# xtpxlib-xoffice

## Conversions for Word and Excel files

Erik Siegel - Xatapult Content Engineering
2023-07-13

# 0 Table of Contents

**0 Xatapult XML Library - Conversions for Word and Excel files** .......... 2

**1 Description** .......... 3

1.1 Converting from Excel (.xlsx) .......... 3

1.2 Converting to Excel (.xlsx) .......... 3

1.3 Converting from Word (.docx) .......... 4

**2 XProc Libraries** .......... 6

2.1 XProc (1.0) library: excel.mod.xpl .......... 6

2.1.1 Step: xtlxo:extract-xlsx .......... 6

2.1.2 Step: xtlxo:modify-xlsx .......... 6

2.2 XProc (1.0) library: word.mod.xpl .......... 6

2.2.1 Step: xtlxo:create-docx .......... 6

2.2.2 Step: xtlxo:extract-docx .......... 7

**3 XML Schemas** .......... 8

3.1 XML Schema: xlsx-extract.xsd .......... 8

3.2 XML Schema: xlsx-modify.xsd .......... 8

**4 XSLT Modules** .......... 9

4.1 XSLT (3.0): excel-conversions.mod.xsl .......... 9

4.1.1 Function: xtlxo:excel-date-to-xs-date() as xs:date .......... 9

4.1.2 Function: xtlxo:xs-date-to-excel-date() as xs:integer .......... 9

4.2 XSLT (2.0): xoffice.mod.xsl .......... 9

4.2.1 Named template: xtlxo:get-properties .......... 11

4.2.2 Function: xtlxo:doc-href() as xs:string .......... 11

4.2.3 Function: xtlxo:get-file-root() as element()? .......... 11

4.2.4 Function: xtlxo:get-file-root-from-relationship-id() as element()? .......... 11

4.2.5 Function: xtlxo:get-file-root-from-relationship-type() as element()? .......... 11

4.2.6 Function: xtlxo:get-file-root-relationship() as element(mso-rels:Relationships)? .......... 11

4.2.7 Function: xtlxo:get-href() as xs:string .......... 11

4.2.8 Function: xtlxo:get-rels-href() as xs:string .......... 11

# 0 Xatapult XML Library - Conversions for Word and Excel files

Xtpxlib

**xtpxlib** library - component **xtpxlib-xoffice** - **v1.1.B** (2020-02-16)
Xatapult Content Engineering - http://www.xatapult.com - +31 6 53260792
Erik Siegel - erik@xatapult.com

**xtpxlib-xoffice** is part of the **xtpxlib** library. **xtpxlib** contains software for processing XML, using languages like XSLT and XProc. It consists of several separate components, all named `xtpxlib-*`. Everything can be found on GitHub (https://github.com/xatapult).

This component contains pipelines for converting Microsoft Office Word (`.docx`) and Excel (`.xlsx`) files to and from some more manageable XML formats.

Installation and usage information can be found on **xtpxlib**'s main website https://www.xtpxlib.org.

## Technical information:

Component documentation: https://xoffice.xtpxlib.org

License: GNU GENERAL PUBLIC LICENSE - Version 3, 29 June 2007

Git URI: `git@github.com:xatapult/xtpxlib-xoffice.git`

Git site: https://github.com/xatapult/xtpxlib-xoffice

This component depends on:

- xtpxlib-container (Support for XML containers (multiple files wrapped into one))
- xtpxlib-common (Common component: Shared libraries and IDE support)

## Release information:

**v1.1.B - 2020-02-16 (current)**

Added the option to insert dates into Excel sheets and a small library for converting dates between Excel and xs:date formats.

**v1.1.A - 2020-02-16**

New logo and minor fixes.

**v1.1 - 2020-02-16**

Added basic support for modifying Excel files and fixed some minor bugs.

**v1.0 - 2019-12-18**

Initial release

**v0.9 - 2019-12-11**

Pre-release to test GitHub pages functionality.

# 1 Description

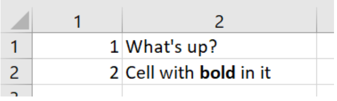
Microsoft Office files are actually zip files with a lot of XML and other stuff inside. It is remarkably difficult to get to the actual contents of them: What is in Excel cell A1B2 or what is written in this Word document. To help with this, the `xtpxlib-xoffice` component contains XProc (1.0) pipelines to extract contents from Excel (`.xlsx`) and Word (`.docx`) files:

The namespace prefix `xtlxo:` is bound to the namespace `http://www.xtpxlib.nl/ns/xoffice` (`xmlns:xtlxo="http://www.xtpxlib.nl/ns/xoffice"`).

## 1.1 Converting from Excel (.xlsx)

The `xtlxo:extract-xlsx` pipeline takes an Excel `.xlsx` file and turns this into much more manageable XML. The schema for the resulting XML format is here.

Take for instance this simple Excel sheet:



| | 1 | 2 |
|---|---|---|
| 1 | 1 | What's up? |
| 2 | 2 | Cell with **bold** in it |

*Figure 1-1 - Excel example sheet*

Running this through the `xtlxo:extract-xlsx` pipeline returns something like:

```
<?xml version="1.0" encoding="UTF-8"?>
<workbook xmlns="http://www.xtpxlib.nl/ns/xoffice"
          href="file:///path/to/excel.xlsx"
          timestamp="2019-12-11T12:50:20.252+01:00">

   <properties>
      … Sheet properties …
   </properties>

   <worksheet name="Sheet1">
      <row index="1">
         <cell index="1" ref="A1">
            <value>1</value>
         </cell>
         <cell index="2" ref="B1">
            <value>What's up?</value>
         </cell>
      </row>
      <row index="2">
         <cell index="1" ref="A2">
            <value>2</value>
            <formula>A1+1</formula>
         </cell>
         <cell index="2" ref="B2">
            <value>Cell with <span class="b">bold</span> in it</value>
         </cell>
      </row>
   </worksheet>

</workbook>
```

## 1.2 Converting to Excel (.xlsx)

The `xtlxo:modify-xlsx` pipeline takes a template Excel `.xlsx` file and changes this. The result will be written to a new Excel file.

It has the following features:

- You can change the individual worksheets in the Excel file. A worksheet is identified by its *name* (the name that is visible on its tab at the bottom of the Excel screen).
- You can identify a cell on a worksheet in three ways:
  - As a direct numeric row/column index
  - As identified by an Excel *name*. You can use this to identify a cell, by row, column, or both. An Excel name can reference an area (or even multiple areas) on a worksheet. To work around this the most upper-left cell in the named area(s) is used.
  - Using an Excel name (like above) and adding a numeric offset.

- You can insert a numeric or string value in a cell.
- You have to specify the type of the data to insert (so you can, for instance, insert a numeric value as a string if necessary)

There are some things you need to take care of creating the template Excel file:

- If you need formatting in a cell you're going to fill with this pipeline (like colors, borders, etc.) there *must* be some contents in the cell. Since this will be overwritten it should not be a problem.
- The same is true for a cell you're referencing by name: It must contain some contents. If you need this contents to be invisible you can always use a single space character.
- Names of worksheets and cells are case-sensitive.

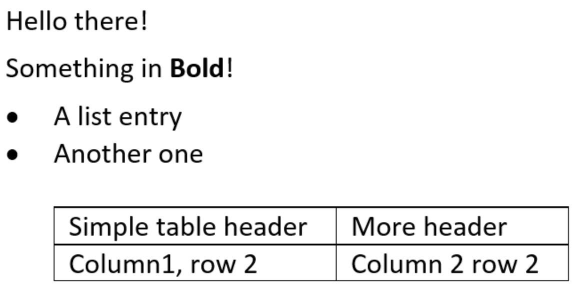
The XML for specifying the changes to the Excel file is quite simple. The schema can be found here. A simple example:

```
<xlsx-modifications xmlns="http://www.xtpxlib.nl/ns/xoffice">

  <worksheet name="TEST">

    <row name="NAMEDCELL" >
      <column name="NAMEDCELL" >
        <number>12345</number>
      </column>
      <column name="NAMEDCELL" offset="1">
        <string>One to the right</string>
      </column>
    </row>

    <row index="1">
      <column index="1">
        <string>Upper left-hand corner</string>
      </column>
      <column index="2">
        <number>6E3</number>
      </column>
    </row>
  </worksheet>

</xlsx-modifications>
```

## 1.3 Converting from Word (.docx)

The `xtlxo:extract-docx` pipeline takes a Word (`.docx`) file and turns this into an understandable XML format. This format is more experimental than the format created by the Excel conversion and there isn't (yet) a schema for it.

As an example take this simple Word file:



Hello there!

Something in **Bold**!

- A list entry
- Another one

| Simple table header | More header |
|---|---|
| Column1, row 2 | Column 2 row 2 |

*Figure 1-2 - Example Word document*

Running this through the `xtlxo:extract-docx` pipeline returns something like:

```
<document xmlns="http://www.xtpxlib.nl/ns/xoffice"
          dref=""
          timestamp="2019-12-11T13:09:15.415+01:00">
   <properties>
      … document properties …
   </properties>

   <p xml:space="preserve">Hello there!</p>
   <p xml:space="preserve">Something in <span class="b">Bold</span>!</p>
   <p class="ListBullet" xml:space="preserve">A list entry</p>
   <p class="ListBullet" xml:space="preserve">Another one</p>
   <p class="ListBullet" indent-left="360" indent-level="0" xml:space="preserve"/>
   <table>
      <tr>
         <td>
            <p class="ListBullet" indent-level="0" xml:space="preserve">Simple table header</p>
         </td>
         <td>
            <p class="ListBullet" indent-level="0" xml:space="preserve">More header</p>
         </td>
      </tr>
      <tr>
         <td>
            <p class="ListBullet" indent-level="0" xml:space="preserve">Column1, row 2</p>
         </td>
         <td>
            <p class="ListBullet" indent-level="0" xml:space="preserve">Column 2 row 2</p>
         </td>
      </tr>
   </table>
   <p class="ListBullet" indent-left="360" indent-level="0" xml:space="preserve"/>

</document>
```

There is an experimental pipeline `xtlxo:create-docx` to create Word documents (using a template Word document for things like styles, margins, etc.). If you feed this the same kind of XML you get from `xtlxo:extract-docx`, the result *should* be a valid, useable Word document with the new text in it. It's currently incomplete (it doesn't do tables for instance). Use at your own risk.

# 2 XProc Libraries

The xtpxlib-xoffice component contains the following XProc (1.0) library modules:

| Module/Pipeline | Description |
|---|---|
| `excel.mod.xpl` | Conversions for Excel (`.xlsx`) files. |
| `word.mod.xpl` | Conversions for Word (`.docx`) documents. |

*Table 2-1 - Module overview*

## 2.1 XProc (1.0) library: excel.mod.xpl

File: `xplmod/excel.mod/excel.mod.xpl`

Conversions for Excel (`.xlsx`) files.

| Prefix | Namespace URI |
|---|---|
| `xtlxo` | `http://www.xtpxlib.nl/ns/xoffice` |

| Step | Description |
|---|---|
| `xtlxo:extract-xlsx` | Extracts the contents of an Excel (`.xlsx`) file in a more useable XML format. |
| `xtlxo:modify-xlsx` | Takes an input/template Excel (`.xlsx`) and a modification specification and from this creates a new modified Excel file that merges these two sources. |

### 2.1.1 Step: xtlxo:extract-xlsx

Extracts the contents of an Excel (`.xlsx`) file in a more useable XML format.

| Port | Type | Primary? | Description |
|---|---|---|---|
| `result` | out | yes | The resulting XML representation of the Excel file. |

| Option | Rq? | Default | Description |
|---|---|---|---|
| `xlsx-href` | yes | | Document reference of the `.xlsx` file to process (must have `file://` in front). |

### 2.1.2 Step: xtlxo:modify-xlsx

Takes an input/template Excel (`.xlsx`) and a modification specification and from this creates a new modified Excel file that merges these two sources.

| Port | Type | Primary? | Description |
|---|---|---|---|
| `source` | in | yes | The modification specification. |
| `result` | out | yes | The output is identical to the input but with `@timestamp`, `@xlsx-href-in` and `@xlsx-href-out` added to the root element. |

| Option | Rq? | Default | Description |
|---|---|---|---|
| `xlsx-href-in` | yes | | URI of the input (template) `.xlsx` file to process |
| `xlsx-href-out` | yes | | URI of the output `.xlsx` file. |

## 2.2 XProc (1.0) library: word.mod.xpl

File: `xplmod/word.mod/word.mod.xpl`

Conversions for Word (`.docx`) documents.

| Prefix | Namespace URI |
|---|---|
| `xtlxo` | `http://www.xtpxlib.nl/ns/xoffice` |

| Step | Description |
|---|---|
| `xtlxo:create-docx` | Turns Word XML (back) into a Word `.docx` file, using a template file. |
| `xtlxo:extract-docx` | Extracts the contents of a Word file in a more useable XML format. |

### 2.2.1 Step: xtlxo:create-docx

Turns Word XML (back) into a Word `.docx` file, using a template file.

The input must be in the format the `xtlxo:extract-docx` pipeline creates.

| Port | Type | Primary? | Description |
|---|---|---|---|
| `source` | in | yes | The Word XML that must be converted to `.docx` format. |
| `result` | out | yes | The document-container (see xtpxlib-container) as written to the final Word file. |

| Option | Rq? | Default | Description |
|---|---|---|---|
| `result-docx-href` | yes | | Document reference where to write the resulting `.docx` file (must have `file://` in front). |
| `template-docx-href` | yes | | Document reference of the template `.docx` file to use (must have `file://` in front). |

### 2.2.2 Step: xtlxo:extract-docx

Extracts the contents of a Word file in a more useable XML format.

| Port | Type | Primary? | Description |
|---|---|---|---|
| `result` | out | yes | The resulting XML representation of the Word file. |

| Option | Rq? | Default | Description |
|---|---|---|---|
| `docx-href` | yes | | Document reference of the `.docx` file to process (must have `file://` in front). |

# 3 XML Schemas

The xtpxlib-xoffice component contains the following XML Schemas:

| Module/Pipeline | Description |
|---|---|
| `xlsx-extract.xsd` | Schema for the result of an Excel (`.xlsx`) data extraction to XML. Format produced by the `xtlxo:extract-xlsx` pipeline. |
| `xlsx-modify.xsd` | Schema for the modification spefication of Excel (`.xlsx`) files. Format used by the `xtlxo:modify-xlsx` pipeline. |

*Table 3-1 - Module overview*

## 3.1 XML Schema: xlsx-extract.xsd

File: `xsd/xlsx-extract.xsd`

Target namespace: `http://www.xtpxlib.nl/ns/xoffice`

Schema for the result of an Excel (`.xlsx`) data extraction to XML. Format produced by the `xtlxo:extract-xlsx` pipeline.

| Element | Description |
|---|---|
| `workbook` | Root element of the Excel workbook extraction XML result. |

## 3.2 XML Schema: xlsx-modify.xsd

File: `xsd/xlsx-modify.xsd`

Target namespace: `http://www.xtpxlib.nl/ns/xoffice`

Schema for the modification spefication of Excel (`.xlsx`) files. Format used by the `xtlxo:modify-xlsx` pipeline.

| Element | Description |
|---|---|
| `xlsx-modifications` | Root element of the Excel modifications specification. |

# 4 XSLT Modules

The xtpxlib-xoffice component contains the following XSLT modules.

| Module/Pipeline | Description |
|---|---|
| excel-conversions.mod.xsl | Excel data specific conversions |
| xoffice.mod.xsl | Library with support code for the MS Office file handling. |

*Table 4-1 - Module overview*

## 4.1 XSLT (3.0): excel-conversions.mod.xsl

File: `xslmod/excel-conversions.mod.xsl`

Excel data specific conversions

| Prefix | Namespace URI |
|---|---|
| xtlxo | http://www.xtpxlib.nl/ns/xoffice |

| Variable | Type | Value | Description |
|---|---|---|---|
| xtlxo:excel-start-date | xs:date | xs:date('1900-01-01') | |

| Function | Description |
|---|---|
| xtlxo:excel-date-to-xs-date() | Converts an Excel date integer into an xs:date. |
| xtlxo:xs-date-to-excel-date() | Converts an xs:date into an Excel date integer. |

### 4.1.1 Function: xtlxo:excel-date-to-xs-date() as xs:date

Converts an Excel date integer into an xs:date.

| Parameter | Type | Description |
|---|---|---|
| excel-value | xs:integer | The Excel date integer to convert. |

### 4.1.2 Function: xtlxo:xs-date-to-excel-date() as xs:integer

Converts an xs:date into an Excel date integer.

| Parameter | Type | Description |
|---|---|---|
| date | xs:date | The xs:date to convert. |

## 4.2 XSLT (2.0): xoffice.mod.xsl

File: `xslmod/xoffice.mod.xsl`

Library with support code for the MS Office file handling.

Depends on the following XSLT modules from the xtpxlib-common component:

- general.mod.xsl
- href.mod.xsl

Yet largely undocumented. Use at your own risk.

| Prefix | Namespace URI |
|---|---|
| xtlxo | http://www.xtpxlib.nl/ns/xoffice |

| Variable | Type | Value | Description |
|---|---|---|---|
| xtlxo:relationship-type-comments | xs:string | 'http://schemas.openxmlformats.org/officeDocument/2006/relationships/comments' | |
| xtlxo:relationship-type-core-properties | xs:string | 'http://schemas.openxmlformats.org/package/2006/relationships/metadata/core-properties' | |
| xtlxo:relationship-type-custom-properties | xs:string | 'http://schemas.openxmlformats.org/officeDocument/2006/relationships/custom-properties' | |
| xtlxo:relationship-type-extended-properties | xs:string | 'http://schemas.openxmlformats.org/officeDocument/2006/relationships/extended-properties' | |
| xtlxo:relationship-type-main-document | xs:string | 'http://schemas.openxmlformats.org/officeDocument/2006/relationships/officeDocument' | |
| xtlxo:relationship-type-shared-strings | xs:string | 'http://schemas.openxmlformats.org/officeDocument/2006/relationships/sharedStrings' | |

| Named template | Description |
|---|---|
| xtlxo:get-properties | |

| Function | Description |
|---|---|
| xtlxo:doc-href() | |
| xtlxo:get-file-root() | |
| xtlxo:get-file-root-from-relationship-id() | |
| xtlxo:get-file-root-from-relationship-type() | |
| xtlxo:get-file-root-relationship() | |
| xtlxo:get-href() | |
| xtlxo:get-rels-href() | |

### 4.2.1 Named template: xtlxo:get-properties

| Parameter | Type | Rq? | Default | Description |
|---|---|---|---|---|
| extracted-office-xml | element(xtlcon:document-container) | | | |

### 4.2.2 Function: xtlxo:doc-href() as xs:string

| Parameter | Type | Description |
|---|---|---|
| href-parts | xs:string+ | |

### 4.2.3 Function: xtlxo:get-file-root() as element()?

| Parameter | Type | Description |
|---|---|---|
| extracted-office-xml | element(xtlcon:document-container) | |
| href-parts | xs:string+ | |
| is-mandatory | xs:boolean | |

### 4.2.4 Function: xtlxo:get-file-root-from-relationship-id() as element()?

| Parameter | Type | Description |
|---|---|---|
| extracted-office-xml | element(xtlcon:document-container) | |
| basefile-href | xs:string | |
| relationship-id | xs:string | |
| is-mandatory | xs:boolean | |

### 4.2.5 Function: xtlxo:get-file-root-from-relationship-type() as element()?

| Parameter | Type | Description |
|---|---|---|
| extracted-office-xml | element(xtlcon:document-container) | |
| basefile-href | xs:string | |
| relationship-type | xs:string | |
| is-mandatory | xs:boolean | |

### 4.2.6 Function: xtlxo:get-file-root-relationship() as element(mso-rels:Relationships)?

| Parameter | Type | Description |
|---|---|---|
| extracted-office-xml | element(xtlcon:document-container) | |
| basefile-href | xs:string | |
| is-mandatory | xs:boolean | |

### 4.2.7 Function: xtlxo:get-href() as xs:string

| Parameter | Type | Description |
|---|---|---|
| elm | element() | |

### 4.2.8 Function: xtlxo:get-rels-href() as xs:string

| Parameter | Type | Description |
|---|---|---|
| basefile-href | xs:string | |