

# The Why-Because Analysis Toolkit Manual

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# 1 Introduction

The Why-Because Analysis (WBA) Software Toolkit aims to help the WBA user to perform an incident analysis. The software has been developed as part of my doctoral thesis on advances in incident analysis. This manual provides help for admins and users of the software, but assumes that the user is familiar with WBA. For admins there is one chapter on platform and installation issues. For users there is a quick start guide, a more comprehensive guide to the software and a reference guide to the functions available in the software.

The whole software, including this manual, is subject to the so called 3-clause BSD-style license<sup>1</sup>.

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<sup>1</sup><http://www.opensource.org/licenses/BSD-3-Clause>

## 2 Installation

### 2.1 Installation Steps in Short

1. Download and install the Java Runtime Environment version 1.5 or greater
2. Download and install the latest version of GraphViz
3. Download the WBA Toolkit Software
4. Copy the WBA Toolkit Software to a location of your choice
5. Start the WBA Toolkit Software with
  - ybt2.sh on GNU/Linux, OS X and other Unices
  - ybt2.bat on Windows

### 2.2 Prerequisites

All prerequisites are the same for the Operating Systems Windows, GNU/Linux and OS X. I have not tested installing the software on other BSD flavours. But it should be clear from the other OSs prerequisites what can and should be done.

#### 2.2.1 Java Runtime Environment

The platform will need the Java Runtime Environment installed. The JRE version should be 1.5 or greater. If the JRE does not come packaged with the respective OS distribution it can be downloaded from Oracles website <http://java.com/en/download/index.jsp>.

#### 2.2.2 GraphViz

GraphViz is needed as the graph layouting engine. If it does not come packaged with the respective OS distribution it can be downloaded from the AT&T Research's GraphViz website <http://www.graphviz.org/Download.php>.

#### 2.2.3 The WBA Software Toolkit

At the time of writing the software is only available inside Bielefeld University's Technical Faculty network in *vollehresysSAFEYBT2.DATE*. The software does not need installation in the classical sense. It is sufficient to just copy the software someplace and directly execute it from there. There can be multiple instances in parallel installed, but they should not be running in parallel.

### 2.3 First Run

#### 2.3.1 After first use

After starting the software for the first time there will be a new directory in the user's home directory. The directory will be called *YBT2Projects*. Inside the directory all files concerning the software will be stored. If the directory is removed the software will behave as if it started for the first time.

### 2.3.2 Testing the Reporters Functionality

Change into the tab labeled *Graph*. Click on the button on the left labeled *Node* inside the box labeled *Create....* Then select the created node in the canvas on the center on the screen by once left-clicking it with the mouse. Node should be highlighted. Now click on the button on the left labeled *Cause* inside the *Create...* box. Now you should see two nodes that are connected by an arrow. If that is not the case please check your *GraphViz* installation especially the *dot* command.

## 3 Quick Start Guide

This quick start guide is intended to get you an overview over what the software can do. It is not a comprehensible guide that will explain everything to you quickly. Throughout the Quick Start Guide it will be assumed that the software started for the first time.

### 3.1 Starting the Software

You can start the software with the scripts provided.

- *ybt2.sh* on GNU/Linux, OS X and other Unices
- *ybt2.bat* on Windows

After starting up, which may take a while depending on the computing power of your machine, a full-screen application will be visible. On top you can see that you are currently viewing the leftmost tab called *Projects*. On the left side there are some buttons grouped according to function. For the moment the *Projects* view should not concern us.

### 3.2 The *Graph* View

Let's change the tab to the one on the immediate right of the *Projects* view, the *Graph* view. On the left there are grouped buttons, at the bottom is a set of tabs and in the middle is the graph although on first start there is not yet much of the graph to be seen.

#### 3.2.1 Creating, Deleting and Changing Nodes in the Graph

- Click on the button labeled *Node* in the box labeled *Create...*
- You should see a diamond with the number 1 in it

From here on we will call the diamond a *Node*. There are other kinds of *Nodes* that have different shapes. If you click the same button a second time then another *Node* will appear right beside the first one. To construct a graph we will not only need *Nodes*, but also *Edges*.

- Click on the *Node* using the left mouse button
- The *Node*'s border should be highlighted in red
- Click on the button labeled *Cause* in the box labeled *Create...*
- You should see another *Node* and a directed *Edge*<sup>2</sup> pointing from the newly created *Node* to the one already existing

The selection of any number of *Nodes* in the graph and then using one of the *Create ... Cause Effect* buttons will

1. Insert a new *Node* into the graph

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<sup>2</sup>Commonly known as an arrow

2. Connect the new *Node* with each of the selected *Nodes* with an *Edge*
3. The new *Edges* will always be pointing from an inserted *Cause* to a selected *Node*<sup>3</sup> and vice versa.

To remove *Nodes* from the graph use the left mouse button plus the SHIFT key to highlightselect a number of nodes. A click on the button labeled *ompletely* in the box labeled *Remove* deletes the selected *Nodes* as well as all belonging *Edges*.

- Add additional *Causes* and *Effects* to the graph
- Select a number of *Nodes* of which each has at least one incoming or outgoing *Edge*
- Click on the button labeled *ompletely* in the box labeled *Remove*
- The *Nodes* have been deleted and all associated *Edges* have been completed with them

### 3.2.2 *Edges* and *Undo/Redo*

There is one other way to introduce *Edges* into a graph. To connect two *Nodes* already in the graph

- Click and hold the left mouse button on one *Node*
- Drag the mouse to an other *Node*
- Release the left mouse button above the other *Node*
- A new *Edge* will have been drawn between the two *Nodes*

There is no visual feedback to indicate the beginning or the origin of the mouse draw gesture. On a side note: There are no functions implemented for the right mouse button (no context menus) or keyboard shortcuts.

Now you have seen the basic graph drawing capabilities of the WBA Software Tool. It will automatically layout the graph and you now know how to change the graph layout. Some additional notes for beginners:

- After every step the changes that have been made to the graph will be saved.
- After having done a few graph manipulations try the *Undo/Redo* buttons. *Undo/Redo* remembers all steps from either starting the software or activating a new project (which has not been discussed).
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<sup>3</sup>Making this one an *Effect*

### 3.2.3 Labeling *Nodes*

The graph drawing capabilities of the WBA Software Toolkit would not be much without labeling *Nodes*. On the bottom of the screen there are a number of tabs. Select the tab labeled *Node Properties and Text*. When you single-select a *Node* using the left mouse button, then you can see that the input fields in the tab come to life.

- **Select one *Node***
- **Click inside the big text area labeled *Text* in the *Nodes Properties and Text* tab**
- **Type some text into the text area.**
- **Click back into the graph area<sup>4</sup>**
- **The graph will be redrawn and you should see the text appear inside the selected *Node***

The *Name* of a *Node* can be changed in a similar way.

Not only the *Node* label (or text) can be changed. The same goes for the shape of the *Node*. If you single-select a diamond shaped *Node* the *Node Kind* combo box should show the label *Unspecified*.

- **Single-select a *Node***
- **Change the *Node Kind* combo box to *Event***
- **The shape of the selected *Node* changes from diamond-shaped to box-shaped**

## 3.3 The Factor View

The graph view has some additional features to offer. To use them effectively we need to have a look on the *Factor* view. The *Factor* view is located under the tab labeled *Factor*<sup>5</sup>. The view resembles the em Graph view in that there is a panel of buttons on the left, a set of tabs on the bottom and a main view in the middle. The main view in this case is a table. If you have a look at the contents of the table you may recognise the textual contents of *Nodes* that already are part of the graph.

Please note that there is a distinction between *Node* and *Factor*. *Nodes* are *Factors* that are part of the graph.

The *Factor* view lists all *Factors*, including those that are not part of the graph. A quick check whether a *Factor* is also an *Node* is provided by the *In Graph* columns of the *Factor* table.

- **Click on the button labeled *Factor* in the box labeled *Create...***
- **A new *Factor* should appear at the bottom of the table**

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<sup>4</sup>The changes will be made after the text area loses the mouse focus; therefore clicking anywhere will assign the changes; there is no "Assign" button for this

<sup>5</sup>I assume you already guessed that



The *Factors* in this view can be manipulated in the same way as in the *Graph* view. The tab labeled *Factor Properties and Text* on the bottom of the screen can be used to change *Factors* has the same functions that the *Node Properties and Text* tab has in the *Graph* view.

Newly created *Factors* can be used directly in the *Graph* view.

- **Change into the *Graph* view**
- **From the bottom tabs select the one labeled *Factors not in Graph***
- **Select the *Factor* in the table at the bottom**
- **Select any number of *Nodes* in the graph**
- **Click on either of the buttons inside the *Insert Factor* box<sup>6</sup>**
- **Depending on the button you clicked the *Factor* has been inserted as a *Node*, a *Cause* or an *Effect*.**

### 3.3.1 More on *Undo/Redo*

Now change back into the *Factor* view. Delete a *Node* inside the *Factor* view and change back to the *Graph* view. When you hit the *Undo* button you will see that the action from the *Factor* view is undone. At the beginning it may be a bit confusing to undo actions that have occurred in a different view than the actual one, but this behaviour is much preferred over constantly changing views in order to undo a series of actions. Also note that undoing an action may not result in any visible change.

## 3.4 Printing

Printing can be done in the tab labeled *Report Generation*. On the left is a panel of buttons and on the right is a table. The document to be printed is represented as the table on the right. The first column, the one with the checkboxes, is used to determine which parts should be included and which not. The second column contains the names of the document parts. You can select a document part on the right and shift its position relative to other document parts. That way you can change the order of document parts in the resulting PDF file. Clicking on the *Save as* button in the *Report* box will open a dialog to choose a file for output. The software will remember the last save action and clicking on the *Save* button will export a PDF to the previously specified location. With the *External PDF* button in the box labeled *Create...* you can include PDF files in the report. A file dialog will open, asking for the location of the external PDF, and then a new document part will appear in the table on the right.

## 3.5 Last Words

This concludes the quick start guide. If you have gained some familiarity with the interface it should not be difficult to grasp the functions of the remaining parts of the software. For a full feature by feature explanation please use the

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<sup>6</sup>use *Undo/Redo* to observe the different functions of the *Insert Factor* buttons

reference manual. If you have questions or suggestions regarding this manual or the software please send me an email to [jsanders@TechFak.Uni-Bielefeld.DE](mailto:jsanders@TechFak.Uni-Bielefeld.DE).

## 4 Reference

### 4.1 General Notes

#### 4.1.1 Starting the Software

Please use the scripts provided. For GNU/Linux and other Unices use the *ybt2.sh*<sup>7</sup> script. For Windows systems use the *ybt2.bat* script.

You may also want to invoke the software directly with Java. For details please consult the shell a/o bat file. If you have the source code than you may also use *ant*. There is a *build.xml* which will let you

- *ant dist*: will build the binary distribution in a directory called *dist*
- *ant run*: will run *ant dist* and then execute the program
- *ant exec*: will execute the program assuming the binary distribution has been built

#### 4.1.2 Function Invocation

For all functions of the software there only one way to invoke it. That does not mean that there are no alternative ways in the software to get to the same end. It means that there are

- no keyboard shortcuts,
- no context menus and
- no main menus

in the software each providing its own way to invoke a specific function. For example there is a button that will create a node. If you click on the button the node creation function will be executed and a node will be created. The button is the only way the function can be invoked. Since there are no menus, context menus or shortcuts all functions are visible, meaning not hidden in submenus. The software offers different views of the project, because of the complexity of the whole, but within a view all functions are easily visible and accessible.

#### 4.1.3 Selection State and Fuction Availability

Buttons, text fields, text areas and other interactive GUI components can change their state. Some times the components are active and can be used, at other times they are inactive. The components are always active if their function can be executed on the current selection. If a function works on one or more *Nodes* but only *Edges* are selected, then the component providing the function will be inactive.

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<sup>7</sup>uses /bin/sh

#### 4.1.4 Undoing

Nearly all functions can be undone and redone. Because the majority of functions can be undone this reference will only explicitly mention those functions that cannot be undone. Having undoable functions saves the user from popup dialogues that ask for explicit acknowledgement of functions that entail huge changes. On top of that there are no *Apply* buttons anywhere. If a change is made in a part of the user interface the changes are applied immediately. If they are not desired they can easily be undone. Selecting (or highlighting) an object is also an undoable and redoable function.

The undo history will go back to the time the active project has been loaded. That happens on startup, when a project will be loaded and every time the active project is changed.

#### 4.1.5 Saving

After nearly every function invocation the whole project is saved. If the machine crashes the user can continue to work on a very recent version. When the software starts it will automatically load the last project worked on. Note that even the selection state of the project is saved, aiding the user is taking up his/her work where he/she left it.

#### 4.1.6 The Log File

There is a log file called *ybt2.log*. It is written into the software's main directory (which is the same where *ybt2.sh* and *ybt2.bat* reside). If you are unfamiliar with the source of the software or even unfamiliar with the workings of Java, you may not want to read the logfile. The value of the logfile for the normal user is to have a log of the inner workings of the software that can be sent to the developer (me<sup>8</sup>) along with an error description.

Please note that the log file may contain sensitive information. If you are unsure do not send the logfile! Just send an error description.

### 4.2 The Views

Generally all *Views* are divided into three parts. One panel on the left side with buttons, one tabbed pane on the bottom and one main component filling the rest.

#### 4.2.1 The Project View

The *Project View* lets you select the project to work on. There is a table containing all projects and switching projects can be done with few mouseclicks. There are provisions to facilitate collaborative work on projects.

#### 4.2.2 The Graph View

The *Graph View* allows the display and manipulation of the Why-Because Graph. After each change to the WBG the display is refreshed and the *dot*<sup>9</sup>

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<sup>8</sup>jsanders@TechFak.Uni-Bielefeld.DE

<sup>9</sup>Part of the GraphViz project, see [www.graphviz.org](http://www.graphviz.org)

graph layout engine renders a new graph.

#### 4.2.3 The Factor View

In the *Factor View* all *Factors* can be edited. Some of the functions in the *Factor View* have effects on the *Graph View*, but do not immediately trigger the layout engine. Only after the *Graph View* is selected the changes to the *Graph* are implemented by the layouting engine.

#### 4.2.4 The Actors View

*Actors* are used to formalize the partaking of an *Actor* in a *Factor*. *Actors* defined and described in the *Actors View* can be assigned to *Factors* in the *Factors View* and the *Graph View* as well. The *Factors Actors* relation will be used in the *Timeline View*.

#### 4.2.5 The Timeline View

The *Timeline View* lists all *Factors* in chronological order and also describes which *Actors* did take part in *Factors*. The *Timeline View* uses the date and time information of *Factors* as well as the *Factors Actors* relationships to generate the *Timeline*.

#### 4.2.6 The Groups View

*Groups* can be defined to further indicate special *Factors*. *Groups* can be associated with colours, so that the *Graph View* can visualize *Factor's* by colouring them.

#### 4.2.7 The Reporter View

The *Reporter View* is designed to be a first reporter tool. Whenever there is an incident some one will be the first to report it. Because these reports are seldom in the form usable directly in a WBG this tool aims to help. A text, e.g. a protocol, can be factorized to make it a suitable starting point for a WBA.

#### 4.2.8 The Report Generation View

This view provides PDF generation functions. There is a standard report form that the software can print into a PDF file. Other PDF files can be inserted in the document to increase report generation flexibility a little.

### 4.3 The Project View Reference

#### 4.3.1 The Projects Table

The table shows which projects are known to the program. At least one project is always the *Current Project*, which is indicated in the table's right-most column. If on startup no project can be found a new project is created and made the *Current Project*. The software only knows the location of projects on the file and does not keep an own database. If a project file is not found at the expected location this is indicated in the *File Found* column. To facilitate collaborative

work on a project a project will be marked as *locked* with the username of the locking user. The lock is not a hard lock, but only provides an indication that the file may be in use.

#### 4.3.2 Buttons

##### Projects: Activate

- The button is enabled if a project is selected in the table on top-right, that is not marked as the *Current Project* in the last column.
  - a project is selected in the table on top-right, that is not marked as the *Current Project* in the last column,
  - the selected project file can be found as indicated by the *File Found* column,
  - and the selected project is not locked, as indicated by the *Locked By* column.
- If this button is clicked the selected project will be activated and become the *Current Project*.
- The new *Current Project* will be locked, the former *Current Project* will remain locked.
- The *Undo/Redo* history will be reset.

##### Projects: New

- This button is always enabled.
- If this button is clicked a new, blank project will be created.
- The new project will not be automatically activated.
- The new project will automatically be locked by the current user.

##### Projects: Lock

- The button is enabled if
  - the selected project is not the *Current Project*,
  - the selected project is not already locked by the current user
  - and the project's file location is known.
- If the button is clicked then a lock will be set.
- The lock is not a hard lock, it is intended to indicate that the project file is in use by another user to facilitate collaborative work on a project.

### **Projects: Unlock**

- The button is enabled if
  - the selected project is not the *Current Project*,
  - the selected project is not already unlocked
  - and the project's file location is known.
- If the button is clicked then the lock, set by a different user, will be removed.
- The lock is not a hard lock, it is intended to indicate that the project file is in use by another user to facilitate collaborative work on a project.

### **Modify: Unregister**

- The button is enabled if the selected project is not the *Current Project*.
- If the button is clicked the projects entry will disappear from the list of projects.
- The project's file on disk will not be affected by this. The file has to be removed separately.

### **Modify: Fork**

- The button is enabled if a project is selected.
- If the button is clicked a copy of the selected project will be made.
- As with the *New* button the forked project will not be automatically activated.

### **External: Export Import**

- The button is enabled if
  - a project is selected
  - and the project's file could be found.
- If the button is clicked
  1. The user is prompted to select a file from the file system.
  2. The file will be checked if it is a valid project file.
  3. If the file is a valid project file it will be registered in the project view.
  4. Work on the project will be done directly on the selected file.

## External: Import

- The button is enabled if
  - a project is selected
  - and the project's file could be found.
- If the button is clicked
  1. The user is prompted to select a file location.
  2. The selected project will be copied to the location specified by the user.

### 4.3.3 Other Functions

**Selecting a Project** Selection of a project is done with the left mouse button in the projects table. Only single selection is allowed.

**Project Location** This label shows the file location of the *Current Project*. It cannot be edited. If the project should reside in a different location the use of *Modify: Fork* is suggested.

**Author** This, by default, is filled with the user name (or logname) of the current user. It is encouraged to change this to the actual authors' names.

**Master Date Time** The date and time in this field are used when creating new *Nodes* or *Factors*. Newly created *Nodes* or *Factors* have a datetime field on their own. The *Master Date Time* sets the default on creation.

**Title** The title or short description of the project.j

**Description** A longer description of the project. This field only accepts plain text, there are no formatting or highlighting provisions.

## 4.4 The Graph View Reference

### 4.4.1 The Graph

The graph is displayed in the top-right part of the display. The graph is re-layouted every time a change to the layout is done.

**Selection** *Nodes* and *Edges* can be select with the left mouse button. There is no function on the right mouse button. Multi-selection is possible using the left mouse button and holding the CTRL key pressed during the mouse click. The same goes for deselecting an element from a selection. If the left mouse button is clicked on the background all objects will be deselected. Selecting and deselecting are undoable functions.

**Drawing an Edge** A new *Edge* between two *Nodes* can be drawn with the mouse by dragging the mouse with the left mouse button from the *Cause Node* to the *Effect Node*.



**Create: Node**

- This button is always enabled.
- Clicking on this button will create a new *Node* in the graph.
- The new *Node* does not have any *Edges* created with it.
- After creation the new *Node* can usually be found on the bottom-right or bottom-left of an already existing graph.

**Create: Effect**

- This node is enabled if
  - a number of *Nodes* have been selected
  - and no *Edges* have been selected.
- Clicking on this button will create a new *Node*.
- Additionally new *Edges* will be created along with the new *Node* making the new one an *Effect* for all selected *Nodes*.

**Create: Cause**

- This button is enabled if
  - a number of *Nodes* has been selected
  - and no *Edges* have been selected.
- Clicking on this button will create a new *Node*.
- Additionally new *Edges* will be created along with the new *Node* making the new one a *Cause* for all selected *Nodes*.

**Remove: Completely**

- This button is enabled if a number of *Nodes* a/o *Edges* has been selected.
- Clicking this button will delete the selected *Nodes* and *Edges*.

**Remove: From Graph**

- This button is enabled if a number of *Nodes* a/o *Edges* has been selected.
- Clicking this button will
  - remove the selected *Nodes* from the graph, but will retain them as *Factors* and
  - delete all selected *Edges*.

**Insert as: Node**

- This button is enabled if a number of *Factors* from the *Factors Not in Graph Table* have been selected.
- Clicking on this button will insert the selected *Factors* as *Nodes* into the graph.
- The new *Nodes* do not have any *Edges* created with them.
- After insertion the new *Nodes* can usually be found on the bottom-right or bottom-left of an already existing graph.

**Insert as: Effect**

- This button is enabled if
  - a number of *Nodes* have been selected,
  - a number of *Factors* from the *Factors Not in Graph Table* have been selected,
  - and no *Edges* have been selected.
- Clicking on this button will insert the *Factors* as *Nodes*.
- Additionally new *Edges* will be created along with the inserted *Factors* making all *Effects* for all selected *Nodes*.

**Insert as: Cause**

- This button is enabled if
  - a number of *Nodes* have been selected,
  - a number of *Factors* from the *Factors Not in Graph Table* have been selected,
  - and no *Edges* have been selected.
- Clicking on this button will insert the *Factors* as *Nodes*.
- Additionally new *Edges* will be created along with the inserted *Factors* making all *Causes* for all selected *Nodes*.

**Subgraph: Collapse**

- The button is enabled if one *Node* is selected.
- If the button is clicked the graph below the selected *Node* will be substituted by a placeholder *Node*

**Subgraph: Expand**

- The button is enabled if one *Node* is selected which is an *Effect* for a subgraph *Node*.
- If the button is clicked the placeholder *Node* will be expanded into the full graph

**Zoom: Zoom In (+)**

- The button is always enables.
- Clicking the button will enlarge the graph displayed in *Graph View*

**Zoom: Zoom Out (-)**

- The button is always enables.
- Clicking the button will scale down the graph displayed in *Graph View*

**Zoom: Scale to Fit**

- The button is always enables.
- Clicking the button will scale the graph so that it can be seen completely in the *Graph View*.
- Note that nodes may be too small to read their containing text.

**Zoom: Normal (1:1)**

- The button is always enables.
- Clicking the button will display the graph at its normal scaling factor.

**4.4.2 Factors not in Graph**

- This table shows all *Factors* that are not *Nodes* in the graph.
- Each table row denotes one *Factor*
- The selection of the *Factors* shown in the table is used by the *Insert Factors* button group.
- A comprehensive view of all *Factors* and *Nodes* in the project can be found in the *Factors View*.

**4.4.3 Node Properties and Text****Node Properties and Text: ID**

- This field is not editable.
- The ID is a unique identifier mainly used internally by the software.
- It is provided here in order to facilitate debugging in case the project file gets corrupted.

### Node Properties and Text: Name

- This text field is enabled if one *Node* is selected.
- This text field contains the name of a *Node*.
- The name of a node is usually automatically set by the software on creation on the *Factor* or *Node*
- In a *Node* the name is displayed on top of the node text in brackets.

### Node Properties and Text: Date/Time

- This text field is enabled if one *Node* is selected.
- The *Node's* timestamp can be manipulated with this text field.
- The text field's content is not show within the *Node*.
- Date/Time is used to create the *Timeline* in the *Timeline View*.

### Node Properties and Text: Node Kind

- This combo box is enabled if one *Node* is selected.
- The node kind determines the *Nodes* shape in the graph.
- At the time of writing the following *Node Kinds* exist:
  1. Unspecified - the default, denoting that no choice has been made which *Node Kind* the *Node* should be assigned.
  2. Event - denoting an event in the sense of a point in time where a system changes its state.
  3. UnEvent - denoting a point in time where a system should have changed its state but did not.
  4. State - denoting a state that is true throughout the whole of the incident .
  5. Process - denoting a series of sufficiently similar event so that they can be aggregated as a process.
  6. Assumption - denoting a *Node* for which at best circumstantial evidence exists, but is believed to be true.
  7. Countermeasure - denotes a measure to counteract a specific *Node* in order to defeat the incident.
  8. Contraindication - denotes the fact that there may be conflicting information about a *Node* to be true or false.

### Node Properties and Text: Text

- This text area is enabled if one *Node* is selected.
- The text in this text area is the *Node's* main text which appears inside the node.

#### 4.4.4 Annotations, Actors, Groups

##### Annotations, Actors, Groups: Annotation

- This text area is enabled if one *Node* is selected.
- The text in this text area is the *Node*'s additional information and is not part of the visible text in the graph. ide the node.

##### Annotations, Actors, Groups: Actor Assignment

- This table is enables if one *Node* is selected.
- This table lists all *Actors* that have been defined int the *Actors View*.
- By clicking on a checkbox in an *Actor*'s row an *Actor* is assigned to the selected *Node*.
- A *Node* may have any number of *Actors* associated to it.
- Changing this table has no effects on the graph.
- The Actor Assignment is used in the *Timeline View* to construct the *Timeline*.

##### Annotations, Actors, Groups: Group Assignment

- This table is enables if one *Node* is selected.
- By clicking on a checkbox in a *Group*'s row this group is assigned to the selected *Node*.
- One *Node* can only be in one *Group*, therefor selecting a *Group* will automatically unselect a previously selected *Group*.
- The *Node* in the graph will be coloured with the associated *Group*'s colour.

#### 4.4.5 Edge Detail

##### Edge Detail: Justified

- This button is enabled if one *Edge* is selected.
- Clicking this button will mark the selected *Edge* as justified<sup>10</sup>.
- The Edge will be highlighted blue when it is marked as justified.

##### Edge Detail: Not Justified

- This button is enabled if one *Edge* is selected.
- Clicking this button will mark the selected *Edge* as not justified<sup>11</sup>.
- The Edge highlighting will be turned off and the *Edge* will appear black again.

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<sup>10</sup>It passed the Counterfactual Test

<sup>11</sup>It did not pass the Counterfactual Test

#### Edge Detail: Edge Label

- This text field is enabled if one *Edge* is selected.
- Editing this text field will change the label of the selected *Edge*.
- Items will be displayed halfway between the *Edge*'s tail and head.

#### Edge Detail: Edge Justification

- This text area is enabled if one *Edge* is selected.
- The text entered into the text area does not affect the layout of the graph.
- The text will be used in *Report Generation*.
- The text is meant to explain why two *Nodes* are causal factors.

### 4.5 The Factor View Reference

The *Factor View* contains an overview of all *Nodes* and *Factors* of the project. The main difference to the *Graph View* is the tabular representation of data instead of the graphical representation used in the *Graph View*.

#### 4.5.1 The Factor Table

##### Create... Factor

- This button is always enabled.
- Clicking this button will create a new *Factor*, which will appear as the bottom most *Factor* in the table.

##### Remove completely

- This button is enabled if at least one *Factor* or *Node* is selected.
- Clicking this button will delete all selected *Factors* or *Nodes*.
- Deleting *Nodes* will lead to a redraw of the graph after changing into *Graph View*

##### Remove from Graph

- This button is enabled if at least one *Node* is selected.
- Clicking this button will remove all selected *Nodes* from the graph and make them *Factors*.
- Removing *Nodes* from the graph will lead to a redraw of the graph after changing into the *Graph View*.

### 4.5.2 Factor Properties and Text

#### Factor Properties and Text: ID

- This field is not editable.
- The ID is a unique identifier mainly used internally by the software.
- It is provided here in order to facilitate debugging in case the project file gets corrupted.

#### Factor Properties and Text: Name

- This text field is enabled if one *Node* or *Factor* is selected.
- This text field contains the name of a *Node* or *Factor*.
- The name of a *Node* or *Factor* is usually automatically set by the software on creation on the *Factor* or *Node*
- In a *Node* the name is displayed on top of the node text in brackets.

#### Factor Properties and Text: Date/Time

- This text field is enabled if one *Node* or *Factor* is selected.
- The *Node* or *Factor's* timestamp can be manipulated with this text field.
- The text field's content is not show within the *Node*.
- Date/Time is used to create the *Timeline* in the *Timeline View*.

#### Factor Properties and Text: Node Kind

- This combo box is enabled if one *Node* or *Factor* is selected.
- The node kind determines the *Nodes* shape in the graph.
- At the time of writing the following *Node Kinds* exist:
  1. Unspecified - the default, denoting that no choice has been made which *Node Kind* the *Node* should be assigned.
  2. Event - denoting an event in the sense of a point in time where a system changes its state.
  3. UnEvent - denoting a point in time where a system should have changed its state but did not.
  4. State - denoting a state that is true throughout the whole of the incident .
  5. Process - denoting a series of sufficiently similar event so that they can be aggregated as a process.
  6. Assumption - denoting a *Node* for which at best circumstantial evidence exists, but is believed to be true.
  7. Countermeasure - denotes a measure to counteract a specific *Node* in order to defeat the incident.
  8. Contraindication - denotes the fact that there may be conflicting information about a *Node* to be true or false.

### Factor Properties and Text: Text

- This text area is enabled if one *Node* or *Factor* is selected.
- The text in this text area is the *Node's* main text which appears inside the node.

### 4.5.3 Annotations, Actors, Groups

#### Annotations, Actors, Groups: Annotation

- This text area is enabled if one *Node* or *Factor* is selected.
- The text in this text area is the *Node's* or *Factor* additional information and is not part of the visible text in the graph.

#### Annotations, Actors, Groups: Actor Assignment

- This table is enabled if one *Node* or *Factor* is selected.
- This table lists all *Actors* that have been defined in the *Actors View*.
- By clicking on a checkbox in an *Actor's* row an *Actor* is assigned to the selected *Node* or *Factor*.
- A *Node* or *Factor* may have any number of *Actors* associated to it.
- The Actor Assignment is used in the *Timeline View* to construct the *Timeline*.

#### Annotations, Actors, Groups: Group Assignment

- This table is enabled if one *Node* or *Factor* is selected.
- By clicking on a checkbox in a *Group's* row this group is assigned to the selected *Node* or *Factor*.
- One *Node* or *Factor* can only be in one *Group*, therefore selecting a *Group* will automatically unselect a previously selected *Group*.

## 4.6 Actors View Reference

In the *Actors View* *Actors* can be managed. *Actors* can be assigned to *Nodes* or *Factors* are used to construct the *Timeline*.

### 4.6.1 Actor Table

#### Create... Actor

- This button is always enabled.
- Clicking this button will create a new *Actor*.
- Properties of a newly created *Actor* will be filled with values indicating that the *Actor* has not been worked on yet.



### Remove Actor(s)

- This button is enabled if at least one *Actor* is selected.
- Clicking this button will delete the selected *Actors*.
- References of *Nodes* or *Factors* to a deleted *Actor* will be automatically deleted.

### ID

- This field is not editable.
- The ID is a unique identifier mainly used internally by the software.
- It is provided here in order to facilitate debugging in case the project file gets corrupted.

### Name

- This text field is enabled if one *Actor* is selected.
- This text field contains the name of a *Actor*.

### Description

- This text area is enabled if one *Actor* is selected.
- The text in this text area is the *Actor's* additional information.

## 4.7 Timeline View Reference

The *Timeline* is derived from the data given in the *Actors View* and the *Graph View* or *Factors View*. *Nodes* and *Factors* can be associated with *Actors*. Each row in the *Timeline* represents a *Node* or *Factors*. Each column, with the exception of the first three columns, represents an *Actor*. If the checkbox in an *Actor* column is set, then the respective *Actor* is taking part in the event(s) described in the *Node* or *Factor*. The first columns are

- The *Factor* column displays the text of the *Node* or *Factor*.
- The *Date/Time* column displays the date and time at which the event(s) described happen.
- The *Duration* column displays the duration of the described event(s).

In contrast to most other tables the checkboxes in the *Timeline* table are editable. They serve the same function as the small *Actor* tables in the *Graph View* or the *Factor View*.

## 4.8 Group View Reference

In the *Group View* *Groups* can be managed. *Groups* can be assigned to *Factors* and *Nodes* and affect their colouring in the graph.

### 4.8.1 Group Table

#### Create... Group

- This button is always enabled.
- Clicking this button will create a new *Group*.
- Properties of a newly created *Group* will be filled with values indicating that the *Group* has not been worked on yet<sup>12</sup>.

#### Remove Group(s)

- This button is enabled if at least one *Group* is selected.
- Clicking this button will delete the selected *Groups*.
- References of *Nodes* or *Factors* to a deleted *Groups* will be automatically deleted.
- This may affect the graph and force a redraw when the *Graph View* is next displayed.

#### ID

- This field is not editable.
- The ID is a unique identifier mainly used internally by the software.
- It is provided here in order to facilitate debugging in case the project file gets corrupted.

#### Name

- This text field is enabled if one *Group* is selected.
- This text field contains the name of a *Group*.

#### Colour Chooser

- This button is enabled if one *Group* is selected.
- Clicking this button will open a colour chooser dialogue from which the *Group's* colour can be selected.
- This may affect the graph and force a redraw when the *Graph View* is next displayed.

#### Description

- This text area is enabled if one *Group* is selected.
- The text in this text area is the *Group's* additional information.

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<sup>12</sup>The default colour is white.

## 4.9 Reporter View Reference

The *Reporter* is a tool to assist in the beginning on an analysis. It is an aid to transform a natural language text into chunks, each chunk being fit as a first approximation to a *Factor* text.

### 4.9.1 The Reporter Text Area

The text area is where the input to the *Reporter View* is put. To achieve the best results the text provided here should be

- in simple present tense,
- and in active voice.

Most protocols will be in this form.

#### Factorize

- This button is always enabled.
- Clicking the button will factorize the text provided in the text area, which will subdivide the text into *Factorized Items* using indicators from punctuation and phrasing, each *Factorized Item* should be a good approximation for an atomic<sup>13</sup> expression.
- For each *Factorized Item* a new row will be inserted into the table at the bottom of the text area.
- All *Factorized Items* in the table will be deleted on factorizing.

#### Delete Items

- This button is enabled if one or more *Factorized Items* in the table are selected.
- Clicking this button will delete all selected *Factorized Items* in the table.

#### Create Item

- This button is always enabled.
- Clicking this button will insert a new, empty *Factorized Item* into the table.

#### Clone Items

- This button is enabled if one or more *Factorized Items* in the table are selected.
- Clicking this button will duplicate all selected *Factorized Items* in the table.

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<sup>13</sup>Not further subdivisible and still making sense.

### Merge Items

- This button is enabled if two or more *Factorized Items* in the table are selected.
- Clicking this button will delete both selected *Factorized Items* and create a new one containing the text of both previously selected *Factorized Items*.
- The order in which the *Factorized Items* appear in the table determines the order in which the texts are concatenated.

### Make New Analysis

- This button is always enabled.
- Clicking this button will delete all projects *Nodes* and *Factors* and create new *Factors* from the *Factorized Items*.
- *Factorized Items* marked as *Damage*, *Incident* or *Proximate Cause* will be converted to *Nodes* and a preliminary graph will be created.

#### 4.9.2 Factorized Item Table

The table contains all *Factorized Items*. The first column contains the textual descriptions, the second column the type of a *Factorized Item*. The table itself is not editable.

### Factorized Item Text Area

- The text area is enabled if one *Factorized Item* is selected.
- The text in this text area is the *Factorized Item*'s main text which appears in the table.

### Factorized Item Combo Box

- The combo box is enabled if one *Factorized Item* is selected.
- The combo box changes the selected *Factorized Item*'s type to one of the following:
  - *None*: This is the default upon creation of a *Factorized Item*.
  - *Damage*: This indicates, that the *Factorized Item* describes the damage in a reported incident.
  - *Incident*: This indicates, that the *Factorized Item* describes the incident event in a reported incident.
  - *Proximate Cause*: This indicates that the *Factorized Item* describes a cause leading to the incident event.
- When creating a preliminary graph from the *Reporter View* all *Proximate Causes* will be causes for all *Incidents*, which will be causes for all *Damage*.

## 4.10 Report Generator Reference

The table in the *Report Generator View* shows the *Report Generator Parts* that will be included in a PDF export. *Report Generator Parts* can be

1. A *Cover*, usually for the front page of a *Report*.
2. The *Graph* on one page, which may leave *Node* texts unreadable.<sup>14</sup>
3. The *List of Factors*, which contains all *Nodes* and *Factors* of the active *Project*.
4. The *Causal Justification List*, similar to the *List of Factors*.
5. The *Group List*, similar to the *List of Factors*.
6. The *Actor List*, similar to the *List of Factors*.
7. The *Timeline* which is a chronological table of all *Nodes* and their respective *Actors*.
8. Additionally other PDF documents can be used as sources for a *Report*. See *Create ... External PDF*.

The order as shown in the table will be the order in which the *Report Generator Parts* will appear in the finished PDF. *Reports Generator Parts* can be excluded from the PDF export by unselecting the checkboxes in the table.

### Report: Save As

- This button is always enabled.
- Clicking this button will open a file output dialogue.
- After a file location has been selected the PDF export will write the *Report* to that file.
- The file location will be stored in the *Project*.

### Report: Save

- This button is always enabled.
- The PDF export will write the *Report* to a previously selected file location.
- If there is no previously selected file location the behaviour will be as in *Report Save As*.

### Move Parts: Move Up

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will move the selected *Report Generation Part* one row up in the table, with respect to the other *Report Generation Parts*.
- If the selected *Report Generation Part* is already the top most, nothing is done.

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<sup>14</sup>An alternative way to display the graph is in progress.

**Move Parts: Move Down**

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will move the selected *Report Generation Part* one row down in the table, with respect to the other *Report Generation Parts*.
- If the selected *Report Generation Part* is already the bottom most, nothing is done.

**Create: Cover**

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will insert a *Report Cover* below the selected *Report Generation Part*.

**Create: Graph**

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will insert a *Report Graph* below the selected *Report Generation Part*.

**Create: Factor List**

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will insert a *Report Factor List* below the selected *Report Generation Part*.

**Create: Causal Justification List**

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will insert a *Report Causal Justification List* below the selected *Report Generation Part*.

**Create: Group List**

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will insert a *Report Group List* below the selected *Report Generation Part*.

**Create: Actor List**

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will insert a *Report Actor List* below the selected *Report Generation Part*.

**Create: Timeline**

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will insert a *Report Timeline* below the selected *Report Generation Part*.

**Create... External PDF**

- This button is enabled if one *Report Generation Part* is selected.
- Clicking this button will open a file open dialogue, to select a PDF for inclusion in the *Report*.
- A new *Report Generation Part* will be inserted into the table below the selected *Report Generation Part*.