Appendix B

User Guide

The *ProvViz Application* is a PROV document editor and visualiser that enables users to explore and modify PROV models without requiring prior knowledge of PROV document syntax. The following user guide aims to provide easy to follow set of instructions on how to use the *ProvViz Application* and the functionality it provides. To start using the application visit the following URL in your web-browser of choice: `https://provviz.com`.

B.1   Loading a PROV Document

To start using the application to explore and modify a PROV document, the document must first be loaded. There are four supported methods for loading a PROV document:

1. upload a PROV document,

2. create an empty PROV document,

3. choose an example PROV document, and

4. choose a previously uploaded PROV document.

B.1.1   Uploading a PROV Document

A PROV document can be uploaded from the application's start page by clicking the "Upload Document" button (Figure B.1.3), or form the menu-bar's "Open" drop-down menu by selecting the "Upload Document" drop-down option (Figure B.2.3). These actions will open a dialog to assist the uploading process. Once the process is complete, the uploaded document will be displayed in the *PROV Document Editor*.
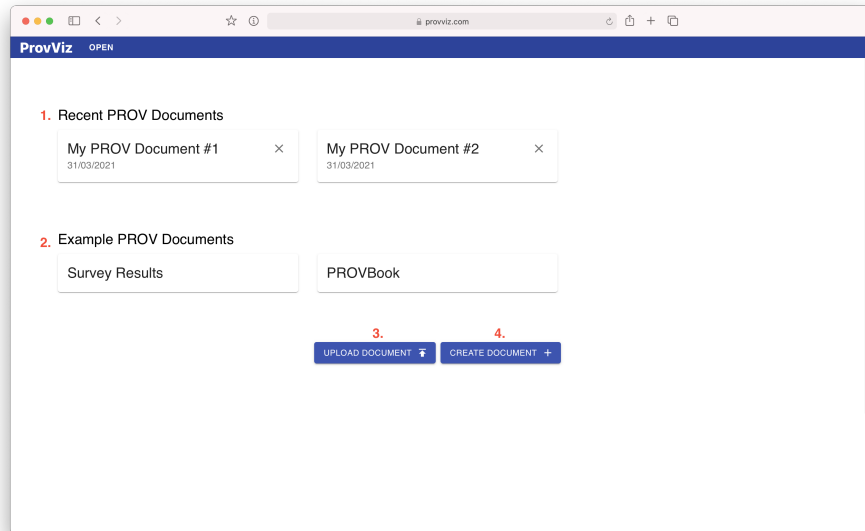
Figure B.1: Start Page

B.1.2 Creating an Empty PROV Document

An empty PROV document can be created from the application's start page by clicking the "Create Document" button (Figure B.1.4), or form the menu-bar's "Open" drop-down menu by selecting the "Create Document" option (Figure B.2.4). These actions will display a dialog where the name and PROV format of the document can be chosen. Once the empty PROV document has been created it will be displayed in the *PROV Document Editor*.

B.1.3 Choosing an Example PROV Document

An example PROV document can be chosen from the application's start page and from the menu-bar's "Open" drop-down menu. On the start page, example documents are listed under the "Example PROV Documents" heading (Figure B.1.2), and in the "Open" menu-bar the example documents are listed in the "Examples" drop-down sub-menu (Figure B.2.2). By clicking on an example document, it is automatically opened in the *PROV Document Editor*.

B.1.4 Choosing a Previously Uploaded PROV Document

A previously uploaded PROV document can be loaded from the application's start page, or from the menu-bar's "Open" drop-down menu. On the start page, the four most recently modified documents are listed under the "Recent PROV Documents" heading (Figure B.1.1), and in the "Open" menu-bar all the previously uploaded PROV documents are listed in the "Recent"
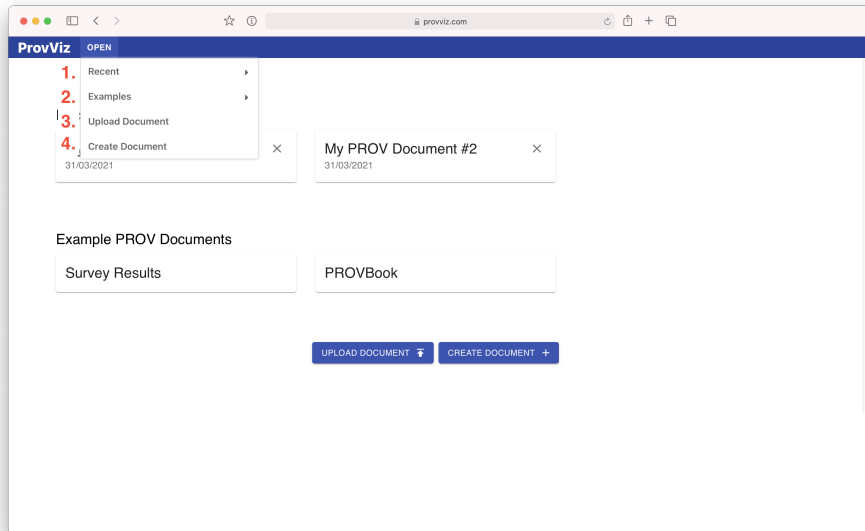
Figure B.2: Menu-Bar Open Drop-Down Menu

drop-down sub-menu (Figure B.2.1). By clicking a recent PROV document, it is automatically opened in the *PROV Document Editor*.
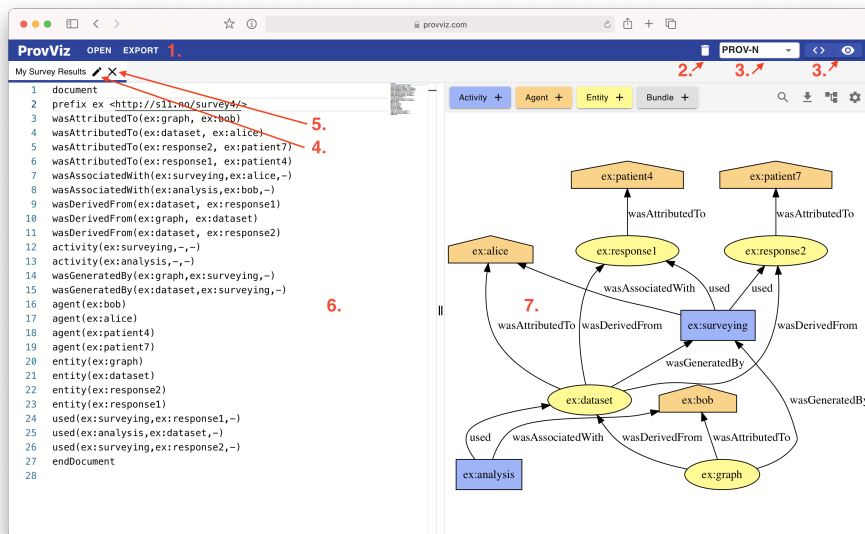
B.2 PROV Document Editor

Figure B.3: Annotated Screenshot of the *PROV Document Editor*

The *PROV Document Editor* is primary interface of the application, where loaded PROV documents can be explored and modified. When a document is loaded, it is opened in a new

tab in the tabbed editor. To close an opened document (without permanently deleting it), the close tab icon button (Figure B.3.5) can be clicked. It can be loaded at a later point as discussed in the previous section.

As illustrated by the screenshot depicted in Figure B.3, the interface is a tabbed editor containing a text-editor on the left (Figure B.3.6) and a visualiser on the right (Figure B.3.7). The text-editor enables direct modification of the underlying PROV Document, requiring familiarity with PROV document syntax. The visualiser provides a visualisation of the PROV document alongside intuitive editing functionality that doesn't require familiarity with PROV document syntax.

Modify the Editor Layout

Whether to show both the text-editor and visualiser or just one of the components can be toggled using the layout editor (Figure B.3.3). When both the text-editor and visualiser components are being displayed simultaneously, the proportion each takes up on the screen horizontally can be adjusted by dragging the divider separating the components to the left or the right, similar to how one would arrange windows on a desktop computer.

Edit the PROV Document's Name

The name of the currently open PROV document is displayed when loading the document from the recent documents, and in the document's tab name. To modify PROV document's name, the edit name icon button (Figure B.3.4) can be clicked to open a section in the editor where it can be modified using a text-field input.

Change the PROV Document's Format

The PROV document format displayed in the text-editor can be modified by interacting with the PROV format select input (Figure B.3.3) in the menu-bar. When the document's format is modified, the most recently saved version of the current PROV document is translated to the new format, updating the text-editor's contents automatically.

Export the PROV Document

The current PROV document in the *PROV Document Editor* can be exported by clicking the "Export" button in the menu-bar (Figure B.3.1). This will open a dialog which let's the user

select the desired PROV format of the exported PROV document. The document is then saved as a file in the default save location of the web-browser.

Delete the PROV Document

The current PROV document in the *PROV Document Editor* can be permanently deleted by clicking the delete icon button in the menu-bar (Figure B.3.2). This action cannot be undone.
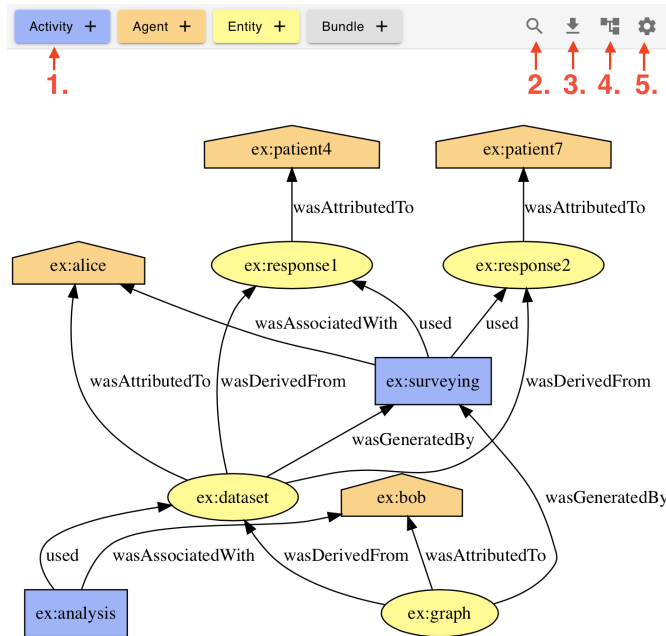
B.2.1 PROV Visualiser

Figure B.4: PROV Visualiser

As mentioned previously, the *PROV Visualiser* visualises the PROV document, and enables the user to explore and intuitively modify a PROV document without any prior knowledge of PROV document syntax. The layout of the *PROV Visualiser* is composed of a menu-bar, the visualisation itself, and a tabbed inspector (that is hidden when no *Entity, Agent, Activity, Bundle* or relationship is selected).

There PROV document can be visualised in two ways: a *Graph View* and a *Tree View*, where the default view is the *Graph View*. These views can be toggled by clicking the view icon button (Figure B.4.4).

There are four types of tabs that can opened in the tabbed inspector: the *Node Inspector, Bundle Inspector, Relationship Inspector* and the *Settings Inspector*. The functionality available

in each inspector tab will be explored in later sections.

Selecting an *Entity*, *Agent*, *Activity*, *Bundle* or relationship

Selecting an *Entity*, *Agent*, *Activity*, *Bundle* or relationship in the *PROV Visualiser* opens its corresponding inspector tab in the tabbed inspector. If the tabbed inspector is hidden from view, it will be automatically displayed. When an item has been successfully selected in the *Graph View*, it will be outlined in red as shown in Figure B.5 where the `ex:dataset` *Entity* has been selected.

The most intuitive method for selecting an *Entity*, *Agent*, *Activity*, *Bundle*, or relationship is by clicking on the corresponding item in the visualisation. For instance, to select an *Agent* in the visualisation its node in the *Graph View* or *Tree View* can be clicked. To select a relationship in the visualisation its arrow or label can be selected in the *Graph View*.

There are alternate methods of selecting PROV items. For instance, an *Entity*, *Agent* or *Activity* that is in a *Bundle* can be selected from the corresponding *Bundle Inspector* tab. In addition, outgoing relationships of an *Entity*, *Agent* or *Activity* can be selected from the corresponding node inspector tab.
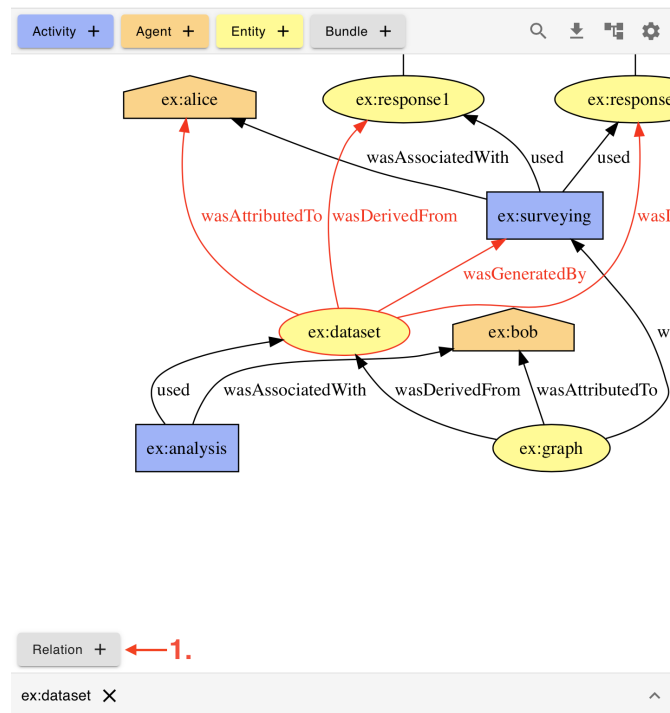

Figure B.5: Annotated Screenshot of PROV Visualiser with Selected Node

Creating an *Entity*, *Agent*, *Activity* or *Bundle*

Buttons for creating *Entities*, *Agents*, *Activities* and *Bundles* are located in the *PROV Visualiser*'s menu-bar (Figure B.4.1). *Entities*, *Agents* and *Activities* can also be created in the *Node Inspector* when creating a new outgoing relationship, which will be discussed further in the section dedicated to the *Node Inspector*.

Creating a Relationship between *Entities*, *Agents* and *Activities*

A PROV relationship can be intuitively drawn between two nodes in the *Graph View* visualisation. First, an *Entity*, *Agent* or *Activity* must be selected, which displays the create relationship button in the bottom-left corner of the *Graph View* (Figure B.5.1). By clicking the create relationship button a list of all valid **outgoing** relationship types of the currently selected node are displayed as buttons. For instance, the valid outgoing relationships of an *Activity* include *used*, *wasInformedBy*, *wasStartedBy*, *wasEndedBy* and *wasAssociatedWith*. The desired relationship type of the outgoing relationship can be selected by clicking the corresponding button. Finally, the relationship can be drawn by selecting a valid range node in the *Graph View* visualisation. This will create the relationship, and open the corresponding *Relationship Inspector* tab of the created relationship in the tabbed inspector. This method for creating a relationship is currently not supported on touch devices, where as an alternative relationships can be created in the *Node Inspector* as discussed in its dedicated section.

Searching for an *Entity*, *Agent* or *Activity*

The search icon button (Figure B.4.2) can be clicked to display a search text-field. When the icon button is clicked, the visualisation is automatically transitioned to the *Tree View*. By typing into the text-field, the *Activities*, *Entities* and *Agents* in the *Tree View* are filtered using their identifier and the search string. The search results can then be selected by clicking on them.

Download the Visualisation as an Image

The download icon button (Figure B.4.3) can be clicked to download the current visualisation as an image in the SVG image format.

Moving an *Entity*, *Agent* or *Activity* from one *Bundle* to another

An *Entity*, *Agent* or *Activity* can be moved from one *Bundle* to another in the *Tree View* visualisation. The tree representing the PROV document in the *Tree View* can be rearranged by simply drag-and-dropping an *Agent*, *Entity* or *Activity* from one position to another.

B.2.2 Node Inspector

The *Node Inspector* provides information and editing functionality related to a specific selected *Agent*, *Entity* or *Activity*. It can be accessed as a tab in the tabbed inspector by selecting an *Agent*, *Entity* or *Activity*. For the remainder of this section, the word "node" will be used to reference the *Agent*, *Entity* or *Activity* related to a particular *Node Inspector* tab.

Edit the Identifier

The identifier of the node can be modified by modifying its namespace using a select input component, and modifying its name using a text-field as displayed in Figure B.6.

Figure B.6: Editable Identifier

Edit the Attributes

Both defined and custom attributes can be edited in the *Node Inspector*. Defined attributes are those that stem from the PROV ontology, such as `prov:startTime` and `prov:startTime` when the node is an *Activity*. Custom attributes are the attributes defined by the user, where the namespace, key, value and value type can be defined as depicted in Figure B.7. Supported value types include *String*, *Boolean*, *Number*, and a custom type.

Figure B.7: Screenshot of Custom Attribute

Edit the Outgoing Relationships

The outgoing relationships of a node can be edited using a collection of auto-complete inputs. An auto-complete input is an text-field that is populated with possible values using a drop-

down menu, such as the identifiers of the possible range nodes of a relationship. The auto-complete input for the *used* relationship illustrates this in Figure B.8, where "ex:response1" and "ex:response2" are existing range nodes of this relationship, and all other *Entities* are possible additional range nodes and listed in a drop-down menu. By clicking on existing range nodes, the *Relationship Inspector* of the corresponding relationship is opened in a new tab.
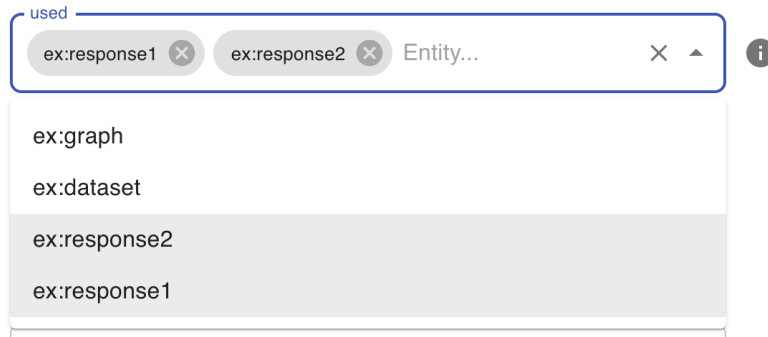

Figure B.8: Screenshot of the *used* Relationship Auto-Complete Input

If an identifier is entered in the text-field that does not yet represent another node in the graph, it can be created as illustrated in Figure B.9.
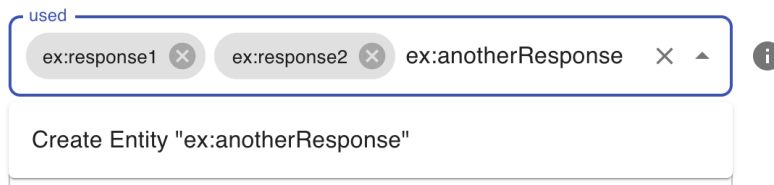

Figure B.9: Screenshot of the *used* Relationship Auto-Complete Input that is Creating a New *Entity*

Edit the Visualisation Settings

Several visualisation settings related to a node can modified in the "Visualisation" section of the *Node Inspector*. This includes:

- overriding the colour of the node in the *Graph View* using a color-picker;

- overriding the shape of the node in the *Graph View* using a select input;

- hiding the node in the *Graph View* using a checkbox; and

- hiding the node's attributes in the *Graph View* using a checkbox.

Delete the *Agent*, *Entity* or *Activity*

The node can be deleted by clicking the "Delete" button located at the bottom of the tab. A consequence of this action is that any incoming or outgoing relationships of the node will be deleted, in which case a warning message will be displayed.

B.2.3   Bundle Inspector

The *Bundle Inspector* provides information and editing functionality related to a specific selected *Bundle*. It can be accessed as a tab in the tabbed inspector by selecting a *Bundle* in the *Graph* or *Tree View*. The identifier of the *Bundle* can be edited as described in the *Node Inspector* section.

Edit the *Bundle*'s Namespace

The namespace of a *Bundle* includes all the namespace declarations that are made in it, where the prefix and values can be modified using text-fields (Figure B.10.1 and .2). The *Agents*, *Entities*, *Activities* and *Bundles* in a namespace can be hidden in the *Graph View* by toggling the hide icon button of the namespace (Figure B.6.3). Namespaces can be created by clicking the create namespace button (Figure B.10.5), and deleted by pressing the delete icon button (Figure B.10.4). The delete icon button is disabled when an *Agent*, *Entity*, *Activity* or *Bundle* is using the namespace.

Prefix **1.** Value   **2.**   **3.**   **4.**   **5.** ⟶   NAMESPACE +
xmlns   http://www.w3.org/1999/xhtml   👁̸   🗑

Figure B.10: Annotated Screenshot of the Editable Namespace

Delete the *Bundle*

The *Bundle* can be deleted by clicking the "Delete" button located at the bottom of the tab. This will also delete any *Agent*, *Entity*, *Activity* and relationship in the *Bundle*, in which case a warning message is displayed.

B.2.4   Relationship Inspector

The *Relationship Inspector* provides information and editing functionality related to a specific selected relationship. It can be accessed as a tab in the tabbed inspector by selecting a relationship in the *Graph View*, or in the outgoing relationships section of the *Node Inspector*. It

provides editing functionality for both defined and custom attributes, as defined in the *Node Inspector* section.

B.2.5   Settings Inspector

The *Settings Inspector* provides editing functionality related to the PROV document as a whole, and can be accessed as a tab in the tabbed inspector by clicking the settings icon button in the menu-bar at any time (Figure B.4.5).

Edit the Global Namespace

The global namespace represents the namespace declarations in the scope of the whole PROV document, equivalent to all the namespace declarations not defined in a Bundle. This includes two namespaces that are declared by default and cannot be deleted:

1. the PROV namespace with the prefix `prov` and the value `http://www.w3.org/ns/prov#`, and

2. the XML Schema namespace with the prefix `xsd` and the value `http://www.w3.org/2001/XMLSchema#`.

The editing functionality of the remaining namespace declarations resembles that of the *Bundle* namespace editing functionality described in the *Bundle Inspector* tab section.

Edit the Global Visualisation Settings

The global visualisation settings are the visualisation settings not related to a single *Agent*, *Entity*, *Activity*, *Bundle*, relationship or namespace. This includes:

- selecting a provenance view of the *Graph View* using a select input (either the *Process Flow*, *Data Flow* or *Responsibility Views*);

- selecting the default colour of *Agents*, *Entities* and *Activities* in the *Graph View* using a colour-picker; and

- hiding all attributes in the *Graph View* using a check-box.

The global visualisation settings section also includes a reset button, which resets the visualisation settings to the default.