INTRODUCTION

Maximizing business process efficiencies in a heterogeneous environment is very difficult. The difficulty stems from the fact that the various applications across the Information Technology (IT) landscape employ different integration standards, different message passing strategies, and different workflow engines. Vendors such as Oracle and others are delivering tools to help IT organizations manage the complexities introduced by these differences.

But the one remaining intractable problem impacting efficient operations is the fact that these applications have different definitions for the same business data. Business processes span these applications. Data problems break these processes rendering them far less efficient than they need to be to achieve organization goals. Thus, the expected return on the investment in these applications is never realized.

The success of all business processes depends on the availability of accurate master data. Clearly, the solution to this problem is to consolidate all the master data an organization uses to run its business. Then clean it up, augment it, govern it, and connect it back to the applications that need it. Until now, this obvious solution has been difficult to achieve for two primary reasons:

1. No one had defined a schema sufficiently broad, deep and flexible enough to support transaction processing on all key business entities and serve as a master superset to all other data models deployed in heterogeneous IT environments.

2. There were no standards for application integration. This created complex point-to-point code based solutions that quickly deteriorated into unmanageable infrastructures.

Today, the situation has changed. Oracle can create and maintain accurate and consistent master data across heterogeneous IT systems. To accomplish this, Oracle has developed a Global Single Schema (GSS) that provides a way to consolidate and integrate master data without having to replace investments in existing applications.
This Global Single Schema represents a revolutionary breakthrough that allows for true master data consolidation. Oracle has deep knowledge of applications dating back to the early 1990s. It developed applications in the areas of Supply Chain Management (SCM), Product Lifecycle Management (PLM), Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Human Capital Management (HCM), Financials and Manufacturing. In addition, Oracle applications were delivered for key industries such as Communications, Financial Services, Retail, Public Sector, High Tech Manufacturing (HTM) and more. Expertise in all these areas drove requirements for GSS. The following figure illustrates Oracle’s unique position that enabled the creation of the Global Single Schema.

GSS Requirements Gathering

GSS defines all the key business objects including Customers, Contacts, Suppliers, Accounts, Products, Services, Installed Base, Sites, Assets, and Inventory to name just a few. In addition, Oracle delivers GSS pre-integrated with a wide variety of operational applications.

In this whitepaper, we will discuss the business process automation that drives improved efficiencies and the data schema that models the key business entities under these processes. We will demonstrate that the model is broad and flexible enough to represent your business. Then, building on this foundation, we will show how these business entities can be populated and managed as the central master data for your organization in its present heterogeneous environment. Throughout this paper, we will discuss the tremendous business advantages this consolidated master data will bring to your business operations.
**BUSINESS PROCESS AUTOMATION**

eBusiness is about maximizing operational efficiency. At the highest level, these ‘operations’ span all that you do as an organization. The following figure illustrates some of these high-level business processes.

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**Enterprise Business Processes**

Supplies are procured. Assets are maintained. Materials are stored. Inventory is accumulated. Products and Services are engineered, produced and sold. Customers are serviced. And across this entire spectrum, Employees do the procuring, supporting, engineering, producing, selling and servicing. Not shown, but not to be overlooked, are the accounting and the financial processes associated with all this procuring, manufacturing, and selling activity.

Supporting all these applications is the master data: Customer, Contact, Account, Product, Inventory, Installed Base, Site, Supplier, Assets and more. When this data is fragmented and inconsistent, the business processes fail and inefficiencies multiply. But imagine having all the data under these operational business processes in one place.

- The same accurate and timely customer data will be provided to all your operational applications from the call center to the point of sale.
- The same accurate and timely supplier data will be provided to all your operational applications from supply chain planning to procurement.
- The same accurate and timely product information will be available to all your operational applications from demand chain planning to marketing.

You would have a single version of the truth about your assets, financial information, inventory, customers, suppliers, employees, products and services to support your business automation processes as they flow across your business applications. All company and partner personnel will access the same exact view of every key data entity across all your channels and across all your lines of business. Oracle’s Global Single Schema enables this vision of a single version of the truth across the heterogeneous operational applications supporting the entire enterprise.
DATA MANAGEMENT

The data is your business information codified for computer programs to use. A good data model will represent the way your company does business. Schema is another name for data model. The computer applications your organization deploys to improve operational efficiency are built to operate on the business data organized into this schema. If the schema does not represent how you do business, the applications on that schema cannot provide the features you need to achieve the desired efficiencies. For example, if the ‘customer’ schema does not allow for more than one account per customer, then the function to create multiple accounts cannot exist in the application that runs on the faulty model.

GLOBAL SINGLE SCHEMA

Oracle’s Global Single Schema organizes hundreds of thousands of attributes into 165 major schema objects supporting over 180 business application modules. It is designed for international operations, and extensibility.

The schema is delivered with a full set of public Application Programming Interfaces (APIs) and an Integration Repository with modern Service Oriented Architecture interfaces to make data available as a services (DaaS) to business processes and enable operations in heterogeneous IT environments.

- Key tables can be extended with unlimited numbers of additional attributes and attribute groups for maximum flexibility.
  - This enables model extensions that reflect business entities unique to your organization’s operations.
- The schema is multi-organization enabled so data manipulation can be controlled along organizational boundaries.
- It uses variable byte Unicode to support over 31 languages.
- The schema encodes flexible date and flexible address formats for easy localizations.

No matter how complex your business is, Oracle’s Global Single Schema can hold your business objects and support your global operations.

Oracle’s Global Single Schema identifies and defines the business objects an enterprise needs within the context of its business operations. The interrelationships between the business objects are also contained within the GSS data model. Their presence expresses fundamental business rules for the interaction between business entities. The following figure illustrates some of these connections.
Interconnected Business Entities

The following sections will examine the unique quality of the Oracle Global Single Schema for a few key illustrative business entities: Customers, Suppliers, Employees, Accounts, Products, Services, Installed Base, Sites, and Assets.

Customers, Suppliers, Employees & Accounts

Oracle has developed a Trading Community Architecture (TCA) to model all participants in your daily business operations. It models people, organizations, groups, customers, contacts, employees, and suppliers. It models their accounts, locations, classifications, and preferences. And most importantly, it models the vast array of hierarchical and matrixed relationships that exist between all the participants in your real world operations. The model logically separates people and organizations from their relationships and accounts. This separation creates flexibility unmatched in the industry and accounts for the fact that the Oracle schema for Customers, Suppliers, and Accounts is a true superset of the wide variety of commercial and homegrown customer models in existence.

In addition, customer data management and data quality management tools are available with the Oracle Customer Hub, and supplier data management with the Oracle Supplier Hub. These packages include the data load, data cleansing tools and data enhancement capabilities. In fact, data enhancement includes full Dun & Bradstreet (D&B) integration where the D&B model is a full subset of the Oracle schema.
Products and Services
The Oracle Global Single Schema includes a number of entities that define the products and services a company creates and offers for sale. Key entities include Items organized into Catalogs and Price Lists.

The Catalog structures provide for the ability to capture different views of a product such as engineering, manufacturing, and service which are based on a unified product model. As a result, designers, manufacturing engineers, purchasers and partners can work simultaneously on a common product definition. The Catalog schema allows for unlimited attributes, combines them into meaningful groups, and maps them to catalog categories to track these different types of information. The model also maps an unlimited number of functional structures for each item. For example, multiple Bills of Material (BOMs) can be constructed representing requirements BOM, features BOM, and packaging BOM for an item. The Catalog model also supports hierarchical information about an item.

In addition, product data management and product data quality management tools are available with the Oracle Product Hub. This package constitutes a true Product master and includes data load, data cleansing and data enhancement capabilities. It also supports GDSN, the global standard for product data synchronization with all necessary attribution and data synchronization capabilities built in.

Installed Base
Oracle Installed Base (IB) provides comprehensive life-cycle product (Item Instance) tracking of products and assets, covering multiple configurations, parties, locations, and history. IB is the schema that ties all the products and services a company produces to all the customers who purchase those products and services. The schema is a repository of Item Instance information for both tangible (e.g. computers and engines) and intangible (e.g. licenses and communication services) products. IB can also include Assets as item instances and associate them to corresponding fixed assets in the Asset schema described below. IB maintains a unique and flexible item instance to item instance relationship to represent assembly-component structure as well as inter-item instance connections and business party relationships such as owner, customer, lessee, and lesser information.

Supporting state-of-the-art customer service functionality, Installed Base is unique as a unifying schema. It must connect to suppliers, inventory, work in process, repair, and order management structures because purchased products may be in any number of states and locations: procurement; warehouse staging; in-transit; at-repair; or in customer’s possession. In addition, integration with ‘contracts’ allows entitlement coverage to be monitored.

Sites
Sites are places where business is conducted. They can be addresses, clusters such as retail malls, locations within a cluster, floors within a building, places where meters are located, rooms on floors, etc. Fully understanding all attributes of a site is key to many business processes. Attributes such as ‘noise abatement policy’ at a
Global Single Schema

point of delivery, or the size of an oven in a business kitchen drive day-to-day activities such as delivery schedules or food promotions. Typically this kind of data is siloed in departments and scattered across applications and spreadsheets. This leads to conflicting information and poor operational efficiencies.

Oracle’s Global Single Schema can hold all site attributes in one place and enables a single version of authoritative site information across the enterprise. In addition, Oracle delivers a Site Hub as part of its Master Data Management suite. Site Hub constitutes a true Site master and includes data load, data cleansing, data standardization and data enhancement capabilities. It supports site hierarchy management, trade areas, site relationships, Google maps and provides direct support for site lifecycle management processes.

**Assets**

Corporate assets have a wide variety of meanings from the narrow definition, as anything that needs maintenance, to the more general definition, as anything you want to keep track of: where it is, how long it has been there, or what it costs to have it there. Real estate would fall into the broader definition, as would everything from the art on the walls at headquarters to primary production line machinery. Oracle has developed a model for assets that covers this entire spectrum.

The Oracle Asset model is a flexible definition with asset groups and attributes that uniquely define asset characteristics. The number of asset attribute elements and values are unlimited. Standards are inherited throughout an asset group. Links to the enterprise and searchable characteristics such as nameplate and engineering specs are included. The model includes asset costs and work history. Also included is a default master Bill of Materials (BOM) for each asset with the flexibility to edit the BOM as different assets are assigned. The model is designed to create a network of assets or routings that combine several assets to a single work activity.

Maximizing asset utilization while minimizing asset maintenance costs can significantly improve the bottom line. Oracle itself is saving millions per year utilizing the Oracle Enterprise Asset Management (eAM) product supported by the asset data model schema.

**BUSINESS PROCESSES UTILIZE LINKED DATA ENTITIES**

Each business entity codified into a centralized master data environment significantly improves the efficiency of the automated business processes that use the consolidated data. When all the key business entities used by a corporate process are so consolidated, the advantages are multiplied. The key reason for business process breakdowns (data errors across application boundaries) is eliminated. All processes are positively impacted and business process automation is itself automated.

As an example, Engineering & Manufacturing (E&M) processes run on E&M data. Consolidated and cleansed E&M data will significantly improve these processes. But these processes also depend on Supply Chain data, Sales data, Procurement & Sourcing data, and Financials data. Errors in these other siloed data stores will
break the manufacturing process flow. On the other hand, if all these entities are also consolidated, cleansed, and connected to the enterprise, the business flows uninterrupted.

Asset schema integration with the enterprise is another example. Maximum business efficiency in production requires that every asset in the chain run at specific capacities at specific times. Therefore, planning asset maintenance requires data on production plans. The asset schema must be linked to production schedules data. Maximum personnel utilization in maintenance requires that the right person with the right skills is sent to the right asset, at the right location, at the right time, with the right tools, the right materials, and the right instructions to get the job done completely and safely. To achieve this goal, asset schema must be linked to employee skills schema.

INTEGRATING GSS TO THE WORLD OF APPLICATIONS

Consider Oracle’s own experience once again. Since developing the E-Business Suite of applications, Oracle acquired PeopleSoft, Siebel, Agile, and a host of other applications. In order to help customers with business flows across this wide variety of applications, Oracle developed out-of-the-box application integration within the context of key business processes. A few examples help illustrate this key point:

- **Order to Cash** - This process touches Sales, Order Management, Purchasing, and Accounts Receivable applications.
- **Design to Release** - This process touches Product Lifecycle Management, Procurement, Manufacturing, Purchasing, and Accounts Payable applications.

Connecting Master Data to the Enterprise

Maximum efficiencies are realized when all applications utilize the consolidated master data directly. But such homogeneous IT environments are rare. To allow maximum use of existing IT infrastructure and application landscapes, Oracle provides all the tools needed to connect the Global Single Schema to the heterogeneous enterprise.

Integrating consolidated master data into all the corporate systems is a competitive key for companies looking to achieve higher customer satisfaction, uniform product information, and maximized corporate asset utilization. Oracle Fusion Middleware (FMW) with its Service Oriented Architecture (SOA) Suite links the consolidated master data to heterogeneous systems regardless of platform or vendor and provides sophisticated content sensitive routing, message handling, and mappings for distributing information.

What’s more, Oracle provides pre-built SOA called Application Integration Architecture (AIA) with a Canonical Data Model¹ at its center for simplifying data transformation logic as information flows between applications.

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¹ “MDM as a Foundation for SOA”, an Oracle Whitepaper, [URL](#).
This standards-based Canonical Model is in large part derived from the Global Single Schema and supports it without modification. The figure on the right illustrates how the Global Single Schema is exposed to the integration layer.

Standards are published by international standards organizations such as OASIS for Service Data Objects (SDOs).

The following ‘Order to Cash’ business process automated by AIA illustrates the synergistic nature of our Global Single Schema as it applies to application integration within the context of a business process.

**Global Single Schema and Order to Cash**

Note how the GSS entities ‘Product’, ‘Customer’ and ‘Installed Base’ are used along with their interrelationships to support business processes across a number of application modules in both the E-Business Suite and Siebel applications.

**AN EVOLUTIONARY APPROACH**

For most organizations, a staged evolutionary approach is superior to wholesale hard to test changes. The staged approach involves consolidating some master data and growing the number of business objects consolidated over time. Once the business data to be consolidated is identified, all instantiations of it across the IT environment must be located; the optimum implementation of the master model for the object must be crafted.
into the Oracle Global Single Schema; the transformation for each instantiation must be configured into the SOA metadata; and finally, the data must be populated in the master. Once populated, the consolidated data can be cleansed, enhanced and governed.

The order in which objects are consolidated will depend on the nature and size of the business problems addressed. For example, if a communications company is having serious problems standardizing its products and pricing across multiple billing engines, consolidating the product information into the Oracle Product Hub might be the best first step. Others are consolidating customer information into the Oracle Customer Hub. But with GSS, you can start with one entity and grow into others without implementing another system. It is already all there. Without GSS, the growth in mastered entities can itself create an \( n^2 \) integration problem between master data hubs. But with the GSS, it is all on one CD with one load on one machine and one support contact.

**CONCLUSION**

According to a Data Warehouse Institute study, poor data quality costs businesses billions of dollars each year. This large monetary figure includes the cost of business process breakdowns and the IT costs to fix them. It also includes the cost associated with the inability to make sound business decisions based on accurate information.

Consolidating master data utilizing Oracle’s Global Single Schema directly supports the Oracle Master Data Management suite that solves this serious IT problem, allowing IT organizations to redirect their resources to realizing their ‘Mission’ instead of constantly allocating their resources to undoing the damage caused by these data quality problems.

Real master data consolidation enables true end-to-end business process integration. Data maintenance costs are dramatically reduced because the global master data resides on one Global Single Instance. Real time analytical data and true business intelligence is available in the vast amount of accurate real time master operational data. Reports can be collected and delivered from the operational data and key dimension and cross-reference information can feed the data warehouse for improved reporting accuracy on the analytical side of the business.

If a company centralizes all its master data, manages it professionally, provides effective governance, and connects it to their enterprise, the company will dramatically improve supply chain management, enterprise resource planning, asset utilization, and customer satisfaction levels. These benefits accrue to all areas of the business. The effectiveness of all employees and business processes will improve. Oracle with its Global Single Schema, Master Data Management, and Application Integration Architecture has a unique and proven set of applications, technologies and tools that enable this strategy. This consolidation will create an order of magnitude improvement in an organization’s operational efficiencies as it maximizes the benefits of all its technology and automation investments.

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2 “Master Data Management, an Oracle Whitepaper” June 2010, URL

You can’t run an e-business on fragmented dirty data.