



Requirements Management Tool rmtoo

Details

by flonatel GmbH & Co. KG

Version 3

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1. Audience

Audience

- Anybody who is interested in open source requirements management tools.
- Anybody looking for a good and usable requirements management tool.
- Prerequisite for this presentation: basic knowledge of rmtoo – as described in *rmtoo – Overview and Feature Set*

2. Requirements

Requirements: Major Attrs

- Requirements have a fixed set of attributes
- Major attributes:
 - Name: headline of the requirement
 - Description: content of the requirement
 - Id: unique id used for referencing
 - Depends on: / Solved by: create dependencies between requirements
 - Topic: assignment to topic

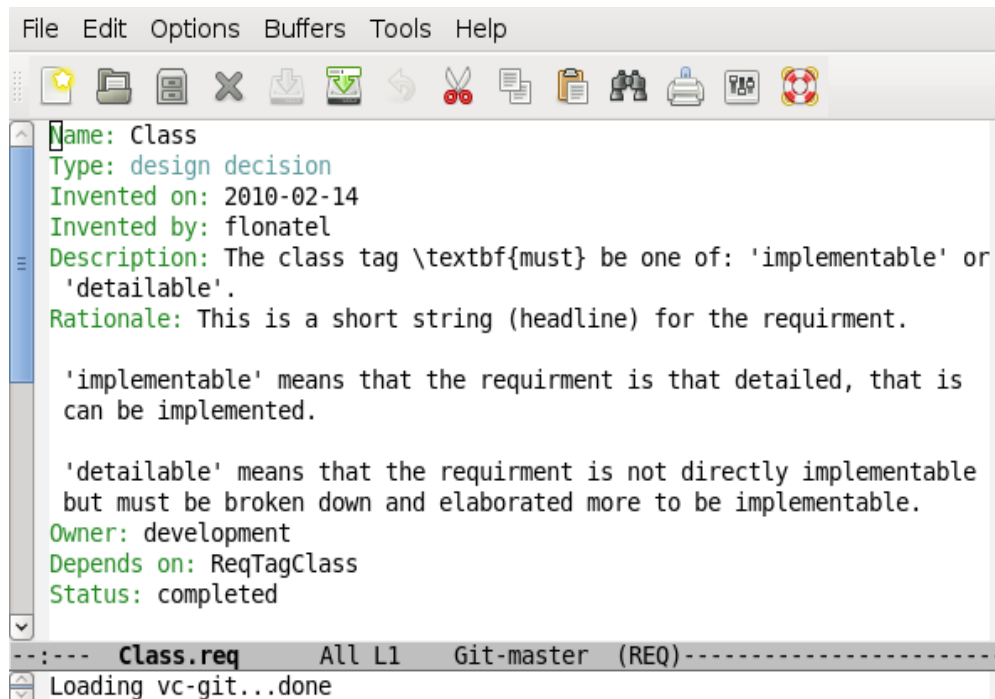
Requirements: Minor Attrs

- Minor attributes:
 - Rational: and Note: details of the description and further information
 - Invented on / by and Owner
 - Type: requirement or design decision
 - Status: finished or not done
 - Priority / Effort Estimation / Class: handling of agile development approach

Input Files

- Input files are plain text files
- Each requirement is noted as a list of key-value pairs
- Each attribute is mapped to a tag
- Files can be handled by most *nix commands (sed, streplace, awk, grep, ...)
- Version control can be carried out by version control system

Input File Example



The screenshot shows a text editor window with a menu bar (File, Edit, Options, Buffers, Tools, Help) and a toolbar. The text content is as follows:

```
Name: Class
Type: design decision
Invented on: 2010-02-14
Invented by: flonatel
Description: The class tag \textbf{must} be one of: 'implementable' or
'detailable'.
Rationale: This is a short string (headline) for the requirement.

'implementable' means that the requirement is that detailed, that is
can be implemented.

'detailable' means that the requirement is not directly implementable
but must be broken down and elaborated more to be implementable.
Owner: development
Depends on: ReqTagClass
Status: completed
```

The status bar at the bottom shows: --:-- Class.req All L1 Git-master (REQ)----- and a message "Loading vc-git...done".

- Simple *key: value* notation
- Space in first column: extend value
- Keys are fixed (predefined)
- Values are checked whenever possible
- Editable with standard text editor

3. Topics

Topics

- Topics are the way requirements are organized
- They provide the structure of the output document(s)
- Each requirement must be assigned to a topic

The Idea behind Topics

- Each topic represents one chapter
- Name is the headline
- Text is additional text
- Subtopics are sub-chapters / sections
- Requirements which are assigned to a topic are printed in the corresponding chapter

Topic Attributes

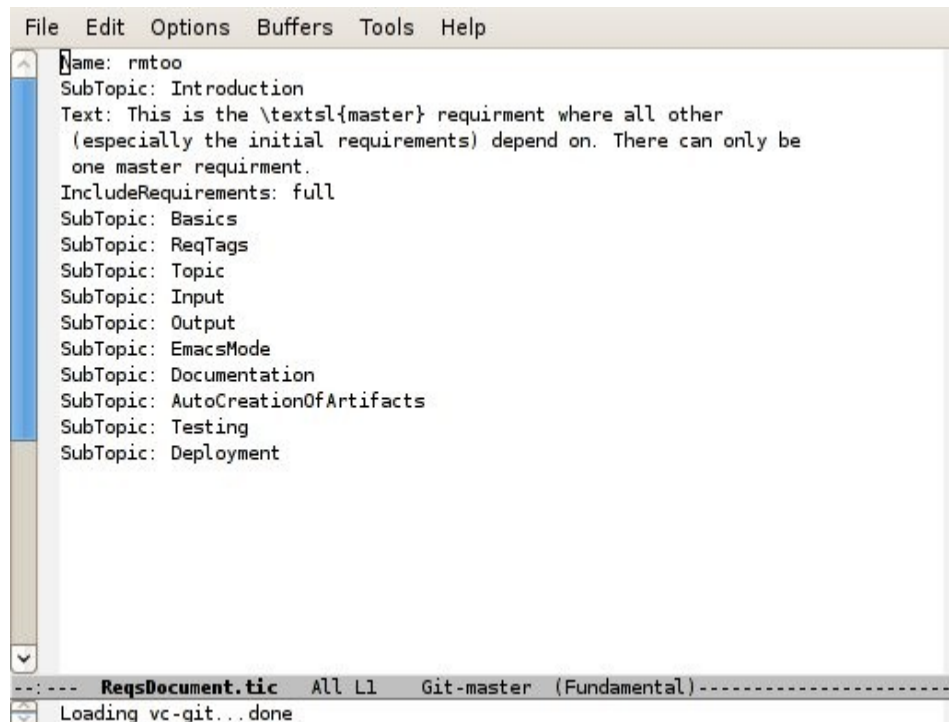
- A topic contains
 - Name: a headline
 - Text: arbitrary text for explanations
 - IncludeRequirements: all requirements contained in the topic
 - Subtopic: other topics
- As many subtopics and texts can be included as necessary

Input Files

- Input file format is generally exactly the same as the input file format for requirements.

Input File Example

- Same format as the requirements input files



The screenshot shows an Emacs editor window with a menu bar (File, Edit, Options, Buffers, Tools, Help) and a text area containing the following text:

```
Name: rmt00
SubTopic: Introduction
Text: This is the \textsl{master} requirment where all other
      (especially the initial requirements) depend on. There can only be
      one master requirment.
IncludeRequirements: full
SubTopic: Basics
SubTopic: ReqTags
SubTopic: Topic
SubTopic: Input
SubTopic: Output
SubTopic: EmacsMode
SubTopic: Documentation
SubTopic: AutoCreationOfArtifacts
SubTopic: Testing
SubTopic: Deployment
```

At the bottom of the window, there is a status bar showing the file name **ReqsDocument.tic**, the buffer **All L1**, the branch **Git-master**, and the mode **(Fundamental)**. Below the status bar, a message line indicates **Loading vc-git... done**.

4. Configuration

Configuration

- Configuration file includes details about
 - Input requirements: location and version
 - Input topic sets (multiple possible)
 - Processing: checks to perform
 - Output artifacts: configuration of all aspects for different output formats
 - Stakeholder
 - Authors

5. Processing

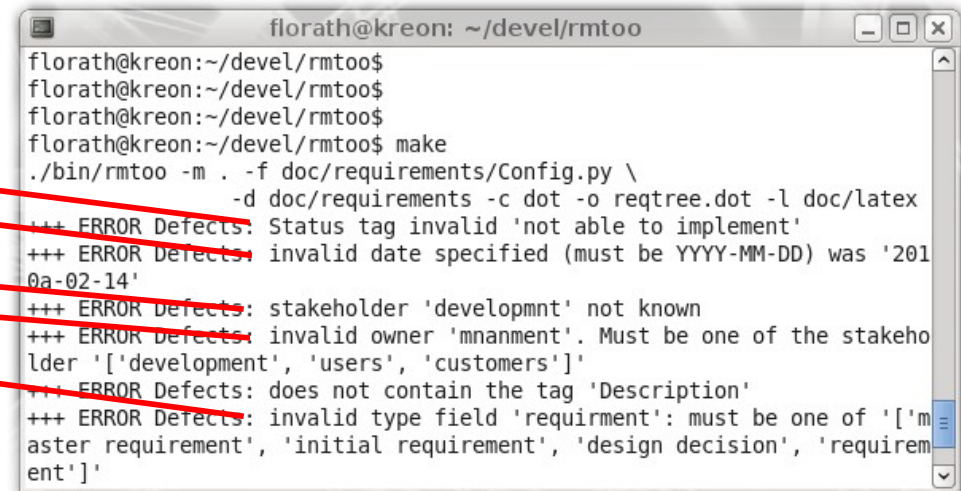
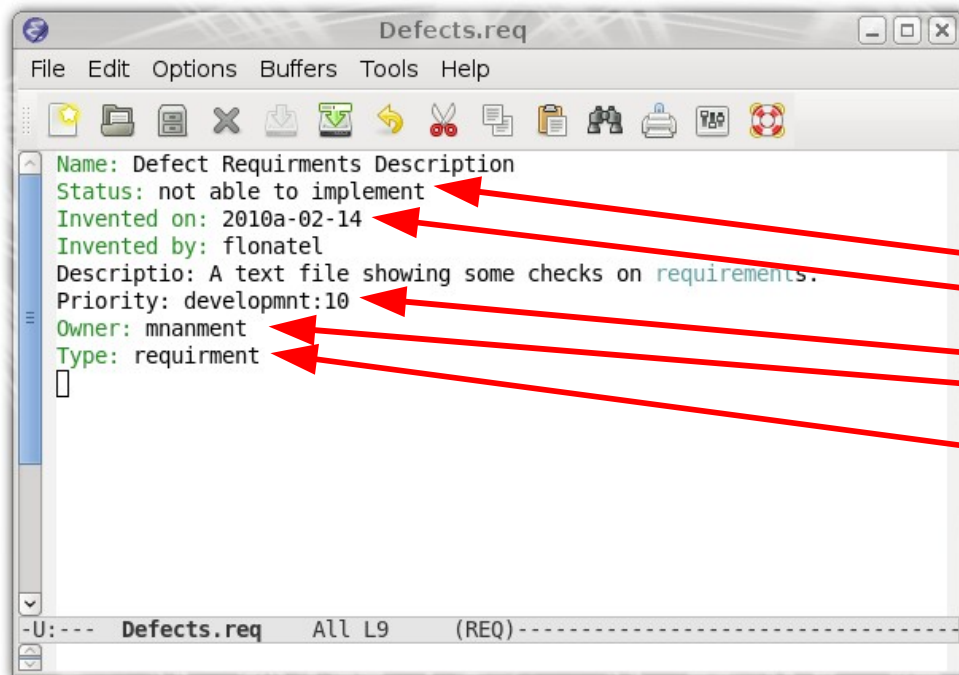
Processing

- rmtoo reads in
 - Requirements files
 - Topic files
 - Configuration file
- Parses and checks all input files
- Creates the configured output artifacts

Checking Requirements

- Consistency checks are carried out
- Checks include:
 - Syntax / formatting checks e.g. for date fields
 - Type checks: some fields are allowed to contain only a limited set of (key)words
 - Typo checks e.g. for owners
 - Dependency checks
- Problems are directly reported

Example: Checks



Requirements' Quality

- *rmtoo* supports some heuristics to check the quality of requirements
- Each heuristic evaluates the requirement and adds or subtracts a number of points
- If the resulting point count is negative a warning is generated

Heuristics

- Good requirements
 - contain only one short sentence
 - use words like *must*, *exactly*
- Bad requirements
 - use enumerations
 - use words like *may*, *possible*, *and*, *or*

Output Artifacts

- If all checks succeed, the configured artifacts are created.
- It is possible to have a whole set of different output documents – based on different topics.
- All different output artifacts are handled during a single run of *rmtoo*.

6.Output Artifacts

Requirements Document – Requirements
Dependency Graph – Project Backlog – Project
Elaboration List – Requirements Count Stats –
Commercial Pricing

Output: Requirements Document

- *rmtoo* can create a requirements document containing all requirements
- Intermediate output format of requirements is LaTeX using hyperref
- Resulting documents can be PDF and HTML for example
- Links in table of contents and dependencies available in PDF and HTML
- Arbitrary text can be added

Output: Table of Contents (PDF)

Contents

| | |
|-------------------------------------|-----------|
| 1 Status | 5 |
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| 5 Implementation Decisions | 13 |
| 5.1 Use Text | 13 |
| 5.2 Use Python | 13 |
| 5.3 Traceability | 14 |

- Each requirement fits into it's own subsection
- Hyperlinks for fast navigation

Output: Requirement (PDF)

4.3 Requirements Invented By

Description: Each requirement **must** have a 'invented by' tag.

Rationale: This names the original (initial) author of the requirement.

Note: None

Depends on: 3.1 rmt00 must work on Requirements,

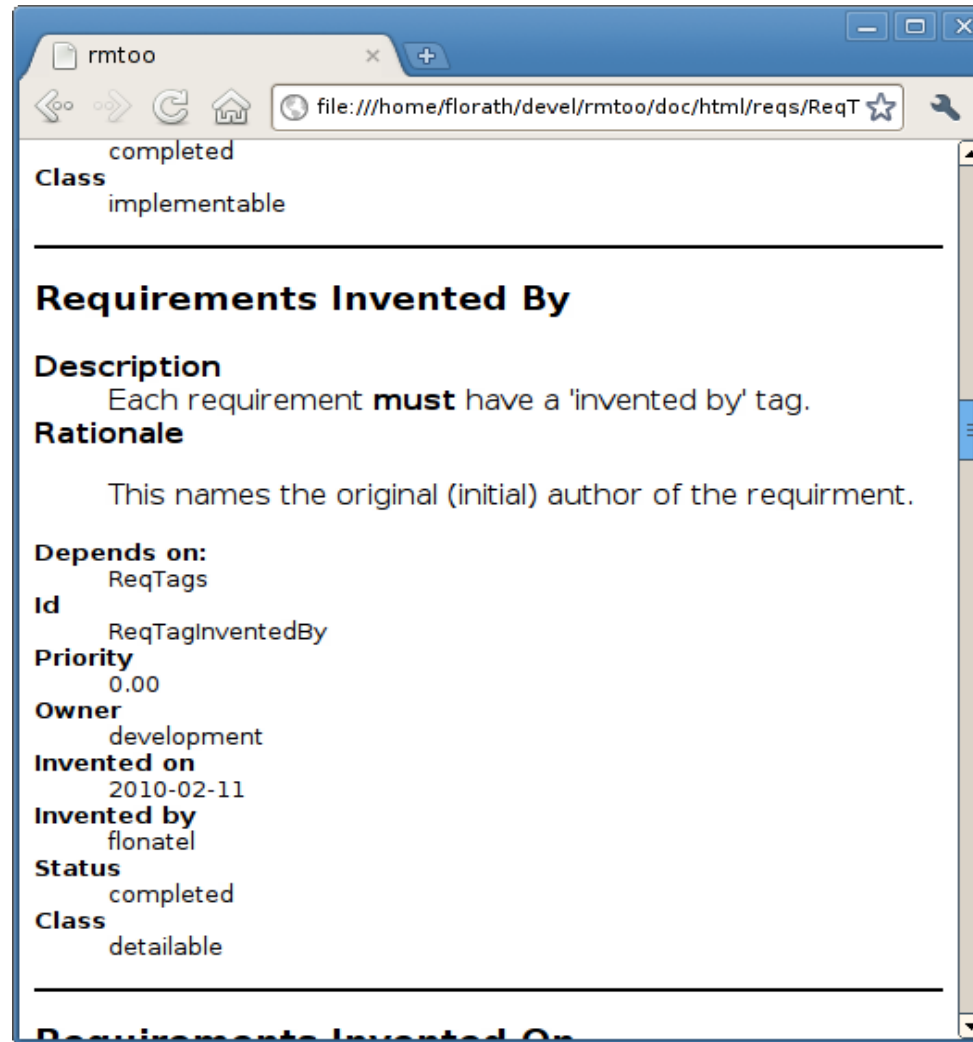
| | | | | | |
|---------------------|------------------|---------------------|----------|----------------|-------------|
| Id: | ReqTagInventedBy | Priority: | 0.00 | Owner: | development |
| Invented on: | 2010-02-11 | Invented by: | flonatel | Status: | completed |
| Class: | detaillable | | | | |

- Each requirement fits into it's own subsection

All input key-values are available

- Hyperlinks to dependencies for fast navigation

Output: HTML Output



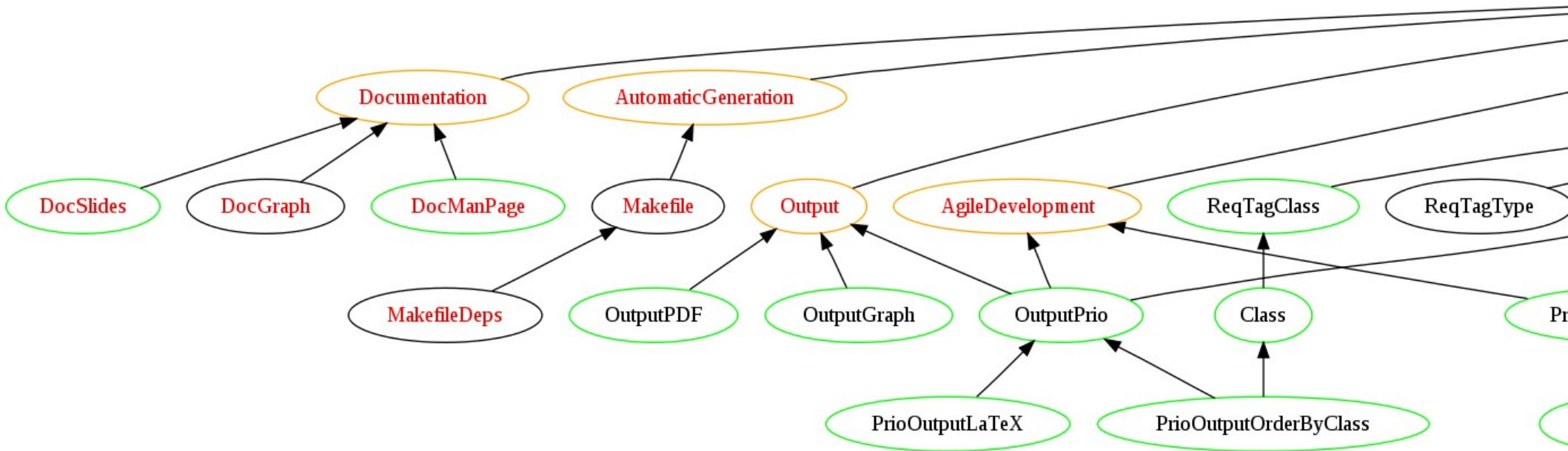
6.Output Artifacts

Requirements Document – Requirements
Dependency Graph – Project Backlog – Project
Elaboration List – Requirements Count Stats –
Commercial Pricing

Output: Dependency Graph

- *rmtoo* can create a requirement dependency graph
- Visualize requirements dependencies
- Color coded status information. For example: red font means open, black font means completed

Output: Dependency Graph Example (Part)



6.Output Artifacts

Requirements Document – Requirements
Dependency Graph – Project Backlog – Project
Elaboration List – Requirements Count Stats –
Commercial Pricing

Output: Project Backlog

- *rmtoo* can create the project backlog as used in SCRUM
- The project backlog contains all the requirements which have been elaborated upon (which means they can be implemented)
- The project backlog is the ToDo list for the developers
- Requirements are sorted by priority

Output: Project Backlog Example

1.1 Backlog

| Prio | Chap | Requirement Id | EfE | Sum |
|-------|------|--|-----|-----|
| 10.00 | 12.2 | Test Before Packaging | 3 | 3 |
| 2.40 | 11.1 | Makefile | 5 | 8 |
| 2.06 | 9.6 | Man Page Artifact Elaboration List | 3 | 11 |
| 2.06 | 9.7 | Man Page Requirements Dependency Graph | 3 | 14 |
| 2.06 | 9.4 | Man Page LaTeX Output | 3 | 17 |
| 2.06 | 9.8 | Man Page Emacs Mode | 3 | 20 |
| 2.06 | 9.9 | Man Page Artifact Backlog | 3 | 23 |
| 1.68 | 11.2 | Makefile Dependencies | 8 | 31 |

- Prioritized list of requirements
- Hyperlinks for fast navigation
- Effort estimation included
- Embedded in the PDF / HTML document

6.Output Artifacts

Requirements Document – Requirements
Dependency Graph – Project Backlog – Project
Elaboration List – Requirements Count Stats –
Commercial Pricing

Output: Project Elaboration List

- *rmtoo* can create a list of all requirements that must be further elaborated upon
- The Elaboration List is the ToDo list for the SCRUM master
- Requirements are sorted by priority

Output: Project Elaboration List Example

1.2 Requirements Elaboration List

| Prio | Chap | Requirement Id | EfE | Sum |
|-------|------|--|-----|-----|
| 10.00 | 3.1 | rmtoo must work on Requirments | 3 | 3 |
| 10.00 | 2.1 | rmtoo | 5 | 8 |
| 10.00 | 12.3 | Test Integration | 13 | 21 |
| 10.00 | 12.5 | Test Tool: python-nose | 5 | 26 |
| 10.00 | 3.9 | Ease of Use | 3 | 29 |
| 10.00 | 12.1 | rmtoo Automated Testing | 3 | 32 |
| 10.00 | 13.1 | Packaging | 3 | 35 |
| 10.00 | 12.4 | Unit Testing | 13 | 48 |
| 9.00 | 3.3 | Simplicity | 21 | 69 |
| 8.10 | 5.1 | Checks | 8 | 77 |
| 6.30 | 8.1 | Emacs Mode | 8 | 85 |
| 6.00 | 3.5 | Easy Extensible | 5 | 90 |
| 5.50 | 3.8 | Documentation | 3 | 93 |
| 5.00 | 3.2 | Agile Development Process | 5 | 98 |
| 4.41 | 8.2 | Emace Mode to Support Traceability | 3 | 101 |
| 4.12 | 9.1 | Documentation Man Page | 5 | 106 |
| 3.78 | 8.7 | Emace Mode Value Highlighting | 3 | 109 |
| 3.00 | 3.6 | Automatic Generation of Results | 3 | 112 |
| 3.00 | 3.7 | Easy Editable | 5 | 117 |
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| 1.60 | 7.4 | Output of Text Document | 8 | 133 |
| 1.50 | 6.3 | Traceability | 13 | 146 |
| 1.28 | 7.8 | Text Base Description Choose Base Tags | 13 | 159 |
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| 1.28 | 7.9 | Text Base Description Requirement References | 13 | 185 |
| 1.28 | 7.5 | Output of HTML | 13 | 198 |
| 1.28 | 7.3 | Output of PDF | 13 | 211 |

- Prioritized list of requirements
- Hyperlinks for fast navigation
- Effort estimation included
- Embedded in the PDF / HTML document

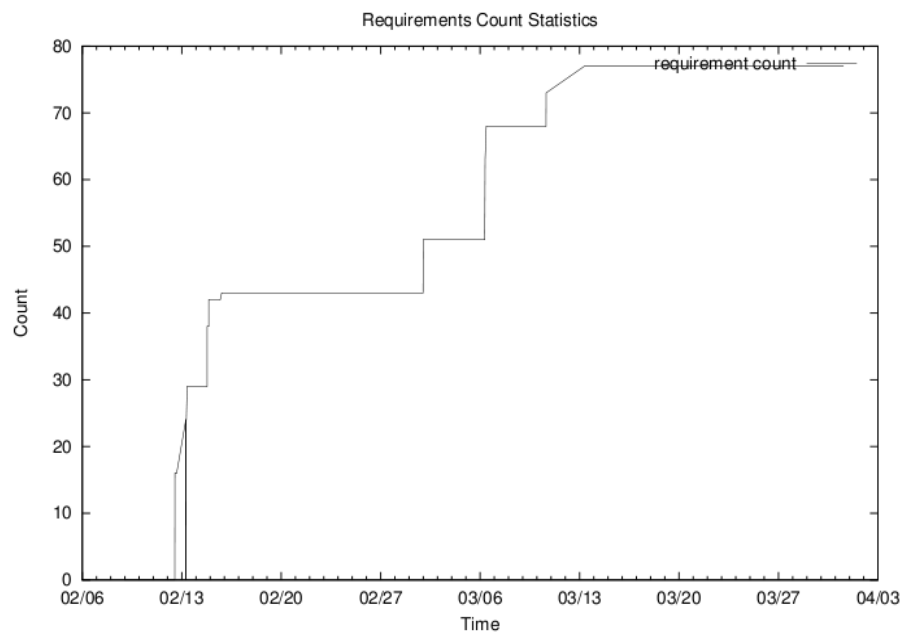
6.Output Artifacts

Requirements Document – Requirements
Dependency Graph – Project Backlog – Project
Elaboration List – Requirements Count Stats –
Commercial Pricing

Output: Requirements Count Stats

- *rmtoo* can create a cvs file for the whole history of the number of requirements
- Prerequisite: the history must be available in a git repository
- Can be preprocessed using spreadsheet or gnuplot

Output: Requirements Count Stats Example



- Number of requirements at a given point in time
- Embedded in the PDF / HTML document

6.Output Artifacts

Requirements Document – Requirements
Dependency Graph – Project Backlog – Project
Elaboration List – Requirements Count Stats –
Commercial Pricing

Idea: Commercial Pricing

- *rmtoo* is able to create a spreadsheet document for pricing
- Whether for an entire project or parts of a project, a set of documentation can be created which includes precisely the information needed
- Sets of documents can be sent to vendor
- Vendor fills in pricing
- *rmtoo* reads in and evaluates results

Document: Commercial Pricing

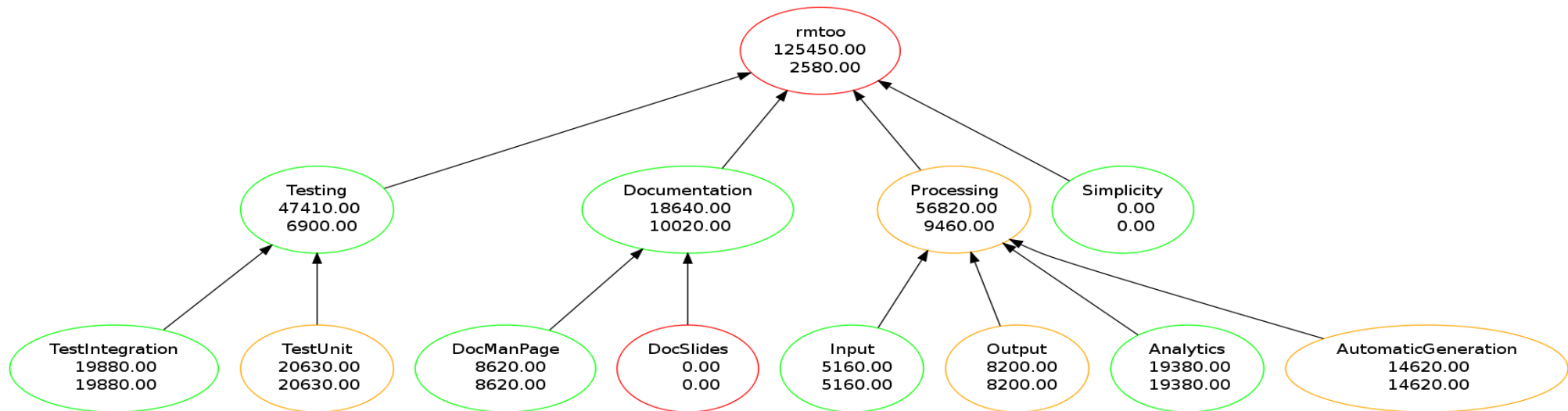
- Each requirement can be separately priced
- The price for each requirement is the sum
 - Of the requirement itself, and
 - All dependent requirements
- Current implementation software project centered – can be easily adapted

Example: Commercial Pricing

| Id | Name | Compliance | Costs for requirement | | | | Dependent from | Costs of dependent | | | Overall sum | | | Supplier |
|----------------------|---------------------------------|------------|-----------------------|-------|----------|----------|----------------|--------------------|----------|-----------|-------------|----------|-----------|----------|
| | | | dayrate | #days | material | sum | | rate | material | sum | rate | material | sum | |
| rmtoo | rmtoo | none | 860 € | 3 | 0 € | 2,580 € | | 96,700 € | 26,170 € | 122,870 € | 99,280 € | 26,170 € | 125,450 € | |
| Simplicity | Simplicity | fully | 0 € | 0 | 0 € | 0 € | rmtoo | 0 € | 0 € | 0 € | 0 € | 0 € | 0 € | |
| Testing | rmtoo Automated Testing | fully | 750 € | 7 | 1,650 € | 6,900 € | rmtoo | 24,750 € | 15,760 € | 40,510 € | 30,000 € | 17,410 € | 47,410 € | |
| Processing | Processing | partial | 860 € | 11 | 0 € | 9,460 € | rmtoo | 46,440 € | 920 € | 47,360 € | 55,900 € | 920 € | 56,820 € | |
| Automatic Generation | Automatic Generation of Results | partial | 860 € | 17 | 0 € | 14,620 € | Processing | 0 € | 0 € | 0 € | 14,620 € | 0 € | 14,620 € | |
| Documentation | Documentation | fully | 540 € | 12 | 3,540 € | 10,020 € | rmtoo | 4,320 € | 4,300 € | 8,620 € | 10,800 € | 7,840 € | 18,640 € | |
| DocSlides | Documentation Slides | none | 0 € | 0 | 0 € | 0 € | Documentation | 0 € | 0 € | 0 € | 0 € | 0 € | 0 € | unclear |
| Analytics | Analytics | fully | 860 € | 22 | 460 € | 19,380 € | Processing | 0 € | 0 € | 0 € | 18,920 € | 460 € | 19,380 € | |
| Output | Output of Different Artifacts | partial | 860 € | 9 | 460 € | 8,200 € | Processing | 0 € | 0 € | 0 € | 7,740 € | 460 € | 8,200 € | |
| TestUnit | Unit Testing | partial | 750 € | 17 | 7,880 € | 20,630 € | Testing | 0 € | 0 € | 0 € | 12,750 € | 7,880 € | 20,630 € | |
| Input | Different Inputs | fully | 860 € | 6 | 0 € | 5,160 € | Processing | 0 € | 0 € | 0 € | 5,160 € | 0 € | 5,160 € | |
| DocManPage | Documentation Man Page | fully | 540 € | 8 | 4,300 € | 8,620 € | Documentation | 0 € | 0 € | 0 € | 4,320 € | 4,300 € | 8,620 € | |
| TestIntegration | Test Integration | fully | 750 € | 16 | 7,880 € | 19,880 € | Testing | 0 € | 0 € | 0 € | 12,000 € | 7,880 € | 19,880 € | |

- Automatic dependency price sum computation
- Vendor is able to pick the most suitable dependency

Evaluation



- rmtoo reads in the data from the spreadsheet and evaluates it
- Upper number: complete price of subtree
- Red: not compliant – Green: compliant

7. Further Reading

Documentation

- *rmtoo* comes with a complete set of documents
- Readme.txt and FAQ.txt as next steps of reading
- About 20 man pages: introduction and reference to all man pages can be found in `rmtoo(7)`
- Complete requirements for *rmtoo* itself

8. Future

Output Modules

- An increasing number of *rmtoo* users ask for extensions of existing or complete new output modules
- Easy to write – easy to adapt
- Current complexity range
 - version1 has 31 lines of code
 - ooprising1 has 726 lines of code

Thank you!



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<http://www.flonatel.de/projekte/rmtoo>