

# The OpenModelica Package Manager

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# Overview

- Part I Current handling of libraries in OpenModelica
- Part II New handling of libraries
- Part III Scripting support
- Part IV OMEdit support
- Part V Conclusion

# How packages are installed in current OpenModelica releases

## ▶ Windows

- ▶ A very large installer (1.4GB) containing all indexed libraries.
- ▶ Actually not true... There were too many for the installer, so only 1/8 of them are now included.
- ▶ Very slow to install the packages, so there is an option to only install some of the few now included.

## ▶ Ubuntu/Debian

- ▶ No library required by default.
- ▶ Option to apt install omlib-modelica-4.0.0 and some of the other indexed libraries.
- ▶ Confusing for new users.

## ▶ MacOS

- ▶ No longer well supported.
- ▶ Had the option of installing all libraries. Large download changing every day.

# Which libraries were indexed?

- ▶ Many libraries tracked only the master branch and might break suddenly.
- ▶ Some libraries tracked older releases but were often outdated.
- ▶ Some libraries tracked multiple versions.
- ▶ When a new library was released, libraries depending on the older version needed to manually handle the uses.
- ▶ For Linux, libraries were updated automatically and might break on the installed release version with no ability to go back in versions.

# Structure of the index

- ▶ <https://github.com/OpenModelica/OMLibraries/blob/master/repos.json>
- ▶ Libraries need to be packaged by OpenModelica, redistribution licenses checked, etc.
- ▶ Manually updating too many things.
- ▶ All libraries are then indexed based on this and packages created. Very slow.

```
[
  {
    "core": true,
    "dest": "BioChem",
    "options": {
      "gittag": "v1.0.2",
      "license": "mpl2"
    },
    "rev": "v1.0.2",
    "url": "https://github.com/OpenModelica/BioChem.git"
  },
  {
    "dest": "Buildings",
    "multitarget": [
      {
        "options": {
          "gitbranch": "master",
          "gittag": "v6.0.0",
          "license": "buildings"
        },
        "rev": "v6.0.0"
      },
      {
        "options": {
          "gitbranch": "master",
          "gittag": "v7.0.0",
          "license": "buildings"
        },
        "rev": "v7.0.0"
      }
    ]
  },
  {
    "url": "https://github.com/lbl-srg/modelica-buildings.git"
  }
]
```

## Part II

# New handling of libraries

# Structure of the libraries to index

- ▶ <https://github.com/OpenModelica/OMPackager/blob/master/repos.json>
- ▶ Similar to the old index.
- ▶ Based on this, a JSON-file with cached information is generated. Updating that index is fast relative to the old system.
- ▶ Need to manually update the support level (new).
- ▶ No license information since OpenModelica will not store any library code on its own servers.

```
{
  "BioChem": {
    "names": ["BioChem"],
    "github": "OpenModelica/BioChem",
    "branches": {"master": "master"},
    "support": [
      ["prerelease", "noSupport"], ["*", "obsolete"]
    ]
  },
  "Buildings": {
    "names": ["Buildings"],
    "github": "lbl-srg/modelica-buildings",
    "branches": {
      "master": "master", "maint_7.0.x": "maint.7.0.x",
      "maint_8.0.x": "maint.8.0.x", "maint_8.1.x": "maint.8.1.x"
    },
    "support": [
      ["prerelease", "noSupport"], [">=7.0.0", "support"],
      [">=5.1.0", "partialSupport"], ["*", "obsolete"]
    ]
  },
  "Modelica_DeviceDrivers": {
    "names": ["Modelica_DeviceDrivers"],
    "github": "modelica-3rdparty/Modelica_DeviceDrivers",
    "branches": {"master": "master"},
    "support": [
      ["prerelease", "noSupport"], [">=1.7.1", "support"],
      ["*", "obsolete"]
    ]
  }
}
```

## Structure of the libraries to index: Special options

- ▶ `ignore-tags` (sometimes the same version was released multiple times or does not contain any Modelica library)
- ▶ `semverTagOverridesAnnotation` (if tagged 3.2.3, assume the package is 3.2.3 even if the maintainer forgot to update the version since 3.2.0)
- ▶ `semverPrereleaseOverridesAnnotation` (if the library has a pre-release in the version, like beta.1 but is tagged with a different pre-release name like beta.2 - use the one in the tag)
- ▶ `git vs github vs URL to zips`
- ▶ `bitbucket-api-downloads-instead-of-tags` (like Github releases)
- ▶ `search-extra-paths` (if not stored at the root of the repository)
- ▶ `standard` (if a tag requires a different Modelica grammar to parse)
- ▶ `singleFileStructureCopyAllFiles` (passed to `index.json`; used for zip-files that do not store everything in a directory)



# Structure of cached metadata

- ▶ <https://github.com/OpenModelica/OMPpackageManager/blob/master/rawdata.json>
- ▶ Does not duplicate information from `repos.json` (support level) since entries are not scanned again later.
- ▶ Contains information about the `uses` and `conversion` annotations.
- ▶ A version number is given to each entry. Although this name is semver-style, the annotations are used to resolve which packages to install later.
- ▶ Old entries are not checked if they are still valid.

```
{
  "Buildings": {
    "refs": {
      "maint.7.0.x": {
        "libs": {
          "Buildings": {
            "convertFromVersion": [
              "6.0.0"
            ],
            "path": "Buildings",
            "provides": [
              "7.0.0",
              "7.0.1",
              "7.0.2"
            ],
            "uses": {
              "Modelica": "3.2.3"
            },
            "version": "7.0.3-maint.7.0.x"
          }
        },
        "sha": "b47602ee2a8d4d74440c18855dea29df0fb909c6"
      }
    }
  }
}
```

# Structure of generated index

- ▶ <https://libraries.openmodelica.org/index/v1/index.json> (now 241 kB)
- ▶ Generated from `repos.json` and `rawdata.json`.
- ▶ Contains support-level (may update without scanning all entries again).
- ▶ Has a URL for a zip-file, hosted somewhere online (Github, self-hosted Gitlab, Bitbucket, or plain URLs).
- ▶ Has dependency information.
- ▶ Downloaded by `updatePackageIndex()` in OMC.

```
{
  "Buildings": {
    "git": "https://github.com/lbl-srg/modelica-buildings.git",
    "versions": {
      "7.0.3-maint.7.0.x": {
        "convertFromVersion": ["6.0.0"],
        "path": "Buildings",
        "provides": ["7.0.0", "7.0.1", "7.0.2"],
        "sha": "b47602ee2a8d4d74440c18855dea29df0fb909c6",
        "support": "noSupport",
        "uses": {"Modelica": "3.2.3"},
        "version": "7.0.3-maint.7.0.x",
        "zipfile": "https://.../modelica-buildings/archive/b47.zip"
      },
      "8.0.0": {
        "convertFromVersion": [
          "7.0.0"
        ],
        "path": "Buildings",
        "sha": "5fa0bed0caa0f27b8ebfa20c1a39e22cdd0f5008",
        "support": "support",
        "uses": {"Modelica": "3.2.3"},
        "version": "8.0.0",
        "zipfile": "https://.../modelica-buildings/archive/5fa.zip"
      }
    }
  }
}
```

## Part III

# Scripting support

# Installing a package

```
updatePackageIndex();getErrorMessage();
installPackage(Buildings, "7.0.0");getErrorMessage();

true
"/home/martin/.openmodelica/libraries/index.json:0:0-0:0:readonly] Notification: Downloaded package index from URL
↳ https://libraries.openmodelica.org/index/v1/index.json.
"

true
"/home/martin/.openmodelica/libraries/ModelicaServices 4.0.0+maint.om/package.mo:0:0-0:0:readonly] Notification: Package
↳ installed successfully (SHA 144b3f853bdbaf0b7de5e127dbe0cfa738adf4f3).
[/home/martin/.openmodelica/libraries/Complex 4.0.0+maint.om/package.mo:0:0-0:0:readonly] Notification: Package installed
↳ successfully (SHA 144b3f853bdbaf0b7de5e127dbe0cfa738adf4f3).
[/home/martin/.openmodelica/libraries/Modelica 3.2.3+maint.om/package.mo:0:0-0:0:readonly] Notification: Package installed
↳ successfully (SHA 093b8cc9ae492e81f0766736ca6e413351319990).
[/home/martin/.openmodelica/libraries/Buildings 7.0.2/package.mo:0:0-0:0:readonly] Notification: Package installed
↳ successfully (SHA 3d0f7d1a9cd14ba54985f024733b27b024774193).
"
```

How does OMC know to install ModelicaServices 4.0.0 instead of 3.2.3?



# How does OMC know to install ModelicaServices 4.0.0 instead of 3.2.3?

```
package ModelicaServices
  annotation (
    version="4.0.0",
    versionDate="2020-06-04",
    dateModified = "2020-06-04 11:00:00Z",
    revisionId="144b3f853 2022-01-01 00:39:47 +0000",
    conversion(
      noneFromVersion="1.0",
      noneFromVersion="1.1",
      noneFromVersion="1.2",
      noneFromVersion="3.2.1",
      noneFromVersion="3.2.2",
      noneFromVersion="3.2.3"));
end ModelicaServices;
```

# Installing a package (exact match)

Not recommended, but can be used to force some known versions of libraries.

```
updatePackageIndex();getErrorMessage();
installPackage(Buildings, "7.0.0", exactMatch=true);getErrorMessage();

true
"/home/martin/.openmodelica/libraries/index.json:0:0-0:0:readonly] Notification: Downloaded package index from URL
↳ https://libraries.openmodelica.org/index/v1/index.json.
"

true
"/home/martin/.openmodelica/libraries/ModelicaServices 3.2.3+maint.om/package.mo:0:0-0:0:readonly] Notification: Package
↳ installed successfully (SHA 093b8cc9ae492e81f0766736ca6e413351319990).
"/home/martin/.openmodelica/libraries/Complex 3.2.3+maint.om/package.mo:0:0-0:0:readonly] Notification: Package installed
↳ successfully (SHA 093b8cc9ae492e81f0766736ca6e413351319990).
"/home/martin/.openmodelica/libraries/Modelica 3.2.3+maint.om/package.mo:0:0-0:0:readonly] Notification: Package installed
↳ successfully (SHA 093b8cc9ae492e81f0766736ca6e413351319990).
"/home/martin/.openmodelica/libraries/Buildings 7.0.0/package.mo:0:0-0:0:readonly] Notification: Package installed
↳ successfully (SHA 903a06999fb514ebc1d0f58ef41b3f6dda0279ed).
"
```

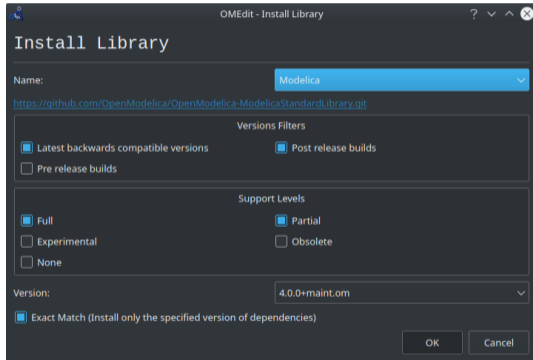
# Part IV

## OMEdit support



# Installing libraries (File⇒Install Library)

- ▶ Filtering based on release/post-release/pre-release.
- ▶ Filtering based on OpenModelica's support level (of the latest release or nightly OpenModelica).
- ▶ Automatically installs dependent libraries.
- ▶ Exact match = do not install newer versions of libraries that state they are backwards-compatible.
- ▶ Ability to install older versions of libraries if necessary.



# Part V

## Conclusion

# Future Work

- ▶ Better support for proxy servers?
- ▶ Dependencies on OpenModelica version (for Modelica/ModelicaServices?)
- ▶ Support for Github releases?
- ▶ Support for git-lfs? Only downloading some of the artifacts?
- ▶ Automatically compiling binary libraries on install?
- ▶ Adding better dependency resolution.
- ▶ Using the same dependency resolution for loading and installing libraries.
- ▶ Also consider conversion scripts.

[www.liu.se](http://www.liu.se)