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November 11–15, 2007



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Data Quality Lifecycle with Oracle Data Integrator:

A Review of Key Patterns and Deployment Strategies

Jeff T. Pollock, Senior Director Fusion Middleware

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.
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Program Agenda

- **Data Quality Backgrounder**
- **Oracle Strategy & Vision**
  - Strategy: Best of Breed, Comprehensive, Pervasive Data Integration
  - Delivered through a Complete, Integrated, Heterogeneous Suite
- **Comprehensive Data Quality: Critical for Integration**
  - Oracle's DQ Strategy: Fit-for-Purpose Out-of-Box Solutions & Openness
  - Announcement: Availability of Oracle Data Profiling & Oracle Data Quality
  - Provide Comprehensive Data Quality Solution for Data Integration with ODI
  - Offer Both Standard and Advanced Data Profiling & Data Quality
  - Integrate Data Profiling, Data Quality, Data Integration Products
  - Differentiate ODP and ODQ from Competition
- **ODI Technology: Strong Foundation for Broad Vision**
  - Architectural Advantages: Declarative Design, Knowledge Modules, ELT
  - Build Out Comprehensive Data Integration Offering from ODI Foundation


Data Quality Backgrounder
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A World Without Data Quality

…data quality concerns are a part of your everyday world

Q: Why is my marketing campaign conversion rate so low?



Q: Why don't the product guys realize that garbage data in is garbage data out?



A: Data Quality

Many times large retailers maintain separate mail marketing lists which contain similar but slightly different data, without the data quality intelligence to match the duplicates.

A: Data Quality

For an IT organization, the Data Quality Service can provide an automated way to do bulk cleansing of bad data – improving data quality with minimal human intervention required

Data Quality Provides

- Governance – Overall Data Controls
- Cleansing – Common Data Typos
- Matching – Eliminate Duplicates
- Parsing – Unstructured Tokens
- Standardization – Common Formats

Customer Data Quality

St. James BBQ & Pool Svc John St. James III 42 Ridge St, #5 St. Louis 5551234	CLEANSE	Saint James Barbeque and Pool Service Jonathan St. James III 42 Ridge Street. NW, #5 St. Louis, MO 63119 314-555-1234

Product Data Quality

WG IK 113 OHM .15W1% RESWG ik 113OHM1/8W 1/8WATT IK @113O 1% ik widg 113Ohm @.15-1 Widget ik – 113O Max 113o 1/8w-1%RES	CLEANSE	*6 Matching Products, each record is identical*: Product: Widget IK Power: .15 Watt Resistance: 113 Ohm Tolerance: 1%

Data Quality for Data Governance

…these may seem deeply technical, but with top-line implications

Group	Quality	Issues Considered	Example of Data Quality Problem
Relation to other data	Referential Integrity	Do records exist where expected? Do they contain unnecessary or inactive data? Are reference files/tables complete?	Transaction records carry codes for products that do not exist on the Product table/file
	Cardinality	Is the structure of relationships among entities and attributes maintained consistently?	A customer has more than one “Current Customer Profile” record
Structure of fields	Format	Do values follow consistent formatting standards?	Telephone number appears as xxxxxxxxxx, (xxx) xxx-xxxx, 1.xxx.xxx.xxxx, etc.
	Standard	Are data elements consistently defined and understood?	Gender code = M, F, U in one system and Gender code = 0, 1, 2 in another system
	Consistent	Do values represent the same meaning across systems and files?	Profit margin is calculated differently across units, using two different formulas
Content within data values	Complete	Is all necessary data present?	17% of customer name data is blank
	Accurate	Does the data accurately represent reality or a verifiable source?	A Supplier is listed as ‘Active’ but went out of business six years ago
	Valid	Do data values fall within acceptable ranges defined by the business?	Transaction Data = 02/07/1902, but business started in 1969
	Fit For Purpose	Is the information valuable to the business? Does the data convey information that can intelligently be consumed by the business?	A person has a SIC code A business has a gender code

Data Quality for Data Governance

…these may seem deeply technical, but with top-line implications

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	Cardinality		
Structure of fields	Format		
	Standard		
	Consistent		
Content within data values	Complete		
	Accurate		
	Valid		
	Fit For Purpose		

What data anomalies exist?

How can we fix them?

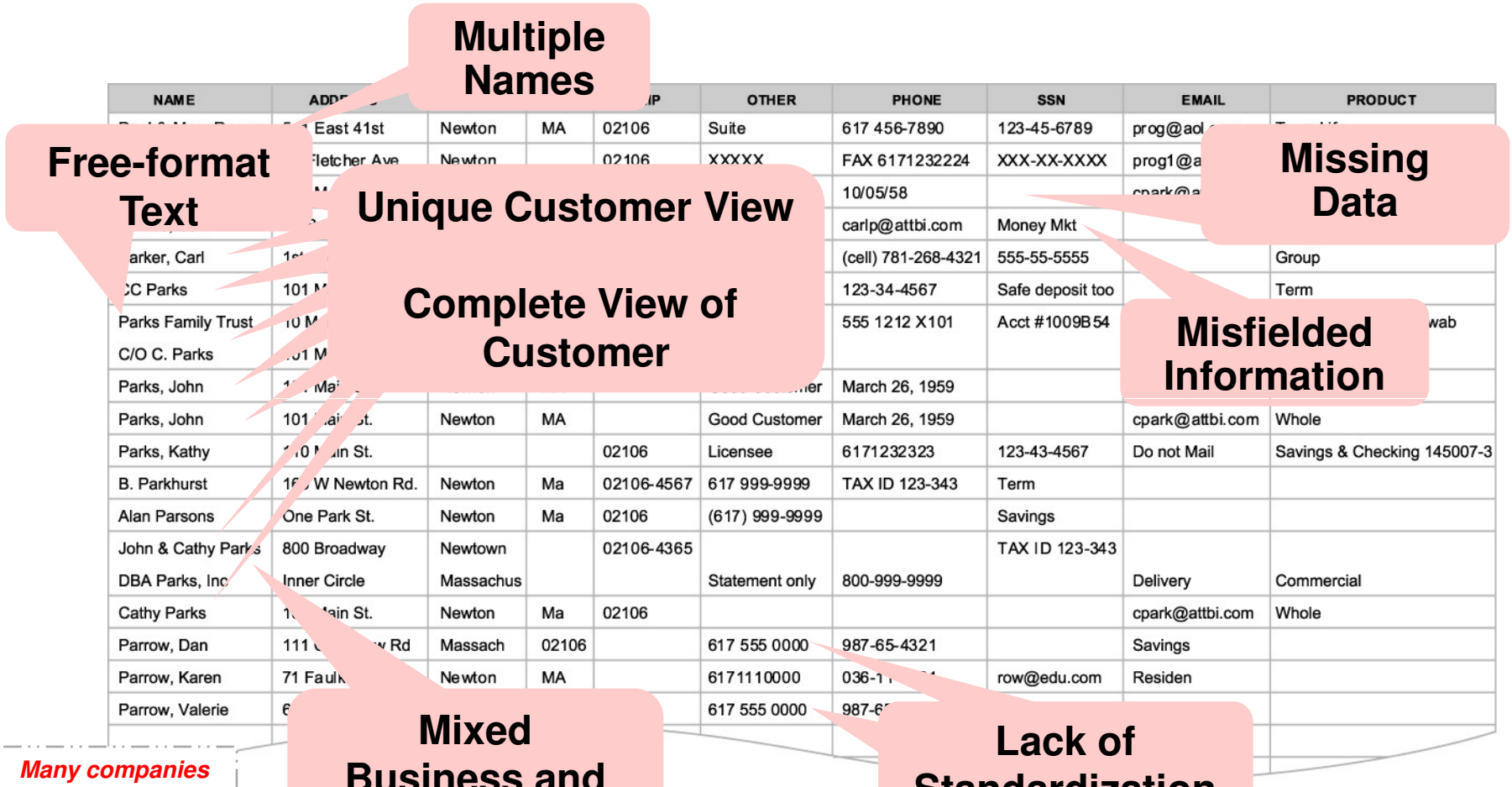
What about when new problems develop over time?

What if I need additional information to meet business objectives?

What processes can stop bad data at the source?

Data Quality is a Multi-faceted Problem

A Clear Picture of Scope Emerges After Deep Investigation



NAME	ADDR			ZIP	OTHER	PHONE	SSN	EMAIL	PRODUCT
	East 41st	Newton	MA	02106	Suite	617 456-7890	123-45-6789	prog@aol	
	Fletcher Ave	Newton		02106	XXXXX	FAX 6171232224	XXX-XX-XXXX	prog1@a	
						10/05/58		cpark@a	
						carlp@attbi.com	Money Mkt		
arker, Carl	1st					(cell) 781-268-4321	555-55-5555		Group
CC Parks	101 M					123-34-4567	Safe deposit too		Term
Parks Family Trust	10 M					555 1212 X101	Acct #1009B54		wab
C/O C. Parks	101 M								
Parks, John	1 Mai				mer	March 26, 1959			
Parks, John	101 Lai st.	Newton	MA		Good Customer	March 26, 1959		cpark@attbi.com	Whole
Parks, Kathy	10 Main St.			02106	Licensee	6171232323	123-43-4567	Do not Mail	Savings & Checking 145007-3
B. Parkhurst	16 W Newton Rd.	Newton	Ma	02106-4567	617 999-9999	TAX ID 123-343	Term		
Alan Parsons	One Park St.	Newton	Ma	02106	(617) 999-9999		Savings		
John & Cathy Parks	800 Broadway	Newtown		02106-4365			TAX ID 123-343		
DBA Parks, Inc	Inner Circle	Massachus			Statement only	800-999-9999		Delivery	Commercial
Cathy Parks	1 Main St.	Newton	Ma	02106				cpark@attbi.com	Whole
Parrow, Dan	111 y Rd	Massach	02106		617 555 0000	987-65-4321		Savings	
Parrow, Karen	71 Faulk	Newton	MA		6171110000	036-1	row@edu.com	Residen	
Parrow, Valerie	6				617 555 0000	987-6			

Many companies underestimate how many *ways unprotected data is devaluated.*

Data Quality Problem Statement

- **Data Quality Must be Pervasive – to Improve Quality in Every ETL Job**
  - Oracle Data Integrator Supplies Standard, Inline Data Quality and Data Profiling Capabilities with Every ETL and E-LT Job
- **Advanced Data Quality Must be Best-of-Breed – to Achieve Best Matching etc.**
  - Oracle Data Profiling and Oracle Data Quality for Data Integrator have Award-Winning Match, Cleanse, and Parse Performance
- **Data Quality Must be Continuous**
  - Oracle Data Profiling and Oracle Data Quality for Data Integrator support Integrated Workflow, Recycling, and Steward GUIs

Oracle's Strategy for Data Quality

- **Use Right Best-of-Breed DQ for Right Job**
  - *MDM-CDI*: Real-time Fuzzy Matching, Name/Address Validation, Specialized Party Content, High Performance for Many Similar Records
  - *MDM-PIM*: Parsing, Metadata Extraction, Specialized Product Content, High Performance for Shorter Lists of Many Varying Types
  - *Data Integration*: Broad Functionality for Any Type of Data Moved in Large Volume Batch Processing or Near Real-time
- **Provide Out-of-Box Solutions**
  - Content *and* Technology Required Together for Comprehensive Solution
  - Pre-package and Integrate as Enabling Functionality As Needed
- **Remain Open to Standard DQ & 3rd Party DQ**
  - Flexibly Support Different Needs – Provide Standard & Advanced DQ
  - Maintain Openness – Enable Integration with Other DQ Vendors

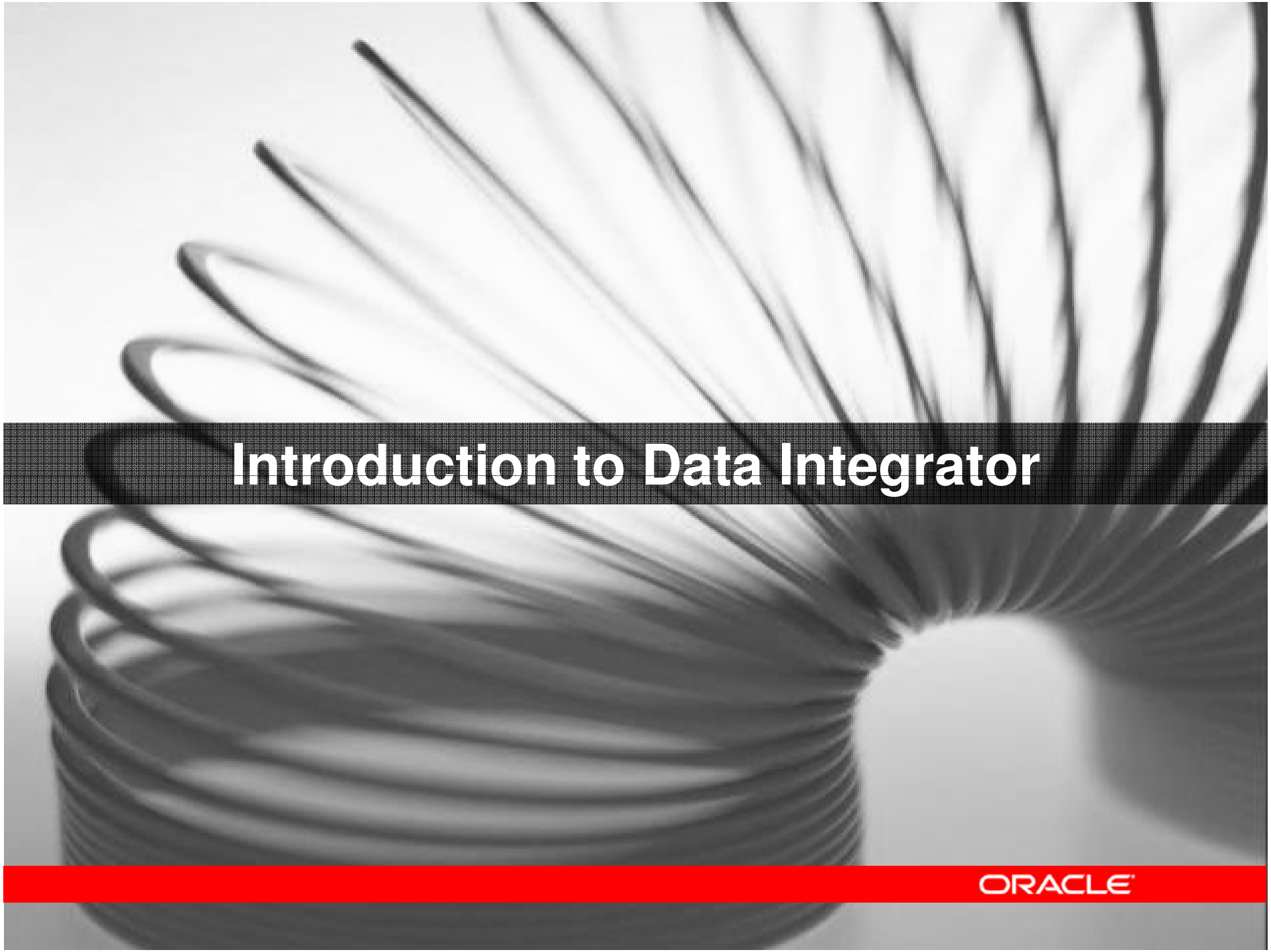
→ ***Oracle's Overall DQ Strategy Motivated a Deeper Partnership with Trillium for Heterogeneous Data Integration in Fusion Middleware***

Oracle's Strategy for Data Integration

Oracle's Data Integration Strategy

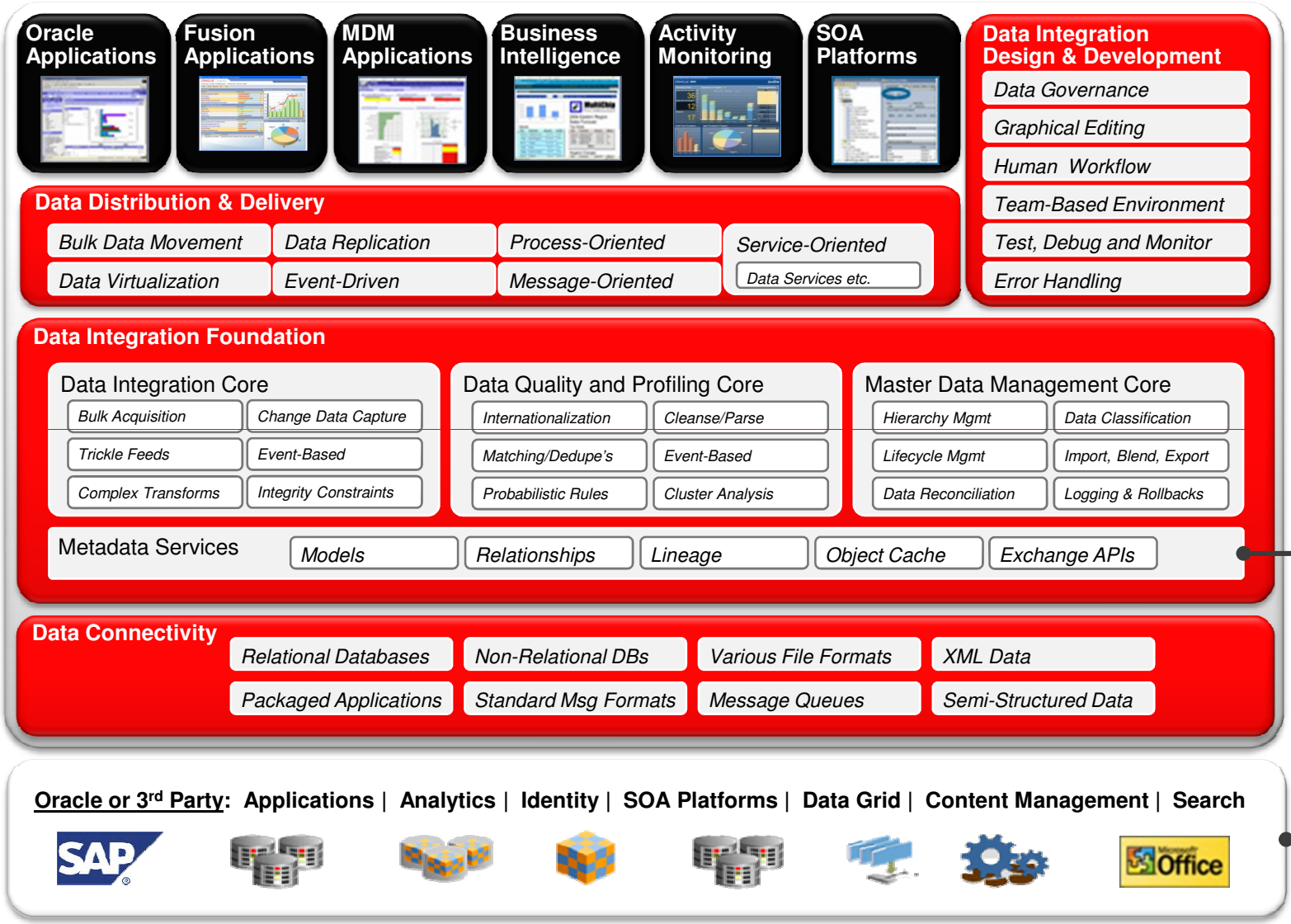
- **Provide Comprehensive Data Integration Foundation**
  - Comprehensive: Complete Data Integration Technology Foundation
    - ***Including best-of-breed Data Quality Foundation Components***
  - Integrated: Unified Tools; Unified Metadata Management; Unified Administration
  - Best of Breed: Significant Architectural & Functional Differentiators vs. Competitors
  - "Hot Pluggable": Very Broad Range of Information Sources & Packaged Applications

- **Pre-Integrate with Oracle's Middleware & Applications**
  - Make Data Integration Pervasive with Lower Cost & Complexity within Applications
  - With Oracle's Business Intelligence Tools & Business Intelligence Applications
  - With Oracle|Hyperion Planning, Budgeting, Financial Consolidation & Reporting
  - With Oracle Packaged Applications for ERP, CRM, & Vertical Applications
  - With Oracle Packaged Composite Applications & Application Integration Architecture
  - With Oracle's Master Data Management & Fusion Application Pillars


Introduction to Data Integrator
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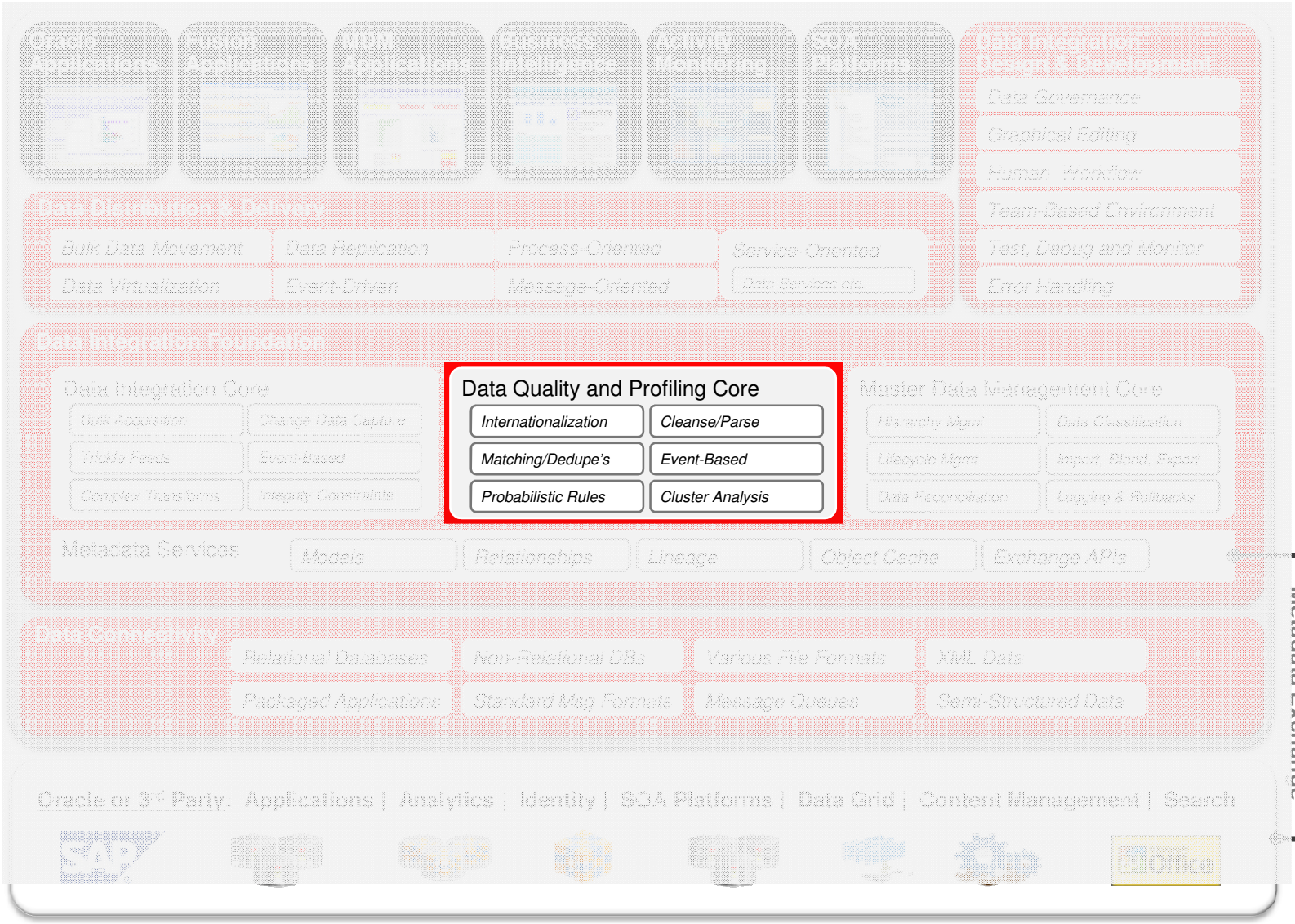
Oracle Data Integration

Comprehensive Driven Data Integration Offering from Oracle



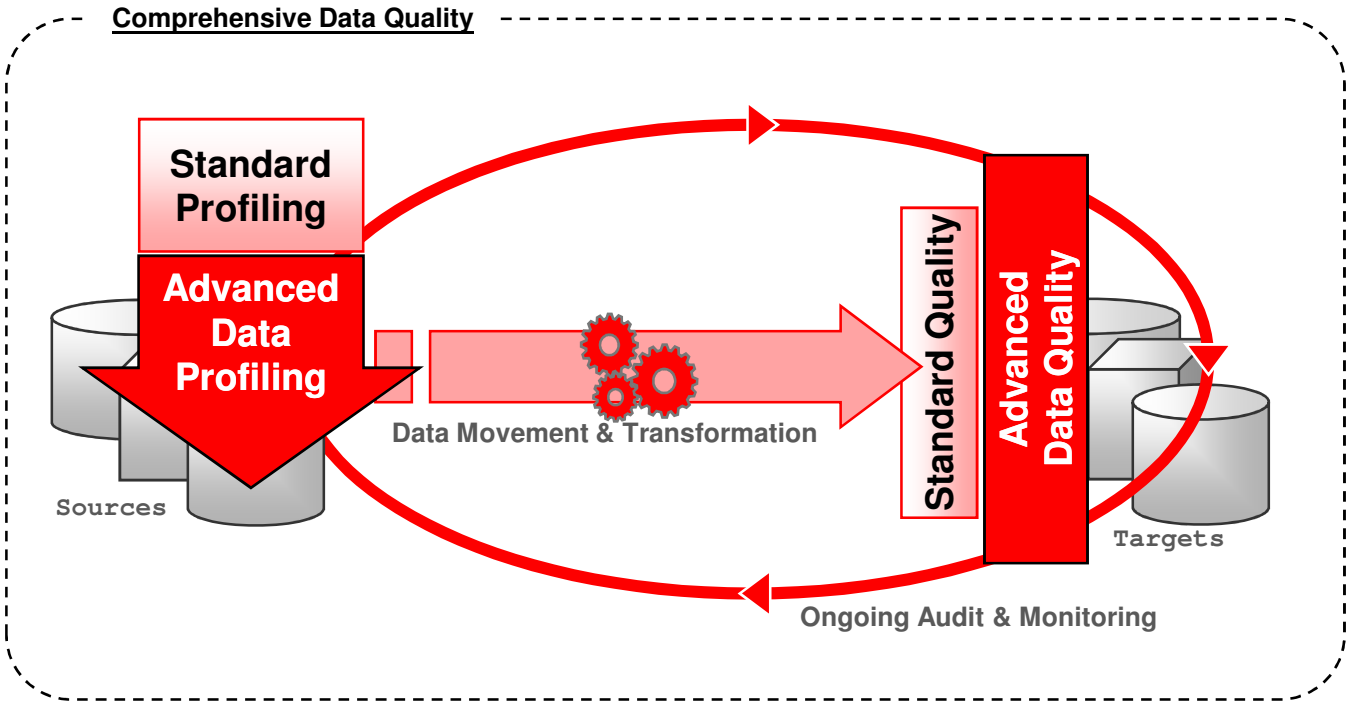
Oracle Data Integration

Comprehensive Driven Data Integration Offering from Oracle



Comprehensive Data Quality

For Data Integration with Oracle Data Integrator



Best of Breed Data Quality & Profiling

Introducing Two New Oracle Products

Data Governance [Auditing, Cleansing, Matching, Parsing and Standardization] for Enterprise Data

BENEFITS	KEY DIFFERENTIATED FEATURES
1. *Governance*	Core Cleansing & Matching
2. *Global Reach*	Internationalization
3. *Performance*	Single-Pass Architecture
4. *Flexibility*	Wide Platform Support
5. *Track Record*	Proven Technology

Advanced Data Quality and Profiling

Well Integrated Data Integration with DQ & DP Features

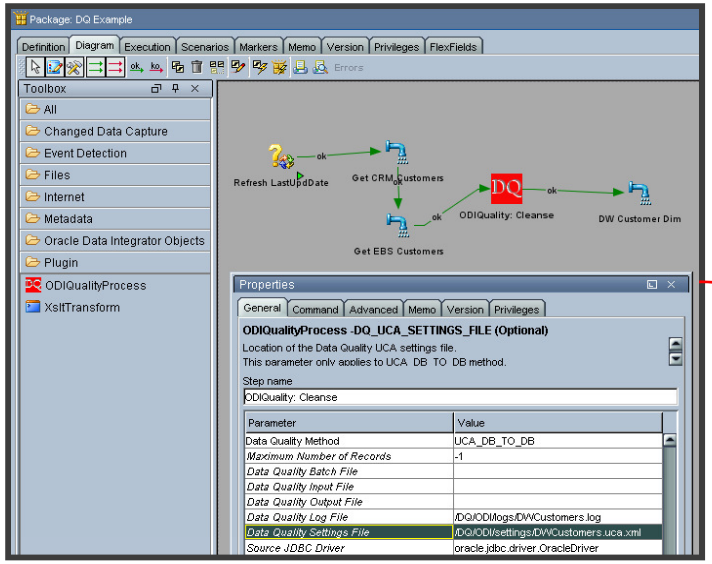
ODI 10g (10.1.3.4) New: Data Quality & Profiling

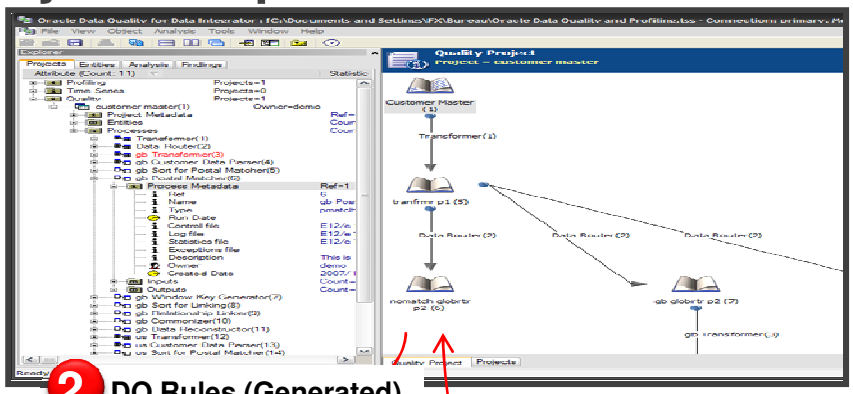
- Joint Development with Trillium Software

- **ODI 10g Solution Now Optionally Includes:**
  - Data Quality Engines (Cleansing, Parsing, Matching, & Standardization)
  - Data Profiling Tools
- **Oracle Data Quality for ODI Integration Points**
  - Save ODI Model Metadata to Trillium File Format
  - Read Trillium Metadata and Automatically Generate ODI Metadata
  - Create ODI Tool to Call Trillium Job - Handle Details of File Manipulation
  - Oracle Re-branding of UI, Error Messages, Doc
  - Single Install with Oracle Universal Installer
- **Customer Benefits**
  - One Vendor for Unified Best of Breed DQ/DP and Data Integration
  - Best Internationalization & Performance

Differentiator: Advanced Governance

Market-Leading Data Quality Jointly Developed w/Trillium Software





3 Add DQ to E-LT Flow

2 DQ Rules (Generated)

1 Profile Data (Sample Set)

4 Deploy

Design-time Metadata

ODI Production Runtime Environment

ODI Admin Interfaces

Administrators

Operators

Topology/Security

Execution Log

Runtime Repository

Code

Execution Logs

ODI Agent

Data Flow Conductor

Batch Script

Return Code

Oracle Data Quality Servers

Global Data Router

Transformer

Parser

Postal Matcher

Relationship Linker

Production Servers and Applications

Execution

Return Code

CRM

Data Warehouse

Legacy

ERP

Files / XML

ESB

Incoming Data

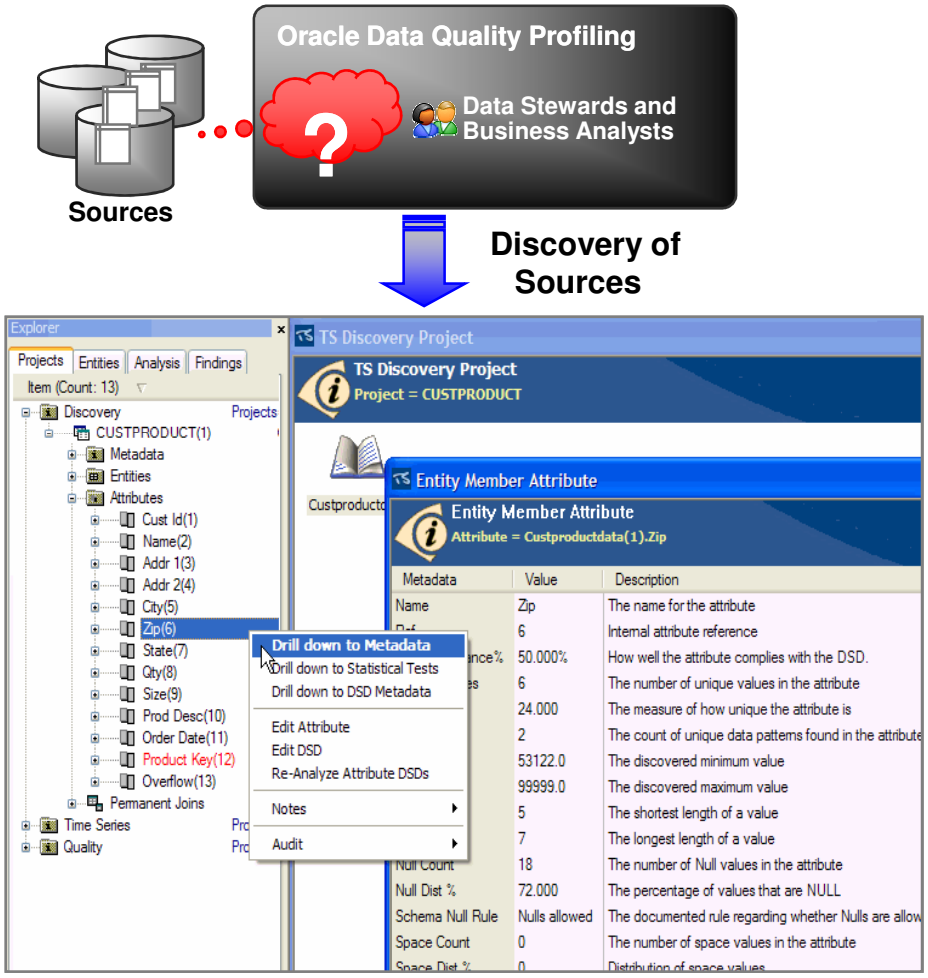
Cleansed Data

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Start by Profiling the Data
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Declarative Data Profiling and Analysis

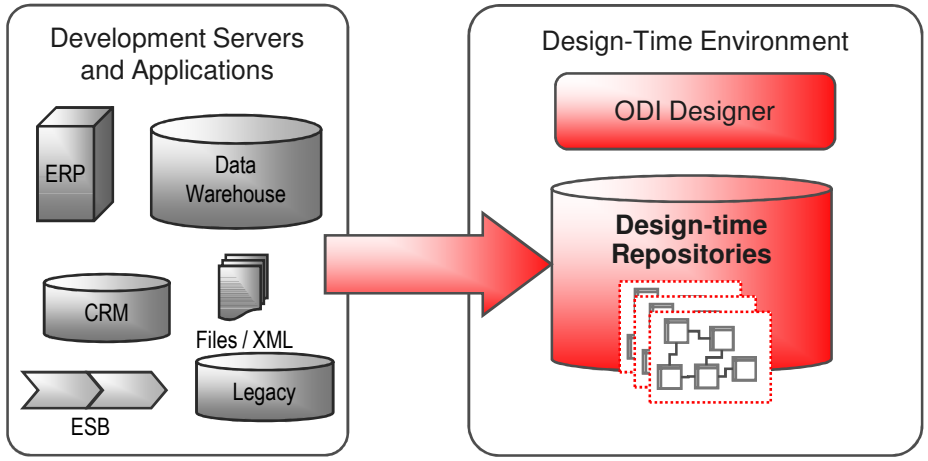
Automatically Generate Data Quality Rules



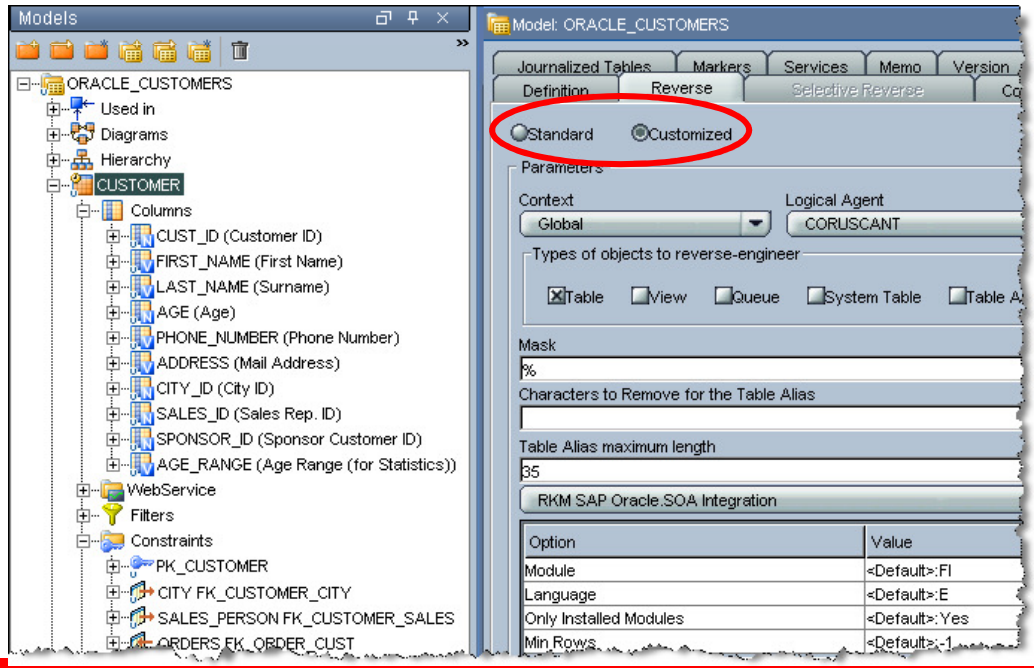
- **Declarative design**
  - Visual modeling
  - Easy user declarative tool
  - Multi-user collaboration
  - Automatic Data Quality Rule generation
  - Extensible by users
- **Integrated metadata**
  - Profiling repository
  - Modeling functions
  - Data integrity constraints
  - Monitoring sources
- **High speed runtime**
  - Optimized for performance
  - High volume & CDC rules
  - Complete, fine grained auditing & traceability

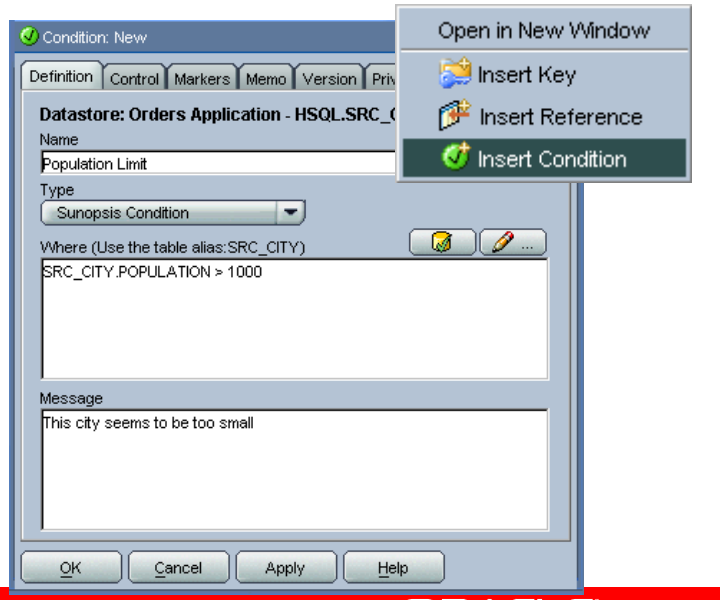
Standard ODI Profiling using RKM Tech

Standard Profiling via ODI Reverse-Engineering Knowledge Modules



1. **Reverse-engineer Metadata**
   - Automatic
   - 40+ technologies supported out-of-box
   - Easily Extensible via Reverse-Engineering KM
2. **Enrich Metadata**
   - Documentation
   - Declarative rules for Data Integrity
   - Cross-technologies references
3. **Highlight Discrepancies**
   - ODI-maintained metadata validated against actual state of the data store



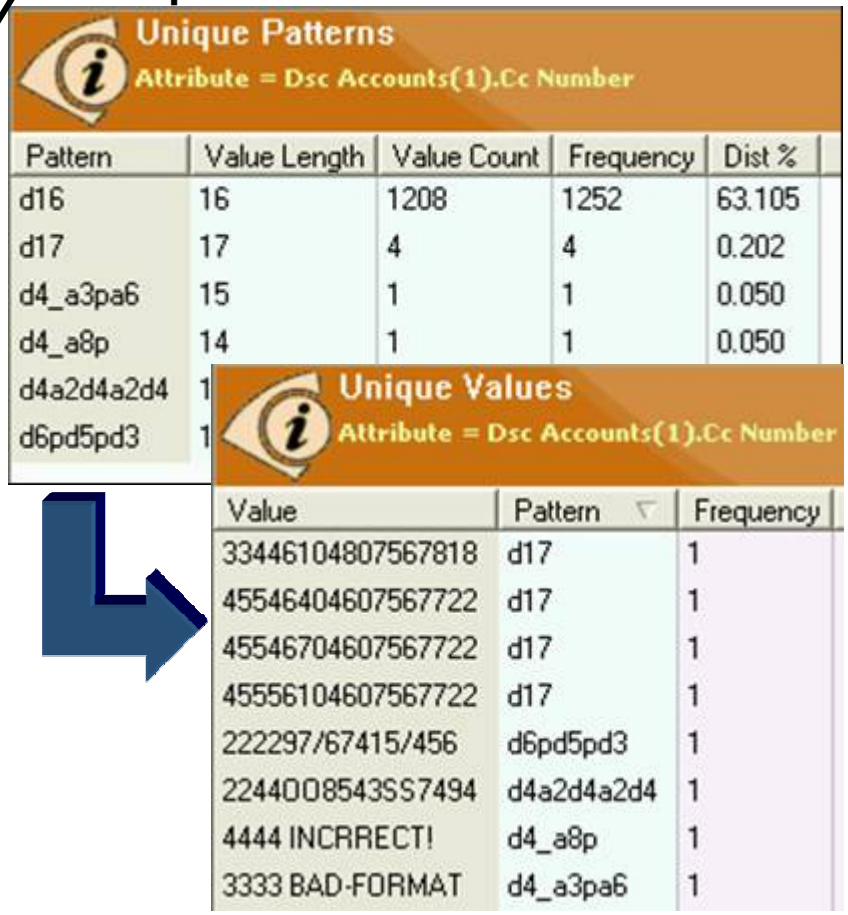


Data Profiling and Analysis Metrics

Data Browser for Business Users to Identify Problems

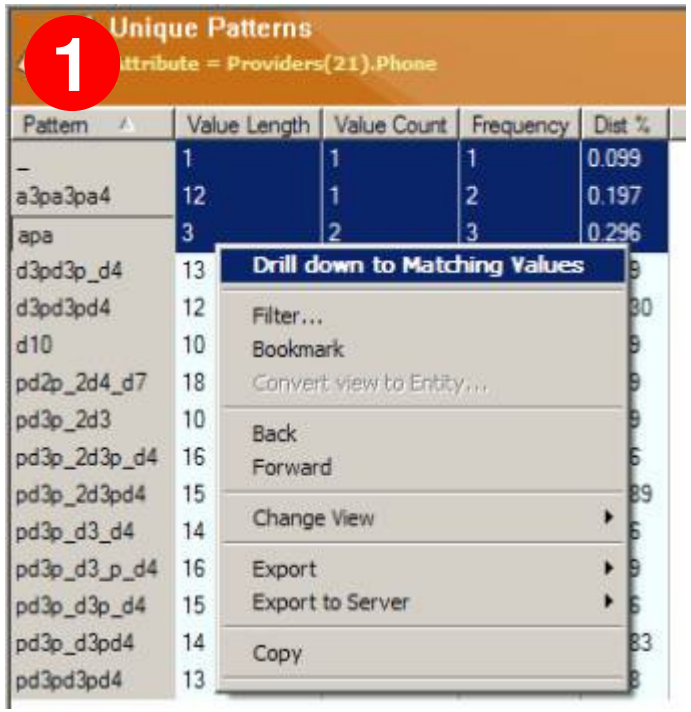
Characteristic	Sample Profiling Metrics
Completeness	▪ Null counts ▪ Minimum & maximum lengths
Conformity	▪ Field structure ▪ Data types ▪ Patterns/ masks
Validity	▪ Unique values ▪ Specific business rules
Consistency	▪ Soundex ▪ Metaphones
Integrity	▪ Dependencies ▪ Keys ▪ Joins

Example: Credit Card Number



Data Profiling and Analysis Drill-Down

Intelligent Drilling Guides Business Users in Context

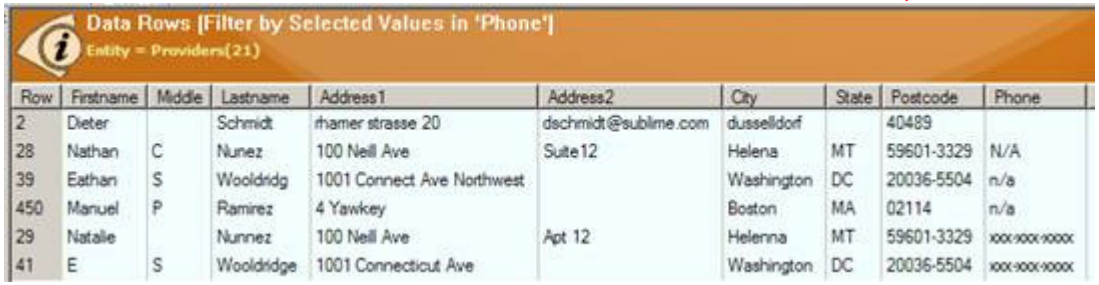




Drill example (using Patterns):

1. **Drill down to patterns list to see all pattern values**

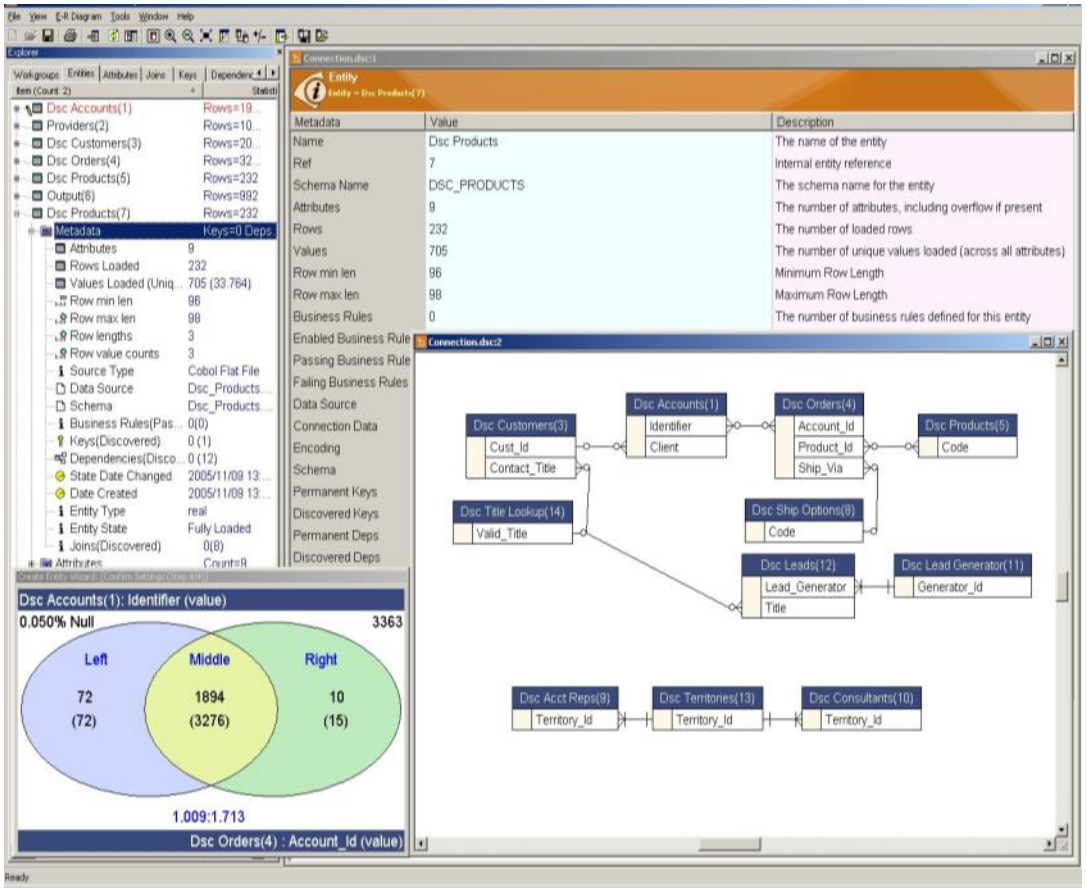
2. **Drill down to values list to see all rows containing a particular value**



3. **Complete understanding and data examples allow you to quickly take action**

Data Profiling and Analysis Visualization

See How your Data Really Is, Not Just by Schema Constraints

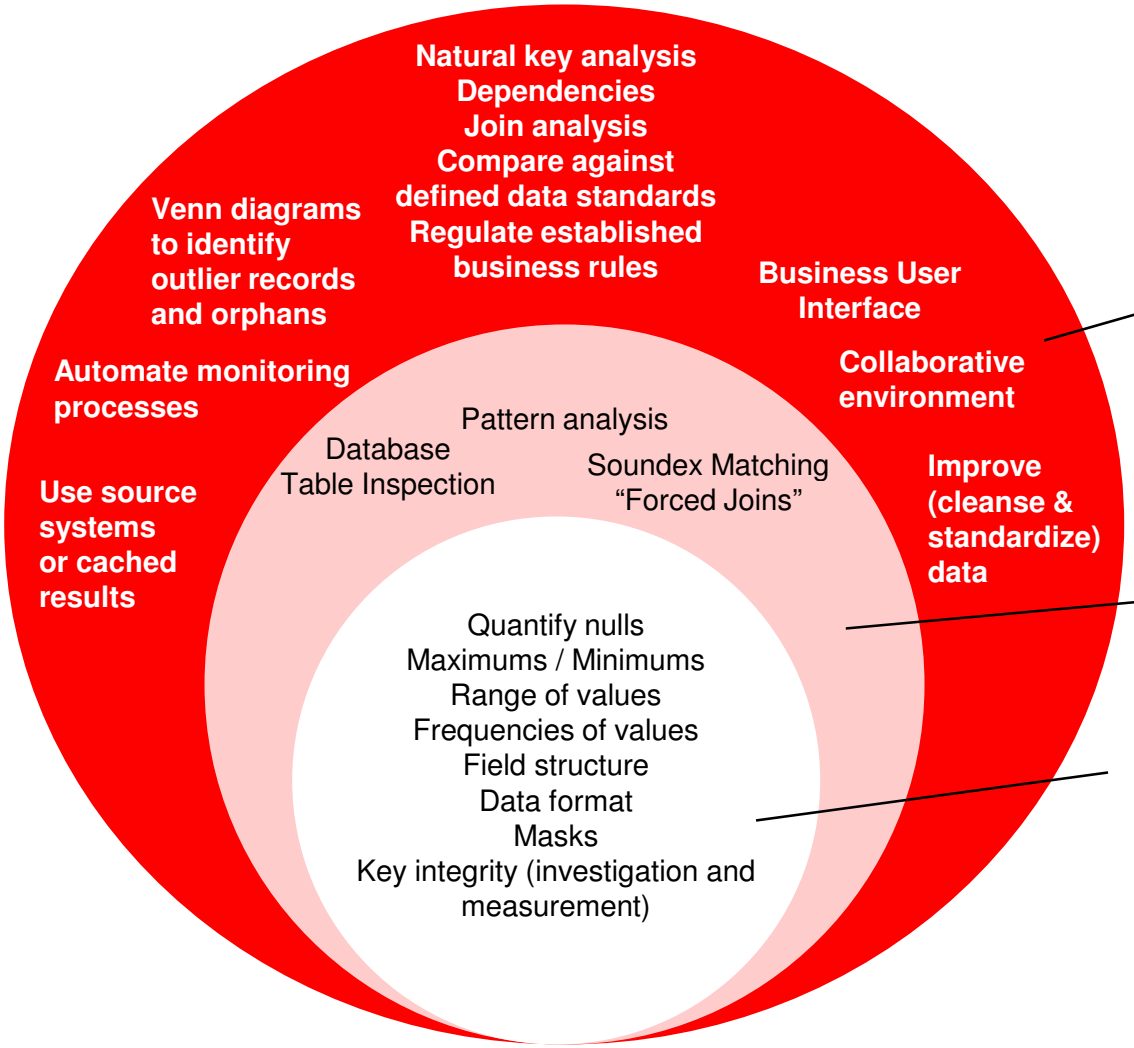


Beyond Profiling

- Discover joins, keys and dependencies
- Generate entity-relationship (ER) diagrams
- Detailed phrase analysis
- Check specific business rules
- Search and filter data and metadata
- Create Venn diagrams to understand outlier records

Beyond Typical Data Profiling

See How your Data Really Is, Not Just by Schema Constraints



Oracle
Data Profiling

"Advanced"
Data Profiling

"Baseline"
SQL Scripts and
most
Data Profiling

Data Profiling: Standard & Advanced

ODI with RKM Technology and/or Oracle Data Profiling

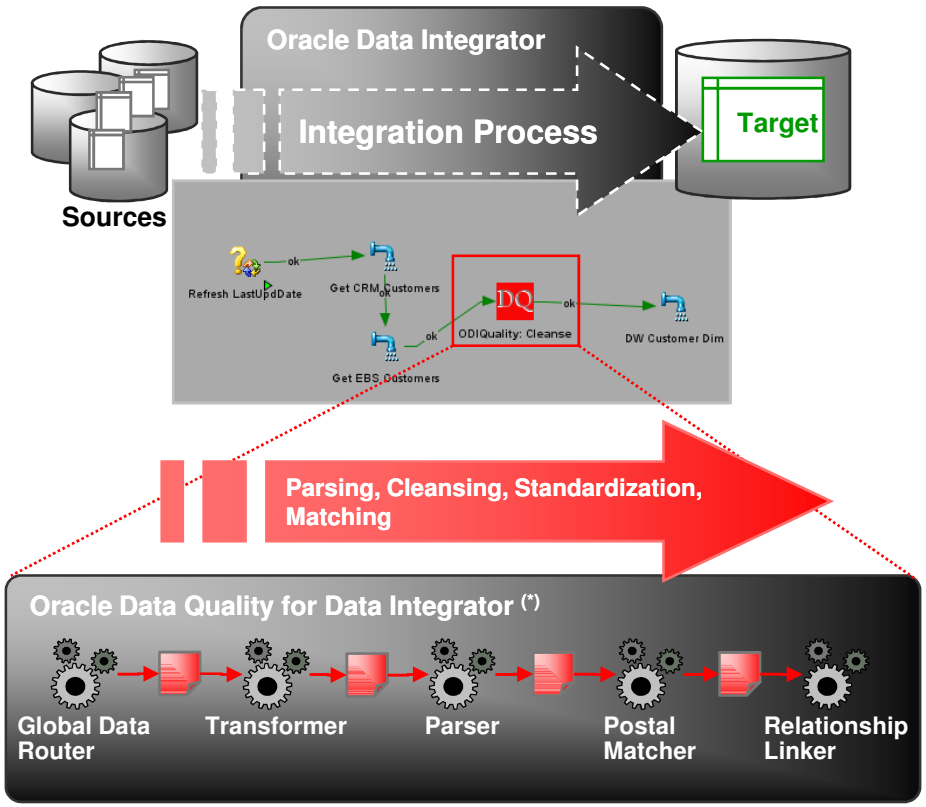
- Standard Data Profiling Built Around Inline Processes for Reverse Knowledge Modules (RKM) to Profile DBMS Metadata and Data
- Advanced Data Profiling Provides Market-Leading, Tightly Integrated Capabilities that can Declaratively Generate Data Quality Rules
- Well-Integrated Standard & Advanced Features

Data Profiling Features	Standard	Advanced
DBMS Metadata Reverse-Engineering	Y	Y
DW Appliance Metadata Reverse-Engineering	Y	Y
Application Interface Reverse-Engineering	Y	Y
Schema or User-generated Constraints	Y	Y
Drill-down and Sample Data Browsing		Y
Automatic Profile Report Generation	Y	Y
Advanced Analysis Techniques and Statistics		Y
Integrated Monitoring, Audit and Profiling		Y
Out-of-Box Data Profiling Sample Projects		Y
Entity, Key & Join Discovery and Analysis		Y
Automatic Runtime Project Generation		Y
Time Series-based Quality Monitoring		Y
Annotation and Assessments		Y


Cleansing, Matching, Standardizing
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Declarative Data Quality

Oracle Data Quality for Data Integrator

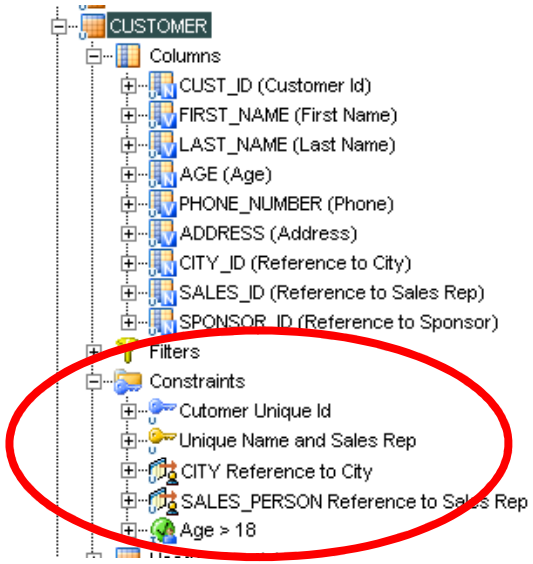


- **Best of breed Quality**
  - Joint development with Trillium
  - Proven, scalable DQ engines
  - Rich global content for cleansing, standardization, validation
  - Extensible by customers with domain-specific Data Quality functions
- **Out-of-box integration**
  - ODI integrates with Quality functions via pre-built Knowledge Modules
  - ODI Model metadata passed to ODQ at design time
  - ODQ source and target Metadata passed to ODI at Design Time
  - Out-of-box ODI Tool for runtime invocation of ODQ processes
- **Packaged Quality Rules**
  - Delivered Out-of-the-Box by Oracle
  - For 35 Countries & Domains

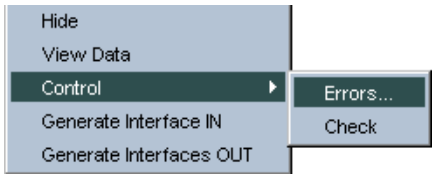
(*) Joint Development with Trillium

Standard ODI Quality using CKM Tech

Standard Quality via ODI Check-Control Knowledge Modules



- **Declarative Data Integrity**
  - Data Integrity Firewall
  - Declarative Validation Constraints
- **Model Data Integrity Rules**
  - Declare constraints at table level
  - Design Maps & check flow integrity
- **Extensible for 3rd Party DQ**
  - Check KM for DQ Firewall
  - ODI Open Tool Framework for flow-based Cleansing



Error Message	Customer Id	First Name	Last Name	Age	City	Sales Rep	Phone	Address	Date Checked
Age should be greater than 18	107	Jacky	Swenson	17	19		(202) 555	64 Imagination Driv	12/23/05
Duplicated Values: "Unique Name and Sales Re	508	Philippe	Michaud	19	23	22	123 456 1	Oakland street 15,	12/23/05
Duplicated Values: "Unique Name and Sales Re	202	Philippe	Michaud	22	23	22	78 21 86 2	197 impasse Renc	12/23/05
Missing Reference (Reference to City) To DEM	103	Peter	Travis	33	342		(510) 555	7835 Hartford Driv	12/23/05
Missing Reference (Reference to Sales Rep) T	105	Tony	Gold	55	19	231	(619) 555	91 Torre drive	12/23/05

Data Quality Context-Aware Cleansing

Key Words and Data are Standardized Situationally

Original Record

Mr. Bob James *St*. John III
St. John Chemicil Corp.
101 S. Main *St*.
St. Louis, MO 63118
www.b_stjohn@stjohnchem.com
Code - Spcl. Deliv. - Hazd Matrls, Flam

1. Key word identification
2. Pattern recognition
3. Data Standardization

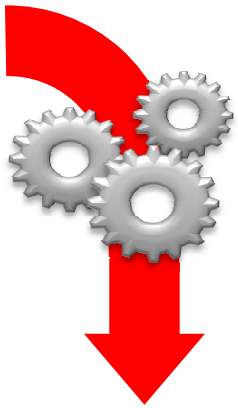
Title:	Mr.
First Name:	Bob (Robert)
Middle Name(s):	James
Last Name:	St. John
Generation:	III
Gender:	M
Business Name:	St. John Chemical Corporation
House Number:	101
Directional:	S (South)
Street Name:	Main
Street Type:	St.
City:	St. Louis (Saint Louis)
State:	MO
Zip Code:	63118
Email:	www.b_stjohn@stjohnchem.com
Delivery Code:	Z99 - Special Handling
Delivery Comments:	Hazardous Materials, Flammable

ORIGINAL DATA						APPENDED DATA									
Name	Bus. Name	St. Add.	City	State	ZIP	Pr. FN	PR MN	PR LN	PR BN	PR HsNo	PR St N	PR St T	PR City	PR State	PR Zip

Data Quality Domain Agnostic Cleansing

Context Aware Cleansing Operates Regardless of Data Domain

P/N	DESCRIPTION
1774-5674	TUBE, CENTRIFUGE POLY S 15ML (CS/500)CONICAL-BOTTOM
1774-5675	TUBE, CENTRIFUGE PPL 15ML (CS/500)CONICAL-BOTTOM
1774-4532	TUBE, CENTRIFUGE PPL 50ML (CS/500)CONICAL-BTTMPCK 25/RACK
1774-4538	TUBE, CENTRIFUGE POLY S 50ML (CS/500)CONICAL-BTMPK 25/RACK
645-4556	PIPET, CLEAR SEROLOGICAL 2ML (CASE/500)
195-7934	NUT, LOCK RH,11”
3324-7955	VIAL, WHEATON 33* CLEAR 4ML (CS/144)

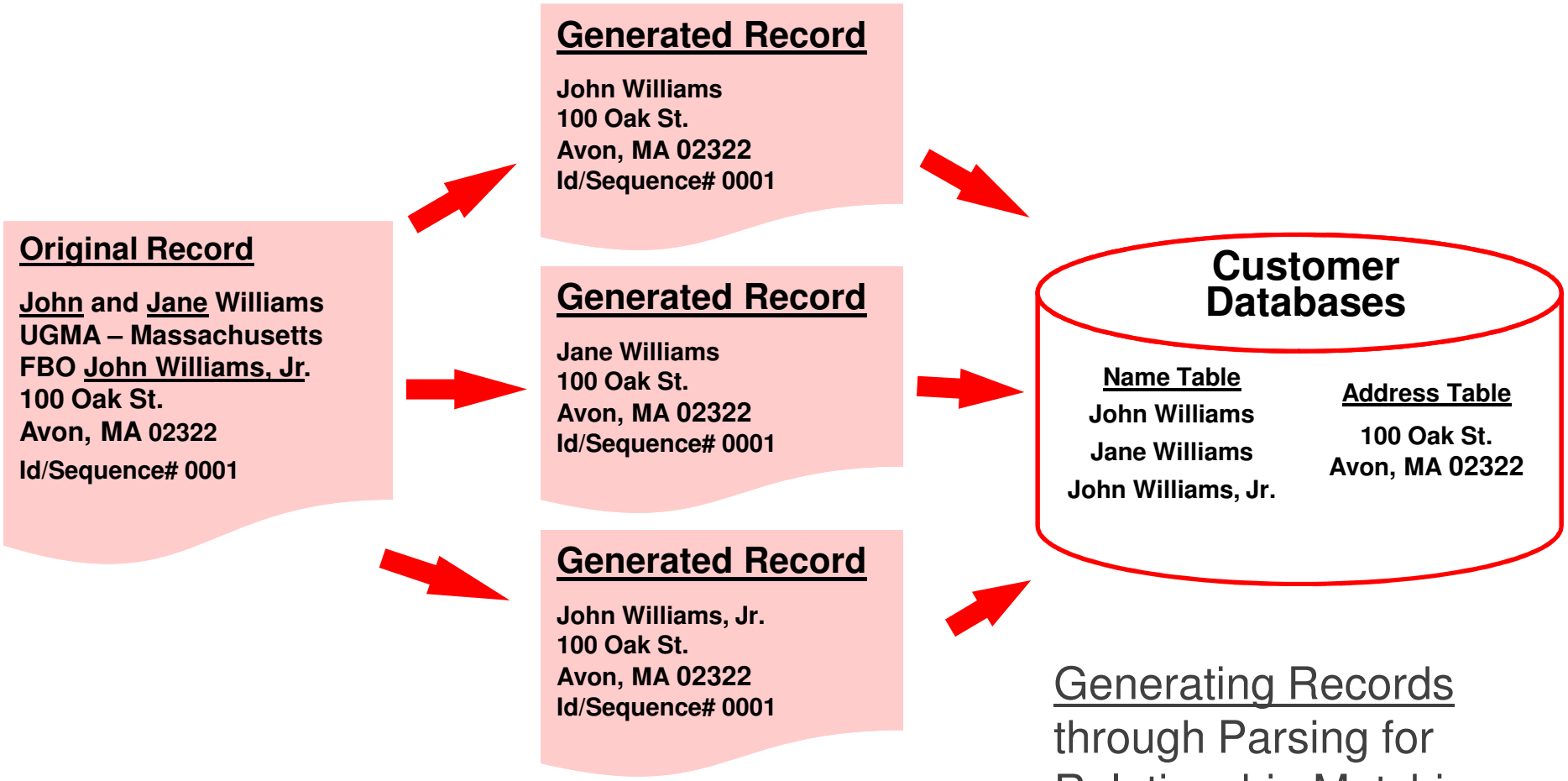


P/N	ITEM NAME	MATERIAL	SIZE	UOM	DESCRIPTOR	PACKAGE	PACK METHOD
1774-5674	CENTRIFUGE TUBE	POLYSTERENE	15	ML	CONICAL	CASE/500	BOTTOM PACKED
1774-5675	CENTRIFUGE TUBE	POLYPROPILENE	15	ML	CONICAL	CASE/500	BOTTOM PACKED
1774-4532	CENTRIFUGE TUBE	POLYPROPILENE	50	ML	CONICAL	CASE/500	BOTTOM PACKED 25/RACK
1774-4538	CENTRIFUGE TUBE	POLYSTERENE	50	ML	CONICAL	CASE/500	BOTTOM PACKED 25/RACK
0645-4556	SEROLOGICAL PIPET		2	ML	CLEAR	CASE/500	
0195-7934	LOCK NUT		11	IN	RIGHT HAND		
3324-7955	WHEATON VIAL		4	ML	CLEAR	CASE/144	

Increased accuracy = better business processes & better matching

Data Quality Entity Identification

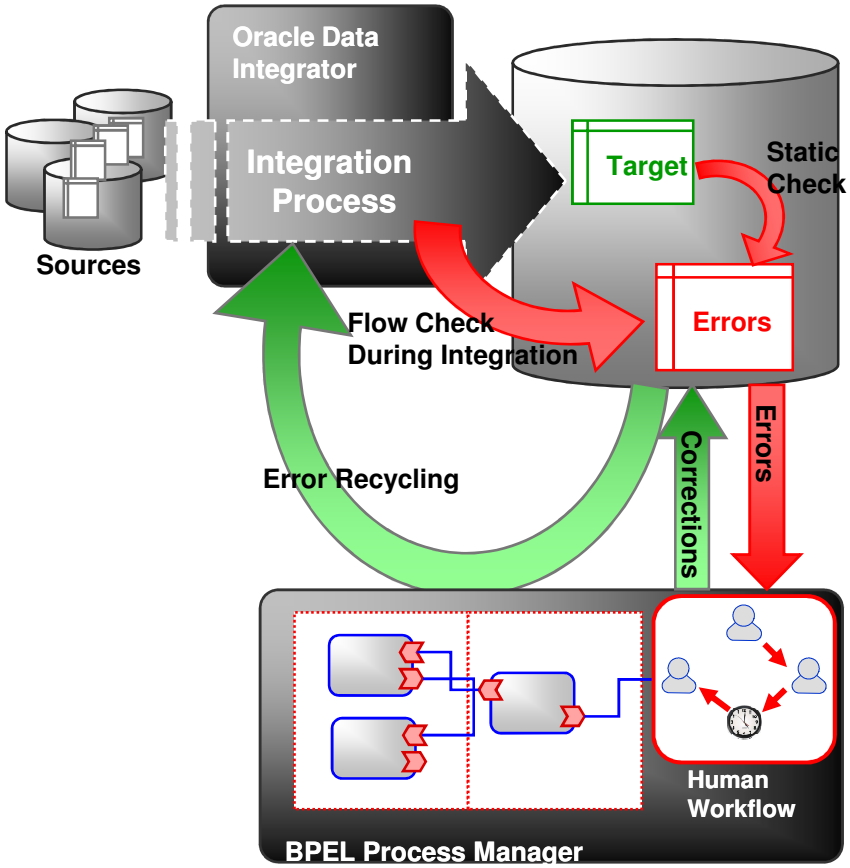
Parsing Operations Can Extract Multiple Entities Per-Record



Generating Records through Parsing for Relationship Matching

Data Quality Integrated SOA Workflow

Standard or Advanced Data Quality can Engage Human Workflow

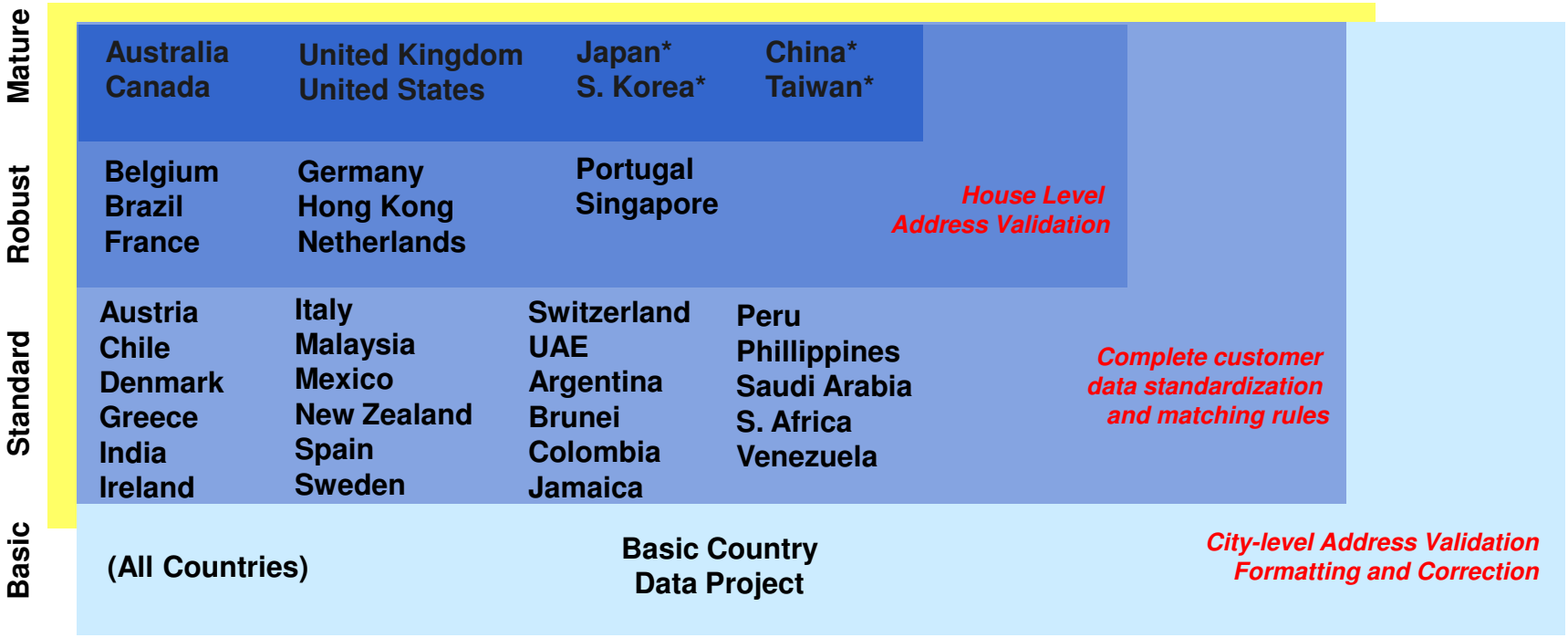


- **Declarative data correction workflow and Integrity Firewall**
  - Static constraint checking and validation
  - Flow-based constraint checking and validation
  - Error recycling
- **Integrated with standard-based process flow**
  - BPEL Process Manager
  - Reuse standardized error handling procedures
- **Integrated with Human Workflow**
  - Manage long running transactions
  - Manage complex approval and overriding patterns

Data Quality Global Reach

Process Global Data According to Local Standards & Practices







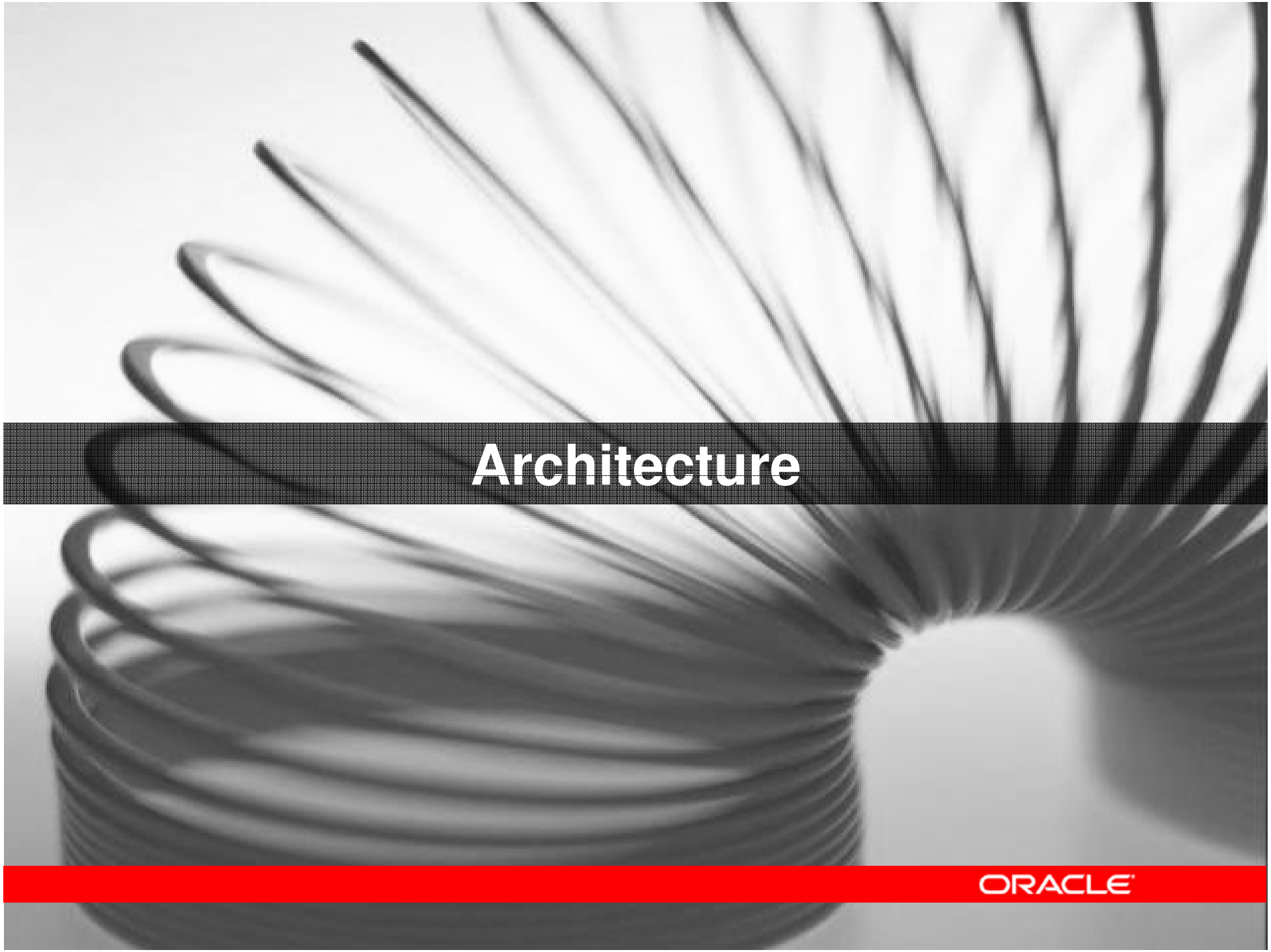
Fully Supports:
**Double Byte*
Unicode Data
ISO Latin 1 Standard

Data Quality: Standard & Advanced

ODI with CKM Technology and/or Oracle Data Quality for DI

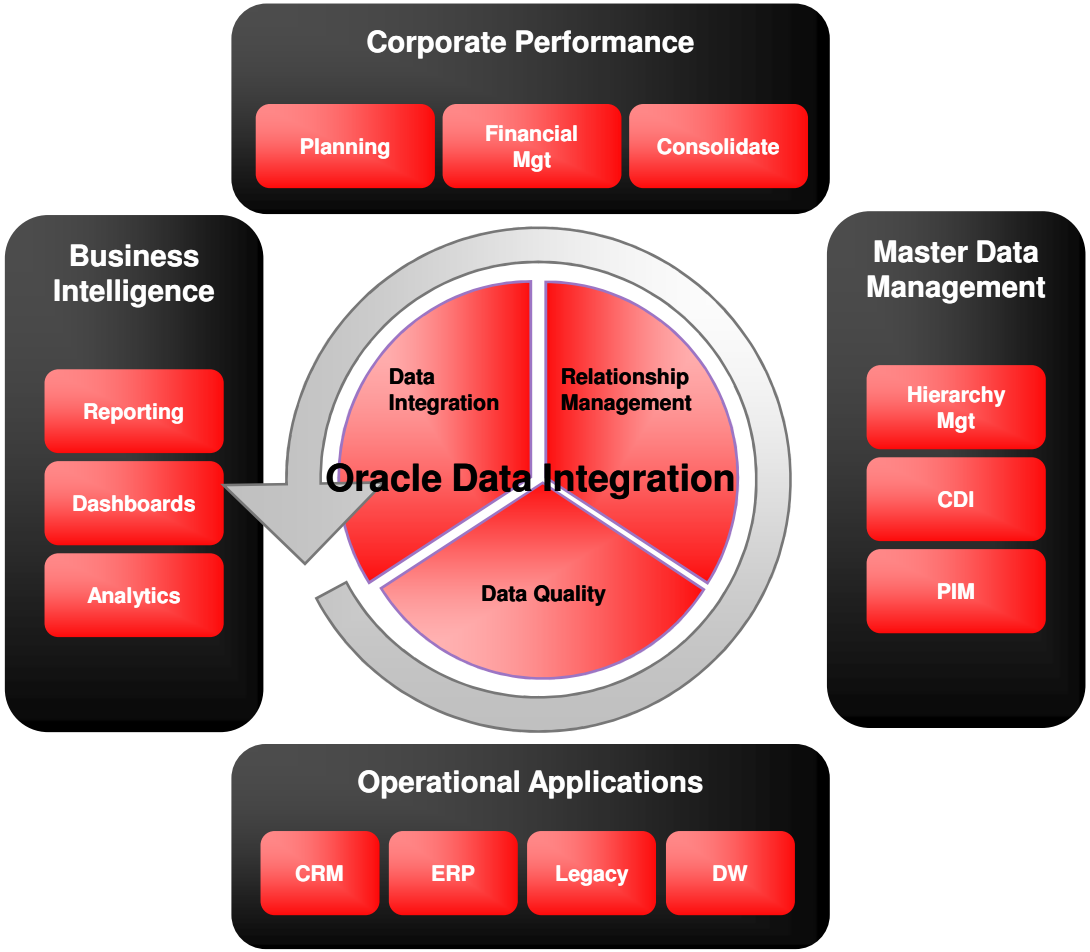
- Standard Data Quality Built Around Inline Data Integration Check Flow Routines for High-Performance Set-Based Standardization, Integrity etc.
- Advanced Data Quality Provide Market-Leading, Tightly Integrated Capabilities for Total Data Governance (Matching, De-Dupe, Cleansing etc)
- Well-Integrated Integrated Standard & Advanced Features

Data Quality Features	Standard	Advanced
E-LT Style Integrity Check Control	Y	Y
Easy Workflow Integration	Y	Y
Uniqueness Rules for Basic Matching	Y	Y
Complex Cross-Reference Rules	Y	Y
Record-level Validation and Standardization	Y	Y
External Key Constraint Checking	Y	Y
Cleanse All Types of Data	Y	Y
Advanced Notifications (Email, SOA, etc)	Y	Y
Out-of-Box International Rule Sets		Y
Street-level Global Post Codes		Y
Highly Customizable Rule Templates		Y
Deep, pre-Configured Matching Rule Sets		Y
Rich Data Survivorship Settings		Y
Out-of-Box Data Quality Sample Projects		Y


Architecture
ORACLE

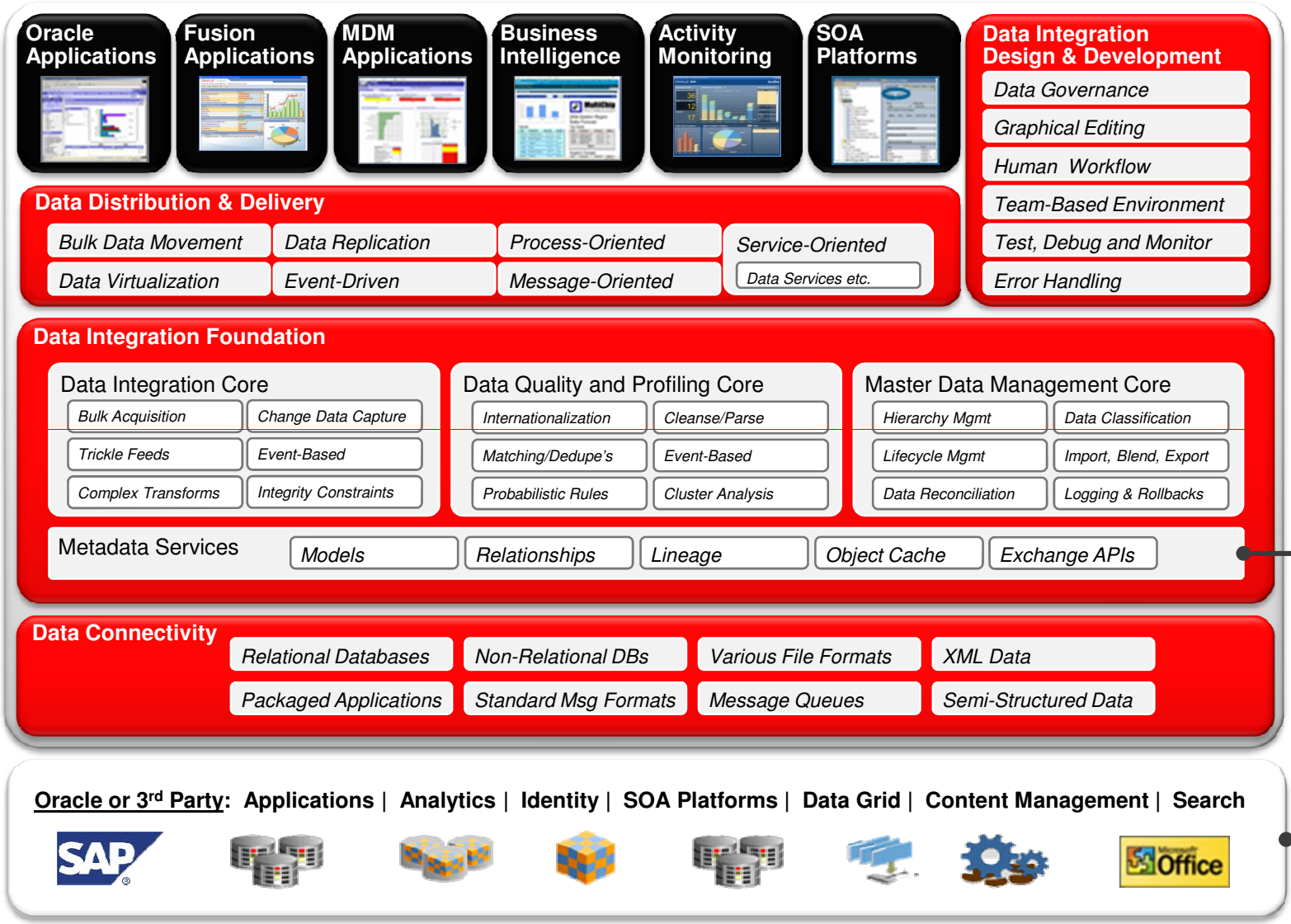
Oracle Data Integrator

Data Integration + Data Quality and Master Data Management



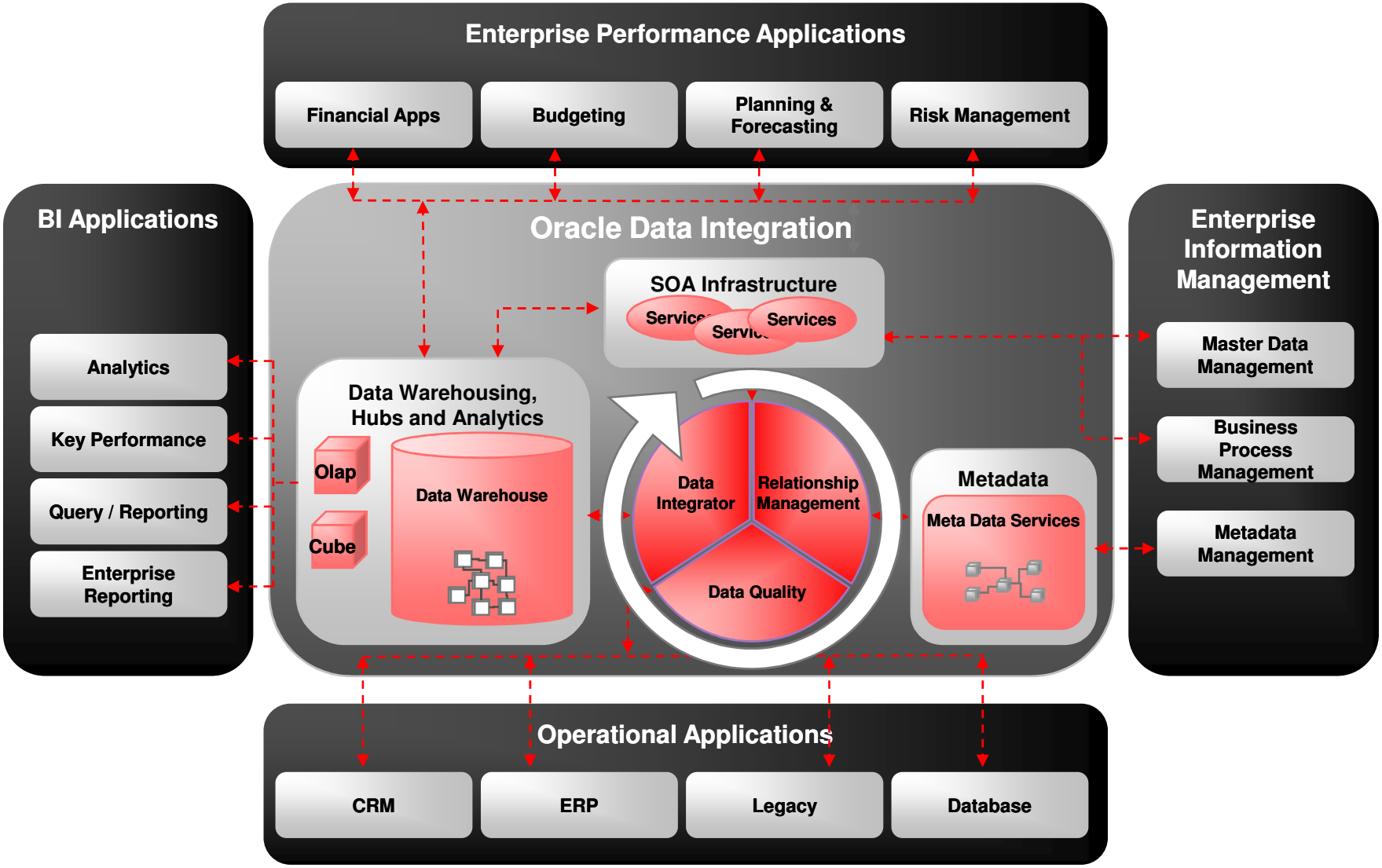
Oracle Data Integration

Comprehensive Driven Data Integration Offering from Oracle



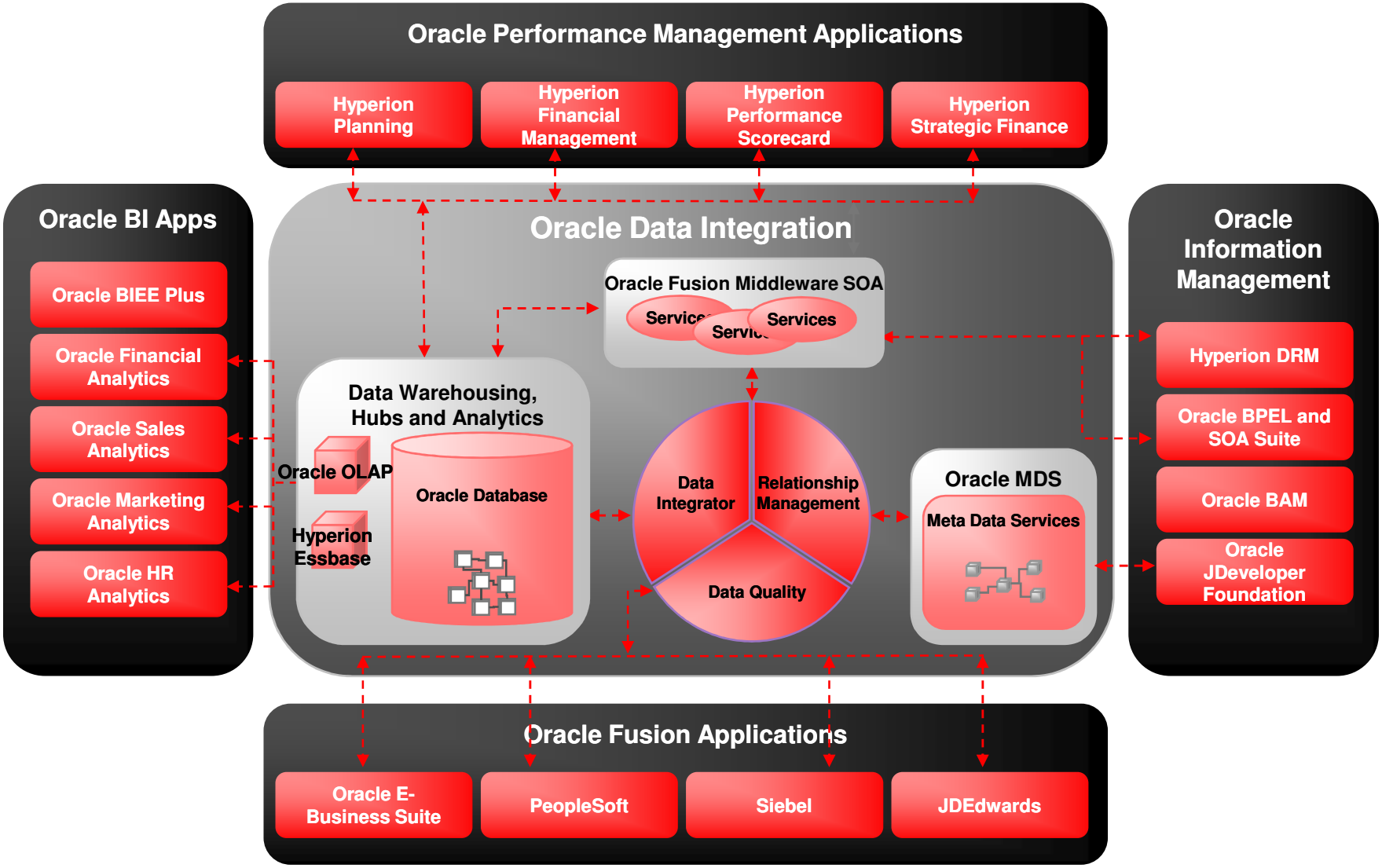
Oracle Data Integrator for the Enterprise

A Key Enabler for Heterogeneous Enterprise Integration Challenges



Oracle Data Integrator for the Enterprise

Integrating with Oracle EPM, BI and Applications Portfolio



Program Agenda

- Data Quality Backgrounder
- Oracle Strategy & Vision
  - Strategy: Best of Breed, Comprehensive, Pervasive Data Integration
  - Delivered through a Complete, Integrated, Heterogeneous Suite
- Comprehensive Data Quality: Critical for Integration
  - Oracle's DQ Strategy: Fit-for-Purpose Out-of-Box Solutions & Openness
  - Announcement: Availability of Oracle Data Profiling & Oracle Data Quality
  - Provide Comprehensive Data Quality Solution for Data Integration with ODI
  - Offer Both Standard and Advanced Data Profiling & Data Quality
  - Integrate Data Profiling, Data Quality, Data Integration Products
  - Differentiate ODP and ODQ from Competition
- ODI Technology: Strong Foundation for Broad Vision
  - Architectural Advantages: Declarative Design, Knowledge Modules, ELT
  - Build Out Comprehensive Data Integration Offering from ODI Foundation


Q&A



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Speaker Contact & Biography



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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.

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