SAP Exchange Infrastructure 3.0

Technical Infrastructure

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Icons

The following icons are used in this document as visual aids.

Icon Meaning **Caution** **Example** **Note** **Recommendation**

Contents

Preface

This document provides you with background information to help planning a technical infrastructure for the SAP Exchange Infrastructure (SAP XI).

The purpose of this guide is to:

- Give you an understanding of the technical requirements of SAP Exchange Infrastructure.
- Explain design criteria and solutions for those requirements.
- Provide guidelines for planning your technical system landscape.
- Illustrate a range of technical solutions from small test and demo systems all the way up to fully scaled, highly available and secure setups.

Who Should Read This Document

Use this guide as a starting point for planning the technical infrastructure for your SAP XI. It is written for anyone interested in the technical implementation aspects and IT infrastructure for SAP XI. This includes:

- System architects
- IT managers responsible for implementing and operating applications based on SAP XI
- System integration consultants

Status and Version History

March 2004: First public release.

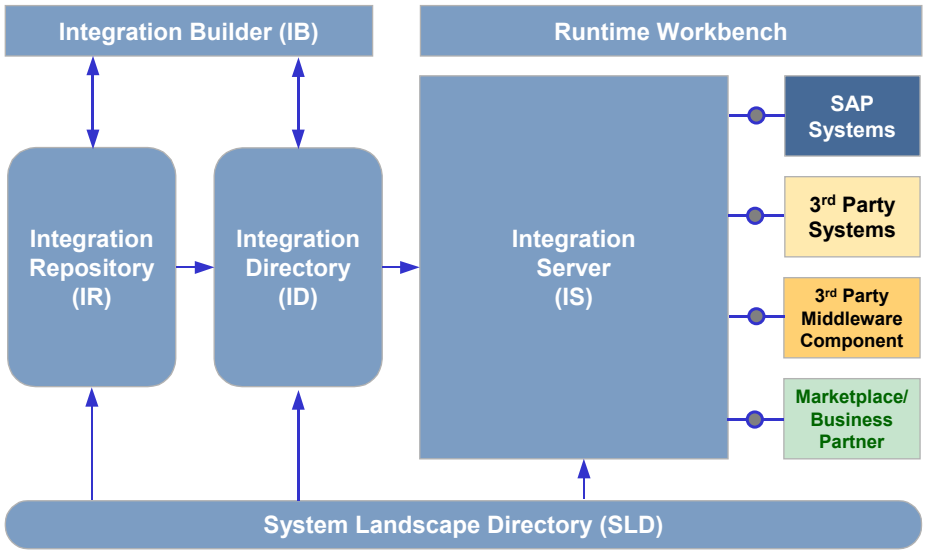
Source and Feedback

You can find this document and related ones on technical infrastructure topics in the SAP Service Marketplace at http://service.sap.com/ti. If you do not have access to that Web site send email to network@sap.com. Please use this address also for any kind of feedback regarding this document.

1 Functional Components - Overview

In this chapter, we give you a high-level overview of the functional components of the SAP Exchange Infrastructure (SAP XI) to help you understand what they do. A detailed description thereof can be found in the XI specific part of the Masterguide for SAPNetWeaver on the SAP Service Marketplace under alias /instguidesnw04.

The following graphic shows the components that make up the SAP Exchange Infrastructure as well as some business systems running applications that are integrated through the exchange. The business systems comprise SAP applications as well as 3rd party applications. The integration is achieved by exchanging XML based message objects through the Integration Server. To adopt different business systems the Integration Server does comprehensive routing and mapping using specific integration data out of the Integration Directory and Integration Repository as well as system specific data of the System Landscape Directory.



The SAP Exchange Infrastructure consists of the following functional components:

- Integration Builder
- Integration Repository
- Integration Directory
- Integration Server
  - Integration Engine
  - Business Process Engine
- Adapter Engine
- Runtime Workbench

- System Landscape Directory

To use the SAP Exchange Infrastructure directly and without adapters applications need the following proxy components:

- Proxy Framework
  - Proxy Generator
  - Proxy Runtime

1.1 Integration Builder (IB)

The Integration Builder is the tool that is needed during design and configuration of the SAP Exchange Infrastructure to access the “Integration Repository” and the “Integration Directory”. It uses Java Web Start during design time to develop new interfaces and mappings and during configuration time to configure services, routings and mappings.

1.2 Integration Repository (IR)

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.

1.3 Integration Directory (ID)

The Integration Directory contains detailed collaboration knowledge about the current system landscape around the SAP Integration Server. 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.

1.4 Integration Server (IS)

The Integration Server is the central part of the SAP Exchange Infrastructure. It 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, but it is the specific configuration that activates its role as a central Integration Server.

Integration Engine

The Integration Engine is one central part of the Integration Server. It offers the main services for processing messages, like mapping and routing, guaranteeing quality of service (e.g. exactly-once delivery of messages).

Business Process Engine

To support cross component Business Process Management the Integration Server of SAP XI also contains a Business Process Engine. This component takes care of the execution and persistency of cross component integration processes.

Adapter Engine

The (J2EE-) Adapter Engine hosts adapters that convert various protocols and data formats into the XI message protocol. A list of adapters delivered with XI 3.0 is provided in chapter Connectivity.

1.5 Runtime Workbench (RWB)

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.

1.6 System Landscape Directory (SLD)

The System Landscape Directory is composed of the Component Repository and the Landscape Directory. The Component Repository includes a description of all SAP Components whereas the Landscape Directory includes a complete description of the actually installed SAP system landscape.

1.7 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. By using the Proxy Runtime, they create or parse XML messages going to or coming from the Integration Server correspondingly.

The Proxy Generation supports target languages ABAP and Java.

Proxy Generation and Proxy Runtime for ABAP

The Proxy Generation and Proxy Runtime for ABAP are part of the SAP Web Application Server 6.40 and no specific installation is needed. The ABAP-Proxy Generator uses interface descriptions available from the Integration Repository to generate the ABAP classes.

Proxy Generation for Java

The Proxy Generation for Java is used to generate proxies (Java Classes) for application programming. It is integrated in the Integration Builder. Similar to the ABAP Proxy Generator, the Java-Proxy Generator uses interface descriptions available from the Integration Repository to generate the Java classes.

Java Proxy Runtime

The Java Proxy Runtime (JPR) is installed together with the J2EE Adapter Engine. It uses the messaging system of the Adapter Engine to transport messages to and from the Integration Server.

2 Technical Architecture

In this section we go into the technical details of the SAP Exchange Infrastructure. We describe the technical components that make up the system, what they do and how they communicate with each other.

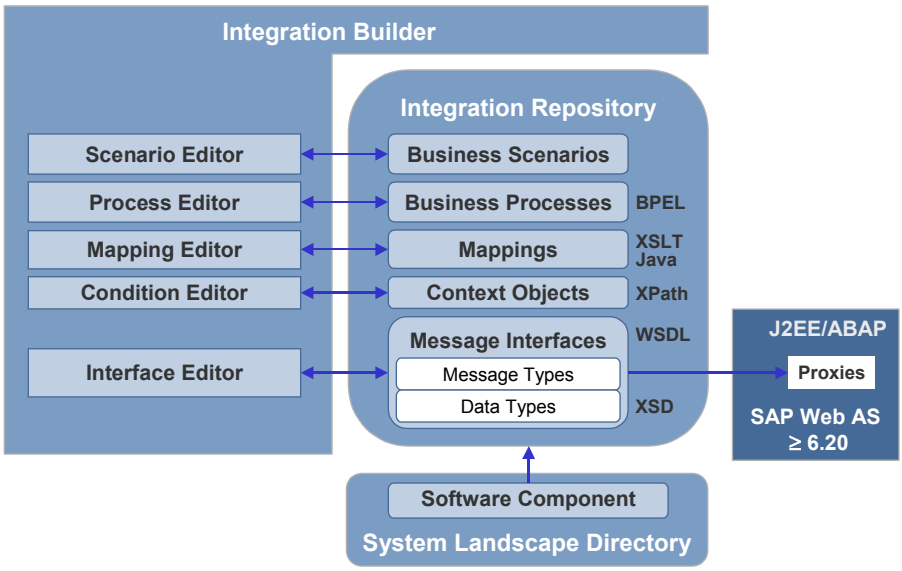
For SAP Exchange Infrastructure it is not only important to know about internal communication between the different components of XI, but also to be aware of security aspects of all communication ways. Especially, connections to external systems should be taken into account. All necessary information about security is available in the SAP XI Security Guide at SAP Helpportal.

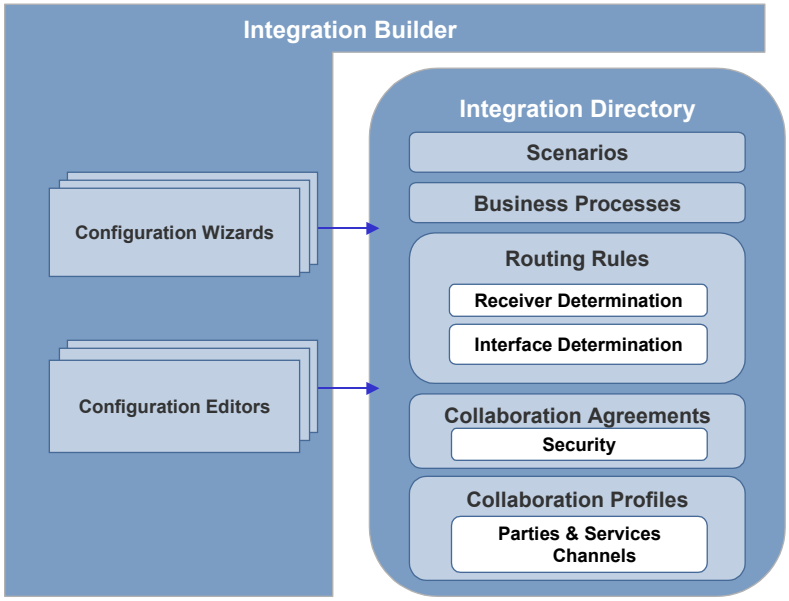
The following sub-sections provide more details about special aspects and components of an SAP Exchange Infrastructure installation.

2.1 Design and Configuration

The central part of the SAP Exchange Infrastructure is the Integration Server that receives message objects from the sending application and sends these message objects to the requested application. This message object transfer is run through different adapters to enable different kinds of applications to connect to the Integration Server using different protocols and data formats. All necessary data for logical and technical routing as well as mapping is provided to the Integration Server by the Integration Directory. All these data is persistently cached within the database of the Integration Server. That makes the Integration Server resilient against communication failure with the Integration Directory and ensures the "standalone" capability of this runtime critical component. Changes or updates of the routing or mapping configuration within the Integration Server require the connection with the Integration Directory. The Integration Directory itself uses data provided by the Integration Repository and the global System Landscape Directory.

While the System Landscape Directory is operated using an Internet browser, specific client software is used to manage the Integration Repository and Directory.



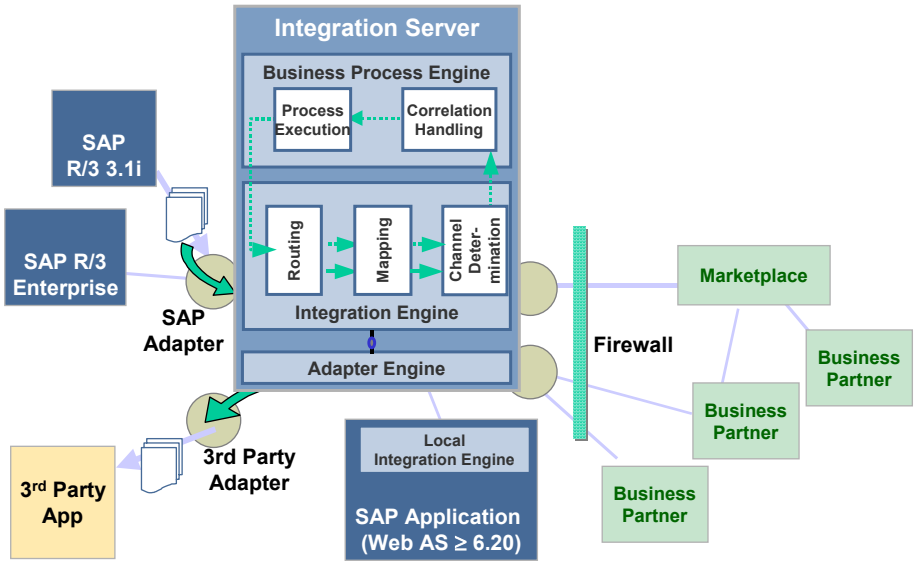


2.2 Message Processing

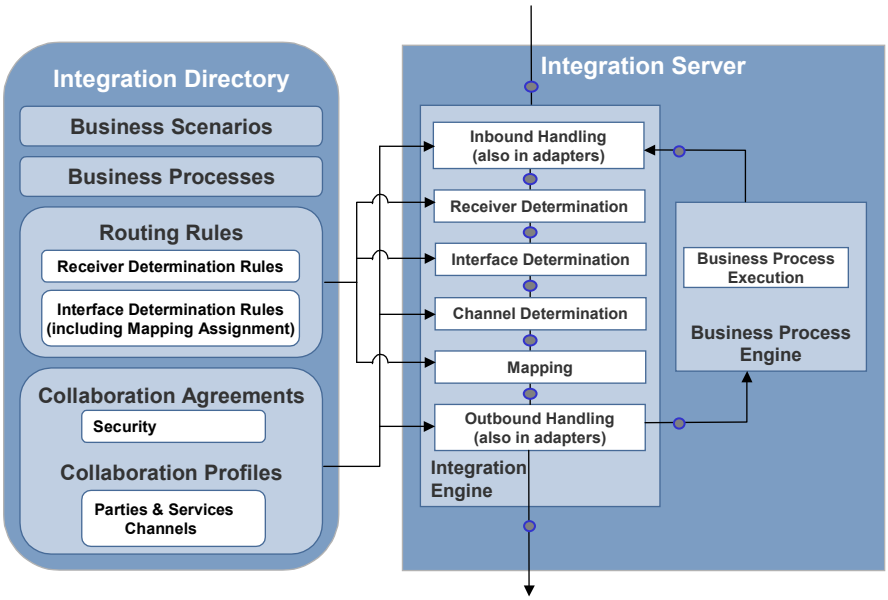
This section explains how to connect the business systems (applications) with the SAP Exchange Infrastructure.

The Integration Server provides various adapters supporting different kinds of protocols and data formats. Natively the Integration Server supports the XI message protocol, which is based on SOAP with attachments communication, using HTTP(S) as transport protocol. This protocol can be used for communication to business systems as well as business partners. In case a system or partner does not support the XI message protocol, adapters are used. The adapters convert the application specific message and data format into the Integration Server's internal XML based message format.

The Integration Server then applies predefined routing and mapping rules on the incoming message objects to obtain the outgoing message. After determining the target application system the outgoing message object is then again passed through an adapter. This adapter is required to convert the message to the target systems message and data format. Thus, different kinds of systems are enabled to connect to the Integration Server.



The following figure shows, where directory configuration influences message processing:



2.3 Connectivity

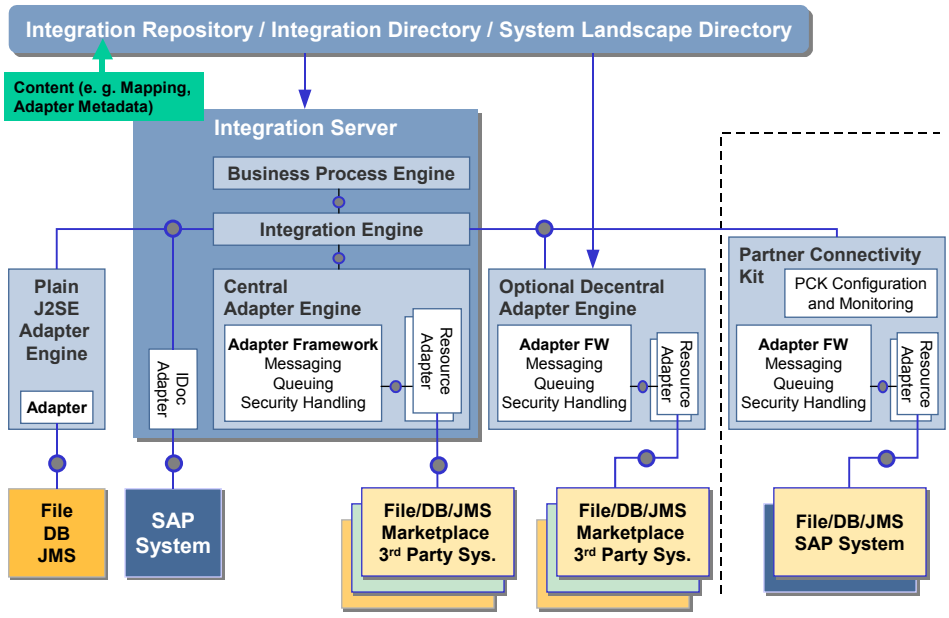
SAP XI offers a wide range of adapters that allow communication with many different application systems, using various message protocols. The Integration Server comes with two built-in adapters (IDoc, HTTP), but most adapters are hosted by the Adapter Engine.

Per 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.

Furthermore, the J2SE Adapter Engine is still available with SAP XI 3.0, but with less adapters than in XI 2.0. The J2SE Adapter Engine is always installed separately and all adapters therein need to be maintained individually.

For customers needing the connection to an SAP XI system, but not it's full functionality (like design of collaboration knowledge, ccBPM), it is also possible to use the SAP Partner Connectivity Kit (PCK). 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. Currently some standard adapters are included in the SAP PCK (like File, Ftp, JDBC), but it can also be used by customers to develop their own adapters. Typically, smaller partners of an XI customer use the PCK to integrate to their partner. This guide will not go in more detail for the PCK. All relevant information is available at the SAP Helpportal.

The following picture shows the main adapter availability with SAP XI:



The adapters offered by SAP XI allow the communication with different kinds of application systems. The used protocols are summarized in the following table:

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	3rd 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	3rd 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)

In addition to adapters provided by SAP there are also 3rd Party Adapters available. These are hosted by the J2EE Adapter Engine as well.

Adapter Engines

Adapter Engine (J2EE)

The J2EE Adapter Engine is the central configuration tool for adapters used with SAP Exchange Infrastructure. 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. This means that 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. Additional functions include an enhanced monitoring and increased downtime security due to the J2EE-based cluster operation of the Adapter Engine.

The J2EE Adapter Engine is an integral part of the Integration Server of SAP Exchange Infrastructure and thus generally serves as a central Adapter Engine. However, it is optionally possible to install the J2EE Adapter Engine non-centrally, if this meets the requirements at customer side in a better way. (e.g. to install the J2EE Adapter Engine close to an application system).

Plain J2SE Adapter Engine

The plain J2SE Adapter Engine is a separate software component that also needs to be installed separately. Its features are the same as those of the Adapter Engine shipped with SAP XI 2.0, but the number of provided adapters is reduced.

The plain J2SE Adapter Engine provides some adapters as a standalone version with restricted functions for operating systems that do not support the SAP J2EE server, but that do have JDK 1.3.1 or higher. Therefore, the plain J2SE Adapter Engine should only be used if the platform prerequisites do not allow to use the J2EE-based Adapter Engine. In addition, the lack of central configuration and security support, indicate the use of the Adapter Engine (J2EE) wherever possible.

Adapters

Plain HTTP Adapter

The plain HTTP adapter is used by external (non-SAP) systems to connect to the SAP Exchange Infrastructure using the native HTTP interface.

IDoc Adapter

The IDoc adapter is used by SAP components to connect to the SAP Exchange Infrastructure using IDoc communication. No additional components are necessary.

RFC Adapter

The RFC adapter is used by SAP components to connect to the SAP Exchange Infrastructure using SAP's RFC functions. It supports existing SAP systems from release 3.1x. Therefore, it enables existing SAP landscapes to use the functions of the SAP Exchange Infrastructure.

SOAP Adapter

The SOAP adapter allows the exchange of SOAP messages between remote clients or Web service servers and the Integration Server.

File/FTP Adapter

The file/FTP adapter enables you to exchange data with the Integration Server by means of a file interface or an FTP server.

JDBC Adapter

The JDBC Adapter enables the connection of database systems with the Integration Server. The adapter converts database content to XML messages and the other way around.

JMS Adapter

With the JMS Adapter it is possible to connect messaging-systems to the Integration Engine. Data can be sent from a messaging-system to the Integration Engine or the other way around (in this case by sending XML-messages). For each sending direction a specific configuration is necessary.

Marketplace Adapter

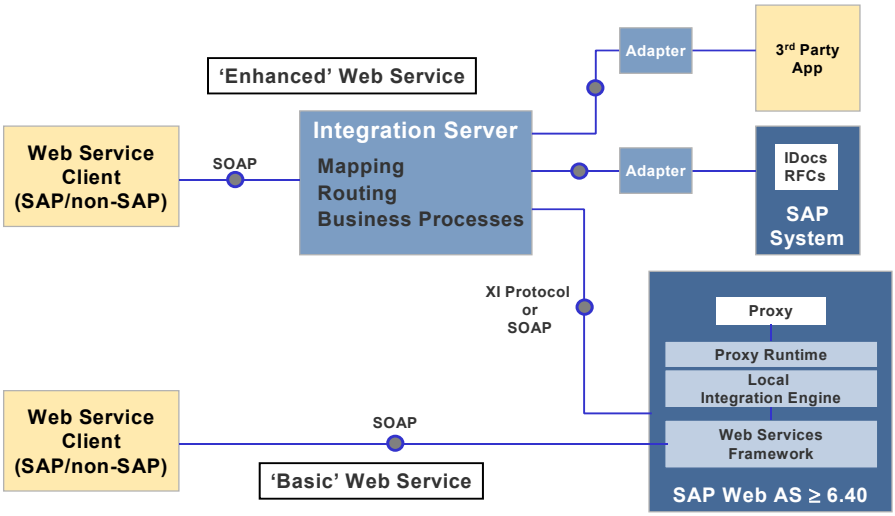
The Marketplace Adapter can be used to connect the Integration Server to Marketplaces. It allows the exchange of messages by converting the XI message-format to the marketplace format, Marketset Markup Language (MML), and vice versa.

RosettaNet Adapter

The RNIF[1] (RosettaNet Implementation Framework) Adapter supports RosettaNet, a standard used for data communication in the High-Tech industry, and is based on RNIF version 2.0. It is used for sending messages between the Integration Server and a RosettaNet-compliant system by transforming the XI message format into RosettaNet PIP message format and so on.

2.4 XI and Web Services

The Integration Adapters are not necessary if the participating communication partners make use of the Proxy Runtime to generate the Integration Server's native XML based message format. In this case SAP XI offers “enhanced” Web Services by forwarding messages from Web Service Clients to the Web Services Framework of SAP Web Application Server (SAP Web AS) and using the respective proxies to deliver the messages.



Once connected to the Integration Server each system can exchange messages with all other systems that are known to the Integration Server.

[1] RNIF is an open network application framework that enables business partners to collaboratively run RosettaNet Partner Interface Processes (PIPs).

3 Infrastructure / Installation Scenarios

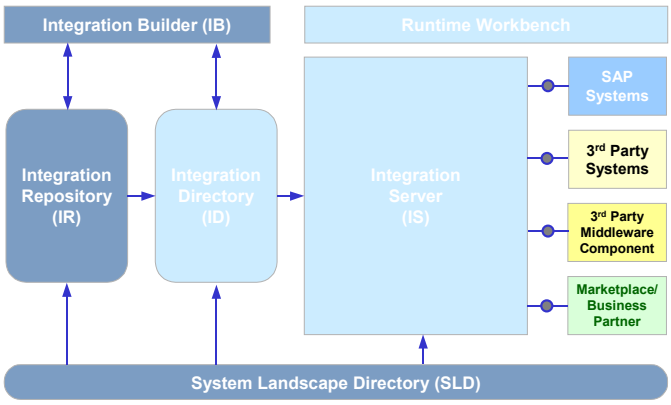
3.1 Components of the SAP Exchange Infrastructure

The components of the SAP Exchange Infrastructure can be classified by their runtime relevance and their throughput relevance. The central Integration Server and its attached adapters are crucial for the operation and represent the single points of failure for the entire SAP Exchange Infrastructure. Business systems and their individual adapters are essential for their own business scenario but with respect to the entire SAP Exchange Infrastructure they are no single points of failure.

Components needed for design and development

Integration Repository as part of the Integration Builder (including client and proxy generator for Java)

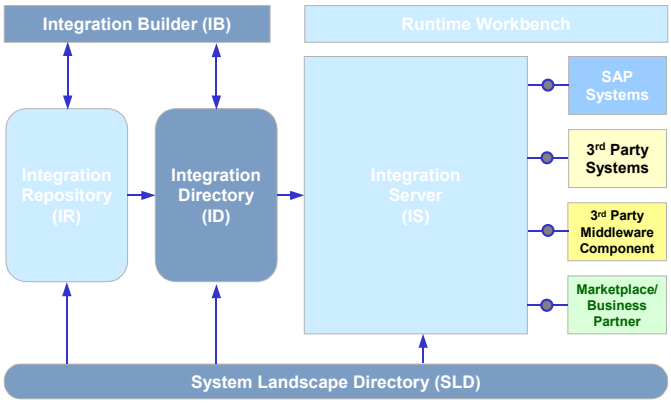
System Landscape Directory



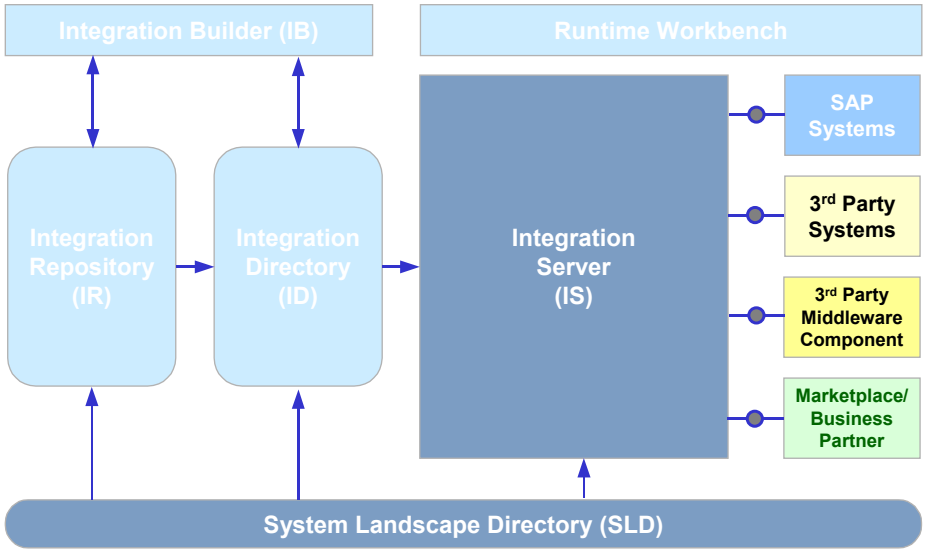
Components needed for configuration of SAP XI

Integration Directory as part of the Integration Builder (including client)

System Landscape Directory



Critical Components for runtime and throughput



Integration Server

The Integration Server runs and depends on the SAP Web Application Server. Most parts of the Integration Server run within the ABAP part but mapping is realized in Java. The mapping part is a registered RFC server that runs within the J2EE part using JCO. To ensure the best possible throughput each mapping RFC server has to be registered to the local SAP Gateway of the local instance. You can use "localhost" hostname to configure the RFC destination.

Scaling of the ABAP part is done by adding dialog instances (application servers) to the SAP Web AS.

Scaling of the J2EE part can be accomplished by increasing the number of J2EE server processes on one server as well as on multiple application servers.

High availability can be accomplished by running the central instance on a highly available cluster server.

For more information on HA procedures see:

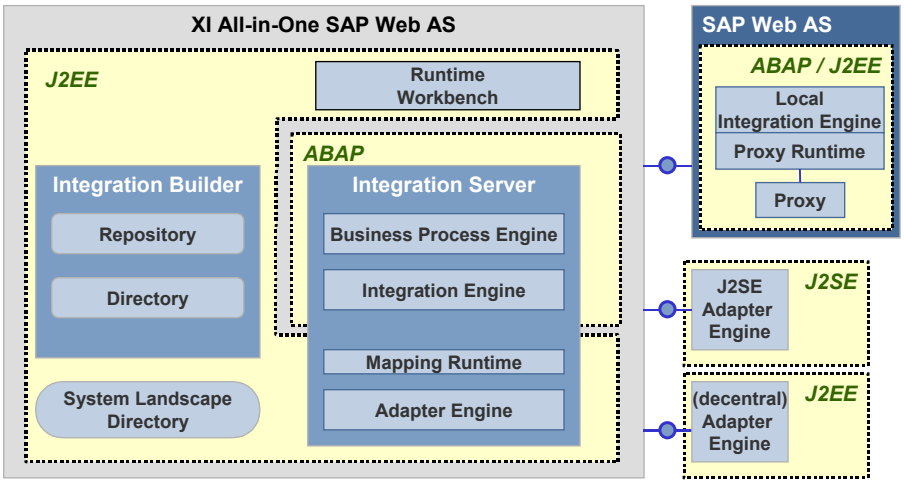
SAP Web AS in Switchover Environments	see: http://service.sap.com/HA
SAP XI High Availability Guide	see: http://service.sap.com/xi

Critical Components for Business scenarios

Components that are critical to particular business scenarios are the business systems involved and all adapters or proxy runtime components not running on the Integration Server. The use of such adapters or of the Java Proxy Runtime depends on the specific business scenario. Scalability and availability of business systems is not covered here.

3.2 All-in-One Scenario

All-in-One scenario means that all installable components run within a single SAP System (see XI All in One Server). Although most components run within the SAP Web Application Server the RFC and MarketPlace Adapter include standalone Java parts.



The standardized scenario for SAP XI 3.0 is the All-in-One scenario, which means that all components of the SAP Exchange Infrastructure are installed and run on a single host. The only external components are business systems, their respective adapters and proxy runtime as well as the System Landscape Directory (SLD), the Central Monitoring Server and – if needed - the non-central Adapter Engine.

The SAP Exchange Infrastructure 3.0 allows the All-in-One scenario with all released Unicode platforms of SAP WebAS 6.40.

3.3 Scaling of All-in-One Scenario

The most critical part regarding availability and throughput is the Integration Server. The Integration Server as well as the Integration Builder, System Landscape Directory and the Runtime Workbench run within the SAP Web Application server (ABAP and J2EE part) and therefore are scaled in the same way as SAP Web AS. Scaling of the SAP Web AS is easily accomplished by adding additional application servers (dialog instances). That means ABAP and J2EE components will be scaled in the same manner and simultaneously by just adding more servers.

Integration Adapters not running within the SAP Web AS can be scaled by adding multiple instances of the same adapter on the same and/or different servers.

Load balancing of incoming requests can be done via message server redirect or the new SAP Web Dispatcher.

Appendix

Related Documentation

SAP Exchange Infrastructure (http://service.sap.com/xi)

SAP Network Integration Guide (http://service.sap.com/network or mail to network@sap.com)

Platform and Technology Information Center (http://service.sap.com/platforms)

R/3 Security Guide (http://service.sap.com/security → Guidelines and Audits)

Sizing (http://service.sap.com/sizing)