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Eclipse Persistence Services
The Full Monty

Peter Krogh, Oracle Canada
EclipseLink Project co-Lead
Doug Clarke, Oracle Canada
EclipseLink Project co-Lead

What you will learn

- What the Eclipse Persistence Services Project is
- How this project can be used and its benefits
- Why you will want to use this project
- Usages with Spring
- How you can get involved

Eclipse Persistence Services

- Eclipse runtime project
  - Nicknamed “EclipseLink”
  - Currently Incubating in Technology Project
- Comprehensive
  - EclipseLink JPA: Object-Relational
  - EclipseLink MOXy: Object-XML
  - EclipseLink SDO: Service Data Objects
  - EclipseLink DBWS: Database Web Services
  - EclipseLink EIS: Non-Relational using JCA
- Defining blueprints for OSGi persistence services

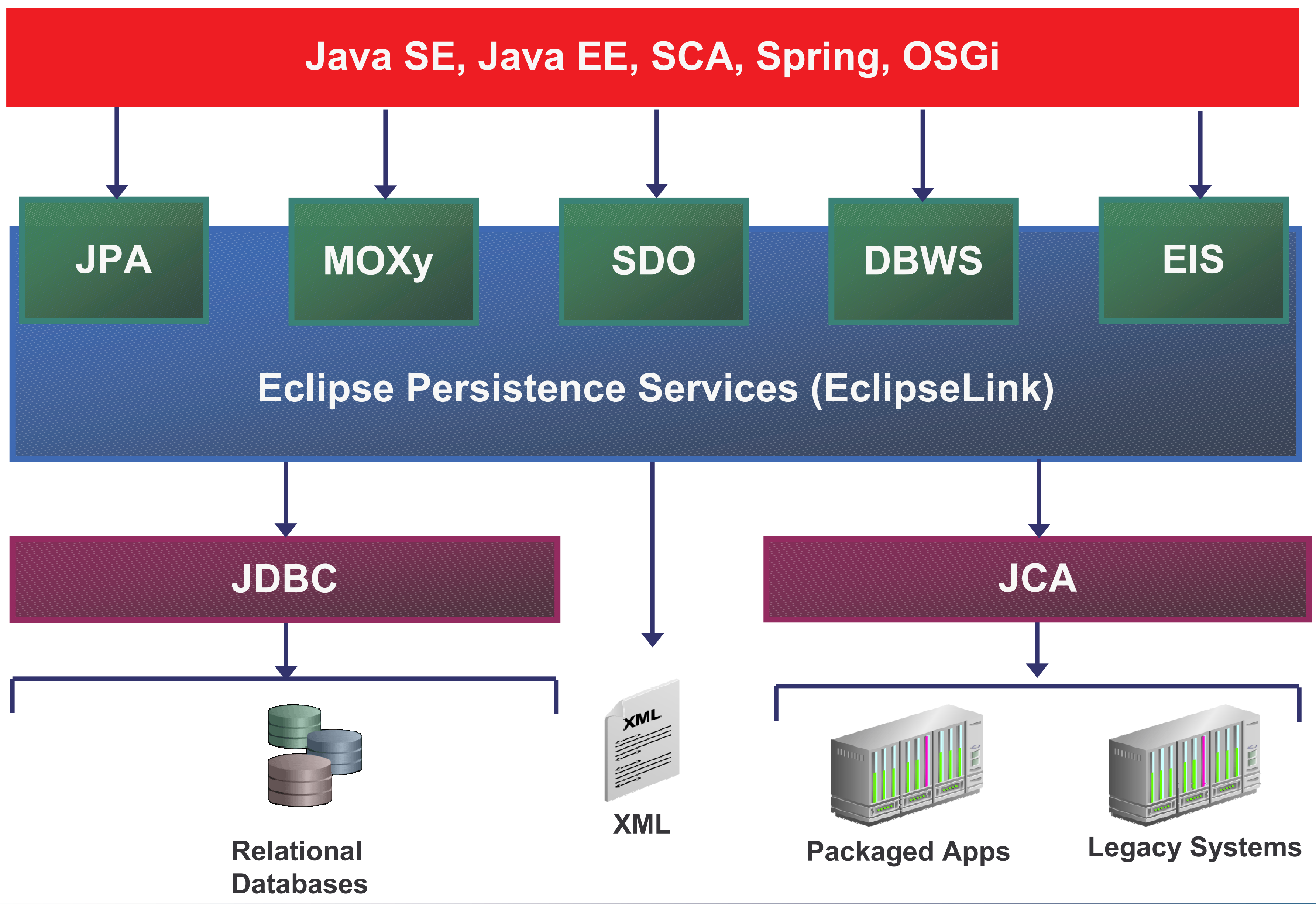
What is Eclipse?

- Eclipse is an open source community
- Eclipse is more then just an IDE
  - Equinox (OSGi), Rich Client Platform (RCP), Higgins (Trust Framework), …
  - Incubating
    - Maya (Deployment Framework)
    - Swordfish (SOA)
    - Persistence Services Project (EclipseLink)
  - Proposals
    - Rich Server Platform, …

Why Eclipse?

- Eclipse has a strong and vibrant community with an effective governance model
- Good reputation for quality
- Interest from within the Eclipse ecosystem
- Oracle has had a positive experience with its existing participation in Eclipse projects
  - Projects lead by Oracle: Dali, BPEL, JSF
  - Other Oracle contributions: WTP and DTP

Oracle TopLink


Java SE, Java EE, SCA, Spring, OSGi
JPA
MOXy
SDO
DBWS
EIS
Eclipse Persistence Services (EclipseLink)
JDBC
JCA
XML
Relational Databases
XML
Packaged Apps
Legacy Systems

Importance

- First comprehensive open source persistence solution
  - Object-Relational and much more
- Based upon product with 12 years of commercial usage
- Shared infrastructure
  - Easily share the same domain model with multiple persistence technologies
  - Leverage metadata for multiple services
- Important part of the Eclipse Ecosystem

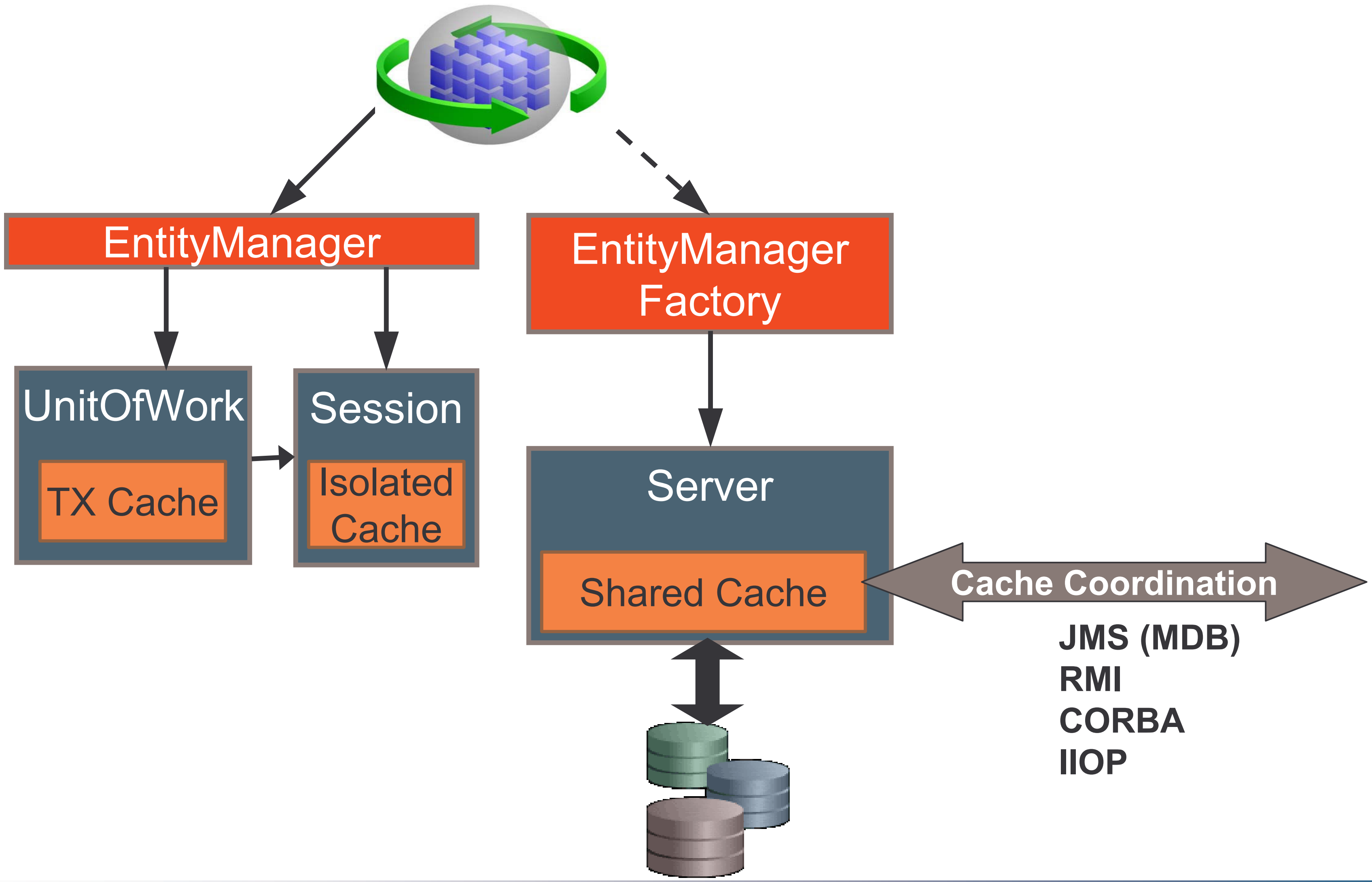
EclipseLink JPA

- JPA 1.0 compliant implementation
- Java EE, Java SE, Web, Spring, and OSGi
- Any JDBC/SQL compliant database
- Extensible and pluggable
- Schema generation
- Key infrastructure:
  - Caching, Locking, Query Framework, Mapping, …
- … plus many valuable advanced features

EclipseLink Caching

- Entity caching
  - L2 shared across transactions/users
  - Coordination in a clustered deployment
- Application specific configuration
  - Cache isolation: per client (EM) or shared
  - Cache Type and Size: Weak, Soft-Weak, Full, None
  - Expiration/Invalidation
    - Time to live, Time of day, API
  - Coordination (cluster-messaging)
    - Messaging: JMS, RMI, CORBA, RMI-IIOP, …
    - Mode: SYNC, SYNC+NEW, INVALIDATE, NONE

Caching Architecture



Configuring the Cache

- Default: objects read are cached and trusted
- Configuration by entity type important
  - Volatility of data
  - Shared usage of data
- Configuration Parameters
  - Cache isolation, type, size, expiry, coordination
  - Refreshing
    - By query (use-case) or descriptor (always)
- Locking is the only way to avoid potential data corruption in concurrent write scenarios

Locking

- Prevent data corruption !!!
- Java Developers think of locking at the object level
- Databases may need to manage locking across many applications
- EclipseLink is able to respect and participate in locks at database level
  - Optimistic: Numeric, Timestamp, All fields, Selected fields, Changed field
  - Pessimistic

Query Framework

- Queries can be defined using
  - Entity Model: JPQL, Expressions, Query-by-example
  - Database: SQL, Stored Procedures
- Customizable
  - Locking, Cache Usage, Refreshing
  - Optimizations: Joining, Batching, parameter binding
  - Result shaping/conversions
- Static or Dynamic
  - Stored Procedure support

EclipseLink JPA Extensions

- Extensions supported through annotations and XML
- Mapping
  - @BasicMap, @BasicCollection, @PrivateOwned, @JoinFetch
  - @Converter, @TypeConverter, @ObjectTypeConverter
- @Cache
  - type, size, isolated, expiry, refresh, cache usage, coordination
  - Cache usage and refresh query hints
- @NamedStoredProcedureQuery
  - IN/OUT/INOUT parameters, multiple cursor results

EclipseLink JPA Extensions

- Locking
  - Non-intrusive policies @OptimisticLocking
  - Pessimistic query hints
- JDBC Connection Pooling
- Logging: Diagnostics, SQL, Debugging
- Weaving for lazy fetch and change tracking
  - Dynamic and Static
- Customization
  - Entity Descriptor: @Customizer, @ReadOnly
  - Session Customizer

Mapping Extensions

```
@Entity
@Cache(type=SOFT_WEAK, coordinationType=SEND_OBJECT_CHANGES)
@OptimisticLocking(type=CHANGED_COLUMNS)
@Converter(name="money", converterClass=MoneyConverter.class)
public class Employee {
   @Id
   private int id;

   private String name;

   @OneToMany(mappedBy="owner")
   @PrivateOwned
   private List<PhoneNumbers> phones;

   @Convert("money")
   private Money salary
   …
}
```

Database Platform

- Native SQL (dialect) support with custom operators
- Stored Procedure & Function
- Extensible Advanced Data Types support (Struct)
- Database Security
  - Oracle DB's VPD/OLS and Proxy Authentication
- Configurable value return from write
- Supported platforms (default = Auto)
  - MySQL, Derby, Oracle, DB2, Sybase, SQLServer, TimesTen, PostgreSQL, SQLAnyWhere, HSQL, Informix, …

Server Platform

- Simplified configuration and mediator for host container environment
- Enables
  - Direct JTA integration
  - Data Source/JDBC connection un-wrapping
  - JMX MBean deployment
  - Logging integration
- Current Server Platforms
  - SunAS/GlassFish, OracleAS/OC4J, WLS, WAS, JBoss

Performance and Tuning

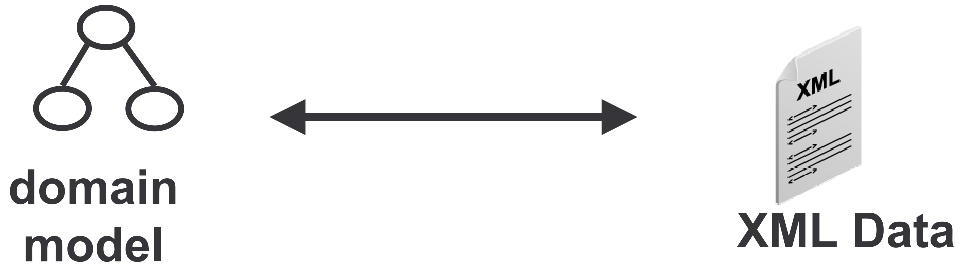
- Highly configurable and tunable
  - Principle: minimize and optimize database calls
  - Enable application specific tuning
- Flexibility allows efficient business models and relational schemas to be used
- Leverages underlying performance tuning features
  - Java, JDBC and the underlying database technology

EclipseLink JPA Config

- JPA (portable)
  - Persistence.xml with EclipseLink properties
  - Mapping: Annotations and/or orm.xml
  - Query hints
- EclipseLink
  - Sessions Configuration (sessions.xml)
  - Mapping using XML or Code
- EclipseLink JPA
  - JPA + EclipseLink configurations options
  - EclipseLink annotations

EclipseLink MOXy

- Provides complete Object-XML mapping
  - Allows developers to work with XML as objects
  - Efficiently produce and consume XML
  - Document Preservation
- Supports Object-XML standard - JAXB
  - Provides additional flexibility to allow complete control on how objects are mapped



EclipseLink MOXy Benefits

- Rich set of mappings providing complete control and flexibility to map objects to any XSD
  - Direct, composite object, composite collection, inheritance, positional, path, transformation ….
- Development Approaches
  - Model + Annotations ➔ XSD
  - XSD ➔ Model + Annotations
  - Model + Mappings(Annotations or XML)
- Supports any JAXP compliant parser
  - SAX, DOM, StAX
- Visual Mapping support using Workbench

EclipseLink MOXy: JAXB

```
JAXBContext ctx = JAXBContext.newInstance(classes);
Marshaller marshaller = ctx.createMarshaller();

Customer customer = new Customer();
customer.setFirstName("William");
customer.setLastName("Gibson");

marshaller.marshal(customer, System.out);
```

```
jaxb.properties:

      javax.xml.bind.context.factory =
      org.eclipse.persistence.jaxb.JAXBContextFactory
```

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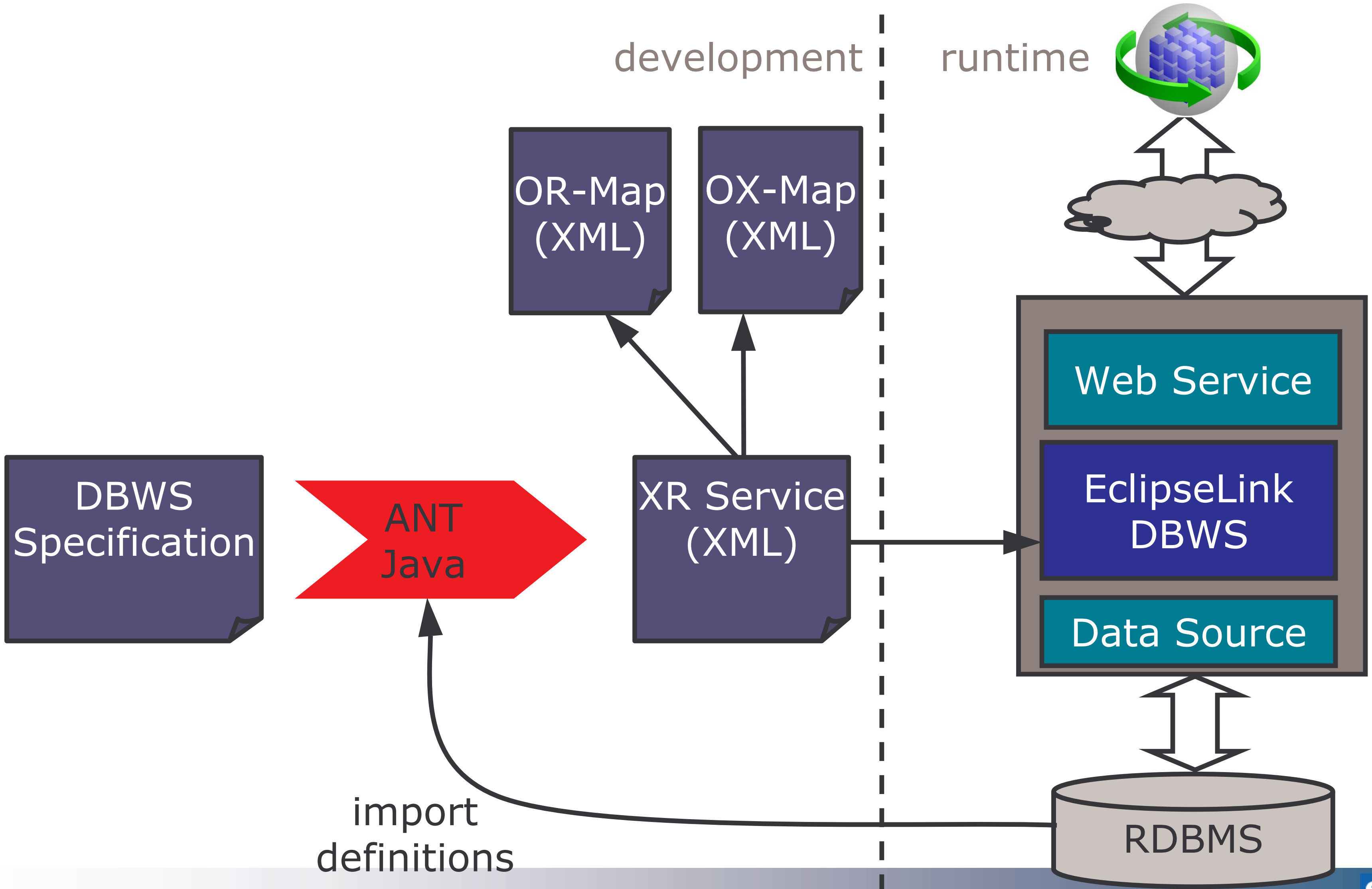
DEMO

EclipseLink MOXy (JAXB)

EclipseLink DBWS

- Simplified and efficient access to relational data through Web Services
- Minimal configuration with development utilities to retrieve metadata and generate/package Web Service
- Developers can fully customize the database access and XML mapping of the data
- Ideal for usage within SOA/SCA

EclipseLink DBWS



EclipseLink SDO

- What can you do?
  - Marshall/Unmarshall objects to/from XML
  - Define Types/Properties programmatically or derive from XSD
  - Generate JavaBean classes from XSD
  - Advanced mapping support for greater flexibility
- Why would you use it?
  - Schema/Structure unknown at compile time
  - Declarative metadata based tools/frameworks
  - XML-centric applications, need open content support
  - Dynamic content user interfaces

EclipseLink EIS

- Provide persistence support for non-relational data stores using Java EE Connector Architecture (JCA)
- Mapping interaction inputs and outputs to persistent domain model
  - XML mapping leveraging EclipseLink MOXy
  - Common Client Interface (CCI) mapping
- Visual mapping Workbench support
- Out of the box support for:
  - MQSeries, OracleAQ, Sun JCA, XML Files

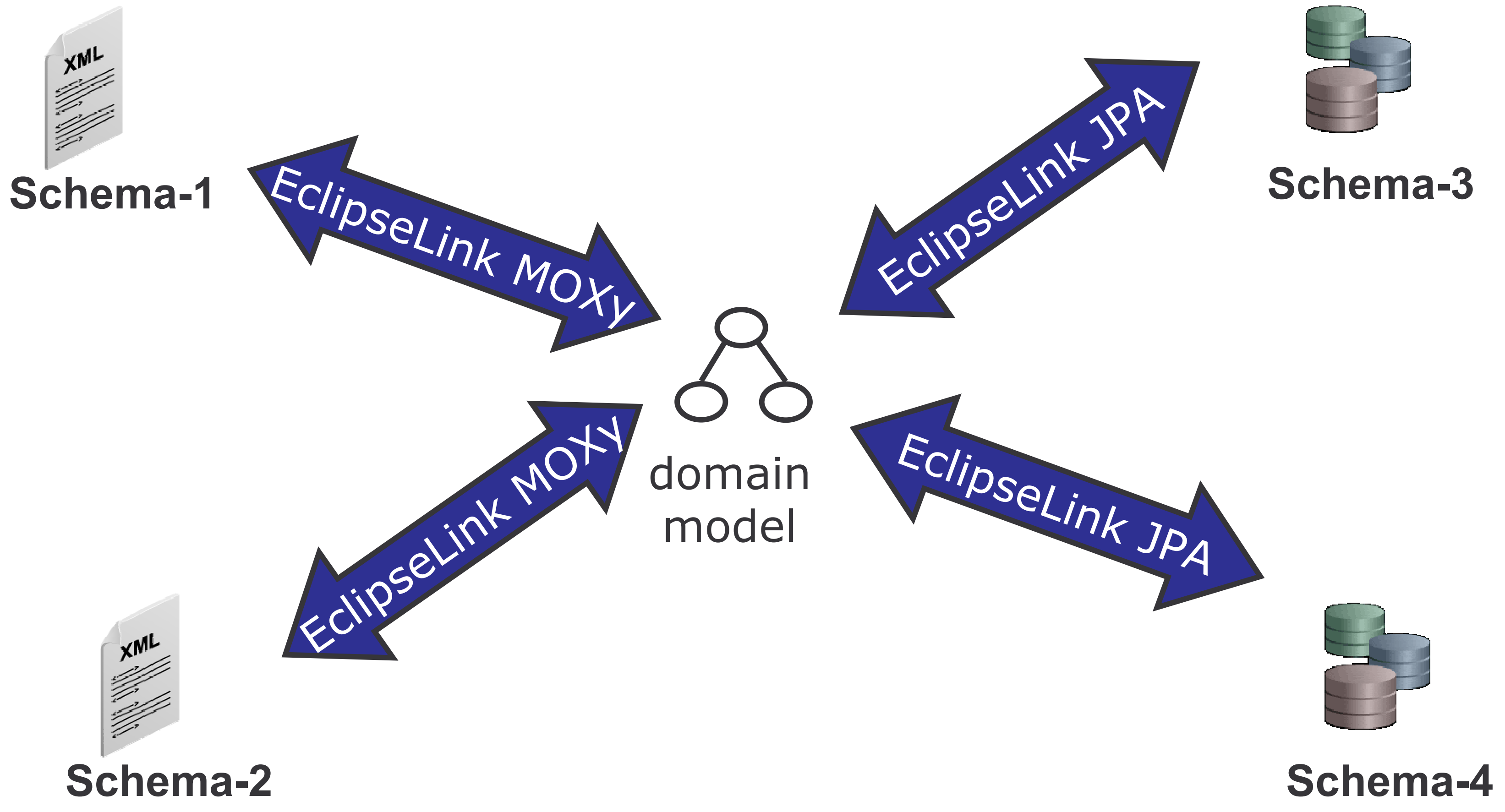
EclipseLink and OSGi

- Work with OSGi expert group to define OSGi persistence services blueprint
- Deliver EclipseLink as OSGi bundle(s)
- Show through examples how to leverage within an OSGi solution
- Address technical challenges as a community

Combining Services

- Metadata based approach allows the same domain model to be mapped with multiple persistence services
  - Supports usage within Web Services/SOA/SCA
  - Domain model can be shared between persistence services (JPA, MOXy, EIS)
  - Transformations are bidirectional:
    - Unmarshall XML to objects and then persist
    - Marshall persistent objects to XML

Common Domain Model



EclipseLink and Spring

- EclipseLink JPA
  – Container
  – Template
- EclipseLink Native ORM Template
- EclipseLink MOXy
  – Direct, Spring WS, Spring Remoting, …

- and many more possibilities…
  – Spring Batch, Spring OSGi, …

EclipseLink JPA in Spring

```
@Repository
@Transactional
public class EntityManagerClinic implements Clinic {

@PersistenceContext
private EntityManager em;

public Collection<Owner> findOwners(String lastName)
   throws DataAccessException
{
   Query query =
   em.createNamedQuery(“Employee.findOwners");
   query.setParameter("lastName", lastName + "%");
   return query.getResultList();
}
```

EclipseLink in the Eclipse Ecosystem

- Provide an Eclipse persistence solution easily consumable by any project
  - Storage of metadata in RDBMS, XML, EIS
  - XML Messaging infrastructure
- Eclipse Projects
  - Dali JPA Tooling Project
  - Teneo to use EclipseLink for EMF model persistence
  - Maya for storage of deployment configuration
  - SOA Project for EclipseLink SDO

Where are we going?

- Delivery of initial 0.1-incubation milestone
  - Build and testing processes
  - Initial contribution functional
  - Spring Framework support
- Specifications: JAXB 2.0, SDO 2.1
- OSGi packaging and usage examples
- Database Web Services (DBWS)
- Data Access Service (DAS) - SDO with JPA
- Simplified DataMap Access and Dynamic Persistence

How can you get involved?

- Users
  - The 0.1-incubation milestone will be available soon
  - Try it out and provide feedback
  - File bug reports and feature requests
- Contributors
  - Contribute to roadmap discussions
  - Bug fixes
- Committers
  - Very interested in growing committer base

EclipseLink Summary

- First comprehensive Open Source Persistence solution
  - EclipseLink JPA: Object-Relational
  - EclipseLink MOXy: Object-XML
  - EclipseLink SDO: Service Data Objects
  - EclipseLink DBWS: Database Web Services
  - EclipseLink EIS: Non-Relational using JCA
- Mature and full featured
- Get involved

More Information

- www.eclipse.org/eclipselink
- Newsgroup: eclipse.technology.eclipselink
- Wiki: wiki.eclipse.org/EclipseLink
- Mailing Lists:
  - eclipselink-dev@eclipse.org
  - eclipselink-users@eclipse.org
- Blogs
  - Committer Team blog: eclipselink.blogspot.com
  - Doug’s blog: java-persistence.blogspot.com

Q&A