DARK2: Simics & Lab 1

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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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Simulation

- Simulation vs Emulation
- Advantages
  - Understanding real systems
  - Fault injection
  - Debugging
  - 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)
- Simics™
- Emulator (~5x)
- Virtual PC, VMWare, Crusoe, etc.

1 KIPS vs 100 MIPS
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**Virtutech AB**

- Small swedish company (70 people)
- Offices in Stockholm\(^1\) and USA
- Simics is the only full system simulator which
  - supports multiple targets
  - is capable of booting unmodified operating systems
- Interesting reading: [www.virtutech.com](http://www.virtutech.com)

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\(^1\) Norrtullsgatan 15, SE-113 27 Stockholm, Sweden
Simics is...²

- simulator
  (designed from the ground up to gather information on execution)
- efficient
- instrumented
- system level
  models the target computer at the level that an OS acts
  - binary interfaces, buses, disks, video memory, etc...
  - can run arbitrary workloads
  - can boot unmodified OS
- instruction set simulator
  - models the target system at the level of individual instructions
  - executing them one at a time

²From the user guide documentation cf http://www.simics.net
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
Example

- Linux on Itanium
- VxWorks on PowerPC
- Solaris on Sun SunFire
- Windows NT on x86
- Windows XP/64 on AMD Hammer
- Linux on x86
- All running on a Linux host
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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

- **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)

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

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

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

- Well-explained: [HOMEPAGE\_DARK2]/assignments/lab1
- 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...