LOOT Documentation

Release latest

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Introduction

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

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

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

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

Installation & Uninstallation

LOOT requires Windows 7 or later.

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

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

1. Delete the files you extracted from the location you chose.

2. Delete the `LOOT` folder in your local application data folder, which can be accessed by entering `%LOCALAPPDATA%` into Windows' File Explorer.

Initialisation

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

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

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

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

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

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

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

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

The Main Interface
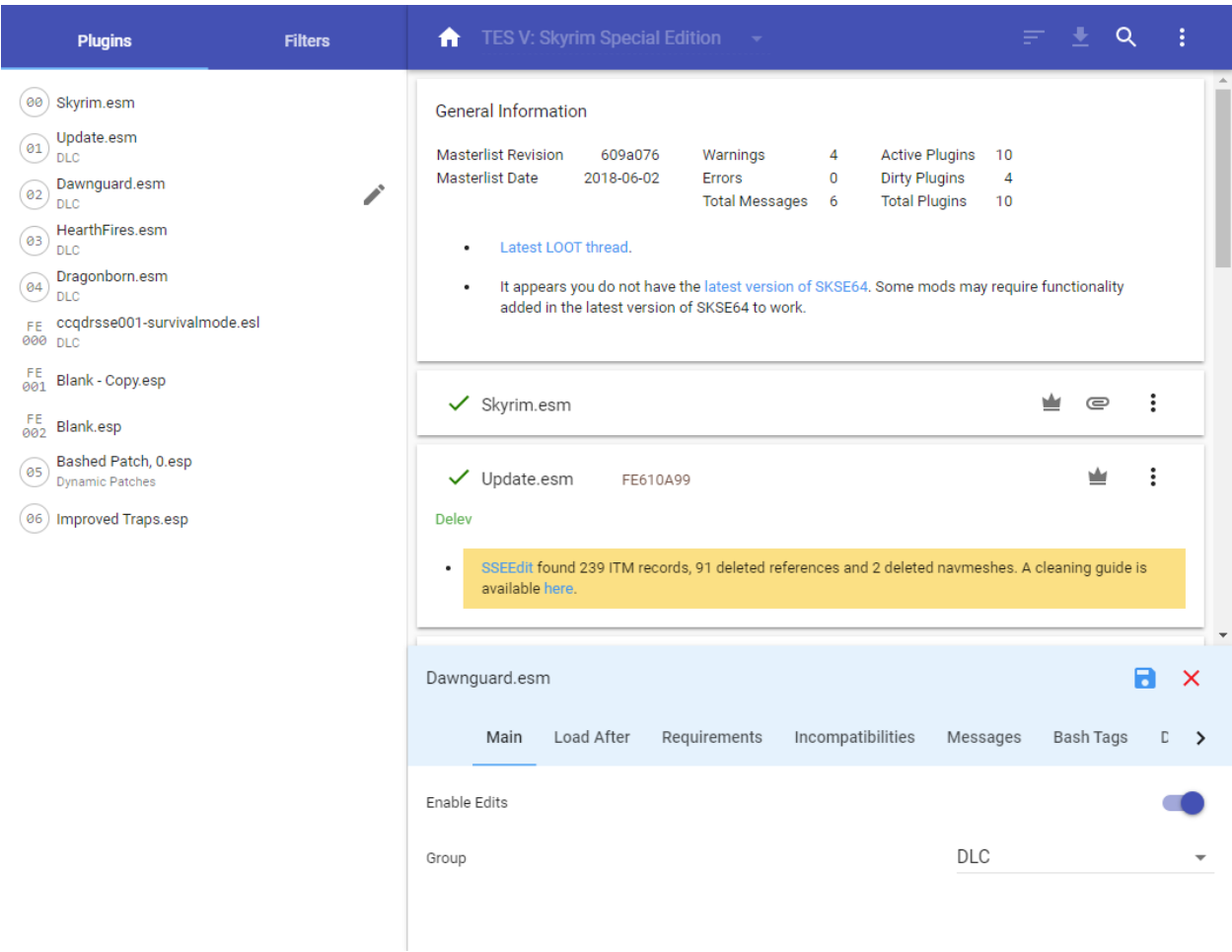
The Header Bar

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

Game Menu

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

Masterlist Update & Sorting

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

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

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

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

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

Load Order Backups

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

Search

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

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

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

Main Menu

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

- "Redate Plugins" is provided so that Skyrim and Skyrim Special Edition modders may set the load order for the Creation Kit. It is only available for Skyrim, and changes the timestamps of the plugins in its Data folder to match their current load order. A side effect of changing the timestamps is that any Steam Workshop mods installed will be re-downloaded.

- "Copy Load Order" copies the displayed list of plugins and the decimal and hexadecimal indices of active plugins to the clipboard. The columns are:

    1. Decimal load order index

    2. Hexadecimal load order index

    3. Hexadecimal light master index

    4. Plugin name

- "Copy Content" copies the data displayed in LOOT's cards to the clipboard as YAML-formatted text.

- "Refresh Content" re-scans the installed plugins' headers and regenerates the content LOOT displays. This can be useful if you have made changes to your installed plugins while LOOT was open. Refreshing content will also discard any CRCs that were previously calculated, as they may have changed.

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

Plugin Cards & Sidebar Items

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

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

- The "Active Plugin" icon.

- The plugin name.

- The plugin's version number, extracted from its description field.

- The plugin's CRC (Cyclic Redundancy Checksum), which can be used to uniquely identify it. CRCs are only displayed after they have been calculated during conflict filtering or sorting, except the the CRC of the game's main master file, which is never displayed.

- The "Master File" icon.

- The "Light Master File" icon.

- The "Empty Plugin" icon.

- The "Loads Archive" icon.

- The "Verified clean" icon.

- The "Has User Metadata" icon.

- The plugin menu button, which provides access to metadata-related features for the plugin. These are explained in later sections.

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

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

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

Filters

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

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

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

Hide Bash Tags Hides all Bash Tag suggestions.

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

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

Hide all plugin messages Hides all plugin messages.

Hide inactive plugins Hides all plugins that are inactive.

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

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

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

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

Editing Plugin Metadata

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

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

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

- The "Enable Edits" toggle must be on for LOOT to use any user-added metadata during sorting, otherwise it will be ignored.

- The "Group" dropdown sets the group that the plugin belongs to, which is the "default" group by default. If a plugin's group is set by user metadata, the non-user-metadata value will be highlighted in bold dark blue text.

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

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

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

- The filename is the path, relative to the game's Data folder, of the file to be checked for. This field is required. It gives the filenames of installed plugins as autocomplete suggestions.

- The display name is optional, and if specified will be used instead of the filename in any error messages that are displayed if a problem is encountered relating to the file.

- The condition is the optional condition string that is used to determine if the file should be checked for. If left blank, the file will always be checked for. Condition strings are a relatively advanced part of LOOT's functionality, and their syntax is covered in the Metadata Syntax documentation.

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

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

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

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

- The type is fairly self-explanatory, and is used to provide messages of varying severity with appropriate emphasis in LOOT's report.

- The content is the actual message text.

- The condition is, like for the corresponding file field, used to determine if the message should be displayed. If left blank, the message is displayed.

- The language is the language LOOT runs in that the message will be displayed for. This field has no effect for user-added messages, as they cannot contain multiple localisations, and LOOT will always display messages that have only one localisation, even if it doesn't match the current language.

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

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

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

Each Bash Tag has three fields:

- The state determines whether the Tag is to be suggested for addition or removal.

- The name is the actual Bash Tag name. The field gives autocomplete suggestions for Bash Tags supported by the current game.

- The condition decides if the Tag is to be suggested or not. It functions as for files and messages.

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

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

- The CRC of the dirty plugin.

- The ITM Count for the dirty plugin.

- The number of Deleted References that the dirty plugin contains.

- The number of Deleted Navmeshes that the dirty plugin contains.

- The name of the Cleaning Utility to use to clean the dirty plugin.

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

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

- The CRC of the clean plugin.

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

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

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

- The URL at which the plugin's parent mod can be found.

- The Name you wish to give the URL.

Editing Plugin Groups
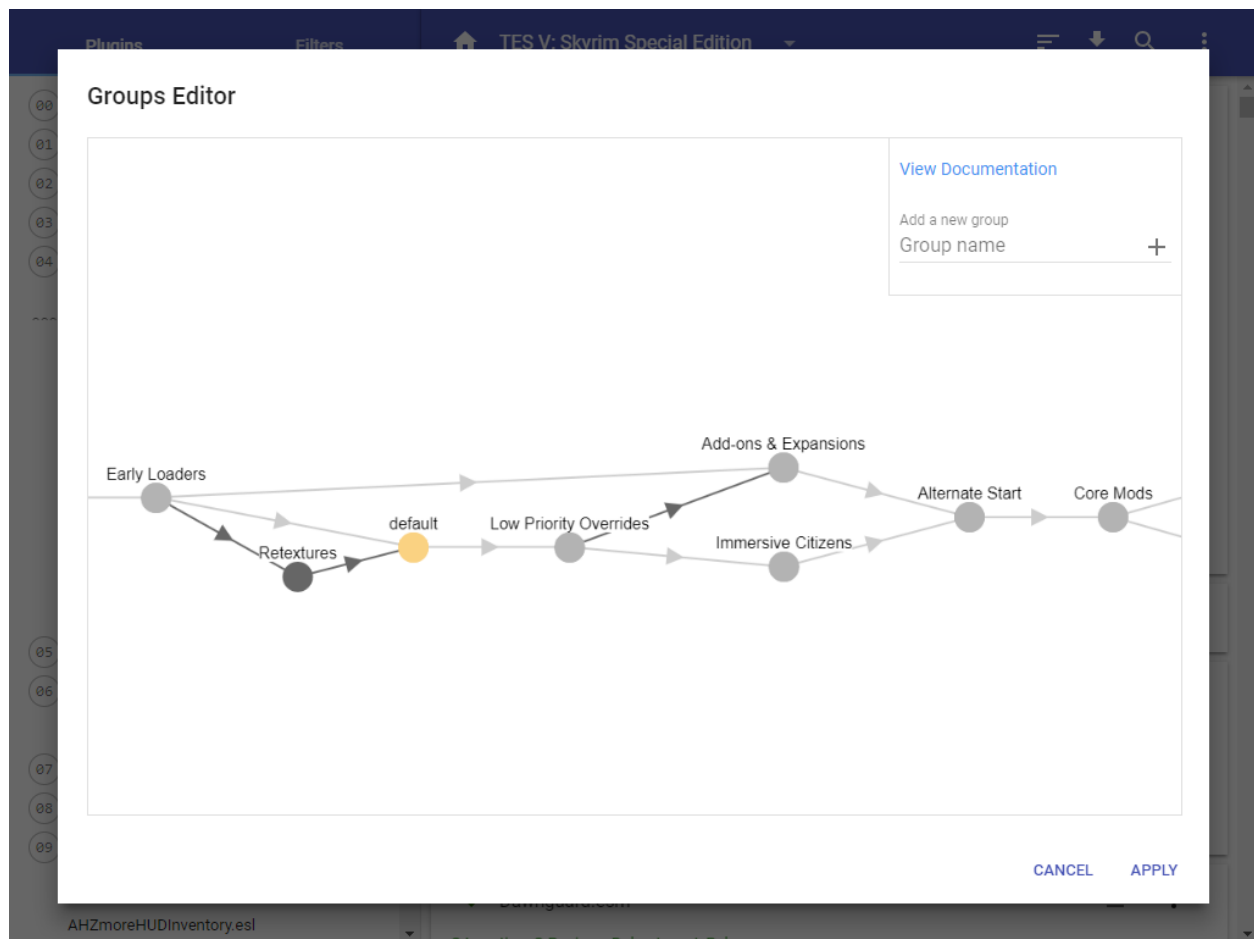
What Are Plugin Groups?

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

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

The Groups Editor

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

The groups editor consists of an interactive graph displaying all defined groups and their load after metadata, and an input for defining new groups.

- Groups are displayed as circular nodes in the graph, labelled with their names.

  - Groups that load after no other groups are displayed in blue.

  - Groups that no other groups load after are displayed in green.

  - The `default` group is displayed in orange.

- Load after metadata is displayed as lines (edges/vertices) between nodes, pointing from the earlier group to the later group.

- Metadata defined in the masterlist is greyed out, while user-defined metadata is not.

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

Right-clicking a load after metadata line will remove that load after metadata, and right-clicking a group will remove it. Masterlist metadata cannot be removed.

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

Rules For Using Groups

The groups editor enforces a few rules:

- A group cannot load after itself.

- A group cannot load after another group if the other group does not exist.

- It's not possible to delete groups that are defined in the masterlist.

- It's not possible to remove 'load after' entries from a group if they were defined in the masterlist.

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

A more complex example involving other types of metadata is where

- `A.esp` is in the `early` group

- `B.esp` is in the `mid` group

- `C.esp` is in the `late` group

- `A.esp` has `C.esp` as a master

- The `late` group loads after the `mid` group, which loads after the `early` group.

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

1. `A.esp`

2. `B.esp`

   3. `C.esp`

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

Cycle Avoidance

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

- If group membership contradicts where a plugin's masters, master flag, load after or requirement metadata say that plugin should load relative to another plugin, the plugins' groups' relationship will not be enforced. For example, if:

  - `dependent.esp` belongs to group `early`

  - `master.esp` belongs to group `late`

  - `master.esp` is a master of `dependent.esp`

  - The `late` group loads after the `early` group.

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

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

  For example, if:

  - `A.esp` is in the `default` group

  - `B.esp` is in the `mid` group

  - `C.esp` is in the `late` group

  - `A.esp` has `C.esp` as a master

  - The `late` group loads after the `mid` group, which loads after the `default` group.

  This will not cause a cycle, as:

  - `A.esp`'s group is ignored for `C.esp` as their groups contradict `C.esp` being a master of `A.esp`

  - `A.esp`'s group is ignored for `B.esp` as `B.esp` is in the `mid` group, which loads between `default` and `late`.

  The sorted load order is therefore:

  1. `B.esp`

  2. `C.esp`

  3. `A.esp`

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

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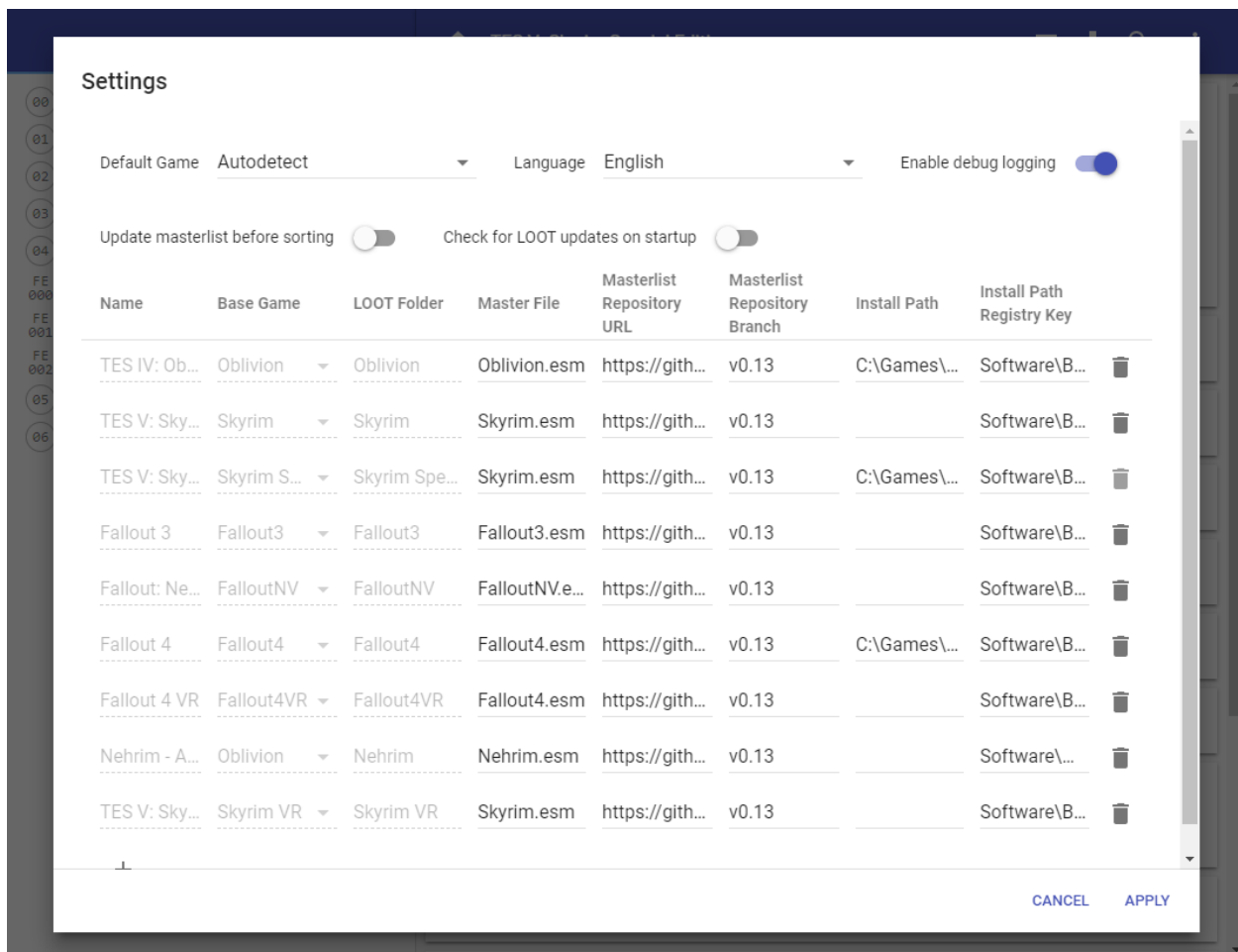
LOOT's settings may be accessed through the main menu.

General Settings

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

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

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

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

Game Settings

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

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

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

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

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

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

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

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

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

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

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

How LOOT Sorts Plugins

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

LOOT represents these rules in a graph, where each point (or *vertex*) represents a plugin, and each line (or *edge*) joins two points, going from the plugin that loads earlier to the plugin that loads later. Visualised, a simple set of rules on a small load order looks like this:
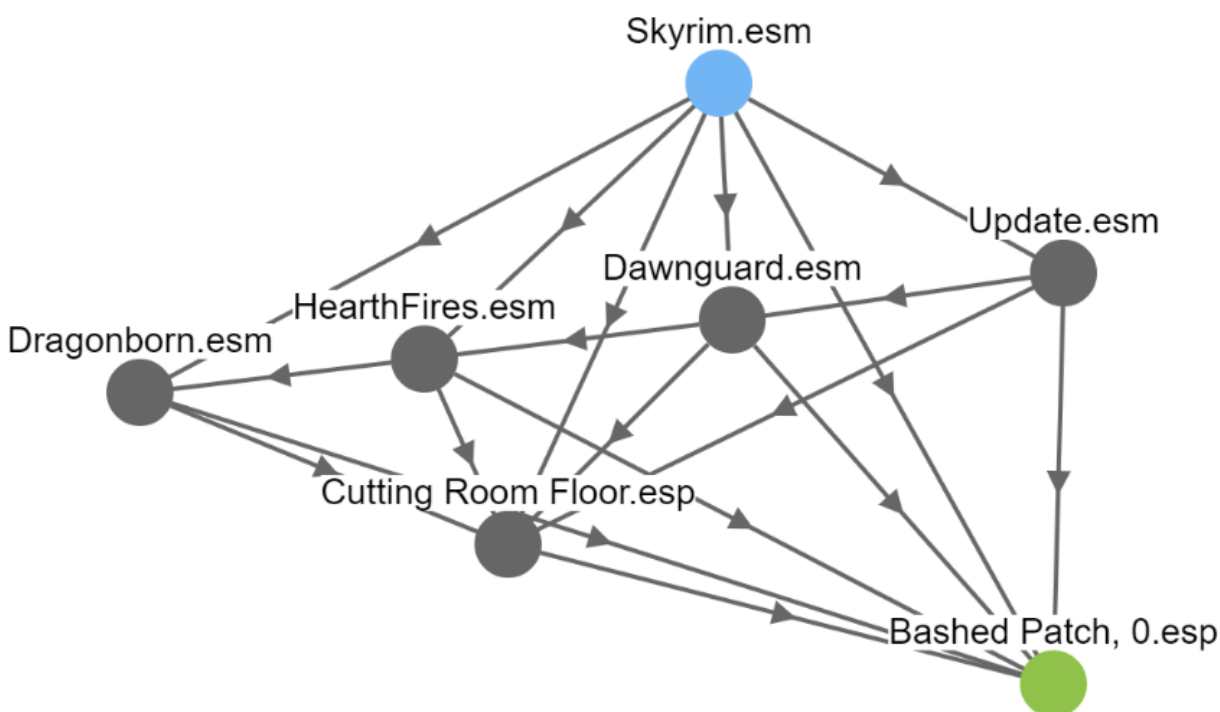
It may seem like there are a lot of edges in that image, but a more realistic load order graph could contain ~ 20 times as many vertices and ~ 1000 times as many edges.

Building The Plugin Graph

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

Hard Rules

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

1. If the plugin has its master flag set, edges are added going from it to every other plugin that does not have its master flag set.

2. If the plugin has any masters, edges are added going from each of them to the plugin.

3. If the plugin has any requirements metadata, edges are added going from each required plugin to the plugin.

4. If the plugin has any "load after" metadata, edges are added going from each "load after" plugin to the plugin.

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

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

- `Skyrim.esm` is a master of all the other plugins.

- `Skyrim.esm`, `Update.esm`, `Dawnguard.esm`, `HearthFires.esm` and `Dragonborn.esm` are all hardcoded to load in that order.

- All of the `*.esm` plugins have their master flag set, and both of the `*.esp` plugins do not have it set.

Group Rules

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

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

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

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

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

Overlap Rules

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

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

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

Tie Breaks

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

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

or it could be:

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

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

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

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

1. If one plugin has a position defined in the current load order and the other plugin does not (e.g. it is newly-installed), then the latter loads after the former.

2. If both plugins have positions in the current load order, they retain their existing relative order, i.e. the plugin that currently loads later still loads later.

3. If neither plugin has a position defined in the current load order, their lowercased filenames are lexicographically compared, ignoring their file extensions. The plugin with the filename that sorts later loads after the other plugin. For example, `A.esp` and `B.esp` would load in that order.

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

Topological Sort

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

The topological sort of the example graph is:

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

Themes

LOOT's user interface has CSS theming support. A dark theme is provided with LOOT: to use it, rename `dark-theme.css` in the `resources/ui/css` folder to `theme.css`. A working knowledge of CSS is required to create new themes, though the provided dark theme CSS file is commented to provide some assistance.

Contributing & Support

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

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

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

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

Credits

LOOT is developed on GitHub, and a full list of GitHub contributors may be found here.

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

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

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

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

Version History

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

0.14.0 - 2019-01-19

Added

- An error message will now be displayed for any light plugin that contains new records with FormIDs outside the valid range for light plugins.

- A warning message will now be displayed for any plugin that has a header version that is older than is used by the game, to help draw attention to plugins that have been incorrectly ported from older games. The header version checked is the value of the version field in the `HEDR` subrecord of the plugin's `TES4` record.

- A section to the documentation that explains LOOT's sorting algorithm.

Fixed

- Creating a new group by pressing the Enter key after typing a name in the Groups Editor input field no longer leaves the group creation button enabled.

- Incorrect handling of non-ASCII characters in plugin filenames when getting their active load order indices, which could lead to incorrect indices being displayed in the sidebar.

- Incorrect handling of non-ASCII characters in games' LOOT folder names. By default all folder names only contained ASCII characters, so this would only affect customised folder names.

- BSAs/BA2s loaded by non-ASCII plugins for Oblivion, Fallout 3, Fallout: New Vegas and Fallout 4 may not have been detected due to incorrect case-insensitivity handling (via LOOT API).

- Fixed incorrect case-insensitivity handling for non-ASCII plugin filenames and File metadata names (via LOOT API).

- Path equivalence checks could be inaccurate as they were using case-insensitive string comparisons, which may not match filesystem behaviour. Filesystem equivalence checks are now used to improve correctness. (Via LOOT API).

- Errors due to filesystem permissions when cloning a new masterlist repository into an existing game directory. Deleting the temporary directory is now deferred until after its contents have been copied into the game directory, and if an error is encountered when deleting the temporary directory, it is logged but does not cause the masterlist update to fail. (Via LOOT API).

- The Czech translation mangled placeholders in message strings, causing errors when it was used.

Changed

- LOOT now requires a C++17-compatible compiler, so Windows builds now require the MSVC 2017 x86 redistributable instead of the MSVC 2015 x86 redistributable.

- The masterlist or default group for a plugin in the plugin editor's group dropdown is now styled with bold dark blue text to make it easier to undo user customisation of a plugin's group.

- Cyclic interaction errors will now detail the data source of each interaction in the cyclic path, to make it easier to identify the problematic metadata and so fix it.

- Updated the Japanese translation.

- Updated the German translation.

- LOOT now supports v0.14 of the metadata syntax (via LOOT API).

- Updated LOOT API, which has been renamed to libloot, to 0.14.1.

- Updated cpptoml to v0.1.1.

- Updated spdlog to v1.3.0.

- Updated nlohmann/json to v3.5.0.

- Updated JavaScript GUI dependencies.

0.13.6 - 2018-11-27

Fixed

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

0.13.5 - 2018-11-26

Fixed

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

Added

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

- A Czech translation by ThePotatoChronicler.

- A documentation section that describes the sorting algorithm.

Changed

- Passing an invalid `--game` value as a parameter to `LOOT.exe` now causes an error to be displayed.

- The Groups Editor now uses a left-to-right layout when displaying the groups graph, which is clearer and more consistent than the previous layout.

- Updated GUI dependencies.

- Updated Japanese translation.

0.13.4 - 2018-09-25

Fixed

- Warnings were displayed for ghosted plugins saying they were invalid and would be ignored when they were not.

- Filesystem errors when trying to set permissions during a masterlist update that clones a new repository (via LOOT API).

Changed

- The Group dropdown menu in the metadata editor now "drops up" to reduce the amount of scrolling necesary by default to see the full list.

- The GUI is now based on a mix of Polymer 3 and React elements.

- Updated GUI dependencies.

- Updated LOOT API to v0.13.8.

0.13.3 - 2018-09-11

Fixed

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

0.13.2 - 2018-09-10

Fixed

- Plugins with a *.esp* file extension and the light master flag set no longer appear as masters.

- Running LOOT outside of its executable's directory no longer results in a blank window.

- Cursor displaying as text selector in dropdown lists.

- Incompatibility messages not being displayed for non-plugin files.

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

- Plugins that are corrupt past their TES4 header are now handled gracefully when sorting and removed from the UI, with a warning message displayed for each removed plugin.

- Metadata editor text fields now trim whitespace to avoid unexpected metadata mismatches.

Changed

- Updated Boost to v1.67.0.

- Updated spdlog to v1.1.0.

- Updated Google Test to v1.8.1.

- Updated cpptoml v0.1.0.

- Updated CEF to v3.3440.1806.g65046b7.

- Updated nlohmann/json to v3.2.0.

- Updated LOOT API to v0.13.7 which should carry a number of performance improvements with it.

- Updated Danish translation.

0.13.1 - 2018-06-03

Changed

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

- Updated LOOT API to v0.13.5.

- Updated spdlog to v0.17.0.

0.13.0 - 2018-06-02

Added

- Support for Skyrim VR.

- Support for plugin groups. Each plugin belongs to a group, and groups can load after zero or more other groups, providing a concise way to load groups of plugins after other groups of plugins. The group a plugin belongs to can be set in the metadata editor, and groups can be edited in the new Groups Editor accessible through the main menu.

- LOOT's update checking on startup can now be toggled from the settings dialog.

Changed

- Bash Tag suggestions now display tags that are present in the plugin's description field in silver text.

- Sorting error messages now includes the full path to `plugins.txt` when suggesting it may be read-only.

- Updated the LOOT API to v0.13.4.

- Updated CEF to v3.3325.1758.g9aea513.

- Updated nlohmann/json to v3.1.2.

Removed

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

Fixed

- `Cannot read property 'status' of undefined` errors could occur when LOOT attempted to check for updated and no Internet connection was available.

- An error that occurred when attempting to apply edits to clean or dirty plugin metadata.

- A potential error during sorting if the number of plugins installed changed since LOOT was started or its content was last refreshed.

- An error when applying a load order for Oblivion, Fallout 3 or Fallout: New Vegas involving a plugin with a timestamp earlier than 1970-01-01 00:00:00 UTC (via LOOT API).

- An error when loading the current load order for Skyrim with a `loadorder.txt` incorrectly encoded in Windows-1252 (via LOOT API).

- Various filesystem-related issues that could be encountered when updating masterlists, including failure due to file handles being left open while attempting to remove the files they referenced (via LOOT API).

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

- Closing LOOT with the metadata editor open or unapplied sorting results displayed would not display a confirmation dialog.

- Editable table rows for non-user metadata were not being made read-only.

- User metadata was not used when checking the validity of a plugin's install environment (e.g. if any incompatible plugins are present).

- Bash Tag removal suggestions were treated as addition suggestions unless the tag name was prefixed by an additional −.

- File metadata's `display` field wasn't used in generated UI messages.

- The top divider in a scrollable dialog could be hidden when scrolling.

0.12.5 - 2018-03-19

Fixed

- LOOT now checks that its game subdirectories are actually directories, not just that they exist, erroring earlier and more helpfully when there is somehow a file with the same name in the LOOT data directory.

- Windows 7 users can now update their masterlists again without having to manually enable system-wide TLS 1.2 support. This was an issue after GitHub disabled support for older, insecure versions of TLS encryption because Microsoft didn't enable TLS 1.2 support in Windows 7 by default. Fixed via the LOOT API.

Changed

- Migrated all non-Polymer GUI dependencies from Bower to NPM.

- Refactored GUI JavaScript and custom elements into ES2015 modules.

- Introduced Webpack to bundle JavaScript and CSS for the GUI.

- Updated Polymer to v2.5.0.

- Updated the LOOT API to v0.12.5.

0.12.4 - 2018-02-22

Fixed

- Loading or saving a load order could be very slow because the plugins directory was scanned recursively, which is unnecessary. In the reported case, this fix caused saving a load order to go from 23 seconds to 43 milliseconds (via the LOOT API).

- Plugin parsing errors were being logged with trace severity, they are now logged as errors (via the LOOT API).

- Chromium console messages are now logged with severity levels that better match the severity with which they appear in the console (via the LOOT API).

- Saving a load order for Oblivion, Fallout 3 or Fallout: New Vegas now updates plugin access times to the current time for correctness (via the LOOT API).

Changed

- Added a specific message for sorting errors that mentions plugins.txt probably being read-only, as it's the most common cause of issues filed.

- Added missing mentions of Fallout 4 VR support.

- Performance improvement for load order operations (via the LOOT API).

- Updated the LOOT API to v0.12.4.

- Updated spdlog to v0.16.3.

- Updated nlohmann/json to v3.1.1.

- Updated CEF to v3.3282.1733.g9091548.

0.12.3 - 2018-02-10

Fixed

- LOOT wouldn't start when run by a user with a `%LOCALAPPDATA` path containing non-ASCII characters, which was a regression introduced in v0.12.0.

- The log buffer is flushed after every statement, fixing the regression introduced in v0.12.2.

- The uninstaller didn't remove `settings.toml`.

Changed

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

0.12.2 - 2018-02-05

Added

- Support for Fallout 4 VR.

- Support for configuring games' local paths, i.e. the directory in which their `plugins.txt` is stored. Each game entry in LOOT's `settings.toml` now has a `local_path` variable that is blank by default, which leaves it up to libloadorder (via the LOOT API) to determine the path. There is no GUI option to configure the value.

- Chromium console messages are now logged to `LOOTDebugLog.txt` to help when debugging.

Changed

- Updated LOOT API to v0.12.3.

- Replaced Protocol Buffers serialisation dependency with nlohmann/json v2.1.1.

- Replaced Boost.Log with spdlog v0.14.0.

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

- Updated Japanese translation.

Removed

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

Fixed

- Plugins with a `.esp` file extension and the light master flag set are no longer treated as masters when sorting, so they can have other `.esp` files as masters without causing cyclic interaction sorting errors (via LOOT API).

- Sorting didn't update sidebar indices.

0.12.1 - 2017-12-03

Fixed

- Settings would not save correctly with debug logging disabled.

- LOOT API logging was disabled on Linux.

- Typos in the v0.12.0 changelog.

0.12.0 - 2017-12-02

Added

- Support for light master (`.esl`) plugins.

    - Light masters are indicated by a new icon on their plugin cards, and the "Master File" icon is suppressed for light masters.

    - In the sidebar, light masters all have the in-game load order index `FE`, followed by the hexadecimal index of the light master relative to only other light masters.

    - A new general warning message will be displayed when 255 normal plugins and at least one light master are active.

    - A new error message will be displayed for light masters that depend on a non-master plugin.

- Support for specifying the game local app data path using the `--game-appdata-path=<path>` command line parameter.

- Japanese translation by kuroko137.

Changed

- LOOT now stores its settings in a `settings.toml` file instead of a `settings.yaml` file. It cannot upgrade from the latter to the former itself, but a converter is available online.

- "Copy Load Order" now includes a third column for the index of light masters relative to other light masters.

- Updated the UI to use Polymer v2 and updated LOOT's custom elements to use the Custom Elements v1 syntax.

- LOOT API log messages are now included in the `LOOTDebugLog.txt` file, and are no longer written to `LOOTAPIDebugLog.txt`.

- Updated the Chinese translation.

- Updated the Danish translation.

- Updated the Russian translation.

- Updated the LOOT API to v0.12.1.

- Updated Lodash to b4.17.4.

- Updated Octokat to v0.8.0.

- Updated CEF to v3.3163.1671.g700dc25.

Fixed

- Error when adding a Bash Tag with no condition using the metadata editor.

- Detection of Skyrim and Skyrim SE when LOOT is installed in the same directory as both.

- General messages disappearing when cancelling a sort.

- Blank messages' content in the metadata editor after updating the masterlist.

- LOOT window size/position not restoring maximised state correctly.

- "Cannot read property of 'text' of undefined" error messages when something went wrong.

- The "new version available" message is no longer displayed for snapshot builds built from code newer than the latest release.

- Significant fixes in the LOOT API:

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

  - LOOT would not resolve game or local data paths that are junction links correctly, which caused problems later when trying to perform actions such as loading plugins.

  - Performing a masterlist update on a branch where the remote and local histories had diverged would fail. The existing local branch is now discarded and the remote branch checked out anew, as intended.

0.11.0 - 2017-05-13

Changed

- The LOOT application now uses the LOOT API, rather than sharing internal code with it.

- LOOT now writes to an additional log file, `LOOTAPIDebugLog.txt`.

- If LOOT is closed while maximised, it will now start maximised.

- Log timestamps now have microsecond precision.

- Updated to CEF v3.2924.1561.g06fde99.

- The LOOT API has had its code split into its own repository. Its documentation, along with the metadata syntax documentation, is now hosted separately.

Fixed

- A few inaccurate logging statements.

- Menu text wrapping during opening animation.

- Inconsistent editor priority values handling, causing priority values user metadata to not trigger the "Has User Metadata" icon appearing in certain circumstances.

- The LOOT window's title is now set on Linux.

- The LOOT window's size and position is now saved and restored on Linux.

- Clipboard operations are now supported on Linux (requires `xclip` to be installed).

0.10.3 - 2017-01-08

Added

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

Changed

- If no game is detected when LOOT is launched and a valid game path or Registry key pointing to a game path is added in the Settings dialog, LOOT will select that game and refresh its content when the new settings are applied.

- Most exception-derived errors now display a generic error message, as exception messages are no longer translatable. Only metadata syntax exceptions still have their message displayed in the UI.

- Improved robustness of error handling when calculating file CRCs.

- Improved consistency of error logging.

- Errors and warnings are now always logged, even when debug logging is disabled.

- The First Time Tips and About dialogs are now fully translatable, with the exception of the legal text in the About dialog.

- Updated Russian translation.

Fixed

- A crash on startup if none of the supported games were detected.

- A crash when applying settings when none of the supported games are detected.

- Buttons and menu items for performing game-specific operations are now disabled while none of the supported games are detected.

- Initialisation error messages were formatted incorrectly.

- An error message reading `Cannot read property 'textContent' of undefined` could be displayed on startup due to UI elements initialising later than expected.

- The texts of the first plugin card and sidebar item were not being translated.

- LOOT now logs being unable to find a game's registry entry as `[info]`, not `[error]`.

- If an error was encountered while loading a userlist, constructing the error message produced a `boost::too_many_args` error that obscured the original error.

- The installer now checks for v14.0.24215 of the MSVC Redistributable, it was previously checking for v14.0.24212, which some users found insufficient.

0.10.2 - 2016-12-03

Added

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

Changed

- The metadata editor now displays an error message when the user inputs invalid priority values, in addition to the input's existing red underline styling for invalid values, and instead of validating the values when trying to save the metadata.

- LOOT's icon now scales better for high-DPI displays.

- LOOT's UI is now built as many loose files instead of one large HTML file, to aid debugging and development.

- Updated Chinese translation.

- Updated Chromium Embedded Framework to 3.2840.1517.gd7afec5.

- Updated libgit2 to 0.24.3.

- Updated Polymer to 1.7.0, and also updated various Polymer elements.

Fixed

- A crash could occur if some plugins that are hardcoded to always load were missing. Fixed by updating to libloadorder v9.5.4.

- Plugin cleaning metadata with no `info` value generated a warning message with no text.

- The LOOT update checker will no longer display an empty error dialog if the update check is unable to connect to the GitHub API (eg. if offline).

- Redate Plugins was accidentally disabled for Skyrim SE in v0.10.1, and had no effect for Skyrim SE in v0.10.0.

- Having more than ~ 100 plugins installed could make the sidebar's plugin list appear on top of dialogs.

- More UI text has been made available for translation.

- Tweak some text formatting to include more context for translators.

- Dirty plugin warning messages now distinguish between singular and plural forms for their ITM, deleted reference and deleted navmesh counts, to allow the construction of more grammatically-correct messages in English and other languages.

- The UI text for the metadata editor was always displayed in English even when LOOT was set to use another language, despite translations being available.

- It was possible to open the metadata editor during sorting by double-clicking a plugin in the sidebar.

- Removed a duplicate section in the documentation for editing metadata.

0.10.1 - 2016-11-12

Changed

- When saving a load order for Fallout 4 or Skyrim SE, the official plugins (including DLC plugins) are no longer written to `plugins.txt` to match game behaviour and improve interoperability with other modding utilities.

- LOOT now uses `Skyrim Special Edition` as the folder name for storing its Skyrim SE data, to mirror the game's own folder naming and improve interoperability with other modding utilities, and automatically renames any `SkyrimSE` folder created by LOOT v0.10.0.

- Updated Russian translation.

- Updated Chinese translation.

Fixed

- When saving a load order for Fallout 4 or Skyrim SE, the positions of official plugins (including DLC plugins) in `plugins.txt` are now ignored if they are present and a hardcoded order used instead. Note that there is

a bug in Skyrim SE v1.2.39 that causes the DLC plugins to be loaded in timestamp order: this behaviour is ignored.

- If the LOOT installer installed the MSVC redistributable, the latter would silently force a restart, leading to possible data loss.

- It was possible to open the metadata editor between sorting and applying/cancelling a sorted load order, which would then cause an error when trying to close the editor. The editor is now correctly disabled during the sort process.

0.10.0 - 2016-11-06

Added

- Support for TES V: Skyrim Special Edition.

- Swedish translation by Mikael Hiort af Ornäs (Lakrits).

- More robust update checker, so now LOOT will notify users of an update without needing a masterlist to be present or for it to be updated for the new release, and will also detect when the user is using a non-release build with the same version number.

Changed

- LOOT now supports v0.10 of the metadata syntax. This breaks compatibility with existing syntax, which may cause existing user metadata to fail to load. See the syntax version history for the details.

- The Global Priority toggle button in the metadata editor has been replaced with an input field to reflect the change in syntax for global priorities.

- Added a "Clean Plugin Info" tab to the metadata editor, for editing metadata that identifies a plugin as being clean.

- Added a "Verified clean" icon to plugin cards that is displayed for plugins that are identified as clean.

- All operations triggered from the UI are now processed asynchronously, which may have a minor positive effect on perceived performance.

- Error messages displayed in dialog boxes no longer include an error code.

- Rewrote the documentation, which is now hosted online at Read The Docs.

- Updated Simplified Chinese translation.

- Updated Russian translation.

- Updated German translation.

- Updated Danish translation.

- Updated CEF to 3.2840.1511.gb345083 and libgit2 to 0.24.2.

Fixed

- Cached plugin CRCs causing checksum conditions to always evaluate to false.

- Data being loaded twice when launching LOOT.

- Updating the masterlist when the user's `TEMP` and `TMP` environmental variables point to a different drive than the one LOOT is installed on.

- Incorrect error message display when there was an issue during initialisation.

- Sidebar plugin load order indices not updating when sorting changed plugin positions.

- The "Has User Metadata" icon not displaying when priority metadata was changed.

0.9.2 - 2016-08-03

Added

- Theming support and the dark theme have been reimplemented and reintroduced.

- Plugin filename and Bash Tag name fields will now autocomplete in the metadata editor.

- The in-game load order indices of active plugins are now displayed in the sidebar.

Changed

- Most URLs now use HTTPS.

- The Danish and French translations have been updated.

- The CEF (3.2743.1442.ge29124d), libespm (2.5.5), Polymer (1.6.0) and Pseudosem (1.1.0) dependencies have been updated to the versions given in brackets.

Fixed

- Error when applying filters on startup.

- Hidden plugin and message counters not updating correctly after sorting.

- An error occurring when the user's temporary files directory didn't exist and updating the masterlist tried to create a directory there.

- The installer failing if LOOT was previously installed on a drive that no longer exists. The installer now always gives the option to change the default install path it selects.

- Startup errors being reported incorrectly and causing additional errors that prevented the user from being informed of the original issue.

- The metadata editor's CRC input field being too short to fully display its validation error message.

- Errors when reading some Oblivion plugins during sorting, including the official DLC.

- Some cases where LOOT would fail to start.

- The conflict filter not including the Unofficial Skyrim Legendary Edition Patch's plugin (and any other plugin that overrides a very large number of records) in results.

- The "not sorted" message reappearing if the load order was sorted twice in one session and cancelled the second time.

- Version numbers where a digit was immediately followed by a letter not being detected.

0.9.1 - 2016-06-23

Added

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

Changed

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

Removed

- Support for Windows Vista.

Fixed

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

0.9.0 - 2016-05-21

Added

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

Changed

- Improve sorting performance by only reading the header when loading game's main master file.
- References to "BSAs" have been replaced with the more generic "Archives" as Fallout 4's BSA equivalents use a different file extension.

- The sorting process now recognises when the sorted load order is identical to the existing load order and informs the user, avoiding unnecessary filesystem interaction.

- The metadata editor has been reimplemented as a single resizeable panel displayed below the plugin card list instead of a separate editor for each plugin card.

- Editable table styling has been improved to more closely align to the Material Design guidelines.

- Minor UI changes have been made to scrollbar and focus outline styling to improve accessibility.

- UI interaction performance has been improved, especially when scrolling the plugin card list.

- The PayPal donation link now points to the PayPal.Me service, which has a more polished UX and lower fees.

- LOOT's settings file handling has been reimplemented, fixing crashes due to invalid settings values and allowing missing settings to use their default values.

- Plugin version string extraction has been reimplemented, improving its accuracy and maintainability.

- Plugin CRC, file and version condition evaluation has been optimised to use cached data where it exists, avoiding unnecessary filesystem interaction.

- The French and Danish translations have been updated.

- The installer now only creates one shortcut for LOOT in the Start menu, following Microsoft guidelines.

- A lot of code has been refactored and improved to increase its quality.

- The Boost (1.60), CEF (3.2623.1401.gb90a3be), libespm (2.5.2), libgit2 (0.24.1), libloadorder (9.3.0) and Polymer (1.4) dependencies have been updated to the versions given in brackets.

Removed

- The Flattr donation link.

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

Fixed

- Redate Plugins attempted to redate plugins that were missing, causing an error.

- LOOT would not launch when run by a user with a non-ASCII local application data path.

- Sorting processed priority value inheritance throughout the load order incorrectly, leading to some plugins being positioned incorrectly.

- The conflict filter displayed only the target plugin when enabled for the first time in a session.

- The behaviour of the search functionality was inconsistent.

- Duplicate messages could be displayed under certain circumstances.

- Opening the metadata editor for one plugin displayed the metadata for another plugin under certain circumstances.

- Changing the current game quickly could leave the UI unresponsive.

- Applying a filter then scrolling the plugin card list would display some cards with no content.

- Plugin cards would disappearing when jumping to a plugin card near the bottom of the load order using the sidebar.

- Clicking on a disabled element in a dropdown menu would cause the menu to close.

- The UI font size was too large, due to a misunderstanding of the Material Design guidelines.

- Attempting to build native Linux and 64-bit executables produced errors. Such builds are unsupported and no official builds are planned.

0.8.1 - 2015-09-27

Added

- Checks for safe file paths when parsing conditions.

Changed

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

Fixed

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

0.8.0 - 2015-07-22

Added

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

Changed

- Improved detail of metadata syntax error messages.
- Improved plugin loading performance for computers with weaker multithreading capabilities (eg. non-hyperthreaded dual-core or single-core CPUs).
- LOOT no longer displays validity warnings for inactive plugins.
- LOOT now displays a more user-friendly error when a syntax error is encountered in an updated masterlist.
- Metadata syntax support changes, see the metadata syntax document for details.
- LOOT's installer now uses Inno Setup instead of NSIS.
- LOOT's installer now uninstalls previous versions of LOOT silently, preserving user data, instead of displaying the uninstaller UI.
- Updated German and Russian translations.
- Updated libgit2 to v0.23.0.

Fixed

- "Cannot read property 'push' of undefined" errors when sorting.

- Many miscellaneous bugs, including initialisation crashes and incorrect metadata input/output handling.

- Metadata editors not clearing unsaved edits when editing is cancelled.

- LOOT silently discarding some non-unique metadata: an error message will now be displayed when loading or attempting to apply such metadata.

- Userlist parsing errors being saved as general messages in the userlist.

- LOOT's version comparison behaviour for a wide variety of version string formats. This involved removing LOOT's usage of the Alphanum code library.

0.7.1 - 2015-06-22

Added

- Content search, accessible from an icon button in the header bar, and using the Ctrl-F keyboard shortcut.

- "Copy Load Order" feature to main menu.

Changed

- LOOT now uses versioned masterlists, so that new features can be used without breaking LOOT for users who haven't yet updated.

- Moved content filter into Filters sidebar tab. The Ctrl-F keyboard shortcut no longer focusses the content filter.

- Checkbox-toggled filters now have their last state restored on launch.

- Darkened background behind cards to increase contrast.

- Updated French translation.

Fixed

- LOOT UI opening in default browser on launch.

- "No existing load order position" errors when sorting.

- Message filters being ignored by plugin cards after navigating the list.

- Output of Bash Tag removal suggestions in userlists.

- Display of masterlist revisions where they were wrongly interpreted as numbers.

0.7.0 - 2015-05-20

Added

- Danish and Korean translations.

- If LOOT can't detect any installed games, it now launches to the settings dialog, where the game settings can be edited to allow a game to be detected.

- A "Copy Content" item in the main menu, to copy the plugin list and all information it contains to the clipboard as YAML-formatted text.

- A "Refresh Content" item in the main menu, which re-scans plugin headers and updates LOOT's content.

- LOOT is now built with High DPI display support.

- Masterlist updates can now be performed independently of sorting.

- A "First-Time Tips" dialog will be displayed on the first run of any particular version of LOOT.

- Attempting to close LOOT with an unapplied sorted load order or an open plugin editor will trigger a confirmation dialog.

- Support for GitHub Flavored Markdown in messages, minus features specific to the GitHub site, such as @mentions and emoji.

- Support for message content substitution metadata syntax in the masterlist.

- Display of LOOT's build revision has been added to the "About" dialog.

- Plugin location metadata can now be added through the user interface.

- A content filter, which hides plugins that don't have the filter text present in their filenames, versions, CRCs, Bash Tags or messages.

Changed

- New single-window HTML5-based interface and a new icon, based on Google's Material Design.

  - LOOT now parses the masterlist and plugin headers on startup, and the resulting content is displayed with the plugins in their current load order.

  - Each plugin now has its own editor, and multiple editors can be opened at once.

  - Drag 'n' drop of plugins from the sidebar into metadata editor tables no longer requires the conflicts filter to be enabled.

  - CRCs are calculated during conflict filtering or sorting, so are notdisplayed until either process has been performed.

  - The "View Debug Log" menu item has been replaced with a "Open Debug Log Location" menu item to make it easier to share the file itself.

  - Debug logging control has been simplified to enable/disable, replacing the "Debug Verbosity" setting with an "Enable Debug Logging" toggle.

  - Changes to game settings now take immediate effect.

  - Masterlist updating now exits earlier if the masterlist is already up-to-date.

  - Masterlist revisions are now displayed using the shortest unique substring that is at least 7 characters long.

  - Making edits to plugin metadata before applying a calculated load order no longer causes LOOT to recalculate the load order. Instead, the displayed load order is applied, and the metadata edits will be applied the next time sorting is performed.

  - All references to "UDRs" have been replaced by the more technically-correct "Deleted References" term.

  - The "Hide inactive plugin messages" filter has been replaced by a "Hide inactive plugins" filter.

- Copied metadata is now wrapped in BBCode `[spoiler][code]...[/code][/spoiler]` tags for easier pasting into forum posts.

- The Summary and General Messages cards have been combined into a General Information card.

- Sorting performance improvements.

- Updated Boost (1.58.0), libgit2 (0.22.2) and libloadorder dependencies.

Removed

- Messages with multiple language strings can no longer be created through the user interface. User-added multiple-language messages will be converted to single-language strings if their plugin's editor is opened then closed using the "OK" button.

- The "Copy Name" menu item has been removed, as plugin names can now be selected and copied using `Ctrl-C`.

- As LOOT no longer generates reports, it doesn't save them either.

Fixed

- The `settings.yaml` included with the installer was very old.

- Inactive incompatibilities were displayed as error messages. They are now displayed as warnings.

- Masterlist entries that matched the same plugin were not being merged. Now one exact match and any number of regex matches will be merged.

- Masterlist updating failed when a fast-forward merge was not possible (eg. when remote has been rebased, or a different repository is used). Such cases are now handled by deleting the local repository and re-cloning the remote.

- Masterlist updating failed when the path to LOOT's folder included a junction link.

- Masterlists would not 'update' to older revisions. This can be useful for testing, so now they can do so.

- Crashes when trying to read corrupt plugins and after masterlist update completion.

- LOOT would crash when trying to detect a game installed to a location in which the user does not have read permissions, now such games are treated as not being installed.

- Plugins with non-ASCII description text would cause `codecvt to wstring` errors.

- LOOT would accept any file with a `.esp` or `.esm` extension as a plugin. It now checks more thoroughly, by attempting to parse such files' headers.

- LOOT would only detect Skyrim plugins as loading BSAs. Plugins for the other games that also load BSAs are now correctly detected as such.

- Depending on the plugins involved, sorting could produce a different load order every time it was run. Sorting now produces unchanging load orders, using existing load order position where there is no reason to move a plugin.

0.6.1 - 2014-12-22

Added

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

Changed

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

Fixed

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

Security

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

0.6.0 - 2014-07-05

Added

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

- LOOT's windows now remember their last position and size.

- Command line parameter for selecting the game LOOT should run for.

- Finnish translation.

Changed

- Unified and improved the metadata editors launched during and outside of sorting.

  - The metadata editor now resizes more appropriately.

  - The mid-sorting instance hides the requirement, incompatibility, Bash Tags, dirty info and message lists.

  - Both instances now have a conflict filter, priority display in their plugin list and drag 'n' drop from the plugin list into whatever metadata lists are visible.

  - The mid-sorting instance also hides the load after entry edit button, and the button to add new entries (so drag 'n' drop is the only available method of adding entries).

  - The metadata editor now displays plugins with user edits using a tick beside their name, rather than bolding their name text.

  - Plugins that have been edited in the current instance have their list entry text bolded.

  - Checkboxes have been added to set whether or not a priority value is "global". The UI also now displays the priority value used in comparisons (ie. with the millions and higher digits omitted).

  - A right-click menu command for clearing all user-added metadata for all plugins has been added to the metadata editor.

- Missing master/requirement and incompatibility errors are downgraded to warnings if the plugin in question is inactive.

- Masterlist update errors have been made more user-friendly.

- If an error is encountered during masterlist update, LOOT will now silently delete the repository folder and attempt the update again. If it fails again, it will then report an error.

- Masterlist update now handles repository interaction a lot more like Git itself does, so should be less error-prone.

- Cyclic dependency error messages now detail the full cycle.

- LOOT's report now uses a static HTML file and generates a javascript file that is dynamically loaded to contain the report data. This removes the PugiXML build dependency.

- Debug log message priorities adjusted so that medium verbosity includes more useful data.

- Updated dependencies: libgit2 (v0.21.0), wxWidgets (v3.0.1), libloadorder (latest), libespm (latest).

Removed

- Support for Windows XP.

- Support for loading BOSS masterlists using the API. This was a leftover from when LOOT was BOSSv3 and backwards compatibility was an issue.

- The ability to open reports in an external browser. This was necessitated by the changes to report generation.

- The MSVC 2013 redistributable requirement.

- The "None Specified" language option is no longer available: English is the new default.

Fixed

- The uninstaller not removing the Git repositories used to update the masterlists.

- Miscellaneous crashes due to uncaught exceptions.

- Plugin priorities are now temporarily "inherited" during sorting so that a plugin with a low priority that is made via metadata to load after a plugin with a high priority doesn't cause other plugins with lower priorities to be positioned incorrectly.

- The default language is now correctly set to English.

- Defaults for the online masterlist repository used for Nehrim.

- Endless sorting loop that occurred if some user metadata was disabled.

0.5.0 - 2014-03-31

- Initial release.

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