Modelling Labwares and Containers

Labware

- Can have a location,
- Can have a barcode,
- Can be comprised of one or many containers,
- Can change location,
- Can have state - pending, started, passed and failed, which can be changed. Can move from pending to started and then started to passed or failed.
- Plate, Sample Tube, Library Tube and Flowcell are all types of Labware

Container

- Contains none to many samples,
- Can have a location,
- Samples can be copied from one container to another,
- Tags can be applied to all samples within a container,
- Cannot contain two samples with the same tag,
- May or may not have a barcode.
- Well, Sample Tube, Library Tube and Lane are all types of Container.

Tag

- Can uniquely identify it a modification to a sample using a sequence of DNA.

Plate

- A two dimensional array of 96 or 384 wells,
- Has a Barcode beginning with DN.

Sample Tube

- Has a Barcode beginning with NT,
- Contains one untagged sample only.

Library Tube

- Has a Barcode begins with NT,
- Contains one or more tagged samples.

Flowcell

- No barcode,

- Consists of two or eight lanes and lanes have a numerical identifier.

Lane

- No barcode,
- Will have a QC pass or fail,
- Can contain one or more tagged samples.

Your mission is to create a module (library of namespace), which can manage the above requirements using any of the Object Oriented techniques in any programming language you like.

At this stage there is no need to consider persistence so you do not need to create a database or use ORM.

As an extra task consider the following user requirement:
"How can I find containers by entering text into an input box, for example, how do I identify a particular well as it doesn't have its own barcode."
For this you don't need to create a UI just a method or class to handle the input and produce the correct output.

If you want feel free to complete the task using TDD or BDD.

Some of the requirements are ambiguous (just like the real world!) so you will have to make some assumptions.