



Technische
Universität
Braunschweig



Parallel Computing

Exercise 3 - Introduction to MPI

Andres Rodriguez, 4th May 2015

Homework 2 - Remember

✓ Deadline

07.05.2015 - 11:59:pm

✓ E-mail

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✓ Content

ZIP file including

- Source code
- Written report as *.pdf file

Remember

Next Thursday 7th of April is Lecture

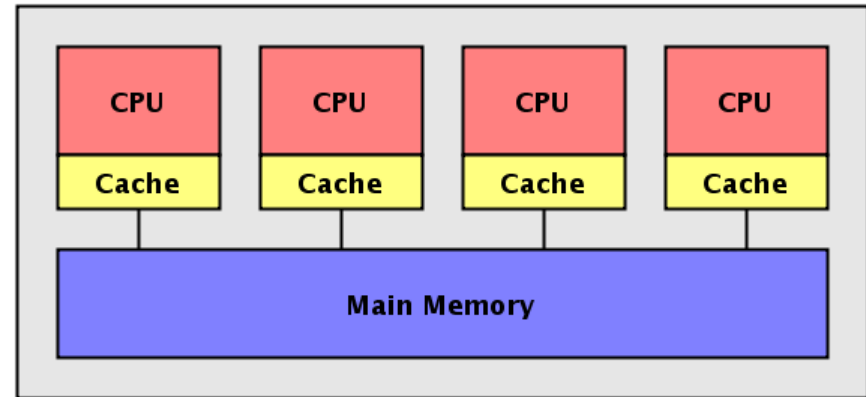
Students without Group

- ✓ Sven Tittel
- ✓ Dhaval Kulkarni
- ✓ Ahrens Sebastian
- ✓ Adrian Wierzbowski
- ✓ Mohammad Hamad

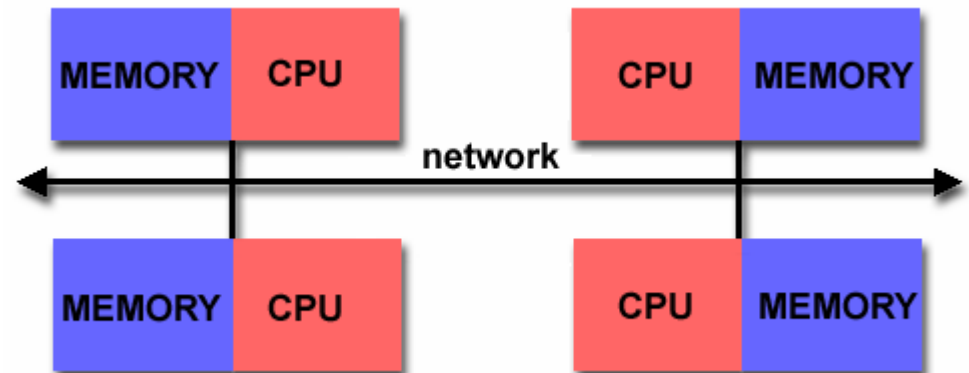
Please meet me at the end of today's exercise session!!

Shared Vs Distributed Memory

Shared Memory

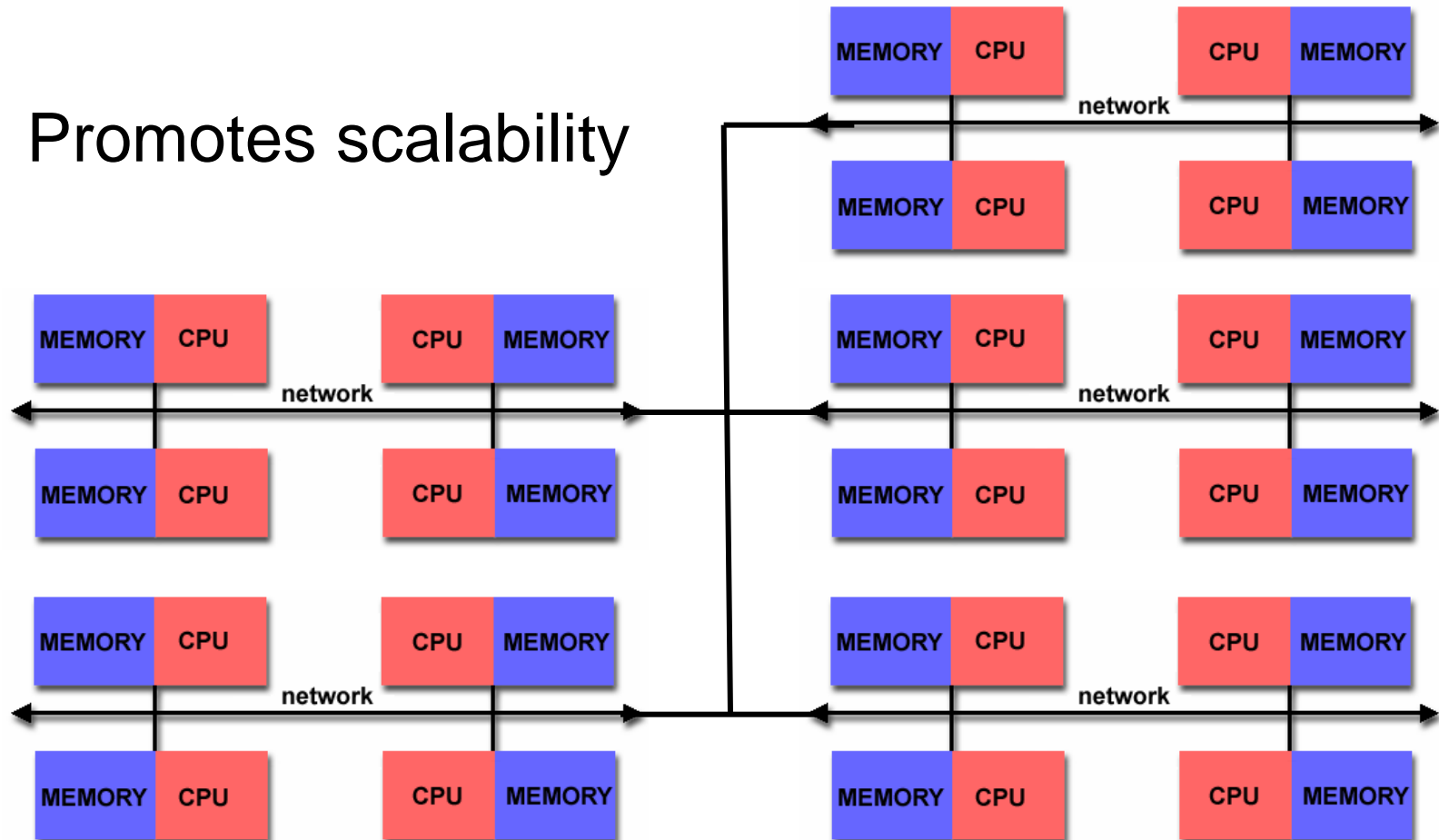


Distributed Memory



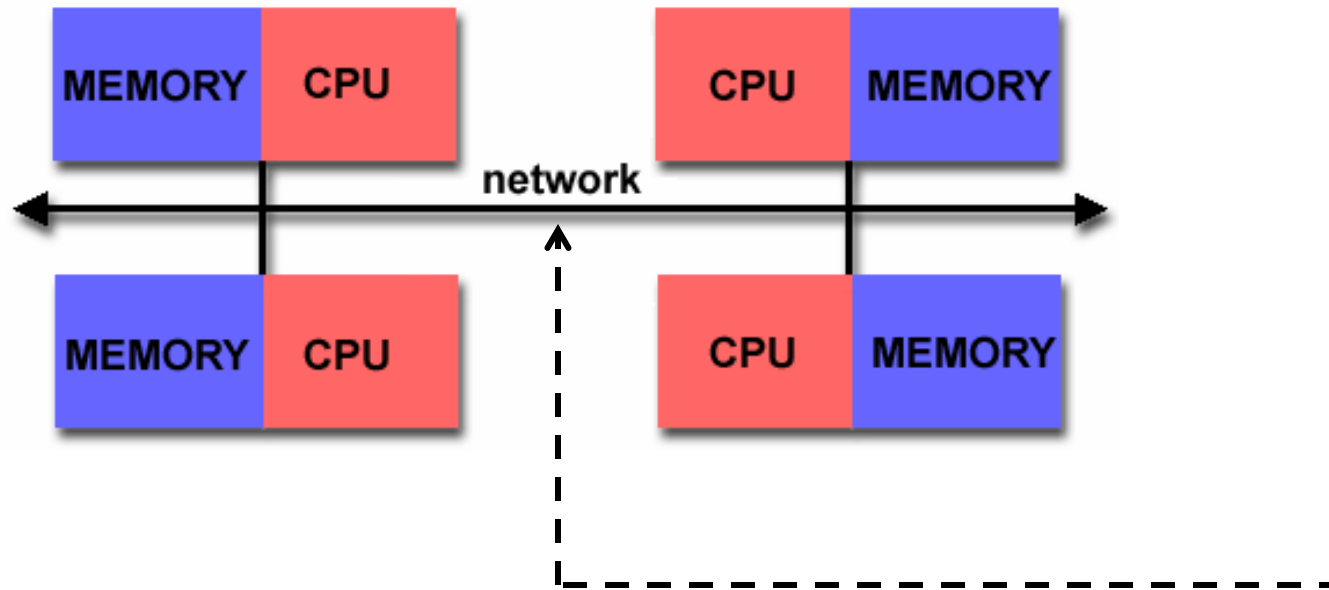
Distributed Memory advantage

Promotes scalability



MPI – Message Passing Interface

- ✓ Communication between processes is held through messages.
- ✓ Resources are private to each process



OpenMP and MPI - Analogy

Context	OpenMP	MPI
Include Library	#include <omp.h>	#include "mpi.h"
Initialization statement	# pragma omp parallel	MPI_Init(&argc, &argv);
Get Thread/Process ID	omp_get_thread_num()	MPI_Comm_rank (MPI_COMM_WORLD, &rank);
Get Number of Threads/Processes	omp_get_num_threads()	MPI_Comm_size (MPI_COMM_WORLD, &size);
Termination statement	N/A	MPI_Finalize();

Other basic MPI functions

✓ *MPI_Send* (**void*** *data*,
int *count*,
MPI_Datatype *datatype*,
int *destination*,
int *tag*,
MPI_Comm *communicator*);

✓ *MPI_Recv* (**void*** *data*,
int *count*,
MPI_Datatype *datatype*,
int *source*,
int *tag*,
MPI_Comm *communicator*,
MPI_Status *status*);

Knowing Pointers in MPI

All instructions in MPI are Pointers and References Based!!

✓ **Some helpful tutorial for understanding Pointers***

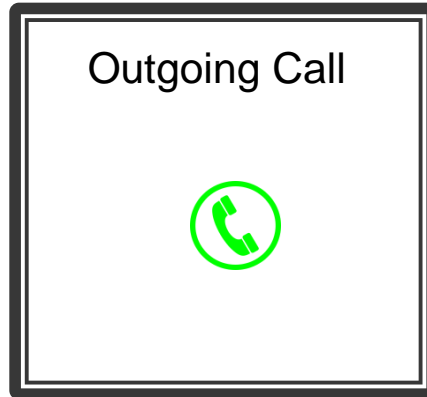
- Tutorial about managing pointers using C++ language
<http://www.cplusplus.com/doc/tutorial/pointers/>
- Video about working with dynamic memory in C++
https://www.youtube.com/watch?v=CSVRA4_xOkw
- Tutorial about managing pointers using C Language
<http://boredzo.org/pointers/>
- Video about working with dynamic memory in C
<https://www.youtube.com/watch?v=xDVC3wKjS64>

**Note that this is not the purpose of this course or a mandatory material but might work as a nice refresher for your C/ C++ foundations.*

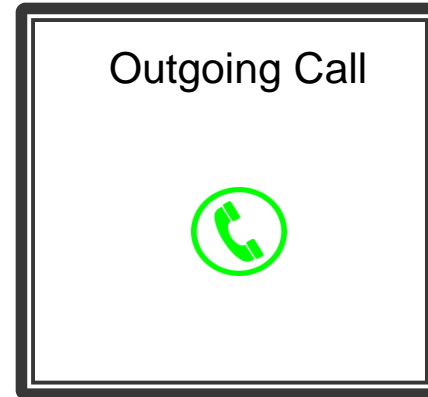
Hello World!! – MPI Version

Communication between processes

Process 1



Process 2

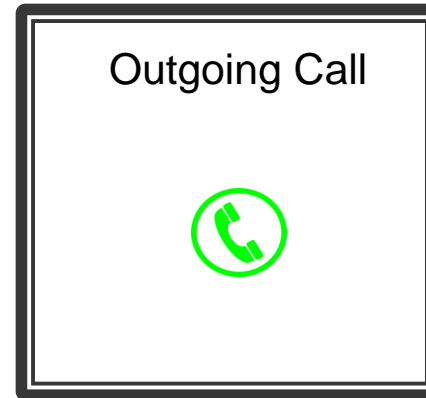


Communication between processes

Process 1



Process 2

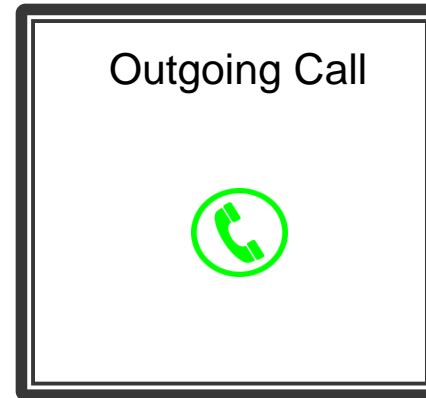


Communication between processes

Process 1



Process 2

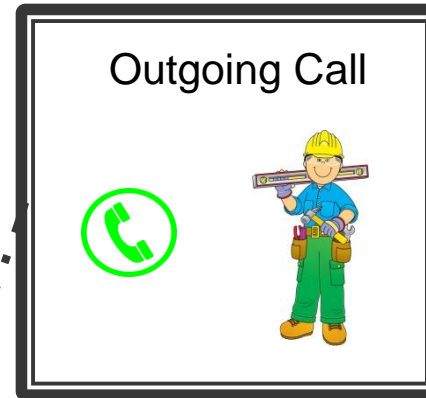


Communication between processes

Process 1

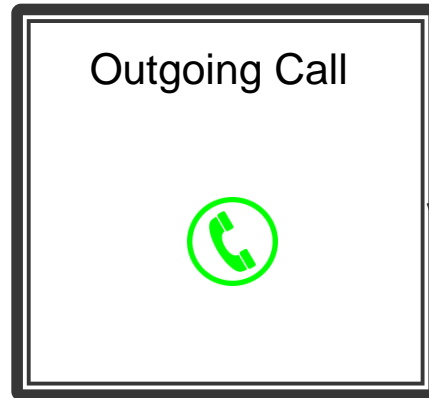


Process 2

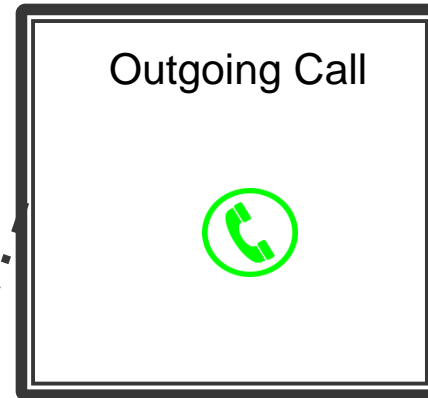


Communication between processes

Process 1



Process 2



Basic communication example

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Sharing a single double type value