



MiDAS

A Model-Driven Approach for Context-Aware Software

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South America / Colombia



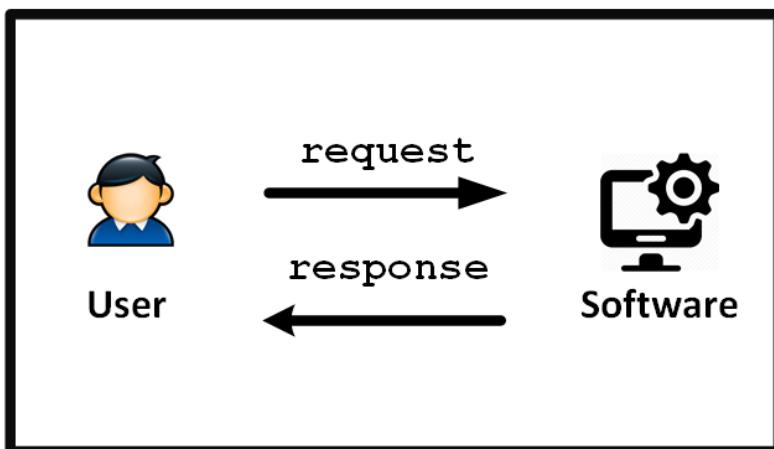
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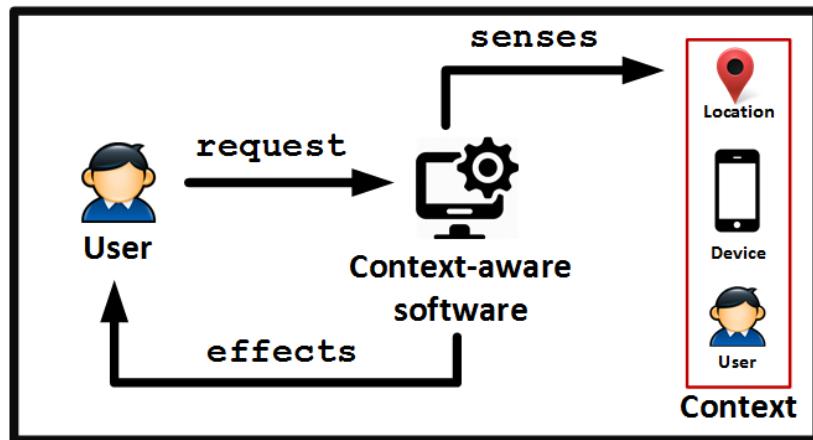
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Traditional software



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Context-Aware Software



"A system is context-aware if it uses context to provide relevant information and/or services to the user". Dey, A. *Understanding and Using Context*.

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Problems



Languages

Concepts

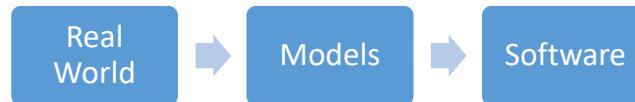
Notation

Implementation

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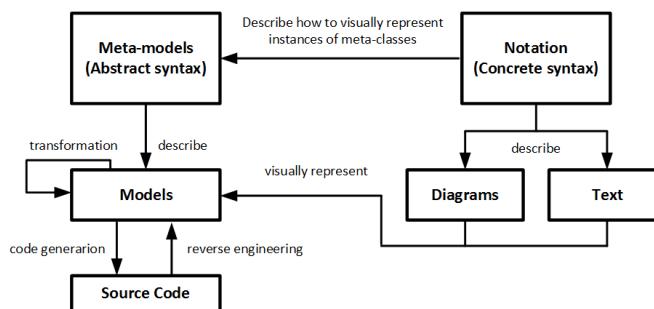
MDE

- Models are the central artifact for software development
- Modeling languages to formalize structure, behavior and requirements of specific domains
- Transformers that convert Models into Code or into other Models



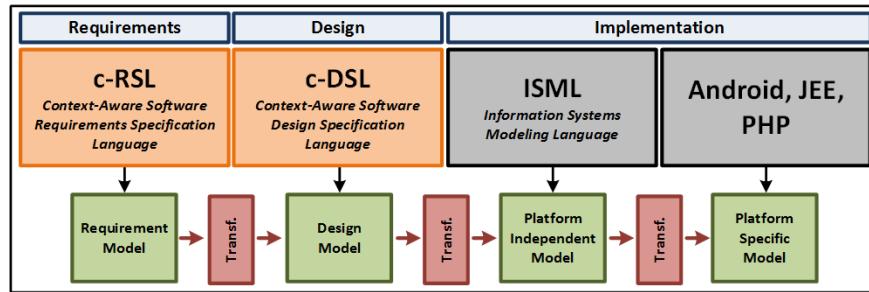
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MDE



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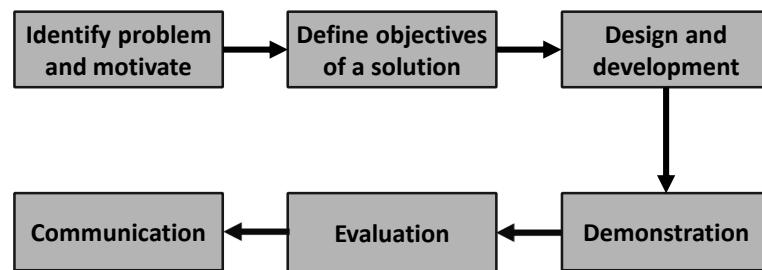
Solution: MiDAS



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General Methodology

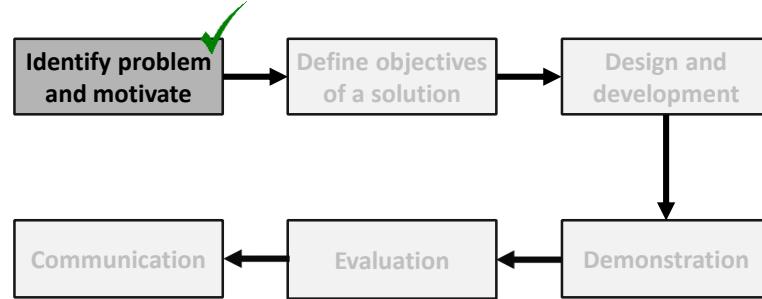
Design Science Research (DSR)



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General Methodology

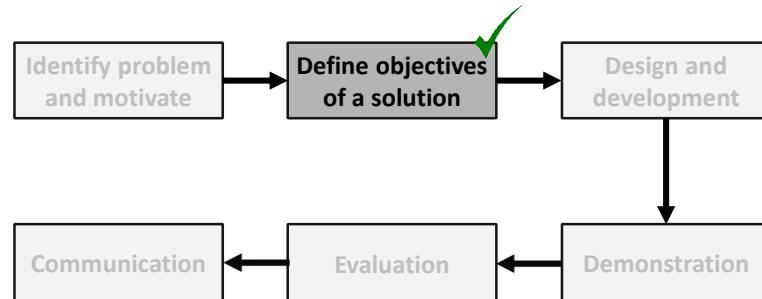
Design Science Research (DSR)



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General Methodology

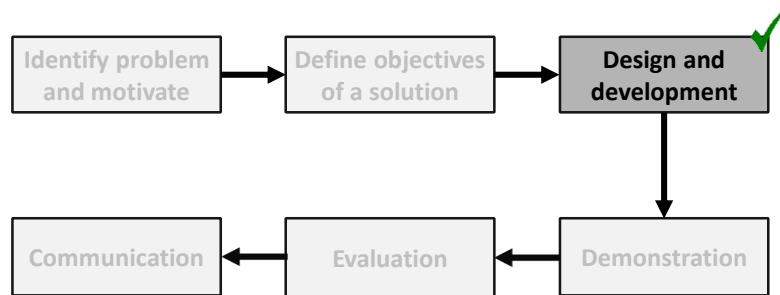
Design Science Research (DSR)



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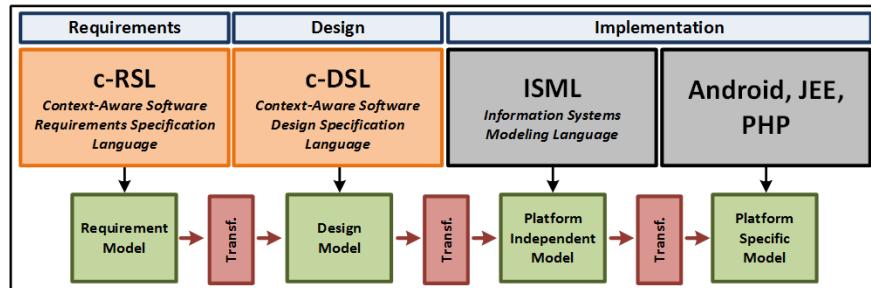
General Methodology

Design Science Research (DSR)



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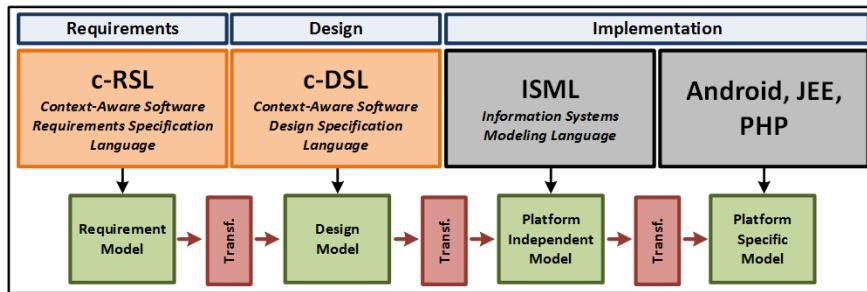
MiDAS



Bocanegra, J., Pavlich-Mariscal, J., Carrillo-Ramos, A. MiDAS: A Model-Driven Approach for Adaptive Software. Webist, 2015

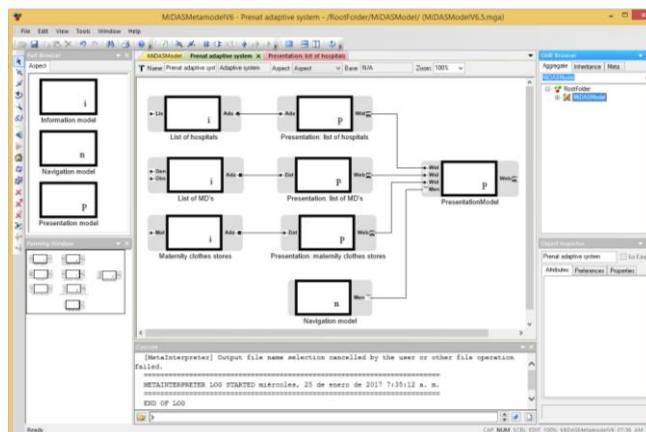
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MiDAS



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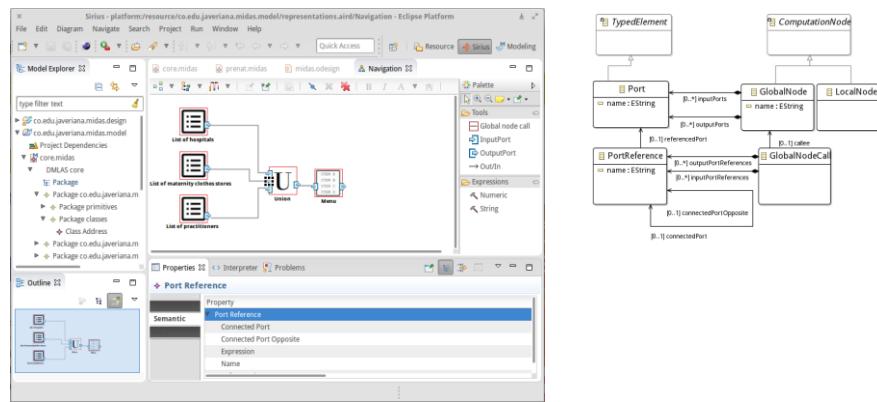
c-DSL – Preliminary Version



Bocanegra, J., Pavlich-Mariscal, J., Carrillo-Ramos. A. DMLAS: A Design-Specific Language for Designing Adaptive Systems. 10 Colombian Computing Congress, 2015

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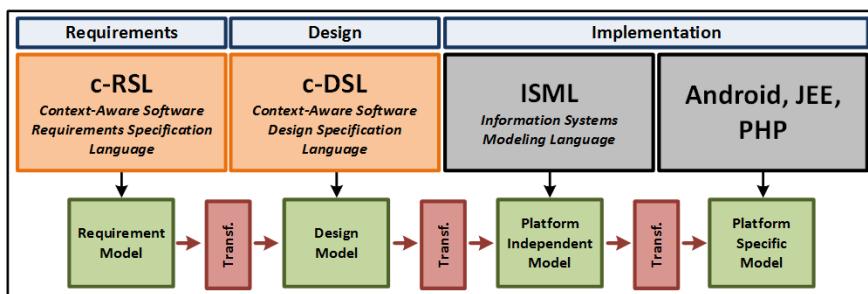
c-DSL – Refined Version



Bocanegra, J., Pavlich-Mariscal, J., Carrillo-Ramos, A. Towards a Domain-Specific Language to Design Adaptive Software: the DMLAS Approach. Ingeniería y Universidad, 2016

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MiDAS



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c-RSL– Preliminary Version

```

Project Explorer
  co.edu.javeriana.midash.design [git master]
    > co.edu.javeriana.midash.model.ashy1 [ ]
      > 01-Core
      > 02-Requirement
        > 01-adaptationModel.midas
        > 02-domainModel.midas
        > 03-requirements.midas
      > 04-Design
      > 04-PIM
      > representations.aird

*03-requirements.midas
  Package Ashy1.requirements;
  import Operations.*;
  import Primitives.*;
  import Ashy1.domainModel.*;
  import Ashy1.adaptationModel.*;
  import Ashy1.generalView.*;

  System {
    ASHYI : "Agent-based platform for dynamic,
              smart, and adaptive activities planning
              in an educational context"
  }

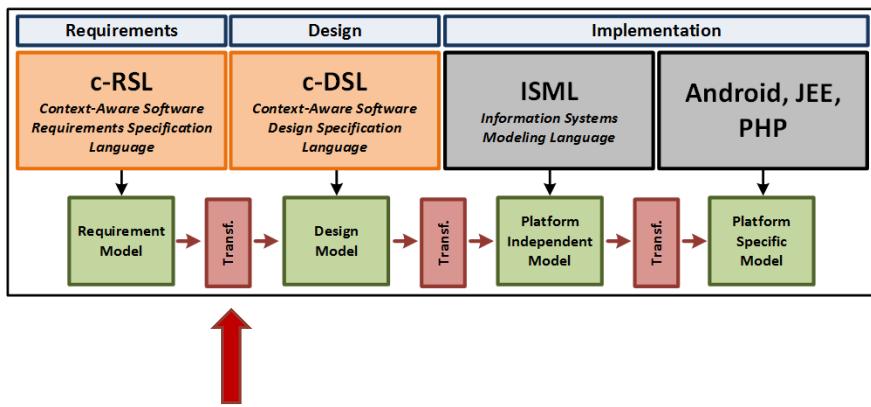
  Requirement R001 : "Candidate activities for a didactic unit" {
    ASHYI
      provides list of
        Activity
      to
        Teacher
      base
        Student - Ashy.adaptationModel.Student
        SystemManager - Ashy.adaptationModel.SystemManager
        Teacher - Ashy.adaptationModel.Teacher
  }

```

Bocanegra, J., Pavlich-Mariscal, J., Carrillo-Ramos. c-RSL: A Context-Aware Software Requirement Specification Language. Submitted to SEAA, 2017

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MiDAS



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M2T Transformation

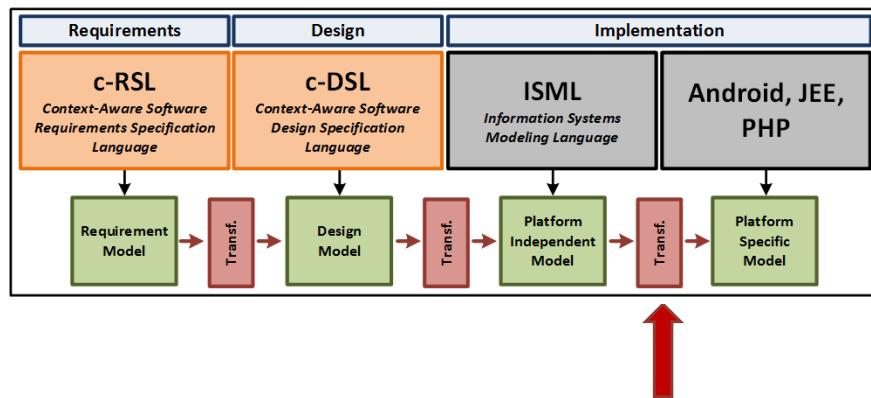
```

1 [comment encoding = UTF-8 /]
2 [module generate("http://www.edu.co/javeriana/midas/Midas")]
3 [for (subComponent : Component | _package, subComponents)]
4 [comment @main]
5 [if (subComponent != _package)]
6 [set system = System + subComponent]
7 [file ("design/0-globalView.midas", "false", "UTF-8")]
8 [Package [system.name].globalView;
9 ]
10 import Operations.*;
11 import [system.name].[system.name.toLowerCase()]/View.*;
12 function Main(){
13     /* TODO: Define required variables*/
14 }
15 [file ("design/" + id + "-" + system.name.toLowerCase() + 'View.midas', "false", "UTF-8")]
16 Package [system.name].[system.name.toLowerCase()]/View;
17 import Operations.*;
18 }
19 */
20 
```

Bocanegra, J., Pavlich-Mariscal, J., Carrillo-Ramos. Generating Design Models from Requirements Specifications in Context-Aware Software. Submitted to Models, 2017

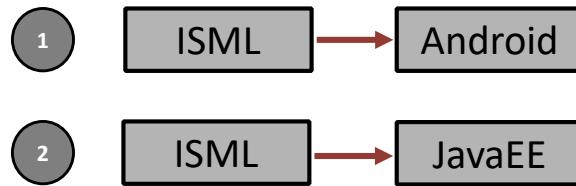
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MiDAS



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Code generation



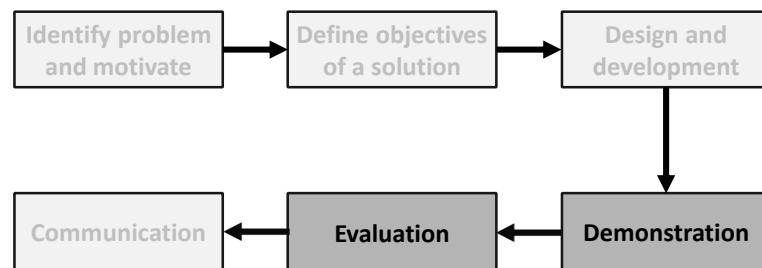
1. Andrade, J. *Transformador para generar aplicaciones móviles con componentes adaptativos a partir de un modelo independiente de plataforma*. MSc Thesis. Pontificia Universidad Javeriana, 2017

2. Olarte, J. *ZOE-GEN: A transformer to facilitate the generation of model-based applications*. MSc Thesis. Pontificia Universidad Javeriana, 2017

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General Methodology

Design Science Research (DSR)



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Evaluation and Validation

MiDAS



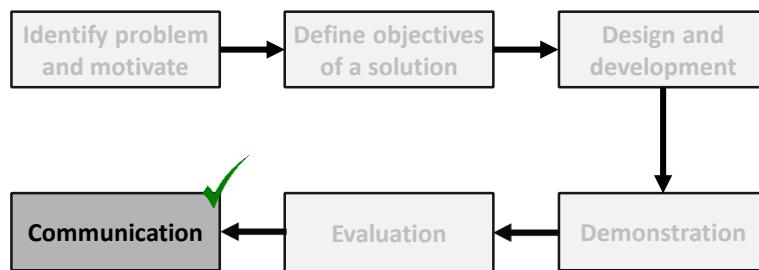
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de Girona

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DO RIO GRANDE DO SUL

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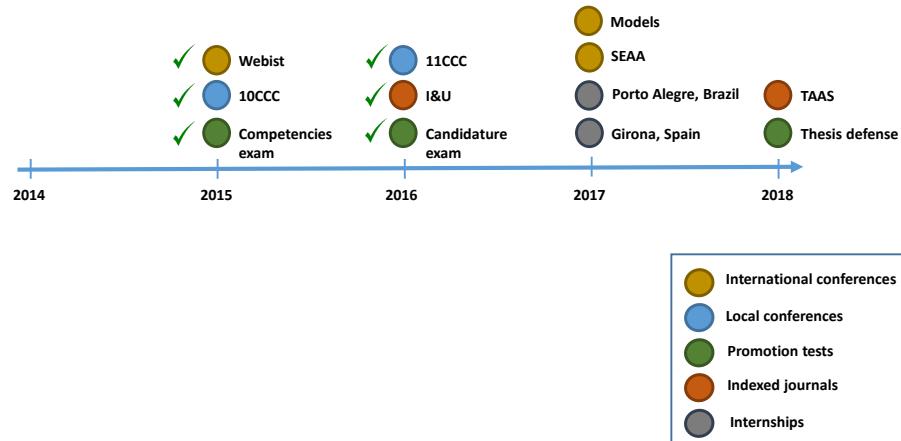
General Methodology

Design Science Research (DSR)



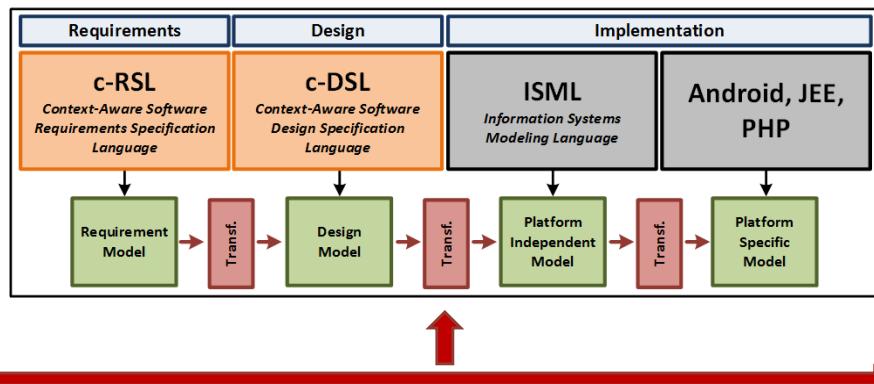
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Milestones



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Future Work



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Thank you!

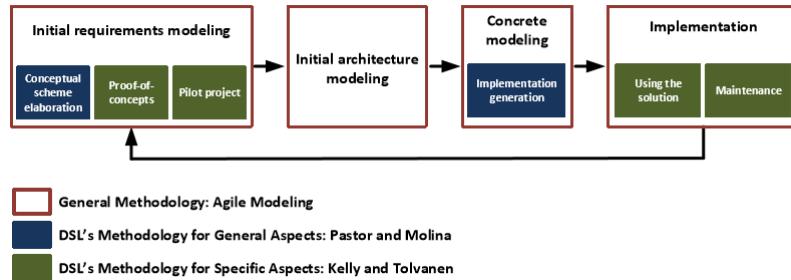
jose_bocanegra@javeriana.edu.co

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Appendices

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Design and Development Methodology

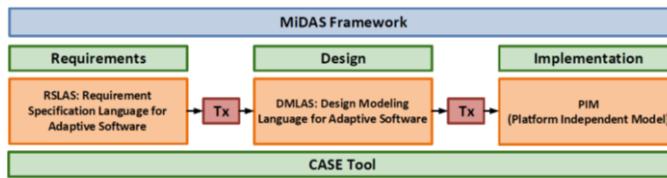


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Advances

11th International Conference on Web Information Systems and Technologies – 2015

MiDAS: A Model-Driven Approach for Adaptive Software



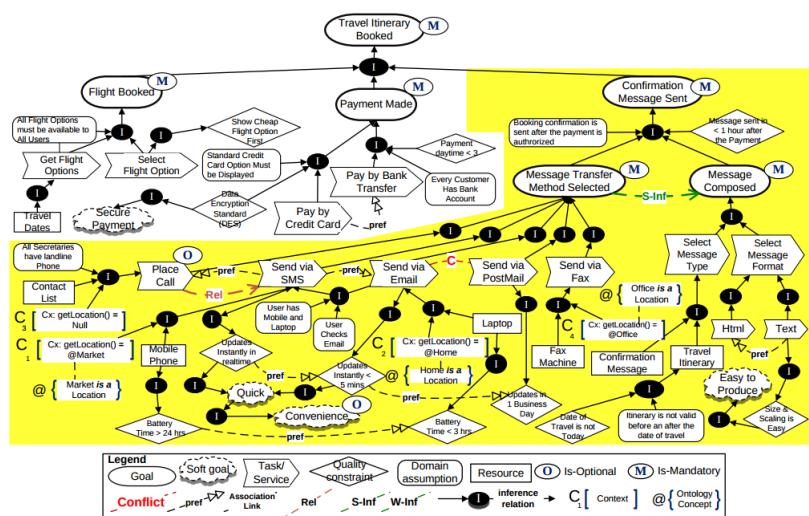
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Requirements and design

1. Current languages are insufficient to specify requirements and design in an adaptive system
2. These languages do not cover all concepts related to adaptation (e.g., user's profiles, contextual information and the dynamic aspects)
3. Moody's principles
4. Graphical and textual notation

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RML



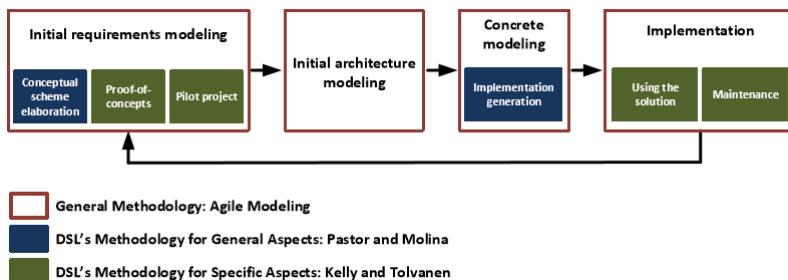
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Validation criteria

Criterion	Description
Usability (van Amstel et al., 2009)	The level of learning, understanding, and memorizing of different concepts, relations, and when and why to use each one of the concepts. It implies that the language contains uniform notation, terminology, and its features are easy to learn, understand, and remember. This criterion is also suitable not only for single elements in the language but for models
Reusability (Barišić et al., 2014)	The ability to reuse existing specifications
Suitability (Kahraman and Bilgen, 2015)	The degree to which a DSL is suitable with the domain
Compatibility (Kahraman and Bilgen, 2015)	The degree to which a DSL is compatible to the development process
Orthogonality (Khedker, 1997)	The language should be based on few simple features which can be combined to produce predictable results
Scalability (Paige et al., 2000)	It should be useful for modeling systems with a few components and interrelations, and systems with thousands of components and inter-relations

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Design and Development Methodology



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Conclusions

- MiDAS provides a MDE approach for context-aware software
- MiDAS addresses challenges in software engineering for context-aware software

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