
TreeTime User Manual

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Jacob Kanev

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TreeTime is a general data organisation, management and analysis tool using linked trees instead of flat lists of tables. A tree is a hierarchical structure that arranges your data into units and sub-units. Mathematical functions (sum, difference, mean, ratio) can be calculated recursively. Linked trees are distinct trees that share data between them. In *TreeTime*, a data object is part of several trees at the same time.

INTRODUCTION

1.1 Concept

1.1.1 What is a Tree?

A “tree” is a data structure, much like a table or a list. A tree sorts information hierarchically into boxes and sub-boxes and sub-sub-boxes.

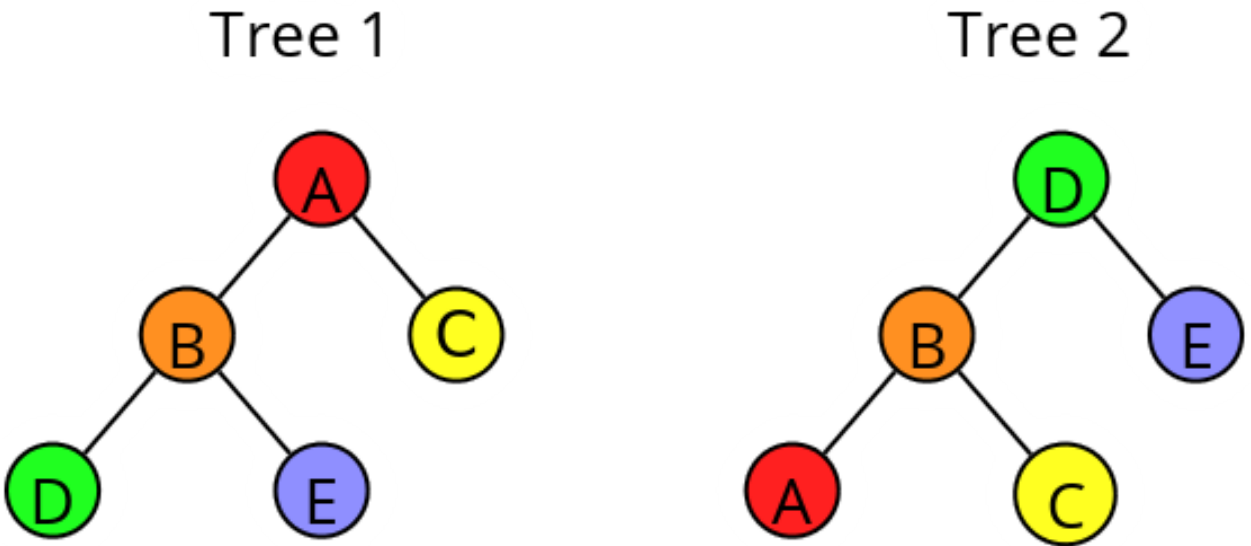
If you want to organise your work tasks you could sort them into work packages, that are part of projects, that are part of products. If you plan a larger project, you can sort all tasks by responsible persons, who are part of teams, that are part of departments, that are part of branches. You can also make a time plan, where a year consists of quarters, that consist of weeks, that contain a number of tasks. You can have an address book where you have a hierarchy of friends / colleagues / acquaintances, or you can sort knowledge about animals into kingdom / class / family / species.

The nice thing about trees is that you can define mathematical functions on them. Planned hours can be summed up per work package and project, or per person and team, or per week and month. A mean priority can be shown per work package and project.

The concept of hierarchical categorisation can be applied to all sorts of data and will feel a lot more natural and easier to use than organising the same data in spread sheets.

1.1.2 What are linked Trees?

The core concept of *TreeTime* are linked trees. Linked trees are separate trees that share the same data. One piece of information (a *node*) can be in several trees at the same time, but in different place of the tree. As a single tree is a way of sorting information, different linked trees sort the same data in different ways.



In *Tree 1*, Node *E* is right at the bottom, as a child of *B* and a grandchild of *A*. In *Tree 2* it is a child of *D*.

In *TreeTime*, a *node* or *item* can hold different information like text, numbers, dates, internet links. These are saved in the *item's fields*.

Here we have a field we call “value”. Each node in all trees has a value field that can hold a number (like a cell in a spread sheet). The node *A* has the value=1, *B*=2, etc. In addition we have a field we call “Sum”. Its content is calculated automatically, summing up the item’s own value plus the values of all children. In *TreeTime*, looking at item *E* and *Tree 1* this looks like this:

E

Tree 1

A

B

>

Tree 2

D

>

value 5

Tree 1

Tree 2

	Value	Sum
√ A	1	15
√ B	2	11
D	4	4
E	5	5
C	3	3

Clicking on the other tab shows the second tree while the same items stays selected:

E

Tree 1

A

B

>

Tree 2

D

>

value 5

Tree 1

Tree 2

	Value	Sum
√ D	4	15
√ B	2	6
A	1	1
C	3	3
E	5	5

Note how the values are summed up the branches. Apart from sums, *TreeTime* also offers means, ratios, or differences, using different combinations of parent, child, or sibling fields.

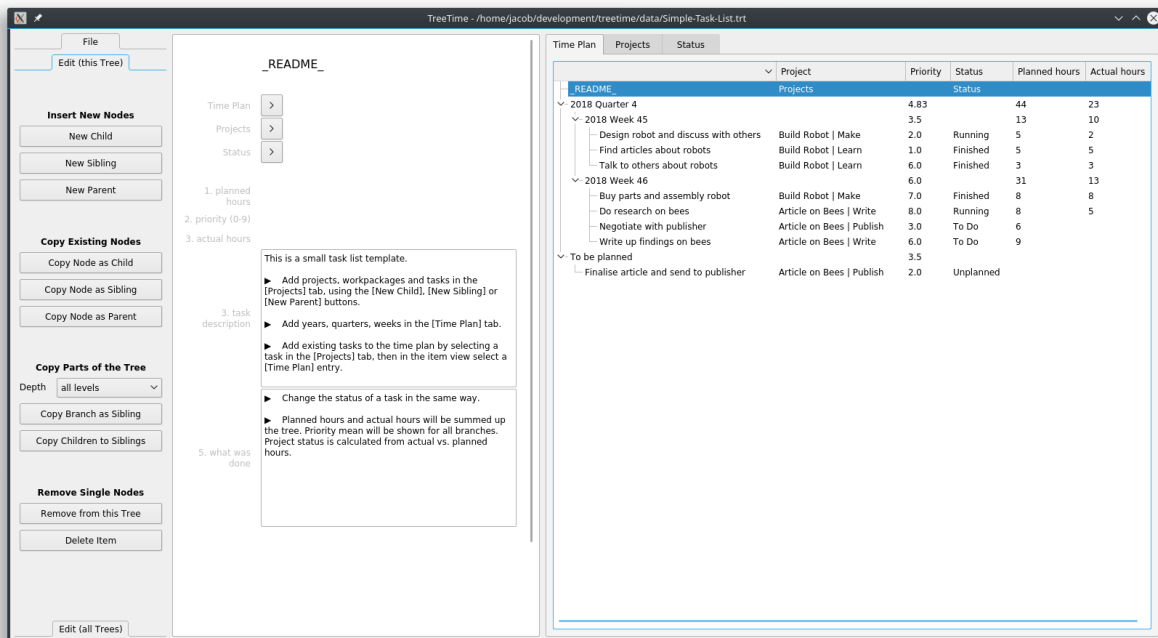
Linked trees are a natural and powerful way to structure data. If you, for instance, organise information about animals, you might want to see the animal's taxonomy (kingdom/class/family/species), but also their habitat (continent/country/area), and switch between both views. If you organise tasks, you could switch between a year/quarter/week/day breakdown, a company/department/team/person tree, and a product/project/package/task overview.

In *TreeTime*, the structure of your data (whether you store priority, hours, and a description for a task, or expected life span, habitat and number of legs for an animal), the trees themselves, and the calculated values within the trees are completely user defined. Data is stored in text files, changes are saved on the fly, and when opening *TreeTime*, the software is automatically connected to the last used file.

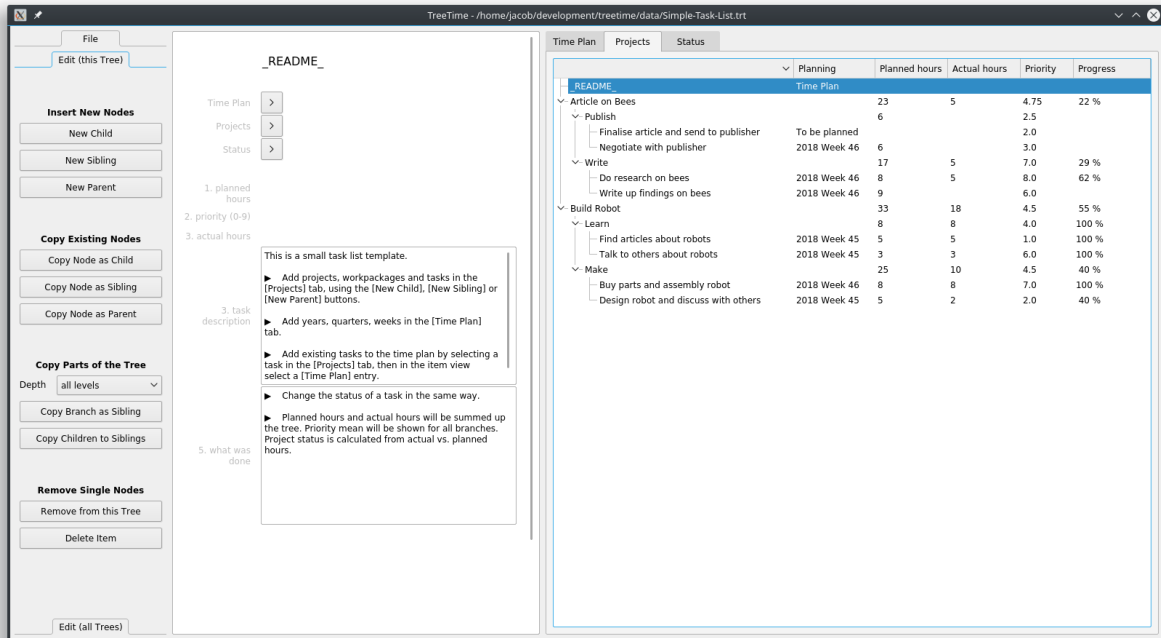
1.2 Basic Use

Start the software (see 'Execute' from the section [Installation](#id-installation)). In the main dialog, go to "File" / "New from Template", select "Simple-Task-List.trt" and in the next dialog give a file name for the new file. An example file with a simple project task list structure will open.

The GUI consists of three parts: - A button box on the left. Execute tree structure operations from here. - An editing grid in the middle, showing the contents of the selected data item. Edit single data items here. - A tab view with trees spanning the center-right. View and analyse your data here.



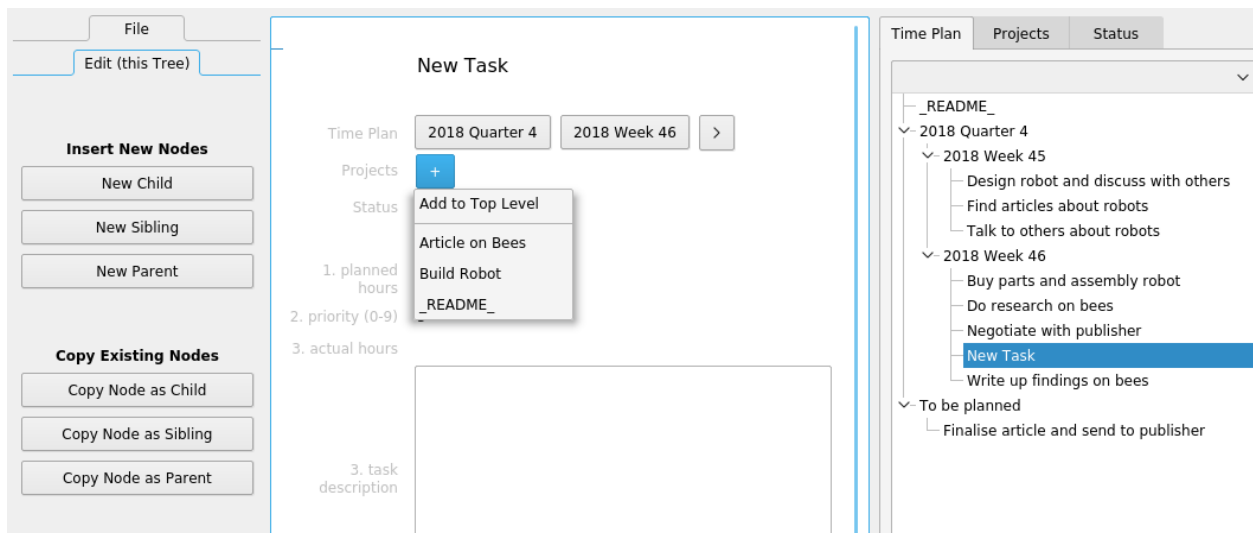
Access each single tree by clicking a tab on the main tree-view widget (the picture above shows the tree *Time Plan*, the picture below the tree *Projects*).



Branches and children can be sorted, branches can be folded and unfolded. Data content is shown via analytic fields that are defined per tree. In the example project you will see a sum, a percentage, and text display.

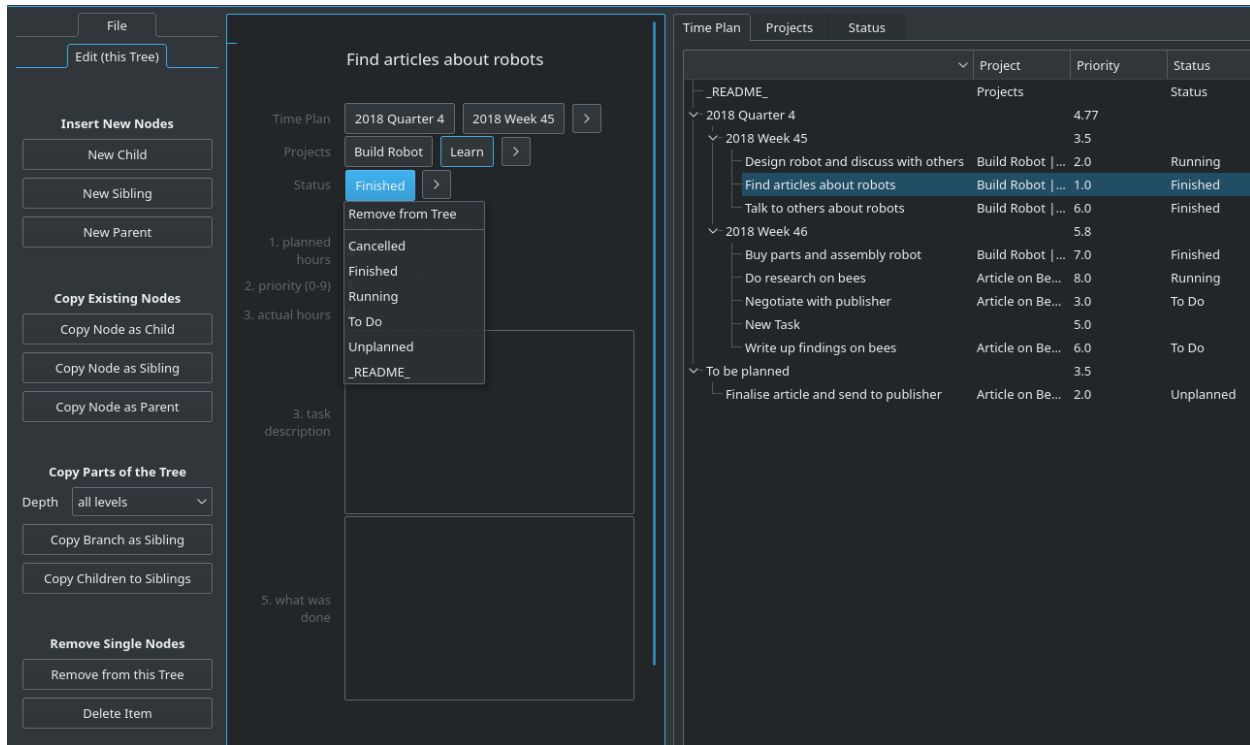
Add, move and remove single nodes and complete branches by using the buttons on the left. Change the name of a node by selecting the node and editing the name in the top of the edit grid in the middle. Change all other values (numbers or text) by clicking into the field and start typing.

The parents of an item are listed underneath the item name. Each tree has a separate line. Change the position of a node within a tree by clicking on any of the parent buttons.



In this example a new node in the tree *Time Plan* has just been created, and is now added to the tree *Projects*.

TreeTime lets you select different themes and will try to use the default colours that are defined with your operating system.



1.3 Data Files

The data in TreeTime is stored in a plain text file, marked with a 'trt' file ending ('trt' for 'TreeTime').

The button 'New empty File' will start an (almost) empty 'trt' file. More trees, data fields, or tree fields can be added using the meta-structure editor.

The button 'Load File' will open an existing 'trt' file. After this, all changes are written to that file. There is no 'Save' button, changes are written to the file immediately.

The button 'New From Template' opens an existing data file, creates a copy, and saves this copy. A data file can be created by copying the currently open file. All write operations will be performed on that copy. This is to create a new file from a basically empty 'trt' file that has a pre-defined data structure.

A data file can be created by saving the currently open file to a copy. The button 'Save As' saves the current state. All write operations will be on the new file.

1.4 Installation

1.4.1 Using pre-compiled Binaries

- Windows, Linux: Go to codeberg.org/jkanev/treetime/releases/tag/2026.1 and download a zipped package for Windows 10, 64 bit, or for Linux 64 bit from there. Unzip it into your program directory and run *TreeTime* or *TreeTime.exe* from the new folder. Unzip the data package too. Add the program folder to your path.

Executable bundles have been created with pyinstaller (www.pyinstaller.org)(<http://www.pyinstaller.org>)).

- Mac: Mac users please use the Python code (see below). There is no executable for Mac. (If anybody can help building an executable for other platforms I'd be delighted.)

1.4.2 Using a PyPi package in Python

1. If you don't have it yet, install python3
2. **Install PyQt6** – on an elevated command prompt (Windows), or on the standard command line (Mac, Linux), type:
pip install PyQt6
3. **Install TreeTime** – on an elevated command prompt (Windows), or on the standard command line (Mac, Linux), type:
pip install treetime

1.4.3 Using script code with Python

1. If you don't have it yet, install python3
2. Install PyQt6 – on an elevated command prompt (Windows), or on the standard command line (Mac, Linux), type: *pip install PyQt6*
3. Download this project from GitHub as a zip file (<https://github.com/jkanev/treetime/archive/master.zip>) and unzip
4. **Install TreeTime:** in the command line, cd into the main directory, then type:
 - **Linux:**
 - *python3 setup.py build*
 - *sudo python3 setup.py install*
 - **Windows:**
 - *py setup.py build*
 - *py setup.py install*

1.4.4 Execute

- Windows: Hit the Windows key and type “TreeTime”, then click the “run command treetime” that comes up.
- Linux, Mac: On the command line, type “TreeTime”. You can also start this any other way your operating system supports. Plus, there's a .desktop file (for KDE and Gnome) in the data directory to create desktop or menu link.

META STRUCTURE

2.1 Principles

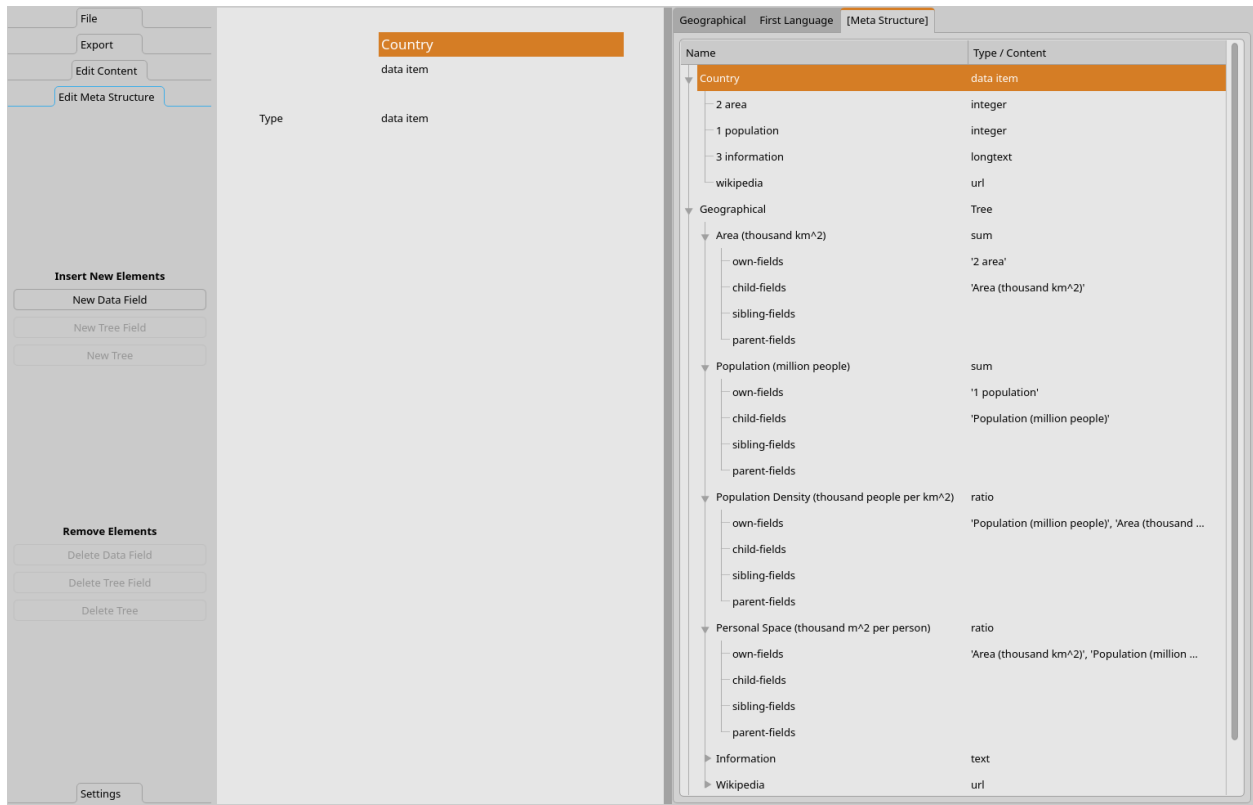
Data – text, numbers, URLs, time records – are stored in data items. You can edit those in the left part of the GUI. You can decide how many data fields your data has and of what type they are – maybe you want a “summary” (text) and a “details” (long text) and a “planned hours” (integer) and a “spent hours” (timer).

Calculations – products, ratios, sums, differences – are calculated on the fly, according to the “tree fields” in your tree. You can decide what mathematical operation each tree field performs, and what its input is. A mathematical operation on a node can take its input from dedicated fields of the same node (“own fields”), of the child nodes (“child fields”), of sibling nodes (“sibling fields”) and of parent nodes (“parent fields”).

When hitting the tab “[Meta Structure]” or the tool button page “Edit Meta Structure” you can design the meta structure of your file: How many trees there are, what kind of data is stored in a data item, and what fields are in each tree. You can create calculations on your data and have results displayed in the tree.

2.2 Trees and the Data Item

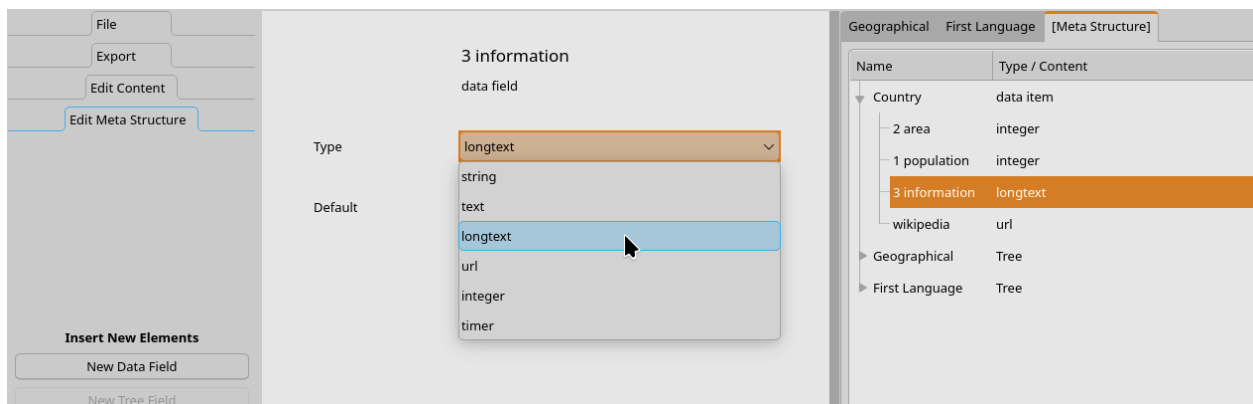
The first entry in the tree on the left is the data item. You can change its name by double clicking on the title in the left. This is the default name of any new item that’s added when you hit any of the “new node” / “new parent” / “new sibling” buttons.



The entries below are tree entries. When selecting a tree entry on the right and double clicking its title on the left you can edit a tree name. You can also create and delete trees.

2.3 Data Fields

Data fields can be renamed, created, and deleted. Note that the order in which fields are displayed in the data part of *TreeTime* is alphabetical. To add or remove a field you can click on the respective buttons on the left.

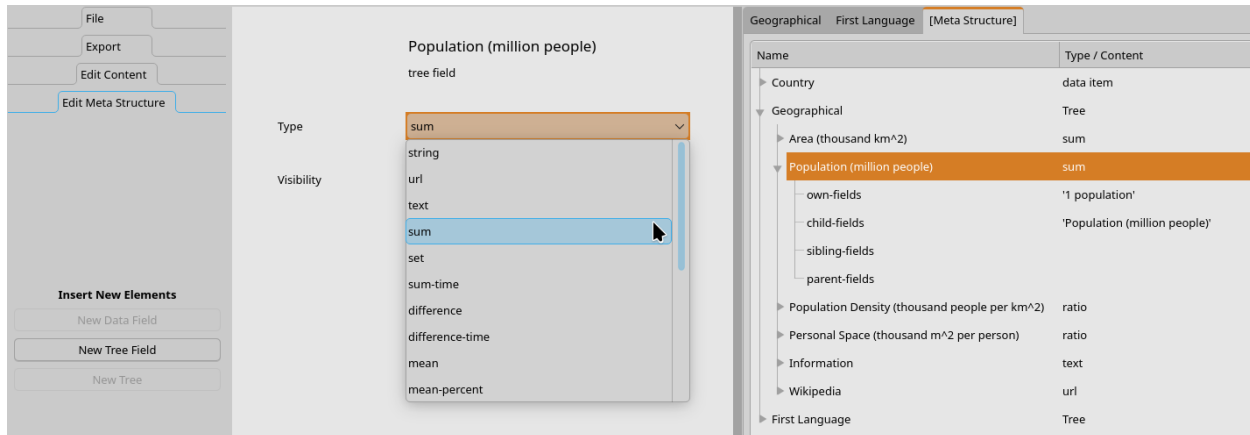


When selecting a field, a dropdown box gives you a selection of possible types.

2.4 Tree Fields

A tree field has four properties:

1. Its name,
2. its type,
3. whether it's hidden or visible (useful for intermediate calculation results),
4. its parameter list (list of input fields).



You can select the type from a dropdown list. The different types are explained in the next chapter. The visibility is a single flag that can be checked or unchecked.

The input list is split into four parts:

2.4.1 1. Own fields

This is a list of fields that are taken from the node itself.

→ Example: You have a data field “planned time” and a data field “spent time” and you want to create a tree field “progress”, which is the ratio of spent time over planned time. The type “ratio” takes two arguments, the first being the numerator and the second the denominator. You would add the field “spent time” as first, and “planned time” as second, in the “own fields” list. Your new field, displayed for each node, will be the spent time over the planned time of that very node.

2.4.2 2. Child fields

This is a list of fields taken from the node’s children.

→ Example: You have a data field “spent time” and want to sum it up over all branches. You would create a tree field “Total Spent Time”, select “spent time” in the “own fields” list, and “Total Spent Time” in the child fields list. That way it will display the sum of its own “spent time” value plus all the “Total Spent Time” of its children, which are in return their sums of “spent time” and children’s “Total Spent Time”, etc, recursively down the tree.

2.4.3 3. Sibling fields

This is a list of fields taken from the node’s siblings.

→ Example: You have a data field “spent time” and want to see the percentage of spent time of all siblings (for example, tasks) of the same parent (for example, the current week), and call it “Relative Effort”. The “ratio-percent” field type computes the ratio y from its inputs x_1, x_2, \dots in the following way: $y = x_1 / (x_2 + x_3 + \dots + x_n)$. In the “own fields” you select “spent time” (that’s your x_1), then you add another entry and also add “spent time” (that’s your x_2), then in

the sibling field list you select one entry “spent time” (that’s your x_3, x_4, \dots , depending on how many siblings the node has). As a result, each node will display a field: “Relativ Effort” = “spent time” of the node / (“spent time” of the node + “spent time” of the first sibling + “spent time” of the next sibling + etc).

2.4.4 4. Parent fields

These are mainly useful for the “node-path” and “node-name” type fields. When using them with other types, be very careful not to create circular dependencies. With these fields, they work in the same way as the other lists, only they take values from the node’s parent. For “node-path” and “node-name”, select the id of a tree from the dropdown (count trees starting with 0). The tree field will then display the node’s parent name in that other tree.

→ Example: You have a tree “Tasks” and a tree “Priority”. The “Priority” tree has all different priorities as branches. If you want to see the priority in the task list, create a field “node-name”, and select the ID of the “Priority” tree in the “parent fields” list. You will then, in the task list, see the parent of that node in the priority list.

In general: the x_1, x_2, x_3, \dots parameters are collected in order they are mentioned from the four lists 1. own fields, 2. child fields, 3. sibling fields, 4. parent fields.

2.5 Recursion

If you have a data field x and define a tree field $y = \text{sum}(\text{children}.x)$ then the tree field y in each node will show the sum of all x of each node’s children. Only the direct children, grandchildren and everything further down is ignored. In most cases this is not what you want.

Recursion is a method of calculating where a method executes itself. As if you had a piece of paper with some instructions, and one of those instructions reads “do what’s on the instruction paper”. Or, as someone once phrased it: “Before you can understand recursion, you must first understand recursion”. A recursive method consists of two parts:

- A watertight stopping criterion
- A call to itself

When calculating values in a tree, the first part (stopping criterion) is implicit by calculating values of children (“stop when there are no more children”) or parents (“stop when there are no more parents”). The second part (call to itself) is present if the tree field definition contains the tree field itself.

In the above case of the sum over a nodes’ childrens’ x this would be:

$$y = \text{own}.x + \text{children}.y.$$

The value of y of each node is calculated by the node’s x , adding the node y of each child. The value y of each child is calculated by adding its own value x plus the value y of each of that child’s children. And so forth.

It is important that the recursion is not defined in own-fields, because then the recursion would not stop: If $y = \text{own}.y + \text{children}.x$ then to calculate that sum, *TreeTime* would calculate a node’s y field by first collecting the value of the its y field, for which in turn it would collect the value of its y field, for which in turn it would first collect the value of its y field... There’s no stopping criterion. That’s what’s called a “circular dependency”. To prevent that, the tree field will not be offered in its own own-fields and sibling-fields drop-down lists.

Recursion can also be defined indirectly, where a depends on b , b depends on c , and c depends on a . *TreeTime* doesn’t check this (at this version, we might add a check later).

To avoid circular dependencies, and tell tree fields and data fields apart, it is good practice to name data fields in lower case (“spent time”), and tree fields with capitalisation (“Spent Time”). By then making sure all capitalised fields are only mentioned in child-fields parameter lists you will avoid infinite recursion.

2.6 Input/Output Types

Not any field can be used as input. You cannot divide two texts, you cannot multiply a URL with a word, and you cannot concatenate two numbers.

If you select a field for your list, *TreeTime* does some type checking for you. There are three global types: “text”, “numerical” and “any”. Tree fields like “URL” or “Text” will accept only text input, fields like “sum” and “ratio” will only accept numerical input, fields like “set” will accept any. Non-matching input fields will not appear in the dropdown box when you select your input.

DATA FORMAT

3.1 Global Structure

TreeTime data files are plain text (Unicode/UTF8) and can be edited with any text editor. The global structure consists of three parts: The tree definition, the item definition, and the item pool.

- The tree definition is preceded with the marker `--trees--` followed by a newline. This defines the number and data structure of the trees in the file.
- The data item definition is preceded by the marker `--item-types--` followed by a newline. This defines the data fields of each data item.
- The item pool is preceded by the marker `--item-pool--` followed by a newline. This section contains the actual data.

The file content of the simple example file in the Introduction chapter looks like this:

```
--trees--

tree "Tree 1"
  field "Value"
    field-type "sum"
    own-fields ["value"]
    child-fields []
    sibling-fields []
    parent-fields []
  field "Sum"
    field-type "sum"
    own-fields ["value"]
    child-fields ["Sum"]
    sibling-fields []
    parent-fields []

tree "Tree 2"
  field "Value"
    field-type "sum"
    own-fields ["value"]
    child-fields []
    sibling-fields []
    parent-fields []
  field "Sum"
    field-type "sum"
    own-fields ["value"]
```

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```

    child-fields ["Sum"]
    sibling-fields []
    parent-fields []

--item-types--

item Node
  fields {"value": {"content": 0, "type": "integer"}}
  trees [[], []]

--item-pool--

item A
  fields {"value": {"content": 1, "type": "integer"}}
  trees [[0], [0, 0, 0]]

item B
  fields {"value": {"content": 2, "type": "integer"}}
  trees [[0, 0], [0, 0]]

item C
  fields {"value": {"content": 3, "type": "integer"}}
  trees [[0, 1], [0, 0, 1]]

item D
  fields {"value": {"content": 4, "type": "integer"}}
  trees [[0, 0, 0], [0]]

item E
  fields {"value": {"content": 5, "type": "integer"}}
  trees [[0, 0, 1], [0, 1]]

```

3.2 Tree Definition

A single tree is defined by the name of the tree and a list of tree fields. A node's tree field values are calculated from data fields or tree fields of the node itself, its siblings, parent and children. Each of these are mentioned in the field definition. There are various different field types, some use values in the current tree, some use values from other trees. You can for example display the name of a node's parent in a different tree. Trees are numbered starting with 0. Look at the first tree in the example:

```

tree "Tree 1"
  field "Value"
    field-type "sum"
    own-fields ["value"]
    child-fields []
    sibling-fields []
    parent-fields []
  field "Sum"
    field-type "sum"
    own-fields ["value"]
    child-fields ["Sum"]

```

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```
sibling-fields []
parent-fields []
```

The tree itself is called “Tree 1”. It has two tree fields, “Value” and “Sum”. The tree field “Value” is of type “sum”, and it displays anything that is found in the data item field “value”. The tree field “Sum” is also of type “Sum” and for each node it adds everything in the node’s item field “value”, plus all values in the tree field “Sum” of its children.

More about how to define tree fields in the next chapter.

3.3 Data Item Definition

Each node in a tree is stored as a “data item”. In the data file a “data item” is stored like this:

```
item A
  fields {"value": {"content": 1, "type": "integer"}}
  trees [[], []]
```

After four spaces indent, there’s the keyword “item” and the name (in this case “A”). This is the name that’s displayed in the heading of the data item pane in the GUI, and as the node name in the tree pane of the GUI. The next line, after an indent of 8 spaces, has the keyword “fields” followed by a json dictionary:

```
"field name 1": {"content": 1, "type": "integer"}, "field name 2": ...
```

In this dictionary, each data field has a sub-dictionary listing its default content, the field type, and possibly some other values (timers have a running/stopped flag and a last-started flag). When a new item/node is created, this default content will be in all data fields. In the example above, a new node will contain one single field called “value” with the content “1”.

For a description of all possible data field types, see the Data Fields chapter.

The last line, “trees ...”, must contain an array of N empty arrays, where N is the number of trees in your file. If you have four trees in your tree fiel, that line must read:

```
trees [[], [], [], []]
```

This makes your field definition available in all trees (and creates an error otherwise).

3.4 The Data Pool

The Data Pool is the last of the three sections of the tree file, and in most cases the largest. This is where the actual data is stored. It consists of a list of items in the tree, with a syntax like in the data item definition section:

```
item D
  fields {"value": {"content": 4, "type": "integer"}}
  trees [[0, 0, 0], [0]]

item E
  fields {"value": {"content": 5, "type": "integer"}}
  trees [[0, 0, 1], [0, 1]]
```

The content here is the actual content in the field. The tree structure is stored in the last line:

```
trees [[0, 0, 1], [0, 1]]
```

This is an array of arrays, each of which is a path in the tree. In the example above the node can be found following the path 0-0-1 in the first tree starting at the root node, and 0-1 in the second tree. Children are numbered using fixed indexes, starting at 0. A path of 0-0-1 means: My node is the second child (-1) of the first child (-0-1) of the first child (0-0-1) of the root node in the (first) tree. And in the second tree, the path 0-1 says the node is the second child of the first child of the root.

DATA FIELDS

Data fields are defined by a dictionary {...} where the field names are the dictionary keys {"name1": ..., "name2": ..., "name3": ...}, and their type as well as their default value are the dictionary values {"name1": {"content": "", "type": "longtext"}, "name2": {"content": "", "type": "url"}, "name3": ...}. The possible types are “string”, “text”, “longtext”, “url”, “integer”, and “timer”.

4.1 string

One line of text.:

```
"Name": {"content": "Maria Sibylla Merian", "type": "string"}
```

The field contains strings (small texts). In the GUI, the field will span one line. Text can be entered.

4.2 text

Longer text.:

```
"details": {"content": "Please do the following: ", "type": "text"}
```

The field can contain longer text. In the GUI, there are 10 lines and there’s a scrollbar for entering longer texts.

4.3 longtext

Quite long text.:

```
"details": {"content": "We discussed the following...", "type": "longtext"}
```

Identical to the text field, but in the GUI there are 25 lines and a scrollbar.

4.4 url

A URL of any type (file, http, ...).:

```
"external link": {"content": "https://tree-time.info", "type": "url"}
```

In the GUI there’s a text field and a button saying “Open”. Clicking the button will use the the content of the text field and call the open method defined in the operating system (e.g. a content of “<https://tree-time.info>” or “<file:///home/myself/downloads/pass-word.info.html>” would be opened with your default web browser).

4.5 integer

A number.:

```
"hours planned": {"content": 4, "type": "integer"}
```

A simple number, can be a floating point number such as -1.23456.

4.6 timer

A stop watch counting hours/minutes/seconds.:

```
"hours spent": {"content": 0, "running_since": false, "type": "timer"}
```

In the GUI there will be a “Start” button and the field will contain a number.

Hitting the “Start” button will change the text in the field to “stop watch running”, and the text on the button changes to “Stop”. The stored item in the field changes to: `"hours spent": {"content": 1.2000021166666666, "running_since": "2024-04-17 10:25:03", "type": "timer"}`. The actual tree field values will get updated once a second, including all branches and parents, updating all values like ratios and sums. It makes sense to use tree fields like *ratio-time* and *sum-time* to see the value in hh:mm:ss format instead of floating point numbers. The stop watch keeps running even when the file is closed or the computer is shut down.

Hitting the “Stop” button will display the currently summed up value in the field, and the text on the button changes to “Start” again. In the file, the “running” flag is removed: `"hours spent": {"content": 1.3, "running_since": false, "type": "timer"}`

Subsequent start/stops on the button will add to the total value.

TREE FIELDS

5.1 General Syntax

Each tree field is a function with a list of input fields. These fields can be either tree fields or data fields. To avoid ambiguities it is good practice to name tree fields starting with a capital letter and data fields with a lower case letter. A tree field is always defined as part of a tree (see previous chapter). The definition states the name, the field type, and the input parameters:

```
field "Name"  
  field-type "type"  
  own-fields [...]  
  child-fields [...]  
  sibling-fields [...]  
  parent-fields [...]
```

The field is started by the line `field "Name"` where “Name” is the name of the field. This will appear as the column heading in the tree list. After this, indented with four spaces, is the field type: `field-type "type"`, where “type” is the type (see next for an overview). After this, the lines `own-fields [...]`, `child-fields [...]`, `sibling-fields [...]`, and `parent-fields [...]` each define a list of field names. These are the input parameters for the function. They are evaluated in the order they are mentioned. A real-world example:

```
field "Progress"  
  field-type "ratio-percent"  
  own-fields ["Spent Hours", "Planned Hours"]  
  child-fields []  
  sibling-fields []  
  parent-fields []
```

The tree field “Progress” is a ratio, defined as $\text{parameter1} / (\text{parameter2} + \text{parameter3} + \dots)$. In the tree view it will be displayed as a percentage. It shows the ratio of the tree fields “Spent Hours” / “Planned Hours”.

5.2 Hidden Fields

Sometimes calculations are more complex than mere ratios, products or sums. The result of any field can be the input of any other field, provided there are no circular dependencies. If chained calculations are needed but intermediate values not interesting, intermediate field can be made *hidden*:

```
field "_sum(x)"  
  field-type "ratio-percent"  
  own-fields ["Spent Hours", "Planned Hours"]  
  child-fields []
```

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```
sibling-fields []  
parent-fields []  
hidden
```

Using the keyword *hidden* after the other field definitions creates a “hidden” field. It can be used for calculations in the tree, but will neither be visible in the GUI, nor in the export.

5.3 string

The simple display of the content of one or multiple data fields or tree fields.

Input has to be of type “text”.

Syntax:

```
field "Name"  
  field-type "string"  
  own-fields ["field1"]  
  child-fields []  
  sibling-fields []  
  parent-fields []
```

Result: The values or strings found in the fields *field1*, *field2*, *field3*, ..., put together, in the order they are mentioned.

5.4 url

Same as “string”, but in an html export the field is formatted as url link (clickable).

5.5 text

Same as “string”, but the exported field has a larger width and can span several lines.

5.6 sum

The sum of all input fields.

Input has to be of type “numerical”.

Syntax:

```
field "Name"  
  field-type "sum"  
  own-fields ["field1", "field2", ...]  
  child-fields ["field3", ...]  
  sibling-fields [...]  
  parent-fields [...]
```

where “field1”, “field2”, “field3”, ..., are the names of data or tree fields. Fields must be integer fields, the result for string fields is not defined.

Result: The value $field1 + field2 + field3 + \dots$

5.7 set

A list of unique occurrences of values of all input fields.

Input can be any type, output will be of type “any”.

Syntax:

```
field "Name"
  field-type "set"
  own-fields ["field1", "field2", ...]
  child-fields ["field3", ...]
  sibling-fields [...]
  parent-fields [...]
```

were “field1”, “field2”, “field3”, ..., are the names of data or tree fields.

Result: A list like *value1*, *value2*, *value3*, *value4*, where each value is the value of at least on input field and each value is listed only once, sorted alphabetically.

5.8 sum-time

Same as “sum”, but will show the result as hour format, e.g. the value *1.5* will be displayed and exported as *1:30:00*.

Input has to be of type “text”.

5.9 difference

Difference of numbers.

Input has to be of type “numerical”.

Syntax:

```
field "Name"
  field-type "difference"
  own-fields ["field1", "field2", ...]
  child-fields ["field3", ...]
  sibling-fields [...]
  parent-fields [...]
```

were “field1”, “field2”, “field3”, ..., are the names of data or tree fields.

Result: The value *field1* - (*field2* + *field3* + ...), in the order they are mentioned.

5.10 difference-time

Same as “difference”, but will show the result as hour format, e.g. the value *1.5* will be displayed and exported as *1:30:00*.

5.11 mean

The statistical mean of all input fields.

Input has to be of type “numerical”.

Syntax:

```
field "Name"  
  field-type "mean"  
  own-fields ["field1", "field2", ...]  
  child-fields ["field3", ...]  
  sibling-fields [...]  
  parent-fields [...]
```

were “field1”, “field2”, “field3”, ..., are the names of data or tree fields.

Result: The value $(field1 + field2 + field3 + \dots) / N$, where N is the number of fields.

5.12 mean-percent

Same as “mean”, but will show the result as a percentage, e.g. the value 0.75 will show as 75 %.

5.13 min

The minimum.

Input has to be of type “numerical”.

Syntax:

```
field "Name"  
  field-type "min"  
  own-fields ["field1", "field2", ...]  
  child-fields ["field3", ...]  
  sibling-fields [...]  
  parent-fields [...]
```

were “field1”, “field2”, “field3”, ..., are the names of data or tree fields.

Result: The minimum value $\min(field1, field2, field3, \dots)$. This can only be for numbers. If you want to find the minimum of texts, use *min-string*.

5.14 max

The Maximum. Same as *min*, but displays the maximum.

5.15 min-string

The smallest of a list of strings.

Input has to be of type “text”.

Same as min, but can be used for text, e.g., names of branches collected by a *node-name* field (see below). Comparison is alphabetically, “aaaab” is smaller than “bc”.

5.16 max-string

The largest of a list of strings. Same as *min-string*, but shows the maximum.

5.17 product

The product of all input fields.

Input has to be of type “numerical”.

Syntax:

```
field "Name"
  field-type "product"
  own-fields ["field1", "field2", ...]
  child-fields ["field3", ...]
  sibling-fields [...]
  parent-fields [...]
```

where “field1”, “field2”, “field3”, ..., are the names of data or tree fields.

Result: The value $field1 * field2 * field3 * \dots$, where N is the number of fields.

5.18 reciprocal

The reciprocal of one input field value (or, if you enter several parameters, of the sum).

Input has to be of type “numerical”.

Syntax:

```
field "Name"
  field-type "reciprocal"
  own-fields ["field1", "field2", ...]
  child-fields ["field3", ...]
  sibling-fields [...]
  parent-fields [...]
```

where “field1”, “field2”, “field3”, ..., are the names of data or tree fields.

Result: The value $1.0 / (field1 + field2 + field3 + \dots)$.

5.19 ratio

The ratio between the first and the sum of all following input fields.

Input has to be of type “numerical”.

Syntax:

```
field "Name"
  field-type "ratio"
  own-fields ["field1", "field2", ...]
  child-fields ["field3", ...]
  sibling-fields [...]
  parent-fields [...]
```

were “field1”, “field2”, “field3”, ..., are the names of data or tree fields.

Result: The value $field1 / (field2 + field3 + \dots)$.

5.20 ratio-percent

Same as “ratio”, but displayed as percentage (e.g., 0.75 is displayed as 75 %).

5.21 count

The number of inputs of all following input fields. Use this to count the number of children, or of siblings, or to count the amount of entries in a set.

Input can be of any type..

Syntax:

```
field "Name"
  field-type "count"
  own-fields ["field1", "field2", ...]
  child-fields ["field3", ...]
  sibling-fields [...]
  parent-fields [...]
```

were “field1”, “field2”, “field3”, ..., are the names of data or tree fields.

Result: The amount of data. Example: If input is a numerical field and entered as child field, the result will be the number of children that have a non-zero value in that field.

5.22 node-name

The name of the node’s parent in another tree.

Input is of type “tree”, either a number (in the file), or an annotated number in the meta editor.

Syntax:

```
field "Name"
  field-type "node-name"
  own-fields []
  child-fields []
  sibling-fields []
  parent-fields [N]
```

were N is an integer number.

Result: Displays the name of the node’s parent in tree N . Trees are counted starting with 0.

Example: This field is called “Project” and is defined in a tree “Time”, which is the first tree (i.e. Tree 0). There is another tree called “Projects”, which is the third tree (i.e. Tree 2):

```
tree "Time"
  field "Project"
    field-type "node-name"
    own-fields []
    child-fields []
```

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```
sibling-fields []
parent-fields [2]

tree "Tasks"
...

tree "Projects"
...
```

This would create the column “Project” in the tree view of the “Time” tree. The line `parent-fields[2]` means each entry shows the respective node’s parent in the “Project” tree (e.g. “TreeTime”).

5.23 node-path

Same as “node-name”, but instead of the parent’s name, the entire path is shown, using “|” as delimiter (e.g. “Coding | Open Source | TreeTime”).

HISTORY AND ROAD MAP

6.1 Past

6.1.1 2015

- November: First implementation, simple data types, simple GUI

6.1.2 2016

- February: Implemented selection (the same item gets selected in all trees, changing a tab shows the same item)
- March: Implemented remaining local functionality (Copy Branch as Sibling, Copy Children to Siblings, Remove from this Tree, Delete Item)
- August: Created installable python package

6.1.3 2017

- May: Implemented new field type *text*
- June: Create deployable packages for Linux and Windows
- June: Made **pre-release v0.0** available
- October: Implemented new field type *node-path*, re-wrote the way nodes move to new parents
- November: Uploaded package to pypi.python.org, *TreeTime* can now be installed using pip

6.1.4 2018

- October: Re-implemented the parent selection mechanism. The old cascaded menus have been replaced with single drop down lists.
- October: Re-furbished the GUI and removed a couple of bugs. Slightly changed the data file format. Implemented theme selection. Tested pyqtdeploy for deployment instead of pyinstaller. Updated the description.
- November: Released **version 2018-10**

6.1.5 2019

- January: Implemented new field type “URL”

6.1.6 2020

- June: Fixed problem with protected cells (typing into a cell without data could cause a crash), and fixed file selection dialog (now only offers .trt files).
- July: Implemented text export - single branches or complete trees can now be exported to txt files.
- August: Implemented time counters - nodes can record the time using a special field of type “timer” (experimental). GUI buttons can start and stop the stopwatch function.
- September: Added move-to-top-level option for first level nodes
- October: Added a dark and a light palette for GUI colours, selectable in addition to the theme selection.
- November: Fixed too slow editing in text fields when tree files are big (>1.5 MB).

6.1.7 2021

- January: Released **version 2021.01**.
- January: Bugfixing (timer crash)
- February: Released **version 2021.2**.
- March: New functions “Delete node” and “Remove node from tree” now move descendants one level up. “Remove branch” removes the respective branch in all trees, “Delete branch” deletes a branch, all child branches and inter-connections in all trees.
- March: If a file with running timers is saved, those timers will be running when the file is loaded.
- March: Added tooltips for main buttons
- March: Implemented HTML export of branches and complete trees
- March: Added auto-delete for orphans
- March: Released **version 2021.3**
- April: Added file option
- April: Implemented four-column layout and rainbow colours for html export
- April: Released **version 2021.4**
- May: Improvement to html and txt export (changed colours, headings have no different sizes)
- May: On export of both html and txt, user can now decide how many tree levels (depth) should be exported.
- May: Released **version 2021.5**
- July: Fixed broken application logo
- July: Implemented CSV export
- August: Released **version 2021.8**
- September: Added new export option “Text to Clipboard”
- November: Added new export option “Html (List) to File”
- December: Added two primitive template files (a text-only single tree and dual tree mindmap)
- December: Released **version 2021.9**

6.1.8 2022

- March: Fixed crash bug on non-export
- March 2022: Improved sorting and grouping in html export, changed to five columns
- June 2022: Added a tutorial file
- June 2022: Added first-use dialog when no file is loaded, instead of the file-open dialog
- June 2022: Released **version 2022.1**

6.1.9 2023

- February 2023: Added new tree field types “concatenation” and “set”.
- February 2023: Implemented adjustable width for the data item and the tree table main view.
- February 2023: Release **version 2023.1**
- April 2023: Removed deprecated tree field (“concatenation”), fixed missing logo.
- May 2023: Ported to PyQt 6.0
- May 2023: Implemented auto-adjusting name column
- June 2023: Created new default theme “Organic”, a mix between Fusion and Breeze
- June 2023: Implemented display of tree field definitions and of data field definitions
- July 2023: Release **version 2023.2**
- October 2023: Fixed crash when exporting text to clipboard.

6.1.10 2024

- January 2024: Changed node symbol to small circle in text eport (after asking users on social media).
- February 2024: Implemented min, max, min-string, max-string fields.
- March 2024: Implemented longtext data field.
- April 2024: Extended documentation on readthedocs.io. Release **version 2024.1**
- April 2024: Restructured export area, added name-only export. Made all export options (full tree / branch / node with context) (all fields / names only) available for all file formats and for both file and clipboard export.
- April 2024: Release **version 2024.2**
- Done March 2024: Implemented changeable font size (zoom) of data display
- Done May 2024: Implemented continuous text and html export
- July 2024: Release **version 2024.3**
- October 2024: Fixed crash bug and improved html output
- November 2024: Improved colours in html output, implemented continuous change to export for textfields even if the focus stays in, fixed broken layout of html export
- December 2024: Changed colours in html output (again?), increased font size
- December 2024: Release **version 2024.4**

6.1.11 2025

- January 2025: Changed colours on html export to a seven-colour rainbow palette.
- February 2025: Implemented PNG export
- March 2025: Implemented SVG export
- March 2025: Implemented HTML/Document export
- April 2025: Improvements to image export.
- April 2025: Release **version 2025.1**
- Done June 2025: Bugfix in SVG export (line breaks)
- Done June 2025: Implemented Markdown export
- Done June 2025: Implemented flexible export (field names / content / node name)
- Done July 2025: Implemented web server for continuous sharing
- Done July 2025: Release **version 2025.2**
- Done October 2025: Added new calculation field: product
- Done October 2025: Enabled running of multiple instances.
- Done October 2025: Fixed display of max numbers
- Done October 2025: Implemented hidden tree fields
- Done October 2025: Added new calculation field: reciprocal
- Done October 2025: Started structure edit functionality: Implemented type change for data and tree fields, change of visibility for tree fields, changing of data item name and data item field name, editing of tree field names, editing of tree names, parameter list editing for tree fields
- Done November 2025: Implemented deleting of trees, adding of trees, deletion of tree fields, adding of tree fields, adding and deleting of data fields
- Done November 2025: Implemented new-file button, removed first dialog
- Done November 2025: Release **version 2025.3**
- Done December 2025: Implemented types in meta editor.
- Done December 2025: Fixed bugs: Non-propagating data field definition, double decorators in text export. Removed empty copy-children button.
- Done December 2025: Added checks and error messages to meta editor (recursion check).
- Done December 2025: Release **version 2025.4**

6.1.12 2026

- Done January 2026: New field type “count”.
- Done February 2026: Improved text and html export.
- Done March 2026: Implemented TSV export, bugfixes.
- Done March 2026: Release **version 2026.1**

6.2 Present

- Bugfixing
- Extend documentation on readthedocs.io
- Add more fields
- Add more examples and more template data files

6.3 Future

6.3.1 Near Future

- Implement search function

6.3.2 Mid Future

- Implement global functions (Linearise Tree, Level-Swap, Merge identical Siblings, Merge Identical Parents/Children)

6.3.3 Far Future

- Implement safe usage by multiple simultaneous users
- A whole lot of other fancy things that will probably never get done
- genindex
- modindex
- search