SYSTEMS, APPLICATIONS AND PRODUCTS IN DATA PROCESSING

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Abstract: The objective of this paper is to understand - what is SAP Process Integration and how SAP PI works. The cornerstone of SAP is its ability to be configured to meet the needs of business. SAP stands for "Systems, Applications, and Products, in Data Processing. "The SAP system consists of complex integration of different modules or applications, each representing part of the basic business process. SAP PI is used to exchange data between Time machine databases and ECC systems. This is a HR functional requirement wherein these attendance data are used for Employee payroll calculations. The Purpose of PI is that SAP Exchange Infrastructure (SAP XI) forms the basis for the integration of business processes. SAP XI provides a technical infrastructure for XML-based message to enable the integration of SAP systems with each other on the one hand, and SAP and non-SAP systems on the other. In SAP XI, integration exchange knowledge is shipped in the form of pre-defined integration scenarios. Furthermore, SAP XI provides a set of integrated tools for creating and managing all integration-relevant information. Process integration is one of the three integration layers of SAP Net Weaver. It also describes the design of the proposed solution and implications for the business process if any. This document is to communicate the new business solution and expected changes to the business process. The information includes Current Process, Expectations and Requirement, Proposed Solution, Changes impact to Existing Business Processes, Reporting Requirements, Integration Requirements, Source and Target systems, Data Transformation.

Keywords: ABAP, ERP, AP, Transaction, NetWeaver, synchronization, process. Integration.

INTRODUCTION

SAP PI is used to exchange data between Time machine databases and ECC systems. This is a HR functional requirement wherein these

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attendance data are used for Employee payroll calculations. The purpose of PI is that SAP Exchange Infrastructure (SAP XI) forms the basis for the integration of business processes. SAP XI provides a technical infrastructure for XML-based message o enable the integration of SAP systems with each other on the one hand, and SAP and non-SAP systems on the other. In SAP XI, integration exchangeknowledge is shipped in the form of pre-defined integration scenarios. Furthermore, SAP XI provides a set of integrated tools for creating and managing all integration-relevant information. Process integration is one of the three integration layers of SAP NetWeaver. Business Blueprint documents the business process requirements of the company. It provides an overview of the processes that the company intends to follow as an integral part of the SAP system.

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SAP (Systems, Applications, and products in Data Processing) is the leading ERP (Enterprise Resource Planning) software package. SAP was the first to integrate a corporation's worldwide functions tightly into one application. Five former EBM programmers founded SAP AG in Germany, and released the first version of their software, SAP R/2, in 1979. SAP R/3, an advanced, client-server based versions of the popular r/2 product, was released in 1992 and sparked a stunning takeover of America's largest businesses –44% of US companies were using it within five years of its expansion. In 1999, SAP introduced its newest major product upgrade. Named mySAP.com to emphasize its shift to an e- business focus, myAP.com builds on the strengths of the SAP r/3 product in a fully Internet enabled architecture. My SAP.com also incorporates Sap's newest business applications for CRM, supply chain management (SAP

APO), and Data Warehousing (Business Information Warehouse or BW). Prior to the introduction of mySAP.com, these applications had been incorporated as add-ons to SAP r/3 and were known as New Dimension products. Companies both large and small traditionally utilized multiple software applications from various vendors or developed their own applications in-house to process their critical business transactions. Prior to the proliferation of SAP, most companies supported a full staff of program developers who wrote their necessary business applications from scratch or developed highly complicated interfaces to allow pre-packaged applications from several vendors to pas data back and forth as necessary to complete any full cycle business transaction. This process was extremely costly, time-consuming, and error prone. It also made it very difficult for business managers and executives to get a timely, comprehensive view of how their business was doing at any given time. SAP was the first and, to date, the most successful company to integrate nearly all business processes into one software solution for use in any business in any business in any country in the world. Not only did SAP's applications reduce the need for complex and redundant in-house development, but it also created new business efficiencies by automating many tasks across a corporation and incorporating business best practices into a updated version of its software. Using AP's products, companies can now integrate their accounting, sales distribution, manufacturing, planning, purchasing, human resources, analysis and other transactions into one application. SAP applications thus provide an environment where "transactions are synchronized throughout the entire systems, meaning a sales-order entry triggers action's within each application that relates and is relevant to the transaction."

SAP COMPANY TIMELINE

1. 1972: SAP AG founded in Germany
2. 1979: SAP R/2 introduced for mainframe computers
3. 1980's: Europe and N. American expansion
4. 1992: SAP R/3 released as client-server application

5. 1996: SAP R/3 becomes partially Internet enabled

6. 1997: Develops and launches new Dimension product line including CRM, SCM and Data Warehousing solutions

7. 1999: SAP announces mySAP.com, the next generation of its Enterprise Application system based on the Internet architecture.

The SAP system consists of complex integration of different modules or applications, each representing part of the basic business process. SAP runs on a fourth generation programming language called Advanced Business Application Programming (ABAP).

LEGACY SYSTEM

While implementing the SAP ERP in a large business establishment, it is found that not all sections can be brought under the SAP ERP. Many of the business sections may have their own proprietary tools which are highly complex and may not be possible to be replaced. They run parallel to the SAP System. They are called the Legacy Systems. Then it becomes necessary to integrate between the SAP Systems and such pre-existing non-SAP System. This is where the SAP PI comes into play.

WHY DO WE NEED SAP PI?

A part from Legacy Systems, in a large business establishment, SAP ERP does not consist of a single system but several integrated systems i.e. CRM, SRM and FICO etc. To handle with such complexities SAP introduced Process Integration a platform to provide a single point of integration for all systems without touching existing complex network of legacy systems. This is a powerful middleware by SAP to provide seamless end to end integration between SAP and non-SAP applications inside and outside the corporate boundary. SAP PI supports B2B as well as A2A exchanges, supports synchronous and asynchronous message exchange and includes built in engine for designing and executing Integration Processes, figureL:1 given below shows integration landscape.

Figure 1: Integration Landscape
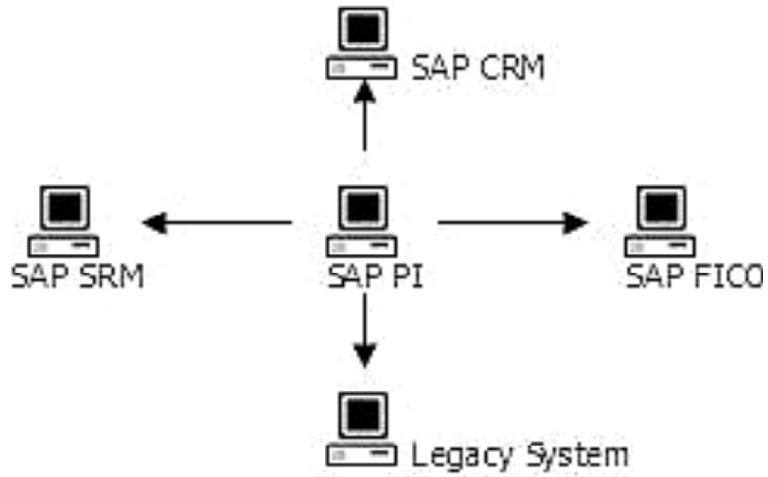
ARCHITECTURE OF SAP PI

Figure 2: for dual –stack with central Integration server
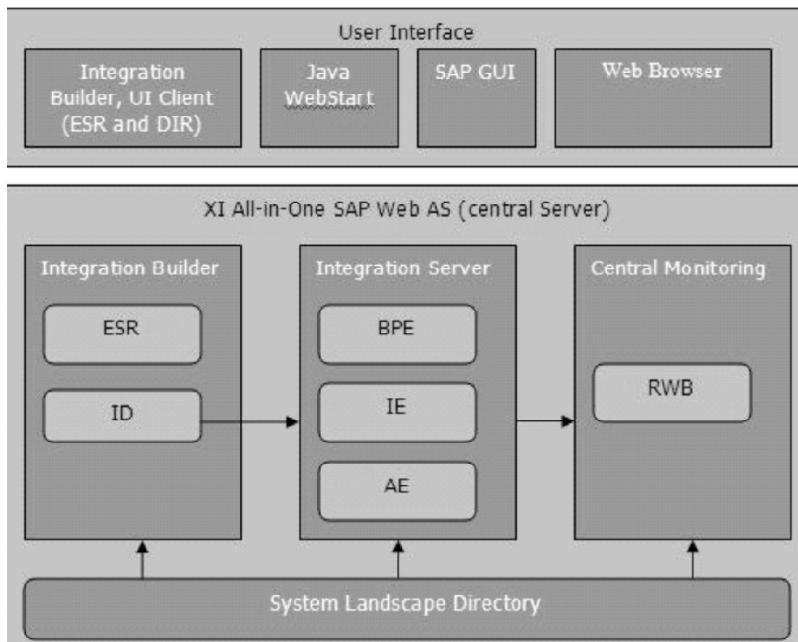
The SAP PI consists of a hub and spoke structure; the spokes connect with external systems while the hub exchange messages between them. The source system is known as the sender system and the target system is known as the receiver system. The PI is not a single component, but rather a collection of components that work together flexibly to implement integration scenarios. The architecture includes components to be used at design time, at configuration time and at run time.

We can divide the SAP PI into several areas

1. Integration Server
2. Integration Builder
3. System Landscape
4. Configuration and Monitoring

Integration Server is the central processing engine of the SAP PI. All messages are processed here in a consistent way. It consists of three separate engines

    1. Integration Engine

    2. Adapter Engine.

Integration Engine

Figure 3: Pipeline steps in integration Engine
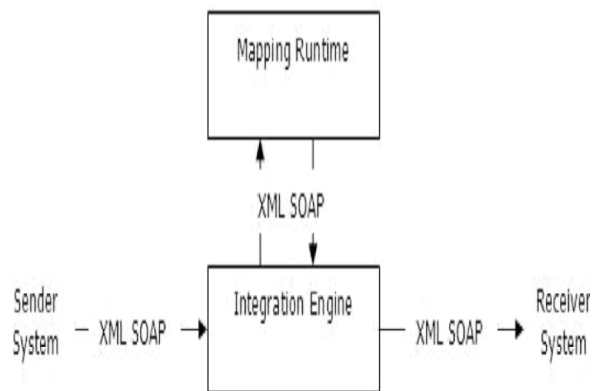
The Integration Engine is responsible for central Integration Server services i.e. the pipe-line steps - routing and mapping. If the source message structure is different from the target message structure, then integration engine calls the Mapping Runtime, where source structure is converted to the target structure. The Mapping Runtime is based on the Java stack. The integration engine can also utilize an ABAP program for the conversion, which is based on the ABAP stack.

A message can be of two types

1. Synchronous   - has both the request-response part

2. Asynchronous   - has either the request or the response part only

In PI, message is represented by an interface.

Interface -> structure of the message in XML format + direction

Based on the above criteria, there are three types of interfaces

1. Outbound interface   - connect to the sender system

2. Inbound interface   - connect to the receiver system

3. Abstract interface   - connect to the BPE

When we configure integration logic (scenario) in the SAP PI as per our business requirements, it is the integration engine which executes that configuration in a step-wise manner. Pipeline is the term used to refer to all steps that are performed during the processing of an XML message. The pipe-line steps consist of the following:

1. Receiver Identification - determines the system that participates in the exchange of the message.

2. Interface Determination - determine which interface will should receive the message.

3. Message Split - if more than one receiver are found, PI will instantiate new message for each receiver.

4. Message Mapping - mapping to transform the source message to destination message format.

5. Technical Routing - bind a specific destination and protocol to the message.

6. Call Adapter - send the transformed message to the adapter or a proxy.

Adapter Engine

You must have noticed earlier that the integration engine handles messages in XML-SOAP protocol only. But what if we have a sender and a receiver business system where the data is not in the same format. We use the various adapters in the Adapter Engine to convert XML- and HTTP-based messages to the specific protocol and format required by these systems, and vice versa.

Figure 4: Protocol conversion in Adapter
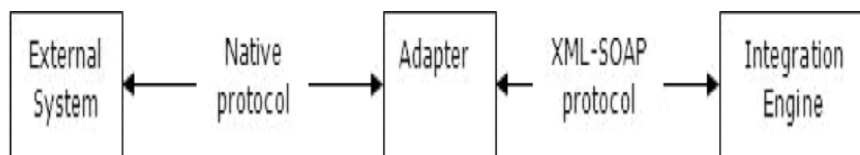
As we have discussed earlier, SAP PI is a hub and spoke structure where the Adapter Engine can be considered as spoke. We use the Adapter Engine to connect the Integration Engine (Hub) to the external systems. The Adapter Framework is the basis of the Adapter Engine. The Adapter Framework is based on the SAP J2EE Engine (as part of the SAP Web Application Server) and the J2EE Connector Architecture (JCA). The Adapter Framework provides interfaces for configuration, management, and monitoring of adapters.

Enterprise Services Repository

Here we design and create objects to be used in the making of an integration scenario. The data flow in PI will look similar to as shown in figure 5 below:

We find the option to design the following.

1. Interface objects – Service Interface, Message Type, Data Type

Figure 5: Data flow: Interfaces and Mapping

Sender System → Outbound Interface → Operation Mapping → Inbound Interface → Receiver System
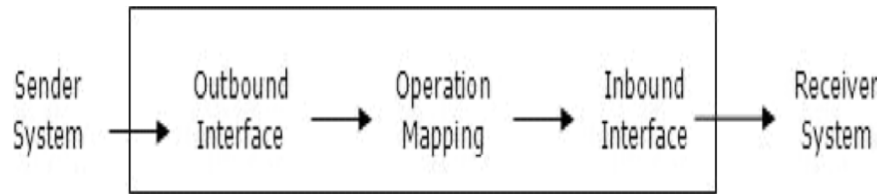
2. Mapping objects – Operation Mapping and Message Mapping

3. Integration Processes

Figure 6: Data Type, Message Type and Service Interface relationship

Service Interface

↑ 1:1 relationship

Message Type

↑ 1:n relationship
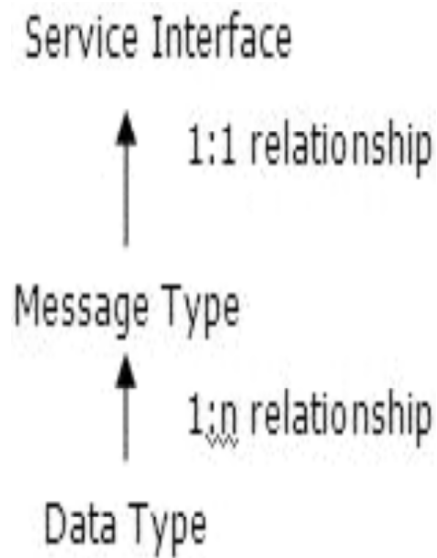
Data Type

PI uses integration repository to design message structure for both sender and receiver systems and develop an interface message using corresponding message structures which act as a point of interaction to the outside world. Data type and Message type are used to simplify and modularize the design of a complex interface.

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Figure 7: Operation Mapping and Message Mapping relationship

Operation Mapping

↑ 1:n relationship

Message Mapping
(Graphical/Java/XSLT/ABAP)
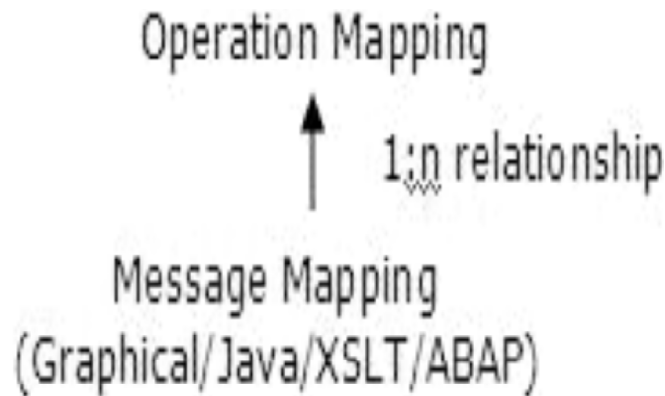
Operation Mapping allows transformation of source structure to target structure when the two structures are different. But if the source and the target structure are same then the operation mapping may be dispensed off. Similar to service interface, message mapping is used to simplify and modularize the design of a complex operation mapping. Message mapping can be implemented in 4 ways

1. Graphical Mapping
2. Java Mapping
3. XSLT Mapping
4. ABAP Mapping

Graphical mapping is the most used as it allows developer to map attributes of both structures graphically to pass data using service interfaces. For the other three, we have to develop the mapping by writing code. If it is a single stack server, then the ABAP mapping will not be available.

SCOPE

Advanced technology: SAP Technology has a very high scope in future applications. It decreases the work load of HR which is very necessary for advancement.

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Integrated Module: SAP system comprises of a number of fully integrated modules, which covers virtually every aspect of the business management.

Worthy Job Opportunity: Regional job prospects are looking good for SAP consultants, with hiring companies willing to offer attractive compensation packages just to get the best talent.

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