

# Beagle

## Implementation Report

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at the Department of Informatics  
Institute for Program Structures and Data Organization (IPD)

|                 |                                   |
|-----------------|-----------------------------------|
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# **1 Design Changes**



## 2 Implemented Tasks

Each task should be implemented in the week it belongs to and tested in the week after that.

### 2.1 Changes to the Implementation Plan

We decided to split up the PCM task (#050) into two:

- In #050A, the loading part should be implemented (read the PCM repository and store the information on the blackboard). This should be done in the first week.
- In #050B, the storing part should be implemented (convert the evaluable expressions from the blackboard to stochastic expressions and store them on the blackboard). This should be done in the last week.

### 2.2 Mandatory Tasks

All mandatory tasks have been implemented.

#### Week 1 (2016-01-11 – 2016-01-17)

|                      |  |
|----------------------|--|
| Task:                | SEFF Classes   |
| Nr:                  | #040   |
| Description/Classes: | Implement SEFFLoop, SEFFBranch, ResourceDemandingInternalAction ExternalCallParameter. |
| Depends on:          | –  |
| Implemented by:      | Roman Langrehr   |
| Tested by:           | Annika Berger  |

## 2 Implemented Tasks

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|                      |   |
|----------------------|---|
| Task:                | PCM Repository Loader   |
| Nr:                  | #050A   |
| Description/Classes: | Create a class that provides all information of the PCM which is relevant for Beagle and a factory that uses this information to create the SEFFLoops, SEFFBranches, ResourceDemandingInternalActions and ExternalCallParameters. |
| Depends on:          | #040 (SEFF classes)   |
| Implemented by:      | Ansgar Spiegler   |
| Tested by:           | Christoph Michelbach  |

|                      |   |
|----------------------|---|
| Task:                | Blackboard  |
| Nr:                  | #060  |
| Description/Classes: | Implement Blackboard.   |
| Depends on:          | –<br>(Not depending on #050 as the Blackboard only needs the class stubs for SEFFLoop, SEFFBranch, ResourceDemandingInternalAction, ExternalCallParameter and the ParameterisationDependentMeasurementResult subclasses and not their functionality). |
| Implemented by:      | Michael Vogt  |
| Tested by:           | Ansgar Spiegler   |

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|----------------------|---|
| Task:                | Blackboard Views  |
| Nr:                  | #070  |
| Description/Classes: | Implement Read-Only Measurement Controller Blackboard View, Measurement Controller Blackboard View, Read-Only Measurement Result Analyser Blackboard View, Measurement Result Analyser Blackboard View, Read-Only Proposed Expression Analyser Blackboard View, Proposed Expression Analyser Blackboard View. |
| Depends on:          | –<br>(Does not depend on #060 as the blackboard views only need the blackboard's method stubs.)   |
| Implemented by:      | Micheal Vogt  |
| Tested by:           | Ansgar Spiegler   |

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|----------------------|--|
| Task:                | Integrate Prototype for Context Menus                  |
| Nr:                  | #080   |
| Description/Classes: | Integrate the prototype for Context Menus into Beagle. |
| Depends on:          | #010   |
| Implemented by:      | Roman Langrehr   |
| Tested by:           | Michael Vogt   |

|                      |   |
|----------------------|---|
| Task:                | Integrate Prototype for Eclipse Extension Points                  |
| Nr:                  | #090  |
| Description/Classes: | Integrate the prototype for Eclipse Extension Points into Beagle. |
| Depends on:          | #020  |
| Implemented by:      | Roman Langrehr  |
| Tested by:           | Michael Vogt  |

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|----------------------|--|
| Task:                | Prototype for GUI                                      |
| Nr:                  | #100   |
| Description/Classes: | Integrate the prototype for Context Menus into Beagle. |
| Depends on:          | #030   |
| Implemented by:      | Christoph Michelbach                                   |
| Tested by:           | Micheal Vogt   |

## Week 2 (2016-01-18 – 2016-01-24)

|                      |   |
|----------------------|---|
| Task:                | Implement Evaluable Expressions   |
| Nr:                  | #110  |
| Description/Classes: | Implement all subclasses of the interface <code>EvaluableExpression</code> .<br>(Package “Evaluable Expressions”) |
| Depends on:          | –   |
| Implemented by:      | Annika Berger   |
| Tested by:           | Joshua Gleitze  |

## 2 Implemented Tasks

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|                      |   |
|----------------------|---|
| Task:                | Implement Measurement Results   |
| Nr:                  | #120  |
| Description/Classes: | Implement ParameterisationDependentMeasurementResult and all of its subclasses. (Package “Measurement”) |
| Depends on:          | –   |
| Implemented by:      | Roman Langrehr  |
| Tested by:           | Annika Berger   |

|                      |   |
|----------------------|---|
| Task:                | Implement Measurement Order                 |
| Nr:                  | #125  |
| Description/Classes: | Implement MeasurementOrder and CodeSection. |
| Depends on:          | #040 (SEFF Classes)                         |
| Implemented by:      | Roman Langrehr                              |
| Tested by:           | Annika Berger                               |

|                      |   |
|----------------------|---|
| Task:                | Implement Blackboard Controllers                      |
| Nr:                  | #130  |
| Description/Classes: | Implement BeagleController and MeasurementController. |
| Depends on:          | #060 (Blackboard) and #070 (Blackboard Views)         |
| Implemented by:      | Christoph Michelbach                                  |
| Tested by:           | Roman Langrehr  |

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|----------------------|--|
| Task:                | Implement Final Judge  |
| Nr:                  | #137   |
| Description/Classes: | Implement Final Judge.   |
| Depends on:          | #060 (Blackboard) and #120 (Measurement Results)<br>(Not depending on #160 (Fitness Function), because only method stubs are needed here.) |
| Implemented by:      | Christoph Michelbach   |
| Tested by:           | Joshua Gleitze   |



**Week 3 (2016-01-25 – 2016-01-31)**

|                      |   |
|----------------------|---|
| Task:                | Kieker Measurement Tool   |
| Nr:                  | #140  |
| Description/Classes: | Build a <code>MeasurementTool</code> executing Kieker.  |
| Depends on:          | #120 (Measurement Results), #060 (Blackboard), #070 (Blackboard Views), #040 (SEFF classes) and #125 (Measurement Order). |
| Implemented by:      | Joshua Gleitze  |
| Tested by:           | Annika Berger   |

|                      |   |
|----------------------|---|
| Task:                | Averaging Measurement Result Analyser   |
| Nr:                  | #150  |
| Description/Classes: | Build a <code>MeasurementResultAnalyser</code> which takes a <code>ConstantExpression</code> as final <code>EvaluableExpression</code> for each <code>MeasurableSeffElement</code> with the average of all available measurement results. |
| Depends on:          | #120 (Measurement Results), #060 (Blackboard), #070 (Blackboard Views), #040 (SEFF classes) and #133 (tool helper classes).   |
| Implemented by:      | Ansgar Spiegler   |
| Tested by:           | Annika Berger   |

|                      |   |
|----------------------|---|
| Task:                | Implement Evaluable Expression Fitness Function               |
| Nr:                  | #160  |
| Description/Classes: | Implement a <code>EvaluableExpressionFitnessFunction</code> . |
| Depends on:          | #120 (Measurement Results) and #040 (SEFF classes)            |
| Implemented by:      | Christoph Michelbach  |
| Tested by:           | Annika Berger   |

**Week 4 (2016-02-08 – 2016-02-14)**

|                      |   |
|----------------------|---|
| Task:                | PCM Repository Storer   |
| Nr:                  | #050B   |
| Description/Classes: | Create a class that writes back all information from the blackboard to the PCM. |
| Depends on:          | #040 (SEFF classes) #110 (Evaluable Expressions)                                |
| Implemented by:      | Ansgar Spiegler   |
| Tested by:           | Annika Berger   |

### Tasks Not Covered by the Implementation Plan

|                      |  |
|----------------------|--|
| Task:                | Facade   |
| Nr:                  | –  |
| Description/Classes: | We realised that the communication between the GUI and Beagle Core is complex because in addition to what we planned, the GUI has to pass information about the project to analyse, e.g. to be able to access the source code files. This is the reason for <code>BeagleController</code> being now more than a controller. It is a facade with some additional classes.<br>The <code>UserConfiguration</code> has been renamed to <code>BeagleConfiguration</code> because it is involved in the facade, too. |
| Depends on:          | –  |
| Implemented by:      | Joshua Gleitze, Chirstoph Michelbach, Roman Langrehr   |
| Tested by:           | Annika Berger  |

### 2.3 Optional Tasks

#### Week 1 (2016-01-11 – 2016-01-17)

|                      |  |
|----------------------|--|
| Task:                | Gradle   |
| Nr:                  | –  |
| Description/Classes: | Our project can be build automatically using gradle. |
| Depends on:          | –  |
| Implemented by:      | Joshua Gleitze                                       |
|                      |  |

**Week 3 (2016-01-25 – 2016-01-31)**

|                      |   |
|----------------------|---|
| Task:                | Fail API  |
| Nr:                  | -   |
| Description/Classes: | On many parts of our project, errors which can't be handled where they emerge can occur. E.g. a source file from the project under test can't be read or doesn't compile.<br>Therefore, we created the "Fail API": Everywhere in our project, these exceptions are reported to the "Fail API" and handled there. At the moment, the Fail API only throws an exception but when we want these exceptions to be reported to the user so the user can choose in a dialogue whether to abort or to retry, this has to be changed only in the Fail API and not on multiple places in the code. |
| Depends on:          | -   |
| Implemented by:      | Joshua Gleitze  |
| Tested by:           | Michael Vogt  |

**2.3.1 Preparation for Other Optional Tasks**

We did a lot of preparation to implement the following optional tasks:

- Parametrisation of the results.
- Using genetic programming for the analysis.

The classes for the parameterisation were created (but are empty) and are used by all classes which don't depend on the implementation of them.

For the genetic programming approach, we already created the fitness function. The tools which combine results to the next generation can be added easily as new `ProposedExpressionAnalysers`.



### 3 Delays

Most of the tasks were scheduled to be done during the first and second week which lead to some small delays. Some of the tasks of the first week were finished in the second week and some of the tasks in the second week were finished in the third week. The tasks for the third week were therefore started at the end of the third week and we used the empty week four for them, too.

Getting these delays was intentional because starting many tasks at the beginning allowed us to recognise which tasks can be implemented fast and which tasks are complicated and therefore need more time early in the implementation phase. These tasks were:

- The PCM connection and the context menus because nobody in our team had experience with the EMF framework and a lot of problem arose and caused delays.
- The Kieker measurement tool because we had to instrument the code on our own.



## 4 Unit Tests

Everything that can be meaningfully tested with JUnit Tests is tested with JUnit tests. The only parts not tested with JUnit tests are:

- The GUI classes because it is not possible to test GUIs meaningfully with JUnit. Instead, we created a document describing what should be done to test the GUI manually.
- The extension points are not tested with JUnit tests because an automated test would rather test the Eclipse extension point mechanism and not whether we used it correctly. Instead, we created some Eclipse plugins with stubs for `MeasurementTool`, `MeasurementResultAnalyser`, and `ProposedExpressionAnalyser` which use the extension point of Beagle Core. Additionally, we created a plugin having `BeagleCore` as a dependency which adds a button to Eclipse allowing the user to see all tools loaded by Beagle Core (using Beagle Core's classes for that). For manual testing of the extension points, a document describing the process and the relevant parts to be tested has been added.

Detailed information on each JUnit test can be found in the Javadoc of the particular test.