PT Histograms by EMPv4

Young-Kyoon Suh
yksuh@cs.arizona.edu

December 21, 2015

1 Experiment Notes

Task Length	Description
PUT1∼PUT64	Regular PUT experiment with runs of 1000 samples (on `sodb12`). Used for the histograms in Figures 2 and 3.
PUT128∼PUT4096	Regular PUT experiment with runs of 300 samples (on `sodb12`). Used for the histograms in Figures 4 and 5.
PUT8192	Regular PUT experiment with separate runs (*i*. Apr and *ii*. Nov/Dec) of 40 and 260 samples (on `sodb12`). Used for the top two histograms in Figure 6.
PUT16384	Regular PUT experiment with a run of 40 samples (on `sodb12`). Used for the bottom histogram in Figure 6.

Table 1: Notes on the PUT data used for the histograms

Task Length	Description
PUT4096	Dual PUT experiment with 1,000 samples on `sodb8`. Now at #890. Estimated time: 4,096 (secs) * 110 (samples) = about 5.2 days
PUT16384	Regular PUT experiment with additional 260 samples on `sodb12`. Now at #133. Estimated time: 16,384 (secs) * 127 (samples) = about 24 days

Table 2: Notes on the ongoing PUT experiments

Task Length	Description
PUT1	Regular PUT experiment wth 20,000 samples on `sodb9`. Used for the histograms in Figures 13(a) and 13(b).
PUT2	Regular PUT experiment wth 20,000 samples on `sodb10`. Used for the histograms in Figures 13(c) and 13(d).

Table 3: Notes on the new PUT experiments

2 Summary of the EMPv4 data

	Num. of Samples	Minimum (msec)	Maximum (msec)	Average (msec)	Std. Dev. (msec)
PUT1	1,000	999.0	1,005.0	1,002.4	0.73
PUT2	1,000	1,996.0	2,007.0	2,004.5	1.38
PUT4	1,000	4,004.0	4,012.0	4,008.6	1.64
PUT8	1,000	8,014.0	8,023.0	8,018.1	1.72
PUT16	1,000	16,029.0	16,041.0	16,034.3	1.86
PUT32	1,000	32,064.0	32,084.0	32,068.2	2.05
PUT64	1,000	64,129.0	64,145.0	64,135.0	2.27
PUT128	300	128,244.0	128,260.0	128,251.2	2.32
PUT256	300	256,494.0	256,523.0	256,502.3	3.29
PUT512	300	512,995.0	513,152.0	513,005.1	9.41
PUT1024	300	1,025,997.0	1,026,141.0	1,026,012.4	11.43
PUT2048	300	2,051,981.0	2,052,156.0	2,052,012.0	11.19
PUT4096	300	4,105,451.0	4,105,629.0	4,105,526.0	25.98
PUT8192	40 (last Apr)	8,207,870.0	8,207,967.0	8,207,918.0	21.03
PUT8192	260 (Nov)	8,210,940.0	8,211,196.0	8,211,049.0	36.60
PUT16384	40	16,415,757.0	16,415,964.0	16,415,810.3	40.43
PUT16384	260 (Dec)	?	?	?	?

Table 4: PT statistics by EMPv4 (extension of Table VI in the EMP paper)

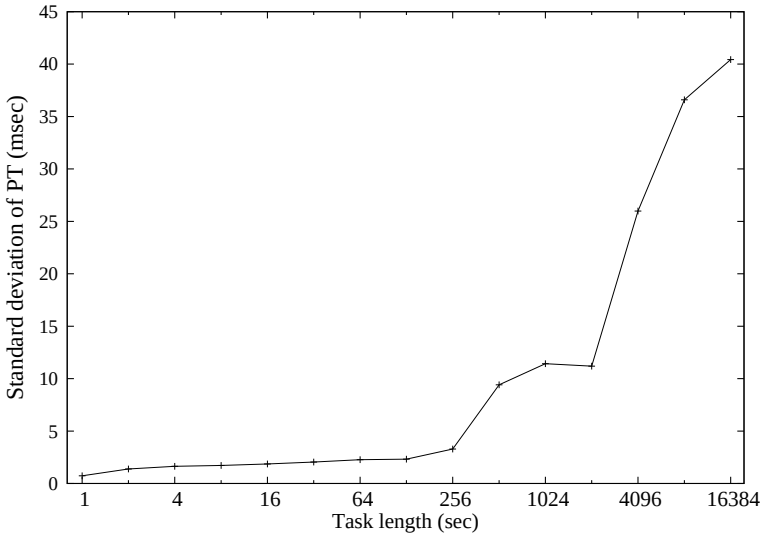
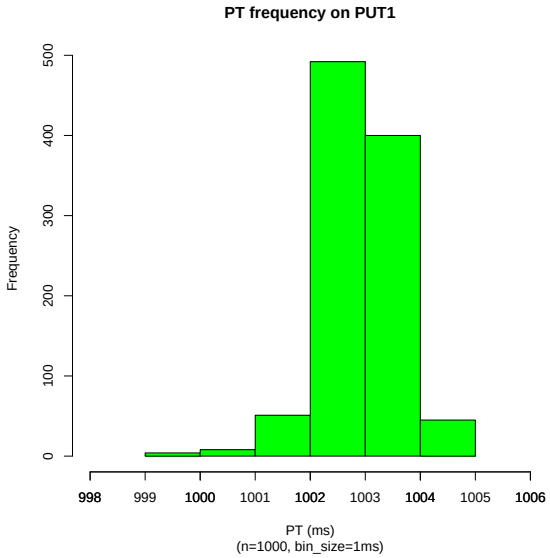
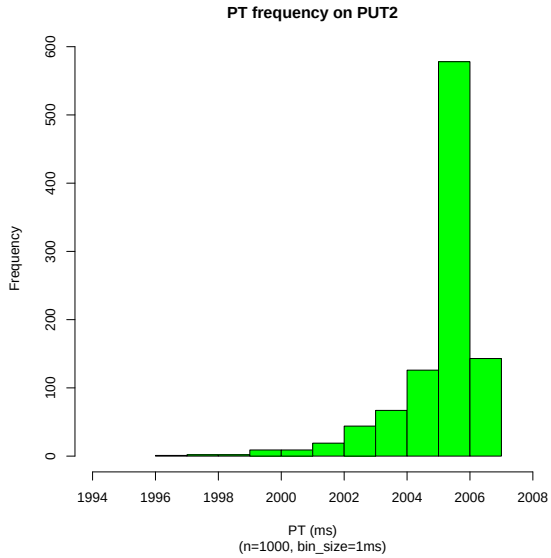


Figure 1: Std. dev. of PT over increasing task length

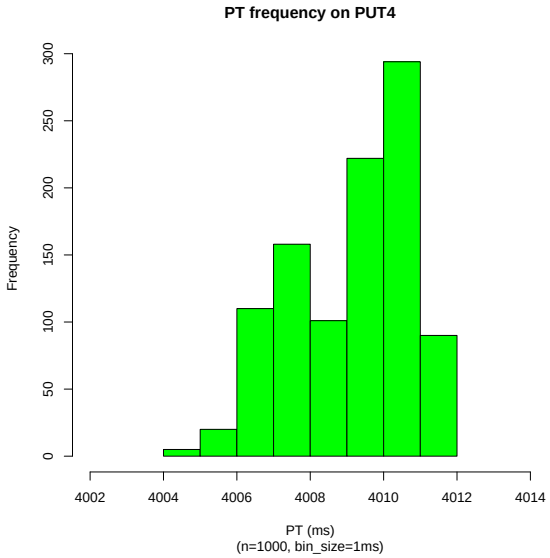
3 Histograms on the EMPv4 Data



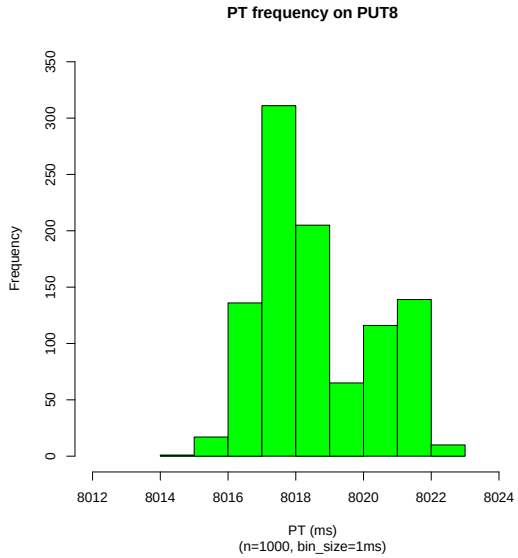
(a) PT frequency on PUT1



(b) PT frequency on PUT2

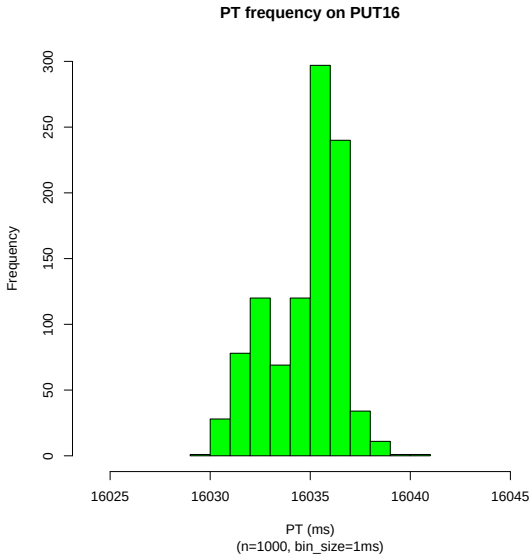


(c) PT frequency on PUT4

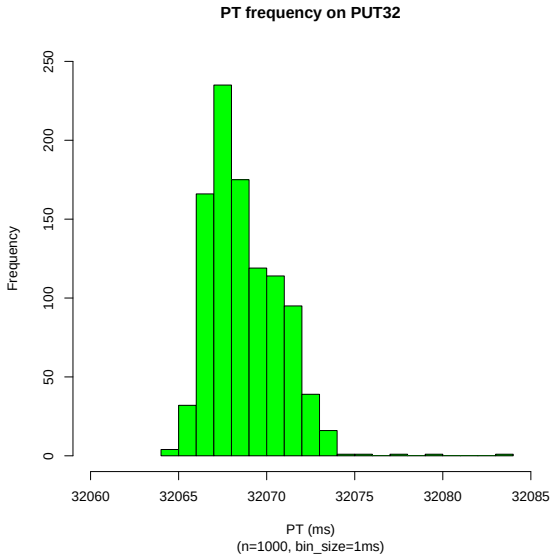


(d) PT frequency on PUT8

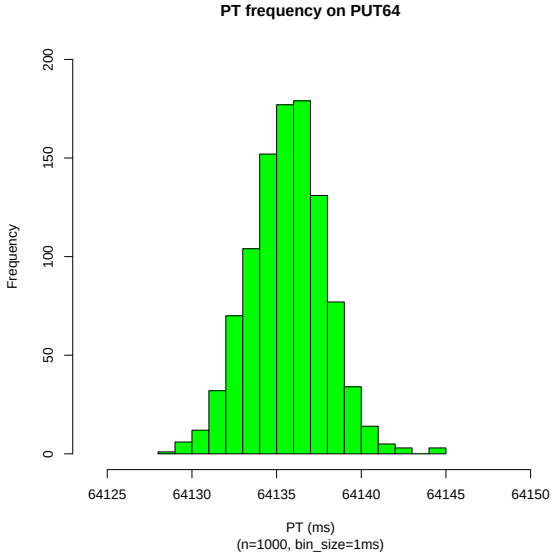
Figure 2: PT Histograms of PUT1 ... PUT8



(a) PT frequency on PUT16

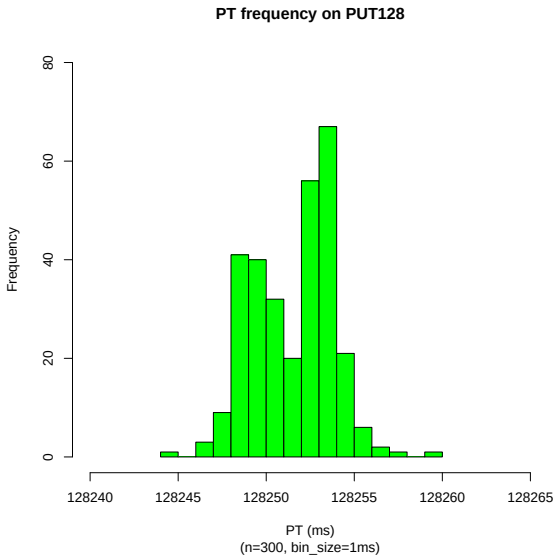


(b) PT frequency on PUT32

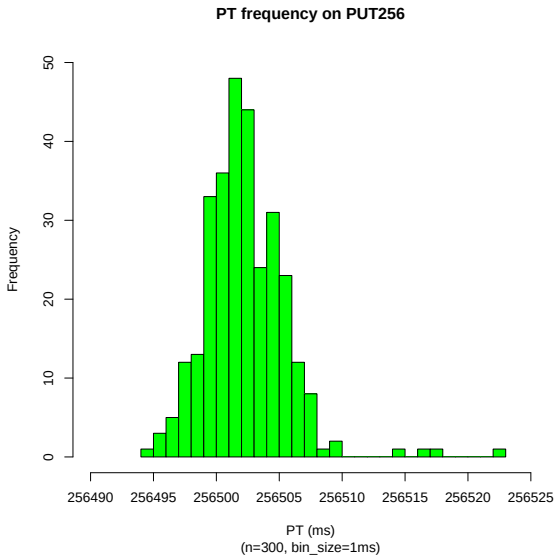


(c) PT frequency on PUT64

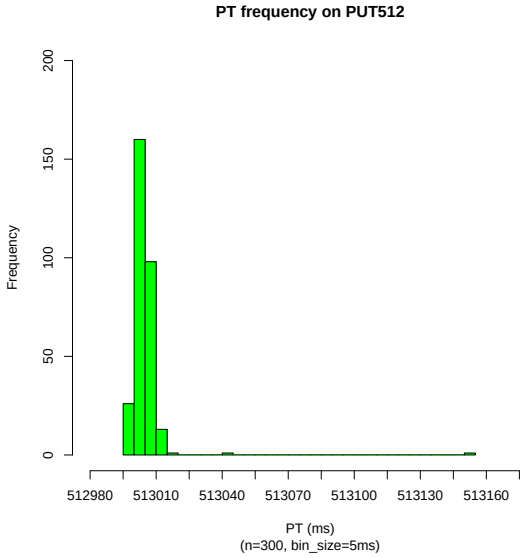
Figure 3: PT Histograms of PUT16 ... PUT64



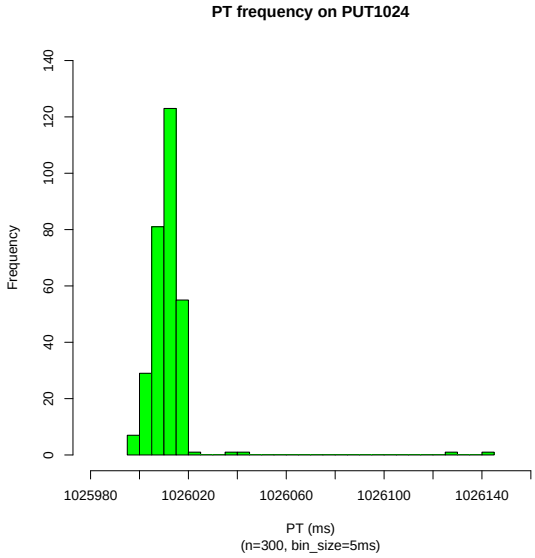
(a) PT frequency on PUT128



(b) PT frequency on PUT256

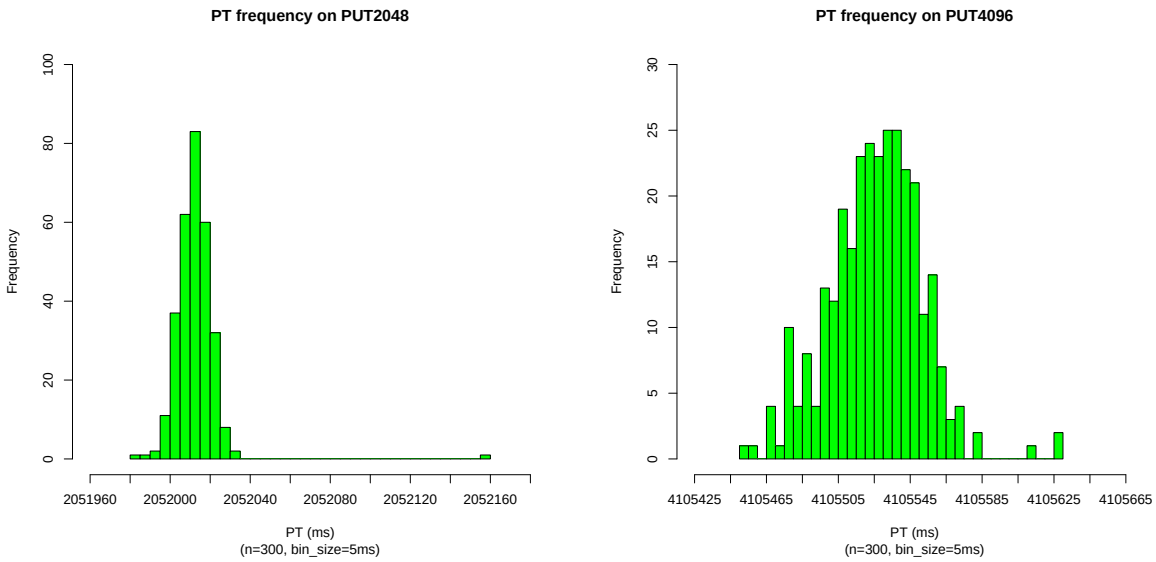


(c) PT frequency on PUT512



(d) PT frequency on PUT1024

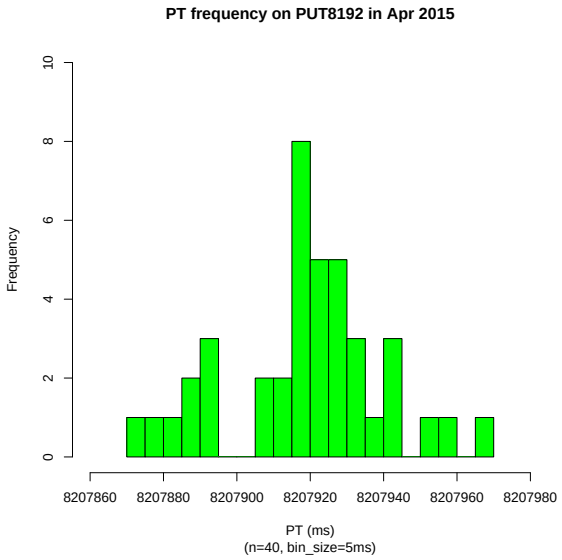
Figure 4: PT Histograms of PUT128 ... PUT1024



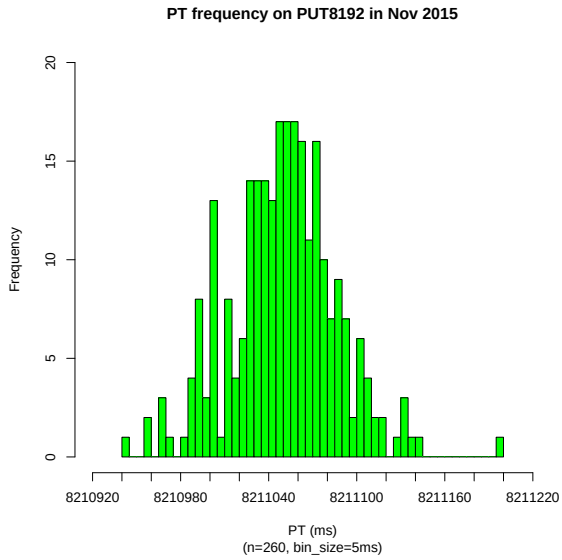
(a) PT frequency on PUT2048

(b) PT frequency on PUT4096

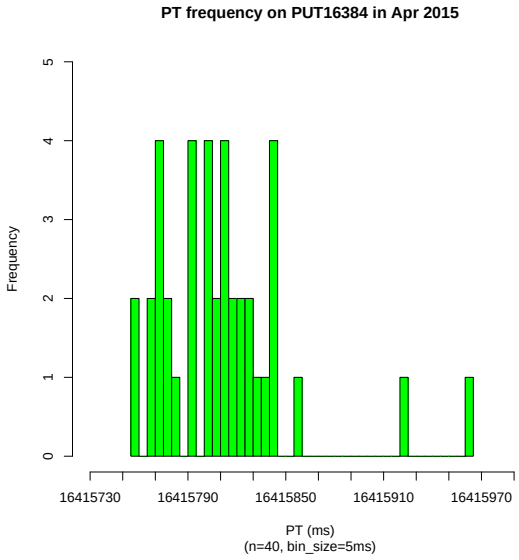
Figure 5: PT Histograms of PUT2048 and PUT4096



(a) PT frequency on PUT8192 with 40 samples (See Table 1.)



(b) PT frequency on PUT8192 with 260 samples (See Table 1.)

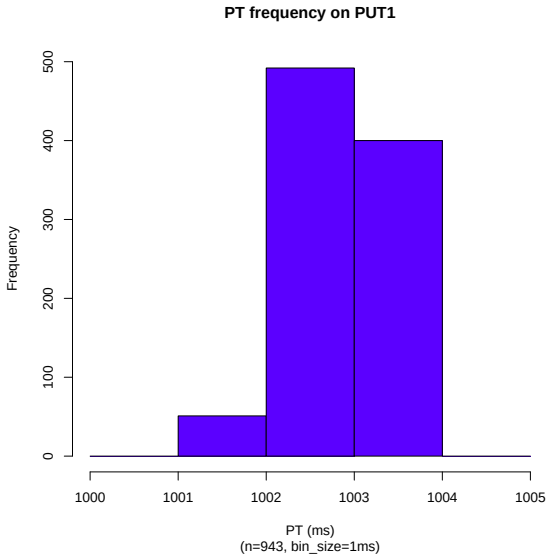


(c) PT frequency on PUT16384 with 40 samples (See Table 1.)

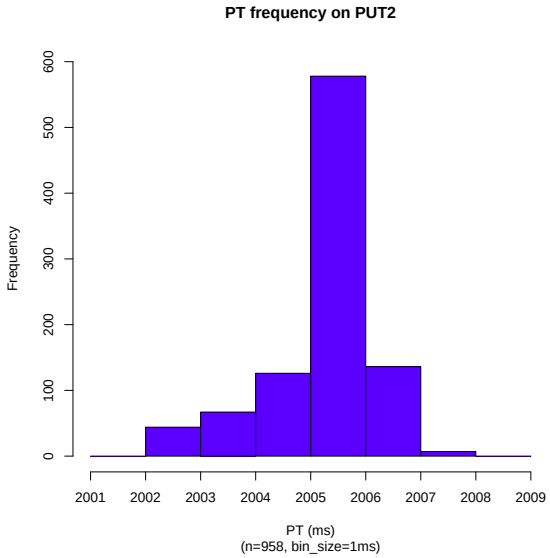
(d) PT frequency on PUT16384 with 260 samples (Available soon. See Table 2.)

Figure 6: PT Histograms of PUT8192 and PUT16384

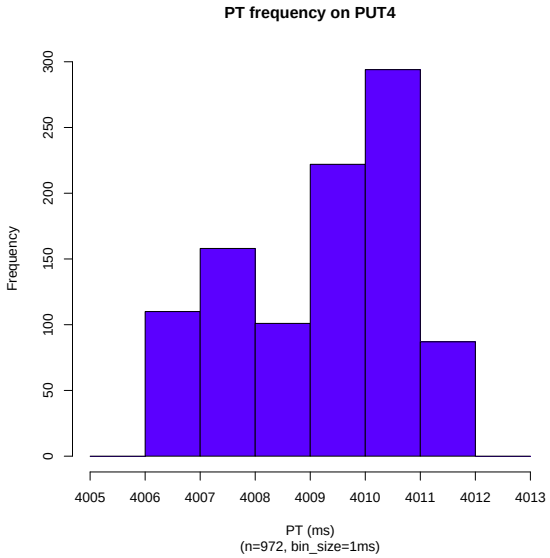
4 Histograms on the EMPv4 Data without Outliers



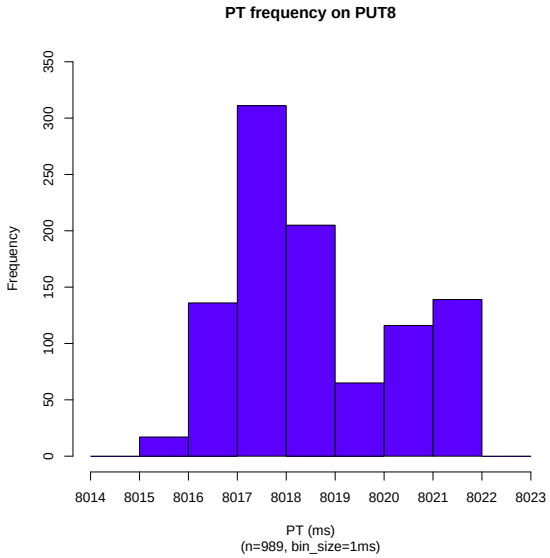
(a) PT frequency on PUT1



(b) PT frequency on PUT2

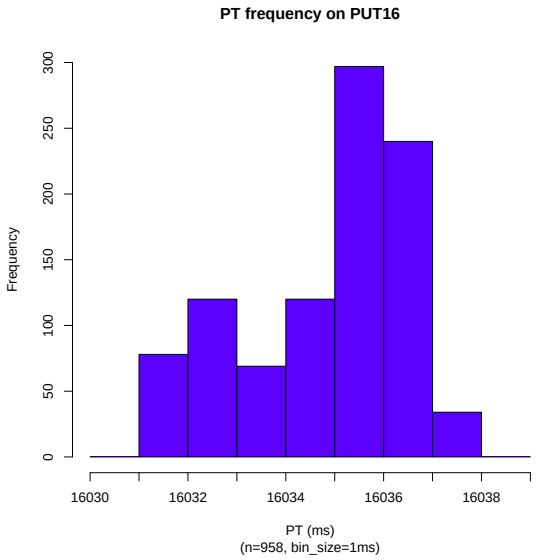


(c) PT frequency on PUT4

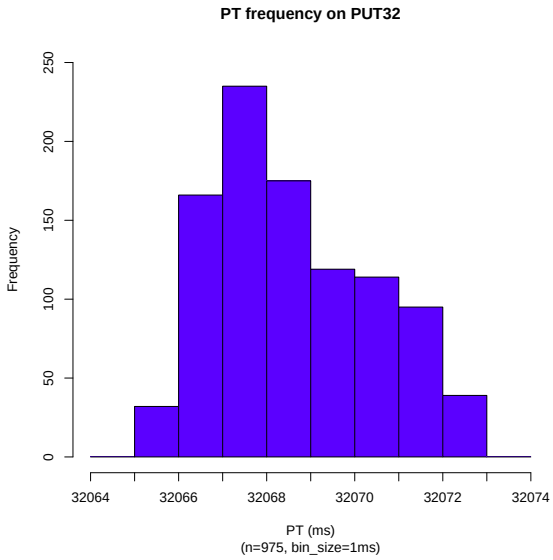


(d) PT frequency on PUT8

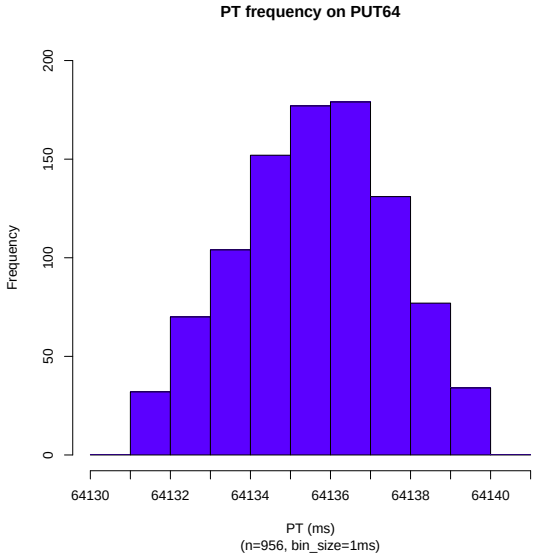
Figure 7: PT Histograms of PUT1 ... PUT8



(a) PT frequency on PUT16

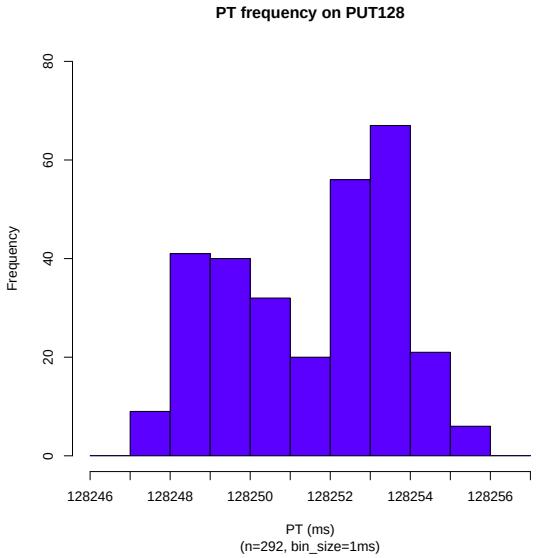


(b) PT frequency on PUT32

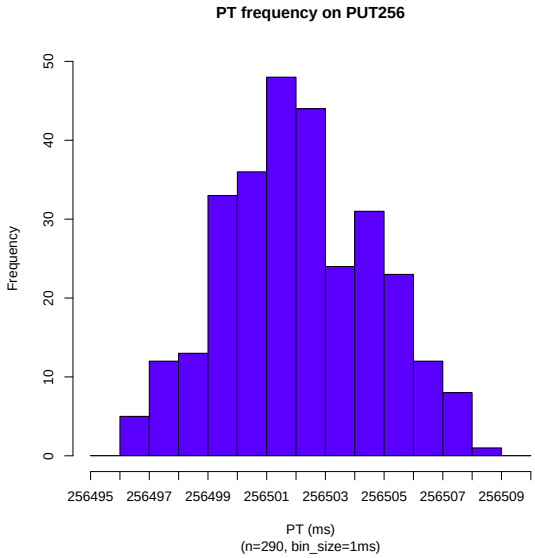


(c) PT frequency on PUT64

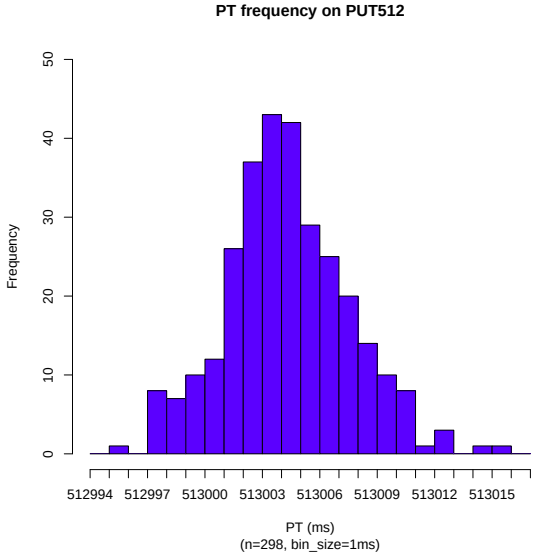
Figure 8: PT Histograms of PUT16 ... PUT64



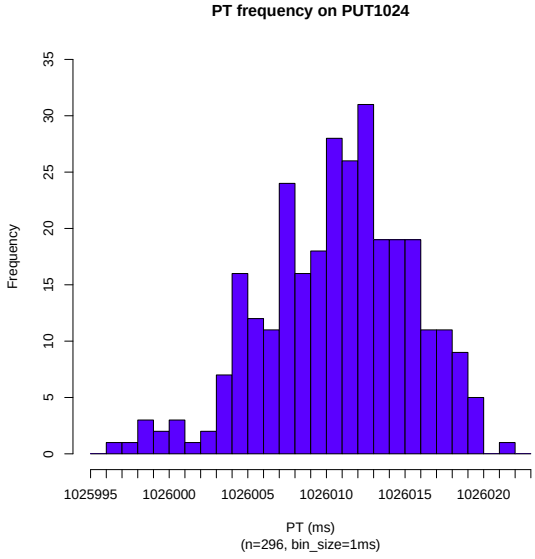
(a) PT frequency on PUT128



(b) PT frequency on PUT256

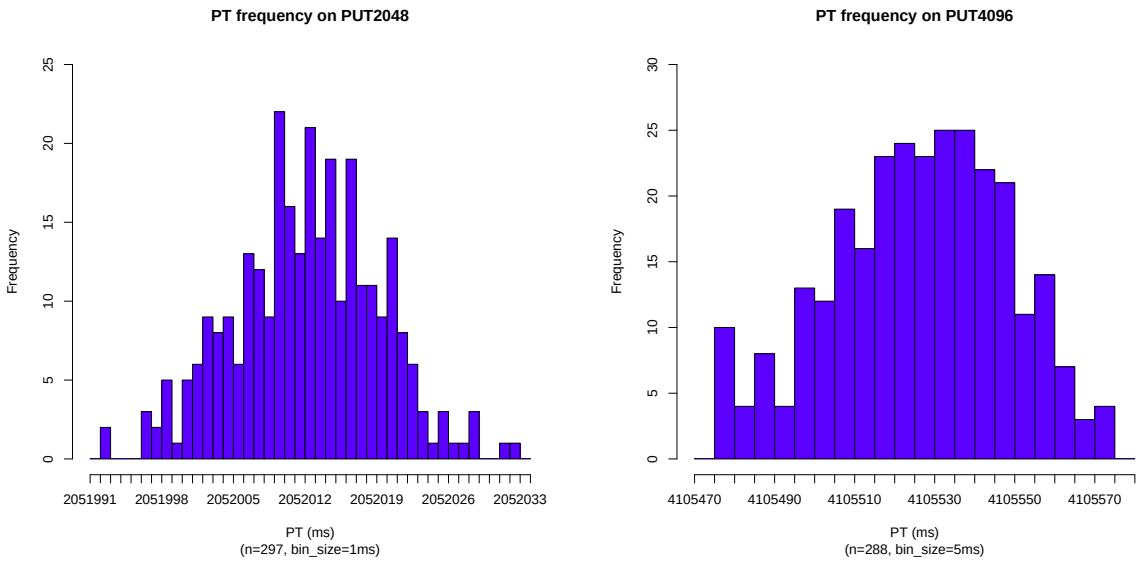


(c) PT frequency on PUT512



(d) PT frequency on PUT1024

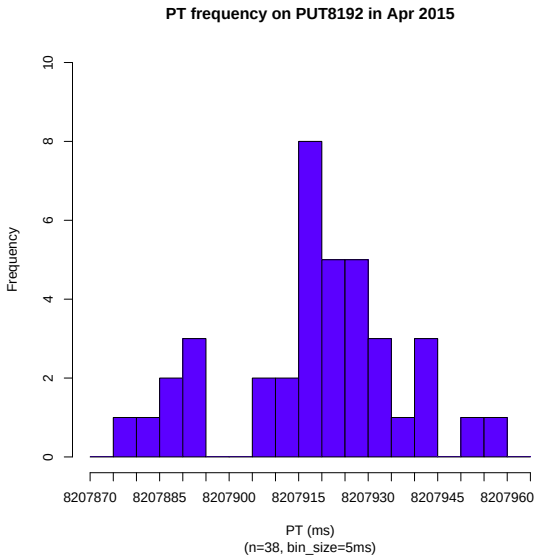
Figure 9: PT Histograms of PUT128 ... PUT1024



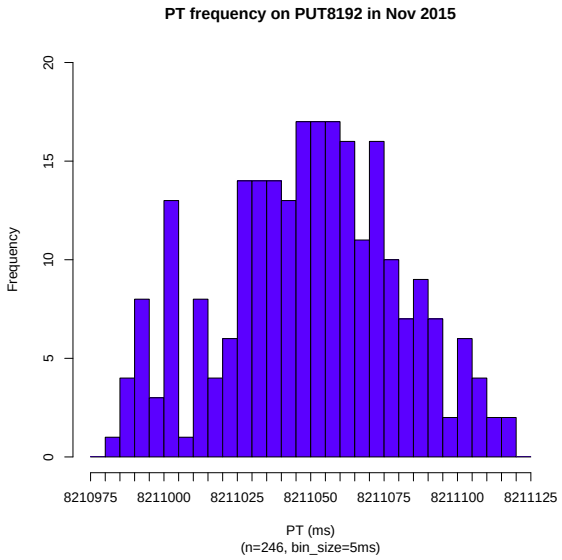
(a) PT frequency on PUT2048

(b) PT frequency on PUT4096

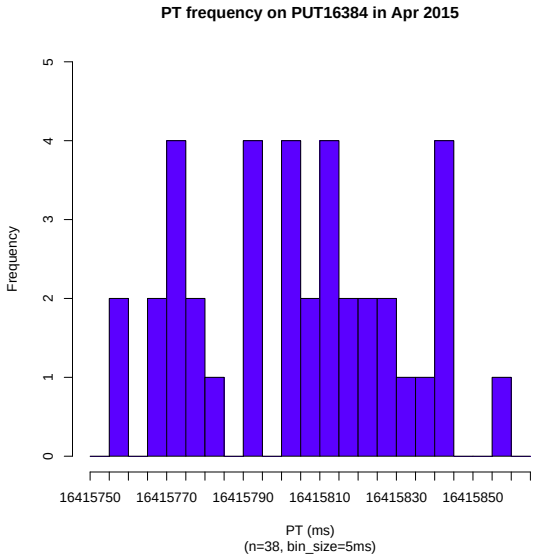
Figure 10: PT Histograms of PUT2048 and PUT4096



(a) PT frequency on PUT8192 with 40 samples (See Table 1.)



(b) PT frequency on PUT8192 with 260 samples (See Table 1.)



(c) PT frequency on PUT16384 with 40 samples (See Table 1.)

(d) PT frequency on PUT16384 with 260 samples (Available soon. See Table 2.))

Figure 11: PT Histograms of PUT8192 and PUT16384

5 Sample Size vs. Standard Deviation of PT

Num. of Samples	Std. Dev. (msec)	
	PUT1	PUT2
1,000	1.07	1.40
2,000	1.06	1.39
3,000	1.07	1.38
4,000	1.07	1.37
5,000	1.07	1.40
6,000	1.06	1.70
7,000	1.06	1.65
8,000	1.07	1.62
9,000	1.07	1.60
10,000	1.07	1.58
11,000	1.08	1.57
12,000	1.08	1.56
13,000	1.08	1.54
14,000	1.08	1.53
15,000	1.08	1.52
16,000	1.08	1.51
17,000	1.08	1.50
18,000	1.08	1.50
19,000	1.08	1.50
20,000	1.08	1.49

Table 5: PT Histograms of PUT1

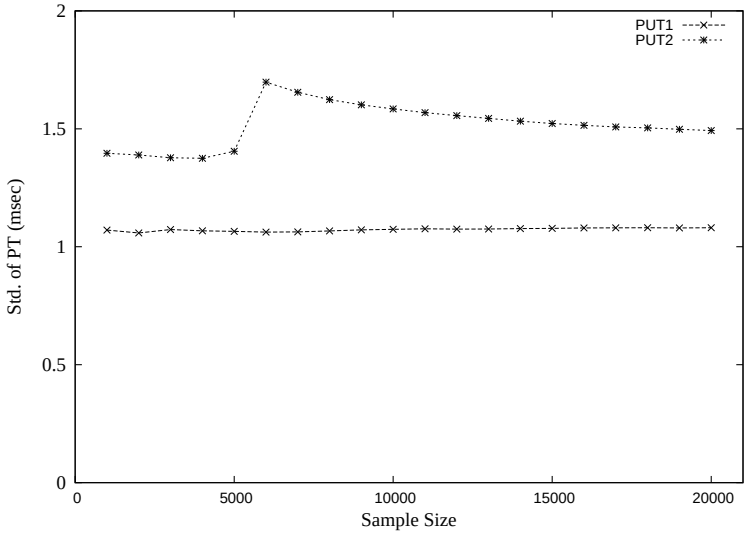
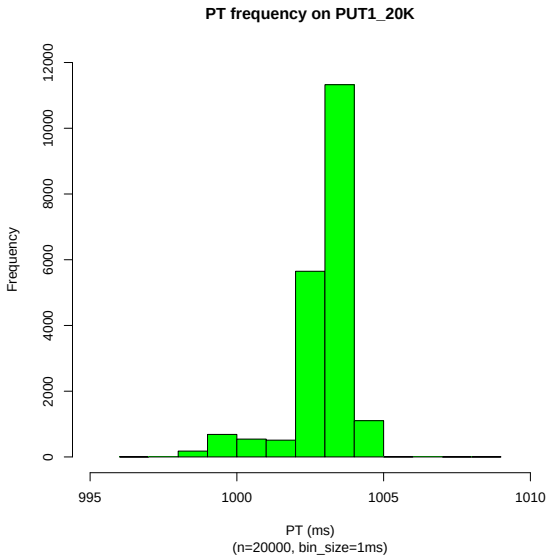
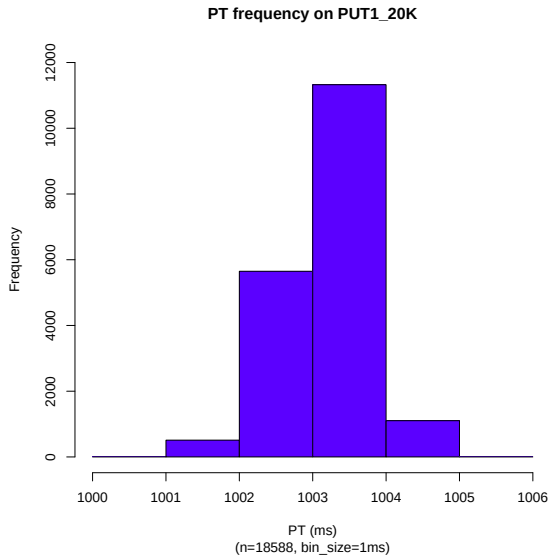


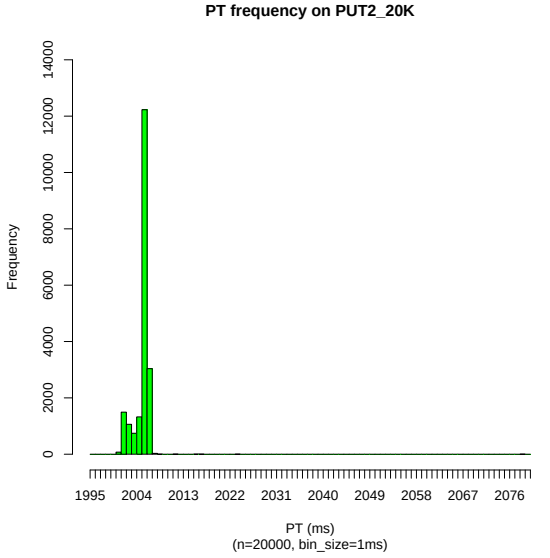
Figure 12: Std. dev. of PT on PUT1 and PUT2 over increasing sample size



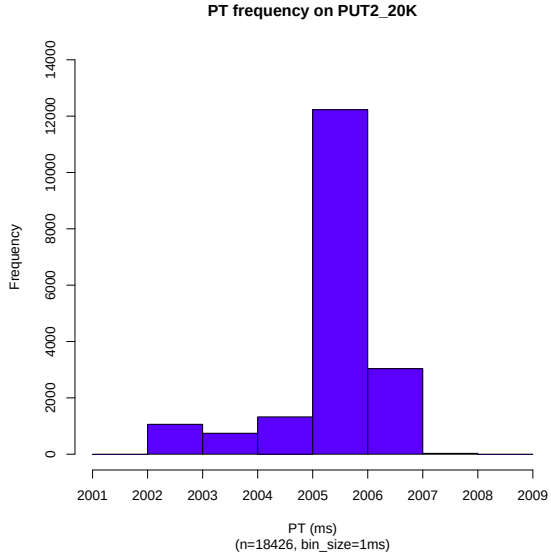
(a) PT frequency on PUT1 with 20,000 samples (See Table 3.)



(b) PT frequency on PUT1 excluding the outliers out of the 20,000 samples (See Table 3.)



(c) PT frequency on PUT2 with 20,000 samples (See Table 3.)



(d) PT frequency on PUT2 excluding the outliers out of the 20,000 samples (See Table 3.)

Figure 13: PT Histograms of PUT1 and PUT2 by 20,000 trials