ENSC 427 Communication Networks Spring 2012 Analysis of VoIP (Voice over Internet Protocol)

Group 11 King Fai Chung Yue Pan Ziyue Zhang

kfchung@sfu.ca ypall@sfu.ca zzal5@sfu.ca http://www.sfu.ca/~ypall/Ensc%20427/427.html



Introduction

Scenario cases

Results analysis

Voice over Internet Protocol

Start 1970s

- Transmit voice and multimedia over packet switched network
- Operate Over Internet Protocol
- Alternative to public switched telephone network (PSTN)
- Allows call to be make over non phone device

VoIP vs. Tradition Calls





Reliability

Introduction

Project motivation

Increasing popularity of VoIP

Project overview

- Performance of VoIP between wire and wireless connection
- Compare and analysis the QoS parameter between scenarios

Scenario Cases



Analysis Parameters

Jitter

Mean Opinion Score Value (MOS Value)

• End to End Delay

• Delay Variation

Simulation Setup

WLAN 802.11g connection using 56Mbps
G.711 encode scheme
1 voice frame / packet
Best effort
One minute /call and total simulation of 5 calls in total

Scenario

• LAN Local call



Scenario

• WLAN Local Call



Scenario

WLAN call with interference from same frequency devices



Scenario – Long Distance Call

Long distance call for LAN and WLAN Continental Size



Future Work

 Multiple access of switch (FTP, Printer server, Http server and Email Server)

• G.729 comparison

• WiMax over WiFi

• Conference Call across the Globe

Results – Jitter (Local Call)



Blue – Ethernet Connection Red – Wireless Connection

Results – Jitter (Long Distance Call)

	■ voip_14-lan far-DES-1 ■ voip_14-wlan far-DES-1
0.0000050.	average (in Voice Application.Jitter (sec))
0.000000000	
0.0000048-	
0.0000046-	
0.00000044 -	
0.00000042 -	
0.00000040 -	
0.00000038 -	
0.00000036 -	
0.00000034 -	
0.00000032 -	
0.00000030 -	
0.00000028 -	
0.00000026 -	
0.00000024-	
0.0000022-	
0.00000020-	
0.00000018-	
0.00000016	
0.00000016	
0.00000014-	
0.0000012-	
0.0000010-	
0.00000008 -	
0.00000006 -	
0.00000004 -	
0.00000002 -	
0.00000000 -	
-0.00000002-	
-0.00000004-	
-0.00000006-	
-0.00000008-	
-0.00000010-	
-0.00000012-	
-0.00000014 -	
-0.00000016-	
-0.00000018-	
-0.00000020-	
Orr	ios 0m 20s 0m 40s 1m 0s 1m 20s 1m 40s 2m 0s 2m 20s 2m 40s 3m 0s 3m 20s 3m 40s 4m 0s 4m 20s 4m 40s 5m 0s 5m 20s 5m 40s 6m 0s 6m 20s 6m 40s 7m 0s

Blue – Ethernet Connection Red – Wireless Connection

Results – Jitter (Wifi connection with interference)

■ voip_14-wlan with interference-DES-1 ■ voip_14-wlan-DES-1
average (in Voice Applicationlitter (sec))
0000028 -
0000026
00000024
00000022
02000000
00000018
00000012
00000014 -
00000016-
00000018 -
00000020 Om 0s 0m 30s 1m 0s 1m 30s 2m 0s 2m 30s 3m 0s 3m 30s 4m 0s 4m 30s 5m 0s 5m 30s 6m 0s 6m 30s 7m 0s 7m 30s 8m 0s 8m 30s 9m 0s 9m 30s 10m

Blue – Wireless Connection with interference Red – Wireless Connection

$Results - ETE \ Delay \ (\text{Local Call})$



Blue – Ethernet Connection Red – Wireless Connection

Results – ETE Delay (Long Distance Call)

	■ voip_14-lan far-DES-1 ■ voip_14-wtan far-DES-1
0.10 -	average (in Voice Application, Packet End -to -End Delay (sec))
0.10	
0.10-	
0.09-	
0.09-	
0.08-	
0.07	
0.07 -	
- 20.0	
0.00	
0.06 -	
0.05 -	
0.05 -	
0.04 -	
0.04 -	
0.04 -	
0.03-	
0.03-	
0.00	
0.02 -	
0.01 -	
0.01 -	
0.01	
0.00 + Om (0s 0m/20s 0m/40s 1m/0s 1m/20s 1m/40s 2m/0s 2m/20s 2m/40s 3m/0s 3m/20s 3m/40s 4m/0s 4m/20s 4m/40s 5m/20s 5m/20s 5m/40s 6m/20s 6m/40s 6m/40s 7m/0s

Blue – Ethernet Connection Red – Wireless Connection

Results – ETE Delay (Interference)



Blue – Wireless Connection with Interference Red – Wireless Connection

Delay Variation

Preview	
	■ voip_14-lan far-DES-1 ■ voip_14-lan-DES-1
, 000000000000 T	average (in Voice Application.Packet Delay Variation)
0000000000000000-	
000000000000000	
00000000000000	
0000000000000000-	
00000000000000	
00000000000000	
00000000000000	
00000000000000	
00000000000000	
00000000000000	
00000000000000	
- 000000000000	
- 000000000000	
- 000000000000	
- 0000000000000 Or	m 2m 4m 6m 8m 10m

Delay Variation

voip_14-wlan far-DES-1 voip_14-wlan with interference-DES-1 □ voip_14-wlan-DES-1 average (in Voice Application.Packet Delay Variation) 0.13 0.12 0.12 0.11 0.11 0.10 0.10 0.09 0.09 0.08 0.07 0.07 0.06 0.06 0.05 0.05 0.04 0.04 0.04 0.03 0.03 0.02 0.01 0.01 0.01

4m 0s

5m 0s

6m 0s

7m 0s

8m 0s

9m 0s

10m 0s

Red – Wireless Connection with Interference

3m Os

0.00 + 0m 0s

1m 0s

2m 0s

RESULTS - MOS VALUE

■ voip_1 ■ voip_1 ■ voip_1 ■ voip_1 ■ voip_1	4-lan far-DES-1 4-lan-DES-1 4-wlan far-DES-1 4-wlan-DES-1									
				average (in '	Voice Application.MC) S Value)				
4						· · · · · · · · · · · · · · · · · · ·				
3.8										
	-									
36-							-			
0.0										
	-						-			
3.4 -										
3.2										
3-										
3										
2.8-										
2.6										
24										
2.2-										
2-										
1.8										
16-										
1.0										
1.4 -										
1.2										
1										
0.0-										
0.0										
0.6-										
0.4										
0.2										
0										
Om Os	1m Os	2m 0s	3m Os	4m Os	5m 0s	6m 0s	7m Os	8m Os	9m Os	10m 0s

RESULTS - MOS VALUE

	■ voip_14-wlan with interference-DES-1 ■ voip_14-wlan-DES-1
4 -	average (in Voice Application.MOS Value)
3.8-	
36-	
0.0	
3.4 -	
3.2 -	
3-	
2.8-	
2.6-	
24	
2.4-	
2.2-	
2-	
1.8 -	
1.6 -	
1.4 -	
1.2-	
1 -	
0.8-	
0.6 -	
0.4 -	
0.2-	
0 - Om	0s 0m 30s 1m 0s 1m 30s 2m 0s 2m 30s 3m 0s 3m 30s 4m 0s 4m 30s 5m 0s 5m 30s 6m 0s 6m 30s 7m 0s 7m 30s 8m 0s 8m 30s 9m 0s 9m 30s 10m 0s

Conclusion

Ethernet has a more stable and less delay connection than wireless connection
Interference near wireless router greatly reduce QoS
Distance VoIP introduce greater jitter, ETE and lower MOS

Reference

- [1] M. Raj, A. Narayan, S. Datta, S.K. Das, J.K. Pathak, "Fixed mobile convergence: challenges and solutions," Communications Magazine, IEEE , vol.48, no.12, pp.26-34, December 2010
- [2] G. Krzysztof, K. Aleksander, W. Jozef, N. Krzysztof, "Testbed analysis of video and VoIP transmission performance in IEEE 802.11 b/g/n networks," Telecommunication Systems, Springer Netherlands, vol. 48, no 3-4, pp. 247-260, December 2011
- [3] K.Salah, P. Calyam, M.I. Buhari, "Assessing Readiness of IP Networks to Support Desktop Videoconferencing using OPNET," Elsevier Journal of Network and Computer Applications (JNCA), 2006
- [4] R. Gill, T. Farah, and Lj. Trajkovic, "Comparison of WiMAX and ADSL performance when streaming audio and video content," OPNETWORK 2011, Washington, DC, Aug. 2011
- [5] E.Yiu, E.Yiu, and Lj. Trajkovic, "OPNET Implementation of the Megaco/H.248 protocol: multi-call and multi-connection scenarios," OPNETWORK 2004, Washington, DC, Aug. 2004

Reference

- [6] K. Salah, A. Alkhoraidly, "An OPNET-based Simulation Approach for Deploying VoIP", Available: http://faculty.kfupm.edu.sa/ics/salah/misc/RecentPubs/IJNM_ VoIP.pdf
- [7] A.Kamerman, and N. Erkoçevic, "Microwave Oven Interference on Wireless LANs Operating in the 2.4 GHz ISM Band," Lucent Technologies, Available: http://archive.devx.com/wireless/articles/bluetooth/whitepapers/1a6900 .pdf
- [8] Luke Dang, Jeffrey Tam, and Kuo-Sheng Tsai, "Voice over Internet Protocol (VoIP) over Wireless and Ethernet," April 2010, Available: http://www.ensc.sfu.ca/~ljilja/ENSC427/Spring10/Projects/team1/ENSC_ 427_Srping_2010_Group_1_Final_Report.pdf
- [9] Hin Heng Chan, "Voice over Internet Protocol (VoIP) over 3G networks," April 2011, Available: http://www.ensc.sfu.ca/~ljilja/ENSC427/Spring11/Projects/team4/ENSC4 27_Spring2011_Team4_Report.pdf