

Enabling Adaptive Business Processes: Oracle E-Business Suite and Service-Oriented Architecture

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EXECUTIVE SUMMARY

Through a combination of Oracle Fusion Middleware and Oracle E-Business Suite, Oracle provides the foundation for adaptive business processes, by enabling a service-oriented architecture. The design of Oracle E-Business Suite lets it work in a service-oriented architecture without your having to rewrite the applications, so you can get the value of adaptable business processes without a painful upgrade.

INTRODUCTION

This white paper demonstrates why you need to have adaptive business processes. In particular, it explains why you should consider implementing a service-oriented architecture (SOA) and how Oracle provides the best SOA through a combination of Oracle E-Business Suite and Oracle Fusion Middleware. It also shows how Oracle E-Business Suite enables services today, without a major upgrade, and highlights why its underlying application architecture provides a solid foundation for services. Finally, it reveals how Oracle Fusion Middleware works in conjunction with Oracle E-Business Suite to provide a foundation for adaptive business processes.

FRAGMENTED INFORMATION TECHNOLOGY LANDSCAPE

Today's chief information officers face a unique challenge: a fragmented IT infrastructure. Over the last 25 years, IT organizations implemented systems to address point solutions, such as manufacturing resource planning (MRP). These systems multiplied and went from just a couple per company to dozens, if not hundreds. This left CIOs with a complex and diverse software portfolio—and with the question of how to make many disparate systems act as one and how to tackle changing business requirements.

Enterprise application integration (EAI) and other middleware solutions certainly address this issue by enabling systems to communicate with each other, but they don't solve the problem entirely. Their ability to create cross-application business processes is inadequate, and they allow only limited business process adaptability.

* Oracle Survey to Customer Base

An Example: New Hire

Did you know that it takes 45 days for a worker to become fully productive in a new job? Most of this time is spent dealing with the administrative tasks associated with work—ordering a computer and entering that person's information into new systems (and learning the processes for doing so). In today's hypercompetitive environment, this time to value is too long. Workers need to be effective from day 1.

The problems they do solve come at a high cost. The majority of EAI and middleware solutions use proprietary technology, which locks you into a single vendor. In addition, the systems become tightly coupled, so if an interface change occurs in one system, all other systems need to be adjusted. This raises the cost of change, and in an operating environment in which IT is being asked to do more with less, this increase in the cost of change means that you can't run the business cost-effectively.

Solution: Service-Oriented Architecture

Although consolidating on Oracle E-Business Suite applications provides a single source of truth and dramatically reduces the cost of changing a business process, that solution is not possible for some customers with entrenched systems that cannot easily be replaced by any packaged application.

For those customers, a service-oriented architecture helps address the fragmented IT landscape. For now, don't worry about the technical aspects of an SOA, which this paper covers later. At the business level, an SOA enables the fragmented aspects of business functionality isolated in various systems to be leveraged within a business process, facilitating easy creation or modification of the process, and thus enabling CIOs to make their diverse, complex software portfolio act as a single unit to better serve the business.

WHAT IS A SERVICE-ORIENTED ARCHITECTURE?

A service-oriented architecture provides a standards-based platform that allows services to be provided, discovered, and consumed by each other, to facilitate the creation of a business process. This definition begs the question: What exactly is a service? A service is a unit of discrete business functionality. The most commonly used example of a service is a stock quote—the service takes a stock symbol as an input and delivers the current price of the stock. In a business context, a good example is an order-status service. It is common for customers to want to use multiple methods to see the status of an order. An order-status service could take an input describing the order, such as the order number, and return the status of the order via telephone, a call center, or the Web.

Services are realized with the advent of Web services. Although the concept of services has existed for decades in the software development arena, Web services take the concept to the next level of practicality, by using standard internet protocols to provide integration. With vendors ubiquitously adopting Web services and standards appearing to address almost any requirement, Web services provide a natural foundation for the next-generation enterprise architecture: SOA.

Design Considerations for SOA

SOA requires several pieces of basic functionality to operate correctly and provide the most value. Here are the necessary components of an SOA:

In a service-oriented architecture, the business process for adding a new hire can be automated, thus reducing the time it takes for the new employee to become productive.

Traditional integration scenarios used tight coupling; interfaces were directly mapped from one system to another. As a result, when one system changed—with the addition of new functionality, for example—the interfaces no longer worked and IT had to recode the integration.

- **Leverage of existing investments.** For SOA to offer value, it must leverage existing systems. Service-enabling existing systems increases the usefulness and value of those systems. Suddenly, existing systems can be used in new ways and pressures to update those systems decrease. For example, Web-service-enabling a custom-built warehousing system means that it can be easily integrated into your pick, pack, and ship process.
- **Loose coupling.** SOA embodies the concept of loose coupling. When the interface is abstracted out, changes in one system do not affect others. This reduces the cost of change, by eliminating the need for extensive retesting if one minor change is made within one system. Because the systems are not directly dependent on each other, changes in one system are not likely to percolate to another system.
- **Service encapsulation.** Encapsulation separates the interface from the way the service is performed. This enables the underlying implementation of the service to change without affecting the integration. For instance, a credit-check service could move from an internal credit system to a credit bureau without recoding of the integration.
- **Interface standardization.** Using standards when developing interfaces lets the interfaces interoperate more easily. Web services standards such as Simple Object Access Protocol (SOAP) and Web Service Description Language (WSDL) enable heterogeneous systems to interoperate. A case in point: Web services enable systems such as a legacy billing system on the multiple virtual storage (MVS) release of OS/VS2 to communicate in real time with a modern customer relationship management (CRM) system.
- **Shared semantic framework.** Semantics are the vocabulary of any service; utilizing the same semantic framework enables various systems to understand each other. For instance, if two systems have a different concept of what a sales order is, it will be difficult for them to easily communicate. With a shared vocabulary, or semantic framework, those systems can more easily communicate. This shared semantic framework can consist of the same definition structure or the ability for a term to be translated into a common definition.
- **Business events.** A business event is a state-change notification that requires human or system intervention. The event moves the business process along, either starting it or providing a key component within it. For example, the creation of a purchase order or a sales order is considered an event. This event starts a business process or occurs within it. For instance, a sales order triggers an order-to-cash process and, in the order-to-cash process, shipment notification is considered a business event.

ORACLE AND SERVICE-ORIENTED ARCHITECTURE

Oracle's complete suite of products, including Oracle Fusion Middleware and Oracle E-Business Suite, enables companies to achieve a service-oriented architecture. Because Oracle E-Business Suite is Web-service-enabled, starting with Release 11i, you can take advantage of your Oracle E-Business Suite applications in a service-oriented architecture without upgrading. This gives you the ability to maximize your investment in Oracle E-Business Suite.

Business Events in Oracle E-Business Suite

Before a discussion of how Oracle E-Business Suite supports events, it is important to understand how events fit into the context of a service-oriented architecture. As described above, events are a change in state—but how is that material to a business process? First, it is important to understand the difference between business events and other events. A business event is a notification of a change in status related to a business item, such as a sales order, purchase order, or employee new hire.

Business events provide the foundation for the business process—how can you know to process a sales order if you don't know that it has arrived? They notify parties in the SOA that something has changed and that action might be necessary. This action might be subsequent processing of a business document or letting an executive know about a business opportunity.

With more than a thousand events defined, Oracle E-Business Suite is built on the concept of business events. You can use Oracle Workflow to manage these events: When a state changes in Oracle E-Business Suite, Oracle Workflow raises an event and does subsequent business processing based on it. For example, the XML Gateway is provided with an XML representation of this event. The XML Gateway can then have the business event surface as a Web service to be used within an adaptive business process. Alternatively, the XML Gateway connects to almost any messaging system, including Oracle InterConnect, Oracle BPEL Process Manager, Java Message Service (JMS) providers, or third-party messaging systems such as IBM MQSeries.

In the service-oriented world, adding a new hire to the HR system triggers a business event, thus creating a signal for other systems to act.

Search and Select: Event Filter (Cancel) (Select)

Search
To find your item, select a filter item in the pulldown list and enter a value in the text field, then select the "Go" button.

Search By Event Name % Go

Results
Personalize "Workflow Test Business Event LOV"

Select	Quick Select	Event Name	Display Name
<input type="radio"/>		oracle.apps.per.api.recruitment_activity.update_recruitment_activity	Update Recruitment Activity
<input type="radio"/>		oracle.apps.per.api.vacancy.update_vacancy	Update Vacancy
<input type="radio"/>		oracle.apps.per.api.recruitment_activity.delete_recruitment_activity	Delete Recruitment Activity
<input type="radio"/>		oracle.apps.per.api.vacancy.delete_vacancy	Delete Vacancy
<input type="radio"/>		oracle.apps.per.api.application.update_apl_details	Update Apl Details
<input type="radio"/>		oracle.apps.per.api.person_address.create_person_address	Create Person Address
<input type="radio"/>		oracle.apps.per.api.person_address.update_person_address	Update Person Address
<input type="radio"/>		oracle.apps.per.api.estab_attendances.create_attended_estab	Create Attended Estab
<input type="radio"/>		oracle.apps.per.api.person_address.update_pers_addr_with_style	Update Pers Addr With Style
<input type="radio"/>		oracle.apps.per.api.estab_attendances.update_attended_estab	Update Attended Estab

(Cancel) (Select)

Figure 1. A list of business events

One key feature that business events enable is loose coupling. Because Oracle E-Business Suite business events ensure that message definitions stay consistent from version to version, other systems don't need to worry about upgrades or changes in the Oracle E-Business Suite applications. Such changes will not break the integration touchpoint.

Enterprise Services

In order to have a service-oriented architecture, you have to have services. In Oracle E-Business Suite, Oracle offers [services through XML Gateway](#). Oracle calls any functionality offered by Oracle E-Business Suite as a **Web service** an *enterprise service*. Enterprise services provide business-defined functionality with enterprise-level scalability, robustness, security, manageability, and supportability. In contrast to traditional Web services, enterprise services possess a more complex collection of business rules. For instance, in advanced pricing, rules regarding pricing can relate to the entity being sold to, date sold, volume ordered, and type of product ordered. An enterprise service would process all of these rules to provide the resulting correct price in a given situation.

All enterprise services offered by Oracle E-Business Suite embrace interface standardization, by utilizing WSDL to describe the service and SOAP for binding. In addition, Oracle E-Business Suite enterprise services support a shared semantic framework through the adoption of the Open Application Group (OAG) definition of business documents, including support for more than 150 OAG

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Business Object Documents (BODs). Oracle is continuing to expand its use of OAG BODs as they become available.

XML Gateway

XML Gateway ~~offers~~ the method of accessing services within Oracle E-Business Suite. XML Gateway provides XML messages for both inbound communication to Oracle E-Business Suite and outbound communication from it. More than 167 XML Gateway messages exist in Oracle E-Business Suite, from Sales Orders to Price Inquiries to Adding a Customer. In addition, every XML Gateway message can be accessed as a Web service.

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Utilizing Services

Introduction to Oracle Fusion Middleware and Oracle BPEL Process Manager

Oracle BPEL Process Manager, a part of Oracle Fusion Middleware, provides a comprehensive, standards-based, easy-to-use solution for creating, deploying, and managing cross-application business processes with both automated and human workflow steps—all in a service-oriented architecture. Oracle BPEL Process Manager consumes services from various applications and orchestrates them into a business process. Its native support for standards such as BPEL, JCA, JMS, Web services, XML, XPATH, and XSLT makes it an ideal solution for creating integrated business processes that are portable across platforms. Oracle BPEL Process Manager fully leverages sophisticated features of the underlying Oracle Fusion Middleware platform such as security, scalability, and high availability. In essence, Oracle BPEL Process Manager acts as Oracle's Business Process Management (BPM) solution.

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Service beans are a fairly recent development in Oracle E-Business Suite. Using them is a standard method for accessing and operating on Oracle E-Business Suite business objects designed for deployment as a Web service. Service beans use the same technology infrastructure as the Oracle Applications Framework, so many functions available on Oracle E-Business Suite HTML screens (which are based on the Oracle Applications Framework) are available as Web services.

"As the development of applications continues to shift toward the process-centric viewpoint, the need to easily piece these components together to form a larger business process increases. Oracle's BPEL Server is a very strong option for meeting this need. . . . Overall, the [Collaxa] BPEL Server is a very capable product and should be considered when building service-oriented architectures."

—*Web Services Journal*, August 7, 2004

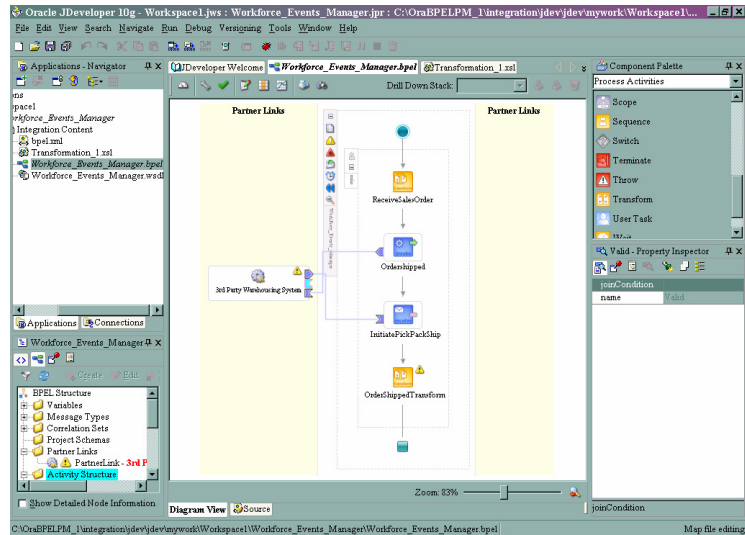


Figure 2. Oracle BPEL Process Manager

Using Oracle BPEL Process Manager with Oracle E-Business Suite

Oracle BPEL Process Manager interacts seamlessly with Oracle E-Business Suite business event and enterprise services, easily receiving business events from Oracle E-Business Suite. These events can start a process within Oracle BPEL Process Manager or send a signal to Oracle BPEL Process Manager to continue a process. Oracle BPEL Process Manager can also invoke enterprise services from within Oracle E-Business Suite.

For instance, if a sales-order process crosses multiple systems before the order can be fulfilled, you can use Oracle E-Business Suite for sales order management and financials but use a homegrown application for pick, pack, and ship, as described in the steps below.

1. The sales representative enters an order in Oracle E-Business Suite for a box of widgets.
2. An event is triggered within Oracle E-Business Suite and is picked up by Oracle BPEL Process Manager, which recognizes the event as the start of a process.
3. Oracle BPEL Process Manager invokes a Web service from the homegrown application to pick, pack, and ship the box of widgets.
4. The homegrown application invokes a Web service to notify Oracle BPEL Process Manager that this part of the process is complete.

5. Oracle BPEL Process Manager notifies Oracle E-Business Suite that it should mark the order as shipped and incorporates the necessary transactions into Oracle Financials.

Developing in a Service-Oriented World

Oracle JDeveloper provides the mechanism for doing development in SOA. It offers a single, unified tool for developing all the aspects of a service-oriented architecture, from creating or customizing a service bean in Oracle E-Business Suite to developing business processes with Oracle BPEL Process Manager.

Leading the charge in Oracle JDeveloper is the Application Development Framework (ADF), which consists of multiple programming models, including a method of creating a business services layer where business logic can reside to be used across ADF components. This enables developers to seamlessly move from developing business logic in Oracle E-Business Suite to developing custom J2EE business logic, which improves their productivity, enabling them to focus on delivering applications, not on learning how to jump from tool to tool.

Finding Services

Oracle E-Business Suite includes many different APIs and integration technologies, such as PL/SQL procedures, Java classes, XML Gateway messages, Electronic Data Interchange (EDI) messages, open interfaces, concurrent programs, business events, and Web services. Beginning with Oracle E-Business Suite 11i/Release 10, Oracle introduced a comprehensive online directory of Web services, interfaces, and integration points that act as the service broker for Oracle E-Business Suite. This directory functions as a catalog of all Oracle E-Business Suite interfaces, including Web services, business-to-business (B2B) protocols, application programming interfaces (APIs), legacy integration technologies, and business events.

The integration repository is more than a simple compilation of call syntax; it is an actual service broker that enables you to find services in Oracle E-Business Suite. The integration repository includes screens for searching and viewing all available interfaces with just a Web browser. With its advanced search capabilities, developers can easily find the exact Web service they need. In turn, this allows the integration repository to facilitate the easy development of business flows and reduces the cost of ownership.

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"The strongest draw to the latest JDeveloper release is the introduction of the newly minted Application Development Framework (ADF), a J2EE MVC framework that helps to facilitate rapid app development from within JDeveloper."

—Application Development Trends Magazine,
August 1, 2004



Figure 3: Integration repository

But just as important, it allows for programmatic interrogation of its APIs by external programs (such as EAI tools) to expose and administer interface points as Web services. Any messages defined in Oracle XML Gateway, and any service bean, can be interrogated by external EAI tools and exposed as Web services. This enables Oracle E-Business Suite integrations to offer value even if you have selected middleware other than Oracle's.

CREATING COMPOSITE APPLICATIONS

Once you have the SOA components, you need to create a composite application that uses them. Composite applications consist of a collection of services and business events. This collection is then orchestrated or assembled to complete a business process within an application or across multiple applications. Once you have a composite application, you can quickly modify it to handle changes in corporate requirements.

By putting together all of the SOA components, you can create business flows. Business flows, created in Oracle BPEL Process Manager or any non-Oracle-based BPM product, can use enterprise services or business events offered by Oracle E-Business Suite [XML Gateway](#) to string together a process encompassing other applications and display them all through Oracle Portal.

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Improving the Flow

Creating and modifying business processes alone won't give your company a competitive edge; you must also be able to monitor and improve them. You have to keep an eye on key performance indicators to ensure that your business is performing according to plan.

A component of Oracle Fusion Middleware, Oracle Business Activity Monitoring (Oracle BAM) enables you to define monitoring points to provide insight into

business flows for reporting, analytic, and performance improvements. Oracle BAM offers a dashboard so you can understand your business processes and key performance indicators.

Business events underlie the use of Oracle BAM with Oracle E-Business Suite. When they notify you about status changes, they provide perfect monitoring points, already engineered within a business process, that can serve as the basis for metrics to examine and improve your business processes by identifying when something of importance occurs.

The best way to demonstrate this is to build on the new-hire example shown in previous sidebars.

Adding an Employee in Service-Oriented Architecture

Let's say a new employee joins your firm. When a new hire is entered into Oracle E-Business Suite, a business event occurs that shows that an employee has been added to your systems. Oracle BPEL Process Manager listens for that event, taking it in and starting a process. Then Oracle BPEL Process Manager sends an e-mail to the new employee, asking him to access Oracle Portal, where he can select his benefits and order his computer, after which Oracle BPEL Process Manager can use a third-party service to provide him with his corporate credit card. Finally, a Web service is invoked to pass the employee information to security, so that the employee can get a badge on his first day. This is just one example of how a business flow can use Oracle technology to create an adaptable business process.

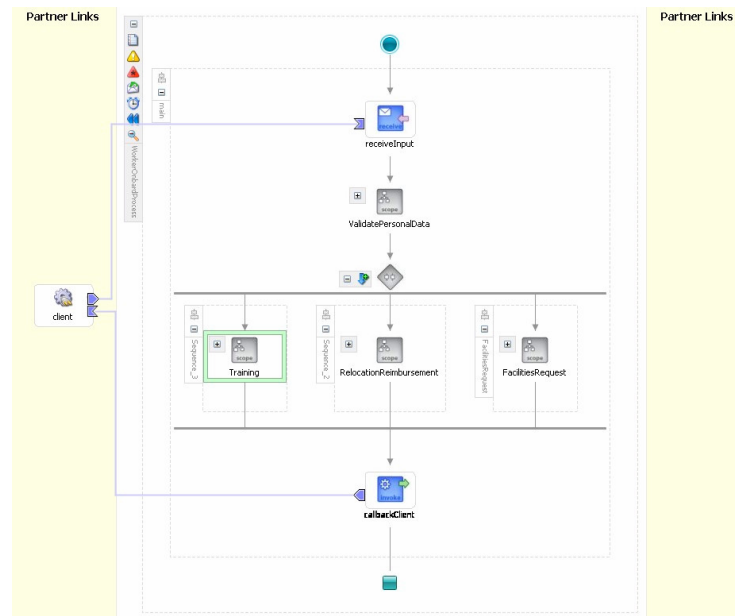


Figure 4. Adding an employee in Oracle BPEL Process Manager

Oracle Application Server 10g, a part of Oracle Fusion Middleware, is positioned in the Leaders Quadrant in the 2005 Gartner Enterprise Application Servers Magic Quadrant.

IMPORTANCE OF INFRASTRUCTURE

Although part of the value of a service-oriented architecture is that it enables otherwise heterogeneous systems or platforms to communicate, the importance of using the right infrastructure increases. The infrastructure provides the foundation for any architecture. If that infrastructure is not scalable, reliable, and secure, can the architecture provide the integrity necessary to enable adaptive business processes? Of course not.

Grid Computing

In a fragmented IT landscape, you never know which systems are going to require additional resources. Your business is always changing—how can your infrastructure adapt and optimize? Grid computing provides the solution, enabling scalability, reliability, and high availability within a service-oriented architecture.

What exactly is grid computing? In the simplest terms, grid computing is the pooling of all IT resources into a single set of shared services for all enterprise computing needs. The grid computing infrastructure continually analyzes demand for resources and adjusts supply accordingly.

You don't have to worry about where your data resides or which computer processes your request. You request information or computing power and have it delivered—as much as you want, whenever you want.

Ensuring that computing resources are available as needed provides scalability. When you are developing adaptive business processes, it is vital that they can scale as the business demands. For instance, during the holiday season, chances are that your business goals are oriented to order-to-cash, not to hiring. Grid computing automatically shifts computing resources from the hiring process to the order-to-cash process. This allows your business processes to scale to meet the increased demand associated with the holiday season. This also reduces your cost of ownership. No longer do you have to purchase hardware to meet peak capacity for individual applications; you can now pool your hardware and purchase a smaller amount.

Reliability and high availability are guaranteed with the same capability. If a network node that provides sales orders goes out, grid computing can adjust resources to this process to ensure that your business can continue to take orders.

Securing Services

Security performs a vital service within service-oriented architecture. You wouldn't let just anyone access a credit-limit-increase application; likewise, you need control of access to services. Only authorized systems should be able to access services.

Through the acquisition of Oblix, Oracle has gained a unique ability to ensure that access to services is secure. Through the use of Oracle Web Services Manager (formerly Oblix COREsv), Oracle equips you with tools for building security and operational policies to be layered on top of Web services. Runtime capabilities

"Oracle is aggressively pursuing its enterprise grid computing agenda by rolling out a second generation of its 10g infrastructure platforms and by integrating these platforms with its application suite and third-party products in an overarching, SOA-based Oracle Information Architecture."

Summit Strategies, February 2005

exist to apply these policies to a service request, ensuring that only authorized systems access service and guaranteeing the integrity of Oracle's service-oriented architecture.

OPENNESS

Although Oracle E-Business Suite is tightly integrated with Oracle Fusion Middleware and customers can decrease their time to value by leveraging the products together, Oracle recognizes that customers may have made other middleware decisions. Because Oracle E-Business Suite uses Web services, it's easy to integrate any middleware—IBM, Tibco, webMethods, or BEA—as long as it supports Web services. Whether it's for business events or enterprise services, Oracle E-Business Suite enables SOA even if Oracle Fusion Middleware is not used.

SUMMARY

This white paper has demonstrated how Oracle E-Business Suite and Oracle Fusion Middleware work together to enable CIOs to coordinate the elements of their diverse software portfolio to act as one. Facilitating events and Web services with Oracle E-Business Suite gives CIOs a foundation of business process components they can leverage to solve myriad problems and rapidly respond to changing business requirements.

This solution is extended through any standards-based middleware, such as the industry-leading Oracle Fusion Middleware, which enables CIOs to quickly modify or change business processes by leveraging Oracle BPEL Process Manager. In addition, they can monitor and improve services by using Oracle Business Activity Monitoring or secure the services by using Oracle Access and Oracle Identity Management. Finally, CIOs don't have to worry about the changing relative importance of business processes, because they can leverage the grid to ensure reliability, scalability, and availability.

When everything works together, you have the most complete and mature foundation for adaptive business processes.



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