TDTS10:
Computer Architecture

Lesson

2021

LINKÖPING UNIVERSITY

Outline

- Lab organization and goals
- SimpleScalar architecture and tools
- Exercises

Organization

- Assistants
  - Group A, B: Rouhollah Mahfouzi 
  - Group C, D: Mina Niknafs
  - Group E, F: Ali Sahraee
  - Extra Assistant: Yungang Pan
- Web page
  - http://www.ida.liu.se/~TDTS10
  - Check the lab page!

Organization

- Sign up in Webreg, TODAY
- Deadline for the assignments:

Lab 1	Nov. 18
Lab 2	Dec. 3
Lab 3	Dec. 14

- Rules: Read them!

Lab Schedule

A (by Rouhollah), C (by Mina), and E (by Ali)

Date	Time	Location*	Type
Nov. 9	15:15–17:00	S2(A), S11(E), S14(C)	Lesson
Nov. 12	15:15–17:00	SU00(A), SU01(C), SU03(E)	Lab
Nov. 17	17:15–19:00	SU00(E), SU01(C), SU02(A)	Lab
Nov. 23	15:15–17:00	SU04(A), SU12(E), SU13(C)	Lab
Nov. 30	15:15–17:00	SU04(A), SU12(C), SU13(E)	Lab
Dec. 7	15:15–17:00	SU04(A), SU12(C), SU13(E)	Lab
Dec. 13	10:15–12:00	SU04(A), SU12(C), SU13(E)	Lab

***SU04(A) means that the students of group A should go to room SU04.**

B (by Rouhollah), D (by Mina), and F (by Ali)

Date	Time	Location*	Type
Nov. 9	15:15–17:00	S2(B), S11(F), S14(D)	Lesson
Nov. 16	15:15–17:00	SU04(B), SU12(D), SU13(F)	Lab
Nov. 18	08:15–10:00	SU10(F), SU11(D), SU12(B)	Lab
Nov. 26	15:15–17:00	SU00(B), SU01(F), SU02(D)	Lab
Dec. 3	15:15–17:00	SU00(B), SU01(F), SU02(D)	Lab
Dec. 10	15:15–17:00	SU00(B), SU01(F), SU02(D)	Lab
Dec. 14	13:15–15:00	SU04(B), SU12(F), SU13(D)	Lab

***SU04(B) means that the students of group B should go to room SU04.**

Please only attend your own lab sessions (6 sessions)

Please check the lab location from these tables (available on webpage).

Examination

For each lab:

1. Demonstrate
   - Must be done during lab sessions
   - Both members must be present during demo
2. Report, Submitted via Teams

Labs

- Three labs:
  1. Cache Memories (2 lab sessions)
  2. Instruction Pipelining (2 lab sessions)
  3. Superscalar Processors (2 lab sessions)

- Respond to last year comments:
  - Slightly more challenging Lab 2
  - Extra lab assistants

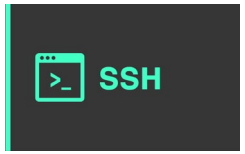
Goals

- Obtain knowledge about computer organization and architecture
- Insights in various trade-offs involved in the design of a processor
- Become familiar with a set of tools necessary for evaluation of computer architectures

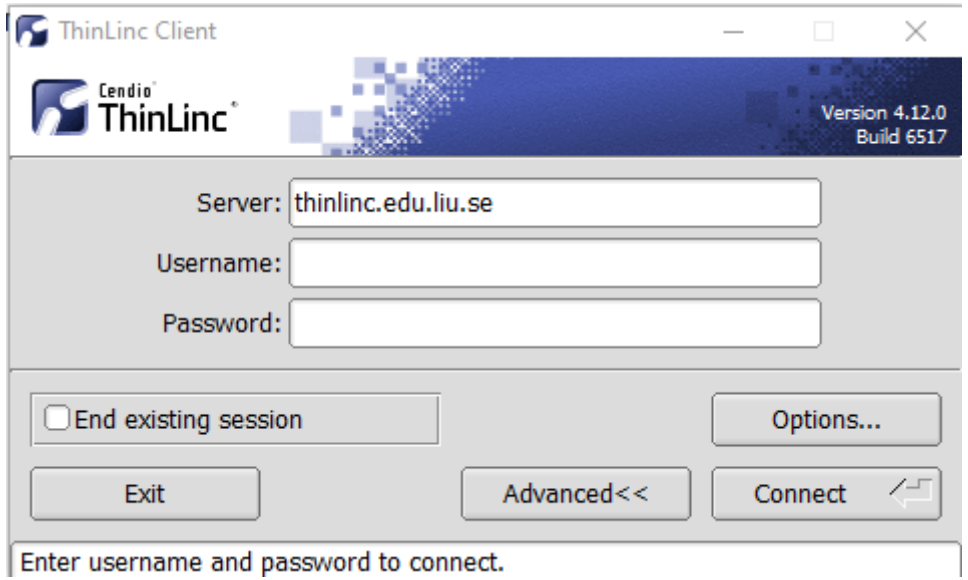
Remote

- Thinlinc client: thinlinc.edu.liu.se

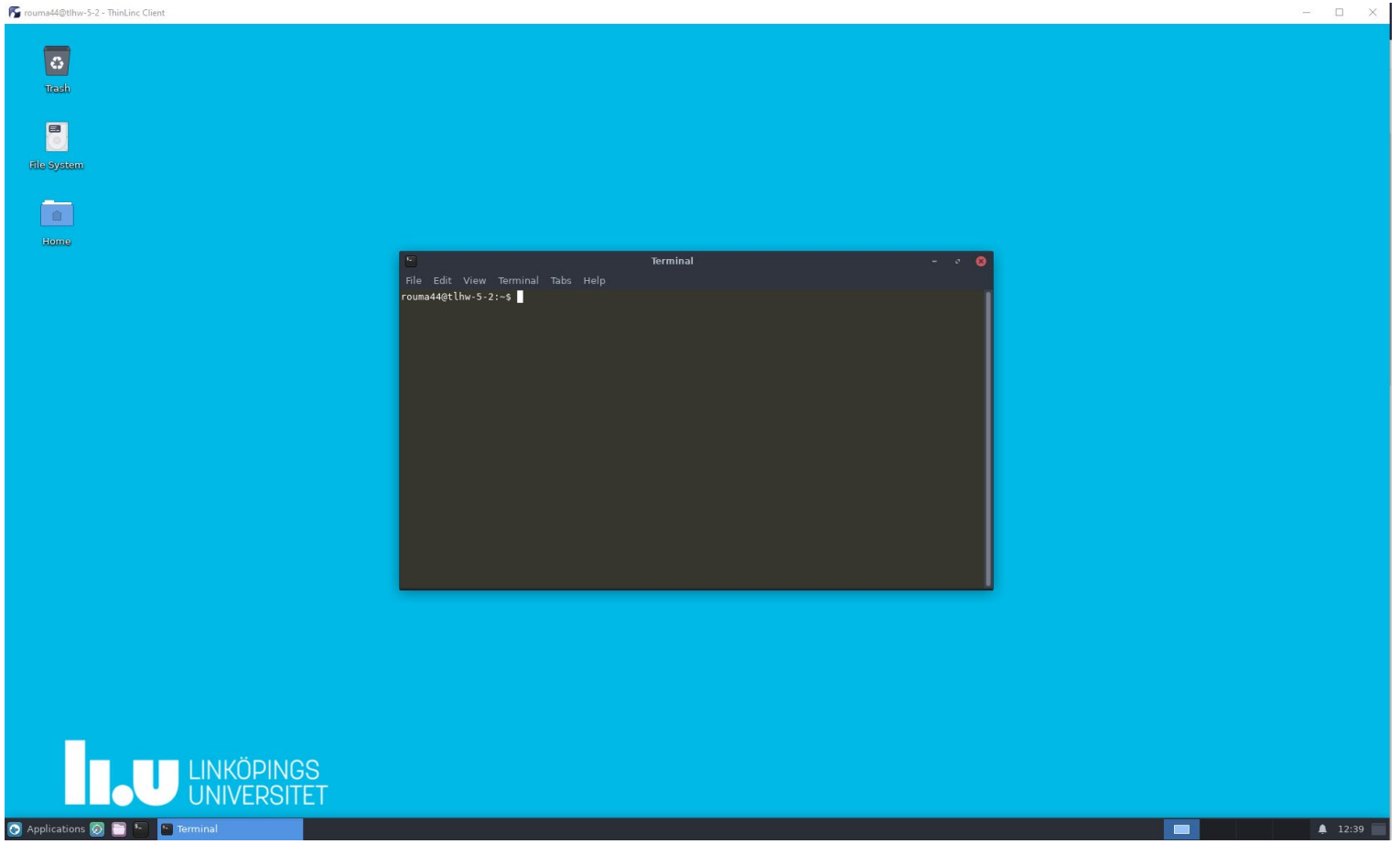
- SSH client: ssh.edu.liu.se



ThinLinc


ThinLinc Client
Cendio ThinLinc
Version 4.12.0
Build 6517
Server: thinlinc.edu.liu.se
Username:
Password:
End existing session
Options...
Exit
Advanced<<
Connect
Enter username and password to connect.

ThinLinc



Press F8 for options

Backup subgroups on Teams

- Private Team for each subgroup
  - Can be used between lab partners
  - Upload your lab reports

Environment

- Linux
- Simulations are started from a command line (i.e., terminal)
  - To open a new terminal you can press ctrl+alt+t
- Get yourself familiarized with the terminal
  - Ask Google first
  - Ask your assistant
- Make sure you learn the basic commands (i.e., *cd, ls, cp*, …)

Tool Setup

- Don’t forget the instructions in lab0
- Instructions should be clear and easy to follow, but if you face difficulties
  - Don’t get frustrated :)
  - Read again carefully (without skipping over the lines)
  - Consult your assistant

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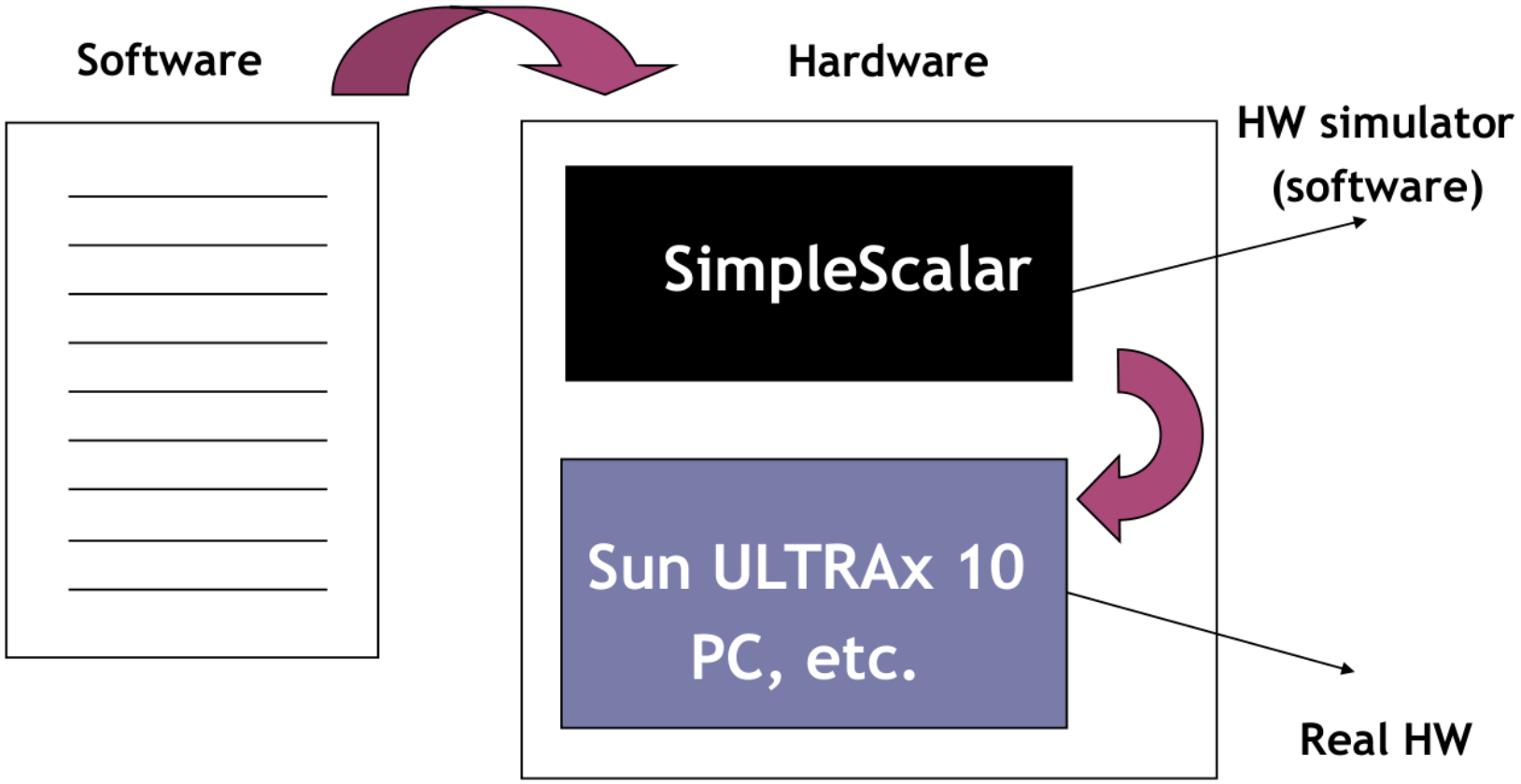
- Exercises

Architecture Simulation



SimpleScalar: Literature

- "*The SimpleScalar Tool Set, Version 2.0*", by Doug Burger and Todd M. Austin
  - Very important preparation for the labs
  - This is your main reference for the tool!
- "User's and Hacker's guide", slides by Austin

SimpleScalar Architecture

- Virtual architecture derived from MIPS
  - Control (j, jr,..., beq, bne,...)
  - Load/Store (lb, lbu, ...)
  - Integer Arithmetic (add, addu, ...)
  - Floating Point Arithmetic (add.s, add.d, ...)
  - Miscellaneous (nop, syscall, break)

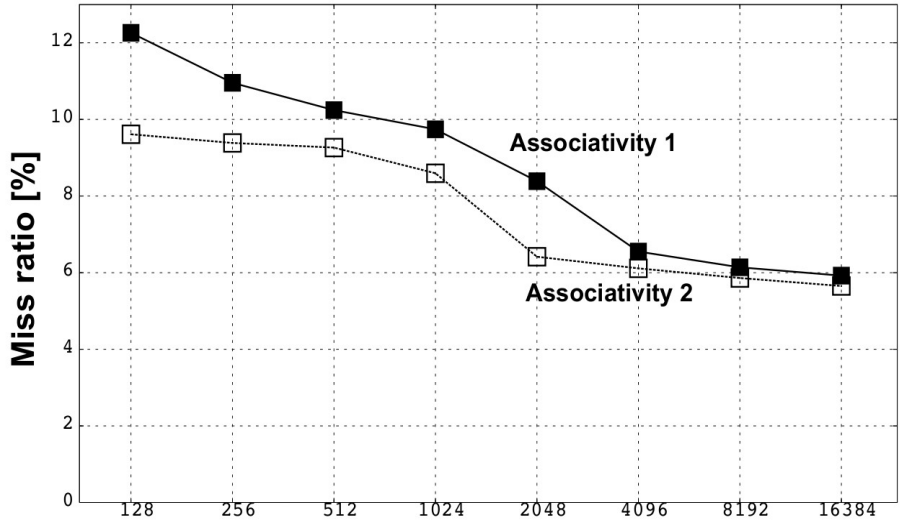
SimpleScalar Architecture (cont'd)

- Several simulators
  - Sim-fast: Fast, only functional simulation (no timing)
  - Sim-safe: Sim-fast + memory checks
  - Sim-cache: Sim-safe + cache simulation and various timing properties (simulation time, measured time, ...)
  - Sim-cheetah: Simulation of multiple cache configurations
  - Sim-outorder: Superscalar simulator

Won't use these two!

An Example

- Lab1, assignment 3
  - Dump the default configuration of sim-cheetah
  - Modify the configuration and simulate
  - Plot the results (e.g. OpenOffice, Gnuplot, Matlab, Excel)



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- Lab organization and goals
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- Let’s solve some exercises on the first lab!
  - Lesson exercises