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Qtractor

An Audio/MIDI multi-track sequencer

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<http://qtractor.sourceforge.net>

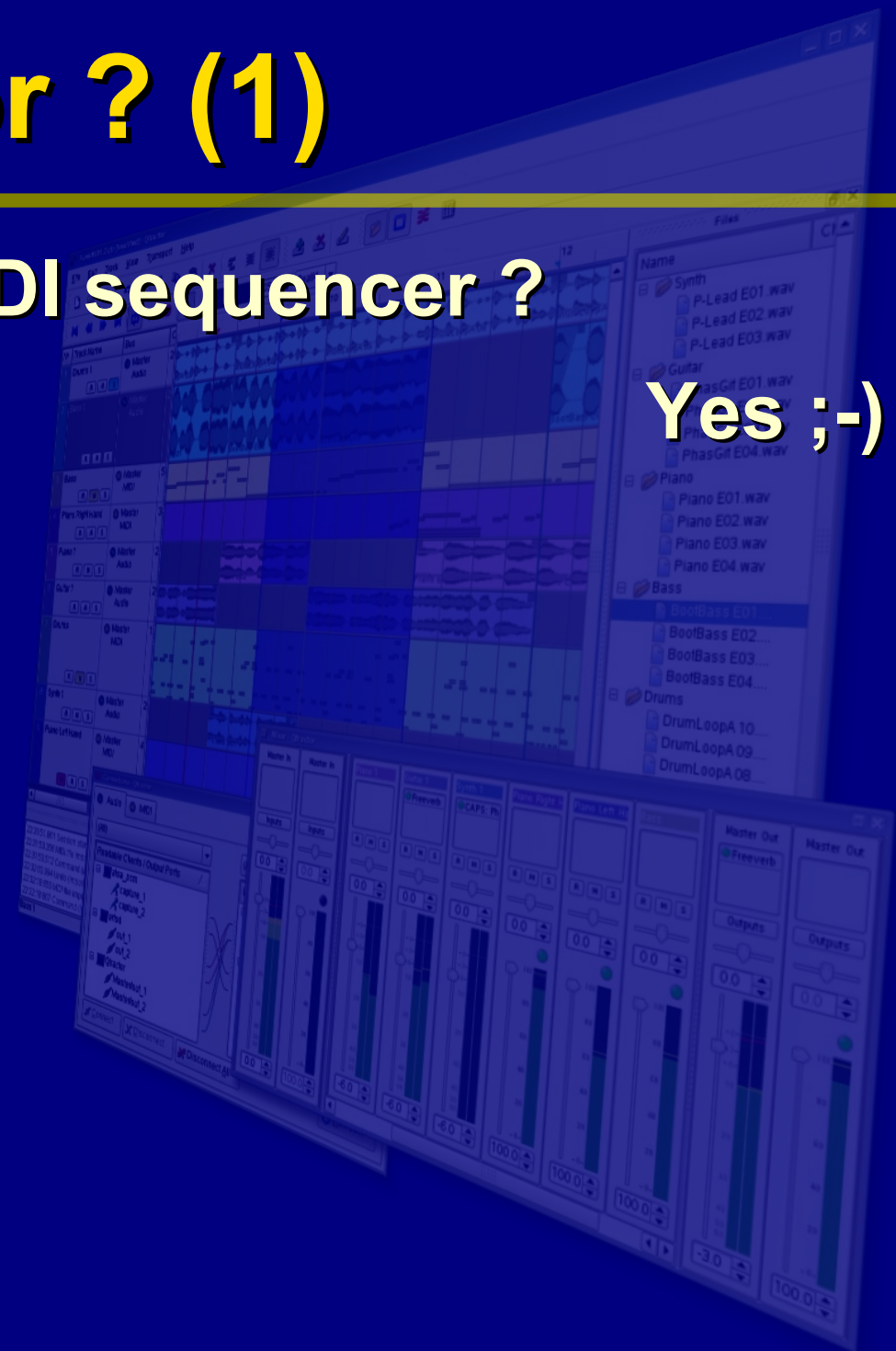
October 2007

What is Qtractor ? (1)

Yet another Audio / MIDI sequencer ?

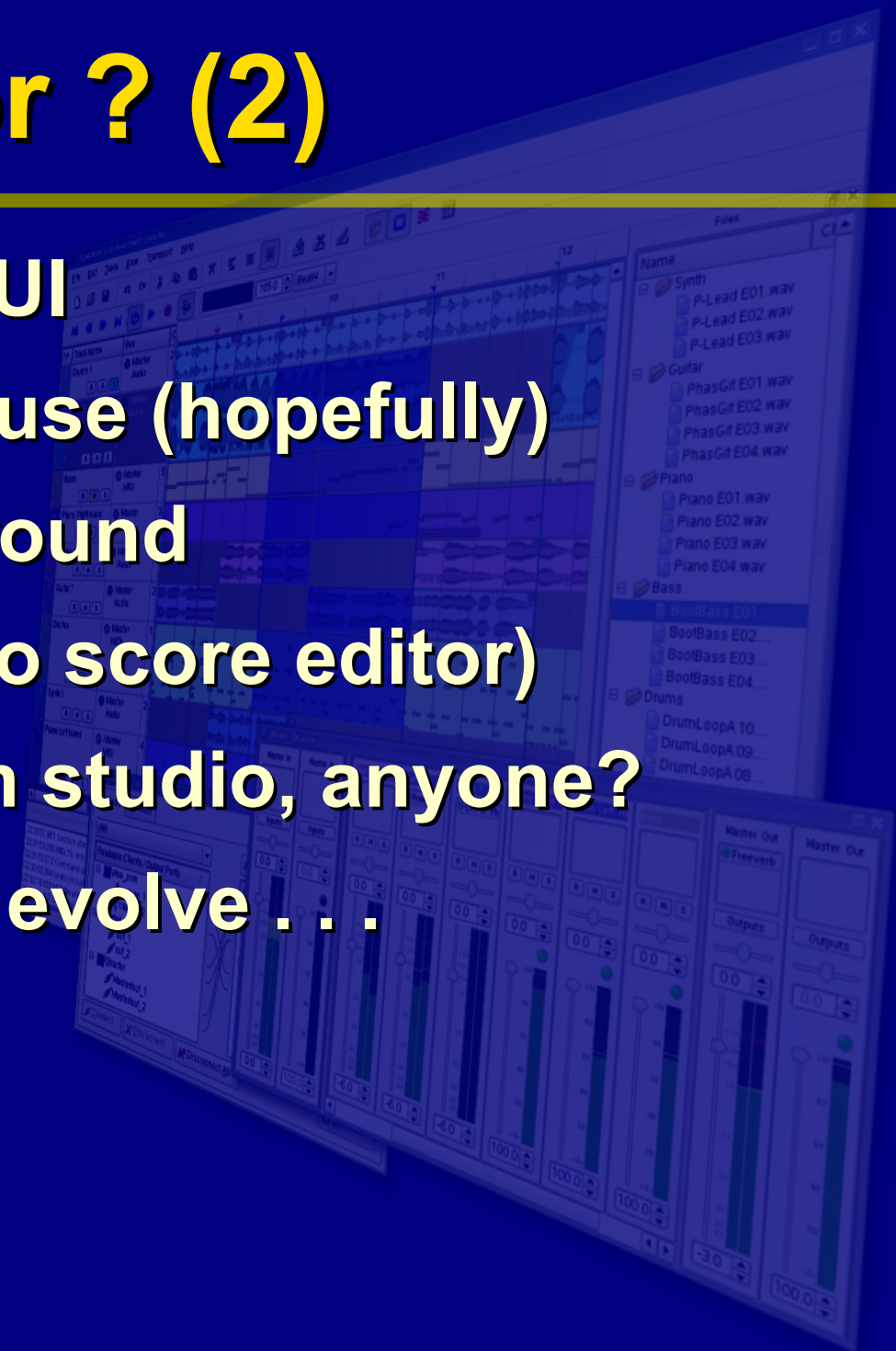
Yes ;-)

- Multi-track paradigm
- Linux
- JACK
- ALSA Sequencer
- C++
- Qt 4
- GPL



What is Qtractor ? (2)

- Home-studio DAW GUI
- Intuitive and easy to use (hopefully)
- 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 ?

qtractor.cvs.sourceforge.net

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

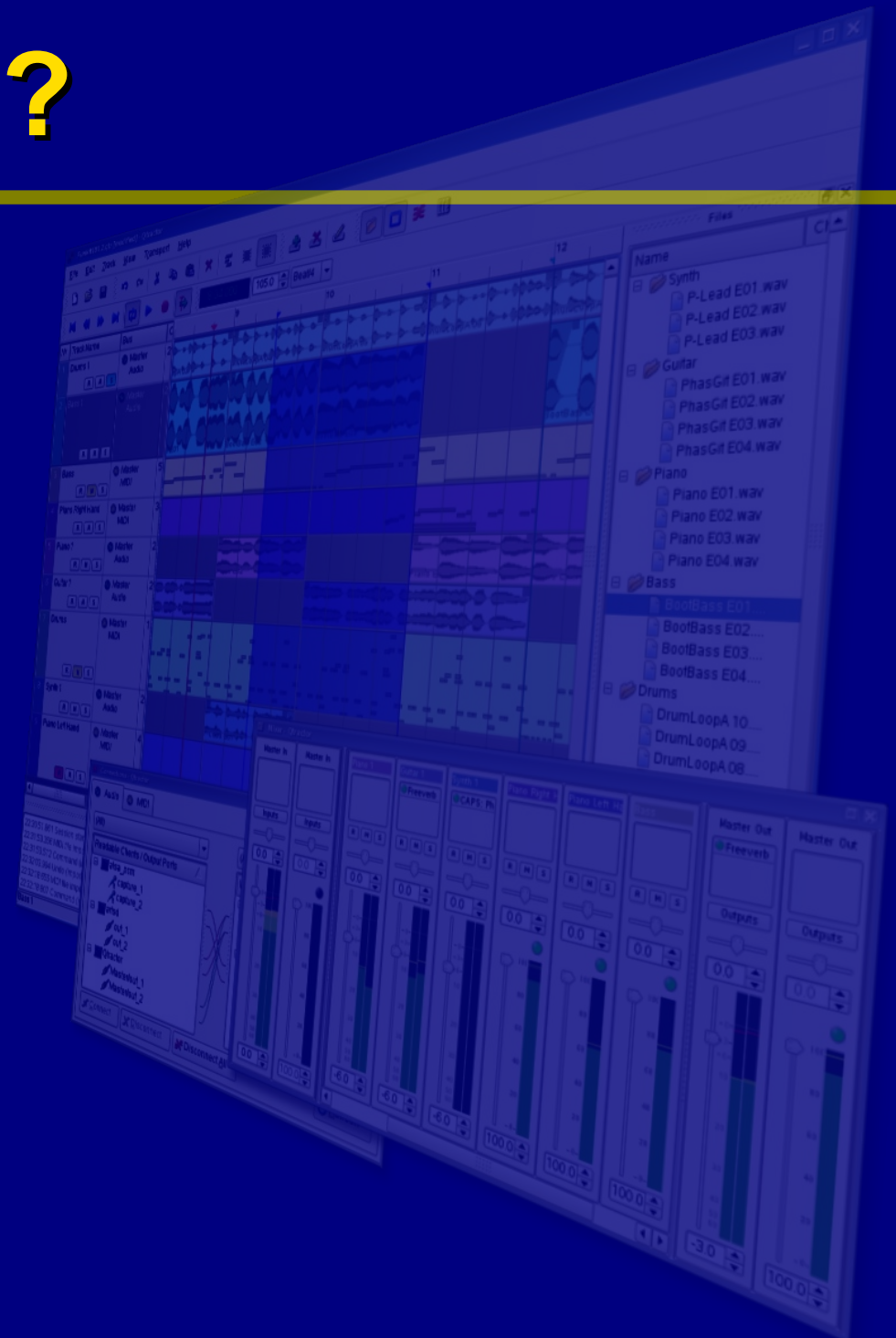
Open for Business (no money involved)

- users, developers, players, nurturers . . .

What do I need ?

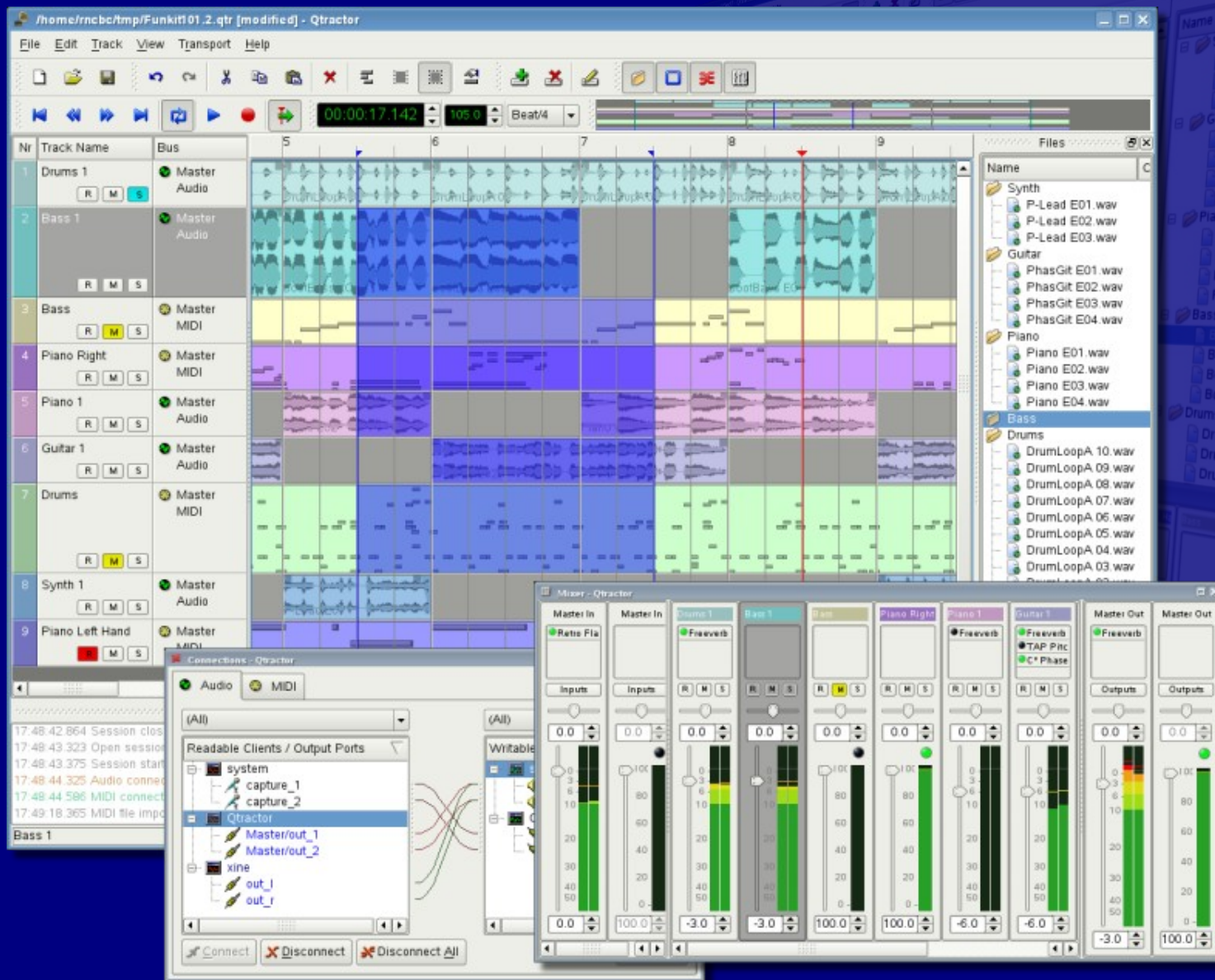
Requirements

- **Mandatory**
 - Qt 4 (core, gui, xml)
 - JACK
 - ALSA
 - libsndfile
- **Optional**
 - libvorbis (enc, file)
 - libmad
 - libsamplerate



Give me figures !

GUI

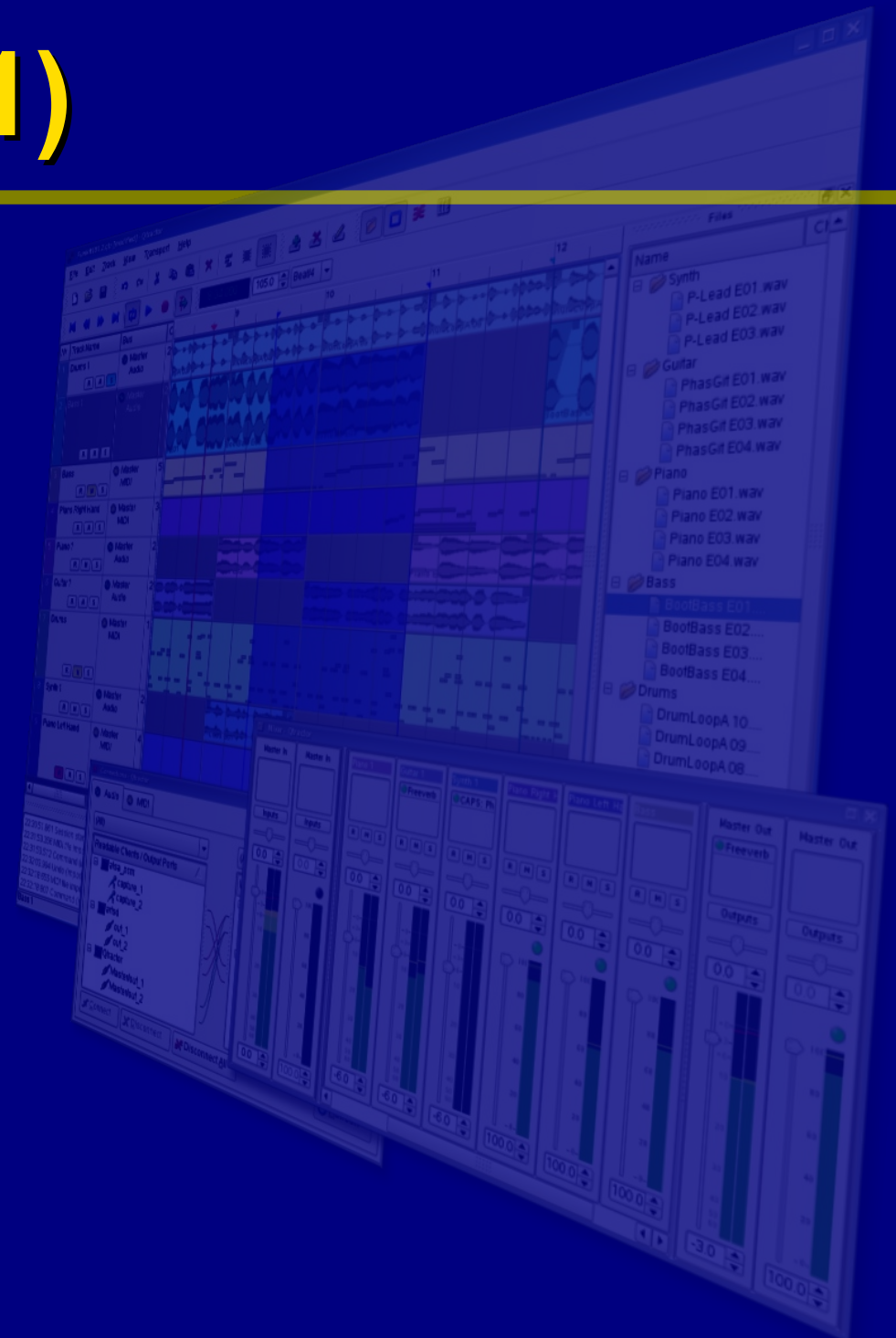


GUI Elements (1)

(business as usual)

Main window

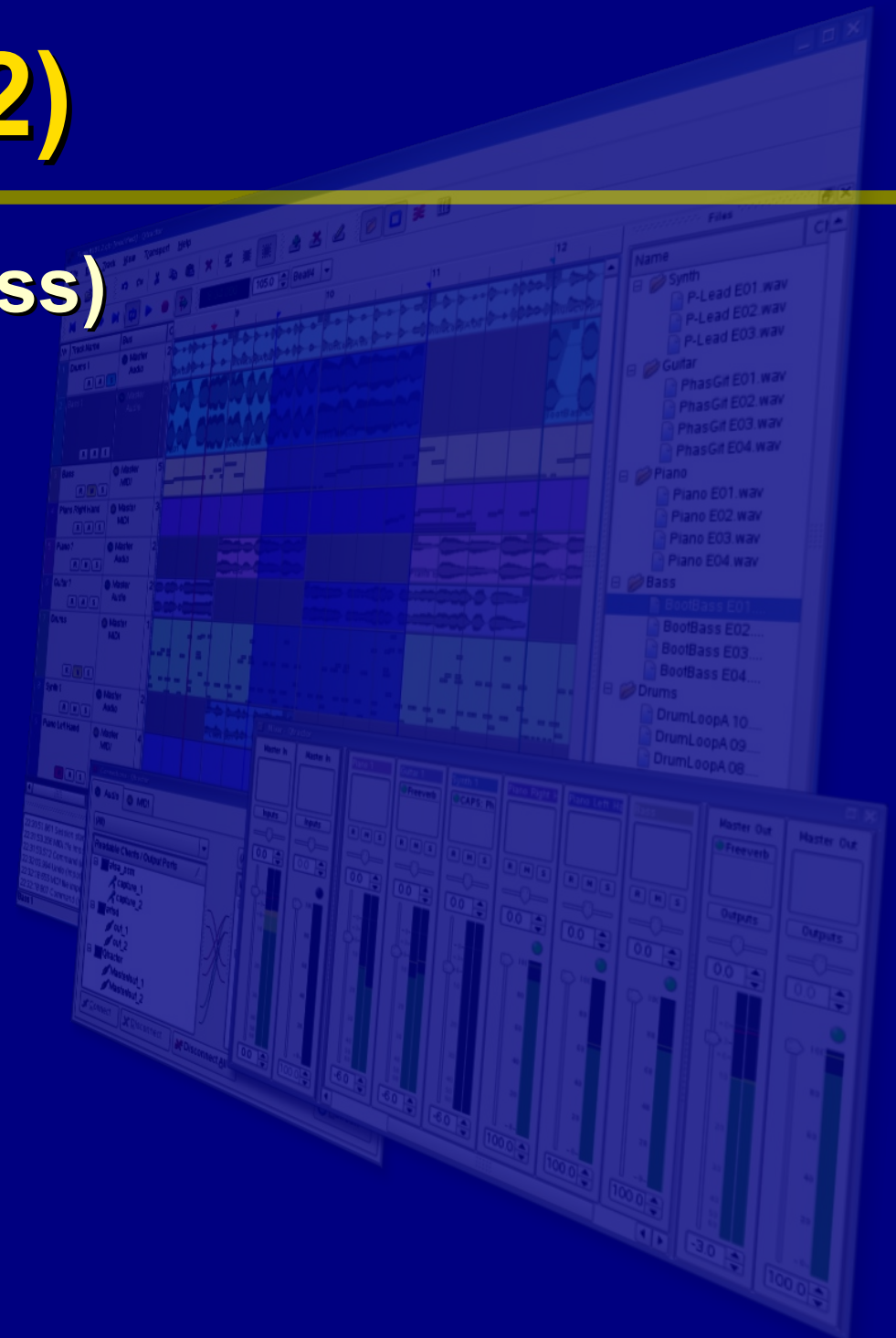
- **Menu**
- **Tool-bars**
- **Workspace (canvas)**
 - **Track list**
 - **Track view**
- **Status-bar**



GUI Elements (2)

Tool windows (modeless)

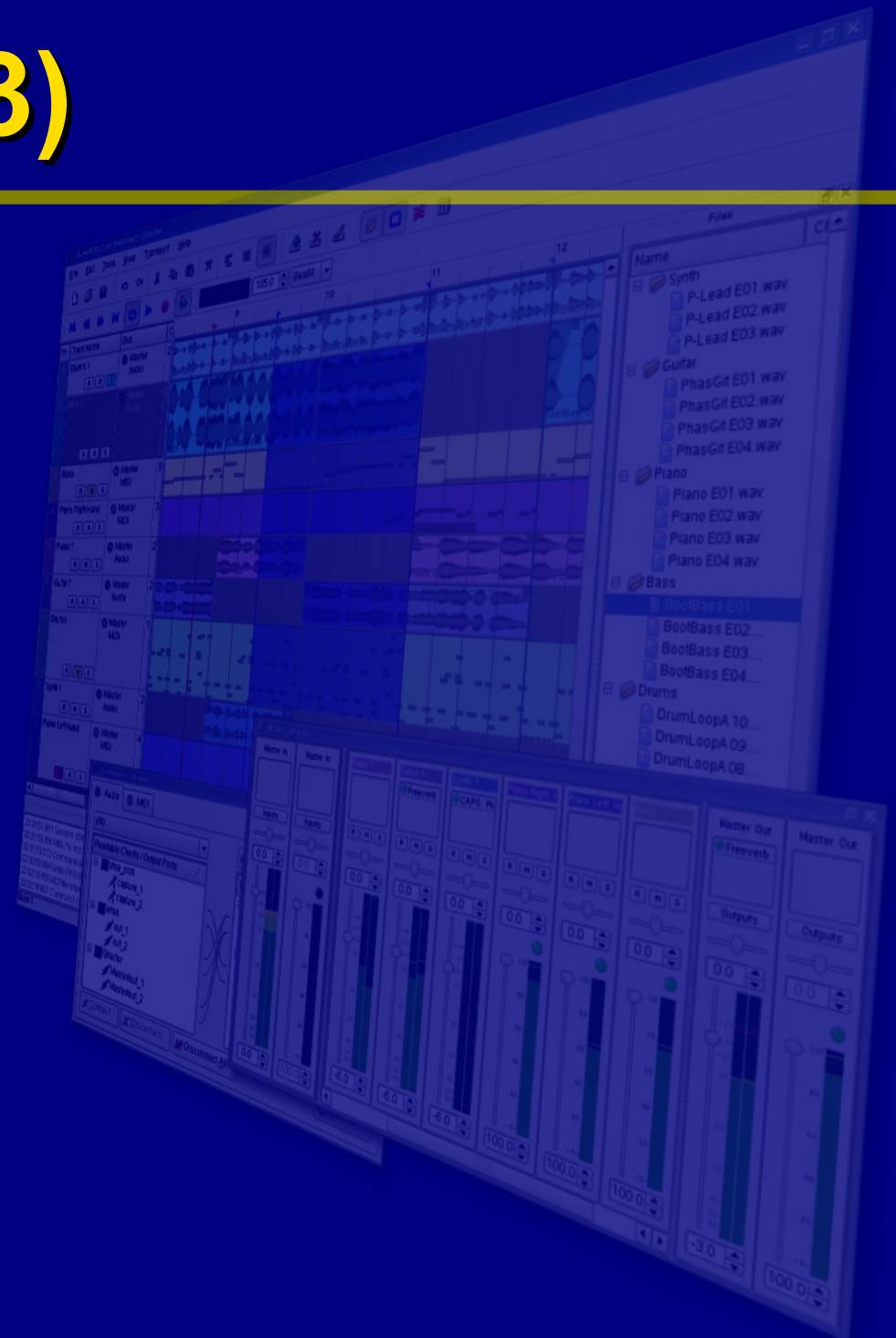
- Connections
- Mixer
- Files
- MIDI Editor (per clip)



GUI Elements (3)

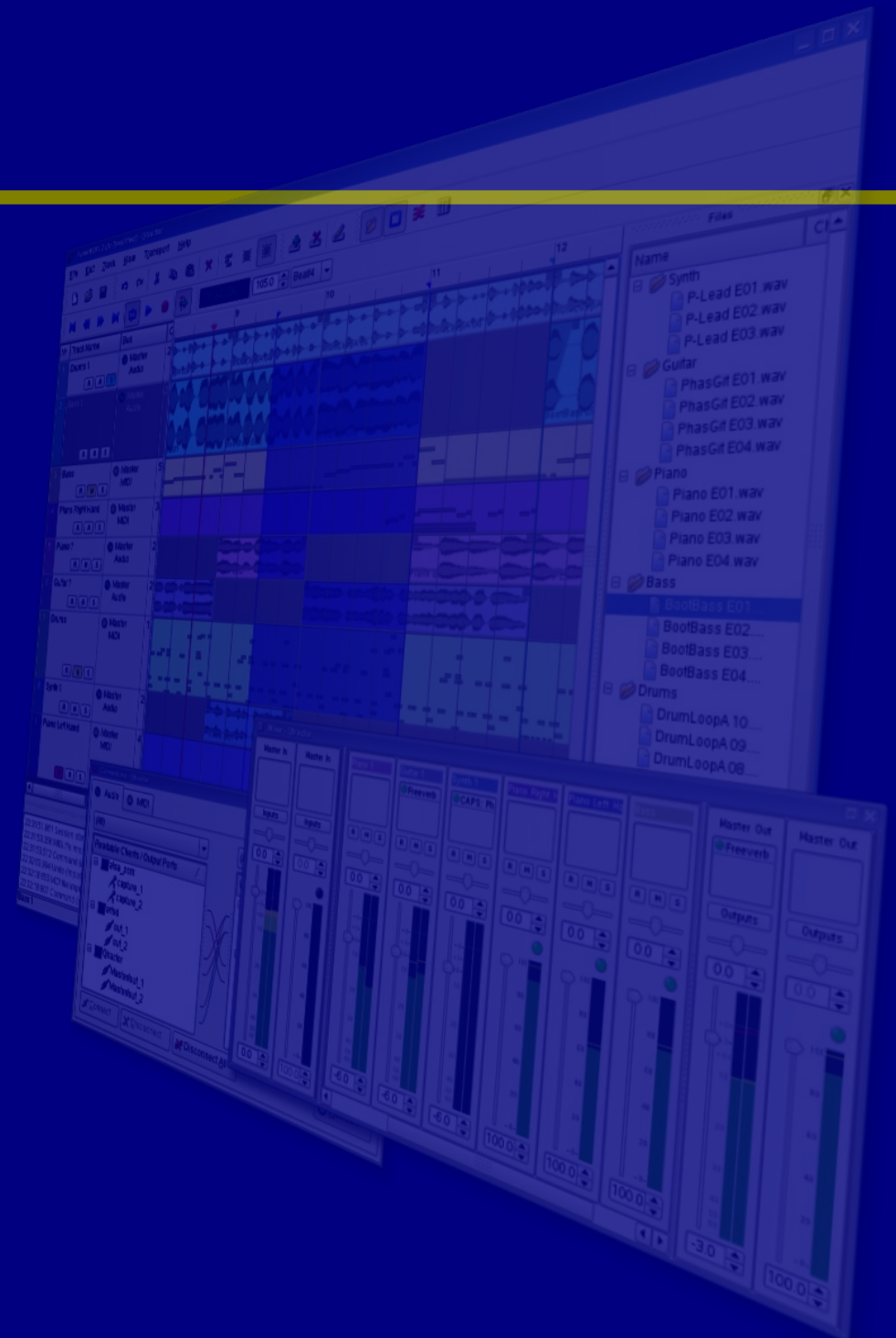
Dialogs (modal)

- **Session properties**
- **Track properties**
- **Bus configuration**
- **Instruments**
- **Options**



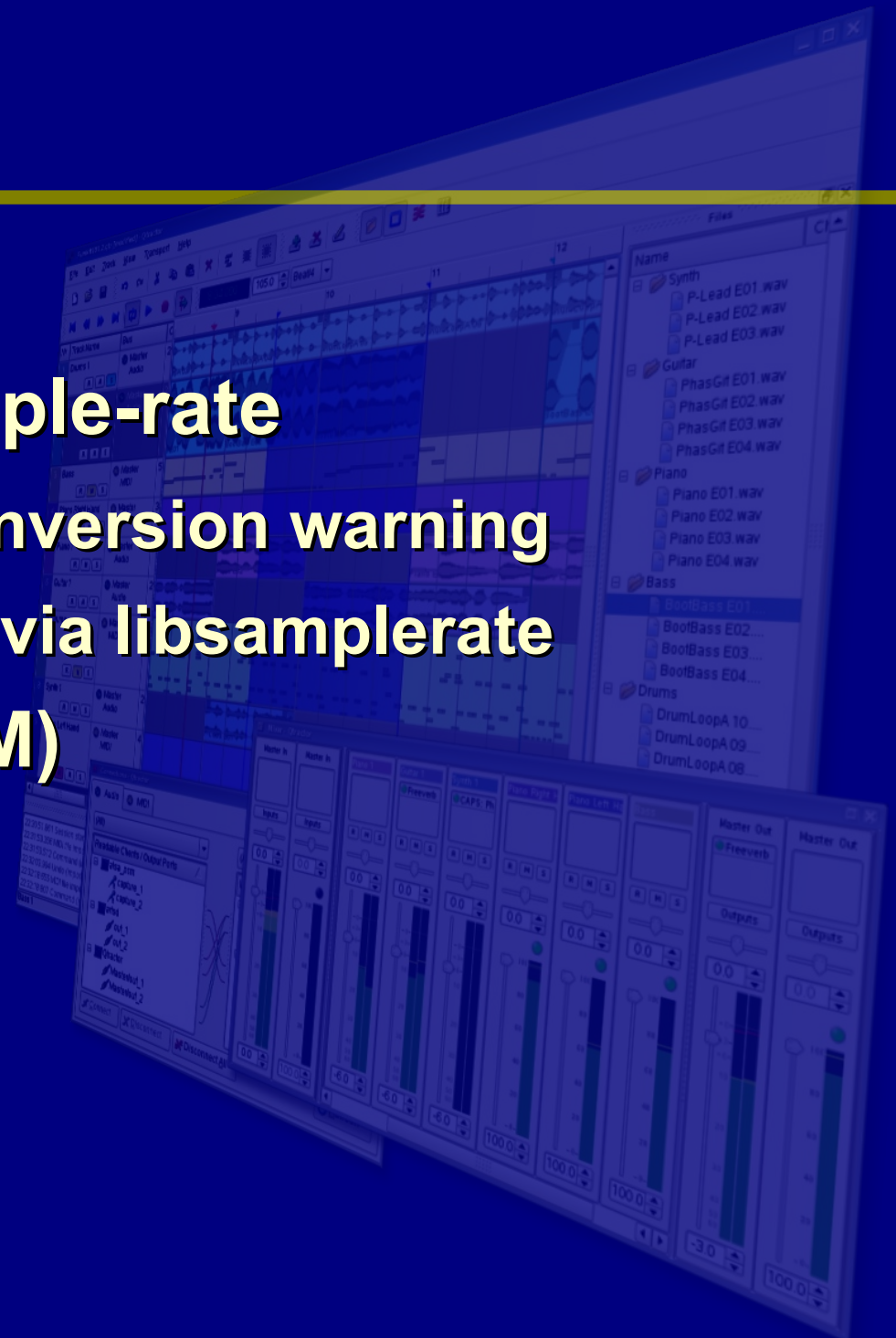
Sessions (1)

- 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

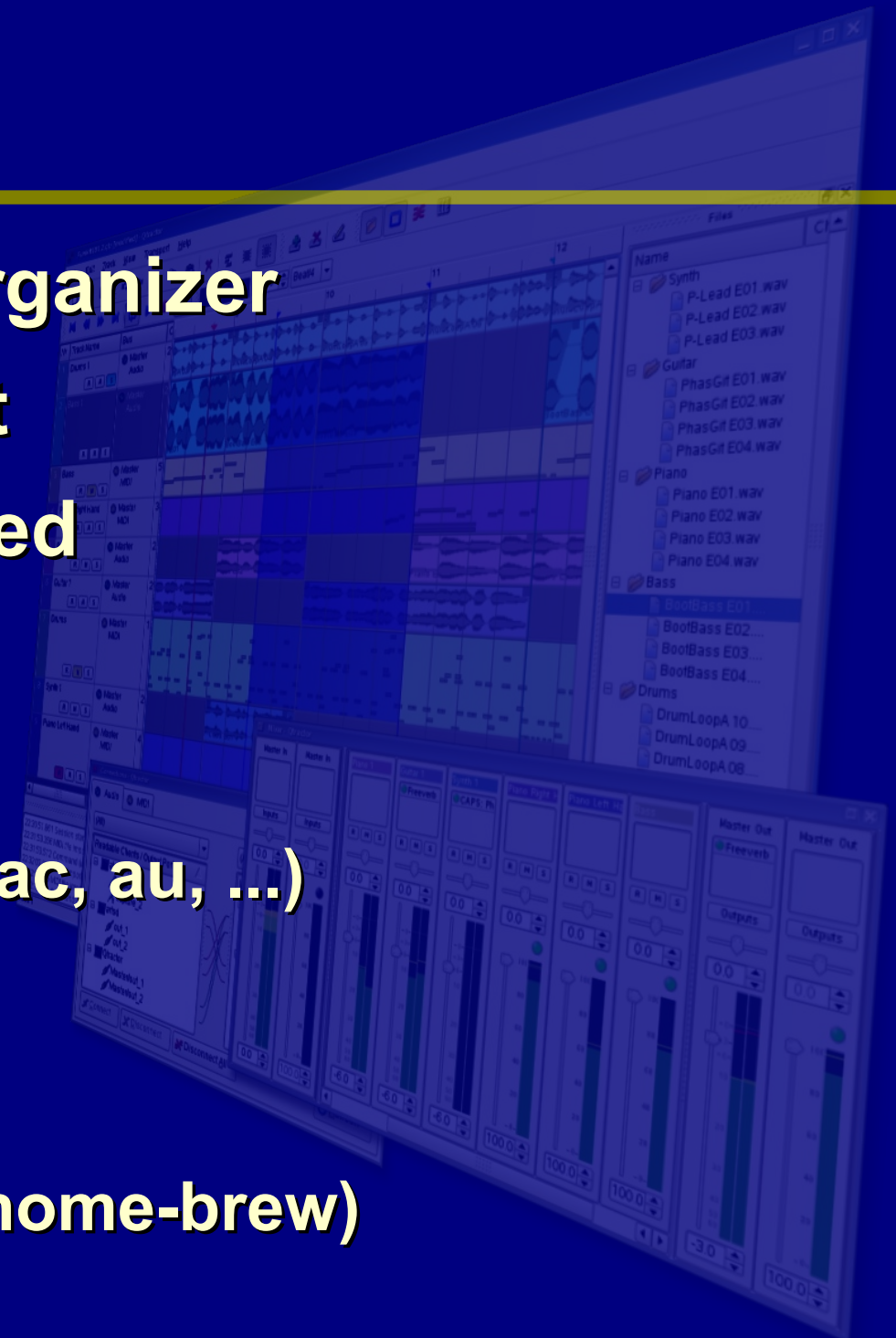
- **File selector / mini-organizer**
- **Hierarchical / tree list**
- **Drag-and-drop enabled**

Audio file support

- **libvorbisfile (ogg)**
- **libsndfile (wav, aiff, flac, au, ...)**
- **libmad (mp3)**

MIDI file support

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

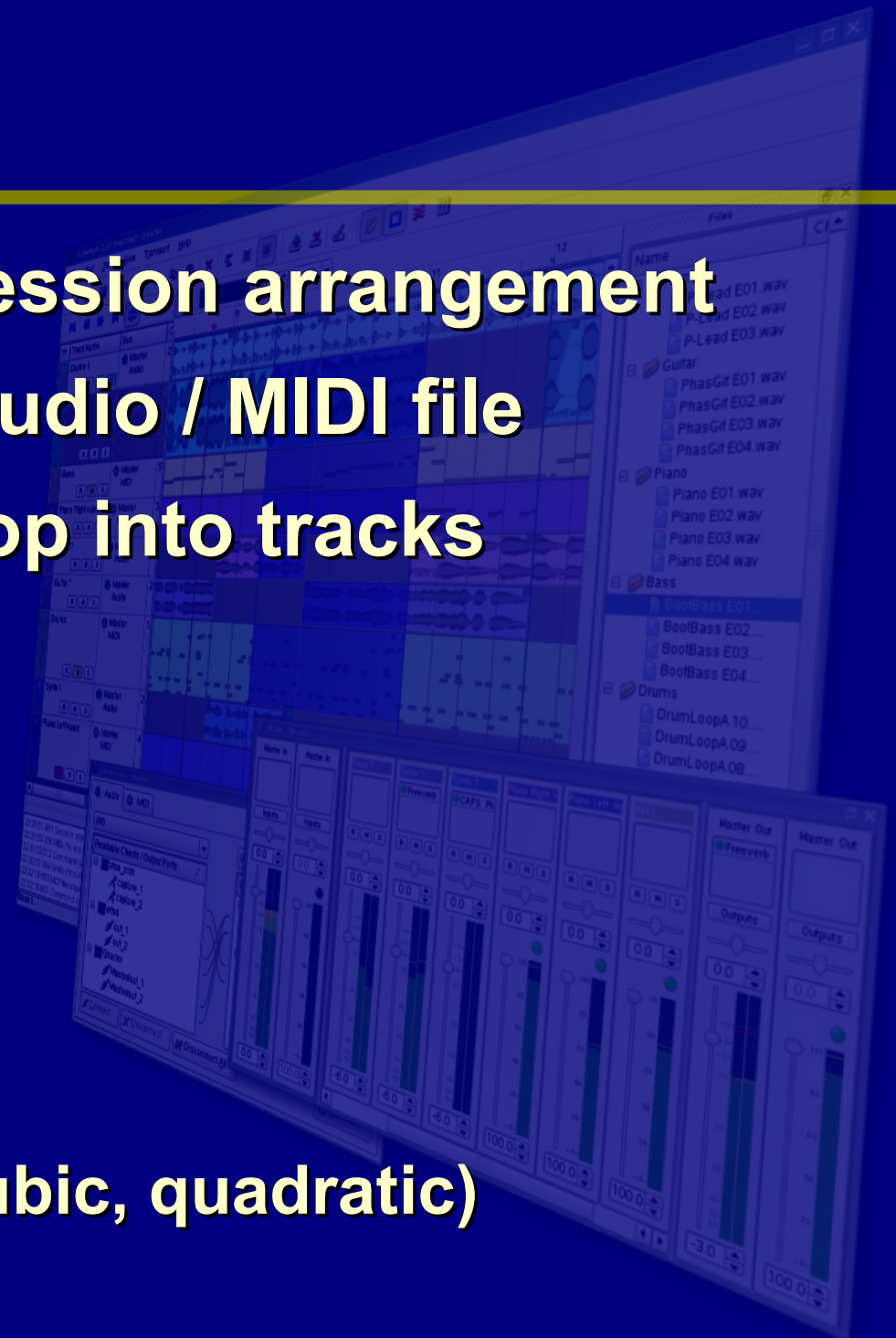


Clips (1)

- **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)**



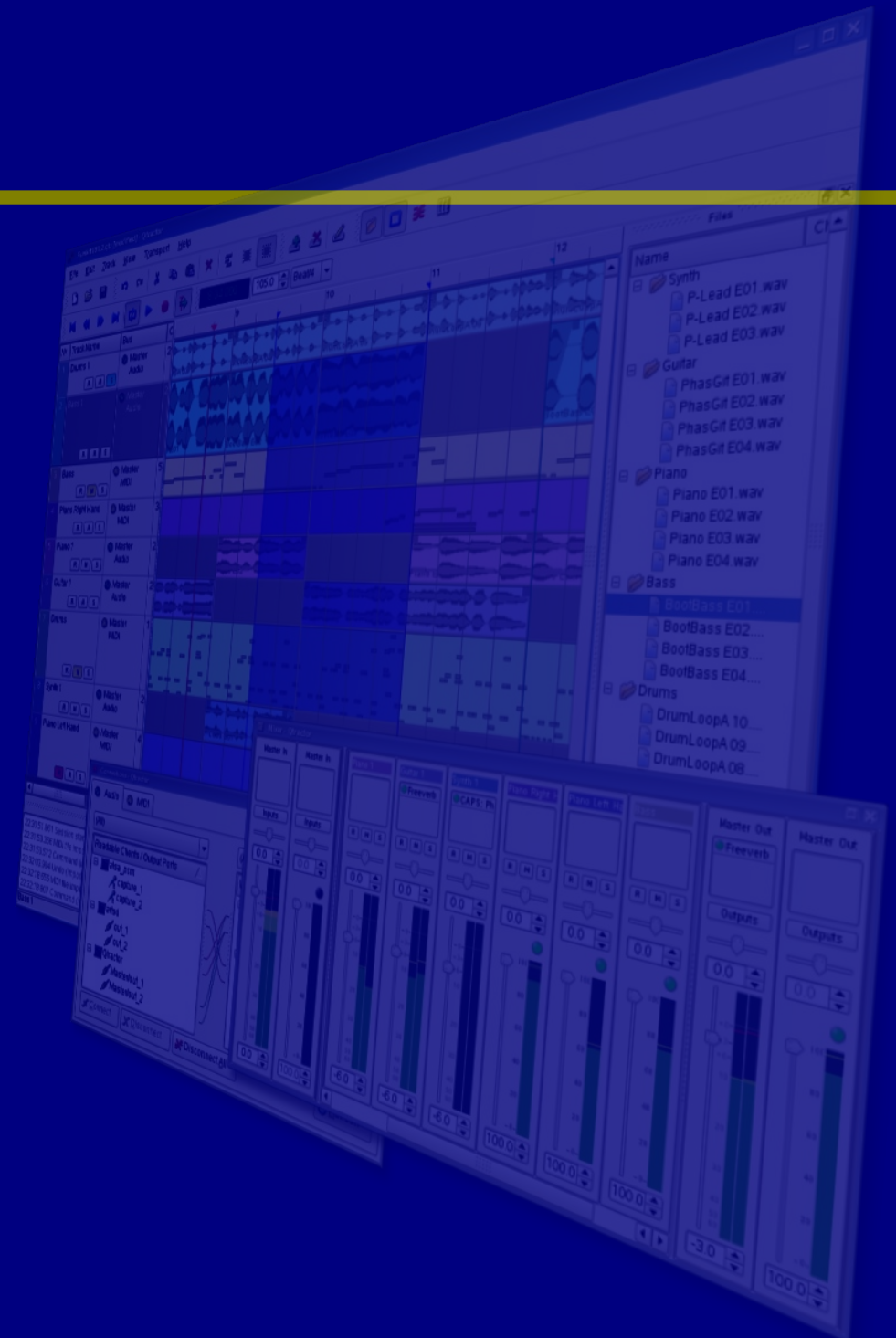
Clips (2)

Selection (modes)

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

Editing (operations)

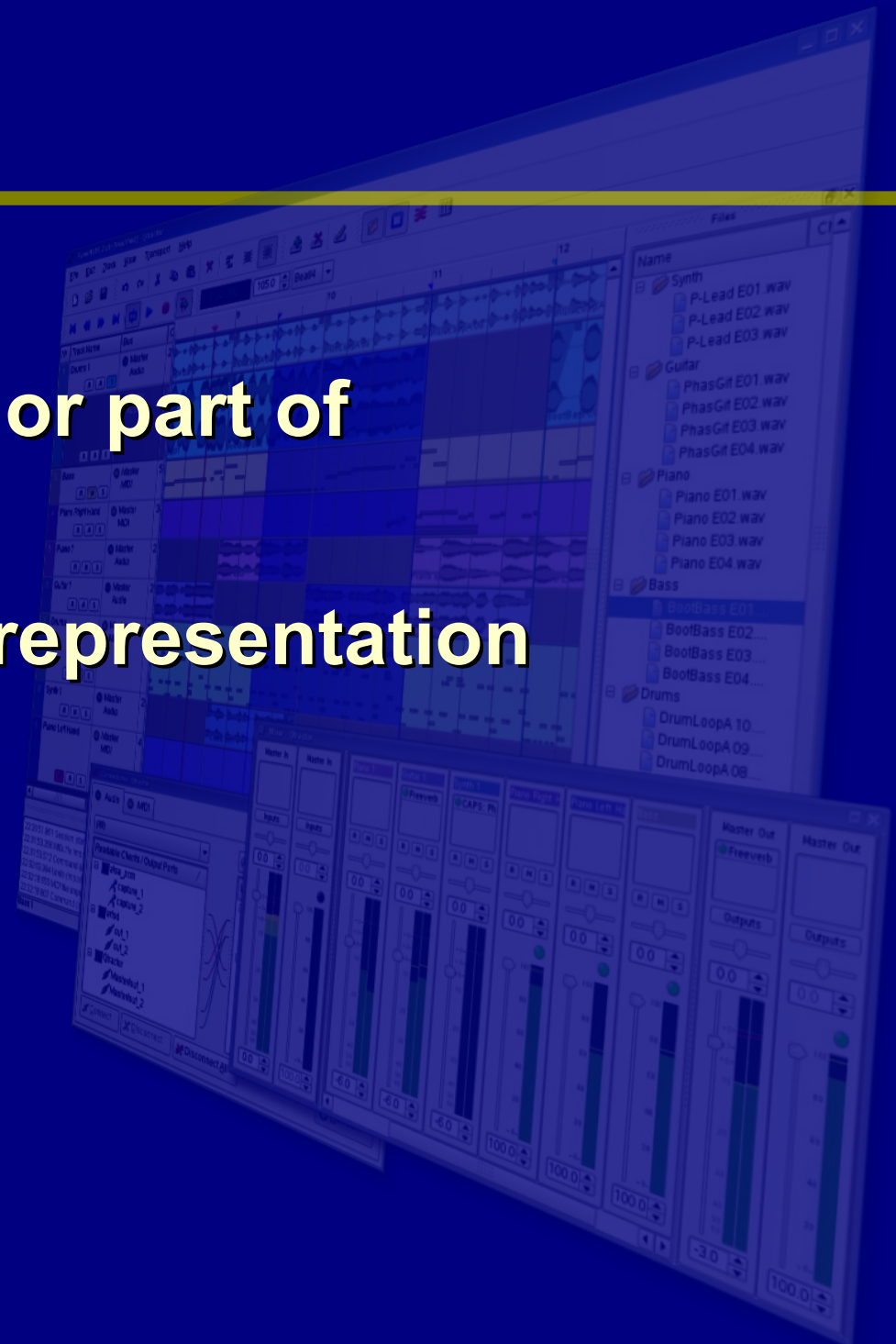
- **Cut**
- **Copy**
- **Paste**
- **Delete**
- **Drag / Move**



Audio Clips

Audio clips

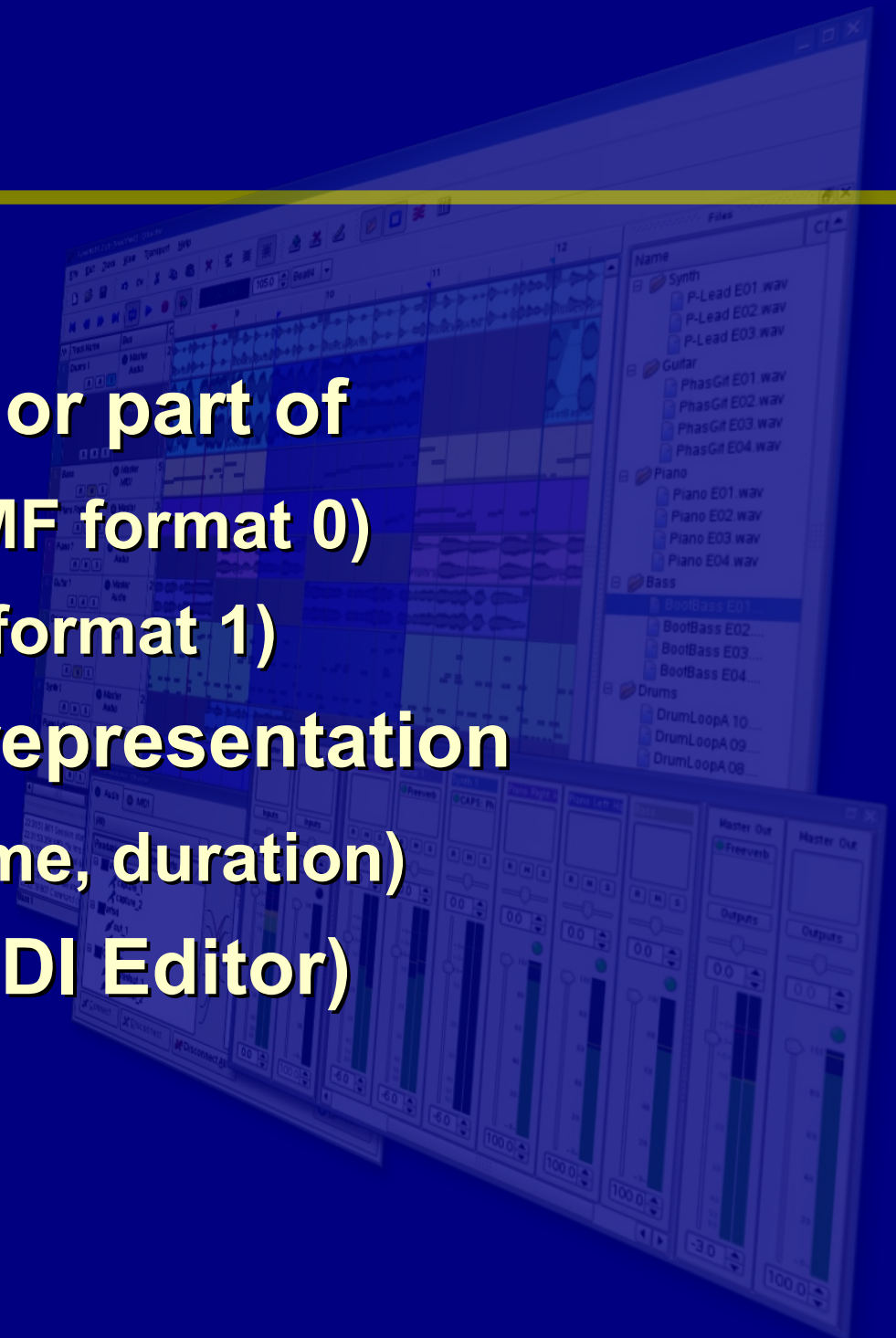
- Represent the whole or part of
 - One audio file
- Waveform graphical representation
 - Peak and RMS



MIDI Clips

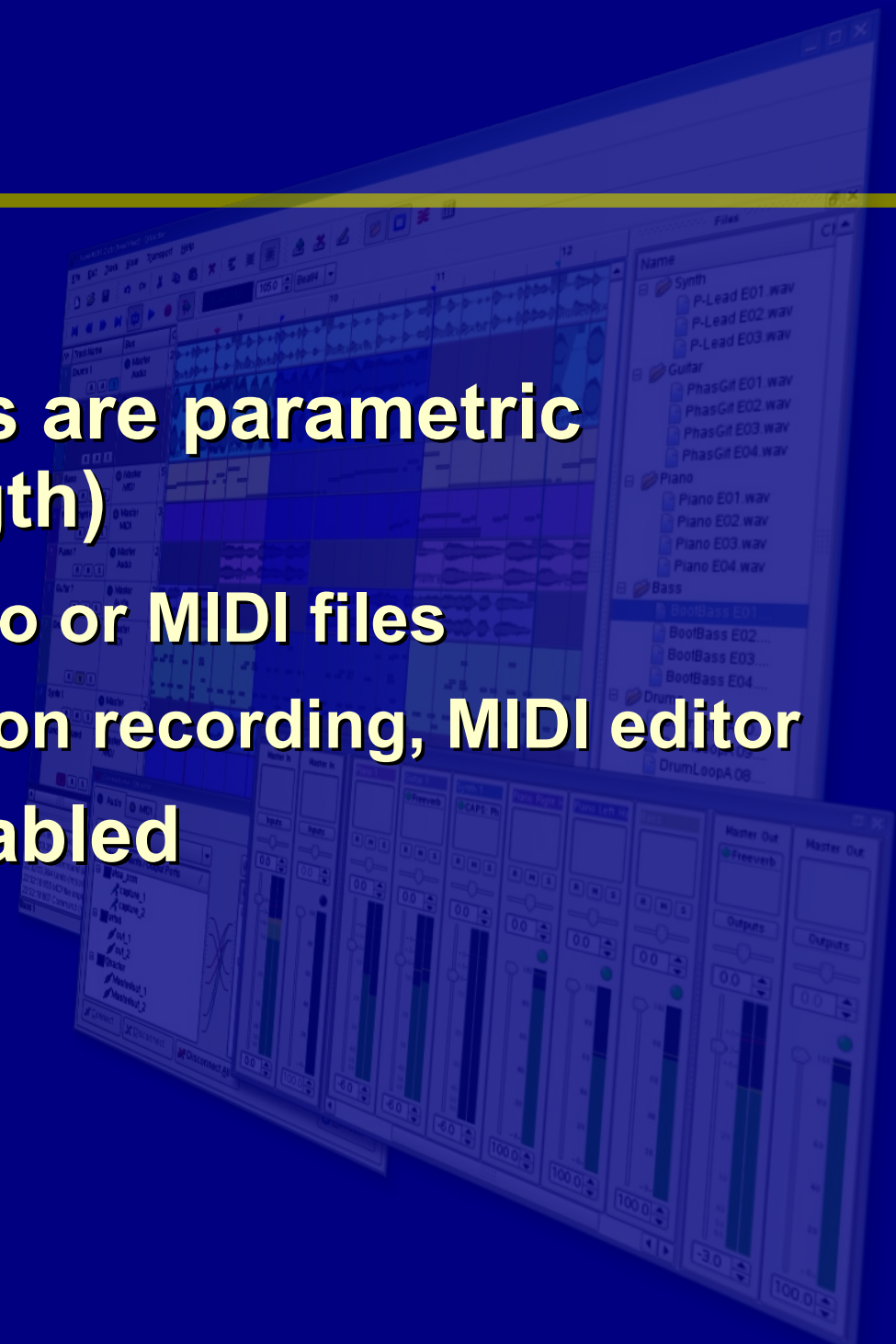
MIDI clips

- 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)
- On-the-fly editing (MIDI Editor)



Editing

- **Non-destructive**
- **All editing operations are parametric (location, offset, length)**
 - **Does not modify audio or MIDI files**
 - **Except: files created on recording, MIDI editor**
- **Undo / Redo fully enabled**
- **Zoom and resizing**

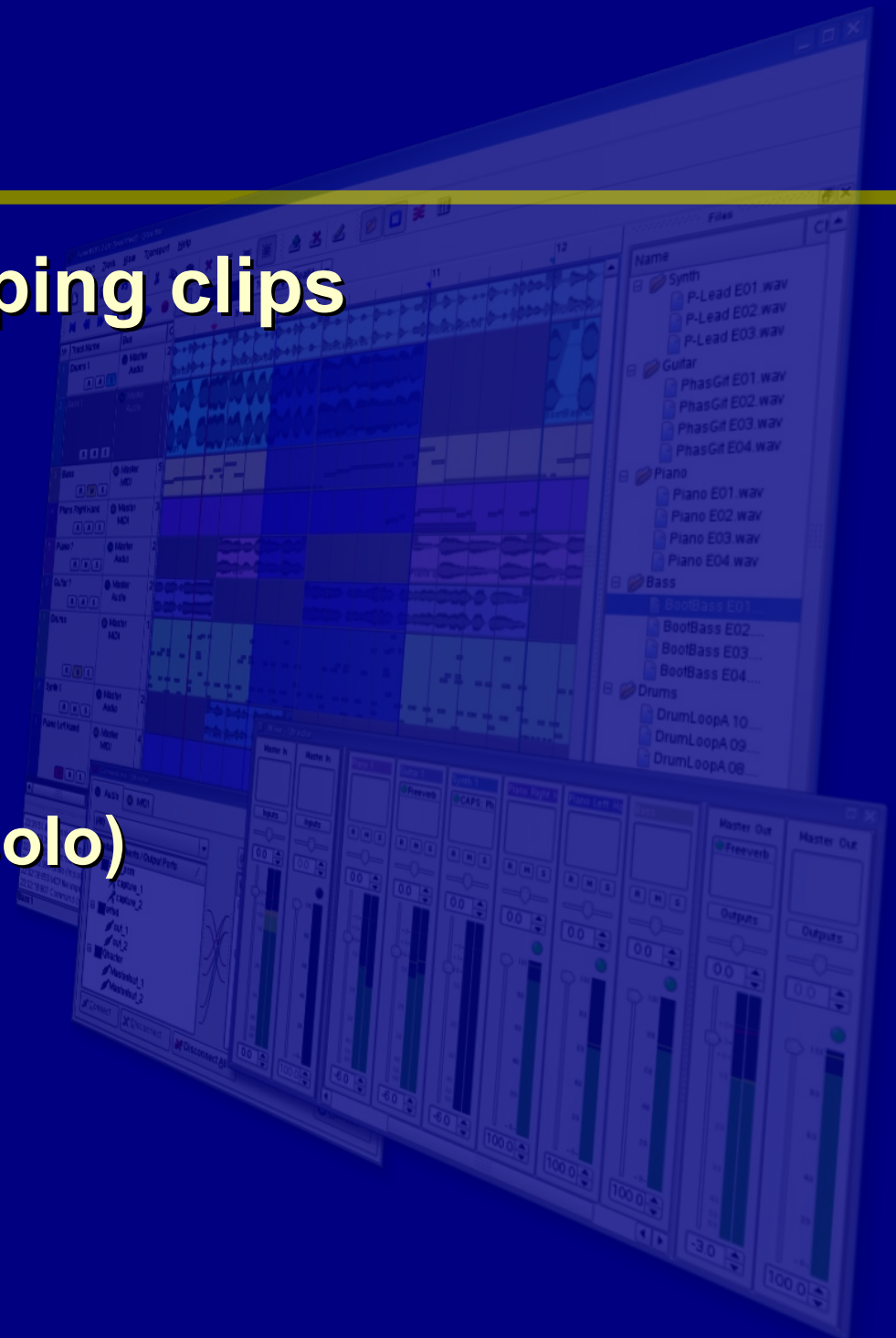


Tracks (1)

- **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

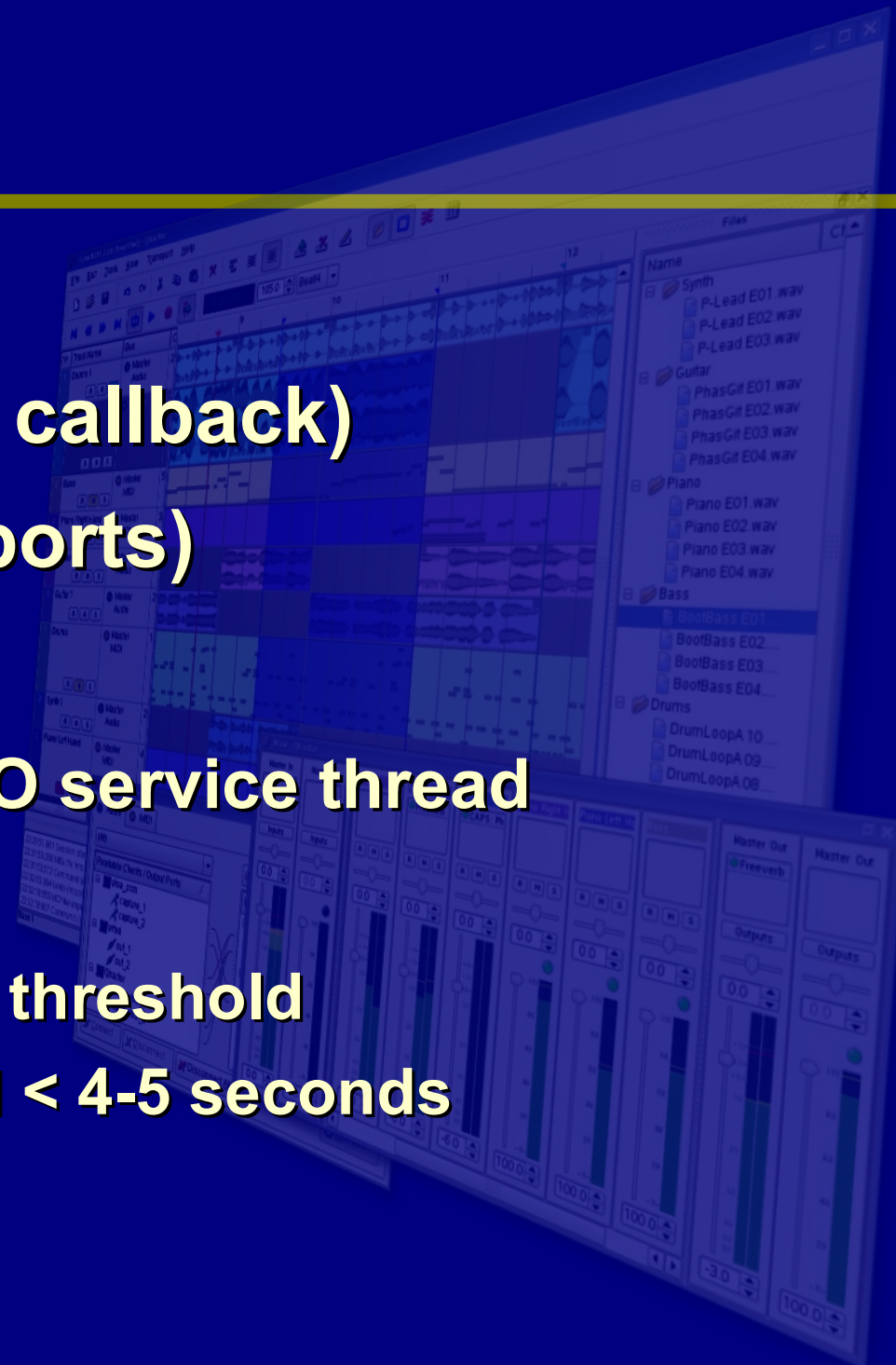
- Capture audio / MIDI files as new clips



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

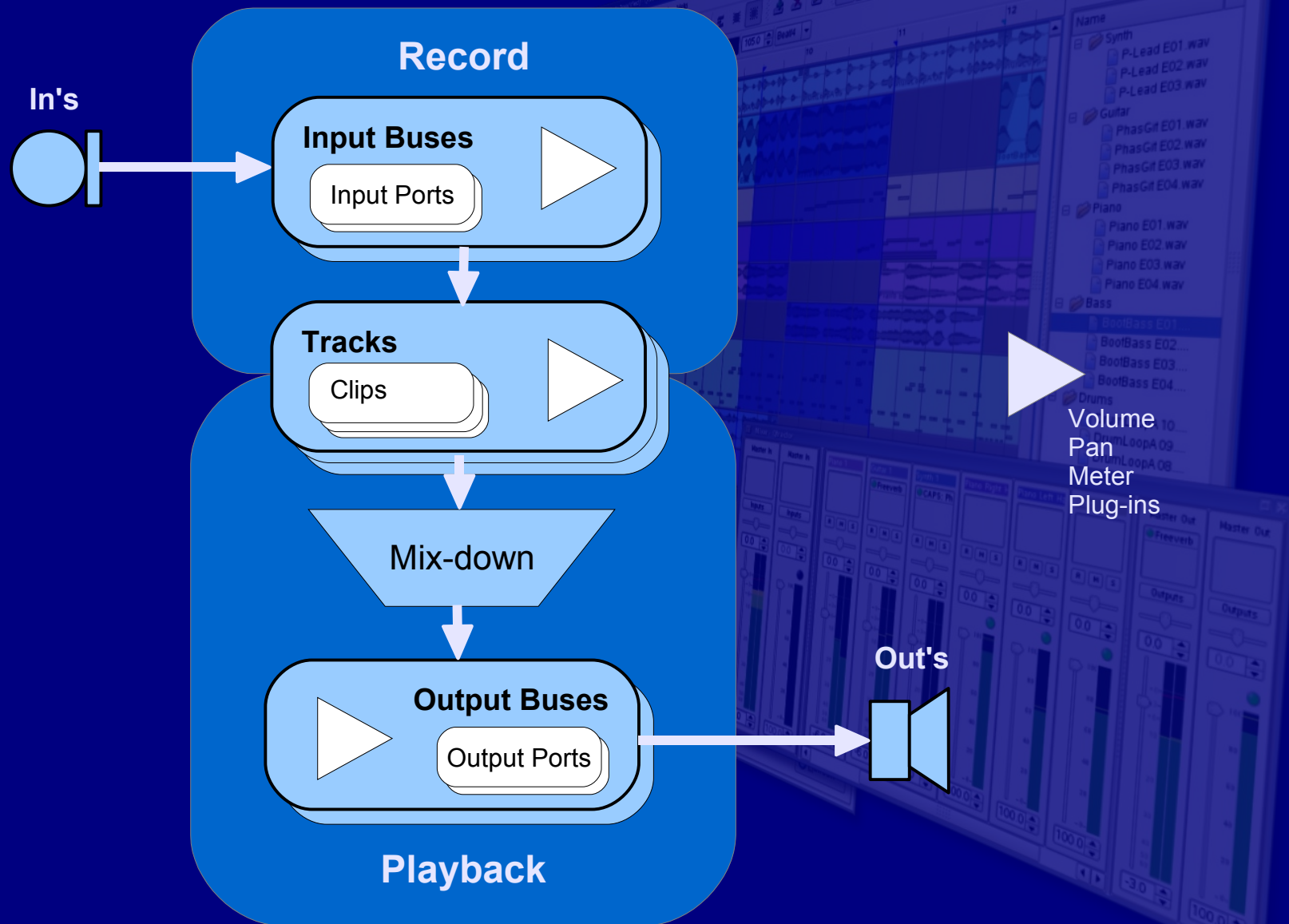


MIDI Engine

ALSA Sequencer client / queue

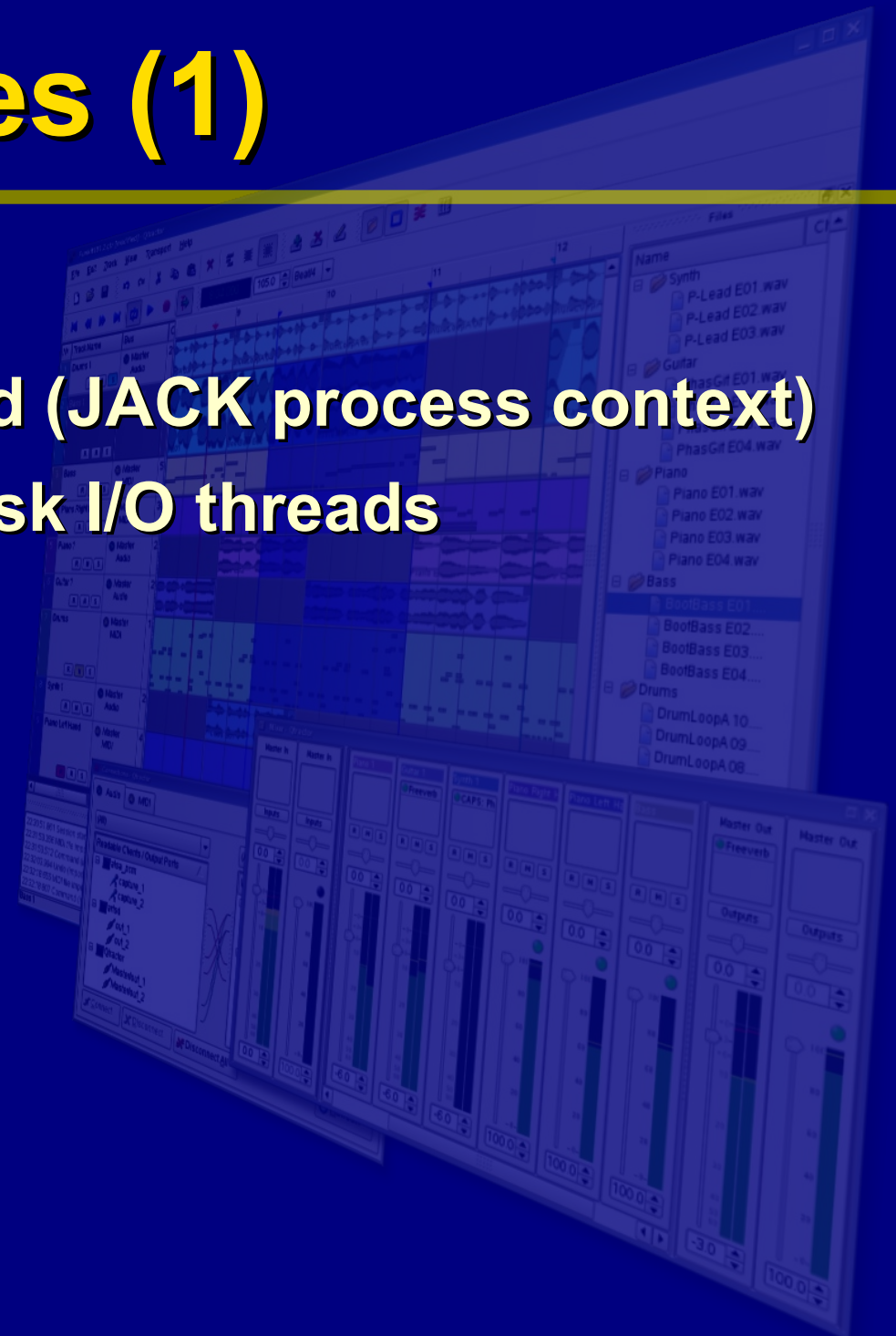
- **Slave thread (MIDI output)**
- **Listener thread (MIDI input)**
 - **Inbound events multiplexed to record-armed track clips**
- **MIDI buses (ALSA seq ports)**
- **MIDI clips**
 - **Outbound events scheduled ~ 1 second period**
- **ALSA seq queue / port time-stamping**

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)

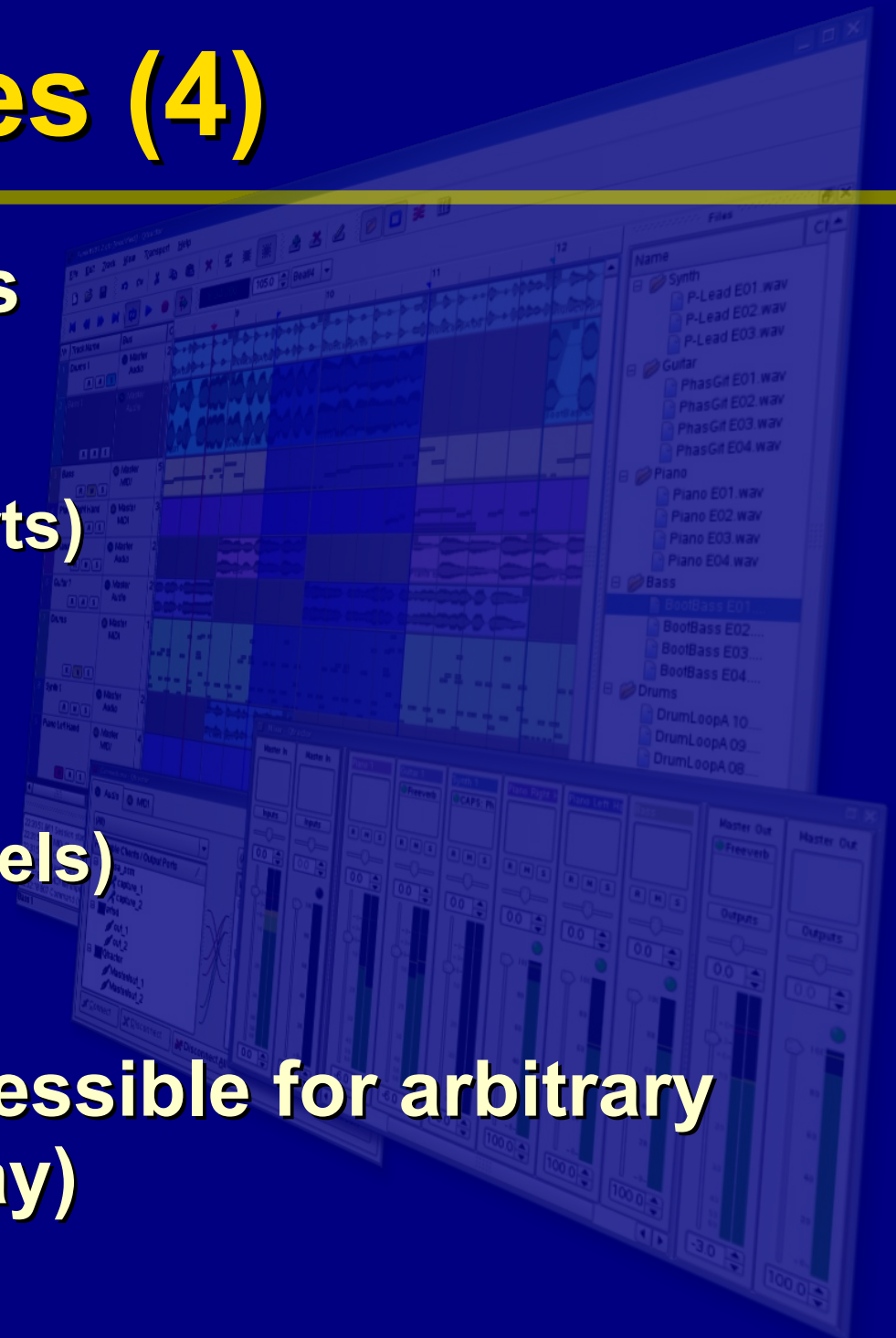
Audio bus-track channel assignment

- **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**

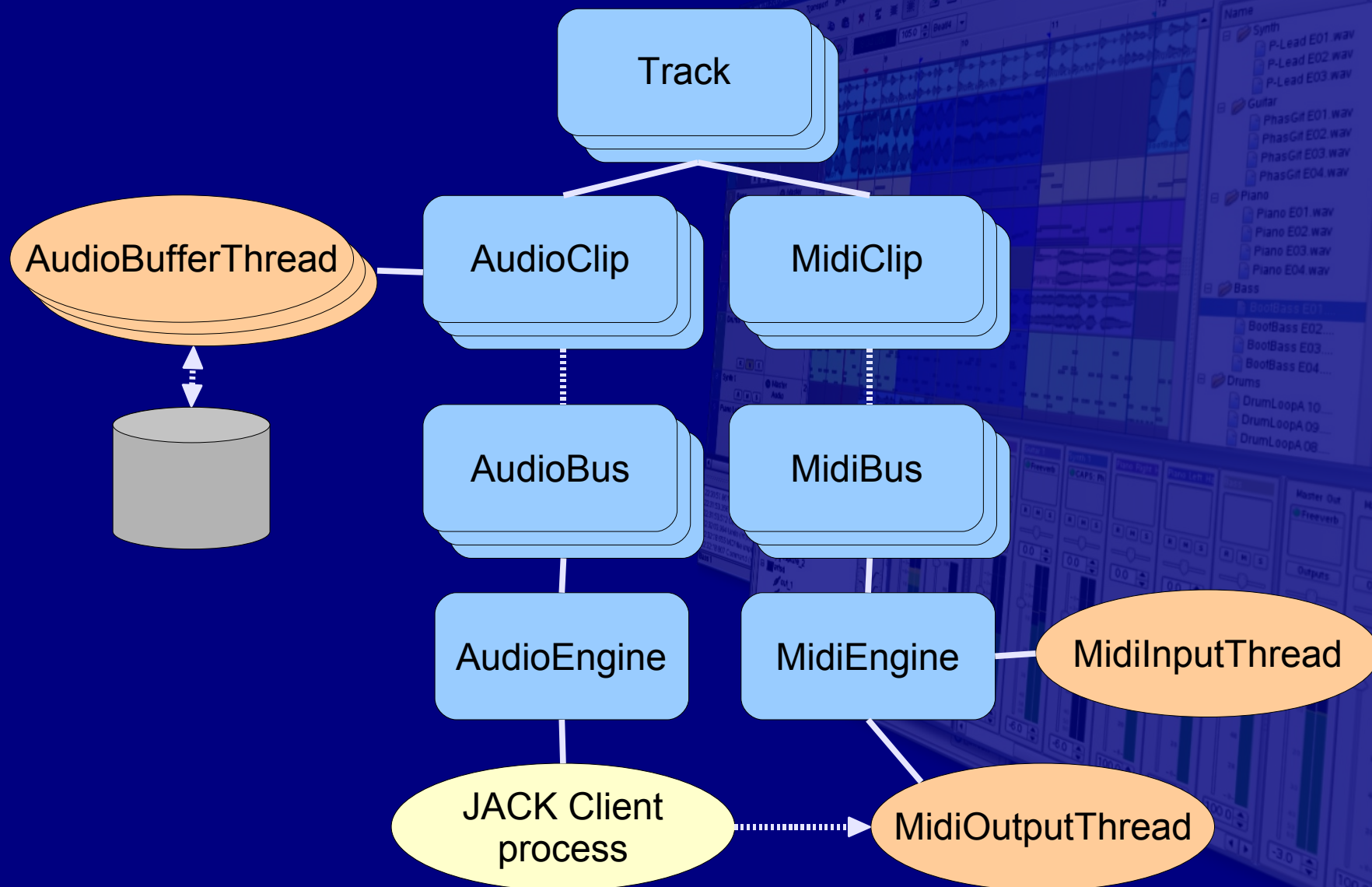
Engines & Buses (4)

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)**

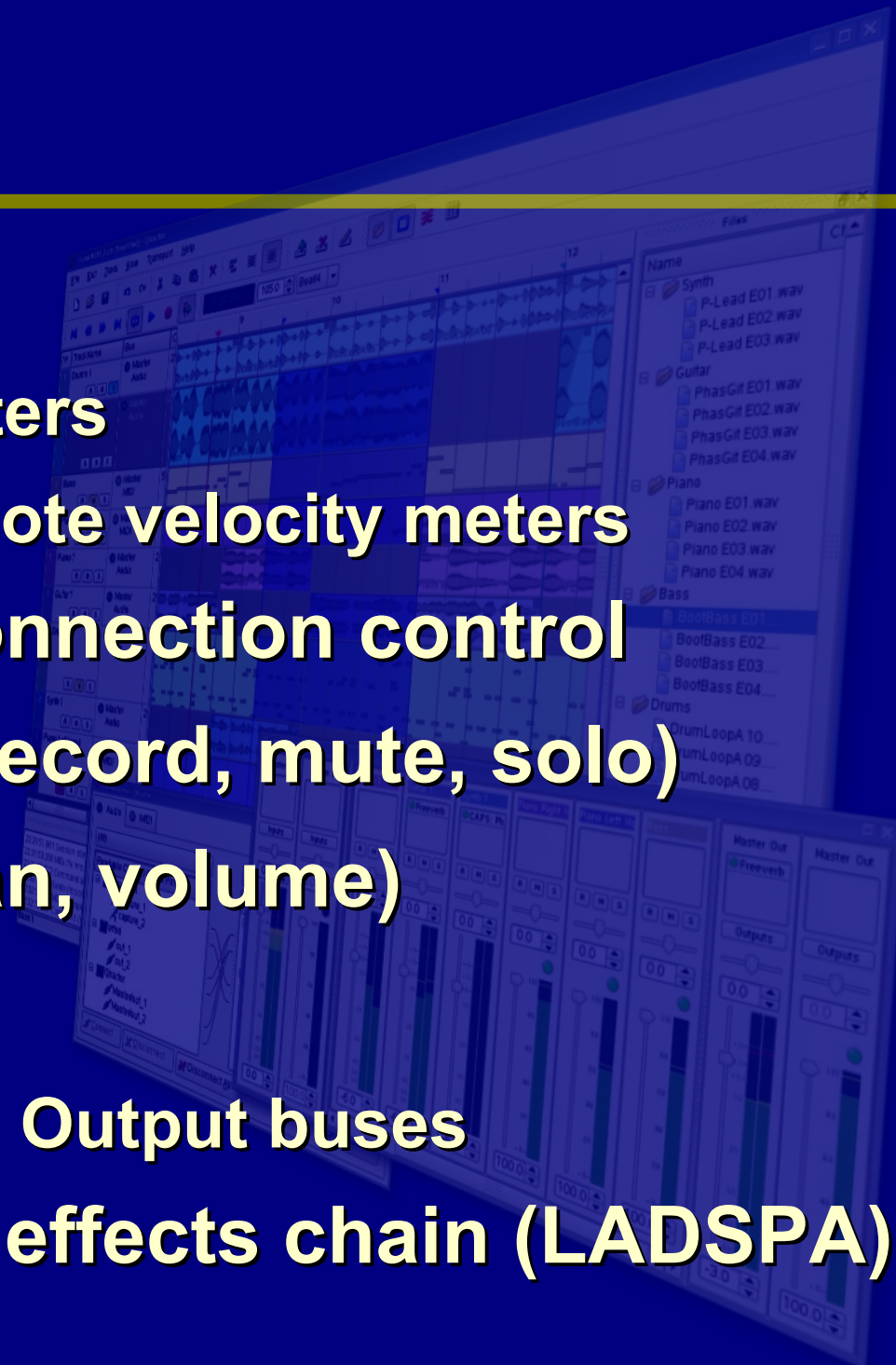


Block Diagram (2)



Mixer

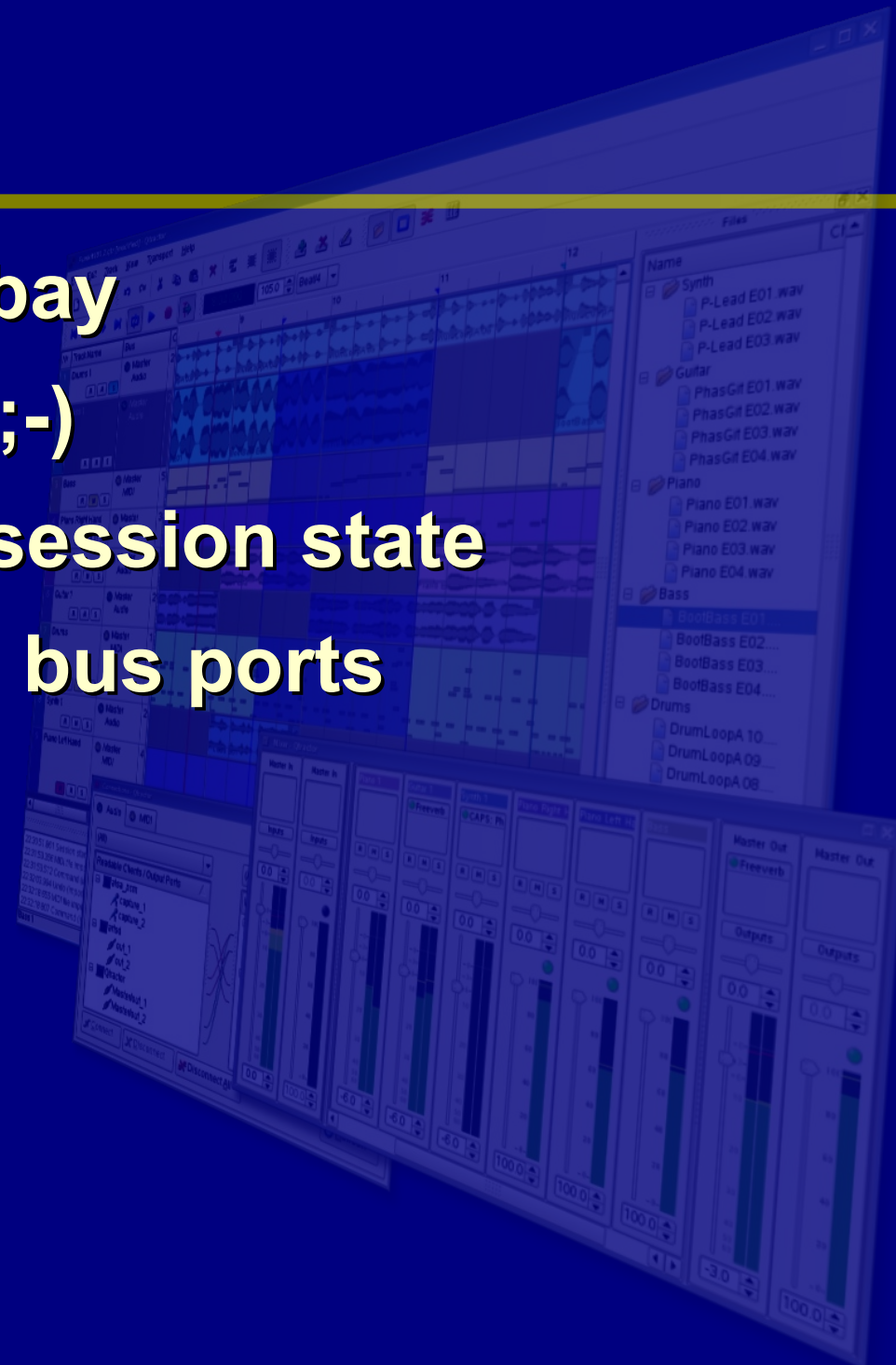
- **Session monitoring**
 - **Audio: peak level meters**
 - **MIDI: event activity, note velocity meters**
- **Input / Output bus connection control**
- **Track state control (record, mute, solo)**
- **Mix-down control (pan, volume)**
- **Mixer strips**
 - **Input buses | Tracks | Output buses**
- **Audio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



Connections

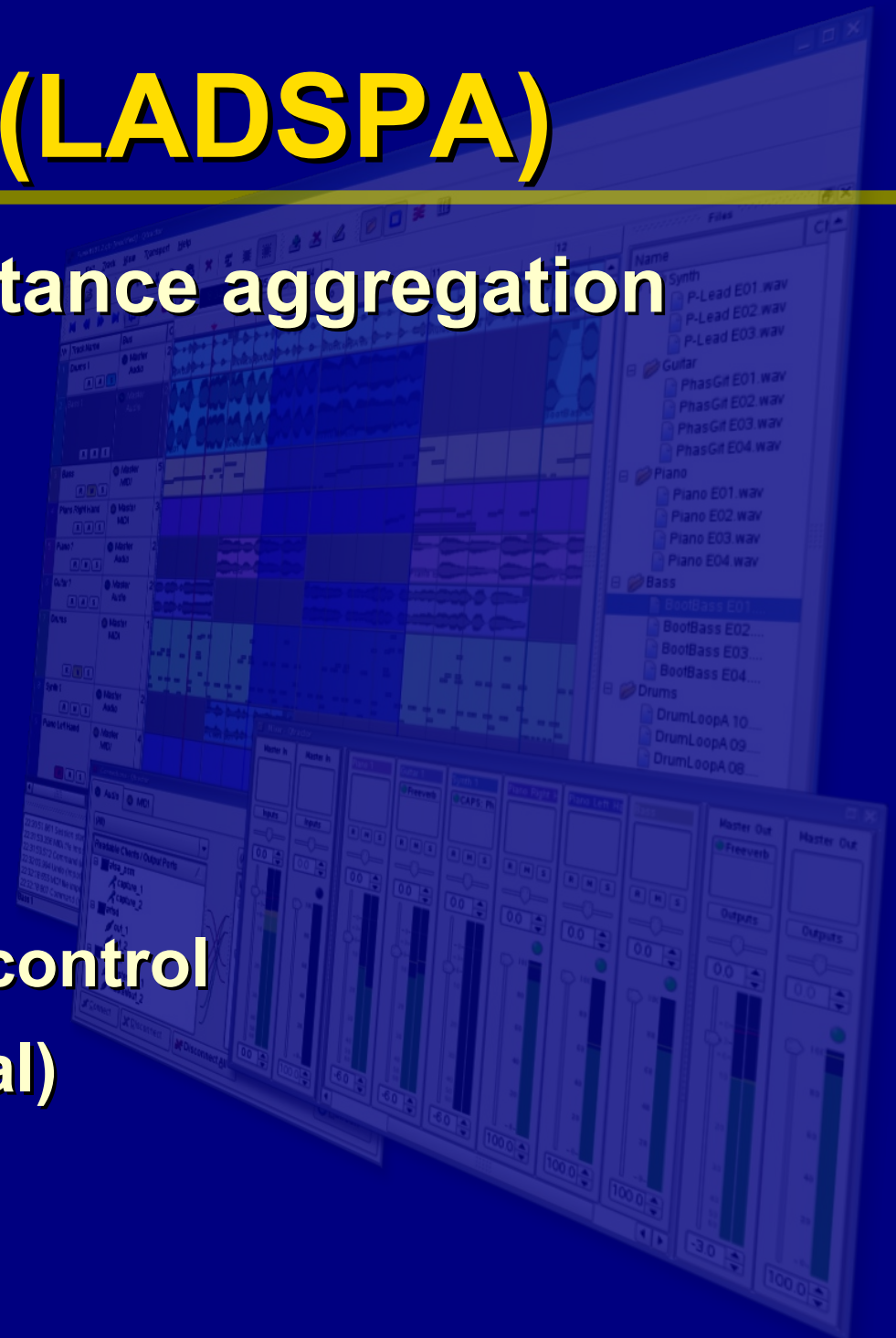
Audio and MIDI patch-bay

- QjackCtl technology ;-)
- Saved / Restored as session state
- Not restricted to own bus ports



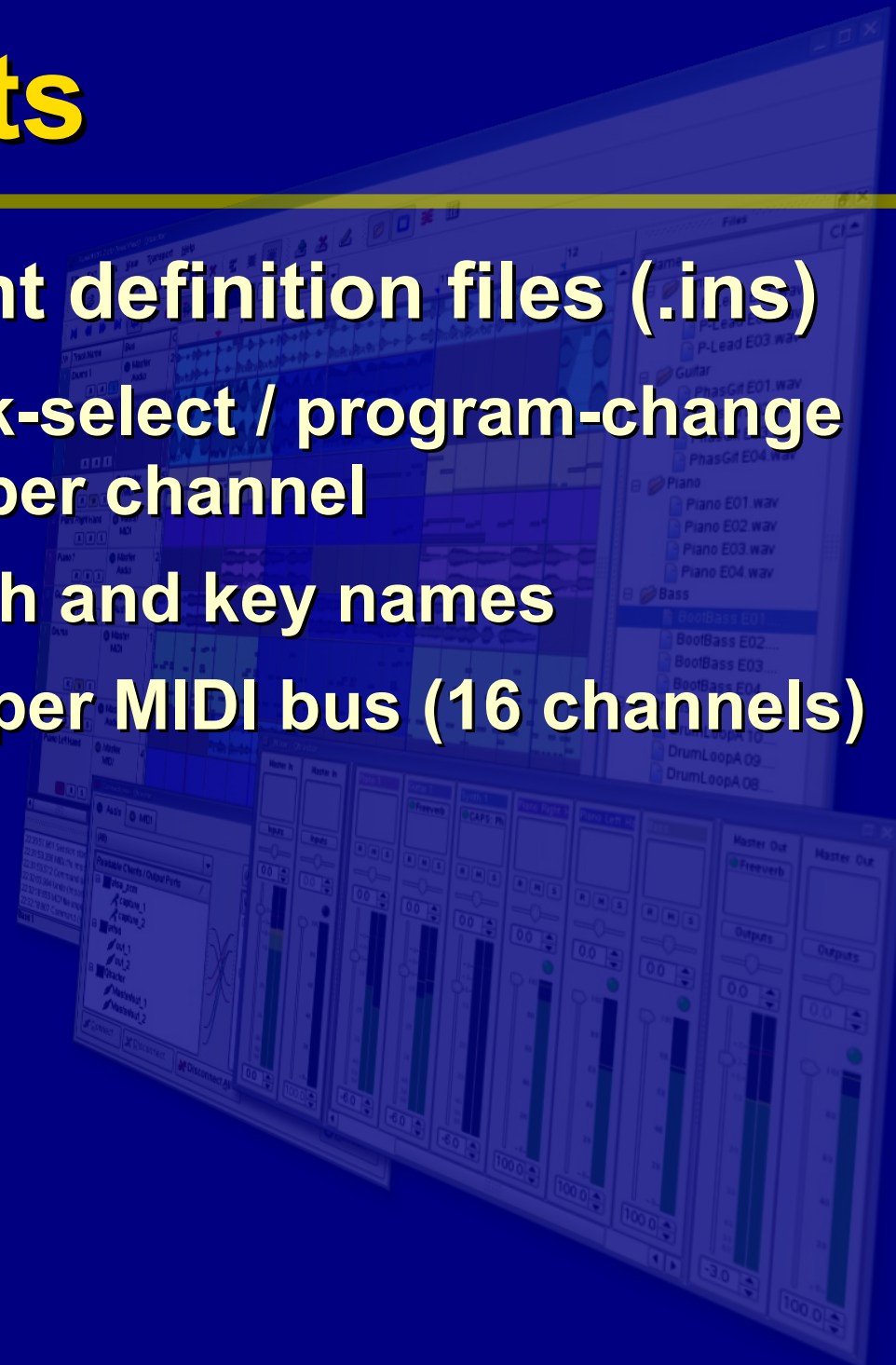
Audio Plug-ins (LADSPA)

- **Seamless plug-in instance aggregation**
- **Plug-in chain**
 - **Select & Edit (dialog)**
 - **Activate**
 - **Move (reordering)**
- **Plug-in dialog**
 - **Real-time parameter control**
 - **Named presets (global)**



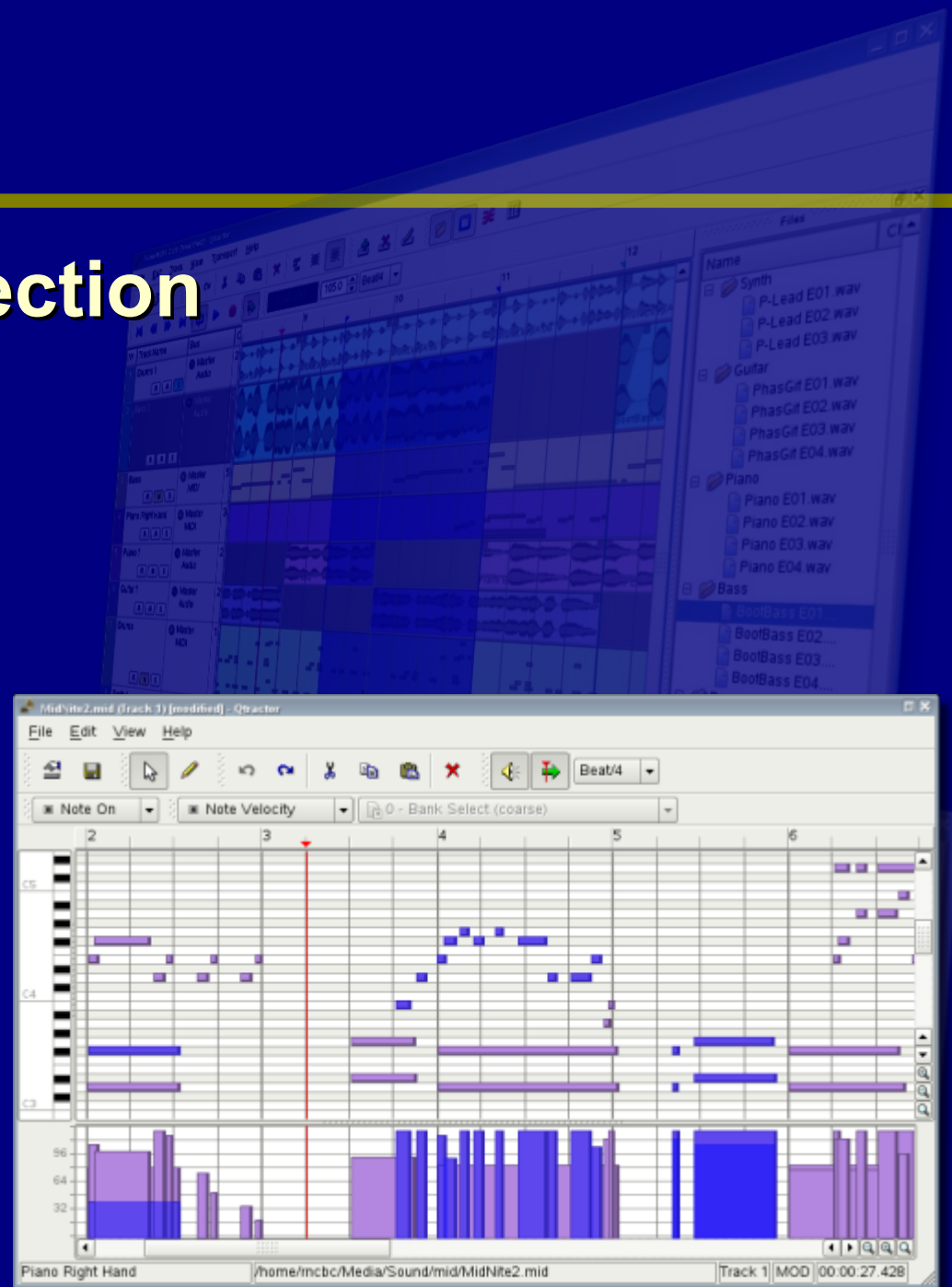
MIDI Instruments

- **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)**



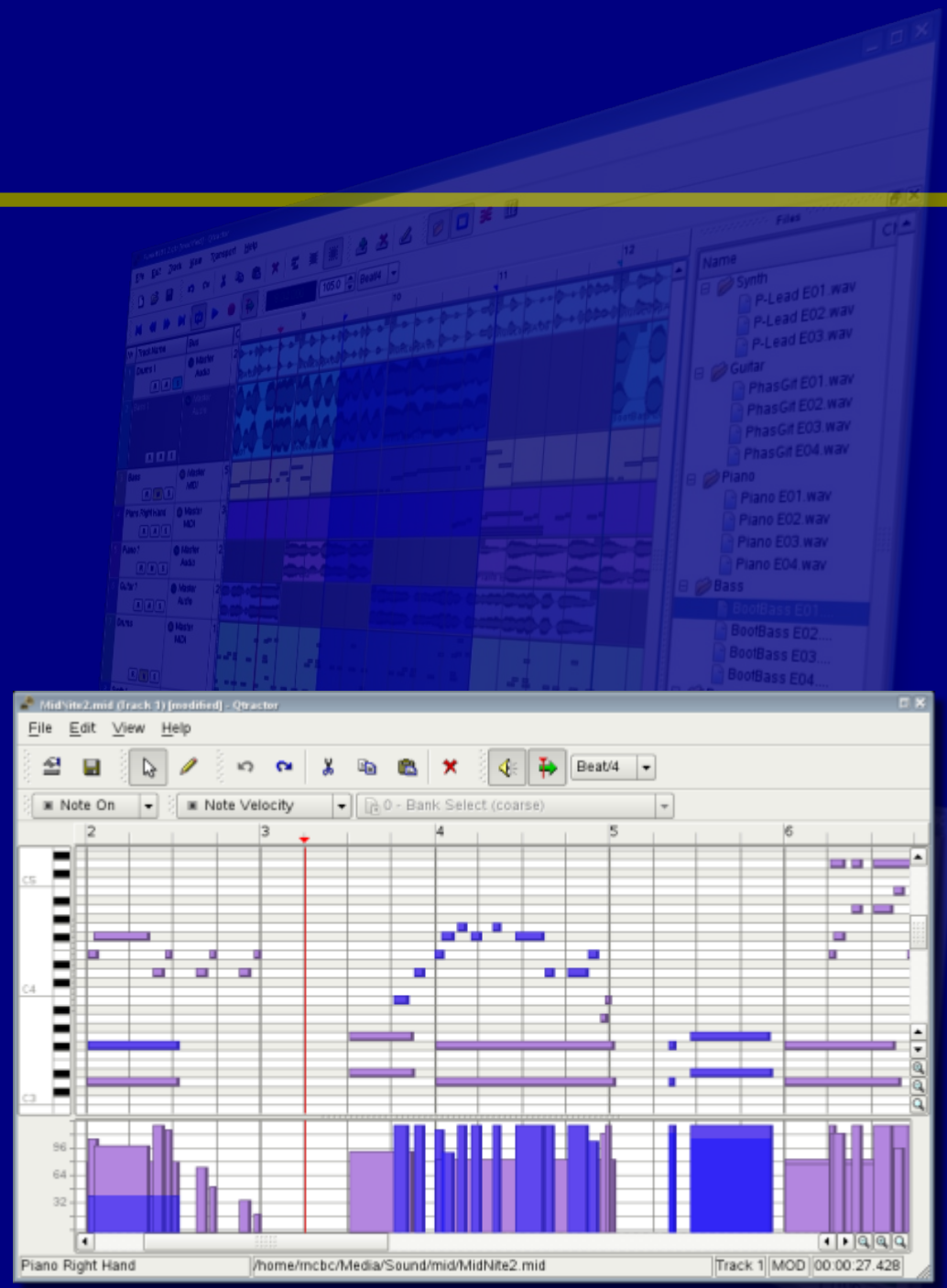
MIDI Editor (1)

- Multi-extended selection
- On-the-fly editing
 - Drag / Move
 - Drag / Resize
 - Cut
 - Copy
 - Paste
 - Delete
- Undo / Redo



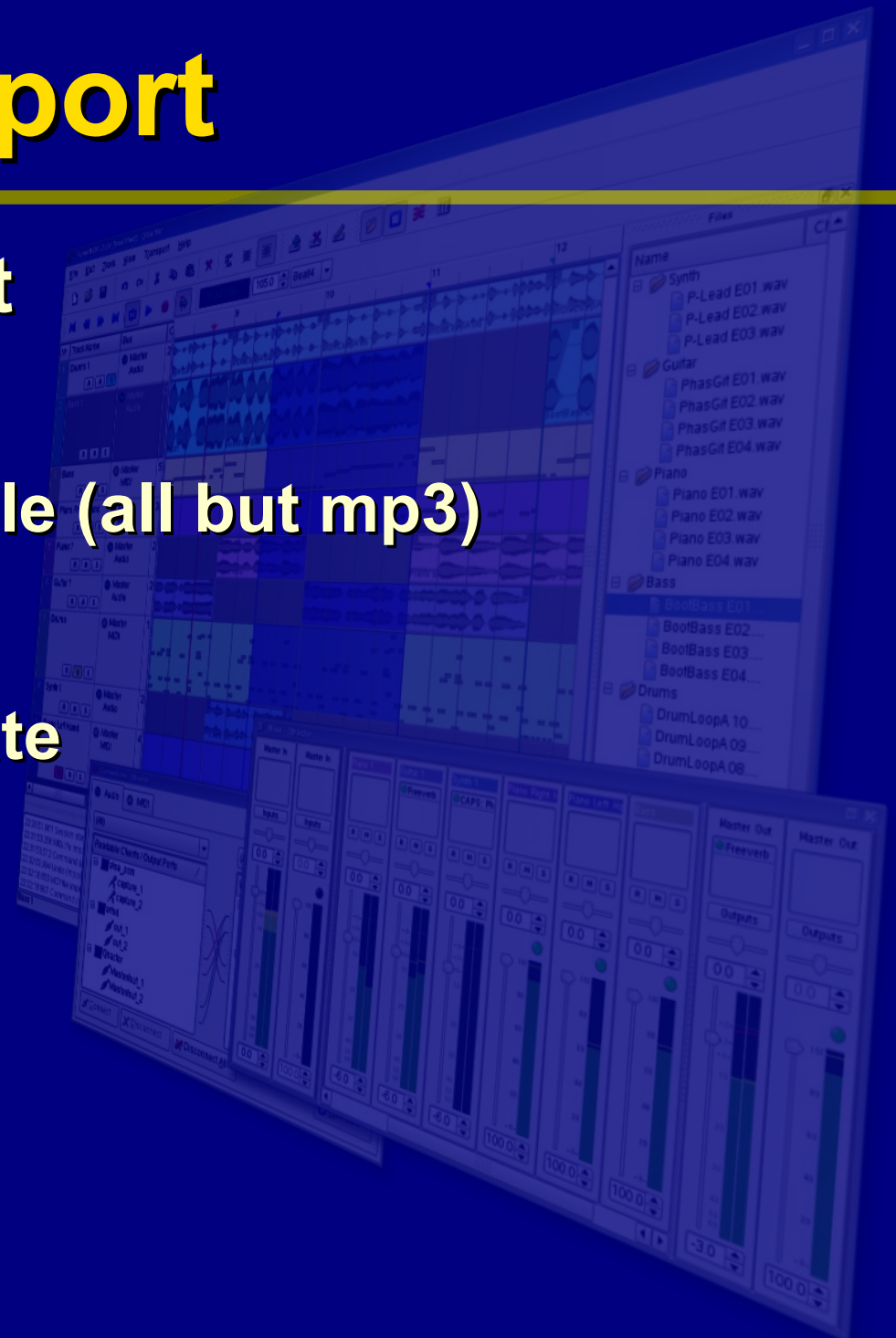
MIDI Editor (2)

- Tools
 - quantize
 - transpose
 - normalize
 - randomize
 - resize



Audio / MIDI Export

- **Audio session export**
 - JACK freewheel
 - Mix-down / to audio file (all but mp3)
- **MIDI session export**
 - Merge and concatenate
 - SMF Format 0 or 1



What's missing ? (1)

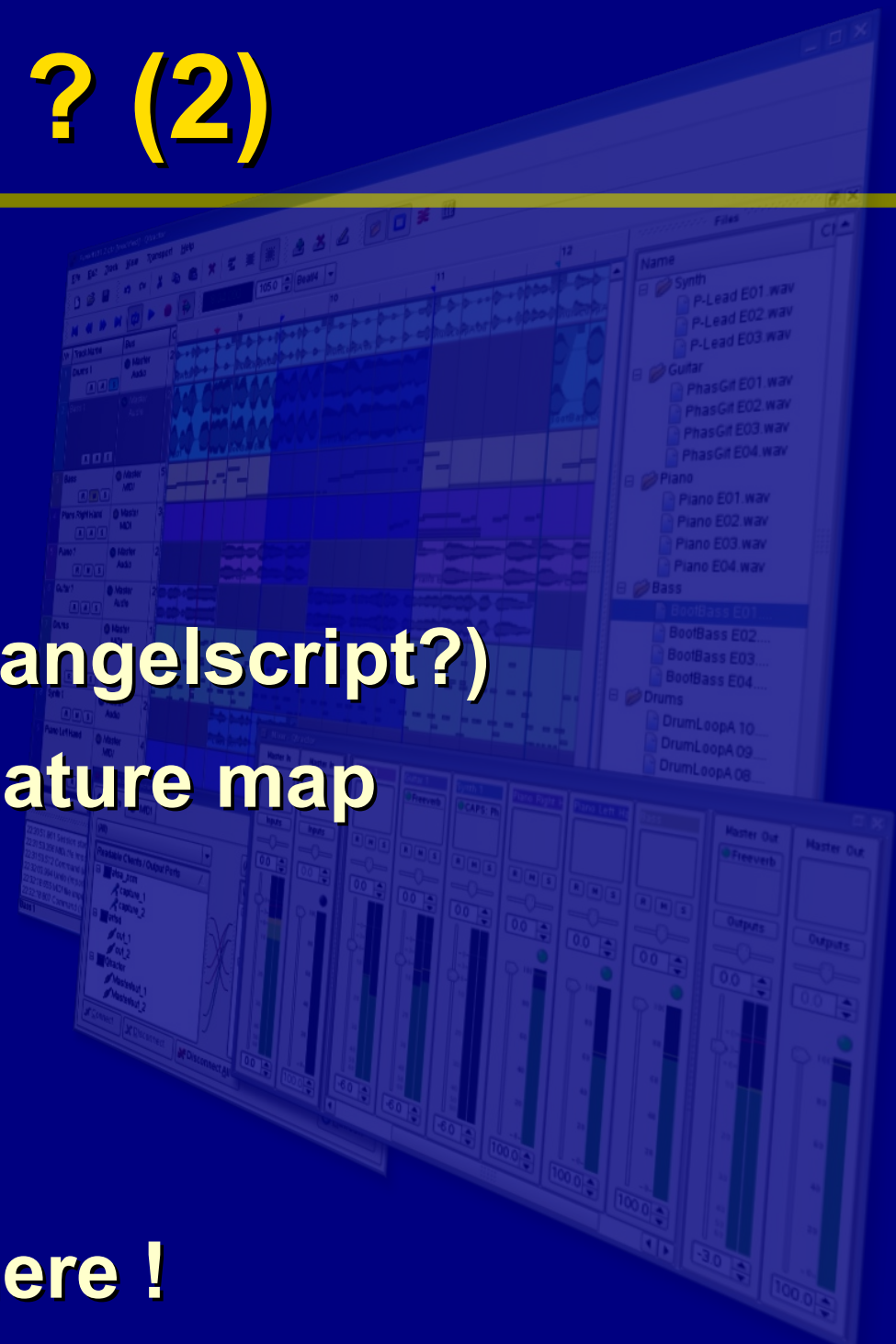
- **Metronome clicks** ✓
- **Punch-in/out and loop recording**
- **Time-stretching / Pitch-shifting**
- **Auto-cross fading**
- **Dynamic curves / Automation (volume, pan, plug-in parameters, controllers)**
- **DSSI (-VST), LV2 Plug-ins**
- **JACK-MIDI**
- **Markers**



What's missing ? (2)

- MIDI Time Code
- MIDI Clock sync
- OSC interface
- Integrated scripting (angelscript?)
- Tempo and time signature map

- **Your suggestion(s) here !**



Q & A

Qtractor

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<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 / or indirect collaborative efforts of the Linux Audio Developers and Users communities.

Thank you all.