horizon
a new star on the EDA sky

Lukas Kramer

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FOSDEM 2018
Motivation

Why write an EDA package from scratch in 2016?

- Convenient and collaborative management of symbols, etc. avoiding redundancy
- Proper support for parts
- Unified editor
- Schematic editor that isn't a drawing program
- Rule-driven design
- Explicit references (i.e. not by name / location)
- Make use of OpenGL 3 features
- Playground for experimentation
Motivation

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Implementation

C++14

Builds and runs on Linux and Windows

JSON

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Implementation

\[ \sim 50 \text{ kLOC} \]

\texttt{C++14}
Implementation

\[ \text{Gtk3 } \geq 3.20 \]

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C++14
Implementation

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\text{C++14}

Builds and runs on Linux and Windows
Implementation

- JSON
- C++14
- Gtk3 ≥ 3.20
- Builds and runs on Linux and Windows

~ 50 kLOC
Implementation

499bf624-b2f1-4366-8b9a-0eeb2c8fbb3f  \sim 50 \text{kLOC}

\text{JSON}

\text{C++14}

\text{Gtk3} \geq 3.20

Builds and runs on Linux and Windows
Implementation

UUIDs

JSON

Gtk3 $\geq$ 3.20

$\sim$ 50 kLOC

C++14

Builds and runs on Linux and Windows
What’s wrong with libraries

- Like a file system with only one level of hierarchy
- Not a database
What’s wrong with libraries

- Like a file system with only one level of hierarchy
- Not a database

The Pool

- Each item is an individual JSON file
- Metadata is stored in a SQLite database
- Only contains real parts / parts that can be mapped to a real part
The Pool

- Entity
  - Gate A
  - Gate B
  - Gate P
  - Gate ...

- Package
  - Pad 1
  - Pad 2
  - Pad n

- Unit 1

- Unit 2

- Symbol 1

- Symbol 2

- Part
  - Entity
  - Package

- Padstack A

- Padstack B

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The Pool

Entity
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Unit 1
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Unit 2
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Padstack A

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Padstack A
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- Symbol 2

Gate A
Gate B
Gate P

Pad 1
Pad 2
Pad n

Padstack B
- Unit 1
- Unit 2

20
19
18
17
16
15
14
13
12
11
The Pool

Entity

Unit 1

Symbol 1

Unit 2

Symbol 2

Padstack A

Padstack B

Pad 1

Pad 2

Pad n

Gate A

Gate B

Gate P
get-parameter [solder_mask_expansion] 2 * +xy
set-shape [mask-ob obround]

1.15 mm
get-parameter [solder_mask_expansion] +
1.55 mm
get-parameter [solder_mask_expansion] 2 * +
set-shape [mask-rect rectangle]

...
The Pool

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- Package

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Padstack A

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## Requirements for schematic editor

- Has to know about nets
- No "it’s connected if it has the same name"
Netlist vs. Schematic

Requirements for schematic editor

- Has to know about nets
- No "it’s connected if it has the same name"

Ideas / How it’s implemented

- So why not build the schematic from the netlist?
- Netlist is edited in sync with schematic
- Schematic doesn’t store net names and connectivity
- Net names are filled in from netlist
### Rules

- Set track width
- Set plane parameters
- Set via sizes
- Set pad/package parameters
## Rules and Checks (DRC)

### Rules
- Set track width
- Set plane parameters
- Set via sizes
- Set pad/package parameters

### Matching
- Net
- Net class
- Net name
## Rules and Checks (DRC)

<table>
<thead>
<tr>
<th>Rules</th>
<th>Matching</th>
<th>Checks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Set track width</td>
<td>• Net</td>
<td>• Clearances</td>
</tr>
<tr>
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<td>• Net class</td>
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</tr>
<tr>
<td>• Set via sizes</td>
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Framwork for DRC, ERC and style checks

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Framework for DRC, ERC and style checks
There's more!

What's working

- Workflow from schematic to board
- Interactive router
- Pool management with GitHub integration
- Gerber export
- Planes with thermals
- Differential Pairs
- Buses
- 3D preview, STEP export
- Airwires
- Undo/Redo
- Copy/Paste

Coming soon

- Pool Convention (WIP)
- UI polish
- Assembly drawings
- Title blocks
- BOM export
- ERC
- Hierachical designs
- Better PDF export
- Performance
There’s more!

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Friends & Testers

People on *the internet*
Thanks

Friends & Testers
People on the internet
KiCad Project
It’s demo time!