TU Berlin WiSe 2014/2015

Computer Arithmetics

Lab Assignment 2: Moving Average Filter

DOUBLE Xavier (ID 367677)

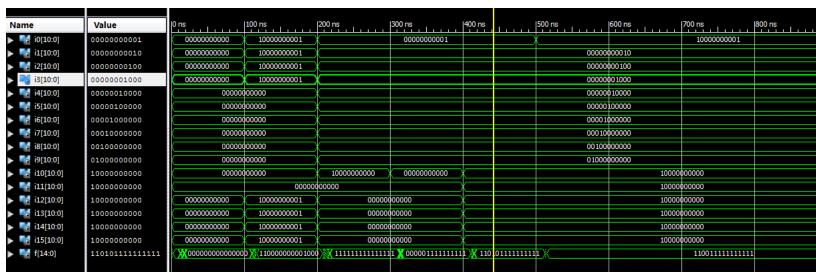
CAO Xu (ID 367965)

A1) The waveform for the 16bit Carry Save Adder:

Behavior:

Name	Value	0 ns	100 ns	200 ns	300 ns	400 ns	500 ns	600 ns	700 ns	800 ns 9
▶ 🥞 i0[10:0]	10000000001	00000000000	10000000001		00000000001		(10000000001	
▶ 🌃 i1[10:0]	00000000010	00000000000	10000000001				000000	00010		
▶ 🐝 i2[10:0]	0000000100	00000000000	10000000001				000000	00100		
▶ 🐝 i3[10:0]	00000001000	00000000000	10000000001				000000	01000		
▶ 🌃 i4[10:0]	00000010000	000000	00000				000000	10000		
▶ 🍯 i5[10:0]	00000100000	000000	00000				00000	00000		
▶ 🍯 i6[10:0]	00001000000	000000	00000				00001	00000		
▶ 🌃 i7[10:0]	00010000000	000000	00000				00010	00000		
▶ 🌃 i8[10:0]	00100000000	000000	00000				001000	00000		
▶ 🌃 i9[10:0]	01000000000	000000	00000				01000	00000		
▶ 📷 i10[10:0]	10000000000	000000	00000	10000000000	00000000000	X		100000	00000	
▶ 📷 i11[10:0]	10000000000		000000	00000		*		100000	00000	
▶ 🌃 i12[10:0]	10000000000	0000000000	10000000001	00000	000000	*		100000	00000	
▶ 🌃 i13[10:0]	10000000000	0000000000	10000000001	00000	000000	*		100000	00000	
▶ 🌃 i14[10:0]	10000000000	0000000000	10000000001	00000	000000	*		100000	00000	
▶ 🌃 i15[10:0]	10000000000	0000000000	10000000001	00000	000000	X		100000	00000	
▶ 🥳 f[14:0]	11001111111111	000000000000000000000000000000000000000	110000000001000	111111111111111	000001111111111	110101111111111			110011111111111	

Post Place & Route:

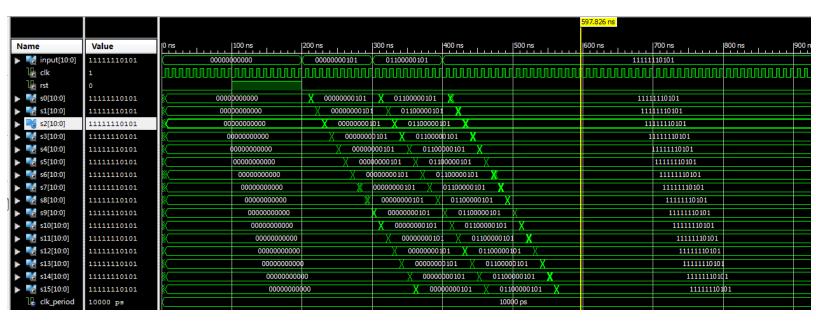


A2) The waveform for the Register:

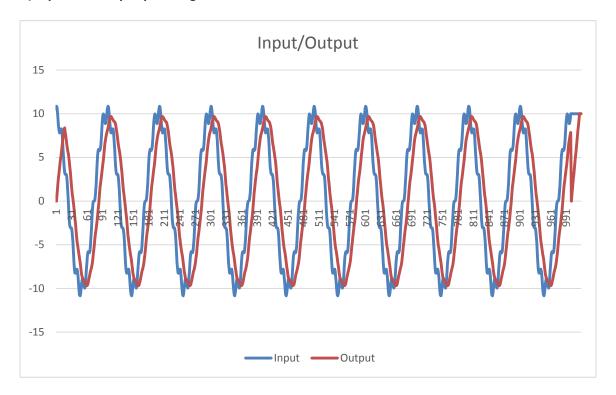
Behavior:

		138.138 ns	
Name	Value	0 ns 200 ns 400 ns 600 ns 800 ns	
▶ ■ input[10:0]	0000000000	00000000000 000000000000000000000000000	
Ū₀ clk	1		M
Ve rst	1		
▶ 🔣 s0[10:0]	0000000000	00000000000 0000000101 01100000101 111111	
▶ 🌃 s1[10:0]	0000000000	00000000000 0 0000000011 01100000101 111111	
▶ 🌃 s2[10:0]	0000000000	(
▶ 😽 s3[10:0]	0000000000	(U) 00000000000 X 0000000011 X 01100000101 X 11111110101	
▶ 54 [10:0]	0000000000	(UUUX 00000000000 X 00000000101 X 011000000101 X 11111111	
▶ 🧲 s5[10:0]	0000000000	(UUUUUX 0000000000 X 00000000101 X 01100000101 X 11111110101	
▶ 🧲 s6[10:0]	0000000000	(0000000000 × 00000000101 × 01100000101 × 11111110101	
▶ 🌃 s7[10:0]	0000000000	0000000000	
▶ 🌃 s8[10:0]	0000000000	(00000000000) 00000000101) 01100000101) 11111111	
▶ 🔣 s9[10:0]	0000000000	(UUUUUUUUU X 00000000000	
▶ 🧲 s10[10:0]	0000000000	(UUUUUUUUU	
▶ 🦷 s11[10:0]	0000000000	(UUUUUUUUU	
▶ 🦬 s12[10:0]	0000000000	(0000000000	
▶ 🌃 s13[10:0]	0000000000	000000000 X 000000000101 X 11111110101	
▶ 🌃 s14[10:0]	00000000000	UUUUUUUUUUU 0000000000	
▶ 🌃 s15[10:0]	0000000000	<u>UUUUUUUUUUU</u> 00000000000	
🖟 clk_period	10000 ps	10000 ps	

Post Place & Route:



B) Input and output plot diagram:



Frequency analysis:

Setup/Hold to clock clk

According to the software ISE, we have the following values

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Data Sheet report:
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All values displayed in nanoseconds (ns)
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-----|Max Setup to|Max Hold to | | Clock | Source | clk (edge) | clk (edge) | Internal Clock(s) | Phase | ----sin<0> | 0.000| 0.486(R) | 0.738(R) | clk_BUFGP | sin<1> | -0.054(R)| 1.169(R)|clk_BUFGP 0.0001 0.0001 sin<2> | 0.053(R)| 1.089(R)|clk_BUFGP | -0.451(R)| 1.492(R)|clk_BUFGP 0.0001 sin<3> | -0.418(R)| 1.461(R)|clk BUFGP 0.0001 | -0.490(R)| 1.519(R)|clk BUFGP sin<5> 0.0001 0.594(R) | 0.655(R) | clk_BUFGP 0.0001 sin<6> -0.234(R) | 1.318(R) | clk_BUFGP 0.0001 sin<7> 1 | 0.718(R)| 0.557(R)|clk_BUFGP sin<8> 0.0001 1 0.0001 sin<9> | 0.885(R)| 0.424(R)|clk_BUFGP sin<10> | 0.924(R)| 0.395(R)|clk_BUFGP | 0.000|

Destination	1	clk (edge) to PAD	 Internal Clock(s)	1	Clock Phase
sout<0>	1	18.678(R)	clk_BUFGP	1	0.000
sout<1>	1	19.711(R)	clk_BUFGP	ī	0.00
sout<2>	1	20.910(R)	clk_BUFGP	1	0.00
sout<3>	1	22.196(R)	clk_BUFGP	1	0.00
sout<4>	1	23.163(R)	clk_BUFGP	1	0.00
sout<5>	1	23.770(R)	clk_BUFGP	1	0.00
sout<6>	1	25.433(R)	clk_BUFGP	1	0.00
sout<7>	1	26.511(R)	clk_BUFGP	1	0.00
sout<8>	1	28.697(R)	clk_BUFGP	1	0.00
sout<9>	1	30.037(R)	clk_BUFGP	1	0.00
sout<10>	1	30.497(R)	clk_BUFGP	1	0.00

From them, we could expect a period of:

$$T = 30.497 + 0.490 = 30.987 \text{ ns}$$

And this is satisfied for maximum frequency which is showed in the slid (10MHz).

In reality, a higher period is needed in some case.