DARK2: Simics & Lab 1

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November 10th
Outline

1. Introduction

2. Simics
   - Virtutech AB
   - Simics is ...
   - Application Areas
   - Supported Architectures and OSes

3. Laboration
   - A simulation with Simics...
   - About the Lab ...
   - The End...
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   - Simics
     - Virtutech AB
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     - Application Areas
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     - About the Lab ...
     - The End...
Simulation
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- Simulation vs Emulation
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- Advantages
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  - Fault injection
  - Debugging
  - Prototyping Hardware before expensive implementations
  - Less dangerous
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  - Prototyping Hardware before expensive implementations
  - Less dangerous
- Possible problems
  - Can I trust the results?
  - How do I verify the results?
  - Realistic workloads?
Speed vs Accuracy

- Spice, etc
- gate/RTL model (>1,000,000x)
- “cycle-accurate” architecture simulator (>10,000x)
- emulator (~5x)
- Virtual PC, VMWare, Crusoe, etc.
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\textsuperscript{1}Norrtullsgatan 15, SE-113 27 Stockholm, Sweden
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- Simics is the only full system simulator which
  - supports multiple targets
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- Simics is the only full system simulator which
  - supports multiple targets
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- Interesting reading: www.virtutech.com

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Simics is...²

²From the user guide documentation cf http://www.simics.net
Simics is... \(^2\)

- simulator

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Simics is...

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  models the target computer at the level that an OS acts
  - binary interfaces, buses, disks, video memory, etc...
  - can run arbitrary workloads
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- instruction set simulator
  models the target system at the level of individual instructions
  executing them one at a time

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Application Areas
Application Areas

- Software Development
- System Architecture
- Software Testing
- Field Operations
- Hardware Verification
- System Security
Supported architectures

- x86
- AMD-64
- Itanium
- SUN Sunfire & Serengeti (USII & USIII)
- PowerPC
- Alpha
- ARM, MIPS and lots of devices
Supported unmodified OS

- Windows (XP, NT, 98, 95, ...)
- Solaris 9 (and more)
- Linux
- Tru64
- VxWorks
Target and Host

- The target is the simulated system
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- The host is the machine which runs Simics
Target and Host

- The target is the simulated system
- The host is the machine which runs Simics
- The prompts:
  - **target#** (the target’s prompt: root on the target system)
  - **host$** (the host’s prompt: user on the host system)
  - **simics>** (the simics prompt)
Simics commands
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- `simics> c`
Simics commands

- `simics > c`
  - Simics continue its simulation
  - `Ctrl-C` stops it (when Simics is running)
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- `simics > c 1000`
Simics commands

- `simics> c`
  - Simics continue its simulation
  - `Ctrl-C` stops it (when Simics is running)
- `simics> c 1000`
  - Simics runs another 1000 machine instructions and stops
Simics commands

- **simics**> c
  - Simics continue its simulation
  - **Ctrl-C** stops it (when Simics is running)
- **simics**> c 1000
  - Simics runs another 1000 machine instructions and stops
- **simics**> help
Simics commands

- `simics > c`
  - Simics continue its simulation
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- `simics > c 1000`
  - Simics runs another 1000 machine instructions and stops

- `simics > help`
  - Huh, guess....
Simics commands

- `simics> c`
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- `simics> help`
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- `simics> help dark2-cache`
Simics commands

- **simics**> c
  - Simics continue its simulation
  - **Ctrl-C** stops it (when Simics is running)

- **simics**> c 1000
  - Simics runs another 1000 machine instructions and stops

- **simics**> help
  - Huh, guess....

- **simics**> help dark2-cache
  - Lists the commands created for Lab1
Simics commands (cont’d)
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- `simics> q`
Simics commands (cont’d)

- `simics > q`
- `quits`
Simics commands (cont’d)

- `simics`> `q`
  - quits
- `simics`> `load-module`
Simics commands (cont’d)

- `simics > q`
  - quits
- `simics > load-module`
  - Loads an extra module onto the Simics platform
Simics commands (cont’d)

- `simics` > `q`
  - quits
- `simics` > `load-module`
  - Loads an extra module onto the Simics platform
- `simics` > `list-modules`
Simics commands (cont’d)

- `simics> q`
  - quits
- `simics> load-module`
  - Loads an extra module onto the Simics platform
- `simics> list-modules`
  - prints a list of all available modules
  - and their current status, loaded or not.
Hostfs

- Virtutech module to mount the host file system into the simulated OS.
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- `target# mount /host`
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- `target# mount /host`
  - mounts the host file system into `/host`
  - the hostfs module must be loaded
The different screens

Time for a little demo...
The different screens

Time for a little demo...
I will start up the "bagle" machine within Simics.
Some dates...

- Deadline: November 18th 17:00
Some dates...

- **Deadline:** November 18\(^{th}\) 17:00
- **Groups:**
  - A: November 14\(^{th}\), Room 1515, 08:15-12:00
  - B: November 16\(^{th}\), Room 1515, 08:15-12:00
Some things you’ll do...

- Well-explained: [HOMEPAGE\_DARK2]/assignments/lab1
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• You will be:
  • Creating a workspace (a directory to work, installing simics...).
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  - Executing host programs on the simulated machine

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Some things you’ll do...

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- You will be:
  - Creating a workspace (a directory to work, installing simics...)
  - Installing an extension for the cache model
  - Simulating a *Sarek* machine
  - Executing host programs on the simulated machine
  - Modifying the cache model (and recompiling it) to do:
Some things you’ll do...

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- Read it carefully and I strongly advise to read it in advance.
- You will be:
  - Creating a workspace (a directory to work, installing simics...)
  - Installing an extension for the cache model
  - Simulating a Sarek machine
  - Executing host programs on the simulated machine
  - Modifying the cache model (and recompiling it) to do:
    - Cache simulation
    - Miss ratio measurements
    - Cache performance improvements
La Fin ...
Questions? Frågor?
La Fin ...

A vous de jouer...³

³Your turn to play...