

**ANALISIS *QUALITY OF SERVICE* PADA PENGGUNAAN IP
TELEPHONY DI PUSAT TEKNOLOGI INFORMASI DAN PANGKALAN
DATA (PTIPD) UIN SUNAN KALIJAGA**

SKRIPSI

Untuk memenuhi sebagian persyaratan

mencapai derajat Sarjana S-1

Program Studi Teknik Informatika



Disusun Oleh :

Mohamad Fahreni

13651092

**PROGRAM STUDI TEKNIK INFORMATIKA
FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS ISLAM NEGERI SUNAN KALIJAGA
YOGYAKARTA**

2018

**ANALISIS *QUALITY OF SERVICE* PADA PENGGUNAAN IP
TELEPHONY DI PUSAT TEKNOLOGI INFORMASI DAN PANGKALAN
DATA (PTIPD) UIN SUNAN KALIJAGA**

SKRIPSI

Untuk memenuhi sebagian persyaratan

mencapai derajat Sarjana S-1

Program Studi Teknik Informatika



Disusun Oleh :

Mohamad Fahroni

13651092

**PROGRAM STUDI TEKNIK INFORMATIKA
FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS ISLAM NEGERI SUNAN KALIJAGA
YOGYAKARTA**

2018



PENGESAHAN SKRIPSI/TUGAS AKHIR

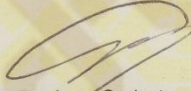
Nomor : 1723/UIN.02/D.ST/PP.01.1/09/2018

Skripsi/Tugas Akhir dengan judul : Analisis *Quality Of Service* pada Penggunaan IP Telephony di Pusat Teknologi Informasi dan Pangkalan Data (PTIPD) UIN Sunan Kalijaga

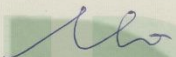
Yang dipersiapkan dan disusun oleh :
Nama : Mohamad Fahrani
NIM : 13651092
Telah dimunaqasyahkan pada : 24 Agustus 2018
Nilai Munaqasyah : A/B
Dan dinyatakan telah diterima oleh Fakultas Sains dan Teknologi UIN Sunan Kalijaga

TIM MUNAQASYAH :


Ketua Sidang


Dr. Bambang Sugiantoro
NIP. 19751024 200912 1 002

Penguji I

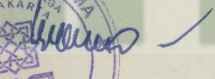

Maria Ulfah Siregar, M.IT. Ph.D
NIP.19780106 200212 2 001

Penguji II


Rahmat Hidayat, S.Kom.M.CS
NIP.19850514 201503 1 002

Yogyakarta, 17 september 2018
UIN Sunan Kalijaga
Fakultas Sains dan Teknologi
Dekan




Dr. Murtono, M.Si
NIP. 19691212 200003 1 001



SURAT PERSETUJUAN SKRIPSI/TUGAS AKHIR

Hal : Persetujuan Skripsi

Lamp : 1 Bendel Skripsi

Kepada

Yth. Dekan Fakultas Sains dan Teknologi

UIN Sunan Kalijaga Yogyakarta

di Yogyakarta

Assalamu'alaikum wr. wb.

Setelah membaca, meneliti, memberikan petunjuk dan mengoreksi serta mengadakan perbaikan seperlunya, maka kami selaku pembimbing berpendapat bahwa skripsi Saudara:

Nama : Mohamad Fahroni

NIM : 13651092

Judul Skripsi : Analisis *Quality Of Service (QOS)* Pada Penggunaan *IP Telephony* di Pusat Teknologi Informasi dan Pangkalan Data (PTIPD) UIN Sunan Kalijaga Yogyakarta


sudah dapat diajukan kembali kepada Program Studi Teknik Informatika Fakultas Sains dan Teknologi UIN Sunan Kalijaga Yogyakarta sebagai salah satu syarat untuk memperoleh gelar Sarjana Strata Satu dalam Program Studi Teknik Informatika.

Dengan ini kami berharap agar skripsi/tugas akhir Saudara tersebut di atas dapat segera dimunaqsyahkan. Atas perhatiannya kami ucapkan terima kasih.

Wassalamu'alaikum wr. wb.

Yogyakarta, 20 Agustus 2018

Pembimbing


Dr. Bambang Sugiantoro, S. Si., M. T.
NIP. 19751024 200912 1 002

SURAT KETERANGAN KEASLIAN SKRIPSI

Saya yang bertanda tangan dibawah ini:

Nama : Mohamad Fahroni
NIM : 13651092
Program Studi : Teknik Informatika
Fakultas : Sains dan Teknologi

Menyatakan bahwa skripsi saya yang berjudul "*Analisis Quality Of Service (QOS) Pada Penggunaan IP Telephony di Pusat Teknologi Informasi dan Pangkalan Data (PTIPD) UIN Sunan Kalijaga Yogyakarta*" merupakan hasil penelitian saya sendiri, tidak terdapat karya yang pernah diajukan untuk memperoleh gelar kesarjanaan di suatu perguruan tinggi, dan bukan plagiasi karya orang lain kecuali yang secara tertulis diacu dalam naskah ini dan disebutkan dalam daftar pustaka.

Yogyakarta, 20 Agustus 2018

Yang menyatakan,



Mohamad Fahroni
NIM. 13651092

KATA PENGANTAR



Puji dan Syukur saya panjatkan kehadiran Allah SWT yang telah memberikan rahmat dan hidayah-Nya, sehingga penulis masih dapat merasakan segala nikmat anugerah dan kesempatan yang diberikan dalam penyelesaian skripsi yang berjudul “ ANALISIS QUALITY OF SERVICE (QOS) PADA PENGGUNAAN IP TELEPHONY DI PUSAT TEKNOLOGI INFORMASI DAN PANGKALAN DATA UIN SUNAN KALIJAGA”.

Skripsi ini disusun untuk memenuhi sebagai syarat gelar kesarjanaan pada Program Studi Teknik Informatika Fakultas Sains dan Teknologi Universitas Islam Negeri Sunan Kalijaga Yogyakarta.

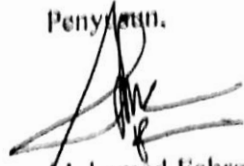
Dalam kesempatan ini,penulis ingin mengucapkan banyak terimakasih kepada :

1. Bapak Prof. Drs. KH Yudian Wahyudi, Ph. D., Selaku Rektor UIN Sunan Kalijaga.
2. Bapak Dr. Murtono, M.Si., selaku Dekan Fakultas Sains dan Teknologi.
3. Bapak Dr. Bambang Sugiantoro, S. Si, M.T, selaku ketua Prodi Studi Teknik Informatika UIN Sunan Kaljaga Yogyakarta.
4. Bapak Dr. Bambang Sugiantoro, M.T., Selaku Dosen Pembimbing Skripsi yang senantiasa sabar membimbing dan meluangkan waktu kepada penulis untuk menyelesaikan skripsi ini.

5. Ibu Dr. Shofwatul ‘Uyun, S.T.,M.Kom, selaku Dosen Pembimbing Akademik Teknik Informatika 2013.
6. Bapak dan Ibu dosen Program Studi Teknik Informatika Fakultas Sains dan Teknologi UIN Sunan Kalijaga.
7. Seluruh Staff Bagian Kemahasiswaan, PTIPD UIN Sunan Kalijaga yang telah membantu dalam menyelesaikan Penelitian ini.
8. Teman-teman sepenjuangan Program Studi Teknik Informatika Mandiri 2013 (THINKS) yang telah memberi dukungan dan bantuan dalam penelitian ini.
9. Semua pihak yang tidak dapat penulis sebutkan satu persatu yang telah membantu dalam proses penyelesaian skripsi ini.

Penulis menyadari masih banyak kekurangan dan kesalahan dalam pelaksanaan dan penyusunan skripsi ini. Oleh karena itu kritik dan saran penulis harapkan untuk dapat menyempurnakannya. Semoga skripsi ini dapat bermanfaat bagi pembaca dan penulis khususnya.

Yogyakarta, 16 Agustus 2018

Penyusun,

Mohamad Fahrani
NIM : 13651092

HALAMAN PERSEMBAHAN

Dengan mengucapkan syukur Alhamdulillah, halaman ini saya tujukan untuk semua pihak yang telah membantu dan mensupport penyelesaian skripsi ini, sebagai berikut :

1. Program Studi Teknik Informatika UIN Sunan Kalijaga Yogyakarta.
2. Kedua Orang Tua Tersayang, Bapak Sumadi dan Ibu Suwarni serta seluruh anggota keluarga tercinta, yang selalu memberikan nasehat, dukungan, motivasi hidup dan do'anya.
3. Terimakasih kepada Bapak Dr. Bambang Sugiantoro, S. Si., M.T, selaku dosen pembimbing saya, yang telah membimbing saya dalam pembuatan skripsi ini.
4. Segenap Dosen Teknik Informatika UIN Sunan Kalijaga Yogyakarta, Pak Agung, Pak Bambang, Pak Sumarsono, Pak Didik, Pak Nurochman, Pak Agus, Pak Mustaqim, Pak Aulia, Pak Imam, Pak Awik, Pak Rahmat, Bu Uyun, Bu Ade, Bu Maria terima kasih atas ilmu yang telah diberikan selama menempuh perkuliahan, semoga bermanfaat dikemudian hari.
5. Teman-teman seperjuangan yang sudah saya anggap sebagai keluarga sendiri, THINKS yang tidak bisa saya sebut satu persatu, terimakasih untuk kebersamaanya dan dukungan kalian sealama saya menjadi mahasiswa di UIN Sunan Kalijaga Yogyakarta.

6. Sahabat PMII KORP FREKUENSI dan segenap keluarga besar AUFKLARUNG DISTRIK dalam berproses dalam organisasi selama ini.
7. Keluarga besar Dusun Dilatan, Saptosari Gunung kidul. Terimakasih untuk keramahannya selama KKN dan terimakasih telah mengajari bermasyarakat selama KKN.
8. Teman-teman KKN 98 Dilatan, (Muklis, Amin, Fahru, Fatma, Nia, Ifah). Sebagai keluarga 1 atap selama 1 bulan KKN sebagai rekan seperjuangan salam KKN.
9. Teman-teman Sejuta Ummat dan user Mobile Legend (Zahid, Anggoro, Alviyan, Yuha, Gembul, Xojrot, Taufik, Rizki, Tulus, Aji Cilik, Multi, Maulana) yang telah menemani setiap jejak langkah perjuangan saya selama menuntut ilmu di Yogyakarta. Terimakasih untuk segala hal yang telah kita lalui selama di Yogyakarta. Terimakasih untuk canda dan tawa yang selalu membuat saya berat meninggalkan Yogyakarta.
10. Terimakasih banyak untuk semua pihak yang sudah membantu dan menyemangati saya dalam menyelesaikan skripsi ini.

Sekian halaman persembahan ini saya buat untuk mengapresiasi kepada semua pihak yang telah memberi bantuan baik doa, moral, dan material dalam penunjang skripsi saya ini, semoga amal perbuatan kalian dibalas berlipat-lipat oleh Allah SWT. Terimakasih banyak dan mohon maaf apabila saya ada kesalahan dalam penulisan, mohon dimaafkan.

MOTTO

“Puncak dari semua pengetahuan dan perjalanan adalah menjadi insan yang pemaaf, pemurah dan penyayang”

(M Fahroni)

“ Lilladziina ahsanul husnaa wa ziyaadah”

(Bagi orang yang berbuat baik, ada pahala yang terbaik dan tambahannya. QS.

Yunus: 26)



DAFTAR ISI

COVER	i
HALAMAN PENGESAHAN	ii
HALAMAN PERSETUJUAN SKRIPSI.....	iii
SURAT PERNYATAAN KEASLIAN SKRIPSI	iv
KATA PENGANTAR	v
HALAMAN PERSEMBAHAN	vii
MOTTO	ix
DAFTAR ISI.....	x
DAFTAR TABEL.....	xiv
DAFTAR GAMBAR	xv
INTISARI	xvi
ABSTRACT.....	xvii
BAB I PENDAHULUAN.....	1
1.1. Latar Belakang	1
1.2. Rumusan Masalah	3
1.3. Batasan Masalah.....	3
1.4. Tujuan Penelitian.....	3
1.5. Manfaat Penelitian.....	4

1.6.	SISTEMATIKA PENULISAN	4
BAB II	LANDASAN TEORI DAN TINJAUAN PUSTAKA.....	6
2.1.	Tinjauan pustaka.....	6
2.2.	Landasan teori.....	9
2.2.1.	Pengertian Quality of Service (QoS).....	9
2.2.2.	Paramater QoS.....	11
2.2.3.	Delay.....	11
2.2.4.	Jitter.....	13
2.2.5.	Packet Loss.....	14
2.2.6.	Throughput.....	15
2.2.7.	IP Telephony.....	16
2.2.8.	Kelebihan VoIP.....	17
2.2.9.	Kekurangan VoIP.....	18
2.2.10.	Komponen VoIP.....	20
2.2.11.	Session Initiation Protocol (SIP).....	20
2.2.12.	Jaringan komputer.....	23
2.2.13.	Metode pengukuran performa layanan jaringan internet.....	25
2.2.14.	Action Research.....	26
2.2.15.	Aplikasi pengukuran.....	26

BAB III METODE PENELITIAN.....	29
3.1. Metode Penelitian.....	29
3.2. Objek penelitian.....	29
3.3. Alur Penelitian.....	30
3.4. Diagnosis (Melakukan Diagnosa).....	30
3.5. Action Planning (Melakukan Perencanaan).....	31
3.6. Action Taking (Melakukan tindakan).....	31
3.7. Evaluating (Melakukan Evaluasi).....	31
3.8. Learning (Pembelajaran).....	31
BAB IV ANALISA DAN PEMBAHASAN.....	33
4.1. Analisa Kebutuhan.....	33
4.1.1. Melakukan Diagnosa (<i>Diagnosis</i>).....	33
4.2. Rencana Tindakan (Action Planning).....	33
4.2.1. Persiapan Perangkat.....	34
4.3. Melakukan Tindakan (Action taking).....	35
4.3.1. Analisis Pengukuran QoS.....	35
4.3.2. Teknik Pengukuran Parameter QoS.....	35
4.3.3. Perhitungan Parameter QoS IP Telephony / VoIP.....	41
4.4. Hasil Pengujian IP Telephony Dengan Parameter QoS.....	41
4.1.2. Analisis Delay.....	43

4.1.3.	Analisis Jitter.....	45
4.1.4.	Analisis Throughput.....	46
4.1.5.	Analisis Packet Loss.....	49
4.1.6.	Analisis perbandingan QOS.....	50
4.1.7.	Kategori Delay.....	51
4.1.8.	Kategori Jitter.....	51
4.1.9.	Kategori Throughput.....	52
4.1.10.	Kategori Packet Loss.....	53
4.1.11.	Wawancara Pengguna.....	54
4.5.	Evaluasi.....	54
BAB V KESIMPULAN.....		56
5.1.	Kesimpulan.....	56
5.2.	Saran.....	58
DAFTAR PUSTAKA.....		58

DAFTAR TABEL

Tabel 2. 1 Perbedaan Penelitian	8
Tabel 2. 2 Persentase dari nilai QoS.....	10
Tabel 2. 3 Standarisasi Delay	13
Tabel 2. 4 Standarisasi Jitter.....	14
Tabel 2. 5 Standarisasi Packet Loss.....	15
Tabel 2. 6 Standarisasi Throughput.....	16
Tabel 4. 1 Spesifikasi perangkat lunak.....	34
Tabel 4. 2 Hari 1 Delay IP Telephony.....	37
Tabel 4. 3 Hari 1 Jitter IP Telephony	39
Tabel 4. 4 Hari 1 Throughput IP Telephony	40
Tabel 4. 5 Hari 1 Packet Loss IP Telephony.....	41
Tabel 4. 6 Hasil rata-rata pengukuran QoS	42
Tabel 4. 7 Perbandingan pengukuran QoS.....	50
Tabel 4. 8 Kategori Delay.....	51
Tabel 4. 9 Kategori Jitter	52
Tabel 4. 10 Kategori Throughput.....	52
Tabel 4. 11 Kategori Packet Loss.....	53

DAFTAR GAMBAR

Gambar 2. 1 Cara Kerja VoIP.....	17
Gambar 2. 2 Arsitektur SIP (Rachman dkk, 2007).....	23
Gambar 2. 3 Tampilan Wireshark.....	27
Gambar 2. 4 Tampilan X-Lite.....	28
Gambar 3. 1 Metode Penelitian	30
Gambar 4. 1 Tampilan Interface Wireshark	36
Gambar 4. 2 Gambar Tampilan Delay.....	37
Gambar 4. 3 Gambar Tampilan Jitter	38
Gambar 4. 4 Gambar Tampilan Throughput.....	39
Gambar 4. 5 Gambar Tampilan Packet Loss	40
Gambar 4. 6 Grafik Delay IP Telephony	43
Gambar 4. 7 Grafik Jitter IP Telephony.....	45
Gambar 4. 8 Grafik Throughput IP Telephony.....	46
Gambar 4. 9 Grafik Packet Loss IP Telephony	49

INTISARI

Dalam perkembangan teknologi yaitu dengan munculnya internet, internet adalah sebuah jaringan yang saling terhubung menggunakan standar system global Transmission Control Protocol/Internet Protocol Suite (TCP/IP) sebagai protocol pertukaran paket untuk melayani milyaran pengguna di seluruh dunia. Internet telah melahirkan teknologi baru yang disebut *IP Telephony*, *IP Telephony* merupakan teknologi yang mampu melewati traffic suara, video dan data yang berbentuk paket melalui jaringan IP. Sebagai langkah awal dalam upaya meningkatkan kualitas layanan jaringan dalam penggunaan *IP Telephony*, maka diperlukan hasil pengukuran yang mewakili nilai rata-rata performa layanan jaringan Internet terhadap perubahan nilai parameter QoS dalam penggunaan *IP Telephony* di Pusat Teknologi Informasi dan Pangkalan Data UIN Sunan Kalijaga.

Dalam penelitian ini diterapkan metode *action research*, metode penelitian ini mengacu pada parameter *QoS*. *QoS* mekanisme pada jaringan yang menentukan bahwa aplikasi-aplikasi atau layanan dapat beroperasi sesuai dengan standar kualitas layanan yang telah ditetapkan. Parameter *QoS* yang terdiri dari *delay*, *jitter*, *throughput* dan *packet loss*.

Hasil analisis *IP Telephony* di Pusat Teknologi Informasi dan Pangkalan Data UIN Sunan Kalijaga mendapat hasil yang belum semuanya maksimal. Pengujian *delay* adalah sebesar 0,18 milidetik yang jika dikategorikan menurut standarisasi *TIPHON* adalah sangat bagus. Pengujian *jitter* adalah sebesar 0,356 milidetik yang jika dikategorikan menurut standarisasi *TIPHON* adalah baik. Pengujian *packet loss* adalah sebesar 0% yang menurut standarisasi *TIPHON* adalah sangat bagus. Pengujian *Throughput* memiliki tingkat kualitas 1 % yang jika dikategorikan menurut standarisasi *TIPHON* tergolong buruk.

Kata Kunci : *internet*, *ip telephony*, *action research*, *QoS*, *delay*, *jitter*, *throughput*, *packet loss*.

ABSTRACT

In the development of technology namely with the advent of the internet, the internet is a network that is interconnected using global system standards Transmission Control Protocol / Internet Protocol Suite (TCP / IP) as a packet exchange protocol to serve billions of users around the world. The internet has given birth to a new technology called IP Telephony, IP Telephony is a technology that is capable of passing packet traffic, video and data in the form of a packet through an IP network. As a first step in an effort to improve the quality of network services in the use of IP Telephony, measurement results are needed that represent the average value of Internet network service performance against changes in QoS parameter values in the use of IP Telephony at the Information Technology Center and Data Base UIN Sunan Kalijaga.

In this study action research method is applied, this research method refers to the QoS parameters. QoS mechanisms on the network that determine that applications or services can operate in accordance with established service quality standards. QoS parameters which consist of delay, jitter, throughput and packet loss.

The results of the IP Telephony analysis at the Information Technology Center and Data Base of the UIN Sunan Kalijaga received results that were not all maximal. Testing delay is 0.18 milliseconds which if categorized according to the standardization of TIPHON is very good. Jitter testing is 0.356 milliseconds which if categorized according to the standardization of TIPHON is good. Testing packet loss is 0% according to the standardization of TIPHON is very good. Throughput testing has a quality level of 1% which if categorized according to the standardization of TIPHON is classified as bad.

Keywords : *internet, ip telephony, QoS, delay, jitter, throughput, packet loss.*

BAB I

PENDAHULUAN

1.1. Latar Belakang

Perkembangan teknologi khususnya teknologi informasi membawa perubahan yang sangat mendasar bagi dunia telekomunikasi, komunikasi menjadi suatu kebutuhan yang sangat penting bagi seluruh orang di dunia. Komunikasi dapat dilakukan secara langsung ataupun jika berkomunikasi memiliki jarak yang cukup jauh dapat menggunakan peralatan telekomunikasi. Banyak cara untuk menyampaikan informasi baik dengan mengirim pesan melalui email maupun bercakap langsung melalui telepon.

Berkomunikasi melalui telepon banyak menjadi pilihan orang-orang maupun suatu instansi ataupun perusahaan di seluruh dunia karena memiliki keunggulan yakni hal yang ingin disampaikan bisa langsung dibicarakan seolah-olah tidak ada jarak antara berkomunikasi dan komunikasi yang dilakukan lebih real time. Namun permasalahan yang timbul adalah ketika pengguna, terutama instansi melakukan komunikasi melalui telepon analog dalam durasi yang lama akan menimbulkan biaya yang tinggi. Untuk itu dibutuhkan suatu teknologi komunikasi suara yang murah untuk memangkas biaya yang mahal.

IP Telephony atau biasa disebut Telepon Internet / VoIP / Digital Phone merupakan sebuah teknologi yang memungkinkan percakapan suara jarak jauh melalui jaringan data/Internet. Data suara diubah menjadi kode digital dan dialirkan melalui jaringan yang mengirimkan paket-paket data, dan bukan

lewat sirkuit analog telepon biasa. Jaringan IP sendiri merupakan jaringan komunikasi data yang berbasis *packet-switch*, sehingga kita dapat menelpon dengan menggunakan jaringan IP atau Internet. Jaringan *IP Telephony* bisa dibangun dengan menggunakan kabel dan nirkabel. Penggunaan *IP Telephony / VoIP* dapat memberi banyak keuntungan terutama dari segi biaya yang lebih murah dibandingkan biaya telepon tradisional, karena jaringan IP bersifat global.

Voice over Internet Protocol (VoIP) adalah teknologi yang mampu melewati trafik suara, video dan data yang berbentuk paket melalui jaringan IP. VoIP merupakan sebuah cara lain untuk berkomunikasi mengirim dan menerima suara, layaknya telepon biasa dengan biaya murah bahkan gratis. Dalam VOIP pengiriman dan penerimaan data ditumpangkan atau dilewatkan melalui Internet. VOIP erat kaitannya dengan adanya QoS , QoS adalah mekanisme pada jaringan yang menentukan apakah aplikasi-aplikasi atau layanan dapat beroperasi sesuai dengan standar kualitas layanan yang telah ditetapkan. Beberapa parameter performansi layanan seperti delay, jitter, throughput, packet loss dan sebagainya sangat mempengaruhi kualitas layanan (Nurjanah, 2016).

UIN Sunan Kalijaga adalah salah satu universitas yang menggunakan IP Telephony untuk berkomunikasi. Maka dari itu untuk mengetahui kualitas jaringan pada IP Telephony pada UIN Sunan Kalijaga Yogyakarta perlu dilakukan analisis untuk mengetahui kualitas jaringan pada IP Telephony.

Oleh karena itu Untuk mengetahui kualitas jaringan *IP Telephony* pada UIN Sunan Kalijaga Yogyakarta, perlu dilakukan analisis jaringan untuk mengetahui seberapa besar kinerja jaringan dalam penggunaan *IP Telephony* yang menekankan,

bagaimana memonitoring dan untuk mengetahui seberapa besar kinerja jaringan dapat menggunakan parameter QoS (Quality of Service). Berdasarkan uraian di atas, maka penulis mengambil judul “*Analisis Quality of Service (QoS) Jaringan Pada Penggunaan IP Telephony di Pusat Teknologi Informasi dan Pangkalan Data (PTIPD) UIN Sunan Kalijaga*”.

1.2. Rumusan Masalah

Berdasarkan latar belakang yang sudah dijelaskan di atas, permasalahan yang dapat diangkat yaitu:

1. Bagaimana memonitoring dan menganalisis kualitas layanan jaringan pada penggunaan IP Telephony.
2. Bagaimana mengukur parameter *Quality of Service* (QoS) pada penggunaan IP Telephony?

1.3. Batasan Masalah

Berdasarkan identifikasi masalah yang telah diuraikan di atas, maka permasalahan dibatasi sebagai berikut:

1. Parameter pengukuran QoS ini meliputi *delay*, *jitter*, *throughput*, dan *packet loss*.
2. Data untuk penelitian ini hanya di wilayah UIN Sunan Kalijaga di Pusat Teknologi Informasi dan Pangkalan Data (PTIPD).

1.4. Tujuan Penelitian

Tujuan yang ingin dicapai adalah menganalisis kualitas layanan jaringan dan mengukur parameter *Quality of Service* (QoS) pada penggunaan IP

Telephony di Pusat Teknologi Informasi dan Pangkalan Data UIN Sunan Kalijaga Yogyakarta.

1.5. Manfaat Penelitian

Manfaat dari penelitian ini yaitu:

1. Dapat mengetahui kualitas layanan (QoS) terhadap penggunaan IP Telephony.
2. Dapat menjadi acuan dalam menganalisa suatu performa terhadap jaringan telekomunikasi sehingga mempermudah user dalam mengolah dan menganalisa suatu jaringan.
3. Hasil analisa ini diharapkan dapat membantu pihak-pihak yang berkomunikasi dengan menggunakan IP Telephony di UIN Sunan Kalijaga.

1.6. SISTEMATIKA PENULISAN

Adapun sistematika penulisan ini terdiri dari 5 bab, dengan sistematika seperti dibawah ini :

- BAB I PENDAHULUAN

Dalam bab ini akan dijelaskan secara singkat mengenai latar belakang, rumusan masalah, batasan masalah, tujuan penelitian, manfaat penelitian dan sistematika penulisan.

- BAB II TINJAUAN PUSTAKA

Dalam bab ini akan dibahas tentang teori-teori dasar yang berkaitan dengan penelitian sebelumnya dan akan menjadi dasar dalam menyelesaikan masalah-masalah dalam penelitian ini.

- BAB III METODE PENELITIAN

Bab ini akan menjelaskan tentang metode penelitian yang akan digunakan pada penelitian analisis *Quality Of Service* (QoS) pada penggunaan *Ip Telephony* di Pusat Teknologi Informasi dan Pangkalan Data (PTIPD) UIN Sunan Kalijaga.

- BAB IV ANALISA DAN PEMBAHASAN

Bab ini akan membahas perhitungan setiap parameter yang akan diuji secara matematis dan kemudian akan dianalisa sesuai standarisasi yang sudah ditentukan.

- BAB V PENUTUP

Bab ini berisi tentang kesimpulan akhir dan saran untuk pengembangan penelitian

BAB V

KESIMPULAN

5.1. Kesimpulan

Berdasarkan hasil pengukuran dalam penelitian yang telah dilakukan dapat ditarik kesimpulan, performa IP Telephony di Pusat Teknologi Informasi dan Pangkalan Data UIN Sunan Kalijaga dengan menggunakan parameter QoS sudah termasuk bagus menurut standarisasi TIPHON. Diperoleh nilai *Delay* pada Client 1 – Client 3 memperoleh hasil yang sama sebesar 0,18 milidetik, Client 4 sebesar 0,16 milidetik dan Client 5 0,2 milidetik yang sudah diuji, jika dikategorikan menurut standarisasi TIPHON masuk dalam kategori yang sangat baik. Pada pengujian *Jitter* dari semua Client yang telah diuji masuk dalam kategori baik menurut standarisasi TIPHON. Untuk pengujian *Throughput* memiliki tingkat kualitas buruk jika dikategorikan menurut standarisasi TIPHON. Kemudian untuk hasil dari pengujian *Packet Loss* memiliki nilai 0% dari semua Client itu adalah hasil yang sangat baik jika dikategorikan menurut standarisasi TIPHON. Nilai dari setiap parameter QoS sudah termasuk baik, hal tersebut dikarenakan layanan jaringan yang sudah memenuhi standar yang bagus.

5.2. Saran

Dalam penelitian ini, adapun beberapa saran yang dapat diberikan untuk pengembangan penelitian ini antara lain:

1. Dari hasil *Throughput* yang buruk, diharapkan melakukan pengukuran secara rutin agar bisa cepat diatasi hal-hal yang bisa menurunkan nilai presentase *Throughput*.

2. Diharapkan penelitian selanjutnya bisa lebih lengkap, tidak hanya di Pusat Teknologi Informasi dan Pangkalan Data tetapi bisa di Fakultas SAINTEK, Gedung PKSI dan gedung lainnya yang sudah dipasang IP Telephony.
3. Untuk pengujian perfomasi *Quality of Service* (QoS) harus dilakukan pengujian MOS (*Mean Opinion Source*).



DAFTAR PUSTAKA

- Asep, W. (2017). *Analisis Quality of Service (QOS) Layanan Video Streaming Youtube Pada Jaringan Wirreless di Lingkungan Fakultas Sains dan Teknologi UIN Sunan Kalijaga*. YOGYAKARTA: UIN Sunan Kalijaga.
- Diponegoro, M. (2015). *Analisis Quality of Service (QoS) Pada Jaringan Internet Dengan Metode Fixed Daily Measurement Interfal (FDMI) dan Non Fdmi*. Yogyakarta: Tesis Ilmu Komputer UGM.
- Janius, D. H. (2013). *Analisis Qos Video Streaming Pada Jaringan Wireless Menggunakan Metode HTB (Hierarchical Token Bucket)*. Pekanbaru: UIN Syarif Kasim Riau.
- Khusni, N. (2014). *Implementasi Dan Analisis Kinerja VoIP Server Menggunakan Trixbox CE Dengan Keamanan Jaringan VPN*. Yogyakarta: UIN Sunan Kalijaga Yogyakarta.
- Mahardika, Y. B. (2017). *Analisis Quality of Service Jaringan Wireless Sukanet WiFi Di Fakultas Sains Dan Teknologi Uin Sunan Kalijaga*. Yogyakarta: UIN Sunan Kalijaga.
- Ningsih, A. (2017). *Analisis Perbandingan Kecepatan Broadcast Video Streaming Wireless Dan 4G LTE Dengan Parameter Bandwidth*. Yogyakarta: UIN Sunan Kalijaga.
- Nurjanah, T. S. (2016). *Analisis QoS pada VOIP dengan Menggunakan Provider Three PT Hutchinson Three Indonesia*. Bandung: UIN Sunan Gunung Djati.

Setiawan, E. B. (2012). *Analisa Quality of Services (QoS) Voice Over Internet Protocol (VoIP) dengan protokol H.323 dan Session Initial Protocol (SIP)*.

Bandung: Universitas Komputer Indonesia.

Wicaksono, N. K. (2016). *Analisis Quality Of Service Jaringan Wireless LAN pada Universitas PGRI Yogyakarta*. Yogyakarta: UIN Sunan Kalijaga.

Zakaria, M. I. (2015). *Analisis Keamanan dan performansi VoIP menggunakan VPN berbasis GNU Linux Trixbox pada jaringan wifi*. Yogyakarta: UIN Sunan Kalijaga.



LAMPIRAN

Lampiran Hari-1

1. Lampiran capture client 1

The image shows the Wireshark Summary dialog box. The 'Capture' section displays:

- Capture HW: Intel(R) Core(TM) i5-5200U CPU @ 2.20GHz (with SS)
- OS: 64-bit Windows 10, build 16299
- Capture application: Dumpcap (Wireshark) 2.4.5 (v2.4.5-0-g153e867ef1)

 The 'Display' section shows:

- Display filter: udp
- Ignored packets: 0 (0.000%)

 The 'Traffic' section provides a summary:

- Captured: 64240 packets, 495,969 bytes, 0.331 MB/sec
- Displayed: 9424 packets, 74,250 bytes, 0.126 MB/sec
- Displayed %: 14.670%

 The 'Packets' section shows:

- Between first and last packet: 129,524 sec
- Avg. packets/sec: 495,969
- Avg. packet size: 84 bytes
- Bytes: 5364520
- Avg. bytes/sec: 41417,089
- Avg. MB/s: 0.331

The image shows the Wireshark RTP Stream Analysis dialog box. It displays a table of RTP packets with the following columns: No., Sequence, Delta (ms), Filtered Jitter (ms), Skew (ms), IP BW (kbps), Marker, and Status. The table shows a sequence of packets from 1 to 39, with sequence numbers ranging from 62583 to 62590. All packets have a status of [Ok].

Summary statistics at the bottom of the dialog:

- Max delta = 25,61 ms at packet no. 698
- Max jitter = 1,21 ms. Mean jitter = 0,23 ms.
- Max skew = -5,91 ms.
- Total RTP packets = 4561 (expected 4561) Lost RTP packets = 0 (0,00%) Sequence errors = 0
- Duration 91,20 s (-1 ms clock drift, corresponding to 8000 Hz (-0,00%))

2. Lampiran capture client 2

The image shows two screenshots of the Wireshark network protocol analyzer. The top screenshot displays the 'Wireshark: Summary' dialog box, which provides details about the capture hardware, OS, and application. The bottom screenshot shows the 'Wireshark RTP Stream Analysis' dialog box, which provides a detailed analysis of the RTP stream, including a table of packet statistics and summary metrics.

Wireshark: Summary

Capture
 Capture HW: Intel(R) Core(TM) i5-5200U CPU @ 2.20GHz (with SS)
 OS: 64-bit Windows 10, build 16299
 Capture application: Dumpcap (Wireshark) 2.4.5 (v2.4.5-0-g153e87ef1)
 Capture file comments:

Interface
 Interface: Dropped Packets Capture Filter Link
 \Device\NPF_{88C5C8E0-FF29-4D2B-9E0F-C641A4383A58} 0 (0,000%) none Eth0

Display
 Display filter: udp
 Ignored packets: 0 (0,000%)

Traffic

Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	20314	6325	31,136%	0	0,000%
Between first and last packet	61,156 sec	60,972 sec			
Avg. packets/sec	332,169	103,736			
Avg. packet size	112 bytes	223 bytes			
Bytes	2284405	1412586	61,836%	0	0,000%
Avg. bytes/sec	37353,994	23167,756			
Avg. MB/s	0,299	0,185			

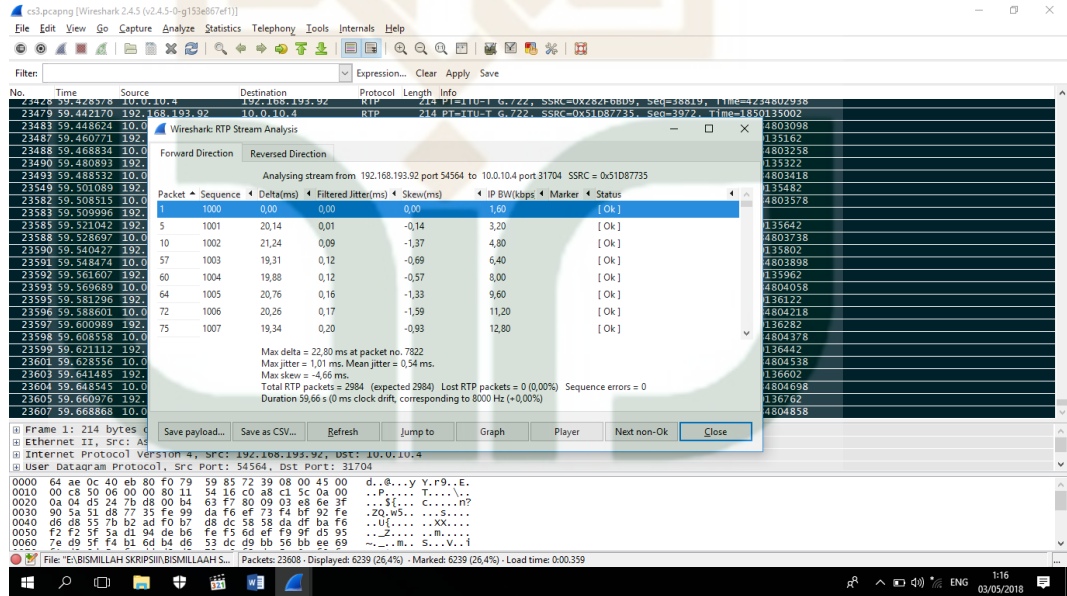
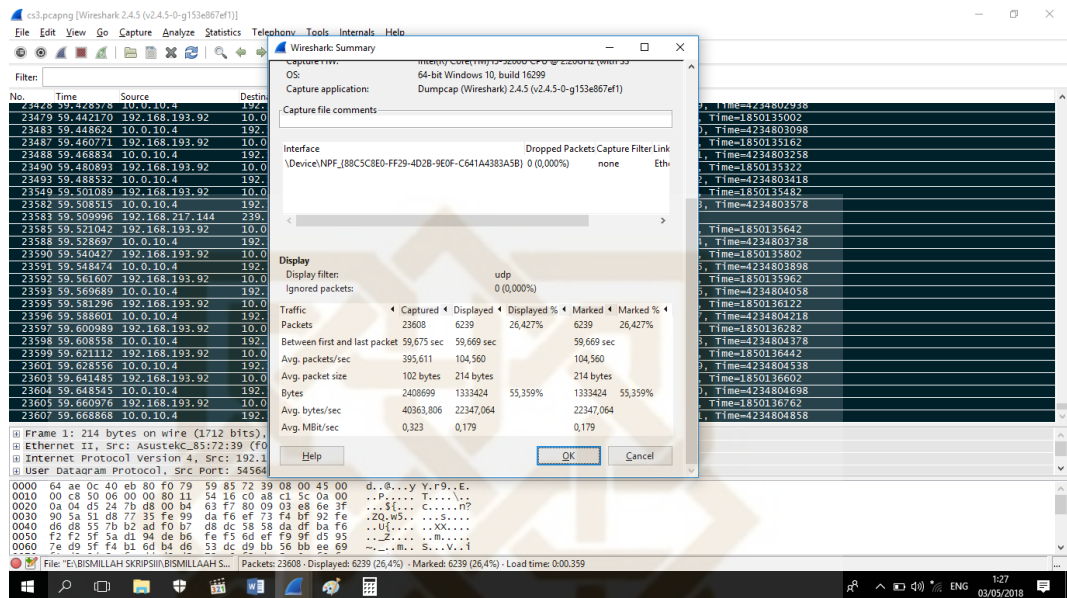
Wireshark RTP Stream Analysis

Analysing stream from 10.0.10.149 port 22772 to 192.168.193.92 port 56094 SSRC = 0x784305AF

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
1	25473	0,00	0,00	0,00	1,60		[Ok]
3	25474	19,76	0,02	0,24	3,20		[Ok]
6	25475	20,44	0,04	-0,20	4,80		[Ok]
9	25476	19,61	0,06	-0,37	6,40		[Ok]
12	25477	20,56	0,09	-0,19	8,00		[Ok]
14	25478	19,60	0,11	0,04	9,60		[Ok]
17	25479	20,22	0,12	-0,19	11,20		[Ok]
27	25480	20,55	0,15	-0,73	12,80		[Ok]

Max delta = 25,63 ms at packet no. 4965
 Max jitter = 1,03 ms. Mean jitter = 0,13 ms.
 Max skew = -5,22 ms.
 Total RTP packets = 2987 (expected 2987) Lost RTP packets = 0 (0,00%) Sequence errors = 0
 Duration 59,72 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))

3. Lampiran client 3



4. Lampiran client 4

cs4l2.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: **rtp** Expression

No.	Time	Source	Destination	Protocol
1	0.000000	192.168.193.92	10.0.10.59	RTP
2	0.001351	10.0.10.59	192.168.193.92	RTP
4	0.019227	192.168.193.92	10.0.10.59	RTP
5	0.021369	10.0.10.59	192.168.193.92	RTP
7	0.040301	192.168.193.92	10.0.10.59	RTP
8	0.041302	10.0.10.59	192.168.193.92	RTP
10	0.061107	192.168.193.92	10.0.10.59	RTP
11	0.061215	10.0.10.59	192.168.193.92	RTP
12	0.080266	192.168.193.92	10.0.10.59	RTP
13	0.081455	10.0.10.59	192.168.193.92	RTP
15	0.101235	192.168.193.92	10.0.10.59	RTP
16	0.101404	10.0.10.59	192.168.193.92	RTP
30	0.121196	192.168.193.92	10.0.10.59	RTP
31	0.121297	10.0.10.59	192.168.193.92	RTP
117	0.140065	192.168.193.92	10.0.10.59	RTP
118	0.141420	10.0.10.59	192.168.193.92	RTP
121	0.160437	192.168.193.92	10.0.10.59	RTP
122	0.161321	10.0.10.59	192.168.193.92	RTP
153	0.180471	192.168.193.92	10.0.10.59	RTP
154	0.181836	10.0.10.59	192.168.193.92	RTP
192	0.200422	192.168.193.92	10.0.10.59	RTP
193	0.201431	10.0.10.59	192.168.193.92	RTP
196	0.220115	192.168.193.92	10.0.10.59	RTP
197	0.221333	10.0.10.59	192.168.193.92	RTP
245	0.240938	192.168.193.92	10.0.10.59	RTP
246	0.241301	10.0.10.59	192.168.193.92	RTP

Sequence number: 21838
Timestamp: 3162248273
Synchronization Source identifier: 0x6cc5961c (1824888348)
Payload: 989ff6d2e828f562edbe5eb5bf87dd9d7f8b9f64789cda...

0030 14 51 6c c5 96 1c b8 9f f6 d2 e8 28 f5 62 ed be 01 (b.....
0040 5e be 3d f8 7d d9 d7 f8 b9 f6 f4 78 9c da fe da 01 x.....
0050 fd 59 59 5a b8 b4 b5 f8 fd d9 d7 f8 b9 f6 f4 78 9c da fe da 01 YZ.....
0060 fc f3 7a bd 71 f7 da f3 dc 7e 9c d9 df f3 bd 7a 01 z.....
0070 5e be 3d f8 7d d9 d7 f8 b9 f6 f4 78 9c da fe da 01 z.....
0080 fd 59 59 5a b8 b4 b5 f8 fd d9 d7 f8 b9 f6 f4 78 9c da fe da 01 YZ.....
0090 88 bb 17 fa d7 f8 fb de d9 7f b8 75 70 f3 97 de 01 up.....

Payload (rtp.payload), 160 bytes Packets: 23775 - Displayed: 6099 (25.7%) - Marked: 6099 (25.7%) - Load time: 0:00:343

cs4l2.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: **rtp** Expression Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Info
23613	58.401391	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x6cc5961c, Seq=21828, Time=3162248673
23616	58.415913	192.168.193.92	10.0.10.59	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224826
23627	58.421113	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23628	58.440898	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23629	58.441002	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23630	58.459979	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23631	58.461170	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23634	58.480493	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23635	58.481544	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23639	58.500396	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23640	58.501327	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23642	58.520445	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23643	58.521394	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23644	58.540338	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23645	58.541346	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23647	58.550963	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23648	58.551822	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23656	58.561132	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=316224833
23684	58.580898	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=3162248113
23685	58.592678	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=3162248273
23691	58.600796	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=3162248273
23695	58.602283	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=3162248273
23736	58.813407	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=3162248273
23737	58.813408	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=3162248273
23738	58.813891	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=3162248273
23740	58.814893	10.0.10.59	192.168.193.92	RTP	214	PT=ITU-T G.722, SSRC=0x22001865, Seq=28009, Time=3162248273

Analysing stream from 10.0.10.59 port 25756 to 192.168.193.92 port 51896 SSRC = 0x6cc5961c

Packet #	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
2	18908	0.00	0.00	0.00	1.60		[Ok]
5	18909	20.02	0.00	-0.02	3.20		[Ok]
8	18910	19.93	0.01	0.05	4.80		[Ok]
11	18911	19.91	0.01	0.14	6.40		[Ok]
13	18912	20.24	0.02	-0.10	8.00		[Ok]
16	18913	19.95	0.03	-0.05	9.60		[Ok]
31	18914	19.89	0.03	0.05	11.20		[Ok]
118	18915	20.12	0.04	-0.07	12.80		[Ok]

Max delta = 27.73 ms at packet no. 3277
Max jitter = 1.38 ms. Mean jitter = 0.35 ms.
Max skew = -7.82 ms.
Total RTP packets = 2931 (expected 2931) Lost RTP packets = 0 (0.00%) Sequence errors = 0
Duration 58.80 s (0 ms clock drift, corresponding to 8000 Hz (+0.00%))

Save payload... Save as CSV... Refresh Jump to Graph Player Next non-Ok Close

File: "E:\BISMILLAH SKRIPSI\BISMILLAAH S..." Packets: 23775 - Displayed: 6099 (25.7%) - Marked: 6099 (25.7%) - Load time: 0:00:343

5. lampiran client 5

Wireshark Summary

Capture application: Dumpcap (Wireshark) 2.4.5 (v2.45-0-g153e867ef1)

Capture file comments:

Interface: \Device\NPF_{88C5C8E0-FF29-402B-9E0F-C641A4383A5B} 0 (0,000%) Dropped Packets: none Filter Link type: Ethernet

Display Filter: udp

Ignored packets: 0 (0,000%)

Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	17423	6116	35,103%	6116	35,103%
Between first and last packet	59,548 sec	59,547 sec		59,547 sec	
Avg. packets/sec	292,589	102,710		102,710	
Avg. packet size	115 bytes	214 bytes		214 bytes	
Bytes	2011623	1311548	65,198%	1311548	65,198%
Avg. bytes/sec	33781,708	22025,500		22025,500	
Avg. MBit/sec	0,270	0,176		0,176	

File: "E:\BISMILLAH SKRIPSI\BISMILLAAH S..." Packets: 17423 - Displayed: 6116 (35,1%) - Marked: 6116 (35,1%) - Load time: 0:00:511

Wireshark RTP Stream Analysis

Analyzing stream from 10.0.10.6 port 20186 to 192.168.193.92 port 60388 SSRC = 0x3A320E7D

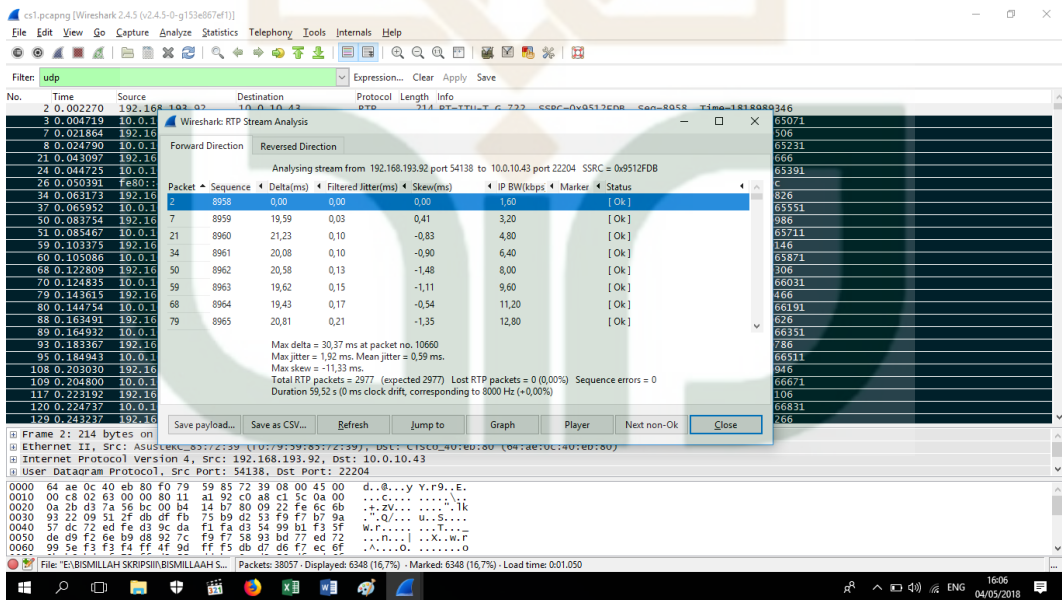
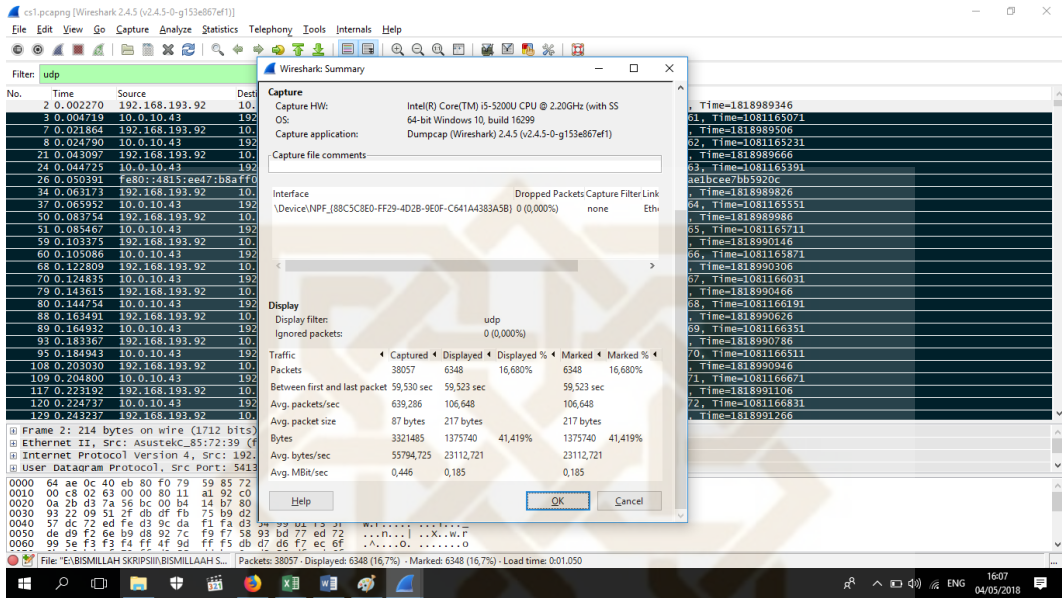
Packet	Sequence	Delta (ms)	Filtered Jitter (ms)	Skew (ms)	IP BW (kbps)	Marker	Status
17	28652	20,06	0,00	-0,06	3,20	[Ok]	
21	28653	19,95	0,01	-0,01	4,80	[Ok]	
38	28654	20,03	0,01	-0,05	6,40	[Ok]	
40	28655	20,10	0,01	-0,14	8,00	[Ok]	
47	28656	19,81	0,02	0,04	9,60	[Ok]	
52	28657	20,10	0,03	-0,05	11,20	[Ok]	
55	28658	19,92	0,03	0,03	12,80	[Ok]	

Max delta = 22,28 ms at packet no. 16553
 Max jitter = 0,61 ms. Mean jitter = 0,19 ms.
 Max skew = -2,22 ms.
 Total RTP packets = 2968 (expected 2968) Lost RTP packets = 0 (0,00%) Sequence errors = 0
 Duration 59,34 s (0 ms clock drift, corresponding to 8000 Hz (+/-0,00%))

File: "E:\BISMILLAH SKRIPSI\BISMILLAAH S..." Packets: 17423 - Displayed: 6116 (35,1%) - Marked: 6116 (35,1%) - Load time: 0:00:511

Lampiran Hari-2

1. Lampiran client 1



2. Laporan client 2

Wireshark: RTP Stream Analysis

Analysing stream from 10.0.10.149 port 24172 to 192.168.193.92 port 53942 SSRC = 0xb86ff9e5

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
5	28726	0,00	0,00	0,00	1,60		[Ok]
9	28727	19,93	0,00	0,07	3,20		[Ok]
11	28728	20,25	0,02	-0,18	4,80		[Ok]
13	28729	19,77	0,03	0,05	6,40		[Ok]
16	28730	20,06	0,03	-0,01	8,00		[Ok]
19	28731	20,00	0,03	-0,01	9,60		[Ok]
23	28732	20,12	0,04	-0,13	11,20		[Ok]
25	28733	20,10	0,04	-0,23	12,80		[Ok]

Max delta = 21,89 ms at packet no. 16261
 Max jitter = 0,45 ms. Mean jitter = 0,13 ms.
 Max skew = -2,90 ms.
 Total RTP packets = 2943 (expected 2943) Lost RTP packets = 0 (0,00%) Sequence errors = 0
 Duration 58,84 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))

Wireshark: Summary

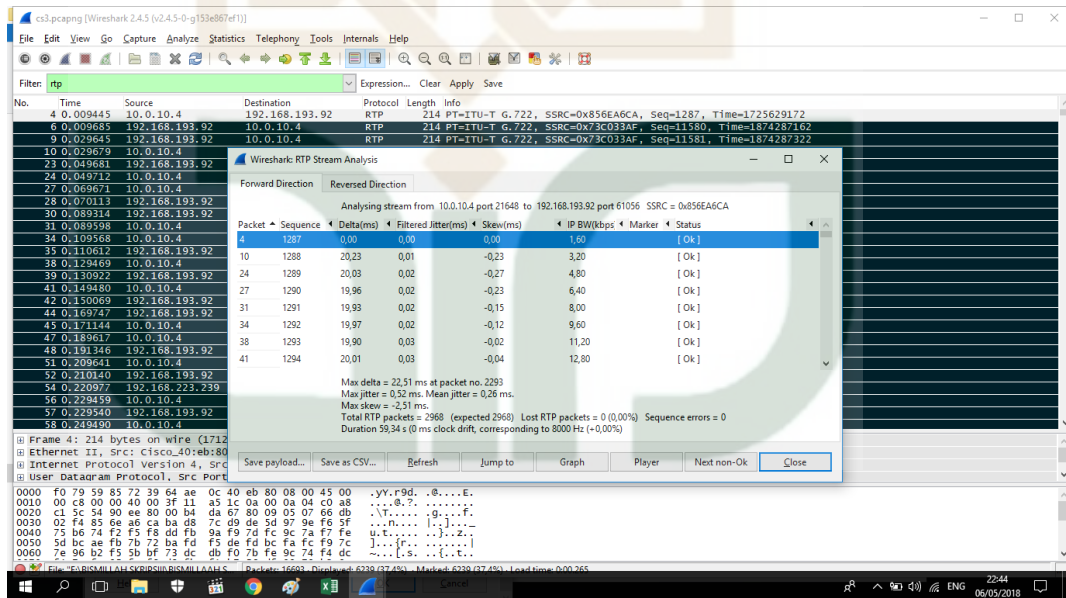
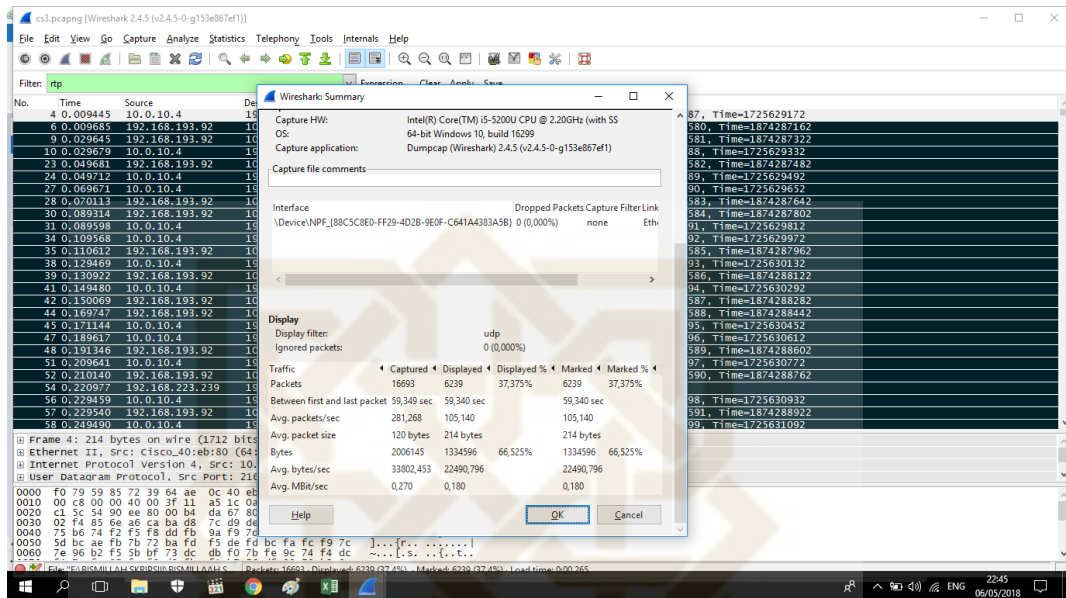
OS: 64-bit Windows 10, build 16299
 Capture application: Dumpcap (Wireshark) 2.4.5 (v2.4.5-0-g153e87ef1)
 Capture file comments:

Interface: Dropped Packets Capture Filter Link
 \Device\NPF_{88C3C8E0-FF29-4D2B-9E0F-C641A4383A58} (0,000%) none Eth

Display filter: udp
 Ignored packets: 0 (0,000%)

Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	31873	6397	20,070%	6397	20,070%
Between first and last packet	59,581 sec	58,920 sec			
Avg. packets/sec	534,951	108,570		108,570	
Avg. packet size	191 bytes	210 bytes		210 bytes	
Bytes	6075995	1340968	22,070%	1340968	22,070%
Avg. bytes/sec	101978,399	22759,036		22759,036	
Avg. MB/s	0,816	0,182		0,182	

3. Lampiran client 3



4. Lampiran client4

Wireshark Summary

Interface: \Device\NPF_{8BC5C8E0-FF29-4D2B-9E0F-C641A4383A58} 0 (0,000%) none Eth

Display filter: udp
Ignored packets: 0 (0,000%)

Traffic: Captured 18758, Displayed 6179, Displayed % 32,941%, Marked 0, Marked % 0,000%

Packets: Between first and last packet 59,644 sec

Avg. packets/sec: 314,498, 103,597

Avg. packet size: 112 bytes, 213 bytes

Bytes: 2099172, 1318121, 62,702%, 0, 0,000%

Avg. bytes/sec: 35194,831, 22099,688

Avg. MBit/sec: 0,282, 0,177

Frame 1: 214 bytes on wire (1712 bits), 214 bytes captured (1712 bits) on interface eth0

Ethernet II, Src: Cisco40:eb:80 (64:ae:0c:00:00:00), Dst: 192.168.193.92

Internet Protocol Version 4, Src: 10.0.10.59, Dst: 192.168.193.92

User Datagram Protocol, Src Port: 30308, Dst Port: 54158

RTP, PT=ITU-T G.722, SSRC=0x2E9BDADF, Seq=24697, Time=4115665139

Wireshark: RTP Stream Analysis

Analysing stream from 10.0.10.59 port 30308 to 192.168.193.92 port 54158 SSRC = 0x2E9BDADF

Packet	Sequence	Delta (ms)	Filtered Jitter (ms)	Skew (ms)	IP BW (kbps)	Marker	Status
1	24697	0,00	0,00	1,60	1,60	[OK]	
8	24698	19,91	0,01	0,09	3,20	[OK]	
14	24699	19,98	0,01	0,11	4,80	[OK]	
21	24700	22,65	0,18	-2,74	6,40	[OK]	
27	24701	17,39	0,34	-0,13	8,00	[OK]	
37	24702	19,88	0,32	-0,01	9,60	[OK]	
45	24703	20,33	0,32	-0,34	11,20	[OK]	
53	24704	19,71	0,32	-0,05	12,80	[OK]	

Max delta = 23,46 ms at packet no. 6018
Max jitter = 0,74 ms. Mean jitter = 0,18 ms.
Max skew = -3,31 ms.

Total RTP packets = 2903 (expected 2903) Lost RTP packets = 0 (0,00%) Sequence errors = 0
Duration 59,64 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))

5. Lampiran client 5

cs5l3.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

Filter: rtp

Display filter: udp

Ignored packets: 0 (0.000%)

Traffic

Packet	Captured	Displayed	Displayed %	Marked	Marked %
Packets	21205	6278	29.606%	6278	29.606%
Between first and last packet	59,277 sec	59,269 sec		59,269 sec	
Avg. packets/sec	357,726	105,923		105,923	
Avg. packet size	106 bytes	212 bytes		212 bytes	
Bytes	2250344	1327922	59,010%	1327922	59,010%
Avg. bytes/sec	37963,096	22404,883		22404,883	
Avg. MB/s	0,304	0,179		0,179	

Interface: Device\NPF_{88C5C8E0-FF29-4D2B-9E0F-C641A4383A58} (0.000%)

Dropped Packets: none

Display Filter: none

Link: Eth

Help OK Cancel

cs5l3.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

Filter: rtp

Display filter: udp

Ignored packets: 0 (0.000%)

Traffic

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
2	35841	0.00	0.00	0.00	1.60	[OK]	
4	35842	19.96	0.00	0.04	3.20	[OK]	
7	35843	20.34	0.02	-0.30	4.80	[OK]	
71	35844	18.64	0.04	0.06	6.40	[OK]	
97	35845	20.31	0.06	-0.25	8.00	[OK]	
157	35846	19.68	0.08	0.00	9.60	[OK]	
161	35847	19.93	0.08	0.14	11.20	[OK]	
169	35848	20.03	0.07	0.11	12.80	[OK]	

Analysing stream from 10.0.10.6 port 30088 to 192.168.193.92 port 59250 SSRC = 0x9EE36AD9

Max delta = 23.75 ms at packet no. 19249

Max jitter = 1.19 ms. Mean jitter = 0.27 ms.

Max skew = 3.65 ms.

Total RTP packets = 2964 (expected 2964) Lost RTP packets = 0 (0.000%) Sequence errors = 0

Duration 59.26 s (0 ms clock drift, corresponding to 8000 Hz (+0.000%))

Save payload... Save as CSV... Refresh Jump to Graph Player Next non-Ok Close

Lampiran Hari-3

1. Lampiran client 1

The screenshot shows the Wireshark interface with a packet capture of RTP traffic. A summary window is open, displaying the following statistics:

Display	Captured	Displayed	Displayed %	Marked	Marked %
Packets	19900	6231	39,189%	6231	39,189%
Between first and last packet	59,315 sec	59,301 sec		59,301 sec	
Avg. packets/sec	298,090	105,075		105,075	
Avg. packet size	122 bytes	214 bytes		214 bytes	
Bytes	1942152	1334096	68,692%	1334096	68,692%
Avg. bytes/sec	32742,939	22497,151		22497,151	
Avg. MBit/sec	0,262	0,180		0,180	

The screenshot shows the Wireshark interface with an RTP Stream Analysis window open. The window displays a table of RTP packets with the following columns: Packet, Sequence, Delta, Filtered Jitter, Skew, IP BW, Marker, and Status.

Packet	Sequence	Delta	Filtered Jitter	Skew	IP BW	Marker	Status
3	41711	0,00	0,00	0,00	1,60		[Ok]
20	41712	20,00	0,00	-0,00	3,20		[Ok]
23	41713	20,00	0,00	-0,01	4,80		[Ok]
25	41714	20,02	0,00	-0,02	6,40		[Ok]
28	41715	20,11	0,01	-0,14	8,00		[Ok]
32	41716	19,88	0,02	-0,02	9,60		[Ok]
34	41717	20,06	0,02	-0,08	11,20		[Ok]
36	41718	20,19	0,03	-0,27	12,80		[Ok]

2. Lampiran client 2

cs2.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e87ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: rtp

Wireshark: Summary

Capture application: Dumpcap (Wireshark) 2.4.5 (v2.4.5-0-g153e87ef1)

Interface: \Device\NPF_{88C5C8E0-FF29-4D2B-9E0F-C641A4383A5B} 0 (0.000%) none Eth

Display Filter: udp

Traffic: Captured 19873, Displayed 6203, Marked 6203

Statistics:

Packets	19873	6203	31,213%	6203	31,213%
Between first and last packet	59,200 sec	59,200 sec			
Avg. packets/sec	335,684	104,781			
Avg. packet size	109 bytes	213 bytes			
Bytes	2171127	1321518	60,868%	1321518	60,868%
Avg. bytes/sec	36673,515	22323,022		22323,022	
Avg. MB/s	0,293	0,179			

Frame 1: 214 bytes on wire (171 bytes captured) on interface 0: Ethernet II, Src: Cisco_40:eb:80:00:00:00, Dst: AsustekC_85:72:39:00:00:00, Protocol: RTP, Src Port: 58286, Dst Port: 58286

cs2.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e87ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: rtp

Wireshark: RTP Stream Analysis

Analysing stream from 100.0.10.149 port 25026 to 192.168.193.92 port 58286 SSRC = 0x4E4B3B2C

Packet	Sequence	Delta (ms)	Filtered Jitter (ms)	Skew (ms)	IP BW (kbps)	Marker	Status
1	58080	0,00	0,00	1,60			[Ok]
3	58081	20,09	0,01	-0,09	3,20		[Ok]
7	58082	20,25	0,02	-0,34	4,80		[Ok]
9	58083	23,19	0,22	-3,53	6,40		[Ok]
14	58084	17,52	0,36	-1,04	8,00		[Ok]
34	58085	19,01	0,40	-0,06	9,60		[Ok]
37	58086	20,02	0,38	-0,08	11,20		[Ok]
40	58087	20,18	0,36	-0,26	12,80		[Ok]

Max delta = 26,21 ms at packet no. 3656
 Max jitter = 1,17 ms. Mean jitter = 0,26 ms.
 Max skew = -4,65 ms.
 Total RTP packets = 2961 (expected 2961) Lost RTP packets = 0 (0,00%) Sequence errors = 0
 Duration 59,20 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))

Frame 1: 214 bytes on wire (171 bytes captured) on interface 0: Ethernet II, Src: Cisco_40:eb:80:00:00:00, Dst: AsustekC_85:72:39:00:00:00, Protocol: RTP, Src Port: 58286, Dst Port: 58286

3. Lampiran client 3

The screenshot shows a Wireshark capture of RTP traffic. The main pane displays a list of packets with columns for No., Time, and Source. A 'Wireshark Summary' window is open, showing traffic statistics for the selected filter 'udp'. The summary includes:

- Interface: Device\NPF_{88C5C8E0-FF29-4D2B-9E0F-C641A438A5B}
- Dropped Packets: 0 (0,000%)
- Display filter: udp
- Traffic: 14453 packets captured, 6240 displayed (43,174%)
- Avg. packet size: 129 bytes
- Avg. bytes/sec: 31306,381
- Avg. MBH/sec: 0,250

The packet list shows a sequence of RTP packets from source 192.168.193.92 to destination 10.0.10.4. The selected packet (No. 1) is an RTP packet with sequence 16583, timestamp 0,00, and length 214 bytes.

The screenshot shows the same Wireshark capture with the 'RTP Stream Analysis' window open. This window provides a detailed view of the RTP stream, including a table of packets and their timing characteristics:

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
1	16583	0,00	0,00	0,00	1,60	[Ok]	
8	16584	19,31	0,04	0,69	3,20	[Ok]	
15	16585	20,26	0,06	0,43	4,80	[Ok]	
20	16586	20,12	0,06	0,31	6,40	[Ok]	
25	16587	19,46	0,09	0,85	8,00	[Ok]	
41	16588	21,78	0,20	-0,93	9,60	[Ok]	
49	16589	19,68	0,20	-0,61	11,20	[Ok]	
63	16590	20,45	0,22	-1,06	12,80	[Ok]	

Summary statistics at the bottom of the window:

- Max delta = 24,22 ms at packet no. 693
- Max jitter = 1,24 ms; Mean jitter = 0,59 ms
- Max skew = -4,79 ms
- Total RTP packets = 2976 (expected 2976) | Lost RTP packets = 0 (0,00%) | Sequence errors = 0
- Duration 59,50 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))

4. Lampiran client 4

cs4L12.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

Filter: rtp

Display

Display filter: udp

Ignored packets: 0 (0.000%)

Traffic

Captured: 15626

Displayed: 6276

Displayed %: 40.164%

Marked: 0

Marked %: 0.000%

Between first and last packet: 59,855 sec

Avg. packets/sec: 261.061

Avg. packet size: 123 bytes

Bytes: 1928687

Avg. bytes/sec: 32222.263

Avg. MB/s: 0.258

OK Cancel

cs4L12.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

Filter: rtp

Wireshark RTP Stream Analysis

Forward Direction Reversed Direction

Analysing stream from 10.0.10.59 port 18194 to 192.168.193.92 port 50480 SSRC = 0x04451AF

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
5	10095	0.00	0.00	1.60		[Ok]	
11	10096	20,31	0,02	-0,31	3,20	[Ok]	
18	10097	19,72	0,04	-0,03	4,80	[Ok]	
25	10098	19,98	0,03	-0,01	6,40	[Ok]	
33	10099	20,08	0,04	-0,08	8,00	[Ok]	
41	10100	19,95	0,04	-0,04	9,60	[Ok]	
43	10101	20,08	0,04	-0,12	11,20	[Ok]	
50	10102	19,94	0,04	-0,05	12,80	[Ok]	

Max delta = 23.85 ms at packet no. 15093
 Max jitter = 0.72 ms, Mean jitter = 0.16 ms
 Max skew = -3.69 ms
 Total RTP packets = 2993 (expected 2993) Lost RTP packets = 0 (0.00%) Sequence errors = 0
 Duration 59.84 s (0 ms clock drift, corresponding to 8000 Hz (+0.00%))

Save payload... Save as CSV... Refresh Jump to Graph Player Next non-Ok Close

5. Lampiran client 5

The screenshot shows the Wireshark interface with a packet capture filter set to 'rtp'. The main pane displays a list of captured packets, with packet 214 selected. A 'Wireshark Summary' dialog box is open, showing statistics for the selected packet:

- Display filter: udp
- Ignored packets: 0 (0,00%)
- Traffic: Captured 14297, Displayed 6332, Displayed % 44,289%, Marked 0, Marked % 0,000%
- Between first and last packet: 59,951 sec
- Avg. packets/sec: 238,480
- Avg. packet size: 130 bytes
- Bytes: 1856555
- Avg. bytes/sec: 30968,077
- Avg. Mbit/sec: 0,248

The packet list shows the following details for packet 214:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.00000	192.168.193.92	10.0.10.6	RTP	214	PT=ITU-T G.722, SSRC=0x779D00FF, Seq=19527, Time=1858258802

The screenshot shows the 'Wireshark: RTP Stream Analysis' dialog box. It provides a detailed analysis of the RTP stream from 192.168.193.92 to 10.0.10.6 port 27756. The analysis includes the following data:

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
1	19527	0,00	0,00	0,00	1,60	[Ok]	
4	19528	19,47	0,03	0,53	3,20	[Ok]	
8	19529	20,38	0,05	0,16	4,80	[Ok]	
11	19530	20,97	0,11	-0,81	6,40	[Ok]	
14	19531	20,07	0,11	-0,88	8,00	[Ok]	
16	19532	19,45	0,14	-0,33	9,60	[Ok]	
18	19533	20,18	0,14	-0,50	11,20	[Ok]	
22	19534	20,72	0,18	-1,23	12,80	[Ok]	

Summary statistics:

- Max delta = 28,32 ms at packet no. 10202
- Max jitter = 1,31 ms. Mean jitter = 0,51 ms.
- Max skew = -9,52 ms.
- Total RTP packets = 2988 (expected 2988) Lost RTP packets = 0 (0,00%) Sequence errors = 0
- Duration 59,74 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))

Lampiran Hari-4

1. Lampiran client 1

The image shows the Wireshark interface with a packet capture of RTP traffic. A 'Wireshark Summary' dialog box is open, displaying statistics for the selected RTP stream. The summary includes the following data:

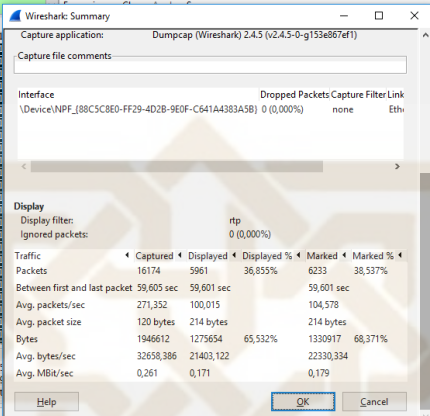
Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	29134	5993	20,570%	6465	22,191%
Between first and last packet	59,924 sec	59,920 sec			
Avg. packets/sec	486,179	100,016		107,893	
Avg. packet size	94 bytes	214 bytes		211 bytes	
Bytes	2747656	1282502	46,676%	1364374	48,656%
Avg. bytes/sec	45852,059	21403,459		22769,807	
Avg. MBit/sec	0,367	0,171		0,182	

The image shows the Wireshark interface with a packet capture of RTP traffic. A 'Wireshark RTP Stream Analysis' dialog box is open, displaying a detailed analysis of the RTP stream. The analysis includes the following data:

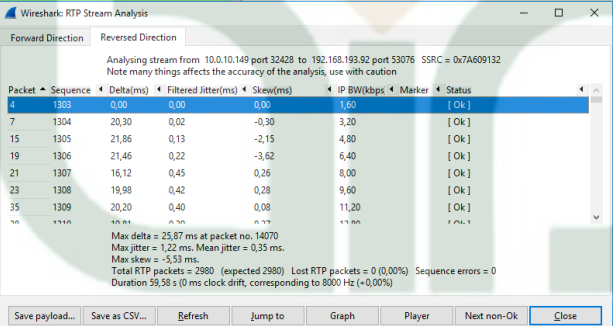
Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
8	6104	0,00	0,00	0,00	1,60	[Ok]	
9	6105	20,04	0,00	-0,04	3,20	[Ok]	
19	6106	20,01	0,00	-0,05	4,80	[Ok]	
27	6107	20,61	0,04	-0,66	6,40	[Ok]	
31	6108	19,51	0,07	-0,17	8,00	[Ok]	
41	6109	19,99	0,07	-0,16	9,60	[Ok]	
45	6110	19,84	0,07	-0,00	11,20	[Ok]	
50	6111	19,87	0,07	0,13	12,80	[Ok]	

Max delta = 22,33 ms at packet no. 322
Max jitter = 0,62 ms. Mean jitter = 0,15 ms.
Max skew = -2,29 ms.
Total RTP packets = 2997 (expected 2997). Lost RTP packets = 0 (0,00%) Sequence errors = 0
Duration 59,92 s (-0 ms clock drift, corresponding to 8000 Hz (-0,00%))

2. Lampiran client 2



The image shows the Wireshark Summary dialog box. The 'Capture application' is 'Dumpcap (Wireshark) 2.4.5 (v2.4.5-0-g153e867ef1)'. The 'Interface' is '\Device\NPF_{80C5C8E0-FF29-4D2B-9E0F-C641A4383A5B} (0,000%)'. The 'Display' section shows 'Display filter: http' and 'Ignored packets: 0 (0,000%)'. The 'Traffic' section shows 'Packets: 16174 (5961 displayed, 36,853% marked) / 59,605 sec (59,601 sec between first and last packet) / 104,578 packets/sec / 120 bytes avg. packet size / 1946612 bytes / 32658,386 avg. bytes/sec / 0,261 avg. MBit/sec'. The 'Dropped Packets' section shows 'Dropped Packets: 6233 (38,537% marked) / 1330917 bytes / 21403,122 avg. bytes/sec / 0,179 avg. MBit/sec'. The 'Help' button is visible at the bottom left, and 'OK' and 'Cancel' buttons are at the bottom right.



The image shows the Wireshark RTP Stream Analysis dialog box. The 'Forward Direction' tab is selected. The analysis is for stream from 10.0.10.149 port 32428 to 192.168.193.92 port 53076. The 'Packet' table shows the following data:

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
4	1303	0,00	0,00	0,00	1,60		[Ok]
7	1304	20,30	0,02	-0,30	3,20		[Ok]
15	1305	21,86	0,13	-2,15	4,80		[Ok]
19	1306	21,46	0,22	-3,62	6,40		[Ok]
21	1307	16,12	0,45	0,26	8,00		[Ok]
23	1308	19,98	0,42	0,28	9,60		[Ok]
35	1309	20,20	0,20	0,08	11,20		[Ok]

Summary statistics: Max delta = 25,87 ms at packet no. 14070; Max jitter = 1,22 ms; Mean jitter = 0,35 ms; Max skew = -5,53 ms; Total RTP packets = 2980 (expected 2980); Lost RTP packets = 0 (0,00%); Sequence errors = 0; Duration 59,58 (0 ms clock drift, corresponding to 8000 Hz (+0,00%)).

Buttons: Save payload..., Save as CSV..., Refresh, Jump to, Graph, Player, Next non-Ok, Close.

3. Lampiran client 3

cs3.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: http Expression... Clear Apply Save

No. Time Source Destination Protocol Length Info

2 0.005611 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2946, Time=1876082042

8 0.008324 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x83511847, Seq=25468, Time=1930902974

11 0.025637 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082202

16 0.028313 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082202

18 0.045788 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2946, Time=1876082042

23 0.048311 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2948, Time=1876082362

25 0.066383 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

30 0.068294 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

31 0.086312 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2950, Time=1876082682

36 0.088268 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

43 0.107232 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2951, Time=1876082842

46 0.108602 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

48 0.125670 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2952, Time=1876083002

49 0.128560 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

51 0.148655 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

54 0.165829 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2954, Time=1876083322

55 0.168401 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1930904254

56 0.186213 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2955, Time=1876083482

57 0.188590 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1930904114

58 0.206780 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2956, Time=1876083642

59 0.208483 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1930904574

62 0.226868 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2957, Time=1876083802

63 0.228547 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1930904734

64 0.246170 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2958, Time=1876083962

0000 64 ae 0c 40 eb 80 f7 79 59 85 72 39 08 00 45 00 d:8...y.Y.F9...E.

0010 00 c8 04 00 00 11 95 08 c0 a8 c1 5c da 00D.....\..

0020 da 04 fc 50 4e 44 00 b4 8d f6 80 09 0b 82 6f d2 ...PND.....0.

0030 bd 7a 15 c5 49 5f b2 74 bb ff b4 fc bf fa f8 6d ...Z...t.....m

0040 fe da bb fd db d9 db fd 77 9f bb fe fe b3 f6W.....

0050 5e fa de f8 ec b9 fe fb fc f4 9a 5b ae fd d9 93J.....U.....

0060 da f9 7e d4 5d f0 ac df 92 55 db df 60 d1 f8 f1J.....U.....

0070 fb 93 5c fc bb d4 91 d9 b6 78 fc fc 74 f1 f5 beX...t.....

0080 dd f3 fa f4 f8 b9 73 b3 f7 f4 f5 f4 b1 f7 fc 73S.....S.....S

0090 ba f2 b8 fd fe fb fc 79 dc db f2 9d dd de de fey.....S.....

File: E:\BISMILLAH SKRIPSI\BISMILLAAH S... Packets: 17425 - Displayed: 6386 (36.6%) - Marked: 6386 (36.6%) - Load time: 0:00:249

cs3.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: http Expression... Clear Apply Save

No. Time Source Destination Protocol Length Info

2 0.005611 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2946, Time=1876082042

8 0.008324 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x83511847, Seq=25468, Time=1930902974

11 0.025637 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082202

16 0.028313 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082202

18 0.045788 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2946, Time=1876082042

23 0.048311 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2948, Time=1876082362

25 0.066383 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

30 0.068294 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

31 0.086312 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2950, Time=1876082682

36 0.088268 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

43 0.107232 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2951, Time=1876082842

46 0.108602 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

48 0.125670 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2952, Time=1876083002

49 0.128560 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

51 0.148655 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1876082322

54 0.165829 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2954, Time=1876083322

55 0.168401 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1930904254

56 0.186213 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2955, Time=1876083482

57 0.188590 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1930904114

58 0.206780 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2956, Time=1876083642

59 0.208483 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1930904574

62 0.226868 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2957, Time=1876083802

63 0.228547 10.0.10.4 192.168.193.92 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2947, Time=1930904734

64 0.246170 192.168.193.92 10.0.10.4 RTP 214 PT=ITU-T G.722, SSRC=0x15C5495F, Seq=2958, Time=1876083962

0000 64 ae 0c 40 eb 80 f7 79 59 85 72 39 08 00 45 00 d:8...y.Y.F9...E.

0010 00 c8 04 00 00 11 95 08 c0 a8 c1 5c da 00D.....\..

0020 da 04 fc 50 4e 44 00 b4 8d f6 80 09 0b 82 6f d2 ...PND.....0.

0030 bd 7a 15 c5 49 5f b2 74 bb ff b4 fc bf fa f8 6d ...Z...t.....m

0040 fe da bb fd db d9 db fd 77 9f bb fe fe b3 f6W.....

0050 5e fa de f8 ec b9 fe fb fc f4 9a 5b ae fd d9 93J.....U.....

0060 da f9 7e d4 5d f0 ac df 92 55 db df 60 d1 f8 f1J.....U.....

0070 fb 93 5c fc bb d4 91 d9 b6 78 fc fc 74 f1 f5 beX...t.....

0080 dd f3 fa f4 f8 b9 73 b3 f7 f4 f5 f4 b1 f7 fc 73S.....S.....S

0090 ba f2 b8 fd fe fb fc 79 dc db f2 9d dd de de fey.....S.....

File: E:\BISMILLAH SKRIPSI\BISMILLAAH S... Packets: 17425 - Displayed: 6386 (36.6%) - Marked: 6386 (36.6%) - Load time: 0:00:249

4. Lampiran client 4

The screenshot shows the Wireshark interface with a packet capture summary window open. The summary window displays the following information:

- Name:** \data penelitian\hari 4\C4\cs4L12.pcapng
- Length:** 2841074 bytes
- Format:** Wireshark/... - pcapng
- Encapsulation:** Ethernet
- Time:**
 - First packet: 2018-04-25 15:56:15
 - Last packet: 2018-04-25 15:57:15
 - Elapsed: 00:00:59

The main packet list shows a filter set to 'rtp'. The selected packet (No. 1) is an RTP packet from 192.168.193.92 to 10.0.10.59. A 'Wireshark Summary' dialog box is open, showing traffic statistics for the selected packet:

Traffic	Captured	Displayed	Displayed %	Marked	Marked %
Packets	19116	6360	33,271%	6360	33,271%
Between first and last packet	59,541 sec	59,541 sec			
Avg. packets/sec	321,057	106,817			
Avg. packet size	116 bytes	214 bytes			
Bytes	2214692	1359445	61,383%	1359445	61,383%
Avg. bytes/sec	37196,156	22832,127			
Avg. MB/sec	0,298	0,183			

The packet list shows the selected packet (No. 1) is an RTP packet from 192.168.193.92 to 10.0.10.59. The packet details pane shows the following information:

- Ethernet II, Src: AsustekC_85:72:39**
- Frame 1: 214 bytes on wire (1712 bits) captured (1712 bits) on interface 0**

The screenshot shows the Wireshark interface with a packet capture summary window open. The summary window displays the following information:

- Name:** \data penelitian\hari 4\C4\cs4L12.pcapng
- Length:** 2841074 bytes
- Format:** Wireshark/... - pcapng
- Encapsulation:** Ethernet
- Time:**
 - First packet: 2018-04-25 15:56:15
 - Last packet: 2018-04-25 15:57:15
 - Elapsed: 00:00:59

The main packet list shows a filter set to 'rtp'. The selected packet (No. 1) is an RTP packet from 192.168.193.92 to 10.0.10.59. A 'Wireshark RTP Stream Analysis' dialog box is open, showing the following information:

- Analyzing stream from 10.0.10.59 port 32400 to 192.168.193.92 port 60846 SSRC = 0x0E35349E**
- Note many things affects the accuracy of the analysis, use with caution**
- Forward Direction**
 - Packet
 - Sequence
 - Delta(ms)
 - Filtered Jitter(ms)
 - Skew(ms)
 - IP BW(kbps)
 - Marker
 - Status
- Reversed Direction**
- Man delta = 26,63 ms at packet no. 11931**
- Man jitter = 1,04 ms. Mean jitter = 0,23 ms.**
- Max skew = -7,30 ms.**
- Total RTP packets = 2977 (expected 2977) Lost RTP packets = 0 (0,00%) Sequence errors = 0**
- Duration 59,52 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))**

The packet list shows the selected packet (No. 1) is an RTP packet from 192.168.193.92 to 10.0.10.59. The packet details pane shows the following information:

- Frame 1: 214 bytes on wire (1712 bits), 214 bytes captured (1712 bits) on interface 0**
- Ethernet II, Src: AsustekC_85:72:39 (F0:79:59:85:72:39), Dst: Cisco_40:eb:80 (64:ae:0c:40:eb:80)**

5. Lampiran client 5

The screenshot shows the Wireshark interface with a packet capture summary window open. The main window displays a list of captured packets, filtered by 'RTP'. The summary window shows the following statistics:

Display	Captured	Displayed	Displayed %	Marked	Marked %
Packets	15702	6250	39,804%	6250	39,804%
Between first and last packet	59,827 sec	59,821 sec		59,821 sec	
Avg. packets/sec	262,456	104,478		104,478	
Avg. packet size	124 bytes	215 bytes		215 bytes	
Bytes	1954539	1343968	68,761%	1343968	68,761%
Avg. bytes/sec	32669,711	22466,492		22466,492	
Avg. MBits/sec	0,261	0,180		0,180	

The screenshot shows the Wireshark interface with the RTP Stream Analysis window open. The window displays the following statistics:

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
1	12463	0,00	0,00	0,00	1,60		[Ok]
7	12464	20,32	0,02	-0,32	3,20		[Ok]
10	12465	20,34	0,04	-0,65	4,80		[Ok]
14	12466	19,35	0,08	-0,00	6,40		[Ok]
16	12467	21,04	0,14	-1,04	8,00		[Ok]
20	12468	20,29	0,15	-1,32	9,60		[Ok]
22	12469	20,09	0,14	-1,41	11,20		[Ok]
53	12470	19,71	0,15	-1,13	12,80		[Ok]

Summary statistics:

- Max delta = 23,19 ms at packet no. 9045
- Max jitter = 1,01 ms. Mean jitter = 0,48 ms.
- Max skew = 4,56 ms.
- Total RTP packets = 2992 (expected 2992) Lost RTP packets = 0 (0,00%) Sequence errors = 0
- Duration 59,82 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))

Lampiran Hari-5

1. Lampiran client 1

The screenshot shows the Wireshark 2.4.5 interface with a packet capture summary window open. The summary window displays the following information:

- Capture HW:** Intel(R) Core(TM) i5-5200U CPU @ 2.20GHz (with SS)
- OS:** 64-bit Windows 10, build 16299
- Capture application:** Dumpcap (Wireshark) 2.4.5 (v2.4.5-0-g153e67ef1)
- Interface:** \Device\NPF{188C58E0-FF29-4D2B-9E0F-C641A4383A5E} 0 (0,000%)
- Display:** Display filter: rtp; Ignored packets: 0 (0,000%)
- Traffic:** Captured: 20288 (29,303%); Displayed: 5945 (31,033%); Marked: 6296 (31,07%)
- Between first and last packet:** 59,446 sec
- Avg. packets/sec:** 341,283
- Avg. packet size:** 108 bytes
- Bytes:** 2192406
- Avg. bytes/sec:** 36880,435
- Avg. MBit/sec:** 0,295

The main packet list shows a sequence of RTP packets from source 192.168.193.92 to destination 10.0.10.43. The selected packet (No. 1) is an RTP packet with a sequence number of 18506.

The screenshot shows the Wireshark 2.4.5 interface with an RTP Stream Analysis window open. The window displays the following information:

- Analysing stream from:** 192.168.193.92 port 51574 to 10.0.10.43 port 32162
- Packet * Sequence * Delta (ms) * Filtered Jitter (ms) * Skew (ms) * IP BW (kbps) * Marker * Status:**

Packet	Sequence	Delta (ms)	Filtered Jitter (ms)	Skew (ms)	IP BW (kbps)	Marker	Status
1	18506	0,00	0,00	1,50		[Ok]	
4	18507	19,70	0,02	0,30	3,20	[Ok]	
6	18508	20,05	0,02	0,25	4,80	[Ok]	
12	18509	19,56	0,05	0,69	6,40	[Ok]	
17	18510	20,60	0,08	0,09	8,00	[Ok]	
20	18511	20,20	0,09	-0,10	9,60	[Ok]	
25	18512	20,47	0,11	-0,57	11,20	[Ok]	
28	18513	21,45	0,20	-2,03	12,80	[Ok]	

- Max delta = 23,64 ms at packet no. 4349**
- Max jitter = 0,96 ms. Mean jitter = 0,51 ms.**
- Max skew = -4,78 ms.**
- Total RTP packets = 2973 (expected 2973). Lost RTP packets = 0 (0,00%). Sequence errors = 0**
- Duration 59,44 s (0 ms clock drift, corresponding to 8000 Hz (+0,03%))**

The main packet list shows a sequence of RTP packets from source 192.168.193.92 to destination 10.0.10.43. The selected packet (No. 1) is an RTP packet with a sequence number of 18506.

2. Lampiran client 2

The image shows the Wireshark interface with a packet capture summary window open. The main window displays a list of captured packets, with the selected packet (No. 2) being an RTP packet. The summary window provides the following details:

- Interface:** Dropped Packets Capture Filter Link
- Display:** Display filter: rtp; Ignored packets: 0 (0,000%)
- Traffic:** Captured: 10148, Displayed: 5956, Displayed %: 32,819%, Marked: 6452, Marked %: 35,552%
- Statistics:** Between first and last packet: 59,560 sec, 59,541 sec, 59,541 sec; Avg. packets/sec: 304,703, 100,032, 108,362; Avg. packet size: 116 bytes, 214 bytes, 210 bytes; Bytes: 2102102, 1274584, 60,634%; Avg. bytes/sec: 35294,084, 21406,749, 22737,592; Avg. MB/s: 0,282, 0,171, 0,182

The packet list shows the following details for the selected packet (No. 2):

- Time: 0.016085
- Source: 10.0.10.149
- Destination: 192.168.193.92
- Protocol: User Datagram Protocol, Src Port: 31490, Dst Port: 54274

The image shows the Wireshark interface with an RTP Stream Analysis window open. The main window displays a list of captured packets, with the selected packet (No. 2) being an RTP packet. The RTP Stream Analysis window provides the following details:

- Forward Direction:** Analysing stream from 10.0.10.149 port 31490 to 192.168.193.92 port 54274. SSRC = 0x04F534F
- Reversed Direction:** (Empty)
- Statistics:** Max delta = 21,86 ms at packet no. 16552; Max jitter = 0,52 ms; Mean jitter = 0,17 ms; Max skew = -1,44 ms; Total RTP packets = 2078 (expected 2378); Lost RTP packets = 0 (0,000%); Sequence errors = 0; Duration 59,54 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))

The packet list shows the following details for the selected packet (No. 2):

- Time: 0.0160
- Source: 10.0.10.149
- Destination: 192.168.193.92
- Protocol: User Datagram Protocol, Src Port: 31490, Dst Port: 54274

3. Lampiran client 3

cs3.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: rtp

Wireshark Summary

Time
 First packet: 2018-04-25 15:48:53
 Last packet: 2018-04-25 15:49:53
 Elapsed: 00:00:59

Capture
 Capture HW: Intel(R) Core(TM) i5-5200U CPU @ 2.20GHz (with SS)
 OS: 64-bit Windows 10, build 16299
 Capture application: Dumpcap (Wireshark) 2.4.5 (v2.4.5-0-g153e867ef1)

Display
 Display filter: rtp
 Ignored packets: 0 (0.000%)

Traffic
 Captured: 20161
 Displayed: 5776 (28.649%)
 Marked: 0 (0.000%)

Between first and last packet: 59,416 sec, 57,741 sec
 Avg. packets/sec: 339,322, 100,032
 Avg. packet size: 109 bytes, 214 bytes
 Bytes: 2206942, 1236064, 56,008%, 0, 0.000%
 Avg. bytes/sec: 37144,206, 21406,870
 Avg. MB/s: 0,297, 0,171

Frame 2: 214 bytes on wire (1712 bits)
 Ethernet II, Src: cisco_40:eb:80:64:2a:2e, Dst: 02:00:0c:00:00:00
 Internet Protocol Version 4, Src: 10.0.10.4, Dst: 192.168.193.92
 User Datagram Protocol, Src Port: 29560, Dst Port: 55540

0000 f0 79 59 85 72 39 64 ae 0c 40 eb 08 00 45 00 ..y.r9d. .@....E.
 0010 00 c8 00 00 40 00 3f 11 a5 1c 0a 00 0a 04 c0 a8 ...@.?.
 0020 c1 5c 73 78 d8 f4 00 b4 e3 cd 80 09 94 e8 d9 94 ...SK.....
 0030 51 55 c9 c5 e1 06 fe f9 f6 dc bc d8 5c 9b 77 9d QU.....
 0040 fe 79 bc de d6 5d 5e 9b f4 bc 73 f0 f3 f5 f0 .y.].^..s....
 0050 be fb fa f1 7c f4 be 71 bb df b5 5c f5 5f f1d.....
 0060 dc bc f8 f7 75 b8 7b b9 92 75 f9 76 fc 5b bd 1du.].u.V[..
 0070 5f 9e fe dc 5f f8 5b f9 df bb 93 5b f5 76 db[...[.V..
 0080 f8 b5 f6 f1 fc bc fb df 77 b5 df f4 db f9 7c|.w.....|
 0090 f8 b9 ed 7b 9f f4 fe f4 74 b8 df 94 78 b1 74 fbT...X.T..
 File: "E:\BISMILLAH SKRIPSI\BISMILLAAH.S..." Packets: 20161 - Displayed: 5776 (28,6%) - Marked: 6226 (30,9%) - Load time: 0:00:249

cs3.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: rtp

Wireshark: RTP Stream Analysis

Analysing stream from 10.0.10.4 port 29560 to 192.168.193.92 port 55540 SSRC = 0xC95CE106

Packet	Sequence	Delta (ms)	Filtered Jitter (ms)	Skew (ms)	IP BW (kbps)	Marker	Status
2	38120	0,00	0,00	-1,60		[Ok]	
10	38121	20,17	0,01	-0,17	3,20	[Ok]	
14	38122	19,83	0,02	0,00	4,80	[Ok]	
17	38123	20,08	0,02	-0,08	6,40	[Ok]	
23	38124	19,94	0,03	-0,03	8,00	[Ok]	
26	38125	19,99	0,03	-0,01	9,60	[Ok]	
28	38126	20,04	0,03	-0,05	11,20	[Ok]	
32	38127	20,04	0,03	-0,09	12,80	[Ok]	

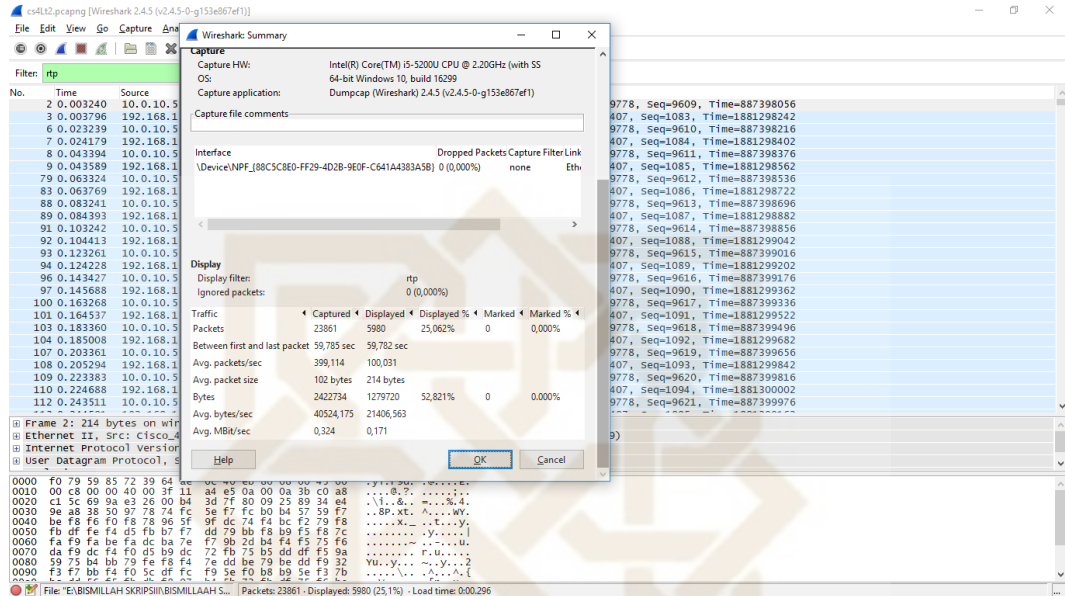
Max delta = 23,28 ms at packet no. 789
 Max jitter = 0,56 ms. Mean jitter = 0,15 ms.
 Max skew = -3,22 ms.
 Total RTP packets = 2888 (expected 2888) Lost RTP packets = 0 (0,00%) Sequence errors = 0
 Duration 57,74 s (0 ms clock drift, corresponding to 8000 Hz (+0,00%))

Save payload... Save as CSV... Refresh Jump to Graph Next non-Ok Close

Frame 2: 214 b
 Ethernet II, Src: cisco_40:eb:80:64:2a:2e, Dst: 02:00:0c:00:00:00
 Internet Protocol Version 4, Src: 10.0.10.4, Dst: 192.168.193.92
 User Datagram Protocol, Src Port: 29560, Dst Port: 55540

0000 f0 79 59 85 72 39 64 ae 0c 40 eb 08 00 45 00 ..y.r9d. .@....E.
 0010 00 c8 00 00 40 00 3f 11 a5 1c 0a 00 0a 04 c0 a8 ...@.?.
 0020 c1 5c 73 78 d8 f4 00 b4 e3 cd 80 09 94 e8 d9 94 ...SK.....
 0030 51 55 c9 c5 e1 06 fe f9 f6 dc bc d8 5c 9b 77 9d QU.....
 0040 fe 79 bc de d6 5d 5e 9b f4 bc 73 f0 f3 f5 f0 .y.].^..s....
 0050 be fb fa f1 7c f4 be 71 bb df b5 5c f5 5f f1d.....
 0060 dc bc f8 f7 75 b8 7b b9 92 75 f9 76 fc 5b bd 1du.].u.V[..
 0070 5f 9e fe dc 5f f8 5b f9 df bb 93 5b f5 76 db[...[.V..
 0080 f8 b5 f6 f1 fc bc fb df 77 b5 df f4 db f9 7c|.w.....|
 0090 f8 b9 ed 7b 9f f4 fe f4 74 b8 df 94 78 b1 74 fbT...X.T..
 File: "E:\BISMILLAH SKRIPSI\BISMILLAAH.S..." Packets: 20161 - Displayed: 5776 (28,6%) - Marked: 6226 (30,9%) - Load time: 0:00:249

4. Lampiran client 4



Wireshark: Summary

Capture

Capture HW: Intel(R) Core(TM) i5-5200U CPU @ 2.20GHz (with SS)
OS: 64-bit Windows 10, build 16299
Capture application: Dumpcap (Wireshark) 2.4.5 (v2.4.5-0-g153e867ef1)
Capture file comments:

Interface: \Device\NPF_{88C5C8E0-FF29-4D2B-9E0F-C641A4383A58} 0 (0,000%)
Dropped Packets: none
Capture Filter: none
Link: Eth

Display

Display filter: rtmp
Ignored packets: 0 (0,000%)

Traffic

Captured	Displayed	Displayed %	Marked	Marked %
23861	5980	25,062%	0	0,000%

Between first and last packet: 59,785 sec / 59,782 sec

Avg. packets/sec: 399,114 / 100,031

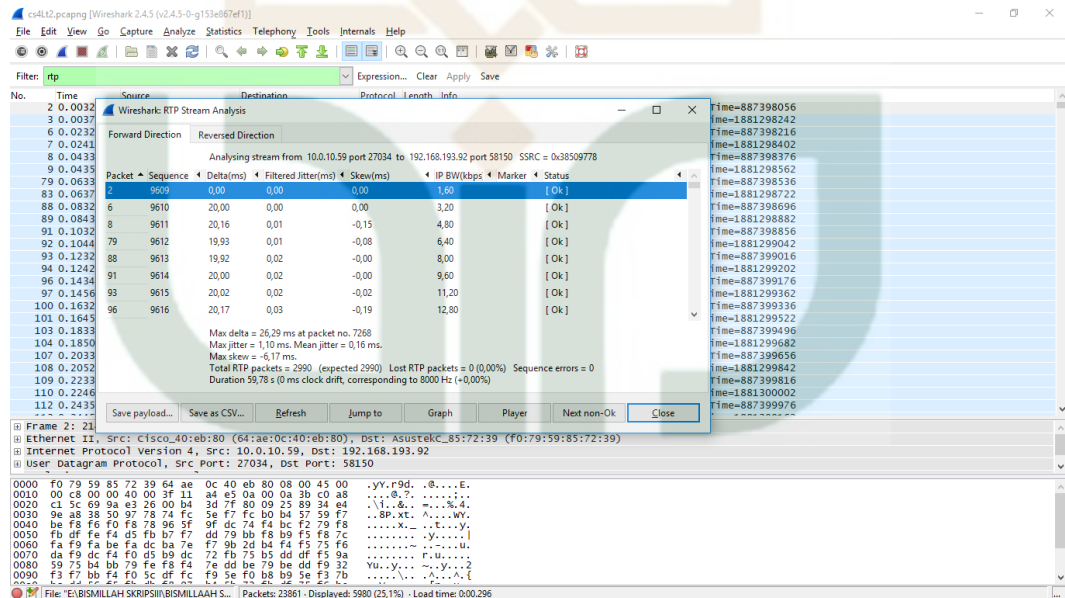
Avg. packet size: 102 bytes / 214 bytes

Bytes: 2422734 / 1279720 / 52,821% / 0 / 0,000%

Avg. bytes/sec: 40524,175 / 21406,563

Avg. MB/s: 0,324 / 0,171

Help OK Cancel



Wireshark RTP Stream Analysis

Forward Direction Reversed Direction

Analysing stream from 10.0.10.59 port 27034 to 192.168.193.92 port 58150 SSRC = 0x38509778

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
2	9609	0,00	0,00	0,00	1,60	[Ok]	
6	9610	20,00	0,00	0,00	3,20	[Ok]	
8	9611	20,16	0,01	-0,15	4,80	[Ok]	
79	9612	19,93	0,01	-0,08	6,40	[Ok]	
88	9613	19,92	0,02	-0,08	8,00	[Ok]	
91	9614	20,00	0,02	-0,00	9,60	[Ok]	
93	9615	20,02	0,02	-0,02	11,20	[Ok]	
96	9616	20,17	0,03	-0,19	12,80	[Ok]	

Max delta = 26,29 ms at packet no. 7268
Max jitter = 1,10 ms. Mean jitter = 0,16 ms.
Max skew = -6,17 ms.

Total RTP packets = 2990 (expected 2990) Lost RTP packets = 0 (0,000%) Sequence errors = 0
Duration 59,78 s (0 ms clock drift, corresponding to 8000 Hz (+0,000%))

Save payload... Save as CSV... Refresh Jump to Graph Player Next non-Ok Close

5. Lampiran client 5

cs5l13.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: rtp

Wireshark: Summary

Capture HW: Intel(R) Core(TM) i5-5200U CPU @ 2.20GHz (with SS)
 OS: 64-bit Windows 10, build 16299
 Capture application: Dumpcap (Wireshark) 2.4.5 (v2.4.5-0-g153e867ef1)
 Capture file comments:

Interface: NPF_{88C5C8E0-FF29-4D2B-9E0F-C641A4383A58} 0 (0.000%) none Eth
 Dropped Packets Capture Filter Link

Display filter: rtp
 Ignored packets: 0 (0.000%)
 Traffic: Captured 15716 5946 37.834% 0 0.000%
 Packets: 15716 5946 37.834% 0 0.000%
 Between first and last packet: 59.453 sec 59.445 sec
 Avg. packets/sec: 264.342 100.026
 Avg. packet size: 123 bytes 214 bytes
 Bytes: 1937943 1272444 65.600% 0 0.000%
 Avg. bytes/sec: 32596.049 21405.518
 Avg. MB/s: 0.261 0.171

Frame 5: 214 bytes on wire (1712 bits)
 Ethernet II, Src: Cisco40:eb:80 (64:ae:0c:40:eb:80), Dst: 192.168.193.92 (08:00:27:27:27:27)
 Internet Protocol Version 4, Src: 10.0.10.6, Dst: 192.168.193.92
 User Datagram Protocol, Src Port: 31604, Dst Port: 61986

0000 f0 79 59 85 72 39 64 ae 0c 40 eb 80 08 00 45 00 .yy.r9d. .@...E.
 0010 00 c8 00 00 40 00 3f 11 a5 1a 0a 00 0a 06 c0 a8@.....
 0020 c1 5c 7b 74 f2 22 00 b4 aa c8 80 09 ad 0a 01 b0 ..{t.....
 0030 71 63 c2 c0 67 b4 f7 79 7e 9e d8 f5 bd fe f9 qc..g...Y...
 0040 54 3c 98 da b6 d9 72 d6 5f b4 9d b9 f3 59 76 5d }.....y.A.t.
 0050 7d da b9 f3 f7 f4 b8 75 f7 79 f2 5e de bb 74 f9 }.....y.A.t.
 0060 1e fe 78 be dc fd dc 5c dd dd fc da 97 fc d3 55 }.....U
 0070 b9 9c d8 54 fd ba d9 77 9d dd 1f 72 b7 f3 df fe }.....T...P.S..
 0080 fe 72 fe ee 73 da f5 f4 f0 fc fd 70 be 73 97 9c }.....T...P.S..
 0090 f7 95 df 7f d1 bf da df 5e d7 fd 52 da f5 1a }.....A...R...
 00a0

File: E:\BISMILLAH SKRIPSI\BISMILLAH S... Packets: 15716 - Displayed: 5946 (37.8%) - Load time: 0:00:218

cs5l13.pcapng [Wireshark 2.4.5 (v2.4.5-0-g153e867ef1)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: rtp

Wireshark: RTP Stream Analysis

Forward Direction Reversed Direction

Analyzing stream from 10.0.10.6 port 31604 to 192.168.193.92 port 61986 SSRC = 0xc2c067e7

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps)	Marker	Status
5	44298	0.00	0.00	0.00	1.60	[Ok]	44298, Time=28340579
6	44299	20.32	0.02	-0.32	3.20	[Ok]	16906, Time=1859986954
9	44300	19.61	0.04	0.07	4.80	[Ok]	44299, Time=28340739
12	44301	20.08	0.05	-0.01	6.40	[Ok]	16907, Time=1859987114
19	44302	19.92	0.05	0.07	8.00	[Ok]	44300, Time=28340899
21	44303	20.17	0.06	-0.11	9.60	[Ok]	16908, Time=1859987274
51	44304	19.95	0.06	-0.05	11.20	[Ok]	44301, Time=28341059
52	44305	19.93	0.06	0.01	12.80	[Ok]	16909, Time=1859987434
55							44302, Time=28341219
56							16910, Time=1859987594
59							44303, Time=28341379
60							16911, Time=1859987754
63							44304, Time=28341539
64							16912, Time=1859987914
66							44305, Time=28341699
67							16913, Time=1859988074
68							44306, Time=28341859
69							16914, Time=1859988234
70							44307, Time=28342019
71							16915, Time=1859988394
72							44308, Time=28342179
73							16916, Time=1859988554
74							44309, Time=28342339
75							16917, Time=1859988714
76							44310, Time=28342499

Max delta = 31.88 ms at packet no. 14346
 Max jitter = 1.69 ms. Mean jitter = 0.21 ms.
 Max skew = -11.45 ms.
 Total RTP packets = 2973 (expected 2973) Lost RTP packets = 0 (0.00%) Sequence errors = 0
 Duration 59.44 s (0 ms clock drift, corresponding to 8000 Hz (+0.00%))

Save payload... Save as CSV... Refresh Jump to Graph Player Next non-Ok Close

Frame 5: 214 bytes on wire (1712 bits), 214 bytes captured (1712 bits) on interface 0
 Ethernet II, Src: Cisco40:eb:80 (64:ae:0c:40:eb:80), Dst: AsustekC_85:72:39 (f0:79:59:85:72:39)
 Internet Protocol Version 4, Src: 10.0.10.6, Dst: 192.168.193.92
 User Datagram Protocol, Src Port: 31604, Dst Port: 61986

0000 f0 79 59 85 72 39 64 ae 0c 40 eb 80 08 00 45 00 .yy.r9d. .@...E.
 0010 00 c8 00 00 40 00 3f 11 a5 1a 0a 00 0a 06 c0 a8@.....
 0020 c1 5c 7b 74 f2 22 00 b4 aa c8 80 09 ad 0a 01 b0 ..{t.....
 0030 71 63 c2 c0 67 b4 f7 79 7e 9e d8 f5 bd fe f9 qc..g...Y...
 0040 54 3c 98 da b6 d9 72 d6 5f b4 9d b9 f3 59 76 5d }.....y.A.t.
 0050 7d da b9 f3 f7 f4 b8 75 f7 79 f2 5e de bb 74 f9 }.....y.A.t.
 0060 1e fe 78 be dc fd dc 5c dd dd fc da 97 fc d3 55 }.....U
 0070 b9 9c d8 54 fd ba d9 77 9d dd 1f 72 b7 f3 df fe }.....T...P.S..
 0080 fe 72 fe ee 73 da f5 f4 f0 fc fd 70 be 73 97 9c }.....T...P.S..
 0090 f7 95 df 7f d1 bf da df 5e d7 fd 52 da f5 1a }.....A...R...
 00a0

File: E:\BISMILLAH SKRIPSI\BISMILLAH S... Packets: 15716 - Displayed: 5946 (37.8%) - Load time: 0:00:218

Tabel Pengujian QoS

1. Tabel hasil pengujian Delay

PERHITUNGAN DEALAY					
HARI	CLIENT				
	CLIENT 1	CLIENT 2	CLIENT 3	CLIENT 4	CLIENT 5
H1	0.3	0.2	0.1	0.1	0.2
H2	0.1	0.1	0.2	0.2	0.2
H3	0.2	0.2	0.2	0.2	0.2
H4	0.1	0.2	0.2	0.2	0.2
H5	0.2	0.2	0.2	0.1	0.2
MEAN	0.18	0.18	0.18	0.16	0.2

2. Tabel hasil pengujian Jitter

PERHITUNGAN JITTER					
HARI	CLIENT				
	CLIENT 1	CLIENT 2	CLIENT 3	CLIENT 4	CLIENT 5
H1	0.23	0.13	0.54	0.35	0.19
H2	0.59	0.15	0.26	0.18	0.27
H3	0.3	0.26	0.59	0.16	0.51
H4	0.15	0.35	0.17	0.23	0.48
H5	0.51	0.17	0.15	0.16	0.21
MEAN	0.356	0.212	0.342	0.216	0.332

3. Tabel hasil pengujian Throughput

PERHITUNGAN THROUGHPUT					
HARI	CLIENT				
	CLIENT 1	CLIENT 2	CLIENT 3	CLIENT 4	CLIENT 5
H1	0.331	0.229	0.323	0.325	0.27
H2	0.446	0.816	0.27	0.282	0.304
H3	0.262	0.293	0.25	0.258	0.248
H4	0.367	0.261	0.274	0.298	0.261
H5	0.295	0.282	0.297	0.324	0.261
MEAN	0.3402	0.3762	0.2828	0.2974	0.2688

4. Tabel pengujian Packet Loss

PERHITUNGAN PACKET LOSS					
HARI	CLIENT				
	CLIENT 1	CLIENT 2	CLIENT 3	CLIENT 4	CLIENT 5
H1	0%	0%	0%	0%	0%
H2	0%	0%	0%	0%	0%
H3	0%	0%	0%	0%	0%
H4	0%	0%	0%	0%	0%
H5	0%	0%	0%	0%	0%
MEAN	0	0	0	0	0

CURRICULUM VITAE

A. Biodata Pribadi

Nama Lengkap : Mohamad Fahroni
Jenis Kelamin : Laki-Laki
Tempat, Tanggal Lahir : Grobogan, 14 November 1995
Alamat Asal : Sambongbangi RT 05 RW 10 Desa
Sambongbangi Kec.Kradenan
Kab.Grobogan
Email : MFahroni14@gmail.com
No. HP : 085770066111



B. Latar Belakang Pendidikan Formal

Jenjang	Nama Pendidikan	Tahun
SD	SDN 2 Sambongbangi	2001-2007
SMP	SMPN 3 Kradenan	2007-2010
SMK	SMK Terpadu Rohmatul Ummah, Kudus	2010-2013
S1	Universitas Islam Negeri Sunan Kalijaga, Yogyakarta	2013-2018