ezTCP Technical Document

ezTCP Throughput

Version 1.0

2010-01-13

☞ ***Caution: Specifications of the product's functions may be changed without prior notice.***

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Contents

1 Overview

What is the most important factor when you buy a new computer? It may be the speed of the CPU. A fact that people wants a computer which has a nice performance on processing speed is natural. Since network technical and Internet communication are propagated, the performance of the CPU has been a major factor for purchasing a communication product.

In this document, a result of tests which were implanted for measuring receiving and transmitting performance are compared and reviewed. The results couldn't be an absolute standard because there are so many factors which can change the result in various network environments. Just use this document for a reference.

1.1 Throughput

1.1.1 Definition

In data communication, “Throughput” means amount of data per unit time to transfer data from one to another terminal. This document define the “Throughput” to measured data transmission rate.

Throughput = File size(bytes) / Measured Time

1.1.2 Factors which can influence the Throughput

ezTCP supports some standard serial data rate. However, the data rate can be realized in a network because of various delays. Then, let’s look in the each delay one by one.

- Propagation Delay
  The propagation delay is amount of time to transmit a packet from one to another. This can be calculated by the speed of light.
- Transmission Delay
  Transmission delay is the time to push all the bits to the network. The size and speed are related.
- Processing Delay
  When a packet passes away a network device like router, processing delay is occurred. This is amount of time to process the packet in the network device. Attaching TCP/IP header can be a part of reason for this.
- Queuing Delay
  Queuing delay means time to waiting for a packet in network devices’ buffer. It can be influenced by performances of the terminals or network traffic.

1.2 Performance

1.2.1 Definition

In this document, “Performance” is defined as ratio of ideal data transmission rate to the measured rate (Throughput). Performance is used to verify the capability for processing data.

Performance = Throughput / Baud Rate * 100

2 Conditions

2.1 Equipments

Table 2-1 equipments

Division	Model(Manufacturer)	Note
PC	Compaq DX2710 MT(HP)	Windows XP Professional SP3 / Intel Core 2 Duo E4600 / 4GB RAM
HUB	3C16702A(3COM)	10M bit dummy hub
AP	G104M(EFM Networks)	-
ezTCP	19 products including CSE-H53(Sollae Systems)	Refer to the Test Subjects

2.2 Diagram

2.2.1 Ethernet (wired LAN)

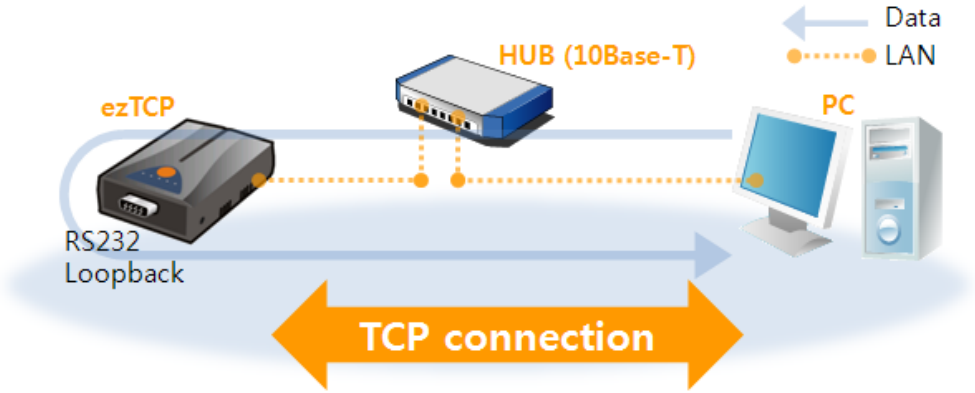

Fig 2-1 the organization for Ethernet products

2.2.2 WLAN (Wireless LAN)

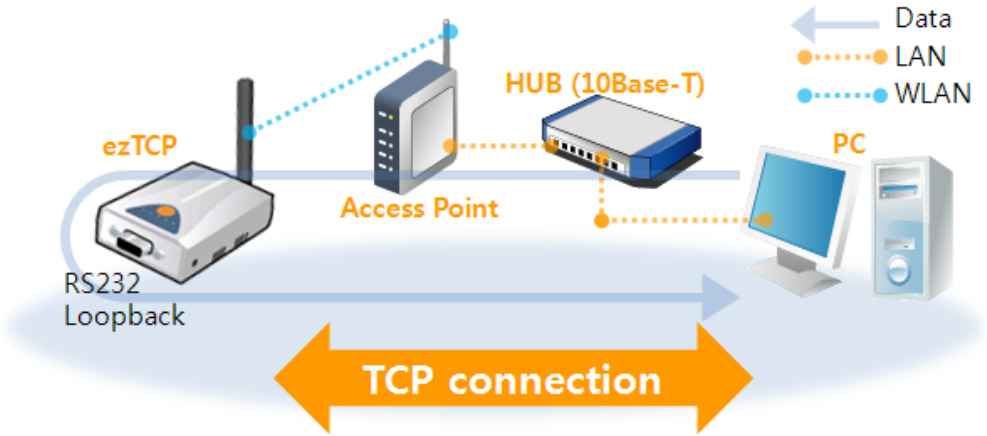

Fig 2-2 the organization for WLAN products

2.2.3 PPP (HSDPA/CDMA/TRS/GPRS)

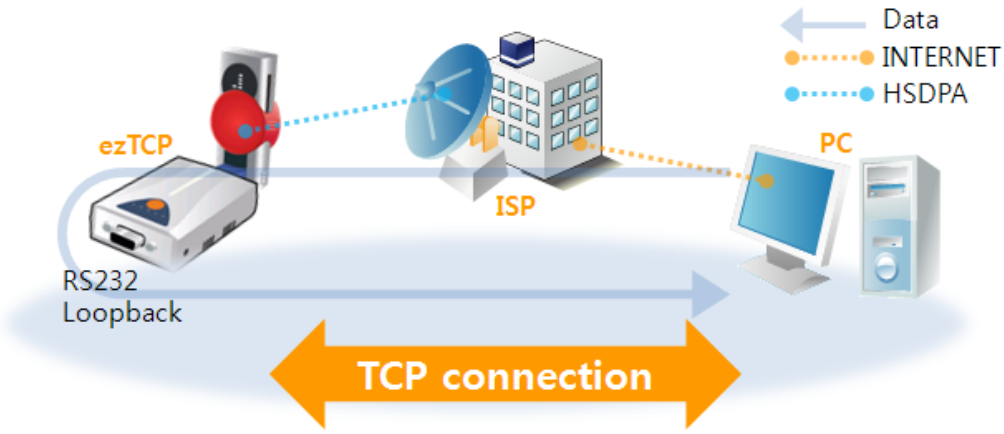

Fig 2-3 the organization for PPP products

2.3 Key Points

- 1:1 TCP connection between a PC and ezTCP
  By using a test program developed by us for the test, data files were sent to the ezTCP through the socket without additional delays.
- A 10M bit network HUB
  Both the PC and ezTCP were connected with a 10M bit network hub.
- RS232 Loopback
  We used RS232 Loopback connectors which have shorted two pairs of pins that RXD(#2)-TXD(#3) and RTS(#7)-CTS(#8).

Fig 2-4 a D-sub 9 pin RS232 Loopback connector

- RTS/CTS Flow control
  To prevent data loss at the RS232 port, we set the RTS/CTS flow control option to ezTCP.
- Distance of WLAN
  The distance between ezTCP and the Access Point (AP) were less than 1 meter (nearly 39.4 inch) for supposing that a condition of the channel has no obstacles to communicate.

- Each Size of data

  In each baud rate, file size is assigned like below table.

Table 2-2 each size of data

Baud Rate	File Size	Bytes	Baud Rate	File Size	Bytes
300	8K	8,192	38,400	1M	1,048,576
600	16K	16,384	57,600		
1,200	32K	32,768	115,200	2M	2,097,152
2,400	64K	65,536	230,400	4M	4,194304
4,800	128K	131,072	460,800	8M	8,388,608
9,600	256K	262,144	921,600	16M	16,777,216
14,400			1,843,200		
19,200	512K	524,288			

- Time Measurement

  The time was measured on the PC from sending the first packet to sending the response of the last received packet which came back to the PC.

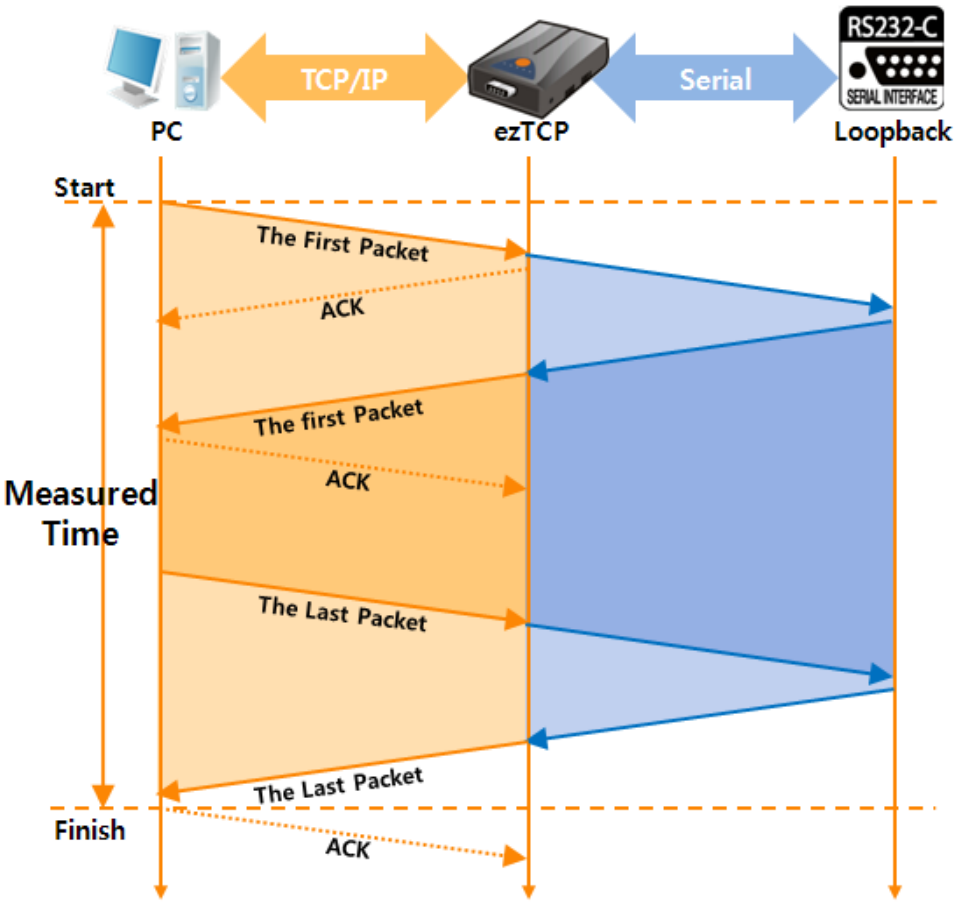

Fig 2-5 time chart of the time measurement

2.4 Test Subjects

2.4.1 ezTCP module type

Table 2-3 ezTCP module type

Model	Type	CPU	ROM(Byte)	RAM(Byte)
EZL-50L	10Mb Ethernet	Atmel AVR	64K	4K
EZL-70	10Mb Ethernet	Atmel AVR	64K	4K
EZL-50M	10Mb Ethernet	Atmel AVR	64K	32K
EZL-410	10/100Mb Ethernet	ARM7 Core	256K	2M(SD)
CSE-M32	10/100Mb Ethernet	ARM7 Core	256K	64K
CSE-M73	10/100Mb Ethernet	ARM7 Core	256K	64K
CIE-M10	10/100Mb Ethernet	ARM7 Core	256K	64K
CSE-M53	10/100Mb Ethernet	Cortex-M3 Core	64K	16K
EZU-100	PPP	Atmel AVR	128K	4K

2.4.2 ezTCP external type

Table 2-4 ezTCP external type

Model	Type	CPU	ROM(Byte)	RAM(Byte)
EZL-200L	10Mb Ethernet	Atmel AVR	64K	4K
EZL-220	10/100Mb Ethernet	ARM7 Core	256K	2M(SD)
EZL-200F	10/100Mb Ethernet	ARM7 Core	256K	2M(SD)
EZL-400S	10/100Mb Ethernet	ARM7 Core	256K	2M(SD)
CSE-H20	10/100Mb Ethernet	ARM7 Core	256K	64K
CSE-H21	10/100Mb Ethernet	ARM7 Core	256K	64K
CSE-H25	10/100Mb Ethernet	ARM7 Core	256K	64K
CIE-H10	10/100Mb Ethernet	ARM7 Core	256K	64K
CSE-H53	10/100Mb Ethernet	Cortex-M3 Core	64K	16K
CSW-H80	IEEE 802.11b/g	ARM7 Core	512K	128K
CSP-H50	PPP	Atmel AVR	128K	4K

☞ ***Products which have the same hardware specification showed the same performances. So, you can refer to above table for finding out results of products which are no on this paper.***

3 Results

3.1 Ethernet- module type products

Table 3-1 throughput of Ethernet-module type products

Baud Rate	CSE-M32	CSE-M53	EZL-50M	EZL-50L
300	299.911	299.859	N/A	N/A
600	599.878	599.839	N/A	N/A
1200	1199.761	1199.792	1199.695	1199.823
2400	2399.523	2399.716	2399.391	2399.654
4800	4799.098	4799.695	4798.852	4799.274
9600	9598.969	9599.988	9597.352	9598.477
14400	14396.872	14399.956	14394.974	14396.318
19200	19195.688	19199.414	19194.845	19198.008
38400	38392.361	38399.391	38392.220	33828.961
57600	57587.803	57599.508	57578.633	46581.226
115200	115173.077	115199.648	115162.325	57400.863
230400	230341.093	230375.253	N/A	N/A
460800	460737.852	455541.147	N/A	N/A
921600	920606.011	739928.641	N/A	N/A
1843200	1670688.004	N/A	N/A	N/A

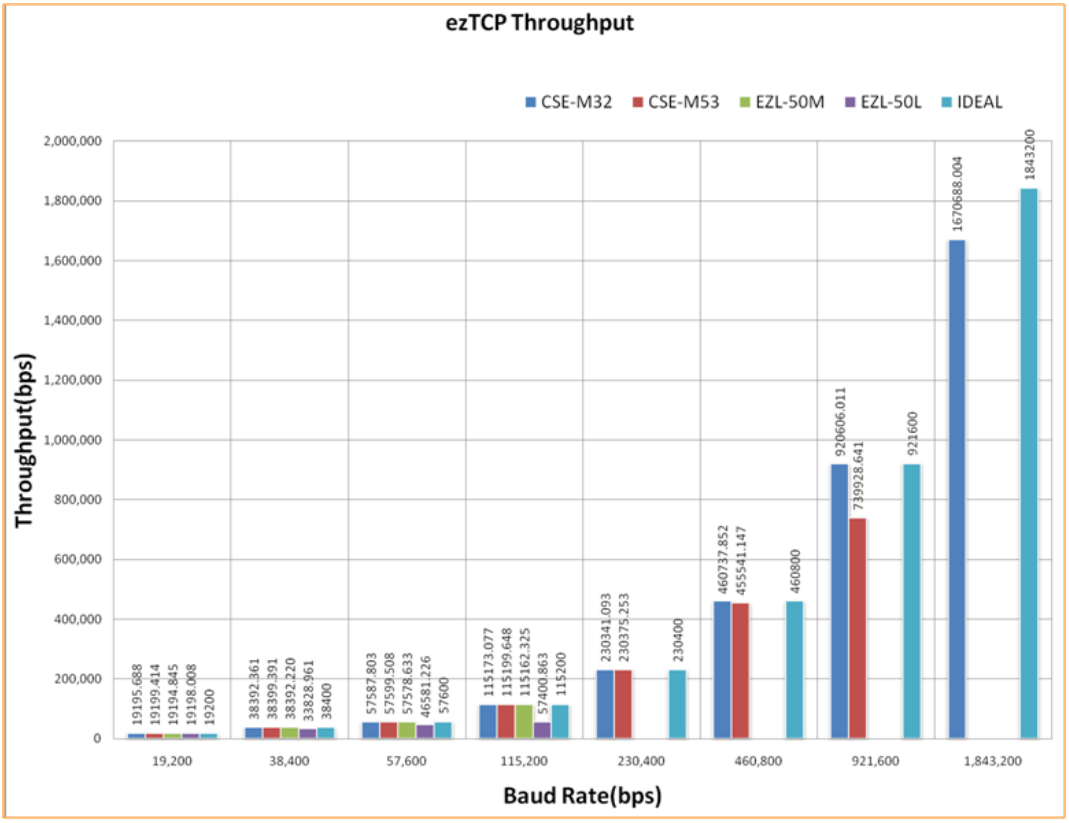

Fig 3-1 throughput of Ethernet-module type products

Table 3-2 performance of Ethernet-module type products

Baud Rate	CSE-M32	CSE-M53	EZL-50M	EZL-50L
300	99.97%	99.95%	N/A	N/A
600	99.98%	99.97%	N/A	N/A
1200	99.98%	99.98%	99.97%	99.99%
2400	99.98%	99.99%	99.97%	99.99%
4800	99.98%	99.99%	99.98%	99.98%
9600	99.99%	100.00%	99.97%	99.98%
14400	99.98%	100.00%	99.97%	99.97%
19200	99.98%	100.00%	99.97%	99.99%
38400	99.98%	100.00%	99.98%	88.10%
57600	99.98%	100.00%	99.96%	80.87%
115200	99.98%	100.00%	99.97%	49.83%
230400	99.98%	99.99%	N/A	N/A
460800	99.99%	98.86%	N/A	N/A
921600	99.89%	80.29%	N/A	N/A
1843200	90.64%	N/A	N/A	N/A

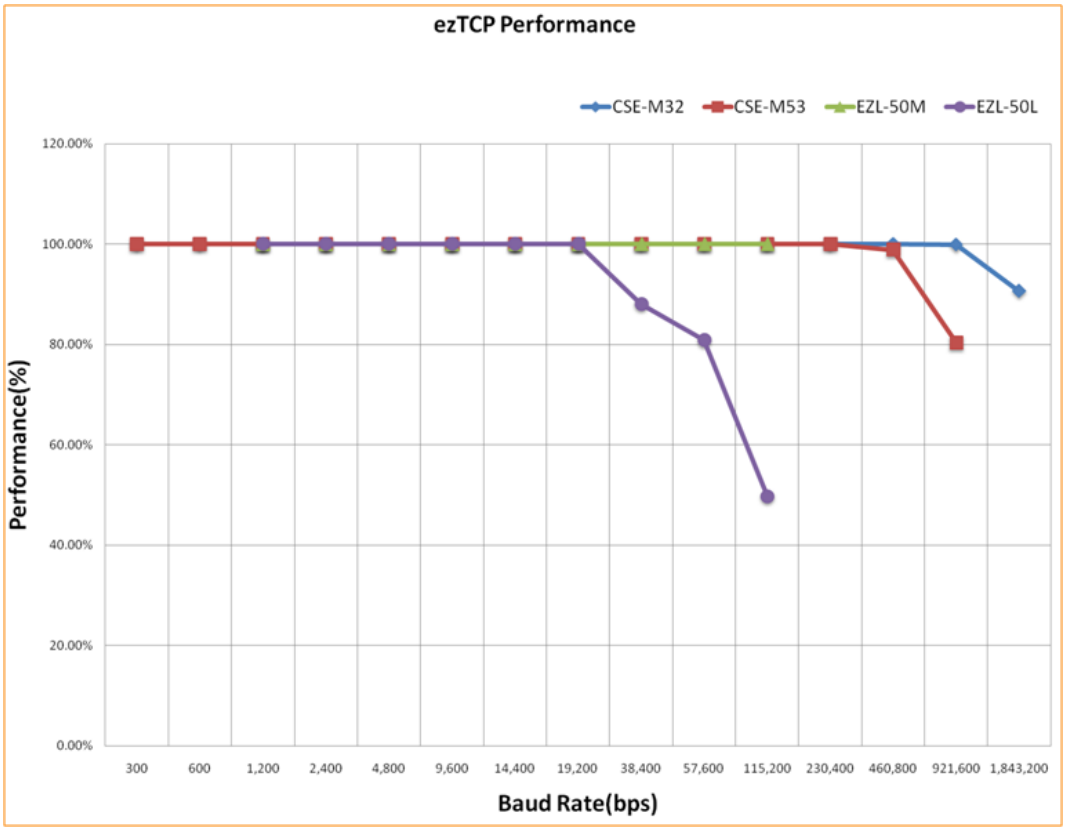

Fig 3-2 performance of Ethernet-module type products

3.2 Ethernet – external type products

Table 3-3 throughput of Ethernet – external type products

Baud Rate	CSE-H25	CSE-H53	EZL-200F
300	299.923	299.869	N/A
600	599.845	599.850	N/A
1200	1199.598	1199.788	1199.961
2400	2399.630	2399.874	2397.369
4800	4799.007	4799.994	4796.780
9600	9598.358	9599.953	9593.176
14400	14395.687	14399.956	14384.404
19200	19196.305	19199.836	19187.118
38400	38393.726	38399.531	38374.108
57600	57585.012	57599.508	57559.726
115200	115181.963	115190.157	115113.134
230400	230329.525	230387.907	N/A
460800	N/A	N/A	N/A
921600	N/A	N/A	N/A
1843200	N/A	N/A	N/A

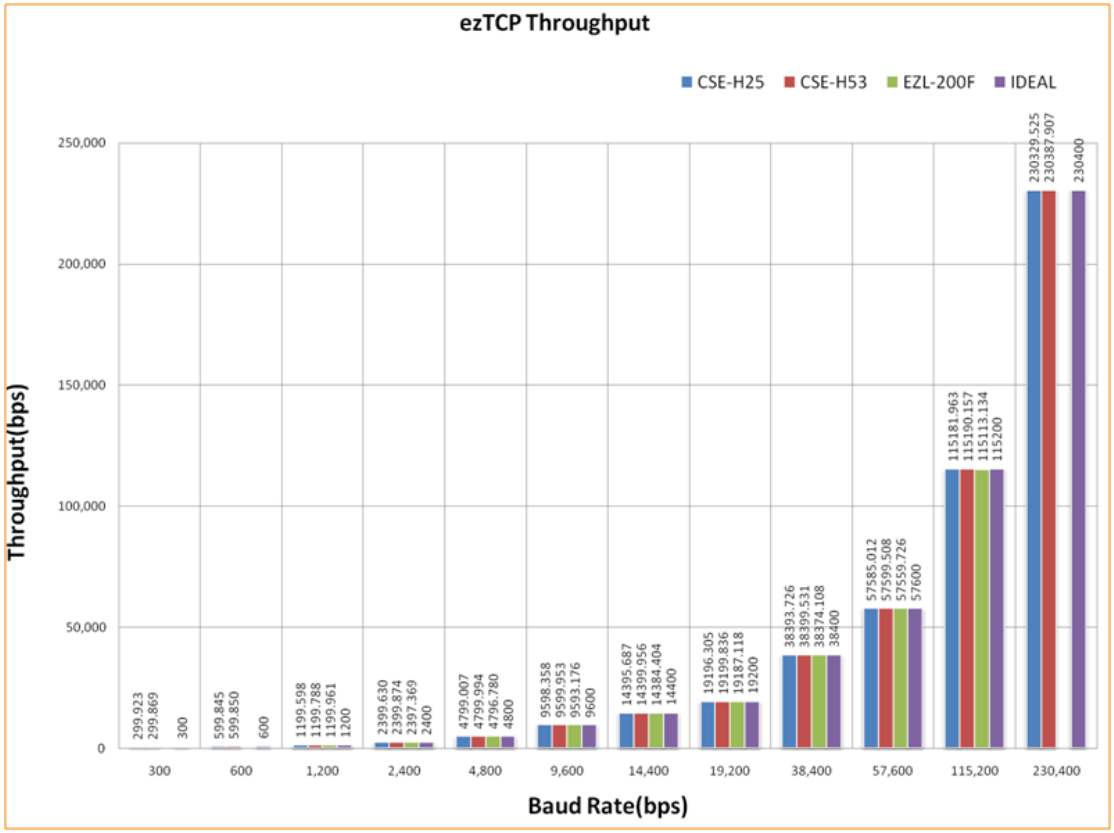

Fig 3-3 throughput of Ethernet – external type products

Table 3-4 performance of Ethernet – external type products

Baud Rate	CSE-H25	CSE-H53	EZL-200F
300	99.97%	99.96%	N/A
600	99.97%	99.97%	N/A
1200	99.97%	99.98%	100.00%
2400	99.98%	99.99%	99.89%
4800	99.98%	100.00%	99.93%
9600	99.98%	100.00%	99.93%
14400	99.97%	100.00%	99.89%
19200	99.98%	100.00%	99.93%
38400	99.98%	100.00%	99.93%
57600	99.97%	100.00%	99.93%
115200	99.98%	99.99%	99.92%
230400	98.88%	99.99%	N/A
460800	N/A	N/A	N/A
921600	N/A	N/A	N/A
1843200	N/A	N/A	N/A

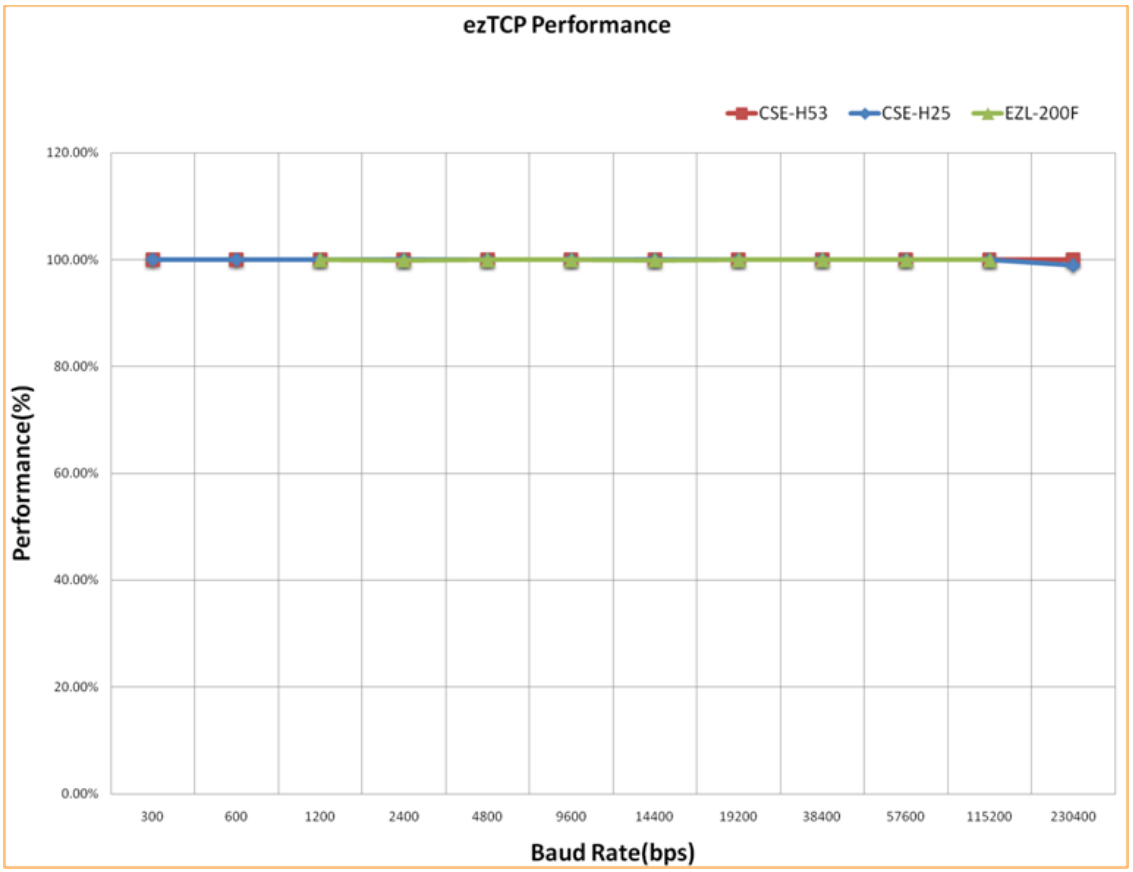

Fig 3-4 performance of Ethernet – external type products

3.3 PPP / WALN products

Table 3-5 throughput of PPP / WLAN products

Baud Rate	CSP-H50	CSW-H80
300	N/A	299.916
600	N/A	599.870
1200	1198.291	1198.897
2400	2363.463	2397.846
4800	4793.166	4796.902
9600	9190.940	9598.301
14400	9611.780	14396.239
19200	9638.427	19196.532
38400	11395.695	38392.783
57600	12816.459	57586.538
115200	11737.441	115174.342
230400	11864.363	230160.343
460800	N/A	N/A
921600	N/A	N/A
1843200	N/A	N/A

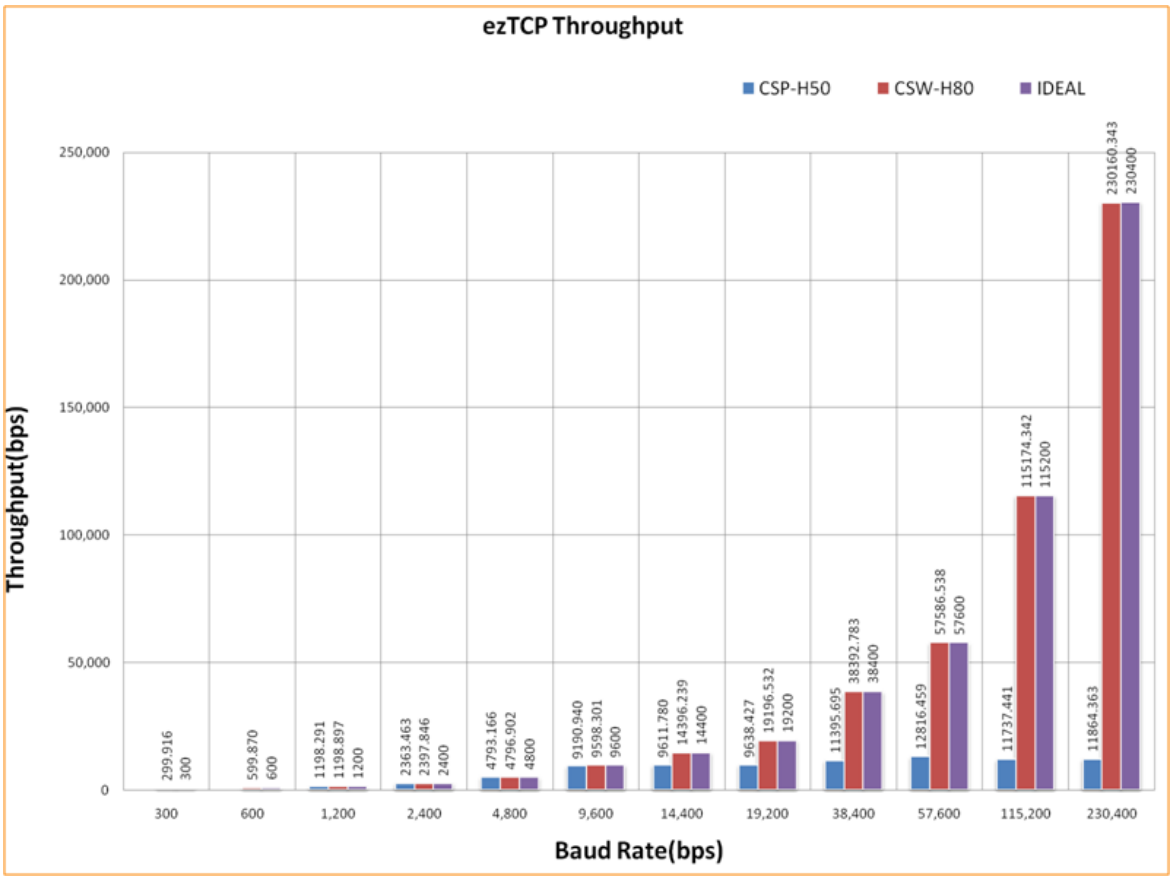

Fig 3-5 throughput of PPP / WLAN products

Table 3-6 performance of the PPP / WLAN products

Baud Rate	CSP-H50	CSW-H80
300	N/A	99.97%
600	N/A	99.98%
1200	99.86%	99.91%
2400	98.48%	99.91%
4800	99.86%	99.94%
9600	95.74%	99.98%
14400	66.75%	99.97%
19200	50.20%	99.98%
38400	29.68%	99.98%
57600	22.25%	99.98%
115200	10.19%	99.98%
230400	5.15%	99.90%
460800	N/A	N/A
921600	N/A	N/A
1843200	N/A	N/A

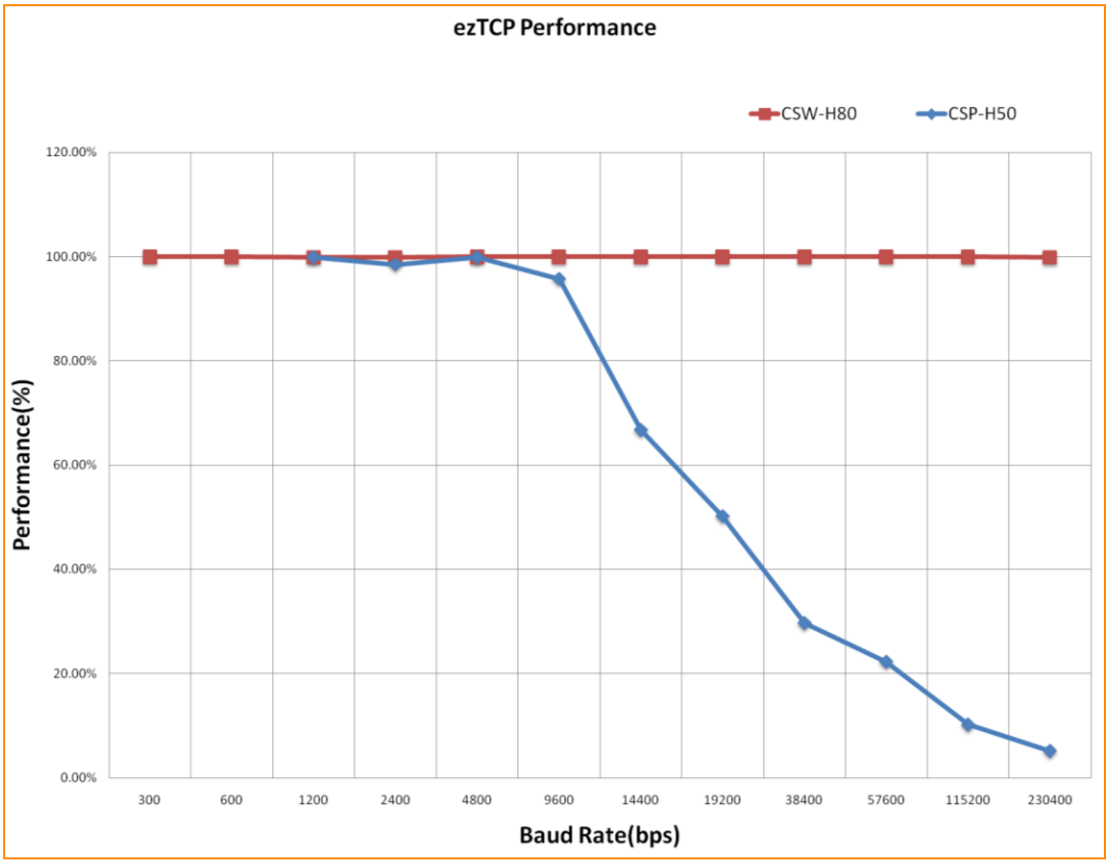

Fig 3-6 performance of the PPP / WLAN products

3.4 A way to improve the performances of EZL-50L/70/200L

By using the [Disable TCP Transmission Delay] option, users can improve the throughput of EZL-50L/70/200L in high baud rates.

Table 3-7 throughput before and after using [Disable TCP Transmission Delay] option

Baud Rate	Before	After
300	N/A	N/A
600	N/A	N/A
1200	1199.823	1199.950
2400	2399.628	2399.900
4800	4799.221	4799.801
9600	9598.161	9599.566
14400	14396.397	14399.323
19200	19196.391	19199.133
38400	33933.400	38398.547
57600	46659.784	57597.293
115200	57102.341	115193.953
230400	N/A	N/A
460800	N/A	N/A
921600	N/A	N/A
1843200	N/A	N/A

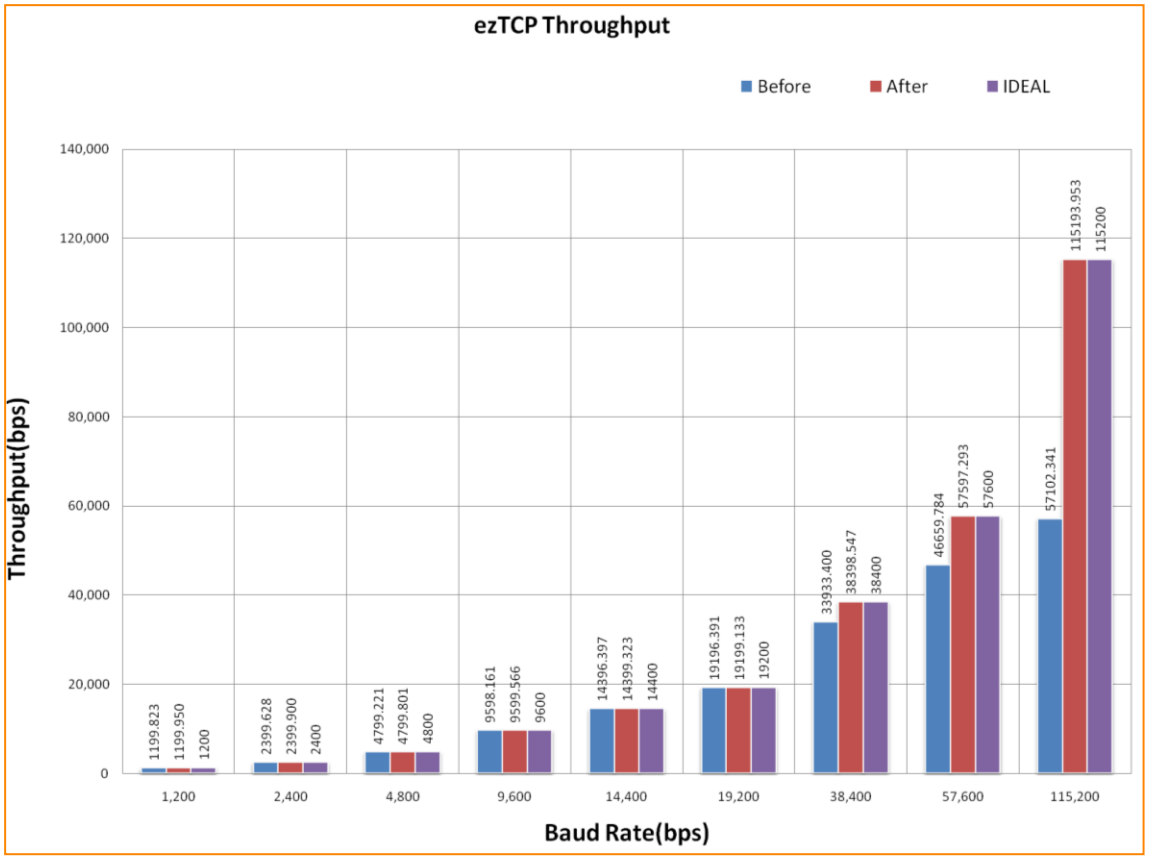

Fig 3-7 throughput before and after using [Disable TCP Transmission Delay] option

Table 3-8 performance before and after using [Disable TCP Transmission Delay] option

Baud Rate	Before	After
300	N/A	N/A
600	N/A	N/A
1200	99.99%	100.00%
2400	99.98%	100.00%
4800	99.98%	100.00%
9600	99.98%	100.00%
14400	99.97%	100.00%
19200	99.98%	100.00%
38400	88.37%	100.00%
57600	81.01%	100.00%
115200	49.57%	99.99%
230400	N/A	N/A
460800	N/A	N/A
921600	N/A	N/A
1843200	N/A	N/A

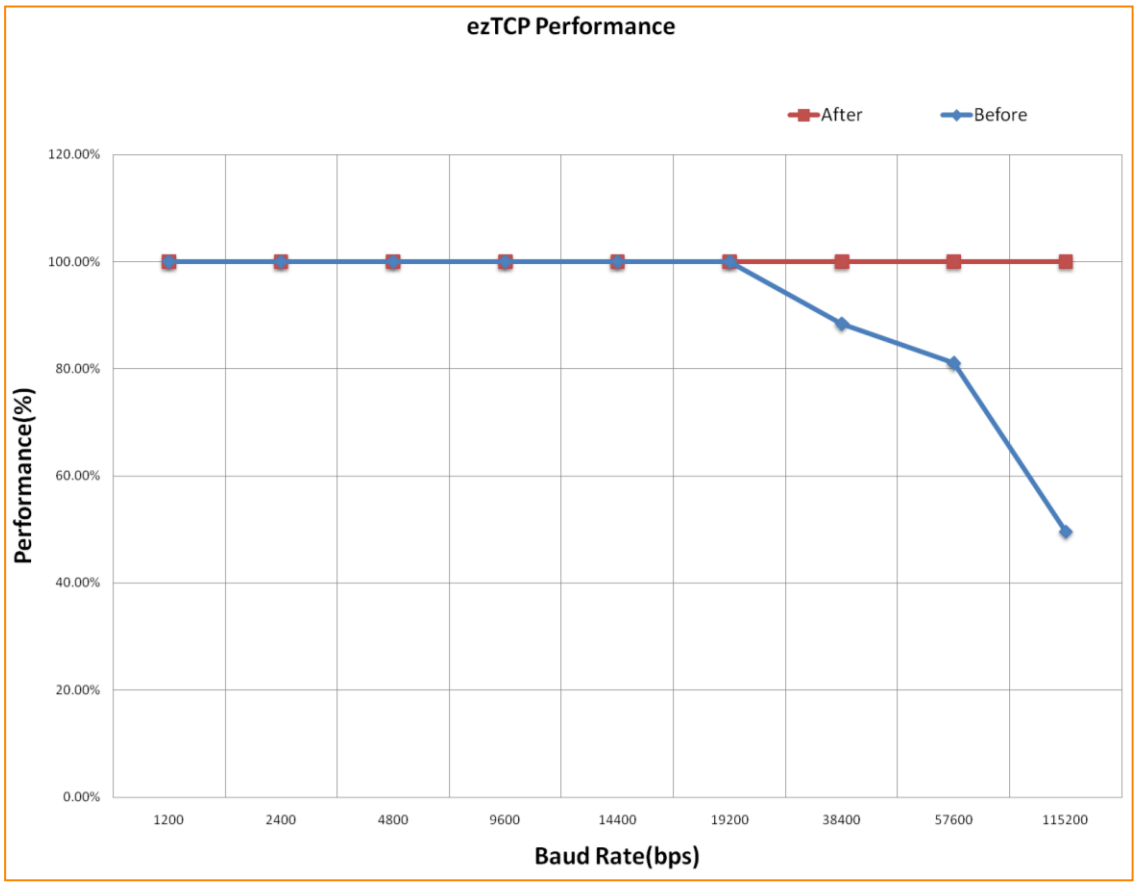

Fig 3-8 performance before and after using [Disable TCP Transmission Delay] option

3.5 Opinions

- About performance when using multiple serial ports
  Above results are based on using just one RS232 port. How could be different if multiple ports are used? CSE-M32 has 2 serial ports and EZL-400S has four. The performance of the condition (named Performance2) was the same with above results. Look at the below graph. It is hard to say that both results are different.

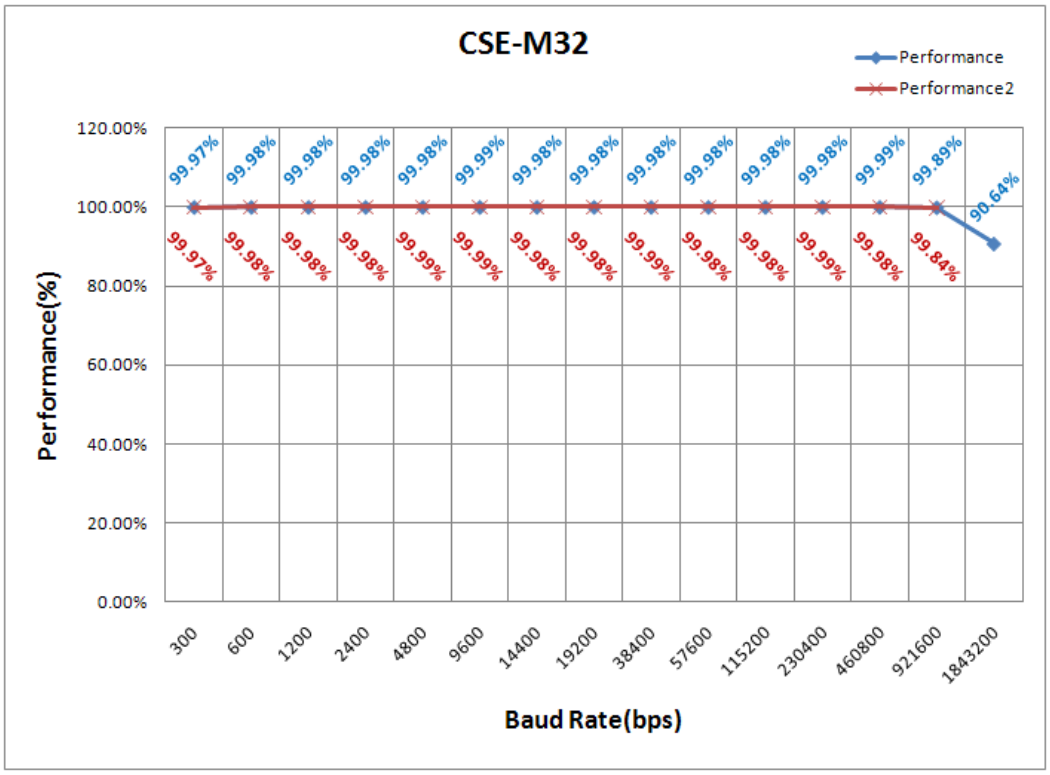

Fig 3-9 comparison with using multiple and single port of CSE-M32

- Performance in various network environments
  This test results couldn't be an absolute standard. As I mentioned, there are so many factors which can influence throughput of the products. In this document, we assumed just one network environment which has a pretty nice condition. Please note that this test is for verifying performance of our products. It is not for performance of network environments.

4 Revision History

Date	Version	Comments	Author
2010.01.13	1.0	○ Initial Release	Roy LEE