SAP Exchange Infrastructure 2.0

Technical Infrastructure

SAP AG
Neurottstraße 16
69190 Walldorf
Germany
T +49/18 05/34 34 24
F +49/18 05/34 34 20
www.sap.com

Copyright

Notices

The information contained herein may be changed without prior notice.

SAP AG provides this publication "as is" without warranty of any kind, either express or implied, including, but not limited to, the implied warranties of non-infringement, merchantability or fitness for a particular purpose.

SAP AG assumes no responsibility for any errors or omissions in these materials. SAP may make changes in the product and/or programs described in this publication at any time without notice.

Trademarks

Some software products marketed by SAP AG and its distributors contain proprietary software components of other software vendors.
Microsoft®, WINDOWS®, NT®, EXCEL®, Word®, PowerPoint® and SQL Server® are registered trademarks of Microsoft Corporation.
IBM®, DB2®, DB2 Universal Database, OS/2®, Parallel Sysplex®, MVS/ESA, AIX®, S/390®, AS/400®, OS/390®, OS/400®, iSeries, pSeries, xSeries, zSeries, z/OS, AFP, Intelligent Miner, WebSphere®, Netfinity®, Tivoli®, Informix and Informix® Dynamic ServerTM are trademarks of IBM Corp. in USA and/or other countries.
ORACLE® is a registered trademark of ORACLE Corporation.
UNIX®, X/Open®, OSF/1®, and Motif® are registered trademarks of the Open Group.
Citrix®, the Citrix logo, ICA®, Program Neighborhood®, MetaFrame®, WinFrame®, VideoFrame®, MultiWin® and other Citrix product names referenced herein are trademarks of Citrix Systems, Inc.
HTML, DHTML, XML, XHTML are trademarks or registered trademarks of W3C®, World Wide Web Consortium, Massachusetts Institute of Technology.
JAVA® is a registered trademark of Sun Microsystems, Inc.
J2EE™ is a registered trademark of Sun Microsystems, Inc.
JAVASCRIPT® is a registered trademark of Sun Microsystems, Inc., used under license for technology invented and implemented by Netscape.
SAP, SAP Logo, R/2, RIVA, R/3, SAP ArchiveLink, SAP Business Workflow, WebFlow, SAP EarlyWatch, BAPI, SAPPHIRE, Management Cockpit, mySAP, mySAP.com, and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP AG in Germany and in several other countries all over the world. MarketSet and Enterprise Buyer are jointly owned trademarks of SAP Markets and Commerce One. All other product and service names mentioned are the trademarks of their respective owners.

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

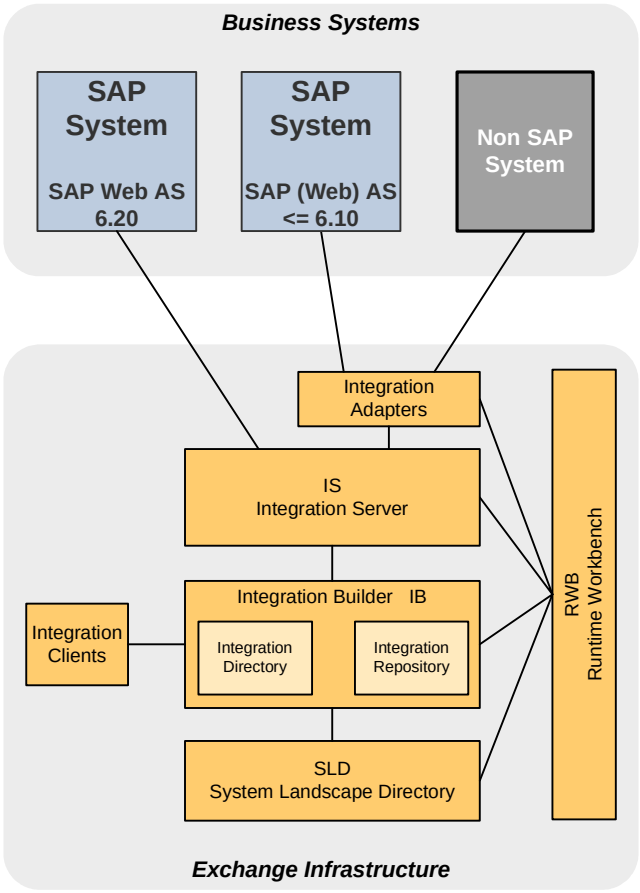
December 2002: First public release.

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 Overview

In this chapter, we give you a very high-level overview of the functional components of the SAP Exchange Infrastructure (SAP XI) to help you understand what they do. 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.



1.1 Functional Components

The SAP Exchange Infrastructure consists of the following components:

- Integration Server
- Integration Adapters
- Runtime workbench
- Integration Builder
  - Integration Repository

    - Integration Directory
- Integration Clients
- System Landscape Directory

Applications need the following proxy components to use the SAP Exchange Infrastructure directly and without adapters.

- Proxy Framework
    - Proxy Generator
    - Proxy Runtime

1.2 Integration Server (IS)

The Integration Server is the central part of the SAP Exchange Infrastructure. It receives messages from the sender applications and then 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.

1.3 Integration Adapters

Integration Adapters are used to convert various protocols and data formats into the Integration Servers XML based message objects and vice versa. The Integration Server comes with some built in adapters but most adapters are additional components.

1.4 Runtime Workbench (RWB)

The Runtime Workbench is used to test and monitor the individual components of the SAP Exchange Infrastructure. Furthermore, you can display the business systems that are defined in the system landscape. If these systems are based on SAP Web Application Server 6.20 or higher, you can also make security settings for communicating with the Integration Server.

1.5 Integration Builder

Integration Repository (IR)

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

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 relations, mapping relations, endpoint definitions, logon data and the specific system landscape.

The Integration Directory details the information from the Integration Repository that is specific to the configuration.

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 Integration Clients

The Integration Repository and Directory require specific Java client software which is stored on the Integration Server and will be automatically installed on the client side using Java Web Start. This client software can be used during design time to develop new interfaces and mappings and to configure services, routings and mappings.

1.8 Proxy Framework

The Proxy Framework consists of the Proxy Generator and the Proxy Runtime.

The Proxy Framework for ABAP (generator and runtime) is part of the SAP Web Application Server and no specific installation is needed.

Proxy Generator for Java

The Proxy Generator for Java is used to generate proxies (Java Classes) for application programming. It makes use of the Integration Repository which contains all interface definitions.

Java Proxy Runtime

The Proxy Runtime for Java is mandatory for all Java programs to exchange messages with the SAP Integration Server. In doing so the proxy runtime converts the used java classes into XML messages. These XML messages are sent to the Integration Server using http protocol.

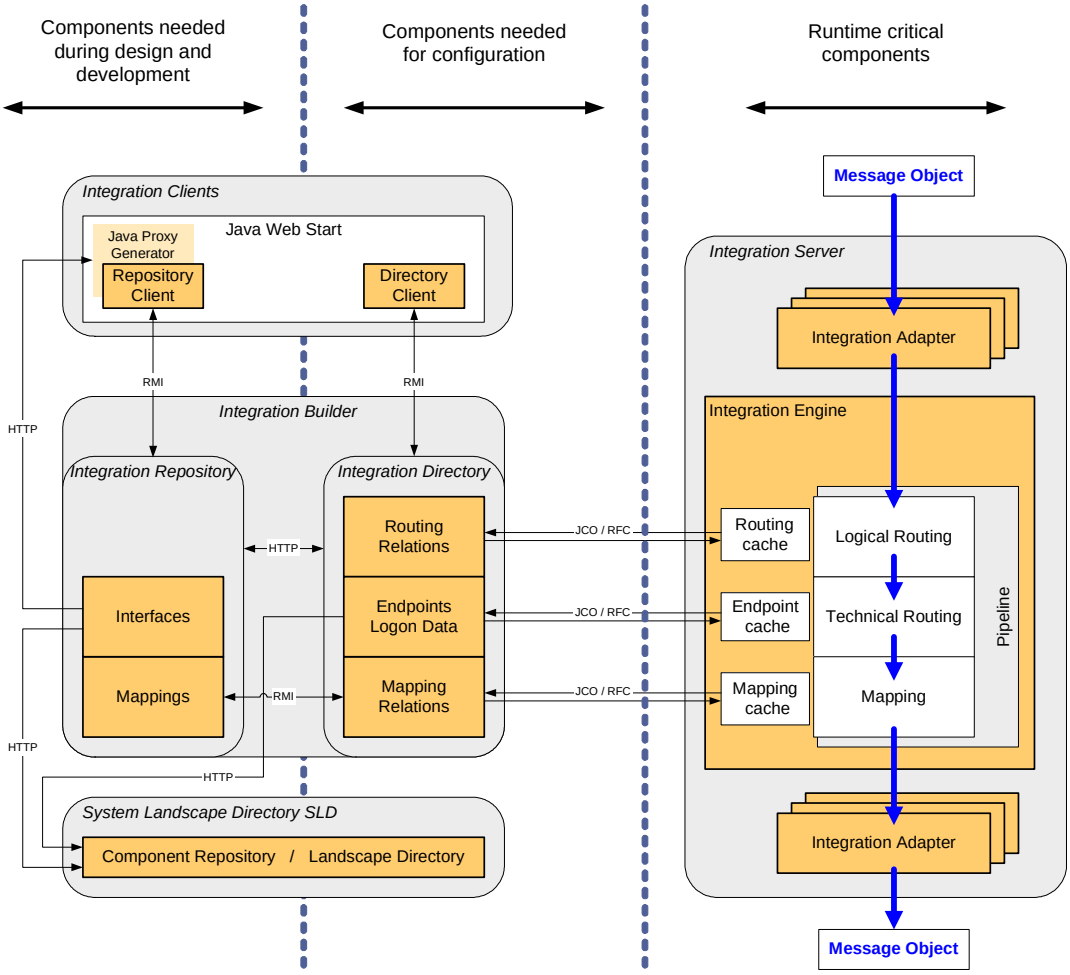
2 Technical Architecture

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. The following sub-sections provide more details about special aspects and components.

2.1 Internal Communication

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.

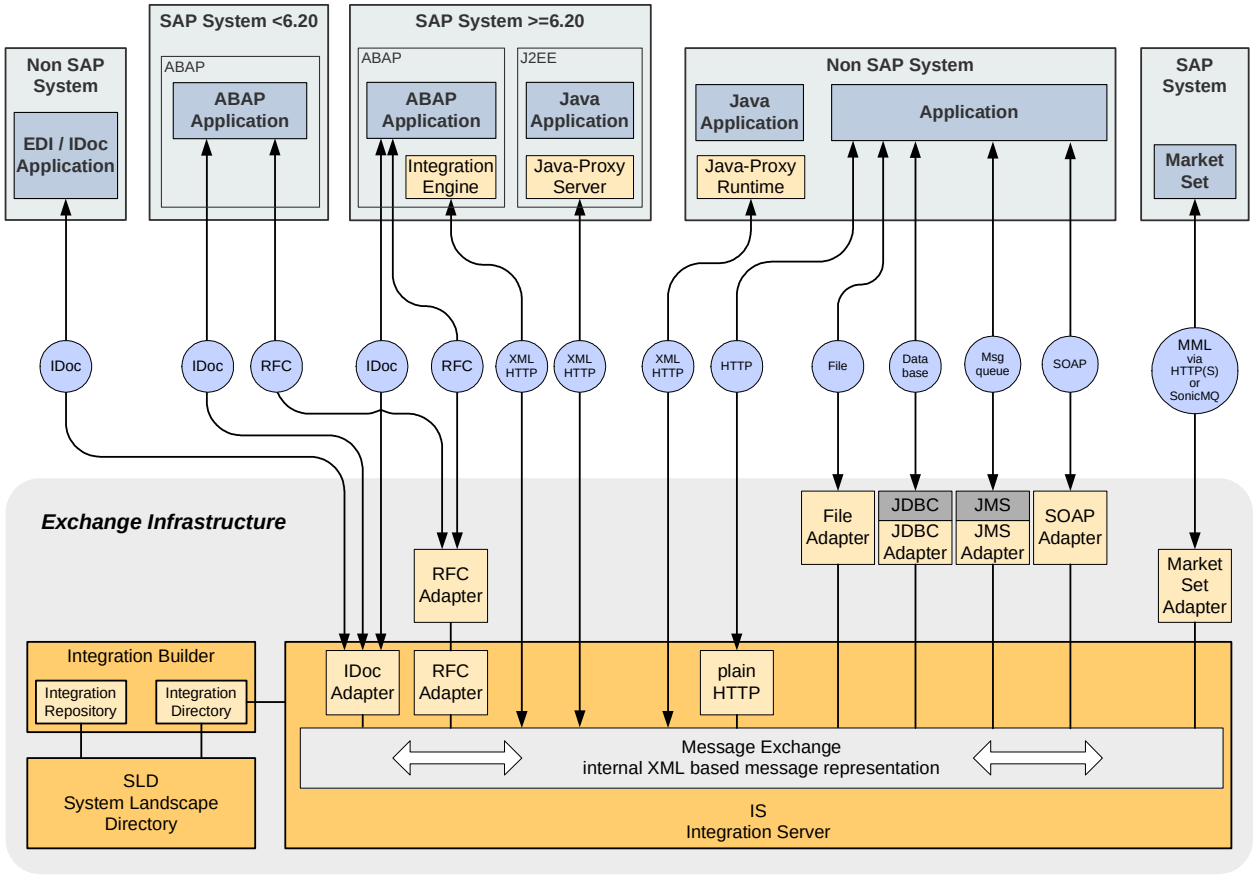
While the System Landscape Directory is operated using an Internet browser, specific client software is used to manage the Integration Repository and Directory.



2.2 External Communication

This section explains how to connect the business systems (applications) with the SAP Exchange Infrastructure. The Integration Server provides various Integration Adapters supporting different kinds of protocols and data formats. 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 required to convert the message to the target systems message and data format. This enables different kinds of systems to connect to the Integration Server. 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.

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



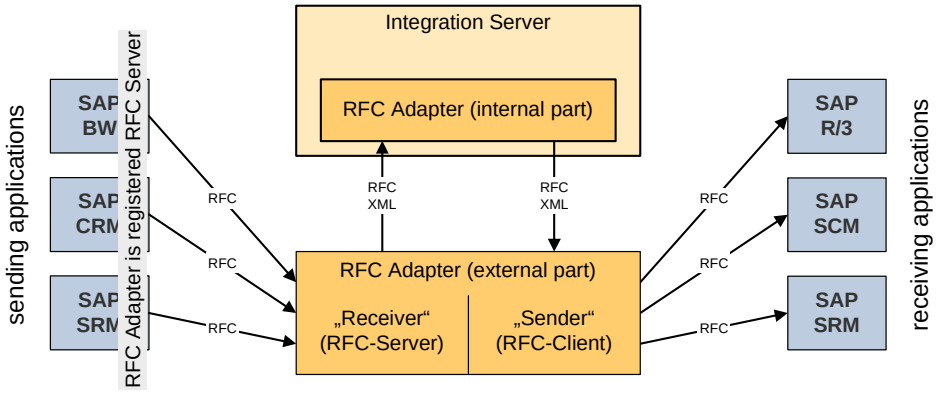
2.3 Integration Adapters

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.

The RFC adapter consists of an internal and external part. The internal part is included in the Integration Server and no separate installation is needed. The external part converts the RFC data structure into the XML based data structure needed by the integration server. It is implemented as a standalone Java application but installed automatically during installation of the SAP Exchange Infrastructure.

Towards the sending application the RFC adapter is acting as a registered RFC server. Therefore the RFC adapter registers itself to the SAP gateway of all configured systems. On the other hand the RFC adapter is acting as a RFC client towards the receiving application and calls the receiver function module there.



IDoc Adapter

The IDoc Adapter is used by SAP components to connect to the SAP Exchange Infrastructure using IDoc communication. The IDoc Adapter is part of the Integration Server. No additional components are necessary.

Plain HTTP Adapter

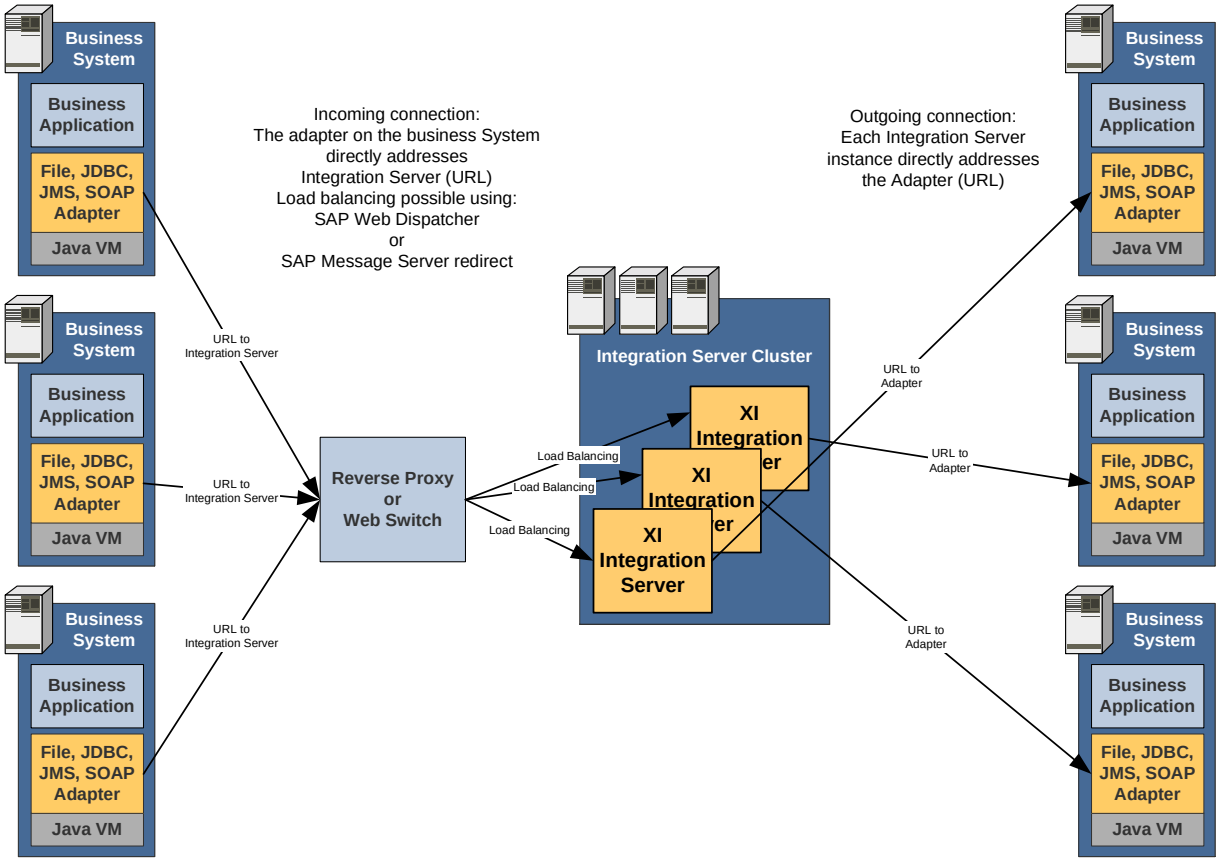
The Plain HTTP Adapter is used by external (non SAP) systems to connect to the SAP Exchange Infrastructure using the native HTTP interface. This Adapter is part of the Integration Server and SAP Web Application Server.

Adapter Engine

The Adapter Engine is used configure, test, start and stop different adapters. It also provides user and password management for use with adapters. The Adapter Engine is a separate software component.

File/JDBC/JMS/SOAP Adapter

The File/JDBC/JMS adapter can be considered as a separate system that is contacted using a URL and HTTP protocol. The Integration Server uses a dedicated URL to address the File/JDBC/JMS adapter. This Adapter is normally located at the business systems side because of its specific data formats.



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 represents the single point 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 point of failure.

Runtime and throughput critical components:

Integration Server

The Integration Server (SAP XI Add On) 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 shall be registered to the local SAP Gateway of the local instance. You may 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.

For more information on scaling of SAP XI see:

Sizing the SAP Exchange Infrastructure	see: http://service.sap.com/sizing

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 (6.20)	see: http://service.sap.com/HA
SAP XI High Availability Guide	see: http://service.sap.com/xi

RFC Adapter

The RFC Adapter runs on the same host as the Integration Server but it is partly realized as a standalone Java application. That means all scaling and HA characteristics of the SAP Web AS and Integration Server do not apply.

- Scaling of incoming RFC connections:
  Use multiple RFC Adapter instances that are registered to the business system.
- Scaling of outgoing RFC connections:
  Multiple RFC-Adapter instances shall be registered to the SAP Gateway of the Integration Server's central instance.

Multiple RFC Adapters can be used in parallel to increase throughput and reinforce the resilience against slow or failing connections.

High Availability of the RFC Adapter is also achieved by running multiple RFC Adapter instances.

Business scenario critical components

Components that are critical to particular business scenarios are the business systems involved and all Integration Adapters or Proxy Runtime components not running on the Integration Server. The use of File/JDBC/JMS/SOAP Adapter or Java Proxy Runtime depends on the specific business scenario. Scalability and availability of Business systems is not covered here.

File/JDBC/JMS/SOAP Adapter

In most cases the specific Adapter will run on the business systems host. That causes the availability of the adapter to be the same as of the business system depending on the availability of the host. To ensure availability the adapter has to be restarted in case of failures. Multiple instances of the same type of adapter may not be possible due to the characteristics of the transferred data formats e.g. duplicate filenames in case of file adapter.

- Scaling incoming to IS: The adapter calls the URL of the Integration Server (host:port). If the Integration Server consists of multiple instances HTTP load balancing is mandatory to schedule the requests onto these instances. We recommend to use SAP Web Dispatcher for that.
- Scaling outgoing of IS: All instances of the Integration Server call the same URL of the respective adapter. That means no scaling and therefore no need for load balancing on the adapters side.

Components needed for configuration of SAP XI

- Integration Directory as part of the Integration Builder (including client)
- System Landscape Directory

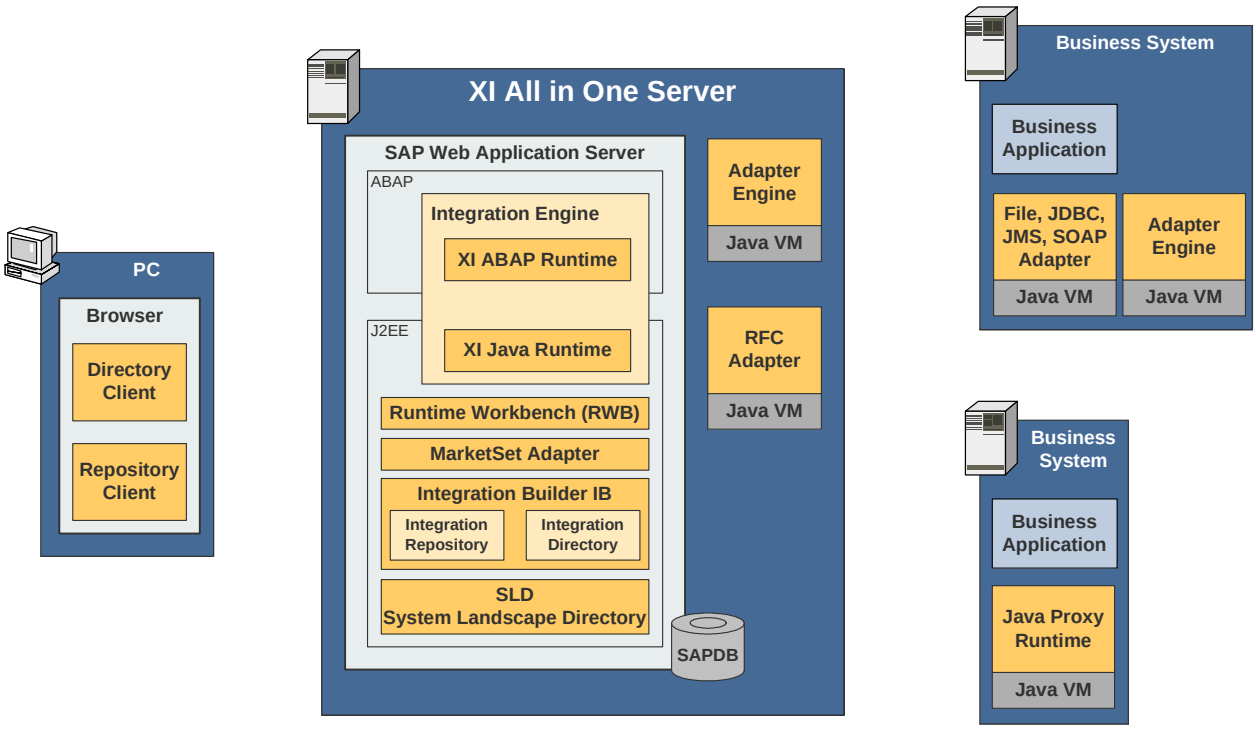
Components needed for design and development

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

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 Market Set Adapter include standalone Java parts. In its smallest appearance this SAP System is running on a single host. That 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 Integration Clients.

The SAP Exchange Infrastructure 2.0 allows the All in One scenario with SAPDB database only.



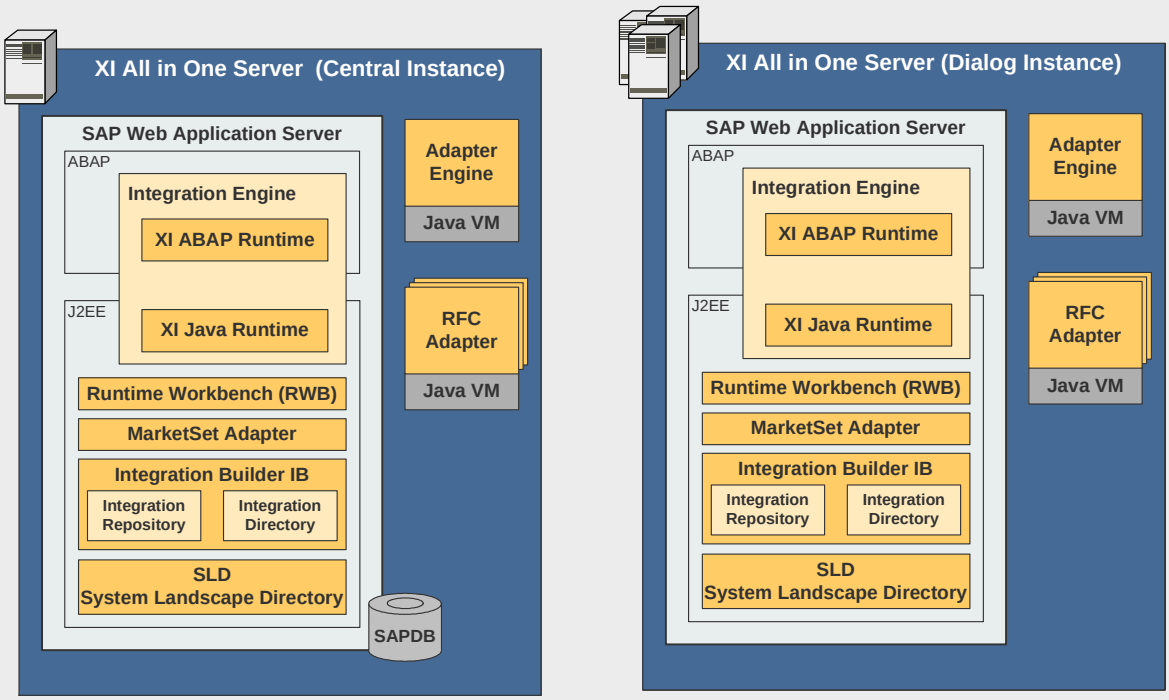
3.3 Scaling of All-in-One Scenario

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). 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. (see chapter Landscape Scenarios for that)

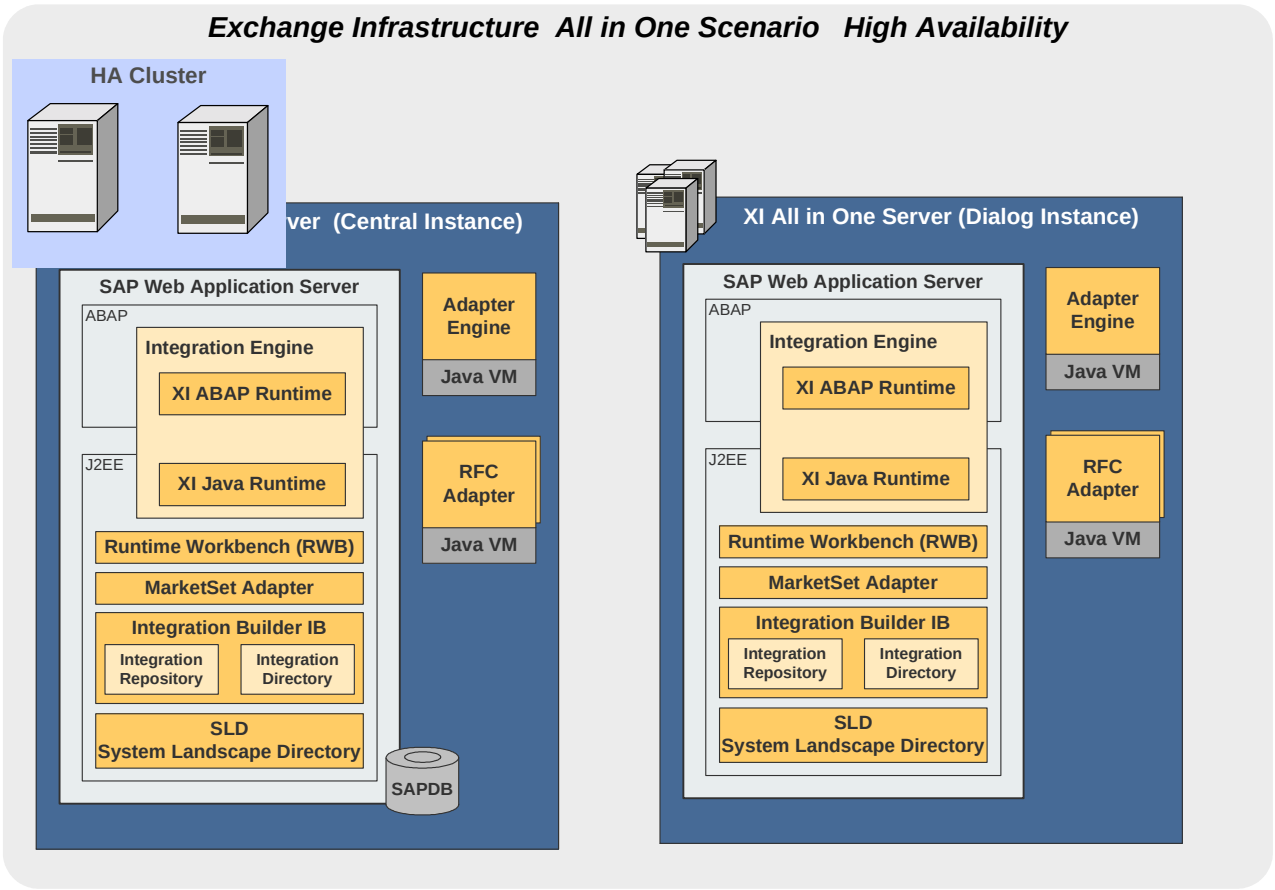
Exchange Infrastructure All in One Scenario with multiple Application Servers



3.4 High Availability aspects of All-in-One

All components running within the SAP Web AS are subject to the same high availability mechanisms that are used for SAP Web AS. Only centralized parts running as the central instance must be run on a high available cluster. All application servers (dialog instances) can replace each other and the load balancing mechanism schedules a request to one of the currently available servers.

High availability of Integration Adapters not running within the SAP Web AS can be achieved by adding multiple instances of the same adapter on different servers.

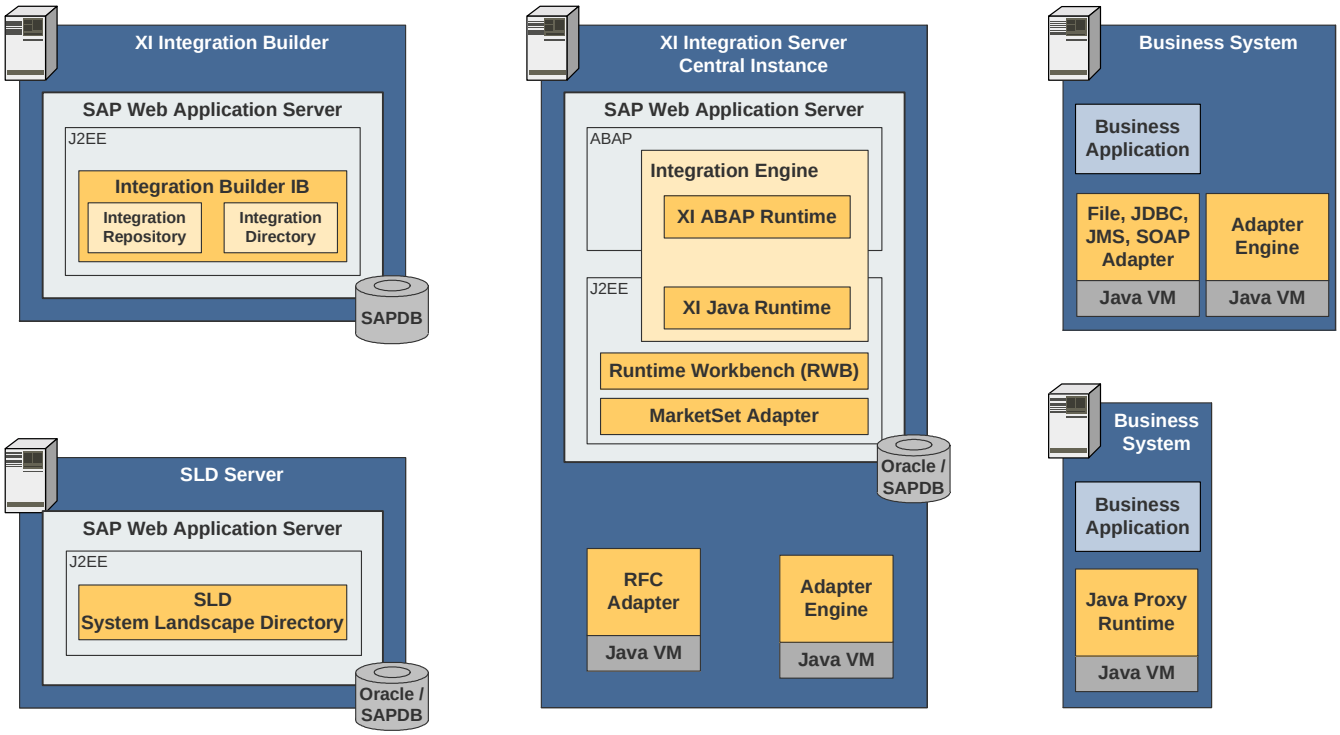


See Document "SAP Exchange Infrastructure in High Availability Environments" for details.

3.5 Distributed Scenario

In a distributed scenario the components of the SAP Exchange Infrastructure are run on different hosts. Therefore the individual requirements of the components can be considered. The three main components to be distributed are the Integration Server, Integration Builder and the System Landscape Directory. None of the Components may be multiplied. That means the distributed scenario consists of one Integration Server, one Integration Builder and one System Landscape Directory.

This simple distribution spreads the load on different servers and makes it possible to size the host running the Integration Server according to the planned message throughput. Scaling aspects will be discussed in detail in the next chapter.

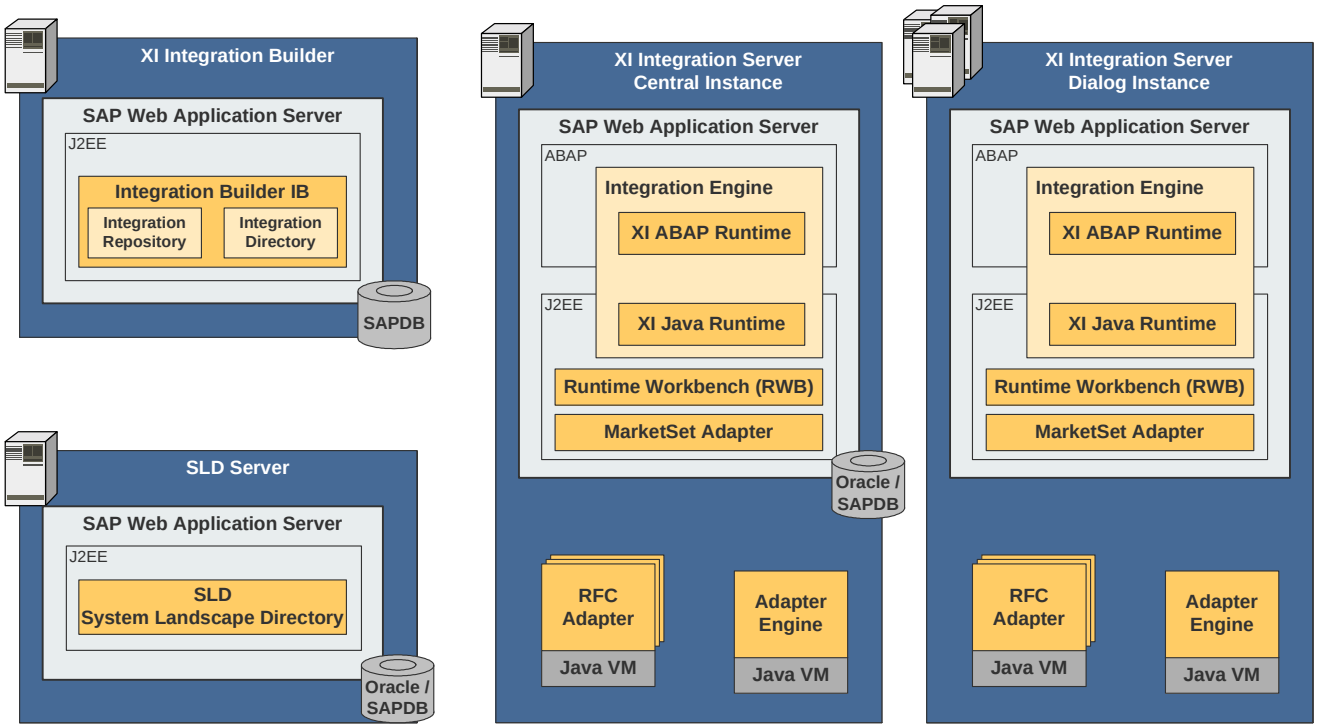


3.6 Scaling aspects in the XI Landscape

The most critical part regarding throughput is the Integration Server. It runs within the SAP Web AS (ABAP and J2EE part). Scaling of the SAP Web AS can be 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 different servers.

Load balancing among different application servers (dialog instances) can be done via message server redirect or the new SAP Web Dispatcher. Each new request can be routed to each server and each server must be able to handle each request. That means all application servers must look the same (installation and configuration). All Software not running within the Web AS e.g. integration adapters must be installed and running on all servers.



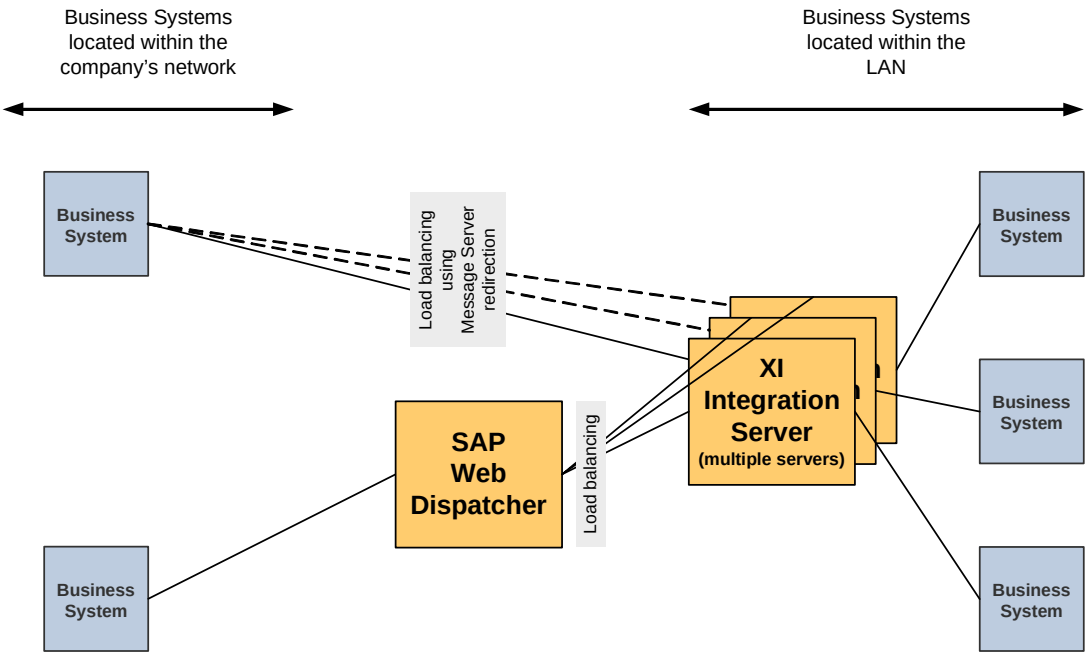
4 Landscape Scenarios

This section shows SAP XI integration scenarios with special respect to networking aspects.

4.1 Intranet Scenario

Intranet means the use of Internet techniques within a corporate network. Although corporate networks incorporate different kinds of networks e.g. LAN, WAN, VPN or leased lines the existence of company wide naming and addressing rules ensure direct addressing and communication between all servers.

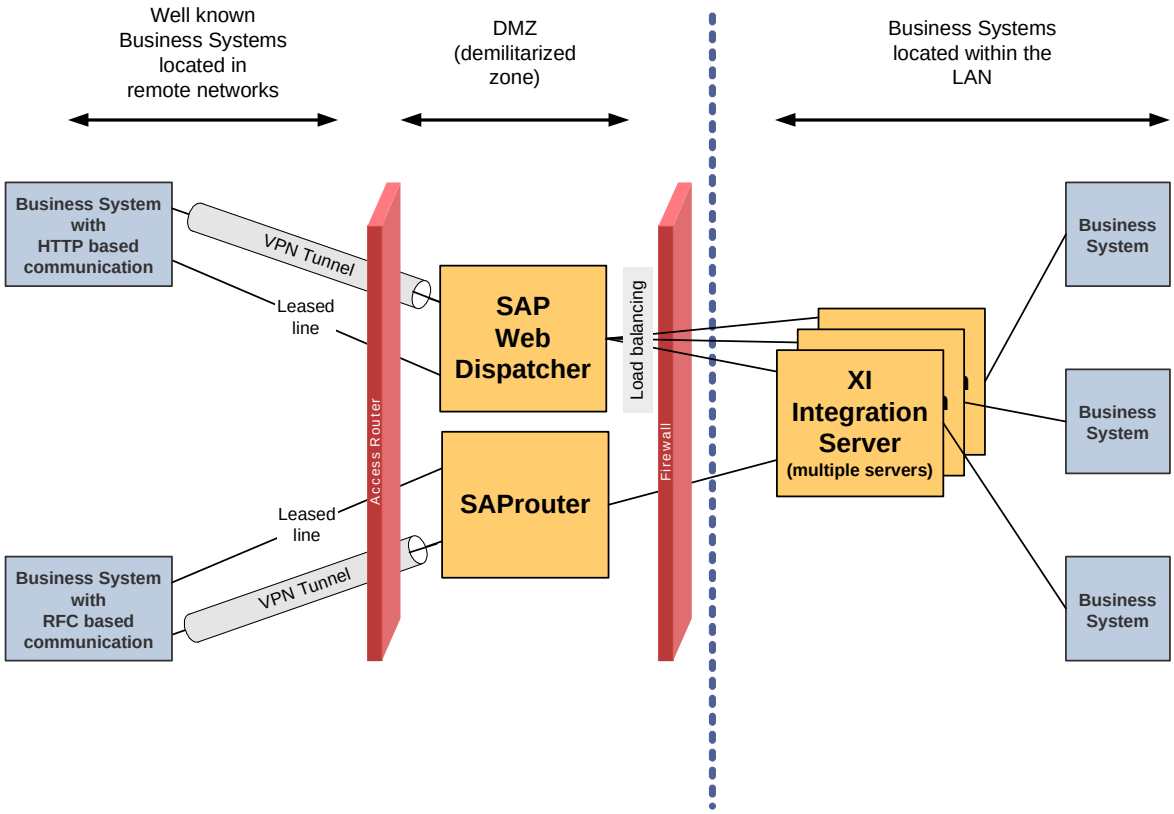
The non existence of barriers like firewalls and NAT (Network Address Translation) allows both of SAP's load balancing solutions to be used. The SAP Message Server redirect mechanism as well as the new SAP Web Dispatcher can be used for load balancing.



4.2 Extranet Scenario

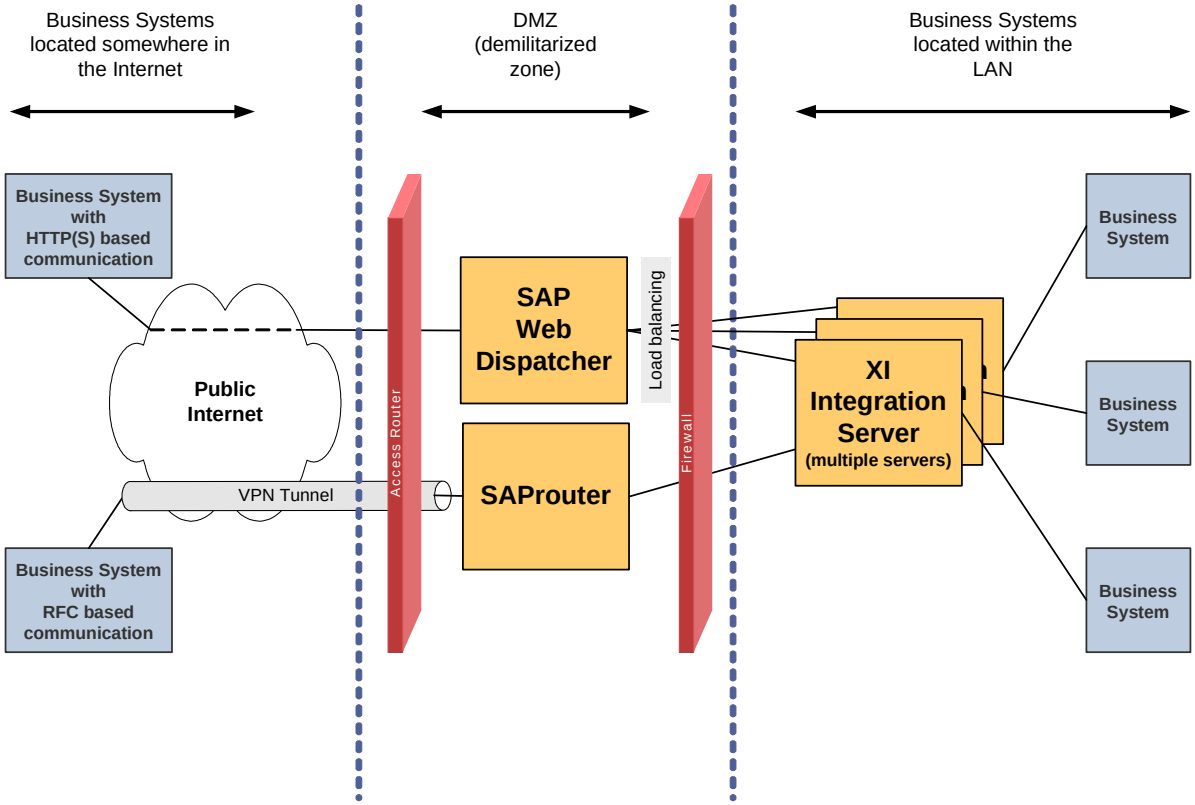
Extranets extend the range of the Intranet. Well known systems for example of business partners get access to some servers within the Intranet. These business systems are normally connected over point to point access through VPN or leased lines but not over public networks. Nevertheless these systems are not allowed to access the whole corporate network but only few dedicated servers. This restriction is normally accomplished by employing some kind of reverse proxy within the DMZ (Demilitarized Zone). This proxy forwards the requests to permissible servers.

SAP provides the SAP Web Dispatcher for use as http reverse proxy and load balancer. SAP router can be used to check and forward RFC connections.



4.3 Internet Scenario

The public Internet enables every public system to address the SAP Integration Server. Although the SAP Exchange Infrastructure deals with well known business systems only, the public Internet can be used to easily connect these known systems. SAP Web Dispatcher can be used for restricting access and load balancing of http/https requests. RFC connections through the public Internet can be setup using secure VPN tunnels between the business system and SAP Router.



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)