Sequencer64 Developer/Tester's Reference Manual

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Contents

Chapter 1

Sequencer64

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1.1 Introduction

Sequencer64 is a major cleanup, refactoring, and documentation of the Seq24 live-play MIDI sequencer.

The current document describes the functions, classes, modules, and other entities used in this project.

For now, please read the ROADMAP and README files to understand the genesis of this project.

Also, we have pretty deeply documented *Seq24* and *Sequencer64* with PDF files that can be generated by git-cloning the following projects, installing a number of tools related to PDF and LaTeX, and running "make":

- https://github.com/ahlstromcj/sequencer24-doc.git

In the present document, we've left out a fair amount of side-code to cut down on the size of the document. For example, the main module, redundant Windows support, utility headers like easy_macros.h, simple stuff like the mutex module, the fruity variants (at least the ones already refactored into their own modules), etc., are all left out.

Chapter 2

User Testing of Sequencer64 with Yoshimi

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2.1 Introduction

This section describes user testing of Sequencer64 using Yoshimi. It will expand as we work our way through all the many use-cases that can be achieved with Sequencer64 and Yoshimi.

2.2 Smoke Test

Every so often we run Sequencer64 with a software synthesizer to make sure we haven't broken any functionality via our major refactoring efforts. We call it a "smoke test". We fire up the two application, and see if anything smokes.

This smoke test sets up Yoshimi with a very simple ALSA setup, and no instruments are loaded. Instead, only the "Simple Sound" is used on all channels. We've been doing this test with Yoshimi 1.3.6. The current Debian Sid ("testing") version of Yoshimi is 1.3.6-2, pulled from SourceForge. It seems to have issues, so we've been cloning and pulling the code from:

```
https://github.com/Yoshimi/yoshimi.git
```

After getting the application build and installed, the next step is to run it, using ALSA for MIDI and for audio:

```
$ yoshimi -a -A &
```

Next, fix up the configuration files for Sequencer64, `~/.config/sequencer64/sequencer64.rc` and `~/.config/sequencer64/sequencer64.usr`.

First hide `sequencer64.usr` somewhere, or delete it, as it will determine what MIDI devices are available, and we don't want that (yet). Second, make sure that `sequencer64.rc` makes the following setting:

```
[manual-alsa-ports]

# Set to 1 if you want seq24 to create its own ALSA ports and
# not connect to other clients

0   # number of manual ALSA ports
```

Next, run the newly-built version of Sequencer64. If desired, use the –bus option described below to force the buss number to the buss you need, as shown in the second version of the command:

```
$ sequencer64/sequencer64 &
$ sequencer64/sequencer64 --bus 5 &
```

In *File / Options / MIDI Clock*, observe the MIDI inputs made available by your system. Our system shows:

```
[0] 14:0 (Midi Through Port-0)
[1] 128:0 (TiMidity port 0)
[2] 128:0 (TiMidity port 1)
[3] 128:0 (TiMidity port 2)
[4] 128:0 (TiMidity port 3)
[5] 129:0 (input)
```

For some reason (a bug in Yoshimi?), input "[5]" doesn't indicate that it is Yoshimi, but it is. Take note of that input number... that is the MIDI buss number that is needed to drive Yoshimi.

Also make sure that of the clock settings for those busses are "Off".

The next instruction still works, but it is easier to simply pass the option `–bus 5` to Sequencer64 when starting it up.

Now open the file `sequencer64/contrib/midi/b4uacuse-GM-format.midi` in Sequencer64. For all of the patterns (slots) that have lots of data in them, right click on the pattern and select *Midi Bus / [5] 129:0 (input)* and the desired channel number. (Doesn't matter much, just use up the lower channel numbers first).

Back in Yoshimi, select each Part corresponding to the channels you selected. Make sure *Enabled* is checked for each desired channel.

Back in Sequencer64, click on each pattern you want to hear, which highlights them in black. Now click the play button (green triangle). The song should play, with each part using the "Simple Sound". Not too bad for a bunch of sine waves, eh?

Now we can test the application more fully. Note that the instructions here are very light. Detailed instructions on the usage of Sequencer64 can be found in the following project, which contains a PDF file and the LaTeX code used to build it:

```
https://github.com/ahlstromcj/sequencer24-doc.git
```

Although it applies to an earlier version of the project, it still mostly holds true for Sequencer64.

2.3 Tests in the Patterns Window

The Patterns window is the inside portion of the main window, supported by the `mainwid` class. it contains a grid of boxes or slots, with each slot potentially containing a pattern, sequence, or track. Empty tracks (i.e. tracks that contain no events, like title-only tracks) are highlighted in yellow.

This window supports only a single variant of mouse-handling.

2.3.1 Button Clicks on a Pattern

A left-click on a pattern slot should cause the following to happen:

1. The pattern will be highlighted (white on a black background). This won't occur until the button is released.
2. During playback, the pattern will emit MIDI events and play its sequence.
3. If the pattern is dragged to another slot, whether playing is in progress or not, releasing the button in the destination slot will move the pattern to that slot.

A right-click on a pattern slot should cause the following to happen:

1. If the pattern is empty, then a pop-up menu to make a New pattern, paste a pattern, or make other selections will appear.
2. If the pattern is active, then a pop-up menu to Edit the pattern or make other selections will appear.
3. A second right-click, just off the menu, will dismiss the menu.

2.3.2 Patterns Window Key Shortcuts

First, note the selection of the File / Options / Keyboard / Show keys option. The tests here should work whether or not it is selected. The only difference is if the keys are shown.

We got a segfault during this test, when we weren't being systematic about it.

2.3.3 The Sequencer64 User File

To be discussed.

2.4 Tests Using Valgrind

Valgrind is a very useful tool for unearthing memory issues and other issues in an application, especially when one has the source code and can build the code with debugging information.

One runs the application from the command line, preceding its command line with valgrind and some of its options.

2.4.1 Valgrind Suppressions

One problem with valgrind is that it also uncovers errors in system libraries that one has no control over. These errors clutter the output, so we suppress them using a valgrind "suppressions" file. Here's how to create one:

```
$ valgrind --gen-suppressions=yes --log-file=val.supp ./Sequencer64/sequencer64
$ valgrind --gen-suppressions=all --log-file=val.supp ./Sequencer64/sequencer64
```

As the program runs, one is asked to print a suppression. If the error is due to a system or third-party library, answer "Y return", and then copy-and-paste the suppression to a file, giving it a name. For example, we provide a file `contrib/seq64.supp` containing suppressions of errors that annoy us. There are way too many "errors" in ALSA, GTK+, gtkmm, glibc, and more.

The second command collects all the suppressions. Passing the val.supp file through sed makes it immediately usable:

```
$ sed -i -e /^==/g val.supp
```

Running valgrind like this then shows mostly the errors we care about:

```
$ valgrind --suppressions=val.supp  ./Sequencer64/sequencer64
```

We've added some other suppression files to the `contrib` directory. Too much! For example:

https://github.com/dtrebbien/GNOME.supp

However, overall this process is very painful, and we're going to eventually do all the valgrind work on the unit-test project for Sequencer64:

https://github.com/ahlstromcj/seq64-tests

2.4.2 Full Valgrind Leak-Checking

Here's how to capture errors, while suppressing the system errors and while generating a log file:

```
$ valgrind --suppressions=contrib/seq64.supp --leak-check=full \
   --track-origins=yes --log-file=valgrind.log --show-leak-kinds=all \
   ./Sequencer64/sequencer64
```

The errors can be also be re-routed to a log-file via the "2> valgrind.log" shell redirection.

Another idea is to precede the valgrind command with the following construct:

```
$ G_SLICE=debug-blocks valgrind ...
```

G_SLICE=debug-blocks will turn off gtk's advanced memory management to allow valgrind to show correct results. This results in an amazing plethora or invalid read and invalid write errors in GNOME-related libraries. Sheesh!

And don't forget about Valgrind's "massif" memory-tracking tool! (More to come!)

2.4.2.1 Leak-Checking Basic Operation

For the first pass, just run Sequencer64, then immediately exit. Then scan the log file to see if any "errors" can be pinpointed to the application and library code.

Don't forget to run the same scenario without valgrind, in a console window, to see if any of our own debug/problem output occurs.

In any case, leakage tagged as "still reachable" isn't as bad as leakage tagged as "definitely lost" or "indirectly lost".

But good luck finding a Sequencer64 bug buried in the chaff of 3rd-party valgrind reports, even with some suppressions enabled. Apparently a lot of them have to do with data structures that are intended to last the full life of the application.

One can make the search a little easier by searching for the "seq64" namespace in the valgrind log.

2.5 Specific Fault Debugging

This section goes through specific debugging cases we encountered. They should be part of the regular testing of Sequencer64.

2.6 Snipping of a MIDI file.

In order to have a test file for the *seq64-tests* project, we loaded up the `b4uacuse-GM-format.midi` file, removed all but four of the tracks, and saved it as `b4uacuse-snipped.midi`. Loading this file into Sequencer64 caused the following:

```
   $ ./Sequencer64/sequencer64
[Reading user configuration /home/ahlstrom/.config/sequencer64/sequencer64.usr]
[Reading rc configuration /home/ahlstrom/.config/sequencer64/sequencer64.rc]
get_sequence(): m_seqs[4] not null
Segmentation fault
```

First step, fire up a debugger and see what happened. We use *cgdb* , a text-based front-end for gdb with a "vi" feel.

```
$ cgdb ./Sequencer64/sequencer64
```

Just hit "r", do *File / Open* , navigate to `b4uacuse-snipped.midi`, select it, and watch what happens.

The "bt" (backtrace) command shows a pretty large stack, 52 items. Page up to the top of the stack, and select frame 1 ("fr 1"). This shows a mutex at a very low address, 0x650! Frame 2 shows we are in the automutex constructor, calling lock() on that same badly-located mutex. Frame 3 is in sequence::event_count(), same bad mutex, and the m_events member is at address 0x0. Obviously, we're dealing with an unallocated sequence.

Frame 4 is in mainwid::draw_sequence_on_pixmap(), just after we've retrieved the next sequence via perform↩ ::get_sequence(4). But that would be the fifth sequence (the sequence numbers start at 0), and we snipped all but 4 from the file before we saved it.

So, one thing we need to do is *check* the value returned by get_sequence() before we try to use it. The other thing to do is figure out how we got to the fifth sequence, and fix that code as well. Using the command "p perf().↩ sequence_count()", we verify that there are indeed only 4 sequences allocated.

Frame 5 is in mainwid::draw_sequences_on_pixmap(). That function tries to load all sequences on the current screen-set, from 0 to 31, without checking to see how many their actually are. Inefficient and dangerous.

Frame 6 is in mainwid::reset(). We could pass perf().sequence_count() here for checking, or get it in mainwid↩ ::draw_sequences_on_pixmap().

Before we fix this issue, we need to load a file that works, to see why it does not fail for most files. We will put a breakpoint at the top mainwid::draw_sequences_on_pixmap().

We hit the breakpoint before even loading a file, with a sequence_count() of 0. The call to valid_sequence(0) passes the test. We may want to make valid_sequence() take the sequence_count() into account. But the call to perf().is_active(0) prevents anything bad from happening at startup time.

Once we load a good file, the sequence_count() is 14 in mainwid::draw_sequences_on_pixmap(). We turn on the display of "offset" using the command "display offset", and "c" (for "continue") until offset = 14, which means we are beyond that last sequence. That bad access is prevented by perf().is_active(14).

So the fundamental problem is that perf().is_active(4) is not protecting the access when we load the "bad file". We need to find and fix that issue before papering over the problem with better access checks.

Start again, putting a breakpoint in the call to "new sequence(m_ppqn)" in midifile. This call sets up some members and clears the list of 256 playing notes. Add another breakpoint at "a_perf.add_sequence()" to see what's happening there.

What we find is that the first two tracks have proper sequence numbers as read from the MIDI file, 0 and 1. But the third one preserves the number from the old file, 4. We have a disjunction between the track number and the sequence number, a conceptual problem. We can leave it as is, and beef up the error-checking, or replace the sequence number with the track number when loading the file. What to do?

- Make sure that the is-active flag for all sequences is "false", that the pointers are always null, and make sure to test both of these items (depending on context) before doing anything with the sequence.
- Convert the sequence number to the track number upon saving the MIDI file, or upon reading the MIDI file, and use that number when adding the sequence to the perform object. This might affect some seq24/sequencer64 functionality, however. It's big move.

We need information on reading and importing.

First, if we look at a file that we created long ago by importing `b4uacuse.mid`, `b4uacuse-GM-format.`↩ `midi`, it has its fourteen sequence numbers identical to their track numbers. No problem.

Second, if we just read `b4uacuse.mid`, a non-seq24-created MIDI file, we see that each of its tracks have no sequence number – they are all zero. The perform::add_sequence() simple iterates from the beginning of m_seqs[] until it finds an inactive m_seqs[i], and uses that element to hold the sequence pointer.

But now it also segfaults! Let's fix all the non-checked get_sequence() calls right away, it is too big an issue to ignore.

In the end, we have to be aware that a screen-set can have blank (null) slots interspersed amongst the active slots.

Chapter 3

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Author(s) Chris Ahlstrom 2015-09-10

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Chapter 4

Todo List

File globals.h

There are additional user-interface and MIDI scaling variables in the perfroll module that we need to move here.

File mainwnd.cpp

Figure out best way to select non-legacy PPQN behavior, probably, for now, a command-line option.

- Add a GUI element that shows the actual PPQN in force, maybe next to the maintime object, or in the title caption.

Global seq64::jack_assistant::init ()

Make sure that global_with_jack_transport, and better yet, its new g_rc_settings member, gets set properly; what option do we need to provide, if any?

Global seq64::mainwid::timeout ()

We should use this callback to display the current time in the playback.

Global seq64::mainwnd::file_import_dialog ()

We need to look into the Import process and document it better.

Global seq64::mainwnd::mainwnd (perform &a_p)

Offload most of the work into an initialization function like options does; make the perform parameter a reference; valgrind flags m_tooltips as lost data, but if we try to manage it ourselves, many more leaks occur.

Global seq64::mainwnd::on_key_press_event (GdkEventKey *a_ev)

Test this functionality in old and new application.

Global seq64::mainwnd::on_key_release_event (GdkEventKey *a_ev)

Test this functionality in old and new application.

Global seq64::mainwnd::open_performance_edit ()

Try to find a way to set m_modified only if the song editor actually changes something, instead of just because it was opened.

Global seq64::perfedit::perfedit (perform &p, int ppqn=SEQ64_USE_DEFAULT_PPQN, int bpm=DEFAUL↩ T_BEATS_PER_MEASURE, int bw=DEFAULT_BEAT_WIDTH)

Offload most of the work into an initialization function like options does; make the perform parameter a reference.

Global seq64::perform::set_bpm (int bpm)

I think this logic is wrong, in that it needs only one of the two to be stopped before it sets the BPM, while it seems to me that both should be stopped; to be determined.

Global seq64::perform::start_playing (bool flag=false)

Verify the usage and nature of this flag.

Global seq64::seqedit::get_measures ()

Create a sequence::set_units() function or a sequence::get_measures() function to forward to.

Global seq64::seqedit::seqedit (sequence &a_seq, perform &a_perf, int pos, int ppqn=SEQ64_USE_DEFAULT_PPQN)

Offload most of the work into an initialization function like options does; make the sequence and perform parameters references.

Global seq64::seqedit::set_background_sequence (int a_seq)

Make the sequence pointer a reference.

Global seq64::seqmenu::seq_clear_perf ()

All of seq_paste() can be offloaded to a (new) perform member function.

Global seq64::seqmenu::seq_copy ()

Can be offloaded to a perform member function that accepts a sequence clipboard non-const reference parameter.

Global seq64::seqmenu::seq_cut ()

A lot of seq_cut() can be offloaded to a (new) perform member function that takes a sequence clipboard non-const reference parameter.

Global seq64::seqmenu::seq_paste ()

All of seq_paste() can be offloaded to a (new) perform member function with a const clipboard reference parameter.

Global seq64::sequence::remove (event *e)

Use find instead in sequence::remove()!

Global user_settings::bus_instrument (int buss, int channel)

Do this for controllers values and for user_instrument members.

Chapter 5

Hierarchical Index

5.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 6

Data Structure Index

6.1 Data Structures

Here are the data structures with brief descriptions:

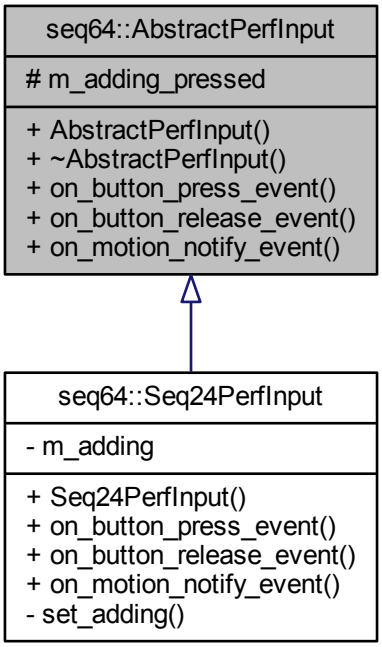
Chapter 7

Data Structure Documentation

7.1 seq64::AbstractPerfInput Class Reference

Provides an abstract base class to provide the minimal interface for the various "perf input" classes.

Inheritance diagram for seq64::AbstractPerfInput:



7.2 seq64::click Class Reference

Encapsulates any possible mouse click.

Public Member Functions

- click ()

  The constructor for class click.
- click (int x, int y, int button=SEQ64_CLICK_BUTTON_LEFT, bool press=true, seq_modifier_t modkey=SE↩ Q64_NO_MASK)

  Principal constructor for class click.
- click (const click &rhs)

  Provides a stock copy constructor.
- click & operator= (const click &rhs)

  Provides a stock principal assignment operator.
- bool is_press () const

  'Getter' function for member m_is_press
- bool is_left () const

  'Getter' function for member m_button to test for the left button.
- bool is_middle () const

  'Getter' function for member m_button to test for the middle button.
- bool is_right () const

  'Getter' function for member m_button to test for the right button.
- int x () const

  'Getter' function for member m_x
- int y () const

  'Getter' function for member m_y
- int button () const

  'Getter' function for member m_button
- seq_modifier_t modifier () const

  'Getter' function for member m_modifier
- bool mod_control () const

  'Getter' function for member m_modifier tested for Ctrl key.
- bool mod_control_shift () const

  'Getter' function for member m_modifier tested for Ctrl and Shift key.
- bool mod_super () const

  'Getter' function for member m_modifier tested for Mod4/Super/Windows key.

Private Attributes

- bool m_is_press

  Determines if the click was a press or a release event.
- int m_x

  The x-coordinate of the click.
- int m_y

  The y-coordinate of the click.
- int m_button

  The button that was pressed or released.
- seq_modifier_t m_modifier

  The optional modifier value.

7.2.1 Detailed Description

Useful in passing more generic events to non-GUI classes.

7.2.2 Constructor & Destructor Documentation

7.2.2.1 seq64::click::click ( )

Sets all members to false, zero, or the lowest good value.

7.2.2.2 seq64::click::click (int *x*, int *y*, int *button* = SEQ64_CLICK_BUTTON_LEFT, bool *press* = true, seq_modifier_t *modkey* = SEQ64_NO_MASK)

This function is the only way to set value for the click members (other than the copy constructor and principal assignment operator.

Parameters

x	The putative x value of the button click.
y	The putative y value of the button click.
button	The value of the button that was clicked, set to 1, 2, or 3.
press	Set to true if the event was a button press, false if it was a button release.
modkey	Indicates which modifier key (such as Ctrl or Alt), if any, was pressed at the same time as the click action.

7.2.2.3 seq64::click::click (const click & *rhs*)

It is nice to be explicit about these kinds of functions, even if it gets tedious.

Parameters

rhs	Provies the source object to be copied.

7.2.3 Member Function Documentation

7.2.3.1 click & seq64::click::operator= (const click & *rhs*)

It is nice to be explicit about these kinds of functions, even if it gets tedious.

Parameters

rhs	Provies the source object to be assigned from. The assignment is not made if "this" has the same address as this parameter.

7.2.4 Field Documentation

7.2.4.1 int seq64::click::m_x [private]

0 is the left-most coordinate.

7.2.4.2 int seq64::click::m_y [private]

0 is the top-most coordinate.

7.2.4.3 int seq64::click::m_button [private]

Left is 1, mmiddle is 2, and right is 3. These numbers are defined via macros, and a Linux-specific and Gtk-specific.

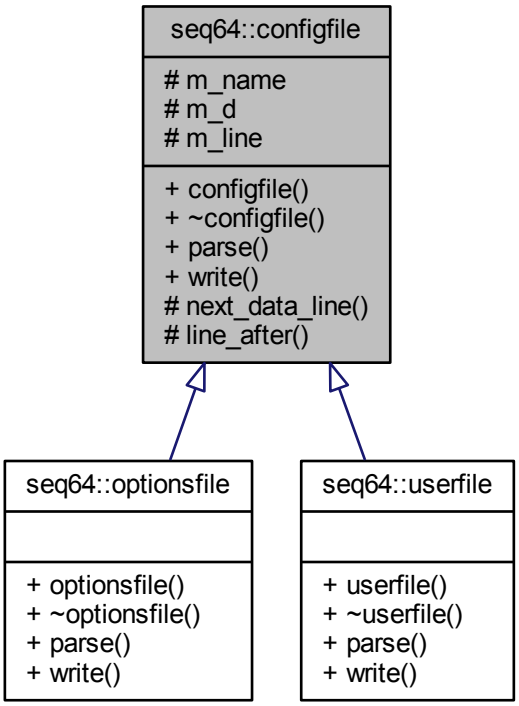
7.2.4.4 seq_modifier_t seq64::click::m_modifier [private]

Note that SEQ64_NO_MASK is our word for 0, meaning "no modifier".

7.3 seq64::configfile Class Reference

This class is the abstract base class for optionsfile and userfile.

Inheritance diagram for seq64::configfile:



Public Member Functions

- configfile (const std::string &a_name)

  Provides the string constructor for a configuration file.
- virtual ~configfile ()

  A rote destructor needed for a base class.

Protected Member Functions

- void next_data_line (std::ifstream &a_file)

  Gets the next line of data from an input stream.
- void line_after (std::ifstream &a_file, const std::string &a_tag)

  This function gets a specific line of text, specified as a tag.

Protected Attributes

- std::string m_name

  Provides the name of the file.

- unsigned char * m_d

  Points to an allocated buffer that holds the data for the configuration file.

- char m_line [SEQ64_LINE_MAX]

  The current line of text being processed.

7.3.1 Constructor & Destructor Documentation

7.3.1.1 seq64::configfile::configfile (const std::string & *name*)

Parameters

name	The name of the configuration file.

7.3.2 Member Function Documentation

7.3.2.1 void seq64::configfile::next_data_line (std::ifstream & *file*) [protected]

If the line starts with a number-sign, a space (!), or a null, it is skipped, to try the next line. This occurs until an EOF is encountered.

We may try to convert this item to a reference; pointers can be subject to problems. For example, what if someone passes a nullpointer? For speed, we don't check it.

Member m_line is a "global" return value.

Parameters

a_file	Points to an input stream.

7.3.2.2 void seq64::configfile::line_after (std::ifstream & *file,* const std::string & *tag*) [protected]

Parameters

file	Points to the input file stream.
tag	Provides a tag to be found. Lines are read until a match occurs with this tag.

7.3.3 Field Documentation

7.3.3.1 char seq64::configfile::m_line[SEQ64_LINE_MAX] [protected]

This member receives an input line, and so needs to be a character buffer.

7.4 seq64::event Class Reference

Provides events for management of MIDI events.

Public Member Functions

- event ()

  This constructor simply initializes all of the class members.
- ~event ()

  This destructor explicitly deletes m_sysex and sets it to null.
- bool operator< (const event &rhsevent) const

  If the current timestamp equal the event's timestamp, then this function returns true if the current rank is less than the event's rank.
- void set_timestamp (unsigned long time)

  'Setter' function for member m_timestamp
- long get_timestamp () const

  'Getter' function for member m_timestamp
- unsigned char status () const

  'Getter' function for member m_status
- void mod_timestamp (unsigned long a_mod)

  Calculates the value of the current timestamp modulo the given parameter.
- void set_status (char status)

  Sets the m_status member to the value of a_status.
- unsigned char get_status () const

  'Getter' function for member m_status
- void set_data (char d1)

  Clears the most-significant-bit of the d1 parameter, and sets it into the first byte of m_data.
- void set_data (char d1, char d2)

  Clears the most-significant-bit of both parameters, and sets them into the first and second bytes of m_data.
- void get_data (unsigned char &d0, unsigned char &d1)

  Retrieves the two data bytes from m_data[] and copies each into its respective parameter.
- void increment_data1 ()

  Increments the first data byte (m_data[1]) and clears the most significant bit.
- void decrement_data1 ()

  Decrements the first data byte (m_data[1]) and clears the most significant bit.
- void increment_data2 ()

  Increments the second data byte (m_data[1]) and clears the most significant bit.
- void decrement_data2 ()

  Decrements the second data byte (m_data[1]) and clears the most significant bit.
- void start_sysex ()

  Deletes and clears out the SYSEX buffer.
- bool append_sysex (unsigned char *data, long size)

  Appends SYSEX data to a new buffer.
- unsigned char * get_sysex () const

  'Getter' function for member m_sysex
- void set_size (long a_size)

  'Setter' function for member m_size
- long get_size () const

  'Getter' function for member m_size
- void link (event *a_event)

  Sets m_has_link and sets m_link to the provided event pointer.
- event * get_linked () const

  'Getter' function for member m_linked
- bool is_linked () const

  'Getter' function for member m_has_link

- void clear_link ()

  'Setter' function for member m_has_link
- void paint ()

  'Setter' function for member m_painted
- void unpaint ()

  'Setter' function for member m_painted
- bool is_painted () const

  'Getter' function for member m_painted
- void mark ()

  'Setter' function for member m_marked
- void unmark ()

  'Setter' function for member m_marked
- bool is_marked () const

  'Getter' function for member m_marked
- void select ()

  'Setter' function for member m_selected
- void unselect ()

  'Setter' function for member m_selected
- bool is_selected () const

  'Getter' function for member m_selected
- void make_clock ()

  Sets m_status to EVENT_MIDI_CLOCK;.
- unsigned char data (int index) const

  'Getter' function for member m_data[]
- unsigned char get_note () const

  Assuming m_data[] holds a note, get the note number, which is in the first data byte, m_data[0].
- void set_note (char a_note)

  Sets the note number, clearing off the most-significant-bit and assigning it to the first data byte, m_data[0].
- unsigned char get_note_velocity () const

  'Getter' function for member m_data[1], the note velocity.
- void set_note_velocity (int a_vel)

  Sets the note velocity, with is held in the second data byte, m_data[1].
- bool is_note_on () const

  Returns true if m_status is EVENT_NOTE_ON.
- bool is_note_off () const

  Returns true if m_status is EVENT_NOTE_OFF.
- void print ()

  Prints out the timestamp, data size, the current status byte, any SYSEX data if present, or the two data bytes for the status byte.
- int get_rank () const

  This function is used in sorting MIDI status events (e.g.

Private Attributes

- unsigned char m_status

  This is status byte without the channel.
- unsigned char m_data [MIDI_DATA_BYTE_COUNT]

  The two bytes of data for the MIDI event.
- unsigned char * m_sysex

  Points to the data buffer for SYSEX messages.
- long m_size

Gives the size of the SYSEX message.

- event * m_linked

  This event is used to link Note Ons and Offs together.

- bool m_has_link

  Indicates that a link has been made.

- bool m_selected

  Answers the question "is this event selected in editing.".

- bool m_marked

  Answers the question "is this event marked in processing.".

- bool m_painted

  Answers the question "is this event being painted.".

7.4.1 Detailed Description

A MIDI event consists of 3 bytes:

```
-#  Status byte, 1sssnnn, where the sss bits specify the type of
    message, and the nnnn bits denote the channel number.
    The status byte always starts with 0.
-#  The first data byte, 0xxxxxxx, where the data byte always
    start with 0, and the xxxxxxx values range from 0 to 127.
-#  The second data byte, 0xxxxxxx.
```

This class may have too many member functions.

7.4.2 Member Function Documentation

7.4.2.1 bool seq64::event::operator< (const event & *rhs*) const

Otherwise, it returns true if the current timestamp is less than the event's timestamp.

Warning

The less-than operator is supposed to support a "strict weak ordering", and is supposed to leave equivalent values in the same order they were before the sort. However, every time we load and save our sample MIDI file, events get reversed. Here are program-changes that get reversed:

```
    Save N:     0070: 6E 00 C4 48 00 C4 0C 00  C4 57 00 C4 19 00 C4 26
    Save N+1:   0070: 6E 00 C4 26 00 C4 19 00  C4 57 00 C4 0C 00 C4 48

The 0070 is the offset within the versions of the
b4uacuse-seq24.midi file.

Because of this mis-feature, and the very slow speed of loading a
MIDI file when Sequencer64 is built for debugging, we are
exploring using an std::map instead of an std::list.  Search for
occurrences of the USE_EVENT_MAP macro. (This actually works better
than a list, we have found).
```

Parameters

rhs	The object to be compared against.

Returns

Returns true if the time-stamp and "rank" are less than those of the comparison object.

7.4.2.2 void seq64::event::mod_timestamp (unsigned long *a_mod*) [inline]

Parameters

a_mod	The value to mod the timestamp against.

Returns

Returns a value ranging from 0 to a_mod-1.

7.4.2.3 void seq64::event::set_status (char *status*)

If a_status is a non-channel event, then the channel portion of the status is cleared using a bitwise AND against EVENT_CLEAR_CHAN_MASK..

7.4.2.4 void seq64::event::set_data (char *d1*)

Parameters

d1	The byte value to set. We should make these all "midibytes".

7.4.2.5 void seq64::event::set_data (char *d1,* char *d2*)

Parameters

d1	The first byte value to set. We should make these all "midibytes".
d2	The second byte value to set. We should make these all "midibytes".

7.4.2.6 void seq64::event::get_data (unsigned char & *d0,* unsigned char & *d1*)

Parameters

d0	[out] The return reference for the first byte.
d1	[out] The return reference for the first byte.

7.4.2.7 bool seq64::event::append_sysex (unsigned char * *a_data,* long *a_size*)

First, a buffer of size m_size+a_size is created. The existing SYSEX data (stored in m_sysex) is copied to this buffer. Then the data represented by a_data and a_size is appended to that data buffer. Then the original SYSEX buffer, m_sysex, is deleted, and m_sysex is assigned to the new buffer..

Warning

This function does not check any pointers.

Parameters

a_data	Provides the additional SYSEX data.
a_size	Provides the size of the additional SYSEX data.

Returns

Returns false if there was an EVENT_SYSEX_END byte in the appended data.

7.4.2.8 int seq64::event::get_rank ( ) const

The ranking, from high to low, is note off, note on, aftertouch, channel pressure, and pitch wheel, control change, and program changes.

note on/off, aftertouch, control change, etc.) The sort order is not determined by the actual status values.

The lower the ranking the more upfront an item comes in the sort order.

Returns

Returns the rank of the current m_status byte.

7.4.3 Field Documentation

7.4.3.1 unsigned char seq64::event::m_status [private]

The channel will be appended on the MIDI bus. The high nibble = type of event; The low nibble = channel. Bit 7 is present in all status bytes.

7.4.3.2 unsigned char seq64::event::m_data[MIDI_DATA_BYTE_COUNT] [private]

Remember that the most-significant bit of a data byte is always 0.

7.4.3.3 unsigned char* seq64::event::m_sysex [private]

This really ought to be a Boost or STD scoped pointer.

7.4.3.4 bool seq64::event::m_has_link [private]

This item is used [via the get_link() and link() accessors] in the sequence class.

7.5 seq64::event_list::event_key Class Reference

Provides a key value for an event map.

Public Member Functions

- event_key (unsigned long tstamp, int rank)

  Principal event_key constructor.
- event_key (const event &e)

  Event-based constructor.
- bool operator< (const event_key &rhs) const

  Provides the minimal operator needed to sort events using an event_key.

Private Attributes

- unsigned long m_timestamp

  The primary key-value for the key.
- int m_rank

  The sub-key-value for the key.

7.5.1 Detailed Description

Its types match the m_timestamp and get_rank() function of this event class.

7.5.2 Constructor & Destructor Documentation

7.5.2.1 seq64::event_list::event_key::event_key (unsigned long *tstamp*, int *rank*)

Parameters

tstamp	The time-stamp is the primary part of the key. It is the most important key item.
rank	Rank is an arbitrary number used to prioritize events that have the same time-stamp. See the event::get_rank() function for more information.

7.5.2.2 seq64::event_list::event_key::event_key (const event & *rhs*)

This constructor makes it even easier to create an event_key. Note that the call to event::get_rank() makes a simple calculation based on the status of the event.

Parameters

rhs	Provides the event key to be copied.

7.5.3 Member Function Documentation

7.5.3.1 bool seq64::event_list::event_key::operator< (const event_key & *rhs*) const

Parameters

e	Provides the event key to be compared against.

7.5.4 Field Documentation

7.5.4.1 unsigned long seq64::event_list::event_key::m_timestamp [private]

7.5.4.2 int seq64::event_list::event_key::m_rank [private]

7.6 seq64::event_list Class Reference

The event_list class is a receptable for MIDI events.

Data Structures

- class event_key

  Provides a key value for an event map.

Public Member Functions

- event_list ()

  Principal constructor.
- event_list (const event_list &a_rhs)

  Copy constructor.

- event_list & operator= (const event_list &a_rhs)

  Principal assignment operator.
- ~event_list ()

  A rote destructor.
- iterator begin ()

  'Getter' function for member m_events.begin(), non-constant version.
- const_iterator begin () const

  'Getter' function for member m_events.begin(), constant version.
- iterator end ()

  'Getter' function for member m_events.end(), non-constant version.
- const_iterator end () const

  'Getter' function for member m_events.end(), constant version.
- int count () const

  Returns the number of events stored in m_events.
- void add (const event &e, bool postsort=true)

  Adds an event to the internal event list in an optionally sorted manner.
- void remove (iterator ie)

  Provides a wrapper for the iterator form of erase(), which is the only one that sequence uses.
- void clear ()

  Provides a wrapper for clear().
- void merge (event_list &el, bool presort=true)

  Provides a merge operation for the event multimap analogous to the merge operation for the event list.
- void sort ()

  Wrapper for std::list::sort(), or, since multimaps are always sorted, an empty function.

Static Public Member Functions

- static event & dref (iterator ie)

  Dereference access for list or map.
- static const event & dref (const_iterator ie)

  Dereference const access for list or map.

Private Types

- typedef std::multimap< event_key, event > Events

  Types to use to swap between list and multimap implementations.

Private Member Functions

- void link_new ()

  Links a new event.
- void clear_links ()

  Clears all event links and unmarks them all.
- void verify_and_link (long slength)

  This function verifies state: all note-ons have an off, and it links note-offs with their note-ons.
- void mark_selected ()

  Marks all selected events.
- void mark_out_of_range (long slength)

  Marks all events that have a time-stamp that is out of range.
- void unmark_all ()

Unmarks all events.

- void unpaint_all ()

  Unpaints all list-events.

- int count_selected_notes ()

  Counts the selected note-on events in the event list.

- int count_selected_events (unsigned char status, unsigned char cc)

  Counts the selected events, with the given status, in the event list.

- void select_all ()

  Selects all events, unconditionally.

- void unselect_all ()

  Deselects all events, unconditionally.

- void print ()

  Prints a list of the currently-held events.

- const Events & events () const

  'Getter' function for member m_events

Private Attributes

- Events m_events

  This list holds the current pattern/sequence events.

7.6.1 Detailed Description

Two implementations, an std::multimap, and the original, an std::list, are provided for comparison, and are selected at build time, by manually defining the USE_EVENT_MAP macro near the top of this module.

7.6.2 Constructor & Destructor Documentation

7.6.2.1 seq64::event_list::event_list (const event_list & *rhs*)

Parameters

rhs	Provides the event list to be copied.

7.6.3 Member Function Documentation

7.6.3.1 event_list & seq64::event_list::operator= (const event_list & *rhs*)

Follows the stock rules for such an operator, just assigning member values.

Parameters

rhs	Provides the event list to be assigned.

7.6.3.2 int seq64::event_list::count ( ) const [inline]

We like returning an integer instead of size_t, and rename the function so nobody is fooled.

7.6.3.3 void seq64::event_list::add (const event & *e*, bool *postsort* = true)

It is a wrapper, wrapper for insert() or push_front(), with an option to call sort().

For the std::multimap implementation, This is an option if we want to make sure the insertion succeed.

```
std::pair<Events::iterator, bool> result = m_events.insert(p);
return result.second;
```

Warning

This pushing (and, in writing the MIDI file, the popping), causes events with identical timestamps to be written in reverse order. Doesn't affect functionality, but it's puzzling until one understands what is happening. That's why we're exploring using a multimap as the container.

Parameters

e	Provides the event to be added to the list.
postsort	If true, and the std::list implementation has been built in, then the event list is sorted after the addition. This is a time-consuming operation.

7.6.3.4 void seq64::event_list::merge (event_list & *el*, bool *presort* = true)

We have certain constraints to preserve, as the following discussion shows.

For std::list, sequence merges list T into list A by first calling T.sort(), and then A.merge(T). The merge() operation merges T into A by transferring all of its elements, at their respective ordered positions, into A. Both containers must already be ordered.

The merge effectively removes all the elements in T (which becomes empty), and inserts them into their ordered position within container (which expands in size by the number of elements transferred). The operation is performed without constructing nor destroying any element, whether T is an lvalue or an rvalue, or whether the value-type supports move-construction or not.

Each element of T is inserted at the position that corresponds to its value according to the strict weak ordering defined by operator $<$. The resulting order of equivalent elements is stable (i.e. equivalent elements preserve the relative order they had before the call, and existing elements precede those equivalent inserted from x). The function does nothing if (&x == this).

For std::multimap, sorting is automatic. However, unless move-construction is supported, merging will be less efficient than for the list version. Also, we need a way to include duplicates of each event, so we need to use a multimap. Once all this setup, merging is really just insertion. And, since sorting isn't needed, the multimap actually turns out to be faster.

Parameters

el	Provides the event list to be merged into the current event list.
presort	If true, the events are presorted. This is a requirement for merging an std::list, but is a no-op for the std::multimap implementation.

7.6.3.5 void seq64::event_list::link_new ( ) [private]

This function checks for a note on, then look for its note off. This function is provided in the event_list because it does not depend on any external data. Also note that any desired thread-safety must be provided by the caller.

7.6.3.6 void seq64::event_list::verify_and_link (long *slength*) [private]

Threadsafe

Parameters

slength	Provides the length beyond which events will be pruned.

7.6.3.7 void seq64::event_list::mark_out_of_range (long *slength*) [private]

Used for killing (pruning) those events not in range. If the current time-stamp is greater than the length, then the event is marked for pruning.

Parameters

slength	Provides the length beyond which events will be pruned.

7.6.3.8 int seq64::event_list::count_selected_events (unsigned char *status*, unsigned char *cc*) [private]

If the event is a control change (CC), then it must also match the given CC value.

7.7 seq64::font Class Reference

This class provides a wrapper for rendering fonts that are encoded as a 16 x 16 pixmap file in XPM format.

Public Types

- enum Color {
  BLACK,
  WHITE,
  BLACK_ON_YELLOW,
  YELLOW_ON_BLACK }

Public Member Functions

- font ()

  Rote default constructor.
- void init (Glib::RefPtr< Gdk::Window > a_window)

  Initialization function for a window on which fonts will be drawn.
- void render_string_on_drawable (Glib::RefPtr< Gdk::GC > m_gc, int x, int y, Glib::RefPtr< Gdk::Drawable > a_draw, const char *str, font::Color col)

  Draws a text string.

Private Attributes

- int m_font_w

  Specifies the exact width of a character cell, in pixels.
- int m_font_h

  Specifies the exact height of a character cell, in pixels.
- Glib::RefPtr< Gdk::Pixmap > * m_pixmap

  Points to the current pixmap (m_black_pixmap or m_white_pixmap) to use to render a string.
- Glib::RefPtr< Gdk::Pixmap > m_black_pixmap

  The pixmap in the file `src/pixmaps/font_b.xpm` is loaded into this object.
- Glib::RefPtr< Gdk::Pixmap > m_white_pixmap

The pixmap in the file `src/pixmaps/font_b.xpm` *is loaded into this object.*

- Glib::RefPtr< Gdk::Pixmap > m_b_on_y_pixmap

  The pixmap in the file `src/pixmaps/font_y.xpm` *is loaded into this object.*
- Glib::RefPtr< Gdk::Pixmap > m_y_on_b_pixmap

  The pixmap in the file `src/pixmaps/font_yb.xpm` *is loaded into this object.*
- Glib::RefPtr< Gdk::Bitmap > m_clip_mask

  This object is instantiated as a default object.

7.7.1 Member Enumeration Documentation

7.7.1.1 enum seq64::font::Color

Enumerator

BLACK A simple enumeration to describe the basic colors used in writing text. Basically, these two values cause the selection of one or another pixmap (font_b_xpm and font_w_xpm). We've added two more pixmaps to draw black text on a yellow background (font_y.xpm) and yellow text on a black background (font_yb.xpm).

```
The first supported color.  A black font on a white
background.
```

WHITE The second supported color. A white font on a black background.

BLACK_ON_YELLOW A new color, for drawing black text on a yellow background.

YELLOW_ON_BLACK A new color, for drawing yellow text on a black background.

7.7.2 Member Function Documentation

7.7.2.1 void seq64::font::init (Glib::RefPtr< Gdk::Window > *wp*)

This function loads four pixmaps that contain the characters to be used to draw text strings.

One pixmap has white characters on a black background, one has black characters on a white background, one has yellow characters on a black background, and one has black characters on a yellow background.

7.7.2.2 void seq64::font::render_string_on_drawable (Glib::RefPtr< Gdk::GC > *a_gc*, int *x*, int *y*, Glib::RefPtr< Gdk::Drawable > *a_draw*, const char * *str*, font::Color *col*)

This function grabs the proper font bitmap, extracts the current character pixmap from it, and slaps it down where it needs to be to render the character in the string.

Parameters

a_gc	Provides the graphics context for drawing the text using GTK+.
x	The horizontal location of the text.
y	The vertical location of the text.
a_draw	The drawable object on which to draw the text.
str	The string to draw. Should use a constant string reference instead.
col	The font color to use to draw the string. The supported values are font::BLACK, font::WHITE, font::BLACK_ON_YELLOW, font::YELLOW_ON_BLACK. The actual correct colors are provided by selecting one of four font pixmaps, as described in the init() function.

7.7.3 Field Documentation

7.7.3.1 int seq64::font::m_font_w [private]

Currently defaults to cf_text_w = 6.

7.7.3.2 int seq64::font::m_font_h [private]

Currently defaults to cf_text_h = 10.

7.7.3.3 Glib::RefPtr<Gdk::Pixmap>* seq64::font::m_pixmap [private]

This member used to be an object, but it's probably a bit faster to just use a pointer (or a reference).

7.7.3.4 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_black_pixmap [private]

It contains a black font on a white background.

7.7.3.5 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_white_pixmap [private]

It contains a black font on a white background.

7.7.3.6 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_b_on_y_pixmap [private]

It contains a black font on a yellow background.

7.7.3.7 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_y_on_b_pixmap [private]

It contains a yellow font on a black background.

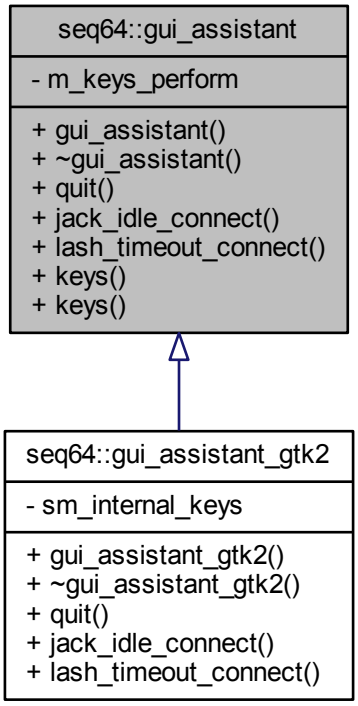
7.7.3.8 Glib::RefPtr<Gdk::Bitmap> seq64::font::m_clip_mask [private]

All we know is it seems to be a requirement for creating a pixmap object from an XMP file.

7.8 seq64::gui_assistant Class Reference

This class provides an interface for some of the GUI support needed in Sequencer64.

Inheritance diagram for seq64::gui_assistant:



Public Member Functions

- gui_assistant (keys_perform &kp)

  This constructor wires in some externally (for now) created objects.
- virtual ~gui_assistant ()

  Stock base-class implementation of a virtual destructor.
- const keys_perform & keys () const

  'Getter' function for member m_keys_perform The const getter.
- keys_perform & keys ()

  'Getter' function for member m_keys_perform The un-const getter.

Private Attributes

- keys_perform & m_keys_perform

  Provides a reference to the app-specific GUI-specific keys_perform-derived object that an application is going to use for handling sequence-control keys.

7.8.1 Detailed Description

It also contain a number of helper objects that all kind of go together; only this assistant object will need to be passed around (by non-GUI code).

7.8.2 Constructor & Destructor Documentation

7.8.2.1 seq64::gui_assistant::gui_assistant (keys_perform & *kp*)

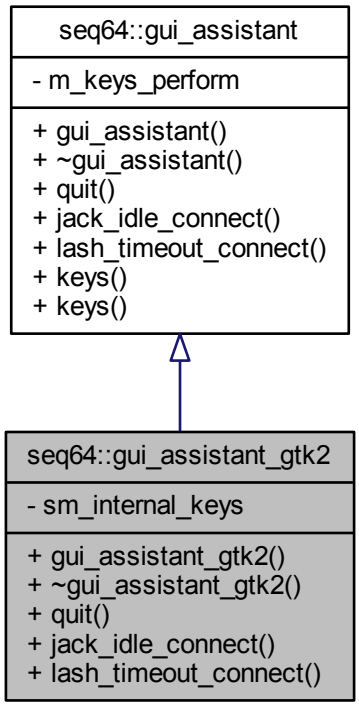
Parameters

kp	Provides a set of key codes to be used by the perform object to control patterns and their performance.

7.9 seq64::gui_assistant_gtk2 Class Reference

This class provides an interface for some of the Gtk/Gdk/Glib support needed in Sequencer64.

Inheritance diagram for seq64::gui_assistant_gtk2:



Public Member Functions

- gui_assistant_gtk2 ()

  This class provides an interface for some of the Gtk/Gdk/Glib support needed in Sequencer64.
- virtual void quit ()

  Calls the Glib Main object's quit() function.
- virtual void jack_idle_connect (jack_assistant &jack)

  Connects the JACK session-event callback to the Glib idle object.
- virtual void lash_timeout_connect (lash &lashobject)

  Connects the LASH timeout-event callback to the Glib timeout object.

Static Private Attributes

- static keys_perform_gtk2 sm_internal_keys

  Provides a pre-made keys_perform object.

7.9.1 Field Documentation

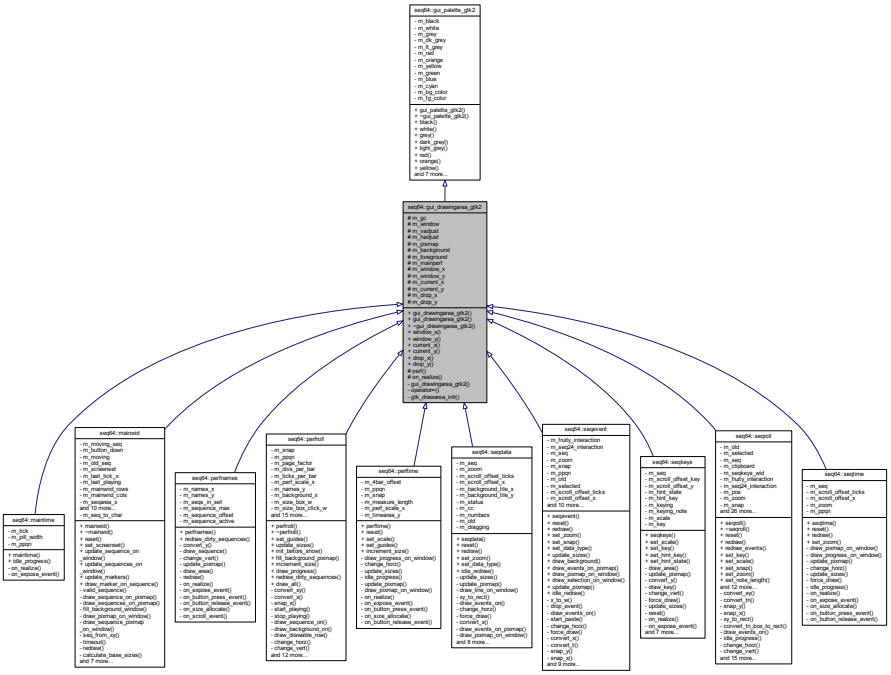
7.9.1.1 keys_perform_gtk2 seq64::gui_assistant_gtk2::sm_internal_keys [static],[private]

This object is set into the reference provided in the gui_assistant base class.

7.10 seq64::gui_drawingarea_gtk2 Class Reference

Implements the basic drawing areas of the application.

Inheritance diagram for seq64::gui_drawingarea_gtk2:



Data Structures

- struct rect

  A small helper structure representing a rectangle.

Public Member Functions

- gui_drawingarea_gtk2 (perform &p, int window_x=0, int window_y=0)

  Perform-only constructor.
- gui_drawingarea_gtk2 (perform &a_perf, Gtk::Adjustment &a_hadjust, Gtk::Adjustment &a_vadjust, int window_x=0, int window_y=0)

  Principal constructor.

- ~gui_drawingarea_gtk2 ()
  Provides a destructor to delete allocated objects.
- int window_x () const
  'Getter' function for member m_window_x
- int window_y () const
  'Getter' function for member m_window_y
- int current_x () const
  'Getter' function for member m_current_x
- int current_y () const
  'Getter' function for member m_current_y
- int drop_x () const
  'Getter' function for member m_drop_x
- int drop_y () const
  'Getter' function for member m_drop_y

Protected Member Functions

- perform & perf ()
  'Getter' function for member m_mainperf
- void on_realize ()
  For this GTK callback, on realization of window, initialize the shiz.

Protected Attributes

- perform & m_mainperf
  A frequent hook into the main perform object.
- int m_window_x
  Window sizes.
- int m_current_x
  The x and y value of the current location of the mouse (during dragging?)
- int m_drop_x
  These values are used when roping and highlighting a bunch of events.

Private Member Functions

- void gtk_drawarea_init ()
  Does basic initialization for each of the constructors.

Additional Inherited Members

7.10.1 Detailed Description

Note that this class really "isn't a" gui_pallete_gtk2; it should simply have one. But that base class must be derived from Gtk::DrawingArea. We don't want to waste some space by using a "has-a" relationship, and also put up with having to access the palette indirectly. So, in this case, we tolerate the less strict implementation.

7.10.2 Member Function Documentation

7.10.2.1 void seq64::gui_drawingarea_gtk2::on_realize ( ) [protected]

It allocates any additional resources that weren't initialized in the constructor.

7.10.3 Field Documentation

7.10.3.1 perform& seq64::gui_drawingarea_gtk2::m_mainperf [protected]

We could move this into yet another base class, since a number of classes don't need it. Probably not worth the effort at this time.

7.10.3.2 int seq64::gui_drawingarea_gtk2::m_window_x [protected]

Could make this constant, but some windows are resizable.

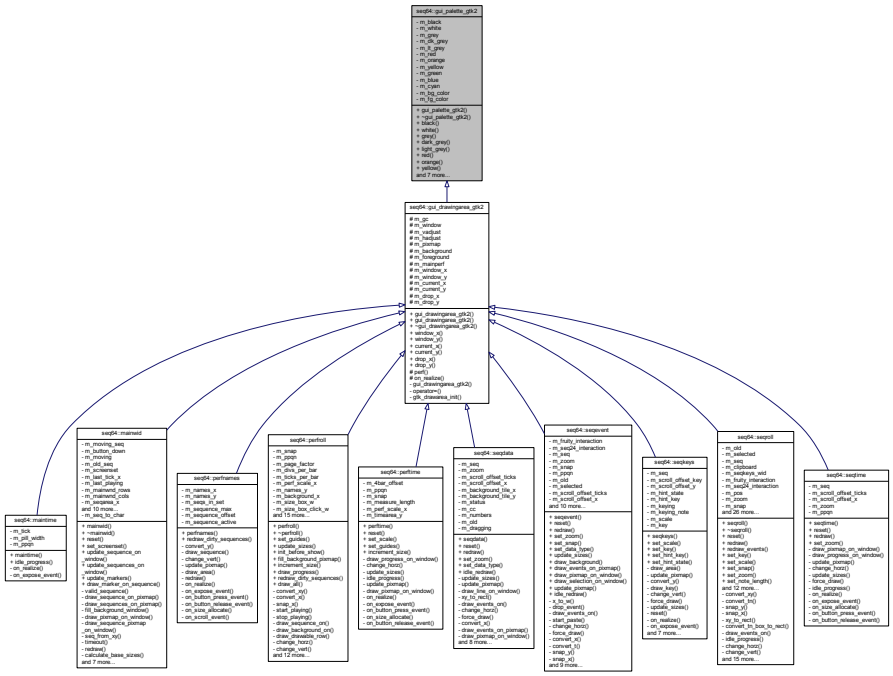
7.10.3.3 int seq64::gui_drawingarea_gtk2::m_drop_x [protected]

Provides the x and y value of where the dragging started.

7.11 seq64::gui_palette_gtk2 Class Reference

Implements a stock palette of Gdk::Color elements.

Inheritance diagram for seq64::gui_palette_gtk2:



Public Member Functions

- gui_palette_gtk2 ()

  Principal constructor.

- ~gui_palette_gtk2 ()

  Provides a destructor to delete allocated objects.

Protected Types

- typedef Gdk::Color Color

  Provides a type for the color object.

7.11.1 Detailed Description

Note that this class must be derived from Gtk::DrawingArea (or Gtk::Widget) in order to get access to the get_↩ default_colormap() function used in the constructor.

7.11.2 Constructor & Destructor Documentation

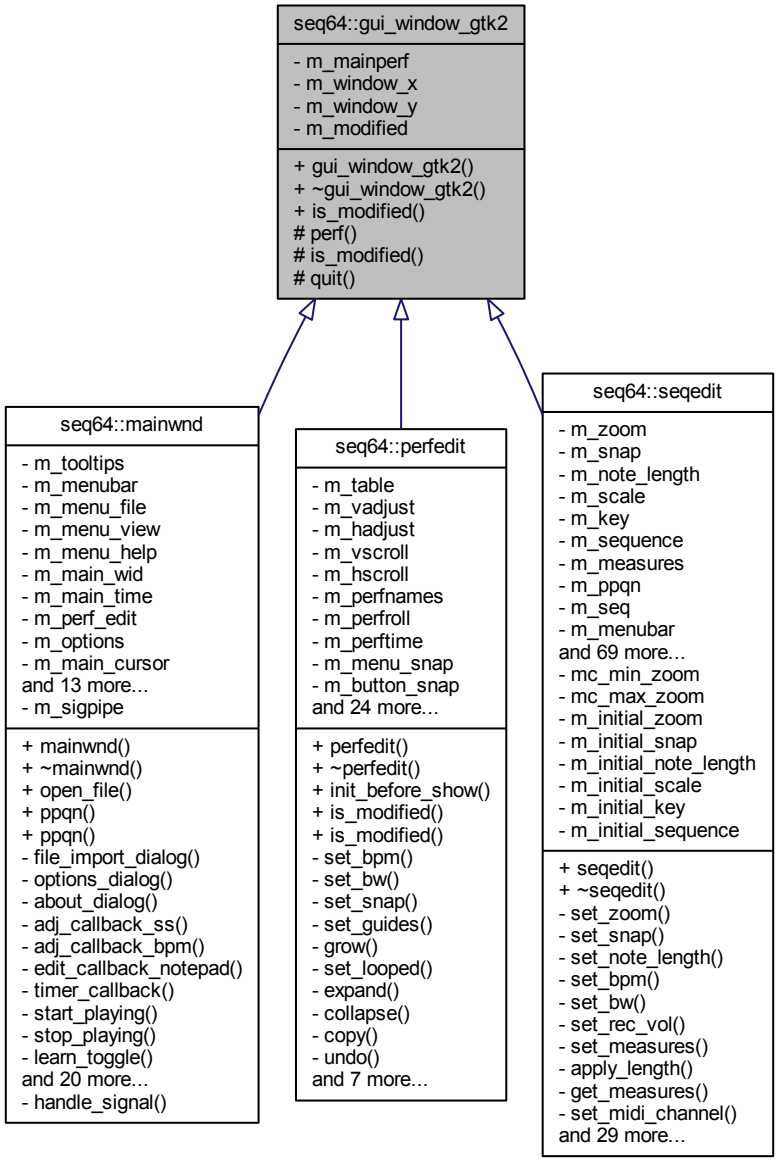
7.11.2.1 seq64::gui_palette_gtk2::gui_palette_gtk2 ( )

In the constructor you can only allocate colors; get_window() returns 0 because this window has not be realized.

7.12 seq64::gui_window_gtk2 Class Reference

This class supports a basic interface for Gtk::Window-derived objects.

Inheritance diagram for seq64::gui_window_gtk2:



Public Member Functions

- gui_window_gtk2 (perform &p, int window_x=0, int window_y=0)

  Principal constructor, has a reference to the all-important perform object.

- ~gui_window_gtk2 ()

  This rote constructor does nothing.

- bool is_modified () const

  'Getter' function for member m_modified

Protected Member Functions

- perform & perf ()
  'Getter' function for member m_mainperf
- void is_modified (bool flag)
  'Setter' function for member m_modified

Private Attributes

- int m_window_x
  Window sizes.

7.12.1 Constructor & Destructor Documentation

7.12.1.1 seq64::gui_window_gtk2::gui_window_gtk2 (perform & *p*, int *window_x* = 0, int *window_y* = 0)

Parameters

a_perf	Refers to the main performance object.

7.12.2 Field Documentation

7.12.2.1 int seq64::gui_window_gtk2::m_window_x [private]

Could make this constant, but some windows are resizable.

7.13 seq64::jack_assistant Class Reference

This class provides the performance mode JACK support.

Public Member Functions

- jack_assistant (perform &parent, int ppqn=SEQ64_USE_DEFAULT_PPQN)
  This constructor initializes a number of member variables, some of them public!
- ~jack_assistant ()
  The destructor doesn't need to do anything yet.
- bool is_running () const
  'Getter' function for member m_jack_running
- bool is_master () const
  'Getter' function for member m_jack_master
- perform & parent ()
  'Getter' function for member m_jack_parent Needed for external callbacks.
- bool init ()
  Initializes JACK support.
- void deinit ()
  Tears down the JACK infrastructure.
- void start ()
  If JACK is supported, starts the JACK transport.
- void stop ()
  If JACK is supported, stops the JACK transport.

- void position (bool a_state)

  If JACK is supported and running, sets the position of the transport.
- bool output (jack_scratchpad &pad)

  Performance output function for JACK, called by the perform function of the same name.

Private Member Functions

- void info_message (const std::string &msg)

  Common-code for console messages.
- void error_message (const std::string &msg)

  Common-code for error messages.

Friends

- int jack_sync_callback (jack_transport_state_t state, jack_position_t *pos, void *arg)

  Global functions for JACK support and JACK sessions.
- void jack_shutdown (void *arg)

  This callback is to shutdown JACK by clearing the jack_assistant::m_jack_running flag.
- void jack_timebase_callback (jack_transport_state_t state, jack_nframes_t nframes, jack_position_t *pos, int new_pos, void *arg)

  This function sets the JACK position structure.

7.13.1 Constructor & Destructor Documentation

7.13.1.1 seq64::jack_assistant::jack_assistant (perform & *parent*, int *ppqn* = SEQ64_USE_DEFAULT_PPQN)

Parameters

parent	Provides a reference to the main perform object that needs to control JACK event.

7.13.2 Member Function Documentation

7.13.2.1 bool seq64::jack_assistant::init ( )

Then we become a new client of the JACK server.

Who calls this routine?

Todo Make sure that global_with_jack_transport, and better yet, its new g_rc_settings member, gets set properly; what option do we need to provide, if any?

Returns

Returns true if JACK is now considered to be running (or if it was already running.)

7.13.2.2 void seq64::jack_assistant::stop ( )

Should it also set m_jack_running to false?

7.13.2.3 void seq64::jack_assistant::position (bool *a_state*)

http://jackaudio.org/files/docs/html/transport-design.html

This function is called via perform::position_jack() in the mainwnd, perfedit, perfroll, and seqroll graphical user-interface support objects.

Warning

A lot of this code is effectively disabled by an early return statement.

Parameters

state	If true, the current tick is set to the leftmost tick.

7.13.2.4 bool seq64::jack_assistant::output (jack_scratchpad & *pad*)

Parameters

pad	Provide a JACK scratchpad, whatever that is.

Returns

Returns true if JACK is running.

7.13.2.5 void seq64::jack_assistant::info_message (const std::string & *msg*) [private]

Adds markers and a newline.

Parameters

msg	The message to print, sans the newline.

7.13.2.6 void seq64::jack_assistant::error_message (const std::string & *msg*) [private]

Adds markers, and sets m_jack_running to false.

Parameters

msg	The message to print, sans the newline.

7.13.3 Friends And Related Function Documentation

7.13.3.1 int jack_sync_callback (jack_transport_state_t *state*, jack_position_t * *pos*, void * *arg*) [friend]

This JACK synchronization callback informs the specified perform object of the current state and parameters of JACK.

Parameters

state	The JACK Transport state.
pos	The JACK position value.

arg	The pointer to the jack_assistant object. Currently not checked for nullity, nor dynamic-casted.

7.13.3.2 void jack_shutdown (void * *arg*) [friend]

Parameters

arg	Points to the jack_assistant in charge of JACK support for the perform object.

7.13.3.3 void jack_timebase_callback (jack_transport_state_t *state*, jack_nframes_t *nframes*, jack_position_t * *pos*, int *new_pos*, void * *arg*) [friend]

Parameters

state	Indicates the current state of JACK transport.
nframes	The number of JACK frames.
pos	Provides the position structure to be filled in.
new_pos	The new positions to be set.
arg	Provides the jack_assistant pointer, currently unchecked for nullity.

7.14 seq64::jack_scratchpad Struct Reference

Provide a temporary structure for passing data and results between a perform and jack_assistant object.

7.14.1 Detailed Description

The jack_assistant class already has access to the members of perform, but it needs access to and modification of local variables in perform::output_func().

7.15 seq64::keybindentry Class Reference

Class for management of application key-bindings.

Inherits Entry.

Public Member Functions

- keybindentry (type t, unsigned int *location_to_write=nullptr, perform *p=nullptr, long s=0)

  This constructor initializes the member with values dependent on the value type provided in the first parameter.

- void set (unsigned int val)

  Gets the key name from the integer value; if there is one, then it is printed into a temporary buffer, otherwise the value is printed into that buffer as is.

- virtual bool on_key_press_event (GdkEventKey *event)

  Handles a key press by calling set() with the event's key value.

Private Types

- enum type {
  location,
  events,
  groups }

Private Attributes

- unsigned int * m_key

  Points to the value of the key that is part of this key-binding.
- type m_type

  Stores the type of key-binding.
- perform * m_perf

  Stores an optional pointer to a perform object.
- long m_slot

  Provides???

7.15.1 Member Enumeration Documentation

7.15.1.1 enum seq64::keybindentry::type [private]

Enumerator

location Provides the type of keybindings that can be made. Used for handling a keystroke made while a keyboard-options field is active, for selecting a key via the keyboard, and binding to pattern/sequence boxes, we think. It is used in the options class to associate a key with the binding.

events Used for binding to events.

groups Used for binding to groups.

7.15.2 Constructor & Destructor Documentation

7.15.2.1 seq64::keybindentry::keybindentry (type *t*, unsigned int * *location_to_write* = nullptr, perform * *p* = nullptr, long *s* = 0)

Usage In options, a pointer to a new key-binding entry is managed by calling `keybindentry(keybindentry::location, &perf->keyname)`.

Parameters

t	Provides the type of key-binding: location, events, or groups.
location_to_write	The location that holds the value of the key associated with the key-binding. The default value of this parameter is the null pointer.
p	Points to the performance object used with this key-binding. The default value of this parameter is the null pointer.
s	Provides the slot value for this key-binding. The default value of this parameter is zero.

7.15.3 Member Function Documentation

7.15.3.1 void seq64::keybindentry::set (unsigned int *val*)

Then we call set_text(buf). The set_width_char() function is then called.

7.15.3.2 bool seq64::keybindentry::on_key_press_event (GdkEventKey * *event*) [virtual]

This value is used to set the event or key depending on the value of m_type.

7.15.4 Field Documentation

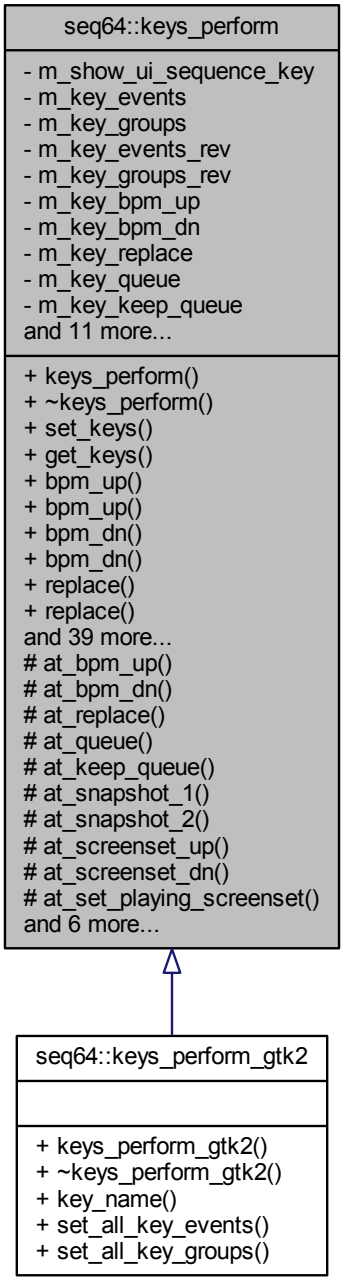
7.15.4.1 unsigned int* seq64::keybindentry::m_key [private]

Not yet sure by the address of this key value is needed. It can be a null pointer, as well.

7.16 seq64::keys_perform Class Reference

This class supports the performance mode.

Inheritance diagram for seq64::keys_perform:



Public Member Functions

- keys_perform ()

  This construction initializes a vast number of member variables, some of them public!

- ~keys_perform ()

  The destructor sets some running flags to false, signals this condition, then joins the input and output threads if the were launched.

- void set_keys (const keys_perform_transfer &kpt)

  Copies fields from the transfer structure in this object.
- void get_keys (keys_perform_transfer &kpt)

  Copies fields from this object into the transfer structure.
- bool show_ui_sequence_key () const

  Accessor *m_key_show_ui_sequency_key*
- virtual std::string key_name (unsigned int key) const

  Obtains the name of the key.
- virtual void set_all_key_events ()

  Provides base class functionality.
- virtual void set_all_key_groups ()

  Provides base class functionality.
- void set_key_event (unsigned int keycode, long sequence_slot)

  At construction time, this function sets up one keycode and one event slot.
- void set_key_group (unsigned int keycode, long group_slot)

  At construction time, this function sets up one keycode and one group slot.

Protected Types

- typedef std::map< unsigned int, long > SlotMap

  This typedef defines a map in which the key is the keycode, that is, the integer value of a keystroke, and the value is the pattern/sequence number or slot.
- typedef std::map< long, unsigned int > RevSlotMap

  This typedef is like SlotMap, but used for lookup in the other direction.

Private Attributes

- unsigned int m_key_bpm_up

  Provides key assignments for some key sequencer features.

7.16.1 Detailed Description

It has way too many data members, many of the public. Might be ripe for refactoring.

7.16.2 Constructor & Destructor Documentation

7.16.2.1 seq64::keys_perform::~keys_perform ( )

Finally, any active patterns/sequences are deleted.

7.16.3 Member Function Documentation

7.16.3.1 void seq64::keys_perform::set_keys (const keys_perform_transfer & *kpt*)

This structure holds all of the key settings from the File / Options / Keyboard tab dialog.

Parameters

kpt	The structure that holds the values of the keys to be used for various purposes in controlling a performance live.

7.16.3.2 void seq64::keys_perform::get_keys (keys_perform_transfer & *kpt*)

Parameters

kpt	The structure that holds the values of the keys to be used for various purposes in controlling a performance live.

7.16.3.3 bool seq64::keys_perform::show_ui_sequence_key ( ) const [inline]

Used in mainwid, options, optionsfile, userfile, and perform.

7.16.3.4 std::string seq64::keys_perform::key_name (unsigned int *key*) const [virtual]

In gtkmm, this is done via the gdk_keyval_name() function. Here, in the base class, we just provide an easy-to-create string.

Parameters

key	Provides the numeric value of the keystroke.

Returns

Returns the name of the key, in the format "Key 0xkkkk".

Reimplemented in seq64::keys_perform_gtk2.

7.16.3.5 virtual void seq64::keys_perform::set_all_key_events ( ) [inline], [virtual]

Must be called by the derived-class's override of this function.

Reimplemented in seq64::keys_perform_gtk2.

7.16.3.6 virtual void seq64::keys_perform::set_all_key_groups ( ) [inline], [virtual]

Must be called by the derived-class's override of this function.

Reimplemented in seq64::keys_perform_gtk2.

7.16.3.7 void seq64::keys_perform::set_key_event (unsigned int *keycode*, long *sequence_slot*)

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window.

Parameters

keycode	The key to be assigned.
sequence_slot	The perform event slot into which the keycode will be assigned.

7.16.3.8 void seq64::keys_perform::set_key_group (unsigned int *keycode*, long *group_slot*)

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window.

Parameters

keycode	The key to be assigned.
group_slot	The perform group slot into which the keycode will be assigned.

7.16.4 Field Documentation

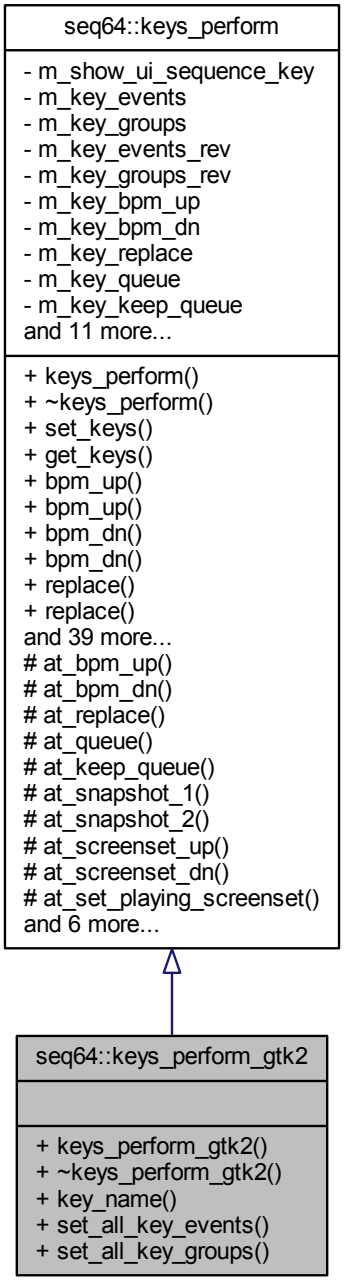
7.16.4.1 unsigned int seq64::keys_perform::m_key_bpm_up [private]

Used in mainwnd, options, optionsfile, perfedit, seqroll, userfile, and perform.

7.17 seq64::keys_perform_gtk2 Class Reference

This class supports the performance mode.

Inheritance diagram for seq64::keys_perform_gtk2:



Public Member Functions

- keys_perform_gtk2 ()

  This construction initializes a vast number of member variables, some of them public!

- virtual ~keys_perform_gtk2 ()

  The destructor sets some running flags to false, signals this condition, then joins the input and output threads if the were launched.

- virtual std::string key_name (unsigned int key) const

  Obtains the name of the key.
- virtual void set_all_key_events ()

  Sets up the keys for arming/unmuting events in the Gtk-2 environment.
- virtual void set_all_key_groups ()

  Sets up the keys for group events in the Gtk-2 environment.

Additional Inherited Members

7.17.1 Detailed Description

It has way too many data members, many of the public. Might be ripe for refactoring.

7.17.2 Constructor & Destructor Documentation

7.17.2.1 seq64::keys_perform_gtk2::~keys_perform_gtk2 ( ) [virtual]

Finally, any active patterns/sequences are deleted.

7.17.3 Member Function Documentation

7.17.3.1 std::string seq64::keys_perform_gtk2::key_name (unsigned int *key*) const [virtual]

In gtkmm, this is done via the gdk_keyval_name() function. Here, in the base class, we just provide an easy-to-create string.

Reimplemented from seq64::keys_perform.

7.17.3.2 void seq64::keys_perform_gtk2::set_all_key_events ( ) [virtual]

The base-class function call makes sure the the related lists are cleared before rebuilding them here.

Reimplemented from seq64::keys_perform.

7.17.3.3 void seq64::keys_perform_gtk2::set_all_key_groups ( ) [virtual]

The base-class function call makes sure the the related lists are cleared before rebuilding them here.

Reimplemented from seq64::keys_perform.

7.18 seq64::keys_perform_transfer Struct Reference

Provides a data-transfer structure to make it easier to fill in a keys_perform object's members using sscanf().

7.19 seq64::keystroke Class Reference

Encapsulates any practical keystroke.

Public Member Functions

- keystroke ()

  The default constructor for class keystroke.
- keystroke (unsigned int key, bool press=SEQ64_KEYSTROKE_PRESS, int modkey=int(SEQ64_NO_MAS↩ K))

  The principal constructor.
- keystroke (const keystroke &rhs)

  Provides the rote copy constructor.
- keystroke & operator= (const keystroke &rhs)

  Provides the rote principal assignment operator.
- bool is_press () const

  'Getter' function for member m_is_press
- bool is_letter (int ch=SEQ64_KEYSTROKE_BAD_VALUE) const

  'Getter' function for member m_key to test letters, handles ASCII only.
- bool is_delete () const

  m_key to test for a delete-causing key.
- unsigned int key () const

  'Getter' function for member m_key
- seq_modifier_t modifier () const

  'Getter' function for member m_modifier
- bool mod_control () const

  'Getter' function for member m_modifier tested for Ctrl key.
- bool mod_control_shift () const

  'Getter' function for member m_modifier tested for Ctrl and Shift key.
- bool mod_super () const

  'Getter' function for member m_modifier tested for Mod4/Super/Windows key.

Private Attributes

- bool m_is_press

  Determines if the key was a press or a release.
- unsigned int m_key

  The key that was pressed or released.
- seq_modifier_t m_modifier

  The optional modifier value.

7.19.1 Detailed Description

Useful in passing more generic events to non-GUI classes.

7.19.2 Constructor & Destructor Documentation

7.19.2.1 seq64::keystroke::keystroke (unsigned int *key*, bool *press* = `SEQ64_KEYSTROKE_PRESS`, int *modkey* = `int(SEQ64_NO_MASK)`)

Parameters

key	The keystroke number of the key that was pressed or released.
press	If true, the keystroke action was a press, otherwise it was a release.
modkey	The modifier key combination that was pressed, if any, in the form of a bit-mask, as defined in the gdk_basic_keys module. Common mask values are SEQ64_SHIFT_MASK, SEQ64_CONTROL_MASK, SEQ64_MOD1_MASK, and SEQ64_MOD4_MASK. If no modifier, this value is SEQ64_NO_MASK.

7.19.2.2 seq64::keystroke::keystroke (const keystroke & *rhs*)

Parameters

rhs	The object to be copied.

7.19.3 Member Function Documentation

7.19.3.1 keystroke & seq64::keystroke::operator= (const keystroke & *rhs*)

Parameters

rhs	The object to be assigned.

Returns

Returns the reference to the current object, for use in assignment chains.

7.19.3.2 bool seq64::keystroke::is_letter (int *ch* = SEQ64_KEYSTROKE_BAD_VALUE) const

Parameters

ch	An optional character to test as an ASCII letter.

Returns

If a character is not provided, true is returned if it is an upper or lower-case letter. Otherwise, true is returned if the m_key value matches the character case-insensitively.

Tricky Code

7.19.4 Field Documentation

7.19.4.1 bool seq64::keystroke::m_is_press [private]

See the SEQ64_KEYSTROKE_PRESS and SEQ64_KEYSTROKE_RELEASE readability macros.

7.19.4.2 unsigned int seq64::keystroke::m_key [private]

Generally, the extended ASCII range (0 to 255) is supported. However, Gtk-2.x/3.x will generally support the full gamut of characters defined in the gdk_basic_keys.h module. We define minimum and maximum range macros for keystrokes that are a bit generous.

7.19.4.3 seq_modifier_t seq64::keystroke::m_modifier [private]

Note that SEQ64_NO_MASK is our word for 0, meaning "no modifier".

7.20 seq64::lash Class Reference

This class supports LASH operations, if compiled with LASH support (i.e.

Public Member Functions

- lash (perform &p, int argc, char **argv)

  This constructor calls lash_extract(), using the command-line arguments, if SEQ64_LASH_SUPPORT is enabled.
- void set_alsa_client_id (int id)

  Make ourselves a LASH ALSA client.
- void start ()

  Process any LASH events every 250 msec, which is an arbitrarily chosen interval.
- bool process_events ()

  Process LASH events.

Private Member Functions

- bool init ()

  Initializes LASH support, if enabled.
- void handle_event (lash_event_t *conf)

  Handle a LASH event.
- void handle_config (lash_config_t *conf)

  Handle a LASH configuration item.

Private Attributes

- perform & m_perform

  A hook into the single perform object in the application.

7.20.1 Detailed Description

SEQ64_LASH_SUPPORT is defined). All of the #ifdef skeleton work is done in this class in such a way that any other part of the code can use this class whether or not lash support is actually built in; the functions will just do nothing.

7.20.2 Constructor & Destructor Documentation

7.20.2.1 seq64::lash::lash (perform & *p*, int *argc*, char ** *argv*)

We fixed the crazy usage of argc and argv here and in the client code in the seq24 module.

Parameters

p	The perform object that needs to implement LASH support.
argc	The number of command-line arguments.
argv	The command-line arguments.

7.20.3 Member Function Documentation

7.20.3.1 void seq64::lash::set_alsa_client_id (int *id*)

/param id The ALSA client ID to be set.

7.20.3.2 bool seq64::lash::process_events ( )

Returns

Always returns true.

7.20.3.3 bool seq64::lash::init ( ) [private]

Returns

Returns true if the LASH subsystem was able to be initialized, and a LASH client representative (m_client) was allocated.

7.20.3.4 void seq64::lash::handle_event (lash_event_t * *ev*) [private]

Parameters

ev	Provides the event to be handled.

7.20.3.5 void seq64::lash::handle_config (lash_config_t * *conf*) [private]

Currently incomplete.

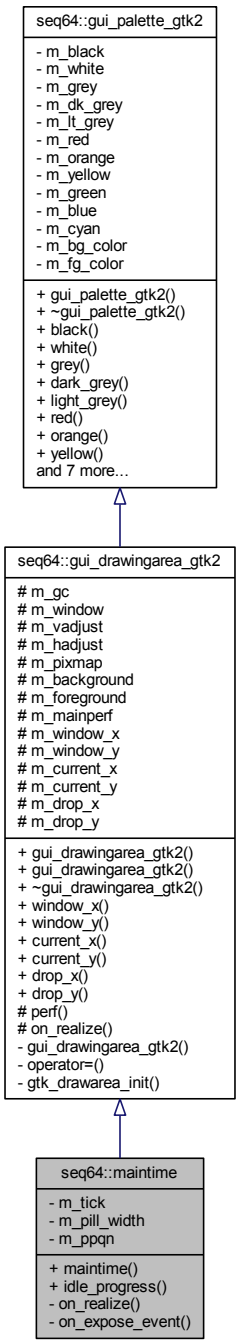
Parameters

conf	Provides the configuration item to handle.

7.21 seq64::maintime Class Reference

This class provides the drawing of the progress bar at the top of the main window, along with the "pills" that move in time with the measures.

Inheritance diagram for seq64::maintime:



Public Member Functions

- maintime (perform &p, int ppqn=SEQ64_USE_DEFAULT_PPQN, int pillwidth=c_pill_width, int x=c_↩ maintime_x, int y=c_maintime_y)

  This constructor sets up the colors black, white, and grey, and then allocates them.
- int idle_progress (long ticks)

  This function clears the window, sets the foreground to black, draws the "time" window's rectangle, and then draws a rectangle for noting the progress of the beat, and the progress for a bar.

Private Member Functions

- void on_realize ()

  Handles realization of the window.

- bool on_expose_event (GdkEventExpose ∗ev)

  This function merely idles.

Additional Inherited Members

7.21.1 Constructor & Destructor Documentation

7.21.1.1 seq64::maintime::maintime (perform & *p*, int *ppqn* = SEQ64_USE_DEFAULT_PPQN, int *pillwidth* = c_pill_width, int *x* = c_maintime_x, int *y* = c_maintime_y)

In the constructor you can only allocate colors; get_window() would return 0 because the windows has not yet been realized.

7.21.2 Member Function Documentation

7.21.2.1 int seq64::maintime::idle_progress (long *ticks*)

Idle hands do the devil's work. We should eventually support some generic coloring for "dark themes". The default coloring is better for "light themes".

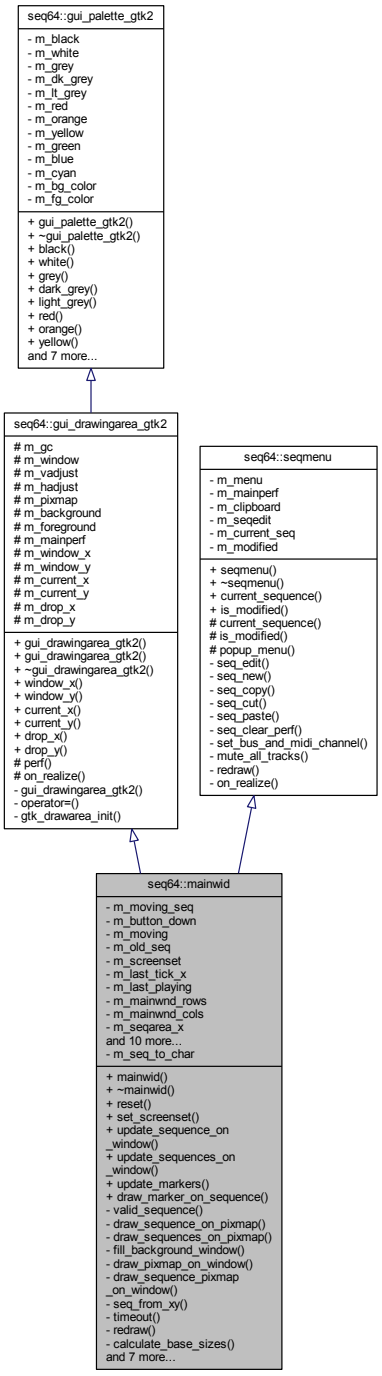
7.21.2.2 void seq64::maintime::on_realize ( ) [private]

It performs the base class's on_realize() function. It then allocates some additional resources: a window, a GC (?), and it clears the window. Then it sets the default size of the window, specified by GUI constructor parameters.

7.22 seq64::mainwid Class Reference

This class implement the piano roll area of the application.

Inheritance diagram for seq64::mainwid:



Public Member Functions

- mainwid (perform &p)

  This constructor sets a lot of the members, but not all.
- ~mainwid ()

  A rote destructor.
- void reset ()

This function redraws everything and queues up a redraw operation.

- void set_screenset (int ss)

  Set the current screen-set.
- void update_sequence_on_window (int seq)

  Updates the image of one sequencer.
- void update_sequences_on_window ()

  Updates the image of multiple sequencers.
- void update_markers (int ticks)

  Draw the cursors (long vertical bars) on each sequence, so that they follow the playing progress of each sequence in the mainwid (Patterns Panel.)
- void draw_marker_on_sequence (int seq, int tick)

  Does the actual drawing of one pattern/sequence position marker, a vertical progress bar.

Private Member Functions

- bool valid_sequence (int seq)

  Common-code helper function.
- void draw_sequence_on_pixmap (int seq)

  This function draws a specific pattern/sequence on the pixmap located in the main window of the application, the Patterns Panel.
- void draw_sequences_on_pixmap ()

  This function fills the pixmap with sequences.
- void fill_background_window ()

  This function updates the background window, clearing it.
- void draw_pixmap_on_window ()

  This function queues the blit of pixmap to window.
- void draw_sequence_pixmap_on_window (int seq)

  This function draws something in the Patterns Panel.
- int seq_from_xy (int x, int y)

  Translates XY coordiinates in the Patterns Panel to a sequence number.
- int timeout ()

  Provides a stock callback, because some kind of callback is need.
- void redraw (int seq)

  Draw the the given pattern/sequence again.
- void calculate_base_sizes (int seq, int &basex, int &basey)

  Provides a way to calculate the base x and y size values for the pattern map.
- void on_realize ()

  For this GTK callback, on realization of window, initialize the shiz.
- bool on_expose_event (GdkEventExpose *ev)

  Implements the GTK expose event callback.
- bool on_button_press_event (GdkEventButton *ev)

  Handles a press of a mouse button.
- bool on_button_release_event (GdkEventButton *ev)

  Handles a release of a mouse button.
- bool on_motion_notify_event (GdkEventMotion *p0)

  Handle the motion of the mouse if a mouse button is down and in another sequence and if the current sequence is not in edit mode.
- bool on_focus_in_event (GdkEventFocus *)

  Handles an on-focus event.
- bool on_focus_out_event (GdkEventFocus *)

  Handles an out-of-focus event.

Private Attributes

- int m_mainwnd_rows

  These values are assigned to the values given by the constants of similar names in globals.h, and we will make them parameters later.

Additional Inherited Members

7.22.1 Constructor & Destructor Documentation

7.22.1.1 seq64::mainwid::mainwid (perform & *p*)

And it asks for a size of c_mainwid_x by c_mainwid_y. It adds GDK masks for button presses, releases, and motion, and key presses and focus changes.

Parameters

p	Provides the reference to the all-important perform object.

7.22.2 Member Function Documentation

7.22.2.1 void seq64::mainwid::set_screenset (int *a_ss*)

Parameters

a_ss	Provides the screen-set number to set.

7.22.2.2 void seq64::mainwid::update_sequence_on_window (int *seqnum*)

Parameters

seqnum	Provides the number of the sequence to update.

7.22.2.3 void seq64::mainwid::update_markers (int *ticks*)

Parameters

ticks	Starting point for drawing the markers.

7.22.2.4 void seq64::mainwid::draw_marker_on_sequence (int *seqnum,* int *tick*)

If the sequence has no events, this function doesn't bother even drawing a position marker.

Note that, when Sequencer64 first comes up, and perform::is_dirty_main() is called, no sequences exist yet.

Parameters

seqnum	Provides the number of the sequence to draw.
tick	Provides the location to draw the marker.

7.22.2.5 bool seq64::mainwid::valid_sequence (int *seqnum*) [private]

Parameters

seqnum	Provides the number of the sequence to validate.

Returns

Returns true if the sequence number is valid for the current m_screenset value.

7.22.2.6 void seq64::mainwid::draw_sequence_on_pixmap (int *seqnum*) [private]

The sequence is drawn only if it is in the current screen set (indicated by m_screenset).

Also, we now ignore the sequence if it does not exist. :-D

Note

If only the main window is up, then the sequences just appear to play – the progress bars move in each pattern. Gaps in the song don't change the appearance of the patterns. But, if the Song (performance) Editor window is up, and the song is started using the controls in the Song (performance) Editor windows, then the active patterns are black (!) while playing, and white when gaps in the song are encountered. Also, the muting status in the main window seems to be ignored (based on coloring, anyway). However, the muting in the Song (performance) windows does seem to be in force.

Parameters

seqnum	Provides the number of the sequence slot that needs to be drawn.

7.22.2.7 void seq64::mainwid::draw_sequences_on_pixmap ( ) [private]

Please note that draw_sequence_on_pixmap() also draws the empty boxes of inactive sequences, so we cannot take shortcuts here.

7.22.2.8 void seq64::mainwid::draw_sequence_pixmap_on_window (int *seqnum*) [private]

The sequence is drawn only if it is in the current screen set (indicated by m_screenset. However, if we comment out this code, we can't see any difference in the Patterns Panel, even when playback is ongoing!

Parameters

seqnum	Provides the number of the sequence to draw.

7.22.2.9 int seq64::mainwid::seq_from_xy (int *a_x*, int *a_y*) [private]

Parameters

a_x	Provides the x coordinate.
a_y	Provides the y coordinate.

Returns

Returns -1 if the sequence number cannot be calculated.

7.22.2.10 int seq64::mainwid::timeout ( ) [private]

Todo We should use this callback to display the current time in the playback.

Returns

Always returns true.

7.22.2.11 void seq64::mainwid::redraw (int *seqnum*) [private], [virtual]

Parameters

seqnum	Provides the number of the sequence to draw.

Implements seq64::seqmenu.

7.22.2.12 void seq64::mainwid::calculate_base_sizes (int *seqnum*, int & *basex*, int & *basey*) [private]

The values are returned as side-effects.

Parameters

seqnum	Provides the number of the sequence to calculate.
basex	A return parameter for the x coordinate of the base size.
basey	A return parameter for the y coordinate of the base size.

7.22.2.13 void seq64::mainwid::on_realize ( ) [private]

It allocates any additional resources that weren't initialized in the constructor.

7.22.2.14 bool seq64::mainwid::on_expose_event (GdkEventExpose * *a_e*) [private]

Parameters

a_e	The expose event.

Returns

Always returns true.

7.22.2.15 bool seq64::mainwid::on_button_press_event (GdkEventButton * *p0*) [private]

It grabs the focus, calculates the pattern/sequence over which the button press occurred, and sets the m_button↩
_down flag if it is over a pattern.

Parameters

p0	Provides the parameters of the button event.

Returns

Always returns true.

7.22.2.16 bool seq64::mainwid::on_button_release_event (GdkEventButton * *p0*) [private]

This event is a lot more complex than a press. The left button toggles playback status. The right button brings up a popup menu. If the slot is empty, then a "New" popup is presented, otherwise an "Edit" and selection popup is presented.

Parameters

p0	Provides the parameters of the button event.

Returns

Always returns true.

7.22.2.17 bool seq64::mainwid::on_motion_notify_event (GdkEventMotion * *p0*) [private]

This function moves the selected pattern to another pattern slot.

Parameters

p0	Provides the parameters of the button event.

Returns

Always returns true.

7.22.2.18 bool seq64::mainwid::on_focus_in_event (GdkEventFocus *) [private]

Just sets the Gtk::HAS_FOCUS flag.

Returns

Always returns false.

7.22.2.19 bool seq64::mainwid::on_focus_out_event (GdkEventFocus *) [private]

Just unsets the Gtk::HAS_FOCUS flag.

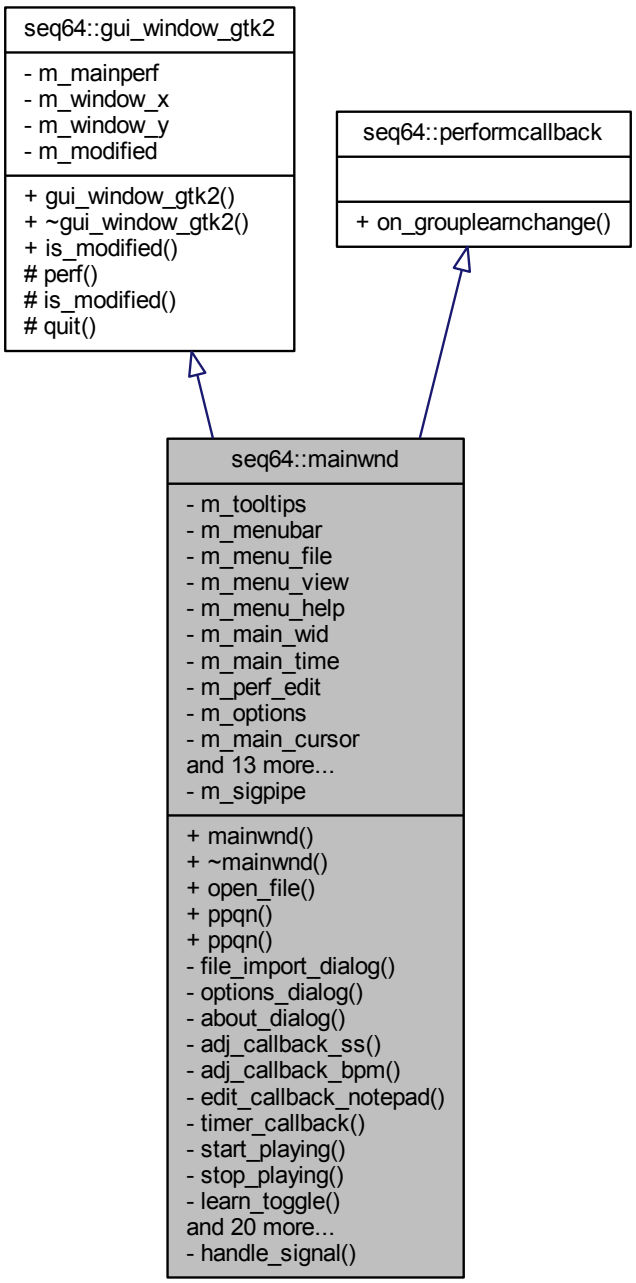
Returns

Always returns false.

7.23 seq64::mainwnd Class Reference

This class implements the functionality of the main window of the application, except for the Patterns Panel functionality, which is implemented in the mainwid class.

Inheritance diagram for seq64::mainwnd:



Public Member Functions

- mainwnd (perform &a_p)

  The constructor the main window of the application.
- ~mainwnd ()

  This destructor must explicitly delete some allocated resources.
- void open_file (const std::string &)

Opens and parses (reads) a MIDI file.

- int ppqn () const

  'Getter' function for member m_ppqn

- void ppqn (int ppqn)

  'Setter' function for member m_ppqn We can't set the PPQN value when the mainwnd is created, we have to do it later, using this function.

Private Member Functions

- void file_import_dialog ()

  Presents a file dialog to import a MIDI file.

- void options_dialog ()

  Opens the File / Options dialog.

- void about_dialog ()

  Presents a Help / About dialog.

- void adj_callback_ss ()

  This function is the callback for adjusting the screen-set value.

- void adj_callback_bpm ()

  This function is the callback for adjusting the BPM value.

- void edit_callback_notepad ()

  A callback function for handling an edit to the screen-set notepad.

- bool timer_callback ()

  This function is the GTK timer callback, used to draw our current time and BPM on_events (the main window).

- void learn_toggle ()

  Toggle the group-learn status.

- void open_performance_edit ()

  Opens the Performance Editor (Song Editor).

- void sequence_key (int seq)

  Use the sequence key to toggle the playing of an active pattern in the current screen-set.

- void update_window_title ()

  Updates the title shown in the title bar of the window.

- void toLower (std::string &)

  Converts a string to lower-case letters.

- void file_new ()

  A callback function for the File / New menu entry.

- void file_open ()

  A callback function for the File / Open menu entry.

- void file_save ()

  A callback function for the File / Save menu entry.

- void file_save_as ()

  A callback function for the File / Save As menu entry.

- void file_exit ()

  A callback function for the File / Exit menu entry.

- void new_file ()

  Actually does the work of setting up for a new file.

- bool save_file ()

  Saves the current state in a MIDI file.

- void choose_file ()

  Creates a file-chooser dialog.

- int query_save_changes ()

  Queries the user to save the changes made while the application was running.

- bool is_save ()

  If the data is modified, then the user is queried, and the file is save if okayed.
- bool install_signal_handlers ()

  Installs the signal handlers and pipe code.
- bool signal_action (Glib::IOCondition condition)

  Handles saving or exiting actions when signalled.
- bool on_delete_event (GdkEventAny *a_e)

  This callback function handles a delete event from ...?
- bool on_key_press_event (GdkEventKey *a_ev)

  Handles a key press event.
- bool on_key_release_event (GdkEventKey *a_ev)

  Handles a key release event.
- virtual void on_grouplearnchange (bool state)

  Notification handler for learn mode toggle.

Static Private Member Functions

- static void handle_signal (int sig)

  This function is the handler for system signals (SIGUSR1, SIGINT...) It writes a message to the pipe and leaves as soon as possible.

Private Attributes

- Gtk::MenuBar * m_menubar

  Theses objects support the menu and its sub-menus.
- mainwid * m_main_wid

  The biggest sub-components of mainwnd.
- maintime * m_main_time

  Is this the bar at the top that shows moving squares?
- perfedit * m_perf_edit

  A pointer to the song/performance editor.
- options * m_options

  A pointer to the program options.
- Gdk::Cursor m_main_cursor

  Mouse cursor?
- Gtk::Button * m_button_learn

  This button is the learn button, otherwise known as the "L" button.
- Gtk::Button * m_button_stop

  Implements the red square stop button.
- Gtk::Button * m_button_play

  Implements the green triangle play button.
- Gtk::Button * m_button_perfedit

  The button for bringing up the Song Editor (Performance Editor).
- Gtk::SpinButton * m_spinbutton_bpm

  The spin/adjustment controls for the BPM (beats-per-minute) value.
- Gtk::SpinButton * m_spinbutton_ss

  The spin/adjustment controls for the screen set value.
- Gtk::SpinButton * m_spinbutton_load_offset

  The spin/adjustment controls for the load offset value.
- Gtk::Entry * m_entry_notes

What is this?

- sigc::connection m_timeout_connect

  Provides a timeout handler.

- int m_ppqn

  Saves the PPQN value obtained from the MIDI file (or the default value, c_ppqn, if SEQ64_USE_DEFAULT_PPQN was specified in reading the MIDI file.

Static Private Attributes

- static int m_sigpipe [2]

  Interesting; what is this used for.

Additional Inherited Members

7.23.1 Constructor & Destructor Documentation

7.23.1.1 seq64::mainwnd::mainwnd (perform & *p*)

This constructor is way too large; it would be nicer to provide a number of well-named initialization functions.

Parameters

p	Refers to the main performance object.

Todo Offload most of the work into an initialization function like options does; make the perform parameter a reference; valgrind flags m_tooltips as lost data, but if we try to manage it ourselves, many more leaks occur.

File menu items, their accelerator keys, and their hot keys.

View menu items and their hot keys.

Help menu items

Top panel items, including the logo (updated for the new version of this application) and the "timeline" progress bar.

7.23.2 Member Function Documentation

7.23.2.1 void seq64::mainwnd::open_file (const std::string & *fn*)

We leave the ppqn parameter set to the SEQ64_USE_DEFAULT for now, to preserve the legacy behavior of using c_ppqn, and scaling the running time against the PPQN read from the MIDI file. Later, we can provide a value like 0, that will certainly be changed by reading the MIDI file.

We don't need to specify the "propformat" parameter of the midifile constructor when reading the MIDI file, since reading handles both the old and new formats.

Parameters

fn	Provides the file-name for the MIDI file to be opened.

7.23.2.2 void seq64::mainwnd::ppqn (int *ppqn*) [inline]

m_ppqn = (ppqn == SEQ64_USE_DEFAULT_PPQN) ? global_ppqn : ppqn ;

7.23.2.3 void seq64::mainwnd::file_import_dialog ( ) [private]

Note that every track of the MIDI file will be imported, even if the track is only a label track (without any MIDI events), or a very long track.

The main difference between the Open operation and the Import operation seems to be that the latter can read MIDI files into a screen-set greater than screen-set 0. No, that's not true, so far. No matter what the current screen-set setting, the import is appended after the current data in screen-set 0. Then, if it overflows that screen-set, the overflow goes into the next screen-set.

It might be nice to have the option of importing a MIDI file into a specific screen-set, for better organization. Set versus append.

Todo We need to look into the Import process and document it better.

7.23.2.4 void seq64::mainwnd::about_dialog ( ) [private]

I (Chris) took the liberty of tacking my name at the end, and hope to eventually have done enough work to warrant having it there.

7.23.2.5 void seq64::mainwnd::adj_callback_ss ( ) [private]

Sets the screen-set value in the Performance/Song window, the Patterns, and something about setting the text based on a screen-set notepad from the Performance/Song window.

Screen-set notepad?

7.23.2.6 bool seq64::mainwnd::timer_callback ( ) [private]

Note

When Sequencer64 first starts up, and no MIDI tune is loaded, the call to mainwid::update_markers() leads to trying to do some work on sequences that don't yet exist.

7.23.2.7 void seq64::mainwnd::open_performance_edit ( ) [private]

Todo Try to find a way to set m_modified only if the song editor actually changes something, instead of just because it was opened.

7.23.2.8 void seq64::mainwnd::update_window_title ( ) [private]

Note that the name of the application is obtained by the "(SEQ64_PACKAGE)" construction.

The format of the caption bar is the name of the package/application, followed by the file-specification (shortened if necessary so that the name of the file itself can be seen), ending with the PPQN value in parentheses.

7.23.2.9 bool seq64::mainwnd::save_file ( ) [private]

Here we specify the current value of m_ppqn, which was set when reading the MIDI file.

7.23.2.10 bool seq64::mainwnd::signal_action (Glib::IOCondition *condition*) [private]

Returns

Returns true if the signalling was able to be completed, even if it was an unexpected signal.

7.23.2.11 bool seq64::mainwnd::on_delete_event (GdkEventAny * *a_e*) [private]

Any changed data is saved. If the pattern is playing, then it is stopped.

7.23.2.12 bool seq64::mainwnd::on_key_press_event (GdkEventKey * *a_ev*) [private]

It also handles the control-key and modifier-key combinations matching the entries in its list of if statements.

Todo Test this functionality in old and new application.

7.23.2.13 bool seq64::mainwnd::on_key_release_event (GdkEventKey * *a_ev*) [private]

Is this worth turning into a switch statement? Or offloading to a perform member function? The latter.

Todo Test this functionality in old and new application.

Returns

Always returns false.

7.23.2.14 void seq64::mainwnd::on_grouplearnchange (bool *state*) [private], [virtual]

This handler responds to a learn-mode change from perf().

Reimplemented from seq64::performcallback.

7.23.3 Field Documentation

7.23.3.1 int seq64::mainwnd::m_sigpipe [static], [private]

This static member provides a couple of pipes for signalling/messaging.

7.23.3.2 mainwid* seq64::mainwnd::m_main_wid [private]

The first is the Patterns Panel.

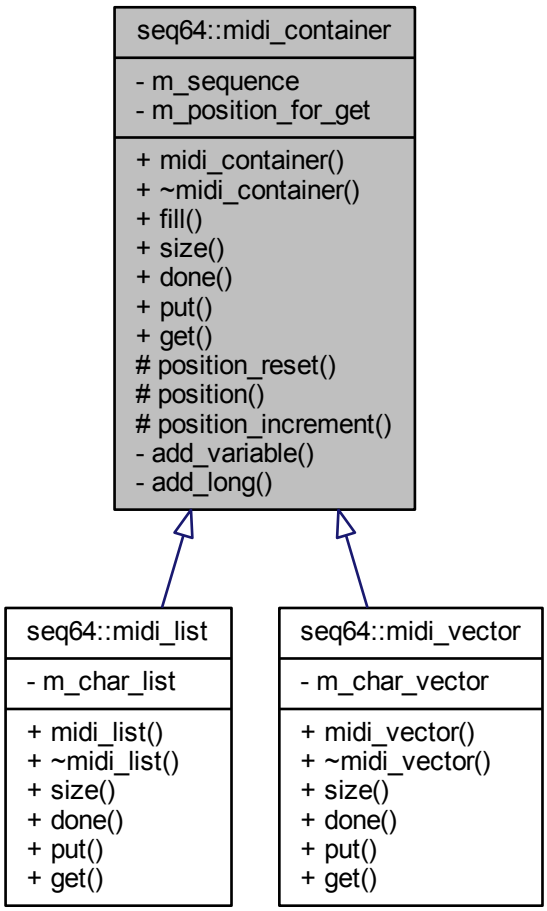
7.23.3.3 Gtk::SpinButton* seq64::mainwnd::m_spinbutton_load_offset [private]

However, where is this button located? It is handled in the code, but I've never seen the button!

7.24 seq64::midi_container Class Reference

This class is the abstract base class for a container of MIDI track information.

Inheritance diagram for seq64::midi_container:



Public Member Functions

- midi_container (sequence &seq)

  Fills in the few members of this class.
- virtual ~midi_container ()

  A rote constructor needed for a base class.
- void fill (int tracknumber)

  This function fills the given character list with MIDI data from the current sequence, preparatory to writing it to a file.
- virtual std::size_t size () const

  Returns the size of the container, in midibytes.
- virtual bool done () const

  Instead of checking for the size of the container when "emptying" it [see the midifile::write() function], use this function, which is overridden to match the type of container being used.

- virtual void put (midibyte b)=0

  Provides a way to add a MIDI byte into the container.
- virtual midibyte get ()=0

  Provide a way to get the next byte from the container.

Protected Member Functions

- unsigned int position () const

  Returns the current position.

Private Member Functions

- void add_variable (long v)

  This function masks off the lower 8 bits of the long parameter, then shifts it right 7, and, if there are still set bits, it encodes it into the buffer in reverse order.
- void add_long (long x)

  What is the difference between this function and add_list_var()?

Private Attributes

- sequence & m_sequence

  Provide a hook into a sequence so that we can exchange data with a sequence object.
- unsigned int m_position_for_get

  Provides the position in the container when making a series of get() calls on the container.

7.24.1 Member Function Documentation

7.24.1.1 void seq64::midi_container::fill (int *tracknumber*)

Note that some of the events might not come out in the same order they were stored in (we see that with program-change events.

This function replaces sequence::fill_container().

Now, for sequence 0, an alternate format for writing the sequencer number chunk is "FF 00 00". But that format can only occur in the first track, and the rest of the tracks then don't need a sequence number, since it is assume to increment. This application doesn't bother with that shortcut.

Not threadsafe The sequence object bound to this container needs to provide the locking mechanism when calling this function.

Parameters

tracknumber	Provides the track number. This number is masked into the track information.

7.24.1.2 virtual void seq64::midi_container::put (midibyte *b*) [pure virtual]

The original seq24 container used an std::list and a push_front operation.

Implemented in seq64::midi_list, and seq64::midi_vector.

7.24.1.3 virtual midibyte seq64::midi_container::get ( ) [pure virtual]

It also increments m_position_for_get.

Implemented in seq64::midi_list, and seq64::midi_vector.

7.24.1.4 unsigned int seq64::midi_container::position ( ) const [inline], [protected]

Before the return, the position counter is incremented to the next position.

7.24.1.5 void seq64::midi_container::add_variable (long *v*) [private]

This function "replaces" sequence::add_list_var().

7.24.1.6 void seq64::midi_container::add_long (long *x*) [private]

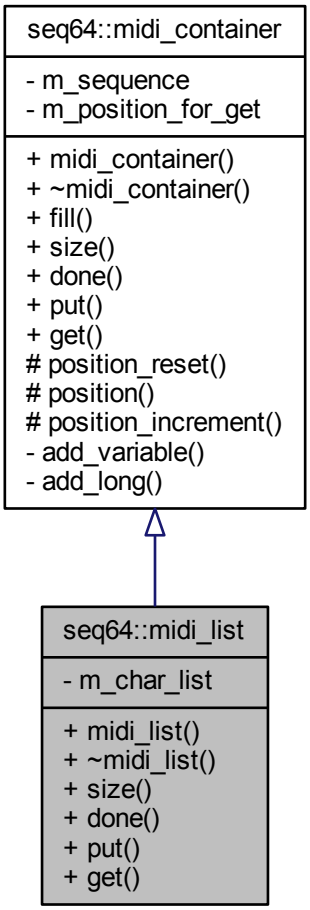
This function "replaces" sequence::add_long_list().

This was a *global* internal function called addLongList(). Let's at least make it a private member now, and hew to the naming conventions of this class.

7.25 seq64::midi_list Class Reference

This class is the std::list implementation of the midi_container.

Inheritance diagram for seq64::midi_list:



Public Member Functions

- midi_list (sequence &seq)

  This constructor fills in the members.
- virtual ~midi_list ()

  A rote constructor needed for a base class.
- virtual std::size_t size () const

  Returns the size of the container, in midibytes.
- virtual bool done () const

  For popping data from the MIDI list, we are done when the container is empty.
- virtual void put (midibyte b)

  Provides a way to add a MIDI byte into the list.
- virtual midibyte get ()

  Provide a way to get the next byte from the container.

Private Types

- typedef std::list< midibyte > CharList

  Provides the type of this container.

Private Attributes

- CharList m_char_list

  The container itself.

Additional Inherited Members

7.25.1 Member Typedef Documentation

7.25.1.1 typedef std::list<midibyte> seq64::midi_list::CharList [private]

This type is basically the same as the container used in the midifile module, and almost identical to the CharList type defined in the sequence module.

7.25.2 Member Function Documentation

7.25.2.1 virtual void seq64::midi_list::put (midibyte *b*) [inline], [virtual]

The original seq24 list used an std::list and a push_front operation.

Implements seq64::midi_container.

7.25.2.2 virtual midibyte seq64::midi_list::get ( ) [inline], [virtual]

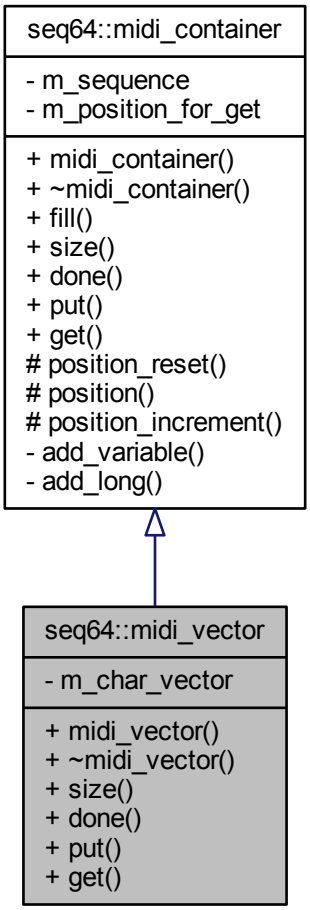
In this implement, m_position_for_get is not used. The elements of the container are popped of backward!

Implements seq64::midi_container.

7.26 seq64::midi_vector Class Reference

This class is the std::vector implementation of the midi_container.

Inheritance diagram for seq64::midi_vector:



Public Member Functions

- midi_vector (sequence &seq)

  This constructor fills in the members.
- virtual ~midi_vector ()

  A rote constructor needed for a base class.
- virtual std::size_t size () const

  Returns the size of the container, in midibytes.
- virtual bool done () const

  For iterating through the data in the MIDI vector, we are done when we've gotten the last element of the container.
- virtual void put (midibyte b)

  Provides a way to add a MIDI byte into the list.
- virtual midibyte get ()

  Provide a way to get the next byte from the container.

Private Types

- typedef std::vector< midibyte > CharVector

  Provides the type of this container.

Private Attributes

- CharVector m_char_vector

  The container itself.

Additional Inherited Members

7.26.1 Member Function Documentation

7.26.1.1 virtual void seq64::midi_vector::put (midibyte *b*) [inline], [virtual]

The original seq24 list used an std::list and a push_front operation.

Implements seq64::midi_container.

7.26.1.2 virtual midibyte seq64::midi_vector::get ( ) [inline], [virtual]

In this implement, m_position_for_get is not used. The elements of the container are popped of backward!

Implements seq64::midi_container.

7.27 seq64::midifile Class Reference

This class handles the parsing and writing of MIDI files.

Public Member Functions

- midifile (const std::string &name, int ppqn=SEQ64_USE_DEFAULT_PPQN, bool propformat=true)

  Principal constructor.
- ~midifile ()

  A rote destructor.
- bool parse (perform &a_perf, int a_screen_set)

  This function opens a binary MIDI file and parses it into sequences and other application objects.
- bool write (perform &a_perf)

  Write the whole MIDI data and Seq24 information out to the file.
- int ppqn () const

  'Getter' function for member m_ppqn Provides a way to get the actual value of PPQN used in processing the sequences when parse() was called.

Private Member Functions

- unsigned long parse_prop_header (int file_size)

  Parse the proprietary header, figuring out if it is the new format, or the legacy format, for sequencer-specific data.
- bool parse_proprietary_track (perform &a_perf, int file_size)

  After all of the conventional MIDI tracks are read, we're now at the "proprietary" Seq24 data section, which describes the various features that Seq24 supports.

- unsigned long read_long ()

  Reads 4 bytes of data using read_byte().
- unsigned short read_short ()

  Reads 2 bytes of data using read_byte().
- unsigned char read_byte ()

  Reads 1 byte of data directly into the m_data vector, incrementing m_pos after doing so.
- unsigned long read_varinum ()

  Read a MIDI Variable-Length Value (VLV), which has a variable number of bytes.
- void write_long (unsigned long)

  Writes 4 bytes, using the write_byte() function.
- void write_short (unsigned short)

  Writes 2 bytes, using the write_byte() function.
- void write_byte (unsigned char c)

  Writes 1 byte.
- void write_varinum (unsigned long)

  Writes a MIDI Variable-Length Value (VLV), which has a variable number of bytes.
- void write_track_name (const std::string &trackname)

  Writes out a track name.
- void write_seq_number (unsigned short seqnum)

  Writes out a sequence number.
- void write_track_end ()

  Writes out the end-of-track marker.
- void write_prop_header (unsigned long tag, long len)

  We want to write:
- bool write_proprietary_track (perform &a_perf)

  Writes out the proprietary section, using the new format if the legacy format is not in force.
- long varinum_size (long len) const

  Calculates the length of a variable length value.
- long prop_item_size (long datalen) const

  Calculates the size of a proprietary item, as written by the write_prop_header() function, plus whatever is called to write the data.
- long track_name_size (const std::string &trackname) const

  Calculates the size of a trackname and the meta event that specifies it.
- long seq_number_size () const

  Returns the size of a sequence-number event, which is always 5 bytes, plus one byte for the delta time that precedes it.
- long track_end_size () const

  Returns the size of a track-end event, which is always 3 bytes.

Private Attributes

- int m_pos

  Holds the position in the MIDI file.
- const std::string m_name

  The unchanging name of the MIDI file.
- std::vector< unsigned char > m_data

  This vector of characters holds our MIDI data.
- std::list< unsigned char > m_char_list

  Provides a list of characters.
- bool m_new_format

  Use the new format for the proprietary footer section of the Seq24 MIDI file.

- int m_ppqn

  Provides the current value of the PPQN, which used to be the constant c_ppqn (which itself is now the variable global_ppqn).
- bool m_use_default_ppqn

  Indicates that the default PPQN is in force.

7.27.1 Detailed Description

In addition to the standard MIDI tracks, it also handles some "private" or "proprietary" tracks specific to Seq24. It does not, however, handle SYSEX events.

7.27.2 Constructor & Destructor Documentation

7.27.2.1 seq64::midifile::midifile (const std::string & *name*, int *ppqn* = SEQ64_USE_DEFAULT_PPQN, bool *propformat* = true)

Parameters

name	Provides the name of the MIDI file to be read or written.
ppqn	Provides the initial value of the PPQN setting. It is handled differently for parsing (reading) versus writing the MIDI file. • Reading. – If set to SEQ64_USE_DEFAULT_PPQN, the legacy application behavior is used. The m_ppqn member is set to the default PPQN, global_ppqn = c_ppqn. The value read from the MIDI file, ppqn, is then use to scale the running-time of the sequence relative to global_ppqn. – Otherwise, m_ppqn is set to the value read from the MIDI file. No scaling is done. Since the value gets written, specify ppqn as 0, an obviously bogus value, to get this behavior. • Writing. This value is written to the MIDI file in the header chunk of the song. Note that the caller must query for the PPQN set during parsing, and pass it to the constructor when preparing to write the file. See how it is done in the mainwnd class.

propformat	If true, write out the MIDI file using the new MIDI-compliant sequencer-specific format for the seq24-specific SeqSpec tags defined in the globals module. This option is true by default. Note that this option is only used in writing; reading can handle either format transparently.

7.27.3 Member Function Documentation

7.27.3.1 bool seq64::midifile::parse (perform & *a_perf,* int *screenset*)

In addition to the standard MIDI track data in a normal track, Seq24 adds four sequencer-specific events just before the end of the track:

```
    c_triggers_new:     SeqSpec FF 7F 1C 24 24 00 08 00 00 ...
    c_midibus:          SeqSpec FF 7F 05 24 24 00 01 00
    c_timesig:          SeqSpec FF 7F 06 24 24 00 06 04 04
    c_midich:           SeqSpec FF 7F 05 24 24 00 02 06


Standard MIDI provides for the port and channel specifications, but
they are apparently considered obsolete:

Obsolete meta-event:               Replacement:


    MIDI port (buss):   FF 21 01 po     Device (port) name: FF 09 len text
    MIDI channel:       FF 20 01 ch


What do other applications use for specifying port/channel?
```

Parameters

a_perf	Provides a reference to the perform object into which sequences/tracks are to be added.
screenset	The screen-set to be updated.

Returns

Returns true if the parsing succeeded.

7.27.3.2 bool seq64::midifile::write (perform & *a_perf*)

Parameters

a_perf	Provides the object that will contain and manage the entire performance.

Returns

Returns true if the write operations succeeded.

Warning

This writing backwards reverses the order of some events that are otherwise equivalent in time-stamp and rank. But it must be done this way, otherwise many items are backward.

7.27.3.3 int seq64::midifile::ppqn ( ) const [inline]

The PPQN will be either global_ppqn = c_ppqn (legacy behavior) or the value read from the file, depending on the ppqn parameter passed to the midifile constructor.

7.27.3.4 unsigned long seq64::midifile::parse_prop_header (int *file_size*) [private]

The new format creates a final track chunk, starting with "MTrk". Then comes the delta-time (here, 0), and the event. An event is a MIDI event, a SysEx event, or a Meta event.

A MIDI Sequencer Specific meta message includes either a delta time or absolute time, and the MIDI Sequencer Specific event encoded as follows:

```
        0xFF 0x7F 0x02 length data
```

```
For convenience, this function first checks the amount of file data
left.  Then it reads a long value.  If the value starts with FF, then
that signals the new format.  Otherwise, it is probably the old
format, and the long value is a control tag (0x242400nn), which can be
returned immedidately.

If it is the new format, we back up to the FF, then get the next byte,
which should be a 7F.  If so, then we read the length (a variable
length value) of the data, and then read the long value, which should
be the control tag, which, again, is returned by this function.
```

Note

Most sequencers seem to be tolerant of both the lack of an "MTrk" marker and of the presence of an unwrapped control tag, and so can handle both the old and new formats of the final proprietary track.

Parameters

file_size	The size of the data file. This value is compared against the member m_pos (the position inside m_data[]), to make sure there is enough data left to process.

Returns

Returns the control-tag value found. These are the values, such as c_midich, found in the globals module, that indicate the type of sequencer-specific data that comes next. If there is not enough data to process, then 0 is returned.

7.27.3.5 bool seq64::midifile::parse_proprietary_track (perform & *a_perf,* int *file_size*) [private]

It consists of series of tags:

- c_midictrl
- c_midiclocks
- c_notes
- c_bpmtag
- c_mutegroups

(There are more tags defined in the globals module, but they are not used in this function. This doesn't quite make sense, as there are also some "triggers" values, and we're pretty sure the application uses them.)

The format is (1) tag ID; (2) length of data; (3) the data.

Change Note ca 2015-08-16 First, we separate out this function for a little more clarify. Then we add code to handle reading both the legacy Seq24 format and the new, MIDI-compliant format. Note that the format is not quite correct, since it doesn't handle a MIDI manufacturer's ID, making it a single byte that is part of the data.

Parameters

a_perf	The performance object that is being set via the incoming MIDI file.
file_size	The file size as determined in the parse() function.

There is also an implicit parameter in the m_pos member variable.

7.27.3.6 unsigned long seq64::midifile::read_long ( ) [private]

Warning

This code looks endian-dependent and integer-size dependent.

7.27.3.7 unsigned short seq64::midifile::read_short ( ) [private]

Warning

This code looks endian-dependent.

7.27.3.8 unsigned long seq64::midifile::read_varinum ( ) [private]

This function reads the bytes while bit 7 is set in each byte. Bit 7 is a continuation bit. See write_varinum() for more information.

7.27.3.9 void seq64::midifile::write_long (unsigned long *a_x*) [private]

Warning

This code looks endian-dependent.

7.27.3.10 void seq64::midifile::write_short (unsigned short *a_x*) [private]

Warning

This code looks endian-dependent.

7.27.3.11 void seq64::midifile::write_byte (unsigned char *c*) [inline], [private]

The byte is written to the m_char_list member, using a call to push_back().

7.27.3.12 void seq64::midifile::write_varinum (unsigned long *value*) [private]

A MIDI file Variable Length Value is stored in bytes. Each byte has two parts: 7 bits of data and 1 continuation bit. The highest-order bit is set to 1 if there is another byte of the number to follow. The highest-order bit is set to 0 if this byte is the last byte in the VLV.

To recreate a number represented by a VLV, first you remove the continuation bit and then concatenate the leftover bits into a single number.

To generate a VLV from a given number, break the number up into 7 bit units and then apply the correct continuation bit to each byte.

In theory, you could have a very long VLV number which was quite large; however, in the standard MIDI file specification, the maximum length of a VLV value is 5 bytes, and the number it represents can not be larger than 4 bytes.

Here are some common cases:

```
-  Numbers between 0 and 127 (0x7F) are represented by a single
   byte.
-  0x80 is represented as "0x81 0x00".
-  0x0FFFFFFF (the largest number) is represented as "0xFF 0xFF
   0xFF 0x7F".
```

Also see the varinum_size() function.

7.27.3.13 void seq64::midifile::write_track_name (const std::string & *trackname*) [private]

Note that we have to precede this "event" with a delta time value, set to 0.

7.27.3.14 void seq64::midifile::write_seq_number (unsigned short *seqnum*) [private]

The format is "FF 00 02 ss ss", where "02" is actually the constant length of the data. We have to precede these values with a 0 delta time, of course.

Now, for sequence 0, an alternate format is "FF 00 00". But that format can only occur in the first track, and the rest of the tracks then don't need a sequence number, since it is assume to increment. This application doesn't bother with that shortcut.

7.27.3.15 void seq64::midifile::write_prop_header (unsigned long *control_tag*, long *data_length*) [private]

- 0x4D54726B. The track tag "MTrk". The MIDI spec requires that software can skip over non-standard chunks. "Prop"? Would require a fix to midicvt.
- 0xaabbccdd. The length of the track. This needs to be calculated somehow.
- 0x00. A zero delta time.
- 0x7f7f, The sequence number, a special value, well out of our normal range.
- The name of the track:
  - "Seq24-Spec"
  - "Sequencer24-S"

  Then follows the proprietary data, written in the normal manner.

  Finally, tack on the track-end meta-event.
  Components of final track size:

```
-# Delta time.  1 byte, always 0x00.
-# Sequence number.  5 bytes.  OPTIONAL.  We won't write it.
-# Track name. 3 + 10 or 3 + 15
-# Series of proprietary specs:
   -# Prop header:
      -# If legacy format, 4 bytes.
      -# Otherwise, 2 bytes + varinum_size(length) + 4 bytes.
      -# Length of the prop data.
-# Track End. 3 bytes.
```

Writes a "proprietary" Seq24 footer header in either the new MIDI-compliant format, or the legacy Seq24 format. This function does not write the data. It replaces calls such as "write_long(c_midich)" in the proprietary secton of write().

The legacy format just writes the control tag (0x242400xx). The new format writes 0x00 0xFF 0x7F len 0x242400xx; the first 0x00 is the delta time.

In the new format, the 0x24 is a kind of "manufacturer ID". At http://www.midi.org/techspecs/manid.↩
php we see that most manufacturer IDs start with 0x00, and are thus three bytes long, or start with codes at 0x40 and above. Similary, http://sequence15.blogspot.com/2008/12/midi-manufacturer-ids.↩
html shows that no manufacturer uses 0x24.

Warning

Currently, the manufacturer ID is not handled; it is part of the data, which can be misleading in programs that analyze MIDI files.

Parameters

control_tag	Determines the type of sequencer-specific section to be written. It should be one of the value in the globals module, such as c_midibus or c_mutegroups.
data_length	The amount of data that will be written. This parameter does not count the length of the header itself.

7.27.3.16 bool seq64::midifile::write_proprietary_track (perform & *a_perf*) [private]

The first thing to do, for the new format only, is calculate the length of this big section of data. This was quite tricky; we tweaked and adjusted until the midicvt program handled the whole new-format file without emitting any errors.

7.27.3.17 long seq64::midifile::varinum_size (long *len*) const [private]

This function is needed when calculating the length of a track. Note that it handles only the following situations:

https://en.wikipedia.org/wiki/Variable-length_quantity

```
1 byte:  0x00 to 0x7F
2 bytes: 0x80 to 0x3FFF
3 bytes: 0x4000 to 0x001FFFFF
4 bytes: 0x200000 to 0x0FFFFFFF
```

Returns

Returns values as noted above. Anything beyond that range returns 0.

7.27.3.18 long seq64::midifile::prop_item_size (long *data_length*) const [private]

If using the new format, the length includes the sum of sequencer-specific tag (0xFF 0x7F) and the size of the variable-length value. Then, for legacy and new format, 4 bytes are added for the Seq24 MIDI control value, and the the data length is added.

7.27.3.19 long seq64::midifile::seq_number_size ( ) const [inline], [private]

7.27.4 Field Documentation

7.27.4.1 int seq64::midifile::m_pos [private]

This is at least a 31-bit value in the recent architectures running Linux and Windows, so it will handle up to 2 Gb of data. This member is used as the offset into the m_data vector.

7.27.4.2 std::vector<unsigned char> seq64::midifile::m_data [private]

We could also use a string of characters, unsigned. This member is resized to the putative size of the MIDI file, in the parse() function. Then the whole file is read into it, as if it were an array. This member is an input buffer.

7.27.4.3 std::list<unsigned char> seq64::midifile::m_char_list [private]

The class pushes each MIDI byte into this list using the write_byte() function. Also note that the write() function calls sequence::fill_list() to fill a temporary std::list<char> (!) buffer, then writes that data *backwards* to this member. This member is an output buffer.

7.27.4.4 bool seq64::midifile::m_new_format [private]

In this new format, each sequencer-specfic value (0x242400xx, as defined in the globals module) is preceded by the sequencer-specific prefix, 0xFF 0x7F len id/date). By default, this value is true, but the user can specify the –legacy (-l) option, or make a soft link to the sequence24 binary called "seq24", to write the data in the old format. [We will eventually add the –legacy option to the ~/.seq24rc configuration file.] Note that reading can handle either format transparently.

7.28 seq64::options Class Reference

This class supports a full tabbed options dialog.

Inherits Dialog.

Private Types

- enum button

  Defines buttons indices or IDs for some controls related to JACK.

Private Attributes

- perform & m_mainperf

  The performance object to which some of these options apply.

- Gtk::Button * m_button_ok

  The famous "OK" button's pointer.

- Gtk::Notebook * m_notebook

  Not sure yet what this notebook is for.

7.28.1 Field Documentation

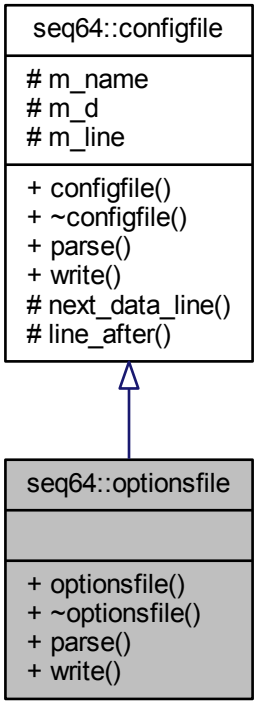
7.28.1.1 Gtk::Notebook* seq64::options::m_notebook [private]

Must be a GTK thang.

7.29 seq64::optionsfile Class Reference

Provides a file for reading and writing the application' main configuration file.

Inheritance diagram for seq64::optionsfile:



Public Member Functions

- optionsfile (const std::string &name)

  Principal constructor.
- ~optionsfile ()

  A rote destructor.
- bool parse (perform &perf)

  Parse the ~/.seq24rc or ~/.config/sequencer64/sequencer64.rc file.
- bool write (const perform &perf)

  This options-writing function is just about as complex as the options-reading function.

Additional Inherited Members

7.29.1 Detailed Description

The settings that are passed around are provided or used by the perform class.

7.29.2 Member Function Documentation

7.29.2.1 bool seq64::optionsfile::parse (perform & *a_perf*) [virtual]

[midi-control]

Get the number of sequence definitions provided in the [midi-control] section. Ranges from 32 on up. Then read in all of the sequence lines. The first 32 apply to the first screen set. There can also be a comment line "# mute in group" followed by 32 more lines. Then there are addditional comments and single lines for BPM up, BPM down, Screen Set Up, Screen Set Down, Mod Replace, Mod Snapshot, Mod Queue, Mod Gmute, Mod Glearn, and Screen Set Play. These are all forms of MIDI automation useful to control the playback while not sitting near the computer.

[mute-group]

The mute-group starts with a line that indicates up to 32 mute-groups are defined. A common value is 1024, which means there are 32 groups times 32 keys. But this value is currently thrown away. This value is followed by 32 lines of data, each contained 4 sets of 8 settings. See the seq24-doc project on GitHub for a much more detailed description of this section.

[midi-clock]

The MIDI-clock section defines the clocking value for up to 16 output busses. The first number, 16, indicates how many busses are specified. Generally, these busses are shown to the user with names such as "[1] seq24 1".

[keyboard-control]

The keyboard control defines the keys that will toggle the stage of each of up to 32 patterns in a pattern/sequence box. These keys are displayed in each box as a reminder. The first number specifies the Key number, and the second number specifies the Sequence number.

[keyboard-group]

The keyboard group specifies more automation for the application. The first number specifies the Key number, and the second number specifies the Group number. This section should be better described in the seq24-doc project on GitHub.

[jack-transport]

This section covers various JACK settings, one setting per line. In order, the following numbers are specfied:

```
-   jack_transport - Enable sync with JACK Transport.
-   jack_master - Seq24 will attempt to serve as JACK Master.
-   jack_master_cond - Seq24 will fail to be Master if there is
    already a Master set.
-   jack_start_mode:
    -   0 = Playback will be in Live mode.  Use this to allow
        muting and unmuting of loops.
    -   1 = Playback will use the Song Editor's data.
```

[midi-input]

This section covers the MIDI input busses, and has a format similar to "[midi-clock]". Generally, these busses are shown to the user with names such as "[1] seq24 1", and currently there is only one input buss. The first field is the port number, and the second number indicates whether it is disabled (0), or enabled (1).

[midi-clock-mod-ticks]

This section covers.... One common value is 64.

[manual-alsa-ports]

This section covers.... Set to 1 if you want seq24 to create its own ALSA ports and not connect to other clients.

[last-used-dir]

This section simply holds the last path-name that was used to read or write a MIDI file. We still need to add a check for a valid path, and currently the path must start with a "/", so it is not suitable for Windows.

[interaction-method]

This section specified the kind of mouse interaction.

- 0 = 'seq24' (original Seq24 method).
- 1 = 'fruity' (similar to a certain fruity sequencer we like).

The second data line is set to "1" if Mod4 can be used to keep seq24 in note-adding mode even after the right-click is released, and "0" otherwise.

Implements seq64::configfile.

7.29.2.2 bool seq64::optionsfile::write (const perform & *a_perf*) [virtual]

Parameters

a_perf	Provides a const reference to the main perform object. However, we have to cast away the constness, because too many of the perform getter functions are used in non-const contexts.

Returns

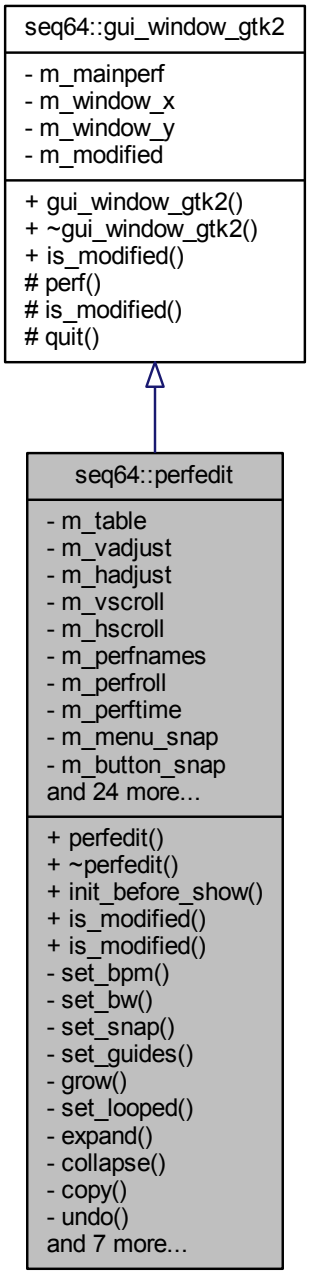
Returns true if the write operations all succeeded.

Implements seq64::configfile.

7.30 seq64::perfedit Class Reference

This class supports a Performance Editor that is used to arrange the patterns/sequences defined in the patterns panel.

Inheritance diagram for seq64::perfedit:



Public Member Functions

- perfedit (perform &p, int ppqn=SEQ64_USE_DEFAULT_PPQN, int bpm=DEFAULT_BEATS_PER_MEAS↩ URE, int bw=DEFAULT_BEAT_WIDTH)

  Principal constructor, has a reference to a perform object.

- ~perfedit ()

  This rote constructor does nothing.

- void init_before_show ()

  This function forwards its call to the perfroll function of the same name.
- void is_modified (bool flag)

  'Setter' function for member m_modified
- bool is_modified () const

  'Getter' function for member m_modified

Private Member Functions

- void set_bpm (int beats_per_measure)

  Sets the BPM (beats per minute) text and values to the given value, and then calls set_guides().
- void set_bw (int beat_width)

  Sets the BW (beat width, or the denominator in the time signature) text and values to the given value, and then calls set_guides().
- void set_snap (int snap)

  Sets the snap text and values to the given value, and then calls set_guides().
- void set_guides ()

  Sets the guides, which are the L and R user-interface elements.
- void grow ()

  Increments the size of the perfroll and perftime objects.
- void set_looped ()

  Set the looping in the perform object.
- void expand ()

  Implement the expand action.
- void collapse ()

  Implement the collapse action.
- void copy ()

  Implement the copy (actually, expand-and-copy) action.
- void undo ()

  Implement the undo feature (Ctrl-Z).
- void popup_menu (Gtk::Menu *menu)

  Opens the given popup menu.
- bool timeout ()

  Handles a drawing timeout.
- void start_playing ()

  Implement the playing.
- void stop_playing ()

  Stop the playing.
- void on_realize ()

  This callback function calls the base-class on_realize() fucntion, and then connects the perfedit::timeout() function to the Glib signal-timeout, with a redraw timeout of m_redraw_ms.
- bool on_key_press_event (GdkEventKey *ev)

  This function is the callback for a key-press event.
- bool on_delete_event (GdkEventAny *)

  All this callback function does is return false.

Private Attributes

- Gtk::Menu * m_menu_bpm

  Menus for time signature, beats per measure, beat width.
- int m_snap

  Set snap-to in "pulses".

Additional Inherited Members

7.30.1 Detailed Description

It has a seqroll and piano roll? No, it has a perform, a perfnames, a perfroll, and a perftime.

7.30.2 Constructor & Destructor Documentation

7.30.2.1 seq64::perfedit::perfedit (perform & *p*, int *ppqn* = SEQ64_USE_DEFAULT_PPQN, int *bpm* = DEFAULT_BEATS_PER_MEASURE, int *bw* = DEFAULT_BEAT_WIDTH)

We've reordered the pointer members and put them in the initializer list to make the constructor a bit cleaner.

Parameters

p	Refers to the main performance object.

Todo Offload most of the work into an initialization function like options does; make the perform parameter a reference.

7.30.2.2 seq64::perfedit::~perfedit ( )

We're going to have to run the application through valgrind to make sure that nothing is left behind.

7.30.3 Member Function Documentation

7.30.3.1 void seq64::perfedit::init_before_show ( )

It does not seem to need to also forward to the perftime function of the same name.

7.30.3.2 void seq64::perfedit::set_guides ( ) [private]

See the set_snap() function.

7.30.3.3 void seq64::perfedit::expand ( ) [private]

This action opens up a space events between the L and R (left and right) markers. This action is preceded by pushing an Undo operation in the perform object, moving its triggers, and telling the perfroll to redraw.

7.30.3.4 void seq64::perfedit::collapse ( ) [private]

This action removes all events between the L and R (left and right) markers. This action is preceded by pushing an Undo operation in the perform object, not moving its triggers (they go away), and telling the perfroll to redraw.

7.30.3.5 void seq64::perfedit::copy ( ) [private]

This action opens up a space events between the L and R (left and right) markers, and copies the information from the same amount of event that follow the R marker. This action is preceded by pushing an Undo operation in the perform object, copying its triggers, and telling the perfroll to redraw.

7.30.3.6 void seq64::perfedit::undo ( ) [private]

We pop an Undo trigger, and then ask the perfroll to queue up a (re)drawing action.

7.30.3.7 bool seq64::perfedit::timeout ( ) [private]

It redraws "dirty" sequences in the perfroll and the perfnames objects, and shows draw progress on the perfroll.

7.30.3.8 void seq64::perfedit::start_playing ( ) [inline], [private]

JACK will be used if it is present and, in the application, enabled. This call also sets g_rc_settings.is_pattern_↩ playing(true).

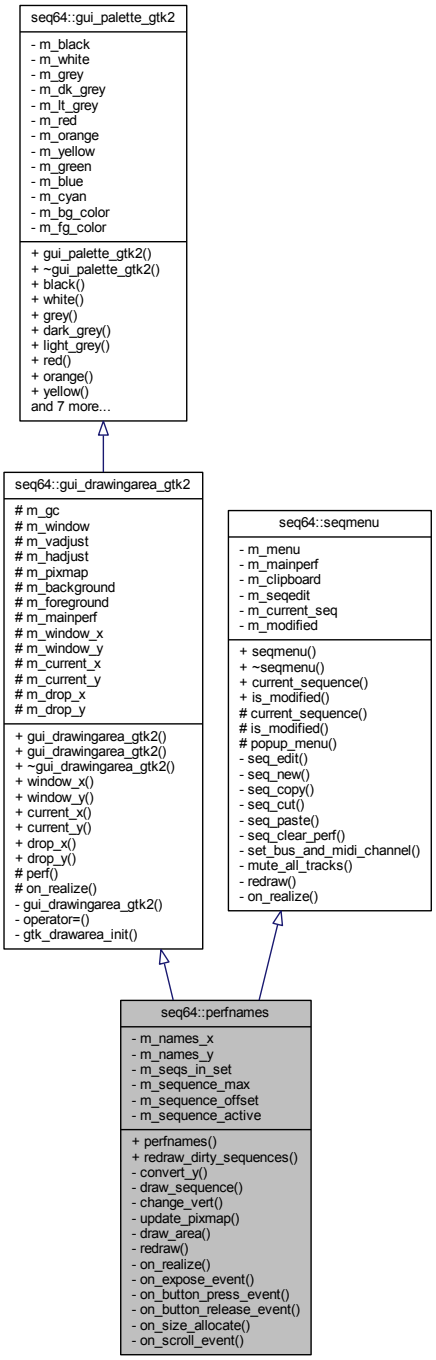
7.30.3.9 void seq64::perfedit::stop_playing ( ) [inline], [private]

This call also sets g_rc_settings.is_pattern_playing(true).

7.31 seq64::perfnames Class Reference

This class implements the left-side keyboard in the patterns window.

Inheritance diagram for seq64::perfnames:



Public Member Functions

- perfnames (perform &p, Gtk::Adjustment &vadjust)

  Principal constructor for this user-interface object.

- void redraw_dirty_sequences ()

  Redraws sequences that have been modified.

Private Member Functions

- int convert_y (int y)

  Converts a y-value into a sequence number and returns it.
- void draw_sequence (int sequence)

  Draw the given sequence.
- void change_vert ()

  Change the vertial offset of a sequence/pattern.
- void update_pixmap ()

  This function does nothing.
- void draw_area ()

  This function does nothing.
- void redraw (int sequence)

  Redraw the given sequence.
- void on_realize ()

  Handles the callback when the window is realized.
- bool on_expose_event (GdkEventExpose *ev)

  Handles an on-expose event.
- bool on_button_press_event (GdkEventButton *ev)

  Provides the callback for a button press, and it handles only a left mouse button.
- bool on_button_release_event (GdkEventButton *ev)

  Handles a button-release for the right button, bringing up a popup menu.
- void on_size_allocate (Gtk::Allocation &)

  Handles a size-allocation event.
- bool on_scroll_event (GdkEventScroll *ev)

  Handle the scrolling of the window.

Additional Inherited Members

7.31.1 Detailed Description

Obsolete Note the usage of virtual base classes. Since these can add some extra overhead, we should determine if we can do without the virtuality (and indeed it doesn't seem to be needed).

7.31.2 Constructor & Destructor Documentation

7.31.2.1 seq64::perfnames::perfnames (perform & *p*, Gtk::Adjustment & *vadjust*)

Weird is that the window (x,y) are set to (c_names_x, 100), when c_names_y is 22 in globals.h.

7.31.3 Member Function Documentation

7.31.3.1 void seq64::perfnames::on_realize ( ) [private]

It first calls the base-class version of on_realize(). Then it allocates any additional resources needed.

7.31.3.2 bool seq64::perfnames::on_expose_event (GdkEventExpose * *a_e*) [private]

It draws all of the sequences.

7.31.3.3 void seq64::perfnames::on_size_allocate (Gtk::Allocation & *a*) [private]

It first calls the base-class version of this function.

7.32 seq64::perform Class Reference

This class supports the performance mode.

Public Member Functions

- perform (gui_assistant &mygui, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  This construction initializes a vast number of member variables, some of them public (but we're working on that)!
- ~perform ()

  The destructor sets some running flags to false, signals this condition, then joins the input and output threads if the were launched.
- int sequence_count () const

  'Getter' function for member m_sequence_count It is better to call this getter before bothering to even try to use a sequence.
- int sequence_max () const

  'Getter' function for member m_sequence_max
- const gui_assistant & gui () const

  'Getter' function for member m_gui_support The const getter.
- gui_assistant & gui ()

  'Getter' function for member m_gui_support The un-const getter.
- const keys_perform & keys () const

  'Getter' function for member m_gui_support.keys() The const getter.
- keys_perform & keys ()

  'Getter' function for member m_gui_support.keys() The un-const getter.
- mastermidibus & master_bus ()

  'Getter' function for member m_master_bus
- bool is_running () const

  'Getter' function for member m_running
- bool is_learn_mode () const

  'Getter' function for member m_mode_group_learn
- void enregister (performcallback *pfcb)

  Adds a pointer to an object to be notified by this perform object.
- void init ()

  Initializes the master MIDI bus.
- void clear_all ()

  Clears all of the patterns/sequences.
- void launch_input_thread ()

  Creates the input thread using input_thread_func().
- void launch_output_thread ()

  Creates the output thread using output_thread_func().
- void init_jack ()

  Initializes JACK support, if SEQ64_JACK_SUPPORT is defined.
- void deinit_jack ()

  Tears down the JACK infrastructure.
- void add_sequence (sequence *seq, int perf)

  Adds a pattern/sequence pointer to the list of patterns.

- void delete_sequence (int seq)

  Deletes a pattern/sequence by number.
- bool is_sequence_in_edit (int seq)

  Check if the pattern/sequence, given by number, has an edit in progress.
- void clear_sequence_triggers (int seq)

  Clears the patterns/sequence for the given sequence, if it is active.
- long get_tick () const

  'Getter' function for member m_tick
- void set_left_tick (long tick)

  Set the left marker at the given tick.
- long get_left_tick () const

  'Getter' function for member m_left_tick
- void set_starting_tick (long tick)

  'Setter' function for member m_starting_tick
- long get_starting_tick () const

  'Getter' function for member m_starting_tick
- void set_right_tick (long tick)

  Set the right marker at the given tick.
- long get_right_tick () const

  'Getter' function for member m_right_tick
- void move_triggers (bool direction)

  If the left tick is less than the right tick, then, for each sequence that is active, its triggers are moved by the difference between the right and left in the specified direction.
- void copy_triggers ()

  If the left tick is less than the right tick, then, for each sequence that is active, its triggers are copied, offset by the difference between the right and left.
- void push_trigger_undo ()

  For every active sequence, call that sequence's push_trigger_undo() function.
- void pop_trigger_undo ()

  For every active sequence, call that sequence's pop_trigger_undo() function.
- midi_control * get_midi_control_toggle (unsigned int seq)

  Retrieves a value from m_midi_cc_toggle[].
- midi_control * get_midi_control_on (unsigned int seq)

  Retrieves a value from m_midi_cc_on[].
- midi_control * get_midi_control_off (unsigned int seq)

  Retrieves a value from m_midi_cc_off[].
- void handle_midi_control (int control, bool state)

  Handle the MIDI Control values that provide some automation for the application.
- const std::string & get_screen_set_notepad (int screen_set) const

  Retrieves the given string from m_screen_set_notepad[].
- const std::string & current_screen_set_notepad () const

  Returns the notepad text for the current screen-set.
- void set_screen_set_notepad (int screenset, const std::string &note)

  Copies the given string into m_screen_set_notepad[].
- void set_current_screen_set_notepad (const std::string &note)

  Sets the notepad text for the current screen-set.
- void set_screenset (int ss)

  Sets the m_screen_set value (the index or ID of the current screen set).
- int get_screenset () const

  'Getter' function for member m_screen_set
- void set_playing_screenset ()

Sets the screen set that is active, based on the value of m_playing_screen.

- int get_playing_screenset () const

  'Getter' function for member m_playing_screen
- void mute_group_tracks ()

  Will need to study this one more closely.
- void select_and_mute_group (int g_group)

  Select a mute group and then mutes the track in the group.
- void set_mode_group_mute ()

  'Setter' function for member m_mode_group
- void unset_mode_group_mute ()

  'Setter' function for member m_mode_group Unsets this member.
- void select_group_mute (int g_mute)

  Makes some checks and sets the group mute flag.
- void set_mode_group_learn ()

  Sets the group-mute mode, then the group-learn mode, then notifies all of the notification subscribers.
- void unset_mode_group_learn ()

  Notifies all of the notification subscribers that group-learn is being turned off.
- void select_mute_group (int group)

  Will need to study this one more closely.
- void start (bool state)

  If JACK is not running, call inner_start() with the given state.
- void stop ()

  If JACK is not running, call inner_stop().
- void start_jack ()

  If JACK is supported, starts the JACK transport.
- void stop_jack ()

  If JACK is supported, stops the JACK transport.
- void position_jack (bool state)

  If JACK is supported and running, sets the position of the transport.
- void off_sequences ()

  For all active patterns/sequences, set the playing state to false.
- void all_notes_off ()

  For all active patterns/sequences, turn off its playing notes.
- void set_active (int seq, bool active)

  Sets or unsets the active state of the given pattern/sequence number.
- void set_was_active (int seq)

  Sets was-active flags: main, edit, perf, and names.
- bool is_active (int seq)

  Checks the pattern/sequence for activity.
- bool is_dirty_main (int seq)

  Checks the pattern/sequence for main-dirtiness.
- bool is_dirty_edit (int seq)

  Checks the pattern/sequence for edit-dirtiness.
- bool is_dirty_perf (int seq)

  Checks the pattern/sequence for perf-dirtiness.
- bool is_dirty_names (int seq)

  Checks the pattern/sequence for names-dirtiness.
- void new_sequence (int seq)

  Creates a new pattern/sequence for the given slot, and sets the new pattern's master MIDI bus address.
- sequence * get_sequence (int seq)

  Retrieves the actual sequence, based on the pattern/sequence number.

- void reset_sequences ()

  For all active patterns/sequences, get its playing state, turn off the playing notes, set playing to false, zero the markers, and, if not in playback mode, restore the playing state.
- void play (long tick)

  Plays all notes to the current tick.
- void set_orig_ticks (long tick)

  For every pattern/sequence that is active, sets the "original ticks" value for the pattern.
- void set_bpm (int bpm)

  Sets the value of the BPM into the master MIDI buss, after making sure it is squelched to be between 20 and 500.
- int get_bpm ()

  Retrieves the BPM setting of the master MIDI buss.
- void set_looping (bool looping)

  'Setter' function for member m_looping
- void set_sequence_control_status (int status)

  If the given status is present in the c_status_snapshot, the playing state is saved.
- void unset_sequence_control_status (int status)

  If the given status is present in the c_status_snapshot, the playing state is restored.
- void set_group_mute_state (int g_track, bool mute_state)

  'Setter' function for member m_mute_group
- bool get_group_mute_state (int g_track)

  'Getter' function for member m_mute_group
- void mute_all_tracks ()

  Mutes all tracks in the current set of active patterns/sequences.
- void output_func ()

  Performance output function.
- void input_func ()

  This function is called by input_thread_func().
- long get_max_trigger ()

  Locates the largest trigger value among the active sequences.
- void set_offset (int offset)

  Calculates the offset into the screen sets.
- void save_playing_state ()

  For all active patterns/sequences, this function gets the playing status and saves it in m_sequence_state[i].
- void restore_playing_state ()

  For all active patterns/sequences, this function gets the playing status from m_sequence_state[i] and sets it for the sequence.
- bool show_ui_sequence_key () const

  ***Accessor** m_show_ui_sequency_key*
- void start_playing (bool flag=false)

  Encapsulates a series of calls used in mainwnd.
- void stop_playing ()

  Encapsulates a series of calls used in mainwnd.
- void learn_toggle ()

  Encapsulates some calls used in mainwnd.
- int decrement_bpm ()

  Encapsulates some calls used in mainwnd.
- int increment_bpm ()

  Encapsulates some calls used in mainwnd.
- int decrement_screenset ()

  Encapsulates some calls used in mainwnd.
- int increment_screenset ()

Encapsulates some calls used in mainwnd.

- void sequence_key (int seq)

  Handle a sequence key to toggle the playing of an active pattern in the selected screen-set.
- void set_input_bus (int bus, bool input_active)

  Sets the input bus, and handles the special "key-labels-on-sequence" functionality.
- bool mainwnd_key_event (const keystroke &k)

  Provided for mainwnd::on_key_press_event() and mainwnd::on_key_release_event() to call.
- bool perfroll_key_event (const keystroke &k, int drop_sequence)

  Provided for perfroll::on_key_press_event() and perfroll::on_key_release_event() to call.

Private Member Functions

- bool is_midi_control_valid (unsigned int seq) const

  Checks the parameter against c_midi_controls.
- bool is_screenset_valid (int screenset) const

  Checks the screenset against c_max_sets.
- void set_running (bool running)

  'Setter' function for member m_running
- void set_playback_mode (bool playbackmode)

  'Setter' function for member m_playback_mode
- bool is_seq_valid (int seq) const

  Provides common code to check for the bounds of a sequence number.
- bool is_mseq_valid (int seq) const

  Validates the sequence number, which is important since they're currently used as array indices.
- void install_sequence (sequence *seq, int seqnum)

  A private helper function for add_sequence().
- void inner_start (bool state)

  Locks on m_condition_var.
- void inner_stop ()

  Unconditionally, and without locking, clears the running status, resets the sequences, and set m_usemidiclock false.
- void set_key_event (unsigned int keycode, long sequence_slot)

  At construction time, this function sets up one keycode and one event slot.
- void set_key_group (unsigned int keycode, long group_slot)

  At construction time, this function sets up one keycode and one group slot.
- int clamp_track (int track) const

  Provides common code to keep the track value valid.

Private Attributes

- gui_assistant & m_gui_support

  Support for a wide range of GUI-related operations.
- bool m_mute_group [c_gmute_tracks]

  Mute group support.
- int m_playing_screen

  Playing screen support.
- sequence * m_seqs [c_max_sequence]

  Provides a vector of patterns/sequences.
- mastermidibus m_master_bus

  Provides our MIDI buss.
- pthread_t m_out_thread

Provides information for managing pthreads.

- bool m_playback_mode

  Specifies the playback mode.

- long m_tick

  MIDI Clock support.

Friends

- int jack_sync_callback (jack_transport_state_t state, jack_position_t *pos, void *arg)

  Global functions for JACK support and JACK sessions.

7.32.1 Detailed Description

It has way too many data members, many of the public. Might be ripe for refactoring.

7.32.2 Constructor & Destructor Documentation

7.32.2.1 seq64::perform::perform (gui_assistant & *mygui*, int *ppqn* = SEQ64_USE_DEFAULT_PPQN)

Parameters

mygui	Provides access to the GUI assistant that holds many things, including the containers of keys and the "events" they provide. This is a base-class reference; for a real class, see the gui_assistant_gtk2 class in the seq_gtkmm2 GUI-specific library. Note that we access the m_gui_support member using the gui() accessor function.

7.32.2.2 seq64::perform::~perform ( )

Finally, any active patterns/sequences are deleted.

7.32.3 Member Function Documentation

7.32.3.1 int seq64::perform::sequence_count ( ) const [inline]

In many cases at startup, or when loading a file, there are no sequences yet, and still the code calls functions that try to access them.

7.32.3.2 void seq64::perform::init ( )

Who calls this routine? The main() routine of the application.

7.32.3.3 void seq64::perform::clear_all ( )

The mainwnd module calls this function.

7.32.3.4 void seq64::perform::launch_input_thread ( )

This might be a good candidate for a small thread class derived from a small base class.

7.32.3.5 void seq64::perform::launch_output_thread ( )

This might be a good candidate for a small thread class derived from a small base class.

7.32.3.6 void seq64::perform::init_jack ( )

Who calls this routine? The main() routine of the application, and the options module.

7.32.3.7 void seq64::perform::add_sequence (sequence * *seq*, int *prefnum*)

No check is made for a null pointer.

This function checks for the preferred sequence number. This is the number that was specified by the Sequence Number meta-event for the current track. If the preferred sequence number is in the valid range (0 to m_sequence↩ _max) and it is not active, add it and activate it.

Otherwise, iterate through all patterns from prefnum to m_sequence_max and add and activate the first one that is not active, and then quit.

Warning

> The logic of the if-statement in this function was such that *prefnum* could be out-of-bounds in the else-clause. We reworked the logic to be airtight. This bug was caught by gcc 4.8.3 on CentOS, but not on gcc 4.9.3 on Debian Sid!

Parameters

seq	The pointer to the pattern/sequence to add.
prefnum	The preferred sequence number of the pattern, as explained above. If this value is out-of-range, then it is basically ignored.

7.32.3.8 void seq64::perform::delete_sequence (int *seq*)

We now also solidify the deletion by setting the pointer to null after deletion.

7.32.3.9 void seq64::perform::clear_sequence_triggers (int *seq*)

Parameters

seq	Provides the desired sequence. Hopefull, the is_active() function validates this value.

7.32.3.10 void seq64::perform::move_triggers (bool *a_direction*)

Parameters

a_direction	Specifies the desired direction; false = left, true = right.

7.32.3.11 void seq64::perform::copy_triggers ( )

This copies the triggers between the L marker and R marker to the R marker.

7.32.3.12 midi_control * seq64::perform::get_midi_control_toggle (unsigned int *seq*)

Parameters

seq	Provides a control value (such as c_midi_control_bpm_up) to use to retrieve the desired midi_control object. Note that this value is unsigned simply to make the legality check of the parameter easier.

7.32.3.13 midi_control * seq64::perform::get_midi_control_on (unsigned int *seq*)

Parameters

seq	Provides a control value (such as c_midi_control_bpm_up) to use to retrieve the desired midi_control object.

7.32.3.14 midi_control * seq64::perform::get_midi_control_off (unsigned int *seq*)

Parameters

seq	Provides a control value (such as c_midi_control_bpm_up) to use to retrieve the desired midi_control object.

7.32.3.15 const std::string & seq64::perform::get_screen_set_notepad (int *screenset*) const

Parameters

screenset	The ID number of the string set, an index into the m_screen_set_notepad[] array. This value is validated.

Returns

Returns a reference to the desired string, or to an empty string if the screen-set number is invalid.

7.32.3.16 void seq64::perform::set_screen_set_notepad (int *screenset,* const std::string & *notepad*)

Parameters

screenset	The ID number of the string set, an index into the m_screen_set_xxx[] arrays.
notepad	Provides the string date to copy into the notepad. Not sure why a pointer is used, instead of nice "const std::string &" parameter. And this pointer isn't checked.

7.32.3.17 void seq64::perform::set_screenset (int *ss*)

Parameters

ss	The index of the desired string set. It is forced to range from 0 to c_max_sets - 1.

7.32.3.18 void seq64::perform::set_playing_screenset ( )

For each value up to c_seqs_in_set (32), the index of the current sequence in the currently screen set (m_playing↩ _screen) is obtained. If it is active and the sequence actually exists

Modifies m_playing_screen, and mutes the group tracks.

7.32.3.19 void seq64::perform::unset_mode_group_learn ( )

Then unsets the group-learn mode flag..

7.32.3.20 void seq64::perform::select_mute_group (int *a_group*)

Parameters

a_group	Provides the group to mute. Note that this parameter is essentially a track or sequence number.

7.32.3.21 void seq64::perform::start (bool *a_state*)

Parameters

a_state	What does this state mean?

7.32.3.22 void seq64::perform::stop ( )

The logic seems backward here, in that we call inner_stop() if JACK is not running. Or perhaps we misunderstand the meaning of m_jack_running?

7.32.3.23 void seq64::perform::position_jack (bool *a_state*)

Warning

A lot of this code is effectively disabled by an early return statement.

7.32.3.24 void seq64::perform::all_notes_off ( )

Then flush the MIDI buss.

7.32.3.25 void seq64::perform::set_active (int *seq*, bool *active*)

Parameters

seq	Provides the prospective sequence number.
active	True if the sequence is to be set to the active state.

7.32.3.26 void seq64::perform::set_was_active (int *seq*)

Why do we need this routine?

Parameters

seq	The pattern number. It is checked for invalidity.

7.32.3.27 bool seq64::perform::is_active (int *seq*)

Parameters

seq	The pattern number. It is checked for invalidity. This can lead to "too many" (i.e. redundant) checks.

Returns

Returns the value of the active-flag, or false if the pattern was invalid.

7.32.3.28 bool seq64::perform::is_dirty_main (int *seq*)

Parameters

seq	The pattern number. It is checked for invalidity.

Returns

Returns the was-active-main flag value, before setting it to false. Returns false if the pattern was invalid.

7.32.3.29 bool seq64::perform::is_dirty_edit (int *seq*)

Parameters

seq	The pattern number. It is checked for invalidity.

Returns

Returns the was-active-edit flag value, before setting it to false. Returns false if the pattern was invalid.

7.32.3.30 bool seq64::perform::is_dirty_perf (int *seq*)

Parameters

seq	The pattern number. It is checked for invalidity.

Returns

Returns the was-active-perf flag value, before setting it to false. Returns false if the pattern/sequence number was invalid.

7.32.3.31 bool seq64::perform::is_dirty_names (int *seq*)

Parameters

seq	The pattern number. It is checked for invalidity.

Returns

Returns the was-active-names flag value, before setting it to false. Returns false if the pattern/sequence number was invalid.

7.32.3.32 void seq64::perform::new_sequence (int *seq*)

Then it activates the pattern.

It doesn't deal with thrown exceptions.

7.32.3.33 sequence * seq64::perform::get_sequence (int *seq*)

Note

Since we can have holes in the sequence array, where there are inactive sequences, we check if the sequence is even active before emitting a message about a null pointer for the sequence. We only want to see messages that indicate actual problems. Actually, we comment out the message-emitting code, as is_mseq_valid() already emits a useful-enough message.

Parameters

seq	The prospective sequence number.

Returns

Returns the value of m_seqs[seq] if seq is valid. Otherwise, a null pointer is returned.

7.32.3.34 void seq64::perform::reset_sequences ( )

Then flush the MIDI buss.

7.32.3.35 void seq64::perform::play (long *tick*)

Starts the playing of all the patterns/sequences.

This function just runs down the list of sequences and has them dump their events.

Parameters

tick	Provides the tick at which to start playing.

7.32.3.36 void seq64::perform::set_orig_ticks (long *tick*)

Parameters

tick	

7.32.3.37 void seq64::perform::set_bpm (int *a_bpm*)

The value is set only if neither JACK nor this performance object are running.

Todo I think this logic is wrong, in that it needs only one of the two to be stopped before it sets the BPM, while it seems to me that both should be stopped; to be determined.

7.32.3.38 void seq64::perform::set_sequence_control_status (int *a_status*)

Then the given status is OR'd into the m_control_status.

7.32.3.39 void seq64::perform::unset_sequence_control_status (int *a_status*)

Then the given status is reversed in m_control_status.

7.32.3.40 void seq64::perform::output_func ( )

1. Get delta time (current - last).
2. Get delta ticks from time.
3. Add to current_ticks.
4. Compute prebuffer ticks.
5. Play from current tick to prebuffer.

Figure out how much time we need to sleep, and do it.

7.32.3.41 long seq64::perform::get_max_trigger ( )

Returns

Returns the highest trigger value, or zero. It is not clear why this function doesn't return a "no trigger found" value. Is there always at least one trigger, at 0?

7.32.3.42 void seq64::perform::set_offset (int *offset*) [inline]

Sets m_offset = offset * c_mainwnd_rows * c_mainwnd_cols;

Parameters

offset	The desired offset.

7.32.3.43 bool seq64::perform::show_ui_sequence_key ( ) const [inline]

Used in mainwid, options, optionsfile, userfile, and perform.

7.32.3.44 void seq64::perform::start_playing (bool *flag* = false) [inline]

We've reversed the start() and start_jack() calls so that JACK is started first, to match all of the other use-cases for playing that we've found in the code.

Todo Verify the usage and nature of this flag.

7.32.3.45 int seq64::perform::decrement_bpm ( ) [inline]

Actually does a lot of work in those function calls.

7.32.3.46 int seq64::perform::increment_bpm ( ) [inline]

Actually does a lot of work in those function calls.

7.32.3.47 void seq64::perform::set_input_bus (int *bus*, bool *input_active*)

This function is called by options::input_callback().

7.32.3.48 bool seq64::perform::mainwnd_key_event (const keystroke & *k*)

Returns

Returns true if the key was handled.

7.32.3.49 bool seq64::perform::perfroll_key_event (const keystroke & *k*, int *drop_sequence*)

Returns

Returns true if the key was handled.

7.32.3.50 bool seq64::perform::is_midi_control_valid (unsigned int *seq*) const [inline], [private]

Parameters

seq	The value that should be in the c_midi_xxx range.

Returns

Returns true if the parameter is valid. For this function, no error print-out is generated.

7.32.3.51 bool seq64::perform::is_screenset_valid (int *screenset*) const [inline], [private]

Parameters

screenset	The prospective screenset value.

Returns

Returns true if the parameter is valid. For this function, no error print-out is generated.

7.32.3.52 bool seq64::perform::is_seq_valid (int *seq*) const [private]

Also see the function is_mseq_valid(), which also checks the pointer stored in the m_seq[] array.

We considered checking the *seq* param against sequence_count(), but this function is called while creating sequences that add to that count, so we continue checking against the "container" size. Also, it is possible to have holes in the array representing inactive sequences, so that sequencer_count() would be too limiting.

Parameters

seq	The sequencer number, in interval [0, m_sequence_max).

Returns

Returns true if the sequence number is valid.

7.32.3.53 bool seq64::perform::is_mseq_valid (int *seq*) const [private]

It also evaluates the m_seq[seq] pointer value.

Note

Since we can have holes in the sequence array, where there are inactive sequences, we check if the sequence is even active before emitting a message about a null pointer for the sequence. We only want to see messages that indicate actual problems.

Parameters

seq	Provides the sequence number to be checked. It is checked for validity. We cannot compare the sequence number versus the sequence_count(), because the current implementation can have inactive holes (with null pointers) interspersed with active pointers.

Returns

Returns true if the sequence number is valid as per is_seq_valid(), and the sequence pointer is not null.

7.32.3.54 void seq64::perform::install_sequence (sequence * *seq*, int *seqnum*) [private]

It is common code and using it prevents inconsistences. It assumes values have already been checked.

Parameters

seq	The pointer to the pattern/sequence to add.
seqnum	The sequence number of the pattern to be added.

7.32.3.55 void seq64::perform::inner_start (bool *a_state*) [private]

Then, if not is_running(), the playback mode is set to the given state. If that state is true, call off_sequences(). Set the running status, and signal the condition. Then unlock.

7.32.3.56 void seq64::perform::set_key_event (unsigned int *keycode*, long *sequence_slot*) [private]

It is called 32 times, corresponding to the pattern/sequence slots in the Patterns window.

It first removes the given key-code from the regular and reverse slot-maps. Then it removes the sequence-slot from the regular and reverse slot-maps.

Finally, it adds the sequence-slot with a key value of key-code, and adds the key-code with a value of sequence-slot.

Why are we erasing four items instead of just two?

7.32.3.57 void seq64::perform::set_key_group (unsigned int *keycode*, long *group_slot*) [private]

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window.

Compare it to the set_key_events() function.

7.32.3.58 int seq64::perform::clamp_track (int *track*) const [inline], [private]

Note the bug we found, where we checked for track > c_seqs_in_set, but set it to c_seqs_in_set - 1 in that case!

7.32.4 Friends And Related Function Documentation

7.32.4.1 int jack_sync_callback (jack_transport_state_t *state*, jack_position_t * *pos*, void * *arg*) [friend]

This JACK synchronization callback informs the specified perform object of the current state and parameters of JACK.

Parameters

state	The JACK Transport state.
pos	The JACK position value.
arg	The pointer to the jack_assistant object. Currently not checked for nullity, nor dynamic-casted.

7.32.5 Field Documentation

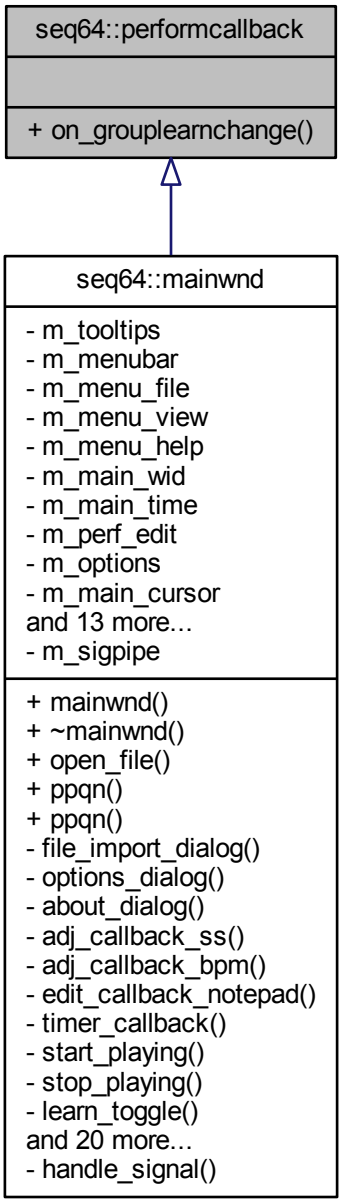
7.32.5.1 bool seq64::perform::m_playback_mode [private]

There are two, "live" and "song", but we're not yet sure what "true" indicates.

7.33 seq64::performcallback Struct Reference

Provides for notification of events.

Inheritance diagram for seq64::performcallback:



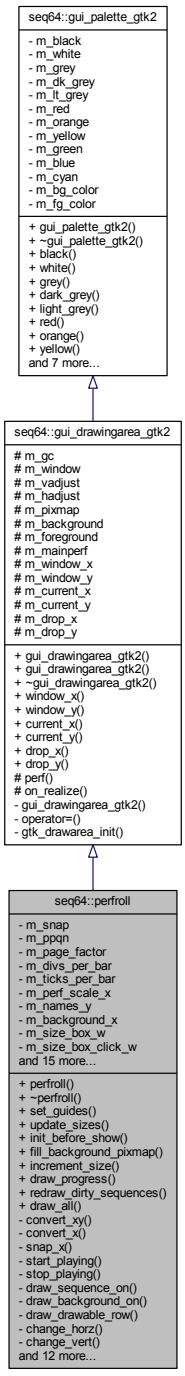
7.33.1 Detailed Description

Provide a response to a group-learn change event.

7.34 seq64::perfroll Class Reference

This class implements the performance roll user interface.

Inheritance diagram for seq64::perfroll:



Public Member Functions

- perfroll (perform &a_perf, Gtk::Adjustment &a_hadjust, Gtk::Adjustment &a_vadjust, int ppqn=SEQ64_US↩ E_DEFAULT_PPQN)

  Principal constructor.

- ~perfroll ()

  This destructor deletes the interaction object.

- void set_guides (int a_snap, int a_measure, int a_beat)

  This function sets the snap, measure, and beats members, fills in the background, and queues up a draw operation.
- void update_sizes ()

  Updates the sizes of various items.
- void init_before_show ()

  Sets the roll-lengths ticks member.
- void fill_background_pixmap ()

  This function updates the background of the Performance roll.
- void increment_size ()

  Increments the value of m_roll_length_ticks by the PPQN ∗ 512, then calls update_sizes().
- void draw_progress ()

  Draws the progess line that shows where we are in the performance.
- void redraw_dirty_sequences ()

  Redraws patterns/sequences that have been modified.
- void draw_all ()

  Provides a very common sequence of calls used in perfroll_input.

Private Member Functions

- void convert_xy (int x, int y, long &ticks, int &seq)

  Converts a tick-offset....
- void convert_x (int x, long &ticks)

  Converts a tick-offset on the x coordinate.
- void snap_x (int &x)

  This function performs a 'snap' action on x.
- void start_playing ()

  Start the performance playing.
- void stop_playing ()

  Stop the performance playing.
- void draw_sequence_on (Glib::RefPtr< Gdk::Drawable > a_draw, int a_sequence)

  Draws the given pattern/sequence on the given drawable area.
- void draw_background_on (Glib::RefPtr< Gdk::Drawable > a_draw, int a_sequence)

  Draws the given pattern/sequence background on the given drawable area.
- void draw_drawable_row (Glib::RefPtr< Gdk::Drawable > a_dest, Glib::RefPtr< Gdk::Drawable > a_src, long a_y)

  Not quite sure what this draws yet.
- void change_horz ()

  Changes the 4-bar horizontal offset member and queues up a draw operation.
- void change_vert ()

  Changes the 4-bar vertical offset member and queues up a draw operation.
- void split_trigger (int a_sequence, long a_tick)

  Splits a trigger, whatever than means.
- void on_realize ()

  Provides the on-realization callback.
- bool on_expose_event (GdkEventExpose ∗a_ev)

  Handles the on-expose event.
- bool on_button_press_event (GdkEventButton ∗a_ev)

  This callback function handles a button press by forwarding it to the interaction object's button-press function.
- bool on_button_release_event (GdkEventButton ∗a_ev)

  This callback function handles a button release by forwarding it to the interaction object's button-release function.

- bool on_motion_notify_event (GdkEventMotion *a_ev)

  Handles motion notification by forwarding it to the interaction object's motion-notification callback function.
- bool on_scroll_event (GdkEventScroll *a_ev)

  Handles horizontal and vertical scrolling.
- bool on_focus_in_event (GdkEventFocus *)

  This callback handles an in-focus event by setting the flag to HAS_FOCUS.
- bool on_focus_out_event (GdkEventFocus *)

  This callback handles an out-of-focus event by resetting the flag HAS_FOCUS.
- void on_size_allocate (Gtk::Allocation &)

  Upon a size allocation event, this callback calls the base-class version of this function, then sets m_window_x and m_window_y, and calls update_sizes().
- bool on_key_press_event (GdkEventKey *a_p0)

  This callback function handles a key-press event.
- void on_size_request (GtkRequisition *)

  This callback throws away a size request.

Additional Inherited Members

7.34.1 Member Function Documentation

7.34.1.1 void seq64::perfroll::update_sizes ( )

Note

Trying to figure out what the 16 is. So take the "bars-visible" calculation, the c_perf_scale_x value, assume that "ticks" is another name for "pulses", and assume that "beats" is a quarter note. Ignoring the numbers, the units come out to:

```
        pixels * ticks / pixel
bars = --------------------------------
        ticks / beat * beats / bar
```

```
Thus, the 16 is a "beats per bar" or "beats per measure" value.
This doesn't quite make sense, but there are 16 divisions per
beat on the perfroll user-interface.  So for now we'll call it
the latter, and make a variable called "m_divs_per_bar", see its
definition in the class initializer list.
```

7.34.1.2 void seq64::perfroll::init_before_show ( )

First, it gets the largest trigger value among the active sequences. Then it truncates this value to the nearest PPQN * 16 ticks. Then it adds PPQN * 4096 ticks.

7.34.1.3 void seq64::perfroll::convert_xy (int *x*, int *y*, long & *a_tick*, int & *a_seq*) [private]

The results are returned via the a_tick and a_seq parameters.

7.34.1.4 void seq64::perfroll::convert_x (int *x*, long & *tick*) [private]

The result is returned via the a_tick parameter.

7.34.1.5 void seq64::perfroll::snap_x (int & *x*) [private]

- m_snap = number pulses to snap to
- m_perf_scale_x = number of pulses per pixel

Therefore mod = m_snap/m_perf_scale_x equals the number pixels to snap to.

7.34.1.6 void seq64::perfroll::start_playing ( ) [private]

We need to keep in sync with perfedit's start_playing()... wish we could call it directly. Well, now we go to the source, calling perform::start_playing().

7.34.1.7 void seq64::perfroll::stop_playing ( ) [private]

We need to keep in sync with perfedit's stop_playing()... wish we could call it directly. Well, now we go to the source, calling perform::stop_playing().

7.34.1.8 void seq64::perfroll::draw_sequence_on (Glib::RefPtr< Gdk::Drawable > *a_draw,* int *a_sequence*) [private]

Statement nesting from hell!

7.34.1.9 void seq64::perfroll::on_realize ( ) [private]

Calls the base-class version first.

Then it allocates the additional resources need, that couldn't be initialized in the constructor, and makes some connections.

7.34.1.10 bool seq64::perfroll::on_button_press_event (GdkEventButton * *ev*) [private]

This gives us Seq24 versus Fruity behavior.

7.34.1.11 bool seq64::perfroll::on_button_release_event (GdkEventButton * *ev*) [private]

This gives us Seq24 versus Fruity behavior.

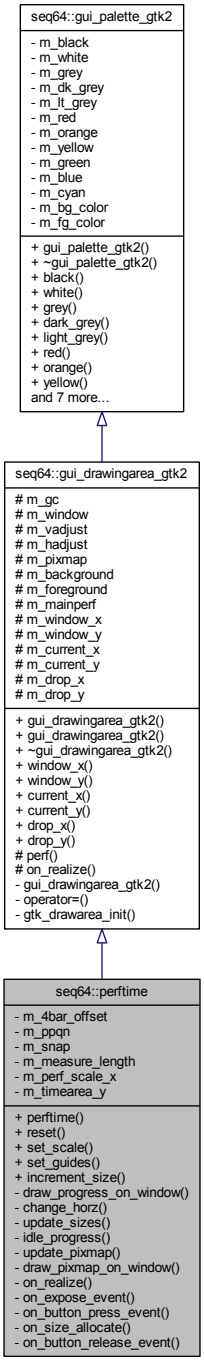
7.34.1.12 bool seq64::perfroll::on_key_press_event (GdkEventKey * *ev*) [private]

If we don't check the event type first, then the ev->keyval value is something weird like 65507.

7.35 seq64::perftime Class Reference

This class implements drawing the piano time at the top of the "performance window" (the "song editor").

Inheritance diagram for seq64::perftime:



Public Member Functions

- perftime (perform &perf, Gtk::Adjustment &hadjust)

  Principal constructor.
- void set_guides (int snap, int measure)

  Sets the snap value and the measure-length members.
- void increment_size ()

This function does nothing.

Private Member Functions

- void change_horz ()

  Change the m_4bar_offset and queue a draw operation.
- void update_sizes ()

  This function does nothing.
- int idle_progress ()

  This function just returns true.
- void update_pixmap ()

  This function does nothing.
- void draw_pixmap_on_window ()

  This function does nothing.
- void on_realize ()

  Implements the on-realization event, then allocates some resources the could not be allocated in the constructor.
- bool on_expose_event (GdkEventExpose *ev)

  Implements the on-expose event.
- bool on_button_press_event (GdkEventButton *ev)

  Implement the button-press event.
- void on_size_allocate (Gtk::Allocation &r)

  Implements a size-allocation event.
- bool on_button_release_event (GdkEventButton *)

  This button-release handler does nothing.

Additional Inherited Members

7.35.1 Constructor & Destructor Documentation

7.35.1.1 seq64::perftime::perftime (perform & *p*, Gtk::Adjustment & *hadjust*)

In the constructor you can only allocate colors; get_window() returns 0 because we have not been realized.

Note

Note that we still have to use a global constant in the base-class constructor; we cannot assign it to the corresponding member beforehand.

7.35.2 Member Function Documentation

7.35.2.1 void seq64::perftime::on_realize ( ) [private]

It is important to call the base-class version of this function.

7.35.2.2 bool seq64::perftime::on_expose_event (GdkEventExpose * *ev*) [private]

Note

The perfedit object is created early on. When brought on-screen from mainwnd (the main window), first, perftime::on_realize() is called, then this event is called.

It crashes trying to set the foreground color.

7.36 rc_settings Class Reference

This class contains the options formerly named "global_xxxxxx".

Public Member Functions

- rc_settings ()

  Default constructor.
- rc_settings (const rc_settings &rhs)

  Copy constructor.
- rc_settings & operator= (const rc_settings &rhs)

  Principal assignment operator.
- std::string home_config_directory () const

  Provides the directory for the configuration file, and also creates the directory if necessary.
- std::string config_filespec () const

  Constructs the full path and file specification for the "rc" file based on whether or not the legacy Seq24 filenames are being used.
- std::string user_filespec () const

  Constructs the full path and file specification for the "user" file based on whether or not the legacy Seq24 filenames are being used.
- void set_defaults ()

  Sets the default values.
- void set_globals ()

  Copies the current values of the member variables into their corresponding global variables.
- void get_globals ()

  Copies the current values of the global variables into their corresponding member variables.
- bool legacy_format () const

  ***Accessor** m_legacy_format*
- bool lash_support () const

  ***Accessor** m_lash_support*
- bool allow_mod4_mode () const

  ***Accessor** m_allow_mod4_mode*
- bool show_midi () const

  ***Accessor** m_show_midi*
- bool priority () const

  ***Accessor** m_priority*
- bool stats () const

  ***Accessor** m_stats*
- bool pass_sysex () const

  ***Accessor** m_pass_sysex*
- bool with_jack_transport () const

  ***Accessor** m_with_jack_transport*
- bool with_jack_master () const

  ***Accessor** m_with_jack_master*
- bool with_jack_master_cond () const

  ***Accessor** m_with_jack_master_cond*
- bool jack_start_mode () const

  ***Accessor** m_jack_start_mode*
- bool manual_alsa_ports () const

  ***Accessor** m_manual_alsa_ports*
- bool is_pattern_playing () const

Accessor *m_is_pattern_playing*

- bool print_keys () const

  Accessor *m_print_keys*

- bool device_ignore () const

  Accessor *m_device_ignore*

- int device_ignore_num () const

  'Getter' function for member m_device_ignore_num

- interaction_method_t interaction_method () const

  'Getter' function for member m_interaction_method

- const std::string & filename () const

  'Getter' function for member m_filename

- const std::string & jack_session_uuid () const

  'Getter' function for member m_jack_session_uuid

- const std::string & last_used_dir () const

  'Getter' function for member m_last_used_dir

- const std::string & config_directory () const

  'Getter' function for member m_config_directory

- const std::string & config_filename () const

  'Getter' function for member m_config_filename

- const std::string & user_filename () const

  'Getter' function for member m_user_filename

- const std::string & config_filename_alt () const

  'Getter' function for member m_config_filename_alt;

- const std::string & user_filename_alt () const

  'Getter' function for member m_user_filename_alt

- void device_ignore_num (int value)

  'Setter' function for member m_device_ignore_num However, please note that this value, while set in the options processing of the main module, does not appear to be used anywhere in the code in seq24, Sequencer24, and this application.

- void interaction_method (interaction_method_t value)

  'Setter' function for member m_interaction_method

- void filename (const std::string &value)

  'Setter' function for member m_filename

- void jack_session_uuid (const std::string &value)

  'Setter' function for member m_jack_session_uuid

- void last_used_dir (const std::string &value)

  'Setter' function for member m_last_used_dir

- void config_directory (const std::string &value)

  'Setter' function for member m_config_directory

- void config_filename (const std::string &value)

  'Setter' function for member m_config_filename

- void user_filename (const std::string &value)

  'Setter' function for member m_user_filename

- void config_filename_alt (const std::string &value)

  'Setter' function for member m_config_filename_alt;

- void user_filename_alt (const std::string &value)

  'Setter' function for member m_user_filename_alt

Private Member Functions

- bool make_directory (const std::string &pathname) const

  An internal function to ensure that the ~/.config/sequencer64 directory exists.

Private Attributes

- std::string m_filename

  Provides the name of current MIDI file.

7.36.1 Member Function Documentation

7.36.1.1 std::string rc_settings::home_config_directory ( ) const

If the legacy format is in force, then the home directory for the configuration is (in Linux) "/home/username", and the configuration file is ".seq24rc".

If the new format is in force, then the home directory is (in Linux) "/home/username/.config/sequencer64", and the configuration file is "sequencer64.rc".

Returns

Returns the selection home configuration directory. If it does not exist orcould not be created, then an empty string is returned.

7.36.1.2 bool rc_settings::make_directory (const std::string & *pathname*) const [private]

This function is actually a little more general than that, but it is not sufficiently general, in general.

Parameters

pathname	Provides the name of the path to create. The parent directory of the final directory must already exist.

Returns

Returns true if the path-name exists.

7.37 seq64::gui_drawingarea_gtk2::rect Struct Reference

A small helper structure representing a rectangle.

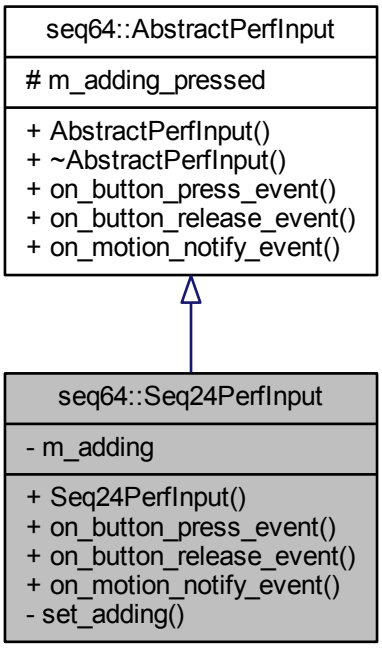
7.38 seq64::rect Class Reference

A small helper class representing a rectangle.

7.39 seq64::Seq24PerfInput Class Reference

Implements the default performance input characteristics of this application.

Inheritance diagram for seq64::Seq24PerfInput:



Public Member Functions

- bool on_button_press_event (GdkEventButton *a_ev, perfroll &roll)

  Handles the normal variety of button-press event.
- bool on_button_release_event (GdkEventButton *a_ev, perfroll &roll)

  Handles various button-release events.
- bool on_motion_notify_event (GdkEventMotion *a_ev, perfroll &roll)

  Handles the normal motion-notify event.

Private Member Functions

- void set_adding (bool a_adding, perfroll &roll)

  A popup menu (which one?) calls this.

7.39.1 Member Function Documentation

7.39.1.1 bool seq64::Seq24PerfInput::on_button_press_event (GdkEventButton * *a_ev*, perfroll & *roll*) [virtual]

Is there any easy way to use ctrl-left-click as the middle button here?

Implements seq64::AbstractPerfInput.

7.39.1.2 bool seq64::Seq24PerfInput::on_button_release_event (GdkEventButton * *a_ev,* perfroll & *roll*) [virtual]

Any use for the middle-button or ctrl-left-click we can add?

Implements seq64::AbstractPerfInput.

7.39.1.3 void seq64::Seq24PerfInput::set_adding (bool *adding,* perfroll & *roll*) [private]

What does it mean?

7.40 seq64::Seq24SeqEventInput Struct Reference

This structure implement the normal interaction methods for Seq24.

Public Member Functions

- Seq24SeqEventInput ()
  Default constructor.
- void set_adding (bool a_adding, seqevent &ths)
  Changes the mouse cursor to a pencil or a left pointer in the given seqevent aobject, depending on the first parameter.
- bool on_button_press_event (GdkEventButton *a_ev, seqevent &ths)
  Implements the on-button-press event callback.
- bool on_button_release_event (GdkEventButton *a_ev, seqevent &ths)
  Implements the on-button-release callback.
- bool on_motion_notify_event (GdkEventMotion *a_ev, seqevent &ths)
  Implements the on-motion-notify event.

7.40.1 Member Function Documentation

7.40.1.1 void seq64::Seq24SeqEventInput::set_adding (bool *adding,* seqevent & *seqev*)

Modifies m_adding as well.

7.40.1.2 bool seq64::Seq24SeqEventInput::on_button_press_event (GdkEventButton * *a_ev,* seqevent & *seqev*)

Set values for dragging, then reset box that holds dirty redraw spot. Needs update.

seqev.m_seq.unselect(); ???????

7.41 seq64::Seq24SeqRollInput Struct Reference

Implements the Seq24 mouse interaction paradigm for the seqroll.

Public Member Functions

- Seq24SeqRollInput ()
  Default constructor.
- void set_adding (bool a_adding, seqroll &ths)
  Changes the mouse cursor pixmap according to whether a note is being added or not.

- bool on_button_press_event (GdkEventButton ∗a_ev, seqroll &ths)

  Implements the on-button-press event handling for the Seq24 style of mouse interaction.

- bool on_button_release_event (GdkEventButton ∗a_ev, seqroll &ths)

  Implements the on-button-release event handling for the Seq24 style of mouse interaction.

- bool on_motion_notify_event (GdkEventMotion ∗a_ev, seqroll &ths)

  Implements the on-motion-notify event handling for the Seq24 style of mouse interaction.

7.41.1 Member Function Documentation

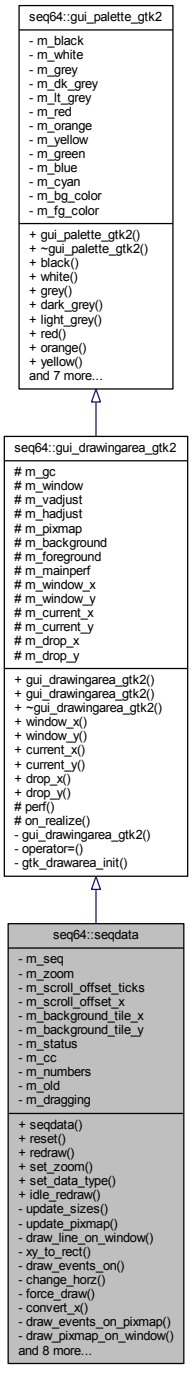
7.41.1.1 void seq64::Seq24SeqRollInput::set_adding (bool *a_adding,* seqroll & *sroll*)

(Which?) popup menu calls this. It is actually a right click, I think.

7.42 seq64::seqdata Class Reference

This class supports drawing piano-roll eventis on a window.

Inheritance diagram for seq64::seqdata:



Public Member Functions

- seqdata (sequence &seq, perform &p, int zoom, Gtk::Adjustment &hadjust)

  Principal constructor.
- void reset ()

  This function calls update_size().
- void redraw ()

Updates the pixmap and queues up a redraw operation.

- void set_zoom (int a_zoom)

  Sets the zoom to the given value and resets the view via the reset function.

- void set_data_type (unsigned char a_status, unsigned char a_control)

  Sets the status to the given value, and the control to the optional given value, which defaults to 0, then calls redraw().

- int idle_redraw ()

  Draws events on this object's built-in window and pixmap.

Private Member Functions

- void update_sizes ()

  Updates the sizes in the pixmap if the view is realized, and queues up a draw operation.

- void update_pixmap ()

  Simply calls draw_events_on_pixmap().

- void draw_line_on_window ()

  Draws on vertical line on...

- void xy_to_rect (int a_x1, int a_y1, int a_x2, int a_y2, int &r_x, int &r_y, int &r_w, int &r_h)

  This function takes two points, and returns an Xwin rectangle, returned via the last four parameters.

- void draw_events_on (Glib::RefPtr< Gdk::Drawable > a_draw)

  Draws events on the given drawable object.

- void change_horz ()

  Change the scrolling offset on the x-axis, and redraw.

- void force_draw ()

  Force a redraw.

- void convert_x (int x, long &tick)

  This function takes screen coordinates, and gives the horizontaol tick value based on the current zoom, returned via the second parameter.

- void draw_events_on_pixmap ()

  Simply calls draw_events_on() for this object's built-in pixmap.

- void draw_pixmap_on_window ()

  Simply queues up a draw operation.

- void on_realize ()

  Implements the on-realization event, by calling the base-class version and then allocating the resources that could not be allocated in the constructor.

- bool on_expose_event (GdkEventExpose *a_ev)

  Implements the on-expose event.

- bool on_button_press_event (GdkEventButton *a_ev)

  Implement a button-press event.

- bool on_button_release_event (GdkEventButton *a_ev)

  Implement a button-release event.

- bool on_motion_notify_event (GdkEventMotion *a_p0)

  Handles a motion-notify event.

- bool on_leave_notify_event (GdkEventCrossing *p0)

  Handles an on-leave notification event.

- bool on_scroll_event (GdkEventScroll *a_ev)

  Implements the on-scroll event.

- void on_size_allocate (Gtk::Allocation &)

  Handle a size-allocation event.

Private Attributes

- int m_zoom

  one pixel == m_zoom ticks
- unsigned char m_status

  What is the data window currently editing?

Additional Inherited Members

7.42.1 Constructor & Destructor Documentation

7.42.1.1 seq64::seqdata::seqdata (sequence & *seq,* perform & *p,* int *zoom,* Gtk::Adjustment & *hadjust*)

In the constructor you can only allocate colors, get_window() returns 0 because we have not been realized.

7.42.2 Member Function Documentation

7.42.2.1 void seq64::seqdata::reset ( )

Then, regardless of whether the view is realized, updates the pixmap and queues up a draw operation.

Note

If it weren't for the is_realized() condition, we could just call update_sizes(), which does all this anyway.

7.42.2.2 void seq64::seqdata::redraw ( ) [inline]

We need to make this an inline function and use it as common code.

7.42.2.3 void seq64::seqdata::set_zoom (int *zoom*)

This begs the question, do we have GUI access to the zoom setting?

7.42.2.4 int seq64::seqdata::idle_redraw ( )

This drawing is done only if there is no dragging in progress, to guarantee no flicker.

7.42.2.5 void seq64::seqdata::update_sizes ( ) [private]

It creates a pixmap with window dimensions given by m_window_x and m_window_y.

7.42.2.6 void seq64::seqdata::xy_to_rect (int *a_x1,* int *a_y1,* int *a_x2,* int *a_y2,* int & *r_x,* int & *r_y,* int & *r_w,* int & *r_h*) [private]

It checks the mins/maxes, then fills in x, y, and width, height.

7.42.2.7 void seq64::seqdata::on_realize ( ) [private]

It also connects up the change_horz() function.

7.42.2.8 bool seq64::seqdata::on_motion_notify_event (GdkEventMotion * *a_p0*) [private]

It converts the x,y of the mouse to ticks, then sets the events in the event-data-range, updates the pixmap, draws events in the window, and draws a line on the window.

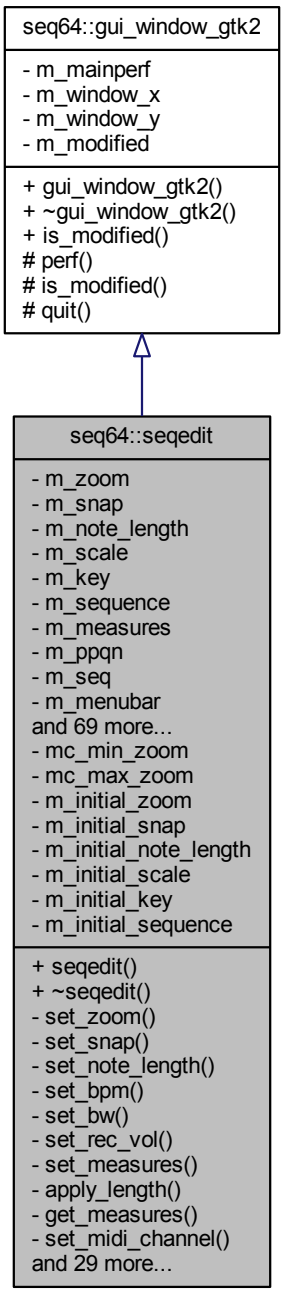
7.42.2.9 bool seq64::seqdata::on_scroll_event (GdkEventScroll * *a_ev*) [private]

This scroll event only handles basic scrolling, without any modifier keys such as GDK_CONTROL_MASK or GDK_SHIFT_MASK.

7.43 seq64::seqedit Class Reference

Implements the Pattern Editor, which has references to:

Inheritance diagram for seq64::seqedit:



Public Member Functions

- seqedit (sequence &a_seq, perform &a_perf, int pos, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Connects to a menu item, tells the performance to launch the timer thread.

- ~seqedit ()

  A rote destructor.

Private Member Functions

- void set_zoom (int a_zoom)

  Selects the given zoom value.
- void set_snap (int a_snap)

  Selects the given snap value.
- void set_note_length (int a_note_length)

  Selects the given note-length value.
- void set_bpm (int a_beats_per_measure)

  Set the bpm (beats per measure) value, using the given parameter, and some internal values passed to apply_length().
- void set_bw (int a_beat_width)

  Set the bw (beat width) value, using the given parameter, and some internal values passed to apply_length().
- void set_rec_vol (int a_rec_vol)

  Passes the given parameter to sequence::set_rec_vol().
- void set_measures (int a_length_measures)

  Set the measures value, using the given parameter, and some internal values passed to apply_length().
- void apply_length (int a_bpm, int a_bw, int a_measures)

  Sets the length based on the three given parameters.
- long get_measures ()

  Calculates the measures value based on the bpm (beats per measure), ppqn (parts per quarter note), and bw (beat width) values, and returns the resultant measures value.
- void set_midi_channel (int a_midichannel)

  Selects the given MIDI channel parameter in the main sequence object, so that it will use that channel.
- void set_midi_bus (int a_midibus)

  Selects the given MIDI buss parameter in the main sequence object, so that it will use that buss.
- void set_scale (int a_scale)

  Selects the given scale value.
- void set_key (int a_note)

  Selects the given key (signature) value.
- void set_background_sequence (int a_seq)

  Draws the given background sequence on the Pattern editor so that the musician has something to see that can be played against.
- void name_change_callback ()

  Set the name for the main sequence to this object's entry name.
- void play_change_callback ()

  Passes the play status to the sequence object.
- void record_change_callback ()

  Passes the recording status to the sequence object.
- void q_rec_change_callback ()

  Passes the quantized-recording status to the sequence object.
- void thru_change_callback ()

  Passes the MIDI Thru status to the sequence object.
- void undo_callback ()

  Pops an undo operation from the sequence object, and then tell the segroll, seqtime, seqdata, and seqevent objects to redraw.
- void redo_callback ()

  Pops a redo operation from the sequence object, and then tell the segroll, seqtime, seqdata, and seqevent objects to redraw.
- void set_data_type (unsigned char a_status, unsigned char a_control=0)

  Sets the data type based on the given parameters.
- void fill_top_bar ()

This function inserts the user-interface items into the top bar or panel of the pattern editor; this bar has two rows of user interface elements.

- void create_menus ()

  Creates the various menus by pushing menu elements into the menus.
- void popup_menu (Gtk::Menu *a_menu)

  Pops up the given pop-up menu.
- void popup_event_menu ()

  Populates the event-selection menu that drops from the "Event" button in the bottom row of the Pattern editor.
- void popup_midibus_menu ()

  Populates the MIDI Output buss pop-up menu.
- void popup_sequence_menu ()

  Populates the "set background sequence" menu (drops from the button that has some note-bars on it at the right of the second row of the top bar).
- void popup_tool_menu ()

  Sets up the pop-up menus that are brought up by pressing the Tools button, which shows a hammer image.
- void popup_midich_menu ()

  Populates the MIDI Channel pop-up menu.
- Gtk::Image * create_menu_image (bool a_state=false)

  Sets the manu pixmap depending on the given state, where true is a full menu (black backgroun), and empty menu (gray background).
- bool timeout ()

  Update the window after a time out, based on dirtiness and on playback progress.
- void do_action (int a_action, int a_var)

  Implements the actions brought forth from the Tools (hammer) button.
- void on_realize ()

  On realization, calls the base-class version, and connects the redraw timeout signal, timed at c_redraw_ms.
- bool on_delete_event (GdkEventAny *a_event)

  Handles an on-delete event.
- bool on_scroll_event (GdkEventScroll *a_ev)

  Handles an on-scroll event.
- bool on_key_press_event (GdkEventKey *a_ev)

  Handles a key-press event.

Private Attributes

- int m_zoom

  Provides the zoom values: 0 1 2 3 4, and 1, 2, 4, 8, 16.
- int m_snap

  Use in setting the snap-to in pulses, off = 1.
- int m_scale

  Settings for the music scale and key.
- Gtk::Menu * m_menu_length

  Provides the length in measures.
- Gtk::Menu * m_menu_bpm

  These member provife the time signature, beats per measure, and beat width menus.
- unsigned char m_editing_status

  Indicates what is the data window currently editing?

Static Private Attributes

- static const int mc_min_zoom

  Static data members.

Additional Inherited Members

7.43.1 Detailed Description

- perform
- seqroll
- seqkeys
- seqdata
- seqtime
- seqevent
- sequence

This class has a metric ton of user-interface objects and other members.

7.43.2 Constructor & Destructor Documentation

7.43.2.1 seq64::seqedit::seqedit (sequence & *seq,* perform & *p,* int *pos,* int *ppqn* = SEQ64_USE_DEFAULT_PPQN)

But this is an unused, empty function.

void seqedit::menu_action_quantise () { } Principal constructor.

Todo Offload most of the work into an initialization function like options does; make the sequence and perform parameters references.

7.43.3 Member Function Documentation

7.43.3.1 void seq64::seqedit::set_zoom (int *a_zoom*) [private]

It is passed to the seqroll, seqtime, seqdata, and seqevent objects, as well.

7.43.3.2 void seq64::seqedit::set_snap (int *a_snap*) [private]

It is passed to the seqroll, seqevent, and sequence objects, as well.

7.43.3.3 void seq64::seqedit::set_note_length (int *a_note_length*) [private]

It is passed to the seqroll object, as well.

7.43.3.4 void seq64::seqedit::apply_length (int *a_bpm,* int *a_bw,* int *a_measures*) [private]

Then the seqroll, seqtime, seqdata, and seqevent objects are reset().

7.43.3.5 long seq64::seqedit::get_measures ( ) [private]

Todo Create a sequence::set_units() function or a sequence::get_measures() function to forward to.

7.43.3.6 void seq64::seqedit::set_scale (int *a_scale*) [private]

It is passed to the seqroll and seqkeys objects, as well.

7.43.3.7 void seq64::seqedit::set_key (int *a_note*) [private]

It is passed to the seqroll and seqkeys objects, as well.

7.43.3.8 void seq64::seqedit::set_background_sequence (int *a_seq*) [private]

Todo Make the sequence pointer a reference.

7.43.3.9 void seq64::seqedit::name_change_callback ( ) [private]

That name is the name the user has given to the sequence being edited.

7.43.3.10 void seq64::seqedit::set_data_type (unsigned char *a_status*, unsigned char *a_control* = 0) [private]

To be determined.

7.43.3.11 void seq64::seqedit::popup_event_menu ( ) [private]

This menu has a large number of items. I think they are filled in in code, but can also be loaded from ~/.seq24usr. To be determined. Create the 8 sub-menus for the various ranges of controller changes, shown 16 per sub-menu.

7.43.3.12 void seq64::seqedit::popup_midibus_menu ( ) [private]

The MIDI busses are obtained by getting the mastermidibus object, and iterating through the busses that it contains.

7.43.3.13 void seq64::seqedit::popup_sequence_menu ( ) [private]

It is populated with an "Off" menu entry, and a second "[0]" menu entry that pulls up a drop-down menu of all of the patterns/sequences that are present in the MIDI file.

7.43.3.14 void seq64::seqedit::popup_tool_menu ( ) [private]

This button shows three sub-menus that need to be filled in by this function. All the functions accessed here seem to be implemented by the do_action() function.

7.43.3.15 void seq64::seqedit::do_action (int *a_action*, int *a_var*) [private]

Note that the push_undo() calls push all of the current events (in sequence::m_events) onto the stack (as a single entry).

7.43.3.16 bool seq64::seqedit::on_delete_event (GdkEventAny * *a_event*) [private]

It tells the sequence to stop recording, tells the perform object's mastermidibus to stop processing input, and sets the sequence object's editing flag to false.

Warning

This function also calls "delete this"!

Returns

Always returns false.

7.43.4 Field Documentation

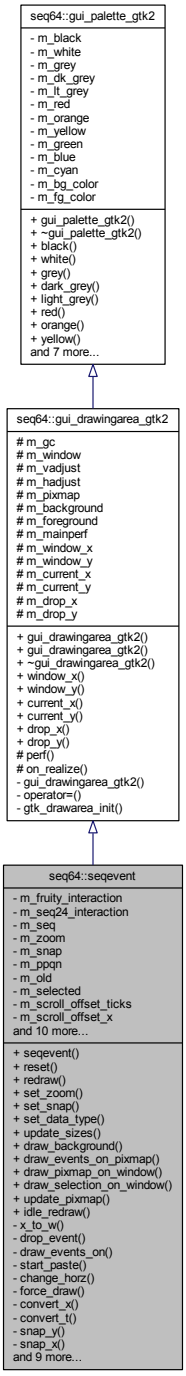
7.43.4.1 const int seq64::seqedit::mc_min_zoom [static], [private]

These items apply to all of the instances of seqedit.

7.44 seq64::seqevent Class Reference

Implements the piano event drawing area.

Inheritance diagram for seq64::seqevent:



Public Member Functions

- seqevent (sequence &seq, perform &p, int zoom, int snap, seqdata &seqdata_wid, Gtk::Adjustment &hadjust, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor.

- void reset ()

  This function basically resets the whole widget as if it was realized again.

- void redraw ()

  Adjusts the scrolling offset for ticks, updates the pixmap, and draws it on the window.
- void set_zoom (int a_zoom)

  Sets zoom to the given value, and resets if the value ended up being changed.
- void set_snap (int a_snap)

  'Setter' function for member m_snap
- void set_data_type (unsigned char a_status, unsigned char a_control)

  Sets the status to the given parameter, and the CC value to the given optional control parameter, which defaults to 0.
- void update_sizes ()

  If the window is realized, this function creates a pixmap with window dimensions, the updates the pixmap, and queues up a redraw.
- void draw_background ()

  This function updates the background.
- void draw_events_on_pixmap ()

  This function fills the main pixmap with events.
- void draw_pixmap_on_window ()

  This function currently just queues up a draw operation for the pixmap.
- void draw_selection_on_window ()

  Draw the selected events on the window.
- void update_pixmap ()

  Redraws the background pixmap on the main pixmap, then puts the events on.
- int idle_redraw ()

  Implements redraw while idling.

Private Member Functions

- void x_to_w (int a_x1, int a_x2, int &a_x, int &a_w)

  This function checks the mins / maxes.
- void drop_event (long a_tick)

  Drops (adds) an event at the given tick.
- void draw_events_on (Glib::RefPtr< Gdk::Drawable > a_draw)

  Draws events on the given drawable object.
- void start_paste ()

  Starts a paste operation.
- void change_horz ()

  Changes the horizontal scrolling offset for ticks, then updates the pixmap and forces a redraw.
- void force_draw ()

  Forces a draw on the current drawable area of the window.
- void convert_x (int x, long &tick)

  Takes the screen x coordinate, multiplies it by the current zoom, and returns the tick value in the given parameter.
- void convert_t (long ticks, int &x)

  Converts the given tick value to an x corrdinate, based on the zoom, and returns it via the second parameter.
- void snap_y (int &y)

  This function performs a 'snap' on y.
- void snap_x (int &a_x)

  This function performs a 'snap' on x.
- void on_realize ()

  Implements the on-realize callback.
- bool on_expose_event (GdkEventExpose *a_ev)

  Implements the on-expose event callback.
- bool on_button_press_event (GdkEventButton *a_ev)

Implements the on-button-press event callback.

- bool on_button_release_event (GdkEventButton *a_ev)

  Implements the on-button-release event callback.
- bool on_motion_notify_event (GdkEventMotion *a_ev)

  Implements the on-motion-notify event callback.
- bool on_focus_in_event (GdkEventFocus *)

  Responds to a focus event by setting the HAS_FOCUS flag.
- bool on_focus_out_event (GdkEventFocus *)

  Responds to a unfocus event by resetting the HAS_FOCUS flag.
- bool on_key_press_event (GdkEventKey *a_p0)

  Implements the key-press event callback function.
- void on_size_allocate (Gtk::Allocation &)

  Implements the on-size-allocate event callback.

Private Attributes

- FruitySeqEventInput m_fruity_interaction

  Why should we need both at the same time? Just load the one that is specified in the configuration.
- int m_zoom

  Zoom setting, means that one pixel == m_zoom ticks.
- bool m_selecting

  Used when highlighting a bunch of events.
- unsigned char m_status

  Indicates what is the data window currently editing?

Additional Inherited Members

7.44.1 Member Function Documentation

7.44.1.1 void seq64::seqevent::set_snap (int *a_snap*) [inline]

Simply sets the snap member.

7.44.1.2 void seq64::seqevent::set_data_type (unsigned char *status*, unsigned char *control* = 0)

Then redraws.

7.44.1.3 void seq64::seqevent::update_sizes ( )

This ends up filling the background with dotted lines, etc.

7.44.1.4 void seq64::seqevent::draw_background ( )

It sets the foreground to white, draws the rectangle.

7.44.1.5 void seq64::seqevent::draw_pixmap_on_window ( )

Old comments:

```
It then tells event to do the same.
We changed something on this window, and chances are we need to
update the event widget as well and update our velocity window.
```

7.44.1.6 int seq64::seqevent::idle_redraw ( )

Who calls this routine?

7.44.1.7 void seq64::seqevent::x_to_w (int *a_x1,* int *a_x2,* int & *a_x,* int & *a_w*) [private]

Then it fills in x and the width.

7.44.1.8 void seq64::seqevent::drop_event (long *a_tick*) [private]

It sets the first byte properly for after-touch, program-change, channel-pressure, and pitch-wheel. The type of event is determined by m_status.

7.44.1.9 void seq64::seqevent::start_paste ( ) [private]

It gets the clipboard box that selected elements are in, makes a coordinate conversion, and then, sets the m_↩ selected rectangle to hold the (x,y,w,h) of the selected events.

7.44.1.10 void seq64::seqevent::convert_x (int *x,* long & *tick*) [inline], [private]

Why not just return it normally?

7.44.1.11 void seq64::seqevent::convert_t (long *ticks,* int & *x*) [inline], [private]

Why not just return it normally?

7.44.1.12 void seq64::seqevent::snap_x (int & *x*) [private]

- snap = number pulses to snap to
- m_zoom = number of pulses per pixel,

Therefore snap / m_zoom = number pixels to snap to.

7.44.1.13 void seq64::seqevent::on_realize ( ) [private]

It calls the base-class version, and then allocates additional resource not allocated in the constructor. Finally, it connects up the change_horz function.

7.44.1.14 bool seq64::seqevent::on_button_press_event (GdkEventButton * *a_ev*) [private]

It distinguishes between the Seq24 and Fruity varieties of mouse interaction.

Odd. In the legacy code, each case fell through to the next case to the "default" case! We will assume for now that this is incorrect.

Note that returning "true" from a Gtkmm event-handler stops the propagation of the event to higher-level widgets. The Fruity and Seq24 event handlers return true, always. In the legacy code, though, the fall-through code caused false to be returned, always. Not sure what effect this had.

7.44.1.15 bool seq64::seqevent::on_button_release_event (GdkEventButton * *a_ev*) [private]

It distinguishes between the Seq24 and Fruity varieties of mouse interaction.

Odd. The fruity case fell through to the Seq24 case. We will assume for now that this is correct.

7.44.1.16 bool seq64::seqevent::on_motion_notify_event (GdkEventMotion * *a_ev*) [private]

It distinguishes between the Seq24 and Fruity varieties of mouse interaction.

Odd. The fruity case fell through to the Seq24 case. We will assume for now that this is correct.

7.44.1.17 bool seq64::seqevent::on_key_press_event (GdkEventKey * *a_p0*) [private]

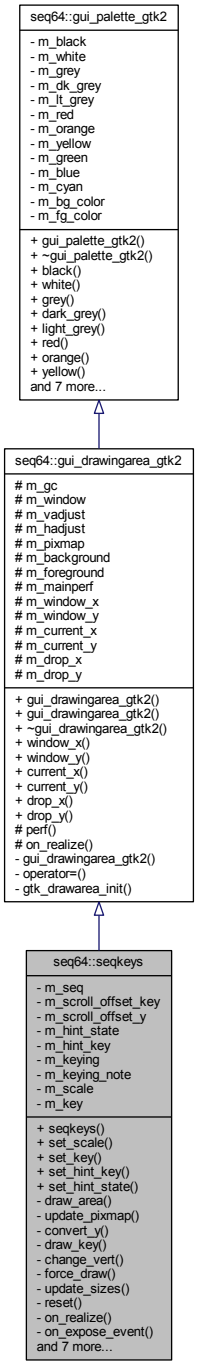
It handles deleted a selection via the Backspace or Delete keys, cut via Ctrl-X, copy via Ctrl-C, paste via Ctrl-V, and undo via Ctrl-Z.

Would be nice to provide redo functionality via Ctrl-Y. :-)

7.45 seq64::seqkeys Class Reference

This class implements the left side piano of the pattern/sequence editor.

Inheritance diagram for seq64::seqkeys:



Public Member Functions

- seqkeys (sequence &seq, perform &p, Gtk::Adjustment &vadjust)

  Principal constructor.
- void set_scale (int a_scale)

  Sets the musical scale, then resets.
- void set_key (int a_key)

Sets the musical key, then resets.

- void set_hint_key (int a_key)

  Sets a key to grey so that it can serve as a scale hint.
- void set_hint_state (bool a_state)

  Sets the hint state to the given value.

Private Member Functions

- void draw_area ()

  Draws the updated pixmap on the drawable area of the window where the keys' location is hardwired.
- void update_pixmap ()

  Updates the pixmaps to prepare it for the next draw operation.
- void convert_y (int a_y, int &a_note)

  Takes the screen y coordinate, and returns the note value in the second parameter.
- void draw_key (int a_key, bool a_state)

  Draws the given key according to the given state.
- void change_vert ()

  Changes the y offset of the scrolling, and the forces a draw.
- void force_draw ()

  Forces a draw operation on the whole window.
- void reset ()

  Resetting the keys view updates the pixmap and queues up a draw operation.
- void on_realize ()

  Implements the on-realize event.
- bool on_expose_event (GdkEventExpose *a_ev)

  Implements the on-expose event, by drawing on the window.
- bool on_button_press_event (GdkEventButton *a_ev)

  Implements the on-button-press event callback.
- bool on_button_release_event (GdkEventButton *a_ev)

  Implements the on-button-release event callback.
- bool on_motion_notify_event (GdkEventMotion *a_p0)

  Implements the on-motion-notify event handler.
- bool on_enter_notify_event (GdkEventCrossing *p0)

  Implements the on-enter notification event handler.
- bool on_leave_notify_event (GdkEventCrossing *p0)

  Implements the on-leave notification event handler.
- bool on_scroll_event (GdkEventScroll *a_ev)

  Implements the on-scroll-event notification event handler.
- void on_size_allocate (Gtk::Allocation &)

  Implements the on-size-allocation notification event handler.

Private Attributes

- bool m_keying

  What is this?

Additional Inherited Members

7.45.1 Member Function Documentation

7.45.1.1 void seq64::seqkeys::set_hint_state (bool *state*)

Parameters

state	Provides the value for hinting, where true == on, false == off.

7.45.1.2 void seq64::seqkeys::draw_key (int *a_key*, bool *a_state*) [private]

It accounts for the black keys and the white keys.

Parameters

a_key	The key to be drawn.
a_state	How the key is to be drawn, where false == normal, true == grayed.

7.45.1.3 void seq64::seqkeys::on_realize ( ) [private]

Call the base-class version and then allocates resources that could not be allocated in the constructor. It connects the change_vert() function and then calls it.

7.45.1.4 bool seq64::seqkeys::on_button_press_event (GdkEventButton * *ev*) [private]

It currently handles only the left button. This button, pressed on the piano keyboard, causes m_keying to be set to true, and the given note to play.

7.45.1.5 bool seq64::seqkeys::on_button_release_event (GdkEventButton * *ev*) [private]

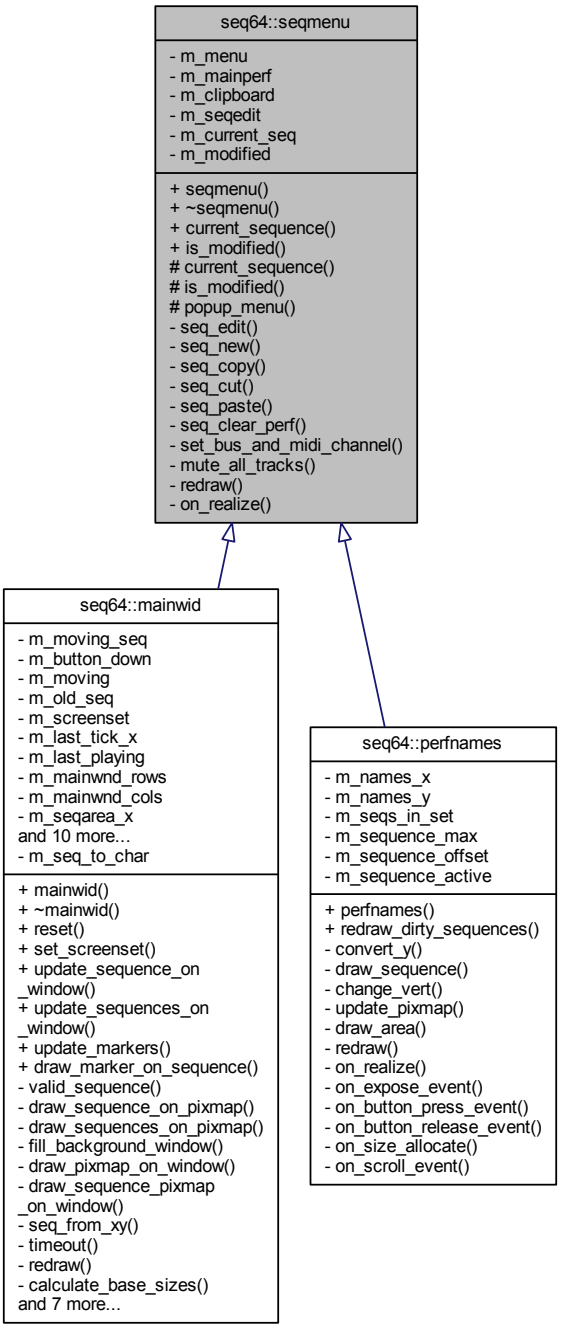
It currently handles only the left button, and only if m_keying is true.

This function is used after pressing on one of the keys on the left-side piano keyboard, to make it play, and turns off the playing of the note.

7.46 seq64::seqmenu Class Reference

This class handles the right-click menu of the sequence slots in the pattern window.

Inheritance diagram for seq64::seqmenu:



Public Member Functions

- seqmenu (perform &a_p)

  Principal constructor.
- virtual ~seqmenu ()

  Provides a rote base-class destructor.
- int current_sequence () const

'Getter' function for member m_current_seq

- bool is_modified () const

  'Getter' function for member m_modified

Protected Member Functions

- void current_sequence (int seq)

  'Setter' function for member m_current_seq
- void is_modified (bool flag)

  'Setter' function for member m_modified
- void popup_menu ()

  This function sets up the File menu entries.

Private Member Functions

- void seq_edit ()

  This menu callback launches the sequence-editor (pattern editor) window.
- void seq_new ()

  This function sets the new sequence into the perform object, a bit prematurely, though.
- void seq_copy ()

  Copies the selected (current) sequence to the clipboard sequence.
- void seq_cut ()

  Deletes the selected (current) sequence and copies it to the clipboard sequence, if it is not in edit mode.
- void seq_paste ()

  Pastes the sequence clipboard into the current sequence, if the current sequence slot is not active.
- void seq_clear_perf ()

  If the current sequence is active, this function pushes a trigger undo in the main perform object, clears its sequence triggers for the current seqeuence, and sets the dirty flag of the sequence.
- void set_bus_and_midi_channel (int a_bus, int a_ch)

  Sets up the bus, MIDI channel, and dirtiness flag of the current sequence in the main perform object, as per the give parameters.
- void mute_all_tracks ()

  Mutes all tracks in the main perform object.

Private Attributes

- seqedit * m_seqedit

  Change Note Added by Chris on 2015-08-02 based on compiler warnings and a comment warning in the seq_edit() function.

7.46.1 Detailed Description

It is an abstract base class.

7.46.2 Constructor & Destructor Documentation

7.46.2.1 seq64::seqmenu::seqmenu (perform & *a_p*)

Apart from filling in some of the members, this function initializes the clipboard, so that we don't get a crash on a paste with no previous copy.

7.46.2.2 seq64::seqmenu::~seqmenu ( ) [virtual]

A rote destructor.

This is necessary in an abstraction base class.

If we determine that we need to delete the m_seqedit pointer, we can do it here. But that is not likely, because we can have many new seqedit objects in play, because we can edit many at once.

7.46.3 Member Function Documentation

7.46.3.1 void seq64::seqmenu::seq_edit ( ) [private]

If it is already open for that sequence, this function just raises it.

Note that the m_seqedit member to which we save the new pointer is currently there just to avoid a compiler warning.

Also, if a new sequences is created, we set the m_modified flag to true, even though the sequence might later be deleted. Too much modification to keep track of!

7.46.3.2 void seq64::seqmenu::seq_copy ( ) [private]

Todo Can be offloaded to a perform member function that accepts a sequence clipboard non-const reference parameter.

7.46.3.3 void seq64::seqmenu::seq_cut ( ) [private]

Todo A lot of seq_cut() can be offloaded to a (new) perform member function that takes a sequence clipboard non-const reference parameter.

7.46.3.4 void seq64::seqmenu::seq_paste ( ) [private]

Then it sets the dirty flag for the destination sequence.

Todo All of seq_paste() can be offloaded to a (new) perform member function with a const clipboard reference parameter.

7.46.3.5 void seq64::seqmenu::seq_clear_perf ( ) [private]

Todo All of seq_paste() can be offloaded to a (new) perform member function.

7.46.4 Field Documentation

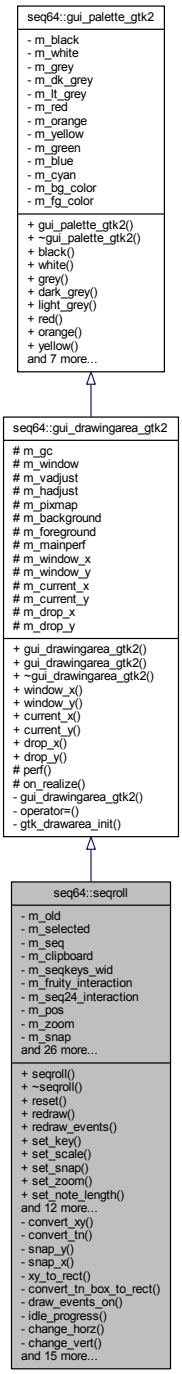
7.46.4.1 seqedit* seq64::seqmenu::m_seqedit [private]

We'll save the result of that function here, and will let valgrind tell us later if Gtkmm takes care of it.

7.47 seq64::seqroll Class Reference

Implements the piano roll section of the pattern editor.

Inheritance diagram for seq64::seqroll:



Public Member Functions

- seqroll (perform &perf, sequence &seq, int zoom, int snap, seqkeys &seqkeys_wid, int pos, Gtk::Adjustment &hadjust, Gtk::Adjustment &vadjust, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor.

- ~seqroll ()

  Provides a destructor to delete allocated objects.

- void reset ()

  This function basically resets the whole widget as if it was realized again.
- void redraw ()

  Redraws unless m_ignore_redraw is true.
- void redraw_events ()

  Redraws events unless m_ignore_redraw is true.
- void set_key (int key)

  Sets the music key to the given value, and then resets the view.
- void set_scale (int scale)

  Sets the music scale to the given value, and then resets the view.
- void set_snap (int snap)

  Sets the snap to the given value, and then resets the view.
- void set_zoom (int zoom)

  Sets the zoom to the given value, and then resets the view.
- void set_note_length (int note_length)

  'Setter' function for member m_note_length
- void set_ignore_redraw (bool ignore)

  'Setter' function for member m_ignore_redraw
- void set_data_type (unsigned char status, unsigned char control)

  Sets the status to the given parameter, and the CC value to the given optional control parameter, which defaults to 0.
- void set_background_sequence (bool state, int seq)

  This function sets the given sequence onto the piano roll of the pattern editor, so that the musician can have another pattern to play against.
- void update_pixmap ()

  This function draws the background pixmap on the main pixmap, and then draws the events on it.
- void update_sizes ()

  Update the sizes of items based on zoom, PPQN, BPM, BW (beat width) and more.
- void update_background ()

  Updates the background of this window.
- void draw_background_on_pixmap ()

  Draws the main pixmap.
- void draw_events_on_pixmap ()

  Fills the main pixmap with events.
- void draw_selection_on_window ()

  Draws the current selecton on the main window.
- void draw_progress_on_window ()

  Draw a progress line on the window.
- int idle_redraw ()

  Draw the events on the main window and on the pixmap.
- void start_paste ()

  Starts a paste operation.

Private Member Functions

- void convert_tn (long ticks, int note, int &x, int &y)

  This function takes the given note and tick, and returns the screen coordinates via the pointer parameters.
- void snap_x (int &x)

  Performs a 'snap' operation on the x coordinate.
- void xy_to_rect (int x1, int y1, int x2, int y2, int &x, int &y, int &w, int &h)

  This function checks the mins / maxes, and then fills in the x, y, width, and height values.
- void convert_tn_box_to_rect (long tick_s, long tick_f, int note_h, int note_l, int &x, int &y, int &w, int &h)

Converts a tick/note box to an x/y rectangle.

- void draw_events_on (Glib::RefPtr< Gdk::Drawable > draw)

  Draws events on the given drawable area.
- void change_horz ()

  Change the horizontal scrolling offset and redraw.
- void change_vert ()

  Change the vertical scrolling offset and redraw.
- void force_draw ()

  Set the pixmap into the window and then draws the selection on it.
- void on_realize ()

  Implements the on-realize event handling.
- bool on_expose_event (GdkEventExpose *ev)

  Implements the on-expose event handling.
- bool on_button_press_event (GdkEventButton *ev)

  Implements the on-button-press event handling.
- bool on_button_release_event (GdkEventButton *ev)

  Implements the on-button-release event handling.
- bool on_motion_notify_event (GdkEventMotion *ev)

  Implements the on-motion-notify event handling.
- bool on_focus_in_event (GdkEventFocus *)

  Implements the on-focus event handling.
- bool on_focus_out_event (GdkEventFocus *)

  Implements the on-unfocus event handling.
- bool on_key_press_event (GdkEventKey *ev)

  Implements the on-key-press event handling.
- bool on_scroll_event (GdkEventScroll *a_ev)

  Implements the on-scroll event handling.
- void on_size_allocate (Gtk::Allocation &)

  Implements the on-size-allocate event handling.
- bool on_leave_notify_event (GdkEventCrossing *p0)

  Implements the on-leave-notify event handling.
- bool on_enter_notify_event (GdkEventCrossing *p0)

  Implements the on-enter-notify event handling.

Private Attributes

- int m_zoom

  *one pixel == m_zoom ticks**
- unsigned char m_status

  Indicates what is the data window currently editing.
- bool m_selecting

  When highlighting a bunch of events.
- int m_move_delta_x

  Tells where the dragging started.

Additional Inherited Members

7.47.1 Member Function Documentation

7.47.1.1 void seq64::seqroll::reset ( )

It's almost identical to the change_horz() function!

7.47.1.2 void seq64::seqroll::set_data_type (unsigned char *status,* unsigned char *control*)

Unlike the same function in seqevent, this version does not redraw.

7.47.1.3 void seq64::seqroll::set_background_sequence (bool *state,* int *seq*)

The a_state parameter sets the boolean m_drawing_background_seq.

7.47.1.4 void seq64::seqroll::draw_events_on_pixmap ( )

Just calls draw_events_on().

7.47.1.5 void seq64::seqroll::convert_tn (long *a_ticks,* int *a_note,* int & *a_x,* int & *a_y*) [private]

This function is the "inverse" of convert_xy().

7.47.1.6 void seq64::seqroll::snap_x (int & *x*) [private]

This function is similar to snap_y(), but it calculates a modulo value from the snap and zoom settings.

```
-   m_snap = number pulses to snap to
-   m_zoom = number of pulses per pixel
```

Therefore, m_snap / m_zoom = number pixels to snap to.

7.47.1.7 bool seq64::seqroll::on_key_press_event (GdkEventKey * *a_p0*) [private]

The start/end key may be the same key (i.e. SPACEBAR). Allow toggling when the same key is mapped to both triggers (i.e. SPACEBAR).

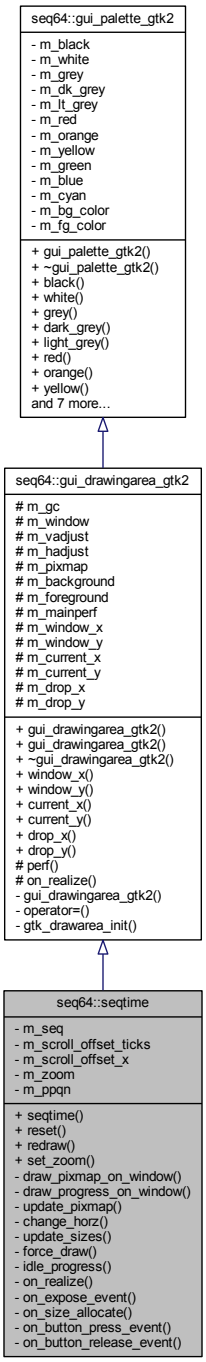
7.47.1.8 bool seq64::seqroll::on_scroll_event (GdkEventScroll * *a_ev*) [private]

This scroll event only handles basic scrolling without any modifier keys such as GDK_CONTROL_MASK or GDK↩ _SHIFT_MASK.

7.48 seq64::seqtime Class Reference

This class implements the piano time, whatever that is.

Inheritance diagram for seq64::seqtime:



Public Member Functions

- void set_zoom (int zoom)

  Sets the zoom to the given value and resets the window.

Private Member Functions

- bool idle_progress ()

  Simply returns true.
- bool on_button_press_event (GdkEventButton *)

  Implements the on-button-press event handler.
- bool on_button_release_event (GdkEventButton *)

  Implements the on-button-release event handler.

Private Attributes

- int m_zoom

  one pixel == m_zoom ticks

Additional Inherited Members

7.48.1 Member Function Documentation

7.48.1.1 bool seq64::seqtime::on_button_press_event (GdkEventButton *) [inline], [private]

Simply returns false.

7.48.1.2 bool seq64::seqtime::on_button_release_event (GdkEventButton *) [inline], [private]

Simply returns false.

7.49 seq64::sequence Class Reference

The sequence class is firstly a receptable for a single track of MIDI data read from a MIDI file or edited into a pattern.

Public Types

- enum select_action_e {
  e_select,
  e_select_one,
  e_is_selected,
  e_would_select,
  e_deselect,
  e_toggle_selection,
  e_remove_one }
- typedef std::list< trigger > Triggers

  Exposes the triggers, currently needed for midi_container only.

Public Member Functions

- sequence (int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor.
- ~sequence ()

  A rote destructor.
- sequence & operator= (const sequence &rhs)

Principal assignment operator.

- event_list & events ()

  'Getter' function for member m_events

- Triggers & triggers ()

  'Getter' function for member m_triggers

- int event_count () const

  Returns the number of events stored in m_events.

- void push_undo ()

  Pushes the list-event into the undo-list.

- void pop_undo ()

  If there are items on the undo list, this function pushes the list-event into the redo-list, puts the top of the undo-list into the list-event, pops from the undo-list, calls verify_and_link(), and then calls unselect.

- void pop_redo ()

  If there are items on the redo list, this function pushes the list-event into the undo-list, puts the top of the redo-list into the list-event, pops from the redo-list, calls verify_and_link(), and then calls unselect.

- void push_trigger_undo ()

  Pushes the list-trigger into the trigger undo-list, then flags each item in the undo-list as unselected.

- void pop_trigger_undo ()

  If the trigger undo-list has any items, the list-trigger is pushed 9nto the redo list, the top of the undo-list is coped into the list-trigger, and then pops from the undo-list.

- void set_name (const std::string &name)

  Sets the sequence name member, m_name.

- void set_name (char *name)

  Sets the sequence name member, m_name.

- void set_bpm (long beats_per_measure)

  'Setter' function for member m_time_beats_per_measure

- long get_bpm () const

  'Getter' function for member m_time_beats_per_measure

- void set_bw (long beat_width)

  'Setter' function for member m_time_beat_width

- long get_bw () const

  'Getter' function for member m_time_beat_width

- void set_rec_vol (long rec_vol)

  'Setter' function for member m_rec_vol

- void set_song_mute (bool mute)

  'Setter' function for member m_song_mute

- bool get_song_mute () const

  'Getter' function for member m_song_mute

- const char * get_name () const

  'Getter' function for member m_name pointer

- const std::string & name () const

  'Getter' function for member m_name

- void set_editing (bool edit)

  'Setter' function for member m_editing

- bool get_editing () const

  'Getter' function for member m_editing

- void set_raise (bool edit)

  'Setter' function for member m_raise

- bool get_raise (void) const

  'Getter' function for member m_raise

- void set_length (long len, bool adjust_triggers=true)

Sets the length (m_length) and adjusts triggers for it if desired.

- long get_length () const

  'Getter' function for member m_length

- long get_last_tick ()

  Returns the last tick played, and is used by the editor's idle function.

- void set_playing (bool)

  Sets the playing state of this sequence.

- bool get_playing () const

  'Getter' function for member m_playing

- void toggle_playing ()

  Toggles the playing status of this sequence.

- void toggle_queued ()

  'Setter' function for member m_queued and m_queued_tick

- void off_queued ()

  'Setter' function for member m_queued

- bool get_queued () const

  'Getter' function for member m_queued

- long get_queued_tick () const

  'Getter' function for member m_queued_tick

- void set_recording (bool)

  'Setter' function for member m_recording and m_notes_on

- bool get_recording () const

  'Getter' function for member m_recording

- void set_snap_tick (int st)

  'Setter' function for member m_snap_tick

- void set_quantized_rec (bool qr)

  'Setter' function for member m_quantized_rec

- bool get_quantized_rec () const

  'Getter' function for member m_quantized_rec

- void set_thru (bool)

  'Setter' function for member m_thru

- bool get_thru () const

  'Getter' function for member m_thru

- bool is_dirty_main ()

  Returns the value of the dirty main flag, and sets that flag to false (i.e.

- bool is_dirty_edit ()

  Returns the value of the dirty edit flag, and sets that flag to false.

- bool is_dirty_perf ()

  Returns the value of the dirty performance flag, and sets that flag to false.

- bool is_dirty_names ()

  Returns the value of the dirty names (heh heh) flag, and sets that flag to false.

- void set_dirty_mp ()

  Sets the dirty flags for names, main, and performance.

- void set_dirty ()

  Call set_dirty_mp() and then sets the dirty flag for editing.

- unsigned char get_midi_channel () const

  'Getter' function for member m_midi_channel

- void set_midi_channel (unsigned char ch)

  Sets the m_midi_channel number.

- void print ()

  Prints a list of the currently-held events.

- void print_triggers ()

  Prints a list of the currently-held triggers.
- void play (long tick, bool playback_mode)

  The play() function dumps notes starting from the given tick, and it pre-buffers ahead.
- void set_orig_tick (long tick)

  'Setter' function for member m_last_tick
- void add_event (const event *e)

  Adds an event to the internal event list in a sorted manner.
- void add_trigger (long tick, long length, long offset=0, bool adjust_offset=true)

  Adds a trigger.
- void split_trigger (long tick)

  Splits a trigger.
- void grow_trigger (long tick_from, long tick_to, long length)

  Grows a trigger.
- void del_trigger (long tick)

  Deletes a trigger, that brackets the given tick, from the trigger-list.
- bool unselect_triggers ()

  Always returns false!
- bool intersectTriggers (long position, long &start, long &end)

  This function examines each trigger in the trigger list.
- bool intersectNotes (long position, long position_note, long &start, long &end, long &note)

  This function examines each note in the event list.
- bool intersectEvents (long posstart, long posend, long status, long &start)

  This function examines each non-note event in the event list.
- void move_selected_triggers_to (long tick, bool adjust_offset, int which=2)

  Moves selected triggers as per the given parameters.
- long selected_trigger_start ()

  Gets the selected trigger's start tick.
- long selected_trigger_end ()

  Gets the selected trigger's end tick.
- long get_max_trigger ()

  Get the ending value of the last trigger in the trigger-list.
- void move_triggers (long start_tick, long distance, bool direction)

  Moves triggers in the trigger-list.
- void copy_triggers (long start_tick, long distance)

  Not sure what these diagrams are for yet.
- void clear_triggers ()

  Clears the whole list of triggers.
- long get_trigger_offset () const

  'Getter' function for member m_trigger_offset
- void set_midi_bus (char mb)

  Sets the midibus number to dump to.
- char get_midi_bus () const

  'Getter' function for member m_bus
- void set_master_midi_bus (mastermidibus *mmb)

  'Setter' function for member m_masterbus
- int select_note_events (long tick_s, int note_h, long tick_f, int note_l, select_action_e action)

  This function selects events in range of tick start, note high, tick end, and note low.
- int select_events (long tick_s, long tick_f, unsigned char status, unsigned char cc, select_action_e action)

  Select all events in the given range, and returns the number selected.
- int select_events (unsigned char status, unsigned char cc, bool inverse=false)

Select all events with the given status, and returns the number selected.

- int get_num_selected_notes ()

  Counts the selected notes in the event list.
- int get_num_selected_events (unsigned char status, unsigned char cc)

  Counts the selected events, with the given status, in the event list.
- void select_all ()

  Selects all events, unconditionally.
- void copy_selected ()

  Copies the selected events.
- void paste_selected (long tick, int note)

  Pastes the selected notes (and only note events) at the given tick and the given note value.
- void get_selected_box (long &tick_s, int &note_h, long &tick_f, int &note_l)

  Returns the 'box' of the selected items.
- void get_clipboard_box (long &tick_s, int &note_h, long &tick_f, int &note_l)

  Returns the 'box' of selected items.
- void move_selected_notes (long delta_tick, int delta_note)

  Removes and adds reads selected in position.
- void add_note (long tick, long length, int note, bool paint=false)

  Adds a note of a given length and note value, at a given tick location.
- void add_event (long tick, unsigned char status, unsigned char d0, unsigned char d1, bool paint=false)

  Adds a event of a given status value and data values, at a given tick location.
- void stream_event (event *ev)

  Streams the given event.
- void change_event_data_range (long tick_s, long tick_f, unsigned char status, unsigned char cc, int d_s, int d_f)

  Changes the event data range.
- void increment_selected (unsigned char status, unsigned char control)

  Increments events the match the given status and control values.
- void decrement_selected (unsigned char status, unsigned char control)

  Decrements events the match the given status and control values.
- void grow_selected (long delta_tick)

  Moves note off event.
- void stretch_selected (long delta_tick)

  Performs a stretch operation on the selected events.
- void remove_marked ()

  Removes marked events.
- void mark_selected ()

  Marks the selected events.
- void unpaint_all ()

  Unpaints all list-events.
- void unselect ()

  Deselects all events, unconditionally.
- void verify_and_link ()

  This function verifies state: all note-ons have an off, and it links note-offs with their note-ons.
- void link_new ()

  Links a new event.
- void zero_markers ()

  Resets everything to zero.
- void play_note_on (int note)

  Plays a note from the piano roll on the main bus on the master MIDI buss.
- void play_note_off (int note)

Turns off a note from the piano roll on the main bus on the master MIDI buss.

- void off_playing_notes ()

  Sends a note-off event for all active notes.

- void reset_draw_marker ()

  This refreshes the play marker to the last tick.

- void reset_draw_trigger_marker ()

  Threadsafe

- draw_type get_next_note_event (long *tick_s, long *tick_f, int *note, bool *selected, int *velocity)

  Each call to seqdata() fills the passed references with a events elements, and returns true.

- int get_lowest_note_event ()

  Threadsafe

- int get_highest_note_event ()

  Threadsafe

- bool get_next_event (unsigned char status, unsigned char cc, long *tick, unsigned char *d0, unsigned char *d1, bool *selected)

  Get the next event in the event list that matches the given status and control character.

- bool get_next_event (unsigned char *status, unsigned char *cc)

  Get the next event in the event list.

- bool get_next_trigger (long *tick_on, long *tick_off, bool *selected, long *tick_offset)

  Get the next trigger in the trigger list, and set the parameters based on that trigger.

- void fill_container (midi_container &c, int tracknumber)

  This function fills the given character list with MIDI data from the current sequence, preparatory to writing it to a file.

- void transpose_notes (int steps, int scale)

  Transposes notes by the given steps, in accordance with the given scale.

Private Member Functions

- void put_event_on_bus (event *ev)

  Takes an event that this sequence is holding, and places it on the midibus.

- void set_trigger_offset (long trigger_offset)

  Sets m_trigger_offset and wraps it to m_length.

- void split_trigger (trigger &trig, long split_tick)

  Splits the trigger given by the parameter into two triggers.

- void adjust_trigger_offsets_to_length (long new_len)

  Not sure what these diagrams are for yet.

- long adjust_offset (long offset)

  Adjusts the given offset by mod'ing it with m_length and adding m_length if needed, and returning the result.

- void remove (event_list::iterator i)

  A helper function, which does not lock/unlock, so it is unsafe to call without supplying an iterator from the list-event.

- void remove (event *e)

  A helper function, which does not lock/unlock, so it is unsafe to call without supplying an iterator from the list-event.

Private Attributes

- event_list m_events

  This list holds the current pattern/sequence events.

- mutex m_mutex

  Provides locking for the sequence.

Static Private Attributes

- static event_list m_events_clipboard

  A static clipboard for holding pattern/sequence events.

7.49.1 Detailed Description

More members than you can shake a stick at.

7.49.2 Member Enumeration Documentation

7.49.2.1 enum seq64::sequence::select_action_e

Enumerator

e_select This enumeration is used in selecting events and note. Se the select_note_events() and select_events() functions.

```
To select ...
```

e_select_one To select ...

e_is_selected The events are selected ...

e_would_select The events would be selected ...

e_deselect To deselect the event under the cursor.

e_toggle_selection To toggle the selection of the event under the cursor.

e_remove_one To remove one note under the cursor.

7.49.3 Member Function Documentation

7.49.3.1 sequence & seq64::sequence::operator= (const sequence & *rhs*)

Follows the stock rules for such an operator, but does a little more then just assign member values. Currently, it does not assign them all, so we should create a partial_copy() function to do this work, and use it where it is needed.

Threadsafe

7.49.3.2 int seq64::sequence::event_count ( ) const

Threadsafe

7.49.3.3 void seq64::sequence::push_undo ( )

Threadsafe

7.49.3.4 void seq64::sequence::pop_undo ( )

Threadsafe

7.49.3.5 void seq64::sequence::pop_redo ( )

Threadsafe

7.49.3.6 void seq64::sequence::push_trigger_undo ( )

Threadsafe

7.49.3.7 void seq64::sequence::set_bpm (long *beats_per_measure*)

Threadsafe

7.49.3.8 void seq64::sequence::set_bw (long *beat_width*)

Threadsafe

7.49.3.9 long seq64::sequence::get_bw ( ) const [inline]

Threadsafe

7.49.3.10 void seq64::sequence::set_rec_vol (long *rec_vol*)

Threadsafe

7.49.3.11 void seq64::sequence::set_length (long *len,* bool *adjust_triggers* = true)

Threadsafe

7.49.3.12 void seq64::sequence::set_playing (bool *a_p*)

When playing, and the sequencer is running, notes get dumped to the ALSA buffers.

Parameters

a_p	Provides the playing status to set. True means to turn on the playing, false means to turn it off, and turn off any notes still playing.

7.49.3.13 void seq64::sequence::toggle_queued ( )

Toggles the queued flag and sets the dirty-mp flag. Also calculates the queued tick based on m_last_tick.

Threadsafe

7.49.3.14 void seq64::sequence::off_queued ( )

Toggles the queued flag and sets the dirty-mp flag.

Threadsafe

7.49.3.15 void seq64::sequence::set_recording (bool *a_r*)

Threadsafe

7.49.3.16 void seq64::sequence::set_snap_tick (int *a_st*)

Threadsafe

7.49.3.17 void seq64::sequence::set_quantized_rec (bool *a_qr*)

Threadsafe

7.49.3.18 void seq64::sequence::set_thru (bool *a_r*)

Threadsafe

7.49.3.19 bool seq64::sequence::is_dirty_main ( )

resets it). This flag signals that a redraw is needed from recording.

Threadsafe

7.49.3.20 bool seq64::sequence::is_dirty_edit ( )

Threadsafe

7.49.3.21 bool seq64::sequence::is_dirty_perf ( )

Threadsafe

7.49.3.22 bool seq64::sequence::is_dirty_names ( )

Threadsafe

7.49.3.23 void seq64::sequence::set_dirty_mp ( )

Not threadsafe

7.49.3.24 void seq64::sequence::set_dirty ( )

Threadsafe

7.49.3.25 void seq64::sequence::set_midi_channel (unsigned char *a_ch*)

Threadsafe

7.49.3.26 void seq64::sequence::print ( )

Not threadsafe

7.49.3.27 void seq64::sequence::print_triggers ( )

Not threadsafe

7.49.3.28 void seq64::sequence::play (long *tick,* bool *playback_mode*)

This function is called by the sequencer thread, performance. The tick comes in as global tick.

It turns the sequence off after we play in this frame.

Threadsafe

7.49.3.29 void seq64::sequence::set_orig_tick (long *tick*)

Threadsafe

7.49.3.30 void seq64::sequence::add_event (const event * *ep*)

Then it reset the draw-marker and sets the dirty flag.

Currently, when reading a MIDI file [see the midifile::parse() function], only the main events (notes, after-touch, pitch, program changes, etc.) are added with this function. So, we can rely on reading only playable events into a sequence.

This module (sequencer) adds all of those events as well, but it can surely add other events. We should assume that any events added by sequencer are playable.

Threadsafe

Warning

> This pushing (and, in writing the MIDI file, the popping), causes events with identical timestamps to be written in reverse order. Doesn't affect functionality, but it's puzzling until one understands what is happening.

7.49.3.31 void seq64::sequence::add_trigger (long *a_tick,* long *a_length,* long *a_offset* = `0`, bool *a_adjust_offset* = `true`)

If a_state = true, the range is on. If a_state = false, the range is off.

What is this?

```
is      ie
<      ><        ><        >
es             ee
<               >
XX

es ee
<   >
<>

es    ee
<      >
<    >

es     ee
<       >
<    >
```

7.49.3.32 void seq64::sequence::split_trigger (long *a_tick*)

This is the public overload of split_trigger.

Threadsafe

7.49.3.33 void seq64::sequence::grow_trigger (long *a_tick_from,* long *a_tick_to,* long *a_length*)

Threadsafe

7.49.3.34 void seq64::sequence::del_trigger (long *a_tick*)

Threadsafe

7.49.3.35 bool seq64::sequence::intersectTriggers (long *position,* long & *start,* long & *end*)

If the given position is between the current trigger's tick-start and tick-end values, the these values are copied to the start and end parameters, respectively, and then we exit.

Threadsafe

Parameters

position	The position to examine.
start	The destination for the starting tick (m_tick_start) of the matching trigger.
end	The destination for the ending tick (m_tick_end) of the matching trigger.

Returns

Returns true if a trigger was found whose start/end ticks contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

7.49.3.36 bool seq64::sequence::intersectNotes (long *position,* long *position_note,* long & *start,* long & *ender,* long & *note*)

If the given position is between the current notes on and off time values, values, the these values are copied to the start and end parameters, respectively, the note value is copied to the note parameter, and then we exit.

Threadsafe

Parameters

position	The position to examine.
position_note	I think this is the note value we might be looking for ???
start	The destination for the starting tick (m_tick_start) of the matching trigger.
end	The destination for the ending tick (m_tick_end) of the matching trigger.
note	The destination for the note of the matching event.

Returns

Returns true if a event was found whose start/end ticks contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

7.49.3.37 bool seq64::sequence::intersectEvents (long *posstart,* long *posend,* long *status,* long & *start*)

If the given position is between the current trigger's tick-start and tick-end values, the these values are copied to the start and end parameters, respectively, and then we exit.

Threadsafe

Parameters

posstart	The starting position to examine.
posend	The ending position to examine.
status	The desired status value.
start	The destination for the starting tick (m_tick_start) of the matching trigger.

Returns

Returns true if a event was found whose start/end ticks contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

7.49.3.38 void seq64::sequence::move_selected_triggers_to (long *a_tick,* bool *a_adjust_offset,* int *a_which* = 2)

```
          min_tick][0                1][max_tick
                           2

-   If we are moving the 0, use first as offset.
-   If we are moving the 1, use the last as the offset.
-   If we are moving both (2), use first as offset.
```

Threadsafe

7.49.3.39 long seq64::sequence::selected_trigger_start ( )

We guess this ends up selecting only one trigger, otherwise only the last selected on would set the result.

Threadsafe

7.49.3.40 long seq64::sequence::selected_trigger_end ( )

Threadsafe

7.49.3.41 long seq64::sequence::get_max_trigger ( )

Threadsafe

7.49.3.42 void seq64::sequence::move_triggers (long *a_start_tick,* long *a_distance,* bool *a_direction*)

Threadsafe

7.49.3.43 void seq64::sequence::copy_triggers (long *a_start_tick,* long *a_distance*)

```
... a
[      ][      ]
...
... a
...

5   7    play
3        offset
8   10   play

X...X...X...X...X...X...X...X...X...X...
L       R
[        ] [     ]  []  orig
[                   ]
```

```
<<
[     ]    [  ][ ]  [] split on the R marker, shift first
[     ]        [     ]
delete middle
[     ][ ]  []         move ticks
[     ][     ]

L       R
[     ][ ] [     ]  [] split on L
[     ][             ]

[     ]         [ ] [     ]  [] increase all after L
[     ]         [             ]
```

Copies triggers to...

Threadsafe

7.49.3.44 void seq64::sequence::clear_triggers ( )

Threadsafe

7.49.3.45 void seq64::sequence::set_midi_bus (char *mb*)

Threadsafe

7.49.3.46 void seq64::sequence::set_master_midi_bus (mastermidibus * *mmb*)

Threadsafe

7.49.3.47 int seq64::sequence::select_note_events (long *a_tick_s*, int *a_note_h*, long *a_tick_f*, int *a_note_l*, select_action_e *a_action*)

Returns the number selected.

Threadsafe

7.49.3.48 int seq64::sequence::select_events (long *tick_s*, long *tick_f*, unsigned char *status*, unsigned char *cc*, select_action_e *action*)

Note that there is also an overloaded version of this function.

Threadsafe

7.49.3.49 int seq64::sequence::select_events (unsigned char *status*, unsigned char *cc*, bool *inverse* = `false`)

Note that there is also an overloaded version of this function.

Threadsafe

Warning

This used to be a void function, so it just returns 0 for now.

7.49.3.50 int seq64::sequence::get_num_selected_notes ( )

Threadsafe

7.49.3.51 int seq64::sequence::get_num_selected_events (unsigned char *status,* unsigned char *cc*)

If the event is a control change (CC), then it must also match the given CC value.

Threadsafe

7.49.3.52 void seq64::sequence::select_all ( )

Threadsafe

7.49.3.53 void seq64::sequence::copy_selected ( )

Threadsafe

7.49.3.54 void seq64::sequence::paste_selected (long *tick,* int *note*)

I wonder if we can get away with just getting a reference to m_events_clipboard, rather than copying the whole thing, for speed.

Threadsafe

7.49.3.55 void seq64::sequence::add_note (long *tick,* long *length,* int *note,* bool *paint* = `false`)

It adds a single note-on / note-off pair.

The a_paint parameter indicates if we care about the painted event, so then the function runs though the events and deletes the painted ones that overlap the ones we want to add.

Threadsafe

7.49.3.56 void seq64::sequence::add_event (long *a_tick,* unsigned char *a_status,* unsigned char *a_d0,* unsigned char *a_d1,* bool *a_paint* = `false`)

The a_paint parameter indicates if we care about the painted event, so then the function runs though the events and deletes the painted ones that overlap the ones we want to add.

Threadsafe

7.49.3.57 void seq64::sequence::stream_event (event * *ev*)

Threadsafe

7.49.3.58 void seq64::sequence::change_event_data_range (long *tick_s,* long *tick_f,* unsigned char *status,* unsigned char *cc,* int *data_s,* int *data_f*)

Changes only selected events, if any.

Threadsafe

Let t == the current tick value; ts == tick start value; tf == tick finish value; ds = data start value; df == data finish value; d = the new data value.

Then

$$d = \frac{df\ (t - ts) + ds\ (tf - t)}{tf - ts}$$

```
If this were an interpolation formula it would be:

                            t -  ts
        d = ds + (df - ds) ---------
                            tf - ts

Something is not quite right; to be investigated.

\param tick_s
    Provides the starting tick value.

\param tick_f
    Provides the ending tick value.

\param status
    Provides the event status that is to be changed.

\param cc
    Provides the event control value.

\param data_s
    Provides the starting data value.

\param data_f
    Provides the finishing data value.
```

7.49.3.59 void seq64::sequence::increment_selected (unsigned char *astat,* unsigned char *control*)

The supported statuses are:

- EVENT_NOTE_ON
- EVENT_NOTE_OFF
- EVENT_AFTERTOUCH
- EVENT_CONTROL_CHANGE
- EVENT_PITCH_WHEEL
- EVENT_PROGRAM_CHANGE
- EVENT_CHANNEL_PRESSURE

Threadsafe

7.49.3.60 void seq64::sequence::decrement_selected (unsigned char *astat,* unsigned char *control*)

The supported statuses are:

- EVENT_NOTE_ON
- EVENT_NOTE_OFF
- EVENT_AFTERTOUCH
- EVENT_CONTROL_CHANGE
- EVENT_PITCH_WHEEL
- EVENT_PROGRAM_CHANGE
- EVENT_CHANNEL_PRESSURE

Threadsafe

7.49.3.61 void seq64::sequence::grow_selected (long *delta_tick*)

Threadsafe

7.49.3.62 void seq64::sequence::stretch_selected (long *delta_tick*)

This should move a note off event, according to old comments, but it doesn't seem to do that. See the grow_↩ selected() function.

Threadsafe

7.49.3.63 void seq64::sequence::remove_marked ( )

Note how this function handles removing a value to avoid incrementing a now-invalid iterator.

Threadsafe

7.49.3.64 void seq64::sequence::mark_selected ( )

Threadsafe

7.49.3.65 void seq64::sequence::unpaint_all ( )

Threadsafe

7.49.3.66 void seq64::sequence::unselect ( )

Threadsafe

7.49.3.67 void seq64::sequence::verify_and_link ( )

Threadsafe

7.49.3.68 void seq64::sequence::link_new ( )

Threadsafe

7.49.3.69 void seq64::sequence::zero_markers ( )

This function is used when the sequencer stops.

Threadsafe

7.49.3.70 void seq64::sequence::play_note_on (int *a_note*)

It flushes a note to the midibus to preview its sound, used by the virtual piano.

Threadsafe

7.49.3.71 void seq64::sequence::play_note_off (int *a_note*)

Threadsafe

7.49.3.72 void seq64::sequence::off_playing_notes ( )

Threadsafe

7.49.3.73 void seq64::sequence::reset_draw_marker ( )

It resets the draw marker so that calls to get_next_note_event() will start from the first event.

Threadsafe

7.49.3.74 draw_type seq64::sequence::get_next_note_event (long * *a_tick_s,* long * *a_tick_f,* int * *a_note,* bool * *a_selected,* int * *a_velocity*)

When it has no more events, returns a false.

7.49.3.75 bool seq64::sequence::get_next_event (unsigned char *status,* unsigned char *cc,* long * *tick,* unsigned char * *d0,* unsigned char * *d1,* bool * *selected*)

Then set the rest of the parameters parameters using that event.

7.49.3.76 bool seq64::sequence::get_next_event (unsigned char * *a_status,* unsigned char * *a_cc*)

Then set the status and control character parameters using that event.

7.49.3.77 void seq64::sequence::fill_container (midi_container & *c,* int *tracknumber*)

Note that some of the events might not come out in the same order they were stored in (we see that with program-change events.

Parameters

c	Provides the std::list object to push events to the front, which thus inserts them in backwards order. (These events are then popped back, which restores the order, with some exceptions).
tracknumber	Provides the track number. This number is masked into the track information.

7.49.3.78 void seq64::sequence::transpose_notes (int *steps,* int *scale*)

If the scale value is 0, this is "no scale", which is the chromatic scale, where all 12 notes, including sharps and flats, are part of the scale.

7.49.3.79 void seq64::sequence::put_event_on_bus (event * *a_e*) [private]

Threadsafe

7.49.3.80 void seq64::sequence::set_trigger_offset (long *a_trigger_offset*) [private]

Threadsafe

7.49.3.81 void seq64::sequence::split_trigger (trigger & *trig,* long *a_split_tick*) [private]

The original trigger ends 1 tick before the a_split_tick parameter, and the new trigger starts at a_split_tick and ends where the original trigger ended.

This is the private overload of split_trigger.

Threadsafe

Parameters

trig	Provides the original trigger, and also holds the changes made to that trigger as it is shortened.

a_split_tick	The position just after where the original trigger will be truncated, and the new trigger begins.

7.49.3.82 void seq64::sequence::adjust_trigger_offsets_to_length (long *a_new_len*) [private]

```
|...|...|...|...|...|...|...

0123456789abcdef0123456789abcdef
[      ][      ][      ][      ][      ][

[  ][      ][  ][][][][][      ]  [  ][  ]
0   4       4   0 7 4 2 0         6   2
0   4       4   0 1 4 6 0         2   6 inverse offset

[              ][              ][              ]
[  ][      ][  ][][][][][      ]  [  ][  ]
0   c       4   0 f c a 8         e   a
0   4       c   0 1 4 6 8         2   6  inverse offset

[                             ][
[  ][      ][  ][][][][][      ]  [  ][  ]
k   g f c a 8
0   4       c   g h k m n       inverse offset

0123456789abcdefghijklmonpq
ponmlkjihgfedcba9876543210
0fedcba9876543210fedcba9876543210fedcba9876543210fedcba9876543210
```

Adjusts trigger offsets to the length of ???, for all triggers, and undo triggers.

Threadsafe

7.49.3.83 void seq64::sequence::remove (event_list::iterator *i*) [private]

If it's a note off, and that note is currently playing, then send a note off.

Not threadsafe

7.49.3.84 void seq64::sequence::remove (event * *e*) [private]

Finds the given event in m_events, and removes the first iterator matching that.

Not threadsafe

Todo Use find instead in sequence::remove()!

7.49.4 Field Documentation

7.49.4.1 mutex seq64::sequence::m_mutex [mutable], [private]

Made mutable for use in certain locked getter functions.

7.50 seq64::trigger Class Reference

This class is used in playback.

Public Member Functions

- trigger ()

  Initializes the trigger structure.
- bool operator< (const trigger &rhs)

  This operator compares only the m_tick_start members.

7.50.1 Detailed Description

Making its members public makes it really "just" a structure.

7.51 user_instrument Class Reference

Provides data about the MIDI instruments, readable from the "user" configuration file.

Public Member Functions

- user_instrument (const std::string &name="")

  Default constructor.
- user_instrument (const user_instrument &rhs)

  Copy constructor.
- user_instrument & operator= (const user_instrument &rhs)

  Principal assignment operator.
- bool is_valid () const

  'Getter' function for member m_is_valid
- void set_defaults ()

  Sets the default values.
- void set_global (int instrum) const

  Copies the current values of the member variables into the selected legacy global variable.
- void get_global (int instrum)

  Copies the current values of the selected legacy global variable into corresponding member variable.
- const std::string & name () const

  'Getter' function for member m_instrument_def.instrument (name of instrument)
- int controller_count () const

  'Getter' function for member m_controller_count This function returns the number of active controllers.
- int controller_max () const

  'Getter' function for member MIDI_CONTROLLER_MAX This function returns the maximum number of controllers, active or inactive.
- const std::string & controller_name (int c) const

  'Getter' function for member m_instrument_def.controllers[c]
- bool controller_active (int c) const

  'Getter' function for member m_instrument_def.controllers_active[c]
- void set_controller (int c, const std::string &cname, bool isactive)

  'Setter' function for member m_instrument_def.controllers[c] and .controllers_active[c] Only sets the controller values if the object is already valid.

Private Member Functions

- void set_name (const std::string &instname)

  'Setter' function for member m_instrument_def.instrument
- void copy_definitions (const user_instrument &rhs)

  Copies the array members from one instance of user_instrument to this one.

Private Attributes

- bool m_is_valid

  Provides a validity flag, useful in returning a reference to a bogus object for internal error-check.
- int m_controller_count

  Provides the actual number of non-default controllers actually set.
- user_instrument_t m_instrument_def

  The instance of the structure that this class wraps.

7.51.1 Detailed Description

Will later make the size adjustable, if it makes sense to do so.

7.51.2 Member Function Documentation

7.51.2.1 void user_instrument::set_defaults ( )

Also invalidates the object.

7.51.2.2 void user_instrument::set_global (int *instrum*) const

Should be called at initialization, and after settings are read from the "user" configuration file.

This function fills in all of the MIDI_CONTROLLER_MAX (128) values of the controllers and controllers_active fields.

Note that this is done only if the object is valid.

Parameters

instrum	Provides the destination instrument number. In order to support the legacy code, this index value must be less than c_max_instruments (64).

7.51.2.3 void user_instrument::get_global (int *instrum*)

Should be called before settings are written to the "user" configuration file.

This function fills in all of the MIDI_CONTROLLER_MAX (128) values of the controllers and controllers_active fields.

This function also sets the validity flag to true if the instrument name is not empty; the rest of the values are not checked.

Parameters

instrum	Provides the source instrument number. In order to support the legacy code, this index value must be less than c_max_instruments (64).

7.51.2.4 int user_instrument::controller_max ( ) const [inline]

Remember that the controller numbers for each MIDI instrument range from 0 to 127 (MIDI_CONTROLLER_MAX-1).

7.51.2.5 const std::string & user_instrument::controller_name (int *c*) const

Parameters

c	The index of the desired controller.

Returns

The name of the desired controller has is returned. If the index c is out of range, or the object is not valid, then a reference to an internal, empty string is returned.

7.51.2.6 bool user_instrument::controller_active (int *c*) const

Parameters

c	The index of the desired controller.

Returns

The status of the desired controller has is returned. If the index c is out of range, or the object is not valid, then false is returned.

7.51.2.7 void user_instrument::set_controller (int *c,* const std::string & *cname,* bool *isactive*)

Parameters

c	The index of the desired controller.
cname	The name of the controller to be set as the controller name.
isactive	A flag that indicates if the desired controller is active.

7.51.2.8 void user_instrument::set_name (const std::string & *instname*) [private]

If the name parameter is not empty, the validity flag is set to true, otherwise it is set to false. Too tricky?

7.51.2.9 void user_instrument::copy_definitions (const user_instrument & *rhs*) [private]

Does not include the validity flag.

7.51.3 Field Documentation

7.51.3.1 bool user_instrument::m_is_valid [private]

Callers should check this flag via the is_valid() accessor before using this object. This flag is set to true when any valid member assignment occurs via a public setter call. However, setting an empty name for the instrument member will render the object invalid.

7.51.3.2 int user_instrument::m_controller_count [private]

Often, the "user" configuration file has only a few out of the 128 assigned explicitly.

7.52 user_instrument_t Struct Reference

This structure corresponds to `[user-instrument-N]` definitions in the `~/.seq24usr` or `~/.config/sequencer64/sequencer64.rc` file.

7.53 user_midi_bus Class Reference

Provides data about the MIDI busses, readable from the "user" configuration file.

Public Member Functions

- user_midi_bus (const std::string &name="")

  Default constructor.
- user_midi_bus (const user_midi_bus &rhs)

  Copy constructor.
- user_midi_bus & operator= (const user_midi_bus &rhs)

  Principal assignment operator.
- bool is_valid () const

  'Getter' function for member m_is_valid
- void set_defaults ()

  Sets the default values.
- void set_global (int buss) const

  Copies the current values of the member variables into their corresponding global variables.
- void get_global (int buss)

  Copies the current values of the global variables into their corresponding member variable.
- const std::string & name () const

  'Getter' function for member m_midi_bus_def.alias (name of alias)
- int channel_count () const

  'Getter' function for member m_channel_count
- int channel_max () const

  'Getter' function for member MIDI_BUS_CHANNEL_MAX
- int instrument (int channel) const

  'Getter' function for member m_midi_bus_def.instrument[channel]
- void set_instrument (int channel, int instrum)

  'Getter' function for member m_midi_bus_def.instrument[channel]

Private Member Functions

- void set_name (const std::string &name)

  'Setter' function for member m_midi_bus_def.alias (name of alias) Also sets the validity flag according to the emptiness of the name parameter.
- void copy_definitions (const user_midi_bus &rhs)

  Copies the member fields from one instance of user_midi_bus to this one.

Private Attributes

- bool m_is_valid

  Provides a validity flag, useful in returning a reference to a bogus object for internal error-check.
- int m_channel_count

  Provides the actual number of non-default buss channels actually set.
- user_midi_bus_t m_midi_bus_def

  The instance of the structure that this class wraps.

7.53.1 Detailed Description

Will later make the size adjustable, if it makes sense to do so.

7.53.2 Member Function Documentation

7.53.2.1 void user_midi_bus::set_defaults ( )

Also invalidates the object. All 16 of the channels are set to GM_INSTRUMENT_FLAG (-1).

7.53.2.2 void user_midi_bus::set_global (int *buss*) const

Should be called at initialization, and after settings are read from the "user" configuration file.

Note that this is done only if the object is valid.

Parameters

buss	Provides the destination buss number. In order to support the legacy code, this index value must be less than c_max_busses (32).

7.53.2.3 void user_midi_bus::get_global (int *buss*)

Should be called before settings are written to the "user" configuration file.

This function also sets the validity flag to true if the instrument name is not empty; the rest of the values are not checked.

Parameters

buss	Provides the destination buss number. In order to support the legacy code, this index value must be less than c_max_busses (32).

7.53.2.4 int user_midi_bus::channel_count ( ) const [inline]

Returns

This function returns the number of channels. Basically this value is always the same as that returned by channel_max(), but this pair of functions is consistent with the count functions in the user_instrument class.

7.53.2.5 int user_midi_bus::channel_max ( ) const [inline]

Returns

Returns the maximum number of MIDI buss channels. Remember that the instrument channels for each MIDI buss range from 0 to 15 (MIDI_BUS_CHANNEL_MAX-1).

7.53.2.6 int user_midi_bus::instrument (int *channel*) const

Parameters

channel	Provides the desired buss channel number.

Returns

The instrument number of the desired buss channel is returned. If the channel number is out of range, or the object is not valid, then GM_INSTRUMENT_FLAG (-1) is returned.

7.53.2.7 void user_midi_bus::set_instrument (int *channel,* int *instrum*)

Does not alter the validity flag, just checks it.

Parameters

channel	Provides the desired buss channel number.
instrum	Provides the instrument number to set that channel to.

7.53.2.8 void user_midi_bus::copy_definitions (const **user_midi_bus** & *rhs*) [private]

Does not include the validity flag.

7.53.3 Field Documentation

7.53.3.1 bool user_midi_bus::m_is_valid [private]

Callers should check this flag via the is_valid() accessor before using this object. This flag is set to true when any valid member assignment occurs via a public setter call.

7.53.3.2 int user_midi_bus::m_channel_count [private]

Often, the "user" configuration file has only a few out of the 16 assigned explicitly.

7.54 user_midi_bus_t Struct Reference

This structure corresponds to `[user-midi-bus-0]` definitions in the `~/.seq24usr` ("user") file.

7.55 user_settings Class Reference

Holds the current values of sequence settings and settings that can modify the number of sequences and the configuration of the user-interface.

Public Member Functions

- user_settings ()
  Default constructor.
- user_settings (const user_settings &rhs)
  Copy constructor.

- user_settings & operator= (const user_settings &rhs)

  Principal assignment operator.
- void set_defaults ()

  Sets the default values.
- void normalize ()

  Calculate the derived values from the already-set values.
- void set_globals () const

  Copies the current values of the member variables into their corresponding global variables.
- void get_globals ()

  Copies the current values of the global variables into their corresponding member variables.
- bool add_bus (const std::string &alias)

  Adds a user bus to the container, but only does so if the name parameter is not empty.
- bool add_instrument (const std::string &instname)

  Adds a user instrument to the container, but only does so if the name parameter is not empty.
- const user_midi_bus & bus (int index)

  'Getter' function for member Unlike the non-const version this function is public.
- const user_instrument & instrument (int index)

  'Getter' function for member Unlike the non-const version this function is public.
- int bus_count () const

  'Getter' function for member m_midi_buses.size()
- void set_bus_instrument (int index, int channel, int instrum)

  'Getter' function for member m_midi_buses[index].instrument[channel] Currently this function is used, in the userfile↩ ::parse() function.
- int bus_instrument (int buss, int channel)

  'Getter' function for member m_midi_buses[buss].instrument[channel]
- const std::string & bus_name (int buss)

  'Getter' function for member m_midi_buses[buss].name
- int instrument_count () const

  'Getter' function for member m_instruments.size()
- void set_instrument_controllers (int index, int cc, const std::string &ccname, bool isactive)

  'Setter' function for member m_midi_instrument_defs[index].controllers, controllers_active
- const std::string & instrument_name (int instrum)

  'Getter' function for member m_instruments[instrument].instrument (name of instrument)
- bool instrument_controller_active (int instrum, int c)

  'Getter' function for member m_instruments[instrument].controllers_active[controller]
- const std::string & instrument_controller_name (int instrum, int c)

  'Getter' function for member m_instruments[instrument].controllers_active[controller]
- int mainwnd_rows () const

  'Getter' function for member m_mainwnd_rows
- int mainwnd_cols () const

  'Getter' function for member m_mainwnd_cols
- int seqs_in_set () const

  'Getter' function for member m_seqs_in_set
- int gmute_tracks () const

  'Getter' function for member m_gmute_tracks
- int max_sets () const

  'Getter' function for member m_max_sets
- int max_sequence () const

  'Getter' function for member m_max_sequence
- int text_x () const

  'Getter' function for member m_text_x

- int text_y () const

  'Getter' function for member m_text_y
- int seqchars_x () const

  'Getter' function for member m_seqchars_x
- int seqchars_y () const

  'Getter' function for member m_seqchars_y
- int seqarea_x () const

  'Getter' function for member m_seqarea_x
- int seqarea_y () const

  'Getter' function for member m_seqarea_y
- int seqarea_seq_x () const

  'Getter' function for member m_seqarea_seq_x
- int seqarea_seq_y () const

  'Getter' function for member m_seqarea_seq_y
- int mainwid_border () const

  'Getter' function for member m_mainwid_border
- int mainwid_spacing () const

  'Getter' function for member m_mainwid_spacing
- int control_height () const

  'Getter' function for member m_control_height
- int mainwid_x () const

  'Getter' function for member m_mainwid_x
- int mainwid_y () const

  'Getter' function for member m_mainwid_y
- void mainwnd_rows (int value)

  'Setter' function for member m_mainwnd_rows This value is not modified unless the value parameter is between 4 and 8, inclusive.
- void mainwnd_cols (int value)

  'Setter' function for member m_mainwnd_cols This value is not modified unless the value parameter is between 8 and 10, inclusive.
- void max_sets (int value)

  'Setter' function for member m_seqs_in_set
- void text_x (int value)

  'Setter' function for member m_max_sequence
- void text_y (int value)

  'Setter' function for member m_text_y This value is not modified unless the value parameter is between 12 and 12, inclusive.
- void seqchars_x (int value)

  'Setter' function for member m_seqchars_x This affects the size or crampiness of a pattern slot, and for now we will hardwire it to 15.
- void seqchars_y (int value)

  'Setter' function for member m_seqchars_y This affects the size or crampiness of a pattern slot, and for now we will hardwire it to 5.
- void seqarea_x (int value)

  'Setter' function for member m_seqarea_x
- void seqarea_y (int value)

  'Setter' function for member m_seqarea_y
- void seqarea_seq_x (int value)

  'Setter' function for member m_seqarea_seq_x
- void seqarea_seq_y (int value)

  'Setter' function for member m_seqarea_seq_y
- void mainwid_border (int value)

'Setter' function for member m_mainwid_border This value is not modified unless the value parameter is between 0 and 3, inclusive.

- void mainwid_spacing (int value)

  'Setter' function for member m_mainwid_spacing This value is not modified unless the value parameter is between 2 and 6, inclusive.

- void control_height (int value)

  'Setter' function for member m_control_height This value is not modified unless the value parameter is between 0 and 4, inclusive.

- void dump_summary ()

  'Setter' function for member m_mainwid_y

Private Types

- typedef std::vector< user_midi_bus > Busses

  Internal type for the container of user_midi_bus objects.

- typedef std::vector< user_instrument > Instruments

  Internal type for the container of user_instrument objects.

Private Member Functions

- user_midi_bus & private_bus (int buss)

  'Getter' function for member m_midi_buses[index] (internal function) If the index is out of range, then an invalid object is returned.

- user_instrument & private_instrument (int instrum)

  'Getter' function for member m_instruments[index] If the index is out of range, then a invalid object is returned.

Private Attributes

- Busses m_midi_buses

  Provides data about the MIDI busses, readable from the "user" configuration file.

- Instruments m_instruments

  Provides data about the MIDI instruments, readable from the "user" configuration file.

- int m_mainwnd_rows

  Number of rows in the Patterns Panel.

- int m_mainwnd_cols

  Number of columns in the Patterns Panel.

- int m_seqs_in_set

  Number of patterns/sequences in the Patterns Panel, also known as a "set" or "screen set".

- int m_gmute_tracks

  Number of group-mute tracks that can be support, which is m_seqs_in_set squared, or 1024.

- int m_max_sets

  Maximum number of screen sets that can be supported.

- int m_max_sequence

  The maximum number of patterns supported is given by the number of patterns supported in the panel (32) times the maximum number of sets (32), or 1024 patterns.

- int m_text_x

  Constants for the mainwid class.

- int m_seqchars_x

  Constants for the mainwid class.

- int m_seqarea_x

The m_seqarea_x and m_seqarea_y constants are derived from the width and heights of the default character set, and the number of characters in width, and the number of lines, in a pattern/sequence box.

- int m_seqarea_seq_x

  Area of what? Doesn't look at all like it is based on the size of characters.

- int m_mainwid_border

  These control sizes.

- int m_control_height

  This constants seems to be created for a future purpose, perhaps to reserve space for a new bar on the mainwid pane.

- int m_mainwid_x

  The width of the main pattern/sequence grid, in pixels.

7.55.1 Detailed Description

These settings will eventually be made part of the "user" settings file.

7.55.2 Member Typedef Documentation

7.55.2.1 typedef std::vector<user_midi_bus> user_settings::Busses [private]

Sorry about the "confusion" about "bus" versus "buss". See Google for arguments about it.

7.55.3 Member Function Documentation

7.55.3.1 void user_settings::set_defaults ( )

For the m_midi_buses and m_instruments members, this function can only iterate over the current size of the vectors. But the default size is zero!

7.55.3.2 void user_settings::set_globals ( ) const

Should be called at initialization, and after settings are read from the "user" configuration file.

7.55.3.3 void user_settings::get_globals ( )

Should be called before settings are written to the "user" configuration file.

7.55.3.4 const user_midi_bus& user_settings::bus (int *index*) [inline]

Cannot append the const specifier.

7.55.3.5 const user_instrument& user_settings::instrument (int *index*) [inline]

Cannot append the const specifier.

7.55.3.6 int user_settings::bus_instrument (int *buss,* int *channel*) [inline]

Todo Do this for controllers values and for user_instrument members.

7.55.3.7 void user_settings::mainwnd_rows (int *value*)

The default value is 4. Dependent values are recalculated after the assignment.

7.55.3.8 void user_settings::mainwnd_cols (int *value*)

The default value is 8. Dependent values are recalculated after the assignment.

7.55.3.9 void user_settings::max_sets (int *value*)

Warning

This is a dependent value at present, and changing it is experimental.

void user_settings::seqs_in_set (int value) { m_seqs_in_set = value; } *'Setter' function* for member *m_gmute_tracks*

Warning

This is a dependent value at present, and changing it is experimental.

void user_settings::gmute_tracks (int value) { m_gmute_tracks = value; } *'Setter' function* for member *m_max_sets* This value is not modified unless the value parameter is between 32 and 64, inclusive. The default value is 32. Dependent values are recalculated after the assignment.

7.55.3.10 void user_settings::text_x (int *value*)

Warning

This is a dependent value at present, and changing it is experimental.

void user_settings::max_sequence (int value) { m_max_sequence = value; } *'Setter' function* for member *m_text↩ _x* This value is not modified unless the value parameter is between 6 and 6, inclusive. The default value is 6. Dependent values are recalculated after the assignment. This value is currently restricted, until we can code up a bigger font.

7.55.3.11 void user_settings::text_y (int *value*)

The default value is 12. Dependent values are recalculated after the assignment. This value is currently restricted, until we can code up a bigger font.

7.55.3.12 void user_settings::mainwid_border (int *value*)

The default value is 0. Dependent values are recalculated after the assignment.

7.55.3.13 void user_settings::mainwid_spacing (int *value*)

The default value is 2. Dependent values are recalculated after the assignment.

7.55.3.14 void user_settings::control_height (int *value*)

The default value is 0. Dependent values are recalculated after the assignment.

7.55.3.15 void user_settings::dump_summary ( )

Warning

This is a dependent value at present, and changing it is experimental.

void user_settings::mainwid_y (int value) { m_mainwid_y = value; } Provides a debug dump of basic information to help debug a surprisingly intractable problem with all busses having the name and values of the last buss in the configuration. Does its work only if PLATFORM_DEBUG and USE_DUMP_SUMMARY are defined. Only enabled in emergencies :-D.

7.55.3.16 user_midi_bus & user_settings::private_bus (int *index*) [private]

This invalid object has an empty alias, and all the instrument numbers are -1.

7.55.3.17 user_instrument & user_settings::private_instrument (int *index*) [private]

This invalid object has an empty(), instrument name, false for all controllers_active[] values, and empty controllers[] string values.

7.55.4 Field Documentation

7.55.4.1 Busses user_settings::m_midi_buses [private]

Since this object is a vector, its size is adjustable.

7.55.4.2 Instruments user_settings::m_instruments [private]

The size is adjustable, and grows as objects are added.

7.55.4.3 int user_settings::m_mainwnd_rows [private]

The current value is 4, and if changed, many other values depend on it. Together with m_mainwnd_cols, this value fixes the patterns grid into a 4 x 8 set of patterns known as a "screen set".

7.55.4.4 int user_settings::m_mainwnd_cols [private]

The current value is 4, and probably won't change, since other values depend on it. Together with m_mainwnd_rows, this value fixes the patterns grid into a 4 x 8 set of patterns known as a "screen set".

7.55.4.5 int user_settings::m_seqs_in_set [private]

This value is 4 x 8 = 32 by default.

Warning

Currently part of the "rc" file and rc_settings!

7.55.4.6 int user_settings::m_max_sets [private]

Basically, that the number of times the Patterns Panel can be filled. 32 sets can be created.

7.55.4.7 int user_settings::m_text_x [private]

The m_text_x and m_text_y constants help define the "seqarea" size. It looks like these two values are the character width (x) and height (y) in pixels. Thus, these values would be dependent on the font chosen. But that, currently, is hard-wired. See the m_font_6_12[] array for the default font specification.

However, please not that font files are not used. Instead, the fonts are provided by two pixmaps in the `src/pixmap` directory: `font_b.xpm` (black lettering on a white background) and `font_w.xpm` (white lettering on a black background).

7.55.4.8 int user_settings::m_seqchars_x [private]

The m_seqchars_x and m_seqchars_y constants help define the "seqarea" size. These look like the number of characters per line and the number of lines of characters, in a pattern/sequence box.

7.55.4.9 int user_settings::m_seqarea_x [private]

Compare these two constants to m_seqarea_seq_x(y), which was in mainwid.h, but is now in this file.

7.55.4.10 int user_settings::m_seqarea_seq_x [private]

These are used only in the mainwid module.

7.55.4.11 int user_settings::m_mainwid_border [private]

We'll try changing them and see what happens. Increasing these value spreads out the pattern grids a little bit and makes the Patterns panel slightly bigger. Seems like it would be useful to make these values user-configurable.

7.55.4.12 int user_settings::m_control_height [private]

But it is used only in this header file, to define m_mainwid_y, but doesn't add anything to that value.

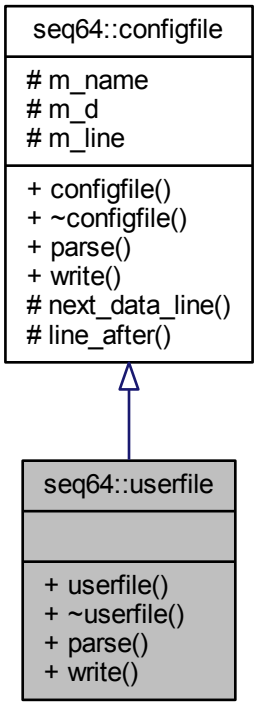
7.55.4.13 int user_settings::m_mainwid_x [private]

Affected by the m_mainwid_border and m_mainwid_spacing values.

7.56 seq64::userfile Class Reference

Supports the user's ~/.seq24usr configuration file.

Inheritance diagram for seq64::userfile:



Public Member Functions

- userfile (const std::string &a_name)

  Principal constructor.
- ~userfile ()

  A rote destructor needed for a derived class.
- bool parse (perform &a_perf)

  Parses a "usr" file, filling in the given perform object.
- bool write (const perform &a_perf)

  This function just returns false, as there is no "perform" information in the user-file yet.

Additional Inherited Members

7.56.1 Member Function Documentation

7.56.1.1 bool seq64::userfile::parse (perform & *a_perf*) [virtual]

This function opens the file as a text file (line-oriented).

Parameters

a_perf	The performance object, currently unused.

Implements seq64::configfile.

7.56.1.2 bool seq64::userfile::write (const perform & *a_perf*) [virtual]

Parameters

a_perf	The performance object, currently unused.

Implements seq64::configfile.

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