Sequencer64 Developer/Tester's Reference Manual

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Contents

1 Sequencer64 **1**

1.1 Introduction . . . 1

2 MIDI File Parsing in Sequencer64 **3**

2.1 Introduction . . . 3

2.2 SMF 1 Parsing . . . 3

2.2.1 MIDI File Header, MThd . . . 3

2.2.2 MIDI Track, MTrk . . . 4

2.2.2.1 Channel Events . . . 4

2.2.2.2 Meta Events . . . 5

2.2.3 Meta Events . . . 6

2.2.3.1 Sequence Number (0x00) . . . 6

2.2.3.2 Track/Sequence Name (0x03) . . . 7

2.2.3.3 End of Track (0x2F) . . . 7

2.2.3.4 Set Tempo Event (0x51) . . . 7

2.2.3.5 Time Signature Event (0x58) . . . 8

2.2.3.6 SysEx Event (0xF0) . . . 9

2.2.3.7 Sequencer Specific (0x7F) . . . 9

2.2.3.8 Non-Specific End of Sequence . . . 10

2.3 SMF 0 Parsing . . . 10

3 JACK, Live, and Song Modes in Sequencer64 **11**

3.1 Introduction . . . 11

3.2 JACK Functions . . . 11

3.2.1 jack_client_open() . . . 12

3.2.2 jack_on_shutdown() . . . 12

3.2.3 jack_set_sync_callback() . . . 12

3.2.4 jack_set_process_callback() . . . 12

3.2.5 jack_set_session_callback() . . . 13

3.2.6 jack_activate() . . . 13

3.2.7 jack_release_timebase() . . . 13

3.2.8 jack_client_close() . . . 13

3.2.9 jack_transport_start() . . . 13
3.2.10 jack_transport_stop() . . . 13
3.2.11 jack_transport_locate() . . . 13
3.2.12 jack_transport_reposition() . . . 13
3.2.13 jack_transport_query() . . . 13
3.3 Modes Operation . . . 14
3.3.1 No JACK, Live Mode . . . 14
3.3.2 No JACK, Song Mode . . . 14
3.3.3 JACK Transport . . . 14
3.4 Breakage . . . 15
3.5 JACK References . . . 15

4 User Testing of Sequencer64 with Yoshimi 17
4.1 Introduction . . . 17
4.2 Smoke Test . . . 17
4.3 Tests in the Patterns Window . . . 18
4.3.1 Button Clicks on a Pattern . . . 18
4.3.2 Patterns Window Key Shortcuts . . . 19
4.3.3 The Sequencer64 User File . . . 19
4.4 Tests Using Valgrind . . . 19
4.4.1 Valgrind Suppressions . . . 19
4.4.2 Full Valgrind Leak-Checking . . . 20
4.4.2.1 Leak-Checking Basic Operation . . . 20
4.5 Specific Fault Debugging . . . 20
4.6 Snipping of a MIDI file. . . . 20

5 Licenses 23
5.1 License Terms for the This Project. . . . 23
5.2 XPC Application License . . . 23
5.3 XPC Library License . . . 24
5.4 XPC Documentation License . . . 24
5.5 XPC Affero License . . . 24
5.6 XPC License Summary . . . 25

6 Todo List 27

7 Deprecated List 29

8 Hierarchical Index 31
8.1 Class Hierarchy . . . 31

9 Data Structure Index 33

9.1 Data Structures . . . 33

10 Data Structure Documentation **37**

10.1 seq64::AbstractPerfInput Class Reference . . . 37
10.2 seq64::automutex Class Reference . . . 37
10.2.1 Detailed Description . . . 38
10.3 seq64::click Class Reference . . . 38
10.3.1 Detailed Description . . . 39
10.3.2 Constructor & Destructor Documentation . . . 39
10.3.2.1 click . . . 39
10.3.2.2 click . . . 39
10.3.2.3 click . . . 39
10.3.3 Member Function Documentation . . . 40
10.3.3.1 operator= . . . 40
10.3.4 Field Documentation . . . 40
10.3.4.1 m_x . . . 40
10.3.4.2 m_y . . . 40
10.3.4.3 m_button . . . 40
10.3.4.4 m_modifier . . . 40
10.4 seq64::condition_var Class Reference . . . 40
10.4.1 Detailed Description . . . 41
10.4.2 Field Documentation . . . 42
10.4.2.1 cond . . . 42
10.5 seq64::configfile Class Reference . . . 42
10.5.1 Constructor & Destructor Documentation . . . 43
10.5.1.1 configfile . . . 43
10.5.2 Member Function Documentation . . . 43
10.5.2.1 next_data_line . . . 43
10.5.2.2 line_after . . . 43
10.5.3 Field Documentation . . . 43
10.5.3.1 m_line . . . 43
10.6 seq64::editable_event Class Reference . . . 43
10.6.1 Detailed Description . . . 47
10.6.2 Member Enumeration Documentation . . . 47
10.6.2.1 category_t . . . 47
10.6.2.2 timestamp_format_t . . . 47
10.6.3 Constructor & Destructor Documentation . . . 48
10.6.3.1 editable_event . . . 48
10.6.3.2 editable_event . . . 48
10.6.3.3 editable_event . . . 48

10.6.4 Member Function Documentation . . . 48
10.6.4.1 value_to_name . . . 48
10.6.4.2 name_to_value . . . 48
10.6.4.3 category . . . 49
10.6.4.4 category . . . 49
10.6.4.5 timestamp . . . 49
10.6.4.6 timestamp . . . 49
10.6.4.7 time_as_measures . . . 49
10.6.4.8 time_as_minutes . . . 50
10.6.4.9 set_status_from_string . . . 50
10.6.4.10 format_timestamp . . . 50
10.6.4.11 stock_event_string . . . 50
10.6.4.12 analyze . . . 50
10.6.5 Field Documentation . . . 50
10.6.5.1 sm_category_names . . . 50
10.6.5.2 sm_channel_event_names . . . 51
10.6.5.3 sm_system_event_names . . . 51
10.6.5.4 sm_meta_event_names . . . 51
10.6.5.5 sm_prop_event_names . . . 51
10.6.5.6 sm_category_arrays . . . 51
10.6.5.7 m_parent . . . 51
10.6.5.8 m_category . . . 51
10.6.5.9 m_format_timestamp . . . 51
10.6.5.10 m_name_status . . . 51
10.6.5.11 m_name_meta . . . 52
10.7 seq64::editable_events Class Reference . . . 52
10.7.1 Member Typedef Documentation . . . 53
10.7.1.1 Key . . . 53
10.7.2 Constructor & Destructor Documentation . . . 53
10.7.2.1 editable_events . . . 53
10.7.2.2 editable_events . . . 53
10.7.3 Member Function Documentation . . . 53
10.7.3.1 operator= . . . 53
10.7.3.2 load_events . . . 54
10.7.3.3 save_events . . . 54
10.7.3.4 count . . . 54
10.7.3.5 add . . . 54
10.7.3.6 add . . . 54
10.7.4 Field Documentation . . . 55
10.7.4.1 m_current_event . . . 55

10.7.4.2 m_sequence . . . 55
10.7.4.3 m_midi_parameters . . . 55
10.8 seq64::event Class Reference . . . 55
10.8.1 Detailed Description . . . 59
10.8.2 Constructor & Destructor Documentation . . . 60
10.8.2.1 event . . . 60
10.8.2.2 ~event . . . 60
10.8.3 Member Function Documentation . . . 60
10.8.3.1 operator= . . . 60
10.8.3.2 operator< . . . 60
10.8.3.3 check_channel . . . 61
10.8.3.4 is_channel_msg . . . 61
10.8.3.5 is_one_byte_msg . . . 61
10.8.3.6 is_two_byte_msg . . . 61
10.8.3.7 is_note_msg . . . 62
10.8.3.8 is_desired_cc_or_not_cc . . . 63
10.8.3.9 mod_timestamp . . . 63
10.8.3.10 set_status . . . 63
10.8.3.11 set_status . . . 64
10.8.3.12 set_channel . . . 64
10.8.3.13 set_data . . . 64
10.8.3.14 set_data . . . 64
10.8.3.15 get_data . . . 64
10.8.3.16 append_sysex . . . 64
10.8.3.17 get_rank . . . 65
10.8.4 Field Documentation . . . 65
10.8.4.1 m_status . . . 65
10.8.4.2 m_channel . . . 65
10.8.4.3 m_data . . . 65
10.8.4.4 m_sysex . . . 65
10.8.4.5 m_has_link . . . 65
10.9 seq64::event_list::event_key Class Reference . . . 65
10.9.1 Detailed Description . . . 66
10.9.2 Constructor & Destructor Documentation . . . 66
10.9.2.1 event_key . . . 66
10.9.2.2 event_key . . . 66
10.9.3 Member Function Documentation . . . 66
10.9.3.1 operator< . . . 66
10.9.4 Field Documentation . . . 66
10.9.4.1 m_timestamp . . . 66

10.9.4.2 m_rank . . . 67
10.10 seq64::event_list Class Reference . . . 67
10.10.1 Detailed Description . . . 69
10.10.2 Constructor & Destructor Documentation . . . 69
10.10.2.1 event_list . . . 69
10.10.3 Member Function Documentation . . . 69
10.10.3.1 operator= . . . 69
10.10.3.2 count . . . 69
10.10.3.3 add . . . 69
10.10.3.4 unmodify . . . 69
10.10.3.5 remove . . . 70
10.10.3.6 clear . . . 70
10.10.3.7 merge . . . 70
10.10.3.8 link_new . . . 70
10.10.3.9 verify_and_link . . . 70
10.10.3.10 mark_out_of_range . . . 70
10.10.3.11 mark_all . . . 71
10.10.3.12 any_selected_notes . . . 71
10.10.3.13 count_selected_events . . . 71
10.10.4 Field Documentation . . . 71
10.10.4.1 m_is_modified . . . 71
10.11 seq64::eventedit Class Reference . . . 71
10.11.1 Constructor & Destructor Documentation . . . 74
10.11.1.1 eventedit . . . 74
10.11.1.2 ~eventedit . . . 75
10.11.2 Member Function Documentation . . . 75
10.11.2.1 enqueue_draw . . . 75
10.11.2.2 set_seq_title . . . 75
10.11.2.3 set_seq_time_sig . . . 75
10.11.2.4 set_seq_ppqn . . . 75
10.11.2.5 set_seq_count . . . 76
10.11.2.6 set_event_category . . . 76
10.11.2.7 set_event_timestamp . . . 76
10.11.2.8 set_event_name . . . 76
10.11.2.9 set_event_data_0 . . . 76
10.11.2.10 set_event_data_1 . . . 76
10.11.2.11 set_dirty . . . 76
10.11.2.12 v_adjustment . . . 77
10.11.2.13 v_adjustment . . . 78
10.11.2.14 timeout . . . 78

10.11.2.15handle_insert . . . 78
10.11.2.16handle_modify . . . 78
10.11.2.17handle_save . . . 78
10.11.2.18on_key_press_event . . . 78
10.11.2.19on_delete_event . . . 79
10.11.3 Field Documentation . . . 79
10.11.3.1 m_redraw_ms . . . 79
10.12seq64::eventslots Class Reference . . . 79
10.12.1 Member Function Documentation . . . 84
10.12.1.1 load_events . . . 84
10.12.1.2 set_current_event . . . 84
10.12.1.3 insert_event . . . 84
10.12.1.4 insert_event . . . 85
10.12.1.5 delete_current_event . . . 85
10.12.1.6 modify_current_event . . . 86
10.12.1.7 save_events . . . 86
10.12.1.8 select_event . . . 86
10.12.1.9 set_text . . . 87
10.12.1.10convert_y . . . 87
10.12.1.11draw_event . . . 87
10.12.1.12draw_events . . . 88
10.12.1.13change_vert . . . 88
10.12.1.14page_movement . . . 88
10.12.1.15page_topper . . . 88
10.12.1.16decrement_top . . . 88
10.12.1.17increment_top . . . 88
10.12.1.18decrement_current . . . 89
10.12.1.19increment_current . . . 89
10.12.1.20decrement_bottom . . . 89
10.12.1.21increment_bottom . . . 89
10.12.1.22on_realize . . . 89
10.12.1.23on_expose_event . . . 89
10.12.1.24on_focus_in_event . . . 89
10.12.1.25on_size_allocate . . . 89
10.12.1.26on_move_up . . . 90
10.12.1.27on_move_down . . . 90
10.12.2 Field Documentation . . . 90
10.12.2.1 m_slots_chars . . . 90
10.12.2.2 m_char_w . . . 90
10.12.2.3 m_setbox_w . . . 90

10.12.2.4 m_slots_y . . . 90
10.12.2.5 m_xy_offset . . . 90
10.12.2.6 m_top_index . . . 90
10.12.2.7 m_current_index . . . 90
10.13seq64::font Class Reference . . . 90
10.13.1 Member Enumeration Documentation . . . 92
10.13.1.1 Color . . . 92
10.13.2 Member Function Documentation . . . 92
10.13.2.1 init . . . 92
10.13.2.2 render_string_on_drawable . . . 92
10.13.3 Field Documentation . . . 93
10.13.3.1 m_font_w . . . 93
10.13.3.2 m_font_h . . . 93
10.13.3.3 m_pixmap . . . 93
10.13.3.4 m_black_pixmap . . . 93
10.13.3.5 m_white_pixmap . . . 93
10.13.3.6 m_b_on_y_pixmap . . . 93
10.13.3.7 m_y_on_b_pixmap . . . 93
10.13.3.8 m_b_on_c_pixmap . . . 93
10.13.3.9 m_c_on_b_pixmap . . . 93
10.13.3.10m_clip_mask . . . 93
10.14seq64::gui_assistant Class Reference . . . 94
10.14.1 Detailed Description . . . 94
10.14.2 Constructor & Destructor Documentation . . . 95
10.14.2.1 gui_assistant . . . 95
10.15seq64::gui_assistant_gtk2 Class Reference . . . 95
10.15.1 Member Function Documentation . . . 96
10.15.1.1 lash_timeout_connect . . . 96
10.15.2 Field Documentation . . . 96
10.15.2.1 sm_internal_keys . . . 96
10.16seq64::gui_drawingarea_gtk2 Class Reference . . . 96
10.16.1 Detailed Description . . . 99
10.16.2 Member Function Documentation . . . 99
10.16.2.1 clear_window . . . 99
10.16.2.2 set_line . . . 99
10.16.2.3 draw_line . . . 99
10.16.2.4 draw_line . . . 99
10.16.2.5 draw_line_on_pixmap . . . 99
10.16.2.6 draw_line_on_pixmap . . . 100
10.16.2.7 draw_line . . . 100

10.16.2.8 draw_line . . . 100
10.16.2.9 draw_line . . . 100
10.16.2.10 draw_line . . . 101
10.16.2.11 render_string . . . 101
10.16.2.12 render_string_on_pixmap . . . 101
10.16.2.13 draw_rectangle . . . 101
10.16.2.14 draw_rectangle . . . 101
10.16.2.15 draw_rectangle . . . 102
10.16.2.16 draw_rectangle . . . 102
10.16.2.17 draw_rectangle . . . 102
10.16.2.18 draw_rectangle . . . 103
10.16.2.19 draw_rectangle_on_pixmap . . . 103
10.16.2.20 draw_rectangle_on_pixmap . . . 103
10.16.2.21 draw_normal_rectangle_on_pixmap . . . 103
10.16.2.22 on_realize . . . 104
10.16.3 Field Documentation . . . 104
10.16.3.1 m_window . . . 104
10.16.3.2 m_pixmap . . . 104
10.16.3.3 m_background . . . 104
10.16.3.4 m_foreground . . . 104
10.16.3.5 m_mainperf . . . 104
10.16.3.6 m_window_x . . . 104
10.16.3.7 m_drop_x . . . 104
10.17 seq64::gui_palette_gtk2 Class Reference . . . 104
10.17.1 Detailed Description . . . 105
10.17.2 Constructor & Destructor Documentation . . . 105
10.17.2.1 gui_palette_gtk2 . . . 105
10.18 seq64::gui_window_gtk2 Class Reference . . . 105
10.18.1 Constructor & Destructor Documentation . . . 107
10.18.1.1 gui_window_gtk2 . . . 107
10.18.2 Field Documentation . . . 108
10.18.2.1 m_window_x . . . 108
10.19 seq64::jack_assistant Class Reference . . . 108
10.19.1 Detailed Description . . . 109
10.19.2 Constructor & Destructor Documentation . . . 109
10.19.2.1 jack_assistant . . . 109
10.19.2.2 ~jack_assistant . . . 109
10.19.3 Member Function Documentation . . . 110
10.19.3.1 init . . . 110
10.19.3.2 restart . . . 110

10.19.3.3 start . . . 110
10.19.3.4 stop . . . 110
10.19.3.5 position . . . 111
10.19.3.6 output . . . 111
10.19.3.7 get_jack_ticks . . . 112
10.19.3.8 info_message . . . 112
10.19.3.9 error_message . . . 112
10.19.3.10 client_open . . . 112
10.19.3.11 show_statuses . . . 113
10.19.3.12 sync . . . 113
10.19.3.13 set_position . . . 113
10.19.4 Friends And Related Function Documentation . . . 114
10.19.4.1 jack_shutdown_callback . . . 114
10.19.4.2 jack_timebase_callback . . . 115
10.19.5 Field Documentation . . . 115
10.19.5.1 sm_status_pairs . . . 115
10.20 seq64::jack_scratchpad Class Reference . . . 115
10.20.1 Detailed Description . . . 116
10.21 seq64::keybindentry Class Reference . . . 116
10.21.1 Member Enumeration Documentation . . . 116
10.21.1.1 type . . . 116
10.21.2 Constructor & Destructor Documentation . . . 117
10.21.2.1 keybindentry . . . 117
10.21.3 Member Function Documentation . . . 117
10.21.3.1 set . . . 117
10.21.3.2 on_key_press_event . . . 117
10.21.4 Field Documentation . . . 117
10.21.4.1 m_key . . . 117
10.22 seq64::keys_perform Class Reference . . . 117
10.22.1 Detailed Description . . . 119
10.22.2 Constructor & Destructor Documentation . . . 119
10.22.2.1 ~keys_perform . . . 119
10.22.3 Member Function Documentation . . . 119
10.22.3.1 set_keys . . . 119
10.22.3.2 get_keys . . . 120
10.22.3.3 show_ui_sequence_key . . . 120
10.22.3.4 show_ui_sequence_number . . . 120
10.22.3.5 key_name . . . 120
10.22.3.6 set_all_key_events . . . 120
10.22.3.7 set_all_key_groups . . . 120

10.22.3.8 set_key_event . . . 120
10.22.3.9 set_key_group . . . 121
10.22.4 Field Documentation . . . 121
10.22.4.1 m_key_show_ui_sequence_number . . . 121
10.22.4.2 m_key_bpm_up . . . 121
10.23 seq64::keys_perform_gtk2 Class Reference . . . 121
10.23.1 Detailed Description . . . 123
10.23.2 Constructor & Destructor Documentation . . . 123
10.23.2.1 ~keys_perform_gtk2 . . . 123
10.23.3 Member Function Documentation . . . 123
10.23.3.1 key_name . . . 123
10.23.3.2 set_all_key_events . . . 123
10.23.3.3 set_all_key_groups . . . 123
10.24 seq64::keys_perform_transfer Struct Reference . . . 123
10.25 seq64::keystroke Class Reference . . . 123
10.25.1 Detailed Description . . . 124
10.25.2 Constructor & Destructor Documentation . . . 124
10.25.2.1 keystroke . . . 124
10.25.2.2 keystroke . . . 125
10.25.3 Member Function Documentation . . . 125
10.25.3.1 operator= . . . 125
10.25.3.2 is_letter . . . 125
10.25.4 Field Documentation . . . 125
10.25.4.1 m_is_press . . . 125
10.25.4.2 m_key . . . 125
10.25.4.3 m_modifier . . . 126
10.26 seq64::lash Class Reference . . . 126
10.26.1 Detailed Description . . . 126
10.26.2 Constructor & Destructor Documentation . . . 126
10.26.2.1 lash . . . 126
10.26.3 Member Function Documentation . . . 127
10.26.3.1 set_alsa_client_id . . . 127
10.26.3.2 process_events . . . 127
10.26.3.3 init . . . 127
10.26.3.4 handle_event . . . 127
10.26.3.5 handle_config . . . 127
10.27 seq64::maintime Class Reference . . . 127
10.27.1 Detailed Description . . . 129
10.27.2 Constructor & Destructor Documentation . . . 129
10.27.2.1 maintime . . . 129

10.27.3 Member Function Documentation . . . 130
10.27.3.1 idle_progress . . . 130
10.27.3.2 on_realize . . . 131
10.27.3.3 on_expose_event . . . 131
10.27.4 Field Documentation . . . 131
10.27.4.1 m_beat_width . . . 131
10.27.4.2 m_bar_width . . . 131
10.27.4.3 m_box_width . . . 131
10.27.4.4 m_box_height . . . 131
10.27.4.5 m_flash_width . . . 131
10.27.4.6 m_flash_height . . . 131
10.27.4.7 m_tick . . . 131
10.27.4.8 m_ppqn . . . 132
10.28 seq64::mainwid Class Reference . . . 132
10.28.1 Constructor & Destructor Documentation . . . 134
10.28.1.1 mainwid . . . 134
10.28.2 Member Function Documentation . . . 134
10.28.2.1 set_screenset . . . 134
10.28.2.2 redraw . . . 134
10.28.2.3 draw_marker_on_sequence . . . 134
10.28.2.4 update_markers . . . 135
10.28.2.5 valid_sequence . . . 135
10.28.2.6 draw_sequence_on_pixmap . . . 135
10.28.2.7 draw_sequences_on_pixmap . . . 135
10.28.2.8 draw_sequence_pixmap_on_window . . . 135
10.28.2.9 seq_from_xy . . . 136
10.28.2.10 timeout . . . 136
10.28.2.11 calculate_base_sizes . . . 136
10.28.2.12 on_realize . . . 136
10.28.2.13 on_expose_event . . . 136
10.28.2.14 on_button_press_event . . . 137
10.28.2.15 on_button_release_event . . . 137
10.28.2.16 on_motion_notify_event . . . 137
10.28.2.17 on_focus_in_event . . . 137
10.28.2.18 on_focus_out_event . . . 138
10.28.3 Field Documentation . . . 138
10.28.3.1 m_screenset_slots . . . 138
10.28.3.2 m_screenset_offset . . . 138
10.29 seq64::mainwnd Class Reference . . . 138
10.29.1 Constructor & Destructor Documentation . . . 142

10.29.1.1 mainwnd . . . 142
10.29.2 Member Function Documentation . . . 142
10.29.2.1 open_file . . . 142
10.29.2.2 ppqn . . . 143
10.29.2.3 file_import_dialog . . . 143
10.29.2.4 about_dialog . . . 143
10.29.2.5 adj_callback_ss . . . 143
10.29.2.6 adj_callback_bpm . . . 143
10.29.2.7 edit_callback_notepad . . . 143
10.29.2.8 timer_callback . . . 143
10.29.2.9 start_playing . . . 144
10.29.2.10 stop_playing . . . 144
10.29.2.11 open_performance_edit . . . 144
10.29.2.12 open_performance_edit_2 . . . 144
10.29.2.13 update_window_title . . . 144
10.29.2.14 new_file . . . 144
10.29.2.15 save_file . . . 144
10.29.2.16 signal_action . . . 144
10.29.2.17 on_delete_event . . . 145
10.29.2.18 on_key_press_event . . . 145
10.29.2.19 on_key_release_event . . . 145
10.29.2.20 on_grouplearnchange . . . 145
10.29.3 Field Documentation . . . 145
10.29.3.1 m_sigpipe . . . 145
10.29.3.2 m_ppqn . . . 145
10.29.3.3 m_main_wid . . . 145
10.29.3.4 m_spinbutton_load_offset . . . 145
10.30 seq64::midi_container Class Reference . . . 145
10.30.1 Member Function Documentation . . . 147
10.30.1.1 fill . . . 147
10.30.1.2 put . . . 147
10.30.1.3 get . . . 148
10.30.1.4 position . . . 148
10.30.1.5 add_variable . . . 148
10.30.1.6 add_long . . . 148
10.31 seq64::midi_list Class Reference . . . 148
10.31.1 Member Typedef Documentation . . . 150
10.31.1.1 CharList . . . 150
10.31.2 Member Function Documentation . . . 150
10.31.2.1 put . . . 150

10.31.2.2 get . . . 150
10.32 seq64::midi_measures Class Reference . . . 150
10.32.1 Field Documentation . . . 151
10.32.1.1 m_divisions . . . 151
10.33 seq64::midi_splitter Class Reference . . . 151
10.33.1 Detailed Description . . . 152
10.33.2 Constructor & Destructor Documentation . . . 152
10.33.2.1 midi_splitter . . . 152
10.33.3 Member Function Documentation . . . 153
10.33.3.1 increment . . . 153
10.33.3.2 split . . . 153
10.33.3.3 ppqn . . . 153
10.33.3.4 split_channel . . . 153
10.33.4 Field Documentation . . . 154
10.33.4.1 m_smf0_channels_count . . . 154
10.33.4.2 m_smf0_channels . . . 154
10.33.4.3 m_smf0_seq_number . . . 154
10.34 seq64::midi_timing Class Reference . . . 154
10.34.1 Detailed Description . . . 155
10.34.2 Field Documentation . . . 155
10.34.2.1 m_beats_per_minute . . . 155
10.34.2.2 m_beats_per_measure . . . 155
10.34.2.3 m_beat_width . . . 155
10.34.2.4 m_ppqn . . . 155
10.35 seq64::midi_vector Class Reference . . . 155
10.35.1 Member Function Documentation . . . 157
10.35.1.1 put . . . 157
10.35.1.2 get . . . 157
10.36 seq64::midibus Class Reference . . . 157
10.36.1 Member Function Documentation . . . 159
10.36.1.1 init_out . . . 159
10.36.1.2 init_in . . . 159
10.36.1.3 deinit_in . . . 159
10.36.1.4 init_out_sub . . . 159
10.36.1.5 init_in_sub . . . 160
10.36.1.6 play . . . 160
10.36.1.7 sysex . . . 160
10.36.1.8 clock . . . 160
10.36.1.9 continue_from . . . 160
10.36.1.10 init_clock . . . 160

10.36.1.11 set_input . . . 160
10.37 seq64::midifile Class Reference . . . 160
10.37.1 Detailed Description . . . 163
10.37.2 Constructor & Destructor Documentation . . . 163
10.37.2.1 midifile . . . 163
10.37.3 Member Function Documentation . . . 164
10.37.3.1 parse . . . 164
10.37.3.2 write . . . 165
10.37.3.3 ppqn . . . 166
10.37.3.4 parse_smf_0 . . . 166
10.37.3.5 parse_smf_1 . . . 166
10.37.3.6 parse_prop_header . . . 166
10.37.3.7 parse_proprietary_track . . . 167
10.37.3.8 pow2 . . . 168
10.37.3.9 read_long . . . 168
10.37.3.10 read_varinum . . . 168
10.37.3.11 write_long . . . 168
10.37.3.12 write_short . . . 168
10.37.3.13 read_byte_array . . . 168
10.37.3.14 write_byte . . . 168
10.37.3.15 write_varinum . . . 169
10.37.3.16 write_track_name . . . 169
10.37.3.17 read_track_name . . . 169
10.37.3.18 write_seq_number . . . 169
10.37.3.19 read_seq_number . . . 169
10.37.3.20 write_prop_header . . . 170
10.37.3.21 write_proprietary_track . . . 170
10.37.3.22 varinum_size . . . 171
10.37.3.23 prop_item_size . . . 171
10.37.3.24 errdump . . . 171
10.37.3.25 errdump . . . 171
10.37.3.26 is_sysex_special_id . . . 172
10.37.4 Field Documentation . . . 173
10.37.4.1 m_file_size . . . 173
10.37.4.2 m_error_message . . . 173
10.37.4.3 m_error_is_fatal . . . 173
10.37.4.4 m_disable_reported . . . 173
10.37.4.5 m_pos . . . 173
10.37.4.6 m_data . . . 173
10.37.4.7 m_char_list . . . 173

10.37.4.8 m_new_format . . . 173
10.37.4.9 m_smf0_splitter . . . 174
10.38 seq64::mutex Class Reference . . . 174
10.38.1 Field Documentation . . . 175
10.38.1.1 sm_recursive_mutex . . . 175
10.39 seq64::options Class Reference . . . 175
10.39.1 Member Enumeration Documentation . . . 175
10.39.1.1 button . . . 176
10.39.2 Field Documentation . . . 176
10.39.2.1 m_notebook . . . 176
10.40 seq64::optionsfile Class Reference . . . 176
10.40.1 Detailed Description . . . 177
10.40.2 Member Function Documentation . . . 177
10.40.2.1 parse . . . 177
10.40.2.2 write . . . 179
10.41 seq64::perfedit Class Reference . . . 179
10.41.1 Detailed Description . . . 182
10.41.2 Constructor & Destructor Documentation . . . 182
10.41.2.1 perfedit . . . 182
10.41.2.2 ~perfedit . . . 182
10.41.3 Member Function Documentation . . . 182
10.41.3.1 init_before_show . . . 182
10.41.3.2 enqueue_draw . . . 182
10.41.3.3 enregister_peer . . . 183
10.41.3.4 set_beats_per_bar . . . 183
10.41.3.5 set_beat_width . . . 183
10.41.3.6 set_guides . . . 183
10.41.3.7 grow . . . 183
10.41.3.8 expand . . . 183
10.41.3.9 collapse . . . 183
10.41.3.10 copy . . . 183
10.41.3.11 undo . . . 183
10.41.3.12 timeout . . . 184
10.41.3.13 start_playing . . . 184
10.41.3.14 stop_playing . . . 184
10.41.4 Field Documentation . . . 184
10.41.4.1 m_bpm . . . 184
10.41.4.2 m_bw . . . 184
10.41.4.3 m_redraw_ms . . . 184
10.42 seq64::perfnames Class Reference . . . 184

10.42.1 Detailed Description . . . 187
10.42.2 Constructor & Destructor Documentation . . . 187
10.42.2.1 perfnames . . . 187
10.42.3 Member Function Documentation . . . 187
10.42.3.1 enqueue_draw . . . 187
10.42.3.2 draw_sequence . . . 187
10.42.3.3 on_realize . . . 187
10.42.3.4 on_expose_event . . . 187
10.42.3.5 on_size_allocate . . . 187
10.42.4 Field Documentation . . . 187
10.42.4.1 m_parent . . . 187
10.42.4.2 m_names_chars . . . 187
10.42.4.3 m_char_w . . . 188
10.42.4.4 m_setbox_w . . . 188
10.42.4.5 m_namebox_w . . . 188
10.42.4.6 m_names_y . . . 188
10.42.4.7 m_xy_offset . . . 188
10.43 seq64::perform Class Reference . . . 188
10.43.1 Detailed Description . . . 195
10.43.2 Constructor & Destructor Documentation . . . 195
10.43.2.1 perform . . . 195
10.43.2.2 ~perform . . . 195
10.43.3 Member Function Documentation . . . 195
10.43.3.1 modify . . . 195
10.43.3.2 sequence_count . . . 195
10.43.3.3 clear_all . . . 195
10.43.3.4 launch . . . 196
10.43.3.5 new_sequence . . . 197
10.43.3.6 add_sequence . . . 197
10.43.3.7 delete_sequence . . . 197
10.43.3.8 clear_sequence_triggers . . . 197
10.43.3.9 finish . . . 198
10.43.3.10 set_left_tick . . . 198
10.43.3.11 set_right_tick . . . 198
10.43.3.12 move_triggers . . . 198
10.43.3.13 copy_triggers . . . 198
10.43.3.14 push_trigger_undo . . . 198
10.43.3.15 get_max_trigger . . . 199
10.43.3.16 midi_control_toggle . . . 199
10.43.3.17 midi_control_on . . . 199

10.43.3.18 midi_control_off . . . 199
10.43.3.19 handle_midi_control . . . 199
10.43.3.20 get_screen_set_notepad . . . 199
10.43.3.21 set_screen_set_notepad . . . 200
10.43.3.22 set_screenset . . . 201
10.43.3.23 set_playing_screenset . . . 201
10.43.3.24 select_group_mute . . . 201
10.43.3.25 unset_mode_group_learn . . . 201
10.43.3.26 select_mute_group . . . 201
10.43.3.27 start . . . 201
10.43.3.28 stop . . . 202
10.43.3.29 position_jack . . . 202
10.43.3.30 all_notes_off . . . 202
10.43.3.31 set_active . . . 202
10.43.3.32 set_was_active . . . 202
10.43.3.33 is_dirty_main . . . 202
10.43.3.34 is_dirty_edit . . . 202
10.43.3.35 is_dirty_perf . . . 203
10.43.3.36 is_dirty_names . . . 203
10.43.3.37 is_active . . . 203
10.43.3.38 get_sequence . . . 203
10.43.3.39 reset_sequences . . . 204
10.43.3.40 play . . . 204
10.43.3.41 set_orig_ticks . . . 204
10.43.3.42 set_beats_per_minute . . . 204
10.43.3.43 set_sequence_control_status . . . 204
10.43.3.44 unset_sequence_control_status . . . 204
10.43.3.45 sequence_playing_on . . . 204
10.43.3.46 sequence_playing_off . . . 204
10.43.3.47 set_group_mute_state . . . 205
10.43.3.48 get_group_mute_state . . . 205
10.43.3.49 output_func . . . 205
10.43.3.50 set_offset . . . 205
10.43.3.51 save_playing_state . . . 206
10.43.3.52 show_ui_sequence_key . . . 206
10.43.3.53 show_ui_sequence_number . . . 206
10.43.3.54 start_playing . . . 206
10.43.3.55 decrement_beats_per_minute . . . 206
10.43.3.56 increment_beats_per_minute . . . 206
10.43.3.57 highlight . . . 206

10.43.3.58 sequence_label . . . 207
10.43.3.59 set_input_bus . . . 207
10.43.3.60 mainwnd_key_event . . . 207
10.43.3.61 perfroll_key_event . . . 207
10.43.3.62 launch_input_thread . . . 208
10.43.3.63 launch_output_thread . . . 208
10.43.3.64 init_jack . . . 208
10.43.3.65 deinit_jack . . . 208
10.43.3.66 seq_in_playing_screen . . . 208
10.43.3.67 is_modified . . . 208
10.43.3.68 is_midi_control_valid . . . 208
10.43.3.69 is_screenset_valid . . . 208
10.43.3.70 is_seq_valid . . . 209
10.43.3.71 is_mseq_valid . . . 209
10.43.3.72 install_sequence . . . 209
10.43.3.73 inner_start . . . 209
10.43.3.74 clamp_track . . . 210
10.43.3.75 set_key_event . . . 210
10.43.3.76 set_key_group . . . 210
10.43.4 Field Documentation . . . 210
10.43.4.1 sm_mc_dummy . . . 210
10.43.4.2 m_playscreen_offset . . . 210
10.43.4.3 m_seqs . . . 210
10.43.4.4 m_playback_mode . . . 210
10.43.4.5 m_one_measure . . . 210
10.43.4.6 m_left_tick . . . 210
10.43.4.7 m_right_tick . . . 211
10.43.4.8 m_starting_tick . . . 211
10.43.4.9 m_tick . . . 211
10.43.4.10 m_seqs_in_set . . . 211
10.43.4.11 m_max_sets . . . 211
10.43.4.12 m_sequence_count . . . 211
10.43.4.13 m_sequence_max . . . 211
10.43.4.14 m_is_modified . . . 211
10.44 seq64::performcallback Struct Reference . . . 211
10.44.1 Detailed Description . . . 212
10.45 seq64::perfroll Class Reference . . . 212
10.45.1 Constructor & Destructor Documentation . . . 215
10.45.1.1 ~perfroll . . . 215
10.45.2 Member Function Documentation . . . 216

10.45.2.1 set_guides . . . 216
10.45.2.2 update_sizes . . . 217
10.45.2.3 init_before_show . . . 217
10.45.2.4 fill_background_pixmap . . . 217
10.45.2.5 set_ppqn . . . 217
10.45.2.6 convert_xy . . . 217
10.45.2.7 convert_x . . . 217
10.45.2.8 snap_x . . . 218
10.45.2.9 start_playing . . . 218
10.45.2.10 stop_playing . . . 218
10.45.2.11 draw_sequence_on . . . 218
10.45.2.12 draw_drawable_row . . . 218
10.45.2.13 enqueue_draw . . . 218
10.45.2.14 on_realize . . . 218
10.45.2.15 on_expose_event . . . 218
10.45.2.16 on_button_press_event . . . 219
10.45.2.17 on_button_release_event . . . 219
10.45.2.18 on_key_press_event . . . 219
10.45.3 Friends And Related Function Documentation . . . 219
10.45.3.1 FruityPerfInput . . . 219
10.45.4 Field Documentation . . . 219
10.45.4.1 m_parent . . . 219
10.45.4.2 m_h_page_increment . . . 219
10.45.4.3 m_v_page_increment . . . 219
10.45.4.4 m_fruity_interaction . . . 219
10.46 seq64::perftime Class Reference . . . 220
10.46.1 Constructor & Destructor Documentation . . . 222
10.46.1.1 perftime . . . 222
10.46.2 Member Function Documentation . . . 222
10.46.2.1 set_guides . . . 222
10.46.2.2 enqueue_draw . . . 222
10.46.2.3 on_realize . . . 222
10.46.2.4 on_expose_event . . . 223
10.46.3 Field Documentation . . . 223
10.46.3.1 m_parent . . . 223
10.46.3.2 m_measure_length . . . 223
10.46.3.3 m_left_marker_tick . . . 223
10.46.3.4 m_right_marker_tick . . . 223
10.47 seq64::rc_settings Class Reference . . . 223
10.47.1 Member Function Documentation . . . 225

10.47.1.1 home_config_directory . . . 225
10.48 seq64::rect Class Reference . . . 225
10.49 seq64::gui_drawingarea_gtk2::rect Struct Reference . . . 226
10.50 seq64::Seq24PerfInput Class Reference . . . 226
10.50.1 Member Function Documentation . . . 227
10.50.1.1 on_button_press_event . . . 227
10.50.1.2 on_button_release_event . . . 227
10.50.1.3 on_motion_notify_event . . . 227
10.50.1.4 set_adding . . . 227
10.50.1.5 handle_motion_key . . . 227
10.51 seq64::Seq24SeqEventInput Struct Reference . . . 229
10.51.1 Member Function Documentation . . . 229
10.51.1.1 set_adding . . . 229
10.51.1.2 on_button_press_event . . . 229
10.51.1.3 on_button_release_event . . . 229
10.51.1.4 on_motion_notify_event . . . 230
10.52 seq64::Seq24SeqRollInput Class Reference . . . 230
10.52.1 Member Function Documentation . . . 230
10.52.1.1 set_adding . . . 230
10.52.1.2 on_button_press_event . . . 230
10.52.1.3 on_button_release_event . . . 230
10.53 seq64::seqdata Class Reference . . . 230
10.53.1 Constructor & Destructor Documentation . . . 233
10.53.1.1 seqdata . . . 233
10.53.2 Member Function Documentation . . . 233
10.53.2.1 reset . . . 233
10.53.2.2 set_zoom . . . 233
10.53.2.3 set_data_type . . . 233
10.53.2.4 idle_redraw . . . 233
10.53.2.5 update_sizes . . . 233
10.53.2.6 xy_to_rect . . . 233
10.53.2.7 on_realize . . . 234
10.53.2.8 on_button_press_event . . . 234
10.53.2.9 on_button_release_event . . . 234
10.53.2.10 on_motion_notify_event . . . 234
10.53.2.11 on_scroll_event . . . 234
10.53.3 Field Documentation . . . 234
10.53.3.1 m_number_w . . . 234
10.53.3.2 m_number_h . . . 234
10.53.3.3 m_number_offset_y . . . 234

10.54 seq64::seqedit Class Reference . . . 235
10.54.1 Detailed Description . . . 238
10.54.2 Constructor & Destructor Documentation . . . 238
10.54.2.1 seqedit . . . 238
10.54.3 Member Function Documentation . . . 238
10.54.3.1 set_zoom . . . 238
10.54.3.2 set_snap . . . 238
10.54.3.3 set_note_length . . . 238
10.54.3.4 set_measures . . . 239
10.54.3.5 apply_length . . . 239
10.54.3.6 get_measures . . . 239
10.54.3.7 set_midi_channel . . . 239
10.54.3.8 set_midi_bus . . . 239
10.54.3.9 set_scale . . . 239
10.54.3.10 set_key . . . 239
10.54.3.11 set_background_sequence . . . 240
10.54.3.12 name_change_callback . . . 240
10.54.3.13 set_data_type . . . 240
10.54.3.14 create_menus . . . 240
10.54.3.15 popup_event_menu . . . 240
10.54.3.16 popup_midibus_menu . . . 240
10.54.3.17 popup_sequence_menu . . . 241
10.54.3.18 popup_tool_menu . . . 241
10.54.3.19 do_action . . . 241
10.54.3.20 on_delete_event . . . 241
10.54.4 Field Documentation . . . 241
10.54.4.1 m_initial_snap . . . 241
10.55 seq64::seqevent Class Reference . . . 242
10.55.1 Member Function Documentation . . . 244
10.55.1.1 set_snap . . . 244
10.55.1.2 set_data_type . . . 244
10.55.1.3 update_sizes . . . 244
10.55.1.4 draw_background . . . 244
10.55.1.5 draw_pixmap_on_window . . . 245
10.55.1.6 idle_redraw . . . 245
10.55.1.7 x_to_w . . . 245
10.55.1.8 drop_event . . . 245
10.55.1.9 draw_events_on . . . 245
10.55.1.10 start_paste . . . 245
10.55.1.11 convert_x . . . 245

10.55.1.12convert_t . . . 245
10.55.1.13snap_x . . . 245
10.55.1.14on_realize . . . 245
10.55.1.15on_button_press_event . . . 246
10.55.1.16on_button_release_event . . . 246
10.55.1.17on_motion_notify_event . . . 246
10.55.1.18on_key_press_event . . . 246
10.56seq64::seqkeys Class Reference . . . 246
10.56.1 Member Function Documentation . . . 249
10.56.1.1 set_hint_state . . . 249
10.56.1.2 draw_key . . . 250
10.56.1.3 on_realize . . . 250
10.56.1.4 on_button_press_event . . . 250
10.56.1.5 on_button_release_event . . . 250
10.56.1.6 on_motion_notify_event . . . 250
10.56.1.7 on_enter_notify_event . . . 250
10.56.1.8 on_leave_notify_event . . . 250
10.57seq64::seqmenu Class Reference . . . 251
10.57.1 Detailed Description . . . 253
10.57.2 Constructor & Destructor Documentation . . . 253
10.57.2.1 seqmenu . . . 253
10.57.2.2 ∼seqmenu . . . 253
10.57.3 Member Function Documentation . . . 253
10.57.3.1 popup_menu . . . 253
10.57.3.2 seq_edit . . . 253
10.57.3.3 seq_event_edit . . . 253
10.57.3.4 seq_new . . . 254
10.57.3.5 seq_copy . . . 254
10.57.3.6 seq_cut . . . 254
10.57.3.7 seq_paste . . . 254
10.57.3.8 seq_clear_perf . . . 254
10.57.4 Field Documentation . . . 254
10.57.4.1 m_seqedit . . . 254
10.57.4.2 m_modified . . . 254
10.58seq64::seqroll Class Reference . . . 254
10.58.1 Member Function Documentation . . . 258
10.58.1.1 reset . . . 258
10.58.1.2 set_data_type . . . 258
10.58.1.3 set_background_sequence . . . 258
10.58.1.4 update_background . . . 258

10.58.1.5 draw_events_on_pixmap . . . 258
10.58.1.6 convert_tn . . . 258
10.58.1.7 snap_x . . . 258
10.58.1.8 draw_events_on . . . 258
10.58.1.9 on_key_press_event . . . 259
10.58.1.10 on_scroll_event . . . 259
10.59 seq64::seqtime Class Reference . . . 259
10.59.1 Member Function Documentation . . . 261
10.59.1.1 on_button_press_event . . . 261
10.59.1.2 on_button_release_event . . . 261
10.60 seq64::sequence Class Reference . . . 261
10.60.1 Detailed Description . . . 269
10.60.2 Member Enumeration Documentation . . . 269
10.60.2.1 select_action_e . . . 269
10.60.3 Member Function Documentation . . . 269
10.60.3.1 partial_assign . . . 269
10.60.3.2 event_count . . . 269
10.60.3.3 push_undo . . . 270
10.60.3.4 pop_undo . . . 270
10.60.3.5 pop_redo . . . 270
10.60.3.6 push_trigger_undo . . . 270
10.60.3.7 set_beats_per_bar . . . 270
10.60.3.8 set_beat_width . . . 270
10.60.3.9 get_beat_width . . . 270
10.60.3.10 set_rec_vol . . . 270
10.60.3.11 get_name . . . 270
10.60.3.12 set_length . . . 271
10.60.3.13 get_last_tick . . . 271
10.60.3.14 mod_last_tick . . . 271
10.60.3.15 set_playing . . . 271
10.60.3.16 toggle_queued . . . 271
10.60.3.17 off_queued . . . 271
10.60.3.18 set_recording . . . 271
10.60.3.19 set_snap_tick . . . 271
10.60.3.20 set_quantized_rec . . . 272
10.60.3.21 set_thru . . . 272
10.60.3.22 is_dirty_main . . . 272
10.60.3.23 is_dirty_edit . . . 272
10.60.3.24 is_dirty_perf . . . 272
10.60.3.25 is_dirty_names . . . 272

10.60.3.26 set_dirty_mp . . . 272
10.60.3.27 set_dirty . . . 272
10.60.3.28 set_midi_channel . . . 272
10.60.3.29 print . . . 272
10.60.3.30 print_triggers . . . 272
10.60.3.31 play . . . 272
10.60.3.32 set_orig_tick . . . 273
10.60.3.33 add_event . . . 273
10.60.3.34 add_trigger . . . 273
10.60.3.35 split_trigger . . . 273
10.60.3.36 grow_trigger . . . 273
10.60.3.37 del_trigger . . . 274
10.60.3.38 get_trigger_state . . . 274
10.60.3.39 select_trigger . . . 274
10.60.3.40 unselect_triggers . . . 274
10.60.3.41 intersect_triggers . . . 274
10.60.3.42 intersect_notes . . . 275
10.60.3.43 intersect_events . . . 275
10.60.3.44 paste_trigger . . . 275
10.60.3.45 move_selected_triggers_to . . . 275
10.60.3.46 selected_trigger_start . . . 276
10.60.3.47 selected_trigger_end . . . 276
10.60.3.48 get_max_trigger . . . 276
10.60.3.49 move_triggers . . . 276
10.60.3.50 copy_triggers . . . 276
10.60.3.51 clear_triggers . . . 276
10.60.3.52 set_midi_bus . . . 276
10.60.3.53 set_master_midi_bus . . . 276
10.60.3.54 select_note_events . . . 276
10.60.3.55 select_events . . . 277
10.60.3.56 select_events . . . 277
10.60.3.57 get_num_selected_notes . . . 277
10.60.3.58 get_num_selected_events . . . 277
10.60.3.59 select_all . . . 277
10.60.3.60 copy_selected . . . 277
10.60.3.61 cut_selected . . . 277
10.60.3.62 paste_selected . . . 277
10.60.3.63 get_selected_box . . . 277
10.60.3.64 get_clipboard_box . . . 278
10.60.3.65 move_selected_notes . . . 278

10.60.3.66 add_note . . . 278
10.60.3.67 add_event . . . 278
10.60.3.68 stream_event . . . 278
10.60.3.69 change_event_data_range . . . 278
10.60.3.70 increment_selected . . . 279
10.60.3.71 decrement_selected . . . 279
10.60.3.72 grow_selected . . . 279
10.60.3.73 stretch_selected . . . 280
10.60.3.74 remove_marked . . . 280
10.60.3.75 mark_selected . . . 280
10.60.3.76 unpaint_all . . . 280
10.60.3.77 unselect . . . 280
10.60.3.78 verify_and_link . . . 280
10.60.3.79 link_new . . . 280
10.60.3.80 zero_markers . . . 280
10.60.3.81 play_note_on . . . 280
10.60.3.82 play_note_off . . . 280
10.60.3.83 off_playing_notes . . . 281
10.60.3.84 reset_draw_marker . . . 281
10.60.3.85 reset_draw_trigger_marker . . . 281
10.60.3.86 get_next_note_event . . . 281
10.60.3.87 get_lowest_note_event . . . 281
10.60.3.88 get_highest_note_event . . . 281
10.60.3.89 get_next_event . . . 281
10.60.3.90 get_next_event . . . 281
10.60.3.91 fill_container . . . 281
10.60.3.92 transpose_notes . . . 282
10.60.3.93 background_sequence . . . 282
10.60.3.94 copy_events . . . 282
10.60.3.95 put_event_on_bus . . . 282
10.60.3.96 set_trigger_offset . . . 282
10.60.3.97 split_trigger . . . 282
10.60.3.98 adjust_trigger_offsets_to_length . . . 283
10.60.3.99 remove . . . 283
10.60.3.100 remove . . . 283
10.60.3.101 remove_all . . . 283
10.60.4 Field Documentation . . . 283
10.60.4.1 m_midi_channel . . . 283
10.60.4.2 m_playing_notes . . . 283
10.60.4.3 m_seq_number . . . 283

10.60.4.4 m_length . . . 283
10.60.4.5 m_snap_tick . . . 283
10.60.4.6 m_time_beats_per_measure . . . 284
10.60.4.7 m_time_beat_width . . . 284
10.60.4.8 m_clocks_per_metronome . . . 284
10.60.4.9 m_32nds_per_quarter . . . 284
10.60.4.10 m_us_per_quarter_note . . . 284
10.60.4.11 m_musical_key . . . 284
10.60.4.12 m_musical_scale . . . 284
10.60.4.13 m_background_sequence . . . 284
10.60.4.14 m_mutex . . . 284
10.61 seq64::trigger Class Reference . . . 284
10.61.1 Detailed Description . . . 285
10.62 seq64::triggers Class Reference . . . 285
10.62.1 Constructor & Destructor Documentation . . . 288
10.62.1.1 triggers . . . 288
10.62.2 Member Function Documentation . . . 288
10.62.2.1 operator= . . . 288
10.62.2.2 set_length . . . 288
10.62.2.3 play . . . 288
10.62.2.4 add . . . 288
10.62.2.5 adjust_offsets_to_length . . . 289
10.62.2.6 split . . . 289
10.62.2.7 split . . . 289
10.62.2.8 grow . . . 289
10.62.2.9 remove . . . 289
10.62.2.10 get_state . . . 290
10.62.2.11 select . . . 290
10.62.2.12 unselect . . . 290
10.62.2.13 intersect . . . 290
10.62.2.14 paste . . . 290
10.62.2.15 move_selected . . . 291
10.62.2.16 get_selected_start . . . 291
10.62.2.17 get_selected_end . . . 291
10.62.2.18 copy . . . 291
10.62.2.19 next . . . 292
10.62.2.20 next_trigger . . . 292
10.62.2.21 adjust_offset . . . 292
10.62.3 Field Documentation . . . 293
10.62.3.1 m_ppqn . . . 293

10.62.3.2 m_length . . . 293
10.63 seq64::user_instrument Class Reference . . . 293
10.63.1 Detailed Description . . . 294
10.63.2 Member Function Documentation . . . 294
10.63.2.1 set_defaults . . . 294
10.63.2.2 controller_max . . . 294
10.63.2.3 controller_name . . . 294
10.63.2.4 controller_active . . . 294
10.63.2.5 set_controller . . . 294
10.63.2.6 set_name . . . 295
10.63.2.7 copy_definitions . . . 295
10.63.3 Field Documentation . . . 295
10.63.3.1 m_is_valid . . . 295
10.63.3.2 m_controller_count . . . 295
10.64 seq64::user_instrument_t Struct Reference . . . 295
10.64.1 Field Documentation . . . 295
10.64.1.1 instrument . . . 295
10.64.1.2 controllers . . . 295
10.64.1.3 controllers_active . . . 296
10.65 seq64::user_midi_bus Class Reference . . . 296
10.65.1 Detailed Description . . . 297
10.65.2 Member Function Documentation . . . 297
10.65.2.1 set_defaults . . . 297
10.65.2.2 channel_count . . . 297
10.65.2.3 channel_max . . . 297
10.65.2.4 instrument . . . 297
10.65.2.5 set_instrument . . . 297
10.65.2.6 copy_definitions . . . 297
10.65.3 Field Documentation . . . 297
10.65.3.1 m_is_valid . . . 297
10.65.3.2 m_channel_count . . . 298
10.66 seq64::user_midi_bus_t Struct Reference . . . 298
10.66.1 Field Documentation . . . 298
10.66.1.1 alias . . . 298
10.66.1.2 instrument . . . 298
10.67 seq64::user_settings Class Reference . . . 298
10.67.1 Detailed Description . . . 304
10.67.2 Member Typedef Documentation . . . 305
10.67.2.1 Busses . . . 305
10.67.2.2 Instruments . . . 305

10.67.3 Member Enumeration Documentation . . . 305
10.67.3.1 mainwid_grid_style_t . . . 305
10.67.4 Constructor & Destructor Documentation . . . 305
10.67.4.1 user_settings . . . 305
10.67.5 Member Function Documentation . . . 305
10.67.5.1 set_defaults . . . 305
10.67.5.2 set_globals . . . 305
10.67.5.3 get_globals . . . 305
10.67.5.4 bus . . . 306
10.67.5.5 instrument . . . 306
10.67.5.6 controller_active . . . 306
10.67.5.7 controller_name . . . 306
10.67.5.8 zoom . . . 306
10.67.5.9 mainwnd_rows . . . 306
10.67.5.10 mainwnd_cols . . . 306
10.67.5.11 max_sets . . . 306
10.67.5.12 text_x . . . 306
10.67.5.13 text_y . . . 306
10.67.5.14 mainwid_border . . . 306
10.67.5.15 mainwid_spacing . . . 306
10.67.5.16 control_height . . . 307
10.67.5.17 dump_summary . . . 307
10.67.5.18 perf_h_page_increment . . . 307
10.67.5.19 perf_v_page_increment . . . 307
10.67.5.20 midi_ppqn . . . 307
10.67.5.21 midi_buss_override . . . 307
10.67.5.22 midi_beats_per_bar . . . 307
10.67.5.23 midi_beats_per_minute . . . 307
10.67.5.24 midi_beat_width . . . 307
10.67.5.25 private_bus . . . 307
10.67.5.26 private_instrument . . . 307
10.67.6 Field Documentation . . . 308
10.67.6.1 m_midi_buses . . . 308
10.67.6.2 m_instruments . . . 308
10.67.6.3 m_grid_style . . . 308
10.67.6.4 m_grid_brackets . . . 308
10.67.6.5 m_mainwnd_rows . . . 308
10.67.6.6 m_mainwnd_cols . . . 308
10.67.6.7 m_max_sets . . . 308
10.67.6.8 m_mainwid_border . . . 308

10.67.6.9 m_control_height . . . 308
10.67.6.10 m_global_seq_feature_save . . . 308
10.67.6.11 m_seqedit_scale . . . 309
10.67.6.12 m_seqedit_key . . . 309
10.67.6.13 m_seqedit_bgsequence . . . 309
10.67.6.14 m_use_new_font . . . 309
10.67.6.15 m_allow_two_perfedits . . . 309
10.67.6.16 m_h_perf_page_increment . . . 309
10.67.6.17 m_v_perf_page_increment . . . 309
10.67.6.18 m_text_x . . . 309
10.67.6.19 m_seqchars_x . . . 310
10.67.6.20 m_midi_ppqn . . . 310
10.67.6.21 m_midi_beats_per_measure . . . 310
10.67.6.22 m_midi_beats_per_minute . . . 310
10.67.6.23 m_midi_beat_width . . . 310
10.67.6.24 m_midi_buss_override . . . 310
10.67.6.25 m_seqs_in_set . . . 311
10.67.6.26 m_gmute_tracks . . . 311
10.67.6.27 m_max_sequence . . . 311
10.67.6.28 m_seqarea_x . . . 311
10.67.6.29 m_seqarea_seq_x . . . 311
10.67.6.30 m_mainwid_x . . . 311
10.67.6.31 m_save_user_config . . . 311
10.67.6.32 mc_min_zoom . . . 311
10.67.6.33 mc_max_zoom . . . 312
10.67.6.34 mc_baseline_ppqn . . . 312
10.68 seq64::userfile Class Reference . . . 312
10.68.1 Member Function Documentation . . . 313
10.68.1.1 parse . . . 313
10.68.1.2 write . . . 313
10.68.1.3 dump_setting_summary . . . 313

Index **315**

Chapter 1

Sequencer64

Author(s) Chris Ahlstrom 2015-11-27

1.1 Introduction

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

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

Also read the ROADMAP, README, and contrib/bugs_to_investigate files to understand the genesis of this project and the things that still need to be done with Sequencer64.

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/seq24-doc.git
- https://github.com/ahlstromcj/sequencer64-doc.git

These project also have prebuilt PDFs should one not want to bother building them.

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, standard stuff like the mutex module, the fruity variants (at least the ones already refactored into their own modules), etc., are all left out. Still, the resulting PDF is over 300 pages long.

Some useful references:

- http://acad.carleton.edu/courses/musc108-00-f14/pages/04/04StandardMIDIFiles.html
- http://www.midimusicadventures.com/qs/midi-zips/soundtracks/kq6gm.zip

Chapter 2

MIDI File Parsing in Sequencer64

Author(s) Chris Ahlstrom 2016-02-01

2.1 Introduction

This section describes the parsing of a MIDI file. We start with the main format that is supported, SMF 1. Once we understood that we, we figured out how to split a SMF 0 tracks correctly.

We split the midifile::parse() function into two sections. The first section analyzes the header of the MIDI. Then, based on whether the file is SMF 1 (the normal case) or SMF 0, either the parse_smf_1() function of or the parse_smf_0() function is called. The parse_smf_0() function creates one sequence object per channel present in the SMF 0 file, plus the original track. The last pattern slot (sequence 16) will contain the original track data, and the rest will contain common data and then channel data for each channel. After the parsing is done, all the tracks (including the original track) will be added to the performance. The user then has the option of deleting the original track, which will be the last track.

2.2 SMF 1 Parsing

This section describes the parsing of the header chunk, MThd, and the track chunk, MTrk.

The midifile::parse() function starts by opening the MIDI file, getting its file-size, pre-allocating the data vector to that size, reading all of the characters into that vector, and then closing the file.

2.2.1 MIDI File Header, MThd

The data of the header is read:

```
Header ID:      "MThd"          read_long()       4 bytes
MThd length:      6             read_long()       4 bytes
Format:         0, 1, 2         read_short()      2 bytes
No. of track:   1 or more       read_short()      2 bytes
PPQN:            192            read_short()      2 bytes
```

The header ID and it's length are always the same values. The formats that Sequencer64 supports are 0 or 1. SMF 0 has only one track, while SMF 1 can support an arbitary number of tracks. The last value in the header is the PPQN value, which specifies the "pulses per quarter note", which is the basic time-resolution of events in the MIDI file. Common values are 96 or 192, but higher values are also common. Sequencer64 and its precursor, Seq24, default to 192.

2.2.2 MIDI Track, MTrk

Sequencer64 next reads the tracks specified in the file. Each track is assumed to cover a different MIDI channel, but always the same MIDI buss. (The MIDI buss is not a data item in standard MIDI files, but it is a special data item in Seq24/Sequencer64 MIDI files.) Each track is tagged by a standard chunk marker, "MTrk". Other markers are possible, and are to be ignored, if nothing else. Here are the values read at the beginning of a track:

```
Track ID:      "MTrk"         read_long()       4 bytes
Track length:  varies         read_long()       4 bytes
```

The track length is the number of bytes that need to be read in order to get all of the data in the track.

Next, a new sequence object is created, with the PPQN value passed to its constructor. The sequence then is hooked to the master MIDI buss object. The "RunningTime" accumulator is set to 0 for that track.

Next, the parse() function loops through the rest of the track, reading data and logging it to the sequence. Let's go through the loop, which is the meat of the processing.

TODO: An empty event is created before track processing, and re-used for every track and event. This seems dangerous. We moved the event constructor two levels of nesting deeper, and it seems to work fine.

Delta time. The amount time that passes from one event to the next is the *delta time*. For some events, the time doesn't matter, and is set to 0. This values is a *variable length value*, also known as a "VLV" or a "varinum". It provides a way of encoding arbitrarily large values, a byte at a time. For now, just note that a varinum is 1 or more bytes, and MIDI provides a way to tell when the varinum is complete.

```
Delta time:    varies         read_varinum()    1 or more bytes
```

2.2.2.1 Channel Events

Status. The byte after the delta time is examined by masking it against 0x80 to check the high bit. If not set, it is a "running status", it is replaced with the "last status", which is 0 at first.

```
Status byte:   varies         read_byte()       1 byte
```

If the high bit is set, it is a status, and is passed to the setter `event::set_status()`.

The "RunningTime" accumulator is incremented by the delta-time. The current time is adjusted as per the PPQN ratio, if needed, and passed to the setter `event::set_timestamp()`.

Now what does the status mean? First, the channel part of the status is masked out using the 0xF0 mask.

If it is a 2-data-byte event (note on, note off, aftertouch, control-change, or pitch-wheel), then the two data bytes are read:

```
Data byte 0:   varies         read_byte()       1 byte
Data byte 1:   varies         read_byte()       1 byte
```

If the status is a note-on event, with data[1] = 0, then it is converted to a note-off event, a fix for the output quirks of some MIDI devices, and the status of the event is amended to EVENT_NOTE_OFF.

If it is a 1-data-btye event (program change or channel pressure), then only data byte 0 is read.

Then the one or two data bytes are added to the event by overloads of `event::set_data()`, the event is added to the current sequence by `sequence::add_event()`, and the MIDI channel of the sequence is set by `sequence::set_midi_channel()`.

Note that this is the point where parsing could detect a change in channel, and select a new sequence to support that channel, and add the events to that sequence, if the file were SMF 0.

Also note that the channel of the sequence is set every a new channel event/status is read. This should be done once, and then simply warned about if a non-matching channel occurs.

Lastly, note that it might be better to do the sequence function calls at the end of processing the event.

2.2.2.2 Meta Events

If the event status masks off to 0xF0 (0xF0 to 0xFF), then it is a meta event. If the status is 0xFF, it is called a "Sequencer-specific", or "SeqSpec" event. For this kind of event, then a type byte and the length of the event are read.

```
Meta type:     varies         read_byte()       1 byte
Meta length:   varies         read_varinum()    1 or more bytes
```

If the type of the SeqSpec (0xFF) meta event is 0x7F, parsing checks to see if it is one of the Seq24 "proprietary" events. These events are tagged with various values that mask off to 0x24240000. The parser reads the tag:

```
Prop tag:     0x242400nn      read_long()       4 bytes
```

These tags provide a way to save and recover Seq24/Sequencer64 properties from the MIDI file: MIDI buss, MIDI channel, time signature, sequence triggers, and (new), the key, scale, and background sequence to use with the track/sequence. Any leftover data for the tagged event is let go. Unknown tags ate skipped.

If the type of the SeqSpec (0xFF) meta event is 0x2F, then it is the End-of-Track marker. The current time is set using `sequence::set_length()` and then `sequence::zero_markers()` is called, and parsing is done for that track.

If the type of the SeqSpec (0xFF) meta event is 0x03, then it is the sequence name. The "length" number of bytes are read, and loaded by `sequence::set_name()`.

If the type of the SeqSpec (0xFF) meta event is 0x00, then it is the sequence number, which is read:

```
Seq number:    varies         read_short()      2 bytes
```

Note that the sequence number might be modified latter to account for the current screenset in force for a file import operation.

Anything other SeqSpec type is simply skipped by reading the "length" number of bytes.

To summarize the process, here are the relevant event and sequence setter calls typically made while parsing a MIDI track:

1. `perform::add_sequence()`
   (a) `sequence::sequence()`
   (b) `sequence::set_master_midi_bus())`
   (c) `sequence::add_event()`
      i. `event::event()`
      ii. `event::set_status()`
      iii. `event::set_timestamp()`
      iv. `event::set_data()`
   (d) `sequence::set_midi_channel()`
   (e) `sequence::set_length()`
   (f) `sequence::zero_markers()`
   (g) `sequence::set_name()`
   (h) `sequence::set_midi_bus()`
2. `xxxxx::yyyy()`

2.2.3 Meta Events

Here, we summarize the MIDI meta events.

1. `FF 00 02 ssss`: Sequence Number.
2. `FF 01 len text`: Text Event.
3. `FF 02 len text`: Copyright Notice.
4. `FF 03 len text`: Sequence/Track Name.
5. `FF 04 len text`: Instrument Name.
6. `FF 05 len text`: Lyric.
7. `FF 06 len text`: Marker.
8. `FF 07 len text`: Cue Point.
9. `FF 08 len text`: Patch/program Name.
10. `FF 09 len text`: Device Name.
11. `FF 0A through 0F len text`: Other kinds of text events.
12. `FF 20 01 cc`: MIDI channel (obsolete, used by Cakewalk)
13. `FF 21 01 pp`: MIDI port (obsolete, used by Cakewalk)
14. `FF 2F 00`: End of Track.
15. `FF 51 03 tttttt`: Set Tempo, us/qn.
16. `FF 54 05 hr mn se fr ff`: SMPTE Offset.
17. `FF 58 04 nn dd cc bb`: Time Signature.
18. `FF 59 02 sf mi`: Key Signature.
19. `FF 7F len data`: Sequencer-Specific.

The next sections describe the events that *Sequencer* tries to handle. These are

- Sequence Number (0x00)
- Track Name (0x03)
- End-of-Track (0x2F)
- Set Tempo (0x51) (Sequencer64 only)
- Time Signature (0x58) (Sequencer64 only)
- Sequencer-Specific (0x7F)
- System Exclusive (0xF0) Sort of handled, functionality incomplete..

2.2.3.1 Sequence Number (0x00)

```
FF 00 02 ss ss
```

This optional event must occur at the beginning of a track, before any non-zero delta-times, and before any transmittable MIDI events. It specifies the number of a sequence.

2.2.3.2 Track/Sequence Name (0x03)

```
FF 03 len text
```

If in a format 0 track, or the first track in a format 1 file, the name of the sequence. Otherwise, the name of the track.

2.2.3.3 End of Track (0x2F)

```
FF 2F 00
```

This event is not optional. It is included so that an exact ending point may be specified for the track, so that it has an exact length, which is necessary for tracks which are looped or concatenated.

2.2.3.4 Set Tempo Event (0x51)

The MIDI Set Tempo meta event sets the tempo of a MIDI sequence in terms of the microseconds per quarter note. This is a meta message, so this event is never sent over MIDI ports to a MIDI device.

After the delta time, this event consists of six bytes of data:

```
FF 51 03 tt tt tt
```

Example:

```
FF 51 03 07 A1 20
```

1. 0xFF is the status byte that indicates this is a Meta event.
2. 0x51 the meta event type that signifies this is a Set Tempo event.
3. 0x03 is the length of the event, always 3 bytes.
4. The remaining three bytes carry the number of microseconds per quarter note. For example, the three bytes above form the hexadecimal value 0x07A120 (500000 decimal), which means that there are 500,000 microseconds per quarter note.

Since there are 60,000,000 microseconds per minute, the event above translates to: set the tempo to 60,000,000 / 500,000 = 120 quarter notes per minute (120 beats per minute). This is a 24-bit binary value, so each byte covers the full range of 0x00 to 0xFF.

This event normally appears in the first track. If not, the default tempo is 120 beats per minute. This event is important if the MIDI time division is specified in "pulses per quarter note", which does not itself define the length of the quarter note. The length of the quarter note is then determined by the Set Tempo meta event.

Representing tempos as time per beat instead of beat per time allows absolutely exact DWORD-term synchronization with a time-based sync protocol such as SMPTE time code or MIDI time code. This amount of accuracy provided by this tempo resolution allows a four-minute piece at 120 beats per minute to be accurate within 500 usec at the end of the piece.

We have now added the Tempo meta event (and the Time Signature meta event) to the track, which allows other sequencers to obtain these values from a Sequencer64 MIDI file. Here are the original headers for a normal MIDI file and its legacy (Seq24) conversion, as shown by the midicvt application:

```
hymne.asc                           hymne-ppqn-384.asc

MThd 1 4 96                         MThd 1 4 384
MTrk                                MTrk
0 Meta SeqName "Vangelis: Hymne"    0 SeqNr 0
0 TimeSig 4/4 24 8                  0 Meta SeqName "Vangelis: Hymne"
0 Tempo 750000                      0 SeqSpec 24 24 00 08       (no triggers)
```

```
0 Meta TrkEnd                          0 SeqSpec 24 24 00 01 00    (MIDI buss 0)
TrkEnd                                 0 SeqSpec 24 24 00 06 04 04 (beats, width)
                                       0 SeqSpec 24 24 00 02 00    (MIDI ch. 0)
                                       96 Meta TrkEnd
                                       TrkEnd
```

Here is the header data that result from the new conversion, which is used if the "legacy" option is not in force:

```
MThd 1 4 192
MTrk
0 SeqNr 0
0 Meta SeqName "Vangelis: Hymne"
0 TimeSig 4/4 24 8
0 Tempo 750000
0 SeqSpec 24 24 00 08
0 SeqSpec 24 24 00 01 00
0 SeqSpec 24 24 00 06 04 04
0 SeqSpec 24 24 00 02 00
48 Meta TrkEnd
TrkEnd
```

2.2.3.5 Time Signature Event (0x58)

After the delta time, this event consists of seven bytes of data:

```
FF 58 04 nn dd cc bb
```

The time signature is expressed as four numbers. `nn` and `dd` represent the numerator and denominator of the time signature as it would be notated. The numerator counts the number of beats in a measure (beats per measure or beats per bar). The denominator is a negative power of two: 2 represents a quarter-note, 3 represents an eighth-note, etc. The denominator specifies the unit of the beat (e.g. 4 or 8). In Seq24/Sequencer64, this value is also called the "beat width".

The `cc` parameter expresses the number of MIDI clocks (or "ticks", or "pulses") in a metronome click. The standard MIDI clock ticks 24 times per quarter note, so a value of 6 would mean the metronome clicks every 1/8th note.

The `bb` parameter expresses the number of notated 32nd-notes in a MIDI quarter note (24 MIDI Clocks). The usual value for this parameter is 8, though some sequencers allow the user to specify that what MIDI thinks of as a quarter note, should be notated as something else. For example, a value of 16 means that the music plays two quarter notes for each quarter note metered out by the MIDI clock, so that the music plays at double speed.

Examples:

```
FF 58 04 04 02 18 08
```

1. 0xFF is the status byte that indicates this is a Meta event.
2. 0x58 the meta event type that signifies this is a Time Signature event.
3. 0x04 is the length of the event, always 4 bytes.
4. 0x04 is the numerator of the time signature, and ranges from 0x00 to 0xFF.
5. 0x02 is the log base 2 of the denominator, and is the power to which 2 must be raised to get the denominator. Here, the denominator is 2 to 0x02, or 4, so the time signature is 4/4.
6. 0x18 is the metronome pulse in terms of the number of MIDI clock ticks per click. Assuming 24 MIDI clocks per quarter note, the value here (0x18 = 24) indidicates that the metronome will tick every 24/24 quarter note. If the value of the sixth byte were 0x30 = 48, the metronome clicks every two quarter notes, i.e. every half-note.
7. 0x08 defines the number of 32nd notes per beat. This byte is usually 8 as there is usually one quarter note per beat, and one quarter note contains eight 32nd notes.

A time signature of 6/8, with a metronome click every 3rd 1/8 note, would be encoded:

```
FF 58 04 06 03 24 08
```

Remember, a 1/4 note is 24 MIDI Clocks, therefore a bar of 6/8 is 72 MIDI Clocks. Hence 3 1/8 notes is 36 (=0x24) MIDI Clocks.

There should generally be a Time Signature Meta event at the beginning of a track (at time = 0), otherwise a default 4/4 time signature will be assumed. Thereafter they can be used to effect an immediate time signature change at any point within a track.

For a format 1 MIDI file, Time Signature Meta events should only occur within the first MTrk chunk.

If a time signature event is not present in a MIDI sequence, 4/4 signature is assumed.

In *Sequencer64*, the c_timesig SeqSpec event is given priority. The conventional time signature is used only if the c_timesig SeqSpec is not present in the file. NEEDS TO BE TESTED.

2.2.3.6 SysEx Event (0xF0)

If the meta event status value is 0xF0, it is called a "System-exclusive", or "SysEx" event.

```
F0 len data F7
```

Sequencer64 has some code in place to store these messages, but the data is currently not actually stored or used. Although there is some infrastructure to support storing the SysEx event within a sequence, the SysEx information is simply skipped. *Sequencer64* warns if the terminating 0xF7 SysEx terminator is not found at the expected length. Also, some malformed SysEx events have been encountered, and those are detected and skipped as well.

2.2.3.7 Sequencer Specific (0x7F)

This data, also known as SeqSpec data, provides a way to encode information that a specific sequencer application needs, while marking it so that other sequences can safely ignore the information.

```
FF 7F len data
```

In *Seq24* and *Sequencer64*, the data portion starts with four bytes that indicate the kind of data for a particular SeqSpec event:

```
c_midibus        ^  0x24240001  Track buss number
c_midich         ^  0x24240002  Track channel number
c_midiclocks     *  0x24240003  Track clocking
c_triggers       ^  0x24240004  See c_triggers_new
c_notes          *  0x24240005  Song data, notes
c_timesig        ^  0x24240006  Track time signature
c_bpmtag         *  0x24240007  Song beats/minute
c_triggers_new   ^  0x24240008  Track trigger data
c_mutegroups     *  0x24240009  Song mute group data
c_midictrl       *  0x24240010  Song MIDI control
c_musickey       +  0x24240011  Track key (Sequencer64 only)
c_musicscale     +  0x24240012  Track scale (Sequencer64 only)
c_backsequence   +  0x24240013  Track background sequence (Sequencer64 only)

* = global only; ^ = track only; + = both
```

In *Seq24*, these events are placed at the end of the song, but are not marked as SeqSpec data. Most MIDI applications handle this situation fine, but some (e.g. midicvt) do not. Therefore, *Sequencer64* makes sure to wrap each data item in the 0xFF 0x7F wrapper.

Also, the last three items above (key, scale, and background sequence) can also be stored (by *Sequencer64*) with a particular sequence/track, as well as at the end of the song. Not sure if this bit of extra flexibility is useful, but it is there.

2.2.3.8 Non-Specific End of Sequence

Any other statuses are deemed unsupportable in *Sequencer64*, and abort parsing with an error.

If the –bus option is in force, `sequence::set_midi_bus()` is called to override the buss number (if any) stored with the sequence.

Finally, `perform::add_sequence()` adds the sequence to the encoded tune.

2.3 SMF 0 Parsing

After parsing SMF 1 track data, we end up with a number of sequences, each on a different MIDI channel. With SMF 0, data for all channels is present in a single track. Sequencer64 will read SMF 0 data, but we really need to be able to have one MIDI channel per track. So we need to take the data from the sequence and use it to make more sequences.

- `sequence::add_event()`.
- `sequence::set_midi_channel()`.
- `sequence::set_length()`.
- `sequence::set_midi_bus()`.
- `perform::add_sequence()`.

This code basically works. For now, please look at the source code for more details. Also, the reading of SMF 0 MIDI files is described in the *sequencer64-doc* project on GitHub.

Chapter 3

JACK, Live, and Song Modes in Sequencer64

Author(s) Chris Ahlstrom 2016-01-23

3.1 Introduction

This section describes the interactions between JACK settings and the Live/Song Mode settings, with an eye to describing the proper behavior of Sequencer64 with JACK settings, how the Live/Song modes are supposed to work, and what bugs or issues remain in Sequencer64's JACK handling.

I'm not sure why Doxygen is applying the "code" font so often here. Weird, annoying.

3.2 JACK Functions

Please study the following URL and note these important points:

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

- The timebase master continuously updates position information, beats, timecode, etc. There is at most one master active at a time. If no client is registered as timebase master, frame numbers will be the only position information available.
- The timebase master registers a callback that updates position information while transport is rolling. Its output affects the following process cycle. This function is called immediately after the process callback in the same thread whenever the transport is rolling, or when any client has set a new position in the previous cycle.
- Clients that don't declare a sync callback are assumed ready immediately, anytime the transport wants to start. If a client doesn't require slow-sync processing, it can set its sync callback to NULL.
- The transport state is always valid; initially it is JackTransportStopped.
- When someone calls `jack_transport_start()`, the engine resets the poll bits and changes to a new state, JackTransportStarting.
- When all slow-sync clients are ready, the state changes to JackTransportRolling.

Does Sequencer64 need a latency callback?

```
http://jackaudio.org/files/docs/html/group__ClientCallbacks.html
```

(We need to see why most of the following is in a monospaced font. Is there a new Doxygen feature?)

Here are summaries of the JACK functions used in the jack_assistant module:

3.2.1 jack_client_open()

```
Open a client session with a JACK server. More complex and
powerful than <tt>jack_client_new()</tt>.
Clients choose which of several
servers to connect, and how to start the server automatically, if
not already running. There is also an option for JACK to generate
a unique client name.


  const char *   client_name,
  jack_options_t    options,
  jack_status_t *   status,
     ...
```

client_name of at most jack_client_name_size() characters. The name scope is local to each server. Unless forbidden by the JackUseExactName option, the server will modify this name to create a unique variant, if needed.

options formed by OR-ing together JackOptions bits. Only the JackOpenOptions bits are allowed.

status (if non-NULL) an address for JACK to return information from the open operation. This status word is formed by OR-ing together the relevant JackStatus bits.

Optional parameters: depending on corresponding [options bits] additional parameters may follow status (in this order).

[JackServerName] (char $*$) server_name selects from among several possible concurrent server instances. Server names are unique to each user. If unspecified, use "default" unless $JACK_DEFAULT_SERVER is defined in the process environment.

Returns:

Opaque client handle if successful. If this is NULL, the open operation failed, and $*$status includes JackFailure, and the caller is not a JACK client.

3.2.2 jack_on_shutdown()

```
Registers a function to call when the JACK server shuts down the
client thread. It must be an asynchonrous POSIX signal
handler: only async-safe functions, executed from another thread.
A typical function might set a flag or write to a pipe so that the
rest of the application knows that the JACK client thread has shut
down.  Clients do not need to call this function. It only helps
clients understand what is going on. It should be called before
<tt>jack_client_activate()</tt>.
```

3.2.3 jack_set_sync_callback()

```
Register/unregister as a slow-sync client; it can't respond
immediately to transport position changes.  The callback is run at
the first opportunity after registration: if the client is active,
this is the next process cycle, otherwise it is the first cycle
after <tt>jack_activate()</tt>.  After that, it runs as per
JackSyncCallback rules.  Clients that don't set this callback are
assumed ready immediately any time the transport wants to start.
```

3.2.4 jack_set_process_callback()

```
Tells the JACK server to call the callback whenever there is work.
The function must be suitable for real-time execution, it cannot
call functions that might block for a long time: malloc(), free(),
printf(), pthread_mutex_lock(), sleep(), wait(), poll(), select(),
pthread_join(), pthread_cond_wait(), etc.  In the current class,
this function is a do-nothing function.
```

3.2.5 jack_set_session_callback()

```
Tells the JACK server to call the callback when a session event is
delivered.  Setting more than one session callback per process is
probably a design error.  For a multiclient application, it's more
sensible to create a JACK client with only one session callback.
```

3.2.6 jack_activate()

```
Tells the JACK server that the application is ready to start
processing.
```

3.2.7 jack_release_timebase()

TODO

3.2.8 jack_client_close()

TODO

3.2.9 jack_transport_start()

```
Starts the JACK transport rolling.  Any client can make this
request at any time. It takes effect no sooner than the next
process cycle, perhaps later if there are slow-sync clients. This
function is realtime-safe.  No return code.
```

3.2.10 jack_transport_stop()

```
Starts the JACK transport rolling.  Any client can make this
request at any time.  This function is realtime-safe.  No return
code.
```

3.2.11 jack_transport_locate()

```
Repositions the transport to a new frame number.  May be called at
any time by any client. The new position takes effect in two
process cycles. If there are slow-sync clients and the transport is
already rolling, it will enter the JackTransportStarting state and
begin invoking their sync_callbacks until ready. This function is
realtime-safe.
```

3.2.12 jack_transport_reposition()

```
Request a new transport position.  May be called at any time by any
client. The new position takes effect in two process cycles. If
there are slow-sync clients and the transport is already rolling,
it will enter the JackTransportStarting state and begin invoking
their sync_callbacks until ready. This function is realtime-safe.
This call, made in the position() function, is currently disabled.
```

3.2.13 jack_transport_query()

Query the current transport state and position. This function is realtime-safe, and can be called from any thread. If called from the process thread, pos corresponds to the first frame of the current cycle and the state returned is valid for the entire cycle.

The first parameter is the client, which is a pointer to the JACK client structure.

The second parameter is a pointer to structure for returning current transport position; pos->valid will show which fields contain valid data. If pos is NULL, do not return position information.

This function returns the current transport state.

3.3 Modes Operation

3.3.1 No JACK, Live Mode

In ~/.config/sequencer64/sequencer64.rc, set:

- jack_transport = 0
- jack_master = 0
- jack_master_cond = 0
- jack_start_mode = 0

By changing the start mode to 0 (false), Sequencer64 is put into Live Mode. With this setting, control of the muting and unmuting of patterns resides in the main window (the patterns window). One can start the playback in the performance (song) window, but it will not affect which patterns play, at all.

Note that this option is part of the *File / Options / JACK/LASH* configuration page.

3.3.2 No JACK, Song Mode

In ~/.config/sequencer64/sequencer64.rc, set:

- jack_transport = 0
- jack_master = 0
- jack_master_cond = 0
- jack_start_mode = 1

By changing the start mode to 1 (true), Sequencer64 is put into Song Mode.

With this setting, control of the muting and unmuting of patterns resides in the song window (the performance window). The patterns shown in the pattern slots of the main window turn on and off whenever the progress bar is in the pattern as drawn in the perforance window.

Note that this option is part of the *File / Options / JACK/LASH* configuration page.

3.3.3 JACK Transport

In ~/.config/sequencer64/sequencer64.rc, set:

- jack_transport = 1
- jack_master = 0
- jack_master_cond = 0
- jack_start_mode = 0 or 1 (see previous section)

The current behavior is that qjackctl and sequencer64 playback/progress seem to be independent of each other.

The workaround seems to be to set seq24/sequencer64 as JACK Master, or if another *application* (e.g. Qtractor) is JACK Master.

OLD BEHAVIOR:

```
Start qjackctl, verify that it sets up correctly, then click it's
"play" button to start the transport rolling.  Run sequencer64, load a
file.  Then note that starting playback (whether in the main window or
in the performance window) is ineffective, but resets the time counter
in qjackctl.  Why?  With JACK sync enabled by the macro:

         [JACK transport slave]
         jack sync(): zero frame rate [single report]!?
         [JackTransportRolling]
         [JackTransportStarting]  (every time space bar pressed)
         [Start playback]
         . . .
```

END OF OLD BEHAVIOR.

3.4 Breakage

Old message about seq24 being broken:

http://lists.linuxaudio.org/pipermail/linux-audio-user/2010-November/073848.html

```
i dont see the transport synchronisation working with a jack1 svn version.
you are still using only a sync callback.

and you are relying on the transport to go through the
JackTransportStarting state.

this issue should be fixed.
iirc we came to the conclusion, that seq24 is broken, and we will not
revert the changes in jack, which break it.

the quick and dirty fix on your side, would be to register an empty
process_callback.

but the issue still remains. seq24 is NOT a slow sync client. but it
registers a sync_callback.
and it even takes a lock in the sync callback.

the patch for jack-session support didnt get merged either.
```

Another one (no need for a URL):

```
I use seq24 for the majority of my projects but it isn't ideal (I should
point out that I never finish anything). I don't like seq24's pianoroll
editor, the way you do CC envelopes isn't ideal, it uses alsa-midi, there's
unnecessary complexity in switching from pattern-trigger mode to song mode,
and its insistence on being transport master while not even being able to
adjust tempo when live is annoying
```

3.5 JACK References

- http://libremusicproduction.com/articles/demystifying-jack-%E2%80%93-beginners-guide
- http://jackaudio.org/files/docs/html/transport-design.html
- http://kxstudio.linuxaudio.org/Repositories

Chapter 4

User Testing of Sequencer64 with Yoshimi

Author(s) Chris Ahlstrom 2015-10-18

4.1 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.

4.2 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.

4.3 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.

4.3.1 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.

4.3.2 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.

4.3.3 The Sequencer64 User File

To be discussed.

4.4 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.

4.4.1 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

4.4.2 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!)

4.4.2.1 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.

4.5 Specific Fault Debugging

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

4.6 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 5

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Chapter 6

Todo List

File calculations.cpp

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

File perfnames.cpp

When bringing up this dialog, and starting play from it, some extra horizontal lines are drawn for some of the sequences. This happens even in seq24, so this is long standing behavior. Is it useful, and how? Where is it done? In perfroll?

Global seq64::editable_events::save_events ()

Consider what to do about the sequence::m_is_modified flag.

Global seq64::eventedit::handle_save ()

Could also support writing the events to a new sequence, for added flexibility.

Global seq64::mainwid::timeout ()

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

Global seq64::mainwnd::mainwnd (perform &a_p, bool allowperf2=true, int ppqn=SEQ64_USE_DEFAUL↩ T_PPQN)

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::perfedit::perfedit (perform &p, bool second_perfedit=false, int ppqn=SEQ64_USE_DEFAU↩ LT_PPQN)

Offload most of the work into an initialization function like options does.

Global seq64::perform::add_sequence (sequence ∗seq, int perf)

Shouldn't we wrap around the sequence list if we can't find an empty sequence slot after prefnum?

Global seq64::perform::is_active (int seq)

We should have the sequence object keep track of its own activity and access that via a reference or pointer.

Global seq64::perform::m_seqs [c_max_sequence]

First, make the sequence array a vector, and second, put allof these flags into a structure and access those members indirectly.

Global seq64::perform::set_beats_per_minute (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::set_left_tick (midipulse tick, bool setstart=true)

The perform::m_one_measure member is currently hardwired to PPQN ∗ 4.

Global seq64::seqedit::get_measures ()

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

Global seq64::seqedit::seqedit (perform &perf, sequence &seq, int pos, int ppqn=SEQ64_USE_DEFAULT↩ _PPQN)

Offload most of the work into an initialization function like options does.

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

Make the sequence pointer a reference.

Global seq64::seqmenu::m_modified

We need to make sure that the perform object is in control of the modification flag.

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 seq64::triggers::next (midipulse ∗tick_on, midipulse ∗tick_off, bool ∗selected, midipulse ∗tick_↩ offset)

It would be a bit simpler to simply return a trigger object, wouldn't it?

Chapter 7

Deprecated List

Global seq64::sequence::get_name () const

Chapter 8

Hierarchical Index

8.1 Class Hierarchy

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

seq64::AbstractPerfInput . . . 37
  seq64::Seq24PerfInput . . . 226
seq64::automutex . . . 37
seq64::click . . . 38
seq64::configfile . . . 42
  seq64::optionsfile . . . 176
  seq64::userfile . . . 312
seq64::editable_events . . . 52
seq64::event . . . 55
  seq64::editable_event . . . 43
seq64::event_list::event_key . . . 65
seq64::event_list . . . 67
seq64::font . . . 90
seq64::gui_assistant . . . 94
  seq64::gui_assistant_gtk2 . . . 95
seq64::gui_palette_gtk2 . . . 104
  seq64::gui_drawingarea_gtk2 . . . 96
    seq64::eventslots . . . 79
    seq64::maintime . . . 127
    seq64::mainwid . . . 132
    seq64::perfnames . . . 184
    seq64::perfroll . . . 212
    seq64::perftime . . . 220
    seq64::seqdata . . . 230
    seq64::seqevent . . . 242
    seq64::seqkeys . . . 246
    seq64::seqroll . . . 254
    seq64::seqtime . . . 259
seq64::gui_window_gtk2 . . . 105
  seq64::eventedit . . . 71
  seq64::mainwnd . . . 138
  seq64::perfedit . . . 179
  seq64::seqedit . . . 235
seq64::jack_assistant . . . 108
seq64::jack_scratchpad . . . 115
seq64::keybindentry . . . 116

seq64::keys_perform . . . 117
seq64::keys_perform_gtk2 . . . 121
seq64::keys_perform_transfer . . . 123
seq64::keystroke . . . 123
seq64::lash . . . 126
seq64::midi_container . . . 145
seq64::midi_list . . . 148
seq64::midi_vector . . . 155
seq64::midi_measures . . . 150
seq64::midi_splitter . . . 151
seq64::midi_timing . . . 154
seq64::midibus . . . 157
seq64::midifile . . . 160
seq64::mutex . . . 174
seq64::condition_var . . . 40
seq64::options . . . 175
seq64::perform . . . 188
seq64::performcallback . . . 211
seq64::mainwnd . . . 138
seq64::rc_settings . . . 223
seq64::rect . . . 225
seq64::gui_drawingarea_gtk2::rect . . . 226
seq64::Seq24SeqEventInput . . . 229
seq64::Seq24SeqRollInput . . . 230
seq64::seqmenu . . . 251
seq64::mainwid . . . 132
seq64::perfnames . . . 184
seq64::sequence . . . 261
seq64::trigger . . . 284
seq64::triggers . . . 285
seq64::user_instrument . . . 293
seq64::user_instrument_t . . . 295
seq64::user_midi_bus . . . 296
seq64::user_midi_bus_t . . . 298
seq64::user_settings . . . 298

Chapter 9

Data Structure Index

9.1 Data Structures

Here are the data structures with brief descriptions:

seq64::AbstractPerfInput
: Provides an abstract base class to provide the minimal interface for the various "perf input" classes . . . . . ??

seq64::automutex
: Provides a mutex that locks automatically when created, and unlocks when destroyed . . . . . ??

seq64::click
: Encapsulates any possible mouse click . . . . . ??

seq64::condition_var
: A mutex works best in conjunction with a condition variable . . . . . ??

seq64::configfile
: This class is the abstract base class for optionsfile and userfile . . . . . ??

seq64::editable_event
: Provides for the management of MIDI editable events . . . . . ??

seq64::editable_events
: Provides for the management of an ordered collection MIDI editable events . . . . . ??

seq64::event
: Provides events for management of MIDI events . . . . . ??

seq64::event_list::event_key
: Provides a key value for an event map . . . . . ??

seq64::event_list
: Receptable for MIDI events . . . . . ??

seq64::eventedit
: This class supports an Event Editor that is used to tweak the details of events and get a better idea of the mix of events in a sequence . . . . . ??

seq64::eventslots
: This class implements the left-side keyboard in the patterns window . . . . . ??

seq64::font
: This class provides a wrapper for rendering fonts that are encoded as a 16 x 16 pixmap file in XPM format . . . . . ??

seq64::gui_assistant
: This class provides an interface for some of the GUI support needed in Sequencer64 . . . . . ??

seq64::gui_assistant_gtk2
: This class provides an interface for some of the Gtk/Gdk/Glib support needed in Sequencer64 ??

seq64::gui_drawingarea_gtk2
: Implements the basic drawing areas of the application . . . . . ??

seq64::gui_palette_gtk2
: Implements a stock palette of Gdk::Color elements . . . . . ??

seq64::gui_window_gtk2
This class supports a basic interface for Gtk::Window-derived objects . . . . . ??
seq64::jack_assistant
This class provides the performance mode JACK support . . . . . ??
seq64::jack_scratchpad
Provide a temporary structure for passing data and results between a perform and jack_assistant object . . . . . ??
seq64::keybindentry
Class for management of application key-bindings . . . . . ??
seq64::keys_perform
This class supports the performance mode . . . . . ??
seq64::keys_perform_gtk2
This class supports the performance mode . . . . . ??
seq64::keys_perform_transfer
Provides a data-transfer structure to make it easier to fill in a keys_perform object's members using sscanf() . . . . . ??
seq64::keystroke
Encapsulates any practical keystroke . . . . . ??
seq64::lash
This class supports LASH operations, if compiled with LASH support (i.e . . . . . ??
seq64::maintime
This class provides the drawing of the progress bar at the top of the main window, along with two "pills" that move in time with the beat and measure . . . . . ??
seq64::mainwid
This class implement the piano roll area of the application . . . . . ??
seq64::mainwnd
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 . . . . . ??
seq64::midi_container
This class is the abstract base class for a container of MIDI track information . . . . . ??
seq64::midi_list
This class is the std::list implementation of the midi_container . . . . . ??
seq64::midi_measures
Provides a data structure to hold the numeric equivalent of the measures string "measures↩ :beats:divisions" ("m:b:d") . . . . . ??
seq64::midi_splitter
This class handles the parsing and writing of MIDI files . . . . . ??
seq64::midi_timing
We anticipate the need to have a small structure holding the parameters needed to calculate MIDI times within an arbitrary song . . . . . ??
seq64::midi_vector
This class is the std::vector implementation of the midi_container . . . . . ??
seq64::midibus
Provides a class for handling the MIDI buss on Linux . . . . . ??
seq64::midifile
This class handles the parsing and writing of MIDI files . . . . . ??
seq64::mutex
Simple wrapper for the pthread_mutex_t type used as a recursive mutex . . . . . ??
seq64::options
This class supports a full tabbed options dialog . . . . . ??
seq64::optionsfile
Provides a file for reading and writing the application' main configuration file . . . . . ??
seq64::perfedit
This class supports a Performance Editor that is used to arrange the patterns/sequences defined in the patterns panel . . . . . ??
seq64::perfnames
This class implements the left-side keyboard in the patterns window . . . . . ??

seq64::perform
This class supports the performance mode . . . ??
seq64::performcallback
Provides for notification of events . . . ??
seq64::perfroll
This class implements the performance roll user interface . . . ??
seq64::perftime
This class implements drawing the piano time at the top of the "performance window" (the "song editor") . . . ??
seq64::rc_settings
This class contains the options formerly named "global_xxxxxx" . . . ??
seq64::rect
A small helper class representing a rectangle . . . ??
seq64::gui_drawingarea_gtk2::rect
A small helper structure representing a rectangle . . . ??
seq64::Seq24PerfInput
Implements the default (Seq24) performance input characteristics of this application . . . ??
seq64::Seq24SeqEventInput
This structure implement the normal interaction methods for Seq24 . . . ??
seq64::Seq24SeqRollInput
Implements the Seq24 mouse interaction paradigm for the seqroll . . . ??
seq64::seqdata
This class supports drawing piano-roll eventis on a window . . . ??
seq64::seqedit
Implements the Pattern Editor, which has references to: . . . ??
seq64::seqevent
Implements the piano event drawing area . . . ??
seq64::seqkeys
This class implements the left side piano of the pattern/sequence editor . . . ??
seq64::seqmenu
This class handles the right-click menu of the sequence slots in the pattern window . . . ??
seq64::seqroll
Implements the piano roll section of the pattern editor . . . ??
seq64::seqtime
This class implements the piano time, whatever that is . . . ??
seq64::sequence
Firstly a receptable for a single track of MIDI data read from a MIDI file or edited into a pattern ??
seq64::trigger
This class hold a single trigger for a sequence object . . . ??
seq64::triggers
Receptable the triggers that can be used with a sequence object . . . ??
seq64::user_instrument
Provides data about the MIDI instruments, readable from the "user" configuration file . . . ??
seq64::user_instrument_t
This structure corresponds to `[user-instrument-N]` definitions in the `~/.seq24usr` or `~/.config/sequencer64/sequencer64.usr` file . . . ??
seq64::user_midi_bus
Provides data about the MIDI busses, readable from the "user" configuration file . . . ??
seq64::user_midi_bus_t
This structure corresponds to `[user-midi-bus-0]` definitions in the `~/.seq24usr` ("user") file (`~/.config/sequencer64/sequencer64.usr` in the latest version of the application) . . . ??
seq64::user_settings
Holds the current values of sequence settings and settings that can modify the number of sequences and the configuration of the user-interface . . . ??
seq64::userfile
Supports the user's `~/.config/sequencer64/sequencer64.usr` and `~/.seq24usr` configuration file . . . ??

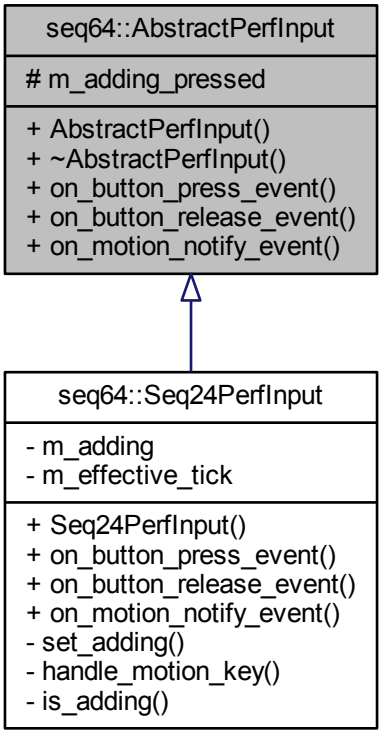
Chapter 10

Data Structure Documentation

10.1 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:



10.2 seq64::automutex Class Reference

Provides a mutex that locks automatically when created, and unlocks when destroyed.

Public Member Functions

- automutex (mutex &my_mutex)

  Principal constructor gets a reference to a mutex parameter, and then locks the mutex.
- ~automutex ()

  The destructor unlocks the mutex.

Private Attributes

- mutex & m_safety_mutex

  Provides the mutex reference to be used for locking.

10.2.1 Detailed Description

This has a couple of benefits. First, it is more threadsafe in the face of exception handling. Secondly, it can be done with just one line of code.

10.3 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=SEQ64_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.

10.3.1 Detailed Description

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

10.3.2 Constructor & Destructor Documentation

10.3.2.1 seq64::click::click ( )

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

10.3.2.2 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.

10.3.2.3 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.

10.3.3 Member Function Documentation

10.3.3.1 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.

10.3.4 Field Documentation

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

0 is the left-most coordinate.

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

0 is the top-most coordinate.

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

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

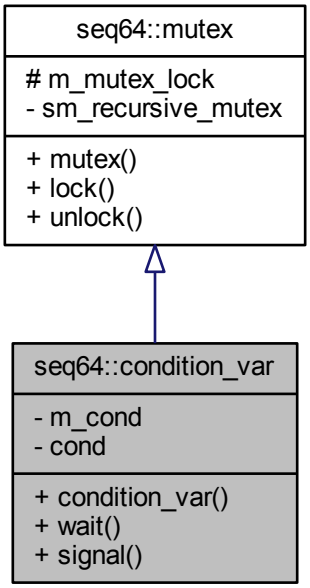
10.3.4.4 seq_modifier_t seq64::click::m_modifier [private]

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

10.4 seq64::condition_var Class Reference

A mutex works best in conjunction with a condition variable.

Inheritance diagram for seq64::condition_var:



Public Member Functions

- condition_var ()

  Initialize the condition variable with the global variable.
- void wait ()

  Waits for the confition variable.
- void signal ()

  Signals the confition variable.

Private Attributes

- pthread_cond_t m_cond

  Provides a class-specific condition variable.

Static Private Attributes

- static const pthread_cond_t cond

  Provides a "global" condition variable.

Additional Inherited Members

10.4.1 Detailed Description

Therefore this class derives from the mutex class. A "has-a" relationship might be more logical than this "is-a" relationship.

10.4.2 Field Documentation

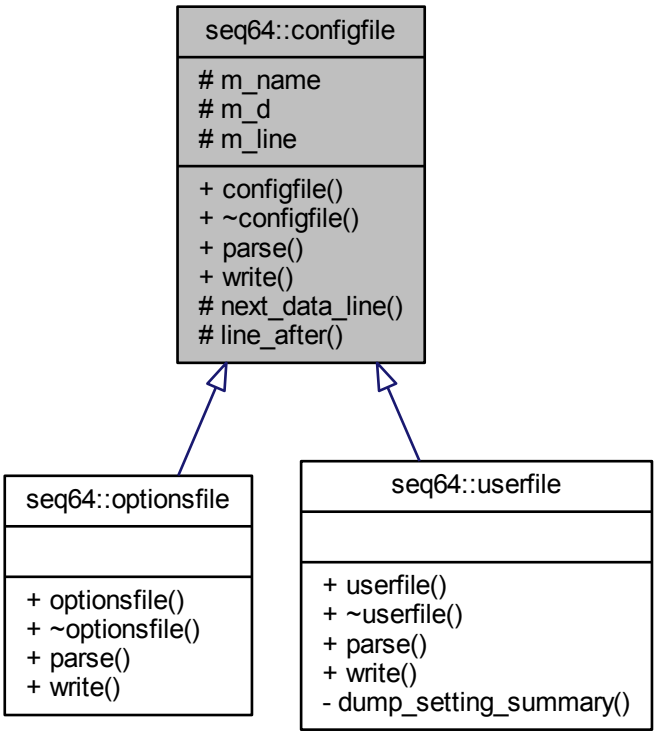
10.4.2.1 const pthread_cond_t seq64::condition_var::cond [static], [private]

Define the static condition variable used by all mutex locks.

10.5 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.
- 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.

10.5.1 Constructor & Destructor Documentation

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

Parameters

name	The name of the configuration file.

10.5.2 Member Function Documentation

10.5.2.1 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.

10.5.2.2 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.

10.5.3 Field Documentation

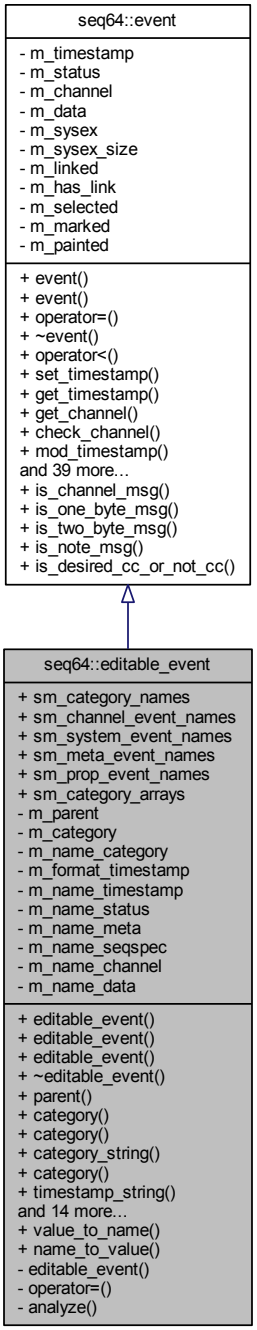
10.5.3.1 char seq64::configfile::m_line[SEQ64_LINE_MAX] [protected]

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

10.6 seq64::editable_event Class Reference

Provides for the management of MIDI editable events.

Inheritance diagram for seq64::editable_event:



Public Types

- enum category_t {
  category_name,
  category_channel_message,
  category_system_message,
  category_meta_event,
  category_prop_event }

- enum timestamp_format_t {
  timestamp_measures,
  timestamp_time,
  timestamp_pulses }

Public Member Functions

- editable_event (const editable_events &parent)

  This constructor simply initializes all of the class members.
- editable_event (const editable_events &parent, const event &ev)

  Event constructor.
- editable_event (const editable_event &rhs)

  This copy constructor initializes most of the class members.
- virtual ~editable_event ()

  This destructor current is a rote virtual function override.
- const editable_events & parent () const

  'Getter' function for member m_parent
- category_t category () const

  'Getter' function for member m_category
- void category (category_t c)

  This principal assignment operator sets the class members.
- const std::string & category_string () const

  'Getter' function for member m_category
- void category (const std::string &cs)

  'Setter' function for member m_category by value Also keeps the m_name_category member in synchrony, but looks up the name, rather than using the name parameter, to avoid storing abbreviations.
- const std::string & timestamp_string () const

  'Getter' function for member m_name_timestamp
- midipulse timestamp () const

  'Getter' function for member event::get_timestamp() Implemented to allow a uniform naming convention that is not slavish to the get/set crowd [this ain't Java].
- void timestamp (midipulse ts)

  'Setter' function for member event::set_timestamp() Implemented to allow a uniform naming convention that is not slavish to the get/set crowd [this ain't Java].
- void timestamp (const std::string &ts_string)

  'Setter' function for member event::set_timestamp() [string version]
- std::string time_as_pulses ()

  Converts the current time-stamp to a string representation in units of pulses.
- std::string time_as_measures ()

  Converts the current time-stamp to a string representation in units of measures, beats, and divisions.
- std::string time_as_minutes ()

  Converts the current time-stamp to a string representation in units of hours, minutes, seconds, and fraction.
- void set_status_from_string (const std::string &ts, const std::string &s, const std::string &sd0, const std::string &sd1)

  Converts a string into an event status, along with timestamp and data bytes.
- std::string format_timestamp ()

  Formats the current timestamp member as a string.
- std::string stock_event_string ()

  Converts the event into a string desribing the full event.
- std::string status_string () const

  'Getter' function for member m_name_status
- std::string meta_string () const

'Getter' function for member m_name_meta

- std::string seqspec_string () const

  'Getter' function for member m_name_seqspec

- std::string channel_string () const

  'Getter' function for member m_name_channel

- std::string data_string () const

  'Getter' function for member m_name_data

Static Public Member Functions

- static std::string value_to_name (midibyte value, category_t cat)

  Provides a static lookup function that returns the name, if any, associated with a midibyte value.

- static unsigned short name_to_value (const std::string &name, category_t cat)

  Provides a static lookup function that returns the value, if any, associated with a name string.

Static Public Attributes

- static const name_value_t sm_category_names [ ]

  An array of event categories and their names.

- static const name_value_t sm_channel_event_names [ ]

  An array of MIDI channel events and their names.

- static const name_value_t sm_system_event_names [ ]

  An array of MIDI system events and their names.

- static const name_value_t sm_meta_event_names [ ]

  An array of Meta events and their names.

- static const name_value_t sm_prop_event_names [ ]

  An array of Sequencer64-specific events and their names.

- static const name_value_t *const sm_category_arrays [ ]

  Provides for fast access (no ifs) to the correct name array for the given category.

Private Member Functions

- void analyze ()

  Analyzes an editable-event to make all the settings it needs.

Private Attributes

- const editable_events & m_parent

  Provides a reference to the container that holds this event.

- category_t m_category

  Indicates the overall category of this event, which will be category_channel_message, category_system_message, category_meta_event, and category_prop_event.

- std::string m_name_category

  Holds the name of the event category for this event.

- timestamp_format_t m_format_timestamp

  Indicates the format to display the time-stamp.

- std::string m_name_timestamp

  Holds the string version of the MIDI pulses time-stamp.

- std::string m_name_status

  Holds the name of the status value for this event.

- std::string m_name_meta

  Holds the name of the meta message, if applicable.
- std::string m_name_seqspec

  If we eventually implement the editing of the Seq24/Sequencer64 "proprietary" meta sequencer-specific events, the name of the SeqSpec will be stored here.
- std::string m_name_channel

  Holds the channel description, if applicable.
- std::string m_name_data

  Holds the data description, if applicable.

10.6.1 Detailed Description

It makes the following members of an event modifiable using human-readable strings:

```
-   m_timestamp
-   m_status
-   m_channel
-   m_data[]
```

Eventually, it would be nice to be able to edit, or at least view, the SysEx events and the Meta events. Those two will require extensions to make events out of them (SysEx is partly supported).

To the concepts of event, the editable_event class adds a category field and strings to represent all of these members.

10.6.2 Member Enumeration Documentation

10.6.2.1 enum seq64::editable_event::category_t

Enumerator

category_name These values determine the major kind of event, which determines what types of events are possible for this editable event object. These tags are accompanied by category names in sm_↩ category_names[]. The enum values are cast to midibyte values for the purposes of using the lookup infrastructure.

```
Indicates that the lookup needs to be done on the category names,
as listed in sm_category_names[].
```

category_channel_message Indicates a channel event, with a value ranging from 0x80 through 0xEF. Some examples are note on/off, control change, and program change. Values are looked up in sm_channel_↩ event_names[].

category_system_message Indicates a system event, with a value ranging from 0xF0 through 0xFF. Some examples are SysEx start/end, song position, and stop/start/continue/reset. Values are looked up in sm↩ _system_event_names[].

category_meta_event Indicates a meta event, and there is a second value that is used to look up the name of the meta event, in sm_meta_event_names[].

category_prop_event Indicates a "proprietary", Sequencer64 event. Indicates to look up the name of the event in sm_prop_event_names[]. Not sure if these kinds of events will be stored separately.

10.6.2.2 enum seq64::editable_event::timestamp_format_t

Enumerator

timestamp_measures Provides a code to indicate the desired timestamp format. Three are supported. All editable events will share the same timestamp format, but it seems good to make this a event class member, rather than something imposed from an outside static value. We shall see.

```
This format displays the time in "measures:beats:divisions"
format, where measures and beats start at 1.  Thus, "1:1:0" is
equivalent to 0 pulses or to "0:0:0.0" in normal time values.
```

timestamp_time This format displays the time in "hh:mm:second.fraction" format. The value displayed should not depend upon the internal timing parameters of the event.

timestamp_pulses This format specifies a bare pulse format for the timestamp – a long integer ranging from 0 on up. Obviously, this representation depends on the PPQN value for the sequence holding this event.

10.6.3 Constructor & Destructor Documentation

10.6.3.1 seq64::editable_event::editable_event (const editable_events & *parent*)

editable_event::editable_event () : event (), m_category (category_name), m_name_category (), m_format_↩ timestamp (timestamp_measures), m_name_timestamp (), m_name_status (), m_name_meta (), m_name_↩ seqspec (), m_name_channel (), m_name_data () { // Empty body } Principal constructor.

10.6.3.2 seq64::editable_event::editable_event (const editable_events & *parent,* const event & *ev*)

This function basically adds all of the extra editable_event stuff to a standard event, so that the resulting editable↩ _event is container-ready.

10.6.3.3 seq64::editable_event::editable_event (const editable_event & *rhs*)

This function is currently geared only toward support of the SMF 0 channel-splitting feature. Many of the members are not set to useful values when the MIDI file is read, so we don't handle them for now.

Warning

This function does not yet copy the SysEx data. The inclusion of SysEx editable_events was not complete in Seq24, and it is still not complete in Sequencer64. Nor does it currently bother with the links.

Parameters

rhs	Provides the editable_event object to be copied.

10.6.4 Member Function Documentation

10.6.4.1 std::string seq64::editable_event::value_to_name (midibyte *value,* editable_event::category_t *cat*) [static]

Parameters

value	The MIDI byte value to look up.
cat	The category of the MIDI byte. Each category calls a different name array into play.

Returns

Returns the name associated with the value. If there is no such name, then an empty string is returned.

10.6.4.2 unsigned short seq64::editable_event::name_to_value (const std::string & *name,* editable_event::category_t *cat*) [static]

The string_match() function, which can match abbreviations, case-insensitively, is used to make the string comparisons.

Parameters

name	The string value to look up.
cat	The category of the MIDI byte. Each category calls a different name array into play.

Returns

Returns the value associated with the name. If there is no such value, then SEQ64_END_OF_MIDIBYTE_↩ TABLE is returned.

10.6.4.3 void seq64::editable_event::category (category_t *c*)

Parameters

rhs	Provides the editable_event object to be assigned.

Returns

Returns a reference to "this" object, to support the serial assignment of editable_events.

editable_event & editable_event::operator = (const editable_event & rhs) { if (this != &rhs) { event::operator =(rhs); m_category = rhs.m_category; m_parent = rhs.m_parent; m_name_category = rhs.m_name_category; m_format↩ _timestamp = rhs.m_format_timestamp; m_name_timestamp = rhs.m_name_timestamp; m_name_status = rhs.↩ m_name_status; m_name_meta = rhs.m_name_meta; m_name_seqspec = rhs.m_name_seqspec; m_name_↩ channel = rhs.m_name_channel; m_name_data = rhs.m_name_data; } return ∗this; } *'Setter' function* for member *m_category* by value Also keeps the m_name_category member in synchrony. Note that a bad value is translated to the value of category_name.

10.6.4.4 void seq64::editable_event::category (const std::string & *name*)

Note that a bad value is translated to the value of category_name.

10.6.4.5 void seq64::editable_event::timestamp (midipulse *ts*)

Plus, we also have to set the string version at the same time.

Parameters

ts	Provides the timestamp in units of MIDI pulses.

The format of the string representation is of the format selected by the m_format_timestamp member and is set by the format_timestamp() function.

10.6.4.6 void seq64::editable_event::timestamp (const std::string & *ts_string*)

Parameters

ts	Provides the timestamp in units of MIDI pulses.

The format of the string representation is of the format selected by the m_format_timestamp member and is set by the format_timestamp() function.

10.6.4.7 std::string seq64::editable_event::time_as_measures ( )

Cannot be inlined because of a circular dependency between the editable_event and editable_events classes.

10.6.4.8 std::string seq64::editable_event::time_as_minutes ( )

Cannot be inlined because of a circular dependency between the editable_event and editable_events classes.

10.6.4.9 void seq64::editable_event::set_status_from_string (const std::string & *ts*, const std::string & *s*, const std::string & *sd0*, const std::string & *sd1*)

Currently, this function handles only the following two messages:

- category_channel_message
- category_system_message

After all of the numbering member items have been set, they are converted and assigned to the string versions via a call to the analyze() function.

Parameters

ts	Provides the time-stamp string of the event.
s	Provides the name of the event, such as "Program Change".
sd0	Provides the string defining the first data byte of the event.
sd1	Provides the string defining the second data byte of the event, if applicable to the event.

10.6.4.10 std::string seq64::editable_event::format_timestamp ( )

The format of the string representation is of the format selected by the m_format_timestamp member.

10.6.4.11 std::string seq64::editable_event::stock_event_string ( )

We get the time-stamp as a string, make sure the event is fully analyzed so that all items and strings are set correctly.

10.6.4.12 void seq64::editable_event::analyze ( ) [private]

Used in the constructors. Some of the setters indirectly set the appropriate string representation, as well.

Category:

```
This function can figure out if the status byte implies a channel
message or a system message, and set the category string as well.
However, at this time, detection of Meta events (0xFF) or
Proprietary/SeqSpec events (0xFF with 0x2424) aren't able to be
detected due to lack of context here (and due to the fact that
currently such events are not yet stored in a sequence, and the
least-significant-byte gets masked off anyway.)
```

Status:

```
We distinguish between channel and system messages, and then one- and
two-byte messages, but don't yet distinguish the data values fully.
```

10.6.5 Field Documentation

10.6.5.1 const editable_event::name_value_t seq64::editable_event::sm_category_names [static]

Initializes the array of event/name pairs for the MIDI events categories.

Terminated by an empty string, the latter being the preferred test, for consistency with the other arrays and because 0 is often a legitimate code value.

10.6.5.2 const editable_event::name_value_t seq64::editable_event::sm_channel_event_names [static]

Initializes the array of event/name pairs for the channel MIDI events.

We split channel and system messages into two arrays, for semantic reasons and for faster linear lookups.

Terminated by an empty string.

10.6.5.3 const editable_event::name_value_t seq64::editable_event::sm_system_event_names [static]

Initializes the array of event/name pairs for the system MIDI events.

We split channel and system messages into two arrays, for semantic reasons and for faster linear lookups.

Terminated by an empty string.

10.6.5.4 const editable_event::name_value_t seq64::editable_event::sm_meta_event_names [static]

Initializes the array of event/name pairs for all of the Meta events.

Terminated only by the empty string.

10.6.5.5 const editable_event::name_value_t seq64::editable_event::sm_prop_event_names [static]

Initializes the array of event/name pairs for all of the seq24/sequencer64-specific events.

Terminated only by the empty string. Note that the numbers reflect the masking off of the high-order bits by 0x242400FF.

10.6.5.6 const editable_event::name_value_t *const seq64::editable_event::sm_category_arrays [static]

Contains pointers (references cannot be stored in an array) to the desired array for a given category.

Too bad that an array of references is not possible.

This code could be considered a bit rococo.

10.6.5.7 const editable_events& seq64::editable_event::m_parent [private]

The container's "children" need to go to their "parent" to get certain items of information.

10.6.5.8 category_t seq64::editable_event::m_category [private]

The category_name value is not set here, since that category is used only for looking up the human-readable form of the category.

10.6.5.9 timestamp_format_t seq64::editable_event::m_format_timestamp [private]

The default is to display in timestamp_measures format.

10.6.5.10 std::string seq64::editable_event::m_name_status [private]

It will include the names of the channel messages and the system messages. The latter includes SysEx and Meta messages.

10.6.5.11 std::string seq64::editable_event::m_name_meta [private]

If not applicable, this name will be empty.

10.7 seq64::editable_events Class Reference

Provides for the management of an ordered collection MIDI editable events.

Public Member Functions

- editable_events (sequence &seq, int bpm)

  This constructor hooks into the sequence object.
- editable_events (const editable_events &rhs)

  This copy constructor initializes most of the class members.
- editable_events & operator= (const editable_events &rhs)

  This principal assignment operator sets most of the class members.
- virtual ~editable_events ()

  This destructor current is a rote virtual function override.
- const midi_timing & timing () const

  'Getter' function for member m_midi_parameters
- midipulse string_to_pulses (const std::string &ts_string) const

  Calculates the MIDI pulses (divisions) from a string using one of the free functions of the calculations module.
- bool load_events ()

  Accesses the sequence's event-list, iterating through it from beginning to end, wrapping each event in the list in an editable event and inserting it into the editable-event container.
- bool save_events ()

  Erases the sequence's event container and recreates it using the edited container of editable events.
- Events & events ()

  'Getter' function for member m_events
- 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.
- bool add (const event &e)

  Adds an event, converted to an editable_event, to the internal event list.
- bool add (const editable_event &e)

  Adds an editable event to the internal event list.
- bool replace (iterator ie, const editable_event &e)

  Provides a wrapper for the iterator form of erase(), which is the only one that the editable_events container uses.
- 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().
- iterator current_event () const

  'Getter' function for member m_current_event The caller must make sure the iterator is not Events::end().

Private Types

- typedef event_list::event_key Key

  Types to use to with the multimap implementation.

Private Member Functions

- void current_event (iterator cei)

  'Setter' function for member m_current_event

Private Attributes

- Events m_events

  Holds the editable_events.
- iterator m_current_event

  Points to the current event, which is the event that has just been inserted.
- sequence & m_sequence

  Provides a reference to the sequence containing the events to be edited.
- midi_timing m_midi_parameters

  Holds the current settings for the sequence (and usually for the whole MIDI tune as well).

10.7.1 Member Typedef Documentation

10.7.1.1 typedef event_list::event_key seq64::editable_events::Key [private]

These typenames are identical to those used in event_list, but of course they are in the editable_events scope instead.

10.7.2 Constructor & Destructor Documentation

10.7.2.1 seq64::editable_events::editable_events (sequence & *seq*, int *bpm*)

Parameters

seq	Provides a reference to the sequence object, which provides the events and some of the MIDI timing parameters.
bpm	Provides the beats/minute value, which the caller figures out how to get and provides in this parameter.

10.7.2.2 seq64::editable_events::editable_events (const editable_events & *rhs*)

Note that we need to reconstitute the event links here, as well.

Parameters

rhs	Provides the editable_events object to be copied.

10.7.3 Member Function Documentation

10.7.3.1 editable_events & seq64::editable_events::operator= (const editable_events & *rhs*)

Note that we need to reconstitute the event links here, as well.

Parameters

rhs	Provides the editable_events object to be assigned.

Returns

Returns a reference to "this" object, to support the serial assignment of editable_eventss.

10.7.3.2 bool seq64::editable_events::load_events ( )

Note that the new events will not have valid links (actually, no links). These links are used for associating Note Off events with their respective Note On events. To be consistent, we must take the time to reconstitute these links, using event_list::verify_and_link().

Returns

Returns true if the size of the final editable_event container matches the size of the original events container.

10.7.3.3 bool seq64::editable_events::save_events ( )

Note that the old events are replaced only if the container of editable events is not empty. There are safer ways for the user to erase all the events.

Todo Consider what to do about the sequence::m_is_modified flag.

Returns

Returns true if the size of the final event container matches the size of the original editable_events container.

10.7.3.4 int seq64::editable_events::count ( ) const [inline]

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

10.7.3.5 bool seq64::editable_events::add (const event & *e*)

Parameters

e	Provides the regular event to be added to the list of editable events.

Returns

Returns true if the insertion succeeded, as evidenced by an increment in container size.

10.7.3.6 bool seq64::editable_events::add (const editable_event & *e*)

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;
```

Parameters

e	Provides the regular event to be added to the list of editable events.

Returns

Returns true if the insertion succeeded, as evidenced by an increment in container size.

Side-effect(s) Sets m_current_event, which can be used right-away in a single-threaded context to get an iterator to the event via the current_event() accessor.

10.7.4 Field Documentation

10.7.4.1 iterator seq64::editable_events::m_current_event [private]

(From this event we can get the current time and other parameters.) If the container were a plain map, we could instead use a key to access it. But we can at least use an iterator, rather than a bare pointer.

10.7.4.2 sequence& seq64::editable_events::m_sequence [private]

Besides the events, this object also holds the beats/measure, beat-width, and the PPQN value. The beats/minute have to be obtained from the application's perform object, and passed to the editable_events constructor by the caller.

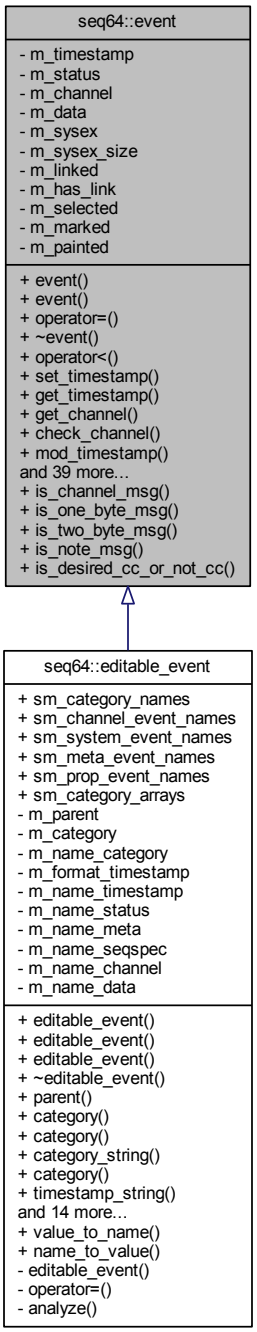
10.7.4.3 midi_timing seq64::editable_events::m_midi_parameters [private]

It holds the beats/minute, beats/measure, beat-width, and PPQN values needed to properly convert MIDI pulse timestamps to time and measure values.

10.8 seq64::event Class Reference

Provides events for management of MIDI events.

Inheritance diagram for seq64::event:



Public Member Functions

- event ()

  This constructor simply initializes all of the class members.
- event (const event &rhs)

  This copy constructor initializes most of the class members.
- event & operator= (const event &rhs)

This principal assignment operator sets most of the class members.

- virtual ~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 (midipulse time)

  'Setter' function for member m_timestamp

- midipulse get_timestamp () const

  'Getter' function for member m_timestamp

- midibyte get_channel () const

  'Getter' function for member m_channel

- bool check_channel (int channel) const

  Checks the channel number to see if the event's channel matches it, or if the event has no channel.

- void mod_timestamp (midipulse a_mod)

  Calculates the value of the current timestamp modulo the given parameter.

- void set_status (midibyte status)

  Sets the m_status member to the value of status.

- void set_status (midibyte eventcode, midibyte channel)

  This overload is useful when synthesizing events, such as converting a Note On event with a velocity of zero to a Note Off event.

- void set_channel (midibyte channel)

  Sets the channel "nybble", without modifying the status "nybble".

- midibyte get_status () const

  'Getter' function for member m_status

- void set_data (midibyte d1)

  Clears the most-significant-bit of the d1 parameter, and sets it into the first byte of m_data.

- void set_data (midibyte d1, midibyte d2)

  Clears the most-significant-bit of both parameters, and sets them into the first and second bytes of m_data.

- void get_data (midibyte &d0, midibyte &d1) const

  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 restart_sysex ()

  Deletes and clears out the SYSEX buffer.

- bool append_sysex (midibyte *data, int len)

  Appends SYSEX data to a new buffer.

- midibyte * get_sysex () const

  'Getter' function for member m_sysex

- void set_sysex_size (int len)

  'Setter' function for member m_sysex_size

- int get_sysex_size () const

  'Getter' function for member m_sysex_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;.
- midibyte data (int index) const

  'Getter' function for member m_data[]
- midibyte 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 (midibyte note)

  Sets the note number, clearing off the most-significant-bit and assigning it to the first data byte, m_data[0].
- midibyte 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.

Static Public Member Functions

- static bool is_channel_msg (midibyte m)

  Static test for channel messages/statuses.
- static bool is_one_byte_msg (midibyte m)

  Static test for channel messages that have only one data byte.
- static bool is_two_byte_msg (midibyte m)

  Static test for channel messages that have two data bytes.
- static bool is_note_msg (midibyte m)

  Static test for messages that involve notes and velocity.
- static bool is_desired_cc_or_not_cc (midibyte m, midibyte cc, midibyte datum)

  Static test for channel messages that are either not control-change messages, or are and match the given controller value.

Private Attributes

- midipulse m_timestamp

  Provides the MIDI timestamp in ticks, otherwise known as the "pulses" in "pulses per quarter note" (PPQN).
- midibyte m_status

  This is the status byte without the channel.
- midibyte m_channel

  In order to be able to handle MIDI channel-splitting of an SMF 0 file, we need to store the channel, even if we override it when playing the MIDI data.
- midibyte m_data [SEQ64_MIDI_DATA_BYTE_COUNT]

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

  Points to the data buffer for SYSEX messages.
- int m_sysex_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.".

10.8.1 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.

10.8.2 Constructor & Destructor Documentation

10.8.2.1 seq64::event::event (const event & *rhs*)

This function is currently geared only toward support of the SMF 0 channel-splitting feature. Many of the members are not set to useful values when the MIDI file is read, so we don't handle them for now.

Note that now events are also copied when creating the editable_events container, so this function is even more important. The event links, for linking Note Off events to their respective Note On events, are dropped. Generally, they will need to be reconstituted by calling the event_list::verify_and_link() function.

Warning

This function does not yet copy the SysEx data. The inclusion of SysEx events was not complete in Seq24, and it is still not complete in Sequencer64. Nor does it currently bother with the links, as noted above.

Parameters

rhs	Provides the event object to be copied.

10.8.2.2 seq64::event::~event ( ) [virtual]

The restart_sysex() function does what we need.

10.8.3 Member Function Documentation

10.8.3.1 event & seq64::event::operator= (const event & *rhs*)

This function is currently geared only toward support of the SMF 0 channel-splitting feature. Many of the member are not set to useful value when the MIDI file is read, so we don't handle them for now.

Warning

This function does not yet copy the SysEx data. The inclusion of SysEx events was not complete in Seq24, and it is still not complete in Sequencer64. Nor does it currently bother with the links.

Parameters

rhs	Provides the event object to be assigned.

Returns

Returns a reference to "this" object, to support the serial assignment of events.

10.8.3.2 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::mulitmap instead of an std::list.  Search for occurrences of
the SEQ64_USE_EVENT_MAP macro. (This actually works better than a
list, for loading MIDI event, we have found, but may cause the upper
limit of the number of playing sequences to drop a little, due to the
overhead of incrementing multimap iterators versus list iterators).
```

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.

10.8.3.3 bool seq64::event::check_channel (int *channel*) const [inline]

Used in the SMF 0 track-splitting code.

10.8.3.4 static bool seq64::event::is_channel_msg (midibyte *m*) [inline], [static]

This function requires that the channel data have already been masked off.

Parameters

m	The channel status or message byte to be tested.

Returns

Returns true if the byte represents a MIDI channel message.

10.8.3.5 static bool seq64::event::is_one_byte_msg (midibyte *m*) [inline], [static]

The rest have two.

Parameters

m	The channel status or message byte to be tested.

Returns

Returns true if the byte represents a MIDI channel message that has only one data byte. However, if this function returns false, it might not be a channel message at all, so be careful.

10.8.3.6 static bool seq64::event::is_two_byte_msg (midibyte *m*) [inline], [static]

Parameters

m	The channel status or message byte to be tested.

Returns

Returns true if the byte represents a MIDI channel message that has two data bytes. However, if this function returns false, it might not be a channel message at all, so be careful.

10.8.3.7 static bool seq64::event::is_note_msg (midibyte *m*) [inline], [static]

Parameters

m	The channel status or message byte to be tested.

Returns

Returns true if the byte represents a MIDI note message.

10.8.3.8 static bool seq64::event::is_desired_cc_or_not_cc (midibyte *m,* midibyte *cc,* midibyte *datum*) [inline], [static]

Note

The old logic was the first line, but can be simplified to the second line; the third line shows the abstract representation. Also made sure of this using a couple truth tables.

```
(m != EVENT_CONTROL_CHANGE) || (m == EVENT_CONTROL_CHANGE && d == cc)
(m != EVENT_CONTROL_CHANGE) || (d == cc)
a || (! a && b)  =>  a || b


\param m
     The channel status or message byte to be tested.

\param cc
     The desired cc value, which the datum must match, if the message is
     a control-change message.

\param datum
     The current datum, to be compared to cc, if the message is a
     control-change message.

\return
     Returns true if the message is not a control-change, or if it is
     and the cc and datum parameters match.
```

10.8.3.9 void seq64::event::mod_timestamp (midipulse *a_mod*) [inline]

Parameters

a_mod	The value to mod the timestamp against.

Returns

Returns a value ranging from 0 to a_mod-1.

10.8.3.10 void seq64::event::set_status (midibyte *status*)

If a_status is a channel event, then the channel portion of the status is cleared using a bitwise AND against EVE↩ NT_CLEAR_CHAN_MASK.

Found in yet another fork of seq24:

```
// ORL fait de la merde
```

He also provided a very similar routine: set_status_midibus().

Parameters

status	The status byte, perhaps read from a MIDI file or edited in the sequencer's event editor. Sometime, this byte will have the channel nybble masked off. If that is the case, the event-code/channel overload of this function is more appropriate.

10.8.3.11 void seq64::event::set_status (midibyte *eventcode,* midibyte *channel*)

Parameters

eventcode	The status byte, perhaps read from a MIDI file. This byte is assumed to have already had its low nybble cleared by masking against EVENT_CLEAR_CHAN_MASK.
channel	The channel byte. Combined with the event-code, this makes a valid MIDI "status" byte. This byte is assume to have already had its high nybble cleared by masking against EVENT_G↩ ET_CHAN_MASK.

10.8.3.12 void seq64::event::set_channel (midibyte *channel*) [inline]

Note that the sequence channel generally overrides this value.

Parameters

channel	The channel byte.

10.8.3.13 void seq64::event::set_data (midibyte *d1*) [inline]

Parameters

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

10.8.3.14 void seq64::event::set_data (midibyte *d1,* midibyte *d2*) [inline]

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".

10.8.3.15 void seq64::event::get_data (midibyte & *d0,* midibyte & *d1*) const [inline]

Parameters

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

10.8.3.16 bool seq64::event::append_sysex (midibyte * *data,* int *dsize*)

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

Parameters

data	Provides the additional SYSEX data. If not provided, nothing is done, and false is returned.
dsize	Provides the size of the additional SYSEX data. If not provided, nothing is done.

Returns

Returns false if there was an EVENT_SYSEX_END byte in the appended data, or if an error occurred, and the caller needs to stop trying to process the data.

10.8.3.17 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.

10.8.4 Field Documentation

10.8.4.1 midibyte 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.

10.8.4.2 midibyte seq64::event::m_channel [private]

This member adds another 4 bytes to the event object, most likely.

10.8.4.3 midibyte seq64::event::m_data[SEQ64_MIDI_DATA_BYTE_COUNT] [private]

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

10.8.4.4 midibyte* seq64::event::m_sysex [private]

This really ought to be a Boost or STD scoped pointer. Currently, it doesn't seem to be used.

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

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

10.9 seq64::event_list::event_key Class Reference

Provides a key value for an event map.

Public Member Functions

- event_key (midipulse 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

- midipulse m_timestamp

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

  The sub-key-value for the key.

10.9.1 Detailed Description

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

10.9.2 Constructor & Destructor Documentation

10.9.2.1 seq64::event_list::event_key::event_key (midipulse *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.

10.9.2.2 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.

10.9.3 Member Function Documentation

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

Parameters

e	Provides the event key to be compared against.

10.9.4 Field Documentation

10.9.4.1 midipulse seq64::event_list::event_key::m_timestamp [private]

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

10.10 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.
- bool empty () const

  Returns true if there are no events.
- bool add (const event &e, bool postsort=true)

  Adds an event to the internal event list in an optionally sorted manner.
- bool is_modified () const

  'Getter' function for member m_is_modified
- void unmodify ()

  'Setter' function for member m_is_modified This function may be needed by some of the sequence editors.
- 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 (midipulse 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 (midipulse slength)

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

  Marks all events.
- void unmark_all ()

  Unmarks all events.
- void unpaint_all ()

  Unpaints all list-events.
- int count_selected_notes () const

  Counts the selected note-on events in the event list.
- bool any_selected_notes () const

  Indicates that at least one note is selected.
- int count_selected_events (midibyte status, midibyte cc) const

  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.
- bool m_is_modified

  A new flag to indicate if an event was added or removed.

10.10.1 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 SEQ64_USE_EVENT_MAP macro near the top of this module.

10.10.2 Constructor & Destructor Documentation

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

Parameters

rhs	Provides the event list to be copied.

10.10.3 Member Function Documentation

10.10.3.1 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.

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

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

10.10.3.3 bool 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.

Returns

Returns true if the insertion succeeded, as evidenced by an increment in container size.

10.10.3.4 void seq64::event_list::unmodify ( ) [inline]

But use it with great caution.

10.10.3.5 void seq64::event_list::remove (iterator *ie*) [inline]

Currently, no check on removal is performed. Set the modified-flag.

10.10.3.6 void seq64::event_list::clear ( ) [inline]

Set the modified-flag.

10.10.3.7 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.

10.10.3.8 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.

10.10.3.9 void seq64::event_list::verify_and_link (midipulse *slength*) [private]

Threadsafe

Parameters

slength	Provides the length beyond which events will be pruned.

10.10.3.10 void seq64::event_list::mark_out_of_range (midipulse *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.

Note

This code was comparing the timestamp as greater than or equal to the sequence length. However, being equal is fine. This may explain why the midifile code would add one tick to the length of the last note when processing the end-of-track.

Parameters

slength	Provides the length beyond which events will be pruned.

10.10.3.11 void seq64::event_list::mark_all ( ) [private]

Not yet used, but might come in handy with the event editor dialog.

10.10.3.12 bool seq64::event_list::any_selected_notes ( ) const [private]

Acts like event_list::count_selected_notes(), but stops after finding a selected note. We could add a flag to count_selected_notes() to break, I suppose.

10.10.3.13 int seq64::event_list::count_selected_events (midibyte *status*, midibyte *cc*) const [private]

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

10.10.4 Field Documentation

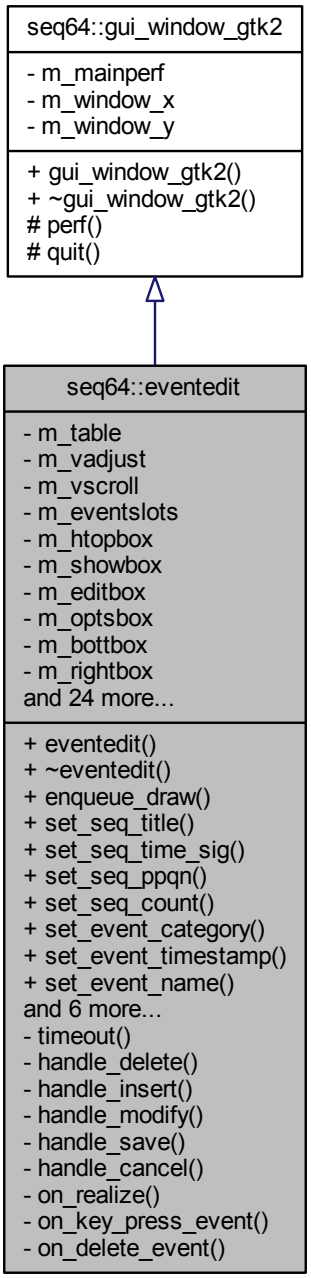
10.10.4.1 bool seq64::event_list::m_is_modified [private]

We may need to give client code a way to reload the sequence. This is currently an issue when a seqroll and an eventedit/eventslots are active for the same sequence.

10.11 seq64::eventedit Class Reference

This class supports an Event Editor that is used to tweak the details of events and get a better idea of the mix of events in a sequence.

Inheritance diagram for seq64::eventedit:



Public Member Functions

- eventedit (perform &p, sequence &seq)

  Principal constructor, has a reference to a perform object.
- ~eventedit ()

  This rote constructor does nothing.
- void enqueue_draw ()

Helper wrapper for calling perfroll::queue_draw() for one or both eventedits.

- void set_seq_title (const std::string &title)

  Sets m_label_seq_name to the title.
- void set_seq_time_sig (const std::string &sig)

  Sets m_label_time_sig to the time-signature string.
- void set_seq_ppqn (const std::string &p)

  Sets m_label_ppqn to the parts-per-quarter-note string.
- void set_seq_count ()

  Sets m_label_ev_count to the number-of-events string.
- void set_event_category (const std::string &c)

  Sets m_label_category to the category string.
- void set_event_timestamp (const std::string &ts)

  Sets m_entry_ev_timestamp to the time-stamp string.
- void set_event_name (const std::string &n)

  Sets m_entry_ev_name to the name-of-event string.
- void set_event_data_0 (const std::string &d)

  Sets m_entry_ev_data_0 to the first data byte string.
- void set_event_data_1 (const std::string &d)

  Sets m_entry_data_1 to the second data byte string.
- void perf_modify ()

  Provides a way to mark the perform object as modified, when the modified sequence is saved.
- void set_dirty (bool flag=true)

  Sets the "modified" status of the user-interface.
- void v_adjustment (int value)

  Sets the parameters for the vertical scroll-bar, using only the value parameter.
- void v_adjustment (int value, int lower, int upper)

  Sets the parameters for the vertical scroll-bar that is associated with the eventslots event-list user-interface.

Private Member Functions

- bool timeout ()

  Handles a drawing timeout.
- void handle_delete ()

  Initiates the deletion of the current editable event.
- void handle_insert ()

  Initiates the insertion of a new editable event.
- void handle_modify ()

  Passes the edited fields to the current editable event in the eventslot.
- void handle_save ()

  Handles saving the edited data back to the original sequence.
- void handle_cancel ()

  Cancels the edits and closes the dialog box.
- void on_realize ()

  This callback function calls the base-class on_realize() function, and then connects the eventedit::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 *event)

  Handles an on-delete event.

Private Attributes

- Gtk::Table ∗ m_table

  A whole horde of GUI elements.
- Gtk::Label ∗ m_label_index

  Items to size the m_indexslots member.
- Gtk::Label ∗ m_label_seq_name

  Items for the inside of the m_showbox member.
- Gtk::Label ∗ m_label_category

  Items for the inside of the m_editbox member.
- Gtk::Label ∗ m_label_right

  Padding for the right side of the user-interface.
- sequence & m_seq

  A reference to the sequence being edited, to control its editing flag.
- int m_redraw_ms

  Provides the timer period for the eventedit timer, used to determine the rate of redrawing.

Additional Inherited Members

10.11.1 Constructor & Destructor Documentation

10.11.1.1 seq64::eventedit::eventedit (perform & *p*, sequence & *seq*)

We've reordered the pointer members and put them in the initializer list to make the constructor a bit cleaner.

Adjustment parameters:

```
value            initial value
lower            minimum value
upper            maximum value
step_increment   step increment
page_increment   page increment
page_size        page size
```

Table constructor parameters:

```
rows
columns
homogenous
```

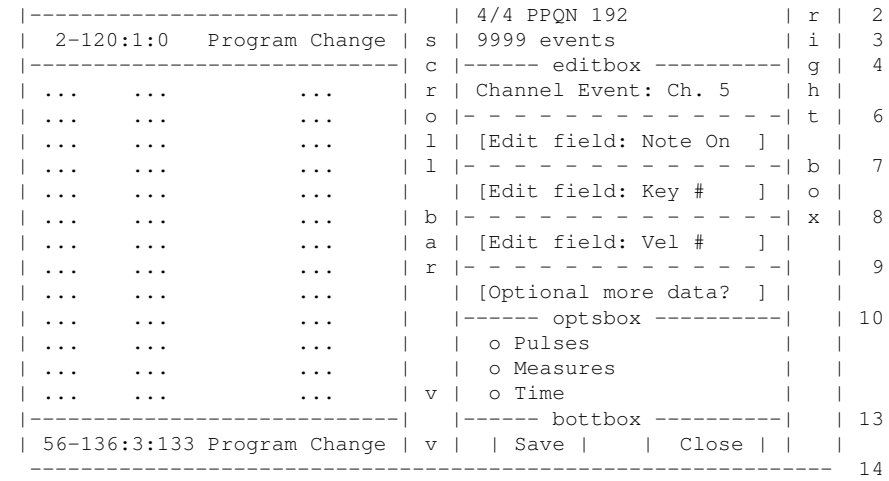
Table attach() parameters:

```
child           widget to add.
left_attach     column number to attach left side of a child widget
right_attach    column number to attach right side of a child widget
top_attach      row number to attach the top of a child widget
bottom_attach   row number to attach the bottom of a child widget
xoptions        properties of the child widget when table resized
yoptions        same as xoptions, except vertical.
xpadding        padding on L and R of widget added to table
ypadding        amount of padding above and below the child widget
```

Layout:

```
 We're going to change the layout.

          0                            1   2                        3   4
           ---------------------------------------------------------------   0
     htop |  (OLD LAYOUT)               :   :                            |
          |---------------------------------------- showbox --------------|  1
  e'slots |  1-120:0:192 Program Change | ^ | "Sequence name"         |   |
```



Parameters

p	Refers to the main performance object.
seq	Refers to the sequence holding the event data to be edited.

10.11.1.2 seq64::eventedit::~eventedit ( )

We're going to have to run the application through valgrind to make sure that nothing is left behind.

10.11.2 Member Function Documentation

10.11.2.1 void seq64::eventedit::enqueue_draw ( )

Parameters

forward	If true (the default), pass the call to the peer. When passing this call to the peer, this parameter is set to false to prevent an infinite loop and the resultant stack overflow.

10.11.2.2 void seq64::eventedit::set_seq_title (const std::string & *title*)

Parameters

title	The name of the sequence.

10.11.2.3 void seq64::eventedit::set_seq_time_sig (const std::string & *sig*)

Parameters

sig	The time signature of the sequence.

10.11.2.4 void seq64::eventedit::set_seq_ppqn (const std::string & *p*)

Parameters

p	The parts-per-quarter-note string for the sequence.

10.11.2.5 void seq64::eventedit::set_seq_count ( )

Parameters

c	The number-of-events string for the sequence.

10.11.2.6 void seq64::eventedit::set_event_category (const std::string & *c*)

Parameters

c	The category string for the current event.

10.11.2.7 void seq64::eventedit::set_event_timestamp (const std::string & *ts*)

Parameters

ts	The time-stamp string for the current event.

10.11.2.8 void seq64::eventedit::set_event_name (const std::string & *n*)

Parameters

n	The name-of-event string for the current event.

10.11.2.9 void seq64::eventedit::set_event_data_0 (const std::string & *d*)

Parameters

d	The first data byte string for the current event.

10.11.2.10 void seq64::eventedit::set_event_data_1 (const std::string & *d*)

Parameters

d	The second data byte string for the current event.

10.11.2.11 void seq64::eventedit::set_dirty (bool *flag* = `true`)

This includes changing a label and enabling/disabling the Save button.

Parameters

flag	If true, the modified status is indicated, otherwise it is cleared.

10.11.2.12 void seq64::eventedit::v_adjustment (int *value*)

This function overload provides a common use case.

Parameters

value	The new current value to be indicated by the scroll-bar.

10.11.2.13 void seq64::eventedit::v_adjustment (int *value*, int *lower*, int *upper*)

It keeps the frame scroll-bar in sync with the frame movement actions. Some of the parameters are obtained from the eventslots object:

```
-   Page size comes from eventslots::line_maximum().
-   Page increment is a little less than the page-size value.
```

Parameters

value	The current value to be indicated by the scroll-bar. It will lie between the lower and upper parameter.
lower	The lowest value to be indicated by the scroll-bar.
upper	The highest value to be indicated by the scroll-bar.

10.11.2.14 bool seq64::eventedit::timeout ( ) [private]

It redraws events in the the eventslots objects. This function is called frequently and continuously.

10.11.2.15 void seq64::eventedit::handle_insert ( ) [private]

The event's location will be determined by the timestamp and existing events. Note that we have to recalibrate the scroll-bar when we insert/delete events by calling v_adjustment().

10.11.2.16 void seq64::eventedit::handle_modify ( ) [private]

Note that there are two cases to worry about. If the timestamp has not changed, then we can simply modify the existing current event in place. Otherwise, we need to delete the old event and insert the new one. But that is done for us by eventslots::modify_current_event().

10.11.2.17 void seq64::eventedit::handle_save ( ) [private]

The event list in the original sequence is cleared, and the editable events are converted to plain events, and added to the container, one by one.

Todo Could also support writing the events to a new sequence, for added flexibility.

10.11.2.18 bool seq64::eventedit::on_key_press_event (GdkEventKey * *ev*) [private]

If the Up or Down arrow is pressed (later, k and j :-), then we tell the eventslots object to move the "current event" highlighting up or down. In Gtkmm, these arrows also cause movement from one edit field to the next, so we disable that process if the event was handled here.

Note that some vi-like keys were supported, but they are needed for the edit fields, so cannot be used here. Also, the Delete key is needed for the edit fields. For now, we replace it with the asterisk, which is easy to access from the numeric pad of a keyboard, and allows for rapid deletion. The Insert key also causes confusing effects in the edit fields, so we replace it by the slash. Note that the asterisk and slash should not be required in any of the edit fields.

HOWEVER, there are still some issues with "/", so you'll just have to click the button to insert an event.

10.11.2.19 bool seq64::eventedit::on_delete_event (GdkEventAny * *event*) [private]

It sets the sequence object's editing flag to false, and deletes "this". This function is called if the "Close" ("X") button in the window's title bar is clicked. That is a different action from clicking the Close button.

Returns

Always returns false.

10.11.3 Field Documentation

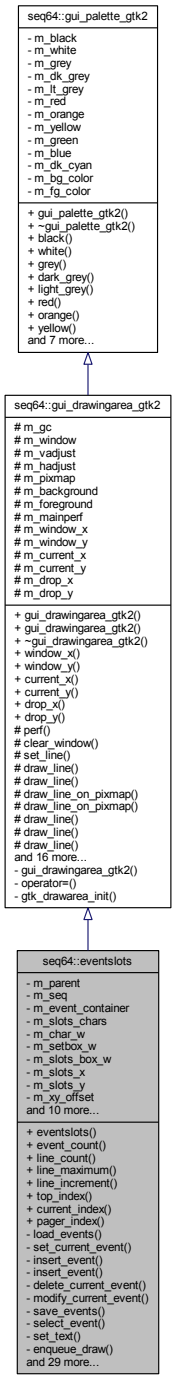
10.11.3.1 int seq64::eventedit::m_redraw_ms [private]

This is hardwired to 40 ms in Linux, and 20 ms in Windows.

10.12 seq64::eventslots Class Reference

This class implements the left-side keyboard in the patterns window.

Inheritance diagram for seq64::eventslots:



Public Member Functions

- eventslots (perform &p, eventedit &parent, sequence &seq, Gtk::Adjustment &vadjust)

  Principal constructor for this user-interface object.
- int event_count () const

  'Getter' function for member m_event_count Returns the number of total events in the sequence represented by the eventslots object.

- int line_count () const

  'Getter' function for member m_line_count Returns the current number of rows (events) in the eventslots's display.
- int line_maximum () const

  'Getter' function for member m_line_maximum Returns the maximum number of rows (events) in the eventslots's display.
- int line_increment () const

  Provides the "page increment" or "line increment" of the frame, This value is the current line-maximum of the frame minus its overlap value.
- int top_index () const

  'Getter' function for member m_top_index
- int current_index () const

  'Getter' function for member m_current_index
- int pager_index () const

  'Getter' function for member m_pager_index

Private Member Functions

- bool load_events ()

  Grabs the event list from the sequence and uses it to fill the editable-event list.
- void set_current_event (const editable_events::iterator ei, int index, bool full_redraw=true)

  Set the current event, which is the event that is highlighted.
- bool insert_event (const editable_event &edev)

  Inserts an event.
- bool insert_event (const std::string &evtimestamp, const std::string &evname, const std::string &evdata0, const std::string &evdata1)

  Inserts an event based on the setting provided, which the eventedit object gets from its Entry fields.
- bool delete_current_event ()

  Deletes the current event, and makes adjustments due to that deletion.
- bool modify_current_event (const std::string &evtimestamp, const std::string &evname, const std::string &evdata0, const std::string &evdata1)

  Modifies the data in the currently-selected event.
- bool save_events ()

  Writes the events back to the sequence.
- void select_event (int event_index=SEQ64_NULL_EVENT_INDEX, bool full_redraw=true)

  Selects and highlights the event that is located in the frame at the given event index.
- void set_text (const std::string &evcategory, const std::string &evtimestamp, const std::string &evname, const std::string &evdata0, const std::string &evdata1)

  Sets the text in the parent dialog, eventedit.
- void enqueue_draw ()

  Wraps queue_draw().
- int convert_y (int y)

  Converts a y-value into an event index relative to 0 (the top of the eventslots window/pixmap) and returns it.
- void draw_event (editable_events::iterator ei, int index)

  Draw the given slot/event.
- void draw_events ()

  Draws all of the events in the current eventslots frame.
- void change_vert ()

  Change the vertical offset of events.
- void page_movement (int new_value)

  Adjusts the vertical position of the frame according to the given new scrollbar/vadjust value.
- void page_topper (editable_events::iterator newcurrent)

Adjusts the vertical position of the frame according to the given new bottom iterator.

- int decrement_top ()

  Decrements the top iterator, if possible.

- int increment_top ()

  Increments the top iterator, if possible.

- int decrement_current ()

  Decrements the current iterator, if possible.

- int increment_current ()

  Increments the current iterator, if possible.

- int decrement_bottom ()

  Decrements the bottom iterator, if possible.

- int increment_bottom ()

  Increments the bottom iterator, if possible.

- void update_pixmap ()

  This function does nothing.

- void draw_area ()

  This function does nothing.

- void redraw ()

  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.

- bool on_focus_in_event (GdkEventFocus *ev)

  This callback is an attempt to get keyboard focus into the eventslots pixmap area.

- bool on_focus_out_event (GdkEventFocus *ev)

  This callback handles an out-of-focus event by resetting the flag HAS_FOCUS.

- bool on_scroll_event (GdkEventScroll *ev)

  Handle the scrolling of the window.

- void on_size_allocate (Gtk::Allocation &)

  Handles a size-allocation event.

- void on_move_up ()

  Move to the previous event.

- void on_move_down ()

  Move to the next event.

- void on_frame_up ()

  Move to the previous frame.

- void on_frame_down ()

  Move to the next frame.

- void on_frame_home ()

  Move to the first frame.

- void on_frame_end ()

  Move to the last frame.

Private Attributes

- eventedit & m_parent

  Provides a link to the eventedit that created this object.

- sequence & m_seq

  Provides a reference to the sequence that this dialog is meant to view or modify.

- editable_events m_event_container

  Holds the editable events for this sequence.

- int m_slots_chars

  Provides the number of the characters in the name box.

- int m_char_w

  Provides the "real" width of a character.

- int m_setbox_w

  Provides the width of the "set number" box.

- int m_slots_box_w

  Provides the width of the "slot" box.

- int m_slots_x

  Provides the width of the names box, which is the width of a character for 24 characters.

- int m_slots_y

  Provides the height of the names box, which is hardwired to 24 pixels.

- int m_xy_offset

  Provides the horizontal and vertical offsets of the text relative to the names box.

- int m_event_count

  The current number of events in the edited container.

- int m_line_count

  Counts the number of displayed events, which depends on how many events there are (m_event_count) and the size of the event list (m_line_maximum).

- int m_line_maximum

  Counts the maximum number of displayed events, which depends on the size of the event list (and thus the size of the dialog box for the event editor).

- int m_line_overlap

  Provides a little overlap for paging through the frame.

- int m_top_index

  The index of the event that is 0th in the visible list of events.

- int m_current_index

  Indicates the index of the current event within the frame.

- editable_events::iterator m_top_iterator

  Provides the top "pointer" to the start of the editable-events section that is being shown in the user-interface.

- editable_events::iterator m_bottom_iterator

  Provides the bottom "pointer" to the end of the editable-events section that is being shown in the user-interface.

- editable_events::iterator m_current_iterator

  Provides the "pointer" to the event currently in focus.

- int m_pager_index

  Indicates the event index that matches the index value of the vertical pager.

Additional Inherited Members

10.12.1 Member Function Documentation

10.12.1.1 bool seq64::eventslots::load_events ( ) [private]

Determines how many events can be shown in the GUI [later] and adjusts the top and bottom editable-event iterators to show the first page of events.

Returns

Returns true if the event iterators were able to be set up as valid.

10.12.1.2 void seq64::eventslots::set_current_event (const editable_events::iterator *ei*, int *index*, bool *full_redraw* = true) [private]

Note in the snprintf() calls that the first digit is part of the data byte, so that translation is easier.

Parameters

ei	The iterator that points to the event.
index	The index (re 0) of the event, starting at the top line of the frame. It is a frame index, not a container index.
full_redraw	If true (the default) does a full redraw of the frame. Otherwise, only the current event is drawn. Generally, the only time a single event (actually, two adjacent events) is convenient to draw is when using the arrow keys, where the speed of keystroke auto-repeats makes the full-frame update scrolling very flickery and disconcerting.

10.12.1.3 bool seq64::eventslots::insert_event (const editable_event & *edev*) [private]

What actually happens here depends if the new event is before the frame, within the frame, or after the frame, based on the timestamp.

If before the frame: To keep the previous events visible, we do not need to increment the iterators (insertion does not affect multimap iterators), but we do need to increment their indices. The contents shown in the frame should not change.

If at the frame top: The new timestamp equals the top timestamp. We don't know exactly where the new event goes in the multimap, but we do have an new event.

If at the frame bottom: TODO

If after the frame: No action needed if the bottom event is actually at the bottom of the frame. But if the frame is not yet filled, we need to increment the bottom iterator, and its index.

Note

Actually, it is far easier to just adjust all the counts and iterators and redraw the screen, as done by the page_topper() function.

Parameters

ev	The event to insert, prebuilt.

Returns

Returns true if the event was inserted.

10.12.1.4 bool seq64::eventslots::insert_event (const std::string & *evtimestamp,* const std::string & *evname,* const std::string & *evdata0,* const std::string & *evdata1*) [private]

It calls the other insert_event() overload.

Note that we need to qualify the temporary event class object we create below, with the seq64 namespace, otherwise the compiler thinks we're trying to access some Gtkmm thing.

Parameters

evtimestamp	The time-stamp of the new event, as obtained from the event-edit timestamp field.
evname	The type name (status name) of the new event, as obtained from the event-edit event-name field.
evdata0	The first data byte of the new event, as obtained from the event-edit data 1 field.
evdata1	The second data byte of the new event, as obtained from the event-edit data 2 field. Used only for two-parameter events.

Returns

Returns true if the event was inserted.

10.12.1.5 bool seq64::eventslots::delete_current_event ( ) [private]

To delete the current event, this function moves the current iterator to the next event, deletes the previously-current iterator, adjusts the event count and the bottom iterator, and redraws the pixmap. The exact changes depend upon whether the deleted event was at the top of the visible frame, within the visible frame, or at the bottom the visible frame. Note that only visible events can be the current event, and thus get deleted.

```
Event Index
 0
 1
 2         Top
 3  <--------- Top case: The new top iterator, index becomes 2
 4
 .
 .         Inside of Visible Frame
 .
43
44         Bottom
45  <--------- Top case: The new bottom iterator, index becomes 44
46             Bottom case: Same result

Basically, when an event is deleted, the frame (delimited by the
event-index members) stays in place, while the frame iterators move to the
previous event.  If the top of the frame would move to before the first
event, then the frame must shrink.

Top case: If the current iterator is the top (of the frame) iterator, then
the top iterator needs to be incremented.  The new top event has the same
index as the now-gone top event. The index of the bottom event is
decremented, since an event before it is now gone.  The bottom iterator
moves to the next event, which is now at the bottom of the frame.  The
current event is treated like the top event.

Inside case: If the current iterator is in the middle of the frame, the top
iterator and index remain unchanged.  The current iterator is incremented,
but its index is now the same as the old bottom index.  Same for the bottom
iterator.

Bottom case: If the current iterator (and bottom iterator) point to the
last event in the frame, then both of them need to be
decremented.  The frame needs to be moved up by one event, so that the
current event remains at the bottom (it's just simpler to manage that way).

If there is no event after the bottom of the frame, the iterators that now
point to end() must backtrack one event.  If the container becomes empty,
then everything is invalidated.
```

Returns

Returns true if the delete was possible. If the container was empty or became empty, then false is returned.

10.12.1.6 bool seq64::eventslots::modify_current_event (const std::string & *evtimestamp,* const std::string & *evname,* const std::string & *evdata0,* const std::string & *evdata1*) [private]

If the timestamp has changed, however, we can't just modify the event in place. Instead, we finish modifying the event, but tell the caller to delete and reinsert the new event (in its proper new location based on timestamp).

This function always copies the original event, modifiies the copy, deletes the original event, and inserts the "new" event into the editable-event container.

Parameters

evtimestamp	Provides the new event time-stamp as edited by the user.
evname	Provides the event name as edited by the user.
evdata0	Provides the time-stamp as edited by the user.
evtimestamp	Provides the time-stamp as edited by the user.

Returns

Returns true simply if the event-count is greater than 0.

10.12.1.7 bool seq64::eventslots::save_events ( ) [private]

Also sets the dirty flag for the sequence, via the sequence::add_event() function, but this doesn't seem to set the perform dirty flag. So now we pass the modification buck to the parent, who passes it to the perform object.

We added a copy_events() function in the sequence class to replace add_event() for the purpose of reconstructing the events container for the sequence. It is locked by a mutex, and so will not draw until all is done, preventing a nasty segfault (all segfaults are nasty).

We create a new plain event container here, and then passing it to the new locked/threadsafe sequence::copy_↩ events() function that clears the sequence container and copies the events from the parameter container.

Note that this code will operate event if all events were deleted.

Returns

Returns true if the operations succeeded.

10.12.1.8 void seq64::eventslots::select_event (int *event_index* = SEQ64_NULL_EVENT_INDEX, bool *full_redraw* = true) [private]

The event index is provided by converting the y-coordinate of the mouse pointer into a slot number, and then an event index (actually the slot-distance from the m_top_iterator. Confusing, yes no?

Note that, if the event index is negative, then we just queue up a draw operation, which should paint an empty frame – the event container is empty.

Parameters

event_index	Provides the numeric index of the event in the event frame, or SEQ64_NULL_EVENT if there is no event to draw.

full_redraw	Defaulting to true, this parameter can be set to false in some case to reduce the flickering of the frame under fast movement.

10.12.1.9 void seq64::eventslots::set_text (const std::string & *evcategory,* const std::string & *evtimestamp,* const std::string & *evname,* const std::string & *evdata0,* const std::string & *evdata1*) [private]

Parameters

evtimestamp	The event time-stamp to be set in the parent.
evname	The event name to be set in the parent.
evdata0	The first event data byte to be set in the parent.
evdata1	The second event data byte to be set in the parent.

10.12.1.10 int seq64::eventslots::convert_y (int *y*) [private]

Parameters

y	The y coordinate of the position of the mouse click in the eventslot window/pixmap.

Returns

Returns the index of the event position in the user-interface, which should range from 0 to m_line_count.

10.12.1.11 void seq64::eventslots::draw_event (editable_events::iterator *ei,* int *index*) [private]

The slot contains the event details in (so far) one line of text in the box:

| timestamp | event kind | channel | data 0 name + value | data 1 name + value

Currently, this view shows only events that get copied to the sequence's event list. This rules out the following items from the view:

```
-   MThd (song header)
-   MTrk and Meta TrkEnd (track marker, a sequence has only one track)
-   SeqNr (sequence number)
-   SeqSpec (but there are three that might appear, see below)
-   Meta TrkName
```

The events that are shown in this view are:

```
-   One-data-value events:
    -   Program Change
    -   Channel Pressure
-   Two-data-value events:
    -   Note Off
    -   Note On
    -   Aftertouch
    -   Control Change
    -   Pitch Wheel
-   Other:
    -   SysEx events, with partial show of data bytes
    -   SeqSpec events (TBD):
        -   Key
        -   Scale
        -   Background sequence
```

The index of the event is shown in the editor portion of the eventedit dialog.

10.12.1.12 void seq64::eventslots::draw_events ( ) [private]

It first clears the whole bitmap to white, so that no artifacts from the previous state of the frame are left behind.

Need to figure out how to calculate the number of displayable events.

```
m_line_maximum = ???
```

10.12.1.13 void seq64::eventslots::change_vert ( ) [private]

Note that m_vadjust is the Gtk::Adjustment object that the eventedit parent passes to the gui_drawingarea_gtk2 constructor.

The top-event and bottom-event indices (and their corresponding editable-event iterators) delimit the part of the event container that is displayed in the eventslots user-interface. The top-event index starts at 0, and the bottom-event is larger (initially, by 42 slots).

When the scroll-bar thumb moves up or down, we need to change both event indices and both event iterators by the corresponding amount. Luckily, the std::multimap iterator is bidirectional.

Note that we may need to reduce the movement of events to a value less than a page; it can be limited backwards by the value of the top index, and forward by the value of the bottom index.

10.12.1.14 void seq64::eventslots::page_movement (int *new_value*) [private]

The adjustment is done via movement from the current position.

Do we even need a way to detect excess movement? The scrollbar, if properly set up, should never move the frame too high or too low. Verified by testing.

Parameters

new_value	Provides the new value of the scrollbar position.

10.12.1.15 void seq64::eventslots::page_topper (editable_events::iterator *newcurrent*) [private]

The adjustment is done "from scratch". We've found page movement to be an insoluable problem in some editing circumstances. So now we move to the inserted event, and make it the top event.

However, always moving an inserted event to the top is a bit annoying. So now we backtrack so that the inserted event is at the bottom.

Parameters

newcurrent	Provides the iterator to the event to be shown at the bottom of the frame.

10.12.1.16 int seq64::eventslots::decrement_top ( ) [private]

Returns

Returns 0, or SEQ64_NULL_EVENT_INDEX if the iterator could not be decremented.

10.12.1.17 int seq64::eventslots::increment_top ( ) [private]

Also handles the top-event index, so that the GUI can display the proper event numbers.

Returns

Returns the top index, or SEQ64_NULL_EVENT_INDEX if the iterator could not be incremented, or would increment to the end of the container.

10.12.1.18 int seq64::eventslots::decrement_current ( ) [private]

Returns

Returns the decremented index, or SEQ64_NULL_EVENT_INDEX if the iterator could not be decremented. Remember that the index ranges only from 0 to m_line_count-1, and that is enforced here.

10.12.1.19 int seq64::eventslots::increment_current ( ) [private]

Returns

Returns the incremented index, or SEQ64_NULL_EVENT_INDEX if the iterator could not be incremented. Remember that the index ranges only from 0 to m_line_count-1, and that is enforced here.

10.12.1.20 int seq64::eventslots::decrement_bottom ( ) [private]

Returns

Returns 0, or SEQ64_NULL_EVENT_INDEX if the iterator could not be decremented.

10.12.1.21 int seq64::eventslots::increment_bottom ( ) [private]

There is an issue in paging down using the scrollbar where, at the bottom of the scrolling, the bottom iterator ends up bad. Not yet sure how this happens, so for now we backtrack one event if this happens.

Returns

Returns the incremented index, or SEQ64_NULL_EVENT_INDEX if the iterator could not be incremented.

10.12.1.22 void seq64::eventslots::on_realize ( ) [private]

It first calls the base-class version of on_realize(). Then it allocates any additional resources needed.

10.12.1.23 bool seq64::eventslots::on_expose_event (GdkEventExpose * *ev*) [private]

It draws all of the sequences.

10.12.1.24 bool seq64::eventslots::on_focus_in_event (GdkEventFocus * *ev*) [private]

See the same function in the perfroll module.

10.12.1.25 void seq64::eventslots::on_size_allocate (Gtk::Allocation & *a*) [private]

It first calls the base-class version of this function.

10.12.1.26 void seq64::eventslots::on_move_up ( ) [private]

We must scroll up if the event is now before the frame, and should be made the new top event of the frame. Note that this function isn't really an event-response callback. It is called byh eventedit::on_key_press_event().

10.12.1.27 void seq64::eventslots::on_move_down ( ) [private]

We must scroll down if the event is now after the frame. Note that this function isn't really an event-response callback. It is called byh eventedit::on_key_press_event().

10.12.2 Field Documentation

10.12.2.1 int seq64::eventslots::m_slots_chars [private]

Pretty much hardwired to 24 at present.

10.12.2.2 int seq64::eventslots::m_char_w [private]

This value is obtained from a font-renderer accessor function.

10.12.2.3 int seq64::eventslots::m_setbox_w [private]

This used to be hardwired to $6 * 2$ (character-width times two).

10.12.2.4 int seq64::eventslots::m_slots_y [private]

This value was once 22 pixels, but we need a little extra room for our new font. This extra room is compatible enough with the old font, as well.

10.12.2.5 int seq64::eventslots::m_xy_offset [private]

Currently hardwired.

10.12.2.6 int seq64::eventslots::m_top_index [private]

It is used in numbering the events that are shown in the event-slot frame. Do not confuse it with m_current_index, which is relative to the frame, not the container-beginning.

10.12.2.7 int seq64::eventslots::m_current_index [private]

This event will also be pointed to by the m_current_event iterator. Do not confuse it with m_top_index, which is relative to the container-beginning, not the frame.

10.13 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,
  BLACK_ON_CYAN,
  CYAN_ON_BLACK }

Public Member Functions

- font ()

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

  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 > drawable, const char *str, font::Color col) const

  Draws a text string.
- int char_width () const

  'Getter' function for member m_font_w
- int char_height () const

  'Getter' function for member m_font_h
- int padded_height () const

  'Getter' function for member m_padded_h

Private Attributes

- bool m_use_new_font

  If true, use the new font, which is a little bit more modern looking.
- int m_cell_w

  Specifies the cell width of the whole cell.
- int m_cell_h

  Specfies the cell height of the whole cell.
- 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.
- int m_offset

  Provides an ad hoc small horizontal or vertical offset for printing strings.
- int m_padded_h

  Provides a common constant used by much of the drawing code, but only marginally related to the padded character height.
- const 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_w.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::Pixmap > m_b_on_c_pixmap

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

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

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

- Glib::RefPtr< Gdk::Bitmap > m_clip_mask

  This object is instantiated as a default object.

10.13.1 Member Enumeration Documentation

10.13.1.1 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.

BLACK_ON_CYAN A new color, for drawing black text on a cyan background.

CYAN_ON_BLACK A new color, for drawing cyan text on a black background.

10.13.2 Member Function Documentation

10.13.2.1 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.

10.13.2.2 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*) const

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.

10.13.3 Field Documentation

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

Currently defaults to cf_text_w = 6. Note that a lot of stuff depends on this being 6 at present, even with our new, slightly wider, font.

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

Currently defaults to cf_text_h = 10. Note that a lot of stuff depends on this being 10 at present, even with our new, slightly wider, font. But some of the drawing code doesn't use the character height, but the padded character height.

10.13.3.3 const Glib::RefPtr<Gdk::Pixmap>* seq64::font::m_pixmap [mutable], [private]

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

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

It contains a black font on a white background. The new-style font, if selected, is `resources/pixmaps/wenfont_b.xmp` pixmap.

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

It contains a black font on a white background. The new-style font, if selected, is `resources/pixmaps/wenfont_w.xmp` pixmap.

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

It contains a black font on a yellow background. The new-style font, if selected, is `resources/pixmaps/wenfont_y.xmp` pixmap.

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

It contains a yellow font on a black background. The new-style font, if selected, is `resources/pixmaps/wenfont_yb.xmp` pixmap.

10.13.3.8 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_b_on_c_pixmap [private]

It contains a black font on a cyan background. It is available only for the new font-style.

10.13.3.9 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_c_on_b_pixmap [private]

It contains a cyan font on a black background. It is available only for the new font-style.

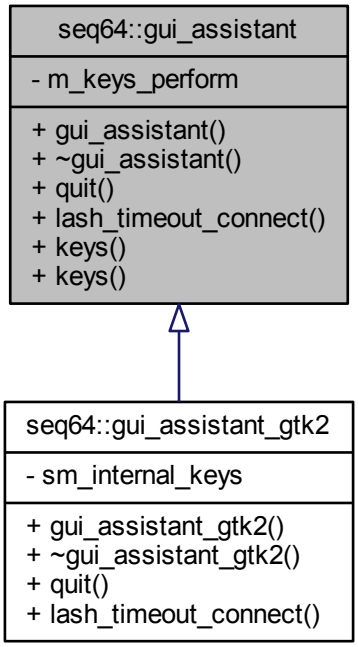
10.13.3.10 Glib::RefPtr<Gdk::Bitmap> seq64::font::m_clip_mask [private]

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

10.14 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.

10.14.1 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).

10.14.2 Constructor & Destructor Documentation

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

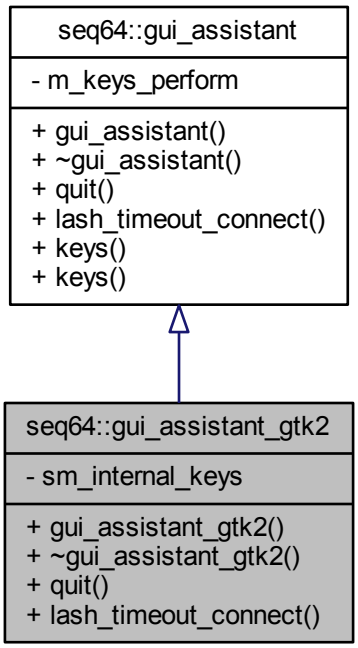
Parameters

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

10.15 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 lash_timeout_connect (lash *lashobject)

  Connects the JACK session-event callback to the Glib idle object.

Static Private Attributes

- static keys_perform_gtk2 sm_internal_keys

  Provides a pre-made keys_perform object.

10.15.1 Member Function Documentation

10.15.1.1 void seq64::gui_assistant_gtk2::lash_timeout_connect (lash * *lashobject*) [virtual]

If JACK session support is not enabled, we might emit a message. This mainly prevents a compiler warning about an unused parameter. Connects the LASH timeout-event callback to the Glib timeout object. The time-out value is set to 250 ms.

Implements seq64::gui_assistant.

10.15.2 Field Documentation

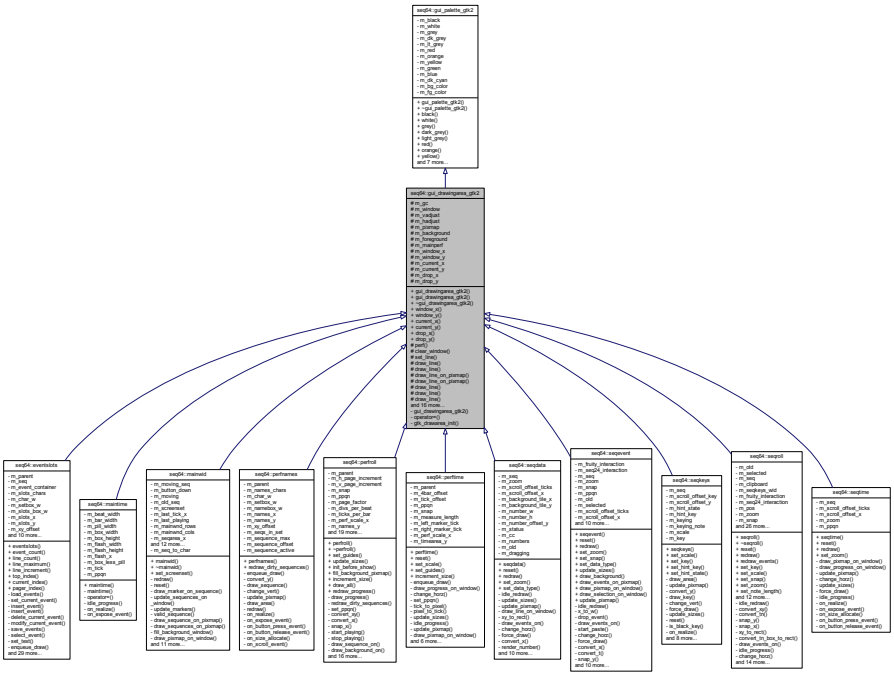
10.15.2.1 keys_perform_gtk2 seq64::gui_assistant_gtk2::sm_internal_keys [static], [private]

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

10.16 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 clear_window ()

  Clears the main window.
- void set_line (Gdk::LineStyle ls, int width=1)

  A small wrapper function for readability in line-drawing.
- void draw_line (int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the window.
- void draw_line (const Color &c, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the window after setting the given foreground color.
- void draw_line_on_pixmap (int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the pixmap.
- void draw_line_on_pixmap (const Color &c, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the pixmap after setting the given foreground color.
- void draw_line (Glib::RefPtr< Gdk::Pixmap > &pixmap, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on any pixmap (not a drawable, though, due to a compiler error after setting the given foreground color.
- void draw_line (Glib::RefPtr< Gdk::Pixmap > &pixmap, const Color &c, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the pixmap after setting the given foreground color.
- void draw_line (Glib::RefPtr< Gdk::Drawable > &drawable, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on any pixmap (not a drawable, though, due to a compiler error after setting the given foreground color.
- void draw_line (Glib::RefPtr< Gdk::Drawable > &drawable, const Color &c, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the drawable after setting the given foreground color.
- void render_string (int x, int y, const std::string &s, font::Color color)

  A small wrapper function for readability in string-drawing to the window.
- void render_string_on_pixmap (int x, int y, const std::string &s, font::Color color)

A small wrapper function for readability in string-drawing to the pixmap.

- void draw_rectangle (int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on the window.
- void draw_rectangle (const Color &c, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing.
- void draw_rectangle (Glib::RefPtr< Gdk::Drawable > &drawable, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on a "drawable" context, where the foreground color has already been specified.
- void draw_rectangle (Glib::RefPtr< Gdk::Drawable > &drawable, const Color &c, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on any drawable context.
- void draw_rectangle (Glib::RefPtr< Gdk::Pixmap > &pixmap, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on a "pixmap" context, where the foreground color has already been specified.
- void draw_rectangle (Glib::RefPtr< Gdk::Pixmap > &pixmap, const Color &c, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on any pixmap context.
- void draw_rectangle_on_pixmap (int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on the pixmap.
- void draw_rectangle_on_pixmap (const Color &c, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on the pixmap.
- void draw_normal_rectangle_on_pixmap (int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on the pixmap.
- void draw_drawable (int xsrc, int ysrc, int xdest, int ydest, int width, int height)

  Provides the most common use case for redrawing.
- void on_realize ()

  For this GTK callback, on realization of window, initialize the shiz.

Protected Attributes

- Glib::RefPtr< Gdk::GC > m_gc

  The graphics context, which is required for ever drawing and rendering operation.
- Glib::RefPtr< Gdk::Window > m_window

  Provides the default "window".
- Gtk::Adjustment & m_vadjust

  Provides an object for vertical "adjustments".
- Gtk::Adjustment & m_hadjust

  Provides an object for horizontal "adjustments".
- Glib::RefPtr< Gdk::Pixmap > m_pixmap

  Provides the default "pixmap".
- Glib::RefPtr< Gdk::Pixmap > m_background

  Another pixmap, used for backgrounds.
- Glib::RefPtr< Gdk::Pixmap > m_foreground

  Another pixmap, used for foregrounds.
- 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

10.16.1 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.

10.16.2 Member Function Documentation

10.16.2.1 void seq64::gui_drawingarea_gtk2::clear_window ( ) [inline], [protected]

One less need to access m_window directly.

10.16.2.2 void seq64::gui_drawingarea_gtk2::set_line (Gdk::LineStyle *ls*, int *width* = 1) [inline], [protected]

Sets the attributes of a line to be drawn.

Parameters

ls	Provides the Gtk-specific line style.
width	Provides the width of the line to be drawn. It defaults to the most common value, 1.

10.16.2.3 void seq64::gui_drawingarea_gtk2::draw_line (int *x1*, int *y1*, int *x2*, int *y2*) [inline], [protected]

Parameters

x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.16.2.4 void seq64::gui_drawingarea_gtk2::draw_line (const Color & *c*, int *x1*, int *y1*, int *x2*, int *y2*) [protected]

Parameters

c	The foreground color in which to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.16.2.5 void seq64::gui_drawingarea_gtk2::draw_line_on_pixmap (int *x1*, int *y1*, int *x2*, int *y2*) [inline], [protected]

Parameters

x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.16.2.6 void seq64::gui_drawingarea_gtk2::draw_line_on_pixmap (const Color & *c*, int *x1*, int *y1*, int *x2*, int *y2*) [protected]

Parameters

c	The foreground color in which to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.16.2.7 void seq64::gui_drawingarea_gtk2::draw_line (Glib::RefPtr< Gdk::Pixmap > & *pixmap*, int *x1*, int *y1*, int *x2*, int *y2*) [inline], [protected]

Parameters

pixmap	Provides the Gdk::Pixmap pointer needed to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.16.2.8 void seq64::gui_drawingarea_gtk2::draw_line (Glib::RefPtr< Gdk::Pixmap > & *pixmap*, const Color & *c*, int *x1*, int *y1*, int *x2*, int *y2*) [protected]

Parameters

drawable	Provides the Gdk::Drawable pointer needed to draw the line.
c	The foreground color in which to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.16.2.9 void seq64::gui_drawingarea_gtk2::draw_line (Glib::RefPtr< Gdk::Drawable > & *drawable*, int *x1*, int *y1*, int *x2*, int *y2*) [inline], [protected]

Parameters

drawable	Provides the Gdk::Drawable pointer needed to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.

x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.16.2.10 void seq64::gui_drawingarea_gtk2::draw_line (Glib::RefPtr< Gdk::Drawable > & *drawable*, const Color & *c*, int *x1*, int *y1*, int *x2*, int *y2*) [protected]

Parameters

drawable	Provides the Gdk::Drawable pointer needed to draw the line.
c	The foreground color in which to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.16.2.11 void seq64::gui_drawingarea_gtk2::render_string (int *x*, int *y*, const std::string & *s*, font::Color *color*) [inline], [protected]

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
s	The string to be drawn.
color	The color with which to draw the string.

10.16.2.12 void seq64::gui_drawingarea_gtk2::render_string_on_pixmap (int *x*, int *y*, const std::string & *s*, font::Color *color*) [inline], [protected]

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
s	The string to be drawn.
color	The color with which to draw the string.

10.16.2.13 void seq64::gui_drawingarea_gtk2::draw_rectangle (int *x*, int *y*, int *lx*, int *ly*, bool *fill* = true) [inline], [protected]

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_↩ foreground(color). Defaults to true.

10.16.2.14 void seq64::gui_drawingarea_gtk2::draw_rectangle (const Color & *c*, int *x*, int *y*, int *lx*, int *ly*, bool *fill* = true) [protected]

It adds setting the foreground color to the draw_rectangle() function.

Parameters

c	Provides the foreground color to set.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_↩ foreground(color). Defaults to true.

10.16.2.15 void seq64::gui_drawingarea_gtk2::draw_rectangle (Glib::RefPtr< Gdk::Drawable > & *drawable*, int *x*, int *y*, int *lx*, int *ly*, bool *fill* = `true`) [inline], [protected]

Parameters

drawable	The object on which to draw the rectangle.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_↩ foreground(color). Defaults to true.

10.16.2.16 void seq64::gui_drawingarea_gtk2::draw_rectangle (Glib::RefPtr< Gdk::Drawable > & *drawable*, const Color & *c*, int *x*, int *y*, int *lx*, int *ly*, bool *fill* = `true`) [protected]

It also supports setting the foreground color to the draw_rectangle() function.

We have a number of such functions: for the main window, for the main pixmap, and for any drawing surface. Is the small bit of conciseness worth it?

Parameters

drawable	The surface on which to draw the box.
c	Provides the foreground color to set.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_↩ foreground(color). Defaults to true.

10.16.2.17 void seq64::gui_drawingarea_gtk2::draw_rectangle (Glib::RefPtr< Gdk::Pixmap > & *pixmap*, int *x*, int *y*, int *lx*, int *ly*, bool *fill* = `true`) [inline], [protected]

Parameters

drawable	The object on which to draw the rectangle.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.

ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_↩ foreground(color). Defaults to true.

10.16.2.18 void seq64::gui_drawingarea_gtk2::draw_rectangle (Glib::RefPtr< Gdk::Pixmap > & *pixmap,* const Color & *c,* int *x,* int *y,* int *lx,* int *ly,* bool *fill* = `true`) [protected]

It also supports setting the foreground color to the draw_rectangle() function.

We have a number of such functions: for the main window, for the main pixmap, and for any drawing surface. Is the small bit of conciseness worth it?

Parameters

pixmap	The surface on which to draw the box.
c	Provides the foreground color to set.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_↩ foreground(color). Defaults to true.

10.16.2.19 void seq64::gui_drawingarea_gtk2::draw_rectangle_on_pixmap (int *x,* int *y,* int *lx,* int *ly,* bool *fill* = `true`) [inline], [protected]

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_↩ foreground(color). Defaults to true.

10.16.2.20 void seq64::gui_drawingarea_gtk2::draw_rectangle_on_pixmap (const Color & *c,* int *x,* int *y,* int *lx,* int *ly,* bool *fill* = `true`) [protected]

It adds setting the foreground color to the draw_rectangle() function.

Parameters

c	Provides the foreground color to set.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_↩ foreground(color). Defaults to true.

10.16.2.21 void seq64::gui_drawingarea_gtk2::draw_normal_rectangle_on_pixmap (int *x,* int *y,* int *lx,* int *ly,* bool *fill* = `true`) [protected]

It uses Gtk to get the proper background styling for the rectange.

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_↩ foreground(color). Defaults to true.

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

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

10.16.3 Field Documentation

10.16.3.1 Glib::RefPtr<Gdk::Window> seq64::gui_drawingarea_gtk2::m_window [protected]

Wrapper functions with undecorated wrapper names are used for accessing this item. We hope to be able to hide this items completely some day.

10.16.3.2 Glib::RefPtr<Gdk::Pixmap> seq64::gui_drawingarea_gtk2::m_pixmap [protected]

Wrapper functions with undecorated wrapper names are used for accessing this item. We hope to be able to hide this items completely some day.

10.16.3.3 Glib::RefPtr<Gdk::Pixmap> seq64::gui_drawingarea_gtk2::m_background [protected]

Our wrappers still leave this member exposed <giggle>.

10.16.3.4 Glib::RefPtr<Gdk::Pixmap> seq64::gui_drawingarea_gtk2::m_foreground [protected]

Our wrappers still leave this member exposed.

10.16.3.5 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.

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

Could make this constant, but some windows are resizable.

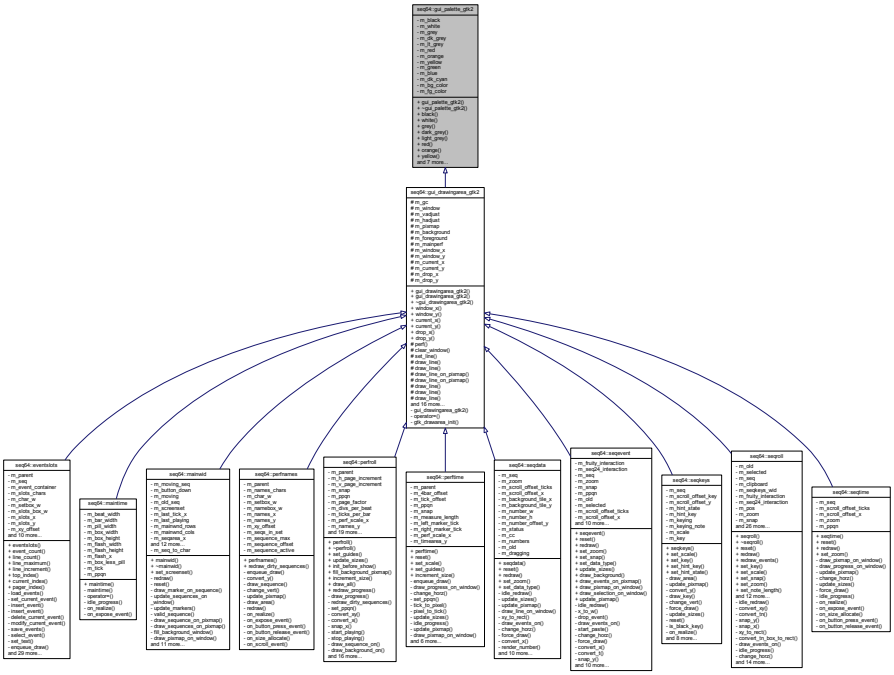
10.16.3.7 int seq64::gui_drawingarea_gtk2::m_drop_x [protected]

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

10.17 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.

10.17.1 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.

10.17.2 Constructor & Destructor Documentation

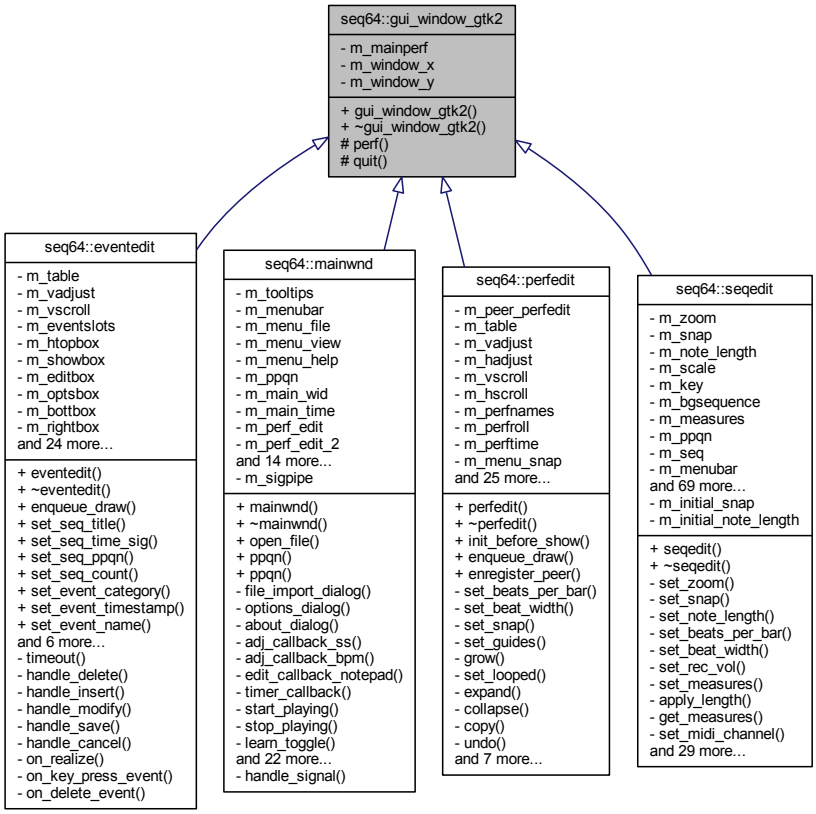
10.17.2.1 seq64::gui_palette_gtk2::gui_palette_gtk2 ( )

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

10.18 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.

Protected Member Functions

- perform & perf ()

  'Getter' function for member m_mainperf

Private Attributes

- perform & m_mainperf

  The master object, sort of a sequence buss.

- int m_window_x

  Window sizes.

10.18.1 Constructor & Destructor Documentation

10.18.1.1 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.

10.18.2 Field Documentation

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

Could make this constant, but some windows are resizable.

10.19 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, int bpm=SEQ64_DEFAULT_↩ BEATS_PER_MEASURE, int beatwidth=SEQ64_DEFAULT_BEAT_WIDTH)

  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.
- bool restart ()

  Let's try to recover from the JackFailures somehow.
- 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 to_left_tick, bool relocate=false)

  If JACK is supported and running, sets the position of the transport to the new frame number, frame 0.
- bool output (jack_scratchpad &pad)

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

Private Member Functions

- void set_ppqn (int ppqn)

  'Setter' function for member m_ppqn For the future, changing the PPQN internally.
- double get_jack_ticks () const

  Helper function for obtaining "jack_ticks_converted".
- double frame_to_ticks (jack_nframes_t frame) const

  Another helper function.

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

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

  Common-code for error messages.
- jack_client_t * client_open (const std::string &clientname)

  A more full-featured initialization for a JACK client, which is meant to be called by the init() function.
- void show_statuses (unsigned bits)

  Loops through the full set of JACK bits, showing the information for any bits that are set in the given parameter.
- int sync (jack_transport_state_t state=(jack_transport_state_t)(-1))

  A helper function for syncing up with JACK parameters.
- void set_position (midipulse currenttick)

  Provides the code that was effectively commented out in the perform::position_jack() function.

Static Private Attributes

- static jack_status_pair_t sm_status_pairs [ ]

  Provides a list of JACK status bits, and a brief string to explain the status bit.

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_callback (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)

  The JACK timebase function defined here sets the JACK position structure.

10.19.1 Detailed Description

WHY PERFORMANCE MODE? Only works in that mode???

10.19.2 Constructor & Destructor Documentation

10.19.2.1 seq64::jack_assistant::jack_assistant (perform & *parent*, int *ppqn* = SEQ64_USE_DEFAULT_PPQN, int *bpm* = SEQ64_DEFAULT_BEATS_PER_MEASURE, int *beatwidth* = SEQ64_DEFAULT_BEAT_WIDTH)

Note that the perform object currently calls jack_assistant::init(), but that call could be made here instead.

Parameters

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

10.19.2.2 seq64::jack_assistant::~jack_assistant ( )

The perform object currently calls jack_assistant::deinit(), but that call could be made here instead.

10.19.3 Member Function Documentation

10.19.3.1 bool seq64::jack_assistant::init ( )

Then we become a new client of the JACK server.

Note the USE_JACK_SYNC_CALLBACK macro. A sync callback is needed for polling of slow-sync clients. But seq24/sequencer64 are not slow-sync clients. Therefore, let's conditionally comment out the sync callback code. One of the author's of JACK notes that seq24 is wrong to set up a sync callback. However, this macro is currently enabled.

Jack transport settings:

```
There are three settings:  On, Master, and Master Conditional.
Currently, they can all be selected in the user-interface's File /
Options / JACK/LASH page.  We really want only the proper combinations
to be set, for clarity (the user-interface now takes care of this.  We
need to initialize if any of them are set, and the
rc_settings::with_jack() function tells us that.
```

jack_set_process_callback() patch:

```
Implemented first patch from freddix/seq24 GitHub project, to fix JACK
transport.  One line of code.  Well, we added some error-checking. :-)
Found some old notes on the Web the this patch really only works (to
prevent seq24 freeze) if seq24 is set as JACK Master, or if another
client application, such as Qtractor, is running as JACK Master (and
then seq24 will apparently follow it).
```

Returns

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

10.19.3.2 bool seq64::jack_assistant::restart ( )

For now, we don't know what is causing this code, which doesn't seem to much affect the JACK transport functionality. This function does nothing.

Returns

Will return true if the restart succeeded. Currently always return false.

10.19.3.3 void seq64::jack_assistant::start ( )

This function assumes that m_jack_client is not null, if m_jack_running is true.

Found this note in the Hydrogen code:

```
When jack_transport_start() is called, it takes effect from the next
processing cycle.  The location info from the timebase_master, if
there is one, will not be available until the _next_ next cycle.  The
code must therefore wait one cycle before syncing up with
timebase_master.
```

10.19.3.4 void seq64::jack_assistant::stop ( )

This function assumes that m_jack_client is not null, if m_jack_running is true.

10.19.3.5 void seq64::jack_assistant::position (bool *to_left_tick,* bool *relocate* = `false`)

This new position takes effect in two process cycles. If there are slow-sync clients and the transport is already rolling, it will enter the JackTransportStarting state and begin invoking their sync_callbacks until ready. This function is realtime-safe.

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

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

The code that was disabled sets the current tick to 0 or, if state was true, to the leftmost tick (which is probably the position of the L marker). The current tick is then converted to a frame number, and then we locate the transport to that position. We're going to enable this code, but make it dependent on a new boolean parameter that defaults to false, in anticipation of trying it out later.

These repositions reset the progress bars. We don't always want that, it should be an option. TODO.

jack_transport_reposition():

```
Requests a new transport position.  The new position takes effect in
two process cycles. If there are slow-sync clients and the transport
is already rolling, it will enter the JackTransportStarting state and
begin invoking their sync_callbacks until ready. This function is
realtime-safe.

It's pos parameter provides the requested new transport position. Fill
pos->valid to specify which fields should be taken into account. If
you mark a set of fields as valid, you are expected to fill them all.
Note that "frame" is always assumed, and generally needs to be set:

   http://comments.gmane.org/gmane.comp.audio.jackit/18705

Returns 0 if a valid request, EINVAL if the position structure is
rejected.
```

Warning

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

Parameters

to_left_tick	If true, the current tick is set to the leftmost tick, instead of the 0th tick. Now used, but only if relocate is true. One question is, do we want to perform this function if rc().with_jack_↩ transport() is true? Seems like we should be able to do it only if m_jack_master is true.
relocate	If true (it defaults to false), then we allow the relocation of the JACK transport to the current↩ _tick or the left tick, rather than to frame 0. EXPERIMENTAL, enables dead code from seq24. Seems to work if set to true when we are the JACK Master. Enabling this code makes "klick -j -P" work, after a fashion. It clicks, but at a way too rapid rate.

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

This code comes from perform::output_func() from seq24.

USE_JACK_TRANSPORT_QUERY_STATUS macro: Sequencer64 (and Seq24) yields JackFailure errors. If we don't respond to them by setting m_jack_running to false, then we get endless errors, and can get a segfault when exiting the application. If we do set m_jack_running to false and then return, we have to disable JACK, and fall back to Sequencer64's own timing. Right now, the best policy is to ignore JackFailure here. At least until we can figure out what causes it.

Note

Follow up on this note found "out there": "Maybe I'm wrong but if I understood correctly, recent jack1 transport no longer goes into Jack_Transport_Starting state before going to Jack_Transport_Rolling (this was deliberately dropped), but seq24 currently needs this to start off with jack transport." On the other hand, some people have no issues. This may have been due to the lack of m_jack_pos initialization.

Parameters

pad	Provide a JACK scratchpad for sharing certain items between the perform object and the jack_assistant object.

Returns

Returns true if JACK is running.

10.19.3.7 double seq64::jack_assistant::get_jack_ticks ( ) const [private]

Note that we will need to replace 4.0 with a member value.

10.19.3.8 bool seq64::jack_assistant::info_message (const std::string & *msg*) [private]

Adds markers and a newline.

Parameters

msg	The message to print, sans the newline.

Returns

Returns true.

10.19.3.9 bool 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.

Returns

Returns false for convenience/brevity in setting function return values.

10.19.3.10 jack_client_t * seq64::jack_assistant::client_open (const std::string & *clientname*) [private]

Status bits for jack_status_t return pointer:

```
JackNameNotUnique means that the client name was not unique. With
JackUseExactName, this is fatal. Otherwise, the name was modified by
appending a dash and a two-digit number in the range "-01" to "-99".
The jack_get_client_name() function returns the exact string used. If
the specified client_name plus these extra characters would be too
long, the open fails instead.

JackServerStarted means that the JACK server was started as a result
of this operation. Otherwise, it was running already. In either case
the caller is now connected to jackd, so there is no race condition.
When the server shuts down, the client will find out.
```

Returns

Returns true if JACK ...

10.19.3.11 void seq64::jack_assistant::show_statuses (unsigned *bits*) [private]

For reference, here are the enumeration values from /usr/include/jack/types.h:

```
JackFailure         = 0x01
JackInvalidOption   = 0x02
JackNameNotUnique   = 0x04
JackServerStarted   = 0x08
JackServerFailed    = 0x10
JackServerError     = 0x20
JackNoSuchClient    = 0x40
JackLoadFailure     = 0x80
JackInitFailure     = 0x100
JackShmFailure      = 0x200
JackVersionError    = 0x400
JackBackendError    = 0x800
JackClientZombie    = 0x1000
```

10.19.3.12 int seq64::jack_assistant::sync (jack_transport_state_t *state* = (jack_transport_state_t)(-1)) [private]

Sequencer64 is not a slow-sync client, so that callback is not really needed, but we probably need this sub-function here to start out with the right values for interacting with JACK.

Note the call to jack_transport_query(). This call is *not* is seq24, but seems to be needed in sequencer64 because we put m_jack_pos in the initializer list, which sets all its fields to 0. Seq24 accesses m_jack_pos before it ever gets set, but its fields have values. These values are bogus, but are consistent from run to run on my computer, and allow seq24 to follow another JACK Master, on some computers. It explains why people had different experiences with JACK sync.

If we explicity call jack_transport_query() here, without changing the *state* parameter, then sequencer64 also can follow another JACK Master. (CURRENTLY BUGGY!)

Note that we should consider massaging the following jack_position_t members to set them to 0 (or 0.0) if less than 1.0 or 0.5:

- bar_start_tick
- ticks_per_beat
- beats_per_minute
- frame_time
- next_time
- audio_frames_per_video_frame

Also, why does bbt_offset start at 2128362496?

10.19.3.13 void seq64::jack_assistant::set_position (midipulse *currenttick*) [private]

We might be able to use it in other functions.

Computing the BBT information from the frame number is relatively simple here, but would become complex if we supported tempo or time signature changes at specific locations in the transport timeline.

```
ticks * 10 = jack ticks;
jack ticks / ticks per beat = num beats;
num beats / beats per minute = num minutes
num minutes * 60 = num seconds
num secords * frame_rate  = frame
```

10.19.4 Friends And Related Function Documentation

10.19.4.1 void jack_shutdown_callback (void * *arg*) [friend]

Parameters

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

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

The original version of the function, enabled by defining USE_ORIGINAL_TIMEBASE_CALLBACK, worked properly with Hydrogen, but not with Klick. The new code seems to work with both. More testing and clarification is needed. This new code was "discovered" in the source-code for the "SooperLooper" project:

```
http://essej.net/sooperlooper/
```

The first difference with the new code is that it handles the case where the JACK position is moved (new_pos == true). If this is true, and the JackPositionBBT bit is off in pos->valid, then the new BBT value is set. (Do we have more work to do in Sequencer64 in this case?) Note that this code does not change beats_per_bar, beat_type, ticks_per_beat, or beats_per_minute. It also hardwires pos->beats_per_bar and pos->beat_type to 4.

The seconds set of differences are in the "else" clause. In the new code, it is very simple: calculate the new tick value, back it off by the number of ticks in a beat, and perhaps go to the first beat of the next bar.

In the old code (complex!), the simple BBT adjustment is always made. This changes (perhaps) the beats_per_bar, beat_type, etc. We probably need to make these settings use the actual global values for beats set for Sequencer64. Then, if transitioning from JackTransportStarting to JackTransportRolling (instead of checking new_pos!), the BBT values (bar, beat, and tick) are finally adjusted. Here are the steps, with old and new steps noted:

```
-#  Calculate the "delta" ticks based on the current frame, the
    ticks_per_beat, the beats_per_minute, and the frame_rate.  The old
    code saves this in a local, the new code assigns it to pos->tick.
-#  Old code: save this delta as a positive value.
-#  Figure out the settings and modify bar, beat, tick, and
    bar_start_tick.  The old and new code seem to have the same intent,
    but it seems like the new code is faster and also correct.
    -   Old code:  Calculations are made by division and mod
        operations.
    -   New code:  Calculations are made by increments and decrements
        in a while loop.
```

Parameters

state	Indicates the current state of JACK transport.
nframes	The number of JACK frames in the current time period.
pos	Provides the position structure to be filled in, the address of the position structure for the next cycle; pos->frame will be its frame number. If new_pos is FALSE, this structure contains extended position information from the current cycle. If TRUE, it contains whatever was set by the requester. The timebase_callback's task is to update the extended information here.
new_pos	TRUE (non-zero) for a newly requested pos, or for the first cycle after the timebase_callback is defined. This is usually 0 in Sequencer64 at present, and 1 if one, say, presses "rewind" in qjackctl.
arg	Provides the jack_assistant pointer, currently unchecked for nullity.

10.19.5 Field Documentation

10.19.5.1 jack_status_pair_t seq64::jack_assistant::sm_status_pairs [static],[private]

Terminated by a 0 value and an empty string.

10.20 seq64::jack_scratchpad Class Reference

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

10.20.1 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(). This scratchpad is useful even if JACK support is not enabled.

10.21 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???

10.21.1 Member Enumeration Documentation

10.21.1.1 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.

10.21.2 Constructor & Destructor Documentation

10.21.2.1 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.

10.21.3 Member Function Documentation

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

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

10.21.3.2 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.

10.21.4 Field Documentation

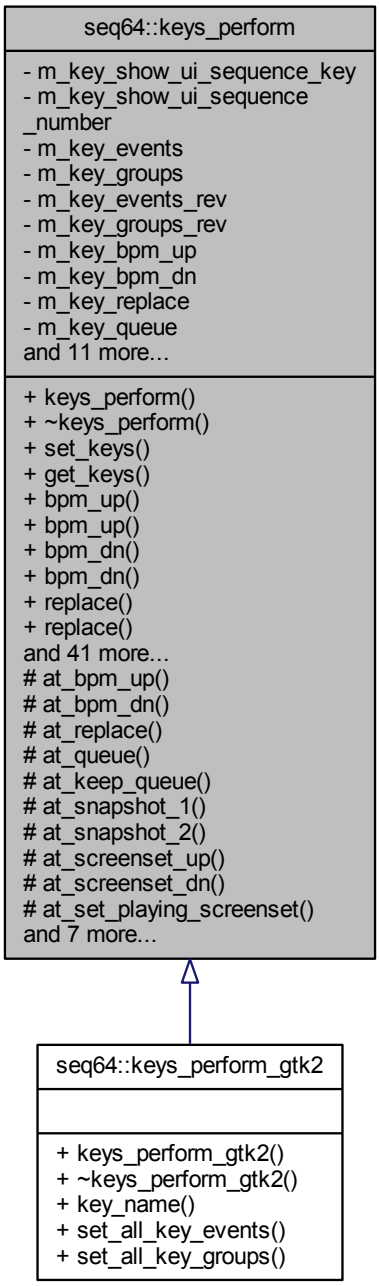
10.21.4.1 unsigned int* seq64::keybindentry::m_key [private]

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

10.22 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*
- bool show_ui_sequence_number () const

  Accessor *m_key_show_ui_sequency_number*
- 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

- bool m_key_show_ui_sequence_key

  If set, shows the shortcut-keys on each filled pattern slot in the main window.
- bool m_key_show_ui_sequence_number

  If set, shows the sequence number on each filled pattern and empty pattern slot in the main window.
- unsigned int m_key_bpm_up

  Provides key assignments for some key sequencer features.

10.22.1 Detailed Description

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

10.22.2 Constructor & Destructor Documentation

10.22.2.1 seq64::keys_perform::~keys_perform ( )

Finally, any active patterns/sequences are deleted.

10.22.3 Member Function Documentation

10.22.3.1 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.

10.22.3.2 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.

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

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

10.22.3.4 bool seq64::keys_perform::show_ui_sequence_number ( ) const [inline]

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

10.22.3.5 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.

10.22.3.6 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.

10.22.3.7 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.

10.22.3.8 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.

10.22.3.9 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.

10.22.4 Field Documentation

10.22.4.1 bool seq64::keys_perform::m_key_show_ui_sequence_number [private]

Also show the sequence number as part of the sequence name in the performance window (song editor).

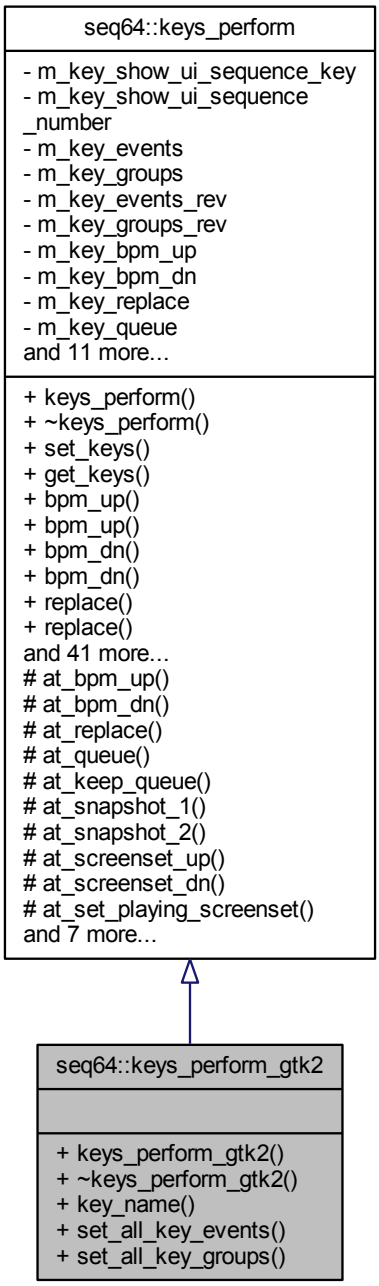
10.22.4.2 unsigned int seq64::keys_perform::m_key_bpm_up [private]

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

10.23 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

10.23.1 Detailed Description

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

10.23.2 Constructor & Destructor Documentation

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

Finally, any active patterns/sequences are deleted.

10.23.3 Member Function Documentation

10.23.3.1 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.

10.23.3.2 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.

10.23.3.3 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.

10.24 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().

10.25 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.

10.25.1 Detailed Description

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

10.25.2 Constructor & Destructor Documentation

10.25.2.1 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.

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

Parameters

rhs	The object to be copied.

10.25.3 Member Function Documentation

10.25.3.1 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.

10.25.3.2 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

10.25.4 Field Documentation

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

See the SEQ64_KEYSTROKE_PRESS and SEQ64_KEYSTROKE_RELEASE readability macros.

10.25.4.2 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.

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

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

10.26 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.

10.26.1 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.

10.26.2 Constructor & Destructor Documentation

10.26.2.1 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.

10.26.3 Member Function Documentation

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

/param id The ALSA client ID to be set.

10.26.3.2 bool seq64::lash::process_events ( )

Returns

Always returns true.

10.26.3.3 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.

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

Parameters

ev	Provides the event to be handled.

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

Currently incomplete.

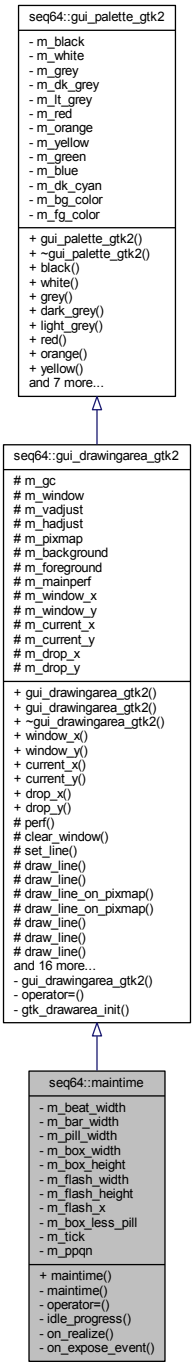
Parameters

conf	Provides the configuration item to handle.

10.27 seq64::maintime Class Reference

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

Inheritance diagram for seq64::maintime:



Public Member Functions

- maintime (perform &p, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  This constructor sets up the colors black, white, and grey, and then allocates them.

Private Member Functions

- int idle_progress (midipulse 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.
- void on_realize ()

  Handles realization of the window.
- bool on_expose_event (GdkEventExpose ∗ev)

  This function merely idles.

Private Attributes

- const int m_beat_width

  Provides the divisor for ticks to produce a beat value.
- const int m_bar_width

  Provides the divisor for ticks to produce a bar value.
- const int m_pill_width

  Provides the width of the pills, little black squares that show the progress of a beat and a bar (measure).
- const int m_box_width

  The width/length of the rectangle to be drawn inside the maintime window.
- const int m_box_height

  The height of the rectangle to be drawn inside the maintime window.
- const int m_flash_width

  The width/length of the flashing rectangle to be drawn inside the maintime window.
- const int m_flash_height

  The height of the flashing rectangle to be drawn inside the maintime window.
- const int m_flash_x

  The x value at which a flash should occur.
- const int m_box_less_pill

  The width/length of the maintime window minus the width of the pill.
- midipulse m_tick

  Saves the tick value for on_expose_event().
- int m_ppqn

  Provides the active PPQN value.

Additional Inherited Members

10.27.1 Detailed Description

We added a lot of members to hold the results of calculations that involve what are essentially constant. This saves CPU time, and maybe a little memory for the code to make those calculations more than once.

10.27.2 Constructor & Destructor Documentation

10.27.2.1 seq64::maintime::maintime (perform & *p*, int *ppqn* = SEQ64_USE_DEFAULT_PPQN)

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

10.27.3 Member Function Documentation

10.27.3.1 int seq64::maintime::idle_progress (midipulse *ticks*) [private]

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".

Parameters

ticks	Provides the main tick setting. This setting is provided by mainwnd(), in its timer callback.

Returns

Always returns 1 (it used to return "true"!).

10.27.3.2 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.

10.27.3.3 bool seq64::maintime::on_expose_event (GdkEventExpose * *a_e*) [private]

We don't need the m_tick member, the function works as well if 0 is passed in. We've removed m_tick permanently.

Actually, it might be useful after all, to avoid flickering under JACK transport. Let's put it back for now. (It doesn't help, but we will leave it in, the overhead is small.)

10.27.4 Field Documentation

10.27.4.1 const int seq64::maintime::m_beat_width [private]

Currently, this value is hardwired to 4, but will eventually be wired up as usr().midi_beat_width().

10.27.4.2 const int seq64::maintime::m_bar_width [private]

Currently, this value is hardwired to 16, but will eventually be wired up as usr().midi_beat_width() * usr().midi_↩ beats_per_bar().

10.27.4.3 const int seq64::maintime::m_box_width [private]

This item absolutely depends on the main window being non-resizable.

10.27.4.4 const int seq64::maintime::m_box_height [private]

This item absolutely depends on the main window being non-resizable.

10.27.4.5 const int seq64::maintime::m_flash_width [private]

Just a bit smaller than m_box_width.

10.27.4.6 const int seq64::maintime::m_flash_height [private]

Just a bit smaller than m_box_width.

10.27.4.7 midipulse seq64::maintime::m_tick [private]

It might actually be useful after all. And the overhead is tiny.

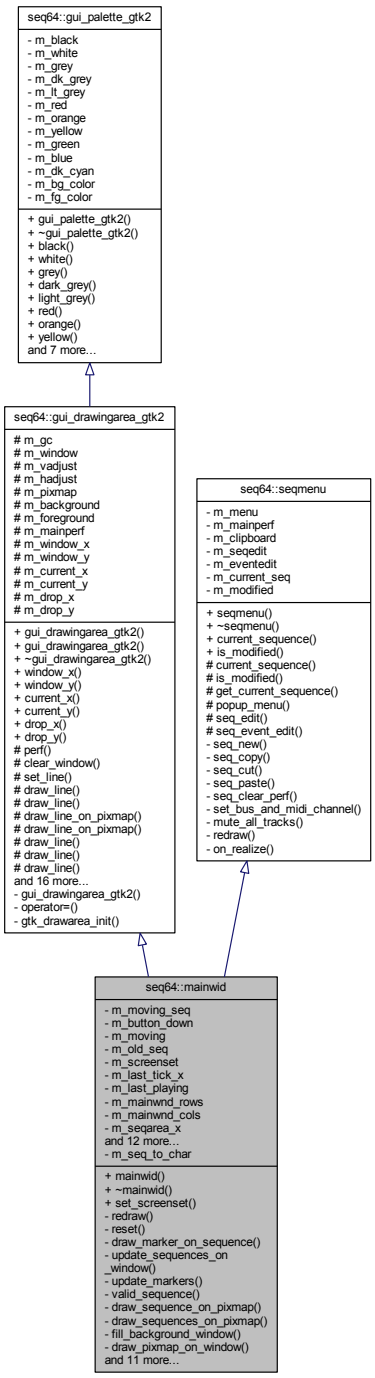
10.27.4.8 int seq64::maintime::m_ppqn [private]

While this is effectively a constant for the duration of a tune, it might change as different tunes are loaded.

10.28 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 set_screenset (int ss)

  Set the current screen-set.

Private Member Functions

- virtual void redraw (int seq)

  This virtual function, overridden from the seqmenu base class, draws the the given pattern/sequence again.
- void reset ()

  This function redraws everything and queues up a redraw operation.
- void draw_marker_on_sequence (int seq, int tick)

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

- int m_screenset_slots

  Provides a convenience variable for avoiding multiplications.

- int m_screenset_offset

  Provides a convenience variable for avoiding multiplications.

Additional Inherited Members

10.28.1 Constructor & Destructor Documentation

10.28.1.1 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.

10.28.2 Member Function Documentation

10.28.2.1 void seq64::mainwid::set_screenset (int *ss*)

Parameters

a_ss	Provides the screen-set number to set.

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

Parameters

seqnum	Provides the number of the sequence to draw.

Implements seq64::seqmenu.

10.28.2.3 void seq64::mainwid::draw_marker_on_sequence (int *seqnum*, int *tick*) [private]

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.

10.28.2.4 void seq64::mainwid::update_markers (int *ticks*) [private]

Parameters

ticks	Starting point for drawing the markers.

10.28.2.5 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.

10.28.2.6 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 play (muted by default) – the progress bars move in each pattern. Gaps in the sequence in the Song (performance) Editor don't change the appearance of the patterns if only the main window is up. But, if the Song Editor window is up, and the song is started using the controls in the Song Editor, then the active patterns are black while playing, and white when gaps in the sequence are encountered. The muting status in the main window is ignored. The muting in the Song (performance) windows is in force.

Parameters

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

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

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

10.28.2.8 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. This function is used when dragging a pattern from one pattern-slot to another pattern-slot.

We have to add 1 pixel to the y height in order to avoid leaving behind a line at the bottom of an empty pattern-slot.

Parameters

seqnum	Provides the number of the sequence to draw.

10.28.2.9 int seq64::mainwid::seq_from_xy (int *x*, int *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.

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

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

Returns

Always returns true.

10.28.2.11 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.

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

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

This function used to call font::init(), and was the only place where the font::init() function was called. The init() function gets a color-map from the window. We need a more fool-proof was to do this!

10.28.2.13 bool seq64::mainwid::on_expose_event (GdkEventExpose * *ev*) [private]

Parameters

ev	The expose event.

Returns

Always returns true.

10.28.2.14 bool seq64::mainwid::on_button_press_event (GdkEventButton * p) [private]

If the press is a single left-click, and no Ctrl key is pressed, then this function 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. In the release event callback, this then causes the sequence arming/muting to be toggled.

If the press is a single Ctrl-left-click, this function brings up the New or Edit menu. The New menu is brought up if the grid slot is empty, and the Edit menu otherwise. Another way to bring up the same functionality is described in the next paragraph.

If the press is a double-click, it first acts just like two single-clicks (which might confuse the user at first). Then it brings up the Edit menu for the sequence. This new behavior is closer to what users have come to expect from a double-click.

We also handle a Ctrl-double-click as a signal to do an event edit, instead of a sequence edit. The event editor provides a way to look at all events in detail, without having to select the type of event to see.

Parameters

p	Provides the parameters of the button event.

Returns

Always returns true.

10.28.2.15 bool seq64::mainwid::on_button_release_event (GdkEventButton * p) [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

p	Provides the parameters of the button event.

Returns

Always returns true.

10.28.2.16 bool seq64::mainwid::on_motion_notify_event (GdkEventMotion * p) [private]

This function moves the selected pattern to another pattern slot.

The perform::delete_sequence() function sets the perform modification flag.

Parameters

p	Provides the parameters of the button event.

Returns

Always returns true.

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

Just sets the Gtk::HAS_FOCUS flag.

Returns

Always returns false.

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

Just unsets the Gtk::HAS_FOCUS flag.

Returns

Always returns false.

10.28.3 Field Documentation

10.28.3.1 int seq64::mainwid::m_screenset_slots [private]

It is equally to m_mainwnd_rows * m_mainwnd_cols.

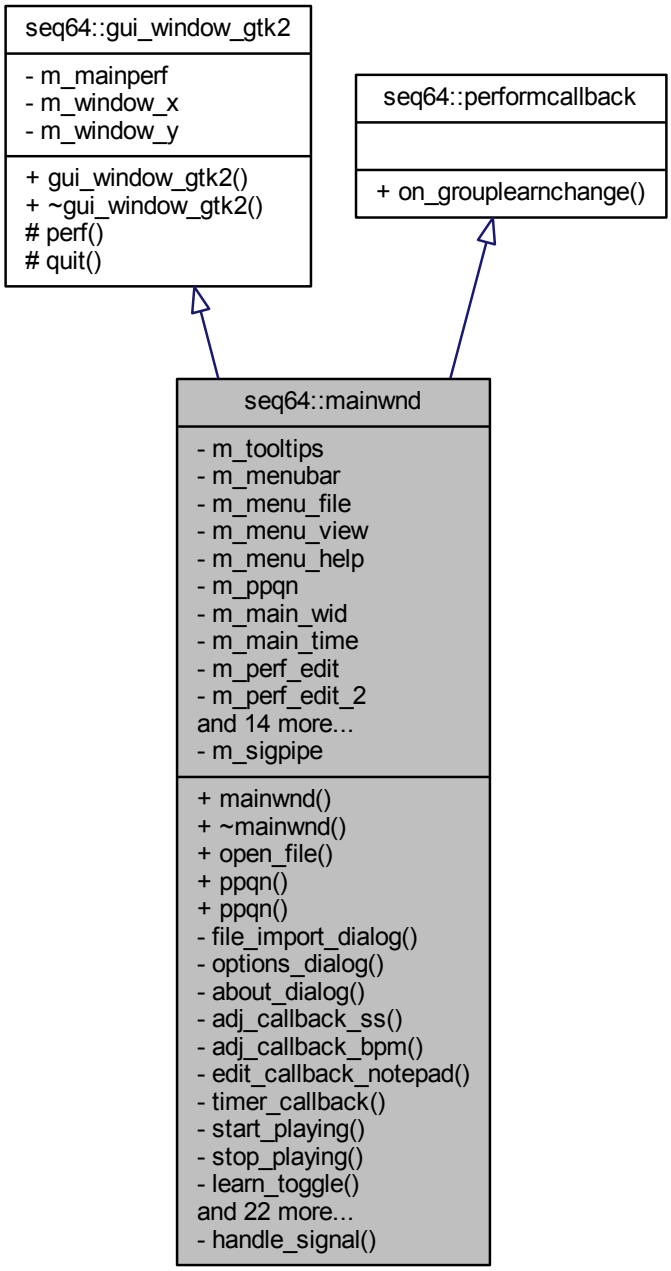
10.28.3.2 int seq64::mainwid::m_screenset_offset [private]

It is equally to m_screenset_slots * m_screenset.

10.29 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, bool allowperf2=true, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  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 start_playing ()

  Starts playing of the song.

- void stop_playing ()

  Stops the playing of the song.

- void learn_toggle ()

  Toggle the group-learn status.

- void open_performance_edit ()

  Opens the Performance Editor (Song Editor).

- void open_performance_edit_2 ()

  Opens the second Performance Editor (Song Editor).

- void enregister_perfedits ()

  This function brings together the two perfedit objects, so that they can tell each other when to queue up a draw operation.

- 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.

- int m_ppqn

  Saves the PPQN value obtained from the MIDI file (or the default value, the global ppqn, if SEQ64_USE_DEFAUL↩ T_PPQN was specified in reading the MIDI file.

- 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.

- perfedit * m_perf_edit_2

  A pointer to an optional second 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.

Static Private Attributes

- static int m_sigpipe [2]

  Interesting; what is this used for.

Additional Inherited Members

10.29.1 Constructor & Destructor Documentation

10.29.1.1 seq64::mainwnd::mainwnd (perform & *p*, bool *allowperf2* = `true`, int *ppqn* = `SEQ64_USE_DEFAULT_PPQN`)

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.
allowperf2	Indicates if a second perfedit window should be created. This is currently a run-time option, selectable in the "user" configuration file.

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.

View menu items 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.

10.29.2 Member Function Documentation

10.29.2.1 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 the global 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 "oldformat" or "global sequence" parameters of the midifile constructor when reading the MIDI file, since reading handles both the old and new formats, dealing with new constructs only if they are present in the file.

Parameters

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

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

m_ppqn = choose_ppqn(ppqn);

10.29.2.3 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, as well as being able to offset the sequence number.

Also, it is important to note that perf().clear_all() is not called by this routine, as we are merely adding to what might already be there.

10.29.2.4 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.

10.29.2.5 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.

Let the perform object keep track of modifications.

Screen-set notepad?

10.29.2.6 void seq64::mainwnd::adj_callback_bpm ( ) [private]

Let the perform object keep track of modifications.

10.29.2.7 void seq64::mainwnd::edit_callback_notepad ( ) [private]

Let the perform object keep track of modifications.

10.29.2.8 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. Also, if a sequence is changed by the event editor, we get a crash; need to find out how seqedit gets away with the changes.

10.29.2.9 void seq64::mainwnd::start_playing ( ) [inline], [private]

The rc_settings::jack_start_mode() function is used (if jack is running) to determine if the playback mode is "live" (false) or "song" (true). An accessor to perform::start_playing().

Note

This overrides the old behavior of playing live mode if the song is started from the main window.

10.29.2.10 void seq64::mainwnd::stop_playing ( ) [inline], [private]

An accessor to perform::stop_playing().

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

We will let perform keep track of modifications, and not just set an is-modified flag just because we opened the song editor. We're going to centralize the modification flag in the perform object, and see if it can work.

10.29.2.12 void seq64::mainwnd::open_performance_edit_2 ( ) [private]

Experiment: open a second one and see what happens. It works, but one needs to tell the other to redraw if a change is made.

10.29.2.13 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.

10.29.2.14 void seq64::mainwnd::new_file ( ) [private]

Not sure that we need to clear the modified flag here, especially since it is now centralizeed in the perform object. Let perf().clear_all() handle it now.

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

Here we specify the current value of m_ppqn, which was set when reading the MIDI file. We also let midifile tell the perform that saving worked, so that the "is modified" flag can be cleared. The midifile class is already a friend of perform.

10.29.2.16 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.

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

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

10.29.2.18 bool seq64::mainwnd::on_key_press_event (GdkEventKey * *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.

10.29.2.19 bool seq64::mainwnd::on_key_release_event (GdkEventKey * *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.

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

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

Reimplemented from seq64::performcallback.

10.29.3 Field Documentation

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

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

10.29.3.2 int seq64::mainwnd::m_ppqn [private]

We need it early here to be able to pass it along to child objects.

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

The first is the Patterns Panel.

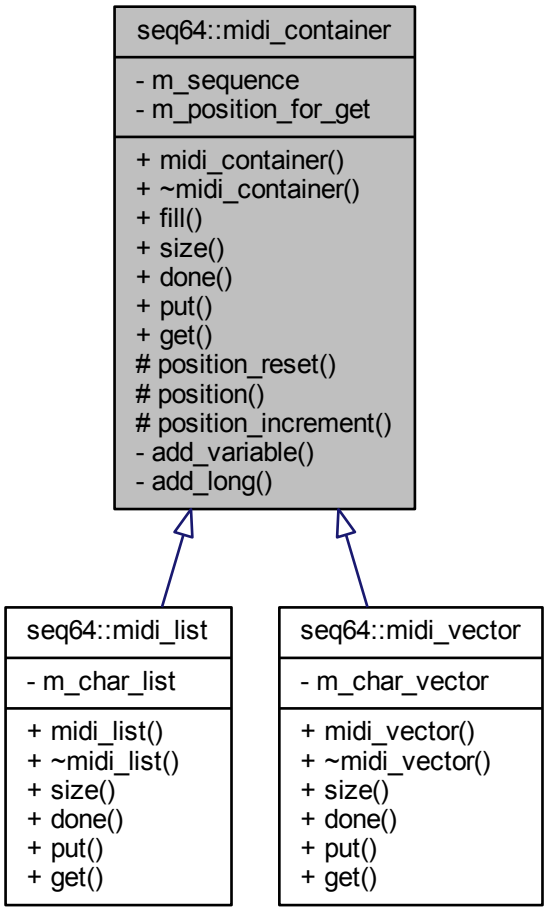
10.29.3.4 Gtk::SpinButton* seq64::mainwnd::m_spinbutton_load_offset [private]

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

10.30 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 track (sequence) 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 (midipulse 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 (midipulse 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.

10.30.1 Member Function Documentation

10.30.1.1 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 use with that shortcut.

Triggers:

```
Triggers are added by first calling add_variable(0), which is needed
because why?

Then 0xFF 0x7F is written, followed by the length value, which is the
number of triggers at 3 long integers per trigger, plus the 4-byte
code for triggers, c_triggers_new = 0x24240008.
```

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.

10.30.1.2 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.

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

It also increments m_position_for_get.

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

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

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

10.30.1.5 void seq64::midi_container::add_variable (midipulse *v*) [private]

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

10.30.1.6 void seq64::midi_container::add_long (midipulse *x*) [private]

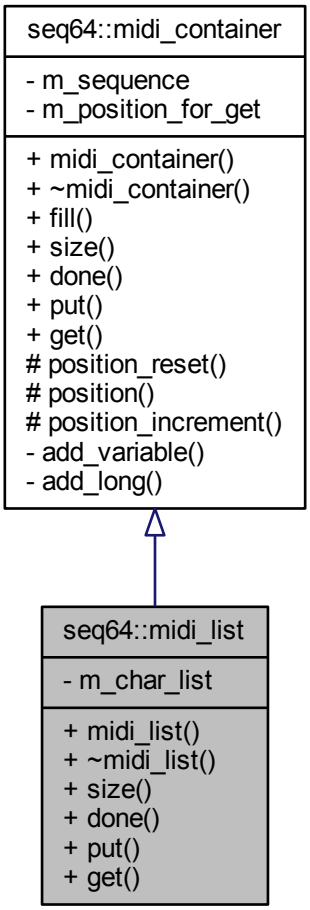
This function "replaces" sequence::add_long_list().

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.

10.31 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

10.31.1 Member Typedef Documentation

10.31.1.1 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.

10.31.2 Member Function Documentation

10.31.2.1 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.

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

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

Implements seq64::midi_container.

10.32 seq64::midi_measures Class Reference

Provides a data structure to hold the numeric equivalent of the measures string "measures:beats:divisions" ("m:b↩:d").

Public Member Functions

- midi_measures ()

  Default constructor for midi_measures.
- midi_measures (int measures, int beats, int divisions)

  Principal constructor for midi_measures.
- int measures () const

  'Getter' function for member m_measures
- void measures (int m)

  'Setter' function for member m_measures We can add validation later.
- int beats () const

  'Getter' function for member m_beats
- void beats (int b)

'Setter' function for member m_beats We can add validation later.

- int divisions () const

  'Getter' function for member m_divisions

- void divisions (int d)

  'Setter' function for member m_divisions We can add validation later.

Private Attributes

- int m_measures

  The integral number of measures in the measures-based time.

- int m_beats

  The integral number of beats in the measures-based time.

- int m_divisions

  The integral number of divisions/pulses in the measures-based time.

10.32.1 Field Documentation

10.32.1.1 int seq64::midi_measures::m_divisions [private]

There are two possible translations of the two bytes of a division. If the top bit of the 16 bits is 0, then the time division is in "ticks per beat" (or “pulses per quarter note”). If the top bit is 1, then the time division is in "frames per second". This function deals only with the ticks/beat definition.

10.33 seq64::midi_splitter Class Reference

This class handles the parsing and writing of MIDI files.

Public Member Functions

- midi_splitter (int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor.

- ~midi_splitter ()

  A rote destructor.

- bool log_main_sequence (sequence &seq, int seqnum)

  Logs the main sequence (an SMF 0 track) for later usage in splitting the track.

- void initialize ()

  Resets the SMF 0 support variables in preparation for parsing a new MIDI file.

- void increment (int channel)

  Processes a channel number by raising its flag in the m_smf0_channels[] array.

- bool split (perform &p, int screenset)

  This function splits an SMF 0, splitting all of the channels in the sequence out into separate sequences, and adding each to the perform object.

- 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.

- int count () const

  'Getter' function for member m_smf0_channels_count

Private Member Functions

- bool split_channel (const sequence &main_seq, sequence *seq, int channel)

  This function splits the given sequence into new sequences, one for each channel found in the SMF 0 track.

Private Attributes

- int m_ppqn

  Provides the current value of the PPQN, which used to be constant and is now only the macro DEFAULT_PPQN.
- bool m_use_default_ppqn

  Indicates that the default PPQN is in force.
- int m_smf0_channels_count

  Provides support for SMF 0, indicates how many channels were found in the file in a single sequence.
- bool m_smf0_channels [16]

  Provides support for SMF 0, holds a bool value that indicates the occurrence of a given channel.
- sequence * m_smf0_main_sequence

  Provides support for SMF 0, points to the initial SMF 0 sequence, from which the single-channel sequences will be created.
- int m_smf0_seq_number

  Provides support for SMF 0, holds the prospective sequence number of the main (SMF 0) sequence.

10.33.1 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.

10.33.2 Constructor & Destructor Documentation

10.33.2.1 seq64::midi_splitter::midi_splitter (int *ppqn* = SEQ64_USE_DEFAULT_PPQN)

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, DEFAULT_PPQN. The value read from the MIDI file, ppqn, is then use to scale the running-time of the sequence relative to DEFAULT_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.

oldformat	If true, write out the MIDI file using the old Seq24 format, instead of the new MIDI-compliant sequencer-specific format, for the seq24-specific SeqSpec tags defined in the globals module. This option is false by default. Note that this option is only used in writing; reading can handle either format transparently.
globalbgs	If true, write any non-default values of the key, scale, and background sequence to the global "proprietary" section of the MIDI file, instead of to each sequence. Note that this option is only used in writing; reading can handle either format transparently.

10.33.3 Member Function Documentation

10.33.3.1 void seq64::midi_splitter::increment (int *channel*)

If it is the first entry for that channel, m_smf0_channels_count is incremented. We won't check the channel number, to save time, until someday we segfault :-D

10.33.3.2 bool seq64::midi_splitter::split (perform & *p*, int *screenset*)

Lastly, it adds the SMF 0 track as the last track; the user can then examine it before removing it. Is this worth the effort?

There is a little oddity, in that, if the SMF 0 track has events for only one channel, this code will still create a new sequence, as well as the main sequence. Not sure if this is worth extra code to just change the channels on the main sequence and put it into the correct track for the one channel it contains.

Parameters

p	Provides a reference to the perform object into which sequences/tracks are to be added.
screenset	The screen-set offset to be used when loading a sequence (track) from the file.

Returns

Returns true if the parsing succeeded. Returns false if no SMF 0 main sequence was logged.

10.33.3.3 int seq64::midi_splitter::ppqn ( ) const [inline]

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

10.33.3.4 bool seq64::midi_splitter::split_channel (const sequence & *main_seq*, sequence * *s*, int *channel*) [private]

Note that the events that are read from the MIDI file have delta times. Sequencer64 converts these delta times to cumulative times. We need to preserve that here. Conversion back to delta times is needed only when saving the sequences to a file. This is done in midi_container::fill().

We have to accumulate the delta times in order to be able to set the length of the sequence in pulses.

Luckily, we don't have to worry about copying triggers, since the imported SMF 0 track won't have any Seq24/↩ Sequencer24 triggers.

It doesn't set the sequence number of the sequence; that is set when the sequence is added to the perform object.

Parameters

main_seq	This parameter is the whole SMF 0 track that was read from the MIDI file. It contains all of the channel data that needs to be split into separate sequences.
s	Provides the new sequence that needs to have its settings made, and all of the selected channel events added to it.
channel	Provides the MIDI channel number (re 0) that marks the channel data the needs to be extracted and added to the new sequence.

Returns

Returns true if at least one event got added. If none were added, the caller should delete the sequence object represented by parameter *s*.

10.33.4 Field Documentation

10.33.4.1 int seq64::midi_splitter::m_smf0_channels_count [private]

SMF 1 file parsing will only warn about more than one channel found in a given sequence.

10.33.4.2 bool seq64::midi_splitter::m_smf0_channels[16] [private]

Obviously, we don't have to worry about multiple MIDI busses.

10.33.4.3 int seq64::midi_splitter::m_smf0_seq_number [private]

We want to be able to add that sequence last, for easier and cleaner removal of that sequence by the user.

10.34 seq64::midi_timing Class Reference

We anticipate the need to have a small structure holding the parameters needed to calculate MIDI times within an arbitrary song.

Public Member Functions

- midi_timing ()

  Defaults constructor for midi_timing.
- midi_timing (int bpminute, int bpmeasure, int beatwidth, int ppqn)

  Principal constructor for midi_timing.
- int beats_per_minute () const

  'Getter' function for member m_beats_per_minute
- void beats_per_minute (int b)

  'Setter' function for member m_beats_per_minute We can add validation later.
- int beats_per_measure () const

  'Getter' function for member m_beats_per_measure
- void beats_per_measure (int b)

  'Setter' function for member m_beats_per_measure We can add validation later.
- int beat_width () const

  'Getter' function for member m_beats_per_beat_width
- void beat_width (int bw)

  'Setter' function for member m_beats_per_beat_width We can add validation later.
- int ppqn () const

'Getter' function for member m_ppqn

- void ppqn (int p)

  'Setter' function for member m_ppqn We can add validation later.

Private Attributes

- int m_beats_per_minute

  This value should match the BPM value selected when editing the song.

- int m_beats_per_measure

  This value should match the numerator value selected when editing the sequence.

- int m_beat_width

  This value should match the denominator value selected when editing the sequence.

- int m_ppqn

  This value provides the precision of the MIDI song.

10.34.1 Detailed Description

Although Seq24/Sequencer64 currently are heavily dependent on hard-wired values, that will be rectified eventually, so let us get ready for it.

10.34.2 Field Documentation

10.34.2.1 int seq64::midi_timing::m_beats_per_minute [private]

This value is most commonly set to 120, but is also read from the MIDI file. This value is needed if one want to calculate durations in true time units such as seconds, but is not needed to calculate the number of pulses/ticks/divisions.

10.34.2.2 int seq64::midi_timing::m_beats_per_measure [private]

This value is most commonly set to 4.

10.34.2.3 int seq64::midi_timing::m_beat_width [private]

This value is most commonly set to 4, meaning that the fundamental beat unit is the quarter note.

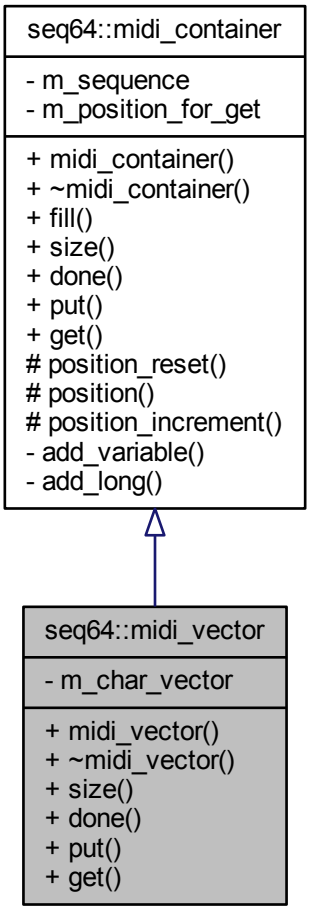
10.34.2.4 int seq64::midi_timing::m_ppqn [private]

This value is most commonly set to 192, but is also read from the MIDI file. We are still working getting "non-standard" values to work.

10.35 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

10.35.1 Member Function Documentation

10.35.1.1 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.

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

In this implementation, m_position_for_get is used.

Implements seq64::midi_container.

10.36 seq64::midibus Class Reference

Provides a class for handling the MIDI buss on Linux.

Public Member Functions

- ~midibus ()

  A rote empty destructor.
- bool init_out ()

  Initialize the MIDI output port.
- bool init_in ()

  Initialize the MIDI input port.
- bool deinit_in ()

  Deinitialize the MIDI input?
- bool init_out_sub ()

  Initialize the output in a different way?
- bool init_in_sub ()

  Initialize the output in a different way?
- void print ()

  Prints m_name.
- const std::string & get_name () const

  'Getter' function for member n_name
- int get_id () const

  'Getter' function for member m_id
- void play (event *e24, midibyte channel)

This play() function takes a native event, encodes it to ALSA event, and puts it in the queue.

- void sysex (event *e24)

  Takes a native SYSEX event, encodes it to an ALSA event, and then puts it in the queue.
- void start ()

  This function gets the MIDI clock a-runnin', if the clock type is not e_clock_off.
- void stop ()

  Stop the MIDI buss.
- void clock (midipulse tick)

  Generates the MIDI clock, starting at the given tick value.
- void continue_from (midipulse tick)

  Continue from the given tick.
- void init_clock (midipulse tick)

  Initialize the clock, continuing from the given tick.
- void set_clock (clock_e clocktype)

  'Setter' function for member m_clock_type
- clock_e get_clock () const

  'Getter' function for member m_clock_type
- void set_input (bool inputing)

  Input functions.
- bool get_input () const

  'Getter' function for member m_inputing
- void flush ()

  Flushes our local queue events out into ALSA.
- int get_client () const

  'Getter' function for member m_dest_addr_client The address of client.
- int get_port () const

  'Getter' function for member m_dest_addr_port

Static Public Member Functions

- static void set_clock_mod (int clockmod)

  Set the clock mod to the given value, if legal.
- static int get_clock_mod ()

  Get the clock mod.

Private Attributes

- int m_id

  The ID of the midibus object.
- clock_e m_clock_type

  The type of clock to use.
- bool m_inputing

  TBD.
- int m_ppqn

  Provides the PPQN value in force, currently a constant.
- const int m_dest_addr_client

  Destination address of client.
- const int m_dest_addr_port

  Destination port of client.
- const int m_local_addr_client

Local address of client.

- int m_local_addr_port

  Local port of client.

- int m_queue

  Another ID of the MIDI queue?

- std::string m_name

  The name of the MIDI buss.

- midipulse m_lasttick

  The last (most recent? final?) tick.

- mutex m_mutex

  Locking mutex.

Static Private Attributes

- static int m_clock_mod

  *This is another name for "16 * 4".*

Friends

- class mastermidibus

  The master MIDI bus sets up the buss.

10.36.1 Member Function Documentation

10.36.1.1 bool seq64::midibus::init_out ( )

Returns

Returns true unless setting up ALSA MIDI failed in some way.

10.36.1.2 bool seq64::midibus::init_in ( )

Returns

Returns true unless setting up ALSA MIDI failed in some way.

10.36.1.3 bool seq64::midibus::deinit_in ( )

Returns

Returns true, unless an error occurs.

10.36.1.4 bool seq64::midibus::init_out_sub ( )

Returns

Returns true unless setting up the ALSA port failed in some way.

10.36.1.5 bool seq64::midibus::init_in_sub ( )

Returns

Returns true unless setting up the ALSA port failed in some way.

10.36.1.6 void seq64::midibus::play (event * *e24*, midibyte *channel*)

Threadsafe

Parameters

e24	The event to be played on this bus.
channel	The channel of the playback.

10.36.1.7 void seq64::midibus::sysex (event * *e24*)

Parameters

e24	The event to be handled.

10.36.1.8 void seq64::midibus::clock (midipulse *tick*)

Parameters

tick	Provides the starting tick.

10.36.1.9 void seq64::midibus::continue_from (midipulse *tick*)

Parameters

tick	The continuing tick.

10.36.1.10 void seq64::midibus::init_clock (midipulse *tick*)

Parameters

tick	The starting tick.

10.36.1.11 void seq64::midibus::set_input (bool *inputing*)

Set status to of "inputting" to the given value.

If the parameter is true, then init_in() is called; otherwise, deinit_in() is called.

Parameters

inputing	The inputing value to set.

10.37 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 oldformat=false, bool globalbgs=true)

  Principal constructor.
- ~midifile ()

  A rote destructor.
- bool parse (perform &a_perf, int a_screen_set=0)

  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.
- const std::string & error_message () const

  'Getter' function for member m_error_message
- bool error_is_fatal () const

  'Getter' function for member m_error_is_fatal
- 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

- bool parse_smf_0 (perform &p, int screenset)

  This function parses an SMF 0 binary MIDI file as if it were an SMF 1 file, then, if more than one MIDI channel was encountered in the sequence, splits all of the channels in the sequence out separate sequences, and deletes the original sequence.
- bool parse_smf_1 (perform &p, int screenset, bool is_smf0=false)

  This function parses an SMF 1 binary MIDI file; it is basically the original seq25 midifile::parse() function.
- midilong 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.
- int pow2 (int logbase2)

  Internal function for simple calculation of a power of 2 without a lot of math.
- bool checklen (midilong len, midibyte type)

  Internal function to check for and report a bad length value.
- midilong read_long ()

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

  Reads 2 bytes of data using read_byte().
- midibyte read_byte ()

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

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

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

  Writes 2 bytes, using the write_byte() function.
- void read_byte_array (midibyte *b, int len)

  A helper function to simplify reading midi_control data from the MIDI file.
- void write_byte (midibyte c)

  Writes 1 byte.

- void write_varinum (midilong)

  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.
- std::string read_track_name ()

  Reads the track name.
- void write_seq_number (midishort seqnum)

  Writes out a sequence number.
- int read_seq_number ()

  Reads the sequence number.
- void write_track_end ()

  Writes out the end-of-track marker.
- void write_prop_header (midilong 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.
- void errdump (const std::string &msg)

  Helper function to emit more useful error messages.
- void errdump (const std::string &msg, unsigned long p)

  Helper function to emit more useful error messages for erroneous long values.
- 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.
- bool is_sysex_special_id (midibyte ch)

  Check for special SysEx ID byte.

Private Attributes

- int m_file_size

  Holds the size of the MIDI file.
- std::string m_error_message

  Holds the last error message, useful for trouble-shooting without having Sequencer64 running in a console window.
- bool m_error_is_fatal

  Indicates if the error should be considered fatal.
- bool m_disable_reported

  Indicates that file reading has already been disabled (due to serious errors), so don't complain about it anymore.
- int m_pos

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

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

  This vector of characters holds our MIDI data.

- std::list< midibyte > 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.
- bool m_global_bgsequence

  Indicates to store the new key, scale, and background sequence in the global, "proprietary" section of the MIDI song.
- int m_ppqn

  Provides the current value of the PPQN, which used to be constant and is now only the macro DEFAULT_PPQN.
- bool m_use_default_ppqn

  Indicates that the default PPQN is in force.
- midi_splitter m_smf0_splitter

  Provides support for SMF 0.

10.37.1 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.

10.37.2 Constructor & Destructor Documentation

10.37.2.1 seq64::midifile::midifile (const std::string & *name*, int *ppqn* = `SEQ64_USE_DEFAULT_PPQN`, bool *oldformat* = `false`, bool *globalbgs* = `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, DEFAULT_PPQN. The value read from the MIDI file, ppqn, is then use to scale the running-time of the sequence relative to DEFAULT_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.

oldformat	If true, write out the MIDI file using the old Seq24 format, instead of the new MIDI-compliant sequencer-specific format, for the seq24-specific SeqSpec tags defined in the globals module. This option is false by default. Note that this option is only used in writing; reading can handle either format transparently.
globalbgs	If true, write any non-default values of the key, scale, and background sequence to the global "proprietary" section of the MIDI file, instead of to each sequence. Note that this option is only used in writing; reading can handle either format transparently.

10.37.3 Member Function Documentation

10.37.3.1 bool seq64::midifile::parse (perform & *p,* int *screenset* = 0)

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?

Note on the is-modified flag.  We now assume that the perform object is
starting from scratch when parsing.  But we let mainwnd tell the perform
object when to clear everything with perform::clear_all().  The mainwnd
does this for a new file, opening a file, but not for a file import, which
might be done simply to add more MIDI tracks to the current composition.
So, if parsing succeeds, all we want to do is make sure the flag is set.

Parsing a file successfully is not always a modification of the setup.
For instance, the first read of a MIDI file should start clean, not dirty.
```

SysEx notes:

```
 Some files (e.g. Dixie04.mid) do not always encode System Exclusive
 messages properly for a MIDI file.  Instead of a varinum length value,
 they are followed by extended IDs (0x7D, 0x7E, or 0x7F).

 We've covered some of those cases by disabling access to m_data if the
 position passes the size of the file, but we want try to bypass these
 odd cases properly.  So we look ahead for one of these special values.
```

Parameters

p	Provides a reference to the perform object into which sequences/tracks are to be added.
screenset	The screen-set offset to be used when loading a sequence (track) from the file. This value ranges from -31 to 0 to +31 (32 is the maximum screen-set available in Seq24). This offset is added to the sequence number read in for the sequence, to place it elsewhere in the imported tune, and locate it in a specific screen-set. If this parameter is non-zero, the we will assume that the perform data is dirty.

Returns

Returns true if the parsing succeeded.

10.37.3.2 bool seq64::midifile::write (perform & *p*)

Parameters

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

Returns

Returns true if the write operations succeeded.

Note

Seq24 reverses the order of some events, due to popping from its container. Not an issue here.

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

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

10.37.3.4 bool seq64::midifile::parse_smf_0 (perform & *p,* int *screenset*) [private]

Parameters

p	Provides a reference to the perform object into which sequences/tracks are to be added.
screenset	The screen-set offset to be used when loading a sequence (track) from the file.

Returns

Returns true if the parsing succeeded.

10.37.3.5 bool seq64::midifile::parse_smf_1 (perform & *p,* int *screenset,* bool *is_smf0* = false) [private]

It assumes the file-data has already been read into memory. It also assumes that the ID, track-length, and format have already been read.

Parameters

p	Provides a reference to the perform object into which sequences/tracks are to be added.
screenset	The screen-set offset to be used when loading a sequence (track) from the file.

Returns

Returns true if the parsing succeeded.

10.37.3.6 midilong 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:

```
        0x00 0xFF 0x7F length data

For convenience, this function first checks the amount of file data left.
If enough, then it reads a long value.  If the value starts with 0x00 0xFF
0x7F, then that is a SeqSpec event, which signals usage of the new
```

```
Sequencer64 "proprietary" 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.

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

It consists of series of tags:

- c_midictrl
- c_midiclocks
- c_notes
- c_bpmtag (beats per minute)
- c_mutegroups
- c_musickey (new, added if usr() global_seq_feature() is true)
- c_musicscale (ditto)
- c_backsequence (ditto)

(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. Oh, it turns out that they are set up by actions performed on each sequence, and are stored as sequencer-specific ("SeqSpec") data with each track's data as held in the MIDI container for the track. See the midi_container module for more information.)

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

First, we separate out this function for a little more clarity. Then we added code to handle reading both the legacy Seq24 format and the new, MIDI-compliant format. Note that even the new 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. But it does have the "MTrk" marker and track name, so that must be processed for the new format.

Now, in our "midicvt" project, we have a test MIDI file, b4uacuse-non-mtrk.midi that is good, except for having a tag "MUnk" instead of "MTrk". We should consider being more permissive, if possible. Otherwise, though, the only penality is that the "proprietary" chunk is completely skipped.

Parameters

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

There are also implicit parameters, with the m_pos and m_new_format member variables.

10.37.3.8 int seq64::midifile::pow2 (int *logbase2*) [private]

Use for calculating the denominator of a time signature.

Parameters

logbase2	Provides the power to which 2 is to be raised. This integer is probably only rarely greater than 4 (which represents a denominator of 16).

Returns

Returns 2 raised to the logbase2 power.

10.37.3.9 midilong seq64::midifile::read_long ( ) [private]

Warning

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

10.37.3.10 midilong 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.

10.37.3.11 void seq64::midifile::write_long (midilong *a_x*) [private]

Warning

This code looks endian-dependent.

10.37.3.12 void seq64::midifile::write_short (midishort *a_x*) [private]

Warning

This code looks endian-dependent.

10.37.3.13 void seq64::midifile::read_byte_array (midibyte * *b*, int *len*) [inline], [private]

Parameters

b	The byte array to receive the data.
len	The number of bytes in the array, and to be read.

10.37.3.14 void seq64::midifile::write_byte (midibyte *c*) [inline], [private]

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

10.37.3.15 void seq64::midifile::write_varinum (midilong *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.

10.37.3.16 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.

10.37.3.17 std::string seq64::midifile::read_track_name ( ) [private]

Meant only for usage in the proprietary footer track, in the new file format.

Returns

Returns the track name, or an empty string if there was a problem.

10.37.3.18 void seq64::midifile::write_seq_number (midishort *seqnum*) [private]

The format is "00 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 assumed to increment. Our application doesn't bother with that shortcut.

10.37.3.19 int seq64::midifile::read_seq_number ( ) [private]

Meant only for usage in the proprietary footer track, in the new file format.

Returns

Returns the sequence number found, or -1 if it was not found.

10.37.3.20 void seq64::midifile::write_prop_header (midilong *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. Sequence number, a special value, well out of normal range.
- The name of the track:
  - "Seq24-Spec"
  - "Sequencer64-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, this site shows that no manufacturer uses 0x24:

```
http://sequence15.blogspot.com/2008/12/midi-manufacturer-ids.html
```

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.

10.37.3.21 bool seq64::midifile::write_proprietary_track (perform & *p*) [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.

Here's the basics of what Seq24 did for writing the data in this part of the file:

```
-#  Write the c_midictrl value, then write a 0.  To us, this looks like
    no one wrote any code to write this data.  And yet, the parsing
    code can handles a non-zero value, which is the number of sequences
    as a long value, not a byte.  So shouldn't we write 4 bytes, not
    one?  Yes, indeed, we made a mistake.  However, we should be
    writing out the full data set as well.  But not even Seq24 does
    that!  Perhaps they decided it was best kept in the "rc"
    configuration file.
-#  MORE TO COME.
```

10.37.3.22 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.

10.37.3.23 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 then the data length is added.

10.37.3.24 void seq64::midifile::errdump (const std::string & *msg*) [private]

It adds the file offset to the message.

Parameters

msg	The main error message string, without an ending newline character.

Returns

The constructed string is returned as a side-effect, in case we want to pass it along to the externally-accessible error-message buffer.

10.37.3.25 void seq64::midifile::errdump (const std::string & *msg,* unsigned long *value*) [private]

It adds the file offset to the message.

Parameters

msg	The main error message string, without an ending newline character.
value	The long value to show as part of the message.

Returns

The constructed string is returned as a side-effect, in case we want to pass it along to the externally-accessible error-message buffer.

10.37.3.26 bool seq64::midifile::is_sysex_special_id (midibyte *ch*) [inline], [private]

Parameters

ch	Provides the byte to be checked against 0x7D through 0x7F.

Returns

Returns true if the byte is SysEx special ID.

10.37.4 Field Documentation

10.37.4.1 int seq64::midifile::m_file_size [private]

This variable was added when loading a file that caused an attempt to load data well beyond the file-size of the midicvt test file Dixie04.mid.

10.37.4.2 std::string seq64::midifile::m_error_message [private]

If empty, there's no pending error. Currently most useful in the parse() function.

10.37.4.3 bool seq64::midifile::m_error_is_fatal [private]

The caller can query for this value after getting the return value from parse().

10.37.4.4 bool seq64::midifile::m_disable_reported [private]

Once is enough.

10.37.4.5 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.

10.37.4.6 std::vector<midibyte> 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.

10.37.4.7 std::list<midibyte> 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.

10.37.4.8 bool seq64::midifile::m_new_format [private]

In the 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, the new format is used, 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 "rc" configuration file.] Note that reading can handle either format transparently.

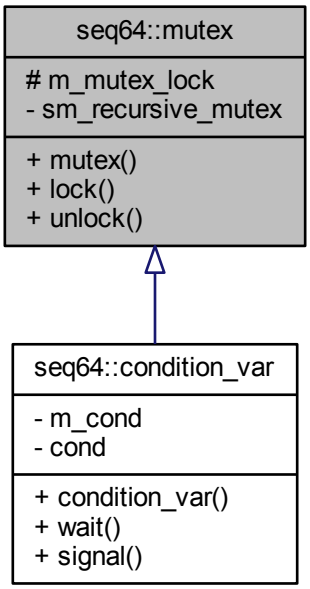
10.37.4.9 midi_splitter seq64::midifile::m_smf0_splitter [private]

This object holds all of the information needed to split a multi-channel sequence.

10.38 seq64::mutex Class Reference

The mutex class provides a simple wrapper for the pthread_mutex_t type used as a recursive mutex.

Inheritance diagram for seq64::mutex:



Public Member Functions

- mutex ()

  The constructor assigns the recursive mutex to the local locking mutex.
- void lock () const

  Lock the mutex.
- void unlock () const

  Unlock the mutex.

Protected Attributes

- pthread_mutex_t m_mutex_lock

  Provides a mutex lock usable by a single module or class.

Static Private Attributes

- static const pthread_mutex_t sm_recursive_mutex

Provides a way to disable the locking.

10.38.1 Field Documentation

10.38.1.1 const pthread_mutex_t seq64::mutex::sm_recursive_mutex [static], [private]

Define the static recursive mutex and its condition variable.

Mostly experimental, we want to disable locking to see if we can speed up MIDI file reading when the application is compiled for debugging. It takes about 8 seconds to read our sample MIDI files. This does not solve the problem of the long MIDI-file parsing, however.

```
static bool sm_mutex_enabled;
```

Provides a recursive mutex that can be used by the whole application, apparently.

10.39 seq64::options Class Reference

This class supports a full tabbed options dialog.

Inherits Dialog.

Private Types

- enum button {
  e_jack_transport,
  e_jack_master,
  e_jack_master_cond,
  e_jack_start_mode_live,
  e_jack_start_mode_song,
  e_jack_connect,
  e_jack_disconnect }

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::CheckButton * m_button_jack_transport

  Main JACK transport selection.
- Gtk::CheckButton * m_button_jack_master

  Main JACK transport master selection.
- Gtk::CheckButton * m_button_jack_master_cond

  Main JACK transport master-conditional selection.
- Gtk::Notebook * m_notebook

  Not sure yet what this notebook is for.

10.39.1 Member Enumeration Documentation

10.39.1.1 enum seq64::options::button [private]

Enumerator

e_jack_transport Defines buttons indices or IDs for some controls related to JACK. These values are handled in options::transport_callback(). Some of them set JACK-related values in the rc_settings object, while the others set up or tear down the JACK support of sequencer24.

The JACK Transport settings are a little messy. They should be radio buttons, and control each other's settings. Currently, if the user wants to set up for JACK Master, the JACK Transport button must also be checked.

```
Turns on the "with JACK Transport" option,
rc_settings::with_jack_transport().
```

e_jack_master Turns on the "with JACK Master" option, rc_settings::with_jack_master(). If another application is already JACK Master, this will fail.

e_jack_master_cond Turns on the "with JACK Master" option rc_settings::with_jack_master_cond(). This option makes sequencer64 the JACK Master conditionally, that is, if no other application has claimed that role.

e_jack_start_mode_live Doesn't directly do anything; the live mode versus song mode is set by the e_jack↩_start_mode_song value.

e_jack_start_mode_song Sets the "JACK start mode" value to true, which means that sequencer64 is in song mode. This value is obtained via rc_settings::jack_start_mode().

e_jack_connect Causes the perform object's JACK initialization function, perform::init_jack(), to be called.

e_jack_disconnect Causes the perform object's JACK deinitialization function, perform::deinit_jack(), to be called.

10.39.2 Field Documentation

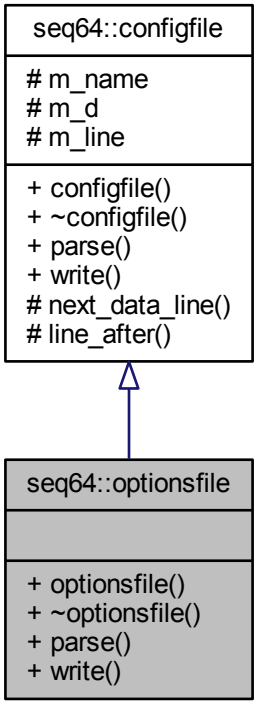
10.39.2.1 Gtk::Notebook* seq64::options::m_notebook [private]

Must be a GTK thang.

10.40 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

10.40.1 Detailed Description

The settings that are passed around are provided or used by the perform class.

10.40.2 Member Function Documentation

10.40.2.1 bool seq64::optionsfile::parse (perform & *p*) [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.

10.40.2.2 bool seq64::optionsfile::write (const perform & *p*) [virtual]

Parameters

p	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.

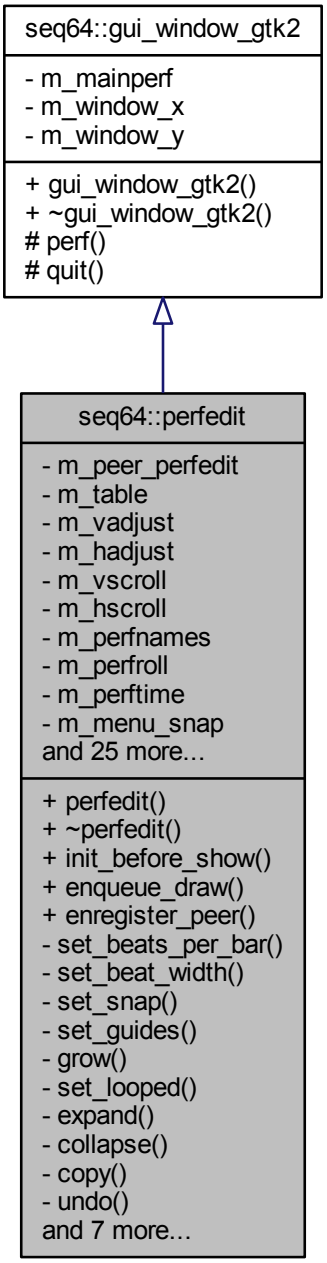
New boolean to show sequence numbers; ignored in legacy mode.

Implements seq64::configfile.

10.41 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, bool second_perfedit=false, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  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 enqueue_draw (bool forward=true)

  Helper wrapper for calling perfroll::queue_draw() for one or both perfedits.

- void enregister_peer (perfedit *peer)

  Register the peer perfedit object.

Private Member Functions

- void set_beats_per_bar (int bpm)

  Sets the beats-per-measure text and value to the given value, and then calls set_guides().

- void set_beat_width (int bw)

  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() function, 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

- perfedit * m_peer_perfedit
  The partner instance of perfedit.
- Gtk::Table * m_table
  A whole horde of GUI elements.
- Gtk::Menu * m_menu_bpm
  Menus for time signature, beats per measure, beat width.
- int m_snap
  Set snap-to in "pulses".
- int m_bpm
  The current "beats per measure" value.
- int m_bw
  The current "beat width" value.
- int m_ppqn
  The current "parts per quarter note" value.
- int m_standard_bpm
  The standard "beats per measure" of Sequencer64, which here matches the beats-per-measure displayed in the perfroll (piano roll).
- int m_redraw_ms
  Provides the timer period for the perfedit timer, used to determine the rate of redrawing.

Additional Inherited Members

10.41.1 Detailed Description

It has a seqroll and piano roll? No, it has a perform, a perfnames, a perfroll, and a perftime.

10.41.2 Constructor & Destructor Documentation

10.41.2.1 seq64::perfedit::perfedit (perform & *p*, bool *second_perfedit* = `false`, int *ppqn* = `SEQ64_USE_DEFAULT_PPQN`)

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.

10.41.2.2 seq64::perfedit::~perfedit ( )

We're going to have to run the application through valgrind to make sure that nothing is left behind.

10.41.3 Member Function Documentation

10.41.3.1 void seq64::perfedit::init_before_show ( )

It does not seem to need to also forward to the perftime function of the same name.

10.41.3.2 void seq64::perfedit::enqueue_draw (bool *forward* = `true`)

Parameters

forward	If true (the default), pass the call to the peer. When passing this call to the peer, this parameter is set to false to prevent an infinite loop and the resultant stack overflow.

10.41.3.3 void seq64::perfedit::enregister_peer (perfedit * *peer*) [inline]

This function is meant to be called by mainwnd, which creates the perfedits and then makes sure they get along.

10.41.3.4 void seq64::perfedit::set_beats_per_bar (int *bpm*) [private]

The usage of is modified was faulty. Offloaded it to the perform object to make it more foolproof. See the perform::modify() function.

10.41.3.5 void seq64::perfedit::set_beat_width (int *bw*) [private]

The usage of is modified was faulty. Offloaded it to the perform object to make it more foolproof. See the perform::modify() function.

10.41.3.6 void seq64::perfedit::set_guides ( ) [private]

See the set_snap() function.

It's a little confusing; I assigned the label "m_standard_bpm" to the value 4 in "measure_pulse = 192 * 4 * m_bpm / m_bw", but I am not sure I understand this equation... why the extra factor of 4? That 4 appears in "c_ppqn * 4" a lot in the original code.

10.41.3.7 void seq64::perfedit::grow ( ) [private]

Make sure that setting the modified flag makes sense for this operation. It doesn't seem to modify members.

10.41.3.8 void seq64::perfedit::expand ( ) [private]

This action opens up a space of 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.

10.41.3.9 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.

10.41.3.10 void seq64::perfedit::copy ( ) [private]

This action opens up a space of events between the L and R (left and right) markers, and copies the information from the same amount of events 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.

10.41.3.11 void seq64::perfedit::undo ( ) [private]

We pop an Undo trigger, and then ask the perfroll to queue up a (re)drawing action.

10.41.3.12 bool seq64::perfedit::timeout ( ) [private]

It redraws "dirty" sequences in the perfroll and the perfnames objects, and shows draw progress on the perfroll. This function is called frequently and continuously. It will work for both perfedit windows, if both are up.

10.41.3.13 void seq64::perfedit::start_playing ( ) [inline], [private]

JACK will be used if it is present and, in the application, enabled. This call also sets rc().is_pattern_playing(true), indirectly. Note that, if the JACK-start-mode value is false, the perfedit's unmute/mute feature is disabled. We no longer hardwire the boolean parameter to "true". (We might reconsider that at some point.)

10.41.3.14 void seq64::perfedit::stop_playing ( ) [inline], [private]

This call also sets rc().is_pattern_playing(true).

10.41.4 Field Documentation

10.41.4.1 int seq64::perfedit::m_bpm [private]

Do not confuse it with BPM (beats per minute). The numerator of the time signature.

10.41.4.2 int seq64::perfedit::m_bw [private]

The denominator of the time signature.

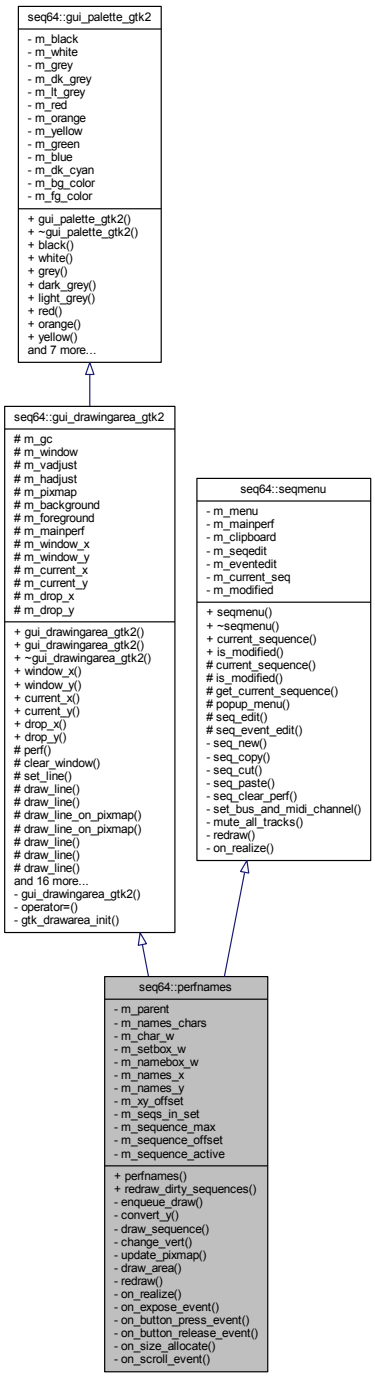
10.41.4.3 int seq64::perfedit::m_redraw_ms [private]

This is hardwired to 40 ms in Linux, and 20 ms in Windows.

10.42 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, perfedit &parent, Gtk::Adjustment &vadjust)

  Principal constructor for this user-interface object.

- void redraw_dirty_sequences ()

  Redraws sequences that have been modified.

Private Member Functions

- void enqueue_draw ()

  Wraps queue_draw() and forwards the call to the parent perfedit, so that it can forward it to any other perfedit that exists.
- 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.

Private Attributes

- perfedit & m_parent

  Provides a link to the perfedit that created this object.
- int m_names_chars

  Provides the number of the characters in the name box.
- int m_char_w

  Provides the "real" width of a character.
- int m_setbox_w

  Provides the width of the "set number" box.
- int m_namebox_w

  Provides the width of the "name" box.
- int m_names_x

  Provides the width of the names box, which is the width of a character for 24 characters.
- int m_names_y

  Provides the height of the names box, which is hardwired to 24 pixels.
- int m_xy_offset

  Provides the horizontal and vertical offsets of the text relative to the names box.

Additional Inherited Members

10.42.1 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).

10.42.2 Constructor & Destructor Documentation

10.42.2.1 seq64::perfnames::perfnames (perform & *p*, perfedit & *parent*, Gtk::Adjustment & *vadjust*)

Weird is that the window (x,y) are set to (c_names_x, 100), when c_names_y is 22 (now 24) in globals.h.

10.42.3 Member Function Documentation

10.42.3.1 void seq64::perfnames::enqueue_draw ( ) [private]

The parent perfedit will call perfnames::queue_draw() on behalf of this object, and it will pass a perfnames::enqueue_draw() to the peer perfedit's perfnames, if the peer exists.

10.42.3.2 void seq64::perfnames::draw_sequence (int *seqnum*) [private]

This function has to be prepared to handle an almost endless list of sequences, including unused ones, to draw them all with compatible styles. The sequences are grouped by set-number. The set-number occurs every 32 sequences in the leftmost column of the window.

10.42.3.3 void seq64::perfnames::on_realize ( ) [private]

It first calls the base-class version of on_realize(). Then it allocates any additional resources needed.

10.42.3.4 bool seq64::perfnames::on_expose_event (GdkEventExpose * *ev*) [private]

It draws all of the sequences.

10.42.3.5 void seq64::perfnames::on_size_allocate (Gtk::Allocation & *a*) [private]

It first calls the base-class version of this function.

10.42.4 Field Documentation

10.42.4.1 perfedit& seq64::perfnames::m_parent [private]

We want to support two perfedit windows, but the children of perfedit will have to communicate changes requiring a redraw through the parent.

10.42.4.2 int seq64::perfnames::m_names_chars [private]

Pretty much hardwired to 24 at present.

10.42.4.3 int seq64::perfnames::m_char_w [private]

This value is obtained from a font-renderer accessor function.

10.42.4.4 int seq64::perfnames::m_setbox_w [private]

This used to be hardwired to 6 ∗ 2 (character-width times two).

10.42.4.5 int seq64::perfnames::m_namebox_w [private]

This used to be a weird calculation based on character width.

10.42.4.6 int seq64::perfnames::m_names_y [private]

This value was once 22 pixels, but we need a little extra room for our new font. This extra room is compatible enough with the old font, as well.

10.42.4.7 int seq64::perfnames::m_xy_offset [private]

Currently hardwired.

10.43 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.
- bool is_modified () const

  'Getter' function for member m_is_modfied
- void modify ()

  'Setter' function for member m_is_modified This setter only sets the modified-flag to true.
- 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 clear_all ()

  Clears all of the patterns/sequences.

- void launch (int ppqn)

  Calls the MIDI buss and JACK initialization functions and the input/output thread-launching functions.

- void new_sequence (int seq)

  Creates a new pattern/sequence for the given slot, and sets the new pattern's master MIDI bus address.

- 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.

- void finish ()

  The rough opposite of launch(); it doesn't stop the threads.

- midipulse get_tick () const

  'Getter' function for member m_tick

- void set_left_tick (midipulse tick, bool setstart=true)

  Set the left marker at the given tick.

- midipulse get_left_tick () const

  'Getter' function for member m_left_tick

- void set_start_tick (midipulse tick)

  'Setter' function for member m_starting_tick

- midipulse get_starting_tick () const

  'Getter' function for member m_starting_tick

- void set_right_tick (midipulse tick, bool setstart=true)

  Set the right marker at the given tick.

- midipulse 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.

- void split_trigger (int seqnum, midipulse tick)

  Convenience function for perfroll's split-trigger functionality.

- midipulse get_max_trigger ()

  Locates the largest trigger value among the active sequences.

- void collapse ()

  Convenience function for perfedit's collapse functionality.
- void copy ()

  Convenience function for perfedit's copy functionality.
- void expand ()

  Convenience function for perfedit's expand functionality.
- midi_control & midi_control_toggle (int seq)

  Retrieves a reference to a value from m_midi_cc_toggle[].
- midi_control & midi_control_on (int seq)

  Retrieves a reference to a value from m_midi_cc_on[].
- midi_control & midi_control_off (int seq)

  Retrieves a reference to 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_screen_set_notepad (const std::string &note)

  Sets the notepad text for the current screen-set.
- void set_screenset (int ss)

  Sets the m_screenset value (the index or ID of the current screen set).
- int get_screenset () const

  'Getter' function for member m_screenset
- 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 on all of the active sequences, and sets the group mute flag, m_mute_group_selected, to the clamped g-mute value.
- 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)

  Makes some checks and sets the group mute flag, m_mute_group_selected, to the clamped g-mute value, if all goes well (no null sequences are encountered).
- 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_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.
- bool is_active (int seq)

  Checks the pattern/sequence for activity.
- 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 (midipulse tick)

  Plays all notes to the current tick.
- void set_orig_ticks (midipulse tick)

  For every pattern/sequence that is active, sets the "original ticks" value for the pattern.
- void set_beats_per_minute (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_beats_per_minute ()

  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 sequence_playing_on (int seq)

  Turn off the playing of a sequence, if it is active.
- void sequence_playing_off (int seq)

  Turn off the playing of a sequence, if it is active.
- void set_group_mute_state (int g_track, bool mute_state)

  This function sets the mute state of an element in the m_mute_group array.
- bool get_group_mute_state (int g_track)

The "inverse" of set_group_mute_state(), it gets the value of the desired track.

- 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().

- 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 Provides access to keys().show_ui_sequence_key().*

- bool show_ui_sequence_number () const

  ***Accessor** m_show_ui_sequency_number Provides access to keys().show_ui_sequence_number().*

- bool is_playing () const

  'Getter' function for member rc().is_pattern_playing() Provide a convenience function so that clients don't have to mess with a global variable when they're dealing with a perform object.

- void start_playing (bool jackflag=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_beats_per_minute ()

  Encapsulates some calls used in mainwnd.

- int increment_beats_per_minute ()

  Encapsulates some calls used in mainwnd.

- int decrement_screenset ()

  Encapsulates some calls used in mainwnd.

- int increment_screenset ()

  Encapsulates some calls used in mainwnd.

- bool highlight (const sequence &) const

  True if a sequence is empty and should be highlighted.

- bool is_smf_0 (const sequence &seq) const

  True if the sequence is an SMF 0 sequence.

- void sequence_key (int seq)

  Handle a sequence key to toggle the playing of an active pattern in the selected screen-set.

- std::string sequence_label (const sequence &seq)

  Provides a way to format the sequence parameters string for display in the mainwid or perfnames modules.

- void set_input_bus (int bus, bool input_active)

  Sets the input bus, and handles the special "key labels on sequence" and "sequence numbers 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

- 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.
- bool seq_in_playing_screen (int seq)

  A helper function for determining if the mode group is in force, the playing screenset is the same as the current screenset, and the sequence is in the range of the playing screenset.
- void is_modified (bool flag)

  'Setter' function for member m_is_modified This setter is private.
- bool is_midi_control_valid (int seq) const

  Checks the parameter against c_midi_controls.
- bool is_screenset_valid (int screenset) const

  Checks the screenset against m_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
- int mute_group_offset (int track)

  A helper function to calculate the index into the mute-group array, based on the desired track.
- 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.
- bool install_sequence (sequence *seq, int seqnum)

  A private helper function for add_sequence() and new_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.
- int clamp_track (int track) const

  Provides common code to keep the track value valid.
- void set_all_key_events ()

  Pass-along function for keys().set_all_key_events.
- void set_all_key_groups ()

  Pass-along function for keys().set_all_key_events.
- 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.

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.
- int m_playscreen_offset

  Playing screen sequence number offset.
- 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.
- int m_ppqn

  Holds the current PPQN for usage in various actions.
- midipulse m_one_measure

  *Holds the "one measure's worth" of pulses (ticks), which is normally m_ppqn * 4.*
- midipulse m_left_tick

  Holds the position of the left (L) marker, and it is first defined as 0.
- midipulse m_right_tick

  Holds the position of the right (R) marker, and it is first defined as the end of the fourth measure.
- midipulse m_starting_tick

  Holds the starting tick for playing.
- midipulse m_tick

  MIDI Clock support.
- bool m_usemidiclock

  More MIDI clock support.
- bool m_midiclockrunning

  More MIDI clock support.
- int m_midiclocktick

  More MIDI clock support.
- int m_midiclockpos

  More MIDI clock support.
- int m_seqs_in_set

  We will eventually replace c_seqs_in_set with this member, which defaults to the value of c_seqs_in_set.
- int m_max_sets

  A replacement for the c_max_sets constant.
- int m_sequence_count

  Keeps track of created sequences, whether or not they are active.
- int m_sequence_max

  A replacement for the c_max_sequence constant.
- bool m_is_modified

  It may be a good idea to eventually centralize all of the dirtiness of a performance here.
- condition_var m_condition_var

  A condition variable to protect...
- jack_assistant m_jack_asst

  A wrapper object for the JACK support of this application.

Static Private Attributes

- static midi_control sm_mc_dummy

  Provides a dummy, inactive midi_control object to handle out-of-range midi_control indicies.

Friends

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

  Global functions for JACK support and JACK sessions.

10.43.1 Detailed Description

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

10.43.2 Constructor & Destructor Documentation

10.43.2.1 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.

10.43.2.2 seq64::perform::~perform ( )

Finally, any active or inactive (but allocated) patterns/sequences are deleted, and their pointers nullified.

10.43.3 Member Function Documentation

10.43.3.1 void seq64::perform::modify ( ) [inline]

The setter that will, is_modified(), is private. No one but perfrom and its friends should falsify this flag.

10.43.3.2 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.

10.43.3.3 void seq64::perform::clear_all ( )

The mainwnd module calls this function. Note that perform now handles the "is modified" flag on behalf of all external objects, to centralize and simplify the dirtying of a MIDI tune.

Anything else to clear? What about all the other sequence flags? We can beef up delete_sequence() for them, at some point.

10.43.3.4 void seq64::perform::launch (int *ppqn*)

This function is called in main(). We collected all the calls here as a simplification, and renamed it because it is more than just initialization. This function must be called after the perform constructor and after the configuration file and command-line configuration overrides.

Parameters

ppqn	Provides the PPQN value, which is either the default value (192) or is read from the "user" configuration file.

10.43.3.5 void seq64::perform::new_sequence (int *seq*)

Then it activates the pattern [this is done in the install_sequence() function]. It doesn't deal with thrown exceptions.

This function is called by the seqmenu and mainwid objects to create a new sequence. We now pass this sequence to install_sequence() to better handle potential memory leakage, and to make sure the sequence gets counted. Also, adding a new sequence from the user-interface is a significant modification, so the "is modified" flag gtes set.

Parameters

seq	The prospective sequence number of the new sequence.

10.43.3.6 void seq64::perform::add_sequence (sequence * *seq*, int *prefnum*)

No check is made for a null pointer, but the install_sequence() call will make sure such a pointer is officially logged.

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 finish.

Finally, note that this function is used only by midifile, when reading in a MIDI song. Therefore, the "is modified" flag is *not* set by this function; loading a sequence from a file is not a modification that should lead to a prompt for saving the file later.

Todo Shouldn't we wrap around the sequence list if we can't find an empty sequence slot after prefnum?

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.

10.43.3.7 void seq64::perform::delete_sequence (int *seq*)

We now also solidify the deletion by setting the pointer to null after deletion, so it will blow up if accidentally accessed. The final act is to raise the "is modified" flag, since deleting an existing sequence is always a significant modification.

Now, this function obviously sets the "active" flag for the sequence to false. But there are a few other flags that are not modified; shouldn't we also falsify them here?

10.43.3.8 void seq64::perform::clear_sequence_triggers (int *seq*)

Parameters

seq	Provides the desired sequence. Hopefull, the is_active() function validates this value.

10.43.3.9 void seq64::perform::finish ( ) [inline]

A minor simplification for the main() routine, hides the JACK support macro.

10.43.3.10 void seq64::perform::set_left_tick (midipulse *tick*, bool *setstart* = true)

We let the caller determine if this setting is a modification. If the left tick is later than the right tick, the right tick is move to one measure past the left tick.

Todo The perform::m_one_measure member is currently hardwired to PPQN * 4.

Parameters

tick	The tick (MIDI pulse) at which to place the left tick. If the left tick is greater than or equal to the right tick, then the right ticked is moved forward by one "measure's length" (m_ppqn * 4) past the left tick.
setstart	If true (the default, and longstanding implicit setting), then the starting tick is also set to the left tick.

10.43.3.11 void seq64::perform::set_right_tick (midipulse *tick*, bool *setstart* = true)

This setting is made only if the tick parameter is at or beyond the first measure. We let the caller determine is this setting is a modification.

Parameters

tick	The tick (MIDI pulse) at which to place the right tick. If less than or equal to the left tick setting, then the left tick is backed up by one "measure's worth" (m_ppqn * 4) worth of ticks from the new right tick.
setstart	If true (the default, and longstanding implicit setting), then the starting tick is also set to the left tick, if that got changed.

10.43.3.12 void seq64::perform::move_triggers (bool *direction*)

Parameters

a_direction	Specifies the desired direction; false = left, true = right.

10.43.3.13 void seq64::perform::copy_triggers ( )

This copies the triggers between the L marker and R marker to the R marker.

10.43.3.14 void seq64::perform::push_trigger_undo ( )

Too bad we cannot yet keep track of all the undoes for the sake of properly handling the "is modified" flag.

10.43.3.15 midipulse 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?

10.43.3.16 midi_control & seq64::perform::midi_control_toggle (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.

10.43.3.17 midi_control & seq64::perform::midi_control_on (int *seq*)

Parameters

seq	Provides a control value (such as c_midi_control_bpm_up) to use to retrieve the desired midi_control object.

10.43.3.18 midi_control & seq64::perform::midi_control_off (int *seq*)

Parameters

seq	Provides a control value (such as c_midi_control_bpm_up) to use to retrieve the desired midi_control object.

10.43.3.19 void seq64::perform::handle_midi_control (int *ctrl,* bool *state*)

Parameters

ctrl	The MIDI control value to use to perform an operation.
state	The state of the control, used with: - c_midi_control_mod_replace - c_midi_control_mod_snapshot - c_midi_control_mod_queue - c_midi_control_mod_gmute - c_midi_control_mod_glearn

10.43.3.20 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.

10.43.3.21 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.

10.43.3.22 void seq64::perform::set_screenset (int *ss*)

It's not clear that we need to set the "is modified" flag just because we changed the screen set.

Parameters

ss	The index of the desired string set. It is forced to range from 0 to m_max_sets - 1.

10.43.3.23 void seq64::perform::set_playing_screenset ( )

For each value up to m_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. Null sequences are no longer flagged as an error, they are just ignored.

Modifies m_playing_screen, and mutes the group tracks.

10.43.3.24 void seq64::perform::select_group_mute (int *a_g_mute*)

Null sequences are no longer flagged as an error, they are just ignored.

Parameters

a_g_mute	The number of the mute group, clamped to be between 0 and m_seqs_in_set-1.

10.43.3.25 void seq64::perform::unset_mode_group_learn ( )

Then unsets the group-learn mode flag.

10.43.3.26 void seq64::perform::select_mute_group (int *a_group*)

Null sequences are no longer flagged as an error, they are just ignored.

Will need to study this one more closely.

Parameters

a_group	Provides the group to mute. Note that this parameter is essentially a track or sequence number.

10.43.3.27 void seq64::perform::start (bool *state*)

Parameters

state	What does this state mean?

10.43.3.28 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?

10.43.3.29 void seq64::perform::position_jack (bool *state*)

If we run "klick -j -P" and then start Sequencer64, we get:

```
klick: src/metronome_jack.cc:52: virtual void
MetronomeJack::process_callback(sample_t*, nframes_t): Assertion
'pos.beat > 0 && pos.beat <= pos.beats_per_bar' failed.
```

Let's try enabling the relocate parameter if we're JACK Master. This removes the error from klick, but it clicks at an extremely fast rate!

10.43.3.30 void seq64::perform::all_notes_off ( )

Then flush the MIDI buss.

10.43.3.31 void seq64::perform::set_active (int *seq*, bool *active*)

If setting it active, the sequence::number() setter is called. It won't modify the sequence's internal copy of the sequence number if it has already been set.

Parameters

seq	Provides the prospective sequence number.
active	True if the sequence is to be set to the active state.

10.43.3.32 void seq64::perform::set_was_active (int *seq*)

Why do we need this routine?

Parameters

seq	The pattern number. It is checked for invalidity.

10.43.3.33 bool seq64::perform::is_dirty_main (int *seq*)

See the sequence::is_dirty_main() function.

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.

10.43.3.34 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.

10.43.3.35 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.

10.43.3.36 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.

10.43.3.37 bool seq64::perform::is_active (int *seq*) [inline]

Todo We should have the sequence object keep track of its own activity and access that via a reference or pointer.

Parameters

seq	The pattern number. It is checked for invalidity. This can lead to "too many" (i.e. redundant) checks, but we're trying to centralize such checks in this function.

Returns

Returns the value of the active-flag, or false if the sequence was invalid or null.

10.43.3.38 sequence* seq64::perform::get_sequence (int *seq*) [inline]

Parameters

seq	The prospective sequence number.

Returns

Returns the value of m_seqs[seq] if seq is valid. Otherwise, a null pointer is returned.

10.43.3.39 void seq64::perform::reset_sequences ( )

Note that these calls could be folded into one member function of the sequence class.

Finally, flush the MIDI buss.

10.43.3.40 void seq64::perform::play (midipulse *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.

10.43.3.41 void seq64::perform::set_orig_ticks (midipulse *tick*)

Parameters

tick	

10.43.3.42 void seq64::perform::set_beats_per_minute (int *bpm*)

Replaces perform::set_bpm() from seq24.

The value is set only if neither JACK nor this performance object are running.

It's not clear that we need to set the "is modified" flag just because we changed the beats per minute. Does this setting get saved to the MIDI file?

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.

10.43.3.43 void seq64::perform::set_sequence_control_status (int *status*)

Then the given status is OR'd into the m_control_status.

10.43.3.44 void seq64::perform::unset_sequence_control_status (int *status*)

Then the given status is reversed in m_control_status.

10.43.3.45 void seq64::perform::sequence_playing_on (int *seq*)

Parameters

seq	The number of the sequence to be turned on.

10.43.3.46 void seq64::perform::sequence_playing_off (int *seq*)

Parameters

seq	The number of the sequence to be turned off.

10.43.3.47 void seq64::perform::set_group_mute_state (int *gtrack*, bool *muted*)

The index value is the track number offset by the number of the selected mute group (which seems equivalent to a set number) times the number of sequences in a set.

Parameters

gtrack	The number of the track to be muted/unmuted.
muted	This boolean indicates the state to which the track should be set.

10.43.3.48 bool seq64::perform::get_group_mute_state (int *gtrack*)

Parameters

gtrack	The number of the track for which the state is to be obtained. Like set_group_mute_state(), this value is offset by adding m_mute_group_selected ∗ m_seqs_in_set.

Returns

Returns the value of m_mute_group[gtrack + set offset]

10.43.3.49 void seq64::perform::output_func ( )

This function is called by the free function output_thread_func(). Here's how it works:

```
-   It runs while m_outputing is true.
-   MORE TO COME
```

Change Note ca 2016-01-26 Hurray, seq24 is coming back to life! We see that there is a fix for clock tick drift here, which relies on using long and long long values. See the Changelog for seq24 0.9.3.

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.

10.43.3.50 void seq64::perform::set_offset (int *offset*) [inline]

Sets m_offset = offset ∗ c_mainwnd_rows ∗ c_mainwnd_cols;

Parameters

offset	The desired offset.

10.43.3.51 void seq64::perform::save_playing_state ( )

Inactive patterns get the value set to false.

10.43.3.52 bool seq64::perform::show_ui_sequence_key ( ) const [inline]

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

10.43.3.53 bool seq64::perform::show_ui_sequence_number ( ) const [inline]

Used in mainwid, optionsfile, and perform.

10.43.3.54 void seq64::perform::start_playing (bool *jackflag* = false)

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.

Note that the complementary function, stop_playing(), is an inline function defined in the header file.

Note

It would be nice to know why the following code snippet disables the mute/unmute functionality of the performance/song editor:

```
    position_jack(false);
    start_jack();
    start(false);

The jack_assistant::position() function doesn't use the boolean
parameter at present; that code is effectively disabled.

Okay, now it does, if the "relocate" parameter is true.  See
perform::position_jack() and jack_assistant::position().  This
parameter, when true, allows the "klick" application to get
proper position data.

The perform::start() function passes its boolean flag to
perform::inner_start(), which sets the playback mode to that flag; if
that flag is false, that turns off "song" mode.  So that explains why
mute/unmute is disabled.
```

Parameters

flag	Indicates if the caller wants to start the playback in JACK mode. In the seq42 (yes, "42", not "24") code at GitHub, this flag was identical to the "global_jack_start_mode" flag, which is true for Song Mode, and false for Live Mode. False disables Song Mode.

10.43.3.55 int seq64::perform::decrement_beats_per_minute ( ) [inline]

Actually does a lot of work in those function calls.

10.43.3.56 int seq64::perform::increment_beats_per_minute ( ) [inline]

Actually does a lot of work in those function calls.

10.43.3.57 bool seq64::perform::highlight (const sequence &) const [inline]

This setting is currently a build-time option, but could be made a run-time option later.

10.43.3.58 std::string seq64::perform::sequence_label (const sequence & *seq*)

This string goes on the bottom-left of those user-interface elements.

The format of this string is something like the following example, depending on the "show sequence numbers" option. The values shown are, in this order, sequence number (if allowed), buss number, channel number, beats per bar, and beat width.

```
No sequence number:     31-16 4/4
Sequence number:        9  31-16 4/4
```

```
The sequence number and buss number are re 0, while the channel number is
displayed re 1, unless it is an SMF 0 null channel (0xFF), in which case
it is 0.
```

Note

Later, we could add the sequence hot-key to this string, though showing that is not much use in perfnames. Also, this function is a stilted mix of direct access and access through sequence number.

Parameters

seq	Provides the reference to the sequence, use for getting the sequence parameters to be written to the label string.

Returns

Returns the filled in label if the sequence is active. Otherwise, an empty string is returned.

10.43.3.59 void seq64::perform::set_input_bus (int *bus,* bool *active*)

This function is called by options::input_callback().

Tricky Code See the bus parameter. We should provide two separate functions for this feature, but it is already combined into one input-callback function with a lot of other functionality in the options module.

Parameters

bus	If this value is greater than SEQ64_DEFAULT_BUSS_MAX (32), then it is treated as a user-interface flag (PERFORM_KEY_LABELS_ON_SEQUENCE or PERFORM_NUM_LABEL↩ S_ON_SEQUENCE) that causes all the sequences to be dirtied, and thus get redrawn iwht the new user-interface setting.
active	Indicates whether the buss or the user-interface feature is active or inactive.

10.43.3.60 bool seq64::perform::mainwnd_key_event (const keystroke & *k*)

Returns

Returns true if the key was handled.

10.43.3.61 bool seq64::perform::perfroll_key_event (const keystroke & *k,* int *drop_sequence*)

The "is modified" flag is raised if something is deleted, but we cannot yet handle the case where we undo all the changes. So, for now, we play it safe with the user, even if the user gets annoyed because he knows that he undid all the changes.

Returns

Returns true if the key was handled.

10.43.3.62 void seq64::perform::launch_input_thread ( ) [private]

This might be a good candidate for a small thread class derived from a small base class.

10.43.3.63 void seq64::perform::launch_output_thread ( ) [private]

This might be a good candidate for a small thread class derived from a small base class.

10.43.3.64 void seq64::perform::init_jack ( ) [inline], [private]

Who calls this routine? The main() routine of the application [via launch()], and the options module, when the Connect button is pressed.

10.43.3.65 void seq64::perform::deinit_jack ( ) [inline], [private]

Called by launch() and in the options module, when the Disconnect button is pressed.

10.43.3.66 bool seq64::perform::seq_in_playing_screen (int *seq*) [private]

Parameters

seq	Provides the index of the desired sequence.

Returns

Returns true if the sequence adheres to the conditions noted above.

10.43.3.67 void seq64::perform::is_modified (bool *flag*) [inline], [private]

The modify() setter, which is public, can only set m_is_motified to true.

10.43.3.68 bool seq64::perform::is_midi_control_valid (int *seq*) const [inline], [private]

Parameters

seq	The value that should be in the c_midi_controls range.

Returns

Returns true if the parameter is valid. For this function, no error print-out is generated.

10.43.3.69 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.

10.43.3.70 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.

10.43.3.71 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.

10.43.3.72 bool 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. It does not set the "is modified" flag, since adding a sequence by loading a MIDI file should not set it. Compare new_sequence(), used by mainwid and seqmenu, with add_sequence(), used by midifile.

Parameters

seq	The pointer to the pattern/sequence to add.
seqnum	The sequence number of the pattern to be added.

Returns

Returns true if a sequence was removed, or the sequence was successfully added. In other words, if a real change in sequence pointers occurred. It is up to the caller to decide if the change warrants setting the "is modified" flag.

10.43.3.73 void seq64::perform::inner_start (bool *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.

10.43.3.74 int seq64::perform::clamp_track (int *track*) const [inline], [private]

Note the bug we found, where we checked for track > m_seqs_in_set, but set it to m_seqs_in_set - 1 in that case!

10.43.3.75 void seq64::perform::set_key_event (unsigned int *keycode,* long *sequence_slot*) [inline], [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.

10.43.3.76 void seq64::perform::set_key_group (unsigned int *keycode,* long *group_slot*) [inline], [private]

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window. Compare it to the set_key↩ _events() function.

10.43.4 Field Documentation

10.43.4.1 midi_control seq64::perform::sm_mc_dummy [static], [private]

Instantiate the dummy midi_control object, which is used in lieu of a null pointer.

We're taking code that basically works already, in the sense that it never seems to access a null pointer. So we're not even risking data transfers between this dummy object and the ones we really want to use.

10.43.4.2 int seq64::perform::m_playscreen_offset [private]

Saves some multiplications, should make the code easier to grok, and centralizes the use of c_seqs_in_set, which we want to be able to change at run-time, as a future enhancement.

10.43.4.3 sequence* seq64::perform::m_seqs[c_max_sequence] [private]

Todo First, make the sequence array a vector, and second, put allof these flags into a structure and access those members indirectly.

10.43.4.4 bool seq64::perform::m_playback_mode [private]

There are two, "live" and "song", indicated by the following values:

```
m_playback_mode == false:       live mode
m_playback_mode == true:        playback/song mode
```

10.43.4.5 midipulse seq64::perform::m_one_measure [private]

We can save some multiplications, and, more importantly, later define a more flexible definition of "one measure's worth" than simply four quarter notes.

10.43.4.6 midipulse seq64::perform::m_left_tick [private]

Note that "tick" is actually "pulses".

10.43.4.7 midipulse seq64::perform::m_right_tick [private]

Note that "tick" is actually "pulses".

10.43.4.8 midipulse seq64::perform::m_starting_tick [private]

By default, this value is always reset to the value of the "left tick". We want to eventually be able to leave it at the last playing tick, to support a "pause" functionality. Note that "tick" is actually "pulses".

10.43.4.9 midipulse seq64::perform::m_tick [private]

The m_tick member holds the tick to be used in displaying the progress bars and the maintime pill.

10.43.4.10 int seq64::perform::m_seqs_in_set [private]

This change will require some arrays to be dynamically allocated (vectors).

10.43.4.11 int seq64::perform::m_max_sets [private]

Again, currently set to the old value, which is used in hard-wired array sizes. To make it variable will require a move from arrays to vectors.

10.43.4.12 int seq64::perform::m_sequence_count [private]

Used by the install_sequence() function.

10.43.4.13 int seq64::perform::m_sequence_max [private]

However, this value is already 32 * 32 = 1024, and is probably enough for any usage. Famous last words?

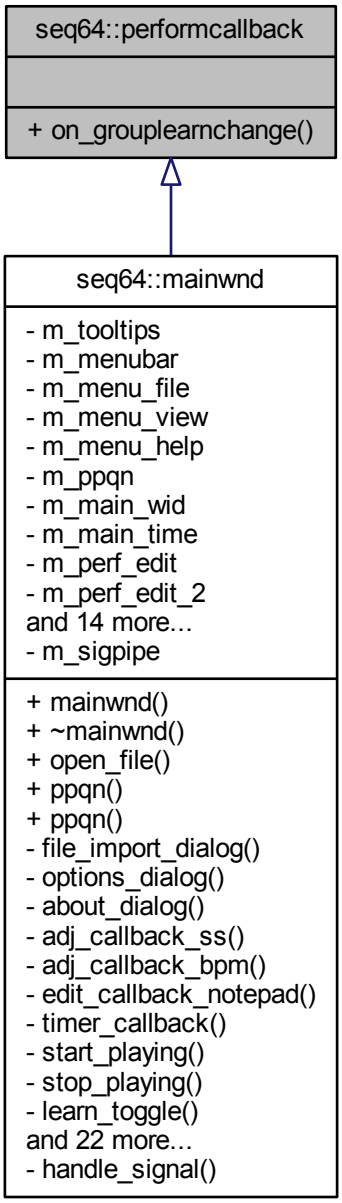
10.43.4.14 bool seq64::perform::m_is_modified [private]

All the GUIs seem to use a perform object. IN PROGRESS.

10.44 seq64::performcallback Struct Reference

Provides for notification of events.

Inheritance diagram for seq64::performcallback:



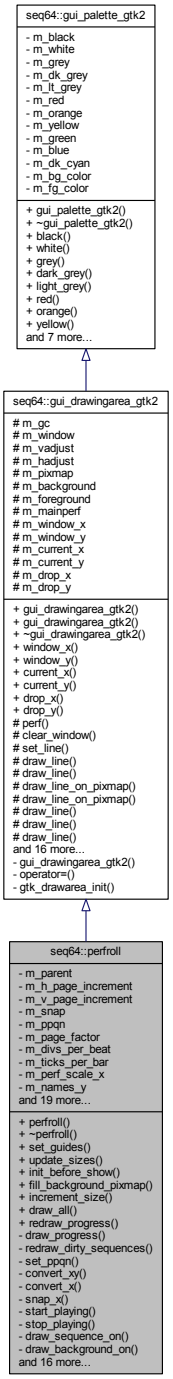
10.44.1 Detailed Description

Provide a response to a group-learn change event.

10.45 seq64::perfroll Class Reference

This class implements the performance roll user interface.

Inheritance diagram for seq64::perfroll:



Public Member Functions

- perfroll (perform &perf, perfedit &parent, Gtk::Adjustment &hadjust, Gtk::Adjustment &vadjust, int ppqn=S↩ EQ64_USE_DEFAULT_PPQN)

  Principal constructor.

- ~perfroll ()

  This destructor deletes the interaction object.

- void set_guides (int snap, int measure, int beat)

  This function sets the m_snap, m_measure_length, and m_beat_length members directly from the function parameters, which are in units of pulses (sometimes misleadingly called "ticks".)
- 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_all ()

  Provides a very common sequence of calls used in perfroll_input.
- void redraw_progress ()

  Helper function to simplify the client call.

Private Member Functions

- 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 set_ppqn (int ppqn)

  Handles changes to the PPQN value in one place.
- void convert_xy (int x, int y, midipulse &ticks, int &seq)

  Converts a tick-offset....
- void convert_x (int x, midipulse &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 (int seqnum)

  Draws the given pattern/sequence on the given drawable area.
- void draw_background_on (int seqnum)

  Draws the given pattern/sequence background on the given drawable area.
- void draw_drawable_row (long 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 sequence, midipulse tick)

  Splits a trigger, whatever that means.
- void enqueue_draw ()

  Wraps queue_draw() and forwards the call to the parent perfedit, so that it can forward it to any other perfedit that exists.
- void on_realize ()

  Provides the on-realization callback.

- bool on_expose_event (GdkEventExpose *ev)

  Handles the on-expose event.
- bool on_button_press_event (GdkEventButton *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 *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 *ev)

  Handles motion notification by forwarding it to the interaction object's motion-notification callback function.
- bool on_scroll_event (GdkEventScroll *ev)

  Handles horizontal and vertical scrolling.
- bool on_focus_in_event (GdkEventFocus *ev)

  This callback handles an in-focus event by setting the flag to HAS_FOCUS.
- bool on_focus_out_event (GdkEventFocus *ev)

  This callback handles an out-of-focus event by resetting the flag HAS_FOCUS.
- void on_size_allocate (Gtk::Allocation &al)

  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 *ev)

  This callback function handles a key-press event.
- void on_size_request (GtkRequisition *)

  This do-nothing callback effectively throws away a size request.

Private Attributes

- perfedit & m_parent

  Provides a link to the perfedit that created this object.
- int m_h_page_increment

  Provides the horizontal page increment for the horizontal scrollbar.
- int m_v_page_increment

  Provides the vertical page increment for the vertical scrollbar.
- FruityPerfInput m_fruity_interaction

  We need both styles of interaction object present.
- Seq24PerfInput m_seq24_interaction

  Provides support for standard Seq24 mouse handling, plus the keystroke handlers.

Friends

- class FruityPerfInput

  These friend implement interaction-specific behavior, although only the Seq24 interactions support keyboard processing, except for some common functionality provided by perform::perfroll_key_event().

Additional Inherited Members

10.45.1 Constructor & Destructor Documentation

10.45.1.1 seq64::perfroll::~perfroll ( )

Well, now there are two objects, so no explicit deletion necessary.

10.45.2 Member Function Documentation

10.45.2.1 void seq64::perfroll::set_guides (int *snap,* int *measure,* int *beat*)

This function then fills in the background, and queues up a draw operation.

Parameters

snap	Provides the number of snap-pulses (pulses per snap interval) as calculated in perfedit::set_guides(). This is actually equal to the measure-pulses divided by the snap value in perfedit; the snap value defaults to 8.
measure	Provides the number of measure-pulses (pulses per measure) as calculated in perfedit::set_guides().
beat	Provides the number of beat-pulses (pulses per beat) as calculated in perfedit::set_guides().

10.45.2.2 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_beat", see its
definition in the class initializer list.
```

10.45.2.3 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.

10.45.2.4 void seq64::perfroll::fill_background_pixmap ( )

This first thing done is to clear the background by painting it with a filled white rectangle.

10.45.2.5 void seq64::perfroll::set_ppqn (int *ppqn*) [private]

The m_ticks_per_bar member replaces the global ppqn times 16. This construct is parts-per-quarter-note times 4 quarter notes times 4 sixteenth notes in a bar. (We think...)

The m_perf_scale_x member starts out at c_perf_scale_x, which is 32 ticks per pixel at the default tick rate of 192 PPQN. We adjust this now. But note that this calculation still involves the c_perf_scale_x constant.

10.45.2.6 void seq64::perfroll::convert_xy (int *x*, int *y*, midipulse & *d_tick*, int & *d_seq*) [private]

The results are returned via the d_tick and d_seq parameters.

10.45.2.7 void seq64::perfroll::convert_x (int *x*, midipulse & *tick*) [private]

The result is returned via the tick parameter.

10.45.2.8 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.

10.45.2.9 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(). Note that we no longer pass "true" as the playback parameter, instead using the global JACK-start-mode flag. (We might reconsider that, later.)

Note

The old behavior was to call this function with true, I believe, which means that starting the song from the performance window forces playback to use the song/performance mode.

10.45.2.10 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().

10.45.2.11 void seq64::perfroll::draw_sequence_on (int *seqnum*) [private]

Statement nesting from hell!

10.45.2.12 void seq64::perfroll::draw_drawable_row (long *y*) [private]

It is involved in the drawing of a greyed (selected) row.

What's weird is that we divide y by m_names_y, then multiply it by m_names_y, before passing the result to draw↩_drawable(). However, if we just as y casted to an int, then the drawing of the row is only partial, vertically.

10.45.2.13 void seq64::perfroll::enqueue_draw ( ) [private]

The parent perfedit will call perfroll::queue_draw() on behalf of this object, and it will pass a perfroll::enqueue_draw() to the peer perfedit's perfroll, if the peer exists.

10.45.2.14 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.

10.45.2.15 bool seq64::perfroll::on_expose_event (GdkEventExpose * *ev*) [private]

Returns

Always returns true.

10.45.2.16 bool seq64::perfroll::on_button_press_event (GdkEventButton * *ev*) [private]

This gives us Seq24 versus Fruity behavior.

One minor issue: Fruity behavior doesn't yet provide the keystroke behavior we now handle for the Seq24 mode of operation.

10.45.2.17 bool seq64::perfroll::on_button_release_event (GdkEventButton * *ev*) [private]

This gives us Seq24 versus Fruity behavior.

10.45.2.18 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. Note that we pass the functionality on to the perform::perfroll_key_event() function for the handling of delete, cut, copy, paste, and undo operations. If the keystroke is not handled by that function, then we handle it here.

Note that only the Seq24 input interaction object handles additional keystrokes not handled by the perfroll_key_↩ event() function.

10.45.3 Friends And Related Function Documentation

10.45.3.1 friend class FruityPerfInput [friend]

The perfedit class needs access to the private enqueue_draw() function.

10.45.4 Field Documentation

10.45.4.1 perfedit& seq64::perfroll::m_parent [private]

We want to support two perfedit windows, but the children of perfedit will have to communicate changes requiring a redraw through the parent.

10.45.4.2 int seq64::perfroll::m_h_page_increment [private]

It was set to 1, the same as the step increment. That is too little. This value will be set to 4, for now. Might be a useful "user" configuration option.

10.45.4.3 int seq64::perfroll::m_v_page_increment [private]

It was set to 1, the same as the step increment. That is too little. This value will be set to 8, for now. Might be a useful "user" configuration option.

10.45.4.4 FruityPerfInput seq64::perfroll::m_fruity_interaction [private]

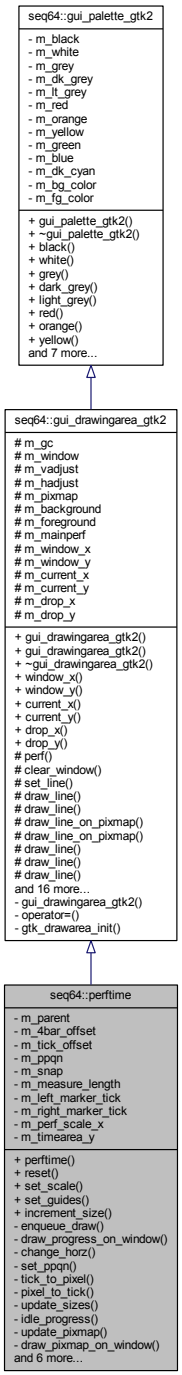
Even if the user specifies the fruity interaction, the Seq24 interaction is still needed to handle our new keystroke support for the perfroll. We need both objects to exist all the time, similar to the Fruity/Seq24 roles in the seqroll object.

Obsolete AbstractPerfInput * m_interaction

10.46 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, perfedit &parent, Gtk::Adjustment &hadjust, int ppqn=SEQ64_USE_DEFAULT_P↩ PQN)

Principal constructor.

- void set_guides (int snap, int measure)

  Sets the m_snap value and the m_measure_length members directly from the function parameters, which are in units of pulses (sometimes misleadingly called "ticks".)
- void increment_size ()

  This function does nothing.

Private Member Functions

- void enqueue_draw ()

  Wraps queue_draw() and forwards the call to the parent perfedit, so that it can forward it to any other perfedit that exists.
- void change_horz ()

  Change the m_4bar_offset and queue a draw operation.
- void set_ppqn (int ppqn)

  Handles changes to the PPQN value in one place.
- long tick_to_pixel (midipulse tick)

  Common calculation to convert a pulse/tick value to a perftime x value.
- midipulse pixel_to_tick (long pixel)

  The inverse of tick_to_pixel().
- 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.

Private Attributes

- perfedit & m_parent

  Provides a link to the perfedit that created this object.
- int m_4bar_offset

  Not yet sure exactly what this member represents.
- int m_tick_offset

  This member is m_4bar_offset times 16 times the current PPQN, to save some calculations and centralize this value.
- int m_ppqn

  The current value of PPQN, which we are trying to get to work everywhere, when PPQN is changed from the global ppqn = 192.
- int m_snap

Snap value, starts out very small, equal to m_ppqn.

- int m_measure_length

  Provides the length of a measure in pulses or ticks.

- int m_left_marker_tick

  Holds the current location of the left (L) marker when arrow movement is in force.

- int m_right_marker_tick

  Holds the current location of the right (R) marker when arrow movement is in force.

- int m_perf_scale_x

  A class version of the global c_perf_scale_x factor.

- int m_timearea_y

  A class version of the global c_timerarea_y factor.

Additional Inherited Members

10.46.1 Constructor & Destructor Documentation

10.46.1.1 seq64::perftime::perftime (perform & *p*, perfedit & *parent*, Gtk::Adjustment & *hadjust*, int *ppqn* = SEQ64_USE_DEFAULT_PPQN)

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.

10.46.2 Member Function Documentation

10.46.2.1 void seq64::perftime::set_guides (int *snap*, int *measure*)

This function then fills in the background, and queues up a draw operation.

Parameters

snap	Provides the number of snap-pulses (pulses per snap interval) as calculated in perfedit::set_guides(). This is actually equal to the measure-pulses divided by the snap value in perfedit; the snap value defaults to 8.
measure	Provides the number of measure-pulses (pulses per measure) as calculated in perfedit::set_guides().

10.46.2.2 void seq64::perftime::enqueue_draw ( ) [private]

The parent perfedit will call perftime::queue_draw() on behalf of this object, and it will pass a perftime::enqueue_draw() to the peer perfedit's perftime, if the peer exists.

10.46.2.3 void seq64::perftime::on_realize ( ) [private]

It is important to call the base-class version of this function.

Done in base-class's on_realize() and in its constructor now.

```
m_window = get_window();
m_gc = Gdk::GC::create(m_window);
m_window->clear();
set_size_request(10, m_timearea_y);
```

10.46.2.4 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.

10.46.3 Field Documentation

10.46.3.1 perfedit& seq64::perftime::m_parent [private]

We want to support two perfedit windows, but the children of perfedit will have to communicate changes requiring a redraw through the parent.

10.46.3.2 int seq64::perftime::m_measure_length [private]

This value is m_ppqn * 4, though eventually we want to employ a more flexible representation of measure length.

10.46.3.3 int seq64::perftime::m_left_marker_tick [private]

Otherwise it is -1.

10.46.3.4 int seq64::perftime::m_right_marker_tick [private]

Otherwise it is -1.

10.47 seq64::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 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.
- bool auto_option_save () const
  ***Accessor** m_auto_option_save*
- 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 with_jack () const

  Accessor *m_with_jack_transport m_with_jack_master, and m_with_jack_master_cond, to save client code some trouble.*
- 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

- std::string home_config_directory () const

  Provides the directory for the configuration file, and also creates the directory if necessary.

Private Attributes

- std::string m_filename

  Provides the name of current MIDI file.

10.47.1 Member Function Documentation

10.47.1.1 std::string seq64::rc_settings::home_config_directory ( ) const [private]

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.

10.48 seq64::rect Class Reference

A small helper class representing a rectangle.

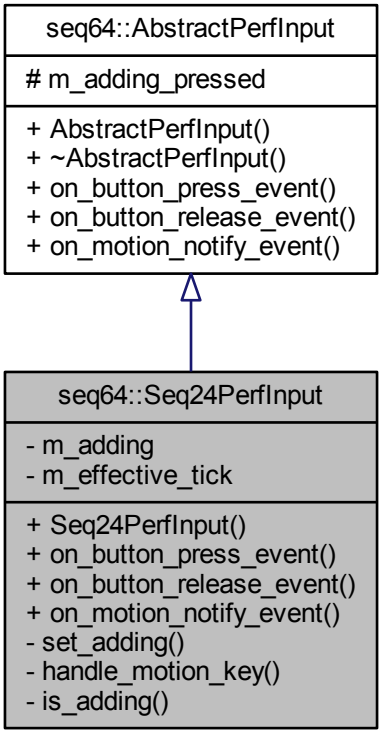
10.49 seq64::gui_drawingarea_gtk2::rect Struct Reference

A small helper structure representing a rectangle.

10.50 seq64::Seq24PerfInput Class Reference

Implements the default (Seq24) 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.

- bool handle_motion_key (bool is_left, perfroll &roll)

  Handles the keystroke motion-notify event for moving a pattern back and forth in the performance.
- bool is_adding () const

  'Getter' function for member m_adding

Private Attributes

- bool m_adding

  Indicates we are in the middle of adding a sequence segment to the performance.
- midipulse m_effective_tick

  The current tick for the current segment?

10.50.1 Member Function Documentation

10.50.1.1 bool seq64::Seq24PerfInput::on_button_press_event (GdkEventButton * *ev*, perfroll & *roll*) [virtual]

Is there any easy way to use ctrl-left-click as the middle button here?

Returns

Returns true if a modification occurred.

Implements seq64::AbstractPerfInput.

10.50.1.2 bool seq64::Seq24PerfInput::on_button_release_event (GdkEventButton * *ev*, perfroll & *roll*) [virtual]

Any use for the middle-button or ctrl-left-click we can add?

Returns

Returns true if any modification occurred.

Implements seq64::AbstractPerfInput.

10.50.1.3 bool seq64::Seq24PerfInput::on_motion_notify_event (GdkEventMotion * *ev*, perfroll & *roll*) [virtual]

Returns

Returns true if a modification occurs. This function used to always return true.

Implements seq64::AbstractPerfInput.

10.50.1.4 void seq64::Seq24PerfInput::set_adding (bool *adding*, perfroll & *roll*) [private]

What does it mean?

10.50.1.5 bool seq64::Seq24PerfInput::handle_motion_key (bool *is_left*, perfroll & *roll*) [private]

What happens when the mouse is used to drag the pattern is that, first, roll.m_drop_tick is set by left-clicking into the pattern to select it. As the pattern is dragged, the drop-tick value does not change, but the tick (converted from the moving x value) does.

Then the button-handler sets roll.m_moving = true, and calculates roll.m_drop_tick_trigger_offset = roll.m_drop_tick - p.get_sequence(dropseq)->selected_trigger_start();

The motion handler sees that roll.m_moving is true, gets the new tick value from the new x value, offsets it, and calls p.get_sequence(dropseq)->move_selected_triggers_to(tick, true).

When the user releases the left button, then roll.m_growing is turned of and the roll draw_all()'s.

Parameters

is_left	False denotes the right arrow key, and true denotes the left arrow key.
roll	Provides a reference to the parent roll, which keeps track of most of the information about the status of the window.

Returns

Returns true if there was some action able to happen that would necessitate a window update. We've updated triggers::move_selected() [called indirectly near the end of this routine] to return false if no more movement could be made. This prevents this routine from moving way ahead after movement of the selected (in the user-interface) trigger stops.

10.51 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.

10.51.1 Member Function Documentation

10.51.1.1 void seq64::Seq24SeqEventInput::set_adding (bool *adding,* seqevent & *seqev*)

Modifies m_adding as well.

10.51.1.2 bool seq64::Seq24SeqEventInput::on_button_press_event (GdkEventButton * *a_ev,* seqevent & *seqev*)

Set values for dragging, then reset the box that holds dirty redraw spot. Then do the rest.

Returns

Returns true if a likely modification was made. This function used to return true all the time.

Needs update. seqev.m_seq.unselect(); ???????

10.51.1.3 bool seq64::Seq24SeqEventInput::on_button_release_event (GdkEventButton * *a_ev,* seqevent & *seqev*)

Returns

Returns true if a likely modification was made. This function used to return true all the time.

10.51.1.4 bool seq64::Seq24SeqEventInput::on_motion_notify_event (GdkEventMotion * *a_ev,* seqevent & *seqev*)

Returns

Returns true if a likely modification was made. This function used to return true all the time.

10.52 seq64::Seq24SeqRollInput Class 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)

  Seq24-style on-motion mouse interaction.

10.52.1 Member Function Documentation

10.52.1.1 void seq64::Seq24SeqRollInput::set_adding (bool *adding,* seqroll & *sroll*)

What calls this? It is actually a right click.

10.52.1.2 bool seq64::Seq24SeqRollInput::on_button_press_event (GdkEventButton * *ev,* seqroll & *sroll*)

This function now uses the needs_update flag to determine if the perform object should modify().

Returns

Returns the value of needs_update. It used to return only true.

10.52.1.3 bool seq64::Seq24SeqRollInput::on_button_release_event (GdkEventButton * *ev,* seqroll & *sroll*)

This function now uses the needs_update flag to determine if the perform object should modify().

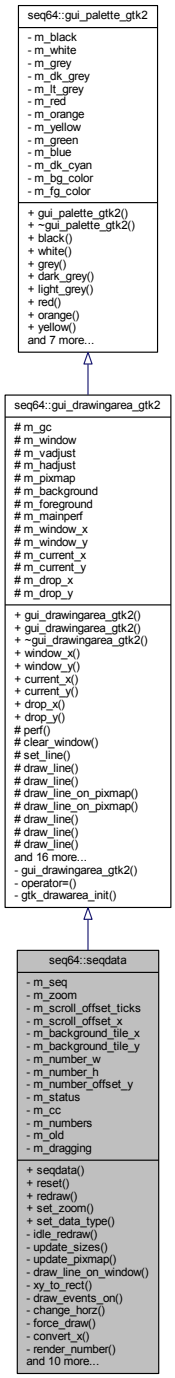
Returns

Returns the value of needs_update. It used to return only true.

10.53 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 (midibyte status, midibyte control)

  Sets the status to the given value, and the control to the optional given value, which defaults to 0, then calls redraw().

Private Member Functions

- int idle_redraw ()

  Draws events on this object's built-in window and pixmap.

- 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 the data window.

- void xy_to_rect (int x1, int y1, int x2, int y2, int &rx, int &ry, int &rw, int &rh)

  This function takes two points, and returns an Xwin rectangle, returned via the last four parameters.

- void draw_events_on (Glib::RefPtr< Gdk::Drawable > drawable)

  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, midipulse &tick)

  This function takes screen coordinates, and gives the horizontaol tick value based on the current zoom, returned via the second parameter.

- void render_number (Glib::RefPtr< Gdk::Pixmap > &pixmap, int x, int y, const char *const num)

  Convenience function for rendering numbers.

- 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 *ev)

  Implements the on-expose event.

- bool on_button_press_event (GdkEventButton *ev)

  Implement a button-press event.

- bool on_button_release_event (GdkEventButton *ev)

  Implement a button-release event.

- bool on_motion_notify_event (GdkEventMotion *ev)

  Handles a motion-notify event.

- bool on_leave_notify_event (GdkEventCrossing *ev)

  Handles an on-leave notification event.

- bool on_scroll_event (GdkEventScroll *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
- int m_number_w

  The adjusted width of a digit in a data number.
- int m_number_h

  The adjusted height of all digits in a data number.
- int m_number_offset_y

  A new value to make it easier to adapt the vertical number drawing of a data item's numeric value to a different font.
- midibyte m_status

  What is the data window currently editing?

Additional Inherited Members

10.53.1 Constructor & Destructor Documentation

10.53.1.1 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.

10.53.2 Member Function Documentation

10.53.2.1 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.

10.53.2.2 void seq64::seqdata::set_zoom (int *zoom*)

This begs the question, do we have GUI access to the zoom setting?

10.53.2.3 void seq64::seqdata::set_data_type (midibyte *status*, midibyte *control*)

Perhaps we should check that at least one of the parameters causes a change.

10.53.2.4 int seq64::seqdata::idle_redraw ( ) [private]

This drawing is done only if there is no dragging in progress, to guarantee no flicker.

10.53.2.5 void seq64::seqdata::update_sizes ( ) [private]

It creates a pixmap with window dimensions given by m_window_x and m_window_y.

10.53.2.6 void seq64::seqdata::xy_to_rect (int *x1*, int *y1*, int *x2*, int *y2*, int & *rx*, int & *ry*, int & *rw*, int & *rh*) [private]

It checks the mins/maxes, then fills in x, y, and width, height.

10.53.2.7 void seq64::seqdata::on_realize ( ) [private]

It also connects up the change_horz() function.

Note that this function creates a small pixmap for every possible y-value, where y ranges from 0 to MIDI_COUNT↩ _MAX-1 = 127. It then fills each pixmap with a numeric representation of that y value, up to three digits (left-padded with spaces).

10.53.2.8 bool seq64::seqdata::on_button_press_event (GdkEventButton * *ev*) [private]

Returns

Always returns true.

10.53.2.9 bool seq64::seqdata::on_button_release_event (GdkEventButton * *ev*) [private]

Returns

Returns true if a modification occurred, and in that case also sets the perform modification flag.

10.53.2.10 bool seq64::seqdata::on_motion_notify_event (GdkEventMotion * *ev*) [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.

Returns

Returns true if a change in event data occurred. If true, then the perform modification flag is set.

10.53.2.11 bool seq64::seqdata::on_scroll_event (GdkEventScroll * *a_ev*) [private]

This scroll event only handles basic scrolling, without any modifier keys such as SEQ64_CONTROL_MASK or SEQ64K_SHIFT_MASK.

Returns

Always returns true.

10.53.3 Field Documentation

10.53.3.1 int seq64::seqdata::m_number_w [private]

By "adjusted", well this is just a minor tweak for appearances.

10.53.3.2 int seq64::seqdata::m_number_h [private]

Basically, the character height times 3. By "adjusted", well this is just a minor tweak for appearances.

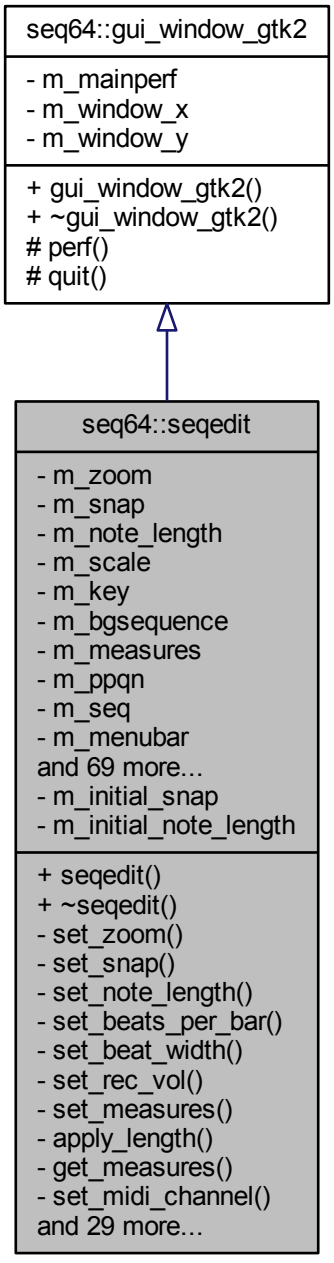
10.53.3.3 int seq64::seqdata::m_number_offset_y [private]

This value was hardwired as 8, for a character height of 10.

10.54 seq64::seqedit Class Reference

Implements the Pattern Editor, which has references to:

Inheritance diagram for seq64::seqedit:



Public Member Functions

- seqedit (perform &perf, sequence &seq, int pos, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor.

- ~seqedit ()

  A rote destructor.

Private Member Functions

- void set_zoom (int zoom)

  Selects the given zoom value.
- void set_snap (int snap)

  Selects the given snap value.
- void set_note_length (int note_length)

  Selects the given note-length value.
- void set_beats_per_bar (int bpm)

  Set the bpm (beats per measure) value, using the given parameter, and some internal values passed to apply_length().
- void set_beat_width (int bw)

  Set the bw (beat width) value, using the given parameter, and some internal values passed to apply_length().
- void set_rec_vol (int recvol)

  Passes the given parameter to sequence::set_rec_vol().
- void set_measures (int lim)

  Set the measures value, using the given parameter, and some internal values passed to apply_length().
- void apply_length (int bpm, int bw, int measures)

  Sets the sequence 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 midichannel)

  Selects the given MIDI channel parameter in the main sequence object, so that it will use that channel.
- void set_midi_bus (int midibus)

  Selects the given MIDI buss parameter in the main sequence object, so that it will use that buss.
- void set_scale (int scale)

  Selects the given scale value.
- void set_key (int note)

  Selects the given key (signature) value.
- void set_background_sequence (int 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 (midibyte status, midibyte 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 *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 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 action, int 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 *event)

  Handles an on-delete event.
- bool on_scroll_event (GdkEventScroll *ev)

  Handles an on-scroll event.
- bool on_key_press_event (GdkEventKey *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.
- int m_pos

  Basically the sequence number.
- midibyte m_editing_status

  Indicates what is the data window currently editing?

Static Private Attributes

- static int m_initial_snap

  Static data members.

Additional Inherited Members

10.54.1 Detailed Description

- perform
- seqroll
- seqkeys
- seqdata
- seqtime
- seqevent
- sequence

This class has a metric ton of user-interface objects and other members.

10.54.2 Constructor & Destructor Documentation

10.54.2.1 seq64::seqedit::seqedit (perform & *p,* sequence & *seq,* int *pos,* int *ppqn* = SEQ64_USE_DEFAULT_PPQN)

If provided, override the scale, key, and background-sequence with the values stored in the file with the sequence, if they are set to non-default values. This is a new feature.

Todo Offload most of the work into an initialization function like options does.

10.54.3 Member Function Documentation

10.54.3.1 void seq64::seqedit::set_zoom (int *z*) [private]

It is passed to the seqroll, seqtime, seqdata, and seqevent objects, as well.

The notation is in pixels:ticks, but I would prefer to use pulses/pixel (pulses per pixel). Oh well.

Finally, note that this value of zoom is saved to the "user" configuration file when Sequencer64 exit.

10.54.3.2 void seq64::seqedit::set_snap (int *snap*) [private]

It is passed to the seqroll, seqevent, and sequence objects, as well.

10.54.3.3 void seq64::seqedit::set_note_length (int *notelength*) [private]

It is passed to the seqroll object, as well.

Warning

Currently, we don't handle changes in the global PPQN after the creation of the menu. The creation of the menu hard-wires the values of note-length. To adjust for a new global PQN, we will need to store the original PPQN (m_original_ppqn = m_ppqn), and then adjust the notelength based on the new PPQN. For example if the new PPQN is twice as high as 192, then the notelength should double, though the text displayed in the "Note length" field should remain the same. A double value would be needed to handle the setting of a smaller m_ppqn. Not needed until we support a set_ppqn() function in this class. Another option is to rebuild the menu.

Parameters

notelength	Provides the note length in units of MIDI pulses. For example

10.54.3.4 void seq64::seqedit::set_measures (int *lim*) [private]

Parameters

lim	Provides the sequence length, in measures.

10.54.3.5 void seq64::seqedit::apply_length (int *bpm,* int *bw,* int *measures*) [private]

There's an implicit "adjust-triggers = true" parameter used in sequence::set_length().

Then the seqroll, seqtime, seqdata, and seqevent objects are reset().

10.54.3.6 long seq64::seqedit::get_measures ( ) [private]

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

10.54.3.7 void seq64::seqedit::set_midi_channel (int *midichannel*) [private]

Should this change raise the is-modified flag?

10.54.3.8 void seq64::seqedit::set_midi_bus (int *bus*) [private]

Should this change raise the is-modified flag?

10.54.3.9 void seq64::seqedit::set_scale (int *scale*) [private]

It is passed to the seqroll and seqkeys objects, as well. As a new feature, it is also passed to the sequence, so that it can be saved as part of the sequence data.

Note that the "initial value" for this parameter is a static variable that gets set to the new value, so that opening up another sequence causes the sequence to take on the new "initial value" as well. A feature, but should it be optional? Now it is, based on the setting of usr().global_seq_feature().

10.54.3.10 void seq64::seqedit::set_key (int *key*) [private]

It is passed to the seqroll and seqkeys objects, as well. As a new feature, it is also passed to the sequence, so that it can be saved as part of the sequence data.

Note that the "initial value" for this parameter is a static variable that gets set to the new value, so that opening up another sequence causes the sequence to take on the new "initial value" as well. A feature, but should it be optional? Now it is, based on the setting of usr().global_seq_feature().

10.54.3.11 void seq64::seqedit::set_background_sequence (int *seqnum*) [private]

As a new feature, it is also passed to the sequence, so that it can be saved as part of the sequence data, but only if less or equal to the maximum single-byte MIDI value, 127.

Note that the "initial value" for this parameter is a static variable that gets set to the new value, so that opening up another sequence causes the sequence to take on the new "initial value" as well. A feature, but should it be optional? Now it is, based on the setting of usr().global_seq_feature().

Todo Make the sequence pointer a reference.

10.54.3.12 void seq64::seqedit::name_change_callback ( ) [private]

That name is the name the user has given to the sequence being edited.

10.54.3.13 void seq64::seqedit::set_data_type (midibyte *status*, midibyte *control* = 0) [private]

This function uses the hardwired array c_controller_names.

Parameters

status	The current editing status.
control	The control value. However, we really need to validate it!

10.54.3.14 void seq64::seqedit::create_menus ( ) [private]

The first menu is the Zoom menu, represented in the pattern/sequence editor by a button with a magnifying glass. The values are "pixels to ticks", where "ticks" are actually the "pulses" of "pulses per quarter note". We would prefer the notation "n" instead of "1:n", as in "n pulses per pixel". The Snap menu is actually the Grid Snap button, which shows two arrows pointing to a central bar.

The note-length menu is on the button that shows four notes.

This menu lets one set the key of the sequence, and is brought up by the button with the "golden key" image on it.

This button shows a down around for the bottom half of the time signature. It's tooltip is "Time signature. Length of beat." But it is called bw, or beat width, in the code.

This menu is shown when pressing the button at the bottom of the window that has "Vol" as its label. Let's show the numbers as well to help the user. And we'll have to document this change.

This menu sets the scale to show on the panel, and the button shows a "staircase" image. See the c_music_scales enumeration defined in the globals module.

This section sets up two different menus. The first is m_menu_length. This menu lets on set the sequence length in bars (not the MIDI channel). The second menu is the m_menu_bpm, or BPM, which here means "beats per measure" (not "beats per minute").

10.54.3.15 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.

10.54.3.16 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.

10.54.3.17 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 for screen-set 0. If more screensets have active sequences, then their screen-set number appears in the screen-set section of the menu.

Now, at present, we can only save background sequence numbers that are less than 128, which means the sequences from 0 to 127, or the first four screen sets. Higher sequences can be selected, but, right now, they cannot be saved. We'll probably fix that at some point, low priority.

10.54.3.18 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.

10.54.3.19 void seq64::seqedit::do_action (int *action*, int *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).

10.54.3.20 bool seq64::seqedit::on_delete_event (GdkEventAny * *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.

10.54.4 Field Documentation

10.54.4.1 int seq64::seqedit::m_initial_snap [static], [private]

These items apply to all of the instances of seqedit, and are passed on to the following constructors:

- seqdata
- seqevent
- seqroll
- seqtime

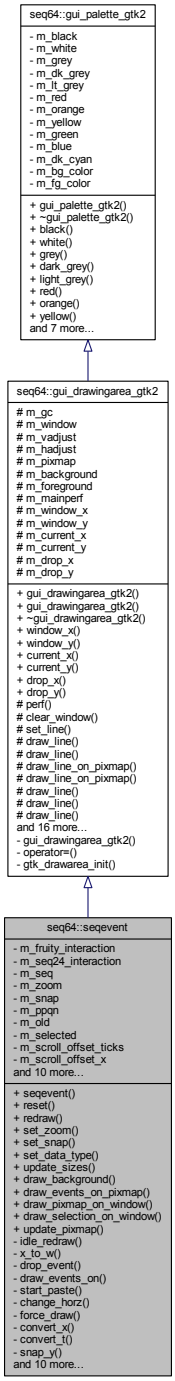
The snap and note-length defaults would be good to write to the "user" configuration file. The scale and key would be nice to write to the proprietary section of the MIDI song. Or, even more flexibly, to each sequence, if that makes sense to do, since all tracks would generally be in the same key. Right, Charles Ives?

Note that, currently, that some of these "initial values" are modified, so that they are "contagious". That is, the next sequence to be opened in the sequence editor will adopt these values. This is a long-standing feature of Seq24, but strikes us as a bit too surprising and tricky.

10.55 seq64::seqevent Class Reference

Implements the piano event drawing area.

Inheritance diagram for seq64::seqevent:



Public Member Functions

- seqevent (perform &p, sequence &seq, 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 (midibyte a_status, midibyte 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.

Private Member Functions

- int idle_redraw ()

  Implements redraw while idling.
- 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 (midipulse 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, midipulse &tick)

  Takes the screen x coordinate, multiplies it by the current zoom, and returns the tick value in the given parameter.
- void convert_t (midipulse 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.
- midibyte m_status

  Indicates what is the data window currently editing?

Additional Inherited Members

10.55.1 Member Function Documentation

10.55.1.1 void seq64::seqevent::set_snap (int *a_snap*) [inline]

Simply sets the snap member.

10.55.1.2 void seq64::seqevent::set_data_type (midibyte *status*, midibyte *control* = 0)

Then redraws.

10.55.1.3 void seq64::seqevent::update_sizes ( )

This ends up filling the background with dotted lines, etc.

10.55.1.4 void seq64::seqevent::draw_background ( )

It sets the foreground to white, draws the rectangle, in order to clear the pixmap.

10.55.1.5 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.
```

10.55.1.6 int seq64::seqevent::idle_redraw ( ) [private]

Who calls this routine?

10.55.1.7 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.

10.55.1.8 void seq64::seqevent::drop_event (midipulse *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.

10.55.1.9 void seq64::seqevent::draw_events_on (Glib::RefPtr< Gdk::Drawable > *draw*) [private]

Parameters

draw	The given drawable object.

10.55.1.10 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.

10.55.1.11 void seq64::seqevent::convert_x (int *x,* midipulse & *tick*) [inline], [private]

Why not just return it normally?

10.55.1.12 void seq64::seqevent::convert_t (midipulse *ticks,* int & *x*) [inline], [private]

Why not just return it normally?

10.55.1.13 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 of pixels to snap to.

10.55.1.14 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.

10.55.1.15 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. Added some fixes, but then commented them out until better testing can be done.

10.55.1.16 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. Added some fixes, but then commented them out until better testing can be done.

10.55.1.17 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. Added some fixes, but then commented them out until better testing can be done.

10.55.1.18 bool seq64::seqevent::on_key_press_event (GdkEventKey * *ev*) [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. :-)

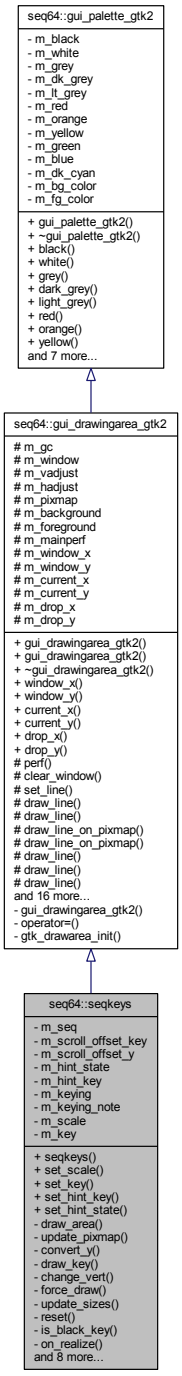
Returns

Returns true if an event was handled. Only some of the handled events also cause the perform modification flag to be set as a side-effect.

10.56 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.

- bool is_black_key (int key) const

  Detects a black key.

- 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

10.56.1 Member Function Documentation

10.56.1.1 void seq64::seqkeys::set_hint_state (bool *state*)

Parameters

state	Provides the value for hinting, where true == on, false == off.

10.56.1.2 void seq64::seqkeys::draw_key (int *key*, bool *state*) [private]

It accounts for the black keys and the white keys, and for the highlighting of the active key.

Parameters

key	The key to be drawn.
state	How the key is to be drawn, where false == normal, true == grayed. A key is greyed when the mouse cursor is at the same vertical location on the piano as the key.

10.56.1.3 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.

10.56.1.4 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.

Returns

Always returns true.

10.56.1.5 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

Returns

Always returns true. piano keyboard, to make it play, and turns off the playing of the note.
Always returns true.

10.56.1.6 bool seq64::seqkeys::on_motion_notify_event (GdkEventMotion * *a_p0*) [private]

This allows rolling down the keyboard, playing the notes one-by-one.

Returns

Always returns false.

10.56.1.7 bool seq64::seqkeys::on_enter_notify_event (GdkEventCrossing * *p0*) [private]

I think this greys the current key.

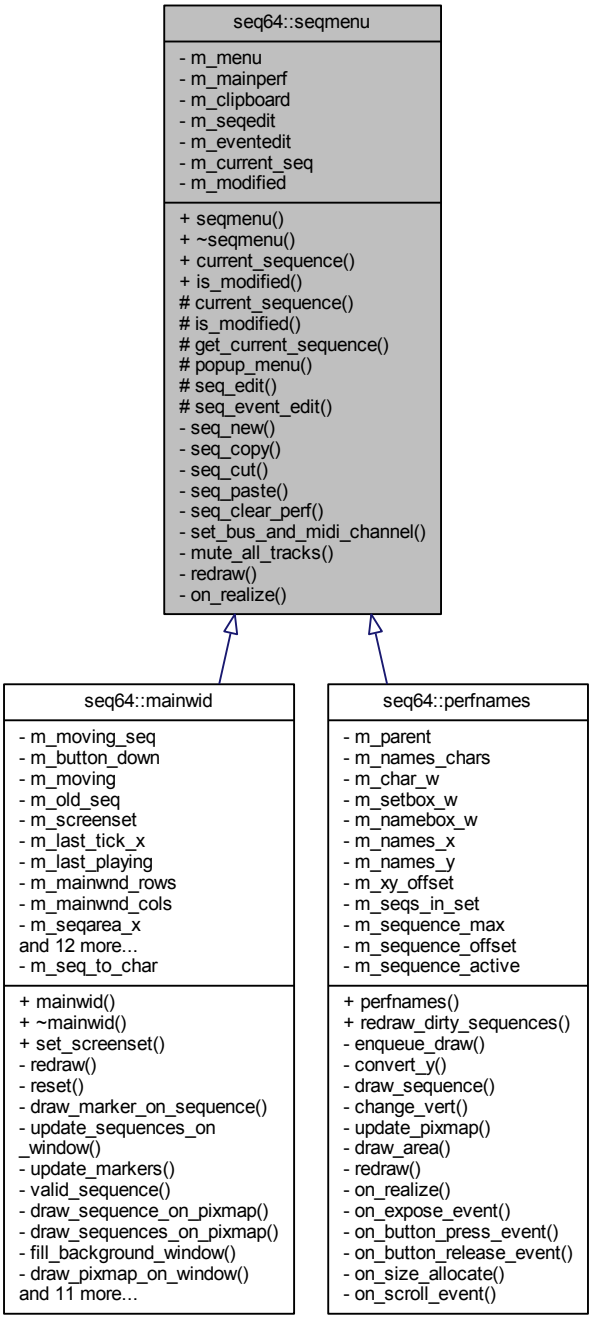
10.56.1.8 bool seq64::seqkeys::on_leave_notify_event (GdkEventCrossing * *p0*) [private]

I think this un-greys the current key.

10.57 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
- sequence * get_current_sequence () const

  'Getter' function for member m_mainperf.get_sequence(current_sequence()) This call is used many, many times.
- void popup_menu ()

  This function sets up the File menu entries.
- void seq_edit ()

  This menu callback launches the sequence-editor (pattern editor) window.
- void seq_event_edit ()

  This menu callback launches the new event editor window.

Private Member Functions

- 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 sequence, 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

- perform & m_mainperf

  Provides a reference to the central object involved in managing a song and performance.
- sequence m_clipboard

  Holds a copy of data concerning a sequence, which can then be pasted into another pattern slot.
- seqedit * m_seqedit

  Points to the latest seqedit object, if created.
- eventedit * m_eventedit

Points to the latest eventedit object, if created.

- int m_current_seq

  References the current sequence by sequence number.

- bool m_modified

  Indicates if a sequence has been created.

10.57.1 Detailed Description

It is an abstract base class.

10.57.2 Constructor & Destructor Documentation

10.57.2.1 seq64::seqmenu::seqmenu (perform & *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.

10.57.2.2 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.

10.57.3 Member Function Documentation

10.57.3.1 void seq64::seqmenu::popup_menu ( ) [protected]

It also sets up the pattern popup menu entries that are used in mainwid. Note that, for the selected sequence, the "Edit" and "Event Edit" menu entries are not included if a pattern editor or event editor is already running.

10.57.3.2 void seq64::seqmenu::seq_edit ( ) [protected]

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!

An oddity is that calling show_all() here does not work unless the seqedit() constructor makes its show_all() call.

10.57.3.3 void seq64::seqmenu::seq_event_edit ( ) [protected]

If it is already open for that sequence, this function just raises it.

Note that the m_eventedit member to which we save the new pointer is currently there just to avoid a compiler warning.

This menu entry is available only if the selected sequence is active. That is, if the sequence has already been created.

An oddity is that we need the show_all() call here in order to see the dialog. A situation different from that for seqedit!

10.57.3.4 void seq64::seqmenu::seq_new ( ) [private]

For one thing, if current_sequence() is either a -1 or is greater than the maximum allowed sequence number, perform::is_active() will return false, and we have no idea whether the sequence is not active or the sequence number is just invalid. So we need to check the pointer we got before trying to use it.

10.57.3.5 void seq64::seqmenu::seq_copy ( ) [private]

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

10.57.3.6 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.

10.57.3.7 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.

10.57.3.8 void seq64::seqmenu::seq_clear_perf ( ) [private]

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

10.57.4 Field Documentation

10.57.4.1 seqedit* seq64::seqmenu::m_seqedit [private]

Change Note Added by Chris on 2015-08-02 based on compiler warnings and a comment warning in the seq_edit() function. We'll save the result of that function here, and will let valgrind tell us later if Gtkmm takes care of it.

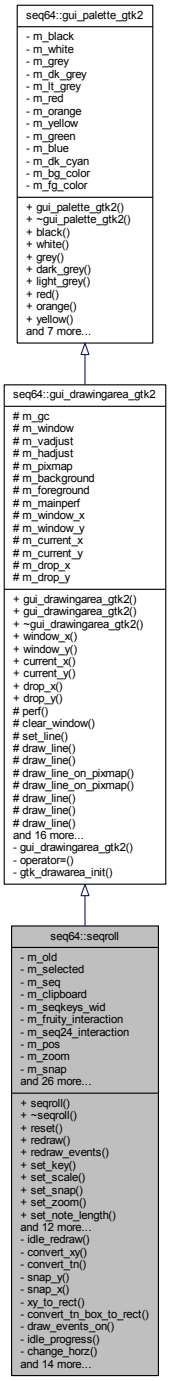
10.57.4.2 bool seq64::seqmenu::m_modified [private]

Todo We need to make sure that the perform object is in control of the modification flag.

10.58 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 (midibyte status, midibyte 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.
- void start_paste ()

  Starts a paste operation.
- void update_and_draw (int force=false)

  Wraps up some common code.

Private Member Functions

- int idle_redraw ()

  Draw the events on the main window and on the pixmap.
- void convert_tn (midipulse 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 (midipulse tick_s, midipulse 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

- FruitySeqRollInput m_fruity_interaction

  Provides a fruity input object, whether it is needed or not.
- Seq24SeqRollInput m_seq24_interaction

  Provides a normal seq24 input object, which is always needed to handle, for example, keystroke input.
- int m_zoom

  one pixel == m_zoom ticks
- midibyte 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.

Friends

- class FruitySeqRollInput

  These friend implement interaction-specific behavior, although only the Seq24 interactions support keyboard processing.

Additional Inherited Members

10.58.1 Member Function Documentation

10.58.1.1 void seq64::seqroll::reset ( )

It's almost identical to the change_horz() function!

10.58.1.2 void seq64::seqroll::set_data_type (midibyte *status*, midibyte *control*)

Unlike the same function in seqevent, this version does not redraw.

10.58.1.3 void seq64::seqroll::set_background_sequence (bool *state*, int *seq*)

The state parameter sets the boolean m_drawing_background_seq.

Parameters

state	If true, the background sequence will be drawn.

seq Provides the sequence number, which is checked against the SEQ64_IS_LEGAL_SEQUENCE() macro before being used. This macro allows the value SEQ64_SEQUENCE_LIMIT, which disables the background sequence.

10.58.1.4 void seq64::seqroll::update_background ( )

The first thing done is to clear the background, painting it white.

10.58.1.5 void seq64::seqroll::draw_events_on_pixmap ( )

Just calls draw_events_on().

10.58.1.6 void seq64::seqroll::convert_tn (midipulse *a_ticks*, int *a_note*, int & *a_x*, int & *a_y*) [private]

This function is the "inverse" of convert_xy().

10.58.1.7 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.

10.58.1.8 void seq64::seqroll::draw_events_on (Glib::RefPtr< Gdk::Drawable > *draw*) [private]

"Method 0" seems be the one that draws the background sequence, if active. "Method 1" draws the sequence itself.

10.58.1.9 bool seq64::seqroll::on_key_press_event (GdkEventKey * *ev*) [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).

Concerning the usage of the arrow keys in this function: This code is reached, but has no visible effect. Why? I think they were meant to move the point for playback. We may HAVE A BUG with our new handling of triggers, or maybe these depend upon the proper playback mode. In any case, the old functionality is preserved. However, if there are notes selected, then these keys support selection movement.

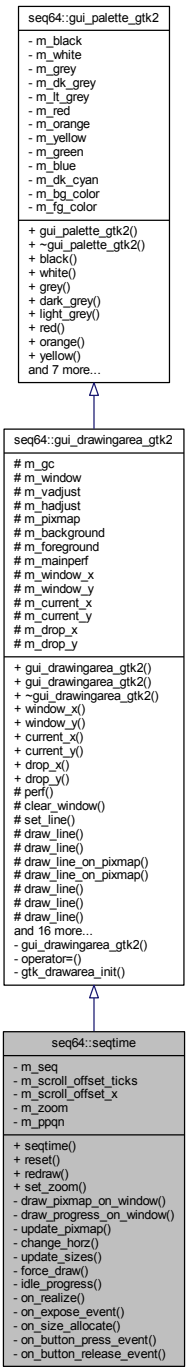
10.58.1.10 bool seq64::seqroll::on_scroll_event (GdkEventScroll * *ev*) [private]

This scroll event only handles basic scrolling without any modifier keys such as SEQ64_CONTROL_MASK or S↩ EQ64_SHIFT_MASK.

10.59 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

10.59.1 Member Function Documentation

10.59.1.1 bool seq64::seqtime::on_button_press_event (GdkEventButton *) [inline], [private]

Simply returns false.

10.59.1.2 bool seq64::seqtime::on_button_release_event (GdkEventButton *) [inline], [private]

Simply returns false.

10.60 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 }

Public Member Functions

- sequence (int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor.
- ~sequence ()

  A rote destructor.
- void partial_assign (const sequence &rhs)

  A cut-down version of principal assignment operator.
- event_list & events ()

'Getter' function for member m_events

- const event_list & events () const

  'Getter' function for member m_events

- bool any_selected_notes () const

  'Getter' function for member m_events.any_selected_notes()

- triggers::List & triggerlist ()

  'Getter' function for member m_triggers

- int number () const

  'Getter' function for member m_seq_number

- void number (int seqnum)

  'Setter' function for member m_seq_number This setter will set the sequence number only if it has not already been set.

- int event_count () const

  Returns the number of events stored in m_events.

- void push_undo ()

  Pushes the event-list into the undo-list.

- void pop_undo ()

  If there are items on the undo list, this function pushes the event-list into the redo-list, puts the top of the undo-list into the event-list, 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 event-list into the undo-list, puts the top of the redo-list into the event-list, pops from the redo-list, calls verify_and_link(), and then calls unselect.

- void push_trigger_undo ()

  Calls triggers::push_undo() with locking.

- void pop_trigger_undo ()

  Calls triggers::pop_undo() with locking.

- 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.

- int get_ppqn () const

  'Getter' function for member m_ppqn Provided as a convenience for the editable_events class.

- void set_beats_per_bar (int beatspermeasure)

  'Setter' function for member m_time_beats_per_measure

- int get_beats_per_bar () const

  'Getter' function for member m_time_beats_per_measure

- void set_beat_width (int beatwidth)

  'Setter' function for member m_time_beat_width

- int get_beat_width () const

  'Getter' function for member m_time_beat_width

- void clocks_per_metronome (int cpm)

  'Setter' function for member m_clocks_per_metronome

- int clocks_per_metronome () const

  'Getter' function for member m_clocks_per_metronome

- void set_32nds_per_quarter (int tpq)

  'Setter' function for member m_32nds_per_quarter

- int get_32nds_per_quarter () const

  'Getter' function for member m_32nds_per_quarter

- void us_per_quarter_note (int upqn)

  'Setter' function for member m_us_per_quarter_note

- int us_per_quarter_note () const

'Getter' function for member m_us_per_quarter_note

- void set_rec_vol (int 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 (midipulse len, bool adjust_triggers=true)

  Sets the length (m_length) and adjusts triggers for it, if desired.
- midipulse get_length () const

  'Getter' function for member m_length
- midipulse get_last_tick ()

  Returns the last tick played, and is used by the editor's idle function.
- midipulse mod_last_tick ()

  Some MIDI file errors and other things can lead to an m_length of 0, which causes arithmetic errors when m_last_tick is modded against it.
- 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
- midipulse get_queued_tick () const

  'Getter' function for member m_queued_tick
- bool check_queued_tick (midipulse tick) const

  Helper function for perform.
- 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.
- midibyte get_midi_channel () const

  'Getter' function for member m_midi_channel
- bool is_smf_0 () const

  Returns true if this sequence is an SMF 0 sequence.
- void set_midi_channel (midibyte 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 (midipulse tick, bool playback_mode)

  The play() function dumps notes starting from the given tick, and it pre-buffers ahead.
- void set_orig_tick (midipulse tick)

  'Setter' function for member m_last_tick
- bool add_event (const event &er)

  Adds an event to the internal event list in a sorted manner.
- void add_trigger (midipulse tick, midipulse len, midipulse offset=0, bool adjust_offset=true)

  Adds a trigger.
- void split_trigger (midipulse tick)

  Splits a trigger.
- void grow_trigger (midipulse tick_from, midipulse tick_to, midipulse len)

  Grows a trigger.
- void del_trigger (midipulse tick)

  Deletes a trigger, that brackets the given tick, from the trigger-list.
- bool get_trigger_state (midipulse tick)

  Checks the list of triggers against the given tick.
- bool select_trigger (midipulse tick)

  Checks the list of triggers against the given tick.
- bool unselect_triggers ()

  Unselects all triggers.
- bool intersect_triggers (midipulse position, midipulse &start, midipulse &ender)

  This function examines each trigger in the trigger list.

- bool intersect_notes (midipulse position, midipulse position_note, midipulse &start, midipulse &ender, int &note)

  This function examines each note in the event list.
- bool intersect_events (midipulse posstart, midipulse posend, midibyte status, midipulse &start)

  This function examines each non-note event in the event list.
- void del_selected_trigger ()

  Deletes the first selected trigger that is found.
- void cut_selected_trigger ()

  Copies and deletes the first selected trigger that is found.
- void copy_selected_trigger ()

  Copies the first selected trigger that is found.
- void paste_trigger ()

  If there is a copied trigger, then this function grabs it from the trigger clipboard and adds it.
- bool move_selected_triggers_to (midipulse tick, bool adjust_offset, int which=2)

  Moves selected triggers as per the given parameters.
- midipulse selected_trigger_start ()

  Gets the last-selected trigger's start tick.
- midipulse selected_trigger_end ()

  Gets the selected trigger's end tick.
- midipulse get_max_trigger ()

  Get the ending value of the last trigger in the trigger-list.
- void move_triggers (midipulse start_tick, midipulse distance, bool direction)

  Moves triggers in the trigger-list.
- void copy_triggers (midipulse start_tick, midipulse distance)

  Copies triggers to...
- void clear_triggers ()

  Clears the whole list of triggers.
- midipulse 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 (midipulse tick_s, int note_h, midipulse 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 (midipulse tick_s, midipulse tick_f, midibyte status, midibyte cc, select_action_e action)

  Select all events in the given range, and returns the number selected.
- int select_events (midibyte status, midibyte cc, bool inverse=false)

  Select all events with the given status, and returns the number selected.
- int get_num_selected_notes () const

  Counts the selected notes in the event list.
- int get_num_selected_events (midibyte status, midibyte cc) const

  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 cut_selected (bool copyevents=true)

  Cuts the selected events.

- void paste_selected (midipulse tick, int note)

  Pastes the selected notes (and only note events) at the given tick and the given note value.
- void get_selected_box (midipulse &tick_s, int &note_h, midipulse &tick_f, int &note_l)

  Returns the 'box' of the selected items.
- void get_clipboard_box (midipulse &tick_s, int &note_h, midipulse &tick_f, int &note_l)

  Returns the 'box' of the clipboard items.
- void move_selected_notes (midipulse deltatick, int deltanote)

  Removes and adds reads selected in position.
- void add_note (midipulse tick, midipulse len, int note, bool paint=false)

  Adds a note of a given length and note value, at a given tick location.
- void add_event (midipulse tick, midibyte status, midibyte d0, midibyte 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.
- bool change_event_data_range (midipulse tick_s, midipulse tick_f, midibyte status, midibyte cc, int d_s, int d_f)

  Changes the event data range.
- void increment_selected (midibyte status, midibyte control)

  Increments events the match the given status and control values.
- void decrement_selected (midibyte status, midibyte control)

  Decrements events the match the given status and control values.
- void grow_selected (midipulse deltatick)

  Moves note off event.
- void stretch_selected (midipulse deltatick)

  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 events in the event-list.
- 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 ()

  Sets the draw-trigger iterator to the beginning of the trigger list.
- draw_type get_next_note_event (midipulse *tick_s, midipulse *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 ()

  Goes through the list of notes, and picks the one with the lowest value.
- int get_highest_note_event ()

  Goes through the list of notes, and picks the one with the highest value.
- bool get_next_event (midibyte status, midibyte cc, midipulse *tick, midibyte *d0, midibyte *d1, bool *selected)

  Get the next event in the event list that matches the given status and control character.
- bool get_next_event (midibyte *status, midibyte *cc)

  Get the next event in the event list.
- bool get_next_trigger (midipulse *tick_on, midipulse *tick_off, bool *selected, midipulse *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 quantize_events (midibyte status, midibyte cc, midipulse snap_tick, int divide, bool linked=false)

  Not deleting the ends, not selected.
- void transpose_notes (int steps, int scale)

  Transposes notes by the given steps, in accordance with the given scale.
- midibyte musical_key () const

  'Getter' function for member m_musical_key
- void musical_key (int key)

  'Setter' function for member m_musical_key
- midibyte musical_scale () const

  'Getter' function for member m_musical_scale
- void musical_scale (int scale)

  'Setter' function for member m_musical_scale
- int background_sequence () const

  'Getter' function for member m_background_sequence
- void background_sequence (int bs)

  'Setter' function for member m_background_sequence Only partial validation at present, we do not want the upper limit to be hard-wired at this time.
- void show_events () const

  A member function to dump a summary of events stored in the event-list of a sequence.
- void copy_events (const event_list &newevents)

  Copies an external container of events into the current container, effectively replacing all of its events.

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 (midipulse trigger_offset)

  Sets m_trigger_offset and wraps it to m_length.
- void split_trigger (trigger &trig, midipulse splittick)

  Splits the trigger given by the parameter into two triggers.
- void adjust_trigger_offsets_to_length (midipulse newlen)

  Adjusts trigger offsets to the length of ???, for all triggers, and undo triggers.
- 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 event-list.
- void remove (event &e)

  A helper function, which does not lock/unlock, so it is unsafe to call without supplying an iterator from the event-list.
- void remove_all ()

  Clears all events from the event container.

Private Attributes

- event_list m_events

  This list holds the current pattern/sequence events.
- midibyte m_midi_channel

  Contains the proper MIDI channel for this sequence.
- midibyte m_bus

  Contains the proper MIDI bus number for this sequence.
- bool m_song_mute

  Provides a flag for the song playback mode muting.
- int m_notes_on

  Provides a member to hold the polyphonic step-edit note counter.
- mastermidibus * m_masterbus

  Provides the master MIDI buss which handles the output of the sequence to the proper buss and MIDI channel.
- int m_playing_notes [SEQ64_MIDI_NOTES_MAX]

  Provides a "map" for Note On events.
- bool m_was_playing

  Indicates if the sequence was playing.
- bool m_playing

  True if sequence playback currently is in progress for this sequence.
- bool m_recording

  True if sequence recording currently is in progress for this sequence.
- bool m_dirty_main

  These flags indicate that the content of the sequence has changed due to recording, editing, performance management, or even (?) a name change.
- bool m_editing

  Indicates that the sequence is currently being edited.
- std::string m_name

  Provides the name/title for the sequence.
- midipulse m_last_tick

  These members manage where we are in the playing of this sequence, including triggering.
- const int m_maxbeats

  This constant provides ...?
- int m_ppqn

  Holds the PPQN value for this sequence, so that we don't have to rely on a global constant value.
- int m_seq_number

  A new member so that the sequence number is carried along with the sequence.
- midipulse m_length

  Holds the length of the sequence in pulses (ticks).
- midipulse m_snap_tick

  The size of snap in units of pulses (ticks).
- int m_time_beats_per_measure

  Provides the number of beats per bar used in this sequence.
- int m_time_beat_width

  Provides with width of a beat.
- int m_clocks_per_metronome

  Augments the beats/bar and beat-width with the additional values included in a Time Signature meta event.
- int m_32nds_per_quarter

  Augments the beats/bar and beat-width with the additional values included in a Time Signature meta event.
- int m_us_per_quarter_note

  Augments the beats/bar and beat-width with the additional values included in a Tempo meta event.

- int m_rec_vol

  The volume to be used when recording.
- midibyte m_musical_key

  Holds a copy of the musical key for this sequence, which we now support writing to this sequence.
- midibyte m_musical_scale

  Holds a copy of the musical scale for this sequence, which we now support writing to this sequence.
- int m_background_sequence

  Holds a copy of the background sequence number for this sequence, which we now support writing to this sequence.
- 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.

10.60.1 Detailed Description

More members than you can shake a stick at.

10.60.2 Member Enumeration Documentation

10.60.2.1 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.

10.60.3 Member Function Documentation

10.60.3.1 void seq64::sequence::partial_assign (const sequence & *rhs*)

We're replacing that incomplete function (many members are not assigned) with the more accurately-named partial_assign() function.

It did not assign them all, so we created this partial_assign() function to do this work, and replaced operator =() with this function in client code.

Threadsafe

10.60.3.2 int seq64::sequence::event_count ( ) const

Threadsafe

10.60.3.3 void seq64::sequence::push_undo ( )

Threadsafe

10.60.3.4 void seq64::sequence::pop_undo ( )

Threadsafe

10.60.3.5 void seq64::sequence::pop_redo ( )

Threadsafe

10.60.3.6 void seq64::sequence::push_trigger_undo ( )

Threadsafe

10.60.3.7 void seq64::sequence::set_beats_per_bar (int *beatspermeasure*)

Threadsafe

Parameters

beatspermeasure	The new setting of the beats-per-bar value.

10.60.3.8 void seq64::sequence::set_beat_width (int *beatwidth*)

Threadsafe

Parameters

beatwidth	The new setting of the beat width value.

10.60.3.9 int seq64::sequence::get_beat_width ( ) const [inline]

Threadsafe

10.60.3.10 void seq64::sequence::set_rec_vol (int *recvol*)

Threadsafe

Parameters

recvol	The new setting of the recording volume setting.

10.60.3.11 const char* seq64::sequence::get_name ( ) const [inline]

Deprecated

10.60.3.12 void seq64::sequence::set_length (midipulse *len*, bool *adjust_triggers* = true)

This function is called in seqedit::apply_length(), when the user selects a sequence length in measures. That function calculates the length in ticks:

```
    L = M x B x 4 x P / W
        L == length (ticks or pulses)
        M == number of measures
        B == beats per measure
        P == pulses per quarter-note
        W == beat width in beats per measure

For our "b4uacuse" MIDI file, M can be about 100 measures, B is 4,
P can be 192 (but we want to support higher values), and W is 4.
So L = 100 * 4 * 4 * 192 / 4 = 76800 ticks.  Seems small.
```

Threadsafe

10.60.3.13 midipulse seq64::sequence::get_last_tick ( )

If m_length is 0, this function returns m_last_tick - m_trigger_offset, to avoid an arithmetic exception. Should we return 0 instead?

10.60.3.14 midipulse seq64::sequence::mod_last_tick ( ) [inline]

This function replaces the "m_last_tick % m_length", returning m_last_tick if m_length is 0 or 1.

10.60.3.15 void seq64::sequence::set_playing (bool *p*)

When playing, and the sequencer is running, notes get dumped to the ALSA buffers.

Parameters

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.

10.60.3.16 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. If m_↩ length is bad (i.e. zero), then m_queued_tick is set to 0, to avoid an arithmetic error.

Threadsafe

10.60.3.17 void seq64::sequence::off_queued ( )

Toggles the queued flag and sets the dirty-mp flag.

Threadsafe

10.60.3.18 void seq64::sequence::set_recording (bool *r*)

Threadsafe

10.60.3.19 void seq64::sequence::set_snap_tick (int *st*)

Threadsafe

10.60.3.20 void seq64::sequence::set_quantized_rec (bool *qr*)

Threadsafe

10.60.3.21 void seq64::sequence::set_thru (bool *r*)

Threadsafe

10.60.3.22 bool seq64::sequence::is_dirty_main ( )

resets it). This flag signals that a redraw is needed from recording.

Threadsafe

10.60.3.23 bool seq64::sequence::is_dirty_edit ( )

Threadsafe

10.60.3.24 bool seq64::sequence::is_dirty_perf ( )

Threadsafe

10.60.3.25 bool seq64::sequence::is_dirty_names ( )

Threadsafe

10.60.3.26 void seq64::sequence::set_dirty_mp ( )

Not threadsafe

10.60.3.27 void seq64::sequence::set_dirty ( )

Threadsafe

10.60.3.28 void seq64::sequence::set_midi_channel (midibyte *ch*)

Threadsafe

10.60.3.29 void seq64::sequence::print ( )

Not threadsafe

10.60.3.30 void seq64::sequence::print_triggers ( )

Not threadsafe

10.60.3.31 void seq64::sequence::play (midipulse *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.

Parameters

tick	Provides the current end-tick value.
playback_mode	Provides how playback is managed. True indicates that it is performance/song-editor playback, controlled by the set of patterns and triggers set up in that editor, and saved with the song in seq24 format. False indicates that the playback is controlled by the main windows, in live mode.

Threadsafe

10.60.3.32 void seq64::sequence::set_orig_tick (midipulse *tick*)

Threadsafe

10.60.3.33 bool seq64::sequence::add_event (const event & *er*)

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. Well, actually, certain meta-events are also read, to obtain channel, buss, and more settings. Also read for a sequence, if the global-sequence flag is not set, are the new key, scale, and background sequence parameters.

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/usable.

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. Actually, this is true only in Seq24, we've fixed that behavior for Sequencer64.

Parameters

ep	Provide a reference to the event to be added; the event is copied into the events container.

10.60.3.34 void seq64::sequence::add_trigger (midipulse *tick*, midipulse *len*, midipulse *offset* = `0`, bool *fixoffset* = `true`)

A pass-through function that calls triggers::add().

10.60.3.35 void seq64::sequence::split_trigger (midipulse *splittick*)

This is the public overload of split_trigger.

Threadsafe

10.60.3.36 void seq64::sequence::grow_trigger (midipulse *tickfrom*, midipulse *tickto*, midipulse *len*)

Parameters

tickfrom	The desired from-value back which to expand the trigger, if necessary.

tickto	The desired to-value towards which to expand the trigger, if necessary.
len	The additional length to append to tickto for the check.

Threadsafe

10.60.3.37 void seq64::sequence::del_trigger (midipulse *tick*)

Threadsafe

10.60.3.38 bool seq64::sequence::get_trigger_state (midipulse *tick*)

If any trigger is found to bracket that tick, then true is returned.

Parameters

tick	Provides the tick of interest.

Returns

Returns true if a trigger is found that brackets the given tick.

10.60.3.39 bool seq64::sequence::select_trigger (midipulse *tick*)

If any trigger is found to bracket that tick, then true is returned, and the trigger is marked as selected.

Parameters

tick	Provides the tick of interest.

Returns

Returns true if a trigger is found that brackets the given tick.

10.60.3.40 bool seq64::sequence::unselect_triggers ( )

Returns

Always returns false.

10.60.3.41 bool seq64::sequence::intersect_triggers (midipulse *position,* midipulse & *start,* midipulse & *ender*)

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 of the matching trigger.
ender	The destination for the ending tick 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.

10.60.3.42 bool seq64::sequence::intersect_notes (midipulse *position,* midipulse *position_note,* midipulse & *start,* midipulse & *ender,* int & *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 timestamp of the matching note.
ender	The destination for the ending timestamp of the matching note.
note	The destination for the note of the matching event. Why is this an int value???

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.

10.60.3.43 bool seq64::sequence::intersect_events (midipulse *posstart,* midipulse *posend,* midibyte *status,* midipulse & *start*)

If the given position is between the current notes's timestamp-start and timestamp-end values, the these values are copied to the posstart and posend 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 timestamp of the matching trigger.

Returns

Returns true if a event was found whose start/end timestamps contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

10.60.3.44 void seq64::sequence::paste_trigger ( )

Why isn't this protected by a mutex? We will eventually enable this see if anything bad happens, such as a deadlock, or corruption.

10.60.3.45 bool seq64::sequence::move_selected_triggers_to (midipulse *tick,* bool *adjustoffset,* int *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

Returns

Returns the value of triggers::move_selected(), which indicate that the movement could be made. Used in Seq24PerfInput::handle_motion_key().

10.60.3.46 midipulse seq64::sequence::selected_trigger_start ( )

Threadsafe

Returns

Returns the tick_start() value of the last-selected trigger. If no triggers are selected, then -1 is returned.

10.60.3.47 midipulse seq64::sequence::selected_trigger_end ( )

Threadsafe

10.60.3.48 midipulse seq64::sequence::get_max_trigger ( )

Threadsafe

10.60.3.49 void seq64::sequence::move_triggers (midipulse *starttick,* midipulse *distance,* bool *direction*)

Note the dependence on the m_length member being kept in sync with the parent's value of m_length.

Threadsafe

10.60.3.50 void seq64::sequence::copy_triggers (midipulse *starttick,* midipulse *distance*)

Threadsafe

10.60.3.51 void seq64::sequence::clear_triggers ( )

Threadsafe

10.60.3.52 void seq64::sequence::set_midi_bus (char *mb*)

Threadsafe

10.60.3.53 void seq64::sequence::set_master_midi_bus (mastermidibus * *mmb*)

Threadsafe

Parameters

mmb	Provides a pointer to the master MIDI buss for this sequence. This should be a reference.

10.60.3.54 int seq64::sequence::select_note_events (midipulse *a_tick_s,* int *a_note_h,* midipulse *a_tick_f,* int *a_note_l,* select_action_e *a_action*)

Returns the number selected.

Threadsafe

10.60.3.55 int seq64::sequence::select_events (midipulse *tick_s*, midipulse *tick_f*, midibyte *status*, midibyte *cc*, select_action_e *action*)

Note that there is also an overloaded version of this function.

Threadsafe

10.60.3.56 int seq64::sequence::select_events (midibyte *status*, midibyte *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.

10.60.3.57 int seq64::sequence::get_num_selected_notes ( ) const

Threadsafe

10.60.3.58 int seq64::sequence::get_num_selected_events (midibyte *status*, midibyte *cc*) const

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

Threadsafe

10.60.3.59 void seq64::sequence::select_all ( )

Threadsafe

10.60.3.60 void seq64::sequence::copy_selected ( )

Threadsafe

10.60.3.61 void seq64::sequence::cut_selected (bool *copyevents* = `true`)

Threadsafe

10.60.3.62 void seq64::sequence::paste_selected (midipulse *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

10.60.3.63 void seq64::sequence::get_selected_box (midipulse & *tick_s*, int & *note_h*, midipulse & *tick_f*, int & *note_l*)

Note the common-code betweem this function and get_clipboard_box().

Threadsafe

10.60.3.64 void seq64::sequence::get_clipboard_box (midipulse & *tick_s,* int & *note_h,* midipulse & *tick_f,* int & *note_l*)

Note the common-code betweem this function and get_selected_box().

Threadsafe

10.60.3.65 void seq64::sequence::move_selected_notes (midipulse *delta_tick,* int *delta_note*)

Parameters

delta_tick	Provides the amount of time to move the selected notes.
delta_note	Provides the amount of pitch to move the selected notes.

10.60.3.66 void seq64::sequence::add_note (midipulse *tick,* midipulse *length,* int *note,* bool *paint* = `false`)

It adds a single note-on / note-off pair.

The 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

10.60.3.67 void seq64::sequence::add_event (midipulse *tick,* midibyte *status,* midibyte *d0,* midibyte *d1,* bool *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

10.60.3.68 void seq64::sequence::stream_event (event & *ev*)

Threadsafe

10.60.3.69 bool seq64::sequence::change_event_data_range (midipulse *tick_s,* midipulse *tick_f,* midibyte *status,* midibyte *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

```
          df (t - ts) + ds (tf - t)
     d = -------------------------
                   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.
```

Parameters

tick_s	Provides the starting tick value.
tick_f	Provides the ending tick value.
status	Provides the event status that is to be changed.
cc	Provides the event control value.
data_s	Provides the starting data value.
data_f	Provides the finishing data value.

Returns

Returns true if the data was changed.

10.60.3.70 void seq64::sequence::increment_selected (midibyte *astat,* midibyte *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

10.60.3.71 void seq64::sequence::decrement_selected (midibyte *astat,* midibyte *control*)

The supported statuses are:

- One-byte messages
  - EVENT_PROGRAM_CHANGE
  - EVENT_CHANNEL_PRESSURE
- Two-byte messages
  - EVENT_NOTE_ON
  - EVENT_NOTE_OFF
  - EVENT_AFTERTOUCH
  - EVENT_CONTROL_CHANGE
  - EVENT_PITCH_WHEEL

Threadsafe

10.60.3.72 void seq64::sequence::grow_selected (midipulse *delta_tick*)

If an event is not linked, this function now ignores the event's timestamp, rather than risk a segfault on a null pointer.

Threadsafe

Parameters

delta_tick	An offset for each linked event's timestamp.

10.60.3.73 void seq64::sequence::stretch_selected (midipulse *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

10.60.3.74 void seq64::sequence::remove_marked ( )

Note how this function handles removing a value to avoid incrementing a now-invalid iterator.

Threadsafe

10.60.3.75 void seq64::sequence::mark_selected ( )

Threadsafe

10.60.3.76 void seq64::sequence::unpaint_all ( )

Threadsafe

10.60.3.77 void seq64::sequence::unselect ( )

Threadsafe

10.60.3.78 void seq64::sequence::verify_and_link ( )

Threadsafe

10.60.3.79 void seq64::sequence::link_new ( )

Threadsafe

10.60.3.80 void seq64::sequence::zero_markers ( )

This function is used when the sequencer stops.

Threadsafe

10.60.3.81 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

10.60.3.82 void seq64::sequence::play_note_off (int *a_note*)

Threadsafe

10.60.3.83 void seq64::sequence::off_playing_notes ( )

Threadsafe

10.60.3.84 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

10.60.3.85 void seq64::sequence::reset_draw_trigger_marker ( )

Threadsafe

10.60.3.86 draw_type seq64::sequence::get_next_note_event (midipulse * *a_tick_s,* midipulse * *a_tick_f,* int * *a_note,* bool * *a_selected,* int * *a_velocity*)

When it has no more events, returns a false.

10.60.3.87 int seq64::sequence::get_lowest_note_event ( )

Threadsafe

Returns

Returns the note with the lowest value. If there are no notes in the list, then SEQ64_MIDI_COUNT_MAX-1 is returned, which of course doesn't tell the caller much.

10.60.3.88 int seq64::sequence::get_highest_note_event ( )

Threadsafe

Returns

Returns the note with the highest value. If there are no notes in the list, then 0 is returned, which of course doesn't tell the caller much.

10.60.3.89 bool seq64::sequence::get_next_event (midibyte *status,* midibyte *cc,* midipulse * *tick,* midibyte * *d0,* midibyte * *d1,* bool * *selected*)

Then set the rest of the parameters parameters using that event.

Note the usage of event::is_desired_cc_or_not_cc(status, cc, *d0); Either we have a control change with the right CC or it's a different type of event.

10.60.3.90 bool seq64::sequence::get_next_event (midibyte * *a_status,* midibyte * *a_cc*)

Then set the status and control character parameters using that event.

10.60.3.91 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.

10.60.3.92 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.

10.60.3.93 void seq64::sequence::background_sequence (int *bs*) [inline]

Disabling the sequence number (setting it to SEQ64_SEQUENCE_LIMIT) is valid.

10.60.3.94 void seq64::sequence::copy_events (const event_list & *newevents*)

Compare this function to the remove_all() function. Copying the container is a lot of work, but fairly fast, even with an std::multimap as the container.

Threadsafe Note that we had to consolidate the replacement of all the events in the container in order to prevent the "Save to Sequence" button in the eventedit object from causing the application to segfault. It would segfault when the mainwnd timer callback would fire, causing updates to the sequence's slot pixmap, which would then try to access deleted events. Part of the issue was that note links were dropped when copying the events, so now we call verify_and_link() to hopefully reconstitute the links.

Parameters

newevents	Provides the container of MIDI events that will completely replace the current container. Normally this container is supplied by the event editor, via the eventslots class.

10.60.3.95 void seq64::sequence::put_event_on_bus (event & *ev*) [private]

Threadsafe

10.60.3.96 void seq64::sequence::set_trigger_offset (midipulse *trigger_offset*) [private]

If m_length is 0, then it is simply set to the parameter.

Threadsafe

Parameters

trigger_offset	The full trigger offset to set.

10.60.3.97 void seq64::sequence::split_trigger (trigger & *trig,* midipulse *splittick*) [private]

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.
splittick	The position just after where the original trigger will be truncated, and the new trigger begins.

10.60.3.98 void seq64::sequence::adjust_trigger_offsets_to_length (midipulse *newlength*) [private]

Threadsafe

Might can get rid of this function?

10.60.3.99 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

10.60.3.100 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()!

10.60.3.101 void seq64::sequence::remove_all ( ) [private]

Unsets the modified flag. Also see the new copy_events() function.

10.60.4 Field Documentation

10.60.4.1 midibyte seq64::sequence::m_midi_channel [private]

However, if this value is EVENT_NULL_CHANNEL (0xFF), then this sequence is an SMF 0 track, and has no single channel.

10.60.4.2 int seq64::sequence::m_playing_notes[SEQ64_MIDI_NOTES_MAX] [private]

It is used when muting, to shut off the notes that are playing.

10.60.4.3 int seq64::sequence::m_seq_number [private]

This number is set in the perform::install_sequence() function.

10.60.4.4 midipulse seq64::sequence::m_length [private]

This value should be a power of two when used as a bar unit.

10.60.4.5 midipulse seq64::sequence::m_snap_tick [private]

It starts out as the value m_ppqn / 4.

10.60.4.6 int seq64::sequence::m_time_beats_per_measure [private]

Defaults to 4. Used by the sequence editor to mark things in correct time on the user-interface.

10.60.4.7 int seq64::sequence::m_time_beat_width [private]

Defaults to 4, which means the beat is a quarter note. A value of 8 would mean it is an eighth note. Used by the sequence editor to mark things in correct time on the user-interface.

10.60.4.8 int seq64::sequence::m_clocks_per_metronome [private]

This value provides the number of MIDI clocks between metronome clicks. The default value of this item is 24. It can also be read from some SMF 1 files, such as our hymne.mid example.

10.60.4.9 int seq64::sequence::m_32nds_per_quarter [private]

This value provides the number of notated 32nd notes in a MIDI quarter note (24 MIDI clocks). The usual (and default) value of this parameter is 8; some sequencers allow this to be changed.

10.60.4.10 int seq64::sequence::m_us_per_quarter_note [private]

This value can be extracted from the beats-per-minute value (mastermidibus::m_beats_per_minute), but here we set it to 0 by default, indicating that we don't want to write it. Otherwise, it can be read from a MIDI file, and saved here to be restored later.

10.60.4.11 midibyte seq64::sequence::m_musical_key [private]

If the value is SEQ64_KEY_OF_C, then there is no musical key to be set.

10.60.4.12 midibyte seq64::sequence::m_musical_scale [private]

If the value is the enumeration value c_scale_off, then there is no musical scale to be set.

10.60.4.13 int seq64::sequence::m_background_sequence [private]

If the value is greater than max_sequence(), then there is no background sequence to be set.

10.60.4.14 mutex seq64::sequence::m_mutex [mutable], [private]

Made mutable for use in certain locked getter functions.

10.61 seq64::trigger Class Reference

This class hold a single trigger for a sequence object.

Public Member Functions

- trigger ()

  Initializes the trigger structure.

- bool operator< (const trigger &rhs)

  This operator compares only the m_tick_start members.
- midipulse tick_start () const

  'Getter' function for member m_tick_start
- void tick_start (midipulse s)

  'Setter' function for member m_tick_start
- void increment_tick_start (midipulse s)

  'Setter' function for member m_tick_start
- void decrement_tick_start (midipulse s)

  'Setter' function for member m_tick_start
- midipulse tick_end () const

  'Getter' function for member m_tick_end
- void tick_end (midipulse e)

  'Setter' function for member m_tick_end
- void increment_tick_end (midipulse s)

  'Setter' function for member m_tick_end
- void decrement_tick_end (midipulse s)

  'Setter' function for member m_tick_end
- midipulse offset () const

  'Getter' function for member m_offset
- void offset (midipulse o)

  'Setter' function for member m_offset
- void increment_offset (midipulse s)

  'Setter' function for member m_offset
- void decrement_offset (midipulse s)

  'Setter' function for member m_offset
- bool selected () const

  'Getter' function for member m_selected
- void selected (bool s)

  'Setter' function for member m_selected

Private Attributes

- midipulse m_tick_start

  Provides the starting tick for this trigger.
- midipulse m_tick_end

  Provides the ending tick for this trigger.
- midipulse m_offset

  Provides the offset for this trigger.
- bool m_selected

  Indicates that the trigger is part of a selection.

10.61.1 Detailed Description

This class is used in playback, and is contained in the triggers class.

10.62 seq64::triggers Class Reference

The triggers class is a receptable the triggers that can be used with a sequence object.

Public Types

- typedef std::list< trigger > List

  Exposes the triggers type, currently needed for midi_container only.

Public Member Functions

- triggers (sequence &parent)

  Principal constructor.
- ~triggers ()

  A rote destructor.
- triggers & operator= (const triggers &rhs)

  Principal assignment operator.
- void set_ppqn (int ppqn)

  'Setter' function for member m_ppqn We have to set this value after construction for best safety.
- void set_length (int len)

  'Setter' function for member m_length We have to set this value after construction for best safety.
- List & triggerlist ()

  'Getter' function for member m_triggers
- void push_undo ()

  Pushes the list-trigger into the trigger undo-list, then flags each item in the undo-list as unselected.
- void pop_undo ()

  If the trigger undo-list has any items, the list-trigger is pushed into the redo list, the top of the undo-list is coped into the list-trigger, and then pops from the undo-list.
- void print (const std::string &seqname)

  Prints a list of the currently-held triggers.
- bool play (midipulse &start_tick, midipulse &end_tick)

  If playback-mode (live mode?) is in force, that is, if using in-triggers and on/off triggers, this function handles that kind of playback.
- void add (midipulse tick, midipulse len, midipulse offset=0, bool adjustoffset=true)

  Adds a trigger.
- void adjust_offsets_to_length (midipulse newlen)

  Adjusts trigger offsets to the length of ???, for all triggers, and undo triggers.
- void split (midipulse tick)

  Splits the first trigger that brackets the splittick parameter.
- void split (trigger &trig, midipulse split_tick)

  Splits the trigger given by the parameter into two triggers.
- void grow (midipulse tick_from, midipulse tick_to, midipulse length)

  Grows a trigger.
- void remove (midipulse tick)

  Deletes the first trigger that brackets the given tick from the trigger-list.
- bool get_state (midipulse tick)

  Checks the list of triggers against the given tick.
- bool select (midipulse tick)

  Checks the list of triggers against the given tick.
- bool unselect ()

  Unselects all triggers.
- bool intersect (midipulse position, midipulse &start, midipulse &end)

  This function examines each trigger in the trigger list.
- void remove_selected ()

  Deletes the first selected trigger that is found.

- void copy_selected ()

  Copies the first selected trigger that is found.
- void paste ()

  If there is a copied trigger, then this function grabs it from the trigger clipboard and adds it.
- bool move_selected (midipulse tick, bool adjustoffset, int which=2)

  Moves selected triggers as per the given parameters.
- midipulse get_selected_start ()

  Gets the selected trigger's start tick.
- midipulse get_selected_end ()

  Gets the selected trigger's end tick.
- midipulse get_maximum ()

  Get the ending value of the last trigger in the trigger-list.
- void move (midipulse start_tick, midipulse distance, bool direction)

  Moves triggers in the trigger-list.
- void copy (midipulse start_tick, midipulse distance)

  Not sure what these diagrams are for yet.
- void clear ()

  Clears the whole list of triggers.
- bool next (midipulse *tick_on, midipulse *tick_off, bool *selected, midipulse *tick_offset)

  'Getter' function for member m_trigger_offset
- trigger next_trigger ()

  Get the next trigger in the trigger list, and set the parameters based on that trigger.
- void reset_draw_trigger_marker ()

  Sets the draw-trigger iterator to the beginning of the trigger list.

Private Member Functions

- midipulse adjust_offset (midipulse offset)

  Adjusts the given offset by mod'ing it with m_length and adding m_length if needed, and returning the result.

Private Attributes

- sequence & m_parent

  Holds a reference to the parent sequence object that owns this trigger object.
- List m_triggers

  This list holds the current pattern/triggers events.
- trigger m_clipboard

  This item holds a single copied trigger, to be pasted later.
- Stack m_undo_stack

  Handles the undo list for a series of operations on triggers.
- Stack m_redo_stack

  Handles the redo list for a series of operations on triggers.
- List::iterator m_iterator_play_trigger

  An iterator for cycling through the triggers during playback.
- List::iterator m_iterator_draw_trigger

  An iterator for cycling through the triggers during drawing.
- bool m_trigger_copied

  Set to true if there is an active trigger in the trigger clipboard.
- midipulse m_trigger_offset

  Offset.

- int m_ppqn

  Holds the value of the PPQN from the parent sequence, for easy access.
- int m_length

  Holds the value of the length from the parent sequence, for easy access.

10.62.1 Constructor & Destructor Documentation

10.62.1.1 seq64::triggers::triggers (sequence & *parent*)

Parameters

parent	The triggers object often needs to tell its parent sequence object what to do (such as stop playing).

10.62.2 Member Function Documentation

10.62.2.1 triggers & seq64::triggers::operator= (const triggers & *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.

10.62.2.2 void seq64::triggers::set_length (int *len*) [inline]

Also, there a chance that the length of the parent might change from time to time. Currently, only the sequence constructor and midifile call this function.

10.62.2.3 bool seq64::triggers::play (midipulse & *start_tick*, midipulse & *end_tick*)

This is a new function for sequence::play() to call.

Parameters

start_tick	Provides the starting tick value, and returns the modified value as a side-effect.
end_tick	Provides the ending tick value, and returns the modified value as a side-effect.

Returns

Returns true if we're through playing the frame, and the caller should stop the playback.

10.62.2.4 void seq64::triggers::add (midipulse *tick*, midipulse *len*, midipulse *offset* = 0, bool *fixoffset* = true)

What is this?

```
is    ie
<      ><        ><        >
es             ee
<               >
XX
es ee
<   >
<>
es    ee
<      >
<    >
es     ee
<       >
<    >
```

Parameters

tick	Provides the tick (pulse) time at which the trigger goes on.
len	Provides the length of the trigger. This value is actually calculated from the "on" value minus the "off" value read from the MIDI file.
offset	This value specifies the offset of the trigger. It is a feature of the c_triggers_new that c_↩ triggers doesn't have. It is the third value in the trigger specification of the Sequencer64 MIDI file.
fixoffset	If true, the offset parameter is modified by adjust_offset() first. We think that basically makes sure it is positive.

10.62.2.5 void seq64::triggers::adjust_offsets_to_length (midipulse *newlength*)

Parameters

newlength	

COMMON CODE?

COMMON CODE?

10.62.2.6 void seq64::triggers::split (midipulse *splittick*)

This is the first trigger where splittick is greater than L and less than R.

Parameters

splittick	Provides the tick that must be bracketed for the split to be made.

10.62.2.7 void seq64::triggers::split (trigger & *trig,* midipulse *splittick*)

The original trigger ends 1 tick before the splittick parameter, and the new trigger starts at splittick and ends where the original trigger ended.

Parameters

trig	Provides the original trigger, and also holds the changes made to that trigger as it is shortened.
splittick	The position just after where the original trigger will be truncated, and the new trigger begins.

10.62.2.8 void seq64::triggers::grow (midipulse *tickfrom,* midipulse *tickto,* midipulse *len*)

This function looks for the first trigger where the tickfrom parameter is between the trigger's tick-start and tick-end values. If found then the trigger's start is moved back to tickto, if necessary, or the trigger's end is moved to tickto plus the length parameter, if necessary.

Then this new trigger is added, and the function breaks from the search loop.

Parameters

tickfrom	The desired from-value back which to expand the trigger, if necessary.
tickto	The desired to-value towards which to expand the trigger, if necessary.
len	The additional length to append to tickto for the check.

10.62.2.9 void seq64::triggers::remove (midipulse *tick*)

Parameters

tick	Provides the tick to be examined.

10.62.2.10 bool seq64::triggers::get_state (midipulse *tick*)

If any trigger is found to bracket that tick, then true is returned.

Parameters

tick	Provides the tick of interest.

Returns

Returns true if a trigger is found that brackets the given tick.

10.62.2.11 bool seq64::triggers::select (midipulse *tick*)

If any trigger is found to bracket that tick, then true is returned, and the trigger is marked as selected.

Parameters

tick	Provides the tick of interest.

Returns

Returns true if a trigger is found that brackets the given tick.

10.62.2.12 bool seq64::triggers::unselect ( )

Returns

Always returns false.

10.62.2.13 bool seq64::triggers::intersect (midipulse *position,* midipulse & *start,* midipulse & *ender*)

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.

Parameters

position	The position to examine.
start	The destination for the starting tick (m_tick_start) of the matching trigger.
ender	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.

10.62.2.14 void seq64::triggers::paste ( )

It pastes at the copy end.

10.62.2.15 bool seq64::triggers::move_selected (midipulse *tick,* bool *fixoffset,* int *which* = 2)

```
          mintick][0                1][maxtick
                        2
```

Parameters

which	Selects which movement will be done. This parameter has three possible values: • 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.

Returns

Returns true if there was room to move. Otherwise, false is returned. We need this feature to support keystoke movement of a selected trigger in the perfroll window, and keep it from continually incremented when there can be no more movement. This causes moving the other direction to be delayed while the accumulating movement counter is used up. However, right now we can't rely on this result, and ignore it. There may be no way around this minor issue.

10.62.2.16 midipulse seq64::triggers::get_selected_start ( )

We guess this ends up selecting only one trigger, otherwise only the last selected one would effectively set the result.

Returns

Returns the tick_start() value of the last-selected trigger. If no triggers are selected, then midipulse(-1) is returned.

10.62.2.17 midipulse seq64::triggers::get_selected_end ( )

Returns

Returns the tick_end() value of the last-selected trigger. If no triggers are selected, then midipulse(-1) is returned.

10.62.2.18 void seq64::triggers::copy (midipulse *starttick,* midipulse *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...

10.62.2.19 bool seq64::triggers::next (midipulse * *tick_on,* midipulse * *tick_off,* bool * *selected,* midipulse * *offset*)

Get the next trigger in the trigger list, and set the parameters based on that trigger.

midipulse get_trigger_offset () const { return m_trigger_offset; }

Todo It would be a bit simpler to simply return a trigger object, wouldn't it?

Parameters

tick_on	Return value for the retrieval of the starting tick for the trigger.
tick_off	Return value for the retrieval of the ending tick for the trigger.
selected	Return value for the retrieval of the is-selected flag for the trigger.
offset	Return value for the retrieval of the offset for the trigger.

Returns

Returns true if a trigger was found. If false, the caller cannot rely on the values returned through the return parameters.

Side-effect(s) The value of the m_iterator_draw_trigger member will be altered by this call, unless pointing to the end of the triggerlist, or if there are no triggers.

10.62.2.20 trigger seq64::triggers::next_trigger ( )

Returns

Returns the next trigger. If there is none, a default trigger object is returned.

Side-effect(s) The value of the m_iterator_draw_trigger member will be altered by this call, unless pointing to the end of the triggerlist, or if there are no triggers.

10.62.2.21 midipulse seq64::triggers::adjust_offset (midipulse *offset*) [private]

Parameters

offset	Provides the offset, mod'ed against m_length, used to adjust the offset.

Returns

Returns the new offset. However, if m_length is 0, no change is made, and the original offset is returned.

10.62.3 Field Documentation

10.62.3.1 int seq64::triggers::m_ppqn [private]

This should not change, but we have to set it after construction, and so we provide a setter for it, set_ppqn(), called by the sequence constructor.

10.62.3.2 int seq64::triggers::m_length [private]

This might change, we're not yet sure.

10.63 seq64::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.
- 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.

10.63.1 Detailed Description

Will later make the size adjustable, if it makes sense to do so.

10.63.2 Member Function Documentation

10.63.2.1 void seq64::user_instrument::set_defaults ( )

Also invalidates the object.

10.63.2.2 int seq64::user_instrument::controller_max ( ) const [inline]

Remember that the controller numbers for each MIDI instrument range from 0 to 127 (MIDI_CONTROLLER_MAX-1).

10.63.2.3 const std::string & seq64::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.

10.63.2.4 bool seq64::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.

10.63.2.5 void seq64::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.

10.63.2.6 void seq64::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?

10.63.2.7 void seq64::user_instrument::copy_definitions (const user_instrument & *rhs*) [private]

Does not include the validity flag.

10.63.3 Field Documentation

10.63.3.1 bool seq64::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.

10.63.3.2 int seq64::user_instrument::m_controller_count [private]

Often, the "user" configuration file has only a few out of the 128 assigned explicitly.

10.64 seq64::user_instrument_t Struct Reference

This structure corresponds to `[user-instrument-N]` definitions in the `~/.seq24usr` or `~/.config/sequencer64/s usr` file.

Data Fields

- std::string instrument

  Provides the name of the "instrument" being supported.
- std::string controllers [SEQ64_MIDI_CONTROLLER_MAX]

  Provides a list of up to 128 controllers (e.g.
- bool controllers_active [SEQ64_MIDI_CONTROLLER_MAX]

  Provides a flag that indicates if each of up to 128 controller is active and supported.

10.64.1 Field Documentation

10.64.1.1 std::string seq64::user_instrument_t::instrument

Do not confuse "instrument" with "program" here. An "instrument" is most likely a hardware MIDI sound-box (though it could be a software synthesizer as well.

10.64.1.2 std::string seq64::user_instrument_t::controllers[SEQ64_MIDI_CONTROLLER_MAX]

"Modulation"). If a controller isn't present, or if General MIDI is in force, this name might be empty.

10.64.1.3 bool seq64::user_instrument_t::controllers_active[SEQ64_MIDI_CONTROLLER_MAX]

If false, it might be an unsupported controller or a General MIDI device.

10.65 seq64::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.
- 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 SEQ64_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.

10.65.1 Detailed Description

Will later make the size adjustable, if it makes sense to do so.

10.65.2 Member Function Documentation

10.65.2.1 void seq64::user_midi_bus::set_defaults ( )

Also invalidates the object. All 16 of the channels are set to SEQ64_GM_INSTRUMENT_FLAG (-1).

10.65.2.2 int seq64::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.

10.65.2.3 int seq64::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).

10.65.2.4 int seq64::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 SEQ64_GM_INSTRUMENT_FLAG (-1) is returned.

10.65.2.5 void seq64::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.

10.65.2.6 void seq64::user_midi_bus::copy_definitions (const user_midi_bus & *rhs*) [private]

Does not include the validity flag.

10.65.3 Field Documentation

10.65.3.1 bool seq64::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.

10.65.3.2 int seq64::user_midi_bus::m_channel_count [private]

Often, the "user" configuration file has only a few out of the 16 assigned explicitly.

10.66 seq64::user_midi_bus_t Struct Reference

This structure corresponds to `[user-midi-bus-0]` definitions in the `~/.seq24usr` ("user") file (`~/.config/sequencer64/sequencer64.usr` in the latest version of the application).

Data Fields

- std::string alias

  Provides the user's desired name for the MIDI bus.
- int instrument [SEQ64_MIDI_BUS_CHANNEL_MAX]

  Provides an implicit list of MIDI channels from 0 to 15 (1 to 16) and the "instrument" number assigned to each channel.

10.66.1 Field Documentation

10.66.1.1 std::string seq64::user_midi_bus_t::alias

For example, "2x2 A" for some kind of MIDI card or USB MIDI cable. If manual-alsa-ports is enabled, this could be something like "[0] seq24 0", and that is what should be shown in that case.

10.66.1.2 int seq64::user_midi_bus_t::instrument[SEQ64_MIDI_BUS_CHANNEL_MAX]

Note that the "instrument" is not a MIDI program number. Instead, it is the number associated with a "user-instrument" section in the "user" configuration file.

10.67 seq64::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 ()

  Scale factor for PPQN.
- 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)
- const std::string & instrument_name (int buss, int channel)

  Gets the correct instrument number from the buss and channel, and then looks up the name of the instrument.
- bool instrument_controller_active (int instrum, int cc)

  'Getter' function for member m_instruments[instrument].controllers_active[controller]
- bool controller_active (int buss, int channel, int cc)

  A convenience function so that the caller doesn't have to get the instrument number from the bus_instrument() member function.
- const std::string & instrument_controller_name (int instrum, int cc)

  'Getter' function for member m_instruments[instrument].controllers_active[controller]
- const std::string & controller_name (int buss, int channel, int cc)

  'Getter' function for member m_instruments[instrument].controllers_active[controller] A convenience function so that the caller doesn't have to get the instrument number from the bus_instrument() member function.
- int grid_style () const

  'Getter' function for member m_grid_style Checks for normal style.
- bool grid_is_normal () const

  'Getter' function for member m_grid_style Checks for normal style.
- bool grid_is_white () const

  'Getter' function for member m_grid_style Checks for the white style.
- bool grid_is_black () const

  'Getter' function for member m_grid_style Checks for the black style.
- int grid_brackets () const

  'Getter' function for member m_grid_brackets
- 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, dependent member

- int gmute_tracks () const

  'Getter' function for member m_gmute_tracks, dependent member
- int max_sets () const

  'Getter' function for member m_max_sets
- int max_sequence () const

  'Getter' function for member m_max_sequence, dependent member
- int text_x () const

  'Getter' function for member m_text_x, not user modifiable, not saved
- int text_y () const

  'Getter' function for member m_text_y, not user modifiable, not saved
- int seqchars_x () const

  'Getter' function for member m_seqchars_x, not user modifiable, not saved
- int seqchars_y () const

  'Getter' function for member m_seqchars_y, not user modifiable, not saved
- int seqarea_x () const

  'Getter' function for member m_seqarea_x, not user modifiable, not saved
- int seqarea_y () const

  'Getter' function for member m_seqarea_y, not user modifiable, not saved
- int seqarea_seq_x () const

  'Getter' function for member m_seqarea_seq_x, not user modifiable, not saved
- int seqarea_seq_y () const

  'Getter' function for member m_seqarea_seq_y, not user modifiable, not saved
- int mainwid_border () const

  'Getter' function for member m_mainwid_border
- int mainwid_spacing () const

  'Getter' function for member m_mainwid_spacing
- int mainwid_x () const

  'Getter' function for member m_mainwid_x, dependent member
- int mainwid_y () const

  'Getter' function for member m_mainwid_y, dependent member
- int control_height () const

  'Getter' function for member m_control_height
- int zoom () const

  'Getter' function for member m_current_zoom
- void zoom (int value)

  'Setter' function for member m_current_zoom This value is not modified unless the value parameter is between 1 and 32, inclusive.
- bool global_seq_feature () const

  'Getter' function for member m_global_seq_feature_save
- void global_seq_feature (bool flag)

  'Setter' function for member m_global_seq_feature_save
- int seqedit_scale () const

  'Getter' function for member m_seqedit_scale
- void seqedit_scale (int scale)

  'Setter' function for member m_seqedit_scale
- int seqedit_key () const

  'Getter' function for member m_seqedit_key
- void seqedit_key (int key)

  'Setter' function for member m_seqedit_key
- int seqedit_bgsequence () const

  'Getter' function for member m_seqedit_bgsequence

- void seqedit_bgsequence (int seqnum)

  'Setter' function for member m_seqedit_bgsequence Note that SEQ64_IS_LEGAL_SEQUENCE() allows the SE↩ Q64_SEQUENCE_LIMIT (0x800 = 2048) value, to turn off the use of a background sequence.

- bool use_new_font () const

  'Getter' function for member m_use_new_font

- bool allow_two_perfedits () const

  'Getter' function for member m_allow_two_perfedits

- int perf_h_page_increment () const

  'Getter' function for member m_h_perf_page_increment

- int perf_v_page_increment () const

  'Getter' function for member m_v_perf_page_increment

- bool save_user_config () const

  'Getter' function for member m_save_user_config

- void save_user_config (bool flag)

  'Setter' function for member m_save_user_config

- int midi_ppqn () const

  'Getter' function for member m_midi_ppqn

- int midi_beats_per_bar () const

  'Getter' function for member m_midi_beats_per_measure

- int midi_beats_per_minute () const

  'Getter' function for member m_midi_beats_per_minute

- int midi_beat_width () const

  'Getter' function for member m_midi_beat_width

- char midi_buss_override () const

  'Getter' function for member m_midi_buss_override

- int min_zoom () const

  'Getter' function for member mc_min_zoom

- int max_zoom () const

  'Getter' function for member mc_max_zoom

- int baseline_ppqn () const

  'Getter' function for member mc_baseline_ppqn

- void use_new_font (bool flag)

  'Setter' function for member m_use_new_font

- void allow_two_perfedits (bool flag)

  Sets the value of allowing two perfedits to be created and shown to the user.

- void perf_h_page_increment (int inc)

  Sets the horizontal page increment size for the horizontal scrollbar of a perfedit window.

- void perf_v_page_increment (int inc)

  Sets the vertical page increment size for the vertical scrollbar of a perfedit window.

- void midi_ppqn (int ppqn)

  'Setter' function for member m_midi_ppqn This value can be set from 96 to 960 (this upper limit will be determined by what Sequencer64 can actually handle).

- void midi_buss_override (char buss)

  'Setter' function for member m_midi_buss_override This value can be set from 0 to 31.

Protected Member Functions

- void grid_brackets (int thickness)

  'Getter' function for member m_grid_brackets
- void grid_style (int gridstyle)

  'Setter' function for member m_grid_style
- 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_max_sets This value is not modified unless the value parameter is between 32 and 64, inclusive.
- void text_x (int value)

  'Setter' function for member m_text_x This value is not modified unless the value parameter is between 6 and 6, inclusive.
- 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 ()

  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.
- void midi_beats_per_bar (int beatsperbar)

  'Setter' function for member m_midi_beats_per_measure This value can be set from 1 to 16.
- void midi_beats_per_minute (int beatsperminute)

  'Setter' function for member m_midi_beats_minute This value can be set from 20 to 500.
- void midi_beat_width (int beatwidth)

  'Setter' function for member m_midi_beatwidth This value can be set to any power of 2 in the range from 1 to 16.

Private Types

- enum mainwid_grid_style_t {
  grid_style_normal,
  grid_style_white,
  grid_style_black,
  grid_style_max }
- typedef std::vector< user_midi_bus > Busses

  [user-midi-bus-definitions]
- typedef std::vector< user_instrument > Instruments

  [user-instrument-definitions]

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.
- mainwid_grid_style_t m_grid_style

  [user-interface-settings]
- int m_grid_brackets

  Specify drawing brackets (like the old Seq24) or a solid box.
- int m_mainwnd_rows

  Number of rows in the Patterns Panel.
- int m_mainwnd_cols

  Number of columns in the Patterns Panel.
- int m_max_sets

  Maximum number of screen sets that can be supported.
- 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_current_zoom

  Provides the initial zoom value, in units of.
- bool m_global_seq_feature_save

  If true, this value provide a bit of backward-compatibility with the global key/scale/background-sequence persistence feature.
- int m_seqedit_scale

  Replaces seqedit::m_initial_scale as the repository for the scale to apply when a sequence is loaded into the sequence editor.
- int m_seqedit_key

  Replaces seqedit::m_initial_key as the repository for the key to apply when a sequence is loaded into the sequence editor.

- int m_seqedit_bgsequence

  Replaces seqedit::m_initial_sequence as the repository for the background sequence to apply when a sequence is loaded into the sequence editor.
- bool m_use_new_font

  Sets the usage of the font.
- bool m_allow_two_perfedits

  Enables the usage of two perfedit windows, for added convenience in editing multi-set songs.
- int m_h_perf_page_increment

  Allows a changed to the page size for the horizontal scroll bar.
- int m_v_perf_page_increment

  Allows a changed to the page size for the vertical scroll bar.
- int m_text_x

  Constants for the mainwid class.
- int m_seqchars_x

  Constants for the mainwid class.
- int m_midi_ppqn

  Provides the universal PPQN setting for the duration of this setting.
- int m_midi_beats_per_measure

  Provides the universal and unambiguous MIDI value for beats per measure, also called "beats per bar" (BPB).
- int m_midi_beats_per_minute

  Provides the universal and unambiguous MIDI value for beats per minute (BPM).
- int m_midi_beat_width

  Provides the universal MIDI value for beats width (BW).
- char m_midi_buss_override

  Provides a universal override of the buss number for all sequences, for the purpose of convenience of of testing.
- 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 supported, which is m_seqs_in_set squared, or 1024.
- 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_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_x

  The width of the main pattern/sequence grid, in pixels.
- bool m_save_user_config

  Provides a temporary variable that can be set from the command line to cause the "user" state to be saved into the "user" configuration file.
- const int mc_min_zoom

  Provides the minimum zoom value, currently a constant.
- const int mc_max_zoom

  Provides the maximum zoom value, currently a constant.
- const int mc_baseline_ppqn

  Permanent storage for the baseline, default PPQN used by Seq24.

10.67.1 Detailed Description

These settings will eventually be made part of the "user" settings file.

10.67.2 Member Typedef Documentation

10.67.2.1 typedef std::vector<user_midi_bus> seq64::user_settings::Busses [private]

Internal type for the container of user_midi_bus objects. Sorry about the "confusion" about "bus" versus "buss". See Google for arguments about it.

10.67.2.2 typedef std::vector<user_instrument> seq64::user_settings::Instruments [private]

Internal type for the container of user_instrument objects.

10.67.3 Member Enumeration Documentation

10.67.3.1 enum seq64::user_settings::mainwid_grid_style_t [private]

Enumerator

grid_style_normal Provides a setting to control the overall style of grid-drawing for the pattern slots in mainwid. These values can be specified in the [user-interface-settings] section of the "user" configuration file.

```
The grid background color is the normal background color for the
current GTK theme.  The box is drawn with brackets on either side.
```

grid_style_white The grid background color is white. This style better fits displaying the white-on-black sequence numbers. The box is drawn with brackets on either side.

grid_style_black The grid background color is black.

grid_style_max Marks the end of the list, and is an illegal value.

10.67.4 Constructor & Destructor Documentation

10.67.4.1 seq64::user_settings::user_settings ( )

Default constructor.

Should this be a float (6 significant digits) or two integers for scaling?

10.67.5 Member Function Documentation

10.67.5.1 void seq64::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!

10.67.5.2 void seq64::user_settings::set_globals ( ) const

Should be called at initialization, and after settings are read from the "user" configuration file.

DO NOT PUT ANY GLOBALS HERE UNTIL THEIR EFFECTS HAVE BEEN TESTED!!!!

10.67.5.3 void seq64::user_settings::get_globals ( )

Should be called before settings are written to the "user" configuration file.

10.67.5.4 const user_midi_bus& seq64::user_settings::bus (int *index*) [inline]

Cannot append the const specifier.

10.67.5.5 const user_instrument& seq64::user_settings::instrument (int *index*) [inline]

Cannot append the const specifier.

10.67.5.6 bool seq64::user_settings::controller_active (int *buss,* int *channel,* int *cc*) [inline]

It also has a shorter name.

10.67.5.7 const std::string& seq64::user_settings::controller_name (int *buss,* int *channel,* int *cc*) [inline]

It also has a shorter name.

10.67.5.8 void seq64::user_settings::zoom (int *value*)

The default value is 2.

10.67.5.9 void seq64::user_settings::mainwnd_rows (int *value*) [protected]

The default value is 4. Dependent values are recalculated after the assignment.

10.67.5.10 void seq64::user_settings::mainwnd_cols (int *value*) [protected]

The default value is 8. Dependent values are recalculated after the assignment.

10.67.5.11 void seq64::user_settings::max_sets (int *value*) [protected]

The default value is 32. Dependent values are recalculated after the assignment.

10.67.5.12 void seq64::user_settings::text_x (int *value*) [protected]

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.

10.67.5.13 void seq64::user_settings::text_y (int *value*) [protected]

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.

10.67.5.14 void seq64::user_settings::mainwid_border (int *value*) [protected]

The default value is 0. Dependent values are recalculated after the assignment.

10.67.5.15 void seq64::user_settings::mainwid_spacing (int *value*) [protected]

The default value is 2. Dependent values are recalculated after the assignment.

10.67.5.16 void seq64::user_settings::control_height (int *value*) [protected]

The default value is 0. Dependent values are recalculated after the assignment.

10.67.5.17 void seq64::user_settings::dump_summary ( ) [protected]

Does its work only if PLATFORM_DEBUG and SEQ64_USE_DEBUG_OUTPUT are defined. Only enabled in emergencies :-D.

10.67.5.18 void seq64::user_settings::perf_h_page_increment (int *inc*)

This value ranges from 1 (the original value, really too small for a "page" operation) to 6 (which is 24 measures, the same as the typical width of the perfroll)

10.67.5.19 void seq64::user_settings::perf_v_page_increment (int *inc*)

This value ranges from 1 (the original value, really too small for a "page" operation) to 18 (which is 18 tracks, slightly more than the typical height of the perfroll)

10.67.5.20 void seq64::user_settings::midi_ppqn (int *value*)

The default value is 192. Dependent values may be recalculated after the assignment.

10.67.5.21 void seq64::user_settings::midi_buss_override (char *buss*)

The default value is -1, which means that there is no buss override. It provides a way to override the buss number for smallish MIDI files. It replaces the buss-number read from the file. This option is turned on by the –bus option, and is merely a convenience feature for the quick previewing of a tune. (It's called "developer laziness".)

10.67.5.22 void seq64::user_settings::midi_beats_per_bar (int *value*) [protected]

The default value is 4.

10.67.5.23 void seq64::user_settings::midi_beats_per_minute (int *value*) [protected]

The default value is 120.

10.67.5.24 void seq64::user_settings::midi_beat_width (int *bw*) [protected]

The default value is 4.

10.67.5.25 user_midi_bus & seq64::user_settings::private_bus (int *index*) [private]

This invalid object has an empty alias, and all the instrument numbers are -1.

10.67.5.26 user_instrument & seq64::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.

10.67.6 Field Documentation

10.67.6.1 Busses seq64::user_settings::m_midi_buses [private]

Since this object is a vector, its size is adjustable.

10.67.6.2 Instruments seq64::user_settings::m_instruments [private]

The size is adjustable, and grows as objects are added.

10.67.6.3 mainwid_grid_style_t seq64::user_settings::m_grid_style [private]

Specifies the current grid style.

10.67.6.4 int seq64::user_settings::m_grid_brackets [private]

0 = no brackets, 1 and above is the thickness of the brakcets. 1 is the normal thickness of the brackets, 2 is a two-pixel thickness, and so on.

10.67.6.5 int seq64::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". We would like to be able to change this value from 4 to 8, and maybe allow the values of 5, 6, and 7 as well. But if we could just get 8 working, then well would Sequencer64 deserve the 64 in its name.

10.67.6.6 int seq64::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".

10.67.6.7 int seq64::user_settings::m_max_sets [private]

Basically, that the number of times the Patterns Panel can be filled. 32 sets can be created. Although this value is part of the "user" configuration file, it is likely that it will never change. Rather, the number of sequences per set would change. We'll see.

10.67.6.8 int seq64::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.

10.67.6.9 int seq64::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.

10.67.6.10 bool seq64::user_settings::m_global_seq_feature_save [private]

In this feature, applying one of these three changes to a sequence causes them to also be applied to sequences that are subsequently opened for editing. However, we improve on this feature by allowing the changes to be saved in the global, proprietary part of the saved MIDI file.

If false, the user can still save the key/scale/background-sequence values with each individual sequence, so they can be different.

This value will be true by default, unless changed in the "user" configuration file.

10.67.6.11 int seq64::user_settings::m_seqedit_scale [private]

Its default value is c_scale_off. Although this value is now stored in the user_settings class, it always comes from the currently loaded MIDI file, if present. If m_global_seq_feature_save is true, this variable is stored in the "proprietary" track at the end of the file, under the control tag c_musicscale, and will be applied to any sequence that is edited. If m_global_seq_feature_save is false, this variable is stored, if used, in the meta-data for the sequence to which it applies, and, again, is tagged with the control tag c_musicscale.

10.67.6.12 int seq64::user_settings::m_seqedit_key [private]

Its default value is SEQ64_KEY_OF_C. Although this value is now stored in the user_settings class, it always comes from the currently loaded MIDI file, if present. If m_global_seq_feature_save is true, this variable is stored in the "proprietary" track at the end of the file, under the control tag c_musickey, and will be applied to any sequence that is edited. If m_global_seq_feature_save is false, this variable is stored, if used, in the meta-data for the sequence to which it applies, and, again, is tagged with the control tag c_musickey.

10.67.6.13 int seq64::user_settings::m_seqedit_bgsequence [private]

Its default value is SEQ64_SEQUENCE_LIMIT. Although this value is now stored in the user_settings class, it always comes from the currently loaded MIDI file, if present. If m_global_seq_feature_save is true, this variable is stored, if it has a valid (but not "legal") value, in the "proprietary" track at the end of the file, under the control tag c_backsequence, and will be applied to any sequence that is edited. If m_global_seq_feature_save is false, this variable is stored, if used, in the meta-data for the sequence to which it applies, and, again, is tagged with the control tag c_backsequence.

10.67.6.14 bool seq64::user_settings::m_use_new_font [private]

By default, in normal mode, the new font is used. In legacy mode, the old font is used.

10.67.6.15 bool seq64::user_settings::m_allow_two_perfedits [private]

Defaults to true.

10.67.6.16 int seq64::user_settings::m_h_perf_page_increment [private]

The value used to be hardwired to 1 (in four-measure units), now it defaults to 4 (16 measures at a time). The value of 1 is already covered by the scrollbar arrows.

10.67.6.17 int seq64::user_settings::m_v_perf_page_increment [private]

The value used to be hardwired to 1 (in single-track units), now it defaults to 8. The value of 1 is already covered by the scrollbar arrows.

10.67.6.18 int seq64::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).

We have added black-on-yellow and yellow-on-black versions of the fonts, to support the highlighting of pattern boxes if they are empty of actual MIDI events.

We have also added a set of four new font files that are roughly the same size, and are treated as the same size, but look smooth and less like a DOS-era font.

The font module does not use these values directly, but does define some similar variables that differ slightly between the two styles of font. There are a lot of tricks and hard-wired places to fix before further work can be done with fonts in Sequencer64.

10.67.6.19 int seq64::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.

10.67.6.20 int seq64::user_settings::m_midi_ppqn [private]

This variable replaces the global ppqn. The default value of this setting is 192 parts-per-quarter-note (PPQN). There is still a lot of work to get a different PPQN to work properly in speed of playback, scaling of the user interface, and other issues. Note that this value can be changed by the still-experimental –ppqn option. There is one remaining trace of the global, though: DEFAULT_PPQN.

10.67.6.21 int seq64::user_settings::m_midi_beats_per_measure [private]

This variable will replace the global beats per measure. The default value of this variable is SEQ64_DEFAULT_↩ BEATS_PER_MEASURE (4). For external access, we will call this value "beats per bar", abbreviate it "BPB", and use "bpb" in any accessor function names. Now, although it applies to the whole session, we should be able to continue seq24's tradition of allowing each sequence to have its own time signature. Also, there are a number of places where the number 4 appears and looks like it might be a hardwired BPB value, either for MIDI purposes or for drawing the piano-roll grids. So we might need a couple different versions of this variable.

10.67.6.22 int seq64::user_settings::m_midi_beats_per_minute [private]

This variable will replace the global beats per minute. The default value of this variable is DEFAULT_BPM (120). This variable should apply to the whole session; there's probably no way to support a diffent tempo for each sequence. But we shall see. For external access, we will call this value "beats per minute", abbreviate it "BPM", and use "bpm" in any accessor function names.

10.67.6.23 int seq64::user_settings::m_midi_beat_width [private]

This variable will replace the global beat_width. The default value of this variable is DEFAULT_BEAT_WIDTH (4). Now, although it applies to the whole session, we should be able to continue seq24's tradition of allowing each sequence to have its own time signature. Also, there are a number of places where the number 4 appears and looks like it might be a hardwired BW value, either for MIDI purposes or for drawing the user-interface. So we might need a couple different versions of this variable. For external access, we will call this value "beat width", abbreviate it "BW", and use "bw" in any accessor function names.

10.67.6.24 char seq64::user_settings::m_midi_buss_override [private]

This variable replaces the global buss-override variable, and is set via the command-line option –bus.

10.67.6.25 int seq64::user_settings::m_seqs_in_set [private]

This value is 4 x 8 = 32 by default.

Warning

Currently implicit/explicit in a number of the "rc" file and rc_settings. Would probably want the left 32 or the first 32 items in the main window only to be subject to keystroke control. This value is calculated by the normalize() function, and is *not* part of the "user" configuration file.

10.67.6.26 int seq64::user_settings::m_gmute_tracks [private]

This value is *not* part of the "user" configuration file; it is calculated by the normalize() function.

10.67.6.27 int seq64::user_settings::m_max_sequence [private]

It is a derived value, and not stored in the "user" file.

```
m_max_sequence = m_seqs_in_set * m_max_sets;
```

10.67.6.28 int seq64::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.

10.67.6.29 int seq64::user_settings::m_seqarea_seq_x [private]

These are used only in the mainwid module.

10.67.6.30 int seq64::user_settings::m_mainwid_x [private]

Affected by the m_mainwid_border and m_mainwid_spacing values.

```
c_mainwid_x =
(
    (c_seqarea_x + c_mainwid_spacing) * c_mainwnd_cols -
        c_mainwid_spacing + c_mainwid_border * 2
);
```

10.67.6.31 bool seq64::user_settings::m_save_user_config [private]

Normally, this state is not saved. It is not saved because there is currently no user-interface for editing it, and because it can pick up some command-line options, and it is not right to have them written to the "user" configuration file.

(The "rc" configuration file is a different case, having historically always been saved, and having a number of command-line options, such as JACK settings that should generally be permanent on a given system.)

Anyway, this flag can be set by the –user-save option. This setting is never saved. But note that, if no "user" configuration file is found, it is then saved anyway.

10.67.6.32 const int seq64::user_settings::mc_min_zoom [private]

It's value is 1.

10.67.6.33 const int seq64::user_settings::mc_max_zoom [private]

It's value is 32.

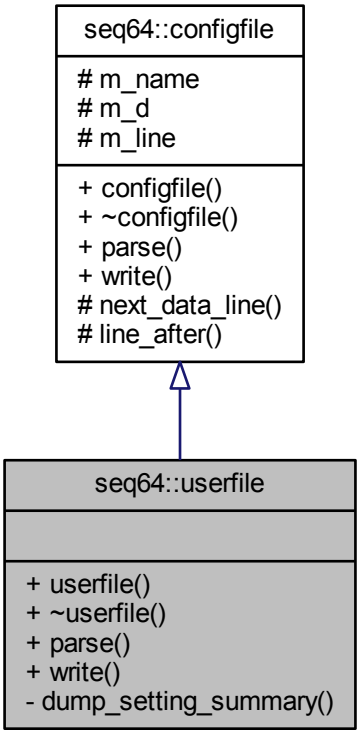
10.67.6.34 const int seq64::user_settings::mc_baseline_ppqn [private]

This value is necessary in order to keep user-interface elements stable when different PPQNs are used. It is set to DEFAULT_PPQN.

10.68 seq64::userfile Class Reference

Supports the user's ~/.config/sequencer64/sequencer64.usr and ~/.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.

Private Member Functions

- void dump_setting_summary ()

  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.

Additional Inherited Members

10.68.1 Member Function Documentation

10.68.1.1 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.

10.68.1.2 bool seq64::userfile::write (const perform & *a_perf*) [virtual]

Parameters

a_perf	The performance object, currently unused.

Implements seq64::configfile.

10.68.1.3 void seq64::userfile::dump_setting_summary ( ) [private]

Does work only if PLATFORM_DEBUG is defined; see the user_settings class.

Index

~event
    seq64::event, 60
~eventedit
    seq64::eventedit, 75
~jack_assistant
    seq64::jack_assistant, 109
~keys_perform
    seq64::keys_perform, 119
~keys_perform_gtk2
    seq64::keys_perform_gtk2, 123
~perfedit
    seq64::perfedit, 182
~perform
    seq64::perform, 195
~perfroll
    seq64::perfroll, 215
~seqmenu
    seq64::seqmenu, 253

about_dialog
    seq64::mainwnd, 143
add
    seq64::editable_events, 54
    seq64::event_list, 69
    seq64::triggers, 288
add_event
    seq64::sequence, 273, 278
add_long
    seq64::midi_container, 148
add_note
    seq64::sequence, 278
add_sequence
    seq64::perform, 197
add_trigger
    seq64::sequence, 273
add_variable
    seq64::midi_container, 148
adj_callback_bpm
    seq64::mainwnd, 143
adj_callback_ss
    seq64::mainwnd, 143
adjust_offset
    seq64::triggers, 292
adjust_offsets_to_length
    seq64::triggers, 289
adjust_trigger_offsets_to_length
    seq64::sequence, 283
alias
    seq64::user_midi_bus_t, 298
all_notes_off
    seq64::perform, 202
analyze
    seq64::editable_event, 50
any_selected_notes
    seq64::event_list, 71
append_sysex
    seq64::event, 64
apply_length
    seq64::seqedit, 239

BLACK
    seq64::font, 92
BLACK_ON_CYAN
    seq64::font, 92
BLACK_ON_YELLOW
    seq64::font, 92
background_sequence
    seq64::sequence, 282
bus
    seq64::user_settings, 305
Busses
    seq64::user_settings, 305
button
    seq64::options, 175

CYAN_ON_BLACK
    seq64::font, 92
calculate_base_sizes
    seq64::mainwid, 136
category
    seq64::editable_event, 49
category_channel_message
    seq64::editable_event, 47
category_meta_event
    seq64::editable_event, 47
category_name
    seq64::editable_event, 47
category_prop_event
    seq64::editable_event, 47
category_system_message
    seq64::editable_event, 47
category_t
    seq64::editable_event, 47
change_event_data_range
    seq64::sequence, 278
change_vert
    seq64::eventslots, 88
channel_count
    seq64::user_midi_bus, 297
channel_max

seq64::user_midi_bus, 297
CharList
seq64::midi_list, 150
check_channel
seq64::event, 61
clamp_track
seq64::perform, 209
clear
seq64::event_list, 70
clear_all
seq64::perform, 195
clear_sequence_triggers
seq64::perform, 197
clear_triggers
seq64::sequence, 276
clear_window
seq64::gui_drawingarea_gtk2, 99
click
seq64::click, 39
client_open
seq64::jack_assistant, 112
clock
seq64::midibus, 160
collapse
seq64::perfedit, 183
Color
seq64::font, 92
cond
seq64::condition_var, 42
configfile
seq64::configfile, 43
continue_from
seq64::midibus, 160
control_height
seq64::user_settings, 306
controller_active
seq64::user_instrument, 294
seq64::user_settings, 306
controller_max
seq64::user_instrument, 294
controller_name
seq64::user_instrument, 294
seq64::user_settings, 306
controllers
seq64::user_instrument_t, 295
controllers_active
seq64::user_instrument_t, 295
convert_t
seq64::seqevent, 245
convert_tn
seq64::seqroll, 258
convert_x
seq64::perfroll, 217
seq64::seqevent, 245
convert_xy
seq64::perfroll, 217
convert_y
seq64::eventslots, 87
copy
seq64::perfedit, 183
seq64::triggers, 291
copy_definitions
seq64::user_instrument, 295
seq64::user_midi_bus, 297
copy_events
seq64::sequence, 282
copy_selected
seq64::sequence, 277
copy_triggers
seq64::perform, 198
seq64::sequence, 276
count
seq64::editable_events, 54
seq64::event_list, 69
count_selected_events
seq64::event_list, 71
create_menus
seq64::seqedit, 240
cut_selected
seq64::sequence, 277

decrement_beats_per_minute
seq64::perform, 206
decrement_bottom
seq64::eventslots, 89
decrement_current
seq64::eventslots, 89
decrement_selected
seq64::sequence, 279
decrement_top
seq64::eventslots, 88
deinit_in
seq64::midibus, 159
deinit_jack
seq64::perform, 208
del_trigger
seq64::sequence, 274
delete_current_event
seq64::eventslots, 85
delete_sequence
seq64::perform, 197
do_action
seq64::seqedit, 241
draw_background
seq64::seqevent, 244
draw_drawable_row
seq64::perfroll, 218
draw_event
seq64::eventslots, 87
draw_events
seq64::eventslots, 87
draw_events_on
seq64::seqevent, 245
seq64::seqroll, 258
draw_events_on_pixmap
seq64::seqroll, 258
draw_key

seq64::seqkeys, 250
draw_line
seq64::gui_drawingarea_gtk2, 99–101
draw_line_on_pixmap
seq64::gui_drawingarea_gtk2, 99, 100
draw_marker_on_sequence
seq64::mainwid, 134
draw_normal_rectangle_on_pixmap
seq64::gui_drawingarea_gtk2, 103
draw_pixmap_on_window
seq64::seqevent, 244
draw_rectangle
seq64::gui_drawingarea_gtk2, 101–103
draw_rectangle_on_pixmap
seq64::gui_drawingarea_gtk2, 103
draw_sequence
seq64::perfnames, 187
draw_sequence_on
seq64::perfroll, 218
draw_sequence_on_pixmap
seq64::mainwid, 135
draw_sequence_pixmap_on_window
seq64::mainwid, 135
draw_sequences_on_pixmap
seq64::mainwid, 135
drop_event
seq64::seqevent, 245
dump_setting_summary
seq64::userfile, 313
dump_summary
seq64::user_settings, 307

e_deselect
seq64::sequence, 269
e_is_selected
seq64::sequence, 269
e_jack_connect
seq64::options, 176
e_jack_disconnect
seq64::options, 176
e_jack_master
seq64::options, 176
e_jack_master_cond
seq64::options, 176
e_jack_start_mode_live
seq64::options, 176
e_jack_start_mode_song
seq64::options, 176
e_jack_transport
seq64::options, 176
e_remove_one
seq64::sequence, 269
e_select
seq64::sequence, 269
e_select_one
seq64::sequence, 269
e_toggle_selection
seq64::sequence, 269
e_would_select
seq64::sequence, 269
edit_callback_notepad
seq64::mainwnd, 143
editable_event
seq64::editable_event, 48
editable_events
seq64::editable_events, 53
enqueue_draw
seq64::eventedit, 75
seq64::perfedit, 182
seq64::perfnames, 187
seq64::perfroll, 218
seq64::perftime, 222
enregister_peer
seq64::perfedit, 183
errdump
seq64::midifile, 171
error_message
seq64::jack_assistant, 112
event
seq64::event, 60
event_count
seq64::sequence, 269
event_key
seq64::event_list::event_key, 66
event_list
seq64::event_list, 69
eventedit
seq64::eventedit, 74
events
seq64::keybindentry, 116
expand
seq64::perfedit, 183

file_import_dialog
seq64::mainwnd, 143
fill
seq64::midi_container, 147
fill_background_pixmap
seq64::perfroll, 217
fill_container
seq64::sequence, 281
finish
seq64::perform, 198
format_timestamp
seq64::editable_event, 50
FruityPerfInput
seq64::perfroll, 219

get
seq64::midi_container, 147
seq64::midi_list, 150
seq64::midi_vector, 157
get_beat_width
seq64::sequence, 270
get_clipboard_box
seq64::sequence, 277
get_data
seq64::event, 64

get_globals
seq64::user_settings, 305
get_group_mute_state
seq64::perform, 205
get_highest_note_event
seq64::sequence, 281
get_jack_ticks
seq64::jack_assistant, 112
get_keys
seq64::keys_perform, 120
get_last_tick
seq64::sequence, 271
get_lowest_note_event
seq64::sequence, 281
get_max_trigger
seq64::perform, 198
seq64::sequence, 276
get_measures
seq64::seqedit, 239
get_name
seq64::sequence, 270
get_next_event
seq64::sequence, 281
get_next_note_event
seq64::sequence, 281
get_num_selected_events
seq64::sequence, 277
get_num_selected_notes
seq64::sequence, 277
get_rank
seq64::event, 65
get_screen_set_notepad
seq64::perform, 199
get_selected_box
seq64::sequence, 277
get_selected_end
seq64::triggers, 291
get_selected_start
seq64::triggers, 291
get_sequence
seq64::perform, 203
get_state
seq64::triggers, 290
get_trigger_state
seq64::sequence, 274
grid_style_black
seq64::user_settings, 305
grid_style_max
seq64::user_settings, 305
grid_style_normal
seq64::user_settings, 305
grid_style_white
seq64::user_settings, 305
groups
seq64::keybindentry, 116
grow
seq64::perfedit, 183
seq64::triggers, 289
grow_selected
seq64::sequence, 279
grow_trigger
seq64::sequence, 273
gui_assistant
seq64::gui_assistant, 95
gui_palette_gtk2
seq64::gui_palette_gtk2, 105
gui_window_gtk2
seq64::gui_window_gtk2, 107

handle_config
seq64::lash, 127
handle_event
seq64::lash, 127
handle_insert
seq64::eventedit, 78
handle_midi_control
seq64::perform, 199
handle_modify
seq64::eventedit, 78
handle_motion_key
seq64::Seq24PerfInput, 227
handle_save
seq64::eventedit, 78
highlight
seq64::perform, 206
home_config_directory
seq64::rc_settings, 225

idle_progress
seq64::maintime, 130
idle_redraw
seq64::seqdata, 233
seq64::seqevent, 245
increment
seq64::midi_splitter, 153
increment_beats_per_minute
seq64::perform, 206
increment_bottom
seq64::eventslots, 89
increment_current
seq64::eventslots, 89
increment_selected
seq64::sequence, 279
increment_top
seq64::eventslots, 88
info_message
seq64::jack_assistant, 112
init
seq64::font, 92
seq64::jack_assistant, 110
seq64::lash, 127
init_before_show
seq64::perfedit, 182
seq64::perfroll, 217
init_clock
seq64::midibus, 160
init_in

seq64::midibus, 159
init_in_sub
seq64::midibus, 159
init_jack
seq64::perform, 208
init_out
seq64::midibus, 159
init_out_sub
seq64::midibus, 159
inner_start
seq64::perform, 209
insert_event
seq64::eventslots, 84
install_sequence
seq64::perform, 209
instrument
seq64::user_instrument_t, 295
seq64::user_midi_bus, 297
seq64::user_midi_bus_t, 298
seq64::user_settings, 306
Instruments
seq64::user_settings, 305
intersect
seq64::triggers, 290
intersect_events
seq64::sequence, 275
intersect_notes
seq64::sequence, 274
intersect_triggers
seq64::sequence, 274
is_active
seq64::perform, 203
is_channel_msg
seq64::event, 61
is_desired_cc_or_not_cc
seq64::event, 63
is_dirty_edit
seq64::perform, 202
seq64::sequence, 272
is_dirty_main
seq64::perform, 202
seq64::sequence, 272
is_dirty_names
seq64::perform, 203
seq64::sequence, 272
is_dirty_perf
seq64::perform, 203
seq64::sequence, 272
is_letter
seq64::keystroke, 125
is_midi_control_valid
seq64::perform, 208
is_modified
seq64::perform, 208
is_mseq_valid
seq64::perform, 209
is_note_msg
seq64::event, 61
is_one_byte_msg
seq64::event, 61
is_screenset_valid
seq64::perform, 208
is_seq_valid
seq64::perform, 208
is_sysex_special_id
seq64::midifile, 171
is_two_byte_msg
seq64::event, 61

jack_assistant
seq64::jack_assistant, 109
jack_shutdown_callback
seq64::jack_assistant, 114
jack_timebase_callback
seq64::jack_assistant, 115

Key
seq64::editable_events, 53
key_name
seq64::keys_perform, 120
seq64::keys_perform_gtk2, 123
keybindentry
seq64::keybindentry, 117
keystroke
seq64::keystroke, 124, 125

lash
seq64::lash, 126
lash_timeout_connect
seq64::gui_assistant_gtk2, 96
launch
seq64::perform, 195
launch_input_thread
seq64::perform, 207
launch_output_thread
seq64::perform, 208
line_after
seq64::configfile, 43
link_new
seq64::event_list, 70
seq64::sequence, 280
load_events
seq64::editable_events, 54
seq64::eventslots, 84
location
seq64::keybindentry, 116

m_32nds_per_quarter
seq64::sequence, 284
m_allow_two_perfedits
seq64::user_settings, 309
m_b_on_c_pixmap
seq64::font, 93
m_b_on_y_pixmap
seq64::font, 93
m_background
seq64::gui_drawingarea_gtk2, 104

m_background_sequence
seq64::sequence, 284
m_bar_width
seq64::maintime, 131
m_beat_width
seq64::maintime, 131
seq64::midi_timing, 155
m_beats_per_measure
seq64::midi_timing, 155
m_beats_per_minute
seq64::midi_timing, 155
m_black_pixmap
seq64::font, 93
m_box_height
seq64::maintime, 131
m_box_width
seq64::maintime, 131
m_bpm
seq64::perfedit, 184
m_button
seq64::click, 40
m_bw
seq64::perfedit, 184
m_c_on_b_pixmap
seq64::font, 93
m_category
seq64::editable_event, 51
m_channel
seq64::event, 65
m_channel_count
seq64::user_midi_bus, 297
m_char_list
seq64::midifile, 173
m_char_w
seq64::eventslots, 90
seq64::perfnames, 187
m_clip_mask
seq64::font, 93
m_clocks_per_metronome
seq64::sequence, 284
m_control_height
seq64::user_settings, 308
m_controller_count
seq64::user_instrument, 295
m_current_event
seq64::editable_events, 55
m_current_index
seq64::eventslots, 90
m_data
seq64::event, 65
seq64::midifile, 173
m_disable_reported
seq64::midifile, 173
m_divisions
seq64::midi_measures, 151
m_drop_x
seq64::gui_drawingarea_gtk2, 104
m_error_is_fatal
seq64::midifile, 173
m_error_message
seq64::midifile, 173
m_file_size
seq64::midifile, 173
m_flash_height
seq64::maintime, 131
m_flash_width
seq64::maintime, 131
m_font_h
seq64::font, 93
m_font_w
seq64::font, 93
m_foreground
seq64::gui_drawingarea_gtk2, 104
m_format_timestamp
seq64::editable_event, 51
m_fruity_interaction
seq64::perfroll, 219
m_global_seq_feature_save
seq64::user_settings, 308
m_gmute_tracks
seq64::user_settings, 311
m_grid_brackets
seq64::user_settings, 308
m_grid_style
seq64::user_settings, 308
m_h_page_increment
seq64::perfroll, 219
m_h_perf_page_increment
seq64::user_settings, 309
m_has_link
seq64::event, 65
m_initial_snap
seq64::seqedit, 241
m_instruments
seq64::user_settings, 308
m_is_modified
seq64::event_list, 71
seq64::perform, 211
m_is_press
seq64::keystroke, 125
m_is_valid
seq64::user_instrument, 295
seq64::user_midi_bus, 297
m_key
seq64::keybindentry, 117
seq64::keystroke, 125
m_key_bpm_up
seq64::keys_perform, 121
m_key_show_ui_sequence_number
seq64::keys_perform, 121
m_left_marker_tick
seq64::perftime, 223
m_left_tick
seq64::perform, 210
m_length
seq64::sequence, 283

seq64::triggers, 293
m_line
seq64::configfile, 43
m_main_wid
seq64::mainwnd, 145
m_mainperf
seq64::gui_drawingarea_gtk2, 104
m_mainwid_border
seq64::user_settings, 308
m_mainwid_x
seq64::user_settings, 311
m_mainwnd_cols
seq64::user_settings, 308
m_mainwnd_rows
seq64::user_settings, 308
m_max_sequence
seq64::user_settings, 311
m_max_sets
seq64::perform, 211
seq64::user_settings, 308
m_measure_length
seq64::perftime, 223
m_midi_beat_width
seq64::user_settings, 310
m_midi_beats_per_measure
seq64::user_settings, 310
m_midi_beats_per_minute
seq64::user_settings, 310
m_midi_buses
seq64::user_settings, 308
m_midi_buss_override
seq64::user_settings, 310
m_midi_channel
seq64::sequence, 283
m_midi_parameters
seq64::editable_events, 55
m_midi_ppqn
seq64::user_settings, 310
m_modified
seq64::seqmenu, 254
m_modifier
seq64::click, 40
seq64::keystroke, 125
m_musical_key
seq64::sequence, 284
m_musical_scale
seq64::sequence, 284
m_mutex
seq64::sequence, 284
m_name_meta
seq64::editable_event, 51
m_name_status
seq64::editable_event, 51
m_namebox_w
seq64::perfnames, 188
m_names_chars
seq64::perfnames, 187
m_names_y
seq64::perfnames, 188
m_new_format
seq64::midifile, 173
m_notebook
seq64::options, 176
m_number_h
seq64::seqdata, 234
m_number_offset_y
seq64::seqdata, 234
m_number_w
seq64::seqdata, 234
m_one_measure
seq64::perform, 210
m_parent
seq64::editable_event, 51
seq64::perfnames, 187
seq64::perfroll, 219
seq64::perftime, 223
m_pixmap
seq64::font, 93
seq64::gui_drawingarea_gtk2, 104
m_playback_mode
seq64::perform, 210
m_playing_notes
seq64::sequence, 283
m_playscreen_offset
seq64::perform, 210
m_pos
seq64::midifile, 173
m_ppqn
seq64::maintime, 131
seq64::mainwnd, 145
seq64::midi_timing, 155
seq64::triggers, 293
m_rank
seq64::event_list::event_key, 66
m_redraw_ms
seq64::eventedit, 79
seq64::perfedit, 184
m_right_marker_tick
seq64::perftime, 223
m_right_tick
seq64::perform, 210
m_save_user_config
seq64::user_settings, 311
m_screenset_offset
seq64::mainwid, 138
m_screenset_slots
seq64::mainwid, 138
m_seq_number
seq64::sequence, 283
m_seqarea_seq_x
seq64::user_settings, 311
m_seqarea_x
seq64::user_settings, 311
m_seqchars_x
seq64::user_settings, 310
m_seqedit

seq64::seqmenu, 254
m_seqedit_bgsequence
seq64::user_settings, 309
m_seqedit_key
seq64::user_settings, 309
m_seqedit_scale
seq64::user_settings, 309
m_seqs
seq64::perform, 210
m_seqs_in_set
seq64::perform, 211
seq64::user_settings, 310
m_sequence
seq64::editable_events, 55
m_sequence_count
seq64::perform, 211
m_sequence_max
seq64::perform, 211
m_setbox_w
seq64::eventslots, 90
seq64::perfnames, 188
m_sigpipe
seq64::mainwnd, 145
m_slots_chars
seq64::eventslots, 90
m_slots_y
seq64::eventslots, 90
m_smf0_channels
seq64::midi_splitter, 154
m_smf0_channels_count
seq64::midi_splitter, 154
m_smf0_seq_number
seq64::midi_splitter, 154
m_smf0_splitter
seq64::midifile, 173
m_snap_tick
seq64::sequence, 283
m_spinbutton_load_offset
seq64::mainwnd, 145
m_starting_tick
seq64::perform, 211
m_status
seq64::event, 65
m_sysex
seq64::event, 65
m_text_x
seq64::user_settings, 309
m_tick
seq64::maintime, 131
seq64::perform, 211
m_time_beat_width
seq64::sequence, 284
m_time_beats_per_measure
seq64::sequence, 283
m_timestamp
seq64::event_list::event_key, 66
m_top_index
seq64::eventslots, 90
m_us_per_quarter_note
seq64::sequence, 284
m_use_new_font
seq64::user_settings, 309
m_v_page_increment
seq64::perfroll, 219
m_v_perf_page_increment
seq64::user_settings, 309
m_white_pixmap
seq64::font, 93
m_window
seq64::gui_drawingarea_gtk2, 104
m_window_x
seq64::gui_drawingarea_gtk2, 104
seq64::gui_window_gtk2, 108
m_x
seq64::click, 40
m_xy_offset
seq64::eventslots, 90
seq64::perfnames, 188
m_y
seq64::click, 40
m_y_on_b_pixmap
seq64::font, 93
maintime
seq64::maintime, 129
mainwid
seq64::mainwid, 134
mainwid_border
seq64::user_settings, 306
mainwid_grid_style_t
seq64::user_settings, 305
mainwid_spacing
seq64::user_settings, 306
mainwnd
seq64::mainwnd, 142
mainwnd_cols
seq64::user_settings, 306
mainwnd_key_event
seq64::perform, 207
mainwnd_rows
seq64::user_settings, 306
mark_all
seq64::event_list, 71
mark_out_of_range
seq64::event_list, 70
mark_selected
seq64::sequence, 280
max_sets
seq64::user_settings, 306
mc_baseline_ppqn
seq64::user_settings, 312
mc_max_zoom
seq64::user_settings, 311
mc_min_zoom
seq64::user_settings, 311
merge
seq64::event_list, 70

midi_beat_width
seq64::user_settings, 307
midi_beats_per_bar
seq64::user_settings, 307
midi_beats_per_minute
seq64::user_settings, 307
midi_buss_override
seq64::user_settings, 307
midi_control_off
seq64::perform, 199
midi_control_on
seq64::perform, 199
midi_control_toggle
seq64::perform, 199
midi_ppqn
seq64::user_settings, 307
midi_splitter
seq64::midi_splitter, 152
midifile
seq64::midifile, 163
mod_last_tick
seq64::sequence, 271
mod_timestamp
seq64::event, 63
modify
seq64::perform, 195
modify_current_event
seq64::eventslots, 86
move_selected
seq64::triggers, 290
move_selected_notes
seq64::sequence, 278
move_selected_triggers_to
seq64::sequence, 275
move_triggers
seq64::perform, 198
seq64::sequence, 276

name_change_callback
seq64::seqedit, 240
name_to_value
seq64::editable_event, 48
new_file
seq64::mainwnd, 144
new_sequence
seq64::perform, 197
next
seq64::triggers, 292
next_data_line
seq64::configfile, 43
next_trigger
seq64::triggers, 292

off_playing_notes
seq64::sequence, 280
off_queued
seq64::sequence, 271
on_button_press_event
seq64::Seq24PerfInput, 227
seq64::Seq24SeqEventInput, 229
seq64::Seq24SeqRollInput, 230
seq64::mainwid, 136
seq64::perfroll, 218
seq64::seqdata, 234
seq64::seqevent, 245
seq64::seqkeys, 250
seq64::seqtime, 261
on_button_release_event
seq64::Seq24PerfInput, 227
seq64::Seq24SeqEventInput, 229
seq64::Seq24SeqRollInput, 230
seq64::mainwid, 137
seq64::perfroll, 219
seq64::seqdata, 234
seq64::seqevent, 246
seq64::seqkeys, 250
seq64::seqtime, 261
on_delete_event
seq64::eventedit, 78
seq64::mainwnd, 144
seq64::seqedit, 241
on_enter_notify_event
seq64::seqkeys, 250
on_expose_event
seq64::eventslots, 89
seq64::maintime, 131
seq64::mainwid, 136
seq64::perfnames, 187
seq64::perfroll, 218
seq64::perftime, 222
on_focus_in_event
seq64::eventslots, 89
seq64::mainwid, 137
on_focus_out_event
seq64::mainwid, 137
on_grouplearnchange
seq64::mainwnd, 145
on_key_press_event
seq64::eventedit, 78
seq64::keybindentry, 117
seq64::mainwnd, 145
seq64::perfroll, 219
seq64::seqevent, 246
seq64::seqroll, 258
on_key_release_event
seq64::mainwnd, 145
on_leave_notify_event
seq64::seqkeys, 250
on_motion_notify_event
seq64::Seq24PerfInput, 227
seq64::Seq24SeqEventInput, 229
seq64::mainwid, 137
seq64::seqdata, 234
seq64::seqevent, 246
seq64::seqkeys, 250
on_move_down
seq64::eventslots, 90

on_move_up
seq64::eventslots, 89
on_realize
seq64::eventslots, 89
seq64::gui_drawingarea_gtk2, 104
seq64::maintime, 131
seq64::mainwid, 136
seq64::perfnames, 187
seq64::perfroll, 218
seq64::perftime, 222
seq64::seqdata, 233
seq64::seqevent, 245
seq64::seqkeys, 250
on_scroll_event
seq64::seqdata, 234
seq64::seqroll, 259
on_size_allocate
seq64::eventslots, 89
seq64::perfnames, 187
open_file
seq64::mainwnd, 142
open_performance_edit
seq64::mainwnd, 144
open_performance_edit_2
seq64::mainwnd, 144
operator<
seq64::event, 60
seq64::event_list::event_key, 66
operator=
seq64::click, 40
seq64::editable_events, 53
seq64::event, 60
seq64::event_list, 69
seq64::keystroke, 125
seq64::triggers, 288
output
seq64::jack_assistant, 111
output_func
seq64::perform, 205

page_movement
seq64::eventslots, 88
page_topper
seq64::eventslots, 88
parse
seq64::midifile, 164
seq64::optionsfile, 177
seq64::userfile, 313
parse_prop_header
seq64::midifile, 166
parse_proprietary_track
seq64::midifile, 167
parse_smf_0
seq64::midifile, 166
parse_smf_1
seq64::midifile, 166
partial_assign
seq64::sequence, 269
paste
seq64::triggers, 290
paste_selected
seq64::sequence, 277
paste_trigger
seq64::sequence, 275
perf_h_page_increment
seq64::user_settings, 307
perf_v_page_increment
seq64::user_settings, 307
perfedit
seq64::perfedit, 182
perfnames
seq64::perfnames, 187
perform
seq64::perform, 195
perfroll_key_event
seq64::perform, 207
perftime
seq64::perftime, 222
play
seq64::midibus, 160
seq64::perform, 204
seq64::sequence, 272
seq64::triggers, 288
play_note_off
seq64::sequence, 280
play_note_on
seq64::sequence, 280
pop_redo
seq64::sequence, 270
pop_undo
seq64::sequence, 270
popup_event_menu
seq64::seqedit, 240
popup_menu
seq64::seqmenu, 253
popup_midibus_menu
seq64::seqedit, 240
popup_sequence_menu
seq64::seqedit, 240
popup_tool_menu
seq64::seqedit, 241
position
seq64::jack_assistant, 110
seq64::midi_container, 148
position_jack
seq64::perform, 202
pow2
seq64::midifile, 168
ppqn
seq64::mainwnd, 143
seq64::midi_splitter, 153
seq64::midifile, 166
print
seq64::sequence, 272
print_triggers
seq64::sequence, 272
private_bus

seq64::user_settings, 307
private_instrument
seq64::user_settings, 307
process_events
seq64::lash, 127
prop_item_size
seq64::midifile, 171
push_trigger_undo
seq64::perform, 198
seq64::sequence, 270
push_undo
seq64::sequence, 269
put
seq64::midi_container, 147
seq64::midi_list, 150
seq64::midi_vector, 157
put_event_on_bus
seq64::sequence, 282

read_byte_array
seq64::midifile, 168
read_long
seq64::midifile, 168
read_seq_number
seq64::midifile, 169
read_track_name
seq64::midifile, 169
read_varinum
seq64::midifile, 168
redraw
seq64::mainwid, 134
remove
seq64::event_list, 69
seq64::sequence, 283
seq64::triggers, 289
remove_all
seq64::sequence, 283
remove_marked
seq64::sequence, 280
render_string
seq64::gui_drawingarea_gtk2, 101
render_string_on_drawable
seq64::font, 92
render_string_on_pixmap
seq64::gui_drawingarea_gtk2, 101
reset
seq64::seqdata, 233
seq64::seqroll, 258
reset_draw_marker
seq64::sequence, 281
reset_draw_trigger_marker
seq64::sequence, 281
reset_sequences
seq64::perform, 203
restart
seq64::jack_assistant, 110

save_events
seq64::editable_events, 54
seq64::eventslots, 86
save_file
seq64::mainwnd, 144
save_playing_state
seq64::perform, 205
select
seq64::triggers, 290
select_action_e
seq64::sequence, 269
select_all
seq64::sequence, 277
select_event
seq64::eventslots, 86
select_events
seq64::sequence, 276, 277
select_group_mute
seq64::perform, 201
select_mute_group
seq64::perform, 201
select_note_events
seq64::sequence, 276
select_trigger
seq64::sequence, 274
selected_trigger_end
seq64::sequence, 276
selected_trigger_start
seq64::sequence, 276
seq64::AbstractPerfInput, 37
seq64::Seq24PerfInput, 226
handle_motion_key, 227
on_button_press_event, 227
on_button_release_event, 227
on_motion_notify_event, 227
set_adding, 227
seq64::Seq24SeqEventInput, 229
on_button_press_event, 229
on_button_release_event, 229
on_motion_notify_event, 229
set_adding, 229
seq64::Seq24SeqRollInput, 230
on_button_press_event, 230
on_button_release_event, 230
set_adding, 230
seq64::automutex, 37
seq64::click, 38
click, 39
m_button, 40
m_modifier, 40
m_x, 40
m_y, 40
operator=, 40
seq64::condition_var, 40
cond, 42
seq64::configfile, 42
configfile, 43
line_after, 43
m_line, 43
next_data_line, 43

seq64::editable_event, 43
analyze, 50
category, 49
category_channel_message, 47
category_meta_event, 47
category_name, 47
category_prop_event, 47
category_system_message, 47
category_t, 47
editable_event, 48
format_timestamp, 50
m_category, 51
m_format_timestamp, 51
m_name_meta, 51
m_name_status, 51
m_parent, 51
name_to_value, 48
set_status_from_string, 50
sm_category_arrays, 51
sm_category_names, 50
sm_channel_event_names, 50
sm_meta_event_names, 51
sm_prop_event_names, 51
sm_system_event_names, 51
stock_event_string, 50
time_as_measures, 49
time_as_minutes, 49
timestamp, 49
timestamp_format_t, 47
timestamp_measures, 47
timestamp_pulses, 48
timestamp_time, 48
value_to_name, 48
seq64::editable_events, 52
add, 54
count, 54
editable_events, 53
Key, 53
load_events, 54
m_current_event, 55
m_midi_parameters, 55
m_sequence, 55
operator=, 53
save_events, 54
seq64::event, 55
∼event, 60
append_sysex, 64
check_channel, 61
event, 60
get_data, 64
get_rank, 65
is_channel_msg, 61
is_desired_cc_or_not_cc, 63
is_note_msg, 61
is_one_byte_msg, 61
is_two_byte_msg, 61
m_channel, 65
m_data, 65
m_has_link, 65
m_status, 65
m_sysex, 65
mod_timestamp, 63
operator<, 60
operator=, 60
set_channel, 64
set_data, 64
set_status, 63, 64
seq64::event_list, 67
add, 69
any_selected_notes, 71
clear, 70
count, 69
count_selected_events, 71
event_list, 69
link_new, 70
m_is_modified, 71
mark_all, 71
mark_out_of_range, 70
merge, 70
operator=, 69
remove, 69
unmodify, 69
verify_and_link, 70
seq64::event_list::event_key, 65
event_key, 66
m_rank, 66
m_timestamp, 66
operator<, 66
seq64::eventedit, 71
∼eventedit, 75
enqueue_draw, 75
eventedit, 74
handle_insert, 78
handle_modify, 78
handle_save, 78
m_redraw_ms, 79
on_delete_event, 78
on_key_press_event, 78
set_dirty, 76
set_event_category, 76
set_event_data_0, 76
set_event_data_1, 76
set_event_name, 76
set_event_timestamp, 76
set_seq_count, 76
set_seq_ppqn, 75
set_seq_time_sig, 75
set_seq_title, 75
timeout, 78
v_adjustment, 76, 78
seq64::eventslots, 79
change_vert, 88
convert_y, 87
decrement_bottom, 89
decrement_current, 89
decrement_top, 88

delete_current_event, 85
draw_event, 87
draw_events, 87
increment_bottom, 89
increment_current, 89
increment_top, 88
insert_event, 84
load_events, 84
m_char_w, 90
m_current_index, 90
m_setbox_w, 90
m_slots_chars, 90
m_slots_y, 90
m_top_index, 90
m_xy_offset, 90
modify_current_event, 86
on_expose_event, 89
on_focus_in_event, 89
on_move_down, 90
on_move_up, 89
on_realize, 89
on_size_allocate, 89
page_movement, 88
page_topper, 88
save_events, 86
select_event, 86
set_current_event, 84
set_text, 87
seq64::font, 90
BLACK, 92
BLACK_ON_CYAN, 92
BLACK_ON_YELLOW, 92
CYAN_ON_BLACK, 92
Color, 92
init, 92
m_b_on_c_pixmap, 93
m_b_on_y_pixmap, 93
m_black_pixmap, 93
m_c_on_b_pixmap, 93
m_clip_mask, 93
m_font_h, 93
m_font_w, 93
m_pixmap, 93
m_white_pixmap, 93
m_y_on_b_pixmap, 93
render_string_on_drawable, 92
WHITE, 92
YELLOW_ON_BLACK, 92
seq64::gui_assistant, 94
gui_assistant, 95
seq64::gui_assistant_gtk2, 95
lash_timeout_connect, 96
sm_internal_keys, 96
seq64::gui_drawingarea_gtk2, 96
clear_window, 99
draw_line, 99–101
draw_line_on_pixmap, 99, 100
draw_normal_rectangle_on_pixmap, 103
draw_rectangle, 101–103
draw_rectangle_on_pixmap, 103
m_background, 104
m_drop_x, 104
m_foreground, 104
m_mainperf, 104
m_pixmap, 104
m_window, 104
m_window_x, 104
on_realize, 104
render_string, 101
render_string_on_pixmap, 101
set_line, 99
seq64::gui_drawingarea_gtk2::rect, 226
seq64::gui_palette_gtk2, 104
gui_palette_gtk2, 105
seq64::gui_window_gtk2, 105
gui_window_gtk2, 107
m_window_x, 108
seq64::jack_assistant, 108
∼jack_assistant, 109
client_open, 112
error_message, 112
get_jack_ticks, 112
info_message, 112
init, 110
jack_assistant, 109
jack_shutdown_callback, 114
jack_timebase_callback, 115
output, 111
position, 110
restart, 110
set_position, 113
show_statuses, 113
sm_status_pairs, 115
start, 110
stop, 110
sync, 113
seq64::jack_scratchpad, 115
seq64::keybindentry, 116
events, 116
groups, 116
keybindentry, 117
location, 116
m_key, 117
on_key_press_event, 117
set, 117
type, 116
seq64::keys_perform, 117
∼keys_perform, 119
get_keys, 120
key_name, 120
m_key_bpm_up, 121
m_key_show_ui_sequence_number, 121
set_all_key_events, 120
set_all_key_groups, 120
set_key_event, 120
set_key_group, 121

set_keys, 119
show_ui_sequence_key, 120
show_ui_sequence_number, 120
seq64::keys_perform_gtk2, 121
~keys_perform_gtk2, 123
key_name, 123
set_all_key_events, 123
set_all_key_groups, 123
seq64::keys_perform_transfer, 123
seq64::keystroke, 123
is_letter, 125
keystroke, 124, 125
m_is_press, 125
m_key, 125
m_modifier, 125
operator=, 125
seq64::lash, 126
handle_config, 127
handle_event, 127
init, 127
lash, 126
process_events, 127
set_alsa_client_id, 127
seq64::maintime, 127
idle_progress, 130
m_bar_width, 131
m_beat_width, 131
m_box_height, 131
m_box_width, 131
m_flash_height, 131
m_flash_width, 131
m_ppqn, 131
m_tick, 131
maintime, 129
on_expose_event, 131
on_realize, 131
seq64::mainwid, 132
calculate_base_sizes, 136
draw_marker_on_sequence, 134
draw_sequence_on_pixmap, 135
draw_sequence_pixmap_on_window, 135
draw_sequences_on_pixmap, 135
m_screenset_offset, 138
m_screenset_slots, 138
mainwid, 134
on_button_press_event, 136
on_button_release_event, 137
on_expose_event, 136
on_focus_in_event, 137
on_focus_out_event, 137
on_motion_notify_event, 137
on_realize, 136
redraw, 134
seq_from_xy, 136
set_screenset, 134
timeout, 136
update_markers, 135
valid_sequence, 135
seq64::mainwnd, 138
about_dialog, 143
adj_callback_bpm, 143
adj_callback_ss, 143
edit_callback_notepad, 143
file_import_dialog, 143
m_main_wid, 145
m_ppqn, 145
m_sigpipe, 145
m_spinbutton_load_offset, 145
mainwnd, 142
new_file, 144
on_delete_event, 144
on_grouplearnchange, 145
on_key_press_event, 145
on_key_release_event, 145
open_file, 142
open_performance_edit, 144
open_performance_edit_2, 144
ppqn, 143
save_file, 144
signal_action, 144
start_playing, 144
stop_playing, 144
timer_callback, 143
update_window_title, 144
seq64::midi_container, 145
add_long, 148
add_variable, 148
fill, 147
get, 147
position, 148
put, 147
seq64::midi_list, 148
CharList, 150
get, 150
put, 150
seq64::midi_measures, 150
m_divisions, 151
seq64::midi_splitter, 151
increment, 153
m_smf0_channels, 154
m_smf0_channels_count, 154
m_smf0_seq_number, 154
midi_splitter, 152
ppqn, 153
split, 153
split_channel, 153
seq64::midi_timing, 154
m_beat_width, 155
m_beats_per_measure, 155
m_beats_per_minute, 155
m_ppqn, 155
seq64::midi_vector, 155
get, 157
put, 157
seq64::midibus, 157
clock, 160

continue_from, 160
deinit_in, 159
init_clock, 160
init_in, 159
init_in_sub, 159
init_out, 159
init_out_sub, 159
play, 160
set_input, 160
sysex, 160
seq64::midifile, 160
errdump, 171
is_sysex_special_id, 171
m_char_list, 173
m_data, 173
m_disable_reported, 173
m_error_is_fatal, 173
m_error_message, 173
m_file_size, 173
m_new_format, 173
m_pos, 173
m_smf0_splitter, 173
midifile, 163
parse, 164
parse_prop_header, 166
parse_proprietary_track, 167
parse_smf_0, 166
parse_smf_1, 166
pow2, 168
ppqn, 166
prop_item_size, 171
read_byte_array, 168
read_long, 168
read_seq_number, 169
read_track_name, 169
read_varinum, 168
varinum_size, 171
write, 164
write_byte, 168
write_long, 168
write_prop_header, 169
write_proprietary_track, 170
write_seq_number, 169
write_short, 168
write_track_name, 169
write_varinum, 168
seq64::mutex, 174
sm_recursive_mutex, 175
seq64::options, 175
button, 175
e_jack_connect, 176
e_jack_disconnect, 176
e_jack_master, 176
e_jack_master_cond, 176
e_jack_start_mode_live, 176
e_jack_start_mode_song, 176
e_jack_transport, 176
m_notebook, 176
seq64::optionsfile, 176
parse, 177
write, 179
seq64::perfedit, 179
∼perfedit, 182
collapse, 183
copy, 183
enqueue_draw, 182
enregister_peer, 183
expand, 183
grow, 183
init_before_show, 182
m_bpm, 184
m_bw, 184
m_redraw_ms, 184
perfedit, 182
set_beat_width, 183
set_beats_per_bar, 183
set_guides, 183
start_playing, 184
stop_playing, 184
timeout, 183
undo, 183
seq64::perfnames, 184
draw_sequence, 187
enqueue_draw, 187
m_char_w, 187
m_namebox_w, 188
m_names_chars, 187
m_names_y, 188
m_parent, 187
m_setbox_w, 188
m_xy_offset, 188
on_expose_event, 187
on_realize, 187
on_size_allocate, 187
perfnames, 187
seq64::perform, 188
∼perform, 195
add_sequence, 197
all_notes_off, 202
clamp_track, 209
clear_all, 195
clear_sequence_triggers, 197
copy_triggers, 198
decrement_beats_per_minute, 206
deinit_jack, 208
delete_sequence, 197
finish, 198
get_group_mute_state, 205
get_max_trigger, 198
get_screen_set_notepad, 199
get_sequence, 203
handle_midi_control, 199
highlight, 206
increment_beats_per_minute, 206
init_jack, 208
inner_start, 209

install_sequence, 209
is_active, 203
is_dirty_edit, 202
is_dirty_main, 202
is_dirty_names, 203
is_dirty_perf, 203
is_midi_control_valid, 208
is_modified, 208
is_mseq_valid, 209
is_screenset_valid, 208
is_seq_valid, 208
launch, 195
launch_input_thread, 207
launch_output_thread, 208
m_is_modified, 211
m_left_tick, 210
m_max_sets, 211
m_one_measure, 210
m_playback_mode, 210
m_playscreen_offset, 210
m_right_tick, 210
m_seqs, 210
m_seqs_in_set, 211
m_sequence_count, 211
m_sequence_max, 211
m_starting_tick, 211
m_tick, 211
mainwnd_key_event, 207
midi_control_off, 199
midi_control_on, 199
midi_control_toggle, 199
modify, 195
move_triggers, 198
new_sequence, 197
output_func, 205
perform, 195
perfroll_key_event, 207
play, 204
position_jack, 202
push_trigger_undo, 198
reset_sequences, 203
save_playing_state, 205
select_group_mute, 201
select_mute_group, 201
seq_in_playing_screen, 208
sequence_count, 195
sequence_label, 206
sequence_playing_off, 204
sequence_playing_on, 204
set_active, 202
set_beats_per_minute, 204
set_group_mute_state, 205
set_input_bus, 207
set_key_event, 210
set_key_group, 210
set_left_tick, 198
set_offset, 205
set_orig_ticks, 204
set_playing_screenset, 201
set_right_tick, 198
set_screen_set_notepad, 199
set_screenset, 201
set_sequence_control_status, 204
set_was_active, 202
show_ui_sequence_key, 206
show_ui_sequence_number, 206
sm_mc_dummy, 210
start, 201
start_playing, 206
stop, 201
unset_mode_group_learn, 201
unset_sequence_control_status, 204
seq64::performcallback, 211
seq64::perfroll, 212
~perfroll, 215
convert_x, 217
convert_xy, 217
draw_drawable_row, 218
draw_sequence_on, 218
enqueue_draw, 218
fill_background_pixmap, 217
FruityPerfInput, 219
init_before_show, 217
m_fruity_interaction, 219
m_h_page_increment, 219
m_parent, 219
m_v_page_increment, 219
on_button_press_event, 218
on_button_release_event, 219
on_expose_event, 218
on_key_press_event, 219
on_realize, 218
set_guides, 216
set_ppqn, 217
snap_x, 217
start_playing, 218
stop_playing, 218
update_sizes, 217
seq64::perftime, 220
enqueue_draw, 222
m_left_marker_tick, 223
m_measure_length, 223
m_parent, 223
m_right_marker_tick, 223
on_expose_event, 222
on_realize, 222
perftime, 222
set_guides, 222
seq64::rc_settings, 223
home_config_directory, 225
seq64::rect, 225
seq64::seqdata, 230
idle_redraw, 233
m_number_h, 234
m_number_offset_y, 234
m_number_w, 234

on_button_press_event, 234
on_button_release_event, 234
on_motion_notify_event, 234
on_realize, 233
on_scroll_event, 234
reset, 233
seqdata, 233
set_data_type, 233
set_zoom, 233
update_sizes, 233
xy_to_rect, 233
seq64::seqedit, 235
apply_length, 239
create_menus, 240
do_action, 241
get_measures, 239
m_initial_snap, 241
name_change_callback, 240
on_delete_event, 241
popup_event_menu, 240
popup_midibus_menu, 240
popup_sequence_menu, 240
popup_tool_menu, 241
seqedit, 238
set_background_sequence, 239
set_data_type, 240
set_key, 239
set_measures, 239
set_midi_bus, 239
set_midi_channel, 239
set_note_length, 238
set_scale, 239
set_snap, 238
set_zoom, 238
seq64::seqevent, 242
convert_t, 245
convert_x, 245
draw_background, 244
draw_events_on, 245
draw_pixmap_on_window, 244
drop_event, 245
idle_redraw, 245
on_button_press_event, 245
on_button_release_event, 246
on_key_press_event, 246
on_motion_notify_event, 246
on_realize, 245
set_data_type, 244
set_snap, 244
snap_x, 245
start_paste, 245
update_sizes, 244
x_to_w, 245
seq64::seqkeys, 246
draw_key, 250
on_button_press_event, 250
on_button_release_event, 250
on_enter_notify_event, 250
on_leave_notify_event, 250
on_motion_notify_event, 250
on_realize, 250
set_hint_state, 249
seq64::seqmenu, 251
∼seqmenu, 253
m_modified, 254
m_seqedit, 254
popup_menu, 253
seq_clear_perf, 254
seq_copy, 254
seq_cut, 254
seq_edit, 253
seq_event_edit, 253
seq_new, 253
seq_paste, 254
seqmenu, 253
seq64::seqroll, 254
convert_tn, 258
draw_events_on, 258
draw_events_on_pixmap, 258
on_key_press_event, 258
on_scroll_event, 259
reset, 258
set_background_sequence, 258
set_data_type, 258
snap_x, 258
update_background, 258
seq64::seqtime, 259
on_button_press_event, 261
on_button_release_event, 261
seq64::sequence, 261
add_event, 273, 278
add_note, 278
add_trigger, 273
adjust_trigger_offsets_to_length, 283
background_sequence, 282
change_event_data_range, 278
clear_triggers, 276
copy_events, 282
copy_selected, 277
copy_triggers, 276
cut_selected, 277
decrement_selected, 279
del_trigger, 274
e_deselect, 269
e_is_selected, 269
e_remove_one, 269
e_select, 269
e_select_one, 269
e_toggle_selection, 269
e_would_select, 269
event_count, 269
fill_container, 281
get_beat_width, 270
get_clipboard_box, 277
get_highest_note_event, 281
get_last_tick, 271

get_lowest_note_event, 281
get_max_trigger, 276
get_name, 270
get_next_event, 281
get_next_note_event, 281
get_num_selected_events, 277
get_num_selected_notes, 277
get_selected_box, 277
get_trigger_state, 274
grow_selected, 279
grow_trigger, 273
increment_selected, 279
intersect_events, 275
intersect_notes, 274
intersect_triggers, 274
is_dirty_edit, 272
is_dirty_main, 272
is_dirty_names, 272
is_dirty_perf, 272
link_new, 280
m_32nds_per_quarter, 284
m_background_sequence, 284
m_clocks_per_metronome, 284
m_length, 283
m_midi_channel, 283
m_musical_key, 284
m_musical_scale, 284
m_mutex, 284
m_playing_notes, 283
m_seq_number, 283
m_snap_tick, 283
m_time_beat_width, 284
m_time_beats_per_measure, 283
m_us_per_quarter_note, 284
mark_selected, 280
mod_last_tick, 271
move_selected_notes, 278
move_selected_triggers_to, 275
move_triggers, 276
off_playing_notes, 280
off_queued, 271
partial_assign, 269
paste_selected, 277
paste_trigger, 275
play, 272
play_note_off, 280
play_note_on, 280
pop_redo, 270
pop_undo, 270
print, 272
print_triggers, 272
push_trigger_undo, 270
push_undo, 269
put_event_on_bus, 282
remove, 283
remove_all, 283
remove_marked, 280
reset_draw_marker, 281
reset_draw_trigger_marker, 281
select_action_e, 269
select_all, 277
select_events, 276, 277
select_note_events, 276
select_trigger, 274
selected_trigger_end, 276
selected_trigger_start, 276
set_beat_width, 270
set_beats_per_bar, 270
set_dirty, 272
set_dirty_mp, 272
set_length, 270
set_master_midi_bus, 276
set_midi_bus, 276
set_midi_channel, 272
set_orig_tick, 273
set_playing, 271
set_quantized_rec, 271
set_rec_vol, 270
set_recording, 271
set_snap_tick, 271
set_thru, 272
set_trigger_offset, 282
split_trigger, 273, 282
stream_event, 278
stretch_selected, 280
toggle_queued, 271
transpose_notes, 282
unpaint_all, 280
unselect, 280
unselect_triggers, 274
verify_and_link, 280
zero_markers, 280
seq64::trigger, 284
seq64::triggers, 285
add, 288
adjust_offset, 292
adjust_offsets_to_length, 289
copy, 291
get_selected_end, 291
get_selected_start, 291
get_state, 290
grow, 289
intersect, 290
m_length, 293
m_ppqn, 293
move_selected, 290
next, 292
next_trigger, 292
operator=, 288
paste, 290
play, 288
remove, 289
select, 290
set_length, 288
split, 289
triggers, 288

unselect, 290
seq64::user_instrument, 293
controller_active, 294
controller_max, 294
controller_name, 294
copy_definitions, 295
m_controller_count, 295
m_is_valid, 295
set_controller, 294
set_defaults, 294
set_name, 295
seq64::user_instrument_t, 295
controllers, 295
controllers_active, 295
instrument, 295
seq64::user_midi_bus, 296
channel_count, 297
channel_max, 297
copy_definitions, 297
instrument, 297
m_channel_count, 297
m_is_valid, 297
set_defaults, 297
set_instrument, 297
seq64::user_midi_bus_t, 298
alias, 298
instrument, 298
seq64::user_settings, 298
bus, 305
Busses, 305
control_height, 306
controller_active, 306
controller_name, 306
dump_summary, 307
get_globals, 305
grid_style_black, 305
grid_style_max, 305
grid_style_normal, 305
grid_style_white, 305
instrument, 306
Instruments, 305
m_allow_two_perfedits, 309
m_control_height, 308
m_global_seq_feature_save, 308
m_gmute_tracks, 311
m_grid_brackets, 308
m_grid_style, 308
m_h_perf_page_increment, 309
m_instruments, 308
m_mainwid_border, 308
m_mainwid_x, 311
m_mainwnd_cols, 308
m_mainwnd_rows, 308
m_max_sequence, 311
m_max_sets, 308
m_midi_beat_width, 310
m_midi_beats_per_measure, 310
m_midi_beats_per_minute, 310
m_midi_buses, 308
m_midi_buss_override, 310
m_midi_ppqn, 310
m_save_user_config, 311
m_seqarea_seq_x, 311
m_seqarea_x, 311
m_seqchars_x, 310
m_seqedit_bgsequence, 309
m_seqedit_key, 309
m_seqedit_scale, 309
m_seqs_in_set, 310
m_text_x, 309
m_use_new_font, 309
m_v_perf_page_increment, 309
mainwid_border, 306
mainwid_grid_style_t, 305
mainwid_spacing, 306
mainwnd_cols, 306
mainwnd_rows, 306
max_sets, 306
mc_baseline_ppqn, 312
mc_max_zoom, 311
mc_min_zoom, 311
midi_beat_width, 307
midi_beats_per_bar, 307
midi_beats_per_minute, 307
midi_buss_override, 307
midi_ppqn, 307
perf_h_page_increment, 307
perf_v_page_increment, 307
private_bus, 307
private_instrument, 307
set_defaults, 305
set_globals, 305
text_x, 306
text_y, 306
user_settings, 305
zoom, 306
seq64::userfile, 312
dump_setting_summary, 313
parse, 313
write, 313
seq_clear_perf
seq64::seqmenu, 254
seq_copy
seq64::seqmenu, 254
seq_cut
seq64::seqmenu, 254
seq_edit
seq64::seqmenu, 253
seq_event_edit
seq64::seqmenu, 253
seq_from_xy
seq64::mainwid, 136
seq_in_playing_screen
seq64::perform, 208
seq_new
seq64::seqmenu, 253

seq_paste
seq64::seqmenu, 254
seqdata
seq64::seqdata, 233
seqedit
seq64::seqedit, 238
seqmenu
seq64::seqmenu, 253
sequence_count
seq64::perform, 195
sequence_label
seq64::perform, 206
sequence_playing_off
seq64::perform, 204
sequence_playing_on
seq64::perform, 204
set
seq64::keybindentry, 117
set_active
seq64::perform, 202
set_adding
seq64::Seq24PerfInput, 227
seq64::Seq24SeqEventInput, 229
seq64::Seq24SeqRollInput, 230
set_all_key_events
seq64::keys_perform, 120
seq64::keys_perform_gtk2, 123
set_all_key_groups
seq64::keys_perform, 120
seq64::keys_perform_gtk2, 123
set_alsa_client_id
seq64::lash, 127
set_background_sequence
seq64::seqedit, 239
seq64::seqroll, 258
set_beat_width
seq64::perfedit, 183
seq64::sequence, 270
set_beats_per_bar
seq64::perfedit, 183
seq64::sequence, 270
set_beats_per_minute
seq64::perform, 204
set_channel
seq64::event, 64
set_controller
seq64::user_instrument, 294
set_current_event
seq64::eventslots, 84
set_data
seq64::event, 64
set_data_type
seq64::seqdata, 233
seq64::seqedit, 240
seq64::seqevent, 244
seq64::seqroll, 258
set_defaults
seq64::user_instrument, 294
seq64::user_midi_bus, 297
seq64::user_settings, 305
set_dirty
seq64::eventedit, 76
seq64::sequence, 272
set_dirty_mp
seq64::sequence, 272
set_event_category
seq64::eventedit, 76
set_event_data_0
seq64::eventedit, 76
set_event_data_1
seq64::eventedit, 76
set_event_name
seq64::eventedit, 76
set_event_timestamp
seq64::eventedit, 76
set_globals
seq64::user_settings, 305
set_group_mute_state
seq64::perform, 205
set_guides
seq64::perfedit, 183
seq64::perfroll, 216
seq64::perftime, 222
set_hint_state
seq64::seqkeys, 249
set_input
seq64::midibus, 160
set_input_bus
seq64::perform, 207
set_instrument
seq64::user_midi_bus, 297
set_key
seq64::seqedit, 239
set_key_event
seq64::keys_perform, 120
seq64::perform, 210
set_key_group
seq64::keys_perform, 121
seq64::perform, 210
set_keys
seq64::keys_perform, 119
set_left_tick
seq64::perform, 198
set_length
seq64::sequence, 270
seq64::triggers, 288
set_line
seq64::gui_drawingarea_gtk2, 99
set_master_midi_bus
seq64::sequence, 276
set_measures
seq64::seqedit, 239
set_midi_bus
seq64::seqedit, 239
seq64::sequence, 276
set_midi_channel

seq64::seqedit, 239
seq64::sequence, 272
set_name
seq64::user_instrument, 295
set_note_length
seq64::seqedit, 238
set_offset
seq64::perform, 205
set_orig_tick
seq64::sequence, 273
set_orig_ticks
seq64::perform, 204
set_playing
seq64::sequence, 271
set_playing_screenset
seq64::perform, 201
set_position
seq64::jack_assistant, 113
set_ppqn
seq64::perfroll, 217
set_quantized_rec
seq64::sequence, 271
set_rec_vol
seq64::sequence, 270
set_recording
seq64::sequence, 271
set_right_tick
seq64::perform, 198
set_scale
seq64::seqedit, 239
set_screen_set_notepad
seq64::perform, 199
set_screenset
seq64::mainwid, 134
seq64::perform, 201
set_seq_count
seq64::eventedit, 76
set_seq_ppqn
seq64::eventedit, 75
set_seq_time_sig
seq64::eventedit, 75
set_seq_title
seq64::eventedit, 75
set_sequence_control_status
seq64::perform, 204
set_snap
seq64::seqedit, 238
seq64::seqevent, 244
set_snap_tick
seq64::sequence, 271
set_status
seq64::event, 63, 64
set_status_from_string
seq64::editable_event, 50
set_text
seq64::eventslots, 87
set_thru
seq64::sequence, 272
set_trigger_offset
seq64::sequence, 282
set_was_active
seq64::perform, 202
set_zoom
seq64::seqdata, 233
seq64::seqedit, 238
show_statuses
seq64::jack_assistant, 113
show_ui_sequence_key
seq64::keys_perform, 120
seq64::perform, 206
show_ui_sequence_number
seq64::keys_perform, 120
seq64::perform, 206
signal_action
seq64::mainwnd, 144
sm_category_arrays
seq64::editable_event, 51
sm_category_names
seq64::editable_event, 50
sm_channel_event_names
seq64::editable_event, 50
sm_internal_keys
seq64::gui_assistant_gtk2, 96
sm_mc_dummy
seq64::perform, 210
sm_meta_event_names
seq64::editable_event, 51
sm_prop_event_names
seq64::editable_event, 51
sm_recursive_mutex
seq64::mutex, 175
sm_status_pairs
seq64::jack_assistant, 115
sm_system_event_names
seq64::editable_event, 51
snap_x
seq64::perfroll, 217
seq64::seqevent, 245
seq64::seqroll, 258
split
seq64::midi_splitter, 153
seq64::triggers, 289
split_channel
seq64::midi_splitter, 153
split_trigger
seq64::sequence, 273, 282
start
seq64::jack_assistant, 110
seq64::perform, 201
start_paste
seq64::seqevent, 245
start_playing
seq64::mainwnd, 144
seq64::perfedit, 184
seq64::perform, 206
seq64::perfroll, 218

stock_event_string
seq64::editable_event, 50
stop
seq64::jack_assistant, 110
seq64::perform, 201
stop_playing
seq64::mainwnd, 144
seq64::perfedit, 184
seq64::perfroll, 218
stream_event
seq64::sequence, 278
stretch_selected
seq64::sequence, 280
sync
seq64::jack_assistant, 113
sysex
seq64::midibus, 160

text_x
seq64::user_settings, 306
text_y
seq64::user_settings, 306
time_as_measures
seq64::editable_event, 49
time_as_minutes
seq64::editable_event, 49
timeout
seq64::eventedit, 78
seq64::mainwid, 136
seq64::perfedit, 183
timer_callback
seq64::mainwnd, 143
timestamp
seq64::editable_event, 49
timestamp_format_t
seq64::editable_event, 47
timestamp_measures
seq64::editable_event, 47
timestamp_pulses
seq64::editable_event, 48
timestamp_time
seq64::editable_event, 48
toggle_queued
seq64::sequence, 271
transpose_notes
seq64::sequence, 282
triggers
seq64::triggers, 288
type
seq64::keybindentry, 116

undo
seq64::perfedit, 183
unmodify
seq64::event_list, 69
unpaint_all
seq64::sequence, 280
unselect
seq64::sequence, 280
seq64::triggers, 290
unselect_triggers
seq64::sequence, 274
unset_mode_group_learn
seq64::perform, 201
unset_sequence_control_status
seq64::perform, 204
update_background
seq64::seqroll, 258
update_markers
seq64::mainwid, 135
update_sizes
seq64::perfroll, 217
seq64::seqdata, 233
seq64::seqevent, 244
update_window_title
seq64::mainwnd, 144
user_settings
seq64::user_settings, 305

v_adjustment
seq64::eventedit, 76, 78
valid_sequence
seq64::mainwid, 135
value_to_name
seq64::editable_event, 48
varinum_size
seq64::midifile, 171
verify_and_link
seq64::event_list, 70
seq64::sequence, 280

WHITE
seq64::font, 92
write
seq64::midifile, 164
seq64::optionsfile, 179
seq64::userfile, 313
write_byte
seq64::midifile, 168
write_long
seq64::midifile, 168
write_prop_header
seq64::midifile, 169
write_proprietary_track
seq64::midifile, 170
write_seq_number
seq64::midifile, 169
write_short
seq64::midifile, 168
write_track_name
seq64::midifile, 169
write_varinum
seq64::midifile, 168

x_to_w
seq64::seqevent, 245
xy_to_rect
seq64::seqdata, 233

YELLOW_ON_BLACK
seq64::font, 92

zero_markers
seq64::sequence, 280
zoom
seq64::user_settings, 306