

LAC2007@TU-Berlin

Qtractor

An Audio/MIDI multi-track sequencer

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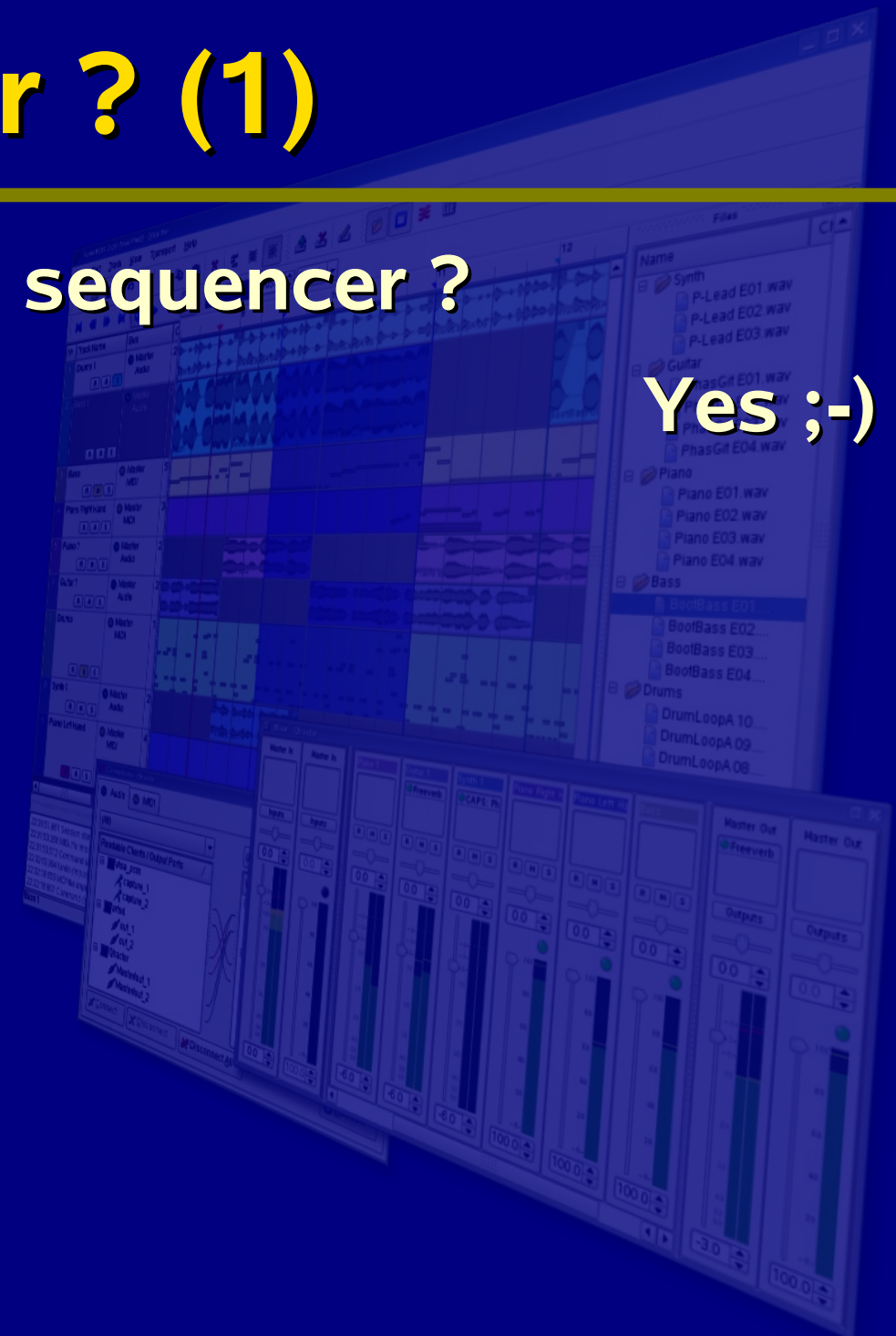
<http://qtractor.sourceforge.net>

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 ?

cv.s.sourceforge.net

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

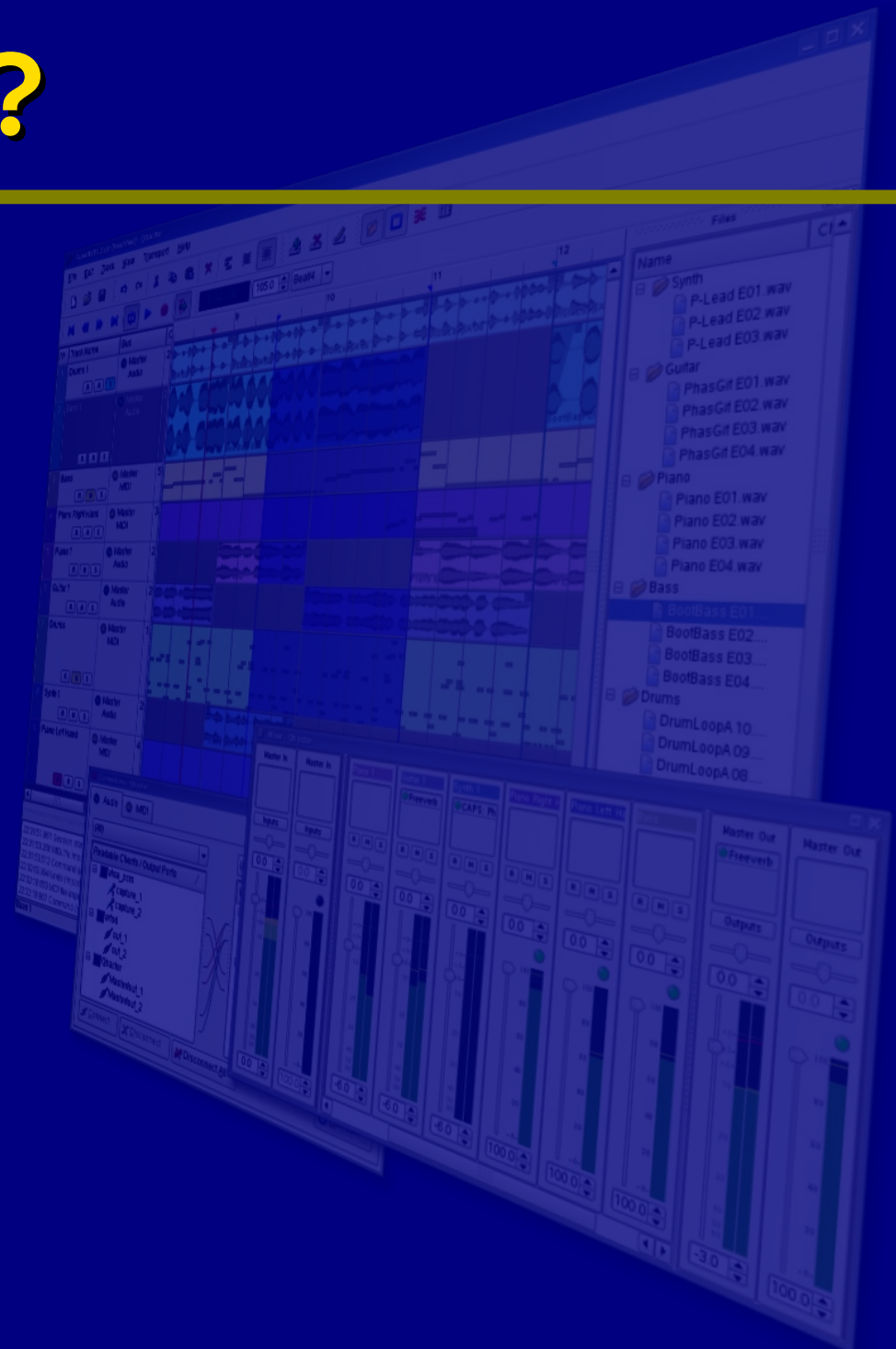
Open for Business (no money involved)

- **users, developers, players, nurturers . . .**

What do I need ?

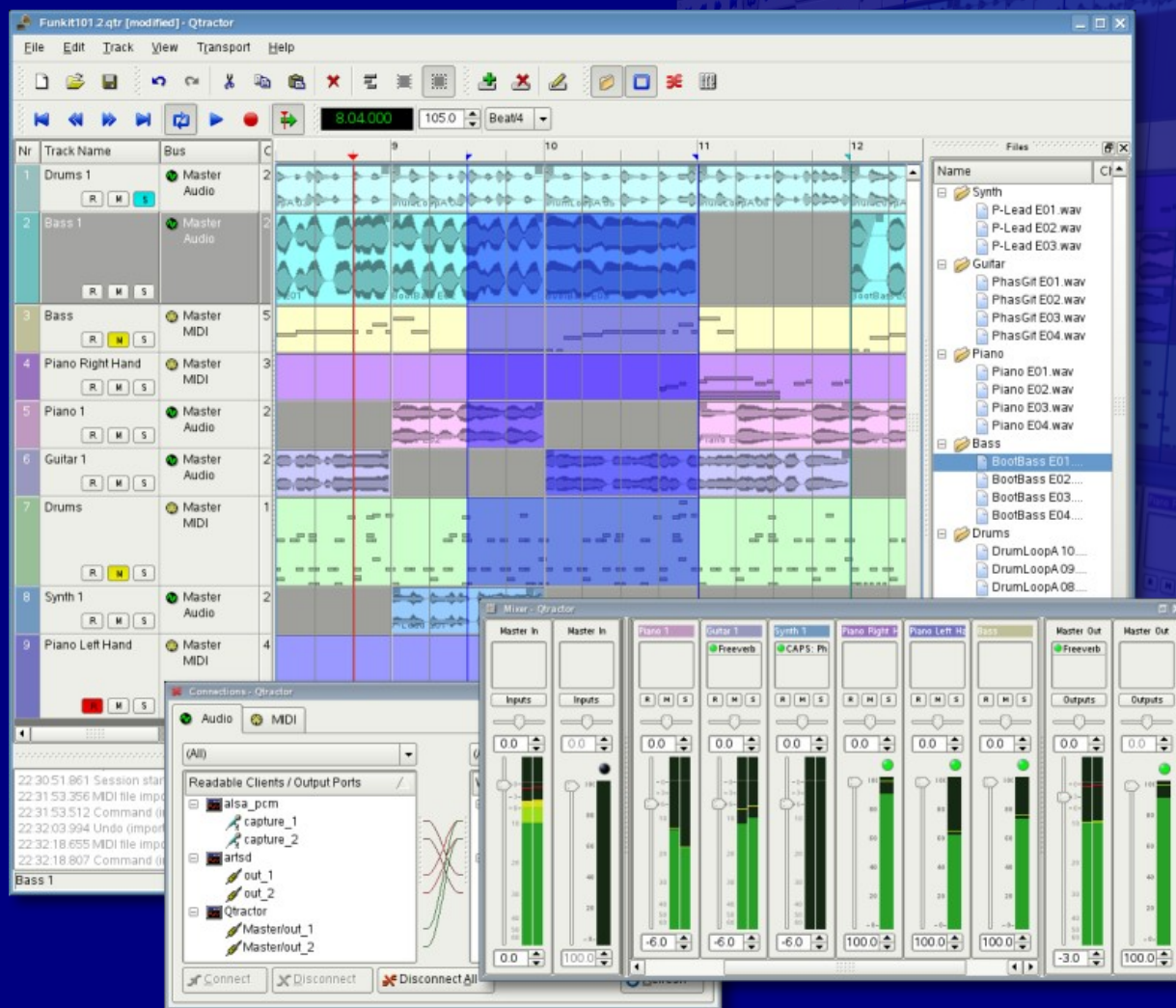
Requirements

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



Give me figures !

GUI

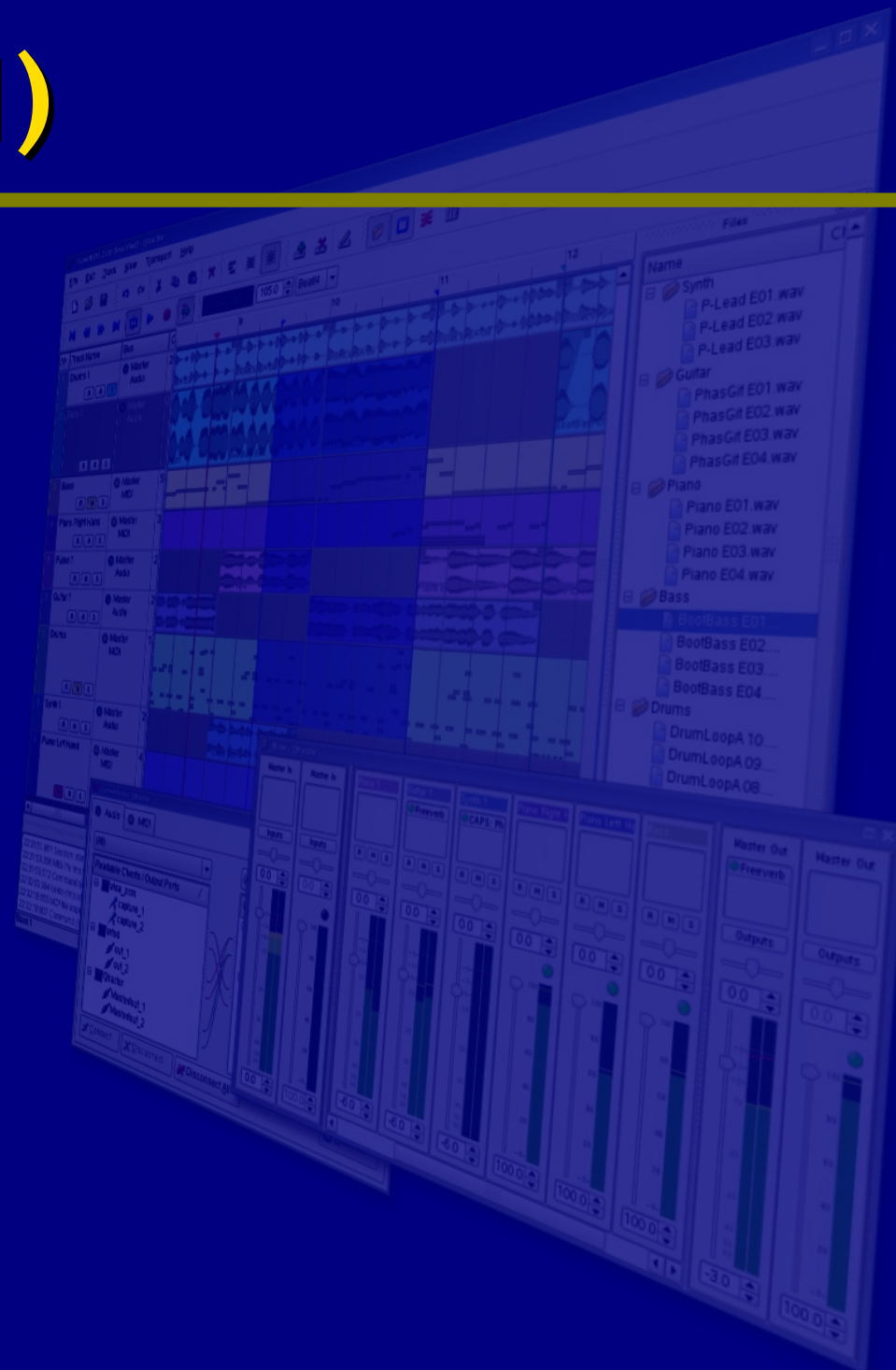


GUI Elements (1)

(business as usual)

Main window

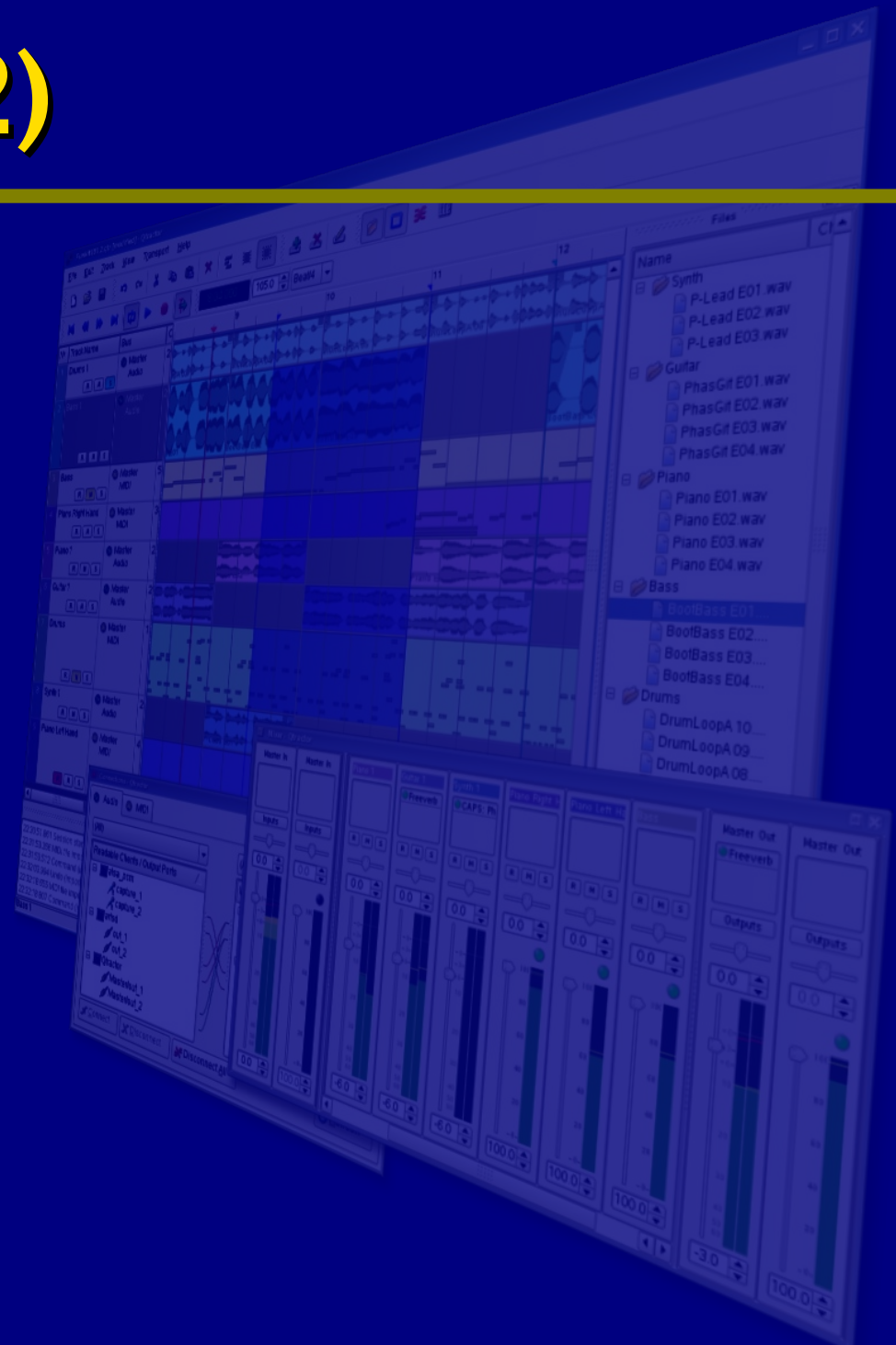
- Menu
- Tool-bars
- Workspace (canvas)
 - Track list
 - Track view
- Status-bar



GUI Elements (2)

Tool windows

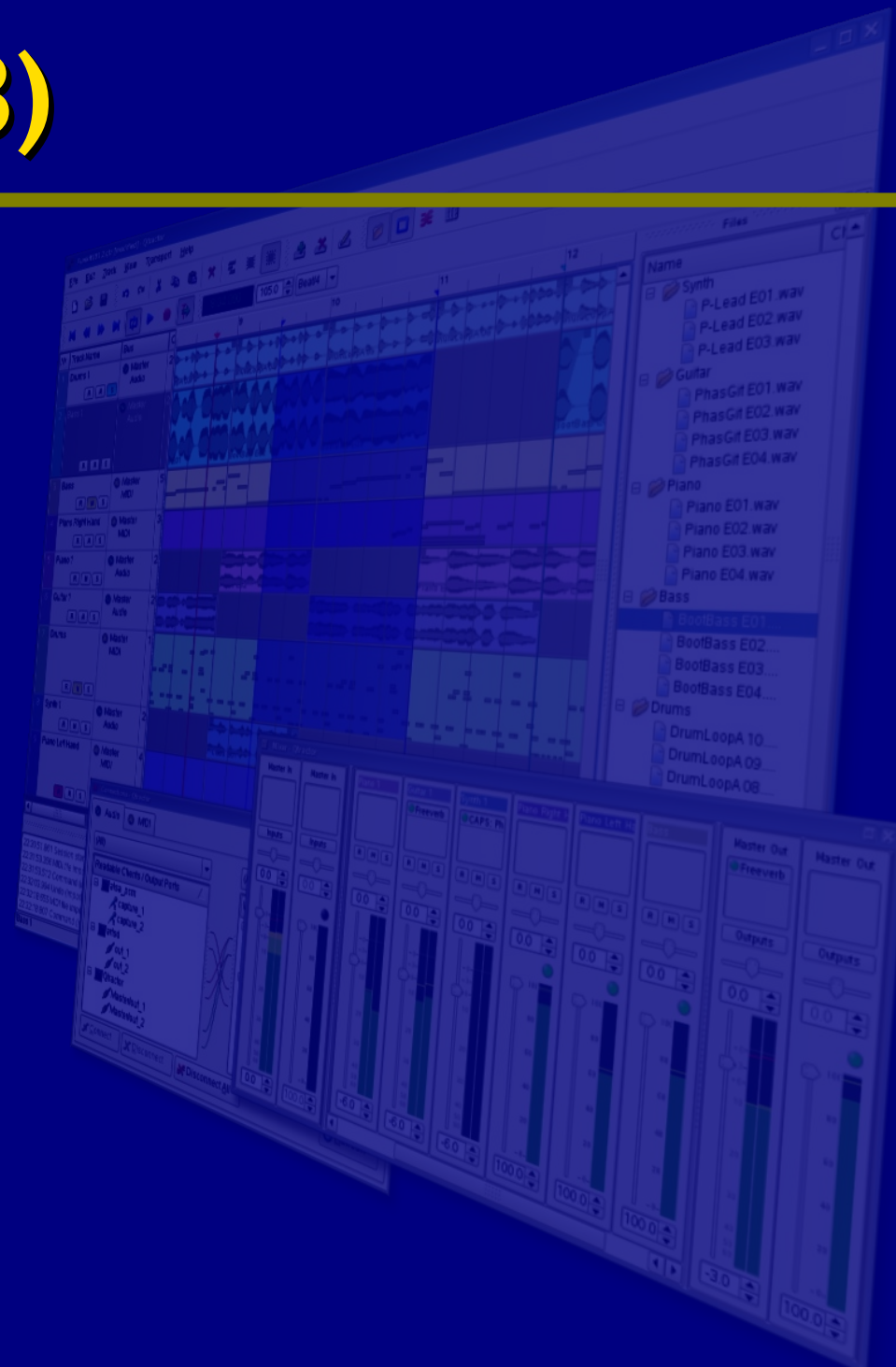
- Connections
- Mixer
- Files



GUI Elements (3)

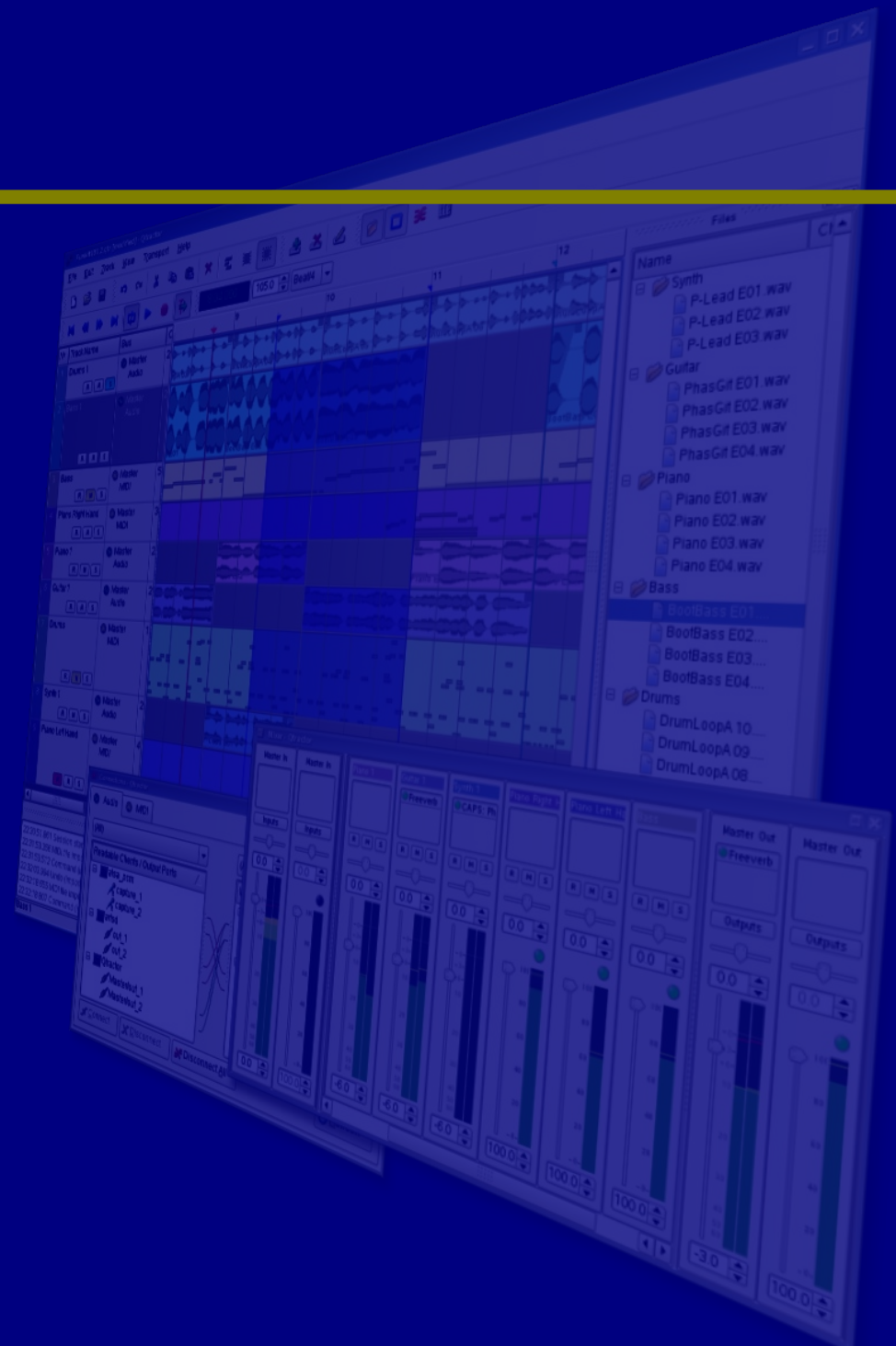
Dialogs (modal)

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



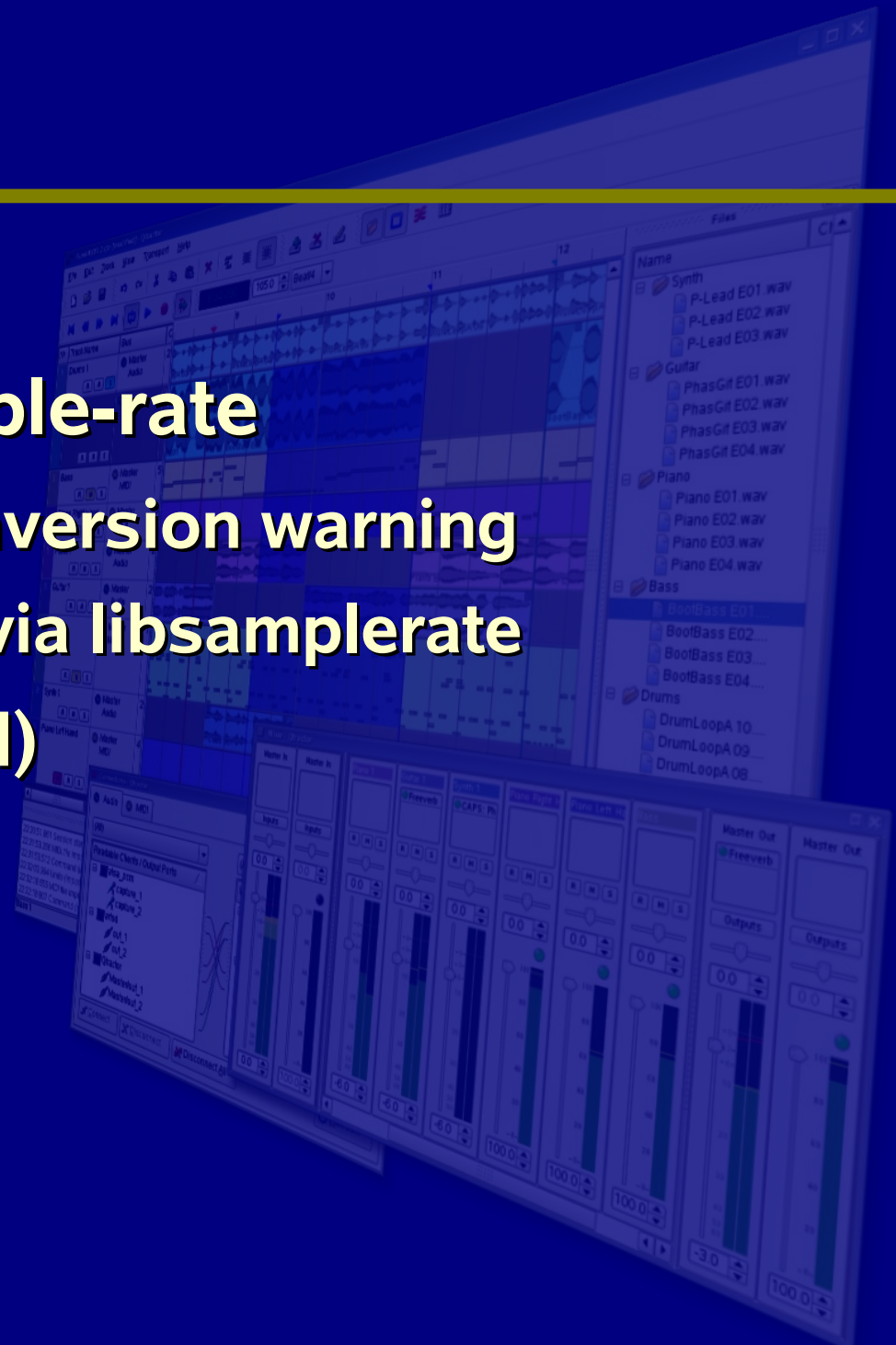
Sessions (1)

- 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)**

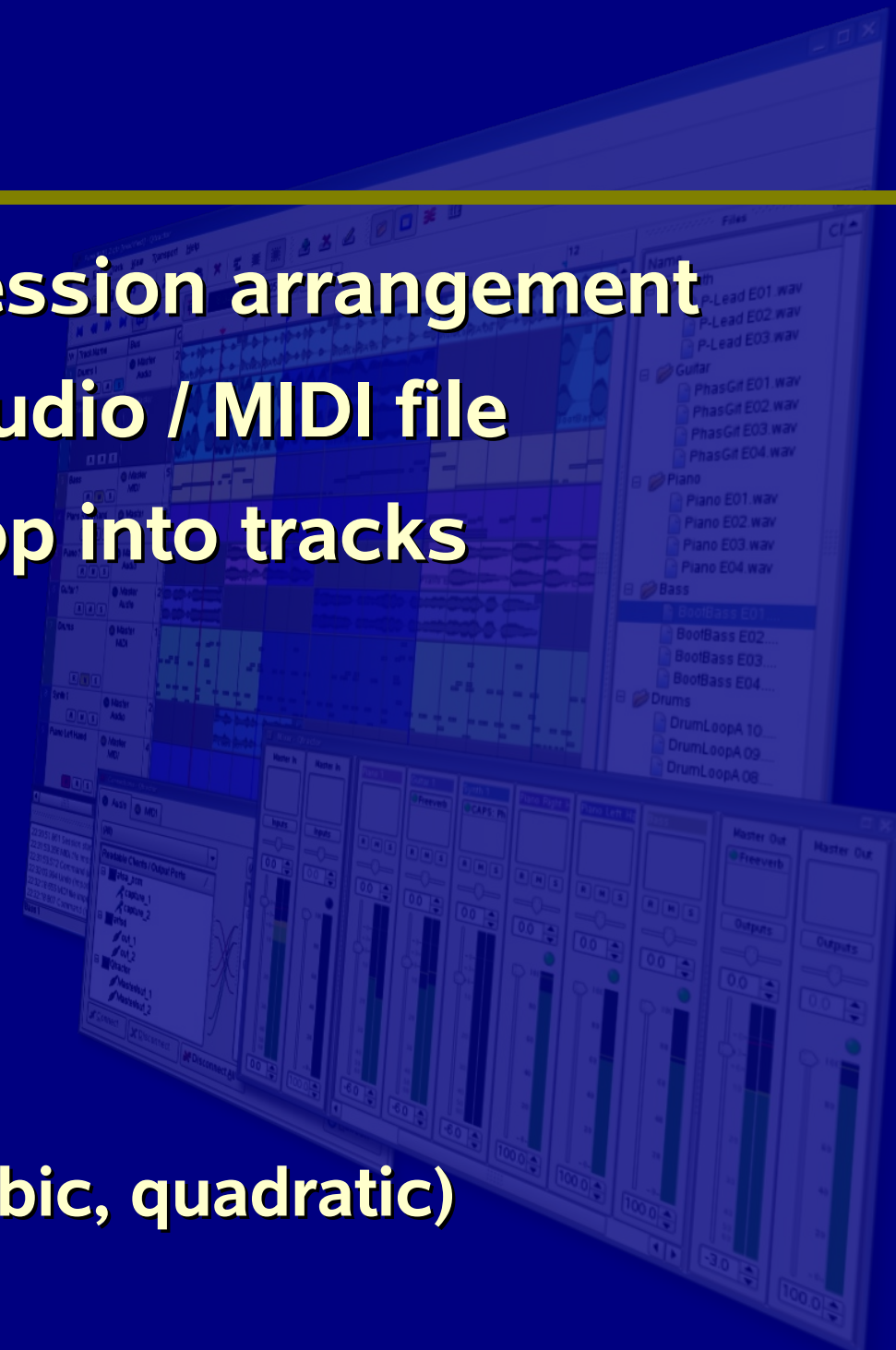


Clips (1)

- **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)**



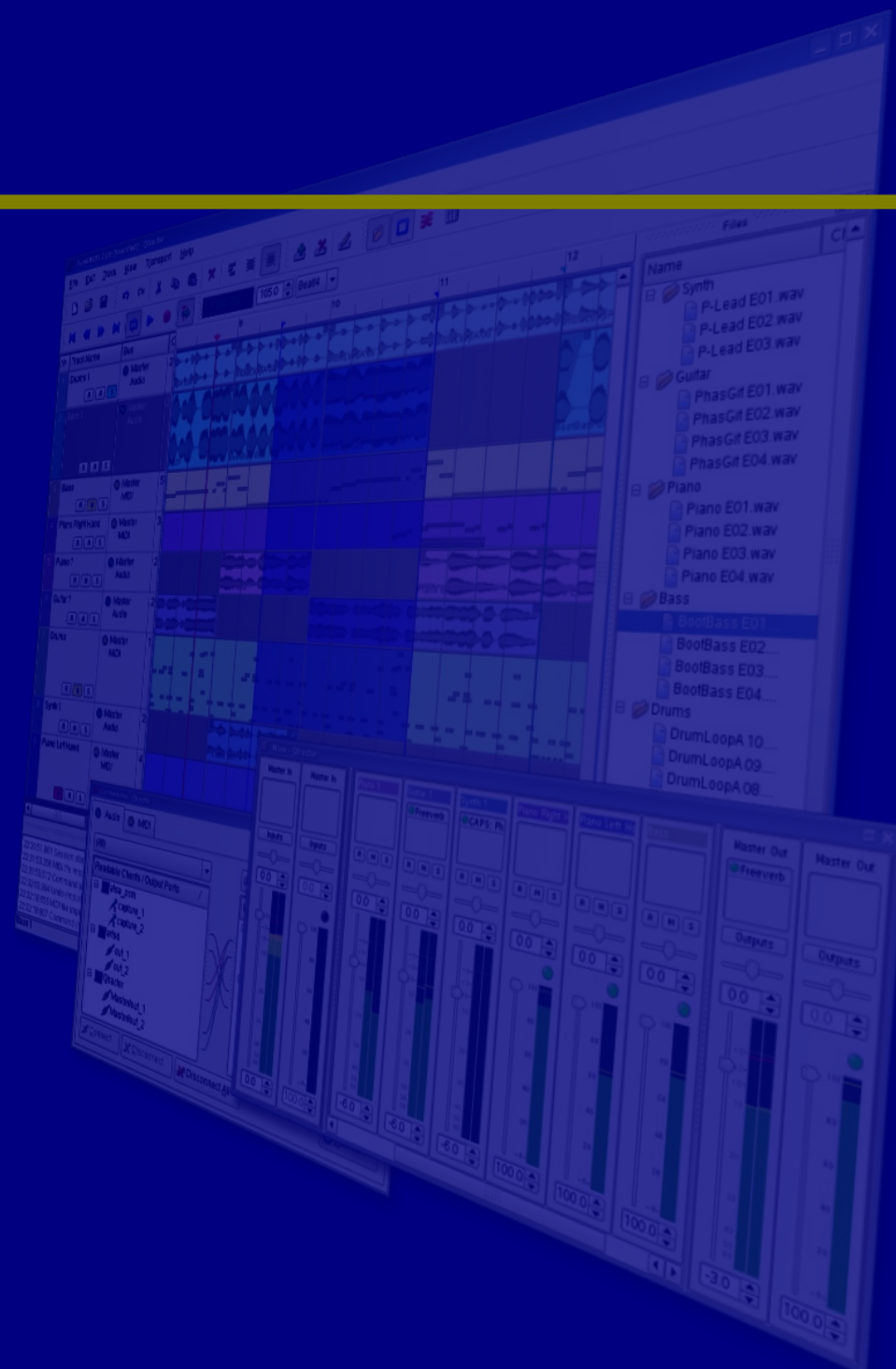
Clips (2)

Selection (modes)

- Clip
- Range
- Rectangular

Editing (operations)

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



Audio Clips

Audio clips

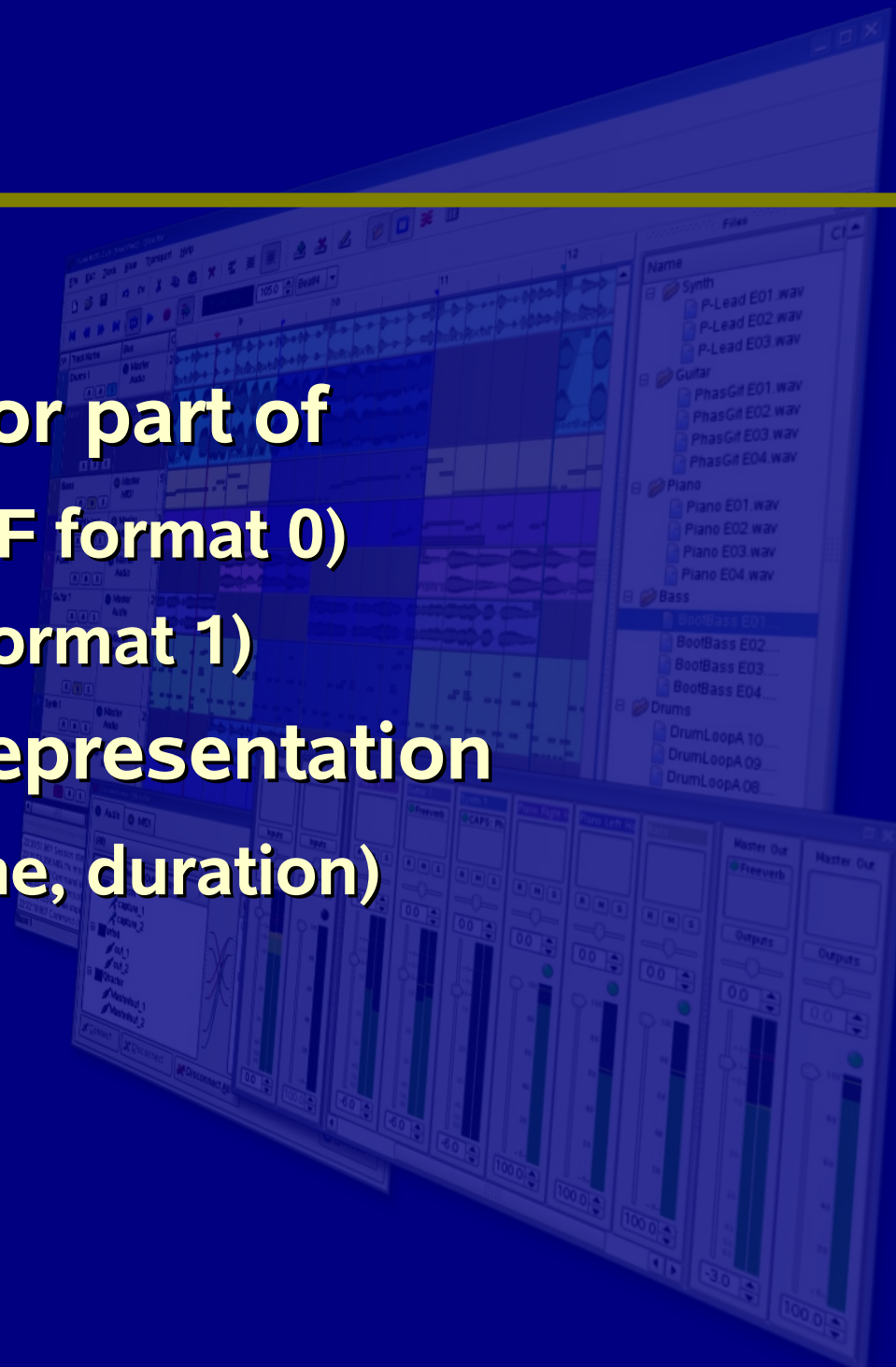
- Represent the whole or part of
 - One audio file
- Waveform graphical representation
 - Peak and RMS



MIDI Clips

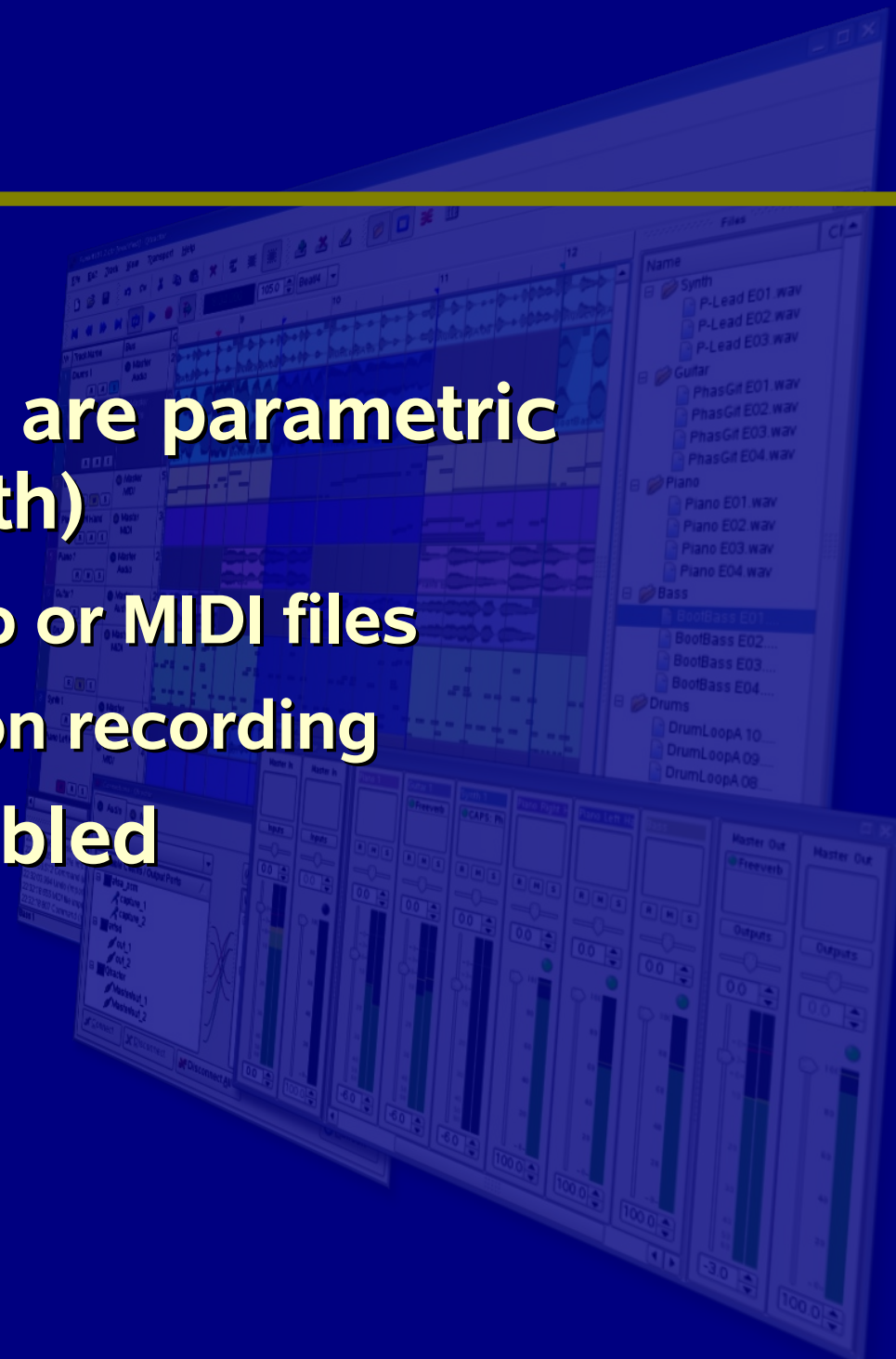
MIDI clips

- 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**

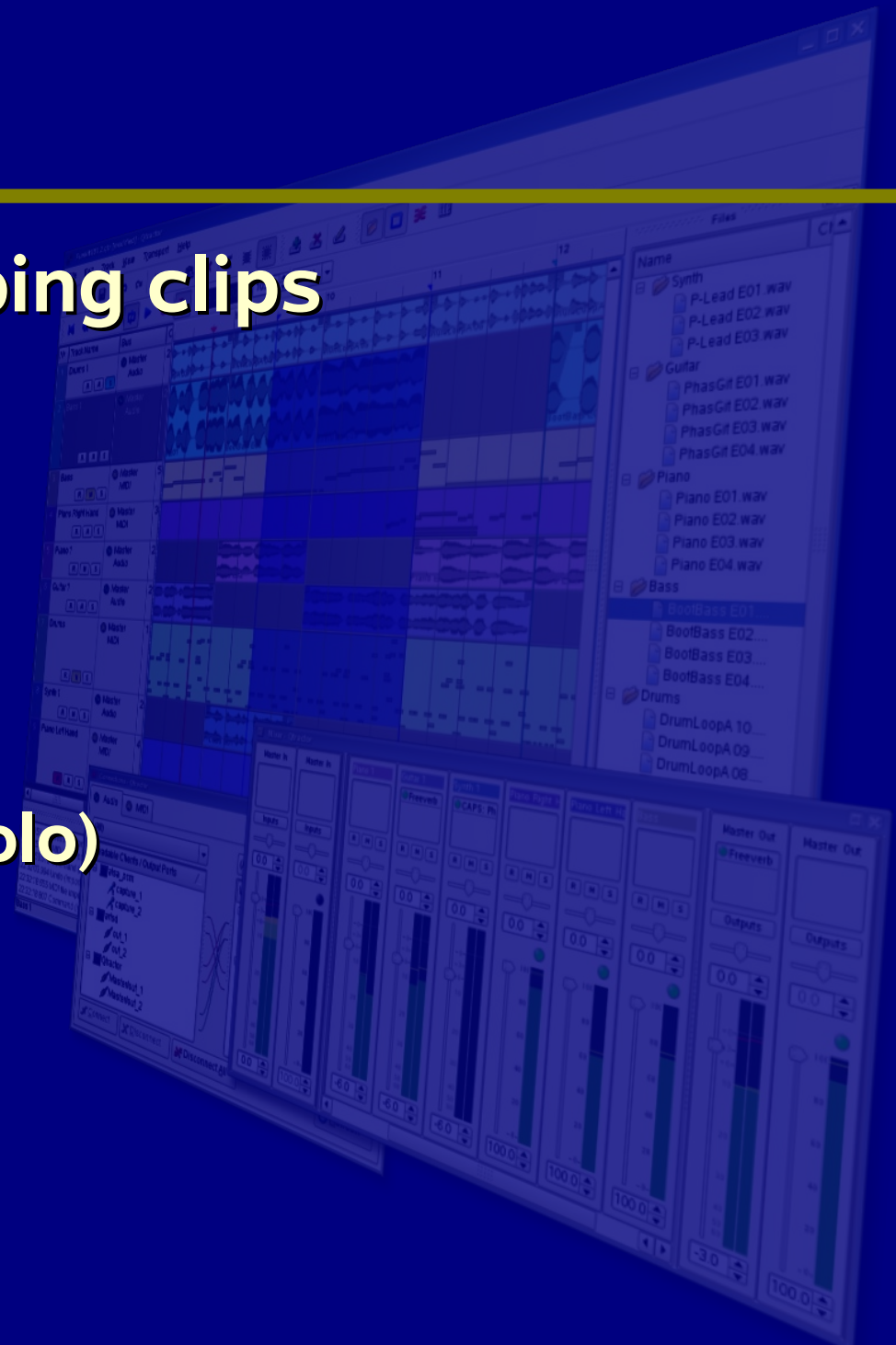


Tracks (1)

- 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

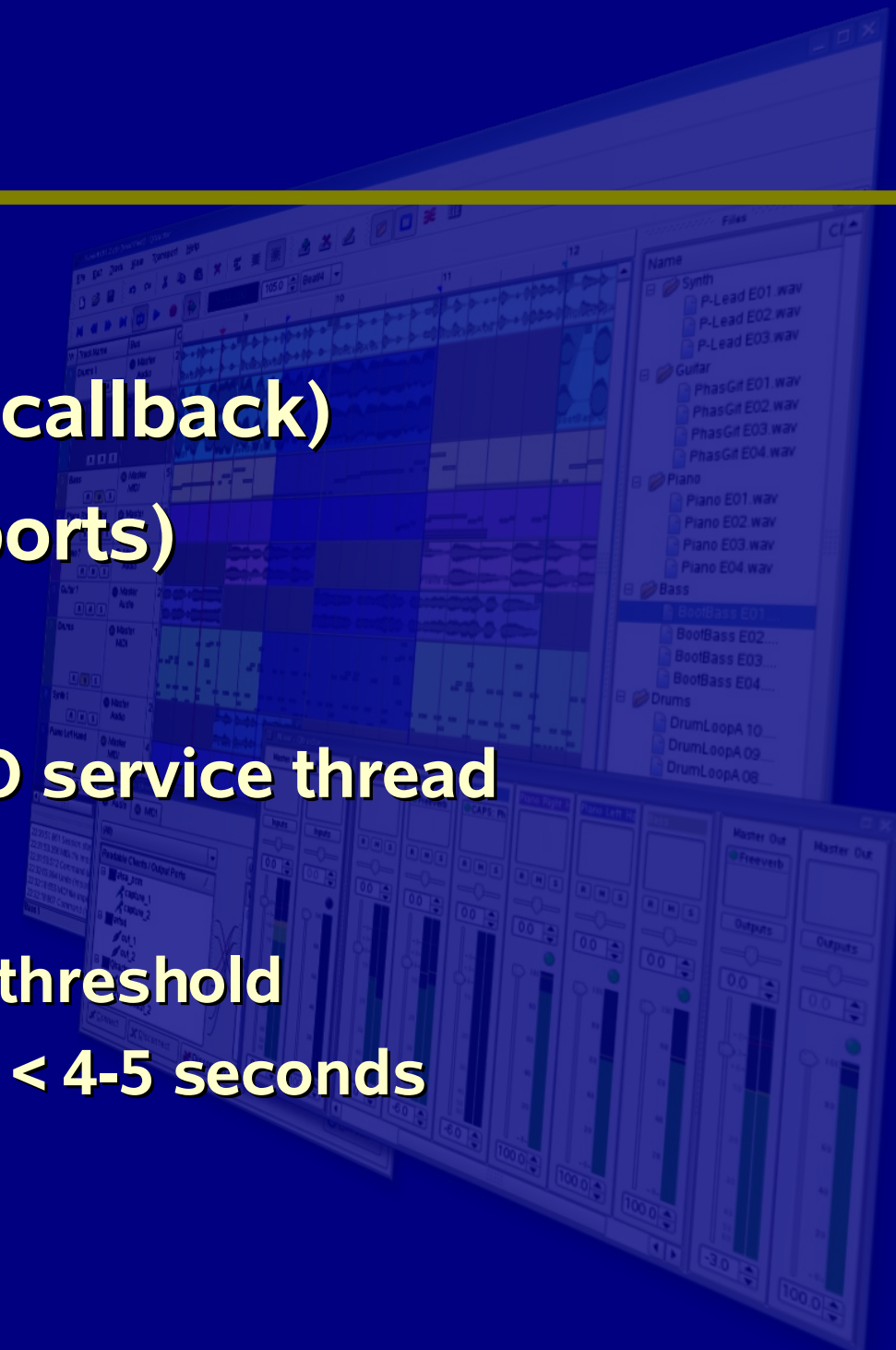
- **Capture audio / MIDI files as new clips**



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

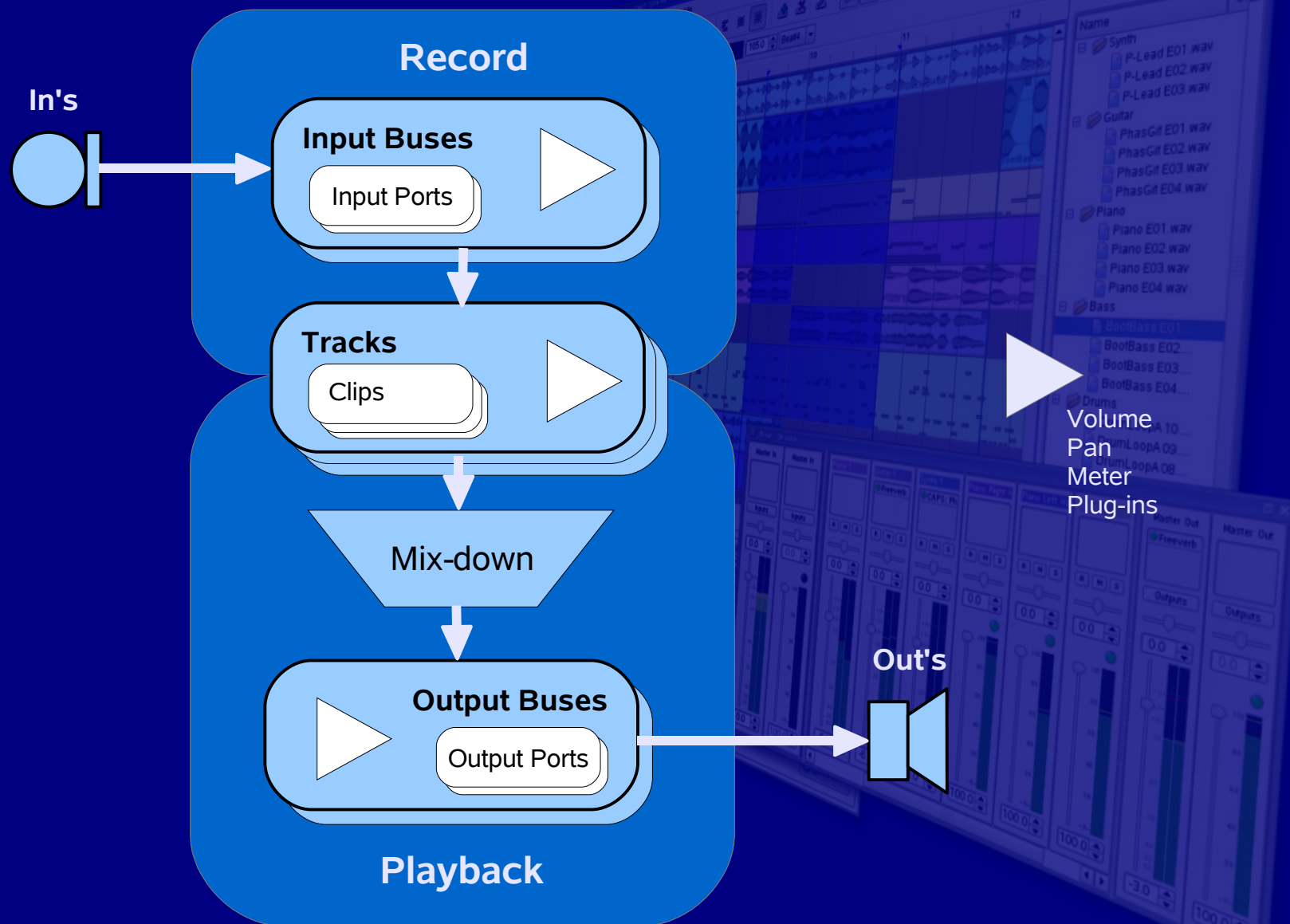


MIDI Engine

ALSA Sequencer client / queue

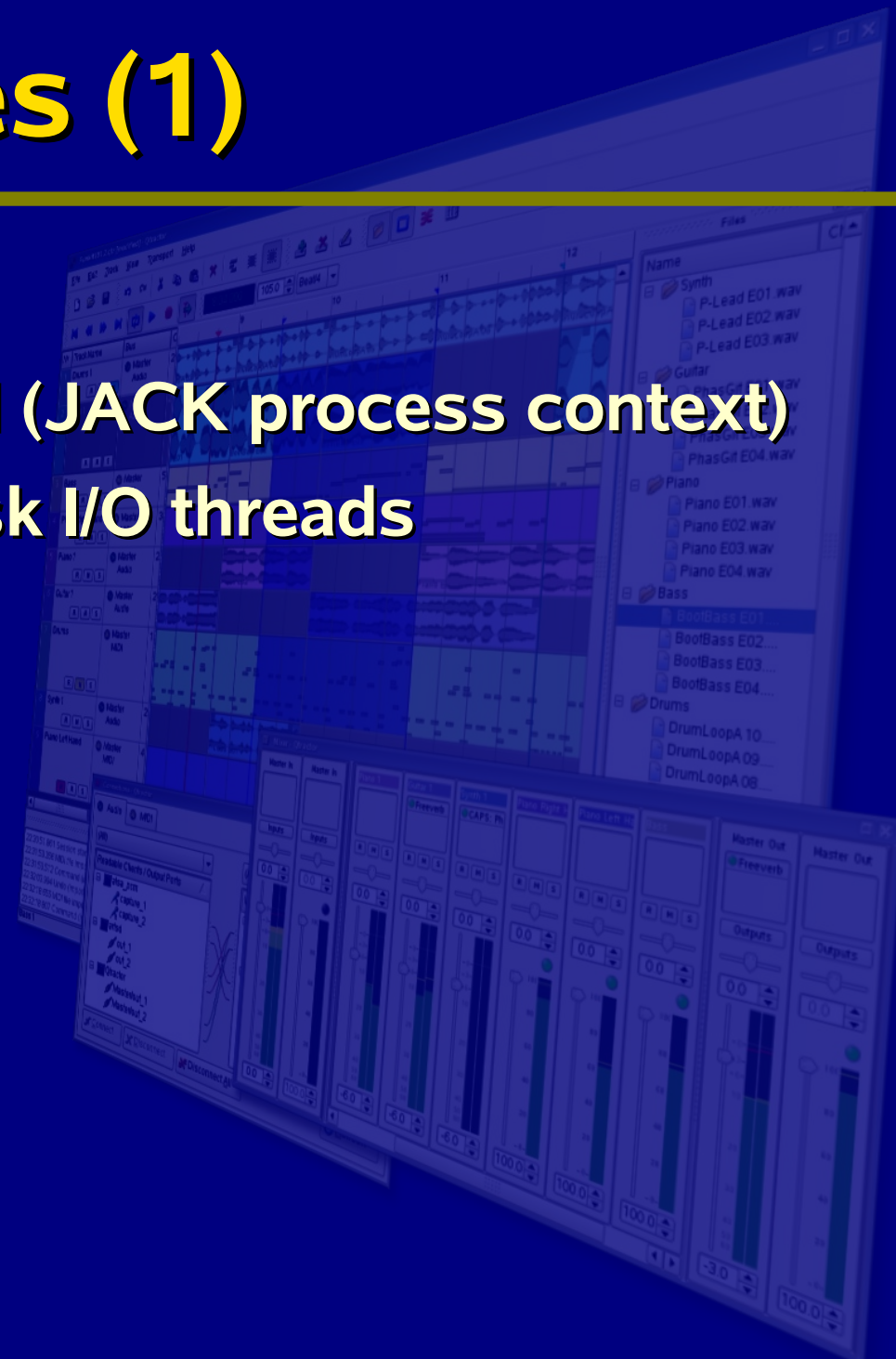
- Slave thread (MIDI output)
- Listener thread (MIDI input)
 - Inbound events multiplexed to record-armed track clips
- MIDI buses (ALSA seq ports)
- MIDI clips
 - Outbound events scheduled ~ 1 second period
- ALSA seq queue / port time-stamping

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)

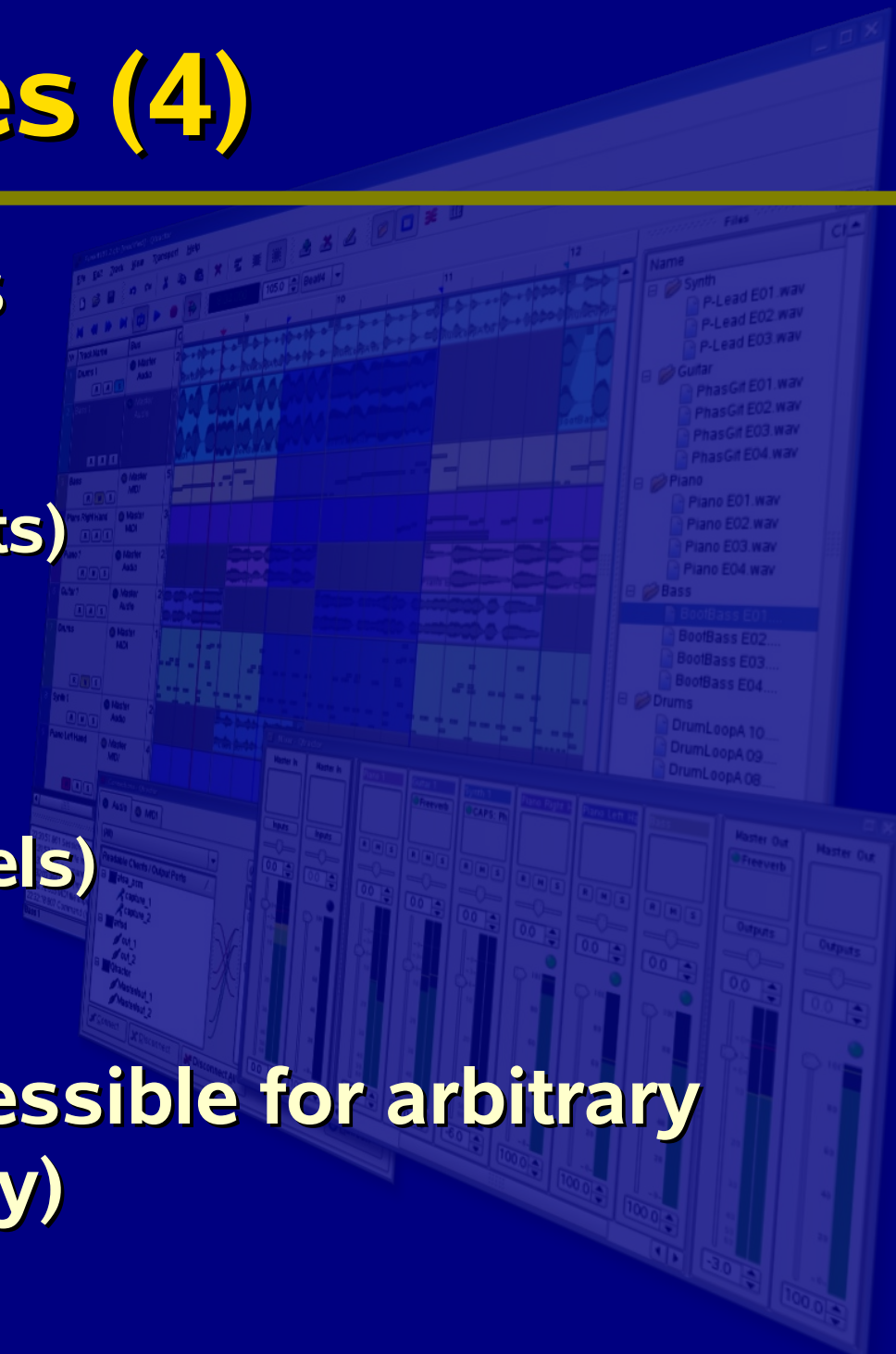
Audio Bus-Track channel assignment

- **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**

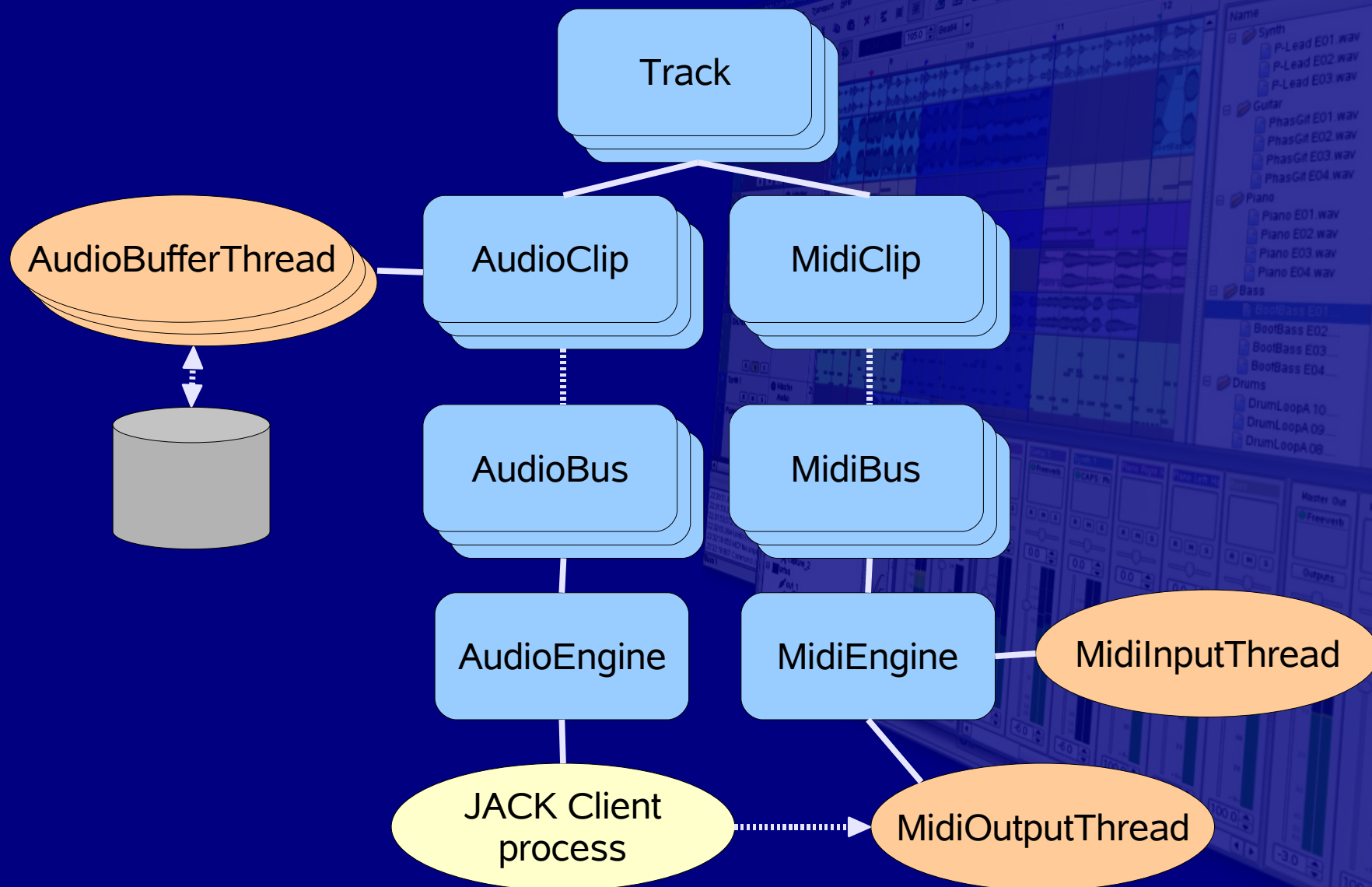
Engines & Buses (4)

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)



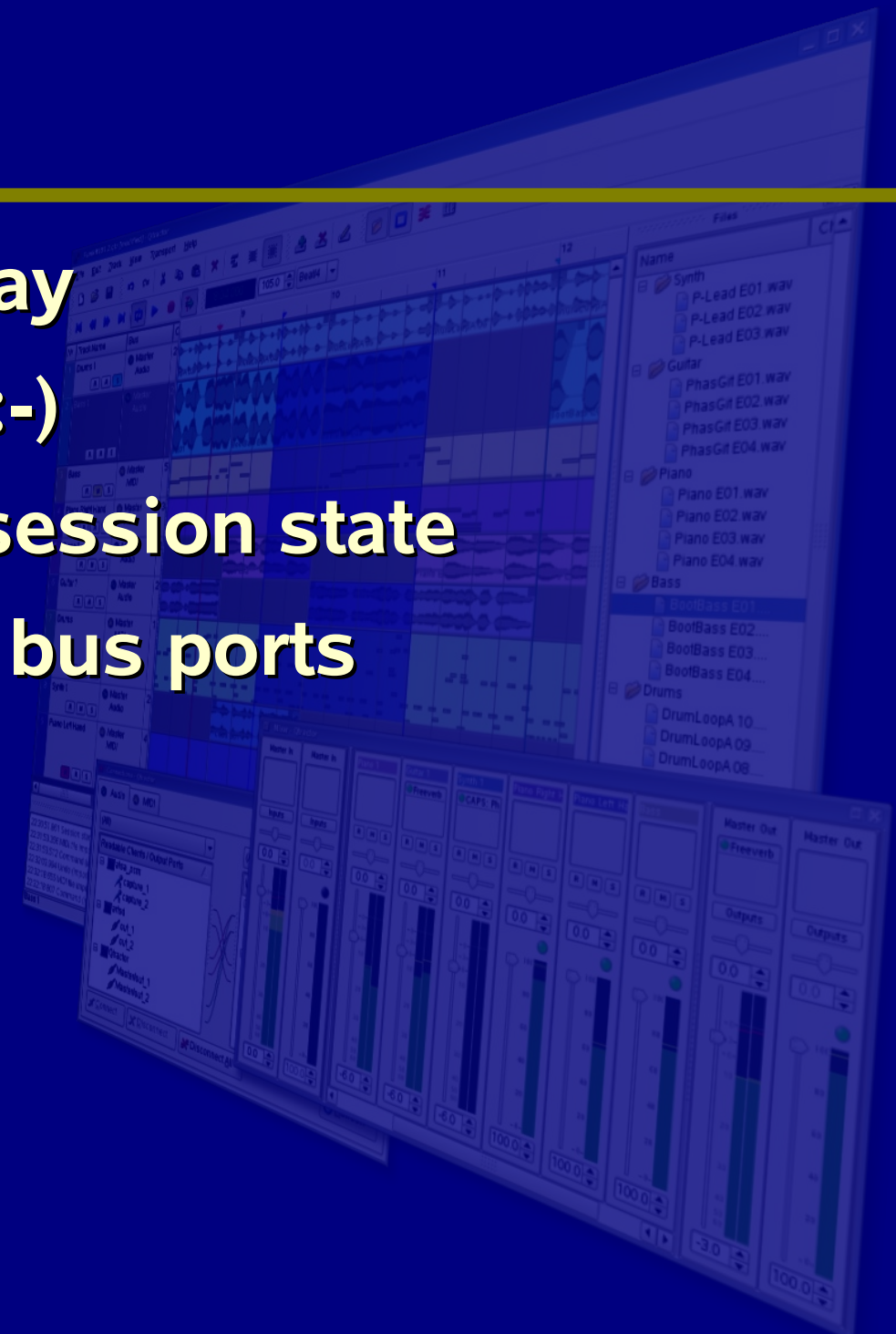
Mixer

- **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

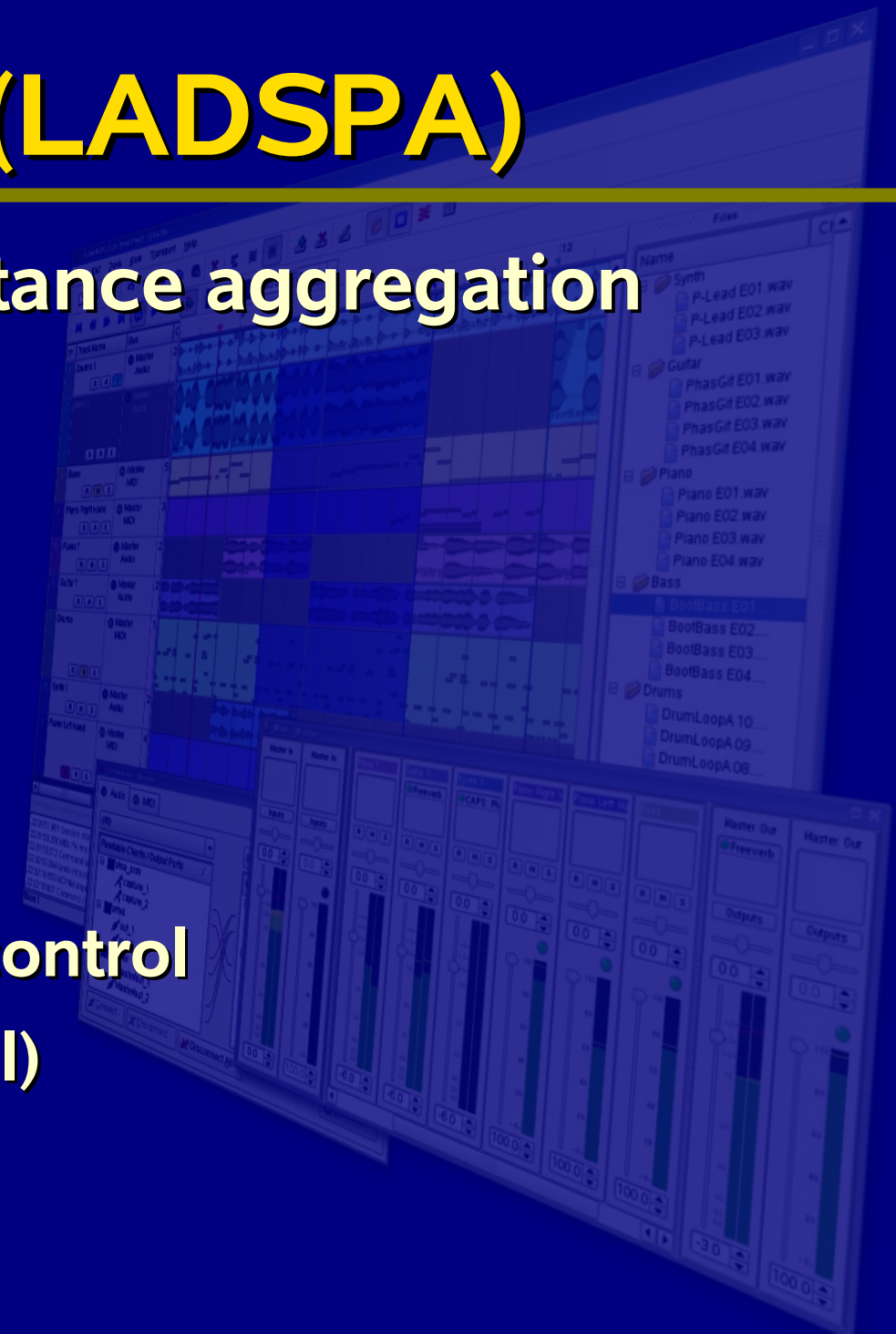
Audio and MIDI patchbay

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

Thank you all.