

2384-9

**ICTP Latin-American Advanced Course on FPGA Design for Scientific
Instrumentation**

19 November - 7 December, 2012

**Digital Design
(Part 9)**

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Outline

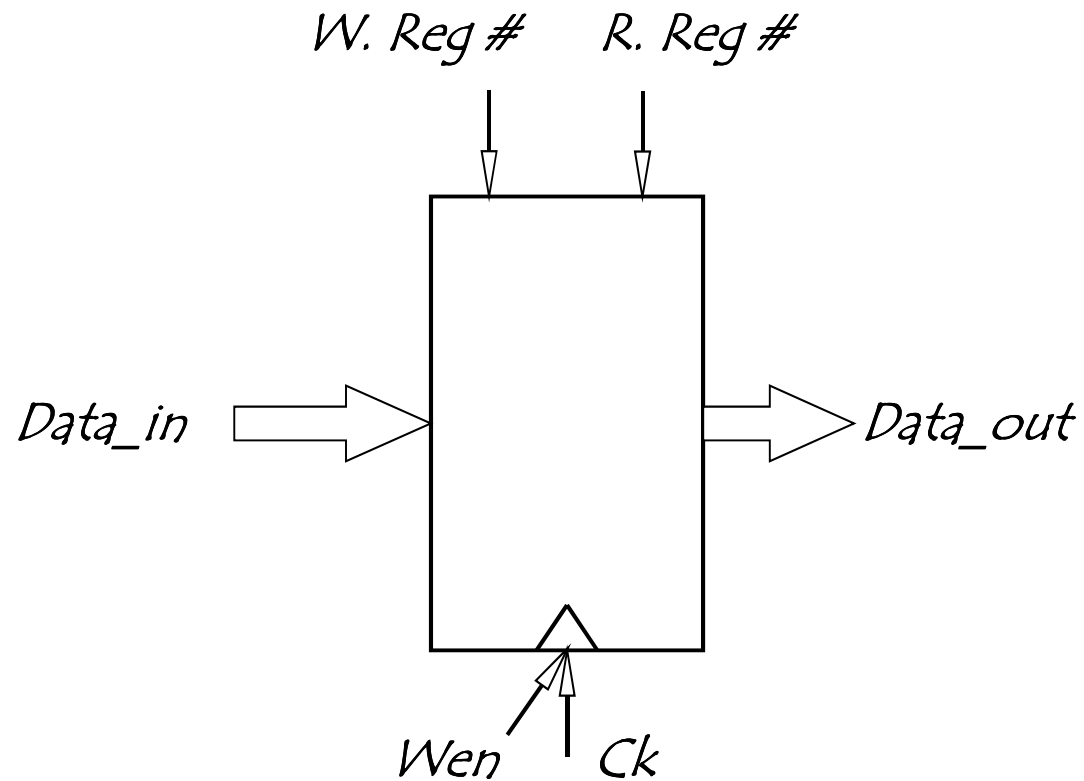
- ❑ Digital CMOS Design
- ❑ Arithmetic Operators
- ❑ Sequential Blocs
 - Register Files
 - Fifos



Register files

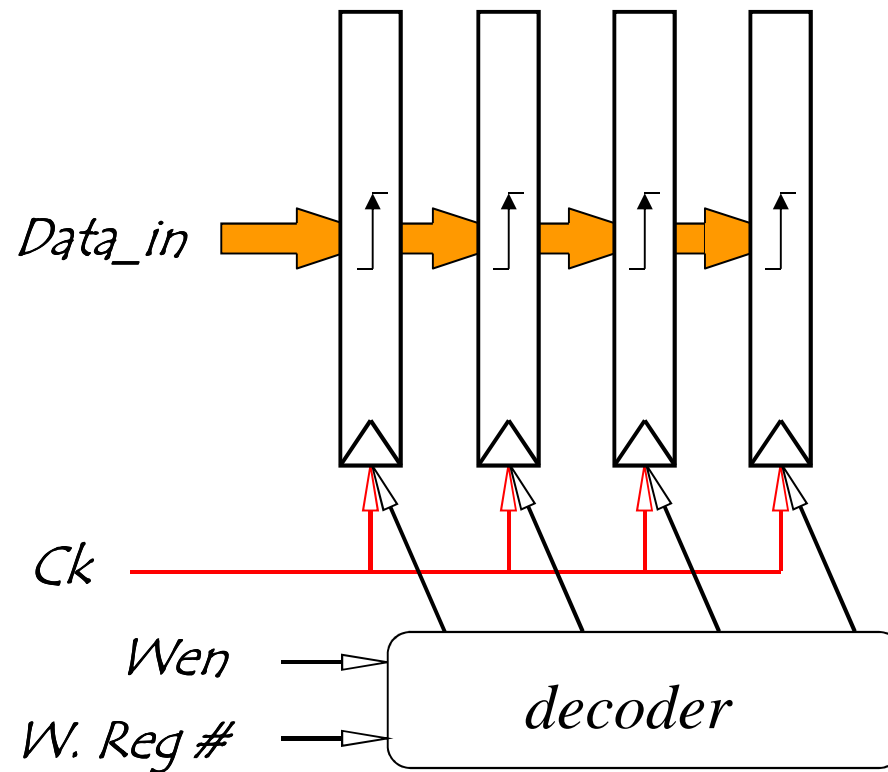
- A set of registers with the same size n -bit
- At each cycle a data can be written into one register
- At each cycle a data can be read from one register

Register files



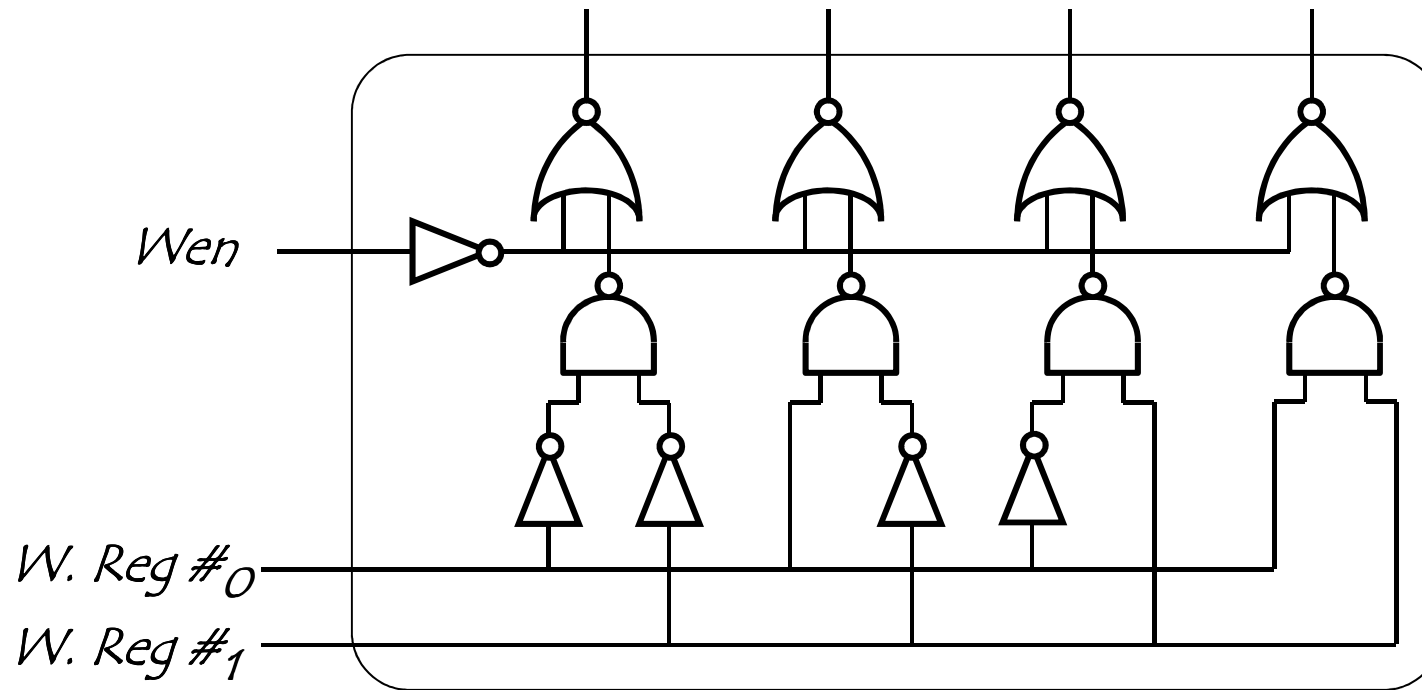
Register files

Write function



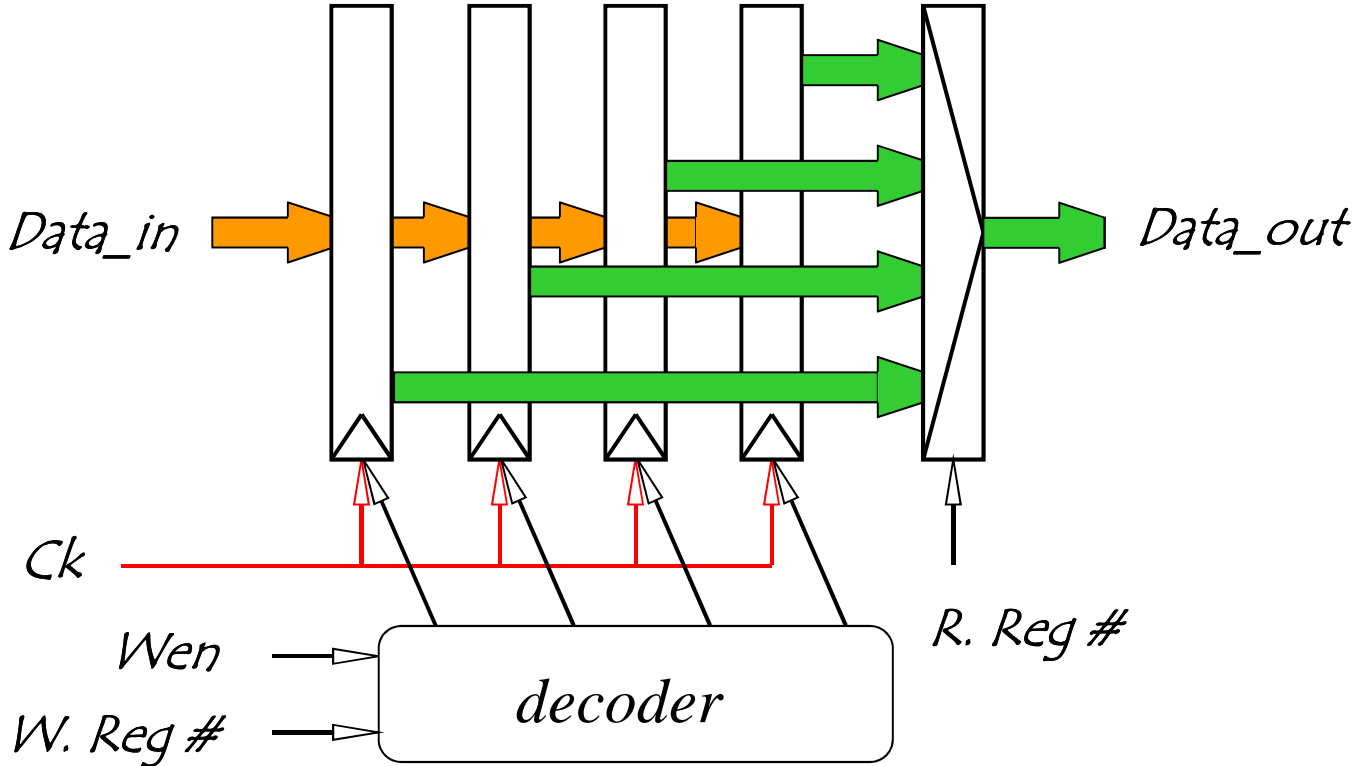
Register files

Write function



Register files

Read function

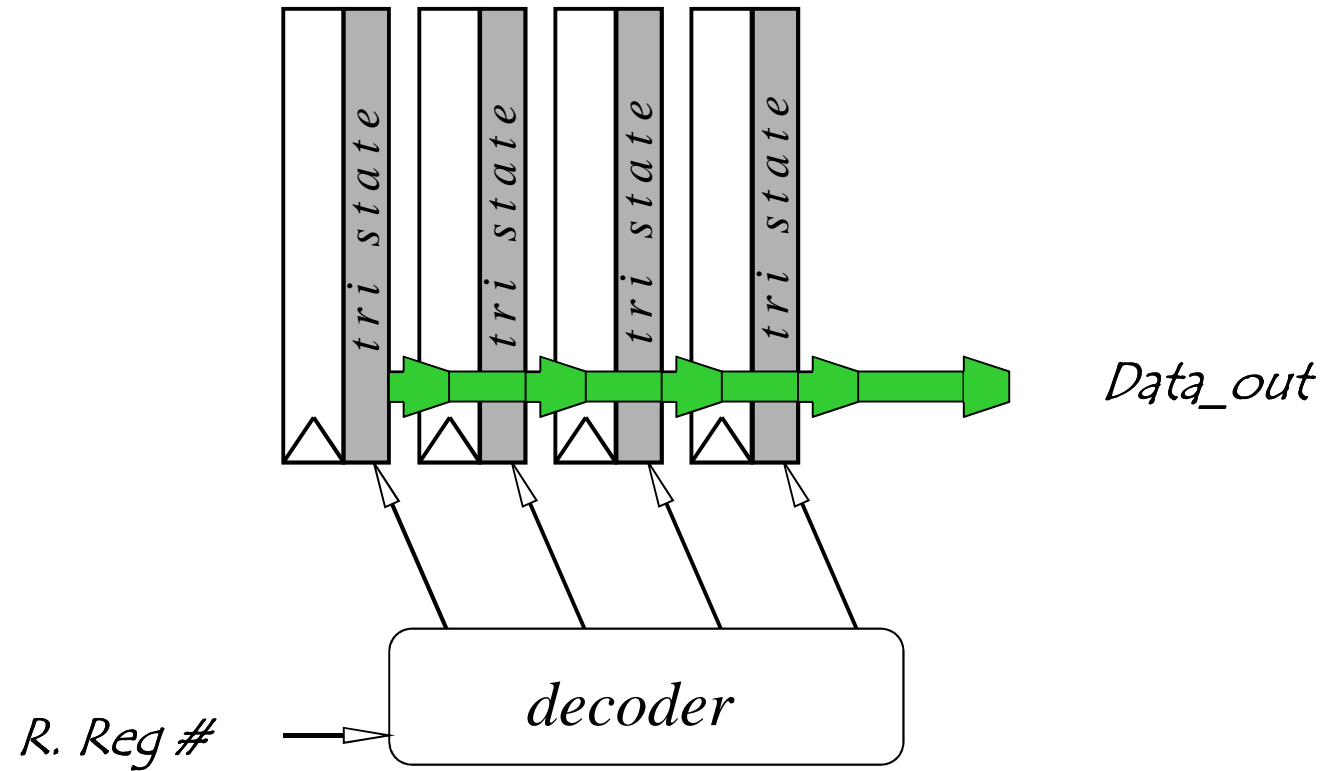


Hardware implementation



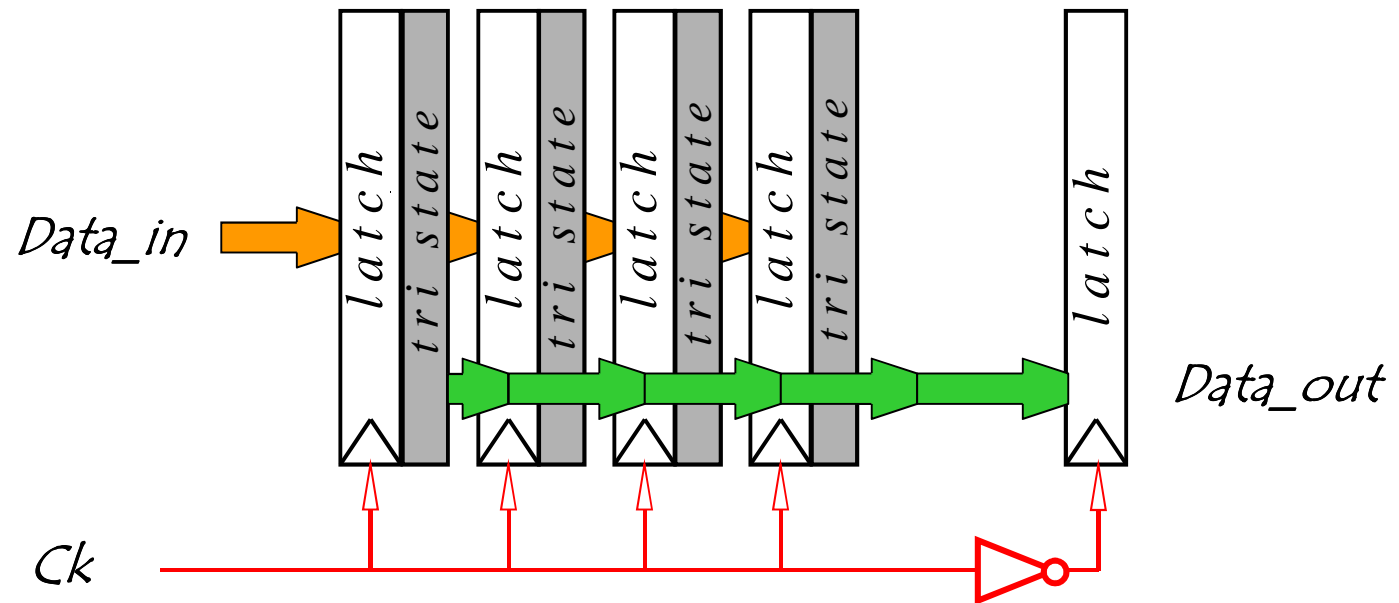
Register files

Read function



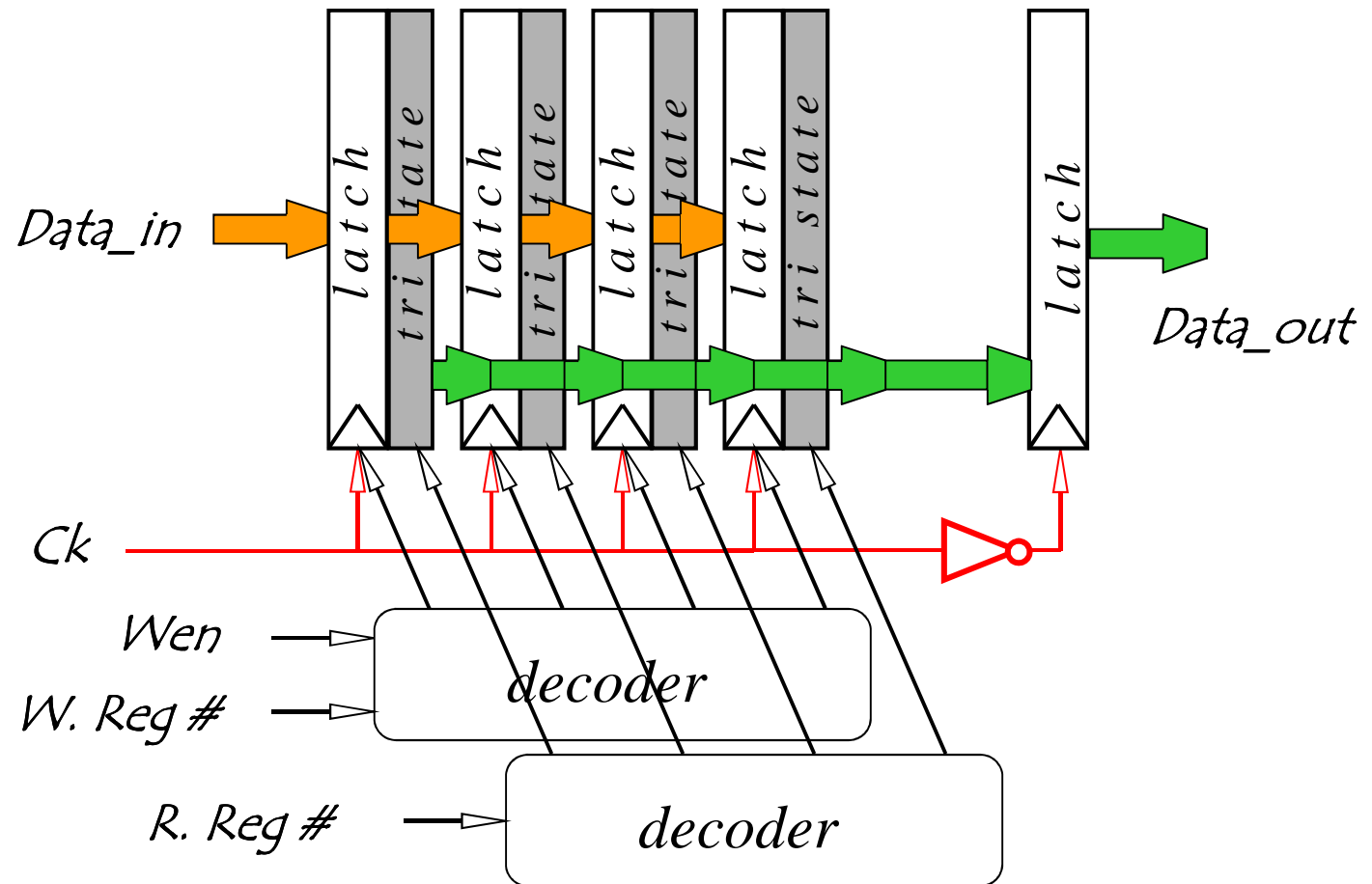
Register files

There is no move of data inside the register file



Register files

Putting all together



Outline

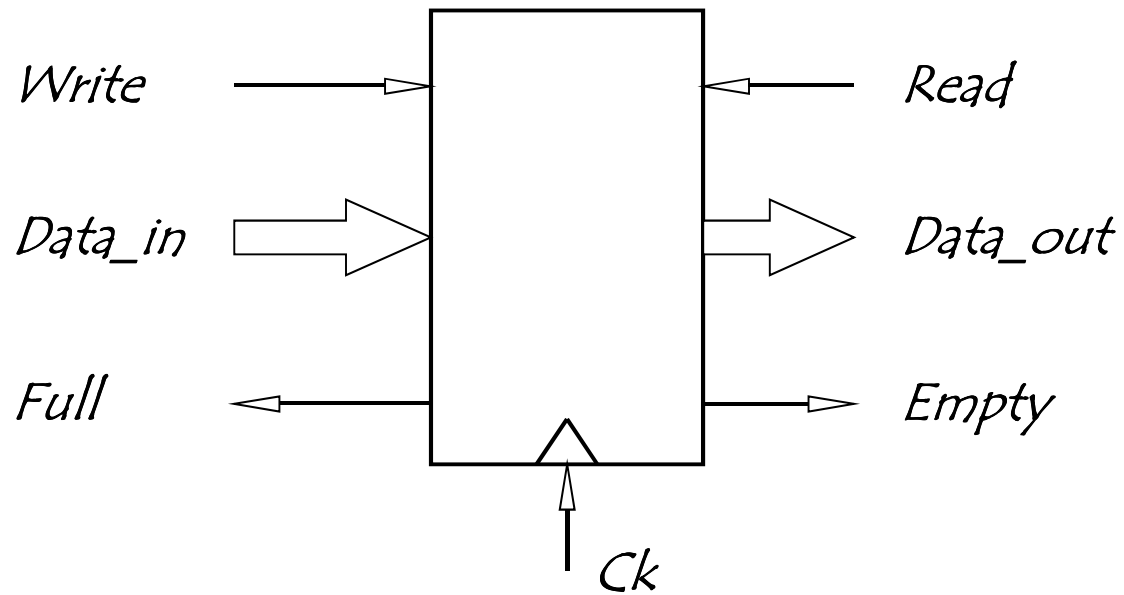
- ❑ Digital CMOS Design
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 - Register Files
 - Fifos



FiFos

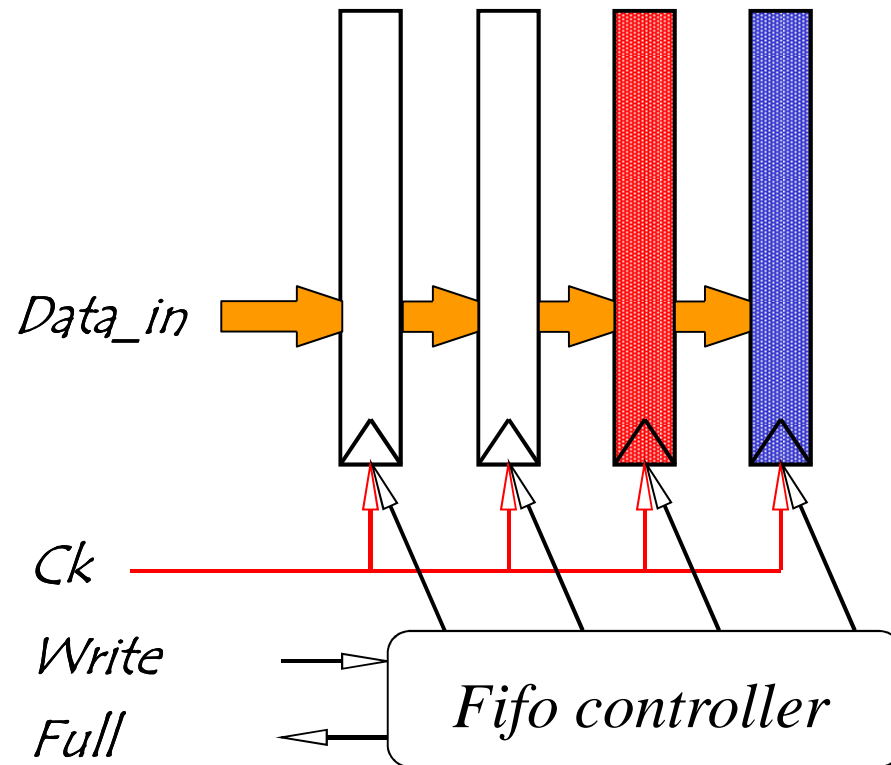
- A set of registers with the same size n-bit
- At each cycle a data can be written into the Fifo
- At each cycle a data can be read from the Fifo
- Data are read in the same order as they are written

Fifos



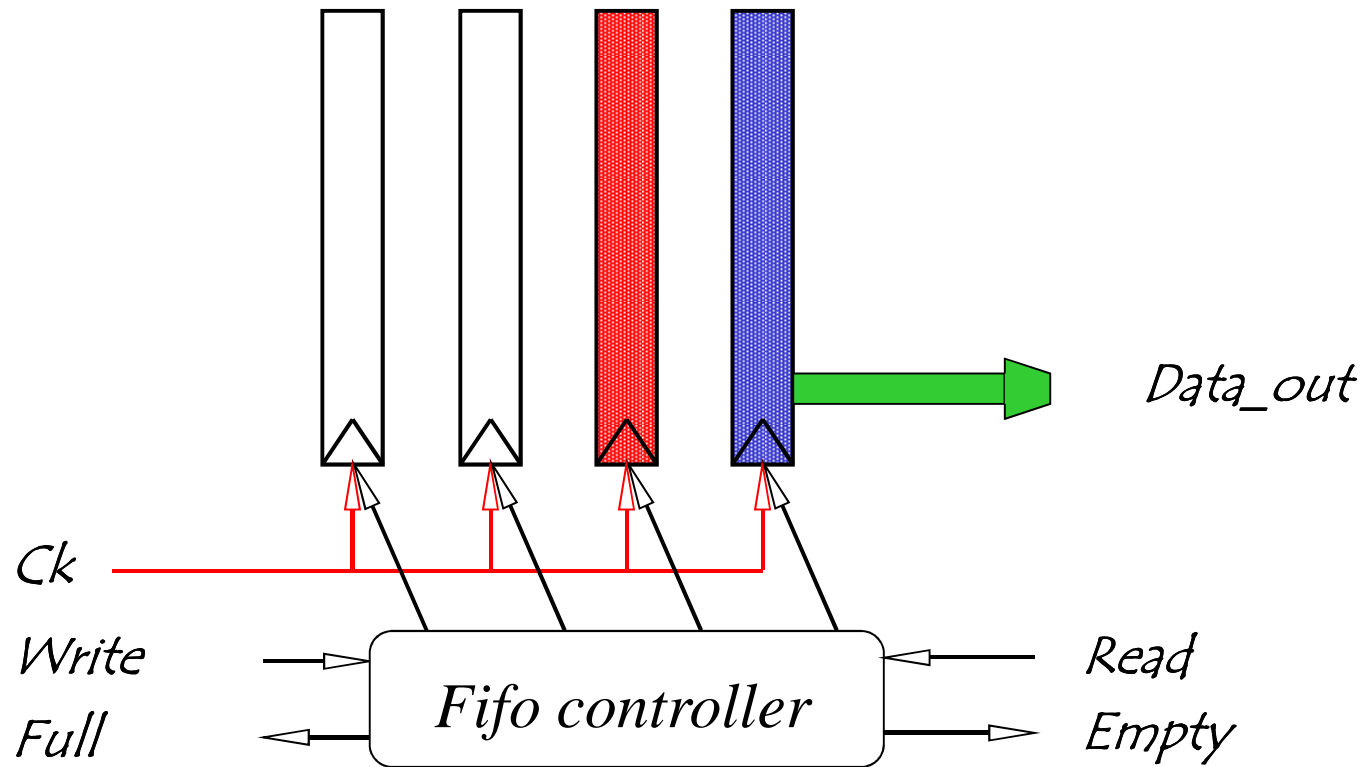
Fifos

Write function



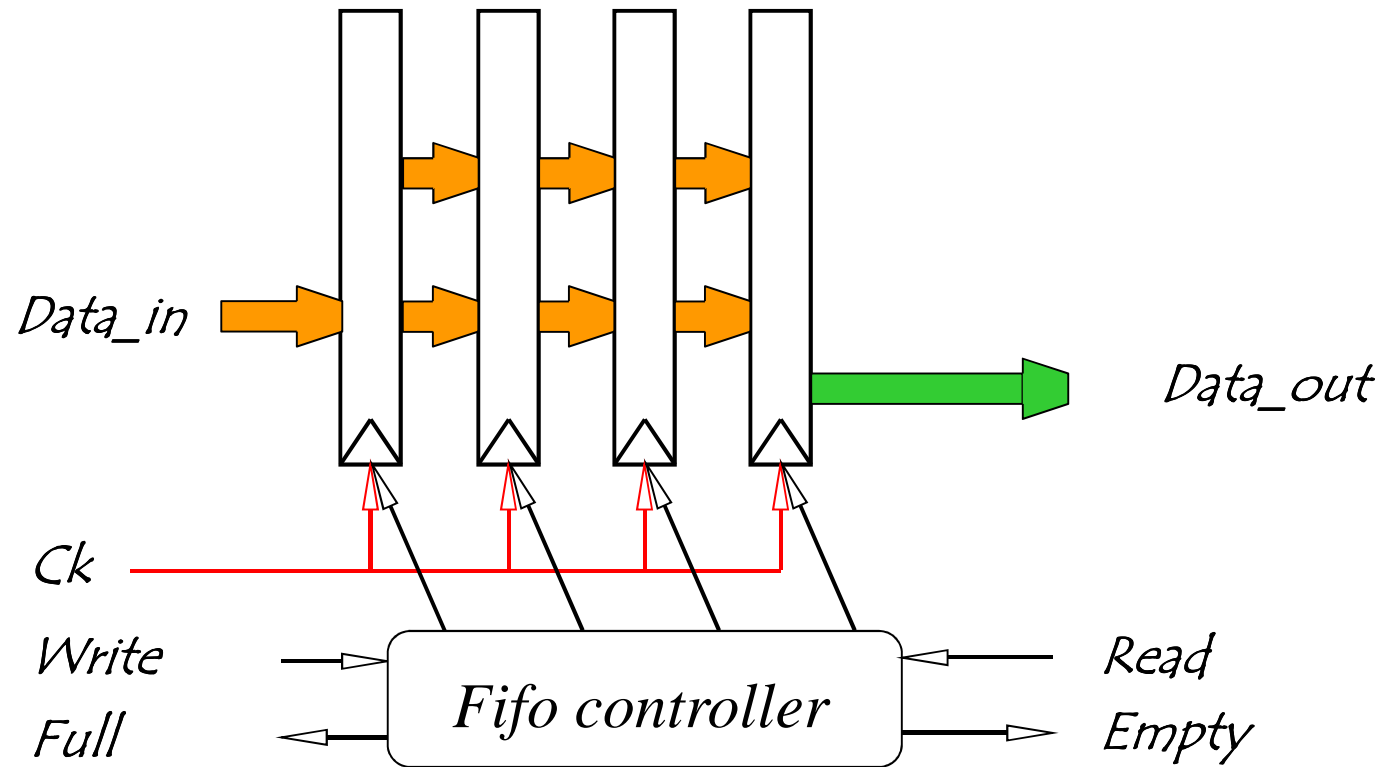
Fifos

Read function



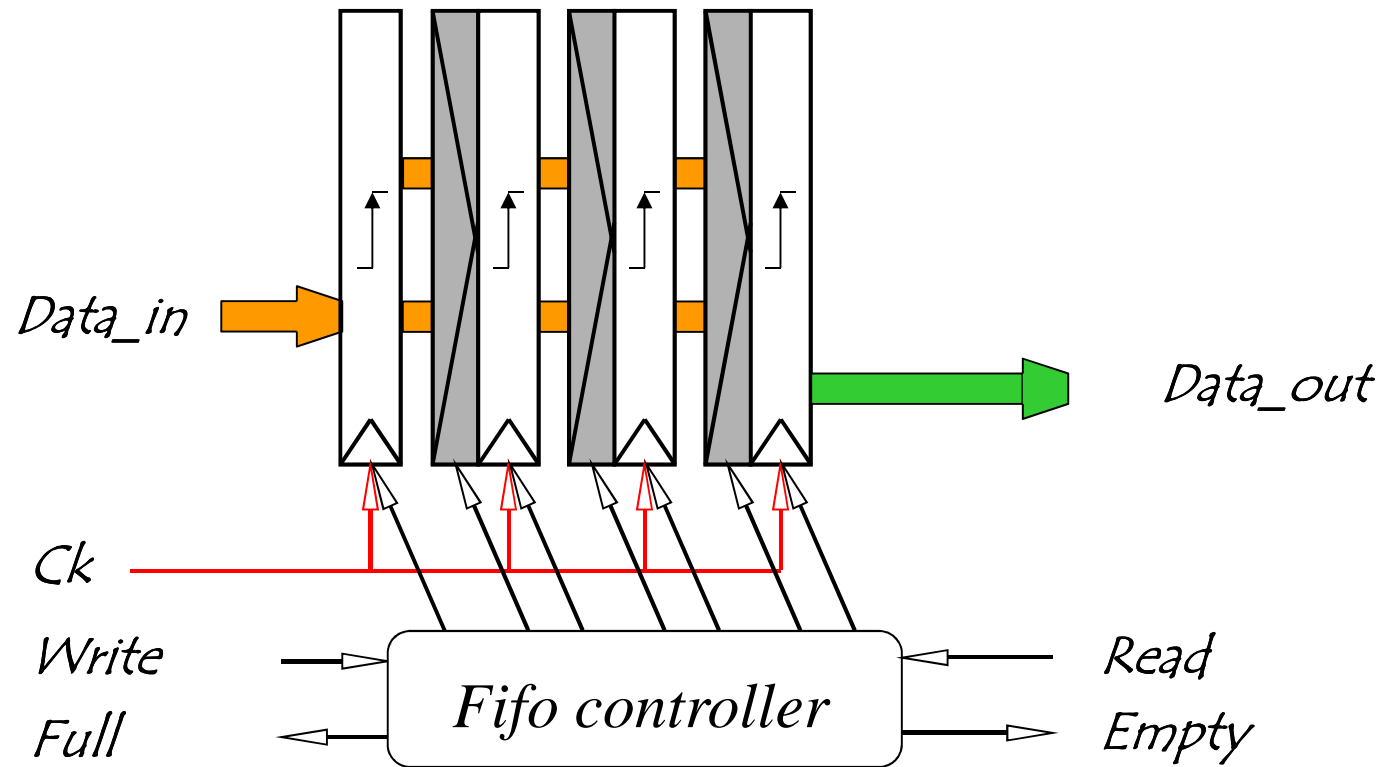
Fifos

Read function



Fifos

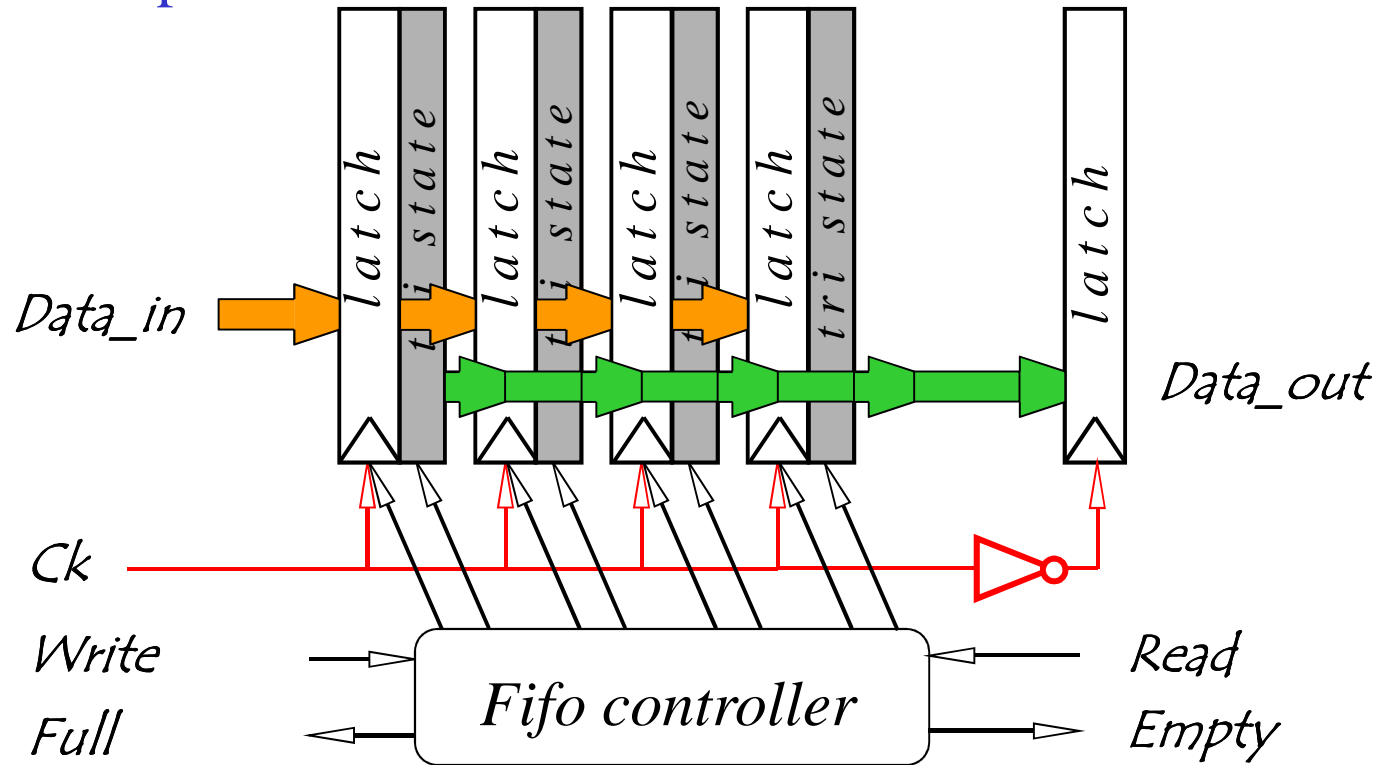
Read function



Data are moved inside the Fifo

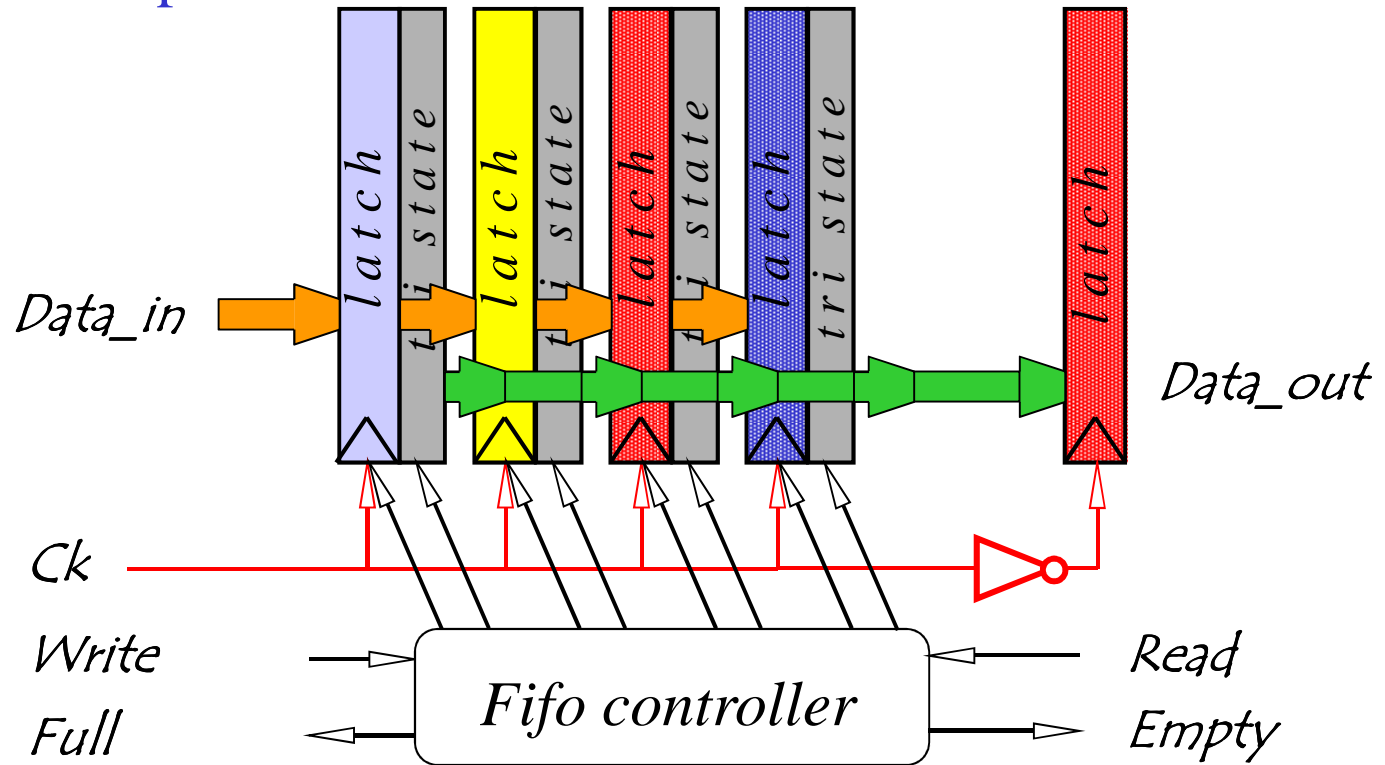
Fifos

Improved implementation



Fifos

Improved implementation

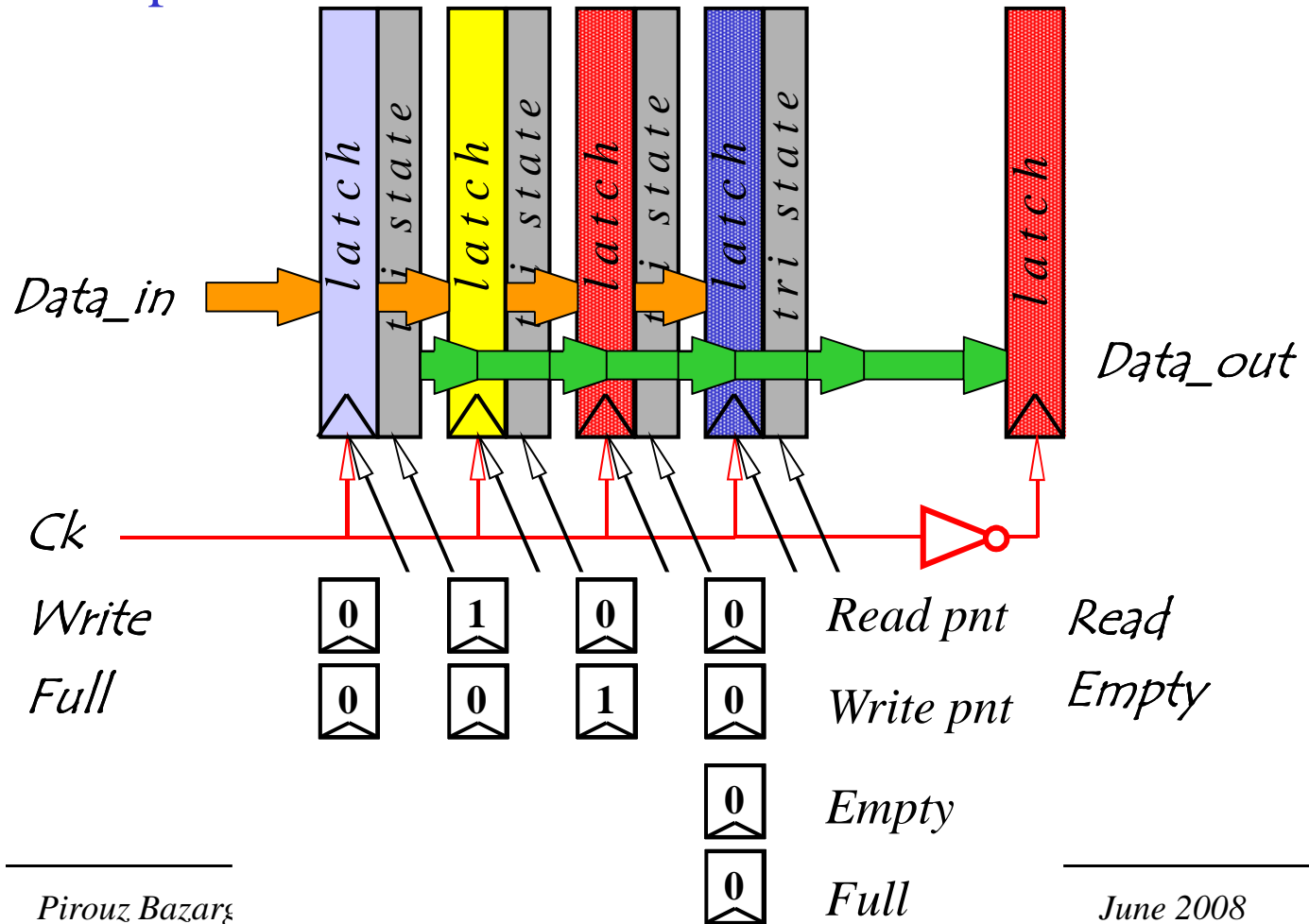


Circular Fifo



Fifos

Improved implementation



Outline

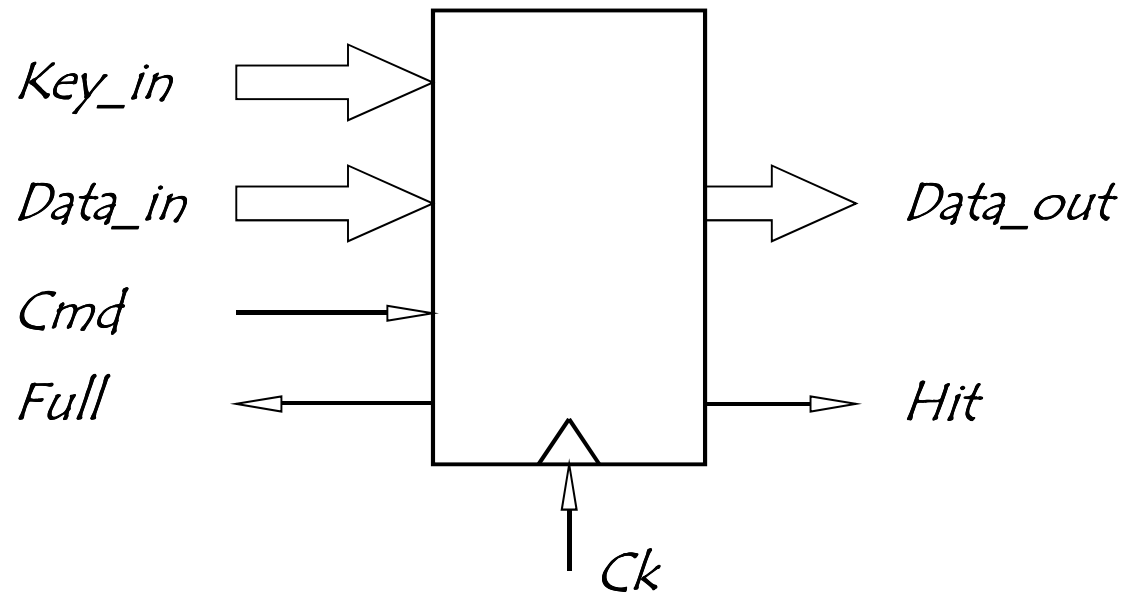
- ❑ Digital CMOS Design
- ❑ Arithmetic Operators
- ❑ Sequential Blocs
 - Register Files
 - Fifos
 - Associative tables



Associative table

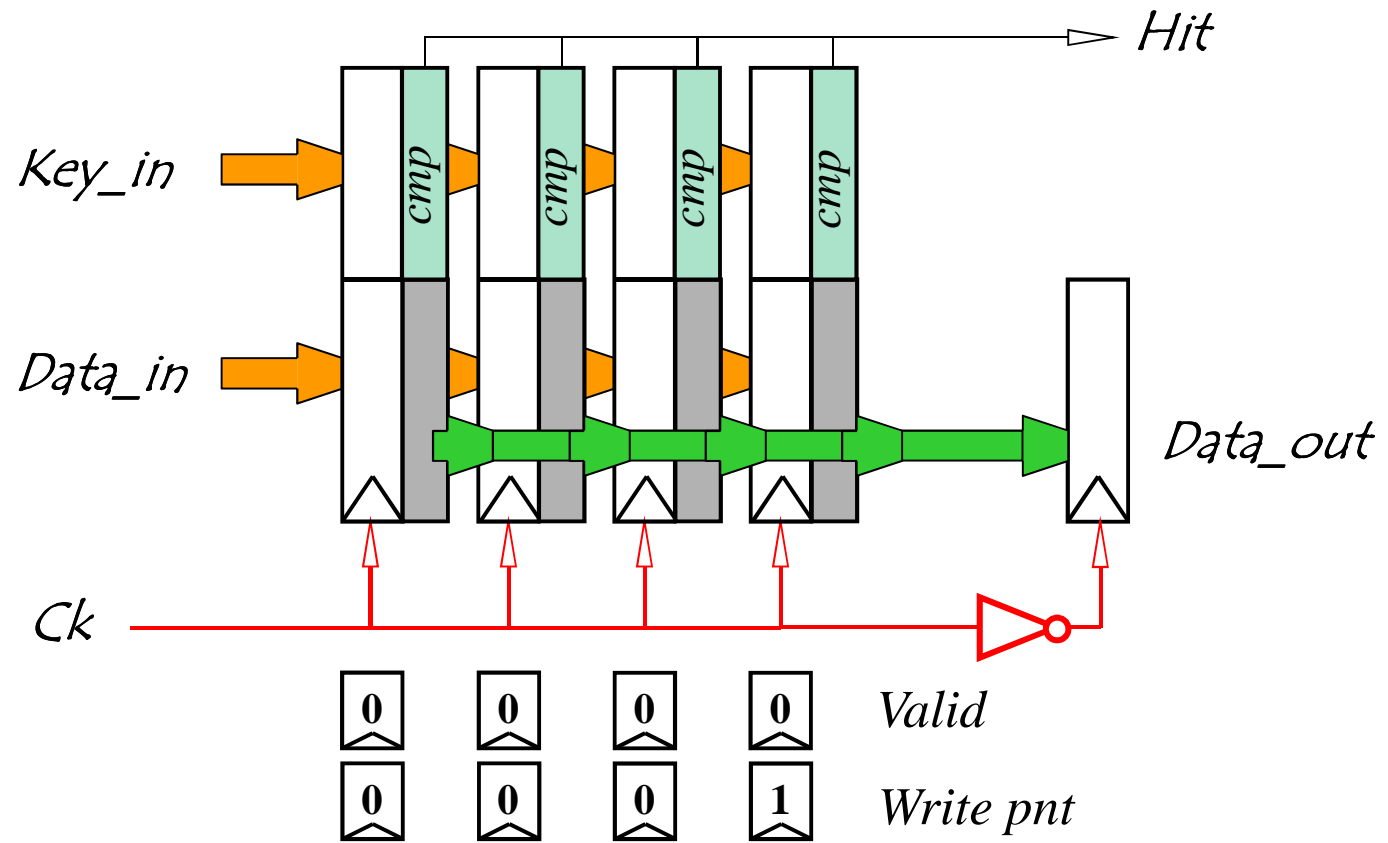
- A set of registers with the same size n -bit
- Each data is associated with a key
- At each cycle a data can be written into the table or read/removed from the table
- The read/removed data is selected by giving the corresponding key

Associative table



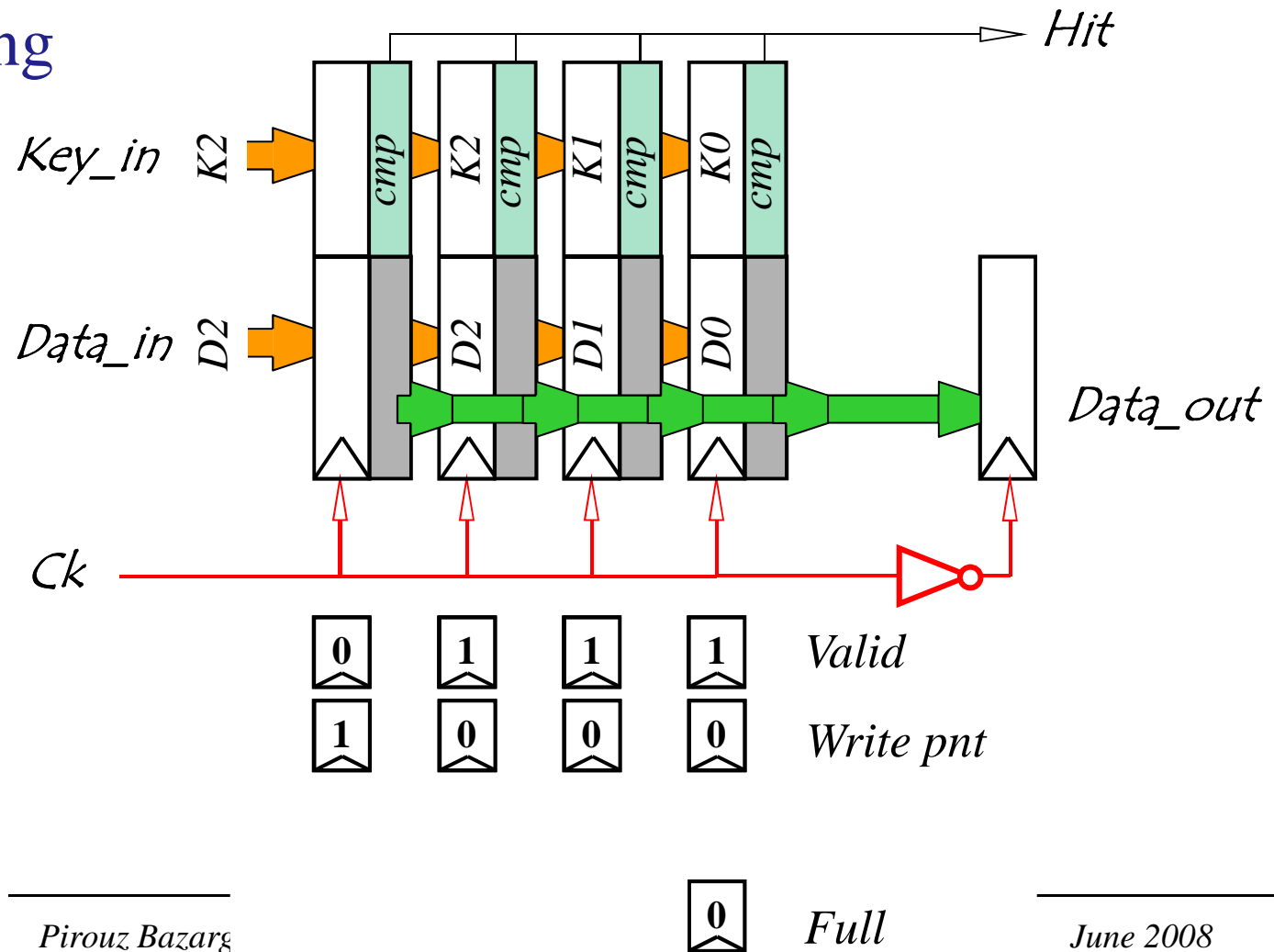
Cmd : Write , Read , Remove

Associative Table



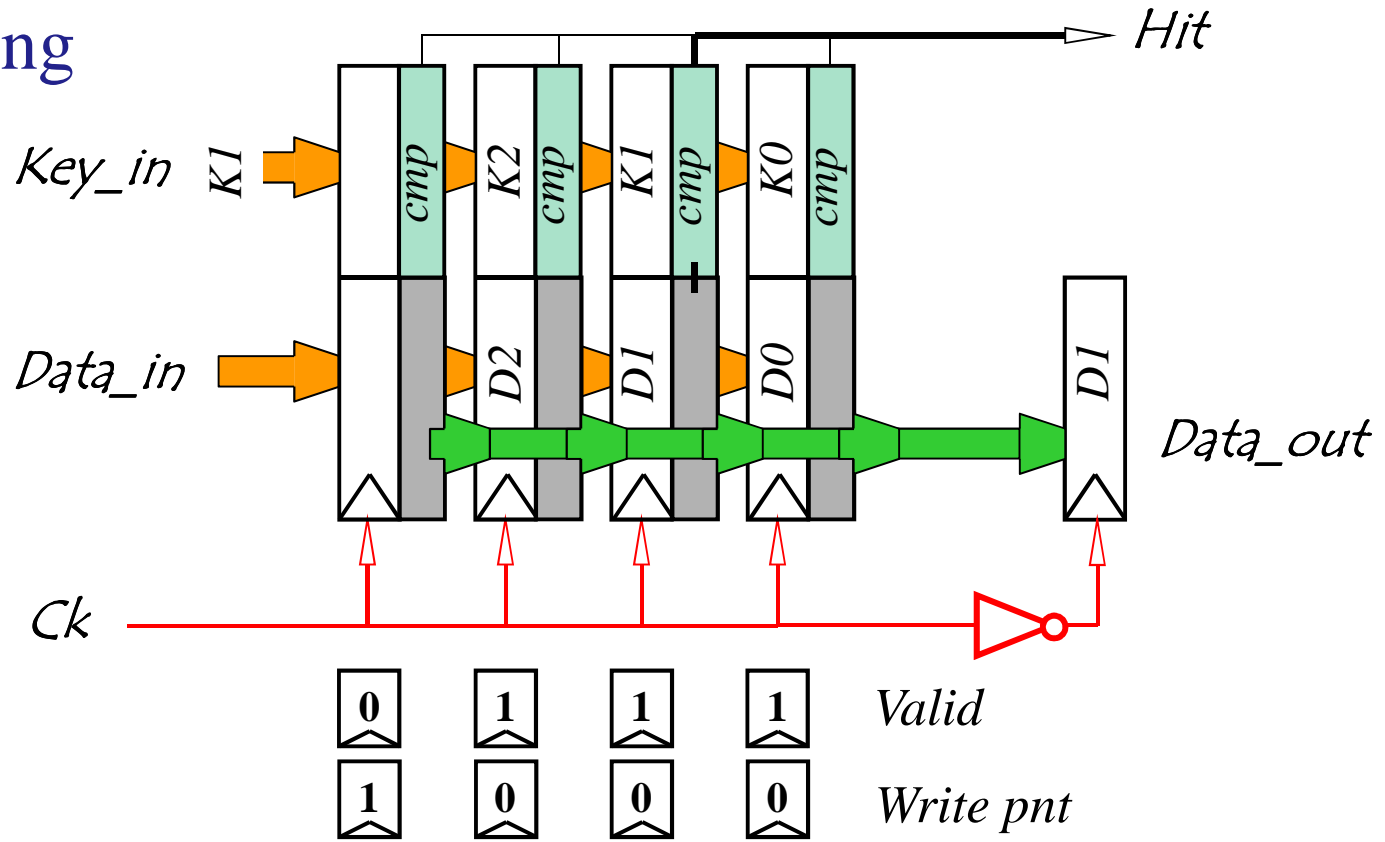
Associative Table

Writing



Associative Table

Reading



Associative Table

Removing

