

Exercise sheet 12 – I/O

Goals:

- Programmed I/O
- Interrupt driven I/O
- DMA

Exercise 12.1: Synchronisation commands

- (a) Describe a machine instruction for synchronisation and its interaction with the application, OS (operating system), and bus level. *Hint: You may consider the TAS command and semaphores, learned in the Operating Systems (Betriebssysteme) lecture as well as in this lecture. Use some pseudo-code to describe your ideas.*

Exercise 12.2: Programmed I/O (single transfer) with busy wait (pseudo C code)

Consider a system with the *F-Bus serial interface* (FSI). You want to receive data (characters) from the FSI with the busy wait approach. Compare the lecture for that.

- (a) Update the RA_exercises repository with `git pull`.
- (b) In
RA_exercises/sheet_12/io_pc_prog_io_busy_wait/io_pc_prog_io_busy_wait.c
you will find a skeleton file.
- (c) Complete the skeleton with pseudo C to read 16 bytes (characters) from the *F-Bus serial interface* (FSI) into the memory buffer.

Exercise 12.3: Programmed I/O (single transfer) with polling (pseudo C code)

Consider a system with the *F-Bus serial interface* (FSI). You want to receive data (characters) from the FSI with the polling approach. Compare the lecture for that.

- (a) In
RA_exercises/sheet_12/io_pc_prog_io_polling/io_pc_prog_io_polling.c
you will find a skeleton file.
- (b) Complete the skeleton with pseudo C to read 16 bytes (characters) from the *F-Bus serial interface* (FSI) into the memory buffer.

Exercise 12.4: Interrupt driven I/O (single transfer) (pseudo C code)

Consider a system with the *F-Bus serial interface* (FSI). You want to receive data (characters) from the FSI with the interrupt control approach. Compare the lecture for that.

- (a) In
RA_exercises/sheet_12/io_pc_interrupt_io/io_pc_interrupt_io.c
you will find a skeleton file.
- (b) Complete the skeleton with pseudo C to read 16 bytes (characters) from the *F-Bus serial interface* (FSI) into the memory buffer.

Exercise 12.5: DMA programming (pseudo C code)

Consider a system with the *F-Bus DMA disk* (FDD). You want to write data (some words) from the memory with the DMA approach to the disk. Compare the lecture for that.

- (a) In
RA_exercises/sheet_12/io_pc_dma/io_pc_dma.c
you will find a skeleton file.
- (b) Complete the skeleton with pseudo C to write 16 words (4 bytes per word) from the memory to the *F-Bus DMA disk* (FDD).
- Source (memory) starting address: 0x400000
 - Target (disk) starting address: 0x4711

Hint: Source, destination, how much, GO!