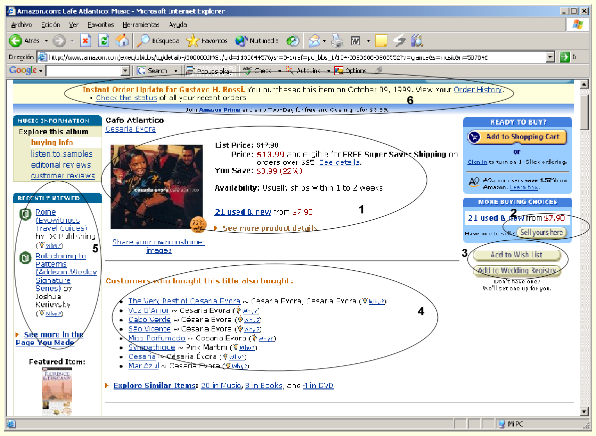
Separation of Concerns in Requirements

- Review: Web apps support a myriad of concerns:



What is a concern?

- A concern refers to a feature that the future system needs to address to satisfy the stakeholders' needs. A concern implies any coherent set of requirements, e.g. all requirements referring to a particular theme or behavioral application feature.

- Concerns may be functional or non-functional

Navigational Concerns

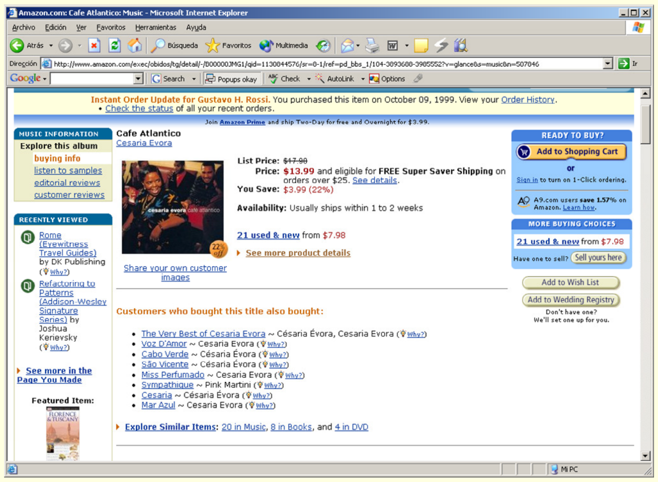
- A navigational concern is an application concern that impacts in the way users navigate the application.
- A navigational concern is reflected in some navigational information structure (e.g. a web page, a link), or behavior (e.g. checking if the user is allowed to navigate to a page).
- As a consequence, a navigational concern will also impact in the application's navigational model, either in a node or link class.
- These concerns may be realized in classes, methods, attributes (such as information or anchors), or links.

Other (non-navigational) Concerns?

In the Amazon.com Application

- Persistence
- Logistics
- Paying to Providers
- ….
- ….

Why Navigational Concerns are Important?


Amazon.com: Cafe Atlantico: Music - Microsoft Internet Explorer

Archivo Edición Ver Favoritos Herramientas Ayuda

Atrás Búsqueda Favoritos Multimedia

Dirección http://www.amazon.com/exec/obidos/tg/detail/-/B00000JMG1/qid=1130844576/sr=8-1/ref=pd_bbs_1/104-3893688-3985552?v=glance&s=music&n=507846 Ir

Google Search Popups okay Check AutoLink Options

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Cesaria Evora

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- Voz D'Amor ~ Cesaria Evora (Why?)
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- São Vicente ~ Césaria Évora (Why?)
- Miss Perfumado ~ Cesaria Evora (Why?)
- Sympathique ~ Pink Martini (Why?)
- Cesaria ~ Césaria Évora (Why?)
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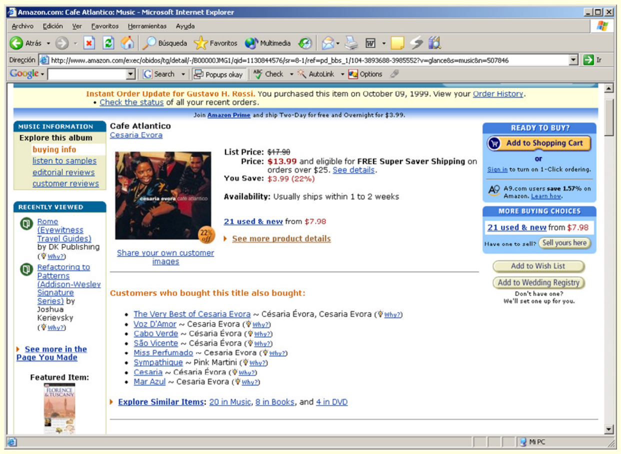
Crosscutting Navigational Concerns

- Navigational concerns crosscut when they are scattered throughout navigational classes (i.e. the same concern shows itself in different node or link classes), or when they are tangled (i.e. the same navigational class supports more than one concern).
- Crosscutting concerns may appear as information or behavior that seems not to completely belong to the current node, as links that “break” the current task flow, as conditions that have to be checked in different classes or methods, etc

Discussion

- When do we realize/decide that some navigational concerns crosscut?



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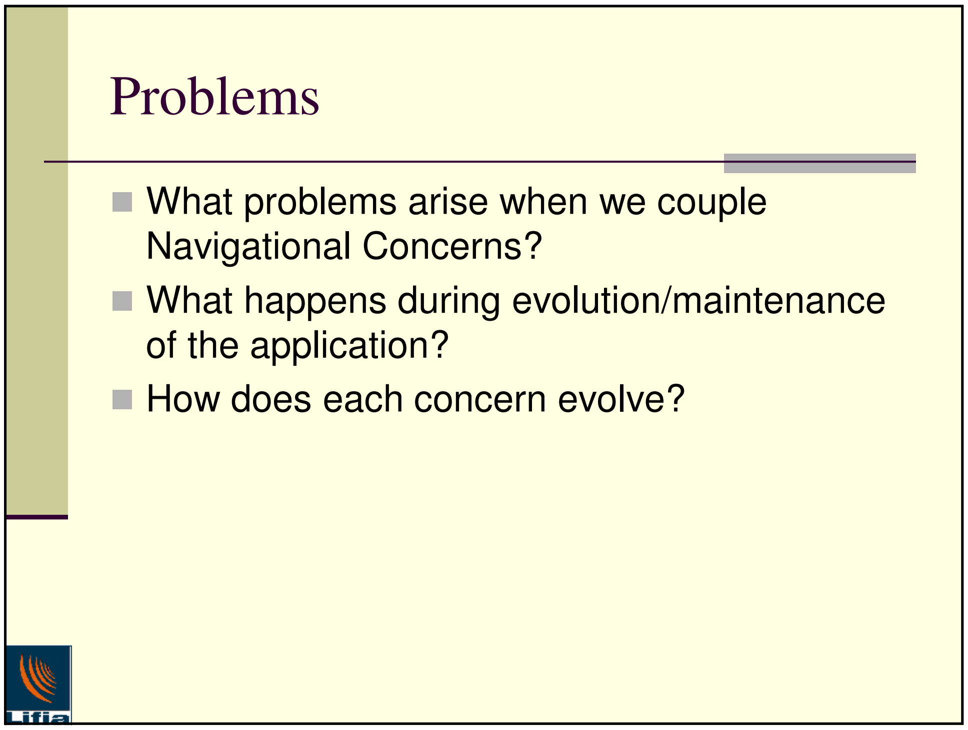
How do we deal with crosscutting concerns?

- Coupling them in a class?

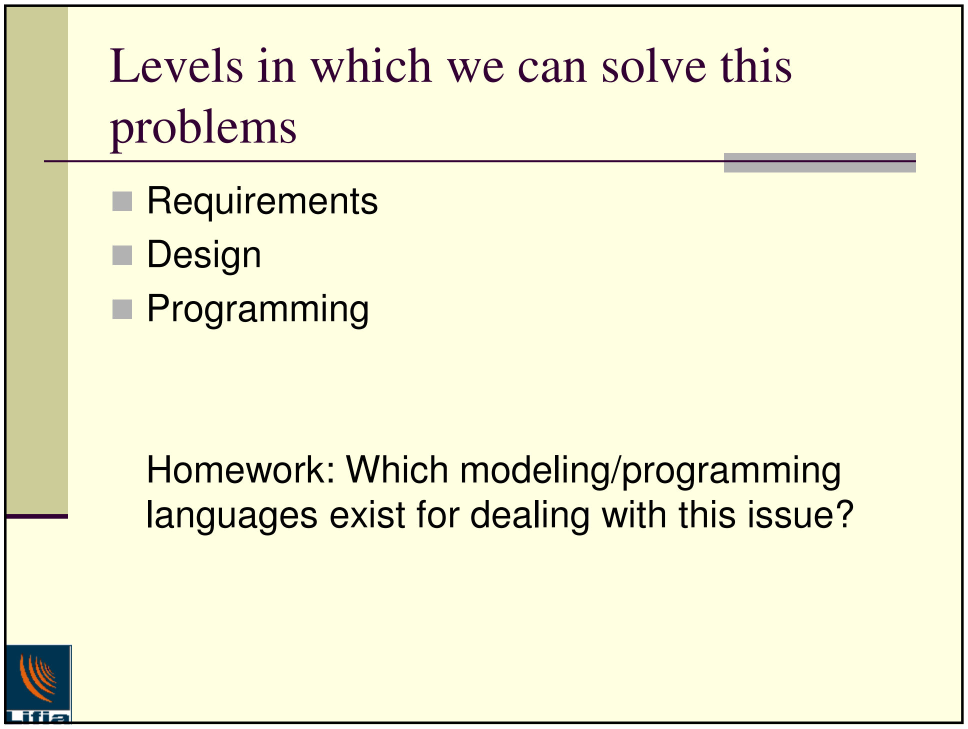
Exercise: Design the Conceptual class CD and its Navigational Counterpart

10 Minutes



Problems

- What problems arise when we couple Navigational Concerns?
- What happens during evolution/maintenance of the application?
- How does each concern evolve?

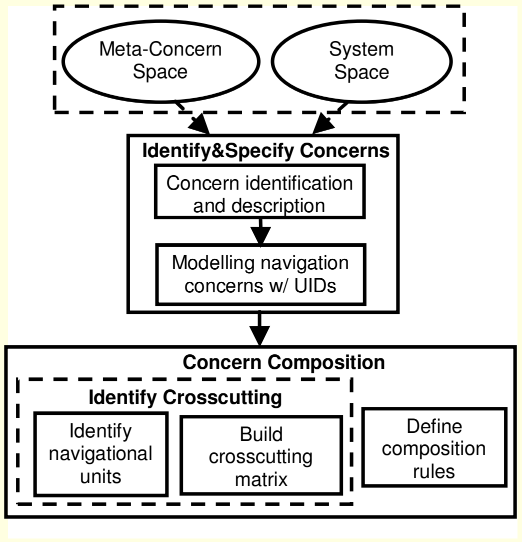


Levels in which we can solve this problems

- Requirements
- Design
- Programming

Homework: Which modeling/programming languages exist for dealing with this issue?

A model at the requirement level



Meta-Concern Space
System Space
Identify&Specify Concerns
Concern identification and description
Modelling navigation concerns w/ UIDs
Concern Composition
Identify Crosscutting
Identify navigational units
Build crosscutting matrix
Define composition rules

Concerns vs Meta-Concerns

- Meta-Concerns and requirements reuse
- Levels of meta-concerns:
  - Abstract: Information Retrieval, Security
  - Domain Specific: Payment, Recommendations
- From Meta to Concrete concerns

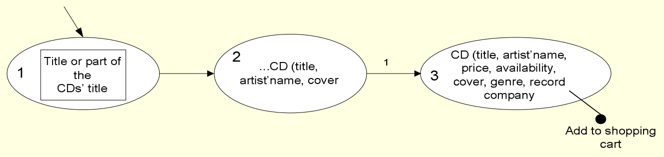
Example of Meta-Concern

```
<MetaConcern name="InformationRetrieval">
  <Description>The operation of accessing information from a
      computer system </Description>
  <Examples>Database retrieval, Multimedia retrieval</Examples>
  <Relationships> Availability, Mobility, InformationUpdate
      </Relationships>
</MetaConcern>
```

Instantiation of a Meta-concern

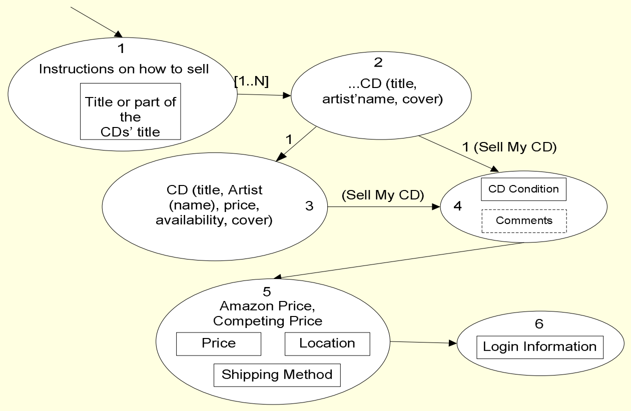
```
<Concern name="Product Information ">
- <Requirement id="1">
  The system will be accessed to provide basic information (e.g. for a
      CD there should be title, artist name, price, availability, cover,
      genre, record company, list of songs with name and excerpt), of
      the store products
- <Requirement id="2">
Different search strategies such as finding the product given the title
      or part of the title can be used to access the product information.
</Requirement>
<Requirement id="3">
Products will be organized in categories according to musical genre
</Requirement>
  </Requirement>
  </Concern>
```

Capturing Navigational Requirements with UIDs


1
Title or part of the CDs' title
2
...CD (title, artist'name, cover
1
3
CD (title, artist'name, price, availability, cover, genre, record company
Add to shopping cart

Finding a CD from its title

Capturing Navigational Requirements with UIDs


1
Instructions on how to sell
Title or part of the CDs' title
[1..N]
2
...CD (title, artist'name, cover)
1
1 (Sell My CD)
CD (title, Artist (name), price, availability, cover)
3
(Sell My CD)
4
CD Condition
Comments
5
Amazon Price, Competing Price
Price
Location
Shipping Method
6
Login Information

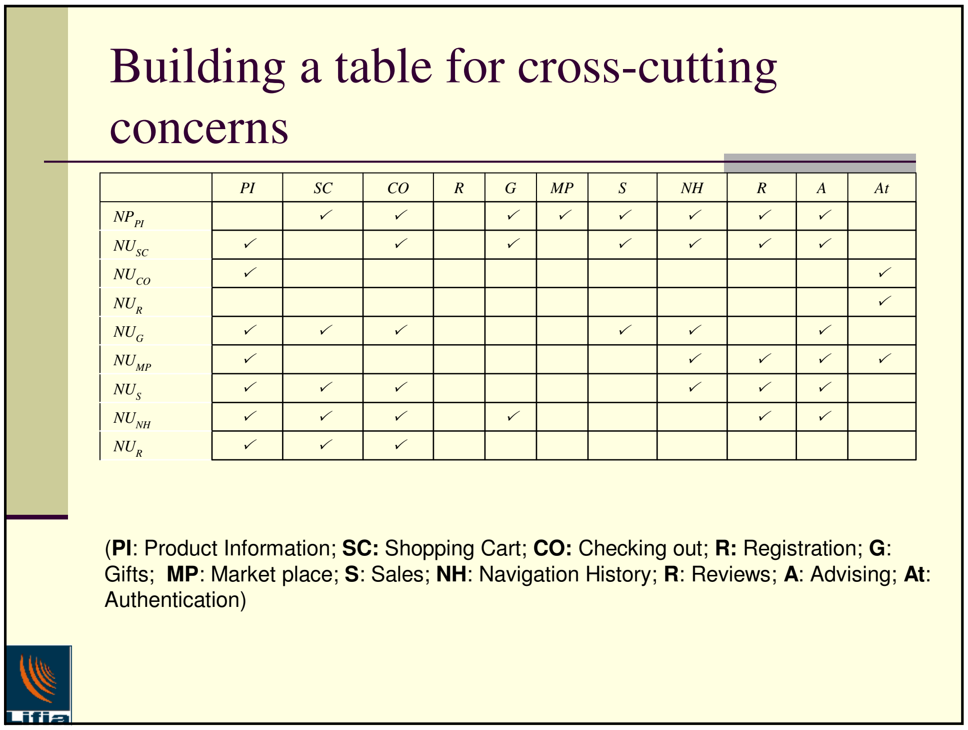
Selling a UID providing its title

How to identify and Characterize Crosscutting

- (1) identifying navigational units and building a crosscutting matrix between navigational units and navigational concerns
- (2) Composing UIDs of concerns which crosscut, analyzing how navigational units must be composed.

Navigational Units

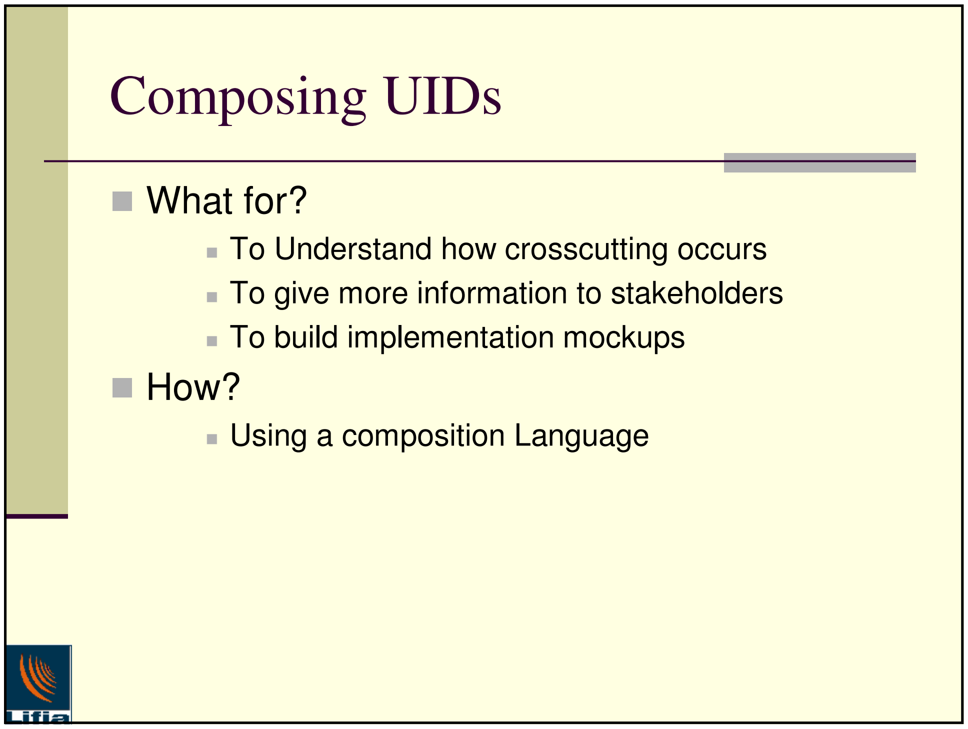
- A navigational unit (NU) is the requirement counterpart of a navigational class (e.g. a node) in the navigational model and reflects an information structure that emerges from an interaction state in a UID (e.g. a CD, a shopping cart, etc).



Building a table for cross-cutting concerns

	PI	SC	CO	R	G	MP	S	NH	R	A	At
NP_{PI}		✓	✓		✓	✓	✓	✓	✓	✓	
NU_{SC}	✓		✓		✓		✓	✓	✓	✓	
NU_{CO}	✓										✓
NU_{R}											✓
NU_{G}	✓	✓	✓				✓	✓		✓	
NU_{MP}	✓							✓	✓	✓	✓
NU_{S}	✓	✓	✓					✓	✓	✓	
NU_{NH}	✓	✓	✓		✓				✓	✓	
NU_{R}	✓	✓	✓								

(**PI**: Product Information; **SC:** Shopping Cart; **CO:** Checking out; **R:** Registration; **G**: Gifts; **MP**: Market place; **S**: Sales; **NH**: Navigation History; **R**: Reviews; **A**: Advising; **At**: Authentication)



Composing UIDs

- What for?
  - To Understand how crosscutting occurs
  - To give more information to stakeholders
  - To build implementation mockups
- How?
  - Using a composition Language

Composition Language

- **Compose** <UID_Base> **with** <UID_NavC1, … UID_NavCk>

  {<UID_Base, UID_Base.State>

  [**Merge** | **AddTransion** | **AddConnection** | **AddOperation**] [**to** | **with**]

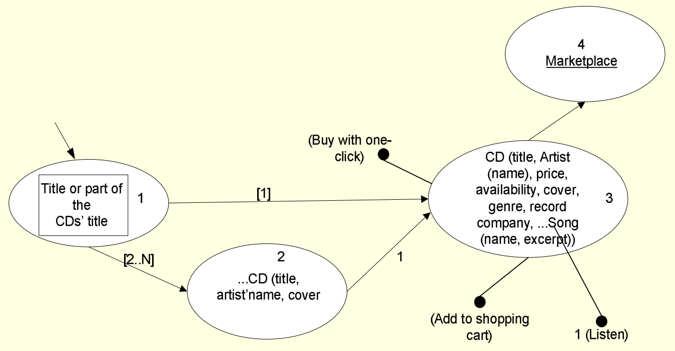
  <UID_NavCi.State, UID_NavC.Operation, NavCi>}

- Example:

  Compose Product Information **with** MarketPlace

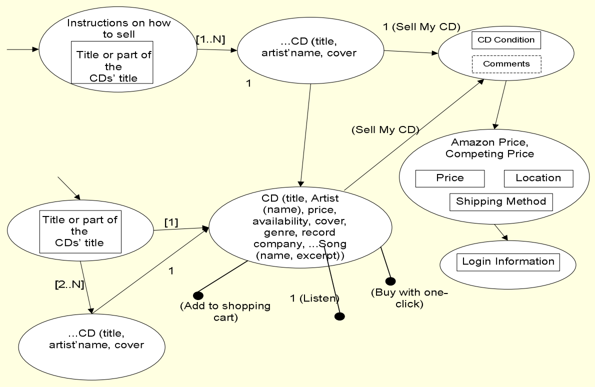
  {ProductInformation.3 **AddConnection to** Marketplace}

Visualizing the Composition


4
Marketplace
(Buy with one-click)
Title or part of the CDs' title
1
[1]
CD (title, Artist (name), price, availability, cover, genre, record company, ...Song (name, excerpt))
3
[2..N]
2
...CD (title, artist'name, cover
1
(Add to shopping cart)
1 (Listen)

A finer-grained composition

- **Compose** Product Information **with** MarketPlace {ProductInformation.3 **Merge with** MarketPlace.3}


Instructions on how to sell
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Comments
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Price
Location
Shipping Method
Login Information
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CD (title, Artist (name), price, availability, cover, genre, record company, …Song (name, excerpt))
[2..N]
1
(Add to shopping cart)
1 (Listen)
(Buy with one-click)
…CD (title, artist'name, cover

Exercise

- What information can we derive from the compositions?
- Can we obtain more than classes with their attributes?
- How do we improve the OOHDM derivation rules?