

---

# **libloot Documentation**

***Release latest***

**WrinklyNinja**

**Aug 22, 2020**



# API DOCUMENTATION

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Miscellaneous Details</b>	<b>3</b>
2.1	String Encoding . . . . .	3
2.2	Language Codes . . . . .	3
2.3	Errors . . . . .	3
2.4	Metadata Files . . . . .	3
2.5	Caching . . . . .	4
2.6	Performance . . . . .	4
<b>3</b>	<b>LOOT's Sorting Algorithm</b>	<b>5</b>
3.1	Load plugin data . . . . .	5
3.2	Create plugin graph vertices . . . . .	5
3.3	Create plugin graph edges . . . . .	5
3.4	Topologically sort the plugin graph . . . . .	6
<b>4</b>	<b>API Reference</b>	<b>7</b>
4.1	Enumerations . . . . .	7
4.2	Public-Field Data Structures . . . . .	9
4.3	Functions . . . . .	9
4.4	Interfaces . . . . .	10
4.5	Classes . . . . .	17
4.6	Exceptions . . . . .	28
4.7	Error Categories . . . . .	29
<b>5</b>	<b>Credits</b>	<b>31</b>
<b>6</b>	<b>Version History</b>	<b>33</b>
6.1	0.16.1 - 2020-08-22 . . . . .	33
6.2	0.16.0 - 2020-07-12 . . . . .	33
6.3	0.15.2 - 2020-06-14 . . . . .	35
6.4	0.15.1 - 2019-12-07 . . . . .	35
6.5	0.15.0 - 2019-11-05 . . . . .	35
6.6	0.14.10 - 2019-09-06 . . . . .	36
6.7	0.14.9 - 2019-07-23 . . . . .	36
6.8	0.14.8 - 2019-06-30 . . . . .	37
6.9	0.14.7 - 2019-06-13 . . . . .	37
6.10	0.14.6 - 2019-04-24 . . . . .	37
6.11	0.14.5 - 2019-02-27 . . . . .	38
6.12	0.14.4 - 2019-01-27 . . . . .	38
6.13	0.14.3 - 2019-01-27 . . . . .	38

6.14	0.14.2 - 2019-01-20	39
6.15	0.14.1 - 2018-12-23	39
6.16	0.14.0 - 2018-12-09	39
6.17	0.13.8 - 2018-09-24	41
6.18	0.13.7 - 2018-09-10	41
6.19	0.13.6 - 2018-06-29	42
6.20	0.13.5 - 2018-06-02	42
6.21	0.13.4 - 2018-06-02	42
6.22	0.13.3 - 2018-05-26	42
6.23	0.13.2 - 2018-04-29	43
6.24	0.13.1 - 2018-04-09	43
6.25	0.13.0 - 2018-04-02	43
6.26	0.12.5 - 2018-02-17	44
6.27	0.12.4 - 2018-02-17	45
6.28	0.12.3 - 2018-02-04	45
6.29	0.12.2 - 2017-12-24	46
6.30	0.12.1 - 2017-11-23	46
6.31	0.12.0 - 2017-11-03	46
6.32	0.11.1 - 2017-06-19	47
6.33	0.11.0 - 2017-05-13	47
6.34	0.10.3 - 2017-01-08	49
6.35	0.10.2 - 2016-12-03	49
6.36	0.10.1 - 2016-11-12	50
6.37	0.10.0 - 2016-11-06	50
6.38	0.9.2 - 2016-08-03	50
6.39	0.9.1 - 2016-06-23	51
6.40	0.9.0 - 2016-05-21	51
6.41	0.8.1 - 2015-09-27	51
6.42	0.8.0 - 2015-07-22	52
6.43	0.7.1 - 2015-06-22	52
6.44	0.7.0 - 2015-05-20	52
<b>7</b>	<b>Introduction</b>	<b>53</b>
<b>8</b>	<b>Metadata File Structure</b>	<b>55</b>
8.1	Example	55
<b>9</b>	<b>Data Structures</b>	<b>57</b>
9.1	Tag	57
9.2	File	58
9.3	Group	58
9.4	Localised Content	60
9.5	Message	60
9.6	Location	62
9.7	Cleaning Data	62
9.8	Plugin	64
<b>10</b>	<b>Condition Strings</b>	<b>67</b>
10.1	Types	67
10.2	Functions	68
10.3	Logical Operators	69
10.4	Performance	69
<b>11</b>	<b>Version History</b>	<b>71</b>
11.1	0.16 - 2020-07-12	71

11.2	0.15 - 2019-11-05 . . . . .	71
11.3	0.14 - 2018-12-09 . . . . .	71
11.4	0.13 - 2018-04-02 . . . . .	72
11.5	0.10 - 2016-11-06 . . . . .	72
11.6	0.8 - 2015-07-22 . . . . .	73
11.7	0.7 - 2015-05-20 . . . . .	73
11.8	0.6 - 2014-07-05 . . . . .	74
11.9	0.5 - 2014-03-31 . . . . .	74
<b>12</b>	<b>Copyright Notice</b>	<b>75</b>
<b>13</b>	<b>Copyright License Texts</b>	<b>77</b>
13.1	Boost . . . . .	77
13.2	libgit2 . . . . .	78
13.3	libloot, esplugin & Libloadorder . . . . .	94
13.4	libloot Documentation . . . . .	105
13.5	spdlog . . . . .	113
13.6	yaml-cpp . . . . .	113
<b>Index</b>		<b>115</b>



## **INTRODUCTION**

LOOT is a utility that helps users avoid serious conflicts between their mods by setting their plugins in an optimal load order. It also provides tens of thousands of plugin-specific messages, including usage notes, requirements, incompatibilities, bug warnings and installation mistake notifications, and thousands of Bash Tag suggestions.

This metadata that LOOT supplies is stored in its masterlist, which is maintained by the LOOT team using information provided by mod authors and users. Users can also add to and modify the metadata used by LOOT through the use of userlist files. libloot provides a way for third-party developers to access this metadata for use in their own programs.





## MISCELLANEOUS DETAILS

### 2.1 String Encoding

- All output strings are encoded in UTF-8.
- Metadata files are written encoded in UTF-8.
- Input strings are expected to be encoded in UTF-8.
- Metadata files read are expected to be encoded in UTF-8.
- File paths are case-sensitive if and only if the underlying file system is case-sensitive.

### 2.2 Language Codes

All language strings in the API are codes of the form `ll` or `ll_CC`, where `ll` is an ISO 639-1 language code and `CC` is an ISO 3166 country code. For example, the default language for metadata message content is English, identified by the code `en`, and Brazilian Portuguese is `pt_BR`.

### 2.3 Errors

All errors encountered are thrown as exceptions that inherit from `std::exception`.

### 2.4 Metadata Files

LOOT stores plugin metadata in YAML files. It distinguishes between *masterlist* and *userlist* files: each game has a single masterlist, which is a public, curated metadata store, and each LOOT user has a private userlist, which can contain metadata added by the user. The two files use the same syntax, but metadata in the userlist extends or replaces metadata sourced from the masterlist.

LOOT's plugin metadata can be conditional, eg. a plugin may require a patch only if another plugin is also present. The API's `LoadLists()` method parses metadata files into memory, but does not evaluate these conditions, so the loaded metadata may contain metadata that is invalid for the installed game that the `loot::DatabaseInterface` object being operated on was created for.

## 2.5 Caching

All unevaluated metadata is cached between calls to *LoadLists()*.

Plugin content is cached between calls to *LoadPlugins()* and *SortPlugins()*.

Load order is cached between calls to *LoadPlugins()*, *SortPlugins()* and *LoadCurrentLoadOrderState()*.

## 2.6 Performance

Loading metadata lists is a relatively costly operation, as is updating the masterlist (which involves loading it).

Sorting plugins is expensive, as it involves loading all the content of all the plugins, apart from the game's main master file, which is skipped as an optimisation (it doesn't depend on anything else and is much bigger than any other plugin, so is unnecessary and slow to load).

Getting plugin metadata once loaded is cheap, as is getting a masterlist's revision.

Loading the current load order state is relatively cheap and can take < 1 ms depending on hardware and the size of the load order, but involves filesystem access and should not be done more often than necessary to avoid a performance impact.

## LOOT'S SORTING ALGORITHM

LOOT's sorting algorithm consists of four stages:

- *Load plugin data*
- *Create plugin graph vertices*
- *Create plugin graph edges*
- *Topologically sort the plugin graph*

### 3.1 Load plugin data

In this first stage, the plugins to be sorted are parsed and their record IDs (which are FormIDs for all games apart from Morrowind) are stored. Parsing is multithreaded by dividing the plugins into buckets with roughly equal total file sizes, and loading each bucket's plugins in a separate thread. The number of buckets created is equal to the number of concurrent threads that are hardware-supported (e.g. a dual-core CPU without hyperthreading may report that it supports two threads).

When parsing plugins, all subrecords are skipped over for efficiency, apart from the subrecords of the TES4 header record.

### 3.2 Create plugin graph vertices

Once loaded, a directed graph is created and the plugins are added to it in lexicographical order as vertices. Any meta-data a plugin has in the masterlist and userlist are then merged into its vertex's data store. Plugin group dependencies are also resolved and added as group-derived plugins.

### 3.3 Create plugin graph edges

In this section, the terms *vertex* and *plugin* are used interchangeably, and the iteration order 'for each plugin' is the order in which the vertices were added to the graph.

For each plugin:

1. If the plugin is a master file, add edges going to all non-master files. If the plugin is a non-master file, add edges coming from all master files.
2. Add edges coming from all the plugin's masters. Missing masters have no edges added.

3. Add edges coming from all the plugin's requirements. Missing requirements have no edges added.
4. Add edges coming from all the plugin's load after files that are installed plugins.

Group-derived interdependencies are then evaluated. Each plugin's group-derived plugins are iterated over and individually checked to see if adding an edge from the group-derived plugin to the plugin would cause a cycle, and if not the edge is recorded. Once all potential edges have been checked, the recorded edges are added to the graph.

Plugin overlap edges are then added. Two plugins overlap if they contain the same record, i.e. if they both edit the same record or if one edits a record the other plugin adds.

For each plugin, skip it if it overrides no records, otherwise iterate over all other plugins.

- If the plugin and other plugin override the same number of records, or do not overlap, skip the other plugin.
- Otherwise, add an edge from the plugin which overrides more records to the plugin that overrides fewer records, unless that edge would cause a cycle.

For Morrowind, identifying which records override others requires all of a plugin's masters to be installed, so if a plugin has missing masters, its total record count is used in place of its override record count.

Finally, tie-break edges are added to ensure that sorting is consistent. For each plugin, iterate over all other plugins and add an edge between each pair of plugins in the direction given by the tie-break comparison function, unless that edge would cause a cycle.

The tie-break comparison function compares current plugin load order positions, falling back to plugin names.

- If both plugins have positions in the current load order, the function preserves their existing relative order.
- If one plugin has a position and the other does not, the edge added goes from the plugin with a position to the plugin without a position.
- If neither plugin has a load order position, a case-insensitive lexicographical comparison of their filenames without file extensions is used to decide their order.

## 3.4 Topologically sort the plugin graph

Note that edges for explicit interdependencies are the only edges allowed to create cycles: this is because the first step of this stage is to check the plugin graph for cycles, and throw an error if any are encountered, so that metadata (or indeed plugin data) that cause them can be corrected.

Once the graph is confirmed to be cycle-free, a topological sort is performed on the graph, outputting a list of plugins in their newly-sorted load order.

## API REFERENCE

### Contents

- *API Reference*
  - *Enumerations*
  - *Public-Field Data Structures*
  - *Functions*
  - *Interfaces*
  - *Classes*
  - *Exceptions*
  - *Error Categories*

## 4.1 Enumerations

**enum** `loot::EdgeType`

An enum representing the different possible types of interactions between plugins or groups.

*Values:*

`hardcoded`

`masterFlag`

`master`

`masterlistRequirement`

`userRequirement`

`masterlistLoadAfter`

`userLoadAfter`

`group`

`overlap`

`tieBreak`

**enum** `loot::GameType`

Codes used to create database handles for specific games.

*Values:*

**tes4**

The Elder Scrolls IV: Oblivion

**tes5**

The Elder Scrolls V: Skyrim

**fo3**

Fallout 3

**fonv**

Fallout: New Vegas

**fo4**

Fallout 4

**tes5se**

The Elder Scrolls V: Skyrim Special Edition

**fo4vr**

Fallout 4 VR

**tes5vr**

Skyrim VR

**tes3**

The Elder Scrolls III: Morrowind

**enum** `loot::LogLevel`

Codes used to specify different levels of API logging.

*Values:*

**trace**

**debug**

**info**

**warning**

**error**

**fatal**

**enum** `loot::MessageType`

Codes used to indicate the type of a message.

*Values:*

**say**

A notification message that is of no significant severity.

**warn**

A warning message, used to indicate that an issue may be present that the user may wish to act on.

**error**

An error message, used to indicate that an issue that requires user action is present.

## 4.2 Public-Field Data Structures

### **struct MasterlistInfo**

A structure that holds data about a masterlist's source control revision.

#### **Public Members**

std::string **revision\_id**

The revision hash for the masterlist. If the masterlist doesn't exist, or there is no Git repository at its location, this will be empty.

std::string **revision\_date**

A pointer to a string containing the ISO 8601 formatted revision date, ie. YYYY-MM-DD. If the masterlist doesn't exist, or there is no Git repository at its location, this will be empty.

bool **is\_modified**

true if the masterlist has been edited since the outputted revision, or false if it is at exactly the revision given.

### **struct SimpleMessage**

A structure that holds the type of a message and the message string itself.

#### **Public Members**

MessageType **type**

The type of the message.

std::string **language**

The language the message string is written in.

std::string **text**

The message string, which may be formatted using [GitHub Flavored Markdown](#).

std::string **condition**

The message's condition string.

## 4.3 Functions

void **loot::SetLoggingCallback** (std::function<void> *LogLevel*, const char \*  
> *callback*) Set the callback function that is called when logging.

If this function is not called, the default behaviour is to print messages to the console.

#### **Parameters**

- **callback**: The function called when logging. The first parameter is the level of the message being logged, and the second is the message.

bool **loot::IsCompatible** (const unsigned int *major*, const unsigned int *minor*, const unsigned int  
*patch*)

Checks for API compatibility.

Checks whether the loaded API is compatible with the given version of the API, abstracting API stability policy away from clients. The version numbering used is major.minor.patch.

**Return** True if the API versions are compatible, false otherwise.

**Parameters**

- `major`: The major version number to check.
- `minor`: The minor version number to check.
- `patch`: The patch version number to check.

```
std::shared_ptr<GameInterface> loot::CreateGameHandle(const GameType game, const
                                                    std::filesystem::path &game_path, const
                                                    std::filesystem::path &game_local_path =
                                                    "")
```

Initialise a new game handle.

Creates a handle for a game, which is then used by all game-specific functions.

**Return** The new game handle.

**Parameters**

- `game`: A game code for which to create the handle.
- `game_path`: The relative or absolute path to the directory containing the game's executable.
- `game_local_path`: The relative or absolute path to the game's folder in %LOCALAPPDATA% or an empty path. If an empty path, the API will attempt to look up the path that %LOCALAPPDATA% corresponds to. This parameter is provided so that systems lacking that environmental variable (eg. Linux) can still use the API.

## 4.4 Interfaces

**class DatabaseInterface**

The interface provided by API's database handle.

**Data Reading & Writing**

```
virtual void LoadLists(const std::filesystem::path &masterlist_path, const
                      std::filesystem::path &userlist_path = "") = 0
```

Loads the masterlist and userlist from the paths specified.

Can be called multiple times, each time replacing the previously-loaded data.

**Parameters**

- `masterlist_path`: The relative or absolute path to the masterlist file that should be loaded.
- `userlist_path`: The relative or absolute path to the userlist file that should be loaded, or an empty path. If an empty path, no userlist will be loaded.

```
virtual void WriteUserMetadata(const std::filesystem::path &outputFile, const bool over-
                             write) const = 0
```

Writes a metadata file containing all loaded user-added metadata.

**Parameters**

- `outputFile`: The path to which the file shall be written.
- `overwrite`: If `false` and `outputFile` already exists, no data will be written. Otherwise, data will be written.



```
virtual void WriteMinimalList (const std::filesystem::path &outputFile, const bool overwrite) const = 0
```

Writes a minimal metadata file that only contains plugins with Bash *Tag* suggestions and/or dirty info, plus the suggestions and info themselves.

#### Parameters

- outputFile: The path to which the file shall be written.
- overwrite: If false and outputFile already exists, no data will be written. Otherwise, data will be written.

### Masterlist Update

```
virtual bool UpdateMasterlist (const std::filesystem::path &masterlist_path, const std::string &remote_url, const std::string &remote_branch) = 0
```

Update the given masterlist.

Uses Git to update the given masterlist to a given remote. If the masterlist doesn't exist, this will create it. This function also initialises a Git repository in the given masterlist's parent folder. If the masterlist was not already up-to-date, it will be re-loaded, but not re-evaluated.

If a Git repository is already present, it will be used to perform a diff-only update, but if for any reason a fast-forward merge update is not possible, the existing repository will be deleted and a new repository cloned from the given remote.

**Return** true if the masterlist was updated. false if no update was necessary, ie. it was already up-to-date. If true, the masterlist will have been re-loaded, but will need to be re-evaluated separately.

#### Parameters

- masterlist\_path: The relative or absolute path to the masterlist file that should be updated. The filename must match the filename of the masterlist file in the given remote repository, otherwise it will not be updated correctly. Although LOOT itself expects this filename to be "masterlist.yaml", the API does not check for any specific filename.
- remote\_url: The URL of the remote from which to fetch updates. This can also be a relative or absolute path to a local repository.
- remote\_branch: The branch of the remote from which to apply updates. LOOT's official masterlists are versioned using separate branches for each new version of the masterlist syntax, so if you're using them, check their repositories to see which is the latest release branch.

```
virtual MasterlistInfo GetMasterlistRevision (const std::filesystem::path &masterlist_path, const bool get_short_id) const = 0
```

Get the given masterlist's revision.

Getting a masterlist's revision is only possible if it is found inside a local Git repository.

**Return** The revision data.

#### Parameters

- masterlist\_path: The relative or absolute path to the masterlist file that should be queried.
- get\_short\_id: If true, the shortest unique hexadecimal revision hash that is at least 7 characters long will be outputted. Otherwise, the full 40 character hash will be outputted.

```
virtual bool IsLatestMasterlist (const std::filesystem::path &masterlist_path, const std::string &branch) const = 0
```

Check if the given masterlist is the latest available for a given branch.

**Return** True if the masterlist revision matches the latest masterlist revision for the given branch, and false otherwise.

**Parameters**

- `masterlist_path`: The relative or absolute path to the masterlist file for which the latest revision should be obtained. It needs to be in a local Git repository.
- `branch`: The branch to check against.

## Non-plugin Data Access

**virtual** `std::vector<std::string> GetKnownBashTags () const = 0`

Gets the Bash Tags that are listed in the loaded metadata lists.

Bash *Tag* suggestions can include plugins not in this list.

**Return** A set of Bash *Tag* names.

**virtual** `std::vector<Message> GetGeneralMessages (bool evaluateConditions = false) const = 0`

Get all general messages listen in the loaded metadata lists.

**Return** A vector of messages supplied in the metadata lists but not attached to any particular plugin.

**Parameters**

- `evaluateConditions`: If true, any metadata conditions are evaluated before the metadata is returned, otherwise unevaluated metadata is returned. Evaluating general message conditions also clears the condition cache before evaluating conditions.

**virtual** `std::vector<Group> GetGroups (bool includeUserMetadata = true) const = 0`

Gets the groups that are defined in the loaded metadata lists.

**Return** An vector of *Group* objects. Each *Group*'s name is unique, if a group has masterlist and user metadata the two are merged into a single group object.

**Parameters**

- `includeUserMetadata`: If true, any group metadata present in the userlist is included in the returned metadata, otherwise the metadata returned only includes metadata from the masterlist.

**virtual** `std::vector<Group> GetUserGroups () const = 0`

Gets the groups that are defined or extended in the loaded userlist.

**Return** An unordered set of *Group* objects.

**virtual** `void SetUserGroups (const std::vector<Group> &groups) = 0`

Sets the group definitions to store in the userlist, overwriting any existing definitions there.

**Parameters**

- `groups`: The unordered set of *Group* objects to set.

```
virtual std::vector<Vertex> GetGroupsPath (const std::string &fromGroupName, const
                                         std::string &toGroupName) const = 0
```

Get the “shortest” path between the two given groups according to their load after metadata.

The “shortest” path is defined as the path that maximises the amount of user metadata involved while minimising the amount of masterlist metadata involved. It’s not the path involving the fewest groups.

**Return** A vector of *Vertex* elements representing the path from the source group to the destination group, or an empty vector if no path exists.

#### Parameters

- fromGroupName: The name of the source group, that loads earlier.
- toGroupName: The name of the destination group, that loads later.

### Plugin Data Access

```
virtual std::optional<PluginMetadata> GetPluginMetadata (const std::string &plugin, bool
                                                         includeUserMetadata = true,
                                                         bool evaluateConditions = false)
                                                         const = 0
```

Get all a plugin’s loaded metadata.

**Return** If the plugin has metadata, an optional containing that metadata, otherwise an optional containing no value.

#### Parameters

- plugin: The filename of the plugin to look up metadata for.
- includeUserMetadata: If true, any user metadata the plugin has is included in the returned metadata, otherwise the metadata returned only includes metadata from the masterlist.
- evaluateConditions: If true, any metadata conditions are evaluated before the metadata is returned, otherwise unevaluated metadata is returned. Evaluating plugin metadata conditions does not clear the condition cache.

```
virtual std::optional<PluginMetadata> GetPluginUserMetadata (const std::string &plugin,
                                                             bool evaluateConditions =
                                                             false) const = 0
```

Get a plugin’s metadata loaded from the given userlist.

**Return** If the plugin has user-added metadata, an optional containing that metadata, otherwise an optional containing no value.

#### Parameters

- plugin: The filename of the plugin to look up user-added metadata for.
- evaluateConditions: If true, any metadata conditions are evaluated before the metadata is returned, otherwise unevaluated metadata is returned. Evaluating plugin metadata conditions does not clear the condition cache.

```
virtual void SetPluginUserMetadata (const PluginMetadata &pluginMetadata) = 0
```

Sets a plugin’s user metadata, overwriting any existing user metadata.

#### Parameters

- `pluginMetadata`: The user metadata you want to set, with `plugin.Name()` being the filename of the plugin the metadata is for.

**virtual void DiscardPluginUserMetadata (const std::string &plugin) = 0**

Discards all loaded user metadata for the plugin with the given filename.

#### Parameters

- `plugin`: The filename of the plugin for which all user-added metadata should be deleted.

**virtual void DiscardAllUserMetadata () = 0**

Discards all loaded user metadata for all plugins, and any user-added general messages and known bash tags.

### class GameInterface

The interface provided for accessing game-specific functionality.

#### Metadata Access

**virtual std::shared\_ptr<DatabaseInterface> GetDatabase () = 0**

Get the database interface used for accessing metadata-related functionality.

**Return** A shared pointer to the game's *DatabaseInterface*

#### Plugin Data Access

**virtual bool IsValidPlugin (const std::string &plugin) const = 0**

Check if a file is a valid plugin.

The validity check is not exhaustive: it checks that the file extension is `.esm` or `.esp` (after trimming any `.ghost` extension), and that the TES4 header can be parsed.

**Return** True if the file is a valid plugin, false otherwise.

#### Parameters

- `plugin`: The filename of the file to check.

**virtual void LoadPlugins (const std::vector<std::string> &plugins, bool loadHeadersOnly) = 0**

Parses plugins and loads their data.

Any previously-loaded plugin data is discarded when this function is called.

#### Parameters

- `plugins`: The filenames of the plugins to load.
- `loadHeadersOnly`: If true, only the plugins' TES4 headers are loaded. If false, all records in the plugins are parsed, apart from the main master file if it has been identified by a previous call to *IdentifyMainMasterFile()*.

**virtual std::shared\_ptr<const PluginInterface> GetPlugin (const std::string &pluginName) const = 0**

Get data for a loaded plugin.

**Return** A shared pointer to a const *PluginInterface* implementation. The pointer is null if the given plugin has not been loaded.

**Parameters**

- `pluginName`: The filename of the plugin to get data for.

**virtual** `std::vector<std::shared_ptr<const PluginInterface>> GetLoadedPlugins () const = 0`

Get a set of const references to all loaded plugins' *PluginInterface* objects.

**Return** A set of const *PluginInterface* references. The references remain valid until the *LoadPlugins()* or *SortPlugins()* functions are next called or this *GameInterface* is destroyed.

**Sorting**

**virtual** `void IdentifyMainMasterFile (const std::string &masterFile) = 0`

Identify the game's main master file.

When sorting, LOOT always only loads the headers of the game's main master file as a performance optimisation.

**virtual** `std::vector<std::string> SortPlugins (const std::vector<std::string> &plugins) = 0`

Calculates a new load order for the game's installed plugins (including inactive plugins) and outputs the sorted order.

Pulls metadata from the masterlist and userlist if they are loaded, and reads the contents of each plugin. No changes are applied to the load order used by the game. This function does not load or evaluate the masterlist or userlist.

**Return** A vector of the given plugin filenames in their sorted load order.

**Parameters**

- `plugins`: A vector of filenames of the plugins to sort, in their current load order.

**Load Order Interaction**

**virtual** `void LoadCurrentLoadOrderState () = 0`

Load the current load order state, discarding any previously held state.

This function should be called whenever the load order or active state of plugins "on disk" changes, so that the cached state is updated to reflect the changes.

**virtual** `bool IsPluginActive (const std::string &plugin) const = 0`

Check if a plugin is active.

**Return** True if the plugin is active, false otherwise.

**Parameters**

- `plugin`: The filename of the plugin for which to check the active state.

**virtual** `std::vector<std::string> GetLoadOrder () const = 0`

Get the current load order.

**Return** A vector of plugin filenames in their load order.

**virtual** void **SetLoadOrder** (const std::vector<std::string> &*loadOrder*) = 0  
Set the game's load order.

#### Parameters

- *loadOrder*: A vector of plugin filenames sorted in the load order to set.

### class PluginInterface

Represents a plugin file that has been parsed by LOOT.

#### Public Functions

**virtual** std::string **GetName** () const = 0  
Get the plugin's filename.

**Return** The plugin filename.

**virtual** float **GetHeaderVersion** () const = 0  
Get the value of the version field in the HEDR subrecord of the plugin's TES4 record.

**Return** The value of the version field, or NaN if the field could not be found.

**virtual** std::optional<std::string> **GetVersion** () const = 0  
Get the plugin's version number from its description field.

The description field may not contain a version number, or LOOT may be unable to detect it. The description field parsing may fail to extract the version number correctly, though it functions correctly in all known cases.

**Return** An optional containing a version string if one is found, otherwise an optional containing no value.

**virtual** std::vector<std::string> **GetMasters** () const = 0  
Get the plugin's masters.

**Return** The plugin's masters in the same order they are listed in the file.

**virtual** std::vector<*Tag*> **GetBashTags** () const = 0  
Get any Bash Tags found in the plugin's description field.

**Return** A set of Bash Tags. The order of elements in the set holds no semantics.

**virtual** std::optional<uint32\_t> **GetCRC** () const = 0  
Get the plugin's CRC-32 checksum.

**Return** An optional containing the plugin's CRC-32 checksum if the plugin has been fully loaded, otherwise an optional containing no value.

**virtual** bool **IsMaster** () const = 0  
Check if the plugin's master flag is set.

**Return** True if the master flag is set, false otherwise.

**virtual** bool **IsLightMaster** () const = 0  
Check if the plugin is a light master.

**Return** True if plugin is a light master, false otherwise.

**virtual** bool **IsValidAsLightMaster** () const = 0  
Check if the plugin is or would be valid as a light master.

**Return** True if the plugin is a valid light master or would be a valid light master, false otherwise.

**virtual bool IsEmpty () const = 0**

Check if the plugin contains any records other than its TES4 header.

**Return** True if the plugin only contains a TES4 header, false otherwise.

**virtual bool LoadsArchive () const = 0**

Check if the plugin loads an archive (BSA/BA2 depending on the game).

**Return** True if the plugin loads an archive, false otherwise.

**virtual bool DoFormIDsOverlap (const PluginInterface &plugin) const = 0**

Check if two plugins contain a record with the same ID.

**Return** True if the plugins both contain at least one record with the same ID, false otherwise. FormIDs are compared for all games apart from Morrowind, which doesn't have FormIDs and so has other identifying data compared.

#### Parameters

- `plugin`: The other plugin to check for overlap with.

## 4.5 Classes

### class ConditionalMetadata

A base class for metadata that can be conditional based on the result of evaluating a condition string.

Subclassed by *File*, *Message*, *Tag*

#### Public Functions

**ConditionalMetadata ()**

Construct a *ConditionalMetadata* object with an empty condition string.

**Return** A *ConditionalMetadata* object.

**ConditionalMetadata (const std::string &condition)**

Construct a *ConditionalMetadata* object with a given condition string.

**Return** A *ConditionalMetadata* object.

#### Parameters

- `condition`: A condition string, as defined in the LOOT metadata syntax documentation.

**bool IsConditional () const**

Check if the condition string is non-empty.

**Return** True if the condition string is not empty, false otherwise.

**void ParseCondition () const**

Check if the condition string is syntactically valid.

Throws a *ConditionSyntaxError* if the condition string's syntax is not valid.

**std::string GetCondition () const**

Get the condition string.

**Return** The object's condition string.

**class Filename**

Represents a case-insensitive filename.

**Public Functions****Filename ()**

Construct a *Filename* using an empty string.

**Return** A *Filename* object.

**Filename (const std::string &filename)**

Construct a *Filename* using the given string.

**Return** A *Filename* object.

**class File : public ConditionalMetadata**

Represents a file in a game's Data folder, including files in subdirectories.

**Public Functions****File ()**

Construct a *File* with blank name, display and condition strings.

**Return** A *File* object.

**File (const std::string &name, const std::string &display = "", const std::string &condition = "")**

Construct a *File* with the given name, display name and condition strings.

**Return** A *File* object.

**Parameters**

- name: The filename of the file.
- display: The name to be displayed for the file in messages, formatted using GitHub Flavored Markdown.
- condition: The *File*'s condition string.

**bool operator< (const File &rhs) const**

A less-than operator implemented with no semantics so that *File* objects can be stored in sets.

**Return** True if this *File* is less than the given *File*, false otherwise.

**bool operator== (const File &rhs) const**

Check if two *File* objects are equal by comparing their fields.

**Return** True if the objects' fields are equal, false otherwise.

**Filename GetName () const**

Get the filename of the file.

**Return** The file's filename.

**std::string GetDisplayName () const**

Get the display name of the file.

If the *File* was constructed with an empty display string, the name field will be returned instead, with any ASCII punctuation characters <>\_escaped. Escaping is not performed if returning the value of the display string.



**Return** The file's display name or filename.

## class Group

Represents a group to which plugin metadata objects can belong.

### Public Functions

#### Group ()

Construct a *Group* with the name "default" and an empty set of groups to load after.

**Return** A *Group* object.

**Group** (**const** std::string &name, **const** std::vector<std::string> &afterGroups = {}, **const** std::string &description = "")

Construct a *Group* with the given name, description and set of groups to load after.

**Return** A *Group* object.

#### Parameters

- name: The group name.
- afterGroups: The names of groups this group loads after.
- description: A description of the group.

bool **operator==** (**const** *Group* &rhs) **const**

Check if two *Group* objects are equal by comparing their names.

**Return** True if the objects' fields are equal, false otherwise.

bool **operator<** (**const** *Group* &rhs) **const**

A less-than operator implemented with no semantics so that *Group* objects can be stored in sets.

**Return** True if this *Group* is less than the given *Group*, false otherwise.

std::string **GetName** () **const**

Get the name of the group.

**Return** The group's name.

std::string **GetDescription** () **const**

Get the description of the group.

**Return** The group's description.

std::vector<std::string> **GetAfterGroups** () **const**

Get the set of groups this group loads after.

**Return** A set of group names.

## class Location

Represents a URL at which the parent plugin can be found.

### Public Functions

#### Location ()

Construct a *Location* with empty URL and name strings.

**Return** A *Location* object.

**Location** (**const** std::string &*url*, **const** std::string &*name* = "")

Construct a *Location* with the given URL and name.

**Return** A *Location* object.

**Parameters**

- *url*: The URL at which the plugin can be found.
- *name*: A name for the URL, eg. the page or site name.

bool **operator**< (**const** *Location* &*rhs*) **const**

A less-than operator implemented with no semantics so that *Location* objects can be stored in sets.

**Return** True if this *Location* is less than the given *Location*, false otherwise.

bool **operator**== (**const** *Location* &*rhs*) **const**

Check if two *Location* objects are equal by comparing their fields.

**Return** True if the objects' fields are equal, false otherwise.

std::string **GetURL** () **const**

Get the object's URL.

**Return** A URL string.

std::string **GetName** () **const**

Get the object's name.

**Return** The name of the location.

**class** **LootVersion**

A purely static class that provides information about the version of libloot that is being run.

### Public Static Functions

**static** std::string **GetVersionString** ()

Get the API version as a string.

**Return** A string of the form "major.minor.patch".

### Public Static Attributes

**const** unsigned int **major**

The major version number.

**const** unsigned int **minor**

The minor version number.

**const** unsigned int **patch**

The patch version number.

**const** std::string **revision**

The source control revision that the API was built from.

**class** **MessageContent**

Represents a message's localised text content.

## Public Functions

### **MessageContent** ( )

Construct a *MessageContent* object with an empty English message string.

**Return** A *MessageContent* object.

### **MessageContent** ( **const** std::string &text, **const** std::string &language = *defaultLanguage* )

Construct a *Message* object with the given text in the given language.

**Return** A *MessageContent* object.

#### Parameters

- text: The message text.
- language: The language that the message is written in.

### std::string **GetText** ( ) **const**

Get the message text.

**Return** A string containing the message text.

### std::string **GetLanguage** ( ) **const**

Get the message language.

**Return** A code representing the language that the message is written in.

### bool **operator<** ( **const** *MessageContent* &rhs ) **const**

A less-than operator implemented with no semantics so that *MessageContent* objects can be stored in sets.

**Return** True if this *MessageContent* is less than the given *MessageContent*, false otherwise.

### bool **operator==** ( **const** *MessageContent* &rhs ) **const**

Check if two *MessageContent* objects are equal by comparing their fields.

**Return** True if the objects' fields are equal, false otherwise.

## Public Static Functions

### **static** *MessageContent* **Choose** ( **const** std::vector<*MessageContent*> content, **const** std::string &language )

Choose a *MessageContent* object from a vector given a language.

**Return** A *MessageContent* object. If the given vector is empty, a default-constructed *MessageContent* is returned.

#### Parameters

- content: The *MessageContent* objects to choose between.
- language: The language code for the preferred language to select. If no message in the preferred language is present, the English *MessageContent* will be returned.

## Public Static Attributes

### **const** std::string **defaultLanguage**

The code for the default language assumed for message content, which is English.

### **class** **Message** : **public** *ConditionalMetadata*

Represents a message with localisable text content.

## Public Functions

### **Message ()**

Construct a *Message* object of type ‘say’ with blank content and condition strings.

**Return** A *Message* object.

### **Message (const MessageType type, const std::string &content, const std::string &condition = "")**

Construct a *Message* object with the given type, English content and condition string.

**Return** A *Message* object.

#### **Parameters**

- type: The message type.
- content: The English message content text.
- condition: A condition string.

### **Message (const MessageType type, const std::vector<MessageContent> &content, const std::string &condition = "")**

Construct a *Message* object with the given type, content and condition string.

**Return** A *Message* object.

#### **Parameters**

- type: The message type.
- content: The message content. If multilingual, one language must be English.
- condition: A condition string.

### **bool operator< (const Message &rhs) const**

A less-than operator implemented with no semantics so that *Message* objects can be stored in sets.

**Return** Returns true if this *Message* is less than the given *Message*, and false otherwise.

### **bool operator== (const Message &rhs) const**

Check if two *Message* objects are equal by comparing their fields.

**Return** True if the objects’ fields are equal, false otherwise.

### **MessageType GetType () const**

Get the message type.

**Return** The message type.

### **std::vector<MessageContent> GetContent () const**

Get the message content.

**Return** The message’s *MessageContent* objects.

### **MessageContent GetContent (const std::string &language) const**

Get the message content given a language.

**Return** A *MessageContent* object for the preferred language, or for English if a *MessageContent* object is not available for the given language.

#### **Parameters**

- language: The preferred language for the message content.

`SimpleMessage ToSimpleMessage (const std::string &language) const`

Get the message as a *SimpleMessage* given a language.

**Return** A *SimpleMessage* object for the preferred language, or for English if message text is not available for the given language.

#### Parameters

- `language`: The preferred language for the message content.

**class PluginCleaningData**

Represents data identifying the plugin under which it is stored as dirty or clean.

### Public Functions

**PluginCleaningData ()**

Construct a *PluginCleaningData* object with zero CRC, ITM count, deleted reference count and deleted navmesh count values, an empty utility string and no info.

**Return** A *PluginCleaningData* object.

**PluginCleaningData (uint32\_t crc, const std::string &utility)**

Construct a *PluginCleaningData* object with the given CRC and utility, zero ITM count, deleted reference count and deleted navmesh count values and no info.

**Return** A *PluginCleaningData* object.

#### Parameters

- `crc`: The CRC of a plugin.
- `utility`: The utility that the plugin cleanliness was checked with.

**PluginCleaningData (uint32\_t crc, const std::string &utility, const std::vector<MessageContent> &info, unsigned int itm, unsigned int ref, unsigned int nav)**

Construct a *PluginCleaningData* object with the given values.

**Return** A *PluginCleaningData* object.

#### Parameters

- `crc`: A clean or dirty plugin's CRC.
- `utility`: The utility that the plugin cleanliness was checked with.
- `info`: A vector of localised information message strings about the plugin cleanliness.
- `itm`: The number of Identical To Master records found in the plugin.
- `ref`: The number of deleted references found in the plugin.
- `nav`: The number of deleted navmeshes found in the plugin.

**bool operator< (const PluginCleaningData &rhs) const**

A less-than operator implemented with no semantics so that *PluginCleaningData* objects can be stored in sets.

**Return** True if this *PluginCleaningData* is less than the given *PluginCleaningData*, false otherwise.

**bool operator== (const PluginCleaningData &rhs) const**

Check if two *PluginCleaningData* objects are equal by comparing their fields.

**Return** True if the objects' fields are equal, false otherwise.

uint32\_t **GetCRC** () **const**

Get the CRC that identifies the plugin that the cleaning data is for.

**Return** A CRC-32 checksum.

unsigned int **GetITMCount** () **const**

Get the number of Identical To Master records in the plugin.

**Return** The number of Identical To Master records in the plugin.

unsigned int **GetDeletedReferenceCount** () **const**

Get the number of deleted references in the plugin.

**Return** The number of deleted references in the plugin.

unsigned int **GetDeletedNavmeshCount** () **const**

Get the number of deleted navmeshes in the plugin.

**Return** The number of deleted navmeshes in the plugin.

std::string **GetCleaningUtility** () **const**

Get the name of the cleaning utility that was used to check the plugin.

**Return** A cleaning utility name, possibly related information such as a version number and/or a Markdown-formatted URL to the utility's download location.

std::vector<*MessageContent*> **GetInfo** () **const**

Get any additional informative message content supplied with the cleaning data, eg. a link to a cleaning guide or information on wild edits or manual cleaning steps.

**Return** A vector of localised *MessageContent* objects.

*MessageContent* **ChooseInfo** (const std::string &*language*) **const**

Choose an info *MessageContent* object given a preferred language.

**Return** The *MessageContent* object for the preferred language, or if one does not exist, the English-language *MessageContent* object.

**Parameters**

- *language*: The preferred language's code.

**class PluginMetadata**

Represents a plugin's metadata.

## Public Functions

**PluginMetadata** ()

Construct a *PluginMetadata* object with a blank plugin name and no metadata.

**Return** A *PluginMetadata* object.

**PluginMetadata** (const std::string &*name*)

Construct a *PluginMetadata* object with no metadata for a plugin with the given filename.

**Return** A *PluginMetadata* object.

**Parameters**

- *name*: The filename of the plugin that the object is constructed for.

void **MergeMetadata** (const *PluginMetadata* &plugin)

Merge metadata from the given *PluginMetadata* object into this object.

If an equal metadata object already exists in this *PluginMetadata* object, it is not duplicated. This object's group is replaced by the given object's group if the latter is explicit.

#### Parameters

- plugin: The plugin metadata to merge.

*PluginMetadata* **NewMetadata** (const *PluginMetadata* &plugin) const

Get metadata in this object that isn't present in the given *PluginMetadata* object.

**Return** A *PluginMetadata* object containing the metadata in this object that is not in the given object. The returned object inherits this object's group.

#### Parameters

- plugin: The *PluginMetadata* object to compare against.

std::string **GetName** () const

Get the plugin name.

**Return** The plugin name.

std::optional<std::string> **GetGroup** () const

Get the plugin's group.

**Return** An optional containing the name of the group this plugin belongs to if it was explicitly set, otherwise an optional containing no value.

std::vector<*File*> **GetLoadAfterFiles** () const

Get the plugins that the plugin must load after.

**Return** The plugins that the plugin must load after.

std::vector<*File*> **GetRequirements** () const

Get the files that the plugin requires to be installed.

**Return** The files that the plugin requires to be installed.

std::vector<*File*> **GetIncompatibilities** () const

Get the files that the plugin is incompatible with.

**Return** The files that the plugin is incompatible with.

std::vector<*Message*> **GetMessages** () const

Get the plugin's messages.

**Return** The plugin's messages.

std::vector<*Tag*> **GetTags** () const

Get the plugin's Bash *Tag* suggestions.

**Return** The plugin's Bash *Tag* suggestions.

std::vector<*PluginCleaningData*> **GetDirtyInfo** () const

Get the plugin's dirty plugin information.

**Return** The *PluginCleaningData* objects that identify the plugin as dirty.

std::vector<*PluginCleaningData*> **GetCleanInfo** () const

Get the plugin's clean plugin information.

**Return** The *PluginCleaningData* objects that identify the plugin as clean.

`std::vector<Location> GetLocations () const`

Get the locations at which this plugin can be found.

**Return** The locations at which this plugin can be found.

`std::vector<SimpleMessage> GetSimpleMessages (const std::string &language) const`

Get the plugin's messages as *SimpleMessage* objects for the given language.

**Return** The plugin's messages as *SimpleMessage* objects.

**Parameters**

- language: The language to create the *SimpleMessage* objects for.

`void SetGroup (const std::string &group)`

Set the plugin's group.

**Parameters**

- group: The name of the group this plugin belongs to.

`void UnsetGroup ()`

Unsets the plugin's group.

`void SetLoadAfterFiles (const std::vector<File> &after)`

Set the files that the plugin must load after.

**Parameters**

- after: The files to set.

`void SetRequirements (const std::vector<File> &requirements)`

Set the files that the plugin requires to be installed.

**Parameters**

- requirements: The files to set.

`void SetIncompatibilities (const std::vector<File> &incompatibilities)`

Set the files that the plugin must load after.

**Parameters**

- incompatibilities: The files to set.

`void SetMessages (const std::vector<Message> &messages)`

Set the plugin's messages.

**Parameters**

- messages: The messages to set.

`void SetTags (const std::vector<Tag> &tags)`

Set the plugin's Bash *Tag* suggestions.

**Parameters**

- tags: The Bash *Tag* suggestions to set.

`void SetDirtyInfo (const std::vector<PluginCleaningData> &info)`

Set the plugin's dirty information.

**Parameters**



- `info`: The dirty information to set.

void **SetCleanInfo** (**const** std::vector<*PluginCleaningData*> &*info*)  
Set the plugin's clean information.

#### Parameters

- `info`: The clean information to set.

void **SetLocations** (**const** std::vector<*Location*> &*locations*)  
Set the plugin's locations.

#### Parameters

- `locations`: The locations to set.

bool **HasNameOnly** () **const**  
Check if no plugin metadata is set.

**Return** True if the group is implicit and the metadata containers are all empty, false otherwise.

bool **IsRegexPlugin** () **const**  
Check if the plugin name is a regular expression.

**Return** True if the plugin name contains any of the characters : \ \* ? | , false otherwise.

bool **NameMatches** (**const** std::string &*pluginName*) **const**  
Check if the given plugin name matches this plugin metadata object's name field.

If the name field is a regular expression, the given plugin name will be matched against it, otherwise the strings will be compared case-insensitively. The given plugin name must be literal, i.e. not a regular expression.

**Return** True if the given plugin name matches this metadata's plugin name, false otherwise.

**class Tag** : public *ConditionalMetadata*  
Represents a Bash *Tag* suggestion for a plugin.

## Public Functions

**Tag** ()  
Construct a *Tag* object with an empty tag name suggested for addition, with an empty condition string.  
**Return** A *Tag* object.

**Tag** (**const** std::string &*tag*, **const** bool *isAddition* = true, **const** std::string &*condition* = "")  
Construct a *Tag* object with the given name, for addition or removal, with the given condition string.  
**Return** A *Tag* object.

#### Parameters

- `tag`: The name of the Bash *Tag*.
- `isAddition`: True if the tag should be added, false if it should be removed.
- `condition`: A condition string.

bool **operator<** (**const** *Tag* &*rhs*) **const**  
A less-than operator implemented with no semantics so that *Tag* objects can be stored in sets.  
**Return** True if this *Tag* is less than the given *Tag*, false otherwise.

bool **operator==** (const *Tag* &*rhs*) const

Check if two *Tag* objects are equal.

**Return** True if the objects' fields are equal, false otherwise.

bool **IsAddition** () const

Check if the tag should be added.

**Return** True if the tag should be added, false if it should be removed.

std::string **GetName** () const

Get the tag's name.

**Return** The tag's name.

#### class **Vertex**

A class representing a plugin or group vertex in a path, and the type of the edge to the next vertex in the path if one exists.

#### Public Functions

**Vertex** (std::string *name*)

Construct a *Vertex* with the given name and no out edge.

##### Parameters

- *name*: The name of the plugin or group that this vertex represents.

**Vertex** (std::string *name*, EdgeType *outEdgeType*)

Construct a *Vertex* with the given name and out edge type.

##### Parameters

- *name*: The name of the plugin or group that this vertex represents.
- *outEdgeType*: The type of the edge going out from this vertex.

std::string **GetName** () const

Get the name of the plugin or group.

**Return** The name of the plugin or group.

std::optional<EdgeType> **GetTypeOfEdgeToNextVertex** () const

Get the type of the edge going to the next vertex.

Each edge goes from the vertex that loads earlier to the vertex that loads later.

**Return** The edge type.

## 4.6 Exceptions

class **CyclicInteractionError** : public runtime\_error

An exception class thrown if a cyclic interaction is detected when sorting a load order.

## Public Functions

**CyclicInteractionError** (std::vector<*Vertex*> cycle)

Construct an exception detailing a plugin or group graph cycle.

### Parameters

- cycle: A representation of the cyclic path.

std::vector<*Vertex*> **GetCycle** ()

Get a representation of the cyclic path.

Each *Vertex* is the name of a graph element (plugin or group) and the type of the edge going to the next *Vertex*. The last *Vertex* has an edge going to the first *Vertex*.

**Return** A vector of *Vertex* elements representing the cyclic path.

**class GitStateError : public logic\_error**

An exception class thrown if an error occurs when performing an operation on a Git repository due to invalid state.

**class ConditionSyntaxError : public runtime\_error**

An exception class thrown if invalid syntax is encountered when parsing a metadata condition.

**class FileAccessError : public runtime\_error**

An exception class thrown if an error is encountered while reading or writing a file.

**class UndefinedGroupError : public runtime\_error**

An exception class thrown if group is referenced but is undefined.

## Public Functions

**UndefinedGroupError** (const std::string &groupName)

Construct an exception for an undefined group.

### Parameters

- groupName: The name of the group that is undefined.

std::string **GetGroupName** ()

Get the name of the undefined group.

**Return** A group name.

## 4.7 Error Categories

LOOT uses error category objects to identify errors with codes that originate in lower-level libraries.

**const** std::error\_category &loot::libloadorder\_category ()

Get the error category that can be used to identify system\_error exceptions that are due to libloadorder errors.

**Return** A reference to the static object of unspecified runtime type, derived from std::error\_category.

**const** std::error\_category &loot::libgit2\_category ()

Get the error category that can be used to identify system\_error exceptions that are due to libgit2 errors.

**Return** A reference to the static object of unspecified runtime type, derived from `std::error_category`.

**CREDITS**

libloot is written by [Ortham](#) in C++ and makes use of the [Boost](#), [esplugin](#), [libgit2](#), [libloadorder](#), [loot-condition-interpreter](#), [spdlog](#) and [yaml-cpp](#) libraries. The copyright licenses for all of these and libloot itself in *[Copyright License Texts](#)*.



---

## VERSION HISTORY

### 6.1 0.16.1 - 2020-08-22

#### 6.1.1 Fixed

- `File::GetDisplayName()` now escapes ASCII punctuation characters when returning the file's name, i.e. when no display name is explicitly set. For example, `File("plugin.esp").GetDisplayName()` will now return `plugin\esp`.

### 6.2 0.16.0 - 2020-07-12

#### 6.2.1 Added

- The `!=`, `>`, `<=` and `>=` comparison operators are now implemented for `loot::File`, `loot::Location`, `loot::Message`, `loot::MessageContent`, `loot::PluginCleaningData` and `loot::Tag`.
- The `!=`, `<`, `>`, `<=` and `>=` comparison operators are now implemented for `loot::Group`.
- A new `Filename()` class for representing strings handled as case-insensitive filenames.
- `PluginMetadata::NameMatches()` checks if the given plugin filename matches the plugin name of the metadata object it is called on. If the plugin metadata name is a regular expression, the given plugin filename will be matched against it, otherwise the comparison is case-insensitive equality.

#### 6.2.2 Changed

- `File::GetName()` now returns a `Filename()` instead of a `std::string`.
- `GetGroups()` and `GetUserGroups()` now return `std::vector<Group>` instead of `std::unordered_set<Group>`.
- `SetUserGroups()` now takes a `const std::vector<Group>&` instead of a `const std::unordered_set<std::string>&`.
- `loot::Group`'s three-argument constructor now takes a `const std::vector<std::string>&` instead of a `const std::unordered_set<std::string>&` as its second parameter.
- `GetAfterGroups()` now returns a `std::vector<std::string>` instead of a `std::unordered_set<std::string>`.
- `std::set<>` usage has been replaced by `std::vector<>` throughout the public API. This affects the following functions:

- `PluginInterface::GetBashTags()`
  - `DatabaseInterface::GetKnownBashTags()`
  - `GameInterface::GetLoadedPlugins()`
  - `PluginMetadata::GetLoadAfterFiles()`
  - `PluginMetadata::SetLoadAfterFiles()`
  - `PluginMetadata::GetRequirements()`
  - `PluginMetadata::SetRequirements()`
  - `PluginMetadata::GetIncompatibilities()`
  - `PluginMetadata::SetIncompatibilities()`
  - `PluginMetadata::GetTags()`
  - `PluginMetadata::SetTags()`
  - `PluginMetadata::GetDirtyInfo()`
  - `PluginMetadata::SetDirtyInfo()`
  - `PluginMetadata::GetCleanInfo()`
  - `PluginMetadata::SetCleanInfo()`
  - `PluginMetadata::GetLocations()`
  - `PluginMetadata::SetLocations()`
- `loot::File`, `loot::Location`, `loot::Message`, `loot::MessageContent`, `loot::PluginCleaningData`, `loot::Tag` and `loot::Group` now implement their comparison operators by comparing all their fields (including inherited fields), using the same operator for the fields. For example, comparing two `loot::File` objects using `==` will now compare each of their fields using `==`.
  - When loading plugins, the speed at which LOOT identifies their corresponding archive files (`*.bsa` or `.ba2`, depending on the game) has been improved.

### 6.2.3 Removed

- `PluginMetadata::IsEnabled()` and `PluginMetadata::SetEnabled()`, as it is no longer possible to disable plugin metadata (though doing so never had any effect).
- `PluginMetadata()` no longer implements the `==` or `!=` comparison operators.
- `std::hash` is no longer specialised for `loot::Group`.

### 6.2.4 Fixed

- `LoadsArchive()` now correctly identifies the BSAs that a Skyrim SE or Skyrim VR loads. This assumes that Skyrim VR plugins load BSAs in the same way as Skyrim SE. Previously LOOT would use the same rules as the Fallout games for Skyrim SE or VR, which was incorrect.
- Some operations involving loaded plugins or copies of game interface objects could potentially cause data races due to a lack of mutex locking in some data read operations.
- Copying a game interface object did not copy its cached archive files, leaving the new copy with no cached archive files.



## 6.3 0.15.2 - 2020-06-14

### 6.3.1 Changed

- *MergeMetadata()* now only uses the group value of the given metadata object if there is not already one set, matching the behaviour for all other merged metadata.
- Updated esplugin to v3.3.1.
- Updated libgit2 to v1.0.1.
- Updated loot-condition-interpreter to v2.1.1.
- Updated spdlog to v1.6.1.

### 6.3.2 Fixed

- *GetPluginMetadata()* preferred masterlist metadata over userlist metadata when merging them, which was the opposite of the intended behaviour.

## 6.4 0.15.1 - 2019-12-07

### 6.4.1 Changed

- The range of FormIDs that are recognised as valid in light masters has been extended for Fallout 4 plugins, from between 0x800 and 0xFFFF inclusive to between 0x001 and 0xFFFF 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 esplugin.
- Updated esplugin to v3.3.0.

## 6.5 0.15.0 - 2019-11-05

### 6.5.1 Changed

- libloot now supports v0.15 of the metadata syntax.
- The order of the plugins passed to *SortPlugins()* is now used as the current load order during sorting. The order of plugins passed in did not previously have any impact.
- Constructors for the following classes and structs are now explicit:
  - *loot::ConditionalMetadata*
  - *loot::File*
  - *loot::Group*
  - *loot::Location*
  - *loot::Message*
  - *loot::MessageContent*
  - *loot::PluginCleaningData*

- `loot::PluginMetadata`
- `loot::Tag`
- `loot::MasterlistInfo`
- `loot::Vertex`

- Updated loot-condition-interpreter to v2.1.0.
- Updated spdlog to v1.4.2.

## 6.5.2 Removed

- `InitialiseLocale()`
- `PluginMetadata::GetLowercasedName()`
- `PluginMetadata::GetNormalizedName()`

## 6.5.3 Fixed

- libloot was unable to extract versions from plugin descriptions containing `version:` followed by whitespace and one or more digits.
- libloot 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.
- Build errors on Linux using GCC 9 and ICU 61+.

## 6.6 0.14.10 - 2019-09-06

### 6.6.1 Changed

- Improved the sorting process for Morrowind. Previously, sorting was unable to determine if a Morrowind plugin contained any records overriding those of its masters, and so added no overlap edges between Morrowind plugins when sorting. Sorting now counts override records by comparing plugins against their masters, giving the same results as for other games.

However, unlike for other games, this requires all a plugin's masters to be installed. If a plugin's masters are missing, the plugin's total record count will be used as if it was the plugin's override record count to ensure that sorting can still proceed, albeit with potentially reduced accuracy.

- Updated esplugin to v3.2.0.
- Updated libgit2 to v0.28.3.

## 6.7 0.14.9 - 2019-07-23

### 6.7.1 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 loot-condition-interpreter.

### 6.7.2 Changed

- Updated loot-condition-interpreter to v2.0.0.

## 6.8 0.14.8 - 2019-06-30

### 6.8.1 Fixed

- 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 loot-condition-interpreter.
- 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.

### 6.8.2 Changed

- Improved load order sorting performance.
- Updated loot-condition-interpreter to v2.0.0.

## 6.9 0.14.7 - 2019-06-13

### 6.9.1 Fixed

- Filename comparisons on Windows now has the same locale-invariant case insensitivity behaviour as Windows itself, instead of being locale-dependent.
- Filename comparisons on Linux now use ICU case folding to give locale-invariant results that are much closer to Windows' case insensitivity, though still not identical.

### 6.9.2 Changed

- Updated libgit2 to v0.28.2.

## 6.10 0.14.6 - 2019-04-24

### 6.10.1 Added

- Support for TES III: Morrowind using `GameType::tes3`. The sorting process for Morrowind is slightly different than for other games, because LOOT cannot currently detect when plugins overlap. As a result, LOOT is much less likely to suggest load order changes.

### 6.10.2 Changed

- Updated esplugin to v2.1.2.
- Updated loot-condition-interpreter to v1.3.0.

### 6.10.3 Fixed

- LOOT would unnecessarily ignore intermediate plugins in a non-master to master cycle involving groups, leading to unexpected results when sorting plugins.

## 6.11 0.14.5 - 2019-02-27

### 6.11.1 Changed

- Updated libgit2 to v0.28.1.
- Updated libloadorder to v12.0.1.
- Updated spdlog to v1.3.1.

### 6.11.2 Fixed

- `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 libloadorder).

## 6.12 0.14.4 - 2019-01-27

### 6.12.1 Added

- Added `UnsetGroup()` to `PluginMetadata`.

## 6.13 0.14.3 - 2019-01-27

### 6.13.1 Changed

- Condition parsing now errors if it does not consume the whole condition string. Via `loot-condition-interpreter`.
- Removed a few unhelpful log statements and changed the verbosity level of others.
- Updated `loot-condition-interpreter` to v1.2.2.

### 6.13.2 Fixed

- Conditions were not parsed past the first instance of `file(<regex>)`, `active(<regex>)`, `many(<regex>)` or `many_active(<regex>)`. Via `loot-condition-interpreter`.
- `loot::CreateGameHandle()` could crash when trying to check if the given paths are symlinks. If a check fails, LOOT will assume the path is not a symlink.

## 6.14 0.14.2 - 2019-01-20

### 6.14.1 Changed

- Updated loot-condition-interpreter to v1.2.1.
- Updated spdlog to v1.3.0.

### 6.14.2 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.
- 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 loot-condition-interpreter.

## 6.15 0.14.1 - 2018-12-23

### 6.15.1 Changed

- Updated loot-condition-interpreter to v1.2.0.

### 6.15.2 Fixed

- Product version conditions read from executables' `VS_FIXEDFILEINFO` structure, so the versions read did not match the versions displayed by Windows' File Explorer. Product versions are now read from executables' `VS_VERSIONINFO` structure, using the `ProductVersion` key. Via loot-condition-interpreter.
- The release date in the metadata syntax changelog for v0.14 was "Unreleased".

## 6.16 0.14.0 - 2018-12-09

### 6.16.1 Added

- `GetHeaderVersion()` to get the value of the version field in the `HEDR` subrecord of a plugin's `TES4` record.
- `IsValidAsLightMaster()` to check if a light master is valid or if a non-light-master plugin would be valid with the light master flag or `.esl` extension. Validity is defined as having no new records with a `FormID` object index greater than `0xFFFF`.
- `GetGroupsPath()` to return the path between two given groups that maximises the user metadata and minimises the masterlist metadata involved.
- `loot::Vertex` to represent a plugin or group vertex in a sorting graph path.
- `loot::EdgeType` to represent the type of the edge between two vertices in a sorting graph. Each edge type indicates the type of data it was sourced from.

## 6.16.2 Changed

- Renamed the library from “the LOOT API” to “libloot” to avoid confusion between the name of the library and the API that it provides. The library filename is changed so that the `loot_api` part is now `loot`, e.g. `loot.dll` on Windows and `libloot.so` on Linux.
- `CyclicInteractionError()` has had its constructor and methods completely replaced to provide a more detailed and flexible representation of the cyclic path that it reports.
- `UndefinedGroupError::getGroupName()` has been renamed to `UndefinedGroupError::GetGroupName()` for consistency with other API method names.
- `LootVersion::string()` has been renamed to `LootVersion::GetString()` for consistency with other API method names.
- `GetPluginMetadata()` and `GetPluginUserMetadata()` now return `std::optional<PluginMetadata>` to differentiate metadata being found or not. Note that the `PluginMetadata` value may still return true for `HasNameOnly()` if a metadata entry exists but has no content other than the plugin name.
- `GetGroup()` now returns `std::optional<std::string>` to indicate when there is no group metadata explicitly set, to simplify distinguishing between explicit and implicit default group membership.
- `GetVersion()` now returns `std::optional<std::string>` to differentiate between there being no version and the version being an empty string, though the latter should never occur.
- `GetCRC()` now returns `std::optional<uint32_t>` to differentiate between there being no CRC calculated and the CRC somehow being zero (which should never occur).
- Filesystem paths are now represented in the API by `std::filesystem::path` values instead of `std::string` values. This affects the following functions:
  - `loot::CreateGameHandle()`
  - `LoadLists()`
  - `WriteUserMetadata()`
  - `WriteMinimalList()`
  - `UpdateMasterlist()`
  - `GetMasterlistRevision()`
  - `IsLatestMasterlist()`
- The metadata condition parsing, evaluation and caching code and the pseudosem dependency have been replaced by a dependency on `loot-condition-interpreter`, which provides more granular caching and more opportunity for future enhancements.
- The API now supports v0.14 of the metadata syntax.
- Updated C++ version required to C++17. This means that Windows builds now require the MSVC 2017 runtime redistributable to be installed.
- Updated esplugin to v2.1.1.
- Updated libloadorder to v12.0.0.
- Updated libgit2 to v0.27.7.
- Updated spdlog to v1.2.1.

### 6.16.3 Removed

- `PluginInterface::GetLowercasedName()`, as the case folding behaviour LOOT uses is not necessarily appropriate for all use cases, so it's up to the client to lowercase according to their own needs.

### 6.16.4 Fixed

- 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.
- Fixed incorrect case-insensitivity handling for non-ASCII plugin filenames and `File` metadata names.
- `FileVersion` and `ProductVersion` properties were not set in the DLL since v0.11.0.
- 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.
- 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.
- An error creating a game handle for Skyrim if `loadorder.txt` is not encoded in UTF-8. In this case, libloadorder will now fall back to interpreting its contents as encoded in Windows-1252, to match the behaviour when reading the load order state.

## 6.17 0.13.8 - 2018-09-24

### 6.17.1 Fixed

- Filesystem errors when trying to set permissions during a masterlist update that clones a new repository.

## 6.18 0.13.7 - 2018-09-10

### 6.18.1 Changed

- Significantly improve plugin loading performance by scanning for BSAs/BA2s once instead of for each plugin.
- Improve performance of metadata evaluation by caching CRCs with the same cache lifetime as condition results.
- Improve performance of sorting when it involves long plugin interaction chains.
- Updated esplugin to v2.0.1.
- Updated libgit2 to v0.27.4.
- Updated libloadorder v11.4.1.
- Updated spdlog to v1.1.0.
- Updated yaml-cpp to 0.6.2+merge-key-support.2.

### 6.18.2 Fixed

- Fallout 4's *DLCUltraHighResolution.esm* is now handled as a hardcoded plugin (via libloadorder).

## 6.19 0.13.6 - 2018-06-29

### 6.19.1 Changed

- Tweaked masterlist repository cloning to avoid undefined behaviour.
- Updated Boost to v1.67.0.
- Updated esplugin to v2.0.0.
- Updated libgit2 to v0.27.2.
- Updated libloadorder to v11.4.0.

## 6.20 0.13.5 - 2018-06-02

### 6.20.1 Changed

- Sorting now enforces hardcoded plugin positions, sourcing them through libloadorder. This avoids the need for often very verbose metadata entries, particularly for Creation Club plugins.
- Updated libgit2 to v0.27.1. This includes a security fix for CVE-2018-11235, but LOOT API's usage is not susceptible. libgit2 is not susceptible to CVE-2018-11233, another Git vulnerability which was published on the same day.
- Updated libloadorder to v11.3.0.
- Updated spdlog to v0.17.0.
- Updated esplugin to v1.0.10.

## 6.21 0.13.4 - 2018-06-02

### 6.21.1 Fixed

- *NewMetadata()* now uses the passed plugin's group if the calling plugin's group is implicit, and sets the group to be implicit if the two plugins' groups are equal.

## 6.22 0.13.3 - 2018-05-26

### 6.22.1 Changed

- Improved cycle avoidance when resolving evaluating plugin groups during sorting. If enforcing the group difference between two plugins would cause a cycle and one of the plugins' groups is the default group, that plugin's group will be ignored for all plugins in groups between default and the other plugin's group.



- The masterlist repository cloning process no longer moves LOOT's game folders, so if something goes wrong the process fails more safely.
- The LOOT API is now built with debugging information on Windows, and its PDB is included in build archives.
- Updated libloadorder to v11.2.2.

### 6.22.2 Fixed

- Various filesystem-related issues that could be encountered when updating masterlists, including failure due to file handles being left open while attempting to remove.
- Building the esplugin and libloadorder dependencies using Rust 1.26.0, which included a [regression](#) to workspace builds.

## 6.23 0.13.2 - 2018-04-29

### 6.23.1 Changed

- Updated libloadorder to v11.2.1.

### 6.23.2 Fixed

- Incorrect load order positions were given for light-master-flagged `.esp` plugins when getting the load order (via libloadorder).

## 6.24 0.13.1 - 2018-04-09

### 6.24.1 Added

- Support for Skyrim VR using `GameType::tes5vr`.

### 6.24.2 Changed

- Updated libloadorder to v11.2.0.

## 6.25 0.13.0 - 2018-04-02

### 6.25.1 Added

- Group metadata as a replacement for priority metadata. Each plugin belongs to a group, and a group can load after other groups. Plugins belong to the `default` group by default.
  - Added the `loot::Group` class to represent a group.
  - Added `loot::UndefinedGroupError`.
  - Added `GetGroups()`, `GetUserGroups()` and `SetUserGroups()`.

- Added `GetGroup()`, `IsGroupExplicit` and `SetGroup()`.
- Updated `MergeMetadata()` to replace the existing group with the given object's group if the latter is explicit.
- Updated `NewMetadata()` to return an object using the called object's group.
- Updated `HasNameOnly()` to check the group is implicit.
- Updated `SortPlugins()` to take into account plugin groups.

## 6.25.2 Changed

- `LoadPlugins()` and `SortPlugins()` no longer load the current load order state, so `LoadCurrentLoadOrderState()` must be called separately.
- Updated libgit2 to v0.27.0.
- Updated libloadorder to v11.1.0.

## 6.25.3 Removed

- Support for local and global plugin priorities.
  - Removed the `loot::Priority` class.
  - Removed `PluginMetadata::GetLocalPriority()`, `PluginMetadata::GetGlobalPriority()`, `PluginMetadata::SetLocalPriority()` and `PluginMetadata::SetGlobalPriority()`
  - Priorities are no longer taken into account when sorting plugins.

## 6.25.4 Fixed

- An error when applying a load order for Morrowind, Oblivion, Fallout 3 or Fallout: New Vegas when a plugin had a timestamp earlier than 1970-01-01 00:00:00 UTC (via libloadorder).
- An error when loading the current load order for Skyrim with a `loadorder.txt` incorrectly encoded in Windows-1252 (via libloadorder).

## 6.26 0.12.5 - 2018-02-17

### 6.26.1 Changed

- Updated esplugin to v1.0.9.
- Updated libgit2 to v0.26.3. This enables TLS 1.2 support on Windows 7, so users shouldn't need to manually enable it themselves.

## 6.27 0.12.4 - 2018-02-17

### 6.27.1 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 libloadorder).
- Plugin parsing errors were being logged with trace severity, they are now logged as errors.
- Saving a load order for Oblivion, Fallout 3 or Fallout: New Vegas now updates plugin access times to the current time for correctness (via libloadorder).

### 6.27.2 Changed

- `GameInterface::SetLoadOrder()` now errors if passed a load order that does not contain all installed plugins. The previous behaviour was to append any missing plugins, but this was undefined and could cause unexpected results (via libloadorder).
- Performance improvements for load order operations, benchmarked at 2x to 150x faster (via libloadorder).
- Updated mentions of libespm in error messages to mention esplugin instead.
- Updated libloadorder to v11.0.1.
- Updated spdlog to v0.16.3.

## 6.28 0.12.3 - 2018-02-04

### 6.28.1 Added

- Support for Fallout 4 VR via the new `loot::GameType::fo4vr` game type.

### 6.28.2 Fixed

- `loot::CreateGameHandle()` no longer accepts an empty game path string, and no longer has a default value for its game path parameter, as using an empty string as the game path is invalid and always causes an exception to be thrown.

### 6.28.3 Changed

- Added an empty string as the default value of `loot::InitialiseLocale`'s string parameter.
- Updated esplugin to v1.0.8.
- Updated libloadorder to v10.1.0.

## 6.29 0.12.2 - 2017-12-24

### 6.29.1 Fixed

- Plugins with a `.esp` file extension that have 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.

### 6.29.2 Changed

- Downgraded Boost to 1.63.0 to take advantage of pre-built binaries on AppVeyor.

## 6.30 0.12.1 - 2017-11-23

### 6.30.1 Added

- Support for identifying Creation Club plugins using `Skyrim.ccc` and `Fallout4.ccc` (via `libloadorder`).

### 6.30.2 Changed

- Update `esplugin` to v1.0.7.
- Update `libloadorder` to v10.0.4.

## 6.31 0.12.0 - 2017-11-03

### 6.31.1 Added

- Support for light master (`.esl`) plugins.
- `LoadCurrentLoadOrderState()` in `loot::GameInterface` to expose load order cache management to clients, as `libloadorder` no longer internally manages it.
- `loot::SetLoggingCallback()` to allow clients to handle the LOOT API's logging statements themselves.
- Logging of `libloadorder` error details.

### 6.31.2 Changed

- `LoadPlugins()` now loads the current load order state before loading plugins.
- Added a `condition` string field to `SimpleMessage`.
- Replaced `libespm` dependency with `esplugin` v1.0.6. This significantly improves safety and sorting performance, especially for large load orders.
- Updated `libloadorder` to v10.0.3. This significantly improves safety and the performance of load order operations, at the expense of exposing cache management to the client.
- Replaced `Boost.Log` with `spdlog` v0.14.0, removing dependencies on several other Boost libraries in the process.

- Updated libgit2 to v0.26.0.
- Update Boost to v1.65.1.

### 6.31.3 Removed

- `DatabaseInterface::EvalLists()` as it was superseded in v0.11.0 by the ability to evaluate conditions when getting general messages and individual plugins' metadata, which is more efficient.
- `SetLoggingVerbosity()` and `SetLogFile()` as they have been superseded by the new `loot::SetLoggingCallback()` function.
- The `loot/yaml/*` headers containing LOOT's internal YAML conversion functions are no longer exposed alongside the API headers.
- The `loot/windows_encoding_converters.h` header is no longer exposed alongside the API headers.

### 6.31.4 Fixed

- Formatting in metadata documentation.
- Saving metadata wrote entries in an inconsistent order.
- Clang build errors.

## 6.32 0.11.1 - 2017-06-19

### 6.32.1 Fixed

- A crash would occur when loading an plugin that had invalid data past its header. Such plugins are now just silently ignored.
- `loot::CreateGameHandle()` 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.

## 6.33 0.11.0 - 2017-05-13

### 6.33.1 Added

- New functions to `loot::DatabaseInterface`:
  - `WriteUserMetadata()`
  - `GetKnownBashTags()`
  - `GetGeneralMessages()`
  - `GetPluginMetadata()`
  - `GetPluginUserMetadata()`
  - `SetPluginUserMetadata()`

- `DiscardPluginUserMetadata()`
- `DiscardAllUserMetadata()`
- `IsLatestMasterlist()`

- A `loot::GameInterface` pure abstract class that exposes methods for accessing game-specific functionality.
- A `loot::PluginInterface` pure abstract class that exposes methods for accessing plugin file data.
- The `loot::SetLoggingVerbosity` and `loot::SetLogFile` functions and `loot::LogVerbosity` enum for controlling the API's logging behaviour.
- An `loot::InitialiseLocale` function that must be called to configure the API's locale before any of its other functionality is used.
- LOOT's internal metadata classes are now exposed as part of the API.

### 6.33.2 Changed

- Renamed `loot::CreateDatabase()` to `loot::CreateGameHandle()`, and changed its signature so that it returns a shared pointer to a `loot::GameInterface` instead of a shared pointer to a `loot::DatabaseInterface`.
- Moved `SortPlugins()` into `loot::GameInterface`.
- Some `loot::DatabaseInterface` methods are now const:
  - `WriteMinimalList()`
  - `GetMasterlistRevision()`
- LOOT's internal YAML conversion functions have been refactored into the `include/loot/yaml` directory, but they are not really part of the API. They're only exposed so that they can be shared between the API and LOOT application without introducing another component.
- LOOT's internal string encoding conversion functions have been refactored into the `include/loot/windows_encoding_converters.h` header, but are not really part of the API. They're only exposed so that they can be shared between the API and LOOT application without introducing another component.
- Metadata is now cached more efficiently, reducing the API's memory footprint.
- Log timestamps now have microsecond precision.
- Updated to libgit2 v0.25.1.
- Refactored code only useful to the LOOT application out of the API internals and into the application source code.

### 6.33.3 Removed

- `DatabaseInterface::GetPluginTags()`, `DatabaseInterface::GetPluginMessages()` and `DatabaseInterface::GetPluginCleanliness()` have been removed as they have been superseded by `DatabaseInterface::GetPluginMetadata()`.
- The `GameDetectionError` class, as it is no longer thrown by the API.
- The `PluginTags` struct, as it is no longer used.
- The `LanguageCode` enum, as the API now uses ISO language codes directly instead.

- The `PluginCleanliness` enum. as it's no longer used. Plugin cleanliness should now be checked by getting a plugin's evaluated metadata and checking if any dirty info is present. If none is present, the cleanliness is unknown. If dirty info is present, check if any of the English info strings contain the text "Do not clean": if not, the plugin is dirty.
- The LOOT API no longer caches the load order, as this is already done more accurately by `libloadorder` (which is used internally).

#### 6.33.4 Fixed

- Libgit2 error details were not being logged.
- A `FileAccessError` was thrown when the masterlist path was an empty string. The API now just skips trying to load the masterlist in this case.
- Updating the masterlist did not update the cached metadata, requiring a call to `LoadLists()`.
- The reference documentation was broken due to an incompatibility between Sphinx 1.5.x and Breathe 4.4.

### 6.34 0.10.3 - 2017-01-08

#### 6.34.1 Added

- Automated 64-bit API builds.

#### 6.34.2 Changed

- Replaced `std::invalid_argument` exceptions thrown during condition evaluation with `ConditionSyntaxError` exceptions.
- Improved robustness of error handling when calculating file CRCs.

#### 6.34.3 Fixed

- Documentation was not generated correctly for enums, exceptions and structs exposed by the API.
- Added missing documentation for `CyclicInteractionError` methods.

### 6.35 0.10.2 - 2016-12-03

#### 6.35.1 Changed

- Updated libgit2 to 0.24.3.

#### 6.35.2 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.

## 6.36 0.10.1 - 2016-11-12

No API changes.

## 6.37 0.10.0 - 2016-11-06

### 6.37.1 Added

- Support for TES V: Skyrim Special Edition.

### 6.37.2 Changed

- Completely rewrote the API as a C++ API. The C API has been reimplemented as a wrapper around the C++ API, and can be found in a [separate repository](#).
- Windows builds now have a runtime dependency on the MSVC 2015 runtime redistributable.
- Rewrote the API documentation, which is now hosted online at [Read The Docs](#).
- The Windows release archive includes the `.lib` file for compile-time linking.
- LOOT now supports v0.10 of the metadata syntax. This breaks compatibility with existing syntax. See [the syntax version history](#) for the details.
- Updated libgit2 to 0.24.2.

### 6.37.3 Removed

- The `loot_get_tag_map()` function has no equivalent in the new C++ API as it is obsolete.
- The `loot_apply_load_order()` function has no equivalent in the new C++ API as it just passed through to `libloadorder`, which clients can use directly instead.

### 6.37.4 Fixed

- Database creation was failing when passing paths to symlinks that point to the game and/or game local paths.
- Cached plugin CRCs causing checksum conditions to always evaluate to false.
- Updating the masterlist when the user's `TEMP` and `TMP` environmental variables point to a different drive than the one LOOT is installed on.

## 6.38 0.9.2 - 2016-08-03

### 6.38.1 Changed

- `libespm` (2.5.5) and `Pseudosem` (1.1.0) dependencies have been updated to the versions given in brackets.



### 6.38.2 Fixed

- The packaging script used to create API archives was packaging the wrong binary, which caused the v0.9.0 and v0.9.1 API releases to actually be re-releases of a snapshot build made at some point between v0.8.1 and v0.9.0: the affected API releases were taken offline once this was discovered.
- `loot_get_plugin_tags()` remembering results and including them in the results of subsequent calls.
- An error occurred when the user's temporary files directory didn't exist and updating the masterlist tried to create a directory there.
- Errors when reading some Oblivion plugins during sorting, including the official DLC.

## 6.39 0.9.1 - 2016-06-23

No API changes.

## 6.40 0.9.0 - 2016-05-21

### 6.40.1 Changed

- Moved API header location to the more standard `include/loot/api.h`.
- Documented LOOT's masterlist versioning system.
- Made all API outputs fully `const` to make it clear they should not be modified and to avoid internal `const` casting.
- The `loot_db` type is now an opaque struct, and functions that used to take it as a value now take a pointer to it.

### 6.40.2 Removed

- The `loot_cleanup()` function, as the one string it used to destroy is now stored on the stack and so destroyed when the API is unloaded.
- The `loot_lang_any` constant. The `loot_lang_english` constant should be used instead.

## 6.41 0.8.1 - 2015-09-27

### 6.41.1 Changed

- Safety checks are now performed on file paths when parsing conditions (paths must not reference a location outside the game folder).
- Updated Boost (1.59.0), libgit2 (0.23.2) and CEF (branch 2454) dependencies.

### 6.41.2 Fixed

- A 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 on Windows Vista.

## 6.42 0.8.0 - 2015-07-22

### 6.42.1 Added

- Support for metadata syntax v0.8.

### 6.42.2 Changed

- Improved plugin loading performance for computers with weaker multithreading capabilities (eg. non-hyperthreaded dual-core or single-core CPUs).
- LOOT no longer outputs validity warnings for inactive plugins.
- Updated libgit2 to v0.23.0.

### 6.42.3 Fixed

- Many miscellaneous bugs, including initialisation crashes and incorrect metadata input/output handling.
- LOOT silently discarding some non-unique metadata: an error will now occur when loading or attempting to apply such metadata.
- LOOT's version comparison behaviour for a wide variety of version string formats.

## 6.43 0.7.1 - 2015-06-22

### 6.43.1 Fixed

- “No existing load order position” errors when sorting.
- Output of Bash Tag removal suggestions in `loot_write_minimal_list()`.

## 6.44 0.7.0 - 2015-05-20

Initial API release.

## INTRODUCTION

The metadata syntax is what LOOT's masterlists and userlists are written in. If you know YAML, good news: the syntax is essentially just YAML 1.2. If you don't know YAML, then its [Wikipedia page](#) is a good introduction. All you really need to know is:

- How lists and associative arrays (key-value maps) are written.
- That whitespace is important, and that only normal spaces (ie. no non-breaking spaces or tabs) count as such.
- That data entries that are siblings must be indented by the same amount, and child data nodes must be indented further than their parents (see the example later in this document if you don't understand).
- That YAML files must be written in a Unicode encoding.
- That each key in a key-value map must only appear once per map object.

An important point that is more specific to how LOOT uses YAML:

- Strings are case-sensitive, apart from file paths, regular expressions and checksums.
- File paths are evaluated relative to the game's Data folder.
- File paths cannot reference a path outside of the game's folder structure, ie. they cannot contain the substring `../../../../`.

In this document, where a value's type is given as `X list` this is equivalent to a YAML sequence of values which are of the data type `X`. Where a value's type is given as `X set`, this is equivalent to a YAML sequence of **unique** values which are of the data type `X`. Uniqueness is determined using the equality criteria for that data type. All the non-standard data types that LOOT's metadata syntax uses have their equality criteria defined later in this document.

Some strings are interpreted as [GitHub Flavored Markdown](#): where this is the case, the strings are interpreted according to version `0.29-gfm` of the specification.



## METADATA FILE STRUCTURE

The root of a metadata file is a key-value map. LOOT will recognise the following keys, none of which are required. Other keys may also be present, but are not processed by LOOT.

### **bash\_tags**

string list

A list of Bash Tags that are supported by the masterlist's game. These Bash Tags are used to provide autocomplete suggestions in LOOT's metadata editor.

### **globals**

message list

A list of message data structures for messages that are displayed independently of any plugin.

### **groups**

group set

A set of group data structures that represent the groups that plugins can belong to.

### **plugins**

plugin list *and* plugin set

The plugin data structures that hold all the plugin metadata within the file. It is a mixture of a list and a set because **no non-regex plugin value may be equal to any other non-regex plugin value**, but there may be any number of equal regex plugin values, and non-regex plugin values may be equal to regex plugin values. If multiple plugin values match a single plugin, their metadata is merged in the order the values are listed, and as defined in *Merging Behaviour*.

The message and plugin data structures are detailed in the next section.

## 8.1 Example

```
bash_tags:
- 'C.Climate'
- 'Relev'

globals:
- type: say
  content: 'You are using the latest version of LOOT.'
  condition: 'version("LOOT", "0.5.0.0", ==)'

groups:
- name: 'Map Markers'
  after:
```

(continues on next page)

(continued from previous page)

```
    - 'default'

plugins:
- name: 'Armamentarium.esm'
  tag:
    - Relev
- name: 'ArmamentariumFran.esm'
  tag:
    - Relev
- name: 'Beautiful People 2ch-Ed.esm'
  tag:
    - Eyes
    - Graphics
    - Hair
    - R.Relations
- name: 'More Map Markers.esp'
  group: 'Map Markers'
```

## DATA STRUCTURES

LOOT expects metadata to be laid out using a certain set of data structures, described in this section.

### 9.1 Tag

LOOT metadata files can contain suggestions for the addition or removal of Bash Tags, and this is the structure used for them. It has two forms: a key-value string map and a scalar string.

#### 9.1.1 Map Form

**name**

**Required.** A Bash Tag, prefixed with a minus sign if it is suggested for removal.

**condition**

A condition string that is evaluated to determine whether this Bash Tag should be suggested: if it evaluates to true, the Tag is suggested, otherwise it is ignored. See *Condition Strings* for details. If undefined, defaults to an empty string.

#### 9.1.2 Scalar Form

The scalar form is simply the value of the map form's name key. Using the scalar form is equivalent to using the map form with an undefined condition key.

#### 9.1.3 Equality

Two tag data structures are equal if all their fields are equal. String equality is case-sensitive.

#### 9.1.4 Examples

Scalar form:

```
Relations
```

Map form:

```
name: -Relations
condition: 'file("Mart"'s Monster Mod for 000.esm") or file("FCOM_Convergence.esm")'
```

## 9.2 File

This structure can be used to hold file paths. It has two forms: a key-value string map and a scalar string.

### 9.2.1 Map Form

**name**

**Required.** An exact (ie. not regex) file path or name.

**display**

A GitHub Flavored Markdown string, to be displayed instead of the file path in any generated messages, eg. the name of the mod the file belongs to.

**condition**

A condition string that is evaluated to determine whether this file data should be used: if it evaluates to true, the data is used, otherwise it is ignored. See *Condition Strings* for details.

### 9.2.2 Scalar Form

The scalar form is simply the value of the map form's `name` key. Using the scalar form is equivalent to using the map form with undefined `display` and `condition` keys.

### 9.2.3 Equality

Two file data structures are equal if all their fields are equal. `name` field equality is case-insensitive, the other fields use case-sensitive equality.

### 9.2.4 Examples

Scalar form:

```
'../obse_loader.exe'
```

Map form:

```
name: '../obse_loader.exe'  
condition: 'version("../obse_loader.exe", "0.0.18.0", >=)'  
display: 'OBSE v18+'
```

## 9.3 Group

Groups represent sets of plugins, and are a way to concisely and extensibly load sets of plugins after other sets of plugins.

This structure can be used to hold group definitions. It is a key-value map.

**name**

string

**Required.** A case-sensitive name that identifies the group.



**description**

string

A GitHub Flavored Markdown description of the group, e.g. what sort of plugins it contains. If undefined, the description is an empty string.

**after**

string set

The names of groups that this group loads after. Group names are case-sensitive. If undefined, the set is empty. The named groups must be defined when LOOT sorts plugins, but they don't need to be defined in the same metadata file.

Sorting errors will occur if:

- A group loads after another group that does not exist.
- Group loading is cyclic (e.g. A loads after B and B loads after A).

### 9.3.1 Merging Groups

When a group definition for an already-defined group is encountered, the `description` field is replaced if the new value is not an empty string, and the `after` sets of the two definitions are merged.

### 9.3.2 The default Group

There is one predefined group named `default` that all plugins belong to by default. It is defined with an empty `after` set, as no other predefined groups exist for it to load after.

Like any other group, the `default` group can be redefined to add group names to its `after` set.

### 9.3.3 Equality

Two group data structures are equal if the values of their `name` keys are identical.

### 9.3.4 Examples

```
# Create a group for map marker plugins that loads after the predefined
# 'default' group.
name: 'Map Markers'
description: 'A group for map marker plugins that need to load late.'
after:
  - 'default'
```

```
# Extend the predefined 'default' group to load after an 'Unofficial Patches'
# group that is defined elsewhere.
name: 'default'
after:
  - 'Unofficial Patches'
```

## 9.4 Localised Content

The localised content data structure is a key-value string map.

**text**

**Required.** The GitHub Flavored Markdown message content string.

**lang**

**Required.** The language that `text` is written in, given as a code of the form `ll` or `ll_CC`, where `ll` is an ISO 639-1 language code and `CC` is an ISO 3166 country code. For example,

Language	Code
Brazilian Portuguese	pt_BR
Chinese	zh_CN
Danish	da
English	en
Finnish	fi
French	fr
German	de
Korean	ko
Polish	pl
Russian	ru
Spanish	es
Swedish	sv

### 9.4.1 Equality

Two localised content data structures are equal if all their fields are equal. Field equality is case-sensitive.

## 9.5 Message

Messages are given as key-value maps.

**type**

`string`

**Required.** The type string can be one of three keywords.

**say**

A generic message, useful for miscellaneous notes.

**warn**

A warning message, describing a non-critical issue with the user's mods (eg. dirty mods).

**error**

An error message, describing a critical installation issue (eg. missing masters, corrupt plugins).

**content**

`string` or localised content list

**Required.** Either simply a GitHub Flavored Markdown string, or a list of localised content data structures. If the latter, one of the structures must be for English.

**condition**

string

A condition string that is evaluated to determine whether the message should be displayed: if it evaluates to true, the message is displayed, otherwise it is not. See *Condition Strings* for details.

**subs**

string list

A list of GitHub Flavored Markdown strings to be substituted into the message content string. The content string must use numbered specifiers (%1%, %2%, etc.), where the numbers correspond to the position of the substitution string in this list to use, to denote where these strings are to be substituted.

### 9.5.1 Language Support

If a message's `content` value is a string, the message will use the string as its content if displayed. Otherwise, the first localised content structure with a language that matches LOOT's current language will be used as the message's content if displayed. If there are no matches, then the first structure in English will be used.

### 9.5.2 Equality

Two message data structures are equal if their *type*, *content* and *condition* fields are equal, after any *subs* values have been substituted into *content* strings. If the *content* field is a string, it is treated as a localised content list containing a single English-language string. String equality is case sensitive.

### 9.5.3 Examples

*Translations by Google*

```
type: say
condition: 'file("foo.esp")'
content:
  - lang: en
    text: 'An example link: <http://www.example.com>'
  - lang: ru
    text: ' : <http://www.example.com>'
```

would be displayed as

: : <http://www.example.com>

if the current language was Russian and `foo.esp` was installed, while

```
type: say
content: 'An alternative [example link](http://www.example.com), with no translations.
↪'
```

would be displayed as

: An alternative [example link](http://www.example.com), with no translations.

In English,

```
type: say
content: 'A newer version of %1% [is available] (%2%).'
subs:
  - 'this plugin'
  - 'http://www.example.com'
```

would be displayed as

Note: A newer version of this plugin is available.

## 9.6 Location

This data structure is used to hold information on where a plugin is hosted online. It has two forms: a key-value string map and a scalar string.

### 9.6.1 Map Form

#### link

**Required.** A URL at which the plugin is found.

#### name

A descriptive name for the URL, which may be used as hyperlink text. If undefined, defaults to an empty string.

### 9.6.2 Scalar Form

The scalar form is simply the value of the map form's `link` key. Using the scalar form is equivalent to using the map form with an undefined `name` key.

### 9.6.3 Equality

Two location data structures are equal if all their fields are equal. Field equality is case-sensitive.

### 9.6.4 Examples

Scalar form:

```
'http://skyrim.nexusmods.com/mods/19/'
```

Map form:

```
link: 'https://steamcommunity.com/sharedfiles/filedetails/?id=419668499'
name: 'Unofficial Skyrim Patch on Steam Workshop'
```

## 9.7 Cleaning Data

This structure holds information on which versions of a plugin are dirty or clean, and if dirty, how many identical-to-master records, deleted records and deleted navmeshes (if applicable) it contains. Cleaning data is given as a key-value map.

**crc**

hexadecimal integer

**Required.** The CRC-32 checksum of the plugin. If the plugin is dirty, this needs to be the CRC of the plugin before cleaning. LOOT displays the CRCs of installed plugins in its report. The 8-character CRC should be preceded by 0x so that it is interpreted correctly.

**util**

string

**Required.** The utility that was used to check the plugin for dirty edits. If available, the version of the utility used should also be included (e.g. TES5Edit v3.11). The string will be interpreted as GitHub Flavored Markdown.

**info**

string or localised content list

A message that will be displayed to the user. If a string is provided, it will be interpreted as GitHub Flavored Markdown. If a localised content list is provided, one of the structures must be for English. This is only used if the plugin is dirty, and is intended for providing cleaning instructions to the user. If undefined, defaults to an empty string.

**itm**

integer

The number of identical-to-master records reported for the dirty plugin. If undefined, defaults to zero.

**udr**

integer

The number of undeleted records reported for the dirty plugin. If undefined, defaults to zero.

**nav**

integer

The number of deleted navmeshes reported for the dirty plugin. If undefined, defaults to zero.

### 9.7.1 Equality

Two plugin cleaning data structures are equal if all their fields are equal. *util* field equality is case-sensitive. If the *info* field is a string, it is treated as a localised content data structure.

### 9.7.2 Examples

A dirty plugin:

```
crc: 0x3DF62ABC
util: '[TES5Edit] (http://www.nexusmods.com/skyrim/mods/25859) v3.1.1'
info: 'A cleaning guide is available [here] (http://www.creationkit.com/index.php?
→title=TES5Edit_Cleaning_Guide_-_TES5Edit) .'
itm: 4
udr: 160
```

A clean plugin:

```
crc: 0x2ABC3DF6
util: '[TES5Edit] (http://www.nexusmods.com/skyrim/mods/25859) v3.1.1'
```

## 9.8 Plugin

This is the structure that brings all the others together, and forms the main component of a metadata file. It is a key-value map.

**name**

string

**Required.** Can be an exact plugin filename or a regular expression plugin filename. If the filename contains any of the characters `\*?|`, the string will be treated as a regular expression, otherwise it will be treated as an exact filename. For example, `Example\*.esm` will be treated as a regular expression, as it contains a `\` character.

Regular expression plugin filenames must be written in [modified ECMAScript](#) syntax.

**group**

string

The name of the group the plugin belongs to. If unspecified, defaults to `default`.

The named group must exist when LOOT sorts plugins, but doesn't need to be defined in the same metadata file. If at sort time the group does not exist, a sorting error will occur.

The plugin must load after all the plugins in the groups its group is defined to load after, resolving them recursively. An exception exists if doing so would introduce a cyclic dependency between two plugins without any other group loading rules applied.

For example, if for plugins `A.esp`, `B.esp`, `C.esp` and `D.esp`:

- `B.esp` has `A.esp` as a master
- `A.esp` is in group `A`
- `B.esp` and `C.esp` are in the default group
- `D.esp` is in group `D`
- group `A` loads after the default group
- the default group loads after group `D`

Then the load order must be `D.esp`, `C.esp`, `A.esp`, `B.esp`. Although `A.esp`'s group must load after `B.esp`'s group, this would cause a cycle between `A.esp` and `B.esp`, so the requirement is ignored for that pair of plugins.

However, if for plugins `A.esp`, `B.esp` and `C.esp` in groups of the same names:

1. group `B` loads after group `A`
2. group `C` loads after group `B`
3. `A.esp` has `C.esp` as a master

This will cause a sorting error, as neither group rule introduces a cyclic dependency when combined in isolation with the third rule, but having all three rules applied causes a cycle.

**after**

file set

Plugins that this plugin must load after, but which are not dependencies. Used to resolve specific compatibility issues. If undefined, the set is empty.

**req**

file set

Files that this plugin requires to be present. This plugin will load after any plugins listed. If any of these files are missing, an error message will be displayed. Intended for use specifying implicit dependencies, as LOOT will detect a plugin's explicit masters itself. If undefined, the set is empty.

**inc**

file set

Files that this plugin is incompatible with. If any of these files are present, an error message will be displayed. If undefined, the set is empty.

**msg**

message list

The messages attached to this plugin. The messages will be displayed in the order that they are listed. If undefined, the list is empty.

**tag**

tag set

Bash Tags suggested for this plugin. If a Bash Tag is suggested for both addition and removal, the latter will override the former when the list is evaluated. If undefined, the set is empty.

**url**

location set

An unordered set of locations for this plugin. If the same version can be found at multiple locations, only one location should be recorded. If undefined, the set is empty. This metadata is not currently used by LOOT.

**dirty**

cleaning data set

An unordered set of cleaning data structures for this plugin, identifying dirty plugins.

**clean**

cleaning data set

An unordered set of cleaning data structures for this plugin, identifying clean plugins. The `itm`, `udr` and `nav` fields are unused in this context, as they're assumed to be zero.

## 9.8.1 Equality

The equality of two plugin data structures is determined by comparing the values of their `name` keys.

- If neither or both values are regular expressions, then the plugin data structures are equal if the lowercased values are identical.
- If one value is a regular expression, then the plugin data structures are equal if the other value is an exact match for it.

## 9.8.2 Merging Behaviour

Key	Merge Behaviour (merging B into A)
name	Not merged.
group	Replaced by B's value only if A has no value set.
after	Merged. If B's file set contains an item that is equal to one already present in A's file set, B's item is discarded.
req	Merged. If B's file set contains an item that is equal to one already present in A's file set, B's item is discarded.
inc	Merged. If B's file set contains an item that is equal to one already present in A's file set, B's item is discarded.
msg	Merged. B's message list is appended to A's message list.
tag	Merged. If B's tag set contains an item that is equal to one already present in A's tag set, B's item is discarded.
url	Merged. If B's location set contains an item that is equal to one already present in A's location set, B's item is discarded.
dirty	Merged. If B's dirty data set contain an item that is equal to one already present in A's dirty data set, B's item is discarded.
clean	Merged. If B's clean data set contain an item that is equal to one already present in A's clean data set, B's item is discarded.

## 9.8.3 Examples

```
name: 'Oscuro's_Oblivion_Overhaul.esm'
req:
  - 'Oblivion.esm' # Don't do this, Oblivion.esm is a master of Oscuro's_Oblivion_
↪Overhaul.esm, so LOOT already knows it's required.
  - name: 'example.esp'
    display: '[Example Mod] (http://www.example.com)'
    condition: 'version("Oscuro's_Oblivion_Overhaul.esm", "15.0", ==)'
tag:
  - Actors.Spells
  - Graphics
  - Invent
  - Relations
  - Scripts
  - Stats
  - name: -Relations
    condition: 'file("Mart's Monster Mod for OOO.esm") or file("FCOM_Convergence.esm
↪")'
msg:
  - type: say
    content: 'Do not clean. "Dirty" edits are intentional and required for the mod to_
↪function.'
```



## CONDITION STRINGS

Condition strings can be used to ensure that data is only acted on by LOOT under certain circumstances. They are very similar to boolean conditional expressions in programming languages such as Python, though more limited.

Omitting optional parentheses (see below), their [EBNF](#) grammar is:

```
compound_condition ::= condition, { ( logical_and | logical_or ), condition }
condition           ::= [ logical_not ], function
logical_and         ::= "and"
logical_or          ::= "or"
logical_not         ::= "not"
```

### 10.1 Types

#### **file\_path**

A double-quoted file path, or "LOOT", which references the LOOT executable being run.

#### **regular\_expression**

A double-quoted file path, with a regular expression in place of a filename. The path must use / for directory separators, not \. The regular expression must be written in a [modified Perl](#) syntax.

Only the filename path component will be evaluated as a regular expression. For example, given the regex file path `Meshes/Resources(1|2)/(upperclass)?table.nif`, LOOT will look for a file named `table.nif` or `upperclasstable.nif` in the `Meshes\Resources(1|2)` folder, rather than looking in the `Meshes\Resources1` and `Meshes\Resources2` folders.

#### **checksum**

A string of hexadecimal digits representing an unsigned integer that is the data checksum of a file. LOOT displays the checksums of plugins in its user interface after running.

#### **version**

A double-quoted string of characters representing the version of a plugin or executable. LOOT displays the versions of plugins in its user interface after running.

#### **comparison\_operator**

One of the following comparison operators.

**==**

Is equal to

**!=**

Is not equal to

<	Is less than
>	Is greater than
<=	Is less than or equal to
>=	Is greater than or equal to

## 10.2 Functions

There are several conditions that can be tested for using the functions detailed below. All functions return a boolean. For functions that take a path or regex, the argument is treated as regex if it contains any of the characters : \ \* ? | .

### **file(file\_path path)**

Returns true if `path` is installed, and false otherwise.

### **file(regular\_expression regex)**

Returns true if a file matching `regex` is found, and false otherwise.

### **active(file\_path path)**

Returns true if `path` is an active plugin, and false otherwise.

### **active(regular\_expression regex)**

Returns true if an active plugin matching `regex` is found, and false otherwise.

### **many(regular\_expression regex)**

Returns true if more than one file matching `regex` is found, and false otherwise.

### **many\_active(regular\_expression regex)**

Returns true if more than one active plugin matching `regex` is found, and false otherwise.

### **is\_master(file\_path path)**

Returns true if `path` is an installed master plugin, and false otherwise.

### **checksum(file\_path path, checksum expected\_checksum)**

Returns true if the calculated CRC-32 checksum of `path` matches `expected_checksum`, and false otherwise. Returns false if `path` does not exist.

### **version(file\_path path, version given\_version, comparison\_operator comparator)**

Returns true if the boolean expression:

`actual_version comparator given_version`

(where `actual version` is the version read from `path`) holds true, and false otherwise. If `path` is a plugin, its version is read from its description field. If `path` is not a plugin, it will be assumed to be an executable (e.g. `*.exe` or `*.dll`), and its version is read from its File Version field. If `path` does not exist or does not have a version number, its version is assumed to be 0. If `path` isn't a plugin or an executable, an error will occur.

The comparison uses the precedence rules defined by [Semantic Versioning](#), extended to allow leading zeroes, an arbitrary number of release version numbers, case-insensitivity and a wider range of separator characters.

### **product\_version(file\_path path, version given\_version, comparison\_operator comparator)**

Returns true if the boolean expression:

`actual_version comparator given_version`

(where `actual version` is the version read from `path`) holds true, and false otherwise. `path` must be an executable (e.g. `*.exe` or `*.dll`), and its version is read from its Product Version field. If `path` does not exist or does not have a version number, its version is assumed to be 0. If `path` is not an executable, an error will occur.

The comparison uses the precedence rules defined by [Semantic Versioning](#), extended to allow leading zeroes, an arbitrary number of release version numbers, case-insensitivity and a wider range of separator characters.

## 10.3 Logical Operators

The `and`, `or` and `not` operators have their usual definitions, except that the `not` operator only ever operates on the result of the function immediately following it.

### 10.3.1 Order of Evaluation

Condition strings are evaluated according to the usual C-style operator precedence rules, and parentheses can be used to override these rules. For example:

```
function and function or not function
```

is evaluated as:

```
( function and function ) or ( not function )
```

but:

```
function and ( function or not function )
```

is evaluated as:

```
function and ( function or ( not function ) )
```

Parentheses cannot be used between a `not` operator and the function following it.

## 10.4 Performance

LOOT caches the results of condition evaluations. A regular expression check will still take longer than a file check though, so use the former only when appropriate to do so.



## VERSION HISTORY

The version history of the metadata syntax is given below.

### 11.1 0.16 - 2020-07-12

#### 11.1.1 Changed

- Equality for all metadata data structures is now determined by comparison of all their fields. String comparison is case-sensitive, with the exception of `File`'s `name` field.

#### 11.1.2 Removed

- The `enabled` field has been removed from plugin metadata objects.

### 11.2 0.15 - 2019-11-05

#### 11.2.1 Added

- The condition function `is_master(file_path path)`, which checks if the given file is an installed master plugin.

### 11.3 0.14 - 2018-12-09

#### 11.3.1 Added

- The `Group` data structure now has a `description` key that takes a string value.
- The condition function `product_version(file_path path, version given_version, comparison_operator comparator)`, which checks against the `Product Version` field of an executable.

### 11.3.2 Changed

- `clean` and `dirty` metadata are now allowed in regex plugin entries.
- `Location`, `Message`, `MessageContent` and `Tag` equality comparisons are now case-sensitive.
- Regular expressions in condition strings now use a [modified Perl grammar](#) instead of a modified ECMAScript grammar. Plugin object `name` fields still use the modified ECMAScript grammar for regex values. To improve portability and avoid mistakes, it's best to stick to using the subset of regular expression features that are common to both grammars.

### 11.3.3 Removed

- The change in regular expression grammar means that the following regular expression features are no longer supported in condition strings:
  - `\c<letter>` control code escape sequences, use `\x<hex>` instead
  - The `\0` null escape sequence, - use `\x00` instead
  - The `[:d:]`, `[:w:]` and `[:s:]` character classes, use `[:digit:]`, `[:alnum:]` and `[:space:]` instead respectively.
  - `\<number>` backreferences
  - `(?= <subpattern>)` and `(?! <subpattern>)` positive and negative lookahead

## 11.4 0.13 - 2018-04-02

### 11.4.1 Added

- The `Group` data structure.
- The `groups` list to the root of the metadata file format.
- The `group` key to the plugin data structure.

### 11.4.2 Removed

- The `priority` field from the plugin data structure.
- The `global_priority` field from the plugin data structure.

## 11.5 0.10 - 2016-11-06

### 11.5.1 Added

- The `clean` key to the plugin data structure.
- The `global_priority` field to the plugin data structure.
- The `many_active()` condition function.
- The `info` key to the cleaning data structure.

## 11.5.2 Changed

- Renamed the `str` key in the localised content data structure to `text`.
- The `priority` field of the plugin data structure now stores values between -127 and 127 inclusive.
- Regular expressions no longer accept `\` as a directory separator: `/` must now be used.
- The `file()` condition function now also accepts a regular expression.
- The `active()` condition function to also accept a regular expression.
- Renamed the dirty info data structure to the cleaning data structure.

## 11.5.3 Removed

- The `regex()` condition function, as it has been obsoleted by the `file()` function's new regex support.

## 11.6 0.8 - 2015-07-22

### 11.6.1 Added

- The `name` key to the location data structure.
- The `many("regex")` condition function.
- The documentation now defines the equality criteria for all of the metadata syntax's non-standard data structures.

### 11.6.2 Changed

- Detection of regular expression plugin entries. Previously, a plugin entry was treated as having a regular expression filename if the filename ended with `\.esp` or `\.esp`. Now, a plugin entry is treated as having a regular expression filename if the filename contains one or more of `: \*?|`.

### 11.6.3 Removed

- Removed the `ver` key in the location data structure.

### 11.6.4 Fixed

- The documentation gave the values of the `after`, `req`, `inc`, `tag`, `url` and `dirty` keys as lists, when they have always been sets.

## 11.7 0.7 - 2015-05-20

### 11.7.1 Added

- The message string substitution key, i.e. `sub`, in the message data structure.
- Support for YAML merge keys, i.e. `<<`.

### 11.7.2 Changed

- Messages may now be formatted using most of GitHub Flavored Markdown, minus the GitHub-specific features (like @mentions, issue/repo linking and emoji).

## 11.8 0.6 - 2014-07-05

No changes.

## 11.9 0.5 - 2014-03-31

Initial release.



## 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—2016 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*.



## COPYRIGHT LICENSE TEXTS

### Contents

- *Copyright License Texts*
  - *Boost*
  - *libgit2*
  - *libloot, esplugin & Libloadorder*
  - *libloot Documentation*
  - *spdlog*
  - *yaml-cpp*

## 13.1 Boost

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

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.

## 13.2 libgit2

libgit2 is Copyright (C) the libgit2 contributors,  
unless otherwise stated. See the AUTHORS file for details.

Note that the only valid version of the GPL as far as this project  
is concerned is `_this_` particular version of the license (ie v2, not  
v2.2 or v3.x or whatever), unless explicitly otherwise stated.

---

### LINKING EXCEPTION

In addition to the permissions in the GNU General Public License,  
the authors give you unlimited permission to link the compiled  
version of this library into combinations with other programs,  
and to distribute those combinations without any restriction  
coming from the use of this file. (The General Public License  
restrictions do apply in other respects; for example, they cover  
modification of the file, and distribution when not linked into  
a combined executable.)

---

### GNU GENERAL PUBLIC LICENSE Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc.  
59 Temple Place, Suite 330, Boston, MA 02111-1307 USA  
Everyone is permitted to copy and distribute verbatim copies  
of this license document, but changing it is not allowed.

#### Preamble

The licenses for most software are designed to take away your  
freedom to share and change it. By contrast, the GNU General Public  
License is intended to guarantee your freedom to share and change free  
software--to make sure the software is free for all its users. This  
General Public License applies to most of the Free Software  
Foundation's software and to any other program whose authors commit to  
using it. (Some other Free Software Foundation software is covered by  
the GNU Library General Public License instead.) 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  
this service 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 make restrictions that forbid  
anyone to deny you these rights or to ask you to surrender the rights.  
These restrictions translate to certain responsibilities for you if you  
distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether

(continues on next page)

(continued from previous page)

gratis or for a fee, you must give the recipients all the rights that you have. 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.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

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

#### GNU GENERAL PUBLIC LICENSE

#### TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute 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 and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion

(continues on next page)

(continued from previous page)

of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

- a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.
- b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.
- c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

- a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
- b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

(continues on next page)

(continued from previous page)

c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), 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 distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent

(continues on next page)

(continued from previous page)

license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the 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 a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

#### NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN

(continues on next page)



(continued from previous page)

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.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE 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.

#### END OF TERMS AND CONDITIONS

#### How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the program's name and a brief idea of what it does.>
Copyright (C) <year> <name of author>
```

```
This program is free software; you can redistribute it and/or modify
it under the terms of the GNU General Public License as published by
the Free Software Foundation; either version 2 of the License, or
(at your option) any later version.
```

```
This program is distributed in the hope that it will be useful,
but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
GNU General Public License for more details.
```

```
You should have received a copy of the GNU General Public License
along with this program; if not, write to the Free Software
Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA
```

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
Gnomovision version 69, Copyright (C) year name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
```

(continues on next page)

(continued from previous page)

under certain conditions; type ``show c'` for details.

The hypothetical commands ``show w'` and ``show c'` should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than ``show w'` and ``show c'`; they could even be mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the program  
'Gnomovision' (which makes passes at compilers) written by James Hacker.

<signature of Ty Coon>, 1 April 1989  
Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

-----  
The bundled ZLib code is licensed under the ZLib license:

Copyright (C) 1995-2010 Jean-loup Gailly and Mark Adler

This software is provided 'as-is', without any express or implied warranty. In no event will the authors be held liable for any damages arising from the use of this software.

Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.
2. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.
3. This notice may not be removed or altered from any source distribution.

Jean-loup Gailly                      Mark Adler  
jloup@gzip.org                      madler@alumni.caltech.edu

-----  
The priority queue implementation is based on code licensed under the Apache 2.0 license:

Copyright 2010 Volkan Yazıcı <volkan.yazici@gmail.com>  
Copyright 2006-2010 The Apache Software Foundation

The full text of the Apache 2.0 license is available at:

(continues on next page)

(continued from previous page)

<http://www.apache.org/licenses/LICENSE-2.0>

-----

The Clay framework is licensed under the MIT license:

Copyright (C) 2011 by Vicent Marti

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.

-----

The regex library (deps/regex/) is licensed under the GNU LGPL

GNU LESSER GENERAL PUBLIC LICENSE  
Version 2.1, February 1999

Copyright (C) 1991, 1999 Free Software Foundation, Inc.  
51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA  
Everyone is permitted to copy and distribute verbatim copies  
of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

#### Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

(continues on next page)

(continued from previous page)

When we speak of free software, we are referring to freedom of use, 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 this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General

(continues on next page)

(continued from previous page)

Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

#### GNU LESSER GENERAL PUBLIC LICENSE TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated

(continues on next page)

(continued from previous page)

interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

- a) The modified work must itself be a software library.
- b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.
- c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
- d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you

(continues on next page)

(continued from previous page)

distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

(continues on next page)

(continued from previous page)

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at

(continues on next page)



(continued from previous page)

least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and

(continues on next page)

(continued from previous page)

all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), 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 distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser 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 Library

(continues on next page)

(continued from previous page)

specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

#### NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "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 LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY 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 LIBRARY (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 LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

#### END OF TERMS AND CONDITIONS

#### How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the library's name and a brief idea of what it does.>

(continues on next page)

(continued from previous page)

```
Copyright (C) <year> <name of author>
```

```
This library is free software; you can redistribute it and/or
modify it under the terms of the GNU Lesser General Public
License as published by the Free Software Foundation; either
version 2.1 of the License, or (at your option) any later version.
```

```
This library is distributed in the hope that it will be useful,
but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU
Lesser General Public License for more details.
```

```
You should have received a copy of the GNU Lesser General Public
License along with this library; if not, write to the Free Software
Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA
```

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the
library 'Frob' (a library for tweaking knobs) written by James Random Hacker.
```

```
<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice
```

That's all there is to it!

## 13.3 libloot, esplugin & Libloadorder

```
GNU GENERAL PUBLIC LICENSE
Version 3, 29 June 2007
```

```
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

(continues on next page)

(continued from previous page)

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.

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.

(continues on next page)

(continued from previous page)

"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.

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.

(continues on next page)

(continued from previous page)

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.

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

(continues on next page)

(continued from previous page)

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 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

(continues on next page)



(continued from previous page)

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.
- 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

(continues on next page)

(continued from previous page)

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.

"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

(continues on next page)

(continued from previous page)

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.

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

(continues on next page)

(continued from previous page)

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** 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".

(continues on next page)

(continued from previous page)

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 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

(continues on next page)

(continued from previous page)

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 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.

(continues on next page)

(continued from previous page)

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

## 13.4 libloot Documentation

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

(continues on next page)

(continued from previous page)

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 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.

(continues on next page)



(continued from previous page)

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 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

(continues on next page)

(continued from previous page)

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.

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

(continues on next page)

(continued from previous page)

- 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 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

(continues on next page)

(continued from previous page)

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 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.

(continues on next page)

(continued from previous page)

## 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 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.

(continues on next page)

(continued from previous page)

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 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**

(continues on next page)

(continued from previous page)

(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.

## 13.5 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.

## 13.6 yaml-cpp

Copyright (c) 2008 Jesse Beder.

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.





## C

Choose (C++ function), 21  
 ChooseInfo (C++ function), 24  
 condition (C++ member), 9  
 ConditionalMetadata (C++ function), 17  
 CyclicInteractionError (C++ function), 29

## D

defaultLanguage (C++ member), 21  
 DiscardAllUserMetadata (C++ function), 14  
 DiscardPluginUserMetadata (C++ function), 14  
 DoFormIDsOverlap (C++ function), 17

## F

File (C++ function), 18  
 Filename (C++ function), 18

## G

GetAfterGroups (C++ function), 19  
 GetBashTags (C++ function), 16  
 GetCleanInfo (C++ function), 25  
 GetCleaningUtility (C++ function), 24  
 GetCondition (C++ function), 17  
 GetContent (C++ function), 22  
 GetCRC (C++ function), 16, 24  
 GetCycle (C++ function), 29  
 GetDatabase (C++ function), 14  
 GetDeletedNavmeshCount (C++ function), 24  
 GetDeletedReferenceCount (C++ function), 24  
 GetDescription (C++ function), 19  
 GetDirtyInfo (C++ function), 25  
 GetDisplayName (C++ function), 18  
 GetGeneralMessages (C++ function), 12  
 GetGroup (C++ function), 25  
 GetGroupName (C++ function), 29  
 GetGroups (C++ function), 12  
 GetGroupsPath (C++ function), 12  
 GetHeaderVersion (C++ function), 16  
 GetIncompatibilities (C++ function), 25  
 GetInfo (C++ function), 24  
 GetITMCount (C++ function), 24  
 GetKnownBashTags (C++ function), 12

GetLanguage (C++ function), 21  
 GetLoadAfterFiles (C++ function), 25  
 GetLoadedPlugins (C++ function), 15  
 GetLoadOrder (C++ function), 15  
 GetLocations (C++ function), 26  
 GetMasterlistRevision (C++ function), 11  
 GetMasters (C++ function), 16  
 GetMessages (C++ function), 25  
 GetName (C++ function), 16, 18–20, 25, 28  
 GetPlugin (C++ function), 14  
 GetPluginMetadata (C++ function), 13  
 GetPluginUserMetadata (C++ function), 13  
 GetRequirements (C++ function), 25  
 GetSimpleMessages (C++ function), 26  
 GetTags (C++ function), 25  
 GetText (C++ function), 21  
 GetType (C++ function), 22  
 GetTypeOfEdgeToNextVertex (C++ function), 28  
 GetURL (C++ function), 20  
 GetUserGroups (C++ function), 12  
 GetVersion (C++ function), 16  
 GetVersionString (C++ function), 20  
 Group (C++ function), 19

## H

HasNameOnly (C++ function), 27

## I

IdentifyMainMasterFile (C++ function), 15  
 is\_modified (C++ member), 9  
 IsAddition (C++ function), 28  
 IsConditional (C++ function), 17  
 IsEmpty (C++ function), 17  
 IsLatestMasterlist (C++ function), 11  
 IsLightMaster (C++ function), 16  
 IsMaster (C++ function), 16  
 IsPluginActive (C++ function), 15  
 IsRegexPlugin (C++ function), 27  
 IsValidAsLightMaster (C++ function), 16  
 IsValidPlugin (C++ function), 14

## L

language (C++ member), 9  
LoadCurrentLoadOrderState (C++ function), 15  
LoadLists (C++ function), 10  
LoadPlugins (C++ function), 14  
LoadsArchive (C++ function), 17  
Location (C++ function), 19  
loot::ConditionalMetadata (C++ class), 17  
loot::ConditionSyntaxError (C++ class), 29  
loot::CreateGameHandle (C++ function), 10  
loot::CyclicInteractionError (C++ class), 28  
loot::DatabaseInterface (C++ class), 10  
loot::debug (C++ enumerator), 8  
loot::EdgeType (C++ enum), 7  
loot::error (C++ enumerator), 8  
loot::fatal (C++ enumerator), 8  
loot::File (C++ class), 18  
loot::FileAccessError (C++ class), 29  
loot::Filename (C++ class), 17  
loot::fo3 (C++ enumerator), 8  
loot::fo4 (C++ enumerator), 8  
loot::fo4vr (C++ enumerator), 8  
loot::fonv (C++ enumerator), 8  
loot::GameInterface (C++ class), 14  
loot::GameType (C++ enum), 7  
loot::GitStateError (C++ class), 29  
loot::Group (C++ class), 19  
loot::group (C++ enumerator), 7  
loot::hardcoded (C++ enumerator), 7  
loot::info (C++ enumerator), 8  
loot::IsCompatible (C++ function), 9  
loot::libgit2\_category (C++ function), 29  
loot::libloadorder\_category (C++ function), 29  
loot::Location (C++ class), 19  
loot::LogLevel (C++ enum), 8  
loot::LootVersion (C++ class), 20  
loot::master (C++ enumerator), 7  
loot::masterFlag (C++ enumerator), 7  
loot::MasterlistInfo (C++ class), 9  
loot::masterlistLoadAfter (C++ enumerator), 7  
loot::masterlistRequirement (C++ enumerator), 7  
loot::Message (C++ class), 21  
loot::MessageContent (C++ class), 20  
loot::MessageType (C++ enum), 8  
loot::overlap (C++ enumerator), 7  
loot::PluginCleaningData (C++ class), 23  
loot::PluginInterface (C++ class), 16  
loot::PluginMetadata (C++ class), 24  
loot::say (C++ enumerator), 8  
loot::SetLoggingCallback (C++ function), 9

loot::SimpleMessage (C++ class), 9  
loot::Tag (C++ class), 27  
loot::tes3 (C++ enumerator), 8  
loot::tes4 (C++ enumerator), 8  
loot::tes5 (C++ enumerator), 8  
loot::tes5se (C++ enumerator), 8  
loot::tes5vr (C++ enumerator), 8  
loot::tieBreak (C++ enumerator), 7  
loot::trace (C++ enumerator), 8  
loot::UndefinedGroupError (C++ class), 29  
loot::userLoadAfter (C++ enumerator), 7  
loot::userRequirement (C++ enumerator), 7  
loot::Vertex (C++ class), 28  
loot::warn (C++ enumerator), 8  
loot::warning (C++ enumerator), 8

## M

major (C++ member), 20  
MergeMetadata (C++ function), 24  
Message (C++ function), 22  
MessageContent (C++ function), 21  
minor (C++ member), 20

## N

NameMatches (C++ function), 27  
NewMetadata (C++ function), 25

## O

operator== (C++ function), 18–23, 27  
operator< (C++ function), 18–23, 27

## P

ParseCondition (C++ function), 17  
patch (C++ member), 20  
PluginCleaningData (C++ function), 23  
PluginMetadata (C++ function), 24

## R

revision (C++ member), 20  
revision\_date (C++ member), 9  
revision\_id (C++ member), 9

## S

SetCleanInfo (C++ function), 27  
SetDirtyInfo (C++ function), 26  
SetGroup (C++ function), 26  
SetIncompatibilities (C++ function), 26  
SetLoadAfterFiles (C++ function), 26  
SetLoadOrder (C++ function), 15  
SetLocations (C++ function), 27  
SetMessages (C++ function), 26  
SetPluginUserMetadata (C++ function), 13  
SetRequirements (C++ function), 26

SetTags (*C++ function*), [26](#)  
SetUserGroups (*C++ function*), [12](#)  
SortPlugins (*C++ function*), [15](#)

## T

Tag (*C++ function*), [27](#)  
text (*C++ member*), [9](#)  
ToSimpleMessage (*C++ function*), [22](#)  
type (*C++ member*), [9](#)

## U

UndefinedGroupError (*C++ function*), [29](#)  
UnsetGroup (*C++ function*), [26](#)  
UpdateMasterlist (*C++ function*), [11](#)

## V

Vertex (*C++ function*), [28](#)

## W

WriteMinimalList (*C++ function*), [10](#)  
WriteUserMetadata (*C++ function*), [10](#)