
LOOT Documentation

Release latest

WrinklyNinja

Jan 25, 2020

| | | |
|-----------|--|-----------|
| 1 | Introduction | 1 |
| 2 | Installation & Uninstallation | 3 |
| 3 | Initialisation | 5 |
| 4 | The Main Interface | 7 |
| 4.1 | The Header Bar | 8 |
| 4.2 | Plugin Cards & Sidebar Items | 9 |
| 4.3 | Filters | 10 |
| 5 | Editing Plugin Metadata | 11 |
| 6 | Editing Plugin Groups | 15 |
| 6.1 | What Are Plugin Groups? | 16 |
| 6.2 | The Groups Editor | 16 |
| 6.3 | Rules For Using Groups | 16 |
| 6.4 | Cycle Avoidance | 17 |
| 7 | Editing Settings | 19 |
| 7.1 | General Settings | 20 |
| 7.2 | Game Settings | 20 |
| 8 | How LOOT Sorts Plugins | 23 |
| 8.1 | Building The Plugin Graph | 24 |
| 8.2 | Topological Sort | 26 |
| 9 | Themes | 27 |
| 10 | Contributing & Support | 29 |
| 11 | Credits | 31 |
| 12 | Version History | 33 |
| 12.1 | 0.15.1 - 2019-12-10 | 33 |
| 12.2 | 0.15.0 - 2019-12-10 | 33 |
| 12.3 | 0.14.6 - 2019-09-28 | 34 |
| 12.4 | 0.14.5 - 2019-07-04 | 35 |

| | | |
|-----------------------------------|-----------------------------|-----------|
| 12.5 | 0.14.4 - 2019-05-11 | 35 |
| 12.6 | 0.14.3 - 2019-02-10 | 36 |
| 12.7 | 0.14.2 - 2019-01-20 | 37 |
| 12.8 | 0.14.1 - 2019-01-19 | 37 |
| 12.9 | 0.14.0 - 2019-01-19 | 37 |
| 12.10 | 0.13.6 - 2018-11-27 | 38 |
| 12.11 | 0.13.5 - 2018-11-26 | 38 |
| 12.12 | 0.13.4 - 2018-09-25 | 39 |
| 12.13 | 0.13.3 - 2018-09-11 | 39 |
| 12.14 | 0.13.2 - 2018-09-10 | 40 |
| 12.15 | 0.13.1 - 2018-06-03 | 40 |
| 12.16 | 0.13.0 - 2018-06-02 | 40 |
| 12.17 | 0.12.5 - 2018-03-19 | 42 |
| 12.18 | 0.12.4 - 2018-02-22 | 42 |
| 12.19 | 0.12.3 - 2018-02-10 | 43 |
| 12.20 | 0.12.2 - 2018-02-05 | 43 |
| 12.21 | 0.12.1 - 2017-12-03 | 44 |
| 12.22 | 0.12.0 - 2017-12-02 | 44 |
| 12.23 | 0.11.0 - 2017-05-13 | 45 |
| 12.24 | 0.10.3 - 2017-01-08 | 46 |
| 12.25 | 0.10.2 - 2016-12-03 | 46 |
| 12.26 | 0.10.1 - 2016-11-12 | 47 |
| 12.27 | 0.10.0 - 2016-11-06 | 48 |
| 12.28 | 0.9.2 - 2016-08-03 | 49 |
| 12.29 | 0.9.1 - 2016-06-23 | 50 |
| 12.30 | 0.9.0 - 2016-05-21 | 50 |
| 12.31 | 0.8.1 - 2015-09-27 | 52 |
| 12.32 | 0.8.0 - 2015-07-22 | 52 |
| 12.33 | 0.7.1 - 2015-06-22 | 53 |
| 12.34 | 0.7.0 - 2015-05-20 | 54 |
| 12.35 | 0.6.1 - 2014-12-22 | 56 |
| 12.36 | 0.6.0 - 2014-07-05 | 56 |
| 12.37 | 0.5.0 - 2014-03-31 | 58 |
| 13 Copyright Notice | | 59 |
| 14 Copyright License Texts | | 61 |
| 14.1 | Boost | 61 |
| 14.2 | cpptoml | 62 |
| 14.3 | Chromium Embedded Framework | 62 |
| 14.4 | github-api | 63 |
| 14.5 | Jed | 64 |
| 14.6 | Jed Gettext Parser | 64 |
| 14.7 | Lodash | 64 |
| 14.8 | LOOT & LOOT API | 65 |
| 14.9 | LOOT Documentation | 76 |
| 14.10 | Marked | 84 |
| 14.11 | nlohmann/json | 84 |
| 14.12 | Polymer | 85 |
| 14.13 | spdlog | 86 |

CHAPTER 1

Introduction

LOOT is a plugin load order optimiser for TES III: Morrowind, TES IV: Oblivion, TES V: Skyrim, TES V: Skyrim Special Edition, Skyrim VR, Fallout 3, Fallout: New Vegas, Fallout 4 and Fallout 4 VR. It is designed to assist mod users in avoiding detrimental conflicts, by automatically calculating a load order that satisfies all plugin dependencies and maximises each plugin's impact on the user's game.

LOOT also provides some load order error checking, including checks for requirements, incompatibilities and cyclic dependencies. In addition, it provides a large number of plugin-specific usage notes, bug warnings and Bash Tag suggestions for Wrye Bash.

While LOOT is able to calculate correct load order positions for the vast majority of plugins using only their content, it cannot do so for all plugins. As such, LOOT provides a mechanism for supplying additional plugin metadata so that it may sort them correctly. An online *masterlist* is provided to supply metadata for many plugins that need it, while users can make their own metadata additions, which are saved in their *userlist*.

LOOT is intended to make using mods easier, and mod users should still possess a working knowledge of mod load ordering. See [Introduction To Load Orders](#) for an overview.

Installation & Uninstallation

LOOT requires Windows 7 or later.

LOOT can be installed either using its automated installer or manually. If you are using the installer, just run it and follow the wizard steps. If installing manually, extract the downloaded archive to a location of your choice, then download and install the [MSVC 2017 x86 redistributable](#) if you don't already have it installed.

If LOOT was installed using the installer, then use the uninstaller linked to in the Start Menu to uninstall LOOT. If LOOT was installed manually:

1. Delete the files you extracted from the location you chose.
2. Delete the LOOT folder in your local application data folder, which can be accessed by entering `%LOCALAPPDATA%` into Windows' File Explorer.

Initialisation

When LOOT is run, it will attempt to detect which of the supported games are installed. If a *default game* has been set, LOOT will run for it, otherwise it will run for the same game as it last ran for. If the relevant game cannot be detected, or if there is no record of the last game LOOT ran for, it will run for the first detected game.

LOOT's initialisation can be customised using command line parameters:

--game=<game folder name>: Set the game to run for. If the supplied game folder name is valid, the default and last game values are ignored. The default folder names are `Morrowind`, `Oblivion`, `Skyrim`, `Skyrim Special Edition`, `Fallout3`, `FalloutNV`, `Fallout4` and `Fallout4VR`.

--loot-data-path=<path>: Set the path to use for LOOT's application data storage. If this is an empty string or not specified, defaults to `%LOCALAPPDATA%\LOOT` on Windows and (in order of decreasing preference) `$XDG_CONFIG_HOME/LOOT`, `$HOME/.config/LOOT` or the current path on Linux.

--auto-sort: Once LOOT has initialised, automatically sort the load order, apply the sorted load order, then quit. If an error occurs at any point, the remaining steps are cancelled. If this is passed, `--game` must also be passed.

If LOOT cannot detect any supported game installs, it will immediately open the *Settings dialog*. There you can edit LOOT's settings to provide a path to a supported game, after which you can select it from the game menu.

Users running LOOT natively on Linux may need to also set the local path for each game, which can only be done by editing LOOT's `settings.toml` file, which can be found in LOOT's data path.

Once a game has been set, LOOT will scan its plugins and load the game's masterlist, if one is present. The plugins and any metadata they have are then listed in their current load order.

If LOOT detects that it is the first time you have run that version of LOOT, it will display a "First-Time Tips" dialog, which provides some information about the user interface that may not be immediately obvious.

CHAPTER 4

The Main Interface

The screenshot shows the main interface of the Skyrim V: Skyrim Special Edition mod manager. The interface is divided into several sections:

- Plugins List (Left):** A list of installed and available plugins, each with a numbered icon and a pencil icon for editing. The list includes:
 - 00 Skyrim.esm
 - 01 Update.esm (DLC)
 - 02 Dawnguard.esm (DLC)
 - 03 HearthFires.esm (DLC)
 - 04 Dragonborn.esm (DLC)
 - FE 000 ccqdrsse001-survivalmode.esl (DLC)
 - FE 001 Blank - Copy.esp
 - FE 002 Blank.esp
 - 05 Bashed Patch, 0.esp (Dynamic Patches)
 - 06 Improved Traps.esp
- General Information (Top Right):** A summary of the current mod state:

| | | | | | |
|---------------------|------------|----------------|---|----------------|----|
| Masterlist Revision | 609a076 | Warnings | 4 | Active Plugins | 10 |
| Masterlist Date | 2018-06-02 | Errors | 0 | Dirty Plugins | 4 |
| | | Total Messages | 6 | Total Plugins | 10 |

 - [Latest LOOT thread.](#)
 - It appears you do not have the [latest version of SKSE64](#). Some mods may require functionality added in the latest version of SKSE64 to work.
- Plugin Details (Middle Right):** A detailed view of the selected plugin, Update.esm (FE610A99). It shows a green checkmark, a crown icon, and a link icon. Below the plugin name, it says "Delev" and lists a warning:
 - [SSEedit](#) found 239 ITM records, 91 deleted references and 2 deleted navmeshes. A cleaning guide is available [here](#).
- Plugin Configuration (Bottom Right):** A configuration panel for Dawnguard.esm. It has tabs for Main, Load After, Requirements, Incompatibilities, Messages, and Bash Tags. The "Main" tab is active, showing:
 - Enable Edits:
 - Group: DLC

4.1 The Header Bar

The header bar provides access to LOOT's main features. Most of these features get disabled while the metadata editor is open, so if you're trying to use an option that is faded out, first close the editor.

4.1.1 Game Menu

LOOT's active game can be changed by clicking on it in the header bar, and selecting another game from the menu that is displayed. Games that have no install detected have their menu items disabled.

4.1.2 Masterlist Update & Sorting

The masterlist update process updates the active game's masterlist to the latest revision at the location given by the game's masterlist repository settings. If the latest revision contains errors, LOOT will roll back to the latest revision that works.

By *default*, sorting first updates the masterlist. LOOT then calculates a load order for your plugins, using their internal data and any metadata they may have. If a cyclic interaction is detected (eg. A depends on B depends on A), then sorting will fail.

Once LOOT has calculated a load order, it is compared with the current load order. If the current and calculated load orders are identical, LOOT will inform the user that no changes were made via a pop-up 'toast' notification. If the calculated load order contains changes, the plugin cards are sorted into that order and the masterlist update and sorting buttons are replaced with **APPLY** and **CANCEL** buttons, which apply and discard the calculated load order respectively. Changing games is disabled until the calculated load order is applied or discarded.

LOOT is able to sort plugins ghosted by Wrye Bash, and can extract Bash Tags and version numbers from plugin descriptions. Provided that they have the `Filter` Bash Tag present in their description, LOOT can recognise filter patches and so avoid displaying unnecessary error messages for any of their masters that may be missing.

Any errors encountered during sorting or masterlist update will be displayed on the "General Information" card.

Load Order Backups

Before a sorted load order is applied, LOOT saves a backup of the current load order as a `loadorder.bak.0` text file in LOOT's data folder for the current game. Up to three load order backups are retained: `loadorder.bak.0` is the backup from the most recent load order change, `loadorder.bak.1` is the second-most recent backup, and `loadorder.bak.2` is the third-most recent backup.

4.1.3 Search

The search toolbar is displayed by clicking the search icon in the header bar, or using the `Ctrl-F` keyboard shortcut. It may be closed using the close button at the right of the toolbar.

Searching is performed as-you-type, or when the Enter key is pressed. All content visible on the front of plugin cards is searched, so the results may be affected by any filters you have active.

The plugin card list will be scrolled to the first card that contains a match. Matches may be scrolled between using the up and down chevron buttons, and the current match and the number of matches are displayed between them and the search input.

4.1.4 Main Menu

A few items in the main menu are not self-explanatory:

- “Redate Plugins” is provided so that Skyrim and Skyrim Special Edition modders may set the load order for the Creation Kit. It is only available for Skyrim, and changes the timestamps of the plugins in its Data folder to match their current load order. A side effect of changing the timestamps is that any Steam Workshop mods installed will be re-downloaded.
- “Copy Load Order” copies the displayed list of plugins and the decimal and hexadecimal indices of active plugins to the clipboard. The columns are:
 1. Decimal load order index
 2. Hexadecimal load order index
 3. Hexadecimal light master index
 4. Plugin name
- “Copy Content” copies the data displayed in LOOT’s cards to the clipboard as YAML-formatted text.
- “Refresh Content” re-scans the installed plugins’ headers and regenerates the content LOOT displays. This can be useful if you have made changes to your installed plugins while LOOT was open. Refreshing content will also discard any CRCs that were previously calculated, as they may have changed.

Users running LOOT natively on Linux must have `xclip` installed in order to use the clipboard copy features.

4.2 Plugin Cards & Sidebar Items

Each plugin is displayed on its own “card”, which displays all the information LOOT has for that plugin, and provides access to plugin-specific functionality, including editing its metadata. Each plugin also has an item in the sidebar’s PLUGINS tab. The sidebar item contains the plugin’s name and icons for plugins that load archives or have user metadata. It also displays the plugin’s in-game load order index if the plugin is active. Light masters also have their light master index displayed below their load order index. Clicking on a plugin’s sidebar item will jump to its card, while double-clicking will jump to its card and open it in the metadata editor.

The plugin card’s header holds the following information, some of which is only displayed if applicable:

- The “Active Plugin” icon.
- The plugin name.
- The plugin’s version number, extracted from its description field.
- The plugin’s CRC (Cyclic Redundancy Checksum), which can be used to uniquely identify it. CRCs are only displayed after they have been calculated during conflict filtering or sorting, except the the CRC of the game’s main master file, which is never displayed.
- The “Master File” icon.
- The “Light Master File” icon.
- The “Empty Plugin” icon.
- The “Loads Archive” icon.
- The “Verified clean” icon.
- The “Has User Metadata” icon.
- The plugin menu button, which provides access to metadata-related features for the plugin. These are explained in later sections.

Bash Tag suggestions and messages are displayed below the plugin card's header.

If LOOT suggests any Bash Tags to be added, they will be displayed in green text, while any Bash Tags to be removed will be displayed in red text. Bash Tags that are already listed in the plugin's description field will be displayed in silver text. Users generally don't need to do anything with this information, as if they're using Wrye Bash it will automatically apply LOOT's suggestions, and if they're not using Wrye Bash then this information doesn't apply.

LOOT's plugin messages are a valuable resource, acting as a means of providing users with information that they might otherwise not obtain. It is important for a stable, healthy game that you act on any messages that require action. If you think a message suggests an unnecessary action, report it to an official LOOT thread. If you encounter a message that is non-conditional, ie. it suggests an action but is still displayed on subsequent runs of LOOT after the action has been carried out, also report it to an official LOOT thread, so that it can be made conditional.

4.3 Filters

Clicking the FILTERS tab in the sidebar will replace the sidebar's plugin list with a list of filter toggles that can be applied to hide various combinations of plugins and other content. The available filter toggles are:

Hide version numbers Hides the version numbers displayed in blue next to those plugins that provide them.

Hide CRCs Hides the CRCs displayed in orange next to those plugins that provide them.

Hide Bash Tags Hides all Bash Tag suggestions.

Hide notes Hides all plugin messages that have the Note: prefix, or the equivalent text for the language selected in LOOT's settings.

Hide 'Do not clean' messages Hides all messages that contain the text Do not clean, or the equivalent text for the language selected in LOOT's settings.

Hide all plugin messages Hides all plugin messages.

Hide inactive plugins Hides all plugins that are inactive.

Hide messageless plugins Hides all plugins that have no visible messages.

The filter toggles have their states saved on quitting LOOT, and they are restored when LOOT is next launched. There are also two other filters in the sidebar tab:

Show only conflicting plugins for... This hides any plugins that don't have the filter input value present in any of the text on their cards.

Show only plugins with cards that contain... This filters the plugin cards displayed so that only plugins which conflict with this plugin will be visible. If this plugin loads an archive, other plugins that load archives which may contain conflicting resources are also displayed. Sorting with the conflict filter active will first deactivate it.

Editing Plugin Metadata

LOOT uses metadata to supply plugins with messages and Bash Tag suggestions, and to help it sort plugins that it can't otherwise sort correctly. Users can add to their plugins' metadata through the metadata editor panel, and plugins with user metadata are indicated with a "Has User Metadata" icon.

The editor panel is accessed by clicking the "Edit Metadata" item in a plugin's menu, or by double-clicking a plugin name in the sidebar. Only one plugin's metadata can be edited at a time. While the editor panel is open, the plugin sidebar also displays any non-default plugin groups, to aid setting new group memberships. The editor can be resized by grabbing the top of the editor's header and dragging it up or down.

The editor's header displays the name of the plugin being edited, "Save Metadata" and "Cancel" buttons, and a row of tabs. The MAIN tab's page contains the following inputs:

- The "Enable Edits" toggle must be on for LOOT to use any user-added metadata during sorting, otherwise it will be ignored.
- The "Group" dropdown sets the group that the plugin belongs to, which is the "default" group by default. If a plugin's group is set by user metadata, the non-user-metadata value will be highlighted in bold dark blue text.

Plugin groups are used to concisely load groups of plugins after others. The dropdown lists all defined groups: to define new groups or edit existing groups, use the Groups Editor.

The other tab pages contain metadata tables, which are detailed below. New rows can be added, and existing user-added rows can be removed, though rows containing metadata from the masterlist cannot. The LOAD AFTER, REQUIREMENTS and INCOMPATIBILITIES tables can have rows added by dragging and dropping plugins from the sidebar into the table area.

LOAD AFTER This is a list of plugins which, if present, the current plugin must load after, but which are not required. This metadata can be used for resolving specific compatibility issues. Each entry has three fields:

- The filename is the path, relative to the game's Data folder, of the file to be checked for. This field is required. It gives the filenames of installed plugins as autocomplete suggestions.
- The display name is optional, and if specified will be used instead of the filename in any error messages that are displayed if a problem is encountered relating to the file.
- The condition is the optional condition string that is used to determine if the file should be checked for. If left blank, the file will always be checked for. Condition strings are a relatively advanced part of LOOT's

functionality, and their syntax is covered in the Metadata Syntax documentation.

REQUIREMENTS This is a list of files that are required by the current plugin for it to function correctly. The current plugin will be loaded after any plugins listed. LOOT will also display an error message if any of the listed files are missing. Any file, not just plugins, can be listed here, and each entry has the same three fields as for the load after table.

Note that listing a plugin's masters as requirements is unnecessary, as LOOT already checks them.

INCOMPATIBILITIES This is a list of files that are incompatible with the plugin. LOOT will display an error message if any of the listed files are found. Any file, not just plugins, can be listed here, and each entry has the same three fields as for the load after table.

MESSAGES A list of messages that are to be displayed for the plugin in LOOT's report. These have no bearing on a plugin's position in the load order. Each message has four fields:

- The type is fairly self-explanatory, and is used to provide messages of varying severity with appropriate emphasis in LOOT's report.
- The content is the actual message text.
- The condition is, like for the corresponding file field, used to determine if the message should be displayed. If left blank, the message is displayed.
- The language is the language LOOT runs in that the message will be displayed for. This field has no effect for user-added messages, as they cannot contain multiple localisations, and LOOT will always display messages that have only one localisation, even if it doesn't match the current language.

If a message's condition determines that it should not be displayed, then it will not be displayed, no matter the language. However, if a message's condition determines that it should be displayed, but the language is specified and doesn't match the language LOOT is running in, the message will not be displayed.

BASH TAGS A list of Bash Tags. These are used by Wrye Bash when generating a Bashed Patch, and are detailed in [Wrye Bash's readme](#). LOOT's metadata includes Bash Tag addition and removal suggestions, and any Bash Tags that came with the plugin are also displayed.

As LOOT can suggest Bash Tags be added or removed, it is possible for the same Tag to appear twice, being suggested for addition and removal. In such cases, removal overrides addition.

Each Bash Tag has three fields:

- The state determines whether the Tag is to be suggested for addition or removal.
- The name is the actual Bash Tag name. The field gives autocomplete suggestions for Bash Tags supported by the current game.
- The condition decides if the Tag is to be suggested or not. It functions as for files and messages.

If a plugin's masters are missing, an error message will be displayed for it. Filter patches are special mods designed for use with a Bashed Patch that do not require all their masters to be present, and so any plugin with the Filter tag applied and missing masters will not cause any errors to be displayed.

DIRTY PLUGIN INFO A list of dirty plugin CRCs and related information. Each row has five fields:

- The CRC of the dirty plugin.
- The ITM Count for the dirty plugin.
- The number of Deleted References that the dirty plugin contains.
- The number of Deleted Navmeshes that the dirty plugin contains.
- The name of the Cleaning Utility to use to clean the dirty plugin.

LOOT uses the information supplied to construct a warning message for the plugin if it matches any of the given CRCs.

CLEAN PLUGIN INFO A list of clean plugin CRCs and the utility they were verified clean by. Each row has two fields:

- The CRC of the clean plugin.
- The name of the Cleaning Utility to use to verify that the plugin is clean.

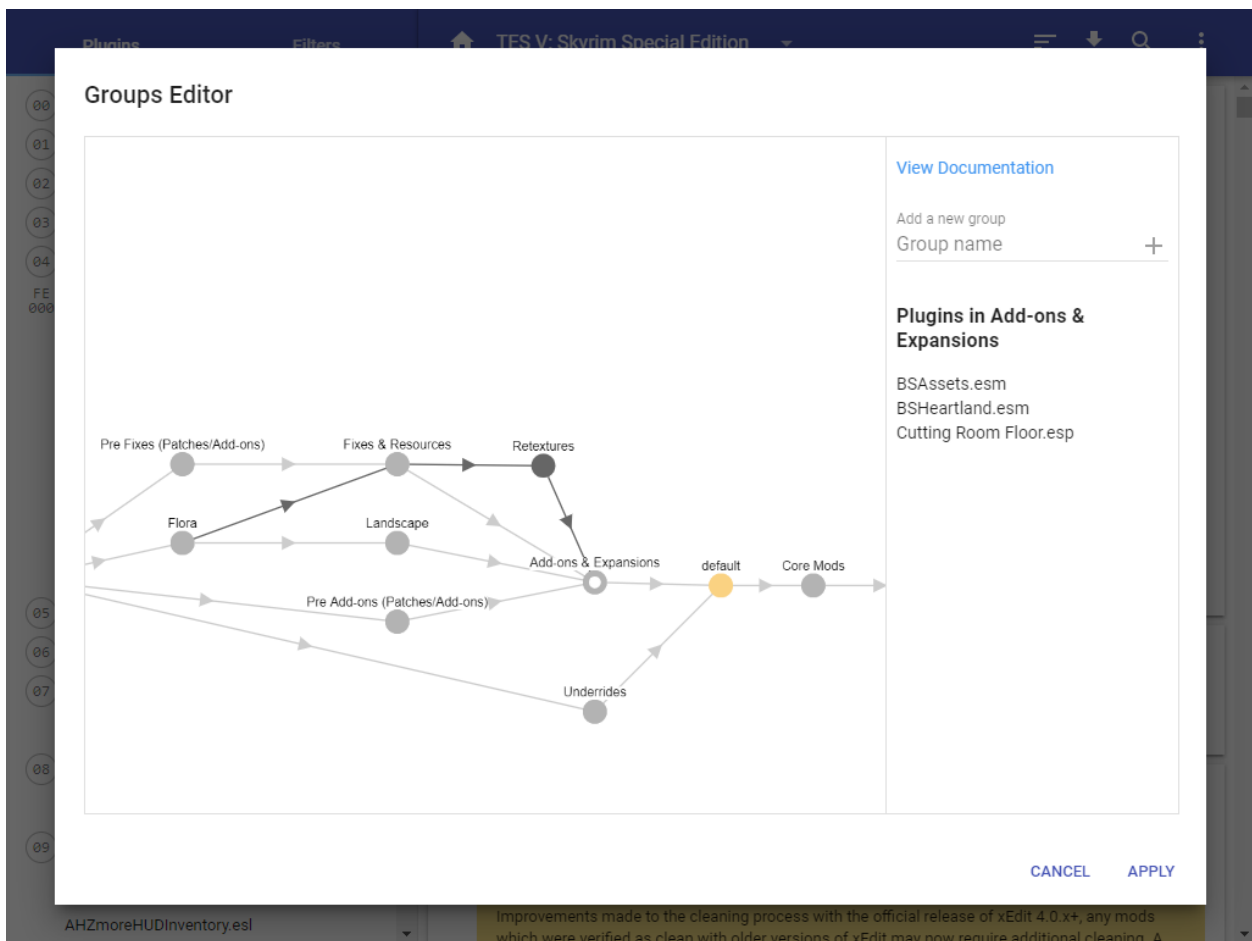
LOOT uses the information supplied to display an icon on the plugin's card if it matches any of the given CRCs.

LOCATIONS A list of URLs that the mod to which the plugin belongs can be found at. This metadata is not currently used by LOOT, but it may be useful to record it. Each location has two fields:

- The URL at which the plugin's parent mod can be found.
- The Name you wish to give the URL.

CHAPTER 6

Editing Plugin Groups



6.1 What Are Plugin Groups?

LOOT assigns each plugin to one plugin group, with plugins belonging to the `default` group by default. Each group has a name and a list of zero or more other groups it loads after. In this way, it's possible to concisely load groups of plugins after other groups of plugins.

Group load order is transitive, i.e. given three groups A, B and C, if C loads after B and B loads after A, then plugins in group C will load after plugins in group A even if no plugins in group B are installed.

6.2 The Groups Editor

A group must be defined before plugins can belong to it, and defining and editing groups is done in the Groups Editor, which can be accessed through the main menu.

The groups editor consists of an interactive graph displaying all defined groups and their load after metadata, and a sidebar containing input for defining new groups and a list of plugins in the currently selected group.

- Groups are displayed as circular nodes in the graph, labelled with their names.
 - Groups that load after no other groups are displayed in blue.
 - Groups that no other groups load after are displayed in green.
 - The `default` group is displayed in orange.
- Load after metadata is displayed as lines (edges/vertices) between nodes, pointing from the earlier group to the later group.
- Metadata defined in the masterlist is greyed out, while user-defined metadata is not.

New load after metadata can be added by clicking on one group and dragging a line from the white circle that appears to another group.

Clicking on a group will cause any installed plugins in that group to be listed in the sidebar.

Right-clicking a load after metadata line will remove that load after metadata, and right-clicking a group will remove it. Masterlist metadata cannot be removed. A group cannot be removed if any installed plugins belong to it.

The graph can be zoomed in and out of using your mouse's scroll wheel. Left-clicking and dragging an empty space will move the whole graph, while left-clicking and dragging a node will move it. Multiple nodes can also be selected by left-clicking with the Ctrl key held down, then dragging the box that appears over the nodes to select. The selected nodes can then be dragged around together.

6.3 Rules For Using Groups

The groups editor enforces a few rules:

- A group cannot load after itself.
- A group cannot load after another group if the other group does not exist.
- It's not possible to delete groups that are defined in the masterlist.
- It's not possible to remove 'load after' entries from a group if they were defined in the masterlist.

Another rule that the groups editor cannot enforce is that **group metadata must not introduce cycles**. A simple example of cyclic groups is where group B loads after group A, and group A loads after group B.

A more complex example involving other types of metadata is where

- `A.esp` is in the `early` group
- `B.esp` is in the `mid` group
- `C.esp` is in the `late` group
- `A.esp` has `C.esp` as a master
- The `late` group loads after the `mid` group, which loads after the `early` group.

This will cause a cyclic interaction error when sorting, because the groups say that the load order should be

1. `A.esp`
2. `B.esp`
3. `C.esp`

but `A.esp` must load after `C.esp` to satisfy its dependency.

6.4 Cycle Avoidance

Groups must not introduce cycles, but in practice this can be quite hard to ensure. LOOT helps by avoiding cycles that have an “obvious” solution.

- If group membership contradicts where a plugin’s masters, master flag, load after or requirement metadata say that plugin should load relative to another plugin, the plugins’ groups’ relationship will not be enforced. For example, if:
 - `dependent.esp` belongs to group `early`
 - `master.esp` belongs to group `late`
 - `master.esp` is a master of `dependent.esp`
 - The `late` group loads after the `early` group.

`dependent.esp` must load after `master.esp` due to the former being a master of the latter, but their groups suggest that `master.esp` must load after `dependent.esp`, so the group metadata is ignored for that pair of plugins.

- In addition, if one of a pair of plugins with contradictory groups is the `default` group, that plugin will also have its group metadata ignored for all plugins in all groups that load between `default` and the other plugin’s group.

For example, if:

- `A.esp` is in the `default` group
- `B.esp` is in the `mid` group
- `C.esp` is in the `late` group
- `A.esp` has `C.esp` as a master
- The `late` group loads after the `mid` group, which loads after the `default` group.

This will not cause a cycle, as:

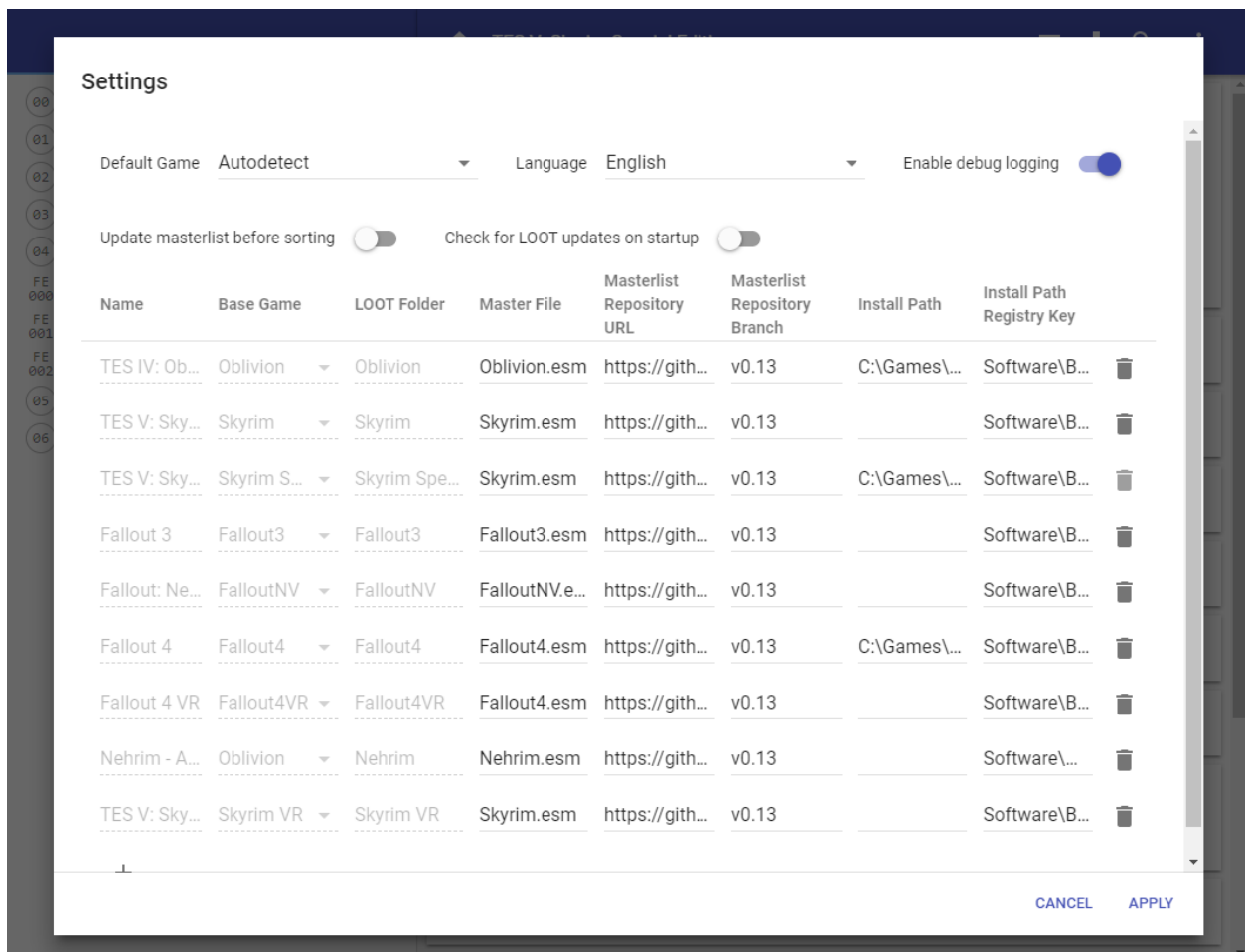
- `A.esp`’s group is ignored for `C.esp` as their groups contradict `C.esp` being a master of `A.esp`
- `A.esp`’s group is ignored for `B.esp` as `B.esp` is in the `mid` group, which loads between `default` and `late`.

The sorted load order is therefore:

1. B.esp
2. C.esp
3. A.esp

This is very similar to the example given in the previous section which *did* cause a cycle: the only difference is that the `early` group is now default.

Editing Settings



LOOT's settings may be accessed through the main menu.

7.1 General Settings

Default Game If set to something other than Autodetect, this overrides game autodetection. If the game specified is not detected, LOOT falls back to autodetection.

Language Controls the language LOOT uses. Any plugin messages that do not have translations in the selected language will be displayed in English, if available, or in their available language otherwise.

Theme Controls the theme LOOT loads. If the specified theme is not found, LOOT falls back to the default theme.

Enable Debug Logging If enabled, writes debug output to `%LOCALAPPDATA%\LOOT\LOOTDebugLog.txt`. Debug logging can have a noticeable impact on performance, so it is off by default.

Update masterlist before sorting If checked, LOOT will update its masterlist, should an update be available, before sorting plugins.

7.2 Game Settings

LOOT's game-specific settings can be customised in the games table. New game profiles can be added, making it easy to use LOOT across multiple copies of a game, including total conversion mods. LOOT ships with settings for the "Nehrim - At Fate's Edge" total conversion mod as an example. Game profiles can also be deleted, though the active game cannot have its profile deleted, and LOOT will recreate the profiles for the base games it supports (Morrowind, Oblivion, Skyrim, Skyrim Special Edition, Skyrim VR, Fallout 3, Fallout: New Vegas, Fallout 4 and Fallout 4 VR) when it is next run.

Name The name of the game, or another identifying text, that is displayed in menus and the LOOT's title bar.

Base Game Type Every game LOOT runs for must use the plugin file format and load order system of one of the following games:

- TES III: Morrowind
- TES IV: Oblivion
- TES V: Skyrim
- TES V: Skyrim Special Edition
- TES V: Skyrim VR
- Fallout 3
- Fallout: New Vegas
- Fallout 4
- Fallout 4 VR

LOOT Folder Name The sub-folder which LOOT uses to store the game's files in. Each game must be given a unique sub-folder.

Master File The game's main master file. This is checked for when detecting if the game is installed.

Masterlist Repository URL The URL of the repository that LOOT uses to update its local copy of the masterlist. If left empty, masterlist updating will be skipped.

Masterlist repositories are [Git](#) repositories that are configured to allow unauthenticated read access and contain a masterlist file named `masterlist.yaml` in their root directory. The LOOT team maintains a set of official repositories for the games that LOOT supports by default.

Masterlist Repository Branch The branch of the masterlist repository that LOOT should get masterlist updates from.

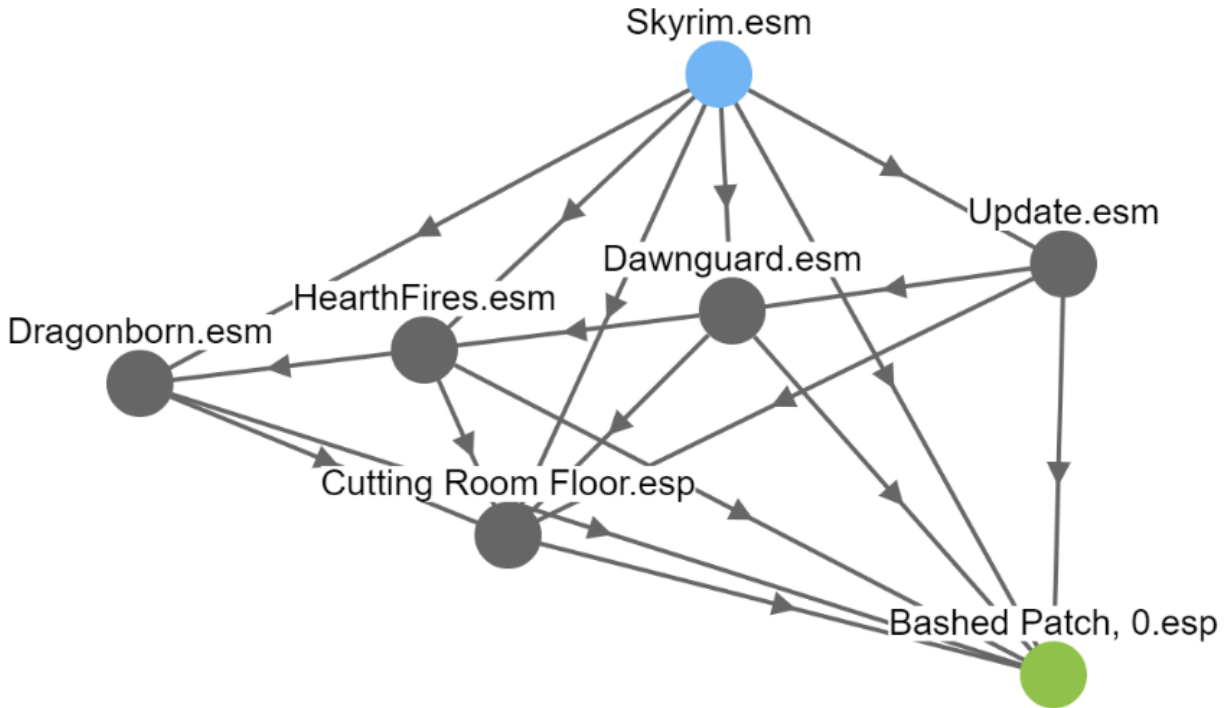
Install Path The path to the game's folder, in which the Data folder lies. Either this or a registry key must be supplied.

Install Path Registry Key The registry key, in `HKEY_LOCAL_MACHINE`, that contains the install path of the game. This is used to obtain the install path if LOOT has no previous record of the game's install path, or LOOT's stored install path is invalid. Either this or an install path must be supplied.

How LOOT Sorts Plugins

LOOT sorts plugins according to a set of rules that dictate how two plugins load relative to one another. An example rule could be “Cutting Room Floor.esp must load after Skyrim.esm”. LOOT derives rules from various data sources: one source for the example rule could be the plugins’ master flag fields: `Skyrim.esm` has its master flag set, and `Cutting Room Floor.esp` does not. Another source could be the plugins’ master fields: `Cutting Room Floor.esp` has `Skyrim.esm` as a master.

LOOT represents these rules in a graph, where each point (or *vertex*) represents a plugin, and each line (or *edge*) joins two points, going from the plugin that loads earlier to the plugin that loads later. Visualised, a simple set of rules on a small load order looks like this:



It may seem like there are a lot of edges in that image, but a more realistic load order graph could contain ~ 20 times as many vertices and ~ 1000 times as many edges.

8.1 Building The Plugin Graph

The plugin graph is constructed in a specific way, partly to ensure that sorting is stable (i.e. it doesn't give you different results every time).

8.1.1 Hard Rules

First the 'hard' rules, which **must** be followed, are applied. For each plugin, going in lexicographical (like alphabetical, but extended to cover digits and other symbols) order:

1. If the plugin has its master flag set, edges are added going from it to every other plugin that does not have its master flag set.
2. If the plugin has any masters, edges are added going from each of them to the plugin.
3. If the plugin has any requirements metadata, edges are added going from each required plugin to the plugin.
4. If the plugin has any "load after" metadata, edges are added going from each "load after" plugin to the plugin.

Some games, like the various versions of Skyrim and Fallout 4, hardcode the positions of some plugins. To take this into account when sorting, LOOT adds hard rules for them. For each plugin that has a hardcoded position, going from the first/earliest hardcoded position to the last/latest position, an edge is added going from that plugin to every other plugin, unless that other plugin is hardcoded to load in an earlier position.

In the example graph image above, all the edges apart from the one between `Cutting Room Floor.esp` and `Bashed Patch, 0.esp` could be due to hard rules:

- `Skyrim.esm` is a master of all the other plugins.
- `Skyrim.esm`, `Update.esm`, `Dawnguard.esm`, `HearthFires.esm` and `Dragonborn.esm` are all hardcoded to load in that order.
- All of the `*.esm` plugins have their master flag set, and both of the `*.esp` plugins do not have it set.

8.1.2 Group Rules

At this point, all hard rules have been applied. Group rules are applied next. This part has the most complex logic, though the ideas behind it are relatively simple. To summarise, each plugin belongs to a group, and groups can load after other groups. If group C loads after group B, and group B loads after group A, this means that all the plugins in group C load after all the plugins in groups A and B.

However, group rules are ‘soft’ rules, so can be ignored to avoid cyclic interactions. A cyclic interaction occurs when following the rules results in a load order that loops back on itself, e.g. the two rules “B loads after A” and “A loads after B” are cyclic. If one of those rules is a hard rule and the other is a group rule, LOOT will ignore the group rule to avoid the cycle. There are also a few other cases in which LOOT can avoid a cycle involving group rules, which are detailed in [Editing Plugin Groups](#).

It’s not always possible for LOOT to choose which plugin’s group metadata to ignore, and it’s often impractical to know all of the hard and group rules that a plugin may be involved in, so plugin grouping is a relatively common source of cyclic interaction errors.

Anyway, after applying all the hard rules, LOOT applies all the group rules it can for each plugin in lexicographical order, avoiding cycles by ignoring those groups that it needs to.

In the example graph image above, the edge from `Cutting Room Floor.esp` to `Bashed Patch, 0.esp` is due to a group rule, because `Bashed Patch, 0.esp` is in a group that loads after `Cutting Room Floor.esp`’s group.

8.1.3 Overlap Rules

Overlap rules are applied after group rules, and have lower priority. They are also soft rules, and are ignored as necessary to avoid cyclic interactions. Two plugins are said to overlap if they both contain a copy of a record. They don’t necessarily have to make any edits to the record for there to be an overlap, it just needs to be in both plugins.

If two plugins overlap, and one overrides more records than the other, then the rule is to load the plugin that overrides fewer records after the other plugin. This is done to help maximise the effect that each plugin has. If the two plugins override the same number of records, the overlap is ignored and no rule exists.

Each pair of plugins is checked in lexicographical order for overlap, and all overlap rules are applied, unless adding a rule would cause a cycle.

Morrowind plugins that have one or more masters that are not installed have their total record count used in place of their override record count, as unlike for other games, a Morrowind plugin’s override records can only be counted by comparing the plugin against its masters.

8.1.4 Tie Breaks

At this point LOOT might be ready to calculate a load order from the graph, but to ensure a stable sort, it needs to make sure there is only one possible path through the graph that visits every plugin. For example, going back to the image above, if there was no edge between `Cutting Room Floor.esp` and `Bashed Patch, 0.esp`, the load order could be:

```
Skyrim.esm
...
Cutting Room Floor.esp
Bashed Patch, 0.esp
```

or it could be:

```
Skyrim.esm
...
Bashed Patch, 0.esp
Cutting Room Floor.esp
```

as there would be no way to decide which plugin to put last. This could mean that LOOT's sorting would be unstable, picking a different result each time, which isn't good.

To avoid this, LOOT loops through each pair of plugins (again, in lexicographical order) and checks if there is a path (i.e. a series of edges added by rules) going from one to the other. If there is no path, LOOT adds a tie-break edge.

The direction of the tie-break edge, i.e. which plugin loads after the other, is decided by a few pieces of data:

1. If one plugin has a position defined in the current load order and the other plugin does not (e.g. it is newly-installed), then the latter loads after the former.
2. If both plugins have positions in the current load order, they retain their existing relative order, i.e. the plugin that currently loads later still loads later.
3. If neither plugin has a position defined in the current load order, their lowercased filenames are lexicographically compared, ignoring their file extensions. The plugin with the filename that sorts later loads after the other plugin. For example, `A.esp` and `B.esp` would load in that order.

It's possible for that logic to be unable to decide how to break the tie: in that case, no tie-break edge is added, as another edge added between another pair may also break the unresolved tie. Such cases are highly unlikely to occur though, and pretty much have to be intentionally created.

8.2 Topological Sort

At this point the plugin graph is now complete. Before calculating a load order from the graph, the graph is checked for cycles: if one is found, a sorting error occurs. If no cycles are found, then the graph is topologically sorted, which produces a path through the graph's vertices that visits each vertex exactly once. This path is the calculated load order.

The topological sort of the example graph is:

```
Skyrim.esm
Update.esm
Dawnguard.esm
HearthFires.esm
Dragonborn.esm
Cutting Room Floor.esp
Bashed Patch, 0.esp
```

CHAPTER 9

Themes

LOOT's user interface has CSS theming support. A dark theme is provided with LOOT: to use it, select it in the Theme dropdown in LOOT's settings dialog.

Themes are installed in the `resources/ui/css` directory, relative to `LOOT.exe`. Theme CSS files must be named `<theme name>.theme.css` to be detected as such by LOOT. A working knowledge of CSS is required to create new themes, though the provided dark theme CSS file is commented to provide some assistance.

CHAPTER 10

Contributing & Support

LOOT is very much a community project, and contributions from its users are very welcome, whether they be metadata, translations, code or anything else. The best way to contribute is to [make changes yourself](#) at GitHub! It's the fastest way to get changes you want applied, and you'll get your name automatically immortalised in our [credits](#).

If you encounter an issue with LOOT, check the [Frequently Asked Questions](#) page in case a solution is available there. Otherwise, general discussion and support takes place in LOOT's official forum thread, which is linked to on [LOOT's homepage](#).

If you want to submit metadata, the easiest way to do so is to add the metadata to your own LOOT install, then use the Copy Metadata feature to easily get it in a form that you can then edit into a masterlist on GitHub or post in the official forum threads.

Information on dirty plugins is very welcome, but for such information to be useful we require at least the filename and the CRC of the dirty plugin. The CRC may be calculated using Wrye Bash or 7-Zip, with other sources being unverified as correct. In the case of 7-Zip, the "CRC checksum for data" is the one required. Any other information, such as the ITM record and deleted reference counts, is very welcome.

CHAPTER 11

Credits

LOOT is developed on [GitHub](#), and a full list of GitHub contributors may be found [here](#).

LOOT's masterlists were largely converted from [BOSS](#)'s masterlists, and so credit is due to the very large number of sources and people who have contributed to them.

In addition, the following are credited with application-related support:

- Original icon: jonwd7
- Translations:
 - Brazilian Portuguese: Kassane
 - Chinese: bluesky404
 - Czech: ThePotatoChronicler
 - Danish: Freso
 - Finnish: 3ventic
 - French: Kaos
 - German: lpradel
 - Japanese: kuroko
 - Korean: SteamB23
 - Polish: Łukasz Niemczyk
 - Russian: Tokc.D.K.
 - Spanish: Sharlikran
 - Swedish: Mikael Hiort af Ornäs
- Testing: Too many to list, thank you all!

LOOT uses the [Boost](#), [cpptoml](#), [github-api](#), [Jed](#), [Jed Gettext Parser](#), [lodash](#), [Marked](#), [nlohmann/json](#), [Polymer](#) and [spdlog](#) libraries, and the [Chromium Embedded Framework](#).

Only application history is recorded here. A full history of masterlist changes may be viewed by browsing the GitHub repositories.

12.1 0.15.1 - 2019-12-10

12.1.1 Fixed

- The “Open Groups Editor” menu item could not be translated (this wasn’t properly fixed in v0.15.0).
- The changelog for the 0.15.0 release was missing.

12.2 0.15.0 - 2019-12-10

12.2.1 Fixed

- The “Open Groups Editor” menu item could not be translated.
- The “Open Groups Editor” menu item was not disabled if game loading failed.
- LOOT would fail to select a game if the preferred game was not installed but another game was.
- LOOT was unable to extract versions from plugin descriptions containing `version:` followed by whitespace and one or more digits. Via libloot.
- LOOT did not error if masterlist metadata defined a group that loaded after another group that was not defined in the masterlist, but which was defined in user metadata. This was unintentional, and now all groups mentioned in masterlist metadata must now be defined in the masterlist. Via libloot.

12.2.2 Changed

- The GUI is now better at handling initialisation failures.
- The “Add New Row” icon button in editable tables has been replaced by text-only button, and its implementation tweaked to reduce the chance of breakage.
- The range of FormIDs that are recognised as valid in light masters has been extended for Fallout 4 plugins, from between `0x800` and `0xFFF` inclusive to between `0x001` and `0xFFF` inclusive, to reflect the extended range supported by Fallout 4 v1.10.162.0.0. The valid range for Skyrim Special Edition plugins is unchanged. Via libloot.
- LOOT now supports v0.15 of the metadata syntax. Via libloot.
- Updated the German translation.
- Updated libloot to v0.15.1.
- Updated nlohmann/json to v3.7.3.
- Updated spdlog to v1.4.2.

12.2.3 Removed

- The ability to specify the HTML file URL to load as a CLI parameter, as it could cause users to see a white screen on launch if they ran LOOT with an unrecognised CLI parameter.

12.3 0.14.6 - 2019-09-28

12.3.1 Added

- Support for TES III: Morrowind.
- Support for selecting a theme in LOOT’s settings dialog, making it easier to use the dark theme that LOOT has bundled since v0.9.2.
- Support for specifying a font family to use per language, so that different languages can use different fonts. The default font families are `Roboto`, `Noto`, `sans-serif`. Korean prefixes this with `Malgun Gothic`, Chinese with `Microsoft Yahei`, and Japanese with `Meiryo`. Font families are specified in the new `languages` table in LOOT’s `settings.toml`.

12.3.2 Fixed

- Regular expressions in condition strings are now prefixed with `^` and suffixed with `$` before evaluation to ensure that only exact matches to the given expression are found. Via libloot.
- LOOT’s taskbar icon would sometimes be displayed with a black bar down its left side.

12.3.3 Changed

- The languages that LOOT supports are no longer hardcoded: the list is now read from the new `languages` table in LOOT’s `settings.toml`. A supported language is expected to have a Gettext MO file at `resources/l10n/<ISO code>/LC_MESSAGES/loot.mo`, relative to `LOOT.exe`.
- Updated libloot to v0.14.10.

- Updated nlohmann/json to v3.7.0.
- Updated JS package dependencies.

12.4 0.14.5 - 2019-07-04

12.4.1 Fixed

- Filename comparisons implemented case-insensitivity incorrectly, which caused LOOT to not properly recognise some files, depending on the characters in their filename and the current locale. On Windows, LOOT now implements case-insensitivity using the same case folding rules as Windows itself. On Linux, LOOT uses the locale-independent case folding rules provided by the ICU library, which are very similar but not identical to the rules used by Windows.
- Evaluating *version()* and *product_version()* conditions will no longer error if the given executable has no version fields. Instead, it will be evaluated as having no version. Via libloot.
- Sorting would not preserve the existing relative positions of plugins that had no relative positioning enforced by plugin data or metadata, if one or both of their filenames were not case-sensitively equal to their entries in `plugins.txt` / `loadorder.txt`. Load order position comparison is now correctly case-insensitive. Via libloot.

12.4.2 Changed

- Improved load order sorting performance.
- Game names and game folder names are now handled case-sensitively to avoid unnecessary and possibly incorrect case folding.
- Updated libloot to v0.14.8.
- Downgraded CEF to v3.3440.1806.g65046b7, as the hashes for v74.1.16+ge20b240+chromium-74.0.3729.131 kept changing unexpectedly, causing builds to fail.
- Updated the German translation.
- Updated the Japanese translation.
- Updated the Russian translation.

12.5 0.14.4 - 2019-05-11

12.5.1 Fixed

- Any instances of `\.` in messages would be incorrectly displayed as `..`
- LOOT would unnecessarily ignore intermediate plugins in a non-master to master cycle involving groups, leading to unexpected results when sorting plugins (via libloot).
- `HearthFires.esm` was not recognised as a hardcoded plugin on case-sensitive filesystems, causing a cyclic interaction error when sorting Skyrim or Skyrim SE (via libloot).

12.5.2 Changed

- Groups that contain installed plugins can no longer be deleted in the groups editor.
- Clicking on a group in the groups editor will now display a list of the installed plugins in that group in the editor's sidebar.
- An error message is now displayed for each plugin that belongs to a nonexistent group.
- Game configuration can now include the root Registry key when specifying a registry key. If no root key is specified, `HKEY_LOCAL_MACHINE` is used. The recognised root keys are:
 - `HKEY_CLASSES_ROOT`
 - `HKEY_CURRENT_CONFIG`
 - `HKEY_CURRENT_USER`
 - `HKEY_LOCAL_MACHINE`
 - `HKEY_USERS`
- Updated the Russian translation.
- Updated libloot to v0.14.6.
- Updated CEF to v74.1.16+ge20b240+chromium-74.0.3729.131.
- Updated nlohmann/json to v3.6.1.
- Updated spdlog to v1.3.1.

12.6 0.14.3 - 2019-02-10

12.6.1 Fixed

- Plugin counters would be set to zero after cancelling a load order sort.
- The user interface would not display default values for some data if overriding values were removed (e.g. removing a plugin's user metadata would not set its group back to the default if no group was set in the masterlist).
- Saving user metadata with the default group would store that group membership in user metadata even if the plugin was already in the default group.
- Condition parsing now errors if it does not consume the whole condition string, so invalid syntax is not silently ignored (via libloot).
- Conditions were not parsed past the first instance of `file(<regex>)`, `active(<regex>)`, `many(<regex>)` or `many_active(<regex>)` (via libloot).
- LOOT could crash on startup or changing game when trying to check if the game or data paths are symlinks. If a check fails, LOOT will now assume the path is not a symlink. Via libloot.

12.6.2 Changed

- Updated libloot to v0.14.4.

12.7 0.14.2 - 2019-01-20

12.7.1 Fixed

- An error when loading plugins with a file present in the plugins directory that has a filename containing characters that cannot be represented in the system code page. Via libloot.
- An error when trying to read the version of an executable that does not have a US English version information resource. Executable versions are now read from the file's first version information resource, whatever its language. Via libloot.

12.7.2 Changed

- Updated libloot to 0.14.2.

12.8 0.14.1 - 2019-01-19

12.8.1 Fixed

- The LOOT update checker would fail when LOOT's version number was equal to the version number of the latest release.

12.9 0.14.0 - 2019-01-19

12.9.1 Added

- An error message will now be displayed for any light plugin that contains new records with FormIDs outside the valid range for light plugins.
- A warning message will now be displayed for any plugin that has a header version that is older than is used by the game, to help draw attention to plugins that have been incorrectly ported from older games. The header version checked is the value of the version field in the HEDR subrecord of the plugin's TES4 record.
- A section to the documentation that explains LOOT's sorting algorithm.

12.9.2 Fixed

- Creating a new group by pressing the Enter key after typing a name in the Groups Editor input field no longer leaves the group creation button enabled.
- Incorrect handling of non-ASCII characters in plugin filenames when getting their active load order indices, which could lead to incorrect indices being displayed in the sidebar.
- Incorrect handling of non-ASCII characters in games' LOOT folder names. By default all folder names only contained ASCII characters, so this would only affect customised folder names.
- BSAs/BA2s loaded by non-ASCII plugins for Oblivion, Fallout 3, Fallout: New Vegas and Fallout 4 may not have been detected due to incorrect case-insensitivity handling (via LOOT API).
- Fixed incorrect case-insensitivity handling for non-ASCII plugin filenames and File metadata names (via LOOT API).

- Path equivalence checks could be inaccurate as they were using case-insensitive string comparisons, which may not match filesystem behaviour. Filesystem equivalence checks are now used to improve correctness. (Via LOOT API).
- Errors due to filesystem permissions when cloning a new masterlist repository into an existing game directory. Deleting the temporary directory is now deferred until after its contents have been copied into the game directory, and if an error is encountered when deleting the temporary directory, it is logged but does not cause the masterlist update to fail. (Via LOOT API).
- The Czech translation mangled placeholders in message strings, causing errors when it was used.

12.9.3 Changed

- LOOT now requires a C++17-compatible compiler, so Windows builds now require the MSVC 2017 x86 redistributable instead of the MSVC 2015 x86 redistributable.
- The masterlist or default group for a plugin in the plugin editor's group dropdown is now styled with bold dark blue text to make it easier to undo user customisation of a plugin's group.
- Cyclic interaction errors will now detail the data source of each interaction in the cyclic path, to make it easier to identify the problematic metadata and so fix it.
- Updated the Japanese translation.
- Updated the German translation.
- LOOT now supports v0.14 of the metadata syntax (via LOOT API).
- Updated LOOT API, which has been renamed to libloot, to 0.14.1.
- Updated cpptoml to v0.1.1.
- Updated spdlog to v1.3.0.
- Updated nlohmann/json to v3.5.0.
- Updated JavaScript GUI dependencies.

12.10 0.13.6 - 2018-11-27

12.10.1 Fixed

- Load order indices in the sidebar were formatted incorrectly for light plugins.

12.11 0.13.5 - 2018-11-26

12.11.1 Fixed

- Out-of-bounds memory read that caused corruption in LOOT's `settings.toml` when LOOT is closed after having been unable to find any installed games.

12.11.2 Added

- An `--auto-sort` parameter that can be passed to `LOOT.exe` with `--game`, and which will cause LOOT to automatically sort the game's load order and apply the sorted load order, then quit. If an error is encountered at any point, auto-sort is cancelled.
- A Czech translation by ThePotatoChronicler.
- A documentation section that describes the sorting algorithm.

12.11.3 Changed

- Passing an invalid `--game` value as a parameter to `LOOT.exe` now causes an error to be displayed.
- The Groups Editor now uses a left-to-right layout when displaying the groups graph, which is clearer and more consistent than the previous layout.
- Updated GUI dependencies.
- Updated Japanese translation.

12.12 0.13.4 - 2018-09-25

12.12.1 Fixed

- Warnings were displayed for ghosted plugins saying they were invalid and would be ignored when they were not.
- Filesystem errors when trying to set permissions during a masterlist update that clones a new repository (via LOOT API).

12.12.2 Changed

- The Group dropdown menu in the metadata editor now “drops up” to reduce the amount of scrolling necessary by default to see the full list.
- The GUI is now based on a mix of Polymer 3 and React elements.
- Updated GUI dependencies.
- Updated LOOT API to v0.13.8.

12.13 0.13.3 - 2018-09-11

12.13.1 Fixed

- LOOT's “check for updates” functionality was failing due to the latest release unexpectedly not appearing on the first page of results when fetching repository tag data.

12.14 0.13.2 - 2018-09-10

12.14.1 Fixed

- Plugins with a *.esp* file extension and the light master flag set no longer appear as masters.
- Running LOOT outside of its executable's directory no longer results in a blank window.
- Cursor displaying as text selector in dropdown lists.
- Incompatibility messages not being displayed for non-plugin files.
- Fallout 4's *DLCUltraHighResolution.esm* is now handled as a hardcoded plugin (via libloadorder via the LOOT API).
- Plugins that are corrupt past their TES4 header are now handled gracefully when sorting and removed from the UI, with a warning message displayed for each removed plugin.
- Metadata editor text fields now trim whitespace to avoid unexpected metadata mismatches.

12.14.2 Changed

- Updated Boost to v1.67.0.
- Updated spdlog to v1.1.0.
- Updated Google Test to v1.8.1.
- Updated cpptoml v0.1.0.
- Updated CEF to v3.3440.1806.g65046b7.
- Updated nlohmann/json to v3.2.0.
- Updated LOOT API to v0.13.7 which should carry a number of performance improvements with it.
- Updated Danish translation.

12.15 0.13.1 - 2018-06-03

12.15.1 Changed

- Sorting now enforces hardcoded plugin positions without the need for LOOT metadata. This helps LOOT avoid producing invalid load orders, particularly those involving Creation Club plugins (via LOOT API).
- Updated LOOT API to v0.13.5.
- Updated spdlog to v0.17.0.

12.16 0.13.0 - 2018-06-02

12.16.1 Added

- Support for Skyrim VR.

- Support for plugin groups. Each plugin belongs to a group, and groups can load after zero or more other groups, providing a concise way to load groups of plugins after other groups of plugins. The group a plugin belongs to can be set in the metadata editor, and groups can be edited in the new Groups Editor accessible through the main menu.
- LOOT's update checking on startup can now be toggled from the settings dialog.

12.16.2 Changed

- Bash Tag suggestions now display tags that are present in the plugin's description field in silver text.
- Sorting error messages now includes the full path to `plugins.txt` when suggesting it may be read-only.
- Updated the LOOT API to v0.13.4.
- Updated CEF to v3.3325.1758.g9aea513.
- Updated nlohmann/json to v3.1.2.

12.16.3 Removed

- Support for local and global priority metadata. Priorities have been superseded by groups, which provide similar functionality more accessibly.

12.16.4 Fixed

- Cannot read property 'status' of undefined errors could occur when LOOT attempted to check for updates and no Internet connection was available.
- An error that occurred when attempting to apply edits to clean or dirty plugin metadata.
- A potential error during sorting if the number of plugins installed changed since LOOT was started or its content was last refreshed.
- An error when applying a load order for Oblivion, Fallout 3 or Fallout: New Vegas involving a plugin with a timestamp earlier than 1970-01-01 00:00:00 UTC (via LOOT API).
- An error when loading the current load order for Skyrim with a `loadorder.txt` incorrectly encoded in Windows-1252 (via LOOT API).
- Various filesystem-related issues that could be encountered when updating masterlists, including failure due to file handles being left open while attempting to remove the files they referenced (via LOOT API).
- Incorrect load order positions were given for light-master-flagged `.esp` plugins when getting the load order (via LOOT API).
- Closing LOOT with the metadata editor open or unapplied sorting results displayed would not display a confirmation dialog.
- Editable table rows for non-user metadata were not being made read-only.
- User metadata was not used when checking the validity of a plugin's install environment (e.g. if any incompatible plugins are present).
- Bash Tag removal suggestions were treated as addition suggestions unless the tag name was prefixed by an additional `-`.
- File metadata's `display` field wasn't used in generated UI messages.
- The top divider in a scrollable dialog could be hidden when scrolling.

12.17 0.12.5 - 2018-03-19

12.17.1 Fixed

- LOOT now checks that its game subdirectories are actually directories, not just that they exist, erroring earlier and more helpfully when there is somehow a file with the same name in the LOOT data directory.
- Windows 7 users can now update their masterlists again without having to manually enable system-wide TLS 1.2 support. This was an issue after GitHub disabled support for older, insecure versions of TLS encryption because Microsoft didn't enable TLS 1.2 support in Windows 7 by default. Fixed via the LOOT API.

12.17.2 Changed

- Migrated all non-Polymer GUI dependencies from Bower to NPM.
- Refactored GUI JavaScript and custom elements into ES2015 modules.
- Introduced Webpack to bundle JavaScript and CSS for the GUI.
- Updated Polymer to v2.5.0.
- Updated the LOOT API to v0.12.5.

12.18 0.12.4 - 2018-02-22

12.18.1 Fixed

- Loading or saving a load order could be very slow because the plugins directory was scanned recursively, which is unnecessary. In the reported case, this fix caused saving a load order to go from 23 seconds to 43 milliseconds (via the LOOT API).
- Plugin parsing errors were being logged with trace severity, they are now logged as errors (via the LOOT API).
- Chromium console messages are now logged with severity levels that better match the severity with which they appear in the console (via the LOOT API).
- Saving a load order for Oblivion, Fallout 3 or Fallout: New Vegas now updates plugin access times to the current time for correctness (via the LOOT API).

12.18.2 Changed

- Added a specific message for sorting errors that mentions plugins.txt probably being read-only, as it's the most common cause of issues filed.
- Added missing mentions of Fallout 4 VR support.
- Performance improvement for load order operations (via the LOOT API).
- Updated the LOOT API to v0.12.4.
- Updated spdlog to v0.16.3.
- Updated nlohmann/json to v3.1.1.
- Updated CEF to v3.3282.1733.g9091548.

12.19 0.12.3 - 2018-02-10

12.19.1 Fixed

- LOOT wouldn't start when run by a user with a `%LOCALAPPDATA` path containing non-ASCII characters, which was a regression introduced in v0.12.0.
- The log buffer is flushed after every statement, fixing the regression introduced in v0.12.2.
- The uninstaller didn't remove `settings.toml`.

12.19.2 Changed

- Disabled CEF debug logging, as the `CEFDebugLog.txt` has generally been more misleading than helpful.

12.20 0.12.2 - 2018-02-05

12.20.1 Added

- Support for Fallout 4 VR.
- Support for configuring games' local paths, i.e. the directory in which their `plugins.txt` is stored. Each game entry in LOOT's `settings.toml` now has a `local_path` variable that is blank by default, which leaves it up to `libloaderorder` (via the LOOT API) to determine the path. There is no GUI option to configure the value.
- Chromium console messages are now logged to `LOOTDebugLog.txt` to help when debugging.

12.20.2 Changed

- Updated LOOT API to v0.12.3.
- Replaced Protocol Buffers serialisation dependency with `nlohmann/json v2.1.1`.
- Replaced `Boost.Log` with `spdlog v0.14.0`.
- Downgraded `Boost` to 1.63.0 to take advantage of pre-built binaries on AppVeyor.
- Updated Japanese translation.

12.20.3 Removed

- The `--game-appdata-path` CLI parameter, which set the local path to use for all games, and which has been superseded by game-specific `local_path` configuration variables.

12.20.4 Fixed

- Plugins with a `.esp` file extension and the light master flag set are no longer treated as masters when sorting, so they can have other `.esp` files as masters without causing cyclic interaction sorting errors (via LOOT API).
- Sorting didn't update sidebar indices.

12.21 0.12.1 - 2017-12-03

12.21.1 Fixed

- Settings would not save correctly with debug logging disabled.
- LOOT API logging was disabled on Linux.
- Typos in the v0.12.0 changelog.

12.22 0.12.0 - 2017-12-02

12.22.1 Added

- Support for light master (`.esl`) plugins.
 - Light masters are indicated by a new icon on their plugin cards, and the “Master File” icon is suppressed for light masters.
 - In the sidebar, light masters all have the in-game load order index FE, followed by the hexadecimal index of the light master relative to only other light masters.
 - A new general warning message will be displayed when 255 normal plugins and at least one light master are active.
 - A new error message will be displayed for light masters that depend on a non-master plugin.
- Support for specifying the game local app data path using the `--game-appdata-path=<path>` command line parameter.
- Japanese translation by kuroko137.

12.22.2 Changed

- LOOT now stores its settings in a `settings.toml` file instead of a `settings.yaml` file. It cannot upgrade from the latter to the former itself, but a converter is available [online](#).
- “Copy Load Order” now includes a third column for the index of light masters relative to other light masters.
- Updated the UI to use Polymer v2 and updated LOOT’s custom elements to use the Custom Elements v1 syntax.
- LOOT API log messages are now included in the `LOOTDebugLog.txt` file, and are no longer written to `LOOTAPIDebugLog.txt`.
- Updated the Chinese translation.
- Updated the Danish translation.
- Updated the Russian translation.
- Updated the LOOT API to v0.12.1.
- Updated Lodash to b4.17.4.
- Updated Octokat to v0.8.0.
- Updated CEF to v3.3163.1671.g700dc25.

12.22.3 Fixed

- Error when adding a Bash Tag with no condition using the metadata editor.
- Detection of Skyrim and Skyrim SE when LOOT is installed in the same directory as both.
- General messages disappearing when cancelling a sort.
- Blank messages' content in the metadata editor after updating the masterlist.
- LOOT window size/position not restoring maximised state correctly.
- “Cannot read property of ‘text’ of undefined” error messages when something went wrong.
- The “new version available” message is no longer displayed for snapshot builds built from code newer than the latest release.
- Significant fixes in the LOOT API:
 - A crash would occur when loading an plugin that had invalid data past its header. Such plugins are now just silently ignored.
 - LOOT would not resolve game or local data paths that are junction links correctly, which caused problems later when trying to perform actions such as loading plugins.
 - Performing a masterlist update on a branch where the remote and local histories had diverged would fail. The existing local branch is now discarded and the remote branch checked out anew, as intended.

12.23 0.11.0 - 2017-05-13

12.23.1 Changed

- The LOOT application now uses the LOOT API, rather than sharing internal code with it.
- LOOT now writes to an additional log file, `LOOTAPIDebugLog.txt`.
- If LOOT is closed while maximised, it will now start maximised.
- Log timestamps now have microsecond precision.
- Updated to CEF v3.2924.1561.g06fde99.
- The LOOT API has had its code split into its own [repository](#). Its documentation, along with the metadata syntax documentation, is now hosted [separately](#).

12.23.2 Fixed

- A few inaccurate logging statements.
- Menu text wrapping during opening animation.
- Inconsistent editor priority values handling, causing priority values user metadata to not trigger the “Has User Metadata” icon appearing in certain circumstances.
- The LOOT window's title is now set on Linux.
- The LOOT window's size and position is now saved and restored on Linux.
- Clipboard operations are now supported on Linux (requires `xclip` to be installed).

12.24 0.10.3 - 2017-01-08

12.24.1 Added

- LOOT now creates a backup of the existing load order when applying a sorted load order. The backup is stored in LOOT's folder for the current game, and up to the three most recent backups are retained.

12.24.2 Changed

- If no game is detected when LOOT is launched and a valid game path or Registry key pointing to a game path is added in the Settings dialog, LOOT will select that game and refresh its content when the new settings are applied.
- Most exception-derived errors now display a generic error message, as exception messages are no longer translatable. Only metadata syntax exceptions still have their message displayed in the UI.
- Improved robustness of error handling when calculating file CRCs.
- Improved consistency of error logging.
- Errors and warnings are now always logged, even when debug logging is disabled.
- The First Time Tips and About dialogs are now fully translatable, with the exception of the legal text in the About dialog.
- Updated Russian translation.

12.24.3 Fixed

- A crash on startup if none of the supported games were detected.
- A crash when applying settings when none of the supported games are detected.
- Buttons and menu items for performing game-specific operations are now disabled while none of the supported games are detected.
- Initialisation error messages were formatted incorrectly.
- An error message reading `Cannot read property 'textContent' of undefined` could be displayed on startup due to UI elements initialising later than expected.
- The texts of the first plugin card and sidebar item were not being translated.
- LOOT now logs being unable to find a game's registry entry as `[info]`, not `[error]`.
- If an error was encountered while loading a userlist, constructing the error message produced a `boost::too_many_args` error that obscured the original error.
- The installer now checks for v14.0.24215 of the MSVC Redistributable, it was previously checking for v14.0.24212, which some users found insufficient.

12.25 0.10.2 - 2016-12-03

12.25.1 Added

- Support for specifying the path to use for LOOT's local data storage, via the `--loot-data-path` parameter.

12.25.2 Changed

- The metadata editor now displays an error message when the user inputs invalid priority values, in addition to the input's existing red underline styling for invalid values, and instead of validating the values when trying to save the metadata.
- LOOT's icon now scales better for high-DPI displays.
- LOOT's UI is now built as many loose files instead of one large HTML file, to aid debugging and development.
- Updated Chinese translation.
- Updated Chromium Embedded Framework to 3.2840.1517.gd7afec5.
- Updated libgit2 to 0.24.3.
- Updated Polymer to 1.7.0, and also updated various Polymer elements.

12.25.3 Fixed

- A crash could occur if some plugins that are hardcoded to always load were missing. Fixed by updating to libloadorder v9.5.4.
- Plugin cleaning metadata with no `info` value generated a warning message with no text.
- The LOOT update checker will no longer display an empty error dialog if the update check is unable to connect to the GitHub API (eg. if offline).
- Redate Plugins was accidentally disabled for Skyrim SE in v0.10.1, and had no effect for Skyrim SE in v0.10.0.
- Having more than ~ 100 plugins installed could make the sidebar's plugin list appear on top of dialogs.
- More UI text has been made available for translation.
- Tweak some text formatting to include more context for translators.
- Dirty plugin warning messages now distinguish between singular and plural forms for their ITM, deleted reference and deleted navmesh counts, to allow the construction of more grammatically-correct messages in English and other languages.
- The UI text for the metadata editor was always displayed in English even when LOOT was set to use another language, despite translations being available.
- It was possible to open the metadata editor during sorting by double-clicking a plugin in the sidebar.
- Removed a duplicate section in the documentation for editing metadata.

12.26 0.10.1 - 2016-11-12

12.26.1 Changed

- When saving a load order for Fallout 4 or Skyrim SE, the official plugins (including DLC plugins) are no longer written to `plugins.txt` to match game behaviour and improve interoperability with other modding utilities.
- LOOT now uses `Skyrim Special Edition` as the folder name for storing its Skyrim SE data, to mirror the game's own folder naming and improve interoperability with other modding utilities, and automatically renames any `SkyrimSE` folder created by LOOT v0.10.0.
- Updated Russian translation.
- Updated Chinese translation.

12.26.2 Fixed

- When saving a load order for Fallout 4 or Skyrim SE, the positions of official plugins (including DLC plugins) in `plugins.txt` are now ignored if they are present and a hardcoded order used instead. Note that there is a bug in Skyrim SE v1.2.39 that causes the DLC plugins to be loaded in timestamp order: this behaviour is ignored.
- If the LOOT installer installed the MSVC redistributable, the latter would silently force a restart, leading to possible data loss.
- It was possible to open the metadata editor between sorting and applying/cancelling a sorted load order, which would then cause an error when trying to close the editor. The editor is now correctly disabled during the sort process.

12.27 0.10.0 - 2016-11-06

12.27.1 Added

- Support for TES V: Skyrim Special Edition.
- Swedish translation by Mikael Hiort af Ornäs (Lakrits).
- More robust update checker, so now LOOT will notify users of an update without needing a masterlist to be present or for it to be updated for the new release, and will also detect when the user is using a non-release build with the same version number.

12.27.2 Changed

- LOOT now supports v0.10 of the metadata syntax. This breaks compatibility with existing syntax, which may cause existing user metadata to fail to load. See [the syntax version history](#) for the details.
- The Global Priority toggle button in the metadata editor has been replaced with an input field to reflect the change in syntax for global priorities.
- Added a “Clean Plugin Info” tab to the metadata editor, for editing metadata that identifies a plugin as being clean.
- Added a “Verified clean” icon to plugin cards that is displayed for plugins that are identified as clean.
- All operations triggered from the UI are now processed asynchronously, which may have a minor positive effect on perceived performance.
- Error messages displayed in dialog boxes no longer include an error code.
- Rewrote the documentation, which is now hosted online at [Read The Docs](#).
- Updated Simplified Chinese translation.
- Updated Russian translation.
- Updated German translation.
- Updated Danish translation.
- Updated CEF to 3.2840.1511.gb345083 and libgit2 to 0.24.2.

12.27.3 Fixed

- Cached plugin CRCs causing checksum conditions to always evaluate to false.
- Data being loaded twice when launching LOOT.
- Updating the masterlist when the user's TEMP and TMP environmental variables point to a different drive than the one LOOT is installed on.
- Incorrect error message display when there was an issue during initialisation.
- Sidebar plugin load order indices not updating when sorting changed plugin positions.
- The "Has User Metadata" icon not displaying when priority metadata was changed.

12.28 0.9.2 - 2016-08-03

12.28.1 Added

- Theming support and the dark theme have been reimplemented and reintroduced.
- Plugin filename and Bash Tag name fields will now autocomplete in the metadata editor.
- The in-game load order indices of active plugins are now displayed in the sidebar.

12.28.2 Changed

- Most URLs now use HTTPS.
- The Danish and French translations have been updated.
- The CEF (3.2743.1442.ge29124d), libespm (2.5.5), Polymer (1.6.0) and Pseudosem (1.1.0) dependencies have been updated to the versions given in brackets.

12.28.3 Fixed

- Error when applying filters on startup.
- Hidden plugin and message counters not updating correctly after sorting.
- An error occurring when the user's temporary files directory didn't exist and updating the masterlist tried to create a directory there.
- The installer failing if LOOT was previously installed on a drive that no longer exists. The installer now always gives the option to change the default install path it selects.
- Startup errors being reported incorrectly and causing additional errors that prevented the user from being informed of the original issue.
- The metadata editor's CRC input field being too short to fully display its validation error message.
- Errors when reading some Oblivion plugins during sorting, including the official DLC.
- Some cases where LOOT would fail to start.
- The conflict filter not including the Unofficial Skyrim Legendary Edition Patch's plugin (and any other plugin that overrides a very large number of records) in results.

- The “not sorted” message reappearing if the load order was sorted twice in one session and cancelled the second time.
- Version numbers where a digit was immediately followed by a letter not being detected.

12.29 0.9.1 - 2016-06-23

12.29.1 Added

- Support for Fallout 4’s Contraptions Workshop DLC, and the upcoming Vault-Tec Workshop and Nuka-World DLC. Support for the latter two is based on their probable but unconfirmed plugin names, which may be subject to change.

12.29.2 Changed

- The content refresh menu item is now disabled during sorting.
- The conflicts filter toggle buttons have been removed from the plugin card menus, and the filter re-implemented as a dropdown menu of plugin names in the Filters sidebar tab.
- Enabling the conflicts filter now scrolls to the target plugin, which is no longer highlighted with a blue border.
- The layout of the Filters sidebar tab has been improved.
- The CEF (3.2704.1427.g95055fe), and libloadorder (9.4.0) dependencies have been updated to the versions given in brackets.
- Some code has been refactored to improve its quality.

12.29.3 Removed

- Support for Windows Vista.

12.29.4 Fixed

- User dirty metadata being read-only in the metadata editor.
- LOOT incorrectly reading a tag with no name from plugin descriptions containing `{{BASH:}}`.

12.30 0.9.0 - 2016-05-21

12.30.1 Added

- Support for Fallout 4.
- A warning message is displayed in the General Information card if the user has not sorted their load order in the current LOOT session.
- An error message is displayed in the General Information card when a cyclic interaction sorting error is encountered, and remains there until sorting is next attempted.

12.30.2 Changed

- Improve sorting performance by only reading the header when loading game's main master file.
- References to "BSAs" have been replaced with the more generic "Archives" as Fallout 4's BSA equivalents use a different file extension.
- The sorting process now recognises when the sorted load order is identical to the existing load order and informs the user, avoiding unnecessary filesystem interaction.
- The metadata editor has been reimplemented as a single resizable panel displayed below the plugin card list instead of a separate editor for each plugin card.
- Editable table styling has been improved to more closely align to the Material Design guidelines.
- Minor UI changes have been made to scrollbar and focus outline styling to improve accessibility.
- UI interaction performance has been improved, especially when scrolling the plugin card list.
- The PayPal donation link now points to the PayPal.Me service, which has a more polished UX and lower fees.
- LOOT's settings file handling has been reimplemented, fixing crashes due to invalid settings values and allowing missing settings to use their default values.
- Plugin version string extraction has been reimplemented, improving its accuracy and maintainability.
- Plugin CRC, file and version condition evaluation has been optimised to use cached data where it exists, avoiding unnecessary filesystem interaction.
- The French and Danish translations have been updated.
- The installer now only creates one shortcut for LOOT in the Start menu, following Microsoft guidelines.
- A lot of code has been refactored and improved to increase its quality.
- The Boost (1.60), CEF (3.2623.1401.gb90a3be), libespm (2.5.2), libgit2 (0.24.1), libloadorder (9.3.0) and Polymer (1.4) dependencies have been updated to the versions given in brackets.

12.30.3 Removed

- The Flattr donation link.
- The experimental theming support, as its implementation was incompatible with Polymer 1.2's styling mechanisms.

12.30.4 Fixed

- Redate Plugins attempted to redate plugins that were missing, causing an error.
- LOOT would not launch when run by a user with a non-ASCII local application data path.
- Sorting processed priority value inheritance throughout the load order incorrectly, leading to some plugins being positioned incorrectly.
- The conflict filter displayed only the target plugin when enabled for the first time in a session.
- The behaviour of the search functionality was inconsistent.
- Duplicate messages could be displayed under certain circumstances.
- Opening the metadata editor for one plugin displayed the metadata for another plugin under certain circumstances.

- Changing the current game quickly could leave the UI unresponsive.
- Applying a filter then scrolling the plugin card list would display some cards with no content.
- Plugin cards would disappearing when jumping to a plugin card near the bottom of the load order using the sidebar.
- Clicking on a disabled element in a dropdown menu would cause the menu to close.
- The UI font size was too large, due to a misunderstanding of the Material Design guidelines.
- Attempting to build native Linux and 64-bit executables produced errors. Such builds are unsupported and no official builds are planned.

12.31 0.8.1 - 2015-09-27

12.31.1 Added

- Checks for safe file paths when parsing conditions.

12.31.2 Changed

- Updated Chinese translation.
- Updated Boost (1.59.0), libgit2 (0.23.2) and CEF (branch 2454) dependencies.

12.31.3 Fixed

- Crash when loading plugins due to lack of thread safety.
- The masterlist updater and validator not checking for valid condition and regex syntax.
- The masterlist updater not working correctly for Windows Vista users.

12.32 0.8.0 - 2015-07-22

12.32.1 Added

- Support for loading custom user interface themes, and added a dark theme.

12.32.2 Changed

- Improved detail of metadata syntax error messages.
- Improved plugin loading performance for computers with weaker multithreading capabilities (eg. non-hyperthreaded dual-core or single-core CPUs).
- LOOT no longer displays validity warnings for inactive plugins.
- LOOT now displays a more user-friendly error when a syntax error is encountered in an updated masterlist.
- Metadata syntax support changes, see the metadata syntax document for details.
- LOOT's installer now uses Inno Setup instead of NSIS.

- LOOT’s installer now uninstalls previous versions of LOOT silently, preserving user data, instead of displaying the uninstaller UI.
- Updated German and Russian translations.
- Updated libgit2 to v0.23.0.

12.32.3 Fixed

- “Cannot read property ‘push’ of undefined” errors when sorting.
- Many miscellaneous bugs, including initialisation crashes and incorrect metadata input/output handling.
- Metadata editors not clearing unsaved edits when editing is cancelled.
- LOOT silently discarding some non-unique metadata: an error message will now be displayed when loading or attempting to apply such metadata.
- Userlist parsing errors being saved as general messages in the userlist.
- LOOT’s version comparison behaviour for a wide variety of version string formats. This involved removing LOOT’s usage of the Alphanum code library.

12.33 0.7.1 - 2015-06-22

12.33.1 Added

- Content search, accessible from an icon button in the header bar, and using the Ctrl-F keyboard shortcut.
- “Copy Load Order” feature to main menu.

12.33.2 Changed

- LOOT now uses versioned masterlists, so that new features can be used without breaking LOOT for users who haven’t yet updated.
- Moved content filter into Filters sidebar tab. The Ctrl-F keyboard shortcut no longer focusses the content filter.
- Checkbox-toggled filters now have their last state restored on launch.
- Darkened background behind cards to increase contrast.
- Updated French translation.

12.33.3 Fixed

- LOOT UI opening in default browser on launch.
- “No existing load order position” errors when sorting.
- Message filters being ignored by plugin cards after navigating the list.
- Output of Bash Tag removal suggestions in userlists.
- Display of masterlist revisions where they were wrongly interpreted as numbers.

12.34 0.7.0 - 2015-05-20

12.34.1 Added

- Danish and Korean translations.
- If LOOT can't detect any installed games, it now launches to the settings dialog, where the game settings can be edited to allow a game to be detected.
- A “Copy Content” item in the main menu, to copy the plugin list and all information it contains to the clipboard as YAML-formatted text.
- A “Refresh Content” item in the main menu, which re-scans plugin headers and updates LOOT's content.
- LOOT is now built with High DPI display support.
- Masterlist updates can now be performed independently of sorting.
- A “First-Time Tips” dialog will be displayed on the first run of any particular version of LOOT.
- Attempting to close LOOT with an unapplied sorted load order or an open plugin editor will trigger a confirmation dialog.
- Support for GitHub Flavored Markdown in messages, minus features specific to the GitHub site, such as @mentions and emoji.
- Support for message content substitution metadata syntax in the masterlist.
- Display of LOOT's build revision has been added to the “About” dialog.
- Plugin location metadata can now be added through the user interface.
- A content filter, which hides plugins that don't have the filter text present in their filenames, versions, CRCs, Bash Tags or messages.

12.34.2 Changed

- New single-window HTML5-based interface and a new icon, based on Google's Material Design.
 - LOOT now parses the masterlist and plugin headers on startup, and the resulting content is displayed with the plugins in their current load order.
 - Each plugin now has its own editor, and multiple editors can be opened at once.
 - Drag 'n' drop of plugins from the sidebar into metadata editor tables no longer requires the conflicts filter to be enabled.
 - CRCs are calculated during conflict filtering or sorting, so are not displayed until either process has been performed.
 - The “View Debug Log” menu item has been replaced with a “Open Debug Log Location” menu item to make it easier to share the file itself.
 - Debug logging control has been simplified to enable/disable, replacing the “Debug Verbosity” setting with an “Enable Debug Logging” toggle.
 - Changes to game settings now take immediate effect.
 - Masterlist updating now exits earlier if the masterlist is already up-to-date.
 - Masterlist revisions are now displayed using the shortest unique substring that is at least 7 characters long.

- Making edits to plugin metadata before applying a calculated load order no longer causes LOOT to recalculate the load order. Instead, the displayed load order is applied, and the metadata edits will be applied the next time sorting is performed.
 - All references to “UDRs” have been replaced by the more technically-correct “Deleted References” term.
 - The “Hide inactive plugin messages” filter has been replaced by a “Hide inactive plugins” filter.
 - Copied metadata is now wrapped in BBCode `[spoiler][code]...[/code][/spoiler]` tags for easier pasting into forum posts.
 - The Summary and General Messages cards have been combined into a General Information card.
- Sorting performance improvements.
 - Updated Boost (1.58.0), libgit2 (0.22.2) and libloadorder dependencies.

12.34.3 Removed

- Messages with multiple language strings can no longer be created through the user interface. User-added multiple-language messages will be converted to single-language strings if their plugin’s editor is opened then closed using the “OK” button.
- The “Copy Name” menu item has been removed, as plugin names can now be selected and copied using `Ctrl-C`.
- As LOOT no longer generates reports, it doesn’t save them either.

12.34.4 Fixed

- The `settings.yaml` included with the installer was very old.
- Inactive incompatibilities were displayed as error messages. They are now displayed as warnings.
- Masterlist entries that matched the same plugin were not being merged. Now one exact match and any number of regex matches will be merged.
- Masterlist updating failed when a fast-forward merge was not possible (eg. when remote has been rebased, or a different repository is used). Such cases are now handled by deleting the local repository and re-cloning the remote.
- Masterlist updating failed when the path to LOOT’s folder included a junction link.
- Masterlists would not ‘update’ to older revisions. This can be useful for testing, so now they can do so.
- Crashes when trying to read corrupt plugins and after masterlist update completion.
- LOOT would crash when trying to detect a game installed to a location in which the user does not have read permissions, now such games are treated as not being installed.
- Plugins with non-ASCII description text would cause `codecv` to `wstring` errors.
- LOOT would accept any file with a `.esp` or `.esm` extension as a plugin. It now checks more thoroughly, by attempting to parse such files’ headers.
- LOOT would only detect Skyrim plugins as loading BSAs. Plugins for the other games that also load BSAs are now correctly detected as such.
- Depending on the plugins involved, sorting could produce a different load order every time it was run. Sorting now produces unchanging load orders, using existing load order position where there is no reason to move a plugin.

12.35 0.6.1 - 2014-12-22

12.35.1 Added

- German translation.
- The Large Address Aware flag to the LOOT executable.

12.35.2 Changed

- Updated Boost (1.57.0), wxWidgets (3.0.2) and libloadorder (6.0.3) dependencies.
- The game menu is now updated when the settings window is exited with the “OK” button.
- Updated Russian translation.
- Updated Brazilian Portuguese translation.

12.35.3 Fixed

- Default Nehrim registry entry path.
- Messages in the wrong language being selected.
- LOOT windows opening off-screen if the screen area had been changed since last run.
- Read-only `.git` folders preventing repository deletion.
- Unnecessary plugins in cyclic dependency error messages.
- Bash Tag suggestions displaying incorrectly.
- The current game can no longer be deleted from the settings window.
- Plugin metadata being lost when the settings window was exited with the “OK” button, leading to possible condition evaluation issues.
- A blank report bug when running on systems which don’t have Internet Explorer 11 installed.
- Reports appearing empty of all content when no global messages are to be displayed.

12.35.4 Security

- Updated libgit2 to 0.21.3, which includes a fix for a critical security vulnerability.

12.36 0.6.0 - 2014-07-05

12.36.1 Added

- Display of masterlist revision date in reports.
- Report filter for inactive plugin messages.
- The number of dirty plugins, active plugins and plugins in total to the report summary.
- A find dialog to the report viewer, initiated using the `Ctrl-F` keyboard shortcut.

- LOOT's windows now remember their last position and size.
- Command line parameter for selecting the game LOOT should run for.
- Finnish translation.

12.36.2 Changed

- Unified and improved the metadata editors launched during and outside of sorting.
 - The metadata editor now resizes more appropriately.
 - The mid-sorting instance hides the requirement, incompatibility, Bash Tags, dirty info and message lists.
 - Both instances now have a conflict filter, priority display in their plugin list and drag 'n' drop from the plugin list into whatever metadata lists are visible.
 - The mid-sorting instance also hides the load after entry edit button, and the button to add new entries (so drag 'n' drop is the only available method of adding entries).
 - The metadata editor now displays plugins with user edits using a tick beside their name, rather than bolding their name text.
 - Plugins that have been edited in the current instance have their list entry text bolded.
 - Checkboxes have been added to set whether or not a priority value is "global". The UI also now displays the priority value used in comparisons (ie. with the millions and higher digits omitted).
 - A right-click menu command for clearing all user-added metadata for all plugins has been added to the metadata editor.
- Missing master/requirement and incompatibility errors are downgraded to warnings if the plugin in question is inactive.
- Masterlist update errors have been made more user-friendly.
- If an error is encountered during masterlist update, LOOT will now silently delete the repository folder and attempt the update again. If it fails again, it will then report an error.
- Masterlist update now handles repository interaction a lot more like Git itself does, so should be less error-prone.
- Cyclic dependency error messages now detail the full cycle.
- LOOT's report now uses a static HTML file and generates a javascript file that is dynamically loaded to contain the report data. This removes the PugiXML build dependency.
- Debug log message priorities adjusted so that medium verbosity includes more useful data.
- Updated dependencies: libgit2 (v0.21.0), wxWidgets (v3.0.1), libloadorder (latest), libespm (latest).

12.36.3 Removed

- Support for Windows XP.
- Support for loading BOSS masterlists using the API. This was a leftover from when LOOT was BOSSv3 and backwards compatibility was an issue.
- The ability to open reports in an external browser. This was necessitated by the changes to report generation.
- The MSVC 2013 redistributable requirement.
- The "None Specified" language option is no longer available: English is the new default.

12.36.4 Fixed

- The uninstaller not removing the Git repositories used to update the masterlists.
- Miscellaneous crashes due to uncaught exceptions.
- Plugin priorities are now temporarily “inherited” during sorting so that a plugin with a low priority that is made via metadata to load after a plugin with a high priority doesn’t cause other plugins with lower priorities to be positioned incorrectly.
- The default language is now correctly set to English.
- Defaults for the online masterlist repository used for Nehrim.
- Endless sorting loop that occurred if some user metadata was disabled.

12.37 0.5.0 - 2014-03-31

- Initial release.

CHAPTER 13

Copyright Notice

LOOT and its API are distributed under the GNU General Public License v3.0. The documentation is distributed under the GNU Free Documentation License v1.3. The full texts of both licenses are included in *Copyright License Texts*.

While the GPL license allows anyone to make derivative works of LOOT, the LOOT Team encourages those thinking of doing so to first discuss their reasoning for such an endeavour with the Team. It may be that what the derivative work would do differently is already planned for a future version of LOOT or would be happily integrated into LOOT, thus avoiding any extra effort by others.

LOOT has been specifically designed to prevent it being locked into the LOOT Team's official masterlist repositories. Nevertheless, the LOOT Team appeals to the community to avoid the distribution of unofficial masterlists, as this would only hamper the effort to create one set of stores for load order information. Any issues with a masterlist are best brought to the attention of the LOOT Team so that they may be remedied.

GNU Free Documentation License Version 1.3 Notice:

Copyright (C) 2012 WrinklyNinja

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.3 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts.

A copy of the license is included in *Copyright License Texts*.

Contents

- *Copyright License Texts*
 - *Boost*
 - *cpptoml*
 - *Chromium Embedded Framework*
 - *github-api*
 - *Jed*
 - *Jed Gettext Parser*
 - *Lodash*
 - *LOOT & LOOT API*
 - *LOOT Documentation*
 - *Marked*
 - *nlohmann/json*
 - *Polymer*
 - *spdlog*

14.1 Boost

Boost Software License - Version 1.0 - August 17th, 2003

(continues on next page)

(continued from previous page)

Permission **is** hereby granted, free of charge, to **any** person **or** organization obtaining a copy of the software **and** accompanying documentation covered by this license (the "**Software**") to use, reproduce, display, distribute, execute, **and** transmit the Software, **and** to prepare derivative works of the Software, **and** to permit third-parties to whom the Software **is** furnished to do so, **all** subject to the following:

The copyright notices **in** the Software **and** this entire statement, including the above license grant, this restriction **and** the following disclaimer, must be included **in all** copies of the Software, **in whole or in part, and all** derivative works of the Software, unless such copies **or** derivative works are solely **in** the form of machine-executable **object** code generated by a source language processor.

THE SOFTWARE IS PROVIDED "**AS IS**", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE AND NON-INFRINGEMENT. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR ANYONE DISTRIBUTING THE SOFTWARE BE LIABLE FOR ANY DAMAGES OR OTHER LIABILITY, WHETHER IN CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

14.2 cpptoml

Copyright (c) 2014 Chase Geigle

Permission **is** hereby granted, free of charge, to **any** person obtaining a copy of this software **and** associated documentation files (the "**Software**"), to deal **in** the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, **and/or** sell copies of the Software, **and** to permit persons to whom the Software **is** furnished to do so, subject to the following conditions:

The above copyright notice **and** this permission notice shall be included **in all** copies **or** substantial portions of the Software.

THE SOFTWARE IS PROVIDED "**AS IS**", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

14.3 Chromium Embedded Framework

```
// Copyright (c) 2008-2013 Marshall A. Greenblatt. Portions Copyright (c)
// 2006-2009 Google Inc. All rights reserved.
//
// Redistribution and use in source and binary forms, with or without
// modification, are permitted provided that the following conditions are
// met:
```

(continues on next page)

(continued from previous page)

```
//
// * Redistributions of source code must retain the above copyright
// notice, this list of conditions and the following disclaimer.
// * Redistributions in binary form must reproduce the above
// copyright notice, this list of conditions and the following disclaimer
// in the documentation and/or other materials provided with the
// distribution.
// * Neither the name of Google Inc. nor the name Chromium Embedded
// Framework nor the names of its contributors may be used to endorse
// or promote products derived from this software without specific prior
// written permission.
//
// THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS
// "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
// LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR
// A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT
// OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
// SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
// LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE,
// DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY
// THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
// (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE
// OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
```

14.4 github-api

Copyright (c) 2012 Michael Aufreiter, Development Seed
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name "Development Seed" nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

14.5 Jed

```
Copyright jQuery Foundation and other contributors, https://jquery.org/
```

```
Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:
```

```
The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

14.6 Jed Gettext Parser

```
The MIT License (MIT)
```

```
Copyright (c) 2014 Oliver Hamlet
```

```
Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:
```

```
The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

14.7 Lodash

```
The MIT License
```

```
Copyright JS Foundation and other contributors <https://js.foundation/>
```

(continues on next page)

(continued from previous page)

Based on Underscore.js, copyright Jeremy Ashkenas,
DocumentCloud **and** Investigative Reporters & Editors <<http://underscorejs.org/>>

This software consists of voluntary contributions made by many individuals. For exact contribution history, see the revision history available at <https://github.com/lodash/lodash>

The following license applies to **all** parts of this software **except as** documented below:

====

Permission **is** hereby granted, free of charge, to **any** person obtaining a copy of this software **and** associated documentation files (the "**Software**"), to deal **in** the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, **and/or** sell copies of the Software, **and** to permit persons to whom the Software **is** furnished to do so, subject to the following conditions:

The above copyright notice **and** this permission notice shall be included **in all** copies **or** substantial portions of the Software.

THE SOFTWARE IS PROVIDED "**AS IS**", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

====

Copyright **and** related rights **for** sample code are waived via CC0. Sample code **is** defined **as** all source code displayed within the prose of the documentation.

CC0: <http://creativecommons.org/publicdomain/zero/1.0/>

====

Files located **in** the node_modules **and** vendor directories are externally maintained libraries used by this software which have their own licenses; we recommend you read them, **as** their terms may differ **from the** terms above.

14.8 LOOT & LOOT API

GNU GENERAL PUBLIC LICENSE
Version 3, 29 June 2007

(continues on next page)

Copyright (C) 2007 Free Software Foundation, Inc. <<http://fsf.org/>>
Everyone **is** permitted to copy **and** distribute verbatim copies
of this license document, but changing it **is not** allowed.

Preamble

The GNU General Public License **is** a free, copyleft license **for**
software **and** other kinds of works.

The licenses **for** most software **and** other practical works are designed
to take away your freedom to share **and** change the works. By contrast,
the GNU General Public License **is** intended to guarantee your freedom to
share **and** change all versions of a program--to make sure it remains free
software **for** all its users. We, the Free Software Foundation, use the
GNU General Public License **for** most of our software; it applies also to
any other work released this way by its authors. You can apply it to
your programs, too.

When we speak of free software, we are referring to freedom, **not**
price. Our General Public Licenses are designed to make sure that you
have the freedom to distribute copies of free software (**and** charge **for**
them **if** you wish), that you receive source code **or** can get it **if** you
want it, that you can change the software **or** use pieces of it **in** new
free programs, **and** that you know you can do these things.

To protect your rights, we need to prevent others **from denying** you
these rights **or** asking you to surrender the rights. Therefore, you have
certain responsibilities **if** you distribute copies of the software, **or if**
you modify it: responsibilities to respect the freedom of others.

For example, **if** you distribute copies of such a program, whether
gratis **or for** a fee, you must **pass** on to the recipients the same
freedoms that you received. You must make sure that they, too, receive
or can get the source code. And you must show them these terms so they
know their rights.

Developers that use the GNU GPL protect your rights **with** two steps:
(1) **assert** copyright on the software, **and** (2) offer you this License
giving you legal permission to copy, distribute **and/or** modify it.

For the developers' **and** authors' protection, the GPL clearly explains
that there **is** no warranty **for** this free software. For both users' **and**
authors' sake, the GPL requires that modified versions be marked as
changed, so that their problems will **not** be attributed erroneously to
authors of previous versions.

Some devices are designed to deny users access to install **or** run
modified versions of the software inside them, although the manufacturer
can do so. This **is** fundamentally incompatible **with** the aim of
protecting users' freedom to change the software. The systematic
pattern of such abuse occurs **in** the area of products **for** individuals to
use, which **is** precisely where it **is** most unacceptable. Therefore, we
have designed this version of the GPL to prohibit the practice **for** those
products. If such problems arise substantially **in** other domains, we
stand ready to extend this provision to those domains **in** future versions
of the GPL, **as** needed to protect the freedom of users.

(continues on next page)

(continued from previous page)

Finally, every program **is** threatened constantly by software patents. States should **not** allow patents to restrict development **and** use of software on general-purpose computers, but **in** those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms **and** conditions **for** copying, distribution **and** modification follow.

TERMS AND CONDITIONS

0. Definitions.

"This License" refers to version 3 of the GNU General Public License.

"Copyright" also means copyright-like laws that apply to other kinds of works, such **as** semiconductor masks.

"The Program" refers to **any** copyrightable work licensed under this License. Each licensee **is** addressed **as** "you". "Licensees" **and** "recipients" may be individuals **or** organizations.

To "modify" a work means to copy **from or** adapt **all or** part of the work **in** a fashion requiring copyright permission, other than the making of an exact copy. The resulting work **is** called a "modified version" of the earlier work **or** a work "based on" the earlier work.

A "covered work" means either the unmodified Program **or** a work based on the Program.

To "propagate" a work means to do anything **with** it that, without permission, would make you directly **or** secondarily liable **for** infringement under applicable copyright law, **except** executing it on a computer **or** modifying a private copy. Propagation includes copying, distribution (**with or** without modification), making available to the public, **and in** some countries other activities **as** well.

To "convey" a work means **any** kind of propagation that enables other parties to make **or** receive copies. Mere interaction **with** a user through a computer network, **with** no transfer of a copy, **is not** conveying.

An interactive user interface displays "Appropriate Legal Notices" to the extent that it includes a convenient **and** prominently visible feature that (1) displays an appropriate copyright notice, **and** (2) tells the user that there **is** no warranty **for** the work (**except** to the extent that warranties are provided), that licensees may convey the work under this License, **and** how to view a copy of this License. If the interface presents a list of user commands **or** options, such **as** a menu, a prominent item **in** the list meets this criterion.

1. Source Code.

The "source code" **for** a work means the preferred form of the work **for** making modifications to it. "Object code" means **any** non-source form of a work.

(continues on next page)

(continued from previous page)

A "Standard Interface" means an interface that either **is** an official standard defined by a recognized standards body, **or, in** the case of interfaces specified **for** a particular programming language, one that **is** widely used among developers working **in** that language.

The "System Libraries" of an executable work include anything, other than the work **as** a whole, that (a) **is** included **in** the normal form of packaging a Major Component, but which **is not** part of that Major Component, **and** (b) serves only to enable use of the work **with** that Major Component, **or** to implement a Standard Interface **for** which an implementation **is** available to the public **in** source code form. A "Major Component", **in** this context, means a major essential component (kernel, window system, **and** so on) of the specific operating system (**if any**) on which the executable work runs, **or** a compiler used to produce the work, **or** an **object** code interpreter used to run it.

The "Corresponding Source" **for** a work **in** object code form means all the source code needed to generate, install, **and** (**for** an executable work) run the **object** code **and** to modify the work, including scripts to control those activities. However, it does **not** include the work's System Libraries, **or** general-purpose tools **or** generally available free programs which are used unmodified **in** performing those activities but which are **not** part of the work. For example, Corresponding Source includes interface definition files associated **with** source files **for** the work, **and** the source code **for** shared libraries **and** dynamically linked subprograms that the work **is** specifically designed to require, such **as** by intimate data communication **or** control flow between those subprograms **and** other parts of the work.

The Corresponding Source need **not** include anything that users can regenerate automatically **from other** parts of the Corresponding Source.

The Corresponding Source **for** a work **in** source code form **is** that same work.

2. Basic Permissions.

All rights granted under this License are granted **for** the term of copyright on the Program, **and** are irrevocable provided the stated conditions are met. This License explicitly affirms your unlimited permission to run the unmodified Program. The output **from running** a covered work **is** covered by this License only **if** the output, given its content, constitutes a covered work. This License acknowledges your rights of fair use **or** other equivalent, **as** provided by copyright law.

You may make, run **and** propagate covered works that you do **not** convey, without conditions so long **as** your license otherwise remains **in** force. You may convey covered works to others **for** the sole purpose of having them make modifications exclusively **for** you, **or** provide you **with** facilities **for** running those works, provided that you comply **with** the terms of this License **in** conveying all material **for** which you do **not** control copyright. Those thus making **or** running the covered works **for** you must do so exclusively on your behalf, under your direction **and** control, on terms that prohibit them **from making** any copies of your copyrighted material outside their relationship **with** you.

(continues on next page)

(continued from previous page)

Conveying under **any** other circumstances **is** permitted solely under the conditions stated below. Sublicensing **is not** allowed; section 10 makes it unnecessary.

3. Protecting Users' Legal Rights From Anti-Circumvention Law.

No covered work shall be deemed part of an effective technological measure under **any** applicable law fulfilling obligations under article 11 of the WIPO copyright treaty adopted on 20 December 1996, **or** similar laws prohibiting **or** restricting circumvention of such measures.

When you convey a covered work, you waive **any** legal power to forbid circumvention of technological measures to the extent such circumvention **is** effected by exercising rights under this License **with** respect to the covered work, **and** you disclaim **any** intention to limit operation **or** modification of the work **as** a means of enforcing, against the work's users, your **or** third parties' legal rights to forbid circumvention of technological measures.

4. Conveying Verbatim Copies.

You may convey verbatim copies of the Program's source code as you receive it, **in any** medium, provided that you conspicuously **and** appropriately publish on each copy an appropriate copyright notice; keep intact **all** notices stating that this License **and any** non-permissive terms added **in** accord **with** section 7 apply to the code; keep intact **all** notices of the absence of **any** warranty; **and** give **all** recipients a copy of this License along **with** the Program.

You may charge **any** price **or** no price **for** each copy that you convey, **and** you may offer support **or** warranty protection **for** a fee.

5. Conveying Modified Source Versions.

You may convey a work based on the Program, **or** the modifications to produce it **from the** Program, **in** the form of source code under the terms of section 4, provided that you also meet **all** of these conditions:

- a) The work must carry prominent notices stating that you modified it, **and** giving a relevant date.
- b) The work must carry prominent notices stating that it **is** released under this License **and any** conditions added under section 7. This requirement modifies the requirement **in** section 4 to "keep intact all notices".
- c) You must license the entire work, **as** a whole, under this License to anyone who comes into possession of a copy. This License will therefore apply, along **with any** applicable section 7 additional terms, to the whole of the work, **and** all its parts, regardless of how they are packaged. This License gives no permission to license the work **in any** other way, but it does **not** invalidate such permission **if** you have separately received it.
- d) If the work has interactive user interfaces, each must display

(continues on next page)

(continued from previous page)

Appropriate Legal Notices; however, **if** the Program has interactive interfaces that do **not** display Appropriate Legal Notices, your work need **not** make them do so.

A compilation of a covered work **with** other separate **and** independent works, which are **not** by their nature extensions of the covered work, **and** which are **not** combined **with** it such **as** to form a larger program, **in or** on a volume of a storage **or** distribution medium, **is** called an "aggregate" **if** the compilation **and** its resulting copyright are **not** used to limit the access **or** legal rights of the compilation's users beyond what the individual works permit. Inclusion of a covered work **in** an aggregate does **not** cause this License to apply to the other parts of the aggregate.

6. Conveying Non-Source Forms.

You may convey a covered work **in** object code form under the terms of sections 4 **and** 5, provided that you also convey the machine-readable Corresponding Source under the terms of this License, **in** one of these ways:

- a) Convey the object code **in, or** embodied **in**, a physical product (including a physical distribution medium), accompanied by the Corresponding Source fixed on a durable physical medium customarily used **for** software interchange.
- b) Convey the object code **in, or** embodied **in**, a physical product (including a physical distribution medium), accompanied by a written offer, valid **for** at least three years **and** valid **for as long as** you offer spare parts **or** customer support **for** that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source **for all** the software **in** the product that **is** covered by this License, on a durable physical medium customarily used **for** software interchange, **for** a price no more than your reasonable cost of physically performing this conveying of source, **or** (2) access to copy the Corresponding Source **from a** network server at no charge.
- c) Convey individual copies of the object code **with** a copy of the written offer to provide the Corresponding Source. This alternative **is** allowed only occasionally **and** noncommercially, **and** only **if** you received the object code **with** such an offer, **in** accord **with** subsection 6b.
- d) Convey the object code by offering access **from a** designated place (gratis **or for** a charge), **and** offer equivalent access to the Corresponding Source **in** the same way through the same place at no further charge. You need **not** require recipients to copy the Corresponding Source along **with** the object code. If the place to copy the object code **is** a network server, the Corresponding Source may be on a different server (operated by you **or** a third party) that supports equivalent copying facilities, provided you maintain clear directions **next** to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it **is** available **for as long as** needed to satisfy these requirements.

(continues on next page)

(continued from previous page)

e) Convey the `object` code using peer-to-peer transmission, provided you inform other peers where the `object` code **and** Corresponding Source of the work are being offered to the general public at no charge under subsection 6d.

A separable portion of the `object` code, whose source code **is** excluded **from the** Corresponding Source **as** a System Library, need **not** be included **in** conveying the `object` code work.

A "User Product" **is** either (1) a "consumer product", which means any tangible personal `property` which **is** normally used **for** personal, family, **or** household purposes, **or** (2) anything designed **or** sold **for** incorporation into a dwelling. In determining whether a product **is** a consumer product, doubtful cases shall be resolved **in** favor of coverage. For a particular product received by a particular user, "normally used" refers to a typical **or** common use of that `class of` product, regardless of the status of the particular user **or** of the way **in** which the particular user actually uses, **or** expects **or** **is** expected to use, the product. A product **is** a consumer product regardless of whether the product has substantial commercial, industrial **or** non-consumer uses, unless such uses represent the only significant mode of use of the product.

"Installation Information" **for** a User Product means any methods, procedures, authorization keys, **or** other information required to install **and** execute modified versions of a covered work **in** that User Product **from** a modified version of its Corresponding Source. The information must suffice to ensure that the continued functioning of the modified `object` code **is in** no case prevented **or** interfered **with** solely because modification has been made.

If you convey an `object` code work under this section **in, or with, or** specifically **for** use **in**, a User Product, **and** the conveying occurs **as** part of a transaction **in** which the right of possession **and** use of the User Product **is** transferred to the recipient **in** perpetuity **or for** a fixed term (regardless of how the transaction **is** characterized), the Corresponding Source conveyed under this section must be accompanied by the Installation Information. But this requirement does **not** apply **if** neither you nor any third party retains the ability to install modified `object` code on the User Product (**for** example, the work has been installed **in** ROM).

The requirement to provide Installation Information does **not** include a requirement to **continue** to provide support service, warranty, **or** updates **for** a work that has been modified **or** installed by the recipient, **or for** the User Product **in** which it has been modified **or** installed. Access to a network may be denied when the modification itself materially **and** adversely affects the operation of the network **or** violates the rules **and** protocols **for** communication across the network.

Corresponding Source conveyed, **and** Installation Information provided, **in** accord **with** this section must be **in** a format that **is** publicly documented (**and with** an implementation available to the public **in** source code form), **and** must require no special password **or** key **for** unpacking, reading **or** copying.

7. Additional Terms.

(continues on next page)

(continued from previous page)

"Additional permissions" are terms that supplement the terms of this License by making exceptions **from one or** more of its conditions. Additional permissions that are applicable to the entire Program shall be treated **as** though they were included **in** this License, to the extent that they are valid under applicable law. If additional permissions apply only to part of the Program, that part may be used separately under those permissions, but the entire Program remains governed by this License without regard to the additional permissions.

When you convey a copy of a covered work, you may at your option remove **any** additional permissions **from that** copy, **or from any** part of it. (Additional permissions may be written to require their own removal **in** certain cases when you modify the work.) You may place additional permissions on material, added by you to a covered work, **for** which you have **or** can give appropriate copyright permission.

Notwithstanding **any** other provision of this License, **for** material you add to a covered work, you may (**if** authorized by the copyright holders of that material) supplement the terms of this License **with** terms:

- a) Disclaiming warranty **or** limiting liability differently **from the** terms of sections 15 **and** 16 of this License; **or**
- b) Requiring preservation of specified reasonable legal notices **or** author attributions **in** that material **or in** the Appropriate Legal Notices displayed by works containing it; **or**
- c) Prohibiting misrepresentation of the origin of that material, **or** requiring that modified versions of such material be marked **in** reasonable ways **as** different **from the** original version; **or**
- d) Limiting the use **for** publicity purposes of names of licensors **or** authors of the material; **or**
- e) Declining to grant rights under trademark law **for** use of some trade names, trademarks, **or** service marks; **or**
- f) Requiring indemnification of licensors **and** authors of that material by anyone who conveys the material (**or** modified versions of it) **with** contractual assumptions of liability to the recipient, **for** any liability that these contractual assumptions directly impose on those licensors **and** authors.

All other non-permissive additional terms are considered "further restrictions" **within the meaning of section 10**. If the Program as you received it, **or** any part of it, contains a notice stating that it **is** governed by this License along **with** a term that **is** a further restriction, you may remove that term. If a license document contains a further restriction but permits relicensing **or** conveying under this License, you may add to a covered work material governed by the terms of that license document, provided that the further restriction does **not** survive such relicensing **or** conveying.

If you add terms to a covered work **in** accord **with** this section, you must place, **in** the relevant source files, a statement of the additional terms that apply to those files, **or** a notice indicating where to find the applicable terms.

(continues on next page)

(continued from previous page)

Additional terms, permissive **or** non-permissive, may be stated **in** the form of a separately written license, **or** stated **as** exceptions; the above requirements apply either way.

8. Termination.

You may **not** propagate **or** modify a covered work **except as** expressly provided under this License. Any attempt otherwise to propagate **or** modify it **is** void, **and** will automatically terminate your rights under this License (including any patent licenses granted under the third paragraph of section 11).

However, **if** you cease all violation of this License, then your license **from a** particular copyright holder **is** reinstated (a) provisionally, unless **and** until the copyright holder explicitly **and finally** terminates your license, **and** (b) permanently, **if** the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license **from a** particular copyright holder **is** reinstated permanently **if** the copyright holder notifies you of the violation by some reasonable means, this **is** the first time you have received notice of violation of this License (**for any work**) **from that** copyright holder, **and** you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does **not** terminate the licenses of parties who have received copies **or** rights **from you** under this License. If your rights have been terminated **and not** permanently reinstated, you do **not** qualify to receive new licenses **for** the same material under section 10.

9. Acceptance Not Required **for** Having Copies.

You are **not** required to accept this License **in** order to receive **or** run a copy of the Program. Ancillary propagation of a covered work occurring solely **as** a consequence of using peer-to-peer transmission to receive a copy likewise does **not** require acceptance. However, nothing other than this License grants you permission to propagate **or** modify any covered work. These actions infringe copyright **if** you do **not** accept this License. Therefore, by modifying **or** propagating a covered work, you indicate your acceptance of this License to do so.

10. Automatic Licensing of Downstream Recipients.

Each time you convey a covered work, the recipient automatically receives a license **from the** original licensors, to run, modify **and** propagate that work, subject to this License. You are **not** responsible **for** enforcing compliance by third parties **with** this License.

An "entity transaction" **is** a transaction transferring control of an organization, **or** substantially all assets of one, **or** subdividing an organization, **or** merging organizations. If propagation of a covered work results **from an** entity transaction, each party to that transaction who receives a copy of the work also receives whatever licenses to the work the party's predecessor in interest had or could

(continues on next page)

(continued from previous page)

give under the previous paragraph, plus a right to possession of the Corresponding Source of the work **from the** predecessor **in** interest, **if** the predecessor has it **or** can get it **with** reasonable efforts.

You may **not** impose **any** further restrictions on the exercise of the rights granted **or** affirmed under this License. For example, you may **not** impose a license fee, royalty, **or** other charge **for** exercise of rights granted under this License, **and** you may **not** initiate litigation (including a cross-claim **or** counterclaim **in** a lawsuit) alleging that **any** patent claim **is** infringed by making, using, selling, offering **for** sale, **or** importing the Program **or** any portion of it.

11. Patents.

A **"contributor"** **is** a copyright holder who authorizes use under this License of the Program **or** a work on which the Program **is** based. The work thus licensed **is** called the contributor's **"contributor version"**.

A contributor's **"essential patent claims"** are all patent claims owned **or** controlled by the contributor, whether already acquired **or** hereafter acquired, that would be infringed by some manner, permitted by this License, of making, using, **or** selling its contributor version, but do **not** include claims that would be infringed only **as** a consequence of further modification of the contributor version. For purposes of this definition, **"control"** includes the right to grant patent sublicenses **in** a manner consistent **with** the requirements of this License.

Each contributor grants you a non-exclusive, worldwide, royalty-free patent license under the contributor's **essential patent claims**, to make, use, sell, offer **for** sale, **import and** otherwise run, modify **and** propagate the contents of its contributor version.

In the following three paragraphs, a **"patent license"** **is** any express agreement **or** commitment, however denominated, **not** to enforce a patent (such **as** an express permission to practice a patent **or** covenant **not** to sue **for** patent infringement). To **"grant"** such a patent license to a party means to make such an agreement **or** commitment **not** to enforce a patent against the party.

If you convey a covered work, knowingly relying on a patent license, **and** the Corresponding Source of the work **is not** available **for** anyone to copy, free of charge **and** under the terms of this License, through a publicly available network server **or** other readily accessible means, then you must either (1) cause the Corresponding Source to be so available, **or** (2) arrange to deprive yourself of the benefit of the patent license **for** this particular work, **or** (3) arrange, **in** a manner consistent **with** the requirements of this License, to extend the patent license to downstream recipients. **"Knowingly relying"** means you have actual knowledge that, but **for** the patent license, your conveying the covered work **in** a country, **or** your recipient's use of the covered work **in** a country, would infringe one **or** more identifiable patents **in** that country that you have reason to believe are valid.

If, pursuant to **or in** connection **with** a single transaction **or** arrangement, you convey, **or** propagate by procuring conveyance of, a covered work, **and** grant a patent license to some of the parties

(continues on next page)

(continued from previous page)

receiving the covered work authorizing them to use, propagate, modify **or** convey a specific copy of the covered work, then the patent license you grant **is** automatically extended to **all** recipients of the covered work **and** works based on it.

A patent license **is** "discriminatory" **if** it does **not** include within the scope of its coverage, prohibits the exercise of, **or is** conditioned on the non-exercise of one **or** more of the rights that are specifically granted under this License. You may **not** convey a covered work **if** you are a party to an arrangement **with** a third party that **is in** the business of distributing software, under which you make payment to the third party based on the extent of your activity of conveying the work, **and** under which the third party grants, to **any** of the parties who would receive the covered work **from you**, a discriminatory patent license (a) **in** connection **with** copies of the covered work conveyed by you (**or** copies made **from those** copies), **or** (b) primarily **for and in** connection **with** specific products **or** compilations that contain the covered work, unless you entered into that arrangement, **or** that patent license was granted, prior to 28 March 2007.

Nothing **in** this License shall be construed **as** excluding **or** limiting any implied license **or** other defenses to infringement that may otherwise be available to you under applicable patent law.

12. No Surrender of Others' Freedom.

If conditions are imposed on you (whether by court order, agreement **or** otherwise) that contradict the conditions of this License, they do **not** excuse you **from the** conditions of this License. If you cannot convey a covered work so **as** to satisfy simultaneously your obligations under this License **and** any other pertinent obligations, then **as** a consequence you may **not** convey it at **all**. For example, **if** you agree to terms that obligate you to collect a royalty **for** further conveying **from those** to whom you convey the Program, the only way you could satisfy both those terms **and** this License would be to refrain entirely **from conveying** the Program.

13. Use **with** the GNU Affero General Public License.

Notwithstanding **any** other provision of this License, you have permission to link **or** combine **any** covered work **with** a work licensed under version 3 of the GNU Affero General Public License into a single combined work, **and** to convey the resulting work. The terms of this License will **continue** to apply to the part which **is** the covered work, but the special requirements of the GNU Affero General Public License, section 13, concerning interaction through a network will apply to the combination **as** such.

14. Revised Versions of this License.

The Free Software Foundation may publish revised **and/or** new versions of the GNU General Public License **from time** to time. Such new versions will be similar **in** spirit to the present version, but may differ **in** detail to address new problems **or** concerns.

Each version **is** given a distinguishing version number. If the Program specifies that a certain numbered version of the GNU General Public License "**or any later version**" applies to it, you have the

(continues on next page)

(continued from previous page)

option of following the terms **and** conditions either of that numbered version **or** of any later version published by the Free Software Foundation. If the Program does **not** specify a version number of the GNU General Public License, you may choose any version ever published by the Free Software Foundation.

If the Program specifies that a proxy can decide which future versions of the GNU General Public License can be used, that proxy's public statement of acceptance of a version permanently authorizes you to choose that version **for** the Program.

Later license versions may give you additional **or** different permissions. However, no additional obligations are imposed on any author **or** copyright holder **as** a result of your choosing to follow a later version.

15. Disclaimer of Warranty.

THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. Limitation of Liability.

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MODIFIES AND/OR CONVEYS THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

17. Interpretation of Sections 15 **and** 16.

If the disclaimer of warranty **and** limitation of liability provided above cannot be given local legal effect according to their terms, reviewing courts shall apply local law that most closely approximates an absolute waiver of all civil liability **in** connection **with** the Program, unless a warranty **or** assumption of liability accompanies a copy of the Program **in return for** a fee.

END OF TERMS AND CONDITIONS

14.9 LOOT Documentation

(continues on next page)

(continued from previous page)

GNU Free Documentation License
Version 1.3, 3 November 2008

Copyright (C) 2000, 2001, 2002, 2007, 2008 Free Software Foundation, Inc.
<<http://fsf.org/>>

Everyone **is** permitted to copy **and** distribute verbatim copies of this license document, but changing it **is not** allowed.

0. PREAMBLE

The purpose of this License **is** to make a manual, textbook, **or** other functional **and** useful document "free" **in** the sense of freedom: to assure everyone the effective freedom to copy **and** redistribute it, **with or** without modifying it, either commercially **or** noncommercially. Secondly, this License preserves **for** the author **and** publisher a way to get credit **for** their work, **while not** being considered responsible **for** modifications made by others.

This License **is** a kind of "copyleft", which means that derivative works of the document must themselves be free **in** the same sense. It complements the GNU General Public License, which **is** a copyleft license designed **for** free software.

We have designed this License **in** order to use it **for** manuals **for** free software, because free software needs free documentation: a free program should come **with** manuals providing the same freedoms that the software does. But this License **is not** limited to software manuals; it can be used **for any** textual work, regardless of subject matter **or** whether it **is** published **as** a printed book. We recommend this License principally **for** works whose purpose **is** instruction **or** reference.

1. APPLICABILITY AND DEFINITIONS

This License applies to **any** manual **or** other work, **in any** medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited **in** duration, to use that work under the conditions stated herein. The "Document", below, refers to **any** such manual **or** work. Any member of the public **is** a licensee, **and is** addressed **as** "you". You accept the license **if** you copy, modify **or** distribute the work **in** a way requiring permission under copyright law.

A "Modified Version" of the Document means **any** work containing the Document **or** a portion of it, either copied verbatim, **or with** modifications **and/or** translated into another language.

A "Secondary Section" **is** a named appendix **or** a front-matter section of the Document that deals exclusively **with** the relationship of the publishers **or** authors of the Document to the Document's overall subject (**or** to related matters) **and** contains nothing that could fall directly within that overall subject. (Thus, **if** the Document **is in** part a textbook of mathematics, a Secondary Section may **not** explain **any** mathematics.) The relationship could be a matter of historical

(continues on next page)

(continued from previous page)

connection **with** the subject **or with** related matters, **or** of legal, commercial, philosophical, ethical **or** political position regarding them.

The "Invariant Sections" are certain Secondary Sections whose titles are designated, **as** being those of Invariant Sections, **in** the notice that says that the Document **is** released under this License. If a section does **not** fit the above definition of Secondary then it **is not** allowed to be designated **as** Invariant. The Document may contain zero Invariant Sections. If the Document does **not** identify **any** Invariant Sections then there are none.

The "Cover Texts" are certain short passages of text that are listed, **as** Front-Cover Texts **or** Back-Cover Texts, **in** the notice that says that the Document **is** released under this License. A Front-Cover Text may be at most 5 words, **and** a Back-Cover Text may be at most 25 words.

A "Transparent" copy of the Document means a machine-readable copy, represented **in** a **format** whose specification **is** available to the general public, that **is** suitable **for** revising the document straightforwardly **with** generic text editors **or** (**for** images composed of pixels) generic paint programs **or** (**for** drawings) some widely available drawing editor, **and** that **is** suitable **for** input to text formatters **or** **for** automatic translation to a variety of formats suitable **for** input to text formatters. A copy made **in** an otherwise Transparent file **format** whose markup, **or** absence of markup, has been arranged to thwart **or** discourage subsequent modification by readers **is not** Transparent. An image **format** **is not** Transparent **if** used **for** any substantial amount of text. A copy that **is not** "Transparent" **is** called "Opaque".

Examples of suitable formats **for** Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML **or** XML using a publicly available DTD, **and** standard-conforming simple HTML, PostScript **or** PDF designed **for** human modification. Examples of transparent image formats include PNG, XCF **and** JPG. Opaque formats include proprietary formats that can be read **and** edited only by proprietary word processors, SGML **or** XML **for** which the DTD **and/or** processing tools are **not** generally available, **and** the machine-generated HTML, PostScript **or** PDF produced by some word processors **for** output purposes only.

The "Title Page" means, **for** a printed book, the title page itself, plus such following pages **as** are needed to hold, legibly, the material this License requires to appear **in** the title page. For works **in** formats which do **not** have **any** title page **as** such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

The "publisher" means **any** person **or** entity that distributes copies of the Document to the public.

A section "Entitled XYZ" means a named subunit of the Document whose title either **is** precisely XYZ **or** contains XYZ **in** parentheses following text that translates XYZ **in** another language. (Here XYZ stands **for** a specific section name mentioned below, such **as** "Acknowledgements", "Dedications", "Endorsements", **or** "History".) To "Preserve the Title" of such a section when you modify the Document means that it remains a

(continues on next page)

(continued from previous page)

section "Entitled XYZ" according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

2. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

(continues on next page)

It **is** requested, but **not** required, that you contact the authors of the Document well before redistributing **any** large number of copies, to give them a chance to provide you **with** an updated version of the Document.

4. MODIFICATIONS

You may copy **and** distribute a Modified Version of the Document under the conditions of sections 2 **and** 3 above, provided that you release the Modified Version under precisely this License, **with** the Modified Version filling the role of the Document, thus licensing distribution **and** modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things **in** the Modified Version:

- A. Use **in** the Title Page (**and** on the covers, **if any**) a title distinct **from that** of the Document, **and from those** of previous versions (which should, **if there were any**, be listed **in** the History section of the Document). You may use the same title **as** a previous version **if** the original publisher of that version gives permission.
- B. List on the Title Page, **as** authors, one **or** more persons **or** entities responsible **for** authorship of the modifications **in** the Modified Version, together **with** at least five of the principal authors of the Document (**all** of its principal authors, **if** it has fewer than five), unless they release you **from this** requirement.
- C. State on the Title page the name of the publisher of the Modified Version, **as** the publisher.
- D. Preserve **all** the copyright notices of the Document.
- E. Add an appropriate copyright notice **for** your modifications adjacent to the other copyright notices.
- F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, **in** the form shown **in** the Addendum below.
- G. Preserve **in** that license notice the full lists of Invariant Sections **and** required Cover Texts given **in** the Document's license notice.
- H. Include an unaltered copy of this License.
- I. Preserve the section Entitled "**History**", Preserve its Title, **and** add to it an item stating at least the title, year, new authors, **and** publisher of the Modified Version **as** given on the Title Page. If there **is** no section Entitled "**History**" **in** the Document, create one stating the title, year, authors, **and** publisher of the Document **as** given on its Title Page, then add an item describing the Modified Version **as** stated **in** the previous sentence.
- J. Preserve the network location, **if any**, given **in** the Document **for** public access to a Transparent copy of the Document, **and** likewise the network locations given **in** the Document **for** previous versions it was based on. These may be placed **in** the "**History**" section. You may omit a network location **for** a work that was published at least four years before the Document itself, **or if** the original publisher of the version it refers to gives permission.
- K. For **any** section Entitled "**Acknowledgements**" **or** "**Dedications**", Preserve the Title of the section, **and** preserve **in** the section **all** the substance **and** tone of each of the contributor acknowledgements **and/or** dedications given therein.
- L. Preserve **all** the Invariant Sections of the Document, unaltered **in** their text **and in** their titles. Section numbers

(continues on next page)

(continued from previous page)

- or** the equivalent are **not** considered part of the section titles.
- M. Delete **any** section Entitled "Endorsements". Such a section may **not** be included **in** the Modified Version.
- N. Do **not** retitle **any** existing section to be Entitled "Endorsements" **or** to conflict **in** title **with any** Invariant Section.
- O. Preserve **any** Warranty Disclaimers.

If the Modified Version includes new front-matter sections **or** appendices that qualify **as** Secondary Sections **and** contain no material copied **from the** Document, you may at your option designate some **or all** of these sections **as** invariant. To do this, add their titles to the **list** of Invariant Sections **in** the Modified Version's license notice. These titles must be distinct **from any** other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties--**for** example, statements of peer review **or** that the text has been approved by an organization **as** the authoritative definition of a standard.

You may add a passage of up to five words **as** a Front-Cover Text, **and** a passage of up to 25 words **as** a Back-Cover Text, to the end of the **list** of Cover Texts **in** the Modified Version. Only one passage of Front-Cover Text **and** one of Back-Cover Text may be added by (**or** through arrangements made by) **any** one entity. If the Document already includes a cover text **for** the same cover, previously added by you **or** by arrangement made by the same entity you are acting on behalf of, you may **not** add another; but you may replace the old one, on explicit permission **from the** previous publisher that added the old one.

The author(s) **and** publisher(s) of the Document do **not** by this License give permission to use their names **for** publicity **for or** to **assert or** imply endorsement of **any** Modified Version.

5. COMBINING DOCUMENTS

You may combine the Document **with** other documents released under this License, under the terms defined **in** section 4 above **for** modified versions, provided that you include **in** the combination **all** of the Invariant Sections of **all** of the original documents, unmodified, **and** **list** them **all as** Invariant Sections of your combined work **in** its license notice, **and** that you preserve **all** their Warranty Disclaimers.

The combined work need only contain one copy of this License, **and** multiple identical Invariant Sections may be replaced **with** a single copy. If there are multiple Invariant Sections **with** the same name but different contents, make the title of each such section unique by adding at the end of it, **in** parentheses, the name of the original author **or** publisher of that section **if** known, **or else** a unique number. Make the same adjustment to the section titles **in** the **list** of Invariant Sections **in** the license notice of the combined work.

In the combination, you must combine **any** sections Entitled "History" **in** the various original documents, forming one section Entitled "History"; likewise combine **any** sections Entitled "Acknowledgements", **and** **any** sections Entitled "Dedications". You must delete **all** sections

(continues on next page)

Entitled "Endorsements".

6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document **and** other documents released under this License, **and** replace the individual copies of this License **in** the various documents **with** a single copy that **is** included **in** the collection, provided that you follow the rules of this License **for** verbatim copying of each of the documents **in all** other respects.

You may extract a single document **from such** a collection, **and** distribute it individually under this License, provided you insert a copy of this License into the extracted document, **and** follow this License **in all** other respects regarding verbatim copying of that document.

7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document **or** its derivatives **with** other separate **and** independent documents **or** works, **in or** on a volume of a storage **or** distribution medium, **is** called an "aggregate" **if** the copyright resulting **from the** compilation **is not** used to limit the legal rights of the compilation's users **beyond what the individual works permit**. When the Document **is** included **in** an aggregate, this License does **not** apply to the other works **in** the aggregate which are **not** themselves derivative works of the Document.

If the Cover Text requirement of section 3 **is** applicable to these copies of the Document, then **if** the Document **is** less than one half of the entire aggregate, the Document's **Cover Texts may be placed on** covers that bracket the Document within the aggregate, **or** the electronic equivalent of covers **if** the Document **is in** electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

8. TRANSLATION

Translation **is** considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections **with** translations requires special permission **from their** copyright holders, but you may include translations of some **or** all Invariant Sections **in** addition to the original versions of these Invariant Sections. You may include a translation of this License, **and all** the license notices **in** the Document, **and any** Warranty Disclaimers, provided that you also include the original English version of this License **and** the original versions of those notices **and** disclaimers. In case of a disagreement between the translation **and** the original version of this License **or** a notice **or** disclaimer, the original version will prevail.

If a section **in** the Document **is** Entitled "Acknowledgements", "Dedications", **or** "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual

(continues on next page)

(continued from previous page)

title.

9. TERMINATION

You may **not** copy, modify, sublicense, **or** distribute the Document **except as** expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, **or** distribute it **is** void, **and** will automatically terminate your rights under this License.

However, **if** you cease **all** violation of this License, then your license **from a** particular copyright holder **is** reinstated (a) provisionally, unless **and** until the copyright holder explicitly **and finally** terminates your license, **and** (b) permanently, **if** the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license **from a** particular copyright holder **is** reinstated permanently **if** the copyright holder notifies you of the violation by some reasonable means, this **is** the first time you have received notice of violation of this License (**for any work**) **from that** copyright holder, **and** you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does **not** terminate the licenses of parties who have received copies **or** rights **from you** under this License. If your rights have been terminated **and not** permanently reinstated, receipt of a copy of some **or all** of the same material does **not** give you **any** rights to use it.

10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License **from time** to time. Such new versions will be similar **in** spirit to the present version, but may differ **in** detail to address new problems **or** concerns. See <http://www.gnu.org/copyleft/>.

Each version of the License **is** given a distinguishing version number. If the Document specifies that a particular numbered version of this License "**or any later version**" applies to it, you have the option of following the terms **and** conditions either of that specified version **or** of **any** later version that has been published (**not as** a draft) by the Free Software Foundation. If the Document does **not** specify a version number of this License, you may choose **any** version ever published (**not as** a draft) by the Free Software Foundation. If the Document specifies that a proxy can decide which future versions of this License can be used, that proxy's **public statement of acceptance of a** version permanently authorizes you to choose that version **for** the Document.

11. RELICENSING

"Massive Multiauthor Collaboration Site" (**or** "MMC Site") means **any** World Wide Web server that publishes copyrightable works **and** also provides prominent facilities **for** anybody to edit those works. A

(continues on next page)

(continued from previous page)

public wiki that anybody can edit **is** an example of such a server. A "Massive Multiauthor Collaboration" (or "MMC") contained **in** the site means **any set** of copyrightable works thus published on the MMC site.

"CC-BY-SA" means the Creative Commons Attribution-Share Alike 3.0 license published by Creative Commons Corporation, a **not-for-profit** corporation **with** a principal place of business **in** San Francisco, California, **as well as** future copyleft versions of that license published by that same organization.

"Incorporate" means to publish **or** republish a Document, **in** whole **or in** part, **as** part of another Document.

An MMC **is** "eligible for relicensing" **if** it **is** licensed under this License, **and if** all works that were first published under this License somewhere other than this MMC, **and** subsequently incorporated **in** whole **or in** part into the MMC, (1) had no cover texts **or** invariant sections, **and** (2) were thus incorporated prior to November 1, 2008.

The operator of an MMC Site may republish an MMC contained **in** the site under CC-BY-SA on the same site at **any** time before August 1, 2009, provided the MMC **is** eligible **for** relicensing.

14.10 Marked

Copyright (c) 2011-2014, Christopher Jeffrey (<https://github.com/chjj/>)

Permission **is** hereby granted, free of charge, to **any** person obtaining a copy of this software **and** associated documentation files (the "Software"), to deal **in** the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, **and/or** sell copies of the Software, **and** to permit persons to whom the Software **is** furnished to do so, subject to the following conditions:

The above copyright notice **and** this permission notice shall be included **in** all copies **or** substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

14.11 nlohmann/json

MIT License

Copyright (c) 2013-2018 Niels Lohmann

(continues on next page)

(continued from previous page)

Permission **is** hereby granted, free of charge, to **any** person obtaining a copy of this software **and** associated documentation files (the "**Software**"), to deal **in** the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, **and/or** sell copies of the Software, **and** to permit persons to whom the Software **is** furnished to do so, subject to the following conditions:

The above copyright notice **and** this permission notice shall be included **in all** copies **or** substantial portions of the Software.

THE SOFTWARE IS PROVIDED "**AS IS**", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

14.12 Polymer

```
// Copyright (c) 2014 The Polymer Authors. All rights reserved.
//
// Redistribution and use in source and binary forms, with or without
// modification, are permitted provided that the following conditions are
// met:
//
// * Redistributions of source code must retain the above copyright
// notice, this list of conditions and the following disclaimer.
// * Redistributions in binary form must reproduce the above
// copyright notice, this list of conditions and the following disclaimer
// in the documentation and/or other materials provided with the
// distribution.
// * Neither the name of Google Inc. nor the names of its
// contributors may be used to endorse or promote products derived from
// this software without specific prior written permission.
//
// THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS
// "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
// LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR
// A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT
// OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
// SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
// LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE,
// DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY
// THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
// (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE
// OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
```

14.13 spdlog

The MIT License (MIT)

Copyright (c) 2016 Gabi Melman.

Permission **is** hereby granted, free of charge, to **any** person obtaining a copy of this software **and** associated documentation files (the "**Software**"), to deal **in** the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, **and/or** sell copies of the Software, **and** to permit persons to whom the Software **is** furnished to do so, subject to the following conditions:

The above copyright notice **and** this permission notice shall be included **in** all copies **or** substantial portions of the Software.

THE SOFTWARE IS PROVIDED "**AS IS**", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.