Qtractor

An Audio/MIDI multi-track sequencer

Rui Nuno Capela
rncbc.org

http://qtractor.sourceforge.net

What is Qtractor ? (1)

Yet another Audio/MIDI sequencer ?

Yes ;-)

- **Multi-track paradigm**
- **Linux**
- **JACK**
- **ALSA Sequencer**
- **C++**
- **Qt**
- **GPL**

What is Qtractor ? (2)

- **Home-studio DAW GUI**
- **Intuitive and easy to use (hopefully)**
- **Not a tracker**
- **Music-making playground**
- **Not for the erudite (no score editor)**
- **Techno-boy bedroom studio, anyone?**
- **Not a revolution, will evolve . . .**
- **Why not Ardour ?**

Who is behind ?

Hobby work of one developer

- **Me, rncbc a.k.a. Rui Nuno Capela**

LAD Portfolio

- **QjackCtl**
- **Qsynth**
- **Qsampler**

A gift economy player :-)

But why ?

- **Just for fun**
- **The motive . . .**
  - **Long time enthusiasm on electronic music**
- **The skill . . .**
  - **A half-life on programming (>20y)**
- **The moment . . .**
  - **An extraordinary event alignment occurred in the whole Universe . . .**
- **So that was it !**

Where can get it ?

cvs.sourceforge.net

- Still alpha, but...
- Fully functional (no not-implemented-yets)
- What You See Is What Is Working
- Bugs'R'Us
- WIP

Open for Business (no money involved)

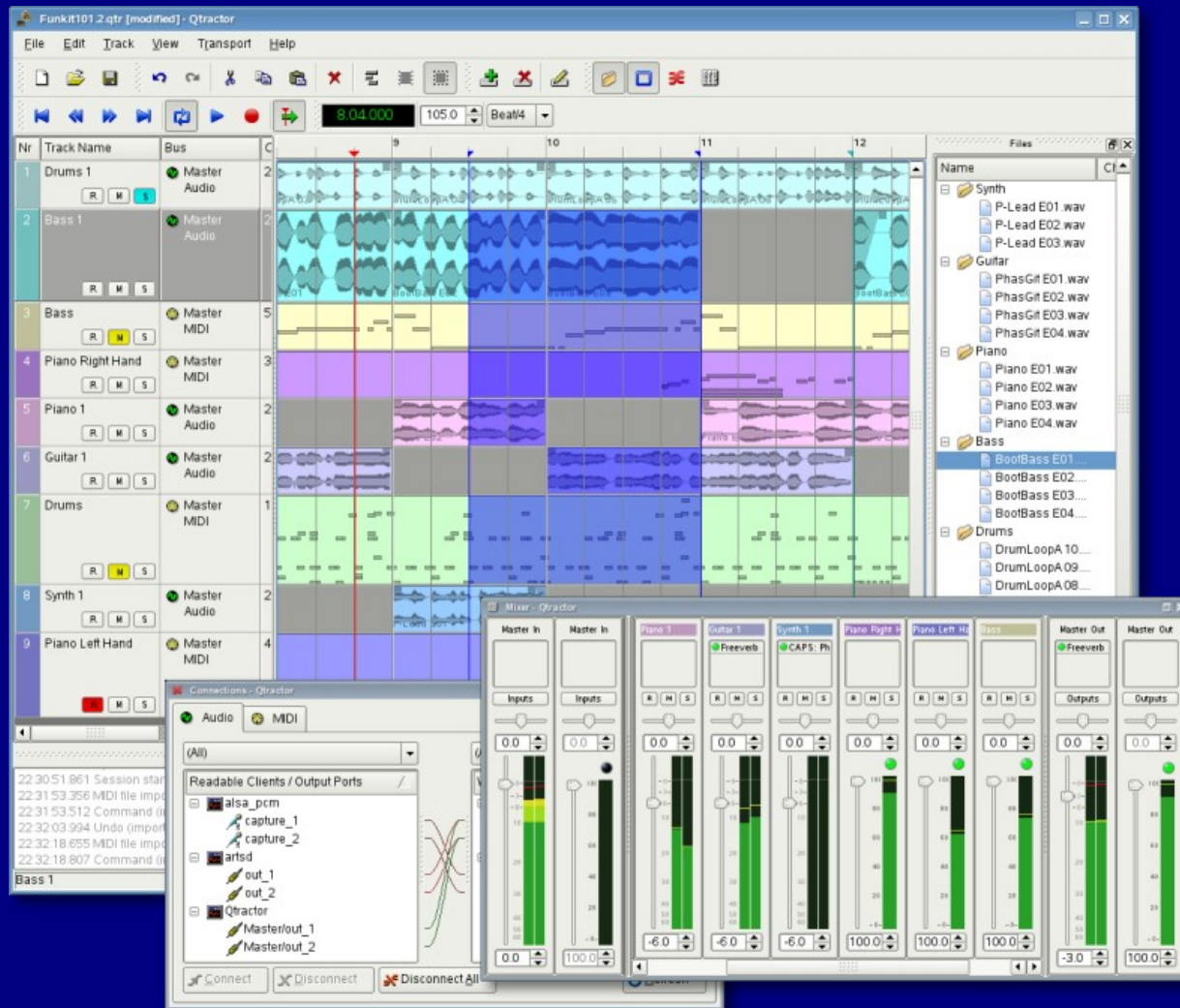- users, developers, players, nurturers . . .

What do I need ?

Requirements

- **Mandatory**
  - **Qt4 (core, gui, xml)**
  - **JACK**
  - **ALSA**
  - **libsndfile**
- **Optional**
  - **libvorbis (enc, file)**
  - **libmad**
  - **libsamplerate**

Give me figures !

GUI

GUI Elements (1)

(business as usual)

Main window

- Menu

- Tool-bars

- Workspace (canvas)

  ▪ Track list

  ▪ Track view

- Status-bar

GUI Elements (2)

Tool windows

- **Connections**

- **Mixer**

- **Files**

GUI Elements (3)

Dialogs (modal)

- **Session properties**

- **Track properties**

- **Bus configuration**

- **Instruments**

- **Options**

Sessions (1)

- **XML encoded file**
  - **Properties**
  - **View state**
  - **Bus configuration**
  - **MIDI Instrument map**
  - **Files**
  - **Tracks**
  - **Clips**

Sessions (2)

- **SDI application**

- **Locked to JACK sample-rate**

  - **Disparate session conversion warning**

  - **Playback conversion via libsamplerate**

- **Constant tempo (BPM)**

  - **No tempo map, yet**

Files

- **File selector / mini-organizer**

- **Hierarchical / tree list**

- **Drag-and-drop enabled**

Audio file support

  - **libvorbisfile (ogg)**

  - **libsndfile (wav, aiff, flac, au, ...)**

  - **libmad (mp3)**

MIDI file support

  - **SMF format 0 and 1 (home-brew)**

Clips (1)

- **Elemental items of session arrangement**
- **Whole or part of an audio / MIDI file**
- **Imported / Drag-n-drop into tracks**

Properties

- ▪ **Label (name)**
- ▪ **Location (start time)**
- ▪ **Offset**
- ▪ **Length**
- ▪ **Fade-in/out (linear, cubic, quadratic)**

Clips (2)

Selection (modes)

- **Clip**
- **Range**
- **Rectangular**

Editing (operations)

- **Cut**
- **Copy**
- **Paste**
- **Delete**
- **Drag / Move**

Audio Clips

Audio clips

- **Represent the whole or part of**
  - **One audio file**
- **Waveform graphical representation**
  - **Peak and RMS**

MIDI Clips

MIDI clips

- **Represent the whole or part of**
  - **One MIDI channel (SMF format 0)**
  - **One MIDI track (SMF format 1)**
- **Piano-roll graphical representation**
  - **Note events (pitch, time, duration)**

Editing

- **Non-destructive**

- **All editing operations are parametric (location, offset, length)**

  - **Does not modify audio or MIDI files**

  - **Except: files created on recording**

- **Undo / Redo fully enabled**

- **Zoom and resizing**

Tracks (1)

- **Sequence of overlapping clips**

Properties

- Name
- Type (audio or MIDI)
- Input / Output buses
- State (record, mute, solo)
- Color

Tracks (2)

Audio tracks

- Input bus: recording
- Output bus: playback / mix-down

MIDI tracks

- Channel
- Instrument (bank, program)

Recording

- Capture audio / MIDI files as new clips

Audio Engine

JACK client

- **Master thread (JACK callback)**

- **Audio buses (JACK ports)**

- **Audio clips**

  - **One dedicated disk I/O service thread**

  - **Lock-free ring-buffer**

    - **Filled / emptied ~ 1s threshold**
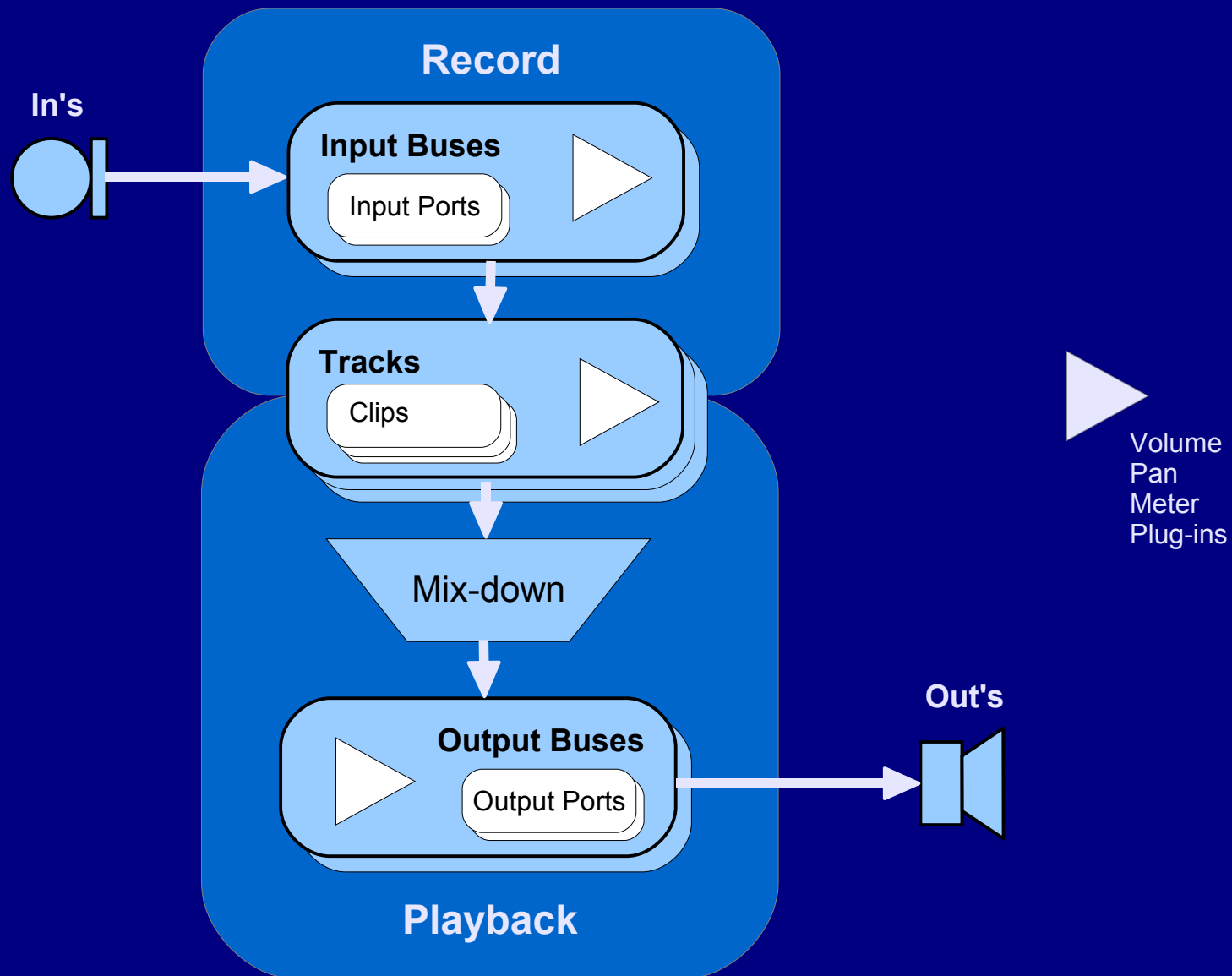   - **Permanently cached < 4-5 seconds**

MIDI Engine

ALSA Sequencer client / queue

- **Slave thread (MIDI output)**

- **Listener thread (MIDI input)**

    - **Inbound events multiplexed to record-armed track clips**

- **MIDI buses (ALSA seq ports)**

- **MIDI clips**

    - **Outbound events scheduled ~ 1 second period**

- **ALSA seq queue / port time-stamping**

Block Diagram (1)

Engines & Buses (1)

- **Multi-threaded**
  - 1 Audio master thread (JACK process context)
  - N Audio ringbuffer-disk I/O threads
  - 1 MIDI input thread
  - 1 MIDI output thread

Engines & Buses (2)

- **Looping (playback)**
  - **Audio clip file-buffer service thread level**
  - **MIDI output thread process level**

- **JACK transport support**
  - **Soft-chase positioning**
  - **Buffer-period resolution**

- **MIDI Machine Control (MMC)**
  - **Transport control (rew, ffw, rec, shuttle, etc.)**
  - **Track arming record, mute, solo***

Engines & Buses (3)

Audio Bus-Track channel assignment

- **Input bus**
  - Determines the number of channels of recorded / captured files

- **Output bus**
  - Determines the number of channels on playback / mix-down
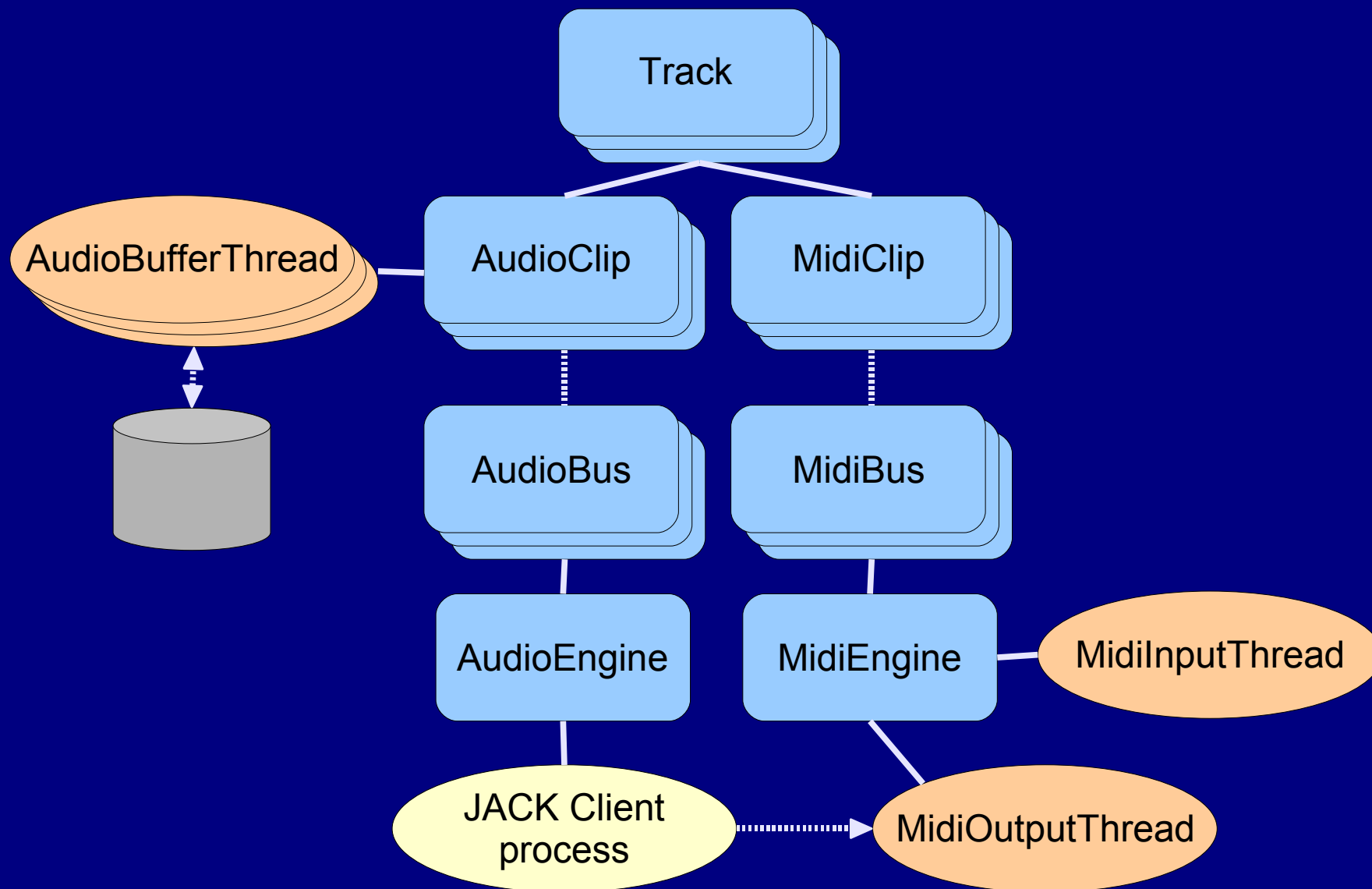 - Automatic multi-channel mix-down resolution

Engines & Buses (4)

Default "Master" buses

- **Audio**
  - **Stereo (2 channel ports)**
  - **Auto-connected**
- **MIDI**
  - **Single port (16 channels)**

- **All bus ports are accessible for arbitrary connection (patch-bay)**

Block Diagram (2)

Mixer

- **Session monitoring**
  - **Audio: peak level meters**
  - **MIDI: event activity, note velocity meters**
- **Input / Output bus connection control**
- **Track state control (record, mute, solo)**
- **Mix-down control (pan, volume)**
- **Mixer strips**
  - **Input buses | Tracks | Output buses**
- **Audio strips: plug-in effects chain (LADSPA)**

Connections

Audio and MIDI patchbay

- **QjackCtl technology :-)**

- **Saved / Restored as session state**

- **Not restricted to own bus ports**

Audio Plug-ins (LADSPA)

- **Seamless plug-in instance aggregation**

- **Plug-in chain**

  - **Select & Edit (dialog)**

  - **Activate**

  - **Move (reordering)**

- **Plug-in dialog**

  - **Real-time parameter control**

  - **Named presets (global)**

MIDI Instruments

- **Cakewalk™ instrument definition files (.ins)**

  - Convenient MIDI bank-select / program-change instrument mapping per channel

  - Human-readable patch and key names

  - One instrument map per MIDI bus (16 channels)

What's missing ? (1)

- **MIDI clip editor**

- **Audio / MIDI file export**

- **Programmed punch-in/out recording**

- **Dynamic curves / Automation (volume, pan, plug-in parameters, controllers)**

- **DSSI, LV2 Plug-ins**

- **JACK-MIDI**

- **Time-stretching / Pitch-shifting**

- **Tempo map**

What's missing ? (2)

- **MIDI Time Code**
- **MIDI Clock**
- **OSC**
- **Integrated scripting (angelscript?)**

- **Your suggestions here !**

Q & A

Qtractor

An Audio/MIDI multi-track sequencer

http://qtractor.sourceforge.net

- **Qtractor is free open-source software; you can redistribute it and / or modify it under the terms of the GNU General Public License version 2 or later.**

- **It is being possible through the knowledgeable, direct and indirect collaborative efforts of the Linux Audio Developers and Users communities.**

Thank you all.