Verifying the Accuracy of sleep() and usleep()

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Objectives

Using the ZYBO Private Timer & DSO:

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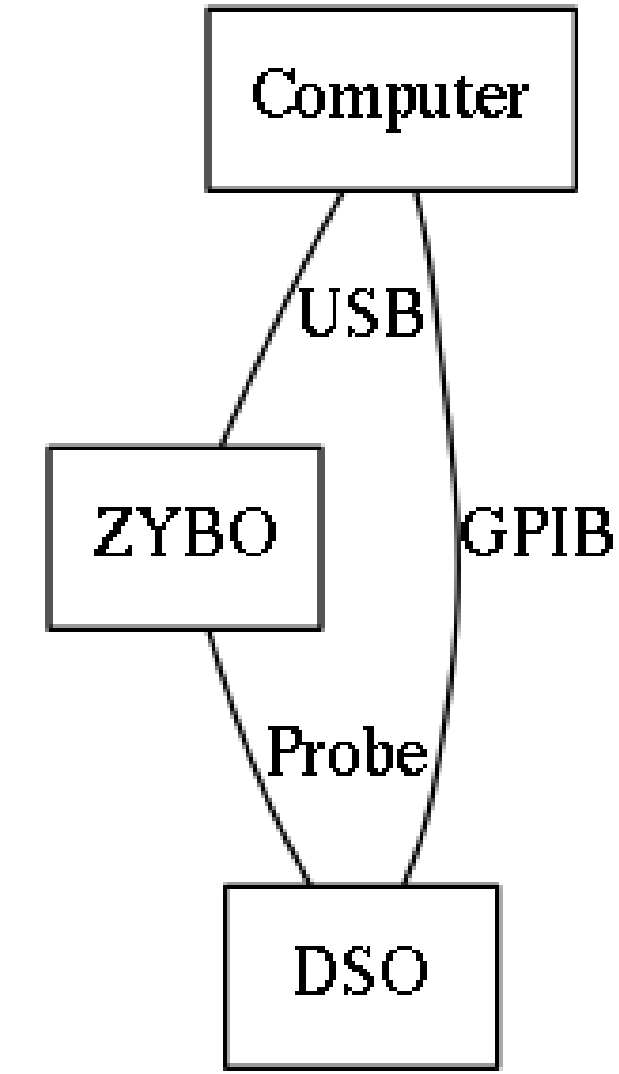
Using the ZYBO Private Timer & DSO:

- Verify the accuracy of both functions
- Compare accuracy of the private timer and DSO
- Determine delay to set a pin high/low

Functional Block Diagram



DSO hooked to pin JB2

Functionality

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- Once finished, the ZYBO sends sleep value to C#
- C# reads all data off the DSO
- C# finds all data that is high

Tests

20 Total Tests

- 10 tests per function
- Values per test range from low to high
- 10 data points per test
- Private timer and DSO data is collected simultaneously

sleep Data for Private Timer

Time	Average Measured	Standard Deviation	Percent Error
1	1	1.542 E-08	4.471 E-05
2	2	1.369 E-08	2.005 E-05
3	3	1.707 E-08	1.476 E-05
5	5	1.897 E-08	8.818 E-06
7	7	2.088 E-08	5.960 E-06
10	10	1.257 E-08	4.575 E-06
13	13	1.537 E-08	3.207 E-06
20	13.22	0	-33.92
30	13.22	0	-55.95
40	13.22	0	-66.962

Note: Time, Average Measured, and Standard Deviation are in seconds

sleep Data for DSO

Time	Average Measured	Standard Deviation	Percent Error
1	0.989	1.17 E-16	-0.01
2	1.98	0	-1
3	2.971	2.846 E-02	-0.9667
5	4.95	9.362 E-16	-1
7	6.96	2.108 E-02	-0.5714
10	9.9	1.872 E-15	-1
13	12.95	0	-0.3846
20	19.8	3.745 E-15	-1
30	29.8	3.745 E-15	-0.6667
40	39.8	7.49 E-15	-0.5

Note: Time, Average Measured, and Standard Deviation are in seconds

usleep Data for Private Timer

Time	Average Measured	Standard Deviation	Percent Error
1u	1.405 E-06	1.452 E-08	40.46
5u	5.394 E-06	6.454 E-09	7.889
10u	1.043 E-05	3.163 E-08	4.28
15u	1.547 E-05	1.038 E-08	3.128
20u	2.043 E-05	3.773 E-08	2.166
100u	1.004 E-04	1.88 E-08	0.4358
1m	1 E-03	1.263 E-08	4.252 E-02
1.25m	1.25 E-03	2.211 E-08	3.621 E-02
10m	1 E-02	1.175 E-08	4.286 E-03
100m	.1	1.869 E-08	4.514 E-04

Note: Time, Average Measured, and Standard Deviation are in seconds

usleep Data for DSO

Time	Average Measured	Standard Deviation	Percent Error
1u	1.444 E-06	8.433 E-09	44.4
5u	5.44 E-06	2.108 E-08	8.8
10u	1.05 E-05	6.667 E-08	5
15u	1.551 E-05	3.162 E-08	3.4
20u	2.044 E-05	1.265 E-07	2.2
100u	1.005 E-04	5.27 E-07	0.5
1m	1.001 E-03	3.162 E-06	0.1
1.25m	1.252 E-03	1.033 E-05	0.16
10m	1 E-02	1.829 E-18	0
100m	9.36 E-02	5.164 E-04	-6.4

Note: Time, Average Measured, and Standard Deviation are in seconds

Conclusion

	SD Private Timer	SD DSO
Max	3.773 E-08	2.846 E-02
Min	6.454 E-09	0
Average	1.757 E-08	2.504 E-03

	Error Private Timer	Error DSO
Max	40.46	44.4
Min	3.207 E-06	0
Average	3.438	2.504

Note: Standard Deviations are in seconds

Conclusion

- Delay for XGpio_DiscreteWrite: about 43.21ns on average
- Delay for DSO: about 45.27ms on average

```
XScuTimer_LoadTimer(&TimerInstance, CntValue1);
XScuTimer_Start(&TimerInstance);
XGpio_DiscreteWrite(&SleepSignal, 1, 1);

sleep(sleepTime);

CntValue2 = XScuTimer_GetCounterValue(&TimerInstance);
XScuTimer_Stop(&TimerInstance);
XGpio_DiscreteWrite(&SleepSignal, 1, 0);
```