Software Engineering of Internet Applications

Section 3: Lecture 3 (part 2)

Enterprise Information System Patterns

Dr Laurence Dawson

laurence.dawson@kcl.ac.uk

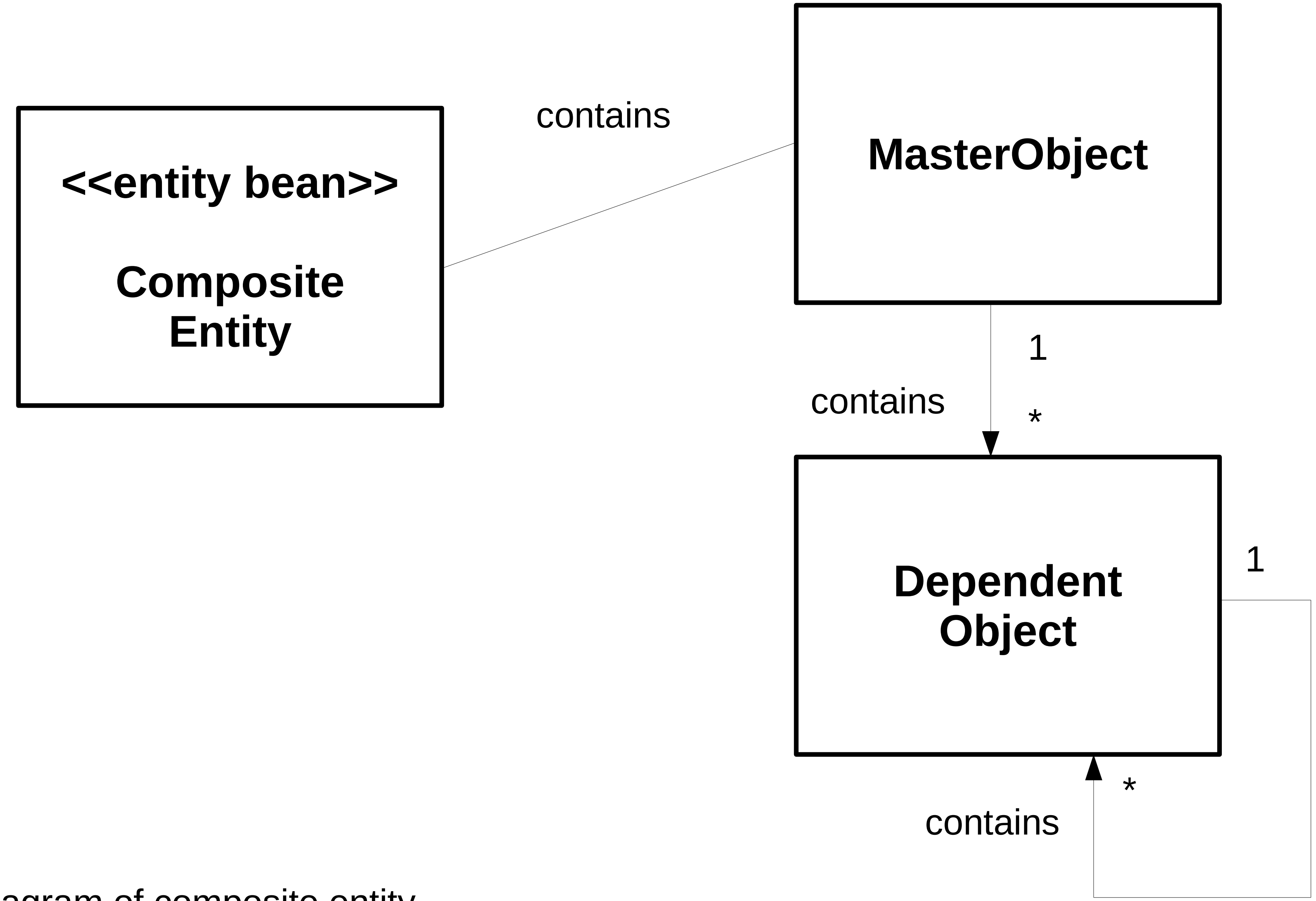
contact@laurencedawson.com

29 February 2016

KING'S College LONDON

Composite Entity

- This business tier pattern uses entity beans to manage a set of interrelated persistent objects, to improve efficiency
- If entity beans are used to represent individual persistent objects (e.g. rows of a relational database table), this can cause inefficiency in access due to the potentially remote nature of all entity bean method calls. Also it leads to very many classes
- Instead, this pattern groups related objects into single entity beans



Class diagram of composite entity

Pattern elements

- Elements of the pattern are:
  - **Composite Entity**: coarse-grained entity bean. It may itself be the ‘master object’ of a group of entities, or hold a reference to this. All accesses to the master and its dependents go via this bean
  - **Master Object**: main object of a set of related objects, e.g., a ‘Bill’ object has subordinate ‘Bill Item’ and ‘Payment’ objects

Pattern elements (cont.)

- **Dependent Object**: subordinate objects of set. Each can have its own dependents. Dependent objects cannot be shared with other object sets

Parts of a master object belong to the same composite entity set as the master

Java Implementation

```
public class BillEntity implements EntityBean
{
  public int billTotal = 0;
  // of BillItem
  public List billItems = new ArrayList();

  // of Payment
  public List payments = new ArrayList();
  ...
}
```

Java Implementation (cont.)

- Subordinate classes, BillItem and Payment, do not need their own entity beans. Can be standard Java classes

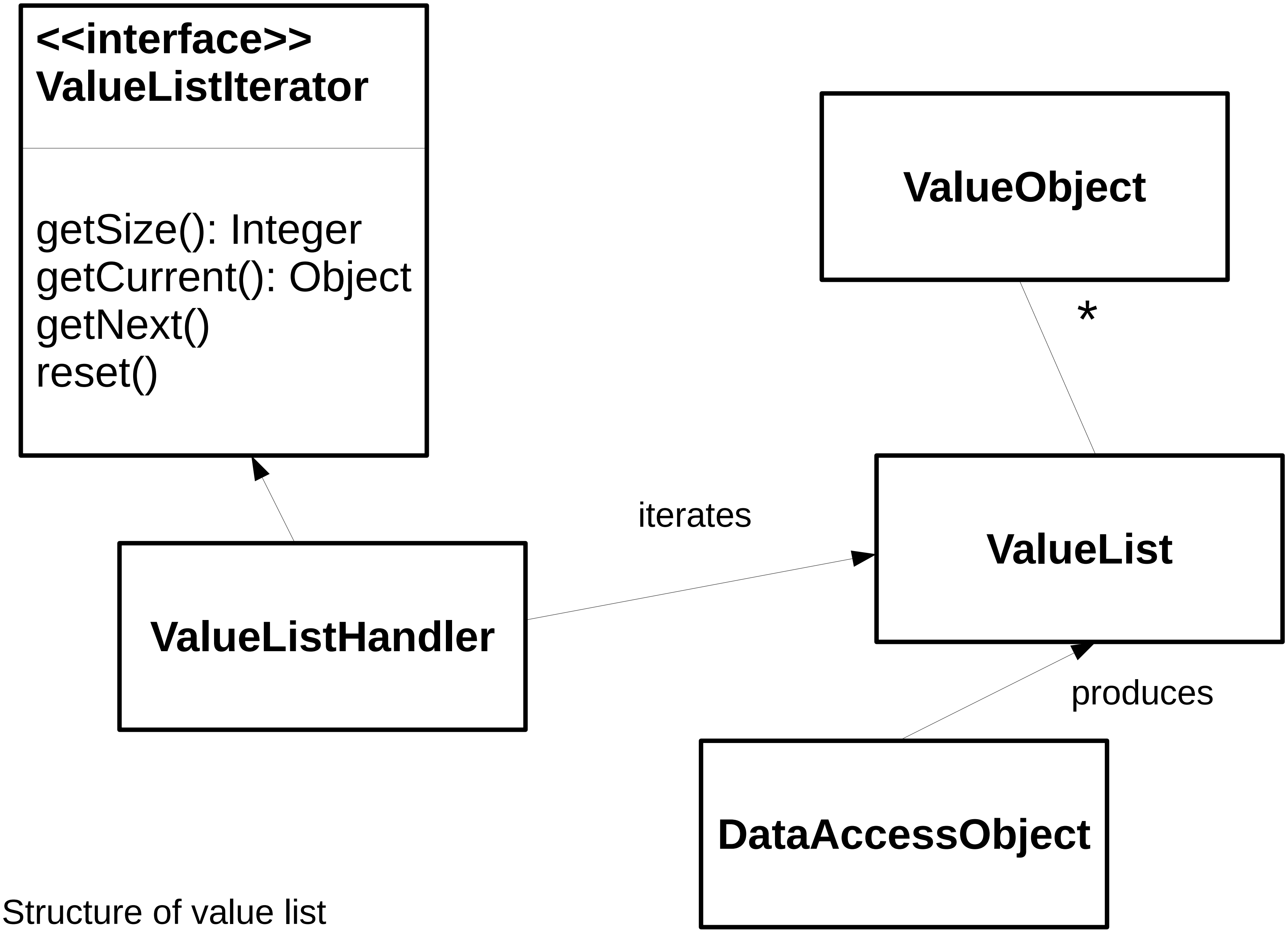
Guidelines for composite objects

- If there is association E → D and no other association to D, put E and D in same entity bean
- Put subclasses of a class in same entity bean as it
- Put aggregate part classes of class in same entity bean as it.
- If D is a target of several associations E → D, F → D, etc, choose the association through which most accesses/use cases will be carried out, and make D part of the same entity bean as the class at the other end of that association.

Value List Handler

- This integration tier pattern has the purpose to manage a list of data items/objects to be presented to clients. It provides an iterator-style interface allowing navigation of such lists

- The result data lists produced by database searches can be very large, so it is impractical to represent the whole set in memory at once. This pattern provides a means to access result lists element by element



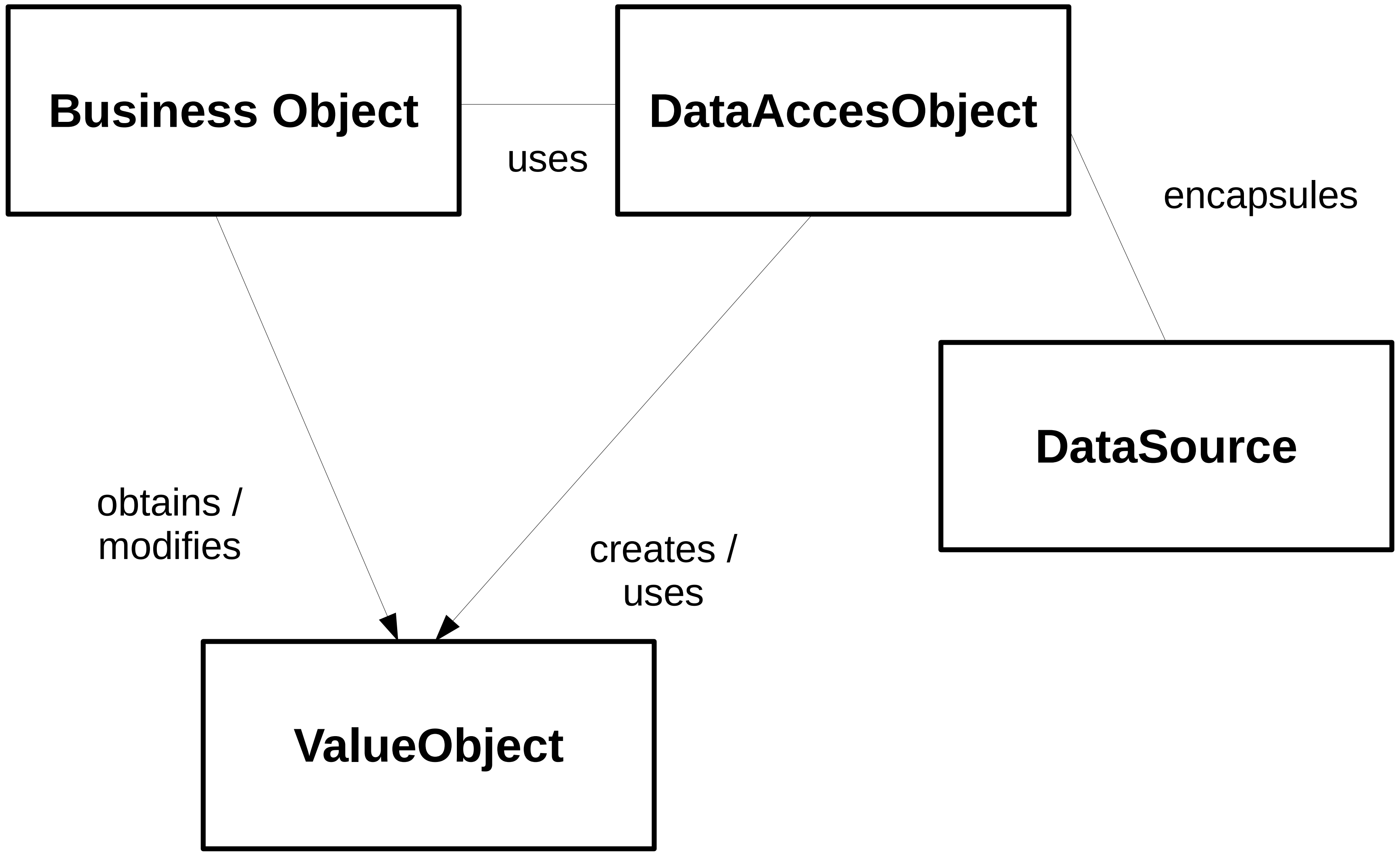
Structure of value list

Pattern elements

- Elements of the pattern are:
  - **ValueListIterator**: an interface with operations such as getCurrentElement(), getNextElements(int number), resetIndex () to navigate along the data list
  - **ValueListHandler**: implements ValueListIterator
  - **DataAccessObject**: implements the database/other data access
  - **ValueList**: the actual results of a query. Can be cached

Data Access Object

- This integration tier pattern abstracts from details of particular persistent data storage mechanisms, hiding these details from the business layer
- The variety of different APIs used for persistent data storage (JDBC, JSON, XML, B2B services, etc) makes it difficult to migrate a system if these operations are invoked directly from business objects
- This pattern decouples the business layer from specific data storage technologies, using the DAO to interact with a data source instead



Structure of data access object

Pattern elements

- Elements of the pattern are:
  - **Business Object**: requires access to some data source. It could
  - be a session bean, entity bean, etc
  - **Data Access Object**: allows simplified access to the data source.
  - Hides details of data source API from business objects
  - **Data Source**: actual data. Could be a relational or object-oriented database, or XML dataset, etc
  - **Value Object**: represents data transmitted as a group between the business and data access objects

Summary

- In this part we have described specification and design techniques for enterprise systems

- The key points are:
  - Enterprise information systems typically involve distributed processing, and multiple client applications using same core business functionality and data

  - Business tier of an EIS can be structured around session beans and entity beans, which directly reflect high-level PIM specification of EIS as use cases and class diagrams

Summary (cont.)

- For each constraint of system there should be some component within business tier which is responsible for maintaining the constraint

- Class invariants and local business rules of a class can be maintained by entity bean which implements semantics of class