

***ENTERPRISE APPLICATION***

***INTEGRATION***

***EVALUATION WORKSHEET***

IBM WebSphere

VS

SAP NetWeaver



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## EXECUTIVE SUMMARY

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Service Oriented Architecture is the evolutionary step that has been developed to help organizations meet their complex challenges, and this can be achieved by using a range of EAI tools. This white paper compares two such technologies – the IBM WebSphere Process Server with the ESOA SAP NetWeaver Process Integration (PI) – and how effectively each one of them can implement and support SOA architecture.

This paper will detail the features of a comprehensive integration solution and SOA, followed by an examination of the features of IBM WebSphere suite and SAP ESOA. A thorough analysis of the architectural similarities between the two, and a comparison of the EAI feature requirements have been compiled. It is clear from the comparisons undertaken that there are no major feature differences between IBM WebSphere Process Server and SAP NetWeaver PI, and both tools are immensely suitable for any SOA solution.



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## DEFINING A COMPREHENSIVE INTEGRATION SOLUTION

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Given the importance of serving customers in a real-time and flexible manner, the management of cross-functional business processes through integration of enterprise applications and systems has become a critical requirement to ensure competitive advantage. IBM and SAP are looking for packaged, flexible interfaces that enable them to quickly and easily integrate their enterprise applications and are adaptable to their changing needs. In essence, a comprehensive, best-practice EAI solution supported as an application enables adaptability, easy upgrades, modularity, fast implementation and comprehensibility. With tight, transaction-based integration that seamlessly pulls together the corporation's underlying applications and systems, best-practices EAI solutions enable the enterprise to complete business processes in real-time and maximise the business velocity of the corporation.

Building flexible, adaptive, and comprehensive integration architecture requires a multi-layered approach in which different applications and systems can easily inter-operate. A comprehensive EAI solution can be broken up into four smaller and more manageable components—business process automation, connectivity, development tools and transaction-enabled message broker—all of which need to be present in an EAI solution.

General-purpose integration architecture must provide the following functionality:

- The architecture must provide a declarative, graphical method to define and capture collaborative business processes that span multiple enterprise applications and legacy and custom systems.
- The architecture must allow these collaborative business processes to be implemented in a modular, application independent fashion. Thus, the architecture must enable separation of cross-application business processes from connectivity to specific applications.



- The architecture must provide a hub-and-spoke architecture where business processes components are executed at a centralised, application-independent hub.
- The architecture must enable the hub to be integrated with disparate enterprise applications, including packaged, custom, and legacy applications.
- The architecture must allow the business process components to be extensible, dynamically configurable, modular and easy to change.
- The architecture must be open and object-oriented, so that it can interact with many application frameworks and reuse infrastructure technology available from other vendors.



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## INTRODUCTION TO SOA

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Service Oriented Architecture (SOA) is an architectural style of building software applications that promotes loose coupling between components so that components can be reused.

An SOA application will have the following characteristics:

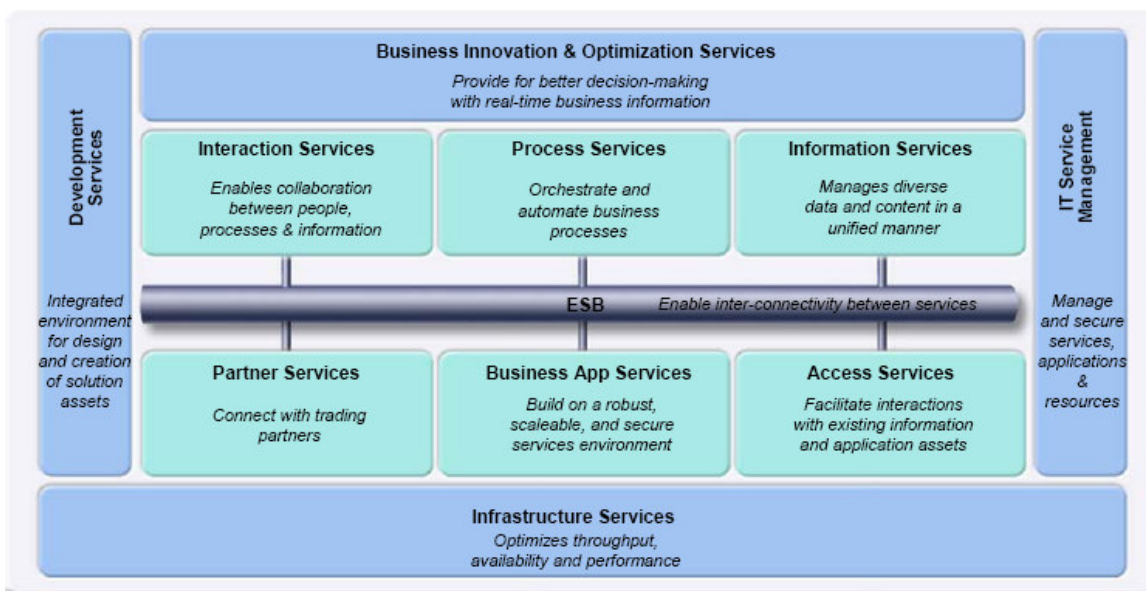
- Services, which are software components that have published contracts/interfaces; these contracts are platform-, language-, and operating-system-independent. XML and the Simple Object Access Protocol (SOAP) are the enabling technologies for SOA, since they're platform-independent standards.
- Consumers can dynamically discover services.
- Services are interoperable.
- Business Components are reusable.
- Services are loosely coupled.

Although the concepts behind SOA were established long before web services came along, web services play a major role in SOA. This is because web services are built on top of well-known and platform-independent protocols. These protocols include HTTP, XML, UDDI, WSDL, and SOAP. It is the combination of these protocols that make web services so attractive. Moreover, it is these protocols that fulfill the key requirements of a SOA. That is, SOA requires that a service be dynamically discoverable and invokeable. This requirement is fulfilled by UDDI, WSDL, and SOAP. SOA requires that a service have a platform-independent interface contract. This requirement is fulfilled by XML. SOA stresses interoperability. This requirement is fulfilled by HTTP. This is why web services lie at the heart of SOA.



## IBM WEBSPHERE PROCESS SERVER & INTEGRATION DEVELOPER

SOA, as defined by IBM, is an application framework that takes everyday business applications and breaks them down into individual business functions and processes, called services. SOA is a conceptual description of the structure of a software system in terms of its components and the services they provide, without regard for the underlying implementation of these components, services and connections between components. Loosely coupled integration applications that are based on SOA provide flexibility and agility. Integrated solutions can be implemented independent of platform, protocols and products. IBM SOA Reference architecture is as shown below:



This reference architecture describes the various layers of implementing an SOA solution. In the above figure, focusing on the parts depicted in light-blue in the diagram – the boxes labeled, **Interaction Services, Process Services, Information Services, Partner Services, Business**



**Application Services** and **Access Services**. These are the parts in which application domain logic will be captured which are specific to the business design.

The other parts of the architecture exist to assist the rest of the SOA lifecycle, which are used for modeling of the business design, construction and assembly of the software, deployment of applications and management of the operational system and the business design which is being implemented.

IBM WebSphere Process Server is the next generation business process integration server that has evolved from proven business integration concepts, application server technologies, and the latest open standards. It provides many of the services stated in the Reference Architecture above. It is an ideal platform for business applications that require business integration using different technologies like web services and MQ. Using the WebSphere Integration Developer tool set, business integration solutions can be created using simplified integration mechanisms, such as the Service Component Architecture (SCA) programming model and the Service Data Objects (SDO) data model. SDO business objects can be defined, transformed, routed, and mapped using SCA components. WebSphere Adapters supply connectivity to back-end Enterprise Information Systems (EIS). With WebSphere Integration Developer, Enterprise applications define business logic – using features like Business Process Execution Language (BPEL), human tasks, business rules, mapping and business state machines. For the runtime monitoring of the business integration solutions, WebSphere Process Server provides Common Event Infrastructure (CEI), which centralizes the monitoring of the various events that can occur in these applications.

The IBM WebSphere Process Server components for an enterprise SOA include:

- **Service Component Architecture** - A service invocation and componentization model for SOA.
- **Business objects** - A format for data exchange between service components, based on service data objects.



- **Common Event Infrastructure** - A foundation for monitoring SOA applications; captures activities as Common Business Events.
- **Mediation flows** - Performs logic on messages flowing through the ESB.
- **Interface maps** – Adapt one service syntax to another.
- **Business object maps** - Adapts one service data format to another.
- **Relationships** - Converts one data store's keys to another's.
- **Dynamic service selection** - Chooses which of multiple components with the same interface to invoke.
- **Business processes** - Executes BPEL business processes for service choreography.
- **Human tasks** - Enables people to perform business process activities.
- **Business state machines** - Models a business process as a finite set of states and event transitions.
- **Business rules** - Rule sets and decision tables for simple decision making.

Features like BPEL, Human Task, Business State Machine and Business Rules are confined to the **Process Services** layer in the reference architecture above.

The IBM WebSphere Enterprise Service Bus includes the components in the middle tier: the SOA core and mediation flows.



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## SAP NETWEAVER PROCESS INTEGRATION (PI)

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Enterprise Service Oriented Architecture (Enterprise SOA) is a term introduced by SAP and stands for a business-driven software architecture that goes beyond SOA fundamentals by introducing business semantics to it. Enterprise SOA combines the technologies, standards, and approaches of a service-oriented architecture with a common business language that SAP co-defines with its ecosystem in the form of enterprise services.

Enterprise Services are services that have well defined business meaning. They are associated with:

- Business Semantics - Enterprise Services are structured according to a harmonized enterprise model based on Process Components, Business Objects and Global Data Types.
- Quality and Stability - Enterprise Services ensure stable interfaces for the future. They are well documented (dependencies, configurations etc.)
- Standards - Enterprise Services are based on open standards. The interfaces are described in WSDL. They are created out of Global Data Types (GDT) which are based on UN/CEFACT CCTS (Core Component Technical Specification)

By introducing enterprise services as its core components, enterprise SOA puts the focus on the reusability of business functionality and thus supports enhanced agility in responding to changes in business process requirements.

Figure 2



The key components for the SAP Enterprise SOA are:

- **User Interface:** Provide a high performance and rich UI experience that includes several RIA as well as legacy components.
- **Enterprise SOA Consumption:** Composition of service based applications by consuming business entities delivered through the platform.
- **Business Process Composition & Management:** Modeling, configuration, execution and monitoring of business processes
- **UI Composition:** Build, code, compose, and adapt UI interaction, logic, and best-practice UI patterns
- **Service & Event Composition:** Composition and adaptation of services and events



- **Information Composition:** Collaborative composition (in business user runtime) of structured and unstructured information within a business context (aka situational composites)
- **SOA Middleware:** Communication and service management layer to ensure optimized interoperability between consumption, provisioning and external entities.
- **Service Bus:** Allows efficient and scalable messaging, routing, mediation, federation, and event processing. Seamless integration with Enterprise Services Repository (ESR), Services Registry (SR), and SOA management capabilities
- **SOA Design Governance:** SOA metadata repository; design, configuration, and management of services prior to deployment; supported by the ESR.
- **Enterprise Service Repository and Registry :**

The Enterprise Services Repository and Registry (ES Repository and Registry) support the governed definition of SOA assets (such as services and data types) for SOA by evolution.

They provide transparency of the business semantics exposed by enterprise services for designers and developers of solutions on top of BPP. It is the basis for enabling easy access to enterprise services - described with rich business classifications - when developing composite applications and business processes. The Enterprise Services Repository is open to managing non-SAP services (provided by customers and ISVs) in a customer landscape and as such provides the single source of truth of a customer's BPP.

Enterprise services are basically highly integrated web services combined with business logic and semantics that can be accessed and used repeatedly to support a particular business process. Enterprise services provide business processes or business process steps that can be used to compose business scenarios while ensuring business integrity and ease of reuse.



The Enterprise Services Repository comprises the design time functionality, while the Services Registry manages the information required to run an enterprise service.

The Enterprise Services Repository:

1. Facilitates the building of service interfaces Service interfaces form the basis of enterprise services.
2. Supports SAP's concept of business-driven process modeling
3. Consists of a pool of SAP-defined Global Data Types based on the Core Component Technical Specification (CTS). This ensures that data types are aligned and can be reused.

The Services Registry:

1. Makes known which enterprise services are available for consumption The Services Registry contains information about all services and service definitions in a SOA landscape, including references to the Web Service Description Language (WSDL) file and to the locations of the callable service endpoints.
  2. Is compliant with Universal Description, Discovery, and Integration 3.0 (UDDI)
  3. Offers classification systems for SAP services that extend the UDDI standard, allowing services to be browsed by classification
  4. Offers a variety of search options, such as search by name and free-text search.
- **SOA Management:** Safe-guard deployment and operations of SOA applications. Runtime governance solutions and security; monitoring and measurement
  - **Enterprise SOA Provisioning:** Provide services and events; manage connectivity integration to other platforms and external entities.
  - **Service & Event Enablement:** Capabilities to create services and events; local event processing
  - **Connectivity & Integration:** Enterprise application integration (EAI) and legacy connectivity capabilities; B2B integration with external business partners



- **Service-enabled Applications:** Service enablement of SAP applications and technology. Integration touch points with partners and legacy systems
- **Process Components:** Service enabled application functionality covering all main domains of enterprise applications (e.g. ERP, SCM, SRM, CRM)
- **Platform Services:** Service enabled integration platform capabilities (e.g. BI, MDM, KM)
- **Customer & Partner Applications:** Service enabled or integrated partner or customer applications
- **Non SAP & Legacy:** Available connectivity capabilities with non-SAP and legacy systems

SAP NetWeaver is the Process Integration tool used by SAP. It delivers SAP's enterprise SOA technology foundation with two product shipments. While **SAP NetWeaver Process Integration (PI) 7.1** provides enterprise SOA provisioning and SOA middleware capabilities, **SAP NetWeaver Composition Environment (CE) 7.1** enables enterprise SOA consumption, development and composition of SOA applications.

The Enterprise Services Repository and Registry are shipped with:

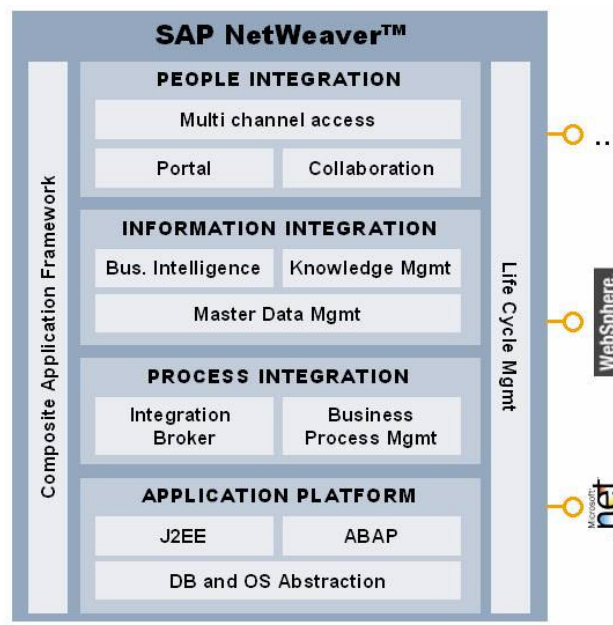
- **SAP NetWeaver Process Integration 7.1 (SAP NetWeaver PI 7.1)**

ES Repository and Registry can be used with SAP NetWeaver PI to take full advantage of the process integration capabilities of SAP NetWeaver. With the ES Repository, modeling business processes and designing interfaces, data types and mappings for the message exchange become more robust. The Integration Directory and Integration Server that are also available with SAP NetWeaver PI, enable a user to configure and to run their business process in their individual system landscape.
- **SAP NetWeaver Composition Environment 7.1 (SAP NetWeaver CE 7.1)**



SAP NetWeaver Composition Environment 7.1 offers full service provisioning capabilities, also for those who need to work with a lean development environment and do not focus on process integration. For those customers, the ES Repository and Registry offers capabilities for service provisioning and consumption.

Figure 3

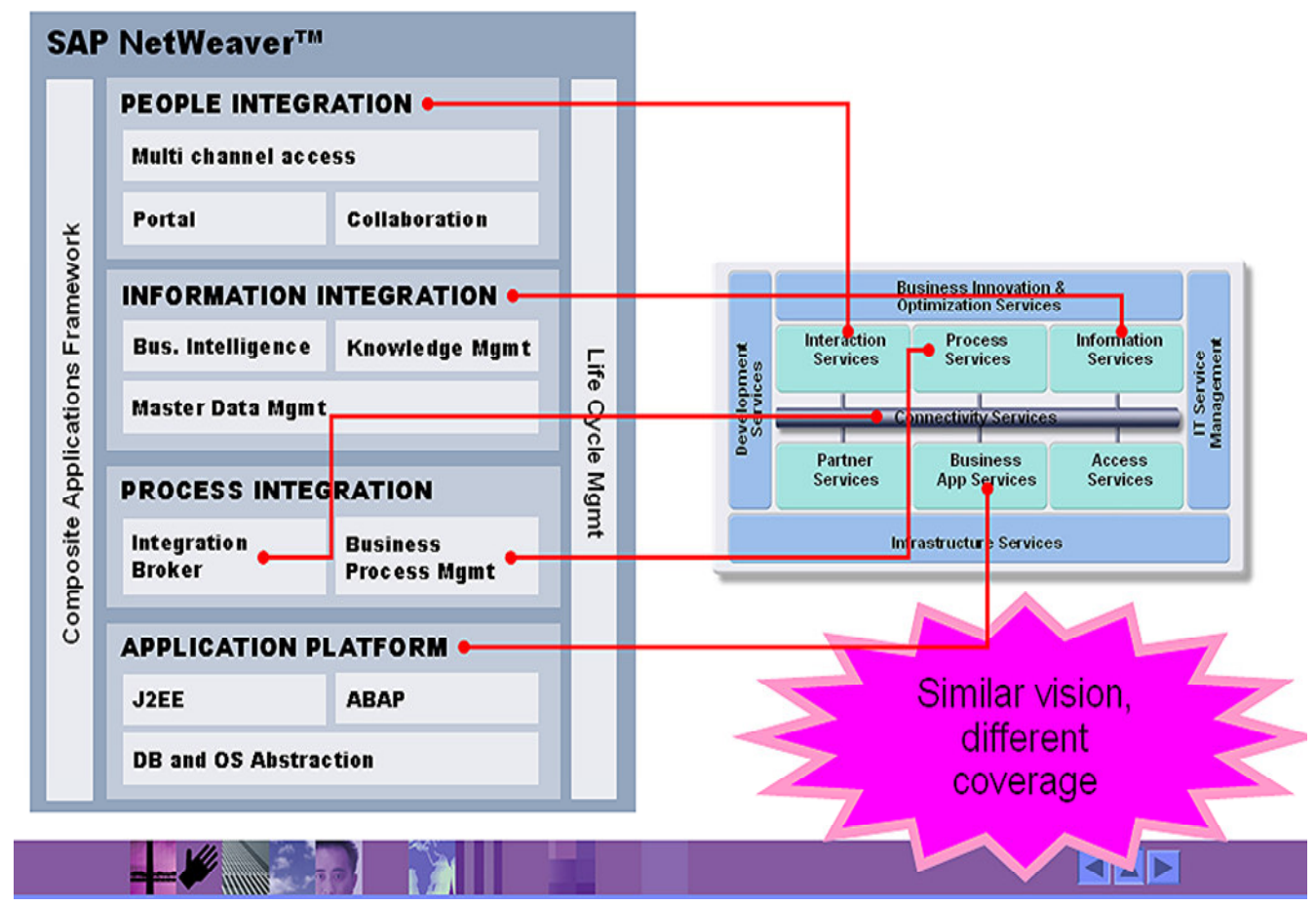


Net Weaver is an application and Integration platform in which web services play a major role and which is open for non-SAP applications and platforms. It is used by organizations to improve productivity and enhance efficiency by making all the resources that are available in an enterprise to work collectively. The SAP customers to bring heterogeneous environments at one platform use SAP NetWeaver. In addition, it enables customers to use the already existing systems without putting in much investment.

SAP NetWeaver attains the process of integration by integrating all the available heterogeneous resources of the existing system and unifying them into a homogeneous form. This integrated information forms the basis of total, comprehensible, focused solution as desired in an enterprise.

## ARCHITECTURAL SIMILARITIES

The diagram below depicts the similarities between the SAP and IBM Reference Architecture



Delving deeper into the different layers of each of the architectures depicted, and comparing the components of each layer, we discover: -



1. People Integration under SAP NetWeaver is compared to Interaction services under the IBM Reference Architecture:

Both these layers specify the same definition, which is the portal layer or the layer which is used for end-users interactions. All the three sub-components, as in the figure above, are supported by both IBM and SAP but IBM has a separate tool set for portal integration called Portal Server and developed using portlets API, whereas SAP uses an iView to display their content on the web page.

2. Information Integration under SAP is compared to Information Services under the IBM Reference Architecture:

Both these layers specify the same definition of information integration. All the three sub-components, as in the figure above, are supported by both IBM and SAP but IBM uses IBM Information Server for information integration services and IBM Infosphere MDM server for MDM, whereas SAP uses SAP Business Information Warehouse (SAP BW) for managing its BI Related applications and SAP MDM for information integrity.

3. Integration Broker under SAP is compared to Connectivity Services under the IBM Reference Architecture:

Both these layers have an integration broker as in the figure above. SAP NetWeaver itself acts as an integration broker for SAP, whereas IBM uses ESB to various services. Services are divided into event services, transport services and mediation services.

4. Business Process Management under SAP is compared to Process Services under the IBM Reference Architecture:

Both layers support BPM as in the figure above. SAP NetWeaver has features like Business Workflow, Business Rules Management, Human Interaction Management, Monitoring and Modeling, whereas IBM has features like BPEL for workflows, Human Task, Business Rules, CEI for monitoring and IBM WebSphere Modeler for



modeling But all the applications developed using IBM can be reused and are loosely coupled, whereas applications developed using SAP NetWeaver are tightly coupled which negates the purpose of using SOA based applications.

SAP will soon be releasing its modelling tool, Aris, with partnership with IDS Scheer. IDS Scheer is considered the leading BPA suite available in the market. A comparison of the IBM WebSphere Modeler, in the IBM suite, with the Aris tool, shows them to be at par as seen in the table below:

IBM WebSphere Modeler	IDS Scheer - Aris
<b>Modeling:</b> Modeler basic, provides an easy-to-use tool for business users to model, document and print business processes.	<b>Modeling:</b> ARIS Business Designer enables the designing of business structure and process models.
<b>Simulation:</b> Modeler advanced, provides complex model simulation and analysis capabilities. It also enables to simulate the dynamic behaviour of the process so that workloads and bottlenecks can be analyzed.	<b>Simulation:</b> ARIS Business Architect allows analysis and simulation of workflows.
<b>Collaboration:</b> Modeler publishing server enables users to publish business-process models to a portlet based server, so that multiple subject experts can review the information simultaneously through a standard internet browser. It also has the capability to generate customized reports.	<b>Collaboration:</b> Has web based publishing tools.
<b>Standards:</b> Modeler Advanced includes a mode for Business Process Execution Language (BPEL) and a mode for WebSphere MQ Workflow Flow Definition Language (FDL).	<b>Standards and Frameworks:</b> ARIS Enterprise Architect has the capability to create, update and optimize enterprise architecture based on standards like DODAF, Zachman and TOGAF.
	<b>Reference Models:</b> ARIS has launched Real Estate Management Reference Model targeted towards SAP's solution in this area.

- Application Platform under SAP is compared to Business App Services under the IBM Reference Architecture: :



SAP has its own programming model called ABAP, whereas IBM is totally based on the J2EE platform and follows XML and web services programming models.

6. Access Services:

Identity management involves establishing an enterprise-wide IT user directory and policy management infrastructure that coordinates the identification and authentication of users, as well as the policy-based authorization of those users' activities on systems and applications across the enterprise. Among many other access control functions, identity management enables single sign-on (SSO) for users, allowing them to log in once to access multiple applications across the enterprise. Identity management also provides the policy-based administration capabilities companies need to manage their application security.

When comparing the IBM Tivoli Identity Management Solutions with SAP NetWeaver Identity Management Solutions, as in the table below, it is clear that SAP NetWeaver's Maxware IDM solution compares well against the IBM Tivoli IDM products in the four important parameters of IDM viz. ID Administration, Password Management, Provisioning and Directory Services.

IDM Components	IBM (Tivoli)	SAP NetWeaver (Maxware)
ID Administration	Tivoli Identity Manager, Tivoli Federated Identity Manager	Identity Center
Password Management	Tivoli Access Manager	Identity Center, Virtual Directory Server
Provisioning	Tivoli Identity Manager, Tivoli Federated Identity Manager	Identity Center
Directory Services	Tivoli Directory Integrator, Tivoli Directory Server	Identity Center, Virtual Directory Server, Data Synchronisation Engine



## ENTERPRISE APPLICATION INTEGRATION REQUIREMENTS

A comprehensive EAI solution must have the features and functionality listed below in order to satisfy current and future integration requirements.

EAI LAYER	DESCRIPTION	COMPONENTS
Cross-functional business process automation	<u>Business process logic</u> encapsulates automated business processes that touch multiple functional departments and applications.	<ul style="list-style-type: none"> <li>• Business logic</li> <li>• Common objects</li> </ul>
Connectivity	<u>Maps and transformations</u> enable information represented in one data model to be translated to another data model. For each application and database, a unique interface contains technical logic that detects events, retrieves data and inputs data into that application or database.	<ul style="list-style-type: none"> <li>• Maps</li> <li>• Application-specific objects</li> <li>• API-level connectivity</li> <li>• Database-level connectivity</li> <li>• Legacy connectivity</li> <li>• Mapping engine</li> </ul>
Tools	These are tools (sometimes graphical) that enable business content to be built and modified according to customer requirements. System management and configuration tools enable the whole integration solution to be configured, monitored, controlled and analyzed.	<ul style="list-style-type: none"> <li>• Business process modeling</li> <li>• Object definition and modification</li> <li>• Map definition and modification</li> <li>• Connectivity construction</li> <li>• System management</li> <li>• Configuration management</li> </ul>
Transaction-enabled message broker	This is the underlying technology that provides services such as transaction assurance and persistence needed to implement mission-critical, real-time integration solutions. In addition, this layer provides data transport services.	<ul style="list-style-type: none"> <li>• Transaction assurance</li> <li>• Data transport</li> <li>• Persistence</li> <li>• Performance</li> </ul>



## ENTERPRISE APPLICATION INTEGRATION CHECKLIST

The table below is a checklist of technology components that must be available in robust enterprise application integration solutions. The respective relevant capabilities of IBM Process Server and SAP PI are compared against this checklist.

CHECKLIST	IBM Process Server	SAP PI
<ul style="list-style-type: none"> <li>• Business logic                             <ul style="list-style-type: none"> <li>- Pre-built</li> <li>- Extensible</li> <li>- Application-independent</li> <li>- Event-based updates</li> <li>- Real Time Processing</li> <li>- Modular (independence of maps, business logic and connectivity)</li> </ul> </li> </ul>	<p>The WebSphere Integration Developer tools have been designed so that users can easily compose integrated business solutions. WPS has a unique set of SCA and non SCA components that fits for various Business logics</p>	<p>With "visual rules", business logic is modelled graphically instead of writing code. The Java code is generated automatically of the models, ready to integrate in enterprise applications. Optionally EJBs can be generated and deployed on SAP Web AS.</p>
<ul style="list-style-type: none"> <li>• Maps                             <ul style="list-style-type: none"> <li>- Pre-defined base maps</li> <li>- Extensible</li> <li>- Modular</li> </ul> </li> </ul>	<p>WPS supports Java, XSLT mapping using graphical tool. We can expose Maps as web services as Web services are self-contained, modular applications.</p>	<p>SAP PI supports mapping using Java, XSLT, ABAP and Message Mapping</p>
<ul style="list-style-type: none"> <li>• Database connectivity                             <ul style="list-style-type: none"> <li>- JDBC</li> <li>- ODBC</li> <li>- Oracle native</li> <li>- Sybase native</li> <li>- Informix native</li> </ul> </li> </ul>	<p>WebSphere Adapter for JDBC is a resource adapter that provides bidirectional connectivity between J2EE applications and enterprise information systems (EISs). For such applications, the exchange of data, which is in the form of business objects, happens at the database</p>	<p>The JDBC adapter enables you to connect database systems to the Integration Server or the PCK. The adapter converts database content to XML messages and the other way around. Database content can be read with any SQL statement, including stored procedures. A special XML format is defined for content coming from the Integration Server or PCK</p>



	level.	
<ul style="list-style-type: none"> <li>• Legacy connectivity             <ul style="list-style-type: none"> <li>- Flatfiles</li> <li>- Emails</li> <li>- CICS</li> </ul> </li> </ul>	<p>WebSphere has a collection of Resource adapters that supports Flatfiles, Emails and CICS</p>	<p>SAP solutions currently available like mySAP ERP, mySAP CRM, mySAP SCM, mySAP SRM, mySAP PLM, etc. continue to run on the SAP Web Application Server within SAP NetWeaver making use of features to integrate legacy application across solutions and processes.</p>
<ul style="list-style-type: none"> <li>• General services             <ul style="list-style-type: none"> <li>- Pre-built event detection</li> <li>- Pre-built event notification</li> <li>- Non-intrusive</li> <li>- Upgrades</li> </ul> </li> </ul>	<p>The Event Viewer allows you to search for events by time, date, event type, event name, and event location. The hub admin can also search by partner, Source IP, and Event ID.</p>	<p>Once the file has arrived on the SAP application server, an ABAP program can be developed and scheduled to periodically check for new files in a certain directory, process these and move them to a save directory.</p>
<ul style="list-style-type: none"> <li>• Business process modeling tools             <ul style="list-style-type: none"> <li>- Graphical environment</li> <li>- Programming environment</li> <li>- Open, modern language</li> <li>- Debugging capability</li> <li>- Upgrade capability</li> <li>- Versioning</li> <li>- Configuration</li> </ul> </li> </ul>	<p>Business process is a graphical environment with debugging, upgrade, versioning and configuration capabilities.</p>	<p>Business process management (BPM) with SAP NetWeaver covers business process modeling with a graphical environment, configuration, execution, and monitoring.</p> <p>A new BPM tool to model business processes based on the BPMN standard and integrated into the Eclipse development framework together with a rules composer tool for modeling of business rules is scheduled for release soon to further augment capabilities. The ARIS suite of products for SAP NetWeaver is a robust set of tools providing multiple process services like Descriptive Models, Business Process Analysis, Conceptual Simulation/Optimization in addition to planning, governance</p>



		and performance measurements for processes
<ul style="list-style-type: none"> <li>• Map definition and modification                             <ul style="list-style-type: none"> <li>- Graphical environment</li> <li>- Open, modern language</li> <li>- Upgrade capability</li> <li>- Versioning</li> <li>- Configuration</li> </ul> </li> </ul>	Mapping with a graphical environment upgrading and various configuration is possible	Mapping with a graphical environment upgrading and various configuration is possible
<ul style="list-style-type: none"> <li>• Connectivity construction                             <ul style="list-style-type: none"> <li>- Metadata browser</li> <li>- Versioning</li> <li>- Configuration</li> </ul> </li> </ul>	The Metadata browser Versioning and Configuration is available	Metadata management is available
<ul style="list-style-type: none"> <li>• Object definition and modification                             <ul style="list-style-type: none"> <li>- Graphical environment</li> <li>- Object-oriented features                                     <ul style="list-style-type: none"> <li>- Hierarchical</li> <li>- Polymorphic</li> </ul> </li> <li>- Versioning</li> <li>- Configuration</li> </ul> </li> </ul>	Object definition with a graphical environment and hierarchical and polymorphic features with configuration is available	Object definition with a graphical environment and hierarchical and polymorphic features with configuration is available
<ul style="list-style-type: none"> <li>• System management                             <ul style="list-style-type: none"> <li>- Visual tool</li> <li>- Monitoring                                     <ul style="list-style-type: none"> <li>- Log viewing</li> <li>- Email notification</li> </ul> </li> <li>- Analysis                                     <ul style="list-style-type: none"> <li>- Statistical reporting</li> </ul> </li> <li>- Control                                     <ul style="list-style-type: none"> <li>- Start / stop / pause</li> <li>- Install / de-install</li> <li>- Error tracing and logging</li> <li>- Job scheduling</li> </ul> </li> </ul> </li> </ul>	System management is possible with all the features	SAP provides log files, enabling administrators to analyze SAP NetWeaver components system states in detail. These files can be read with the help of the log viewer. State-of-the-art monitoring solutions streamline this process by automatically analyzing log files and importing them into the system monitoring tool.
<ul style="list-style-type: none"> <li>• Messaging                             <ul style="list-style-type: none"> <li>- Open and standard</li> <li>- MQSeries</li> </ul> </li> </ul>	1. MQ client can be configured in WAS server and does not need any	1. PI server supports MQ messaging but via JMS adapter which needs to be installed and



<ul style="list-style-type: none"> <li>- CORBA</li> <li>- Proprietary</li> <li>- Asynchronous publish/subscribe             <ul style="list-style-type: none"> <li>- One to One</li> <li>- One to Many</li> <li>- Many to One</li> <li>- Many to Many</li> </ul> </li> <li>- Synchronous request/reply</li> </ul>	<p>prior installations to use it.</p> <p>2. Supports CORBA applications.</p>	<p>configured to PI.</p> <p>2. Supports CORBA applications.</p>
<ul style="list-style-type: none"> <li>• Performance / scalability             <ul style="list-style-type: none"> <li>- Content execution</li> <li>- Multi-threaded</li> <li>- Message prioritization</li> <li>- Content-based routing</li> </ul> </li> </ul>	<p>1. Performance Tuning can be performed. During runtime. Logging can be activated at different levels and monitoring can be done using CEI or a separate tool called Tivoli Monitoring.</p>	<p>1. Performance Tuning can be performed. No monitoring is done and if BPM is involved PI performance will drastically reduce and there is a limit on file size though SAP NetWeaver BPM, the new tool, might remedy this weakness when it releases in Q3 2009.</p>
<ul style="list-style-type: none"> <li>• Reliability / availability             <ul style="list-style-type: none"> <li>- Persistence                 <ul style="list-style-type: none"> <li>- Persistent repository</li> <li>- Persistent queues</li> <li>- Persistent WIP</li> </ul> </li> <li>- Hot backups or Dynamic backup</li> <li>- Error handling</li> <li>- Compensating transactions</li> <li>- Event sequencing</li> <li>- Work-in-progress queue</li> <li>- Versioning</li> <li>- Initialization</li> <li>- Registry</li> <li>- Confirmation</li> <li>- Guaranteed transactions</li> <li>- Failover</li> <li>- Load-balancing</li> </ul> </li> </ul>	<p>1.Supports Reliability and Persistence</p> <p>2.Backend database is responsible for Hot backups</p> <p>3. Errors can be handled, stored and monitored at different phases of the flow.</p> <p>4. A GUI based BPEL can handle compensation. Using a Compensation Handler can be compensated at any point of the flow.</p> <p>5. A CBE and CEI GUI is available to configure event sequencing.</p> <p>6. WIP queue can be managed using MQ.</p>	<p>1.Supports Reliability and Persistence</p> <p>2.Backend database is responsible for Hot backups</p> <p>3. PI has its own error handling framework.</p> <p>4. Implemented using Tentative Update and Confirm or Compensate pattern.</p> <p>5. Event sequencing is code based.</p> <p>6. WIP queue can be managed using MQ.</p> <p>7. No versioning tools available and older versions are available in a History cache.</p>



	7. Versioning can be managed using Clearcase or CVS.	
<ul style="list-style-type: none"> <li>• Security</li> <li>- Authentication</li> <li>- Encryption</li> </ul>	<p>1. Supports Single Sign-On and LDAP can be configured.</p> <p>2. Several authentication mechanisms like HTTP authentication, SSL, WS Security and JAAS are supported.</p> <p>3. Interfaces are secured using SCA qualifier security permission which is set using a security qualifier in WID.</p> <p>4. Has separate BPEL and CEI authentications.</p>	<p>1. Supports Single Sign-On and LDAP can be configured.</p> <p>2. Several authentication mechanisms like HTTP authentication, SSL, WS Security and JAAS are supported.</p>
<ul style="list-style-type: none"> <li>• Access Services</li> </ul>	<p>MaXware's virtualization and user provisioning technologies form the core of its identity management solution are built on an enterprise SOA and offer identity management as a service—providing scalable, real-time and standards-based access to identity information residing in multiple repositories.</p>	<p>IBM Tivoli Identity Manager helps enterprises strengthen and automate internal controls governing user access rights</p>



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## CONCLUSION

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In conclusion, IBM and SAP are well versed in developing integration solutions based on SOA and each of them has their own way of developing applications. SAP has its own product list to support the whole project lifecycle whereas IBM uses varied tools and other third party tools to support the whole project lifecycle.

We have presented various differences and similarities between IBM and SAP PI by which we can conclude that both tools are equally capable of delivering the required SOA solutions in their own way.

SAP should focus on its strength within the enterprise application market and transform its current solutions to fit into an open SOA world and leverage the vast industry domain experience and pre-built business services to create industry specific SOA fabric to fast track SOA implementations.

IBM has always been an infrastructure provider. With enterprise infrastructure as the foundation of a SOA-based corporate IT world, IBM has been vindicated in putting great efforts into transforming its infrastructure offerings to comply with the SOA paradigm. However, since it has an extremely broad product range that has been further extended massively by a large number of acquisitions, it has become a hassle for customers to select a combination of products from such a broad range. Once the products have been selected, the next step of configuring the products together is a further challenge for customers involving higher budgets and longer timescales.