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Network Performance study on OpenStack Cloud Computing

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Master's Thesis Spring 2014

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18th June 2014

Abstract

Cloud computing is gaining increasing popularity because of its higher scalability, more flexibility and ease of availability of its services.

Cloud Computing enables service providers to build a large pool of resources to their customers so that users will have resources accessible on demand. To this end, cloud computing service providers use Virtualization, since it gives them the ability to effectively share resources among their users. OpenStack, a relatively new open source cloud computing platform, focuses on delivering network as a service (NaaS) using virtualization technology.

OpenStack promises massively scalable cloud infrastructures. Being new, it remains to be investigated on how it delivers those abilities, and what the exact workings of its internal details are. The aim of this project is to study the internal network performance of OpenStack based on Neutron implementation. Network performance parameters like throughput, packet loss and packet delay will be evaluated under TCP and UDP traffic using IPERF benchmarking tool.

This research work is partly inspired by the fact that HIOA's Faculty of Technology, Art and Design uses OpenStack for its own cloud based infrastructure.

The investigation about network flow pattern confirm that VMs on the same network communicate at layer 2 and those at different networks communicate at layer 3, irrespective of their compute node locations. The results from network performance experiments showed that OpenStack Neutron guarantees a performance with virtually no network bandwidth bottleneck. In addition, the results shows that the location of machines in terms of compute node and network address affect network performance. The results also showed that OpenStack Neutron is scalable.

Acknowledgement

First and foremost, I offer my sincerest gratitude to God for His love, Provision and wisdom throughout my life.

It is with great gratitude that I acknowledge the support of my advisors Tore Jonassen and Kyrre Begnum. Kyrre,this thesis would not have been possible without your help and guidance.

I would like to acknowledge the entire Network and system Administration staff: -Hårek Haugerud, Ismail Hassen, and Prof.Aeleen Frisch for giving me a diverse knowledge in network and system administration. I would also like to thank HIOA for providing me with necessary tools, devices and platform to undertake this project.

I am most grateful to my Mom, Mrs Mahari, and my sister, Mrs Almaz, who help me to bring my dreams true and taking care of my child.

My special thanks also goes to my brother, Mr. Michael, and my best friends, Selam and Isayas, for supporting me.

To my friends, Mr. Ephrem and Mr. Samuel,I say many thanks for supporting me in many ways throughout this project.

Last, but by no means least, I would like to thank my husband, Mr. Yohannes , my sweet baby , Abel, and my second unborn baby for their great patience.

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Chapter 1

Introduction

One of the greatest advancement in Information Technology in the recent decades is the innovation of Cloud computing. Cloud computing is a great design of technology ever made which provides services, applications and resources through a network [1].

Unlike traditional service provision, cloud computing gives the opportunity to use very large amount of resources on demand. Cloud computing has made services to be accessible via Internet regardless where they are located and types of hardware that are in use. The opportunity to provide unlimited resources and its cost effective nature made the demand for cloud computing services to increase tremendously. This has contributed for companies that provide cloud computing service such as Amazon, Google, Microsoft, Rackspace and Justcloud to generate more revenue [1].

Users of cloud computing are charged based on usage time, and amount of resources they get. For instance, a user can be billed based on the amount of time he/she uses the resource. Furthermore, consumers get high performance services as well as low cost services or resources instead of building their own highly costly infrastructure [1].

Thus, customers are more aware of the quality of services they get. Quality can be in terms of availability, scalability and efficiency. Qualities of services are difficult to predict where users use the same resources. Therefore, it is the job of system administrators to ensure resource allocation.

In this research, network quality (network performance) in cloud computing is the focus of investigation. Specifically, it will be investigating the network performance of OpenStack cloud computing.

In order to know the scalability and predictability of network performance of an OpenStack cloud computing, first, the network traffic characteristics will be studied. Then, the network performance will be investigated. The study will be conducted within an existing cloud infrastructure of HIOA.

Key words: Cloud computing, OpenStack and performance.

1.1 Motivations

Cloud computing is a technology that provides services and/or applications through internet. It gives the ability to get data and information from wherever the system is located at any moment. However there may be possible interruptions and severe failure of the system due to some technical problems. Therefore it should be kept in mind that there is high requirement of maintenance despite the advantages cloud services provide [2].

In this service, the quality of services in terms of latency, packet loss and speed are readily noticed by customers who are using the service, no matter how small or big services they are using. Moreover, in order to provide a good quality of service, a good capacity of network layer(Layer3) or data link layer(Layer2) performance is a necessity. Such demand from customers leads to the need for more study on network performances in general. Studying this also enables to have knowledge of predictability and scalability of network traffic.

The main functional technology behind cloud computing is *virtualization*. Virtualization is a technology where physical hardware components are made to be more easily manageable and utilizable. Furthermore, Virtualization is the method where it underlies an abstraction layer either between the hardware and operating system or between the operating system and applications [3].

Thus, usefulness of virtualization has been applied by most cloud providers due to its pliable and efficient use of resources among customers. A particular physical server hosts several virtual machines using virtualization techniques. For instance, Xen Virtualization is used by the most famous cloud provider Amozon EC2 [4]. The same physical processors and I/O interfaces are typically shared among several virtual machines. Therefore the computing process and connection performance is anticipated to be affected by virtualization[27].

A research on impact of virtualization on network performance [27] showed that there was strange value of packet delay variety between Amazon EC2 instances. They believe this packet delay variation is caused by large amount of queuing time differences at the driver domains of the virtualized machines. Furthermore, Throughput of TCP/UDP traffic was significantly fluctuating due to use of same processor among the virtual machine instances resulting in unstable network performance. They were also able to show medium sized virtual machines shares only 40-50% of the processor. Finally they concluded that processor sharing and virtualization causes network performance to be unstable among virtual machine servers.

Therefore, different software programs and techniques have been developed to address performance issues on virtualized cloud services.

This case study aims to help service providers to effectively manage virtual machines to meet their customers' needs better. It will also help system administrators to predict the performance of the system when the number of users increasing. Furthermore, applications that are running on the virtual machines would be managed effectively to reduce for unexpected performance influences and obtain the required performance.

While the need of high performance computing has been increasing tremendously, cloud providers are not still using the full advantage of the underlined high performance infrastructure they have, like network capacity. Though the network can support 1Gbps, users are unlikely to use even 100Mbps. This kind of inefficiency can happen due to the lack of efficient inspection of performance issues.

Therefore, a highly efficient HPC system requires a high-bandwidth, low-latency network to connect multiple nodes and clusters.

1.2 Problem statement

Cloud computing is a hot issue in this era and researchers come with brilliant ideas in this field. So far a lot of cloud computing operating system comes to exist for cloud platforms. Some of them are Openstack, EC2, OpenNebula, CloudStack etc...

Cloud computing provides several services. Those services are IaaS (Infrastructure as a Service), PaaS (Platform as a Service), DaaS (Data as a Service) and SaaS(Software as a Service).

As the demand of cloud computing is growing very fast, its performance has to be good enough to satisfy the need of its users weather it is private or public cloud. One of the most important concern of cloud computing is to achieve a better network performance because a system without good network performance is almost impossible to be regarded as a high performance clouding system.

This project will focus specially on OpenStack cloud computing that provides an infrastructure as a service.

The problem statements of this research are:-

1. *To identify the Network traffic flow in the Open-Stack platform.*

2. *To evaluate network performance in cloud computing based on Open stack.*

3. *To analyze the predictability and scalability of the existing OpenStack based on the network performance*.

It is believed that the study will lead to predict the behavior of network traffic on Open-stack and Users can know what network performance features they will get using open-stack cloud computing. The study will only be based on the local network performance with in Open-stack environment.

This paper is organized as follows: Literature and related works will be briefly discussed on chapter 2. Chapter 3 presents the approach and methodology used in this research. Chapter 4 gives the actual results obtained. Chapter 5 will analyze the obtained results. Conclusion will be represented on Chapter 7 precceded by the discussion section done in chapter 6.

Chapter 2

Background and Literature

2.1 Cloud computing

Cloud computing is atechnology where a distributed- computing resources are served by a network-based mechanism[1].

The advancement of cloud computing minimizes the job of system administrators when there is a need a very huge amount of resourced system with the ability of consolidation of resources for better management. The idea of cloud computing started to emerge in the early 1960 where there was only an idea of "computation may someday be organized as a public utility"[1]. Then in 2000 Amazon which was the first company to start the use cloud computing in its data centers using a small amount of its capacity.

Eucalyptus and OpenNebula are the first open source cloud computing OS in the early 2008. Since then many open source software have been created including OpenStack.

The growth of Open source Cloud computing is shown on the below table.

Name	Year	Description	Deployment
Eucalyptus	Early 2008	AWS API-compatible platform	AWS API-compatible platform
OpenNebula	Early 2008	RESERVOIR European Commission-funded project	private and hybrid clouds, and for the federation of clouds
CloudStack	In May 2010	Began at cloud.com	Public, private and hybrid cloud services
OpenStack	2010	By Rackspace and NASA	Public and private cloud platform

Table 2.1: Open Source Cloud Computing [1]

Cloud-computing systems continue to grow, both in number and scale. As

this goes on, studies are required so that how to make future cloud computing services successful might be determined more precisely. With the current state being that most existing cloud-computing offerings are either proprietary or depend on software that is not amenable to experimentation or instrumentation, the need for such a study is unwarranted [19].

Today, there are three famous types of services for the end consumers of cloud. These are IaaS (infrastructure as a service), PaaS (platform as a service), and SaaS (software as a service).

2.1.1 IaaS

Infrastructure as a Service (IaaS) model delivers users physical resources or virtual machines in terms of CPU, storage, load balancers or operating system. However, Some IaaS service providers provide disk image library and file-based storage. End users are charged on pay per use basis. Today most of cloud computing companies is able to deliver IaaS for end-users.

2.1.2 PaaS

In this type of service, cloud providers provide database or web servers for consumers and consumers has full control to software deployment and configurations.

2.1.3 SaaS

For few years ago, users were obliged to install their own platform. However today, due to cloud computing users are provided with application software such as web-based email or games which run under cloud provider's infrastructure and platforms. In such case users uses the resources effectively regardless constrains of IT implantations problems. Furthermore it minimizes users maintain and support cost. Customers are charged on pay per use basis monthly or yearly. The billing is adjustable when the users stop to use the cloud services.

Even though SaaS has many advantages, there is a security drawback. Unauthorized users may try to access others' information on remote servers.

2.2 OpenStack

OpenStack is an open source platform for cloud computing designed using python programming. It can also be defined as compute, networking and storage that provides a pool of services like CPU, memory and storage. It is made available to consumers as building box through applications.

It was first launched in 2010 by the cooperation of RAKSPACE and NASA.

Today they are called OpenStack foundation [5]. Since 2010, a numbers of releases has been released. The following table shows the progress of OpenStack and the different features added in each release.

Release Name	Release Date	Component names included	Status
Austin	21 October 2010	Nova, Swift	Deprecated
Bexar	3 February 2011	Nova, Glance, Swift	Deprecated.
Cactus	15 April 2011	Nova, Glance, swift	Deprecated
Diablo	22 September 2011	Nova, Glance, swift	EOL(End of life) no longer supported
Essex	5 April 2012	Nova, Glance, Swift, Horizon, Keystone	EOL
Folsom	27 September 2012	Nova, Glance, Swift, Horizon, Keystone, Quantum, cinder	EOL
Grizzly	4 April 2013	Nova, Glance, Swift, Horizon, Keystone, Quantum, Cinder	Security-supported
Havana	17 October 2013	Nova, Glance, Swift, Horizon, Keystone, Neutron, Cinder, Heat, Ceilometer	Current stable release, security-supported
Icehouse	Expected 17 April 2014	Under development	Under development

Table 2.2: OpenStack Releases [5][6]

2.2.1 OpenStack Architecture

OpenStack has been developing from time to time and it has been improving its architecture by separating its components/nodes according their use. Thus, the architecture of OpenStack is in a distributed fashion.

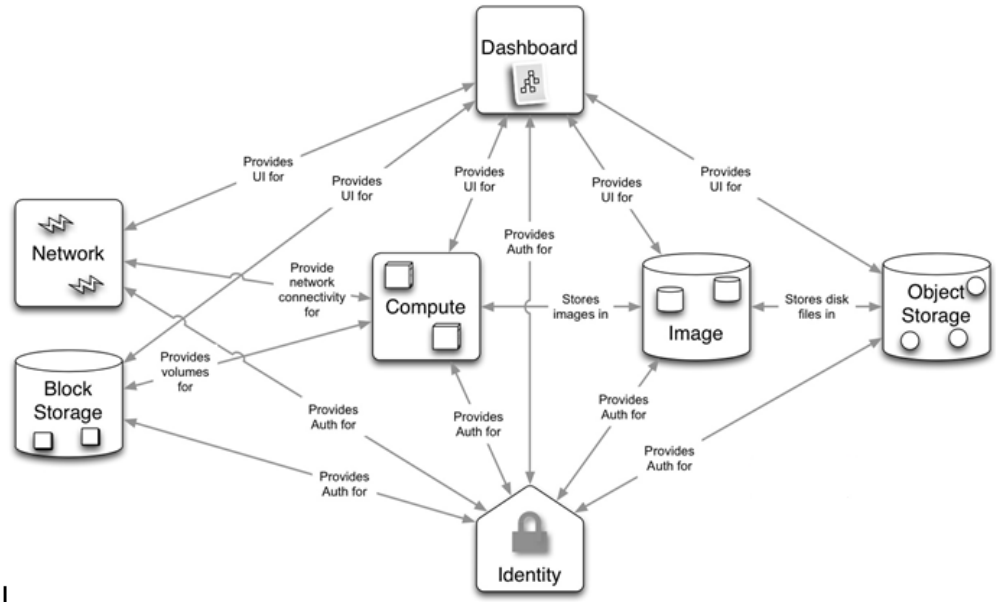

Figure 2.1: Basic Architecture of OpenStack [7]

In order to understand the design of OpenStack, details of each component is necessary albeit the focus of this research is on the networking part. In this research, Havana which is the stable release of OpenStack will be discussed in detail.

Nova (Compute node)
This component provides virtual machines (instances) and servers. It also provides different flavors of virtual machines that are pre-defined in terms of CPU, memory or storage. Different types of instances can normally be created that shares the same physical processors and I/O interfaces. The standard instances are tiny, small, medium, large and xlarge.

Neutron (Network Node)
This component provides dynamic networking by creating networks, subnets, routers and ports when users create virtual machines. In other words, it provides network as a Service between devices that are managed by compute node.

Cinder (Block Storage)
This provides the ability of creating volumes and taking snapshots.

Glance (Image Storage)
It is a registry for disc images for creating virtual machines. It also stores the metadata of the images.

Swift (Object Storage)
It stores object of user's data in containers.

Identity(Keystone)
This is the identity component that defines users, roles of users, services, tenants and so on. Tenants are group of users that shares the same resources of server, network or block storage.
Horizon (dashboard)
It is web user interface where users can login and create virtual machines. Moreover, it gives the overview of the whole OpenStack.

Heat (Orchestration)
This provides the ability to define application in terms of the template. "Heat Keeps the OpenStack Up". It has the possibilities to scale up or scale down the OpenStack cloud.

Ceilometer (Metering)
This component provides the ability of billing users measuring and tracking how much of services they used.

2.2.2 Network Evolution of OpenStack

Due to the increase of routing protocols, security rules and IP addresses, conventional network management system is limited to support next-generation network system. Furthermore, customers have big expectation to manage the system. Thus the need of further devices like storage, network devices, and security tools has grown to large extent that can spilt into virtual devices and networks [24].

Like other cloud computing components, OpenStack network handles IP addresses and other networking services. It is an API-guided and flexible system that assures network as unlimited element in the deployed cloud resources. Moreover, it provides its users truly self-service beyond its network setup[24].

The OpenStack network has come a long way from its first release. In the early release of OpenStack, networking was a sub-component of Nova called nova-network. It was easy to configure was only component which is responsible for networking.

Nova-network had different network managers for the isolation of network traffic. Such as FlatManager, FlatDHCPManager and VlanManger. Traffic are isolated with a network bridge inside compute nodes in case of flat manager technique and the bridge is set as their default gateway for every virtual machines within the same compute node.

Figure 2.2 shows how network traffic is isolated in flat-networking inside One Compute node. However, flat isolation had limitations, as it does not isolate traffic between tenants. Moreover, it has only single IP pools.

Then developers came with new idea of vlan networking with the ability

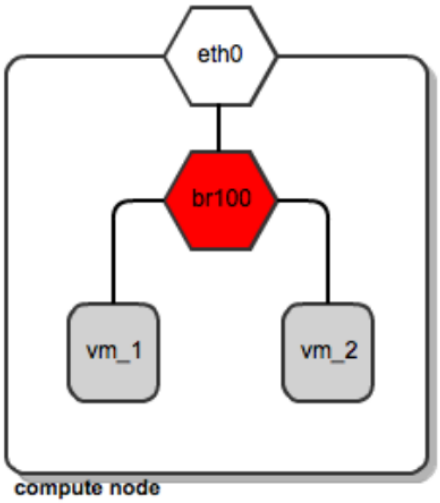

Figure 2.2: Traffic isolation using Flat manager [8]

of isolating traffic by given vlan tagging over the physical interface while bridging the network of virtual machines as shown in figure 2.3. Here it is able to separate traffic between tenants. Perhaps, the scaling of vlan tagging is limited to value of 4096.

Those types of networking have some key issues. VLAN is the only way

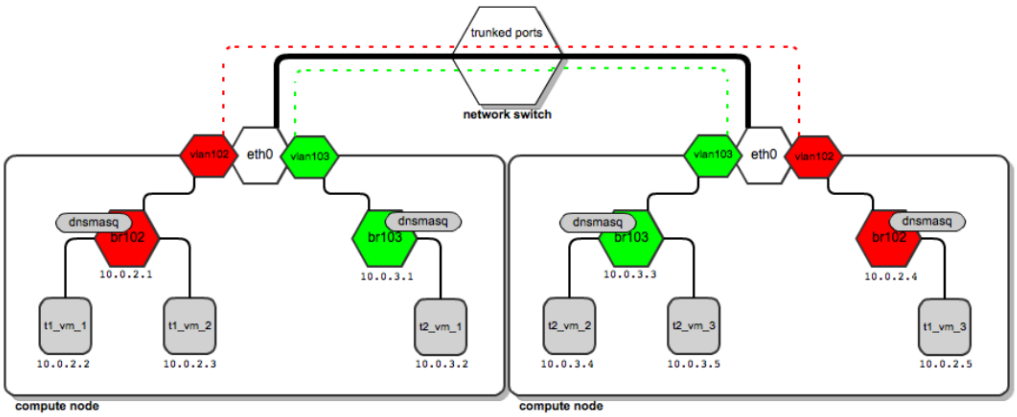

Figure 2.3: Traffic isolation using VLAN [8]

of doing multi-tenancy and they support only Linux bridges, which do not

support advanced network services ACLs, QoS, firewall and monitoring. Furthermore, the only point of failure will be Nova-network. Thus, the OpenStack foundation came with new project to tackle the above-mentioned problems. A new networking project Quantum has emerged which basically works based on software-defined networking (SDN) with OpenVSwitch as a plugin. Quantum is named Neutron in the newly release of OpenStack.

This new networking component supplies different networking service like DNS, DHCP, IP addressing management, load balancing and firewall managements for cloud service users. It gives also a structure for SDN to consolidate with different pluggable networking solutions. Furthermore, it provides tenants (cloud users) to administrate their network setups and network security services such as traffic segregation and availability and so on [9].

2.2.2.1 Software-defined networking (SDN)

Today the cloud is stressing the network due to massive scale of high-density, multi-tenancy cloud environments. They are trying to keep up with the explosive, dynamic nature of these virtualized environments where work-loads are moved, added or removed on the fly to address new requirements, and multiple tenants are leveraging shared resources to drive their bussiness [18].

Therefore, neutron is trying to deliver networking as a service in the cloud so that the network in the cloud environments can be relieved the network stress. It is actually designed to supply a plugin mechanism that will provide an option for network operators to enable different technologies via the quantum API and it lets tenants create multiple private networks and control the IP addressing on them. As a result of API extensions, organizations have additional control over security and compliance policies [10].

Software-defined networking(SDN) provides delicated and flexible contol of network for devices with OpenFlow enabled. This technology helps to provide Network-as-a-service for cloud environment despite some challengs like the amount of ACL-based tables that maintaines and update's the state rate [18].

2.2.2.2 OpenvSwitch

OpenVswitch is mutli-layer virtual Switch plugin which is mostly used today. Like a hardware switch, it operates in Layer 2 but it also works on layer 3 and layer 4, i.e it not only works with mac address but it can forward packets with IP addresses. This plugin helps hypervisors to enable bridging traffic between VMs of internal and external networks [11].

OpenVswitch provides two types of technologies when creating virtual networks [12].

1. VLAN (virtual LAN) is where traffic is isolated from each other by adding a 4-byte VLAN tag to Ethernet header. This tag varies from 1 to

4095. OpenVSwitch enabled switch and routers know how to translate the VLAN tag. Those packets that are tagged with one VLAN shares are only shared with other devices configured to be that VLAN, even through all devices are on the same physical network.

2. GRE (Generic Routing Encapsulation) which encapsulate IP packets that makes new packet with new routing information. Then the packet is de-encapsulated and routed when it reaches its destination. Here, neutron creates GRE tunnels. They are basically ports on a bridge that allow them to acts as single bridge and enable the compute and network nodes to perform as a one in routing the packets.

There are two bridges in neutron which are emerged with the OpenvSwitch plugin: - integration bridge (br-int) and external bridge. The integration bridge enables communications between internal VMs whereas the external bridges connect VMs to external network [12].

2.2.3 OpenStack Network Operationalization

Quantum which is newly named neutron uses network virtualization that provides Network as a Service. Quantum will be used mostly in this research. It uses an API to setup and offer virtual networks (vNIC) that links with other OpenStack services. Moreover, those APIs determines other network services like QoS, networking monitoring and so forth [13].

Figure 2.4 shows the relationships of network component with other OpenStack components.

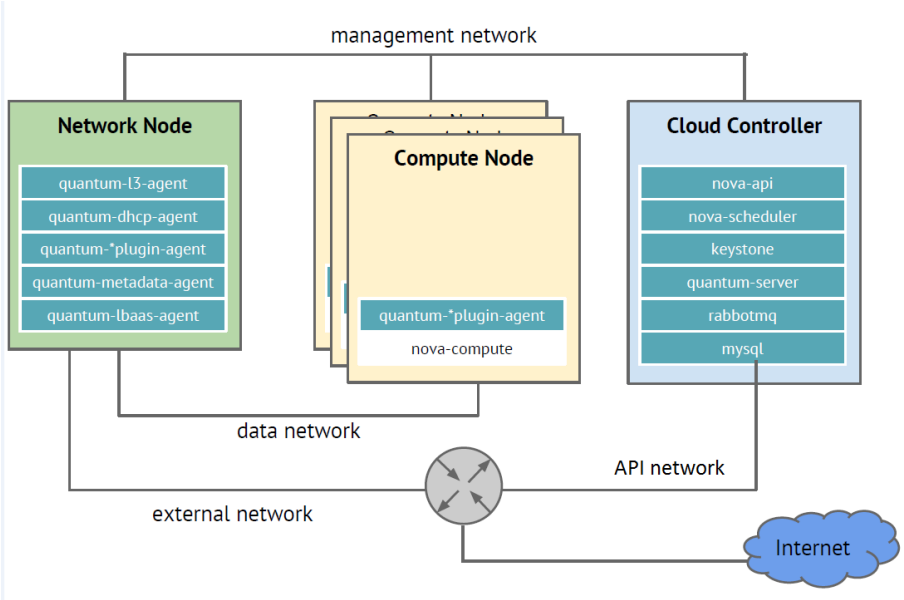

Figure 2.4: Quantum Deployment [13]

The management network provides connectivity of OpenStack component with in the datacenter. On the other hand, Virtual machines communicate through the Data network. All OpenStack APIs are pointed out by API network.

2.2.3.1 Components of Neutron

- **Neutron Server**
  This component starts Quantum API and its extensions accomplishes network services like network, subnet and port. Moreover it assigns IP address to each port.

- **Neutron Plugin**
  Each virtual machine runs the plugin that connects to network port.

- **Neutron DHCP agent**
  It starts or stops DHCP server and keeps up its DHCP configuration. Each compute node runs this agent in case of multi-host mode.

- **Neutron L3-agent**
  Every network runs L3-agent in order to implement floating IPs and other L3 features like Network Address Translation(NAT).

- **Neutron Metadata-agent**
  This component mediates between Quantum L3-agent, DHCP agent with OpenStack nova metadata API server.

During creation of a virtual machine, the neutron creates a network, and associate the create network with a subnet. When the virtual machine boots, it

connects to the network [14].

Each virtual machine can have two IP address. These IP adress are private IP and floating IP.
A DHCP server assigns a private IP address from a private network to the virtual machine interface and is visible by "ifconfig" command from its terminal i.e, the guest operating system has knowledge about it. Thus, virtual machines (VMs) communicates each other via virtual switch on each compute node using those private IPs. Whereas floating IP address is a service given by Neutron to VMs. The delivery of packets to the interface with the assigned floating adress is the responsibility of Neutron's L3 agent. Moreover,floating IP address is used to access VMs from external network. A Vm can attain both private and floating IPs on a single interface at the same time.

2.3 Network performance

Today parameters of HPC have to be evaluated with various configurations and different types of resources because the performance of networks becomes increasingly limited by different virtual constrains in High performance networks.network information like network channel state, network topology, network protocol and traffic information are fundamental and significant elements. In general if more information of network is collected, it can be much easier to improve network performance[22]. Thus, Measuring such characteristics is important for both users and providers to proof the SLS (Service Level Specification) auditing and assures the network behaves as specified inthe contract [15].

In cloud computing, specifically OpenStack, the configuration and use of various hypervisor technologies, implementing of different network switching technologies like VLANs or GRE tuning, and variety of filesystem play a great role in the overall determination of system performance [26]. In this research paper, more emphasis will be given to analyze performance of TCP and UDP traffic. Those protocols provide network services and is very important to understand briefly.

- **TCP (Transmission Control Protocol)**

  It is a transport protocol in the Suite of TCP/IP. It provides reliable delivery of packets through a connection-oriented service. It is used by many higher layer applications such as WWW, FTP and E-mail due to secure delivery of packets.

  The TCP header structure format explains its various functionality. For example the window size format manages the flow of packet in the network hence prevents buffer overflow. Its size can be regulated by the

receiver in order to protect congestion.

- **UDP (User Datagram Protocol)**

  This transport protocol model delivers packets without guarantee and/or order to the upper layer. However it is more suitable for time-sensitive applications where small error or packet loss would not affect the flow of data for instance VOIP application.

  Unlike TCP, UDP has no any means of congestion control. Therefore applications that uses high bandwidth need to implement congestion control mechanism in its application level.

2.3.1 Measurable Network Performance Metrics

Here different network performance metrics that can be measured will be explained briefly.

- **Transmission Bandwidth**

  Bandwidth (throughput) measures the speed how quick data can be transmitted once it start to flow. In other words, throughput is the amount of data that is sent over a certain amount of time or the amount of time consumed to transfer a certain amount of data between two devices.

  There is a big differentiation between actual and theoretical bandwidth. Theoretically a network can support very high bandwidth however practically due to the existence of overhead in hardware and operating system is much lower bandwidth.

- **Packet latency**

  Latency is a value that tells how long communication across network links take. Packet transmission consumes a certain amount of time regardless the network traffic capacity or CPU speed of a system. There are several ways in which packet transmssion can be influenced by latency. Data protocols, queuing and buffing, and routing and switching are few to mention.

- **Packet loss**

  In network communication, packet loss refers to the failure of packets in transmission due to weak signal strength, interference by nature or human, noise, hardware, software failure. The loss of a packet in networking causes evident performance issue or jitter, which will affect the network application in general. Since TCP does not report loss to the user, it was found UDP tests are helpful to see packet loss along a path.

2.3.2 Tools for measuring network performance

The task of computer network Performance measurements consumes plenty of time unless proper tools are used. Moreover, choosing of appropriate tool for generating and transmitting of packets would be so difficult task as there exist plenty of tools [25].

In this section, the main tools which will be used in this research will be described briefly.

- **IPerf (Intelligent PERFormance)**

  It is one of the most popular and powerful benchmarking tool used for network performance today [25]. It measures end to end obtainable bandwidth using both UDP and TCP streams. It allows parameter variations such as TCP window size, maximum segment size and multiple parallel streams.

  It was originally developed by DAST (Distributed Applications Support Team at the National Laboratory for Applied Network Research (NLANR). Iperf is written in C programming. In general iperf reports parameters as throughput, jitter, and packet loss. Iperf works in a client-server model in order to measure the throughput in bps between two of them by generating packets.By default iperf calculates the throughput for 10 seconds.

  Tools like iperf measures very large amount data. Iperf utilized the client architecture sending a selected amount of data from iperf client to iperf server and measuring the time that it takes to transfer or receive the data.

  There is also a GUI version of iperf called jperf that is developed in java programming. Iperf works witth both IPv4 and IPv6.

  A simple Iperf TCP output format looks like the following on both client and server side:-

Client Side

```
ubuntu@net-vm:~$ iperf -c 10.0.3.11
------------------------------------------------------------
Client connecting to 10.0.3.11, TCP port 5001
TCP window size: 23.5 KByte (default)
------------------------------------------------------------
[3] local 172.16.0.2 port 51435 connected with 10.0.3.11 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec   530 MBytes   445 Mbits/sec
```

Server Side

```
ubuntu@new-vm:~$iperf -s
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)
------------------------------------------------------------
[4] local 10.0.3.11 port 5001 connected with 172.16.0.2 port 51435
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.0 sec   530 MBytes   445 Mbits/sec
```

The client reported that the amount of TCP packets generated is 586 MBytes and a throughput of 492 Mbits/sec which is used to transmit the packets. By default, Iperf generates packet for 10 seconds.

Iperf output for UDP traffic is as shown below:-

Client Side

```
ubuntu@net-vm:~$ iperf -u -c 10.0.3.11
------------------------------------------------------------
Client connecting to 10.0.3.11, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[3] local 172.16.0.2 port 49227 connected with 10.0.3.11 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec
[  3] Sent 893 datagrams
[  3] Server Report:
[3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.026 ms   0/893 (0%)
```

Server Side

```
ubuntu@new-vm:~$iperf -u -s
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.11 port 5001 connected with 172.16.0.2 port 49227
[ ID] Interval  Transfer   Bandwidth    Jitter   Lost/Total Datagrams
[3]  0.0-10.0 sec  1.25 MBytes  1.05 Mbits/sec   0.027 ms   0/ 893(0%)
```

Here a total of 1.25 MBytes are send to the server with a bandwith of 1.05 Mbits/sec. Then ther server reported that there was no packet loss but there was a jitter (arrival time variation of packets) of 0.026ms.

- **Ping**

  Ping is a software utility used to test a connectivity of a remote network (host) usually by sending an Internet Control Message Protocol (ICMP) Echo Request packet to its destination, where it then returns the packet to the source. The request is send in a given intervals and measures the round-trip time. The RTT is measured in milliseconds. In this measurement, the lower is the better. Ping is also used for troubleshooting.

- **Tcpdump**

  Tcpdump is a network sniffer that captures and displays packet headers by comparing to a predefined criteria. It is an open source command line tool, which can search based on a given arguments such as host names, protocols, IP addresses etc.

2.4 Related works

A number of research and efforts has been done for the development and enhancement of high performance cloud computing in the past few years. Today those efforts can be categorized into resources performance, security performance and performance comparison between different cloud platforms. Given that the focus of this research is on the evaluation of network performance earlier related research works will be briefly explained under this section.

"Analysis of Security in Cloud Platforms using OpenStack as Case Study"[20].

Despite the advantage of cloud computing on improving better use of large resources, the concern of security and privacy is an obstruction for many in implementing it. This research is conducted to examine the characteristics and problem of security of cloud platforms specifically based on OpenStack [20]. Cloud customers are afraid of attackers as their information and IT resources are more exposed to them. On the other hand, implementing security in cloud computing is very hard due to various attacks that can happen on application and hardware components [20].

This study of security investigation of cloud computing based on OpenStack was to find out the lack of trust on Authentication and Identity Management (IAM), and Data Management. The current security of cloud computing is very complicated, the paper reviewed various schemes that can efficiently attain information privacy in cloud. Some of them are a powerful user authentication framework, which gives mutual authentication, user privacy and a better way of security against intruders, access control approach, and privacy

and data protection solution were proposed by a number of researchers [20]. The research investigated security issues on OpenStack Object Storage (Swift) and found out that low permission administrators are able to get credentials of highly permissioned administrators. Furthermore, they concluded that isolated files can be compromised and most cloud service provides are weak to afford encrypted users' information [20].

"Deployment and Performance Evaluation of Virtual Network based on OpenStack"[29].

This article was first conducted on the international workshop on cloud Computing and Information Security in 2013.

The research paper was written to address performance of Quantum (the network component of OpenStack) when it is deployed on single-host and/or multiple hosts[29].

The research described that in early release of OpenStack. Compute node (nova) was responsible to create network function for the instances. However Quantum, which was released in Folsom and Grizzly version of OpenStack, is excluded form Nova. It obtained new APIs and was able to provide users to set up their network topology[29].

The study also stated that Multi-host virtualization routing is a new idea that emerged in Grizzly OpenStack version. Therefore the deployment performance of virtual networks is yet doubtful.

The experiment of this research was to design a number of practical deployment strategies and examine communication tests and evaluate their performance. In the deployment of single-host, a single network node and multiple compute nodes are implemented. In this scenario, the risk of failure is very high as the network node is a single point of failure (SPoF). Moreover, if there is high network traffic on the system, then network node will be the bottleneck for the performance of the system[29].

Therefore this study designed a new deployment strategies called multi-host deployment to increase better network services reliability and avoid SPoF on OpenStack platform. In this scenario, the network traffic will be uniformly distributes among the compute nodes. Connectivity tests were conducted on different instances on the same compute node, among VMs located on different compute nodes and between VMs in the cloud and outside the cloud for both single-host and multi-host deployments. The research concluded that the connectivity test of the deployed virtual machines was successful.

In the performance evaluation experiments, they made an approximately estimation of delay and packet loss rate using D-ITG software under both scen-

arios. The result shows time delay increases as the size of sent data increases in the single-host deployment whereas there was double increases of time delay of different VMs within the cloud than a VM communicates with external VM(as external VM is close to the router) in multi-host deployment. However, multi host deployment has advantage over single host deployment because as the data size increases, the time-delay and packet delay was almost distributed uniformly[29].

Some of the future works that the research highlighted are it is difficult to investigate the exact number of redundant routers and design an efficient agent algorithm for scheduling and allocation of resources[29].

"The Eucalyptus Open-source Cloud-computing System"[24].

The research presented an open source platform called Eucalyptus which implements Infrastructure as a Service. They described its fundamental concepts and functionality. Eucalyptus is made to enable researchers substitute their own experimental system using other cloud solutions like Amazon EC2 and S3 user interface. Eucalyptus have four main components called Node controller, cluster controller, storage controller and cloud controller and each component has its own functionality to the creation of VMs[24].

In cloud computing, resources allocation to users depends on different features such as storage, memory and network capacity, and as well as geographical location. Perhaps the process of the allocation associates with resource availability, software service requirements and so on [24].

In this work, they addressed cloud computing problems like VM scheduling, VM interconnectivity and building of virtual networks. The solution for VM network must deal with communication, separation and performance of the network traffic [24].

"Comparison of Open-Source Cloud Management Platforms: OpenStack and OpenNebula"[28].

This research study is conducted in the 9th International Conference on Fuzzy Systems and Knowledge Discovery in 2012.

The research focused on comparison of open and free source cloud computing platforms OpenStack and OpenNubla which provides Infrastructure as a Service. Those two platforms were compared based on theirs architecture, hypervisors, security, and other important features [28].

The paper showed that OpenStack has stable and easy architecture. A project called Keystone provides services for security by managing and author-

izing users. Moreover OpenStack supports Xen, KVM, Hyperv, XenServer, VMware, and LXC whereas OpenNebula does not support HyperV and LXC virtualizations [28].

By looking at the comparison outcome, the researchers suggested that OpenStack is more applicable for an enterprise due to its ability to encapsulate its services. Whereas OpenNebula is more advisable for research institutions, universities and for large data centers enterprises [28].

"Impact of Information on Network Performance – An Information-Theoretic Perspective"[22].

This research paper is conducted by Jun Hong and Victor O. K. Li at the University of Hong Kong in 2009. The main objective of this paper was to investigate the relation between network information and network performance by considering network information as a very vital factor to decide network performance. They studied network performance considering the fundamental network information that should be transferred along the network. Furthermore, they had to answer basic questions such as how much information is needed for deciding how much a network is efficient and how the transmission traffic overhead can affect the network performance [22].

The main idea of this paper is develop a theoretical information framework and relate network information and network performance quantitatively based on the rate of distortion theory concept. Network performance metrics such as packet loss rate and network traffic capacity can be extracted from the rate of distortion [22].

This study is performed to analyze traffic information on a wireless network. Network information like traffic information, network topology, and channel state are very vital factors that can affect network performance. They assumed Time Division Multiple Access (TDMA) as a channel access protocol where a sender in each link tells the controller if there is a packet waiting to be transmitted in each time slot. Thus the controller will plan depending on the information received and informs the nodes the schedule. Here they tried to measure the network metrics like network transmission delay, throughput, and packet loss from the obtained information. Those results were related to the traffic information between to nodes [22].

The research concluded by saying network throughput improves when the scheduler gathers more information without considering the overhead of gathering the traffic information [22].

"High performance network virtualization with SR-IOV"[21].

This project was conducted to address how I/O virtualization performance can be improved using SR-IOV (single-root I/O virtualization) device driver standard. When implementing SR-IOV, it enables I/O device to share its resources without distorting its performance. Furthermore the research investigated the performance of SR-IOV through several experiments[21].

In a high performance computer environment, the performance I/O is crucial because the need of high computing capability system is increasing extremely. However long latency PCI Express due to fixed number of PCIs slots and the constraint hardware scalability are still limiting the I/O performance[21].

A technique to over the aforementioned problem is to sue virtualization where multiple users share the same resources. An abstraction layer called Virtual Machine Monitor (VMM) or Hypervisor is introduced on the top of the hardware. Each VM (user) then assumes as it owns the whole resource[21].

Nevertheless, virtualization overhead keeps the CPU busy decreasing the performance of the system. Different methods have been introduced to eliminate the above mentioned problem. Such as interrupt mask and unmask acceleration, virtual End of Interrupt (EOI) acceleration, and adaptive interrupt coalescing. In this experiment, generic virtualization architecture for SR-IOV-capable devices and a dynamic network interface switching (DNIS) scheme were proposed which helped the SR-IOV capable device driver in order to simplify VM immigration respectively [21].

The paper analyzed a throughput of 9.48Gbps was able to attain using SR-IOV. The network was scaled to host about 60 VMs with only increase of 1.76% of CPU per VM[21].

Chapter 3

Approach and Methodology

The research will be carried out in two phases. The first phase of the experiment is to investigate traffic flow pattern and the second to study network performance in terms of throughput, packet loss and delay. The research will be conducted by deploying virtual machines(VMs) on same and/or different compute nodes. All VMs will be using 64-bit Ubuntu 12.04 operating system as their base OS.

Phase 1. Investigation of Network Traffic flow on OpenStack

Nowadays virtualization is a fundamental function which has huge contribution in a cloud computing environment. It is needed for network transport and computing as well as storage. Network virtualization enables instances to communicate in a secure and pliable way during migration. It also creates virtual networks that provide an intelligent abstraction that makes easy to deploy and manage network services and underlying network resources. Virtual switches like Cisco Nexus have capabilities of port-profile portability in addition to features like QoS [16].

In such system, traffic segmentation is achieved using VLAN tagging or GRE tunneling for each tenant. Thus, the different alternative of network switching system plays a big role in the complexity of networking architecture in cloud computing.

In the architectural setup of the experiment environment for this research on OpenStack, Vlan-tagging is activated for network traffic isolation.

By studying different flowing pattern across the network, cloud providers will be able to find out the nature of Vlan-tagging service with other network service such as GRE Tunneling. To investigate traffic flow characteristics, a number of tools will be required. Those tools will be capable of tracing the flow of the traffic over the network. The tools that are going to be applied in this research will be **traceroute or tracepath/route** and **tcpdump** in order to observe the network flow.

Phase 2. Network Performance on OpenStack

The second thing to investigate is network performance in OpenStack cloud computing environment, which is a high performance computing network. In order to carry out this investigation, benchmarking tools, with the ability to report about throughput, packet loss and packet delay about both TCP and UDP traffic, are needed.

3.1 Experimental setup

This experiment is conducted on the Alto OpenStack cloud, which is already deployed at Høgskolen i Oslo og Akershus (HiOA). The system consists 12 compute and 1 network nodes. Each compute node has two 10GB and 1 GB physical network cards, 256GB ram and 2*1TB in RAID1 disk. Figure 3.1 illustrates the connectivity of network node, compute nodes and controller node in Alto deployment.

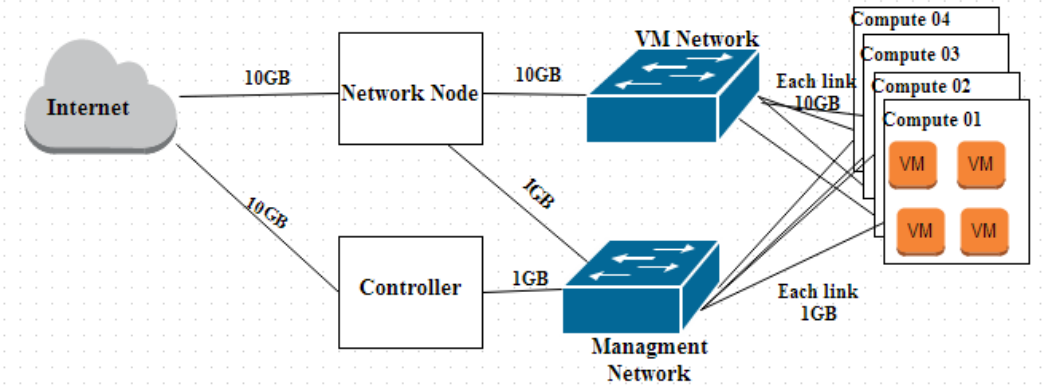

Figure 3.1: Simple infrastructure of Alto Network

Cloud computing service providers provide different virtual instances which differ in their machine hardware, virtualization technology and hosting setup. Instances in the lower tier have slower CPU, less VCPU cores, less RAM size and less amount of disk size than instances in the higher tier. Therefore, the experiments done should be able to show how the difference in parameters affects network performance. In this case, i.e. Open Stack, experiments will be performed on both M1.medium and M1.tiny flavored virtual machines.Their specifications is as in table 3.1.

Virtual Machine Type	CPU	Memory(RAM) size	Storage(Disk size)
Tiny	1VCPU	512MB	2GB
Medium	2 VCPUs	4GB	40GB

Table 3.1: Virtual Machine Specification

3.2 Experimental Design

The concrete experimental plan for the investigation task is as follows:

3.2.1 Topology Case1 Experiment

Experiment will be done to investigate the traffic flow between two virtual machines located at same compute node and same network. Figure 3.2 portraits the logical flow of network traffic.

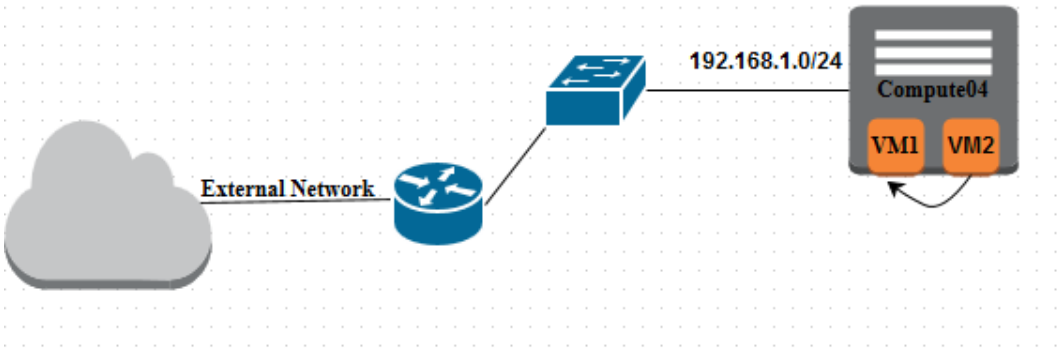

Figure 3.2: VMs on the same compute node and same network address

3.2.2 Topology Case2 Experiment

This test will be performed in order to study the traffic flow between two virtual machines located at same compute node but different network. The two different network can be attached to the same router or they can attached to two different routers. Figure 3.3 and Figure 3.4 portrait the logical flow of network traffic for both networks respectively.

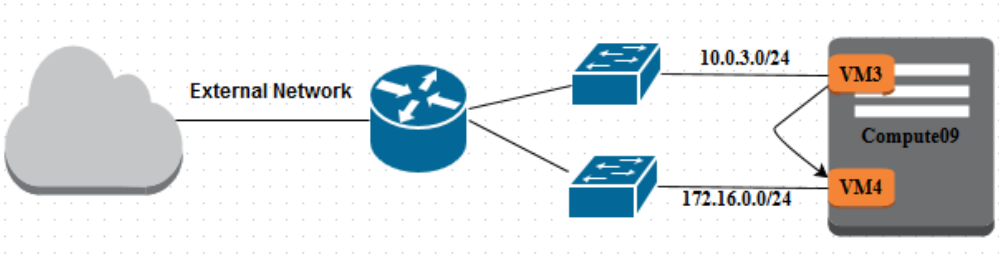

Figure 3.3: VMs on the same compute node but different network address

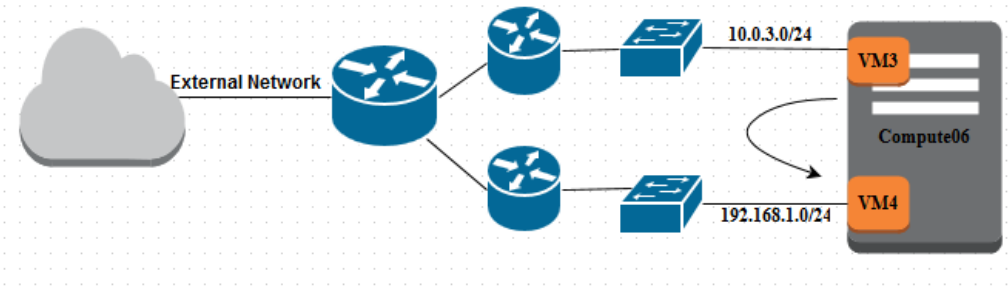

Figure 3.4: VMs on for the same case above

3.2.3 Topology Case3 Experiment

Here traffic flow pattern will be investigated between two virtual machines located at different compute nodes but same network as shown in figure 3.5.

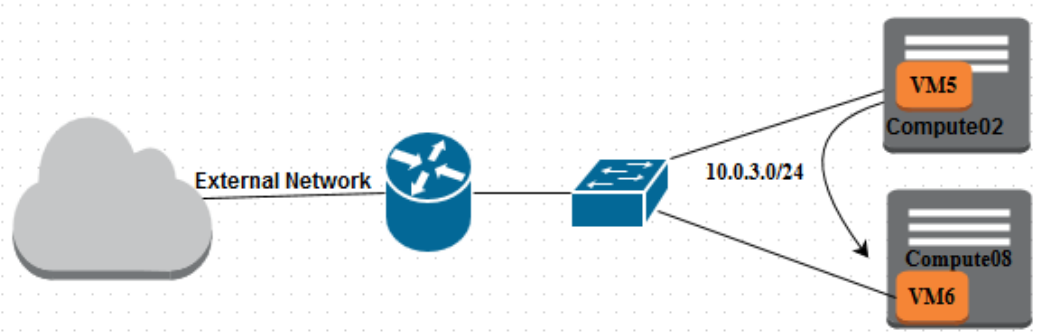

Figure 3.5: VMs on different compute node but same network address

3.2.4 Topology Case4 Experiment

This experiment will be conducted to examine the traffic flow between two virtual machines located at different compute nodes and different networks. It's setup is as in figure 3.6

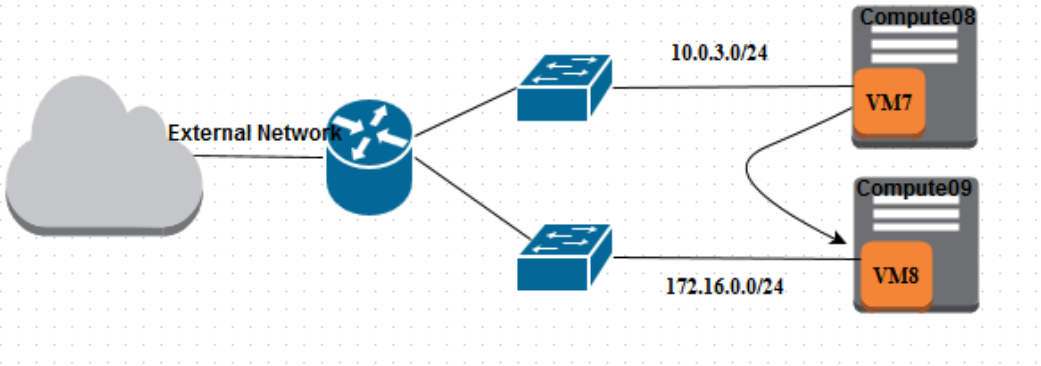

Figure 3.6: VMs on different compute node and different network address

3.3 Studying the Network Performance

This section will evaluate the network behavior between instances within OpenStack cloud. Due to the use of different type of network equipment like switches, VLAN configuration and so forth, network properties within one cloud and network between different clouds have quite different behavior. Many providers promise high bandwidth from Mbps to Gbps inside their cloud infrastructure [23].

To compare the network performance, matrices like throughput, latency and loss will be measured. Both TCP and UDP will be used to measure the throughput. All these metrics will contribute awareness to customers on how OpenStack cloud provider's network is provisioned.

In the second experiment, the network throughput, which is a major factor, will be evaluated. It will also examine the behavior of bandwidth sharing in case of multiple Virtual machines in one compute node. Simultaneously round-trip packet delay and packet loss will be measured between two specified virtual machines.

In order to carry out the throughput and packet loss experiments **Iperf** which is a benchmark tool that generates TCP and UDP traffic will be used. **Iperf** uses a default bandwidth of 1.05 Mbps in case of UDP traffic. However in order to have accuracy in measuring achievable bandwidth, the maximum available bandwidth which is 10 Gbps will be set using –b option. The default maximum transmission unit (MTU) and UDP buffer size is 1500 bytes and 224 Kbytes respectively. For TCP, default TCP window size is 23.5 Kbytes.

To minimize complexity in measuring and evaluating the network performance, all factors that can affect the performance are kept as their defaults values. Factors like TCP window size, maximum transmission unit, UDP buffer size, datagram length and parallel transmission will keep unchanged because the problem statement address how is the bandwidth sharing between

instances with their defaults. Furthermore, the experiment will be huge if experiments are done by changing those parameters.

To measure packet round-trip delay (RTT), **ping** tool will be used. Basically ping command is used to check the existence of a network connection of a remote host by sending ICMP packets. If the host is reachable then it tells how much time it uses until the response comes back to its source that is the delay time of the packet. For better effectiveness the tool will send ping packet for 1500 times and collect the average delay time.

In order to measure the above-mentioned metrics, a pair of instances will be allocated as shown in section 3.2.

First, tests will be done for a single pair of VMs by running one pair at a time. Next, multiple of pairs of VMs which are located on the same compute node will be made to execute Iperf simultaneously.

Finally, the experiment will be repeated for different flavors of virtual machines in order to analyze the sharing of available bandwidth among the processes and/or virtual machines.

Chapter 4

Result

This section includes the test result found from the actual experimental set up to address the problem statement section 1.2. The results are collected while 36 VMs were running in OpenStack cloud computing at Alto. The results are categorized according to the classification mentioned in section 3.2.

Table 4.1 and 4.2 summarize the locations of tiny and medium-sized instances and their IPs addresses for the different scenarios mentioned in section 3.2. VM1 and VM2 are in the same compute node that belongs to the same network and is taken as **Case1**. While VM3 and VM4 have different network address but they belong to the same compute node and treated as **Case2**. VM5 and VM6 reside on different compute node but on the same network, which is **Case3** where as VM7 and VM8 are on different compute node and different network and is considered as **Case4**.

Name of Scenarios	Name of VM	Private IP address	Compute node name
Case1	VM1 and VM2	192.168.1.2 and 192.168.1.4	Compute04
Case2	VM3 and VM4	10.0.3.8 and 172.16.0.2	Compute09
Case3	VM5 and VM4	10.0.3.8 and 10.0.3.9	Compute08 and Compute02
Case4	VM7 and VM8	10.0.3.2 and 172.16.0.2	Compute08 and Compute09

Table 4.1: Tiny VM Pairs of experimental setup

Name of Scenarios	Name of VM	Private IP address	Compute node name
Case1	VM_M1 and VM_M2	10.0.3.12 and 10.0.3.16	Compute06
Case2	VM_M3 and VM_M4	172.16.0.5 and 10.0.3.15	Compute08
Case3	VM_M5 and VM_M6	10.0.3.13 and 10.0.3.14	Compute03 and Compute04
Case4	VM_M7 and VM_M8	10.0.3.12 and 192.168.1.5	Compute10 and Compute08

Table 4.2: Medium VM Pairs of experimental setup

4.1 Results for Network Traffic flow

For each case as mentioned on section 3.2, one VM sent continuously ping packet to its respective destination. At the same time, packets were tracked on both internal and external bridge interfaces of compute node and network node using **tcpdump** in order to see the traffic flow as in the following command:-

Tcpdump Command

```
tcpdump -n -e -i interface  host ip address
-n       To display addressess by names
-e       To display link-level header
-i       To specifyinterface name
```

However it is necessary to know how VMs are interconnected inside one compute node and how OpenvSwitch is configured to use VLAN to isolate traffic flows on the physical network. On compute node, OpenVSwitch is configured as follows:-

OpenVSwich setup

```
[OVS]
tenant_network_type = vlan
network_vlan_ranges = default:3000:3999
bridge_mappings = default:br-eth7
```

This shows that vlan is used to isolate traffic, which has tagging id ranging from 3000 to 3999 and bridge eth7 was used for data forwarding. Br-eth7 was created on each compute node and added to the physical network.

Then the OVS-agent of each node connected bridges br-int and br-eth7 by adding ports int-br-eth7 and physical-br-eth7 and connecting them with a veth

pair. These ports do not have tags. Therefore they are trunk ports.

Then when creating a VM, it is associated with previously create network. When VMs boot, the DHCP-agent created a tap device for each network and openvswitch-agent created local VLANs to them.

These local VLANs are local to br-int and isolate different networks on br-int. However if a packet needs to go to VM running on another compute node, then it will have to go via br-eth7, and its VLAN id will be translated to the provider: segmentation_id of its neutron network that provides different types of flow matches i.e, another VLAN tagging.

Diagram 4.1 shows the internal view of a compute and network node along with its interfaces and bridges.

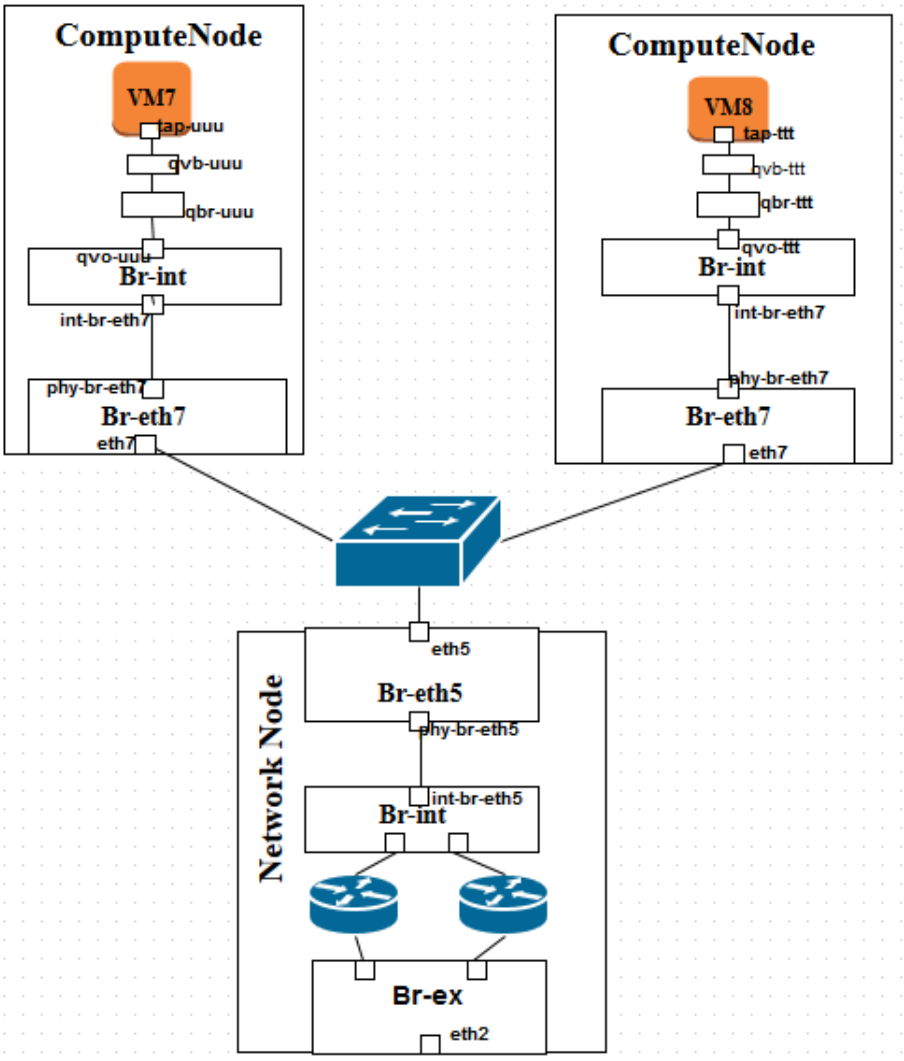

Figure 4.1: Briges and interfaces of Compute and Network node

To investigate the traffic flow, a source VM (i.e. client VM) pings its corresponding destination as shown in table 4.1 and on each interfaces of internal and external bridges, packet were tracked using *tcpdump*. While pinging and tracing the packets, private IPs are used because the floating IPs are assigned by Neutron's L3 agent. Thus, packets will definitly go to network node interfaces. If two private downs are connected as in shown in figure -3.4, then floating IP must be used in order to ping each other.

The results of each scenario are explained below.

4.1.1 Results for Same Compute node and same Network

When instances are on the same compute node and on the same network, the traffic flow was traced on all the interfaces of the br-int and br-eth7. Then the flow was traced on only two interfaces inside the br-int switch.

On interfaces qvo -XX that connects client VM to br-int and qvo-YY which connects br-int to Destination VM were the data flow tracked and can be shown in figure 4.2:-

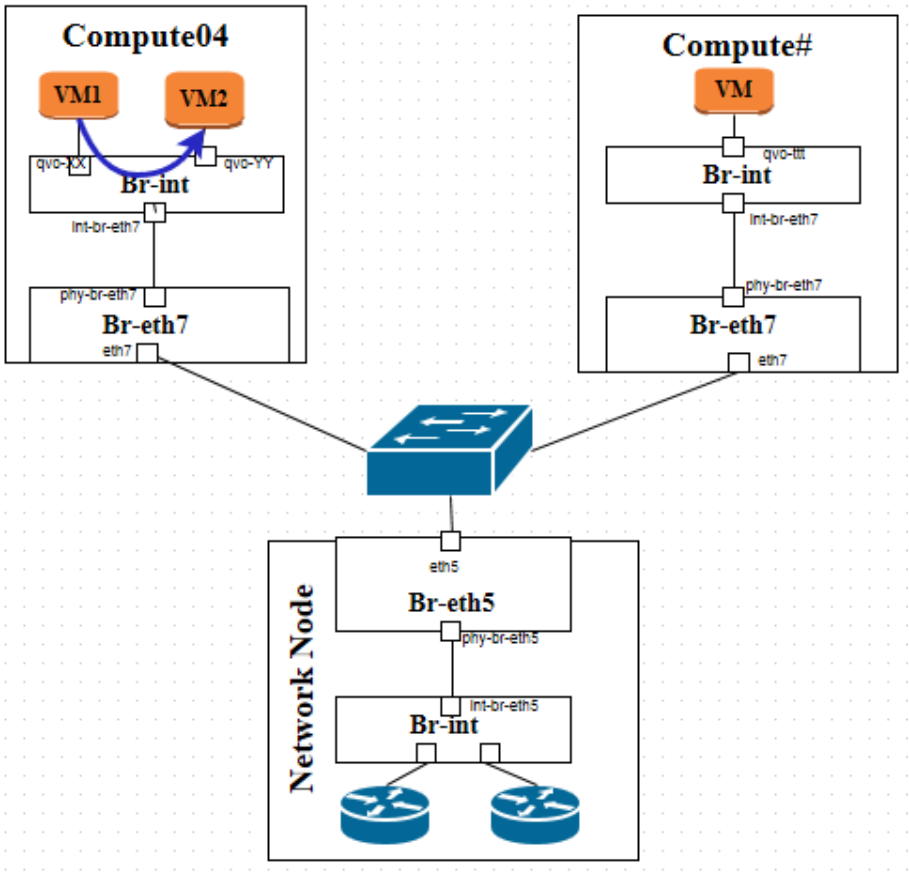

Figure 4.2: Traffic Flow for Case1

4.1.2 Results for Same Compute but different Network

To study the flow pattern of VMs on same compute node but different network, tcpdump data was collected on interfaces of br-int and interfaces on br-eth7 of the compute node09 to collect icmp packets. On two interfaces qvo-xxx, qvo-yyy and int-br-eth7 of br-int and on interfaces of phy-br-eth7 and eth7 of br-eth7 were packets traced as shown in the diagram 4.3. The results from the traced packets showed that packets were going out of the compute node. Next network node interfaces were traced for the icmp packets. Then, there were packets passing through interfaces of eth5, phy-br-eth5 ,int-br-eth5 and two qvo-interfaces.

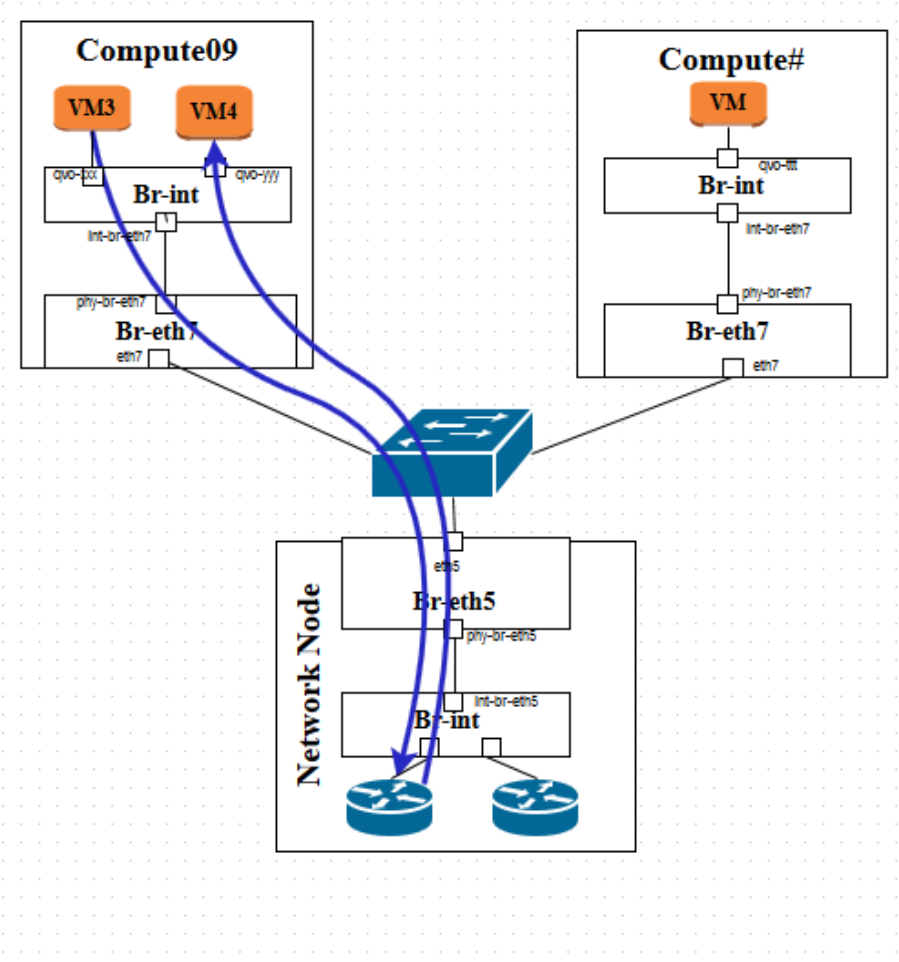

Figure 4.3: Traffic Flow for Case2

4.1.3 Results for Different Compute node but the same Network

Here two VMs are on different compute node but the same network,therefore packets were traced on the two different compute nodes.
On the compute node where the client VM is located, packets were traced on

interfaces qvo-vvv and int-br-eth7 of the br-int and phy-br-eth7 and eth7 of the br-eth7. Next, Network node interfaces were investigated if ICMP packets are passing through them, but there were no packets detected. Then on the compute node where the other VM is situated, traffic was tracked on interfaces eth7, phy-br-eth7, int-br-eth7 and qvo-zzz before reaching its destination VM.

The flow is illustrated in the figure 4.4:-

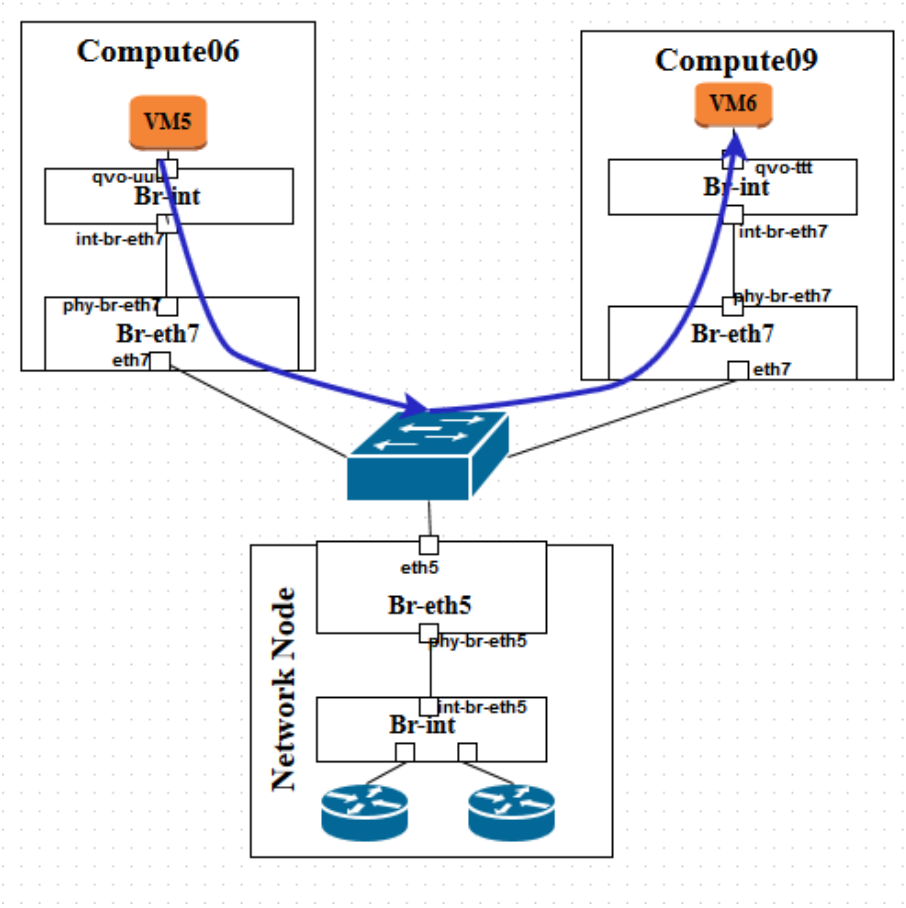

Figure 4.4: Traffic Flow for Case3

4.1.4 Results for Different Compute node and Different Network

Network traffic flow between VMs on different compute node and different network was investigated here. The result showed packets were passing through interfaces qvo-uuu, int-br-eth7, phy-br-eth7 and eth7 of client compute node, then they went to network node on interfaces of eth5, br-eth5, phy-br-eth5 and on int-br-eth5 and reached its destination compute node. On the destination node packets passed through eth7 to phy-br-eth5 and in the internal bridges. The packet flow is shown in figure 4.5:-

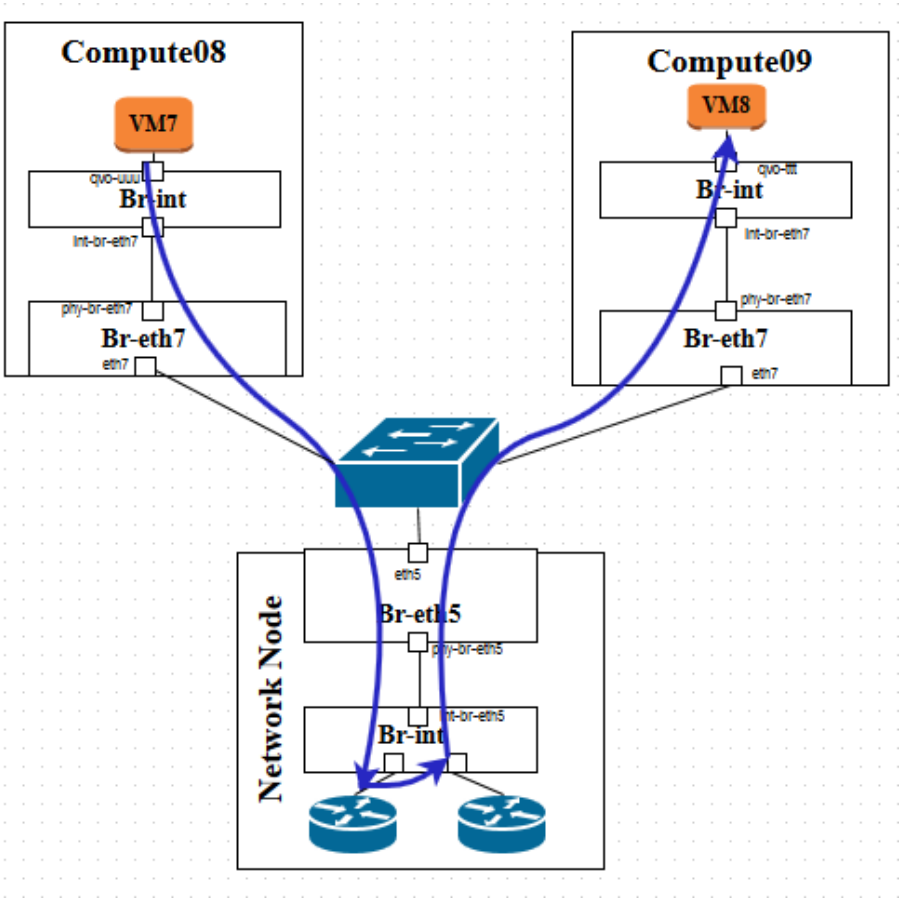

Figure 4.5: Traffic Flow for Case4

4.2 Results for Network Performance

This subsection explains the calculated average values of all network performance parameters considered in this project.

4.2.1 Results for Tiny-sized instances

The following subsection will present results for average TCP and UDP throughput, packet delay and packet loss for tiny-sized VMs representing all the scenarios. Only one pair of instances run at a time for measuing each parameter.

4.2.1.1 Average TCP Throughput

To measure TCP throughput, **IPERF** was executed for 15 minutes and data was collected every 5 seconds. The command was executed on the client side. While collecting data for one scenario, the other scenarios were not running.

Iperf Command for TCP traffic

```
iperf -c server_ip -i 5 -t 900
```

Figure 4.6 depicts the average TCP throughput found from client VMs for all cases mentioned in section 3.2. On this experiment IPERF run for 900 seconds that collected throughput for every 5 seconds and then average value is calculated. As it can be seen from the figure, the network performs quite

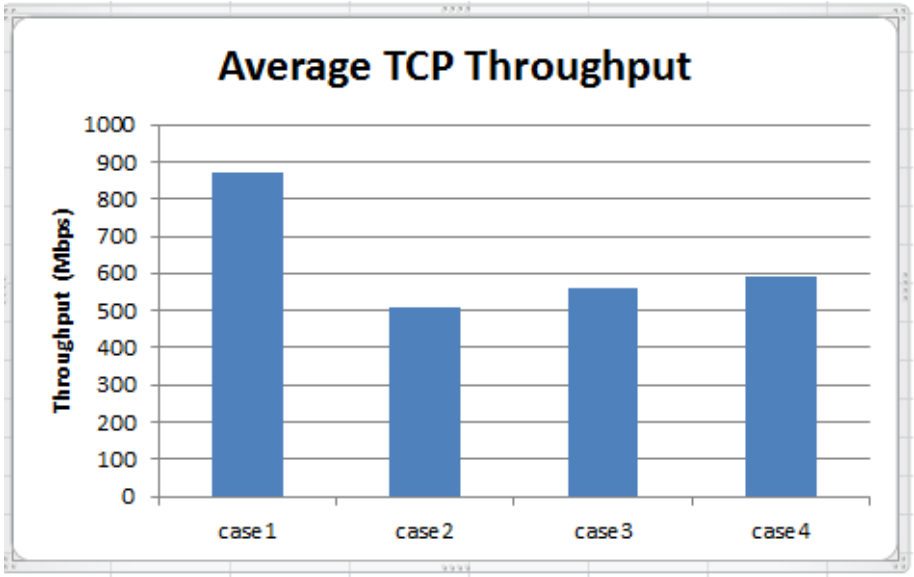

Figure 4.6: Average TCP throughput found for all scenarios

differently depending on instances locations. The first case has the highest average while the second case displays the lowest average.

4.2.1.2 Average UDP Throughput

In order to collect throughput and loss for UDP traffic, the following command was executed for 15 minutes and it reported data every 5 seconds.

Iperf Command for UDP traffic

```
iperf -u  -c server_ip -i 5 -t 900  -b 10G
```

The *–b* option is used in order to specify the total available bandwidth for accuracy purpose because by default IPERF benchmark tool uses 1.05Gbps for UDP traffic.

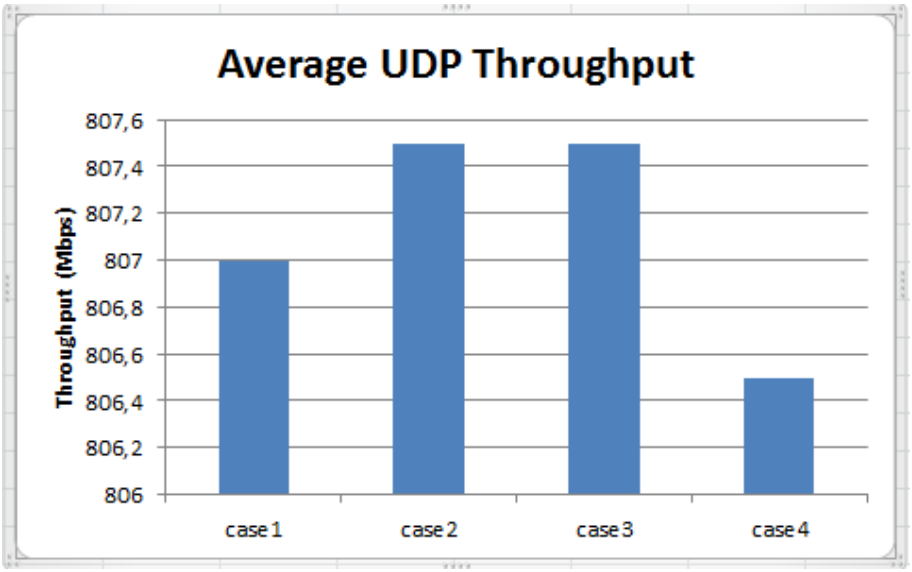

Figure 4.7: Average UDP throughput found for all scenarios

Figure 4.7 depicts the result of average UDP throughput for case1, case2, case3 and case4 respectively.

4.2.1.3 Average Packet Delay (Latency)

Ping command was executed on the client side for 1500 times in order to measure round-trip delay. During collection of data, no other processes were running on the VM. Figure 4.8 displays the average latency for each case considered for this project.

Ping command

```
1 ping -c 1500 server_ip
```

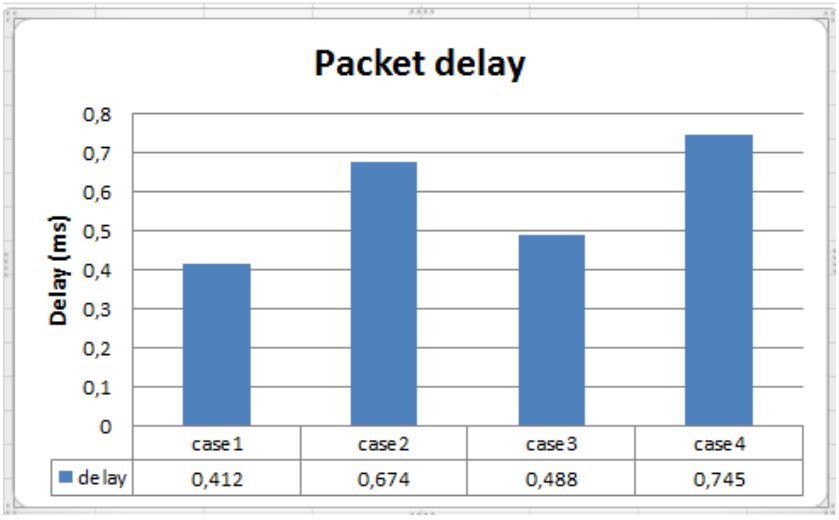

Figure 4.8: Average packet delay for all scenarios

4.2.1.4 Total Packet loss

Packet loss was obtained during the collection of UDP throughput. Figure 4.9 depicts packet loss for UDP packets. In case3, UDP packet loss was very high comparing to other cases addressed in this research work.

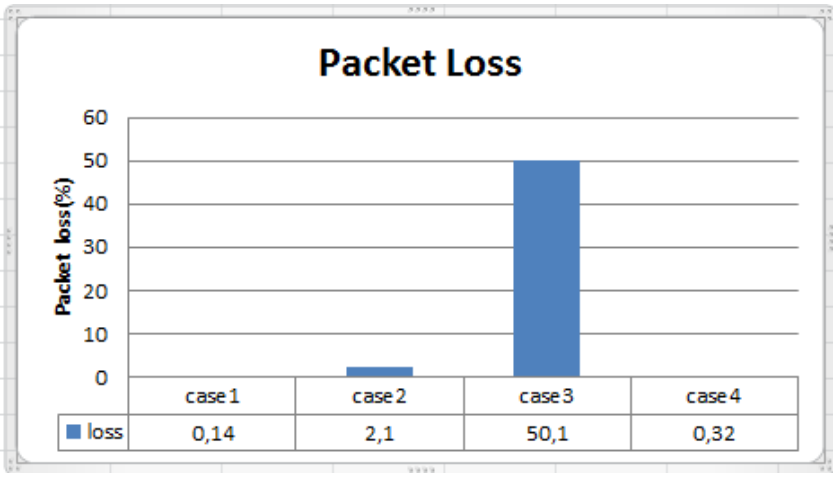

Figure 4.9: Total packet loss for all scenarios

4.2.2 Results for Medium-sized instances

The following subsection will present results for average TCP and UDP throughput, packet delay and packet loss for medium-sized VMs representing all the scenarios. When measuring the throughput, packet latency and packet loss, only one pair of instances run at a time.

4.2.2.1 Average TCP Throughput

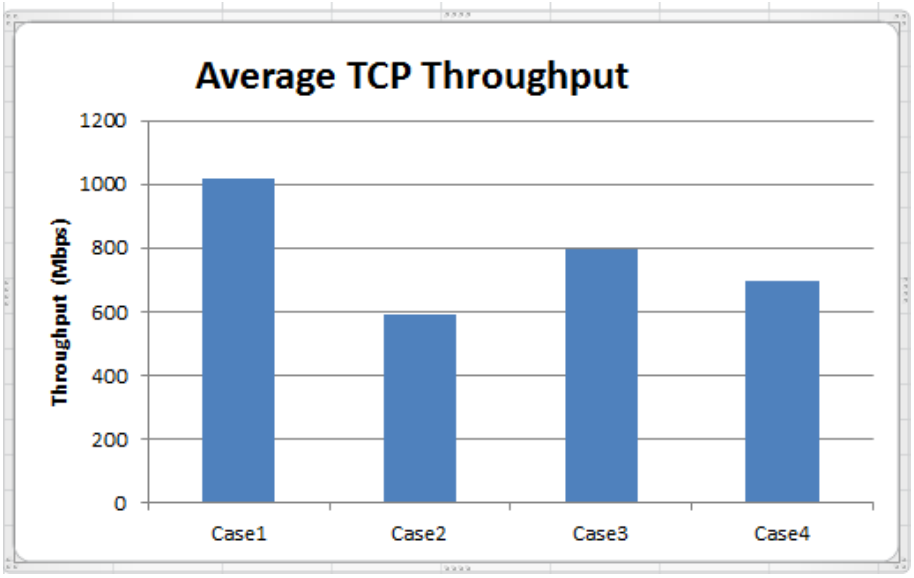

Figure 4.10: Average TCP throughput found for all scenarios under medium sized VMs

Figure 4.10 depicts average achieved TCP throughput for medium type of instances. As shown case1, case2, case3 and case4 attained 1017 Mbps, 591 Mbps, 798 Mbps and 693,5 Mbps respectively.

4.2.2.2 Average UDP Throughput

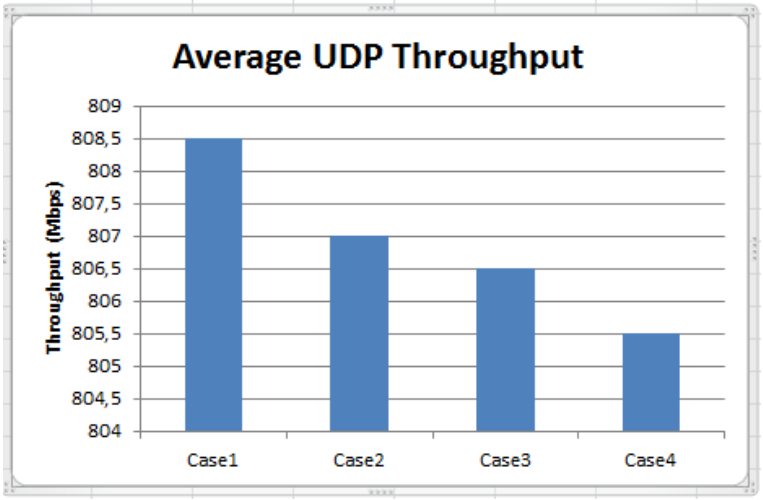

Figure 4.11: Average UDP throughput found for all scenarios under medium sized VMs

As can be seen from figure 4.11, the average UDP throughput obtained for all cases. It is shown that 808,5Mbps, 807Mbps, 806,5Mbps and 805,5Mbps for case1, case2, case3 and case4 respectively.

4.2.2.3 Average Packet Delay

Figure 4.12 shows the average packet delay for medium instances under case1, case2, case3 and case4 were 0,449ms, 0,741 ms, 0,526ms and 0,784ms respectively.

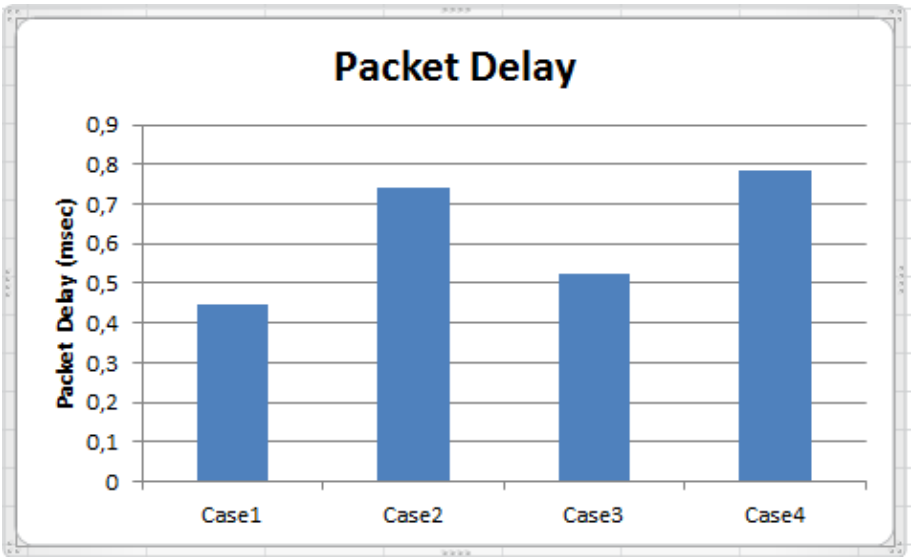

Figure 4.12: Average packet delayfor all scenarios under medium sized VMs

4.2.2.4 Total Packet loss

Packet loss for UDP traffic for the four differentcases is shown in figure **??**. During the whole experimental period, the measured packet loss for case1, case2, case3 and case4 are 0.12%,2.9%, 39% and 1.1% respectively.

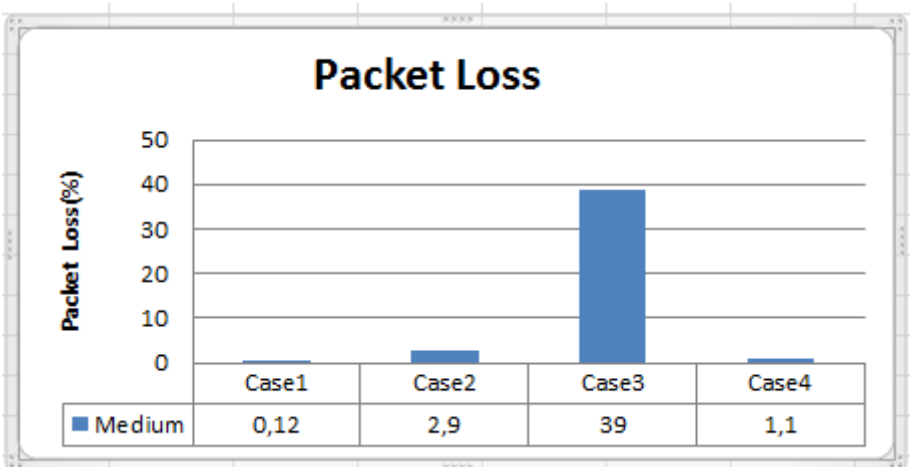

Figure 4.13: Total packet loss for all scenarios under medium sized VMs

4.2.3 Results for multiple tiny-sized VMs

In this experiment, more than one pair of instances were tested at the same time and on the same compute node having the same network. This helps to investigate the network performance when multiple VMs use the network resource at the same time, which is the scenario in real conditions. To automate running the VMs at the same time, iperf script was run by crontab.

4.2.3.1 Average TCP Throughput

Figure 4.14 depicts the average TCP throughput for multiple pairs of tiny sized instances.

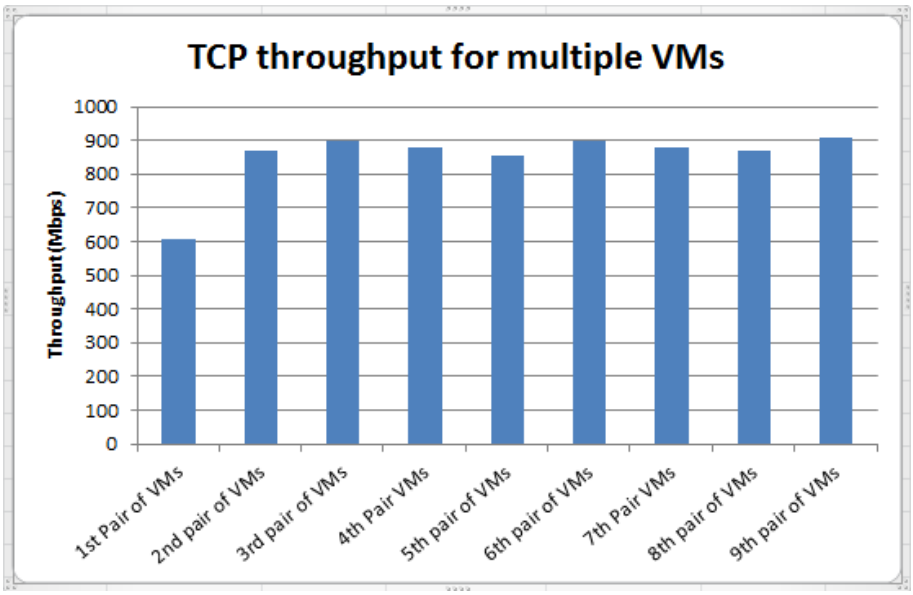

Figure 4.14: Average TCP throughput for each VM pairs

4.2.3.2 Average UDP Throughput

Figure 4.15 depicts the results of the average throughput for UDP traffic of each pair.

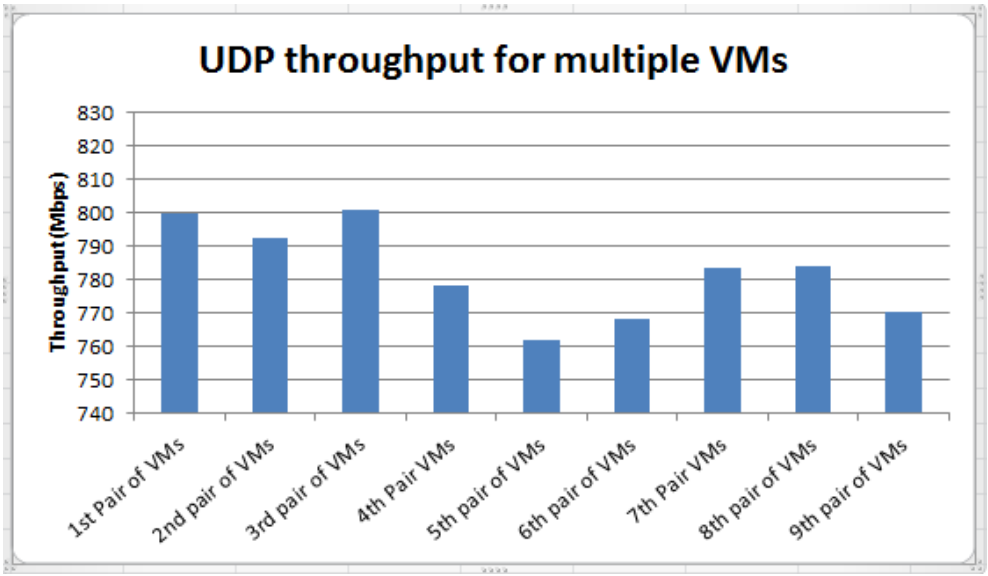

Figure 4.15: Average UDP throughput for each VM pairs

4.2.3.3 Average Packet Delay

Figure 4.16 illustrates the obtained result for average packet delay in milliseconds.

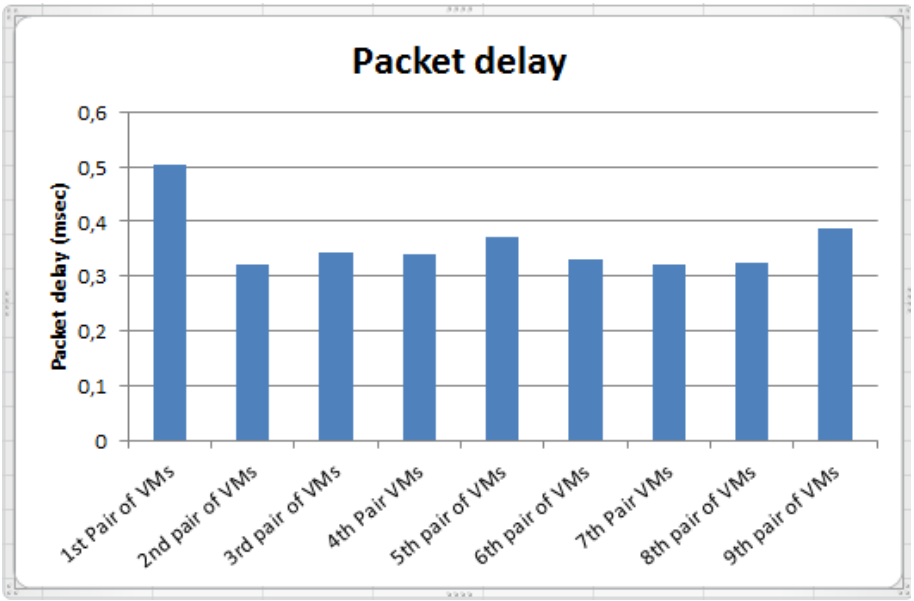

Figure 4.16: Average packet delay for each VM pairs

4.2.3.4 Total Packet loss

The measured packet loss for each pair of VMs is shown in figure 4.17.

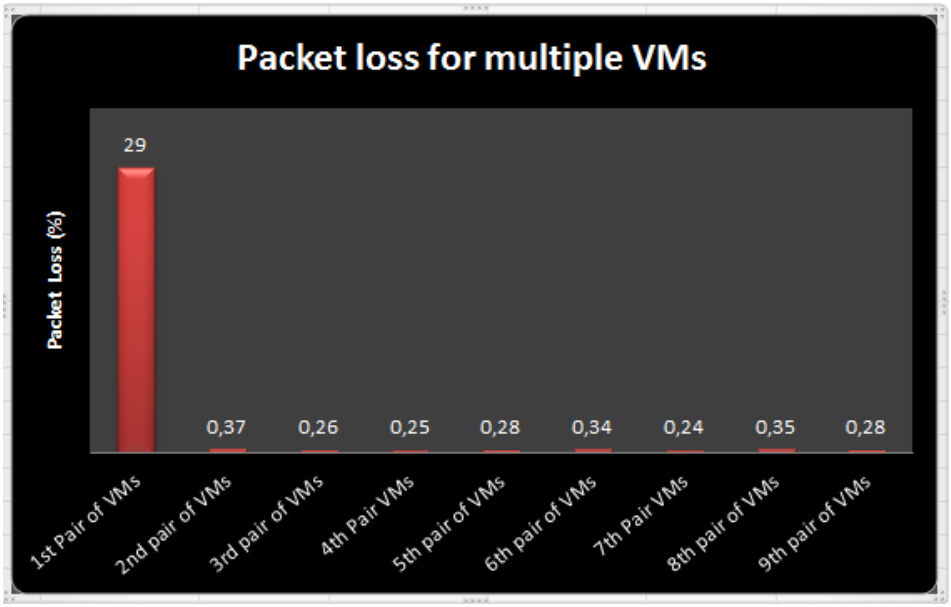

Figure 4.17: Total packet loss for each VM pairs

Chapter 5

Analysis

In this section, the attempt is to explain and elaborate the meaning of the results obtained. Different network performance metrics will be compared for different scenarios.

5.1 Tiny sized instances Comparison

There are four scenarios to compare and analyze for tiny flavored VMs. Case1 refers to VMs on same compute node and same network. Case2 refers to VMs on the same compute node but different network. On the other hand, Case3 refers to VMs on different compute node but same network, while Case4 refers to VMs on different compute node and different network The focus in this comparison is to evaluate TCP/UDP throughput, packet delay and packet loss.

5.1.1 TCP Throughput comparison between case1 and case2

Figure 5.1 shows the first value of TCP throughput collected every 5 seconds for 200 seconds. This is drawn to show how the throughput looks like along the time of collection. The throughput for VMs on the same compute node and network oscillates around 900Mbps while for VMs on the same compute node but different network is around 500Mbps.

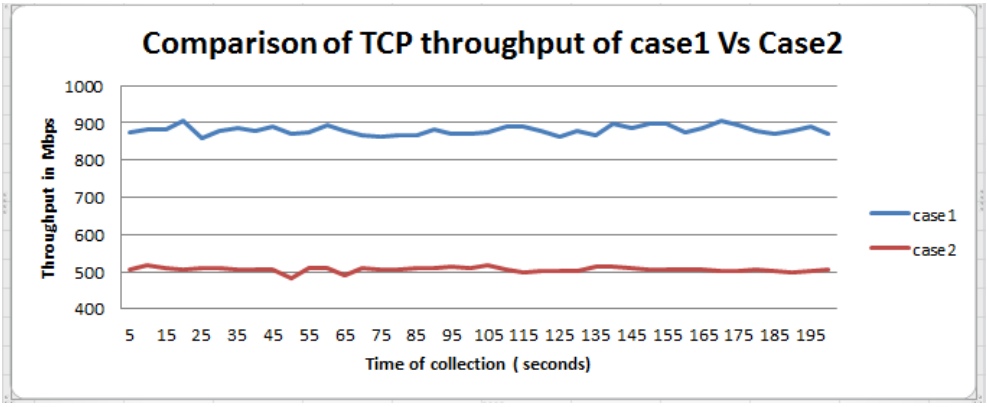

Figure 5.1: Comparing case1 vs case2 for TCP throughput

As it has been illustrated in section 4.2.1.1, the throughput for VMs on the same compute node and network is much higher than the TCP throughput for VMs on the same compute node and different network, i.e. while the first achieved an average throughput of 870Mbps, the later was 500Mbps. Therefore case 1 performs better than case2, i.e. VMs in case1 have more access to the network resources than VMs in case2.

5.1.2 UDP Throughput comparison between case1 and case2

Figure 5.2 shows the UDP throughput between case1 and case2. The UDP

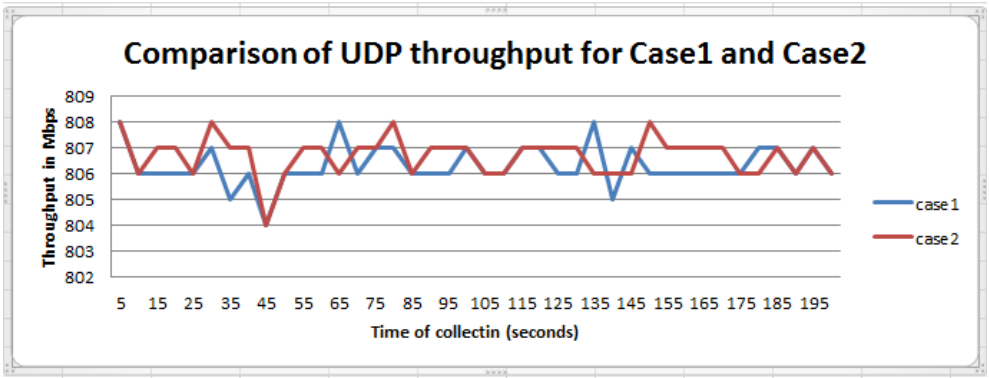

Figure 5.2: Comparing case1 vs case2 for UDP throughput

throughput for case1 and case2 varies in between the range of 804 and 808 Mbps. According to section 4.2.1.2, average UDP throughput for case1 and case2 was 807 Mbps and 807.5 Mbps respectively. From their average UDP values, there seems no considerable difference between instances whether they are on the same or different network as long as they are on the same compute node.

5.1.3 Packet Delay (Latency) comparison between case1 and case2

Figure 5.3 shows the average delay time obtained for VMs which are located on the same compute node and same network against VMs on same compute node but different network. Latency for VMs that are located on same compute

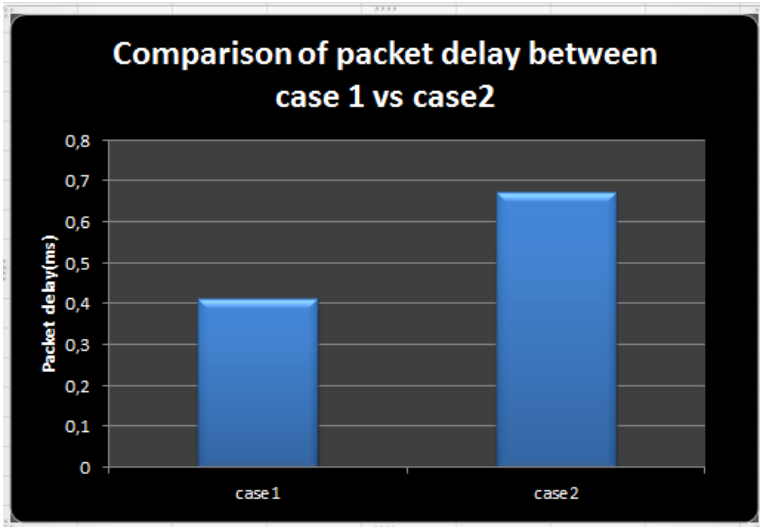

Figure 5.3: Comparing packet delay for case1 vs case2

node and the same network is lower than for VMs on same compute node but different network. Lower packet delay shows packets arrive at faster speed to their destination. This result is verified true from the previous TCP throughput. Higher throughput implies lower packet delay.

5.1.4 Packet loss comparison between case1 and case2

Packet loss for UDP traffic was measured using iperf tool for UDP traffic as illustrated in section 4.2.1.2.

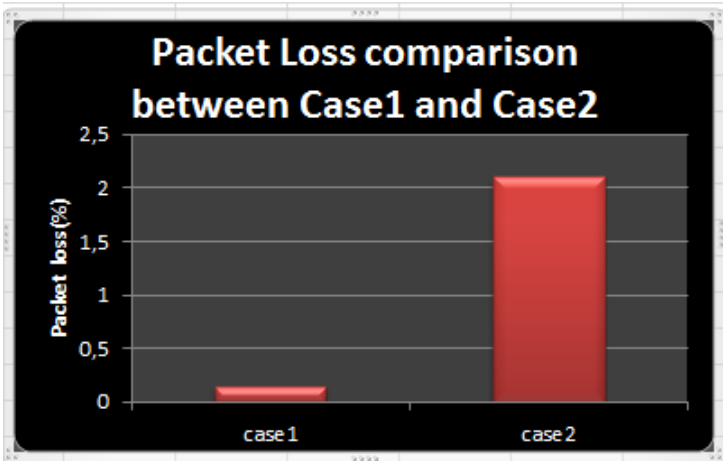

Figure 5.4: Comparing packet loss for case1 vs case2

Packet loss is higher in case2 than case1. Therefore VMs on the same compute node but different network perform less than VMs on the same node and network.

5.1.5 TCP Throughput comparison between case3 and case4

Figure 5.5 shows the TCP throughput comparison of case3 vs case4 collected every 5 seconds for about 200 seconds. Their values are almost the same whether they are on the same network or different network as long as they are on different compute node. This similarity is also confirmed by the results for average TCP throughput value as demonstrated in figure 4.2.1.1.

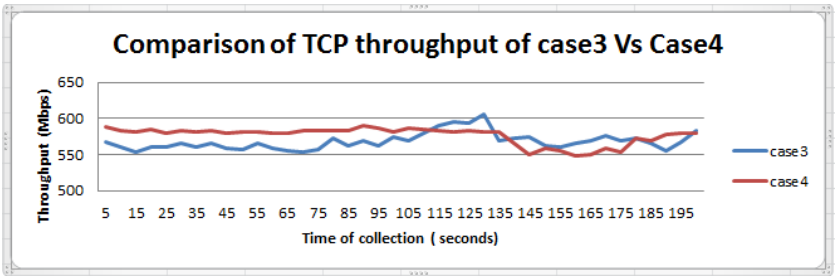

Figure 5.5: Comparing TCP throughput for case3 with case4

5.1.6 UDP Throughput comparison between case3 and case4

The throughput of UDP traffic for VMs on different compute node and same network or different network address lies between 803 Mbps and 808 Mbps. This clearly shows that in case of UDP traffic, the system performs the same no matter where VMs are located. The average values of those two cases as shown in section 4.2.1.2 have no significant differences.

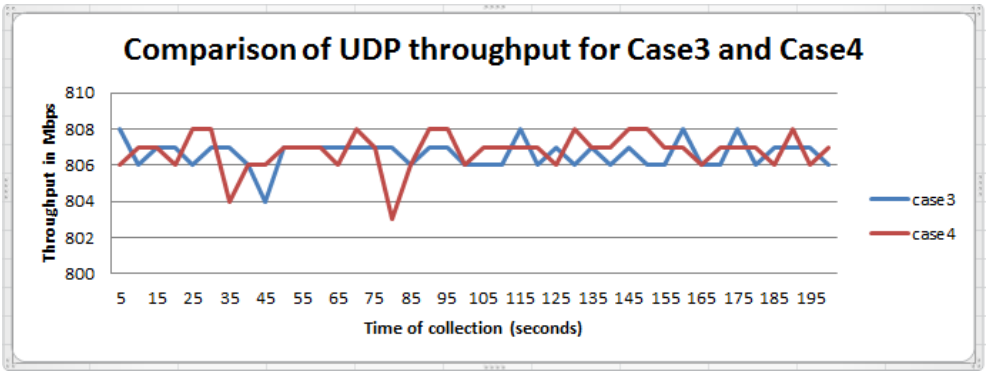

Figure 5.6: Comparing UDP throughput for case3 with case4

5.1.7 Packet Delay comparison between case3 and case4

As shown in figure 5.7 packet delay for TCP traffic is higher for VMs on different compute node and different network than on the different compute node but the same network. This result is as expected due to the fact that VMs on the same network communicate each other through virtual switches between the compute nodes while VMs on different network must go through the network node as demonstrated on section 4.4.

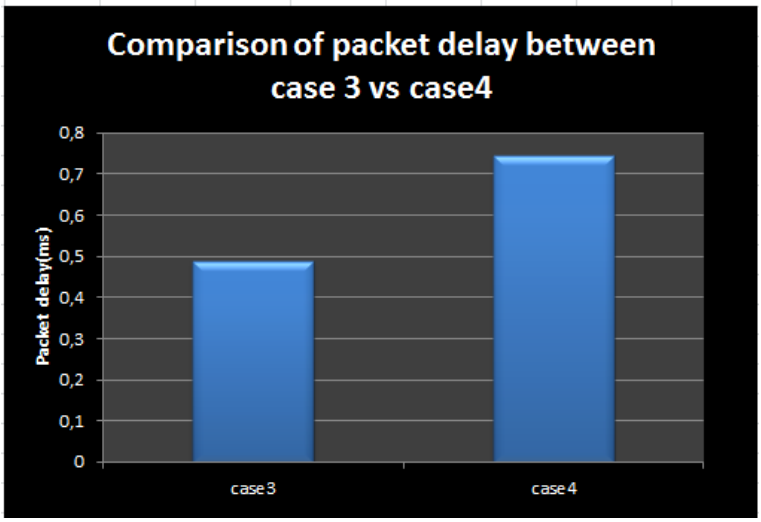

Figure 5.7: Comparing packet delay for case3 with case4

5.1.8 Packet Loss comparison between case3 and case4

Packet loss for case3 is considerably higher than for case4 as shown in figure 5.8. Thus, VMs which are on different compute node but the same network perform worse than VMs which are on different compute node and different network.

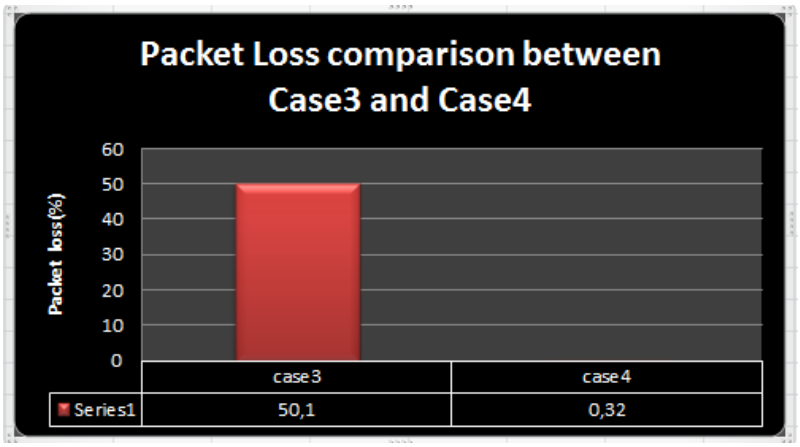

Figure 5.8: Comparing packet loss for case3 with case4

5.2 Medium sized instances Comparison

As was the case for tiny sized VMs, there are four scenarios for medium sized machines too. Case1 refers to VMs on same compute node and same network. Case2 refers to VMs on the same compute node but different network. On the other hand, Case3 refers to VMs on different compute node but same network, while Case4 refers to VMs on different compute node and different network.

5.2.1 TCP Throughput comparison between case1 and case2

Figure 5.9 compares TCP throughput between VMs on the same compute node having the same or different network. The throughput for case1 rises from 900Mbps to 1.1 Gbps and keeps constant while the throughput for case2 reaches only 700Mbps. Thus, case1 has better performance than case2.

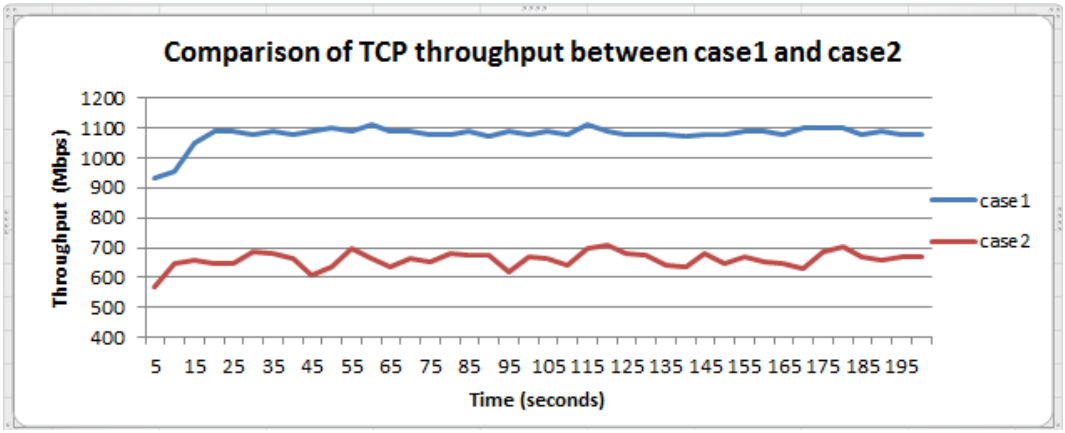

Figure 5.9: Comparing TCP throughput case1 with case2 for medium VMs

5.2.2 UDP Throughput comparison between case1 and case2

Figure 5.10 portrays UDP throughput for case1 and case2 measured every 5 seconds for 200 seconds. As it can be seen, there is no significant difference between them. Thus, in case of UDP traffic, VMs have the same performance whether they are on the the same or different network when they are on different compute node. This is also verified from their average UDP throughput as shown in figure 4.7.

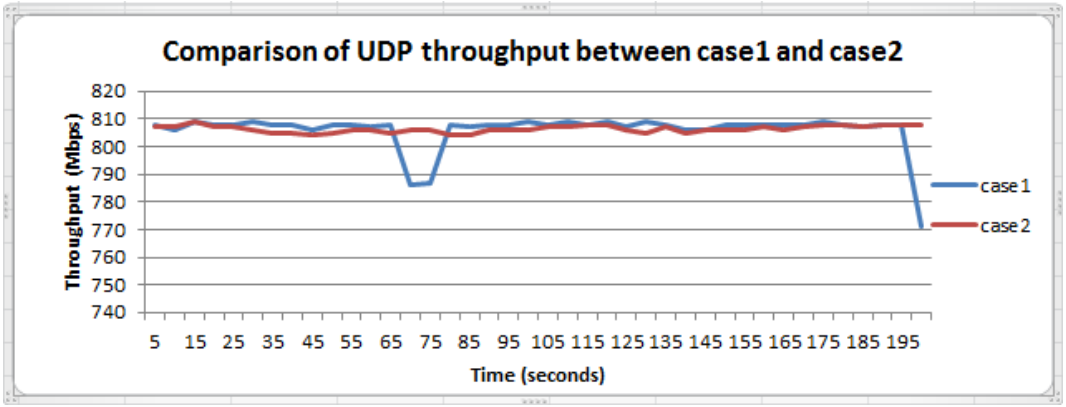

Figure 5.10: Comparing UDP throughput case1 with case2 for medium VMs

5.2.3 Packet delay comparison between case1 and case2

Figure 5.12 depicts the packet delay for case1 and case2. The result shows case2 has higher delay than case1. Accordingly, case1 has better performance than case2. The result is also as anticipated because when VMs are on different network, packet travels through network node to reach its destination.

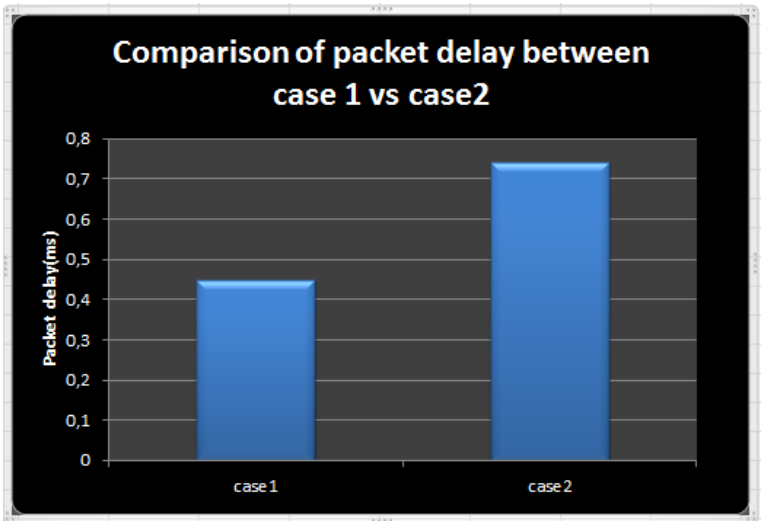

Figure 5.11: Comparing packet delay for case1 with case2

5.2.4 Packet Loss comparison between case1 and case2

Figure 5.12 depicts packet loss value for case1 and case2. The result illustrates that VMs on the same compute node and the same network has slightly better performance than when they are on the same compute node having different network.

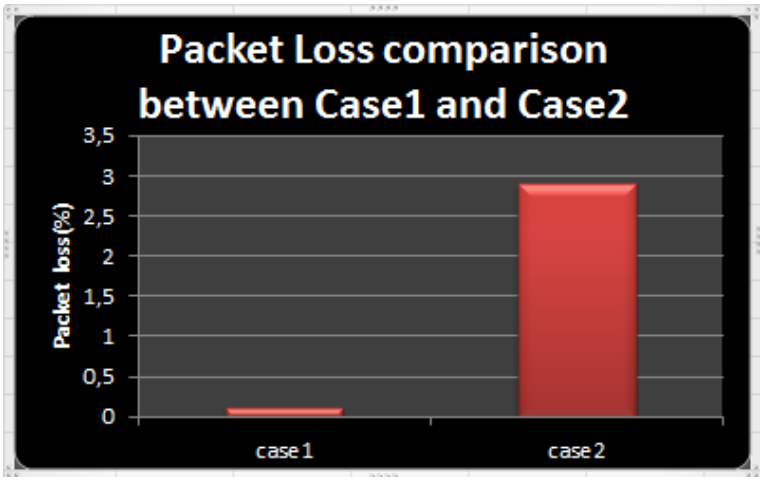

Figure 5.12: Comparing packet delay for case1 with case2

5.2.5 TCP Throughput comparison between case3 and case4

The TCP throughput for case3 is higher than case4 as shown in figure 5.13. This result is different to the case of tiny VMs. In fact, the result depends on how the two network is attached each other. Here tests were taken on the scenario as in figure 3.4 setup.

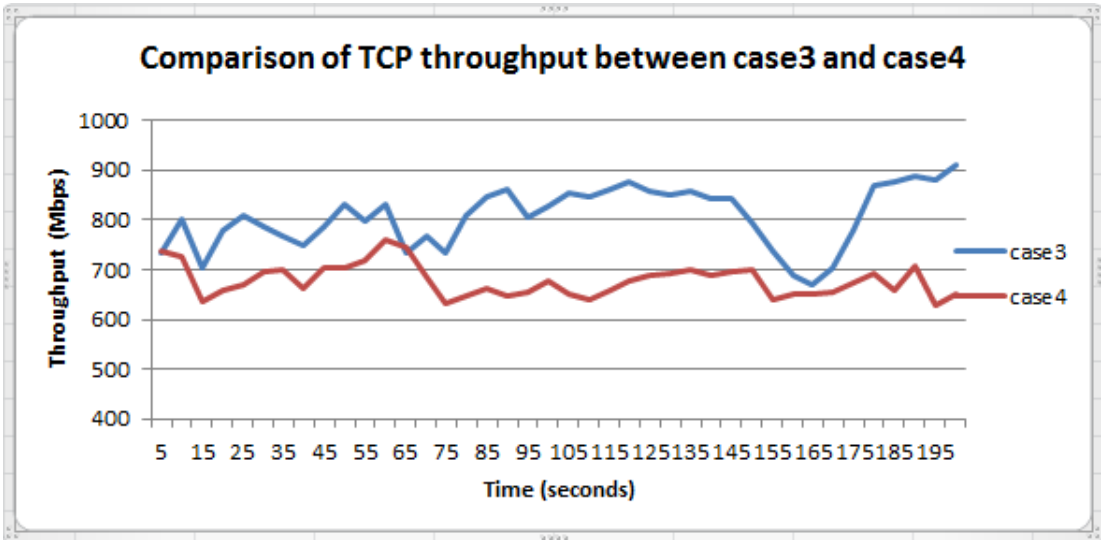

Figure 5.13: Comparing TCP throughput case3 with case4 for medium VMs

5.2.6 UDP Throughput comparison between case3 and case4

Figure 5.14 depicts the UDP throughput measured every 5 seconds for 200 seconds. There isn't significant difference between the values. Thus, both cases achieved the same UDP throughput.

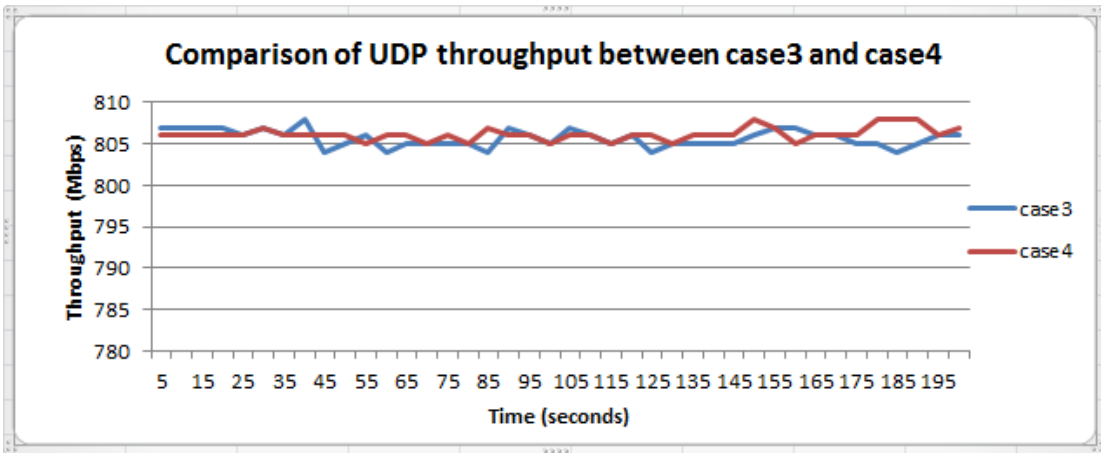

Figure 5.14: Comparing UDP throughput case3 with case4 for medium VMs

5.2.7 Packet Delay comparison between case3 and case4

Figure 5.15 illustrates packet delay for VMs on different compute node when they are on the same and different network. As can be seen, VMs located on different network have higher packet delay than when they are on the same network.

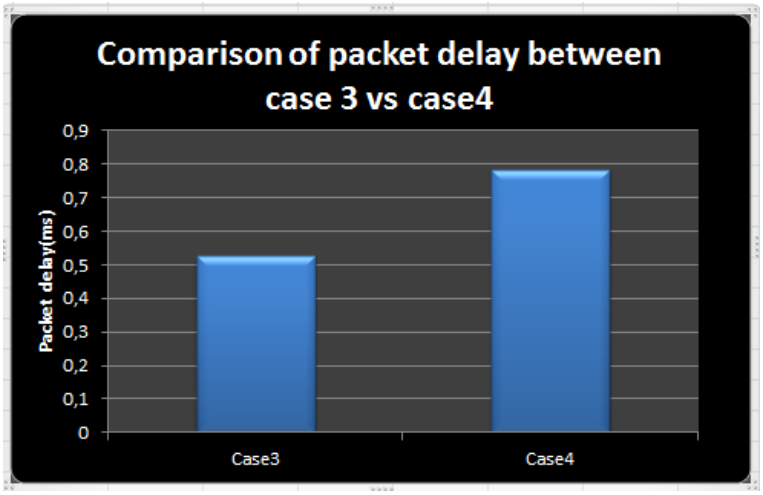

Figure 5.15: Comparing packet Delay case3 with case4 for medium VMs

5.2.8 Packet Loss comparison between case3 and case4

Figure 5.16 compares packet loss for case3 and case4. As it can be seen, packet loss for VMs on different compute node but the same network is higher than for VMs located on different compute node and network. Thus, case3 performs better than case4.

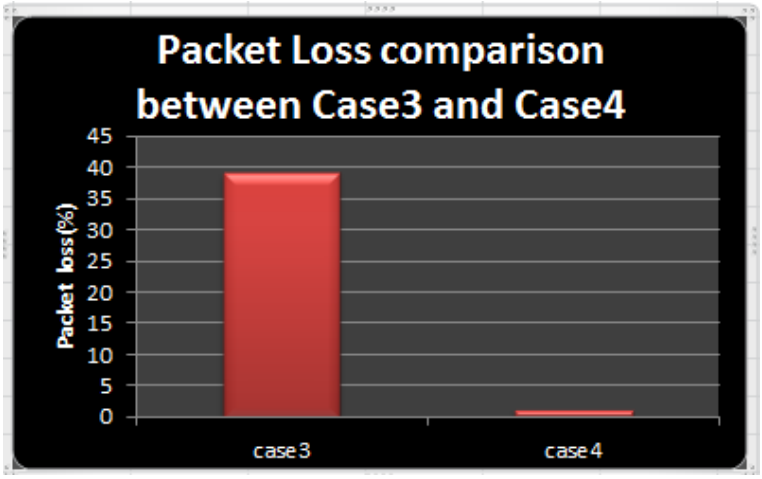

Figure 5.16: Comparing packet Loss case3 with case4 for medium VMs

Chapter 6

Discussion

OpenStack networking project (Neutron) which is based on software-defined networking (SDN) is a relatively new technology that provides ability to manage network resources through an abstraction layer and OpenVSwitch is used as its plugin for its network services which will enhance multi-tenancy for its users.

This research was carried out in the newly established Alto cloud computing infrastructure at HIOA network.

In this project, research has been made with an intention to investigate how the neutron shares the available network bandwidth among cloud users.

Pertaining to network bandwidth, OpenStack provided two options. One, each machine will have a predetermined amount of bandwidth. Two, the bandwidth is left for any available machine to use as needed. The second option means that machines will practically share the available bandwidth among themselves. This gives, in principle, an unlimited network bandwidth for the active machines unless there is a real congestion, which happens only when there are fairly many machines.

The specific purpose of this research was to investigate what the real practical network performance of OpenStack is in the second scenario, i.e., in the unlimited bandwidth scenario.

The first experimental setup was to study the traffic characteristics. Accordingly, it was arranged that the OpenStack that was deployed at HIOA, have four different network flow patterns.

- Virtual machines located on same compute node with the same network.
- Virtual machines located on same compute node with different network.
- Virtual machines located on different compute node with the same network.

- Virtual machines located on different compute node with different network.

In the scenario that VMs are located on same compute node with the same network, icmp packets were detected at the data link layer but not at the network layer. On the other hand, when VMs were located on same compute node with different network, icmp packets were detected at both data link and network layer. This means that on the latter scenario, a router was involved.

The same detection of icmp packets, indicating the existence of a router was also observed on case of VMs located on different compute node with different network. VMs located on different compute node with the same network did not indicate the existence of a router.

The results found from this led us to conclude that when VMs are on the same compute node having the same network, trafficflow is within the compute node whereas the traffic goes out of compute node to network node when VMs areon different network even though they are on the same compute Node.

In the second phase, studying the network performance, the above four different setup scenarios were also used, on tiny and medium sized instances.

So this gives a total of eight scenarios, where the important parameters investigated were:-

- TCP throughput
- UDP throughput
- Packet delay
- Datagram loss

From the network performance study, when two tiny sized VMs are located on the same compute node and same network, they perform better than when they are on the same compute node but different network. Thus, the measurement showed that VMs on the same compute node and same network achieved an average TCP throughput of 42% better than VMs on same compute node but different network.

Where as in the case where VMs are located on different network, they perform better when they are on different compute node than when they are on the same compute node. On the other hand, there is no significant difference between their average UDP throughputs.

In the case of packet delay, VMs on the same compute node but different network have higher values than VMs that are located on the same compute node and same network. This result is expected because when VMs are on different

network, traffic flows through more hops than when they are on the same network.

The measurement of packet (datagram) loss shows that the highest recorded packet loss obtained from VMs located on different compute node but same network. This result seems contradictory with the results of UDP throughput. This is because, if UDP throughput is similar between the two cases, so should their UDP loss be similar too. But, the result deviated from expectation. Therefore, a more thorough investigation becomes necessary to find the root cause of this deviation. First, the error may be due to defect in the VMs. For this case, different VMs were created and tested several times, but the result remained the same. Next, the compute node was changed several times, and the tests done. Still, the result remained the same. Then, the VMs were tested in a different scenario, and the results were confirming that there was no defect on the VMs or the compute nodes. Finally, the VMs were attached to a floating ip and the tests conducted.This is because, in this research, only private IPs were used throughout the whole experiment. This time, i.e. using floating ips, the loss came significantly down, eventhough the delay increased as expected. But this decrease in loss does not clarify why the previous losses were very high. More investigation is needed to conclusively explain this result,which could not be covered in the time scope of this thesis.

For the medium sized VMs, the same pattern of result was observed as for the tiny sized VMs. Except for the TCP throughput performance is better on the case when VMs are located on different compute node and different network than when VMs are on different compute node but the same network. This is because the test was done on a scenario where the two network are attached with two routers unlike on tiny VMs, where the two network is connected with one router. Of course, the difference of values are somewhat larger between medium sized VMs than the tiny ones.

From the observed results, latency is higher for VMs that are situated on different network independent of on which compute node they are located.

In case of packet loss, VMs on same compute node has less packet loss than VMs on different compute node.

In order to study sharing of bandwith within the same compute node, multiple VM pairs on the same network, were tested. Then the result showed that they attained almost the same amount TCP and UDP throughput, packet delay and packet loss except for one VM pair. This exception could be due to system debugs because its result was persistant for all parameters.

During the experiment, it was noticed, in most of the cases, that TCP throughput in case of small instances and medium instances is much more less than UDP throughput. TCP throughput can be affected by several factors like TCP window size or network congestion. However in this experiment it is hard to

say there is network congestion because the cloud infrastructure is being used only by few people so far.

In this research, there were certain limitations. This study could have been expanded by including measurements for congested environments for all the four scenarios considered. However it was unable to be done due to resources limitations and sharing resources other students who were involved in order to carry their research later on.

Chapter 7

Conclusion and Future work

7.1 Conclusion

Owing to its importance and impact on improving network and distributed services, there is an ongoing research and innovation in cloud computing. As new innovations arrive, it is tantamount to evaluate new technologies applied on cloud computing environment, so that to enhance the correct understanding about the new technology.

This research investigated the possible internal traffic flow pattern and evaluated network performance of each pattern on OpenStack cloud computing environment.

Openstack falls into this category of new arrivals in cloud computing. Thus, this research aimed to add some contribution towards understanding the detail workings of Openstack. To that end, it investigated the possible internal traffic flow pattern and evaluated network performance of each pattern on OpenStack cloud computing environment. From the investigation, it can be confirmed that when Virtual machines (VMs) with private IPs are located on the same network, then they only use switches in order to communicate with each other independent of their location on the compute nodes.

The results showed that the location of machines in terms of compute node and network address matters for the network performance. Thus, when VMs are on the same compute node and the same network , they perform better than other scenarios. This is because the transmission path, for example, is shorter (in case of delay) than the other scenarios.

In OpenStack, bandwidth is unlimited in principle. What exactly is the effect of this unlimited bandwidth on performance? Since it is intuitive that network performance cannot be unlimited in practice, what exactly did Openstack provide by making unlimited bandwidth available? This needed an investigation to understand, and thus the investigation on network performance was conducted. And, the results from the study of network performance

showed that, by providing unlimited network bandwidth, OpenStack didn't assure unlimited network performance. Rather it ensured that there will be no network bandwidth bottleneck.

The results also showed that the existing Alto OpenStack cloud computing is scalable, a conclusion drawn due to the fact that there is high network capacity. By the scope of this research, it is difficult to predict the network performance. Therefore in order to evaluate predictability of Alto more study is needed.

It is expected that OpenStack users in general and HIOA which has deployed it for practical use in particular, will benefit from this research.

7.2 Future work

In this research, unforeseen results have been seen and unanswered questions were popped up. Having experienced the unknown challenges as well as considering the importance of dealing with some problems, it can be suggested further research work on the following events:-

1. Since Neutron gives higher bandwidth for medium-sized than for tiny VMs, it would be important to investigate CPU and memory usage of VMs.

2. Since Alto infrastructure has a very huge network capacity and VMs attained only limited throughput, it is important to test its performance under congested environment for the four different scenarios considered in this project in order to further study predictability of the network performance in short and long term expansion of Alto.

3. Since Neutron gives lower performance in terms of bandwidth for each VM, it would be important to study how to improve its network performance.

Appendix A

Detailed results from performance experiments

Results for Tiny VMs case1

```
TCP Traffic
------------------------------------------------------------
Client connecting to 192.168.1.4, TCP port 5001
TCP window size: 23.5 KByte (default)
------------------------------------------------------------
[  3] local 192.168.1.2 port 49412 connected with 192.168.1.4 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   521 MBytes   875 Mbits/sec
[  3]  5.0-10.0 sec   525 MBytes   881 Mbits/sec
[  3] 10.0-15.0 sec   526 MBytes   882 Mbits/sec
[  3] 15.0-20.0 sec   540 MBytes   906 Mbits/sec
[  3] 20.0-25.0 sec   512 MBytes   859 Mbits/sec
[  3] 25.0-30.0 sec   523 MBytes   878 Mbits/sec
[  3] 30.0-35.0 sec   528 MBytes   885 Mbits/sec
[  3] 35.0-40.0 sec   524 MBytes   880 Mbits/sec
[  3] 40.0-45.0 sec   530 MBytes   889 Mbits/sec
[  3] 45.0-50.0 sec   518 MBytes   869 Mbits/sec
[  3] 50.0-55.0 sec   520 MBytes   873 Mbits/sec
[  3] 55.0-60.0 sec   532 MBytes   892 Mbits/sec
[  3] 60.0-65.0 sec   523 MBytes   877 Mbits/sec
[  3] 65.0-70.0 sec   516 MBytes   867 Mbits/sec
[  3] 70.0-75.0 sec   514 MBytes   862 Mbits/sec
[  3] 75.0-80.0 sec   516 MBytes   865 Mbits/sec
[  3] 80.0-85.0 sec   516 MBytes   865 Mbits/sec
[  3] 85.0-90.0 sec   526 MBytes   883 Mbits/sec
[  3] 90.0-95.0 sec   519 MBytes   871 Mbits/sec
[  3] 95.0-100.0 sec   518 MBytes   870 Mbits/sec
[  3] 100.0-105.0 sec   520 MBytes   873 Mbits/sec
[  3] 105.0-110.0 sec   530 MBytes   889 Mbits/sec
[  3] 110.0-115.0 sec   531 MBytes   891 Mbits/sec
[  3] 115.0-120.0 sec   524 MBytes   878 Mbits/sec
[  3] 120.0-125.0 sec   515 MBytes   864 Mbits/sec
[  3] 125.0-130.0 sec   523 MBytes   877 Mbits/sec
[  3] 130.0-135.0 sec   517 MBytes   867 Mbits/sec
[  3] 135.0-140.0 sec   536 MBytes   898 Mbits/sec
[  3] 140.0-145.0 sec   528 MBytes   885 Mbits/sec
[  3] 145.0-150.0 sec   534 MBytes   896 Mbits/sec
[  3] 150.0-155.0 sec   535 MBytes   898 Mbits/sec
[  3] 155.0-160.0 sec   522 MBytes   876 Mbits/sec
[  3] 160.0-165.0 sec   528 MBytes   886 Mbits/sec
[  3] 165.0-170.0 sec   541 MBytes   907 Mbits/sec
[  3] 170.0-175.0 sec   532 MBytes   892 Mbits/sec
[  3] 175.0-180.0 sec   524 MBytes   880 Mbits/sec
[  3] 180.0-185.0 sec   519 MBytes   871 Mbits/sec
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[  3] 185.0-190.0 sec   524 MBytes   880 Mbits/sec
[  3] 190.0-195.0 sec   530 MBytes   890 Mbits/sec
[  3] 195.0-200.0 sec   519 MBytes   870 Mbits/sec
[  3] 200.0-205.0 sec   524 MBytes   880 Mbits/sec
[  3] 205.0-210.0 sec   522 MBytes   876 Mbits/sec
[  3] 210.0-215.0 sec   514 MBytes   862 Mbits/sec
[  3] 215.0-220.0 sec   517 MBytes   867 Mbits/sec
[  3] 220.0-225.0 sec   529 MBytes   888 Mbits/sec
[  3] 225.0-230.0 sec   520 MBytes   873 Mbits/sec
[  3] 230.0-235.0 sec   513 MBytes   861 Mbits/sec
[  3] 235.0-240.0 sec   533 MBytes   895 Mbits/sec
[  3] 240.0-245.0 sec   521 MBytes   874 Mbits/sec
[  3] 245.0-250.0 sec   520 MBytes   872 Mbits/sec
[  3] 250.0-255.0 sec   515 MBytes   863 Mbits/sec
[  3] 255.0-260.0 sec   521 MBytes   874 Mbits/sec
[  3] 260.0-265.0 sec   521 MBytes   874 Mbits/sec
[  3] 265.0-270.0 sec   520 MBytes   873 Mbits/sec
[  3] 270.0-275.0 sec   527 MBytes   884 Mbits/sec
[  3] 275.0-280.0 sec   524 MBytes   880 Mbits/sec
[  3] 280.0-285.0 sec   525 MBytes   881 Mbits/sec
[  3] 285.0-290.0 sec   521 MBytes   875 Mbits/sec
[  3] 290.0-295.0 sec   533 MBytes   894 Mbits/sec
[  3] 295.0-300.0 sec   524 MBytes   879 Mbits/sec
[  3] 300.0-305.0 sec   528 MBytes   885 Mbits/sec
[  3] 305.0-310.0 sec   523 MBytes   877 Mbits/sec
[  3] 310.0-315.0 sec   525 MBytes   880 Mbits/sec
[  3] 315.0-320.0 sec   524 MBytes   879 Mbits/sec
[  3] 320.0-325.0 sec   535 MBytes   897 Mbits/sec
[  3] 325.0-330.0 sec   518 MBytes   870 Mbits/sec
[  3] 330.0-335.0 sec   516 MBytes   866 Mbits/sec
[  3] 335.0-340.0 sec   520 MBytes   873 Mbits/sec
[  3] 340.0-345.0 sec   524 MBytes   880 Mbits/sec
[  3] 345.0-350.0 sec   524 MBytes   880 Mbits/sec
[  3] 350.0-355.0 sec   520 MBytes   872 Mbits/sec
[  3] 355.0-360.0 sec   517 MBytes   867 Mbits/sec
[  3] 360.0-365.0 sec   517 MBytes   867 Mbits/sec
[  3] 365.0-370.0 sec   522 MBytes   875 Mbits/sec
[  3] 370.0-375.0 sec   523 MBytes   878 Mbits/sec
[  3] 375.0-380.0 sec   516 MBytes   866 Mbits/sec
[  3] 380.0-385.0 sec   514 MBytes   862 Mbits/sec
[  3] 385.0-390.0 sec   519 MBytes   870 Mbits/sec
[  3] 390.0-395.0 sec   518 MBytes   868 Mbits/sec
[  3] 395.0-400.0 sec   517 MBytes   868 Mbits/sec
[  3] 400.0-405.0 sec   517 MBytes   868 Mbits/sec
[  3] 405.0-410.0 sec   521 MBytes   874 Mbits/sec
[  3] 410.0-415.0 sec   528 MBytes   886 Mbits/sec
[  3] 415.0-420.0 sec   530 MBytes   890 Mbits/sec
[  3] 420.0-425.0 sec   528 MBytes   886 Mbits/sec
[  3] 425.0-430.0 sec   520 MBytes   872 Mbits/sec
[  3] 430.0-435.0 sec   527 MBytes   885 Mbits/sec
[  3] 435.0-440.0 sec   524 MBytes   879 Mbits/sec
[  3] 440.0-445.0 sec   526 MBytes   883 Mbits/sec
[  3] 445.0-450.0 sec   513 MBytes   861 Mbits/sec
[  3] 450.0-455.0 sec   523 MBytes   877 Mbits/sec
[  3] 455.0-460.0 sec   523 MBytes   878 Mbits/sec
[  3] 460.0-465.0 sec   522 MBytes   876 Mbits/sec
[  3] 465.0-470.0 sec   522 MBytes   876 Mbits/sec
[  3] 470.0-475.0 sec   530 MBytes   890 Mbits/sec
[  3] 475.0-480.0 sec   530 MBytes   889 Mbits/sec
[  3] 480.0-485.0 sec   539 MBytes   904 Mbits/sec
[  3] 485.0-490.0 sec   522 MBytes   875 Mbits/sec
[  3] 490.0-495.0 sec   518 MBytes   868 Mbits/sec
[  3] 495.0-500.0 sec   524 MBytes   878 Mbits/sec
[  3] 500.0-505.0 sec   528 MBytes   885 Mbits/sec
[  3] 505.0-510.0 sec   515 MBytes   864 Mbits/sec
[  3] 510.0-515.0 sec   516 MBytes   866 Mbits/sec
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```
[  3] 515.0-520.0 sec   513 MBytes   861 Mbits/sec
[  3] 520.0-525.0 sec   513 MBytes   861 Mbits/sec
[  3] 525.0-530.0 sec   523 MBytes   877 Mbits/sec
[  3] 530.0-535.0 sec   514 MBytes   862 Mbits/sec
[  3] 535.0-540.0 sec   509 MBytes   854 Mbits/sec
[  3] 540.0-545.0 sec   518 MBytes   870 Mbits/sec
[  3] 545.0-550.0 sec   515 MBytes   863 Mbits/sec
[  3] 550.0-555.0 sec   523 MBytes   878 Mbits/sec
[  3] 555.0-560.0 sec   516 MBytes   865 Mbits/sec
[  3] 560.0-565.0 sec   521 MBytes   875 Mbits/sec
[  3] 565.0-570.0 sec   526 MBytes   882 Mbits/sec
[  3] 570.0-575.0 sec   516 MBytes   866 Mbits/sec
[  3] 575.0-580.0 sec   520 MBytes   873 Mbits/sec
[  3] 580.0-585.0 sec   511 MBytes   857 Mbits/sec
[  3] 585.0-590.0 sec   521 MBytes   874 Mbits/sec
[  3] 590.0-595.0 sec   531 MBytes   891 Mbits/sec
[  3] 595.0-600.0 sec   527 MBytes   884 Mbits/sec
[  3] 600.0-605.0 sec   531 MBytes   891 Mbits/sec
[  3] 605.0-610.0 sec   518 MBytes   869 Mbits/sec
[  3] 610.0-615.0 sec   530 MBytes   889 Mbits/sec
[  3] 615.0-620.0 sec   520 MBytes   873 Mbits/sec
[  3] 620.0-625.0 sec   511 MBytes   857 Mbits/sec
[  3] 625.0-630.0 sec   518 MBytes   868 Mbits/sec
[  3] 630.0-635.0 sec   514 MBytes   863 Mbits/sec
[  3] 635.0-640.0 sec   515 MBytes   864 Mbits/sec
[  3] 640.0-645.0 sec   518 MBytes   870 Mbits/sec
[  3] 645.0-650.0 sec   527 MBytes   884 Mbits/sec
[  3] 650.0-655.0 sec   514 MBytes   863 Mbits/sec
[  3] 655.0-660.0 sec   520 MBytes   872 Mbits/sec
[  3] 660.0-665.0 sec   517 MBytes   867 Mbits/sec
[  3] 665.0-670.0 sec   523 MBytes   878 Mbits/sec
[  3] 670.0-675.0 sec   521 MBytes   874 Mbits/sec
[  3] 675.0-680.0 sec   522 MBytes   876 Mbits/sec
[  3] 680.0-685.0 sec   524 MBytes   880 Mbits/sec
[  3] 685.0-690.0 sec   515 MBytes   864 Mbits/sec
[  3] 690.0-695.0 sec   522 MBytes   875 Mbits/sec
[  3] 695.0-700.0 sec   527 MBytes   884 Mbits/sec
[  3] 700.0-705.0 sec   534 MBytes   896 Mbits/sec
[  3] 705.0-710.0 sec   533 MBytes   894 Mbits/sec
[  3] 710.0-715.0 sec   524 MBytes   879 Mbits/sec
[  3] 715.0-720.0 sec   525 MBytes   881 Mbits/sec
[  3] 720.0-725.0 sec   533 MBytes   894 Mbits/sec
[  3] 725.0-730.0 sec   531 MBytes   891 Mbits/sec
[  3] 730.0-735.0 sec   518 MBytes   870 Mbits/sec
[  3] 735.0-740.0 sec   532 MBytes   892 Mbits/sec
[  3] 740.0-745.0 sec   526 MBytes   883 Mbits/sec
[  3] 745.0-750.0 sec   530 MBytes   889 Mbits/sec
[  3] 750.0-755.0 sec   526 MBytes   882 Mbits/sec
[  3] 755.0-760.0 sec   516 MBytes   866 Mbits/sec
[  3] 760.0-765.0 sec   526 MBytes   883 Mbits/sec
[  3] 765.0-770.0 sec   521 MBytes   874 Mbits/sec
[  3] 770.0-775.0 sec   528 MBytes   887 Mbits/sec
[  3] 775.0-780.0 sec   524 MBytes   880 Mbits/sec
[  3] 780.0-785.0 sec   535 MBytes   898 Mbits/sec
[  3] 785.0-790.0 sec   516 MBytes   865 Mbits/sec
[  3] 790.0-795.0 sec   529 MBytes   888 Mbits/sec
[  3] 795.0-800.0 sec   526 MBytes   883 Mbits/sec
[  3] 800.0-805.0 sec   518 MBytes   868 Mbits/sec
[  3] 805.0-810.0 sec   514 MBytes   862 Mbits/sec
[  3] 810.0-815.0 sec   520 MBytes   873 Mbits/sec
[  3] 815.0-820.0 sec   521 MBytes   874 Mbits/sec
[  3] 820.0-825.0 sec   518 MBytes   869 Mbits/sec
[  3] 825.0-830.0 sec   518 MBytes   869 Mbits/sec
[  3] 830.0-835.0 sec   532 MBytes   893 Mbits/sec
[  3] 835.0-840.0 sec   517 MBytes   867 Mbits/sec
[  3] 840.0-845.0 sec   518 MBytes   868 Mbits/sec
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[  3] 845.0-850.0 sec   515 MBytes   865 Mbits/sec
[  3] 850.0-855.0 sec   524 MBytes   879 Mbits/sec
[  3] 855.0-860.0 sec   537 MBytes   900 Mbits/sec
[  3] 860.0-865.0 sec   528 MBytes   887 Mbits/sec
[  3] 865.0-870.0 sec   519 MBytes   871 Mbits/sec
[  3] 870.0-875.0 sec   527 MBytes   885 Mbits/sec
[  3] 875.0-880.0 sec   530 MBytes   890 Mbits/sec
[  3] 880.0-885.0 sec   523 MBytes   878 Mbits/sec
[  3] 885.0-890.0 sec   511 MBytes   858 Mbits/sec
[  3] 890.0-895.0 sec   526 MBytes   882 Mbits/sec
[  3] 895.0-900.0 sec   518 MBytes   870 Mbits/sec
[  3]  0.0-900.0 sec  91.9 GBytes   877 Mbits/sec
------------------------------------------------------------------------------
 UDP Traffic
------------------------------------------------------------
Client connecting to 192.168.1.4, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 192.168.1.2 port 42027 connected with 192.168.1.4 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   481 MBytes   808 Mbits/sec
[  3]  5.0-10.0 sec   480 MBytes   806 Mbits/sec
[  3] 10.0-15.0 sec   480 MBytes   806 Mbits/sec
[  3] 15.0-20.0 sec   480 MBytes   806 Mbits/sec
[  3] 20.0-25.0 sec   480 MBytes   806 Mbits/sec
[  3] 25.0-30.0 sec   481 MBytes   807 Mbits/sec
[  3] 30.0-35.0 sec   480 MBytes   805 Mbits/sec
[  3] 35.0-40.0 sec   480 MBytes   806 Mbits/sec
[  3] 40.0-45.0 sec   479 MBytes   804 Mbits/sec
[  3] 45.0-50.0 sec   481 MBytes   806 Mbits/sec
[  3] 50.0-55.0 sec   480 MBytes   806 Mbits/sec
[  3] 55.0-60.0 sec   480 MBytes   806 Mbits/sec
[  3] 60.0-65.0 sec   481 MBytes   808 Mbits/sec
[  3] 65.0-70.0 sec   481 MBytes   806 Mbits/sec
[  3] 70.0-75.0 sec   481 MBytes   807 Mbits/sec
[  3] 75.0-80.0 sec   481 MBytes   807 Mbits/sec
[  3] 80.0-85.0 sec   481 MBytes   806 Mbits/sec
[  3] 85.0-90.0 sec   480 MBytes   806 Mbits/sec
[  3] 90.0-95.0 sec   480 MBytes   806 Mbits/sec
[  3] 95.0-100.0 sec   481 MBytes   807 Mbits/sec
[  3] 100.0-105.0 sec   480 MBytes   806 Mbits/sec
[  3] 105.0-110.0 sec   480 MBytes   806 Mbits/sec
[  3] 110.0-115.0 sec   481 MBytes   807 Mbits/sec
[  3] 115.0-120.0 sec   481 MBytes   807 Mbits/sec
[  3] 120.0-125.0 sec   481 MBytes   806 Mbits/sec
[  3] 125.0-130.0 sec   480 MBytes   806 Mbits/sec
[  3] 130.0-135.0 sec   481 MBytes   808 Mbits/sec
[  3] 135.0-140.0 sec   480 MBytes   805 Mbits/sec
[  3] 140.0-145.0 sec   481 MBytes   807 Mbits/sec
[  3] 145.0-150.0 sec   480 MBytes   806 Mbits/sec
[  3] 150.0-155.0 sec   480 MBytes   806 Mbits/sec
[  3] 155.0-160.0 sec   480 MBytes   806 Mbits/sec
[  3] 160.0-165.0 sec   480 MBytes   806 Mbits/sec
[  3] 165.0-170.0 sec   480 MBytes   806 Mbits/sec
[  3] 170.0-175.0 sec   481 MBytes   806 Mbits/sec
[  3] 175.0-180.0 sec   481 MBytes   807 Mbits/sec
[  3] 180.0-185.0 sec   481 MBytes   807 Mbits/sec
[  3] 185.0-190.0 sec   481 MBytes   806 Mbits/sec
[  3] 190.0-195.0 sec   481 MBytes   807 Mbits/sec
[  3] 195.0-200.0 sec   480 MBytes   806 Mbits/sec
[  3] 200.0-205.0 sec   480 MBytes   806 Mbits/sec
[  3] 205.0-210.0 sec   481 MBytes   807 Mbits/sec
[  3] 210.0-215.0 sec   481 MBytes   806 Mbits/sec
[  3] 215.0-220.0 sec   481 MBytes   807 Mbits/sec
[  3] 220.0-225.0 sec   480 MBytes   806 Mbits/sec
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[  3] 225.0-230.0 sec   481 MBytes   807 Mbits/sec
[  3] 230.0-235.0 sec   481 MBytes   806 Mbits/sec
[  3] 235.0-240.0 sec   481 MBytes   807 Mbits/sec
[  3] 240.0-245.0 sec   481 MBytes   807 Mbits/sec
[  3] 245.0-250.0 sec   480 MBytes   806 Mbits/sec
[  3] 250.0-255.0 sec   481 MBytes   807 Mbits/sec
[  3] 255.0-260.0 sec   481 MBytes   807 Mbits/sec
[  3] 260.0-265.0 sec   480 MBytes   806 Mbits/sec
[  3] 265.0-270.0 sec   481 MBytes   808 Mbits/sec
[  3] 270.0-275.0 sec   480 MBytes   806 Mbits/sec
[  3] 275.0-280.0 sec   480 MBytes   806 Mbits/sec
[  3] 280.0-285.0 sec   480 MBytes   806 Mbits/sec
[  3] 285.0-290.0 sec   481 MBytes   807 Mbits/sec
[  3] 290.0-295.0 sec   481 MBytes   807 Mbits/sec
[  3] 295.0-300.0 sec   481 MBytes   806 Mbits/sec
[  3] 300.0-305.0 sec   481 MBytes   807 Mbits/sec
[  3] 305.0-310.0 sec   480 MBytes   806 Mbits/sec
[  3] 310.0-315.0 sec   481 MBytes   807 Mbits/sec
[  3] 315.0-320.0 sec   481 MBytes   807 Mbits/sec
[  3] 320.0-325.0 sec   481 MBytes   807 Mbits/sec
[  3] 325.0-330.0 sec   480 MBytes   806 Mbits/sec
[  3] 330.0-335.0 sec   481 MBytes   808 Mbits/sec
[  3] 335.0-340.0 sec   480 MBytes   806 Mbits/sec
[  3] 340.0-345.0 sec   480 MBytes   806 Mbits/sec
[  3] 345.0-350.0 sec   480 MBytes   806 Mbits/sec
[  3] 350.0-355.0 sec   480 MBytes   806 Mbits/sec
[  3] 355.0-360.0 sec   481 MBytes   807 Mbits/sec
[  3] 360.0-365.0 sec   481 MBytes   807 Mbits/sec
[  3] 365.0-370.0 sec   480 MBytes   806 Mbits/sec
[  3] 370.0-375.0 sec   481 MBytes   808 Mbits/sec
[  3] 375.0-380.0 sec   481 MBytes   808 Mbits/sec
[  3] 380.0-385.0 sec   482 MBytes   809 Mbits/sec
[  3] 385.0-390.0 sec   482 MBytes   808 Mbits/sec
[  3] 390.0-395.0 sec   482 MBytes   809 Mbits/sec
[  3] 395.0-400.0 sec   482 MBytes   808 Mbits/sec
[  3] 400.0-405.0 sec   480 MBytes   806 Mbits/sec
[  3] 405.0-410.0 sec   480 MBytes   806 Mbits/sec
[  3] 410.0-415.0 sec   481 MBytes   807 Mbits/sec
[  3] 415.0-420.0 sec   481 MBytes   807 Mbits/sec
[  3] 420.0-425.0 sec   481 MBytes   807 Mbits/sec
[  3] 425.0-430.0 sec   481 MBytes   807 Mbits/sec
[  3] 430.0-435.0 sec   480 MBytes   806 Mbits/sec
[  3] 435.0-440.0 sec   481 MBytes   806 Mbits/sec
[  3] 440.0-445.0 sec   481 MBytes   807 Mbits/sec
[  3] 445.0-450.0 sec   480 MBytes   806 Mbits/sec
[  3] 450.0-455.0 sec   481 MBytes   806 Mbits/sec
[  3] 455.0-460.0 sec   480 MBytes   806 Mbits/sec
[  3] 460.0-465.0 sec   480 MBytes   806 Mbits/sec
[  3] 465.0-470.0 sec   480 MBytes   806 Mbits/sec
[  3] 470.0-475.0 sec   481 MBytes   808 Mbits/sec
[  3] 475.0-480.0 sec   481 MBytes   807 Mbits/sec
[  3] 480.0-485.0 sec   481 MBytes   807 Mbits/sec
[  3] 485.0-490.0 sec   481 MBytes   807 Mbits/sec
[  3] 490.0-495.0 sec   481 MBytes   807 Mbits/sec
[  3] 495.0-500.0 sec   480 MBytes   806 Mbits/sec
[  3] 500.0-505.0 sec   481 MBytes   807 Mbits/sec
[  3] 505.0-510.0 sec   481 MBytes   807 Mbits/sec
[  3] 510.0-515.0 sec   481 MBytes   806 Mbits/sec
[  3] 515.0-520.0 sec   481 MBytes   807 Mbits/sec
[  3] 520.0-525.0 sec   480 MBytes   806 Mbits/sec
[  3] 525.0-530.0 sec   481 MBytes   807 Mbits/sec
[  3] 530.0-535.0 sec   481 MBytes   806 Mbits/sec
[  3] 535.0-540.0 sec   481 MBytes   807 Mbits/sec
[  3] 540.0-545.0 sec   481 MBytes   808 Mbits/sec
[  3] 545.0-550.0 sec   481 MBytes   806 Mbits/sec
[  3] 550.0-555.0 sec   481 MBytes   808 Mbits/sec
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[  3] 555.0-560.0 sec   481 MBytes   807 Mbits/sec
[  3] 560.0-565.0 sec   481 MBytes   807 Mbits/sec
[  3] 565.0-570.0 sec   481 MBytes   807 Mbits/sec
[  3] 570.0-575.0 sec   481 MBytes   807 Mbits/sec
[  3] 575.0-580.0 sec   481 MBytes   807 Mbits/sec
[  3] 580.0-585.0 sec   480 MBytes   806 Mbits/sec
[  3] 585.0-590.0 sec   480 MBytes   806 Mbits/sec
[  3] 590.0-595.0 sec   481 MBytes   807 Mbits/sec
[  3] 595.0-600.0 sec   481 MBytes   807 Mbits/sec
[  3] 600.0-605.0 sec   481 MBytes   807 Mbits/sec
[  3] 605.0-610.0 sec   481 MBytes   807 Mbits/sec
[  3] 610.0-615.0 sec   481 MBytes   807 Mbits/sec
[  3] 615.0-620.0 sec   481 MBytes   807 Mbits/sec
[  3] 620.0-625.0 sec   480 MBytes   806 Mbits/sec
[  3] 625.0-630.0 sec   480 MBytes   806 Mbits/sec
[  3] 630.0-635.0 sec   481 MBytes   807 Mbits/sec
[  3] 635.0-640.0 sec   481 MBytes   807 Mbits/sec
[  3] 640.0-645.0 sec   480 MBytes   806 Mbits/sec
[  3] 645.0-650.0 sec   481 MBytes   807 Mbits/sec
[  3] 650.0-655.0 sec   481 MBytes   807 Mbits/sec
[  3] 655.0-660.0 sec   481 MBytes   807 Mbits/sec
[  3] 660.0-665.0 sec   481 MBytes   807 Mbits/sec
[  3] 665.0-670.0 sec   481 MBytes   806 Mbits/sec
[  3] 670.0-675.0 sec   481 MBytes   807 Mbits/sec
[  3] 675.0-680.0 sec   480 MBytes   806 Mbits/sec
[  3] 680.0-685.0 sec   481 MBytes   806 Mbits/sec
[  3] 685.0-690.0 sec   481 MBytes   807 Mbits/sec
[  3] 690.0-695.0 sec   481 MBytes   807 Mbits/sec
[  3] 695.0-700.0 sec   481 MBytes   807 Mbits/sec
[  3] 700.0-705.0 sec   480 MBytes   806 Mbits/sec
[  3] 705.0-710.0 sec   480 MBytes   806 Mbits/sec
[  3] 710.0-715.0 sec   480 MBytes   806 Mbits/sec
[  3] 715.0-720.0 sec   481 MBytes   807 Mbits/sec
[  3] 720.0-725.0 sec   481 MBytes   807 Mbits/sec
[  3] 725.0-730.0 sec   480 MBytes   806 Mbits/sec
[  3] 730.0-735.0 sec   480 MBytes   806 Mbits/sec
[  3] 735.0-740.0 sec   481 MBytes   807 Mbits/sec
[  3] 740.0-745.0 sec   481 MBytes   807 Mbits/sec
[  3] 745.0-750.0 sec   480 MBytes   806 Mbits/sec
[  3] 750.0-755.0 sec   481 MBytes   806 Mbits/sec
[  3] 755.0-760.0 sec   481 MBytes   807 Mbits/sec
[  3] 760.0-765.0 sec   481 MBytes   806 Mbits/sec
[  3] 765.0-770.0 sec   481 MBytes   806 Mbits/sec
[  3] 770.0-775.0 sec   481 MBytes   807 Mbits/sec
[  3] 775.0-780.0 sec   481 MBytes   807 Mbits/sec
[  3] 780.0-785.0 sec   481 MBytes   808 Mbits/sec
[  3] 785.0-790.0 sec   480 MBytes   806 Mbits/sec
[  3] 790.0-795.0 sec   481 MBytes   807 Mbits/sec
[  3] 795.0-800.0 sec   481 MBytes   806 Mbits/sec
[  3] 800.0-805.0 sec   481 MBytes   808 Mbits/sec
[  3] 805.0-810.0 sec   481 MBytes   808 Mbits/sec
[  3] 810.0-815.0 sec   481 MBytes   807 Mbits/sec
[  3] 815.0-820.0 sec   481 MBytes   807 Mbits/sec
[  3] 820.0-825.0 sec   480 MBytes   806 Mbits/sec
[  3] 825.0-830.0 sec   480 MBytes   806 Mbits/sec
[  3] 830.0-835.0 sec   481 MBytes   808 Mbits/sec
[  3] 835.0-840.0 sec   480 MBytes   806 Mbits/sec
[  3] 840.0-845.0 sec   481 MBytes   808 Mbits/sec
[  3] 845.0-850.0 sec   480 MBytes   806 Mbits/sec
[  3] 850.0-855.0 sec   481 MBytes   806 Mbits/sec
[  3] 855.0-860.0 sec   481 MBytes   807 Mbits/sec
[  3] 860.0-865.0 sec   480 MBytes   806 Mbits/sec
[  3] 865.0-870.0 sec   480 MBytes   806 Mbits/sec
[  3] 870.0-875.0 sec   481 MBytes   807 Mbits/sec
[  3] 875.0-880.0 sec   480 MBytes   806 Mbits/sec
[  3] 880.0-885.0 sec   480 MBytes   805 Mbits/sec
```

```
[  3] 885.0-890.0 sec   480 MBytes   806 Mbits/sec
[  3] 890.0-895.0 sec   481 MBytes   807 Mbits/sec
[  3] 895.0-900.0 sec   480 MBytes   806 Mbits/sec
[  3]  0.0-900.0 sec  84.5 GBytes   807 Mbits/sec
[  3] Sent 61729642 datagrams
[  3] Server Report:
[3]0.0-900.0 sec 84.4 GBytes 805 Mbits/sec 0.230 ms 84573/61729641 (0.14%)
[  3]  0.0-900.0 sec  21 datagrams received out-of-order
```

Results for Tiny VMs case2

```
TCP Traffic
------------------------------------------------------------
Client connecting to 172.16.0.2, TCP port 5001
TCP window size: 23.5 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.8 port 56771 connected with 172.16.0.2 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   302 MBytes   506 Mbits/sec
[  3]  5.0-10.0 sec   308 MBytes   517 Mbits/sec
[  3] 10.0-15.0 sec   304 MBytes   509 Mbits/sec
[  3] 15.0-20.0 sec   302 MBytes   507 Mbits/sec
[  3] 20.0-25.0 sec   303 MBytes   508 Mbits/sec
[  3] 25.0-30.0 sec   304 MBytes   509 Mbits/sec
[  3] 30.0-35.0 sec   302 MBytes   507 Mbits/sec
[  3] 35.0-40.0 sec   302 MBytes   507 Mbits/sec
[  3] 40.0-45.0 sec   302 MBytes   507 Mbits/sec
[  3] 45.0-50.0 sec   288 MBytes   482 Mbits/sec
[  3] 50.0-55.0 sec   302 MBytes   508 Mbits/sec
[  3] 55.0-60.0 sec   303 MBytes   508 Mbits/sec
[  3] 60.0-65.0 sec   291 MBytes   489 Mbits/sec
[  3] 65.0-70.0 sec   304 MBytes   509 Mbits/sec
[  3] 70.0-75.0 sec   302 MBytes   506 Mbits/sec
[  3] 75.0-80.0 sec   302 MBytes   506 Mbits/sec
[  3] 80.0-85.0 sec   302 MBytes   508 Mbits/sec
[  3] 85.0-90.0 sec   305 MBytes   511 Mbits/sec
[  3] 90.0-95.0 sec   305 MBytes   512 Mbits/sec
[  3] 95.0-100.0 sec   303 MBytes   509 Mbits/sec
[  3] 100.0-105.0 sec   308 MBytes   517 Mbits/sec
[  3] 105.0-110.0 sec   301 MBytes   505 Mbits/sec
[  3] 110.0-115.0 sec   298 MBytes   500 Mbits/sec
[  3] 115.0-120.0 sec   300 MBytes   503 Mbits/sec
[  3] 120.0-125.0 sec   299 MBytes   502 Mbits/sec
[  3] 125.0-130.0 sec   300 MBytes   504 Mbits/sec
[  3] 130.0-135.0 sec   306 MBytes   513 Mbits/sec
[  3] 135.0-140.0 sec   306 MBytes   513 Mbits/sec
[  3] 140.0-145.0 sec   303 MBytes   509 Mbits/sec
[  3] 145.0-150.0 sec   301 MBytes   505 Mbits/sec
[  3] 150.0-155.0 sec   302 MBytes   506 Mbits/sec
[  3] 155.0-160.0 sec   302 MBytes   506 Mbits/sec
[  3] 160.0-165.0 sec   301 MBytes   506 Mbits/sec
[  3] 165.0-170.0 sec   300 MBytes   504 Mbits/sec
[  3] 170.0-175.0 sec   300 MBytes   504 Mbits/sec
[  3] 175.0-180.0 sec   301 MBytes   505 Mbits/sec
[  3] 180.0-185.0 sec   300 MBytes   503 Mbits/sec
[  3] 185.0-190.0 sec   297 MBytes   498 Mbits/sec
[  3] 190.0-195.0 sec   300 MBytes   503 Mbits/sec
[  3] 195.0-200.0 sec   302 MBytes   507 Mbits/sec
[  3] 200.0-205.0 sec   302 MBytes   507 Mbits/sec
[  3] 205.0-210.0 sec   299 MBytes   501 Mbits/sec
[  3] 210.0-215.0 sec   301 MBytes   505 Mbits/sec
[  3] 215.0-220.0 sec   300 MBytes   503 Mbits/sec
[  3] 220.0-225.0 sec   304 MBytes   509 Mbits/sec
[  3] 225.0-230.0 sec   305 MBytes   512 Mbits/sec
[  3] 230.0-235.0 sec   306 MBytes   513 Mbits/sec
[  3] 235.0-240.0 sec   305 MBytes   512 Mbits/sec
[  3] 240.0-245.0 sec   294 MBytes   493 Mbits/sec
[  3] 245.0-250.0 sec   302 MBytes   506 Mbits/sec
```

```
[  3] 250.0-255.0 sec   302 MBytes   507 Mbits/sec
[  3] 255.0-260.0 sec   290 MBytes   487 Mbits/sec
[  3] 260.0-265.0 sec   305 MBytes   511 Mbits/sec
[  3] 265.0-270.0 sec   306 MBytes   514 Mbits/sec
[  3] 270.0-275.0 sec   301 MBytes   506 Mbits/sec
[  3] 275.0-280.0 sec   299 MBytes   501 Mbits/sec
[  3] 280.0-285.0 sec   289 MBytes   485 Mbits/sec
[  3] 285.0-290.0 sec   302 MBytes   506 Mbits/sec
[  3] 290.0-295.0 sec   302 MBytes   507 Mbits/sec
[  3] 295.0-300.0 sec   287 MBytes   482 Mbits/sec
[  3] 300.0-305.0 sec   300 MBytes   504 Mbits/sec
[  3] 305.0-310.0 sec   302 MBytes   506 Mbits/sec
[  3] 310.0-315.0 sec   303 MBytes   508 Mbits/sec
[  3] 315.0-320.0 sec   303 MBytes   508 Mbits/sec
[  3] 320.0-325.0 sec   302 MBytes   506 Mbits/sec
[  3] 325.0-330.0 sec   301 MBytes   505 Mbits/sec
[  3] 330.0-335.0 sec   303 MBytes   508 Mbits/sec
[  3] 335.0-340.0 sec   302 MBytes   507 Mbits/sec
[  3] 340.0-345.0 sec   300 MBytes   504 Mbits/sec
[  3] 345.0-350.0 sec   298 MBytes   501 Mbits/sec
[  3] 350.0-355.0 sec   301 MBytes   505 Mbits/sec
[  3] 355.0-360.0 sec   302 MBytes   507 Mbits/sec
[  3] 360.0-365.0 sec   301 MBytes   505 Mbits/sec
[  3] 365.0-370.0 sec   300 MBytes   504 Mbits/sec
[  3] 370.0-375.0 sec   300 MBytes   503 Mbits/sec
[  3] 375.0-380.0 sec   303 MBytes   508 Mbits/sec
[  3] 380.0-385.0 sec   300 MBytes   504 Mbits/sec
[  3] 385.0-390.0 sec   302 MBytes   506 Mbits/sec
[  3] 390.0-395.0 sec   303 MBytes   508 Mbits/sec
[  3] 395.0-400.0 sec   299 MBytes   502 Mbits/sec
[  3] 400.0-405.0 sec   299 MBytes   502 Mbits/sec
[  3] 405.0-410.0 sec   302 MBytes   507 Mbits/sec
[  3] 410.0-415.0 sec   301 MBytes   505 Mbits/sec
[  3] 415.0-420.0 sec   308 MBytes   517 Mbits/sec
[  3] 420.0-425.0 sec   302 MBytes   507 Mbits/sec
[  3] 425.0-430.0 sec   302 MBytes   506 Mbits/sec
[  3] 430.0-435.0 sec   301 MBytes   506 Mbits/sec
[  3] 435.0-440.0 sec   304 MBytes   510 Mbits/sec
[  3] 440.0-445.0 sec   300 MBytes   503 Mbits/sec
[  3] 445.0-450.0 sec   301 MBytes   505 Mbits/sec
[  3] 450.0-455.0 sec   302 MBytes   506 Mbits/sec
[  3] 455.0-460.0 sec   298 MBytes   500 Mbits/sec
[  3] 460.0-465.0 sec   300 MBytes   503 Mbits/sec
[  3] 465.0-470.0 sec   301 MBytes   505 Mbits/sec
[  3] 470.0-475.0 sec   300 MBytes   504 Mbits/sec
[  3] 475.0-480.0 sec   302 MBytes   507 Mbits/sec
[  3] 480.0-485.0 sec   300 MBytes   504 Mbits/sec
[  3] 485.0-490.0 sec   299 MBytes   502 Mbits/sec
[  3] 490.0-495.0 sec   303 MBytes   508 Mbits/sec
[  3] 495.0-500.0 sec   300 MBytes   503 Mbits/sec
[  3] 500.0-505.0 sec   302 MBytes   506 Mbits/sec
[  3] 505.0-510.0 sec   301 MBytes   505 Mbits/sec
[  3] 510.0-515.0 sec   303 MBytes   508 Mbits/sec
[  3] 515.0-520.0 sec   288 MBytes   483 Mbits/sec
[  3] 520.0-525.0 sec   300 MBytes   504 Mbits/sec
[  3] 525.0-530.0 sec   297 MBytes   498 Mbits/sec
[  3] 530.0-535.0 sec   299 MBytes   502 Mbits/sec
[  3] 535.0-540.0 sec   302 MBytes   507 Mbits/sec
[  3] 540.0-545.0 sec   302 MBytes   507 Mbits/sec
[  3] 545.0-550.0 sec   301 MBytes   505 Mbits/sec
[  3] 550.0-555.0 sec   301 MBytes   505 Mbits/sec
[  3] 555.0-560.0 sec   301 MBytes   505 Mbits/sec
[  3] 560.0-565.0 sec   304 MBytes   509 Mbits/sec
[  3] 565.0-570.0 sec   299 MBytes   502 Mbits/sec
[  3] 570.0-575.0 sec   301 MBytes   505 Mbits/sec
[  3] 575.0-580.0 sec   300 MBytes   504 Mbits/sec
```

```
[  3] 580.0-585.0 sec   299 MBytes   502 Mbits/sec
[  3] 585.0-590.0 sec   301 MBytes   505 Mbits/sec
[  3] 590.0-595.0 sec   296 MBytes   496 Mbits/sec
[  3] 595.0-600.0 sec   301 MBytes   505 Mbits/sec
[  3] 600.0-605.0 sec   301 MBytes   505 Mbits/sec
[  3] 605.0-610.0 sec   301 MBytes   504 Mbits/sec
[  3] 610.0-615.0 sec   303 MBytes   508 Mbits/sec
[  3] 615.0-620.0 sec   301 MBytes   505 Mbits/sec
[  3] 620.0-625.0 sec   301 MBytes   505 Mbits/sec
[  3] 625.0-630.0 sec   302 MBytes   506 Mbits/sec
[  3] 630.0-635.0 sec   300 MBytes   503 Mbits/sec
[  3] 635.0-640.0 sec   302 MBytes   507 Mbits/sec
[  3] 640.0-645.0 sec   302 MBytes   506 Mbits/sec
[  3] 645.0-650.0 sec   301 MBytes   506 Mbits/sec
[  3] 650.0-655.0 sec   302 MBytes   506 Mbits/sec
[  3] 655.0-660.0 sec   299 MBytes   501 Mbits/sec
[  3] 660.0-665.0 sec   299 MBytes   501 Mbits/sec
[  3] 665.0-670.0 sec   304 MBytes   509 Mbits/sec
[  3] 670.0-675.0 sec   302 MBytes   506 Mbits/sec
[  3] 675.0-680.0 sec   306 MBytes   513 Mbits/sec
[  3] 680.0-685.0 sec   304 MBytes   511 Mbits/sec
[  3] 685.0-690.0 sec   305 MBytes   511 Mbits/sec
[  3] 690.0-695.0 sec   306 MBytes   513 Mbits/sec
[  3] 695.0-700.0 sec   304 MBytes   510 Mbits/sec
[  3] 700.0-705.0 sec   299 MBytes   502 Mbits/sec
[  3] 705.0-710.0 sec   294 MBytes   494 Mbits/sec
[  3] 710.0-715.0 sec   296 MBytes   497 Mbits/sec
[  3] 715.0-720.0 sec   296 MBytes   497 Mbits/sec
[  3] 720.0-725.0 sec   302 MBytes   506 Mbits/sec
[  3] 725.0-730.0 sec   301 MBytes   505 Mbits/sec
[  3] 730.0-735.0 sec   302 MBytes   507 Mbits/sec
[  3] 735.0-740.0 sec   303 MBytes   508 Mbits/sec
[  3] 740.0-745.0 sec   302 MBytes   507 Mbits/sec
[  3] 745.0-750.0 sec   304 MBytes   510 Mbits/sec
[  3] 750.0-755.0 sec   304 MBytes   510 Mbits/sec
[  3] 755.0-760.0 sec   302 MBytes   506 Mbits/sec
[  3] 760.0-765.0 sec   303 MBytes   509 Mbits/sec
[  3] 765.0-770.0 sec   306 MBytes   513 Mbits/sec
[  3] 770.0-775.0 sec   303 MBytes   509 Mbits/sec
[  3] 775.0-780.0 sec   302 MBytes   506 Mbits/sec
[  3] 780.0-785.0 sec   299 MBytes   502 Mbits/sec
[  3] 785.0-790.0 sec   300 MBytes   502 Mbits/sec
[  3] 790.0-795.0 sec   303 MBytes   508 Mbits/sec
[  3] 795.0-800.0 sec   286 MBytes   480 Mbits/sec
[  3] 800.0-805.0 sec   300 MBytes   504 Mbits/sec
[  3] 805.0-810.0 sec   304 MBytes   509 Mbits/sec
[  3] 810.0-815.0 sec   303 MBytes   509 Mbits/sec
[  3] 815.0-820.0 sec   302 MBytes   507 Mbits/sec
[  3] 820.0-825.0 sec   302 MBytes   506 Mbits/sec
[  3] 825.0-830.0 sec   301 MBytes   505 Mbits/sec
[  3] 830.0-835.0 sec   301 MBytes   505 Mbits/sec
[  3] 835.0-840.0 sec   302 MBytes   506 Mbits/sec
[  3] 840.0-845.0 sec   301 MBytes   506 Mbits/sec
[  3] 845.0-850.0 sec   302 MBytes   508 Mbits/sec
[  3] 850.0-855.0 sec   302 MBytes   507 Mbits/sec
[  3] 855.0-860.0 sec   305 MBytes   512 Mbits/sec
[  3] 860.0-865.0 sec   306 MBytes   514 Mbits/sec
[  3] 865.0-870.0 sec   304 MBytes   509 Mbits/sec
[  3] 870.0-875.0 sec   303 MBytes   509 Mbits/sec
[  3] 875.0-880.0 sec   301 MBytes   505 Mbits/sec
[  3] 880.0-885.0 sec   304 MBytes   509 Mbits/sec
[  3] 885.0-890.0 sec   307 MBytes   515 Mbits/sec
[  3] 890.0-895.0 sec   307 MBytes   515 Mbits/sec
[  3] 895.0-900.0 sec   305 MBytes   512 Mbits/sec
[  3]  0.0-900.0 sec  53.0 GBytes   505 Mbits/sec
-----------------------------------------------------------
```

```
UDP Traffic
------------------------------------------------------------
Client connecting to 172.16.0.2, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.8 port 49002 connected with 172.16.0.2 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   481 MBytes   808 Mbits/sec
[  3]  5.0-10.0 sec   481 MBytes   806 Mbits/sec
[  3] 10.0-15.0 sec   481 MBytes   807 Mbits/sec
[  3] 15.0-20.0 sec   481 MBytes   807 Mbits/sec
[  3] 20.0-25.0 sec   480 MBytes   806 Mbits/sec
[  3] 25.0-30.0 sec   481 MBytes   808 Mbits/sec
[  3] 30.0-35.0 sec   481 MBytes   807 Mbits/sec
[  3] 35.0-40.0 sec   481 MBytes   807 Mbits/sec
[  3] 40.0-45.0 sec   479 MBytes   804 Mbits/sec
[  3] 45.0-50.0 sec   481 MBytes   806 Mbits/sec
[  3] 50.0-55.0 sec   481 MBytes   807 Mbits/sec
[  3] 55.0-60.0 sec   481 MBytes   807 Mbits/sec
[  3] 60.0-65.0 sec   481 MBytes   806 Mbits/sec
[  3] 65.0-70.0 sec   481 MBytes   807 Mbits/sec
[  3] 70.0-75.0 sec   481 MBytes   807 Mbits/sec
[  3] 75.0-80.0 sec   481 MBytes   808 Mbits/sec
[  3] 80.0-85.0 sec   481 MBytes   806 Mbits/sec
[  3] 85.0-90.0 sec   481 MBytes   807 Mbits/sec
[  3] 90.0-95.0 sec   481 MBytes   807 Mbits/sec
[  3] 95.0-100.0 sec   481 MBytes   807 Mbits/sec
[  3] 100.0-105.0 sec   480 MBytes   806 Mbits/sec
[  3] 105.0-110.0 sec   481 MBytes   806 Mbits/sec
[  3] 110.0-115.0 sec   481 MBytes   807 Mbits/sec
[  3] 115.0-120.0 sec   481 MBytes   807 Mbits/sec
[  3] 120.0-125.0 sec   481 MBytes   807 Mbits/sec
[  3] 125.0-130.0 sec   481 MBytes   807 Mbits/sec
[  3] 130.0-135.0 sec   481 MBytes   806 Mbits/sec
[  3] 135.0-140.0 sec   480 MBytes   806 Mbits/sec
[  3] 140.0-145.0 sec   481 MBytes   806 Mbits/sec
[  3] 145.0-150.0 sec   481 MBytes   808 Mbits/sec
[  3] 150.0-155.0 sec   481 MBytes   807 Mbits/sec
[  3] 155.0-160.0 sec   481 MBytes   807 Mbits/sec
[  3] 160.0-165.0 sec   481 MBytes   807 Mbits/sec
[  3] 165.0-170.0 sec   481 MBytes   807 Mbits/sec
[  3] 170.0-175.0 sec   480 MBytes   806 Mbits/sec
[  3] 175.0-180.0 sec   481 MBytes   806 Mbits/sec
[  3] 180.0-185.0 sec   481 MBytes   807 Mbits/sec
[  3] 185.0-190.0 sec   481 MBytes   806 Mbits/sec
[  3] 190.0-195.0 sec   481 MBytes   807 Mbits/sec
[  3] 195.0-200.0 sec   481 MBytes   806 Mbits/sec
[  3] 200.0-205.0 sec   481 MBytes   807 Mbits/sec
[  3] 205.0-210.0 sec   480 MBytes   806 Mbits/sec
[  3] 210.0-215.0 sec   481 MBytes   807 Mbits/sec
[  3] 215.0-220.0 sec   481 MBytes   807 Mbits/sec
[  3] 220.0-225.0 sec   481 MBytes   806 Mbits/sec
[  3] 225.0-230.0 sec   481 MBytes   806 Mbits/sec
[  3] 230.0-235.0 sec   481 MBytes   807 Mbits/sec
[  3] 235.0-240.0 sec   481 MBytes   806 Mbits/sec
[  3] 240.0-245.0 sec   481 MBytes   806 Mbits/sec
[  3] 245.0-250.0 sec   481 MBytes   807 Mbits/sec
[  3] 250.0-255.0 sec   481 MBytes   807 Mbits/sec
[  3] 255.0-260.0 sec   481 MBytes   806 Mbits/sec
[  3] 260.0-265.0 sec   481 MBytes   807 Mbits/sec
[  3] 265.0-270.0 sec   481 MBytes   806 Mbits/sec
[  3] 270.0-275.0 sec   481 MBytes   807 Mbits/sec
[  3] 275.0-280.0 sec   481 MBytes   806 Mbits/sec
[  3] 280.0-285.0 sec   481 MBytes   806 Mbits/sec
[  3] 285.0-290.0 sec   481 MBytes   808 Mbits/sec
```

```
[  3] 290.0-295.0 sec   481 MBytes   806 Mbits/sec
[  3] 295.0-300.0 sec   481 MBytes   807 Mbits/sec
[  3] 300.0-305.0 sec   480 MBytes   805 Mbits/sec
[  3] 305.0-310.0 sec   481 MBytes   807 Mbits/sec
[  3] 310.0-315.0 sec   481 MBytes   806 Mbits/sec
[  3] 315.0-320.0 sec   481 MBytes   806 Mbits/sec
[  3] 320.0-325.0 sec   481 MBytes   807 Mbits/sec
[  3] 325.0-330.0 sec   481 MBytes   807 Mbits/sec
[  3] 330.0-335.0 sec   481 MBytes   807 Mbits/sec
[  3] 335.0-340.0 sec   480 MBytes   805 Mbits/sec
[  3] 340.0-345.0 sec   481 MBytes   807 Mbits/sec
[  3] 345.0-350.0 sec   481 MBytes   806 Mbits/sec
[  3] 350.0-355.0 sec   480 MBytes   806 Mbits/sec
[  3] 355.0-360.0 sec   481 MBytes   807 Mbits/sec
[  3] 360.0-365.0 sec   481 MBytes   807 Mbits/sec
[  3] 365.0-370.0 sec   481 MBytes   806 Mbits/sec
[  3] 370.0-375.0 sec   480 MBytes   806 Mbits/sec
[  3] 375.0-380.0 sec   481 MBytes   807 Mbits/sec
[  3] 380.0-385.0 sec   481 MBytes   806 Mbits/sec
[  3] 385.0-390.0 sec   482 MBytes   808 Mbits/sec
[  3] 390.0-395.0 sec   481 MBytes   807 Mbits/sec
[  3] 395.0-400.0 sec   481 MBytes   807 Mbits/sec
[  3] 400.0-405.0 sec   480 MBytes   806 Mbits/sec
[  3] 405.0-410.0 sec   481 MBytes   807 Mbits/sec
[  3] 410.0-415.0 sec   481 MBytes   806 Mbits/sec
[  3] 415.0-420.0 sec   481 MBytes   806 Mbits/sec
[  3] 420.0-425.0 sec   481 MBytes   806 Mbits/sec
[  3] 425.0-430.0 sec   481 MBytes   807 Mbits/sec
[  3] 430.0-435.0 sec   481 MBytes   806 Mbits/sec
[  3] 435.0-440.0 sec   481 MBytes   807 Mbits/sec
[  3] 440.0-445.0 sec   481 MBytes   807 Mbits/sec
[  3] 445.0-450.0 sec   481 MBytes   807 Mbits/sec
[  3] 450.0-455.0 sec   481 MBytes   806 Mbits/sec
[  3] 455.0-460.0 sec   481 MBytes   807 Mbits/sec
[  3] 460.0-465.0 sec   481 MBytes   806 Mbits/sec
[  3] 465.0-470.0 sec   481 MBytes   806 Mbits/sec
[  3] 470.0-475.0 sec   481 MBytes   807 Mbits/sec
[  3] 475.0-480.0 sec   481 MBytes   807 Mbits/sec
[  3] 480.0-485.0 sec   481 MBytes   807 Mbits/sec
[  3] 485.0-490.0 sec   481 MBytes   806 Mbits/sec
[  3] 490.0-495.0 sec   481 MBytes   807 Mbits/sec
[  3] 495.0-500.0 sec   481 MBytes   806 Mbits/sec
[  3] 500.0-505.0 sec   481 MBytes   808 Mbits/sec
[  3] 505.0-510.0 sec   481 MBytes   807 Mbits/sec
[  3] 510.0-515.0 sec   481 MBytes   807 Mbits/sec
[  3] 515.0-520.0 sec   481 MBytes   807 Mbits/sec
[  3] 520.0-525.0 sec   480 MBytes   805 Mbits/sec
[  3] 525.0-530.0 sec   481 MBytes   807 Mbits/sec
[  3] 530.0-535.0 sec   481 MBytes   806 Mbits/sec
[  3] 535.0-540.0 sec   481 MBytes   807 Mbits/sec
[  3] 540.0-545.0 sec   481 MBytes   807 Mbits/sec
[  3] 545.0-550.0 sec   481 MBytes   807 Mbits/sec
[  3] 550.0-555.0 sec   481 MBytes   807 Mbits/sec
[  3] 555.0-560.0 sec   481 MBytes   807 Mbits/sec
[  3] 560.0-565.0 sec   481 MBytes   807 Mbits/sec
[  3] 565.0-570.0 sec   481 MBytes   807 Mbits/sec
[  3] 570.0-575.0 sec   481 MBytes   807 Mbits/sec
[  3] 575.0-580.0 sec   480 MBytes   806 Mbits/sec
[  3] 580.0-585.0 sec   480 MBytes   806 Mbits/sec
[  3] 585.0-590.0 sec   481 MBytes   806 Mbits/sec
[  3] 590.0-595.0 sec   481 MBytes   807 Mbits/sec
[  3] 595.0-600.0 sec   481 MBytes   806 Mbits/sec
[  3] 600.0-605.0 sec   481 MBytes   808 Mbits/sec
[  3] 605.0-610.0 sec   480 MBytes   806 Mbits/sec
[  3] 610.0-615.0 sec   481 MBytes   808 Mbits/sec
[  3] 615.0-620.0 sec   481 MBytes   806 Mbits/sec
```

```
[  3] 620.0-625.0 sec   481 MBytes   806 Mbits/sec
[  3] 625.0-630.0 sec   481 MBytes   808 Mbits/sec
[  3] 630.0-635.0 sec   480 MBytes   806 Mbits/sec
[  3] 635.0-640.0 sec   481 MBytes   807 Mbits/sec
[  3] 640.0-645.0 sec   481 MBytes   806 Mbits/sec
[  3] 645.0-650.0 sec   481 MBytes   806 Mbits/sec
[  3] 650.0-655.0 sec   481 MBytes   807 Mbits/sec
[  3] 655.0-660.0 sec   481 MBytes   807 Mbits/sec
[  3] 660.0-665.0 sec   481 MBytes   807 Mbits/sec
[  3] 665.0-670.0 sec   481 MBytes   806 Mbits/sec
[  3] 670.0-675.0 sec   481 MBytes   807 Mbits/sec
[  3] 675.0-680.0 sec   481 MBytes   807 Mbits/sec
[  3] 680.0-685.0 sec   481 MBytes   807 Mbits/sec
[  3] 685.0-690.0 sec   481 MBytes   807 Mbits/sec
[  3] 690.0-695.0 sec   481 MBytes   808 Mbits/sec
[  3] 695.0-700.0 sec   481 MBytes   806 Mbits/sec
[  3] 700.0-705.0 sec   481 MBytes   806 Mbits/sec
[  3] 705.0-710.0 sec   481 MBytes   807 Mbits/sec
[  3] 710.0-715.0 sec   481 MBytes   807 Mbits/sec
[  3] 715.0-720.0 sec   481 MBytes   807 Mbits/sec
[  3] 720.0-725.0 sec   481 MBytes   806 Mbits/sec
[  3] 725.0-730.0 sec   481 MBytes   807 Mbits/sec
[  3] 730.0-735.0 sec   481 MBytes   807 Mbits/sec
[  3] 735.0-740.0 sec   481 MBytes   807 Mbits/sec
[  3] 740.0-745.0 sec   481 MBytes   807 Mbits/sec
[  3] 745.0-750.0 sec   480 MBytes   806 Mbits/sec
[  3] 750.0-755.0 sec   481 MBytes   808 Mbits/sec
[  3] 755.0-760.0 sec   480 MBytes   806 Mbits/sec
[  3] 760.0-765.0 sec   480 MBytes   806 Mbits/sec
[  3] 765.0-770.0 sec   481 MBytes   807 Mbits/sec
[  3] 770.0-775.0 sec   481 MBytes   807 Mbits/sec
[  3] 775.0-780.0 sec   480 MBytes   806 Mbits/sec
[  3] 780.0-785.0 sec   481 MBytes   806 Mbits/sec
[  3] 785.0-790.0 sec   481 MBytes   807 Mbits/sec
[  3] 790.0-795.0 sec   481 MBytes   806 Mbits/sec
[  3] 795.0-800.0 sec   481 MBytes   808 Mbits/sec
[  3] 800.0-805.0 sec   480 MBytes   806 Mbits/sec
[  3] 805.0-810.0 sec   481 MBytes   808 Mbits/sec
[  3] 810.0-815.0 sec   481 MBytes   806 Mbits/sec
[  3] 815.0-820.0 sec   481 MBytes   807 Mbits/sec
[  3] 820.0-825.0 sec   480 MBytes   806 Mbits/sec
[  3] 825.0-830.0 sec   481 MBytes   807 Mbits/sec
[  3] 830.0-835.0 sec   481 MBytes   807 Mbits/sec
[  3] 835.0-840.0 sec   481 MBytes   807 Mbits/sec
[  3] 840.0-845.0 sec   481 MBytes   807 Mbits/sec
[  3] 845.0-850.0 sec   480 MBytes   806 Mbits/sec
[  3] 850.0-855.0 sec   481 MBytes   808 Mbits/sec
[  3] 855.0-860.0 sec   481 MBytes   806 Mbits/sec
[  3] 860.0-865.0 sec   481 MBytes   808 Mbits/sec
[  3] 865.0-870.0 sec   481 MBytes   807 Mbits/sec
[  3] 870.0-875.0 sec   481 MBytes   807 Mbits/sec
[  3] 875.0-880.0 sec   481 MBytes   807 Mbits/sec
[  3] 880.0-885.0 sec   480 MBytes   806 Mbits/sec
[  3] 885.0-890.0 sec   481 MBytes   807 Mbits/sec
[  3] 890.0-895.0 sec   481 MBytes   807 Mbits/sec
[  3] 895.0-900.0 sec   481 MBytes   807 Mbits/sec
[  3]  0.0-900.0 sec  84.5 GBytes   807 Mbits/sec
[  3] Sent 61738784 datagrams
[  3] Server Report:
[3]0.0-900.0 sec  82.7 GBytes 790 Mbits/sec 0.122 ms 1298601/61738783 (2.1%)
[  3]  0.0-900.0 sec  18127 datagrams received out-of-order
```

Results for Tiny VMs case3

```
TCP Traffic
------------------------------------------------------------
Client connecting to 10.0.3.9, TCP port 5001
TCP window size: 23.5 KByte (default)
```

```
------------------------------------------------------------
[  3] local 10.0.3.8 port 48739 connected with 10.0.3.9 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   338 MBytes   567 Mbits/sec
[  3]  5.0-10.0 sec   334 MBytes   560 Mbits/sec
[  3] 10.0-15.0 sec   329 MBytes   553 Mbits/sec
[  3] 15.0-20.0 sec   334 MBytes   560 Mbits/sec
[  3] 20.0-25.0 sec   335 MBytes   561 Mbits/sec
[  3] 25.0-30.0 sec   337 MBytes   566 Mbits/sec
[  3] 30.0-35.0 sec   334 MBytes   560 Mbits/sec
[  3] 35.0-40.0 sec   337 MBytes   566 Mbits/sec
[  3] 40.0-45.0 sec   332 MBytes   558 Mbits/sec
[  3] 45.0-50.0 sec   332 MBytes   557 Mbits/sec
[  3] 50.0-55.0 sec   337 MBytes   565 Mbits/sec
[  3] 55.0-60.0 sec   332 MBytes   558 Mbits/sec
[  3] 60.0-65.0 sec   331 MBytes   555 Mbits/sec
[  3] 65.0-70.0 sec   330 MBytes   554 Mbits/sec
[  3] 70.0-75.0 sec   332 MBytes   557 Mbits/sec
[  3] 75.0-80.0 sec   341 MBytes   573 Mbits/sec
[  3] 80.0-85.0 sec   335 MBytes   562 Mbits/sec
[  3] 85.0-90.0 sec   339 MBytes   569 Mbits/sec
[  3] 90.0-95.0 sec   335 MBytes   562 Mbits/sec
[  3] 95.0-100.0 sec   342 MBytes   574 Mbits/sec
[  3] 100.0-105.0 sec   340 MBytes   570 Mbits/sec
[  3] 105.0-110.0 sec   346 MBytes   580 Mbits/sec
[  3] 110.0-115.0 sec   352 MBytes   590 Mbits/sec
[  3] 115.0-120.0 sec   355 MBytes   596 Mbits/sec
[  3] 120.0-125.0 sec   354 MBytes   593 Mbits/sec
[  3] 125.0-130.0 sec   361 MBytes   606 Mbits/sec
[  3] 130.0-135.0 sec   340 MBytes   570 Mbits/sec
[  3] 135.0-140.0 sec   342 MBytes   573 Mbits/sec
[  3] 140.0-145.0 sec   343 MBytes   575 Mbits/sec
[  3] 145.0-150.0 sec   336 MBytes   563 Mbits/sec
[  3] 150.0-155.0 sec   334 MBytes   560 Mbits/sec
[  3] 155.0-160.0 sec   338 MBytes   566 Mbits/sec
[  3] 160.0-165.0 sec   339 MBytes   569 Mbits/sec
[  3] 165.0-170.0 sec   343 MBytes   576 Mbits/sec
[  3] 170.0-175.0 sec   340 MBytes   570 Mbits/sec
[  3] 175.0-180.0 sec   341 MBytes   572 Mbits/sec
[  3] 180.0-185.0 sec   338 MBytes   566 Mbits/sec
[  3] 185.0-190.0 sec   332 MBytes   556 Mbits/sec
[  3] 190.0-195.0 sec   338 MBytes   568 Mbits/sec
[  3] 195.0-200.0 sec   348 MBytes   584 Mbits/sec
[  3] 200.0-205.0 sec   339 MBytes   568 Mbits/sec
[  3] 205.0-210.0 sec   327 MBytes   549 Mbits/sec
[  3] 210.0-215.0 sec   341 MBytes   572 Mbits/sec
[  3] 215.0-220.0 sec   357 MBytes   599 Mbits/sec
[  3] 220.0-225.0 sec   331 MBytes   556 Mbits/sec
[  3] 225.0-230.0 sec   341 MBytes   572 Mbits/sec
[  3] 230.0-235.0 sec   346 MBytes   580 Mbits/sec
[  3] 235.0-240.0 sec   339 MBytes   569 Mbits/sec
[  3] 240.0-245.0 sec   335 MBytes   561 Mbits/sec
[  3] 245.0-250.0 sec   338 MBytes   567 Mbits/sec
[  3] 250.0-255.0 sec   327 MBytes   549 Mbits/sec
[  3] 255.0-260.0 sec   345 MBytes   579 Mbits/sec
[  3] 260.0-265.0 sec   340 MBytes   571 Mbits/sec
[  3] 265.0-270.0 sec   332 MBytes   558 Mbits/sec
[  3] 270.0-275.0 sec   332 MBytes   558 Mbits/sec
[  3] 275.0-280.0 sec   334 MBytes   561 Mbits/sec
[  3] 280.0-285.0 sec   335 MBytes   562 Mbits/sec
[  3] 285.0-290.0 sec   330 MBytes   554 Mbits/sec
[  3] 290.0-295.0 sec   336 MBytes   564 Mbits/sec
[  3] 295.0-300.0 sec   344 MBytes   577 Mbits/sec
[  3] 300.0-305.0 sec   333 MBytes   558 Mbits/sec
[  3] 305.0-310.0 sec   328 MBytes   551 Mbits/sec
[  3] 310.0-315.0 sec   326 MBytes   547 Mbits/sec
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[  3] 315.0-320.0 sec   335 MBytes   563 Mbits/sec
[  3] 320.0-325.0 sec   323 MBytes   543 Mbits/sec
[  3] 325.0-330.0 sec   344 MBytes   577 Mbits/sec
[  3] 330.0-335.0 sec   333 MBytes   559 Mbits/sec
[  3] 335.0-340.0 sec   333 MBytes   559 Mbits/sec
[  3] 340.0-345.0 sec   327 MBytes   549 Mbits/sec
[  3] 345.0-350.0 sec   330 MBytes   553 Mbits/sec
[  3] 350.0-355.0 sec   322 MBytes   541 Mbits/sec
[  3] 355.0-360.0 sec   342 MBytes   574 Mbits/sec
[  3] 360.0-365.0 sec   346 MBytes   581 Mbits/sec
[  3] 365.0-370.0 sec   337 MBytes   565 Mbits/sec
[  3] 370.0-375.0 sec   333 MBytes   559 Mbits/sec
[  3] 375.0-380.0 sec   364 MBytes   610 Mbits/sec
[  3] 380.0-385.0 sec   342 MBytes   574 Mbits/sec
[  3] 385.0-390.0 sec   335 MBytes   561 Mbits/sec
[  3] 390.0-395.0 sec   343 MBytes   576 Mbits/sec
[  3] 395.0-400.0 sec   343 MBytes   576 Mbits/sec
[  3] 400.0-405.0 sec   335 MBytes   562 Mbits/sec
[  3] 405.0-410.0 sec   331 MBytes   555 Mbits/sec
[  3] 410.0-415.0 sec   333 MBytes   559 Mbits/sec
[  3] 415.0-420.0 sec   326 MBytes   547 Mbits/sec
[  3] 420.0-425.0 sec   329 MBytes   552 Mbits/sec
[  3] 425.0-430.0 sec   329 MBytes   552 Mbits/sec
[  3] 430.0-435.0 sec   325 MBytes   545 Mbits/sec
[  3] 435.0-440.0 sec   343 MBytes   575 Mbits/sec
[  3] 440.0-445.0 sec   341 MBytes   573 Mbits/sec
[  3] 445.0-450.0 sec   339 MBytes   569 Mbits/sec
[  3] 450.0-455.0 sec   334 MBytes   560 Mbits/sec
[  3] 455.0-460.0 sec   333 MBytes   559 Mbits/sec
[  3] 460.0-465.0 sec   321 MBytes   539 Mbits/sec
[  3] 465.0-470.0 sec   326 MBytes   548 Mbits/sec
[  3] 470.0-475.0 sec   330 MBytes   553 Mbits/sec
[  3] 475.0-480.0 sec   322 MBytes   540 Mbits/sec
[  3] 480.0-485.0 sec   320 MBytes   538 Mbits/sec
[  3] 485.0-490.0 sec   344 MBytes   576 Mbits/sec
[  3] 490.0-495.0 sec   334 MBytes   561 Mbits/sec
[  3] 495.0-500.0 sec   326 MBytes   547 Mbits/sec
[  3] 500.0-505.0 sec   351 MBytes   589 Mbits/sec
[  3] 505.0-510.0 sec   344 MBytes   578 Mbits/sec
[  3] 510.0-515.0 sec   337 MBytes   565 Mbits/sec
[  3] 515.0-520.0 sec   320 MBytes   537 Mbits/sec
[  3] 520.0-525.0 sec   328 MBytes   551 Mbits/sec
[  3] 525.0-530.0 sec   326 MBytes   548 Mbits/sec
[  3] 530.0-535.0 sec   328 MBytes   551 Mbits/sec
[  3] 535.0-540.0 sec   323 MBytes   541 Mbits/sec
[  3] 540.0-545.0 sec   326 MBytes   547 Mbits/sec
[  3] 545.0-550.0 sec   333 MBytes   559 Mbits/sec
[  3] 550.0-555.0 sec   333 MBytes   559 Mbits/sec
[  3] 555.0-560.0 sec   349 MBytes   585 Mbits/sec
[  3] 560.0-565.0 sec   335 MBytes   563 Mbits/sec
[  3] 565.0-570.0 sec   338 MBytes   567 Mbits/sec
[  3] 570.0-575.0 sec   325 MBytes   546 Mbits/sec
[  3] 575.0-580.0 sec   333 MBytes   559 Mbits/sec
[  3] 580.0-585.0 sec   317 MBytes   532 Mbits/sec
[  3] 585.0-590.0 sec   320 MBytes   536 Mbits/sec
[  3] 590.0-595.0 sec   342 MBytes   574 Mbits/sec
[  3] 595.0-600.0 sec   331 MBytes   556 Mbits/sec
[  3] 600.0-605.0 sec   332 MBytes   557 Mbits/sec
[  3] 605.0-610.0 sec   327 MBytes   549 Mbits/sec
[  3] 610.0-615.0 sec   336 MBytes   565 Mbits/sec
[  3] 615.0-620.0 sec   337 MBytes   565 Mbits/sec
[  3] 620.0-625.0 sec   345 MBytes   579 Mbits/sec
[  3] 625.0-630.0 sec   326 MBytes   547 Mbits/sec
[  3] 630.0-635.0 sec   341 MBytes   572 Mbits/sec
[  3] 635.0-640.0 sec   341 MBytes   572 Mbits/sec
[  3] 640.0-645.0 sec   338 MBytes   566 Mbits/sec
```

```
[  3] 645.0-650.0 sec   338 MBytes   568 Mbits/sec
[  3] 650.0-655.0 sec   338 MBytes   568 Mbits/sec
[  3] 655.0-660.0 sec   341 MBytes   572 Mbits/sec
[  3] 660.0-665.0 sec   333 MBytes   558 Mbits/sec
[  3] 665.0-670.0 sec   342 MBytes   574 Mbits/sec
[  3] 670.0-675.0 sec   341 MBytes   573 Mbits/sec
[  3] 675.0-680.0 sec   341 MBytes   572 Mbits/sec
[  3] 680.0-685.0 sec   351 MBytes   589 Mbits/sec
[  3] 685.0-690.0 sec   342 MBytes   574 Mbits/sec
[  3] 690.0-695.0 sec   342 MBytes   574 Mbits/sec
[  3] 695.0-700.0 sec   325 MBytes   545 Mbits/sec
[  3] 700.0-705.0 sec   334 MBytes   561 Mbits/sec
[  3] 705.0-710.0 sec   344 MBytes   578 Mbits/sec
[  3] 710.0-715.0 sec   333 MBytes   558 Mbits/sec
[  3] 715.0-720.0 sec   340 MBytes   571 Mbits/sec
[  3] 720.0-725.0 sec   332 MBytes   557 Mbits/sec
[  3] 725.0-730.0 sec   327 MBytes   549 Mbits/sec
[  3] 730.0-735.0 sec   327 MBytes   548 Mbits/sec
[  3] 735.0-740.0 sec   336 MBytes   563 Mbits/sec
[  3] 740.0-745.0 sec   324 MBytes   543 Mbits/sec
[  3] 745.0-750.0 sec   330 MBytes   554 Mbits/sec
[  3] 750.0-755.0 sec   327 MBytes   548 Mbits/sec
[  3] 755.0-760.0 sec   324 MBytes   543 Mbits/sec
[  3] 760.0-765.0 sec   323 MBytes   541 Mbits/sec
[  3] 765.0-770.0 sec   331 MBytes   555 Mbits/sec
[  3] 770.0-775.0 sec   327 MBytes   549 Mbits/sec
[  3] 775.0-780.0 sec   327 MBytes   549 Mbits/sec
[  3] 780.0-785.0 sec   321 MBytes   538 Mbits/sec
[  3] 785.0-790.0 sec   328 MBytes   551 Mbits/sec
[  3] 790.0-795.0 sec   320 MBytes   538 Mbits/sec
[  3] 795.0-800.0 sec   342 MBytes   574 Mbits/sec
[  3] 800.0-805.0 sec   335 MBytes   562 Mbits/sec
[  3] 805.0-810.0 sec   329 MBytes   553 Mbits/sec
[  3] 810.0-815.0 sec   331 MBytes   555 Mbits/sec
[  3] 815.0-820.0 sec   321 MBytes   538 Mbits/sec
[  3] 820.0-825.0 sec   332 MBytes   558 Mbits/sec
[  3] 825.0-830.0 sec   336 MBytes   563 Mbits/sec
[  3] 830.0-835.0 sec   346 MBytes   581 Mbits/sec
[  3] 835.0-840.0 sec   328 MBytes   551 Mbits/sec
[  3] 840.0-845.0 sec   336 MBytes   563 Mbits/sec
[  3] 845.0-850.0 sec   337 MBytes   565 Mbits/sec
[  3] 850.0-855.0 sec   329 MBytes   552 Mbits/sec
[  3] 855.0-860.0 sec   336 MBytes   564 Mbits/sec
[  3] 860.0-865.0 sec   338 MBytes   567 Mbits/sec
[  3] 865.0-870.0 sec   339 MBytes   569 Mbits/sec
[  3] 870.0-875.0 sec   340 MBytes   571 Mbits/sec
[  3] 875.0-880.0 sec   339 MBytes   568 Mbits/sec
[  3] 880.0-885.0 sec   326 MBytes   547 Mbits/sec
[  3] 885.0-890.0 sec   323 MBytes   541 Mbits/sec
[  3] 890.0-895.0 sec   352 MBytes   591 Mbits/sec
[  3] 895.0-900.0 sec   328 MBytes   551 Mbits/sec
[  3]  0.0-900.0 sec  58.9 GBytes   562 Mbits/sec
------------------------------------------------------------
UDP Treaffic
------------------------------------------------------------
Client connecting to 10.0.3.9, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.8 port 50346 connected with 10.0.3.9 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   481 MBytes   808 Mbits/sec
[  3]  5.0-10.0 sec   480 MBytes   806 Mbits/sec
[  3] 10.0-15.0 sec   481 MBytes   807 Mbits/sec
[  3] 15.0-20.0 sec   481 MBytes   807 Mbits/sec
[  3] 20.0-25.0 sec   481 MBytes   806 Mbits/sec
```

```
[  3] 25.0-30.0 sec   481 MBytes   807 Mbits/sec
[  3] 30.0-35.0 sec   481 MBytes   807 Mbits/sec
[  3] 35.0-40.0 sec   481 MBytes   806 Mbits/sec
[  3] 40.0-45.0 sec   479 MBytes   804 Mbits/sec
[  3] 45.0-50.0 sec   481 MBytes   807 Mbits/sec
[  3] 50.0-55.0 sec   481 MBytes   807 Mbits/sec
[  3] 55.0-60.0 sec   481 MBytes   807 Mbits/sec
[  3] 60.0-65.0 sec   481 MBytes   807 Mbits/sec
[  3] 65.0-70.0 sec   481 MBytes   807 Mbits/sec
[  3] 70.0-75.0 sec   481 MBytes   807 Mbits/sec
[  3] 75.0-80.0 sec   481 MBytes   807 Mbits/sec
[  3] 80.0-85.0 sec   480 MBytes   806 Mbits/sec
[  3] 85.0-90.0 sec   481 MBytes   807 Mbits/sec
[  3] 90.0-95.0 sec   481 MBytes   807 Mbits/sec
[  3] 95.0-100.0 sec   480 MBytes   806 Mbits/sec
[  3] 100.0-105.0 sec   480 MBytes   806 Mbits/sec
[  3] 105.0-110.0 sec   480 MBytes   806 Mbits/sec
[  3] 110.0-115.0 sec   481 MBytes   808 Mbits/sec
[  3] 115.0-120.0 sec   481 MBytes   806 Mbits/sec
[  3] 120.0-125.0 sec   481 MBytes   807 Mbits/sec
[  3] 125.0-130.0 sec   480 MBytes   806 Mbits/sec
[  3] 130.0-135.0 sec   481 MBytes   807 Mbits/sec
[  3] 135.0-140.0 sec   480 MBytes   806 Mbits/sec
[  3] 140.0-145.0 sec   481 MBytes   807 Mbits/sec
[  3] 145.0-150.0 sec   481 MBytes   806 Mbits/sec
[  3] 150.0-155.0 sec   480 MBytes   806 Mbits/sec
[  3] 155.0-160.0 sec   481 MBytes   808 Mbits/sec
[  3] 160.0-165.0 sec   481 MBytes   806 Mbits/sec
[  3] 165.0-170.0 sec   480 MBytes   806 Mbits/sec
[  3] 170.0-175.0 sec   481 MBytes   808 Mbits/sec
[  3] 175.0-180.0 sec   481 MBytes   806 Mbits/sec
[  3] 180.0-185.0 sec   481 MBytes   807 Mbits/sec
[  3] 185.0-190.0 sec   481 MBytes   807 Mbits/sec
[  3] 190.0-195.0 sec   481 MBytes   807 Mbits/sec
[  3] 195.0-200.0 sec   481 MBytes   806 Mbits/sec
[  3] 200.0-205.0 sec   481 MBytes   807 Mbits/sec
[  3] 205.0-210.0 sec   481 MBytes   806 Mbits/sec
[  3] 210.0-215.0 sec   481 MBytes   806 Mbits/sec
[  3] 215.0-220.0 sec   481 MBytes   807 Mbits/sec
[  3] 220.0-225.0 sec   480 MBytes   806 Mbits/sec
[  3] 225.0-230.0 sec   480 MBytes   806 Mbits/sec
[  3] 230.0-235.0 sec   481 MBytes   807 Mbits/sec
[  3] 235.0-240.0 sec   481 MBytes   807 Mbits/sec
[  3] 240.0-245.0 sec   481 MBytes   806 Mbits/sec
[  3] 245.0-250.0 sec   481 MBytes   806 Mbits/sec
[  3] 250.0-255.0 sec   481 MBytes   808 Mbits/sec
[  3] 255.0-260.0 sec   481 MBytes   807 Mbits/sec
[  3] 260.0-265.0 sec   481 MBytes   807 Mbits/sec
[  3] 265.0-270.0 sec   481 MBytes   806 Mbits/sec
[  3] 270.0-275.0 sec   481 MBytes   807 Mbits/sec
[  3] 275.0-280.0 sec   481 MBytes   807 Mbits/sec
[  3] 280.0-285.0 sec   481 MBytes   807 Mbits/sec
[  3] 285.0-290.0 sec   481 MBytes   807 Mbits/sec
[  3] 290.0-295.0 sec   481 MBytes   807 Mbits/sec
[  3] 295.0-300.0 sec   481 MBytes   806 Mbits/sec
[  3] 300.0-305.0 sec   481 MBytes   807 Mbits/sec
[  3] 305.0-310.0 sec   481 MBytes   807 Mbits/sec
[  3] 310.0-315.0 sec   480 MBytes   806 Mbits/sec
[  3] 315.0-320.0 sec   481 MBytes   808 Mbits/sec
[  3] 320.0-325.0 sec   481 MBytes   807 Mbits/sec
[  3] 325.0-330.0 sec   481 MBytes   807 Mbits/sec
[  3] 330.0-335.0 sec   480 MBytes   806 Mbits/sec
[  3] 335.0-340.0 sec   480 MBytes   806 Mbits/sec
[  3] 340.0-345.0 sec   481 MBytes   808 Mbits/sec
[  3] 345.0-350.0 sec   481 MBytes   806 Mbits/sec
[  3] 350.0-355.0 sec   481 MBytes   808 Mbits/sec
```

```
[  3] 355.0-360.0 sec   480 MBytes   806 Mbits/sec
[  3] 360.0-365.0 sec   481 MBytes   807 Mbits/sec
[  3] 365.0-370.0 sec   481 MBytes   807 Mbits/sec
[  3] 370.0-375.0 sec   480 MBytes   806 Mbits/sec
[  3] 375.0-380.0 sec   481 MBytes   808 Mbits/sec
[  3] 380.0-385.0 sec   481 MBytes   807 Mbits/sec
[  3] 385.0-390.0 sec   481 MBytes   807 Mbits/sec
[  3] 390.0-395.0 sec   481 MBytes   807 Mbits/sec
[  3] 395.0-400.0 sec   481 MBytes   807 Mbits/sec
[  3] 400.0-405.0 sec   481 MBytes   807 Mbits/sec
[  3] 405.0-410.0 sec   480 MBytes   806 Mbits/sec
[  3] 410.0-415.0 sec   481 MBytes   808 Mbits/sec
[  3] 415.0-420.0 sec   481 MBytes   807 Mbits/sec
[  3] 420.0-425.0 sec   481 MBytes   807 Mbits/sec
[  3] 425.0-430.0 sec   481 MBytes   807 Mbits/sec
[  3] 430.0-435.0 sec   481 MBytes   806 Mbits/sec
[  3] 435.0-440.0 sec   481 MBytes   807 Mbits/sec
[  3] 440.0-445.0 sec   481 MBytes   807 Mbits/sec
[  3] 445.0-450.0 sec   481 MBytes   807 Mbits/sec
[  3] 450.0-455.0 sec   481 MBytes   807 Mbits/sec
[  3] 455.0-460.0 sec   481 MBytes   807 Mbits/sec
[  3] 460.0-465.0 sec   481 MBytes   806 Mbits/sec
[  3] 465.0-470.0 sec   481 MBytes   807 Mbits/sec
[  3] 470.0-475.0 sec   481 MBytes   807 Mbits/sec
[  3] 475.0-480.0 sec   481 MBytes   807 Mbits/sec
[  3] 480.0-485.0 sec   481 MBytes   806 Mbits/sec
[  3] 485.0-490.0 sec   481 MBytes   807 Mbits/sec
[  3] 490.0-495.0 sec   480 MBytes   806 Mbits/sec
[  3] 495.0-500.0 sec   481 MBytes   806 Mbits/sec
[  3] 500.0-505.0 sec   481 MBytes   807 Mbits/sec
[  3] 505.0-510.0 sec   481 MBytes   806 Mbits/sec
[  3] 510.0-515.0 sec   481 MBytes   806 Mbits/sec
[  3] 515.0-520.0 sec   481 MBytes   807 Mbits/sec
[  3] 520.0-525.0 sec   481 MBytes   806 Mbits/sec
[  3] 525.0-530.0 sec   481 MBytes   807 Mbits/sec
[  3] 530.0-535.0 sec   481 MBytes   806 Mbits/sec
[  3] 535.0-540.0 sec   481 MBytes   807 Mbits/sec
[  3] 540.0-545.0 sec   481 MBytes   807 Mbits/sec
[  3] 545.0-550.0 sec   480 MBytes   806 Mbits/sec
[  3] 550.0-555.0 sec   481 MBytes   807 Mbits/sec
[  3] 555.0-560.0 sec   481 MBytes   807 Mbits/sec
[  3] 560.0-565.0 sec   481 MBytes   807 Mbits/sec
[  3] 565.0-570.0 sec   481 MBytes   806 Mbits/sec
[  3] 570.0-575.0 sec   481 MBytes   807 Mbits/sec
[  3] 575.0-580.0 sec   481 MBytes   807 Mbits/sec
[  3] 580.0-585.0 sec   481 MBytes   806 Mbits/sec
[  3] 585.0-590.0 sec   481 MBytes   807 Mbits/sec
[  3] 590.0-595.0 sec   481 MBytes   806 Mbits/sec
[  3] 595.0-600.0 sec   481 MBytes   807 Mbits/sec
[  3] 600.0-605.0 sec   481 MBytes   807 Mbits/sec
[  3] 605.0-610.0 sec   481 MBytes   806 Mbits/sec
[  3] 610.0-615.0 sec   481 MBytes   806 Mbits/sec
[  3] 615.0-620.0 sec   481 MBytes   807 Mbits/sec
[  3] 620.0-625.0 sec   481 MBytes   807 Mbits/sec
[  3] 625.0-630.0 sec   481 MBytes   807 Mbits/sec
[  3] 630.0-635.0 sec   481 MBytes   807 Mbits/sec
[  3] 635.0-640.0 sec   481 MBytes   807 Mbits/sec
[  3] 640.0-645.0 sec   481 MBytes   807 Mbits/sec
[  3] 645.0-650.0 sec   481 MBytes   806 Mbits/sec
[  3] 650.0-655.0 sec   481 MBytes   807 Mbits/sec
[  3] 655.0-660.0 sec   481 MBytes   807 Mbits/sec
[  3] 660.0-665.0 sec   481 MBytes   807 Mbits/sec
[  3] 665.0-670.0 sec   481 MBytes   807 Mbits/sec
[  3] 670.0-675.0 sec   480 MBytes   806 Mbits/sec
[  3] 675.0-680.0 sec   481 MBytes   807 Mbits/sec
[  3] 680.0-685.0 sec   481 MBytes   807 Mbits/sec
```

```
[  3] 685.0-690.0 sec   481 MBytes   807 Mbits/sec
[  3] 690.0-695.0 sec   481 MBytes   807 Mbits/sec
[  3] 695.0-700.0 sec   481 MBytes   806 Mbits/sec
[  3] 700.0-705.0 sec   481 MBytes   807 Mbits/sec
[  3] 705.0-710.0 sec   480 MBytes   806 Mbits/sec
[  3] 710.0-715.0 sec   481 MBytes   808 Mbits/sec
[  3] 715.0-720.0 sec   481 MBytes   806 Mbits/sec
[  3] 720.0-725.0 sec   480 MBytes   806 Mbits/sec
[  3] 725.0-730.0 sec   481 MBytes   808 Mbits/sec
[  3] 730.0-735.0 sec   480 MBytes   806 Mbits/sec
[  3] 735.0-740.0 sec   481 MBytes   807 Mbits/sec
[  3] 740.0-745.0 sec   481 MBytes   807 Mbits/sec
[  3] 745.0-750.0 sec   481 MBytes   806 Mbits/sec
[  3] 750.0-755.0 sec   481 MBytes   807 Mbits/sec
[  3] 755.0-760.0 sec   481 MBytes   807 Mbits/sec
[  3] 760.0-765.0 sec   481 MBytes   806 Mbits/sec
[  3] 765.0-770.0 sec   481 MBytes   807 Mbits/sec
[  3] 770.0-775.0 sec   481 MBytes   807 Mbits/sec
[  3] 775.0-780.0 sec   481 MBytes   807 Mbits/sec
[  3] 780.0-785.0 sec   480 MBytes   806 Mbits/sec
[  3] 785.0-790.0 sec   481 MBytes   808 Mbits/sec
[  3] 790.0-795.0 sec   480 MBytes   806 Mbits/sec
[  3] 795.0-800.0 sec   481 MBytes   807 Mbits/sec
[  3] 800.0-805.0 sec   481 MBytes   806 Mbits/sec
[  3] 805.0-810.0 sec   480 MBytes   806 Mbits/sec
[  3] 810.0-815.0 sec   481 MBytes   807 Mbits/sec
[  3] 815.0-820.0 sec   481 MBytes   806 Mbits/sec
[  3] 820.0-825.0 sec   481 MBytes   807 Mbits/sec
[  3] 825.0-830.0 sec   481 MBytes   807 Mbits/sec
[  3] 830.0-835.0 sec   481 MBytes   807 Mbits/sec
[  3] 835.0-840.0 sec   481 MBytes   806 Mbits/sec
[  3] 840.0-845.0 sec   481 MBytes   807 Mbits/sec
[  3] 845.0-850.0 sec   481 MBytes   806 Mbits/sec
[  3] 850.0-855.0 sec   481 MBytes   807 Mbits/sec
[  3] 855.0-860.0 sec   481 MBytes   807 Mbits/sec
[  3] 860.0-865.0 sec   481 MBytes   807 Mbits/sec
[  3] 865.0-870.0 sec   481 MBytes   807 Mbits/sec
[  3] 870.0-875.0 sec   481 MBytes   808 Mbits/sec
[  3] 875.0-880.0 sec   481 MBytes   807 Mbits/sec
[  3] 880.0-885.0 sec   481 MBytes   807 Mbits/sec
[  3] 885.0-890.0 sec   481 MBytes   807 Mbits/sec
[  3] 890.0-895.0 sec   481 MBytes   807 Mbits/sec
[  3] 895.0-900.0 sec   481 MBytes   807 Mbits/sec
[  3]  0.0-900.0 sec  84.5 GBytes   807 Mbits/sec
[  3] Sent 61740013 datagrams
[  3] Server Report:
[3]0.0-900.0 sec 41.2 GBytes 393 Mbits/sec 0.145 ms 31654985/61740009 (51%)
[  3]  0.0-900.0 sec  309 datagrams received out-of-order
```

Results for Tiny VMs case4

```
TCP Traffic
------------------------------------------------------------
Client connecting to 172.16.0.2, TCP port 5001
TCP window size: 23.5 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.2 port 56102 connected with 172.16.0.2 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   351 MBytes   589 Mbits/sec
[  3]  5.0-10.0 sec   347 MBytes   583 Mbits/sec
[  3] 10.0-15.0 sec   347 MBytes   582 Mbits/sec
[  3] 15.0-20.0 sec   348 MBytes   585 Mbits/sec
[  3] 20.0-25.0 sec   346 MBytes   580 Mbits/sec
[  3] 25.0-30.0 sec   348 MBytes   584 Mbits/sec
[  3] 30.0-35.0 sec   346 MBytes   581 Mbits/sec
[  3] 35.0-40.0 sec   348 MBytes   584 Mbits/sec
[  3] 40.0-45.0 sec   346 MBytes   580 Mbits/sec
[  3] 45.0-50.0 sec   346 MBytes   581 Mbits/sec
```

```
[  3] 50.0-55.0 sec   347 MBytes   582 Mbits/sec
[  3] 55.0-60.0 sec   345 MBytes   579 Mbits/sec
[  3] 60.0-65.0 sec   345 MBytes   579 Mbits/sec
[  3] 65.0-70.0 sec   348 MBytes   583 Mbits/sec
[  3] 70.0-75.0 sec   348 MBytes   583 Mbits/sec
[  3] 75.0-80.0 sec   348 MBytes   584 Mbits/sec
[  3] 80.0-85.0 sec   348 MBytes   583 Mbits/sec
[  3] 85.0-90.0 sec   352 MBytes   590 Mbits/sec
[  3] 90.0-95.0 sec   350 MBytes   587 Mbits/sec
[  3] 95.0-100.0 sec   347 MBytes   582 Mbits/sec
[  3] 100.0-105.0 sec   349 MBytes   586 Mbits/sec
[  3] 105.0-110.0 sec   348 MBytes   585 Mbits/sec
[  3] 110.0-115.0 sec   348 MBytes   583 Mbits/sec
[  3] 115.0-120.0 sec   346 MBytes   581 Mbits/sec
[  3] 120.0-125.0 sec   347 MBytes   583 Mbits/sec
[  3] 125.0-130.0 sec   346 MBytes   581 Mbits/sec
[  3] 130.0-135.0 sec   347 MBytes   582 Mbits/sec
[  3] 135.0-140.0 sec   337 MBytes   565 Mbits/sec
[  3] 140.0-145.0 sec   329 MBytes   551 Mbits/sec
[  3] 145.0-150.0 sec   333 MBytes   559 Mbits/sec
[  3] 150.0-155.0 sec   331 MBytes   555 Mbits/sec
[  3] 155.0-160.0 sec   328 MBytes   549 Mbits/sec
[  3] 160.0-165.0 sec   328 MBytes   550 Mbits/sec
[  3] 165.0-170.0 sec   332 MBytes   558 Mbits/sec
[  3] 170.0-175.0 sec   330 MBytes   554 Mbits/sec
[  3] 175.0-180.0 sec   341 MBytes   573 Mbits/sec
[  3] 180.0-185.0 sec   340 MBytes   570 Mbits/sec
[  3] 185.0-190.0 sec   344 MBytes   578 Mbits/sec
[  3] 190.0-195.0 sec   345 MBytes   579 Mbits/sec
[  3] 195.0-200.0 sec   346 MBytes   580 Mbits/sec
[  3] 200.0-205.0 sec   345 MBytes   579 Mbits/sec
[  3] 205.0-210.0 sec   348 MBytes   584 Mbits/sec
[  3] 210.0-215.0 sec   350 MBytes   587 Mbits/sec
[  3] 215.0-220.0 sec   345 MBytes   578 Mbits/sec
[  3] 220.0-225.0 sec   350 MBytes   588 Mbits/sec
[  3] 225.0-230.0 sec   351 MBytes   589 Mbits/sec
[  3] 230.0-235.0 sec   346 MBytes   580 Mbits/sec
[  3] 235.0-240.0 sec   347 MBytes   583 Mbits/sec
[  3] 240.0-245.0 sec   348 MBytes   583 Mbits/sec
[  3] 245.0-250.0 sec   348 MBytes   584 Mbits/sec
[  3] 250.0-255.0 sec   346 MBytes   581 Mbits/sec
[  3] 255.0-260.0 sec   347 MBytes   583 Mbits/sec
[  3] 260.0-265.0 sec   350 MBytes   587 Mbits/sec
[  3] 265.0-270.0 sec   351 MBytes   589 Mbits/sec
[  3] 270.0-275.0 sec   349 MBytes   585 Mbits/sec
[  3] 275.0-280.0 sec   350 MBytes   588 Mbits/sec
[  3] 280.0-285.0 sec   352 MBytes   591 Mbits/sec
[  3] 285.0-290.0 sec   351 MBytes   589 Mbits/sec
[  3] 290.0-295.0 sec   352 MBytes   591 Mbits/sec
[  3] 295.0-300.0 sec   355 MBytes   595 Mbits/sec
[  3] 300.0-305.0 sec   352 MBytes   591 Mbits/sec
[  3] 305.0-310.0 sec   354 MBytes   593 Mbits/sec
[  3] 310.0-315.0 sec   352 MBytes   590 Mbits/sec
[  3] 315.0-320.0 sec   353 MBytes   592 Mbits/sec
[  3] 320.0-325.0 sec   350 MBytes   587 Mbits/sec
[  3] 325.0-330.0 sec   350 MBytes   588 Mbits/sec
[  3] 330.0-335.0 sec   348 MBytes   585 Mbits/sec
[  3] 335.0-340.0 sec   347 MBytes   582 Mbits/sec
[  3] 340.0-345.0 sec   348 MBytes   583 Mbits/sec
[  3] 345.0-350.0 sec   347 MBytes   583 Mbits/sec
[  3] 350.0-355.0 sec   347 MBytes   582 Mbits/sec
[  3] 355.0-360.0 sec   348 MBytes   584 Mbits/sec
[  3] 360.0-365.0 sec   349 MBytes   586 Mbits/sec
[  3] 365.0-370.0 sec   346 MBytes   580 Mbits/sec
[  3] 370.0-375.0 sec   345 MBytes   579 Mbits/sec
[  3] 375.0-380.0 sec   348 MBytes   583 Mbits/sec
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[  3] 380.0-385.0 sec   350 MBytes   587 Mbits/sec
[  3] 385.0-390.0 sec   349 MBytes   585 Mbits/sec
[  3] 390.0-395.0 sec   348 MBytes   584 Mbits/sec
[  3] 395.0-400.0 sec   349 MBytes   585 Mbits/sec
[  3] 400.0-405.0 sec   347 MBytes   582 Mbits/sec
[  3] 405.0-410.0 sec   347 MBytes   582 Mbits/sec
[  3] 410.0-415.0 sec   346 MBytes   580 Mbits/sec
[  3] 415.0-420.0 sec   347 MBytes   582 Mbits/sec
[  3] 420.0-425.0 sec   349 MBytes   585 Mbits/sec
[  3] 425.0-430.0 sec   349 MBytes   586 Mbits/sec
[  3] 430.0-435.0 sec   348 MBytes   585 Mbits/sec
[  3] 435.0-440.0 sec   351 MBytes   589 Mbits/sec
[  3] 440.0-445.0 sec   350 MBytes   588 Mbits/sec
[  3] 445.0-450.0 sec   352 MBytes   591 Mbits/sec
[  3] 450.0-455.0 sec   352 MBytes   590 Mbits/sec
[  3] 455.0-460.0 sec   350 MBytes   588 Mbits/sec
[  3] 460.0-465.0 sec   349 MBytes   586 Mbits/sec
[  3] 465.0-470.0 sec   352 MBytes   591 Mbits/sec
[  3] 470.0-475.0 sec   334 MBytes   560 Mbits/sec
[  3] 475.0-480.0 sec   349 MBytes   585 Mbits/sec
[  3] 480.0-485.0 sec   352 MBytes   591 Mbits/sec
[  3] 485.0-490.0 sec   353 MBytes   592 Mbits/sec
[  3] 490.0-495.0 sec   353 MBytes   592 Mbits/sec
[  3] 495.0-500.0 sec   352 MBytes   591 Mbits/sec
[  3] 500.0-505.0 sec   353 MBytes   592 Mbits/sec
[  3] 505.0-510.0 sec   353 MBytes   592 Mbits/sec
[  3] 510.0-515.0 sec   353 MBytes   592 Mbits/sec
[  3] 515.0-520.0 sec   347 MBytes   582 Mbits/sec
[  3] 520.0-525.0 sec   352 MBytes   590 Mbits/sec
[  3] 525.0-530.0 sec   352 MBytes   590 Mbits/sec
[  3] 530.0-535.0 sec   347 MBytes   582 Mbits/sec
[  3] 535.0-540.0 sec   349 MBytes   585 Mbits/sec
[  3] 540.0-545.0 sec   346 MBytes   581 Mbits/sec
[  3] 545.0-550.0 sec   349 MBytes   585 Mbits/sec
[  3] 550.0-555.0 sec   349 MBytes   585 Mbits/sec
[  3] 555.0-560.0 sec   348 MBytes   584 Mbits/sec
[  3] 560.0-565.0 sec   348 MBytes   583 Mbits/sec
[  3] 565.0-570.0 sec   347 MBytes   582 Mbits/sec
[  3] 570.0-575.0 sec   345 MBytes   578 Mbits/sec
[  3] 575.0-580.0 sec   343 MBytes   576 Mbits/sec
[  3] 580.0-585.0 sec   351 MBytes   590 Mbits/sec
[  3] 585.0-590.0 sec   348 MBytes   584 Mbits/sec
[  3] 590.0-595.0 sec   346 MBytes   581 Mbits/sec
[  3] 595.0-600.0 sec   349 MBytes   586 Mbits/sec
[  3] 600.0-605.0 sec   350 MBytes   587 Mbits/sec
[  3] 605.0-610.0 sec   351 MBytes   588 Mbits/sec
[  3] 610.0-615.0 sec   353 MBytes   592 Mbits/sec
[  3] 615.0-620.0 sec   351 MBytes   589 Mbits/sec
[  3] 620.0-625.0 sec   351 MBytes   588 Mbits/sec
[  3] 625.0-630.0 sec   353 MBytes   592 Mbits/sec
[  3] 630.0-635.0 sec   350 MBytes   587 Mbits/sec
[  3] 635.0-640.0 sec   349 MBytes   585 Mbits/sec
[  3] 640.0-645.0 sec   347 MBytes   582 Mbits/sec
[  3] 645.0-650.0 sec   346 MBytes   581 Mbits/sec
[  3] 650.0-655.0 sec   346 MBytes   580 Mbits/sec
[  3] 655.0-660.0 sec   339 MBytes   569 Mbits/sec
[  3] 660.0-665.0 sec   336 MBytes   563 Mbits/sec
[  3] 665.0-670.0 sec   334 MBytes   560 Mbits/sec
[  3] 670.0-675.0 sec   332 MBytes   557 Mbits/sec
[  3] 675.0-680.0 sec   342 MBytes   573 Mbits/sec
[  3] 680.0-685.0 sec   330 MBytes   553 Mbits/sec
[  3] 685.0-690.0 sec   340 MBytes   571 Mbits/sec
[  3] 690.0-695.0 sec   329 MBytes   552 Mbits/sec
[  3] 695.0-700.0 sec   334 MBytes   560 Mbits/sec
[  3] 700.0-705.0 sec   329 MBytes   552 Mbits/sec
[  3] 705.0-710.0 sec   338 MBytes   567 Mbits/sec
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[  3] 710.0-715.0 sec   328 MBytes   550 Mbits/sec
[  3] 715.0-720.0 sec   332 MBytes   557 Mbits/sec
[  3] 720.0-725.0 sec   326 MBytes   547 Mbits/sec
[  3] 725.0-730.0 sec   334 MBytes   560 Mbits/sec
[  3] 730.0-735.0 sec   330 MBytes   553 Mbits/sec
[  3] 735.0-740.0 sec   336 MBytes   563 Mbits/sec
[  3] 740.0-745.0 sec   332 MBytes   557 Mbits/sec
[  3] 745.0-750.0 sec   347 MBytes   582 Mbits/sec
[  3] 750.0-755.0 sec   353 MBytes   592 Mbits/sec
[  3] 755.0-760.0 sec   352 MBytes   591 Mbits/sec
[  3] 760.0-765.0 sec   352 MBytes   590 Mbits/sec
[  3] 765.0-770.0 sec   350 MBytes   587 Mbits/sec
[  3] 770.0-775.0 sec   348 MBytes   584 Mbits/sec
[  3] 775.0-780.0 sec   348 MBytes   584 Mbits/sec
[  3] 780.0-785.0 sec   347 MBytes   582 Mbits/sec
[  3] 785.0-790.0 sec   344 MBytes   576 Mbits/sec
[  3] 790.0-795.0 sec   347 MBytes   582 Mbits/sec
[  3] 795.0-800.0 sec   346 MBytes   581 Mbits/sec
[  3] 800.0-805.0 sec   353 MBytes   593 Mbits/sec
[  3] 805.0-810.0 sec   353 MBytes   592 Mbits/sec
[  3] 810.0-815.0 sec   351 MBytes   589 Mbits/sec
[  3] 815.0-820.0 sec   352 MBytes   590 Mbits/sec
[  3] 820.0-825.0 sec   351 MBytes   589 Mbits/sec
[  3] 825.0-830.0 sec   350 MBytes   587 Mbits/sec
[  3] 830.0-835.0 sec   352 MBytes   591 Mbits/sec
[  3] 835.0-840.0 sec   352 MBytes   591 Mbits/sec
[  3] 840.0-845.0 sec   352 MBytes   591 Mbits/sec
[  3] 845.0-850.0 sec   352 MBytes   591 Mbits/sec
[  3] 850.0-855.0 sec   351 MBytes   589 Mbits/sec
[  3] 855.0-860.0 sec   349 MBytes   585 Mbits/sec
[  3] 860.0-865.0 sec   348 MBytes   585 Mbits/sec
[  3] 865.0-870.0 sec   351 MBytes   589 Mbits/sec
[  3] 870.0-875.0 sec   349 MBytes   585 Mbits/sec
[  3] 875.0-880.0 sec   350 MBytes   588 Mbits/sec
[  3] 880.0-885.0 sec   351 MBytes   590 Mbits/sec
[  3] 885.0-890.0 sec   348 MBytes   583 Mbits/sec
[  3] 890.0-895.0 sec   349 MBytes   586 Mbits/sec
[  3] 895.0-900.0 sec   352 MBytes   590 Mbits/sec
[  3]  0.0-900.0 sec  60.9 GBytes   581 Mbits/sec
------------------------------------------------------------
UDP Traffic
------------------------------------------------------------
Client connecting to 172.16.0.2, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.2 port 58882 connected with 172.16.0.2 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   481 MBytes   806 Mbits/sec
[  3]  5.0-10.0 sec   481 MBytes   807 Mbits/sec
[  3] 10.0-15.0 sec   481 MBytes   807 Mbits/sec
[  3] 15.0-20.0 sec   481 MBytes   806 Mbits/sec
[  3] 20.0-25.0 sec   481 MBytes   808 Mbits/sec
[  3] 25.0-30.0 sec   481 MBytes   808 Mbits/sec
[  3] 30.0-35.0 sec   479 MBytes   804 Mbits/sec
[  3] 35.0-40.0 sec   480 MBytes   806 Mbits/sec
[  3] 40.0-45.0 sec   481 MBytes   806 Mbits/sec
[  3] 45.0-50.0 sec   481 MBytes   807 Mbits/sec
[  3] 50.0-55.0 sec   481 MBytes   807 Mbits/sec
[  3] 55.0-60.0 sec   481 MBytes   807 Mbits/sec
[  3] 60.0-65.0 sec   481 MBytes   806 Mbits/sec
[  3] 65.0-70.0 sec   481 MBytes   808 Mbits/sec
[  3] 70.0-75.0 sec   481 MBytes   807 Mbits/sec
[  3] 75.0-80.0 sec   479 MBytes   803 Mbits/sec
[  3] 80.0-85.0 sec   481 MBytes   806 Mbits/sec
[  3] 85.0-90.0 sec   481 MBytes   808 Mbits/sec
```

```
[  3] 90.0-95.0 sec   481 MBytes   808 Mbits/sec
[  3] 95.0-100.0 sec   480 MBytes   806 Mbits/sec
[  3] 100.0-105.0 sec   481 MBytes   807 Mbits/sec
[  3] 105.0-110.0 sec   481 MBytes   807 Mbits/sec
[  3] 110.0-115.0 sec   481 MBytes   807 Mbits/sec
[  3] 115.0-120.0 sec   481 MBytes   807 Mbits/sec
[  3] 120.0-125.0 sec   480 MBytes   806 Mbits/sec
[  3] 125.0-130.0 sec   481 MBytes   808 Mbits/sec
[  3] 130.0-135.0 sec   481 MBytes   807 Mbits/sec
[  3] 135.0-140.0 sec   481 MBytes   807 Mbits/sec
[  3] 140.0-145.0 sec   481 MBytes   808 Mbits/sec
[  3] 145.0-150.0 sec   481 MBytes   808 Mbits/sec
[  3] 150.0-155.0 sec   481 MBytes   807 Mbits/sec
[  3] 155.0-160.0 sec   481 MBytes   807 Mbits/sec
[  3] 160.0-165.0 sec   481 MBytes   806 Mbits/sec
[  3] 165.0-170.0 sec   481 MBytes   807 Mbits/sec
[  3] 170.0-175.0 sec   481 MBytes   807 Mbits/sec
[  3] 175.0-180.0 sec   481 MBytes   807 Mbits/sec
[  3] 180.0-185.0 sec   481 MBytes   806 Mbits/sec
[  3] 185.0-190.0 sec   482 MBytes   808 Mbits/sec
[  3] 190.0-195.0 sec   481 MBytes   806 Mbits/sec
[  3] 195.0-200.0 sec   481 MBytes   807 Mbits/sec
[  3] 200.0-205.0 sec   481 MBytes   807 Mbits/sec
[  3] 205.0-210.0 sec   482 MBytes   808 Mbits/sec
[  3] 210.0-215.0 sec   481 MBytes   808 Mbits/sec
[  3] 215.0-220.0 sec   480 MBytes   806 Mbits/sec
[  3] 220.0-225.0 sec   481 MBytes   807 Mbits/sec
[  3] 225.0-230.0 sec   481 MBytes   806 Mbits/sec
[  3] 230.0-235.0 sec   481 MBytes   807 Mbits/sec
[  3] 235.0-240.0 sec   481 MBytes   807 Mbits/sec
[  3] 240.0-245.0 sec   481 MBytes   807 Mbits/sec
[  3] 245.0-250.0 sec   481 MBytes   807 Mbits/sec
[  3] 250.0-255.0 sec   481 MBytes   807 Mbits/sec
[  3] 255.0-260.0 sec   481 MBytes   807 Mbits/sec
[  3] 260.0-265.0 sec   481 MBytes   807 Mbits/sec
[  3] 265.0-270.0 sec   481 MBytes   808 Mbits/sec
[  3] 270.0-275.0 sec   481 MBytes   808 Mbits/sec
[  3] 275.0-280.0 sec   481 MBytes   807 Mbits/sec
[  3] 280.0-285.0 sec   481 MBytes   806 Mbits/sec
[  3] 285.0-290.0 sec   481 MBytes   808 Mbits/sec
[  3] 290.0-295.0 sec   481 MBytes   806 Mbits/sec
[  3] 295.0-300.0 sec   481 MBytes   808 Mbits/sec
[  3] 300.0-305.0 sec   480 MBytes   806 Mbits/sec
[  3] 305.0-310.0 sec   481 MBytes   808 Mbits/sec
[  3] 310.0-315.0 sec   481 MBytes   807 Mbits/sec
[  3] 315.0-320.0 sec   481 MBytes   807 Mbits/sec
[  3] 320.0-325.0 sec   481 MBytes   808 Mbits/sec
[  3] 325.0-330.0 sec   481 MBytes   808 Mbits/sec
[  3] 330.0-335.0 sec   481 MBytes   808 Mbits/sec
[  3] 335.0-340.0 sec   481 MBytes   806 Mbits/sec
[  3] 340.0-345.0 sec   481 MBytes   807 Mbits/sec
[  3] 345.0-350.0 sec   481 MBytes   807 Mbits/sec
[  3] 350.0-355.0 sec   481 MBytes   807 Mbits/sec
[  3] 355.0-360.0 sec   481 MBytes   807 Mbits/sec
[  3] 360.0-365.0 sec   481 MBytes   806 Mbits/sec
[  3] 365.0-370.0 sec   481 MBytes   807 Mbits/sec
[  3] 370.0-375.0 sec   481 MBytes   807 Mbits/sec
[  3] 375.0-380.0 sec   481 MBytes   806 Mbits/sec
[  3] 380.0-385.0 sec   481 MBytes   808 Mbits/sec
[  3] 385.0-390.0 sec   482 MBytes   808 Mbits/sec
[  3] 390.0-395.0 sec   481 MBytes   808 Mbits/sec
[  3] 395.0-400.0 sec   481 MBytes   807 Mbits/sec
[  3] 400.0-405.0 sec   481 MBytes   807 Mbits/sec
[  3] 405.0-410.0 sec   481 MBytes   807 Mbits/sec
[  3] 410.0-415.0 sec   481 MBytes   807 Mbits/sec
[  3] 415.0-420.0 sec   481 MBytes   807 Mbits/sec
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[  3] 420.0-425.0 sec   481 MBytes   806 Mbits/sec
[  3] 425.0-430.0 sec   481 MBytes   807 Mbits/sec
[  3] 430.0-435.0 sec   481 MBytes   806 Mbits/sec
[  3] 435.0-440.0 sec   480 MBytes   806 Mbits/sec
[  3] 440.0-445.0 sec   481 MBytes   808 Mbits/sec
[  3] 445.0-450.0 sec   481 MBytes   808 Mbits/sec
[  3] 450.0-455.0 sec   481 MBytes   808 Mbits/sec
[  3] 455.0-460.0 sec   481 MBytes   808 Mbits/sec
[  3] 460.0-465.0 sec   481 MBytes   807 Mbits/sec
[  3] 465.0-470.0 sec   481 MBytes   807 Mbits/sec
[  3] 470.0-475.0 sec   481 MBytes   808 Mbits/sec
[  3] 475.0-480.0 sec   481 MBytes   808 Mbits/sec
[  3] 480.0-485.0 sec   480 MBytes   806 Mbits/sec
[  3] 485.0-490.0 sec   481 MBytes   808 Mbits/sec
[  3] 490.0-495.0 sec   481 MBytes   807 Mbits/sec
[  3] 495.0-500.0 sec   481 MBytes   806 Mbits/sec
[  3] 500.0-505.0 sec   481 MBytes   808 Mbits/sec
[  3] 505.0-510.0 sec   481 MBytes   808 Mbits/sec
[  3] 510.0-515.0 sec   481 MBytes   807 Mbits/sec
[  3] 515.0-520.0 sec   481 MBytes   806 Mbits/sec
[  3] 520.0-525.0 sec   481 MBytes   808 Mbits/sec
[  3] 525.0-530.0 sec   481 MBytes   806 Mbits/sec
[  3] 530.0-535.0 sec   481 MBytes   807 Mbits/sec
[  3] 535.0-540.0 sec   481 MBytes   807 Mbits/sec
[  3] 540.0-545.0 sec   480 MBytes   806 Mbits/sec
[  3] 545.0-550.0 sec   481 MBytes   807 Mbits/sec
[  3] 550.0-555.0 sec   481 MBytes   807 Mbits/sec
[  3] 555.0-560.0 sec   482 MBytes   808 Mbits/sec
[  3] 560.0-565.0 sec   482 MBytes   809 Mbits/sec
[  3] 565.0-570.0 sec   482 MBytes   809 Mbits/sec
[  3] 570.0-575.0 sec   481 MBytes   808 Mbits/sec
[  3] 575.0-580.0 sec   481 MBytes   807 Mbits/sec
[  3] 580.0-585.0 sec   481 MBytes   807 Mbits/sec
[  3] 585.0-590.0 sec   481 MBytes   807 Mbits/sec
[  3] 590.0-595.0 sec   481 MBytes   807 Mbits/sec
[  3] 595.0-600.0 sec   481 MBytes   807 Mbits/sec
[  3] 600.0-605.0 sec   481 MBytes   807 Mbits/sec
[  3] 605.0-610.0 sec   481 MBytes   807 Mbits/sec
[  3] 610.0-615.0 sec   481 MBytes   807 Mbits/sec
[  3] 615.0-620.0 sec   481 MBytes   807 Mbits/sec
[  3] 620.0-625.0 sec   481 MBytes   808 Mbits/sec
[  3] 625.0-630.0 sec   482 MBytes   808 Mbits/sec
[  3] 630.0-635.0 sec   481 MBytes   808 Mbits/sec
[  3] 635.0-640.0 sec   481 MBytes   806 Mbits/sec
[  3] 640.0-645.0 sec   481 MBytes   807 Mbits/sec
[  3] 645.0-650.0 sec   481 MBytes   806 Mbits/sec
[  3] 650.0-655.0 sec   481 MBytes   808 Mbits/sec
[  3] 655.0-660.0 sec   481 MBytes   807 Mbits/sec
[  3] 660.0-665.0 sec   481 MBytes   806 Mbits/sec
[  3] 665.0-670.0 sec   481 MBytes   808 Mbits/sec
[  3] 670.0-675.0 sec   481 MBytes   806 Mbits/sec
[  3] 675.0-680.0 sec   481 MBytes   807 Mbits/sec
[  3] 680.0-685.0 sec   481 MBytes   807 Mbits/sec
[  3] 685.0-690.0 sec   482 MBytes   808 Mbits/sec
[  3] 690.0-695.0 sec   481 MBytes   808 Mbits/sec
[  3] 695.0-700.0 sec   481 MBytes   806 Mbits/sec
[  3] 700.0-705.0 sec   481 MBytes   807 Mbits/sec
[  3] 705.0-710.0 sec   481 MBytes   806 Mbits/sec
[  3] 710.0-715.0 sec   481 MBytes   807 Mbits/sec
[  3] 715.0-720.0 sec   481 MBytes   807 Mbits/sec
[  3] 720.0-725.0 sec   481 MBytes   807 Mbits/sec
[  3] 725.0-730.0 sec   481 MBytes   807 Mbits/sec
[  3] 730.0-735.0 sec   481 MBytes   808 Mbits/sec
[  3] 735.0-740.0 sec   481 MBytes   807 Mbits/sec
[  3] 740.0-745.0 sec   481 MBytes   807 Mbits/sec
[  3] 745.0-750.0 sec   482 MBytes   808 Mbits/sec
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[  3] 750.0-755.0 sec   481 MBytes   807 Mbits/sec
[  3] 755.0-760.0 sec   481 MBytes   807 Mbits/sec
[  3] 760.0-765.0 sec   481 MBytes   806 Mbits/sec
[  3] 765.0-770.0 sec   481 MBytes   806 Mbits/sec
[  3] 770.0-775.0 sec   481 MBytes   807 Mbits/sec
[  3] 775.0-780.0 sec   481 MBytes   807 Mbits/sec
[  3] 780.0-785.0 sec   481 MBytes   807 Mbits/sec
[  3] 785.0-790.0 sec   481 MBytes   808 Mbits/sec
[  3] 790.0-795.0 sec   481 MBytes   808 Mbits/sec
[  3] 795.0-800.0 sec   481 MBytes   807 Mbits/sec
[  3] 800.0-805.0 sec   481 MBytes   808 Mbits/sec
[  3] 805.0-810.0 sec   482 MBytes   808 Mbits/sec
[  3] 810.0-815.0 sec   481 MBytes   807 Mbits/sec
[  3] 815.0-820.0 sec   481 MBytes   807 Mbits/sec
[  3] 820.0-825.0 sec   481 MBytes   807 Mbits/sec
[  3] 825.0-830.0 sec   481 MBytes   807 Mbits/sec
[  3] 830.0-835.0 sec   481 MBytes   807 Mbits/sec
[  3] 835.0-840.0 sec   481 MBytes   807 Mbits/sec
[  3] 840.0-845.0 sec   480 MBytes   806 Mbits/sec
[  3] 845.0-850.0 sec   481 MBytes   808 Mbits/sec
[  3] 850.0-855.0 sec   481 MBytes   807 Mbits/sec
[  3] 855.0-860.0 sec   481 MBytes   807 Mbits/sec
[  3] 860.0-865.0 sec   481 MBytes   808 Mbits/sec
[  3] 865.0-870.0 sec   482 MBytes   808 Mbits/sec
[  3] 870.0-875.0 sec   481 MBytes   808 Mbits/sec
[  3] 875.0-880.0 sec   481 MBytes   807 Mbits/sec
[  3] 880.0-885.0 sec   481 MBytes   807 Mbits/sec
[  3] 885.0-890.0 sec   481 MBytes   807 Mbits/sec
[  3] 890.0-895.0 sec   481 MBytes   806 Mbits/sec
[  3]  0.0-900.0 sec  84.6 GBytes   807 Mbits/sec
[  3] Sent 61764867 datagrams
[  3] Server Report:
[3]0.0-900.0 sec  84.3 GBytes 804 Mbits/sec 0.008 ms 196586/61764866 (0.32%)
[  3]  0.0-900.0 sec  3718 datagrams received out-of-order
```

Results for Medium VMs case1

```
TCP Traffic
------------------------------------------------------------
Client connecting to 10.0.3.16, TCP port 5001
TCP window size: 23.5 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.12 port 43973 connected with 10.0.3.16 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   557 MBytes   934 Mbits/sec
[  3]  5.0-10.0 sec   569 MBytes   954 Mbits/sec
[  3] 10.0-15.0 sec   623 MBytes  1.05 Gbits/sec
[  3] 15.0-20.0 sec   648 MBytes  1.09 Gbits/sec
[  3] 20.0-25.0 sec   651 MBytes  1.09 Gbits/sec
[  3] 25.0-30.0 sec   643 MBytes  1.08 Gbits/sec
[  3] 30.0-35.0 sec   648 MBytes  1.09 Gbits/sec
[  3] 35.0-40.0 sec   641 MBytes  1.08 Gbits/sec
[  3] 40.0-45.0 sec   651 MBytes  1.09 Gbits/sec
[  3] 45.0-50.0 sec   658 MBytes  1.10 Gbits/sec
[  3] 50.0-55.0 sec   652 MBytes  1.09 Gbits/sec
[  3] 55.0-60.0 sec   662 MBytes  1.11 Gbits/sec
[  3] 60.0-65.0 sec   648 MBytes  1.09 Gbits/sec
[  3] 65.0-70.0 sec   651 MBytes  1.09 Gbits/sec
[  3] 70.0-75.0 sec   646 MBytes  1.08 Gbits/sec
[  3] 75.0-80.0 sec   646 MBytes  1.08 Gbits/sec
[  3] 80.0-85.0 sec   647 MBytes  1.09 Gbits/sec
[  3] 85.0-90.0 sec   638 MBytes  1.07 Gbits/sec
[  3] 90.0-95.0 sec   651 MBytes  1.09 Gbits/sec
[  3] 95.0-100.0 sec   646 MBytes  1.08 Gbits/sec
[  3] 100.0-105.0 sec   649 MBytes  1.09 Gbits/sec
[  3] 105.0-110.0 sec   644 MBytes  1.08 Gbits/sec
[  3] 110.0-115.0 sec   659 MBytes  1.11 Gbits/sec
[  3] 115.0-120.0 sec   652 MBytes  1.09 Gbits/sec
```

```
[  3] 120.0-125.0 sec   642 MBytes  1.08 Gbits/sec
[  3] 125.0-130.0 sec   645 MBytes  1.08 Gbits/sec
[  3] 130.0-135.0 sec   642 MBytes  1.08 Gbits/sec
[  3] 135.0-140.0 sec   636 MBytes  1.07 Gbits/sec
[  3] 140.0-145.0 sec   644 MBytes  1.08 Gbits/sec
[  3] 145.0-150.0 sec   646 MBytes  1.08 Gbits/sec
[  3] 150.0-155.0 sec   650 MBytes  1.09 Gbits/sec
[  3] 155.0-160.0 sec   652 MBytes  1.09 Gbits/sec
[  3] 160.0-165.0 sec   642 MBytes  1.08 Gbits/sec
[  3] 165.0-170.0 sec   656 MBytes  1.10 Gbits/sec
[  3] 170.0-175.0 sec   656 MBytes  1.10 Gbits/sec
[  3] 175.0-180.0 sec   656 MBytes  1.10 Gbits/sec
[  3] 180.0-185.0 sec   646 MBytes  1.08 Gbits/sec
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[  3] 200.0-205.0 sec   644 MBytes  1.08 Gbits/sec
[  3] 205.0-210.0 sec   654 MBytes  1.10 Gbits/sec
[  3] 210.0-215.0 sec   648 MBytes  1.09 Gbits/sec
[  3] 215.0-220.0 sec   661 MBytes  1.11 Gbits/sec
[  3] 220.0-225.0 sec   653 MBytes  1.10 Gbits/sec
[  3] 225.0-230.0 sec   651 MBytes  1.09 Gbits/sec
[  3] 230.0-235.0 sec   650 MBytes  1.09 Gbits/sec
[  3] 235.0-240.0 sec   664 MBytes  1.11 Gbits/sec
[  3] 240.0-245.0 sec   652 MBytes  1.09 Gbits/sec
[  3] 245.0-250.0 sec   644 MBytes  1.08 Gbits/sec
[  3] 250.0-255.0 sec   650 MBytes  1.09 Gbits/sec
[  3] 255.0-260.0 sec   648 MBytes  1.09 Gbits/sec
[  3] 260.0-265.0 sec   646 MBytes  1.08 Gbits/sec
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[  3] 270.0-275.0 sec   654 MBytes  1.10 Gbits/sec
[  3] 275.0-280.0 sec   644 MBytes  1.08 Gbits/sec
[  3] 280.0-285.0 sec   654 MBytes  1.10 Gbits/sec
[  3] 285.0-290.0 sec   650 MBytes  1.09 Gbits/sec
[  3] 290.0-295.0 sec   658 MBytes  1.10 Gbits/sec
[  3] 295.0-300.0 sec   657 MBytes  1.10 Gbits/sec
[  3] 300.0-305.0 sec   648 MBytes  1.09 Gbits/sec
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[  3] 310.0-315.0 sec   645 MBytes  1.08 Gbits/sec
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[  3] 320.0-325.0 sec   644 MBytes  1.08 Gbits/sec
[  3] 325.0-330.0 sec   650 MBytes  1.09 Gbits/sec
[  3] 330.0-335.0 sec   655 MBytes  1.10 Gbits/sec
[  3] 335.0-340.0 sec   655 MBytes  1.10 Gbits/sec
[  3] 340.0-345.0 sec   645 MBytes  1.08 Gbits/sec
[  3] 345.0-350.0 sec   638 MBytes  1.07 Gbits/sec
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[  3] 415.0-420.0 sec   662 MBytes  1.11 Gbits/sec
[  3] 420.0-425.0 sec   656 MBytes  1.10 Gbits/sec
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[  3] 430.0-435.0 sec   650 MBytes  1.09 Gbits/sec
[  3] 435.0-440.0 sec   648 MBytes  1.09 Gbits/sec
[  3] 440.0-445.0 sec   645 MBytes  1.08 Gbits/sec
[  3] 445.0-450.0 sec   650 MBytes  1.09 Gbits/sec
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[  3] 450.0-455.0 sec   646 MBytes  1.08 Gbits/sec
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[  3] 525.0-530.0 sec   650 MBytes  1.09 Gbits/sec
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[  3] 775.0-780.0 sec   655 MBytes  1.10 Gbits/sec
```

```
[  3] 780.0-785.0 sec   644 MBytes  1.08 Gbits/sec
[  3] 785.0-790.0 sec   645 MBytes  1.08 Gbits/sec
[  3] 790.0-795.0 sec   643 MBytes  1.08 Gbits/sec
[  3] 795.0-800.0 sec   643 MBytes  1.08 Gbits/sec
[  3] 800.0-805.0 sec   648 MBytes  1.09 Gbits/sec
[  3] 805.0-810.0 sec   655 MBytes  1.10 Gbits/sec
[  3] 810.0-815.0 sec   654 MBytes  1.10 Gbits/sec
[  3] 815.0-820.0 sec   623 MBytes  1.05 Gbits/sec
[  3] 820.0-825.0 sec   660 MBytes  1.11 Gbits/sec
[  3] 825.0-830.0 sec   649 MBytes  1.09 Gbits/sec
[  3] 830.0-835.0 sec   664 MBytes  1.11 Gbits/sec
[  3] 835.0-840.0 sec   661 MBytes  1.11 Gbits/sec
[  3] 840.0-845.0 sec   650 MBytes  1.09 Gbits/sec
[  3] 845.0-850.0 sec   648 MBytes  1.09 Gbits/sec
[  3] 850.0-855.0 sec   654 MBytes  1.10 Gbits/sec
[  3] 855.0-860.0 sec   642 MBytes  1.08 Gbits/sec
[  3] 860.0-865.0 sec   653 MBytes  1.10 Gbits/sec
[  3] 865.0-870.0 sec   653 MBytes  1.10 Gbits/sec
[  3] 870.0-875.0 sec   650 MBytes  1.09 Gbits/sec
[  3] 875.0-880.0 sec   654 MBytes  1.10 Gbits/sec
[  3] 880.0-885.0 sec   646 MBytes  1.08 Gbits/sec
[  3] 885.0-890.0 sec   647 MBytes  1.09 Gbits/sec
[  3] 890.0-895.0 sec   655 MBytes  1.10 Gbits/sec
[  3] 895.0-900.0 sec   656 MBytes  1.10 Gbits/sec
[  3]  0.0-900.0 sec   114 GBytes  1.09 Gbits/sec
------------------------------------------------------------
UDP Traffic
------------------------------------------------------------
Client connecting to 10.0.3.16, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.12 port 47298 connected with 10.0.3.16 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   482 MBytes   808 Mbits/sec
[  3]  5.0-10.0 sec   480 MBytes   806 Mbits/sec
[  3] 10.0-15.0 sec   482 MBytes   809 Mbits/sec
[  3] 15.0-20.0 sec   482 MBytes   808 Mbits/sec
[  3] 20.0-25.0 sec   482 MBytes   808 Mbits/sec
[  3] 25.0-30.0 sec   482 MBytes   809 Mbits/sec
[  3] 30.0-35.0 sec   481 MBytes   808 Mbits/sec
[  3] 35.0-40.0 sec   481 MBytes   808 Mbits/sec
[  3] 40.0-45.0 sec   480 MBytes   806 Mbits/sec
[  3] 45.0-50.0 sec   481 MBytes   808 Mbits/sec
[  3] 50.0-55.0 sec   481 MBytes   808 Mbits/sec
[  3] 55.0-60.0 sec   481 MBytes   807 Mbits/sec
[  3] 60.0-65.0 sec   481 MBytes   808 Mbits/sec
[  3] 65.0-70.0 sec   468 MBytes   786 Mbits/sec
[  3] 70.0-75.0 sec   469 MBytes   787 Mbits/sec
[  3] 75.0-80.0 sec   482 MBytes   808 Mbits/sec
[  3] 80.0-85.0 sec   481 MBytes   807 Mbits/sec
[  3] 85.0-90.0 sec   482 MBytes   808 Mbits/sec
[  3] 90.0-95.0 sec   482 MBytes   808 Mbits/sec
[  3] 95.0-100.0 sec   482 MBytes   809 Mbits/sec
[  3] 100.0-105.0 sec   482 MBytes   808 Mbits/sec
[  3] 105.0-110.0 sec   482 MBytes   809 Mbits/sec
[  3] 110.0-115.0 sec   481 MBytes   808 Mbits/sec
[  3] 115.0-120.0 sec   482 MBytes   809 Mbits/sec
[  3] 120.0-125.0 sec   481 MBytes   807 Mbits/sec
[  3] 125.0-130.0 sec   482 MBytes   809 Mbits/sec
[  3] 130.0-135.0 sec   481 MBytes   808 Mbits/sec
[  3] 135.0-140.0 sec   481 MBytes   806 Mbits/sec
[  3] 140.0-145.0 sec   481 MBytes   806 Mbits/sec
[  3] 145.0-150.0 sec   481 MBytes   808 Mbits/sec
[  3] 150.0-155.0 sec   481 MBytes   808 Mbits/sec
[  3] 155.0-160.0 sec   481 MBytes   808 Mbits/sec
```

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[  3] 160.0-165.0 sec   481 MBytes   808 Mbits/sec
[  3] 165.0-170.0 sec   481 MBytes   808 Mbits/sec
[  3] 170.0-175.0 sec   482 MBytes   809 Mbits/sec
[  3] 175.0-180.0 sec   482 MBytes   808 Mbits/sec
[  3] 180.0-185.0 sec   481 MBytes   807 Mbits/sec
[  3] 185.0-190.0 sec   481 MBytes   808 Mbits/sec
[  3] 190.0-195.0 sec   482 MBytes   808 Mbits/sec
[  3] 195.0-200.0 sec   459 MBytes   771 Mbits/sec
[  3] 200.0-205.0 sec   481 MBytes   807 Mbits/sec
[  3] 205.0-210.0 sec   481 MBytes   807 Mbits/sec
[  3] 210.0-215.0 sec   482 MBytes   809 Mbits/sec
[  3] 215.0-220.0 sec   482 MBytes   808 Mbits/sec
[  3] 220.0-225.0 sec   482 MBytes   809 Mbits/sec
[  3] 225.0-230.0 sec   482 MBytes   808 Mbits/sec
[  3] 230.0-235.0 sec   482 MBytes   809 Mbits/sec
[  3] 235.0-240.0 sec   482 MBytes   808 Mbits/sec
[  3] 240.0-245.0 sec   480 MBytes   806 Mbits/sec
[  3] 245.0-250.0 sec   481 MBytes   807 Mbits/sec
[  3] 250.0-255.0 sec   481 MBytes   807 Mbits/sec
[  3] 255.0-260.0 sec   481 MBytes   806 Mbits/sec
[  3] 260.0-265.0 sec   482 MBytes   808 Mbits/sec
[  3] 265.0-270.0 sec   482 MBytes   809 Mbits/sec
[  3] 270.0-275.0 sec   482 MBytes   808 Mbits/sec
[  3] 275.0-280.0 sec   481 MBytes   808 Mbits/sec
[  3] 280.0-285.0 sec   482 MBytes   809 Mbits/sec
[  3] 285.0-290.0 sec   482 MBytes   808 Mbits/sec
[  3] 290.0-295.0 sec   482 MBytes   809 Mbits/sec
[  3] 295.0-300.0 sec   482 MBytes   808 Mbits/sec
[  3] 300.0-305.0 sec   480 MBytes   806 Mbits/sec
[  3] 305.0-310.0 sec   481 MBytes   808 Mbits/sec
[  3] 310.0-315.0 sec   482 MBytes   809 Mbits/sec
[  3] 315.0-320.0 sec   482 MBytes   808 Mbits/sec
[  3] 320.0-325.0 sec   481 MBytes   808 Mbits/sec
[  3] 325.0-330.0 sec   482 MBytes   809 Mbits/sec
[  3] 330.0-335.0 sec   482 MBytes   808 Mbits/sec
[  3] 335.0-340.0 sec   482 MBytes   808 Mbits/sec
[  3] 340.0-345.0 sec   482 MBytes   809 Mbits/sec
[  3] 345.0-350.0 sec   482 MBytes   808 Mbits/sec
[  3] 350.0-355.0 sec   482 MBytes   809 Mbits/sec
[  3] 355.0-360.0 sec   481 MBytes   808 Mbits/sec
[  3] 360.0-365.0 sec   481 MBytes   807 Mbits/sec
[  3] 365.0-370.0 sec   482 MBytes   808 Mbits/sec
[  3] 370.0-375.0 sec   482 MBytes   809 Mbits/sec
[  3] 375.0-380.0 sec   480 MBytes   805 Mbits/sec
[  3] 380.0-385.0 sec   482 MBytes   809 Mbits/sec
[  3] 385.0-390.0 sec   482 MBytes   808 Mbits/sec
[  3] 390.0-395.0 sec   481 MBytes   808 Mbits/sec
[  3] 395.0-400.0 sec   482 MBytes   809 Mbits/sec
[  3] 400.0-405.0 sec   482 MBytes   808 Mbits/sec
[  3] 405.0-410.0 sec   482 MBytes   809 Mbits/sec
[  3] 410.0-415.0 sec   482 MBytes   808 Mbits/sec
[  3] 415.0-420.0 sec   482 MBytes   808 Mbits/sec
[  3] 420.0-425.0 sec   481 MBytes   807 Mbits/sec
[  3] 425.0-430.0 sec   482 MBytes   808 Mbits/sec
[  3] 430.0-435.0 sec   482 MBytes   808 Mbits/sec
[  3] 435.0-440.0 sec   481 MBytes   808 Mbits/sec
[  3] 440.0-445.0 sec   482 MBytes   809 Mbits/sec
[  3] 445.0-450.0 sec   482 MBytes   808 Mbits/sec
[  3] 450.0-455.0 sec   482 MBytes   809 Mbits/sec
[  3] 455.0-460.0 sec   482 MBytes   808 Mbits/sec
[  3] 460.0-465.0 sec   482 MBytes   809 Mbits/sec
[  3] 465.0-470.0 sec   482 MBytes   808 Mbits/sec
[  3] 470.0-475.0 sec   481 MBytes   808 Mbits/sec
[  3] 475.0-480.0 sec   482 MBytes   808 Mbits/sec
[  3] 480.0-485.0 sec   481 MBytes   806 Mbits/sec
[  3] 485.0-490.0 sec   481 MBytes   807 Mbits/sec
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[  3] 490.0-495.0 sec   482 MBytes   809 Mbits/sec
[  3] 495.0-500.0 sec   482 MBytes   808 Mbits/sec
[  3] 500.0-505.0 sec   482 MBytes   809 Mbits/sec
[  3] 505.0-510.0 sec   482 MBytes   808 Mbits/sec
[  3] 510.0-515.0 sec   482 MBytes   809 Mbits/sec
[  3] 515.0-520.0 sec   481 MBytes   808 Mbits/sec
[  3] 520.0-525.0 sec   480 MBytes   806 Mbits/sec
[  3] 525.0-530.0 sec   481 MBytes   808 Mbits/sec
[  3] 530.0-535.0 sec   482 MBytes   809 Mbits/sec
[  3] 535.0-540.0 sec   482 MBytes   808 Mbits/sec
[  3] 540.0-545.0 sec   482 MBytes   809 Mbits/sec
[  3] 545.0-550.0 sec   482 MBytes   808 Mbits/sec
[  3] 550.0-555.0 sec   482 MBytes   809 Mbits/sec
[  3] 555.0-560.0 sec   481 MBytes   808 Mbits/sec
[  3] 560.0-565.0 sec   482 MBytes   809 Mbits/sec
[  3] 565.0-570.0 sec   482 MBytes   808 Mbits/sec
[  3] 570.0-575.0 sec   482 MBytes   809 Mbits/sec
[  3] 575.0-580.0 sec   482 MBytes   808 Mbits/sec
[  3] 580.0-585.0 sec   482 MBytes   809 Mbits/sec
[  3] 585.0-590.0 sec   482 MBytes   808 Mbits/sec
[  3] 590.0-595.0 sec   482 MBytes   809 Mbits/sec
[  3] 595.0-600.0 sec   482 MBytes   808 Mbits/sec
[  3] 600.0-605.0 sec   481 MBytes   806 Mbits/sec
[  3] 605.0-610.0 sec   481 MBytes   807 Mbits/sec
[  3] 610.0-615.0 sec   481 MBytes   808 Mbits/sec
[  3] 615.0-620.0 sec   481 MBytes   808 Mbits/sec
[  3] 620.0-625.0 sec   482 MBytes   808 Mbits/sec
[  3] 625.0-630.0 sec   482 MBytes   809 Mbits/sec
[  3] 630.0-635.0 sec   481 MBytes   808 Mbits/sec
[  3] 635.0-640.0 sec   482 MBytes   809 Mbits/sec
[  3] 640.0-645.0 sec   482 MBytes   808 Mbits/sec
[  3] 645.0-650.0 sec   482 MBytes   809 Mbits/sec
[  3] 650.0-655.0 sec   482 MBytes   808 Mbits/sec
[  3] 655.0-660.0 sec   482 MBytes   809 Mbits/sec
[  3] 660.0-665.0 sec   480 MBytes   806 Mbits/sec
[  3] 665.0-670.0 sec   482 MBytes   808 Mbits/sec
[  3] 670.0-675.0 sec   482 MBytes   809 Mbits/sec
[  3] 675.0-680.0 sec   482 MBytes   808 Mbits/sec
[  3] 680.0-685.0 sec   482 MBytes   809 Mbits/sec
[  3] 685.0-690.0 sec   482 MBytes   808 Mbits/sec
[  3] 690.0-695.0 sec   482 MBytes   809 Mbits/sec
[  3] 695.0-700.0 sec   482 MBytes   808 Mbits/sec
[  3] 700.0-705.0 sec   482 MBytes   809 Mbits/sec
[  3] 705.0-710.0 sec   482 MBytes   808 Mbits/sec
[  3] 710.0-715.0 sec   482 MBytes   809 Mbits/sec
[  3] 715.0-720.0 sec   482 MBytes   808 Mbits/sec
[  3] 720.0-725.0 sec   481 MBytes   808 Mbits/sec
[  3] 725.0-730.0 sec   482 MBytes   808 Mbits/sec
[  3] 730.0-735.0 sec   482 MBytes   809 Mbits/sec
[  3] 735.0-740.0 sec   482 MBytes   808 Mbits/sec
[  3] 740.0-745.0 sec   482 MBytes   809 Mbits/sec
[  3] 745.0-750.0 sec   482 MBytes   808 Mbits/sec
[  3] 750.0-755.0 sec   482 MBytes   809 Mbits/sec
[  3] 755.0-760.0 sec   482 MBytes   808 Mbits/sec
[  3] 760.0-765.0 sec   482 MBytes   809 Mbits/sec
[  3] 765.0-770.0 sec   482 MBytes   808 Mbits/sec
[  3] 770.0-775.0 sec   482 MBytes   809 Mbits/sec
[  3] 775.0-780.0 sec   482 MBytes   808 Mbits/sec
[  3] 780.0-785.0 sec   481 MBytes   807 Mbits/sec
[  3] 785.0-790.0 sec   481 MBytes   806 Mbits/sec
[  3] 790.0-795.0 sec   480 MBytes   805 Mbits/sec
[  3] 795.0-800.0 sec   480 MBytes   805 Mbits/sec
[  3] 800.0-805.0 sec   482 MBytes   809 Mbits/sec
[  3] 805.0-810.0 sec   482 MBytes   808 Mbits/sec
[  3] 810.0-815.0 sec   482 MBytes   809 Mbits/sec
[  3] 815.0-820.0 sec   482 MBytes   808 Mbits/sec
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[  3] 820.0-825.0 sec   482 MBytes   809 Mbits/sec
[  3] 825.0-830.0 sec   482 MBytes   808 Mbits/sec
[  3] 830.0-835.0 sec   482 MBytes   809 Mbits/sec
[  3] 835.0-840.0 sec   482 MBytes   808 Mbits/sec
[  3] 840.0-845.0 sec   480 MBytes   806 Mbits/sec
[  3] 845.0-850.0 sec   482 MBytes   809 Mbits/sec
[  3] 850.0-855.0 sec   482 MBytes   808 Mbits/sec
[  3] 855.0-860.0 sec   482 MBytes   809 Mbits/sec
[  3] 860.0-865.0 sec   482 MBytes   808 Mbits/sec
[  3] 865.0-870.0 sec   482 MBytes   809 Mbits/sec
[  3] 870.0-875.0 sec   482 MBytes   808 Mbits/sec
[  3] 875.0-880.0 sec   482 MBytes   809 Mbits/sec
[  3] 880.0-885.0 sec   482 MBytes   809 Mbits/sec
[  3] 885.0-890.0 sec   482 MBytes   809 Mbits/sec
[  3] 890.0-895.0 sec   482 MBytes   808 Mbits/sec
[  3] 895.0-900.0 sec   482 MBytes   809 Mbits/sec
[  3]  0.0-900.0 sec  84.6 GBytes   808 Mbits/sec
[  3] Sent 61806161 datagrams
[  3] Server Report:
[3]0.0-900.0 sec 84.5 GBytes 807 Mbits/sec 0.161 ms 77203/61806160 (0.12%)
[  3]  0.0-900.0 sec  25 datagrams received out-of-order
```

Results for Medium VMs case2

```
TCP Traffic
------------------------------------------------------------
Client connecting to 10.0.3.15, TCP port 5001
TCP window size: 23.5 KByte (default)
------------------------------------------------------------
[  3] local 172.16.0.5 port 52818 connected with 10.0.3.15 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   339 MBytes   569 Mbits/sec
[  3]  5.0-10.0 sec   385 MBytes   646 Mbits/sec
[  3] 10.0-15.0 sec   391 MBytes   656 Mbits/sec
[  3] 15.0-20.0 sec   386 MBytes   648 Mbits/sec
[  3] 20.0-25.0 sec   386 MBytes   647 Mbits/sec
[  3] 25.0-30.0 sec   409 MBytes   686 Mbits/sec
[  3] 30.0-35.0 sec   405 MBytes   679 Mbits/sec
[  3] 35.0-40.0 sec   395 MBytes   663 Mbits/sec
[  3] 40.0-45.0 sec   362 MBytes   607 Mbits/sec
[  3] 45.0-50.0 sec   380 MBytes   638 Mbits/sec
[  3] 50.0-55.0 sec   415 MBytes   696 Mbits/sec
[  3] 55.0-60.0 sec   396 MBytes   664 Mbits/sec
[  3] 60.0-65.0 sec   378 MBytes   635 Mbits/sec
[  3] 65.0-70.0 sec   396 MBytes   664 Mbits/sec
[  3] 70.0-75.0 sec   389 MBytes   652 Mbits/sec
[  3] 75.0-80.0 sec   406 MBytes   681 Mbits/sec
[  3] 80.0-85.0 sec   401 MBytes   673 Mbits/sec
[  3] 85.0-90.0 sec   402 MBytes   674 Mbits/sec
[  3] 90.0-95.0 sec   369 MBytes   619 Mbits/sec
[  3] 95.0-100.0 sec   399 MBytes   670 Mbits/sec
[  3] 100.0-105.0 sec   394 MBytes   661 Mbits/sec
[  3] 105.0-110.0 sec   381 MBytes   640 Mbits/sec
[  3] 110.0-115.0 sec   416 MBytes   699 Mbits/sec
[  3] 115.0-120.0 sec   423 MBytes   709 Mbits/sec
[  3] 120.0-125.0 sec   405 MBytes   679 Mbits/sec
[  3] 125.0-130.0 sec   401 MBytes   673 Mbits/sec
[  3] 130.0-135.0 sec   384 MBytes   644 Mbits/sec
[  3] 135.0-140.0 sec   379 MBytes   636 Mbits/sec
[  3] 140.0-145.0 sec   407 MBytes   683 Mbits/sec
[  3] 145.0-150.0 sec   386 MBytes   648 Mbits/sec
[  3] 150.0-155.0 sec   399 MBytes   669 Mbits/sec
[  3] 155.0-160.0 sec   388 MBytes   651 Mbits/sec
[  3] 160.0-165.0 sec   384 MBytes   645 Mbits/sec
[  3] 165.0-170.0 sec   377 MBytes   632 Mbits/sec
[  3] 170.0-175.0 sec   408 MBytes   684 Mbits/sec
[  3] 175.0-180.0 sec   420 MBytes   705 Mbits/sec
[  3] 180.0-185.0 sec   397 MBytes   667 Mbits/sec
```

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[  3] 185.0-190.0 sec   391 MBytes   656 Mbits/sec
[  3] 190.0-195.0 sec   398 MBytes   668 Mbits/sec
[  3] 195.0-200.0 sec   400 MBytes   672 Mbits/sec
[  3] 200.0-205.0 sec   395 MBytes   662 Mbits/sec
[  3] 205.0-210.0 sec   376 MBytes   631 Mbits/sec
[  3] 210.0-215.0 sec   358 MBytes   600 Mbits/sec
[  3] 215.0-220.0 sec   397 MBytes   666 Mbits/sec
[  3] 220.0-225.0 sec   396 MBytes   665 Mbits/sec
[  3] 225.0-230.0 sec   363 MBytes   610 Mbits/sec
[  3] 230.0-235.0 sec   396 MBytes   664 Mbits/sec
[  3] 235.0-240.0 sec   388 MBytes   651 Mbits/sec
[  3] 240.0-245.0 sec   386 MBytes   648 Mbits/sec
[  3] 245.0-250.0 sec   411 MBytes   690 Mbits/sec
[  3] 250.0-255.0 sec   371 MBytes   622 Mbits/sec
[  3] 255.0-260.0 sec   381 MBytes   640 Mbits/sec
[  3] 260.0-265.0 sec   374 MBytes   628 Mbits/sec
[  3] 265.0-270.0 sec   364 MBytes   610 Mbits/sec
[  3] 270.0-275.0 sec   384 MBytes   643 Mbits/sec
[  3] 275.0-280.0 sec   410 MBytes   687 Mbits/sec
[  3] 280.0-285.0 sec   386 MBytes   647 Mbits/sec
[  3] 285.0-290.0 sec   368 MBytes   618 Mbits/sec
[  3] 290.0-295.0 sec   400 MBytes   672 Mbits/sec
[  3] 295.0-300.0 sec   404 MBytes   678 Mbits/sec
[  3] 300.0-305.0 sec   378 MBytes   634 Mbits/sec
[  3] 305.0-310.0 sec   386 MBytes   648 Mbits/sec
[  3] 310.0-315.0 sec   366 MBytes   614 Mbits/sec
[  3] 315.0-320.0 sec   376 MBytes   631 Mbits/sec
[  3] 320.0-325.0 sec   381 MBytes   640 Mbits/sec
[  3] 325.0-330.0 sec   386 MBytes   648 Mbits/sec
[  3] 330.0-335.0 sec   394 MBytes   661 Mbits/sec
[  3] 335.0-340.0 sec   391 MBytes   656 Mbits/sec
[  3] 340.0-345.0 sec   385 MBytes   646 Mbits/sec
[  3] 345.0-350.0 sec   375 MBytes   630 Mbits/sec
[  3] 350.0-355.0 sec   403 MBytes   677 Mbits/sec
[  3] 355.0-360.0 sec   408 MBytes   684 Mbits/sec
[  3] 360.0-365.0 sec   410 MBytes   687 Mbits/sec
[  3] 365.0-370.0 sec   371 MBytes   623 Mbits/sec
[  3] 370.0-375.0 sec   390 MBytes   654 Mbits/sec
[  3] 375.0-380.0 sec   386 MBytes   648 Mbits/sec
[  3] 380.0-385.0 sec   389 MBytes   653 Mbits/sec
[  3] 385.0-390.0 sec   370 MBytes   621 Mbits/sec
[  3] 390.0-395.0 sec   391 MBytes   656 Mbits/sec
[  3] 395.0-400.0 sec   414 MBytes   695 Mbits/sec
[  3] 400.0-405.0 sec   386 MBytes   648 Mbits/sec
[  3] 405.0-410.0 sec   403 MBytes   676 Mbits/sec
[  3] 410.0-415.0 sec   375 MBytes   629 Mbits/sec
[  3] 415.0-420.0 sec   401 MBytes   673 Mbits/sec
[  3] 420.0-425.0 sec   394 MBytes   661 Mbits/sec
[  3] 425.0-430.0 sec   404 MBytes   678 Mbits/sec
[  3] 430.0-435.0 sec   400 MBytes   672 Mbits/sec
[  3] 435.0-440.0 sec   423 MBytes   710 Mbits/sec
[  3] 440.0-445.0 sec   369 MBytes   619 Mbits/sec
[  3] 445.0-450.0 sec   386 MBytes   648 Mbits/sec
[  3] 450.0-455.0 sec   402 MBytes   675 Mbits/sec
[  3] 455.0-460.0 sec   418 MBytes   702 Mbits/sec
[  3] 460.0-465.0 sec   392 MBytes   658 Mbits/sec
[  3] 465.0-470.0 sec   399 MBytes   669 Mbits/sec
[  3] 470.0-475.0 sec   402 MBytes   674 Mbits/sec
[  3] 475.0-480.0 sec   364 MBytes   610 Mbits/sec
[  3] 480.0-485.0 sec   394 MBytes   662 Mbits/sec
[  3] 485.0-490.0 sec   396 MBytes   665 Mbits/sec
[  3] 490.0-495.0 sec   369 MBytes   619 Mbits/sec
[  3] 495.0-500.0 sec   381 MBytes   639 Mbits/sec
[  3] 500.0-505.0 sec   361 MBytes   606 Mbits/sec
[  3] 505.0-510.0 sec   382 MBytes   642 Mbits/sec
[  3] 510.0-515.0 sec   416 MBytes   697 Mbits/sec
```

```
[  3] 515.0-520.0 sec   406 MBytes   682 Mbits/sec
[  3] 520.0-525.0 sec   345 MBytes   579 Mbits/sec
[  3] 525.0-530.0 sec   369 MBytes   619 Mbits/sec
[  3] 530.0-535.0 sec   385 MBytes   646 Mbits/sec
[  3] 535.0-540.0 sec   400 MBytes   671 Mbits/sec
[  3] 540.0-545.0 sec   406 MBytes   681 Mbits/sec
[  3] 545.0-550.0 sec   393 MBytes   659 Mbits/sec
[  3] 550.0-555.0 sec   376 MBytes   631 Mbits/sec
[  3] 555.0-560.0 sec   392 MBytes   657 Mbits/sec
[  3] 560.0-565.0 sec   398 MBytes   668 Mbits/sec
[  3] 565.0-570.0 sec   388 MBytes   652 Mbits/sec
[  3] 570.0-575.0 sec   425 MBytes   713 Mbits/sec
[  3] 575.0-580.0 sec   378 MBytes   635 Mbits/sec
[  3] 580.0-585.0 sec   384 MBytes   644 Mbits/sec
[  3] 585.0-590.0 sec   363 MBytes   608 Mbits/sec
[  3] 590.0-595.0 sec   379 MBytes   636 Mbits/sec
[  3] 595.0-600.0 sec   390 MBytes   654 Mbits/sec
[  3] 600.0-605.0 sec   385 MBytes   646 Mbits/sec
[  3] 605.0-610.0 sec   407 MBytes   683 Mbits/sec
[  3] 610.0-615.0 sec   403 MBytes   677 Mbits/sec
[  3] 615.0-620.0 sec   368 MBytes   617 Mbits/sec
[  3] 620.0-625.0 sec   399 MBytes   670 Mbits/sec
[  3] 625.0-630.0 sec   407 MBytes   682 Mbits/sec
[  3] 630.0-635.0 sec   392 MBytes   657 Mbits/sec
[  3] 635.0-640.0 sec   373 MBytes   626 Mbits/sec
[  3] 640.0-645.0 sec   380 MBytes   638 Mbits/sec
[  3] 645.0-650.0 sec   359 MBytes   603 Mbits/sec
[  3] 650.0-655.0 sec   381 MBytes   639 Mbits/sec
[  3] 655.0-660.0 sec   396 MBytes   665 Mbits/sec
[  3] 660.0-665.0 sec   399 MBytes   669 Mbits/sec
[  3] 665.0-670.0 sec   374 MBytes   627 Mbits/sec
[  3] 670.0-675.0 sec   374 MBytes   627 Mbits/sec
[  3] 675.0-680.0 sec   399 MBytes   670 Mbits/sec
[  3] 680.0-685.0 sec   402 MBytes   675 Mbits/sec
[  3] 685.0-690.0 sec   394 MBytes   660 Mbits/sec
[  3] 690.0-695.0 sec   395 MBytes   663 Mbits/sec
[  3] 695.0-700.0 sec   407 MBytes   682 Mbits/sec
[  3] 700.0-705.0 sec   351 MBytes   588 Mbits/sec
[  3] 705.0-710.0 sec   375 MBytes   629 Mbits/sec
[  3] 710.0-715.0 sec   391 MBytes   655 Mbits/sec
[  3] 715.0-720.0 sec   372 MBytes   624 Mbits/sec
[  3] 720.0-725.0 sec   403 MBytes   676 Mbits/sec
[  3] 725.0-730.0 sec   394 MBytes   661 Mbits/sec
[  3] 730.0-735.0 sec   389 MBytes   653 Mbits/sec
[  3] 735.0-740.0 sec   408 MBytes   684 Mbits/sec
[  3] 740.0-745.0 sec   400 MBytes   672 Mbits/sec
[  3] 745.0-750.0 sec   376 MBytes   631 Mbits/sec
[  3] 750.0-755.0 sec   376 MBytes   631 Mbits/sec
[  3] 755.0-760.0 sec   362 MBytes   608 Mbits/sec
[  3] 760.0-765.0 sec   358 MBytes   600 Mbits/sec
[  3] 765.0-770.0 sec   367 MBytes   616 Mbits/sec
[  3] 770.0-775.0 sec   377 MBytes   632 Mbits/sec
[  3] 775.0-780.0 sec   393 MBytes   660 Mbits/sec
[  3] 780.0-785.0 sec   378 MBytes   634 Mbits/sec
[  3] 785.0-790.0 sec   381 MBytes   639 Mbits/sec
[  3] 790.0-795.0 sec   405 MBytes   679 Mbits/sec
[  3] 795.0-800.0 sec   368 MBytes   617 Mbits/sec
[  3] 800.0-805.0 sec   400 MBytes   670 Mbits/sec
[  3] 805.0-810.0 sec   392 MBytes   658 Mbits/sec
[  3] 810.0-815.0 sec   379 MBytes   636 Mbits/sec
[  3] 815.0-820.0 sec   393 MBytes   659 Mbits/sec
[  3] 820.0-825.0 sec   397 MBytes   665 Mbits/sec
[  3] 825.0-830.0 sec   381 MBytes   640 Mbits/sec
[  3] 830.0-835.0 sec   368 MBytes   618 Mbits/sec
[  3] 835.0-840.0 sec   397 MBytes   666 Mbits/sec
[  3] 840.0-845.0 sec   406 MBytes   681 Mbits/sec
```

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[  3] 845.0-850.0 sec   416 MBytes   698 Mbits/sec
[  3] 850.0-855.0 sec   405 MBytes   679 Mbits/sec
[  3] 855.0-860.0 sec   401 MBytes   673 Mbits/sec
[  3] 860.0-865.0 sec   394 MBytes   661 Mbits/sec
[  3] 865.0-870.0 sec   386 MBytes   648 Mbits/sec
[  3] 870.0-875.0 sec   400 MBytes   670 Mbits/sec
[  3] 875.0-880.0 sec   400 MBytes   671 Mbits/sec
[  3] 880.0-885.0 sec   405 MBytes   679 Mbits/sec
[  3] 885.0-890.0 sec   421 MBytes   707 Mbits/sec
[  3] 890.0-895.0 sec   386 MBytes   648 Mbits/sec
[  3] 895.0-900.0 sec   365 MBytes   613 Mbits/sec
[  3]  0.0-900.0 sec  68.4 GBytes   653 Mbits/sec
------------------------------------------------------
UDP Traffic
------------------------------------------------------------
Client connecting to 10.0.3.15, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 172.16.0.5 port 41446 connected with 10.0.3.15 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   481 MBytes   807 Mbits/sec
[  3]  5.0-10.0 sec   481 MBytes   807 Mbits/sec
[  3] 10.0-15.0 sec   482 MBytes   809 Mbits/sec
[  3] 15.0-20.0 sec   481 MBytes   807 Mbits/sec
[  3] 20.0-25.0 sec   481 MBytes   807 Mbits/sec
[  3] 25.0-30.0 sec   481 MBytes   806 Mbits/sec
[  3] 30.0-35.0 sec   480 MBytes   805 Mbits/sec
[  3] 35.0-40.0 sec   480 MBytes   805 Mbits/sec
[  3] 40.0-45.0 sec   479 MBytes   804 Mbits/sec
[  3] 45.0-50.0 sec   480 MBytes   805 Mbits/sec
[  3] 50.0-55.0 sec   480 MBytes   806 Mbits/sec
[  3] 55.0-60.0 sec   480 MBytes   806 Mbits/sec
[  3] 60.0-65.0 sec   480 MBytes   805 Mbits/sec
[  3] 65.0-70.0 sec   480 MBytes   806 Mbits/sec
[  3] 70.0-75.0 sec   480 MBytes   806 Mbits/sec
[  3] 75.0-80.0 sec   479 MBytes   804 Mbits/sec
[  3] 80.0-85.0 sec   479 MBytes   804 Mbits/sec
[  3] 85.0-90.0 sec   480 MBytes   806 Mbits/sec
[  3] 90.0-95.0 sec   480 MBytes   806 Mbits/sec
[  3] 95.0-100.0 sec   480 MBytes   806 Mbits/sec
[  3] 100.0-105.0 sec   481 MBytes   807 Mbits/sec
[  3] 105.0-110.0 sec   481 MBytes   807 Mbits/sec
[  3] 110.0-115.0 sec   481 MBytes   808 Mbits/sec
[  3] 115.0-120.0 sec   481 MBytes   808 Mbits/sec
[  3] 120.0-125.0 sec   480 MBytes   806 Mbits/sec
[  3] 125.0-130.0 sec   480 MBytes   805 Mbits/sec
[  3] 130.0-135.0 sec   481 MBytes   807 Mbits/sec
[  3] 135.0-140.0 sec   480 MBytes   805 Mbits/sec
[  3] 140.0-145.0 sec   480 MBytes   806 Mbits/sec
[  3] 145.0-150.0 sec   480 MBytes   806 Mbits/sec
[  3] 150.0-155.0 sec   481 MBytes   806 Mbits/sec
[  3] 155.0-160.0 sec   481 MBytes   807 Mbits/sec
[  3] 160.0-165.0 sec   480 MBytes   806 Mbits/sec
[  3] 165.0-170.0 sec   481 MBytes   807 Mbits/sec
[  3] 170.0-175.0 sec   481 MBytes   808 Mbits/sec
[  3] 175.0-180.0 sec   481 MBytes   808 Mbits/sec
[  3] 180.0-185.0 sec   481 MBytes   807 Mbits/sec
[  3] 185.0-190.0 sec   481 MBytes   808 Mbits/sec
[  3] 190.0-195.0 sec   482 MBytes   808 Mbits/sec
[  3] 195.0-200.0 sec   481 MBytes   808 Mbits/sec
[  3] 200.0-205.0 sec   480 MBytes   806 Mbits/sec
[  3] 205.0-210.0 sec   479 MBytes   804 Mbits/sec
[  3] 210.0-215.0 sec   480 MBytes   805 Mbits/sec
[  3] 215.0-220.0 sec   481 MBytes   807 Mbits/sec
[  3] 220.0-225.0 sec   480 MBytes   806 Mbits/sec
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```
[  3] 225.0-230.0 sec   480 MBytes   805 Mbits/sec
[  3] 230.0-235.0 sec   481 MBytes   806 Mbits/sec
[  3] 235.0-240.0 sec   480 MBytes   805 Mbits/sec
[  3] 240.0-245.0 sec   480 MBytes   805 Mbits/sec
[  3] 245.0-250.0 sec   480 MBytes   806 Mbits/sec
[  3] 250.0-255.0 sec   481 MBytes   808 Mbits/sec
[  3] 255.0-260.0 sec   481 MBytes   807 Mbits/sec
[  3] 260.0-265.0 sec   481 MBytes   807 Mbits/sec
[  3] 265.0-270.0 sec   481 MBytes   807 Mbits/sec
[  3] 270.0-275.0 sec   481 MBytes   806 Mbits/sec
[  3] 275.0-280.0 sec   480 MBytes   806 Mbits/sec
[  3] 280.0-285.0 sec   480 MBytes   806 Mbits/sec
[  3] 285.0-290.0 sec   480 MBytes   806 Mbits/sec
[  3] 290.0-295.0 sec   481 MBytes   807 Mbits/sec
[  3] 295.0-300.0 sec   481 MBytes   808 Mbits/sec
[  3] 300.0-305.0 sec   481 MBytes   807 Mbits/sec
[  3] 305.0-310.0 sec   482 MBytes   808 Mbits/sec
[  3] 310.0-315.0 sec   482 MBytes   809 Mbits/sec
[  3] 315.0-320.0 sec   481 MBytes   806 Mbits/sec
[  3] 320.0-325.0 sec   481 MBytes   808 Mbits/sec
[  3] 325.0-330.0 sec   481 MBytes   806 Mbits/sec
[  3] 330.0-335.0 sec   481 MBytes   807 Mbits/sec
[  3] 335.0-340.0 sec   480 MBytes   806 Mbits/sec
[  3] 340.0-345.0 sec   480 MBytes   806 Mbits/sec
[  3] 345.0-350.0 sec   480 MBytes   805 Mbits/sec
[  3] 350.0-355.0 sec   480 MBytes   805 Mbits/sec
[  3] 355.0-360.0 sec   480 MBytes   806 Mbits/sec
[  3] 360.0-365.0 sec   480 MBytes   806 Mbits/sec
[  3] 365.0-370.0 sec   481 MBytes   806 Mbits/sec
[  3] 370.0-375.0 sec   481 MBytes   808 Mbits/sec
[  3] 375.0-380.0 sec   480 MBytes   806 Mbits/sec
[  3] 380.0-385.0 sec   481 MBytes   808 Mbits/sec
[  3] 385.0-390.0 sec   480 MBytes   806 Mbits/sec
[  3] 390.0-395.0 sec   480 MBytes   806 Mbits/sec
[  3] 395.0-400.0 sec   481 MBytes   806 Mbits/sec
[  3] 400.0-405.0 sec   479 MBytes   804 Mbits/sec
[  3] 405.0-410.0 sec   480 MBytes   805 Mbits/sec
[  3] 410.0-415.0 sec   481 MBytes   807 Mbits/sec
[  3] 415.0-420.0 sec   481 MBytes   806 Mbits/sec
[  3] 420.0-425.0 sec   481 MBytes   807 Mbits/sec
[  3] 425.0-430.0 sec   481 MBytes   808 Mbits/sec
[  3] 430.0-435.0 sec   481 MBytes   808 Mbits/sec
[  3] 435.0-440.0 sec   481 MBytes   807 Mbits/sec
[  3] 440.0-445.0 sec   481 MBytes   807 Mbits/sec
[  3] 445.0-450.0 sec   481 MBytes   808 Mbits/sec
[  3] 450.0-455.0 sec   482 MBytes   808 Mbits/sec
[  3] 455.0-460.0 sec   481 MBytes   808 Mbits/sec
[  3] 460.0-465.0 sec   481 MBytes   806 Mbits/sec
[  3] 465.0-470.0 sec   481 MBytes   807 Mbits/sec
[  3] 470.0-475.0 sec   480 MBytes   805 Mbits/sec
[  3] 475.0-480.0 sec   481 MBytes   807 Mbits/sec
[  3] 480.0-485.0 sec   481 MBytes   807 Mbits/sec
[  3] 485.0-490.0 sec   480 MBytes   805 Mbits/sec
[  3] 490.0-495.0 sec   480 MBytes   806 Mbits/sec
[  3] 495.0-500.0 sec   481 MBytes   807 Mbits/sec
[  3] 500.0-505.0 sec   481 MBytes   808 Mbits/sec
[  3] 505.0-510.0 sec   481 MBytes   807 Mbits/sec
[  3] 510.0-515.0 sec   481 MBytes   808 Mbits/sec
[  3] 515.0-520.0 sec   481 MBytes   806 Mbits/sec
[  3] 520.0-525.0 sec   480 MBytes   806 Mbits/sec
[  3] 525.0-530.0 sec   480 MBytes   805 Mbits/sec
[  3] 530.0-535.0 sec   481 MBytes   806 Mbits/sec
[  3] 535.0-540.0 sec   481 MBytes   808 Mbits/sec
[  3] 540.0-545.0 sec   481 MBytes   807 Mbits/sec
[  3] 545.0-550.0 sec   481 MBytes   807 Mbits/sec
[  3] 550.0-555.0 sec   480 MBytes   806 Mbits/sec
```

```
[  3] 555.0-560.0 sec   481 MBytes   806 Mbits/sec
[  3] 560.0-565.0 sec   481 MBytes   807 Mbits/sec
[  3] 565.0-570.0 sec   481 MBytes   807 Mbits/sec
[  3] 570.0-575.0 sec   481 MBytes   808 Mbits/sec
[  3] 575.0-580.0 sec   480 MBytes   806 Mbits/sec
[  3] 580.0-585.0 sec   481 MBytes   806 Mbits/sec
[  3] 585.0-590.0 sec   481 MBytes   807 Mbits/sec
[  3] 590.0-595.0 sec   481 MBytes   808 Mbits/sec
[  3] 595.0-600.0 sec   481 MBytes   808 Mbits/sec
[  3] 600.0-605.0 sec   481 MBytes   807 Mbits/sec
[  3] 605.0-610.0 sec   482 MBytes   808 Mbits/sec
[  3] 610.0-615.0 sec   482 MBytes   808 Mbits/sec
[  3] 615.0-620.0 sec   481 MBytes   807 Mbits/sec
[  3] 620.0-625.0 sec   481 MBytes   807 Mbits/sec
[  3] 625.0-630.0 sec   481 MBytes   807 Mbits/sec
[  3] 630.0-635.0 sec   481 MBytes   807 Mbits/sec
[  3] 635.0-640.0 sec   480 MBytes   806 Mbits/sec
[  3] 640.0-645.0 sec   480 MBytes   806 Mbits/sec
[  3] 645.0-650.0 sec   481 MBytes   807 Mbits/sec
[  3] 650.0-655.0 sec   480 MBytes   806 Mbits/sec
[  3] 655.0-660.0 sec   480 MBytes   806 Mbits/sec
[  3] 660.0-665.0 sec   481 MBytes   806 Mbits/sec
[  3] 665.0-670.0 sec   481 MBytes   808 Mbits/sec
[  3] 670.0-675.0 sec   481 MBytes   808 Mbits/sec
[  3] 675.0-680.0 sec   481 MBytes   806 Mbits/sec
[  3] 680.0-685.0 sec   480 MBytes   806 Mbits/sec
[  3] 685.0-690.0 sec   481 MBytes   808 Mbits/sec
[  3] 690.0-695.0 sec   481 MBytes   807 Mbits/sec
[  3] 695.0-700.0 sec   480 MBytes   806 Mbits/sec
[  3] 700.0-705.0 sec   480 MBytes   805 Mbits/sec
[  3] 705.0-710.0 sec   481 MBytes   807 Mbits/sec
[  3] 710.0-715.0 sec   482 MBytes   808 Mbits/sec
[  3] 715.0-720.0 sec   481 MBytes   808 Mbits/sec
[  3] 720.0-725.0 sec   481 MBytes   808 Mbits/sec
[  3] 725.0-730.0 sec   481 MBytes   808 Mbits/sec
[  3] 730.0-735.0 sec   481 MBytes   807 Mbits/sec
[  3] 735.0-740.0 sec   481 MBytes   807 Mbits/sec
[  3] 740.0-745.0 sec   481 MBytes   806 Mbits/sec
[  3] 745.0-750.0 sec   481 MBytes   807 Mbits/sec
[  3] 750.0-755.0 sec   481 MBytes   807 Mbits/sec
[  3] 755.0-760.0 sec   481 MBytes   807 Mbits/sec
[  3] 760.0-765.0 sec   481 MBytes   807 Mbits/sec
[  3] 765.0-770.0 sec   481 MBytes   806 Mbits/sec
[  3] 770.0-775.0 sec   481 MBytes   808 Mbits/sec
[  3] 775.0-780.0 sec   481 MBytes   808 Mbits/sec
[  3] 780.0-785.0 sec   480 MBytes   806 Mbits/sec
[  3] 785.0-790.0 sec   480 MBytes   806 Mbits/sec
[  3] 790.0-795.0 sec   480 MBytes   805 Mbits/sec
[  3] 795.0-800.0 sec   479 MBytes   804 Mbits/sec
[  3] 800.0-805.0 sec   480 MBytes   806 Mbits/sec
[  3] 805.0-810.0 sec   479 MBytes   804 Mbits/sec
[  3] 810.0-815.0 sec   481 MBytes   806 Mbits/sec
[  3] 815.0-820.0 sec   481 MBytes   808 Mbits/sec
[  3] 820.0-825.0 sec   481 MBytes   807 Mbits/sec
[  3] 825.0-830.0 sec   481 MBytes   806 Mbits/sec
[  3] 830.0-835.0 sec   481 MBytes   808 Mbits/sec
[  3] 835.0-840.0 sec   481 MBytes   808 Mbits/sec
[  3] 840.0-845.0 sec   481 MBytes   808 Mbits/sec
[  3] 845.0-850.0 sec   481 MBytes   807 Mbits/sec
[  3] 850.0-855.0 sec   480 MBytes   806 Mbits/sec
[  3] 855.0-860.0 sec   481 MBytes   807 Mbits/sec
[  3] 860.0-865.0 sec   480 MBytes   806 Mbits/sec
[  3] 865.0-870.0 sec   481 MBytes   807 Mbits/sec
[  3] 870.0-875.0 sec   481 MBytes   807 Mbits/sec
[  3] 875.0-880.0 sec   481 MBytes   807 Mbits/sec
[  3] 880.0-885.0 sec   481 MBytes   808 Mbits/sec
```

```
[  3] 885.0-890.0 sec   481 MBytes   806 Mbits/sec
[  3] 890.0-895.0 sec   481 MBytes   808 Mbits/sec
[  3]  0.0-900.0 sec  84.5 GBytes   807 Mbits/sec
[  3] Sent 61730492 datagrams
[  3] Server Report:
[3]0.0-900.0 sec  82.0 GBytes 783 Mbits/sec 0.010 ms 1811588/61730491 (2.9%)
[  3]  0.0-900.0 sec  8195 datagrams received out-of-order
```

Results for Medium VMs case3

```
TCP Traffic
------------------------------------------------------------
Client connecting to 10.0.3.14, TCP port 5001
TCP window size: 23.5 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.13 port 56416 connected with 10.0.3.14 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   436 MBytes   732 Mbits/sec
[  3]  5.0-10.0 sec   478 MBytes   803 Mbits/sec
[  3] 10.0-15.0 sec   419 MBytes   703 Mbits/sec
[  3] 15.0-20.0 sec   464 MBytes   779 Mbits/sec
[  3] 20.0-25.0 sec   481 MBytes   807 Mbits/sec
[  3] 25.0-30.0 sec   470 MBytes   788 Mbits/sec
[  3] 30.0-35.0 sec   456 MBytes   766 Mbits/sec
[  3] 35.0-40.0 sec   447 MBytes   750 Mbits/sec
[  3] 40.0-45.0 sec   468 MBytes   786 Mbits/sec
[  3] 45.0-50.0 sec   496 MBytes   833 Mbits/sec
[  3] 50.0-55.0 sec   475 MBytes   797 Mbits/sec
[  3] 55.0-60.0 sec   496 MBytes   831 Mbits/sec
[  3] 60.0-65.0 sec   437 MBytes   734 Mbits/sec
[  3] 65.0-70.0 sec   458 MBytes   769 Mbits/sec
[  3] 70.0-75.0 sec   438 MBytes   735 Mbits/sec
[  3] 75.0-80.0 sec   481 MBytes   807 Mbits/sec
[  3] 80.0-85.0 sec   506 MBytes   848 Mbits/sec
[  3] 85.0-90.0 sec   513 MBytes   860 Mbits/sec
[  3] 90.0-95.0 sec   480 MBytes   806 Mbits/sec
[  3] 95.0-100.0 sec   493 MBytes   826 Mbits/sec
[  3] 100.0-105.0 sec   510 MBytes   855 Mbits/sec
[  3] 105.0-110.0 sec   504 MBytes   846 Mbits/sec
[  3] 110.0-115.0 sec   512 MBytes   860 Mbits/sec
[  3] 115.0-120.0 sec   523 MBytes   877 Mbits/sec
[  3] 120.0-125.0 sec   512 MBytes   858 Mbits/sec
[  3] 125.0-130.0 sec   508 MBytes   852 Mbits/sec
[  3] 130.0-135.0 sec   511 MBytes   858 Mbits/sec
[  3] 135.0-140.0 sec   502 MBytes   843 Mbits/sec
[  3] 140.0-145.0 sec   502 MBytes   842 Mbits/sec
[  3] 145.0-150.0 sec   472 MBytes   792 Mbits/sec
[  3] 150.0-155.0 sec   439 MBytes   737 Mbits/sec
[  3] 155.0-160.0 sec   410 MBytes   687 Mbits/sec
[  3] 160.0-165.0 sec   398 MBytes   668 Mbits/sec
[  3] 165.0-170.0 sec   418 MBytes   702 Mbits/sec
[  3] 170.0-175.0 sec   465 MBytes   780 Mbits/sec
[  3] 175.0-180.0 sec   518 MBytes   869 Mbits/sec
[  3] 180.0-185.0 sec   524 MBytes   878 Mbits/sec
[  3] 185.0-190.0 sec   528 MBytes   886 Mbits/sec
[  3] 190.0-195.0 sec   526 MBytes   882 Mbits/sec
[  3] 195.0-200.0 sec   542 MBytes   910 Mbits/sec
[  3] 200.0-205.0 sec   535 MBytes   897 Mbits/sec
[  3] 205.0-210.0 sec   506 MBytes   849 Mbits/sec
[  3] 210.0-215.0 sec   461 MBytes   773 Mbits/sec
[  3] 215.0-220.0 sec   436 MBytes   731 Mbits/sec
[  3] 220.0-225.0 sec   502 MBytes   843 Mbits/sec
[  3] 225.0-230.0 sec   524 MBytes   880 Mbits/sec
[  3] 230.0-235.0 sec   520 MBytes   873 Mbits/sec
[  3] 235.0-240.0 sec   540 MBytes   905 Mbits/sec
[  3] 240.0-245.0 sec   530 MBytes   888 Mbits/sec
[  3] 245.0-250.0 sec   534 MBytes   897 Mbits/sec
[  3] 250.0-255.0 sec   487 MBytes   817 Mbits/sec
```

```
[  3] 255.0-260.0 sec   495 MBytes   830 Mbits/sec
[  3] 260.0-265.0 sec   494 MBytes   829 Mbits/sec
[  3] 265.0-270.0 sec   453 MBytes   760 Mbits/sec
[  3] 270.0-275.0 sec   471 MBytes   790 Mbits/sec
[  3] 275.0-280.0 sec   440 MBytes   738 Mbits/sec
[  3] 280.0-285.0 sec   436 MBytes   732 Mbits/sec
[  3] 285.0-290.0 sec   448 MBytes   752 Mbits/sec
[  3] 290.0-295.0 sec   468 MBytes   785 Mbits/sec
[  3] 295.0-300.0 sec   461 MBytes   774 Mbits/sec
[  3] 300.0-305.0 sec   500 MBytes   839 Mbits/sec
[  3] 305.0-310.0 sec   544 MBytes   912 Mbits/sec
[  3] 310.0-315.0 sec   439 MBytes   736 Mbits/sec
[  3] 315.0-320.0 sec   443 MBytes   743 Mbits/sec
[  3] 320.0-325.0 sec   478 MBytes   801 Mbits/sec
[  3] 325.0-330.0 sec   497 MBytes   833 Mbits/sec
[  3] 330.0-335.0 sec   468 MBytes   786 Mbits/sec
[  3] 335.0-340.0 sec   418 MBytes   702 Mbits/sec
[  3] 340.0-345.0 sec   445 MBytes   747 Mbits/sec
[  3] 345.0-350.0 sec   480 MBytes   806 Mbits/sec
[  3] 350.0-355.0 sec   503 MBytes   845 Mbits/sec
[  3] 355.0-360.0 sec   513 MBytes   861 Mbits/sec
[  3] 360.0-365.0 sec   528 MBytes   885 Mbits/sec
[  3] 365.0-370.0 sec   518 MBytes   869 Mbits/sec
[  3] 370.0-375.0 sec   513 MBytes   861 Mbits/sec
[  3] 375.0-380.0 sec   504 MBytes   845 Mbits/sec
[  3] 380.0-385.0 sec   429 MBytes   719 Mbits/sec
[  3] 385.0-390.0 sec   477 MBytes   800 Mbits/sec
[  3] 390.0-395.0 sec   487 MBytes   817 Mbits/sec
[  3] 395.0-400.0 sec   450 MBytes   754 Mbits/sec
[  3] 400.0-405.0 sec   475 MBytes   797 Mbits/sec
[  3] 405.0-410.0 sec   497 MBytes   834 Mbits/sec
[  3] 410.0-415.0 sec   516 MBytes   865 Mbits/sec
[  3] 415.0-420.0 sec   546 MBytes   917 Mbits/sec
[  3] 420.0-425.0 sec   494 MBytes   828 Mbits/sec
[  3] 425.0-430.0 sec   505 MBytes   847 Mbits/sec
[  3] 430.0-435.0 sec   520 MBytes   872 Mbits/sec
[  3] 435.0-440.0 sec   538 MBytes   902 Mbits/sec
[  3] 440.0-445.0 sec   479 MBytes   804 Mbits/sec
[  3] 445.0-450.0 sec   463 MBytes   777 Mbits/sec
[  3] 450.0-455.0 sec   455 MBytes   763 Mbits/sec
[  3] 455.0-460.0 sec   419 MBytes   704 Mbits/sec
[  3] 460.0-465.0 sec   476 MBytes   798 Mbits/sec
[  3] 465.0-470.0 sec   498 MBytes   835 Mbits/sec
[  3] 470.0-475.0 sec   546 MBytes   916 Mbits/sec
[  3] 475.0-480.0 sec   531 MBytes   890 Mbits/sec
[  3] 480.0-485.0 sec   476 MBytes   799 Mbits/sec
[  3] 485.0-490.0 sec   494 MBytes   828 Mbits/sec
[  3] 490.0-495.0 sec   510 MBytes   856 Mbits/sec
[  3] 495.0-500.0 sec   525 MBytes   881 Mbits/sec
[  3] 500.0-505.0 sec   535 MBytes   897 Mbits/sec
[  3] 505.0-510.0 sec   475 MBytes   797 Mbits/sec
[  3] 510.0-515.0 sec   400 MBytes   672 Mbits/sec
[  3] 515.0-520.0 sec   404 MBytes   678 Mbits/sec
[  3] 520.0-525.0 sec   442 MBytes   741 Mbits/sec
[  3] 525.0-530.0 sec   480 MBytes   804 Mbits/sec
[  3] 530.0-535.0 sec   499 MBytes   837 Mbits/sec
[  3] 535.0-540.0 sec   511 MBytes   857 Mbits/sec
[  3] 540.0-545.0 sec   506 MBytes   850 Mbits/sec
[  3] 545.0-550.0 sec   504 MBytes   846 Mbits/sec
[  3] 550.0-555.0 sec   520 MBytes   873 Mbits/sec
[  3] 555.0-560.0 sec   458 MBytes   769 Mbits/sec
[  3] 560.0-565.0 sec   454 MBytes   763 Mbits/sec
[  3] 565.0-570.0 sec   438 MBytes   735 Mbits/sec
[  3] 570.0-575.0 sec   460 MBytes   772 Mbits/sec
[  3] 575.0-580.0 sec   405 MBytes   679 Mbits/sec
[  3] 580.0-585.0 sec   471 MBytes   790 Mbits/sec
```

```
[  3] 585.0-590.0 sec   496 MBytes   832 Mbits/sec
[  3] 590.0-595.0 sec   506 MBytes   849 Mbits/sec
[  3] 595.0-600.0 sec   506 MBytes   850 Mbits/sec
[  3] 600.0-605.0 sec   508 MBytes   851 Mbits/sec
[  3] 605.0-610.0 sec   512 MBytes   860 Mbits/sec
[  3] 610.0-615.0 sec   517 MBytes   867 Mbits/sec
[  3] 615.0-620.0 sec   496 MBytes   833 Mbits/sec
[  3] 620.0-625.0 sec   506 MBytes   848 Mbits/sec
[  3] 625.0-630.0 sec   506 MBytes   849 Mbits/sec
[  3] 630.0-635.0 sec   439 MBytes   736 Mbits/sec
[  3] 635.0-640.0 sec   440 MBytes   739 Mbits/sec
[  3] 640.0-645.0 sec   476 MBytes   798 Mbits/sec
[  3] 645.0-650.0 sec   456 MBytes   766 Mbits/sec
[  3] 650.0-655.0 sec   457 MBytes   767 Mbits/sec
[  3] 655.0-660.0 sec   468 MBytes   786 Mbits/sec
[  3] 660.0-665.0 sec   455 MBytes   763 Mbits/sec
[  3] 665.0-670.0 sec   464 MBytes   779 Mbits/sec
[  3] 670.0-675.0 sec   488 MBytes   819 Mbits/sec
[  3] 675.0-680.0 sec   508 MBytes   852 Mbits/sec
[  3] 680.0-685.0 sec   451 MBytes   756 Mbits/sec
[  3] 685.0-690.0 sec   451 MBytes   757 Mbits/sec
[  3] 690.0-695.0 sec   437 MBytes   733 Mbits/sec
[  3] 695.0-700.0 sec   427 MBytes   716 Mbits/sec
[  3] 700.0-705.0 sec   423 MBytes   710 Mbits/sec
[  3] 705.0-710.0 sec   438 MBytes   735 Mbits/sec
[  3] 710.0-715.0 sec   452 MBytes   759 Mbits/sec
[  3] 715.0-720.0 sec   435 MBytes   729 Mbits/sec
[  3] 720.0-725.0 sec   424 MBytes   711 Mbits/sec
[  3] 725.0-730.0 sec   447 MBytes   750 Mbits/sec
[  3] 730.0-735.0 sec   478 MBytes   802 Mbits/sec
[  3] 735.0-740.0 sec   503 MBytes   843 Mbits/sec
[  3] 740.0-745.0 sec   503 MBytes   843 Mbits/sec
[  3] 745.0-750.0 sec   388 MBytes   650 Mbits/sec
[  3] 750.0-755.0 sec   427 MBytes   716 Mbits/sec
[  3] 755.0-760.0 sec   434 MBytes   728 Mbits/sec
[  3] 760.0-765.0 sec   472 MBytes   791 Mbits/sec
[  3] 765.0-770.0 sec   434 MBytes   729 Mbits/sec
[  3] 770.0-775.0 sec   439 MBytes   737 Mbits/sec
[  3] 775.0-780.0 sec   448 MBytes   752 Mbits/sec
[  3] 780.0-785.0 sec   454 MBytes   763 Mbits/sec
[  3] 785.0-790.0 sec   435 MBytes   729 Mbits/sec
[  3] 790.0-795.0 sec   429 MBytes   719 Mbits/sec
[  3] 795.0-800.0 sec   476 MBytes   798 Mbits/sec
[  3] 800.0-805.0 sec   508 MBytes   853 Mbits/sec
[  3] 805.0-810.0 sec   474 MBytes   795 Mbits/sec
[  3] 810.0-815.0 sec   394 MBytes   662 Mbits/sec
[  3] 815.0-820.0 sec   423 MBytes   709 Mbits/sec
[  3] 820.0-825.0 sec   479 MBytes   803 Mbits/sec
[  3] 825.0-830.0 sec   497 MBytes   833 Mbits/sec
[  3] 830.0-835.0 sec   481 MBytes   807 Mbits/sec
[  3] 835.0-840.0 sec   431 MBytes   723 Mbits/sec
[  3] 840.0-845.0 sec   460 MBytes   771 Mbits/sec
[  3] 845.0-850.0 sec   472 MBytes   793 Mbits/sec
[  3] 850.0-855.0 sec   498 MBytes   836 Mbits/sec
[  3] 855.0-860.0 sec   506 MBytes   849 Mbits/sec
[  3] 860.0-865.0 sec   512 MBytes   859 Mbits/sec
[  3] 865.0-870.0 sec   472 MBytes   793 Mbits/sec
[  3] 870.0-875.0 sec   462 MBytes   775 Mbits/sec
[  3] 875.0-880.0 sec   426 MBytes   715 Mbits/sec
[  3] 880.0-885.0 sec   458 MBytes   769 Mbits/sec
[  3] 885.0-890.0 sec   484 MBytes   812 Mbits/sec
[  3] 890.0-895.0 sec   508 MBytes   852 Mbits/sec
[  3] 895.0-900.0 sec   515 MBytes   864 Mbits/sec
[  3]  0.0-900.0 sec  83.9 GBytes   801 Mbits/sec
------------------------------------------------------------
UDP Traffic
```

```
------------------------------------------------------------
Client connecting to 10.0.3.14, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.13 port 47520 connected with 10.0.3.14 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   481 MBytes   807 Mbits/sec
[  3]  5.0-10.0 sec   481 MBytes   807 Mbits/sec
[  3] 10.0-15.0 sec   481 MBytes   807 Mbits/sec
[  3] 15.0-20.0 sec   481 MBytes   807 Mbits/sec
[  3] 20.0-25.0 sec   481 MBytes   806 Mbits/sec
[  3] 25.0-30.0 sec   481 MBytes   807 Mbits/sec
[  3] 30.0-35.0 sec   480 MBytes   806 Mbits/sec
[  3] 35.0-40.0 sec   481 MBytes   808 Mbits/sec
[  3] 40.0-45.0 sec   479 MBytes   804 Mbits/sec
[  3] 45.0-50.0 sec   480 MBytes   805 Mbits/sec
[  3] 50.0-55.0 sec   480 MBytes   806 Mbits/sec
[  3] 55.0-60.0 sec   479 MBytes   804 Mbits/sec
[  3] 60.0-65.0 sec   480 MBytes   805 Mbits/sec
[  3] 65.0-70.0 sec   480 MBytes   805 Mbits/sec
[  3] 70.0-75.0 sec   480 MBytes   805 Mbits/sec
[  3] 75.0-80.0 sec   480 MBytes   805 Mbits/sec
[  3] 80.0-85.0 sec   479 MBytes   804 Mbits/sec
[  3] 85.0-90.0 sec   481 MBytes   807 Mbits/sec
[  3] 90.0-95.0 sec   480 MBytes   806 Mbits/sec
[  3] 95.0-100.0 sec   480 MBytes   805 Mbits/sec
[  3] 100.0-105.0 sec   481 MBytes   807 Mbits/sec
[  3] 105.0-110.0 sec   481 MBytes   806 Mbits/sec
[  3] 110.0-115.0 sec   480 MBytes   805 Mbits/sec
[  3] 115.0-120.0 sec   480 MBytes   806 Mbits/sec
[  3] 120.0-125.0 sec   479 MBytes   804 Mbits/sec
[  3] 125.0-130.0 sec   480 MBytes   805 Mbits/sec
[  3] 130.0-135.0 sec   480 MBytes   805 Mbits/sec
[  3] 135.0-140.0 sec   480 MBytes   805 Mbits/sec
[  3] 140.0-145.0 sec   480 MBytes   805 Mbits/sec
[  3] 145.0-150.0 sec   481 MBytes   806 Mbits/sec
[  3] 150.0-155.0 sec   481 MBytes   807 Mbits/sec
[  3] 155.0-160.0 sec   481 MBytes   807 Mbits/sec
[  3] 160.0-165.0 sec   480 MBytes   806 Mbits/sec
[  3] 165.0-170.0 sec   480 MBytes   806 Mbits/sec
[  3] 170.0-175.0 sec   480 MBytes   805 Mbits/sec
[  3] 175.0-180.0 sec   480 MBytes   805 Mbits/sec
[  3] 180.0-185.0 sec   479 MBytes   804 Mbits/sec
[  3] 185.0-190.0 sec   480 MBytes   805 Mbits/sec
[  3] 190.0-195.0 sec   480 MBytes   806 Mbits/sec
[  3] 195.0-200.0 sec   481 MBytes   806 Mbits/sec
[  3] 200.0-205.0 sec   481 MBytes   807 Mbits/sec
[  3] 205.0-210.0 sec   479 MBytes   804 Mbits/sec
[  3] 210.0-215.0 sec   480 MBytes   805 Mbits/sec
[  3] 215.0-220.0 sec   480 MBytes   805 Mbits/sec
[  3] 220.0-225.0 sec   481 MBytes   806 Mbits/sec
[  3] 225.0-230.0 sec   479 MBytes   804 Mbits/sec
[  3] 230.0-235.0 sec   479 MBytes   804 Mbits/sec
[  3] 235.0-240.0 sec   480 MBytes   805 Mbits/sec
[  3] 240.0-245.0 sec   479 MBytes   804 Mbits/sec
[  3] 245.0-250.0 sec   480 MBytes   805 Mbits/sec
[  3] 250.0-255.0 sec   480 MBytes   805 Mbits/sec
[  3] 255.0-260.0 sec   479 MBytes   804 Mbits/sec
[  3] 260.0-265.0 sec   479 MBytes   804 Mbits/sec
[  3] 265.0-270.0 sec   481 MBytes   806 Mbits/sec
[  3] 270.0-275.0 sec   480 MBytes   806 Mbits/sec
[  3] 275.0-280.0 sec   481 MBytes   807 Mbits/sec
[  3] 280.0-285.0 sec   482 MBytes   808 Mbits/sec
[  3] 285.0-290.0 sec   481 MBytes   807 Mbits/sec
[  3] 290.0-295.0 sec   480 MBytes   806 Mbits/sec
```

```
[  3] 295.0-300.0 sec   481 MBytes   807 Mbits/sec
[  3] 300.0-305.0 sec   481 MBytes   807 Mbits/sec
[  3] 305.0-310.0 sec   480 MBytes   806 Mbits/sec
[  3] 310.0-315.0 sec   481 MBytes   806 Mbits/sec
[  3] 315.0-320.0 sec   481 MBytes   807 Mbits/sec
[  3] 320.0-325.0 sec   481 MBytes   807 Mbits/sec
[  3] 325.0-330.0 sec   480 MBytes   806 Mbits/sec
[  3] 330.0-335.0 sec   481 MBytes   807 Mbits/sec
[  3] 335.0-340.0 sec   480 MBytes   805 Mbits/sec
[  3] 340.0-345.0 sec   481 MBytes   807 Mbits/sec
[  3] 345.0-350.0 sec   481 MBytes   806 Mbits/sec
[  3] 350.0-355.0 sec   481 MBytes   806 Mbits/sec
[  3] 355.0-360.0 sec   481 MBytes   807 Mbits/sec
[  3] 360.0-365.0 sec   481 MBytes   807 Mbits/sec
[  3] 365.0-370.0 sec   481 MBytes   806 Mbits/sec
[  3] 370.0-375.0 sec   481 MBytes   807 Mbits/sec
[  3] 375.0-380.0 sec   481 MBytes   806 Mbits/sec
[  3] 380.0-385.0 sec   478 MBytes   803 Mbits/sec
[  3] 385.0-390.0 sec   480 MBytes   806 Mbits/sec
[  3] 390.0-395.0 sec   479 MBytes   804 Mbits/sec
[  3] 395.0-400.0 sec   480 MBytes   805 Mbits/sec
[  3] 400.0-405.0 sec   480 MBytes   806 Mbits/sec
[  3] 405.0-410.0 sec   480 MBytes   806 Mbits/sec
[  3] 410.0-415.0 sec   480 MBytes   806 Mbits/sec
[  3] 415.0-420.0 sec   480 MBytes   805 Mbits/sec
[  3] 420.0-425.0 sec   479 MBytes   804 Mbits/sec
[  3] 425.0-430.0 sec   480 MBytes   805 Mbits/sec
[  3] 430.0-435.0 sec   479 MBytes   804 Mbits/sec
[  3] 435.0-440.0 sec   479 MBytes   804 Mbits/sec
[  3] 440.0-445.0 sec   480 MBytes   806 Mbits/sec
[  3] 445.0-450.0 sec   481 MBytes   806 Mbits/sec
[  3] 450.0-455.0 sec   481 MBytes   807 Mbits/sec
[  3] 455.0-460.0 sec   481 MBytes   807 Mbits/sec
[  3] 460.0-465.0 sec   480 MBytes   805 Mbits/sec
[  3] 465.0-470.0 sec   481 MBytes   806 Mbits/sec
[  3] 470.0-475.0 sec   481 MBytes   807 Mbits/sec
[  3] 475.0-480.0 sec   481 MBytes   807 Mbits/sec
[  3] 480.0-485.0 sec   481 MBytes   807 Mbits/sec
[  3] 485.0-490.0 sec   481 MBytes   807 Mbits/sec
[  3] 490.0-495.0 sec   481 MBytes   807 Mbits/sec
[  3] 495.0-500.0 sec   481 MBytes   806 Mbits/sec
[  3] 500.0-505.0 sec   481 MBytes   807 Mbits/sec
[  3] 505.0-510.0 sec   481 MBytes   807 Mbits/sec
[  3] 510.0-515.0 sec   481 MBytes   807 Mbits/sec
[  3] 515.0-520.0 sec   481 MBytes   807 Mbits/sec
[  3] 520.0-525.0 sec   481 MBytes   808 Mbits/sec
[  3] 525.0-530.0 sec   481 MBytes   807 Mbits/sec
[  3] 530.0-535.0 sec   481 MBytes   807 Mbits/sec
[  3] 535.0-540.0 sec   481 MBytes   808 Mbits/sec
[  3] 540.0-545.0 sec   481 MBytes   806 Mbits/sec
[  3] 545.0-550.0 sec   481 MBytes   808 Mbits/sec
[  3] 550.0-555.0 sec   481 MBytes   807 Mbits/sec
[  3] 555.0-560.0 sec   481 MBytes   807 Mbits/sec
[  3] 560.0-565.0 sec   480 MBytes   806 Mbits/sec
[  3] 565.0-570.0 sec   481 MBytes   807 Mbits/sec
[  3] 570.0-575.0 sec   481 MBytes   807 Mbits/sec
[  3] 575.0-580.0 sec   481 MBytes   806 Mbits/sec
[  3] 580.0-585.0 sec   482 MBytes   808 Mbits/sec
[  3] 585.0-590.0 sec   481 MBytes   807 Mbits/sec
[  3] 590.0-595.0 sec   481 MBytes   807 Mbits/sec
[  3] 595.0-600.0 sec   481 MBytes   806 Mbits/sec
[  3] 600.0-605.0 sec   481 MBytes   807 Mbits/sec
[  3] 605.0-610.0 sec   481 MBytes   807 Mbits/sec
[  3] 610.0-615.0 sec   481 MBytes   807 Mbits/sec
[  3] 615.0-620.0 sec   481 MBytes   807 Mbits/sec
[  3] 620.0-625.0 sec   481 MBytes   806 Mbits/sec
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```
[  3] 625.0-630.0 sec   481 MBytes   807 Mbits/sec
[  3] 630.0-635.0 sec   481 MBytes   806 Mbits/sec
[  3] 635.0-640.0 sec   481 MBytes   807 Mbits/sec
[  3] 640.0-645.0 sec   482 MBytes   808 Mbits/sec
[  3] 645.0-650.0 sec   481 MBytes   806 Mbits/sec
[  3] 650.0-655.0 sec   481 MBytes   808 Mbits/sec
[  3] 655.0-660.0 sec   481 MBytes   807 Mbits/sec
[  3] 660.0-665.0 sec   481 MBytes   807 Mbits/sec
[  3] 665.0-670.0 sec   481 MBytes   807 Mbits/sec
[  3] 670.0-675.0 sec   481 MBytes   807 Mbits/sec
[  3] 675.0-680.0 sec   481 MBytes   806 Mbits/sec
[  3] 680.0-685.0 sec   481 MBytes   808 Mbits/sec
[  3] 685.0-690.0 sec   480 MBytes   806 Mbits/sec
[  3] 690.0-695.0 sec   481 MBytes   807 Mbits/sec
[  3] 695.0-700.0 sec   481 MBytes   806 Mbits/sec
[  3] 700.0-705.0 sec   481 MBytes   808 Mbits/sec
[  3] 705.0-710.0 sec   481 MBytes   808 Mbits/sec
[  3] 710.0-715.0 sec   481 MBytes   807 Mbits/sec
[  3] 715.0-720.0 sec   481 MBytes   807 Mbits/sec
[  3] 720.0-725.0 sec   481 MBytes   807 Mbits/sec
[  3] 725.0-730.0 sec   481 MBytes   806 Mbits/sec
[  3] 730.0-735.0 sec   481 MBytes   807 Mbits/sec
[  3] 735.0-740.0 sec   481 MBytes   807 Mbits/sec
[  3] 740.0-745.0 sec   480 MBytes   806 Mbits/sec
[  3] 745.0-750.0 sec   481 MBytes   808 Mbits/sec
[  3] 750.0-755.0 sec   480 MBytes   806 Mbits/sec
[  3] 755.0-760.0 sec   481 MBytes   807 Mbits/sec
[  3] 760.0-765.0 sec   481 MBytes   807 Mbits/sec
[  3] 765.0-770.0 sec   481 MBytes   807 Mbits/sec
[  3] 770.0-775.0 sec   481 MBytes   807 Mbits/sec
[  3] 775.0-780.0 sec   481 MBytes   807 Mbits/sec
[  3] 780.0-785.0 sec   481 MBytes   807 Mbits/sec
[  3] 785.0-790.0 sec   481 MBytes   806 Mbits/sec
[  3] 790.0-795.0 sec   481 MBytes   807 Mbits/sec
[  3] 795.0-800.0 sec   481 MBytes   807 Mbits/sec
[  3] 800.0-805.0 sec   481 MBytes   807 Mbits/sec
[  3] 805.0-810.0 sec   481 MBytes   807 Mbits/sec
[  3] 810.0-815.0 sec   478 MBytes   803 Mbits/sec
[  3] 815.0-820.0 sec   480 MBytes   804 Mbits/sec
[  3] 820.0-825.0 sec   480 MBytes   806 Mbits/sec
[  3] 825.0-830.0 sec   481 MBytes   808 Mbits/sec
[  3] 830.0-835.0 sec   481 MBytes   806 Mbits/sec
[  3] 835.0-840.0 sec   481 MBytes   807 Mbits/sec
[  3] 840.0-845.0 sec   481 MBytes   807 Mbits/sec
[  3] 845.0-850.0 sec   481 MBytes   807 Mbits/sec
[  3] 850.0-855.0 sec   481 MBytes   806 Mbits/sec
[  3] 855.0-860.0 sec   481 MBytes   807 Mbits/sec
[  3] 860.0-865.0 sec   481 MBytes   807 Mbits/sec
[  3] 865.0-870.0 sec   481 MBytes   806 Mbits/sec
[  3] 870.0-875.0 sec   481 MBytes   807 Mbits/sec
[  3] 875.0-880.0 sec   481 MBytes   806 Mbits/sec
[  3] 880.0-885.0 sec   481 MBytes   808 Mbits/sec
[  3] 885.0-890.0 sec   481 MBytes   808 Mbits/sec
[  3] 890.0-895.0 sec   481 MBytes   808 Mbits/sec
[  3] 895.0-900.0 sec   481 MBytes   806 Mbits/sec
[  3]  0.0-900.0 sec  84.5 GBytes   806 Mbits/sec
[  3] Sent 61703902 datagrams
[  3] Server Report:
[3] 0.0-900.0 sec  51.7 GBytes 493 Mbits/sec 0.306 ms 23950457/61703901 (39%)
[  3]  0.0-900.0 sec  324 datagrams received out-of-order
```

Results for Medium VMs case4

```
TCP Traffic
------------------------------------------------------------
Client connecting to 128.39.121.193, TCP port 5001
TCP window size: 23.5 KByte (default)
------------------------------------------------------------
```

```
[  3] local 10.0.3.12 port 58926 connected with 128.39.121.193 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   439 MBytes   737 Mbits/sec
[  3]  5.0-10.0 sec   434 MBytes   728 Mbits/sec
[  3] 10.0-15.0 sec   379 MBytes   636 Mbits/sec
[  3] 15.0-20.0 sec   394 MBytes   660 Mbits/sec
[  3] 20.0-25.0 sec   398 MBytes   668 Mbits/sec
[  3] 25.0-30.0 sec   414 MBytes   695 Mbits/sec
[  3] 30.0-35.0 sec   418 MBytes   700 Mbits/sec
[  3] 35.0-40.0 sec   396 MBytes   664 Mbits/sec
[  3] 40.0-45.0 sec   418 MBytes   702 Mbits/sec
[  3] 45.0-50.0 sec   418 MBytes   702 Mbits/sec
[  3] 50.0-55.0 sec   429 MBytes   720 Mbits/sec
[  3] 55.0-60.0 sec   454 MBytes   761 Mbits/sec
[  3] 60.0-65.0 sec   444 MBytes   745 Mbits/sec
[  3] 65.0-70.0 sec   407 MBytes   683 Mbits/sec
[  3] 70.0-75.0 sec   376 MBytes   631 Mbits/sec
[  3] 75.0-80.0 sec   386 MBytes   648 Mbits/sec
[  3] 80.0-85.0 sec   394 MBytes   661 Mbits/sec
[  3] 85.0-90.0 sec   386 MBytes   648 Mbits/sec
[  3] 90.0-95.0 sec   389 MBytes   653 Mbits/sec
[  3] 95.0-100.0 sec   404 MBytes   678 Mbits/sec
[  3] 100.0-105.0 sec   388 MBytes   650 Mbits/sec
[  3] 105.0-110.0 sec   380 MBytes   638 Mbits/sec
[  3] 110.0-115.0 sec   392 MBytes   658 Mbits/sec
[  3] 115.0-120.0 sec   405 MBytes   679 Mbits/sec
[  3] 120.0-125.0 sec   411 MBytes   690 Mbits/sec
[  3] 125.0-130.0 sec   412 MBytes   692 Mbits/sec
[  3] 130.0-135.0 sec   417 MBytes   700 Mbits/sec
[  3] 135.0-140.0 sec   411 MBytes   690 Mbits/sec
[  3] 140.0-145.0 sec   415 MBytes   696 Mbits/sec
[  3] 145.0-150.0 sec   416 MBytes   698 Mbits/sec
[  3] 150.0-155.0 sec   382 MBytes   641 Mbits/sec
[  3] 155.0-160.0 sec   389 MBytes   652 Mbits/sec
[  3] 160.0-165.0 sec   388 MBytes   651 Mbits/sec
[  3] 165.0-170.0 sec   390 MBytes   654 Mbits/sec
[  3] 170.0-175.0 sec   401 MBytes   673 Mbits/sec
[  3] 175.0-180.0 sec   412 MBytes   691 Mbits/sec
[  3] 180.0-185.0 sec   393 MBytes   659 Mbits/sec
[  3] 185.0-190.0 sec   421 MBytes   706 Mbits/sec
[  3] 190.0-195.0 sec   375 MBytes   629 Mbits/sec
[  3] 195.0-200.0 sec   389 MBytes   652 Mbits/sec
[  3] 200.0-205.0 sec   400 MBytes   672 Mbits/sec
[  3] 205.0-210.0 sec   434 MBytes   728 Mbits/sec
[  3] 210.0-215.0 sec   419 MBytes   703 Mbits/sec
[  3] 215.0-220.0 sec   437 MBytes   733 Mbits/sec
[  3] 220.0-225.0 sec   410 MBytes   687 Mbits/sec
[  3] 225.0-230.0 sec   406 MBytes   680 Mbits/sec
[  3] 230.0-235.0 sec   373 MBytes   626 Mbits/sec
[  3] 235.0-240.0 sec   389 MBytes   653 Mbits/sec
[  3] 240.0-245.0 sec   403 MBytes   676 Mbits/sec
[  3] 245.0-250.0 sec   388 MBytes   651 Mbits/sec
[  3] 250.0-255.0 sec   422 MBytes   708 Mbits/sec
[  3] 255.0-260.0 sec   407 MBytes   683 Mbits/sec
[  3] 260.0-265.0 sec   360 MBytes   605 Mbits/sec
[  3] 265.0-270.0 sec   393 MBytes   660 Mbits/sec
[  3] 270.0-275.0 sec   361 MBytes   605 Mbits/sec
[  3] 275.0-280.0 sec   393 MBytes   660 Mbits/sec
[  3] 280.0-285.0 sec   402 MBytes   674 Mbits/sec
[  3] 285.0-290.0 sec   411 MBytes   690 Mbits/sec
[  3] 290.0-295.0 sec   410 MBytes   687 Mbits/sec
[  3] 295.0-300.0 sec   385 MBytes   646 Mbits/sec
[  3] 300.0-305.0 sec   465 MBytes   780 Mbits/sec
[  3] 305.0-310.0 sec   450 MBytes   755 Mbits/sec
[  3] 310.0-315.0 sec   441 MBytes   740 Mbits/sec
[  3] 315.0-320.0 sec   466 MBytes   781 Mbits/sec
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[  3] 320.0-325.0 sec   475 MBytes   797 Mbits/sec
[  3] 325.0-330.0 sec   503 MBytes   844 Mbits/sec
[  3] 330.0-335.0 sec   434 MBytes   729 Mbits/sec
[  3] 335.0-340.0 sec   407 MBytes   683 Mbits/sec
[  3] 340.0-345.0 sec   400 MBytes   670 Mbits/sec
[  3] 345.0-350.0 sec   383 MBytes   643 Mbits/sec
[  3] 350.0-355.0 sec   412 MBytes   691 Mbits/sec
[  3] 355.0-360.0 sec   406 MBytes   681 Mbits/sec
[  3] 360.0-365.0 sec   415 MBytes   696 Mbits/sec
[  3] 365.0-370.0 sec   427 MBytes   717 Mbits/sec
[  3] 370.0-375.0 sec   425 MBytes   713 Mbits/sec
[  3] 375.0-380.0 sec   470 MBytes   789 Mbits/sec
[  3] 380.0-385.0 sec   437 MBytes   733 Mbits/sec
[  3] 385.0-390.0 sec   417 MBytes   699 Mbits/sec
[  3] 390.0-395.0 sec   460 MBytes   772 Mbits/sec
[  3] 395.0-400.0 sec   470 MBytes   788 Mbits/sec
[  3] 400.0-405.0 sec   464 MBytes   778 Mbits/sec
[  3] 405.0-410.0 sec   412 MBytes   690 Mbits/sec
[  3] 410.0-415.0 sec   424 MBytes   712 Mbits/sec
[  3] 415.0-420.0 sec   433 MBytes   726 Mbits/sec
[  3] 420.0-425.0 sec   470 MBytes   789 Mbits/sec
[  3] 425.0-430.0 sec   416 MBytes   699 Mbits/sec
[  3] 430.0-435.0 sec   439 MBytes   737 Mbits/sec
[  3] 435.0-440.0 sec   390 MBytes   655 Mbits/sec
[  3] 440.0-445.0 sec   368 MBytes   617 Mbits/sec
[  3] 445.0-450.0 sec   398 MBytes   667 Mbits/sec
[  3] 450.0-455.0 sec   374 MBytes   627 Mbits/sec
[  3] 455.0-460.0 sec   380 MBytes   638 Mbits/sec
[  3] 460.0-465.0 sec   386 MBytes   647 Mbits/sec
[  3] 465.0-470.0 sec   402 MBytes   675 Mbits/sec
[  3] 470.0-475.0 sec   386 MBytes   648 Mbits/sec
[  3] 475.0-480.0 sec   379 MBytes   636 Mbits/sec
[  3] 480.0-485.0 sec   373 MBytes   626 Mbits/sec
[  3] 485.0-490.0 sec   379 MBytes   636 Mbits/sec
[  3] 490.0-495.0 sec   384 MBytes   644 Mbits/sec
[  3] 495.0-500.0 sec   407 MBytes   682 Mbits/sec
[  3] 500.0-505.0 sec   395 MBytes   663 Mbits/sec
[  3] 505.0-510.0 sec   391 MBytes   657 Mbits/sec
[  3] 510.0-515.0 sec   395 MBytes   663 Mbits/sec
[  3] 515.0-520.0 sec   388 MBytes   652 Mbits/sec
[  3] 520.0-525.0 sec   366 MBytes   614 Mbits/sec
[  3] 525.0-530.0 sec   390 MBytes   653 Mbits/sec
[  3] 530.0-535.0 sec   386 MBytes   647 Mbits/sec
[  3] 535.0-540.0 sec   413 MBytes   693 Mbits/sec
[  3] 540.0-545.0 sec   428 MBytes   719 Mbits/sec
[  3] 545.0-550.0 sec   421 MBytes   707 Mbits/sec
[  3] 550.0-555.0 sec   389 MBytes   653 Mbits/sec
[  3] 555.0-560.0 sec   443 MBytes   743 Mbits/sec
[  3] 560.0-565.0 sec   438 MBytes   736 Mbits/sec
[  3] 565.0-570.0 sec   465 MBytes   780 Mbits/sec
[  3] 570.0-575.0 sec   389 MBytes   652 Mbits/sec
[  3] 575.0-580.0 sec   408 MBytes   684 Mbits/sec
[  3] 580.0-585.0 sec   430 MBytes   722 Mbits/sec
[  3] 585.0-590.0 sec   386 MBytes   648 Mbits/sec
[  3] 590.0-595.0 sec   399 MBytes   670 Mbits/sec
[  3] 595.0-600.0 sec   384 MBytes   645 Mbits/sec
[  3] 600.0-605.0 sec   391 MBytes   656 Mbits/sec
[  3] 605.0-610.0 sec   381 MBytes   639 Mbits/sec
[  3] 610.0-615.0 sec   372 MBytes   625 Mbits/sec
[  3] 615.0-620.0 sec   438 MBytes   734 Mbits/sec
[  3] 620.0-625.0 sec   447 MBytes   750 Mbits/sec
[  3] 625.0-630.0 sec   414 MBytes   694 Mbits/sec
[  3] 630.0-635.0 sec   459 MBytes   770 Mbits/sec
[  3] 635.0-640.0 sec   456 MBytes   765 Mbits/sec
[  3] 640.0-645.0 sec   465 MBytes   780 Mbits/sec
[  3] 645.0-650.0 sec   432 MBytes   726 Mbits/sec
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[  3] 650.0-655.0 sec   454 MBytes   763 Mbits/sec
[  3] 655.0-660.0 sec   456 MBytes   765 Mbits/sec
[  3] 660.0-665.0 sec   461 MBytes   773 Mbits/sec
[  3] 665.0-670.0 sec   444 MBytes   746 Mbits/sec
[  3] 670.0-675.0 sec   409 MBytes   686 Mbits/sec
[  3] 675.0-680.0 sec   385 MBytes   647 Mbits/sec
[  3] 680.0-685.0 sec   384 MBytes   645 Mbits/sec
[  3] 685.0-690.0 sec   378 MBytes   634 Mbits/sec
[  3] 690.0-695.0 sec   386 MBytes   647 Mbits/sec
[  3] 695.0-700.0 sec   382 MBytes   641 Mbits/sec
[  3] 700.0-705.0 sec   374 MBytes   627 Mbits/sec
[  3] 705.0-710.0 sec   392 MBytes   658 Mbits/sec
[  3] 710.0-715.0 sec   392 MBytes   658 Mbits/sec
[  3] 715.0-720.0 sec   396 MBytes   664 Mbits/sec
[  3] 720.0-725.0 sec   381 MBytes   640 Mbits/sec
[  3] 725.0-730.0 sec   409 MBytes   686 Mbits/sec
[  3] 730.0-735.0 sec   405 MBytes   680 Mbits/sec
[  3] 735.0-740.0 sec   423 MBytes   710 Mbits/sec
[  3] 740.0-745.0 sec   396 MBytes   664 Mbits/sec
[  3] 745.0-750.0 sec   385 MBytes   645 Mbits/sec
[  3] 750.0-755.0 sec   386 MBytes   648 Mbits/sec
[  3] 755.0-760.0 sec   388 MBytes   650 Mbits/sec
[  3] 760.0-765.0 sec   381 MBytes   640 Mbits/sec
[  3] 765.0-770.0 sec   396 MBytes   665 Mbits/sec
[  3] 770.0-775.0 sec   396 MBytes   664 Mbits/sec
[  3] 775.0-780.0 sec   400 MBytes   672 Mbits/sec
[  3] 780.0-785.0 sec   403 MBytes   676 Mbits/sec
[  3] 785.0-790.0 sec   370 MBytes   621 Mbits/sec
[  3] 790.0-795.0 sec   378 MBytes   634 Mbits/sec
[  3] 795.0-800.0 sec   412 MBytes   691 Mbits/sec
[  3] 800.0-805.0 sec   412 MBytes   692 Mbits/sec
[  3] 805.0-810.0 sec   398 MBytes   667 Mbits/sec
[  3] 810.0-815.0 sec   385 MBytes   646 Mbits/sec
[  3] 815.0-820.0 sec   396 MBytes   665 Mbits/sec
[  3] 820.0-825.0 sec   386 MBytes   648 Mbits/sec
[  3] 825.0-830.0 sec   390 MBytes   655 Mbits/sec
[  3] 830.0-835.0 sec   395 MBytes   663 Mbits/sec
[  3] 835.0-840.0 sec   335 MBytes   562 Mbits/sec
[  3] 840.0-845.0 sec   409 MBytes   687 Mbits/sec
[  3] 845.0-850.0 sec   414 MBytes   694 Mbits/sec
[  3] 850.0-855.0 sec   416 MBytes   698 Mbits/sec
[  3] 855.0-860.0 sec   409 MBytes   687 Mbits/sec
[  3] 860.0-865.0 sec   399 MBytes   669 Mbits/sec
[  3] 865.0-870.0 sec   368 MBytes   617 Mbits/sec
[  3] 870.0-875.0 sec   364 MBytes   610 Mbits/sec
[  3] 875.0-880.0 sec   397 MBytes   666 Mbits/sec
[  3] 880.0-885.0 sec   380 MBytes   638 Mbits/sec
[  3] 885.0-890.0 sec   375 MBytes   629 Mbits/sec
[  3] 890.0-895.0 sec   384 MBytes   645 Mbits/sec
[  3] 895.0-900.0 sec   388 MBytes   650 Mbits/sec
[  3]  0.0-900.0 sec  71.4 GBytes   682 Mbits/sec
------------------------------------------------------------
UDP Traffic
------------------------------------------------------------
Client connecting to 128.39.121.193, UDP port 5001
Sending 1470 byte datagrams
UDP buffer size:  224 KByte (default)
------------------------------------------------------------
[  3] local 10.0.3.12 port 58257 connected with 128.39.121.193 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 5.0 sec   480 MBytes   806 Mbits/sec
[  3]  5.0-10.0 sec   480 MBytes   806 Mbits/sec
[  3] 10.0-15.0 sec   480 MBytes   806 Mbits/sec
[  3] 15.0-20.0 sec   480 MBytes   806 Mbits/sec
[  3] 20.0-25.0 sec   480 MBytes   806 Mbits/sec
[  3] 25.0-30.0 sec   481 MBytes   807 Mbits/sec
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[  3] 30.0-35.0 sec   481 MBytes   806 Mbits/sec
[  3] 35.0-40.0 sec   481 MBytes   806 Mbits/sec
[  3] 40.0-45.0 sec   480 MBytes   806 Mbits/sec
[  3] 45.0-50.0 sec   480 MBytes   806 Mbits/sec
[  3] 50.0-55.0 sec   480 MBytes   805 Mbits/sec
[  3] 55.0-60.0 sec   480 MBytes   806 Mbits/sec
[  3] 60.0-65.0 sec   480 MBytes   806 Mbits/sec
[  3] 65.0-70.0 sec   480 MBytes   805 Mbits/sec
[  3] 70.0-75.0 sec   480 MBytes   806 Mbits/sec
[  3] 75.0-80.0 sec   480 MBytes   805 Mbits/sec
[  3] 80.0-85.0 sec   481 MBytes   807 Mbits/sec
[  3] 85.0-90.0 sec   480 MBytes   806 Mbits/sec
[  3] 90.0-95.0 sec   480 MBytes   806 Mbits/sec
[  3] 95.0-100.0 sec   480 MBytes   805 Mbits/sec
[  3] 100.0-105.0 sec   480 MBytes   806 Mbits/sec
[  3] 105.0-110.0 sec   480 MBytes   806 Mbits/sec
[  3] 110.0-115.0 sec   480 MBytes   805 Mbits/sec
[  3] 115.0-120.0 sec   480 MBytes   806 Mbits/sec
[  3] 120.0-125.0 sec   480 MBytes   806 Mbits/sec
[  3] 125.0-130.0 sec   480 MBytes   805 Mbits/sec
[  3] 130.0-135.0 sec   480 MBytes   806 Mbits/sec
[  3] 135.0-140.0 sec   480 MBytes   806 Mbits/sec
[  3] 140.0-145.0 sec   480 MBytes   806 Mbits/sec
[  3] 145.0-150.0 sec   482 MBytes   808 Mbits/sec
[  3] 150.0-155.0 sec   481 MBytes   807 Mbits/sec
[  3] 155.0-160.0 sec   480 MBytes   805 Mbits/sec
[  3] 160.0-165.0 sec   480 MBytes   806 Mbits/sec
[  3] 165.0-170.0 sec   480 MBytes   806 Mbits/sec
[  3] 170.0-175.0 sec   481 MBytes   806 Mbits/sec
[  3] 175.0-180.0 sec   481 MBytes   808 Mbits/sec
[  3] 180.0-185.0 sec   481 MBytes   808 Mbits/sec
[  3] 185.0-190.0 sec   481 MBytes   808 Mbits/sec
[  3] 190.0-195.0 sec   480 MBytes   806 Mbits/sec
[  3] 195.0-200.0 sec   481 MBytes   807 Mbits/sec
[  3] 200.0-205.0 sec   482 MBytes   808 Mbits/sec
[  3] 205.0-210.0 sec   481 MBytes   808 Mbits/sec
[  3] 210.0-215.0 sec   481 MBytes   808 Mbits/sec
[  3] 215.0-220.0 sec   480 MBytes   806 Mbits/sec
[  3] 220.0-225.0 sec   480 MBytes   805 Mbits/sec
[  3] 225.0-230.0 sec   480 MBytes   806 Mbits/sec
[  3] 230.0-235.0 sec   480 MBytes   806 Mbits/sec
[  3] 235.0-240.0 sec   480 MBytes   805 Mbits/sec
[  3] 240.0-245.0 sec   480 MBytes   806 Mbits/sec
[  3] 245.0-250.0 sec   480 MBytes   806 Mbits/sec
[  3] 250.0-255.0 sec   480 MBytes   806 Mbits/sec
[  3] 255.0-260.0 sec   480 MBytes   805 Mbits/sec
[  3] 260.0-265.0 sec   481 MBytes   806 Mbits/sec
[  3] 265.0-270.0 sec   481 MBytes   806 Mbits/sec
[  3] 270.0-275.0 sec   482 MBytes   808 Mbits/sec
[  3] 275.0-280.0 sec   481 MBytes   807 Mbits/sec
[  3] 280.0-285.0 sec   481 MBytes   807 Mbits/sec
[  3] 285.0-290.0 sec   481 MBytes   808 Mbits/sec
[  3] 290.0-295.0 sec   481 MBytes   807 Mbits/sec
[  3] 295.0-300.0 sec   481 MBytes   808 Mbits/sec
[  3] 300.0-305.0 sec   481 MBytes   807 Mbits/sec
[  3] 305.0-310.0 sec   481 MBytes   807 Mbits/sec
[  3] 310.0-315.0 sec   481 MBytes   808 Mbits/sec
[  3] 315.0-320.0 sec   481 MBytes   807 Mbits/sec
[  3] 320.0-325.0 sec   482 MBytes   808 Mbits/sec
[  3] 325.0-330.0 sec   481 MBytes   808 Mbits/sec
[  3] 330.0-335.0 sec   481 MBytes   808 Mbits/sec
[  3] 335.0-340.0 sec   481 MBytes   808 Mbits/sec
[  3] 340.0-345.0 sec   481 MBytes   808 Mbits/sec
[  3] 345.0-350.0 sec   481 MBytes   808 Mbits/sec
[  3] 350.0-355.0 sec   481 MBytes   808 Mbits/sec
[  3] 355.0-360.0 sec   481 MBytes   807 Mbits/sec
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[  3] 360.0-365.0 sec   481 MBytes   807 Mbits/sec
[  3] 365.0-370.0 sec   480 MBytes   806 Mbits/sec
[  3] 370.0-375.0 sec   480 MBytes   806 Mbits/sec
[  3] 375.0-380.0 sec   480 MBytes   805 Mbits/sec
[  3] 380.0-385.0 sec   480 MBytes   806 Mbits/sec
[  3] 385.0-390.0 sec   480 MBytes   806 Mbits/sec
[  3] 390.0-395.0 sec   480 MBytes   805 Mbits/sec
[  3] 395.0-400.0 sec   480 MBytes   806 Mbits/sec
[  3] 400.0-405.0 sec   480 MBytes   805 Mbits/sec
[  3] 405.0-410.0 sec   480 MBytes   805 Mbits/sec
[  3] 410.0-415.0 sec   480 MBytes   806 Mbits/sec
[  3] 415.0-420.0 sec   480 MBytes   806 Mbits/sec
[  3] 420.0-425.0 sec   480 MBytes   805 Mbits/sec
[  3] 425.0-430.0 sec   480 MBytes   806 Mbits/sec
[  3] 430.0-435.0 sec   480 MBytes   806 Mbits/sec
[  3] 435.0-440.0 sec   480 MBytes   805 Mbits/sec
[  3] 440.0-445.0 sec   480 MBytes   806 Mbits/sec
[  3] 445.0-450.0 sec   480 MBytes   806 Mbits/sec
[  3] 450.0-455.0 sec   480 MBytes   806 Mbits/sec
[  3] 455.0-460.0 sec   480 MBytes   805 Mbits/sec
[  3] 460.0-465.0 sec   480 MBytes   806 Mbits/sec
[  3] 465.0-470.0 sec   480 MBytes   806 Mbits/sec
[  3] 470.0-475.0 sec   480 MBytes   805 Mbits/sec
[  3] 475.0-480.0 sec   480 MBytes   806 Mbits/sec
[  3] 480.0-485.0 sec   480 MBytes   806 Mbits/sec
[  3] 485.0-490.0 sec   480 MBytes   805 Mbits/sec
[  3] 490.0-495.0 sec   480 MBytes   806 Mbits/sec
[  3] 495.0-500.0 sec   480 MBytes   806 Mbits/sec
[  3] 500.0-505.0 sec   480 MBytes   806 Mbits/sec
[  3] 505.0-510.0 sec   480 MBytes   805 Mbits/sec
[  3] 510.0-515.0 sec   480 MBytes   806 Mbits/sec
[  3] 515.0-520.0 sec   480 MBytes   806 Mbits/sec
[  3] 520.0-525.0 sec   480 MBytes   805 Mbits/sec
[  3] 525.0-530.0 sec   480 MBytes   806 Mbits/sec
[  3] 530.0-535.0 sec   481 MBytes   807 Mbits/sec
[  3] 535.0-540.0 sec   481 MBytes   808 Mbits/sec
[  3] 540.0-545.0 sec   481 MBytes   807 Mbits/sec
[  3] 545.0-550.0 sec   481 MBytes   807 Mbits/sec
[  3] 550.0-555.0 sec   481 MBytes   808 Mbits/sec
[  3] 555.0-560.0 sec   481 MBytes   808 Mbits/sec
[  3] 560.0-565.0 sec   482 MBytes   808 Mbits/sec
[  3] 565.0-570.0 sec   481 MBytes   808 Mbits/sec
[  3] 570.0-575.0 sec   481 MBytes   808 Mbits/sec
[  3] 575.0-580.0 sec   481 MBytes   808 Mbits/sec
[  3] 580.0-585.0 sec   481 MBytes   807 Mbits/sec
[  3] 585.0-590.0 sec   481 MBytes   808 Mbits/sec
[  3] 590.0-595.0 sec   481 MBytes   808 Mbits/sec
[  3] 595.0-600.0 sec   481 MBytes   807 Mbits/sec
[  3] 600.0-605.0 sec   481 MBytes   807 Mbits/sec
[  3] 605.0-610.0 sec   480 MBytes   806 Mbits/sec
[  3] 610.0-615.0 sec   480 MBytes   806 Mbits/sec
[  3] 615.0-620.0 sec   480 MBytes   805 Mbits/sec
[  3] 620.0-625.0 sec   480 MBytes   805 Mbits/sec
[  3] 625.0-630.0 sec   480 MBytes   806 Mbits/sec
[  3] 630.0-635.0 sec   480 MBytes   805 Mbits/sec
[  3] 635.0-640.0 sec   481 MBytes   807 Mbits/sec
[  3] 640.0-645.0 sec   480 MBytes   805 Mbits/sec
[  3] 645.0-650.0 sec   481 MBytes   808 Mbits/sec
[  3] 650.0-655.0 sec   481 MBytes   808 Mbits/sec
[  3] 655.0-660.0 sec   481 MBytes   807 Mbits/sec
[  3] 660.0-665.0 sec   481 MBytes   808 Mbits/sec
[  3] 665.0-670.0 sec   480 MBytes   805 Mbits/sec
[  3] 670.0-675.0 sec   480 MBytes   806 Mbits/sec
[  3] 675.0-680.0 sec   480 MBytes   806 Mbits/sec
[  3] 680.0-685.0 sec   480 MBytes   806 Mbits/sec
[  3] 685.0-690.0 sec   481 MBytes   806 Mbits/sec
```

```
[  3] 690.0-695.0 sec   481 MBytes   808 Mbits/sec
[  3] 695.0-700.0 sec   481 MBytes   808 Mbits/sec
[  3] 700.0-705.0 sec   481 MBytes   807 Mbits/sec
[  3] 705.0-710.0 sec   481 MBytes   808 Mbits/sec
[  3] 710.0-715.0 sec   481 MBytes   807 Mbits/sec
[  3] 715.0-720.0 sec   481 MBytes   807 Mbits/sec
[  3] 720.0-725.0 sec   481 MBytes   807 Mbits/sec
[  3] 725.0-730.0 sec   480 MBytes   806 Mbits/sec
[  3] 730.0-735.0 sec   480 MBytes   806 Mbits/sec
[  3] 735.0-740.0 sec   480 MBytes   806 Mbits/sec
[  3] 740.0-745.0 sec   481 MBytes   806 Mbits/sec
[  3] 745.0-750.0 sec   482 MBytes   808 Mbits/sec
[  3] 750.0-755.0 sec   481 MBytes   808 Mbits/sec
[  3] 755.0-760.0 sec   481 MBytes   808 Mbits/sec
[  3] 760.0-765.0 sec   480 MBytes   806 Mbits/sec
[  3] 765.0-770.0 sec   479 MBytes   804 Mbits/sec
[  3] 770.0-775.0 sec   480 MBytes   805 Mbits/sec
[  3] 775.0-780.0 sec   480 MBytes   806 Mbits/sec
[  3] 780.0-785.0 sec   480 MBytes   806 Mbits/sec
[  3] 785.0-790.0 sec   480 MBytes   806 Mbits/sec
[  3] 790.0-795.0 sec   481 MBytes   807 Mbits/sec
[  3] 795.0-800.0 sec   482 MBytes   808 Mbits/sec
[  3] 800.0-805.0 sec   481 MBytes   808 Mbits/sec
[  3] 805.0-810.0 sec   482 MBytes   808 Mbits/sec
[  3] 810.0-815.0 sec   481 MBytes   808 Mbits/sec
[  3] 815.0-820.0 sec   481 MBytes   808 Mbits/sec
[  3] 820.0-825.0 sec   481 MBytes   807 Mbits/sec
[  3] 825.0-830.0 sec   481 MBytes   807 Mbits/sec
[  3] 830.0-835.0 sec   481 MBytes   807 Mbits/sec
[  3] 835.0-840.0 sec   481 MBytes   807 Mbits/sec
[  3] 840.0-845.0 sec   481 MBytes   808 Mbits/sec
[  3] 845.0-850.0 sec   480 MBytes   805 Mbits/sec
[  3] 850.0-855.0 sec   480 MBytes   806 Mbits/sec
[  3] 855.0-860.0 sec   481 MBytes   808 Mbits/sec
[  3] 860.0-865.0 sec   481 MBytes   808 Mbits/sec
[  3] 865.0-870.0 sec   482 MBytes   808 Mbits/sec
[  3] 870.0-875.0 sec   481 MBytes   808 Mbits/sec
[  3] 875.0-880.0 sec   481 MBytes   808 Mbits/sec
[  3] 880.0-885.0 sec   481 MBytes   808 Mbits/sec
[  3] 885.0-890.0 sec   479 MBytes   804 Mbits/sec
[  3] 890.0-895.0 sec   480 MBytes   806 Mbits/sec
[  3] 895.0-900.0 sec   480 MBytes   805 Mbits/sec
[  3]  0.0-900.0 sec  84.5 GBytes   806 Mbits/sec
[  3] Sent 61718544 datagrams
[  3] Server Report:
[3] 0.0-989.3 sec 83.5 GBytes  725 Mbits/sec  0.141 ms 695559/61718543 (1.1%)
[  3]  0.0-989.3 sec  38422 datagrams received out-of-order
Average packet delay results for Tiny-sized VMs
```

Tiny-sized VMs	Average Packet Delay (milliseconds)
Case1	0,412
Case2	0,674
Case3	0,488
Case4	0,745

Figure A.1: Results of Average packet delay for Tiny-sized VMs

Medium sized VMs	Average Packet Delay(milliseconds)
Case1	0,449
Case2	0,741
Case3	0,526
Case4	0,745

Figure A.2: Results of Average packet delay for Medium-sized VMs

Multiple Tiny-sized VMs pairs	TCP Throughput (Mbps)	UDP Throughput (Mbps)	Packet Loss(%)	Average Packet Delay (milliseconds)
1st pair of VMs	606	799	29	0,502
2nd pair of VMs	869	792	0,37	0,322
3rd pair of VMs	897	800	0,26	0,342
4th pair of VMs	878	778	0,25	0,341
5th pair of VMs	855	762	0,28	0,372
6th pair of VMs	897	768	0,34	0,332
7th pair of VMs	880	783	0,24	0,32
8th pair of VMs	870	784	0,35	0,323
9th pair of VMs	909	770	0,28	0,388

Figure A.3: Results for Multiple tiny-sized VMs

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