Lecture Notes
October 3, 2017

Please sit together with your team

4th individual/pair assignment (development technologies) due tonight

3rd team assignment (revised proposal) due this Thursday

Requirements and Wireframes team assignment due Thursday October 12

Wireframes

A “wireframe” is a sketch of a screen or page for a web or mobile application (the concept arose in engineering design for skeletal three-dimensional models of physical objects or structures)

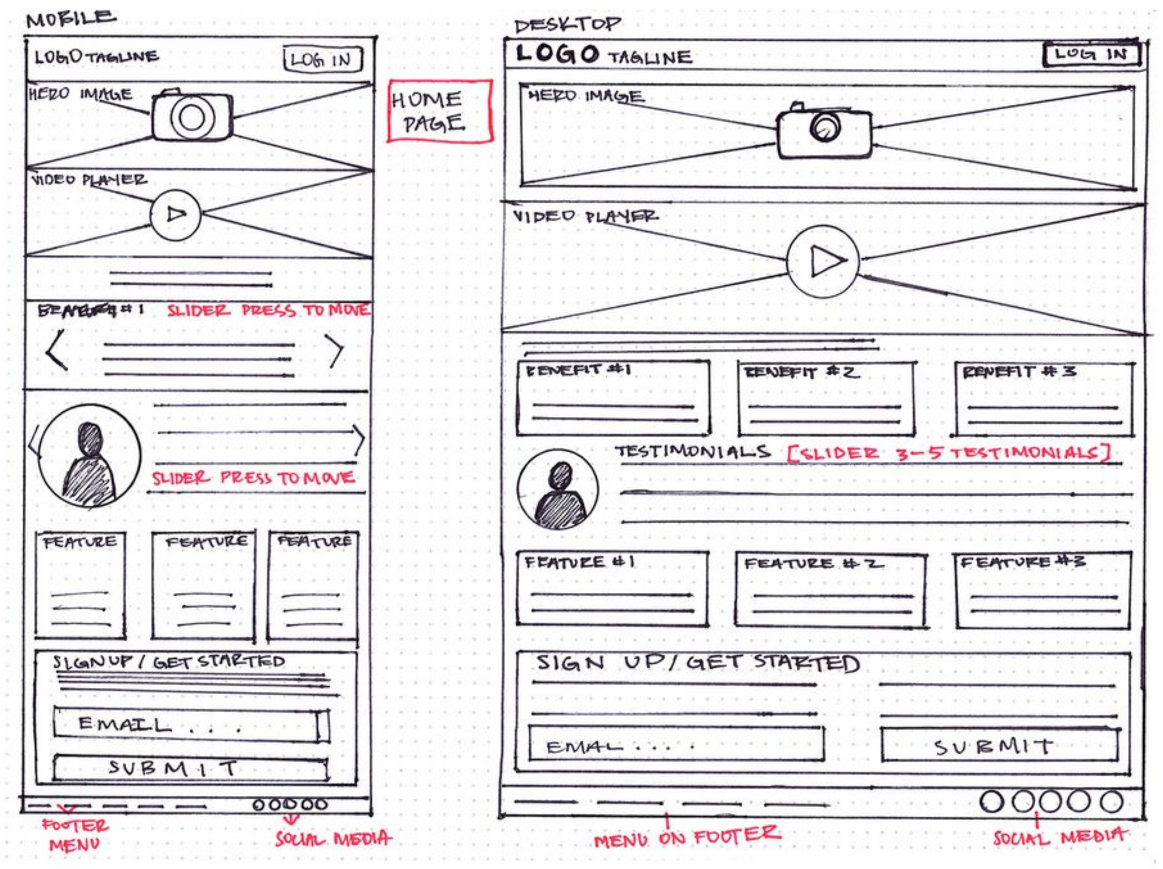
A wireframe lays out content and functionality, establishes basic structure and what interface elements will be shown

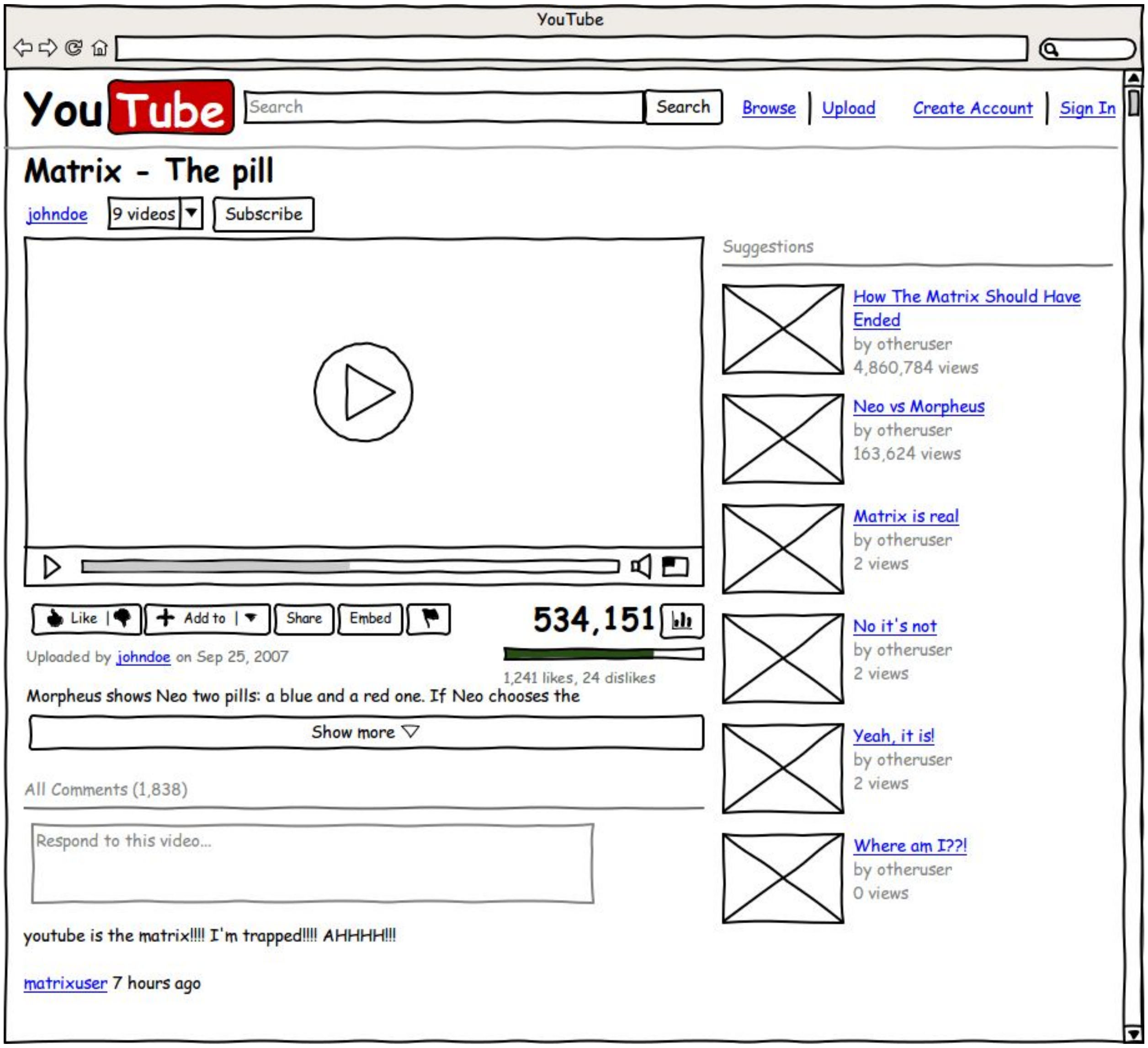
In the case of single-page applications, no you do not put everything in the same wireframe (unless that page literally never changes), there are different wireframes depicting different states of that single-page

A “storyboard” is a sequence of wireframes, often corresponding to a user story or use case (the concept arose with video, as in movies or TV, for mapping out the shots)

Often used for the “fake it” prototypes of design sprints

[Minimal wireframing tool]





Matrix - The pill

johndoe

534,151

Uploaded by johndoe on Sep 25, 2007

1,241 likes, 24 dislikes

Morpheus shows Neo two pills: a blue and a red one. If Neo chooses the

All Comments (1,838)

youtube is the matrix!!!! I'm trapped!!!! AHHHH!!!

matrixuser 7 hours ago

How The Matrix Should Have Ended
by otheruser
4,860,784 views

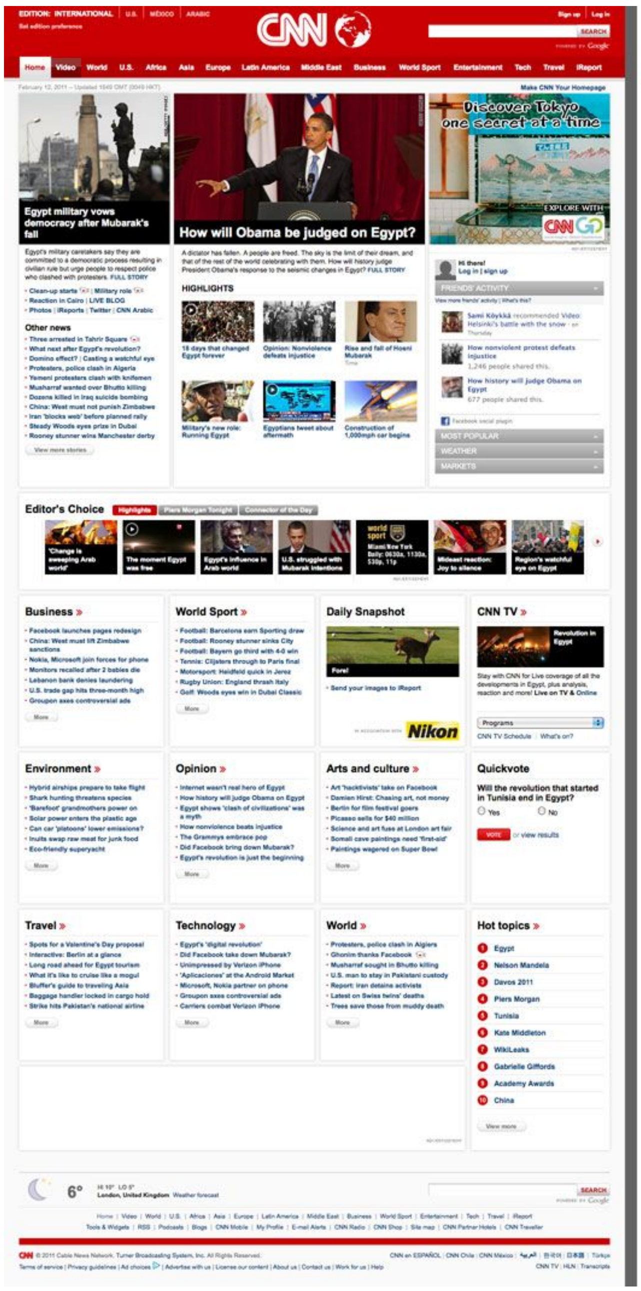
Neo vs Morpheus
by otheruser
163,624 views

Matrix is real
by otheruser
2 views

No it's not
by otheruser
2 views

Yeah, it is!
by otheruser
2 views

Where am I??!
by otheruser
0 views



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February 12, 2011 -- Updated 1049 GMT (0049 HKT)

Make CNN Your Homepage

Egypt military vows democracy after Mubarak's fall

Egypt's military caretakers say they are committed to a democratic process resulting in civilian rule but urge people to respect police who clashed with protesters. FULL STORY

- Clean-up starts | Military role
- Reaction in Cairo | LIVE BLOG
- Photos | iReports | Twitter | CNN Arabic

Other news

- Three arrested in Tahrir Square
- What next after Egypt's revolution?
- Domino effect? | Casting a watchful eye
- Protesters, police clash in Algeria
- Yemeni protesters clash with knifemen
- Musharraf wanted over Bhutto killing
- Dozens killed in Iraq suicide bombing
- China: West must not punish Zimbabwe
- Iran 'blocks web' before planned rally
- Steady Woods eyes prize in Dubai
- Rooney stunner wins Manchester derby

View more stories

How will Obama be judged on Egypt?

A dictator has fallen. A people are freed. The sky is the limit of their dream, and that of the rest of the world celebrating with them. How will history judge President Obama's response to the seismic changes in Egypt? FULL STORY

HIGHLIGHTS

18 days that changed Egypt forever | Opinion: Nonviolence defeats injustice | Rise and fall of Hosni Mubarak

Military's new role: Running Egypt | Egyptians tweet about aftermath | Construction of 1,000mph car begins

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FRIENDS' ACTIVITY
View more friends' activity | What's this?

Sami Köykkä recommended Video: Helsinki's battle with the snow · on Thursday

How nonviolent protest defeats injustice
1,246 people shared this.

How history will judge Obama on Egypt
677 people shared this.

Facebook social plugin

MOST POPULAR
WEATHER
MARKETS

Editor's Choice Highlights | Piers Morgan Tonight | Connector of the Day

'Change is sweeping Arab world' | The moment Egypt was free | Egypt's influence in Arab world | U.S. struggled with Mubarak intentions | world sport Miami/New York Daily: 0630a, 1130a, 530p, 11p | Mideast reaction: Joy to silence | Region's watchful eye on Egypt

Business »

- Facebook launches pages redesign
- China: West must lift Zimbabwe sanctions
- Nokia, Microsoft join forces for phone
- Monitors recalled after 2 babies die
- Lebanon bank denies laundering
- U.S. trade gap hits three-month high
- Groupon axes controversial ads

More

World Sport »

- Football: Barcelona earn Sporting draw
- Football: Rooney stunner sinks City
- Football: Bayern go third with 4-0 win
- Tennis: Clijsters through to Paris final
- Motorsport: Heidfeld quick in Jerez
- Rugby Union: England thrash Italy
- Golf: Woods eyes win in Dubai Classic

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Daily Snapshot

Fore!

- Send your images to iReport

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CNN TV »

Revolution in Egypt

Stay with CNN for Live coverage of all the developments in Egypt, plus analysis, reaction and more! Live on TV & Online

Programs
CNN TV Schedule | What's on?

Environment »

- Hybrid airships prepare to take flight
- Shark hunting threatens species
- 'Barefoot' grandmothers power on
- Solar power enters the plastic age
- Can car 'platoons' lower emissions?
- Inuits swap raw meat for junk food
- Eco-friendly superyacht

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Opinion »

- Internet wasn't real hero of Egypt
- How history will judge Obama on Egypt
- Egypt shows 'clash of civilizations' was a myth
- How nonviolence beats injustice
- The Grammys embrace pop
- Did Facebook bring down Mubarak?
- Egypt's revolution is just the beginning

More

Arts and culture »

- Art "hacktivists" take on Facebook
- Damien Hirst: Chasing art, not money
- Berlin for film festival goers
- Picasso sells for $40 million
- Science and art fuse at London art fair
- Somali cave paintings need 'first-aid'
- Paintings wagered on Super Bowl

More

Quickvote

Will the revolution that started in Tunisia end in Egypt?
○ Yes ○ No

VOTE or view results

Travel »

- Spots for a Valentine's Day proposal
- Interactive: Berlin at a glance
- Long road ahead for Egypt tourism
- What it's like to cruise like a mogul
- Bluffer's guide to traveling Asia
- Baggage handler locked in cargo hold
- Strike hits Pakistan's national airline

More

Technology »

- Egypt's 'digital revolution'
- Did Facebook take down Mubarak?
- Unimpressed by Verizon iPhone
- 'Aplicaciones' at the Android Market
- Microsoft, Nokia partner on phone
- Groupon axes controversial ads
- Carriers combat Verizon iPhone

More

World »

- Protesters, police clash in Algiers
- Ghonim thanks Facebook
- Musharraf sought in Bhutto killing
- U.S. man to stay in Pakistani custody
- Report: Iran detains activists
- Latest on Swiss twins' deaths
- Trees save those from muddy death

More

Hot topics »

1. Egypt
2. Nelson Mandela
3. Davos 2011
4. Piers Morgan
5. Tunisia
6. Kate Middleton
7. WikiLeaks
8. Gabrielle Giffords
9. Academy Awards
10. China

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6° HI 10° LO 5°
London, United Kingdom Weather forecast

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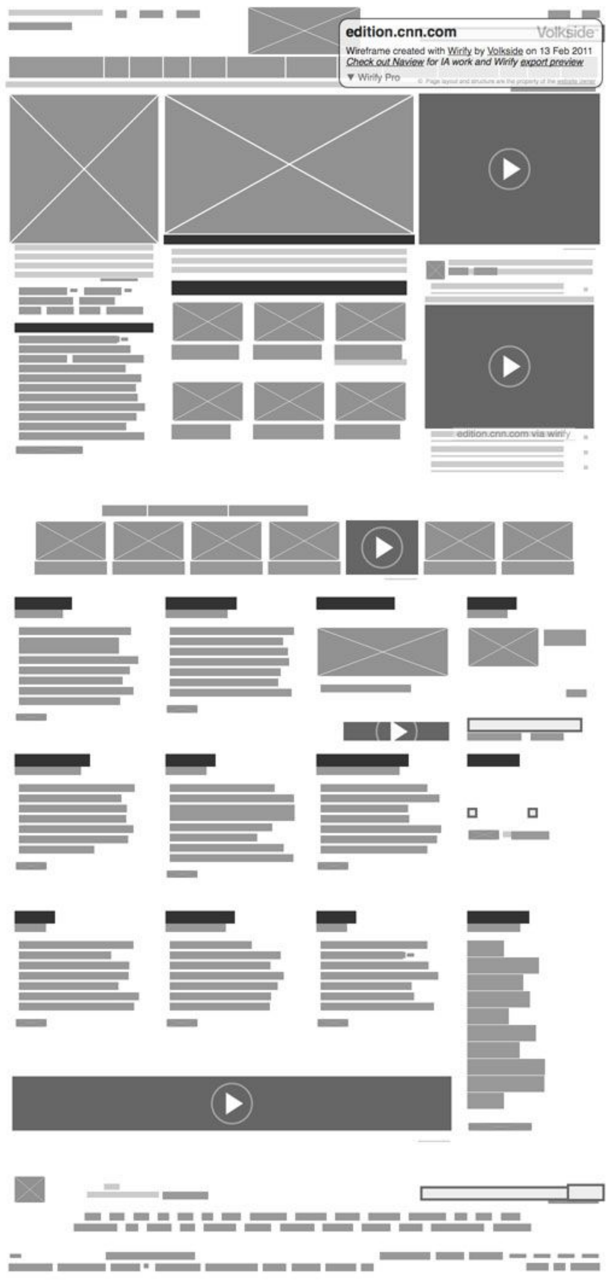

edition.cnn.com Volkside
Wireframe created with Wirify by Volkside on 13 Feb 2011
Check out Naview for IA work and Wirify export preview
▼ Wirify Pro
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Object-Oriented Analysis and Design (OOAD)

Design sprints and wireframes are primarily concerned with *external* design of a product, now we consider *internal* design - how do we achieve that external design in software

Analysis translates requirements into design

There are other approaches to this translation, we will consider only OOAD

“Object-oriented” analysis and design applies even when using non-OO programming language

Do not start coding, do not use a code editor or IDE, instead use whiteboard, paper, index cards

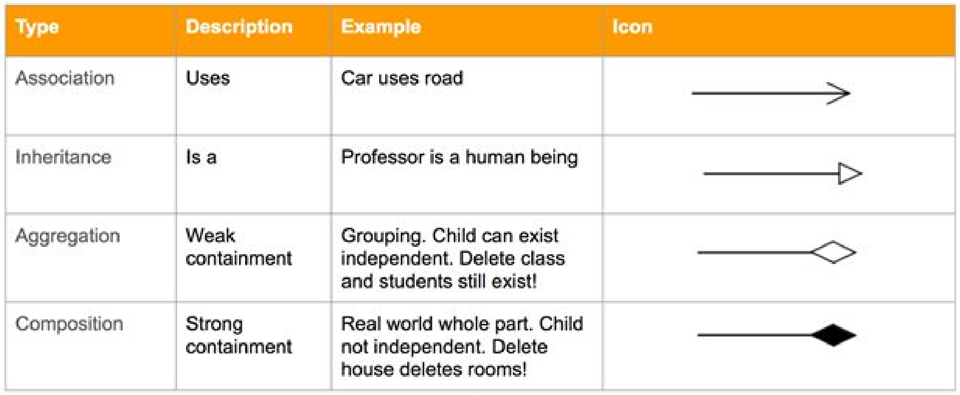
Two stages

1. Build an abstract model of the problem domain or application domain (what)
2. Add architectural style, design patterns, implementation constraints to make concrete (how)

Basic Process for first stage

Identify “things” or “entities” (nouns) - roles, events, sites, physical, tangible, devices, ...

Identify static relationships among the things



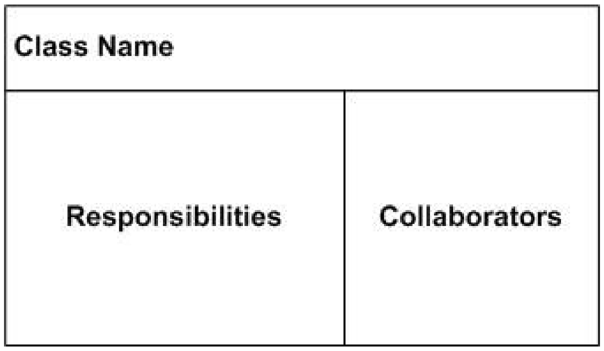
Type	Description	Example	Icon
Association	Uses	Car uses road	⟶
Inheritance	Is a	Professor is a human being	—▷
Aggregation	Weak containment	Grouping. Child can exist independent. Delete class and students still exist!	—◇
Composition	Strong containment	Real world whole part. Child not independent. Delete house deletes rooms!	—◆

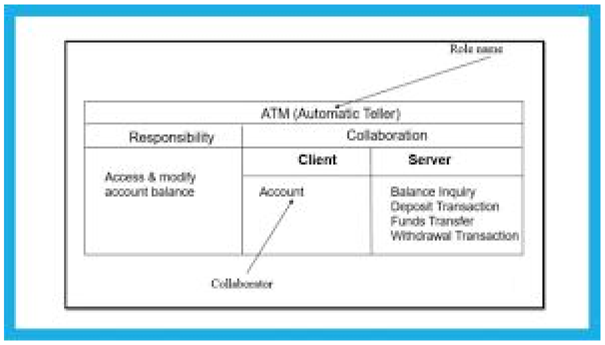
Construct scenarios corresponding to a single path through a use case

Identify dynamic responsibilities of the things during these scenarios

CRC Cards

One approach to OOAD





The Classes are the things or entities

Responsibilities = what it needs to do

Collaborators = classes that it interacts with, knows about, communicates with, contains

Look for noun/verb combinations in user stories or use cases

> Nouns are classes - **except** classes should be the objects that “do” operations, not the actors who initiate operation, so distinguish subject and object
>
> Verbs are responsibilities

Look for relationships among nouns in user stories/use cases

When “the system” does something, that means some class in the system does it -
No global master objects that do everything and/or are related to everything else

Combine and split

- Split classes with too many responsibilities
- Combine classes with too few responsibilities
- Remove duplicates
- Avoid classes with only CRUD operations (create, read, update, delete)

Walk through the scenarios of each use case (often more than one per use case)

Animate the CRC cards, move index cards on a table or sticky notes on a board

Make sure everything is handled by some class

Identify all class collaborators

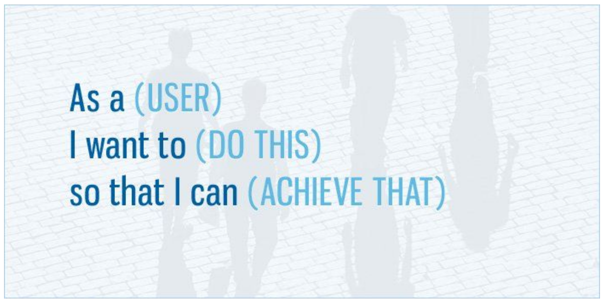
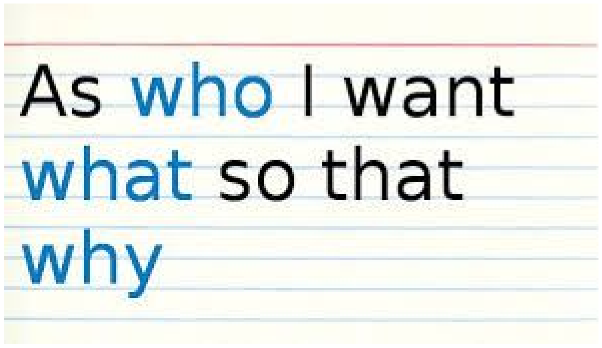
YAGNI (you aren't going to need it) **-** only design for the *current* iteration, not classes, responsibilities, collaborators than may come up later

After CRC cards cover every user story for the current iteration, next step is Class Diagrams

Class exercise part 1: 5 minutes

Teams meet and put together ONE user story for your project

Recall a user story is a short simple description of ONE feature, about three sentences that can fit on a 3x5 card

 As a (USER) I want to (DO THIS) so that I can (ACHIEVE THAT)	 As who I want what so that why

Class exercise part 2: 10 minutes

Teams meet and expand your ONE user story into a use case

If we already have a user story like this one:

As a shopper, I want to select items to purchase and then order the items.

[This is probably an "epic", should be broken down into two or more user stories, one for selecting items and at least one for ordering.]

The corresponding use case might look something like the following (for your exercise you should think of a few steps and one or two alternate flows but do not need to be exhaustive)

Use Case Name: Place Order

Actors:

- Registered Shopper (Has an existing account, possibly with billing and shipping information)
- Non-registered Shopper (Does not have an existing account)
- Fulfillment System (processes orders for delivery to customers)
- Billing System (bills customers for orders that have been placed)

Triggers: The user indicates that she wants to purchase items that she has selected.

Preconditions: User has selected the items to be purchased.

Post-conditions:

- The order will be placed in the system.
- The user will have a tracking ID for the order.
- The user will know the estimated delivery date for the order.

Normal Flow:

1. The user will indicate that she wants to order the items that have already been selected.
2. The system will present the billing and shipping information that the user previously stored.
3. The user will confirm that the existing billing and shipping information should be used for this order.
4. The system will present the amount that the order will cost, including applicable taxes and shipping charges.
5. The user will confirm that the order information is accurate.
6. The system will provide the user with a tracking ID for the order.

7. The system will submit the order to the *fulfillment system* for evaluation.
8. The *fulfillment system* will provide the system with an estimated delivery date.
9. The system will present the estimated delivery date to the user.
10. The user will indicate that the order should be placed.
11. The system will request that the *billing system* should charge the user for the order.
12. The *billing system* will confirm that the charge has been placed for the order.
13. The system will submit the order to the *fulfillment system* for processing.
14. The *fulfillment system* will confirm that the order is being processed.
15. The system will indicate to the user that the user has been charged for the order.
16. The system will indicate to the user that the order has been placed.
17. The user will exit the system.

Alternate Flows:

3A1: The user enters billing and shipping information for the order. The user desires to use shipping and billing information that differs from the information stored in her account. This alternate flow also applies if the user does not maintain billing and / or shipping information in their account, or if the user does not have an account.

1. The user will indicate that this order should use alternate billing or shipping information.
2. The user will enter billing and shipping information for this order.
3. The system will validate the billing and shipping information.
4. The use case continues

5A1: The user will discover an error in the billing or shipping information associated with their account, and will change it.

1. The user will indicate that the billing and shipping information is incorrect.
2. The user will edit the billing and shipping information associated with their account.
3. The system will validate the billing and shipping information.
4. The use case returns to step 2 and continues.

5A2: The user will discover an error in the billing or shipping information that is uniquely being used for this order, and will change it.

1. The user will indicate that the billing and shipping information is incorrect.
2. The user will edit the billing and shipping information for this order.
3. The use case returns to step 3A1 step 3.

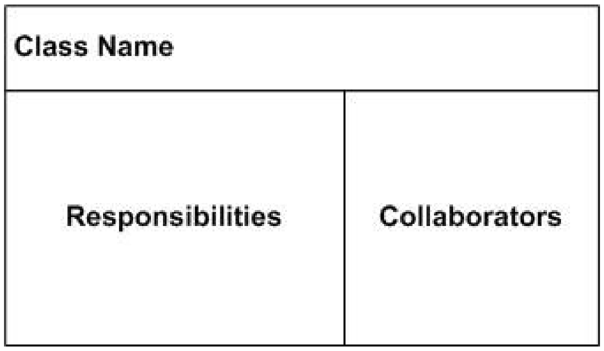
10A1: The user will determine that the order is not acceptable (perhaps due to dissatisfaction with the estimated delivery date) and will cancel the order.

1. The user will request that the order be cancelled.
2. The system will confirm that the order has been cancelled.
3. The use case ends.

Class exercise part 3: 5 minutes

Teams meet and create one or more CRC cards that cover the ONE user story / use case

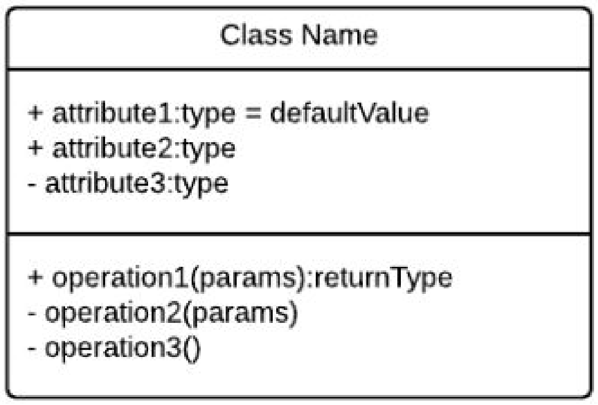
YAGNI: Do not include any classes, responsibilities, collaborators that are not needed for that ONE user story



Class Name	
Responsibilities	Collaborators

Will cover next time

Class Diagrams



A class can be a type (that can be instantiated many times) or a singleton (no more than one)

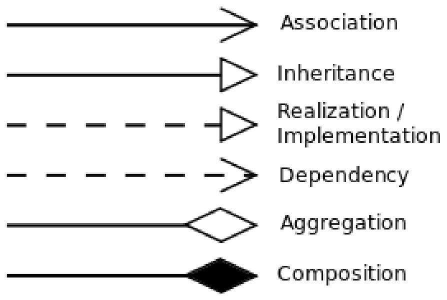
Attributes: What describes it? Properties of the object - may be primitive or references to collaborators

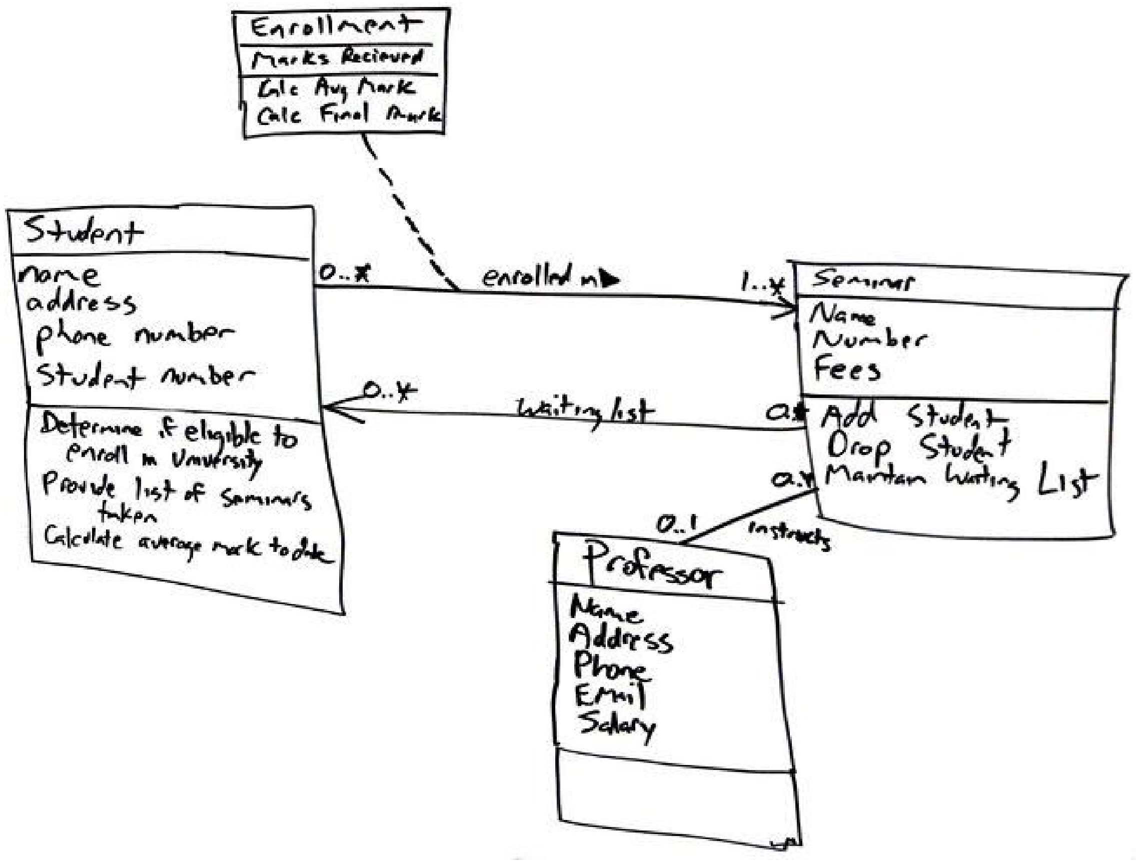
Operations: What does it do? Behaviors correspond to the responsibilities (omit CRUD)

Some class diagrams show the structure of a single class
while others show the relationships among classes

On CRC cards, *any* kind of relationship is fine for “collaborators”, but in class diagrams, we refine the kind of relationship

The OOA icons above are from the UML Class Diagram notation, which also include implementation relationships such as realization (e.g., of an interface) and dependency (e.g., package import)


Association
Inheritance
Realization / Implementation
Dependency
Aggregation
Composition


Enrollment
Marks Recieved
Calc Avg Mark
Calc Final Mark
Student
name
address
phone number
Student number
Determine if eligible to enroll in University
Provide list of Seminars taken
Calculate average mark to date
0..*
enrolled in ▶
1..*
Seminar
Name
Number
Fees
Add Student
Drop Student
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Professor
Name
Address
Phone
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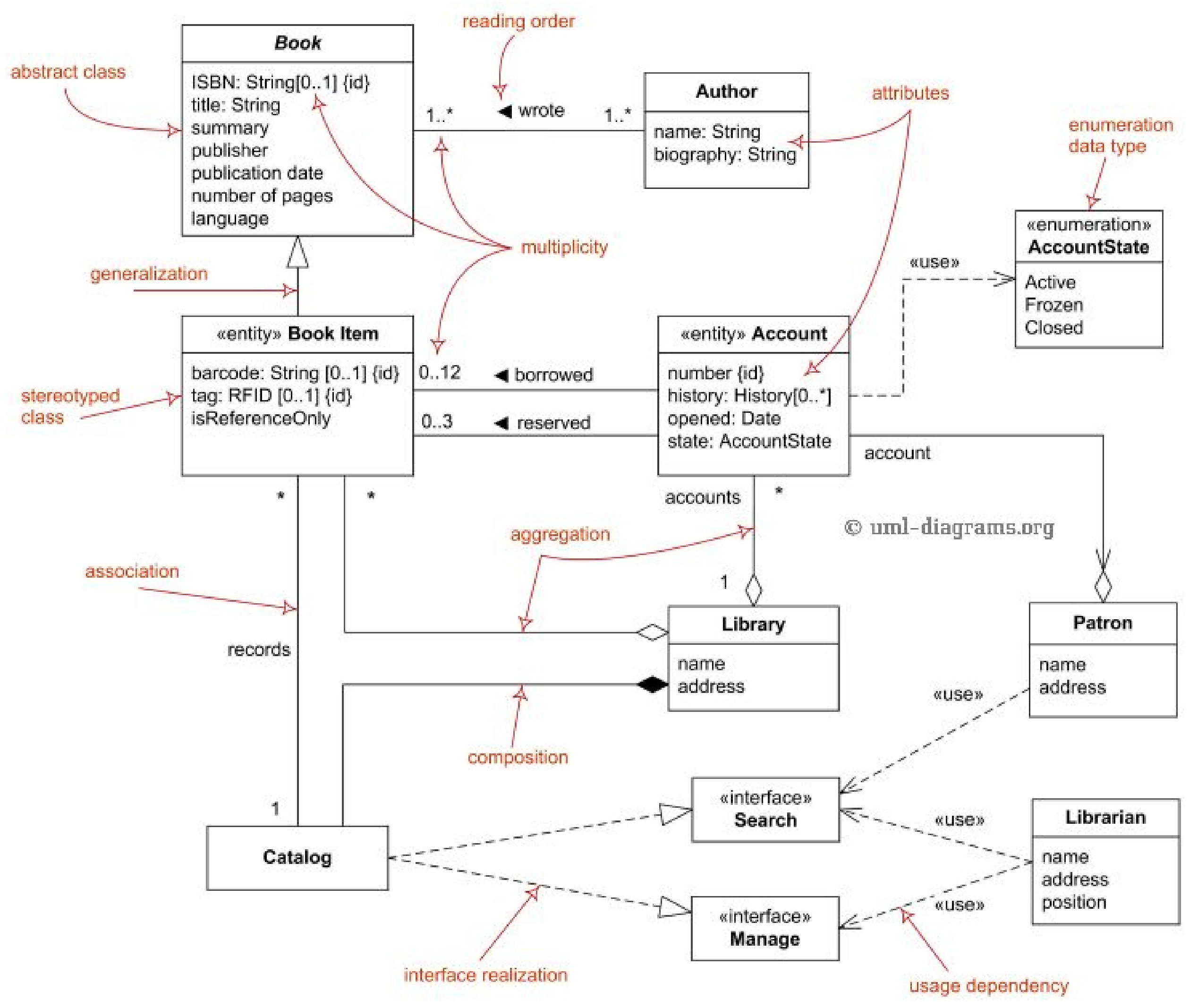
Salary



reading order
abstract class
Book
ISBN: String[0..1] {id}
title: String
summary
publisher
publication date
number of pages
language
1..*
◀ wrote
1..*
Author
name: String
biography: String
attributes
enumeration data type
«enumeration» AccountState
Active
Frozen
Closed
multiplicity
generalization
«use»
«entity» Book Item
barcode: String [0..1] {id}
tag: RFID [0..1] {id}
isReferenceOnly
stereotyped class
0..12
◀ borrowed
0..3
◀ reserved
«entity» Account
number {id}
history: History[0..*]
opened: Date
state: AccountState
account
accounts
*
*
*
1
aggregation
© uml-diagrams.org
association
records
Library
name
address
Patron
name
address
composition
«use»
1
Catalog
«interface» Search
«interface» Manage
«use»
«use»
Librarian
name
address
position
interface realization
usage dependency

“Association” is most general, instances of one class know about or communicate with instances of another class (or the same class), unidirectional represented as line with arrow, bidirectional represented as just plain line

Open aggregation is a special case of association, corresponds to HAS-A

> Line with open diamond at container class, optional name of attribute on the line
>
> Multiplicity at contained class end of line: N..M, 0..*, 1..5, 3

Closed aggregation (composition) is another special case of association, more like CONSISTS-OF than HAS-A, strong lifecycle relationship

> Line with closed/filled diamond at container class
>
> Closed means deleting parent automatically deletes all the children, or alternatively that all the children must have already been deleted in order to delete the parent

Inheritance from superclass (abstraction, generalization, base class) to subclass (specialization, derived class)

> Solid line with open (unfilled) arrowhead from subclass to superclass

Implementation of an interface

> Dashed line with open arrowhead from implementing class to interface
>
> The actual interface is represented in UML like a class, adding special marker <<interface>>