

Live Network conditions of Device configuration for Telepresence

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Abstract— At 2014, I tried to do telepresence between different companies, it was not working because of bad network condition. I tested Network by Chariot on all of network points. And I found Network configuration and condition at all of network points.

In this paper, I talk about problem analysis and find out problem of that phenomenon going on.

Keywords— Network test

I. INTRODUCTION

In 2014, two Korean companies did telepresence. But, teleconference was not working between two companies. It had broken video, low quality video, and noise voice. I checked teleconference software, it has not any problem. So, I tested network.

A distance of this network was directly 7 km, 10km that is a private network line.

A handicap of network test is that backbone is always working. I checked all networks except of backbone. Network performance test of backbone is impossible. But the Internet Service Provider (ISP) said to me, backbone had no problem.

On this paper, I found a solution to its problem because of network problem analysis by network testing program. I suggest how to solve these problems.

II. RELATED WORKS

In network connection, when network has problem, professional tester analyses protocol packets by sniffer. He knows a reason of problem. Or a network engineer figures out broken network points by experience.

Protocol packet analysis is possible on limit. For example, somebody measure packet received time and ACK send time on a line. If, ACK send time is late, it is server delay is long. [1]

In client delay, It is not quickly changed GET and ACK. Client is not processing on time. [1]

But, when it is not server delay or client processing delay, it is device problem or line broken or etc. It is not able to know easily that problem.

In this paper, if you have these symptoms it may cause this problem, normally the network is the solution to your problem in order to operate and to try to consider about what this approach

III. NETWORK PROBLEMS

If there is no problem in the Protocol, when a network problem occurs largely divided into three types.

- (1) Line Problem
- (2) Device Problem
- (3) Server/Client Problem

The Line Problems are below.

- (a) Line Short/Different Line
- (b) Line Interference
- (c) Connect short/Different Connect

Device Problem to occur the following problems.

- (a) Device configuration
- (b) Broken Device

Server/Client Problems are bellows.

- (a) Operating System configuration
- (b) Hardware Problem
- (c) Software Problem

When Network is wrong, Network check according to the symptom. When packet loss is occurred, I have to find problem on Server/Client, Device, and Line.

In this paper, it has a few assumptions before test.

First, during 2 month, test of telepresence equipment, and S/W was finished. It had not any problem. (It tested in closed network.)

Second, Layer 1 test of Line had not any problem.

In test of network, Test configuration is Table 1.

Table 1. Test Configuration

Tester	Model
PC(Notebook)	Lenovo Y50-70 4K Limited
Tester S/W	Ixia IxChariot 9.0

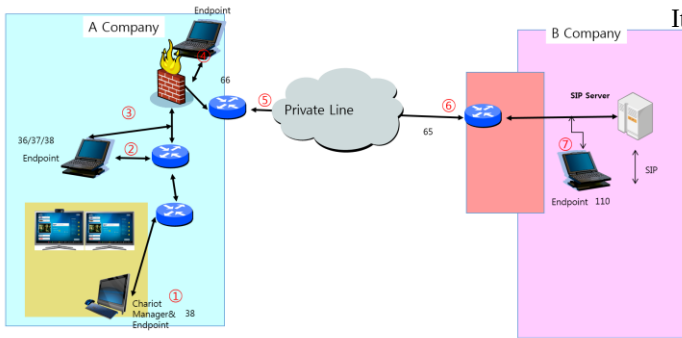


Figure 1. Test Configuration

I measured network factors by section.

1. Auto-Negotiation Problem

Test Execution (Endpoint 1 to Endpoint 2)

Group/Pair	Endpoint 1	Endpoint 2	Network Protocol	Endpoint 1 Service Quality	Endpoint 2 Service Quality	Script/Stream Name
All Pairs						
Pair 1	38	36	TCP			High_Performance_Throughput.scr
Pair 2	36	38	TCP			High_Performance_Throughput.scr

Throughput

Group/Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	149.123	44.395	93.567			
Pair 1	58.296	44.395	91.429	1.265	299.163	2.170
Pair 2	91.026	55.172	93.567	0.837	299.695	0.920
Totals:	149.123	44.395	93.567			

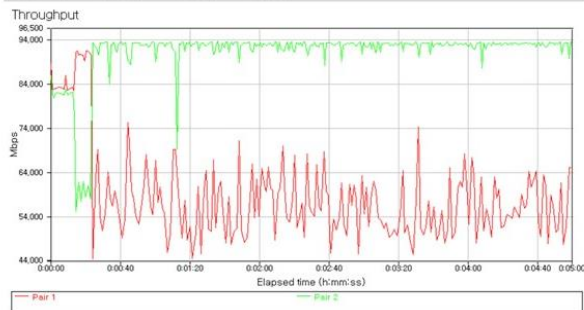


Figure 2. Network TCP Test(①- ②)

In Figure 2, I tested TCP between ① and ②, during 5 Minutes, on 100Mbps Fast Ethernet. ① → ② throughput

was 58.296Mbps, ②→① throughput was 91.026Mbps. It was extremely difference. But, at same time, UDP test had different result.

Group/Pair	Endpoint 1	Endpoint 2	Network Protocol	Endpoint 1 Service Quality	Endpoint 2 Service Quality	Script/Stream Name
All Pairs						
Pair 1	38	36	UDP			UDP_Throughput.scr
Pair 2	36	38	UDP			UDP_Throughput.scr

Throughput

Group/Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	67.234	9.621	64.176			
Pair 1	57.825	55.094	64.176	0.039	298.440	0.068
Pair 2	9.755	9.621	14.140	0.030	299.930	0.308
Totals:	67.234	9.621	64.176			

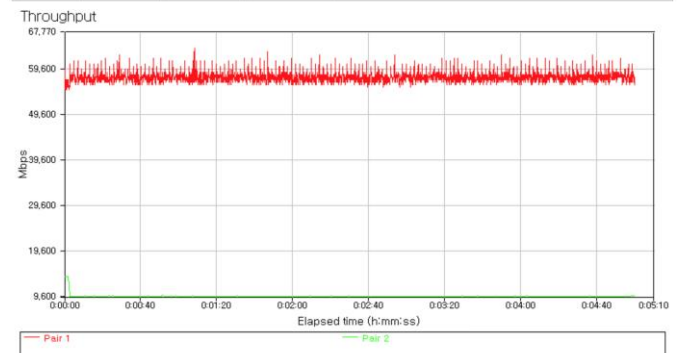


Figure 3. Network TCP Test(①- ②)

In Figure 3, I tested TCP between ① and ②, during 5 Minutes, on 100Mbps Fast Ethernet. ① → ② throughput was 57.825Mbps, ②→① throughput was 9.755Mbps. It has extremely up/down stream difference, too.

It had not any packloss. But TCP, UDP traffic different was very serious.

I was not able to find trouble on network configuration and device hardware. I guess that up-down link speed was too different.

I changed Auto-negotiation to 100Mbps Fast Ethernet of Layer 2 Ethernet Speed.

After speed change, Result is Figure 4.

Test Execution (Endpoint 1 to Endpoint 2)

Group/Pair	Endpoint 1	Endpoint 2	Network Protocol	Endpoint 1 Service Quality	Endpoint 2 Service Quality	Script/Stream Name
All Pairs						
Pair 1	38	36	TCP			High_Performance_Throughput.scr
Pair 2	36	38	TCP			High_Performance_Throughput.scr

Throughput

Group/Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	176.283	25.470	94.118			
Pair 1	86.651	25.470	93.677	2.444	299.131	2.821
Pair 2	89.794	85.016	94.118	0.168	299.353	0.187
Totals:	176.283	25.470	94.118			

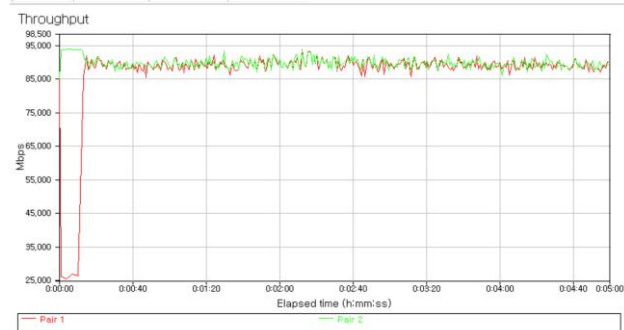


Figure 4. Network TCP Test(①-②) after change.

It changed 100Mbps fixed speed configuration, ①→② throughput was 86.651Mbps, ②→① throughput was 89.794Mbps. It was very stable high speed.

2. Device Problem & Optical Module

Group/Pair	Endpoint 1	Endpoint 2	Network Protocol	Endpoint 1 Service Quality	Endpoint 2 Service Quality	Script/Stream Name
All Pairs						
Pair 1 Error: CH#0202	38	110	TCP			High_Performance_Throughput.scr
Pair 2 Error: CH#0200	110	38	TCP			High_Performance_Throughput.scr

Throughput

Group/Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	9.032	0.737	9.400			
Pair 1 Error: CH#0202	0.821	0.737	0.930	0.125	389.651	15.201
Pair 2 Error: CH#0200	8.264	7.106	9.400	0.177	416.259	2.138
Totals:	9.032	0.737	9.400			



Figure 5. Network TCP Test(①-⑦)

In figure 5, ① → ⑦ throughput was 0.812Mbps, ⑦→① throughput was 8.264Mbps. They are very slow speed.

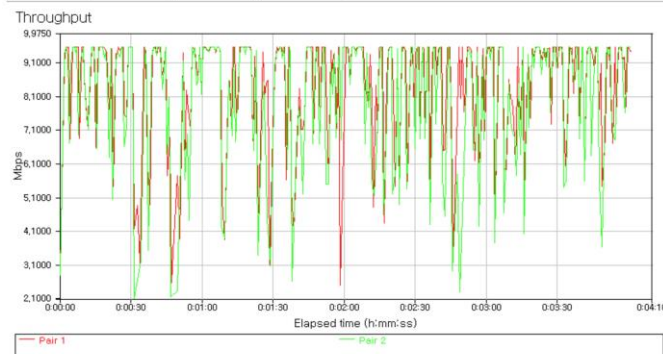
I tried UDP test and IPTV test, But, testes were not processed, because of Connection Error(Packet loss).

I had a step-by-step test ②↔④, ⑥↔⑦, ⑤↔⑥ to uncover the problem section. Specially, ⑤↔⑥ section was a allways using Private Network. So, I was not able to shutdown test. It was a low utilization section.

Group/ Pair	Endpoint 1	Endpoint 2	Network Protocol	Endpoint 1 Service Quality	Endpoint 2 Service Quality	Script/Stream Name
All Pairs						
Pair 1 Error: CHR0216	65	36	UDP			UDP_Throughput.scr
Pair 2 Error: CHR0216	36	65	UDP			UDP_Throughput.scr

Throughput

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	15.604	2.118	9.574			
Pair 1 Error: CHR0216	8.038	2.496	9.574	0.287	241.220	3.576
Pair 2 Error: CHR0216	7.595	2.118	9.574	0.365	241.002	4.814
Totals:	15.604	2.118	9.574			



Lost Data

Group/ Pair	Bytes Sent by E1	Bytes Received E2 (Streaming)	Bytes Lost from E1 to E2	Percent Bytes Lost E1 to E2	Throughput (Mbps)	Maximum Consecutive Lost Datagrams	Measured Time (secs)	Relative Precision
All Pairs	0	470,850,000	0	0		n/a		
Pair 1 Error: CHR0216	242,422,780	242,360,000	62,780	0.026	8.040	n/a	241.220	3.576
Pair 2 Error: CHR0216	228,798,060	228,490,000	308,060	0.135	7.595	n/a	241.002	4.814
Totals:	0	470,850,000	0	0		n/a		

Figure 6. Network TCP Test(③-⑥).

This section was ③↔⑥. Its throughput was 100Mbps and no error section in theory. But, packet lost was occurred and throughput is 7~8Mbps.

So, the MSPP(Multi Service Provisioning Platform) of ⑤↔⑥ section network device was changed to Layer 3 Switch.

Test Execution (Endpoint 1 to Endpoint 2)

Group/ Pair	Endpoint 1	Endpoint 2	Network Protocol	Endpoint 1 Service Quality	Endpoint 2 Service Quality	Script/Stream Name
All Pairs						
Pair 1	110	36	UDP			UDP_Throughput.scr
Pair 2	36	110	UDP			UDP_Throughput.scr

Throughput

Group/ Pair	Average (Mbps)	Minimum (Mbps)	Maximum (Mbps)	Throughput 95% Confidence Interval	Measured Time (secs)	Relative Precision
All Pairs	19.706	7.201	13.094			
Pair 1	10.202	8.225	13.094	0.128	300.061	1.251
Pair 2	9.522	7.201	11.798	0.125	300.113	1.308
Totals:	19.706	7.201	13.094			

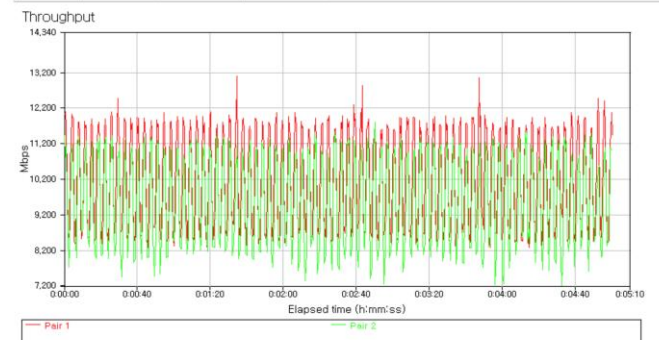


Figure 7. Network TCP Test(③-⑥) after device changing

After device changing, I checked ③↔⑥ section. It was strange result. Transfer did not occur uniformly, showed the extremely unstable network condition. I checked hardware of whole line. I found wrong. Optical module was 1310nm single mode. But Optical cable is 8050nm of Multi mode.

That was problem. So, I changed optical modules. After it changing, the network was working well.

IV. CONCLUSIONS

When network service did not working, first you perform test in closed network. It has no problem, then network test is performed. In this test, the problem is a matter of hardware (line, network device or module) is greater than a matter of protocol. In this paper, what is wrong with the hardware of the network showed that it can lead to this phenomenon.

In the future, if network trouble occurs, I have to clean up the various situations that may arise, depending on the network symptoms. I want to write book like the Harrison book(textbook) in medical internal medicine.

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REFERENCES

- [1] "Wireshark-Network Analysis", Laura Chappell, 2010.