BUILDING BLOCKS

UML & more....

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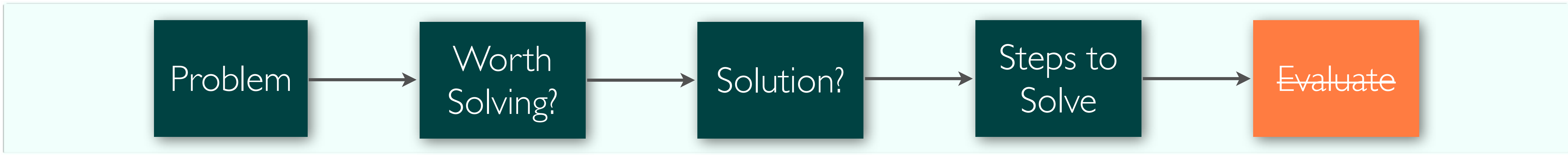
Main Sections

UML

Sequence Diagrams

Use Case Diagrams



Problem

Worth Solving?

Solution?

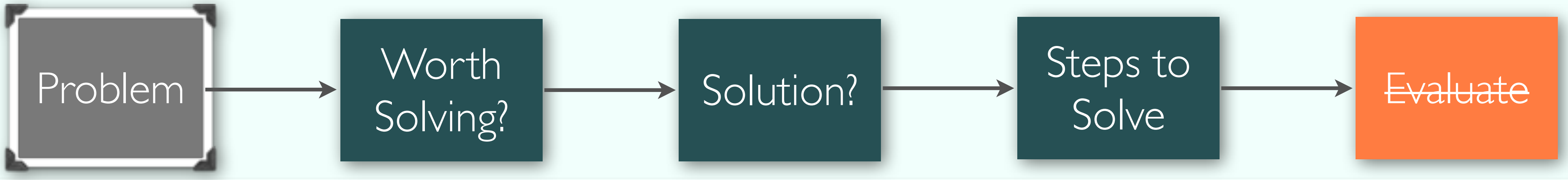
Steps to Solve

~~Evaluate~~

So, what is the problem ?

- Software is extremely complex.
    - Once a structure is in place, very difficult to change.
    - Requires teamwork to build.
    - Software usually requires maintenance.
    - Requirements need to be traced.

Should we reduce 'effective' complexity?

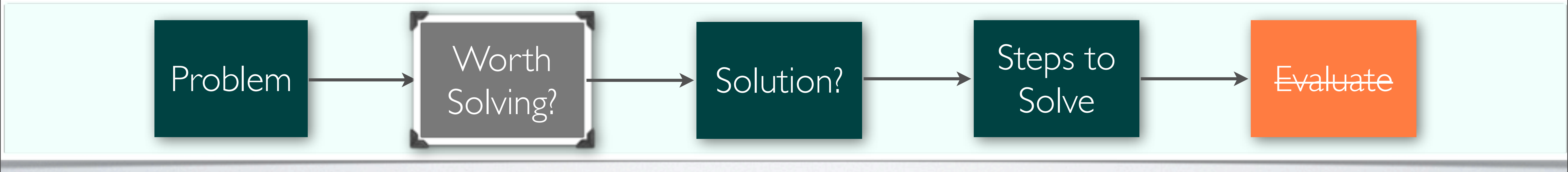


Structure in place, hard to change.
Teamwork required. Team mates need to communicate.
Maintenance, hence documentation.
Traceability is important to check if the final product delivers on the functional requirements.

Why Reduce 'Effective Complexity'?

- Software is ubiquitous. Chances are, you will encounter it.
- Will require less work from each team member to get it right the first time.
- Easier documentation and greater maintainability.

How to reduce effective complexity?



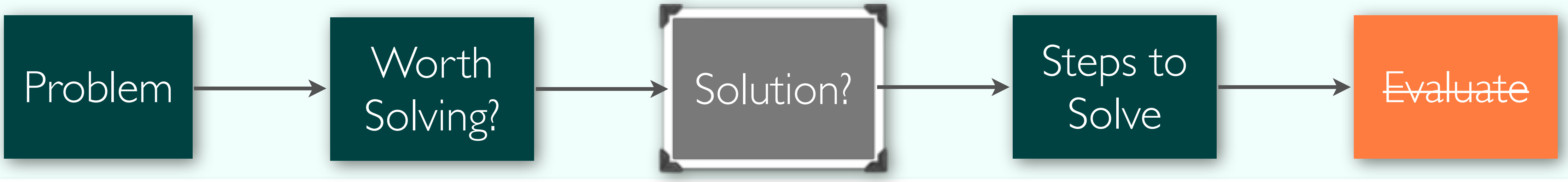
1. Definitely computer scientists.
2. If team members share a common vocabulary and can communicate, it'll be easier for everyone.
3. Reduce risk of failure.

How to reduce ‘Effective Complexity’?

Visualize software

UML designed with the following major goals

- A Plan
- Visualize different layers of detail
- Apply to new and legacy systems
- Universal
- Support parallel dev. of large systems



Problem

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Steps to Solve

~~Evaluate~~

Software construction needs a plan.
The overall scope of the software can quickly and easily be defined at the start of the project with a high level model allowing for accurate estimation. Increasing levels of detail can then be added to each part of the software as it is constructed
Universal + Unified = standard for software modelling languages.

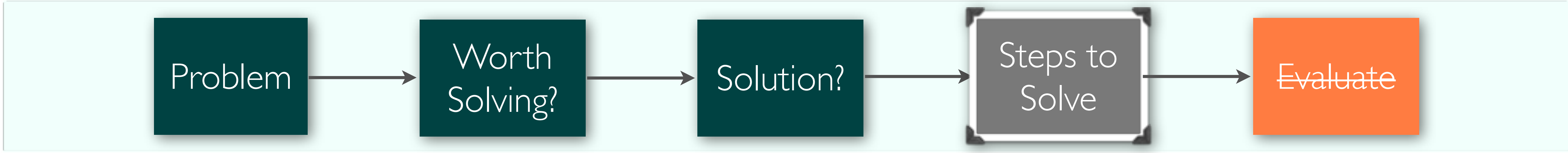
Just like a building

UML (design and represent Building Blocks)

UML - Unified Modelling Language

“The three amigos”

James Rumbaugh (OMT + UML, RUP)
Grady Booch (Booch Method, RUP)
Ivar Jacobson (RUP, EssUP)



Problem

Worth Solving?

Solution?

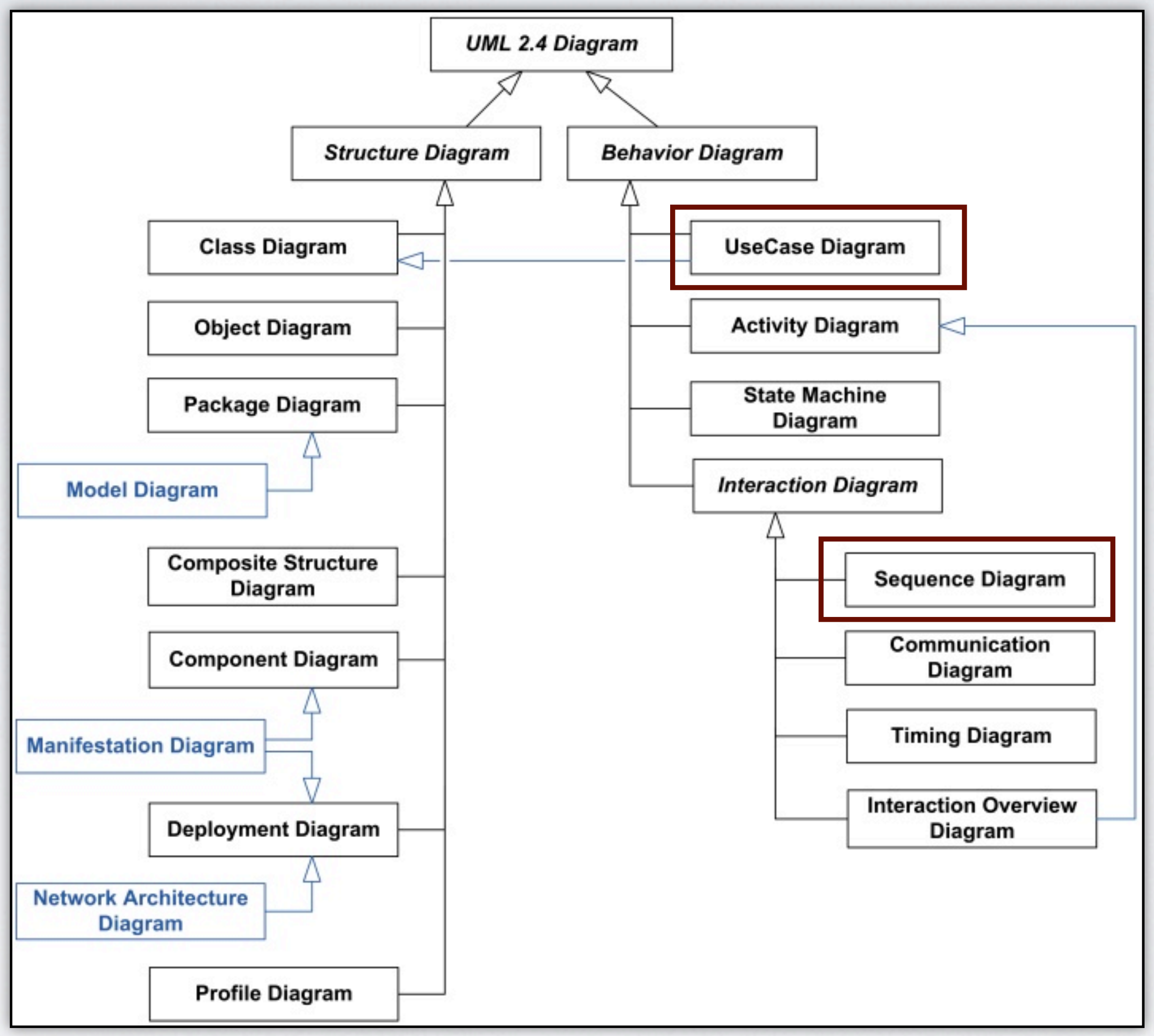
Steps to Solve

~~Evaluate~~

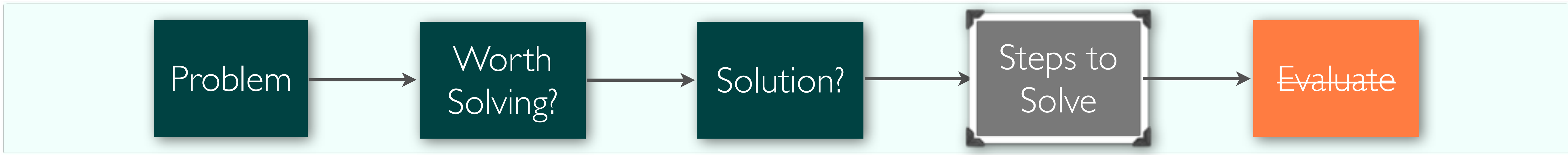
OMT – Object modelling technique

UML (design and represent Building Blocks)

UML - Published by the OMG



Source: omg.org

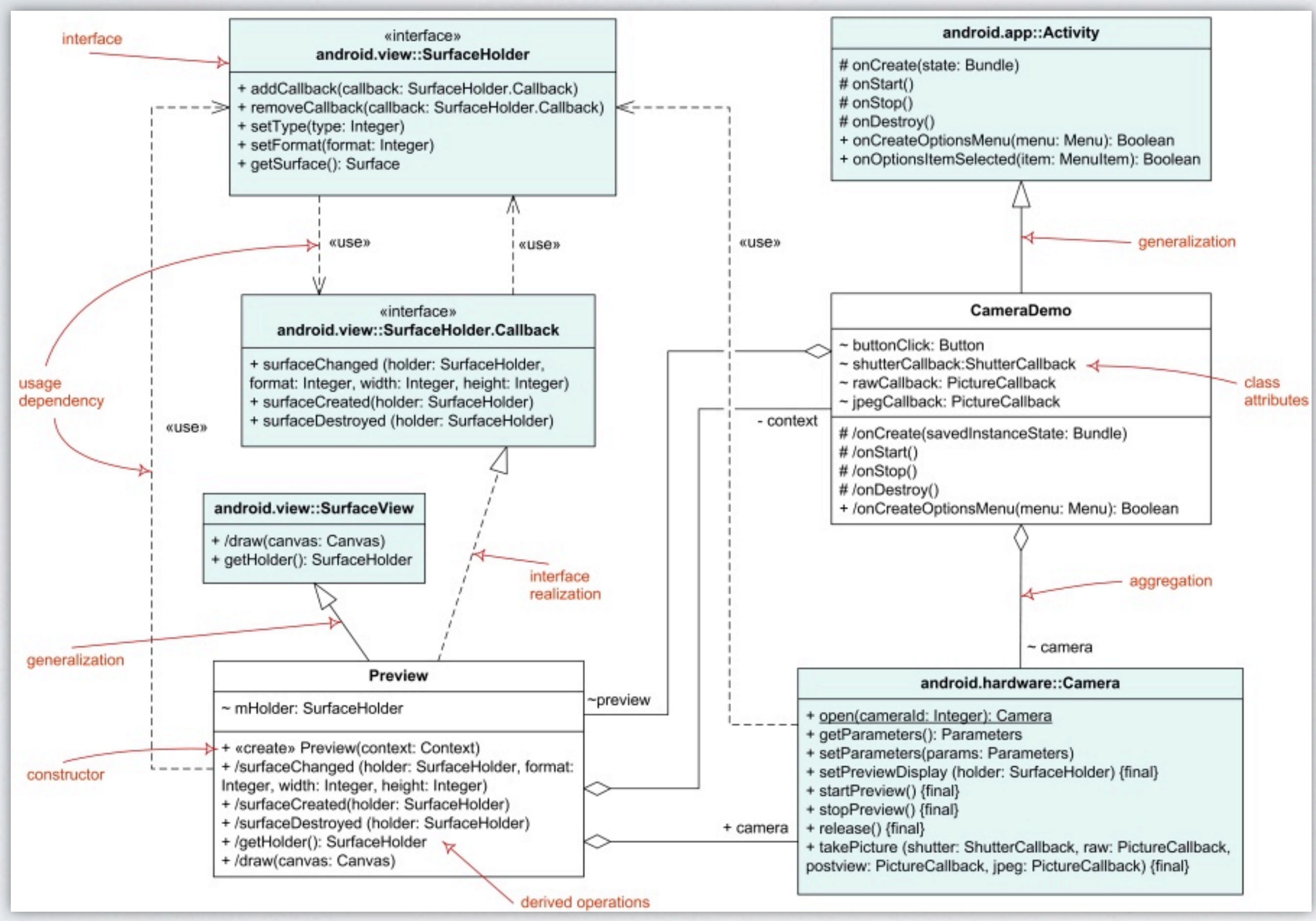


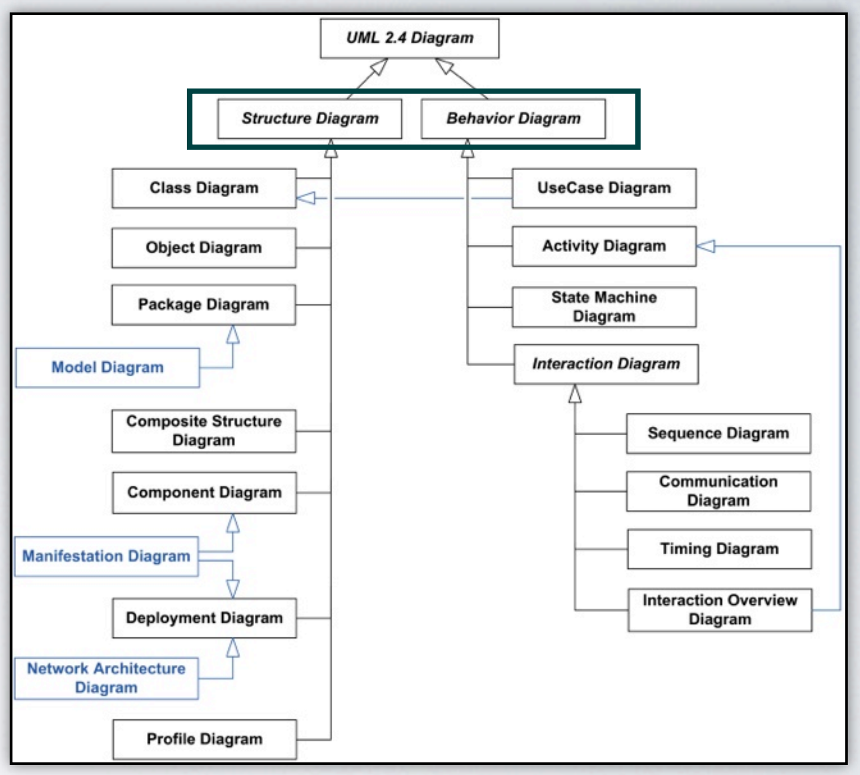
Problem → Worth Solving? → Solution? → Steps to Solve → ~~Evaluate~~

OMG – Object Modelling Group
UML 2.4 – March 2011

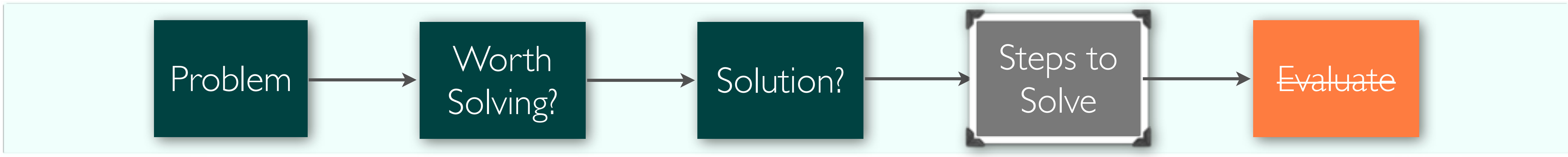
UML (contd.)

- Structure diagram (not our focus!)
  - Shows the *static* structure of the system.


interface
«interface»
android.view::SurfaceHolder
+ addCallback(callback: SurfaceHolder.Callback)
+ removeCallback(callback: SurfaceHolder.Callback)
+ setType(type: Integer)
+ setFormat(format: Integer)
+ getSurface(): Surface
android.app::Activity
# onCreate(state: Bundle)
# onStart()
# onStop()
# onDestroy()
+ onCreateOptionsMenu(menu: Menu): Boolean
+ onOptionsItemSelected(item: MenuItem): Boolean
«use»
«use»
«use»
generalization
usage dependency
«interface»
android.view::SurfaceHolder.Callback
+ surfaceChanged (holder: SurfaceHolder, format: Integer, width: Integer, height: Integer)
+ surfaceCreated(holder: SurfaceHolder)
+ surfaceDestroyed (holder: SurfaceHolder)
CameraDemo
~ buttonClick: Button
~ shutterCallback:ShutterCallback
~ rawCallback: PictureCallback
~ jpegCallback: PictureCallback
# /onCreate(savedInstanceState: Bundle)
# /onStart()
# /onStop()
# /onDestroy()
+ /onCreateOptionsMenu(menu: Menu): Boolean
class attributes
«use»
- context
android.view::SurfaceView
+ /draw(canvas: Canvas)
+ getHolder(): SurfaceHolder
interface realization
aggregation
generalization
~ camera
Preview
~ mHolder: SurfaceHolder
~preview
+ «create» Preview(context: Context)
+ /surfaceChanged (holder: SurfaceHolder, format: Integer, width: Integer, height: Integer)
+ /surfaceCreated(holder: SurfaceHolder)
+ /surfaceDestroyed (holder: SurfaceHolder)
+ /getHolder(): SurfaceHolder
+ /draw(canvas: Canvas)
constructor
+ camera
derived operations
android.hardware::Camera
+ open(cameraId: Integer): Camera
+ getParameters(): Parameters
+ setParameters(params: Parameters)
+ setPreviewDisplay (holder: SurfaceHolder) {final}
+ startPreview() {final}
+ stopPreview() {final}
+ release() {final}
+ takePicture (shutter: ShutterCallback, raw: PictureCallback, postview: PictureCallback, jpeg: PictureCallback) {final}



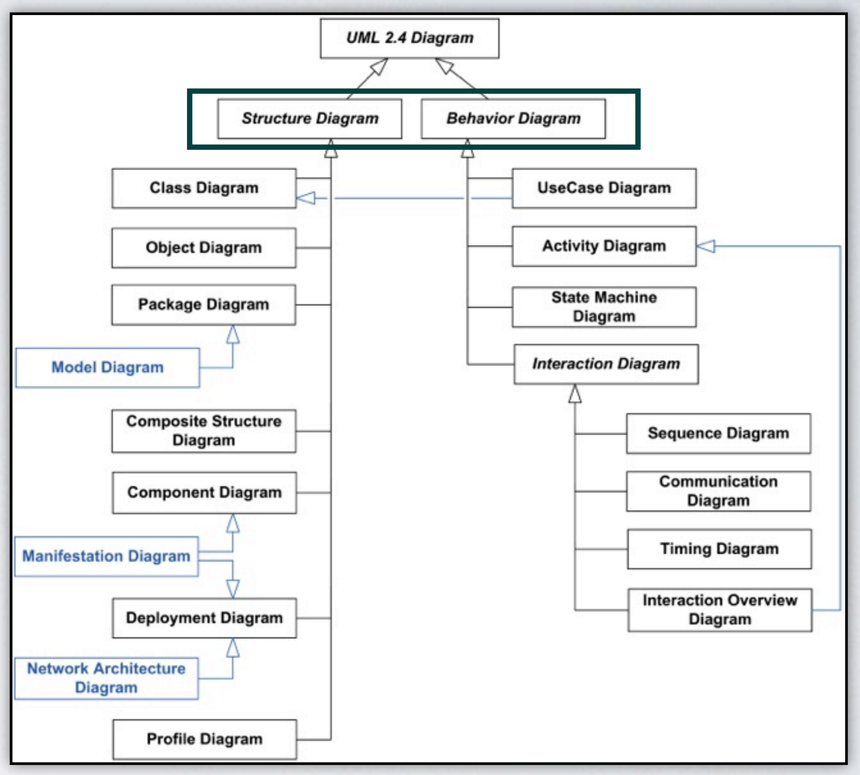
Implementation Class Diagram, Source: uml-diagrams.org

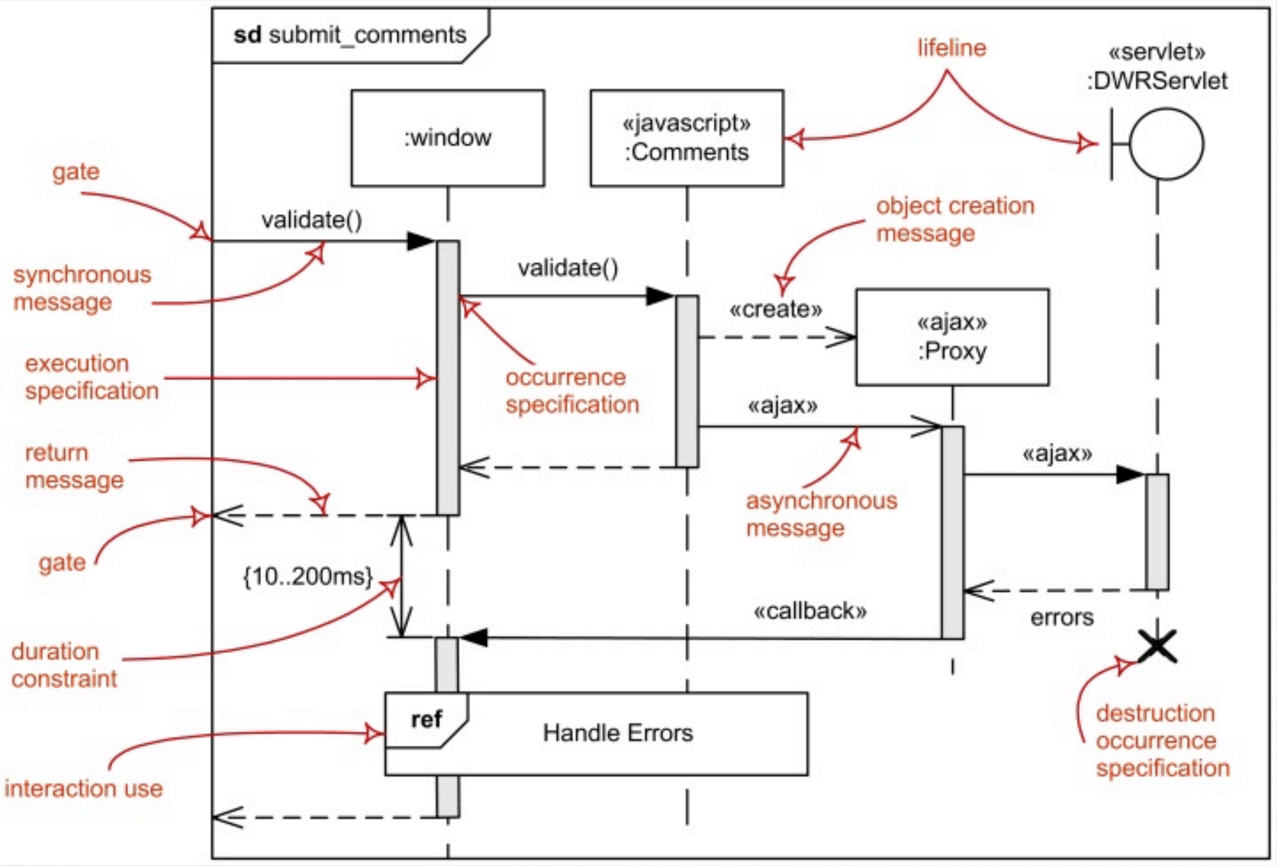


- The elements in a structure diagram represent the meaningful concepts of a system, and may include abstract, real world and implementation concepts.

UML (contd.)

- Behavior diagram
  - Shows the *dynamic* structure of the system.

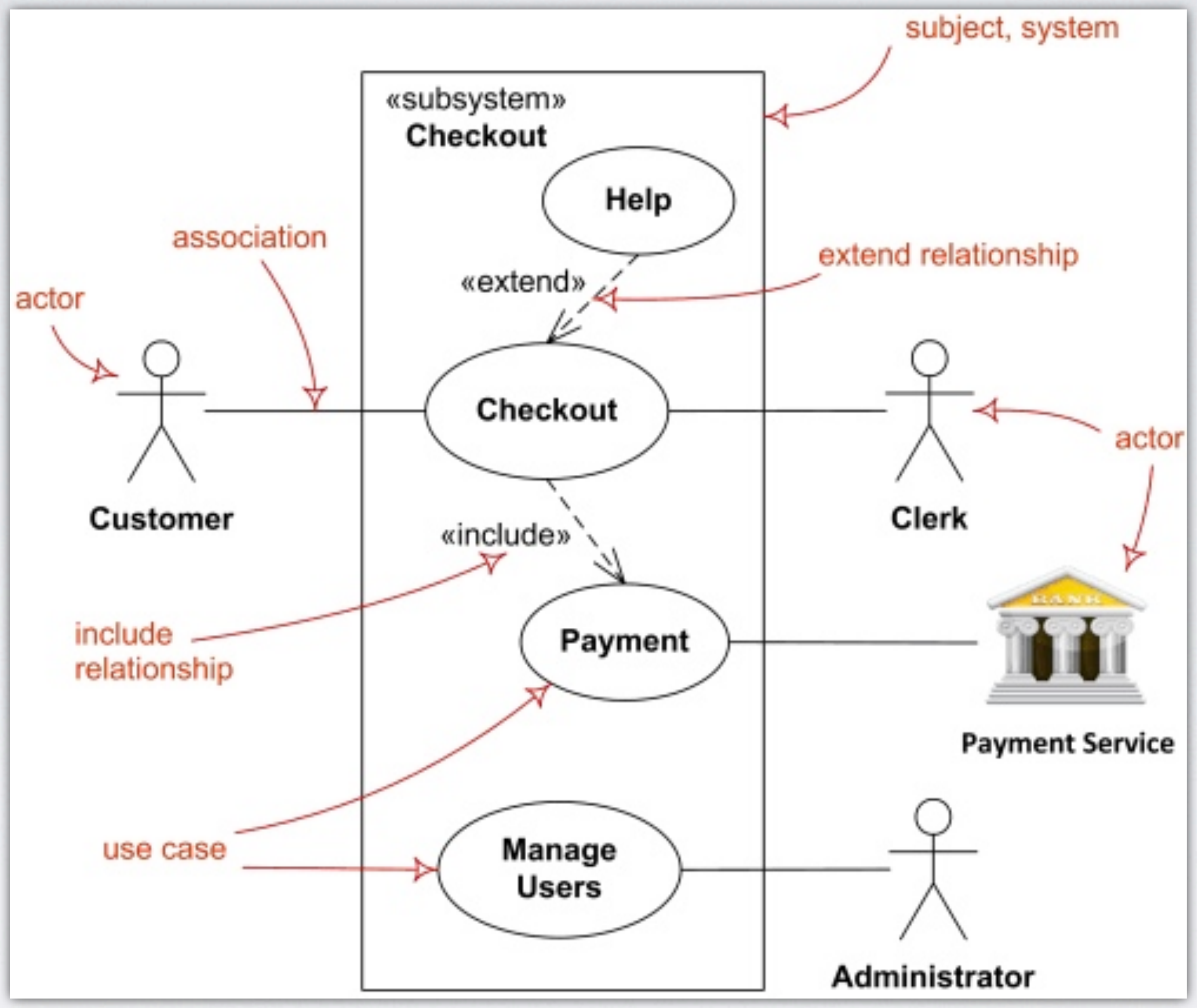




Sequence Diagram, Source: uml-diagrams.org

- The elements in a behavior diagram represent a series of changes to the system over time.

Use Case Diagrams



A closer look !

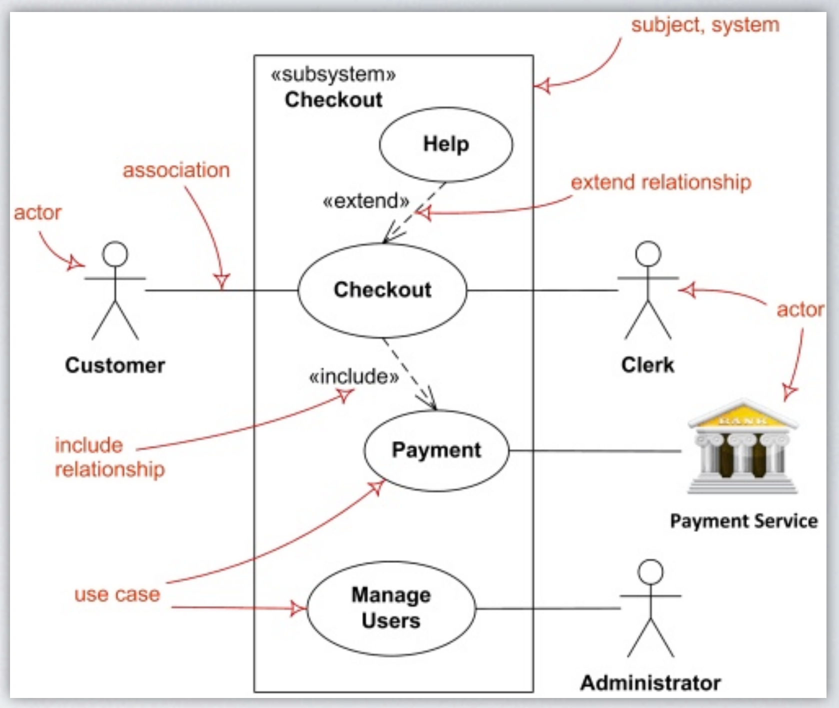
Problem → Worth Solving? → Solution? → Steps to Solve → ~~Evaluate~~

- Use case diagrams are also known as extensions of class diagrams.
- Use case diagrams are supposed to be behavior and structure diagrams according to UML 2.4

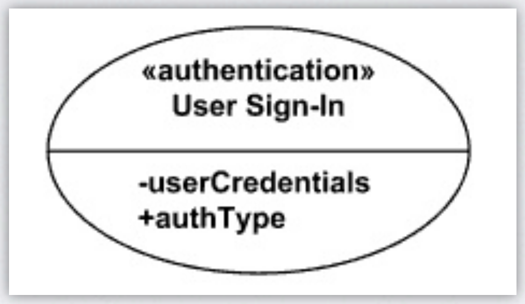
Use Case Diagrams (contd.)

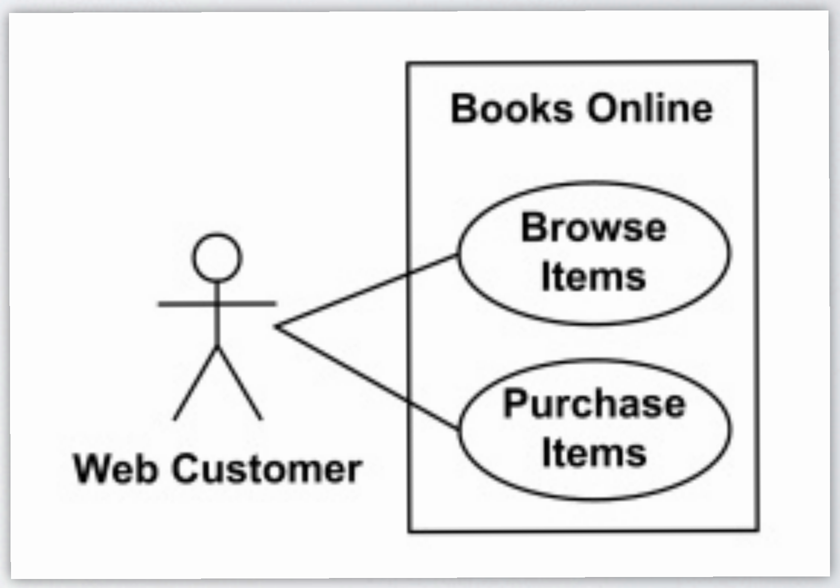
Use case diagrams are used to specify:

- (external) requirements.
- what a *system can* do;
- how environment should interact with the *subject* so that the system will be able to perform its services.



Use Case - A *set* of actions





Subject - System under analysis to which a set of use cases apply.

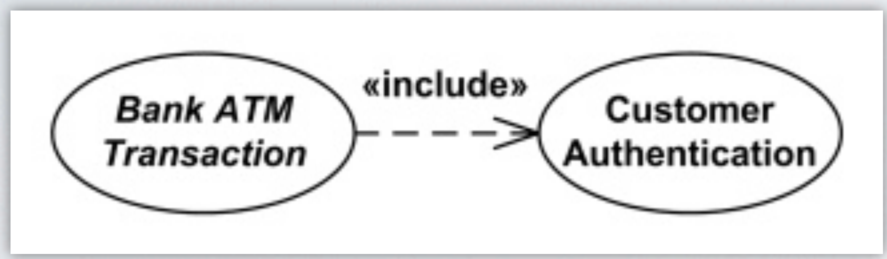
Actor - external users of a system

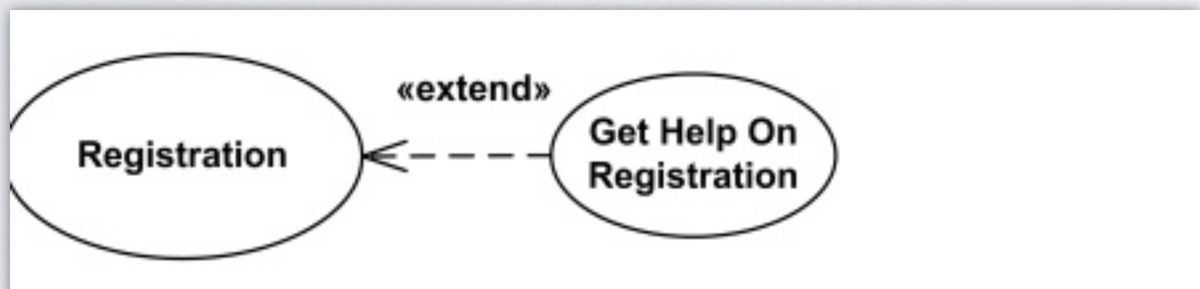
Problem
Worth Solving?
Solution?
Steps to Solve
~~Evaluate~~

Use case – Set of actions performed by the system to yield an observable result.
Subject – The subject could be a business or company, software system, physical system or device, or a smaller subsystem having some behavior.
Actor – Standard UML notation for actor is "**stick man**" icon with the name of the actor above or below of the icon. Actor names should follow the capitalization and punctuation guidelines for classes. The names of **abstract actors** should be shown in italics. Custom icons can be used, such as the “non-human” payment service.
Actors are “associated” to use-cases, there can be multiple associations for each actor.

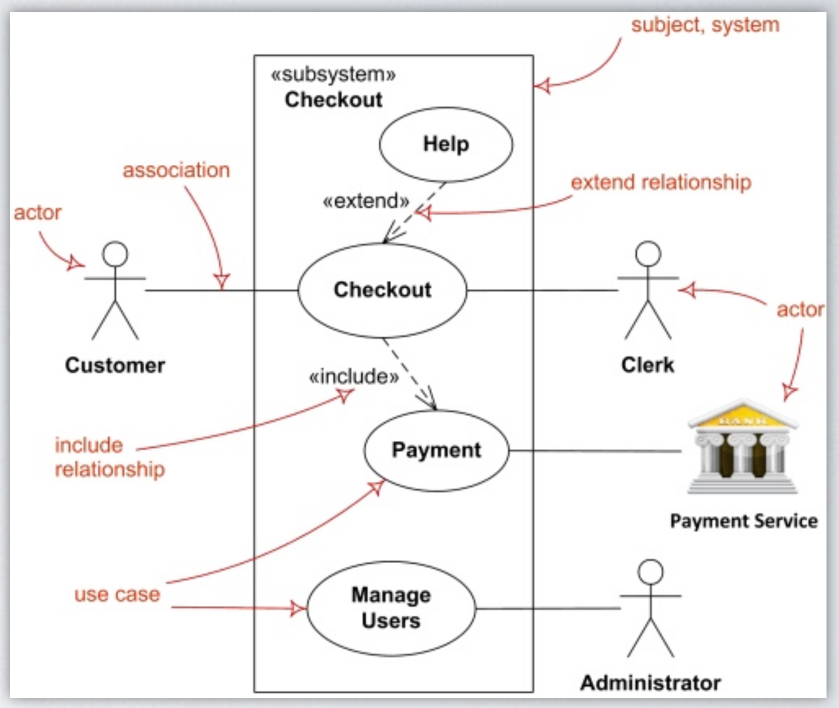
Use Case Diagrams (contd.)

Extend, Include - Shown using a dotted line.





***Registration** use case is meaningful on its own.*
*It could be extended with optional **Get Help On Registration** use case*



A Plan

Visualize different layers of detail

Apply to new and legacy systems

Universal

Support parallel dev. of large systems

Problem
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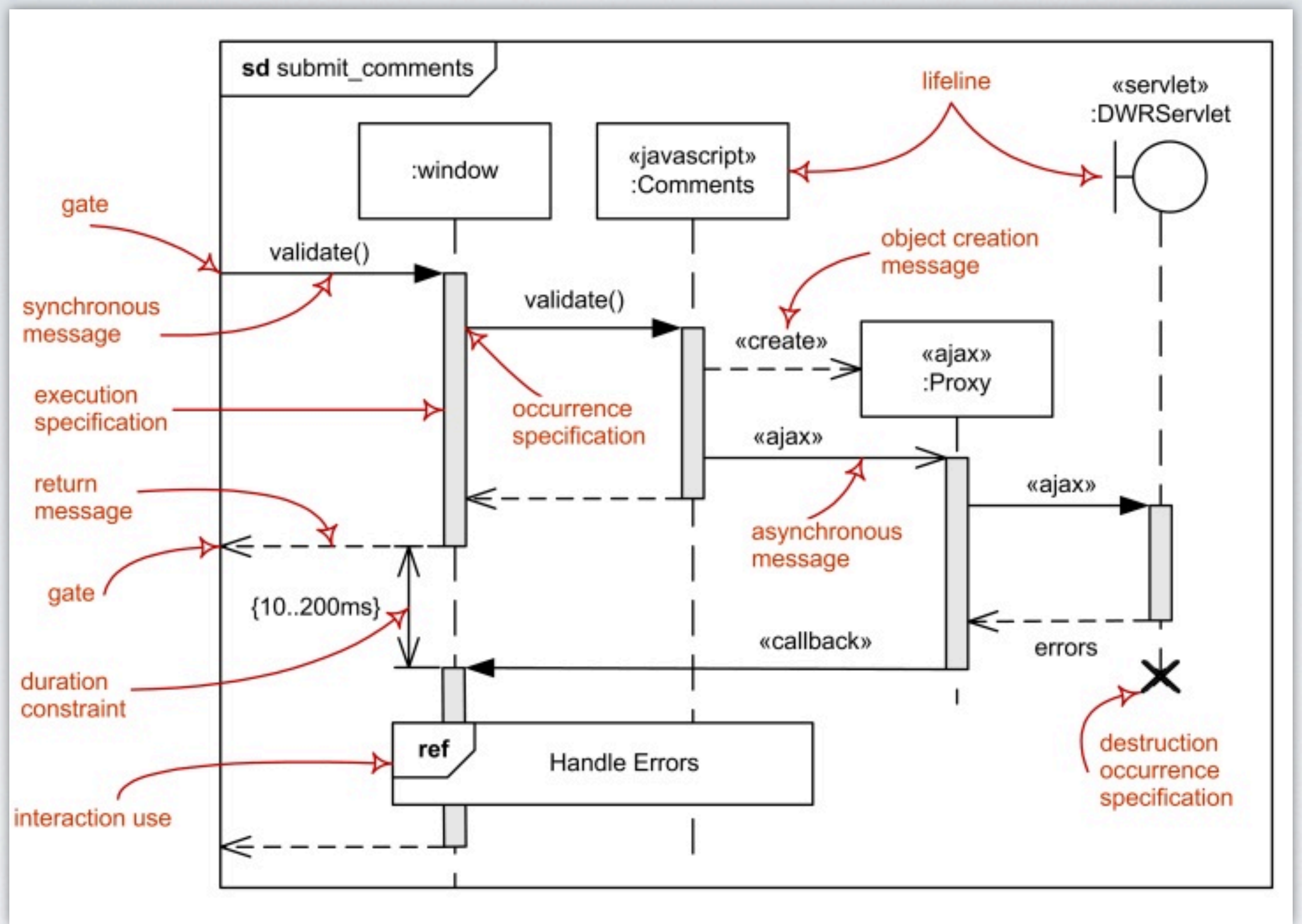
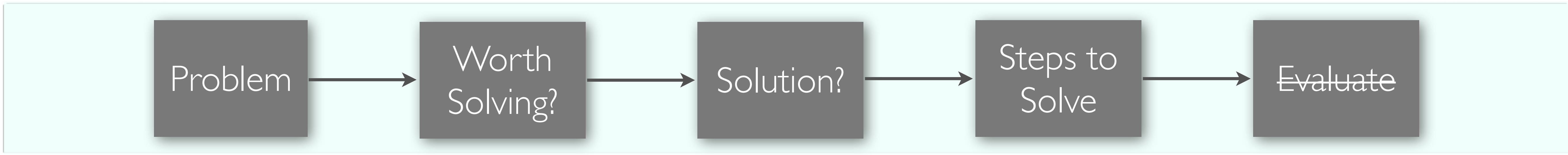
~~Evaluate~~

Include similar to abstract use case defined in UML 1.xxx, UML 2.4 specifies an ‘include’ relationship, which means “what is left in the base use case is usually not complete”. Extend – open arrowhead directed from the extending use case to the extended (base) use case.

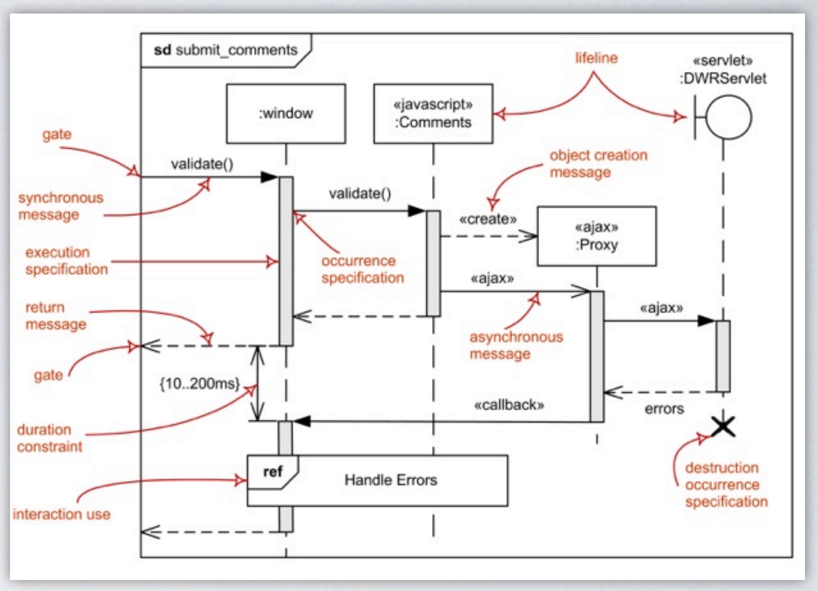
Sequence Diagrams



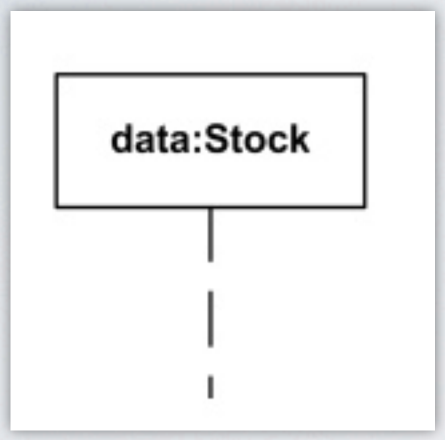
Focusses on message interchange between "lifelines"



Sequence Diagrams (Main Elements.)



Lifeline: is a named element which represents an individual participant in the interaction



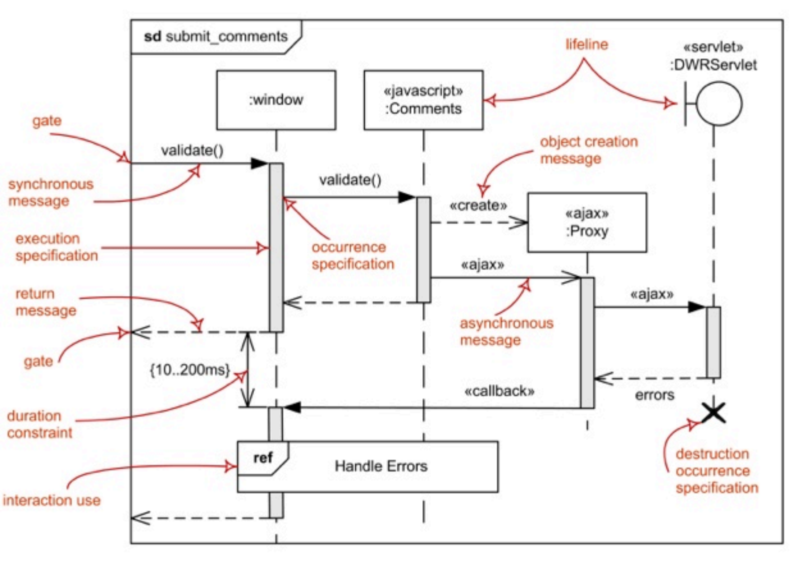
Message: is a named element which defines a specific kind of communication between lifelines.

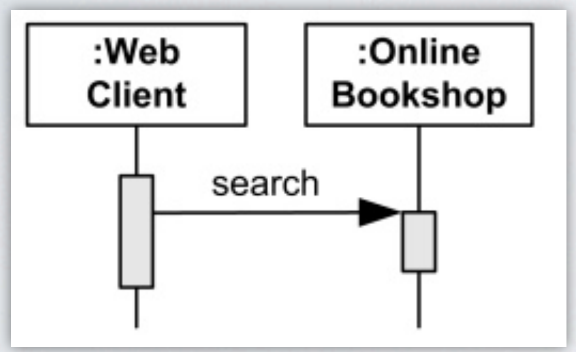
Problem → Worth Solving? → Solution? → Steps to Solve → ~~Evaluate~~

Message specifies not only the kind of communication, but also the sender and the receiver. Sender and receiver are normally two occurrence specifications (points at the ends of messages).

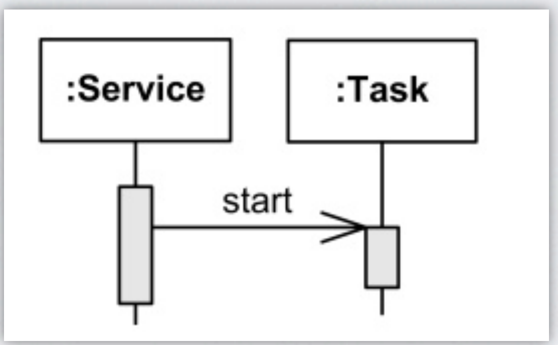
Sequence Diagrams (Main Elements.)

Message Types: Synchronous Call , Asynchronous Call, ~~Asynchronous signal~~, Create, Delete, Reply

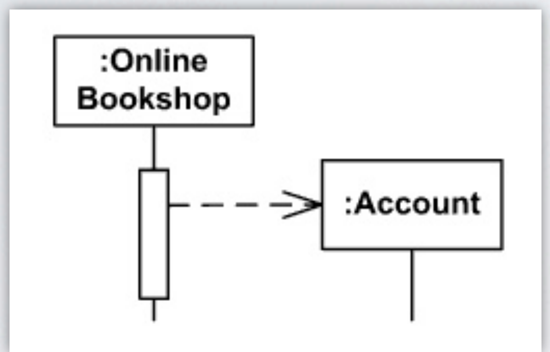




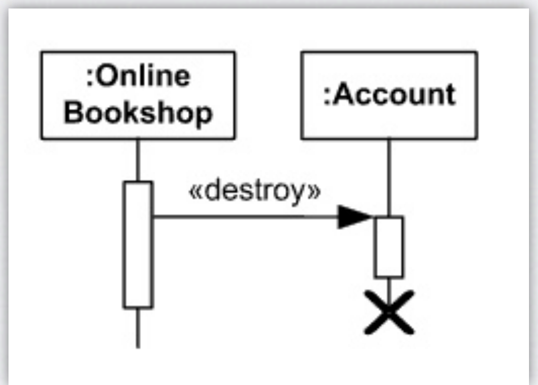
Synchronous Call



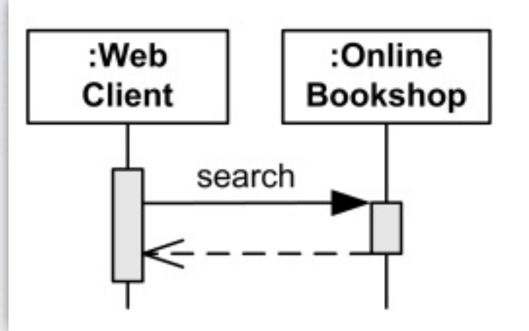
Asynchronous Call



Create



Delete

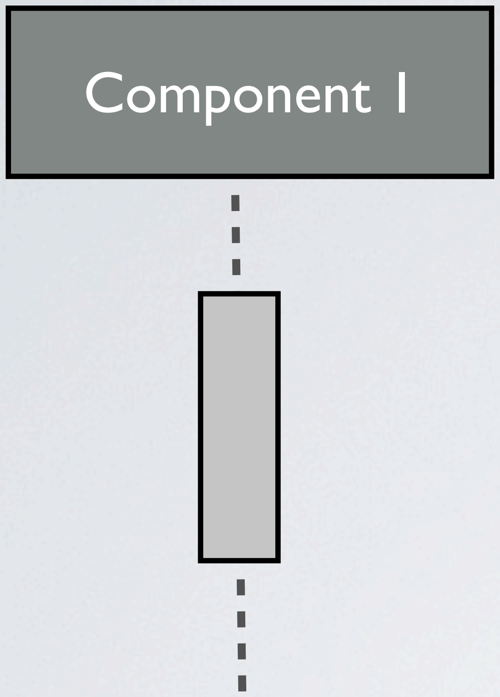


Reply

Problem → Worth Solving? → Solution? → Steps to Solve → ~~Evaluate~~

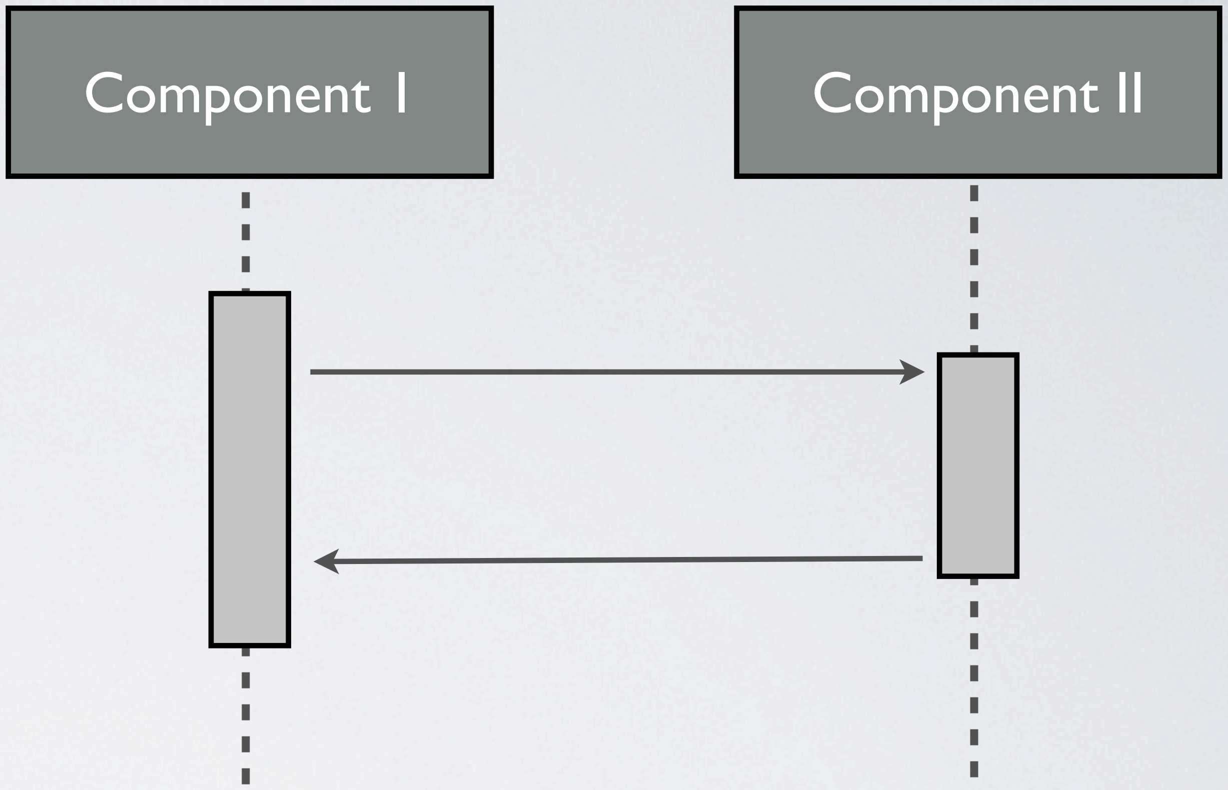
Synchronous Call – represents operation call – send message and suspend execution while waiting for response
Asynchronous Call– send message and proceed immediately without waiting for return value.
Asynchronous Signal – message corresponds to asynchronous send signal
Create message is sent to lifeline to create itself
Delete message (called **stop** in previous versions of UML) is sent to terminate another lifeline (x marks the destruction occurence).

Sequence Diagrams (Simplified for this course)



Component I

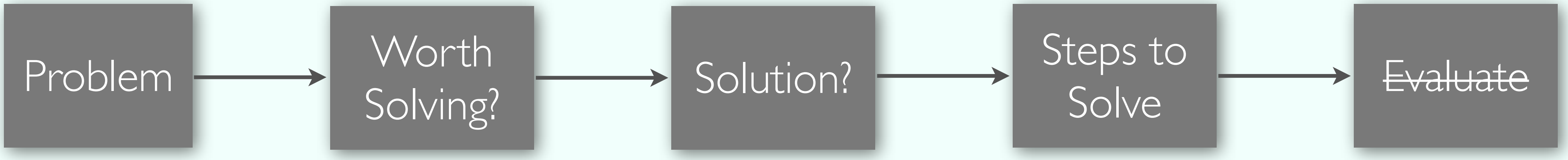
Lifeline



Component I

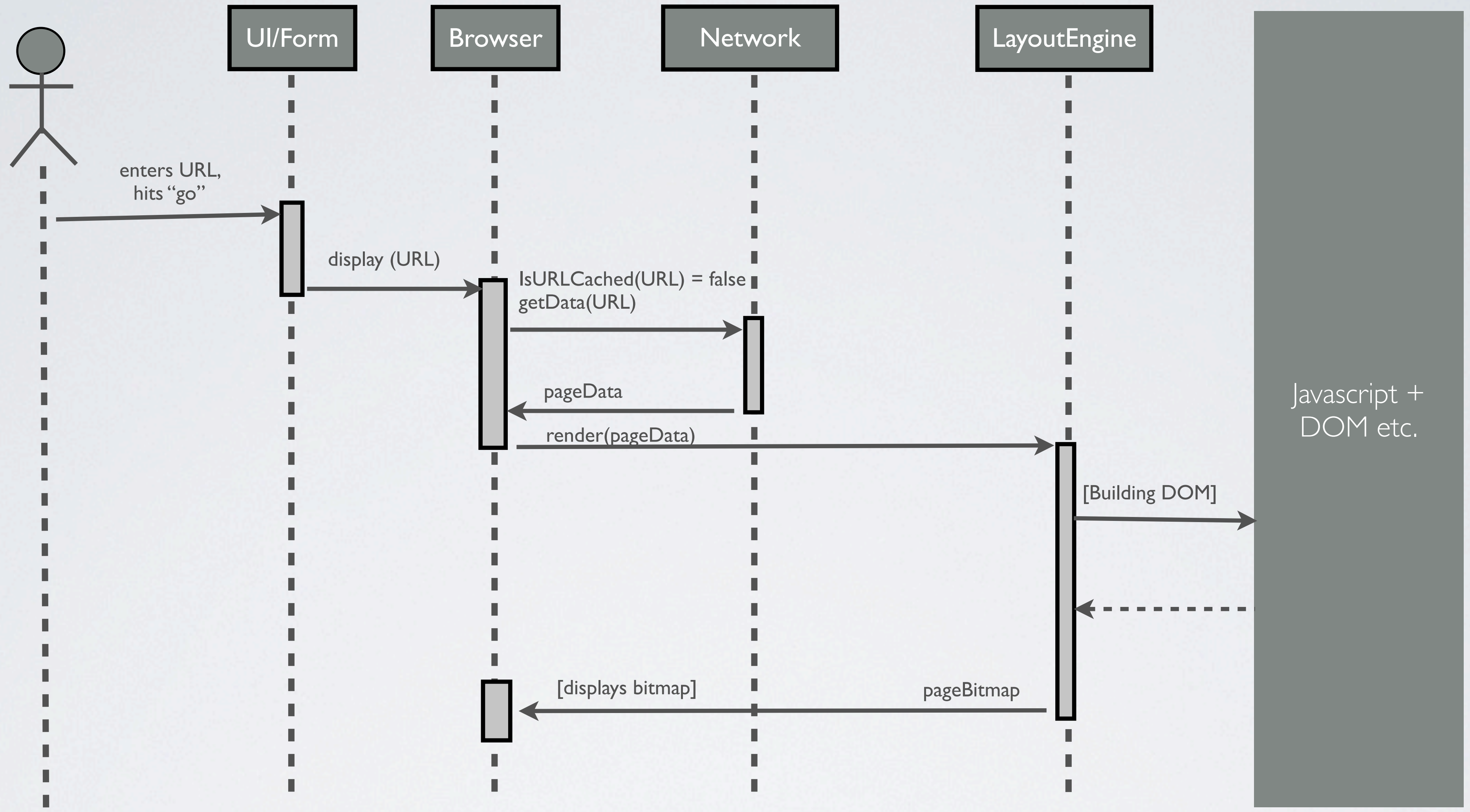
Component II

Lifeline + Messages



Problem → Worth Solving? → Solution? → Steps to Solve → ~~Evaluate~~

Sequence Diagrams (example extract)



Problem
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~~Evaluate~~

The large gray box is abstracted for now, basically the DOM, XML parser etc. Note that this is the partial sequence diagram when the page is not cached.

The dashed backwards arrow represents a “reply” (check earlier slides). You should use a dashed forward arrow if there is a component that is **created** (not shown here).

THANK YOU