C2115 Practical Introduction to Supercomputing

7th Lesson

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Exercise LV.2

- Results
- Discussion

Results

wolf01, **4 CPU**, Intel(R) Xeon(R) CPU X3460 @ 2.80GHz, L1: 32kB, L2: 256kB, L3: 8192kB

	load_cpu		
Number of concurrent processes	**Real runtime [s]**	**Theoretical runtime [s]**	**Overhead [%]**
1	20.15	20.15	
4	30.20	20.15	49.9
8	61.67	40.30	53.0
12	94.12	60.45	55.7
16	126.23	80.60	56.6
20	159.87	100.75	58.7
24	191.64	120.90	58.5

$$overhead = 100 \frac{t_{real}}{t_{theory}} - 100$$

How many % slower is run to theoretical ideal.

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Find reason for high start overheads

Overhead grows

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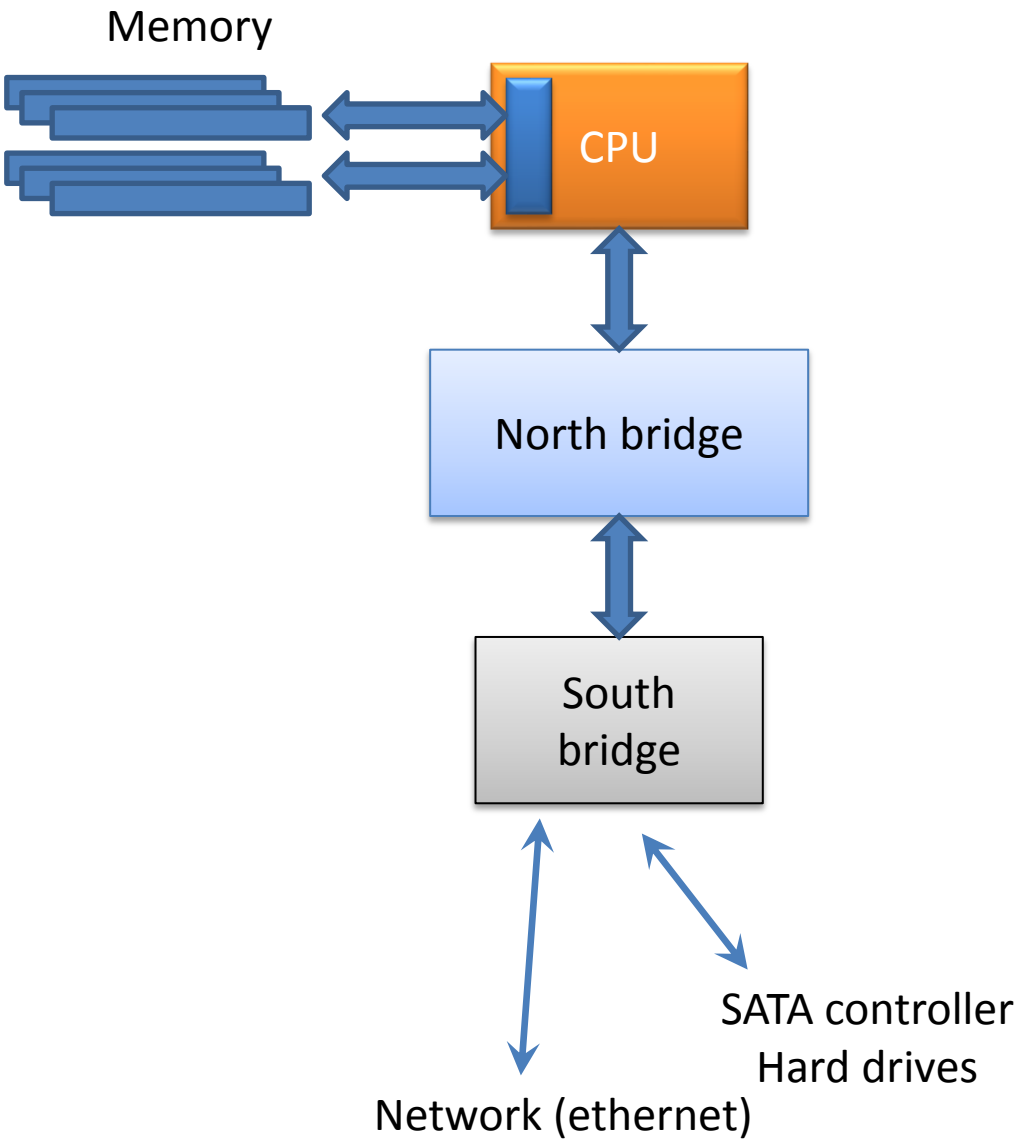
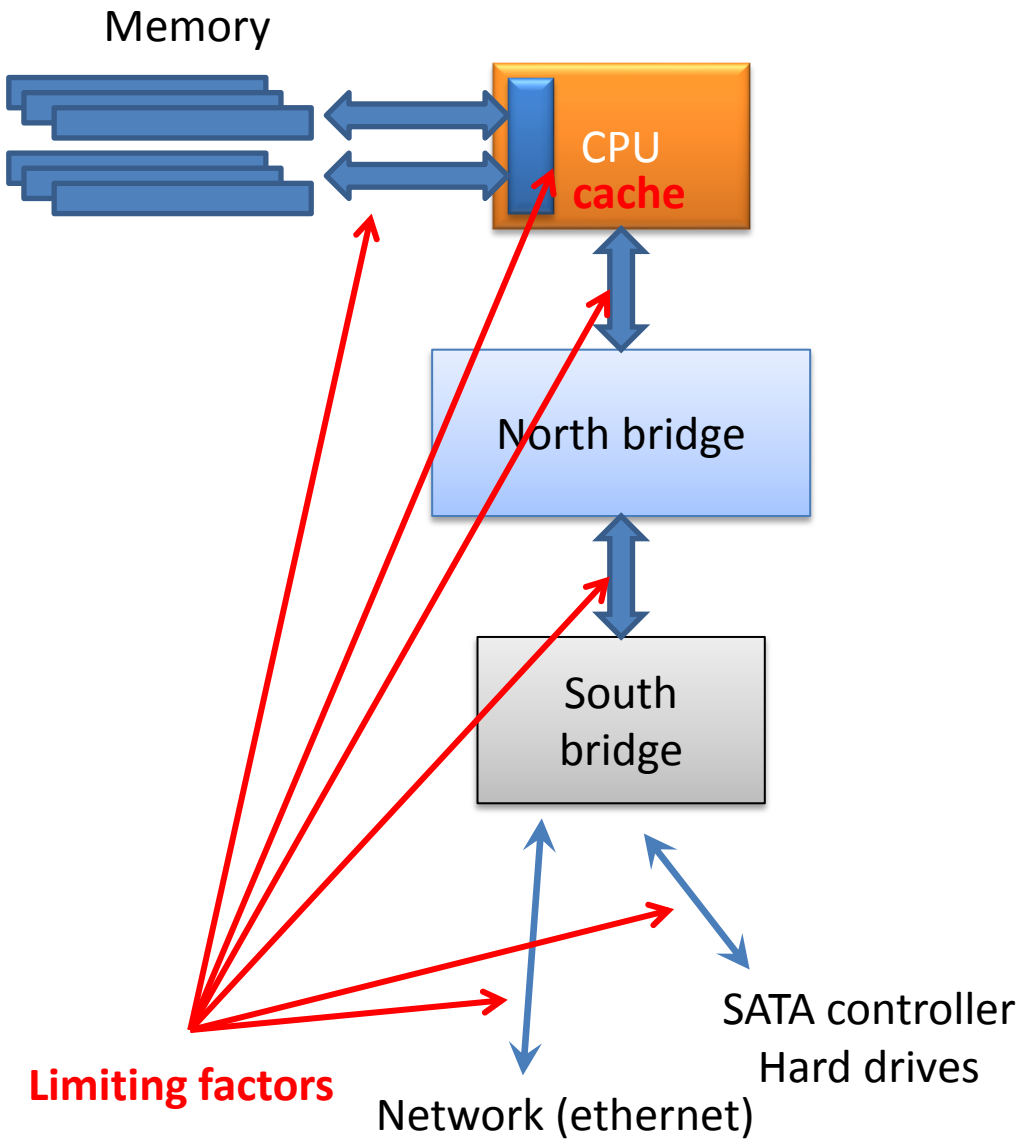
Computer architecture

- Limiting factors
- Application types and their relation to limiting factors

Architecture, general view



Architecture, limiting factorsfaktory



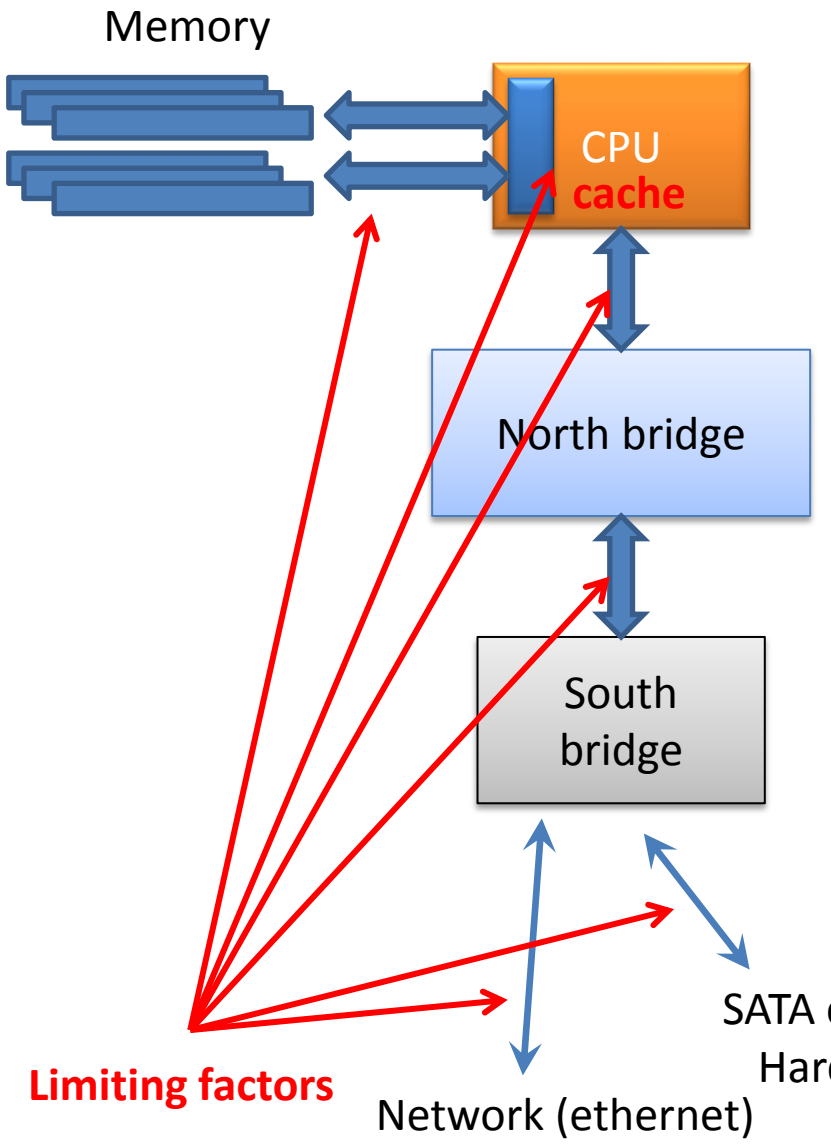
Fastest component is CPU
Other components are slower

RAM
~10 GB/s

SATA disc
SATA III: 600 MB/s

Network
10/100/1000 Mb/s

Architecture, limiting factors



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High latencies

Exercise VI.1

1. Use command wget to download install image of Ubuntu Server 12.04.1 LTS

```
$ wget http://www.ubuntu.com/start-download?distro=server&bits=64&release=lts
```

2. State transfer rate for different number of concurrent downloading processes in teams. What is the limiting factor for the transfer?

Batch systems

- Definition
- Overview

Batch processing

Batch processing is running of series of programs (so called batches) on computer with **no user interaction**. Batches are prepared in advance and submitted for processing without user interaction. All input data are prepared in advance in files (scripts) or given in command line arguments. Batch processing is opposite to interactive processing when user gives input data during actual program run.

Batch processing advantages

- resource sharing among many users and programs
- start of batch run when computer has enough resources (low load)
- remove of user input delays
- maximizing computer usage improves computer investments utilization (expensive machines)

Source: www.wikipedia.cz, adjusted

Batch system tools

- **OpenPBS**
  http://www.mcs.anl.gov/research/projects/openpbs/
- **PBSPro**
  http://www.pbsworks.com
- **Oracle Grid Engine**
  http://www.oracle.com/us/products/tools/oracle-grid-engine-075549.html
- **Open Grid Scheduler**
  http://gridscheduler.sourceforge.net/
- **Torque**
  http://www.adaptivecomputing.com/products/open-source/torque/

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open source

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- **Oracle Grid Engine**
  http://www.oracle.com/us/products/tools/oracle-grid-engine-075549.html
- **Open Grid Scheduler**
  http://gridscheduler.sourceforge.net/
  open source
- **Torque**
  http://www.adaptivecomputing.com/products/open-source/torque/

Used as batch system in MetaCentrum VO, and on clusters SOKAR and WOLF