

Evaluation and Characterization of Business-to-Business Integration Systems

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Abstract

Business-to-Business (B2B) E-commerce activities involve selling goods and services to organizations, both public and private, to be used directly or indirectly in their own production or service-delivery operations. Due to the variety of existing systems, integration efforts are inevitable. Therefore, B2B integration servers provide solutions for the integration of different B2B systems of possibly different vendors.

In our paper, we evaluate relevant B2B integration systems. Therefore, we conduct a comparison between two representative systems, namely the Microsoft BizTalk Server 2000 and the Oracle Integration Server, with respect to the characteristics and functionality they offer. To our best knowledge, such a study and analysis of these tools has not been realized so far. We compare the B2B integration systems and their respective tools in a conceptual manner. Criteria for the comparison include system architecture and document processing as well as data/application integration and design issues of the systems under examination. The evaluation is based on available documentation literature and test installations. Typical B2B processes have been identified, designed and implemented for both B2B integration servers. The outcome of our work can assist system integrators and administrators to get an overview of market relevant B2B integration systems.

1 Introduction

According to the Association of National Advertisers, 44% of U.S. companies are selling online (early 2001). Additional 36% say they will do so by the end of 2001. The Gartner Group estimates the annual online sales to rise from \$403 billion in 2000 to \$7.290 billion in 2004. These numbers clearly show the forthcoming need for integration of online businesses.

When outsourcing parts of businesses to Third-Party companies, virtual supply chains form. Therefore the participating companies have to tightly link their supply chains and information systems together. E-Business should provide the customer with a consistent view of the company despite the variety of deployed front-end applications (web site, web store, call centre etc.). This consistent view can be facilitated by B2B integration systems.

The three main tasks of B2B integration systems are Data Integration, Application Integration and Business Process Integration, as shown in Figure 1.

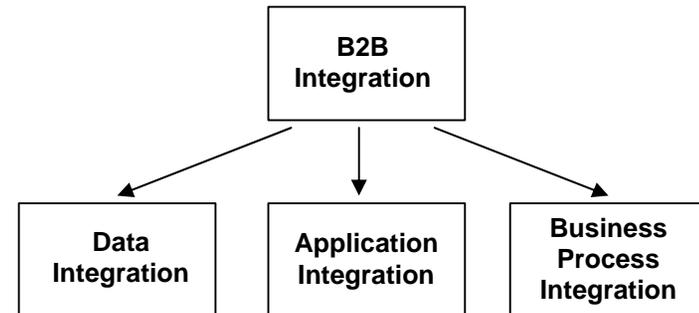


Figure 1: B2B Integration

In addition to E-Business integration between companies, the need for integration is also driven by developments inside an organisation [10], [11]. In case of mergers or acquisitions, heterogeneous databases and business processes have to be integrated – for instance the customer and supplier databases of the newly formed corporation have to be consolidated. To enable communication between newly bought packaged applications and legacy systems within the enterprise, these components need a mediating server. Also, when re-engineering business processes, the integration of (former stand-alone)

applications is inevitable. When a company moves towards E-Business, corporate self-service can be implemented. For example employees can be able to place orders for office supply online, which have to be integrated into a centralised buying system.

This study aims to provide an overview of existing relevant tools for business-to-business integration systems. These systems allow for communication between massively heterogeneous computer systems. Therefore a manufacturer can interact with customers and suppliers in an automated way, business processes can be executed autonomously. We have chosen two representative tools for investigation – Microsoft BizTalk Server and Oracle Integration Server. We aimed at examining these two market relevant tools developed by two leading information technology vendors. To our knowledge, such a comparison and analysis of these tools has not been carried out so far.

This paper should assist system integrators and administrators to get an overview of market relevant business-to-business integration systems. Thus, the decision-makers will be able to choose the right tools for their individual needs. The choice of the appropriate application for a company's business needs is crucial for future business success. This document aids to pick out a suitable solution for the integration of business-to-business systems.

This characterization is based on online documentation, white papers, online presentations, online help and newsgroups and experiences from the vendors' staff.

In Section 2 general requirements for B2B-integration systems are given. Architectural concepts and approaches of both servers are compared in Section 3. Section 4 provides an overall system description for Oracle Integration Server and Microsoft BizTalk Server 2000. In Section 5 the data transformation approach of the two servers is characterized and evaluated. Section 6 describes the integration of third party applications, namely SAP R/3 Adaptors, using a B2B integration server.

2 B2B Integration Requirements

To enable an enterprise to become an efficient E-Business, many heterogeneous applications as illustrated in Figure 2 have to be integrated, including E-commerce web sites, portals, supply chain management, procurement management, online market places, customer relationship management and enterprise resource planning.

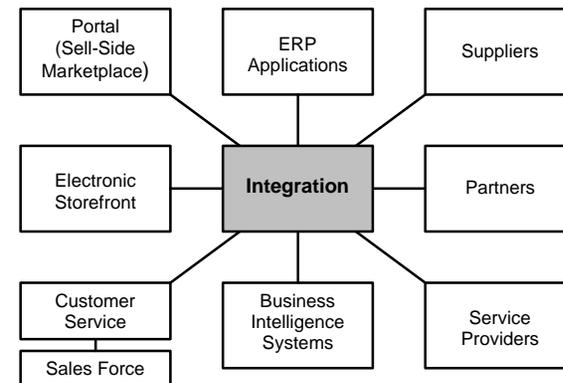


Figure 2: E-Business Integration [9]

To enable a company to implement business-to-business integration, the integration solution has to provide end-to-end security, mechanisms for auditing and tracking of documents, high system availability, tools for the integration of complex business processes and has to observe Internet standards. End-to-end security means that transactions conducted over the Internet have to be totally secure over their entire lifecycle, i.e. when stored in databases, when processed by applications and when transmitted over the network. To ensure auditing and tracking of business documents a systems must record tracking information even when documents are transferred over the Internet. To provide high availability, integration software connecting business partners and their applications has to supply highly reliable, scalable and always available services. When integrating complex business processes the integration has to be able to deal with long lasting processes involving many partners and/or applications. It is essential to support Internet standards like HTTP (Hypertext

Transfer Protocol) and XML (Extensible Markup Language) when transferring data over the Internet to be able to interface with applications to be integrated [5].

Integration scenarios have three fundamental integration problems, which have to be solved. First the integration of data between systems, second the integration of applications and businesses and finally the automation of multistep business processes (cf. Figure 1).

2.1 Data Integration

Different applications use different database systems, where frequent changes take place in individual databases independently. To provide access to these individual databases by B2B integration servers, interfaces to a variety of database systems have to be implemented. The access to remote data leads to data synchronization problems, which can be solved by using data access gateways and data replication.

2.2 Application Integration

To facilitate the integration of application logic and application functionality, applications must communicate to exchange business information. This can be done synchronously or asynchronously. Synchronous communication is accomplished by functional interfaces using request-reply protocols like Remote Procedure Call (RPC), Common Object Request Broker Architecture (CORBA), Microsoft Component Object Model (COM+), or Java Remote Method Invocation (RMI) [29]. Asynchronous communication with message-based interfaces uses message queues for incoming and outgoing messages.

2.3 Business Process Integration

The four key issues for automating multistep business processes are the integration of heterogeneous topologies, the creation of a standardised messaging architecture, the automatic transformation of data and integrated business process management. Business process modelling and execution should minimize the time between decision-making and the implementation of modifications; therefore graphical modelling tools are required [6]. B2B integration is simplified by tools for business process modelling integrated within the integration server. Business process intelligence allows to identify inefficiencies and bottlenecks, to track entire business processes and to do data mining for optimal resource planning [8].

3 Comparing Architectural Concepts and Approaches

The examined B2B integration servers are based on two different architectural concepts. Oracle Integration Server [33] is part of the Oracle database system. Microsoft BizTalk Server 2000 [17] on the other hand is a standalone product. Application integration within BizTalk is accomplished based on a loosely coupled approach to exchange messages.

3.1 Microsoft BizTalk 2000 Server

Microsoft BizTalk 2000 Server is a standalone product and part of an integrated infrastructure within the .NET strategy [2]. As a component of this infrastructure, BizTalk interacts with Application Center, Commerce Server, Exchange Server, Host Integration Server, Internet Security and Acceleration Server, Mobile Information Server, SQL Server, Windows 2000 Server, Windows 2000 Advanced Server and Windows 2000 Datacenter Server. Figure 3 gives an overview of the Microsoft .NET strategy that is represented by the cloud.

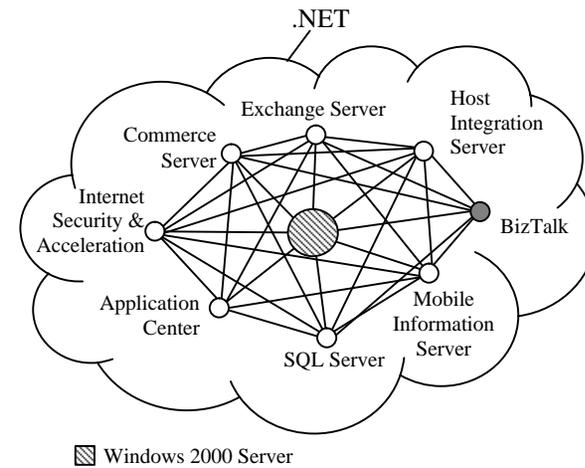


Figure 3: Microsoft .NET Strategy

BizTalk provides mechanisms for application integration and business-to-business integration not only to other servers in the Microsoft .NET strategy, but also to systems manufactured by other vendors. Integration is mainly based on means to receive, transform and send messages from and to a large number of applications in varying system environments with different interfaces. Communication, internal data representation and transformation of MS BizTalk Server are based on XML, XSL (Extensible Stylesheet Language) and DTD (Document Type Definition). BizTalk Server is also able to communicate using a multitude of interfaces and data formats, which are described in detail in Section 5.

3.2 Oracle Integration Server

Oracle consists of the core database and several optional add-ons. These modules all depend on the Oracle DBMS (Database Management System). Figure 4 shows this architecture with a few example modules – there are many more available.

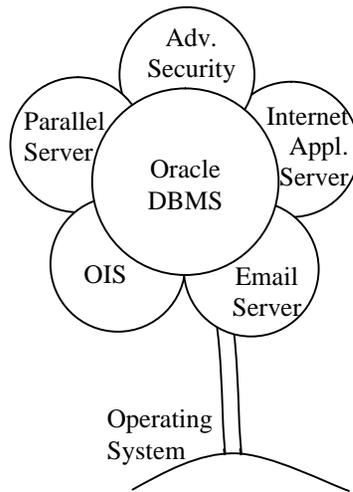


Figure 4: Oracle8i Architecture

Oracle Integration Server (OIS) is an integral part of the Oracle8i DBMS. To communicate between Oracle Integration Server and applications that were not

originally designed to be integrated, application adapters are required. These adapters are attached to their respective application using the application's native interfaces (in/out) for transmitting business objects. If the adapter detects a business event occurring in the application, this information is spread to other applications. Business objects may be translated into an XML-formatted message and error checking is performed. The connection to the Integration Server uses a standard interface (like JMS – Java Messaging Service) for the transmission of the information. For convenient development of Application Adapters, Oracle will provide an adapter Software Development Kit (SDK).

Pricing

Because the Oracle Integration Server is an integrated component of Oracle8i, there is no extra fee to pay – it is already owned if you get an Oracle8i licence. The beta version of the Microsoft BizTalk Server is also for free, but the final version will not. The price for the Standard Edition is estimated to be US\$ 4,999, the Enterprise Edition US\$ 24,999 (per CPU)¹ [16]. The future pricing strategy of Oracle is not known by now.

4 Overall Systems Description

Both investigated integration systems offer numerous possible server topologies. In general the functional components of the two integration servers are spread over many physical workstations, to provide a system with highest possible fault-tolerance. The administration of such highly distributed constellations is a demanding task, which is facilitated by respective tools – for Oracle the Enterprise Manager, and for Microsoft the BizTalk Management Desk and BizTalk Server Administration. To provide BizTalk with a scalable and fault-tolerant clustering solution, Microsoft Cluster Server is used.

4.1 Microsoft BizTalk Server 2000

Microsoft BizTalk Server 2000 combines enterprise application integration, business-to-business integration and Orchestration for business interaction [7]. Orchestration allows to design dynamic business processes that span applications over the Internet [12].

To allow secure communications with trading partners over the Internet, BizTalk Server 2000 uses Microsoft Windows 2000 security features which

¹ The Standard Edition is limited to five trading partners and five applications.

provide full support for a public key infrastructure, digital signatures and encryption. Also support for S/MIME (Secure Multipurpose Internet Mail Extensions) 2.0/3.0 and a pluggable architecture for third-party security products are included [23]. Microsoft BizTalk Server 2000 sends, queues and receives messages with exact-once semantics, including support for synchronous and asynchronous interaction [3]. BizTalk based servers can be clustered as needed, BizTalk Tools provide support for handling clusters and replication servers [3]. Together with Microsoft SQL Server document tracking and performance analysis is built in. BizTalk Server Architecture is illustrated in Figure 5.

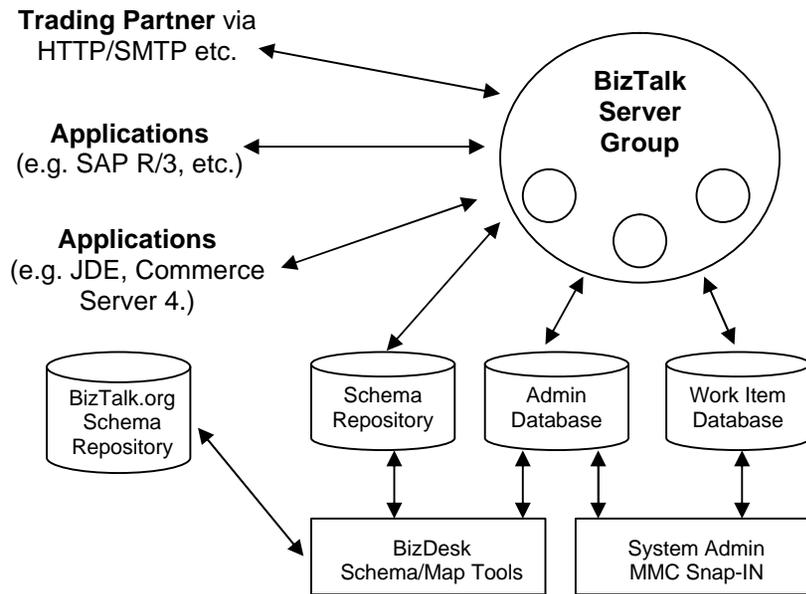


Figure 5: BizTalk Server Architecture [14]

4.1.1 Architecture

Figure 6 provides a system-level view of BizTalk Server 2000 deployment. It uses Microsoft Windows 2000 Server and Microsoft SQL Server 2000 to

implement a horizontally scalable, reliable and extensible document interchange engine [1], [3].

Microsoft proposes to use more than one BizTalk Server configured as a group for standard deployment [21]. Each of these servers will be able to process documents independently, thus providing a horizontal scalable and fault tolerant system without a separate clustering solution. Document specifications and maps are shared between the servers through the Windows 2000 Web distributed Authoring and Versioning (WebDAV) service [3]. By accessing a set of shared SQL server queues, the Microsoft BizTalk Servers share working interchange data. For document processing, four SQL queues are used: the scheduled queue, the work queue, the retry queue and the suspend queue [3].

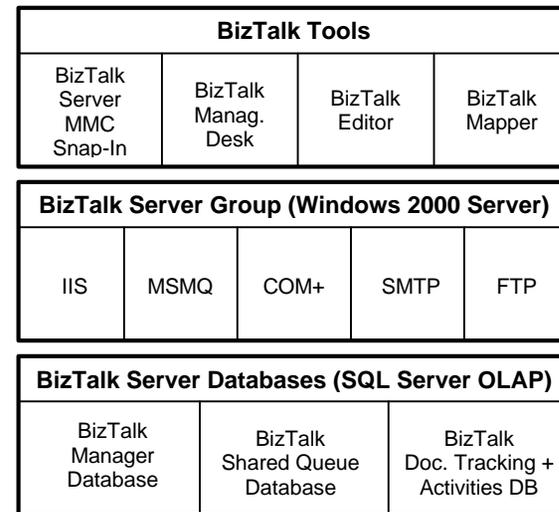


Figure 6: BizTalk Server Deployment [3]

The Microsoft BizTalk Server 2000 relies on Microsoft Windows 2000 Server services, the Internet Information Services (IIS) 5.0, the Network Load Balancing Service, the Cluster Service, the COM+ Component Services, the Microsoft Message Queuing (MSMQ) and the WebDAV service [3].

4.1.2 Document Processing

The first available BizTalk Server retrieves a document for processing and places it on the working queue. If a necessary service for document processing is unavailable the document is placed on the scheduled queue. If processing of a document fails and its count is nonzero it is placed on the retry queue and its count is decremented otherwise it is placed on the suspend queue [1], [3]. This process can be seen in Figure 7.

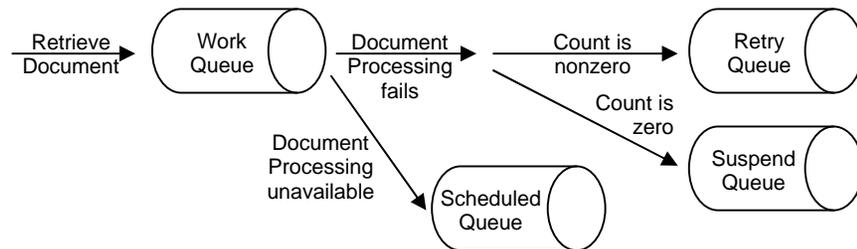


Figure 7: Document Processing

To enable easy integration of applications and business partners document exchange with Microsoft BizTalk Server 2000 can be done in XML and all document transformation is done in XSL-T (XSL Transformation). Multiple transports and protocols are supported by BizTalk Server, including EDI (Electronic Data Interchange) – ANSI X12 and UN EDIFACT, HTTP, HTTPS (Secure HTTP), SMTP (Simple Mail Transfer Protocol), Flat-File Transfer and outbound Fax [3], [22]. With BizTalk Framework 2.0 an open industry framework for reliable document exchange and routing was established [4], [18]. It is compliant with SOAP 1.1 (Simple Object Access Protocol) and provides exactly-once delivery of documents. BizTalk Server 2000 also contains an open binding adapter architecture to enable developers to build adapters that allow their products to be accessed from BizTalk.

When BizTalk Server 2000 receives a document, these logical processing steps are triggered [3]:

1. *Route checking:* The agreement route is checked.

2. *Parsing:* The parser looks up the document specification defined in the agreement, loads it using the WebDAV protocol and creates an intermediate XML representation of the submitted data.
3. *Validation:* The structure and grammar of the document is validated using rules provided by the document specification.
4. *Transformation:* The document is transformed using the defined document map in the agreements pipeline configuration. Data in the field of the source document are moved to the fields of the destination document.
5. *Serializing:* The internal XML representation of the document is serialized to the output format.
6. *Transport:* The appropriate transport service (HTTP, HTTPS, SMTP, MSMQ, FTP, flat file, Fax) is selected and the data is sent to the specified location.

Data can be submitted to Microsoft BizTalk Server 2000 directly by using a COM-aware application through the Iinterchange interface, or it may be submitted as a file, FTP, MSMQ or a custom receive function [22].

4.1.3 Tools

Microsoft BizTalk Server 2000 contains visual design tools based on Microsoft Visio 2000 to build dynamic, distributed business processes with BizTalk Orchestration designer. It supplies a common design environment for business analysts, IT-professionals and developers. Within the BizTalk Editor the developer is able to create and edit XML-schemas. Business Processes can be modelled with XLANG [39], which is an XML-based language for describing business processes. The BizTalk Editor allows to transform one XML schema into another and generates standardized Extensible Stylesheet Language Transformation (XSL-T) files to transform documents. The BizTalk Mapper supports the process of setting up trading profiles and agreements to exchange business documents with applications and trading partners over the Internet [3].

BizTalk Application Designer

Microsoft BizTalk Application Designer is a design tool enabling the creation of drawings describing long running, loosely coupled, executable business processes. Once a drawing is complete, it can be compiled as an XLANG schedule. An XLANG schedule is a business process implemented by connecting each step in the process to an application service that can execute the step. The definition and implementation tasks of business processes are separated from each other – on the left side of the design window, the analyst draws flow charts, while on the right side the developer implements the ports.

BizTalk Editor

Microsoft BizTalk Editor is used to create document specifications that are based on industry standards (XML) and common schemas (XSL), or specifications that are unique to an organization.

BizTalk Mapper

Microsoft BizTalk Mapper is employed to create a map between the records and fields of two different document specifications. The server uses these maps to process and translate data from the source format arriving at the server to formats that can be understood by the applications to which the output document is sent.

BizTalk Management Desk

BizTalk Management Desk provides a central means for managing the exchange of business documents between trading partner organizations and applications within businesses.

BizTalk Server Administration

BizTalk Server 2000 includes a Microsoft Management Console (MMC) snap-in called BizTalk Server Administration. The administration console is used to manage and maintain servers or server groups. Knowing the concept of the Microsoft computer management console helps to manage the BizTalk Server.

4.2 Oracle Integration Server

Oracle Integration Server was designed not solely for the solution of business-to-business problems, it also addresses company intern integration problems – for instance a simple front-office to back-office integration or the creation of a strategic IT infrastructure [9]. To solve these problems Oracle Integration Server provides means for Data Integration and Replication, Application Integration, Data Transformation, Business Process Intelligence, Business Process Modelling and Execution and Systems Management.

All the technologies provided by the Oracle Integration Server can be used independently of each other. This avoids useless complexity when choosing a particular technology – for instance, one can use the Advanced Queuing feature (for asynchronous communication) without knowing anything about the CORBA-based Object Request Broker mechanisms (synchronous communication) or about Advanced Replication (data integration). Thus, one can choose the technology that leads to the best solution of a particular

integration problem. The overall facilities of Oracle Integration Server are shown in Figure 8.

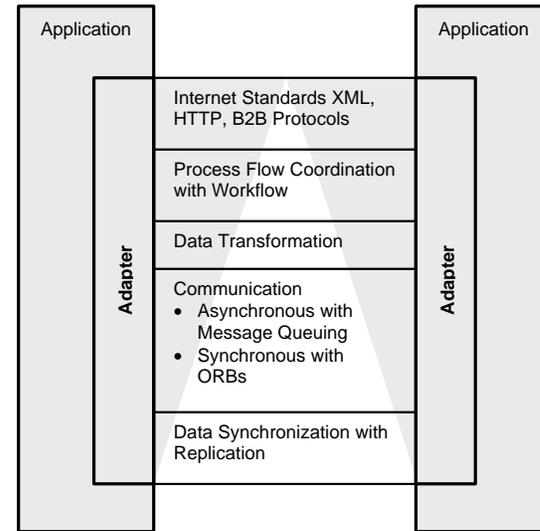


Figure 8: Oracle Integration Server facilities [29]

4.2.1 Architecture

Oracle Integration Server is designed to provide high reliability, availability and scalability [9]. To achieve this goal, it is based on the proven process architecture and runtime environment of the Oracle8i platform. Another advantage of this platform is the variety of available tools that can be used for administrating Oracle Integration Server, for instance Oracle Enterprise Manager, Oracle Designer and Oracle JDeveloper. To access the Integration Server functionality conveniently, standard languages like Java, C, C++, and PL/SQL (Procedural Language / SQL) can be used.

As an example for asynchronous message-based integration, Figure 9 illustrates an exchange integration scenario.

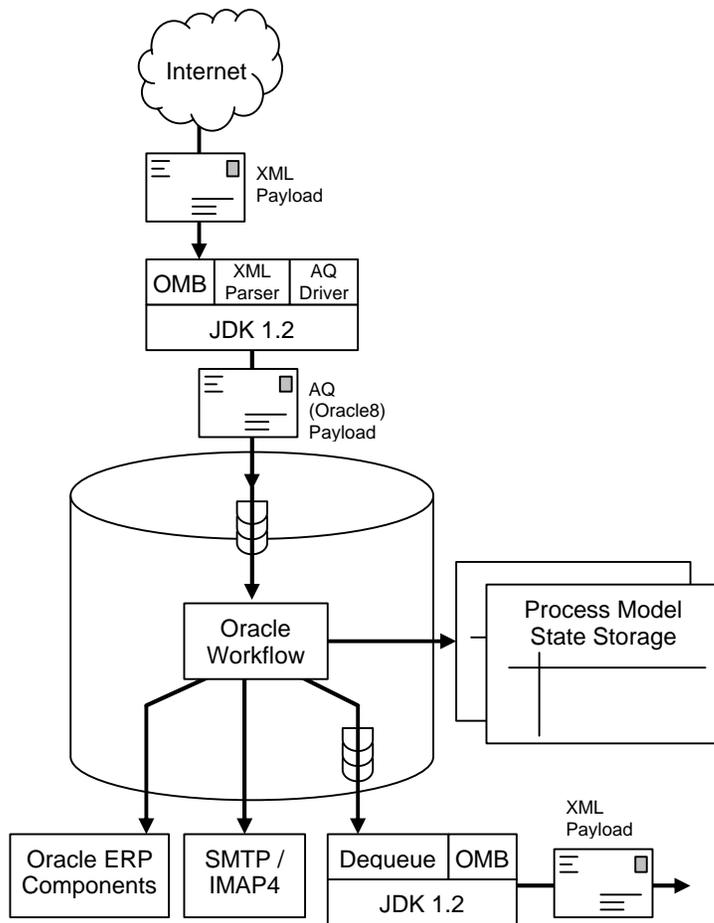


Figure 9: Integrating with a B2B Exchange [29]

To access and manage data from distributed heterogeneous databases (Data Integration), Oracle Data Access Gateways provide access to non-Oracle transactional systems (e.g. IBM-CICS, IBM IMS/TM, CA-IDMS/DC) and non-

Oracle databases (e.g. Sybase, Informix, SQL Server, DB2) respectively. With Oracle Replication Manager, synchronization of data across multiple distributed databases is accomplished.

Synchronous application integration at the application layer is supported by a Java-based CORBA 2.0 compliant Object Request Broker (ORB) and an Enterprise JavaBeans (EJB) server. Oracle Integration Server can also interoperate with the COM+ component model (Microsoft) through third party bridges. Asynchronous communication is provided by the full-service message queuing system Advanced Queuing. Features include a guaranteed, exactly once delivery of messages, publish and subscribe communication which is subject- or content-based, and propagation to remote queues [37]. Additionally, Java Messaging Service with access through PL/SQL, C, C++, and Visual Basic and Message Management to retain and analyse messages are available [13].

4.2.2 Document Processing

Because heterogeneous applications have different definitions of business objects, schemas, and message formats, these formats have to be transformed when sent from one application to another.

Oracle Integration Server encapsulates data transformation, i.e. the conversion performs transparently (cf. Figure 10).

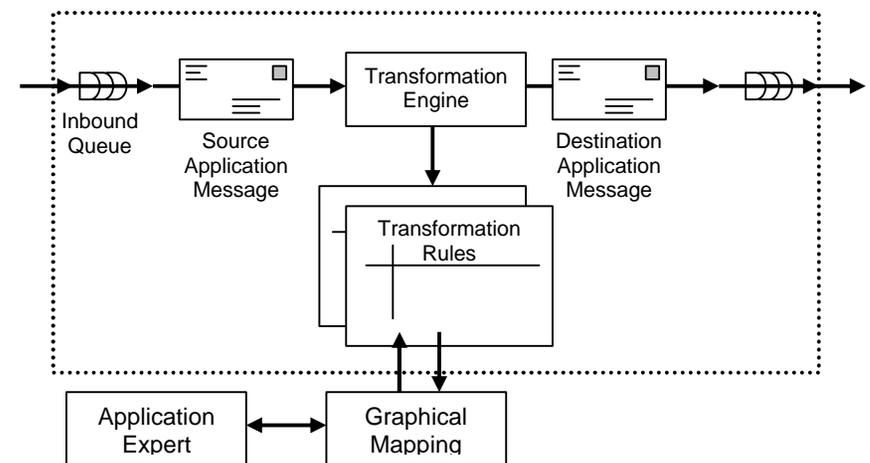


Figure 10: Message Encapsulation [29]

For the definition of data types and transformations between them, Oracle Integration Server provides a design-time visual tool. This tool can import type definitions from Oracle and SAP repositories, but also XML Document Type Definitions (DTD). Coming releases of the Integration Server will also offer XSL-T-based transformation of XML messages.

4.2.3 Tools

When installing and maintaining the Oracle Integration Server, it is inevitable to be at least familiar with Oracle8i – a comprehensive knowledge is recommended. Oracle's graphical, visual process modelling tool can be deployed by a business analyst using the Universal Modelling Language (UML) as well as by a technical analyst. To obtain a better understanding of the overall functionality of the business process, the tool provides a holistic view. One can validate and possibly modify the model before it is made ready for execution by the execution engine. The Business Process Coordinator manages multiple models simultaneously; it can automate processes that require human intervention as well as those that do not.

To gather intelligence about business processes, Advanced Queuing automatically retains and tracks every sent message [37]. This allows analysing live or in-process transactions and message warehousing and analysis respectively. Typical results from querying the message warehouse can be the elapsed time between order (through web site) and delivery, the variation of this time over the year (per month) or over a day, or the response time of the suppliers (which supplier is best).

Oracle Enterprise Manager

The Oracle Enterprise Manager is provided by Oracle8i and also used to manage and monitor Oracle Integration Server [32]. To manage a distributed environment from a single, central console, Oracle Enterprise Manager has been extended to handle the moving pieces of an integrated system. The systems objects can be managed at three different levels of granularity. At the lowest layer (queues, messages and queue propagation) queues can be started and stopped, propagations can be scheduled and statistics can be conducted. At the next layer, individual business processes can be started, stopped, resumed and queried. At the highest layer (system processes) Integration Server, Message Broker, adapters, applications and databases are managed.

Oracle Message Broker

The Oracle Message Broker provides an open, asynchronous, system-independent, message-based communication mechanism [34], [35], [36]. The foundation of the Oracle Message Broker is an implementation of the Java Messaging Service API. Oracle Message Broker allows different applications or systems to interact in a near real-time, robust, reliable, and scalable manner to complete end-to-end cross-functional business processes. A message selection engine supports message routing based on the contents of a message header, transactions are performed across application boundaries.

Oracle Applications InterConnect (iStudio)

Applications InterConnect (OAI) is specifically designed to integrate Oracle products with other Oracle products or third party legacy systems within the enterprise [30]. It allows decoupled integration of applications and eliminates the complexities of point-to-point solutions. In addition, OAI provides a tool (iStudio) for modelling the data in the integration scenario. iStudio eliminates the need for "hardwired" or "hard-coded" integrations. Users define their integration using iStudio, which minimizes the need to write any code for the integration. The integration information is captured as metadata in a repository.

Oracle Business Process Coordinator

The Oracle Business Process Coordinator is a runtime engine for the execution of business process models. It maintains the transition state information for all the processes it is executing. It can automate processes that require human interaction (traditional workflow) as well as those that do not (system-to-system processes).

5 Comparing the Data Transformation Approach

This Section describes which data formats and data definition languages, which communication mechanisms and which protocols and services are supported by the two B2B integration servers under review [22].

5.1.1 Supported Formats

The integration servers support the data formats shown in Table 1 [9], [15]:

Data Definition Languages	Oracle Integration Server	Microsoft BizTalk Server
XML 1.0	yes	yes
XML Data Reduced	no	yes
XML DTD	yes	yes
XSL	no	yes
XSL-T	future	yes

Table 1: Supported data formats

For consistent implementation XSL mapping between schemas is done according to W3C standards. Both Oracle Integration Server and Microsoft BizTalk Server 2000 support UN/EDIFACT and ANSI X12 EDI as data exchange standards for business documents (orders, invoices etc.) [15], [27]. These are already implemented for the respective business-to-business integration servers. Because both Microsoft BizTalk Server and Oracle Integration Server are based on an open architecture, additional data exchange formats can be defined and implemented within the integration server framework. The BizTalk community² provides hundreds of XML business document schemas covering a wide variety of industry and business

² <http://www.biztalk.org>

applications [28]. These are universally applicable – even for the Oracle Integration Server, because they are entirely written in XML.

5.1.2 Communication Mechanisms

Table 2 lists all interfaces supported by Oracle Integration Server and Microsoft BizTalk Server 2000.

Interface	OIS	BizTalk
COM+ Components	yes	yes
Object Request Broker (ORB)	yes	no
Message Queuing	yes ³	yes ⁴
BizTalk Messaging	no	yes
Java Messaging Service	yes	no
MS Active Directory support ⁴	no	yes
Oracle LDAP ⁵ directory service	yes	no
Script Components	yes	yes
SOAP 1.1	no	yes
SAP interface	yes	yes
IInterchange Interface	no	receive
Web (IIS)	yes	yes

Table 2: Interfaces

³ Provided by Oracle8i

⁴ Provided by Microsoft Windows 2000 Server or Advanced Server

⁵ Lightweight Data Access Protocol

Protocols supported by the two business-to-business integration systems are given in Table 3 [15].

Protocols and Services	OIS	BizTalk
HTTP (transport bindings)	yes	yes
HTTPS	yes	yes
MS Message Queuing	no	yes
Oracle Advanced Queuing	yes	no
FTP	no	yes
SMTP	yes	yes
Flat-File Transfer	yes	yes
Fax	no	outbound
Active Server Pages (ASP)	no	yes

Table 3: Protocols and Services

6 Third Party Integration – SAP R/3 Adaptors

When a company is forced to integrate with business partners, it is usually not able to change its whole IT-infrastructure because of economic considerations. Therefore the need for an intermediate integration solution providing a variety of different interfaces arises, at least for those systems, which have to be integrated. One of the most common Enterprise Resource Planning (ERP) applications to be integrated is SAP R/3 – thus interfaces to SAP R/3 are crucial and will be reviewed in this Section.

6.1 Microsoft BizTalk Server

The document processing sequence within Microsoft BizTalk Server is illustrated in Figure 11.

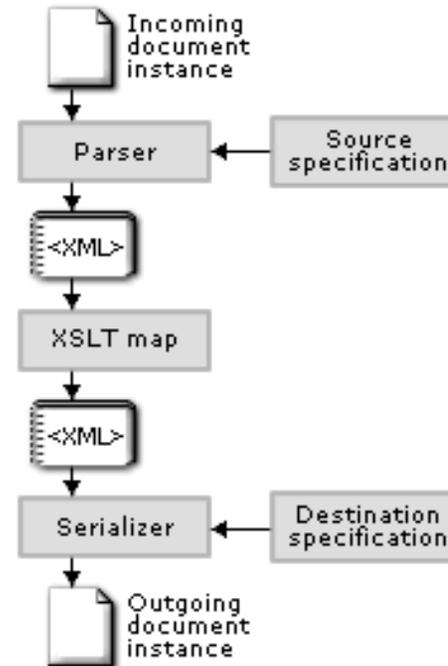


Figure 11: BizTalk Document Processing [24]

Microsoft BizTalk Server provides a wide variety of different interfaces to use for data exchange. To communicate between two applications all data is converted into an intermediate representation in XML [19], [20]. To do this conversion SAP provides XDR schemas for certain modules and supports development of interfaces for further SAP R/3 modules. Additionally it is feasible to create a XDR schema for arbitrary SAP R/3 modules. This can be done using the Microsoft BizTalk Mapper, which is employed to create a map between the records and fields of two different document specifications. The server uses these maps to process and translate data from the source format to XML. This data can be transformed to an output format required by the application receiving the document.

6.2 Oracle Integration Server

In Figure 12 the structure of the Oracle Adapter for SAP R/3 is sketched.

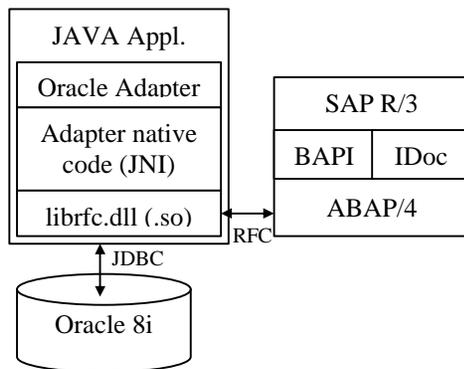


Figure 12: Oracle Adapter for SAP R/3 [30]

To exchange data with SAP R/3 the Business Application Programming Interface (BAPI) and Intermediate Documents (IDocs) are used [30]. These two are the most widely used and SAP recommended interface technologies. SAP applications are structured into high-level business components that split into business objects. BAPIs are interfaces for these business objects while IDocs are used for data exchange; IDocs is an asynchronous messaging data format. For the communication between Oracle Adaptor and SAP R/3 the Remote Function Call (RFC) protocol is used. The Oracle Adaptor for SAP R/3 is available at the Oracle website and consists of a set of Java packages.

7 Conclusions and Work in Progress

Oracle Integration Server was designed not solely for the solution of business-to-business problems, it also addresses company intern integration problems, for instance a simple front-office to back-office integration [9]. Microsoft BizTalk Server 2000 combines enterprise application integration, business-to-business integration and orchestration for business interaction. Orchestration allows designing dynamic business processes spanning applications over the Internet. BizTalk 2000 is already in use by major companies [38].

The two servers under examination are based on different architectural concepts. Oracle Integration Server is an integral part of the Oracle8i DBMS. To communicate between Oracle Integration Server and applications that were not originally designed to be integrated, application adapters are required. Microsoft BizTalk 2000 Server is a standalone product and part of an integrated infrastructure within the .NET strategy. Communication, internal data representation and transformation are based on XML, XSL and DTD.

An advantage of business-to-business integration servers is the holistic concept of application, business process and data integration. Together with the application of accepted industry standards (e.g. XML and XSL), this concept simplifies the establishment of a tighter connection between the participating business partners.

The minimal hardware requirements are quite moderate for both systems, but Oracle Integration Server (without Oracle8i) is even more frugal [33]. Oracle's system requires Windows NT 4.0 (SP5), while BizTalk is based on Windows 2000 (SP1) [26]. Furthermore, both systems require the support of an appropriate database system – Oracle8i and Microsoft SQL Server (7.0 or 2000) respectively. Currently, no comparison of the pricing policies can be conducted, because of a lack of information about the future price of Oracle Integration Server.

Widely accepted industry standard data formats are used by both servers, however the Microsoft BizTalk Server supports additional formats like XSL and XDR. The data exchange standards UN/EDIFACT and ANSI X12 EDI are implemented by both systems. The BizTalk community, which provides business document schemas, is unique in the sense that it has no counterpart at Oracle. Regarding the communication mechanisms, no substantial differences can be observed, except that both systems have their own implementations of

the communication concepts. The Microsoft BizTalk Server 2000 supports all transports and protocols offered by Oracle and additional services like outbound fax, FTP and Active Server Pages (ASP).

Both business-to-business integration systems offer security mechanisms for secure message transfer. Microsoft provides a more detailed specification of its security standards, including support for digital signatures, encryption, S/MIME and PKCS [25]. The customer support for Microsoft BizTalk Server uses much more communication channels than that for Oracle Integration Server. Some of this media offered by Microsoft – like web sites or newsgroups – provide more comprehensive and more specific information.

When installing and maintaining Oracle Integration Server, it is inevitable to be at least familiar with Oracle8i, comprehensive knowledge is recommended. Knowing the concept of the Microsoft computer management console helps to manage the BizTalk Server. For both products, experience with Windows NT/2000 is helpful. The tools shipped with BizTalk 2000 all use the standard Windows GUI, making it easier to become acquainted with them.

Further Areas of Research

A methodological framework for the evaluation of the running prototypical systems of the Microsoft BizTalk Server 2000 and the Oracle Integration Server has already been established. Future work will focus on the design and implementation of sample applications on both business-to-business integration servers.

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Biographical Sketches

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He was born in Vienna in 1975. In 1994 he graduated in technical high school as a building engineer (cum laude). Afterwards he did community service at the Austrian Red Cross for one year. From 1995 until 2000 he studied Business Informatics and Computer Science at the Technical University of Vienna and at the University of Vienna for nine semesters. In 1998 he was an exchange student at University of Limerick in Ireland for one semester. In the beginning of 2000 he concluded his studies magna cum laude with his master degree (Mag. rer. soc. oec.). Afterwards he became scientific assistant at University of Vienna, working on the Esprit Project BISANTE (Broadband Integrated Satellite Network Traffic Evaluation). His main task was in modelling user behaviour. Since February 2001 he is assistant professor at University of Vienna, Institute for Business Informatics and Computer Science, Department for Distributed Systems. He has teaching experience in Computer Networks. His main interests are in network simulation, user behaviour modelling, mobile communications and the evaluation and benchmarking of E-Business systems.

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