

Book Marketplace Specification

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Introduction

This document is an introduction to the specification models created for analysing the marketplace system where books can be ordered from different bookshops. Each specification is explained separately. It is described what the specification is modeling, what is the purpose of the specification and what analyses were conducted for the specification, such as safety, progress and deadlock analyses.

Additionally, this document lists assumptions which were made about the system. The specifications are defined so that they follow these assumptions.

Assumptions

The assumptions are grouped so that assumptions related to same aspect of the system are together.

Users

General

1. There are three system user types (*=roles*) in which the user can be registered to the system: customer, bookshop owner (*=shopkeeper*) and system administrator (*=admin*).
2. Single user can be registered to multiple roles.
 - 2.1. First the user has to sign in to their system account.
 - 2.2. Then they have to choose a role in which they want to access the system. User can only choose roles in which they are registered.
 - 2.3. This means that the user has only one user credentials (username and password) for accessing all their different roles.
 - 2.4. The user cannot access the system in multiple roles at the same time: the roles are separate from each other. If the user wants to access the system in different role then they must revoke their currently selected role and choose another role.
3. When a user is accessing the system in specific role a timeout can occur after the user has been idle for some time. Timeout will throw the user out of their role back to the role selection view.
4. User cannot perform actions of specific role only by being registered to that role. Being registered to a role only means that the user's account has the right to that role. It does not mean that the user has signed in to their account and then chosen to access the system in that role. So, in addition to being registered to a role the user has to also sign in to the system and then choose that specific role.
5. When the user is not signed in to the system and therefore not accessing it in any registered role they are referred to as *guest* user.

Guest

1. A guest user is an user who has not signed in to the system and chosen any role in which to access the system (this is our term for "unregistered user" mentioned in the coursework assignment).
2. A guest may or may not be registered to any role in their account. Because the guest is not signed in it does not matter to which roles they may have been registered: they are anonymous and therefore have only one type of rights to the system.
3. A guest can only browse and search the catalogues in the system.

Customer

1. The user can register themselves as customer after signing in to the system.
2. In addition to functionalities of a guest the customer can also order books.

Shopkeeper

1. User cannot register themselves to shopkeeper role.

- 1.1. The user can request from system admins the right to shopkeeper role. The request can be sent when signed in to the system but not selected any role yet.
 - 1.2. Admins can register the user as shopkeeper after which the user can access the system in shopkeeper role.
2. The shopkeeper always owns some bookstore in the system.
3. The shopkeeper can add and remove books to/from their bookshop.

Admin

1. User cannot register themselves to admin role.
2. The admin can register any other user as shopkeeper.
 - 2.1. The admin can decide to register a user as a shopkeeper even though the user may not have sent a request to that role. It is assumed that when this happens the admin already knows which user must become a shopkeeper, e.g. when some registered shopkeeper wants to quit and tells the admins which user will continue to run their bookstore and therefore needs to be registered as shopkeeper.
3. The admin can register any other user as admin.
4. The admin can unregister any other user from any role. This means that admin can undo the registration of a role and therefore prevent user from performing functions of that role.
 - 4.1. The unregistration can only happen when the target user is not currently accessing the system in any role.
 - 4.2. It is assumed that the users which are registered to admin roles are trustworthy people, like staff of the company responsible of the system. Therefore it is OK to allow admin to not only unregister customer and shopkeeper roles but also admin roles.

Bookstores and books

Bookstore

1. Bookstores can be created and deleted by admins.
2. The bookstore does not necessarily have a shopkeeper.
 - 2.1. When a bookstore is created it does not initially have a shopkeeper.
 - 2.2. The bookstore is left without shopkeeper when admin unregisters its shopkeeper.
3. The bookstore can have only one shopkeeper at maximum.
4. Admin assigns a shopkeeper for the bookstore.
 - 4.1. When admin registers a shopkeeper they also decide at the same time which bookstore they will own. Admin can assign a new shopkeeper to any bookstore in the system, even to a store which already has a shopkeeper.

- 4.1.1. If admin assigns shopkeeper to a store which already has a shopkeeper then the old shopkeeper becomes shopkeeper with no store.
- 4.2. It is assumed that the admin knows to which bookstore the registered shopkeeper must be assigned. For example, an existing shopkeeper of a bookstore quits running the store. The ownership of the store is then transferred to a different shopkeeper who will continue to manage it after registering to the system.

Book

1. In this context the “book” means a physical copy of the book. It does not refer to a title which contains numerous physical copies of that title. For example, there can be multiple books with the title “Robinson Crusoe” belonging to exactly the same edition.
2. Because of the previous assumption, each sellable book in the system is unique even though some of them may have same titles.
3. A book can belong to only one bookstore.
4. A book can be added and removed to/from the bookstore by the store’s shopkeeper.
5. Shopkeeper can remove a book as long as it is not purchased or about to be purchased by a customer. Therefore it can be removed while it is in customer’s shopping basket or in the middle of purchasing process before it is paid or before customer enters the payment service.

Ordering books

Shopping basket

1. When a book is placed to shopping basket it is reserved to the customer.
 - 1.1. No other customer can add that book to their basket
 - 1.2. None customer can browse/search for that book.
2. The book can be removed from the basket either by customer themselves, shopkeeper when removing the entire book from their store’s selection or by itself when a timeout (for example after customer being idle for 10 minutes) occurs.
3. If a book is forcibly removed, e.g. due to shopkeeper removing it from bookstore, from customer’s shopping basket then the customer is notified of it
4. If the customer who owns the shopping basket is unregistered then the books in the basket are removed and made available for selection to other customers

Purchasing

1. It is necessary to provide necessary delivery information such as customer email, shipping address, perhaps credit card number etc. only once when making the very first order in the system.
 - 1.1. The delivery information is saved so that the customer does not have to provide then again when purchasing something again.
 - 1.2. The customer can edit delivery information at any time.

2. If a book is forcibly removed during purchasing process then the customer is forced to cancel the purchasing process.

Specifications

Model #1 - Handling of users' access rights

Name	Model #1 - Handling of users' access rights
Tool	LTSA
File	AccessSpec.lts
Purpose	<ul style="list-style-type: none"> • Specifies how the users can access the system at different access levels and how the users' access levels are modified by the admins • Makes sure that correct actions can be executed at each access level <ul style="list-style-type: none"> ◦ For example a guest must be able to browse and search books but not order them • Makes sure that users can freely be able to register themselves as customers but only admins must be able to register them as shopkeepers or admins • The model makes sure that there are no problems when multiple users are simultaneously accessing the system or tampering with the access rights of other users
Description	<ol style="list-style-type: none"> 1) Three users are modeled 2) All users have account to the system 3) Initially one user is registered as admin and the rest two are not registered to any role 4) The user can browse and search the books while not signed in 5) After signing in the user must choose in which registered role they want to access the system or sign out 6) If the user is not registered as customer they have an option to do so 7) If the user is not registered as shopkeeper they have an option to send request to be registered in that role 8) In customer role the user can in addition to browsing and searching also order. In shopkeeper role the user can manage their bookstore. In admin role the user can modify other users' access rights. 9) When user is in a role a timeout can occur which deselects the role 10) Admin can register user as shopkeeper 11) Admin can register user as admin 12) Admin can unregister a user from any role 13) The admin can unregister the user when the user has not selected any role yet
Checks	<ol style="list-style-type: none"> 1) Safety analysis produces no errors or deadlocks.

Model #2 - Handling of books

Name	Model #2 - Handling of books
Tool	DisCo
File	exercise.dsp
Purpose	<ul style="list-style-type: none"> • Specifies how the sellable books are handled in the system • Customers should be able to browse and search books which are placed to bookstores by the shopkeepers • Makes sure that each bookstore has only one shopkeeper at maximum, the admin can remove the shopkeeper from the bookstore and choose to which bookstore a registered shopkeeper will be placed • Shopkeeper should be able to remove book from their bookstore as long as it is not purchased by any customer • No problems should arise when multiple users, both customers and shopkeepers, can handle the books
Description	<ol style="list-style-type: none"> 1) The shopkeepers without bookstores represent users who are not yet registered as shopkeepers but will be as soon as some bookstore is assigned to them 2) When a book is not added as sellable by the bookstore's shopkeeper then the customers cannot browse, search or add that book to their basket 3) Admin can remove a shopkeeper from bookstore as a result of unregistering the shopkeeper or assigning a different shopkeeper to that store 4) If a customer has a book of a bookstore which shopkeeper is removed in their shopping basket then it is removed by action <code>automatic_remove_book_from_basket</code>. 5) Admin can assign a shopkeeper to any bookstore in which case the shopkeeper becomes registered 6) The customer can perform browse and search actions to books placed as sellable in the bookstores all the time. 7) The customer can add a book of a bookstore to their shopping basket in which point no other customer can not take it 8) The book is removed from customer's basket when customer themselves removes it, or it is automatically removed 9) The customer can order the contents of their shopping basket only when there is at least one book 10) When customer orders the books in their shopping basket the books become owned by that customer.
Scenario	<ol style="list-style-type: none"> 1) MarketPlaceScenario.dsi 2) In the scenario's initial state there is one system, one admin, two customers with one shopping basket for each of them, two bookstores with one shopkeeper for each of them, one not registered

	shopkeeper, and four books two for one store, one for another and one not belonging to any store 3) None user is initially logged in
Checks	There was not any observable deadlock user types can at least login and logout all the time.

Model #3 - The process of ordering books

Name	Model #3 - The process of ordering books
Tool	LTSA
File	Ordering.lts
Purpose	<ul style="list-style-type: none"> • Specifies the process of ordering shopping basket contents • Specifies how the situation is handled when suddenly one or more books which are already in a shopping basket are disabled <ul style="list-style-type: none"> ○ The disabling of a book means that the book is removed from the bookstore by the shopkeeper or some other reason which renders the book unbuyable by customers ○ The disabled book can be enabled again which means that the shopkeeper has placed the book for sell again to the bookstore • Makes sure that the customer has given their delivery information before the order is completed • Makes sure that the ordering of a book cannot be completed after it has been disabled • Makes sure that the customer is notified when the contents of their shopping basket have changed due to disabling of a book
Description	<ol style="list-style-type: none"> 1) Two shopping baskets and a collection of three books are modeled 2) Initially baskets do not contain any books 3) When a book is added to the first basket the second basket cannot take it anymore unless the first basket voluntarily removes it or it becomes disabled and then enabled again 4) When there is at least one book in the basket the process of ordering its contents can be started 5) The customer can cancel the ordering of the basket's contents before the order is verified 6) If the customer has not yet modified/given their contact and delivery information then they are asked to do so during the ordering process. After that they do not need to input information again. 7) The customer can freely update the contact and delivery information when not ordering books 8) A book can be disabled at any time except after the customer has

	<p>already verified the ordering of that book</p> <p>9) When a book is disabled while it is in a shopping basket then the owner of that basket is notified about it and the ordering process is cancelled if it was already started</p> <p>10) When a book has been bought then a new sellable book can be added to its place</p>
Checks	<p>1) Deadlock check: no deadlocks were found and neither “sub-deadlocks” where a certain process would not be able to continue while some other could</p> <p>2) Ordering safety: it is checked that after the order has been verified it will be fulfilled</p> <p>3) Book enabling safety: it is checked that after a book has been rendered unsellable it can be made sellable again</p> <p>4) Other safety: no errors were found</p> <p>5) Book buying progress: it is checked that the customers will be able to order any books eventually</p>