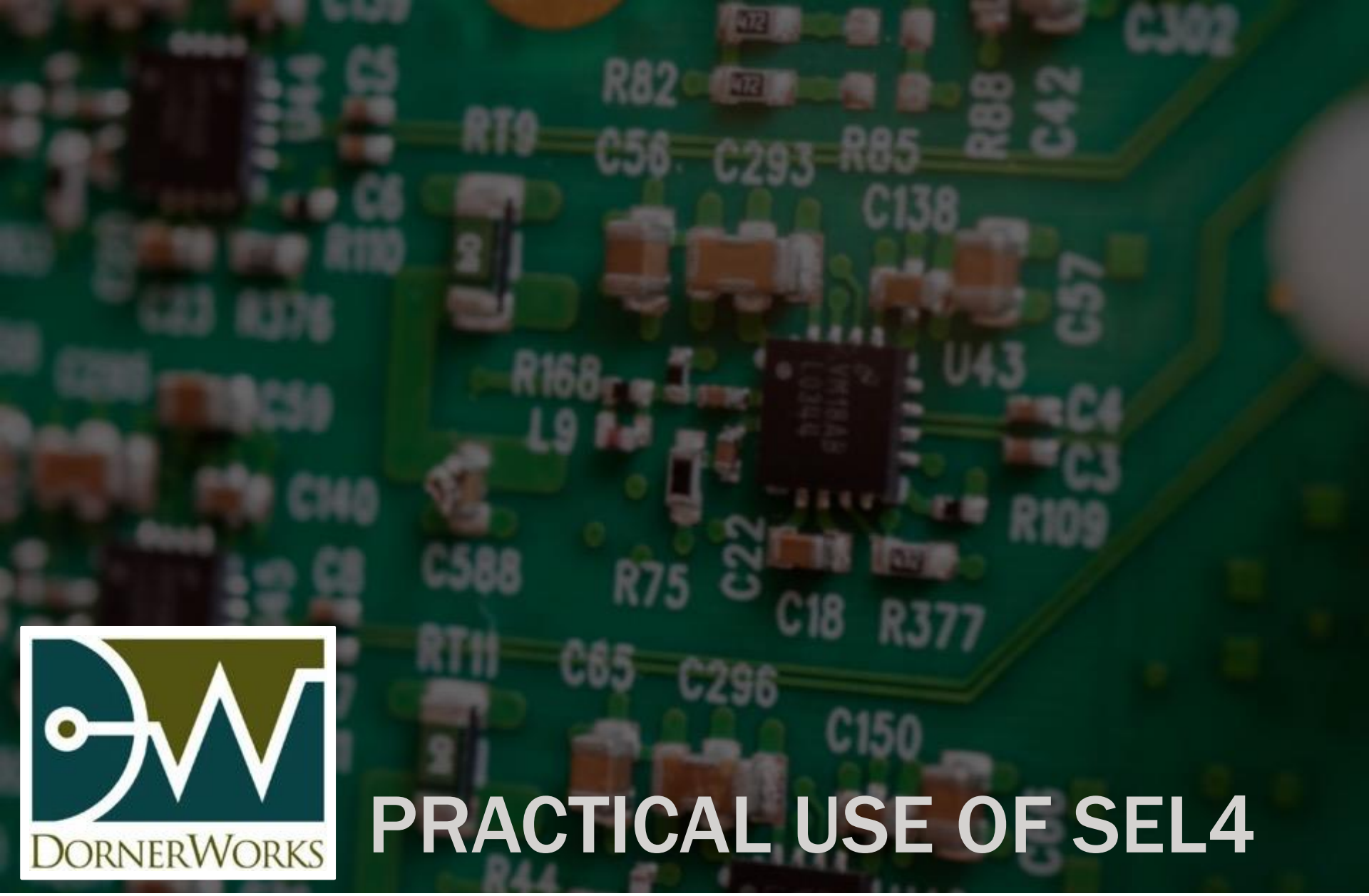


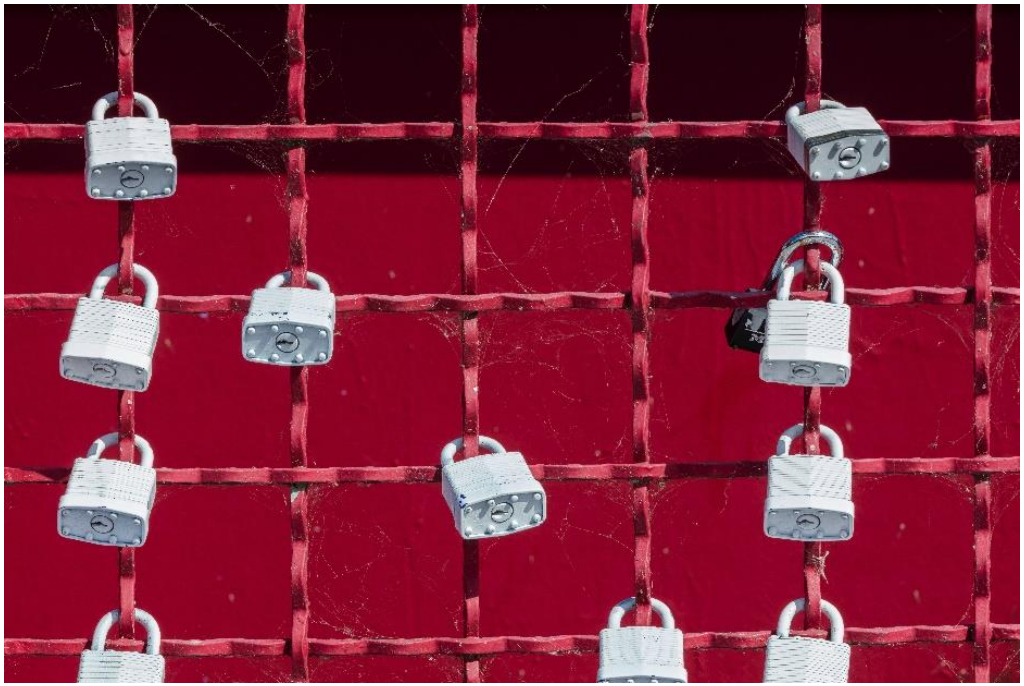
PRACTICAL USE OF SEL4

Robbie VanVossen @ seL4 Summit 2018

seL4 Practicality

seL4
Security. Performance. Proof.

- Great solution for security:
  - Formally proven
  - Small size
  - Open source
  - COE



seL4 Practicality

- Difficult to use, lacking:
  - Drivers/Libraries
  - Platform support
  - Standardized API
  - Dev tool support
  - Overall performance
  - Certification artifacts

seL4 Practicality

- **seL4 in real products:**
  - Leverage proof
  - Expand ecosystem
  - Virtualization as a stop-gap solution
  - Work towards certifications

seL4 on AR System

Use Case 1:

- Port existing FreeRTOS implementation to seL4
  - Secure augmented reality application
- Challenges:
  - Configuration of system
  - Tools missing from ecosystem
  - FreeRTOS functionality missing from seL4
  - Unsupported platform

seL4 on AR System

Case 1 Customer Feedback:

- Virtualization > Porting
- Configuration: steep learning curve
- New tools eased development
- Difficult to add new drivers

seL4 on AR System - Contributions

- Tools
  - ARM GDB-Server
  - IBLL
  - ARM Code Profiler
- Platform Support
  - Zynq UltraScale+ MPSoC
- Drivers/Apps
  - TCP/IP Support
  - HTTPServer
  - Zynq7000 Ethernet Driver

Virtualized seL4 on ARM

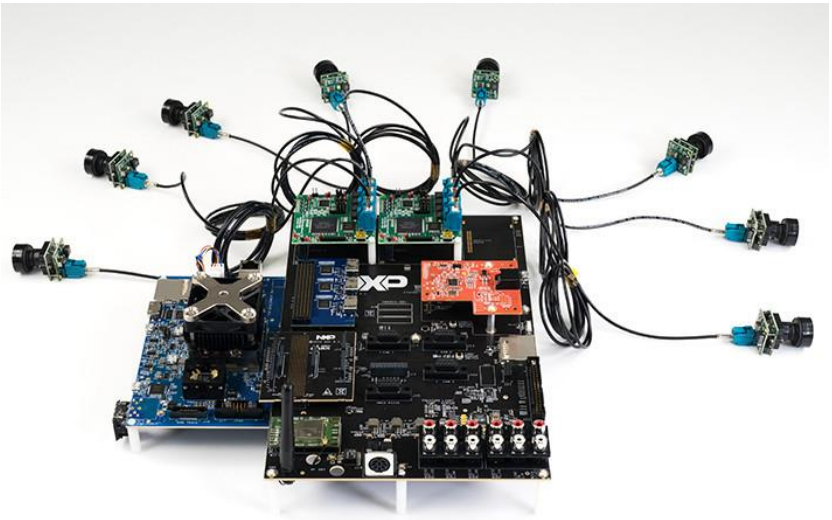
Use Case 2:

- Demonstrate isolation of seL4
- Support Linux applications
- Ruggedized ARMv8 platform
- Challenges:
  - Unsupported platform
  - ARMv8 virtualization not implemented
  - Missing drivers

Virtualized seL4 on ARM

Case 2 Resulting Contributions (In Process):

- ARMv8 virtualization
  - Kernel mods
  - Library mods
  - Multi VM Support
  - Virtual channels
  - Configurations
    - Xilinx ZCU102
    - NXP i.MX8
- Platform Support
  - i.MX8
    - ARM GIC500 driver
    - BSP
- ARM SMMUv2 driver



seL4 on RISC-V

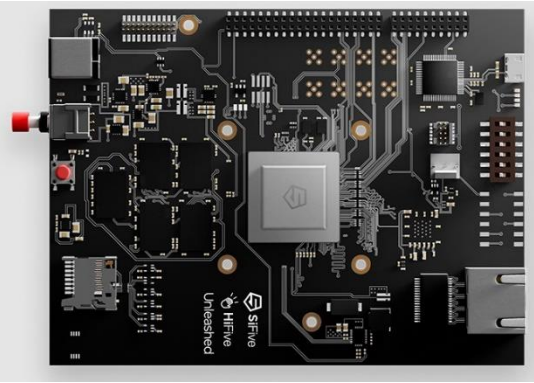
Use Case 3:

- Port seL4 to open RISC-V hardware
- Collaboration with Data61
- Challenges:
  - Rapidly changing spec/tools
  - 32-bit implementation
  - Memory on real hardware

seL4 on RISC-V

Case 3 Resulting Contributions:

- Platforms:
  - HighFive Unleashed
    - First hard RISC-V
  - 32-bit Spike
  - Rocket-Chip



- Future Plans:
  - Continue improving RISC-V support
    - Tools
    - Example apps
    - New platforms
    - Latest spec

seL4 DornerWorks Training

- **seL4 COE Summit training**
  - Tomorrow – Nov. 2018
- **seL4 webinar**
  - Dec. 2018
- **SAE seL4 training**
  - March 2019
- **seL4 Quick Start Package (QSP)**
  - Advanced customer on-site training
  - seL4 working on selected platform

Future Enablers

- COE
- Community roadmap
  - Foster collaboration
  - Avoid duplication of effort
- Training
- Better/Quicker open sourcing process
- Less restrictions in contracts
  - ITAR/CUI

Questions?

Robbie VanVossen

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