# Digital Library

The aim is to design a public digital library: all the standard services of a library should also be proposed by the digital library. Once the user has subscribed to the digital library, she can enjoy digital media: namely music and audiobook, books, and movies. Just like in real life libraries, the number of copies of a medium is controlled (it also helps to prevent intellectual property). First the subscriber browses the catalogue (see the example below)
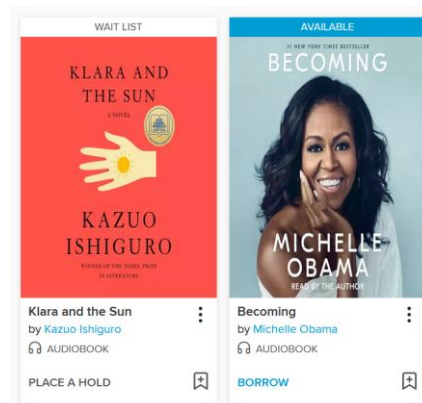
The subscriber may borrow the medium if it is available; she will then enjoy the medium for four weeks. After the four weeks the "digital copy" of the medium will no longer be available. Before the end of the borrowing period, the subscriber may request an extension of two weeks. Of course, the subscriber may "virtually" return the medium before the end of the four weeks.

When a medium is not available, the subscriber may "place a hold" and the system will indicate an approximative availability date. When the medium will be available, the subscriber will receive a notification.

All media has a title, an illustration, and a creator (called a director for video, author for books and singer for music), a description, a score and (of course) a number of digital copies (see below). Notice that the creator has a name and brief description. Video also considers a recommended audience (kids, teenagers…) and a distribution (list of main actors)
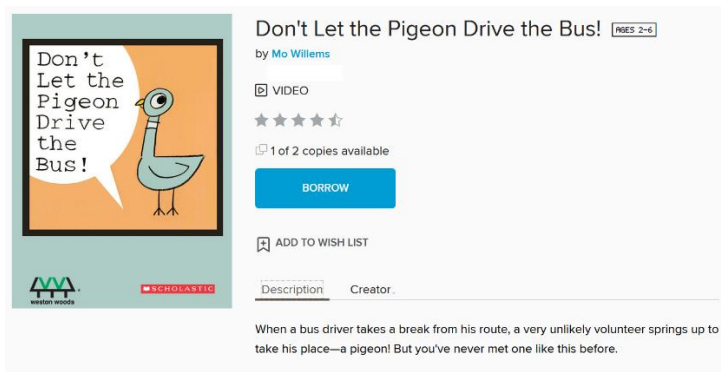
The subscriber, when looking at the details of a media, may add it to her wish list. The wish list may contain different kinds of media. When the subscriber returns the media, she can mark the media (not compulsory) from 1☆ to 5☆. The wish list helps the subscriber to maintain a list of shortcuts to different media.

Finally, the system can provide suggestions to the subscriber:
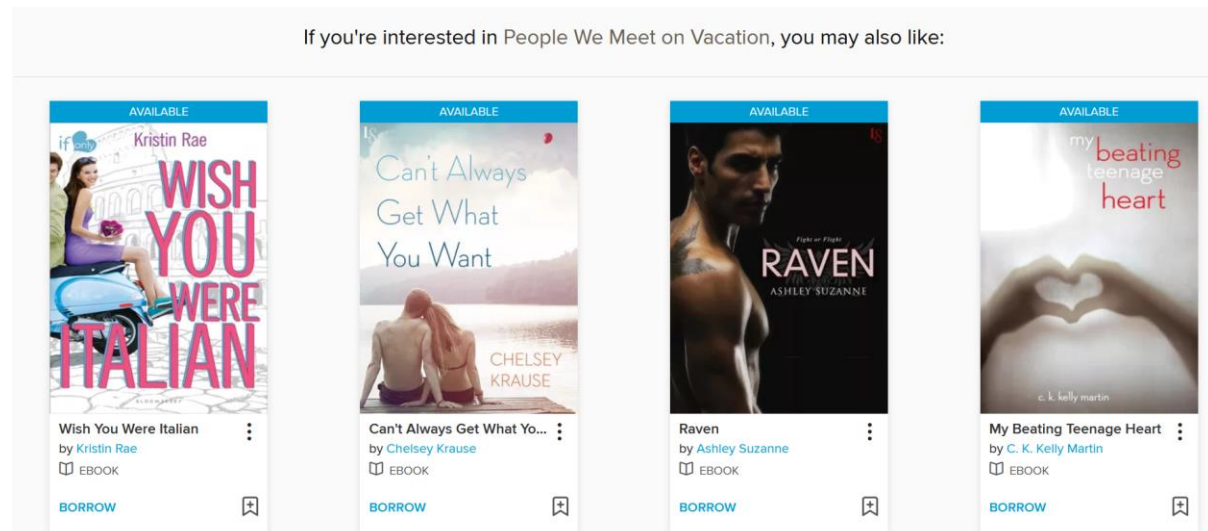
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Suggestions are computed in the following way. Goal is to suggest n media.

- **Book**: randomly pick up 5 borrowers $B_1 \dots B_5$ different from borrower B, get the books they previously read, remove from this list the books already read by B and rank the resulting list according to the number of times the book has been read by $B_1 \dots B_5$ (ie, score goes from 1 to 5). The top n books are recommended.
- **Video**: among the video with the same audience, find the ones which have the largest proportion of common actors: if D_A and D_B represent the distribution of movies A and B, proportion is:

$$\frac{|D_A \cap D_B|}{|D_A \cup D_B|}$$

- If there is no distribution, then recommendation is computed as for books.
- **Audio**: randomly pick up 10 borrowers of the Audio A and extract what they borrow next: remove the ones with the same creator as A; rank the remaining audio according to the number of times they appear.

Tasks

Propose an implementation of the digital library in Java.
Your solution should/could:
- include a graphical user interface
- allow to register users
- read library items (media) from a file
- provide a medium reservation system as described above
- simulate time week by week with a button (you click and one week passes)

- automatically load default users and their history (for testing purpose)
- save users information (include renting history) and library status on disk
- build a graph that connect users if they have rent the same medium
- propose an alternative recommendation based on the user graph with two different modes. This recommendation system is personalized and is specific to a particular user U1.
    - The mode "inner circle" randomly picks one of U1's neighbours in the graph and randomly suggests one of the media that has been rent by the neighbour but not by U1. If no such medium exists, the recommendation fails
    - The mode "discovery" randomly selects a user U2 which is not a neighbour of U1, finds a path between U1 and U2, and selects random media from each user along the way (again, media that were never rent by U1 before). If no such medium exists, the recommendation fails
    - In this recommendation system, the medium type does not matter (all media types are treated at the same time)