

Me4MAP

A method for the development of metadata application profiles

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Where?

Algoritmi Research Center, University of Minho, Portugal

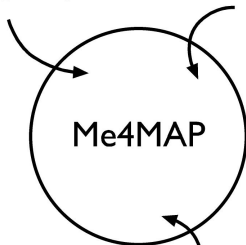


PhD Thesis (supervisor: Ana Alice Baptista)

Sources of information

Knowledge base from
early stages (data modeling)
of software development
processes (e.g. RUP)

State of the art on
methods for the
development of MAP



Analysis of 3 semi-structured
interviews conducted to MAP
developers

Perspective and intentions

- a software engineer perspective;
- no universal solution;
- intention: to establish a starting point for the study and design of methods for the development of MAPs.

What is a method?

- a selection of techniques

What is a method?

- a selection of techniques
- the control of their usage

What is a method?

- a selection of techniques
- the control of their usage
- the integration of the obtained partial results

Me4MAP defines the path to follow ...

- which activities to develop

Me4MAP defines the path to follow ...

- which activities to develop
- when these activities may take place

Me4MAP defines the path to follow ...

- which activities to develop
- when these activities may take place
- how they are interconnected

Me4MAP defines the path to follow ...

- which activities to develop
- when these activities may take place
- how they are interconnected
- which artifacts they produce

... and the ideal work-team

- Project Manager

... and the ideal work-team

- Project Manager
- System Analyst

... and the ideal work-team

- Project Manager
- System Analyst
- Semantic Developer

... and the ideal work-team

- Project Manager
- System Analyst
- Semantic Developer
- Technical Editor

... and the ideal work-team

- Project Manager
- System Analyst
- Semantic Developer
- Technical Editor
- Application Domain Expert

... and the ideal work-team

- Project Manager
- System Analyst
- Semantic Developer
- Technical Editor
- Application Domain Expert
- Final User

On big MAP projects

- Core team: persons with technical skills, i.e. System Analyst and Semantic Developer

On big MAP projects

- Core team: persons with technical skills, i.e. System Analyst and Semantic Developer
- Extended team: all

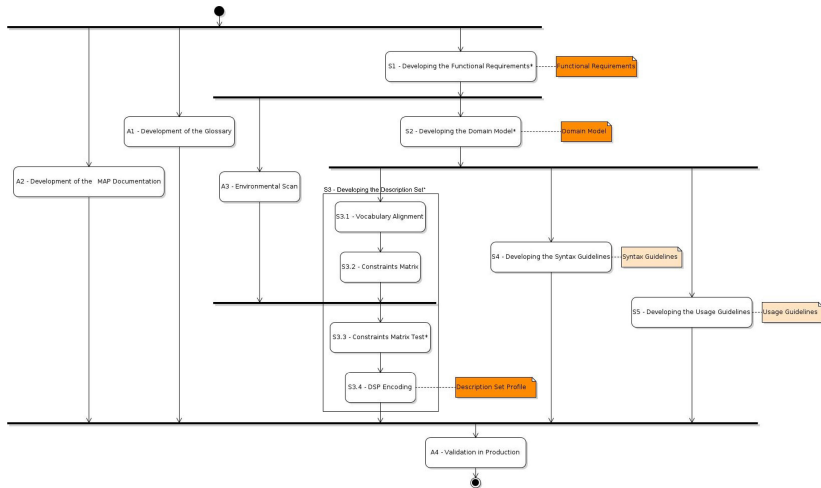
Singapore Framework

- Functional Requirements (S1)
- Domain Model (S2)
- Description Set Profile (S3)
- Syntax Guidelines (S4) (*optional*)
- Usage Guidelines (S5) (*optional*)

Shall we start?

How are we now going to proceed....

All activities



■ Mandatory deliverable (Singapore)

■ Optional deliverable (Singapore)

* Composite activity

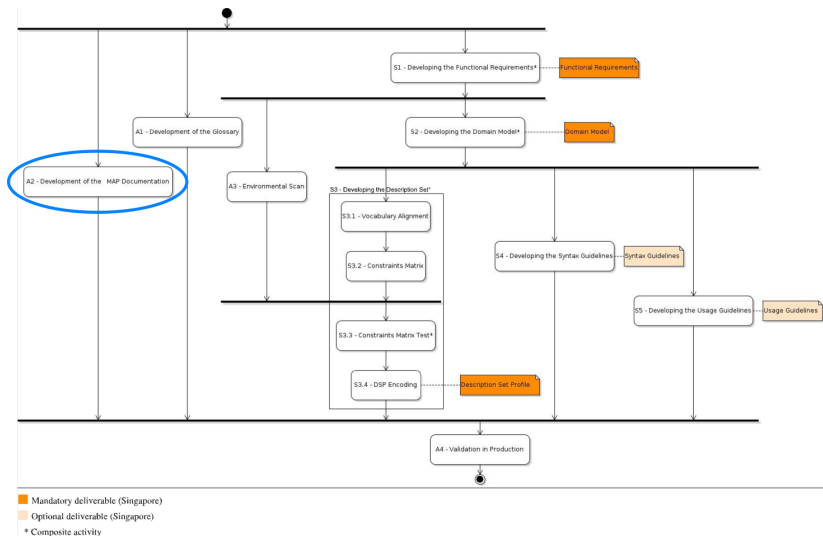
A1: Development of the Glossary



A1: Development of the Glossary

What	A list of keywords and accompanying definitions used by the MAP development team.
How	When the team has questions about a concept they should open a new entry on the Glossary and agree on a definition of the new key term A tool that allows the text entry and insertion of images may be used
By Whom	Extended Team, led by the Project Manager
Deliverable	Glossary

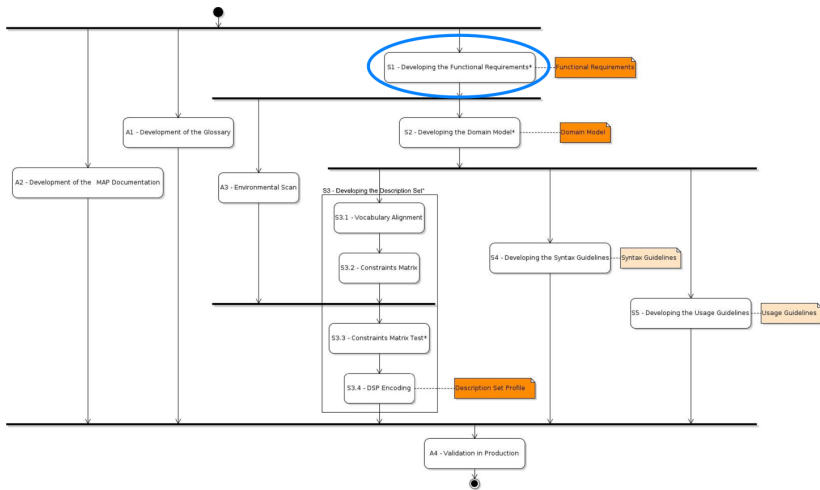
A2: Development of the MAP Documentation



A2: Development of the MAP Documentation

What	Developed by recording the results of the development process as well as the justification of the choices made. The development of the documentation of each process is fundamental since the documents produced will help some MAP users (such as app designers or programmers) to apply the properties and classes correctly to the specific context. It also ensures that future MAP developers understand the MAP development process used
How	As the artifacts and models are being defined throughout the development process, the related documentation should be defined at the same time, in a collaborative way. A tool that allows text entry and insertion of images may be used
By Whom	Core Team, led by the Technical Editor
Deliverable	MAP Documentation

Developing the Functional Requirements

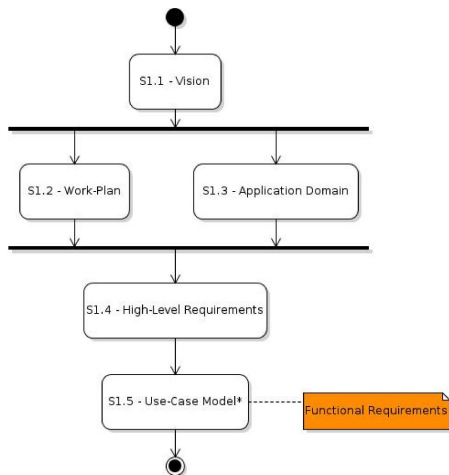


■ Mandatory deliverable (Singapore)

■ Optional deliverable (Singapore)

* Composite activity

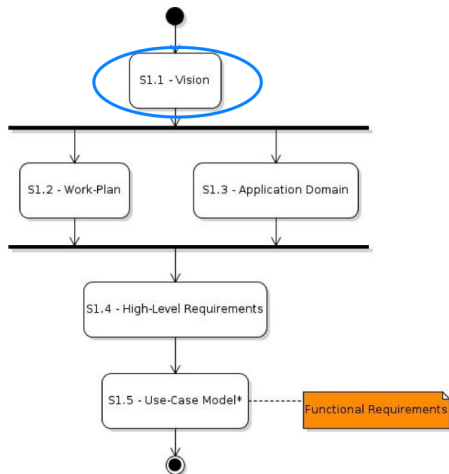
Developing the Functional Requirements



■ Mandatory deliverable (Singapore)

* Composite activity

S1 - Developing the Functional Requirements



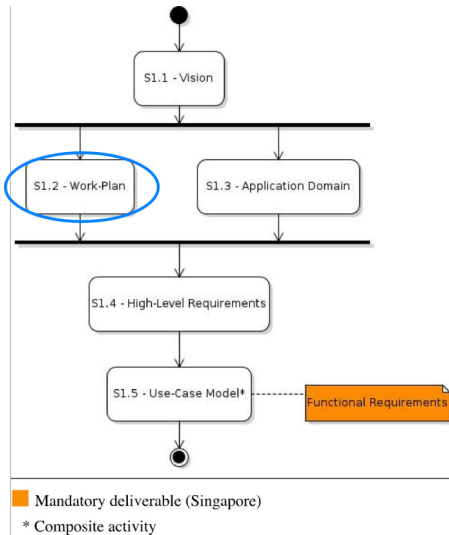
■ Mandatory deliverable (Singapore)

* Composite activity

S1.1: Developing the Vision

What	A document that states what developers want to achieve with the MAP development and that defines the scope of the MAP. The result may be a simple document with a clear and accurate view of the vision
How	Me4MAP recommends the use of brainstorming technique, where all members of the team should feel free to write ideas on a board (physical board or web tool), followed by discussion. In the end, the set of ideas chosen should be organized in simple sentences. A tool that allows text entry and insertion of images may be used
By Whom	Extended Team, led by the Project Manager
Deliverable	Vision

Developing the Functional Requirements



S1.2: Development of the Work-Plan

What	This activity has as goal the time planning of the project's activities and serves as a guide to the team. The Work-Plan defines the beginning and ending dates of each activity and their outputs. It also includes information on the responsibilities of each part of the work team in each activity. It is acceptable for the Work-Plan to be modified as the project evolves
How	The members of the team give inputs on their availability for each task they have to develop. Each task has to be defined in terms of time (when it starts and finishes) and how it is articulated with other tasks. The team can use a Gantt Chart or any other type of graph or scheme that the team finds most convenient to define the Work-Plan
By Whom	Extended Team, led by the Project Manager
Deliverable	Work-Plan

Developing the Functional Requirements



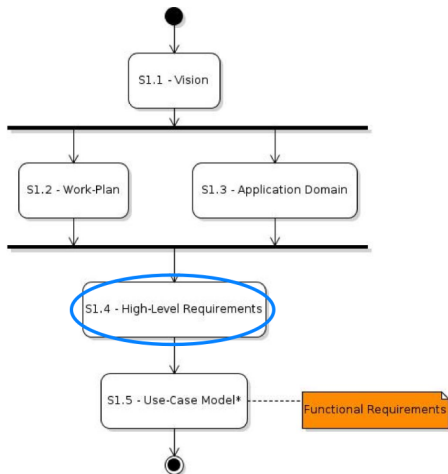
■ Mandatory deliverable (Singapore)

* Composite activity

S1.3: Definition of the Application Domain

What	This activity has as goals to: (i) understand the scope of the MAP; and (ii) define the boundaries of the application of the MAP.
How	This task can be done using several sources: 1) A study of the literature or other documental sources may be developed where the main concepts of the application context should be explored, 2) Visits to events organised by entities of the application context to collect information, 3) talks to or observation of application domain specialists, through techniques such as interviews or direct observation. In this last case the information collected can be treated using content analysis tools. A tool that allows text entry and insertion of images may be used
By Whom	Extended Team, led by the Application Domain Expert
Deliverable	Application Domain Report

Developing the Functional Requirements



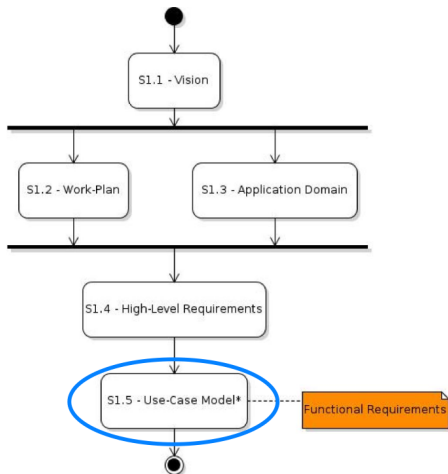
■ Mandatory deliverable (Singapore)

* Composite activity

S1.4: Elicitation of High-Level Requirements

What	A list of the functional and non-functional requirements expressed by the work team members. This document should provide a very short description for each requirement.
How	The work team can use the same technique (brainstorming) used in the definition of the Vision Statement. The team may also wish to start eliciting requirements on the interviews and direct observations taking place for defining the Application Domain (the boundaries between activities are not strict). A tool that allows text entry and insertion of images may be used
By Whom	Extended Team, led by the System Analyst
Deliverable	High-Level Requirements

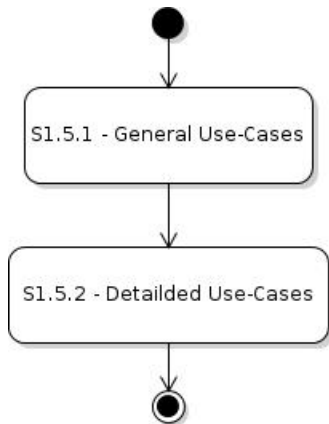
Developing the Functional Requirements



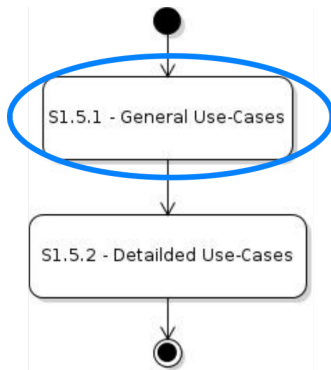
■ Mandatory deliverable (Singapore)

* Composite activity

S1.5: Use Case Model



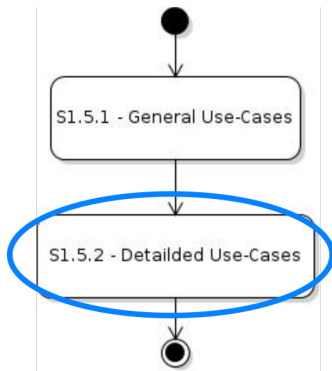
S1.5: Use Case Model



S1.5.1: Definition of the Use-Case Diagram

What	A Use-Case Diagram presents the actors that interact in the use-cases and describes the functionality of the system. Use Cases “offer a systematic and intuitive means of capturing functional requirements” (Booch et al., 1999, p. 37). It is important to understand the concepts of use case and actor in building a Use-Case Model. “A use case is a sequence of actions a system performs and an actor is someone or something outside the system that interacts with the system.” (Booch et al., 1999, p. 98)
How	For information on how to build a Use-Case diagram see Booch et al. (1999)
By Whom	Extended Team, led by the System Analyst
Deliverable	Use-Case Diagram

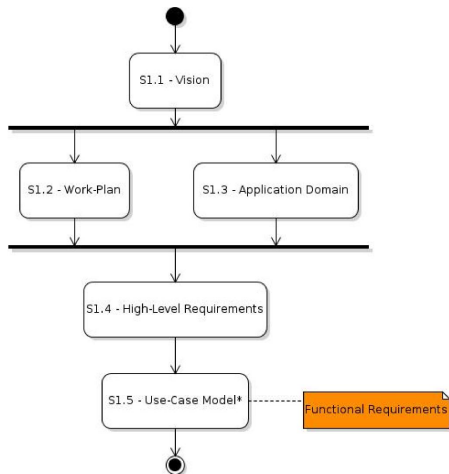
S1.5: Use Case Model



S1.5.2: Definition of the Detailed Use-Cases

What	To detail the use-cases. “Each use-case must include details about what has to be done to achieve its functionality” (Schneider & Winters, 2001, p. 21). “The most important part of the use case in the requirements workflow is the flow of events. The flow of events describes the sequence of actions between the actor and the system” (Booch et al., 1999, p. 98). The documentation that presents the detailed use-cases should set the sequence of actions - a specific sequence of events that happen in the system - that a system performs to bring added value to a specific actor
How	The detailed use-case may be developed using (i) the template and a guide on how to fill the template proposed by Schneider & Winters (2001, pp.28). For more information on how to develop a flow of events, see Fowler (2004) A tool that allows the text entry and insertion of images may be used
By Whom	Extended Team, led by the System Analyst
Deliverable	Functional Requirements (mandatory Singapore Stage Component)

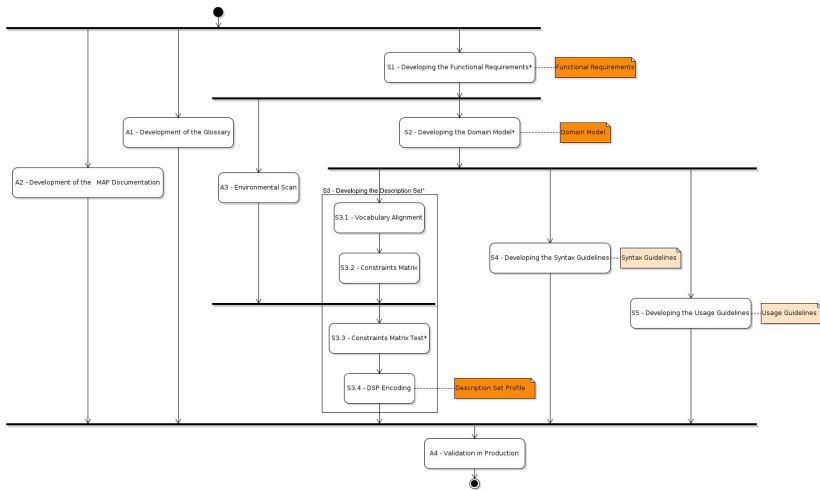
Developing the Functional Requirements



■ Mandatory deliverable (Singapore)

* Composite activity

All activities

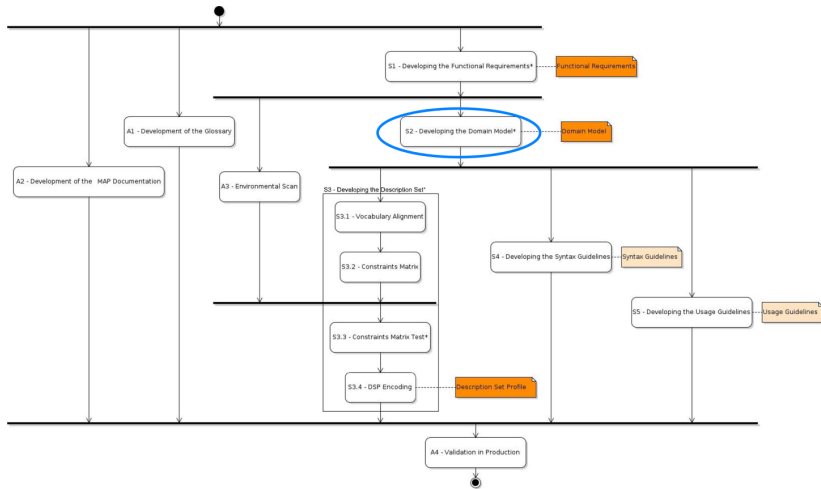


■ Mandatory deliverable (Singapore)

■ Optional deliverable (Singapore)

* Composite activity

Developing the Domain Model

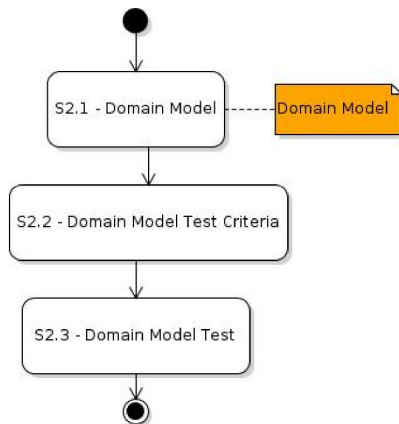



■ Mandatory deliverable (Singapore)

■ Optional deliverable (Singapore)

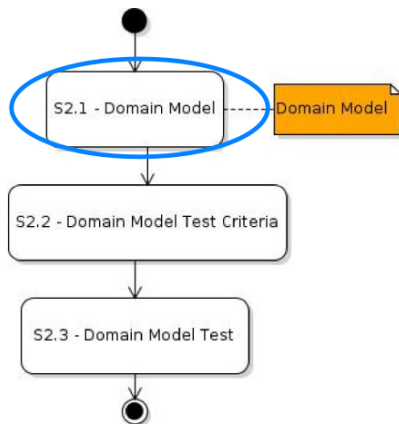
* Composite activity


Developing the Domain Model



 Mandatory deliverable (Singapore)

Developing the Domain Model



 Mandatory deliverable (Singapore)

S2.1: Definition of the Domain Model

What

A domain model “captures the most important types of objects in the context of the system.” (Booch et al., 1999, p. 119). According to Baker & Coyle (2009) “a domain model is a description of what things your metadata will describe, and the relationships between those things. The domain model is the basic blueprint for the construction of the application profile”. It identifies the entities and their relationships, and the entities attributes (e.g., datatypes and other attributes with literal values). The Domain Model is based on the Functional Requirements described in Section 3.5

How

If there is access to documentation that describes resources or databases of the application domain, the work team can resort to the document analysis technique as a starting point to define the Domain Model. The team needs to capture the things (entities) and their relationships that support the previously identified Functional Requirements. The Domain Model is developed using a graphical data modeling technique such as e.g. ORM diagrams, Entity-Relationship diagrams (ER), UML diagrams or RDF graphs. The data modeling technique should be the one that best serves the whole work team - not the technique that best serves only the core team

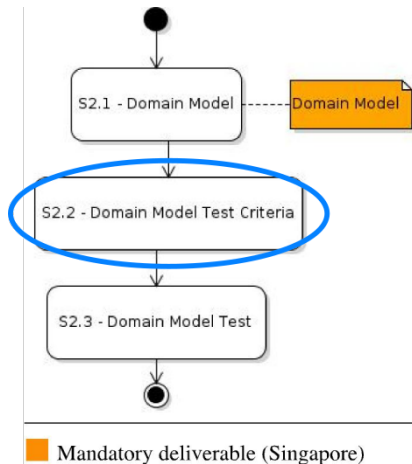
By Whom

Core Team, led by the System Analyst

Deliverable

Domain Model (mandatory Singapore Stage Component) >

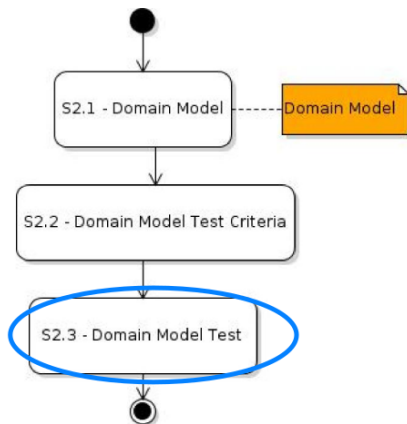
Developing the Domain Model




S2.2: Definition of the Domain Model Test Criteria

What	Defines a way or a model to test if the MAP supports the Functional Requirements. The team has to verify if the attributes that were chosen on the Domain Model support the Functional Requirements
How	“MAPs are, essentially, intangible - users cannot interact with them directly” (Walk, 2010). The same happens to other models or MAP components as the Domain Model. The use of paper prototyping technique (see for example Ema Tonkin (2009) can be a way to engage prospective end-users in the Domain Model Test
By Whom	Extended Team, led by the Semantic Developer
Deliverable	Domain Model Test Criteria

Developing the Domain Model

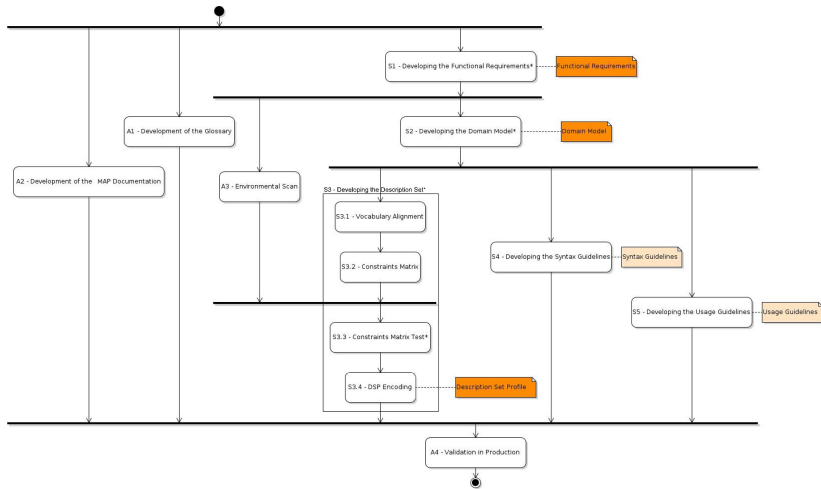


 Mandatory deliverable (Singapore)

S2.3: Application of the Domain Model Test

What	Application of the test defined in the S2.2
How	It depends on the technique used, for the paper prototyping technique suggested in S2.2 see Tonkin (2009) where Tonkin presents an example of validation on the context of MAP development
By Whom	Prospective end-users such as representatives of application programmers that make use of the MAP or representatives of final users that feed the system or any general final user, or even team members that have been involved in the development of the requirements and domain model
Deliverable	Report with the results of the Domain Model Test

All activities



■ Mandatory deliverable (Singapore)

■ Optional deliverable (Singapore)

* Composite activity

Environmental Scan



■ Mandatory deliverable (Singapore)

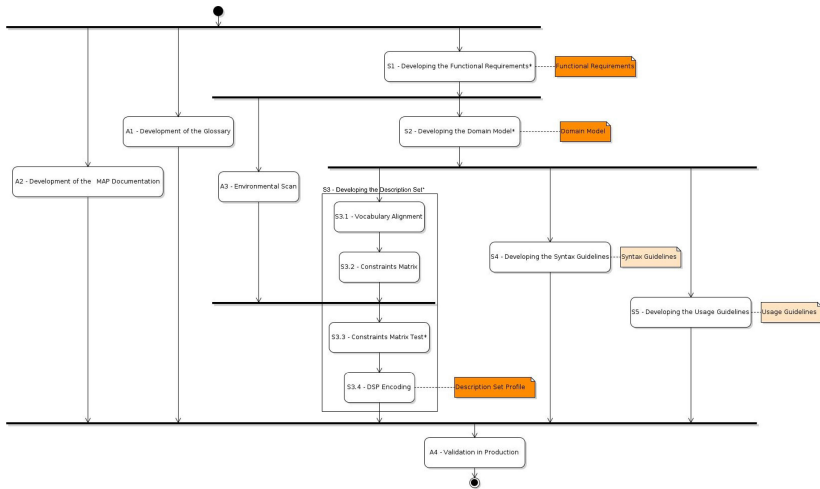
■ Optional deliverable (Singapore)

* Composite activity

A3: development of the Environmental Scan

What	A report that contains a review of the metadata schemas that are available in any serialization of the Semantic Web (e.g. RDF/XML, turtle, etc.) and that may serve the needs of the Domain Model deliverable
How	Searches should be made in order to find existing, appropriate metadata schemas. To perform an environmental scan, online tools can be used - e.g. the Open Metadata Registry - http://metadataregistry.org/ , the Linked Open Vocabularies (LOV) - http://lov.okfn.org/dataset/lov/ , the Basel Register of Thesauri, Ontologies & Classifications (BARTOC) - http://www.bartoc.org/ , among others. A spreadsheet to register and organize the information may be used
By Whom	Semantic Developer
Deliverable	Environmental Scan

All activities



■ Mandatory deliverable (Singapore)

■ Optional deliverable (Singapore)

* Composite activity

Developing the Description Set

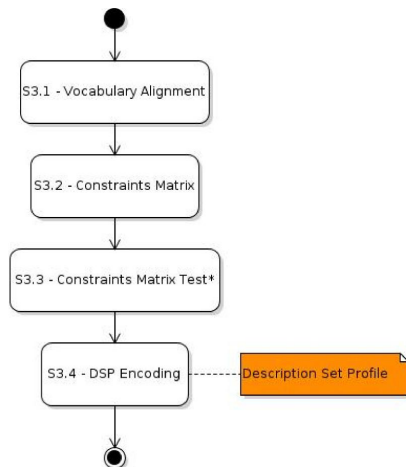



■ Mandatory deliverable (Singapore)

■ Optional deliverable (Singapore)

* Composite activity

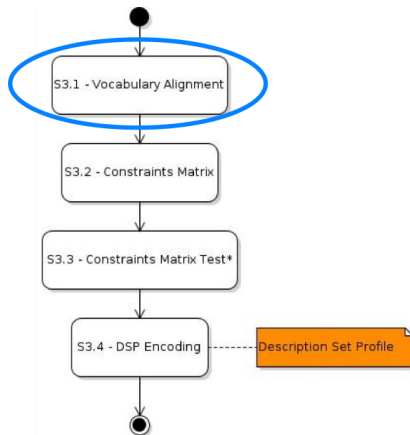
Developing the Description Set



 Mandatory deliverable (Singapore)

* Composite activity

Developing the Description Set



 Mandatory deliverable (Singapore)

* Composite activity

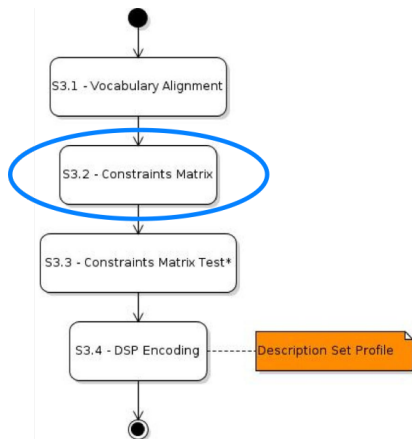
S3.1: Definition of the Vocabulary Alignment


What	Matches the terms of the metadata schemas identified in the Environmental Scan (A3) with the needs of the Domain Model.
How	Identification of the Domain Model Attribute - metadata schema property pairs in a table. Note that the team may identify more than one metadata schema property per Domain Model attribute. However, at the end of the development of this activity only one has to be chosen That property will be the one included in the Constraints Matrix (S3.2) Note that some properties may not be present in the schemas previously identified in the environmental scan, but that may be present, with the adequate semantics, in other schemas of other application domains. Also, for generic properties, the team may prefer to use cross-domain schemas such as DC Terms
By Whom	The Core Team, led by the Semantic Developer
Deliverable	Vocabulary Alignment

Excerpt of a Vocabulary Alignment

Entity	DM Attribute	Metadata Schema	Metadata Schema Property Name
Initiative	Name	dcterms	title
		Good relations	name
	Description	dcterms	description
		Good Relations	description
	Email address	Vcard	hasEmail
Foaf		mbox	
URL	Foaf	Homepage	
	Vcard	hasURL	
Network	Name	dcterms	title
		Good relations	name
	isPartOf	dcterms	isPartOf
Product-or-service	Category	Good relations	category
		VCard	category
	Unit	Good relations	hasUnitOfMeasurement

Developing the Description Set



 Mandatory deliverable (Singapore)

* Composite activity

S3.2: Definition of the Constraints Matrix

What	Deepening of the Vocabulary Alignment. It is the detailed definition of each attribute or entity of the Domain Model by means of its constraints, through the identification of the metadata schemas, Vocabulary Encoding Schemes (VES), or Syntax Encoding Schemes (SES).
How	Me4MAP provides a template of the Constraints Matrix which is based in the matrix presented in the DCMI Guidelines. The Constraints Matrix template has two tables that should be filled: (1) Definition of Namespaces used and (2) Definition of Description Templates. In case the work team cannot find a property that conveniently expresses the semantics of a given attribute present in the Domain Model, that property may be declared in a new schema created by the work team and made openly available using a proper encoding (RDFS and/or OWL). The same applies for controlled vocabularies (RDFS and/or OWL and/or SKOS)
By Whom	Semantic Developer
Deliverable	Constraints Matrix

Constraints Matrix Template

Constraints Matrix: *name of the Application Profile*

Identification of Namespaces used

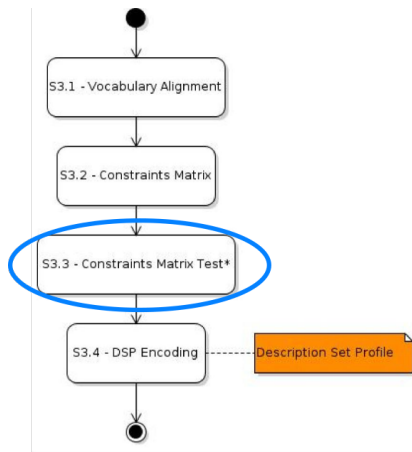
Title	Full Namespace IRI	Prefix
<i>as many rows as needed...</i>		


Definition of Description Template (*as many Description Sets as needed*)

<u>Description Template:</u>	<i>name of the class</i>	<u>Term:</u>	<i>name of term</i>			<u>Usage:</u>	<i>description of the class</i>					
Label	Property	Range	Value String	SES IRI	Value IRI	VES IRI	Related description	Min	Max	Type	Usage	
<i>as many rows as needed...</i>												

<u>Description Template:</u>	<i>name of the class</i>	<u>Term:</u>	<i>name of term</i>			<u>Usage:</u>	<i>description of the class</i>					
Label	Property	Range	Value String	SES IRI	Value IRI	VES IRI	Related description	Min	Max	Type	Usage	
<i>as many rows as needed...</i>												

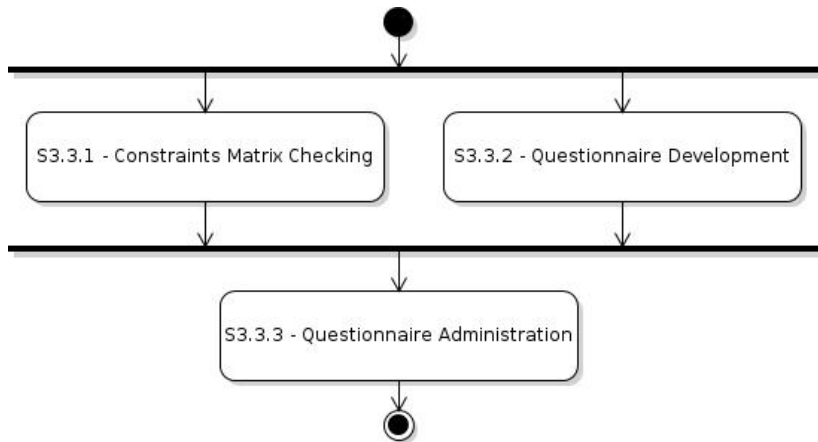
Developing the Description Set



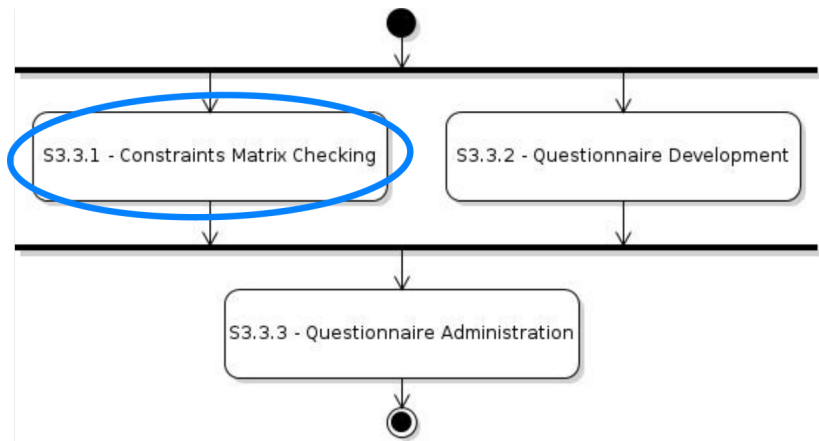
 Mandatory deliverable (Singapore)

* Composite activity

S3.3: Constraints Matrix Test



S3.3: Constraints Matrix Test



S3.3.1: Constraints Matrix Checking

What	This process is the application of the MAP in development to a set of sample resources..
How	The team should identify a set of resources that constitute a trustworthy sample of the application domain of the MAP under development and complete the form (Me4MAP provides a template of such a form) with data referring to each resource. This form should be simple to fill, where each element of the metadata is populated with the data that corresponds to the resource. This work may be developed with the support of the Syntax Guidelines and Usage Guidelines (S4 and S5, respectively)
By Whom	Representatives of application programmers that make use of the MAP or representatives of final users that feed the system or any general final user. This activity is led by the Semantic Developer
Deliverable	Test in Laboratory

Constraints Matrix Checking Template

Resource A

Label	Value
<i>Instance of Class</i>	<i>Class X</i>
Property A1	
Property A2	
<i>as many rows as needed</i>	

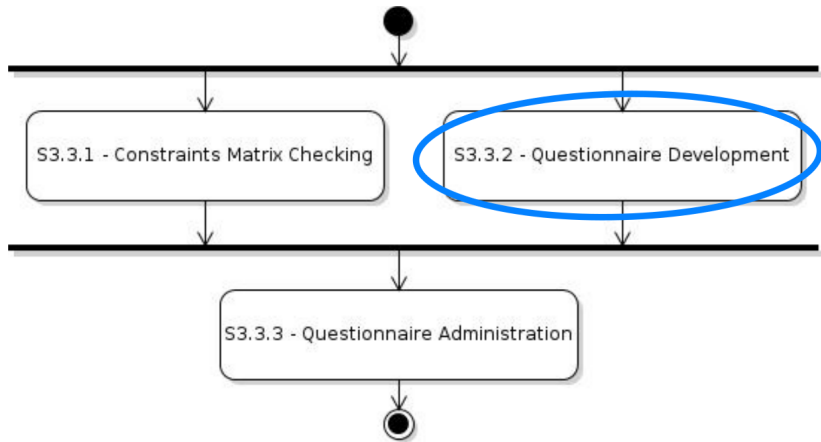
Resource B

Label	Value
<i>Instance of Class</i>	<i>Class Y</i>
Property B1	
Property B2	
<i>as many rows as needed</i>	

Resource n *(as many resources as needed)*

Label	Value
<i>Instance of Class</i>	<i>Class Z</i>
Property n1	
Property n2	
<i>as many rows as needed</i>	

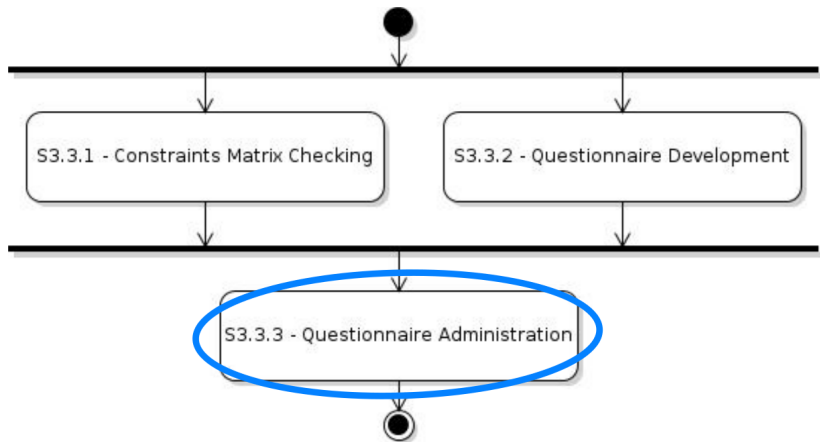
S3.3: Constraints Matrix Test



S3.3:2: Questionnaire Development

What	To develop the questionnaire that will be administrated in the next activity (S3.3.4 - Questionnaire Administration). This questionnaire will assess the difficulties of the Constraints Matrix checking. The goal is to understand: (i) if there is data for which there are no properties available in the Constraints Matrix; (ii) if there are properties defined in the Constraints Matrix that are not suitable to the resources; (iii) whether there are VES and SES, domains and ranges that are not suitable to the resources; (iv) any other kind of difficulty or ambiguity
How	A set of questions should be set in order to achieve the goals defined. The team can observe the execution of the Constraints Matrix Checking and from there think on the questions that might highlight problems and its reasons. The Questionnaire can be implemented on paper or using any Web service like surveymonkey.com or even any open-source software like LimeSurvey software (limesurvey.org) installed in a Web Server
By Whom	Semantic Developer
Deliverable	The Questionnaire Template

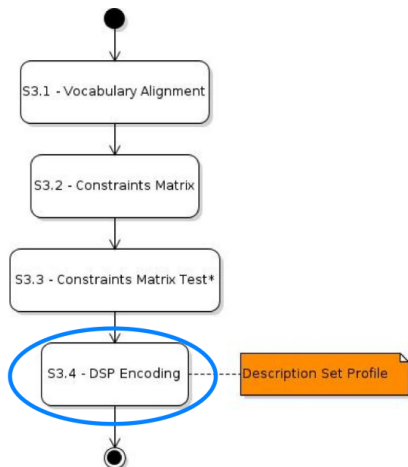
S3.3: Constraints Matrix Test




S3.3.3: Questionnaire Administration

What	To administrate the Questionnaire that was developed in the S3.3.3 activity (Questionnaire Development).
How	The persons involved in the Constraints Matrix checking (S3.3.1) should respond to the Questionnaire using the tool proposed
By Whom	Semantic Developer administrates, participants of the Constraints Matrix checking (S3.3.1) fill the Questionnaire
Deliverable	The completed Questionnaire

S3: Developing the Description Set



 Mandatory deliverable (Singapore)

* Composite activity

S3.4: Encoding the Description Set Profile

What	A document with the description of the MAP using the mark-up language defined by Nilsson (2008)
How	Use the DSP constraint language having as reference the Constraints Matrix. Further information on DSP, including implementation examples, can be found in Baker & Coyle (2009)
By Whom	Semantic Developer
Deliverable	Description Set Profile (mandatory Singapore Stage component)

S4: Developing the Syntax Guideline



■ Mandatory deliverable (Singapore)

■ Optional deliverable (Singapore)

* Composite activity

S4: Developing the Syntax Guideline

What	The Syntax Guidelines describe “any application profile-specific syntaxes and/or syntax guidelines, if any” (Baker & Coyle, 2009).
How	Using text processor, software tools or by any other means deemed appropriate by the team
By Whom	Semantic Developer
Deliverable	Syntax Guidelines (optional Singapore Stage Component)

S5: Developing the Usage Guidelines



■ Mandatory deliverable (Singapore)

□ Optional deliverable (Singapore)

* Composite activity

S5: Developing the Usage Guidelines

What	The DCMI Guidelines explain: “Description Set Profile defines the “what” of the application profile; usage guidelines provide the how and why.” (Baker & Coyle, 2009). “Usage guidelines offer instructions to those who will create the metadata records. Ideally, they explain each property and anticipate the decisions that must be made in the course of creating a metadata record” (Baker & Coyle, 2009)
How	Using text processor, software tools or by any other means deemed appropriate by the team
By Whom	Technical writer, supported by the Core Team and the Application Domain Expert
Deliverable	Usage Guidelines (optional Singapore Stage Component)

Validation in Production



■ Mandatory deliverable (Singapore)

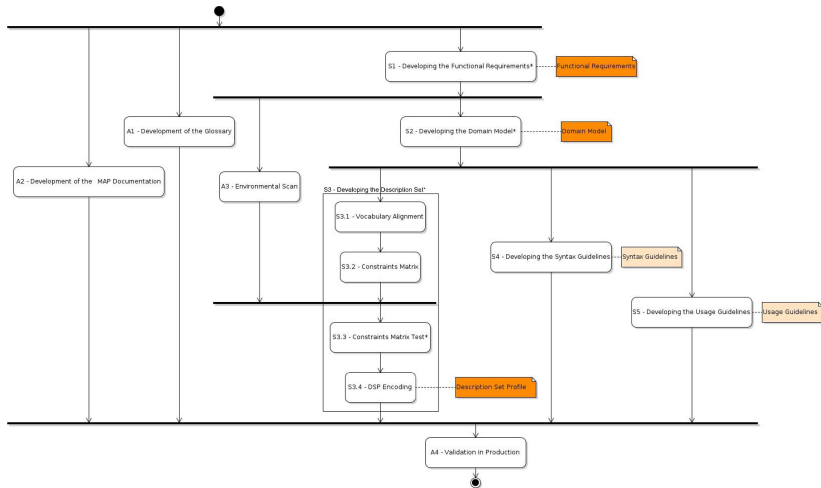
■ Optional deliverable (Singapore)

* Composite activity

A4: Validation in Production

What	Validates, in production, the MAP. Changes should only be made in a controlled environment, before releasing the MAP for the Web
How	Using a log registration technique or observing final-users working with the system that has implemented the MAP
By Whom	Semantic Developer
Deliverable	Validation in Production report

All activities



■ Mandatory deliverable (Singapore)

■ Optional deliverable (Singapore)

* Composite activity

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Thank you

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P.PORTO

