

On debugging

HVC'10 – Yoav Hollander



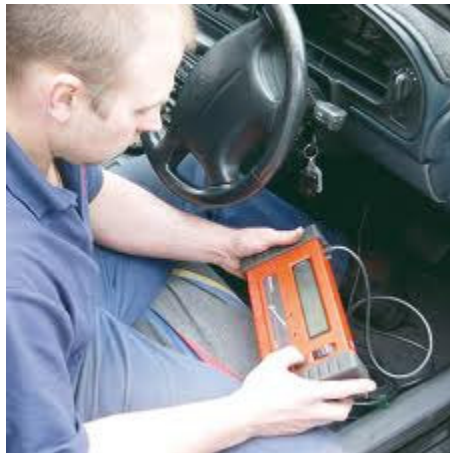
Agenda

- Why debugging is hard and getting harder
- The challenges of system debugging
- Automatic debugging
- Q & A



Debugging in context

- I'll talk about HW and embedded SW debugging
 - HW module => SoC => Smartphone + SW
- Many other professions do “debugging”
 - I.e. trying to understand why bad things are happening



- It is hard work





The debug problem is growing

- System bugs are harder
 - See next slide
- In HW, bug finding is now “good enough”
 - So debug becomes the next bottleneck
- In SW, verification requirements are lower
 - So most of verification is debugging anyway

System debug is especially hard



- Lots of HW and SW modules
 - From many groups
 - Some only lightly verified
 - Spanning many disciplines (Digital, analog, many SW layers)
 - Parallelism is hard (many HW modules, CPUs, threads)
 - Nobody has the full picture
- Running environments all have problems
 - Some are slow
 - Some have limited visibility
 - Some are non-repeatable
- Lots of incidental complexity
 - Debug times do not add up

The three kinds of system bugs

- System bring-up bugs
 - Nothing works, every run fails
 - Can recur for every HW/SW version
- Interaction bugs
 - Simple scenarios work, but fail with some specific parameters or specific interaction with other scenarios
- Performance/power bugs
 - Some scenarios take more time / power than expected
 - Often discovered only as a functional bug (e.g. missing frames)
 - Often caused by a functional bug at the lower level





Automatic debugging

- What is it
 - Techniques to make debugging faster
 - Usually assume pre-processing / retries “in the night”
- Techniques
 - Correlations
 - Simplifications
 - Dynamic slicing
 - Formal debug
 - Reverse debugging
 - ...



What we do at Cadence

- Can't tell you ;-)
- A mix of many techniques
- Trying to combine various hints
- Trying to work with the “regular” debugger
- Trying to remove incidental complexity
- Trying to add user “cookbooks”

Summary

- Debugging, especially system debug, is the “next frontier”
- Automatic debugging shows some promise
- Questions?

