SAP Exchange Infrastructure, go to the address listed here.

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Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. All customer examples described are presented as illustrations of how those customers have used IBM products and the results they may have achieved. The actual throughput or performance that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput or performance improvements equivalent to the ratios stated here.

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