



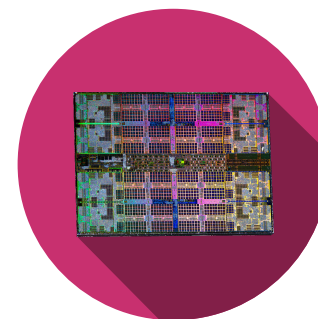
Computer Architecture

Introduction

Ind

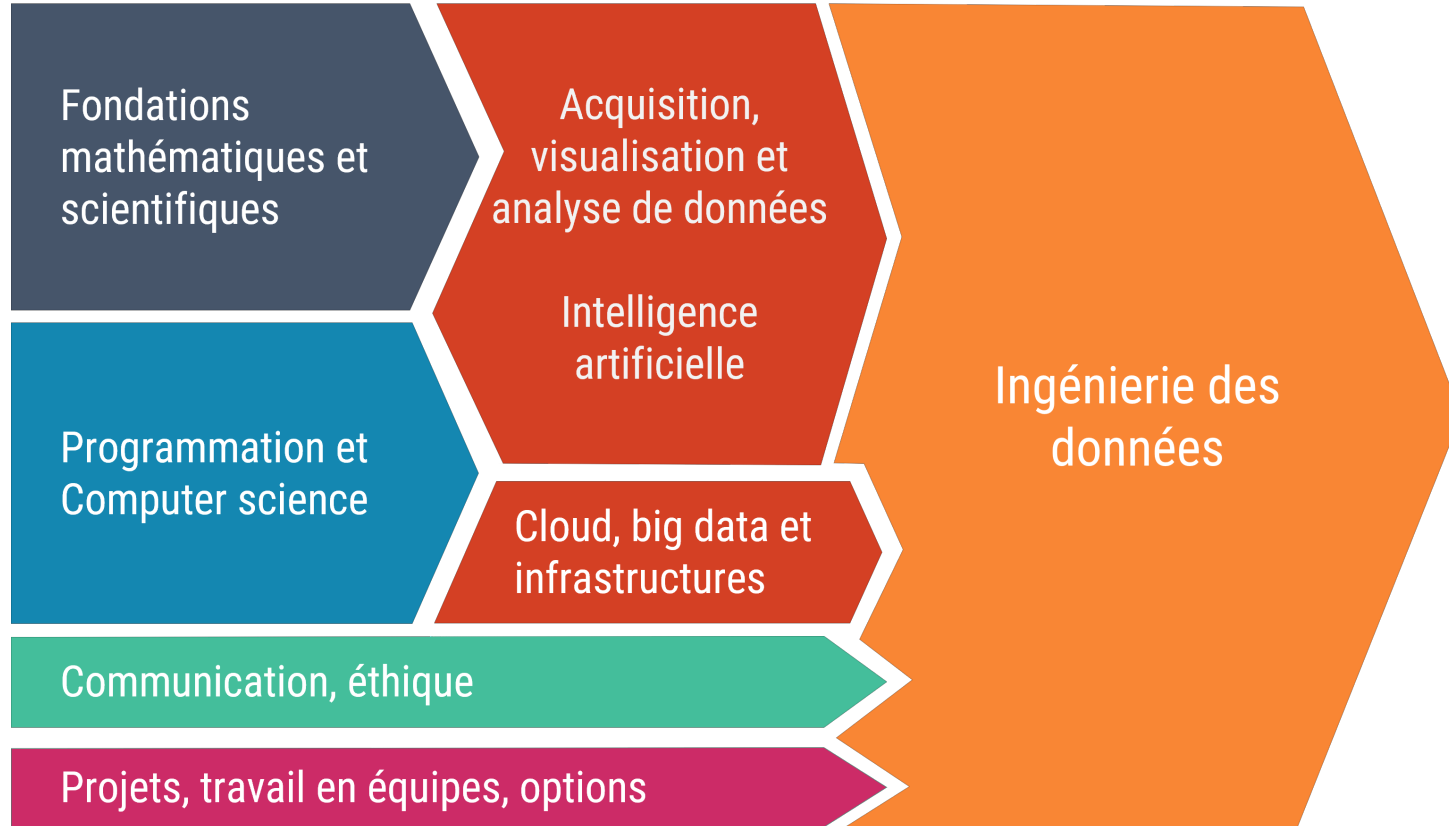
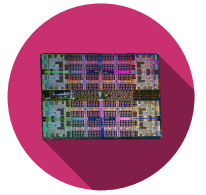
Information and Communication Systems program

Silvan Zahno silvan.zahno@hevs.ch



Modules

ISC

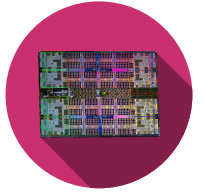


**BSc en Informatique
et Systèmes de
communication**



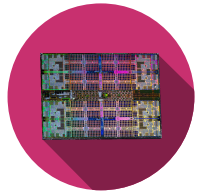
Modules

First Year



1 ^{ère} année / 1. Jahr	Cours Vorlesungen	Heures Stunden	Crédits Credits
	Semestre 1 / Semester 1	32	28
	Algèbre linéaire 1 / Lineare Algebra 1	4	4
	Analyse 1 / Analysis 1	6	5
	Communication 1 / Kommunikation 1	2	2
	Ethique et aspects juridiques / Ethik und Rechtsaspekte	2	2
	Langues 1 / Sprachen 1	4	3
	Programmation impérative / Imperative Programmierung	8	7
	Systèmes numériques / Digitale Technik	6	5
	Semestre 2 / Semester 2	36	32
	Algèbre linéaire 2 / Lineare Algebra 1	4	4
	Analyse 2 / Analysis 2	6	5
	Architecture des ordinateurs / Computerarchitektur	4	3
	Communication 2 / Kommunikation 2	2	2
	Intro. à la sécurité / Sicherheitbewusstsein	4	3
	Langues 2 / Sprachen 2	4	3
	Programmation objet / Objektorientierte Programmierung	8	6
	Réseaux / Netzwerke	4	6
ZaS	Projet 1 / Projekt 1		
	CAr Ind	Summer school	3 4

Goal of the course



Understand the basic structure of modern computers and its connection with programming.

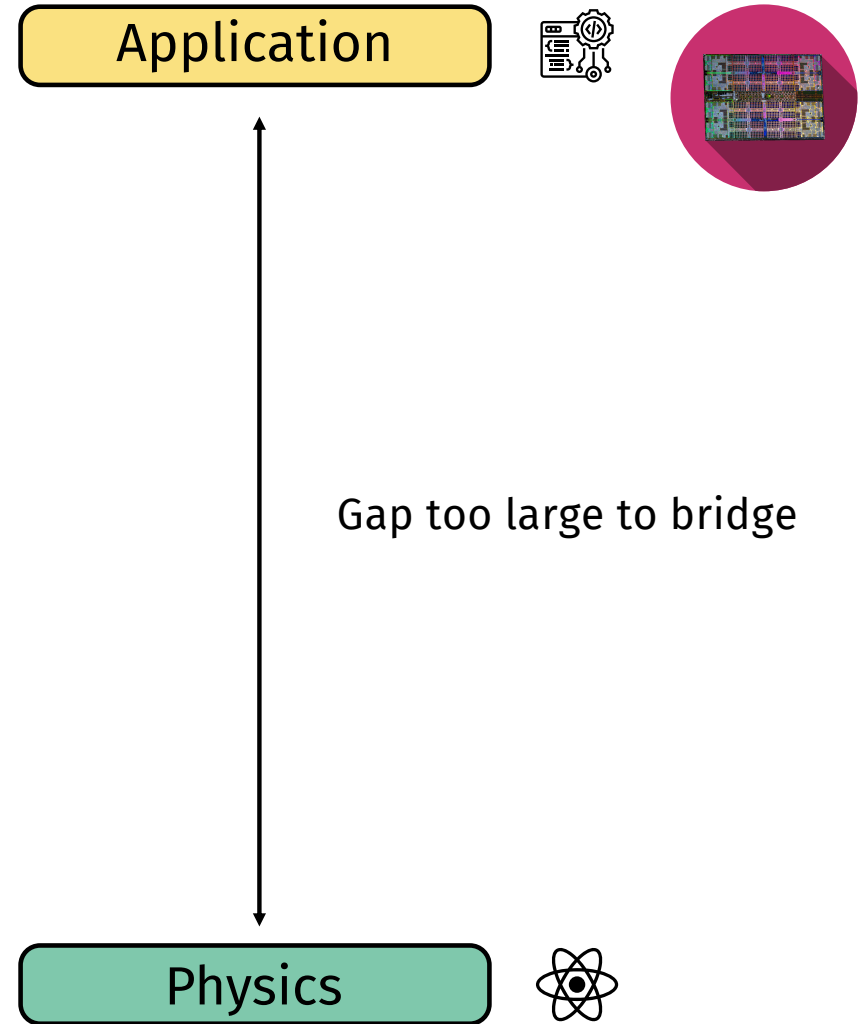
This means:

- Methodical basics: beginning of the semester
- Simple system: end of the semester

What is Computer Architecture?

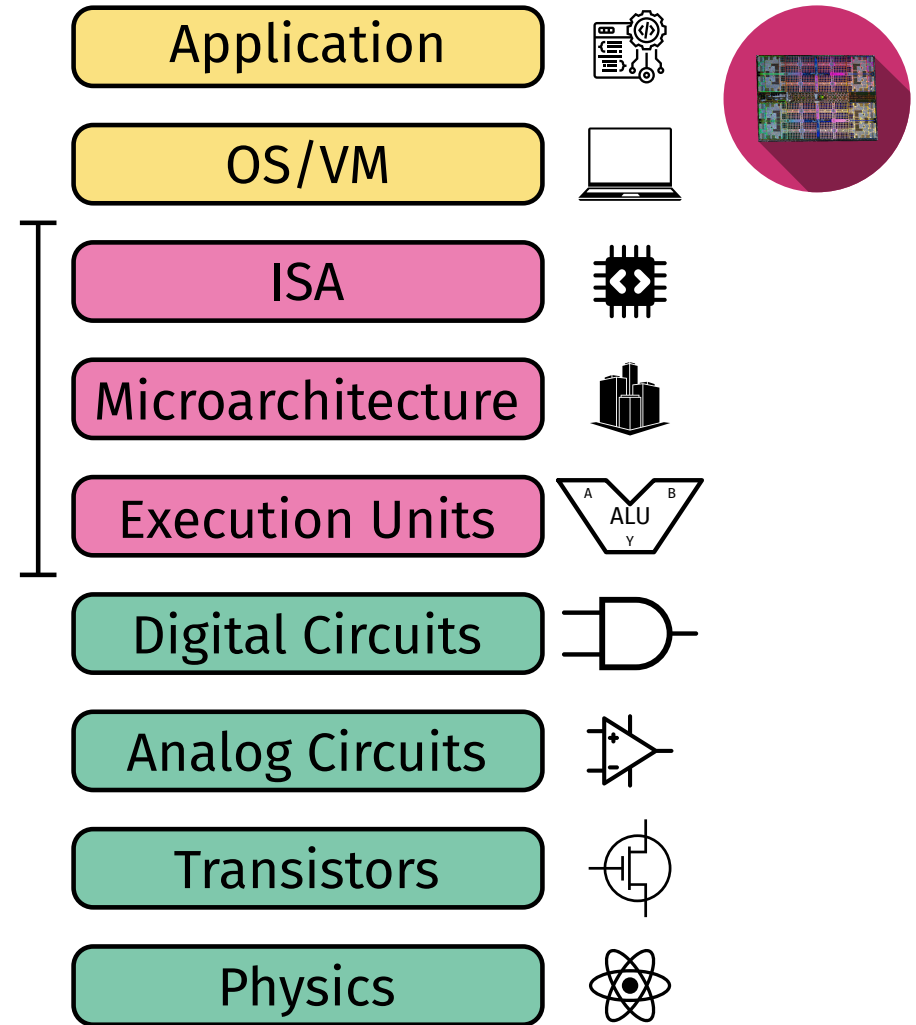
The gap

In the most general definition, computer architecture is the design of the abstraction and implementation layers that allow us to execute information processing applications efficiently using manufacturing technologies



What is Computer Architecture?

The different layers



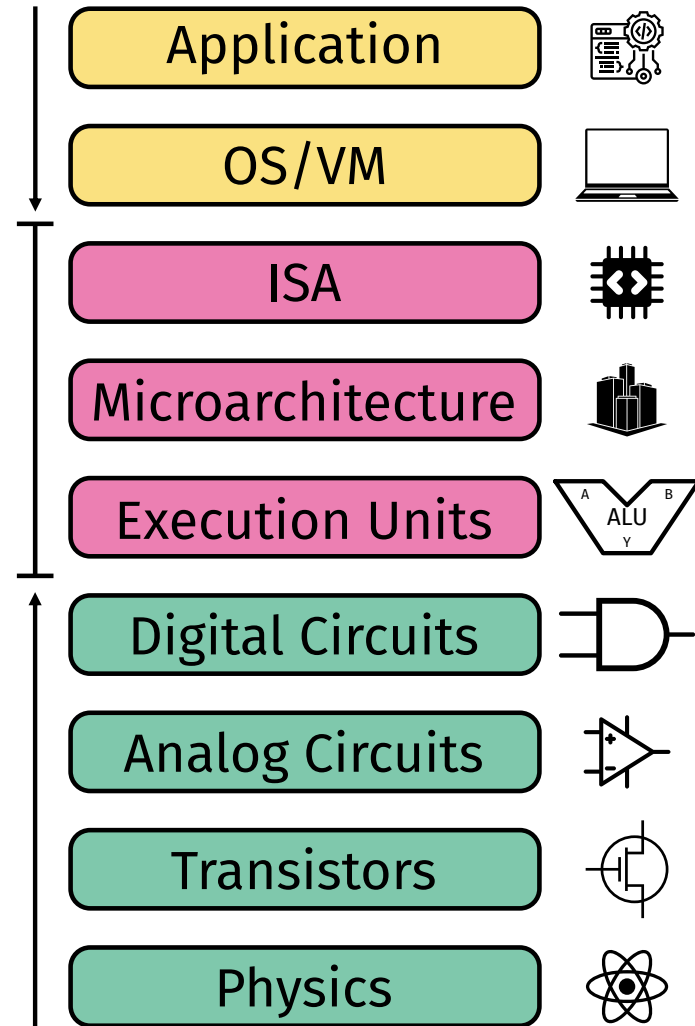
What is Computer Architecture?

Constantly changing

Application
Requirements

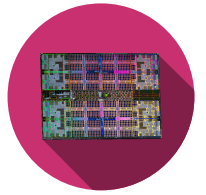
Car
We are here

Technology
Constraints

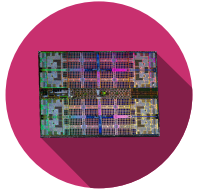


Computer Architecture in practice

Ariane 5



Application Areas



Organisation

Contact points

Professors

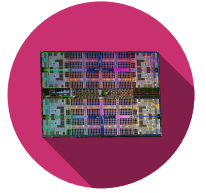


Zahno Silvan (ZaS)
Office: ENG.23.N312
Email: silvan.zahno@hevs.ch
Tel: +41 58 606 88 07

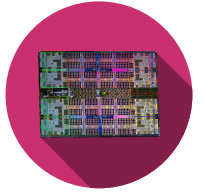
Collaborators



Amand Axel (AmA)
Office: ENG.23.N313
Email: axel.amand@hevs.ch
Tel: +41 58 606 87 43



Organisation



- Cours - 2h/week
- Labor - 2h/week
- Project - last 5-6 weeks
- Exam
 - Labo evaluation
 - Project evaluation
 - Exam at the end of the semester (only summary of 2 pages allowed)

	<i>Fallsemester (DiD)</i>			<i>Springsemester (CAr)</i>		
Evaluation	Exa 1	Project	Exa Sem	Labo	Project	Exa
Coefficient	0.5	0.5	1	0.5	0.5	1
Semestergrade	1		1	1		1
Modulegrade	5/9			4/9		

Documents and Informations

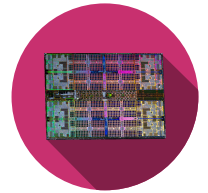
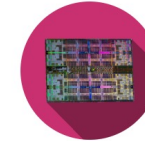
Moodle Cyberlearn

- <https://isc.hevs.ch/learn/course/view.php?id=12>
- 102.2 – ArchOrd
- Password: welcome

Microsoft Teams

- ISC-CAR
- Access Code: tah5o6p
- Channels
 - Announcements – Message of the module management
 - General – Class chat

INFORMATIONS DU MODULE – MODULINFORMATIONEN MODULE Car – KURS CAR



Le module "102 Architecture materielle" est composé des deux cours suivants: 102.1 Systèmes numériques et 102.2 Architecture des ordinateurs.

Das Modul "102 Materielle Architektur" besteht aus den beiden folgenden Kursen: 102.1 Digitale Systeme und 102.2 Computerarchitektur.

Vous trouverez tous les documents de cours sur le repo Git.

Alle Kursdokumente finden Sie auf dem Git Repository.

Download: [zip](#)

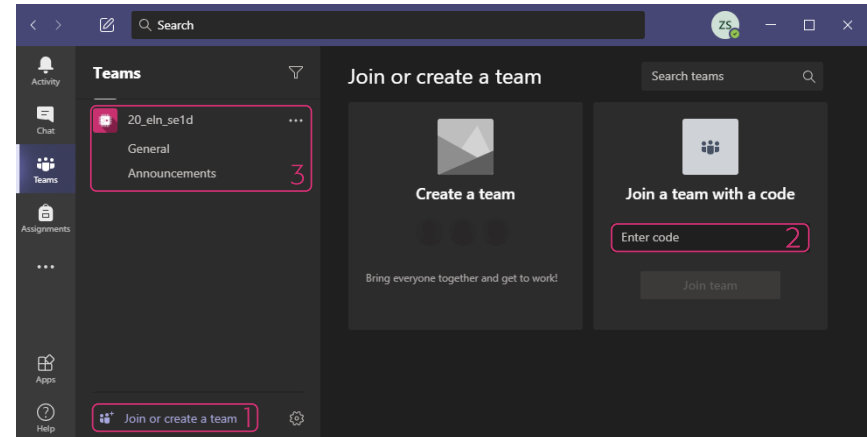
Clone the repo `git clone https://github.com/hej-isc-car/car-docs.git`

Descriptive du module / Modulbeschreibung

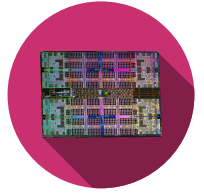
- 102-Architecture_materielle_de
- 102-Architecture_materielle_fr
- 102-Architecture_materielle_en

Planification hebdomadaire / Wochenplanung

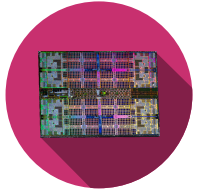
- CAR-ISC-Planning



What programming languages do you know?



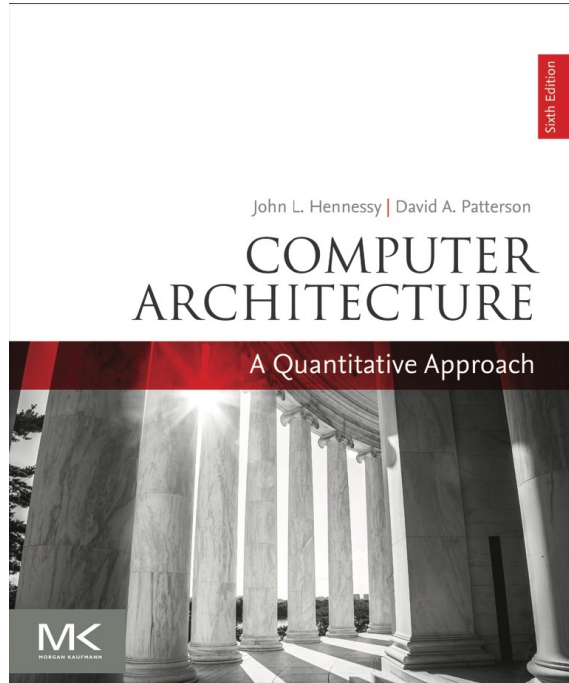
Additional Books



Computer Architecture – A Quantitative Approach

John L. Hennessy & David A. Patterson

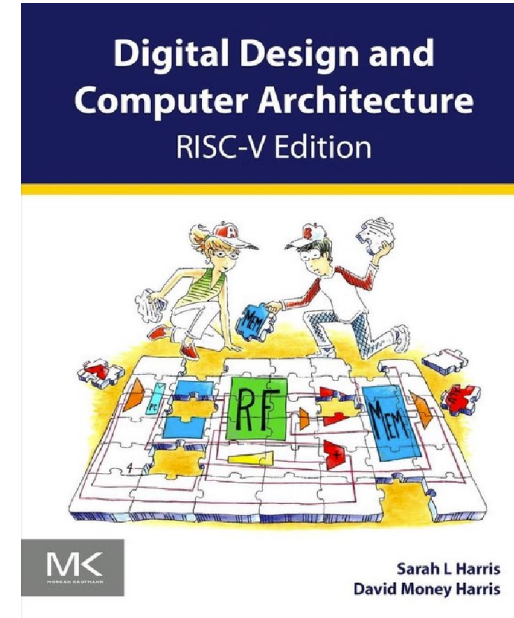
ISBN: 978-0-12-811905-1



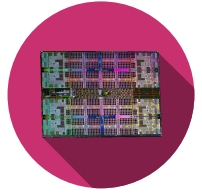
Digital Design and Computer Architecture

Sarah L. Harris & David Money Harris

ISBN: 978-0-12-820064-3



References



[1]

“Ariane 5 rocket launch explosion - YouTube.”

https://www.youtube.com/watch?v=PK_yguLapgA&t=142s (accessed Jul. 18, 2022).

[2]

J. L. Hennessy and D. A. Patterson, *Computer Architecture: A Quantitative Approach*, 6th Edition. Elsevier, 2019.

[3]

HEVs, “Formation Bachelor Ingénieur·e en I... | HES-SO Valais-Wallis,” *La HES-SO Valais-Wallis propose 10 filières de formation dans 5 Hautes Ecoles: Ingénierie, Gestion, Santé, Travail Social et Art*. <https://www.hevs.ch/fr/hautes-ecoles/haute-ecole-d-ingenierie/informatique-et-systemes-de-communication/formation-bachelor-ingenieure-en-informatique-et-systemes-de-communication-201140> (accessed Jul. 18, 2022).

[4]

Prof. Dr. Ben H. Juurlink, *TU Berlin: Course AES*, (Oct. 22, 2018). Accessed: Jul. 18, 2022. [Online Video]. Available: <https://www.youtube.com/channel/UCPSsA8oxLSBjidJsSPdpjsQ>

WHY ARE THERE MIRRORS ABOVE BEDS

WHY DO I SAY UH

WHY IS SEA SALT BETTER

WHY ARE THERE TREES IN THE MIDDLE OF FIELDS

WHY IS THERE NOT A POKEMON MMO

WHY IS THERE LAUGHING IN TV SHOWS

WHY ARE THERE DOORS ON THE FREEWAY

WHY ARE THERE SO MANY SUCHOST-EXE RUNNING

WHY AREN'T ANY COUNTRIES IN ANTARCTICA

WHY ARE THERE SCARY SOUNDS IN MINECRAFT

WHY IS THERE KICKING IN MY STOMACH

WHY ARE THERE TWO SLASHES AFTER HTTP

WHY ARE THERE CELEBRITIES

WHY DO SNAKES EXIST

WHY DO OYSTERS HAVE PEARLS

WHY ARE DUCKS CALLED DUCKS

WHY DO THEY CALL IT THE CLAP

WHY ARE KYLE AND CARTMAN FRIENDS

WHY IS THERE AN ARROW ON AANG'S HEAD

WHY ARE TEXT MESSAGES BLUE

WHY ARE THERE MUSTACHES ON CLOTHES

WHY WUBA LUBBA DUB DUB MEANING

WHY IS THERE A WHALE AND A POT FALLING

WHY ARE THERE SO MANY BIRDS IN SWISS

WHY IS THERE SO LITTLE RAIN IN WALLIS

WHY IS WALLIS WEATHER FORECAST ALWAYS WRONG

WHY ARE THERE MALE AND FEMALE BIKES

WHY ARE THERE BRIDESMAIDS

WHY DO DYING PEOPLE REACH UP

HOW FAST IS LIGHTSPEED

WHY ARE OLD KLINGONS DIFFERENT

WHY ARE THERE TINY SPIDERS IN MY HOUSE

WHY DO SPIDERS COME INSIDE

WHY ARE THERE HUGE SPIDERS IN MY HOUSE

WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE

WHY ARE THERE SPIDERS IN MY ROOM

WHY ARE THERE SO MANY SPIDERS IN MY ROOM

WHY DO SPYDER BITES ITCH

WHY IS DYING SO SCARY

WHY IS THERE NO GPS IN LAPTOPS

WHY DO KNEES CLICK

WHY AREN'T THERE 5 GRADES

WHY ARE THERE FEMALE N

WHY ARE THERE FEMALE N

WHY ARE THERE FEMALE N

WHY ARE THERE FEMALE N

WHY ARE THERE FEMALE N

WHY ARE THERE FEMALE N

WHY IS THERE CAFFEINE IN MY SHAMPOO

WHY HAVE DINOSAURS NO FUR

WHY ARE SWISS AFRAID OF DRAGONS

WHY IS THERE A LINE THROUGH HTTPS

WHY IS THERE A RED LINE THROUGH HTTPS ON TWITTER

WHY IS HTTPS IMPORTANT

WHY ARE THERE WEEKS

WHY DO I FEEL DIZZY

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

WHY ARE THERE ZIPPER

QUESTIONS

CAN BE ASKED BY ANYONE ANYTIME

WHY AREN'T ECONOMISTS RICH

WHY DO AMERICANS CALL IT SOCCER

WHY ARE MY EARS RINGING

WHY IS 42 THE ANSWER TO EVERYTHING

WHY CAN'T NOBODY ELSE LIFT THORS HAMMER

WHY IS MARVIN ALWAYS SO SAD

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY AREN'T ECONOMISTS RICH

WHY DO AMERICANS CALL IT SOCCER

WHY ARE MY EARS RINGING

WHY IS 42 THE ANSWER TO EVERYTHING

WHY CAN'T NOBODY ELSE LIFT THORS HAMMER

WHY IS MARVIN ALWAYS SO SAD

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

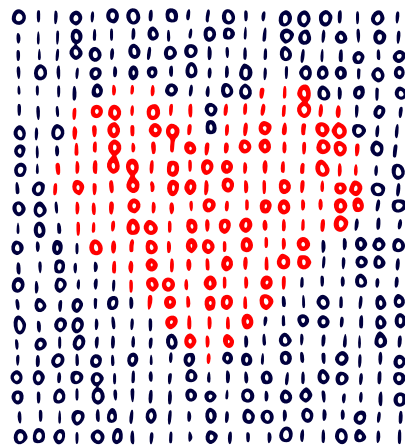
WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE ANTS IN MY LAPTOP

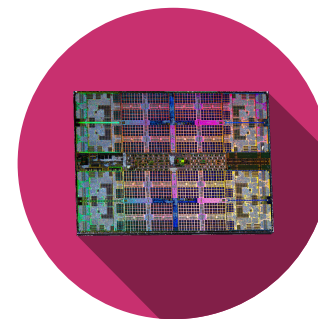
WHY ARE THERE ANTS IN MY LAPTOP



Hes·so  **VALAIS
WALLIS**



Haute Ecole d'Ingénierie
Hochschule für Ingenieurwissenschaften



Silvan Zahno silvan.zahno@hevs.ch