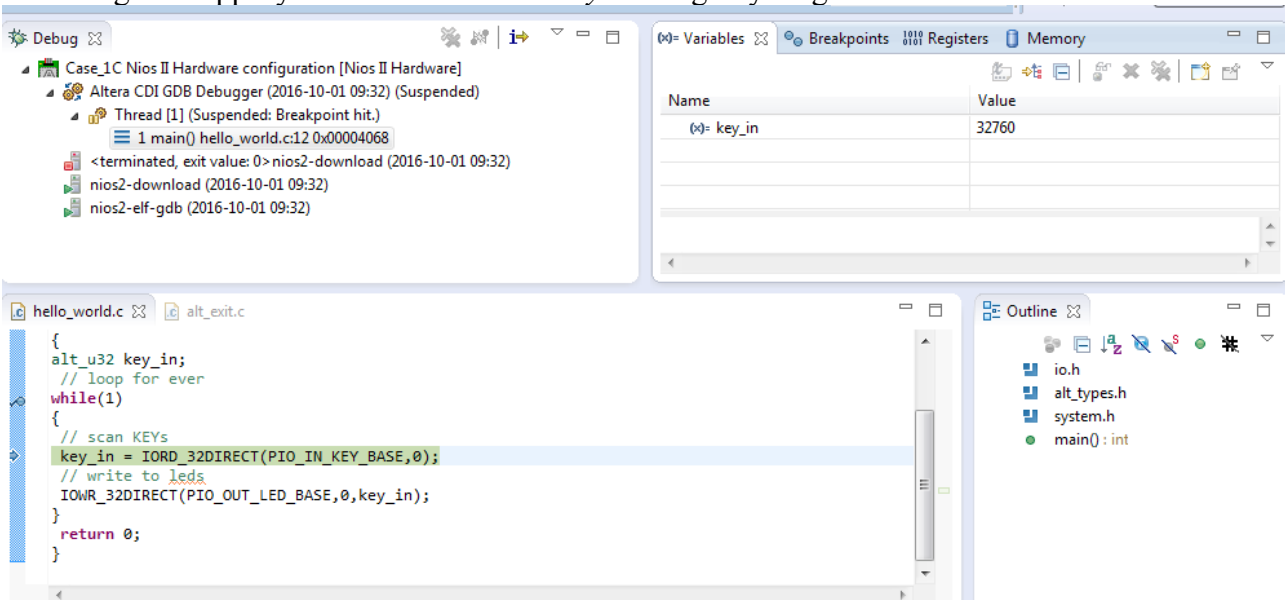


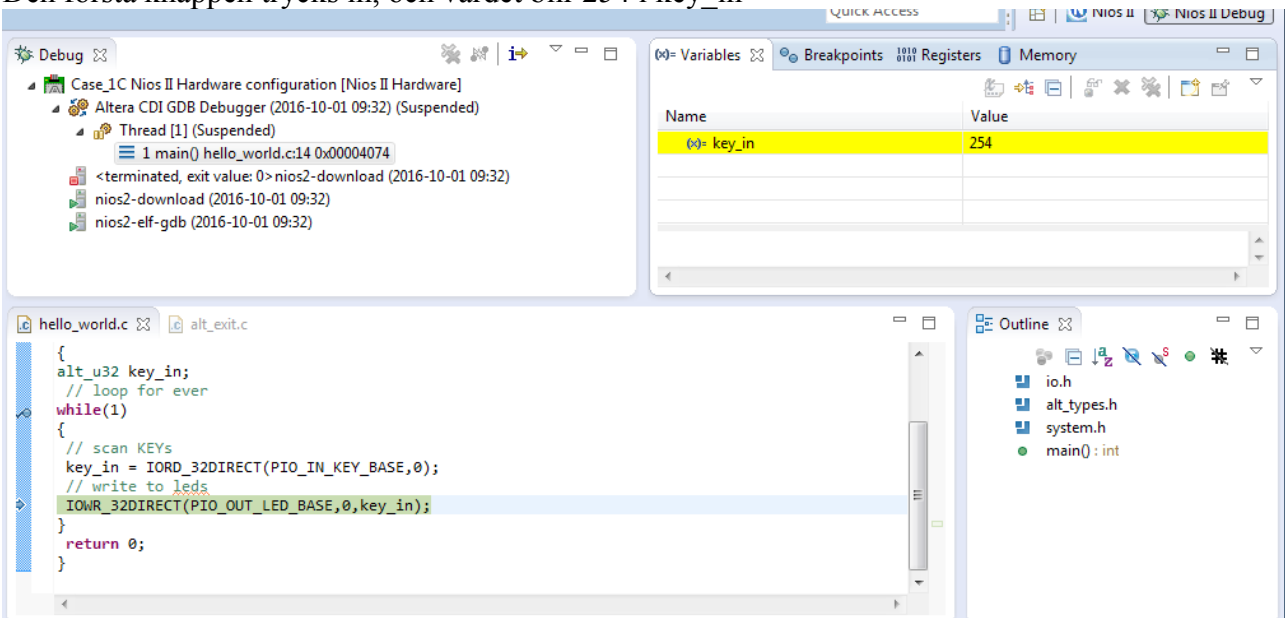
Krav2

Krav_002 Stega igenom programmet i bilagan med debuggern och visa resultatet med skärmdumpar från PIO data register (minnesadresserna) och variabeln "key_in". Minst två varv med olika knappnertryckningar.

Innan någon knapp tryckts in har variabeln *key_in* ett godtyckligt värde



Den första knappen trycks in, och värdet blir 254 i *key_in*



Variabeln *key_in* har tilldelats värdet från läsning av PIO data in på adress 0x9000

The screenshot shows the Nios II IDE interface. The 'Debug' window on the left shows the execution state: 'Case_1C Nios II Hardware configuration [Nios II Hardware]', 'Altera CDI GDB Debugger (2016-10-01 09:32) (Suspended)', 'Thread [1] (Suspended)', and '1 main() hello_world.c:14 0x00004074'. The 'Monitors' window on the right shows the memory at address 0x00009000 with a value of 00. The code window at the bottom shows the 'main' function in 'hello_world.c' with a loop that reads from PIO_IN_KEY_BASE and writes to PIO_OUT_LED_BASE.

```
1 main() hello_world.c:14 0x00004074
<terminated, exit value: 0>nios2-download (2016-10-01 09:32)
nios2-download (2016-10-01 09:32)
nios2-elf-gdb (2016-10-01 09:32)
```

```
hello_world.c
alt_exit.c

{
  alt_u32 key_in;
  // loop for ever
  while(1)
  {
    // scan KEYS
    key_in = IORD_32DIRECT(PIO_IN_KEY_BASE,0);
    // write to leds
    IOWR_32DIRECT(PIO_OUT_LED_BASE,0,key_in);
  }
  return 0;
}
```

Monitors

0x00009000 <Hex> 0x00009000 : 0x9000 <Hex> New Renderings...

Address	0
00008FFF	00
00009000	FE
00009001	00

Outline

- io.h
- alt_types.h
- system.h
- main() : int

Här har skrivning till adress 0x9010 gjorts vilken är PIO_data ut till LED, och första lysdioden lyser.

The screenshot shows the Nios II IDE interface after writing to address 0x9010. The 'Debug' window on the left shows the execution state: 'Case_1C Nios II Hardware configuration [Nios II Hardware]', 'Altera CDI GDB Debugger (2016-10-01 09:32) (Suspended)', 'Thread [1] (Suspended)', and '1 main() hello_world.c:15 0x00004080'. The 'Monitors' window on the right shows the memory at address 0x00009000 with a value of FF000000. The code window at the bottom shows the 'main' function in 'hello_world.c' with a loop that reads from PIO_IN_KEY_BASE and writes to PIO_OUT_LED_BASE.

```
1 main() hello_world.c:15 0x00004080
<terminated, exit value: 0>nios2-download (2016-10-01 09:32)
nios2-download (2016-10-01 09:32)
nios2-elf-gdb (2016-10-01 09:32)
```

```
hello_world.c
alt_exit.c

// scan KEYS
key_in = IORD_32DIRECT(PIO_IN_KEY_BASE,0);
// write to leds
IOWR_32DIRECT(PIO_OUT_LED_BASE,0,key_in);
return 0;
}
```

Monitors

0x00009000 <Hex> 0x00009000 <Hex> New Renderings...

Address	0 - 3	4 - 7	8 - B	C - F
00009000	FF000000	00000000	00000000	00000000
00009010	FE000000	00000000	00000000	00000000
00009020	00000000	889B5155	00240000	00244000
00009030	3A882398	3A882720	06BA3F00	170AC0DF
00009040	170900DF	1708C0DD	170780DD	170640DD

Outline

- io.h
- alt_types.h
- system.h
- main() : int

Nästa debuggnings-session trycks tredjeknappen in och värdet 251 läses in från adress 0x9000

Debug Console:

- Case_1C Nios II Hardware configuration [Nios II Hardware]
- Altera CDI GDB Debugger (2016-10-01 09:50) (Suspended)
- Thread [1] (Suspended)
- 1 main() hello_world.c:14 0x00004074
- <terminated, exit value: 0>nios2-download (2016-10-01 09:49)
- nios2-download (2016-10-01 09:50)
- nios2-elf-gdb (2016-10-01 09:50)

Monitors:

0x00009000 : 0x9000 <Hex>

Address	0 - 3	4 - 7	8 - B	C - F
00009000	FB000000	00000000	00000000	00000000
00009010	FF000000	00000000	00000000	00000000
00009020	00000000	889B5155	00240000	00244000
00009030	3A882308	3A882770	06A83E00	170AC00E

Code:

```
hello_world.c
{
    alt_u32 key_in;
    // loop for ever
    while(1)
    {
        // scan KEYS
        key_in = IORD_32DIRECT(PIO_IN_KEY_BASE,0);
        // write to leds
        IOWR_32DIRECT(PIO_OUT_LED_BASE,0,key_in);
    }
    return 0;
}
```

Outline:

- io.h
- alt_types.h
- system.h
- main() : int

Debug Console:

- Case_1C Nios II Hardware configuration [Nios II Hardware]
- Altera CDI GDB Debugger (2016-10-01 09:50) (Suspended)
- Thread [1] (Suspended)
- 1 main() hello_world.c:14 0x00004074
- <terminated, exit value: 0>nios2-download (2016-10-01 09:49)
- nios2-download (2016-10-01 09:50)
- nios2-elf-gdb (2016-10-01 09:50)

Variables:

Name	Value
key_in	251

Code:

```
hello_world.c
{
    alt_u32 key_in;
    // loop for ever
    while(1)
    {
        // scan KEYS
        key_in = IORD_32DIRECT(PIO_IN_KEY_BASE,0);
        // write to leds
        IOWR_32DIRECT(PIO_OUT_LED_BASE,0,key_in);
    }
    return 0;
}
```

Outline:

- io.h
- alt_types.h
- system.h
- main() : int

Resultatet från skrivningen till adress 0x9010 ses här:

Debug Console:

- Case_1C Nios II Hardware configuration [Nios II Hardware]
- Altera CDI GDB Debugger (2016-10-01 09:50) (Suspended)
- Thread [1] (Suspended)
- 1 main() hello_world.c:15 0x00004080
- <terminated, exit value: 0>nios2-download (2016-10-01 09:49)
- nios2-download (2016-10-01 09:50)
- nios2-elf-gdb (2016-10-01 09:50)

Monitors:

0x00009000 : 0x9000 <Hex>

Address	0 - 3	4 - 7	8 - B	C - F
00009000	FF000000	00000000	00000000	00000000
00009010	FB000000	00000000	00000000	00000000
00009020	00000000	889B5155	00240000	00244000
00009030	3A882308	3A882770	06A83E00	170AC00E

Code:

```
hello_world.c
{
    alt_u32 key_in;
    // loop for ever
    while(1)
    {
        // scan KEYS
        key_in = IORD_32DIRECT(PIO_IN_KEY_BASE,0);
        // write to leds
        IOWR_32DIRECT(PIO_OUT_LED_BASE,0,key_in);
    }
    return 0;
}
```

Outline:

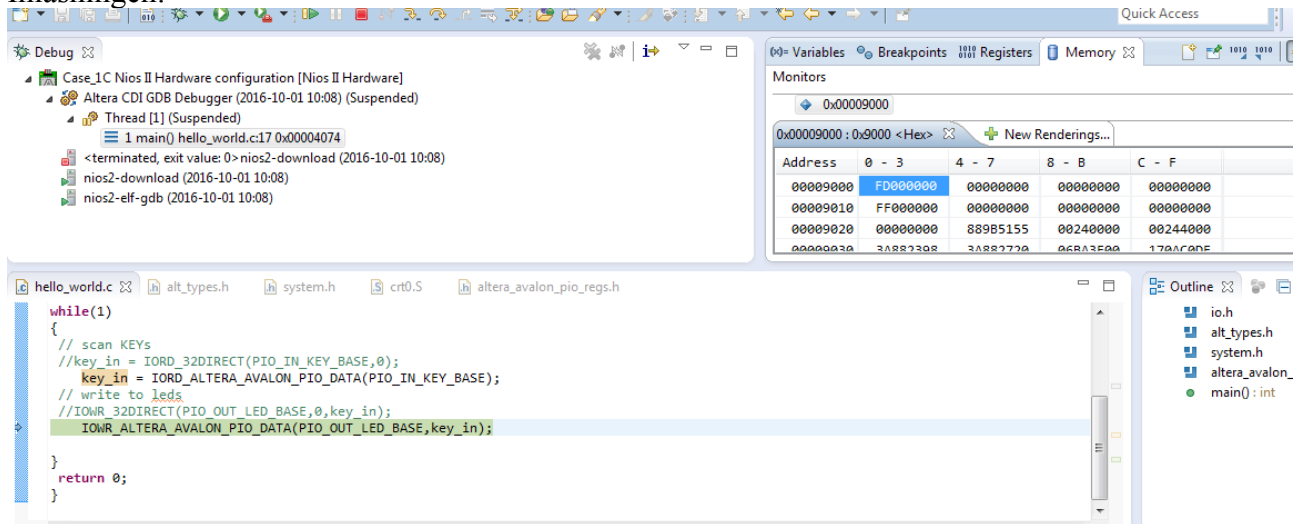
- io.h
- alt_types.h
- system.h
- main() : int

Krav 3

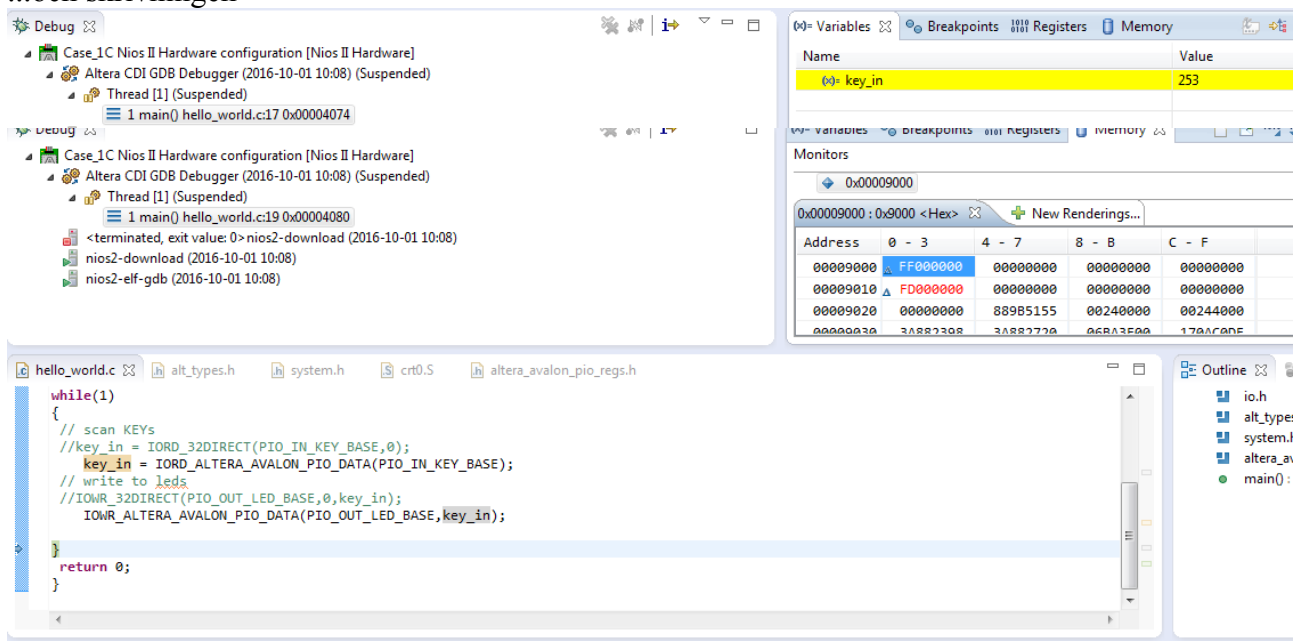
Krav_003 Redovisa hur koden ändras om header-filen `#include "altera_avalon_pio_regs.h"` används. Redovisa med förklaring detta kort i ett separat kapitel.

Header-filen inkluderas och vid inspektion ses vilka macron som ska användas. Omkompilering och debuggning, intryckning av andra knappen ger följande:

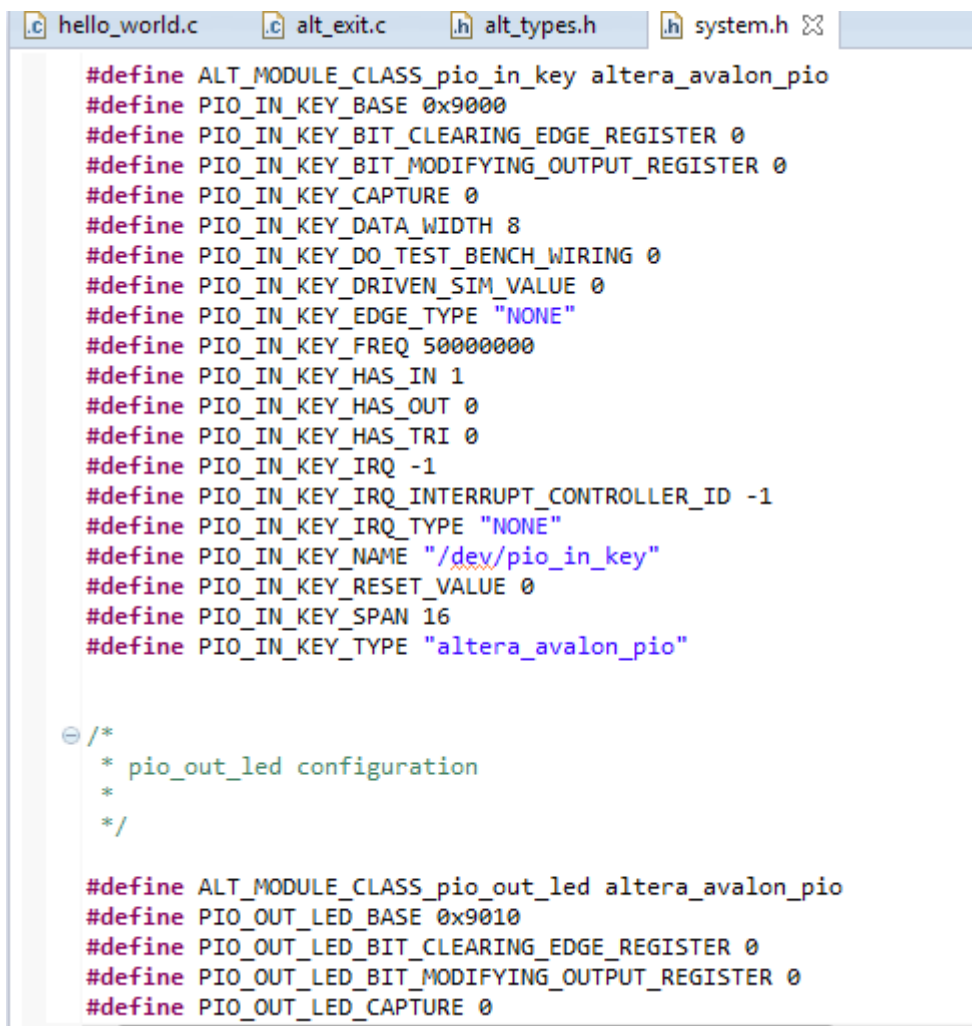
Inläsningen:



...och skrivningen



Avseende bas-adresserna så finns dessa i System.h. Se andra raden i första och andra stycket.



```
#define ALT_MODULE_CLASS_pio_in_key altera_avalon_pio
#define PIO_IN_KEY_BASE 0x9000
#define PIO_IN_KEY_BIT_CLEARING_EDGE_REGISTER 0
#define PIO_IN_KEY_BIT_MODIFYING_OUTPUT_REGISTER 0
#define PIO_IN_KEY_CAPTURE 0
#define PIO_IN_KEY_DATA_WIDTH 8
#define PIO_IN_KEY_DO_TEST_BENCH_WIRING 0
#define PIO_IN_KEY_DRIVEN_SIM_VALUE 0
#define PIO_IN_KEY_EDGE_TYPE "NONE"
#define PIO_IN_KEY_FREQ 50000000
#define PIO_IN_KEY_HAS_IN 1
#define PIO_IN_KEY_HAS_OUT 0
#define PIO_IN_KEY_HAS_TRI 0
#define PIO_IN_KEY_IRQ -1
#define PIO_IN_KEY_IRQ_INTERRUPT_CONTROLLER_ID -1
#define PIO_IN_KEY_IRQ_TYPE "NONE"
#define PIO_IN_KEY_NAME "/dev/pio_in_key"
#define PIO_IN_KEY_RESET_VALUE 0
#define PIO_IN_KEY_SPAN 16
#define PIO_IN_KEY_TYPE "altera_avalon_pio"

/*
 * pio_out_led configuration
 */

#define ALT_MODULE_CLASS_pio_out_led altera_avalon_pio
#define PIO_OUT_LED_BASE 0x9010
#define PIO_OUT_LED_BIT_CLEARING_EDGE_REGISTER 0
#define PIO_OUT_LED_BIT_MODIFYING_OUTPUT_REGISTER 0
#define PIO_OUT_LED_CAPTURE 0
```

Krav_004 Leveransen ska ske till plattformen Itslearning. Leveransen ska vara en kort rapport. Namnet på filen ska vara "förnamn_efternamn_C_uppgift_3". Sista leveransdag se