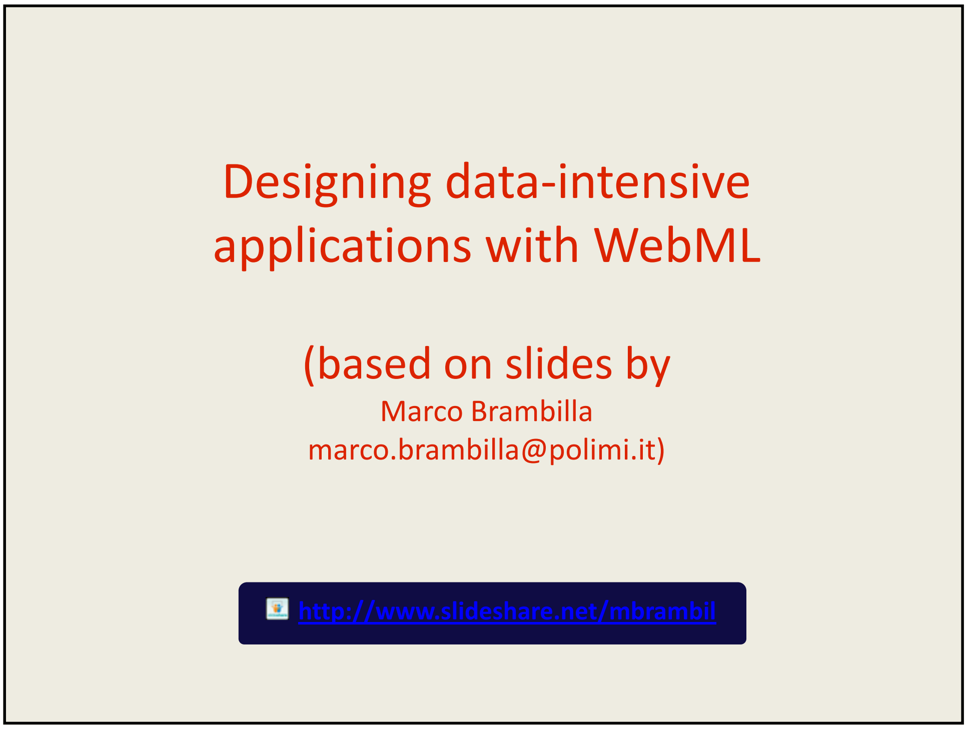
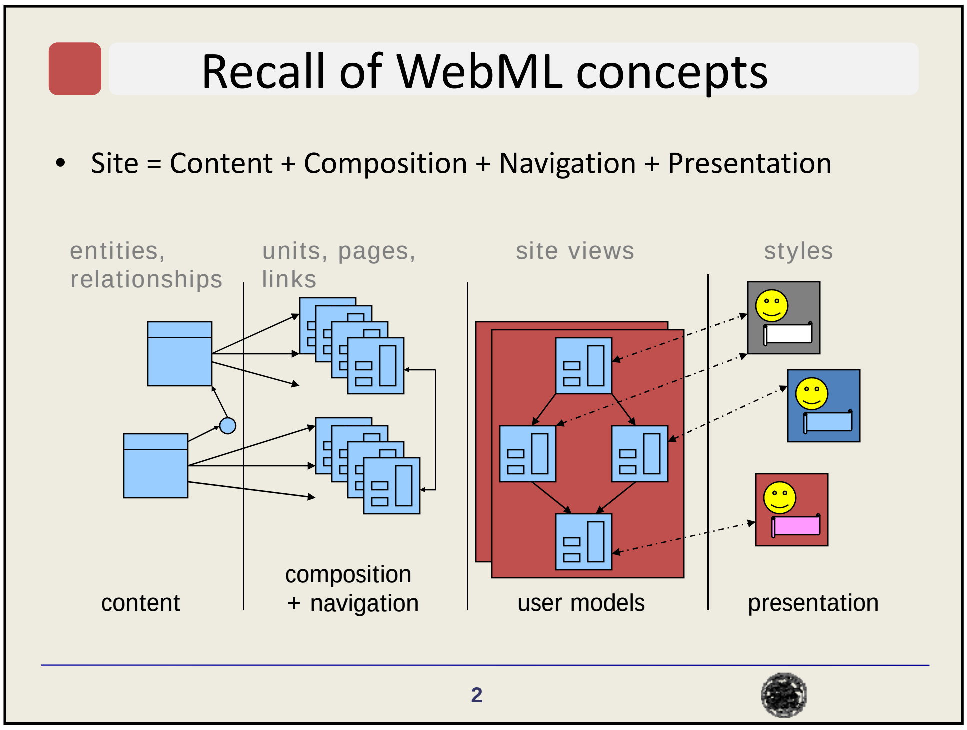


Designing data-intensive applications with WebML

(based on slides by

Marco Brambilla
marco.brambilla@polimi.it)

http://www.slideshare.net/mbrambil



Recall of WebML concepts

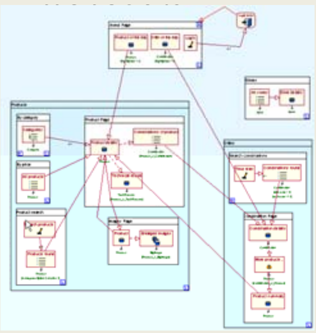
- Site = Content + Composition + Navigation + Presentation

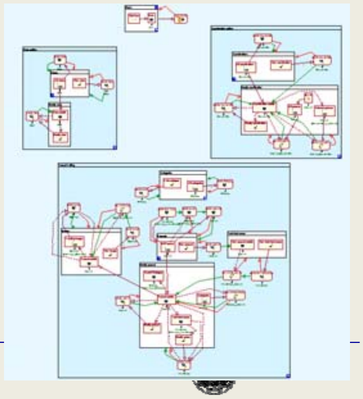
Site Views

- A siteview is a set of pages and/or areas forming a coherent view of the site
- Multiple site views can be defined on the same data model
- Different site views can be published for different types of users and/or for different types of output devices
- Site views can be
  - Public: everyone can enter
  - Private: access control with password protection is enforced

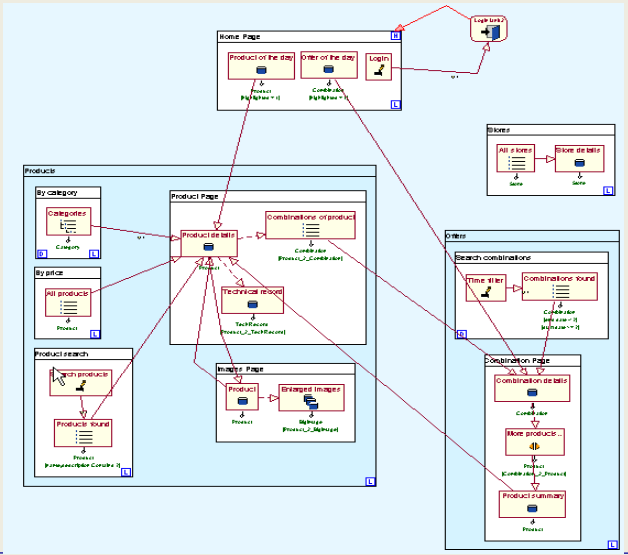
Acme site view modeling

- Two site views on the same data model
  - Customer: public, for customers
  - Admin: private, for the administrators and content



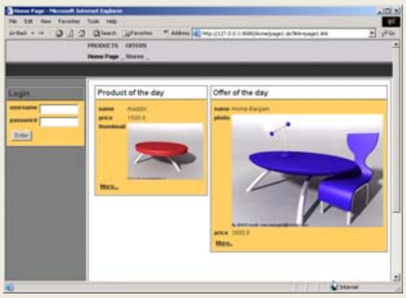


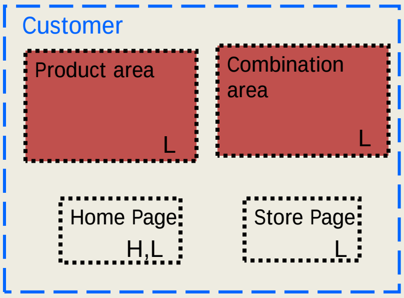
Acme site view: public, for customers



Acme customer site view

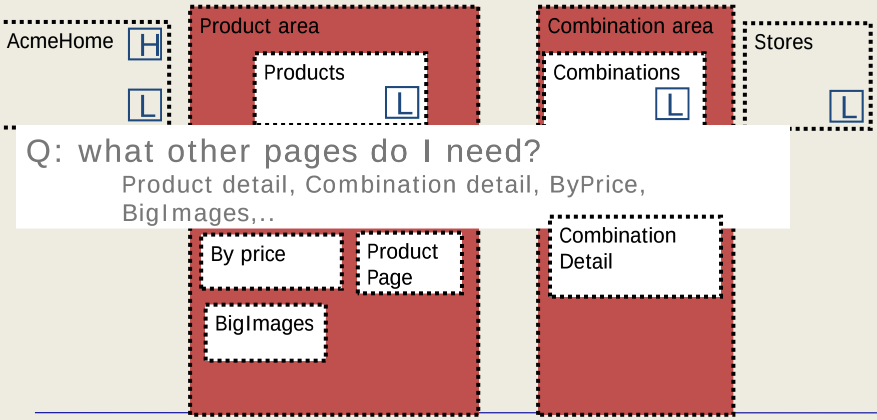
- Purpose: define the customer experience of the site
- Structure:
  - Two main areas: products and combinations
  - Other landmark pages: home, stores





ACME page modeling

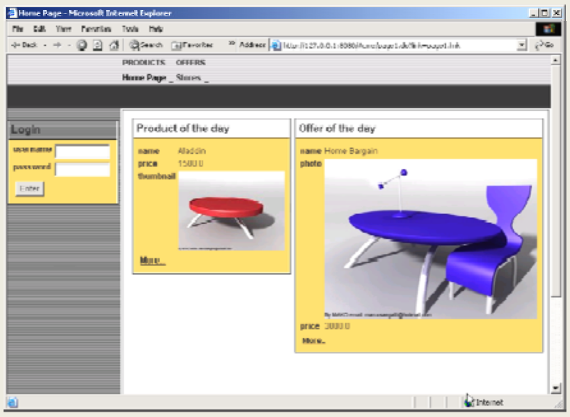
- Q: what “main” pages do I need in the site?
    - Home, Products, Combinations, Stores



Q: what other pages do I need?

Product detail, Combination detail, ByPrice, BigImages,..

ACME: HomePage


Home Page - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Address
Go
PRODUCTS OFFERS
Home Page _ Stores _
Internet

Login

user name

password

Enter

Product of the day

name Aladdin

price 1500.0

thumbnail

More..

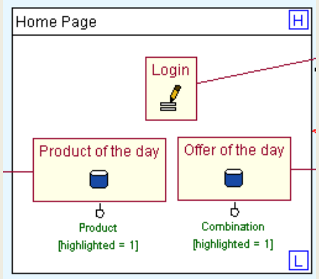
Offer of the day

name Home Bargain

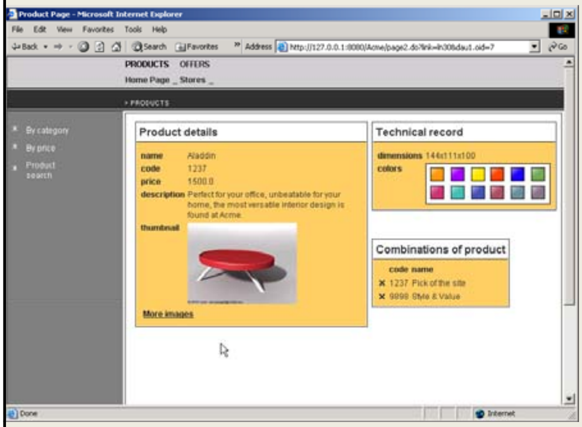
photo

price 3000.0

More..



ACME product page


Product Page - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Address http://127.0.0.1:8080/Acme/page2.do?link=ln30&dau1.oid=7 Go
PRODUCTS OFFERS
Home Page _ Stores _
› PRODUCTS
By category
By price
Product search
Done
Internet

Product details

name Aladdin
code 1237
price 1500.0
description Perfect for your office, unbeatable for your home, the most versatile interior design is found at Acme.
thumbnail

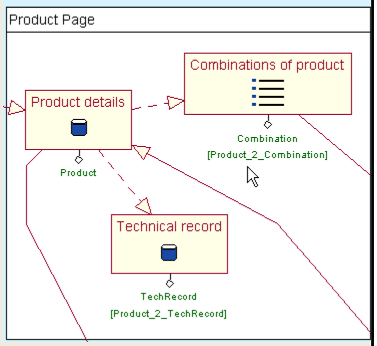
More images

Technical record

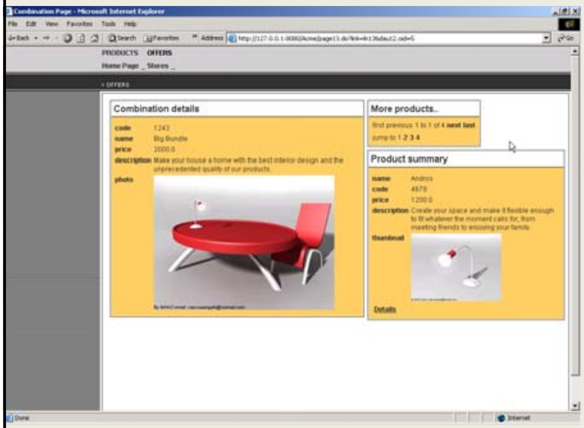
dimensions 144x111x100
colors

Combinations of product

code	name
✕ 1237	Pick of the site
✕ 9999	Style & Value


Product Page
Product details
Product
Combinations of product
Combination
[Product_2_Combination]
Technical record
TechRecord
[Product_2_TechRecord]

ACME combination page


Combination Page - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Address http://127.0.0.1:8080/Acme/page13.do?link=ln13&dau2.oid=5 Go
PRODUCTS OFFERS
Home Page _ Stores _
› OFFERS
Done
Internet

Combination details

code 1243
name Big Bundle
price 2000.0
description Make your house a home with the best interior design and the unprecedented quality of our products.
photo

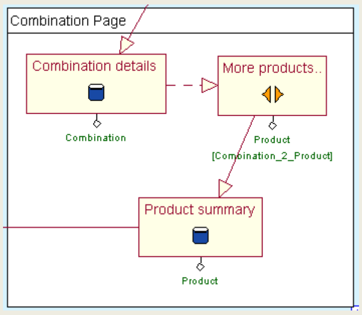
More products..

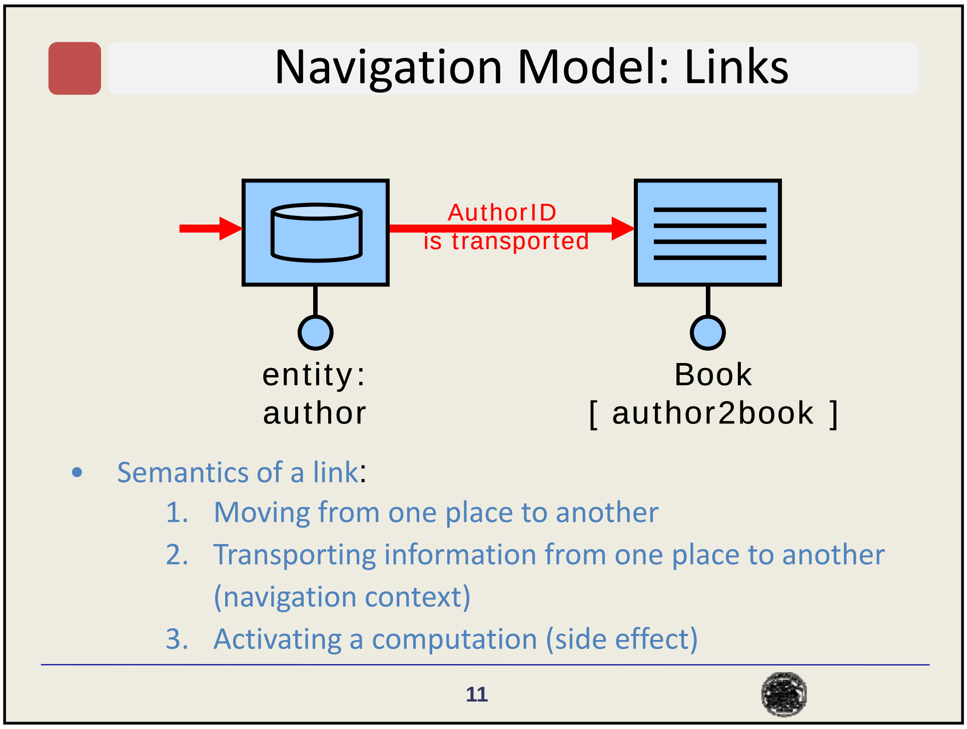
first previous 1 to 1 of 4 next last
jump to 1 2 3 4

Product summary

name Andros
code 4679
price 1200.0
description Create your space and make it flexible enough to fit whatever the moment calls for, from meeting friends to enjoying your family.
thumbnail

Details


Combination Page
Combination details
Combination
More products..
Product
[Combination_2_Product]
Product summary
Product



Navigation Model: Links

AuthorID
is transported
entity:
author
Book
[author2book]

- Semantics of a link:
    1. Moving from one place to another
    2. Transporting information from one place to another (navigation context)
    3. Activating a computation (side effect)

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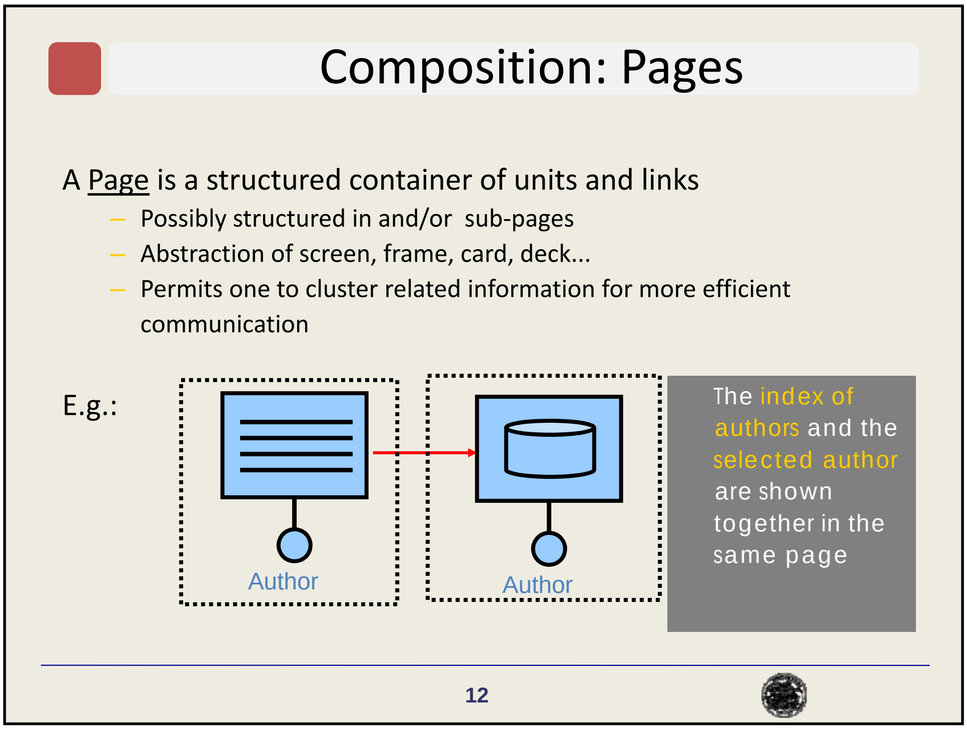

Composition: Pages

A Page is a structured container of units and links

- Possibly structured in and/or sub-pages
- Abstraction of screen, frame, card, deck...
- Permits one to cluster related information for more efficient communication

E.g.:

Author
Author

The index of authors and the selected author are shown together in the same page

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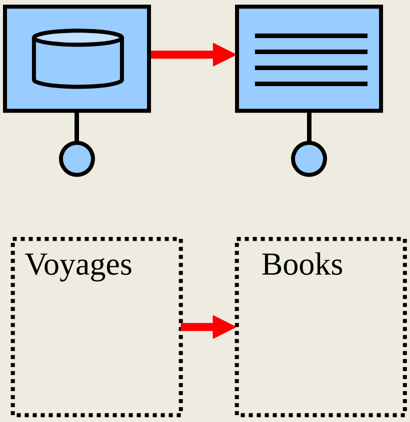
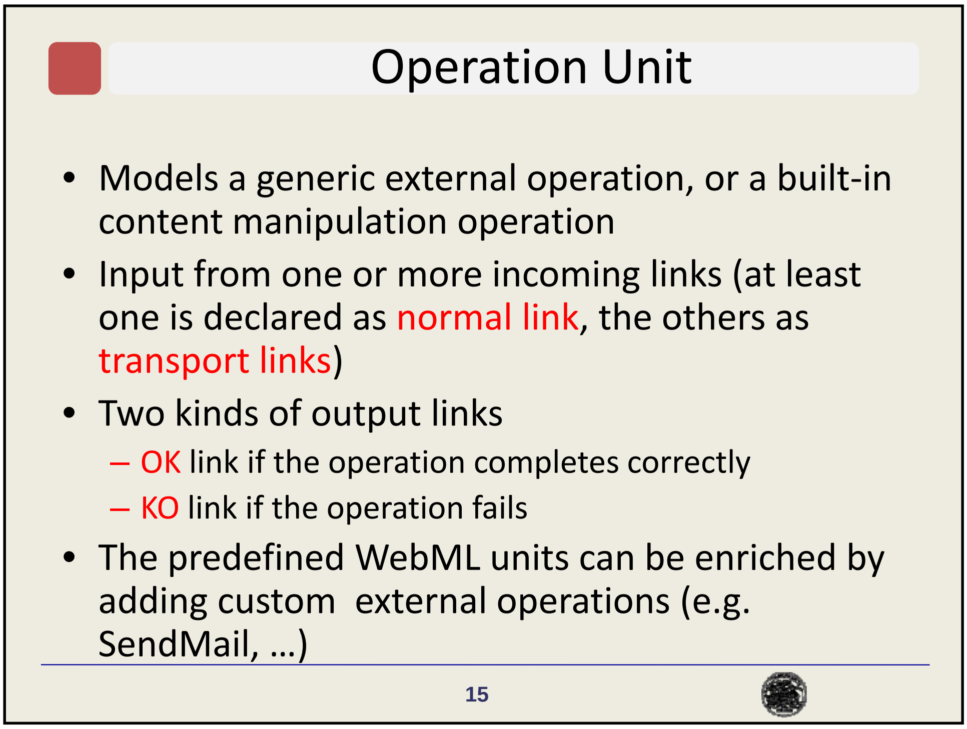
Types of links

- Contextual links
  - Between units
  - Context transported
- Non-contextual links
  - Between pages
  - No context transported



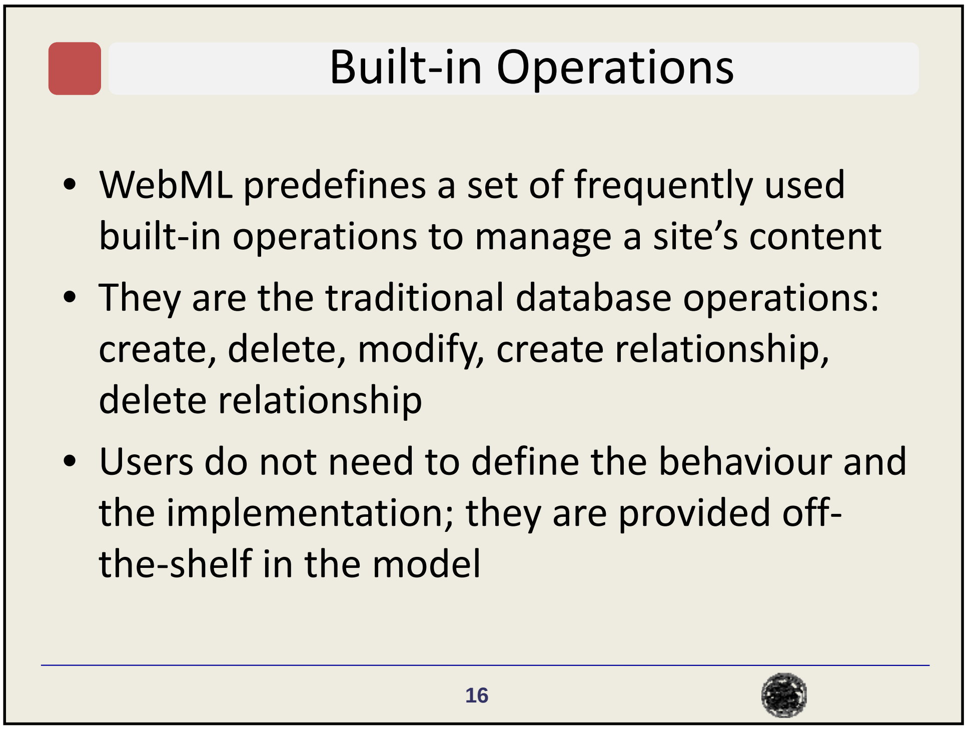
Integrating backend business logic

- Example of web sites using backend/remote services:
  - Reservation Web site: create a reservation, undo a reservation, overwrite a reservation..
  - Other examples: content management, e-commerce trolley management, update personal profile ..
- How can we model the invocation of backend operations, e.g., the update of content by the user?
- Answer:
  - Embedding operation calls into the hypertext
- To the Basic Content Units we add another unit



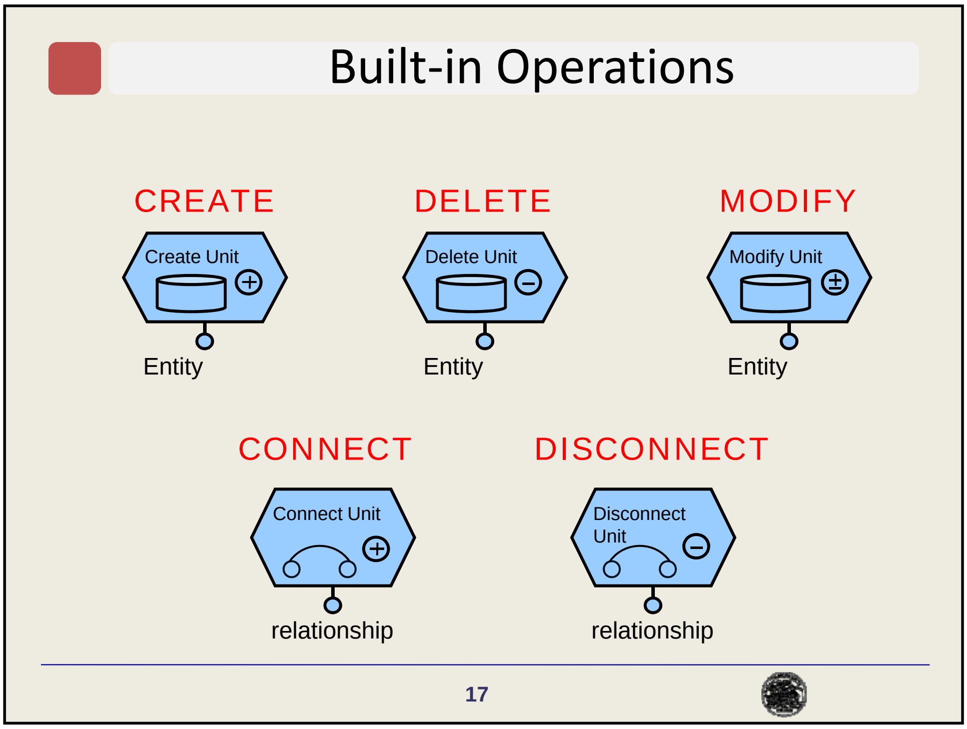
Operation Unit

- Models a generic external operation, or a built-in content manipulation operation
- Input from one or more incoming links (at least one is declared as normal link, the others as transport links)
- Two kinds of output links
  - OK link if the operation completes correctly
  - KO link if the operation fails
- The predefined WebML units can be enriched by adding custom external operations (e.g. SendMail, …)



Built-in Operations

- WebML predefines a set of frequently used built-in operations to manage a site’s content
- They are the traditional database operations: create, delete, modify, create relationship, delete relationship
- Users do not need to define the behaviour and the implementation; they are provided off-the-shelf in the model



Built-in Operations

CREATE

Create Unit

Entity

DELETE

Delete Unit

Entity

MODIFY

Modify Unit

Entity

CONNECT

Connect Unit

relationship

DISCONNECT

Disconnect Unit

relationship

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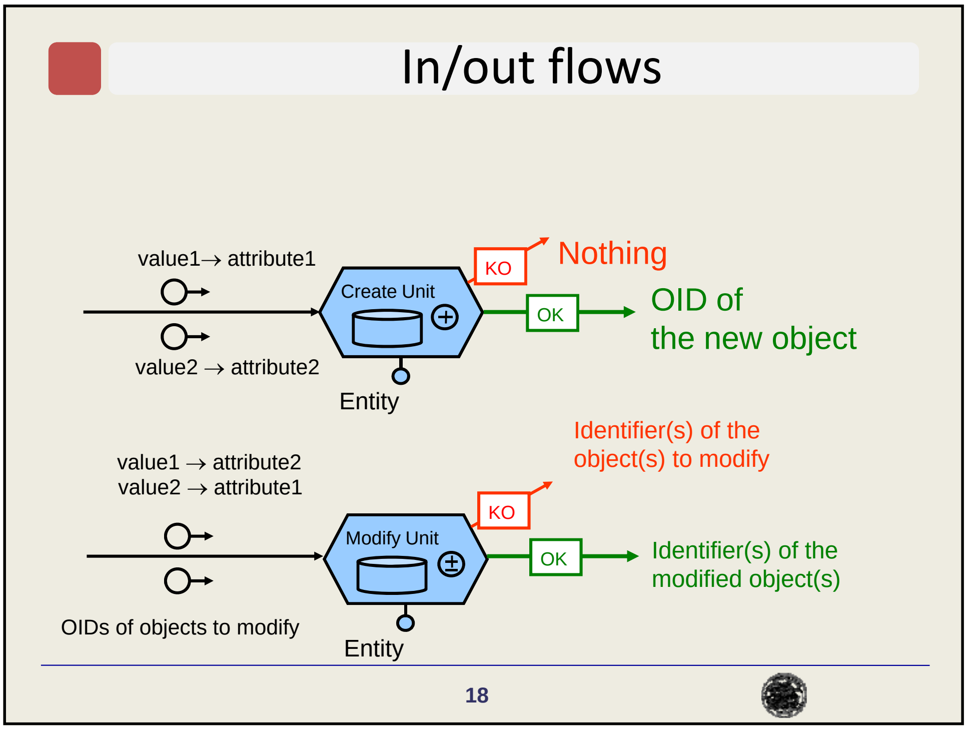


In/out flows

value1→ attribute1

value2 → attribute2

Create Unit

Entity

KO

Nothing

OK

OID of the new object

Identifier(s) of the object(s) to modify

value1 → attribute2
value2 → attribute1

OIDs of objects to modify

Modify Unit

Entity

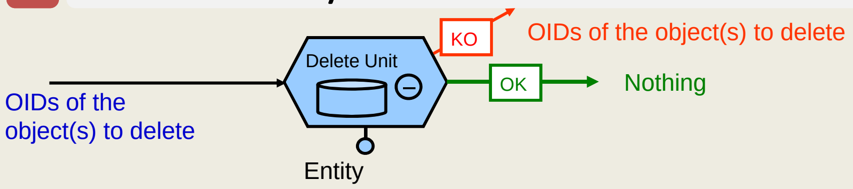
KO

OK

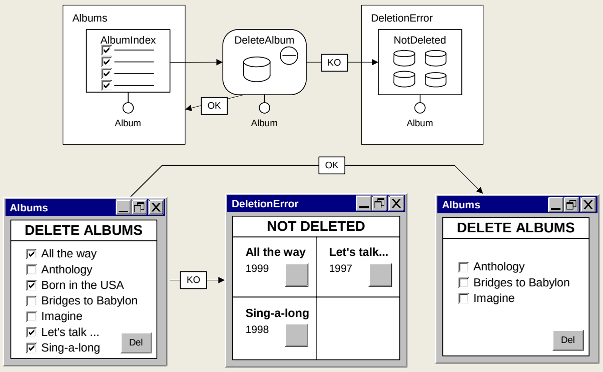
Identifier(s) of the modified object(s)

18

In/out flow: delete

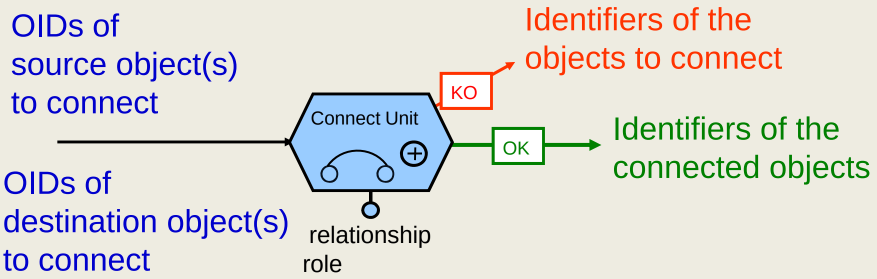


Example:

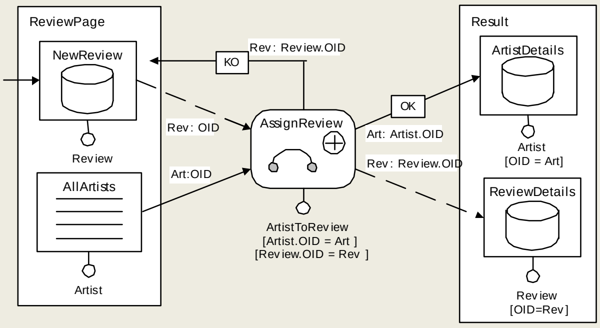


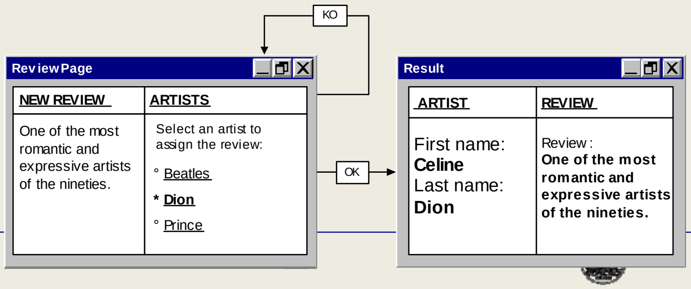
In/out flow: connect

- Note: if any of the input parameters is a set of OIDs, the operation is applied to each element of the set
- The disconnect operation is similar



Example

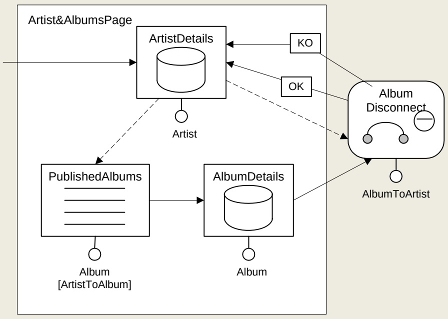


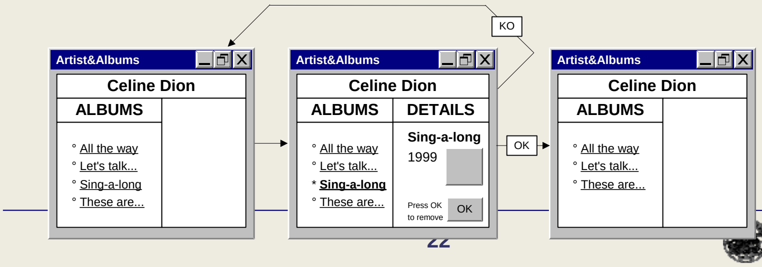


NEW REVIEW	ARTISTS
One of the most romantic and expressive artists of the nineties.	Select an artist to assign the review: ° Beatles * Dion ° Prince

ARTIST	REVIEW
First name: **Celine** Last name: **Dion**	Review: **One of the most romantic and expressive artists of the nineties.**

Example/2





Celine Dion

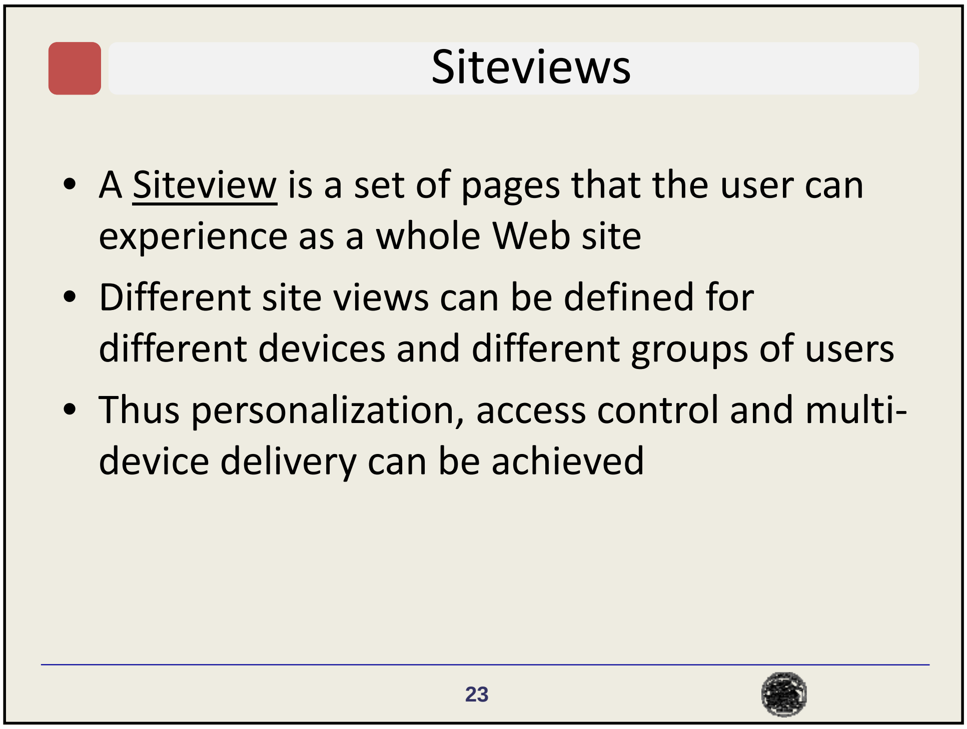
ALBUMS	
° All the way ° Let's talk... ° Sing-a-long ° These are...	

Celine Dion

ALBUMS	DETAILS
° All the way ° Let's talk... * **Sing-a-long** ° These are...	**Sing-a-long** 1999 Press OK to remove OK

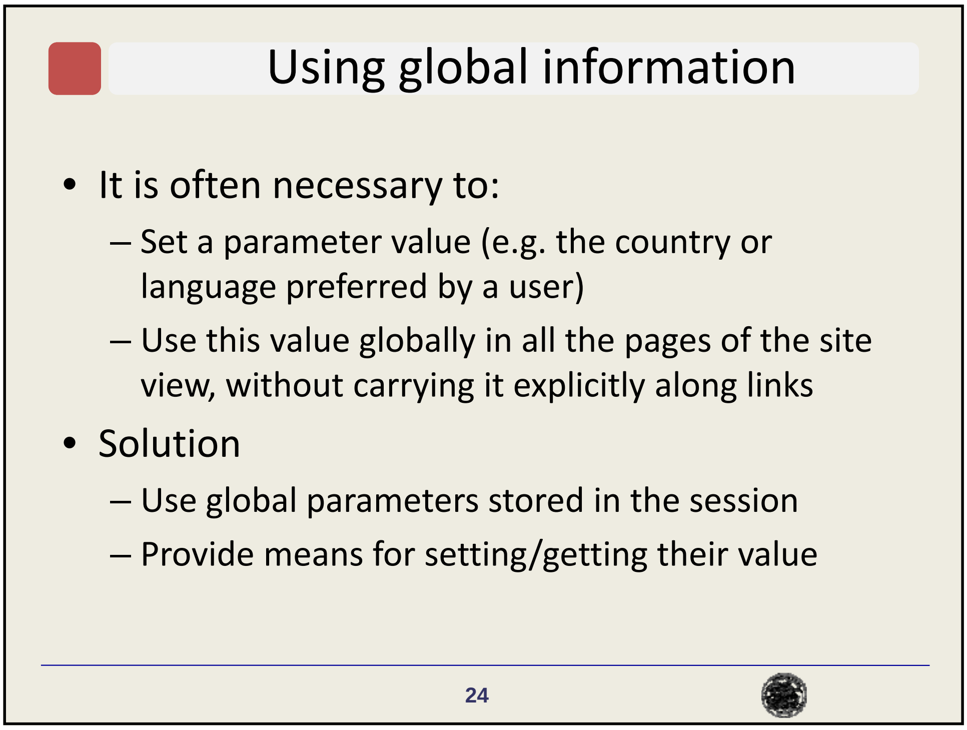
Celine Dion

ALBUMS	
° All the way ° Let's talk... ° These are...	



Siteviews

- A Siteview is a set of pages that the user can experience as a whole Web site
- Different site views can be defined for different devices and different groups of users
- Thus personalization, access control and multi-device delivery can be achieved



Using global information

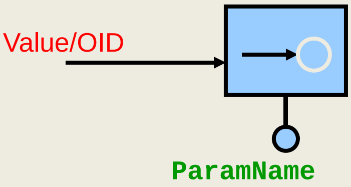
- It is often necessary to:
  - Set a parameter value (e.g. the country or language preferred by a user)
  - Use this value globally in all the pages of the site view, without carrying it explicitly along links
- Solution
  - Use global parameters stored in the session
  - Provide means for setting/getting their value

Context Parameters

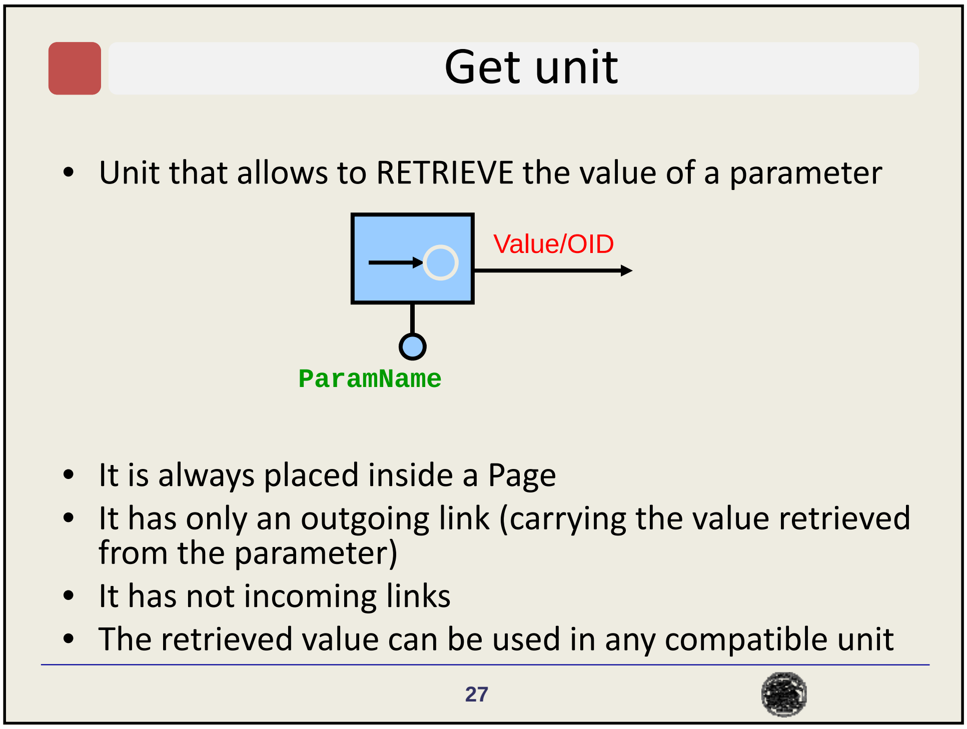
- WebML Context Parameters allow to achieve this goal in a simple way
- Designer defines one or more Context parameters.
- A context parameter is defined by:
  - Name
  - ID
  - Duration (User session or Application)
  - Value type: can be either:
    - A Printable value (integer, string, …)
    - An Entity (thus, the parameter can assume an OID value of that entity)
  - Starting value [optional]
- We introduce yet another unit

Set unit

- Unit that allows to SET the value of a parameter



- It is always placed outside a Page
- It has only an incoming link (carrying the value to be assigned to the parameter)
- It has not outgoing links



Get unit

- Unit that allows to RETRIEVE the value of a parameter

Value/OID
ParamName

- It is always placed inside a Page
- It has only an outgoing link (carrying the value retrieved from the parameter)
- It has not incoming links
- The retrieved value can be used in any compatible unit

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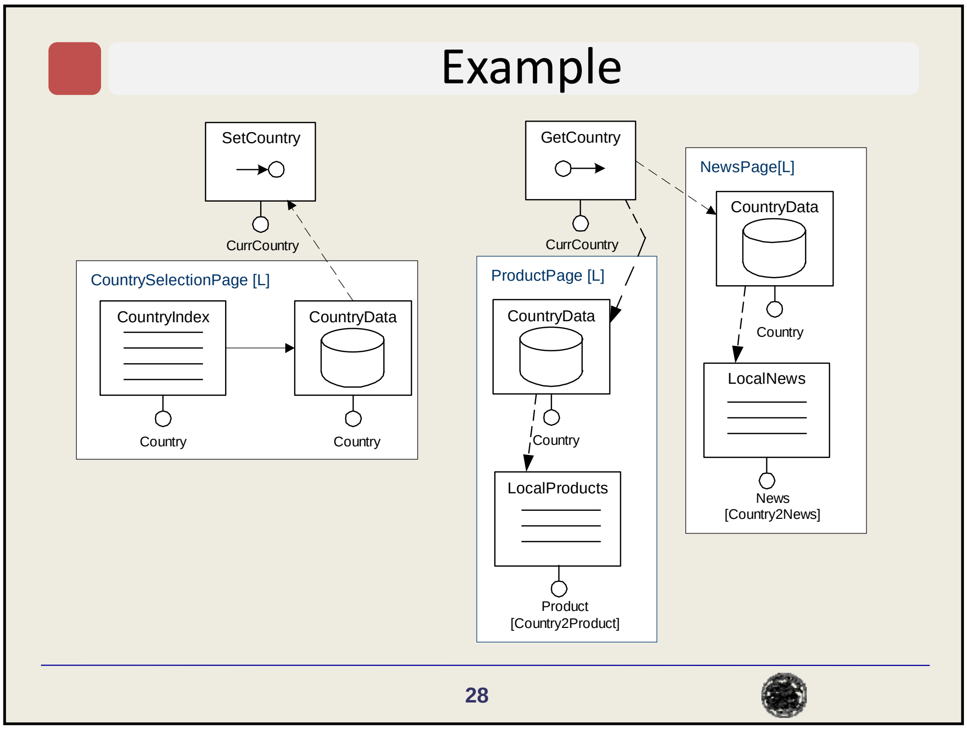
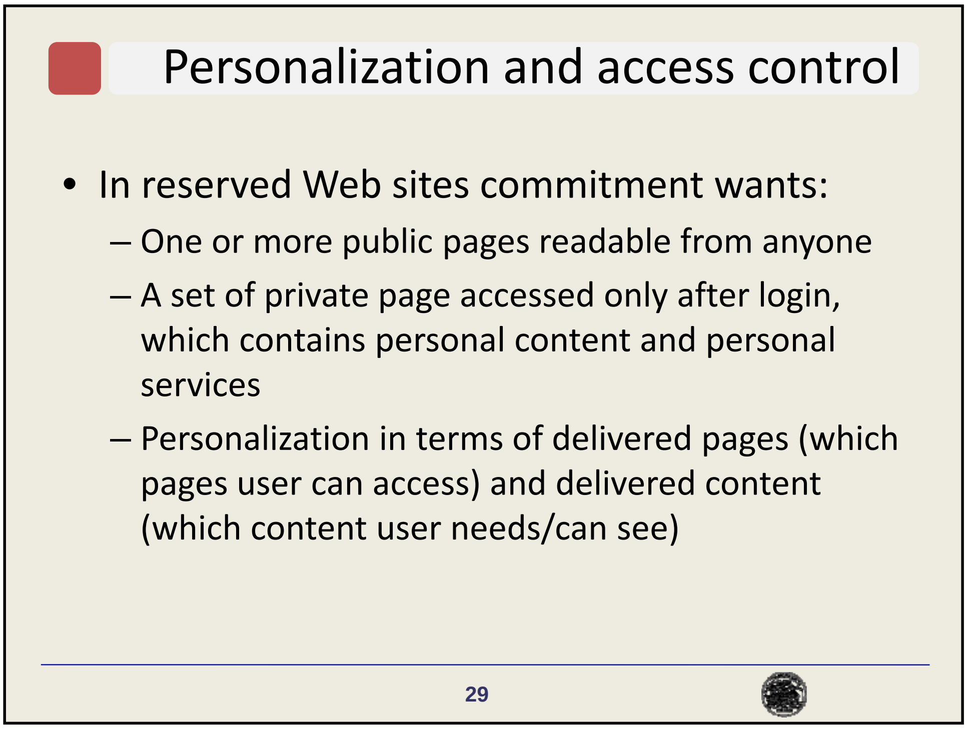


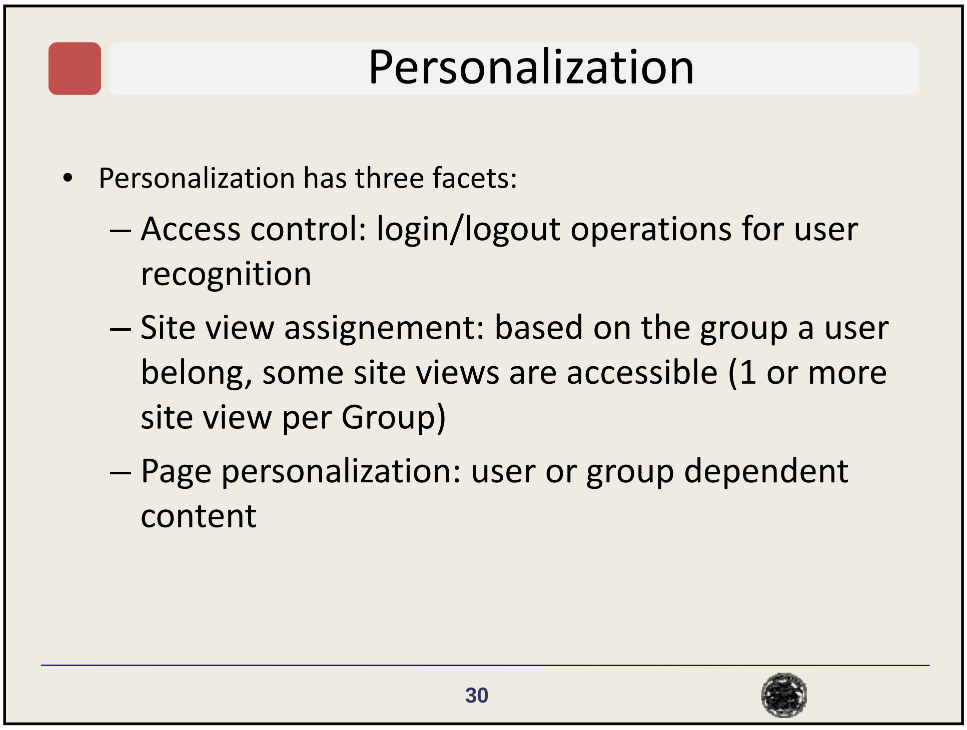
Example

28



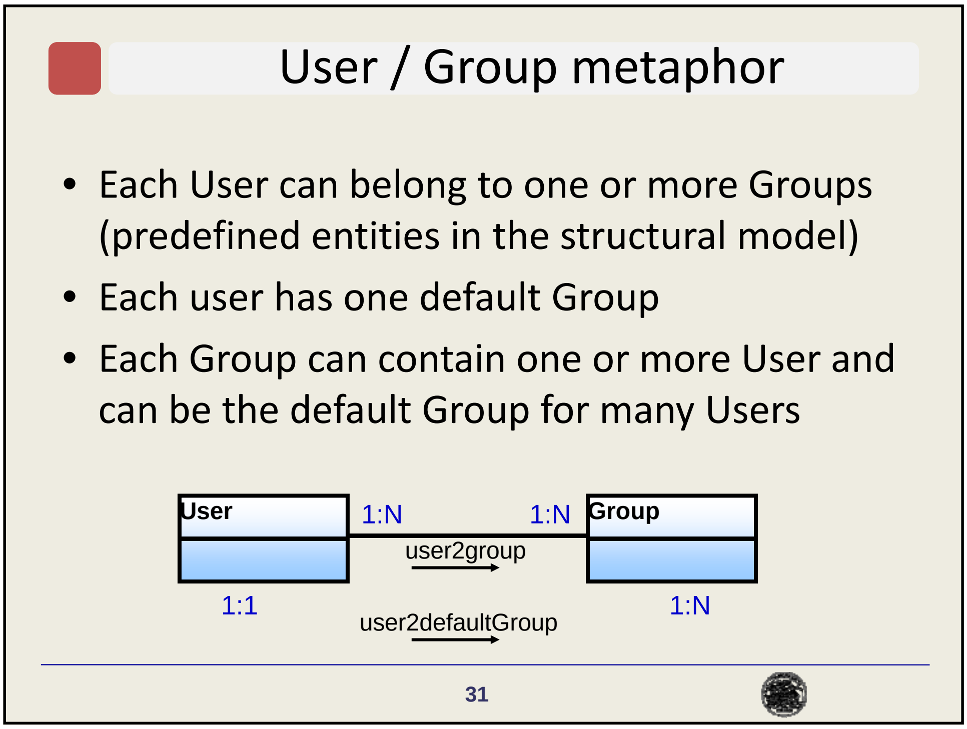
Personalization and access control

- In reserved Web sites commitment wants:
  - One or more public pages readable from anyone
  - A set of private page accessed only after login, which contains personal content and personal services
  - Personalization in terms of delivered pages (which pages user can access) and delivered content (which content user needs/can see)



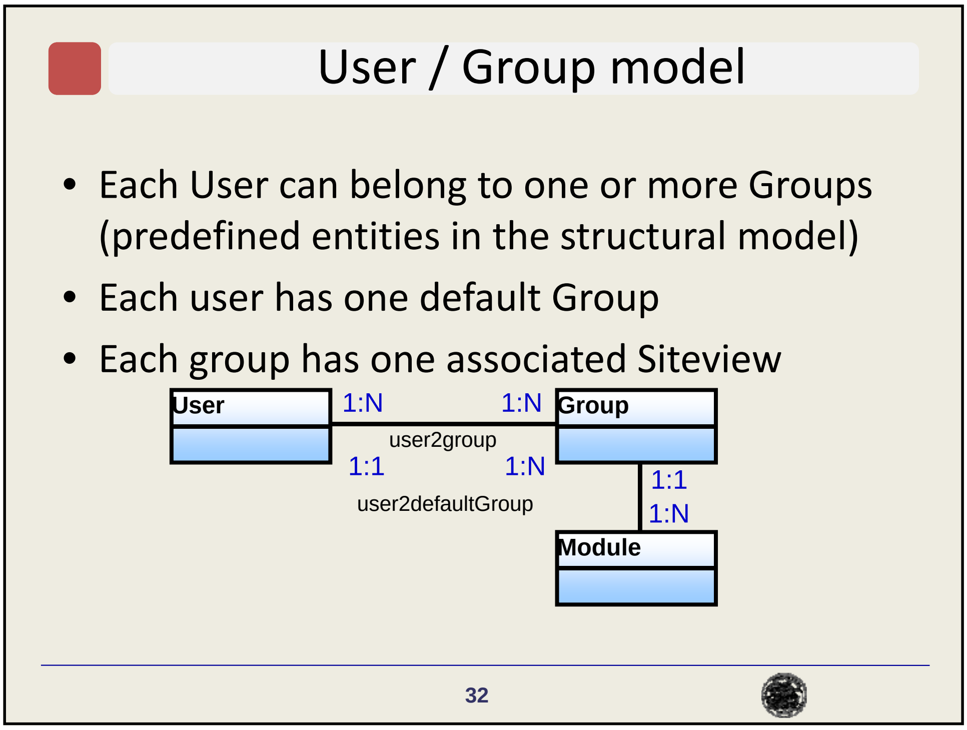
Personalization

- Personalization has three facets:
  - Access control: login/logout operations for user recognition
  - Site view assignement: based on the group a user belong, some site views are accessible (1 or more site view per Group)
  - Page personalization: user or group dependent content



User / Group metaphor

- Each User can belong to one or more Groups (predefined entities in the structural model)
- Each user has one default Group
- Each Group can contain one or more User and can be the default Group for many Users



User / Group model

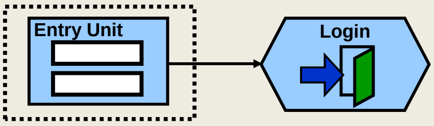
- Each User can belong to one or more Groups (predefined entities in the structural model)
- Each user has one default Group
- Each group has one associated Siteview

Anonymous access

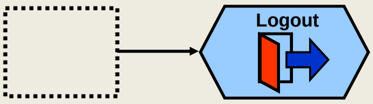
- One group is predefined (everyone)
- Users belonging to this group need not login, but access only unprotected site views, which has unprotected content (the “everyone” site views)
- Other site views can be accessed only after login (secured site views)

Login/ Logout

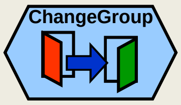
- A site-view may contain a page allowing users to login

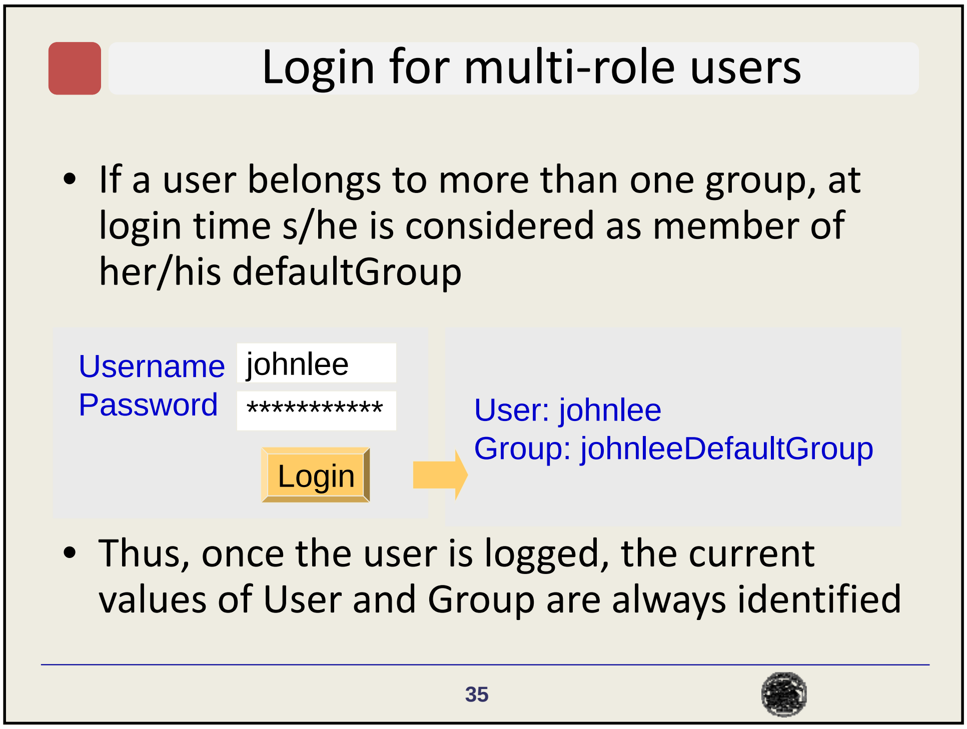


- Each secured site-view should allow users to logout



- Dynamic Role Changing (i.e. group) allowed





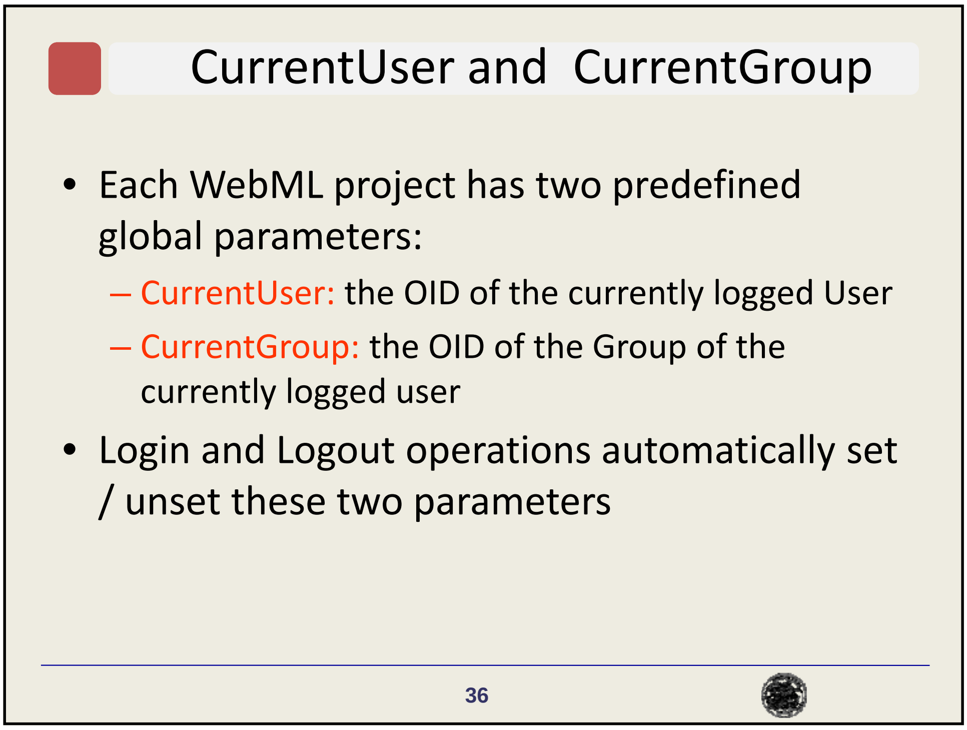
Login for multi-role users

- If a user belongs to more than one group, at login time s/he is considered as member of her/his defaultGroup

Username johnlee
Password ***********
Login

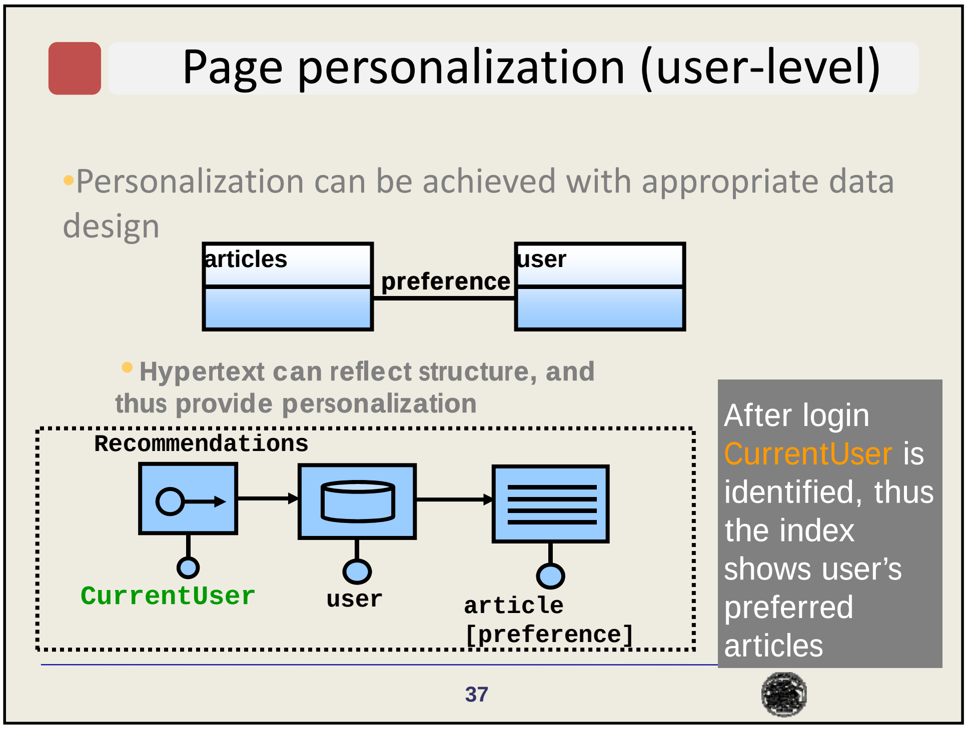
User: johnlee
Group: johnleeDefaultGroup

- Thus, once the user is logged, the current values of User and Group are always identified



CurrentUser and CurrentGroup

- Each WebML project has two predefined global parameters:
  - CurrentUser: the OID of the currently logged User
  - CurrentGroup: the OID of the Group of the currently logged user
- Login and Logout operations automatically set / unset these two parameters

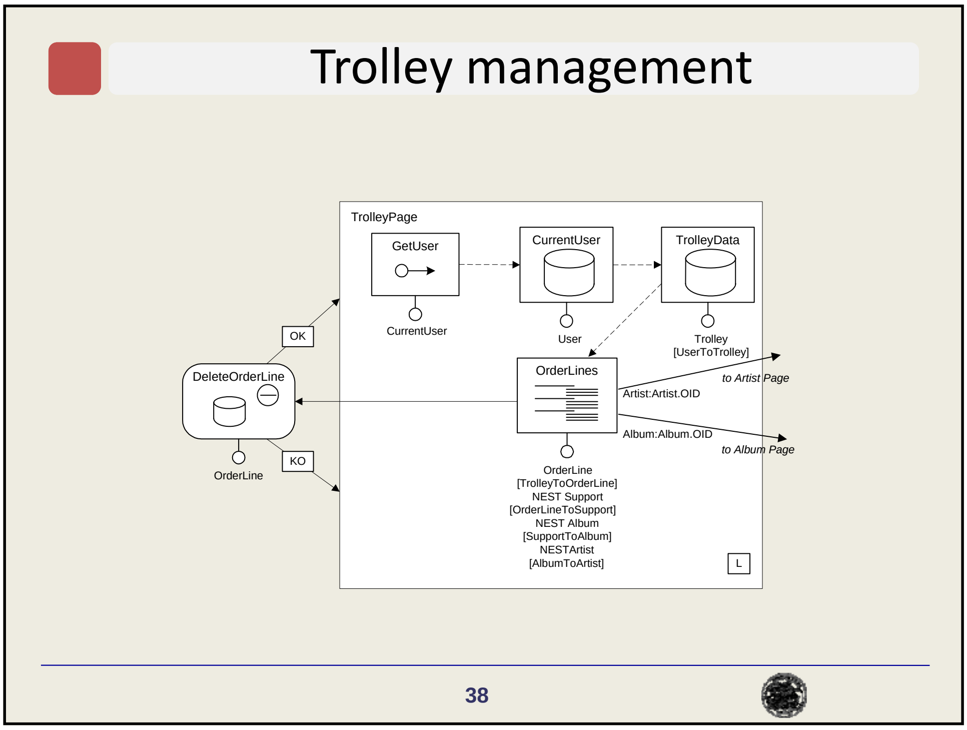


Page personalization (user-level)

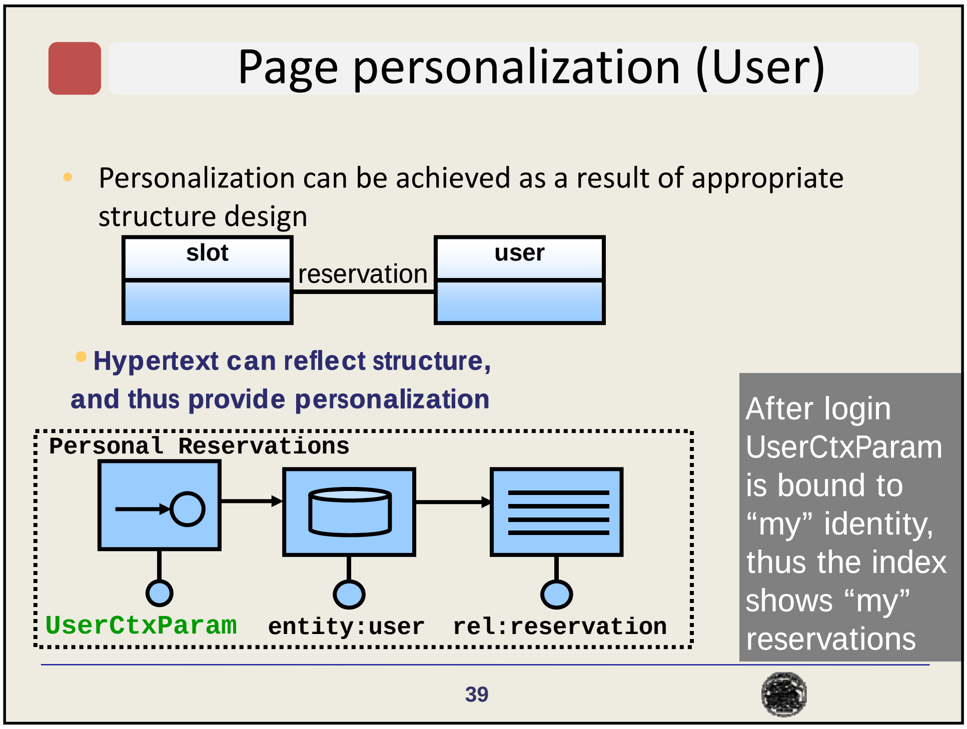
- Personalization can be achieved with appropriate data design

- Hypertext can reflect structure, and thus provide personalization

After login CurrentUser is identified, thus the index shows user's preferred articles



Trolley management

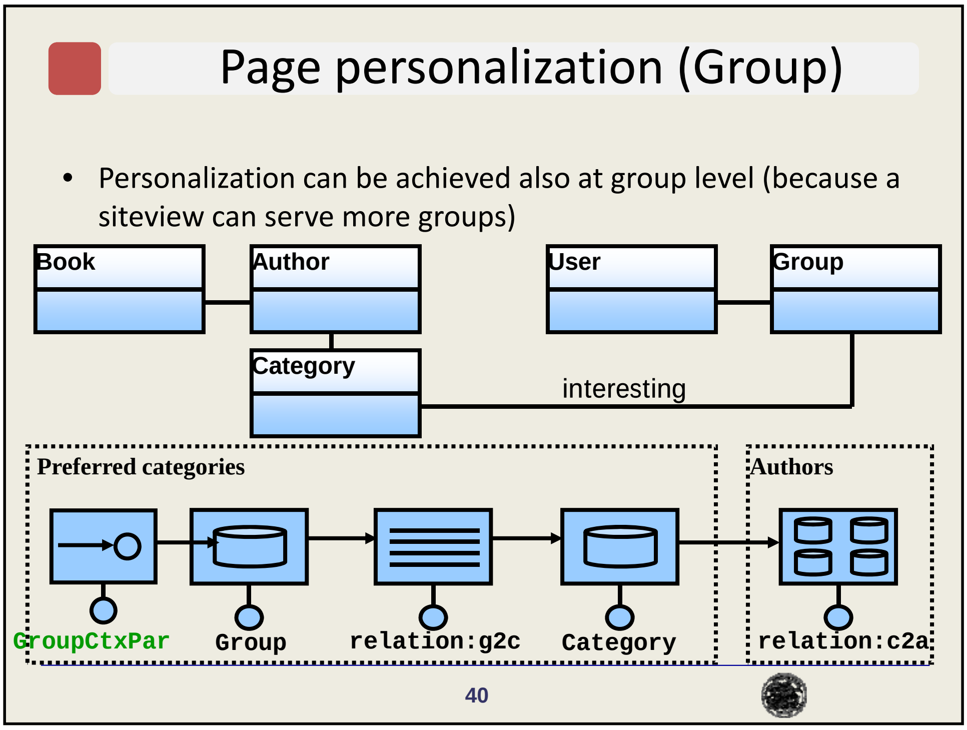


Page personalization (User)

- Personalization can be achieved as a result of appropriate structure design

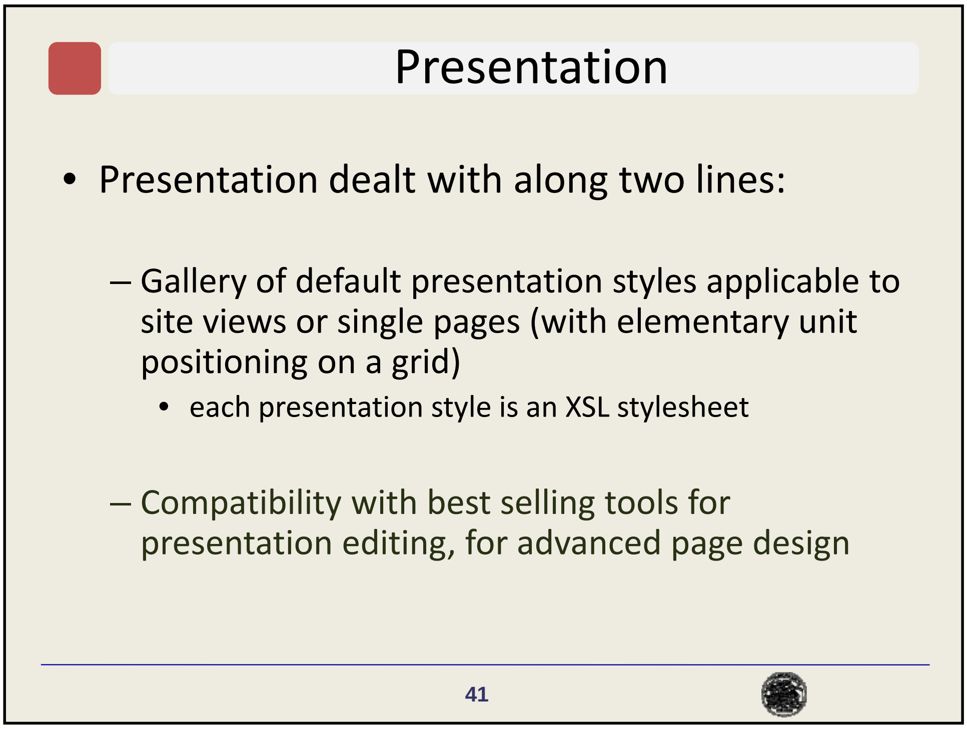
- **Hypertext can reflect structure, and thus provide personalization**

After login UserCtxParam is bound to “my” identity, thus the index shows “my” reservations



Page personalization (Group)

- Personalization can be achieved also at group level (because a siteview can serve more groups)



Presentation

- Presentation dealt with along two lines:
  - Gallery of default presentation styles applicable to site views or single pages (with elementary unit positioning on a grid)
    - each presentation style is an XSL stylesheet
  - Compatibility with best selling tools for presentation editing, for advanced page design

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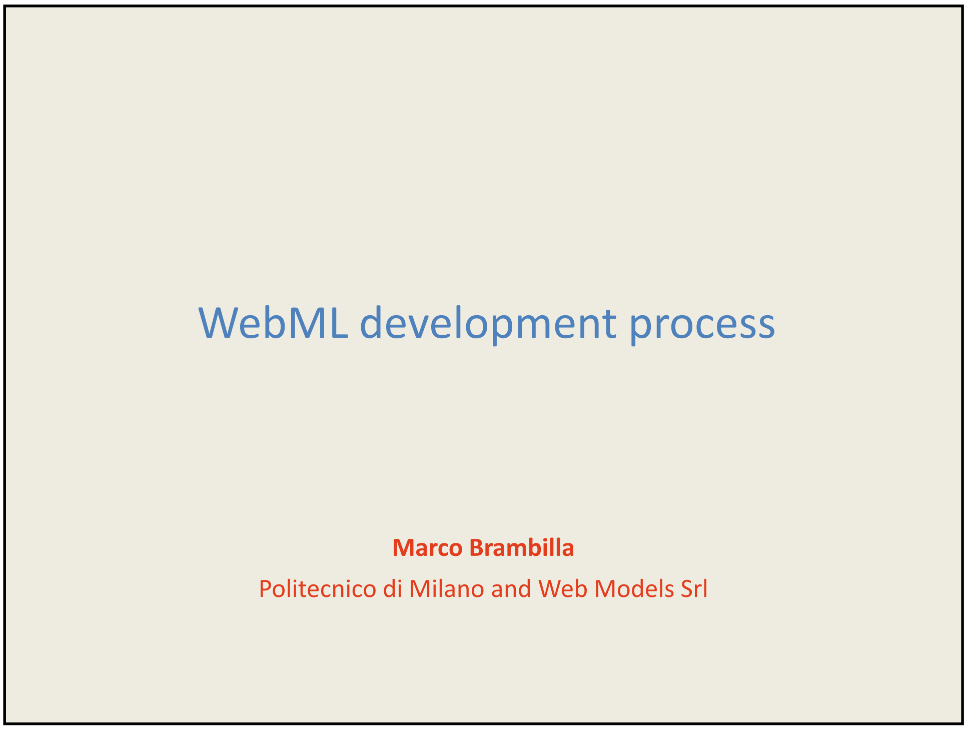

WebML development process

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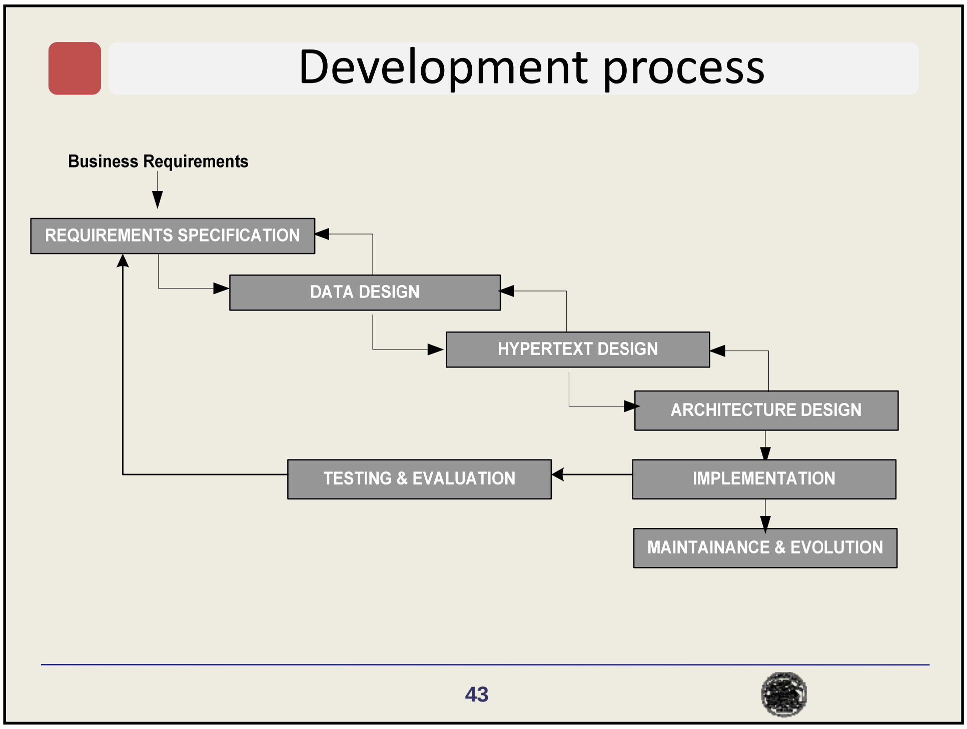
Politecnico di Milano and Web Models Srl



Development process

Business Requirements

REQUIREMENTS SPECIFICATION

DATA DESIGN

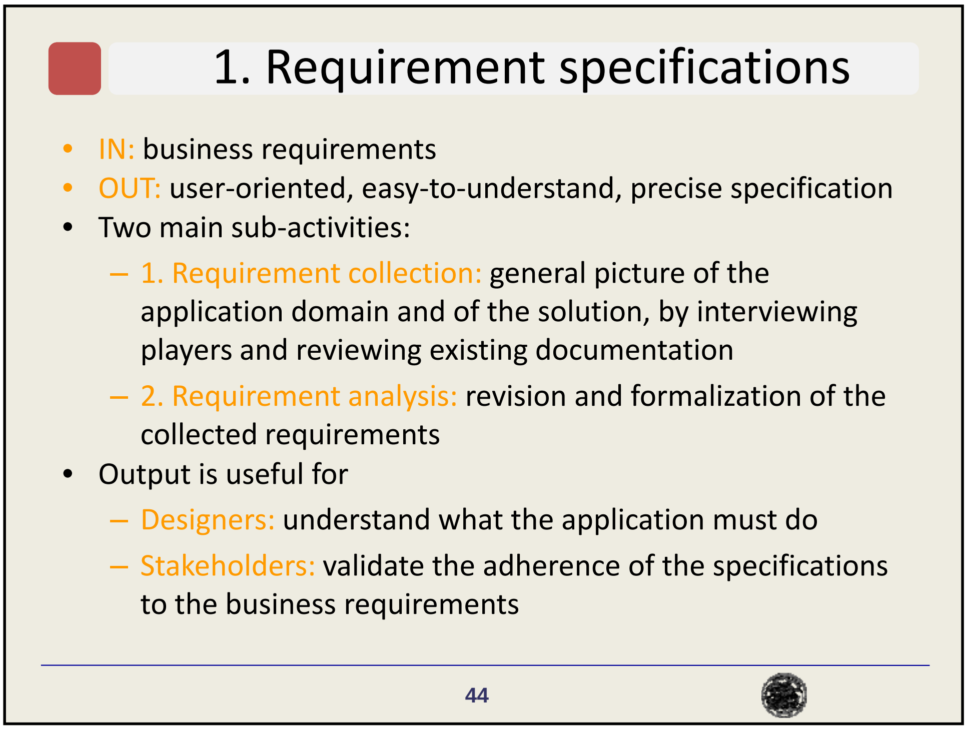
HYPERTEXT DESIGN

ARCHITECTURE DESIGN

IMPLEMENTATION

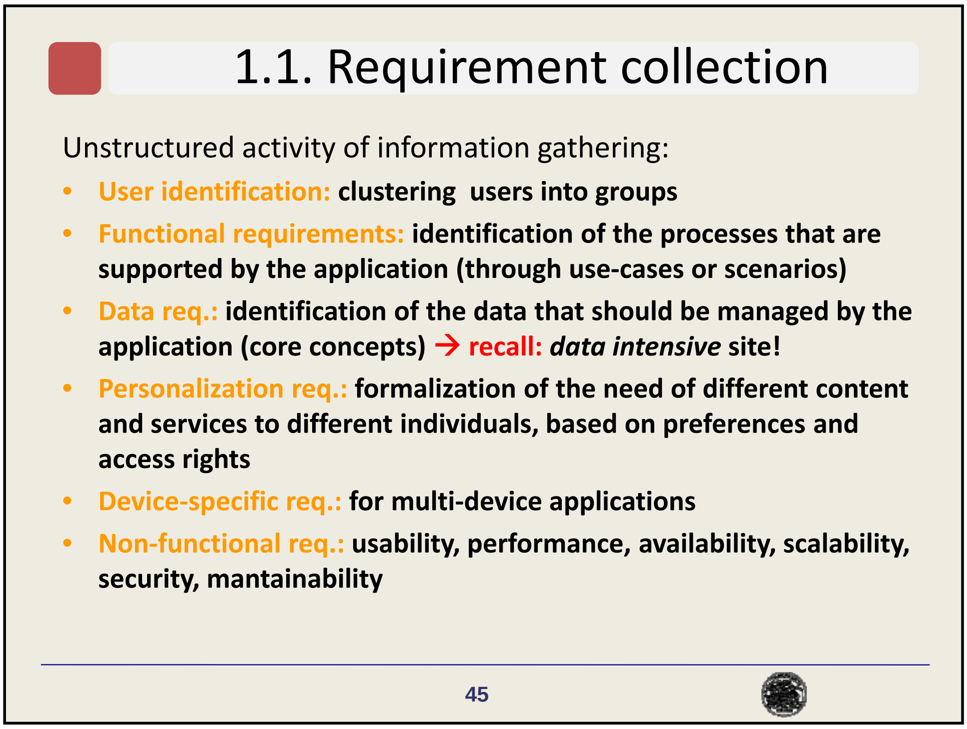
TESTING & EVALUATION

MAINTAINANCE & EVOLUTION



1. Requirement specifications

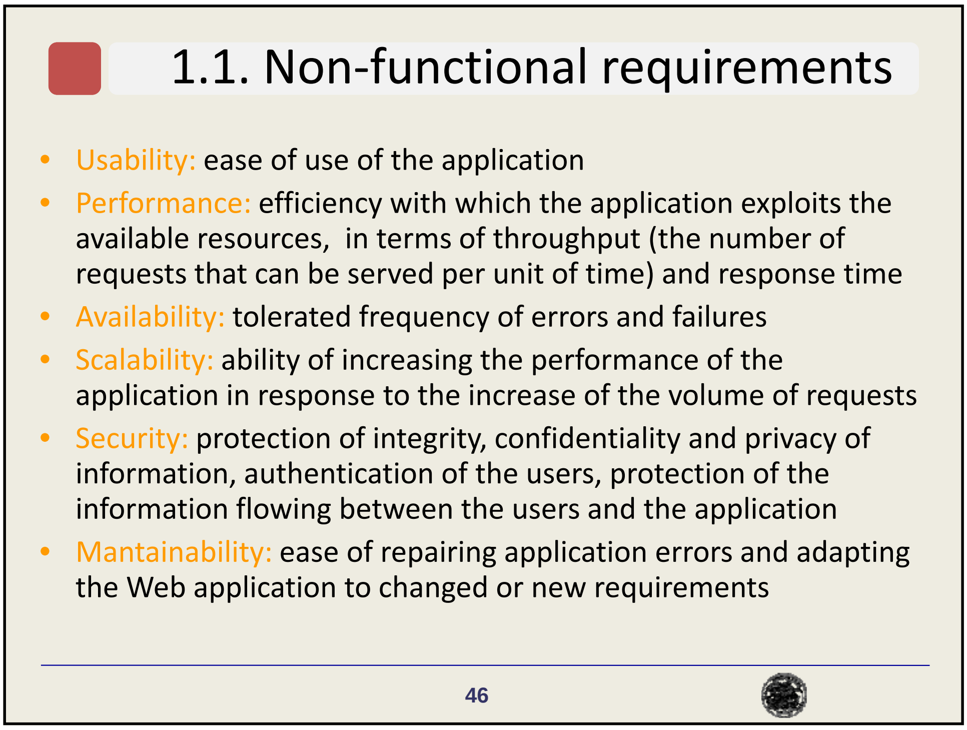
- IN: business requirements
- OUT: user-oriented, easy-to-understand, precise specification
- Two main sub-activities:
  - 1. Requirement collection: general picture of the application domain and of the solution, by interviewing players and reviewing existing documentation
  - 2. Requirement analysis: revision and formalization of the collected requirements
- Output is useful for
  - Designers: understand what the application must do
  - Stakeholders: validate the adherence of the specifications to the business requirements



1.1. Requirement collection

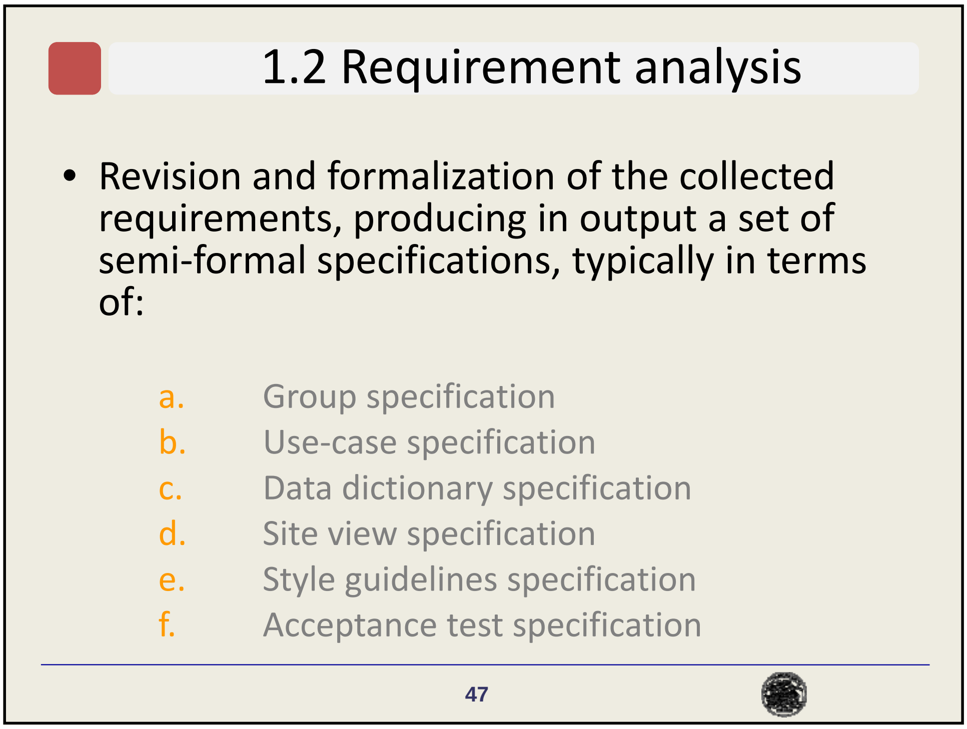
Unstructured activity of information gathering:

- User identification: **clustering users into groups**
- Functional requirements: **identification of the processes that are supported by the application (through use-cases or scenarios)**
- Data req.: **identification of the data that should be managed by the application (core concepts) → recall: *data intensive* site!**
- Personalization req.: **formalization of the need of different content and services to different individuals, based on preferences and access rights**
- Device-specific req.: **for multi-device applications**
- Non-functional req.: **usability, performance, availability, scalability, security, mantainability**



1.1. Non-functional requirements

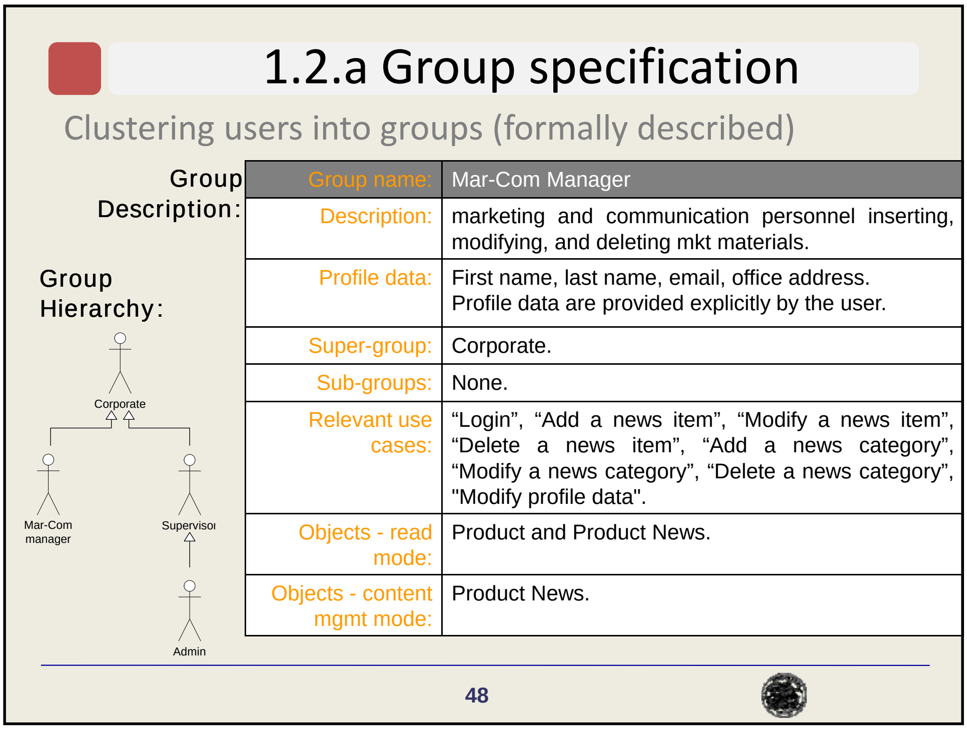
- Usability: ease of use of the application
- Performance: efficiency with which the application exploits the available resources, in terms of throughput (the number of requests that can be served per unit of time) and response time
- Availability: tolerated frequency of errors and failures
- Scalability: ability of increasing the performance of the application in response to the increase of the volume of requests
- Security: protection of integrity, confidentiality and privacy of information, authentication of the users, protection of the information flowing between the users and the application
- Mantainability: ease of repairing application errors and adapting the Web application to changed or new requirements



1.2 Requirement analysis

- Revision and formalization of the collected requirements, producing in output a set of semi-formal specifications, typically in terms of:

  a. Group specification
  b. Use-case specification
  c. Data dictionary specification
  d. Site view specification
  e. Style guidelines specification
  f. Acceptance test specification


Corporate
Mar-Com manager
Supervisor
Admin

1.2.a Group specification

Clustering users into groups (formally described)

Group Description:

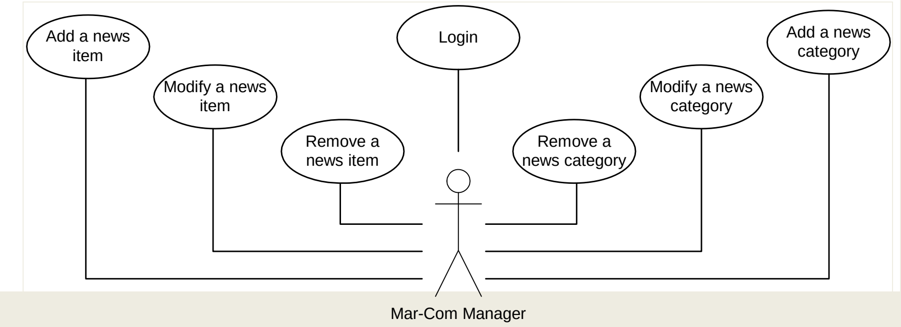
Group Hierarchy:

Group name:	Mar-Com Manager
Description:	marketing and communication personnel inserting, modifying, and deleting mkt materials.
Profile data:	First name, last name, email, office address. Profile data are provided explicitly by the user.
Super-group:	Corporate.
Sub-groups:	None.
Relevant use cases:	“Login”, “Add a news item”, “Modify a news item”, “Delete a news item”, “Add a news category”, “Modify a news category”, “Delete a news category”, "Modify profile data".
Objects - read mode:	Product and Product News.
Objects - content mgmt mode:	Product News.

1.2.b Use-case specification

Formal description of units of interaction with the application by users of a given group (e.g., thru tables or UML diagrams)

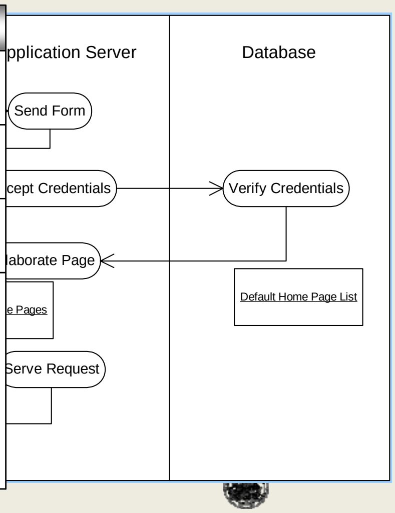
1. Use case list for a user (use case diagram)



1.2.b Use-case specification

2. Single use case specification (table or activity diagram)

Title	Login of user belonging to multiple groups
Purpose	To express how users with more than one role access the functions of the applications.
Pre-condition	A user that belongs to multiple groups is registered. For each group, the site view serving the requirements of the group members is defined.
Post-condition	The user successfully logs into the application and accesses the site view corresponding to one of his groups.
Workflow	The following steps must be performed: 1.The user receives an input form asking for username and password; 2.The user inputs his credentials; 3.If the credentials are correct, the user is authenticated, the list of groups the user belongs to is determined, and the list of names and URLs of the home pages of the site view of such groups is displayed to user; 4.The user chooses one entry from the list, and enters into the selected site view.



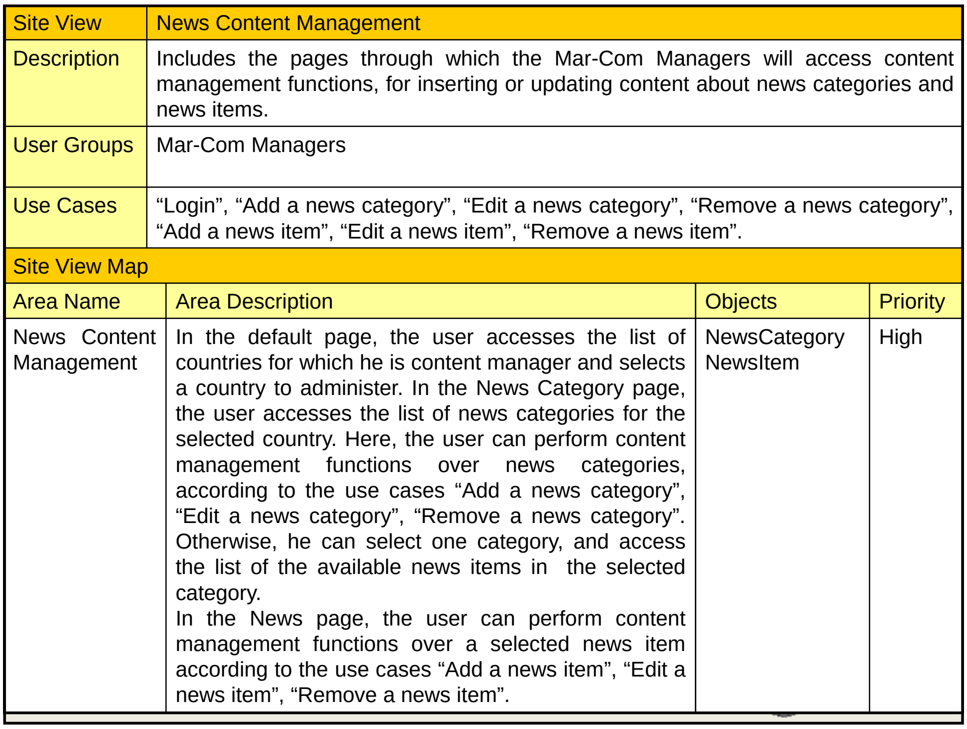
1.2.c Data dictionary specification

- List of the main information objects identified during data requirements collection
- Each entry can be spec
  - Name
  - Synonyms
  - Description
  - Sample instances
  - Properties
  - Relationships
  - Components
  - Super-concept
  - Sub-concepts

- *NewsItem*
- *Piece of news*
- *A corporate or product piece of news*
- *TravelMate 610 launched, 20th June 01*
- *Title, Body, Image, Date, …*
- *NewsToProduct*
- *None*
- *None*
- *Highlighted news*

1.2.d Site view specification (site map)

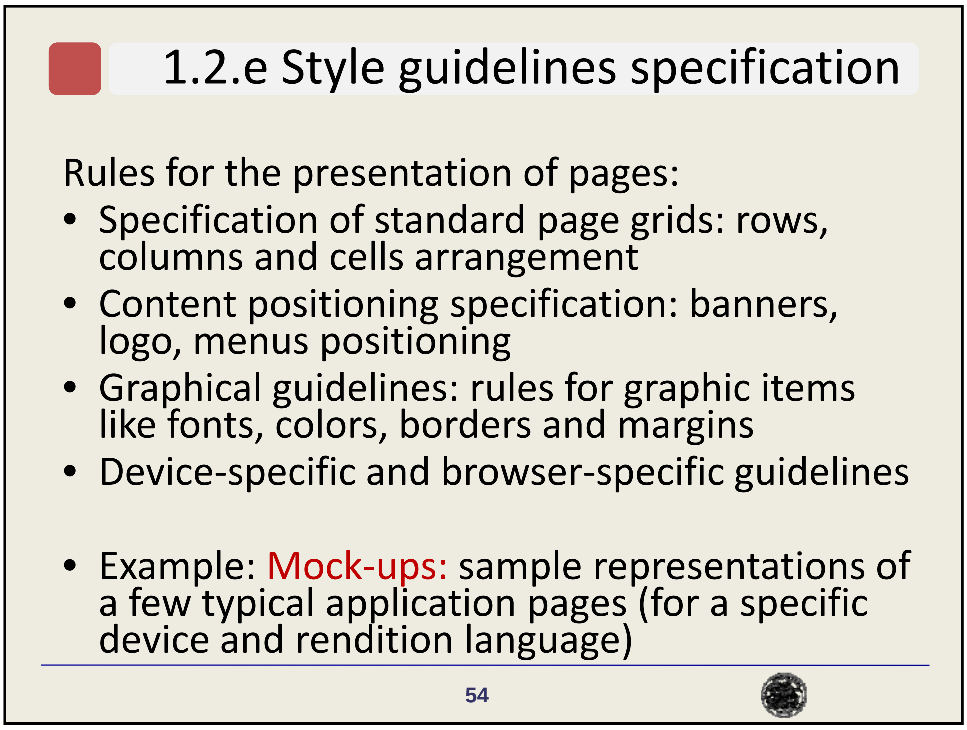
- IN: list of user groups, list of use cases, data dictionary
- OUT: list of needed site views, specified by:
  - Name
  - Description
  - Target User Groups
  - Implemented use cases
  - Site view map: a table illustrating the different areas that compose the site view. Each area is specified by:
    - Area Name
    - Area Description
    - Accessed/Managed Objects
    - Priority level



Site View	News Content Management
Description	Includes the pages through which the Mar-Com Managers will access content management functions, for inserting or updating content about news categories and news items.
User Groups	Mar-Com Managers
Use Cases	“Login”, “Add a news category”, “Edit a news category”, “Remove a news category”, “Add a news item”, “Edit a news item”, “Remove a news item”.

Site View Map

Area Name	Area Description	Objects	Priority
News Content Management	In the default page, the user accesses the list of countries for which he is content manager and selects a country to administer. In the News Category page, the user accesses the list of news categories for the selected country. Here, the user can perform content management functions over news categories, according to the use cases “Add a news category”, “Edit a news category”, “Remove a news category”. Otherwise, he can select one category, and access the list of the available news items in the selected category. In the News page, the user can perform content management functions over a selected news item according to the use cases “Add a news item”, “Edit a news item”, “Remove a news item”.	NewsCategory NewsItem	High



1.2.e Style guidelines specification

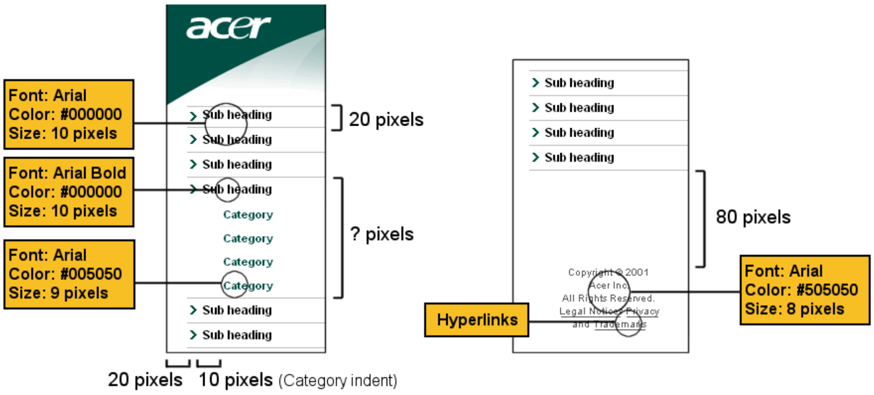
Rules for the presentation of pages:

- Specification of standard page grids: rows, columns and cells arrangement
- Content positioning specification: banners, logo, menus positioning
- Graphical guidelines: rules for graphic items like fonts, colors, borders and margins
- Device-specific and browser-specific guidelines

- Example: Mock-ups: sample representations of a few typical application pages (for a specific device and rendition language)

1.2.e Style guidelines specification

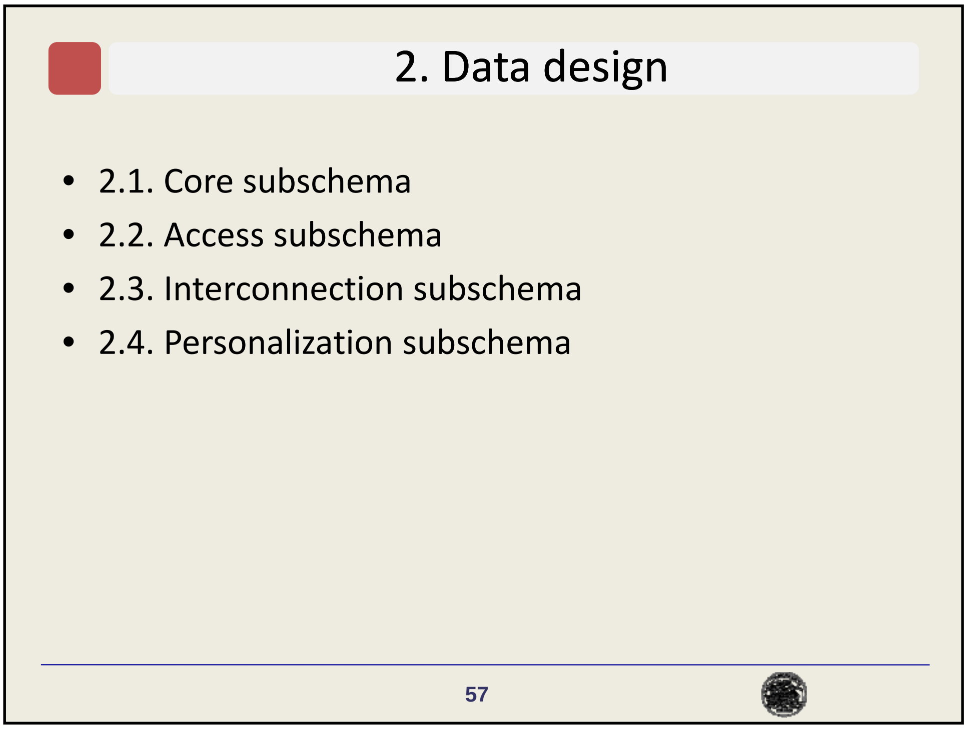
Graphical guidelines:



1.2.e Acceptance tests specification

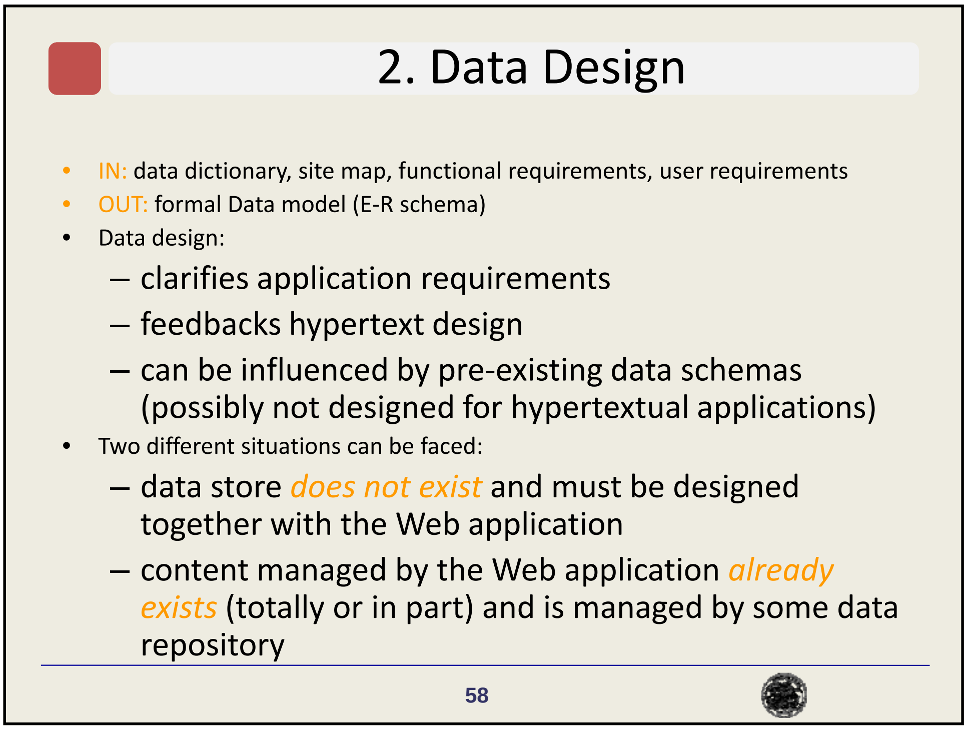
Formalization into a plan of acceptance tests of non-functional requirements about:

- performance
- availability
- scalability
- security
- maintainability



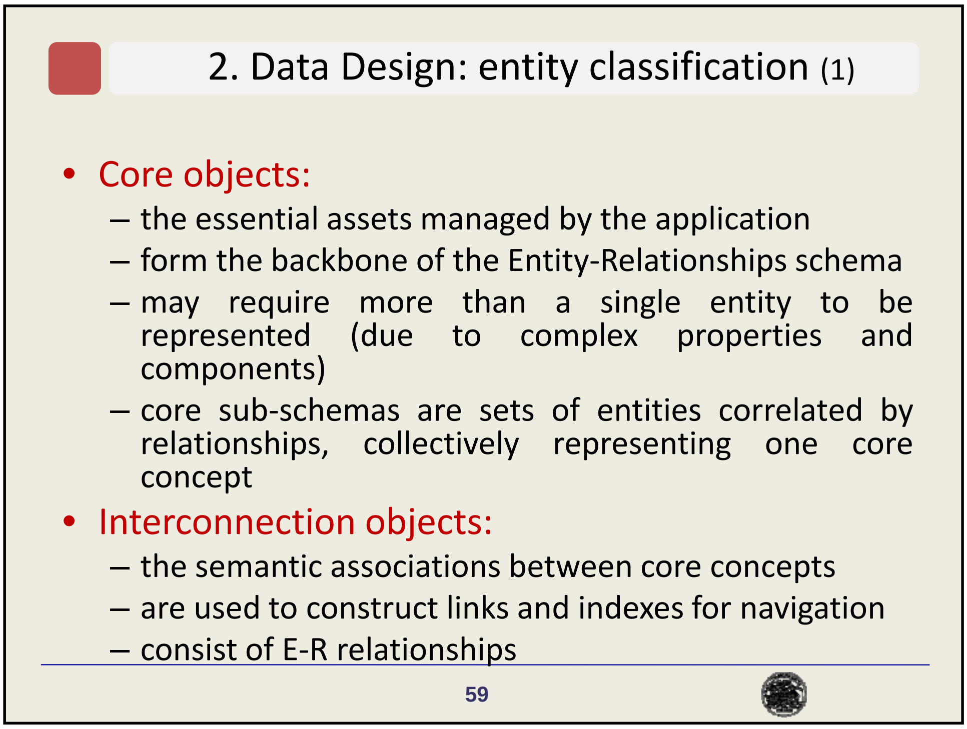
2. Data design

- 2.1. Core subschema
- 2.2. Access subschema
- 2.3. Interconnection subschema
- 2.4. Personalization subschema



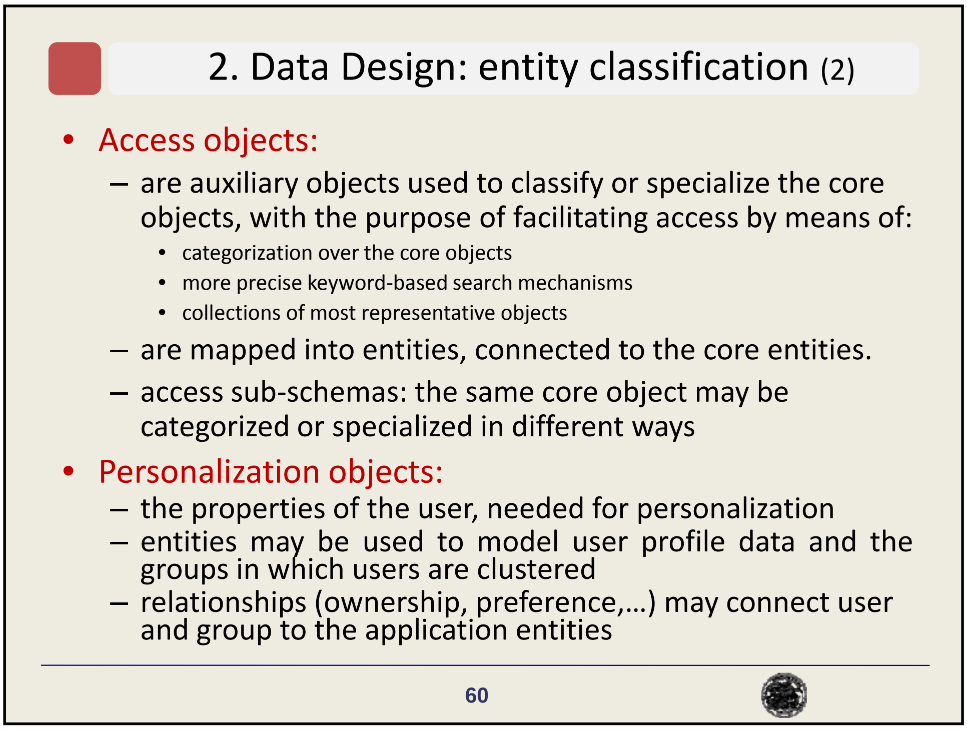
2. Data Design

- IN: data dictionary, site map, functional requirements, user requirements
- OUT: formal Data model (E-R schema)
- Data design:
  - clarifies application requirements
  - feedbacks hypertext design
  - can be influenced by pre-existing data schemas (possibly not designed for hypertextual applications)
- Two different situations can be faced:
  - data store *does not exist* and must be designed together with the Web application
  - content managed by the Web application *already exists* (totally or in part) and is managed by some data repository



2. Data Design: entity classification (1)

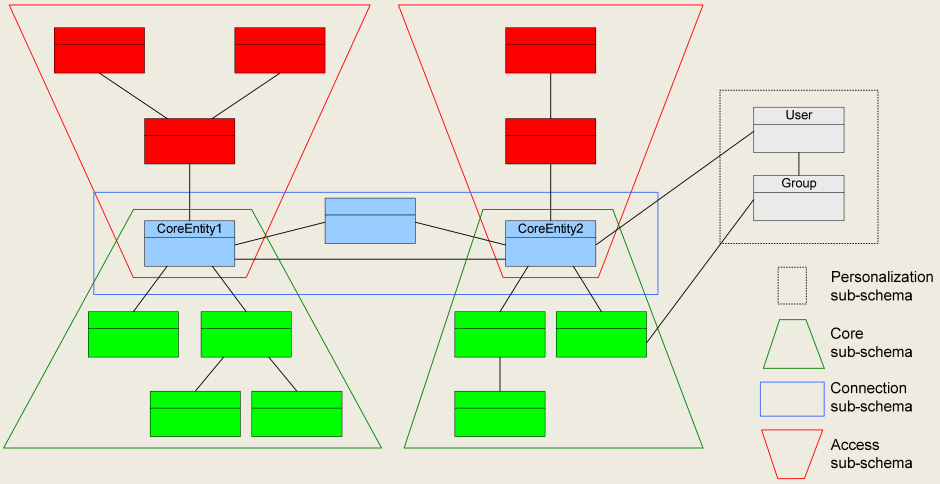
- Core objects:
  - the essential assets managed by the application
  - form the backbone of the Entity-Relationships schema
  - may require more than a single entity to be represented (due to complex properties and components)
  - core sub-schemas are sets of entities correlated by relationships, collectively representing one core concept
- Interconnection objects:
  - the semantic associations between core concepts
  - are used to construct links and indexes for navigation
  - consist of E-R relationships



2. Data Design: entity classification (2)

- Access objects:
  - are auxiliary objects used to classify or specialize the core objects, with the purpose of facilitating access by means of:
    - categorization over the core objects
    - more precise keyword-based search mechanisms
    - collections of most representative objects
  - are mapped into entities, connected to the core entities.
  - access sub-schemas: the same core object may be categorized or specialized in different ways
- Personalization objects:
  - the properties of the user, needed for personalization
  - entities may be used to model user profile data and the groups in which users are clustered
  - relationships (ownership, preference,…) may connect user and group to the application entities

2. Data Design: entity classification (3)

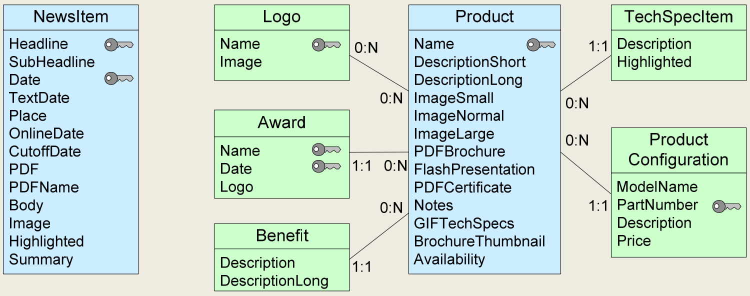


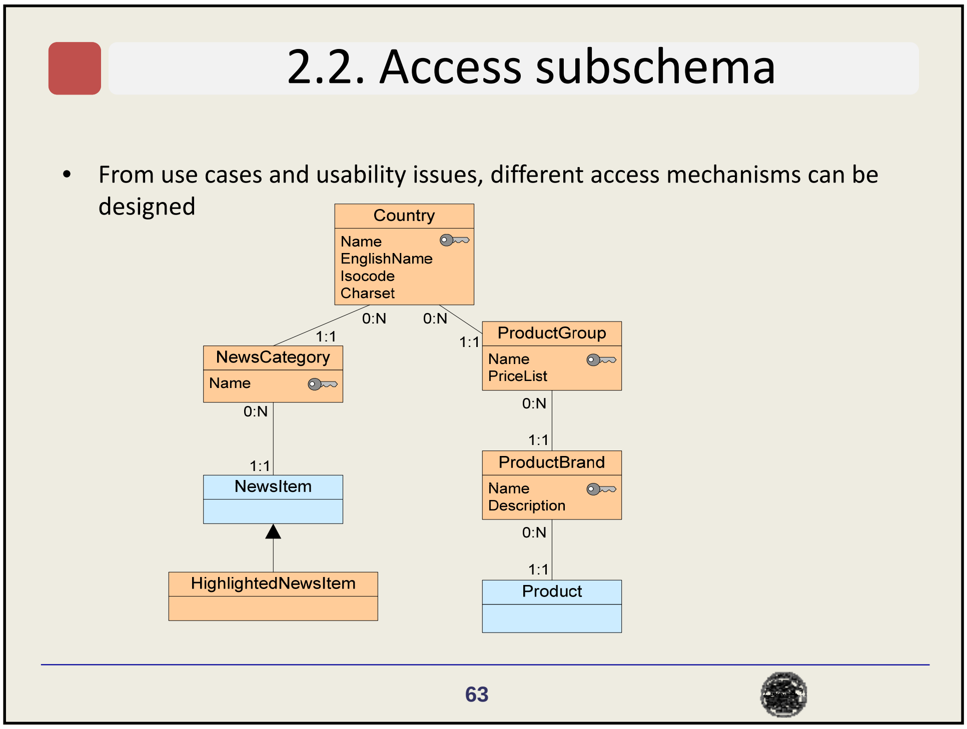
2.1. Core subschema

- Core entity identification: from data dictionary and the other requirements

NewsItem
Product

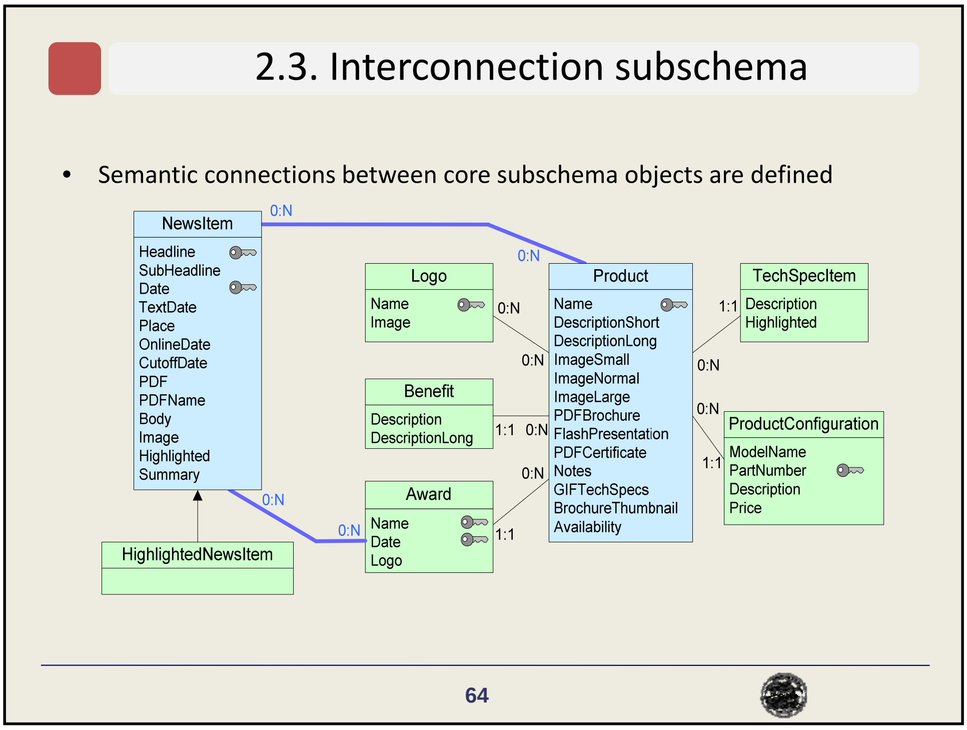
- Detailed design of core subschema: attributes, components and relationships





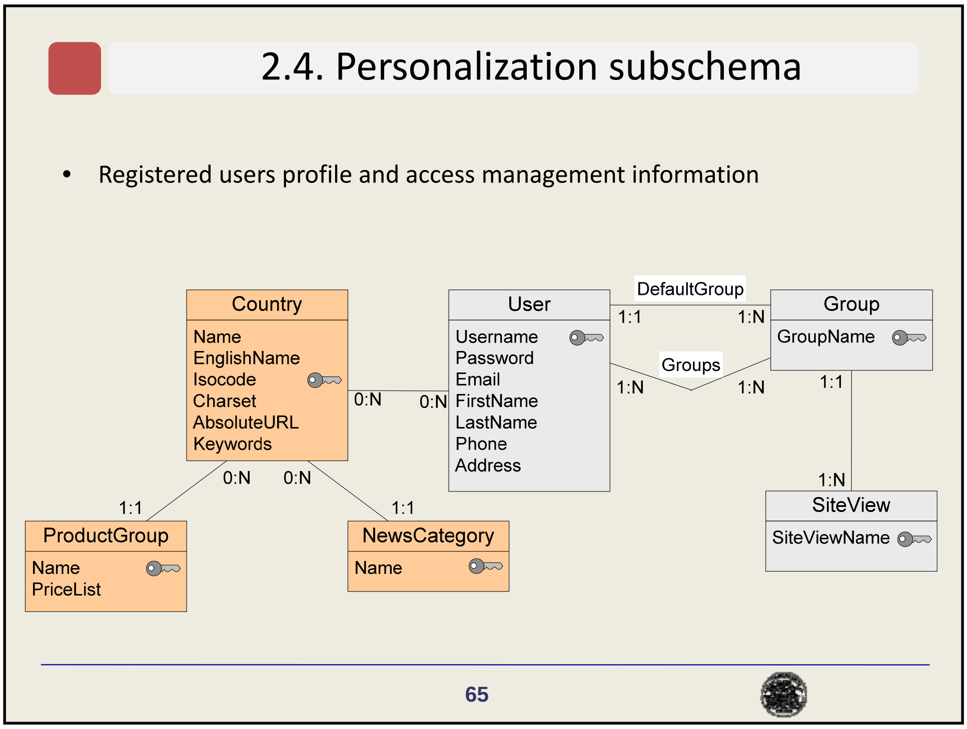
2.2. Access subschema

- From use cases and usability issues, different access mechanisms can be designed



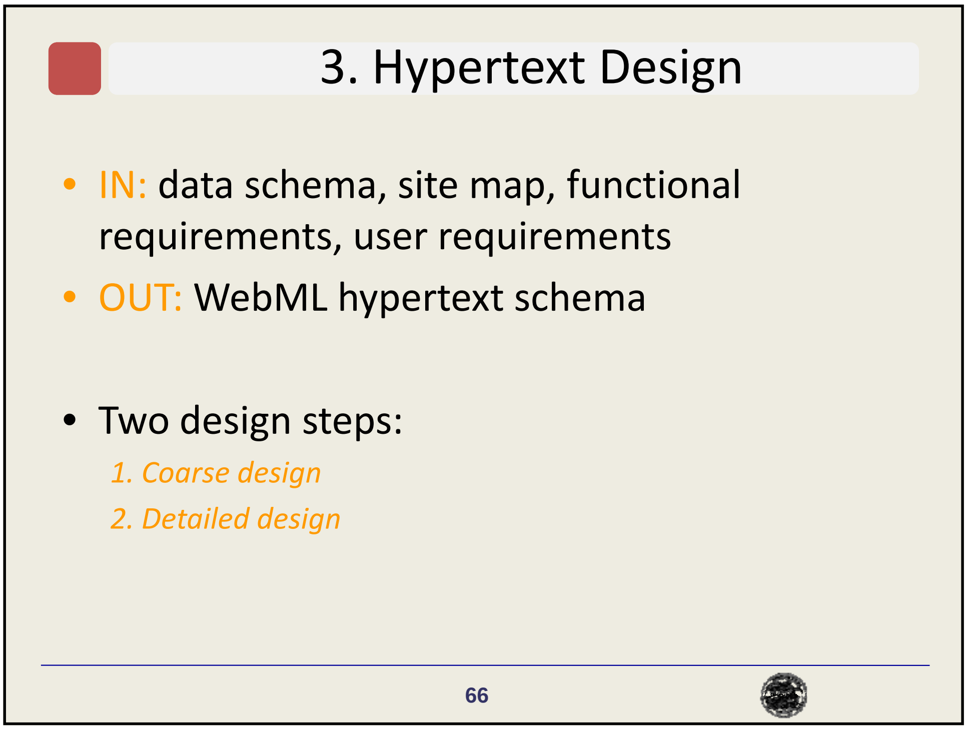
2.3. Interconnection subschema

- Semantic connections between core subschema objects are defined



2.4. Personalization subschema

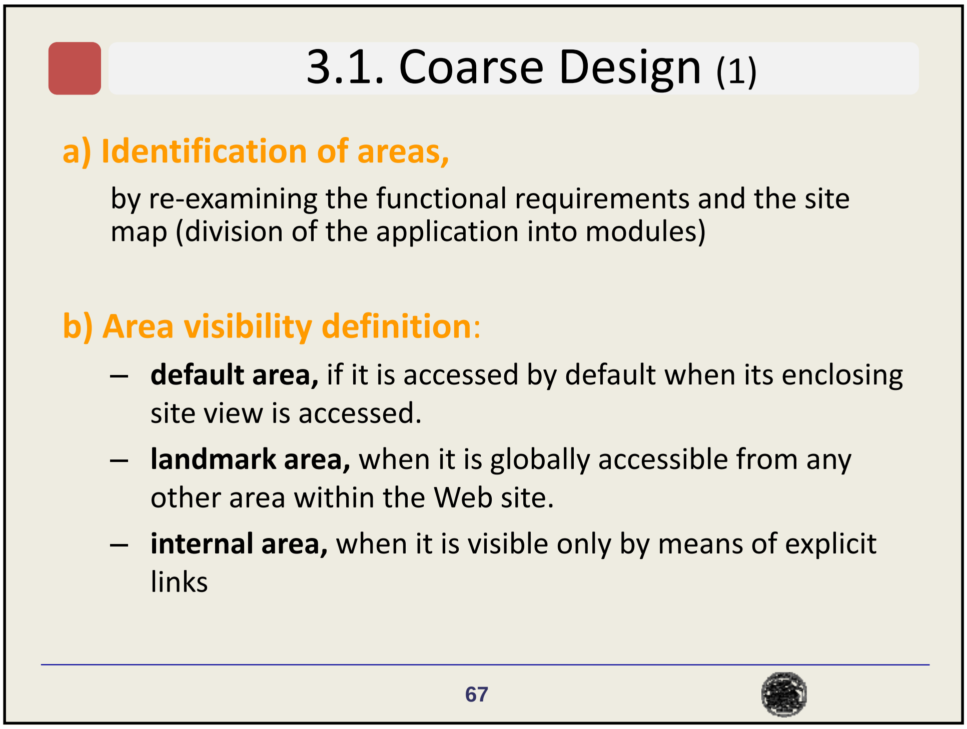
- Registered users profile and access management information



3. Hypertext Design

- IN: data schema, site map, functional requirements, user requirements
- OUT: WebML hypertext schema

- Two design steps:
  1. *Coarse design*
  2. *Detailed design*



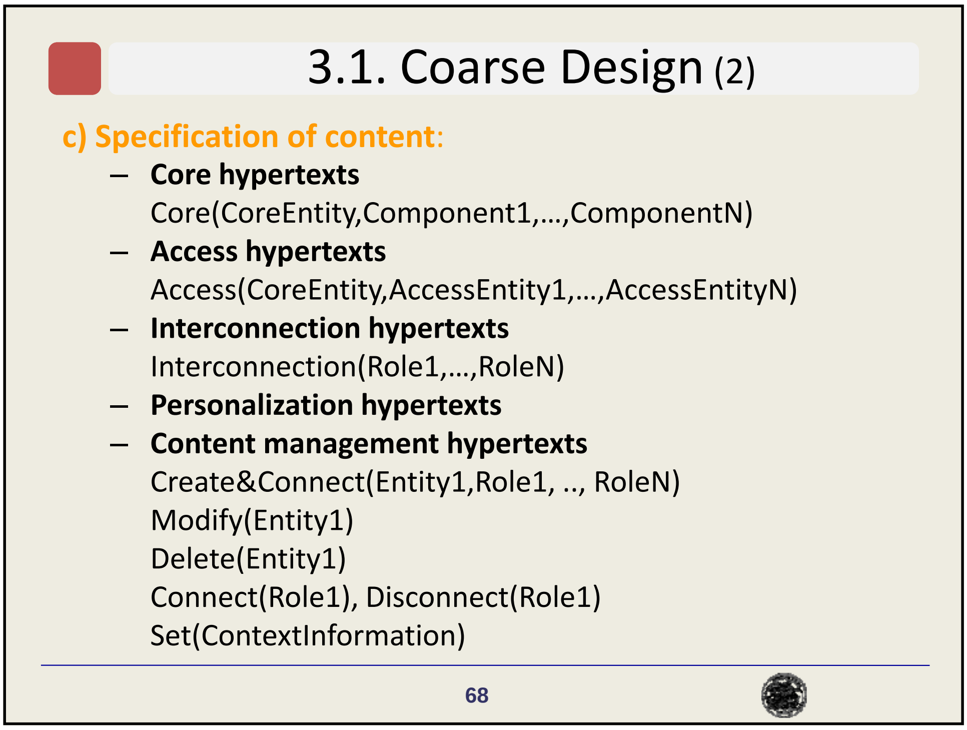
3.1. Coarse Design (1)

a) Identification of areas,

by re-examining the functional requirements and the site map (division of the application into modules)

b) Area visibility definition:

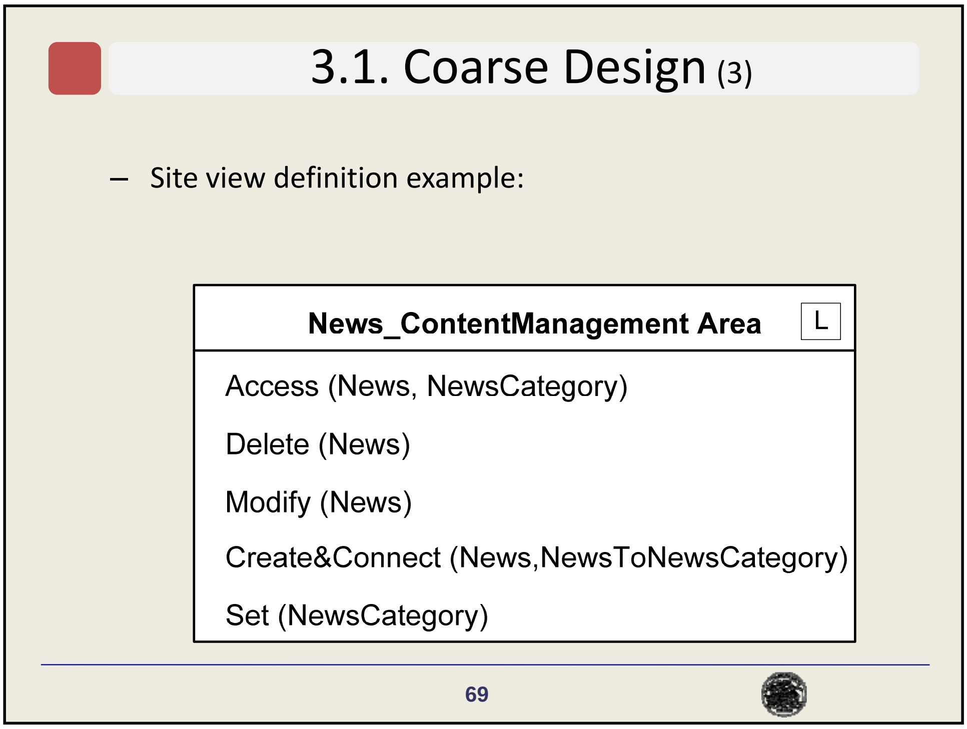
- **default area,** if it is accessed by default when its enclosing site view is accessed.
- **landmark area,** when it is globally accessible from any other area within the Web site.
- **internal area,** when it is visible only by means of explicit links



3.1. Coarse Design (2)

c) Specification of content:

- **Core hypertexts**
  Core(CoreEntity,Component1,…,ComponentN)
- **Access hypertexts**
  Access(CoreEntity,AccessEntity1,…,AccessEntityN)
- **Interconnection hypertexts**
  Interconnection(Role1,…,RoleN)
- **Personalization hypertexts**
- **Content management hypertexts**
  Create&Connect(Entity1,Role1, .., RoleN)
  Modify(Entity1)
  Delete(Entity1)
  Connect(Role1), Disconnect(Role1)
  Set(ContextInformation)



3.1. Coarse Design (3)

- Site view definition example:

News_ContentManagement Area L

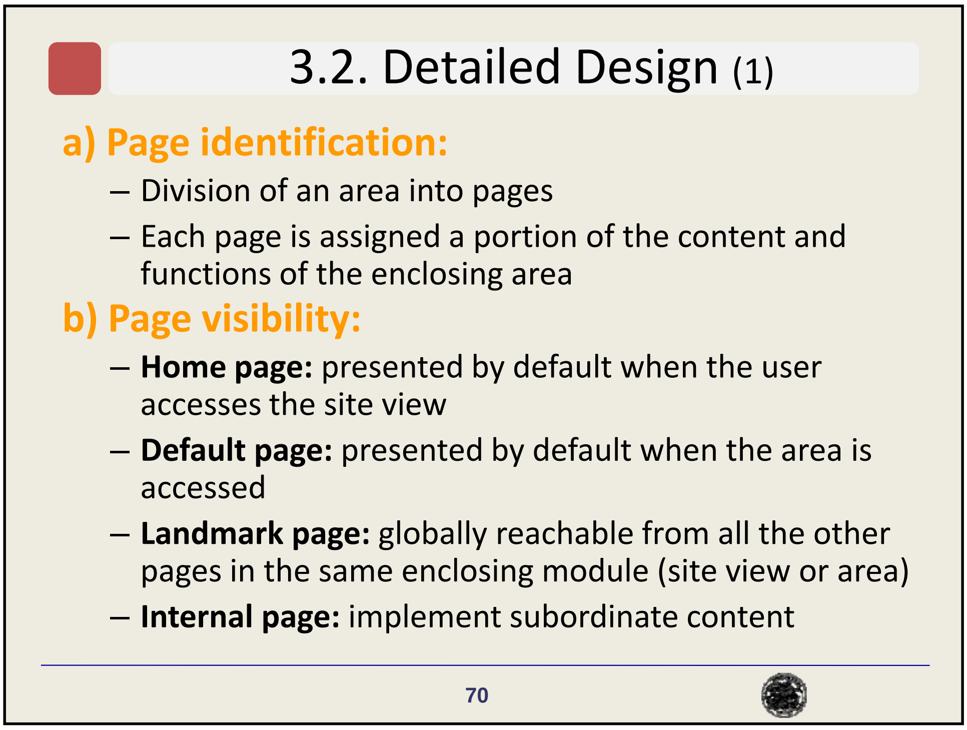
Access (News, NewsCategory)

Delete (News)

Modify (News)

Create&Connect (News,NewsToNewsCategory)

Set (NewsCategory)



3.2. Detailed Design (1)

a) Page identification:

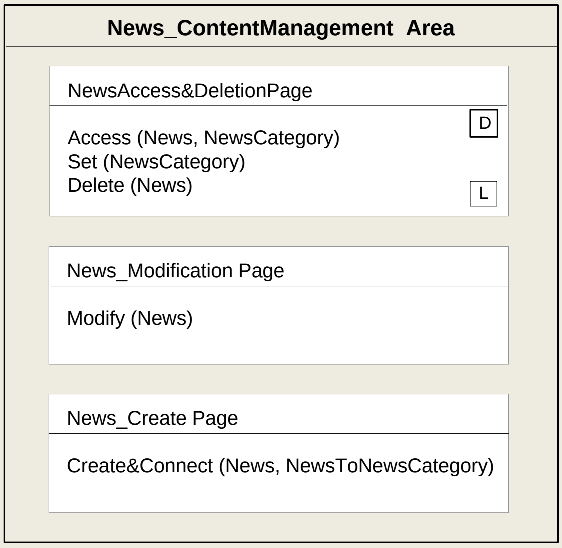
- Division of an area into pages
- Each page is assigned a portion of the content and functions of the enclosing area

b) Page visibility:

- **Home page:** presented by default when the user accesses the site view
- **Default page:** presented by default when the area is accessed
- **Landmark page:** globally reachable from all the other pages in the same enclosing module (site view or area)
- **Internal page:** implement subordinate content

3.2. Detailed Design (2)

- Example:



News_ContentManagement Area

NewsAccess&DeletionPage

Access (News, NewsCategory)
Set (NewsCategory)
Delete (News)

News_Modification Page

Modify (News)

News_Create Page

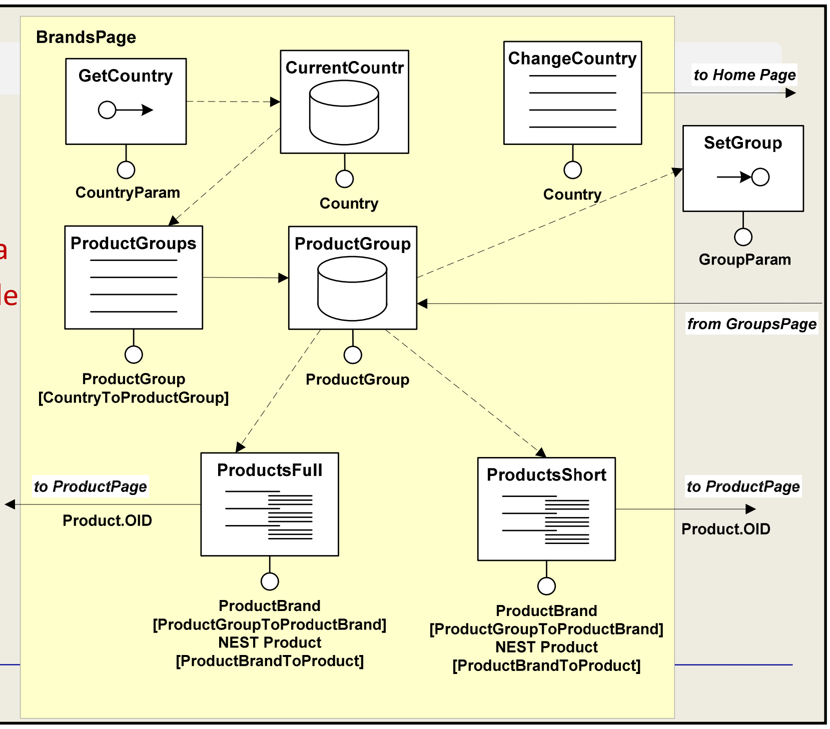
Create&Connect (News, NewsToNewsCategory)

3.2. Detailed Design (3)

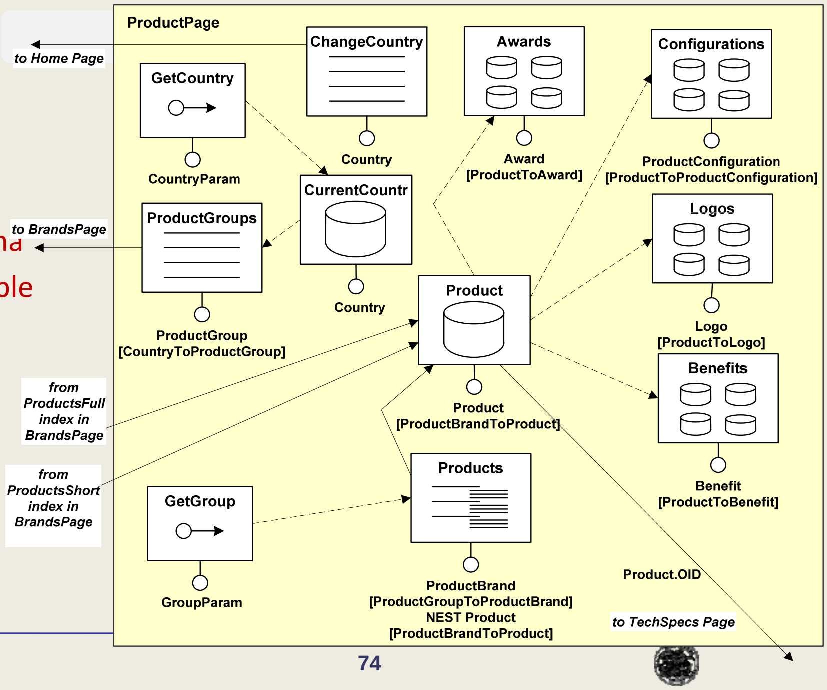
c) Page specification:

- Detailed specification of units and links necessary to deliver the content and services established in the coarse hypertext design
- Exploit some typical hypertext sub-schemas, which are hypertext design patterns
  - A core sub-schema
  - An interconnection sub-schema
  - An access sub-schema
  - The personalization sub-schema

access sub-schema example



core sub-schema example


ProductPage
to Home Page
GetCountry
CountryParam
ChangeCountry
Country
Awards
Award [ProductToAward]
Configurations
ProductConfiguration [ProductToProductConfiguration]
to BrandsPage
ProductGroups
ProductGroup [CountryToProductGroup]
CurrentCountr
Country
Logos
Logo [ProductToLogo]
Product
Product [ProductBrandToProduct]
Benefits
Benefit [ProductToBenefit]
from ProductsFull index in BrandsPage
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to TechSpecs Page

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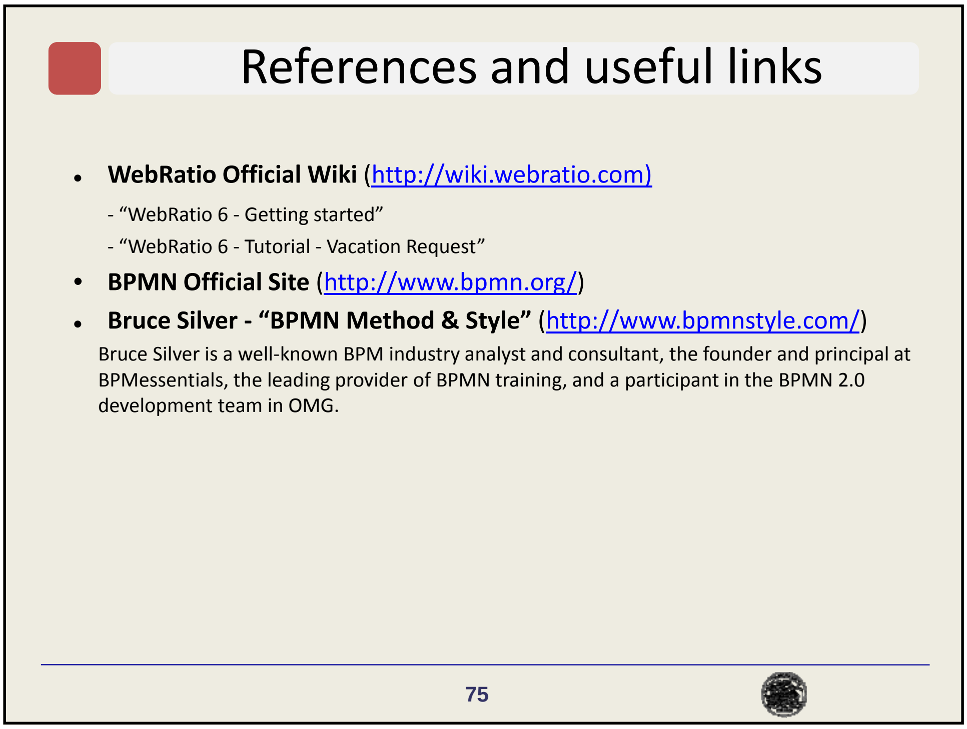

References and useful links

- **WebRatio Official Wiki** (http://wiki.webratio.com)
  - "WebRatio 6 - Getting started"
  - "WebRatio 6 - Tutorial - Vacation Request"
- **BPMN Official Site** (http://www.bpmn.org/)
- **Bruce Silver - "BPMN Method & Style"** (http://www.bpmnstyle.com/)

  Bruce Silver is a well-known BPM industry analyst and consultant, the founder and principal at BPMessentials, the leading provider of BPMN training, and a participant in the BPMN 2.0 development team in OMG.