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Universidade de Aveiro
Mestrado Integrado em Engenharia de Computadores e Telemática
Arquitectura de Computadores Avançada

Memory

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1. Assume a memory subsystem with 23 address lines.
 - 1.1. How many bytes, half-words, words and double-words can be stored in it?
 - 1.2. Give examples of addresses (in hexadecimal form) for bytes, half-words, words and double-words stored in the last quarter of its addressing space.
 - 1.3. Which of the following addresses are classified as *misaligned* if one intends to reference a byte, a half-word, a word and a double-word: 14902_{10} , 3710_{10} , 5555_{10} , 764_{10} and 2760_{10} ? Convert them first to hexadecimal form before giving your answer.
 - 1.4. Can the address 11899675_{10} express a valid byte reference for the memory subsystem?
2. Consider a 128Mbit SDRAM chip organized in 8 banks of 4096 rows x 1024 columns of 4 bits.
 - 2.1. How many address lines are there? Justify clearly your answer.
 - 2.2. How many chips are needed to build a 64-bit data wide memory subsystem? Justify clearly your answer.
 - 2.3. What is the storage capacity of such subsystem? Justify clearly your answer.
 - 2.4. Sketch how the external address bus are mapped internally to make data access as efficient as possible. What is the main concern to be taken into account?