Benker Documentation

Release 0.5.1

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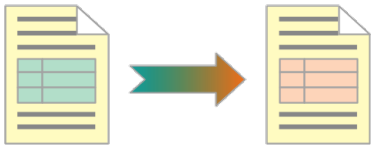
Nov 22, 2019

Contents:

The Benker library can be used to convert tables from one format to another.

Yes, it only converts the tables, not the whole document, but it tries to do it well. The document itself is not changed, and the paragraphs inside the cells, neither. It's your responsibility to do this part of the work.



CHAPTER 1

Available formats

The Benker library works on XML documents. Currently, it can handle:

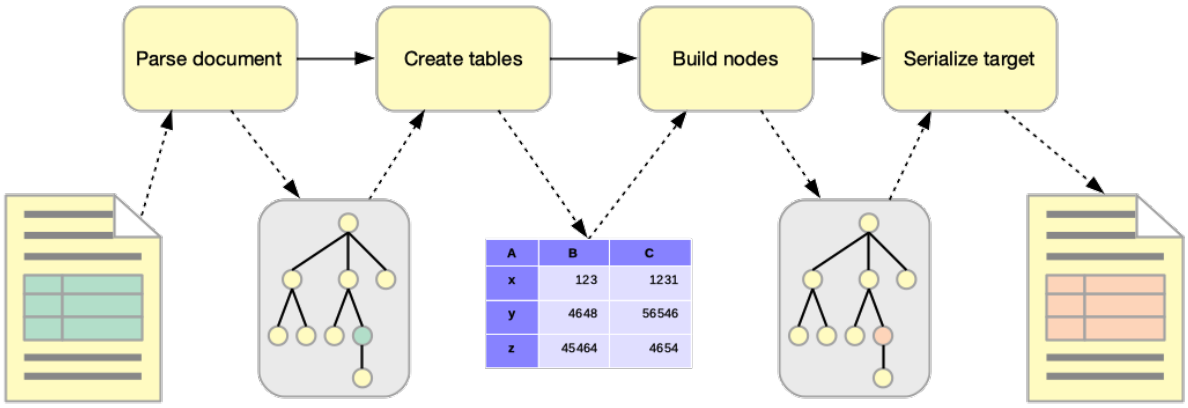
OOXML (Office Open XML) is an XML-based format for office documents, including word processing documents, spreadsheets, presentations, as well as charts, diagrams, shapes, and other graphical material. This is the XML format used by Microsoft Word documents: `*.docx`. • Officiel web site: http://officeopenxml.com/. • Wikipedia page: https://en.wikipedia.org/wiki/Office_Open_XML.	
CALS (Continuous Acquisition and Life-cycle Support) table model is a standard for representing tables in SGML/XML. Developed as part of the CALS Department of Defence initiative. The DTD of the CALS table model is available in the OASIS (Organization for the Advancement of Structured Information Standards) web site. • Specification on OASIS web site: https://www.oasis-open.org/specs/tablemodels.php • Wikipedia page: https://en.wikipedia.org/wiki/CALS_Table_Model	
FORMEX (Formalized Exchange of Electronic Publications) describes the format for the exchange of data between the Publication Office and its contractors. In particular, it defines the logical markup for documents which are published in the different series of the Official Journal of the European Union. Formex v4 is based on the international standard XML. • Official web site: https://op.europa.eu/en/web/eu-vocabularies/formex/	

CHAPTER 2

Conversion stages

To convert a document, Benker uses several stages:

1. Parse the source document and construct a nodes tree,
2. Search for table elements and construct the table objects,
3. Build the target nodes tree by replacing table nodes,
4. Serialise the target document.

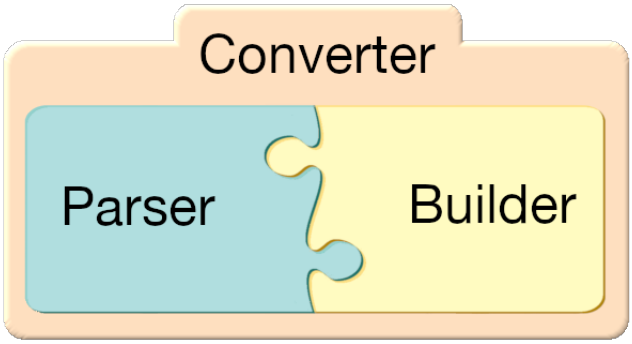


CHAPTER 3

Converters: Parsers + Builders

The decoupling between parsing, building and final serialization allows a simplified and modular implementation. This decoupling also allows to multiply the combinations: it is easy to change a builder to another one, and to develop its own parser...

The advantage of this approach is that we avoid having a specific document conversion for each format pair (input, output). Instead, you can build a converter by choosing a parser and a builder, as you assemble the pieces of a puzzle.

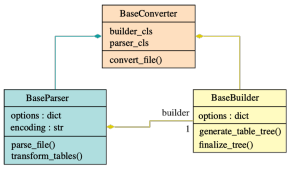


The following table show you the available converters which groups parser and builders by pairs.

Table 1: **Available converters**

\	OOXML	HTML	CALS	Formex4
OOXML	–	*(unavailable)*	`convert_ooxml2cals()`	`convert_ooxml2formex()`
HTML	*(unavailable)*	–	*(unavailable)*	*(unavailable)*
CALS	*(unavailable)*	*(unavailable)*	–	`convert_cals2formex()`
Formex4	*(unavailable)*	*(unavailable)*	`convert_formex2cals()`	–

You can create your own converter by inheriting the available base classes:



- `BaseConverter`: inherit this class to create your own converter. Set your own parser class to the *parser_cls* class attribute, and your own builder class to the *builder_cls* class attribute.
- `BaseParser`: inherit this class to create your own parser. The method `transform_tables()` is an abstract method, so you need to implement it in your subclass: it must call the method `generate_table_tree()` each time a table node is found and converted to a `Table` object.
- `BaseBuilder`: inherit this class to create your own builder. The method `generate_table_tree()` is an abstract method, so you need to implement it in your subclass: it must convert the `Table` object into a target XML node (the resulting table format). You can also implement the method `finalize_tree()` to do any post-processing to the resulting XML tree.

Hint: Contribution is welcome!

CHAPTER 4

Usage

For example, to convert the tables of a `.docx` document to Formex4 format, you can process as follow:

```
import os
import zipfile

from benker.converters.ooxml2formex import convert_ooxml2formex

# - Unzip the ``.docx`` in a temporary directory
src_zip = "/path/to/demo.docx"
tmp_dir = "/path/to/tmp/dir/"
with zipfile.ZipFile(src_zip) as zf:
    zf.extractall(tmp_dir)

# - Source paths
src_xml = os.path.join(tmp_dir, "word/document.xml")
styles_xml = os.path.join(tmp_dir, "word/styles.xml")

# - Destination path
dst_xml = "/path/to/demo.xml"

# - Create some options and convert tables
options = {
    'encoding': 'utf-8',
    'styles_path': styles_xml,
}
convert_ooxml2formex(src_xml, dst_xml, **options)
```

This code produces a table like that:

```
<TBL COLS="7" NO.SEQ="0001">
  <CORPUS>
    <ROW>
      <CELL COL="1" ROWSPAN="2">
        <w:p w:rsidR="00EF2ECA" w:rsidRDefault="00EF2ECA"><w:r><w:t>A</w:t></w:r></
↪w:p>
```

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```
      </CELL>
      <CELL COL="2" COLSPAN="2">
        <w:p w:rsidR="00EF2ECA" w:rsidRDefault="00EF2ECA"><w:r><w:t>B</w:t></w:r></
↪w:p>
      </CELL>
      <CELL COL="4">
        <IE/>
      </CELL>
      <CELL COL="5">
        <IE/>
      </CELL>
      <CELL COL="6">
        <IE/>
      </CELL>
      <CELL COL="7">
        <IE/>
      </CELL>
    </ROW>
    <ROW>
      ...
    </ROW>
  </CORPUS>
</TBL>
```

The content of the cells still contains OOXML fragments. It's your own responsibility to convert them to the target format.

4.1 Benker

Easily convert your CALS, HTML, Formex4, Office Open XML (docx) tables from one format to another.

4.1.1 Overview

To convert the tables of a `.docx` document to CALS format, you can process as follow:

```
import os
import zipfile

from benker.converters.ooxml2cals import convert_ooxml2cals

# - Unzip the ``.docx`` in a temporary directory
src_zip = "/path/to/demo.docx"
tmp_dir = "/path/to/tmp/dir/"
with zipfile.ZipFile(src_zip) as zf:
    zf.extractall(tmp_dir)
```

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```
# - Source paths
src_xml = os.path.join(tmp_dir, "word/document.xml")
styles_xml = os.path.join(tmp_dir, "word/styles.xml")

# - Destination path
dst_xml = "/path/to/demo.xml"

# - Create some options and convert tables
options = {
    'encoding': 'utf-8',
    'styles_path': styles_xml,
    'width_unit': "mm",
    'table_in_tgroup': True,
}
convert_ooxml2cals(src_xml, dst_xml, **options)
```

4.1.2 Installation

To install this library, you can create and activate a virtualenv, and run:

```
pip install benker
```

Requirements

This library uses lxml library and is tested with the versions 3.x (for Python < 3.7), and 4.x.

Usage in your library/application

You can use this library in your own library/application.

To do so, add this library in your `setup.py` in your project requirements:

```
setup(
    name="YourApp",
    install_requires=['benker'],
    ...
)
```

To install the dependencies, activate your virtualenv and run:

```
pip install -e .
```

And enjoy!

4.1.3 Licence

This library is distributed according to the MIT licence.

Users have legal right to download, modify, or distribute the library.

4.1.4 Authors

`Benker` was written by Laurent LAPORTE.

4.2 Tutorials

This section presents the different tutorials available to discover and learn how to use Benker. This library has high-level conversion functions to convert tables from one format to another. All functions have the same API, it's easier for everyone.

The following tutorials will give you sample files to convert and the expected results. Of course, you will have the opportunity to choose your conversion options according to your needs:

4.2.1 OOXML to Formex 4 converter

Description

The *`convert_ooxml2formex()`* converter is a function designed to convert tables from an Office Open XML (OOXML) document (which respects the schema defined in Office Open XML File Formats) in the Formex 4 format.

The conversion is done in the source XML document by replacing the tables of the OOXML format with those transformed in the Formex format. In other words, the general structure of the source XML document is retained except for tables.

The *`Ooxml2FormexConverter`* converter is composed of:

- a *`OoxmlParser`* parser that allows you to parse tables in OOXML format,

  The tutorial *OOXML tables (Word) parser* describes the usage of this parser and gives some examples.

- a *`FormexBuilder`* builder that allows you to build tables in the Formex format.

  The tutorial *Formex 4 tables builder* describes the usage of this builder and gives some examples.

Conversion options

The tables parsing and building can be parameterized using the options described below:

Common parsing options:

`encoding` (default: "utf-8"): XML encoding of the destination file.

OOXML parser options:

`styles_path` (default: `None`): Path to the stylesheet to use to resole table styles. In an uncompressed `.docx` tree structure, the stylesheet path is `word/styles.xml`.

Formex 4 builder options:

`use_cals` (default: `False`): Generate additional CALS-like elements and attributes to simplify the layout of Formex document in typesetting systems.

`cals_ns` (default: "https://lib.benker.com/schemas/cals.xsd"): Namespace to use for CALS-like elements and attributes (requires: `use_cals`). Set `None` (or "") if you don't want to use namespace.

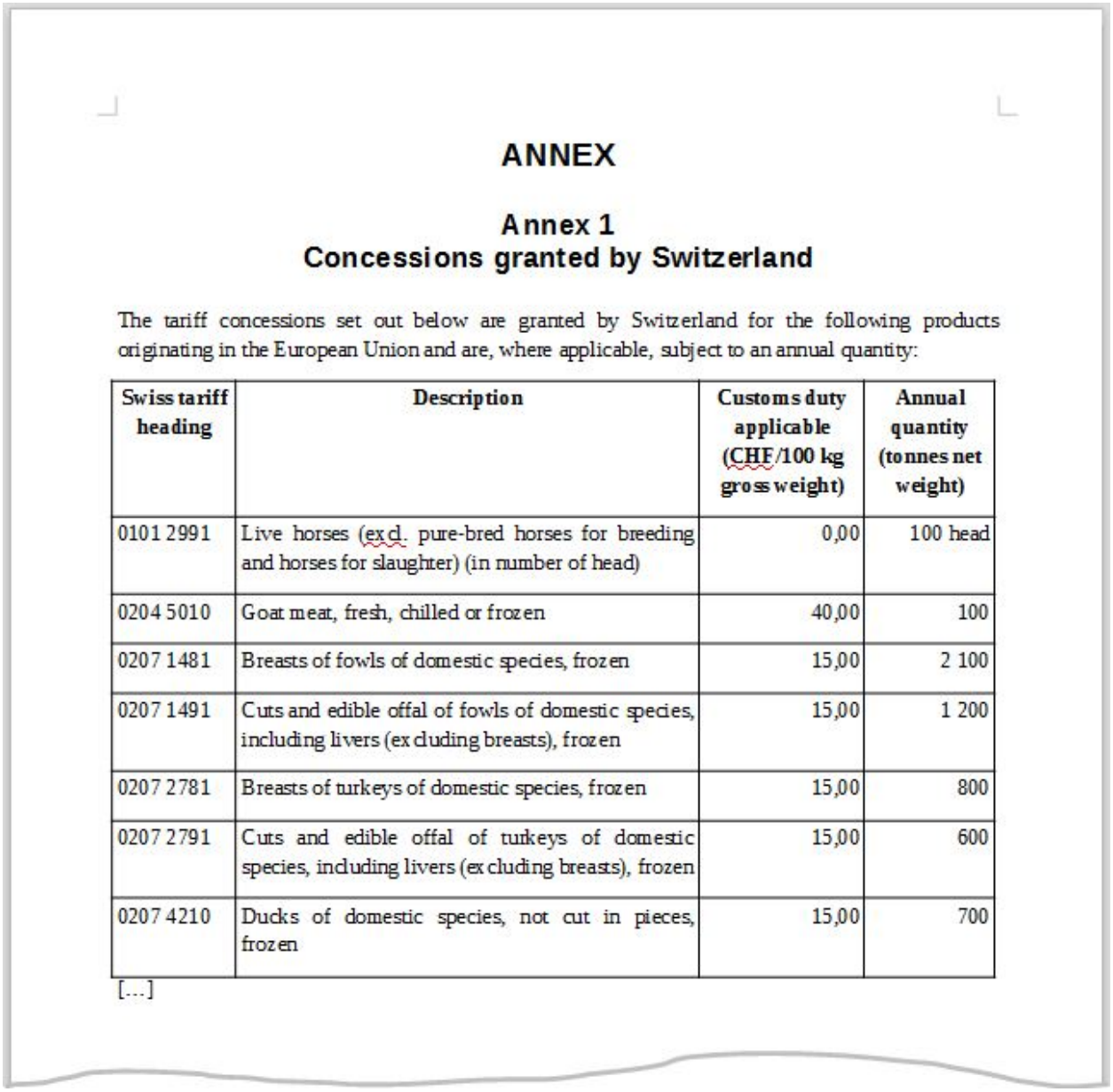
`cals_prefix` (default: "cals"): Namespace prefix to use for CALS-like elements and attributes (requires: `use_cals`).

`width_unit` (default: "mm"): Unit to use for column widths (requires: `use_cals`). Possible values are: 'cm', 'dm', 'ft', 'in', 'm', 'mm', 'pc', 'pt', 'px'.

Examples of conversions

Converting a `.docx` document

You can use the *`convert_ooxml2formex()`* converter to convert a Word document, for instance, we have the following annex:



ANNEX

Annex 1
Concessions granted by Switzerland

The tariff concessions set out below are granted by Switzerland for the following products originating in the European Union and are, where applicable, subject to an annual quantity:

Swiss tariff heading	Description	Customs duty applicable (CHF/100 kg gross weight)	Annual quantity (tonnes net weight)
0101 2991	Live horses (excl. pure-bred horses for breeding and horses for slaughter) (in number of head)	0,00	100 head
0204 5010	Goat meat, fresh, chilled or frozen	40,00	100
0207 1481	Breasts of fowls of domestic species, frozen	15,00	2 100
0207 1491	Cuts and edible offal of fowls of domestic species, including livers (excluding breasts), frozen	15,00	1 200
0207 2781	Breasts of turkeys of domestic species, frozen	15,00	800
0207 2791	Cuts and edible offal of turkeys of domestic species, including livers (excluding breasts), frozen	15,00	600
0207 4210	Ducks of domestic species, not cut in pieces, frozen	15,00	700

[...]

If you want to convert a `.docx` file, you need first to decompress it in a temporary directory in order to access the "word/document.xml" and "word/styles.xml" stored in the `.docx` package.

To decompress the `.docx` package and convert the tables, you can do:

```
>>> import os
>>> import zipfile

>>> from benker.converters.ooxml2formex import convert_ooxml2formex

>>> src_zip = "docs/_static/converters.ooxml2formex.sample1.docx"
>>> with zipfile.ZipFile(src_zip) as zf:
...     zf.extractall(tmp_dir)

>>> src_xml = os.path.join(tmp_dir, "word/document.xml")
>>> styles_xml = os.path.join(tmp_dir, "word/styles.xml")

>>> dst_xml = os.path.join(tmp_dir, "converters.ooxml2formex.sample1.xml")
>>> options = {
...     'encoding': 'utf-8',
...     'styles_path': styles_xml,
... }
>>> convert_ooxml2formex(src_xml, dst_xml, **options)
```

The result is the "word/document.xml" document, but with tables replaced by the Formex `TBL` elements.

Here is a sample of the result XML:

```
<?xml version='1.0' encoding='UTF-8'?>
<w:document xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
            xmlns:w="http://schemas.openxmlformats.org/wordprocessingml/2006/main"
            mc:Ignorable="w14 w15 w16se w16cid wp14">
  <w:body>
    <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
      <w:pPr>
        <w:pStyle w:val="Titre1"/>
        <w:jc w:val="center"/>
      </w:pPr>
      <w:r><w:t>ANNEX</w:t></w:r>
    </w:p>
    <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
      <w:pPr>
        <w:pStyle w:val="Titre2"/>
        <w:jc w:val="center"/>
      </w:pPr>
      <w:r><w:t>Annex 1</w:t></w:r>
      <w:r><w:br/><w:t>Concessions granted by Switzerland</w:t></w:r>
    </w:p>
    <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
      <w:pPr>
        <w:pStyle w:val="Corpsdetexte"/>
      </w:pPr>
      <w:r><w:t>The tariff concessions set out below are granted by Switzerland
        for the following products originating in the European Union and are,
        where applicable, subject to an annual quantity:</w:t></w:r>
    </w:p>
    <TBL NO.SEQ="0001" COLS="4">
      <CORPUS>
        <ROW TYPE="HEADER">
          <CELL COL="1">
            <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
              <w:pPr>
                <w:pStyle w:val="Corpsdetexte"/>
```

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```
            <w:keepNext/>
            <w:jc w:val="center"/>
            <w:rPr><w:b/><w:bCs/></w:rPr>
          </w:pPr>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:t>Swiss tariff</w:t></w:r>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/></w:r>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:t>heading</w:t></w:r>
        </w:p>
      </CELL>
      <CELL COL="2">
        <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
          <w:pPr>
            <w:pStyle w:val="Corpsdetexte"/>
            <w:jc w:val="center"/>
            <w:rPr><w:b/><w:bCs/></w:rPr>
          </w:pPr>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:t>Description</w:t></w:r>
        </w:p>
      </CELL>
      <CELL COL="3">
        <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
          <w:pPr>
            <w:pStyle w:val="Corpsdetexte"/>
            <w:jc w:val="center"/>
            <w:rPr><w:b/><w:bCs/></w:rPr>
          </w:pPr>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:t>Customs duty</w:t></w:r>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/><w:t>applicable</w:t></w:r>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/><w:t>(CHF/100 kg</w:t></w:r>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/><w:t>gross weight)</w:t></w:r>
        </w:p>
      </CELL>
      <CELL COL="4">
        <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
          <w:pPr>
            <w:pStyle w:val="Corpsdetexte"/>
            <w:jc w:val="center"/>
            <w:rPr><w:b/><w:bCs/></w:rPr>
          </w:pPr>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:t>Annual</w:t></w:r>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/><w:t>quantity</w:t></w:r>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/><w:t>(tonnes net</w:t></w:r>
          <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/><w:t>weight)</w:t></w:r>
        </w:p>
      </CELL>
    </ROW>
    <ROW>
      <CELL COL="1">
        <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
```

Using CALS-like attributes and elements

The Formex table format is good to structure tables. The logical structure is similar to the one used for HTML tables but without CSS.

Some difficulties appears when you want to do the layout of Formex tables in typesetting systems: Formex tables

doesn't have much layout information:

- no borders,
- no horizontal of vertical alignment of the text,
- no background color,
- no indication of the column width,
- etc.

To solve that, it is possible to generate CALS-like attributes and elements in the Formex. Of course, we can use a namespace and a namespace prefix for the CALS attributes and elements.

To convert the tables using CALS, you can do:

```
>>> dst_xml = os.path.join(tmp_dir, "converters.ooxml2formex.sample2.xml")
>>> options = {
...     'encoding': 'utf-8',
...     'styles_path': styles_xml,
...     'use_cals': True,
...     'cals_ns': "http://cals",
...     'cals_prefix': "cals",
... }
>>> convert_ooxml2formex(src_xml, dst_xml, **options)
```

The result is the "word/document.xml" document, but with tables replaced by the Formex `TBL` elements.

Here is a sample of the result XML:

```
    <TBL xmlns:cals="http://cals" NO.SEQ="0001" COLS="4">
      <CORPUS cals:frame="none" cals:colsep="0" cals:rowsep="0" cals:pgwide="1">
        <cals:colspec cals:colname="c1" cals:colwidth="24.04mm"/>
        <cals:colspec cals:colname="c2" cals:colwidth="89.09mm"/>
        <cals:colspec cals:colname="c3" cals:colwidth="31.96mm"/>
        <cals:colspec cals:colname="c4" cals:colwidth="24.91mm"/>
        <ROW TYPE="HEADER">
          <CELL COL="1" cals:rowsep="1" cals:align="center">
            <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
              <w:pPr>
                <w:pStyle w:val="Corpsdetexte"/>
                <w:keepNext/>
                <w:jc w:val="center"/>
                <w:rPr><w:b/><w:bCs/></w:rPr>
              </w:pPr>
              <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:t>Swiss tariff</w:t></w:r>
              <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/></w:r>
              <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:t>heading</w:t></w:r>
            </w:p>
          </CELL>
          <CELL COL="2" cals:rowsep="1" cals:align="center">
            <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
              <w:pPr>
                <w:pStyle w:val="Corpsdetexte"/>
                <w:jc w:val="center"/>
                <w:rPr><w:b/><w:bCs/></w:rPr>
              </w:pPr>
              <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:t>Description</w:t></w:r>
            </w:p>
          </CELL>
```

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```
          <CELL COL="3" cals:rowsep="1" cals:align="center">
            <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
              <w:pPr>
                <w:pStyle w:val="Corpsdetexte"/>
                <w:jc w:val="center"/>
                <w:rPr><w:b/><w:bCs/></w:rPr>
              </w:pPr>
              <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:t>Customs duty</w:t></w:r>
              <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/><w:t>applicable</w:t></w:r>
              <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/><w:t>(CHF/100 kg</w:t></w:r>
              <w:r><w:rPr><w:b/><w:bCs/></w:rPr><w:br/><w:t>gross weight)</w:t></w:r>
            </w:p>
          </CELL>
          <CELL COL="4" cals:rowsep="1" cals:align="center">
            <w:p w:rsidR="001E0B3A" w:rsidRDefault="00883CDC">
              <w:pPr>
                <w:pStyle w:val="Corpsdetexte"/>
```

In the result, we can notice:

- the presence of the namespace `xmlns:cals="http://cals"`.
- the additional attributes, like `cals:frame="none"`, `cals:colsep="0"`, `cals:rowsep="0"`...
- the additional `colspec` elements: `<cals:colspec cals:colname="c1" cals:colwidth="24.04mm"/>`.

This kind of information is will be preserved if you use a Formex to CALS conversion (see the *Formex 4 to CALS converter* tutorial).

4.2.2 OOXML to CALS converter

Description

The *convert_ooxml2cals()* converter is a function designed to convert tables from an Office Open XML (OOXML) document (which respects the schema defined in Office Open XML File Formats) in the CALS table format.

The conversion is done in the source XML document by replacing the tables of the OOXML format with those transformed in the CALS format. In other words, the general structure of the source XML document is retained except for tables.

The *Ooxml2CalsConverter* converter is composed of:

- a *OoxmlParser* parser that allows you to parse tables in OOXML format,

  The tutorial *OOXML tables (Word) parser* describes the usage of this parser and gives some examples.

- a *CalsBuilder* builder that allows you to build tables in the CALS format.

  The tutorial *CALS tables builder* describes the usage of this builder and gives some examples.

Conversion options

The tables parsing and building can be parameterized using the options described below:

Common parsing options:

`encoding` (default: "utf-8"): XML encoding of the destination file.

OOXML parser options:

`styles_path` (default: `None`): Path to the stylesheet to use to resole table styles. In an uncompressed `.docx` tree structure, the stylesheet path is `word/styles.xml`.

CALS builder options:

`cals_ns` (default: `None`): Namespace to use for CALS-like elements and attributes to generate. Set `None` (or "") if you don't want to use namespace.

`cals_prefix` (default: `None`): Namespace prefix to use for CALS-like elements and attributes to generate.

`width_unit` (default: "mm"): Unit to use for column widths. Possible values are: 'cm', 'dm', 'ft', 'in', 'm', 'mm', 'pc', 'pt', 'px'.

`table_in_tgroup` (default: `False`): Where should we put the table properties:

- `False` to insert the attributes `@colsep`, `@rowsep`, and `@tabstyle` in the `<table>` element,
- `True` to insert the attributes `@colsep`, `@rowsep`, and `@tgroupstyle` in the `<tgroup>` element.

`tgroup_sorting` (default: `["header", "footer", "body"]`): List used to sort (and group) the rows in a `tgroup`. The sorting is done according to the row natures which is by default: `["header", "footer", "body"]` (this order match the CALS DTD defaults, where the footer is between the header and the body. To move the footer to the end, you can use `["header", "body", "footer"]`.

Examples of conversions

4.2.3 Formex 4 to CALS converter

Description

The *`convert_formex2cals()`* converter is a function designed to convert tables from an Formex 4 document (which respects the schema defined in Formex 4 format) in the CALS table format.

The conversion is done in the source XML document by replacing the tables of the Formex 4 format with those transformed in the CALS format. In other words, the general structure of the source XML document is retained except for tables.

The *`Formex2CalsConverter`* converter is composed of:

- a *`FormexParser`* parser that allows you to parse tables in Formex 4 format,

  The tutorial *Formex 4 tables parser* describes the usage of this parser and gives some examples.

- a `CalsBuilder` builder that allows you to build tables in the CALS format.

  The tutorial *CALS tables builder* describes the usage of this builder and gives some examples.

Conversion options

The tables parsing and building can be parameterized using the options described below:

Common parsing options:

`encoding` (default: "utf-8"): XML encoding of the destination file.

Formex parser options:

formex_ns (default None): Namespace to use for Formex elements and attributes parsing. Set None (or "") if you don't use namespace.

cals_ns (default None): Namespace to use for CALS-like elements and attributes parsing. Set None (or "") if you don't use namespace.

CALS builder options:

cals_ns (default: None): Namespace to use for CALS-like elements and attributes to generate. Set None (or "") if you don't want to use namespace.

cals_prefix (default: None): Namespace prefix to use for CALS-like elements and attributes to generate.

width_unit (default: "mm"): Unit to use for column widths. Possible values are: 'cm', 'dm', 'ft', 'in', 'm', 'mm', 'pc', 'pt', 'px'.

table_in_tgroup (default: False): Where should we put the table properties:

- False to insert the attributes @colsep, @rowsep, and @tabstyle in the <table> element,
- True to insert the attributes @colsep, @rowsep, and @tgroupstyle in the <tgroup> element.

tgroup_sorting (default: ["header", "footer", "body"]): List used to sort (and group) the rows in a tgroup. The sorting is done according to the row natures which is by default: ["header", "footer", "body"] (this order match the CALS DTD defaults, where the footer is between the header and the body. To move the footer to the end, you can use ["header", "body", "footer"].

Examples of conversions

4.2.4 CALS to Formex 4 converter

Description

The *convert_cals2formex()* converter is a function designed to convert tables from an CALS document (which respects the schema defined in CALS table format) in the Formex 4 format.

The conversion is done in the source XML document by replacing the tables of the CALS format with those transformed in the Formex 4 format. In other words, the general structure of the source XML document is retained except for tables.

The *Cals2FormexConverter* converter is composed of:

- a *CalsParser* parser that allows you to parse tables in CALS format,

  The tutorial *CALS tables parser* describes the usage of this parser and gives some examples.

- a FormexBuilder builder that allows you to build tables in the Formex 4 format.

  The tutorial *Formex 4 tables builder* describes the usage of this builder and gives some examples.

Conversion options

The tables parsing and building can be parameterized using the options described below:

Common parsing options:

encoding (default: "utf-8"): XML encoding of the destination file.

CALS parser options:

cals_ns (default None): Namespace to use for CALS elements and attributes parsing. Set None (or "") if you don't use namespace in your XML.

Formex 4 builder options:

use_cals (default: False): Generate additional CALS-like elements and attributes to simplify the layout of Formex document in typesetting systems.

cals_ns (default: "https://lib.benker.com/schemas/cals.xsd"): Namespace to use for CALS-like elements and attributes (requires: `use_cals`). Set `None` (or "") if you don't want to use namespace.

cals_prefix (default: "cals"): Namespace prefix to use for CALS-like elements and attributes (requires: `use_cals`).

width_unit (default: "mm"): Unit to use for column widths (requires: `use_cals`). Possible values are: 'cm', 'dm', 'ft', 'in', 'm', 'mm', 'pc', 'pt', 'px'.

Examples of conversions

Note: future converters are coming.

All the converters available in the benker library use parser/builder pairs. There is one parser for each XML document type to read and one builder for each XML document type to write. For example, you have the parser OOXML which will allow you to analyze the tables contained in Word documents (of type `.docx`); and you can choose the Formex builder to generate valid Formex 4 tables.

The following tutorials will give you some use cases for parsers and builders. You could immerse yourself in the classes usage and available options.

4.2.5 OOXML tables (Word) parser

4.2.6 Formex 4 tables parser

Description

A *FormexParser* is used to parse the tables (actually, it parses `CORPUS` elements) of a Formex 4 document and generate a *Table* instances (memory representation of a table). The instance can then be serialize in another XML format, like CALS.

To use this class, you need to inherit the *BaseBuilder* class and create an instance of your class to used in the *FormexParser* parser.

Of course, for the sake of this demonstration we can used an instance of the class *BaseBuilder*, without implementing the *generate_table_tree()* method.

```
>>> from lxml import etree
>>> from benker.builders.base_builder import BaseBuilder
>>> from benker.parsers.formex import FormexParser

>>> builder = BaseBuilder()
>>> parser = FormexParser(builder)
```

For example, you can parse the following Formex 4 table:

```
<TBL COLS="9" NO.SEQ="0001" PAGE.SIZE="SINGLE.LANDSCAPE">
  <CORPUS>
    <ROW TYPE="HEADER">
```

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```
      <CELL COL="1"><IE/></CELL>
      <CELL COL="2" COLSPAN="4">Identification des substances</CELL>
      <CELL COL="6" COLSPAN="3">Conditions</CELL>
      <CELL COL="9"><IE/></CELL>
    </ROW>
    <ROW TYPE="HEADER">
      <CELL COL="1">Numéro d'ordre</CELL>
      <CELL COL="2">Nom chimique/DCI/XAN</CELL>
      <CELL COL="3">Dénomination commune du glossaire des ingrédients</CELL>
      <CELL COL="4">Numéro CAS</CELL>
      <CELL COL="5">Numéro CE</CELL>
      <CELL COL="6">Type de produit, parties du corps</CELL>
      <CELL COL="7">Concentration maximale dans les préparations prêtes
        à l'emploi</CELL>
      <CELL COL="8">Autres</CELL>
      <CELL COL="9">Libellé des conditions d'emploi et des avertissements</CELL>
    </ROW>
    <ROW TYPE="ALIAS">
      <CELL COL="1">a</CELL>
      <CELL COL="2">b</CELL>
      <CELL COL="3">c</CELL>
      <CELL COL="4">d</CELL>
      <CELL COL="5">e</CELL>
      <CELL COL="6">f</CELL>
      <CELL COL="7">g</CELL>
      <CELL COL="8">h</CELL>
      <CELL COL="9">i</CELL>
    </ROW>
    <ROW>
      <CELL COL="1">31</CELL>
      <CELL COL="2">3,3'-(1,4-phénylène)bis(5,6-diphényl-1,2,4-triazine)</CELL>
      <CELL COL="3">phénylène bis-diphényltriazine</CELL>
      <CELL COL="4">55514-22-2</CELL>
      <CELL COL="5">700-823-1</CELL>
      <CELL COL="6"><IE/></CELL>
      <CELL COL="7">5 %</CELL>
      <CELL COL="8">Ne pas utiliser dans des applications pouvant conduire à
        l'exposition des poumons de l'utilisateur final par inhalation.</CELL>
      <CELL COL="9"><IE/></CELL>
    </ROW>
  </CORPUS>
</TBL>
```

And generate a *Table* instance:

```
>>> tree = etree.parse("docs/_static/parsers.formex.sample1.xml")
>>> fmx_table = tree.getroot()
>>> table = parser.parse_table(fmx_table)
>>> print(table)
+-----------+-----------------------------------------------+-------------------------
↪----------+-----------+
|           |             Identific                         |             Condition  ␣
↪          |           |
+-----------+-----------+-----------+-----------+-----------+-----------+-----------+-
↪----------+-----------+
| Numéro d' | Nom chimi | Dénominat | Numéro CA | Numéro CE | Type de p | Concentra |␣
↪ Autres   | Libellé d |
```

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```
+----------+----------+----------+----------+----------+----------+----------+-
↪----------+----------+
|     a    |     b    |     c    |     d    |     e    |     f    |     g    |␣
↪    h     |     i    |
+----------+----------+----------+----------+----------+----------+----------+-
↪----------+----------+
|    31    | 3,3'-(1,4 | phénylène | 55514-22- | 700-823-1 |          |    5 %   |␣
↪Ne pas ut |          |
+----------+----------+----------+----------+----------+----------+----------+-
↪----------+----------+
```

Options

The *FormexParser* parser accept the following options:

- *formex_ns* namespace to use for Formex elements and attributes. Usually, a Formex document has no namespace, but in some case, you can have "http://opoce".

  For instance, if you have :

```
<TBL COLS="2" xmlns="http://opoce">
  <CORPUS>
    <ROW TYPE="HEADER">
      <CELL COL="1">Région</CELL>
      <CELL COL="2">Vin</CELL>
    </ROW>
    <ROW>
      <CELL COL="1">Alsace</CELL>
      <CELL COL="2">Gewurztraminer</CELL>
    </ROW>
    <ROW>
      <CELL COL="1">Beaujolais</CELL>
      <CELL COL="2">Brouilly</CELL>
    </ROW>
  </CORPUS>
</TBL>
```

  To parse this XML document, you can create a parser using the *formex_ns* option:

```
>>> parser = FormexParser(builder, formex_ns="http://opoce")
>>> tree = etree.parse("docs/_static/parsers.formex.sample2.xml")
>>> fmx_table = tree.getroot()
>>> table = parser.parse_table(fmx_table)
>>> print(table)
+-----------+-----------+
|  Région   |    Vin    |
+-----------+-----------+
|  Alsace   | Gewurztra |
+-----------+-----------+
| Beaujolai | Brouilly  |
+-----------+-----------+
```

- *cals_ns* namespace to use for CALS-like elements and attributes. For the purpose of typesetting enhancement, a Formex document may contains CALS-like elements and attributes. This elements and attributes may use a different namespace. In order to parse them, you can use the *cals_ns* options.

  For instance, if you have :

```
<TBL COLS="2" xmlns:cals="http://my.cals.ns">
  <CORPUS cals:colsep="1" cals:frame="all" cals:pgwide="1" cals:rowsep="1">
    <cals:colspec cals:colname="c1" cals:colwidth="80mm" cals:align="left"/>
    <cals:colspec cals:colname="c2" cals:colwidth="60mm" cals:align="center"/>
    <ROW TYPE="HEADER">
      <CELL TYPE="HEADER" COL="1">Header 1</CELL>
      <CELL TYPE="HEADER" COL="2">Header 2</CELL>
    </ROW>
    <ROW cals:rowsep="0" cals:valign="middle">
      <CELL COL="1">Cell A1</CELL>
      <CELL COL="2">Cell B1</CELL>
    </ROW>
    <ROW>
      <CELL COL="1" COLSPAN="2" cals:nameend="c2" cals:namest="c1">Cell A2-B2</
↪CELL>
    </ROW>
    <ROW>
      <CELL COL="1" ROWSPAN="2" cals:morerows="1">Cell A3-A4</CELL>
      <CELL COL="2">Cell B3</CELL>
    </ROW>
    <ROW>
      <CELL COL="2">Cell B4</CELL>
    </ROW>
  </CORPUS>
</TBL>
```

To parse this XML document, you can create a parser using the *cals_ns* option:

```
>>> parser = FormexParser(builder, cals_ns="http://my.cals.ns")
>>> tree = etree.parse("docs/_static/parsers.formex.sample3.xml")
>>> fmx_table = tree.getroot()
>>> table = parser.parse_table(fmx_table)
>>> print(table)
+-----------+-----------+
| Header 1  | Header 2  |
+-----------+-----------+
|  Cell A1  |  Cell B1  |
+-----------------------+
| Cell A2-B             |
+-----------+-----------+
| Cell A3-A |  Cell B3  |
|           +-----------+
|           |  Cell B4  |
+-----------+-----------+
```

Supported values

The *FormexParser* parser can handle the following values: `Formex styles`.

4.2.7 CALS tables parser

Description

A *CalsParser* is used to parse the tables (`table` elements) of a CALS file and generate a *Table* instances (memory representation of a table). The instance can then be serialize in another XML format, like HTML, Formex 4

or even CALS.

To use this class, you need to inherit the *BaseBuilder* class and create an instance of your class to used in the *CalsParser* parser.

Of course, for the sake of this demonstration we can used an instance of the class *BaseBuilder*, without implementing the *generate_table_tree()* method.

```
>>> from lxml import etree
>>> from benker.builders.base_builder import BaseBuilder
>>> from benker.parsers.cals import CalsParser

>>> builder = BaseBuilder()
>>> parser = CalsParser(builder)
```

For example, you can parse the following CALS table:

```
<table frame="all">
  <tgroup cols="2" colsep="0" rowsep="1">
    <colspec colnum="1" colname="c1" colwidth="50mm" align="left"/>
    <colspec colnum="2" colname="c2" colwidth="20mm" align="right"/>
    <colspec colnum="3" colname="c3" colwidth="20mm" align="char" char="." charoff="20
↪"/>
    <thead>
      <row bgcolor="#90ee90">
        <entry valign="top">Element</entry>
        <entry valign="top">(Z)</entry>
        <entry valign="top">(A)</entry>
      </row>
    </thead>
    <tbody>
      <row bgcolor="#cdcdcd">
        <entry>Hydrogen</entry>
        <entry>1</entry>
        <entry>1.008</entry>
      </row>
      <row>
        <entry>Helium</entry>
        <entry>2</entry>
        <entry>4.0026</entry>
      </row>
      <row bgcolor="#cdcdcd">
        <entry>Lithium</entry>
        <entry>3</entry>
        <entry>6.94</entry>
      </row>
    </tbody>
  </tgroup>
</table>
```

And generate a *Table* instance:

```
>>> tree = etree.parse("docs/_static/parsers.cals.sample1.xml")
>>> cals_table = tree.getroot()
>>> table = parser.parse_table(cals_table)
>>> print(table)
+-----------+-----------+-----------+
|  Element  |    (Z)    |    (A)    |
+-----------+-----------+-----------+
```

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```
| Hydrogen  |     1     |   1.008   |
+-----------+-----------+-----------+
|  Helium   |     2     |  4.0026   |
+-----------+-----------+-----------+
|  Lithium  |     3     |   6.94    |
+-----------+-----------+-----------+
```

Options

The *CalsParser* parser accept the following options:

- *cals_ns* is used to specify a specific namespace used by your CALS tables.

  For instance, if you have :

```
<table frame="box" xmlns="http://my.cals.ns">
  <tgroup cols="2" colsep="0" rowsep="1">
    <colspec colnum="1" colname="c1"/>
    <colspec colnum="2" colname="c2"/>
    <colspec colnum="3" colname="c3"/>
    <thead>
      <row><entry/><entry>k</entry><entry>unit</entry></row>
    </thead>
    <tbody>
      <row><entry>Meter</entry><entry>km</entry><entry>m</entry></row>
      <row><entry>Liter</entry><entry>KL</entry><entry>L</entry></row>
      <row><entry>Gram</entry><entry>Kg</entry><entry>g</entry></row>
    </tbody>
  </tgroup>
</table>
```

  To parse this XML document, you can create a parser using the *cals_ns* option:

```
>>> parser = CalsParser(builder, cals_ns="http://my.cals.ns")
>>> tree = etree.parse("docs/_static/parsers.cals.sample2.xml")
>>> cals_table = tree.getroot()
>>> table = parser.parse_table(cals_table)
>>> print(table)
+-----------+-----------+-----------+
|           |     k     |   unit    |
+-----------+-----------+-----------+
|   Meter   |    km     |     m     |
+-----------+-----------+-----------+
|   Liter   |    KL     |     L     |
+-----------+-----------+-----------+
|   Gram    |    Kg     |     g     |
+-----------+-----------+-----------+
```

Supported values

The *CalsParser* parser can handle the following values: `CALS styles`.

4.2.8 Formex 4 tables builder

4.2.9 CALS tables builder

Note: future parsers and builders are coming.

Warning: here, we are talking about tables parsers and not documents parsers: only tables are analyzed and converted into an object structure in memory. The rest of the document is not touched (only namespaces).

The Benker Library also has low-level functions in core modules. These core modules are the essential building blocks for having in memory table structures. A set of tutorials is also available for these modules.

4.2.10 Size

Description

A `Size` is a tuple with *width*, *height* coordinates. It represents the width and the height of a cell in a grid.

```
>>> from benker.size import Size

>>> size = Size(4, 5)
```

The representation of a size is "(*width* x *height*)":

```
>>> print(size)
(4 x 5)
```

Operations

You can change the size of a *Size* by adding, subtracting of multiplying values.

You can add two sizes, a size and a tuple (*x*, *y*), a size and a single quantity (integer):

```
>>> Size(2, 3) + Size(3, 4)
Size(width=5, height=7)

>>> Size(2, 3) + (3, 4)
Size(width=5, height=7)

>>> Size(2, 3) + 1
Size(width=3, height=4)
```

You can subtract two sizes, a size and a tuple (*x*, *y*), a size and a single quantity (integer):

```
>>> Size(1, 4) - Size(2, 1)
Size(width=-1, height=3)

>>> Size(1, 4) - (2, 1)
Size(width=-1, height=3)

```

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```
>>> Size(1, 4) - 1
Size(width=0, height=3)
```

You can multiply a size by an integer. This last ability is useful to reverse a size:

```
>>> Size(3, 4) * 3
Size(width=9, height=12)

>>> Size(3, 4) * -1
Size(width=-3, height=-4)
```

You can also negate a size:

```
>>> -Size(3, 5)
Size(width=-3, height=-5)

>>> +Size(3, 5)
Size(width=3, height=5)
```

All this operations are useful to do mathematical transformation with *Coord — Operations*, for instance, a translation of a coord is done by adding a coord and a size.

4.2.11 Coord

Description

A `Coord` is a tuple with *x*, *y* coordinates. It represents the top-left origin of a cell in a grid.

```
>>> from benker.coord import Coord

>>> coord = Coord(4, 5)
```

We use the Excel convention to represent a *Coord*: columns are represented by letters, rows are represented by numbers.

```
>>> print(Coord(2, 5))
B5
```

Operations

Mathematical operations are an easy way to translate a *Coord* to another locations.

You can use a *Size* to move a coord to another position. You can also use a tuple (*x*, *y*) or a single quantity (integer):

```
>>> from benker.size import Size

>>> Coord(2, 5) + Size(1, 2)
Coord(x=3, y=7)

>>> Coord(2, 5) + (1, 2)
Coord(x=3, y=7)

>>> Coord(2, 5) + 1
Coord(x=3, y=6)
```

The translation can be positive or negative:

```
>>> Coord(2, 5) - Size(1, 2)
Coord(x=1, y=3)

>>> Coord(2, 5) - (1, 2)
Coord(x=1, y=3)

>>> Coord(2, 5) - 1
Coord(x=1, y=4)
```

You cannot add or subtract two coordinates:

```
>>> Coord(2, 5) + Coord(2, 1)
Traceback (most recent call last):
    ...
TypeError: <class 'benker.coord.Coord'>

>>> Coord(2, 5) - Coord(1, 2)
Traceback (most recent call last):
    ...
TypeError: <class 'benker.coord.Coord'>
```

Again, you cannot add a size and a coord:

```
>>> Size(2, 5) + Coord(2, 1)
Traceback (most recent call last):
    ...
TypeError: <class 'benker.coord.Coord'>

>>> Size(2, 5) - Coord(1, 2)
Traceback (most recent call last):
    ...
TypeError: <class 'benker.coord.Coord'>
```

Warning: This constraint must be respected in order to help diagnosing conceptual errors.

4.2.12 Box

Description

A *Box* is a rectangular area defined by two coordinates:

- the top-left corner of the rectangle: the *min* coord,
- the bottom-right corner of the rectangle: the *max* coord.

The default size of a *Box* is (1, 1), so you can create a *box* by only specifying the top-let corner of the rectangle.

```
>>> from benker.box import Box

>>> Box(1, 2, 2, 3)
Box(min=Coord(x=1, y=2), max=Coord(x=2, y=3))
>>> Box(1, 2)
Box(min=Coord(x=1, y=2), max=Coord(x=1, y=2))
```

You can use two coordinates to define a box:

```
>>> from benker.coord import Coord

>>> Box(Coord(5, 6), Coord(7, 8))
Box(min=Coord(x=5, y=6), max=Coord(x=7, y=8))
>>> Box(Coord(5, 6))
Box(min=Coord(x=5, y=6), max=Coord(x=5, y=6))
```

You can specify the size of a box:

```
>>> from benker.size import Size

>>> Box(Coord(5, 6), Size(3, 2))
Box(min=Coord(x=5, y=6), max=Coord(x=7, y=7))
```

We use the Excel convention to represent a *Box*: columns are represented by letters, rows are represented by numbers.

```
>>> print(Box(Coord(2, 5)))
B5
>>> print(Box(Coord(2, 5), Size(3, 2)))
B5:D6
```

Properties

You can use the following properties to extract information from a *box*:

- use *min* to get the top-left corner coordinates,
- use *max* to get the bottom-right corner coordinates,
- use *width* to get the width of the box (number of columns),
- use *height* to get the height of the box (number of rows),
- use *size* to get the size (*width* and *height*) of the box.

```
>>> b1 = Box(Coord(5, 6), Size(3, 2))

>>> b1.min
Coord(x=5, y=6)
>>> b1.max
Coord(x=7, y=7)
>>> b1.width
3
>>> b1.height
2
>>> b1.size
Size(width=3, height=2)
```

Warning: All properties are non-mutable:

```
>>> b1.width = 9
Traceback (most recent call last):
...
AttributeError: can't set attribute
```

Operations

Contains

You can check if a point, defined by its coordinates (tuple (*x*, *y*) or *Coord* instance), is contained in a box:

```
>>> top_left = Coord(5, 6)
>>> top_right = Coord(6, 6)
>>> bottom_left = Coord(5, 8)
>>> bottom_right = Coord(6, 8)

>>> b1 = Box(top_left, bottom_right)

>>> top_left in b1
True
>>> top_right in b1
True
>>> bottom_left in b1
True
>>> bottom_right in b1
True

>>> Coord(7, 6) in b1
False

>>> (5, 7) in b1
True
```

Warning: Even if a *Size* object is a subtype of `tuple`, such an object cannot be "contained" in a *Box*.

```
>>> b1 = Box(Coord(x=5, y=6), Coord(x=6, y=8))
>>> Size(5, 7) in b1
Traceback (most recent call last):
    ...
TypeError: <class 'benker.size.Size'>
```

You can check if a *Box* is contained in another box:

```
>>> b1 = Box(Coord(x=5, y=6), Coord(x=6, y=8))
>>> b2 = Box(Coord(x=5, y=7), Coord(x=6, y=7))
>>> b3 = Box(Coord(x=6, y=6), Coord(x=7, y=6))

>>> b1 in b1
True
>>> b2 in b1
True
>>> b3 in b2
False
```

Intersection and Union

You can find if a *Box* intersects another *Box*:

```
>>> b1 = Box(Coord(x=1, y=1), Coord(x=3, y=3))
>>> b2 = Box(Coord(x=2, y=2), Coord(x=4, y=4))
>>> b3 = Box(Coord(x=4, y=1), Coord(x=5, y=1))

>>> b1.intersect(b2)
True
>>> b1.intersect(b3)
False
```

Two boxes are disjoint if they don't intersect each other:

```
>>> b1.isdisjoint(b2)
False
>>> b1.isdisjoint(b3)
True
```

You can calculate the intersection of two boxes. You can use the "&" operator to do that:

```
>>> b1.intersection(b2)
Box(min=Coord(x=2, y=2), max=Coord(x=3, y=3))
>>> b1 & b2
Box(min=Coord(x=2, y=2), max=Coord(x=3, y=3))
```

Warning: If the two boxes are disjoint, there is no intersection:

```
>>> b1 & b3
Traceback (most recent call last):
  ...
ValueError: (Box(min=Coord(x=1, y=1), max=Coord(x=3, y=3)), Box(min=Coord(x=4, y=1),
↪ max=Coord(x=5, y=1)))
```

You can calculate the union of two boxes. The union of two boxes is the bounding box: You can use the "|" operator to do that:

```
>>> b1.union(b2)
Box(min=Coord(x=1, y=1), max=Coord(x=4, y=4))
>>> b1 | b2
Box(min=Coord(x=1, y=1), max=Coord(x=4, y=4))
```

Total ordering

A total ordering is defined for the boxes. The aim is to order the cells in a grid sorted from left to right and from top to bottom. This order is useful to group the cells by rows.

You can compare boxes:

```
>>> b1 = Box(Coord(3, 2), Coord(6, 4))
>>> b1 < b1
False
>>> b1 < Box(Coord(3, 2), Coord(6, 5))
True
>>> b1 < Box(Coord(3, 2), Coord(7, 4))
True
>>> b1 < Box(Coord(4, 2), Coord(6, 4))
```

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```
True
>>> b1 < Box(Coord(3, 3), Coord(6, 4))
True
```

You can sort boxes. The sort order can be defined as below:

- top cells are sorted before bottom cells,
- top-left cells are sorted before top-right cells,
- smaller cells are sorted before bigger.

```
>>> from random import shuffle

>>> boxes = [Box(x, y) for x in range(1, 4) for y in range(1, 3)]
>>> [str(box) for box in boxes]
['A1', 'A2', 'B1', 'B2', 'C1', 'C2']

>>> shuffle(boxes)
>>> [str(box) for box in sorted(boxes)]
['A1', 'B1', 'C1', 'A2', 'B2', 'C2']
```

4.2.13 Styled

Description

A *Styled* object contains a dictionary of styles.

It is mainly used for *Table*, *RowView*, *ColView*, and *Cell*.

```
>>> from benker.styled import Styled

>>> styled = Styled({'text-align': 'justify'}, "body")
```

The representation of a styled is the representation of its dictionary of styles:

```
>>> print(styled)
{'text-align': 'justify'}
```

Attributes

A *Styled* object has the following attribute:

- *styles* is the user-defined styles: a dictionary of key-value pairs. This values are useful to store some HTML-like styles (border-style, border-width, border-color, vertical-align, text-align, etc.). Of course, we are not tied to the HTML-like styles, you can use your own styles list.

  Note: The style dictionary is always copied: in other words, key-value pairs are copied but a shallow copy is done for the values (in general, it is not a problem if you use non-mutable values like `str`).

- *nature*: a way to distinguish the body cells, from the header and the footer. The default value is "body", but you can use "header", "footer" or whatever is suitable for your needs. This kind of information is in general not stored in the styles, even if it is similar.

Tables can also have a *nature*, similar to HTML `@class` attribute, you can use it do identify the styles to apply to your table. For tables, the default value is `None`.

Note: In a *Grid*, the *merging* of two natures is done by keeping the first nature and dropping the second one. In other words, the resulting nature is the group of the most top-left nature of the merged cells.

Example of *styles* initialisation and shallow copy:

```
>>> css =  { 'border-style': 'solid', 'border-width': '5px'}

>>> one = Styled(css, "body")
>>> one.styles['border-width'] = '2px 10px 4px 20px'
>>> two = Styled(one.styles, "body")
>>> two.styles['border-width'] = 'medium'

>>> css
{'border-style': 'solid', 'border-width': '5px'}

>>> one.styles
{'border-style': 'solid', 'border-width': '2px 10px 4px 20px'}

>>> two.styles
{'border-style': 'solid', 'border-width': 'medium'}
```

4.2.14 Cell

Description

A *Cell* object stores the *content* of a *Grid* cell.

A cell can have *styles*, a dictionary of key-value properties attached to the cell.

A cell has a *type* to distinguish between header, body and footer cells. The default type is "body", but you can also use "header", "footer" or whatever...

A cell has top-left coordinates: *x* and *y*. The default coordinates is (1, 1): this is the top-left coordinate of the cell box. The coordinates *x* and *y* cannot be null: grid coordinates are 1-indexed.

A cell has a size: *width* and *height*. The default size is (1, 1), you can increase them to represent horizontal or vertical spanning. The *width* and the *height* cannot be null.

To instantiate a *Cell*, you can do:

```
>>> from benker.cell import Cell

>>> c1 = Cell("c1")
>>> c2 = Cell("c2", styles={'color': 'red'})
>>> c3 = Cell("c3", x=2, y=3, nature="footer")
>>> c4 = Cell("c4", width=2)
>>> c5 = Cell("c5", height=2)
```

The string representation of a cell is the string representation of it's content:

```
>>> for cell in c1, c2, c3, c4, c5:
...     print(cell)
c1
```

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```
c2
c3
c4
c5
```

Attributes

A cell has the following attributes:

- *content* is the user-defined cell content. It can be of any type: `None`, `str`, `int`, `float`, a container (`list`), a XML element, etc. The same content can be shared by several cells, it's your own responsibility to handle the copy (or deep copy) of the *content* reference when needed.

  Note: In a *`Grid`*, the *merging* of two cell contents is done with the "+" operator (`__add__()`). You can override this by using a *content_appender*, a two-arguments function which will perform the concatenation of the two contents.

- *styles* is the user-defined cell styles: a dictionary of key-value pairs. This values are useful to store some HTML-like styles (border-style, border-width, border-color, vertical-align, text-align, etc.). Of course, we are not tied to the HTML-like styles, you can use your own styles list.

  Note: The style dictionary is always copied: in other words, key-value pairs are copied but a shallow copy is done for the values (in general, it is not a problem if you use non-mutable values like `str`).

- *type* is a way to distinguish the body cells, from the header and the footer. The default value is "body", but you can use "header", "footer" or whatever is suitable for your needs.

  Note: In a *`Grid`*, the *merging* of two cell types is done by keeping the first cell type and dropping the second one. In other words, the resulting cell type is the type of the most top-left cell type of the merged cells.

Using the cell attributes:

```
>>> paragraphs = ["Hello", "How are you?"]
>>> css = {'text-align': 'justify', 'vertical-align': 'top'}

>>> c1 = Cell(paragraphs, styles=css, nature="normal")
>>> c2 = Cell(paragraphs, styles=css, nature="normal")

# this will mutate the referenced *paragraphs* list:
>>> c1.content.append("I am well.")
>>> c2.content
['Hello', 'How are you?', 'I am well.']

# this will change only the cell styles:
>>> c1.styles['vertical-align'] = 'middle'
>>> c2.styles == {'text-align': 'justify', 'vertical-align': 'top'}
True
```

Properties

You can use the following properties to extract information from a *cell*:

- use *min* to get the top-left corner coordinates,
- use *max* to get the bottom-right corner coordinates,
- use *width* to get the width of the box (number of columns),
- use *height* to get the height of the box (number of rows),
- use *size* to get the size (*width* and *height*) of the box.

```
>>> c1 = Cell("Hi", x=5, y=6, width=3, height=2)

>>> c1.min
Coord(x=5, y=6)
>>> c1.max
Coord(x=7, y=7)
>>> c1.width
3
>>> c1.height
2
>>> c1.size
Size(width=3, height=2)
```

Warning: All properties are non-mutable:

```
>>> c1.width = 9
Traceback (most recent call last):
...
AttributeError: can't set attribute
```

Operations

Contains

You can check if a point, defined by its coordinates (tuple (*x*, *y*) or `Coord` instance), is contained in a `Cell`.

A cell contains a point if it is in its `Box`. This rule is explained in detail in the section *Box – Contains*.

```
>>> c1 = Cell("A", x=2, y=3, width=2, height=1)

>>> (3, 3) in c1
True
>>> (7, 9) in c1
False
```

Total ordering

A total ordering is defined for the cells. The aim is to order the cells in a grid sorted from left to right and from top to bottom. This order is useful to group the cells by rows.

The total ordering is base on the `Box` *Total ordering*.

```
>>> c1 = Cell("one")
>>> c2 = Cell("two", x=2)
>>> c3 = Cell("three", y=2)

>>> c1 < c2 < c3
True
```

This total ordering allow us to sort the cells:

```
>>> from random import shuffle

>>> cells = [c1, c2, c3]
>>> shuffle(cells)
>>> [str(cell) for cell in sorted(cells)]
['one', 'two', 'three']
```

Transformations

It is possible to change the cell position and size by using two kind of transformations:

- Move a cell to a different coordinates,
- Resize a cell.

```
>>> from benker.coord import Coord
>>> from benker.size import Size

>>> c1 = Cell("A")
>>> c1
<Cell('A', styles={}, nature=None, x=1, y=1, width=1, height=1)>

>>> c1.move_to(Coord(2, 3))
<Cell('A', styles={}, nature=None, x=2, y=3, width=1, height=1)>

>>> c1.resize(Size(3, 4))
<Cell('A', styles={}, nature=None, x=1, y=1, width=3, height=4)>

>>> c1.transform(Coord(2, 3), Size(3, 4))
<Cell('A', styles={}, nature=None, x=2, y=3, width=3, height=4)>
```

The transformation functions don't change the current cell but produce a new one with new coordinates/size.

4.2.15 Grid

Description

A *Grid* is a collection of *Cell* objects ordered in a grid of rows and columns.

You can define a empty grid like this:

```
>>> from benker.grid import Grid

>>> Grid()
Grid([])
```

You can also define a grid from a collection (`list`, `set`...) of cells. Cells are ordered according to the total ordering of the cell boxes:

```
>>> from benker.cell import Cell

>>> red = Cell('red', x=1, y=1, height=2)
>>> pink = Cell('pink', x=2, y=1, width=2)
>>> blue = Cell('blue', x=2, y=2)

>>> grid = Grid([red, blue, pink])
>>> for cell in grid:
...     print(cell)
red
pink
blue
```

Warning: If at least one cell intersect another one, an exception is raised:

```
>>> Grid([Cell("one"), Cell("two")])
Traceback (most recent call last):
    ...
KeyError: Coord(x=1, y=1)
```

So, it is important to define the coordinates of the cells.

It's easy to copy the cells of another grid.

Remember that:

- cells are copied (not shared between grids),
- cell contents are shared: two different cells share the same content,
- cell styles are copied (but not deeply).

```
>>> grid1 = Grid([red, blue, pink])
>>> grid2 = Grid(grid1)

>>> tuple(id(cell) for cell in grid1) != tuple(id(cell) for cell in grid2)
True
>>> tuple(id(cell.content) for cell in grid1) == tuple(id(cell.content) for cell in␣
↪grid2)
True
>>> tuple(id(cell.styles) for cell in grid1) != tuple(id(cell.styles) for cell in␣
↪grid2)
True
```

You can pretty print a grid:

```
>>> grid = Grid([red, blue, pink])
>>> print(grid)
+-----------+-----------------------+
|    red    |   pink                |
|           +-----------+-----------+
|           |   blue    |           |
+-----------+-----------+-----------+
```

Properties

The bounding box of a grid is the bounding box of all cells:

```
>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
>>> grid[2, 1] = Cell("pink", width=2)
>>> grid[3, 2] = Cell("gray")
>>> print(grid)
+-----------+-----------------------+
|    red    |   pink                |
|           +-----------+-----------+
|           |           |   gray    |
+-----------+-----------+-----------+

>>> grid.bounding_box
Box(min=Coord(x=1, y=1), max=Coord(x=3, y=2))
```

Important: The bounding box is not defined for an empty grid, so `None` is returned in that case (this behavior is preferable to raising an exception, in order to simplify interactive debugging).

```
>>> grid = Grid()
>>> grid.bounding_box is None
True
```

Operations

Contains

You can check if a point, defined by its coordinates (tuple (*x*, *y*) or *Coord* instance), is contained in a *Grid*.

The rule is simple: a grid contains a point if it exists a *Cell* of the grid which contains that point. In other words, a point may be contained in the bounding box of a grid but not in any cell if there are some gaps in the grid.

```
>>> from benker.coord import Coord

>>> red = Cell('red', x=1, y=1, height=2)
>>> pink = Cell('pink', x=2, y=1, width=2)
>>> blue = Cell('blue', x=2, y=2)
>>> grid = Grid([red, blue, pink])

>>> (1, 1) in grid
True
>>> (3, 1) in grid
True
>>> (4, 1) in grid
False
>>> (3, 2) in grid
False

>>> Coord(1, 2) in grid
True
```

Set, Get, Delete cells

A grid is a `MutableMapping`, it works like a dictionary of cells. Keys of the dictionary are coordinates (tuple (*x*, *y*) or *`Coord`* instance). The coordinates are the top-left coordinates of the cells.

```
>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
>>> grid[2, 1] = Cell("pink", width=2)
>>> grid[2, 2] = Cell("blue")
>>> grid[3, 2] = Cell("gray")

>>> print(grid)
+-----------+-----------------------+
|    red    |   pink                |
|           +-----------+-----------+
|           |   blue    |   gray    |
+-----------+-----------+-----------+
```

Warning: Unlike a `dict`, you cannot set a cell to a given location if a cell already exist in that location, an exception is raised in that case.

```
>>> grid[3, 1] = Cell("purple")
Traceback (most recent call last):
    ...
KeyError: Coord(x=3, y=1)
```

You can get a cell at a given location:

```
>>> grid[1, 1]
<Cell('red', styles={}, nature=None, x=1, y=1, width=1, height=2)>
>>> grid[3, 1]
<Cell('pink', styles={}, nature=None, x=2, y=1, width=2, height=1)>
```

You can delete a cell at a given location:

```
>>> del grid[3, 1]
>>> print(grid)
+-----------+-----------+-----------+
|    red    |           |           |
|           +-----------+-----------+
|           |   blue    |   gray    |
+-----------+-----------+-----------+
```

Merging/expanding

It is possible to merge several cells in the grid. The merging takes the *start* coordinates and the *end* coordinates of the cells to merge.

We can define a *content_appender* to give the content merging operation to use to merge several cell contents.

```
>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
>>> grid[2, 1] = Cell("pink")
```

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```
>>> grid[3, 1] = Cell("blue")
>>> print(grid)
+-----------+-----------+-----------+
|    red    |   pink    |   blue    |
|           +-----------+-----------+
|           |           |           |
+-----------+-----------+-----------+

>>> grid.merge((2, 1), (3, 1), content_appender=lambda a, b: "/".join([a, b]))
<Cell('pink/blue', styles={}, nature=None, x=2, y=1, width=2, height=1)>
>>> print(grid)
+-----------+-----------------------+
|    red    | pink/blue             |
|           +-----------+-----------+
|           |           |           |
+-----------+-----------+-----------+
```

Warning: All cells in the bounding box of the merging must be inside of the bounding box. In other words, the bounding box of the merging must not intersect any cell in the grid.

```
>>> grid.merge((1, 2), (2, 2))
Traceback (most recent call last):
  ...
ValueError: ((1, 2), (2, 2))
```

Similar to the merging, you can expand the size of a cell;

```
>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
>>> grid[2, 1] = Cell("pink")
>>> grid[3, 1] = Cell("blue")
>>> print(grid)
+-----------+-----------+-----------+
|    red    |   pink    |   blue    |
|           +-----------+-----------+
|           |           |           |
+-----------+-----------+-----------+

>>> grid.expand((2, 1), height=1)
<Cell('pink', styles={}, nature=None, x=2, y=1, width=1, height=2)>
>>> print(grid)
+-----------+-----------+-----------+
|    red    |   pink    |   blue    |
|           |           +-----------+
|           |           |           |
+-----------+-----------+-----------+
```

Iterators

You can iterate the cells of a grid:

```
>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
```

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```
>>> grid[2, 1] = Cell("hot", width=2)
>>> grid[2, 2] = Cell("chili")
>>> grid[3, 2] = Cell("peppers")
>>> grid[1, 3] = Cell("Californication", width=3)

>>> print(grid)
+-----------+----------------------+
|    red    |    hot               |
|           +-----------+----------+
|           |   chili   |  peppers |
+-----------------------------------+
|             Californi             |
+-----------------------------------+

>>> for cell in grid:
...     print(cell)
red
hot
chili
peppers
Californication
```

You can iterate over the grid rows with the method *iter_rows()*. Each row is a tuple of cells:

```
>>> for row in grid.iter_rows():
...     print(" / ".join(cell.content for cell in row))
red / hot
chili / peppers
Californication
```

4.2.16 Table

Description

A *Table* is a data structure used to represent Office Open XML tables, CALS tables or HTML tables.

A *Table* is a *Styled* object, so you can attach a dictionary of styles and a nature ("body" by default). The nature is used to give a default value to the the row/column views.

```
>>> from benker.table import Table

>>> Table(styles={'frame': 'all'})
<Table({'frame': 'all'}, None)>
```

A table can be initialize with a collection of cells. Make sure all cells are disjoints.

```
>>> from benker.cell import Cell

>>> red = Cell('red', x=1, y=1, height=2)
>>> pink = Cell('pink', x=2, y=1, width=2)
>>> blue = Cell('blue', x=2, y=2)

>>> table = Table([red, pink, blue], nature='header')
>>> table
<Table({}, 'header')>
```

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```
>>> print(table)
+-----------+-----------------------+
|    red    |   pink                |
|           +-----------+-----------+
|           |   blue    |           |
+-----------+-----------+-----------+
```

Warning: Make sure all cells are disjoints:

```
>>> red = Cell('overlap', x=1, y=1, width=2)
>>> pink = Cell('oops!', x=2, y=1)
>>> Table([red, pink])
Traceback (most recent call last):
    ...
KeyError: Coord(x=2, y=1)
```

Properties

You can use the following properties to extract information from a *table*:

The bounding box of a table is the bounding box of all cells in the grid:

```
>>> red = Cell('red', x=1, y=1, height=2)
>>> pink = Cell('pink', x=2, y=1, width=2)
>>> blue = Cell('blue', x=2, y=2)
>>> table = Table([red, pink, blue])

>>> table.bounding_box
Box(min=Coord(x=1, y=1), max=Coord(x=3, y=2))
```

Important: The bounding box is not defined for an empty table, so `None` is returned in that case (this behavior is preferable to raising an exception, in order to simplify interactive debugging).

```
>>> table = Table()
>>> table.bounding_box is None
True
```

Operations

Cells Insertion

You can insert a row to a table. This row is then used to insert cells.

```
>>> table = Table()

>>> row = table.rows[1]
>>> row.nature = "header"
>>> row.insert_cell("Astronomer", width=2)
```

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```
>>> row.insert_cell("Year")
>>> row.insert_cell("Country")

>>> row = table.rows[2]
>>> row.insert_cell("Nicolaus")
>>> row.insert_cell("Copernicus")
>>> row.insert_cell("1473-1543")
>>> row.insert_cell("Royal Prussia")

>>> row = table.rows[3]
>>> row.insert_cell("Charles")
>>> row.insert_cell("Messier")
>>> row.insert_cell("1730-1817")
>>> row.insert_cell("France", height=2)

>>> row = table.rows[4]
>>> row.insert_cell("Jean-Baptiste")
>>> row.insert_cell("Delambre")
>>> row.insert_cell("1749-1822")

>>> print(table)
+----------------------+-----------+-----------+
| Astronome            |   Year    |  Country  |
+-----------+----------+-----------+-----------+
| Nicolaus  | Copernicu | 1473-1543 | Royal Pru |
+-----------+----------+-----------+-----------+
|  Charles  |  Messier  | 1730-1817 |  France   |
+-----------+----------+-----------|           |
| Jean-Bapt | Delambre  | 1749-1822 |           |
+-----------+----------+-----------+-----------+
```

The *nature* of a cell is inherited from its parent's row. The first row contains the header, so the cell nature is "header":

```
>>> table.rows[1].nature
'header'
>>> [cell.nature for cell in table.rows[1].owned_cells]
['header', 'header', 'header']
```

The other rows have no *nature*, so the cell nature is `None`

```
>>> table.rows[2].nature is None
True
>>> all(cell.nature is None for cell in table.rows[2].owned_cells)
True
```

Cells Merging

You can merge cells by giving the coordinates of the cells to merge or by extending the size of a given cell.

```
>>> table = Table()
>>> letters = "abcdEFGHijklMNOP"
>>> for index, letter in enumerate(letters):
...     table[(1 + index % 4, 1 + index // 4)] = Cell(letter)
>>> print(table)
+-----------+-----------+-----------+-----------+
```

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```
|     a     |     b     |     c     |     d     |
+-----------+-----------+-----------+-----------+
|     E     |     F     |     G     |     H     |
+-----------+-----------+-----------+-----------+
|     i     |     j     |     k     |     l     |
+-----------+-----------+-----------+-----------+
|     M     |     N     |     O     |     P     |
+-----------+-----------+-----------+-----------+

>>> table.merge((2, 2), (3, 3))
>>> print(table)
+-----------+-----------+-----------+-----------+
|     a     |     b     |     c     |     d     |
+-----------+-----------------------+-----------+
|     E     |   FGjk                |     H     |
+-----------|                       +-----------+
|     i     |                       |     l     |
+-----------+-----------+-----------+-----------+
|     M     |     N     |     O     |     P     |
+-----------+-----------+-----------+-----------+

>>> table.expand((2, 3), height=1)
>>> print(table)
+-----------+-----------+-----------+-----------+
|     a     |     b     |     c     |     d     |
+-----------+-----------------------+-----------+
|     E     |                       |     H     |
+-----------|                       +-----------+
|     i     |  FGjkNO               |     l     |
+-----------|                       +-----------+
|     M     |                       |     P     |
+-----------+-----------------------+-----------+
```

Owned and caught cells

When a cell is merged into a row group, it is always bound to the top row of this group (the first row). In that case, we say that the first row **owns** the cell and the other rows **catch** the cell.

```
>>> table = Table()

>>> row = table.rows[1]
>>> row.insert_cell("merged", height=2)
>>> row.insert_cell("A")

>>> row = table.rows[2]
>>> row.insert_cell("B")

>>> row = table.rows[3]
>>> row.insert_cell("C")
>>> row.insert_cell("D")
>>> print(table)
+-----------+-----------+
|  merged   |     A     |
|           +-----------+
|           |     B     |
```

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```
+-----------+-----------+
|     C     |     D     |
+-----------+-----------+
```

Here are the **owned_cells** of this table:

```
>>> for pos, row in enumerate(table.rows, 1):
...     cells = ", ".join("{}".format(cell) for cell in row.owned_cells)
...     print("row #{pos}: {cells}".format(pos=pos, cells=cells))
row #1: merged, A
row #2: B
row #3: C, D
```

Here are the **caught_cells** of this table:

```
>>> for pos, row in enumerate(table.rows, 1):
...     cells = ", ".join("{}".format(cell) for cell in row.caught_cells)
...     print("row #{pos}: {cells}".format(pos=pos, cells=cells))
row #1: merged, A
row #2: merged, B
row #3: C, D
```

The same applies to columns: if a cell is merged into several columns then it belongs to the first column (left) of the merged column group.

```
>>> table = Table()

>>> row = table.rows[1]
>>> row.insert_cell("merged", width=2)
>>> row.insert_cell("A")

>>> row = table.rows[2]
>>> row.insert_cell("B")
>>> row.insert_cell("C")
>>> row.insert_cell("D")
>>> print(table)
+-----------------------+-----------+
|  merged               |     A     |
+-----------+-----------+-----------+
|     B     |     C     |     D     |
+-----------+-----------+-----------+
```

Here are the **owned_cells** of this table:

```
>>> for pos, col in enumerate(table.cols, 1):
...     cells = ", ".join("{}".format(cell) for cell in col.owned_cells)
...     print("col #{pos}: {cells}".format(pos=pos, cells=cells))
col #1: merged, merged, B
col #2: C
col #3: A, D
```

Here are the **caught_cells** of this table:

```
>>> for pos, col in enumerate(table.cols, 1):
...     cells = ", ".join("{}".format(cell) for cell in col.caught_cells)
...     print("col #{pos}: {cells}".format(pos=pos, cells=cells))
```

(continues on next page)

(continued from previous page)

```
col #1: merged, merged, B
col #2: merged, merged, C
col #3: A, D
```

Fill missing cells

When you build a table (from an uncontrolled source), you may have missing cells (holes). For instance, in the table below, the cell C2 is missing:

```
>>> table = Table()
>>> table.rows[1].insert_cell("one")
>>> table.rows[1].insert_cell("two")
>>> table.rows[1].insert_cell("three")
>>> table.rows[1].insert_cell("four", height=2)
>>> table.rows[2].insert_cell("un-deux", width=2)
>>> print(table)
+-----------+-----------+-----------+-----------+
|    one    |    two    |   three   |   four    |
+-----------------------+-----------|           |
|  un-deux              |           |           |
+-----------------------+-----------+-----------+
```

If you need to fill the missing cells, you can use the *fill_missing()* method, like this:

```
>>> table.fill_missing(table.bounding_box, "HERE")
>>> print(table)
+-----------+-----------+-----------+-----------+
|    one    |    two    |   three   |   four    |
+-----------------------+-----------|           |
|  un-deux              |   HERE    |           |
+-----------------------+-----------+-----------+
```

4.3 API

Benker - Easily convert your CALS, HTML, Formex 4, Office Open XML (docx) tables from one format to another.

4.3.1 Cell Size

A *Size* object is used to represent the *width* and *height* of a *Cell*. The *width* is the number of spanned columns and the *height* is the number of spanned rows. The default cell size is (1, 1).

This module defines the *Size* tuple and give some classic use cases.

class benker.size.**Size**

Bases: *benker.size.SizeTuple*

Size of a cell: *width* is the number of columns and *height* is the number of row.

Usage:

```
>>> from benker.size import Size
```

```
>>> size = Size(2, 1)
>>> size
Size(width=2, height=1)
>>> size.width
2
>>> size.height
1
>>> str(size)
'(2 x 1)'
```

You can use the "+" or "-" operators to increase or decrease the size:

```
>>> Size(2, 1) + Size(3, 3)
Size(width=5, height=4)
>>> Size(5, 4) - Size(3, 3)
Size(width=2, height=1)
```

You can expand the *width* and *height* to a given factor using the "*" operator:

```
>>> Size(2, 1) * 2
Size(width=4, height=2)
```

You can have negative or positive sizes using the unary operators "-" and "+":

```
>>> +Size(3, 2)
Size(width=3, height=2)
>>> -Size(3, 2)
Size(width=-3, height=-2)
```

Note: A *Cell* object cannot have a negative or nul sizes, but you can need this values for calculation, for instance when you want to reduce the cell size.

---

classmethod from_value(*value*)

Convert a value of type tuple to a *Size* tuple.

Parameters **value** – tuple of two integers or *Size* tuple.

Returns Newly created object.

Raises **TypeError** – if the value is not a tuple of integers nor a *Size* tuple.

class benker.size.**SizeTuple**(*width*, *height*)

Bases: tuple

height

Alias for field number 1

width

Alias for field number 0

4.3.2 Cell Coordinates

A *Coord* object is used to represent the *x* and *y* positions of a *Cell*. The *x* is the left position (column number) and the *y* is the top position (row number). The default cell coordinates is (1, 1).

This module defines the *Coord* tuple and give some classic use cases.

class benker.coord.**Coord**
Bases: *benker.coord.CoordTuple*

Coordinates of a cell in a grid: *x* is the left column, *y* if the top row.

Usage:

```
>>> from benker.coord import Coord

>>> coord = Coord(5, 3)
>>> coord
Coord(x=5, y=3)
>>> coord.x
5
>>> coord.y
3
>>> str(coord)
'E3'
```

You can use the "+" or "-" operators to move the coordinates:

```
>>> from benker.size import Size

>>> Coord(2, 1) + Size(3, 3)
Coord(x=5, y=4)
>>> Coord(5, 4) - Size(3, 3)
Coord(x=2, y=1)
```

Warning: You cannot add or subtract two coordinates, only a coordinate and a size.

```
>>> from benker.coord import Coord

>>> Coord(2, 1) + Coord(3, 3)
Traceback (most recent call last):
    ...
TypeError: <class 'benker.coord.Coord'>
```

classmethod from_value(*value*)
Convert a value of type `tuple` to a *Coord* tuple.

Parameters **value** – tuple of two integers or *Coord* tuple.

Returns Newly created object.

Raises **TypeError** – if the value is not a tuple of integers nor a *Coord* tuple.

class benker.coord.**CoordTuple**(*x*, *y*)
Bases: `tuple`

x
Alias for field number 0

y
Alias for field number 1

4.3.3 Box

A *Box* is a rectangular area defined by two coordinates:

- the top-left corner of the rectangle: the *min* coord,
- the bottom-right corner of the rectangle: the *max* coord.

To instantiate a *Box*, you can do:

```
>>> b1 = Box(Coord(5, 6), Coord(7, 8))
>>> b2 = Box(Coord(5, 6))
>>> b3 = Box(1, 2, 2, 3)
>>> b4 = Box(1, 2)
>>> b5 = Box(b1)
```

Box objects have a string representation à la Excel:

```
>>> for box in b1, b2, b3, b4, b5:
...     print(box)
E6:G8
E6
A2:B3
A2
E6:G8
```

You can calculate the *width* and *height* of boxes:

```
>>> b1 = Box(Coord(5, 6), Coord(6, 8))
>>> b1.width, b1.height
(2, 3)

>>> b2 = Box(Coord(5, 6))
>>> b2.width, b2.height
(1, 1)
```

You can determine if a *Coord* is included in a *Box*:

```
>>> top_left = Coord(5, 6)
>>> top_right = Coord(6, 6)
>>> bottom_left = Coord(5, 8)
>>> bottom_right = Coord(6, 8)

>>> b1 = Box(top_left, bottom_right)

>>> top_left in b1
True
>>> top_right in b1
True
>>> bottom_left in b1
True
>>> bottom_right in b1
True

>>> Coord(7, 6) in b1
False

>>> (5, 7) in b1
True
```

You can determine if two boxes intersect each other, or are disjoints:

```
>>> b1 = Box(Coord(5, 6), Coord(6, 8))
>>> b2 = Box(Coord(6, 6), Coord(6, 7))
>>> b3 = Box(Coord(7, 6), Coord(7, 8))
>>> b2.intersect(b3)
False
>>> b1.isdisjoint(b2)
False
>>> b2.isdisjoint(b1)
False
>>> b1.isdisjoint(b3)
True
>>> b3.isdisjoint(b1)
True
```

class benker.box.**Box**

Bases: *benker.box.BoxTuple*

A *Box* is a rectangular area defined by two coordinates:

- the top-left corner of the rectangle: the *min* coord,
- the bottom-right corner of the rectangle: the *max* coord.

Usage:

```
>>> from benker.box import Box

>>> box = Box(1, 1, 5, 3)
>>> box
Box(min=Coord(x=1, y=1), max=Coord(x=5, y=3))
```

height

intersect(*that*)

intersection(**others*)

Return the intersection of *self* and all the *boxes*.

Usage:

```
>>> from benker.box import Box
>>> from benker.coord import Coord

>>> b1 = Box(Coord(3, 2), Coord(6, 4))
>>> b2 = Box(Coord(4, 3), Coord(5, 7))
>>> b1.intersection(b2)
Box(min=Coord(x=4, y=3), max=Coord(x=5, y=4))

>>> b1 & b2
Box(min=Coord(x=4, y=3), max=Coord(x=5, y=4))
```

Parameters **others** – collections of boxes

Returns The inner box of all the boxes.

Raises **ValueError** – if the two boxes are disjoint.

isdisjoint(*that*)

move_to(*coord*)

resize(*size*)

size

transform(*coord=None*, *size=None*)

union(**others*)

Return the union of *self* and all the *boxes*.

Usage:

```
>>> from benker.box import Box
>>> from benker.coord import Coord

>>> b1 = Box(Coord(3, 2), Coord(6, 4))
>>> b2 = Box(Coord(4, 3), Coord(5, 7))
>>> b1.union(b2)
Box(min=Coord(x=3, y=2), max=Coord(x=6, y=7))

>>> b1 | b2
Box(min=Coord(x=3, y=2), max=Coord(x=6, y=7))
```

Parameters **others** – collections of boxes

Returns The bounding box of all the boxes.

width

class benker.box.**BoxTuple**(*min*, *max*)

Bases: tuple

max

Alias for field number 1

min

Alias for field number 0

4.3.4 Styled object

A *Styled* object contains a dictionary of styles.

It is mainly used for *Table*, *RowView*, *ColView*, and *Cell*.

class benker.styled.**Styled**(*styles*, *nature*)

Bases: object

Styled object, like Table, Row, Column, or Cell objects.

A styled object stores user-defined styles: a dictionary of key-value pairs. This values are useful to store some HTML-like styles (border-style, border-width, border-color, vertical-align, text-align, etc.). Of course, we are not tied to the HTML-like styles, you can use your own list of styles.

Note: The style dictionary is always copied: in other words, key-value pairs are copied but a shallow copy is done for the values (in general, it is not a problem if you use non-mutable values like str).

A styled object stores a nature: a way to distinguish the body cells, from the header and the footer. The default value is None, but you can use "body", "header", "footer" or whatever is suitable for your needs. This kind of information is in general not stored in the styles, even if it is similar.

Tables can also have a *nature*, similar to HTML `@class` attribute, you can use it do identify the styles to apply to your table.

Note: In a *Grid*, the *merging* of two natures is done by keeping the first nature and dropping the second one. In other words, the resulting nature is the group of the most top-left nature of the merged cells.

---

nature
Cell *nature* used to distinguish the body cells, from the header and the footer.

styles
Dictionary of key-value pairs, where *keys* are the style names.

4.3.5 Grid Cell

A *Cell* object stores the *content* of a *Grid* cell.

A cell can have *styles*, a dictionary of key-value properties attached to the cell.

A cell has a *nature* to distinguish between header, body and footer cells. The default *nature* is `None`, but you can also use "body", "header", "footer" or whatever...

A cell has top-left coordinates: *x* and *y*. The default coordinates is (1, 1): this is the top-left coordinate of the cell box. The coordinates *x* and *y* cannot be null: grid coordinates are 1-indexed.

A cell has a size: *width* and *height*. The default size is (1, 1), you can increase them to represent horizontal or vertical spanning. The *width* and the *height* cannot be null.

To instantiate a *Cell*, you can do:

```
>>> c1 = Cell("c1")
>>> c2 = Cell("c2", styles={'color': 'red'})
>>> c3 = Cell("c3", nature="footer")
>>> c4 = Cell("c4", width=2)
>>> c5 = Cell("c5", height=2)
```

The string representation of a cell is the string representation of it's content:

```
>>> for cell in c1, c2, c3, c4, c5:
...     print(cell)
c1
c2
c3
c4
c5
```

On initialization, the cell min position is always (1, 1), a.k.a. the top-left.

```
>>> c1 = Cell("c1")
>>> c1.min
Coord(x=1, y=1)
>>> c1.size
Size(width=1, height=1)
>>> c1.box
Box(min=Coord(x=1, y=1), max=Coord(x=1, y=1))
```

A cell can be moved to another position:

```
>>> c1 = Cell("c1", width=3, height=2)
>>> c2 = c1.move_to(Coord(5, 3))
>>> c2.min
Coord(x=5, y=3)
>>> c2.size
Size(width=3, height=2)
>>> c2.box
Box(min=Coord(x=5, y=3), max=Coord(x=7, y=4))
```

You can check if a coord is inside the box:

```
>>> c1 = Cell("c1", width=3, height=2)
>>> c2 = c1.move_to(Coord(5, 3))
>>> (7, 4) in c2
True
>>> Coord(6, 3) in c2
True
>>> Box(6, 3, 7, 4) in c2
True
```

class benker.cell.**Cell**(*content*, *styles=None*, *nature=None*, *x=1*, *y=1*, *width=1*, *height=1*)

Bases: *benker.styled.Styled*

Cell of a grid.

Variables ***content*** – user-defined cell content. It can be of any type: `None`, `str`, `int`, `float`, a container (`list`), a XML element, etc. The same content can be shared by several cells, it's your own responsibility to handle the copy (or deep copy) of the *content* reference when needed.

Note: In a *Grid*, the *merging* of two cell contents is done with the "+" operator (`__add__()`). You can override this by using a *content_appender*, a two-arguments function which will perform the concatenation of the two contents.

Changed in version 0.4.2: The default value of *nature* is `None` (instead of "body").

box

Bounding box of the cell.

content

height

Height of the cell – rows spanning.

max

Maximum coordinates of the cell – bottom-right coordinates.

min

Minimum coordinates of the cell – top-left coordinates.

move_to(*coord*)

Move the cell to the given coordinates.

See: *transform()*.

Parameters **coord** (*tuple[int, int] or benker.coord.Coord*) – new top-left coordinates of the cell, by default it is unchanged.

Return type *benker.cell.Cell*

Returns a copy of this cell after transformation.

resize(*size*)
Resize the cell to the given size.

See: *transform()*.

Parameters **size** (*tuple[int, int] or benker.size.Size*) – new size of the cell, by default it is unchanged.

Return type *benker.cell.Cell*

Returns a copy of this cell after transformation.

size
Size of the cell – (*with*, *height*).

transform(*coord=None*, *size=None*)
Transform the bounding box of the cell by making a move and a resize.

Parameters

- **coord** (*tuple[int, int] or benker.coord.Coord*) – new top-left coordinates of the cell, by default it is unchanged.
- **size** (*tuple[int, int] or benker.size.Size*) – new size of the cell, by default it is unchanged.

Return type *benker.cell.Cell*

Returns a copy of this cell after transformation.

width
Width of the cell – columns spanning.

benker.cell.**get_content_text**(*content*)
Try hard to extract a good string representation of the cell content.

```
>>> from benker.cell import get_content_text
```

```
>>> get_content_text(None) == ''
True
>>> get_content_text('') == ''
True
>>> print(get_content_text('Hi'))
Hi
>>> print(get_content_text(True))
True
>>> print(get_content_text(123))
123
>>> print(get_content_text(3.14))
3.14
>>> get_content_text([None, None]) == ''
True
>>> print(get_content_text(["hello", " ", "world!"]))
hello world!
```

Parameters **content** – Cell content.

Returns

the cell text:

- if the content is `None`: returns "",

- if the content is a string: return the string unchanged,
- if the content is a number: return the string representation of the number,
- if the content is a list of strings, return the concatenated strings (`None` is ignored),
- if the content is a list of XML nodes, return the concatenated strings of the elements (the processing-instruction and the comments are ignored),
- else: return a concatenation of the string representation of the content items.

New in version 0.4.1.

Changed in version 0.5.1: Returns the XML Element text and tail text.

4.3.6 Grid

A grid of cells.

Example of grid:

```
.. doctest:: grid_demo
```

```
>>> from benker.grid import Grid
>>> from benker.cell import Cell
```

```
>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
>>> grid[2, 1] = Cell("pink", width=2)
>>> grid[2, 2] = Cell("blue")
```

```
>>> print(grid)
+-----------+-----------------------+
|    red    |   pink                |
|           +-----------+-----------+
|           |   blue    |           |
+-----------+-----------+-----------+
```

You can retrieve the grid cells as follow:

```
>>> from benker.grid import Grid
>>> from benker.cell import Cell

>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
>>> grid[2, 1] = Cell("pink", width=2)
>>> grid[2, 2] = Cell("blue")

>>> grid[1, 1]
<Cell('red', styles={}, nature=None, x=1, y=1, width=1, height=2)>
>>> grid[2, 1]
<Cell('pink', styles={}, nature=None, x=2, y=1, width=2, height=1)>
>>> grid[2, 2]
<Cell('blue', styles={}, nature=None, x=2, y=2, width=1, height=1)>
>>> grid[3, 3]
Traceback (most recent call last):
    ...
KeyError: Coord(x=3, y=3)
```

A grid has a bounding box, useful to get the grid sizes:

```
>>> from benker.grid import Grid
>>> from benker.cell import Cell

>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
>>> grid[2, 1] = Cell("pink", width=2)
>>> grid[2, 2] = Cell("blue")

>>> grid.bounding_box
Box(min=Coord(x=1, y=1), max=Coord(x=3, y=2))
>>> grid.bounding_box.size
Size(width=3, height=2)
```

You can expand the cell size horizontally or vertically:

```
>>> from benker.grid import Grid
>>> from benker.cell import Cell

>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
>>> grid[2, 1] = Cell("pink", width=2)
>>> grid[2, 2] = Cell("blue")

>>> grid.expand((2, 2), width=1)
<Cell('blue', styles={}, nature=None, x=2, y=2, width=2, height=1)>
>>> print(grid)
+-----------+-----------------------+
|    red    |   pink                |
|           +-----------------------+
|           |   blue                |
+-----------+-----------------------+
```

The content of the merged cells is merged too:

```
>>> from benker.grid import Grid
>>> from benker.cell import Cell

>>> grid = Grid()
>>> grid[1, 1] = Cell("red", height=2)
>>> grid[2, 1] = Cell("pink", width=2)
>>> grid[2, 2] = Cell("blue", width=2)

>>> grid.merge((2, 1), (3, 2), content_appender=lambda a, b: "/".join([a, b]))
<Cell('pink/blue', styles={}, nature=None, x=2, y=1, width=2, height=2)>
>>> print(grid)
+-----------+-----------------------+
|    red    | pink/blue             |
|           |                       |
|           |                       |
+-----------+-----------------------+
```

class benker.grid.**Grid**(*cells=None*)

Bases: collections.abc.MutableMapping

Collection of *Cell* objects ordered in a grid of rows and columns.

bounding_box

Bounding box of the grid (`None` if the grid is empty).

expand(*coord*, *width=0*, *height=0*, *content_appender=None*)
Expand (or shrink) the *width* and/or *height* of a cell, using the *content_appender* to append cell contents.

See also the method *merge()* to merge a group of cells contained in a bounding box.

Parameters

- **coord** – Coordinates of the cell to expand (or shrink).
- **width** – Number of columns to add to the cell width.
- **height** – Number of rows to add to the cell height.
- **content_appender** – Function to use to append the cell contents. The function must have the following signature: `f(a, b) -> c`, where *a*, *b* anc *c* must be of the same type than the cell content. If not provided, the default function is `operator.__add__()`.

Returns The merged cell.

Raises **ValueError** – If the group of cells is empty or if cells cannot be merged.

iter_rows()
Iterate the cells grouped by rows.

merge(*start*, *end*, *content_appender=None*)
Merge a group of cells contained in a bounding box, using the *content_appender* to append cell contents.

The coordinates *start* and *end* delimit a group of cells to merge.

> **Warning:** All the cells of the group must be included in the group bounding box, no intersection is allowed. If not, `ValueError` is raised.

See also the method *expand()* to expand (or shrink) the width and/or height of a cell.

Parameters

- **start** (*Coord or tuple[int, int]*) – Top-left coordinates of the group of cells to merge.
- **end** – Bottom-right coordinates of the group of cells to merge (inclusive).
- **content_appender** – Function to use to append the cell contents. The function must have the following signature: `f(a, b) -> c`, where *a*, *b* anc *c* must be of the same type than the cell content. If not provided, the default function is `operator.__add__()`.

Returns The merged cell.

Raises **ValueError** – If the group of cells is empty or if cells cannot be merged.

4.3.7 Table

Generic table structure which simplify the conversion from docx table format to CALS or HTML tables.

class benker.table.**ColView**(*table*, *pos*, *styles=None*, *nature=None*)
Bases: *benker.table.TableView*

A view on the table cells for a given column.

can_catch(*cell*)
Check if a cell can be caught by that view.

Parameters **cell** (benker.cell.Cell) – table cell

Returns True if the cell intercept to this view.

can_own(*cell*)
Check if a cell can be stored it that view.

Parameters **cell** (benker.cell.Cell) – table cell

Returns True if the cell belong to this view.

col_pos
Column position in the table (1-based).

insert_cell(*content*, *styles=None*, *nature=None*, *width=1*, *height=1*)
Insert a new cell in the column at the next free position, or at the end.

Parameters

- **content** – User-defined cell content. It can be of any type: None, str, int, float, a container (list), a XML element, etc. The same content can be shared by several cells, it's your own responsibility to handle the copy (or deep copy) of the *content* reference when needed.
- **styles** (*typing.Dict[str, str]*) – User-defined cell styles: a dictionary of key-value pairs. This values are useful to store some HTML-like styles (border-style, border-width, border-color, vertical-align, text-align, etc.). Of course, we are not tied to the HTML-like styles, you can use your own list of styles.
- **width** (*int*) – Width of the cell (columns spanning), default to 1.
- **height** (*int*) – Height of the cell (rows spanning), default to 1.

Variables ***nature*** – a way to distinguish the body cells, from the header and the footer. The default value is None, but you can use "body", "header", "footer" or whatever is suitable for your needs. If set to None, the cell nature is inherited from the column nature.

Changed in version 0.4.2: The *nature* of a cell is inherited from its parent's column.

class benker.table.**RowView**(*table*, *pos*, *styles=None*, *nature=None*)
Bases: *benker.table.TableView*

A view on the table cells for a given row.

can_catch(*cell*)
Check if a cell can be caught by that view.

Parameters **cell** (benker.cell.Cell) – table cell

Returns True if the cell intercept to this view.

can_own(*cell*)
Check if a cell can be stored it that view.

Parameters **cell** (benker.cell.Cell) – table cell

Returns True if the cell belong to this view.

insert_cell(*content*, *styles=None*, *nature=None*, *width=1*, *height=1*)
Insert a new cell in the row at the next free position, or at the end.

Parameters

- **content** – User-defined cell content. It can be of any type: None, str, int, float, a container (list), a XML element, etc. The same content can be shared by several cells,

it's your own responsibility to handle the copy (or deep copy) of the *content* reference when needed.

- **styles** (*typing.Dict[str, str]*) – User-defined cell styles: a dictionary of key-value pairs. This values are useful to store some HTML-like styles (border-style, border-width, border-color, vertical-align, text-align, etc.). Of course, we are not tied to the HTML-like styles, you can use your own list of styles.
- **width** (*int*) – Width of the cell (columns spanning), default to 1.
- **height** (*int*) – Height of the cell (rows spanning), default to 1.

Variables ***nature*** – a way to distinguish the body cells, from the header and the footer. The default value is `None`, but you can use "body", "header", "footer" or whatever is suitable for your needs. If set to `None`, the cell nature is inherited from the row nature.

Changed in version 0.4.2: The *nature* of a cell is inherited from its parent's row.

row_pos
Row position in the table (1-based).

class benker.table.**Table**(*cells=None*, *styles=None*, *nature=None*)
Bases: *benker.styled.Styled*, collections.abc.MutableMapping

Table data structure used to simplify conversion to CALS or HTML.

Short demonstration:

```
>>> from benker.cell import Cell
>>> from benker.table import Table

>>> table = Table(styles={'frame': 'all'})

>>> table[(1, 1)] = Cell("one")
>>> table.rows[1].insert_cell("two")

>>> table[(2, 1)]
<Cell('two', styles={}, nature=None, x=2, y=1, width=1, height=1)>

>>> table.cols[1].insert_cell("alpha")
>>> table.cols[2].insert_cell("beta")
>>> (1, 2) in table
True

>>> del table[(1, 2)]
>>> (1, 2) in table
False

>>> len(table)
3

>>> for cell in table:
...     print(cell)
one
two
beta

>>> for row in table.rows:
...     print(row)
[one, two]
[beta]
```

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```
>>> table.merge((1, 2), (2, 2))
>>> print(table)
+-----------+-----------+
|    one    |    two    |
+-----------+-----------+
|   beta                |
+-----------------------+

>>> table.expand((1, 1), width=3)
>>> print(table)
+-----------------------------------------------+
|              onetwo                           |
+-----------------------+-----------+-----------+
|   beta                |           |           |
+-----------------------+-----------+-----------+
```

bounding_box
Bounding box of the table (`None` if the table is empty).

Return type *benker.box.Box*

Returns The bounding box.

cols
List of views of type *ColView*

expand(*coord*, *width=0*, *height=0*, *content_appender=None*)

fill_missing(*bounding_box*, *content*, *styles=None*, *nature=None*)
Fill the missing cells in the table.

This method is useful when some rows has missing cells (holes).

Parameters

- **bounding_box** (`Box`) – The bounding box delimiting the cells/rows to fill if missing.
- **content** – User-defined cell content. It can be of any type: `None`, `str`, `int`, `float`, a container (`list`), a XML element, etc. The same content can be shared by several cells, it's your own responsibility to handle the copy (or deep copy) of the *content* reference when needed.
- **styles** (*typing.Dict[str, str]*) – User-defined cell styles: a dictionary of key-value pairs. This values are useful to store some HTML-like styles (border-style, border-width, border-color, vertical-align, text-align, etc.). Of course, we are not tied to the HTML-like styles, you can use your own list of styles.

Variables ***nature*** – a way to distinguish the body cells, from the header and the footer. The default value is `None`, but you can use "body", "header", "footer" or whatever is suitable for your needs. If set to `None`, the cell nature is inherited from the row nature.

New in version 0.5.0.

merge(*start*, *end*, *content_appender=None*)

rows
List of views of type *RowView*

class benker.table.**TableView**(*table*, *pos*, *styles=None*, *nature=None*)
Bases: *benker.styled.Styled*

Base class of *RowView* and *ColView* used to create a view on the table cells for a given row or column.

See also: *TableViewList*

adopt_cell(*cell*)
Event handler called by the system when a cell is about to be inserted in the table.

can_catch(*cell*)
Check if a cell can be caught by that view.

Parameters **cell** (benker.cell.Cell) – table cell

Returns True if the cell intercept to this view.

can_own(*cell*)
Check if a cell can be stored it that view.

Parameters **cell** (benker.cell.Cell) – table cell

Returns True if the cell belong to this view.

caught_cells
List of cells caught (intercepted) by this view.

owned_cells
List of cells owned by this view.

table
Non-mutable reference to the table (instance of *Table*).

class benker.table.**TableViewList**(*table*, *view_cls*)
Bases: object

This class defined a (simplified) list of views.

Short demonstration:

```
>>> from benker.cell import Cell
>>> from benker.table import Table
>>> from benker.table import ColView
>>> from benker.table import RowView
>>> from benker.table import TableViewList

>>> red = Cell('red', x=1, y=1, height=2)
>>> pink = Cell('pink', x=2, y=1, width=2)
>>> blue = Cell('blue', x=2, y=2)
>>> table = Table([red, pink, blue])
>>> print(table)
+-----------+-----------------------+
|    red    |   pink                |
|           +-----------+-----------+
|           |   blue    |           |
+-----------+-----------+-----------+

>>> cols = TableViewList(table, ColView)
>>> len(cols)
3
>>> rows = TableViewList(table, RowView)
>>> len(rows)
2

>>> for pos, col in enumerate(cols, 1):
```

(continues on next page)

(continued from previous page)

```
...     print("col #{pos}: {col}".format(pos=pos, col=str(col)))
col #1: [red]
col #2: [pink, blue]
col #3: []

>>> cols[3].insert_cell("yellow")
>>> print(table)
+-----------+-----------------------+
|    red    |   pink                |
|           +-----------+-----------+
|           |   blue    |  yellow   |
+-----------+-----------+-----------+
```

adopt_cell(*cell*)
Adopt a new cell in the views.

Parameters **cell** (benker.cell.Cell) – New cell to adopt

refresh_all()
Cleanup and refresh all the views, taking into account the cells which are in the table grid.

class benker.table.**ViewsProperty**(*view_cls*)
Bases: object

Descriptor used to define the rows/cols properties in the class *Table*.

4.3.8 Available Parsers

This package contains a collection of parsers which you can use in conjonction with builders to convert tables from one format to another.

You can pick a builder in the *Available Builders*.

4.3.9 Base Parser

Base class of parsers.

class benker.parsers.base_parser.**BaseParser**(*builder*, *encoding='utf-8'*, ***options*)
Bases: object

Abstract base class of the parsers classes.

parse_file(*src_xml*, *dst_xml*)
Parse and convert the tables from one format to another.

Parameters

- **src_xml** (*str*) – Source path of the XML file to convert.
- **dst_xml** (*str*) – Destination path of the XML file to produce.

Changed in version 0.5.0: Always generate the XML declaration in the destination file.

transform_tables(*tree*)

benker.parsers.base_parser.**value_of**(*element*, *xpath*, *namespaces=None*, *default=None*)
Take the first value of a xpath evaluation.

Parameters

- **element** (*etree._Element*) – Root element used to evaluate the xpath expression.
- **xpath** (*str*) – xpath expression. This expression will be evaluated using the *namespaces* namespaces.
- **namespaces** (*dict[str, str]*) – Namespace map to use for the xpath evaluation.
- **default** – default value used if the xpath evaluation returns no result.

Returns the first result or the *default* value.

4.3.10 Office Open XML parser

This module can parse Office Open XML (OOXML) tables.

Specifications:

- The documentation about OOXML Table is available online at Word Processing - Table Grid/Column Definition.

class benker.parsers.ooxml.**OoxmlParser**(*builder*, *styles_path=None*, ***options*)

Bases: *benker.parsers.base_parser.BaseParser*

Office Open XML parser.

parse_grid_col(*w_grid_col*)

Parse a <w:gridCol> element.

See: Table Grid/Column Definition.

Parameters **w_grid_col** (*etree._Element*) – Table element.

parse_table(*w_tbl*)

Convert a Office Open XML <w:tbl> into CALS <table>

Parameters **w_tbl** (*etree._Element*) – Office Open XML element.

Return type etree._Element

Returns CALS element.

parse_tbl(*w_tbl*)

Parse a <w:tbl> element.

See: Table Properties.

Parameters **w_tbl** (*etree._Element*) – Table element.

Changed in version 0.4.0: The section width and height are now stored in the 'x-sect-size' table style (units in 'pt').

parse_tc(*w_tc*)

Parse a <w:tc> element.

See: Table Cell Properties.

Parameters **w_tc** (*etree._Element*) – Table element.

Changed in version 0.5.1: XML indentation between cell paragraphs is ignored.

parse_tr(*w_tr*)

Parse a <w:tr> element.

See: Table Row Properties.

Parameters **w_tr** (*etree._Element*) – Table element.

transform_tables(*tree*)

benker.parsers.ooxml.**value_of**(*element*, *xpath*, *, *namespaces={'w': 'http://schemas.openxmlformats.org/wordprocessingml/2006/main'}*, *default=None*)

Take the first value of a xpath evaluation.

Parameters

- **element** (*etree._Element*) – Root element used to evaluate the xpath expression.
- **xpath** (*str*) – xpath expression. This expression will be evaluated using the *namespaces* namespaces.
- **namespaces** (*dict[str, str]*) – Namespace map to use for the xpath evaluation.
- **default** – default value used if the xpath evaluation returns no result.

Returns the first result or the *default* value.

benker.parsers.ooxml.**w**(*name*)

4.3.11 OOXML namespaces

benker.parsers.ooxml.namespaces.**NS = {'w': 'http://schemas.openxmlformats.org/wordprocessi**

Namespace map used for xpath evaluation in Office Open XML documents

benker.parsers.ooxml.namespaces.**ns_name**(*ns*, *name*)

benker.parsers.ooxml.namespaces.**value_of**(*element*, *xpath*, *, *namespaces={'w': 'http://schemas.openxmlformats.org/wordprocessingml/2006/main'}*, *default=None*)

Take the first value of a xpath evaluation.

Parameters

- **element** (*etree._Element*) – Root element used to evaluate the xpath expression.
- **xpath** (*str*) – xpath expression. This expression will be evaluated using the *namespaces* namespaces.
- **namespaces** (*dict[str, str]*) – Namespace map to use for the xpath evaluation.
- **default** – default value used if the xpath evaluation returns no result.

Returns the first result or the *default* value.

benker.parsers.ooxml.namespaces.**w**(*name*)

4.3.12 OOXML Standard Types

Utility classes used to store/convert OOXML standard types.

class benker.parsers.ooxml.types.**StHexColor**(*value*)

Bases: *benker.parsers.ooxml.types.StValue*

Color Value

style

class benker.parsers.ooxml.types.**StPageOrientation**(*value*, *default=None*)

Bases: *benker.parsers.ooxml.types.StValue*

Page Orientation

http://www.datypic.com/sc/ooxml/t-w_ST_PageOrientation.html

class benker.parsers.ooxml.types.**StTwipsMeasure**(*value*, *default=None*)
Bases: *benker.parsers.ooxml.types.StValue*

Measurement in Twentieths of a Point

style

class benker.parsers.ooxml.types.**StValue**(*value*, *default=None*)
Bases: object

Base class of ST_* types.

style

4.3.13 OOXML Page size

Page Size dimensions, orientation and printer paper code.

class benker.parsers.ooxml.w_pg_sz.**PgSz**(*w_pg_sz*)
Bases: object

Page Size. – This element specifies the properties (size and orientation) for all pages in the current section.

Example: <w:pgSz w:w="11907" w:h="16839" />, for A4 portrait.

styles

w_code = None
Printer Paper Code

w_h = None
Page Height

w_orient = None
Page Orientation (Possible values are “landscape” and “portrait”).

w_w = None
Page Width

benker.parsers.ooxml.w_pg_sz.**value_of**(*element*, *xpath*, ***, *namespaces={'w': 'http://schemas.openxmlformats.org/wordprocessingml/2006/main'}*, *default=None*)

Take the first value of a xpath evaluation.

Parameters

- **element** (*etree._Element*) – Root element used to evaluate the xpath expression.
- **xpath** (*str*) – xpath expression. This expression will be evaluated using the *namespaces* namespaces.
- **namespaces** (*dict[str, str]*) – Namespace map to use for the xpath evaluation.
- **default** – default value used if the xpath evaluation returns no result.

Returns the first result or the *default* value.

4.3.14 OOXML Shading

Table/Cell shading and Table Shading Exception

class benker.parsers.ooxml.w_shd.**Shd**(*w_shd*)

Bases: object

Table/Cell shading and Table Shading Exception

Example: `<w:shd w:val="clear" w:color="auto" w:fill="E6E6E6"/>`

See: http://www.datypic.com/sc/ooxml/e-w_shd-3.html See: http://www.datypic.com/sc/ooxml/e-w_shd-4.html See: http://www.datypic.com/sc/ooxml/e-w_shd-5.html

styles

w_color = None
Shading Pattern Color

w_fill = None
Shading Background Color

w_themeColor = None
Shading Pattern Theme Color

w_themeFill = None
Shading Background Theme Color

w_themeFillShade = None
Shading Background Theme Color Shade

w_themeFillTint = None
Shading Background Theme Color Tint

w_themeShade = None
Shading Pattern Theme Color Shade

w_themeTint = None
Shading Pattern Theme Color Tint

w_val = None
Shading Pattern

benker.parsers.ooxml.w_shd.**value_of**(*element*, *xpath*, *, *namespaces={'w': 'http://schemas.openxmlformats.org/wordprocessingml/2006/main'}*, *default=None*)

Take the first value of a xpath evaluation.

Parameters

- **element** (*etree._Element*) – Root element used to evaluate the xpath expression.
- **xpath** (*str*) – xpath expression. This expression will be evaluated using the *namespaces* namespaces.
- **namespaces** (*dict[str, str]*) – Namespace map to use for the xpath evaluation.
- **default** – default value used if the xpath evaluation returns no result.

Returns the first result or the *default* value.

4.3.15 Formex 4 Parser

This module can parse the tables (`TBL` elements) of a Formex 4 file.

The `TBL` element is used to mark up a Formex table, which actually contains text structured in columns with related data.

A table usually contains the following information:

- an optional title (`TITLE`),
- one or more structured text blocks (`GR.SEQ`) in order to mark up optional explanatory information about the table content, located between the title of the table and the table itself,
- optionally a group of notes called in the table (`GR.NOTES`),
- the corpus of the table (`CORPUS`).

When building the internal table object, this builder will:

- interpret the title (`TITLE`) and structured text blocks (`GR.SEQ`) like rows. The *nature* attribute of each row will be "title" and "text-block" respectively.
- interpret the group of notes (`GR.NOTES`) like a row of *nature* "footer"
- interpret the corpus of the table (`CORPUS`) like the body of the table. The *nature* attribute of each row will be "body".

Note: Since the Formex table structure is not suitable for typesetting/page layout, this parser is also able to parse CALS-like attributes (for instance `frame`, `cols`, `colsep`, `rowsep`, ...) and CALS-like elements (for instance `colspec`). This attributes and elements may be added with the Formex 4 builder, see *FormexBuilder*.

New in version 0.5.0.

benker.parsers.formex.**ElementType**
alias of lxml.etree._Element

class benker.parsers.formex.**FormexParser**(*builder*, *formex_ns=None*, *cals_ns=None*, *embed_gr_notes=False*, ***options*)
Bases: *benker.parsers.base_parser.BaseParser*

Formex 4 tables parser

contains_ie(*fmx_node*)

get_cals_qname(*name*)

get_formex_qname(*name*)

parse_cals_row_styles(*fmx_elem*)
Parse the row styles

Parameters **fmx_elem** (*ElementType*) – Formex element: `ROW`, `TI.BLK`, `STI.BLK` or `GR.NOTES`.

Returns CSS-like styles

Changed in version 0.5.1: The "vertical-align" style is built from the `@cals:valign` attribute.

parse_fmx_cell(*fmx_cell*)
Parse a `CELL` element.

Parameters **fmx_cell** (*ElementType*) – table cell

parse_fmx_colspec(*cals_colspec*)
Parse a CALS-like `colspec` element.

For instance:

```
<colspec
  colname="c1"
  colnum="1"
  colsep="1"
  rowsep="1"
  colwidth="30mm"
  align="center"/>
```

Parameters **cals_colspec** (*ElementType*) – CALS-like `colspec` element.

parse_fmx_corpus (*fmx_corpus*)

parse_fmx_row (*fmx_row*)
Parse a `ROW` element which contains `CELL` elements.

This element may be in a `BLK`

Parameters **fmx_row** (*ElementType*) – table row

parse_fmx_sti_blk (*fmx_sti_blk*)
Parse a `STI.BLK` element, considering it like a row of a single cell.

For instance:

```
<STI.BLK COL.START="1" COL.END="1">
  <P>STI.BLK title</P>
</STI.BLK>
```

Parameters **fmx_sti_blk** (*ElementType*) – subtitle of the `BLK`.

parse_fmx_ti_blk (*fmx_ti_blk*)
Parse a `TI.BLK` element, considering it like a row of a single cell.

For instance:

```
<TI.BLK COL.START="1" COL.END="2">
  <P><HT TYPE="BOLD">TI.BLK title</HT></P>
</TI.BLK>
```

Parameters **fmx_ti_blk** (*ElementType*) – title of the `BLK`.

parse_gr_notes (*fmx_gr_notes*)
Parse a `GR.NOTES` element, considering it like a row of a single cell.

For instance:

```
<GR.NOTES>
  <TITLE>
    <TI>
      <P>GR.NOTES Title</P>
    </TI>
  </TITLE>
  <NOTE NOTE.ID="N0001">
    <P>Table note</P>
  </NOTE>
</GR.NOTES>
```

Parameters **fmx_gr_notes** (*ElementType*) – group of notes called in the table (GR.NOTES)

Changed in version 0.5.1: GR.NOTES elements can be embedded if the *embed_gr_notes* options is True.

parse_table(*fmx_corpus*)
Convert a <CORPUS> Formex element into table object.

Parameters **fmx_corpus** (*ElementType*) – Formex element.

Return type ElementType

Returns Table.

parse_tbl_styles(*fmx_tbl*)
Parse a TBL element and extract the styles

Parameters **fmx_tbl** (*ElementType*) – table

Returns dictionary of styles and nature

setup_table(*styles=None*, *nature=None*)

transform_tables(*tree*)

4.3.16 benker.parsers.cals package

CALS Parser Implementation

This module can parse the tables (table elements) of a CALS file.

Specifications and examples:

- The CALS DTD is available online in the OASIS web site: CALS Table Model Document Type Definition.
- An example of CALS table is available in Wikipedia: CALS Table Model

The main elements of a CALS table are:

- table: a table can contains one or several tgroup.
  - titles: table titles (*not supported by the CALS parser*)
  - tgroup: a portion of table
    - colspec: column specifications
    - spanspec: spanning specifications (*not supported by the CALS parser*)
    - thead: table header
      - colspec: header column specifications (*not supported by the CALS parser*)
      - row: table row (see tbody)
    - tfoot: table footer
      - colspec: footer column specifications (*not supported by the CALS parser*)
      - row: table row (see tbody)
    - tbody: table body
      - row: table row
      - entry: table entry which contains paragraphs

- `entrytbl`: table entry which contains a table (*not supported by the CALS parser*)

An example of CALS table is available in Wikipedia: CALS Table Model

New in version 0.5.0.

class benker.parsers.cals.**CalsParser**(*builder*, *cals_ns=None*, *width_unit='mm'*, ***options*)

Bases: *benker.parsers.base_parser.BaseParser*

CALS tables parser

get_cals_qname(*name*)

parse_cals_colspec(*cals_colspec*)

Parse a CALS-like `colspec` element.

For instance:

```
<colspec
  colname="c1"
  colnum="1"
  colsep="1"
  rowsep="1"
  colwidth="30mm"
  align="center"/>
```

Parameters **cals_colspec** (*ElementType*) – CALS-like `colspec` element.

parse_cals_entry(*cals_entry*)

Parse a `entry` element.

Parameters **cals_entry** (*ElementType*) – table entry

Changed in version 0.5.1: The "vertical-align" style is built from the `@cals:valign` attribute.

parse_cals_row(*cals_row*)

Parse a `row` element which contains `entry` elements.

This element may be in a `BLK`

Parameters **cals_row** (*ElementType*) – table row

Changed in version 0.5.1: The "vertical-align" style is built from the `@cals:valign` attribute.

parse_cals_table(*cals_table*)

Parse a CALS `table` element.

Parameters **cals_table** (*ElementType*) – CALS table Element.

Returns State of the parser (for debug purpose).

Changed in version 0.5.1: Add support for the `@cals:width` attribute (table width).

parse_cals_tgroup(*cals_tgroup*)

parse_table(*cals_table*)

Convert a `<table>` CALS element into table object.

Parameters **cals_table** (*ElementType*) – CALS element.

Return type *benker.table.Table*

Returns Table.

setup_table(*styles=None*, *nature=None*)

transform_tables(*tree*)

benker.parsers.cals.**ElementType**
alias of lxml.etree._Element

Submodules

CALS - Frame Styles

New in version 0.5.0.

benker.parsers.cals.frame_styles.**BORDER_NONE = 'none'**
Default value for no border (for @cals:frame/@cals:colsep/@cals:rowsep, ...)

benker.parsers.cals.frame_styles.**BORDER_SOLID = 'solid 1pt black'**
Default value for a solid border (for @cals:frame/@cals:colsep/@cals:rowsep, ...)

benker.parsers.cals.frame_styles.**get_frame_styles**(*frame*)

4.3.17 Available Builders

This package contains a collection of builders which you can use in conjonction with parsers to convert tables from one format to another.

You can pick a parser in the *Available Parsers*.

4.3.18 Base Builder

Base class of Builders.

class benker.builders.base_builder.**BaseBuilder**(***options*)
Bases: object

Base class of Builders.

static append_cell_elements(*cell_elem*, *elements*)
Append XML elements, PIs or texts to a cell element.

Parameters

- **cell_elem** (*ElementType*) – Cell element
- **elements** – list of child elements to append

New in version 0.5.1.

finalize_tree(*tree*)
Give the opportunity to finalize the resulting tree structure.

Parameters **tree** – The resulting tree.

New in version 0.4.0.

generate_table_tree(*table*)
Build the XML table from the Table instance.

Parameters **table** (benker.table.Table) – Table

Returns Table tree

benker.builders.base_builder.**ElementType**
alias of lxml.etree._Element

4.3.19 CALS Builder

This module can construct a CALS table from an instance of type *Table*.

Specifications and examples:

- The CALS DTD is available online in the OASIS web site: CALS Table Model Document Type Definition.
- An example of CALS table is available in Wikipedia: CALS Table Model

class benker.builders.cals.**CalsBuilder**(*cals_ns=None*, *cals_prefix=None*, *width_unit='mm'*, *table_in_tgroup=False*, *tgroup_sorting=None*, ***options*)
Bases: *benker.builders.base_builder.BaseBuilder*

CALS table builder.

build_cell(*row_elem*, *cell*)
Build the CALS <entry> element.

CALS attributes:

- @colsep is built from the "border-right" style. Default value is "1" (displayed), so, it is better to always define it. This value is only set if different from the table @colsep value.
- @rowsep is built from the "border-bottom" style. Default value is "1" (displayed), so, it is better to always define it. This value is only set if different from the table @rowsep value.
- @valign is built from the "vertical-align" style. Values can be "top", "middle", "bottom" (note: "baseline" is not supported). Default value is "bottom".
- @align is built from the "align" style. Values can be "left", "center", "right", or "justify". Default value is "left". note: paragraphs alignment should be preferred to cells alignment.
- @namest/@nameend are set when the cell is spanned horizontally.
- @morerows is set when the cell is spanned vertically.
- @bgcolor is built from the "background-color" style (HTML color).

Parameters

- **row_elem** (*ElementType*) – Parent element: <row>.
- **cell** (benker.cell.Cell) – The cell.

Changed in version 0.5.0: Add support for bgcolor.

Changed in version 0.5.1: Preserve processing instruction in cell content.

build_colspec(*group_elem*, *col*)
Build the CALS <colspec> element.

CALS attributes:

- @colnum is the column number.
- @colname is the column name. Its format is "c{col_pos}".
- @colwidth width of the column (with its unit). The unit is defined by the *width_unit* options.

- `@align` horizontal alignment of table entry content. Possible values are: “left”, “right”, “center”, “justify” (“char” is not supported).
- `@colsep` column separators (vertical ruling). Possible values are “0” or “1”.
- `@colsep` row separators (horizontal ruling). Possible values are “0” or “1”.

Parameters

- **group_elem** (*ElementType*) – Parent element: `<tgroup>`.
- **col** (benker.table.ColView) – Columns

Changed in version 0.5.0: The `@colnum` and `@align` attributes are generated.

Changed in version 0.5.1: The `@colsep` and `@rowsep` attributes are generated.

build_row(*tbody_elem*, *row*)

Build the CALS `<row>` element.

CALS attributes:

- `@valign` is built from the “vertical-align” style. Values can be “top”, “middle”, “bottom” (note: “baseline” is not supported). Default value is “bottom”.

Note: A row can be marked as inserted if “x-ins” is defined in the row styles. Revision marks are inserted before and after a `<row>` using a couple of processing-instructions. We use the `<?change-start?>` PI to mark the start of the inserted row, and the `<?change-end?>` PI to mark the end.

Parameters

- **tbody_elem** (*ElementType*) – Parent element: `<tbody>`, *<thead>*‘, or *<tfoot>*‘.
- **row** (benker.table.RowView) – The row.

New in version 0.5.0: Add support for the `@cals:rowstyle` attribute (extension).

Changed in version 0.5.1: The `@cals:valign` attribute is built from the “vertical-align” style.

build_table(*table*)

Build the CALS `<table>` element.

CALS attributes:

- `@colsep` is built from the “x-cell-border-right” style. Default value is “0” (not displayed).
- `@rowsep` is built from the “x-cell-border-bottom” style. Default value is “0” (not displayed).
- `@tabstyle` is built from the table nature.
- `@orient` is built from the “x-sect-orient” style (orientation of the current section). Possible values are “port” (portrait, the default) or “land” (landscape).
- `@pgwide` is built from the “x-sect-cols” style (column number of the current section). Default value is “0” (width of the current column).
- `@bgcolor` is built from the “background-color” style (HTML color).
- `@width` is built from the “width” style (percentage or width with unit). This attribute in an extension.

Note: `@colsep`, `@rowsep` and `@tabstyle` attributes are generated only if the *table_in_tgroup* options is `False`.

Attention: According to the CALS specification, the default value for `@colsep` and `@rowsep` should be "1". But, having this value as a default is really problematic for conversions: most of nowadays formats, like Office Open XML and CSS, consider that the default value is "no border" (a.k.a: `border: none`). So, setting "0" as a default value is a better choice.

Parameters **table** (benker.table.Table) – Table

Returns The newly-created `<table>` element.

Changed in version 0.5.0: Add support for the `bgcolor` attribute (background color).

Changed in version 0.5.1: Add support for the `@width` attribute (table width).

build_tbody(*group_elem*, *row_list*, *nature_tag*)
Build the CALS `<tbody>`, <*thead*>', or <*tfoot*>' element.

Parameters

- **group_elem** (*ElementType*) – Parent element: `<tgroup>`.
- **row_list** – List of rows
- **nature_tag** – name of the tag: 'tbody', 'thead' or 'tfoot'.

build_tgroup(*table_elem*, *table*)
Build the CALS `<tgroup>` element.

CALS attributes:

- `@cols` is the total number of columns.
- `@colsep` is built from the "x-cell-border-right" style. Default value is "0" (not displayed).
- `@rowsep` is built from the "x-cell-border-bottom" style. Default value is "0" (not displayed).
- `@tgroupstyle` is built from the table nature.

Note: `@colsep`, `@rowsep` and `@tgroupstyle` attributes are generated only if the *table_in_tgroup* options is `True`.

Parameters

- **table_elem** (*ElementType*) – Parent element: `<table>`.
- **table** (benker.table.Table) – Table

Returns The newly-created `<tgroup>` element.

generate_table_tree(*table*)
Build the XML table from the Table instance.

Parameters **table** (benker.table.Table) – Table

Returns Table tree

ns_map

setup_table(*table*)

benker.builders.cals.**ElementType**
alias of lxml.etree._Element

benker.builders.cals.**get_colsep_attr**(*styles*, *style='x-cell-border-right'*)

benker.builders.cals.**get_frame_attr**(*styles*)

benker.builders.cals.**get_rowsep_attr**(*styles*, *style='x-cell-border-bottom'*)

benker.builders.cals.**revision_mark**(*name*, *attrs*)

4.3.20 Formex 4 Builder

This module can construct a Formex 4 table from an instance of type *Table*.

FORMEX describes the format for the exchange of data between the Publication Office and its contractors. In particular, it defines the logical markup for documents which are published in the different series of the Official Journal of the European Union.

This builder allow you to convert Word document tables into Formex 4 tables using the Formex 4 schema (formex-05.59-20170418.xd).

Specifications and examples:

- The Formex 4 documentation and schema is available online in the Publication Office: Formex Version 4.
- An example of Formex 4 table is available in the Schema documentation: TBL

Changed in version 0.5.0: Refactoring (rename "Formex4" to "Formex"):

- the class Formex4Builder is renamed FormexBuilder,

benker.builders.formex.**ElementTreeType**
alias of lxml.etree._ElementTree

benker.builders.formex.**ElementType**
alias of lxml.etree._Element

class benker.builders.formex.**FormexBuilder**(*detect_titles=False*, *use_cals=False*, *cals_ns='https://lib.benker.com/schemas/cals.xsd'*, *cals_prefix='cals'*, *width_unit='mm'*, ***options*)
Bases: *benker.builders.base_builder.BaseBuilder*

Formex 4 builder used to convert tables into TBL elements according to the TBL Schema

build_cell(*row_elem*, *cell*, *row*)
Build the Formex 4 <CELL> element.

Formex 4 attributes:

- @COL The mandatory COL attribute is used to specify in which column the cell is located.
- @COLSPAN When a cell in a row 'A' must be linked to a group of cells in the same row, the first CELL element of this group has to provide the COLSPAN attribute. The value of the COLSPAN attribute is the number of cells in the group. The COL attribute of the first cell indicates the number of the first column in the group.

  The use of the COLSPAN attribute is only allowed to relate the value of a cell in several columns within the same row. Its value must be at least equal to '2'.

- `@ROWSPAN` When a cell in column 'A' is linked to a cell in row 'B' located just below row 'A', the CELL element of this single cell must provide the ROWSPAN attribute. The value of the ROWSPAN attribute is equal to the number of cells in the group. The CELL element relating to the single cell must be placed within the first ROW element in the group. The ROW elements corresponding to the other rows in the group may not contain any CELL elements for the column containing the single cell 'A'.

  The use of the ROWSPAN attribute is only authorised to relate the value of a cell in several rows. Its value must be at least equal to '2'.

- `@ACCH` If the group of related cells is physically delimited by a horizontal brace, this symbol must be marked up using the ACCH attribute.
- `@ACCV` If the group of related cells is physically delimited by a vertical brace, this symbol must be marked up using the ACCV attribute.
- `@TYPE` The TYPE attribute of the CELL element is used to indicate locally the type of contents of the cells. It overrides the value of the TYPE attribute defined for the row (ROW) which contains the cell.

Parameters

- **row_elem** (*ElementType*) – Parent element: `<ROW>`.
- **cell** (`benker.cell.Cell`) – The cell.
- **row** (`benker.table.RowView`) – The parent row.

Changed in version 0.5.0: Add support for CALS-like elements and attributes. Add support for `bgcolor` (Table background color).

Changed in version 0.5.1: Preserve processing instruction in cell content.

build_colspec(*group_elem*, *col*)

Build the CALS `<colspec>` element (only is *use_cals* is `True`).

CALS attributes:

- `@colnum` is the column number.
- `@colname` is the column name. Its format is "c{col_pos}".
- `@colwidth` width of the column (with its unit). The unit is defined by the *width_unit* options.
- `@align` horizontal alignment of table entry content. Possible values are: "left", "right", "center", "justify" ("char" is not supported).
- `@colsep` column separators (vertical ruling). Possible values are "0" or "1".
- `@colsep` row separators (horizontal ruling). Possible values are "0" or "1".

Note: The `@colnum` attribute (number of column) is not generated because this value is usually implied, and can be deduce from the `@colname` attribute.

Parameters

- **group_elem** (*ElementType*) – Parent element: `<tgroup>`.
- **col** (`benker.table.ColView`) – Columns

Changed in version 0.5.0: Add support for CALS-like elements and attributes.

Changed in version 0.5.1: Add support for CALS-like attributes: `@colnum`, `@align`, `@colsep`, and `@rowsep`.

build_corpus(*tbl_elem*, *table*)
Build the Formex 4 <CORPUS> element.

Parameters

- **tbl_elem** (*ElementType*) – Parent element: <TBL>.
- **table** (benker.table.Table) – Table

Changed in version 0.5.1: If this option *detect_titles* is enable, a title will be generated if the first row contains an unique cell with centered text.

Changed in version 0.5.1: Add support for the `@width` CALS-like attribute (table width).

build_row(*corpus_elem*, *row*)
Build the Formex 4 <ROW> element.

Formex 4 attributes:

- `@TYPE` The TYPE attribute indicates the specific role of the row in the table. The allowed values are:
  - ALIAS: if the row contains aliases. Such references may be used when the table is included on several pages of a publication. The references are associated to column headers on the first page and are repeated on subsequent pages.
  - HEADER: if the row contains cells which may be considered as a column header. This generally occurs for the first row of a table.
  - NORMAL: if most of the cells of the row contain 'simple' or 'normal' data. This is the default value.
  - NOTCOL: if the cells of the row contain units of measure relating to subsequent rows.
  - TOTAL: if the row contains data which could be considered as 'totals'.

  Note that this TYPE attribute is also provided for the cells (CELL), which could be used to override the value defined for the row. On the other hand, 'NORMAL' is the default value, so it is necessary to specify the TYPE attribute value in each cell of a row which has a specific type in order to avoid the default overriding (see the first row of the example below).

Parameters

- **corpus_elem** (*ElementType*) – Parent element: <CORPUS>.
- **row** (benker.table.RowView) – The row.

Changed in version 0.5.0: Add support for CALS-like elements and attributes.

Changed in version 0.5.1: The `@cals:valign` attribute is built from the "vertical-align" style.

build_tbl(*table*)
Build the Formex 4 <TBL> element.

Formex 4 attributes:

- `@NO.SEQ` This mandatory attribute provides a sequence number to the table. This number represents the order in which the table appears in the document.

- `@CLASS` The CLASS attribute is mandatory and is used to specify the type of data contained in the table. The allowed values are:
  - GEN: if the table contains general data (default value),
  - SCHEDULE: if it is a schedule,
  - RECAP: if it is a synoptic table.

  These two last values are only used for documents related to the general budget.
- `@COLS` This mandatory attribute provides the actual number of columns of the table.
- `@PAGE.SIZE` The PAGE.SIZE attribute takes one of these values:
  - DOUBLE.LANDSCAPE: table on two A4 pages forming an A3 landscape page,
  - DOUBLE.PORTRAIT: table on two A4 pages forming an A3 portrait page,
  - SINGLE.LANDSCAPE: table on a single A4 page in landscape,
  - SINGLE.PORTRAIT: table on a single A4 page in portrait (default).

Parameters **table** (benker.table.Table) – Table

Returns The newly-created <TBL> element.

Changed in version 0.5.0: Add support for CALS-like elements and attributes. Add support for `bgcolor` (Table background color).

build_title(*tbl_elem*, *row*)

Build the table title using the <TITLE> element.

For instance:

```
<TITLE>
  <TI>
    <P>Table IV</P>
  </TI>
</TITLE>
```

Parameters

- **tbl_elem** (*ElementType*) – Parent element: <TBL>.
- **row** (benker.table.RowView) – The row which contains the title.

cleanup_tbl_in_tbl(*fmx_root*)

Cleanup the `TBL` elements when they are direct children of another `TBL`

Parameters **fmx_root** (*ElementType*) – The result tree which contains the `TBL` elements to remove.

drop_superfluous_attrs(*fmx_root*)

Drop superfluous CALS-like attributes at the end of the Formex building.

- `@cals:namest` and `@cals:nameend` are defined by `@COLSPAN`
- `@cals:morerows` is defined by `@ROWSPAN`
- `@cals:rowstyle` is defined by `ROW/@TYPE`, `GR.NOTES`, `TI.BLK` or `STI.BLK`.

Parameters **fmx_root** (*ElementType*) – Root element of the Formex file.

New in version 0.5.1.

extract_gr_notes(*fmx_root*)
Extract GR.NOTES from the table footers.

This function moves or creates a GR.NOTES just before the CORPUS.

Parameters **fmx_root** (*ElementType*) – The result tree with GR.NOTES.

Changed in version 0.5.1: If the ROW contains a GR.NOTES, we move it before the CORPUS, else we create it.

finalize_tree(*tree*)
Finalize the resulting tree structure:

- Calculate the @NO.SEQ values: sequence number of each table;
- Cleanup the TBL elements when they are direct children of another TBL;
- Extract GR.NOTES from the table footers;
- Group ROW elements by BLK based on the @cals:rowstyle attribute (CALS extension).

Parameters **tree** (*ElementTreeType*) – The resulting tree.

Changed in version 0.5.1: Drop superfluous CALS-like attributes at the end of the Formex building.

generate_table_tree(*table*)
Build the XML table from the Table instance.

Parameters **table** (benker.table.Table) – Table

Returns Table tree

get_cals_qname(*name*)

get_formex_qname(*name*)

insert_blk(*fmx_root*)
Group ROW elements by BLK based on the @cals:rowstyle attribute (CALS extension).

Parameters **fmx_root** (*ElementType*) – The result tree which contains the CORPUS/ROW elements.

ns_map

setup_table(*table*)

update_no_seq(*fmx_root*)
Calculate the @NO.SEQ values: sequence number of each table.

Parameters **fmx_root** (*ElementType*) – The result tree which contains the TBL elements to update.

benker.builders.formex.**ProcessingInstructionType**
alias of lxml.etree._ProcessingInstruction

class benker.builders.formex.**RowInfo**(*tag*, *type*, *level*)
Bases: tuple

level
Alias for field number 2

tag
Alias for field number 0

type
Alias for field number 1

benker.builders.formex.**guess_row_info**(*rowstyle*)

benker.builders.formex.**revision_mark**(*name*, *attrs*)

4.3.21 Namespace

class benker.builders.namespace.**Namespace**
Bases: *benker.builders.namespace.Namespace*

A namespace is defined by a *prefix* and an *uri*.

New in version 0.5.0.

get_name(*name*)
get the prefixed name

get_qname(*name*)
get the qualified name

4.3.22 Available Converters

This package contains a collection of converters which you can use to convert tables from one format to another.

To do that, you need to select a **parser** and a **builder**:

- You can pick a parser in the *Available Parsers*.
- You can pick a builder in the *Available Builders*.

4.3.23 Base Converter

Bas class of all converters.

class benker.converters.base_converter.**BaseConverter**
Bases: object

Bas class of all converters.

builder_cls
alias of *benker.builders.base_builder.BaseBuilder*

convert_file(*src_xml*, *dst_xml*, ***options*)
Convert the tables from one format to another.

Parameters

- **src_xml** (*str*) – Source path of the XML file to convert.
- **dst_xml** (*str*) – Destination path of the XML file to produce.
- **options** – Dictionary of parsing/building options.

  Common parsing options:

  encoding (default: "utf-8"): XML encoding of the destination file.

parser_cls
alias of *benker.parsers.base_parser.BaseParser*

4.3.24 CALS to Formex 4 converter

New in version 0.5.0.

class benker.converters.cals2formex.**Cals2FormexConverter**
Bases: *benker.converters.base_converter.BaseConverter*

CALS to Formex 4 converter

builder_cls
alias of *benker.builders.formex.FormexBuilder*

parser_cls
alias of *benker.parsers.cals.CalsParser*

benker.converters.cals2formex.**convert_cals2formex**(*src_xml*, *dst_xml*, ***options*)
Convert CALS 4 tables to Formex tables.

Parameters

- **src_xml** (*str*) – Source path of the XML file to convert.
- **dst_xml** (*str*) – Destination path of the XML file to produce.
- **options** – Dictionary of parsing/building options.

  Common parsing options:

  encoding (default: "utf-8"): XML encoding of the destination file.

  CALS parser options:

  cals_ns (default None): Namespace to use for CALS elements and attributes parsing. Set `None` (or "") if you don't use namespace in your XML.

  width_unit (default: "mm"): Unit to use for table/column widths. Possible values are: 'cm', 'dm', 'ft', 'in', 'm', 'mm', 'pc', 'pt', 'px'.

  Formex 4 builder options:

  use_cals (default: False): Generate additional CALS-like elements and attributes to simplify the layout of Formex document in typesetting systems.

  cals_ns (default: "https://lib.benker.com/schemas/cals.xsd"): Namespace to use for CALS-like elements and attributes (requires: `use_cals`). Set `None` (or "") if you don't want to use namespace.

  cals_prefix (default: "cals"): Namespace prefix to use for CALS-like elements and attributes (requires: `use_cals`).

  width_unit (default: "mm"): Unit to use for table/column widths (requires: `use_cals`). Possible values are: 'cm', 'dm', 'ft', 'in', 'm', 'mm', 'pc', 'pt', 'px'.

4.3.25 Formex 4 to CALS converter

New in version 0.5.0.

class benker.converters.formex2cals.**Formex2CalsConverter**
Bases: *benker.converters.base_converter.BaseConverter*

Formex 4 to CALS converter

builder_cls
alias of *benker.builders.cals.CalsBuilder*

parser_cls
alias of *benker.parsers.formex.FormexParser*

benker.converters.formex2cals.**convert_formex2cals**(*src_xml*, *dst_xml*, ***options*)
Convert Formex 4 tables to Cals tables.

Parameters

- **src_xml** (*str*) – Source path of the XML file to convert.
- **dst_xml** (*str*) – Destination path of the XML file to produce.
- **options** – Dictionary of parsing/building options.

  Common parsing options:

  encoding (default: "utf-8"): XML encoding of the destination file.

  Formex parser options:

  formex_ns (default None): Namespace to use for Formex elements and attributes parsing. Set `None` (or "") if you don't use namespace.

  cals_ns (default None): Namespace to use for CALS-like elements and attributes parsing. Set `None` (or "") if you don't use namespace.

  embed_gr_notes (default False): If `True`, Embed the `GR.NOTES` in a row/cell, else only copy the content (not the `GR.NOTES` tag).

  CALS builder options:

  cals_ns (default: None): Namespace to use for CALS-like elements and attributes to generate. Set `None` (or "") if you don't want to use namespace.

  cals_prefix (default: None): Namespace prefix to use for CALS-like elements and attributes to generate.

  width_unit (default: "mm"): Unit to use for column widths. Possible values are: 'cm', 'dm', 'ft', 'in', 'm', 'mm', 'pc', 'pt', 'px'.

  table_in_tgroup (default: False): Where should we put the table properties:

  - `False` to insert the attributes `@colsep`, `@rowsep`, and `@tabstyle` in the `<table>` element,
  - `True` to insert the attributes `@colsep`, `@rowsep`, and `@tgroupstyle` in the `<tgroup>` element.

  tgroup_sorting (default: ["header", "footer", "body"]): List used to sort (and group) the rows in a `tgroup`. The sorting is done according to the row natures which is by default: `["header", "footer", "body"]` (this order match the CALS DTD defaults, where the footer is between the header and the body. To move the footer to the end, you can use `["header", "body", "footer"]`.

Changed in version 0.5.0: Add the options *cals_ns*, *cals_prefix*, *tgroup_sorting*.

4.3.26 Office Open XML to CALS converter

class benker.converters.ooxml2cals.**Ooxml2CalsConverter**
Bases: *benker.converters.base_converter.BaseConverter*

Office Open XML to CALS converter

builder_cls
alias of *benker.builders.cals.CalsBuilder*

parser_cls
alias of *benker.parsers.ooxml.OoxmlParser*

benker.converters.ooxml2cals.**convert_ooxml2cals**(*src_xml*, *dst_xml*, ***options*)
Convert Office Open XML (OOXML) tables to CALS tables.

Parameters

- **src_xml** (*str*) – Source path of the XML file to convert.

  This must be an XML file, for instance, if you want to convert a Word document (`.docx`), you first need to unzip the `.docx` file, and then, run this function on the file `word/document.xml`. You can also use the *styles_path* option to parse and use the table styles defined in the file `word/styles.xml`.

- **dst_xml** (*str*) – Destination path of the XML file to produce.

- **options** – Dictionary of parsing/building options.

  Common parsing options:

  encoding (default: "utf-8"): XML encoding of the destination file.

  OOXML parser options:

  styles_path (default: None): Path to the stylesheet to use to resole table styles. In an uncompressed `.docx` tree structure, the stylesheet path is `word/styles.xml`.

  CALS builder options:

  cals_ns (default: None): Namespace to use for CALS-like elements and attributes to generate. Set `None` (or "") if you don't want to use namespace.

  cals_prefix (default: None): Namespace prefix to use for CALS-like elements and attributes to generate.

  width_unit (default: "mm"): Unit to use for column widths. Possible values are: 'cm', 'dm', 'ft', 'in', 'm', 'mm', 'pc', 'pt', 'px'.

  table_in_tgroup (default: False): Where should we put the table properties:

  - `False` to insert the attributes `@colsep`, `@rowsep`, and `@tabstyle` in the `<table>` element,
  - `True` to insert the attributes `@colsep`, `@rowsep`, and `@tgroupstyle` in the `<tgroup>` element.

  tgroup_sorting (default: ["header", "footer", "body"]): List used to sort (and group) the rows in a `tgroup`. The sorting is done according to the row natures which is by default: `["header", "footer", "body"]` (this order match the CALS DTD defaults, where the footer is between the header and the body. To move the footer to the end, you can use `["header", "body", "footer"]`.

Changed in version 0.5.0: Add the options *cals_ns*, *cals_prefix*, *tgroup_sorting*.

4.3.27 Office Open XML to Formex 4 converter

Changed in version 0.5.0: Refactoring (rename "Formex4" to "Formex"):

- the class `Ooxml2Formex4Converter` is renamed `Ooxml2FormexConverter`,

- the function `convert_ooxml2formex4` is renamed `convert_ooxml2formex`,

class benker.converters.ooxml2formex.**Ooxml2FormexConverter**
Bases: *benker.converters.base_converter.BaseConverter*

Office Open XML to Formex 4 converter

builder_cls
alias of *benker.builders.formex.FormexBuilder*

parser_cls
alias of *benker.parsers.ooxml.OoxmlParser*

benker.converters.ooxml2formex.**convert_ooxml2formex**(*src_xml*, *dst_xml*, ***options*)
Convert Office Open XML (OOXML) tables to Formex 4 tables.

Parameters

- **src_xml** (*str*) – Source path of the XML file to convert.

  This must be an XML file, for instance, if you want to convert a Word document (`.docx`), you first need to unzip the `.docx` file, and then, run this function on the file `word/document.xml`. You can also use the *styles_path* option to parse and use the table styles defined in the file `word/styles.xml`.

- **dst_xml** (*str*) – Destination path of the XML file to produce.

- **options** – Dictionary of parsing/building options.

  Common parsing options:

  encoding (default: "utf-8"): XML encoding of the destination file.

  OOXML parser options:

  styles_path (default: None): Path to the stylesheet to use to resole table styles. In an uncompressed `.docx` tree structure, the stylesheet path is `word/styles.xml`.

  Formex 4 builder options:

  detect_titles (default: False): If this option is enable, a title will be generated if the first row contains an unique cell with centered text.

  use_cals (default: False): Generate additional CALS-like elements and attributes to simplify the layout of Formex document in typesetting systems.

  cals_ns (default: "https://lib.benker.com/schemas/cals.xsd"): Namespace to use for CALS-like elements and attributes (requires: `use_cals`). Set `None` (or "") if you don't want to use namespace.

  cals_prefix (default: "cals"): Namespace prefix to use for CALS-like elements and attributes (requires: `use_cals`).

  width_unit (default: "mm"): Unit to use for column widths (requires: `use_cals`). Possible values are: 'cm', 'dm', 'ft', 'in', 'm', 'mm', 'pc', 'pt', 'px'.

4.3.28 benker.common package

Common libraries

Submodules

lxml Iterators

Python alternative to `lxml.etree.iterwalk` for lxml < 4.2.1

`benker.common.lxml_iterwalk.`**`ElementTreeType`**
alias of `lxml.etree._ElementTree`

`benker.common.lxml_iterwalk.`**`ElementType`**
alias of `lxml.etree._Element`

lxml - QName

Python alternative to `lxml.etree.QName` for lxml < 4

New in version 0.5.0.

4.3.29 Alphabet

Utility functions to convert integer into a base-26 "number", and vis versa.

`benker.alphabet.`**`alphabet_to_int`**(*letters*, *alphabet='ABCDEFGHIJKLMNOPQRSTUVWXYZ'*)
Convert a base-26 "number" using uppercase ASCII letters into an integer.

```
>>> from benker.alphabet import alphabet_to_int

>>> alphabet_to_int("A")
1
>>> alphabet_to_int("B")
2
>>> alphabet_to_int("AA")
27
>>> alphabet_to_int("AB")
28
>>> alphabet_to_int("ZZZ")
18278
>>> alphabet_to_int("")
0
>>> alphabet_to_int("AA@")
Traceback (most recent call last):
    ...
ValueError: AA@
```

Parameters

- **`letters`** – string representing a "number" in the base-26.
- **`alphabet`** – alphabet to use for the conversion.

Returns Integer value of the "number".

`benker.alphabet.`**`int_to_alphabet`**(*value*, *alphabet='ABCDEFGHIJKLMNOPQRSTUVWXYZ'*)
Convert a non-nul integer into a base-26 "number" using uppercase ASCII letters.

Usage:

```
>>> from benker.alphabet import int_to_alphabet

>>> int_to_alphabet(1)
'A'
>>> int_to_alphabet(2)
'B'
>>> int_to_alphabet(26)
'Z'
>>> int_to_alphabet(27)
'AA'
>>> int_to_alphabet(28)
'AB'
>>> int_to_alphabet(52)
'AZ'
>>> int_to_alphabet(53)
'BA'
>>> int_to_alphabet(18278)
'ZZZ'
>>> int_to_alphabet(-5)
Traceback (most recent call last):
    ...
ValueError: -5
```

Parameters

- **value** (*int*) – value to convert
- **alphabet** – alphabet to use for the conversion.

Returns string representing this "number" in the base-26.

4.3.30 Drawing

Utility functions used to draw a *Grid*.

benker.drawing.**TILES = {(False, False, False, False): ' \n XXXXXXXXX \n', (False, False,**

Default tiles used to draw a *Grid*.

Keys are tuples (*left*, *top*, *right*, *bottom*) : which represent the presence (if `True`) or absence (if `False`) : of the border. Values are the string representation of the tiles, "XXXXXXXXX" will be replaced by the cell content.

benker.drawing.**draw**(*grid*, *tiles=None*)

Draw a grid using a collection of tiles.

Parameters

- **grid** (benker.grid.Grid) – Grid to draw.
- **tiles** – Collection of tiles, use *TILES* if not provided.

Returns String representation of the grid.

benker.drawing.**iter_lines**(*grid*, *tiles=None*)

benker.drawing.**iter_tiles**(*grid*, *tiles=None*)

4.3.31 Units

Utility functions to convert values from one unit to another.

benker.units.**UNITS = {'cm': 0.01, 'dm': 0.1, 'ft': 0.3048, 'in': 0.0254, 'm': 1.0, 'mm**
Usual units Lengths in meter

benker.units.**convert_value**(*value*, *unit_in*, *unit_out*)
Convert a value from one unit to another.

To convert '1pt' to 'mm', you can do:

```
>>> from benker.units import convert_value

>>> convert_value(1, 'pt', 'mm')
0.353
```

Parameters

- **value** (*int or float*) – Value to convert
- **unit_in** – Current unit of the value.
- **unit_out** – Expected unit of the value.

Return type float

Returns The converted value

benker.units.**parse_width**(*width*, *default_unit='mm'*)
Parse a width and return the value and its unit.

```
>>> from benker.units import parse_width

>>> parse_width("210")
(210.0, 'mm')

>>> parse_width("210mm")
(210.0, 'mm')

>>> parse_width("210pt")
(210.0, 'pt')
```

Parameters

- **width** – width string to parse, for instance: "247mm".
- **default_unit** – default unit to use if it is not specified

Return type (float, str)

Returns the value and its unit.

New in version 0.5.1.

4.4 Changelog

All notable changes to this project will be documented in this file.

The format is based on Keep a Changelog and this project adheres to Semantic Versioning.

4.4.1 v0.5.1 (2019-11-12)

Bug fix release

Changed

Add the *parse_width()* function used to parse a width and return the value and its unit.

Fixed

- Documentation: add missing link to `convert_cals2formex` in the main page.
- Fix #4: Remove superfluous attributes in cals2formex.

  Change in the *FormexBuilder* class: Add the *drop_superfluous_attrs()* method: drop superfluous CALS-like attributes at the end of the Formex building.
- Fix #5: The title generation should be optional.

  Change in the `Formex4Builder` class: Add the *detect_titles* option: if this option is enable, a title will be generated if the first row contains an unique cell with centered text. The *detect_titles* options is disable by default.
- Change in the `Formex4Builder` class: Allow empty strings for *cals_ns* and *cals_prefix* options.
- Fix #6: Formex 2 Cals conversion: missing `entry/@valign`.

  Change in the *FormexParser* class: The "vertical-align" style is built from the `@cals:valign` attribute.

  Change in the *CalsParser* class: The "vertical-align" style is built from the `@cals:valign` attribute.

  Change in the *FormexBuilder* class: The `@cals:valign` attribute is built from the "vertical-align" style.

  Change in the *CalsBuilder* class: The `@cals:valign` attribute is built from the "vertical-align" style.
- Fix #7: Formex 2 Cals conversion: missing `table/@width`.

  Change in the *CalsBuilder* class: Add support for the `@width` attribute (table width).

  Change in the *FormexBuilder* class: Add support for the `@width` CALS-like attribute (table width).
- Minor change in the *OoxmlParser* class: XML indentation between cell paragraphs is ignored.
- Fix #9: Cals 2 Formex conversion: Text and PIs lost in entries.

  Add the *append_cell_elements()* method: Append XML elements, PIs or texts to a cell element.

  Change in the *CalsBuilder* and *FormexBuilder* classes: Preserve processing instruction in cell content.
- Fix #10: Formex 2 Cals conversion: `GR.NOTES` should be preserved.

  Change in *FormexParser* class: `GR.NOTES` elements can be embedded if the *embed_gr_notes* options is `True`.

  Change in the *FormexBuilder* class: During `GR.NOTES` extraction, existing `GR.NOTES` are moved before the `CORPUS` (or created if missing).

  Change in the *convert_formex2cals()* function: Add the *embed_gr_notes* options to allow `GR.NOTES` element embedding.

- Fix #11: Cals 2 Formex conversion: missing `CORPUS/@width`.

  Change in the *`CalsParser`* class: Add the `width_unit` option, and add support for the `@cals:width` attribute (table width).

- Fix #12: Cals 2 Formex conversion: missing `colspec` attributes.

  Change in the *`FormexBuilder`* class: Add support for CALS-like attributes: `@colnum`, `@align`, `@colsep`, and `@rowsep` in the `colspec` element.

  Change in the *`CalsBuilder`* class: The `@colsep` and `@rowsep` attributes are generated.

Other

- Change link to the Formex documentation to "https://op.europa.eu/en/web/eu-vocabularies/formex".
- Change Tox & AppVeyor configuration to use lxml v4.3.3 on Windows (for Python 3.4), because lxml v4.3.5 is not available for this platform.

4.4.2 v0.5.0 (2019-09-25)

Minor release

Changed

- Refactoring (rename "Formex4" to "Formex"):
  - the module `benker/builders/formex4.py` is renamed `benker/builders/formex.py`,
  - the module `benker/converters/ooxml2formex4.py` is renamed `benker/converters/ooxml2formex.py`,
  - the module `benker/parsers/formex4.py` is renamed `benker/parsers/formex.py`,
  - the class `Formex4Builder` is renamed `FormexBuilder`,
  - the class `Ooxml2Formex4Converter` is renamed `Ooxml2FormexConverter`,
  - the function `convert_ooxml2formex4` is renamed `convert_ooxml2formex`,
  - the class `Formex4Parser` is renamed `FormexParser`,
- Change in the class *`Table`*: add the method *`fill_missing()`* to fill the missing cells in a table.
- Change in the class *`CalsBuilder`*: Add support for the `@cals:rowstyle` attribute (extension). The `@colnum` and `@align` attributes are generated for the `<colspec>` element. The new options *cals_ns* and *cals_prefix* allow the used of namespaces in CALS. The option *tgroup_sorting* can be used to sort the `thead`, `tbody` and `tfoot` elements.
- Change in the method *`parse_file`*: Always generate the XML declaration in the destination file.

Added

- Change in the converter: *`convert_ooxml2formex()`*: Add the option *use_cals* (and related options: *cals_ns*, *cals_prefix* and *width_unit*): This options is used to generate additional CALS-like elements and attributes to simplify the layout of Formex document in typesetting systems.
- Add support for the Table/Cell shading in the OOXML parser.

- Add support for `bgcolor` (Table/Cell background color) in the CALS builder.
- Add support for `bgcolor` (Table/Cell background color) in the Formex 4 builder (only with the *use_cals* option).
- New parser: *CalsParser*: CALS tables parser.

Fixed

- Change in the builder *CalsBuilder*: the possible values for row/cell *nature* is "header", "body" and "footer" (instead of "head", "body", "foot").
- Fix in the class *OoxmlParser*: rows with missing cells are filled with empty cells of the same nature as the row.

Other

- Fix an issue with the AppVeyor build: upgrade setuptools version in `appveyor.yml`, change the Tox configuration: set `py27,py34,py35:  pip >= 9.0.3, < 19.2`.
- Change the project's slogan: "Easily convert your CALS, HTML, Formex 4, Office Open XML (docx) tables from one format to another."
- Change Tox configuration file to test the library with lxml v4.3 on Python 3.4 (support for Python 3.4 was removed in lxml v4.4).
- Change Tox configuration file to test the library on Python 3.8.
- Change the Travis CI configuration to build on Python 3.7 and 3.8-dev.

4.4.3 v0.4.3 (unreleased)

Bug fix release

Fixed

- Fix #5: The title generation should be optional.

  Change in the `Formex4Builder` class: Add the *detect_titles* option: if this option is enable, a title will be generated if the first row contains an unique cell with centered text. The *detect_titles* options is disable by default.

4.4.4 v0.4.2 (2019-06-06)

Bug fix release

Fixed

- Fix #1: Cell nature should inherit row nature by default.

  Change in the class *Styled*: The default value of the *nature* parameter is `None` (instead of "body").

  Change in the methods *insert_cell()* and *insert_cell()* The *nature* of a cell is inherited from its parent's row (or column).

Other

- Change the requirements for Sphinx: add 'requests[security]' for Python 2.7.
- Fix an issue with the AppVeyor build: change the Tox configuration: set `py27,py34,py35: pip >= 9.0.3`.

4.4.5 v0.4.1 (2019-04-24)

Bug fix release

Fixed

- Change in the parser *OoxmlParser*: fix the 'x-sect-cols' value extraction when the `w:sectPr` is missing (use "1" by default).
- Fix the Formex 4 builder *FormexBuilder*: Generate a `<IE/>` element if the cell content (the string representation) is empty.

4.4.6 v0.4.0 (2019-04-23)

Feature release

Added

- New converter: *convert_ooxml2formex()*: Convert Office Open XML (OOXML) tables to Formex 4 tables.
- New builder: *FormexBuilder*: Formex 4 builder used to convert tables into `TBL` elements.
- Change in the parser *OoxmlParser*:
  - The section width and height are now stored in the 'x-sect-size' table style (units in 'pt').
- Change in the builder *BaseBuilder*: Add the method *finalize_tree()*: Give the opportunity to finalize the resulting tree structure.

4.4.7 v0.3.0 (2019-02-16)

Feature release

Added

- Change in the parser *OoxmlParser*:
  - Parse cell `w:tcPr/w:vAlign` values.
  - Parse paragraph alignments to calculate cell horizontal alignments.
  - Parse cell `w:tcPr/w:tcBorders` values to extract border styles.
- Change in the builder *benker.builders.cals.CalsBuilder*:
  - Generate `entry/@valign` attributes.

  - Generate `entry/@align` attributes.
  - Generate `entry/@colsep` and `entry/@rowsep` attributes.

Changed

- Change in the parser *`OoxmlParser`*:
  - Add more supported border styles

4.4.8 v0.2.2 (2018-12-15)

Bug fix release

Added

- Add a Python alternative to `lxml.etree.iterwalk` if using lxml < 4.2.1. See lxml changelog v4.2.1.

Fixed

- Fix the implementation of *`parse_table()`*: use a new implementation of `lxml.etree.iterwalk` if using lxml < 4.2.1.

Other

- Change Tox configuration file to test the library with lxml v3 and v4.
- Add a changelog in the documentation.

4.4.9 v0.2.1 (2018-11-27)

Fixed

- Fix Coverage configuration file.
- Fix and improve configuration for Tox.
- Fix docstring in *`ooxml2cals`*.
- Fix calculation of the `@frame` attribute in the method *`benker.builders.cals.CalsBuilder.build_table()`*.

Other

- Change link to PyPi project to "https://pypi.org/project/Benker/".
- Add the README to the documentation.
- Add configuration files for TravisCI and AppVeyor.

4.4.10 v0.2.0 (2018-11-26)

Changed

- Update project configuration
- Add missing `__init__.py` file in `tests` directory: it is required for test modules import.

Fixed

- Fix unit tests (Python 2.7).
- Fix flakes8 problems.
- Fix implementation of the *Grid* class for Python 2.7 (remove annotation). And minor fixes.
- Remove pipenv configuration files.
- Fix project configuration.

4.4.11 v0.1.0 (2018-11-26)

- First version of Benker.

CHAPTER 5

Indices and tables

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Python Module Index

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