LAB HANDBOOK

Module 1:

Flow Summary

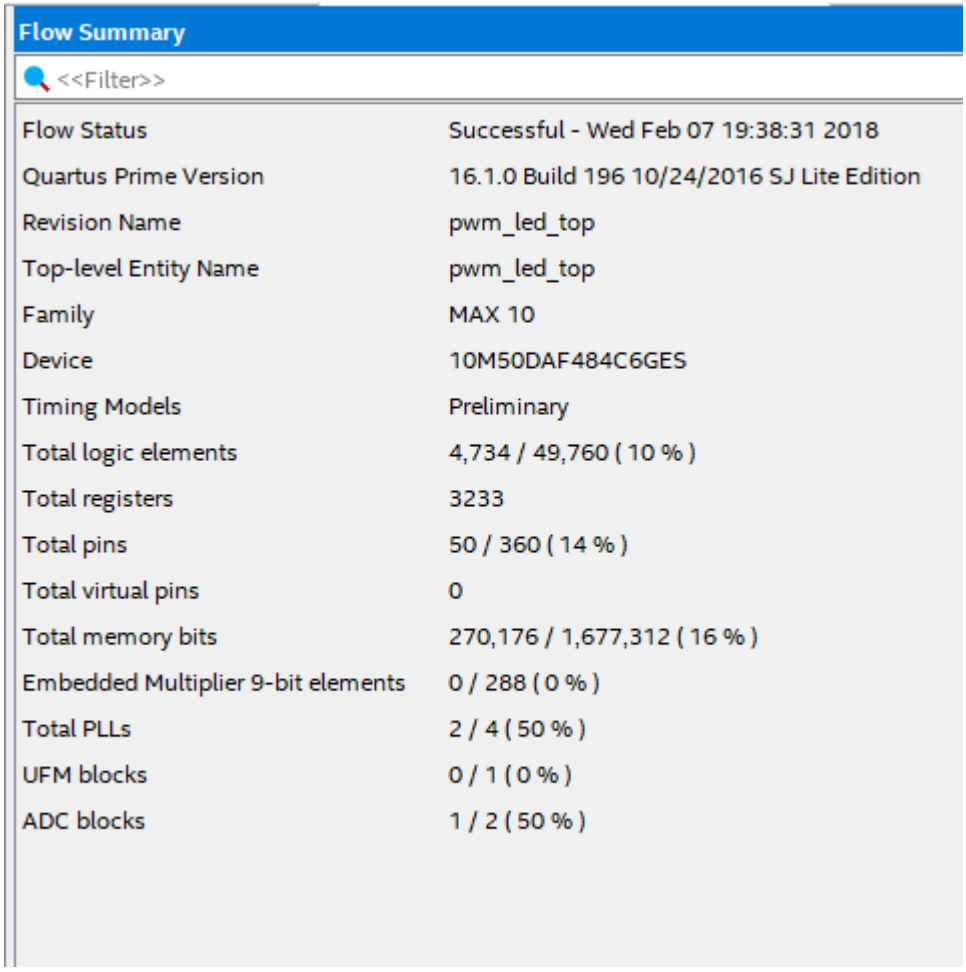
<<Filter>>

Flow Status	Successful - Wed Feb 21 15:04:39 2018
Quartus Prime Version	16.1.0 Build 196 10/24/2016 SJ Lite Edition
Revision Name	pwm_led_top
Top-level Entity Name	pwm_led_top
Family	MAX 10
Device	10M50DAF484C7G
Timing Models	Final
Total logic elements	33 / 49,760 (< 1 %)
Total registers	31
Total pins	6 / 360 (2 %)
Total virtual pins	0
Total memory bits	0 / 1,677,312 (0 %)
Embedded Multiplier 9-bit elements	0 / 288 (0 %)
Total PLLs	1 / 4 (25 %)
UFM blocks	0 / 1 (0 %)
ADC blocks	0 / 2 (0 %)

Figure 1: Compilation report of Module 1 (PWM)

	Fmax	Restricted Fmax	Clock Name	Note
1	422.83 MHz	416.15 MHz	b2v_inst|altp...d|pll1|clk[1]	limit due to minimum period restriction (tmin)
2	508.65 MHz	416.15 MHz	b2v_inst|altp...d|pll1|clk[0]	limit due to minimum period restriction (tmin)

Figure 2: Fmax of Module 1(PWM)



Flow Summary

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Flow Status	Successful - Wed Feb 07 19:38:31 2018
Quartus Prime Version	16.1.0 Build 196 10/24/2016 SJ Lite Edition
Revision Name	pwm_led_top
Top-level Entity Name	pwm_led_top
Family	MAX 10
Device	10M50DAF484C6GES
Timing Models	Preliminary
Total logic elements	4,734 / 49,760 (10 %)
Total registers	3233
Total pins	50 / 360 (14 %)
Total virtual pins	0
Total memory bits	270,176 / 1,677,312 (16 %)
Embedded Multiplier 9-bit elements	0 / 288 (0 %)
Total PLLs	2 / 4 (50 %)
UFM blocks	0 / 1 (0 %)
ADC blocks	1 / 2 (50 %)

Figure 3: Compilation report of Module 1(ADC)

Slow 1200mV 85C Model Fmax Summary

<<Filter>>

	Fmax	Restricted Fmax	Clock Name	Note
1	50.38 MHz	50.38 MHz	ADC_CLK_10	
2	64.02 MHz	64.02 MHz	altera_reserved_tck	
3	413.74 MHz	413.74 MHz	inst|altpll_c...d|pll1|clk[1]	
4	623.05 MHz	450.05 MHz	inst|altpll_c...d|pll1|clk[0]	limit due to minimum period restriction (tmin)

Figure 4: Fmax of Module 1(ADC)

Module 2:

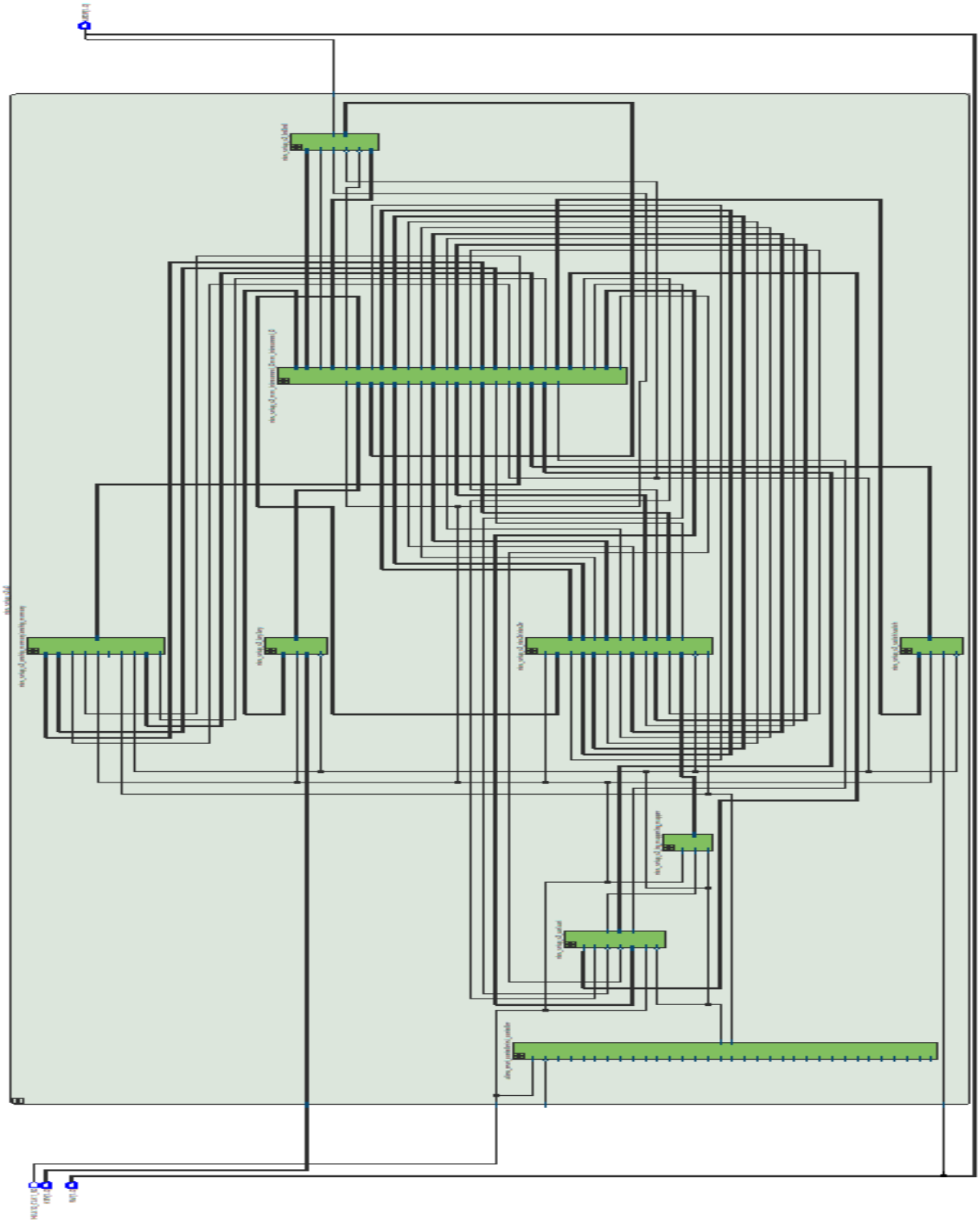


Figure 5: RTL view of Module 2

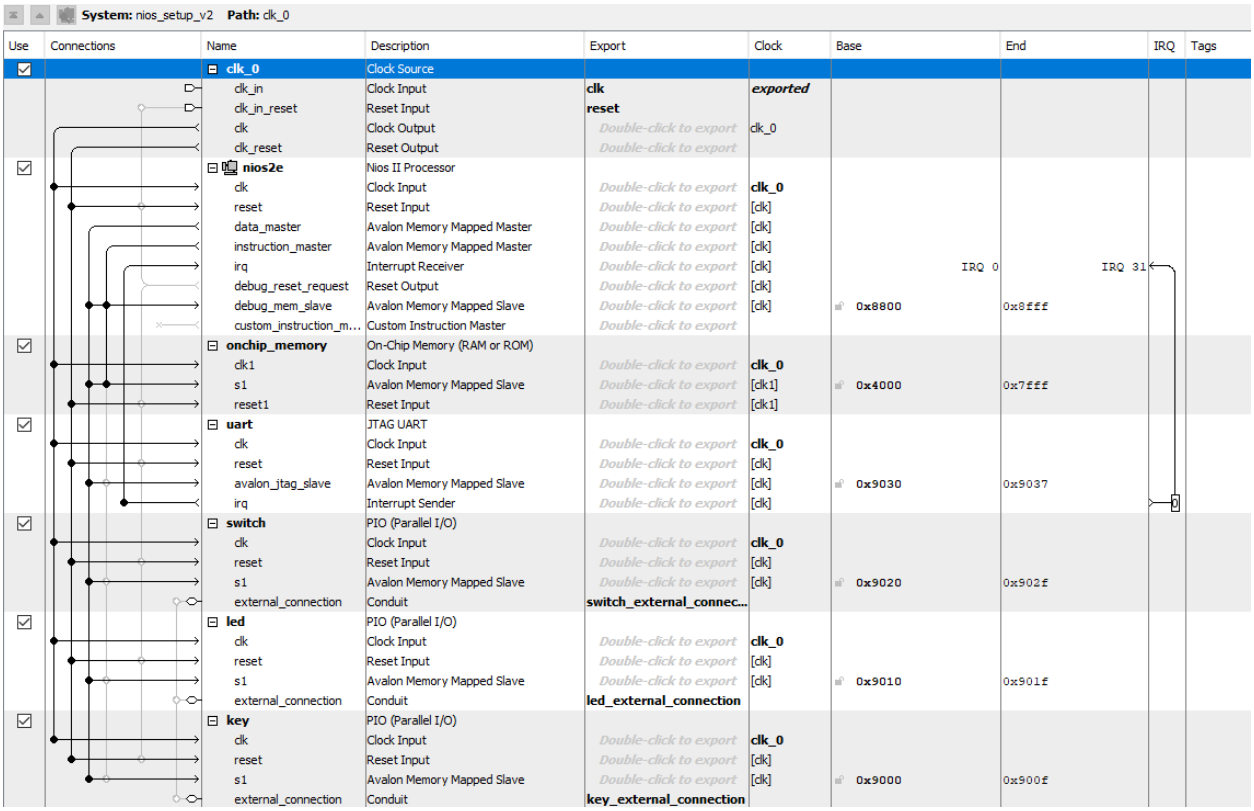


Figure 6: Qsys connections of Module 2

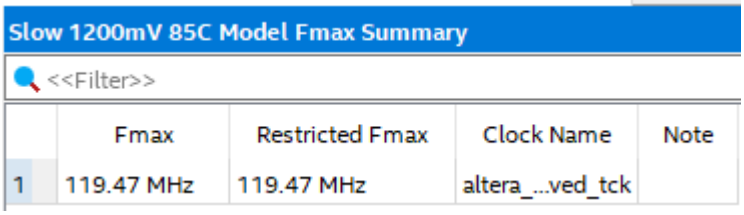
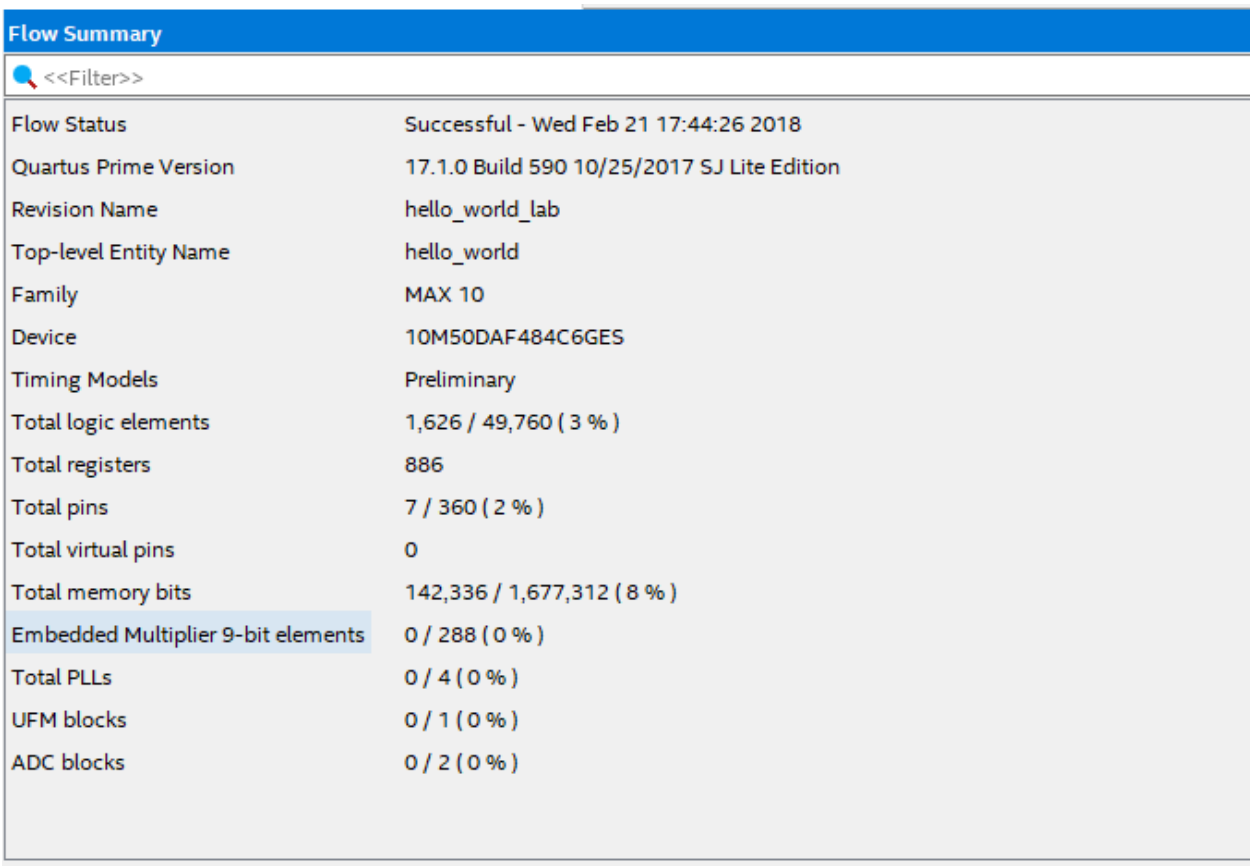


Figure 7: Fmax of Module 2



Flow Summary

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Flow Status	Successful - Wed Feb 21 17:44:26 2018
Quartus Prime Version	17.1.0 Build 590 10/25/2017 SJ Lite Edition
Revision Name	hello_world_lab
Top-level Entity Name	hello_world
Family	MAX 10
Device	10M50DAF484C6GES
Timing Models	Preliminary
Total logic elements	1,626 / 49,760 (3 %)
Total registers	886
Total pins	7 / 360 (2 %)
Total virtual pins	0
Total memory bits	142,336 / 1,677,312 (8 %)
Embedded Multiplier 9-bit elements	0 / 288 (0 %)
Total PLLs	0 / 4 (0 %)
UFM blocks	0 / 1 (0 %)
ADC blocks	0 / 2 (0 %)

Figure 8: Compilation Report of Module 2

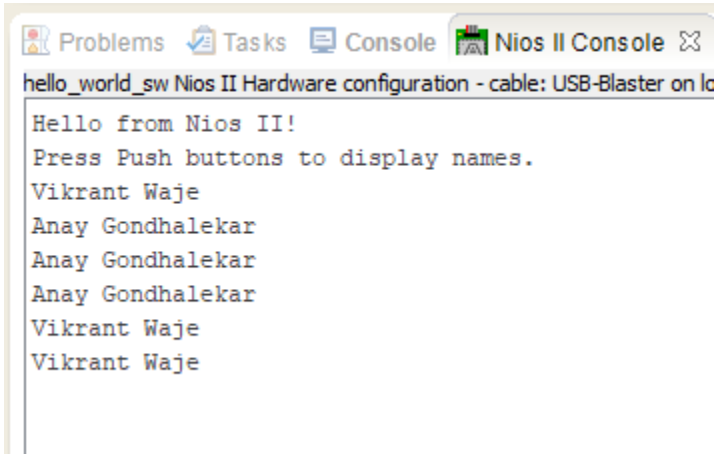

Figure 9: Output of software part of Module 2

Module 3:

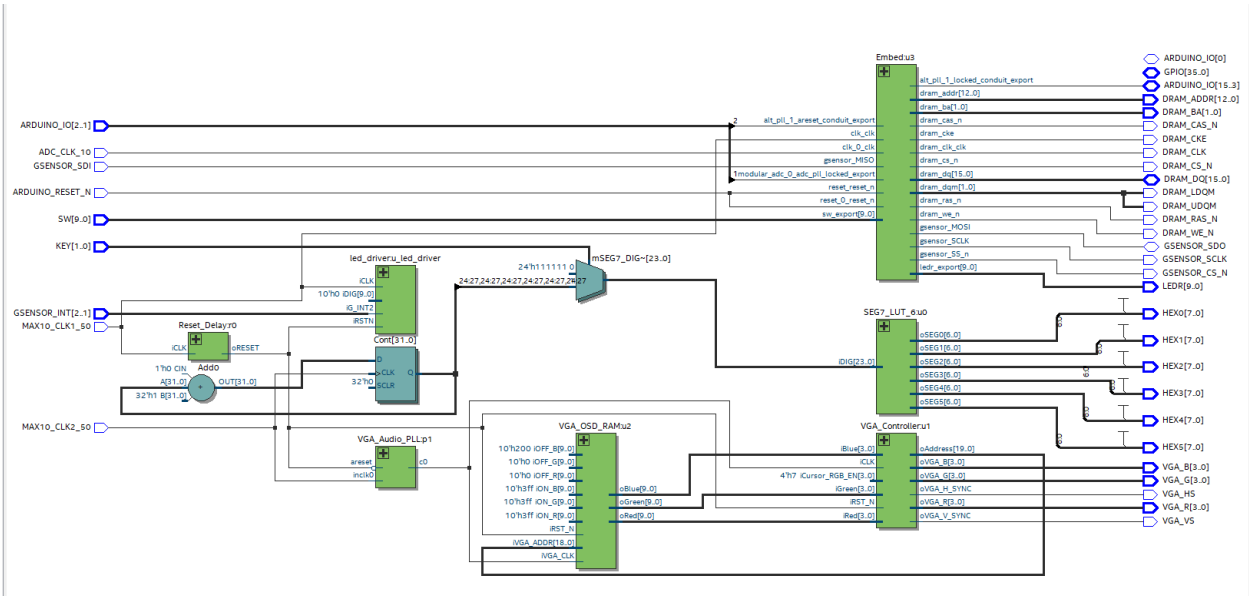

Figure 10: RTL view of Module 3

Slow 1200mV 85C Model Fmax Summary

<<Filter>>

	Fmax	Restricted Fmax	Clock Name	Note
1	86.22 MHz	86.22 MHz	altera_reserved_tck	

Figure 11: Fmax of Module 3

Flow Status	Successful - Fri Feb 16 15:03:52 2018
Quartus Prime Version	16.1.0 Build 196 10/24/2016 SJ Lite Edition
Revision Name	Embed
Top-level Entity Name	DE10_LITE_Default
Family	MAX 10
Device	10M50DAF484C6GES
Timing Models	Preliminary
Total logic elements	7,778 / 49,760 (16 %)
Total registers	4606
Total pins	185 / 360 (51 %)
Total virtual pins	0
Total memory bits	490,296 / 1,677,312 (29 %)
Embedded Multiplier 9-bit elements	6 / 288 (2 %)
Total PLLs	3 / 4 (75 %)
UFM blocks	1 / 1 (100 %)
ADC blocks	1 / 2 (50 %)

Figure 12: Compilation report of Module 3

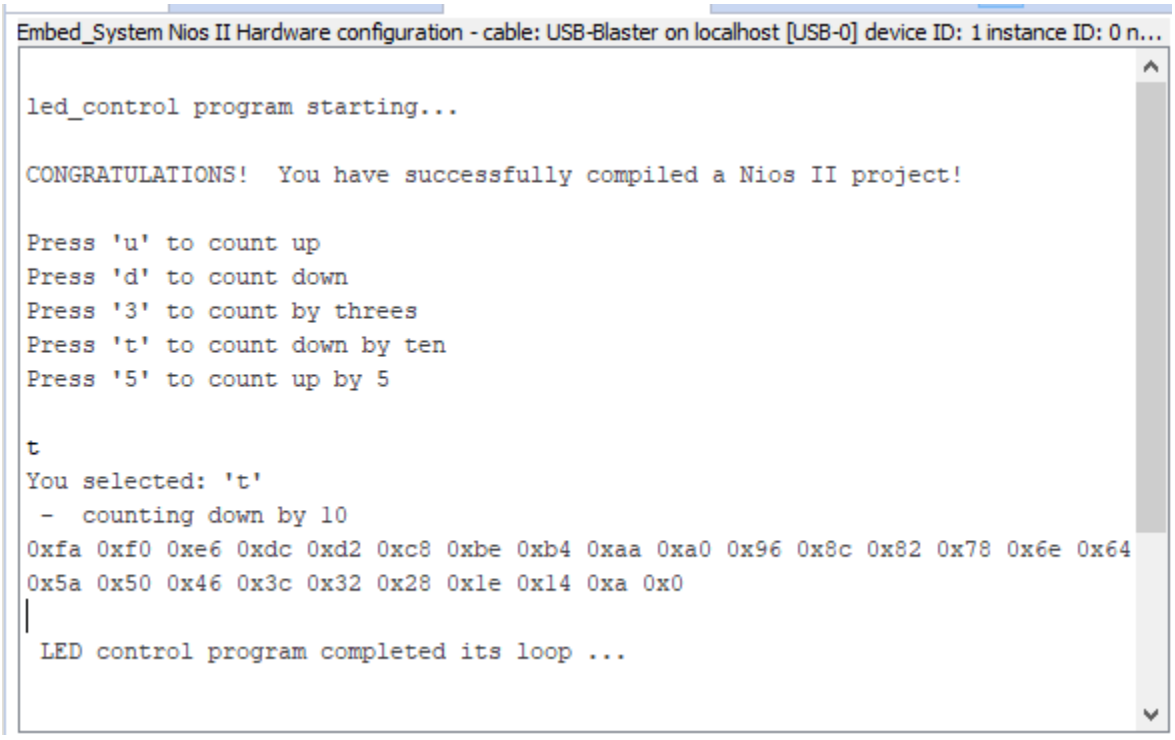

Figure 13: Output when down counting of 10 is done by pressing 't'

Figure 14: Upcounting by 1

Figure 15: Down counting by 1

```
3
You selected: '3'
 -  counting up by 3
0x0 0x3 0x6 0x9 0xc 0xf 0x12 0x15 0x18 0x1b 0x1e 0x21 0x24 0x27 0x2a 0x2d
0x30 0x33 0x36 0x39 0x3c 0x3f 0x42 0x45 0x48 0x4b 0x4e 0x51 0x54 0x57 0x5a 0x5d
0x60 0x63 0x66 0x69 0x6c 0x6f 0x72 0x75 0x78 0x7b 0x7e 0x81 0x84 0x87 0x8a 0x8d
0x90 0x93 0x96 0x99 0x9c 0x9f 0xa2 0xa5 0xa8 0xab 0xae 0xb1 0xb4 0xb7 0xba 0xbd
0xc0 0xc3 0xc6 0xc9 0xcc 0xcf 0xd2 0xd5 0xd8 0xdb 0xde 0xe1 0xe4 0xe7 0xea 0xed
0xf0 0xf3 0xf6 0xf9 0xfc 0xff
```

Figure 16: Upcounting by 3

Embed_System Nios II Hardware configuration - cable: USB-Blaster on localhost [USB-0] device ID: 1 instance ID: 0 n...

```
Press 'u' to count up
Press 'd' to count down
Press '3' to count by threes
Press 't' to count down by ten
Press '5' to count up by 5

5
You selected: '5'
 -  counting up by 5
0x0 0x5 0xa 0xf 0x14 0x19 0x1e 0x23 0x28 0x2d 0x32 0x37 0x3c 0x41 0x46 0x4b
0x50 0x55 0x5a 0x5f 0x64 0x69 0x6e 0x73 0x78 0x7d 0x82 0x87 0x8c 0x91 0x96 0x9b
0xa0 0xa5 0xaa 0xaf 0xb4 0xb9 0xbe 0xc3 0xc8 0xcd 0xd2 0xd7 0xdc 0xe1 0xe6 0xeb
0xf0 0xf5 0xfa 0xff

 LED control program completed its loop ...
```

Figure 17: Up counting by 5