Simulation Concepts to Model Real-Time Properties of Symmetric Multiprocessor Systems

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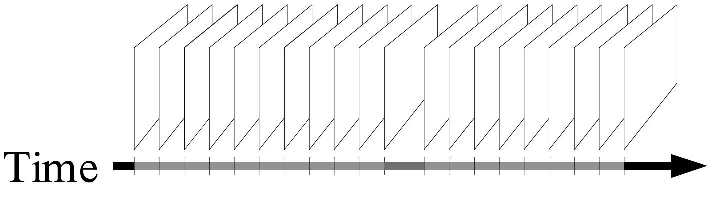
Tools for soft real-time applications

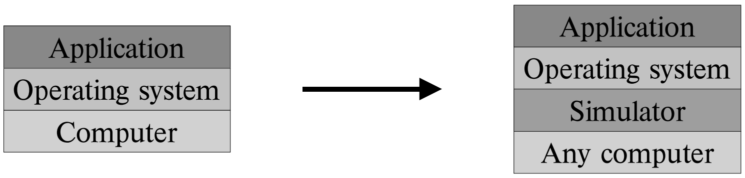
- High performance and real-time requirements
- Example: video



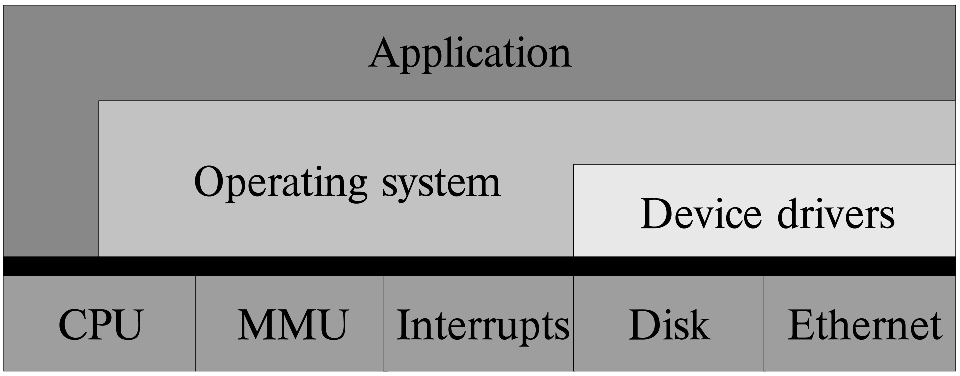
- General purpose tools ignore temporal correctness
- Real-time tools insufficient for high-performance systems

Project goals

- Develop tools for analysis of temporal correctness
  - Testing - are there temporal errors?
  - Debugging - why are there temporal errors?
  - Programming support - how should errors be corrected?
- Based on simulation of computer systems



Complete system simulation

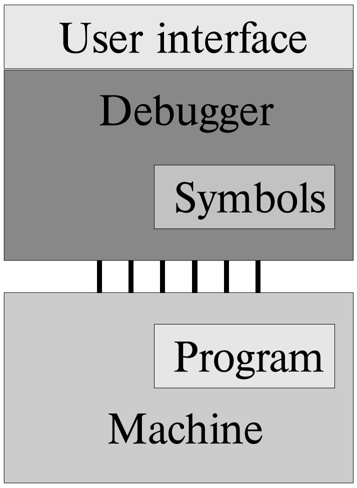


- Simulation of all hardware in a computer system
- Software runs unmodified

Lars Albertsson, Swedish Institute of Computer Science

Example tool: temporal debugger

- Traditional debuggers stop program to probe state
- Time flow differs from normal execution
- Debugging changes temporal correctness



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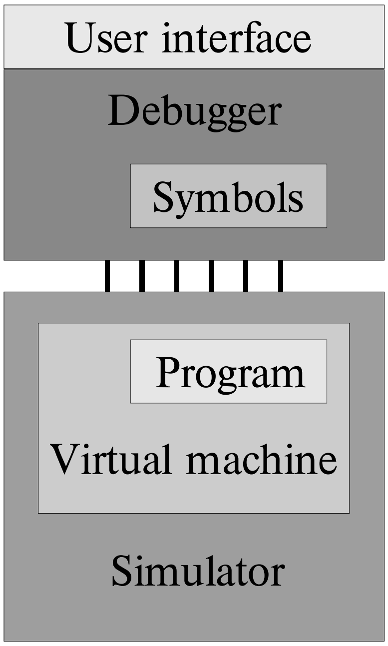
Temporal debugger (continued)

- A simulated machine has a separate, artificial time scale
- Time flow is preserved
- Predictable - each execution is identical



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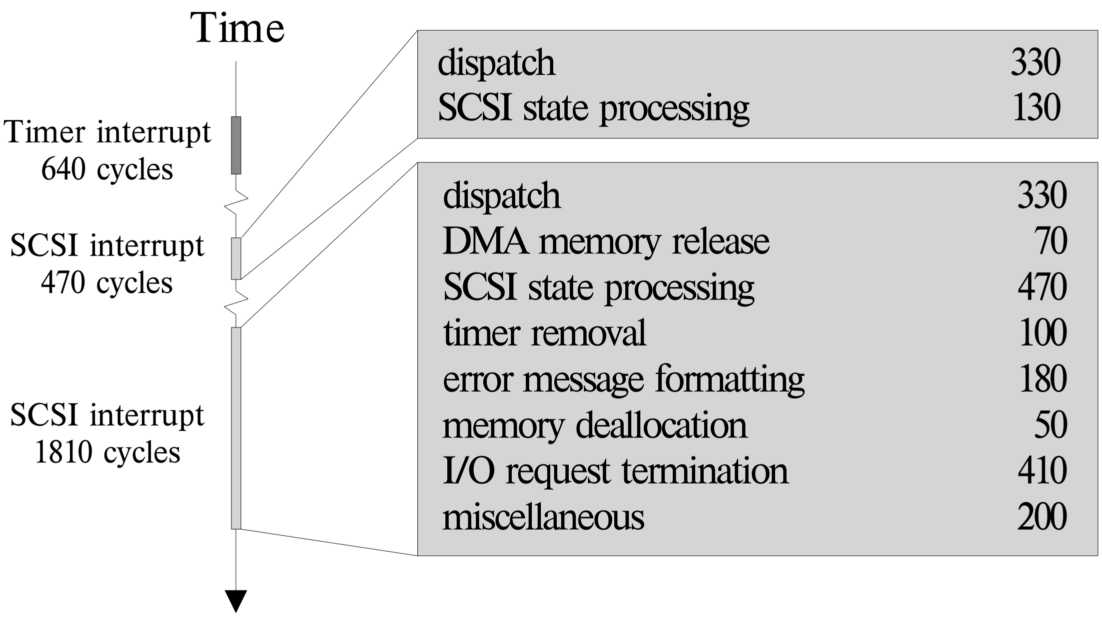
Case study: interrupt latency in Linux

- Task: explain varations in interrupt service latency



Conclusions

- Development of simulation based tools
  - Temporally correct debugger
- Current issues
  - Extending debugger to support user applications
  - Automated tools
- Complete system simulation is a robust platform for construction of real-time tools
  - Non-intrusive
  - Predictable