Introduction

References and Presentation at:
http://www.elinux.org/Open_tools
Introduction

- Dave Anders aka prpplague
Introduction

- Dave Anders aka prpplague
- Employed at Intel as part of OTC/MinnowBoard
Introduction

- Dave Anders aka prpplague
- Employed at Intel as part of OTC/MinnowBoard
- Creating Open Hardware Tools
Introduction

- Dave Anders aka prpplague
- Employed at Intel as part of OTC/MinnowBoard
- Creating Open Hardware Tools
  - Background and History (Past)
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- Dave Anders aka prpplague
- Employed at Intel as part of OTC/MinnowBoard
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  - Background and History (Past)
  - Creating new tools (Present)
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- Creating Open Hardware Tools
  - Background and History (Past)
  - Creating new tools (Present)
  - Challenges going forward (Future)
Open Tools History

- Open Tools in Science
Open Tools History

- Open Tools in Science
  - Experiments often require special tools
Open Tools in Science

- Experiments often require special tools
- New tools are shared with other scientists
Open Tools History

- Open Tools in Science
  - Experiments often require special tools
  - New tools are shared with other scientists
  - Robert Bunsen - Bunsen Burner
Open Tools History

- Open Tools in Science
- Commercial Solutions
Open Tools History

- Open Tools in Science
- Commercial Solutions
Open Tools History

- Open Tools in Science
- Commercial Solutions
  - Limited Operating Systems Supported
Open Tools History

- Open Tools in Science
- Commercial Solutions
  - Limited Operating Systems Supported
  - Price
Open Tools History

- Open Tools in Science
- Commercial Solutions
  - Limited Operating Systems Supported
  - Price
  - Features/Fixes
Open Tools History

- Open Tools in Science
- Commercial Solutions
- LART Project
Open Tools History

- Open Tools in Science
- Commercial Solutions
- LART Project
  - Open Platform
Open Tools History

- Open Tools in Science
- Commercial Solutions
- LART Project
  - Open Platform
  - JTAG – Holly Gates Dongle
Open Tools History

- Open Tools in Science
- Commercial Solutions
- LART Project
  - Open Platform
  - JTAG – Holly Gates Dongle
  - Linux + Open Hardware + Open Tools
Open Hardware Solutions

The Maker/Hacker Community has changed the way people create hardware and software solutions
Open Hardware Solutions

A good multimeter used to be enough!
Open Hardware Solutions

- Logic Analyzers
Open Hardware Solutions

- Logic Analyzers
  - Open Workbench Logic Sniffer - FPGA
Open Hardware Solutions

- Logic Analyzers
  - Open Workbench Logic Sniffer - FPGA
  - Bus Pirate - PIC
Open Hardware Solutions

- Logic Analyzers
  - Open Workbench Logic Sniffer - FPGA
  - Bus Pirate - PIC
  - Saleae Logic - Cypress FX2
Open Hardware Solutions

- Logic Analyzers
  - Open Workbench Logic Sniffer - FPGA
  - Bus Pirate - PIC
  - Saleae Logic - Cypress FX2
  - AVR/Arduino (Insert Arduino Jokes Here)
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
  - Handhelds
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
  - Handhelds
  - AVR and Arduino (Insert More Arduino Jokes here)
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
  - Handhelds
  - AVR and Arduino
  - Kits
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
- Custom Solutions
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
- Custom Solutions
  - Bridge Solutions
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
- Custom Solutions
  - Bridge Solutions
  - Common Interfaces
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
- Custom Solutions
  - Bridge Solutions
  - Common Interfaces
  - Shared tool
    - Flashrom
    - Openocd
    - Sigrok
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
- Custom Solutions
- Creating Your Own!
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
- Custom Solutions
- Creating Your Own!
  - KiCad
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
- Custom Solutions
- Creating Your Own!
  - KiCad
  - Eagle CAD
Open Hardware Solutions

- Logic Analyzers
- Oscilloscopes
- Custom Solutions
- Creating Your Own!
  - KiCad
  - Eagle CAD
  - License it!
Challenges Going Forward

- Simple User Display
Challenges Going Forward

- Simple User Display

[Diagram of an LED circuit with +3.3V, a resistor labeled 330 OHM, and GPIO]
Challenges Going Forward

- Simple User Display
  - Easy to visualize
  - Easy to measure
  - Easy to program
Challenges Going Forward

- Simple User Display
- Evolution of Displays
Challenges Going Forward

- Simple User Display
- Evolution of Displays
  - Clocking
  - Multiple signals
  - Introduction of controllers
Challenges Going Forward

- Simple User Display
- Evolution of Displays
- Transition to LCD
Challenges Going Forward

- Simple User Display
- Evolution of Displays
- Transition to LCD
  - Higher frequency
  - More signals
  - Complex Controllers
Challenges Going Forward

- Design Constraints
Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
  - Matched Lengths
Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
  - Matched Lengths
  - Matched Impedence
Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
  - Matched Lengths
  - Matched Impedence
  - Package type
Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
  - Matched Lengths
  - Matched Impedence
  - Package type
    - BGA
Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
  - Matched Lengths
  - Matched Impedence
  - Package type
    - BGA
    - QFN
Challenges Going Forward

- Design Constraints
- Differential Pairs
Challenges Going Forward

- Design Constraints
- Differential Pairs
  - PCIe/mPCIe
Challenges Going Forward

- Design Constraints
- Differential Pairs
  - PCIe/mPCle
  - SATA/mSATA
Challenges Going Forward

- Design Constraints
- Differential Pairs
  - PCIe/mPCIe
  - SATA/mSATA
  - HDMI/DisplayPort
Challenges Going Forward

Are FPGA based implementations the solution?
Challenges Going Forward

- Design Constraints
- Differential Pairs
- Documentation/Licenses
Challenges Going Forward

- Design Constraints
- Differential Pairs
- Documentation/Licenses
  - Closed or NDA Documents
Challenges Going Forward

- Design Constraints
- Differential Pairs
- Documentation/Licenses
  - Closed or NDA Documents
  - Restrictive License
Challenges Going Forward

- Design Constraints
- Differential Pairs
- Documentation/Licenses
  - Closed or NDA Documents
  - Restrictive License
  - DRM
Conclusion

- Long History of Open Tools (Past)
Conclusion

- Long History of Open Tools (Past)
- Creating New Open Hardware Tools (Present)
Conclusion

- Long History of Open Tools (Past)
- Creating New Open Hardware Tools (Present)
- Challenges Ahead (Future)
Conclusion

- Long History of Open Tools (Past)
- Creating New Open Hardware Tools (Present)
- Challenges Ahead (Future)
- Incentive to create Open Hardware Tools
Conclusion

- Long History of Open Tools (Past)
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- Challenges Ahead (Future)
- Incentive to create Open Hardware Tools
- Incentive to use Open Hardware Tools
Conclusion

- Long History of Open Tools (Past)
- Creating New Open Hardware Tools (Present)
- Challenges Ahead (Future)
- Incentive to create Open Hardware Tools
- Incentive to use Open Hardware Tools
- Documentation
  http://www.elinux.org/Open_tools
Questions?