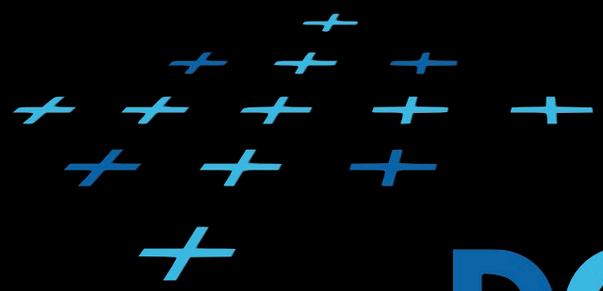


DCGI

DEPARTMENT OF COMPUTER GRAPHICS AND INTERACTION

PLATFORM-AWARE RICH FORM GENERATION FOR ADAPTIVE SYSTEMS THROUGH CODE-INSPECTION

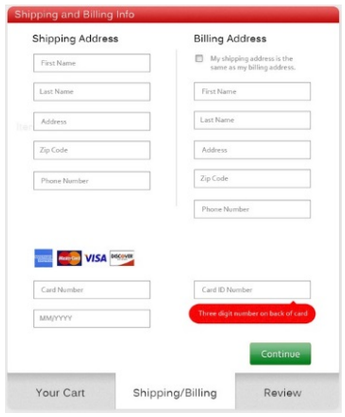
Macik, M., Cerny T., Basek J. & Slavik, P.

Czech Technical University in Prague

Faculty of Electrical Engineering

MOTIVATION

MOTIVATION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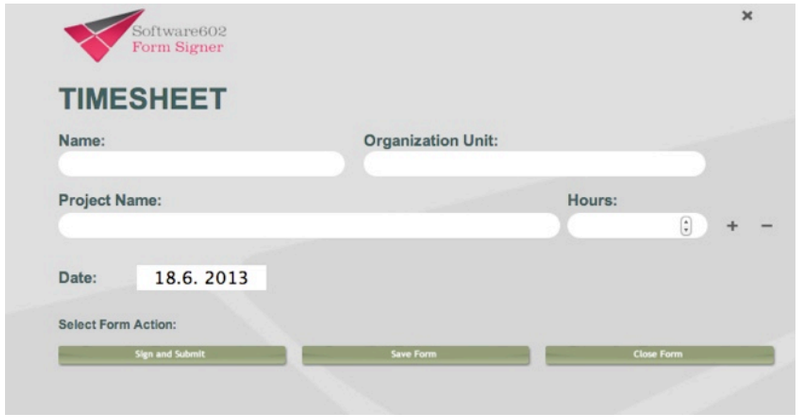
Shipping/Billing
Review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Save Form
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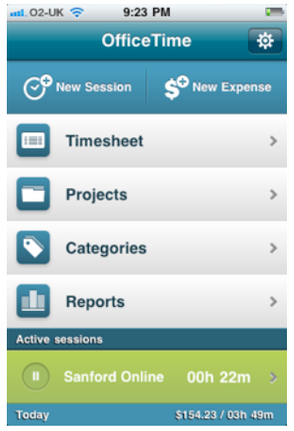
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OfficeTime
New Session
New Expense
Timesheet
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Today
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Bakerloo
Central
Circle
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Jubilee
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Sign In
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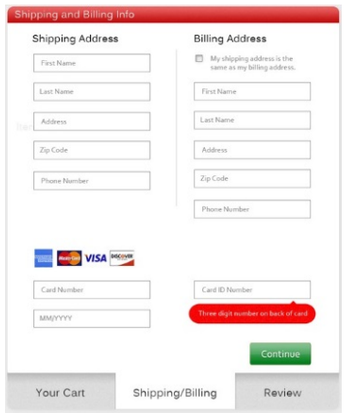
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Three digit number on back of card
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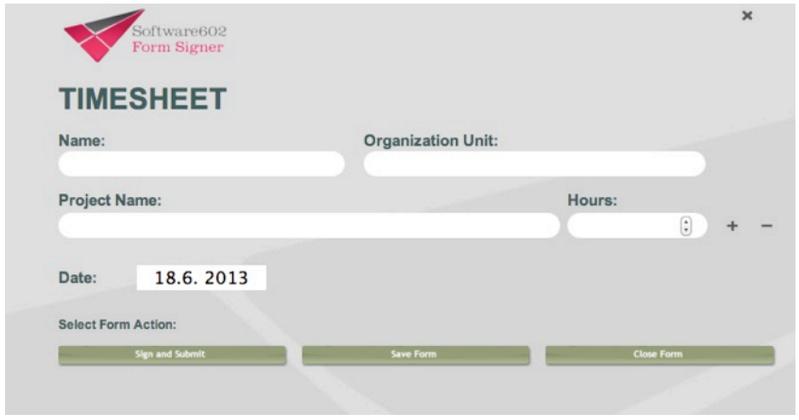
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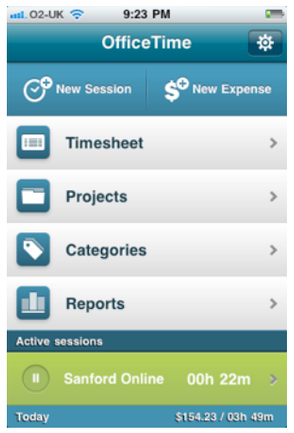
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Bakerloo
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Sign In
Find Us
send
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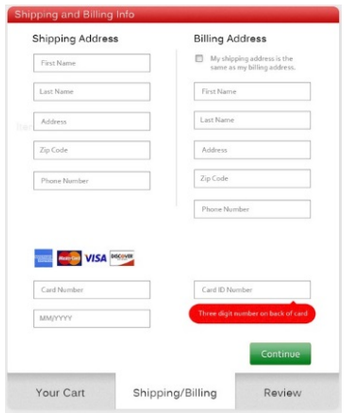
revision history

ThinkPad
amazonkindle
HD
FIOS TV
SONY

MOTIVATION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Three digit number on back of card
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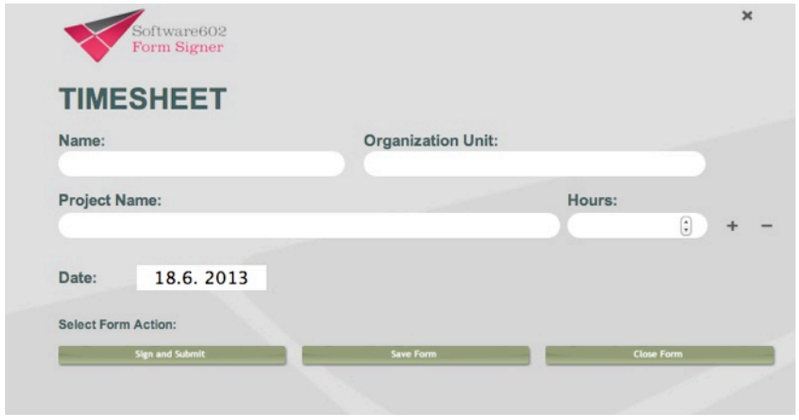
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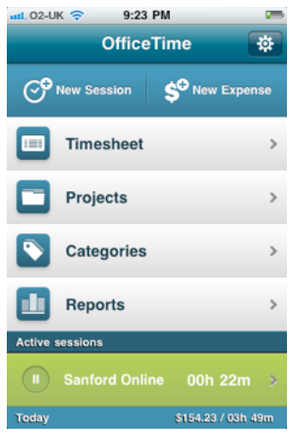
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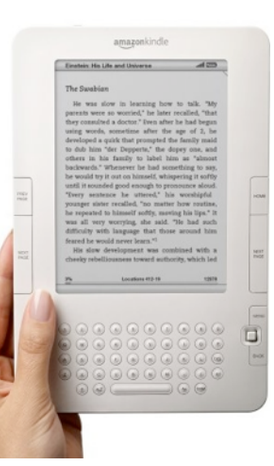
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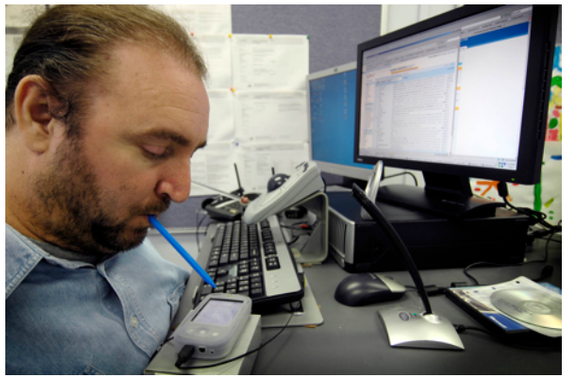

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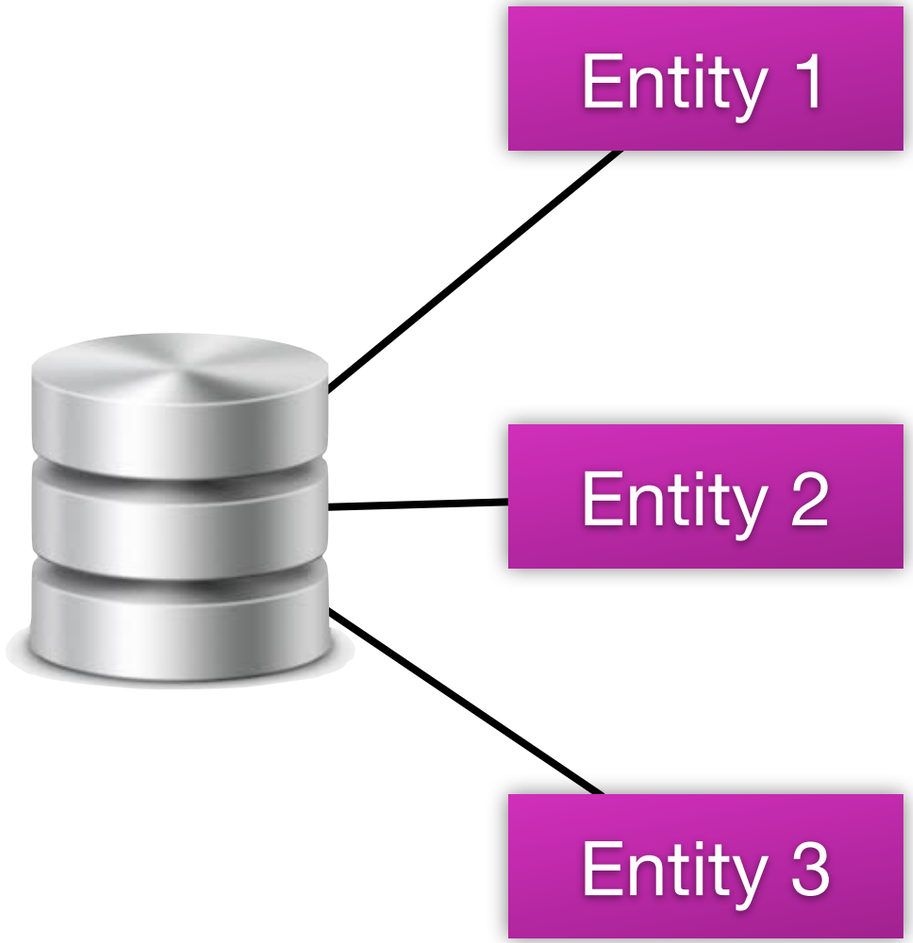
MOTIVATION | CONT.



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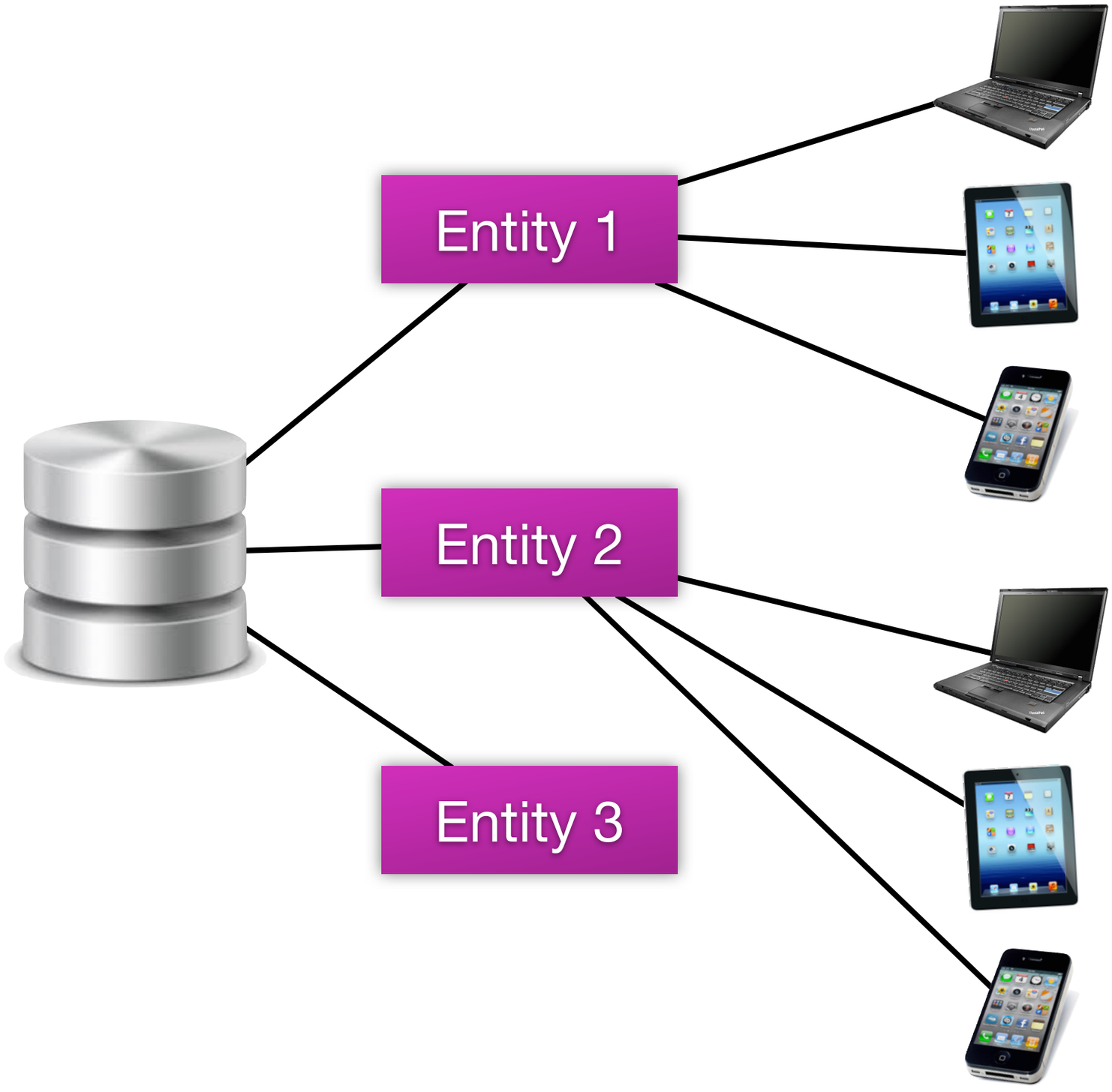

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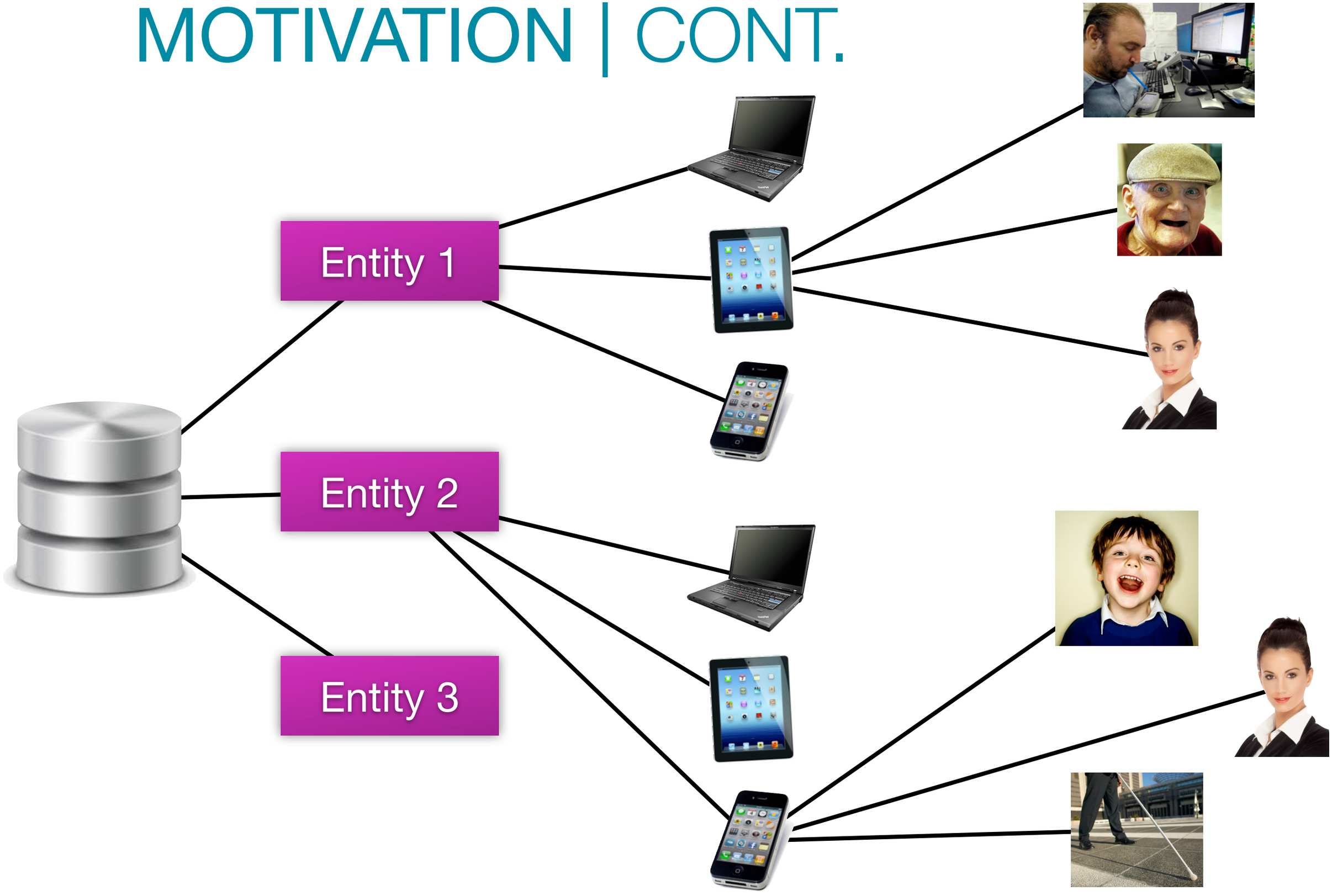

MOTIVATION

MOTIVATION

Problems

MOTIVATION

Problems

Information restatement

Data Entity

```
@Table(name = "person_info")
public class PersonInfo extends EntityObject {

   /*fields*/
   @Column(name = "first_name", nullable = false)
   public String getFirstName() {return this.firstName;}

   @Column(name = "last_name")
   public String getLastName() {return this.lastName;}
}
```

MOTIVATION

Problems

Information restatement

Data Entity → User Interface

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    /*fields*/
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    public String getFirstName() {return this.firstName;}

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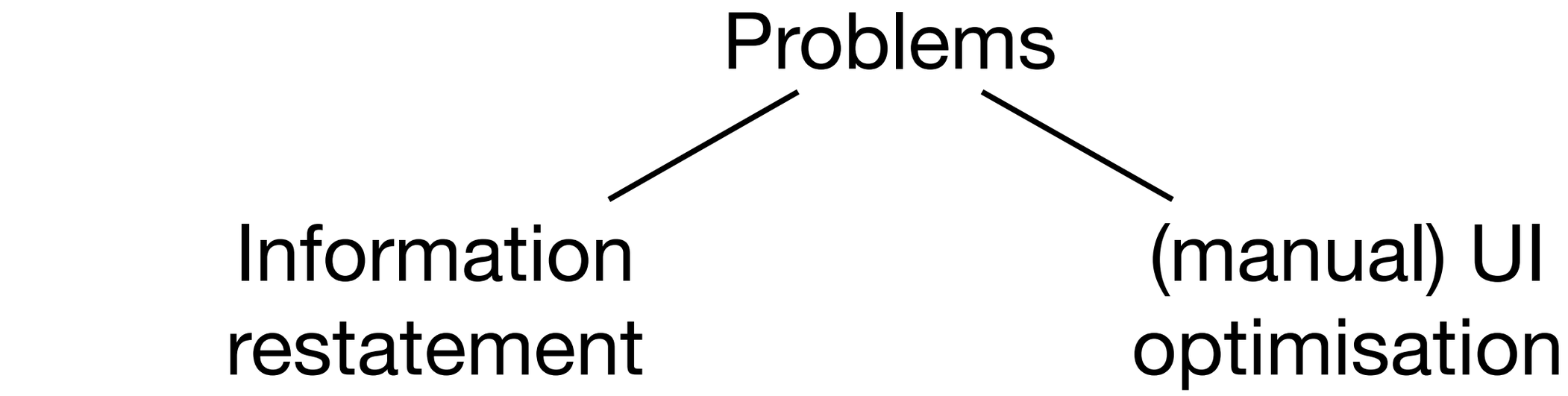
MOTIVATION


Problems
Information restatement
(manual) UI optimisation
Data Entity
User Interface
UI
iOS
XAML
HTML
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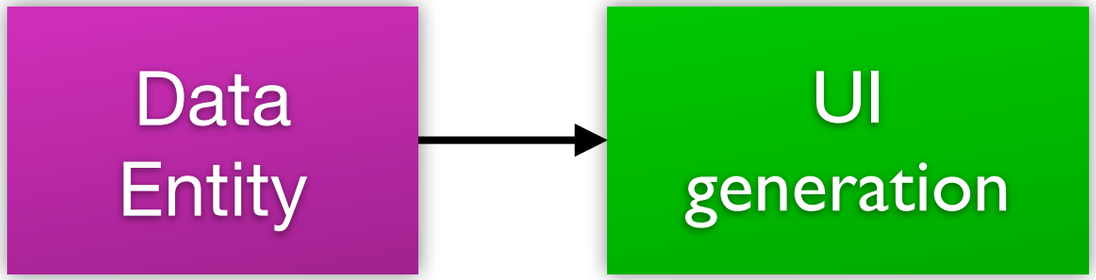
VISION

VISION



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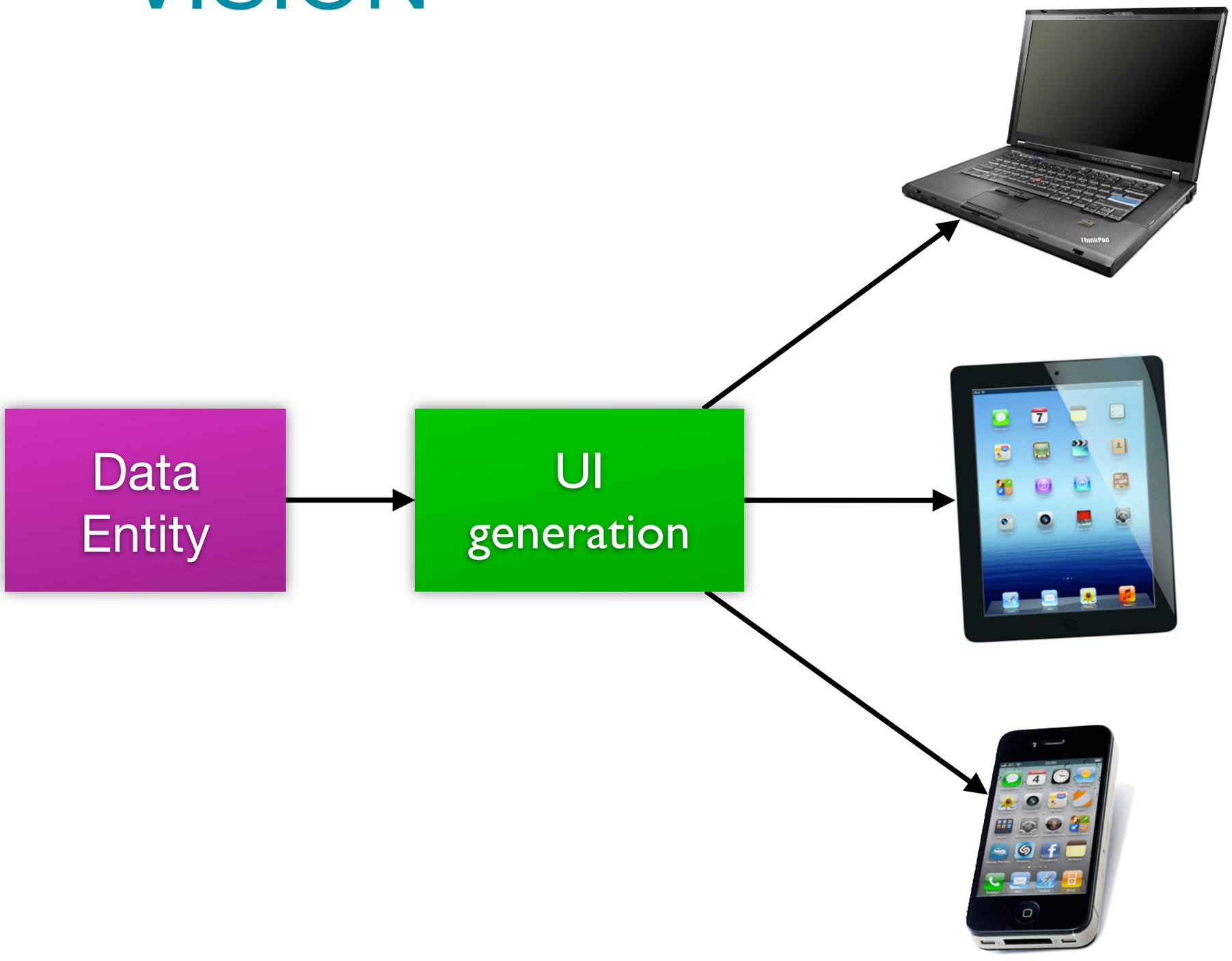
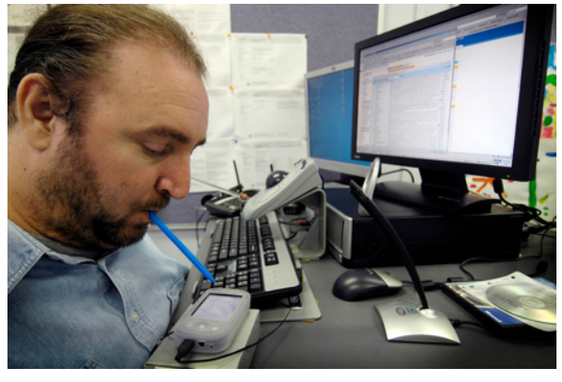


VISION

Data Entity

UI generation



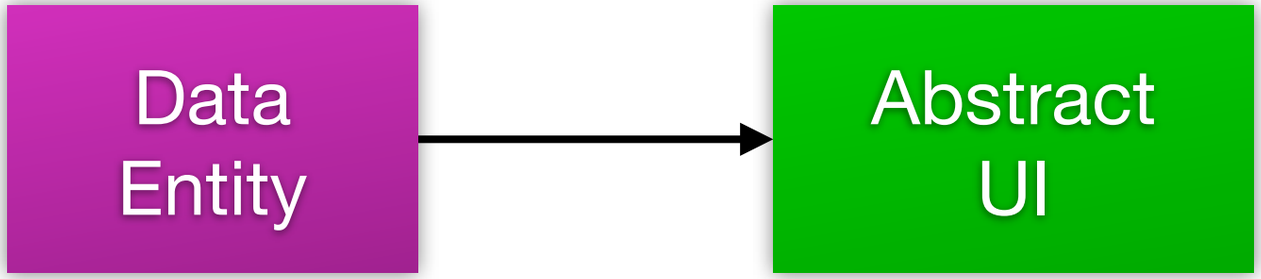
UI GENERATION | STAGES

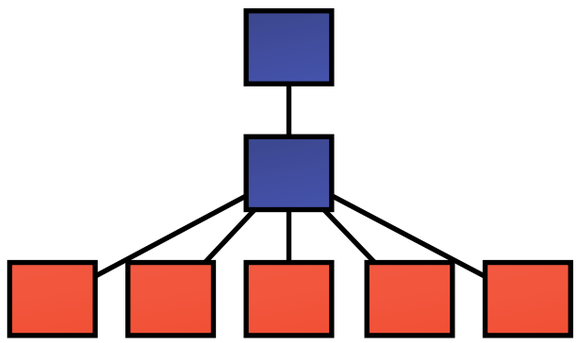
Data Entity

UI GENERATION | STAGES

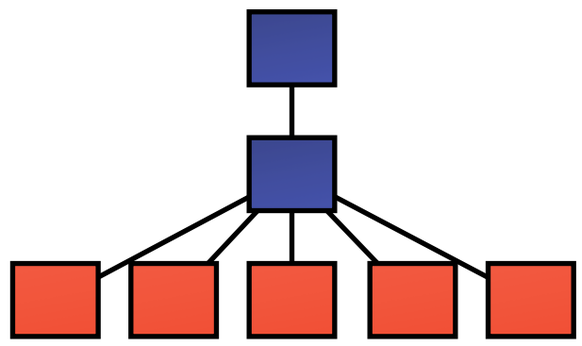
Data Entity

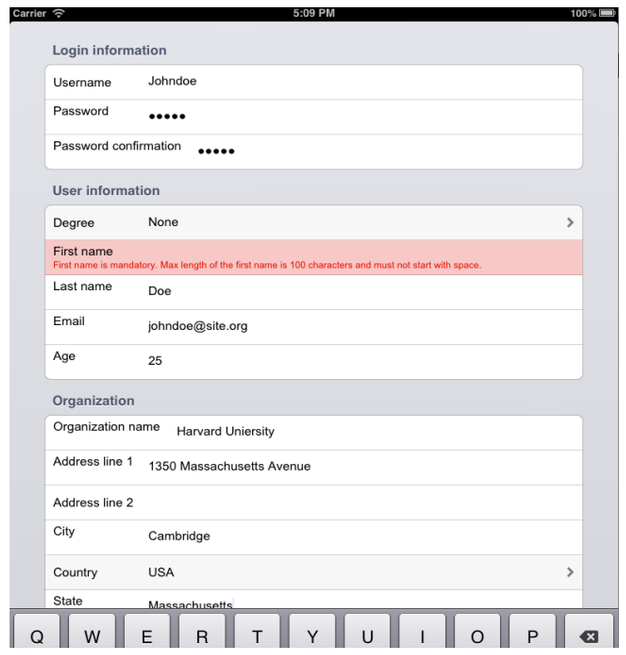
UI GENERATION | STAGES





UI GENERATION | STAGES





UI GENERATION | STAGES

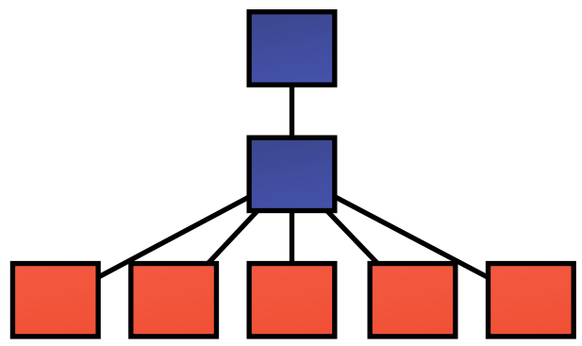
[Cerny 2011]

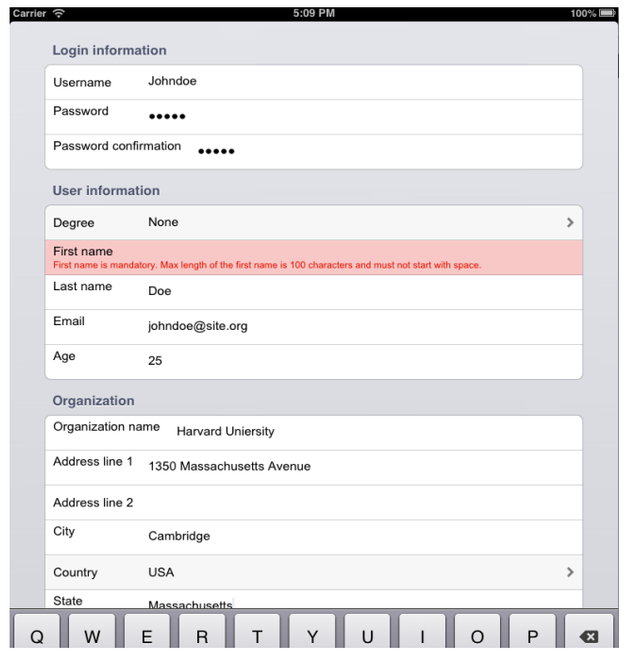
Code Inspection (Aspect Faces)

Data Entity

Abstract UI

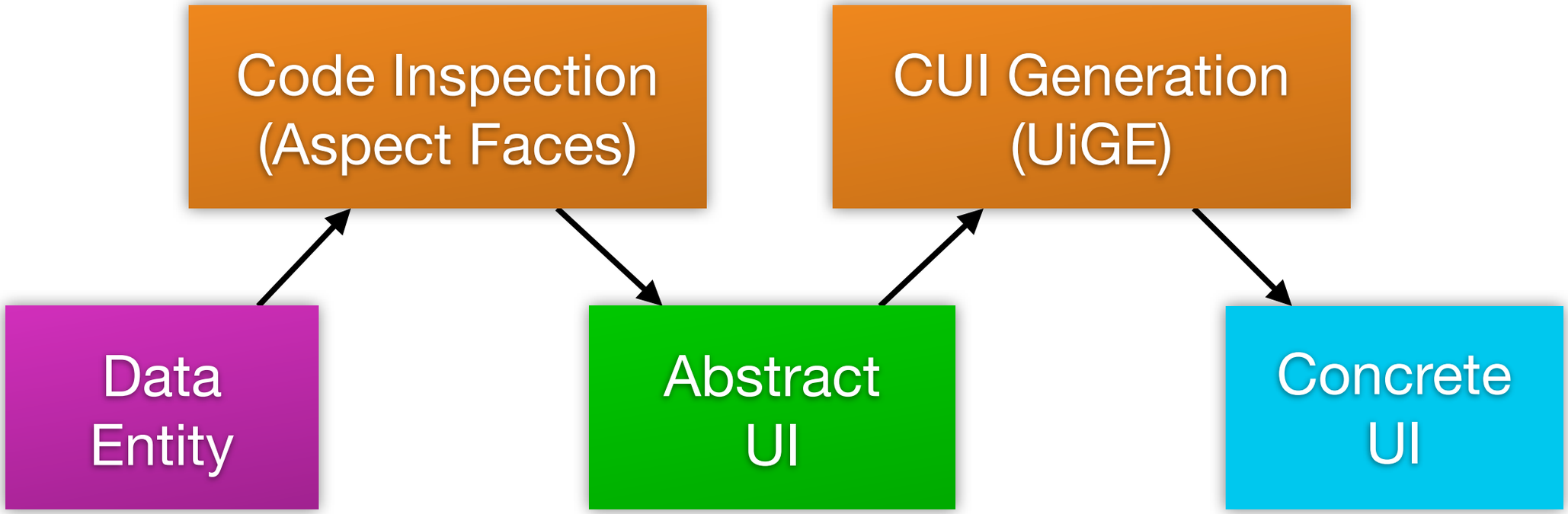
Concrete UI

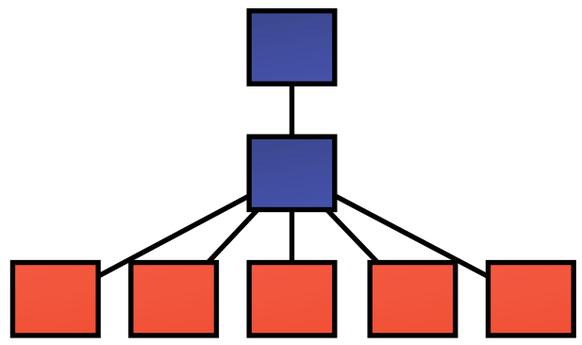


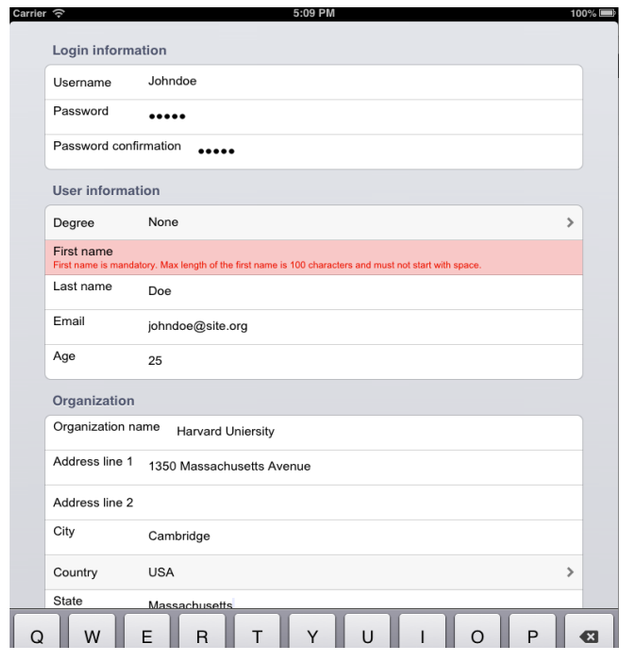


UI GENERATION | STAGES

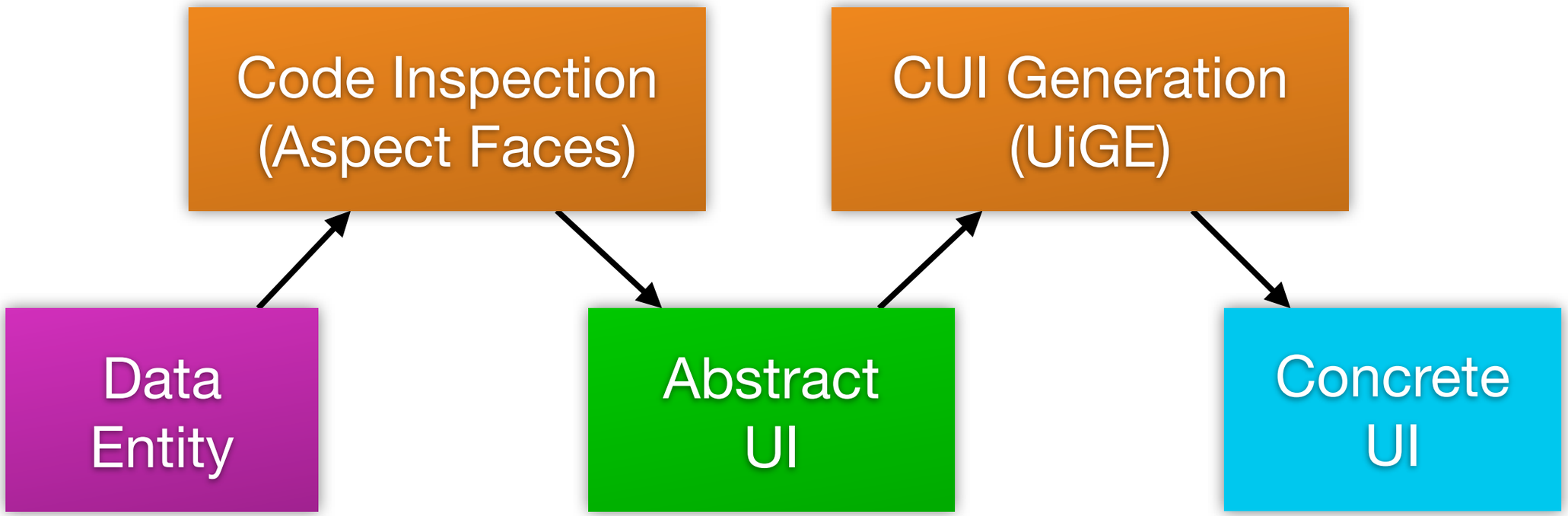
[Cerny 2011] [Macik 2012]



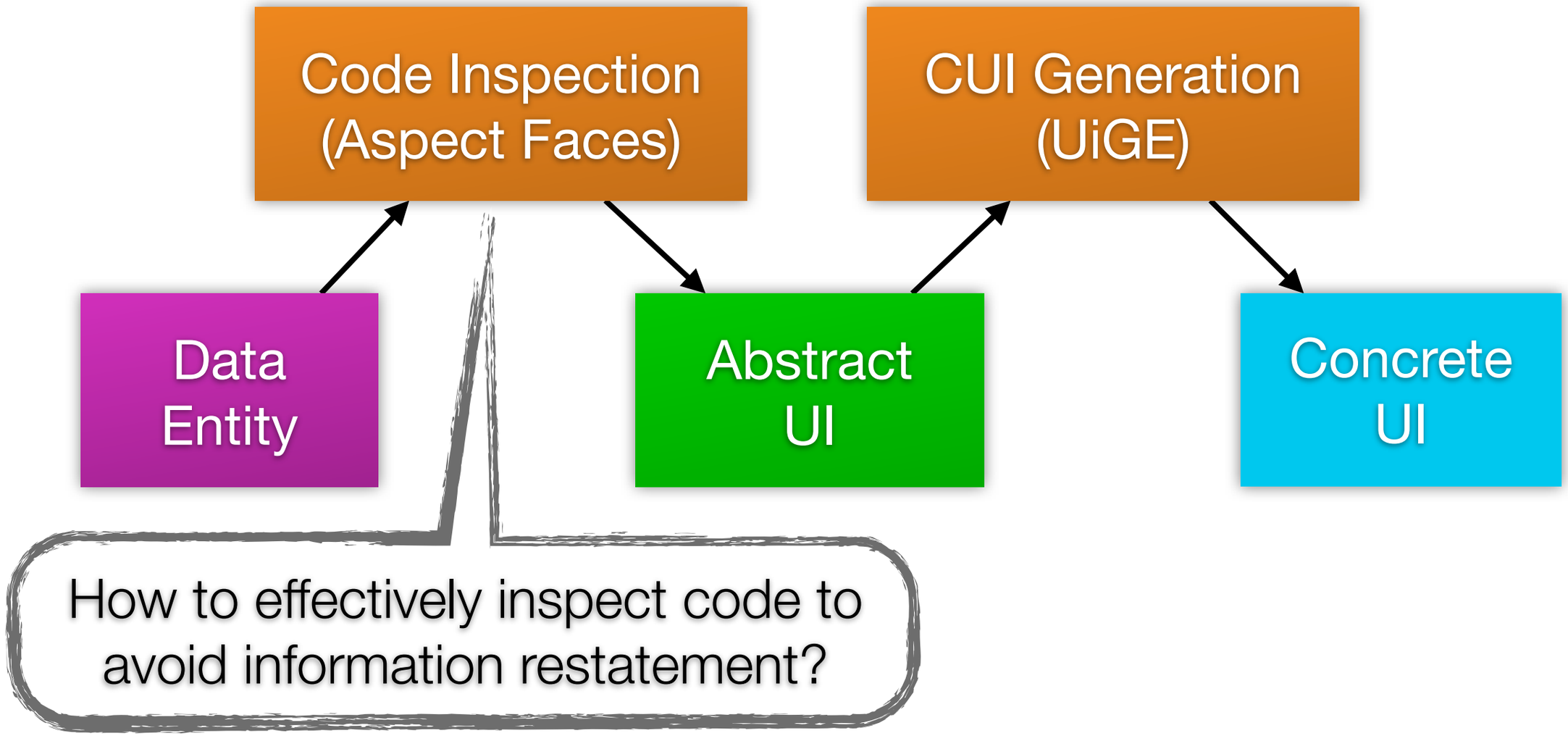




UI GENERATION | STAGES

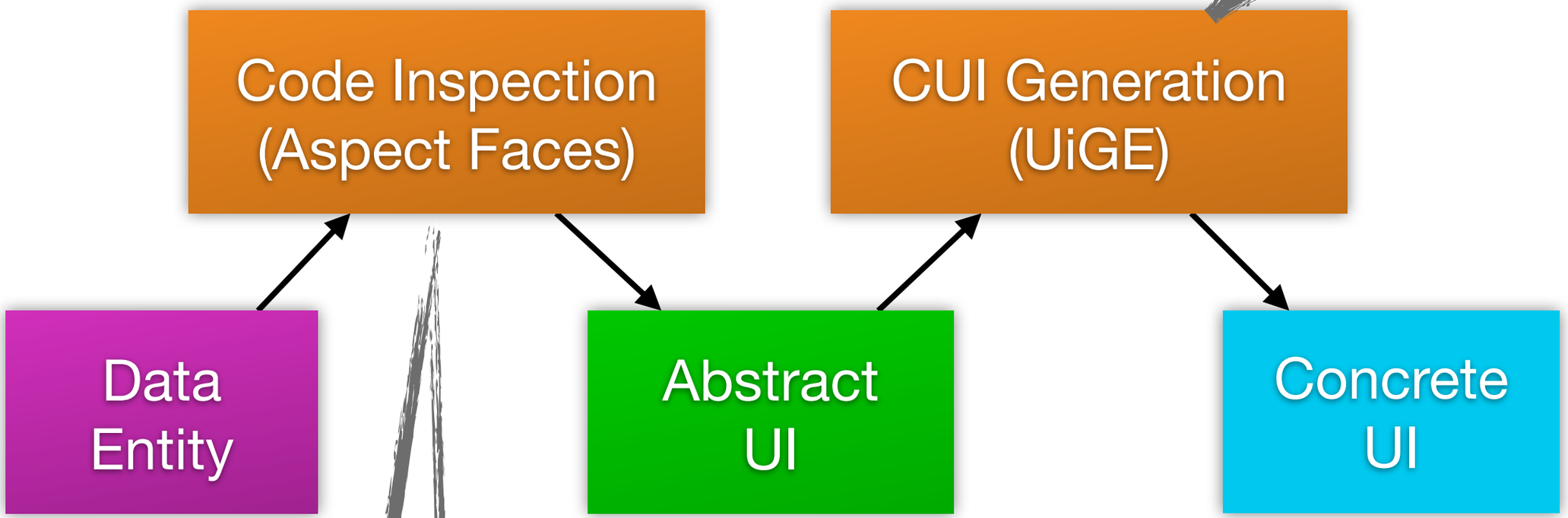


UI GENERATION | STAGES



UI GENERATION | STAGES

How to reflect user's needs and preferences?



How to effectively inspect code to avoid information restatement?

UI GENERATION | STAGES

How to describe usage context in general?

How to reflect user's needs and preferences?

Code Inspection (Aspect Faces)

CUI Generation (UiGE)

Data Entity

Abstract UI

Concrete UI

How to effectively inspect code to avoid information restatement?

UI GENERATION | STAGES

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Code Inspection (Aspect Faces)

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UI GENERATION | STAGES

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CODE INSPECTION | ASPECT FACES

CODE INSPECTION | ASPECT FACES

JPA
Entity

CODE INSPECTION | ASPECT FACES

JPA Entity

Extension marks

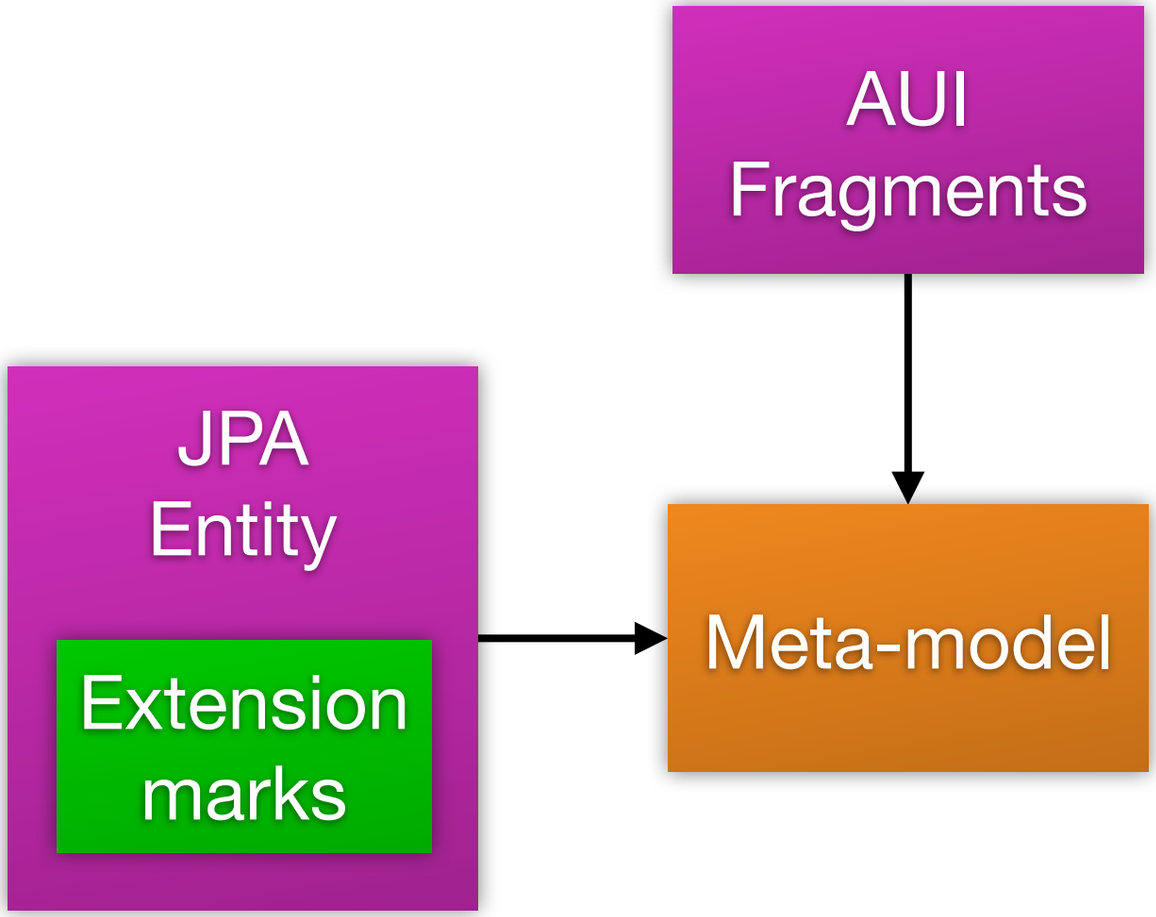
CODE INSPECTION | ASPECT FACES

AUI Fragments

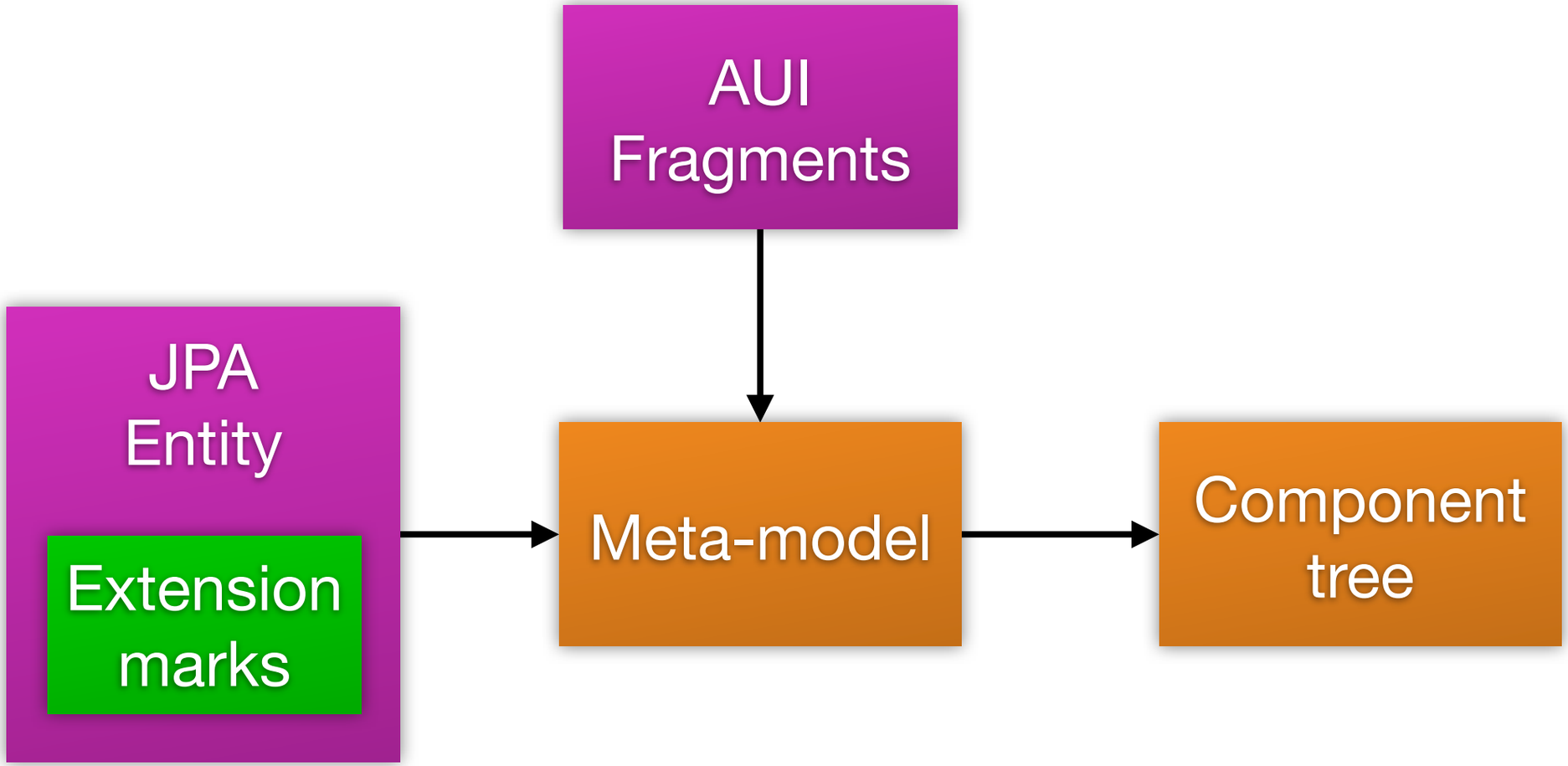
JPA Entity

Extension marks

CODE INSPECTION | ASPECT FACES



CODE INSPECTION | ASPECT FACES



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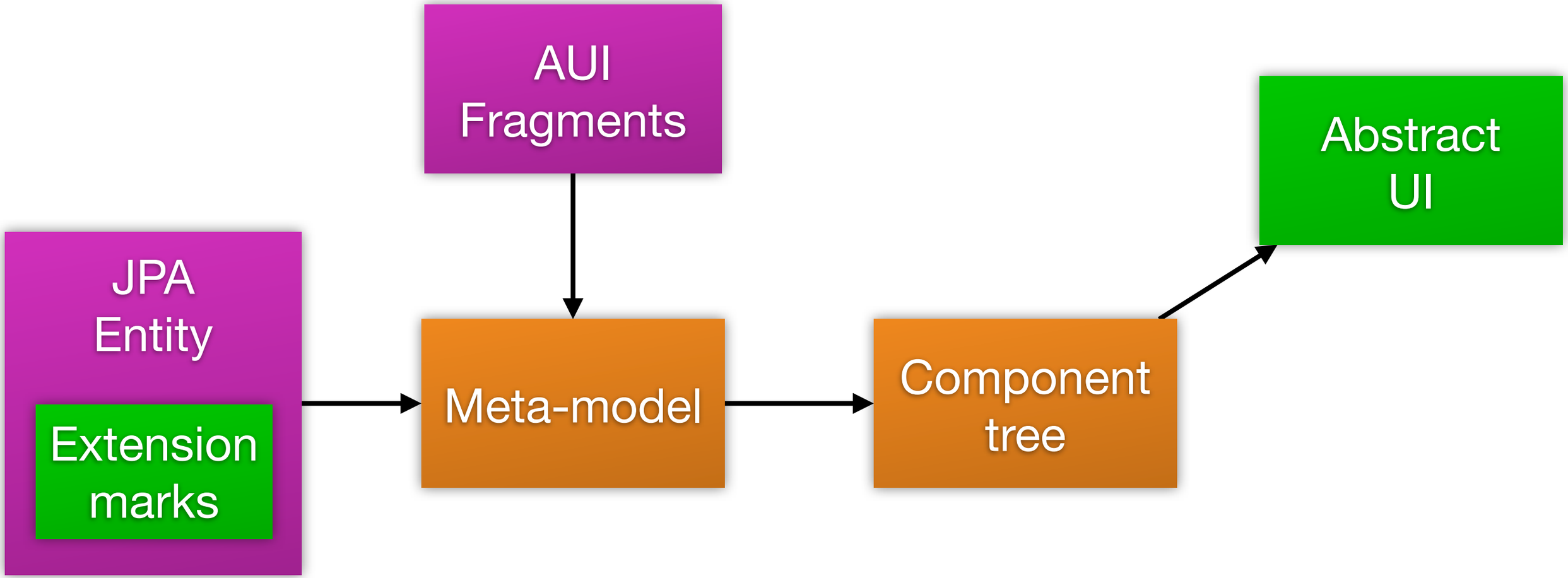

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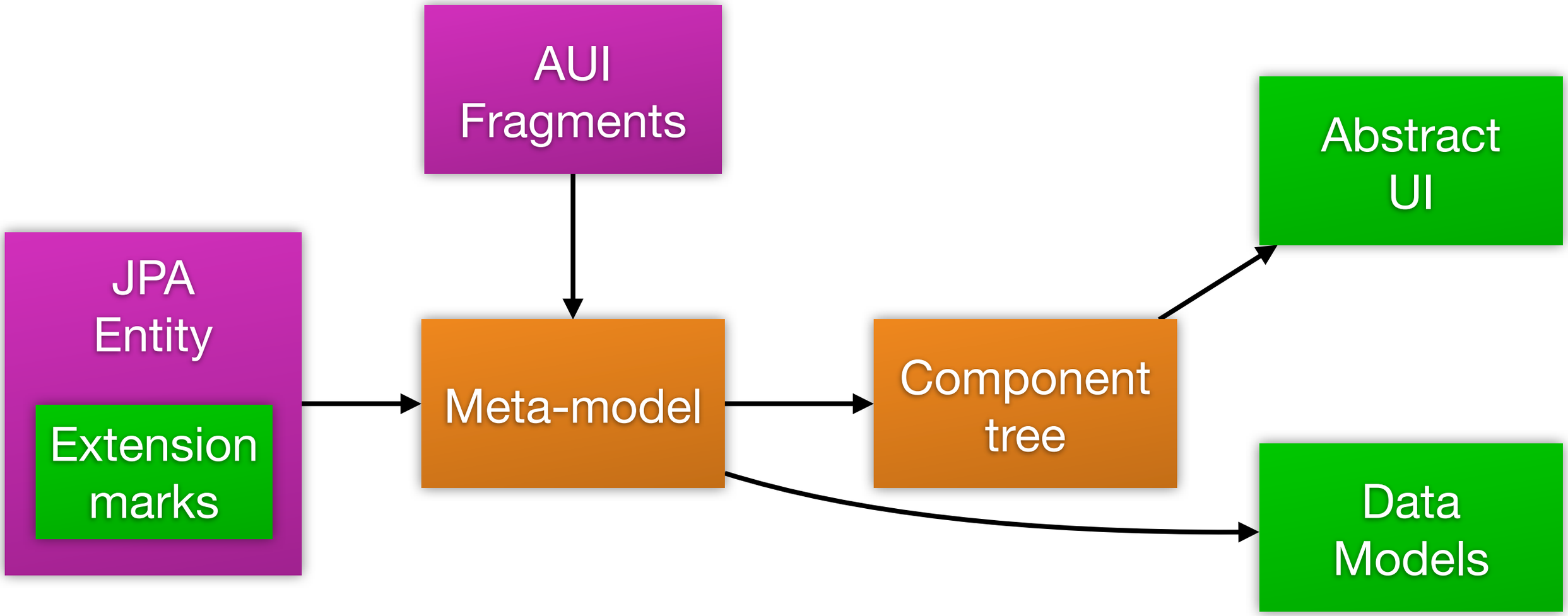
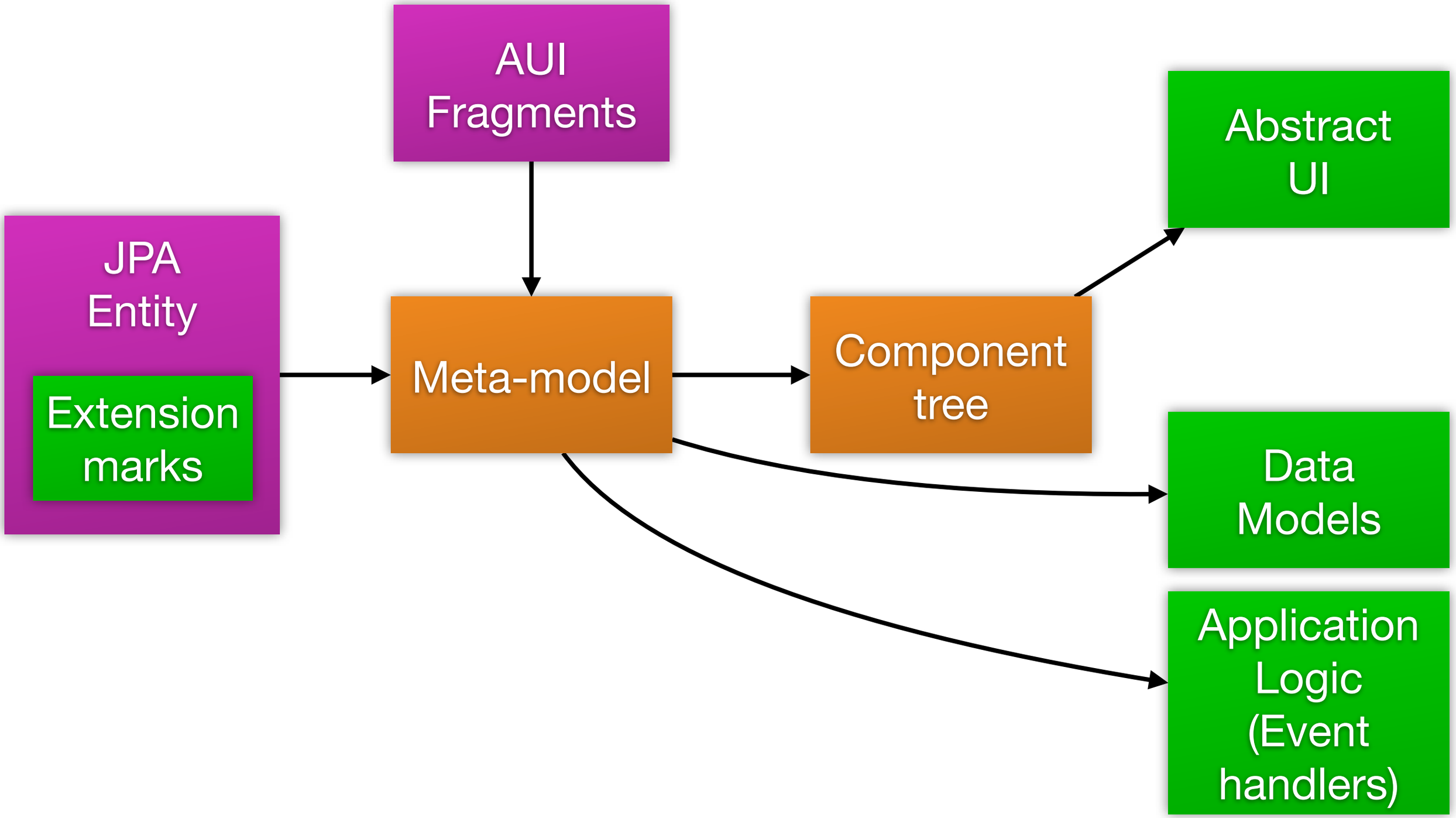
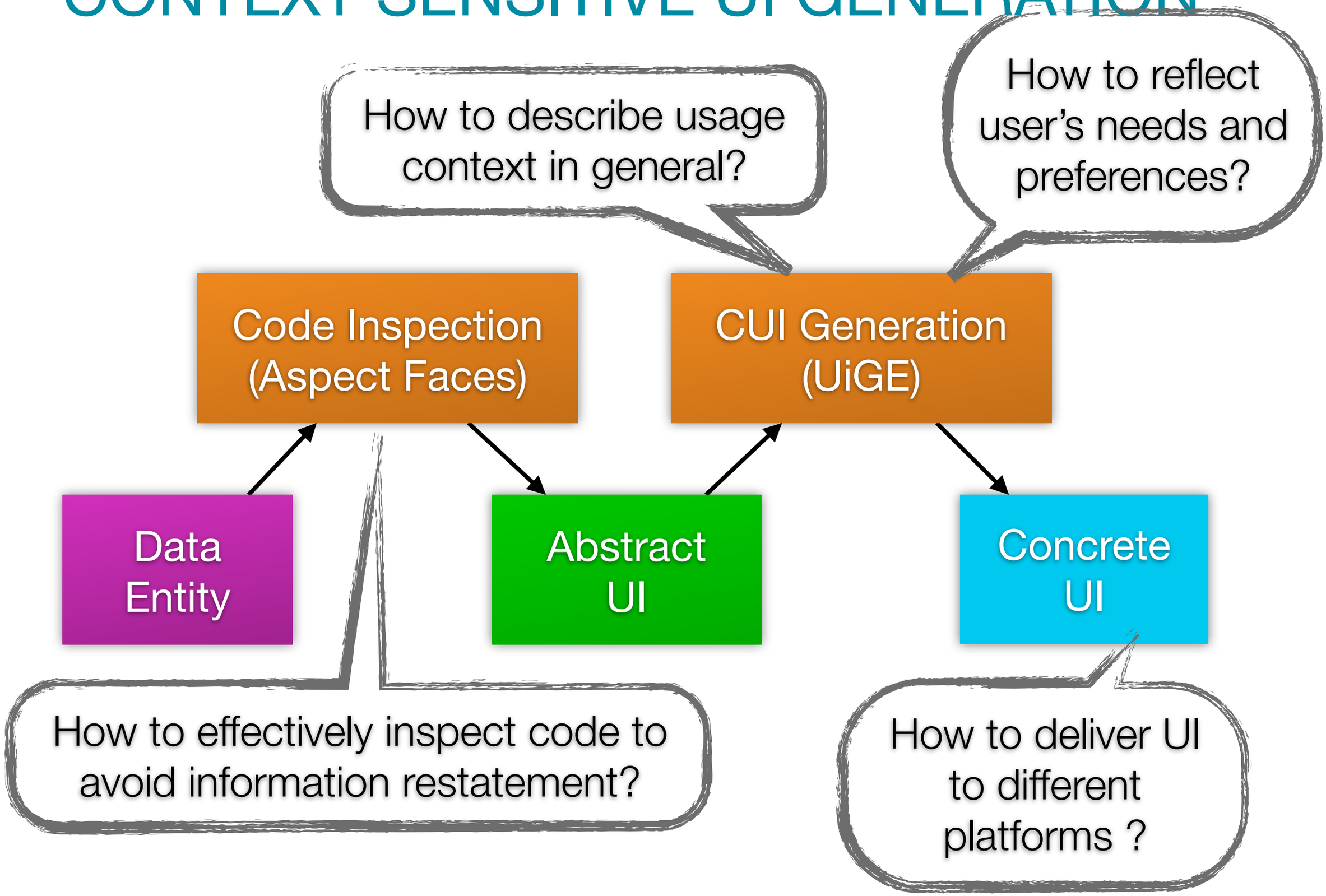


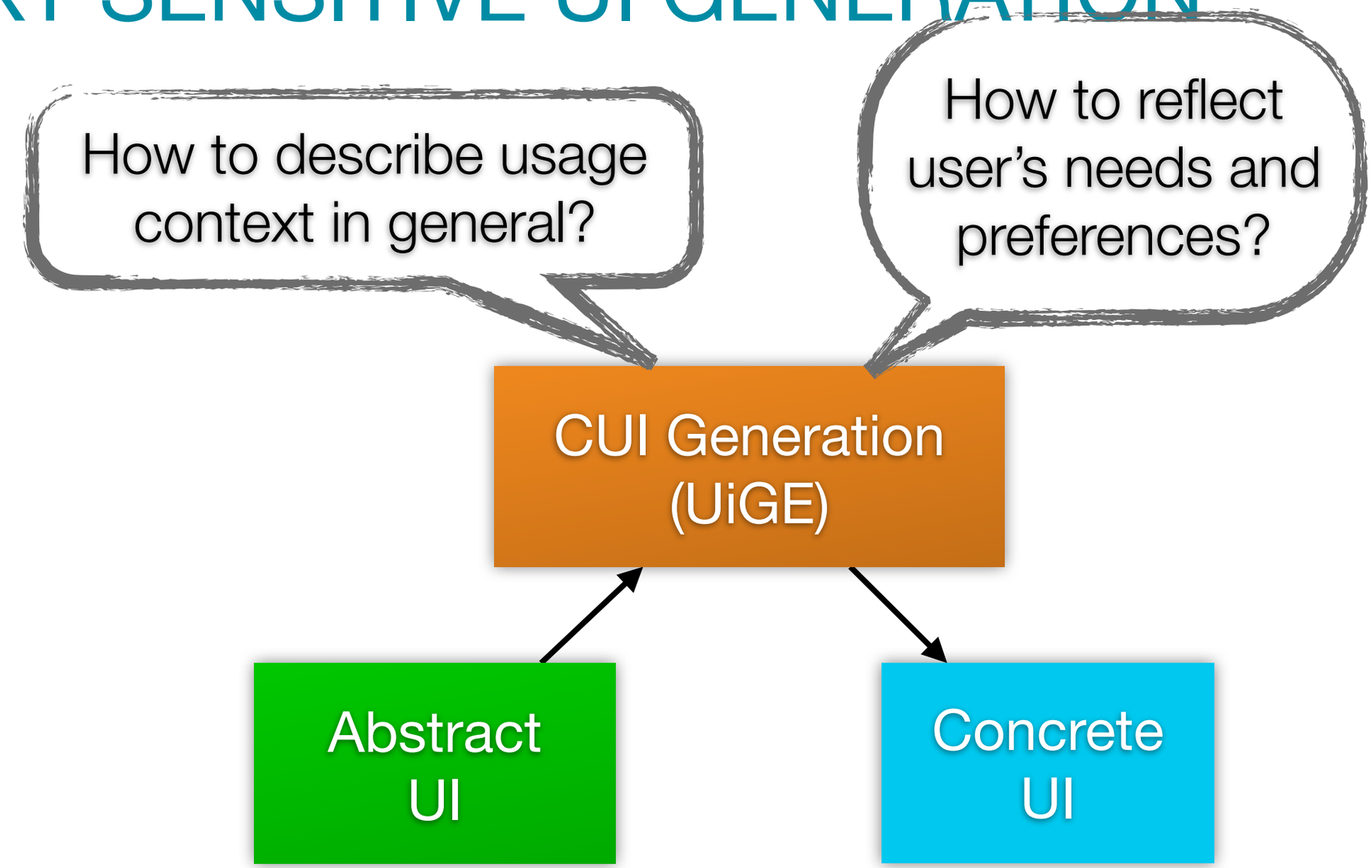
CODE INSPECTION | ASPECT FACES



CONTEXT SENSITIVE UI GENERATION



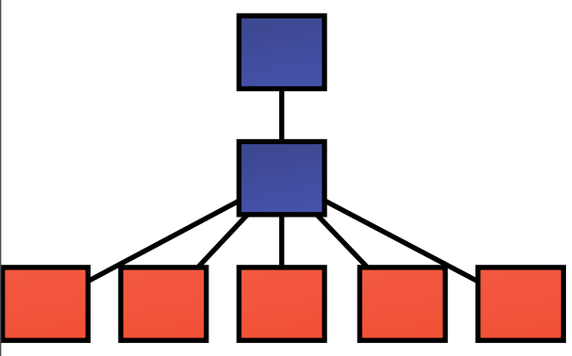
CONTEXT SENSITIVE UI GENERATION



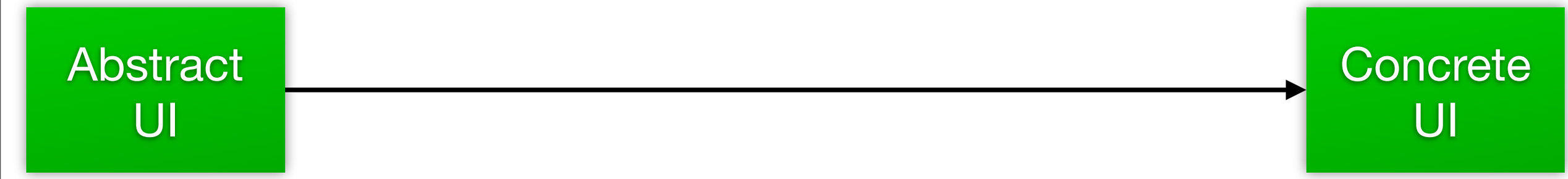
UI GENERATION | UiGE

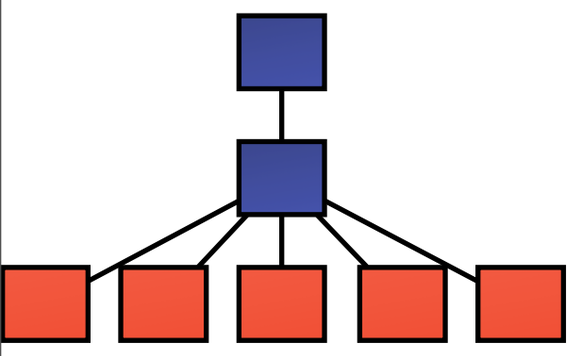
UI GENERATION | UiGE

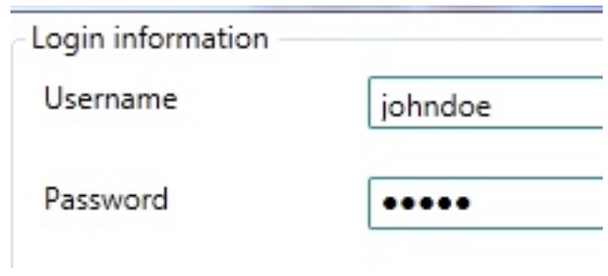
Abstract UI



UI GENERATION | UiGE







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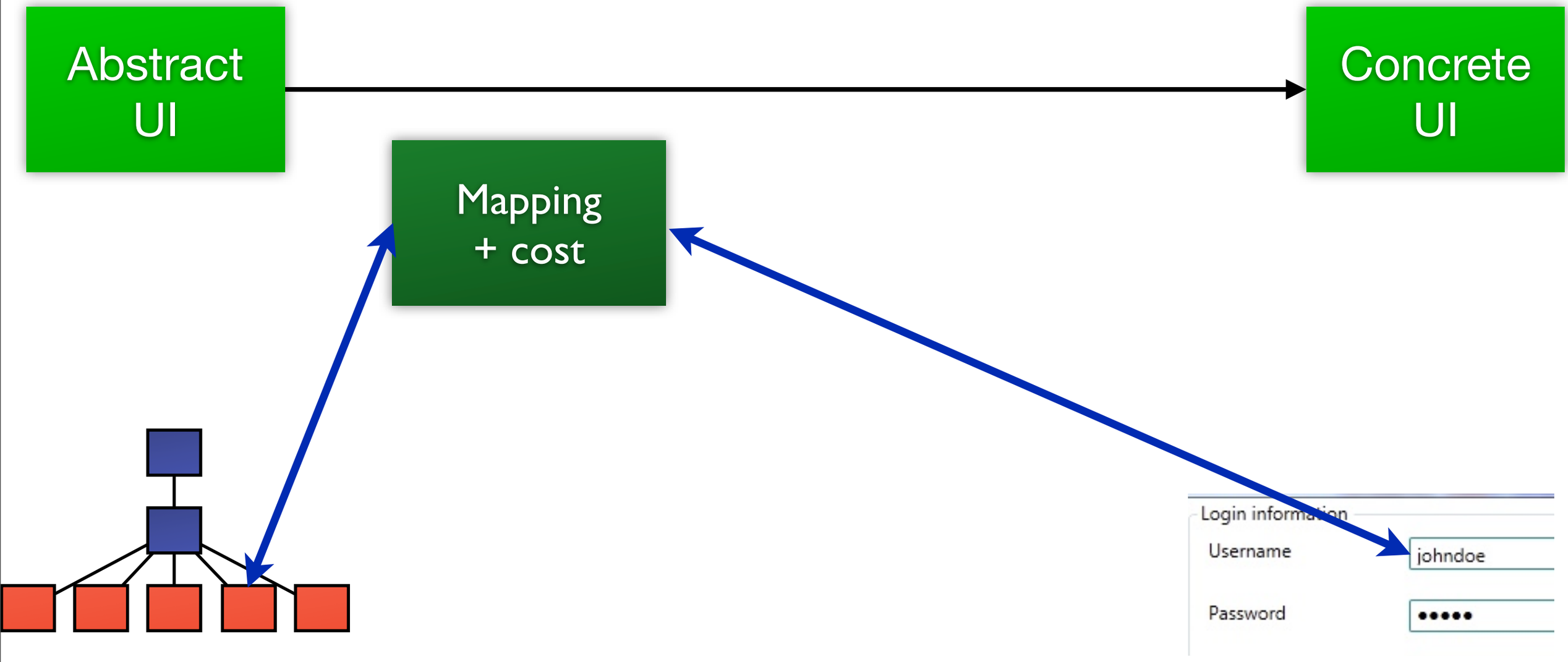
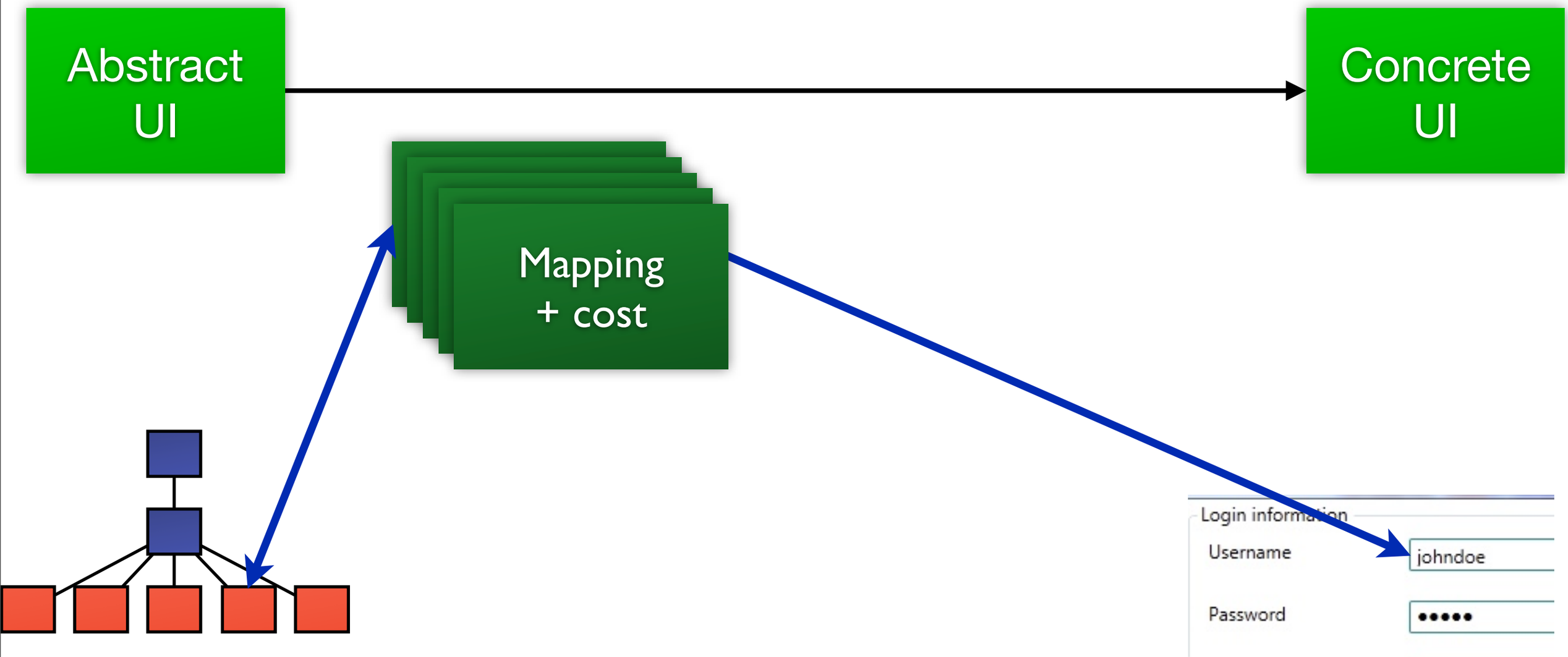
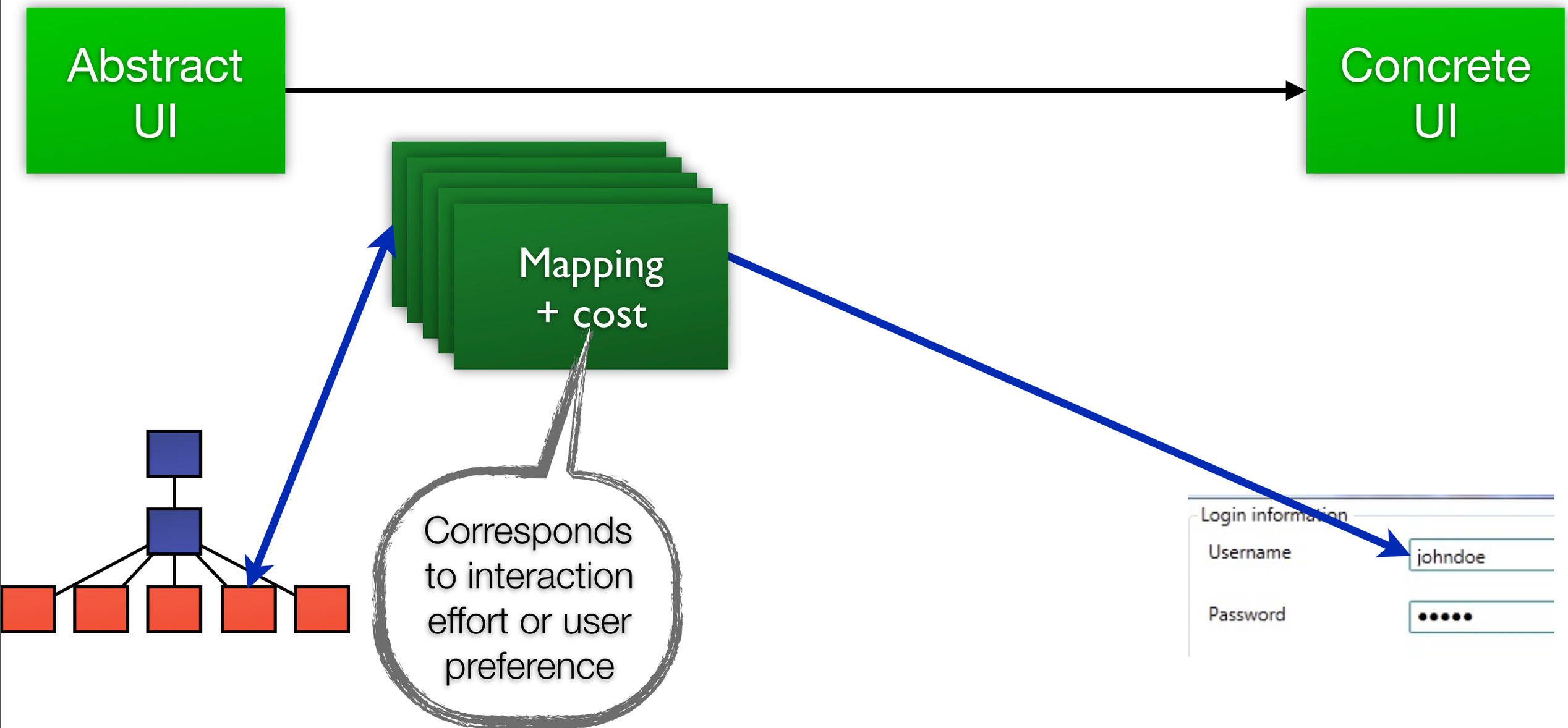


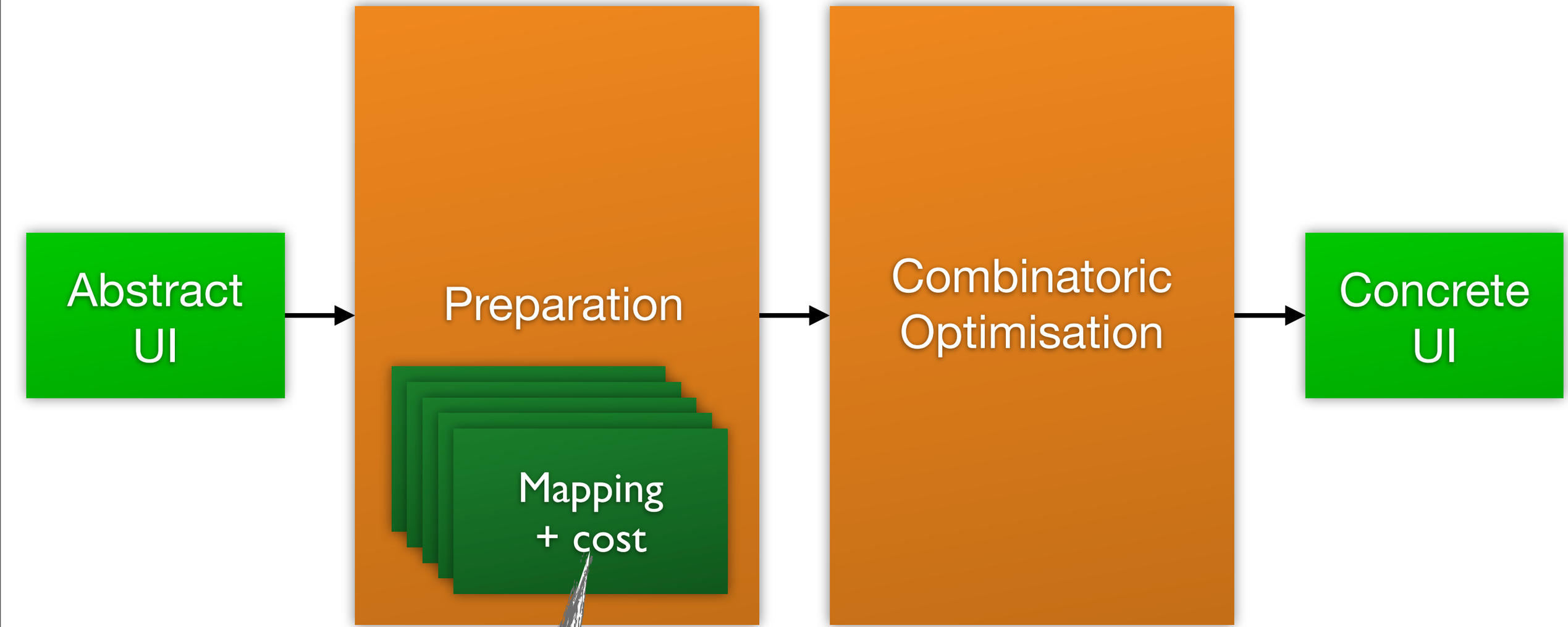
UI GENERATION | UiGE

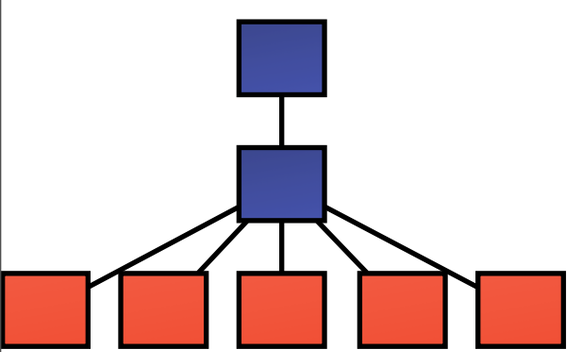


UI GENERATION | UiGE

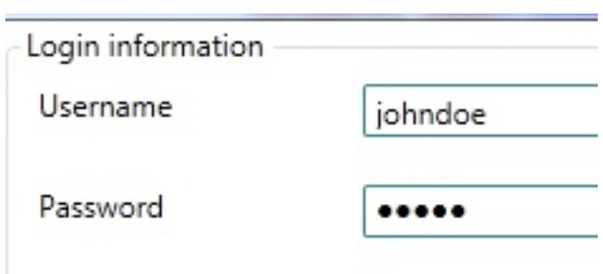


UI GENERATION | UiGE

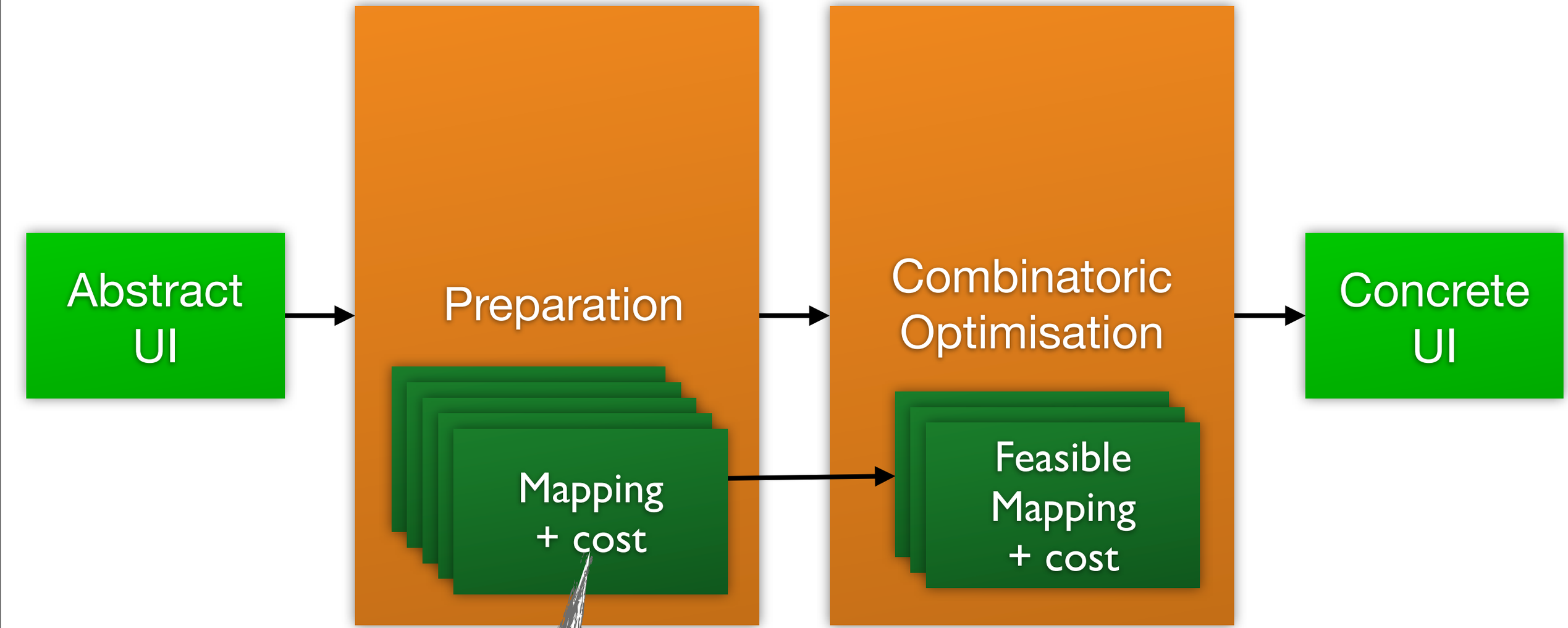


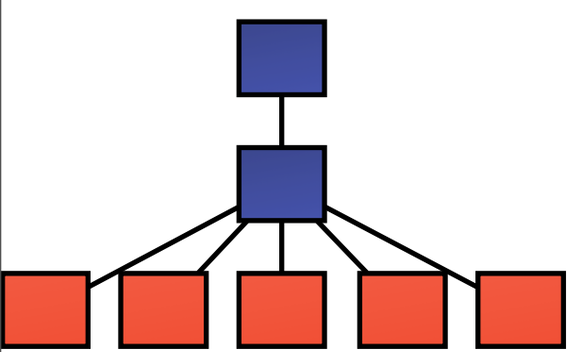


Corresponds to interaction effort or user preference



UI GENERATION | UiGE





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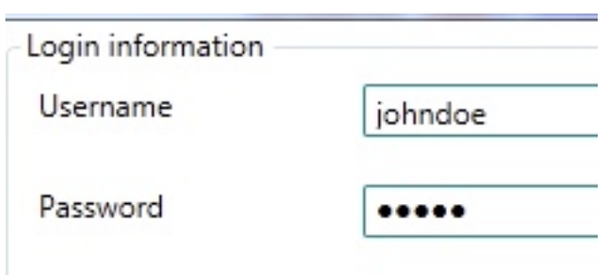


UI GENERATION | UiGE

Abstract UI

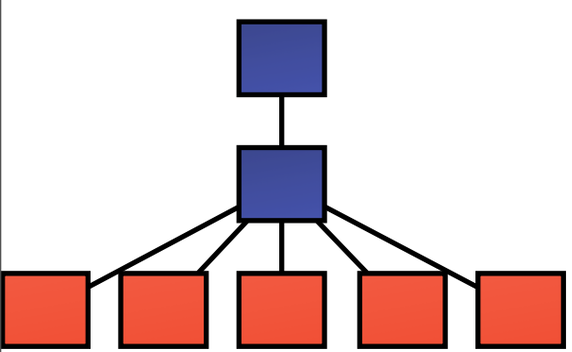
Preparation

Mapping + cost

Combinatoric Optimisation

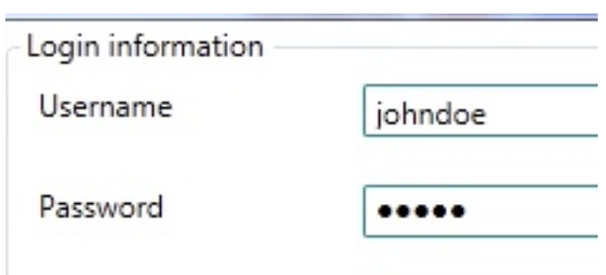
Feasible Mapping + cost

Concrete UI



Corresponds to interaction effort or user preference

Context Model



UI GENERATION | UiGE

Abstract UI

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Template + cost

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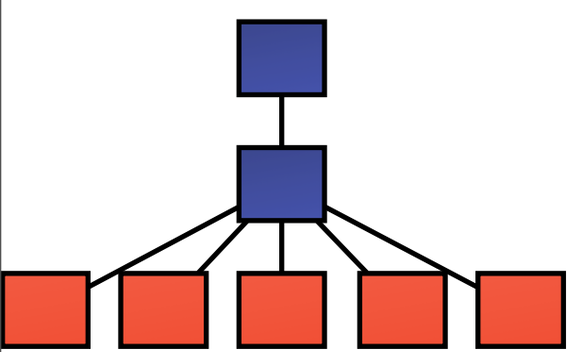

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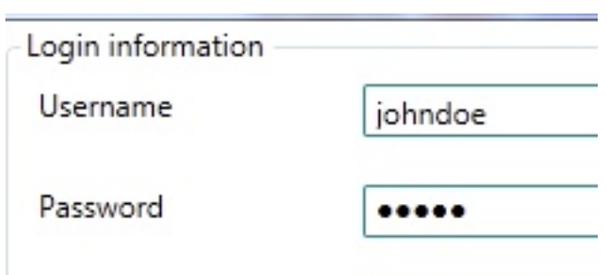
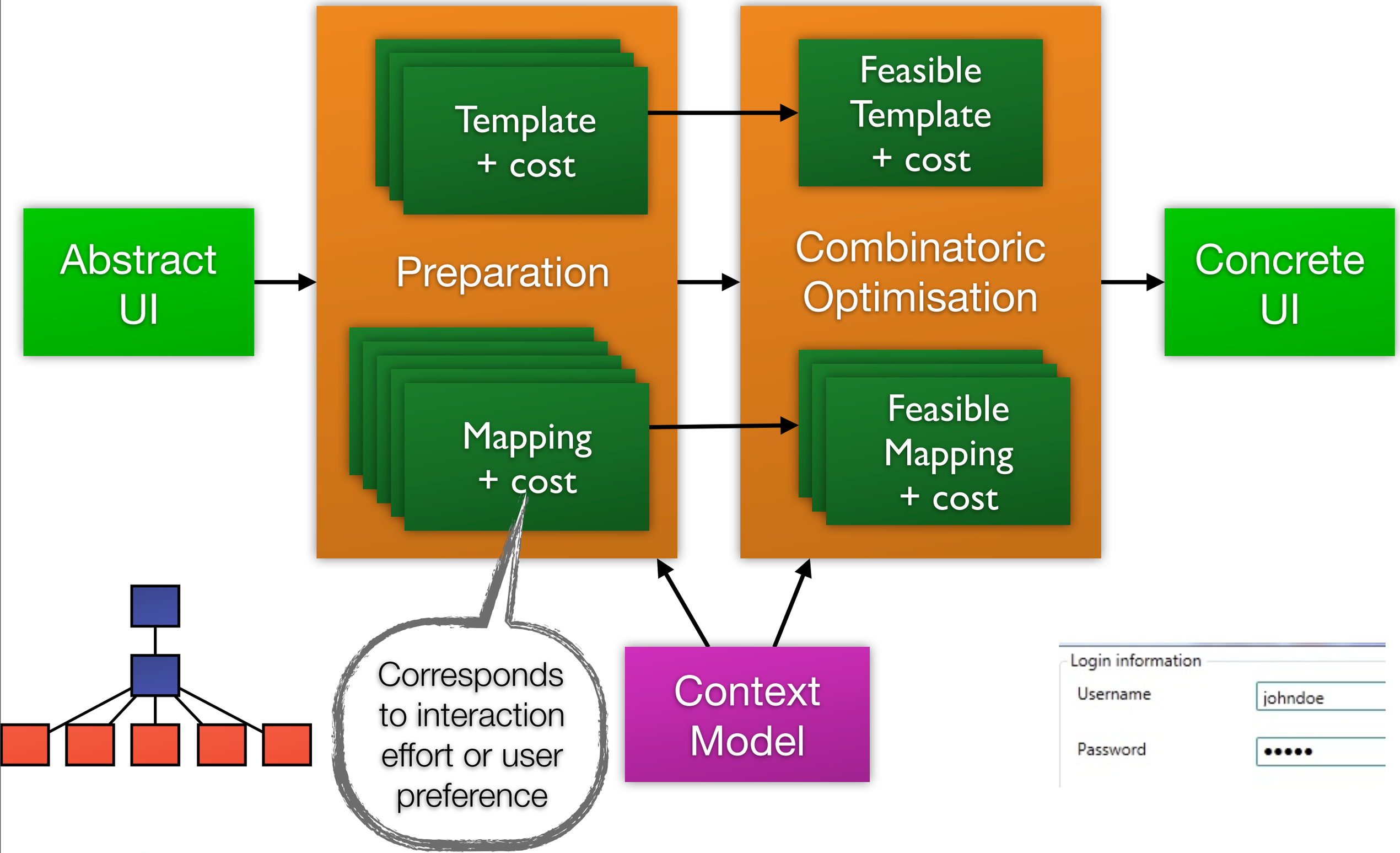


UI GENERATION | UiGE



UI GENERATION | UiGE

Abstract UI

Template + cost

Preparation

Mapping + cost

Fe… Ter… + c…

Combinatoric Optimisation

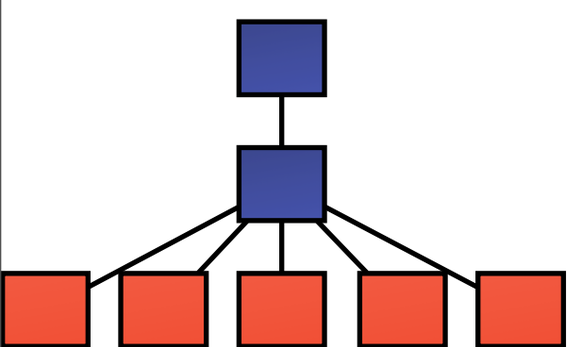
Feasible Mapping + cost

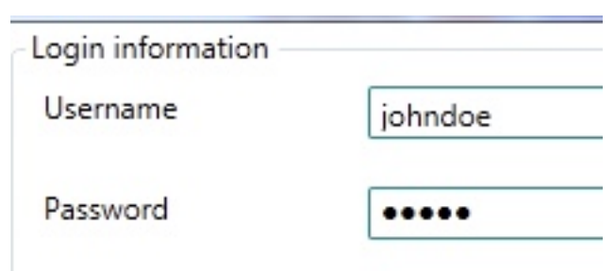
Concrete UI

Finds combination of mappings and templates with minimum cost

Context Model

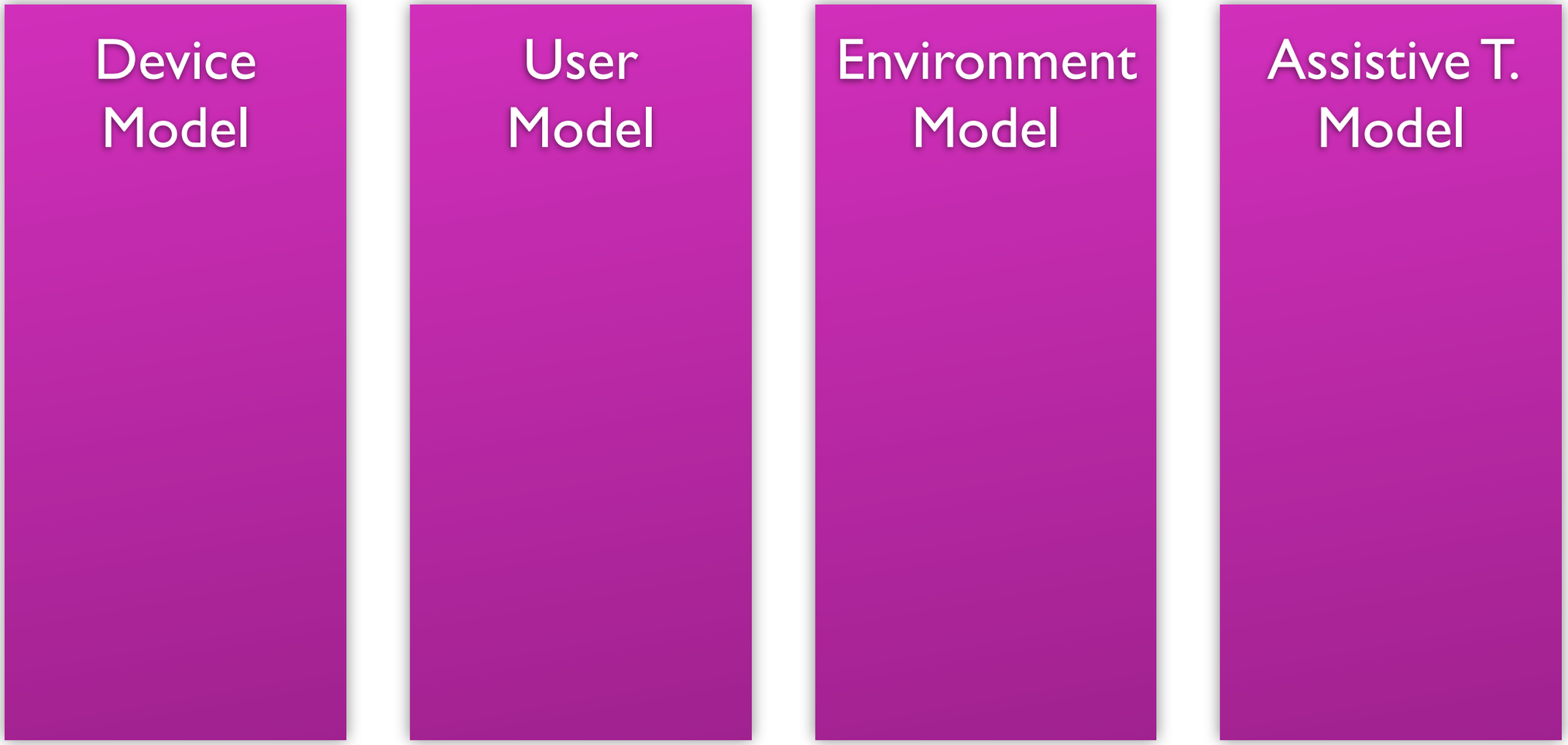
Corresponds to interaction effort or user preference



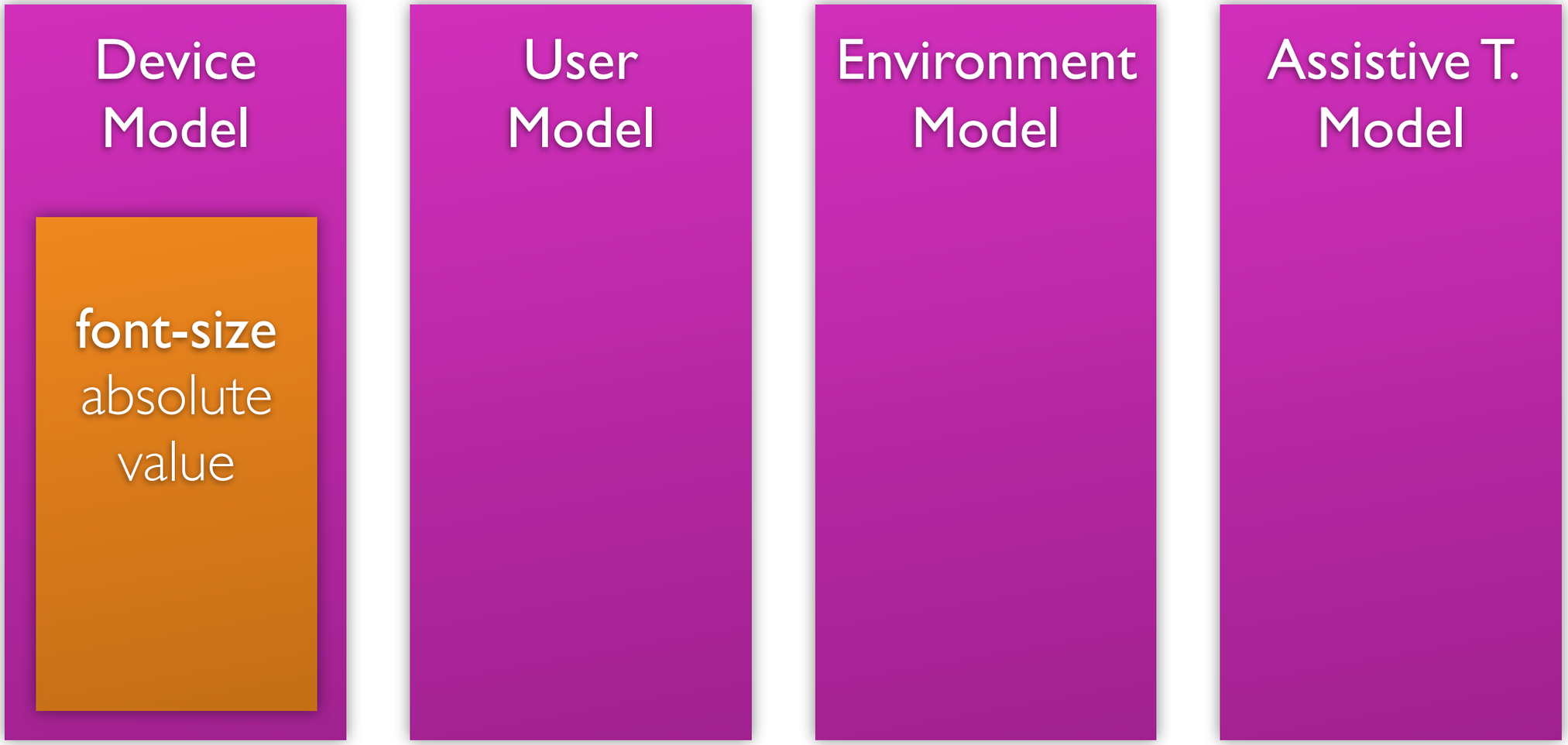


CONTEXT MODEL | PRINCIPLE

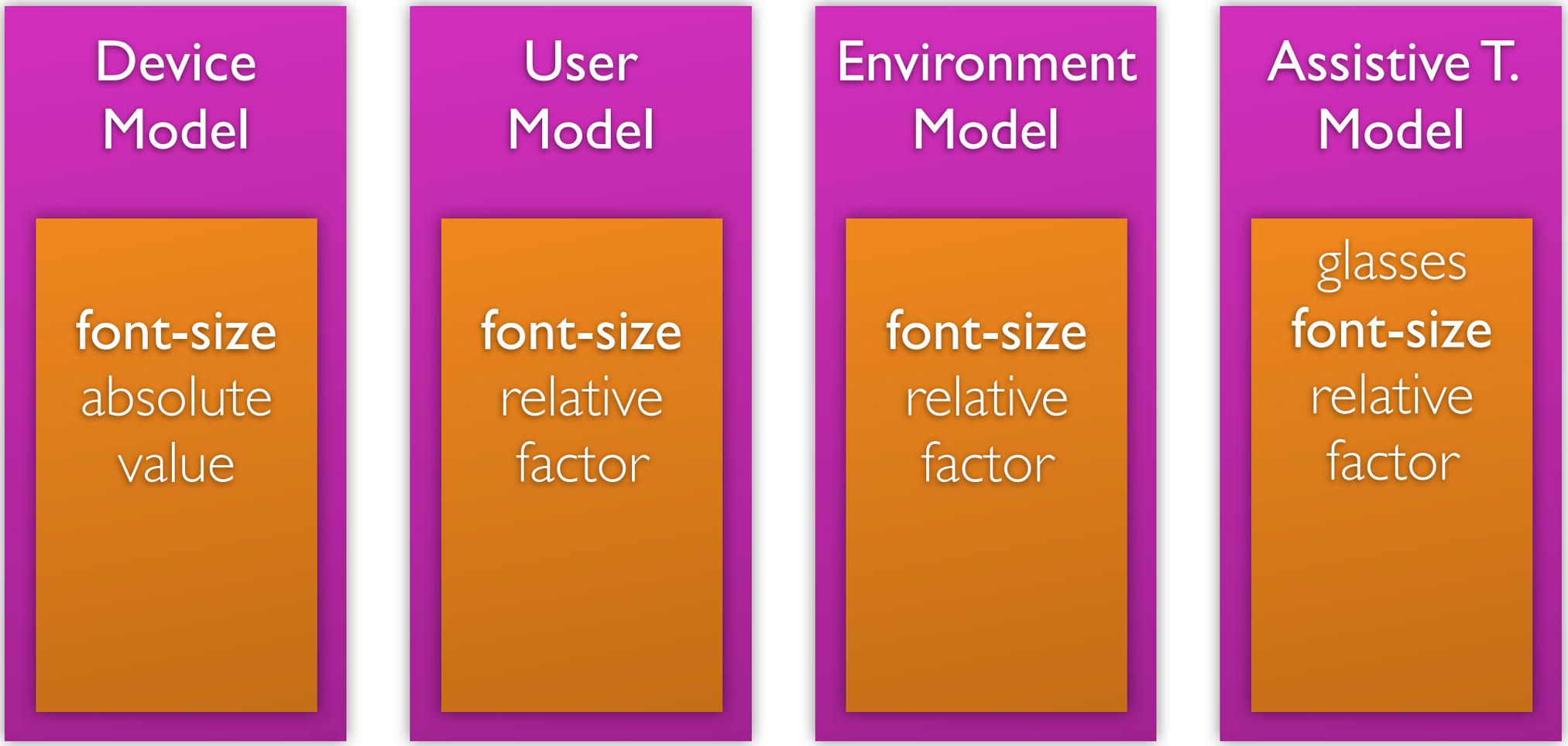
CONTEXT MODEL | PRINCIPLE



CONTEXT MODEL | PRINCIPLE



CONTEXT MODEL | PRINCIPLE

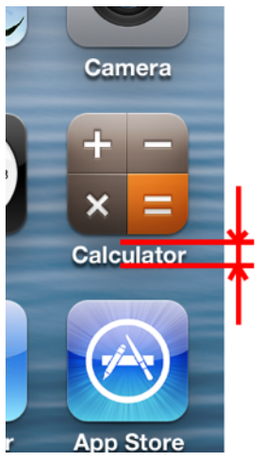


CONTEXT MODEL | PRINCIPLE

Device Model

font-size
absolute
value

12 px



User Model

font-size
relative
factor

4.5

Environment Model

font-size
relative
factor

1.2

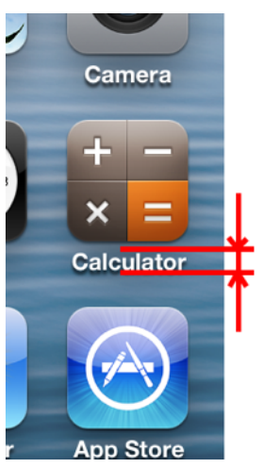
Assistive T. Model

glasses
font-size
relative
factor

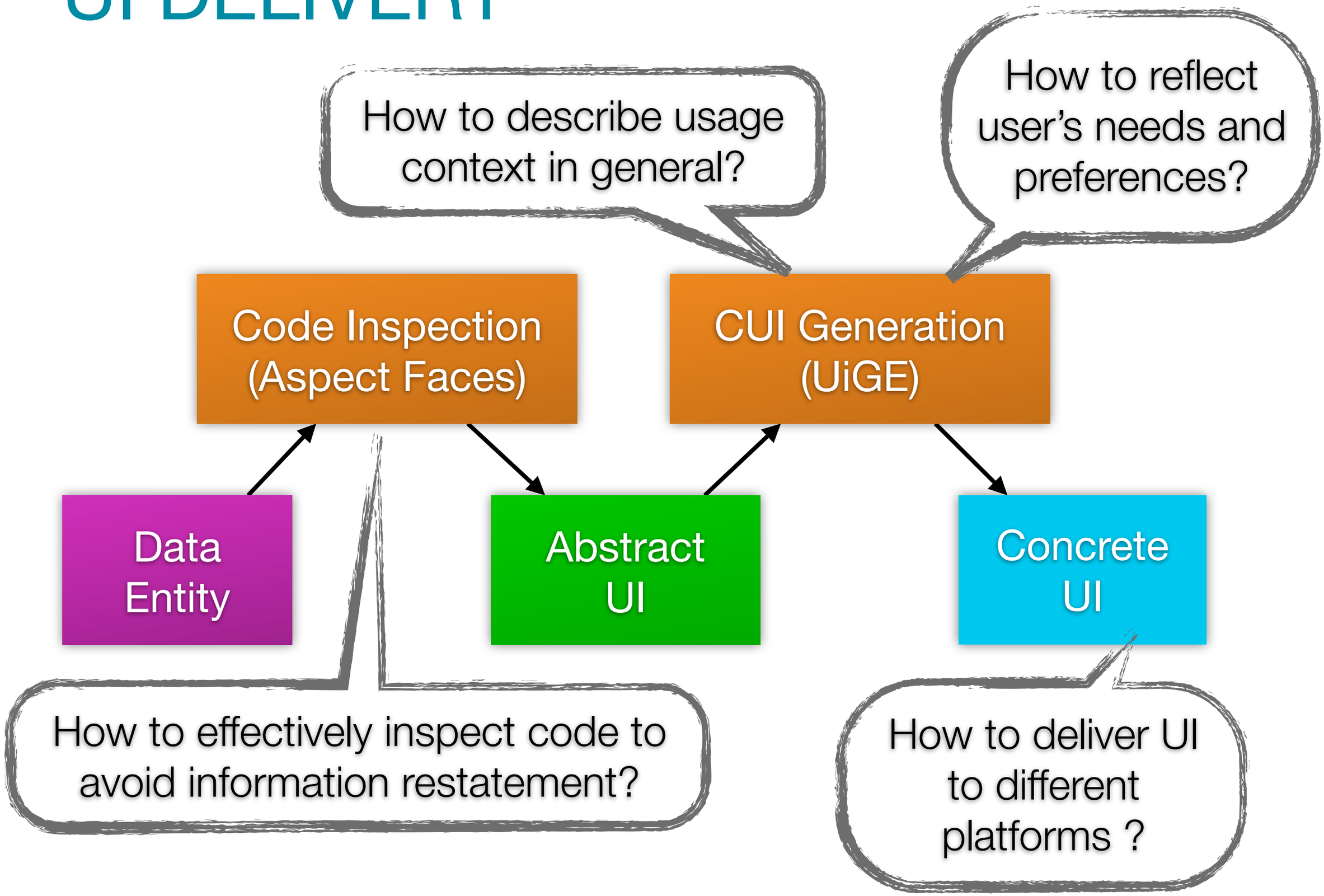
0.5

CONTEXT MODEL | PRINCIPLE

final value		Device Model		User Model		Environment Model		Assistive T. Model
font-size		**font-size** absolute value		**font-size** relative factor		**font-size** relative factor		glasses **font-size** relative factor
33 px	=	12 px	x	4.5	x	1.2	x	0.5



UI DELIVERY


How to describe usage context in general?
How to reflect user's needs and preferences?
Code Inspection (Aspect Faces)
CUI Generation (UiGE)
Data Entity
Abstract UI
Concrete UI
How to effectively inspect code to avoid information restatement?
How to deliver UI to different platforms ?

UI DELIVERY

sage
l?

How to reflect user's needs and preferences?

CUI Generation (UiGE)

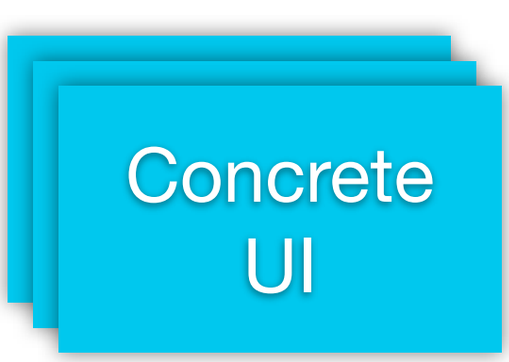
Concrete UI

How to deliver UI to different platforms ?

UIP | USER INTERFACE DELIVERY

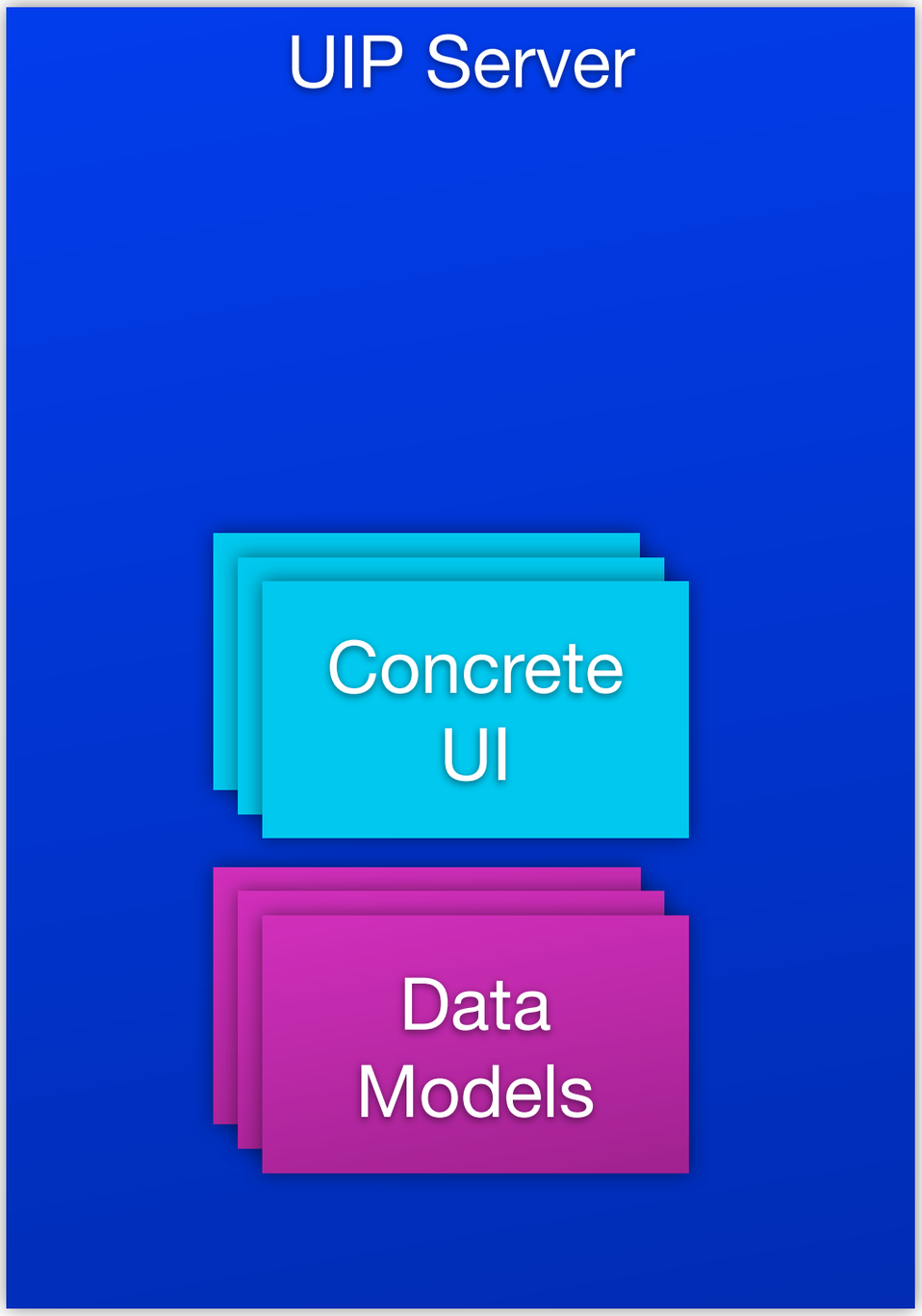
Concrete UI

UIP | USER INTERFACE DELIVERY

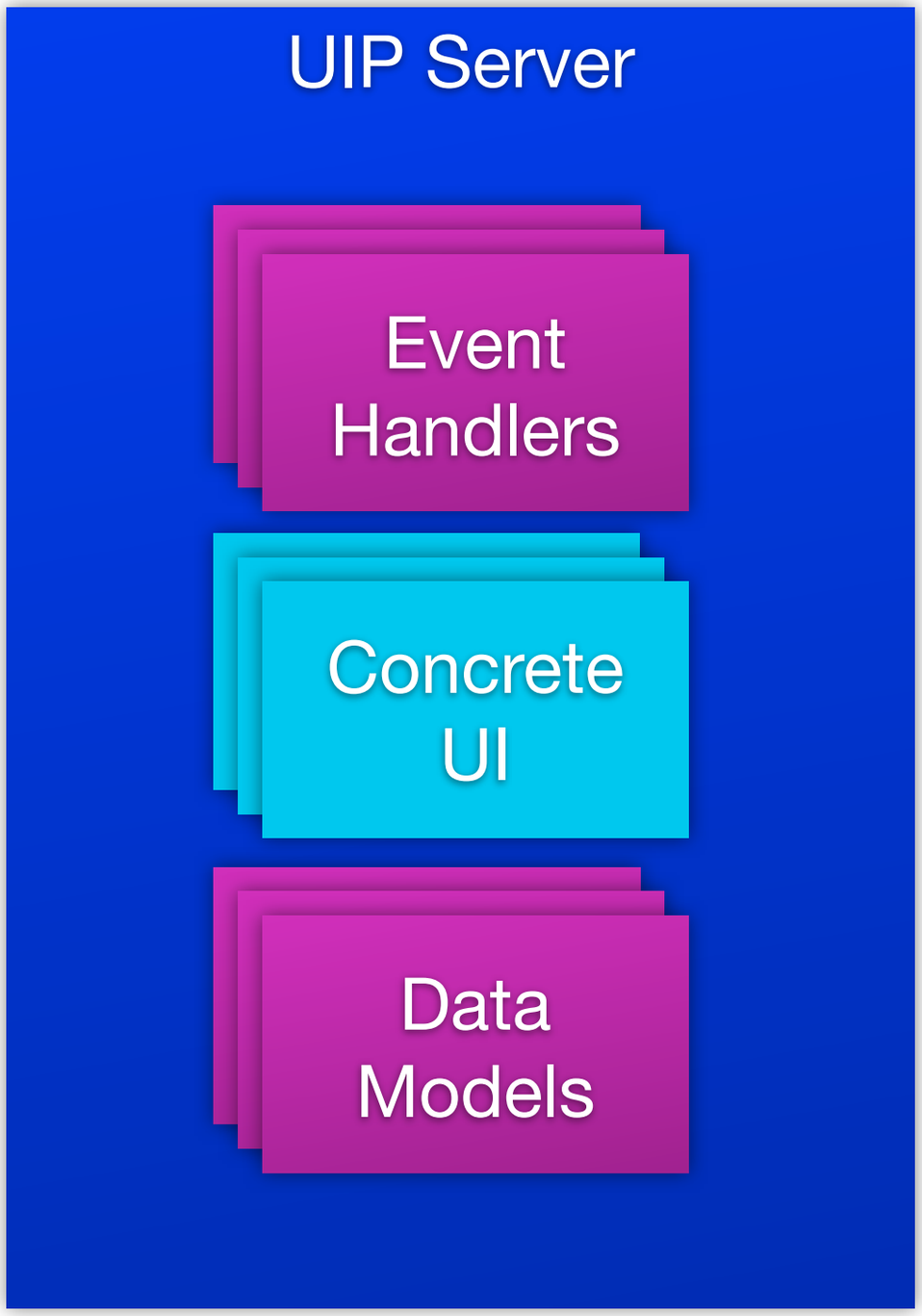


UIP | USER INTERFACE DELIVERY

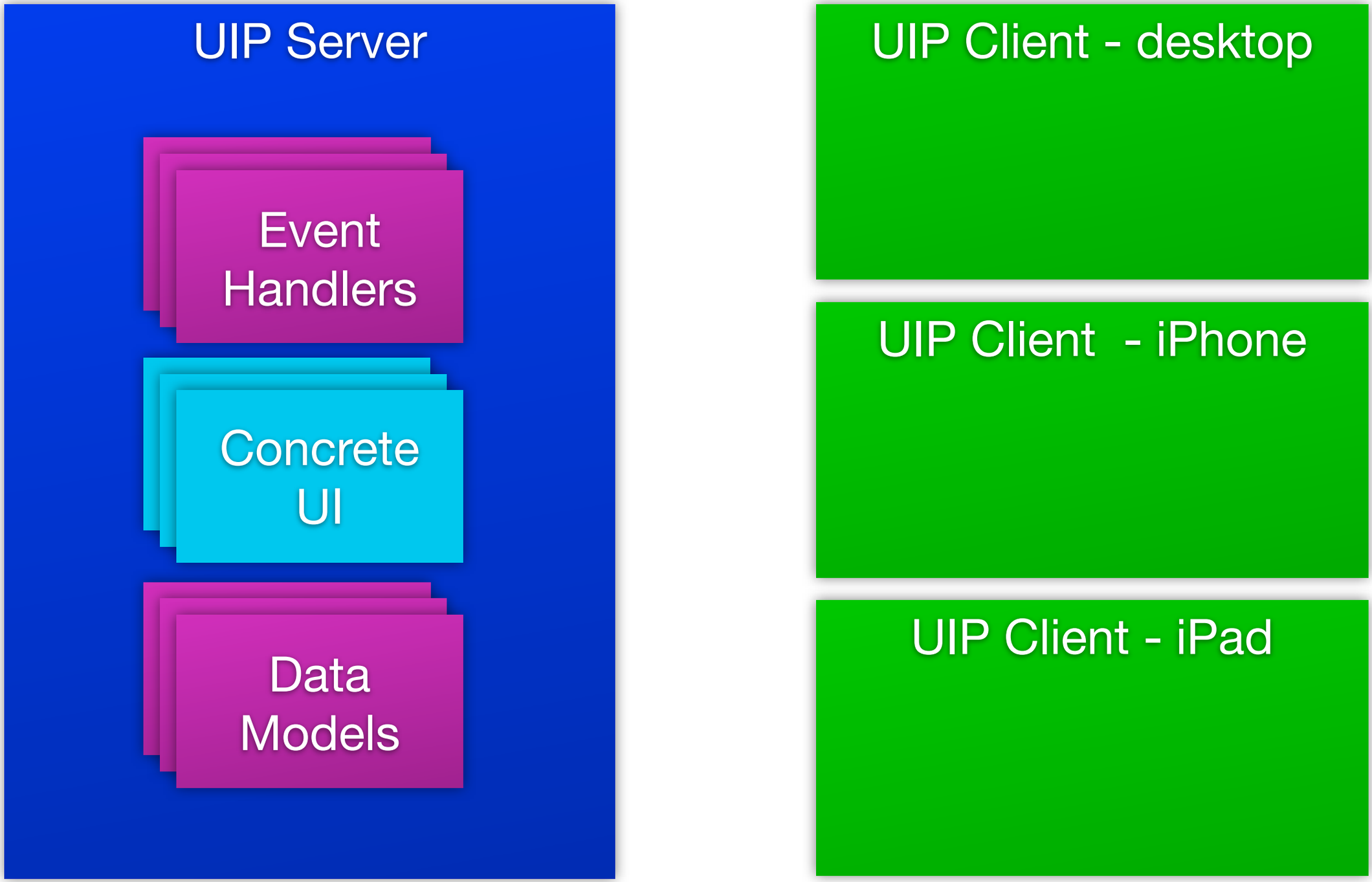
UIP | USER INTERFACE DELIVERY



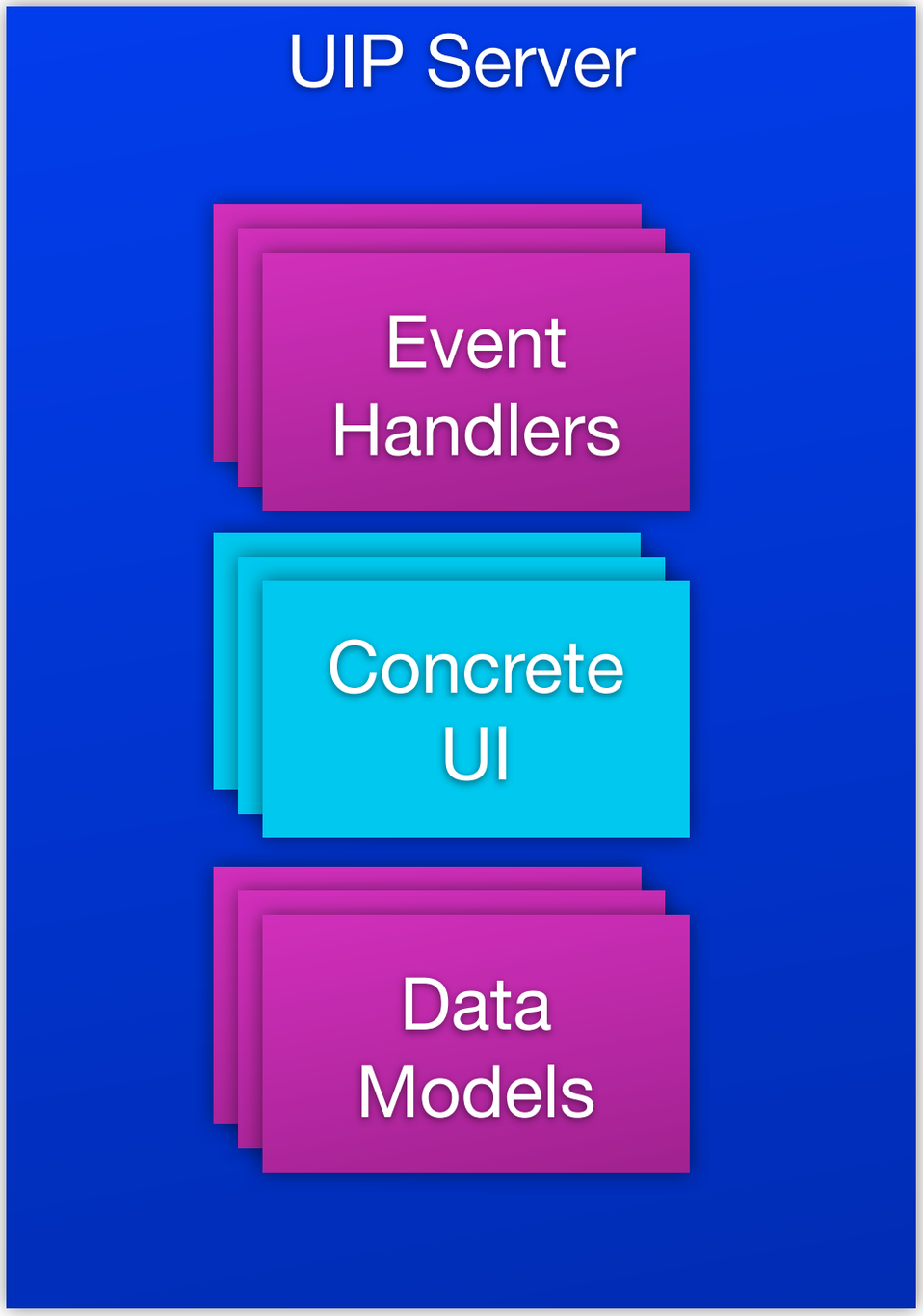
UIP | USER INTERFACE DELIVERY

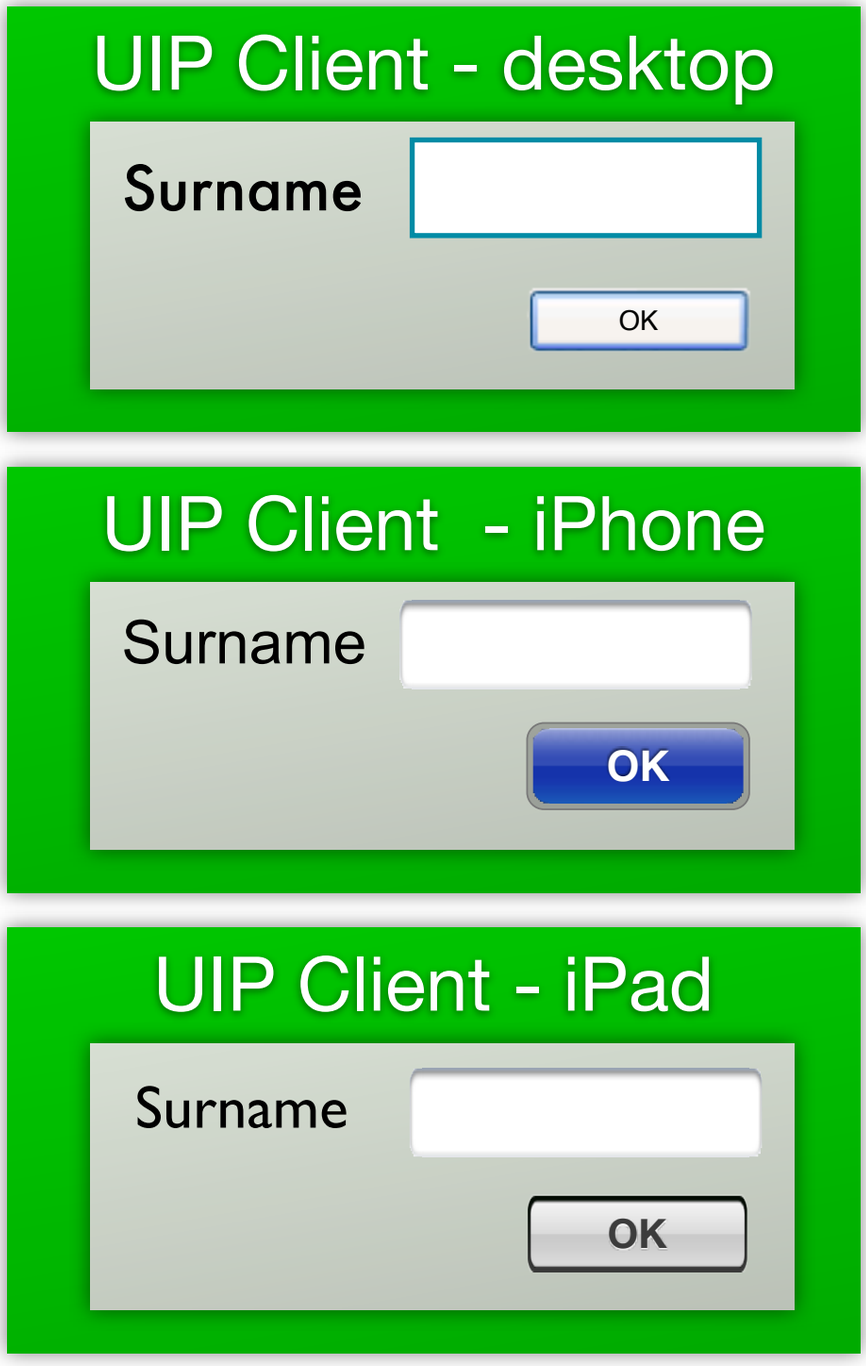


UIP | USER INTERFACE DELIVERY

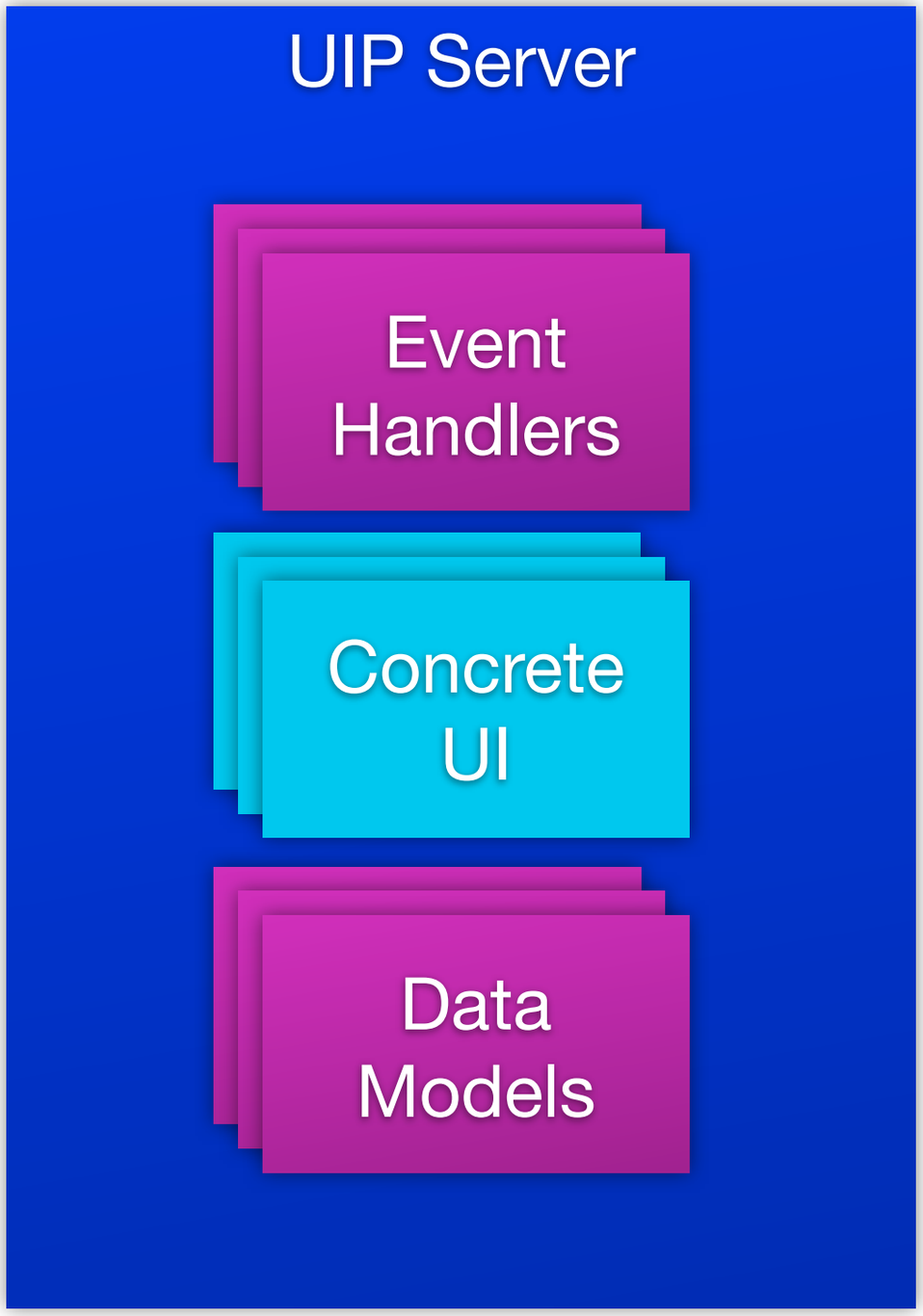


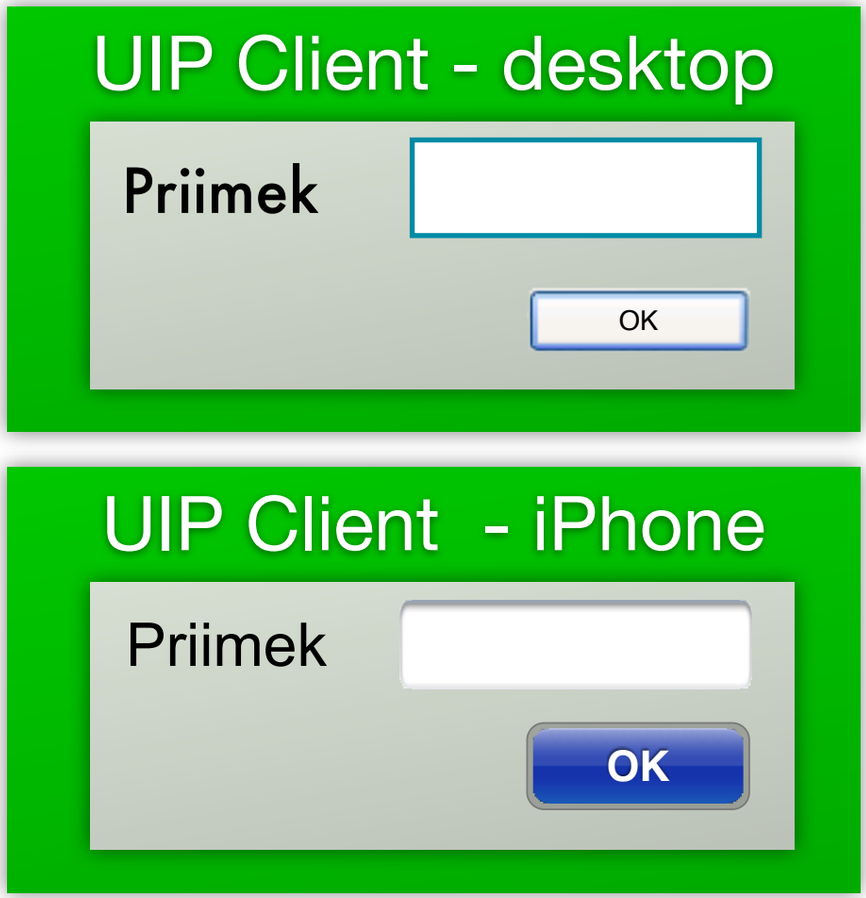
UIP | USER INTERFACE DELIVERY

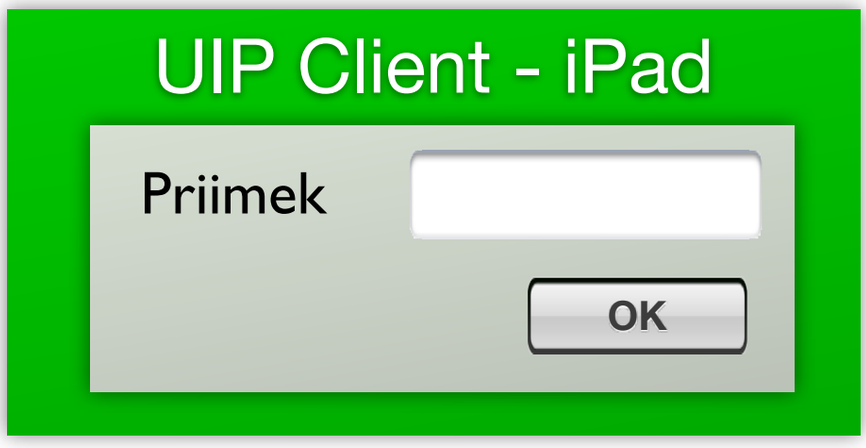




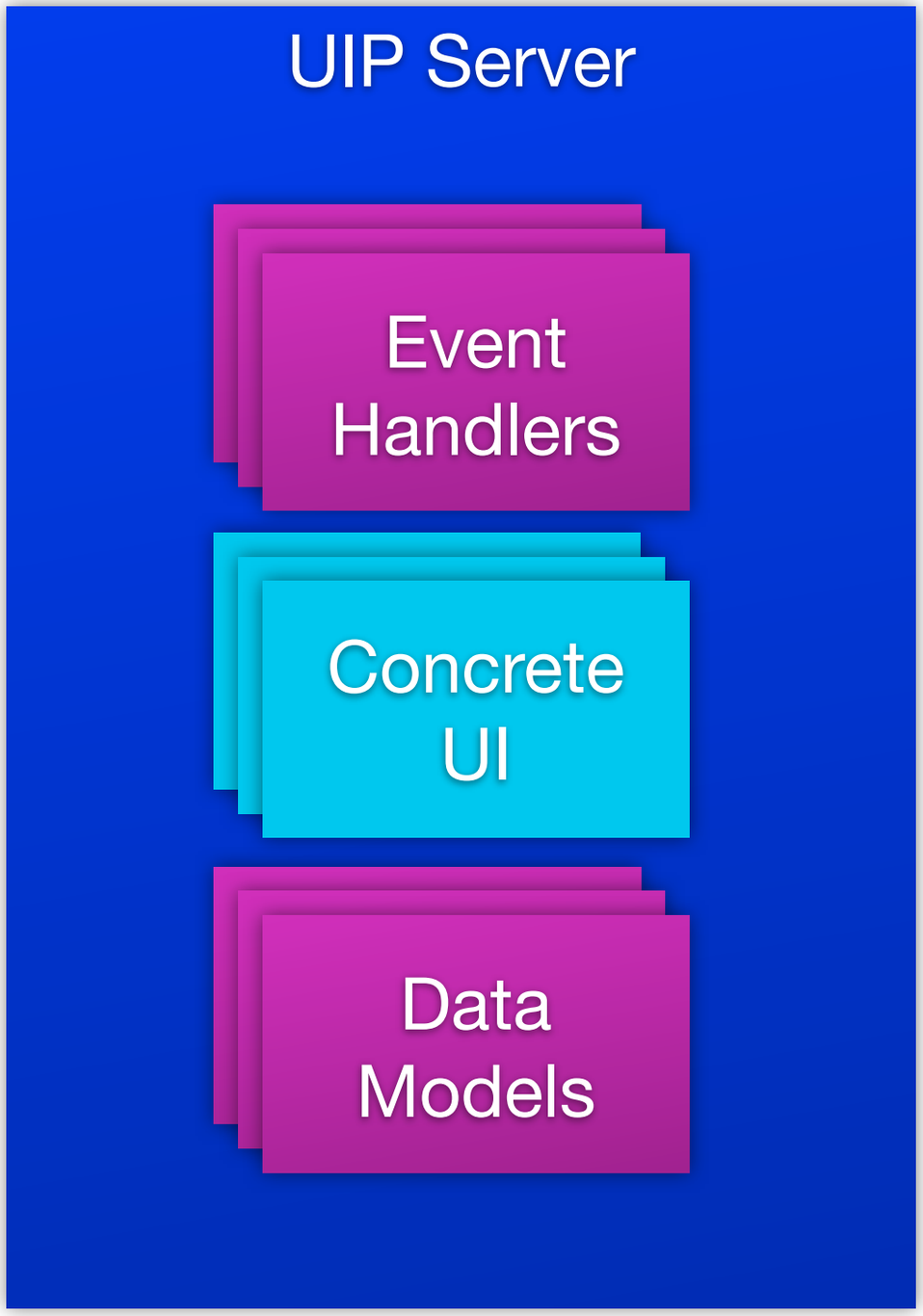
UIP | USER INTERFACE DELIVERY

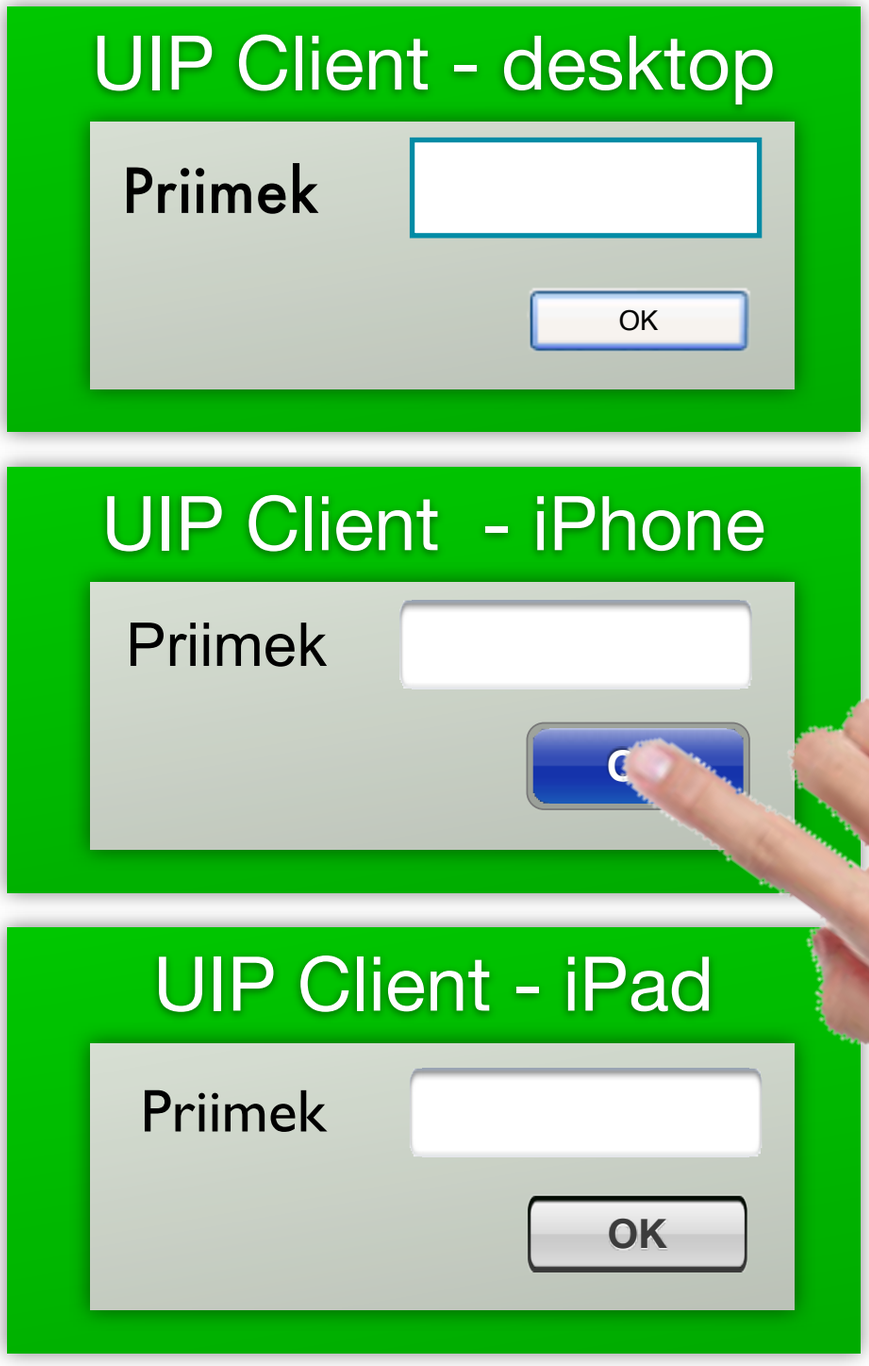




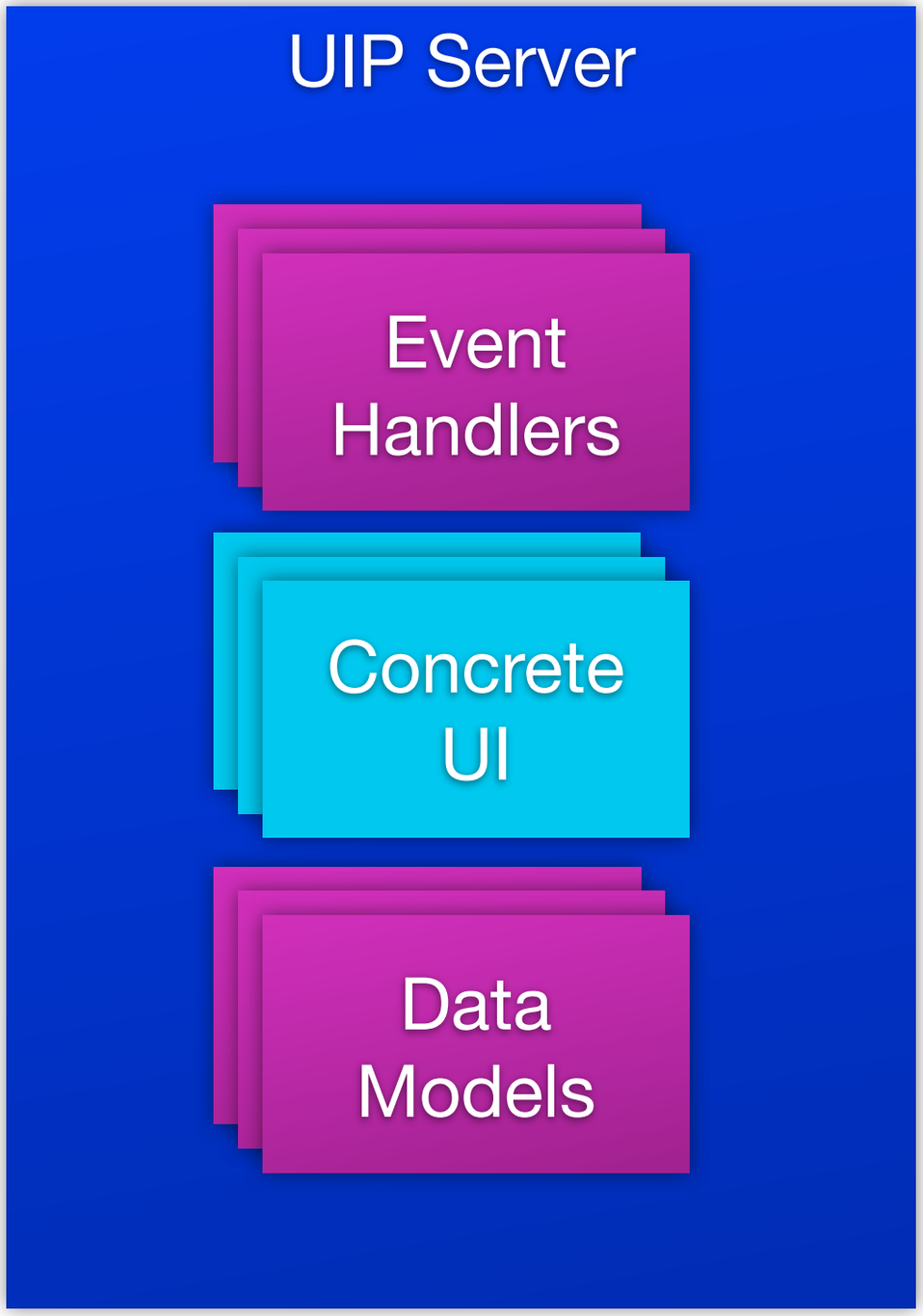


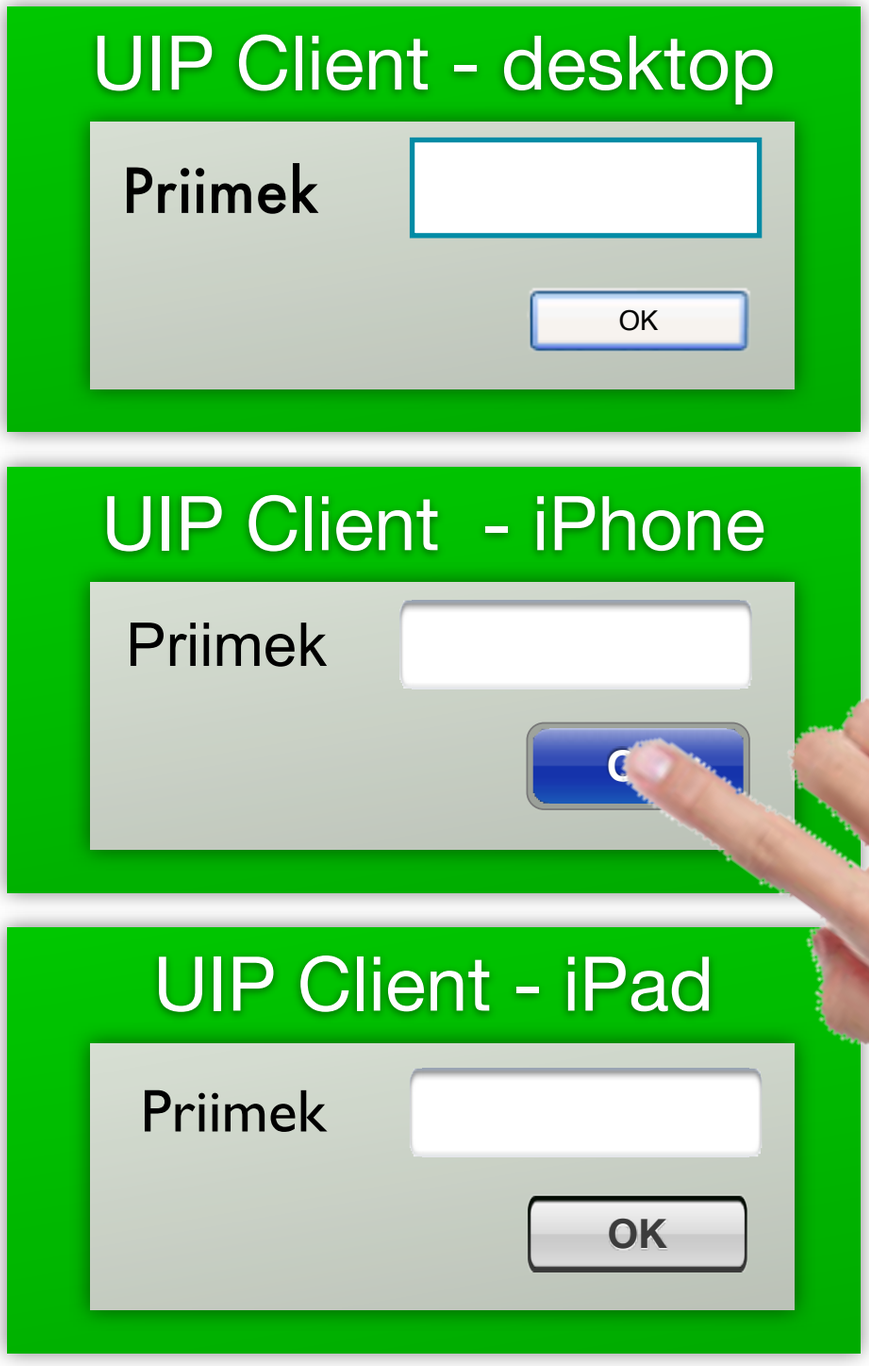
UIP | USER INTERFACE DELIVERY



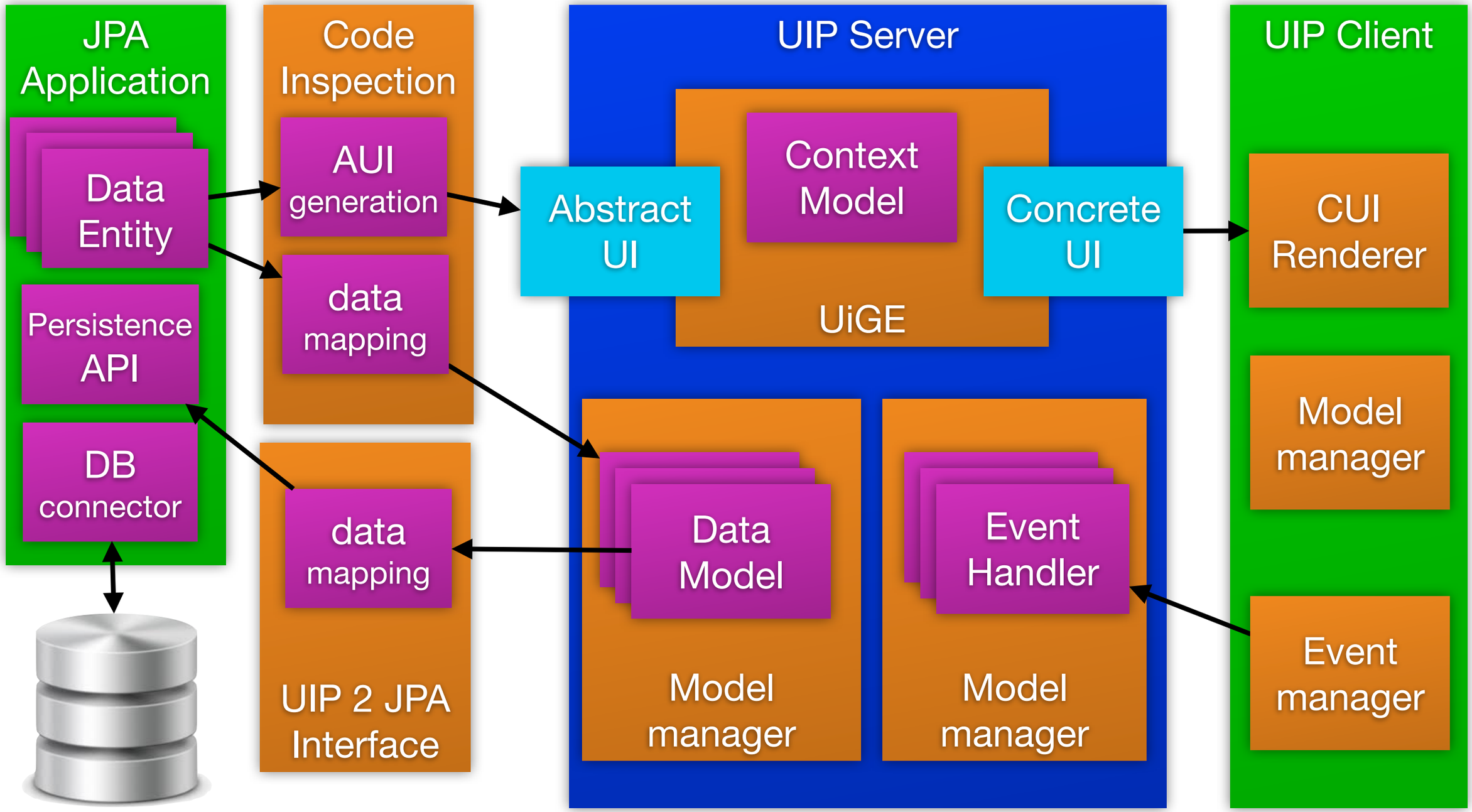


UIP | USER INTERFACE DELIVERY



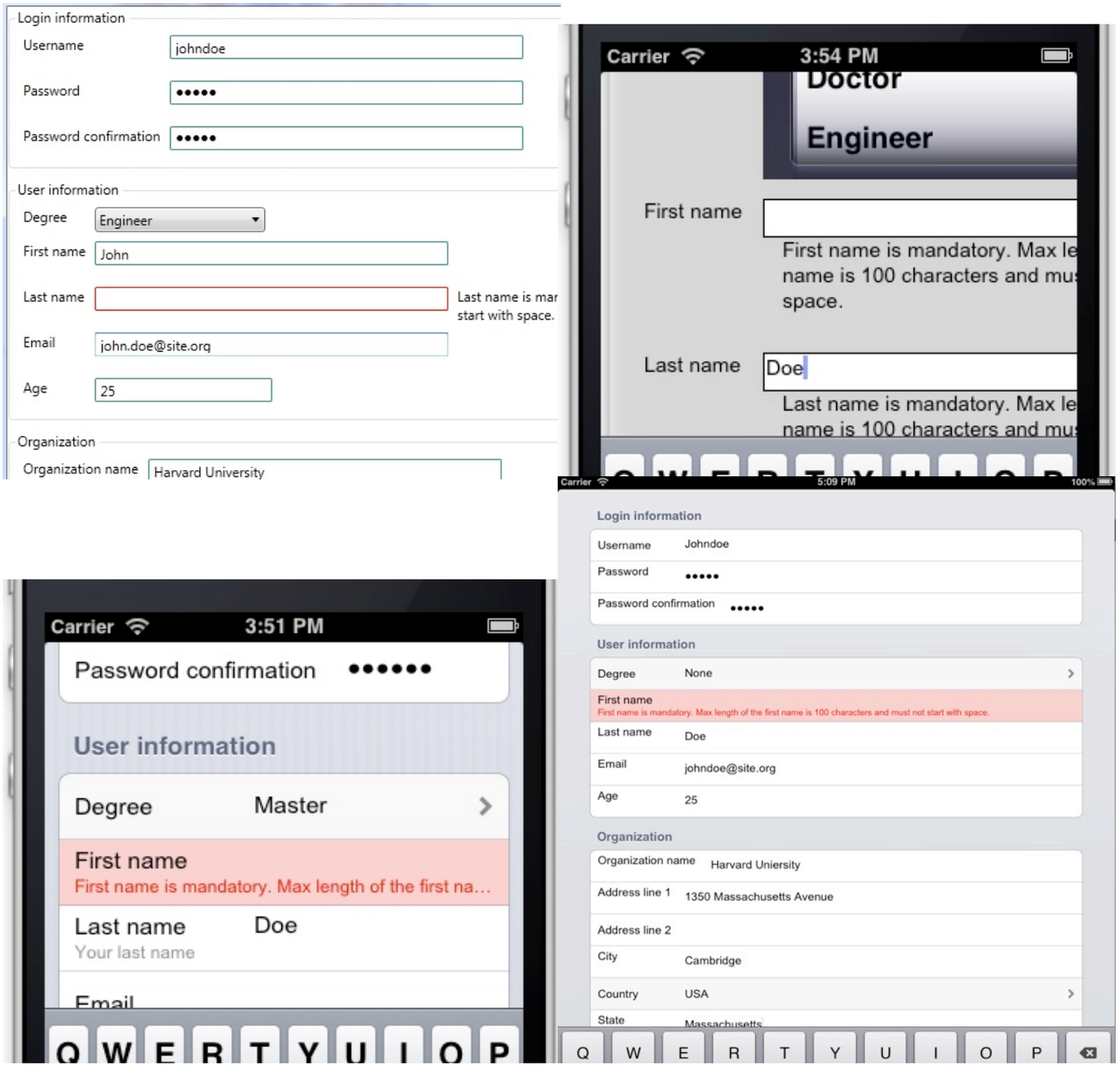


INTEGRATION



RESULTS

without templates



with templates

RESULTS

without templates

with templates

Login information

Username johndoe

Password •••••

Password confirmation •••••

User information

Degree Engineer

First name John

Last name

Last name is man
start with space.

Email john.doe@site.org

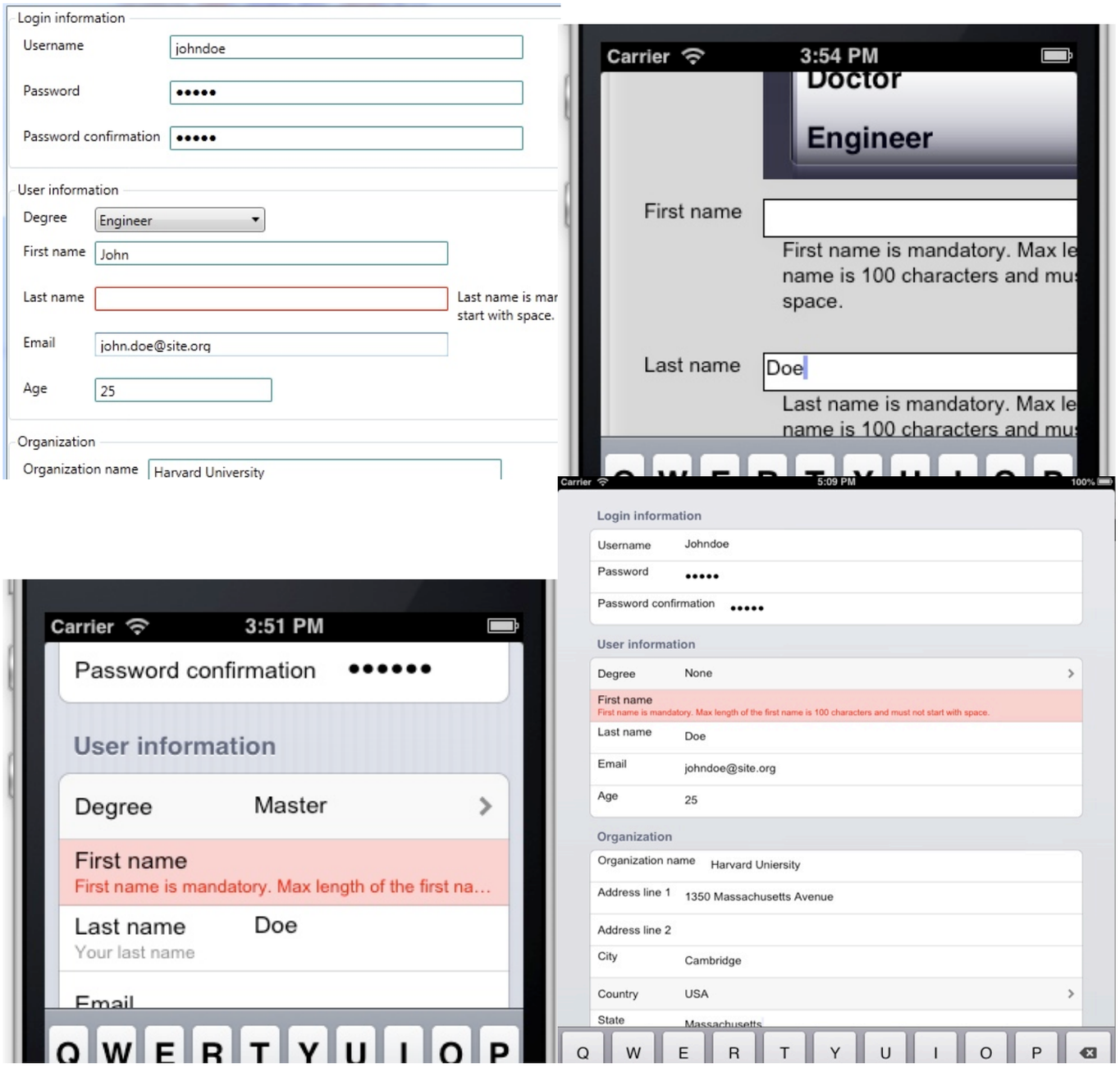
Age 25

Organization

Organization name Harvard University

RESULTS

without templates

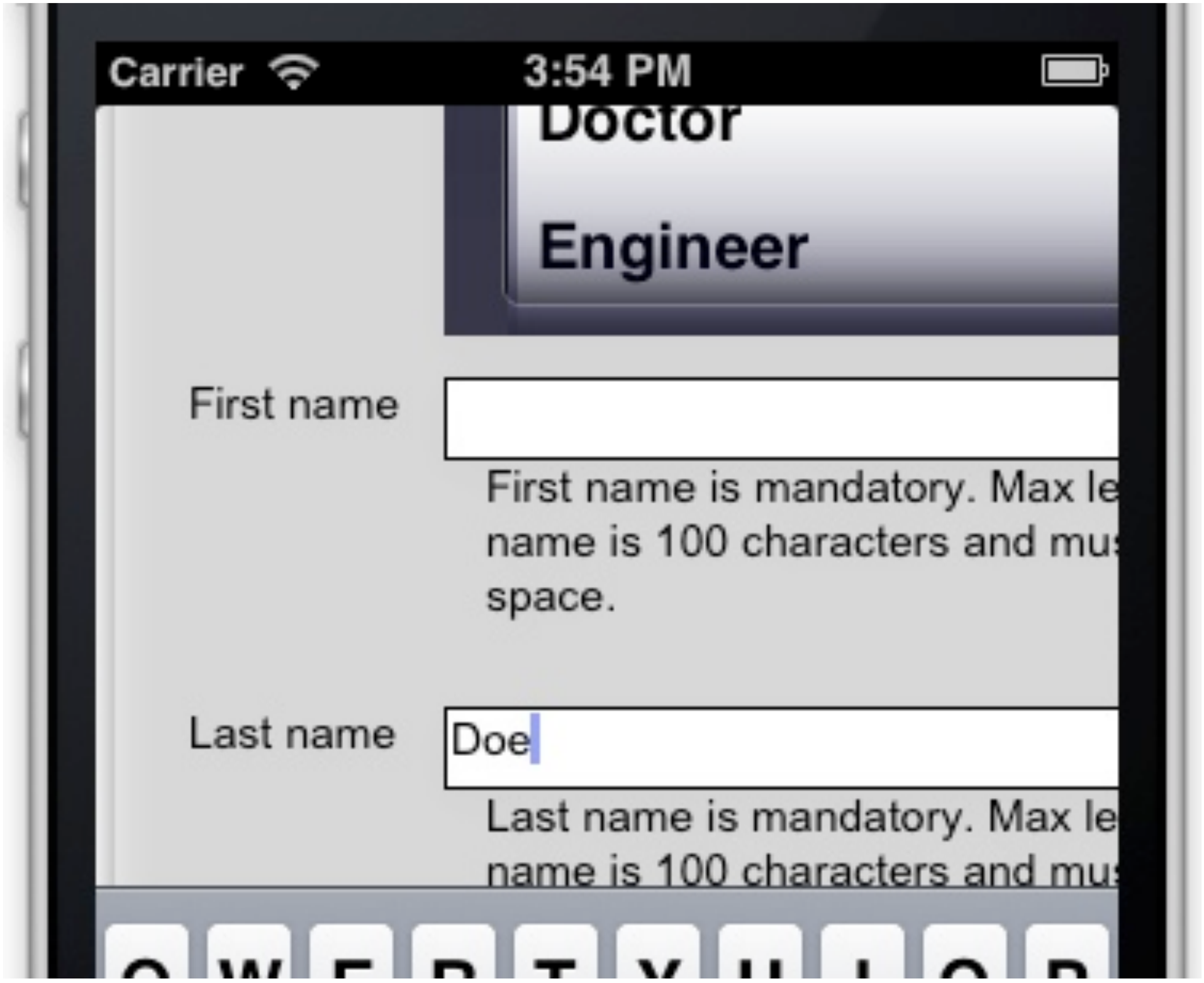


with templates

RESULTS

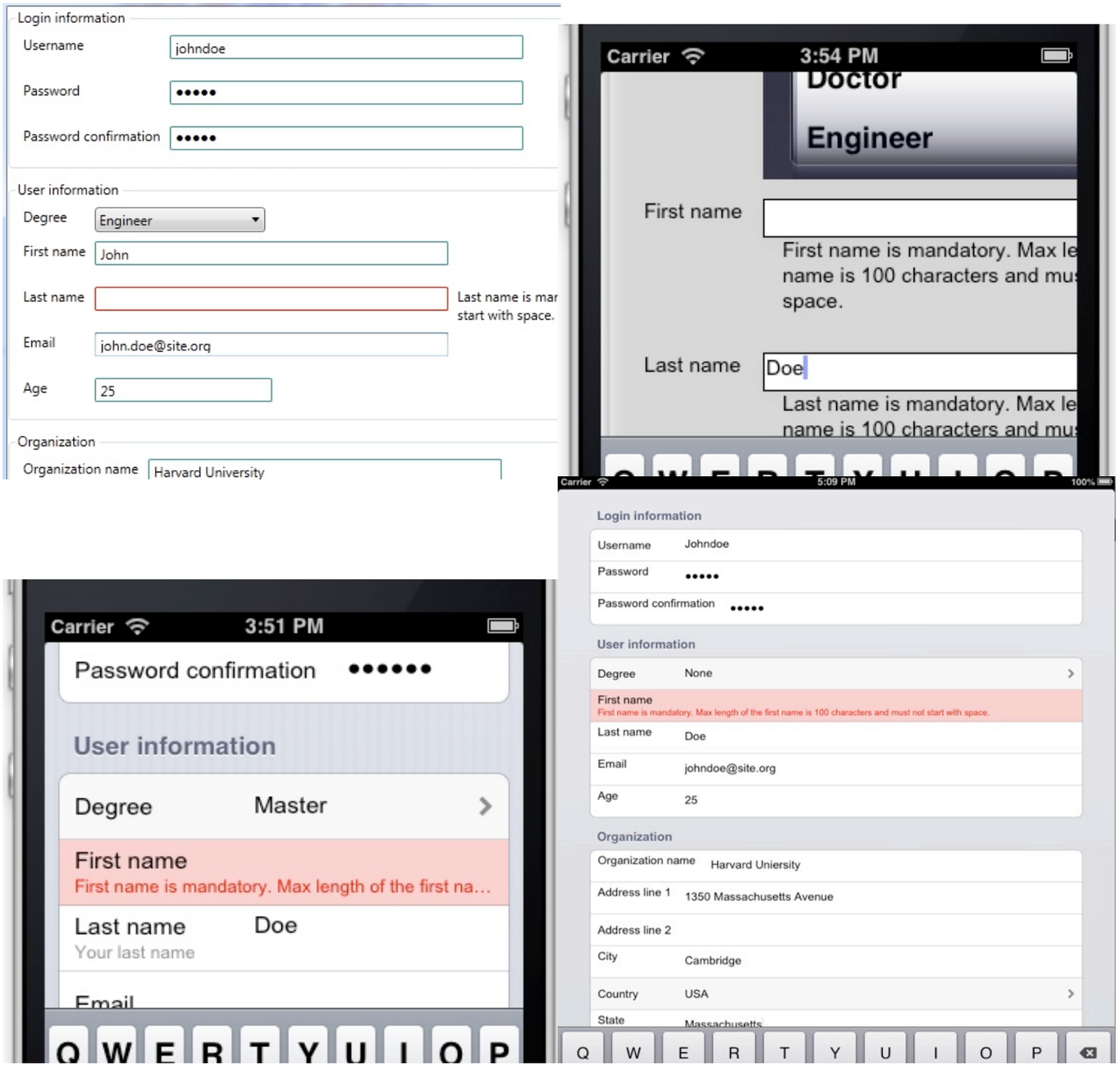
without templates

with templates



RESULTS

without templates



with templates

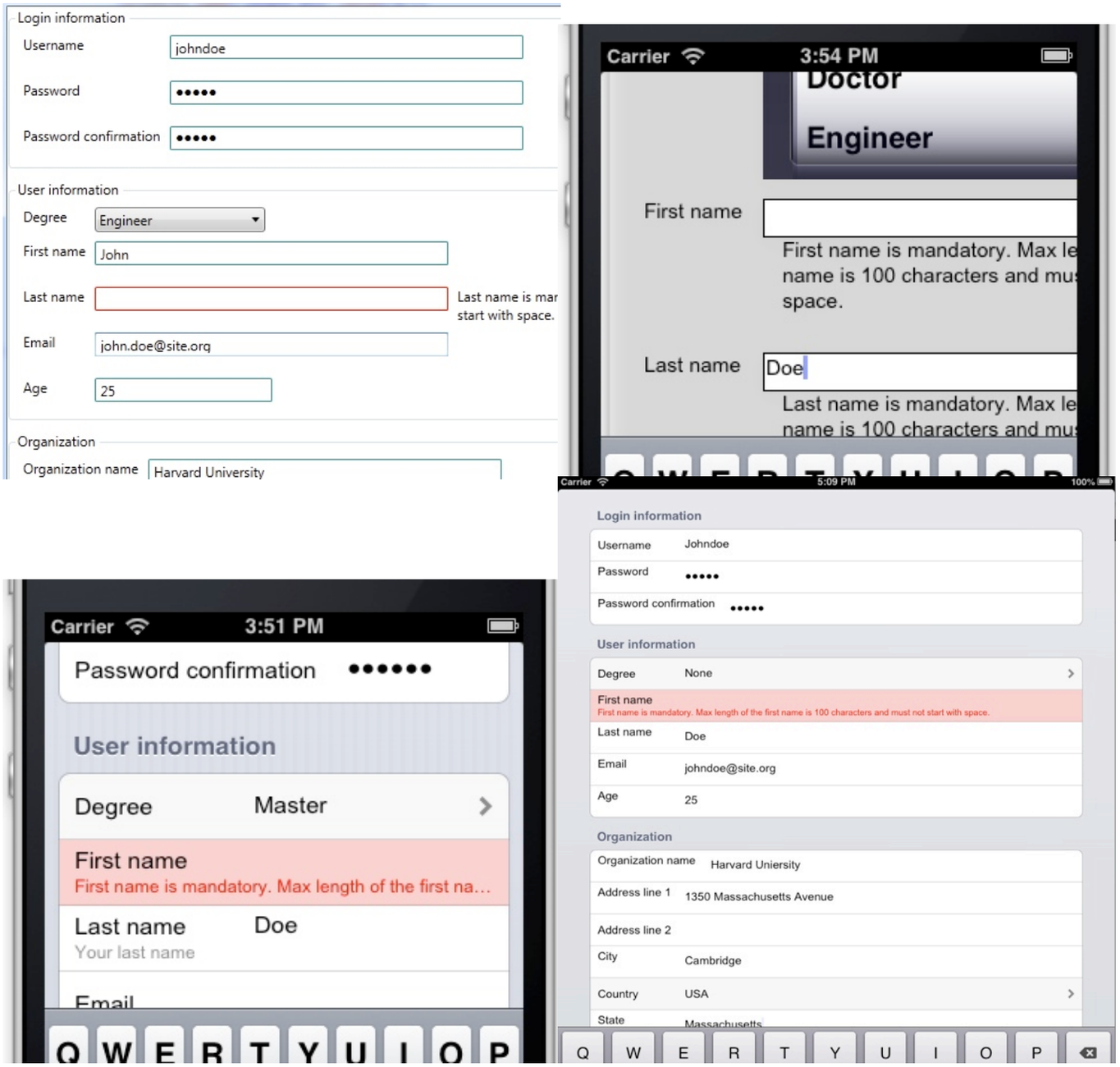
RESULTS

without templates

with templates

RESULTS

without templates

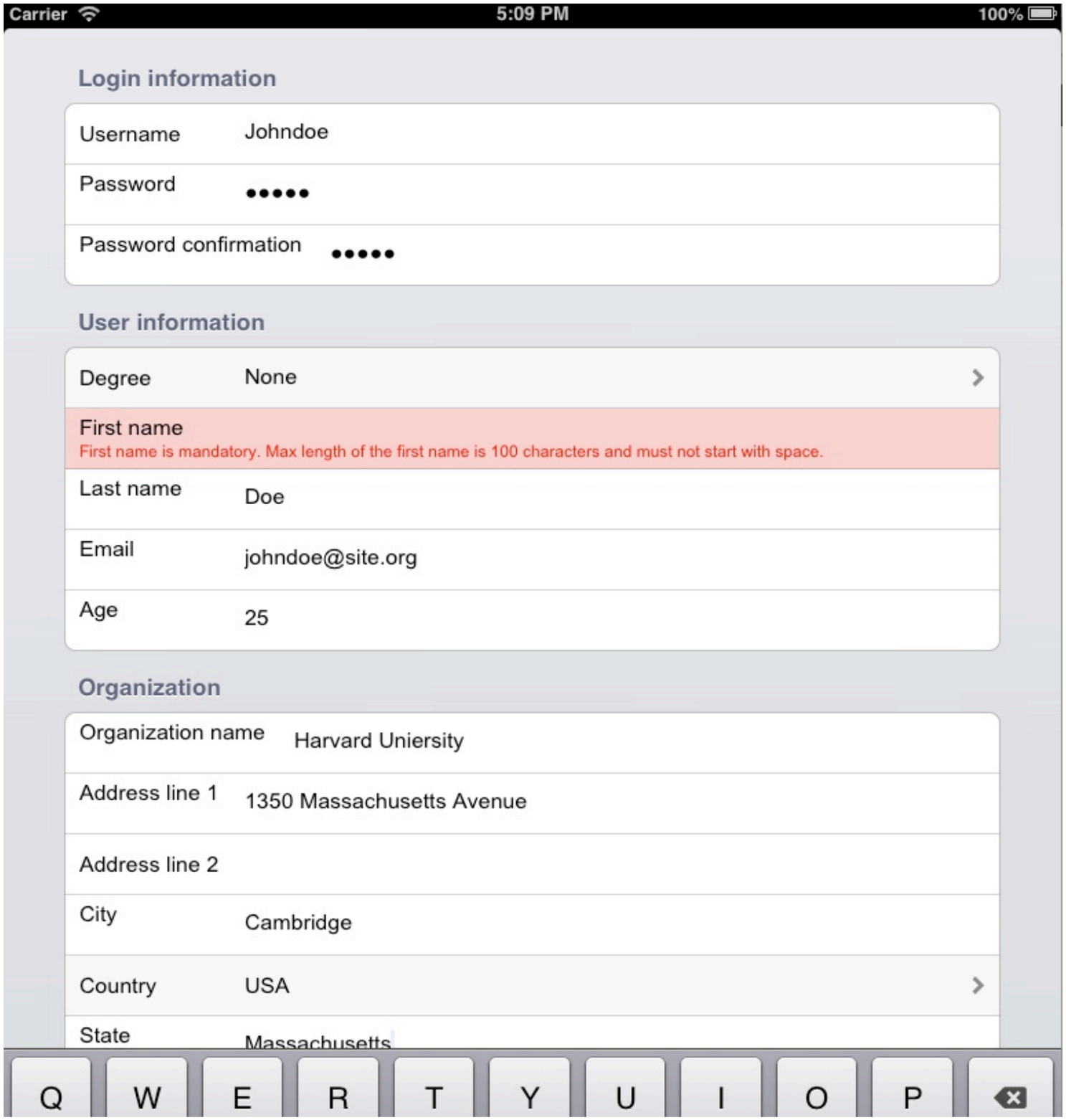


with templates

RESULTS

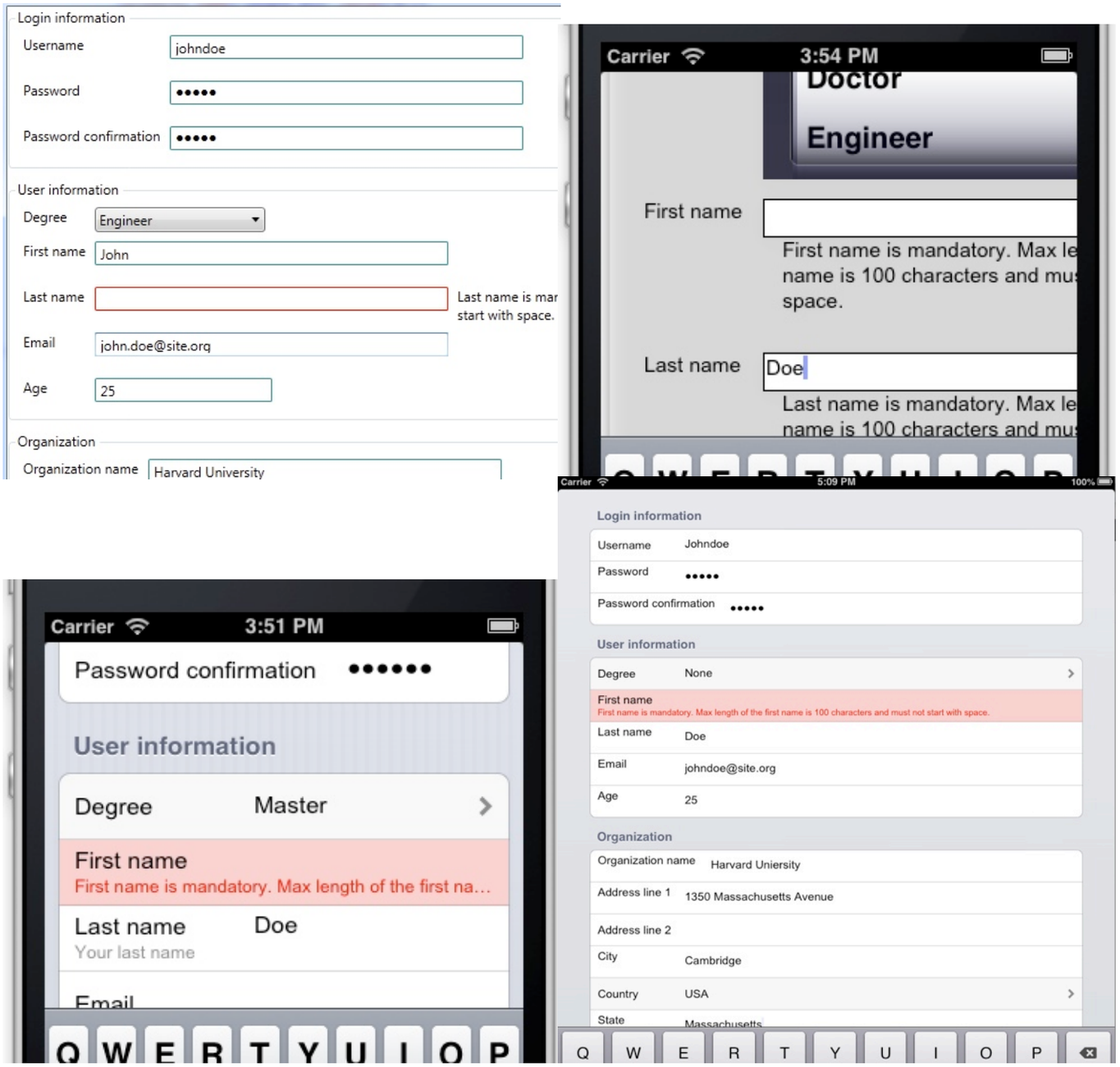
without templates

with templates



RESULTS

without templates



with templates

PROOF OF CONCEPT | USER STUDY

- 12 participants, compared against web application

Device	UI aspect	M(web)	M(UIP)	Statistics
Desktop	comfort	2	1	$p < 0.05$
	efficiency	2	1	$p > 0.05$
	aesthetic quality	4	2	$p < 0.05$
iPhone	comfort	4	2	$p < 0.005$
	efficiency	4	2	$p < 0.05$
	aesthetic quality	4	2	$p < 0.005$
iPad	comfort	3	2	$p < 0.05$
	efficiency	3	2	$p < 0.05$
	aesthetic quality	4	2	$p < 0.005$

PROOF OF CONCEPT | DEVELOPMENT AND MAINTENANCE EFFORT

Component	Manual (LOC)	Our approach (LOC)
Persistence model	370	370
Extension to persistence model	-	96
Text Label Properties	-	108
UIP XML Forms	703	-
Java Script Library	300	300
Java Script in View	446	-
Total	1819	874

CONCLUSION

- code inspection significantly reduces development and maintenance effort
- various heterogeneous target UI platforms supported
- context-sensitive UIs generated at runtime
- simple but scalable context model

FUTURE WORK

- focus on non data-oriented applications
  - e.g. workflow based
- more challenging target user audience
  - blind users
- support for more modalities
- market dissemination

Q & A

UIPROTOCOL.EU

ASPECTFACES.COM

Thank you for your attention.

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cernyto3@fel.cvut.cz

Technologická agentura
České republiky