Using Multiple Feature Models to Design Applications for Mobile Phones

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Outline

• Industrial context

• Our proposition: AppliDE
  • Handling functional variability
  • Handling device variability

• Conclusion & Perspectives
Outline

• Industrial context

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• Conclusion & Perspectives
Industrial context
Industrial context
Industrial context
Industrial context

<table>
<thead>
<tr>
<th>Year</th>
<th>Downloaded applications (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>2.4</td>
</tr>
<tr>
<td>2010</td>
<td>8.2</td>
</tr>
<tr>
<td>2011</td>
<td>+ 17</td>
</tr>
</tbody>
</table>

Gartner

http://www.appbrain.com/stats/number-of-android-apps
http://developer.apple.com/wwdc/

250,000+ (07/11)

425,000+ (06/11)
Challenges

$C_1$: functional variability

$C_2$: device variability
Challenges

$C_1$: functional variability

$C_2$: device variability

$C_1$: SPL approach
Challenges

$C_1$: functional variability

$C_2$: device variability

$C_1$: SPL approach

$C_2$: Rhomobile, PhoneGap, Titanium, MoSync
Challenges

$C_1$: functional variability

$C_2$: device variability

$C_1$: SPL approach

$C_2$: Rhomobile, PhoneGap, Titanium, MoSync

$\text{AppliDE} \Rightarrow C_1 + C_2$
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AppliDE meta-model

- **73 concepts in 4 packages**
  - Data
  - Action
  - Event
  - GUI
Our contribution: AppliDE

- $C_1$: functional variability

- $C_2$: device variability

List of devices: iPhone, Android, Windows Phone, ...
Our contribution: AppliDE

Application Configuration

C₂: device variability

iPhone  Android  Windows Phone
C₁: functional variability
C₁: functional variability
$C_1$: functional variability

MobiCRM

Authentication  CustomerDB  Interact

Login  Remote  SMS
C₁: functional variability
C₁: functional variability
$C_1$: functional variability

- bo: BusinessObject
  - name: string="Customer"
  - <<manipulates>>

- app: Application
  - name: string="MobiCRM"

- logView: BasicView
  - name: string="LoginView"

- custView: BasicView
  - name: string="Interact"

- listView: ListView
  - name: string="CustomerDB"

- sms: Button
  - <<listen>>
  - <<trigger>>

- loginMethod: Operator
  - <<call>>

- diaryMethod: Operator
  - <<call>>

- ws: WebService
  - name: string="MobiCRM"
  - name: string="getDiary"

- ws: WebService
  - name: string="MobiCRM"

- id: InputText
- pwd: InputText
- click: TouchEvent
- <<trigger>>
$C_1$ : functional variability
C₁: functional variability
C₁: functional variability
C₁: functional variability
$C_1$: functional variability

The MobiCRM application model
Our proposition: AppliDE

\[ C_1: \text{functional variability} \]
Our proposition: AppliDE

C₁: functional variability

C₂: device variability
C₂: device variability

Device

System

... iPhone Android

3 4 2.0 3.0

Functionality

SMS Picture Location

Email Call Weak Strong

Classic Video
C₂: device variability

![Diagram showing device variability with nodes for System and Functionality, branches for iPhone and Android, Call, SMS, Location, and email.](image)
C₂: device variability, meta-model pruning

AppliDE meta-model
C₂: device variability, meta-model pruning

AppliDE meta-model

Device
- System
  - iPhone
    - Android
      - 3
      - 4
      - 2.0
      - 3.0
- Functionality
  - SMS
    - Email
    - Call
      - Classic
      - Video
    - Picture
    - Location
      - Weak
      - Strong
  - ClassicCall
  - VideoCall
  - SendMail
  - SendSMS
C₂: device variability, meta-model pruning

AppliDE meta-model
C₂: device variability, meta-model pruning

AppliDE meta-model

[Sen et al. MODELS’09]
C₂: device variability, meta-model pruning

AppliDE meta-model

[Sen et al. MODELS’09]
C₂: device variability

ApplIDE pruned meta-model

MobiCRM model

MobiCRM feature model

associated to
C₂: device variability

AppliDE pruned meta-model

MobiCRM model

MobiCRM feature model

conforms to

can be executed on

associated to
C₂: device variability

ApplIDE pruned meta-model

 conforms to

MobiCRM model

 can be executed on

MobiCRM feature model

associated to

MobiCRM

Authentication CustomerDB Interact

Login Remote VideoCall

requires
C₂: device variability

ApplIDE pruned meta-model

MobiCRM model

MobiCRM feature model

conforms to

can be executed on

associated to
C₂: device variability

ApplIDE pruned meta-model

MobiCRM model

MobiCRM feature model
C₂: device variability

ApplIDE pruned meta-model

MobiCRM model

conforms to

can be executed on

associated to

MobiCRM feature model
C2: device variability
C₂: device variability

AppliDE pruned meta-model

MobiCRM model

conforms to

MobiCRM feature model

associated to
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Conclusion
Conclusion

C₁: functional variability
Conclusion

C₁: functional variability

C₂: device variability

iPhone 3G  

iPhone 4


c₁: functional variability

c₂: device variability

Application Configuration

Product Derivation

Analysis

Smartphone library (products)

Merge

iOS  

Android  

Windows Phone  

...
Conclusion

360 product configurations

100% generated

C₁: functional variability

C₂: device variability

iPhone 3G, iPhone 4

Smartphone library (products)

Analysis

Product Derivation

Merge

Application Configuration

iOS, Android, Windows Phone
Perspectives

![Diagram of MobiCRM system with components such as Authentication, CustomerDB, Interact, Location, Login, Remote, Local, SMS, Picture, Email, Call, Classic, Video, Google, Weak, Strong, iPhone 4, and GALAXY S.](Image)
Perspectives

- MobiCRM
  - Authentication
    - Google
    - Login
  - CustomerDB
    - Remote
    - Local
  - Interact
    - SMS
    - Picture
    - Email
    - Call
      - Classic
      - Video
  - Location
    - Weak
    - Strong

iPhone 4

GALAXY S
Perspectives

- MobiCRM
  - Authentication
    - Google
    - Login
  - CustomerDB
    - Remote
    - Local
  - Interact
    - SMS
    - Picture
    - Email
    - Call
      - Classic
      - Video
  - Location
    - Weak
    - Strong

Requirements:

- Video
- Classic
- Weak
- Strong

Supported devices:

- Windows phone
- iPhone 4
- iPhone 3G
- GALAXY
- GALAXY

...
Questions

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