Bit Pathways User Guide

For Bit Pathways version 2.1.0

September 2012

Contents

1 Introduction

1.1 Overview

Bit Pathways is a template-based flowchart editor which can be applied for visualisation and structurisation of knowledge in different disciplines.

The editor has been developed by Andrzej Kononowicz to serve as a clinical pathways editor. Currently the tool is also used for other purposes including learning using graphic organisers, design of virtual patients, building cognitive maps, visualisation of workflows. Being developed in Java Swing technology the Bit Pathways tool can be used on various operating systems and does not require complicated installation.

Bit Pathways represents flowcharts at three levels: Context, Template, Pathway Data. The level of context defines the types of nodes and edges available in the flowchart. At the level of templates attribute groups composed of single attributes or attribute lists can be defined and attached to nodes and edges of the flowchart graph. Various templates may be prepared and stored on-line in a repository. At the pathway data level individual flowcharts graphs are created. Pathways can reference to subordinated pathways (subpathways).

Flowcharts created by Bit Pathways may be stored as separate files locally or (by default) remotely in a native XML database. The pathways may be exported as PNG images, interactive HTML pages (hyper-flowcharts), MedBiquitous Virtual Patient (MVP) packages and GLIF guidelines (in RDF-format).

In addition to the editor, a system for viewing Bit Pathways flowcharts on-line was developed called Bit Pathways Teacher.

1.2 Basic features

- graphical drag'n'drop design of flowcharts
- flowchart elements described in exchangeable attribute sets (templates)
- sub-pathways
- editors for different attribute types
- export in several formats: PNG, HTML (hyper-flowchart), MedBiquitous Virtual Patient, GLIF (prototype)
- user login, roles and groups
- data storage locally or remotely on XML servers

2 Installation

2.1 Prerequisites

Bit Pathways requires that Java Run-Time environment in version 1.5 or higher is installed. The **java** command should be accessible from the folder where Bit Pathways is installed

- How to check prerequisites in MS Windows:
  - Go to **Start -> Run -> Cmd** to open the console
  - In the console type **java -version**
  - If you obtain as the result the java version number 1.5 or higher than everything is set up properly and you may start using Bit Pathways
  - If not:
    - Make sure Java is installed on your machine, if not or you are not sure about it download the newest JRE or JDK from http://www.oracle.com/technetwork/java/javase/downloads/index.html
    - If the java command is still not working add the path to your Java installation to the PATH system variable:
      - My computer->Properties->Advanced->Environment variables->System variables
      - Select the variable Path and click on Edit
      - Add at the end of the line ; and the path to the bin folder in your Java installation – e.g. C:\Java\jdk1.7.0_01\bin
    - It is recommended to add also a new variable JAVA_HOME with the path to your Java installation – e.g. C:\Java\jdk1.7.0_01

2.2 Installation/Deinstallation process

- For MS Windows:

Execute the **bpath_install.exe** and follow the instructions. A desktop icon and Start menu entries will be created (this step may be skipped while installing the application).

In order to uninstall the application use the Uninstall application in the Start menu or uninstall.exe in the application folder.

- For Linux:

To be documented …

In order to install Bit Pathways extract the content of the **bpath_bin.zip** package into any folder on your hard drive.

File execution – to be documented. For now look for hints in the bp.bat file.

Uninstall –delete the folder to which you copied the content of bpath_bin.zip.

2.3 Setup

Bit Pathways requires a repository to store pathways and user data.

You may configure the repository by editing the **conf/conf.xml** file in the application folder.

If the standard settings do not apply (i.e. you do not have an account on the default server) refer to section 6 on how to install and configure a repository.

3 Creating a Pathway

3.1 Running Bit Pathways

To start Bit Pathways execute one of the attached batch files located directly in the installation folder e.g. :

- bp.bat - for English language version
- bp_pl.bat – for Polish language version

3.1.1 Running Bit Pathways on-line

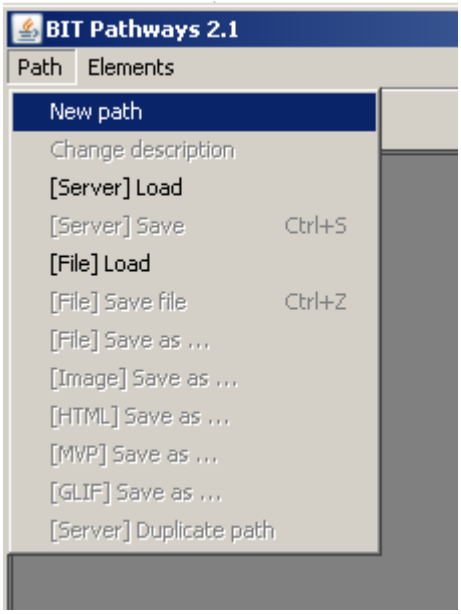
First step after executing Bit Pathways is the choice of the pathway server and input of the proper username/password. Click OK to start the session.

3.1.2 Running Bit Pathways off-line

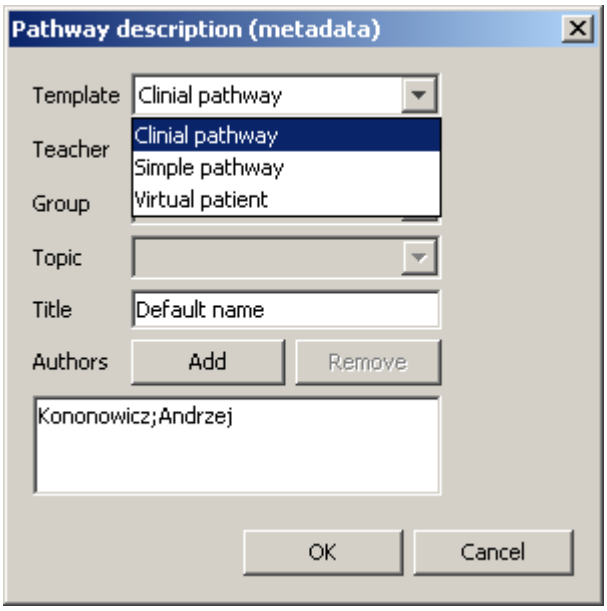
An offline version of the software is not available at the current moment due to the necessity of downloading pathway templates from an on-line repository. The feature of buffering of templates to work off-line needs to be implemented.

3.2 Initiating a new pathway

To create a new pathway go to the **Path** menu and select **New path**



A new pathway window will be opened where you can select, depending on the user account settings, different metadata describing the pathway. Upon selection of the "OK" the pathway is created and the user may start designing the pathway.



3.2.1 Template property

A template is a set of attributes (grouped in attribute groups) which are attached to different types of flowchart elements. The number of possible templates is unlimited. Examples of templates already available are Simple pathway, Clinical pathway, Virtual patient. User account administrators decide which templates are available to individual users or user groups.

3.2.2 Teacher, Group & Topic properties

Bit Pathways is also used as an educational tool. In such case users can be put into students' groups with predefined topics of pathways, subgroup ids, and instructor names. E.g. the 4-year programme of medicine in year 2012 may have two teachers assigned ("Andrzej", "Michal"), four groups ("A","B","C","D"), and three topics ("Acute stroke", "Minor head injuries", "Lyme disease").

Individual students select their instructor, group and teacher. For all other users these fields are disabled.

3.2.3 Title property

Title of the pathway as displayed in the window's title and in the pathway repository.

3.2.4 Authors property

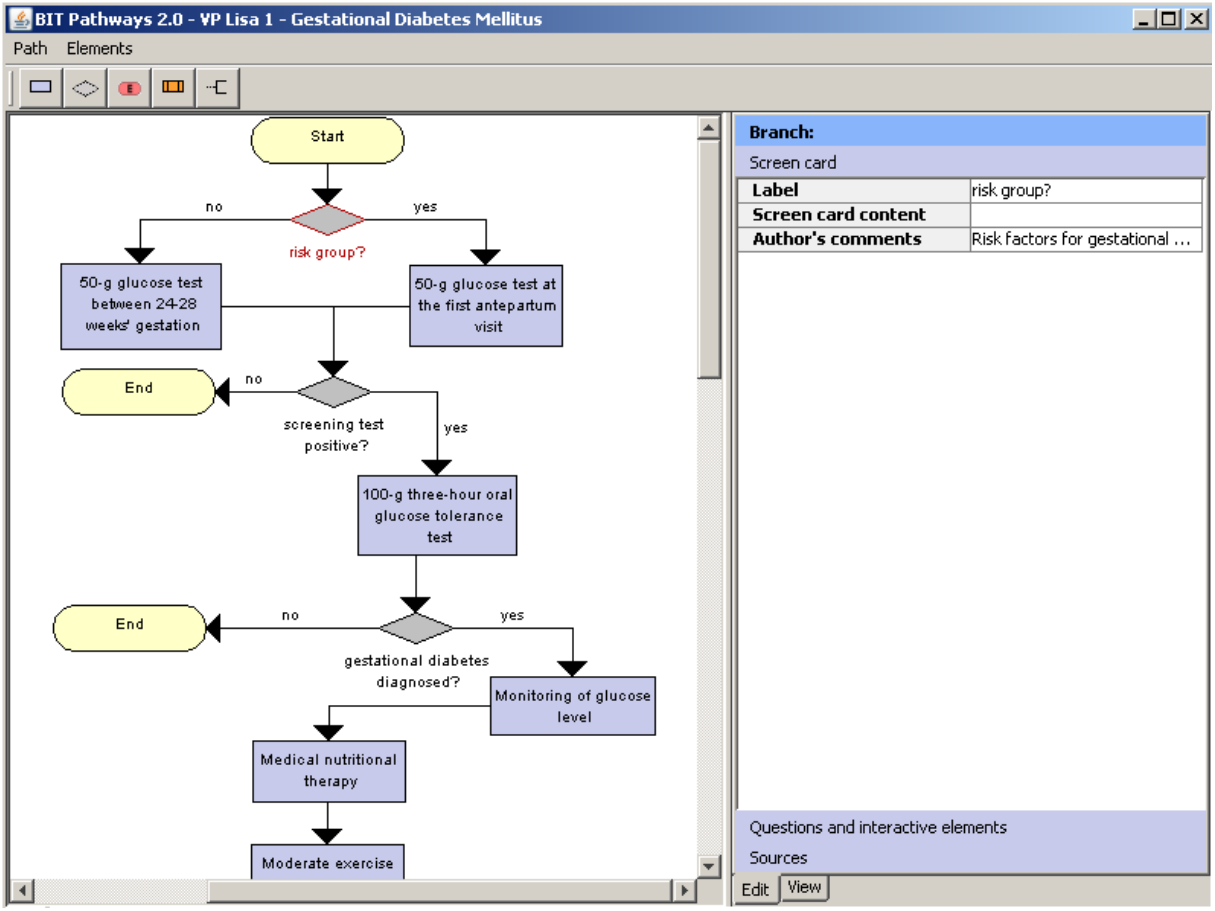
A list of co-authors of the pathway. Each author is characterised by first and family name. By default the name of the user logged into the system is added automatically to the authors' list. New users can be added or existing user removed by the "Add" and "Remove" buttons.

You may change the metadata of the pathway at a later stage by selecting **Path** menu, then the **Change Description** item.

3.3 Designing the pathway

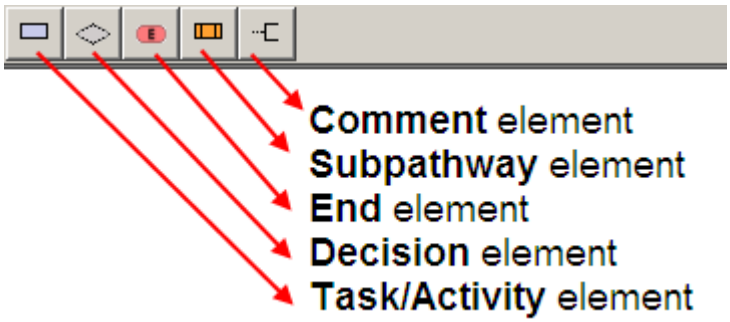
After a new pathway has been created the user interface displays three main parts:

- Upper-left corner: **toolbar** with shapes that can be placed in the flowchart
- Centre of the screen: **canvas** – i.e. area for drawings the . The user designs using the drag'n'drop method the topology of the pathway.
- Right side of the picture: **property panel** with attributes (properties) describing the selected element (e.g. activity node, branch element or edge). The list of attributes (attribute groups) has been defined in the template selected while creating the pathway.



3.3.1 The toolbar

The toolbar is composed of icons presenting elements (vertices) of the flowchart graph. To add a new element to the canvas make a left-click on one of the icons in the toolbar and click then again on the canvas in the place where would you like to place the element.

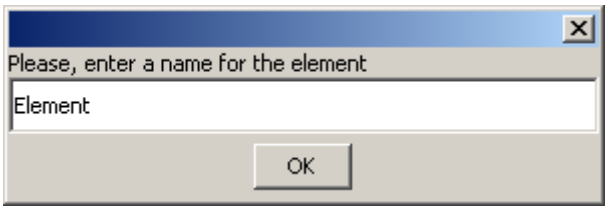


The pathways have always one **start element** that is always present in the pathway, cannot be removed. It is also not permitted to have two start elements in one pathway. Elements may be connected by **edges** with a separate set of attributes defined in the template. The start element cannot have any incoming edges.

Note for advanced users: The list of available shapes is defined in the application's **context** and can be extended by implementing proper interfaces. This feature is still in development phase and needs to be better documented.

3.3.1.1 Task/Activity element

A rectangular shape usually denotes a task or activity to be carried out. Upon creation of the element the user is asked to provide a name for the element. This name can be changed later on using the property panel. The name of the task element is displayed within the shape.



3.3.1.2 Decision element

Decision elements are presented as diamond shapes of fixed size (in contrast to other element cannot be enlarged). Its caption can be set by the label property and is displayed below the shape. A Decision element should have at least one incoming and two outgoing edges. The number of outgoing edges is not limited.

3.3.1.3 End element

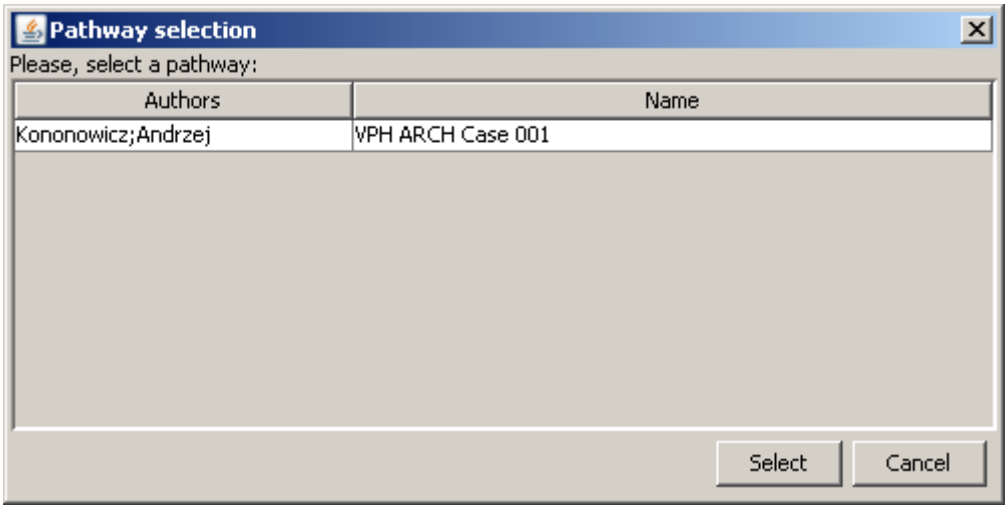
A pathway may have several end elements depicted as rounded rectangles. The caption of end elements cannot be changed. The end element cannot have any outgoing edges.

3.3.1.4 Subpathway element

Pathways can be linked to other (sub-pathways) by the rectangular shape with three compartments. Upon creating a pathway the user can selected between:

- Attaching a new pathway – this feature is not working yet
- Attaching an existing path to the current path

When attaching an existing path the user has to select a pathway from the repository to which (s)he has access right:



The default label of the subpathway is the title of the attached pathway but it can be changed to a different name.

3.3.1.5 Comment element

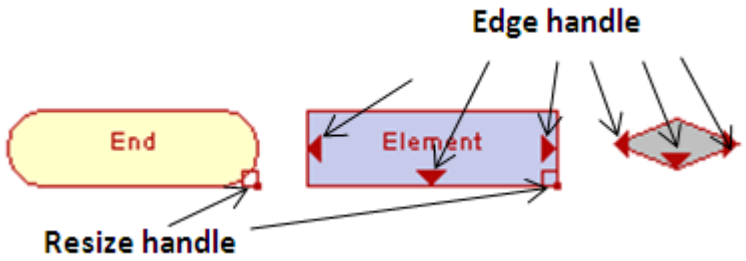
The recommended way of describing pathway elements is by their properties. Nevertheless there are sometimes situation in which the user prefers to add on-screen comments of an arbitrary place or element in the pathway.

This element cannot be attached to the other pathway elements using edges.

3.3.2 The canvas

3.3.2.1 Moving elements

The canvas is fixed on the top and left hand side but can be enlarged by moving the elements to the right or bottom side. Elements placed on the canvas can be moved to different locations upon a left click on their shapes (the shape gets a red surrounding and the resize and edge handles become visible) and dragging it with the left mouse button pressed to a new location. Do not pull edge or resize handle if you would like to move the shape to a new location.

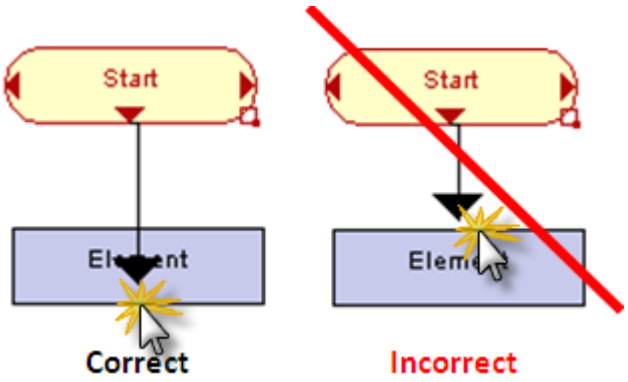


You may move the whole flowchart to a new position by having the Ctrl button pressed, end relocating the graph with the arrow keys.

It is also possible to select a subset of elements (keep the shift button pressed and select elements with the mouse pointer) and then moving them to a new place by pulling the selection (keep the shift button pressed).

3.3.2.2 Connecting elements

An edge can only be placed between two existing elements. Drag the edge handle from the source element and drop it **over** the shape of the target node and **not before** the element as on the right hand side in the figure below.



The route of edge is automatically calculated using an internal algorithm. Note: alternative algorithms are in preparation.

3.3.2.3 Changing the size of the elements

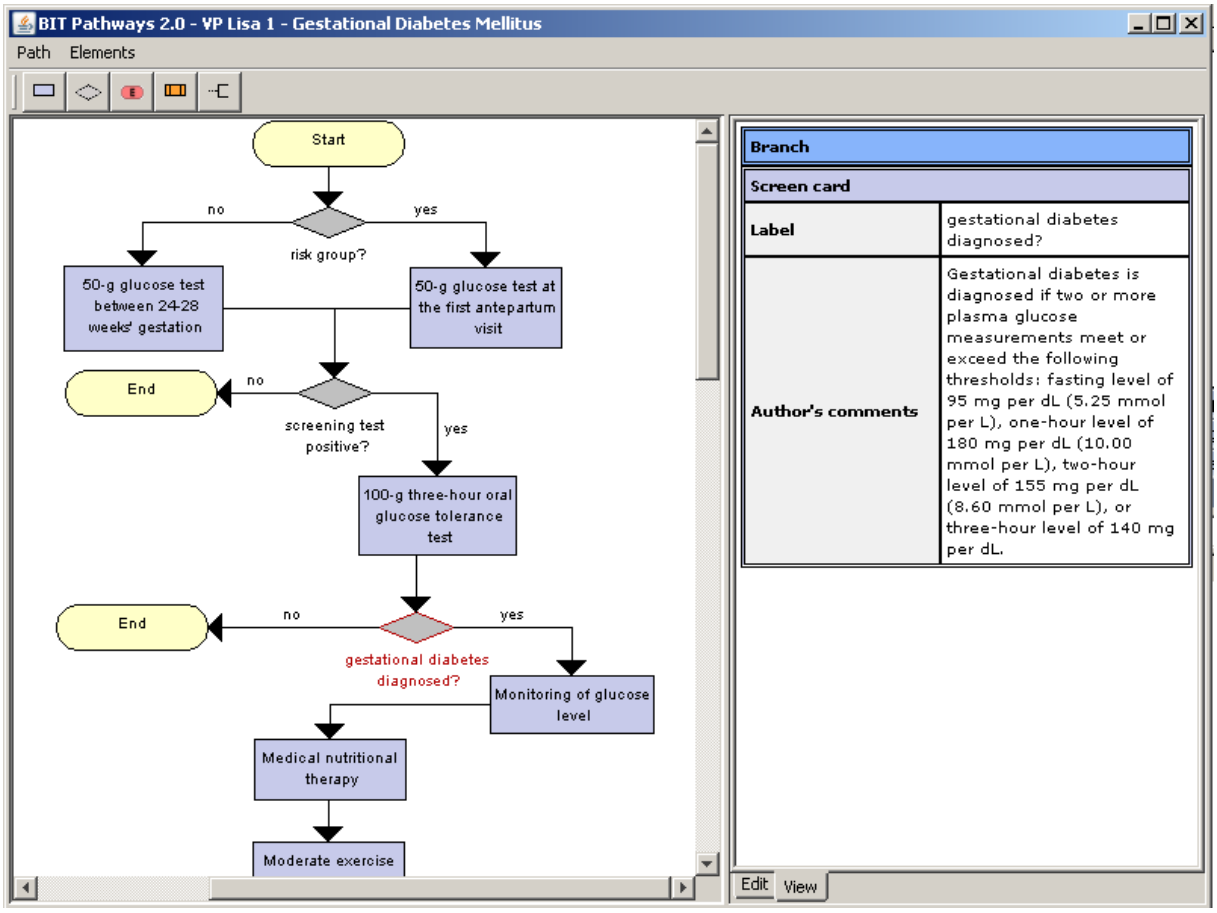
To resize an element drag the resize handle after the element was selected. You cannot resize decision elements.

3.3.2.4 Removing elements

Select the element (or edge) to be removed with the right mouse. Select delete from the context menu. You cannot delete the start node. The edge is removed if either the source of target node is deleted.

3.4 The property panel

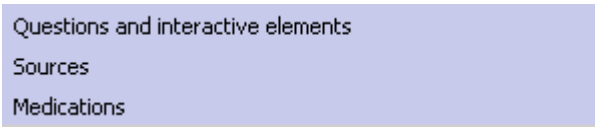
The attribute panel may be switched either to the **edit mode** (to modify the attribute values) or **view mode** (to see whole description of elements including HTML formatting). To toggle between the views use the tabs below the property panel.



The **first row** in the property panel describes the class of the currently selected pathway component (like Task, Start, Edge, Decision).

There is one special type of element called "**Pathway**" (with only one instance) which is activated upon a left mouse click on the canvas in a place without any other element. This element contains attributes describing the pathway as a whole. The attributes of this element are defined (as for the other element types) in the template.

The property panel contains attributes divided in **attribute groups**. You may switch between them clicking on their names.



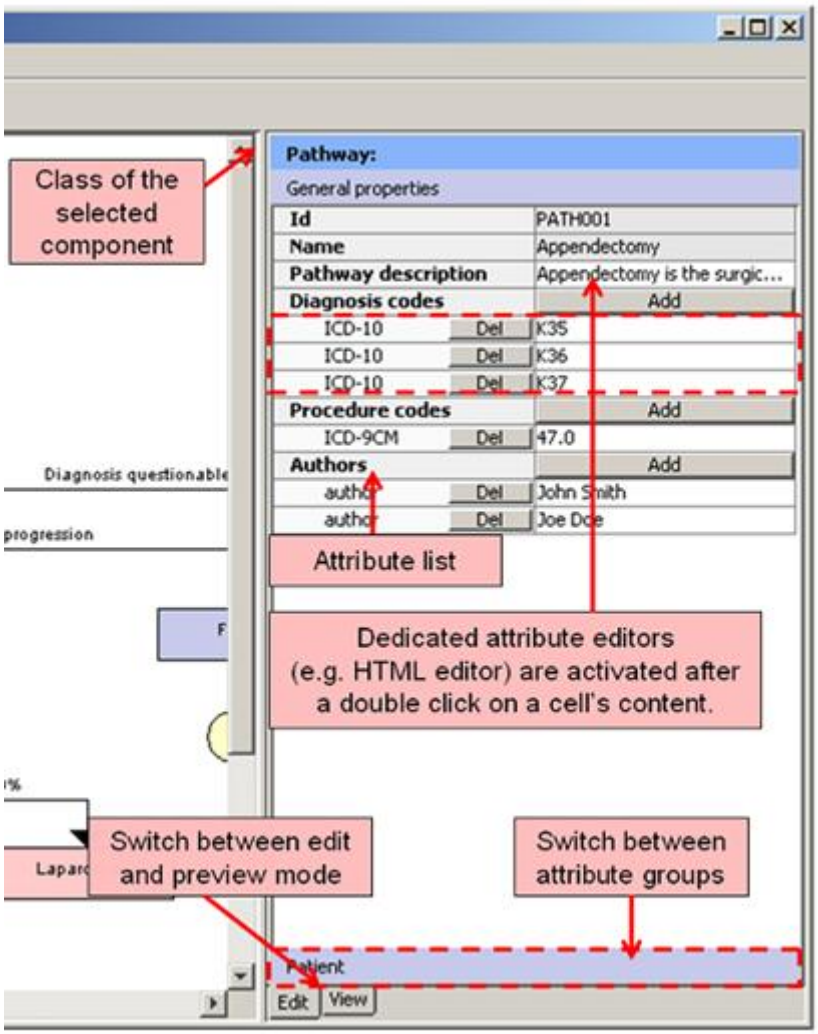
Three attribute groups

On top of the property panel (just below the class of the currently selected element) is the name of the currently selected attribute group.

The attribute group panel is divided into two columns :

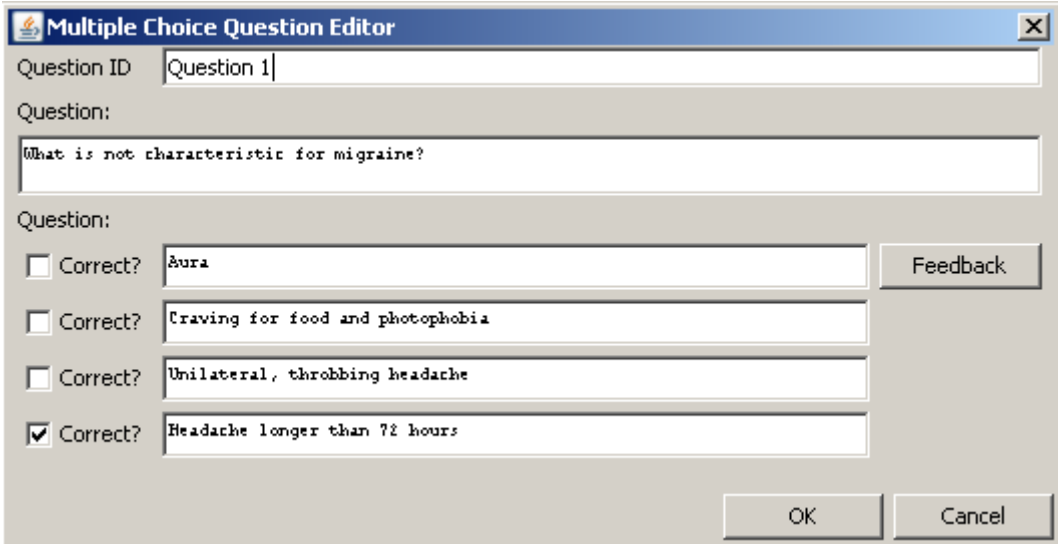
- the left one with **names** of attributes
- the right one with **values** of attributes

If a value is on grey background it is in **read only mode**. Otherwise a double click activates the editor of the attribute.



Attribute editors are depended of the type of the attribute set in the template. Editors are activated upon a left mouse click on the value box. Some of the editors are displayed “in-line” (like for instance the type “string”). To accept the change of attribute’s value hit on the **Enter** key. Other editors (more advanced) are opened in a separate window. Examples of more advanced editors include editor for MCQ questions, HTML editor, duration editor, citation editor, etc.

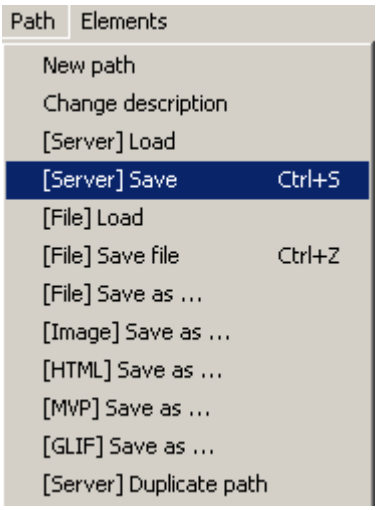
Some attributes may be declared **as attribute lists**. If so, the first row of the attribute list value contains the “add” button for adding new items to the list (displayed in the rows below). On the left of the attribute list items is a “Del” button to remove the values from the list.



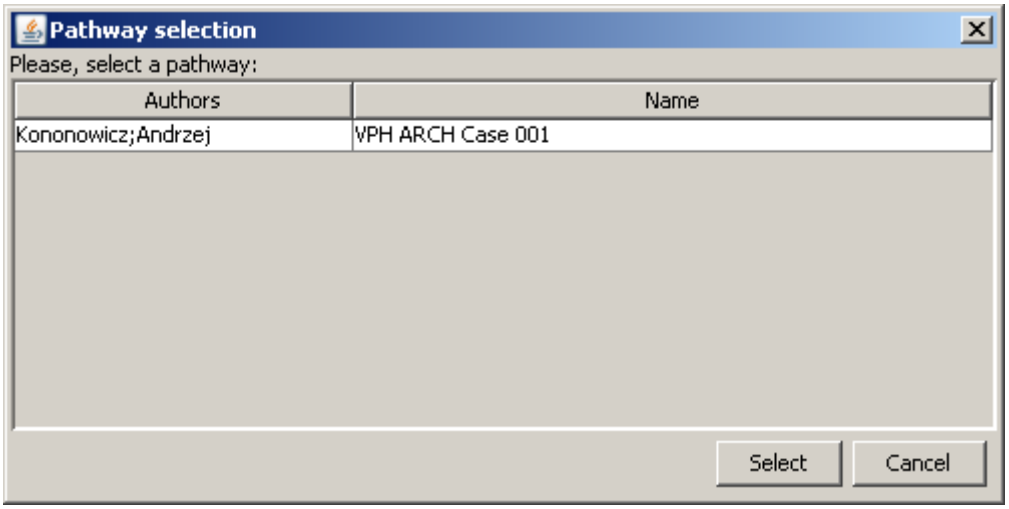
4 Saving pathways

4.1 Saving pathways on-line

It is recommended to save pathways on-line. They are stored on the server on which the user logged into. To store a pathways select the Path menu, next **[Server] Save**. T

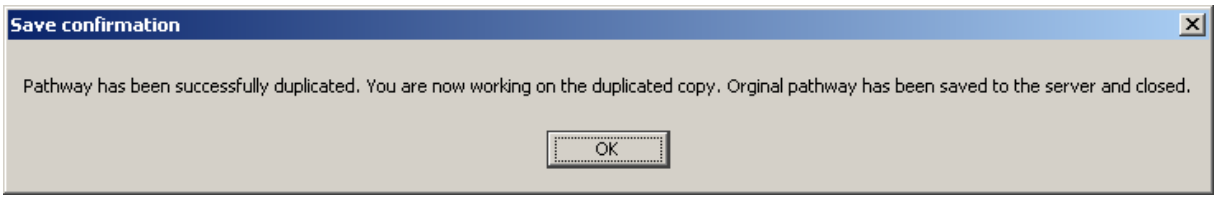


o load a pathway from the server select the Path menu and **[Server] Load**. A plain user has access only the pathways he has created (or those with explicit access permission – this feature needs to be implemented). A superuser (admin) may open all pathways stored on the server.



4.2 Duplicating pathways

A pathway that has been opened may be duplicated on the server. To do so select **[Server] Duplicate path** in the Path menu. When selecting this option the original pathway is stored on the server and closed, and a new pathway is created with exactly the same content as the original one.



It is recommended to change the name of the new pathway by selecting **Path** -> **Change description**.

4.3 Saving pathways off-line

The pathways can be stored and loaded off-line as XML files with the **[File] Save**, **[File] Save As** and **[File] Load** options in the Pathway menu.

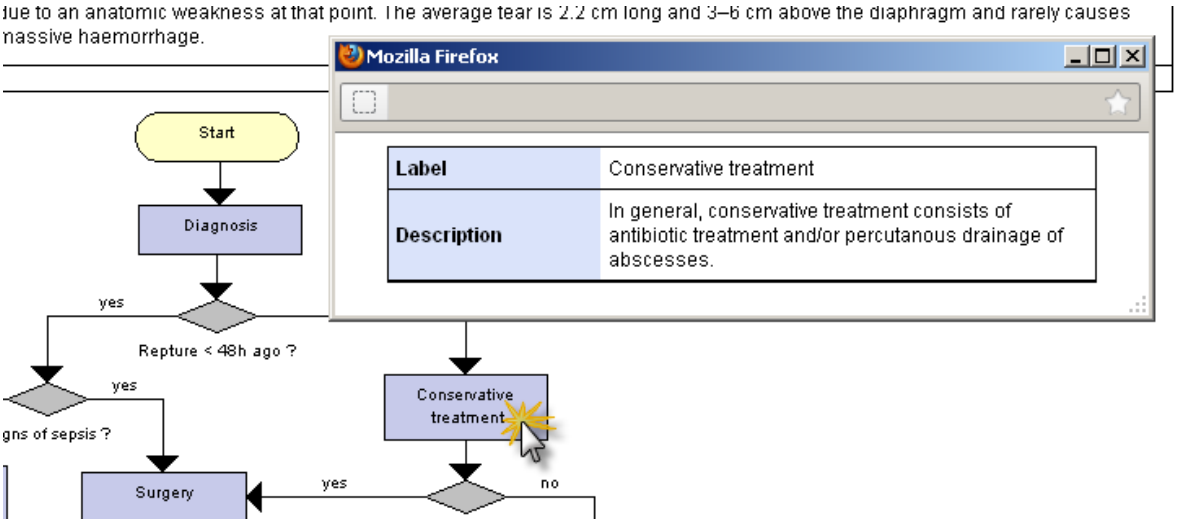
It is also possible to export pathways from the Bit Pathways editor to the following formats:

4.3.1 PNG image

The flowchart may be stored as a static graphic file in the PNG format. No attributes values will be exported in that form. To export the file as PNG image select **[Image] Save As …** in the **Path** menu.

4.3.2 HTML page - Hyperflowchart

The pathway stored as a hyperflowchart is a document in HTML format with element descriptions displayed in pop-up windows activated upon clicking on the elements.



To store the pathway as a HTML page select **[HTML] Save As …** in the Path menu. Then select the folder to which the page will be exported.

The exported pathway consists of:

- HTML page containing all element descriptions. Open this file to view the hyperflowchart
- PNG file with the pathway image
- pics folder with additional images belonging to the pathway (and the Bit Pathways logo)
- css – style sheet defining the graphical layout of the exported pathway

4.3.3 MVP Package

This option is active for pathways with selected **virtual patient** template. The MedBiquitous Virtual Patient standard (MVP) [http://www.medbiq.org/working_groups/virtual_patient/index.html] is a format for exchanging virtual patients data. Bit Pathways supports export of pathways both as linear and branched virtual patient packages

To export the pathway as a branched MVP package do not select any element in the canvas and click on Path menu, next on **[MVP] Save as …**

Saving a linear VP requires selection of a linear path in the editor before selecting the **[MVP] Save as …** option. Select the elements starting from the root and keeping the shift button pressed, select successive nodes.

The MVP package will be exported to a folder selected by the user after clicking the **[MVP] Save as …** menu item.

4.3.4 GLIF format

This option is active for pathways with selected **clinical pathways** template. The Guideline Interchange Format (GLIF) [http://mis.hevra.haifa.ac.il/~morpeleg/Intermed] is a specification for exchanging computer-interpretable clinical guidelines.

To export the pathway as a GLIF package select **[GLIF] Save as …** and a folder where the package should be stored.

5 Setup of a pathway repository

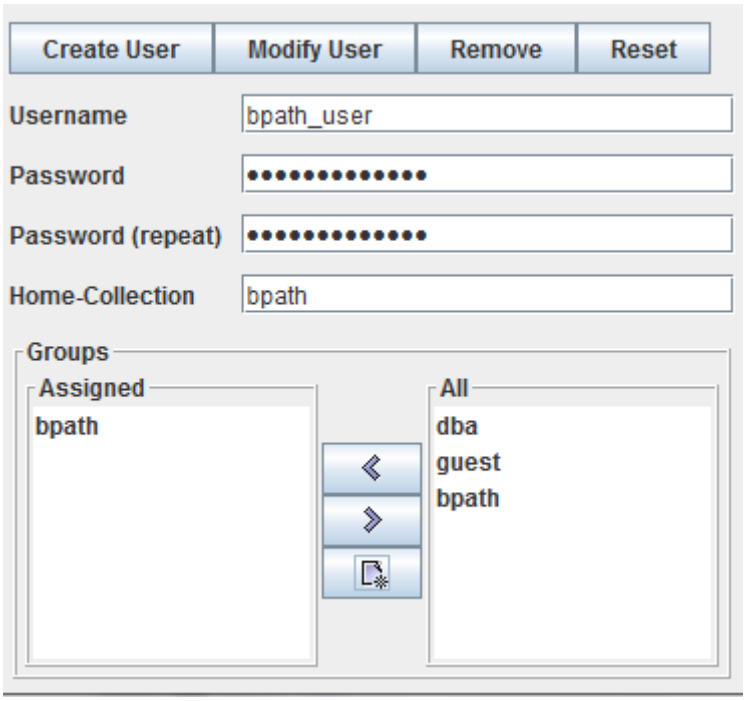
5.1 Install the repository

Bit Pathways requires a XML-native database to store pathways and user data. So far only the **eXist-db** binding has been implemented (tested with eXist 1.2.6). For instructions how to download and install eXist refer to http://exist-db.org/exist/download.xml .

Note: Install exist in the folder **exist** on your application server.

5.2 Create and configure pathways collection

After installing eXist create a collection – e.g. **`bpath`** owned by a new database user e.g. `bpath_user` with free selected password (for more information how to do it refer to exits-db documentation http://exist-db.org) belonging to a new user group (e.g. bpath).



In the bpath collection create a file users.xml .

An example of user.xml file is presented in the code snippet below:

```
<configuration>

  <bp_users>
    <bp_user uid="1" name="myuser" password="test" role="user" firstname="John" famname="Doe" group="group_test"/>
  </bp_users>

  <groups>
    <group id="group_test">
      <templates>
        <template>
          <name>Clinial pathway</name>
          <url>http://puls.cm-uj.krakow.pl/bpath/templates/t_cp_v001.xml</url>
        </template>
        <template>
          <name>Simple pathway</name>
          <url>http://puls.cm-uj.krakow.pl/bpath/templates/t_simple_v001.xml</url>
        </template>
        <template>
          <name>Virtual patient</name>
          <url>http://puls.cm-uj.krakow.pl/bpath/templates/t_vp_v001.xml</url>
        </template>
      </templates>
    </group>
  </groups>

</configuration>
```

It creates a Bit Pathways program user (not to be confused with eXist database user) with the username “myuser” and password “test”. The user belongs to the group “group_test” with three defined templates: Clinical pathways, Simple pathway and Virtual patient.

5.3 Configure Bit Pathways to use the repository

After setting up the pathways repository configure the **conf/conf.xml** file in the install directory of Bit Pathways. You may either add a new server item to the servers branch of the configuration file, or modify the existing entries corresponding to the parameters set while installing the pathways repository . If no db_user, db_pass, db_name parameters are set – the values encoded in the compiled files will be taken.

```
<bpath_conf>

  <servers>

    <server>
      <label>vph</label>
      <address>149.136.32.129</address>
      <port>80</port>
    </server>

    <server>
      <label>localhost</label>
      <address>127.0.0.1</address>
      <port>8080</port>

      <!-- db config may be skipped, in such case
      data encoded in the source code ServerConf.java
      will be taken -->

      <db_user>bpath_user</db_user>
      <db_pass>bpath_default</db_pass>
      <db_name>bpath</db_name>
      <db_type>existdb</db_type>
    </server>

  </servers>

</bpath_conf>
```

6 Templates

6.1 Designing your own template

To be documented

6.2 Template repository

To be documented

7 To do list

- Alternative algorithms for tracing out edges connecting elements (e.g. simple straight edges connecting the elements, arcs, Bezier curves)
- Adding images to pathways
- Undo button
- Zoom in/out function
- Tool for editing templates

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