WOSP_C 2015 Breakout Session: SPE Challenges for Embedded Systems

Scribe: André Bondi

Discussion Leader: Giuliano Casale

Examples of embedded systems:

- Trains
- Conveyor belts
- Building management
- Alarm systems
- Industrial controls
- Cardiac pacemakers
- Automobiles
- Avionics
- Etc.

Challenges

- Hard to obtain case studies
    - Systems may be proprietary or military
    - Lack of awareness of metrics
    - Domain specificity

Embedded systems no longer run in isolation. They might communicate with one another. They are pervasive in our daily lives. The devices that control them may have considerable computational power.

How can we apply our methods in different domains? How does one cope with the [perceived] heterogeneity of the problems? How should resource allocation be handled within and between embedded components?

Can the usual performance methods and formal verification methods both be scaled to analyze systems with large numbers of components?

Would the use of model-driven techniques help us reason about the performance and function of large-scale embedded systems? This has been done for Smart Cities and Infrastructure systems.

Objected-oriented methods have been applied in different domains, but domain experts hacven to learned from each other's s/w mistakes.

Tools to Study the Performance of Embedded Systems

There are open source tools such as SystemC to simulate the hardware and software components of embedded systems. See, for example: https://www.ida.liu.se/~TDDI08/labs/lab1.pdf

Emulators may be used to exercise embedded systems to see how they run. They can also intercept incoming and outgoing control messages.

Performance Requirements for Embedded Systems

- Domain-specific
- Training is required in performance requirements methodology.
- Performance metrics are domain-specific and not necessarily equilibrium measures. Transient behavior is very important, too.
- Can one hierarchically decompose the performance requirements, and by extension performance models of the system, into disjoint components that interact with one another?

Whiteboard notes