



Meta-models and Infrastructure for Smalltalk Omnipresent History

Verónica Uquillas-Gómez
Stéphane Ducasse
Theo D'Hondt

Andy Kellens, VUB

Argentina - Nov 12th 2010

Source Code History Analysis

Source Code History Analysis

- ✿ Linear history

Source Code History Analysis

- ✿ Linear history

Pharo 0.x

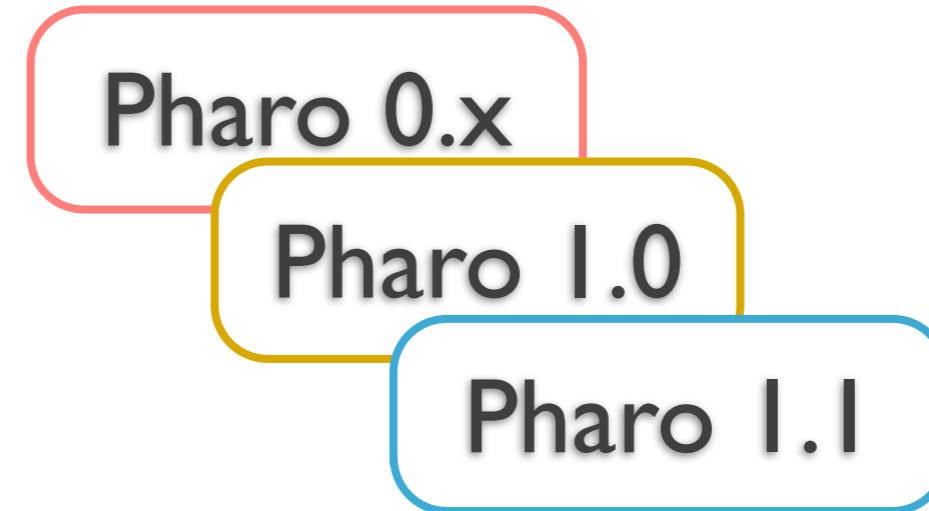
Source Code History Analysis

- ✿ Linear history



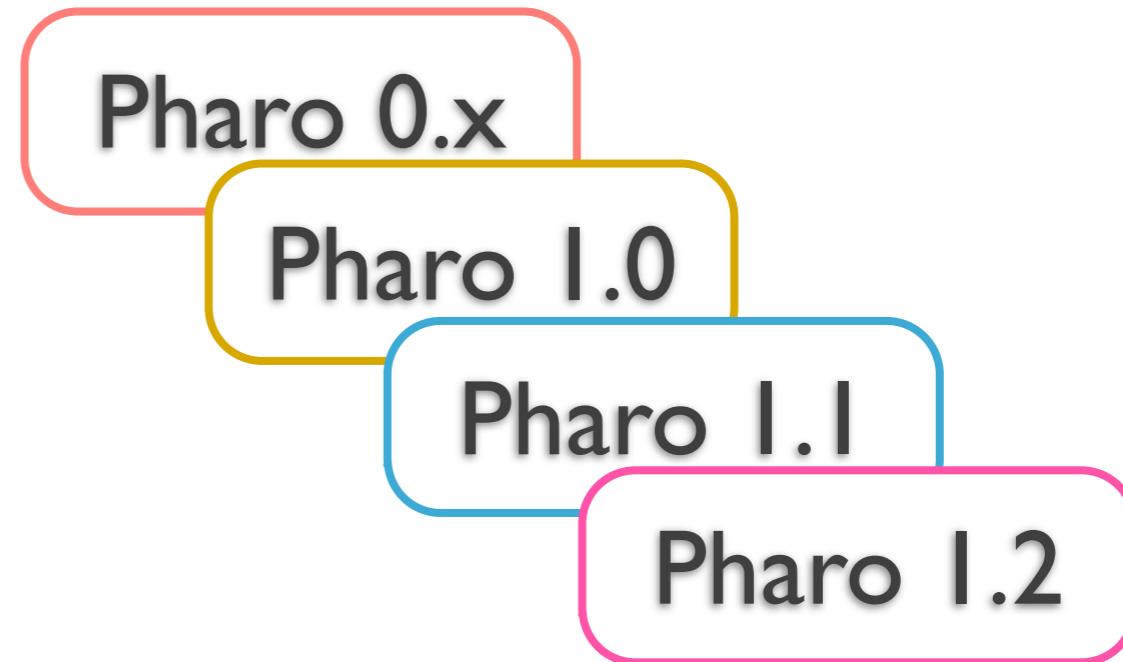
Source Code History Analysis

- ✿ Linear history



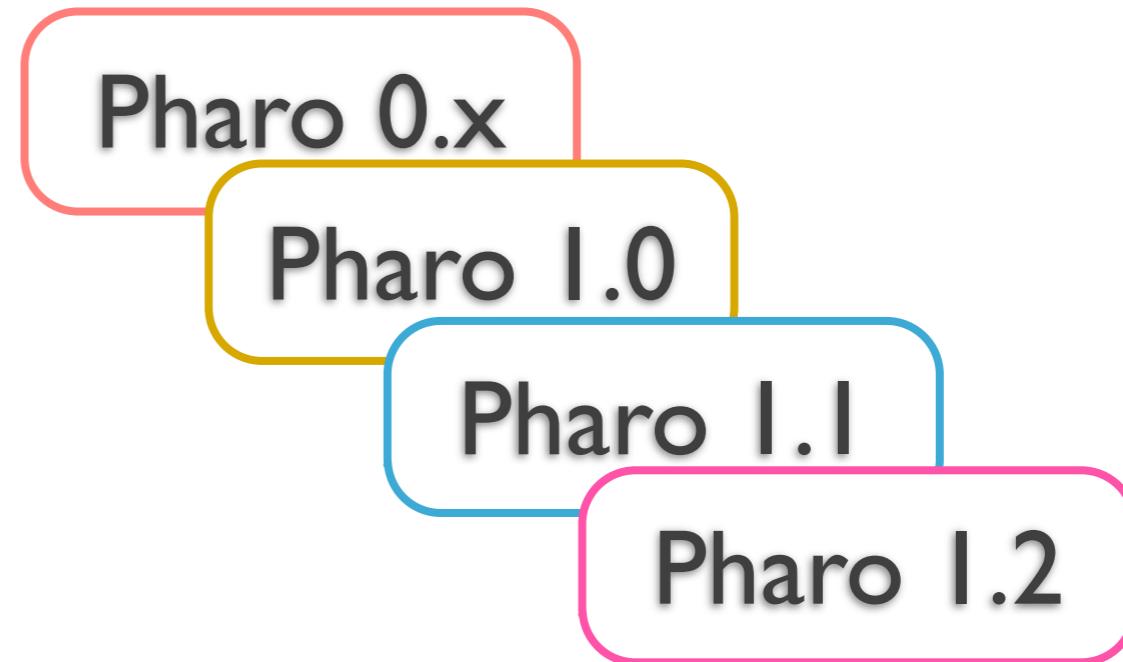
Source Code History Analysis

- ✿ Linear history



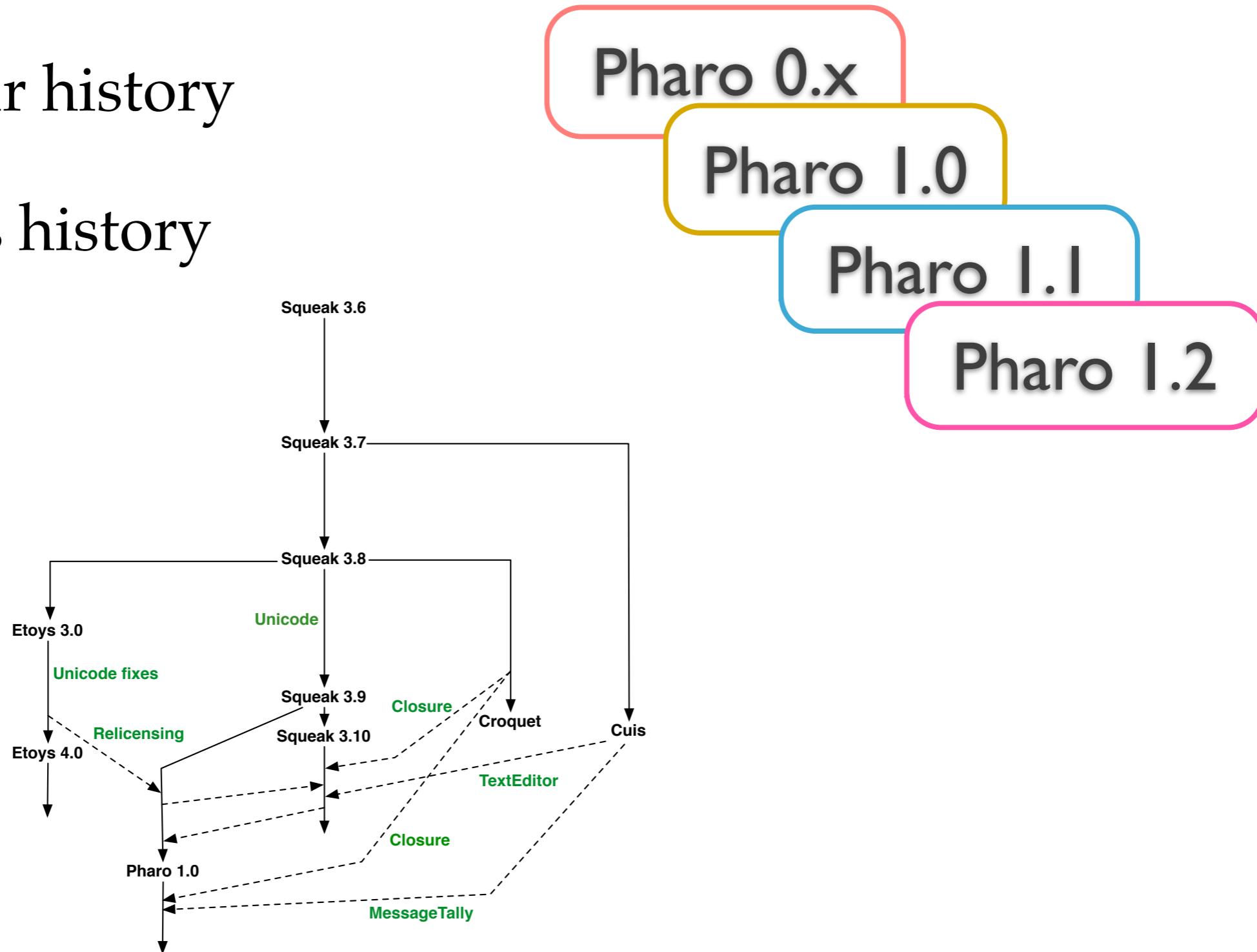
Source Code History Analysis

- ✿ Linear history
- ✿ Cross history



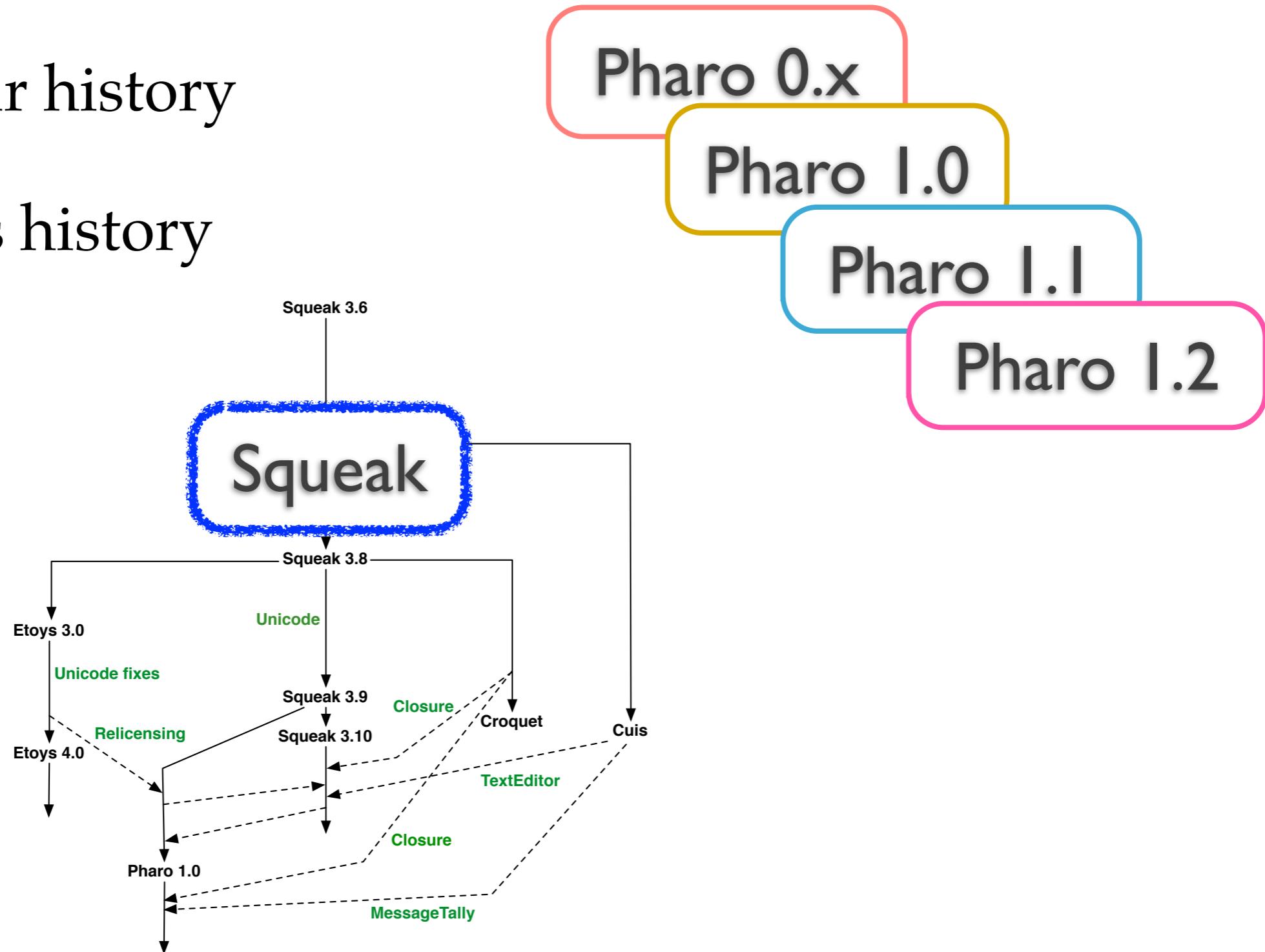
Source Code History Analysis

- ✿ Linear history
- ✿ Cross history



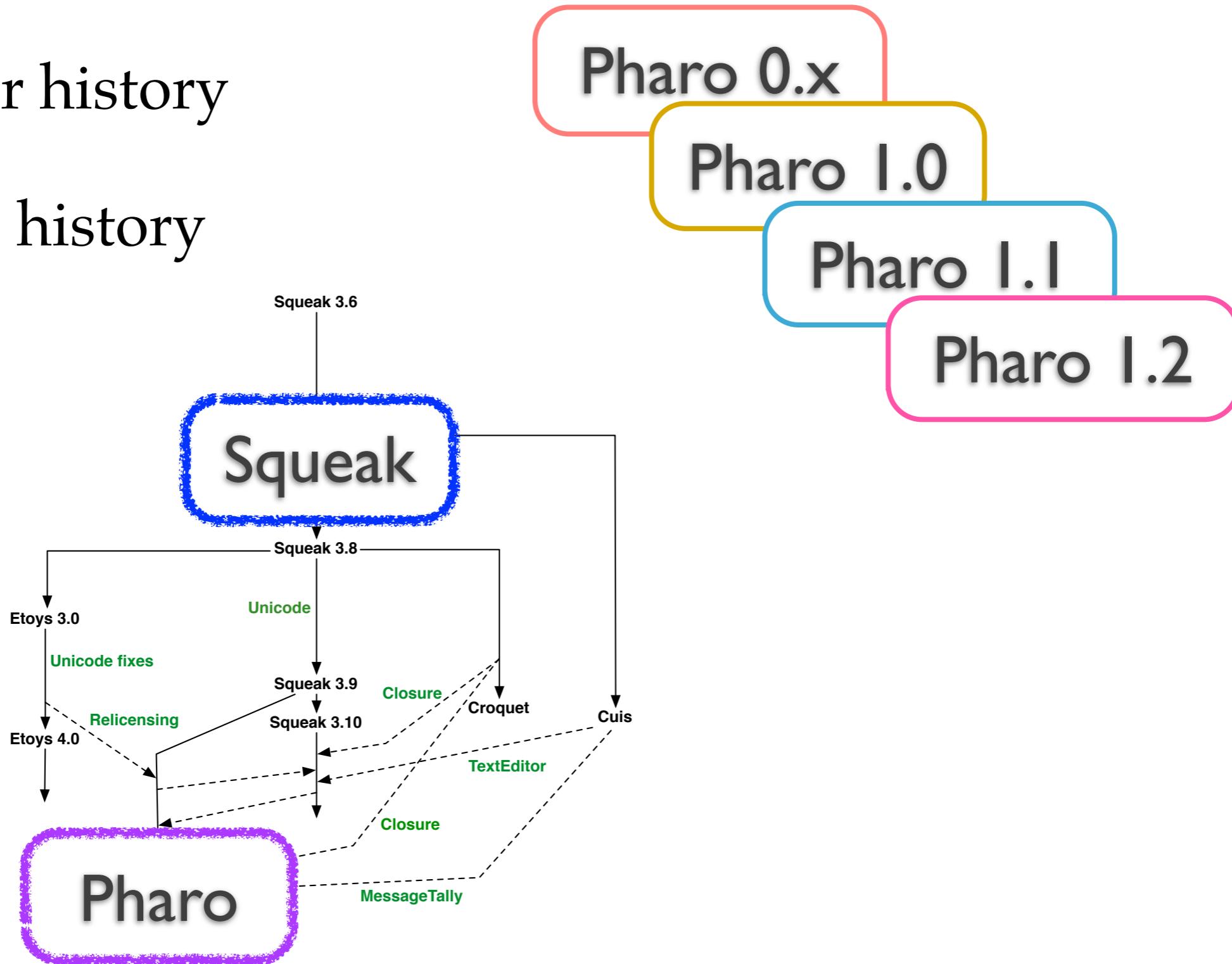
Source Code History Analysis

- ✿ Linear history
- ✿ Cross history



Source Code History Analysis

- ✿ Linear history
- ✿ Cross history



Querying the History of a System



Querying the History of a System

Co-change analysis

what are the entities that changed together with entity
Number in version 3 ?

Querying the History of a System

Co-change analysis	what are the entities that changed together with entity <i>Number</i> in version 3 ?
Queries as in the past	what were the senders of the method <code>#asString</code> in Squeak 3.9?

Querying the History of a System

Co-change analysis	what are the entities that changed together with entity <i>Number</i> in version 3 ?
Queries as in the past	what were the senders of the method <code>#asString</code> in Squeak 3.9?
Queries as in the present	what are the messages sent by method <code>#printOn:</code> in version 2?

Querying the History of a System

Co-change analysis	what are the entities that changed together with entity <i>Number</i> in version 3 ?
Queries as in the past	what were the senders of the method <code>#asString</code> in Squeak 3.9?
Queries as in the present	what are the messages sent by method <code>#printOn:</code> in version 2?
Bug spot	was the method <code>#printString</code> regularly changed over the last 5 years?

Querying the History of a System

Co-change analysis	what are the entities that changed together with entity <i>Number</i> in version 3 ?
Queries as in the past	what were the senders of the method <code>#asString</code> in Squeak 3.9?
Queries as in the present	what are the messages sent by method <code>#printOn:</code> in version 2?
Bug spot	was the method <code>#printString</code> regularly changed over the last 5 years?
Global analysis	what is the whole history of method <code>#detect:ifNone:?</code>

Querying the History of a System

Co-change analysis	what are the entities that changed together with entity <i>Number</i> in version 3 ?
Queries as in the past	what were the senders of the method <code>#asString</code> in Squeak 3.9?
Queries as in the present	what are the messages sent by method <code>#printOn:</code> in version 2?
Bug spot	was the method <code>#printString</code> regularly changed over the last 5 years?
Global analysis	what is the whole history of method <code>#detect:ifNone:?</code>
Forks analysis	if the version of method <code>#isNil</code> changed in Squeak 3.9, should it be changed in Pharo?

Querying the History of a System

Co-change analysis

Queries as in the past

Queries as in the present

Bug spot

Global analysis

Forks analysis

Comparison profiler

what are the entities that changed together with entity *Number* in version 3 ?

method #asString in

method #printOn: in

early changed over

method #detect:ifNone:?

changed in Squeak 3.9,



what are the differences or similarities of running versions 4 and 5?

We need ...

We need ...

- ❖ History meta-model

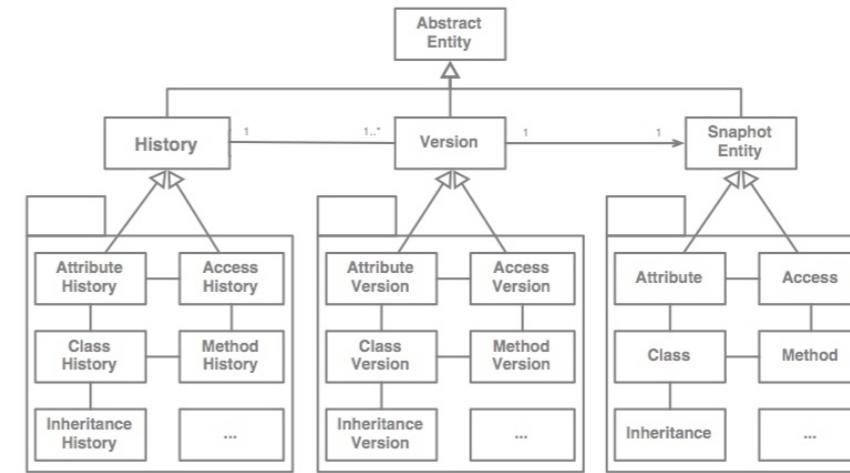
We need ...

- ✿ History meta-model
 - ◆ Linear history

We need ...

❖ History meta-model

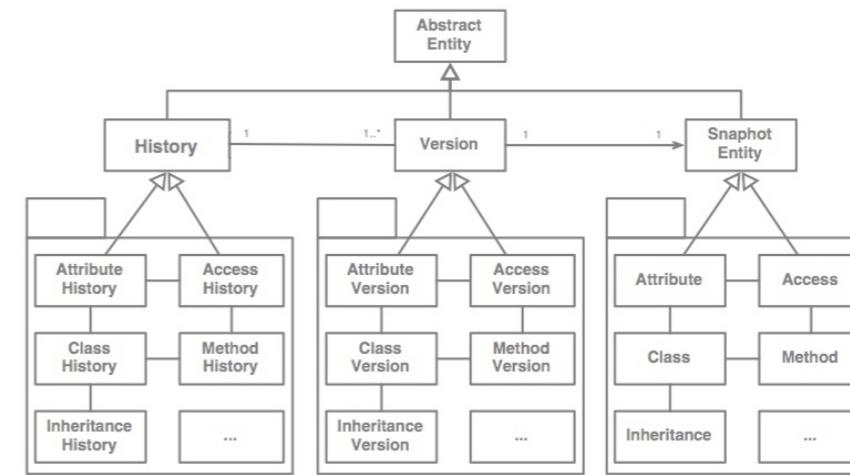
- ❖ Linear history
- ❖ Cross history



We need ...

- ❖ History meta-model

- ❖ Linear history
- ❖ Cross history

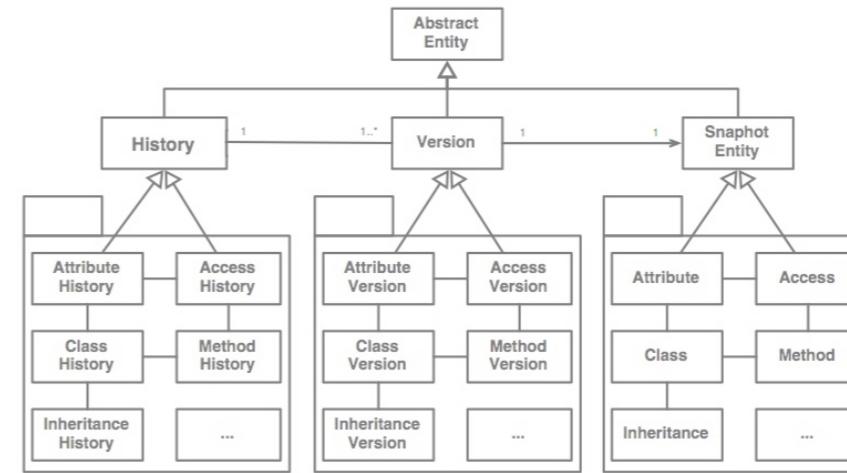


- ❖ Infrastructure

We need ...

- ❖ History meta-model

- ❖ Linear history
- ❖ Cross history



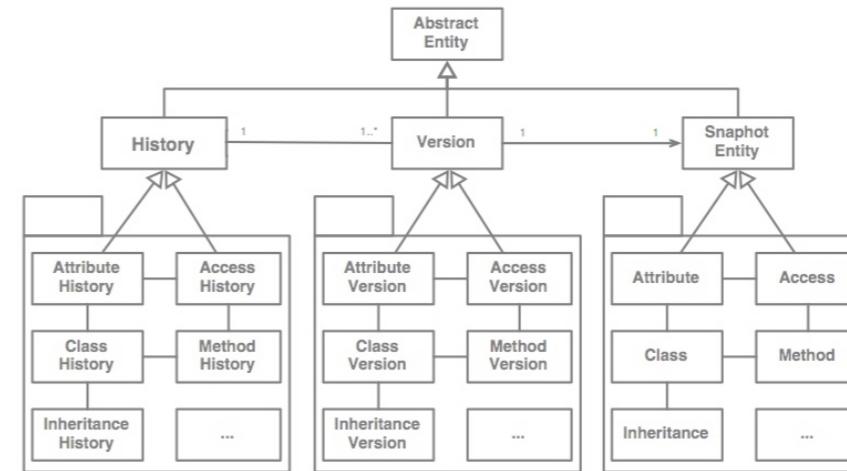
- ❖ Infrastructure

- ❖ Store lot of data

We need ...

✿ History meta-model

- ◆ Linear history
- ◆ Cross history



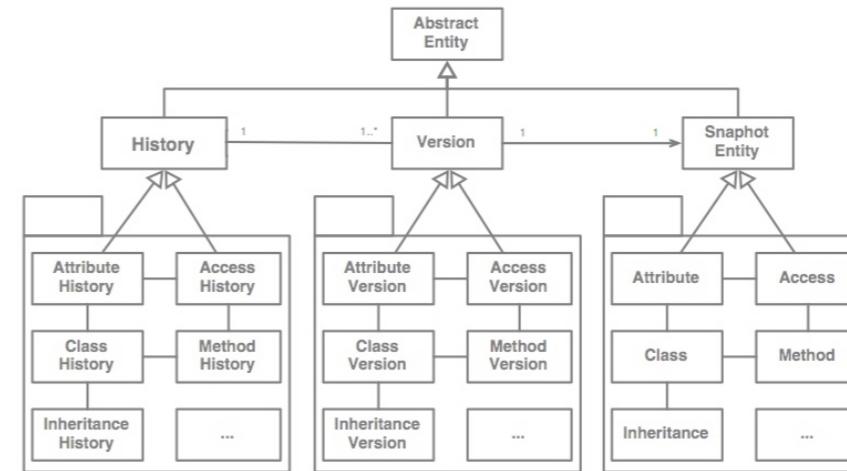
✿ Infrastructure

- ◆ Store lot of data
- ◆ Efficient / Fast

We need ...

✿ History meta-model

- ◆ Linear history
- ◆ Cross history



✿ Infrastructure

- ◆ Store lot of data
- ◆ Efficient / Fast
- ◆ Accessible



Multiple Meta-Models

Smalltalk model

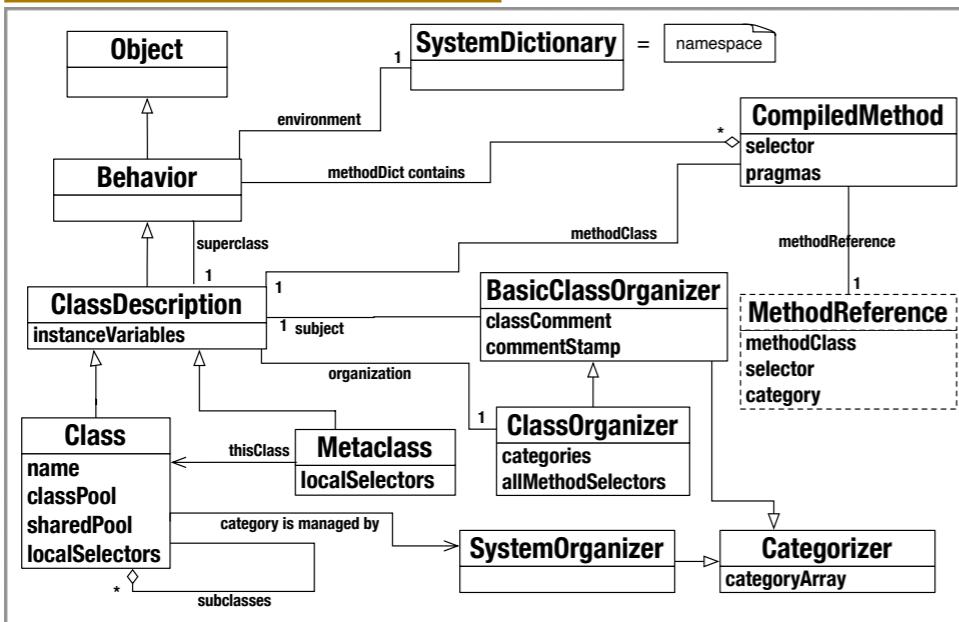
RB source code model

MC source code model

Tools source code model

Multiple Meta-Models

Smalltalk model



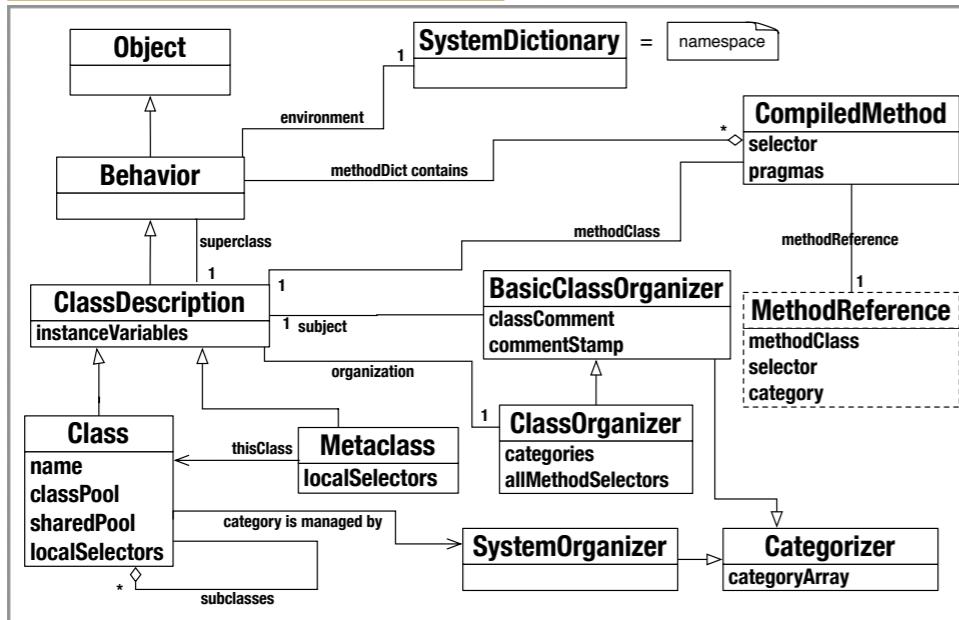
RB source code model

MC source code model

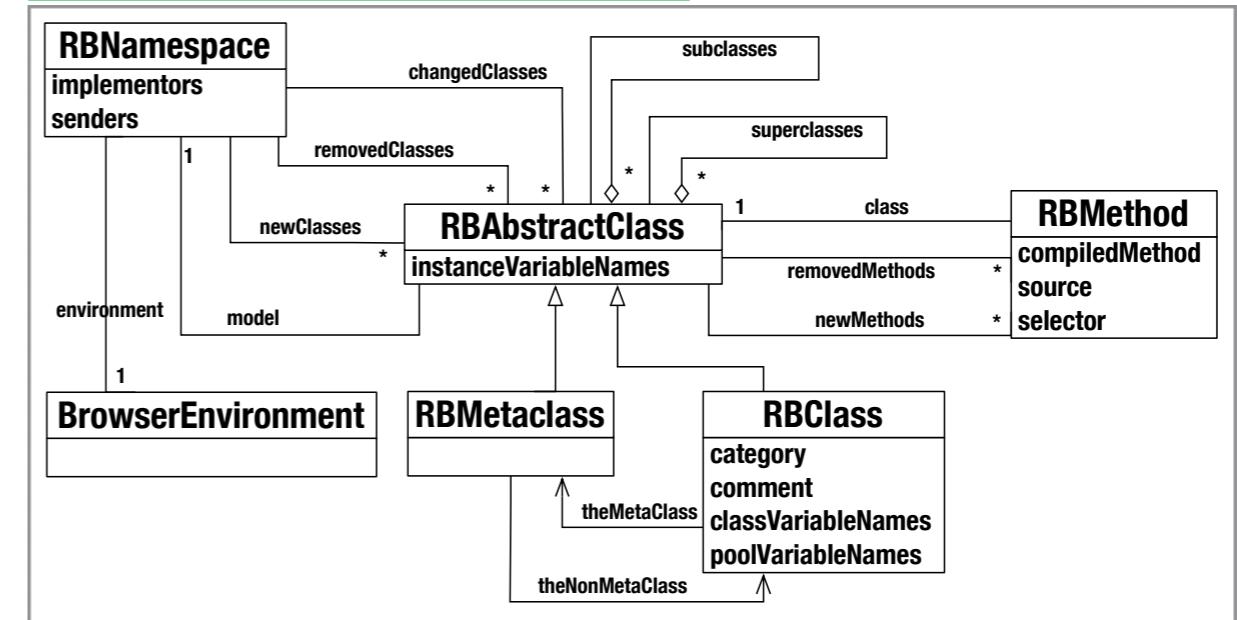
Tools source code model

Multiple Meta-Models

Smalltalk model



RB source code model

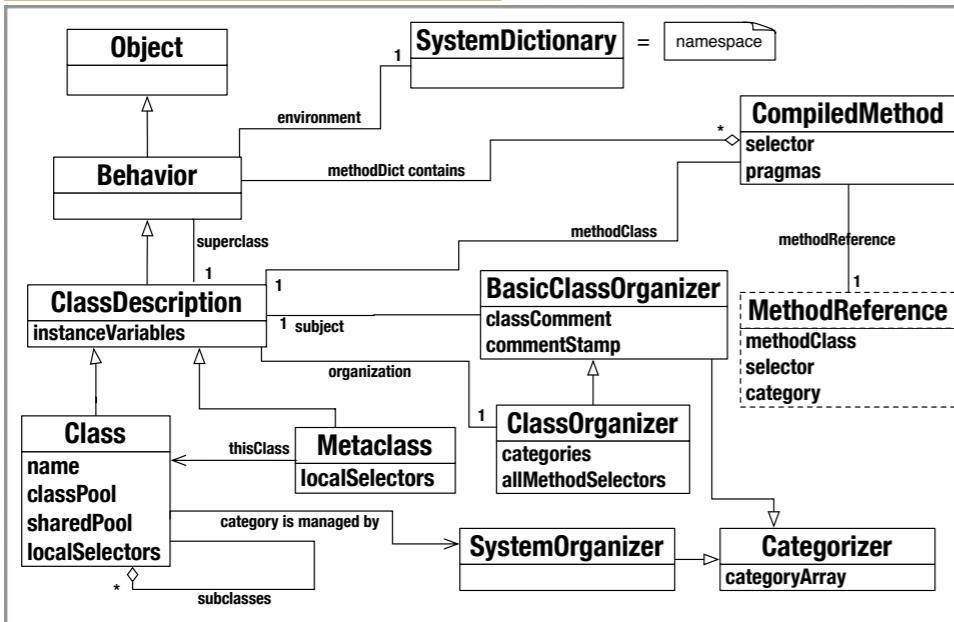


MC source code model

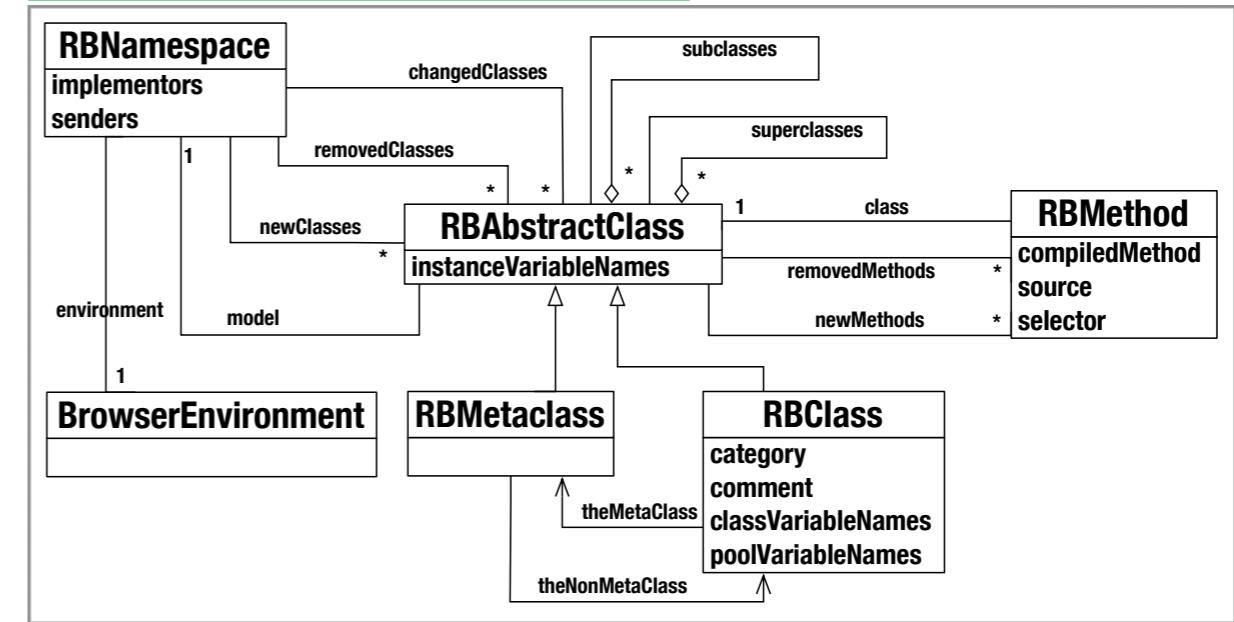
Tools source code model

Multiple Meta-Models

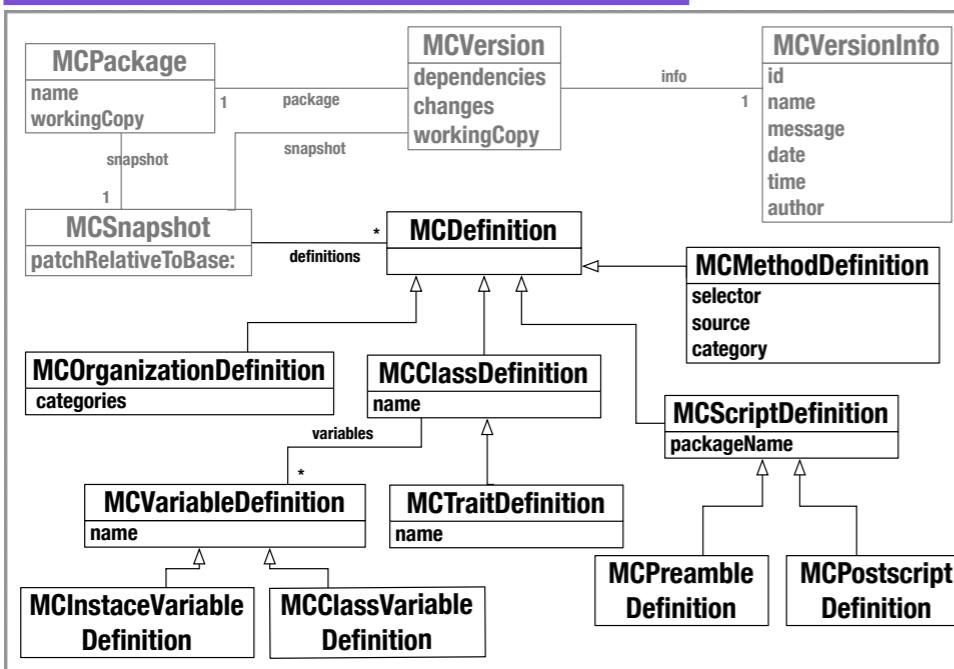
Smalltalk model



RB source code model



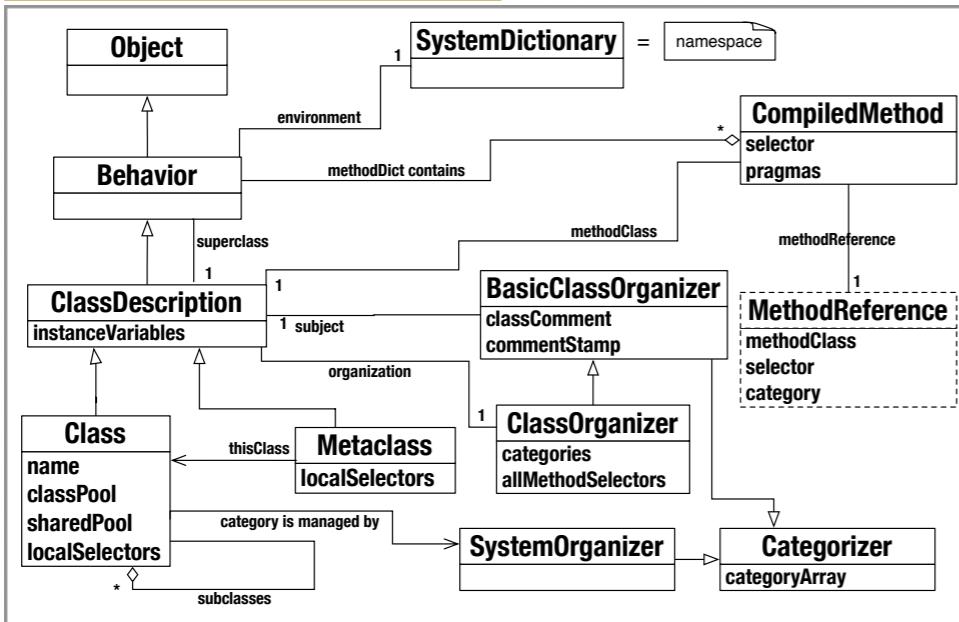
MC source code model



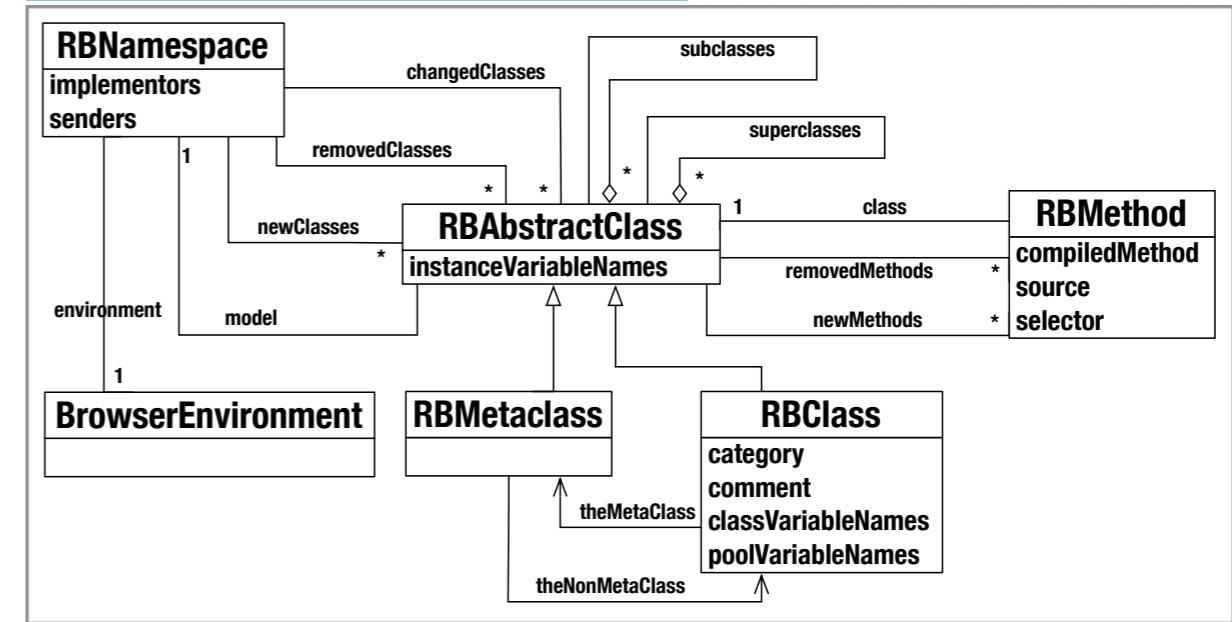
Tools source code model

Multiple Meta-Models

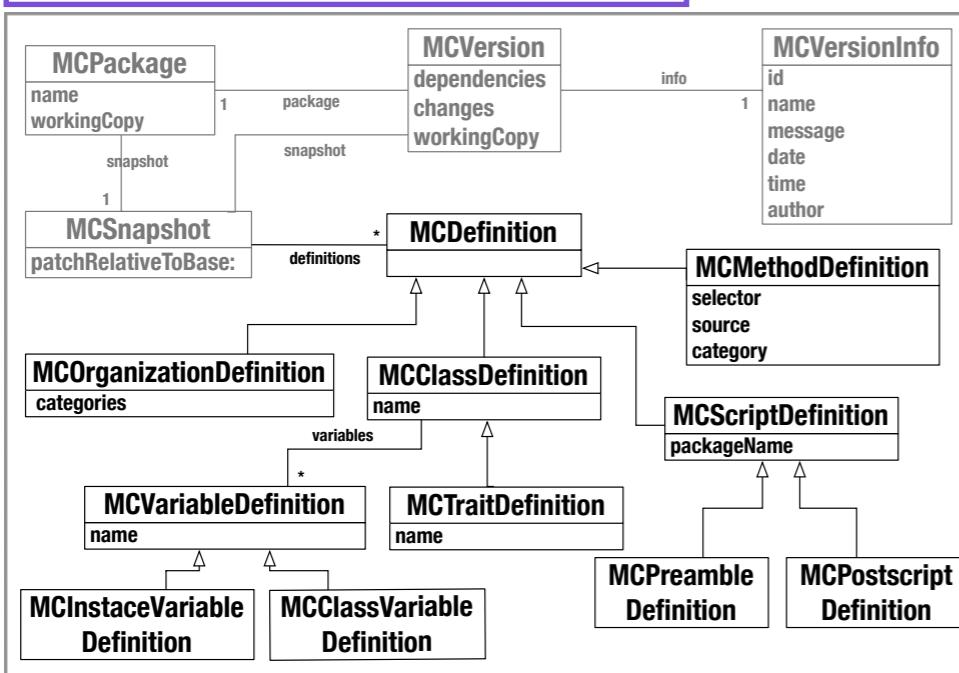
Smalltalk model



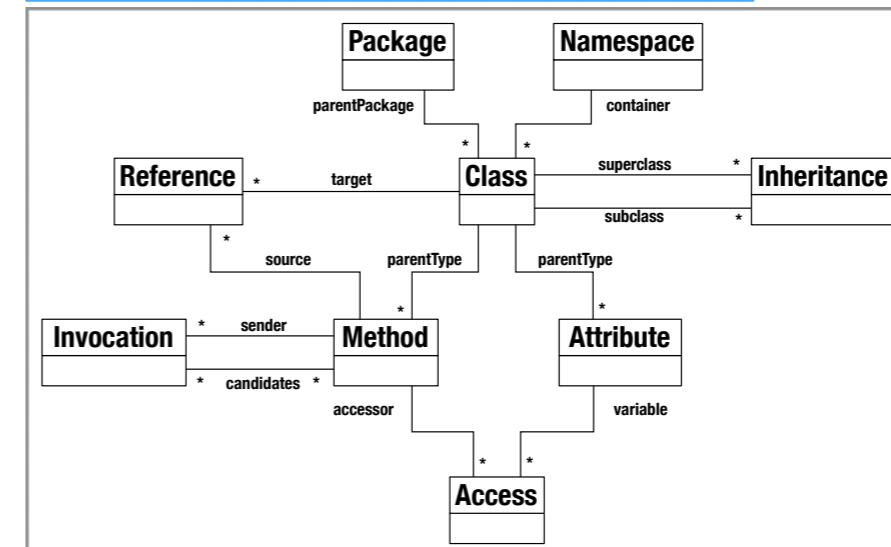
RB source code model



MC source code model

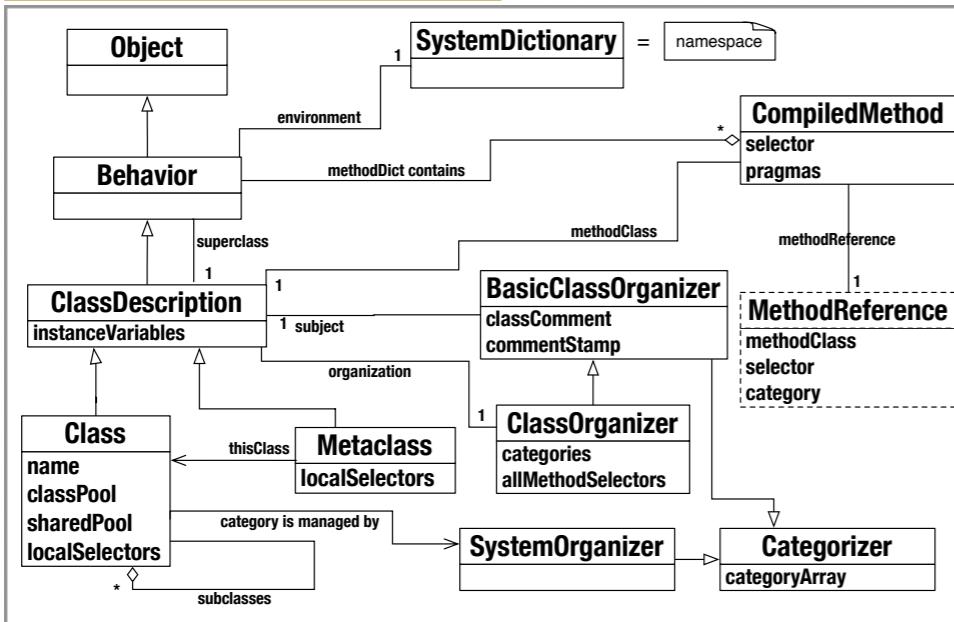


Tools source code model

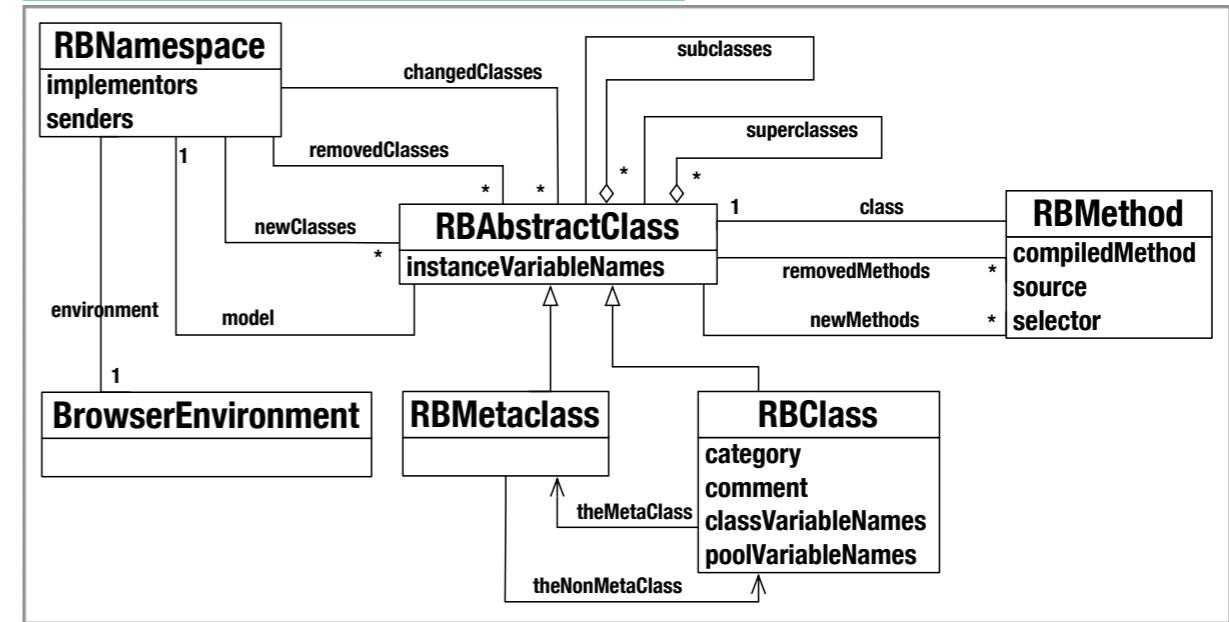


Multiple Meta-Models

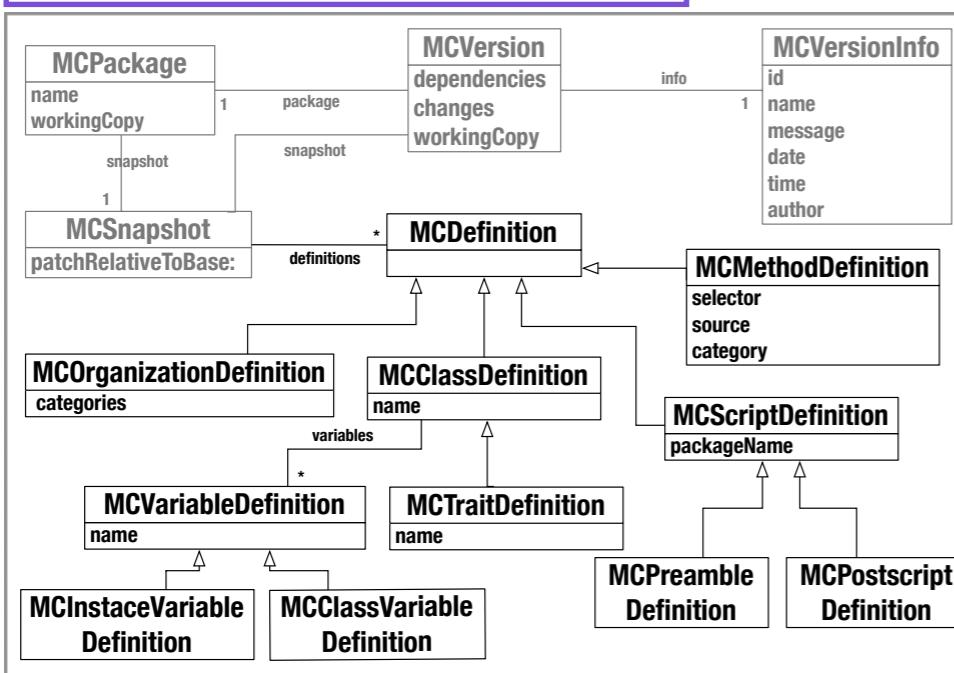
Smalltalk model



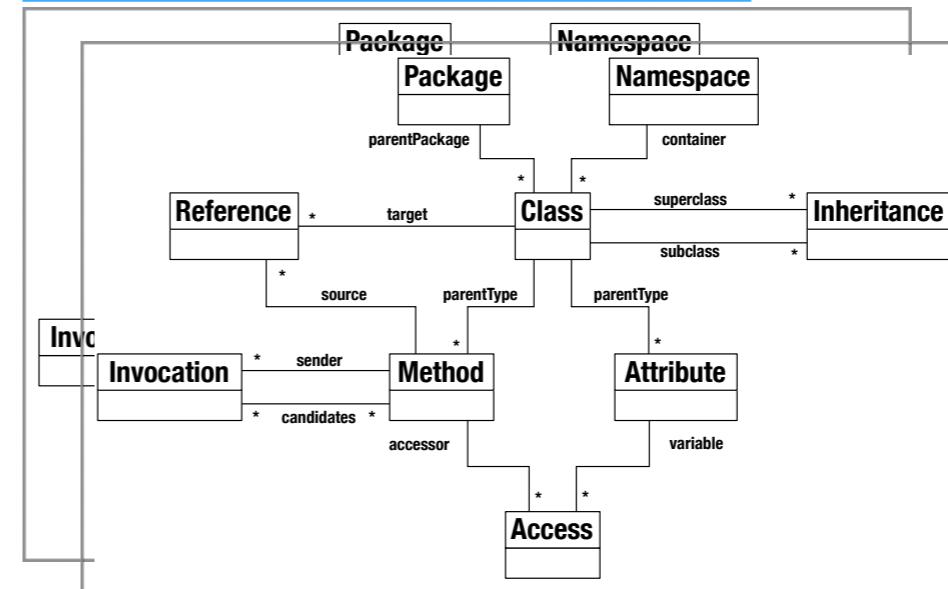
RB source code model



MC source code model

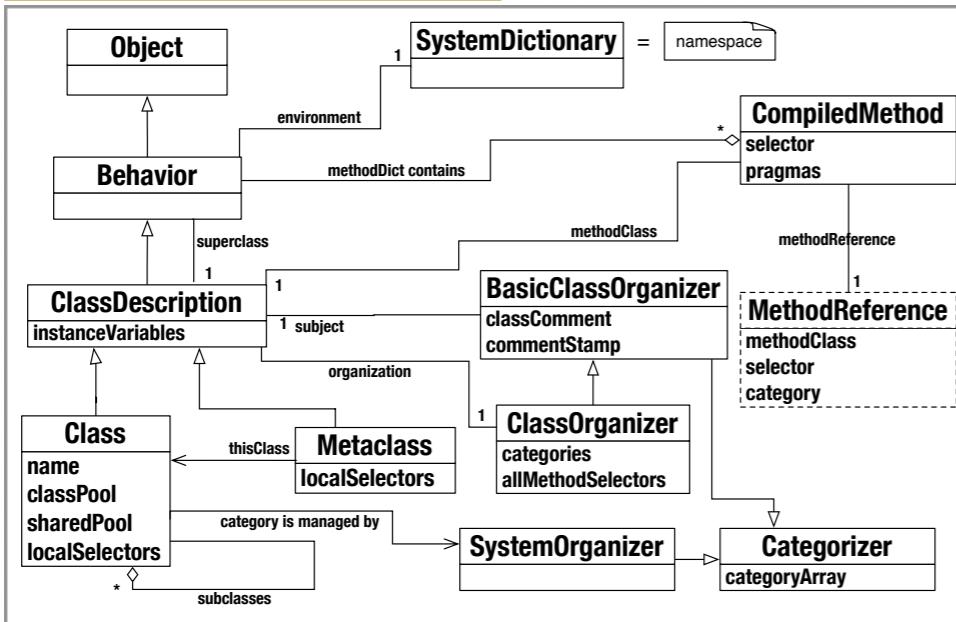


Tools source code model

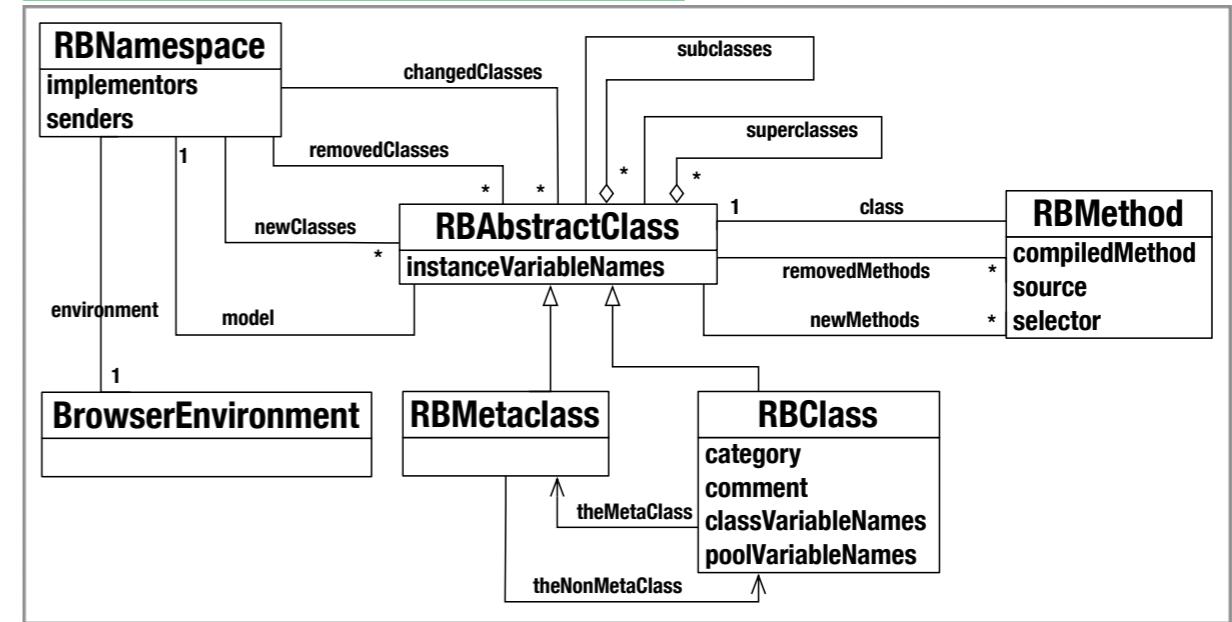


Multiple Meta-Models

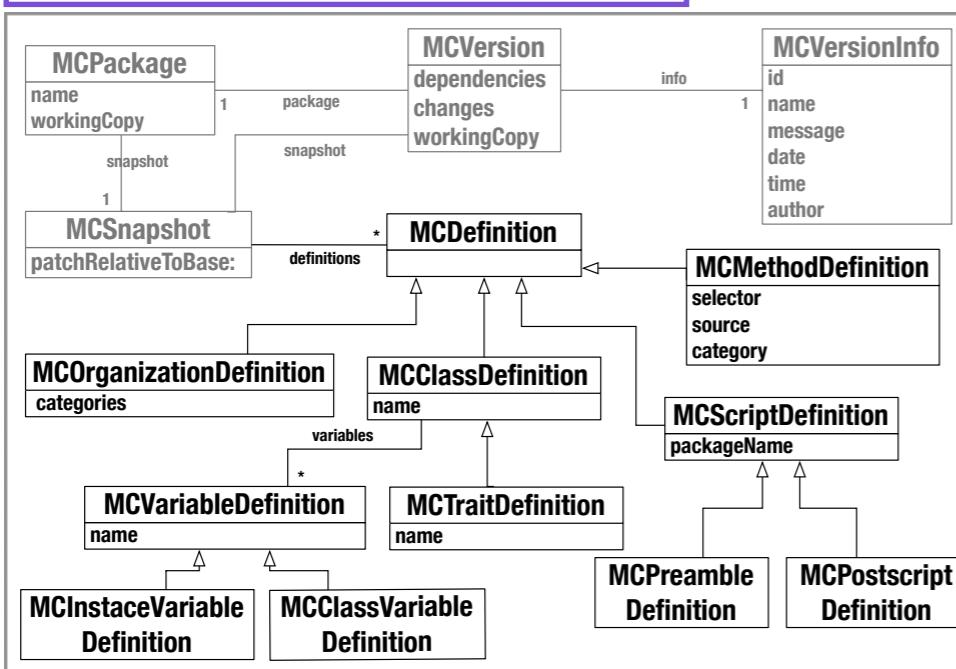
Smalltalk model



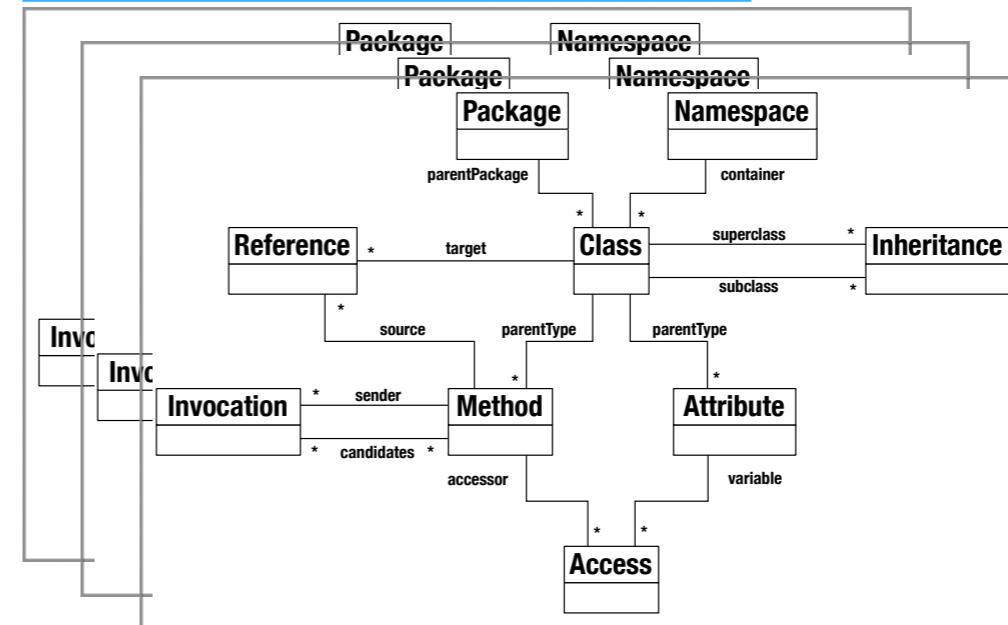
RB source code model



MC source code model

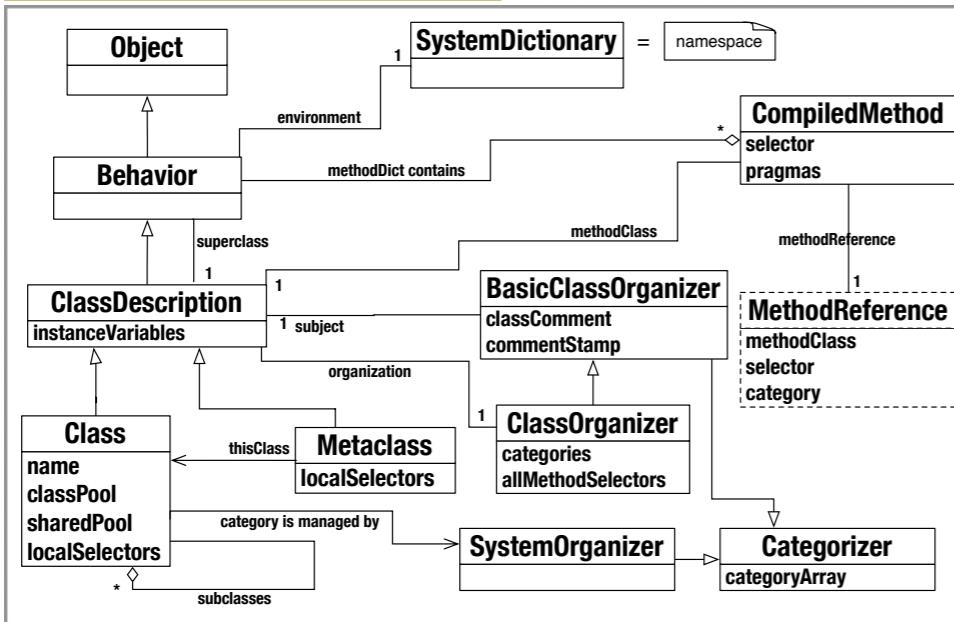


Tools source code model

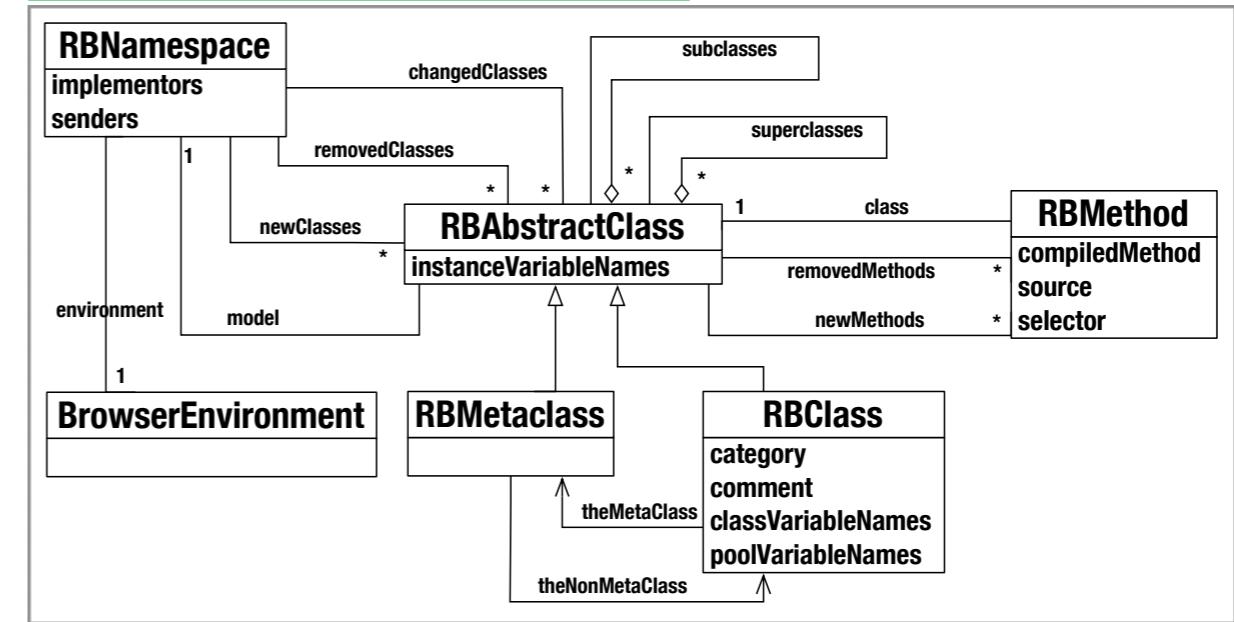


Multiple Meta-Models

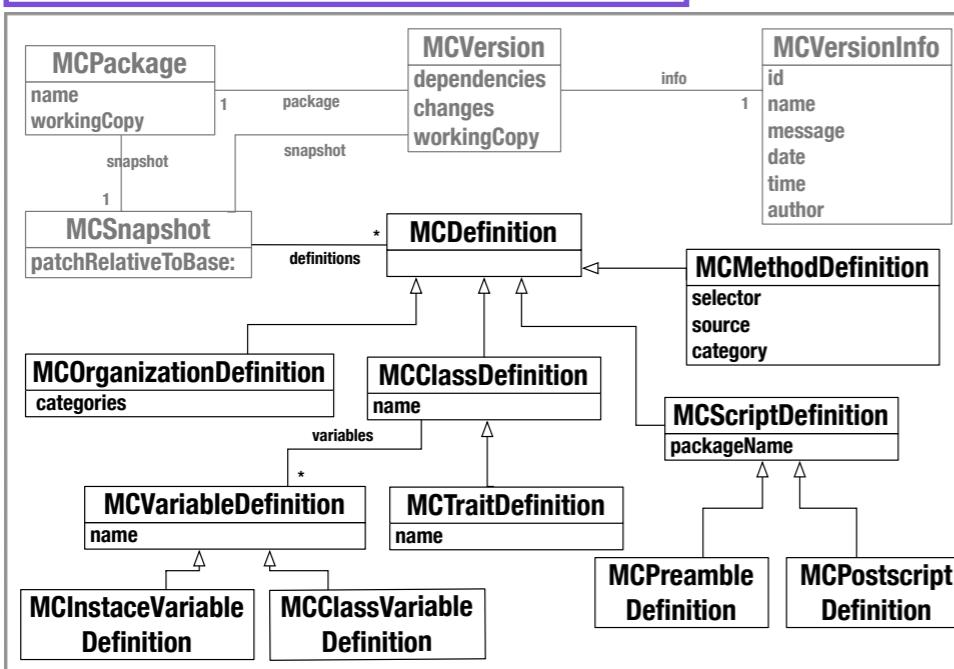
Smalltalk model



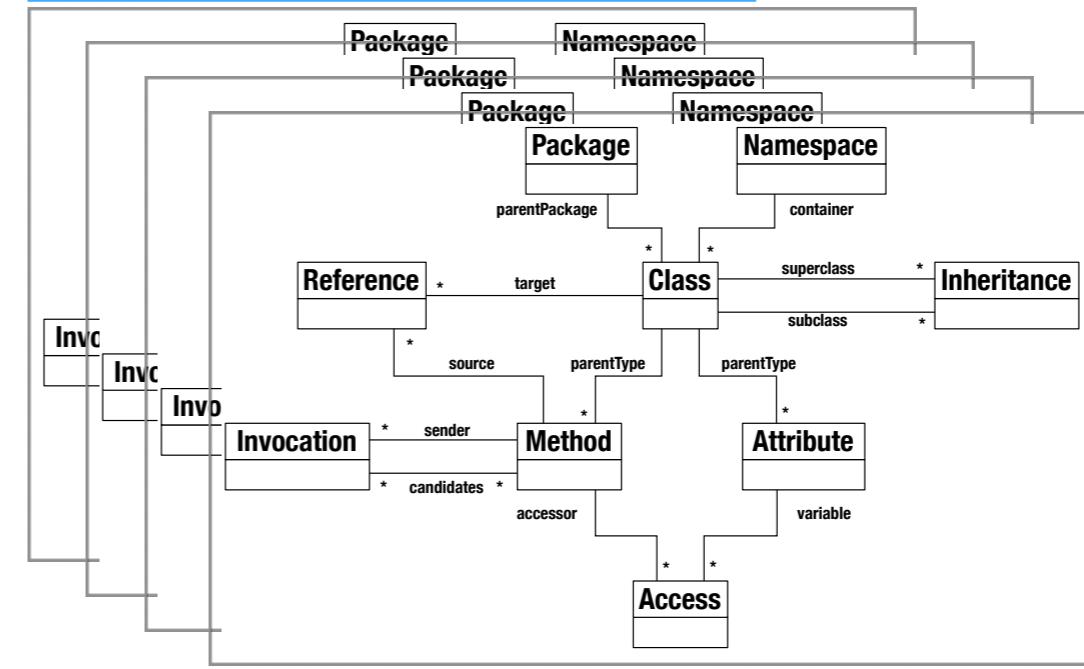
RB source code model



MC source code model

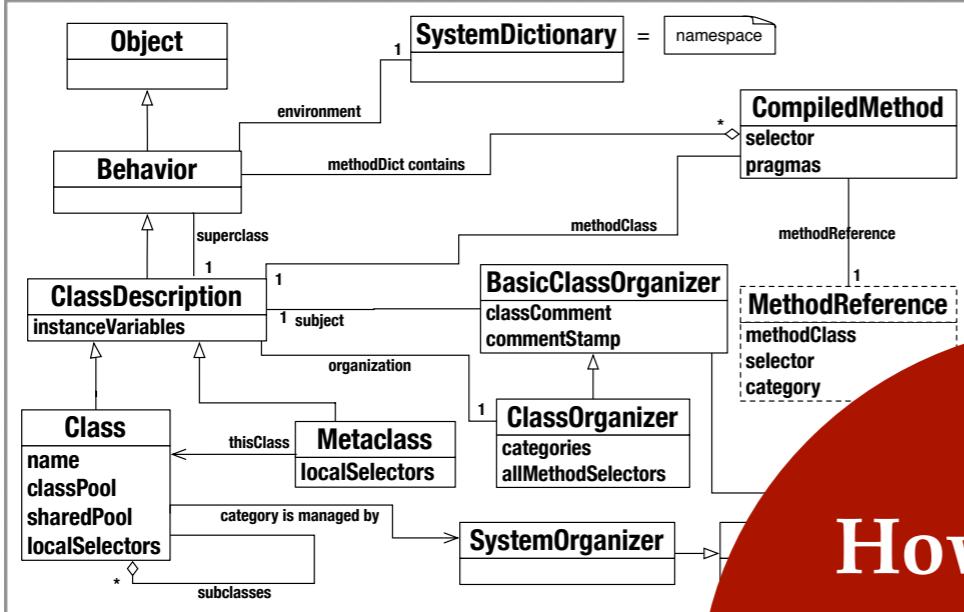


Tools source code model

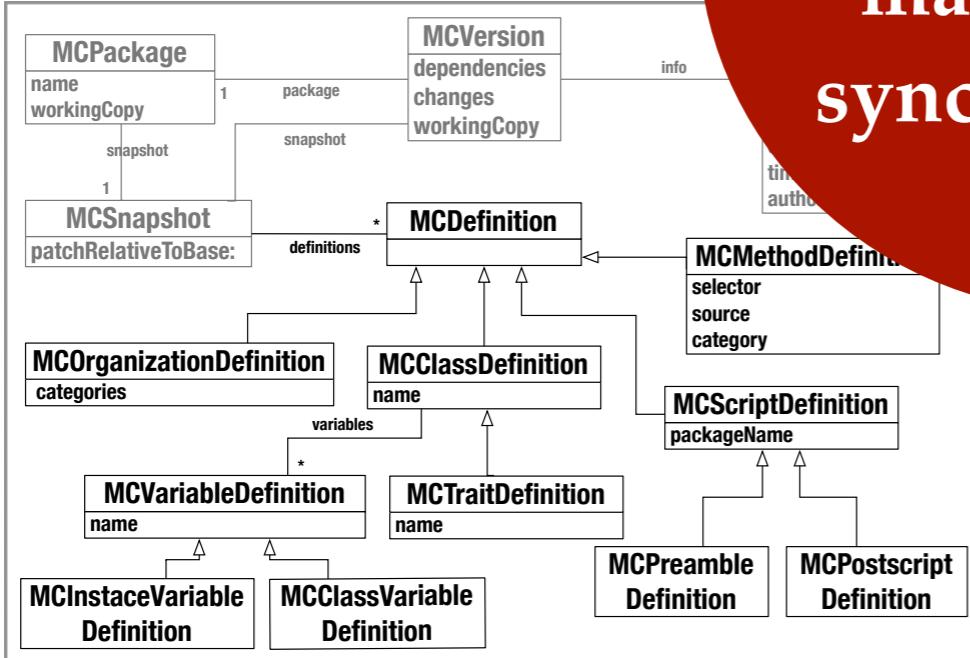


Multiple Meta-Models

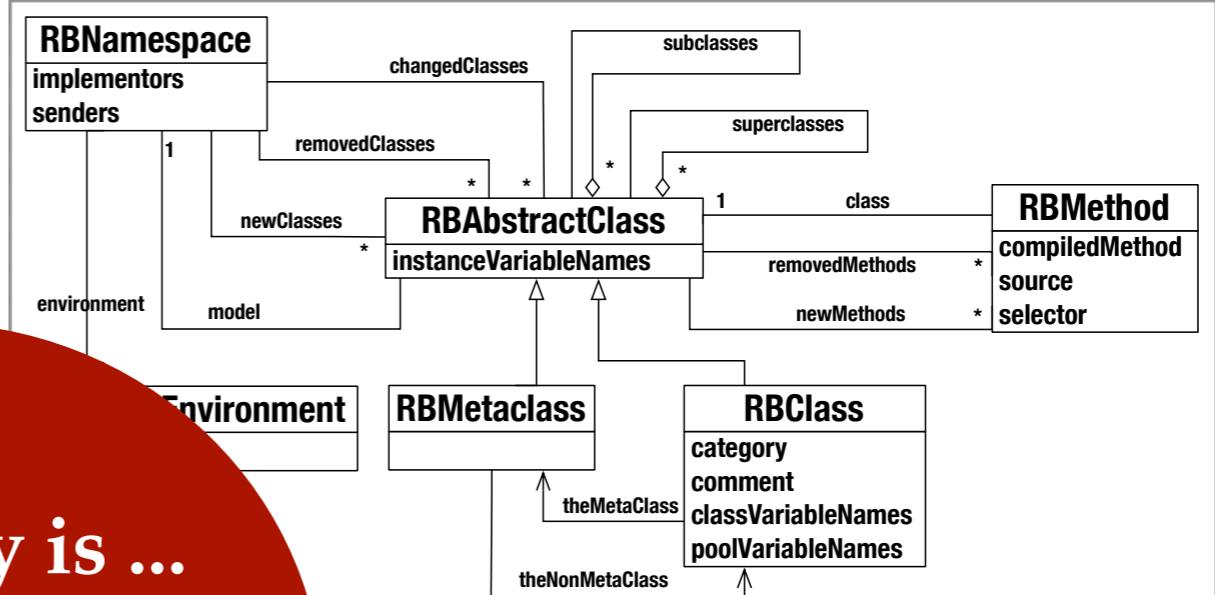
Smalltalk model



MC source code model

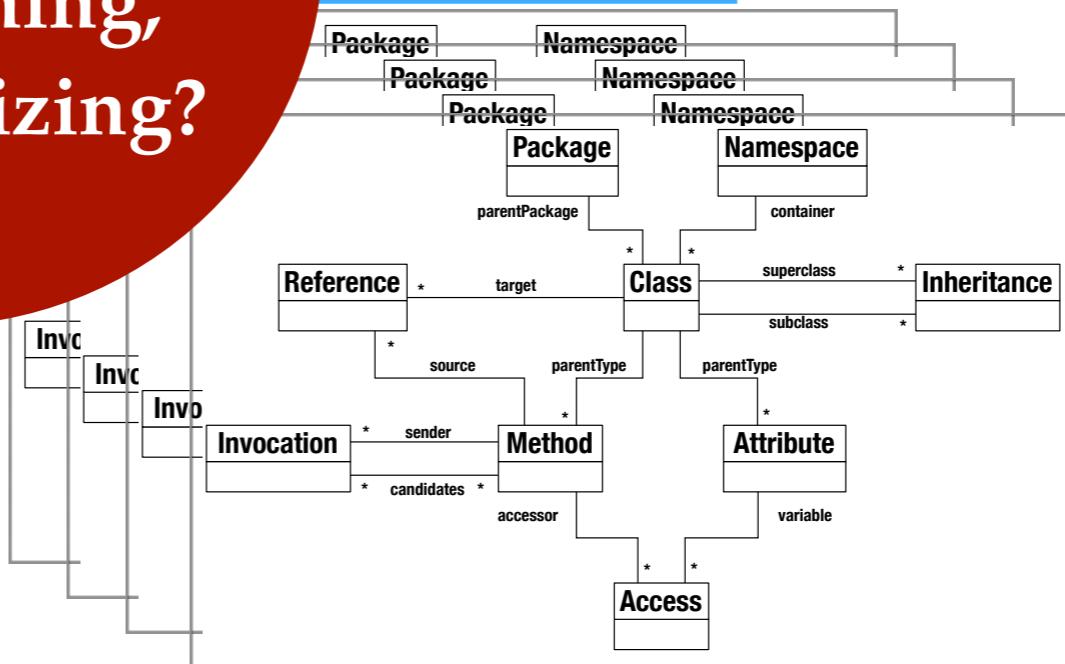


RB source code model



How easy is ...
interacting,
maintaining,
synchronizing?

source code model



Meta-Models Plague

Meta-Models Plague

- ❖ Multiple models API

Meta-Models Plague

- ❖ Multiple models \neq API

Meta-Models Plague

- ❖ Multiple models \neq API
 - ❖ conversion or transformation

Meta-Models Plague

- ❖ Multiple models \neq API
 - ❖ conversion or transformation
 - ❖ duplication of data, tests

Meta-Models Plague

- ❖ Multiple models **≠** API
 - ◆ conversion or transformation
 - ◆ duplication of data, tests
 - ◆ more maintenance tasks

Meta-Models Plague

- ❖ Multiple models \neq A single model
- ❖ conversion or transformation of data
- ❖ duplication of data, tests
- ❖ maintenance tasks

Mass duplication of efforts/tasks

Versioning Systems vs. Source Code Meta-Model

Versioning Systems vs. Source Code Meta-Model



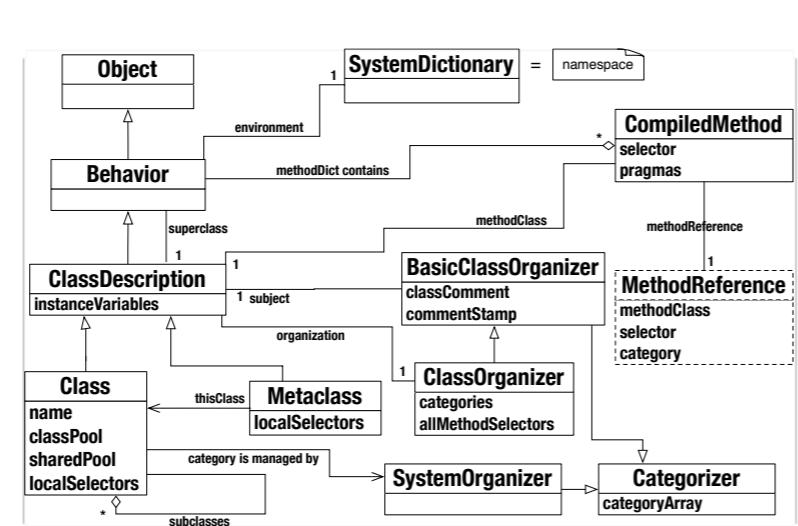
Versioning System

Versioning Systems vs. Source Code Meta-Model



Versioning System

Source Code Meta-Model



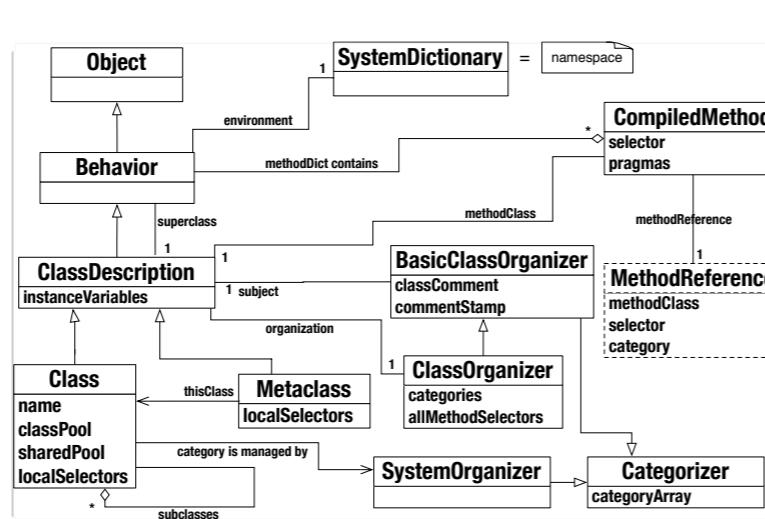
Versioning Systems vs. Source Code Meta-Model



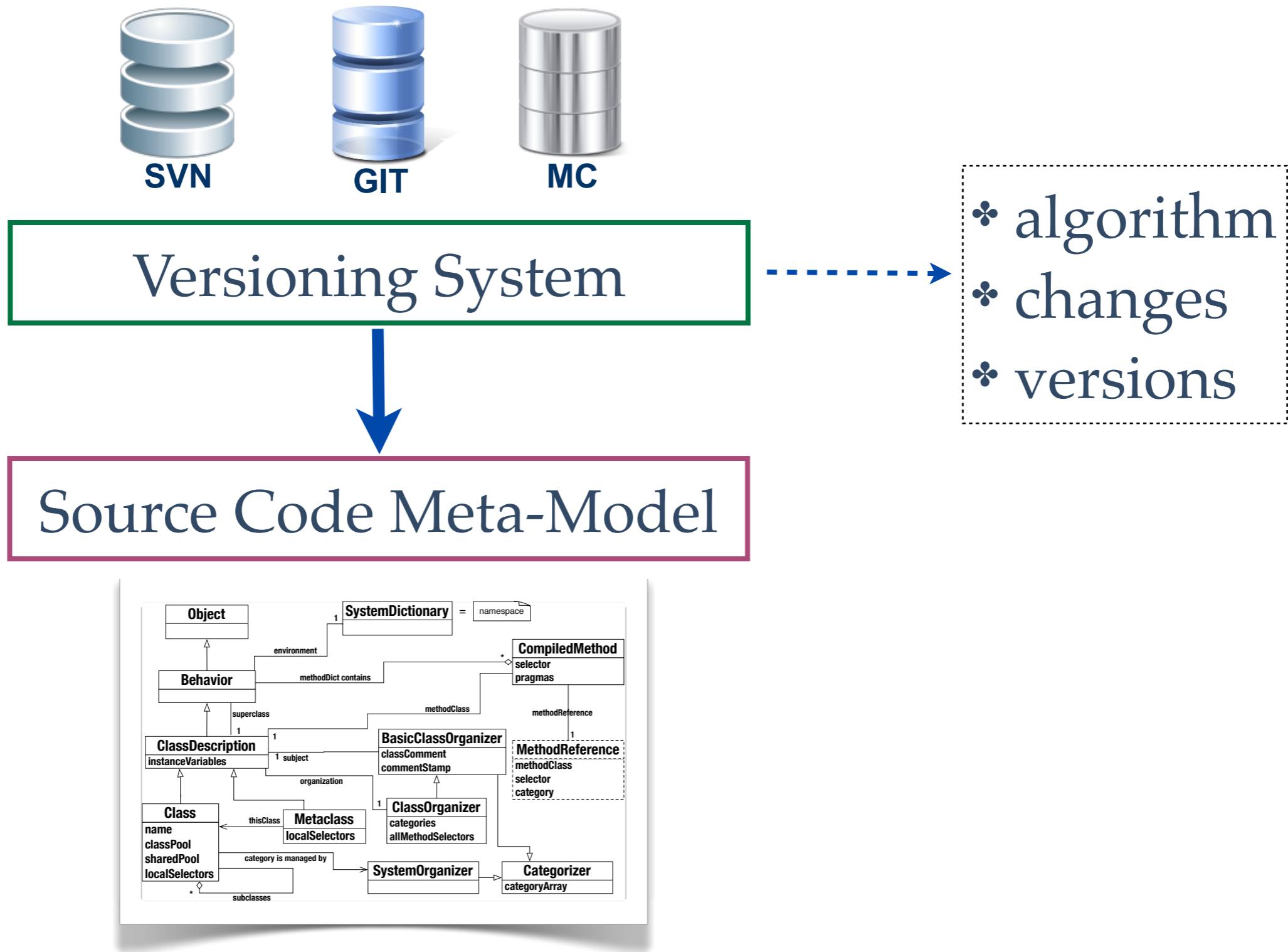
Versioning System



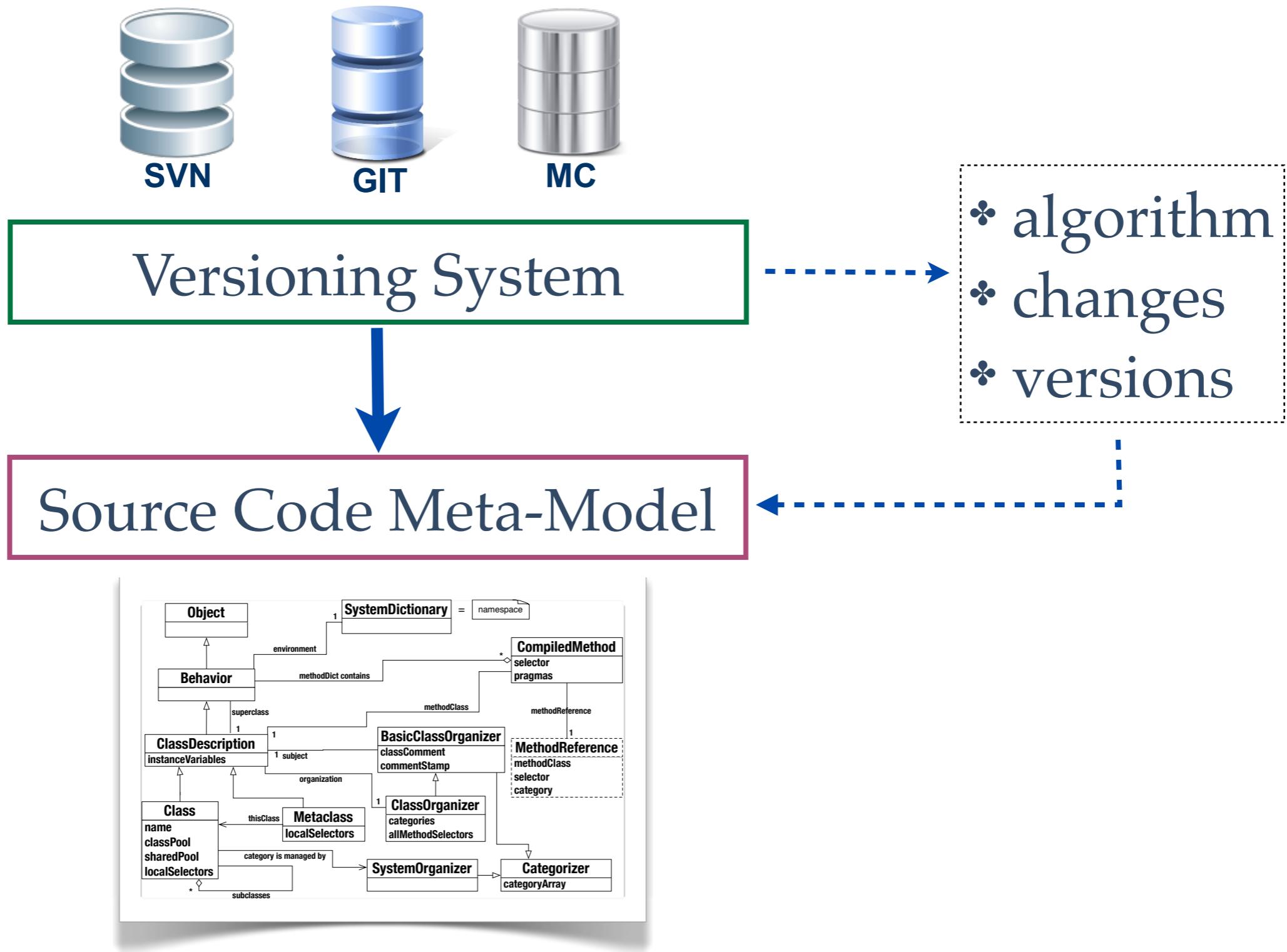
Source Code Meta-Model



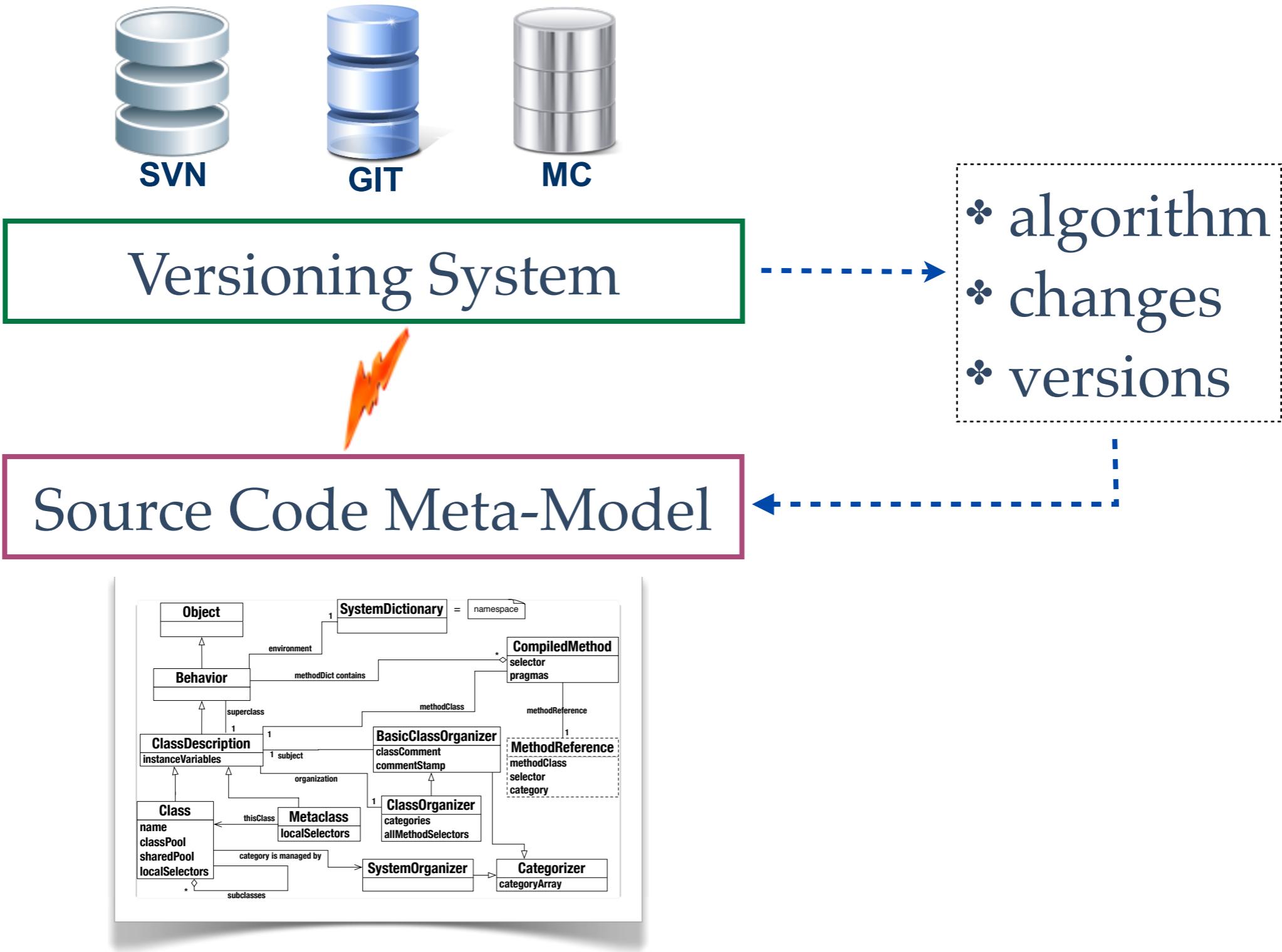
Versioning Systems vs. Source Code Meta-Model



Versioning Systems vs. Source Code Meta-Model



Versioning Systems vs. Source Code Meta-Model



Requirements for Source Code and History Modeling

Requirements for Source Code and History Modeling

- ❖ No duplication of meta-models



Requirements for Source Code and History Modeling

- ❖ No duplication of meta-models
- ❖ Model update as cheap as possible



Requirements for Source Code and History Modeling

- ❖ No duplication of meta-models
- ❖ Model update as cheap as possible
- ❖ Tool reusability relying on common APIs



Unifying and Foundational Model Infrastructure

Unifying and Foundational Model Infrastructure

Unifying and Foundational Model Infrastructure

- ❖ Provide a common API (structural & runtime level)

Unifying and Foundational Model Infrastructure

- ❖ Provide a common API (structural & runtime level)
- ❖ Allow tools to interact and integrate directly with the host environment

Unifying and Foundational Model Infrastructure

- ❖ Provide a common API (structural & runtime level)
- ❖ Allow tools to interact and integrate directly with the host environment
- ❖ Become the foundational model in Pharo

Unifying and Foundational Model Infrastructure

- ❖ Provide a common API (structural & runtime level)
- ❖ Allow tools to interact and integrate directly with the host environment
- ❖ Become the foundational model in  Pharo
- ❖ Support history analysis

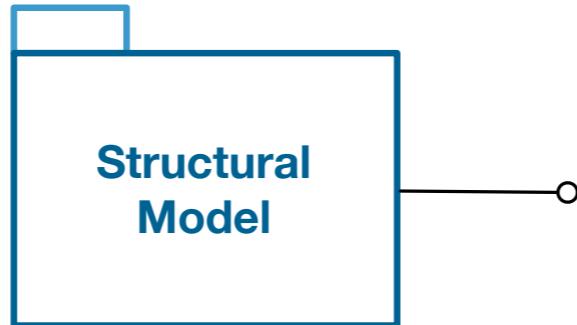
Unifying and Foundational Model Infrastructure



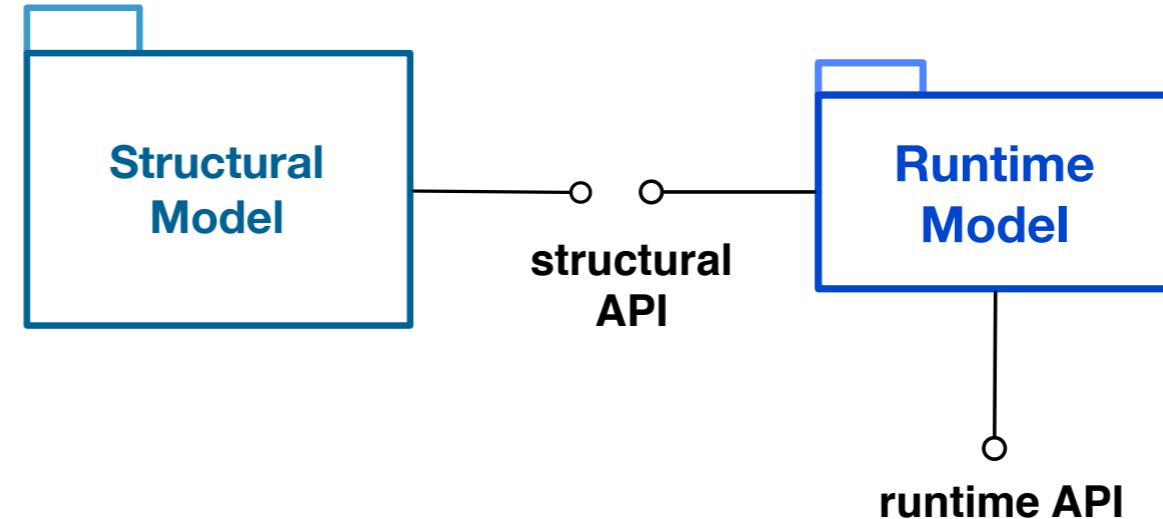
- ❖ Provide a common API (structural & runtime level)
- ❖ Allow tools to interact and integrate directly with the host environment
- ❖ Become the foundational model in  Pharo
- ❖ Support history analysis

Ring Overview

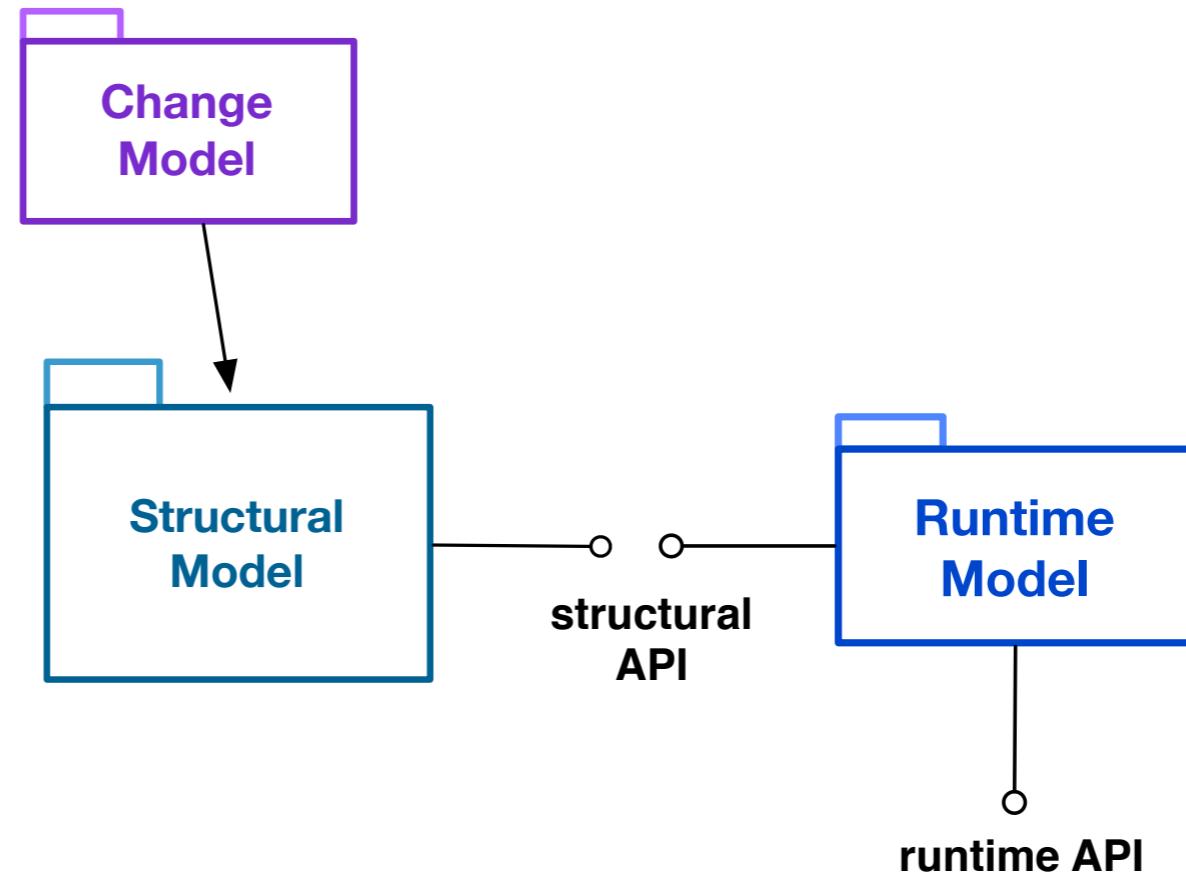
Ring Overview



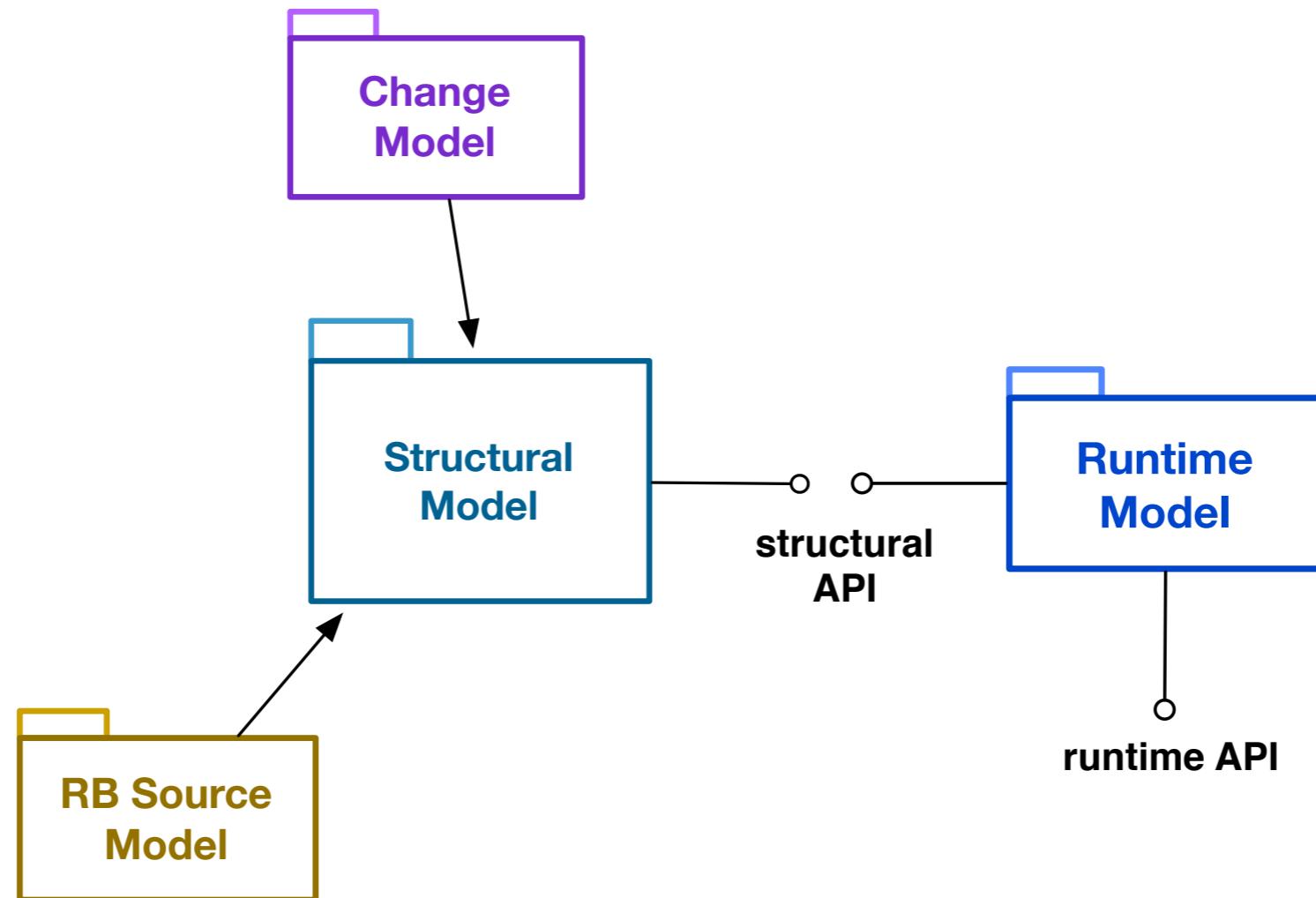
Ring Overview



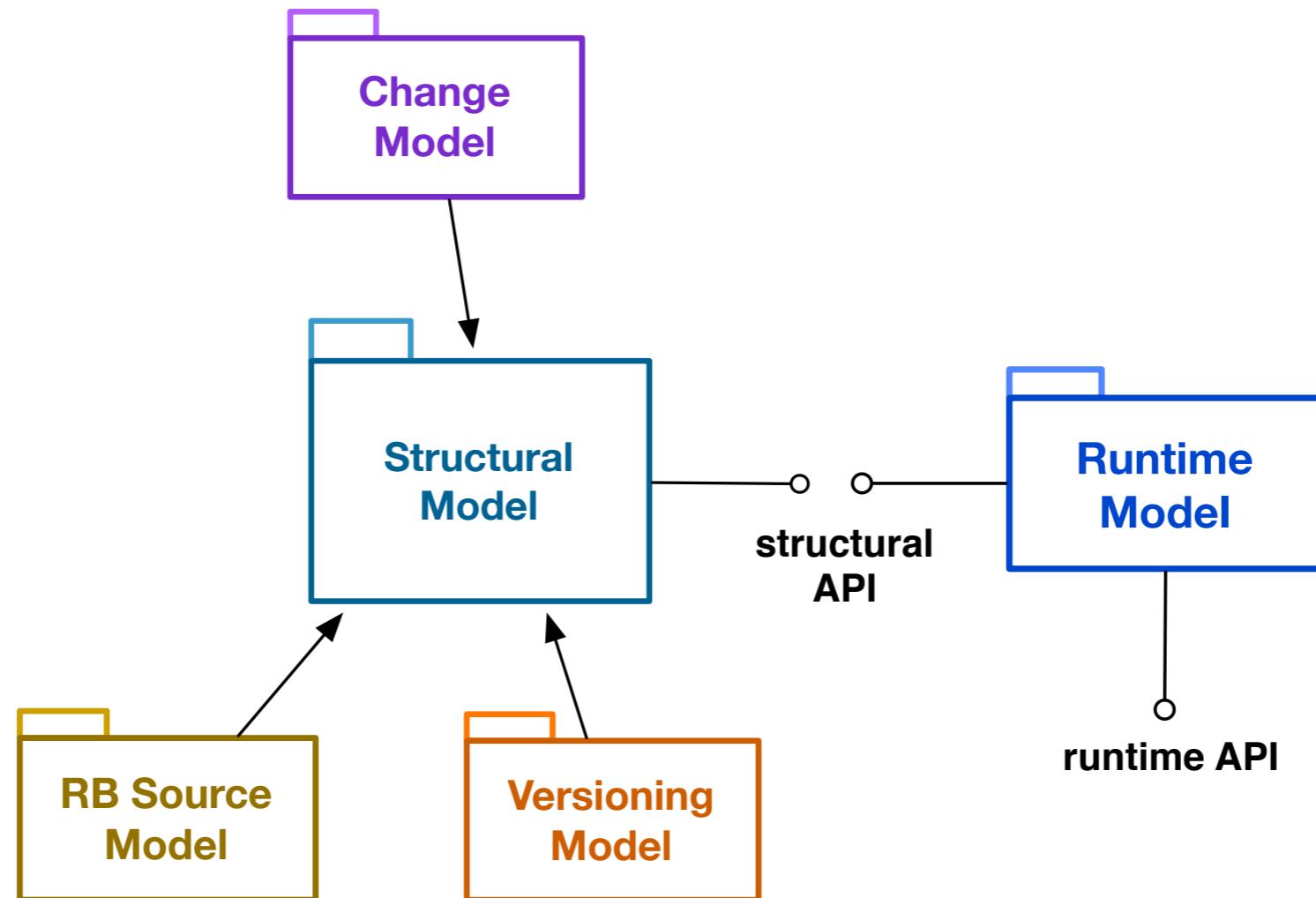
Ring Overview



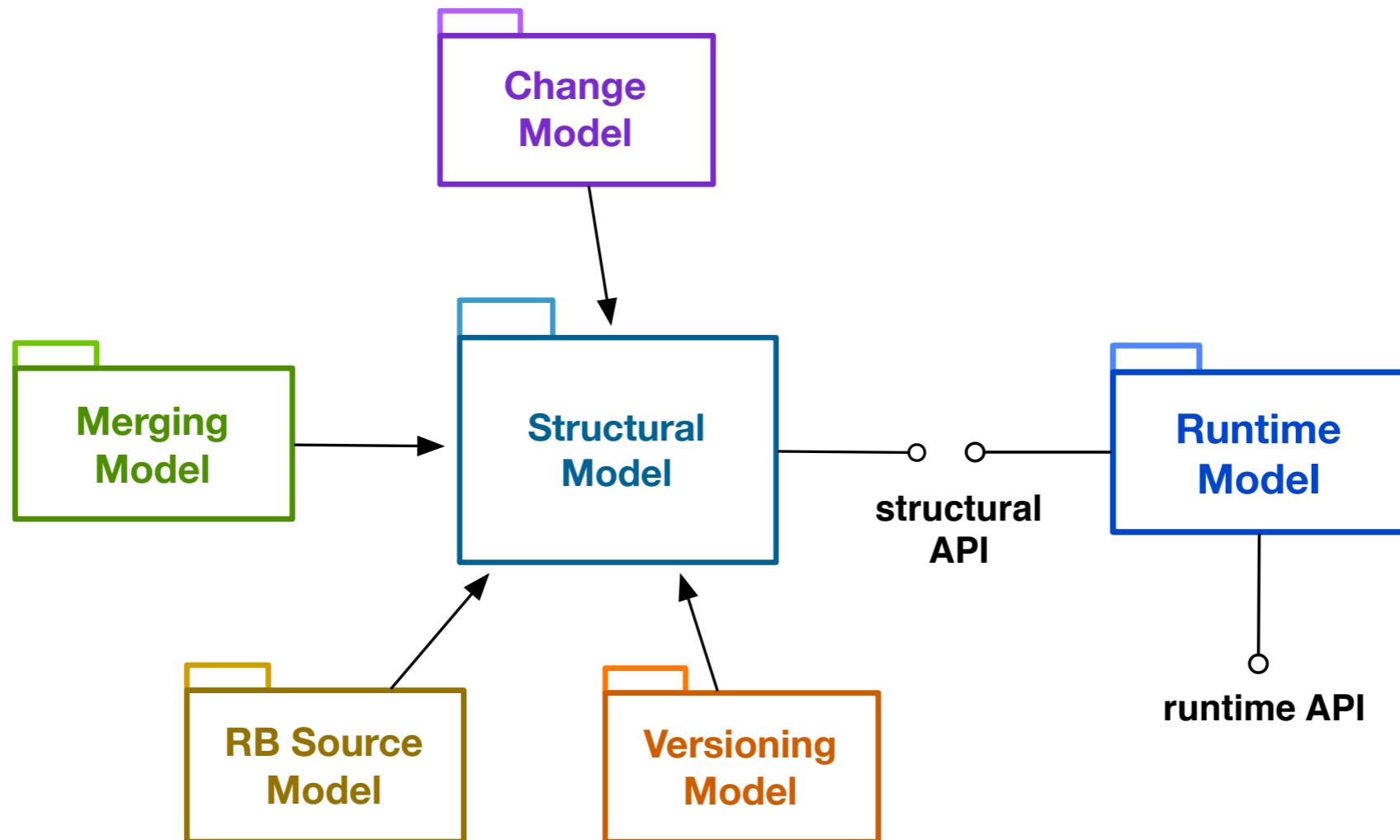
Ring Overview



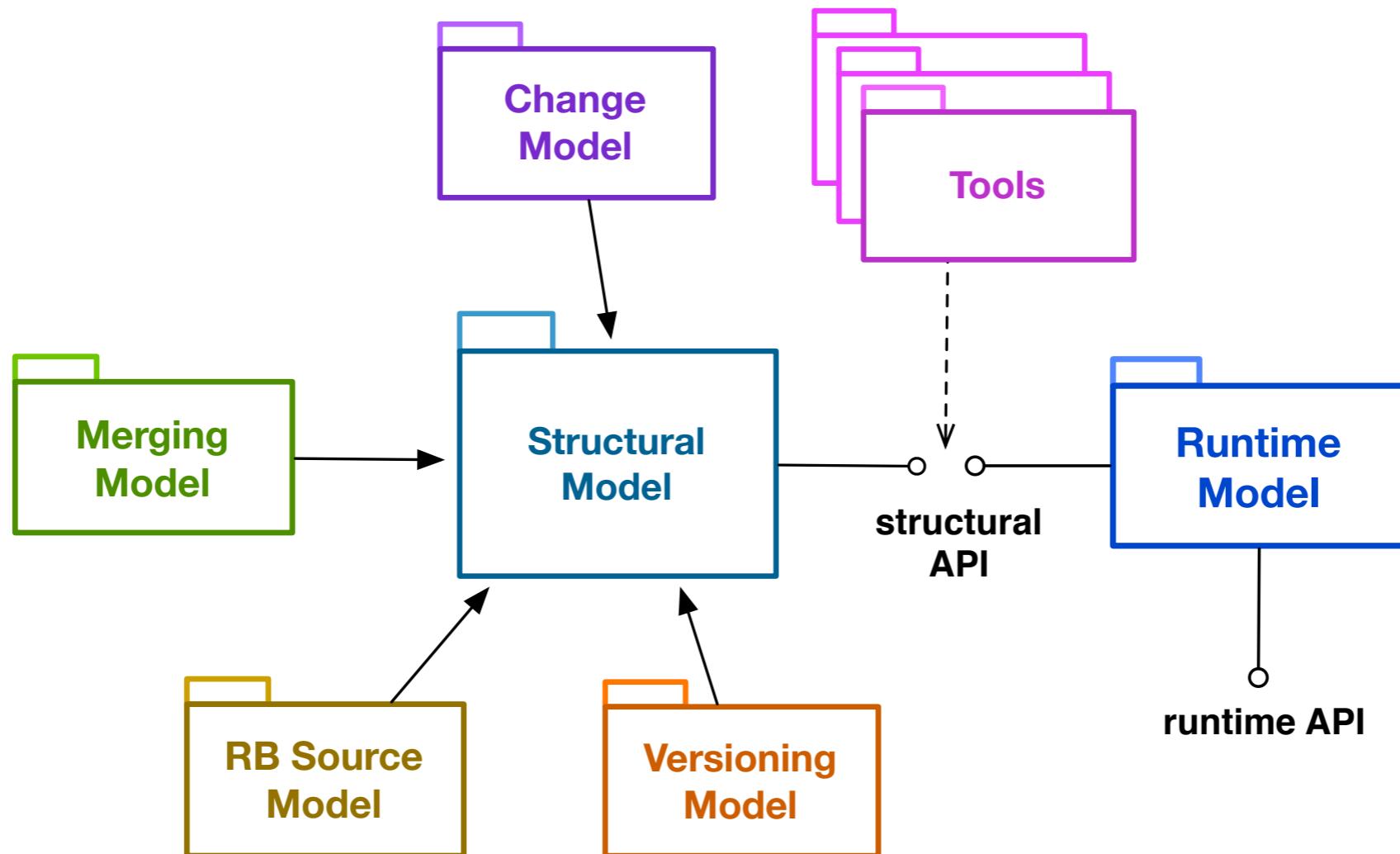
Ring Overview



Ring Overview

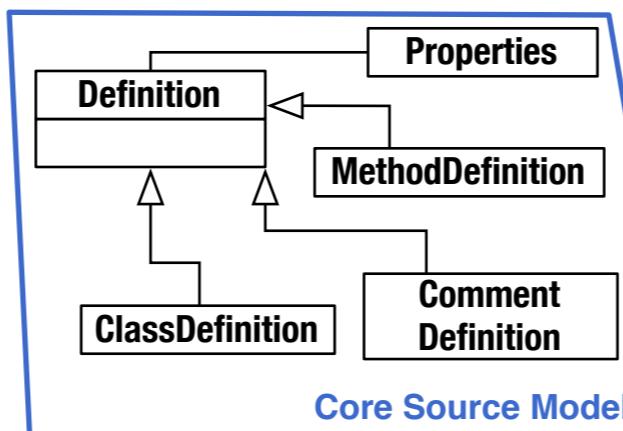


Ring Overview

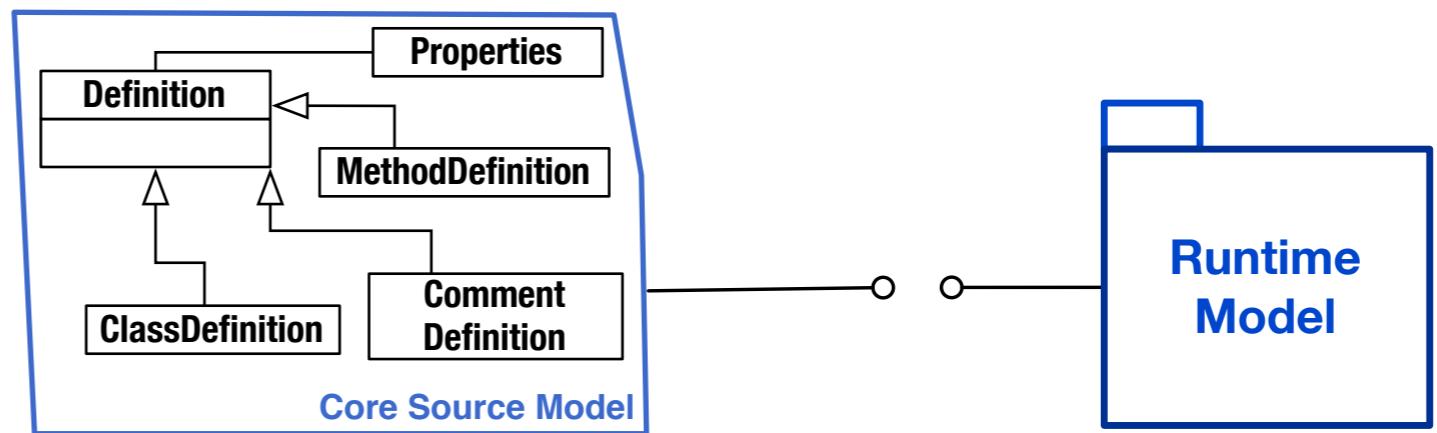


The Onion Structure of the Ring

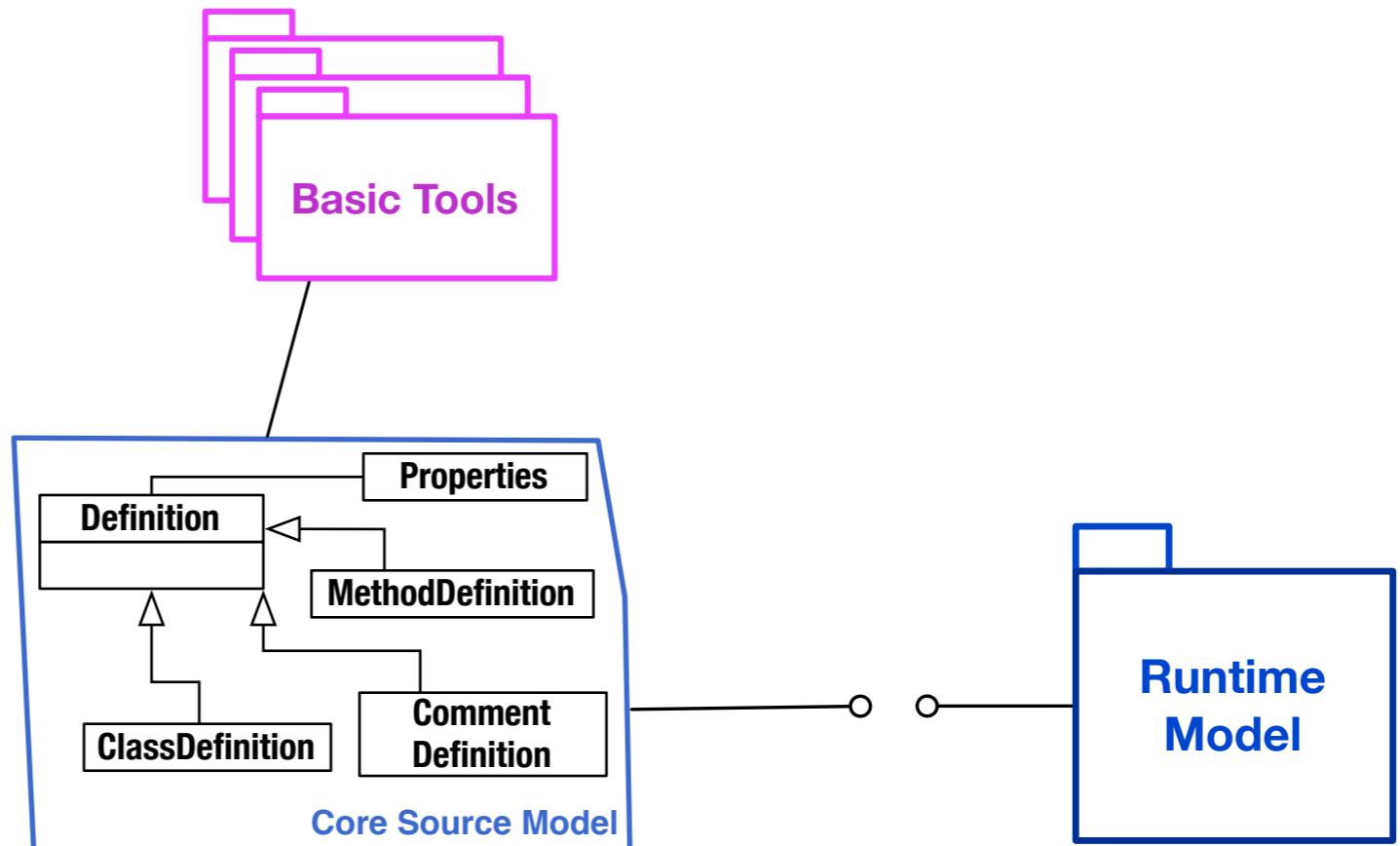
The Onion Structure of the Ring



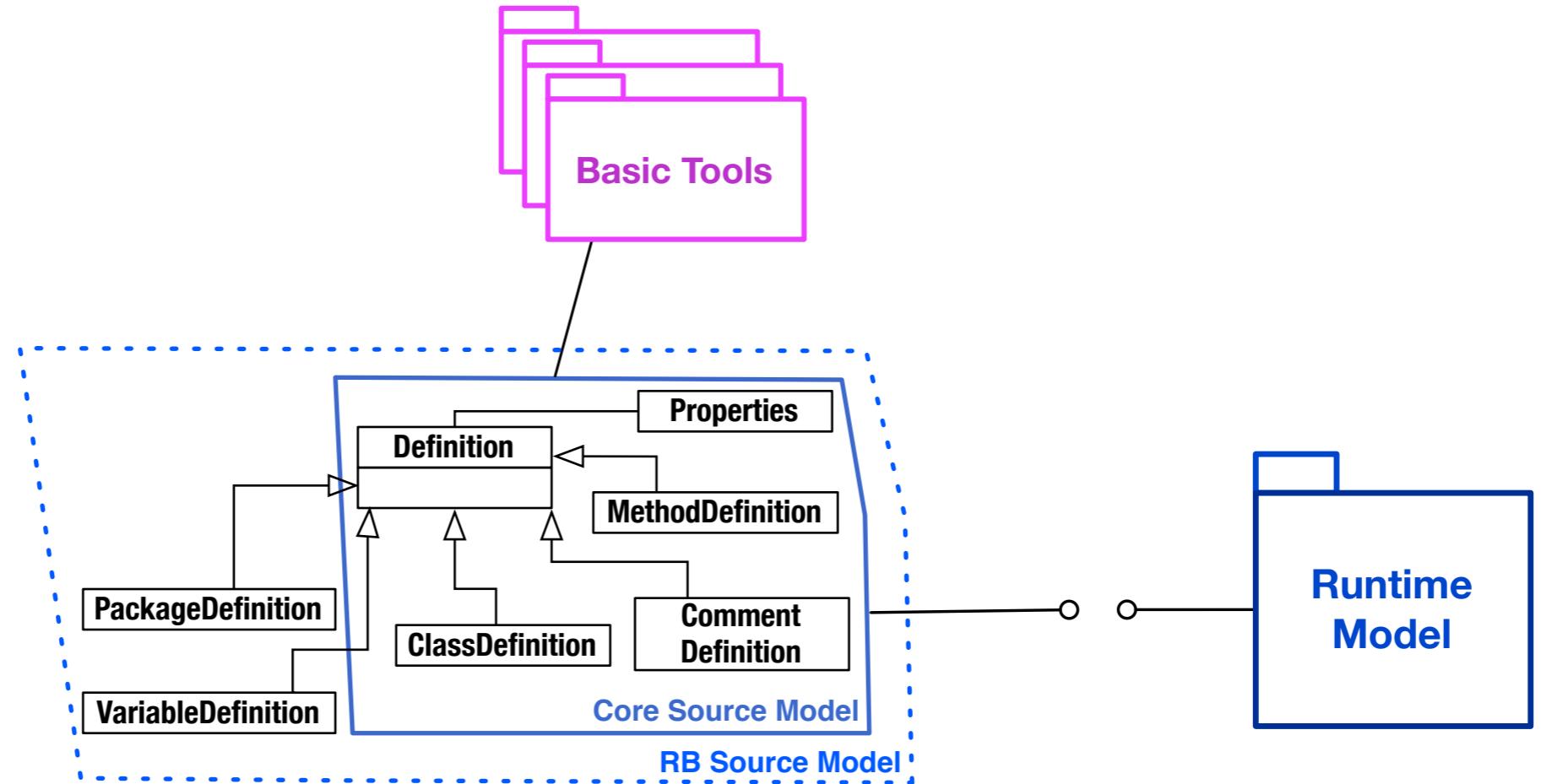
The Onion Structure of the Ring



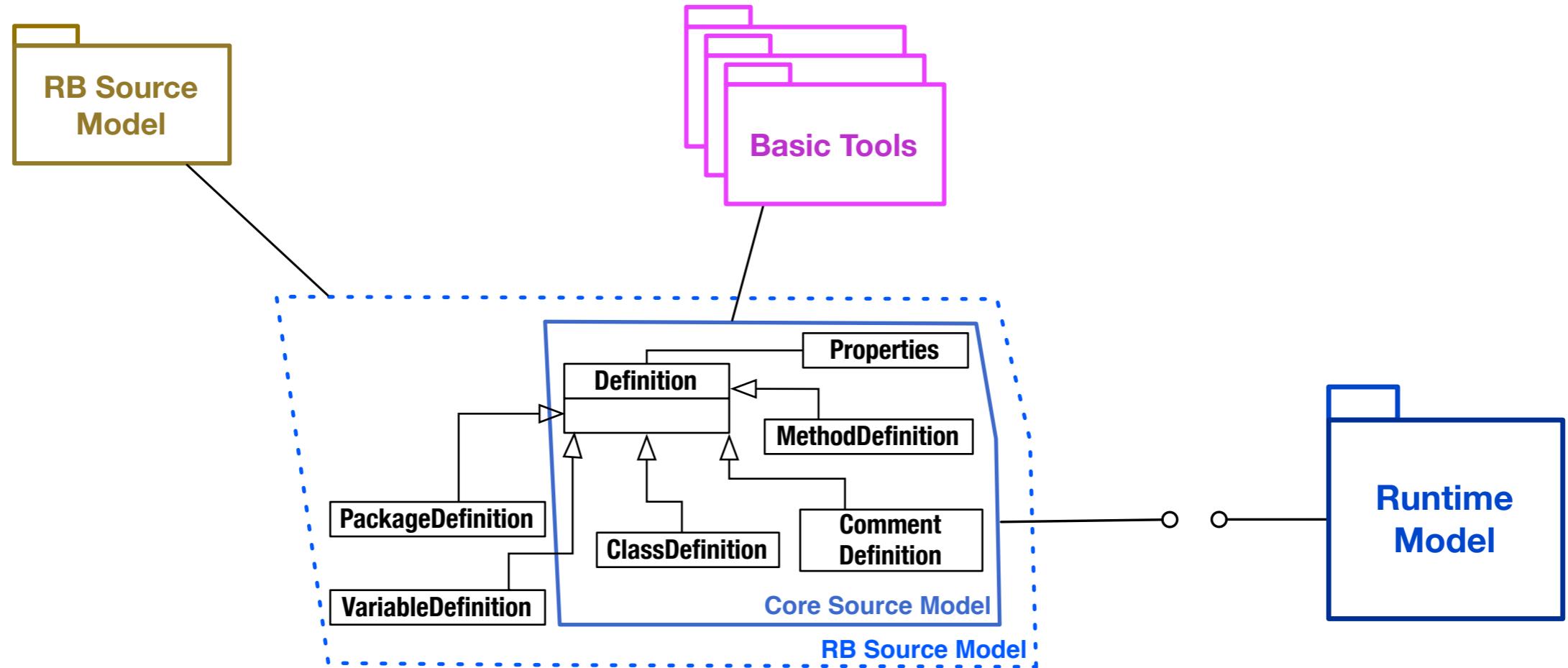
The Onion Structure of the Ring



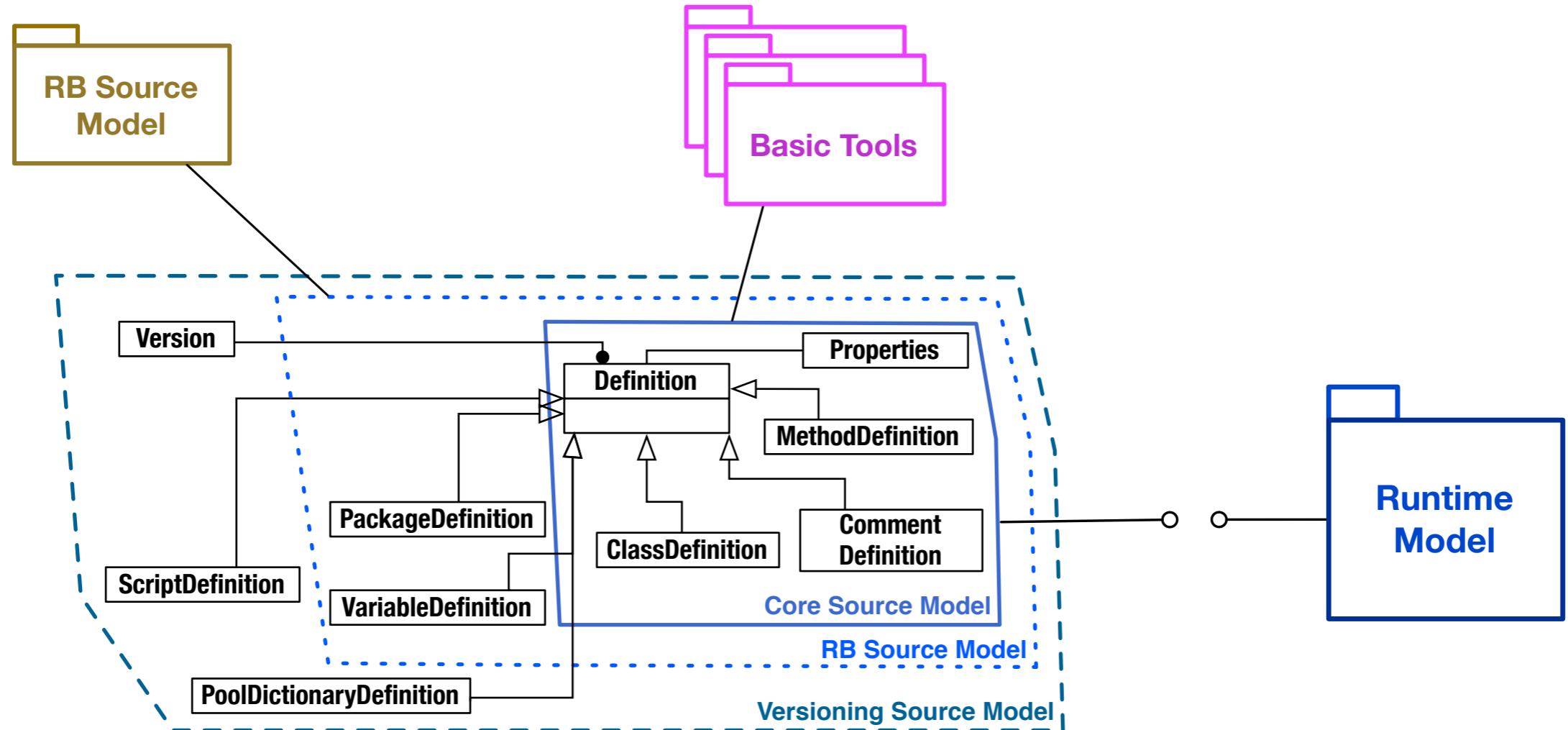
The Onion Structure of the Ring



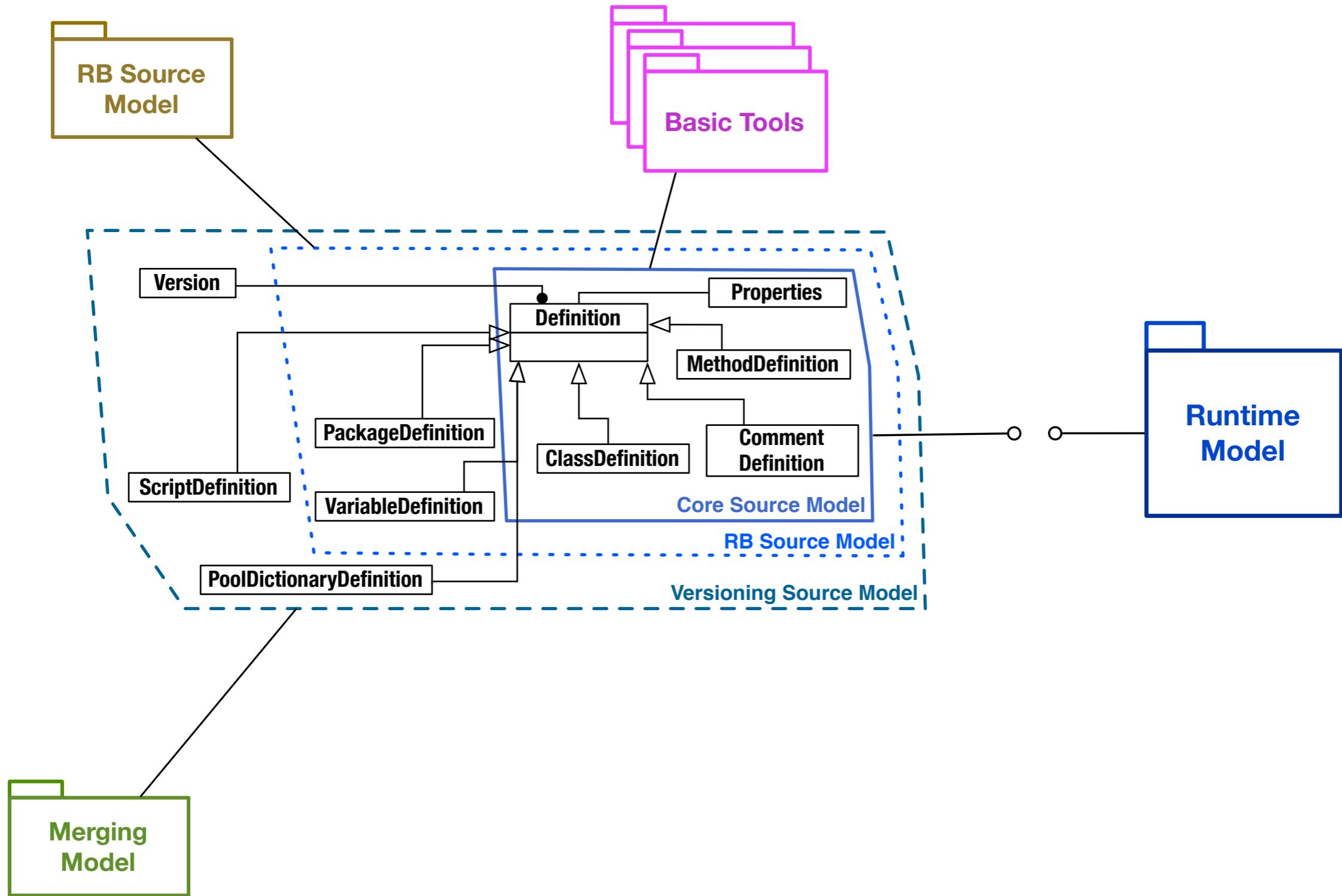
The Onion Structure of the Ring



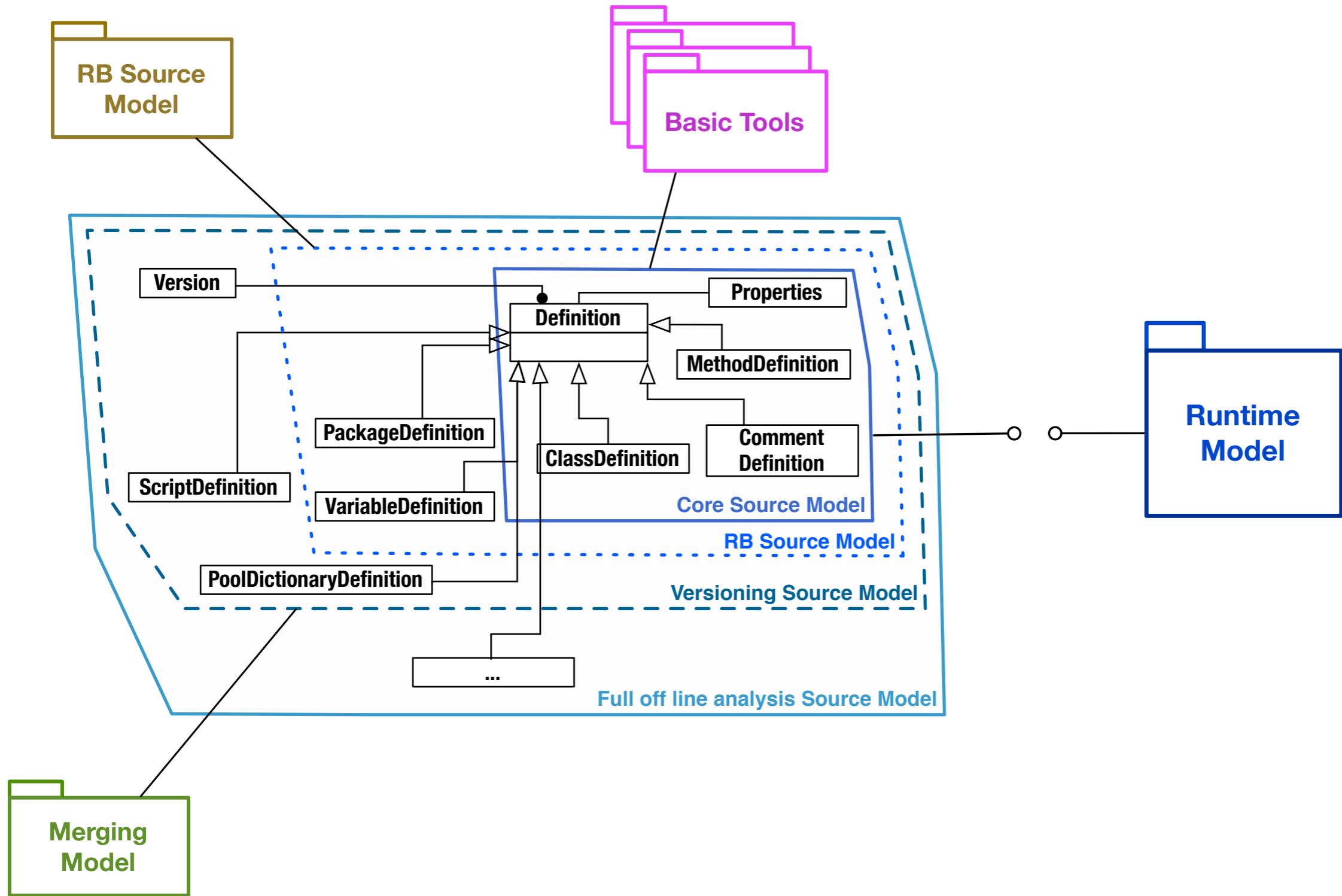
The Onion Structure of the Ring



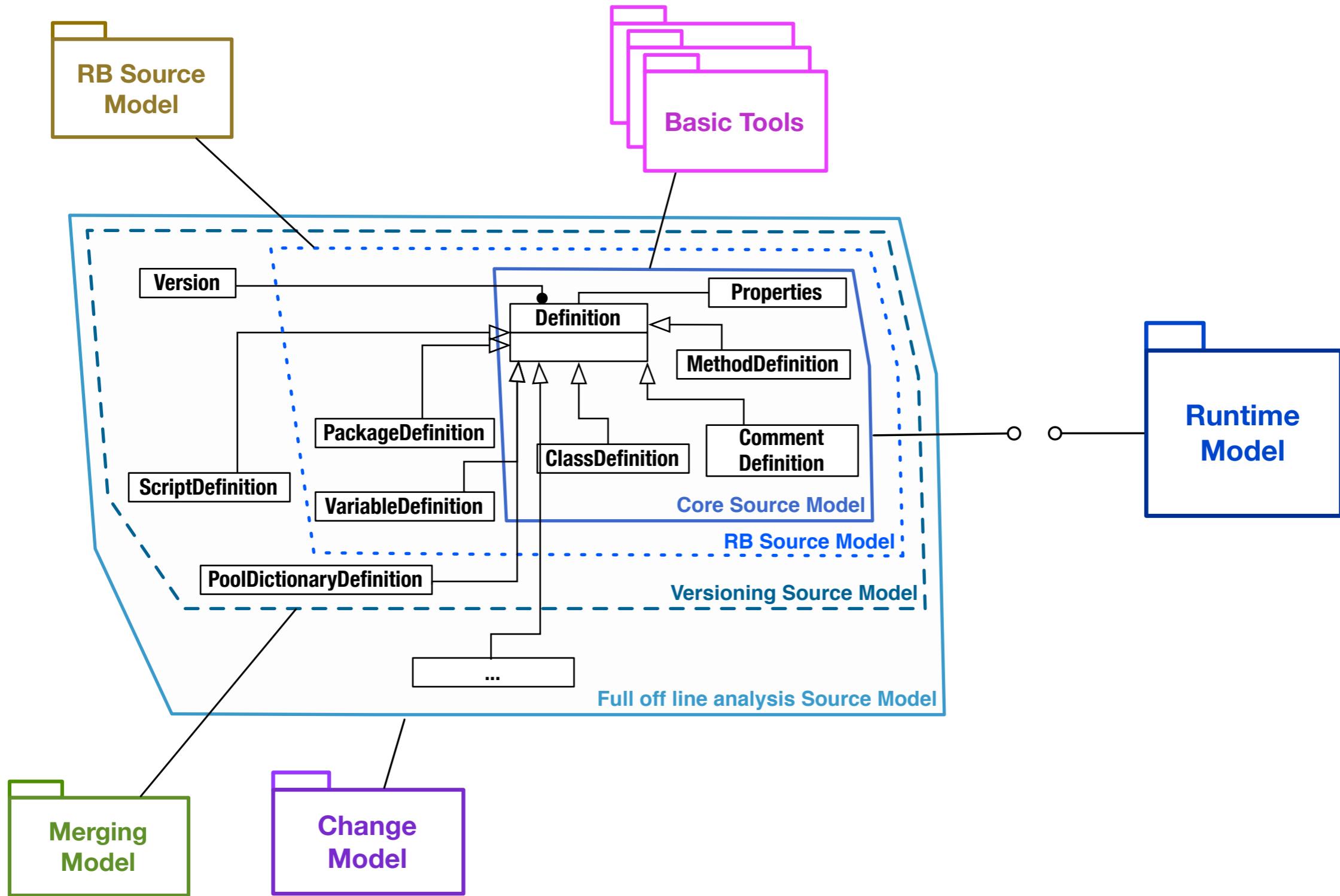
The Onion Structure of the Ring



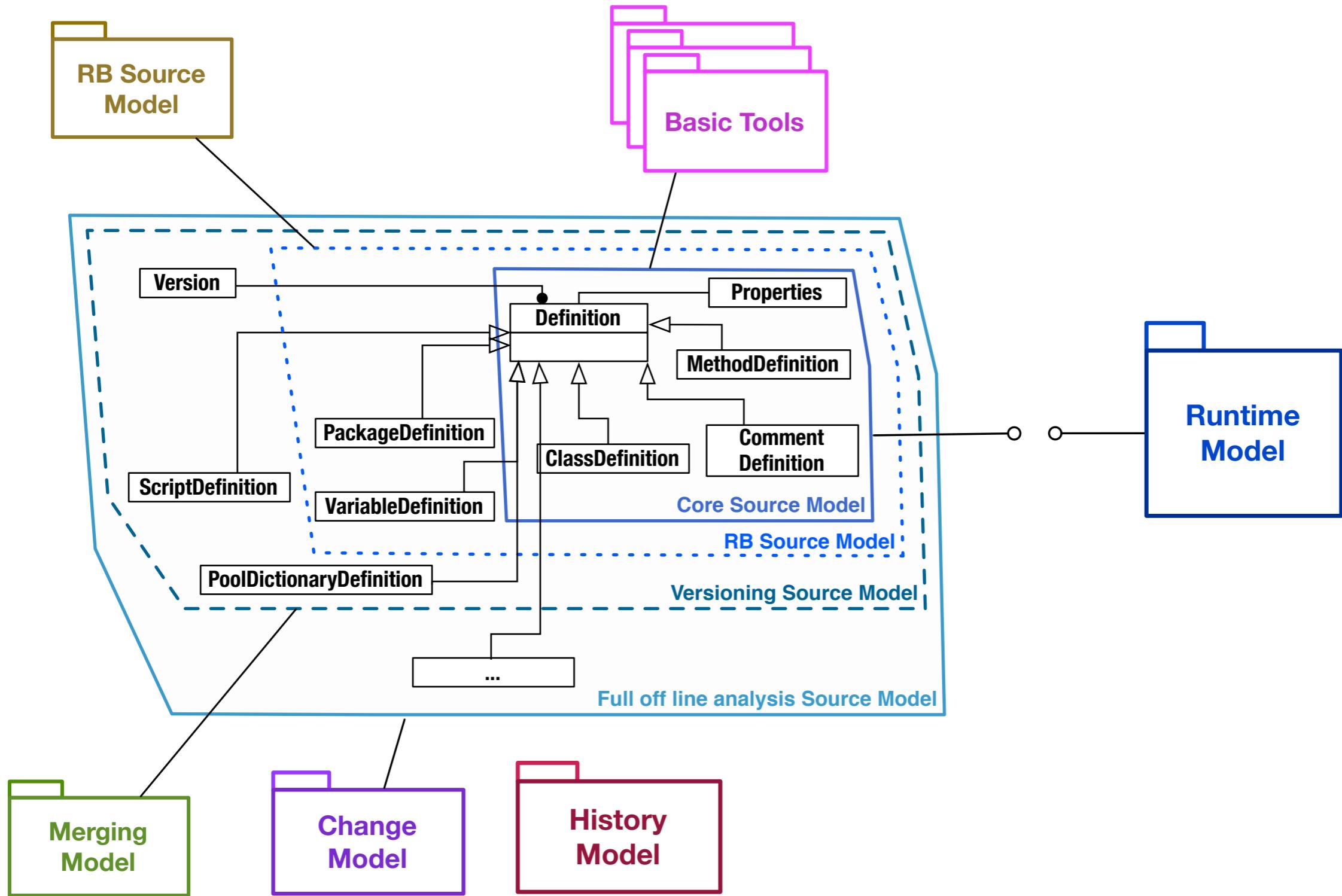
The Onion Structure of the Ring



The Onion Structure of the Ring



The Onion Structure of the Ring



Open Questions

Open Questions

- ❖ Expensive queries

Open Questions

- ❖ Expensive queries
- ❖ Version ids

Open Questions

- ❖ Expensive queries
- ❖ Version ids
- ❖ Annotations

Open Questions

- ❖ Expensive queries
- ❖ Version ids
- ❖ Annotations
- ❖ Meta-model vs. Database schema

Open Questions

- ❖ Expensive queries
- ❖ Version ids
- ❖ Annotations
- ❖ Meta-model vs. Database schema
- ❖ Core code model API

Open Questions

- ❖ Expensive queries
- ❖ Version ids
- ❖ Annotations
- ❖ Meta-model vs. Database schema
- ❖ Core code model API
- ❖ Meta-models extensibility

Open Questions

- ✿ Expensive queries
- ✿ Version ids
- ✿ Annotations
- ✿ Meta-model vs. Database schema
- ✿ Core code model API
- ✿ Meta-models extensibility
- ✿ Unifying models

Summary

Summary

- ❖ Goal:

- ◆ perform linear and cross history analysis



Summary

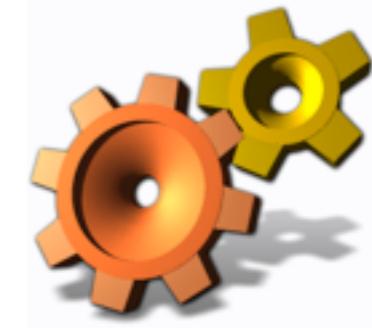
- ❖ Goal:

- ❖ perform linear and cross history analysis



- ❖ Problem:

- ❖ unsuitable infrastructure for querying the history
 - ❖ several meta-models overlapping & non-polymorphic APIs



Summary

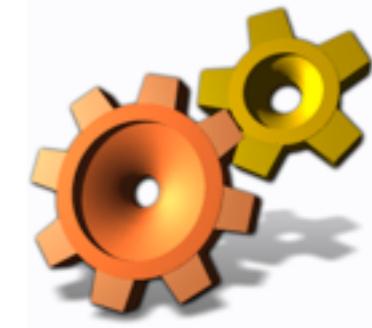
- ❖ Goal:

- ❖ perform linear and cross history analysis



- ❖ Problem:

- ❖ unsuitable infrastructure for querying the history
 - ❖ several meta-models overlapping & non-polymorphic APIs



- ❖ Proposal:

- ❖ unifying and foundational model infrastructure, Ring



Summary

❖ Goal:

- ❖ perform linear and cross history analysis



❖ Problem:

- ❖ unsuitable infrastructure for querying the history
- ❖ several meta-models overlapping & non-polymorphic APIs



❖ Proposal:

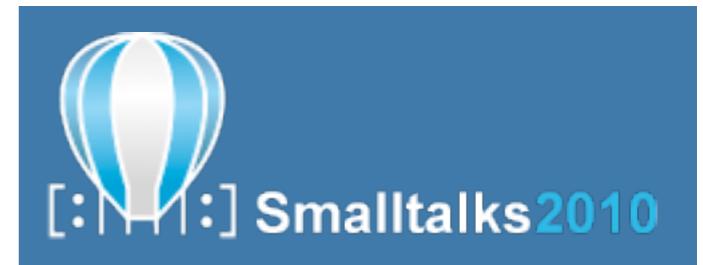
- ❖ unifying and foundational model infrastructure, Ring



❖ Current work:

- ❖ implementation of the Ring





Meta-models and Infrastructure for Smalltalk Omnipresent History

Verónica Uquillas-Gómez, vuquilla@vub.ac.be

Argentina - Nov 12th 2010

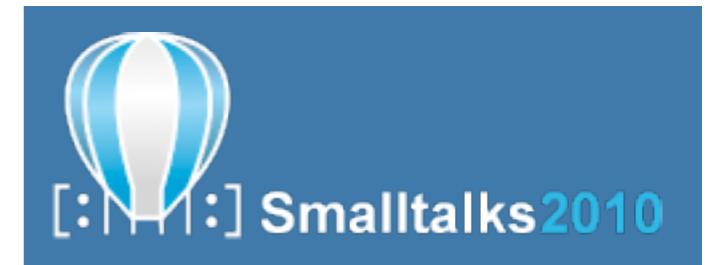


Meta-models and Infrastructure for Smalltalk Omnipresent History



Verónica Uquillas-Gómez, vuquilla@vub.ac.be

Argentina - Nov 12th 2010



Meta-models and Infrastructure for Smalltalk Omnipresent History



Verónica Uquillas-Gómez, vuquilla@vub.ac.be

Argentina - Nov 12th 2010