GNU libtextstyle, version 0.22

Output of styled text
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Table of Contents

1 Introduction

Text is easier to read when it is accompanied with styling information, such as color, font attributes (weight, posture), or underlining, and this styling is customized appropriately for the output device.

GNU libtextstyle provides an easy way to add styling to programs that produce output to a console or terminal emulator window. It does this in a way that allows the end user to customize the styling using the industry standard, namely Cascading Style Sheets (CSS).

1.1 Style definitions

Let's look at the traditional way styling is done for specific programs.

Browsers, when they render HTML, use CSS styling.

The older approach to user-customizable text styling is that the user associates patterns with escape sequences in an environment variable or a command-line argument. This is the approach used, for example, by the GNU '`ls`' program in combination with the '`dircolors`' program. The processing is distributed across several steps:

1. There is default style definition that is hard-coded in the '`dircolors`' program. The user can also define their own definitions in a file such as `~/.dir_colors`. This style definition contains explicit terminal escape sequences; thus, it can only be used with consoles and terminal emulators, and each style definition applies only to a certain class of mostly-compatible terminal emulators.
2. The `dircolors` program, when invoked, translates such a style definition to a sequence of shell statements that sets an environment variable `LS_COLORS`.
3. The shell executes these statements, and thus sets the environment variable `LS_COLORS`.
4. The program looks at the environment variable and emits the listed escape sequences.

In contrast, this library implements styling as follows:

1. There is a default style definition in a CSS file that is part of the same package as the stylable program. The user can also define their own definitions in a CSS file, and set an environment environment variable to point to it.
2. The program looks at the environment variable, parses the CSS file, translates the styling specifications to the form that is appropriate for the output device (escape sequences for terminal emulators, inline CSS and `<span>` elements for HTML output), and emits it.

Thus, with GNU libtextstyle, the styling has the following properties:

- It is easier for the user to define their own styling, because the file format is standardized and supported by numerous syntax aware editors.
- A styling file does not depend on the particular output device. An HTML output and a black-on-white terminal emulator can use the same styling file. A white-on-black (or even green-on-black) terminal emulator will need different styling, though.
- It is simpler: There is no need for a program that converts the style specification from one format to another.

1.2 Built-in versus separate styling

There are generally two approaches for adding styling to text:

- The program that generates the text adds the styling. It does so through interleaved statements that turn on or off specific attributes.
- The styling gets added by a separate program, that postprocesses the output. This separate program usually uses regular expressions to determine which text regions to style with a certain set of text attributes.

The first approach produces a styling that is 100% correct, regardless of the complexity of the text that is being output. This is the preferred approach for example for JSON, XML, or programming language text.

The second approach works well if the output has a simple, easy-to-parse format. It may produce wrong styling in some cases when the text format is more complex. This approach is often used for viewing log files.

GNU libtextstyle supports both approaches; it includes an example program for each of the two approaches.

2 The end user's perspective

Styled output can viewed fine in a console or terminal emulator window.

The stylable program will typically have the following options:

`--color` Use colors and other text attributes always.

`--color=`*`when`*
: Use colors and other text attributes if *when*. *when* may be `always`, `never`, `auto`, or `html`.

`--style=`*`style-file`*
: Specify the CSS style rule file for `--color`.

For more details, see the sections Section 2.5 [The –color option], page 5 and Section 2.6 [The –style option], page 5 below.

If the output does not fit on a screen, you can use '`less -R`' to scroll around in the styled output. For example:

```
program --color arguments | less -R
```

2.1 The environment variable `TERM`

The environment variable `TERM` contains a identifier for the text window's capabilities. You can get a detailed list of these cababilities by using the '`infocmp`' command (for example: `infocmp -L1 xterm`), using '`man 5 terminfo`' as a reference.

When producing text with embedded color directives, a `libtextstyle`-enabled program looks at the `TERM` variable. Text windows today typically support at least 8 colors. Often, however, the text window supports 16 or more colors, even though the `TERM` variable is set to a identifier denoting only 8 supported colors. It can be worth setting the `TERM` variable to a different value in these cases.

After setting `TERM`, you can verify how well it works by invoking '*`program`* `--color=test`', where *`program`* is any `libtextstyle`-enabled program, and seeing whether the output looks like a reasonable color map.

2.1.1 Terminal emulator programs

The following terminal emulator programs support 256 colors and set `TERM=xterm-256color` accordingly:

- In GNOME: `gnome-terminal`, `tilda`.
- `rxvt-unicode` (sets `TERM=rxvt-unicode-256color`).
- `st` (sets `TERM=st-256color`).
- `QTerminal`.
- On macOS: `Terminal`, `iTerm2`.

The following terminal emulator programs support 256 colors. You only need to set `TERM=xterm-256color` or similar; the programs by default set `TERM` to a value that supports only 8 colors.

- `xterm` is in many cases built with support for 256 colors. But it sets `TERM=xterm`. You need to set `TERM=xterm-256color`.

- In GNOME: `guake` (sets `TERM=xterm`). You need to set `TERM=xterm-256color`.
- In KDE: `konsole` (sets `TERM=xterm`). You need to set `TERM=xterm-256color` or `TERM=konsole-256color`.
- In KDE: `yakuake` (sets `TERM=xterm`). You need to set `TERM=xterm-256color`.
- In Enlightenment: `Eterm` (sets `TERM=Eterm`). You need to set `TERM=Eterm-256color`.
- `mlterm` (sets `TERM=mlterm`). You need to set `TERM=mlterm-256color`.
- On Windows: `PuTTY` (sets `TERM=xterm`). You need to set `TERM=xterm-256color` or `TERM=putty-256color`.
- On Windows: `TeraTerm` (sets `TERM=xterm`). You need to set `TERM=xterm-256color`.

A couple of terminal emulator programs support even the entire RGB color space (16 million colors). To get this to work, at this date (2019), you need three things:

- The `ncurses` library version 6.1 or newer must be installed.
- You need a recent version of the respective terminal emulator program. See `https://gist.github.com/XVilka/8346728` for the most recent developments in this area.
- You need to set the `TERM` environment variable to the corresponding value: `TERM=xterm-direct` instead of `TERM=xterm` or `TERM=xterm-256color`, `TERM=konsole-direct` in `konsole`, `TERM=st-direct` in `st`, `TERM=mlterm-direct` in `mlterm`, or `TERM=iterm2-direct` in `iTerm2` on macOS.

2.1.2 Consoles

On OpenBSD 6 consoles, `TERM=xterm` produces better results than the default `TERM=vt220`.

On NetBSD 8 consoles, `TERM=netbsd6` produces better results than the default `TERM=vt100`.

On Windows consoles, no `TERM` setting is needed.

2.2 The environment variable `NO_COLOR`

The environment variable `NO_COLOR` can be used to suppress styling in the textual output. When this environment variable is set (to any value), `libtextstyle`-enabled programs will not emit colors and other text styling.

This environment variable can be overridden by passing the command-line option '`--color=always`' (see Section 2.5 [The –color option], page 5).

2.3 The environment variable `NO_TERM_HYPERLINKS`

The environment variable `NO_TERM_HYPERLINKS` can be used to suppress hyperlinks in the textual output. When this environment variable is set (to any value), `libtextstyle`-enabled programs will not emit hyperlinks. This may be useful for terminal emulators which produce garbage output when they receive the escape sequence for a hyperlink. Currently (as of 2019), this affects some versions of `konsole`, `emacs`, `lxterminal`, `guake`, `yakuake`, `rxvt`.

2.4 Emacs as a terminal emulator

Emacs has several terminal emulators: `M-x shell` and `M-x term`. `M-x term` has good support for styling, whereas in `M-x shell` most of the styling gets lost.

2.5 The `--color` option

The '`--color=`*when*' option specifies under which conditions styled (colorized) output should be generated. The *when* part can be one of the following:

`always`
`yes` The output will be colorized.

`never`
`no` The output will not be colorized.

`auto`
`tty` The output will be colorized if the output device is a tty, i.e. when the output goes directly to a text screen or terminal emulator window.

`html` The output will be colorized and be in HTML format. This value is only supported by some programs.

`test` This is a special value, understood only by some programs. It is explained in the section (Section 2.1 [The TERM variable], page 3) above.

'`--color`' is equivalent to '`--color=yes`'. The default is '`--color=auto`'.

Thus, a command that invokes a `libtextstyle`-enabled program will produce colorized output when called by itself in a command window. Whereas in a pipe, such as '*`program arguments`* `| less -R`', it will not produce colorized output. To get colorized output in this situation nevertheless, use the command '*`program`* `--color` *`arguments`* `| less -R`'.

The '`--color=html`' option will produce output that can be viewed in a browser. This can be useful, for example, for Indic languages, because the renderic of Indic scripts in browsers is usually better than in terminal emulators.

Note that the output produced with the `--color` option is *not* consumable by programs that expect the raw text. It contains additional terminal-specific escape sequences or HTML tags. For example, an XML parser will give a syntax error when confronted with a colored XML output. Except for the '`--color=html`' case, you therefore normally don't need to save output produced with the `--color` option in a file.

2.6 The `--style` option

The '`--style=`*`style_file`*' option specifies the style file to use when colorizing. It has an effect only when the `--color` option is effective.

If the `--style` option is not specified, the program may consider the value of an environment variable. It is meant to point to the user's preferred style for such output. The name of such an environment variable, if supported, is documented in the documentation of the `libtextstyle`-enabled program.

You can also design your own styles. This is described in the next section.

2.6.1 Creating your own style files

The same style file can be used for styling a certain type of output, for terminal output and for HTML output. It is written in CSS (Cascading Style Sheet) syntax. See `https://www.w3.org/TR/css2/cover.html` for a formal definition of CSS. Many HTML authoring tutorials also contain explanations of CSS.

In the case of HTML output, the style file is embedded in the HTML output. In the case of text output, the style file is interpreted by the `libtextstyle`-enabled program.

You should avoid `@import` statements, because

- In the case of HTML output, the files referenced by the `@import` statements would not be embedded in the HTML output. In fact, relative file names would be interpreted relative to the resulting HTML file.
- In the case of text output, `@import`s are not supported, due to a limitation in `libcroco`.

CSS rules are built up from selectors and declarations. The declarations specify graphical properties; the selectors specify when they apply.

GNU libtextstyle supports simple selectors based on "CSS classes", see the CSS2 spec, section 5.8.3. The set of CSS classes that are supported by a `libtextstyle`-enabled program are documented in the documentation of that program.

These selectors can be combined to hierarchical selectors. For example, assume a program supports the CSS classes `string` (that matches a string) and `non-ascii` (that matches a word with non-ASCII characters), you could write

```
.string .non-ascii { color: red; }
```

to highlight only the non-ASCII words inside strings.

In text mode, pseudo-classes (CSS2 spec, section 5.11) and pseudo-elements (CSS2 spec, section 5.12) are not supported.

The declarations in HTML mode are not limited; any graphical attribute supported by the browsers can be used.

The declarations in text mode are limited to the following properties. Other properties will be silently ignored.

`color` (CSS2 spec, section 14.1)
`background-color` (CSS2 spec, section 14.2.1)
: These properties are supported. Colors will be adjusted to match the terminal's capabilities. Note that many terminals support only 8 colors.

`font-weight` (CSS2 spec, section 15.2.3)
: This property is supported, but most terminals can only render two different weights: `normal` and `bold`. Values >= 600 are rendered as `bold`.

`font-style` (CSS2 spec, section 15.2.3)
: This property is supported. The values `italic` and `oblique` are rendered the same way.

`text-decoration` (CSS2 spec, section 16.3.1)
: This property is supported, limited to the values `none` and `underline`.

2.6.2 Debugging style files

If you want to understand why the style rules in a style file produce the output that you see, you can do so in three steps:

1. Run the program with the command-line option `--color=html`, redirecting the output to a file.
2. Open the resulting HTML file in a browser.
3. Use the browser's built-in CSS debugging tool.
   - In Firefox: From the pop-up menu, select "Inspect Element". Click somewhere in the DOM tree ("Inspector" tab) and look at the CSS declarations in the "Rules" tab.
   - In Chromium: From the pop-up menu, select "Inspect". Click somewhere in the DOM tree ("Elements" tab) and look at the CSS declarations in the "Styles" tab.

This technique allows you, in particular, to see which CSS declarations override which other CSS declarations from other CSS rules.

3 The programmer's perspective

As a programmer, enabling styling consists of the following tasks:

1. Define the command-line options and environment variable that the user can use to control the styling.
2. Define the CSS classes that the user can use in the CSS file. Each CSS class corresponds to a text role; each CSS class can be given a different styling by the user.
3. Change the output routines so that they take an '`ostream_t`' object as argument instead of a '`FILE *`'.
4. Insert paired invocations to `styled_ostream_begin_css_class`, `styled_ostream_end_css_class` around each run of text with a specific text role.
5. Link with `libtextstyle`. If your package is using GNU autoconf, you can use the `libtextstyle.m4` macro from Gnulib.
6. Prepare a default style file.
7. Update the documentation of your package.

The following sections go into more detail.

3.1 Basic use of libtextstyle

Source code that makes use of GNU libtextstyle needs an include statement:

```
#include <textstyle.h>
```

Basic use of GNU libtextstyle consists of statements like these:

```
styled_ostream_t stream =
  styled_ostream_create (STDOUT_FILENO, "(stdout)", TTYCTL_AUTO,
                         style_file_name);
...
styled_ostream_begin_use_class (stream, css_class);
...
ostream_write_str (stream, string);
...
styled_ostream_end_use_class (stream, css_class);
...
styled_ostream_free (stream);
```

Before this snippet, your code needs to determine the name of the style file to use (`style_file_name`). If no styling is desired – the precise condition depends on the value of `color_mode` but also on your application logic –, you should set `style_file_name` to `NULL`.

An object of type `styled_ostream_t` is allocated. The function `styled_ostream_create` allocates it; the function `styled_ostream_free` deallocates it.

Such `styled_ostream_t` supports output operations (`ostream_write_str`), interleaved with adding and removing CSS classes. The CSS class in effect when an output operation is performed determines, through the style file, the text attributes associated with that piece of text.

3.1.1 Hyperlinks

Text output may contain hyperlinks. These hyperlinks are encoded through an escape sequence, specified at Hyperlinks in terminal emulators (`https://gist.github.com/`

egmontkob/eb114294efbcd5adb1944c9f3cb5feda). Currently (as of 2019), they are displayed only in `gnome-terminal` version 3.26 or above. More terminal emulators will support hyperlinks in the future. Terminal emulators which don't support hyperlinks ignore it, except for a few terminal emulators, for which users may need to disable the hyperlinks (see Section 2.3 [The NO_TERM_HYPERLINKS variable], page 4) if the heuristic built into `libtextstyle` does not already disable them.

To emit a hyperlink, use code like this:

```
styled_ostream_t stream = ...
...
/* Start a hyperlink.  */
styled_ostream_set_hyperlink (stream, url, NULL);
...
/* Emit the anchor text.  This can be styled text.  */
ostream_write_str (stream, "Click here!");
...
/* End the current hyperlink.  */
styled_ostream_set_hyperlink (stream, NULL, NULL);
```

The anchor text can be styled. But the hyperlinks themselves cannot be styled; they behave as implemented by the terminal emulator.

3.2 Include files

The include file `<textstyle.h>` declares all facilities defined by the library.

3.3 Link options

The library to link with is called `libtextstyle`, with a system-dependent suffix. You link with it though link options of the form `-ltextstyle` for a library installed in system locations, or `-L`*`libdir`* `-ltextstyle` for a static library installed in other locations, or `-L`*`libdir`* `-ltextstyle -Wl,-rpath,`*`libdir`* for a shared library installed in other locations (assuming a GCC compatible compiler and linker and no `libtool`), or `-L`*`libdir`* `-ltextstyle -R`*`libdir`* for a shared library installed in other locations (with `libtool`). Additionally, the link options may need to include the dependencies: `-lm`, and `-lncurses` or (on NetBSD) `-ltermcap` or (on AIX) `-lxcurses` or (on HP-UX) `-lcurses`, and on some systems also `-liconv`.

It is a bit complicated to determine the right link options in a portable way. Therefore an Autoconf macro is provided in the file `libtextstyle.m4` in Gnulib, that makes this task easier. Assuming the build system of your package is based on GNU Autoconf, you invoke it through `gl_LIBTEXTSTYLE`. It searches for an installed `libtextstyle`. If found, it sets and AC_SUBSTs `HAVE_LIBTEXTSTYLE=yes` and the `LIBTEXTSTYLE` and `LTLIBTEXTSTYLE` variables, and augments the `CPPFLAGS` variable, and #defines `HAVE_LIBTEXTSTYLE` to 1. Otherwise, it sets and AC_SUBSTs `HAVE_LIBTEXTSTYLE=no` and `LIBTEXTSTYLE` and `LTLIBTEXTSTYLE` to empty. In link commands that use `libtool`, use `LTLIBTEXTSTYLE`; in link commands that don't use `libtool`, use `LIBTEXTSTYLE`.

If you use GNU Automake, the proper place to use the link options is *`program`*`_LDADD` for programs and *`library`*`_LIBADD` for libraries.

3.4 Command-line options

While you are free to provide any command-line option to enable the styling of the output, it is good if different GNU programs use the same command-line options for this purpose. These options are described in the sections Section 2.5 [The –color option], page 5 and Section 2.6 [The –style option], page 5. To achieve this, use the following API (declared in `<textstyle.h>`):

`bool color_test_mode` [Variable]
: True if a `--color` option with value `test` has been seen.

`enum color_option color_mode` [Variable]
: Stores the value of the `--color` option.

`const char * style_file_name` [Variable]
: Stores the value of the `--style` option.

Note: These variables, like any variables exported from shared libraries, can only be used in executable code. You *cannot* portably use their address in initializers of global or static variables. This is a restriction that is imposed by the Windows, Cygwin, and Android platforms.

`bool handle_color_option` (*const char *option*) [Function]
: You invoke this function when, during argument parsing, you have encountered a `--color` or `--color=...` option. The return value is an error indicator: `true` means an invalid option.

`void handle_style_option` (*const char *option*) [Function]
: You invoke this function when, during argument parsing, you have encountered a `--style` or `--style=...` option.

`void print_color_test` (*void*) [Function]
: Prints a color test page. You invoke this function after argument parsing, when the `color_test_mode` variable is true.

`void style_file_prepare` (*const char *style_file_envvar*, const char *stylesdir_envvar*, const char *stylesdir_after_install*, const char *default_style_file*) [Function]
: Assigns a default value to `style_file_name` if necessary. You invoke this function after argument parsing, when `color_test_mode` is false.

  style_file_envvar is an environment variable that, when set to a non-empty value, specifies the style file to use. This environment variable is meant to be set by the user.

  stylesdir_envvar is an environment variable that, when set to a non-empty value, specifies the directory with the style files, or `NULL`. This is necessary for running the testsuite before '`make install`'.

  stylesdir_after_install is the directory with the style files after '`make install`'.

  default_style_file is the file name of the default style file, relative to *stylesdir*.

3.5 The output stream hierarchy

There are various classes of output streams, some of them with styling support. These "classes" are defined in an object-oriented programming style that resembles C++ or Java, but are actually implemented in C with a little bit of object orientation syntax. These definitions are preprocessed down to C. As a consequence, GNU libtextstyle is a C library and does not need to link with the C++ standard library.

All these classes are declared in `<textstyle.h>`.

The base output stream type is '`ostream_t`'. It is a pointer type to a (hidden) implementation type. Similarly for the subclasses.

When we say that '`some_ostream_t`' is a subclass of '`ostream_t`', what we mean is:

- Every '`some_ostream_t`' object can be converted to an '`ostream_t`', by virtue of a simple assignment. No cast is needed.
- The opposite conversion, from '`ostream_t`' to '`some_ostream_t`', can also be performed, provided that the object is actually an instance of '`some_ostream_t`'. You can test whether an object is an instance of '`some_ostream_t`' by invoking the method '`bool is_instance_of_some_ostream (ostream_t stream)`'.
- Every method '`ostream_`*`foobar`*' exists also as a method '`some_ostream_`*`foobar`*' with compatible argument types and a compatible return type.

3.5.1 The abstract `ostream` class

The base output stream type is '`ostream_t`'.

It has the following methods:

`void ostream_write_mem (`*ostream_t* ***stream***, *const void* ***data***, *size_t* ***len***`)` [Function]
Writes a sequence of bytes to a stream.

`void ostream_write_str (`*ostream_t* ***stream***, *const char* ****string***`)` [Function]
Writes a string's contents to a stream.

`ptrdiff_t ostream_printf (`*ostream_t* ***stream***, *const char* ****format***, ...`)` [Function]
`ptrdiff_t ostream_vprintf (`*ostream_t* ***stream***, *const char* ****format***, *va_list args*`)` [Function]
Writes formatted output to a stream.

These functions return the size of formatted output, or a negative value in case of an error.

`void ostream_flush (`*ostream_t* ***stream***, *ostream_flush_scope_t* ***scope***`)` [Function]
Brings buffered data to its destination.

`void ostream_free (`*ostream_t* ***stream***`)` [Function]
Closes and frees a stream.

3.5.2 The abstract `styled_ostream` class

The type for a styled output stream is '`styled_ostream_t`'. It is a subclass of '`ostream_t`' that adds the following methods:

`void styled_ostream_begin_use_class` (*styled_ostream_t* ***stream***, *const char* ****classname***) [Function]

Starts a run of text belonging to ***classname***. The ***classname*** is the name of a CSS class. It can be chosen arbitrarily and customized through the CSS file.

`void styled_ostream_end_use_class` (*styled_ostream_t* ***stream***, *const char* ****classname***) [Function]

Ends a run of text belonging to ***classname***. The `styled_ostream_begin_use_class` / `styled_ostream_end_use_class` calls must match properly.

`const char * styled_ostream_get_hyperlink_ref` (*styled_ostream_t* ***stream***) [Function]

Returns the referred URL of the currently set hyperlink, or `NULL` if no hyperlink attribute is currently set.

Note: The returned string is only valid up to the next invocation of `styled_ostream_set_hyperlink`.

`const char * styled_ostream_get_hyperlink_id` (*styled_ostream_t* ***stream***) [Function]

Returns the id of the currently set hyperlink, or `NULL` if no hyperlink attribute is currently set.

Note: The returned string is only valid up to the next invocation of `styled_ostream_set_hyperlink`.

`void styled_ostream_set_hyperlink` (*styled_ostream_t* ***stream***, *const char* ****ref***, *const char* ****id***) [Function]

Sets or removes a hyperlink attribute.

To set a hyperlink attribute, pass a non-`NULL` *ref*. *ref* is an URL; it should be at most 2083 bytes long. Non-ASCII characters should be URI-escaped (using the %nn syntax). *id* is an optional identifier. On terminal output, multiple hyperlinks with the same *id* will be highlighted together. If specified, *id* should be at most 250 bytes long.

To remove a hyperlink attribute, pass `NULL` for *ref* and *id*.

Hyperlinks don't nest. That is, a hyperlink attribute is enabled only up to the next invocation of `styled_ostream_set_hyperlink`.

`void styled_ostream_flush_to_current_style` (*styled_ostream_t* ***stream***) [Function]

This function acts like `ostream_flush (stream, FLUSH_THIS_STREAM)`, except that it leaves the destination with the current text style enabled, instead of with the default text style.

After calling this function, you can output strings without newlines(!) to the underlying stream, and they will be rendered like strings passed to `ostream_write_mem`, `ostream_write_str`, or `ostream_printf`.

3.5.3 Concrete ostream subclasses without styling

3.5.3.1 The `file_ostream` class

The `file_ostream` class supports output to an `<stdio.h>` `FILE` stream. Its type is '`file_ostream_t`'. It is a subclass of '`ostream_t`' that adds no methods.

It can be instantiated through this function:

`file_ostream_t file_ostream_create` (*FILE *fp*) [Function]

Creates an output stream referring to *fp*.

Note: The resulting stream must be closed before *fp* can be closed.

3.5.3.2 The `fd_ostream` class

The `file_ostream` class supports output to a file descriptor. Its type is '`fd_ostream_t`'. It is a subclass of '`ostream_t`' that adds no methods.

It can be instantiated through this function:

`fd_ostream_t fd_ostream_create` (*int fd, const char *filename, bool buffered*) [Function]

Creates an output stream referring to the file descriptor *fd*.

filename is used only for error messages.

Note: The resulting stream must be closed before *fd* can be closed.

3.5.3.3 The `term_ostream` class

The `term_ostream` class supports output to a file descriptor that is connected to a terminal emulator or console. Its type is '`term_ostream_t`'. It is a subclass of '`ostream_t`'.

It can be instantiated through this function:

`term_ostream_t term_ostream_create` (*int fd, const char *filename, ttyctl_t tty_control*) [Function]

Creates an output stream referring to the file descriptor *fd*.

filename is used only for error messages.

tty_control specifies the amount of control to take over the underlying tty.

The resulting stream will be line-buffered.

Note: The resulting stream must be closed before *fd* can be closed.

The class adds the following methods:

`term_color_t term_ostream_rgb_to_color` (*term_ostream_t stream, int red, int green, int blue*) [Function]

Converts an RGB value (*red*, *green*, *blue* in [0..255]) to a color, valid for this stream only.

`term_color_t term_ostream_get_color` (*term_ostream_t stream*) [Function]

`void term_ostream_set_color` (*term_ostream_t stream, term_color_t color*) [Function]

Gets/sets the text color.

`term_color_t term_ostream_get_bgcolor` (*term_ostream_t* ***stream***) [Function]
`void term_ostream_set_bgcolor` (*term_ostream_t* ***stream***, [Function]
term_color_t ***color***)
Gets/sets the background color.

`term_weight_t term_ostream_get_weight` (*term_ostream_t* ***stream***) [Function]
`void term_ostream_set_weight` (*term_ostream_t* ***stream***, [Function]
term_weight_t ***weight***)
Gets/sets the font weight.

`term_posture_t term_ostream_get_posture` [Function]
(*term_ostream_t* ***stream***)
`void term_ostream_set_posture` (*term_ostream_t* ***stream***, [Function]
term_posture_t ***posture***)
Gets/sets the font posture.

`term_underline_t term_ostream_get_underline` [Function]
(*term_ostream_t* ***stream***)
`void term_ostream_set_underline` (*term_ostream_t* ***stream***, [Function]
term_underline_t ***underline***)
Gets/sets the text underline decoration.

`const char * term_ostream_get_hyperlink_ref` [Function]
(*term_ostream_t* ***stream***)
Returns the referred URL of the currently set hyperlink, or `NULL` if no hyperlink attribute is currently set.

Note: The returned string is only valid up to the next invocation of `term_ostream_set_hyperlink`.

`const char * term_ostream_get_hyperlink_id` [Function]
(*term_ostream_t* ***stream***)
Returns the id of the currently set hyperlink, or `NULL` if no hyperlink attribute is currently set.

Note: The returned string is only valid up to the next invocation of `term_ostream_set_hyperlink`.

`void term_ostream_set_hyperlink` (*term_ostream_t* ***stream***, [Function]
const char ****ref***, *const char* ****id***)
Sets or removes a hyperlink attribute.

To set a hyperlink attribute, pass a non-`NULL` *ref*. *ref* is an URL; it should be at most 2083 bytes long. Non-ASCII characters should be URI-escaped (using the %nn syntax). *id* is an optional identifier. Multiple hyperlinks with the same *id* will be highlighted together. If specified, *id* should be at most 250 bytes long.

To remove a hyperlink attribute, pass `NULL` for *ref* and *id*.

Hyperlinks don't nest. That is, a hyperlink attribute is enabled only up to the next invocation of `styled_ostream_set_hyperlink`.

`void term_ostream_flush_to_current_style` [Function]
(*term_ostream_t* ***stream***)

This function acts like `ostream_flush (stream, FLUSH_THIS_STREAM)`, except that it leaves the terminal with the current text attributes enabled, instead of with the default text attributes.

After calling this function, you can output strings without newlines(!) to the underlying file descriptor, and they will be rendered like strings passed to `ostream_write_mem`, `ostream_write_str`, or `ostream_printf`.

3.5.3.4 The `html_ostream` class

The `html_ostream` class supports output to any destination, in HTML syntax. Its type is '`html_ostream_t`'. It is a subclass of '`ostream_t`'.

It can be instantiated through this function:

`html_ostream_t html_ostream_create` (*ostream_t* ***destination***) [Function]

Creates an output stream that takes input in the UTF-8 encoding and writes it in HTML form on ***destination***.

This stream produces a sequence of lines. The caller is responsible for opening the `<body><html>` elements before and for closing them after the use of this stream.

Note: The resulting stream must be closed before ***destination*** can be closed.

The class adds the following methods:

`void html_ostream_begin_span` (*html_ostream_t* ***stream***, [Function]
const char ****classname***)

Starts a `<span class="`***classname***`">` element. The ***classname*** is the name of a CSS class. It can be chosen arbitrarily and customized through the CSS file.

`void html_ostream_end_span` (*html_ostream_t* ***stream***, [Function]
const char ****classname***)

Ends a `<span class="`***classname***`">` element.

The `html_ostream_begin_span` / `html_ostream_end_span` calls must match properly.

`const char * html_ostream_get_hyperlink_ref` [Function]
(*html_ostream_t* ***stream***)

Returns the referred URL of the currently set hyperlink, or `NULL` if no hyperlink attribute is currently set.

Note: The returned string is only valid up to the next invocation of `html_ostream_set_hyperlink_ref`.

`void html_ostream_set_hyperlink_ref` (*html_ostream_t* ***stream***, [Function]
const char ****ref***)

Sets or removes a hyperlink attribute.

To set a hyperlink attribute, pass a non-`NULL` *ref*. *ref* is an URL; it should be at most 2083 bytes long. Non-ASCII characters should be URI-escaped (using the %nn syntax).

To remove a hyperlink attribute, pass `NULL` for *ref*.

Hyperlinks don't nest. That is, a hyperlink attribute is enabled only up to the next invocation of `html_ostream_set_hyperlink_ref`.

`void html_ostream_flush_to_current_style` [Function]
(*html_ostream_t* ***stream***)
This function acts like `ostream_flush (`***stream***`, FLUSH_THIS_STREAM)`, except that it leaves the destination with the current text style enabled, instead of with the default text style.

After calling this function, you can output strings without newlines(!) to the underlying stream, and they will be rendered like strings passed to `ostream_write_mem`, `ostream_write_str`, or `ostream_printf`.

3.5.3.5 The `memory_ostream` class

The `memory_ostream` class supports output to an in-memory buffer. Its type is '`memory_ostream_t`'. It is a subclass of '`ostream_t`'.

It can be instantiated through this function:

`memory_ostream_t memory_ostream_create` (*void*) [Function]
Creates an output stream that accumulates the output in a memory buffer.

The class adds the following method:

`void memory_ostream_contents` (*memory_ostream_t* ***stream***, [Function]
const void ****bufp***, *size_t* ****buflenp***)
Returns a pointer to the output accumulated so far and its size. It stores them in ****bufp*** and ****buflenp***, respectively.

Note: These two return values become invalid when more output is done to the stream or when the stream is freed.

3.5.3.6 The `iconv_ostream` class

The `iconv_ostream` class supports output to any destination. Its type is '`iconv_ostream_t`'. It is a subclass of '`ostream_t`' that adds no methods.

It can be instantiated through this function:

`iconv_ostream_t iconv_ostream_create` [Function]
(*const char* ****from_encoding***, *const char* ****to_encoding***,
ostream_t ***destination***)
Creates an output stream that converts from ***from_encoding*** to ***to_encoding***, writing the result to ***destination***.

Note: The resulting stream must be closed before ***destination*** can be closed.

3.5.4 Concrete `styled_ostream` subclasses

3.5.4.1 The `term_styled_ostream` class

The `term_styled_ostream` class supports styled output to a file descriptor that is connected to a terminal emulator or console. Its type is '`term_styled_ostream_t`'. It is a subclass of '`styled_ostream_t`'.

It can be instantiated through this function:

`term_styled_ostream_t term_styled_ostream_create` (*int* ***fd***, *const char **`filename`, *ttyctl_t* `tty_control`, *const char **`css_filename`) [Function]

Creates an output stream referring to the file descriptor ***fd***, styled with the file ***css_filename***.

filename is used only for error messages.

tty_control specifies the amount of control to take over the underlying tty.

Note: The resulting stream must be closed before ***fd*** can be closed.

Returns `NULL` upon failure.

The following is a variant of this function. Upon failure, it does not return `NULL`; instead, it returns a styled `fd_stream` on which the styling operations exist but are no-ops.

`styled_ostream_t styled_ostream_create` (*int* ***fd***, *const char **`filename`, *ttyctl_t* `tty_control`, *const char **`css_filename`) [Function]

Creates an output stream referring to the file descriptor ***fd***, styled with the file ***css_filename*** if possible.

filename is used only for error messages.

tty_control specifies the amount of control to take over the underlying tty.

Note: The resulting stream must be closed before ***fd*** can be closed.

3.5.4.2 The `html_styled_ostream` class

The `html_styled_ostream` class supports styled output to any destination, in HTML syntax. Its type is '`html_styled_ostream_t`'. It is a subclass of '`styled_ostream_t`'.

It can be instantiated through this function:

`html_styled_ostream_t html_styled_ostream_create` (*ostream_t* ***destination***, *const char **`css_filename`) [Function]

Creates an output stream that takes input in the UTF-8 encoding and writes it in HTML form on ***destination***, styled with the file ***css_filename***.

Note: The resulting stream must be closed before ***destination*** can be closed.

3.5.4.3 The `noop_styled_ostream` class

The `noop_styled_ostream` class supports the styled output operations to any destination. The text is output to the given destination; the styling operations, however, do nothing. Its type is '`noop_styled_ostream_t`'. It is a subclass of '`styled_ostream_t`'.

It can be instantiated through this function:

`noop_styled_ostream_t noop_styled_ostream_create` [Function]
(*ostream_t* ***destination***, *bool* ***pass_ownership***)

Creates an output stream that delegates to ***destination*** and that supports the styling operations as no-ops.

If ***pass_ownership*** is `true`, closing the resulting stream will automatically close the ***destination***.

Note: If ***pass_ownership*** is `false`, the resulting stream must be closed before ***destination*** can be closed.

3.5.5 Accessor functions

The various concrete stream classes have methods that allow you to retrieve the arguments passed to the respective constructor function.

Note: While these methods allow you to retrieve the underlying destination stream of various kinds of stream, it is not recommended to operate on both the stream and its underlying destination stream at the same time. Doing so can lead to undesired interactions between the two streams.

The `file_ostream` class has this accessor method:

`FILE * file_ostream_get_stdio_stream` (*file_ostream_t* ***stream***) [Function]

The `fd_ostream` class has these accessor methods:

`int fd_ostream_get_descriptor` (*fd_ostream_t* ***stream***) [Function]

`const char * fd_ostream_get_filename` (*fd_ostream_t* ***stream***) [Function]

`bool fd_ostream_is_buffered` (*fd_ostream_t* ***stream***) [Function]

The `term_ostream` class has these accessor methods:

`int term_ostream_get_descriptor` (*term_ostream_t* ***stream***) [Function]

`const char * term_ostream_get_filename` [Function]
(*term_ostream_t* ***stream***)

`ttyctl_t term_ostream_get_tty_control` (*term_ostream_t* ***stream***) [Function]

`ttyctl_t term_ostream_get_effective_tty_control` [Function]
(*term_ostream_t* ***stream***)

Returns the effective tty control of the stream (not `TTYCTL_AUTO`).

The `iconv_ostream` class has these accessor methods:

`const char * iconv_ostream_get_from_encoding` [Function]
(*iconv_ostream_t* ***stream***)

`const char * iconv_ostream_get_to_encoding` [Function]
(*iconv_ostream_t* ***stream***)

`ostream_t iconv_ostream_get_destination` [Function]
(*iconv_ostream_t* ***stream***)

The `html_ostream` class has this accessor method:

`ostream_t html_ostream_get_destination` [Function]
(*html_ostream_t* ***stream***)

The `term_styled_ostream` class has these accessor methods:

`term_ostream_t term_styled_ostream_get_destination` [Function]
(*term_styled_ostream_t* ***stream***)

`const char * term_styled_ostream_get_css_filename` [Function]
(*term_styled_ostream_t* ***stream***)

The `html_styled_ostream` class has these accessor methods:

`ostream_t html_styled_ostream_get_destination` [Function]
(*html_styled_ostream_t* ***stream***)

`html_ostream_t html_styled_ostream_get_html_destination` [Function]
(*html_styled_ostream_t* ***stream***)

`const char * html_styled_ostream_get_css_filename` [Function]
(*html_styled_ostream_t* ***stream***)

The `noop_styled_ostream` class has these accessor methods:

`ostream_t noop_styled_ostream_get_destination` [Function]
(*noop_styled_ostream_t* ***stream***)

`bool noop_styled_ostream_is_owning_destination` [Function]
(*noop_styled_ostream_t* ***stream***)

3.6 Debugging the text styling support

If you want to understand which output of your program is associated with which CSS classes, the simplest way is as follows:

1. Run the program with the command-line option `--color=html`, redirecting the output to a file.
2. Then inspect this output. Text regions associated with a CSS class are surrounded by `<span class="`*`css-class`*`">...</span>`.

3.7 Documenting the text styling support

To make the text styling support available to the end user of your package, the following need to be documented:

- The command-line options. This typically needs to be done in several places: in the '`--help`' output, in the `man` pages (if present), and in the documentation.
- Which programs support '`--color=test`'?
- The list of CSS classes and their meaning. This is necessary, so that the user can create their own style file; the CSS classes are part of the selectors in the CSS rules.
- The location of the default style file. This is a convenience, so that the user, when creating their own style file, can start from the default one.
- The environment variable, called ***`style_file_envvar`*** above, that, when set to a non-empty value, specifies the style file to use.

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Version 3, 29 June 2007

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Function Index

F

H

I

M

N

O

P

S

T

Variable Index

C

N

S

T

General Index