NICTA

Automatic Device Driver Synthesis

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Australian Government
Department of Broadband, Communications and the Digital Economy
Australian Research Council

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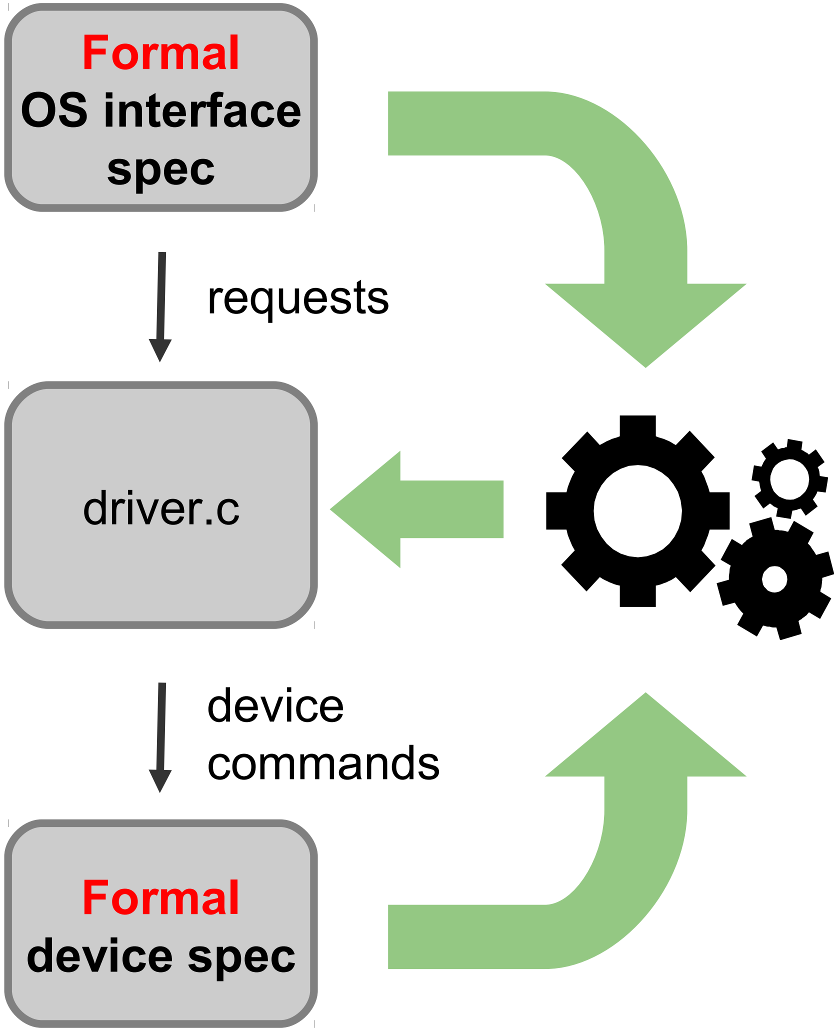
Motivation

- **70%** of OS failures are caused by driver bugs
- Drivers contain **3-7** times more bugs per loc than the rest of the kernel
- **70%** of OS code is in device drivers
- Solution: automatically synthesize device drivers
  - Correct by construction

Overview



- Separation of concerns
- Reuse
  - Specify once, synthesise many

Approach

- Formalise the problem as a two player game (driver vs OS and device)
- Specs synchronize on shared events
- Driver objectives are temporal logic formulas
- Driver synthesis is controller synthesis problem on finite state machines

Challenges

- State space explosion
  - Symbolic state space representation
  - Predicate abstraction
- Synthesis with imperfect information
  - Driver cannot directly observe device state transitions
- Efficient code generation
- Verification: is the synthesized driver correct?
  - Errors in the specification
  - Errors in the synthesis tool