OOA/OOD/OOP Example

See `http://www.cs.toronto.edu/~matz/instruct/csc407/eg`

Introduction

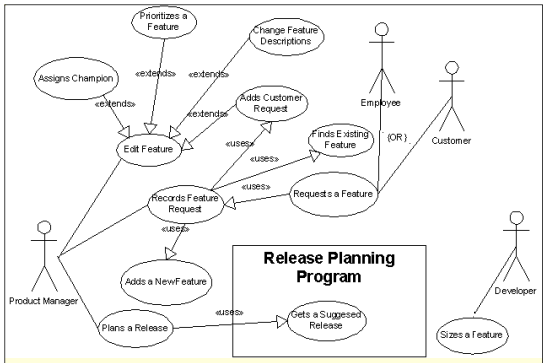
- This was David Penny's research topic.
- Want a (Java) program to help a software company plan new releases of their software (340 refers to person-days):

```
$ java Plan features.xml Planetaria 340
```

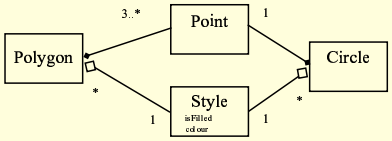
- xml file contains sized (in coder days), prioritized (hi,med,low), feature requests for various products
  - includes list of requesting customers with how much they want it (1-10).
- Suggest an "optimal" release plan given the available capacity (in coder days).
- Sample output

OOA

- See `~matz/csc407/eg/ooa/index.html`
- Introduction
  - why are we doing this
  - what is the current document for
  - where did the information come from
  - general points (change & XML file in this case)
- Use Cases
  - what is the bigger problem
  - how does this particular program fit into it
- Class Diagrams
  - restate information from the requirements statement in UML
  - (mostly you have no "requirements statement")
  -



multiplicity review



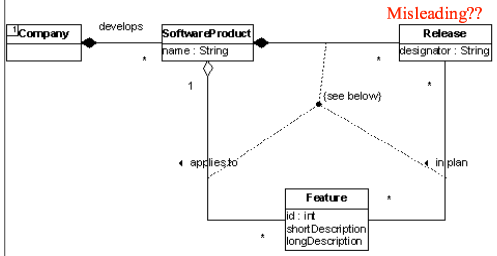
From Fowler, pp 86

Sometimes detailed multiplicity has important things to tell the reader about the domain model.

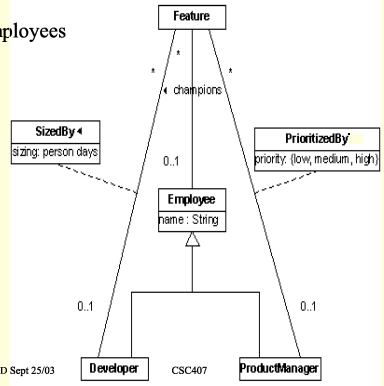
Often not..

Features

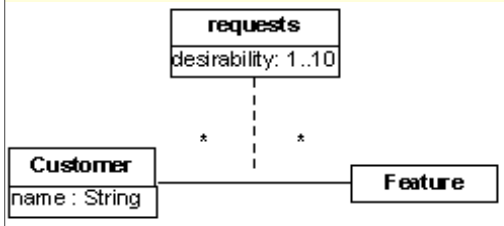
Misleading??



Employees



Customers



OOD

- See ood document
  - David's presentation is excellent.
- Package design
  - what rationale for the package breakdown
- Main driver
  - sequence diagram explaining how (one) use case is executed
- For each package
  - a collection of class diagrams
    - shows important methods
    - shows important attributes
    - shows association navigability
    - indicates how associations are implemented
    - indicates inheritance and interface implementation

important = helps in understanding the design

About Source and Javadoc

- Javadoc is a tool that extracts comments formatted in a certain manner and produces Web pages documenting the details of a class design.
  - See example
-
- To display source code, I used a tool called java2html for pretty-printing Java source to HTML.
  - See example

Experiments show..

```
/** Suggests a release of this software product.
 *  @param capacity number of person-days of  effort available to work release
 *  @return a Release containing a suggested list of features
 */
public Release planRelease(double capacity) {
      double inplan = 0.0;
      //Sort in order of desirability somehow
      sortFeatures(ReverseFeaturePlanningOrder.get());
      Release r = new Release();
      for (Iterator i = featureIterator(); i.hasNext(); ) {
          Feature f = (Feature)i.next();
          if (inplan + f.getSizing() <= capacity) {
              r.addFeature(f);
              inplan += f.getSizing();
          }
      }
      return r;
  }
```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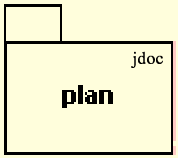
Top Package



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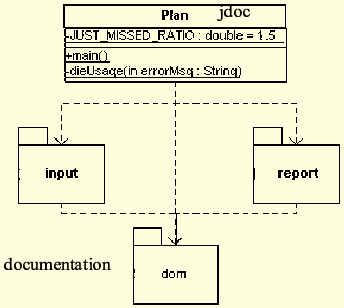
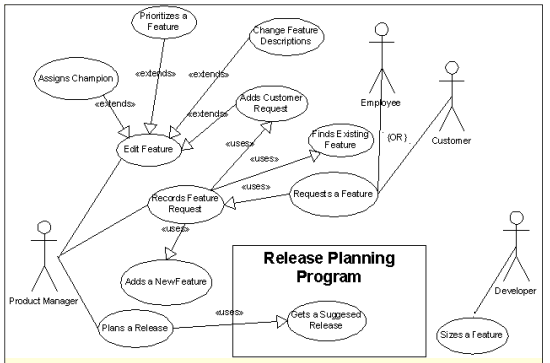
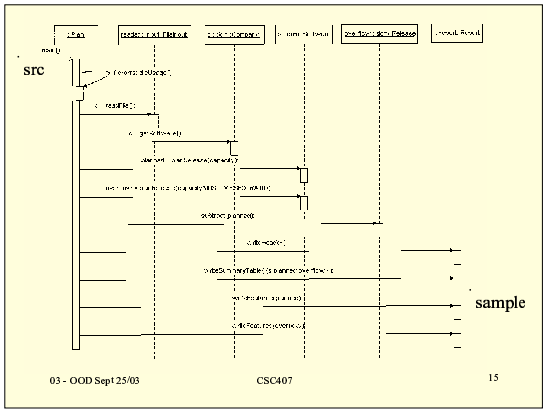
Package Plan



package documentation





src

sample

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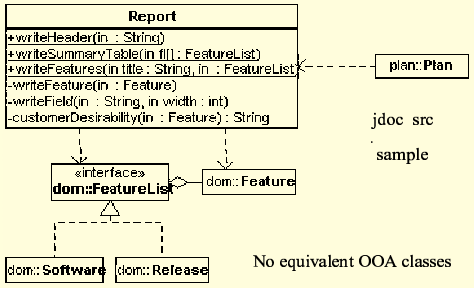
Package Report



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sample

No equivalent OOA classes

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Package Input

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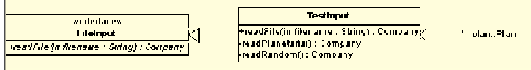

- No equivalent OOA classes
- Sequence diagram for readFile is fairly clear just from the class description (see also Report class)

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Package dom

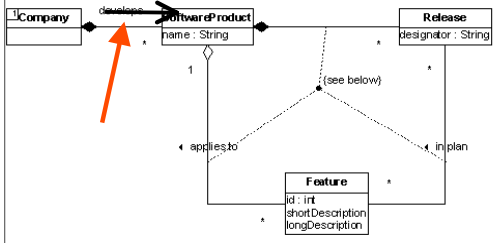
- For "Domain Object Model"
-
- Coad's "Problem Domain Component"
-
- Implements an in-memory, object-oriented data model reflecting the OOA
-
- Must be modified/extended to work in a program

jdoc

Implementing Associations

- Decide on navigability
  - The direction in which the association can be efficiently navigated
    - If you have one object of the Left class, can you in O(n) time access all objects of the Right class linked to that Left object.
- Decide on interface for
  - Navigating the links
    - usually get method for 1 side, iterator for * side.
  - Adding new links
  - Deleting links (if necessary)
- Decide on implementation
  - Simple pointer to implement the [0..1] side
    - (if required by navigatability)
  - Array, Vector, Map, Linked List to do the [*] side
    - (if required by navigatability)

Features (from OOA)



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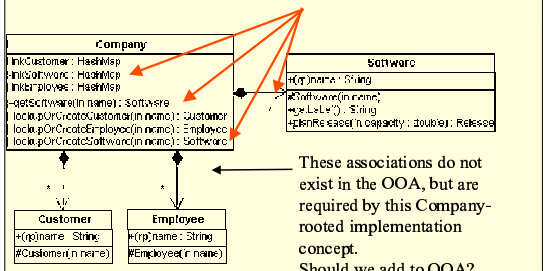
DOM Company



These associations do not exist in the OOA, but are required by this Company-rooted implementation concept.
Should we add to OOA?
Maybe.

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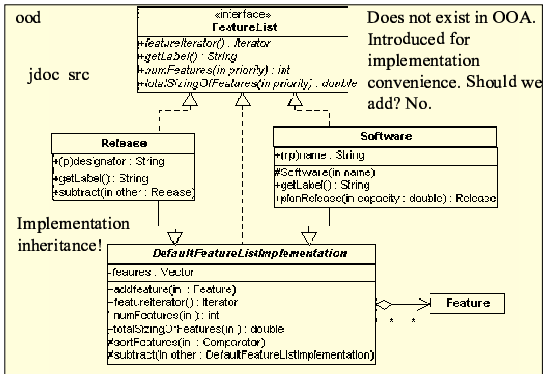

Does not exist in OOA. Introduced for implementation convenience. Should we add? No.

Implementation inheritance!

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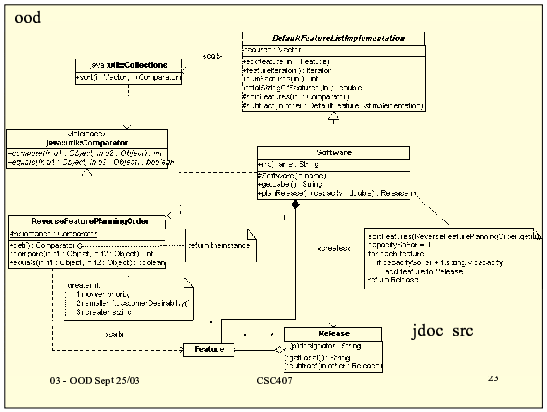

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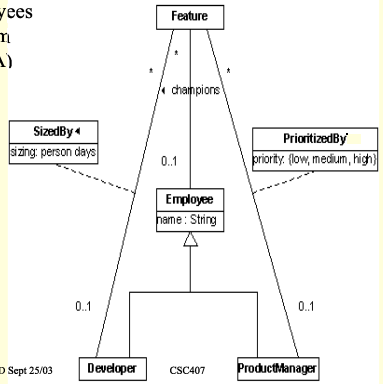
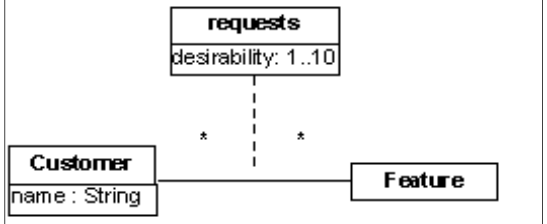
Employees (from OOA)



Customers (from OOA)



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