Course selection
Study period 2
MPCSN & MPHPC 2020

Director of Programme, Magnus Almgren
Director of Programme, Pedro P. M. Trancoso
Student guidance counsellor, Ingegerd Nilsson
Director of studies, Hadi Zarshamfar

Agenda

- > 15:00 - 15:15 The course selection process
- > 15:15 - 15:20 Computer security+Network security (MPCSN)
- > 15:20 - 15:25 Distributed systems (MPCSN)
- > 15:25 - 15:30 Real-time systems (MPCSN & MPHPC)
- > 15:30 - 15:40 Architecture+Sustainable+Parallel (MPCSN & MPHPC)
- > 15:40 - 15:45 Computer graphics (MPHPC)
- > 15:45 - 15:50 Entrepreneurship
- > 15:50 - 16:00 Q&A

MPHPC courses

Compulsory

- Computer architecture
- High-performance parallel programming
- Technical writing
- **Master Thesis**

Compulsory elective

(select minimum 2 out of 4 tracks)

Computer Systems	Sustainable computing	Parallel computer architecture
Computer Graphics	Computer graphics	Advanced computer graphics
Real-Time Systems	Real-time systems	Dependable real-time systems
Entre-preneurship	Strategic management of technological innovation	Creating technology-based ventures

Elective

- Elective
- Elective
- Elective
- Elective
- Elective

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Recommended elective MPHPC courses Sp2, 2020

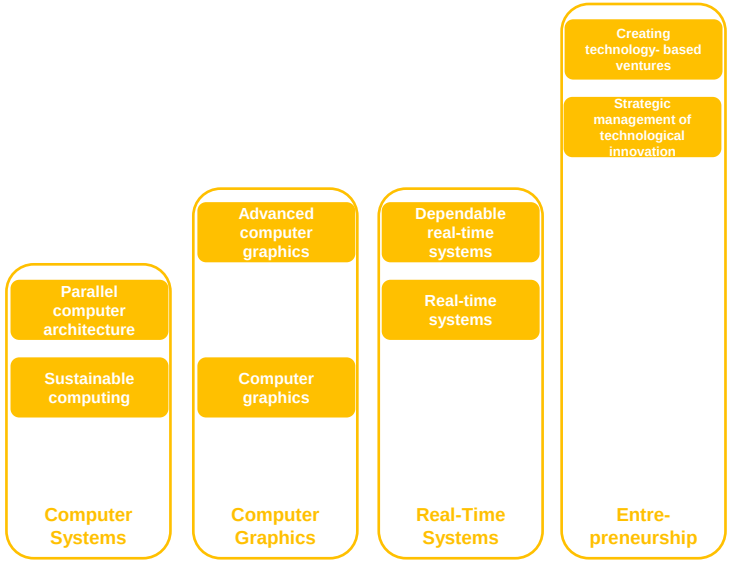
Course	Course round	Study period	Block schedule
DAT246	1	LP2	
DAT278	1	LP2	A+
EEN020	1	LP2	C
ENM130	1	LP2	B
FKA121	1	LP2	D
MCC155	1	LP2	C
TDA362	1	LP2	D+
TDA507	1	LP2	A
TDA596	1	LP2	C

Find course descriptions here.

MPHPC - Degree Requirements 20/21

CHALMERS

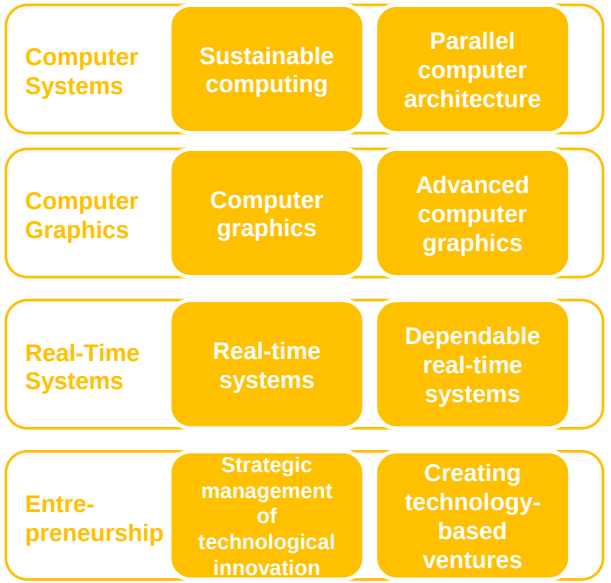
Year 2	sp 4	Master thesis in Computer Science and Engineering	
	sp 3		
	sp 2	Compulsory elective / Elective	Compulsory elective / Elective
	sp 1	DAT147 Technical writing in Computer Systems and Networks	Compulsory elective / Elective
Year 1	sp 4	Compulsory elective / Elective	Compulsory elective / Elective
	sp 3	Compulsory elective / Elective	Compulsory elective / Elective
	sp 2	Compulsory elective / Elective	Compulsory elective / Elective
	sp 1	DAT105 Computer architecture	DAT400 High-performance parallel programming



TRACKS degree requirement - Select minimum 2 of the following 4 tracks:
"Computer Systems" / "Computer Graphics" / "Entrepreneurship" / "Real-Time Systems"

Compulsory elective courses MPHPC 2019/2020

Code	Course name	Study period
DAT278	Sustainable computing	2
EDA223	Real time systems	3
TDA362	Computer graphics	2
TEK650	Strategic management of technological innovation	1
EDA284	Parallel computer architecture	3
EDA423	Dependable Real-Time Systems	4
DAT205	Advanced computer graphics	4
TEK655	Creating technology- based ventures	2



Select at least two tracks: “Computer Systems” / “Computer Graphics” / “Entrepreneurship” / “Real-Time Systems”.

MPCSN courses

Compulsory

- Computer networks
- Operating systems
- Technical writing
- **Master´s thesis**

Compulsory elective

(select minimum 2 out of 4 tracks)

Computer architecture	Computer architecture	Sustainable computing
Cyber security	Computer security	Network security
Distributed systems	Distributed systems	Distributed systems, advanced
Real-time systems	Real-time systems	Dependable real-time systems

Elective

- Elective
- Elective
- Elective
- Elective
- Elective

Recommended elective MPCSN courses Sp2, 2020

Course	Course round	Study period	Block schedule
DAT151	1	LP2	B
DAT278	1	LP2	A+
DAT295	1	LP2	
DAT415	1	LP2	A
EEN020	1	LP2	C
TDA251	1	LP2	C
TDA352	1	LP2	D
TDA362	1	LP2	D+
TDA452	1	LP2	C
TDA596	1	LP2	C

Find course descriptions here.

MPCSN - Degree Requirements 20/21

Year 2	sp 4	DATX05 Master thesis in Computer Science and Engineering	
	sp 3		
	sp 2	**Compulsory elective / Elective**	**Compulsory elective / Elective**
	sp 1	DAT147 Technical writing in Computer Systems and Networks	**Compulsory elective / Elective**
Year 1	sp 4	**Compulsory elective / Elective**	**Compulsory elective / Elective**
	sp 3	**Compulsory elective / Elective**	**Compulsory elective / Elective**
	sp 2	**Compulsory elective / Elective**	**Compulsory elective / Elective**
	sp 1	EDA093 Operating system	EDA387 Computer networks

Computer Architecture
- Sustainable computing
- Computer architecture

Cyber Security
- Network security
- Computer security

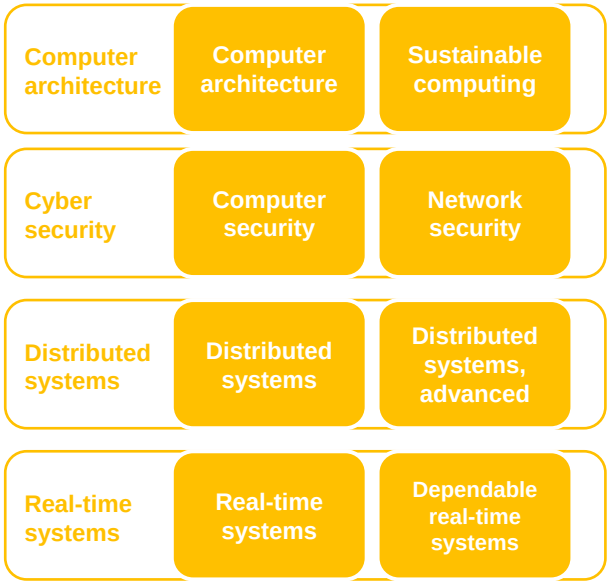
Distributed Systems
- Distributed systems, adv.
- Distributed systems

Real-Time systems
- Dependable real-time systems
- Real-time systems

TRACKS degree requirement - Select minimum 2 of the following 4 tracks:
"Computer Architecture" / "Cyber Security" / Distributed Systems" / "Real-Time Systems

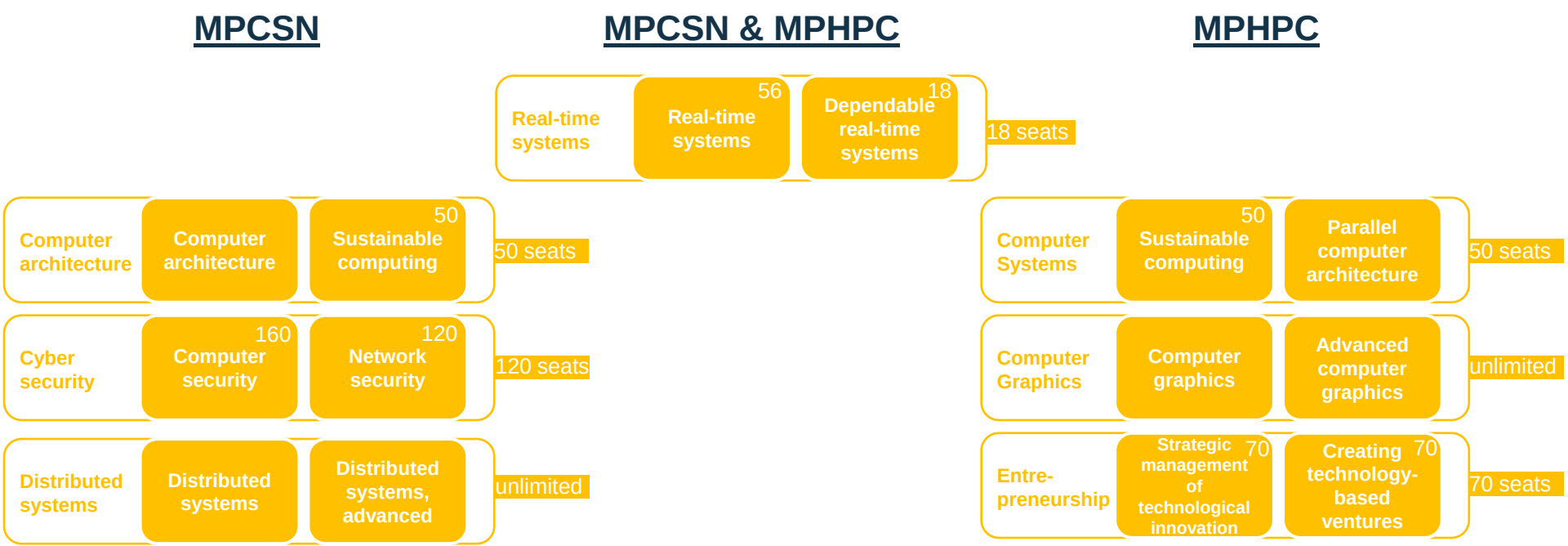
Compulsory elective courses MPCSN 2019/2020

Code	Course name	Study period
DAT105	Computer architecture	1
EDA263	Computer security	3
TDA596	Distributed systems	2
EDA223	Real time systems	3
DAT278	Sustainable computing	2
EDA491	Network security	4
TDA297	Distribuerade systems, advanced	3
EDA423	Dependable Real-Time Systems	4



Select at least two tracks: “Computer Architecture” / “Cyber Security” / Distributed Systems” / “Real-Time Systems”.

Seat limitations per course & track



Real-time systems track – seat limitation

- EDA223 Real-time systems (56 seats)
- EDA423 Dependable Real-Time Systems (18 seats)
- If you intend to take Real-time system track, make sure to have a plan for the selection of an extra track if you don’t get a seat on EDA423.
- Have in mind that if you get a seat on EDA223, but don’t get a seat on EDA423, then EDA223 will still count as an elective course for you.

Course selection Sp2, 2020

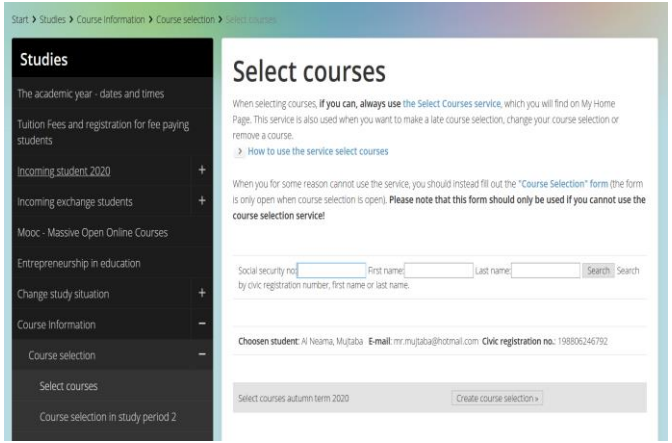
Key dates for the course selection

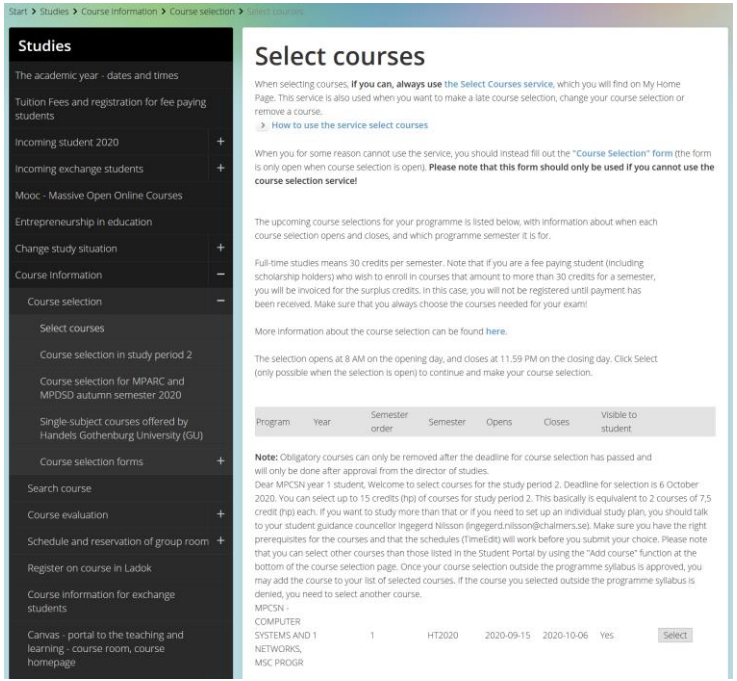
- **15 September** - The course selection opens. Use the service Select courses.
- **6 October** - Last day to select courses
- **Make sure that you make your selection on time!**
- **9 November** - Last day to register on courses in study period 2.

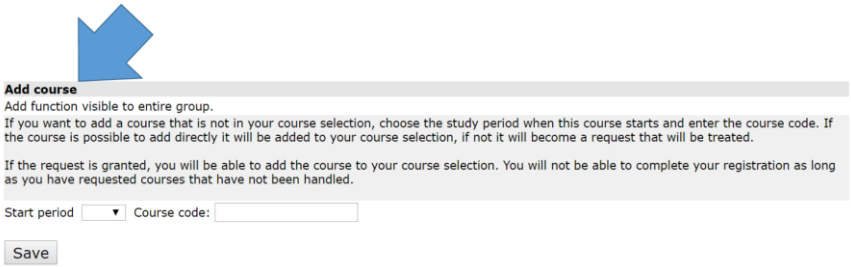
Course selection Sp2, 2020

- You will select 2 courses in Sp2.
- If you intend to select more courses than 2, you need to first discuss your plan with student guidance councellor Ingegerd Nilsson.
- Have a look at the schedule to prevent (too many) clashes.
- Make sure you fulfill the course prerequisites stated in the course description.
- A course selection is a request to be registered – we may be forced to select participants if there are too many applicants.
- Students who cannot be offered a seat in a particular course will be informed
- Log in to Studentportal with your CID, then choose ”Select courses” or click below on:
- **Select courses**

- More information about course selction.


Start › Studies › Course Information › Course selection › Select courses
Studies
The academic year - dates and times
Tuition Fees and registration for fee paying students
Incoming student 2020
Incoming exchange students
Mooc - Massive Open Online Courses
Entrepreneurship in education
Change study situation
Course Information
Course selection
Select courses
Course selection in study period 2
Select courses
When selecting courses, If you can, always use the Select Courses service, which you will find on My Home Page. This service is also used when you want to make a late course selection, change your course selection or remove a course.
How to use the service select courses
When you for some reason cannot use the service, you should instead fill out the "Course Selection" form (the form is only open when course selection is open). Please note that this form should only be used if you cannot use the course selection service!
Social security no: First name: Last name: Search Search by civic registration number, first name or last name.
Choosen student: Al Neama, Mujtaba E-mail: mr.mujtaba@hotmail.com Civic registration no.: 198806246792
Select courses autumn term 2020
Create course selection »


Start › Studies › Course Information › Course selection › Select courses
Studies
The academic year - dates and times
Tuition Fees and registration for fee paying students
Incoming student 2020
Incoming exchange students
Mooc - Massive Open Online Courses
Entrepreneurship in education
Change study situation
Course Information
Course selection
Select courses
Course selection in study period 2
Course selection for MPARC and MPDSD autumn semester 2020
Single-subject courses offered by Handels Gothenburg University (GU)
Course selection forms
Search course
Course evaluation
Schedule and reservation of group room
Register on course in Ladok
Course information for exchange students
Canvas - portal to the teaching and learning - course room, course homepage
Select courses
When selecting courses, If you can, always use the Select Courses service, which you will find on My Home Page. This service is also used when you want to make a late course selection, change your course selection or remove a course.
How to use the service select courses
When you for some reason cannot use the service, you should instead fill out the "Course Selection" form (the form is only open when course selection is open). Please note that this form should only be used if you cannot use the course selection service!
The upcoming course selections for your programme is listed below, with information about when each course selection opens and closes, and which programme semester it is for.
Full-time studies means 30 credits per semester. Note that if you are a fee paying student (including scholarship holders) who wish to enroll in courses that amount to more than 30 credits for a semester, you will be invoiced for the surplus credits. In this case, you will not be registered until payment has been received. Make sure that you always choose the courses needed for your exam!
More information about the course selection can be found here.
The selection opens at 8 AM on the opening day, and closes at 11.59 PM on the closing day. Click Select (only possible when the selection is open) to continue and make your course selection.
Program Year Semester order Semester Opens Closes Visible to student
Note: Obligatory courses can only be removed after the deadline for course selection has passed and will only be done after approval from the director of studies.
Dear MPCSN year 1 student, Welcome to select courses for the study period 2. Deadline for selection is 6 October 2020. You can select up to 15 credits (hp) of courses for study period 2. This basically is equivalent to 2 courses of 7,5 credit (hp) each. If you want to study more than that or if you need to set up an individual study plan, you should talk to your student guidance councellor Ingegerd Nilsson (ingegerd.nilsson@chalmers.se). Make sure you have the right prerequisites for the courses and that the schedules (TimeEdit) will work before you submit your choice. Please note that you can select other courses than those listed in the Student Portal by using the "Add course" function at the bottom of the course selection page. Once your course selection outside the programme syllabus is approved, you may add the course to your list of selected courses. If the course you selected outside the programme syllabus is denied, you need to select another course.
MPCSN - COMPUTER SYSTEMS AND NETWORKS, MSC PROGR 1 HT2020 2020-09-15 2020-10-06 Yes Select


Add course
Add function visible to entire group.
If you want to add a course that is not in your course selection, choose the study period when this course starts and enter the course code. If the course is possible to add directly it will be added to your course selection, if not it will become a request that will be treated.
If the request is granted, you will be able to add the course to your course selection. You will not be able to complete your registration as long as you have requested courses that have not been handled.
Start period
Course code:
Save

Degree requirements MPCSN & MPHPC

Degree Of Master (120 Credits):

- Passed courses comprising 120 credits
- Passed advanced level courses (including degree project) comprising at least 90 credits
- Degree project 30 credits
- Advanced level courses passed at Chalmers comprising at least 45 credits
- Courses (including degree project) within a major main subject 60 credits
- Fulfilled course requirements according to the study programme
- The prior award of a Bachelors degree, Bachelors degree in fine arts, professional or vocational qualification of at least 180 credits or a corresponding qualification from abroad.

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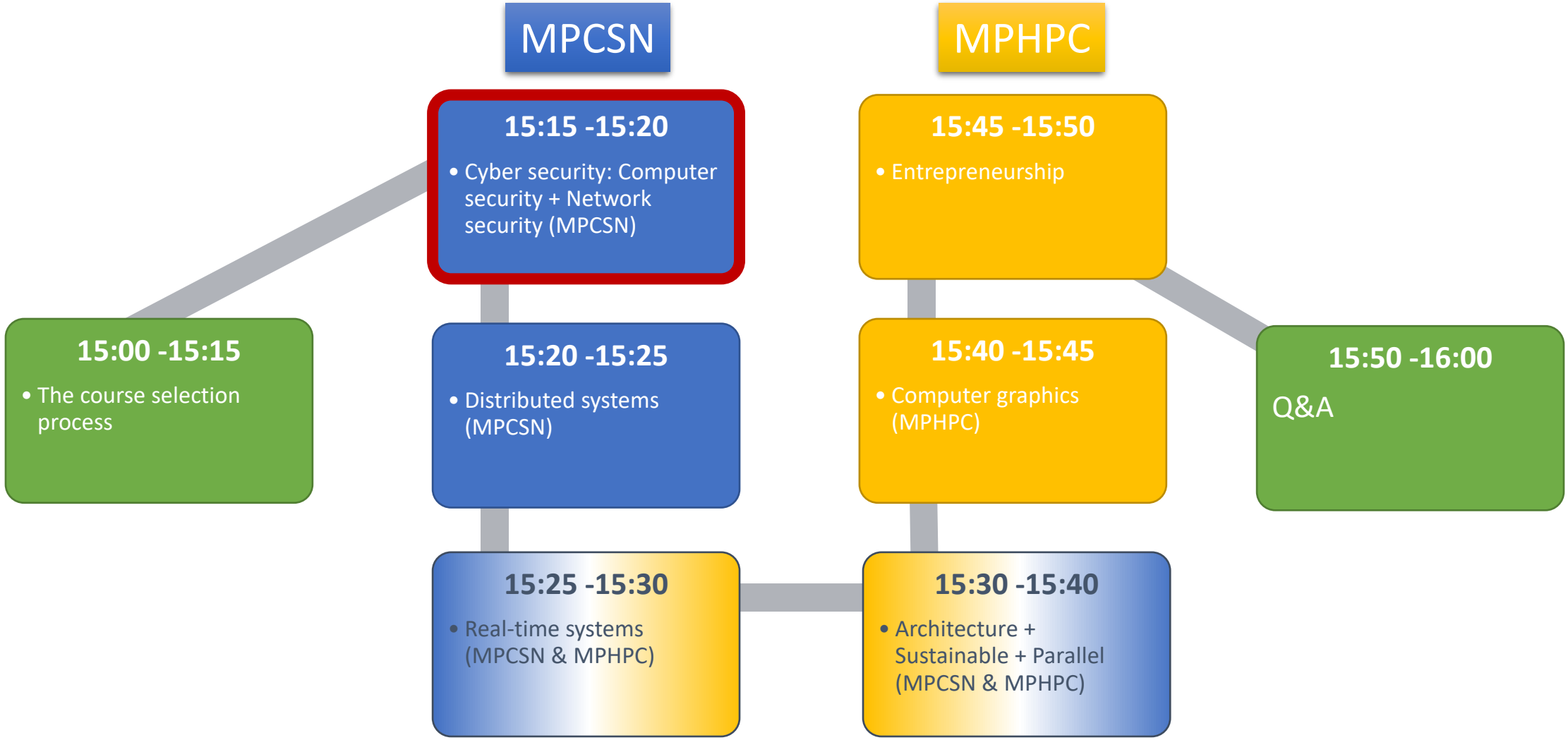

MPCSN
MPHPC
15:15 -15:20
• Cyber security: Computer security + Network security (MPCSN)
15:45 -15:50
• Entrepreneurship
15:00 -15:15
• The course selection process
15:20 -15:25
• Distributed systems (MPCSN)
15:40 -15:45
• Computer graphics (MPHPC)
15:50 -16:00
Q&A
15:25 -15:30
• Real-time systems (MPCSN & MPHPC)
15:30 -15:40
• Architecture + Sustainable + Parallel (MPCSN & MPHPC)

MPCSN Tracks

Obligatory courses

- Computer networks
- Operating systems
- Technical writing
- Master's thesis

Tracks: 2 out of 4
(semi-obligatory courses)

4 **Computer architecture**
- Computer architecture
- Sustainable computing

1 **Cyber Security**
- Computer Security
- Network Security

2 **Distributed systems**
- Distributed systems
- Distributed systems, adv.

3 **Real-time systems**
- Real-time systems
- Parallel and distributed RTS

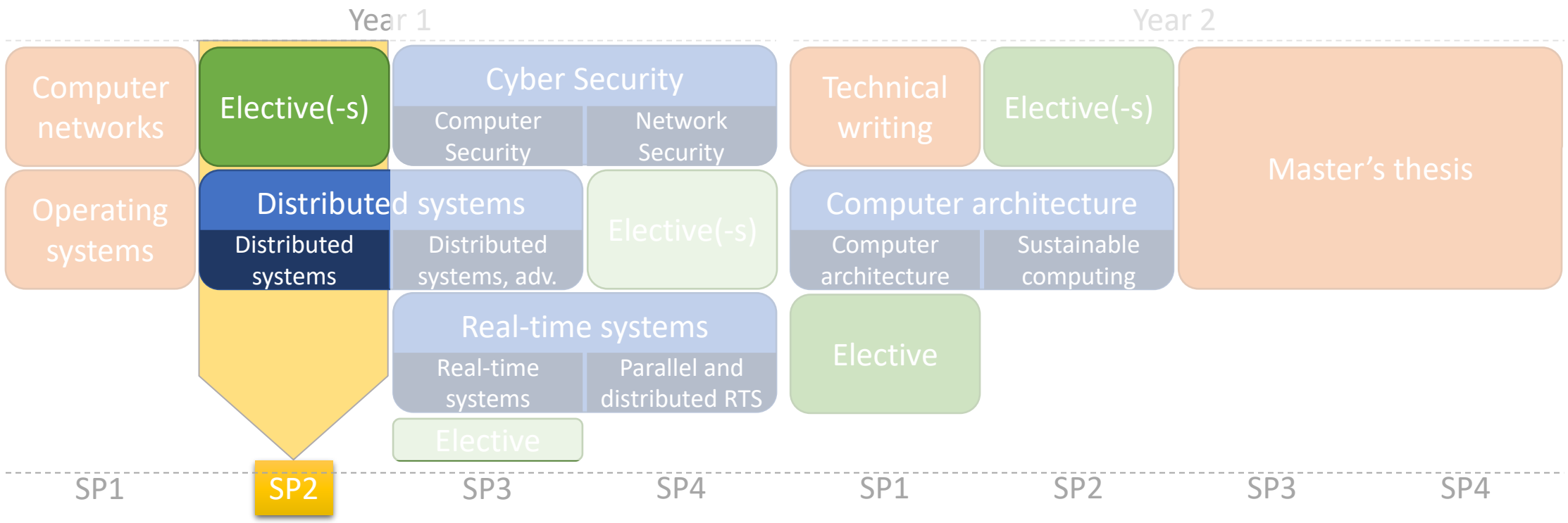
Elective courses

- Elective
- Elective
- Elective
- Elective
- Elective

Direct research exploitation courses:
- Data-driven support for cyber-physical systems (SP1)
- Autonomous and Cooperative Vehicular Systems (SP2) joint course with applied mechanics

19% 25% 25% 31%

MPCSN course timeline



Security Track

Tomas Olovsson

Motivation

Security is needed when adopting the Internet of Things

System architects and designers must have security expertise, systems should not fall victims to trivial attacks

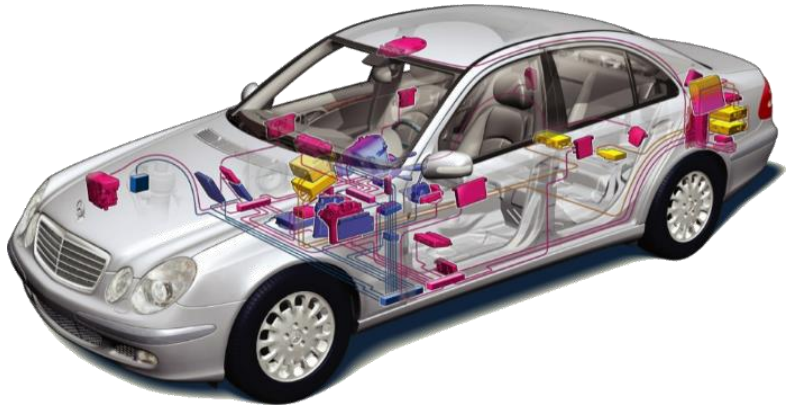
Software developers, programmers must have security expertise for their programs to survive

Security and network specialists must have enough knowledge to protect the systems they are responsible for

“Amateurs produce amateur security, which costs more in dollars, time, liberty, and dignity while giving us less – or even no – security.”

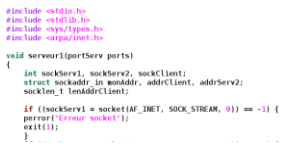
Bruce Schneier

2014 Mercedes S-class



144 Electrical Control Units, ECUs (computers)

200 microprocessors

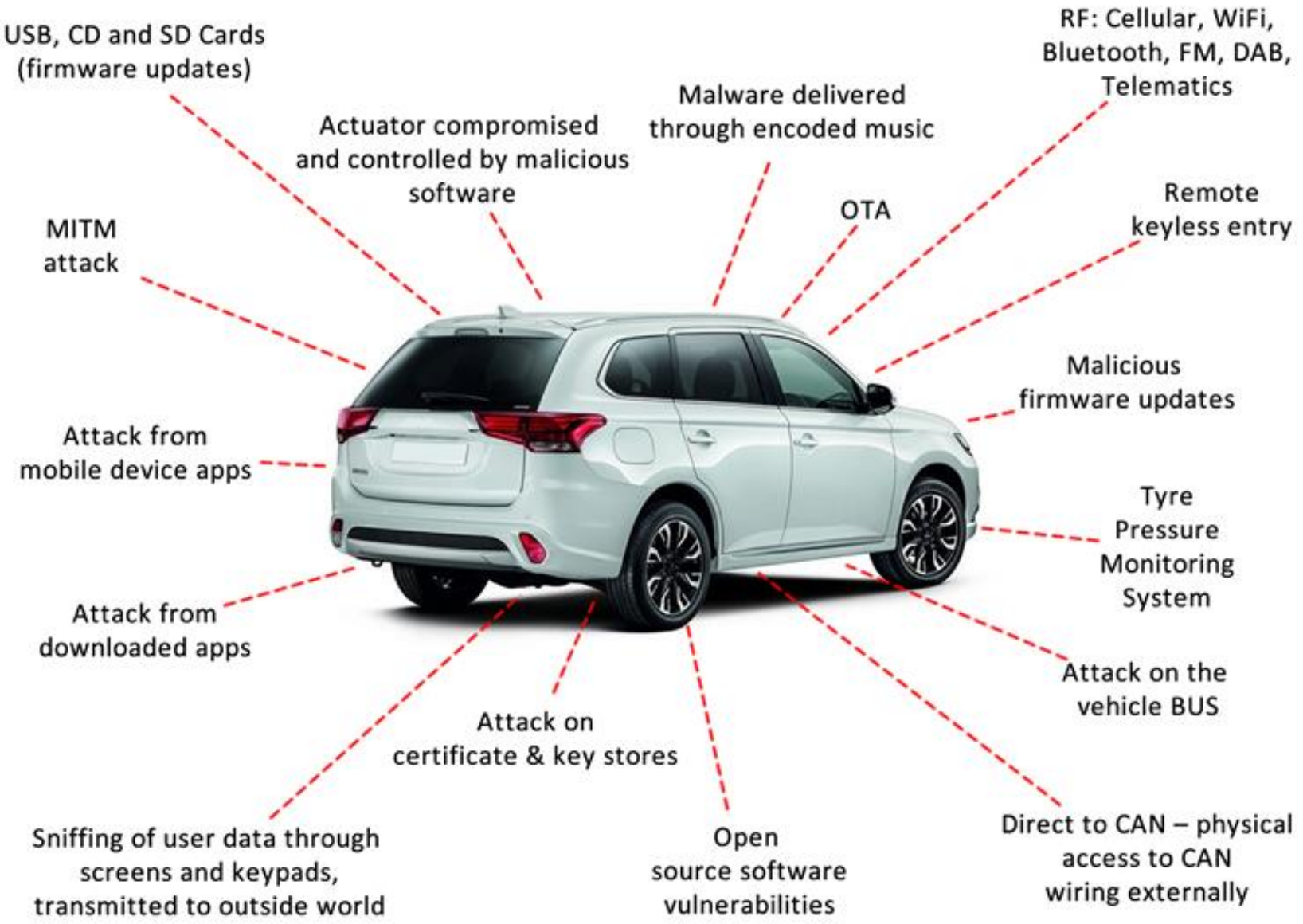


```
#include <stdio.h>
#include <stdlib.h>
#include <sys/types.h>
#include <arpa/inet.h>

void serveur1(portServ ports)
{
    int sockServ1, sockServ2, sockClient;
    struct sockaddr_in monAddr, addrClient, addrServ2;
    socklen_t lenAddrClient;

    if ((sockServ1 = socket(AF_INET, SOCK_STREAM, 0)) == -1) {
    perror("Erreur socket");
    exit(1);
    }
```

65 million lines of code

NASA flight control software: 2 bugs per 1,000 lines of code = 130,000 bugs

Attack Surfaces



Source: pentestpartners.com

http://www.cse.chalmers.se/edu/master/secspec

Security specialization
at Chalmers and Gothenburg University

CHALMERS | UNIVERSITY OF GOTHENBURG

We are proud to possess multifaceted security expertise at Chalmers University of Technology and Gothenburg University, home to a world-leading research environment on computer and network security.

Based on this expertise, we offer a security specialization that consists of the following course package*

Computer Security

The course provides basic knowledge in the security area, i.e. how to protect systems against attacks. Attacks may change or delete resources (data, programs, hardware, etc), get unauthorized access to confidential information or make unauthorized use of the system's services. The course covers threats and vulnerabilities, as well as rules, methods and mechanisms for protection. Modeling and assessment of security and dependability as well as metrication methods are covered. A holistic security approach is presented and organizational, business-related, social, human, legal and ethical aspects are treated.

Runs in study period 3

Compulsory

Cryptography

The course covers cryptographic primitives such as private-key and public-key ciphers, hash functions, MAC's and signatures and how to embed these in cryptographic protocols to achieve basic goals such as confidentiality, authentication and non-repudiation, but also more elaborate services, such as key management, digital cash and electronic voting. Many examples of broken protocols are also discussed to enhance understanding of the engineering difficulties in building secure systems.

Runs in study period 2

Language-based Security

The course covers the principles of programming language-based techniques for computer security. The goal is understanding such application-level attacks as races, buffer overruns, covert channels, and code injection as well as mastering the principles behind such language-based protection techniques as static analysis, program transformation, and reference monitoring. The dual perspective of attack vs. protection is threaded through the lectures, laboratory assignments, and projects.

Runs in study period 4.

Network security

Why is it possible to break into networked applications and computer systems? What weaknesses are used? And what makes one protocol more secure than another? This course answers these questions and many more. We look at weaknesses that have plagued wired and wireless networked systems for years and investigate the security of countermeasures like firewalls and security protocols such as SSL, SSH and IPsec. Knowledge about possible threats and countermeasures is important for understanding what level of security a system and an application can offer.

Runs in study period 4

Compulsory

DAT 300: Data-driven support for cyber-physical systems

- Advanced course, close to research
  - SP1
  - Seminars with research papers and industry speakers
  - Individual projects
- Topics vary slightly from year to year:
  - Data analysis and visualization for the smart grid
  - Intrusion detection for the smart grid
  - New services in the smart grid

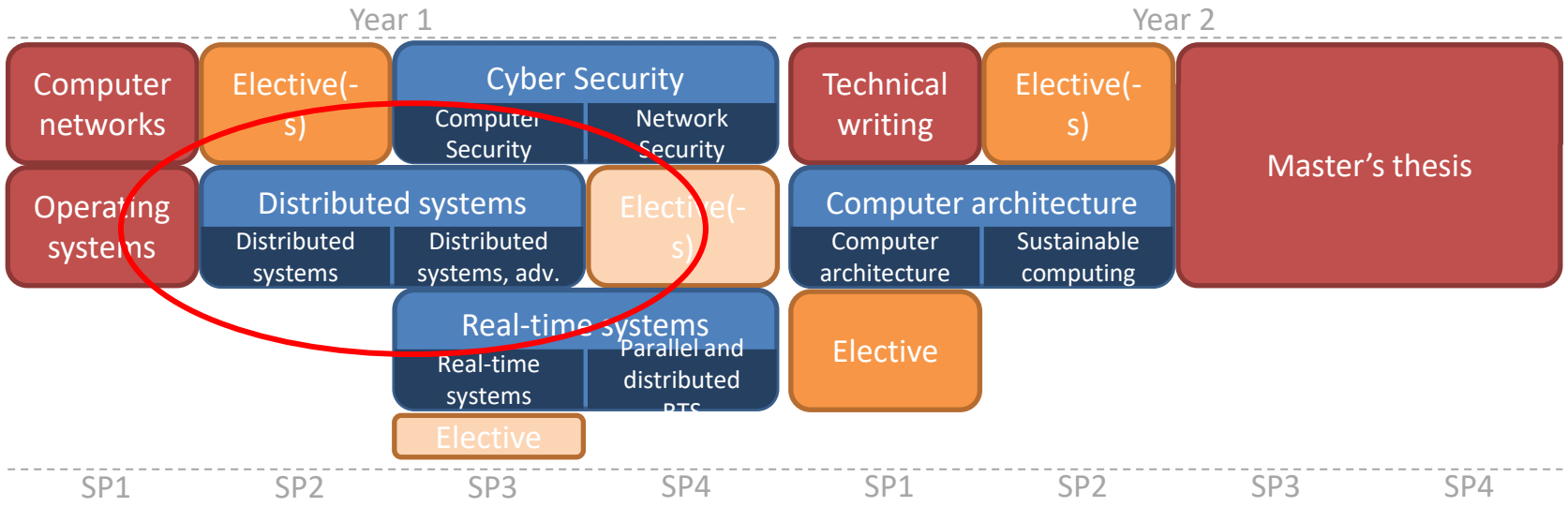
Security by design is important

- System architects and designers must have security expertise
- Software developers, programmers must know how to develop safe, secure and working software
- Security and network specialists must have deep knowledge of security principles and practice

- Necessary when designing applications and systems that should be trusted

DISTRIBUTED SYSTEMS TRACK

Distributed Systems Profile
MPCSN



Distributed Systems Profile

Distributed Systems I

(Year 1, LP 2)

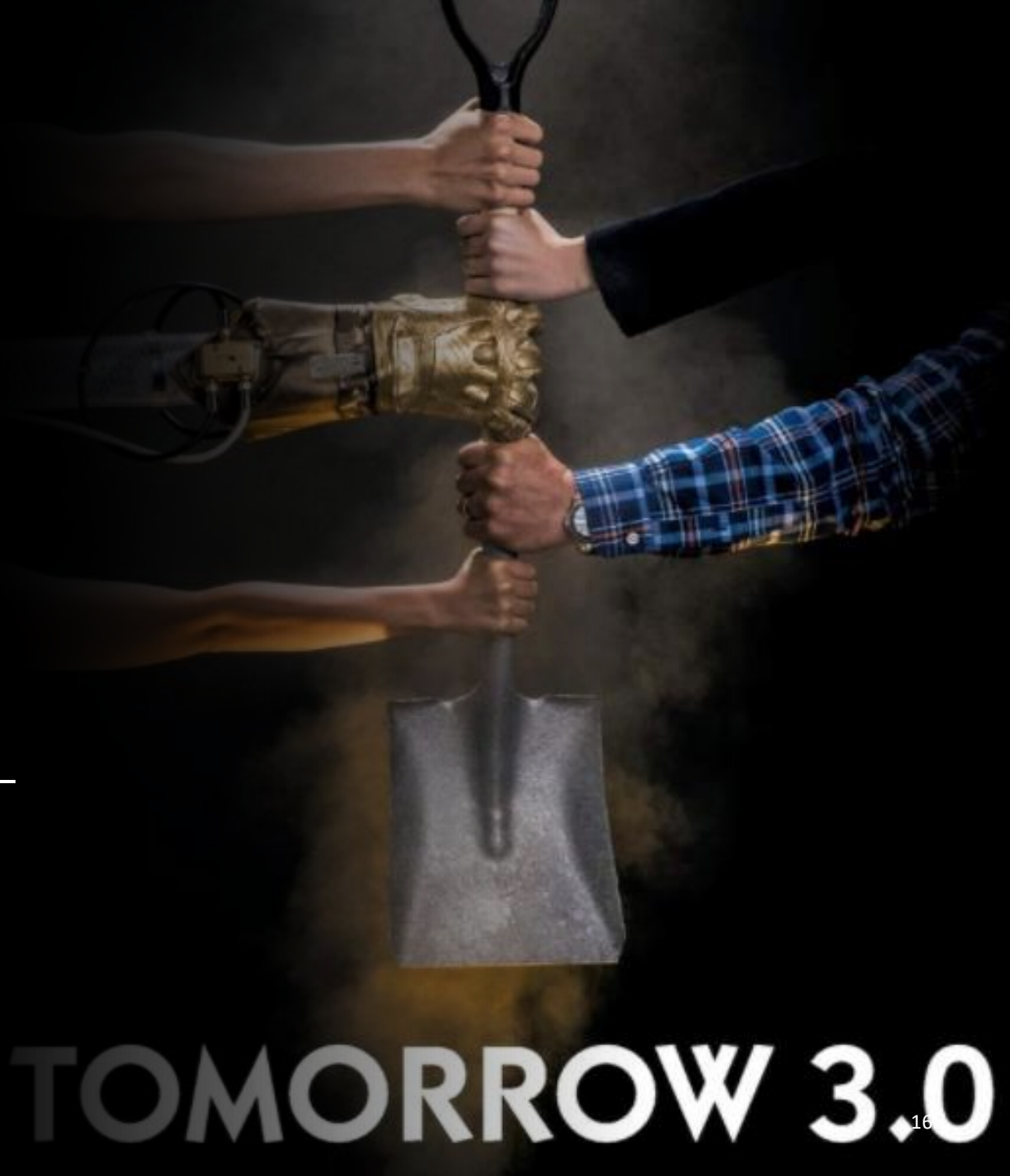
Ahmed Ali-Eldin

Advanced Distributed Systems

(Year 1, LP 3)

Philippas Tsigas

Why should I take this profile?



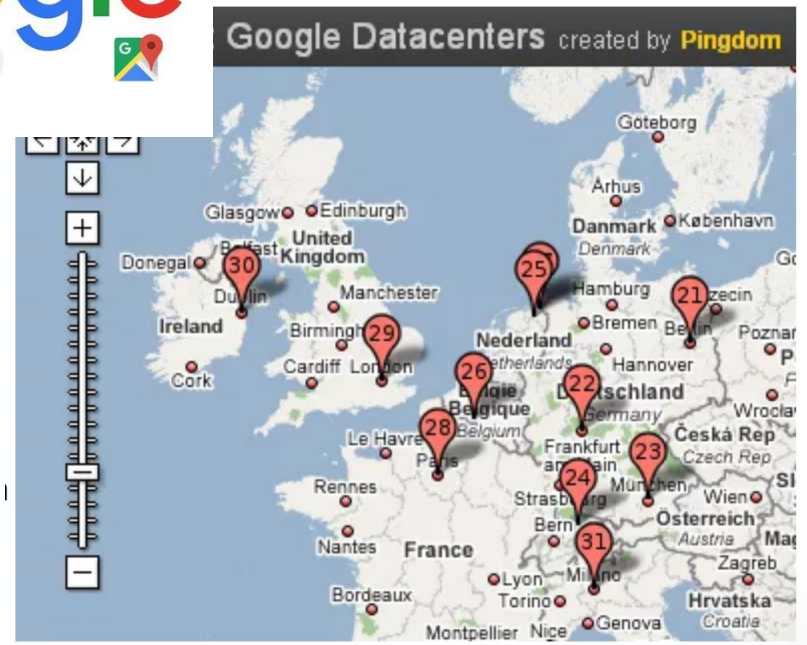
airbnb

UBER

amazon

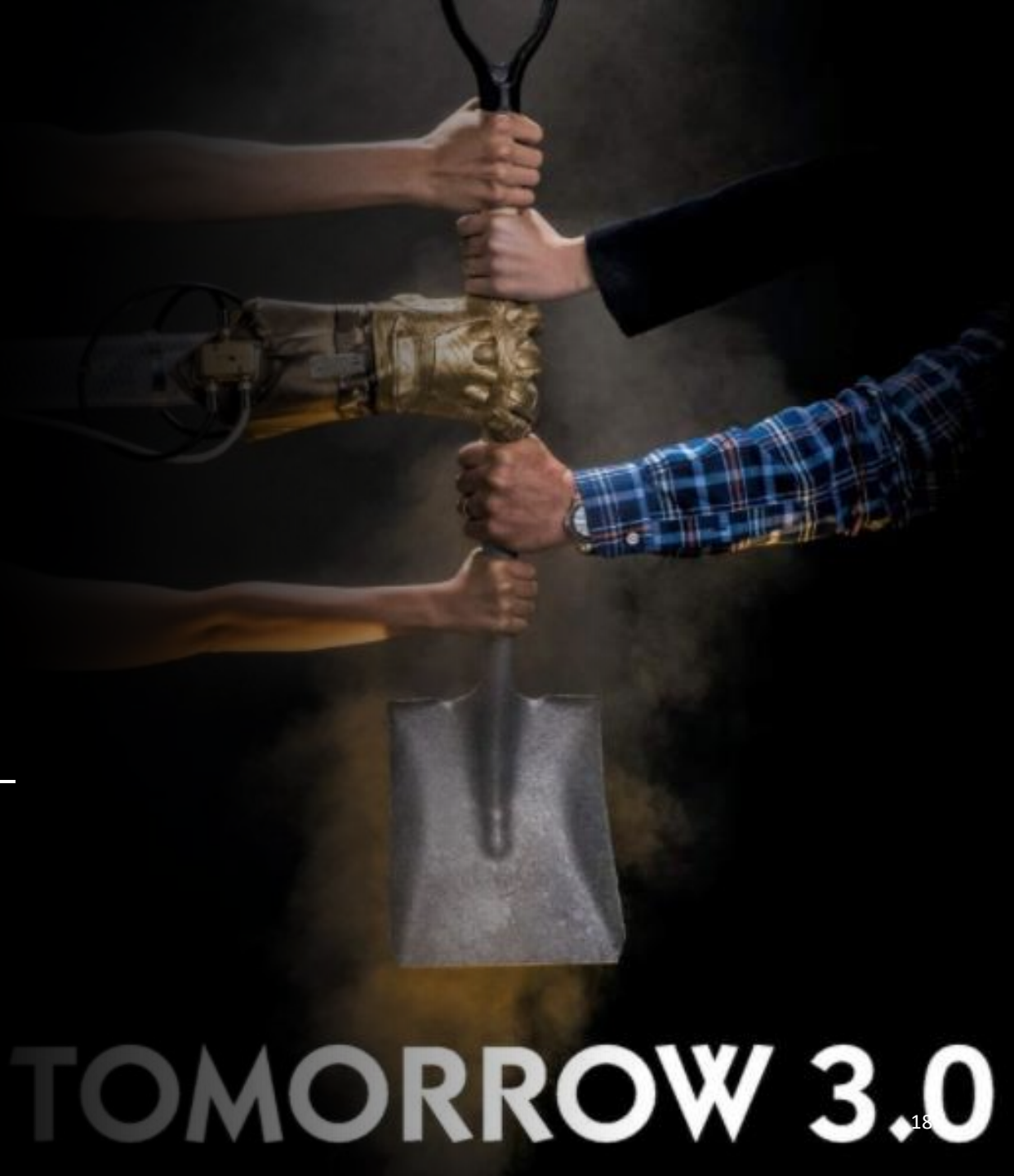
Google

Spotify®



A map view of Google's European data centers.

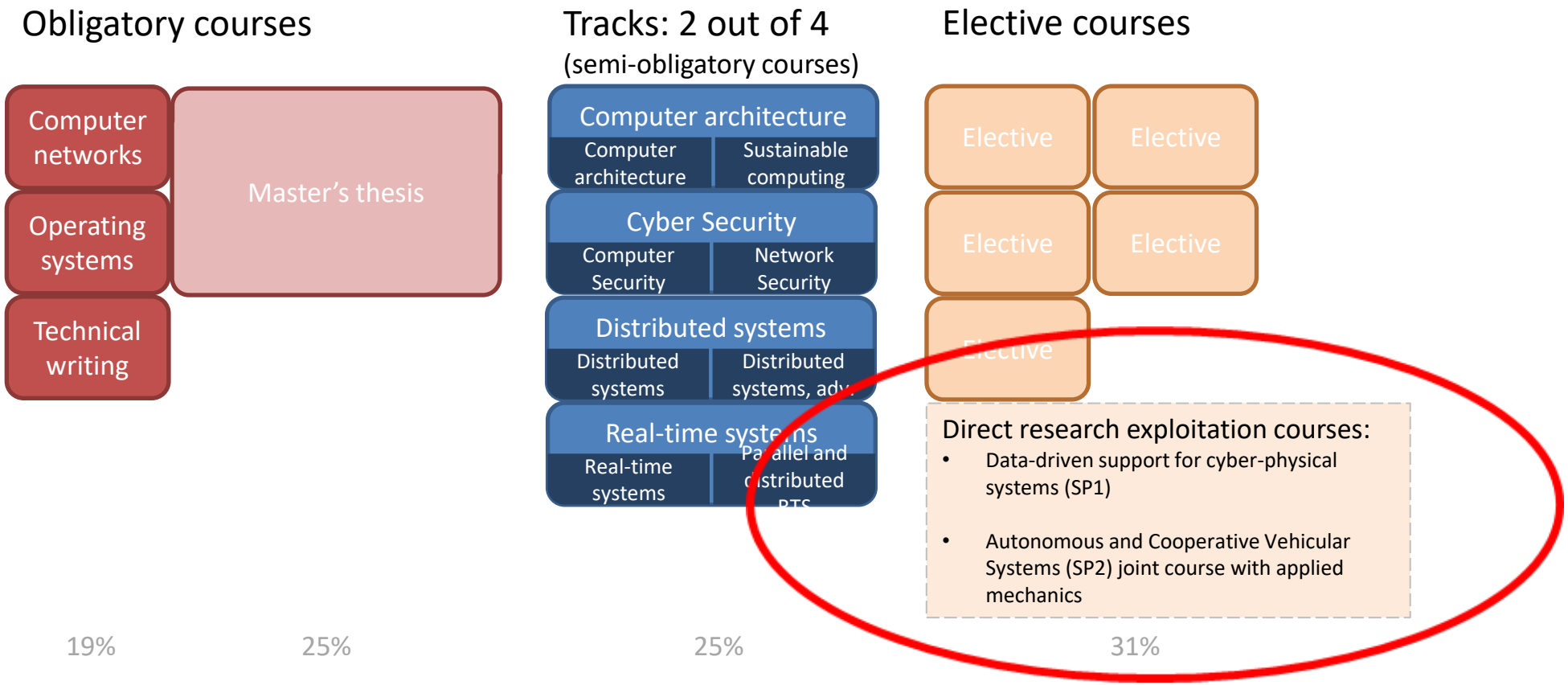
Welcome to the world of **Distributed Platforms**



What will I learn?

- How to build Distributed Systems
  - Concepts and challenges
  - Make them scale, reliable, consistent, …
- Theory and Practice
  - Lectures:
    - Foundation and underlying mechanisms
    - Practice: Real-world challenges and case studies
  - Labs:
    - Master the techniques
    - Feel and learn the challenges

Prepares and connects with the direct research exploitation courses



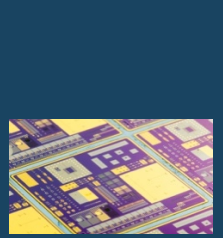
MPHPC 2020
Track & course selection event

Pedro Petersen Moura Trancoso
MPHPC Programme Director (MPA)
Associate Professor
Department of Computer Science and Engineering

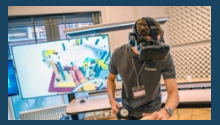
THE TRACKS

Core Knowledge:

Computer Architecture
&
High-Performance Parallel Programming



Computer Systems



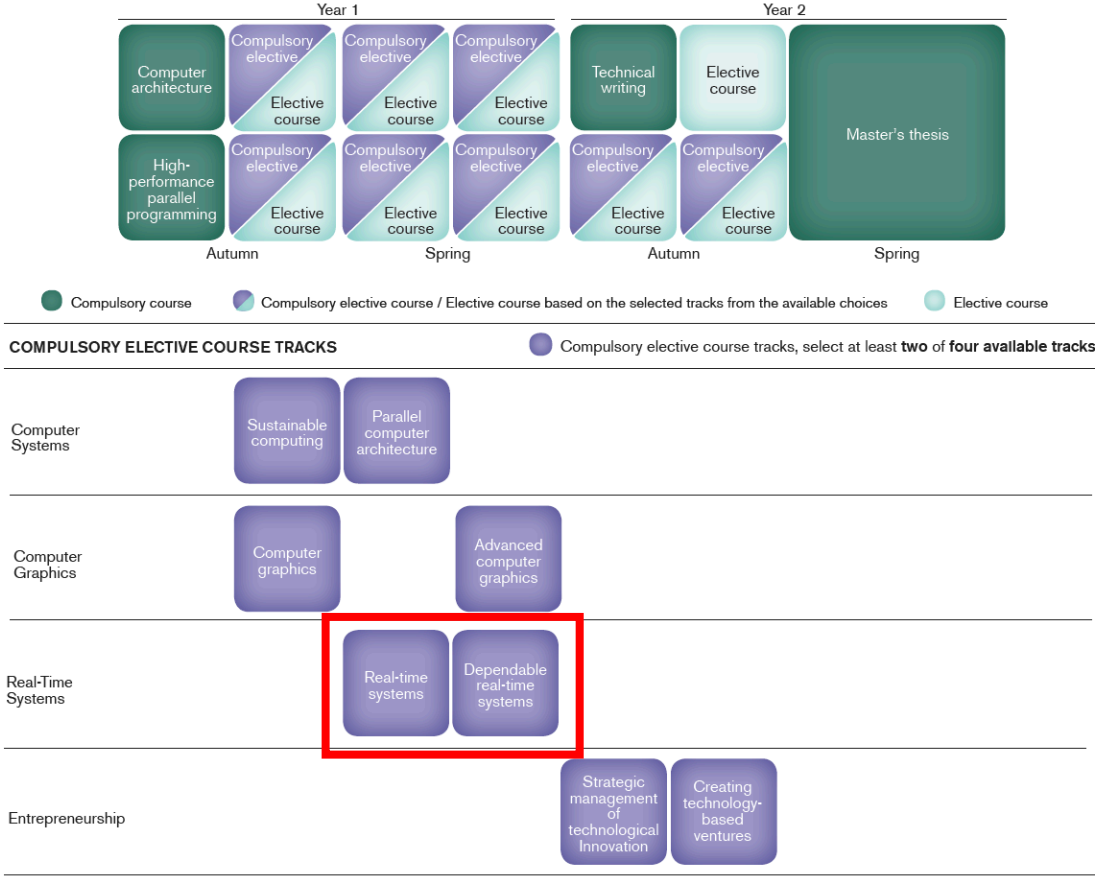
Computer Graphics

Entrepreneurship

Real-Time Systems

Masters Thesis Project

THE STUDY PLAN



Track for both
MPHPC & MPCSN

Real-time systems track

Professor Jan Jonsson

EDA223 (Real-time systems, SP3) +

EDA423 (Dependable real-time systems, SP4)

"A real-time system is one in which the correctness of the system depends not only on the logical result of computation, but also on the time at which the results are generated"

Challenges in real-time computing

Many safety-critical system have strict timing constraints

- E.g. self-driving cars, autonomous robots, weapon systems
- Timing constraints = periodicity, responsiveness (deadlines)

Requires timing to be visible throughout the design process

- At specification level
- At programming language level
- At run-time system level

Intended timing behavior should be formally verified

- Chosen implementation (software/hardware) must be modeled
- Behavior of the model must be verified w.r.t. given specification

Course theory

Programming paradigm (EDA223)

- Concurrent, object-oriented, reactive, and timing aware

Run-time systems (EDA223)

- Task dispatching, network message dispatching

System modeling (EDA223, EDA423)

- Worst-case execution time analysis (EDA223)
- Fault-tolerance and overload management (EDA423)

Scheduling theory (intro in EDA223, advanced in EDA423)

- Uniprocessor / multiprocessor scheduling theory
- Complexity theory for real-time scheduling

Course project assignment

Small synthesizer/sequencer combo (EDA223)

- Be able to play a given melody on a computer board
- Done individually by each project group

Network-aware real-time music application (EDA223)

- Be able to play the melody collectively (in different modes)
- Sets of computer boards connect via a CAN bus

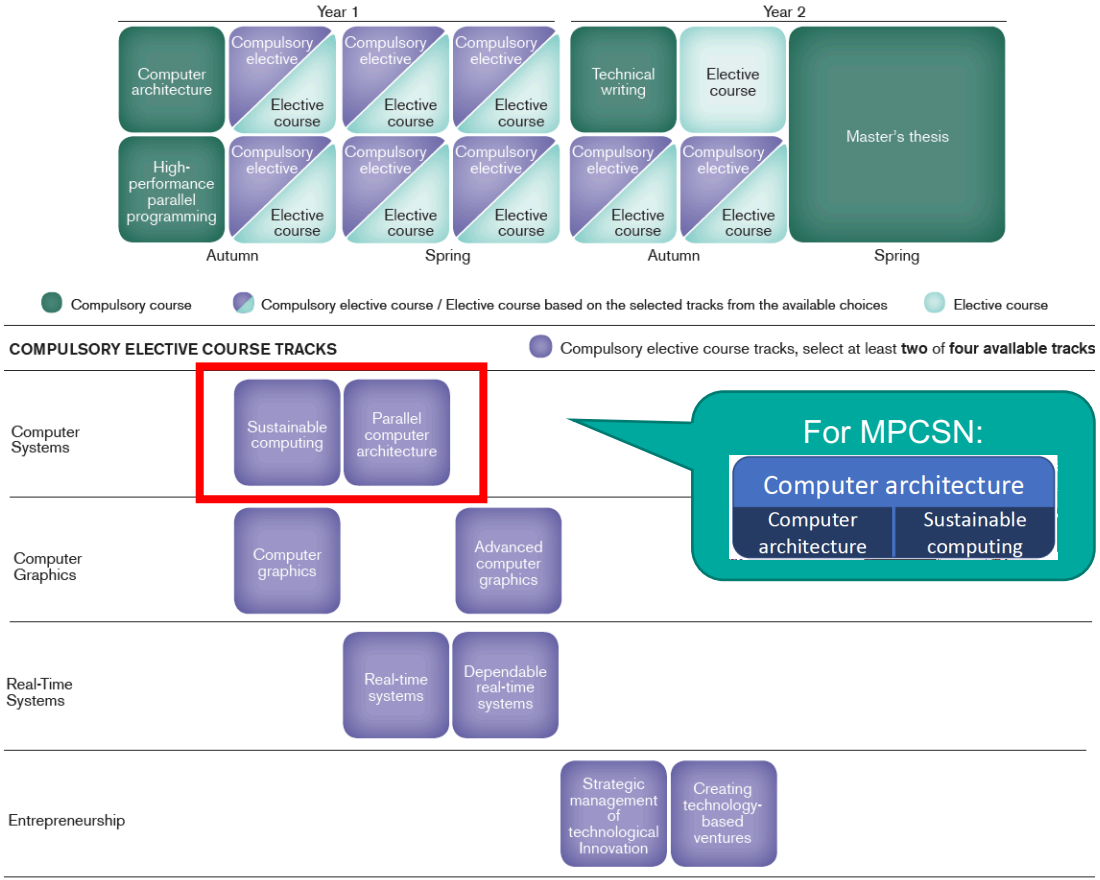
Fault-tolerant application (EDA423 – extends EDA223 assignment)

- Even if one or more boards fail, the collective application must continue to deliver the correct music playing service

Pedagogical twist: The nature of the assignment allows the student to

1. easily trace timing constraints from specification to implementation,
2. clearly perceive when implementation is incorrect (“non-musical”)

THE STUDY PLAN



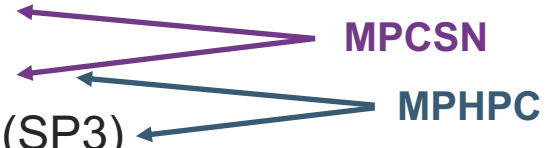
COMPUTER SYSTEMS/ARCHITECTURE TRACKS (MPHPC & MPCSN)

Overview:

- Design of memory and processor technology for High-performance computer systems: present and future parallel and heterogeneous systems as well as holistic energy-efficient solutions from circuits to data-centers

Courses:

- DAT105 Computer Architecture (SP1)
- DAT278 Sustainable computing (SP2)
- EDA284 Parallel computer architecture (SP3)



Computer Architecture (DAT 105)

Credit points: 7.5 EHC

Course Examiner and Lecturer: Per Stenstrom

Teaching Assistant:
Muhammad Waqar Azhar
Fazeleh Hoseini
Evangelos Vasilakis

Department of Computer Science & Engineering
Chalmers University of Technology

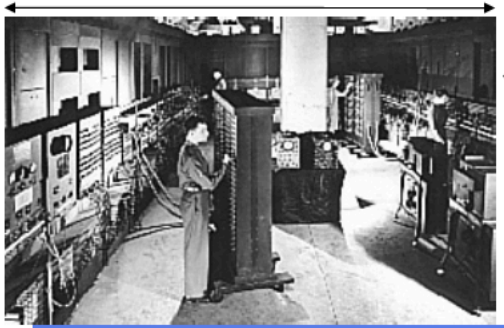
A Fascinating Success Story

Intel i9 (2017)
~ 30 billion ops/s,
~ 7 billion transistors

~ 3.7 cm

ENIAC (1946):
~ 1000 ops/s 18000 vacuum tubes

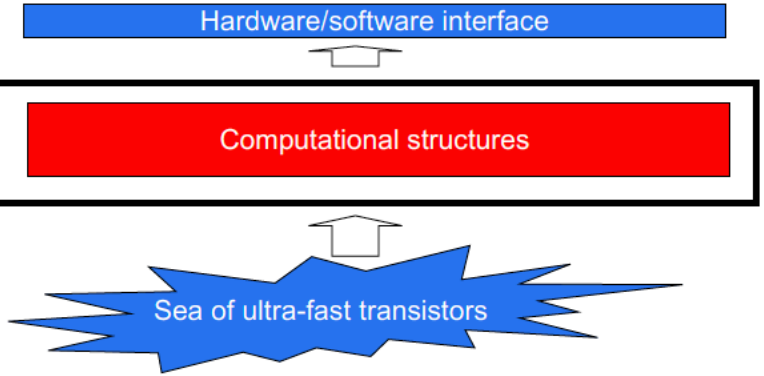
~ 10 m



Millions of times faster, smaller, and more cost effective

Michel Dubois, Murali Annavaram, Per Stenström © 2019

Computer Architecture



The engineering discipline of computer design

The hardware/software interface

- Instruction Set Architecture (ISA)
- Computer organization
- Hardware design

Learning Objectives

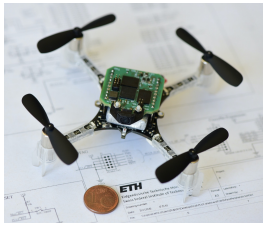
After the course you should:

- **master** fundamental **concepts and terminology**
- **understand** **design principles of processors**
- **understand** **design principles of memory hierarchies**
- **understand** **design principles of multicore microprocessors**
- **be able to use** **modeling methods** to assess the impact design alternatives have on **performance/energy**

DAT278 SUSTAINABLE COMPUTING

Computing for sustainability: Efficient systems for sustainability applications

Sustainable computing: sustainable data center systems



Low-power HW devices:

- ML accelerators
- Algorithms
- Compilers
- Runtime

HW-SW Co-design

Course objectives

4.4

- Be aware!
- Act responsibly
- Participate in discussions
- Design more efficient systems
- Program more efficient applications
- Use more appropriate technology
- Harvest or re-use consumed energy
- MAKE A DIFFERENCE!

EDA284: Parallel Computer Architecture

DAT400: High Performance Parallel Programming

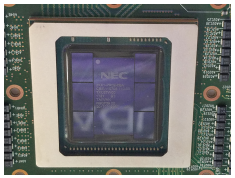
DAT105: Computer Architecture

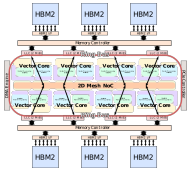
Threads, processes, warps, vectorization, fine-grained synchronization, shared memory, message passing, mutexes, atomics, locality-aware programming...

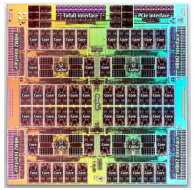
How to design scalable parallel computers?
How to support parallel programming in HW?

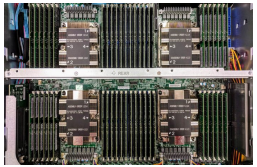
Components

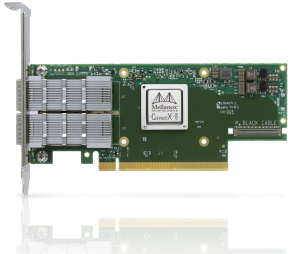
1. **SIMD & Vector Processors**
2. **Multicores & NUMA systems**
3. **Clusters & Message Passing HW**
4. **Accelerators (GPGPU)**
5. **Atomicity, Coherence & Consistency**

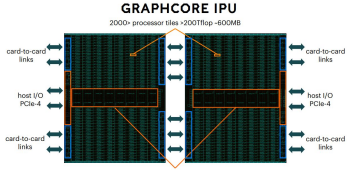






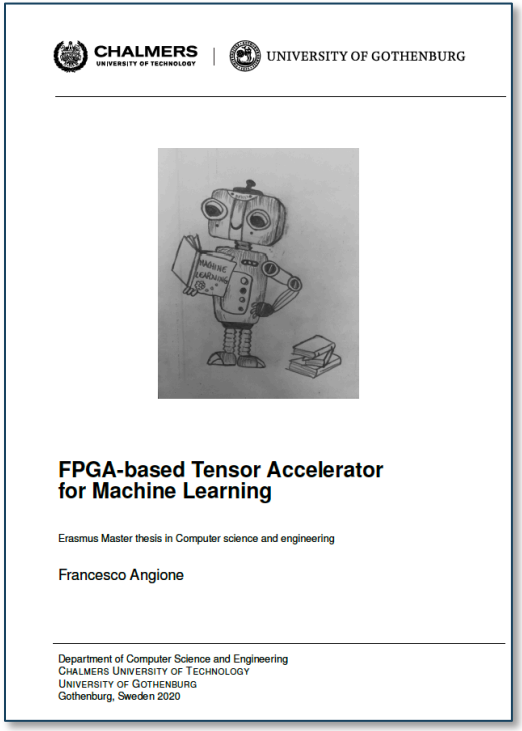






COMPUTER SYSTEMS THESIS EXAMPLES

- Implementation of a ML accelerator in FPGA
- Efficient ML training
- Runtime system for a new parallel programming model
- Resource management system for saving energy
- In-memory computing accelerators


CHALMERS UNIVERSITY OF TECHNOLOGY | UNIVERSITY OF GOTHENBURG

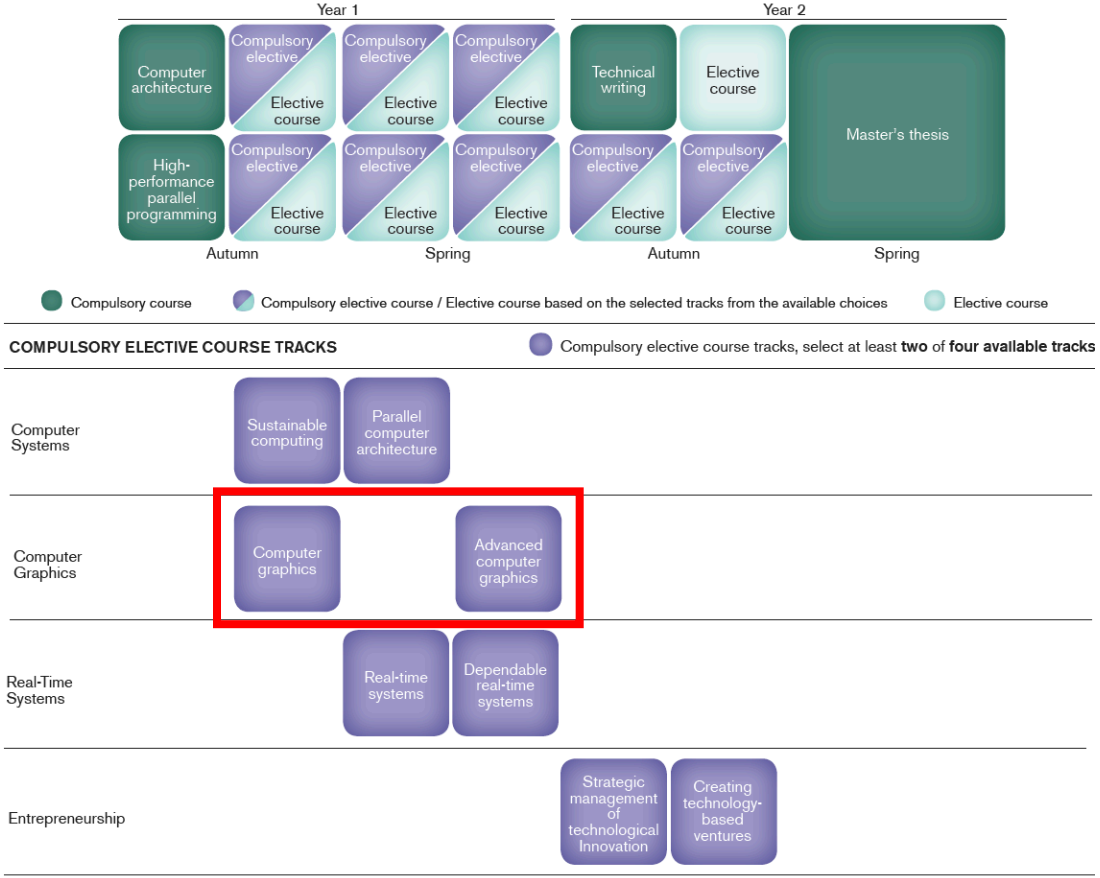
FPGA-based Tensor Accelerator for Machine Learning

Erasmus Master thesis in Computer science and engineering

Francesco Angione

Department of Computer Science and Engineering
CHALMERS UNIVERSITY OF TECHNOLOGY
UNIVERSITY OF GOTHENBURG
Gothenburg, Sweden 2020

THE STUDY PLAN



COMPUTER GRAPHICS TRACK

- Computer graphics is everywhere
  - **Movies / TV**
  - **Video Games**
  - **Product Visualization** (commercials/online)
  - **Simulators** (eg. surgical/flight/…)
  - **Lots of deep learning research**
  - …

TDA362 - COMPUTER GRAPHICS

- Lectures (14)
  - Developed along with the course book
  - Teaches the basic theory and algorithms for real-time and offline rendering.
- Labs (6 + project)
  - Teaches you to write a real-time renderer (OpenGL) from scratch
  - Optionally implement a path-tracer

DAT205 – ADVANCED COMPUTER GRAPHICS

- Lect
  - Ph
  - Gr
- Sem
  - Ea
- Proj
  - Whatever you

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Real-Time Water Animation and Rendering using Wavefront Parameter Interpolation

Master's thesis in Complex Adaptive Systems

Gustav Olsson

Department of Computer Science and Engineering
Chalmers University of Technology
University of Gothenburg
Gothenburg, Sweden 2017

CHALMERS
UNIVERSITY OF TECHNOLOGY | UNIVERSITY OF GOTHENBURG

Convincing Cloud Rendering
An Implementation of Real-Time Dynamic Volumetric Clouds in Frostbite

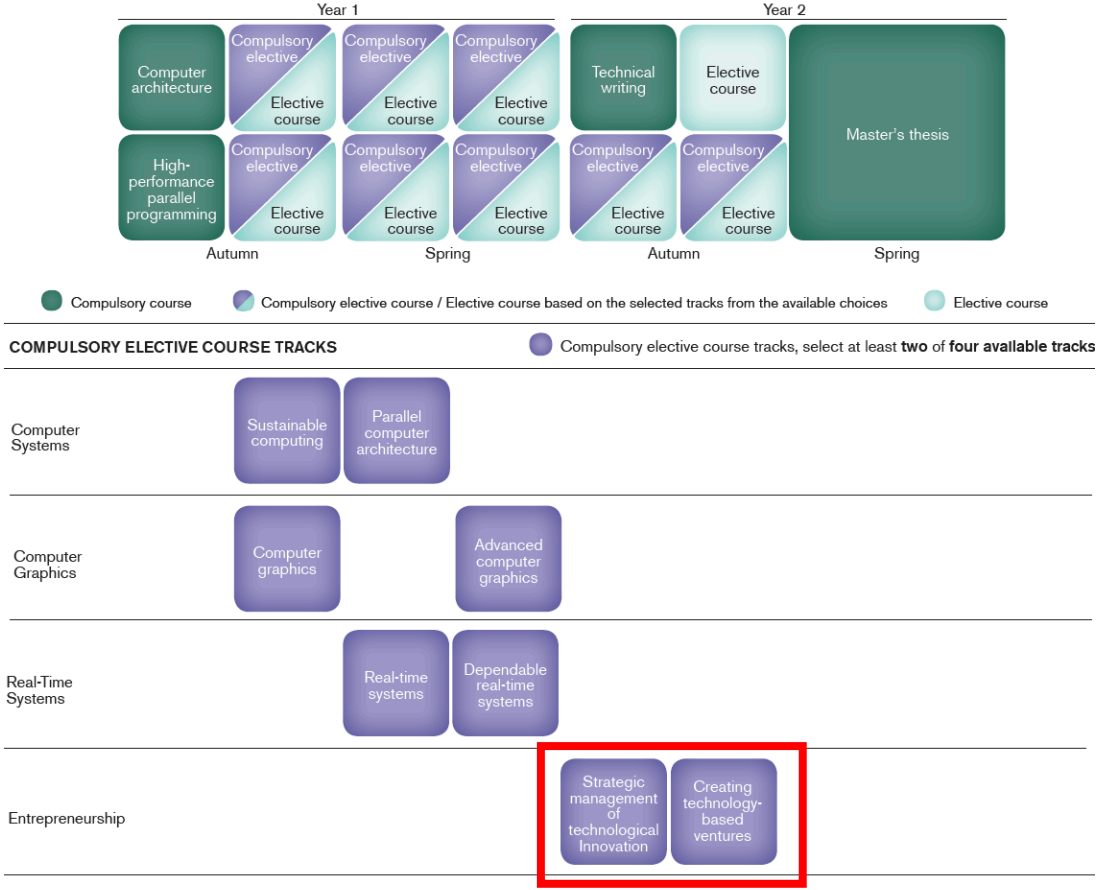
Master's thesis in Computer Science – Computer Systems and Networks

RURIK HÖGFELDT

Department of Computer Science and Engineering
CHALMERS UNIVERSITY OF TECHNOLOGY
UNIVERSITY OF GOTHENBURG
Gothenburg, Sweden 2016

VORKS®

THE STUDY PLAN



ENTREPRENEURSHIP TRACK

- Courses:
  - Strategical management of technological innovation (Y2 SP1)
  - Creating technology-based ventures (Y2 SP2)

Q&A

Also: Canvas discussion board!

EXIT POLL!

- Go to www.menti.com and use the code 12 12 77 6
- https://www.menti.com/e613daqmp5

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