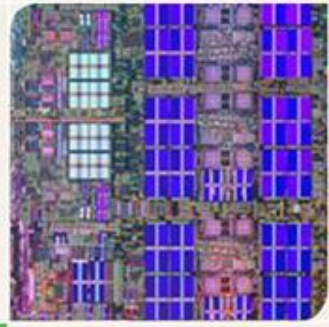
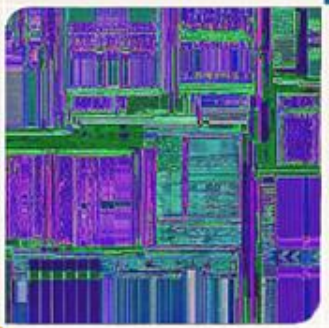
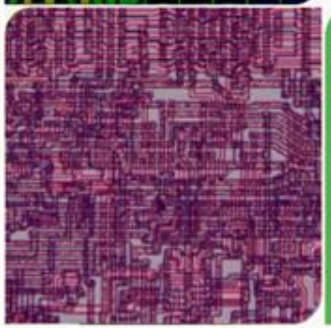


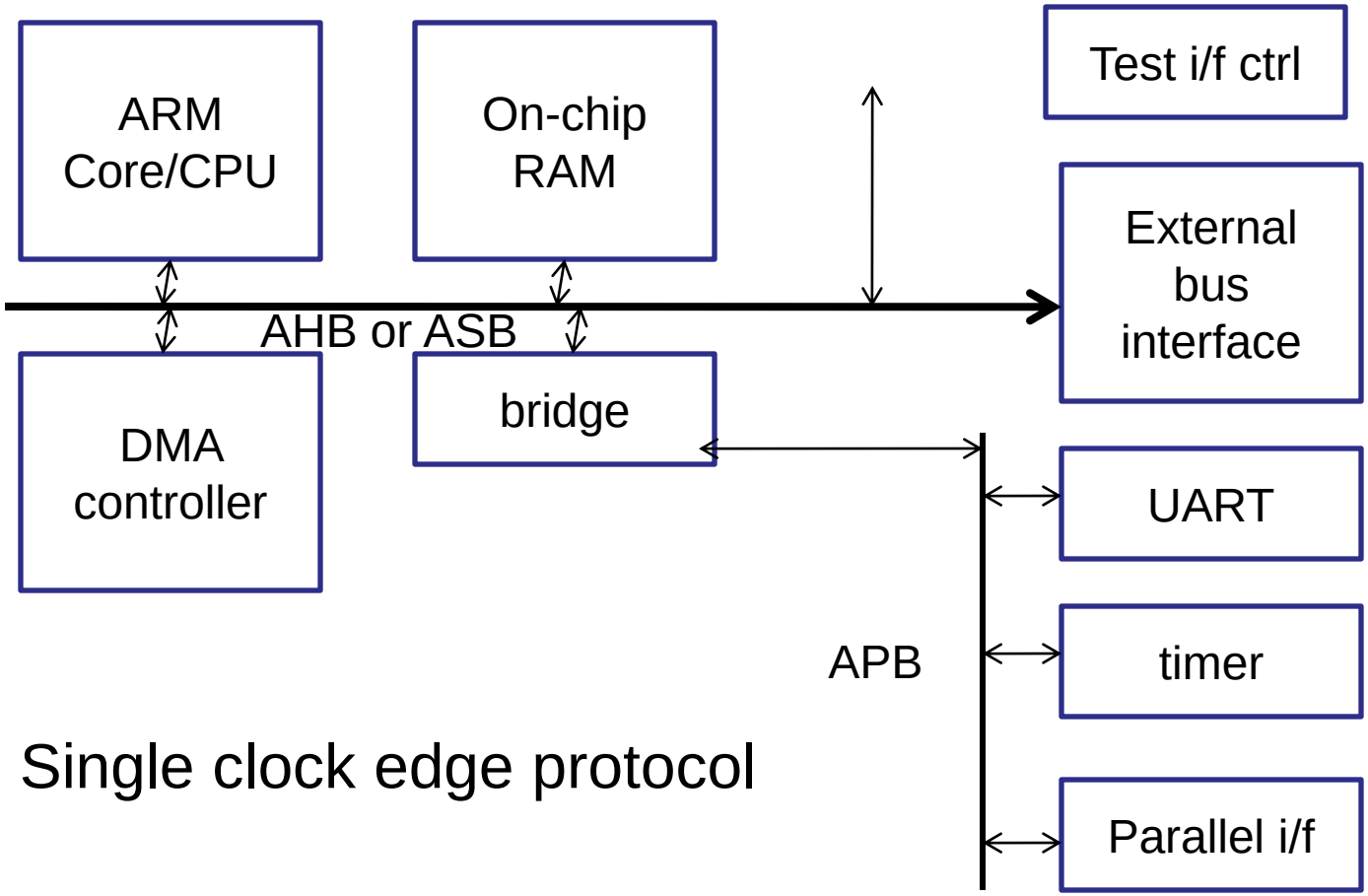

CS4803DGC Design Game Console

Spring 2010

Prof. Hyesoon Kim

Georgia Tech College of Computing

Advanced Microcontroller Bus Architecture (AMBA)



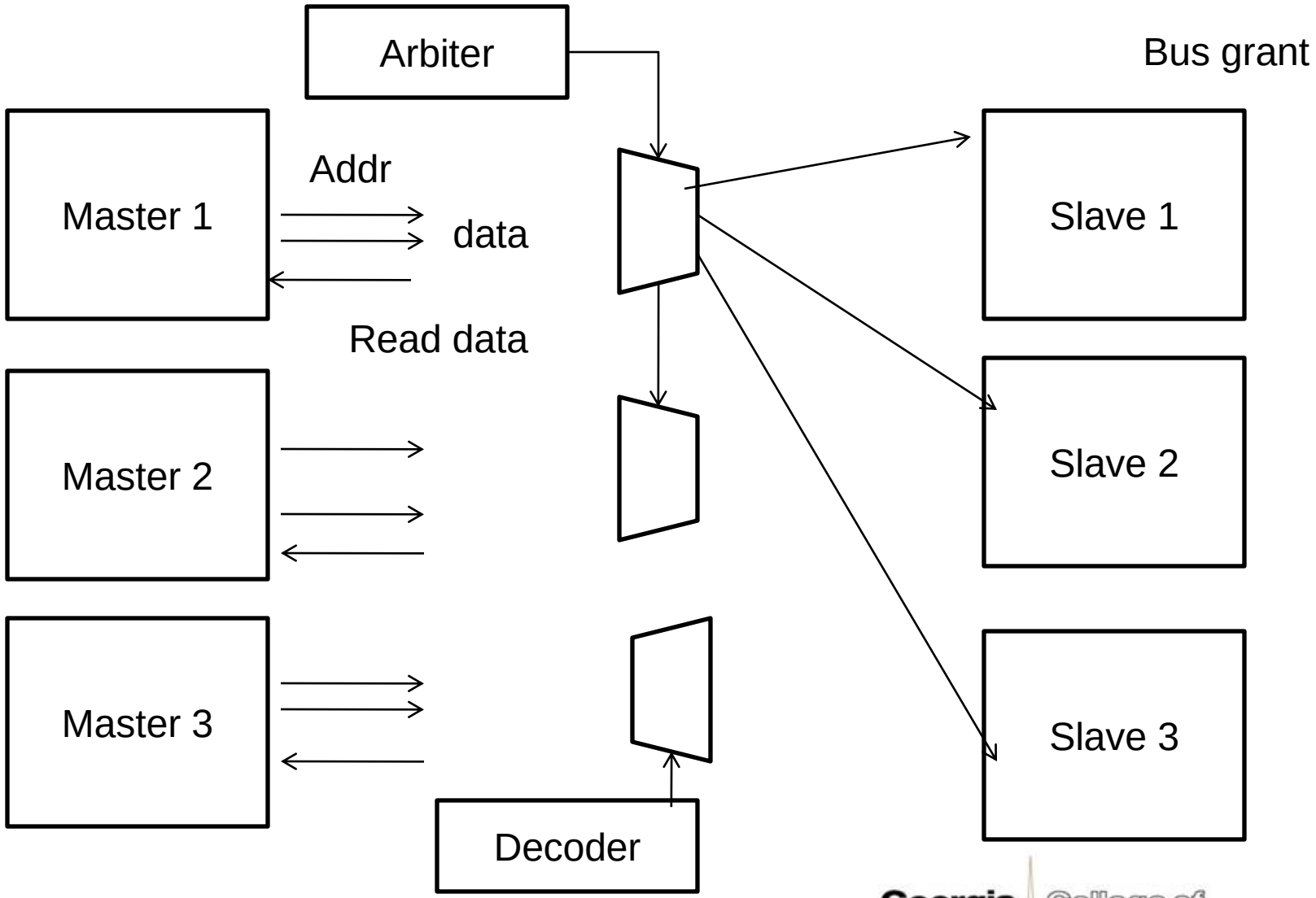
- Single clock edge protocol



AMBA

- AHB (Advanced High-performance Bus)
  - New standard
  - Connect high-performance system
  - Burst mode data transfer and split transactions
  - Pipelined
- ASB (Advanced System Bus)
  - Old standard
  - Connect high-performance system
  - Pipelined
  - Multiple systems
- APB (Advanced Peripheral Bus)
  - A simpler interface for low-performance peripherals
  - Low power
  - Latched address, simple interface

Bus Arbitration



AMBA Arbitration

- A bus transaction is initiated by a bus master which requests access from a central arbiter.
- The arbiter decides priorities when there are conflicting requests.
- The design of the arbiter is a system specific issue.
- The ASB only specifies the protocol:
  - The master issues a request to the arbiter
  - When the bus is available, the arbiter issues a grant to the master.

Bus Pipelining

- A memory access consists of several cycles (including arbitration)
- Since the bus is not used in all cycles, pipelining can be used to increase performance

Write Access

	AR	ARB	AG	RQ	ACK
Arb request					
Arbiter					
Arb grant					
Bus					

Read Access

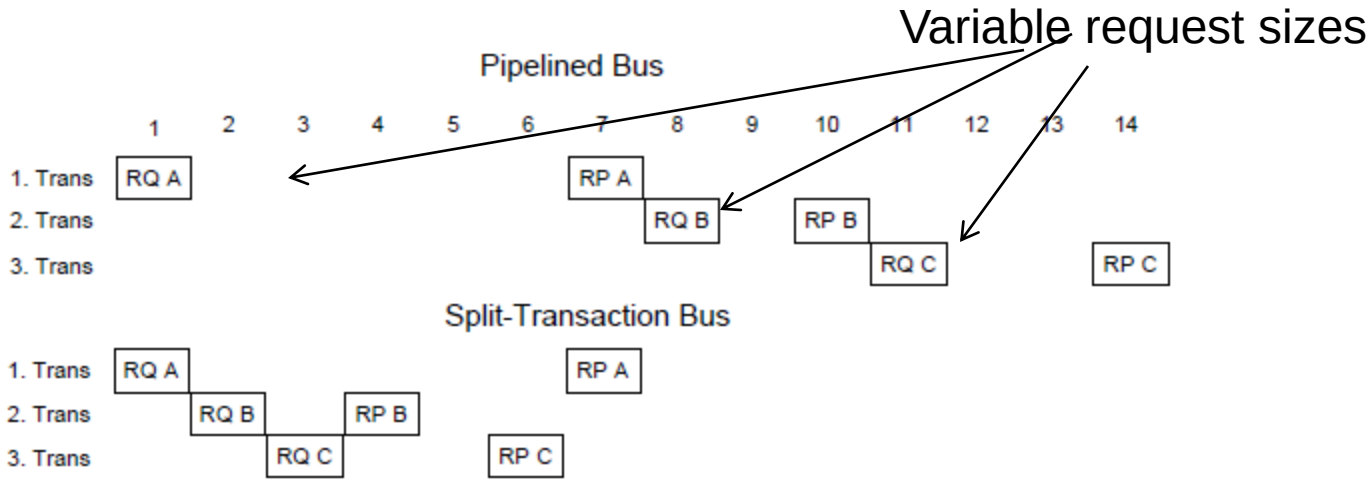
	AR	ARB	AG	RQ	P	RPLY
Arb request						
Arbiter						
Arb grant						
Bus						

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Read	AR	ARB	AG	RQ	P	RPLY									
2. Write		AR	ARB	AG	Stall	Stall	RQ	ACK							
3. Write			AR	ARB	Stall	Stall	AG	Stall	RQ	ACK					
4. Read				AR	Stall	Stall	ARB	Stall	AG	Stall	RQ	P	RPLY	RQ	
5. Read							AR	Stall	ARB	Stall	AG	RQ	P	RPLY	
6. Read									AR	Stall	ARB	AG	Stall	Stall	RQ
Bus busy															

http://www.imit.kth.se/courses/2B1447/Lectures/2B1447_L4_Buses.pdf

Split Transactions

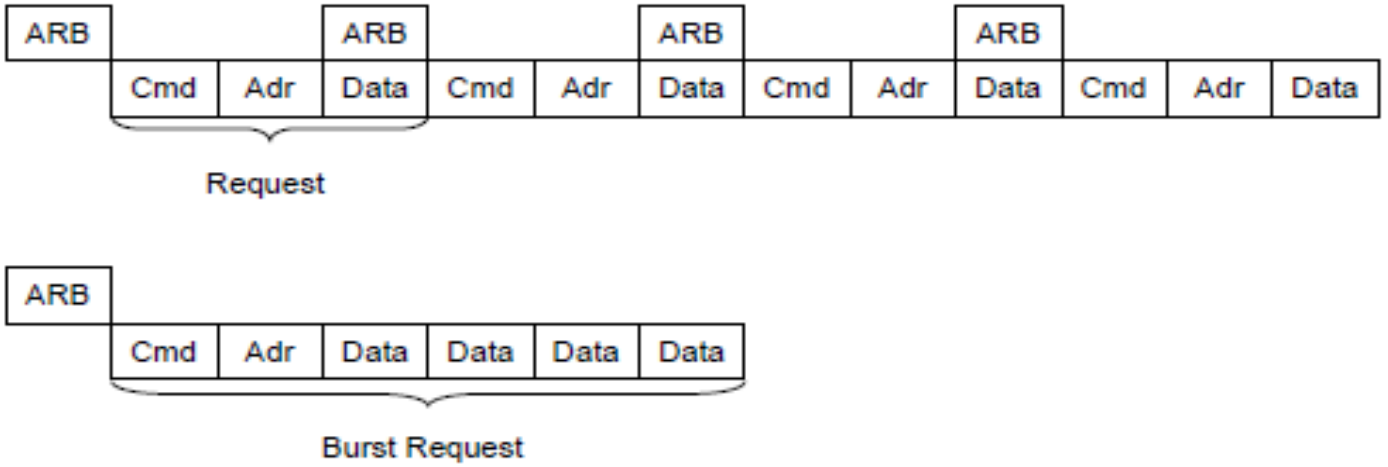
- A transaction is splitted into a two transactions
  - Request-transaction
  - Reply-transaction
- Both transactions have to compete for the bus by arbitration



http://www.imit.kth.se/courses/2B1447/Lectures/2B1447_L4_Buses.pdf

Burst Messages

- Overheads can be reduced if the requests are sent as a burst
- Overheads
  - Arbitration, Addressing, Acknowledgement
- Better efficiency, but be careful with long requests





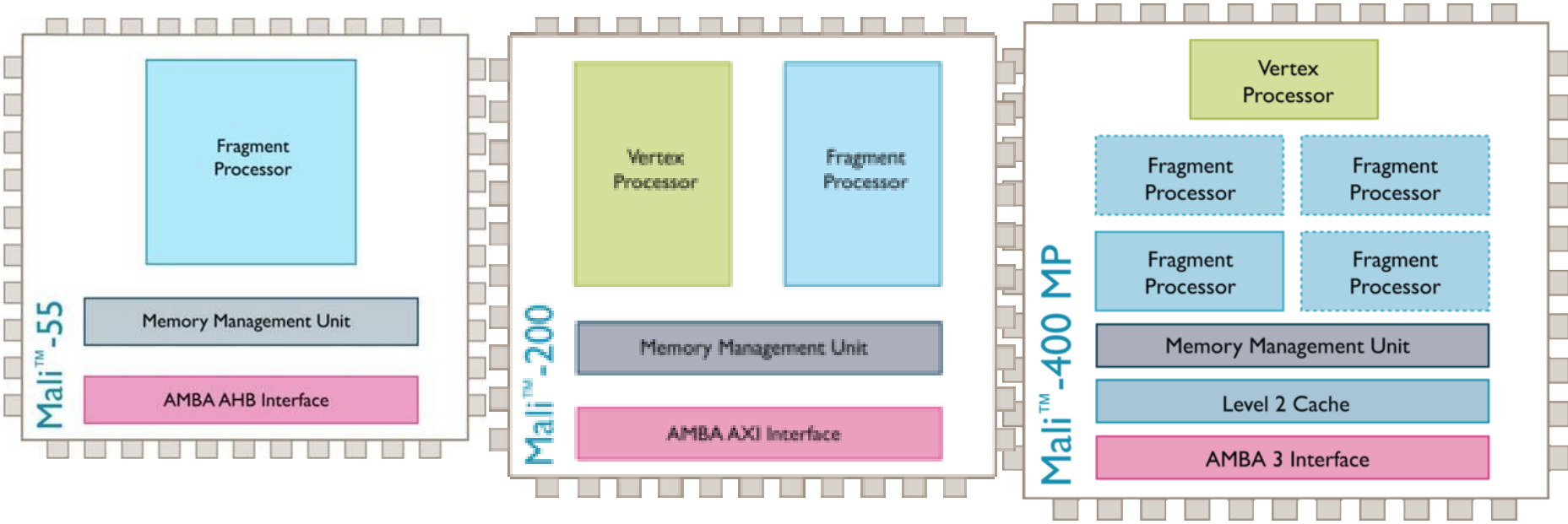
Bus Bridges

- Bus bridges are used to separate high-performance devices from low-performance devices
- All communication from high-performance bus with the low performance device goes via the bridge



ARM GPUS

ARM Mali Graphics Processors



- Mali-55: smallest graphics processors
- Mali-200
- Mali-400 MP

http://www.arm.com/products/multimedia/mali-graphics-hardware/mali-400-mp.php