

# **crystal\_facet\_uml user documentation**

**COLLABORATORS**

	<i>TITLE :</i> crystal_facet_uml user documentation		
<i>ACTION</i>	<i>NAME</i>	<i>DATE</i>	<i>SIGNATURE</i>
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**REVISION HISTORY**

NUMBER	DATE	DESCRIPTION	NAME

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# 1 Introduction



crystal\_facet\_uml is an application to support software architects.

## 1.1 Goal



crystal\_facet\_uml creates a set of uml diagrams.

It ensures consistency of uml elements: Their names and their relationships are in sync in all diagrams.

crystal\_facet\_uml exports diagrams in various vector and pixel-based image formats.

## 1.2 Features



crystal\_facet\_uml provides a graphical user interface to

- create diagrams  
(use-case, deployment, component, composite-structure, package, class, activity, state, timing, communication, sequence)
- create uml elements  
(actor, system-boundary, use-case, node, component, part, interface, package, class, activity, state, object, artifact, comment, requirement)
- move, modify and delete uml elements
- create, modify and delete relationships  
(dependency, association, aggregation, composition, generalization, realization, contains, sync-call, return-call, async-message, communication-path, control-flow, object-flow, deployment, manifest, include, extend)
- create, modify and delete features  
(port, field, operation)
- cut, copy, paste uml elements between diagrams
- undo and redo are supported
- multiple windows can show different or same parts of the uml model

Diagrams are layouted part-automatically:

- The user chooses the relative location of uml elements towards others
- crystal\_facet\_uml selects the exact locations of uml elements
- The user controls the positions of messages/transitions in sequence and timing diagrams

- crystal\_facet\_uml auto-lays out relationships in other diagrams

crystal\_facet\_uml manages a meta model:

- Diagrams are organized as a tree, similar to a book's table-of-contents
- Uml elements exist only once even if shown in many diagrams
- Relationships and features are consistent between all diagrams
- Diagram-local messages/transitions are supported in scenario-based diagrams (sequence, communication, timing)

crystal\_facet\_uml exports diagrams as

- vector graphics  
(pdf, ps, svg)
- pixel graphics  
(png)
- textual representation  
(utf-8)

crystal\_facet\_uml can also be started from command line to check and repair database files.

## 1.3 Usage Overview



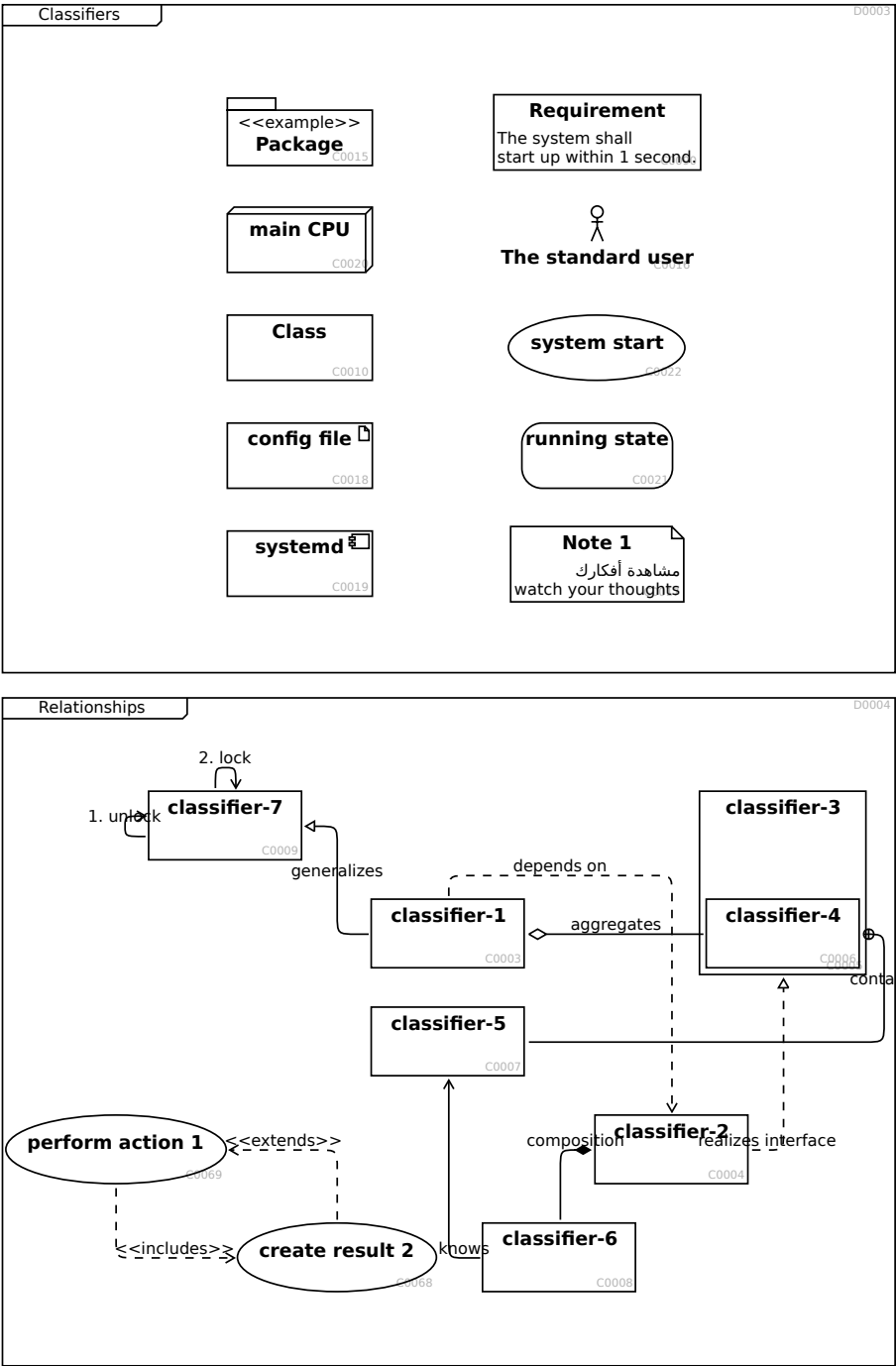
crystal\_facet\_uml can be started in graphical mode (see Section 3) or from command line (for help run **crystal\_facet\_uml -h**).

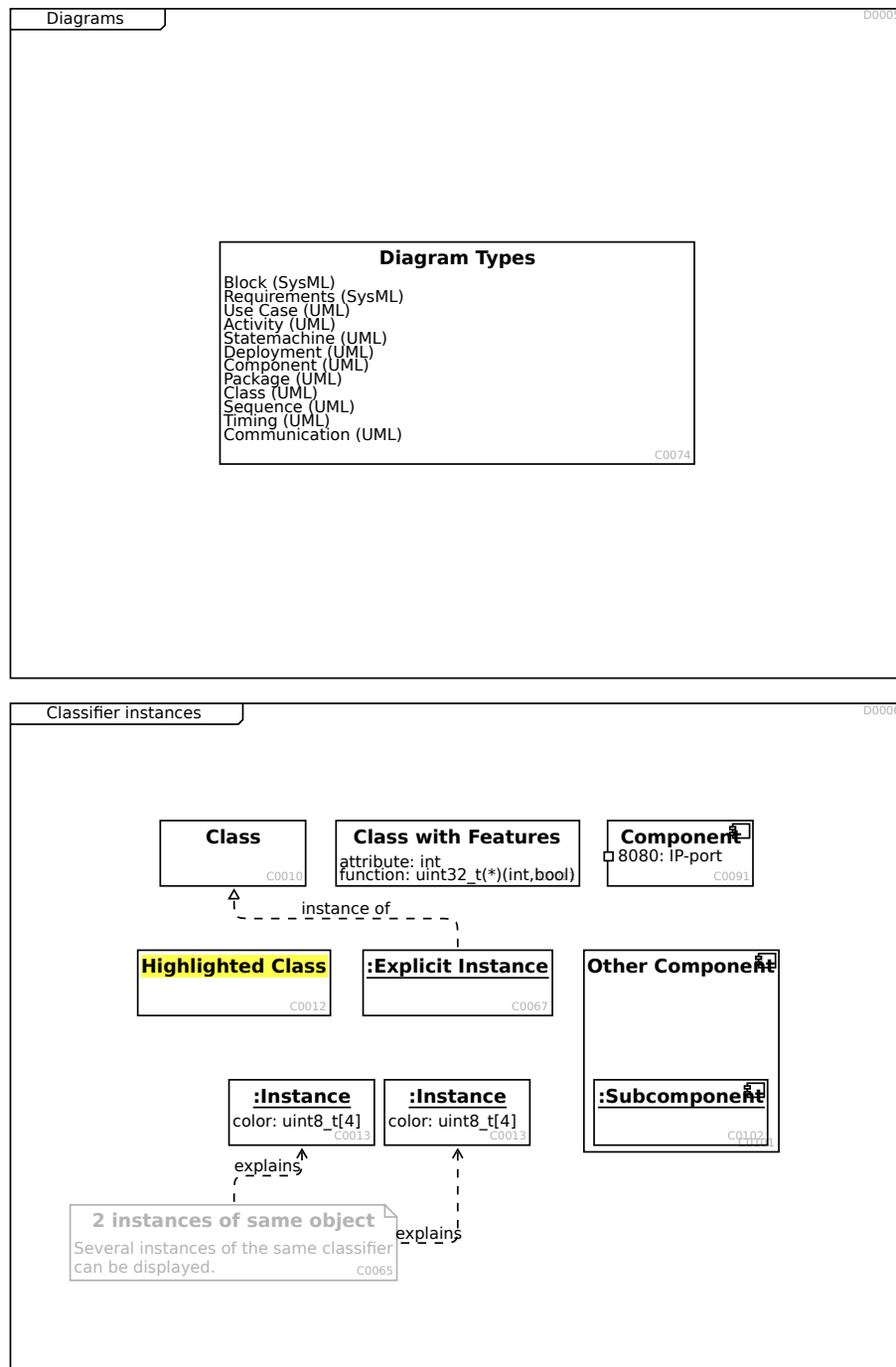
## 2 Example Diagrams

This sections presents the features of crystal\_facet\_uml.

### 2.1 Feature List

This section lists what kind of elements crystal\_facet\_uml can draw in diagrams.

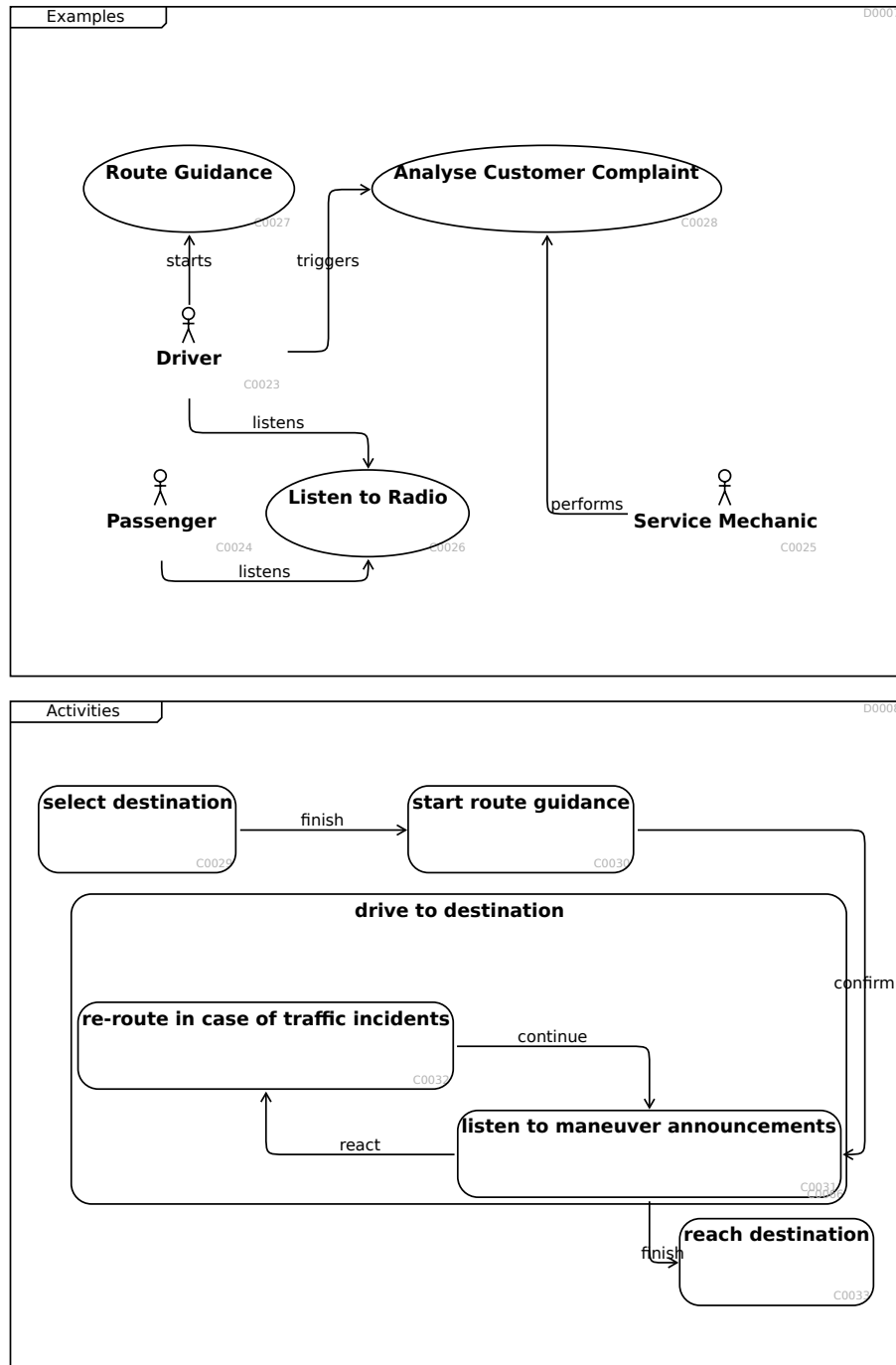


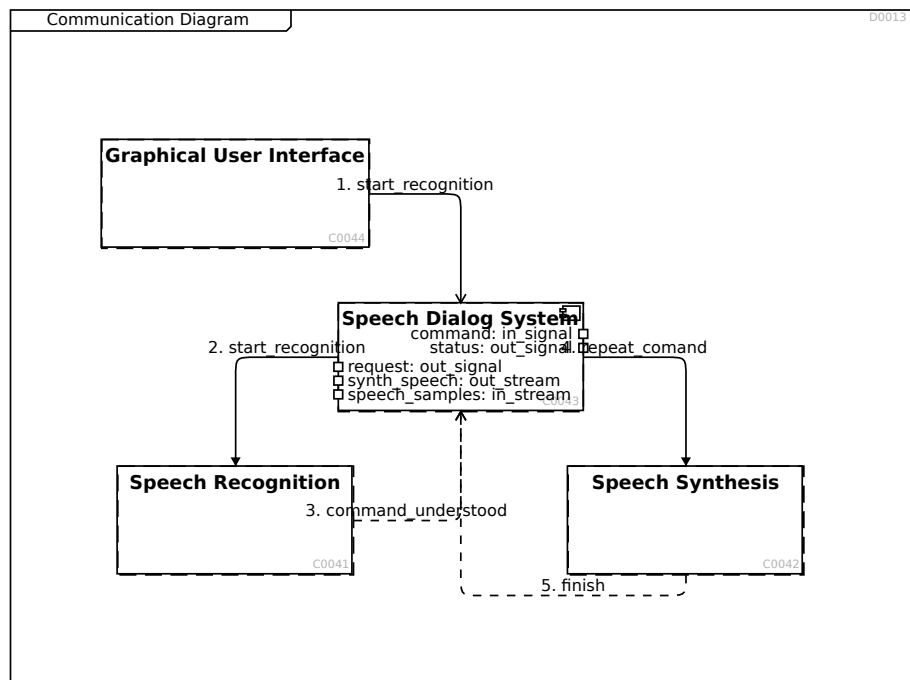


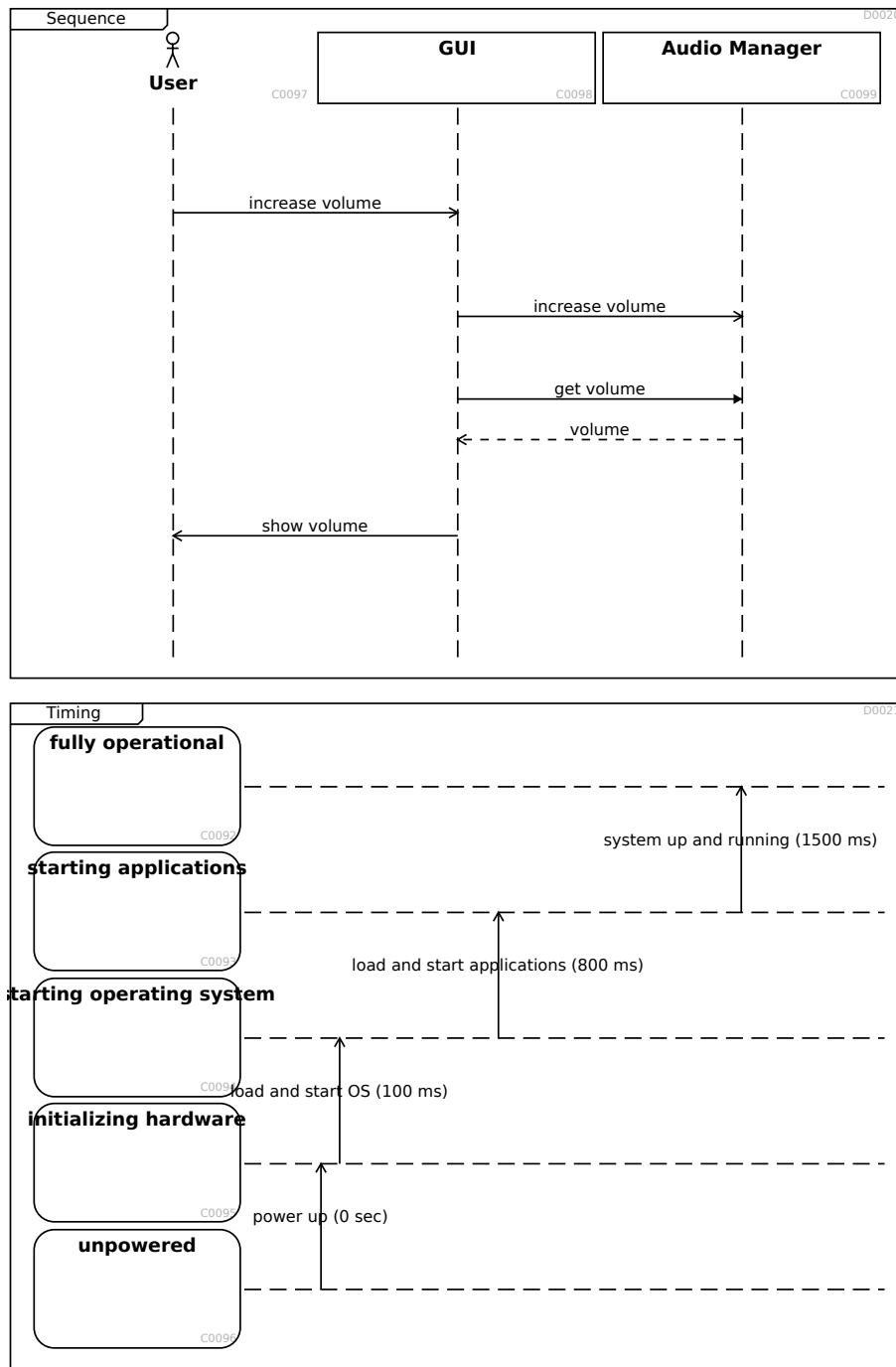
## 2.2 Example UML Behavioral Views

This section lists what kind of elements `crystal_facet_uml` can draw in diagrams.



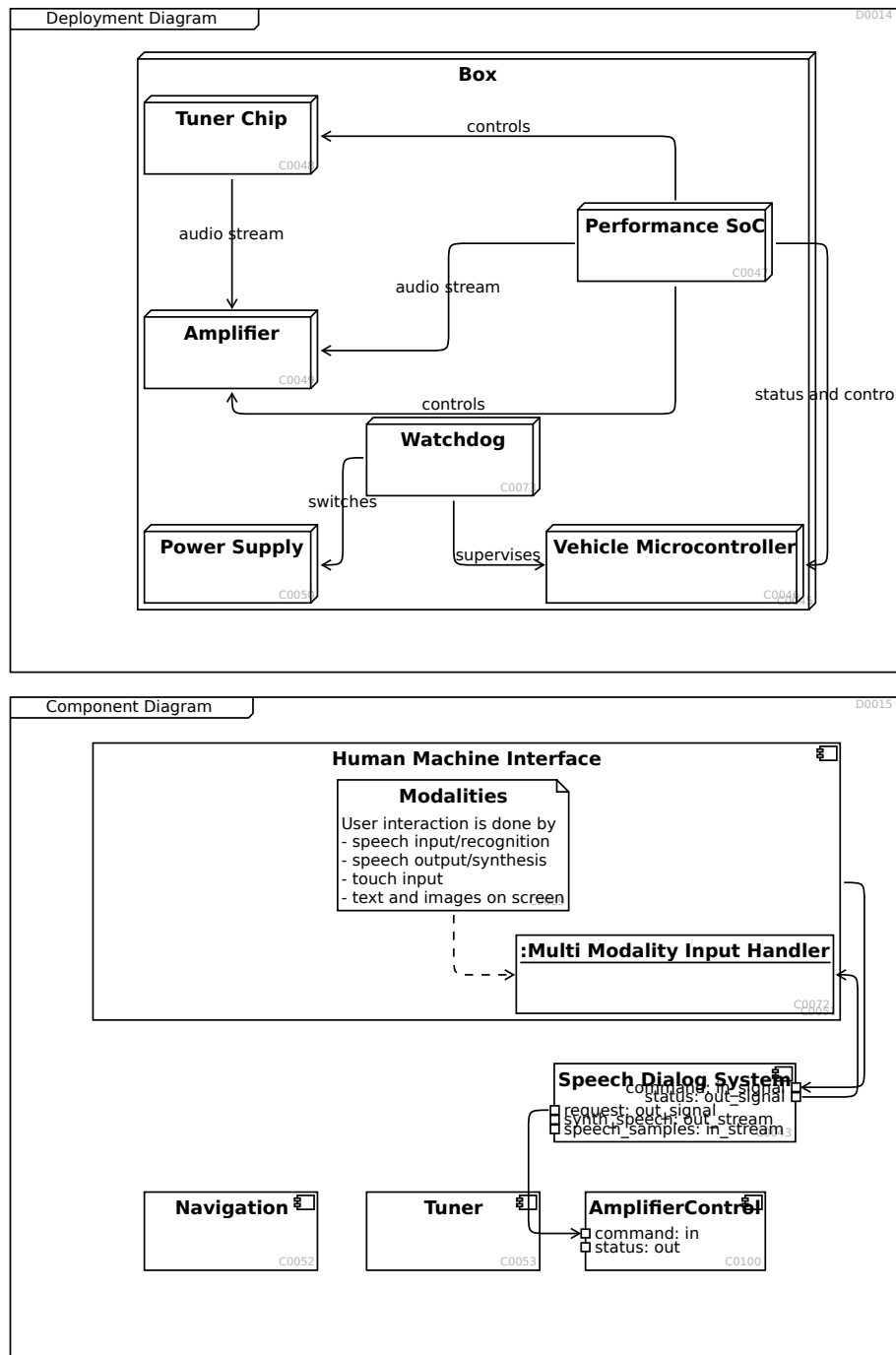


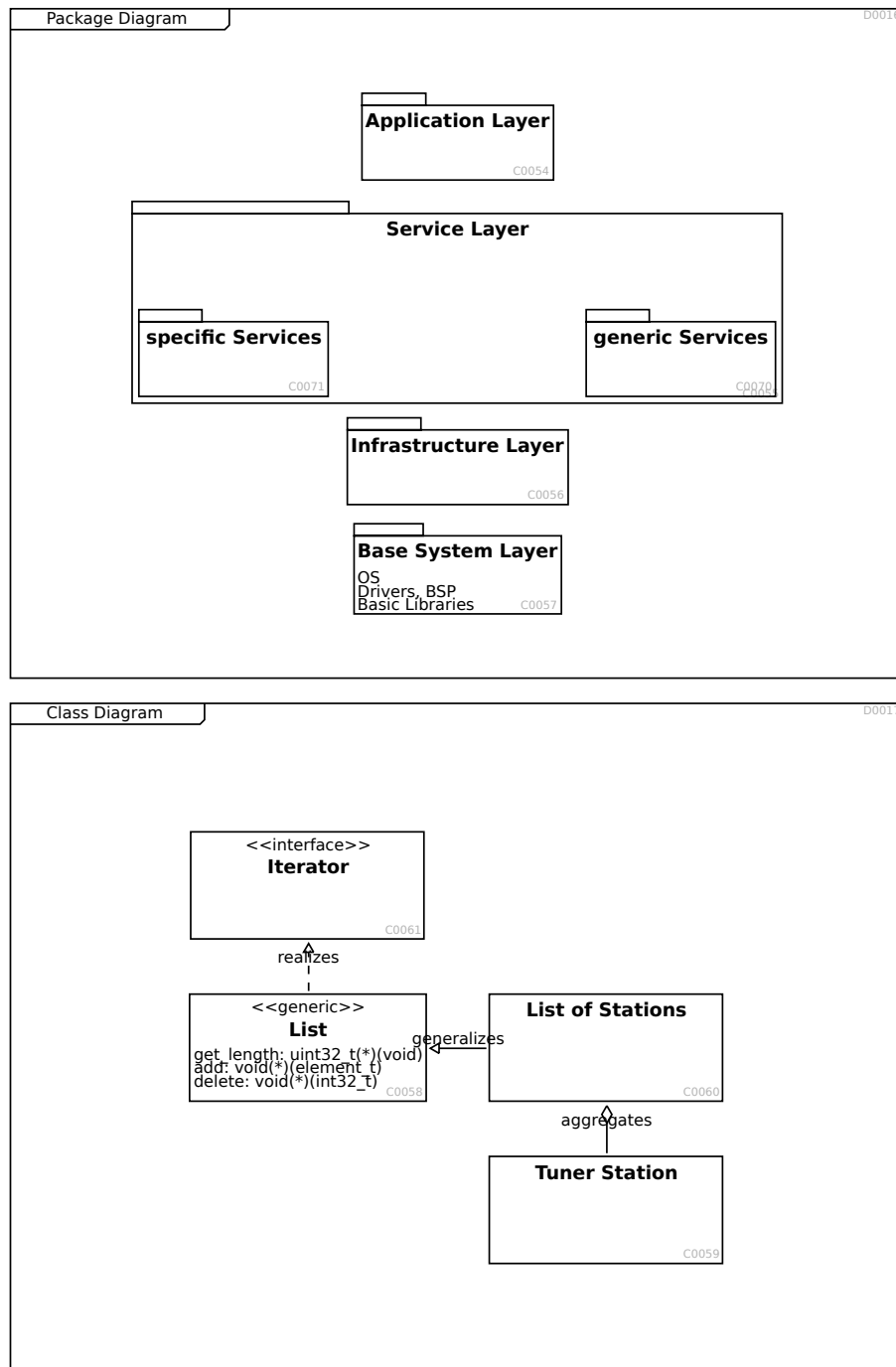




## 2.3 Example UML Static Views

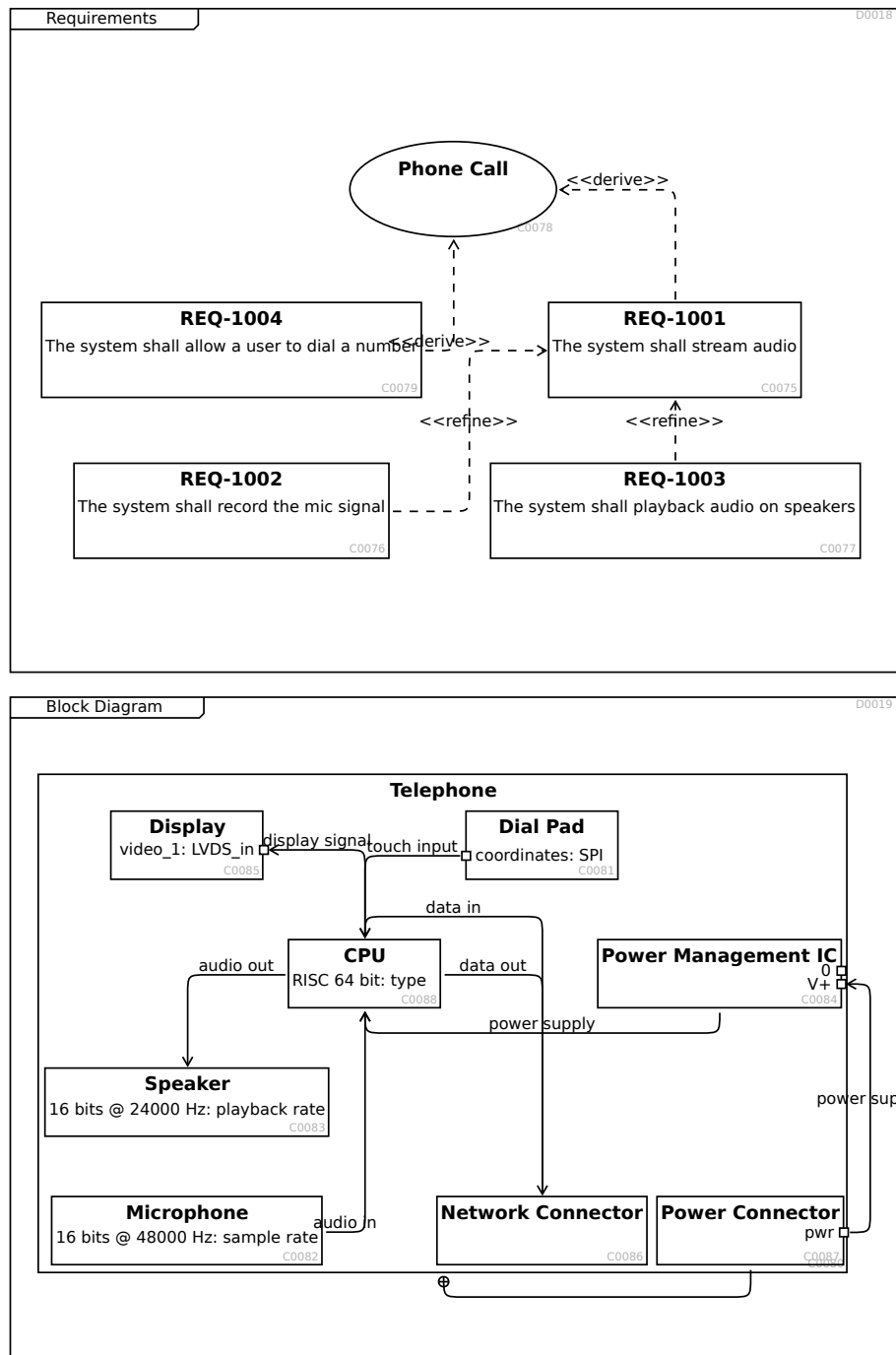
This section lists what kind of elements crystal\_facet\_uhl can draw in diagrams.





## 2.4 Example SysML Views

This section lists what kind of elements crystal\_facet\_uml can draw in diagrams.



## 2.5 Other Examples

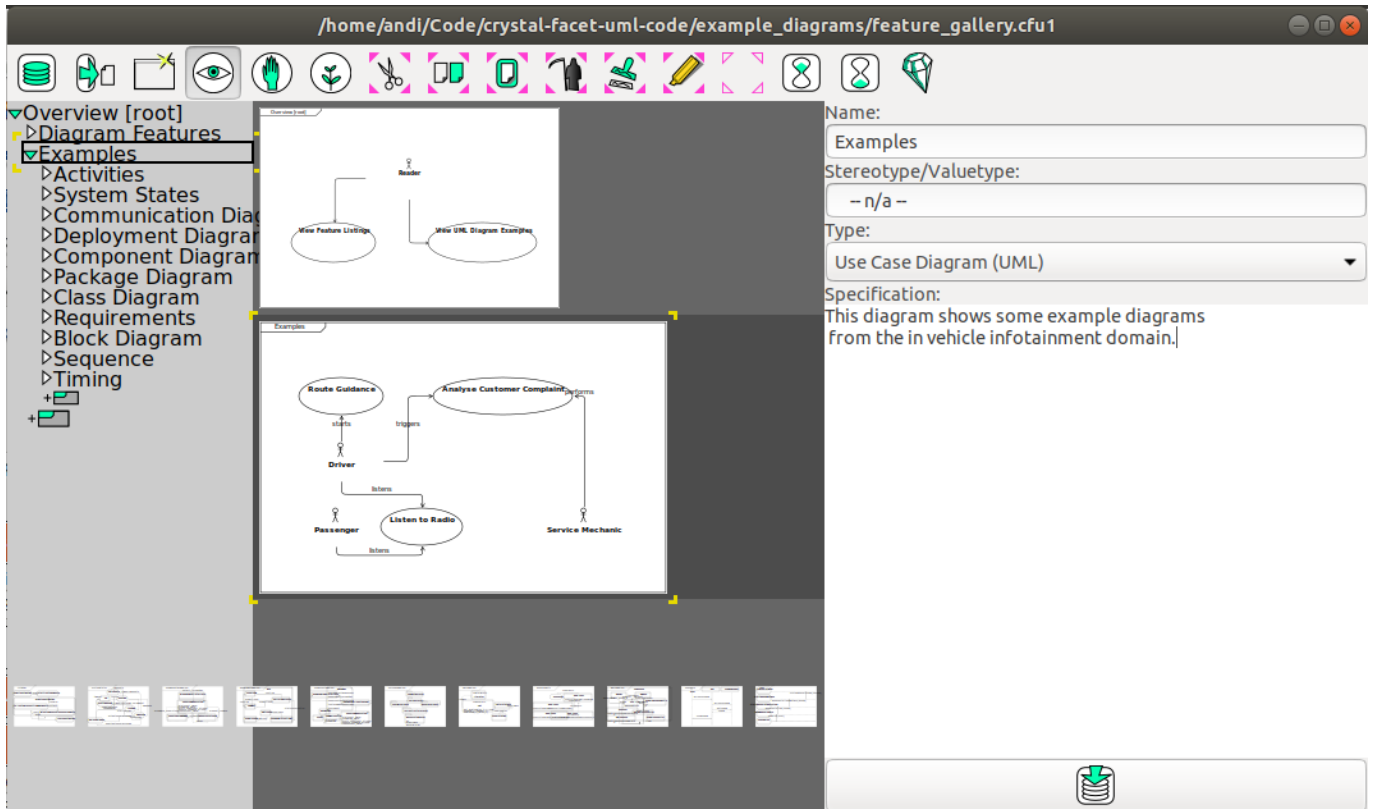
See [https://github.com/awarnke/crystal\\_facet\\_uuml/blob/master/example\\_diagrams/quality.pdf](https://github.com/awarnke/crystal_facet_uuml/blob/master/example_diagrams/quality.pdf) to get another view on how to use crystal\_facet\_uuml.

## 3 GUI

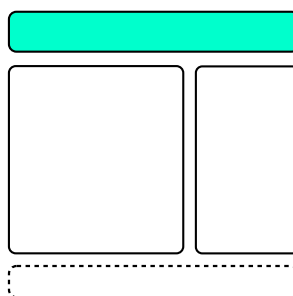
### 3.1 Window Area Overview

If started in graphical mode, crystal\_facet\_uuml shows a window with

- toolbar on top,
- drawing area in the center,
- element configuration widgets to the right and
- an optional notification bar at the bottom.



## 3.2 Tool Bar



### 3.2.1 Create/Use DB



- Opens an existing database file or creates a new database file

### 3.2.2 Export



- Exports all diagrams to the selected folder (supported formats are txt, png, pdf, ps and svg)

### 3.2.3 New Window



- Opens another window on the same database.

This option allows you to work reliably with multiple windows on the same database.

### 3.2.4 Navigate



- Navigate to parent or child diagrams
- Create a new diagram (see Section [3.3.1](#))

### 3.2.5 Edit



- Modify elements in the diagram (see Section [3.3.2](#))

### 3.2.6 Create



- Create elements in the diagram (see Section [3.3.3](#))

### 3.2.7 Cut



- Cut all pink-cornered elements to the clipboard (features of classifiers are cut independantly of their corner-colors)



### 3.2.8 Copy



- Copy all pink-cornered elements to the clipboard (features of classifiers are copied independantly of their corner-colors)

### 3.2.9 Paste



- Pastes diagrams and classifiers from the clipboard to the uml model. (Relationships are not pasted) If id and name are identical to an existing element, an instance of the existing element is pasted to the diagram. Otherwise a new element is created.

### 3.2.10 Delete



- Deletes all pink-cornered elements. This operation may fail if a marked diagram contains unmarked elements.

### 3.2.11 Instantiate



- Toggles the pink-cornered classifiers between classes and instances. (Does not work for relationships and features)

### 3.2.12 Highlight



- Toggles the pink-cornered classifiers between yellow-marked, greyed-out and normal. (Does not work for relationships and features)

### 3.2.13 Reset Selection



- Resets the pink-cornered selection

### 3.2.14 Undo



- Un-does the last operation (Opening a database and exporting files cannot be undone)
-

### 3.2.15 Redo



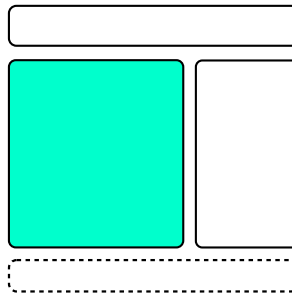
- Re-does the last un-done operation

### 3.2.16 About



- Shows version, license and copyrights



## 3.3 Drawing Area



Diagrams are layouted automatically. You can influence the locations of classifiers only. When adding too many classifiers or relations, auto layouting may not achieve the expected results. In many cases, splitting the diagram into two or more diagrams solves the layouting issues and at the same time improves understandability by focusing on one aspect/topic per diagram.

### 3.3.1 Navigate



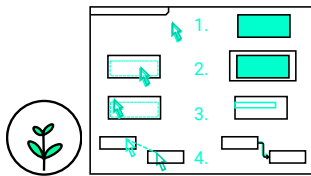
- To navigate to parent, sibling or children diagrams, click on the diagram.
- To create a new diagram, click on the  icon, or the smaller  icon for a new child-diagram.
- To restructure the diagram tree, drag a diagram name to the new location.

### 3.3.2 Edit



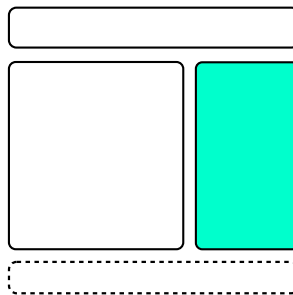
- To select the diagram or a classifier or a feature or a relationship with yellow corners, click on this object.
- To mark an element with pink corners, click on these objects twice.
- To move classifiers within the diagram, 1.) press, 2.) drag and 3.) release the mouse button.

### 3.3.3 Create



1. To create a classifier, click at an empty space in the diagram.
2. To create a child classifier, click into the white space of a classifier. (Alternatively, create a classifier and a containment relationship.)
3. To create a feature, click onto a classifier (name or border).
4. To create a relationship, press on the source classifier and drag it to the destination classifier.

## 3.4 Element Configuration Area



Edit the properties of the yellow-cornered object.

- name of the focused object
- stereotype/valuetype of the focused object (deactivated depending on object-type)
- type of the focused object
- description of the focused object

### 3.4.1 Maximum stringlengths

All strings (names, descriptions, stereotypes) have a maximum length. Ascii characters require one, most other characters two bytes. Current sizes in bytes are: Classifiers:

- `DATA_CLASSIFIER_MAX_NAME_LENGTH = 47`,
- `DATA_CLASSIFIER_MAX_STEREOTYPE_LENGTH = 47`,
- `DATA_CLASSIFIER_MAX_DESCRIPTION_LENGTH = 4095`,

Features:

- `DATA_FEATURE_MAX_KEY_LENGTH = 47`, (name)
- `DATA_FEATURE_MAX_VALUE_LENGTH = 255`, (type)
- `DATA_FEATURE_MAX_DESCRIPTION_LENGTH = 1023`,

Relationships:

- DATA\_RELATIONSHIP\_MAX\_NAME\_LENGTH = 47,
- DATA\_RELATIONSHIP\_MAX\_DESCRIPTION\_LENGTH = 1023,

Diagrams:

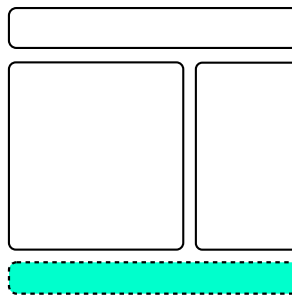
- DATA\_DIAGRAM\_MAX\_NAME\_LENGTH = 47,
- DATA\_DIAGRAM\_MAX\_DESCRIPTION\_LENGTH = 8191,

### 3.4.2 Commit



- Stores the latest changes to the database immediately. This feature is optional, it is not necessary to explicitly save the file.

## 3.5 Notification Bar



### 3.5.1 Information



- Informs on success of an operation, e.g. an export

### 3.5.2 Warning



- Informs on a possible problem

### 3.5.3 Error



- Informs on an error
-

## 4 Modelling Guidelines

This page lists remarks on creating a software architecture and design document in general and it lists hints on getting along with the tool crystal\_facet\_uml. As all tools, this program has its strengths and weaknesses. This page helps in making use of the strenghts.

### 4.1 crystal\_facet\_uml Hints

#### 4.1.1 Tree Structure

Diagrams are organized as a tree. Start the root of the tree explaining the document structure. At the second level of the tree, list the main areas to be shown, for example based on the arc42 template <https://arc42.org/overview/> :

- Introduction and Goals
- Constraints
- Context and Scope (show the system boundary, what is outside, what use-cases exist)
- Solution Strategy
- Building Block View,
- Runtime View,
- Deployment View,
- Crosscutting Concepts,
- Architectural Decisions (show alternatives, give a rationale),
- Quality Requirements
- Risks and Technical Debt
- Glossary (table showing Context, Term and Description)

#### 4.1.2 Focus

Put only few elements into each diagram. This increases understandability of the main purpuse of the diagram. Put further aspects of a topic into a separate diagram. Do not hesitate to copy an element from one diagram to the next. This is what crystal\_facet\_uml is good at: it keeps the model in sync.

#### 4.1.3 Namespaces

Put a prefix to all your elements denoting its namespace. You can then distinguish a GLOBAL\_START\_STATE from an AUDIO\_START\_STATE. Or global::start from audio::start.

#### 4.1.4 Attic/Storage room

If you are not sure if you really want to delete elements, 1) copy them to an attic-diagram and then 2) delete them from the original diagram.

## 4.2 General Hints on Architecture Documentation

### 4.2.1 Problem vs. Solution

Distinguish things that are

- given constraints (problem space),
- decisions, chosen and rejected alternatives and
- the designed solution

### 4.2.2 Names

Names of things are crucial: If the reader gets a wrong understanding by the name of an element, a hundred correct sentences of describing text cannot set this straight again.

### 4.2.3 Description

Every design element needs a description, maybe a list of responsibilities: What shall this element do, what is it for? Names alone cannot explain a system part.

### 4.2.4 Precise sentences

Be precise: Write in active form, e.g. The persistence component shall store and retrieve binary data records identified by string-based keys.

### 4.2.5 Distinguish similar things

Things that are similar but not the same shall be different entities when modelling. E.g. The process in which an example application runs may be different from the storage location and may be different from the software-component. These are three things: Example\_App\_Process (Type: Node), Example\_App\_ObjectFile (Type:Artifact) and Example\_App\_SWComponent (Type:Component).

## A Download Information

### A.1 Download Links

Find the latest version at:

- <https://sourceforge.net/projects/crystal-facet-uml/>
- [https://github.com/awarnke/crystal\\_facet\\_uml](https://github.com/awarnke/crystal_facet_uml)
- [https://build.opensuse.org/package/show/home:awarnke/crystal\\_facet\\_uml](https://build.opensuse.org/package/show/home:awarnke/crystal_facet_uml)

User documentation is available here:

- [http://www.andreaswarnke.de/crystal\\_facet\\_uml/crystal\\_facet\\_uml\\_user\\_documentation.pdf](http://www.andreaswarnke.de/crystal_facet_uml/crystal_facet_uml_user_documentation.pdf)
- [https://github.com/awarnke/crystal\\_facet\\_uml/blob/master/user\\_doc/crystal\\_facet\\_uml\\_user\\_documentation.pdf](https://github.com/awarnke/crystal_facet_uml/blob/master/user_doc/crystal_facet_uml_user_documentation.pdf)

### A.2 License

License of crystal\_facet\_uml is Apache-2.0. crystal\_facet\_uml contains sqlite which is Public Domain. Unit tests are based on embunit (MIT/X Consortium License). (c) 2016-2019 Andreas Warnke; Email-contact: cfu-at-andreaswarnke-dot-de

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