

Computer Architecture

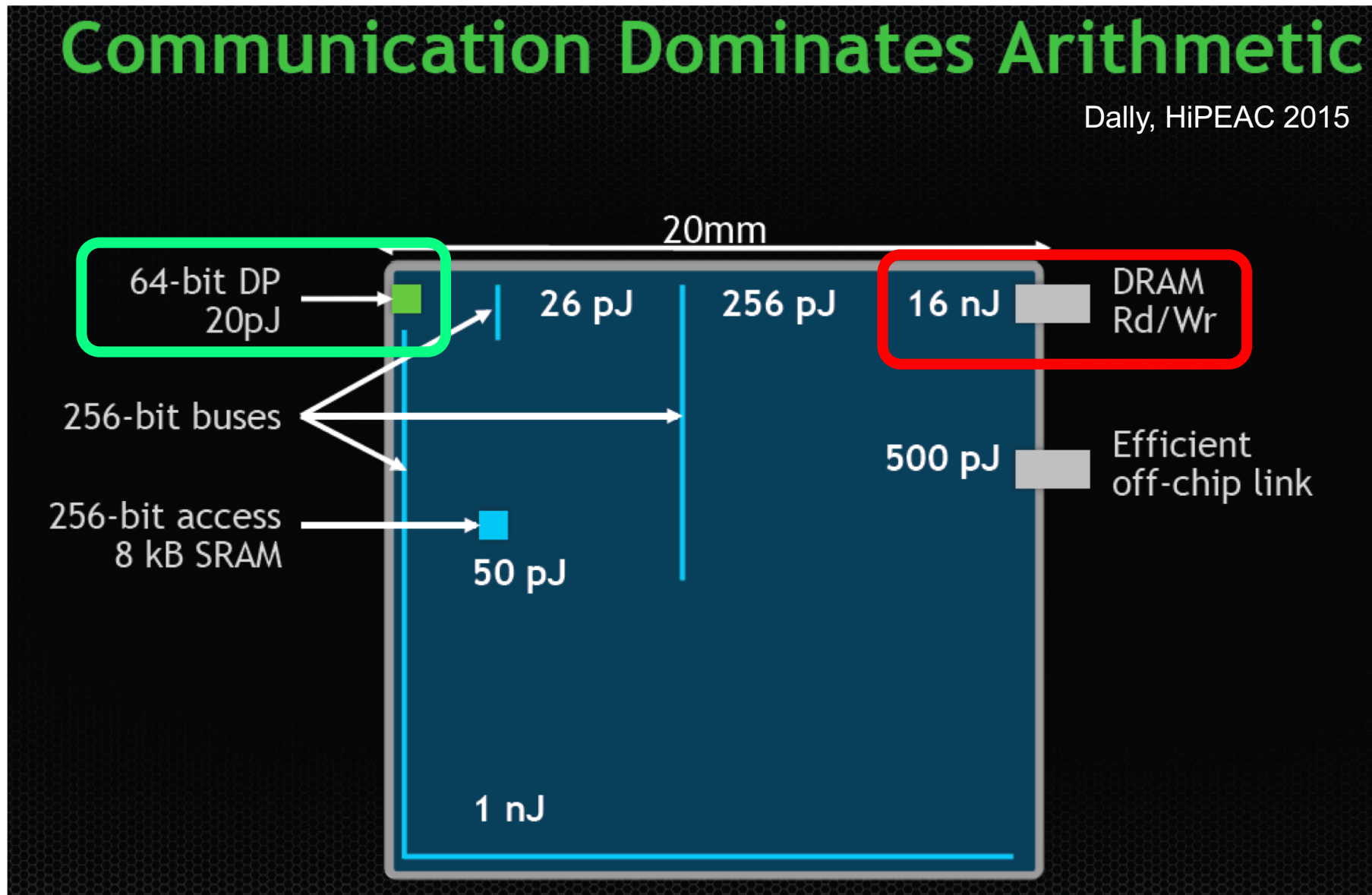
Lecture 2b: Course Logistics

Prof. Onur Mutlu
ETH Zürich
Fall 2019
20 September 2019

Increasingly Demanding Applications

- Dream, and they will come

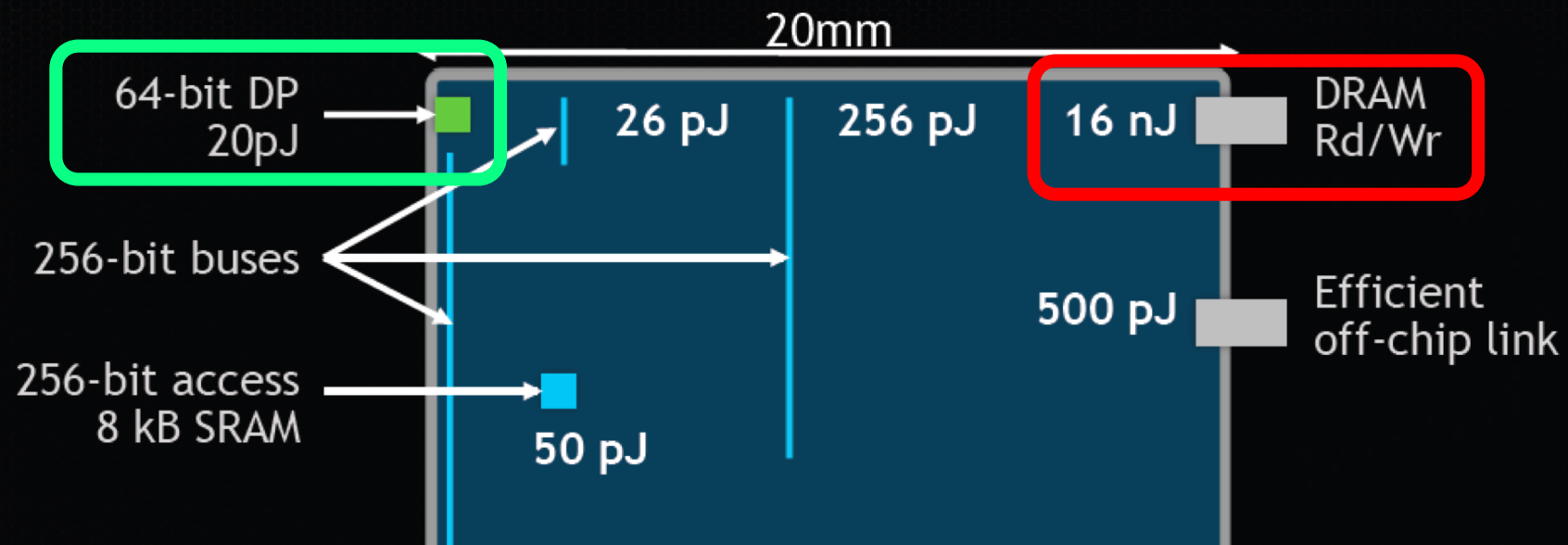
Increasingly Diverging/Complex Tradeoffs



Increasingly Diverging/Complex Tradeoffs

Communication Dominates Arithmetic

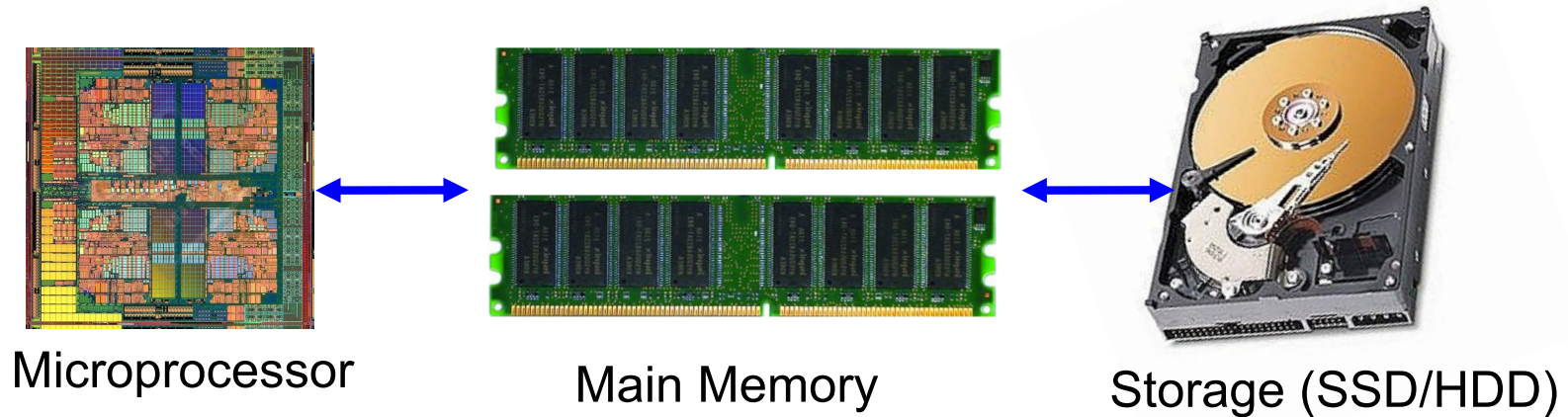
Dally, HiPEAC 2015



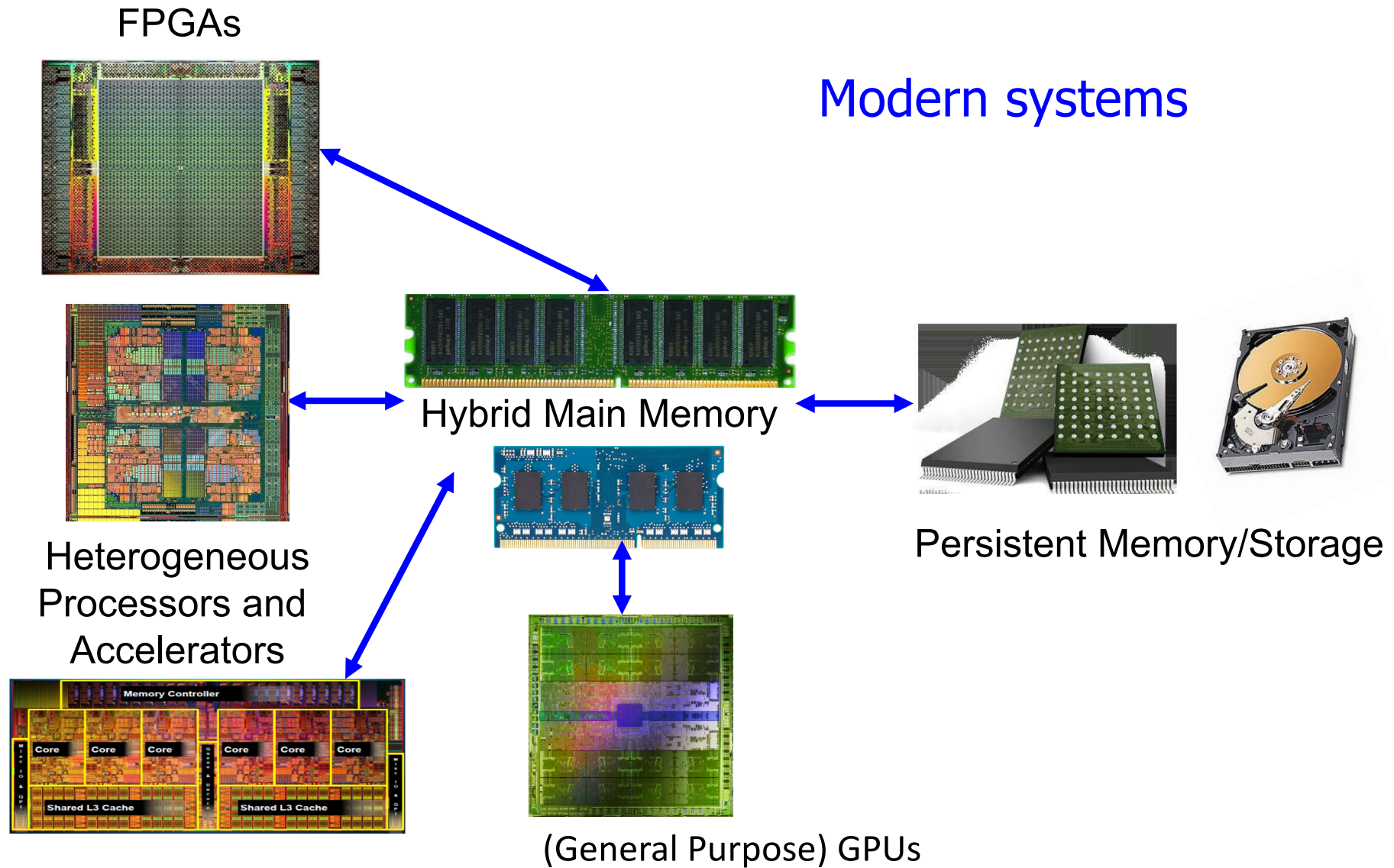
A memory access consumes $\sim 1000\times$ the energy of a complex addition

Increasingly Complex Systems

Past systems



Increasingly Complex Systems



Recap: Some Goals of This Course

- Teach/enable/empower you to:
 - Understand how a computing platform works
 - Understand how decisions made in hardware affect the software/programmer as well as the hardware designer
 - Think critically (in solving problems)
 - Think broadly across the levels of transformation
 - Understand how to analyze and make tradeoffs in design
 - Apply the above in several lab projects and HWs

Course Info: Who Are We?



■ Onur Mutlu

- ❑ Full Professor @ ETH Zurich CS, since September 2015
- ❑ Strecker Professor @ Carnegie Mellon University ECE/CS, 2009-2016, 2016-...
- ❑ PhD from UT-Austin, worked at Google, VMware, Microsoft Research, Intel, AMD
- ❑ <https://people.inf.ethz.ch/omutlu/>
- ❑ omutlu@gmail.com (Best way to reach me)
- ❑ <https://people.inf.ethz.ch/omutlu/projects.htm>

■ Research and Teaching in:

- ❑ Computer architecture, computer systems, hardware security, bioinformatics
- ❑ Memory and storage systems
- ❑ Hardware security, safety, predictability
- ❑ Fault tolerance
- ❑ Hardware/software cooperation
- ❑ Architectures for bioinformatics, health, medicine
- ❑ ...

Course Info: Who Are We?

- Teaching Assistants
 - Dr. Mohammed Alser
 - Rahul Bera
 - Geraldo F. de Oliveira Jr.
 - Can Firtina
 - Dr. Juan Gomez Luna
 - Dr. Jawad Haj-Yahya
 - Hasan Hassan
 - Konstantinos Kanellopoulos
 - Jeremie Kim
 - Nika Mansouri Ghiasi
 - Dr. Lois Orosa Nogueira
 - Dr. Jisung Park
 - Minesh Patel
 - Giray Yaglikci

- Get to know them and their research

Review: Major High-Level Goals of This Course

- Understand the principles
- Understand the precedents
- Based on such understanding:
 - Enable you to evaluate tradeoffs of different designs and ideas
 - Enable you to develop principled designs
 - Enable you to develop novel, out-of-the-box designs
- The focus is on:
 - Principles, precedents, and how to use them for new designs
- In Computer Architecture

A Note on Hardware vs. Software

- This course might seem like it is only “Computer Hardware”
- However, you will be much more capable if you master both hardware and software (and the interface between them)
 - Can develop better software if you understand the hardware
 - Can design better hardware if you understand the software
 - Can design a better computing system if you understand both
- This course covers the HW/SW interface and microarchitecture
 - We will focus on tradeoffs and how they affect software

What Do I Expect From You?

- **Required background:** Digital circuits course, programming, an open mind willing to take in many exciting concepts.
- **Learn the material thoroughly**
 - attend lectures, do the readings, do the exercises, do the labs
- **Work hard:** this will be a hard, but fun & informative course
- **Ask questions, take notes, participate**
- **Perform the assigned readings**
- **Come to class, participate**
- **Start early**
- If you want feedback, come to office hours
- Remember “**Chance favors the prepared mind.**” (Pasteur)



What Do I Expect From You?

- How you prepare and manage your time is very important
- There will be many lab and homework assignments
 - They will take time
 - Start early, work hard
- This will be a heavy course
 - However, you will learn a lot of fascinating topics and understand how a computing platform works
 - And, it will hopefully change how you look at and think about designs around you

How Will You Be Evaluated?

- Project assignments: 45%
 - Midterm exam: 15%
 - Final exam: 25%
 - Homeworks: 15%
-
- More on this later

Course Goals

- Goal 1: To familiarize those interested in computer system design with both fundamental operation principles and design tradeoffs of processor, memory, and platform architectures in today's systems.
 - Strong emphasis on fundamentals, design tradeoffs, key current/future issues
 - Strong emphasis on looking backward, forward, up and down

- Goal 2: To provide the necessary background and experience to design, implement, and evaluate a modern processor by performing hands-on simulator implementation.
 - Strong emphasis on functionality, hands-on design & implementation, and efficiency.
 - Strong emphasis on making things work, realizing ideas

Course Website

- <https://safari.ethz.ch/architecture/fall2019/doku.php>
- All slides, lecture videos, readings, assignments to be posted
- Plus other useful information for the course
- Check frequently for announcements and due dates

Homework 0

- Due Sep 26
 - <https://safari.ethz.ch/architecture/fall2019/lib/exe/fetch.php?media=hw0.pdf>
- Information about yourself
- All future grading is predicated on homework 0

Heads Up

- We will have a few required review assignments
 - Due likely end of next week
- HW1 will be out early next week
 - Due in ~2 weeks
- Lab 1 will be out today
 - Due in ~2 weeks
- Check the website. Will also be announced in lecture

Computer Architecture

Lecture 2b: Course Logistics

Prof. Onur Mutlu
ETH Zürich
Fall 2019
20 September 2019