CS577a
SSAD
9/18/02

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- Analysis: The What

For Non-Techie Stake-holders

- Design: The How

For Techie Stakeholders

1.1 Purpose of the System and Software Architecture Description Document (IOC)

The System and Software Architecture Description (SSAD) describes how the Wilson Dental Library New Book List (WDL-NBL) system requirements will be realized. The target audience for this system includes the primary programmers (Wenkuang Chang and Suim Hurr) and the maintainers (William Derby and Kenneth Martin).

1.2 Standards and Conventions

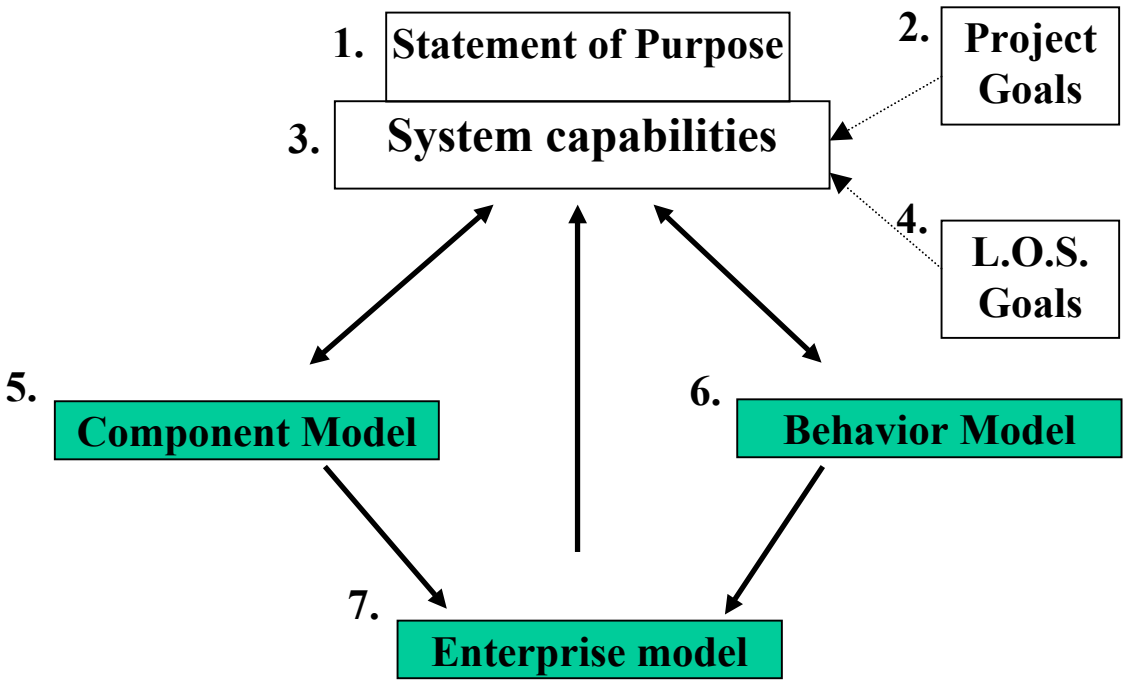
- **MBASE Guidelines v2.3.6**
- **UML version 1.4**

1.3 References

- **MBASE Guidelines v2.3.6**
- **Easy WinWin report**
- **Prototype**
- **Operational Concept Description (OCD)**
- **System and Software Requirements Definition (SSRD)**
- **Life Cycle Plan (LCP)**
- **Client Meetings**
- **HELIX: Catalog of the USC Health Sciences Libraries**

2. Architectural Analysis

Analysis Deliverables



OCD 3.0

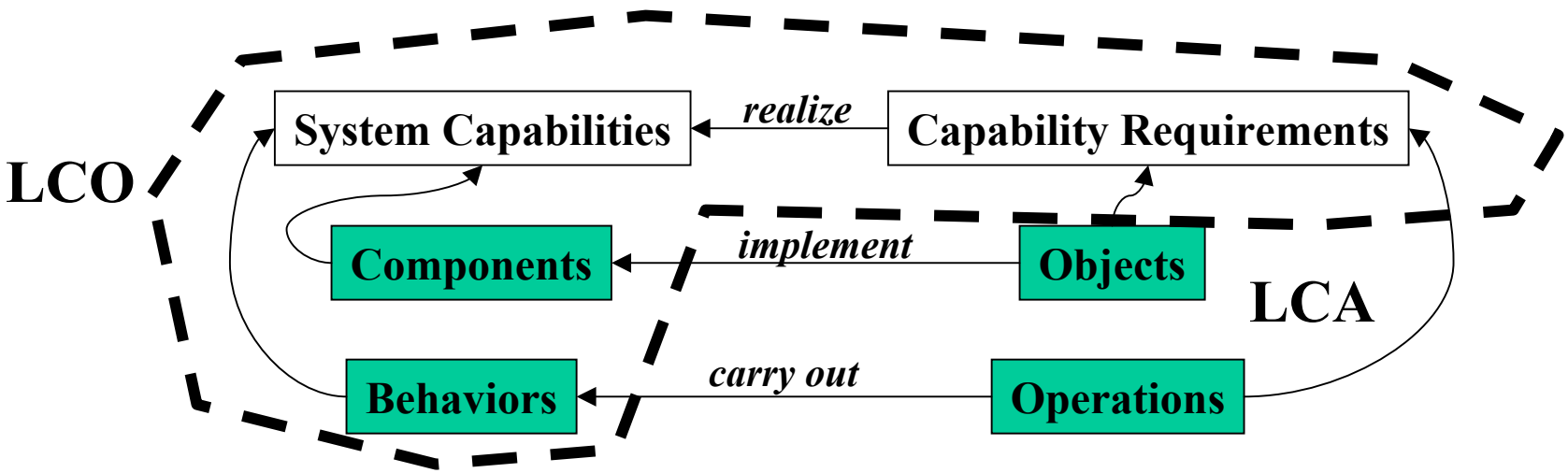
SSAD 2.0

2. Architectural Analysis

- Describes the domain experts' vision of the system without implementation details
- …more precisely than in OCD
- …using MBASE's version of Component/Object Oriented Analysis (2 lectures by Ed Colbert)

2.1 Component Model

- High-level architectural decomposition of the target system into functional parts
- Should be consistent with System Capabilities(OCD 4.3)
  - Requirements in SSRD 3.0 will be based on what is mandated to be built in order to realize these capabilities
  - Object models in SSAD 3.0 will be derived from components in such as way as to realize the requirements in SSRD 3.0



Component Modeling

- Output is a collection of *diagrams* and *specifications*
- Provides details on important component qualities required for a *faithful* implementation
- Serves as the overall view of the system "parts" and their relationships (a system *partition*)

Component Modeling

- Why model components?
  - A language is needed to explain why a component exists or not, and to get a handle on the "things" which comprise the system
  - Systems are not often built entirely from scratch anymore, identification needed for integration
- How the components can or will be implemented is a design issue (OOD: SSAD 3.0 + 2 lectures by Ed Colbert)
- All components should be faithful as determined by Domain Experts (i.e. ask them!)

What is a Component?

- An abstraction that represents both *memory* and *functionality* :
  - *memory*: a component's static qualities such as attributes and relationships.
  - *Functionality*: a set of methods (qualities) that embody operations
  - Represents a major highly cohesive "block" of the system
  - The components *partition* the system
    - Many ways to do this, you want an "elegant" one
- MBASE: A refinement of an Entity within the Domain Description

Component Qualities

Identity -

- Defining Quality -
- Name -

Attributes -

Behaviors -

Relationships -

Roles -

State Groups

Constraints -

Characteristics of Components

- Analysis components always have direct counterparts in the domain
- Important test: Components have *form* which allow them to transition from one *state* to another and take on *roles*

Components vs. Objects

- **Objects** are the smallest (most refined) entity we consider in our models prior to implementation
- **Components** are compositions (sets) of objects with a high degree of *cohesion* within the domain
- Components are what you need to describe the system to domain experts at a higher level of abstraction (less detail)

Objects

- The Design phase may decompose components into objects.
- Objects are used to represent the system in software.
- Objects are used to implement components

Component Model

Simple Example

Example System Capabilities

Statement of purpose for the system:
The Columbia Library Reference-Librarian Management System (CLRMS) enables the Library system to locate and allocate appropriate library staff to serve Library Patrons in locating and borrowing Library reserve materials.

System capabilities:

1) Assign Reference Librarians to Library areas
2) Track consulting (part-time) Reference Librarians
3) Manage Reference Librarian services to Patrons (including other Libraries) for particular reference collections
4) Assess need for consulting (part-time) Reference Librarians (where, when, who)

Identify possible components

- Possible components
  - Library
  - Library Staff (full-time)
  - Library Patrons
  - Reserve Materials
  - Library Area
  - Consulting Librarians (part-time)
  - Reference Collection

Example: Component Definition

Component 3

Identity:

Defining Quality.:

(Database of) Scheduling and tracking information for permanent and temporary staff of the Columbia Libraries.

Name: Library_Staff_ Information

Attributes:

1) name
2) address
3) skills
4) schedule
5) availability
6) area_assignment
7) contract_info
8) service_requests

Example: Component Definition (cont)

Behaviors:

1) manage Reference_Material (organize, locate)

2) service Patrons

State groups:

1) employment_status:{part-time, full-time}

2) service_status:{serving_patron_request, managing_material, waiting_for_request, off_duty}

3) area_assignment:{assigned_to_area, available_for_area, unavailable}

Constraints:

1) can not be consulting librarian and reference librarian for same Reference_Material

2) dependency: service_status is off_duty when area_assignment is unavailable

SSAD Architectural Analysis

HDA Example

Example #1 Component Specification

COM-01 HDA_Material

Defining Quality	Digitized information on Hispanic material of th Boeckmann Center.	
Attributes	a) Location b) Box number c) Folder number d) Item number e) Item type f) Title g) Source	h) Date i) Descriptors j) Country k) Language l) Notes m) Collection
Behaviors	Display information Display images	
Relationships	a) Hispanic_Digital_Archive b) HDA_Patron_Interface c) HDA_Manager d) HDA_Operator	
Roles	Viewed item {view <patron_brief_view>, view <patron_detail_view>, view <administrator_view>	
State Groups	See Figure 2	
Constraints	*Candidate Key*	Item Id (*Not from domain*)
	Cardinality	→ 1 Hispanic_Digital_Archive → n HDA_Manager → n HDA_Patron_Interface
Relates to	Entity E-03 of OCD 2.4	

From Hispanic Digital Archive LCA SSAD 2.2

Example #1 Component Attributes

Attribute ATR-01

Name	**Item Type**	
Defining Quality	**The item type determines the relevance of various fields describing an archive item**	
Accessibility	**Readable, Settable**	
Scope	**Unique, Shared**	
Constraints	*Initial Value*	**Book**
	Modality	**Required**
	Cardinality	**→ n**

Attribute ATR-02

Name	**Collection**	
Defining Quality	**A group of items belonging to a logical grouping as determined by the Administrator**	
Accessibility	**Readable, Settable**	
Scope	**Unique, Shared**	
Constraints	*Initial Value*	**None**
	Modality	**Optional**
	Cardinality	**→ n**

From Hispanic Digital Archive LCA SSAD 2.2

Example #1 Component Relationships

Relationship REL-01

Name	**Inspects**	
Defining Quality	**A patron requests to inspect an item.**	
Accessibility	**Readable**	
Scope	**Shared**	
Constraints	*Modality*	**Optional**
	Cardinality	**→ n**
Role names	**Inspected Item {Viewed, Retrieval Requested}**	

Relationship REL-02

Name	**Maintains**	
Defining Quality	**An administrator performs maintenance operations on items such as add, modify, delete.**	
Accessibility	**Settable**	
Scope	**Shared**	
Constraints	*Modality*	**Optional**
	Cardinality	**→ n**
Role names	**Maintained Item: {Added, Deleted, Modified,Approved}**	

Example #1 relationship diagram

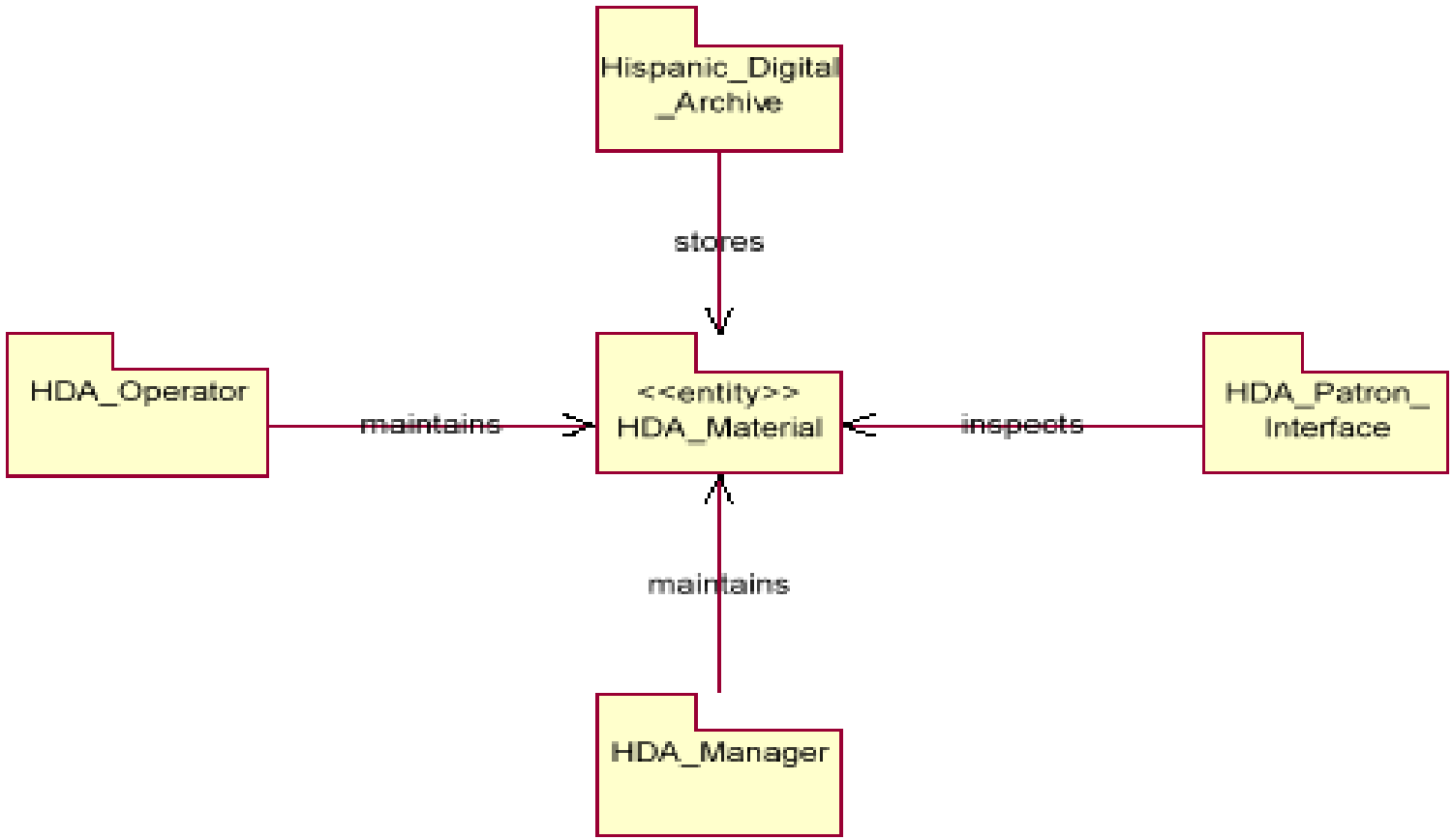
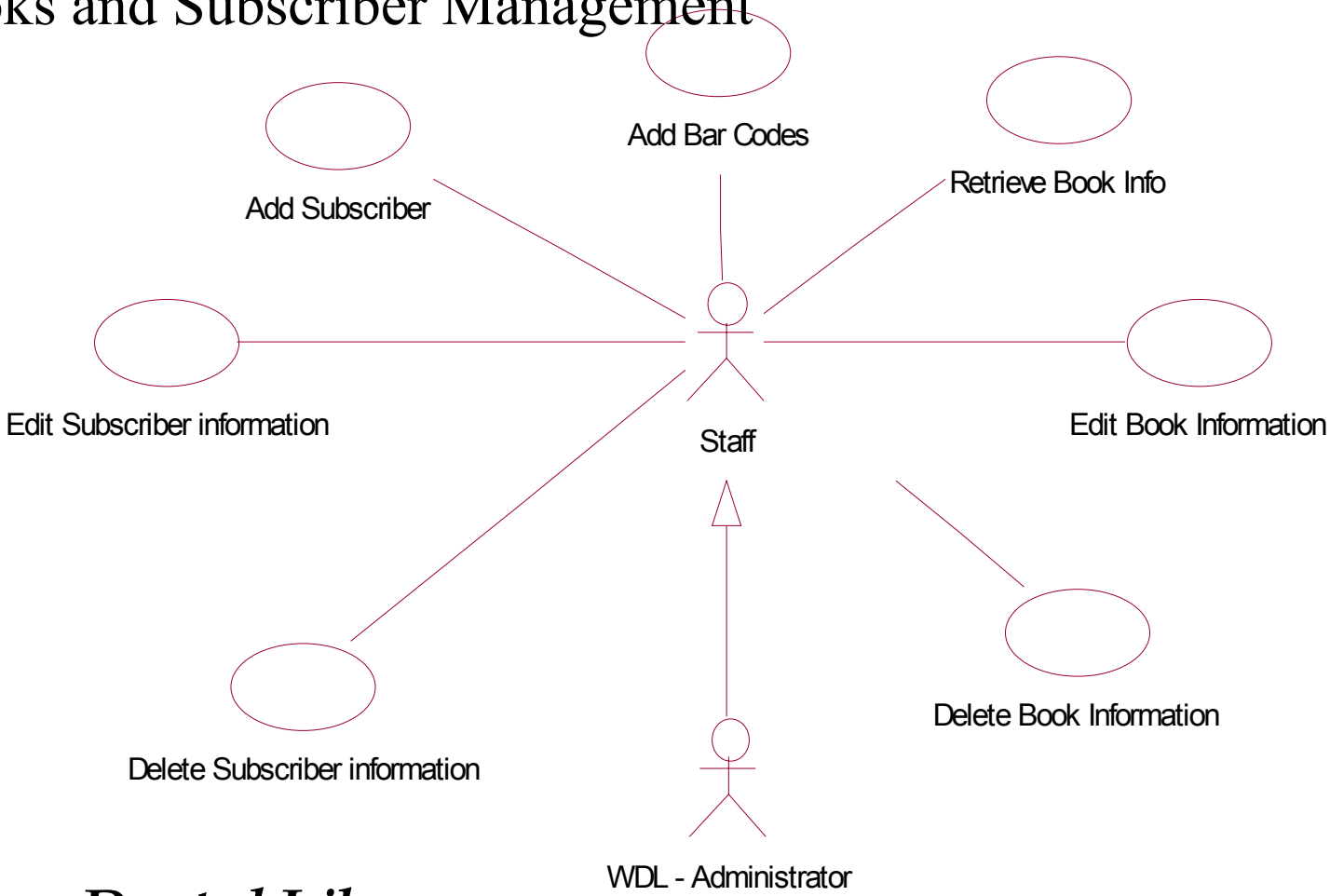


Figure 1 COM-01 HDA_Material

From Hispanic Digital Archive LCA SSAD 2.2

2.1 Behavior Model Model

Books and Subscriber Management



Wilson Dental Library

New Book List

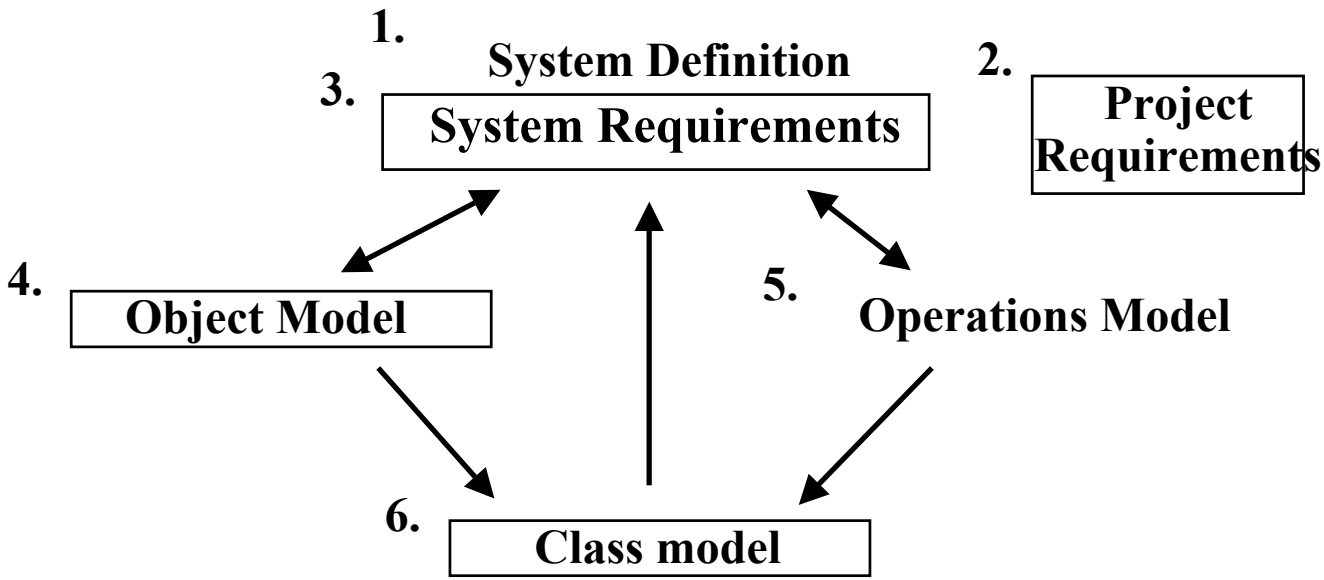
Figure 1. Identifier	UC – 03
Figure 2. Use-Case Name	Add Barcodes
Figure 3. Abstract	**3.1. No**
Figure 4. Purpose	To add bar codes of the books received by the library
Figure 5. Actors	WDL Administrator and Staff
Figure 6. Importance	Primary
Figure 7. Requirements	RQ – 02, RQ-03
Figure 8. Risks	Mistake in entering the barcode
Figure 9. High–Risk	No
Figure 10. Architecturally Significant	No
Figure 11. Development Status	RLCA
Figure 12. Interface	It's a web-based interface and the input data can be typed
Figure 13. Pre-conditions	A screen with textboxes to add barcodes
Figure 14. Post-conditions	Bar-code entered confirmation screen
Figure 15. Includes	N/A
Figure 16. Extension Points	N/A

Figure 1. Seq. #	Figure 2. Actor Actions	Figure 3. System Response
1.	The WDL Administrator or Staff enters the bar-codes	**3.1.**
2.		The system saves them onto the database
3.		The system displays the barcode list

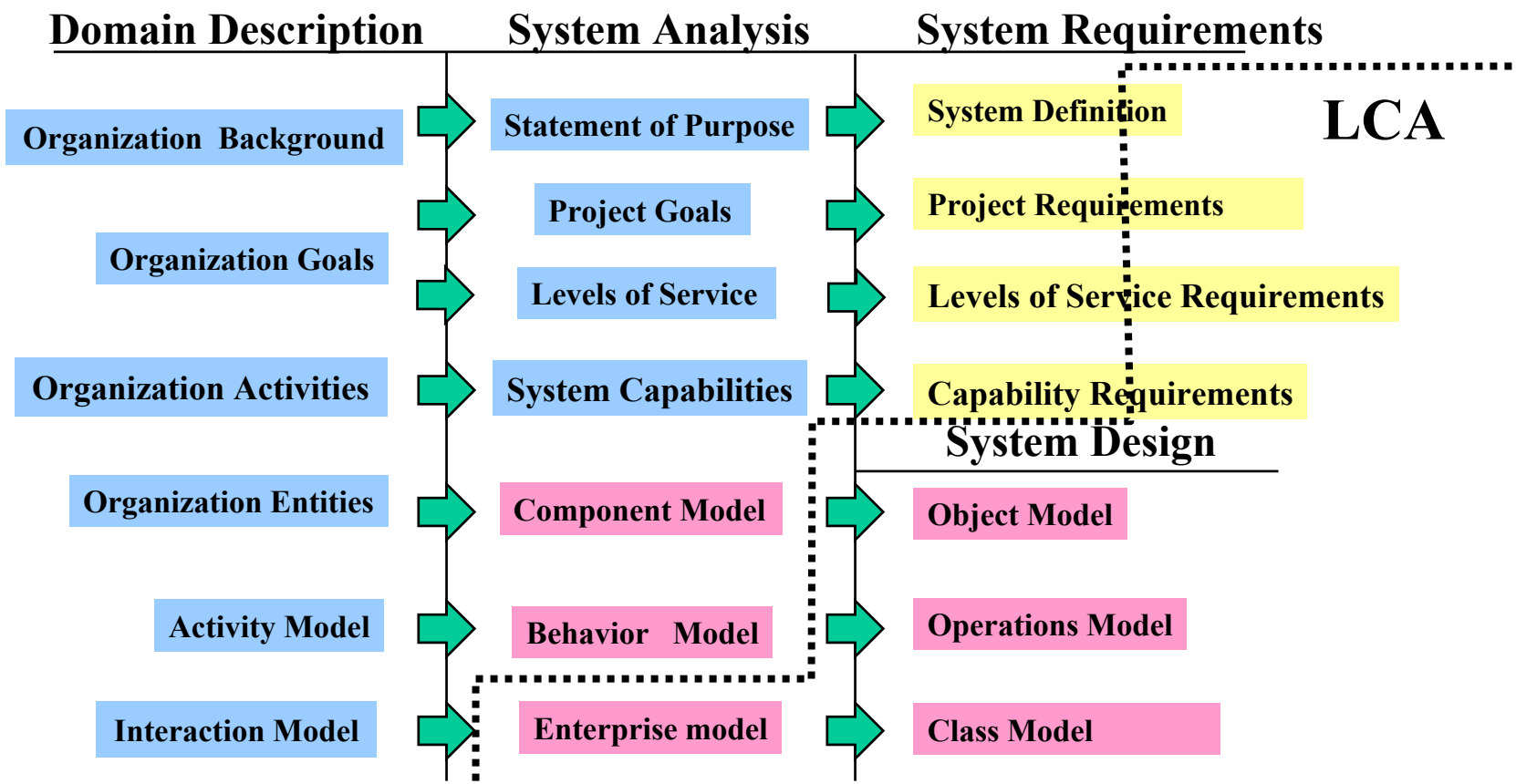
3 System Design

3.1 Architectural Views
3.2 Object Static Structure Model
3.3 Operations Model
3.4 Classification Model
3.5 Configuration Model

Design Model Views



Integration of MBASE System Definition Elements

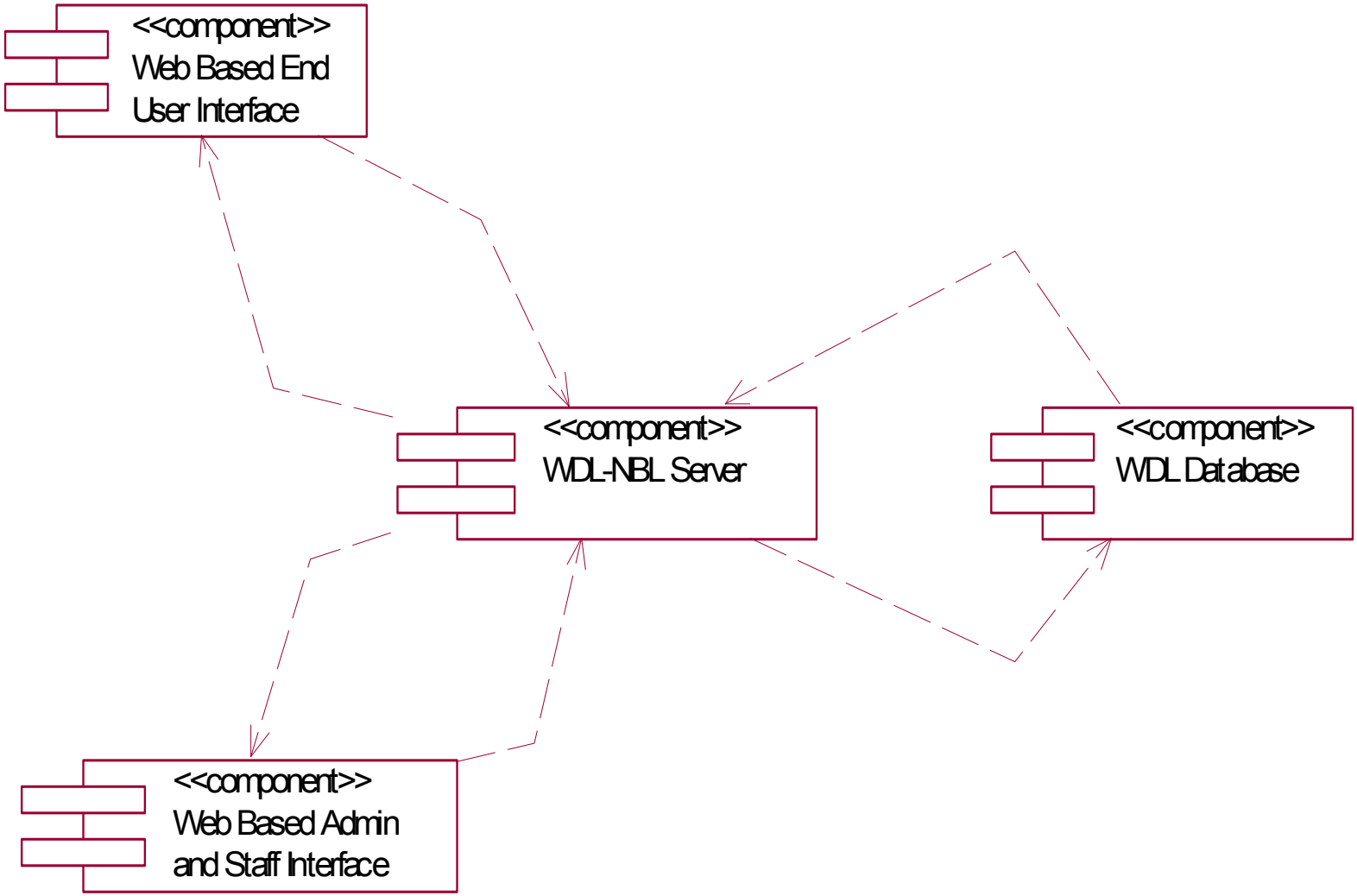


Examples From

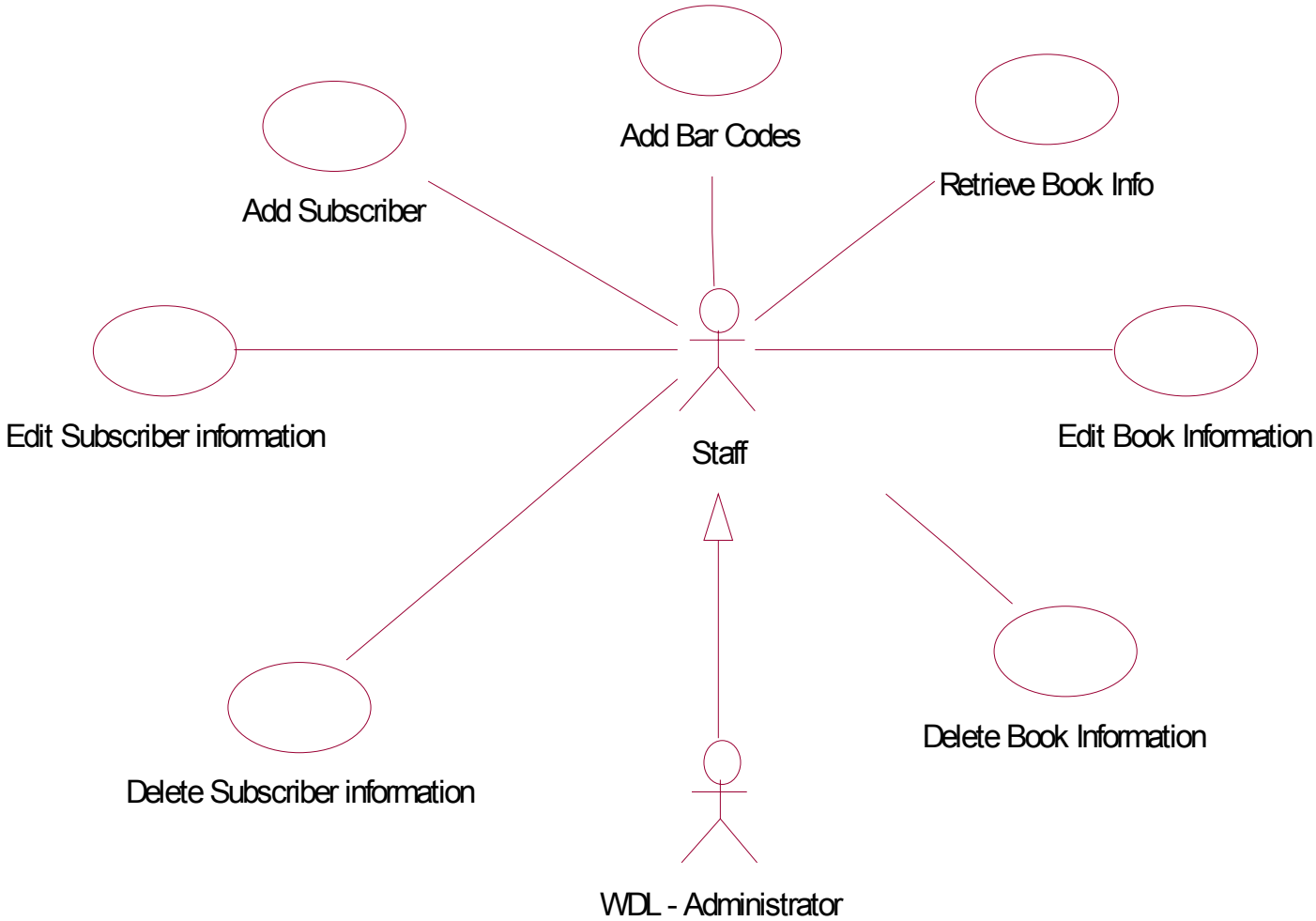
Wilson Dental Library
New Book List
(IOC)

There are four components for the WDL-NBL system

- **Web Based subscriber Interface (Com1)**
- **Web based administrator Interface (Com4)**
- **Server Side Processing Scripts (Com2)**
- **WDL Database System (Com3)**

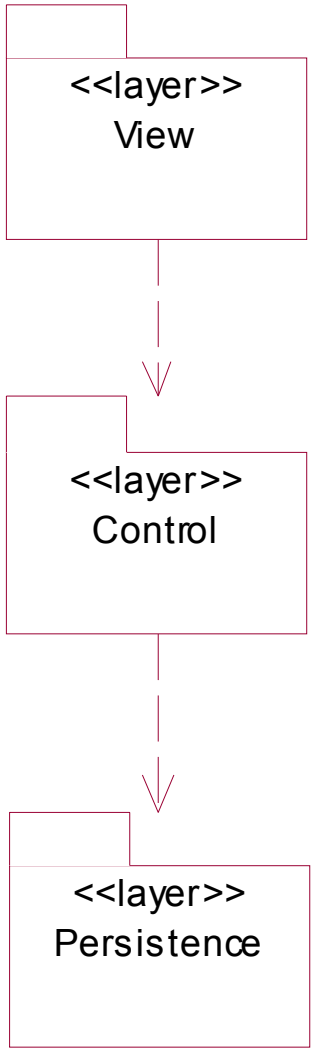

<<component>>
Web Based End
User Interface
<<component>>
WDL-NBL Server
<<component>>
WDL Database
<<component>>
Web Based Admin
and Staff Interface

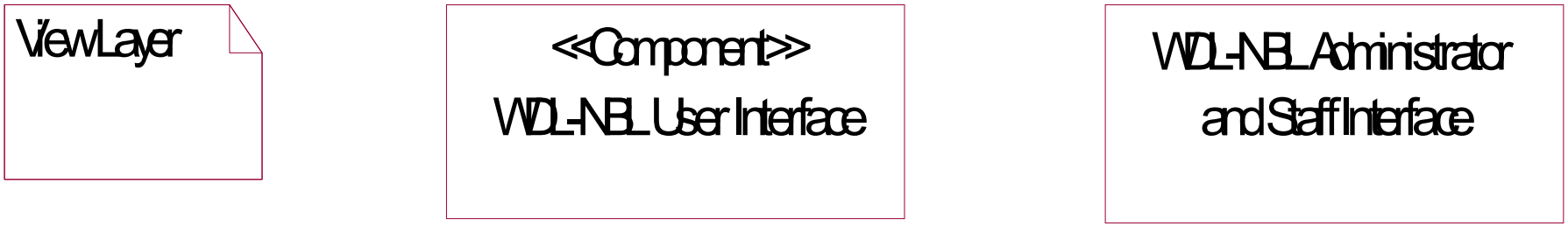
Books and Subscriber Management



3.1 Architectural Views

System Layers:





Components in View Layer

Components in Control Layer

Components in Persistence Layer

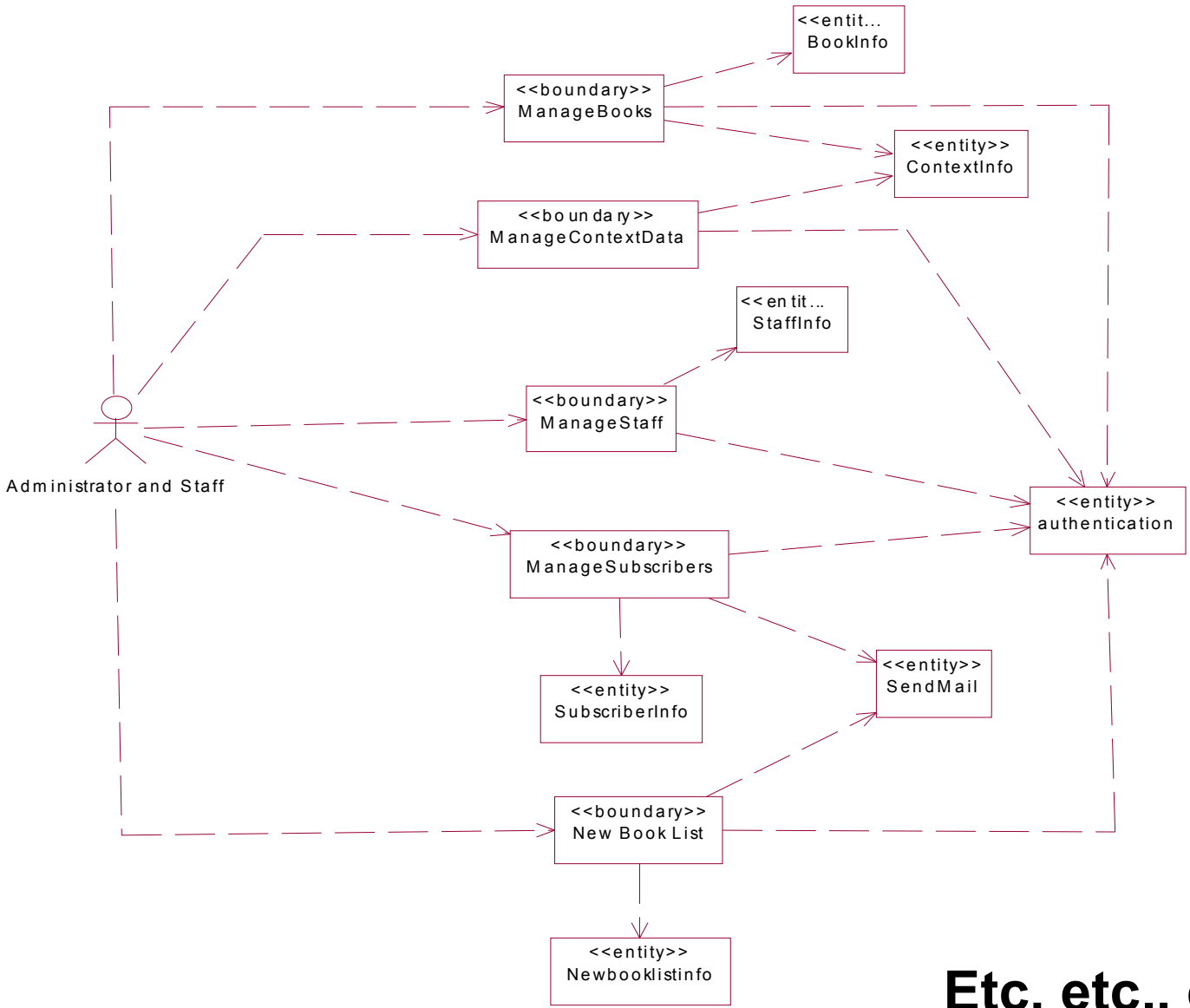
System Deployment View

System node Configuration

Etc., etc., etc.

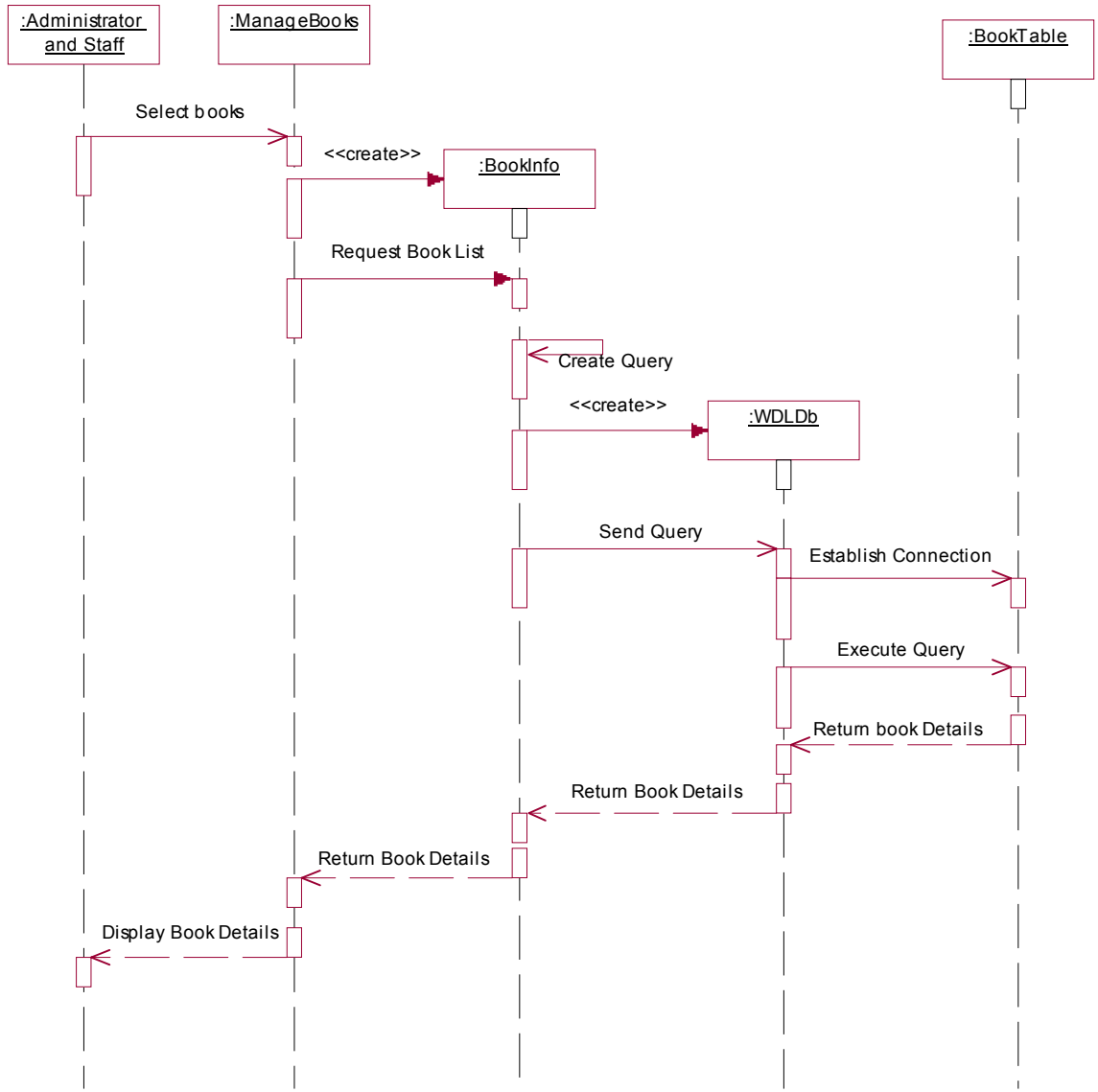
3.2 Object Static Structure Model

Classes for Web Based interface for Administrator and Staff



Etc, etc., etc

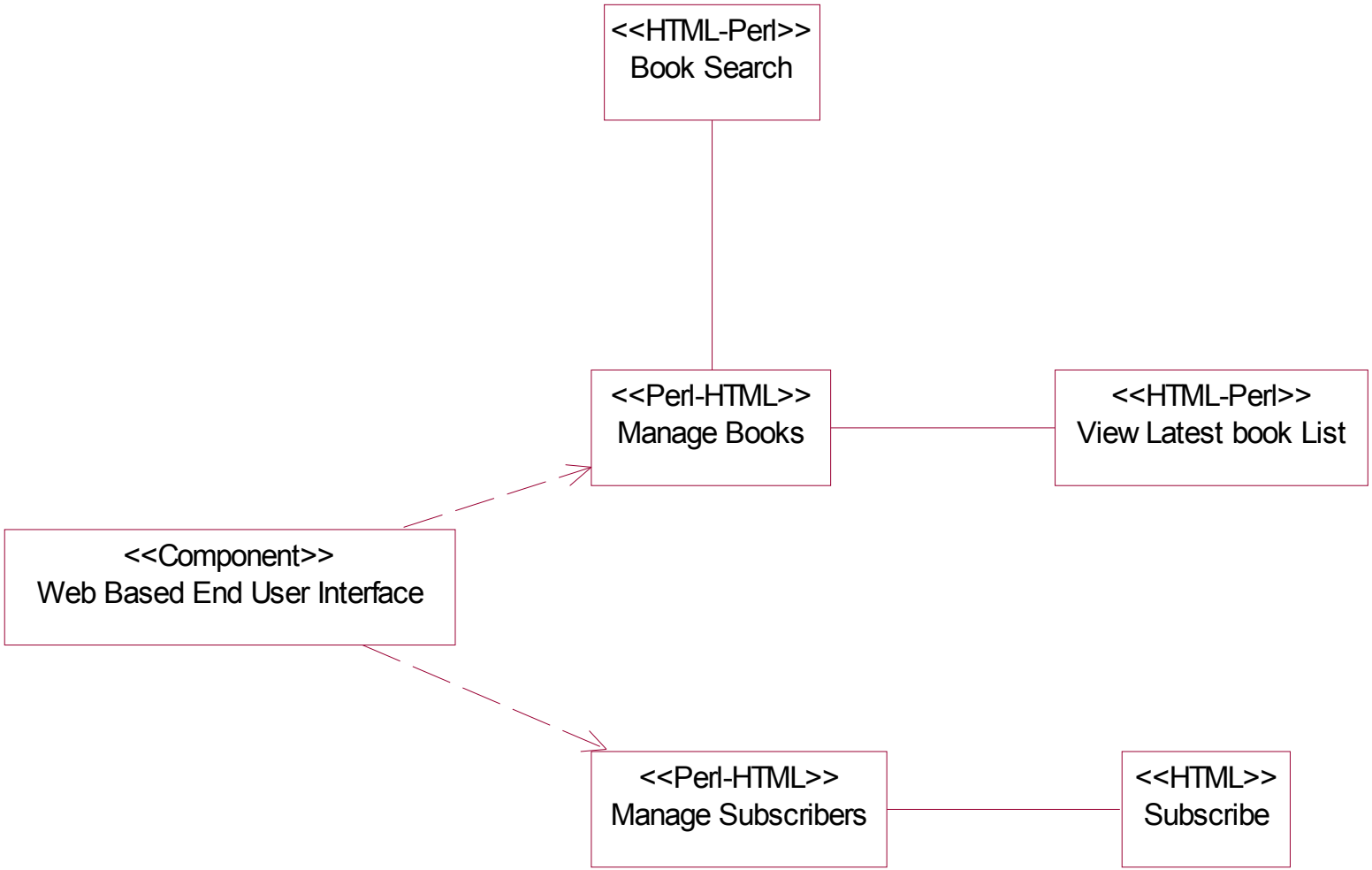
3.3 Operations Model



View Book Details

Etc, etc., etc

3.4 Classification Model



Implementation Class Model for Web Based End User Interface

Etc, etc., etc

4. Common Definition Language (CDL) for System Design

- Definitions of unfamiliar terms, and acronyms encountered or introduced during the requirements elicitation process
- Do not repeat the common definition language for the domain description (will make it harder to ensure consistency)

Common Definition Language

COTS
Commercial Off the Shelf

DBMS
Database Management System

Helix cataloging system
The system used by Norris Medical Library and Dental School Library to catalog library resources in different formats.

HTML
Hypertext Markup Language

HTTP
Hypertext Transfer Protocol

Etc, etc., etc

5. Appendix

- Supplementary data
  - algorithm descriptions
  - alternative procedures
- Vendor documents
  - technical specification sheets on the COTS
  - domain or application independent components

    Frameworks
    Components
    Class Libraries

5. Appendix

5.1 References: none

5.2 Vendor Documents

The vendor documents are available at

For Apache Web Server: http://www.apache.org

For Red Hat Linux: http://www.redhat.com

For mySQL: http://www.mysql.org

For Perl: http://www.perl.org