

MDM as a Foundation for SOA

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MDM as a Foundation for SOA

INTRODUCTION

Service Oriented Architecture (SOA) has the potential to transform Information Technology (IT). Properly deployed and managed, it has the power to create business flexibility where today there is none. Master Data Management (MDM) enables a single view of the business across operational and analytical systems for the first time since data warehousing was invented. In combination, SOA and MDM can literally revolutionize IT and enable centralized shared services over existing application infrastructures. Organizations that deploy these two technologies together will realize significant sustainable competitive advantage, as their IT groups once again become centers of innovation.

OVERVIEW

Over the last three decades, IT organizations have grown into a combination of large data centers that support corporate business functions, and distributed computing centers that support departmental needs. Large installations of legacy mainframe technologies still exist. Client/Server systems provide distributed functionality and are hard to retire. Internet computing adds another layer of complexity instead of replacing existing systems. This ceaseless complexity has driven the cost of maintaining modern IT organizations through the roof. Recent studies have shown that as much as 80% of a CIO's annual budget can be spent on maintenance. New applications must integrate with existing systems. This can cost 60% of what is left after maintenance expenditures. This leaves 8 cents on the dollar for new software licenses¹. This complexity increases the costs, limits innovation, increases risk, and reduces IT's ability to respond to changing business needs in a timely fashion. The situation is critical.

SOA is a major advancement designed specifically to address this problem. The architecture brings together a set of cooperating technologies that can bring flexibility to the existing IT landscape. These technologies include modern application integration techniques, web services, and business process orchestration. Tools include user interface portals, web services managers, rules engines, transformation engines, and user community identity management. Application servers and Internet development environments are also included. Open standards are key to the success of an architecture that brings so many technologies together to solve a specific overarching problem.

IT fragmentation not only reduces agility, it creates a significant data quality problem. Every silo has its own definition of the business data designed to support its own features and functions. This is all well and good until business processes

¹ Gartner IT Spending and Demand Survey

need to work across these silos. At that point, the different definition of the same business data often breaks the business process. SOA does not deal with this problem directly. In fact, SOA will enable companies to rapidly deploy new business processes across these applications. These new processes will also ‘break’ on the rocks of poor data quality.

Master Data Management is a modern architecture designed to eliminate poor data quality under heterogeneous IT application landscapes. It employs tools such as data survivorship engines, data quality rules engines, data standardization, and data synchronization. It employs interfaces to third party data augmentation and address standardization providers. It builds cross-references for federated data and golden records for centralized data.

MDM solves the one problem that can reduce the effectiveness of SOA implementations. Yet, clean augmented quality master data in its own silo does not bring the potential advantages to the organization. For MDM to be most effective, a modern SOA layer is needed to propagate the master data to the applications and expose the master data to the business processes. SOA and MDM need each other if the full potential of their respective capabilities are to be realized. In combination, they can have a profound impact on IT.

Oracle has the world’s fastest growing SOA Suite, and Oracle is the market leader in MDM². Oracle is bringing these two state-of-the-art architectures to market with MDM serving as a foundation for SOA deployments. The SOA-MDM combination creates the most strategic business value. This whitepaper identifies the key SOA and MDM components and describes how they work together to bring this value to our customers.

ENTERPRISE BUSINESS PROCESSES

A business is its processes. Business processes cover everything an organization does. Automating these processes is what the operational side of IT is all about. Efficiency on this front is critical for a company’s very survival. Every department and every line of business has its own processes. Many of these processes can be supported by a single application or set of unified applications in a suite. But the most strategic processes cross applications and departments. These are the business processes that differentiate a company from its competitors. Departmental efficiencies come with the out-of-the-box application capabilities. Everyone who buys the application gets the same features and functions. But cross department processes define how an enterprise works to build customer value. These are the processes that are inhibited by current IT infrastructure rigidity. These are the processes that break down when poor data quality exists across application boundaries. These are the Enterprise Business Processes and they are the target for SOA and MDM.

“My suggestion is: start with the data. This sounds counterintuitive, since SOA is about offering standardized business processes as services, but the concept of data as a service is actually more viable for companies just beginning to think about SOA.”

Jill Dyche
Baseline Consulting
September 2007

² ARC – Master Data Management Worldwide Outlook Market Analysis and Forecast through 2011, 2006

To illustrate how Oracle's SOA-MDM works to optimize these processes, we will use a simplified 'Order to Cash' process throughout this paper. It has three lines of business supported by three different applications:

- Sales
- Order Management
- Accounts Receivable

Each department has its own supporting application. Each department manages its own customer data.

Sales

In our example, Sales is supported by a front office sales automation application. This application automates Opportunity Management with Point of Sale support. Order capture information is collected on price and discounts. Contracts are established with customers. Customer information is maintained and governed locally according to Sales Department rules.



Order Management



Order Management (OM) is supported by a back office application. The OM application manages the configuration of products sold and shipping. It enables customer access to order progress and supports a Call Center. Customer information is maintained and governed locally according to OM Department rules.

Accounts Receivable

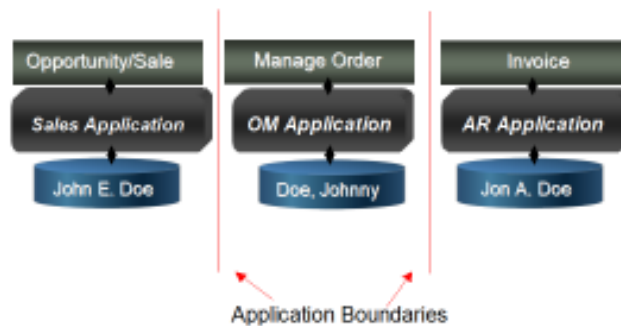
Accounts Receivable (AR) is supported by a financial application. This application automates Invoice generation, billing, and if necessary, collections. Customer information is maintained and governed locally according to Financial Department rules.



Order to Cash

Order to Cash is the business process that starts when an opportunity turns into a sale and ends when the money is in the bank. Enterprise business processes cross the Sales, OM, and AR department domains and their supporting application boundaries. Inconsistent data in these application silos severely impacts the operations of these processes. Master data, good enough to support the local operations of each department, can break these enterprise processes.

The following figure illustrates how Customer data can vary.



Each application has its own version of John Doe. If these differences are not correctly dealt with at the application boundaries, the business process breaks down. The product is sent to the wrong address, the bill is sent to the wrong person, or the process winds up in a slow and costly manual procedure to correct the errors.

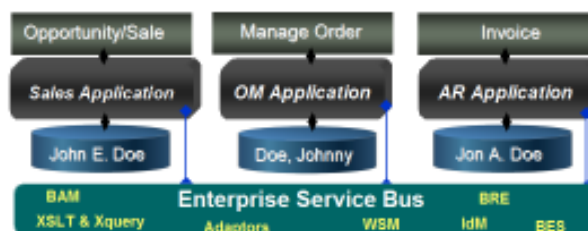
SOA Enable Applications without MDM

SOA enables organizations to 1) integrate their applications and 2) orchestrate their business processes. We will examine each of these two as they apply to our Order to Cash Enterprise Business Process example.

Integrate the applications

The best practice for integrating applications together is to provide an Enterprise Service Bus (ESB). It utilizes a metadata repository to manage hub-and-spoke or point-to-point high volume low latency data movement between applications.

The following figure illustrates how applications are connected to the ESB rather than to each other.



An ESB usually comes with a number of imbedded tools such as a business activity monitor (BAM); standards based data transformation tools (XSLT,

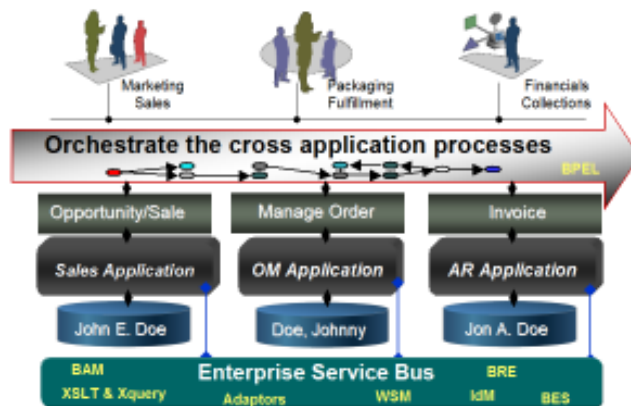
Xquery); adaptors to connect the applications; web services management (WSM); identity management (IdM), a business rules engine (BRE) to control flow logic, and a business event system (BES) to support event driven real time activity.

The Enterprise Service Bus facilitates the movement of data between the applications to support the business processes, but it does not deal with the internal data problems. Good integration technologies deal with data fragmentation, but they are not designed to eliminate it.

Orchestrate the Business Processes

Orchestration tools represent a powerful technology to turn application features and functions into web services and then build enterprise business processes from these services.

The following figure illustrates how an Order to Cash business process might be built across Sales, OM, and AR to create an Enterprise Business Process.



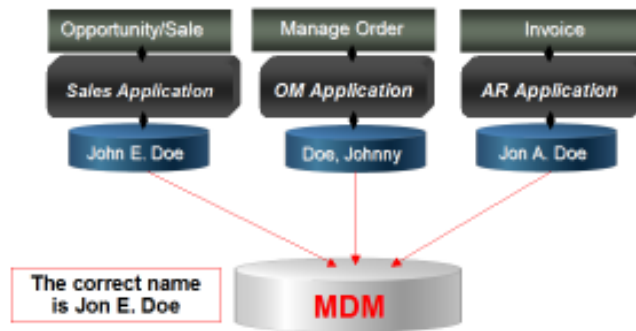
Open standards are critical for orchestration tools. The generally accepted standard is called Business Process Execution Language (BPEL). A good BPEL process manager can connect most modern applications via web services. They provide high productivity user interfaces to develop and deploy new business processes. The potential for adding real business flexibility is created. But the anticipated improvements are never realized when data quality issues abound in the underlying applications. Without MDM to fix these data problems, products are still sent to the wrong address, bills are still sent to the wrong person, and these newly automated business processes continue to move to the costly and time consuming manual error correction procedures.

MDM Enable Applications without SOA

MDM is designed to consolidate master data from all connected applications and hold it in a data model that is centrally governed. Once consolidated, MDM standardizes the data; finds and eliminates duplicates; augments the data with 3rd party content; and literally creates an authoritative 'Golden Record' that represents a single version of the truth about each and every master data entity.

Consolidated and Cleansed Master Data

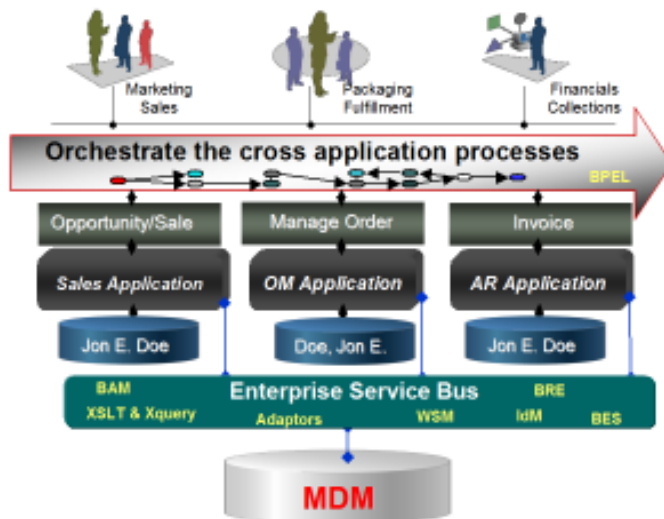
In our example, MDM has consolidated customer data from the Sales, OM and AR applications. It proceeds to execute all the corporate data governance rules established by the central 'Governance' organization. In our case, MDM has found that John E. Doe from the Sales application, Doe, Johnny from the OM application, and Jon A. Doe from the AR application are actually one person: Jon E. Doe. MDM corrects any and all address errors as well as profile information and augments the record with 3rd party demographic data.



This data can be used to improve reporting, but the correct name and address remain in the MDM store. Without SOA, it becomes its own silo. Maximum value is achieved when this quality master data can be placed back into the applications that need it to support local and cross application processes.

MDM Deployed as a Foundation for SOA

If we deploy MDM solutions as a foundation for and in combination with SOA, all the potential business value from the data quality improvements are realized as this quality data finds its way to every application and business process that needs it. And all the potential improvements in flexibility from the SOA implementation are realized as they operate across application boundaries without faults due to data errors.



"A bio-tech client we're working with now has taken the "start with the data" route. "We need to make sure that we have standardized, reconciled master data to apply our processes to when the time comes,"

Jill Dyche
Baseline Consulting
September 2007

ORACLE MDM & SOA

As we can see from the above Order to Cash example, combining SOA and MDM is a highly productive and natural thing to do. Most vendors will claim that they are delivering just such combinations. But there are many levels of integration between MDM and SOA.

- Connectors and transformations
- Mutually understood data structures and access methods
- Pre-Built Application and Master Data synchronization
- Pre-Built SOA/MDM Enterprise Business Processes

The business value goes up the more levels a vendor provides. All MDM vendors provide some level of connectors and templates for transformations. Only vendors that provide both MDM and SOA can integrate the two. Most of these vendors provide their SOA with knowledge of their MDM data structures and access methods. But only vendors who actually have applications can provide pre-built master data synchronizations and pre-built enterprise business processes.

Oracle is integrating its market leading MDM suite of applications with its powerful Fusion Middleware driven SOA suite. The following sections describe how Oracle is bringing these two together at all the unification levels listed above.

Oracle Master Data Management

Oracle has the broadest range of Master Data Management applications. It has the market leading solutions for Customer, Product and Account master data. It consolidates & maintains complete and accurate master data across the enterprise. Oracle MDM enables organizations to:

- Accelerate new product introductions
- Increase reporting accuracy
- Reduce costs
- Increase revenue

“Through 2010, 70 percent of Fortune 1000 organizations will apply MDM programs to ensure the accuracy and integrity of commonly shared business information for compliance, operational efficiency and competitive differentiation purposes (0.7 probability).”

Gartner, Jan. 2006

- Govern centrally
- Reduce risk
- Improve compliance
- Optimize business processes
- Rapidly deploy new applications
- Know their customers
- Synchronize with partners



Oracle Service Oriented Architecture

Fusion Middleware ranked as Leader in the following Gartner Magic Quadrants:

- Application Platform Suites
- Development Tools
- Application Server
- Web Services Platform
- Enterprise Portal
- Business Integration
- Identity Management
- Web Services Management
- ETL Data Integration

Through homegrown development, strategic acquisitions, and the maximum use of open standards, Oracle has put together the most comprehensive SOA suite in the industry. With market leading components such as the BPEL Process Manager and Oracle Identity Management joining the world's leading Database and BI products, Oracle's Fusion Middleware based SOA suite is second to none.



MDM and SOA Unification

In this section we will examine Oracle's unification of MDM and SOA. We discuss how they work together at a number of levels. Some of these are generic.

- Data Structures
 - Oracle MDM data structures are open and available. Data is stored in the Oracle Database, the world's leading RDBMS.
 - Oracle SOA components understand the MDM data structures. User interfaces provide detail descriptions of the data for access and application development.
- Access Methods
 - Oracle MDM Data is available for load or access via ETL, open integration registry defined APIs, or web services.
 - Oracle SOA components understand the MDM access methods and have out-of-the-box access to the open services registry. User interfaces provide detail descriptions of the APIs and services.
- Connectors
 - Oracle SOA provides connectors/adaptors to all MDM data stores and most applications.

The above level of SOA – MDM cooperation is provided by most enterprise MDM vendors. But maximum business value comes from being able to go a level deeper to provide sustainable and extensible out-of-the-box integrations to all applications in an IT landscape. These are the levels that establish MDM as a foundation for SOA. These include:

- Transformations

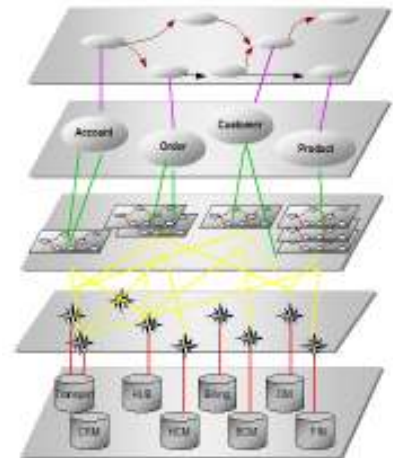
- Oracle SOA components provide transformations between MDM structures and connected systems such as Siebel, E-Business Suite and Peoplesoft.
- Data Synchronization
 - Oracle Application Integration Architecture (AIA) pre-built SOA synchronizes data between attached applications and Oracle MDM data stores.
- Prebuilt SOA for major Business Processes
 - Oracle AIA provides out-of-the-box cross-application Business Processes that include all appropriate MDM capabilities.

These are the key areas that separate what Oracle is able to do from all other MDM solutions on the market. The next few sections discuss how Oracle AIA leverages Applications knowledge, MDM and SOA to deliver the best possible solution for our customers.

Application Integration Architecture

AIA utilizes Oracle's premier SOA suite to build out-of-the-box Oracle Application integrations in the context of enterprise business processes. We begin by identifying the Oracle components deployed at the various levels of the SOA stack.

- 1) Industry reference models cover the best practice business processes for key industries.
- 2) This layer is supported by Enterprise Business Objects.
- 3) These objects are orchestrated into process & task flows with data transformations.
- 4) Flows utilize Enterprise Web Services.
- 5) These services are provided by the underlying Oracle Applications and MDM Data Hubs.



The Enterprise Business Objects (EBOs) are key to extensibility and the connection between AIA's pre-built SOA and MDM. The following section discusses how they are defined utilizing open standards and Oracle Applications knowledge.

Enterprise Business Objects

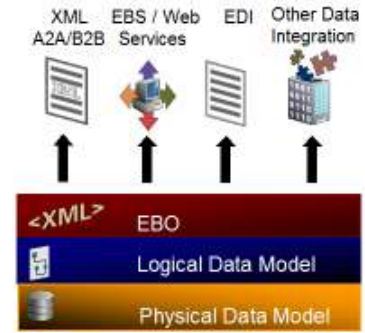
EBOs are logical models that include both transactional entities such as Purchase Order and Invoice, and Master Data entities such as Customer, Product, and Account. The data is exposed as XML Schema Definitions (XSDs). The underlying Logical Data Model is based on both open standards and Oracle Applications. Precise definition of each business component and attribute is done by adoption

"One of the most complicated aspects of any cross application IT project is determining the underlying canonical model. You can't communicate effectively if every application is using a different set of terms and definitions."

Erin Kinikin, Independent Analyst

of standards for both content as well as naming and design. They are designed for extensibility.

The defining process used inputs from multiple applications and content standards. Standards published by international standards organizations including W3C, UN/CEFACT Core Components Technical Specification (CCTS), Open Applications Group Integration Specification (OAGIS),



Resource Description Framework (RDF), UML Profile and XML Naming and Design Rules, and OASIS for Service Data Objects (SDOs).

EBOs are based on knowledge of application schemas such as Siebel, Peoplesoft, E-Business Suite, JDE, and Fusion. Data EBOs are based on knowledge of Oracle MDM Application schemas such as Siebel's UCM and Oracle's TCA, and Item Master.

The OASIS Open Composite Services Architecture (CSA) Member Section advances open standards that simplify SOA application development. Open CSA brings together vendors and users from around the world to collaborate on the further development and adoption of the Service Component Architecture (SCA) and Service Data Objects (SDO) families of specifications.

Master Data EBOs

The following is a list of MDM EBOs currently in development and scheduled for release according to the AIA Roadmap.

<u>EBO Name</u>	<u>EBO Description</u>
CustomerParty	A CustomerParty represents persons or organizations which have a buying relationship with the organization that is defining the customer. A CustomerParty can have one or more Accounts with the selling organization, such as a personal account, business account, and so forth. An Account is created once a party makes a purchase or establishes a financial agreement with the deploying organization. The combination of a party and its account(s) is considered a customer.
Item	An item is the identification and definition of a unique manufactured or purchased part, material, intermediate, subassembly, or product.
ItemPublication	An Item Publication defines a complex item, including the component items and the BOM (Item structure of the component items). A typical usage of an Item Publication would be by a publisher (such as a manufacturer) to one or more subscriber organizations. A single publication can be from multiple publishers.
ItemStructure	The Item Structure describes the composition of an item and also the definition of it's constituent items e.g. Bill of Materials, Sales Kit / Bundle etc. It provides a single level of item composition - thus, in a multi-level Bill of Materials, the Item

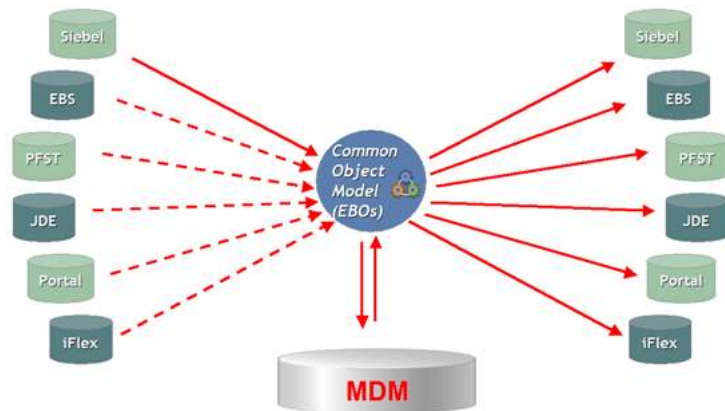
	Structure EBO gives only the immediate children items but not the composition of the children items. If a child item is a complex item, it will have its own item structure which will provide its composition
ItemCatalog	List of items available for purchase, with the description, classification and price of each item.
FixedAsset	A long-term, tangible asset held for business use and not expected to be converted to cash in the current or upcoming fiscal year, such as manufacturing equipment, real estate, and furniture. Fixed assets generally have a life of more than one year, are acquired for use in the operation of the business, and are not intended for resale to customers. Assets differ from inventory items since you use them rather than sell them.
Location	A Location encapsulates the postal address and / or geographic coordinate of the location based on a Cartesian coordinate System.
SupplierParty	A party (business or individual) that provides goods or services or both in return for payment.
Employee	A person who works for a Party in return for financial or other compensation.
GLAccount	A structure (generally with multiple segments) that records values and represents assets, liabilities, revenues, expenses and fund balances. A GL account has transaction figures that record changes to the account during a posting period. These figures are used for financial reporting
Organization	A business unit such as a company, division, or department. Organization can refer to a complete company, or to divisions within a company. Typically, you define an organization or a similar term as part of your account. Internal organizations are divisions, groups, cost centers or other organizational units in a company. External organizations can include the contractors your company employs. Organizations can be used to demonstrate ownership or management of functions such as projects and tasks, non-labor resources, and bill rate schedules.

PRE-BUILT INTEGRATION

Oracle is utilizing all its MDM & SOA capabilities, along with the AIA EBOs and associated structures, to pre-build application integrations in the context of key industry specific business processes. The EBOs are deployed as part of a common object methodology that uses the EBOs to define all transformation from target and source applications included in the business process.

Common Object Methodology

The following figure illustrates how the common object methodology is used to integrate the Oracle Applications.



As data flows from source systems, it is transformed via provided maps into a common object model. Once the appropriate business logic is executed for a particular business process, the data is again transformed via provided maps from the common object model to the format needed by target systems.

The common object model is realized in AIA as EBOs. This schema was in turn created based on real application knowledge. It is a straightforward exercise to realize the logical model in its corresponding physical data model.

Deploying the MDM Hubs and connecting them to the common object model in the AIA integrations, provides the consolidated, cleansed, deduplicated, augmented authoritative 'Golden Record' to every application and business process in the delivered pre-built SOA integration.

CONCLUSION

Service Oriented Architecture is a modern technology for adding business process flexibility to existing IT infrastructures. But the anticipated improvements are never realized when data quality issues abound in the underlying applications. In fact Gartner³ has pointed out that, without quality data, "...SOA will become a veritable 'Pandora's box' of information chaos within the enterprise." This is why Forrester⁴ considers Master Data Management the most "strategic entry point for SOA" bringing the most strategic value to the business.

Oracle has leveraged its ability to fuse applications and technology to incorporate MDM applications as a foundation component for its SOA Suite. MDM is providing cleansed, governed, and authoritative data services in a Service Oriented Architecture. Fusion Middleware is the central technology for Oracle's SOA Suite. MDM is a key component in Fusion Middleware. Delivering more than just connectors and templates, Oracle's MDM-SOA combination delivers out-of-the-box, fully tested and extensible, pre-built SOA enterprise business processes that synchronize MDM data stores with applications. Oracle MDM as a foundation for SOA raises the bar for both MDM and SOA. Oracle's approach insures that the

³ The Essential Building Blocks for EIM, Gartner 2005

⁴ June 2006, Best Practices "Eleven Entry Points To SOA For Packaged Applications"

IT transformational potential of SOA is achieved.



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