

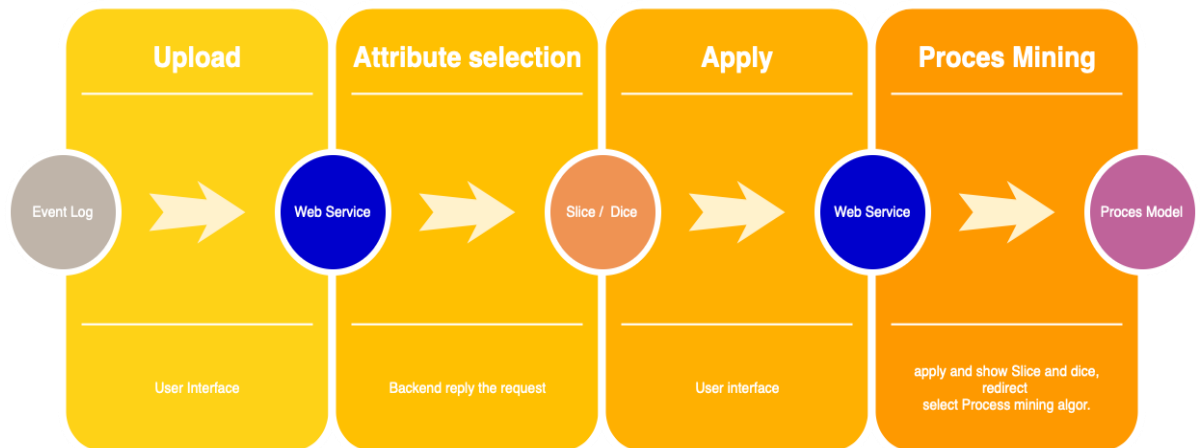
# Process Cubes User Manual

## Table of Contents

|    |                                |    |
|----|--------------------------------|----|
| 1. | General overview .....         | 2  |
| 2. | Introduction .....             | 2  |
| a. | General .....                  | 2  |
| 3. | Home .....                     | 2  |
| 4. | Upload .....                   | 3  |
| 5. | Dimension .....                | 3  |
| 6. | Process Cube View.....         | 5  |
| 7. | Slice and Dice.....            | 6  |
| 8. | Visualizing Process Model..... | 8  |
| a. | Heuristic Miner Options .....  | 9  |
| 9. | Closing Remarks .....          | 10 |
| a. | Future Work .....              | 10 |
| b. | Deployment Information .....   | 10 |

## 1. General overview

Before reading the manual, let zoom out and look a big picture about process cube, we provide the reader a small figure below. It describes refinement of process cube, in which processes goes from one point to another. As example you are at home and want to upload your event log file to the point editing event log data by applying slice or dice on cubes, into generating petri-nets model at the end.



## 2. Introduction

This document will help the user to use the webservice. It will give a short but precise description of each page and will explain its functionalities.

### a. General

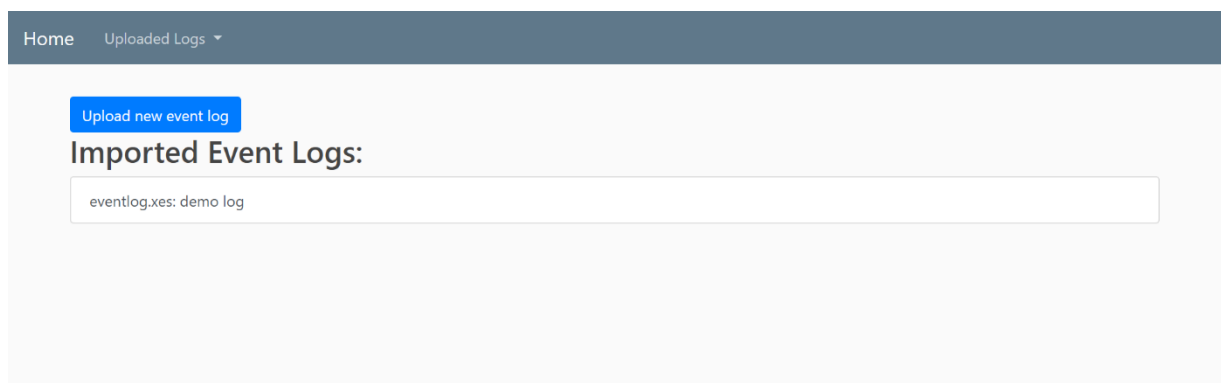
Every page has a navigation bar which shows, depending on the current site, the currently selected event log and the current process cube on right side. Furthermore, it lists all uploaded event logs under “Uploaded Logs” and all process cubes that where created for the current event log under “Process Cubes”.



Clicking on **Home** will redirect to the “*Home*” page.

## 3. Home

On the landing page, the *Home* page, the user can see all uploaded event logs. Furthermore, it allows to upload a new event log by clicking on “**Upload new event log**” button. This will redirect to the *Upload* page.



## 4. Upload

This page allows to upload a new event log. By clicking on the **Browse** button, a file chooser window will open which allows to select a XES file.

## 5. Dimension

This page allows to create and edit the dimensions of the process cube. First, general information about this page are explained, then the process of creating dimension is explained step by step.

For each dimension and attribute, the number of possible values, i.e. the number elements of the attribute, is shown (1) and (2). The number of elements for an attribute is just the number of possible values the attributes takes in the event log. The elements/values of a dimension are a combination of all attributes. So, the number of elements for a dimension is the product of number of elements of an attribute.

### Dimension Editor

3 Cells: 5 Done

Show/Hide Log Add Dimension

Name Time Save name X

# elements: 5 2

Attributes: Add Attribute

event:time:timestamp Step 10 Save X

# elements: 41 1

Show values

On the top, the page shows the current number of cells (3) the process cube consists of. It is computed by the product of number of elements for each dimension, in this example:  $5 \times 1 = 5$ .

To view the event log to check which attributes you want to use click on the “**Show/Hide Log**” Button and the event log will appear in a table on top of the page.

### Dimension Editor

Show/Hide Log Add Dimension Cells: 5 Done

Show 10 entries Search:

| event: time:timestamp | event: Activity    | event: concept:name | event: org:resource | event: Costs |
|-----------------------|--------------------|---------------------|---------------------|--------------|
| 2010-12-30 10:02:00   | register request   | register request    | Pete                | 50           |
| 2010-12-30 10:32:00   | register request   | register request    | Mike                | 50           |
| 2010-12-30 11:12:00   | check ticket       | check ticket        | Mike                | 100          |
| 2010-12-30 13:16:00   | examine casually   | examine casually    | Sean                | 400          |
| 2010-12-30 13:32:00   | register request   | register request    | Pete                | 50           |
| 2010-12-30 14:06:00   | examine casually   | examine casually    | Mike                | 400          |
| 2010-12-30 15:34:00   | check ticket       | check ticket        | Ellen               | 100          |
| 2010-12-31 09:06:00   | examine thoroughly | examine thoroughly  | Sue                 | 400          |
| 2011-01-05 10:22:00   | decide             | decide              | Sara                | 200          |
| 2011-01-05 14:12:00   | check ticket       | check ticket        | Mike                | 100          |

Now the steps to create a dimension are explained:

1. Add a Dimension: To do this click on **Add Dimension**. This will add a dimension to the process cube. It will be listed under Dimensions

## Dimension Editor

Show/Hide Log Add Dimension Cells: 5 Done

Name Time Save name X

# elements: 5

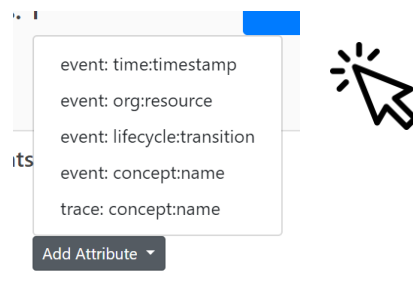
Attributes: Add Attribute X

event:time:timestamp Step 10 Save X

# elements: 41

Show values

2. At this moment the created dimension doesn't consist of any attributes. To add attributes to the dimension, click on **Add Attribute**. This will open a popup that lists all attributes, that don't belong to any dimensions yet.



Clicking on some attribute will add it to the dimension. It will then be listed under Attributes in the corresponding dimension list item. If you want to see what values an attribute can take, click on **Show Values** (1). This will open a popup that lists all possible values of this attribute.

## Dimension Editor

Show/Hide Log Add Dimension Cells: 5 Done

Name Time Save name 3 X

# elements: 5

Attributes: Add Attribute X

event:time:timestamp Step 2 X

# elements: 41

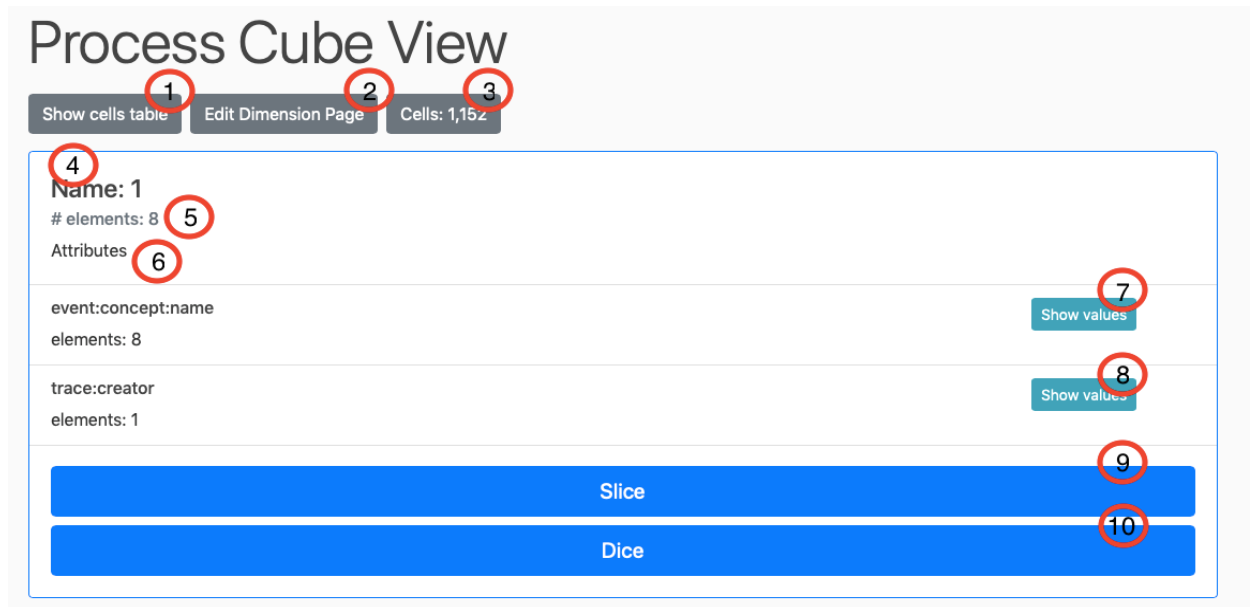
Show values 1 Save

3. Getting all events for exactly one timestamp does not make much sense. Thus, it is possible to set a “step-size” (2). Setting a step-size greater than one will combine multiple elements of the attribute to one element, i.e. the elements are now value ranges. This is possible for integer, float and timestamp values.

4. Finally, you can also give a name to the dimension. Just type it in the text field and click on save (3).

## 6. Process Cube View

On this page, we can check the process cube view with all the selected dimensions, its name and their attributes. Example below are taken from runningexamples.xes file



Let's look at the figure above that shows us an example of one-dimension of a process cube and start with:

- a. The **"Name"** of the dimension: 1, as denoted by (4)
- b. the total elements of each dimension provided **"# elements:"** (5)
- c. The dimension has 2 attributes. (6)
  - event:concept:name attribute that comprise of 8 elements
  - trace:creator attribute that comprise of 1 elements

User can check the values of each attributes by clicking **"Show Values"** (7) and (8) button, this process cube has total **"Cells"** of 1,152 (3) and the total cells of process cube on the right corner of the process cube view page. After that for each dimension the user can perform **"Slice"** and **"Dice"** functionality by clicking their buttons (9) and (10).

Say the user desire to make a change and wants to alter their cubes. Let assume the dimension is wrong, then there is an **"Edit Dimension Page"** (2) button to take the user to the previous page. After the user is satisfied with their cube and want to model them with process discovery algorithms, one can process it further by clicking **"Show cell tables"** (1) button.

Furthermore, on the top of the page exactly on the right corner one can check if you are working on the right event log file and the name of your cubes. On the left of the page, one could switch to the home, inspect the uploaded log and check the created cubes.

## 7. Slice and Dice

When the Slice operation is selected, a table of possible values for the slice operation is shown. The content of the table is searchable using the **Search Bar** (1). Each row represents an element in the dimension the slice operation is planned for and contains an additional **checkbox** (3). By clicking a checkbox, the row and its element represented is **selected** (4). Since for the slice operation only one element is possible, by clicking another checkbox again the first selected element will be deselected. A green **Slice button** (2) gives the possibility for the user to save the Slice operation in the database (but only if a selected element exists). A user can filter every column using its own **Search "column"** (5). If a Slice object already exists in the Database a warning banner is shown to inform the user that the existing object will be changed.

### Slice Dimension: Time

Editing existing Slice

2 Slice

1 Search:

3 ☐ 2010-12-30 10:02:00 to 2011-01-06 08:02:00

☐ 2011-01-06 08:02:00 to 2011-01-07 15:22:00

4 ☒ 2011-01-07 15:22:00 to 2011-01-12 14:44:00

☐ 2011-01-12 14:44:00 to 2011-01-24 13:56:00

☐ 2011-01-24 13:56:00 to 2011-01-24 13:56:00

Search event: time:timestamp

type value 5

Showing 1 to 5 of 5 entries 1 row selected

Previous 1 Next

# Dice Dimension: Time

Existing Slice will get overridden

1

Dice

Show 10 entries

2

Search:

3

Select all

event: time:timestamp

|   |                                     |  |
|---|-------------------------------------|--|
| 4 | <input type="checkbox"/>            | 2010-12-30 10:02:00 to 2011-01-06 08:02:00 |
|   | <input checked="" type="checkbox"/> | 2011-01-06 08:02:00 to 2011-01-07 15:22:00 |
|   | <input checked="" type="checkbox"/> | 2011-01-07 15:22:00 to 2011-01-12 14:44:00 |
|   | <input checked="" type="checkbox"/> | 2011-01-12 14:44:00 to 2011-01-24 13:56:00 |
|   | <input type="checkbox"/>            | 2011-01-24 13:56:00 to 2011-01-24 13:56:00 |

Search event: time:timestamp

6

type value

Showing 1 to 5 of 5 entries
3 rows selected

Previous

1

Next

The dice operation is similar, but allows multiple elements to be selected. The content of the table is searchable using the **Search Bar** (2). Each row represents an element in the dimension the slice operation is planned for and contains an additional **checkbox** (4). By clicking a checkbox, the row and its element represented is **selected** (5). Since for the dice operation multiple elements can be selected, by clicking another checkbox again it selects the row too, in contrast to the Slice operation. A shortcut to **select all** elements is possible with the button in the first table cell (3). A green **Dice button** (1) gives the possibility for the user to save the Dice operation in the database (but only if at least one selected element exists). A user can filter every column using its own **Search "column"** (6). If a Dice object already exists in the Database a warning banner is shown to inform the user that the existing object will be changed.

## 8. Visualizing Process Model

After performing slice and dice, its time to view much awaited process model. But before you see, you have to go through three simple steps,

1. Click on the Model button against any selected attribute bin.
2. Select process mining algorithm to apply [default algorithm is alpha miner], currently our software is supporting three algorithms for process discovery including,
  - a. Alpha Miner
  - b. Inductive Miner
  - c. Heuristic Miner [see options section below]
3. Now you will be redirected to the model page where you can visualize and download it in form of image file.

The screenshot displays the software interface for visualizing a process model. The top navigation bar includes 'Home', 'Uploaded Logs', 'Process Cubes', and a breadcrumb trail: 'Log: Sepsis Cases - Event Log.xes: Sepsis Cases - Event Log - Cube: TestCube'. Below the navigation bar, there is a search bar and a 'Show Model' button. The main content area is divided into two sections. The first section, titled 'Time', shows a table with four rows of time intervals. Each row has a 'Model' button next to it. The second section, also titled 'Time', shows a search bar for 'event:time:timestamp' and a 'Show Model' button. Below this, there is a pagination bar showing 'Showing 1 to 4 of 4 entries' and 'Previous 1 Next'. The third section, titled 'Algorithm', shows a dropdown menu with 'Alpha Miner' selected. The fourth section, titled 'Model', shows the 'Algorithm:' label.

Home Uploaded Logs Process Cubes Log: Sepsis Cases - Event Log.xes: Sepsis Cases - Event Log Cube: TestCube

Show 10 entries Search:

**Time** Show Model

| event:time:timestamp                       | 1:      |
|--|---------|
| 2013-11-07 07:18:29 to 2013-11-14 06:00:00 | Model 1 |
| 2013-11-14 06:00:00 to 2013-11-18 10:01:59 | Model   |
| 2013-11-18 10:01:59 to 2013-11-21 11:00:00 | Model   |
| 2013-11-24 13:56:22 to 2013-11-28 13:33:20 | Model   |

**Time** Show Model

Search event:time:timestamp

Showing 1 to 4 of 4 entries Previous 1 Next

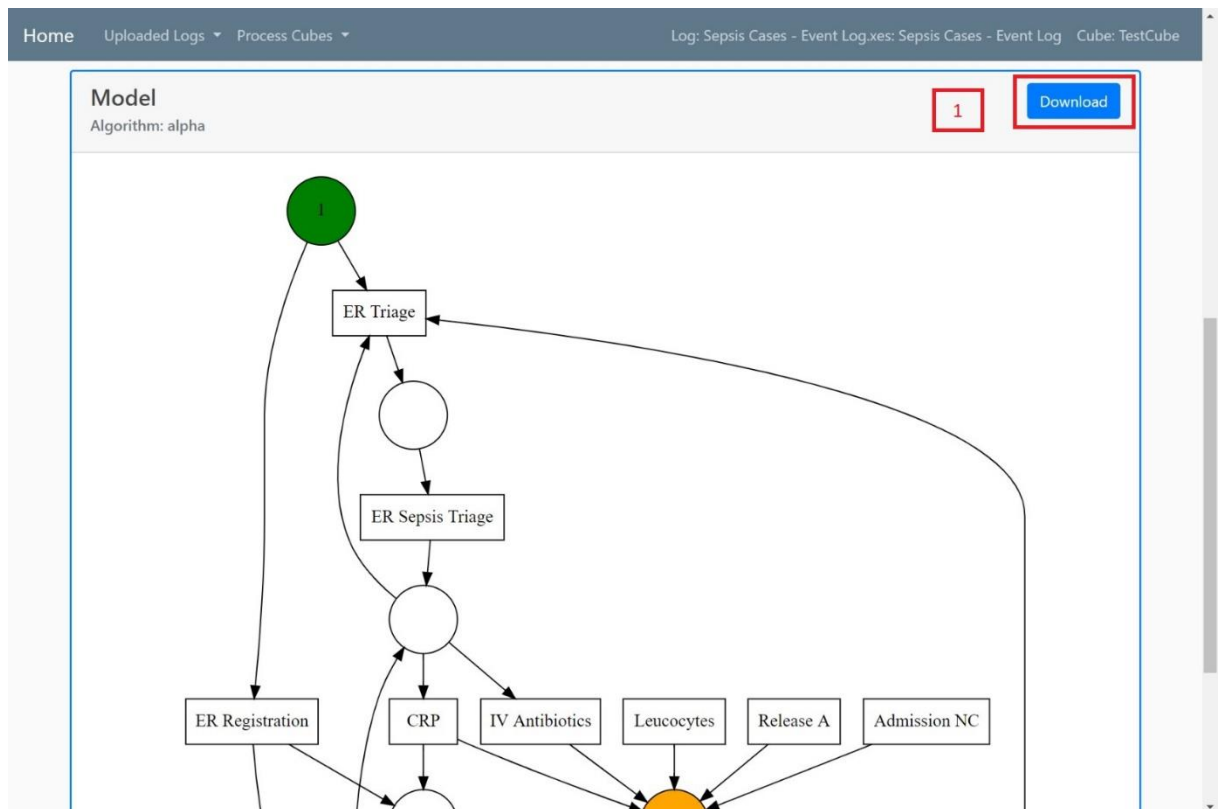
**Algorithm** 2

Alpha Miner

**Model** 3

Algorithm:





### a. Heuristic Miner Options

If you select heuristic miner as process mining algorithm in the process of visualizing model then in this case, you have some options available for customization [requires understanding of algorithm]. You can select appropriate values upon our choice.

Home Uploaded Logs ▾ Process Cubes ▾ Log: Sepsis Cases - Event Log.xes Sepsis Cases - Event Log Cube: TestCube

**Time** Show Model

Search event:time:timestamp

Showing 1 to 4 of 4 entries Previous 1 Next

**Algorithm**  
Heuristic Miner ▾

**Parameters**

dependency\_thresh  
0,5

and\_measure\_thresh  
0,65

min\_act\_count  
1

min\_dfg\_occurrences  
1

dfg\_pre\_cleaning\_noise\_thresh  
0,05

**Model**  
Algorithm: alpha Download

## 9. Closing Remarks

This concludes our user tutorial for generating process model using process cubes from very beginning using our software. You can find the source on GitHub: <https://github.com/Moo-State/PCubes-PADS2019>. Feel free to contribute by opening issues or making pull request.

### a. Future Work

This project was done for completing compulsory requirement of lab course of process discovery using python in summer 2019 semester. Although this software successfully meets requirements mentioned in proposal document but it can certainly be enhanced and improved in many ways. To find chances of improvement please read documentation associated with the project.

### b. Deployment Information

Detailed information about deployment of the software can be found in GitHub repository.