

# Domain Model in ICIS5/Java Platform: Case Study



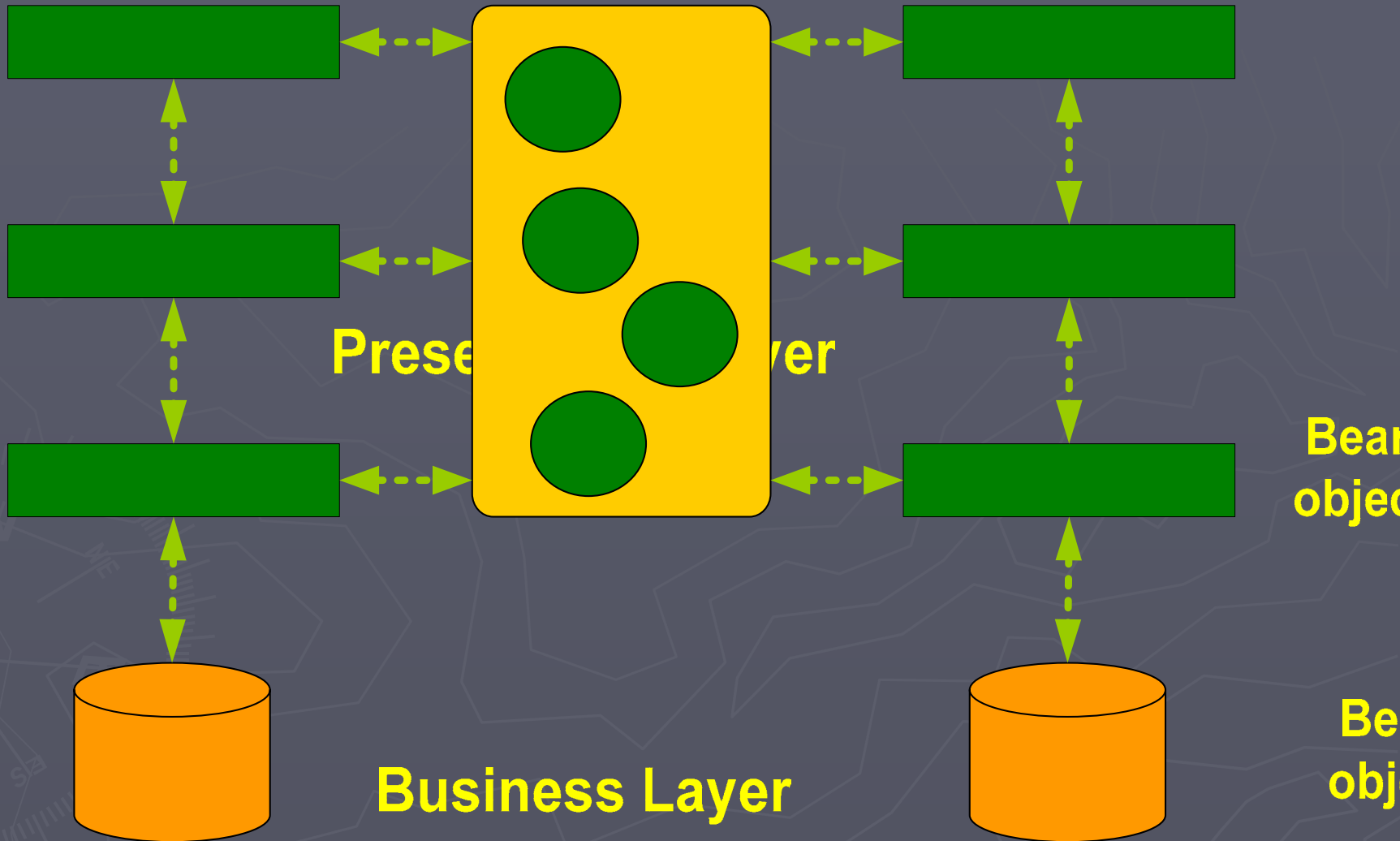
# Domain Model Representation at the Database Level

- ▶ Tables represent the main structures in relational database where crop-pertinent information is stored (e.g. in ICIS)
- ▶ Examples: ICIS tables - GERMPLSM, ATRIBUTS, FACTOR, LEVEL, METHODS, NAMES, STUDY, TRAIT, etc.
- ▶ Easily query able by direct SQL

# Domain Model Representation at the Middleware Level

- ▶ Represent objects which applications load from persistent information. In the case of Java, modeled as JavaBeans.
- ▶ Beans are not tied to any persistence framework (i.e. they can be reusable across different persistence frameworks); that is, alternative schemata (e.g. Germinate) may be substituted at the database level or schema may evolve in the future, without breaking higher level software layers.
- ▶ Can be reusable across diverse software layers & systems

# Beans Reusable and Portable

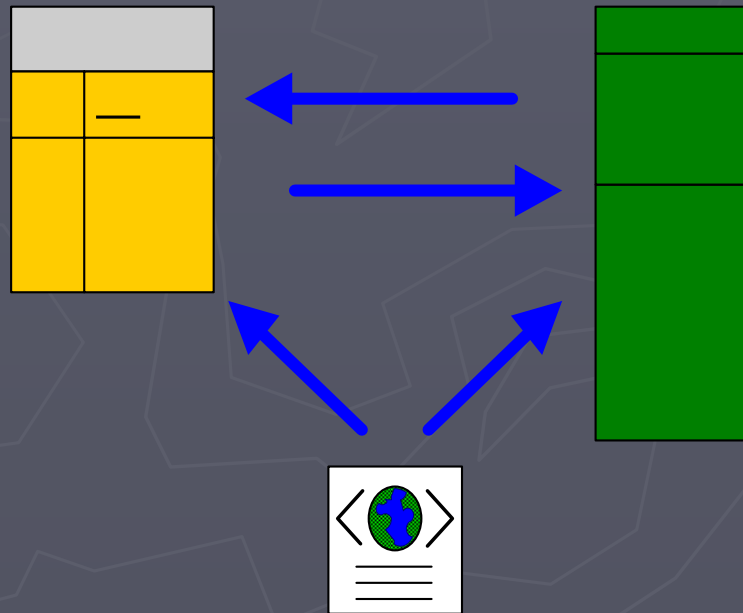


# Beans II.

- ▶ JavaBeans can encapsulate object behavior
- ▶ Can make use of inheritance
- ▶ Many open source tools work best with data represented as beans
- ▶ Easily serializable into XML (important for Web services applications)
- ▶ Can be generated from XML Schemas (and other XML representations) using some tool, or hand-coded if preferred

# Case Study: ICIS5

- ▶ JavaBeans are mapped to tables using an object-relational mapping (ORM) & persistence tool (Hibernate)
- ▶ Mapping file (in XML) maps tables & columns to beans & properties



# XML Mapping File

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE hibernate-mapping
    PUBLIC "-//Hibernate/Hibernate Mapping DTD//EN"
    "http://hibernate.sourceforge.net/hibernate-mapping-2.0.dtd">
<hibernate-mapping>
    <class name="org.cgiar.icis.gms5.beans.Germplasm"
        table="germplasm">
        <id name="gid" type="long" column="gid">
            <generator class="assigned"/>
        </id>
        <property name="methn" column="methn" type="long"
            not-null="true"/>
        // other properties mapped here...
        <property name="grplce" column="grplce" type="long"
            not-null="true"/>
    </class>
</hibernate-mapping>
```

# Case Study: ICIS5

- ▶ Uses Hibernate Query Language (portable across supported databases); queries result in beans ready for processing
- ▶ High-performance, supports transactions, smart fetching & caching, works in managed & unmanaged environments, etc.
- ▶ Currently limited to mapping of one bean-to-one table (or a subset of a table); next release extends functionality to allow mapping of one bean-to-many tables (equivalent to joins)

# Case Study: ICIS5

- ▶ Bean serialization is done using open source tool (XStream)
- ▶ Simple and fast
- ▶ Produces reasonably compact XML:

```
<icis:Germplasm>  
  <gid>50533</gid>  
  <methn>205</methn>  
  <gnpgs>-1</gnpgs>  
  <gp1d1>24489</gp1d1>  
  <gp1d2>50532</gp1d2>  
  <germuid>10</germuid>  
  <l1gid>-50533</l1gid>  
  <glocn>9000</glocn>  
  <gdate>19850000</gdate>  
  <gref>1</gref>  
  <grplce>0</grplce>  
</icis:Germplasm>
```

- ▶ XML allows exchange of data across different systems and using different programming languages