
ORACLE®

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions.
The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.



ORACLE OPEN WORLD

Your. Open. World.

Data Services at Oracle: A Guide to Enterprise Data Services

Jeff Pollock, Senior Director Fusion Middleware
Dain Hansen, Director Product Marketing

ORACLE

Program Agenda

- **Key Points of This Talk:**
  - Data Service Concepts Still Maturing
  - Data Services Value is at Enterprise Scale
    - (not really a per-project value proposition)
  - Data Services are Key for SOA Success
  - Data Services Functional Patterns in Detail

Functional Patterns	Deployment Patterns
• Master Data Services • Bulk Data Services • Data Access Services • Data Event Services • Data Quality Services	• Java Data Services • Standalone SOAP Data Services • Grid-Based Data Services

  - Recommendation: Go Hybrid, Use the Right Tools!


Data Services Backgrounder
ORACLE

Everyday Data Integration Problems

Integrating and Managing Data is Critical for Everybody

Q: Why can't the bank reconcile my London account with my NY account?



Fragmented Data

Ensure the information is connected, available, secure, and reliable. Distributing information across heterogeneous sources.

Q: Why do my credit card reward points take 15 days to appear on my airline website?



Out-of-date Data

Integrate bulk data of information across data warehouses, data marts, process or SOA applications in real-time.

Q: Why does this store keep sending me three of the same catalogs every month?

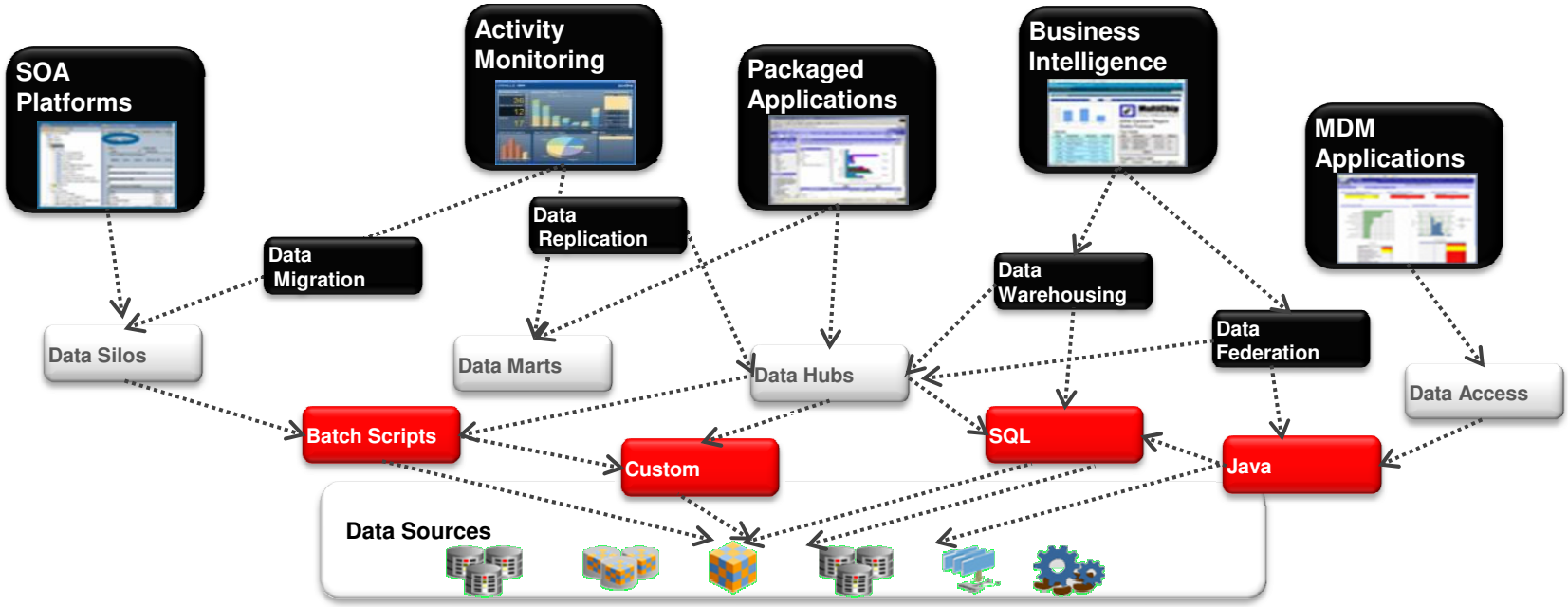


Dirty Data

Ensure data consistency, quality, use tools for profiling for better data visibility and data insight.

Data Integration Nightmare

Is Spaghetti Code the Best Alternative?

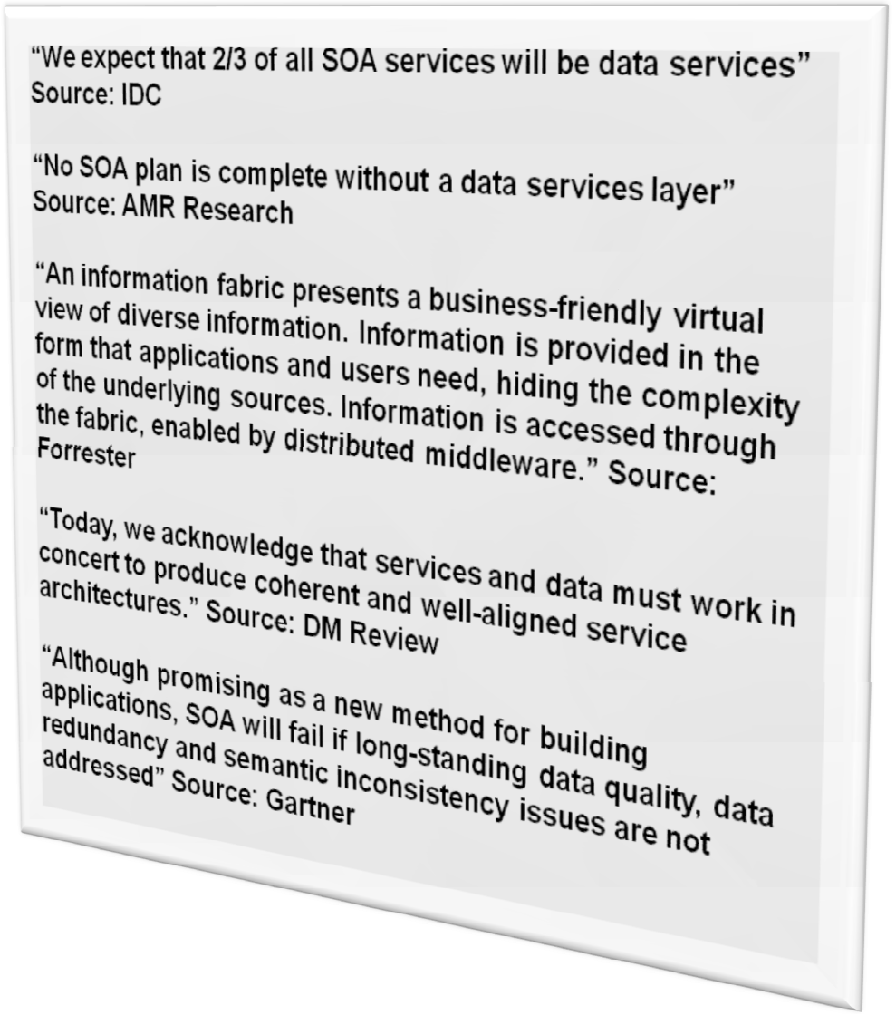


How do you Manage it?
Does it Scale?
Will SOA Help?

Data Services for SOA

Analyst Coverage Highlights Importance – and Confusion

- **Data Services?**
- **Information as a Service?**
- **Information Fabric?**
  - Gartner
  - Forrester
  - IDC
  - AMR
  - Burton Group
  - Bloor Research
  - Zap Think
  - …etc etc.
- **One Thing They All Seem to Agree On:**
  - They're Crucial to SOA Success !
- **One Thing They Can't:**
  What are they ?



A Bit of Data Services History

A Rose by any Other Name…

- **Reality Check About "Data Services"**
  - This new hype is about an old idea – ***reusable data is a good thing***
  - 1968 – formation of EDI document translation standards for banks
  - 1986 – Design by Contract: Precondition and Postcondition driven services
  - Early 1990's – tech roots of Informatica, IBM DataStage and Ab Initio
  - 1994 – Design Patterns: Factory, Adapter, Façade, Proxy, Mediator…
  - Late 1990's – the application server data services (Kiva, Net Dynamics…)

- **Long Before Java (and Before EAI or SOA)**
  - Data interchange among: banks, railways, airlines, militaries, etc.
  - Massive data warehouses for analytic purposes
  - Enterprise software for mass data transform and DB loads
  - Object-oriented design patterns for decoupled data access

- **So What's Different About Data Services Today?**
  - Modern (***new and different***) standards & protocols
  - Business scale, complexity, and expectations

So What Are Data Services?

Casting a Wide Technical Net…

- **A General Software Pattern?**
  - Using contract-based development patterns for data distribution…
- **A Java Software Pattern?**
  - Pick your favorite TLA: DTO, DAS, SDO, JPA, ORM, JAXB, OXM…
- **A Web Services Stereotype?**
  - Dedicated SOAP services for reusable data manipulation and access…
- **An Enterprise Class of Conventional IT Services?**
  - The same tools we used to work with data before Java & SOA…

ALL OF THE ABOVE !


Data Service Patterns
ORACLE

Java/J2EE Patterns (Alphabet Soup)

Data Services from a Java/Object/Component Viewpoint

BUSINESS SERVICE PATTERNS

- **SCA**
  - Service Component Architecture – Key framework spec for Java Business Services

DATA SERVICE PATTERNS

- **DAS, DTO & JDO**
  - Data Access Service – Java service for accessing RDB's and other Source Types
  - Data Transfer Object – Java object for moving data (w/in container)
  - Java Data Object – Java object for data containment (POJO-oriented)
- **JPA & SDO**
  - Java Persistence API – EJB 3.0 spec for accessing external data (typically relational)
  - Service Data Object – Entity objects targeted for SOA data use
- **ORM**
  - Object Relational Mapping – A generic term typically applied to some solution approach to handling "impedance mismatch"
    - Oracle Toplink – A proven industrial strength data services layer for managing object persistence
- **JAXB / OXM**
  - Java Architecture for XML Binding – Standard set of APIs for XML
  - Object to XML – Toplink extended implementation of JAXB

Conventional Data Patterns

Data Management Software Pre-Dates SOA by Many Years

Business Data Services (Intelligence & Analytic Platforms)

- Function: crucial for business visibility and manipulation of data
- Key Value: most sophisticated data analysis and reporting
- SOA Intersection: integrated into SOA for closed-loop analytics

Technical Data Services (Data Integration)

- Function: moving and transforming data, geared towards enterprise-scale data challenges, includes: **ETL**, **Quality**, **CDC…**
- Key Value: proven, fastest and feature rich data integration
- SOA Intersection: SOA adds new APIs for easier service coupling

Other Data Service Software Tools

- EII – Federated DB Query
- Data Quality Engines
- Master Data Management
- Metadata Management
- Enterprise Search
- Content Management

A Taxonomy of SOA Data Services

JAVA DATA SERVICE IMPLEMENTATION PATTERNS

- **DAS & DTO –** Access and in-container data transfer
- **JPA, JDO & SDO –** Enterprise intra-container data entity transfer
- **JAXB & OXM (Toplink) –** Access and binding to XML data

SOA DATA SERVICE FUNCTIONAL PATTERNS

- **Master Data Services –** Golden Records, Hierarchies, & Policies
- **Bulk Data Services –** Bulk Refresh, CDC, Trickle Feeds, SCD…
- **Data Access Services –** Virtualization, Federated Query, ORM…
  - **Really Urgent Data Access** – Data Grid Cache / Virtualization
  - **Real Time Data Access** – Query Federation & Layered Data Services
  - **Right Time Data Access** – Data Hubs & Warehouses
- **Data Event Services –** Low Latency CDC, Trigger-Based CDC…
- **Data Quality Services –** Cleansing, Matching, De-Duplication…

DATA SERVICE DEPLOYMENT PATTERNS

- **Data Hub –** Centralized cache (variation of Data Virtualization) or repository
- **Data Grid –** Distributed RAM-based data partitions with decentralized access

Master Data Services

SOA Data Services Pattern

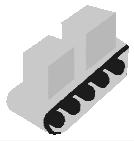
Name: Master Data Services
Motivation: *Where to find or assemble the best (trusted) high quality business data records, hierarchies, and policies?*
SOA Usage: May be used as a reference or lookup service during SOA transactions, during bulk data movement, typically applied with transformations.
Variations: Master Data Hub, Master Data Cache, Master Data Applications (CDI, PIM, FIN, Chart of Accounts…etc)
References: See Oracle MDM, IBM MDM, SAP MDM, Kalido, Siperian, etc.

Business Motivation

…keeping track of trusted business metrics



Ledger #	Acct	Legal Entity
1-MR7	6-123	AMER-SW01
6-2X8	J-F3	AMER-SW01

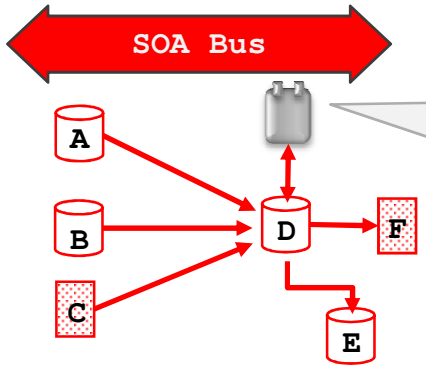


Vendor #	Name	Address
6-123	ABC	3 Main Street
2-234	HGL	1 Market Ave.



Part #	Desc	Unit of Measure
ABC	Bolt	12 ct box
HGL	Widget	Piece

Technology Picture



Trusted single point of reference

- **Golden Records**
- **Master Hierarchy**
- **Canonical Objects**

```
A|B|C→D = Load
D→E = Synchronize
D→F = Audit & Govern
```

Oracle Customers



(Dutch Government) Applying MDM with SOA using Business Process Management from Oracle

telenor

Getting control of Financial Data Warehouse with Oracle Data Relationship Manager

Gruppo PAM s.p.a.

Master Data Policy Hub using Oracle Data Integrator

© Copyright 2007, Oracle Corporation. All Rights Reserved.

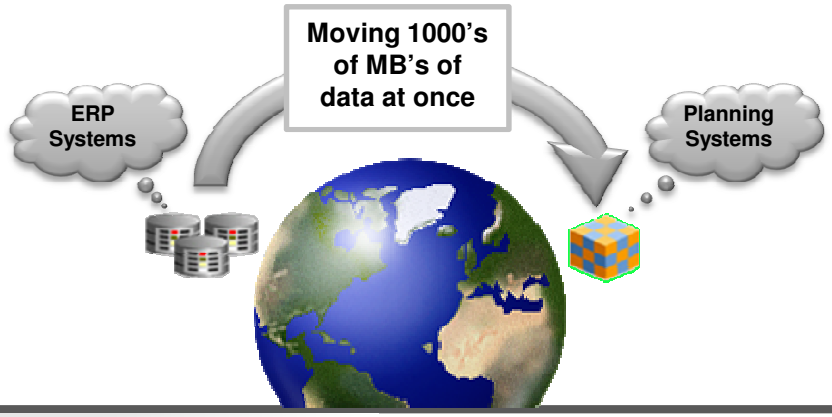
Bulk Data Services

SOA Data Services Pattern

Name: Bulk Data Services
Motivation: *How to move and transform huge amounts of data at one time in the most efficient way?* (supporting BI, DW and ERP needs)
SOA Usage: Leverage conventional ETL or modern E-LT as a slave process to SOA. (eg: data integration as a service) Do not consume the data into the SOA tier.
Variations: ETL (requires new hardware and central server), E-LT (low cost, high performance, no new hardware or central server)
References: See Oracle Data Integrator, IBM DataStage, Informatica, Ab Initio, etc.

Business Motivation

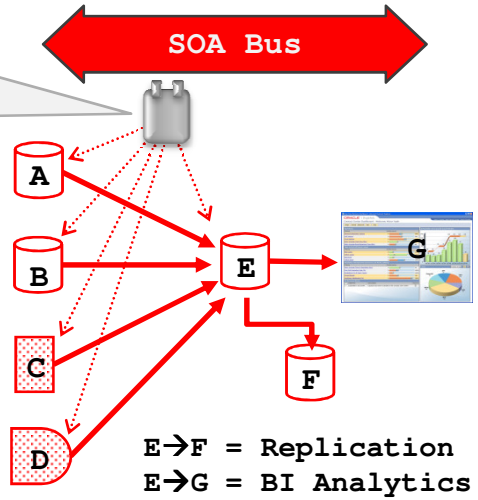
…data must be fresh, regardless of quantity



Technology Picture

Loose-coupled bulk data service

- **ETL / E-LT**
- **Replication**
- **Changed Data**
- **Bulk X-Form**



Oracle Customers

ROSS DRESS FOR LESS

Oracle Data Integrator enables high-performance data xform from BPEL PM

Deutsche Post

Oracle Data Integrator enables high-performance data xform from BPEL PM

J.CREW

Oracle Data Integrator enables high-performance loads from supplier data

© Copyright 2007, Oracle Corporation. All Rights Reserved.

Data Access Services

SOA Data Services Pattern

Name: Data Access Services
Motivation: *How to query and merge data from several places into a single XML message that can be consumed by SOA clients?*
SOA Usage: Expose a logical data view to SOA clients and allow them to query it, manage the data merge difficulties transparently in a server as fast as possible for high transaction speeds.
Variations: Query Federation, Data Hub & Spoke (Object|SQL|XQuery), Object-Relational Mapping
References: See Oracle Data Service Integrator, Oracle Data Integrator, Oracle Coherence, Composite Software, MetaMatrix, IBM DB2ii

Business Motivation

…data must be easily accessible

Really Urgent (application cache)

- Motivation: business benefits from fastest possible data retrieval from SOA or Application

Real Time (query federation, no hub)

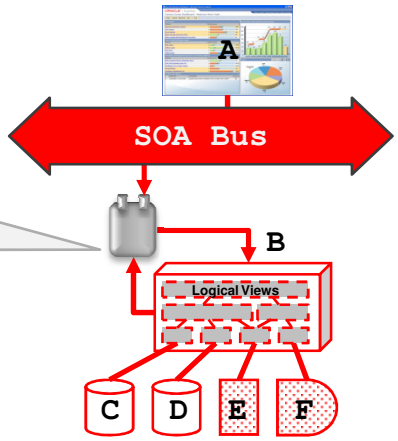
- Motivation: business policy prevents co-mingling of data in same repository / demands no copies

Right Time (composite data hub)

- Motivation: business needs to move of view lots of data, not just small transactions

Technology Picture

Query Layer for Data Virtualization



- **Federated Query**
- **Hub-and-Spoke**
- **Synchronous Data**

A = Mashup/Portal
B = Virtual View

Oracle Customers



Data Access services for key SOA deployment that integrates ERP systems for Sales & Territory leads

Important operations data access services enable internal service and tech management processes

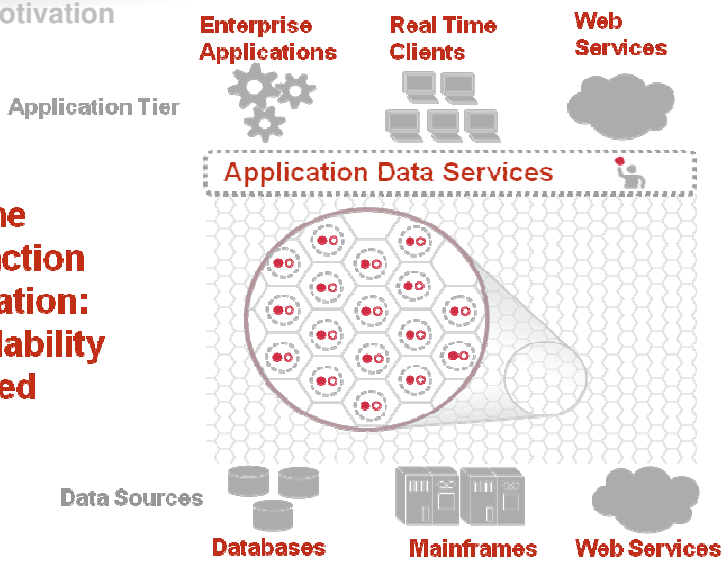
© Copyright 2007, Oracle Corporation. All Rights Reserved.

Really Urgent Data Access

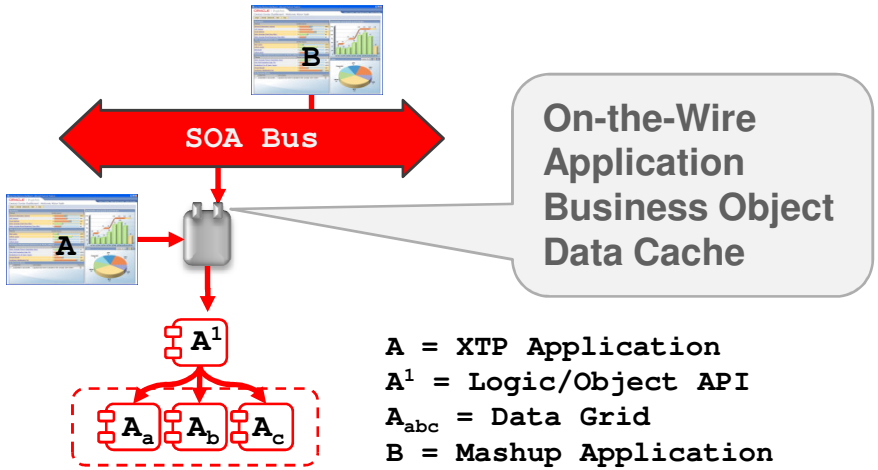
SOA Data Services Pattern

Name: Really Urgent Data Access
Motivation: *How can SOA/Apps get reliable sub-second access to huge amounts of data?*
(consistently faster than querying a database)
SOA Usage: Deploy federated state-full persistence at business object tier (under an App or behind a SOA service), in order to predictably "scale-out" applications while maintaining exceptionally fast performance
Variations: Java, .Net, C++ variations. Peer-to-Peer and Hierarchical Clusters, UDP/TCP…
References: See Oracle Coherence, Gigaspaces, Gemstone

Business Motivation



Technology Picture



Oracle Customers

Overstock.com Your Online Outlet™

Oracle Coherence makes the Web site perform under extreme loads

WACHOVIA

Leverage Oracle Coherence for high-performance Risk Engine

© Copyright 2007, Oracle Corporation. All Rights Reserved.

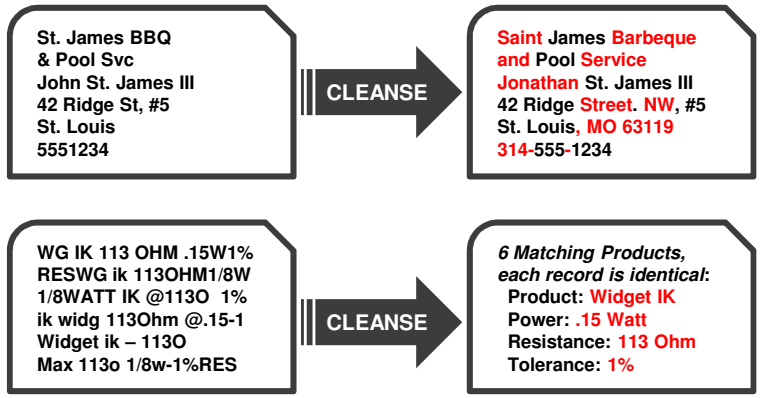
Data Quality Services

SOA Data Services Pattern

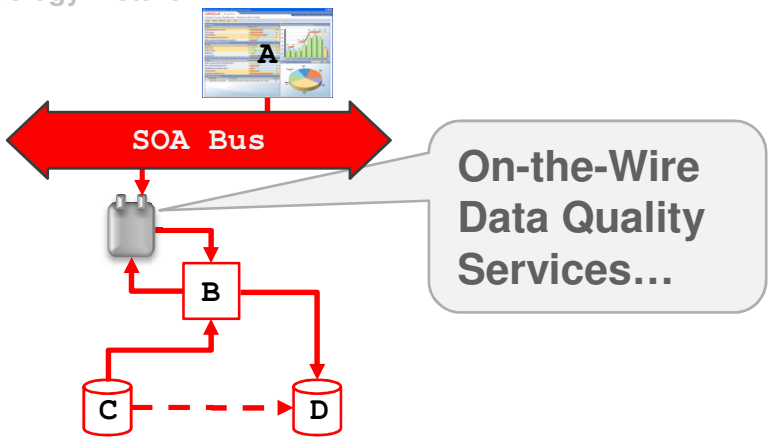
Name: Data Quality Services
Motivation: *What can automatically improve the quality of bad data so that legacy data resources become more valuable and usable?*
SOA Usage: Apply in bulk data to clean up Data Warehouses and BI repositories, or apply in realtime to prevent bad data before it's a problem
Variations: Declarative/Rule-Driven, Probabilistic or Statistical Learning-based, Domain-Specific and Content-Oriented Data Quality
References: See Oracle Data Integrator, Oracle Data Quality, Oracle Warehouse Builder, Silver Creek, Informatica/ISS etc.

Business Motivation

…data must be clean and standardized



Technology Picture



A→B→A = Message Cleansing | Matching
C→D = Bulk Cleansing | Matching

Oracle Solutions

- Oracle Data Integrator
  - Built-in Data Quality & Data Profiling
  - High-Performance E-LT Architecture
  - 100% Native Java & SOA Services
  - Declarative Design Framework
  - Open, Heterogeneous Platform
  - Event-Driven | Changed Data Capture
- Oracle Warehouse Builder
  - Built-in to Oracle Database 11g
  - Native Support for Oracle OLAP

© Copyright 2007, Oracle Corporation. All Rights Reserved.

Data Event Services

SOA Data Services Pattern

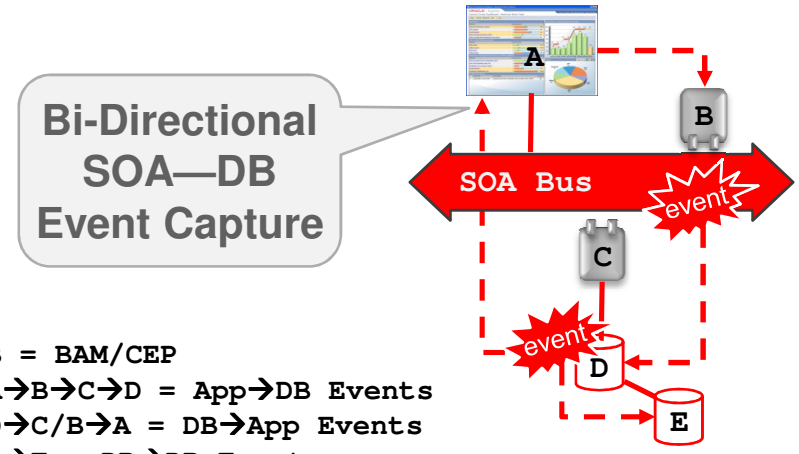
Name: Data Event Services
Motivation: *What can detect changes, correlate events, check new data and take action based on policies that the business defines?*
SOA Usage: Deployed on a given technology tier (eg: within Java, or on a Bus, or in a DB), but should be capable of calling to other event systems (eg: Java event triggers SOA triggers DB)
Variations: EDA (Event Driven Architecture), CDC (Change Data Capture), CEP (Complex Event Processor), Java Event Listeners…etc.
References: See Oracle Application Server, Oracle Data Integrator, Oracle Event Driven Architecture Suite, Tibco CEP. BEA Event Server

Business Motivation

…actions must happen in realtime



Technology Picture




```
B = BAM/CEP
A→B→C→D = App→DB Events
D→C/B→A = DB→App Events
D→E = DB→DB Events
```

Oracle Customers



Oracle Data Integrator enables high-performance bulk and real time event to key financial single source of truth warehouse fresh

METRO Group Future Store Initiative

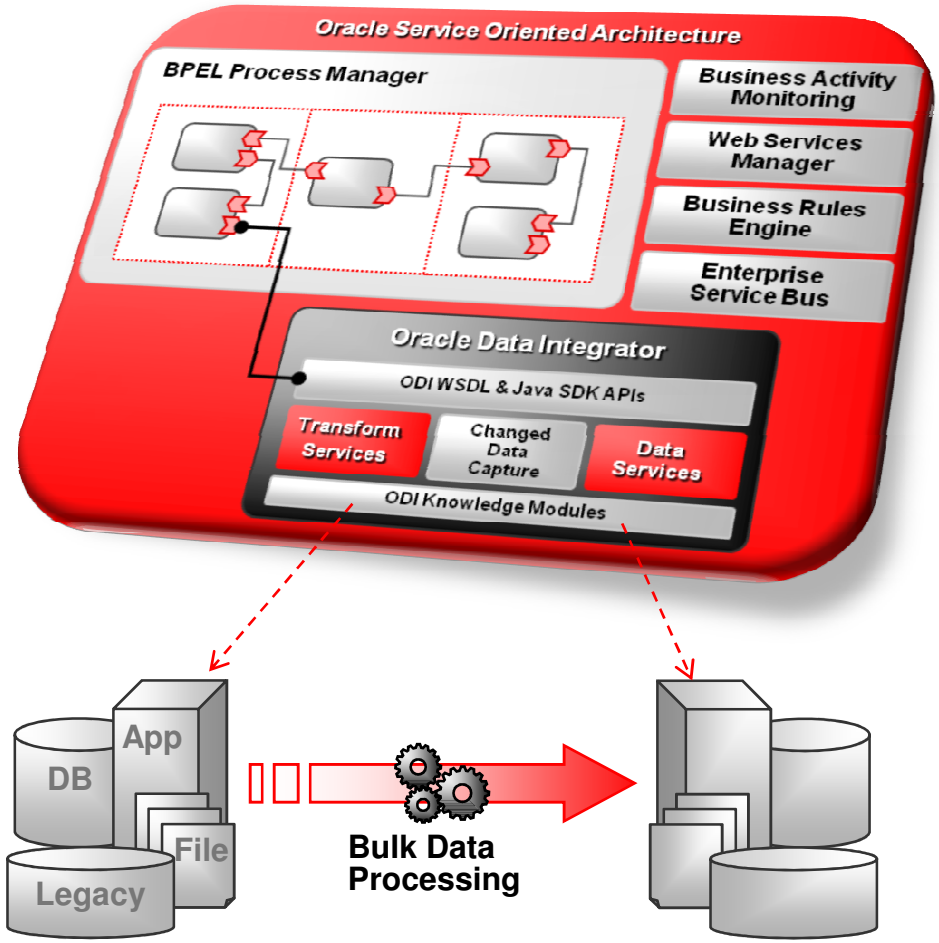
BAM and Data Integrator keep systems up-to-date with recent store inventory levels in real time

© Copyright 2007, Oracle Corporation. All Rights Reserved.


Simple Data Service Use Cases for SOA
ORACLE

Oracle SOA Suite and Data Integrator

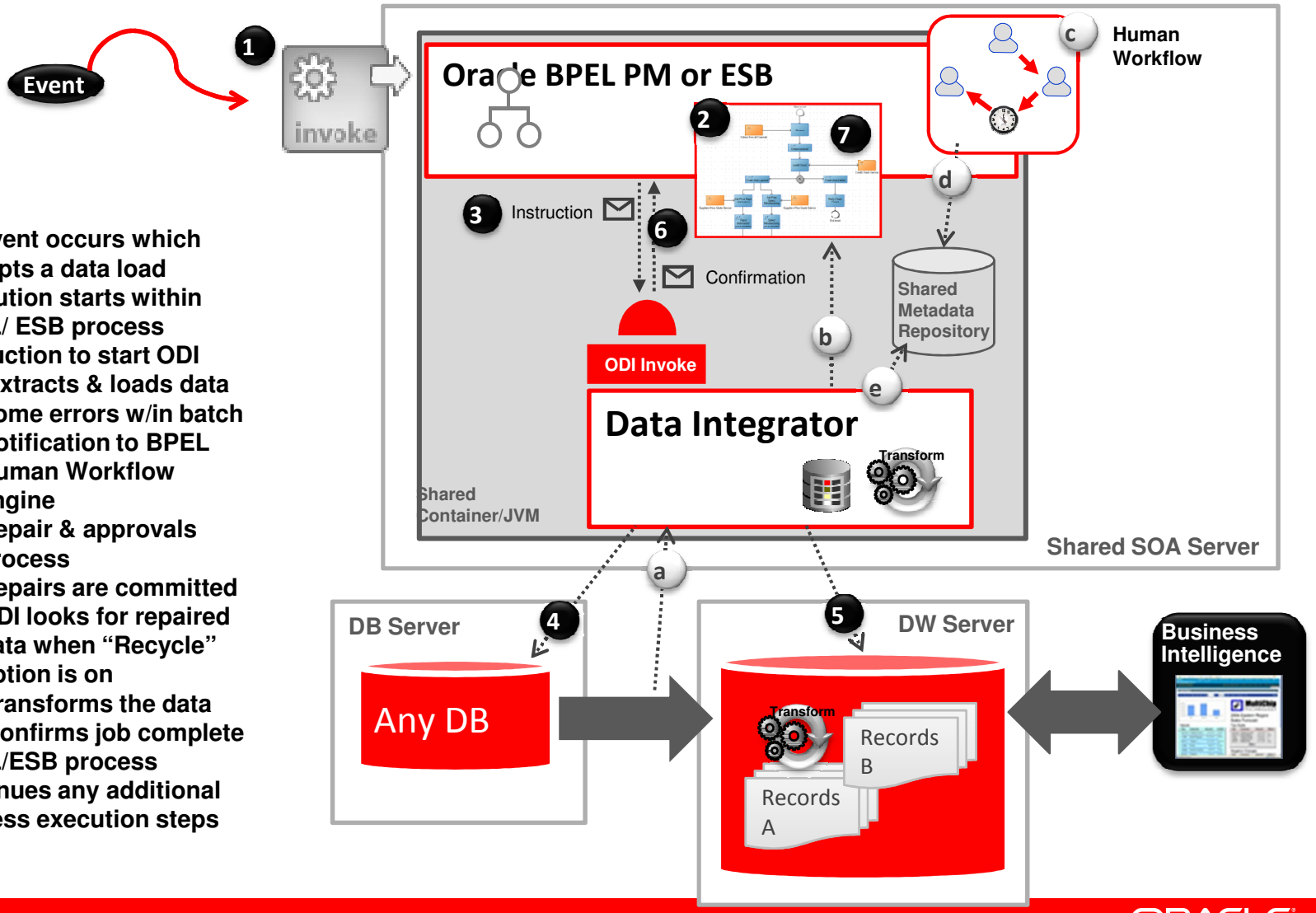
Add Comprehensive Data Service Capabilities to SOA



- **Oracle SOA Suite - BPEL**
  - BPEL Process Manager for Business Process Orchestration & Workflow
  - Standards-based Composite Apps and Integration Processes
  - Strategic SOA Technology
- **Oracle Data Integrator**
  - Efficient bulk data processing as part of Business Process
  - Interact via **Data Services** and **Transformation Services**
  - Unified modeling, monitoring, metadata, error mgmt, auditing
- **Example use cases**
  - SOA Rules/Event driven BI Loads
  - Bulk Data Transformation (any2any)
  - Unified Data Steward Workflow
  - Data Virtualization (with caching)
  - XML/EDI Large File Handling
  - ERP Migration, Replication / Loading

ODI Loads a BI Warehouse
(with Error Hospital Human Workflow)

1. An event occurs which prompts a data load
2. Execution starts within BPEL/ ESB process
3. Instruction to start ODI
4. ODI extracts & loads data
   a) Some errors w/in batch
   b) Notification to BPEL Human Workflow engine
   c) Repair & approvals process
   d) Repairs are committed
   e) ODI looks for repaired data when "Recycle" option is on
5. ODI transforms the data
6. ODI confirms job complete
7. BPEL/ESB process continues any additional process execution steps

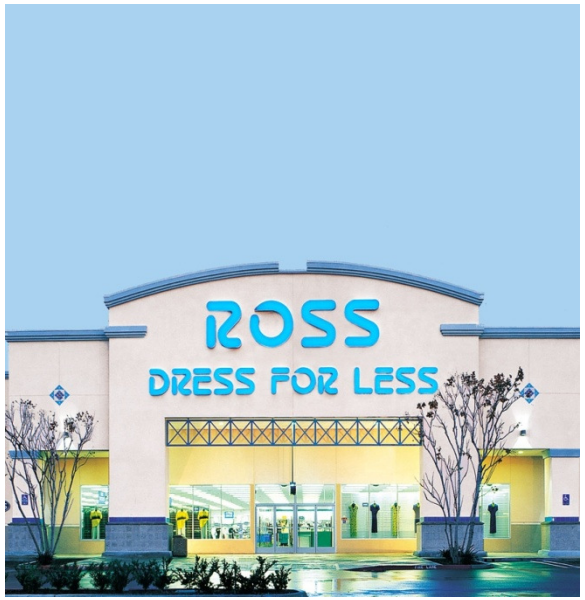


IT Consolidation, Inventory Control

Ross Stores

Business Challenges

- Hard to consolidate consistent, accurate inventory information across over 800 multiple store chains
- Lack of visibility to errors to the business
- Higher cost and time to delivery of new value



IT Challenges

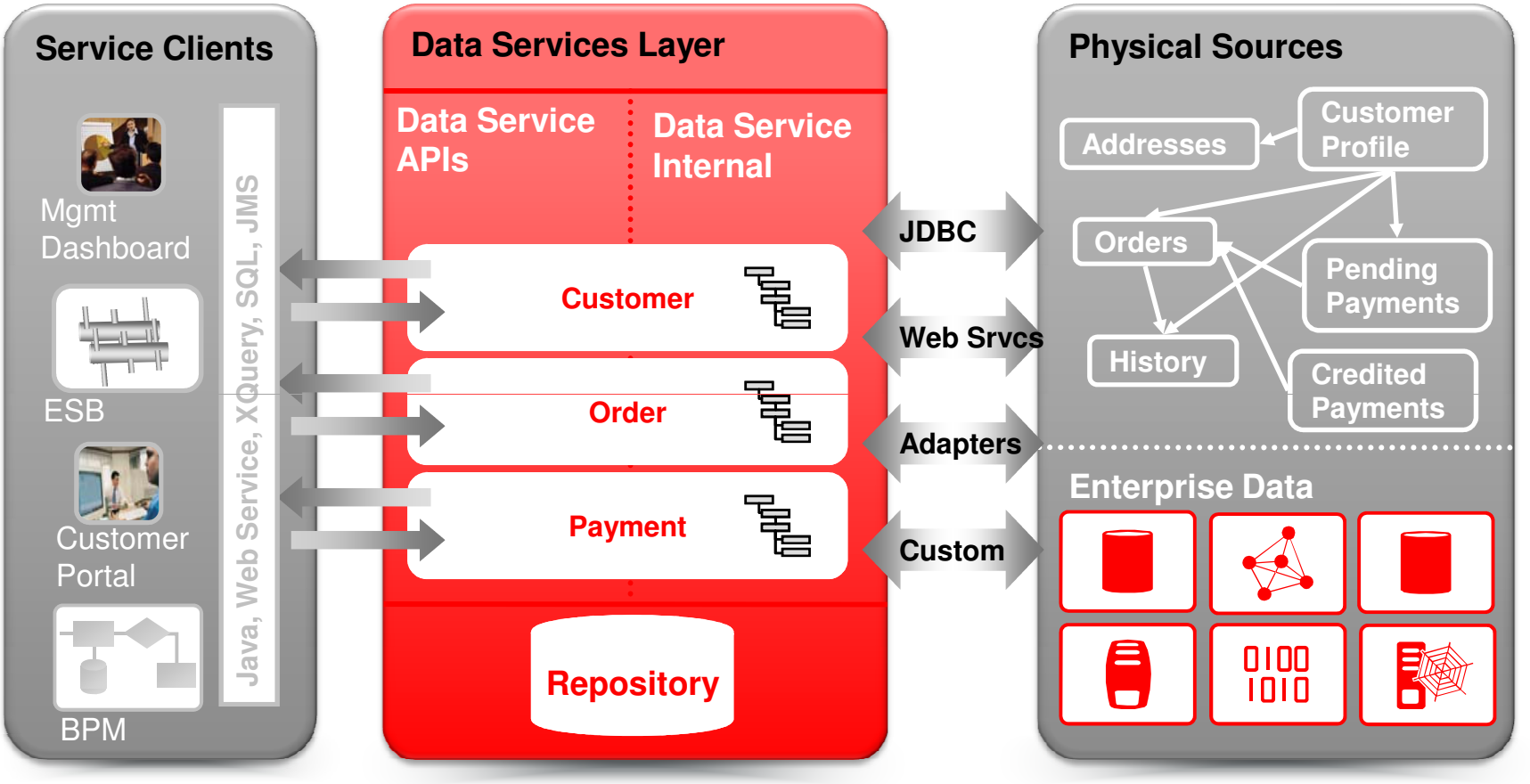
- Current state was complex, didn't scale, and difficult to manage
- Non-standard approach required coding paradigm, inconsistent error handling

Oracle Data Integration Solution Benefits

- Seamless data integration from heterogeneous sources leveraging SOA helped to create a more flexible, standards based integration approach
- 73% Bulk data transfer performance improvement
- Together with Oracle SOA Suite (Oracle BPEL PM) provided business optimization, process visibility, exception handling
- Closed loop processing using BAM and Data Integration combined eliminated ordering/replenishing inventory errors by reducing inaccurate data

Real Time Data Access Services

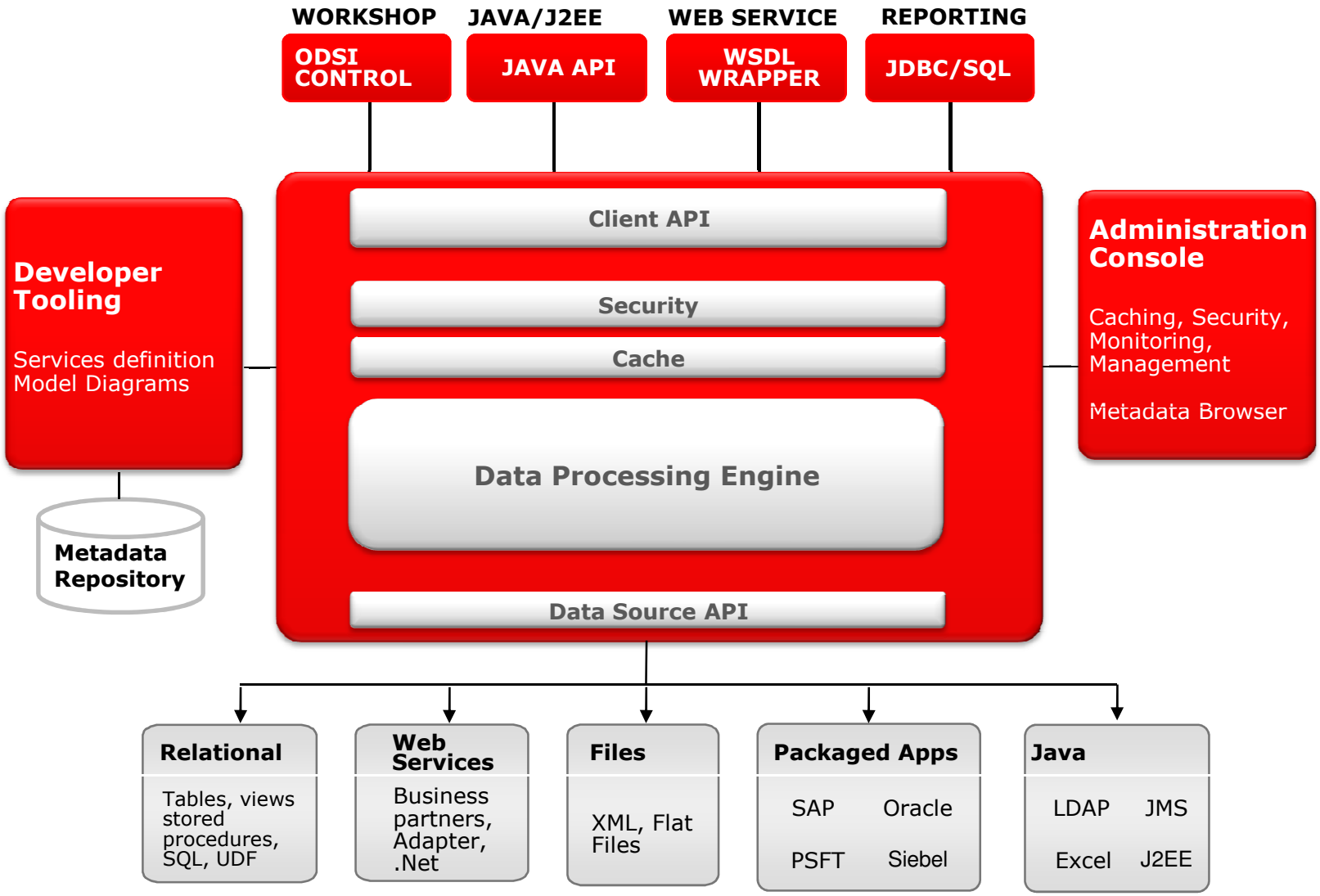
Decouple Data Consumers from Sources for Real Time Queries



- Data services layer provides data access capabilities
- Data services modeling organizes services for use and reuse

Oracle Data Service Integrator

Functional Product Architecture

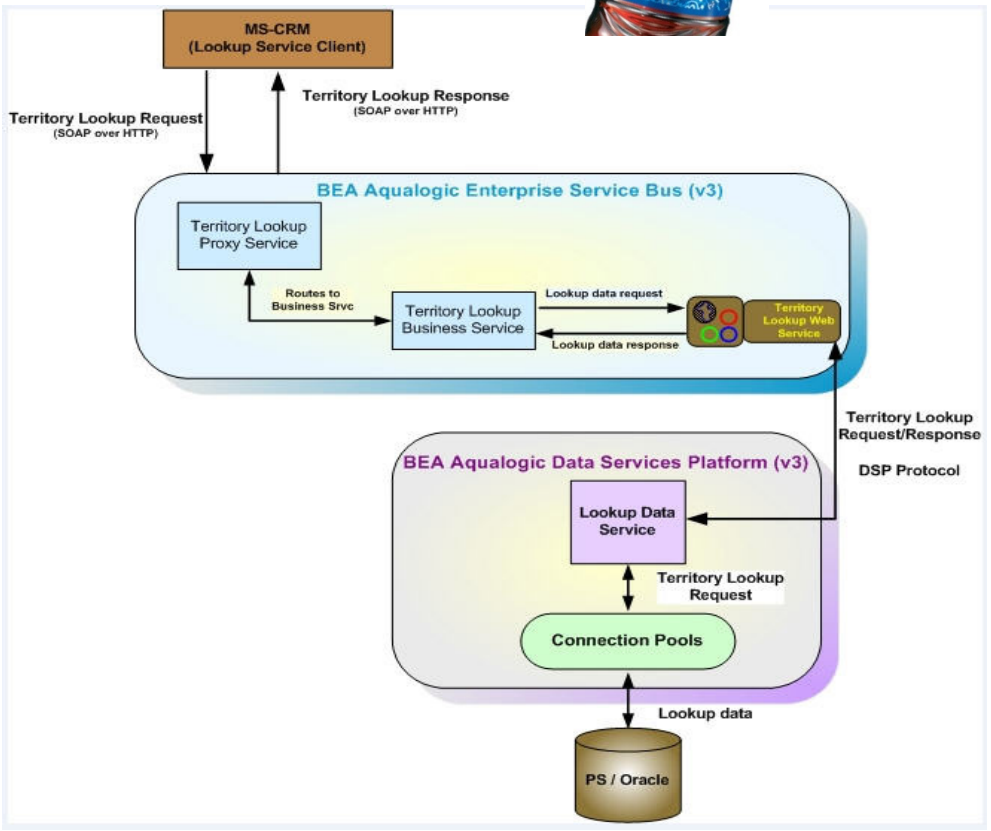


Data Services Federation Example

Using Data Services + Enterprise Service Bus



- Data Federation together with ESB; loose coupling of data together with loose couple of messages
- Improved real-time access of customer information for improved sales responsiveness
- Single view of customer for multiple fragmented systems
- Highly optimized within same design time/run-time platform




Comprehensive Data Services @ Oracle
ORACLE

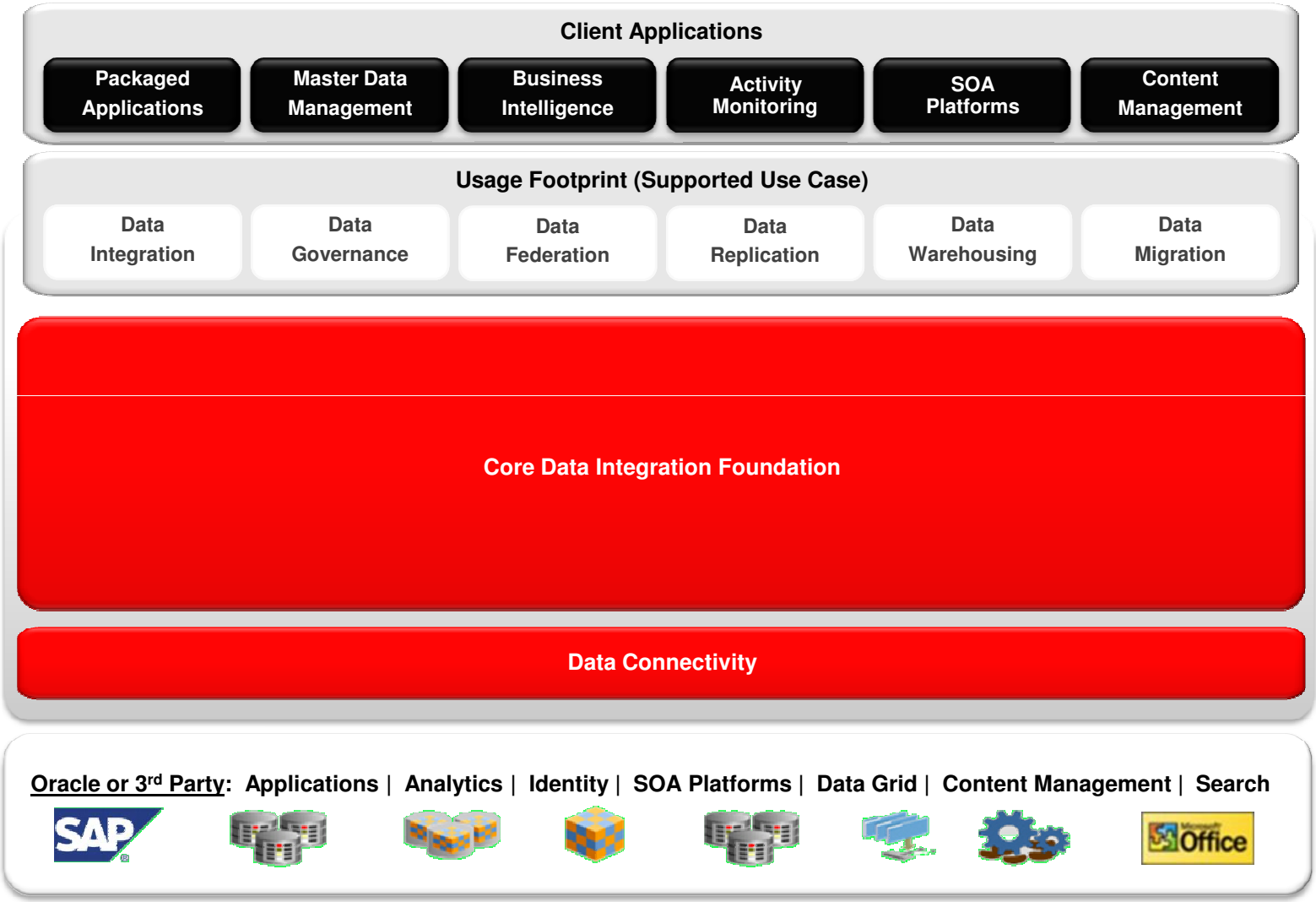
What is ODI Suite?

Best of Breed Data Integration Bundle

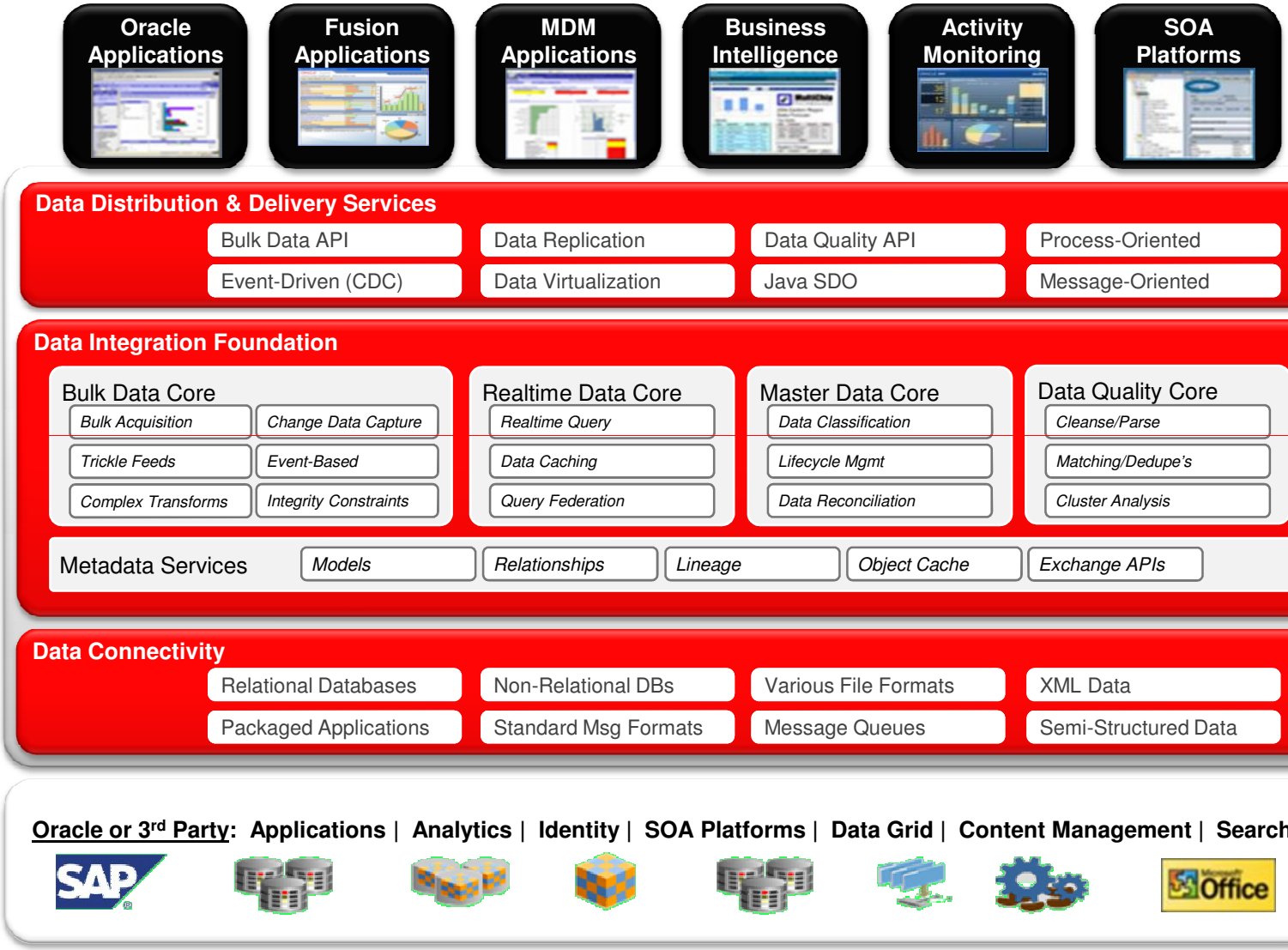


- **Base Components**
  - Oracle Data Integrator
  - Data Relationship Management (Hyperion MDM)
  - BPEL Process Manager & Oracle Service Bus
  - Weblogic Suite:
    - B2B Engine, Business Rules, Coherence Data Grid
- **Optional Components**
  - Oracle Data Quality, Oracle Data Profiling
  - Oracle Data Service Integrator (BEA ALDSP Federation)
  - Adapters (ERP, B2B, Unstructured, Mainframe, etc)

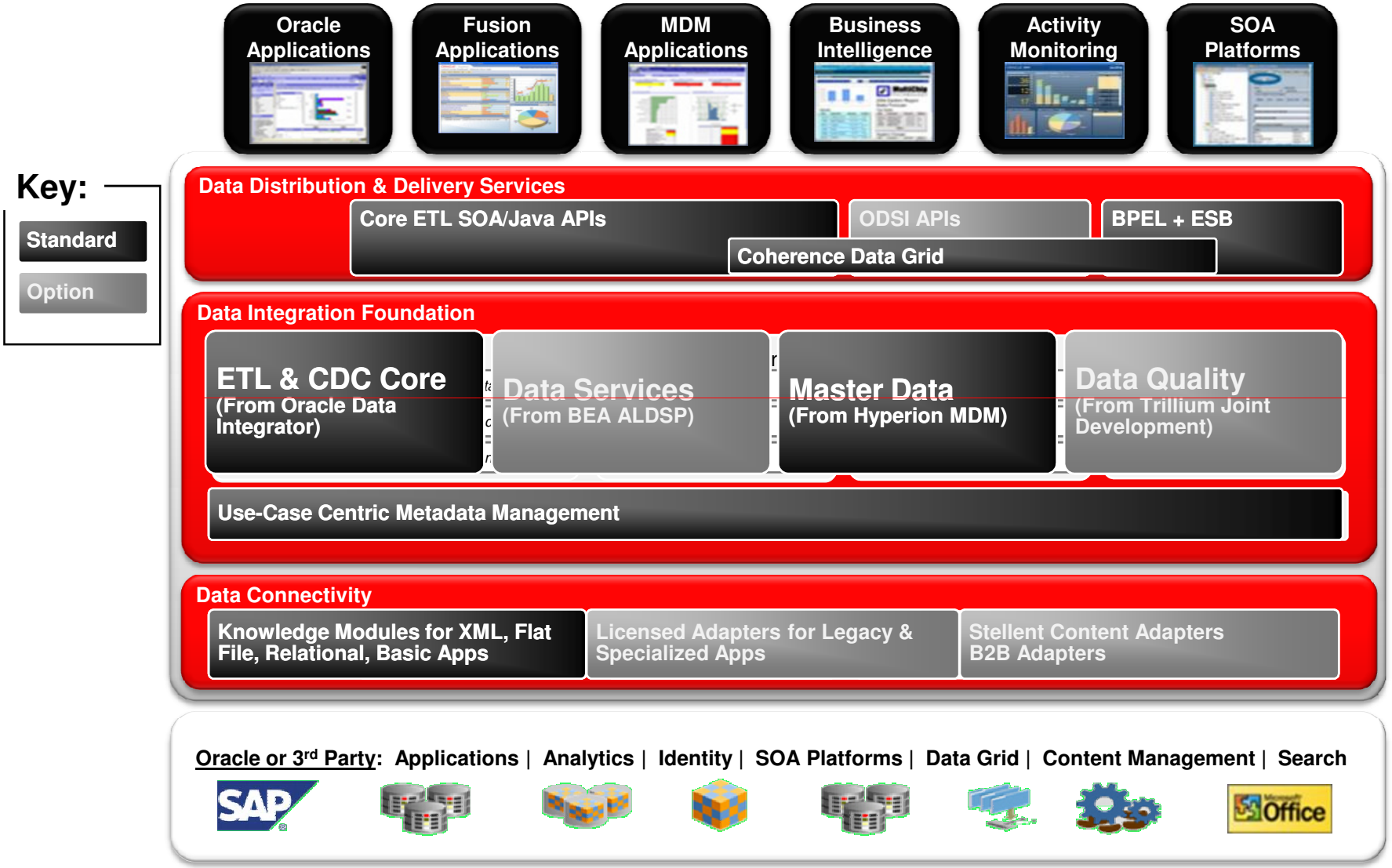
Leverage a Comprehensive Foundation



Oracle Data Integration Suite

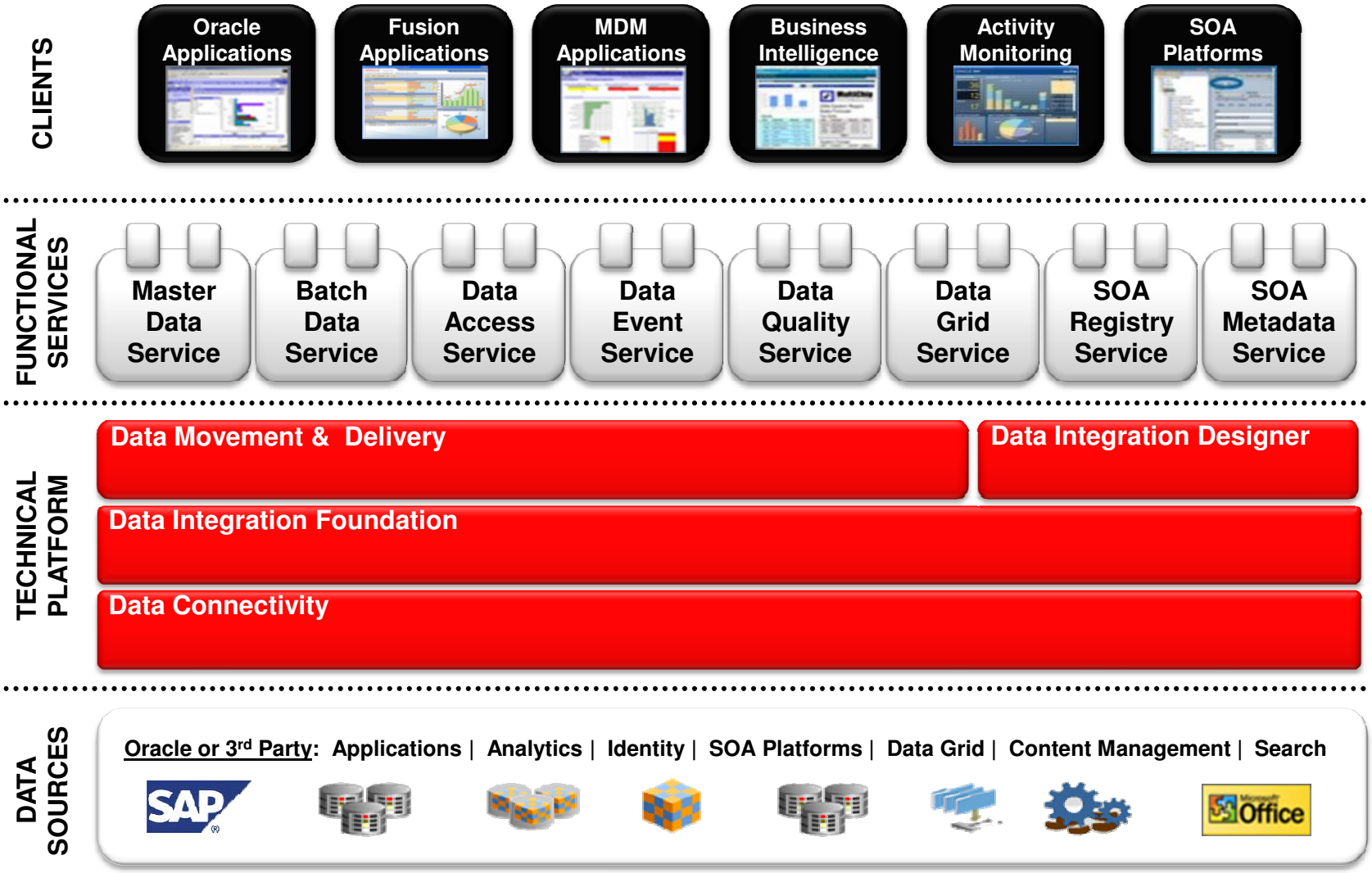


Best-of-Breed Data Integration Platform



Comprehensive Data Services

In an Enterprise Context, Supporting All Types of Data Services




Concluding Thoughts
ORACLE

Data Service Pattern Tradeoffs

Each Pattern Class Carries Assumptions and Limitations

J2EE/Java Only

J2EE Pattern Assumption

- Business Object tier instantiated in Java
- The master reference point is marshaled to Java at some process point

Limitation #1: Scalability

- RAM memory-model vis JVM
- Query performance across JDO/SDOs
- Non-declarative access methodology (API vs. SQL)
- Transformation overhead (SQL to Java to XML vs SQL to XML)

Limitation #2: Redundancy

- Replicating data instances across compute tiers / inelegant
- Synch consistency issues to persistence becomes a challenge at scale

Limitation #3: Granularity

- Specific patterns solve specific issues (eg: Object to RDB)
- These (DTO, DAS, SDO, JPA, ORM, JAXB, OXM, etc.) are programming patterns – not business or system service-level patterns

SOA/XML-Centric

SOA Service Pattern Assumption

- Business Object tier typically defined with Canonical XML
- The master reference point is "on the Bus" or XML document-oriented

Limitation #1: Bloat

- Data + XML Markup = 3 to 6 times original data size
- This can take a 30MB product catalog to >100MB of XML

Limitation #2: Performance

- XML processing is inherently disadvantaged (DOM/Infoset model)
- Data sets are typically navigated with XPath and/or in-memory
- Streaming XML approaches have limited applicability in complex data sets

Limitation #3: Expressivity

- XML does not guarantee precise modeling semantics (relative to RDB)
- This limits automated capabilities
- It also limits overall transferability of common exchange models (models must be accompanied by explanatory human readable text specification)

Conventional DI

Conventional Pattern Assumption

- Business Object tier may be defined within any technology (typically RDB)
- The master reference point is typically (data+metadata) a proprietary API

Limitation #1: Ownership Cost

- Different core technology components (ETL, MDM, IdM, etc) may have radically different underlying technology, architecture, and integration styles
- Impact – Training Overhead
- Impact – Data Center Overhead
- Impact – Duplicate Hardware
- Impact – Integration Costs

Limitation #2: Flexibility and Reuse

- Once conventional (non-SOA) integrations are tightly coupled
- Data bindings often result in the classical n^2 mapping nightmare

Limitation #3: Lock-in Tendencies

- Monolithic conventional architectures create incentives to buy more from existing vendors, which leads to a repetitive cycle and vendor lock-in (aka: the SAP approach)

Key Recommendation – Go Hybrid

Use the Right Tool for your Data Services Requirements, One Size Does NOT Fit All!

- **Core Hybrid Pattern Assumption**
  - Best-of-breed platform enables customer-choice – right tools for the job
  - The master reference points, Business Data Objects, may be instantiated as Java, XML, or manipulated solely as RDB structures depending on the use case
- **Requirement #1: Leverage Native Architecture Patterns**
  - Avoid “bolt-on Java” – because API-only will not lower TCO, only access layers
  - Avoid “bolt-on SOA” – SOAP-wrapper will not improve performance, or data decoupling
  - Avoid “Java or XML bulk data processing” – limited power when used in isolation
- **Requirement #2: Demand Runtime Integration**
  - Avoid having to integrate the integration platforms!
  - Look for cross-system Human Workflow, common Hardware and Platform runtime arch.
- **Requirement #3: Demand Design-time Integration**
  - Avoid having to train developers on four or five different tools for the same use cases
  - Look for integration tools that use the same Design Platform across runtime engines

Recap:

- **Key Points of This Talk:**
  - Data Service Concepts Still Maturing
  - Data Services Value is at Enterprise Scale
    - (not really a per-project value proposition)
  - Data Services are Key for SOA Success
  - Data Services Functional Patterns in Detail

Functional Patterns	Deployment Patterns
• Master Data Services • Bulk Data Services • Data Access Services • Data Event Services • Data Quality Services	• Java Data Services • Standalone SOAP Data Services • Grid-Based Data Services

  - Recommendation: Go Hybrid, Use the Right Tools!


Q&A



ORACLE IS THE INFORMATION COMPANY

Thank You

For More Information

search.oracle.com



or

oracle.com

Speaker Contact & Biography



Jeff.Pollock at oracle.com

Mr. Pollock is an integration technology expert and author of the enterprise software book "Adaptive Information“ (John Wiley & Sons). Currently a Senior Director with Oracle’s Fusion Middleware group, he is responsible for management of Oracle’s data integration product portfolio, Mr. Pollock was formerly an independent systems architect for the Defense Department, Vice President of Technology at Cerebra and Chief Technology Officer of Modulant, developing semantic middleware platforms and inference-driven SOA platforms from 2001 to 2006. Throughout his career, he has architected, designed, and built application server/middleware solutions for Fortune 500 and US Government clients. Previously, Mr. Pollock was a Principal Engineer with Modem Media and Senior Architect with Ernst & Young’s Center for Technology Enablement. He is also a frequent speaker at industry conferences, author for industry journals, active member of W3C and OASIS, and formerly an engineering instructor with University of California at Berkeley’s Extension on the subjects of object-oriented systems, software development process and enterprise systems architecture.

Speaker Contact & Biography



Dain.Hansen at oracle.com

Dain Hansen is Director of Product Marketing at Oracle systems where he leads Data Integration Product Marketing for *Oracle Data Integration Suite,* part of Oracle Fusion Middleware. Dain has over 13 years industry experience in enterprise software technologies including: Service Oriented Architecture, data services, enterprise service bus, SOA management, security, SOA governance, and BPM. Previously to this role, Dain was Director of Product Marketing at BEA Systems for SOA integration. Also at BEA, Dain led product management of AquaLogic Service Bus, which is now Oracle's strategic ESB offering. Prior to BEA, Dain was a business analyst for HP and Bechtel.

You can read Dain's blog on
http://blogs.oracle.com/dataintegration

The preceding is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions.
The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.


ORACLE