Module Code & Module Title

CS5001NA Networks and Operating System

Assessment Weightage & Type

30% Individual Coursework

Year and Semester

2018-19 Autumn

Student Name: Abiral Joshi Shrestha

London Met ID: 17030696

College ID: NP01NT4A170008

Assignment Due Date: 14th January 2019

Assignment Submission Date: 14th January 2019

Word Count (Where Required): 1995

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TASK A

1. Introduction

This report was created using COMNET III. COMNET III can be described a performance analysis tool for communication networks. It is used to create model networks. It stimulates the data flow and operations that occur in the network, and provides values for the performance of the various aspects of the network (Ahuja, 1998). The various network topologies used in the model are: LAN and WAN. LAN (short for Local Area Network) is a group of interconnected devices, through wired, wireless or a combination of both, within a small specific area such as homes, institutions, etc. (Christensson, 2016). WAN (short for Wide Area Network) is a communications network which covers a large geographical area such as cities, countries, or even the world (Mitchell, 2018).

2. Description of the WAN model.

Three LANs named; London, Kathmandu and Pokhara, were set up. Each LAN was set up using IEEE802.5 4 Mbps token passing standard. The Kathmandu and Pokhara LANs each consist of 60 ATM transaction nodes plus one single teller giving a total of 61 ATMs each in a LAN.

Figure 1 Setting up London, Kathmandu and Pokhara LANs

In the London LAN, a network device was created and named Router. Then, a token passing link was created and named Token Ring. A processing node was added and name London Server. Finally, a Response source was added and all the devices were connected as shown in the figure below:

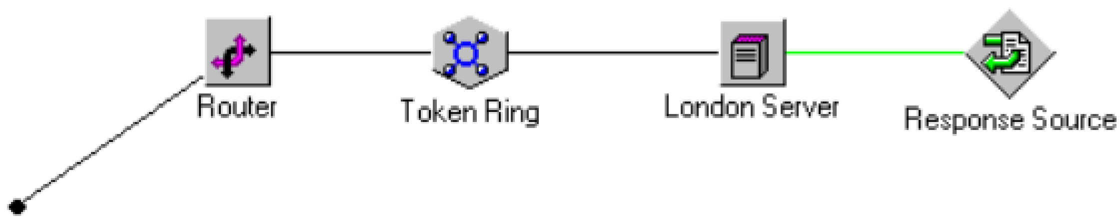


Figure 2 London LAN

In the Kathmandu LAN, a network device was created and named Router. Then, a token passing link was created and named Token Ring. A processing node was created, named Teller and connected to the Token Ring. A message source was added, named Teller source and connected to the Teller. A computer group was created and named KTM ATM and then, connected to the Token Ring. Finally, a message source was added, named ATM Source and connected to the KTM ATM. All the devices were connected as shown in the figure below:

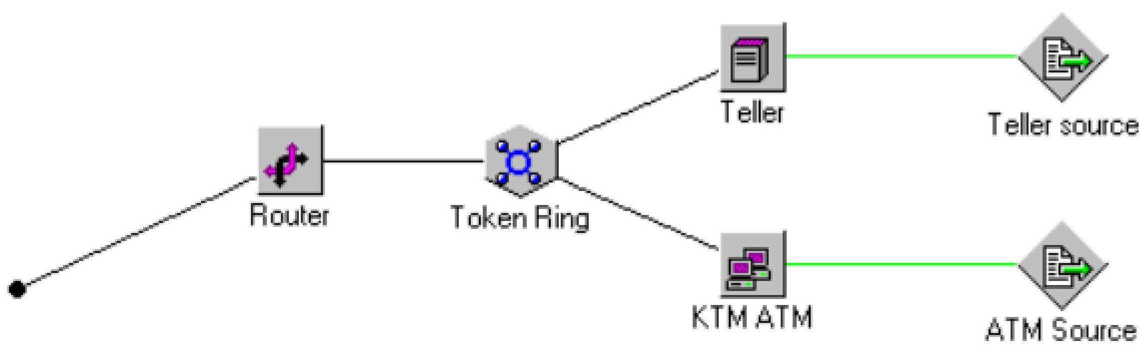


Figure 3 Kathmandu LAN

In the Pokhara LAN, a network device was created and named Router. A token passing link was created and named Token Ring. A processing node was created and name Teller and connected to the Token Ring. A message source was created, name

Teller Source and connected to the Teller. A computer group was created and named ATM PKR and connected to the Token Ring. Finally, a message source was created, named ATM Source and connected to ATM PKR. The devices were connected as shown in the figure below:

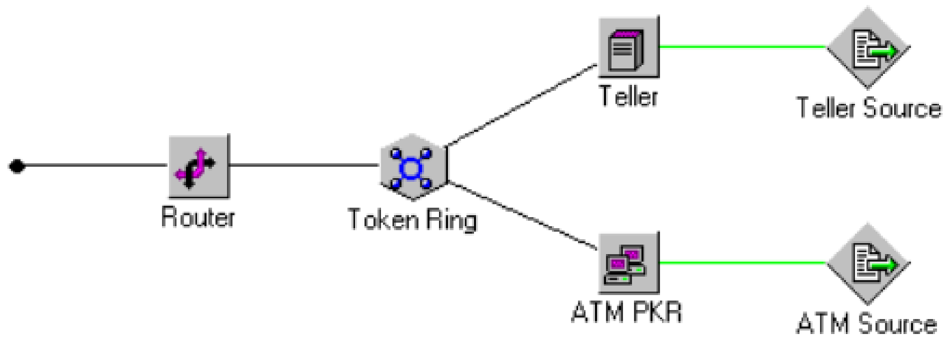


Figure 4 Pokhara LAN

Three point to point links were created and named London Access, KTM Access and Pokhara Access respectively. London Access and Kathmandu Access were connected using two VCs named, Kathmandu_London and London_Kathmandu. Similarly, London Access and Pokhara Access were connected using two VCs named, Pokhara_London and London_Pokhara. The topology is as shown below:

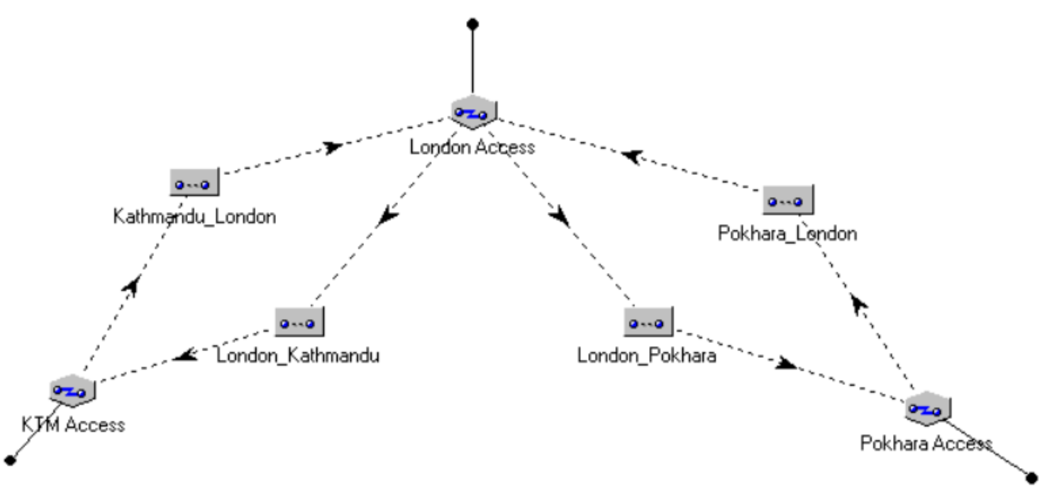


Figure 5 WAN Cloud

All three LANs, London, Kathmandu and Pokhara, were connected to the WAN Cloud as shown in the figure below:

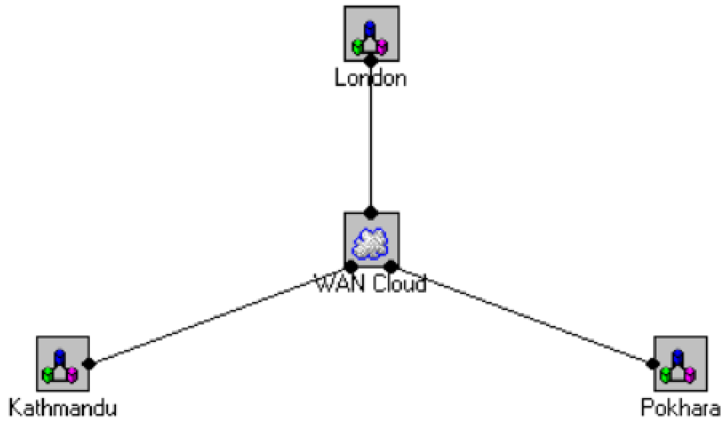


Figure 6 Establishment of connection between the LANs and WAN Cloud

2.1 London LAN

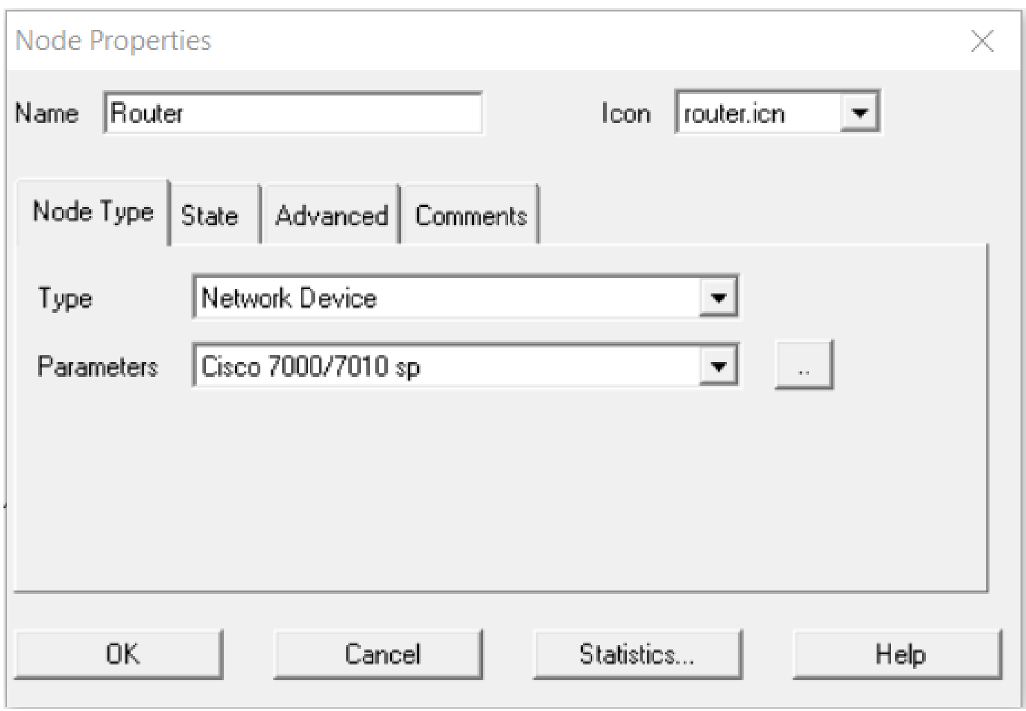


Figure 7 Parameters of London LAN Router

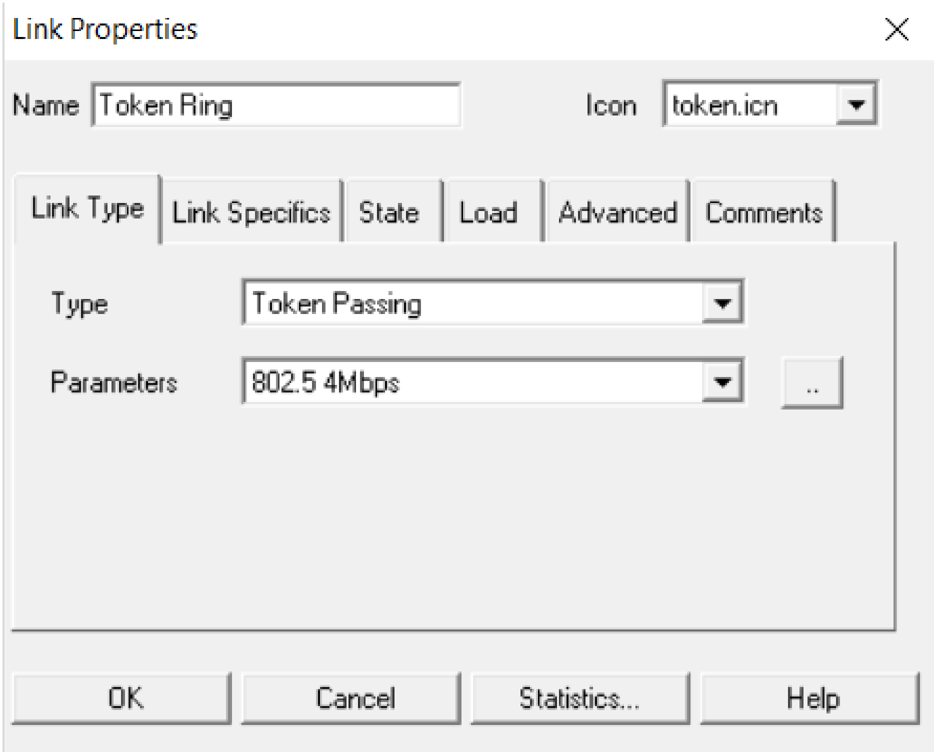


Figure 8 Parameters of London LAN Token Ring

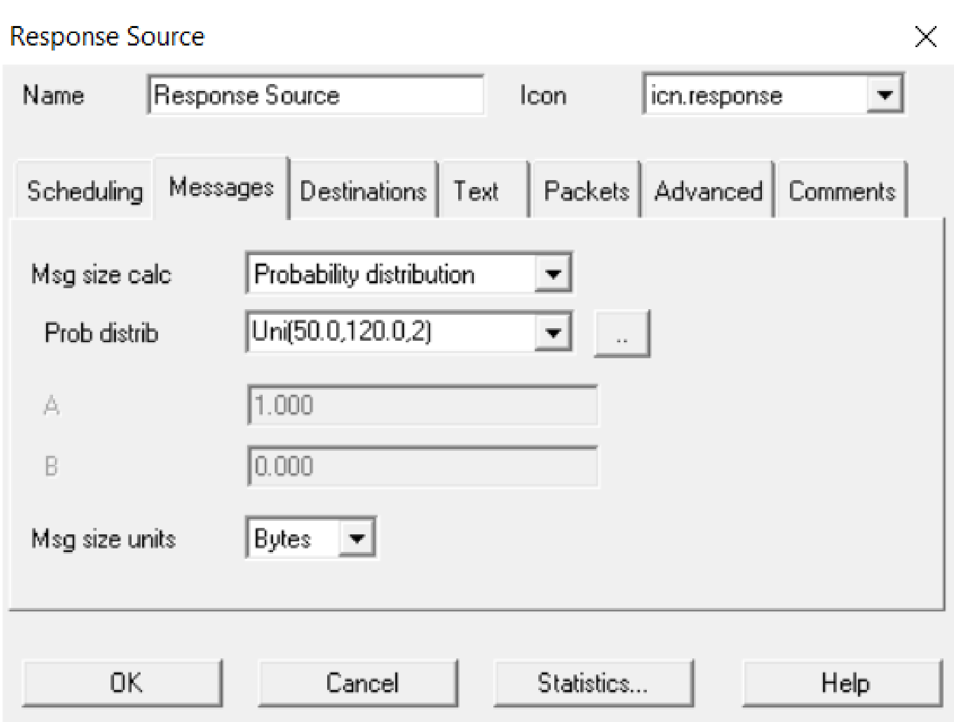


Figure 9 Parameters of London LAN Response Source

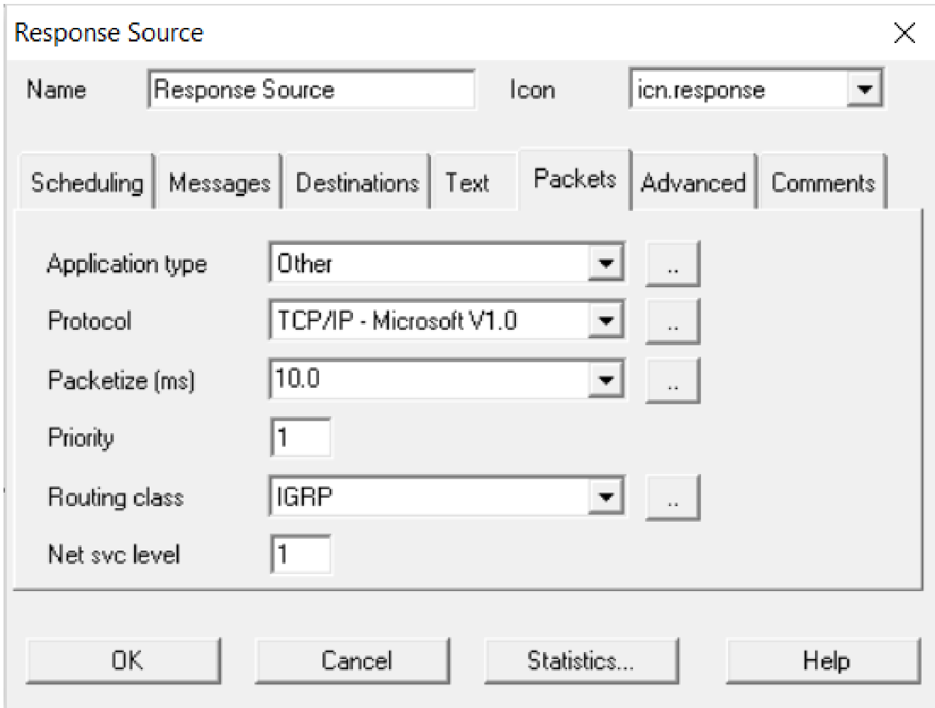


Figure 10 Parameters of London LAN Response Source

2.2 Kathmandu LAN

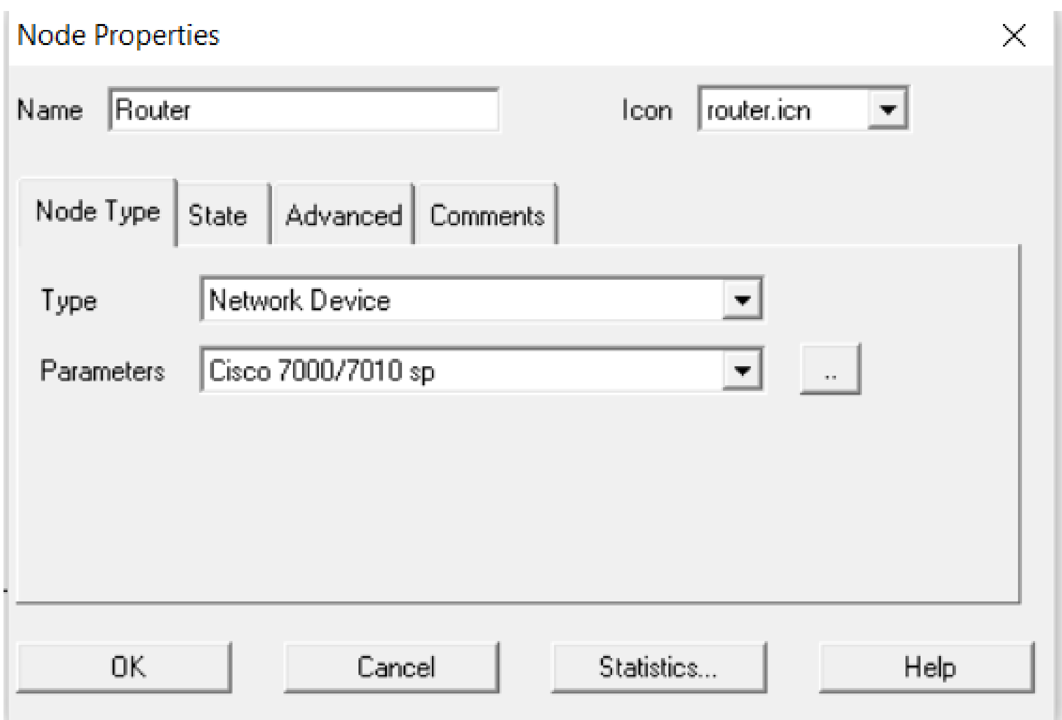


Figure 11 Parameters of Kathmandu LAN Router

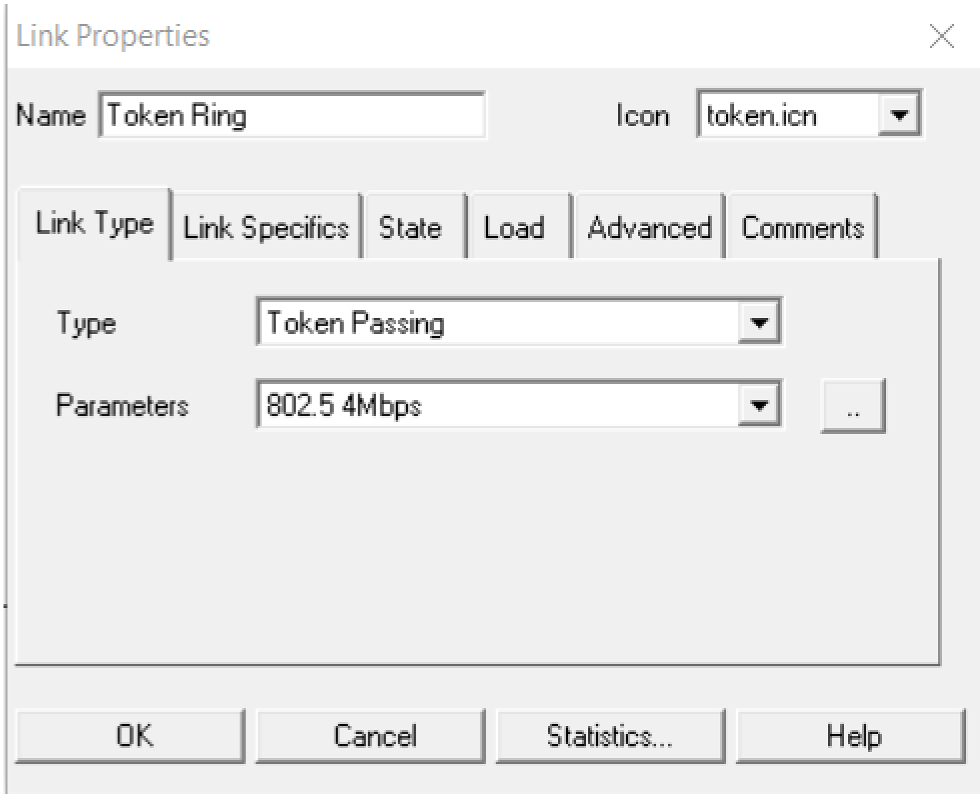


Figure 12 Parameters of Kathmandu LAN Token Ring

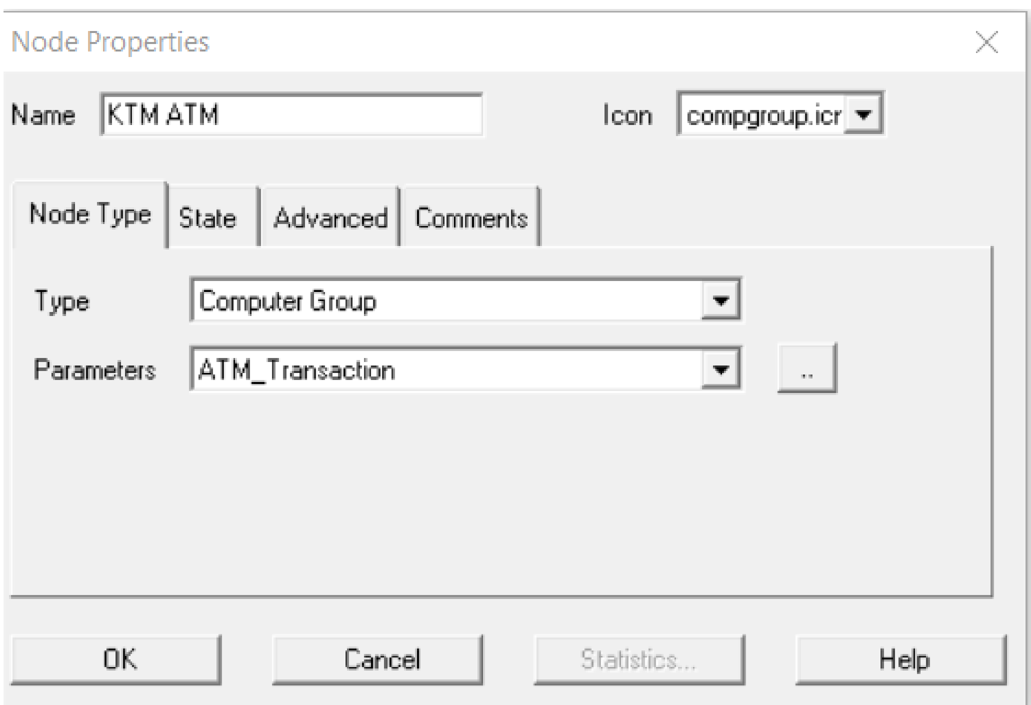


Figure 13 Parameters of Kathmandu LAN KTM ATM

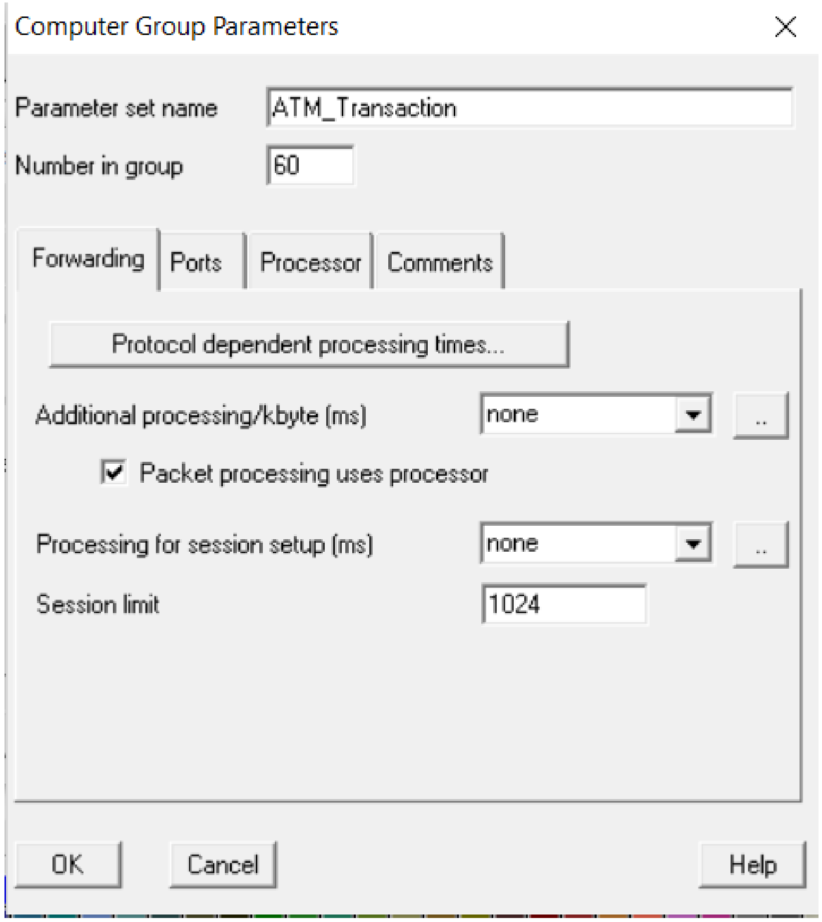


Figure 14 Parameters set for KTM ATM_Transaction

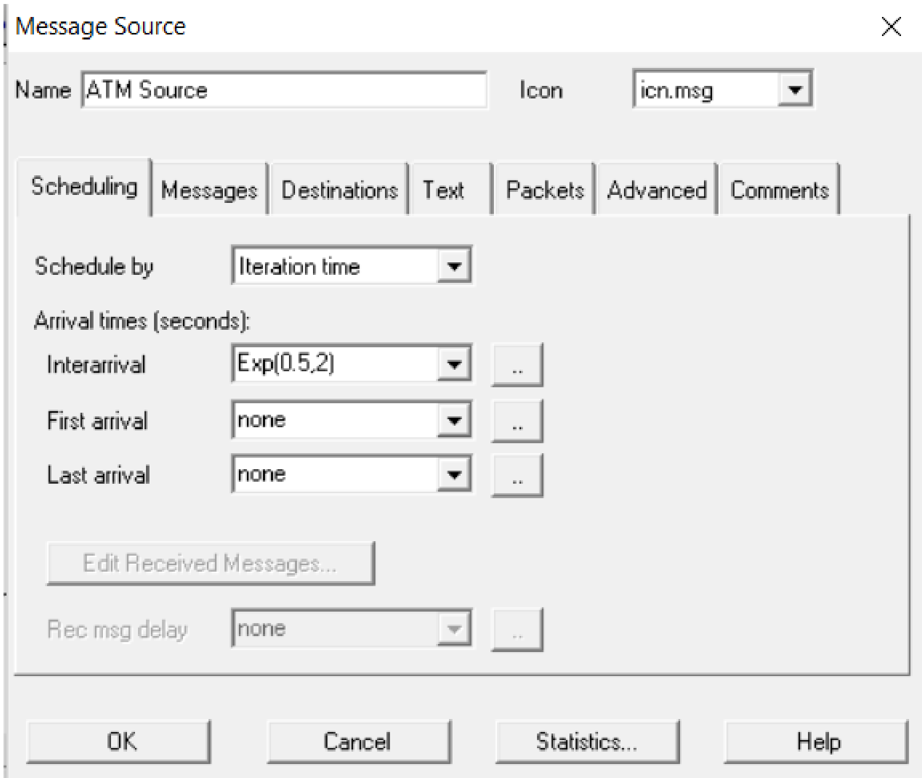


Figure 15 Parameters of KTM LAN ATM Source-Scheduling

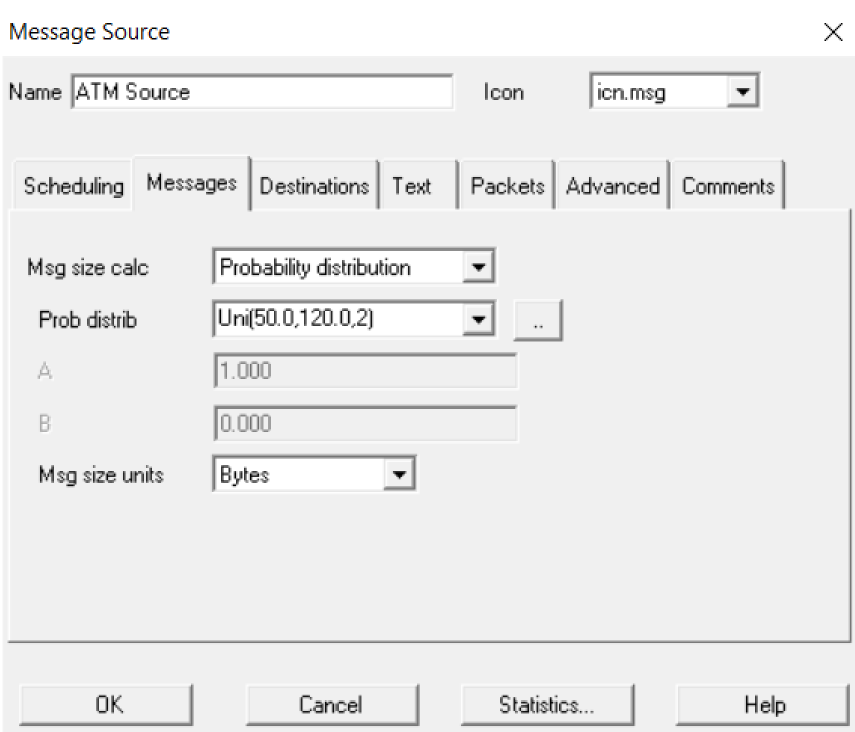


Figure 16 Parameters of KTM LAN ATM Source-Messages

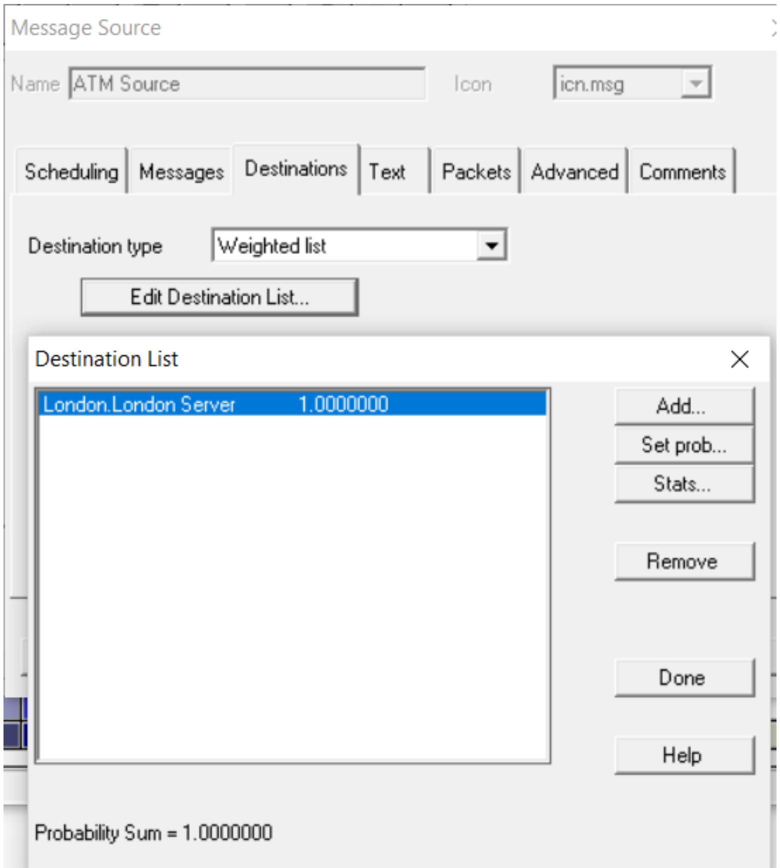


Figure 17 Parameters of Kathmandu LAN ATM Source-Destinations

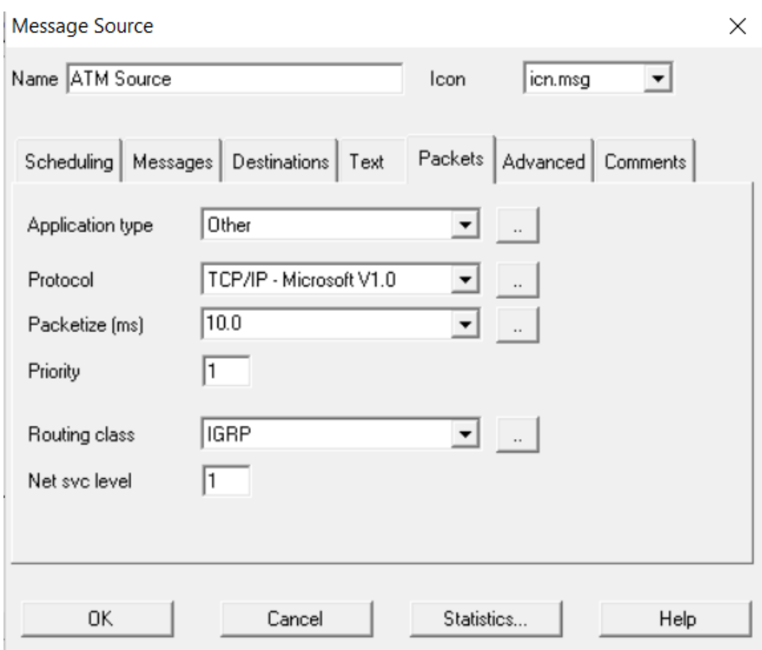


Figure 18 Parameters of Kathmandu LAN ATM Source-Packets

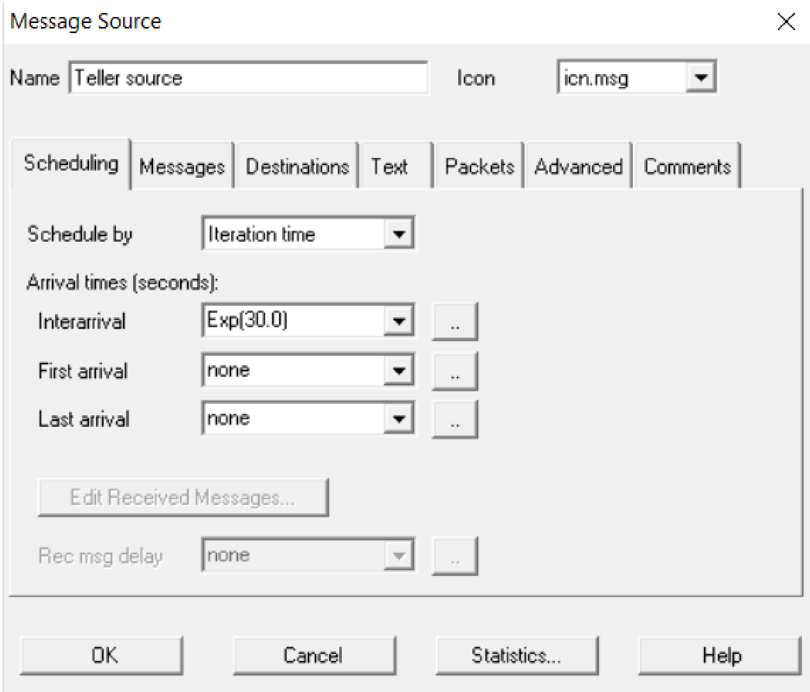


Figure 19 Parameters of Kathmandu LAN Teller Source-Scheduling

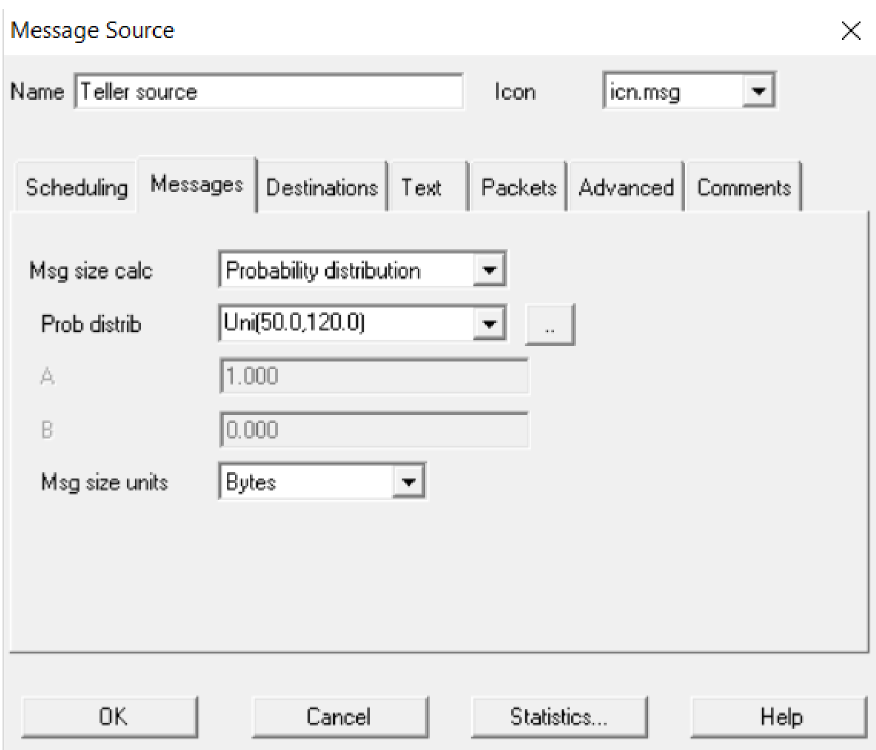


Figure 20 Parameters of Kathmandu LAN Teller Source-Messages

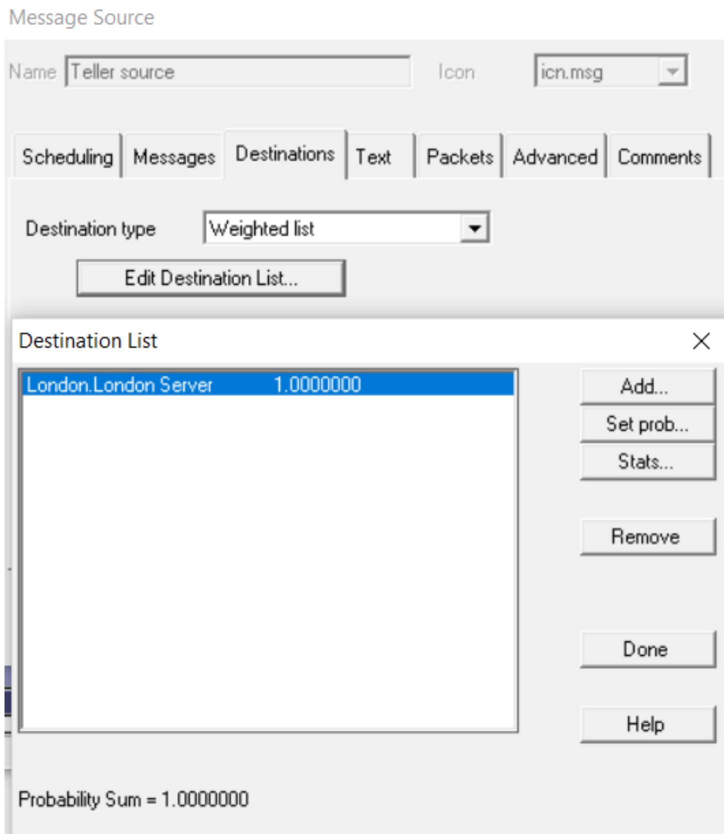


Figure 21 Parameters of Kathmandu LAN Teller Source-Destinations

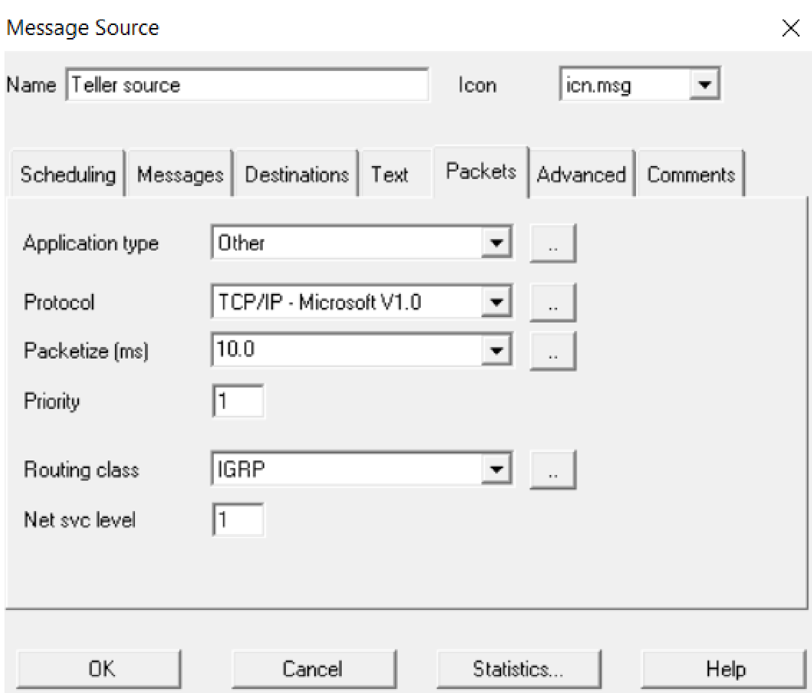


Figure 22 Parameters of Kathmandu LAN Teller Source-Packets

2.3 Pokhara LAN

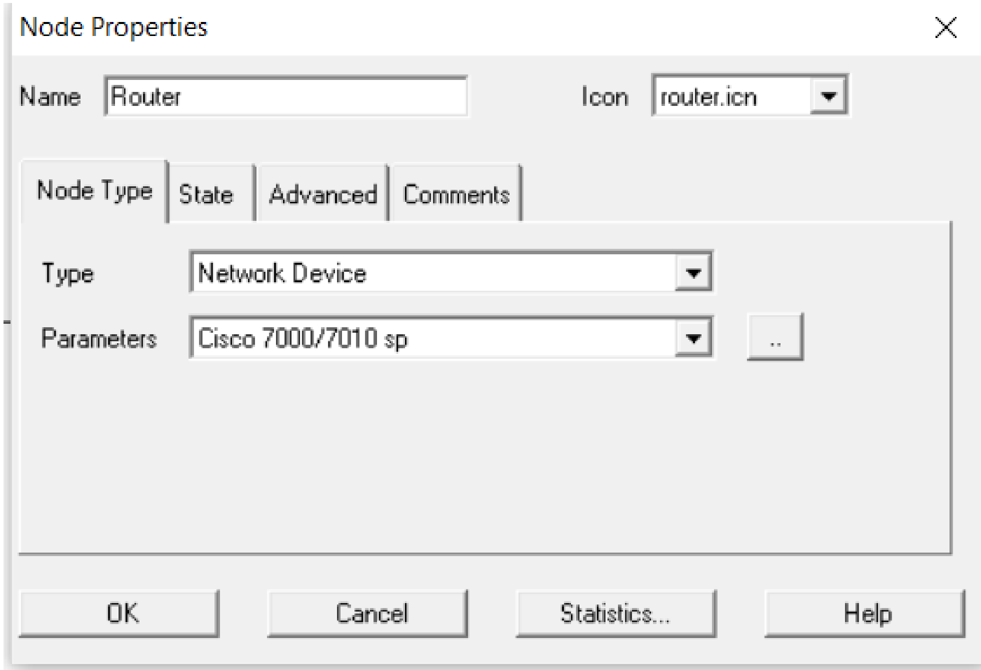


Figure 23 Parameters of Pokhara LAN Router

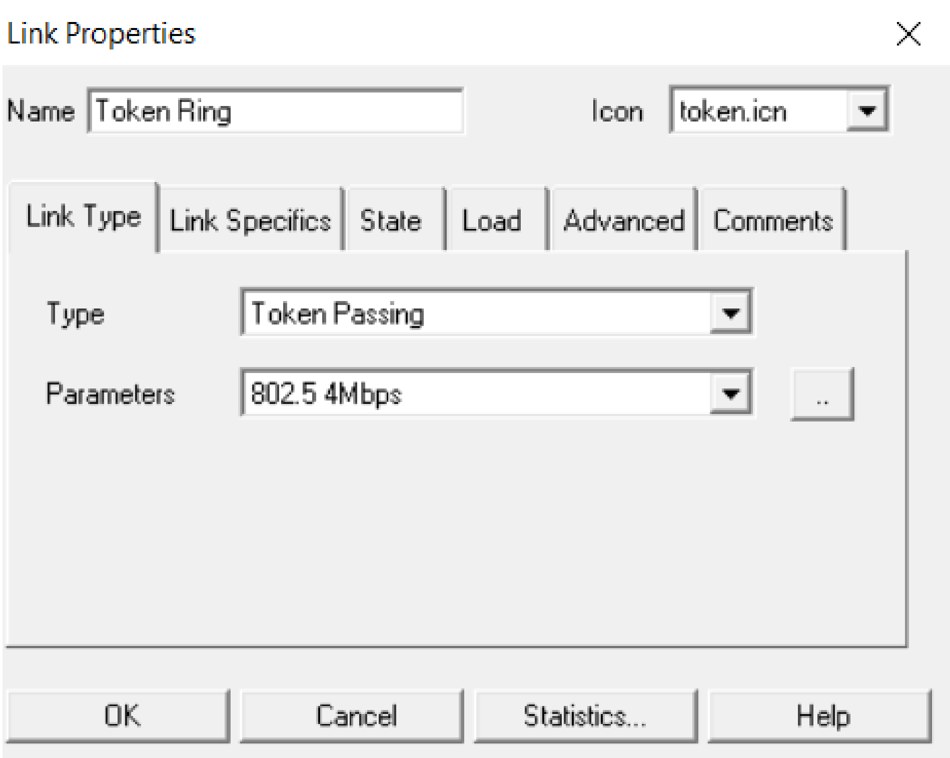


Figure 24 Parameters of Pokhara LAN Token Ring

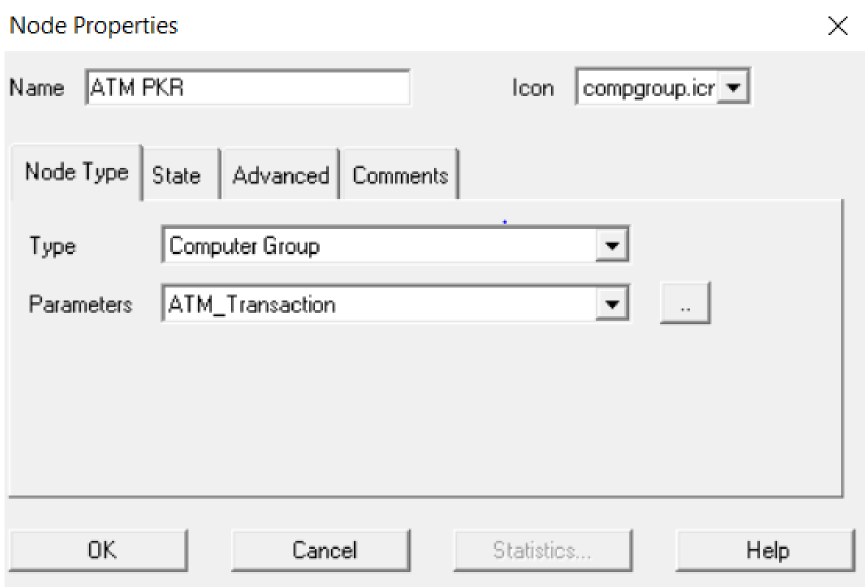


Figure 25 Parameters of Pokhara LAN ATM

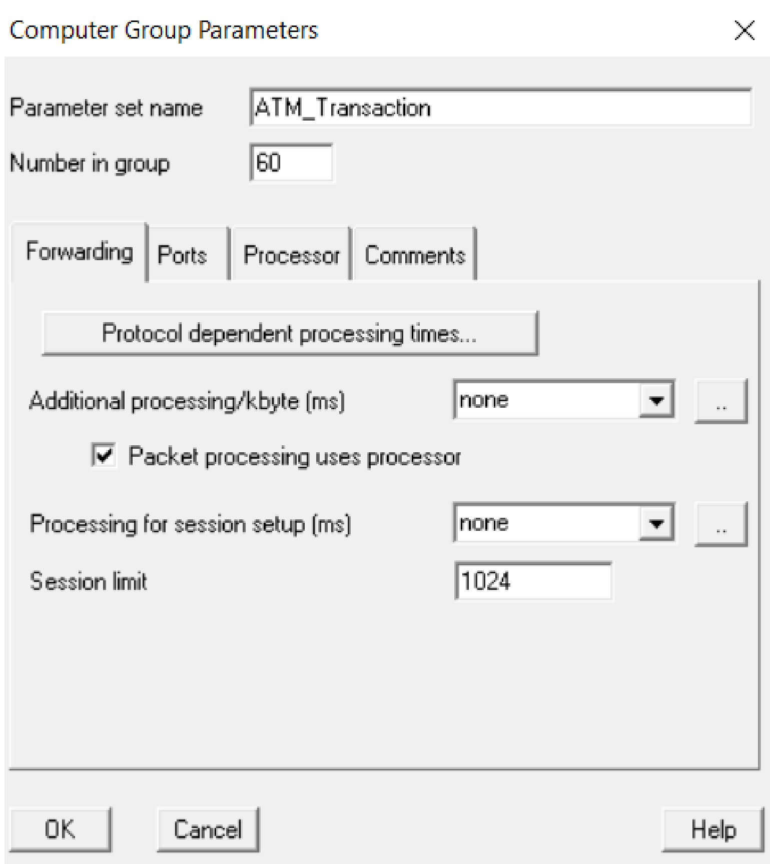


Figure 26 Parameters of Computer Group in Pokhara LAN

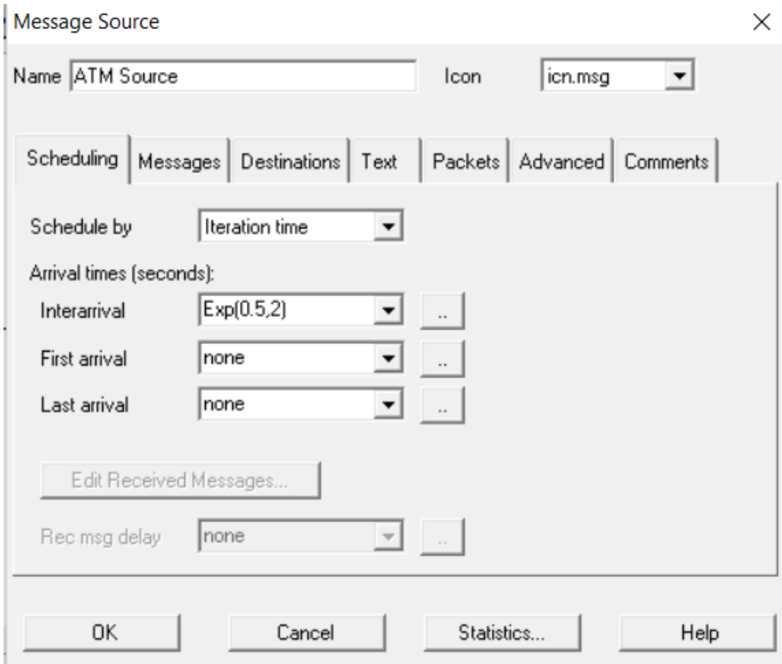


Figure 27 Parameters of Pokhara LAN ATM Source-Scheduling

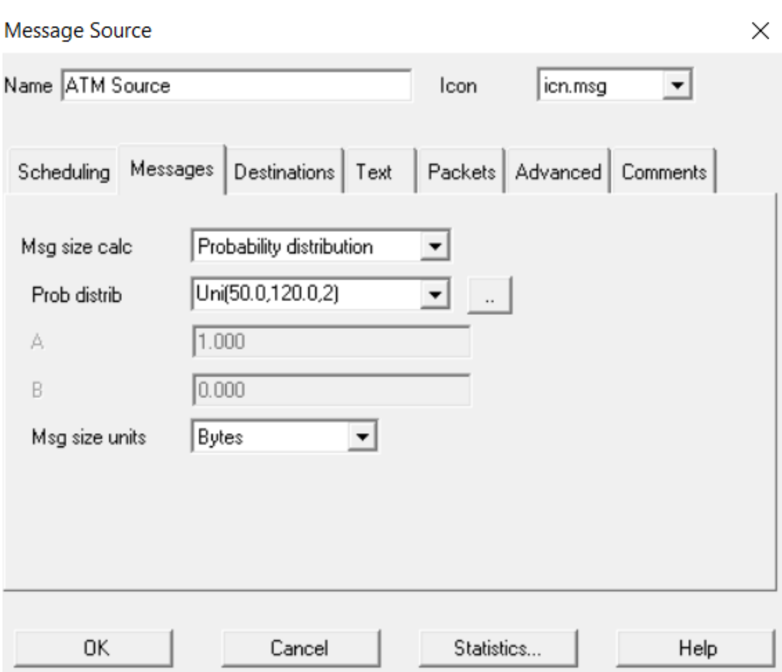


Figure 28 Parameters of Pokhara LAN ATM Source-Messages

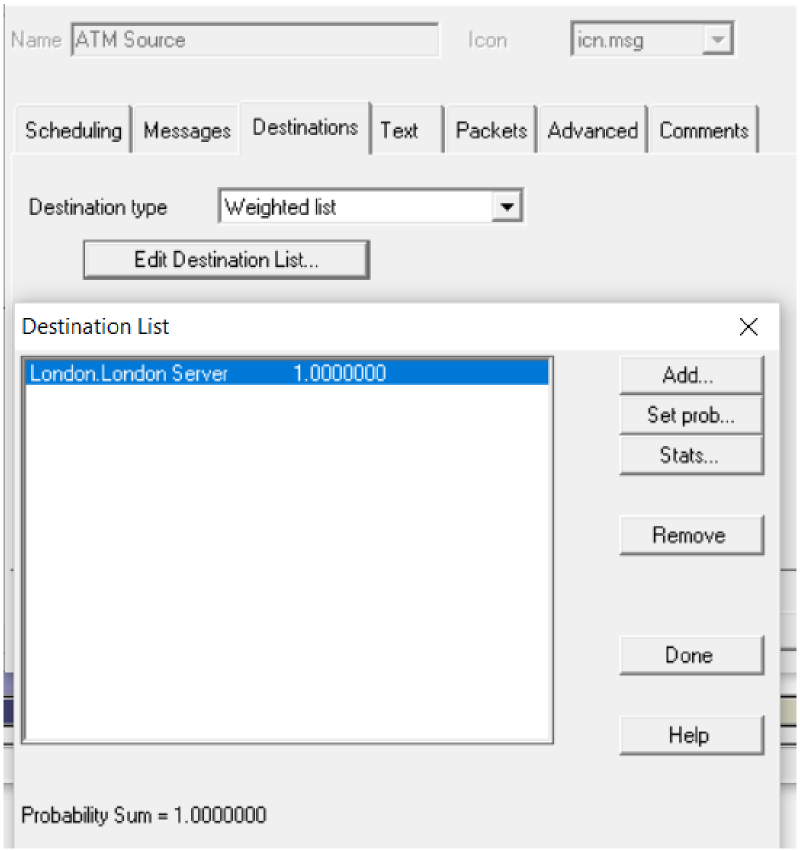


Figure 29 Parameters of Pokhara LAN ATM Source-Destinations

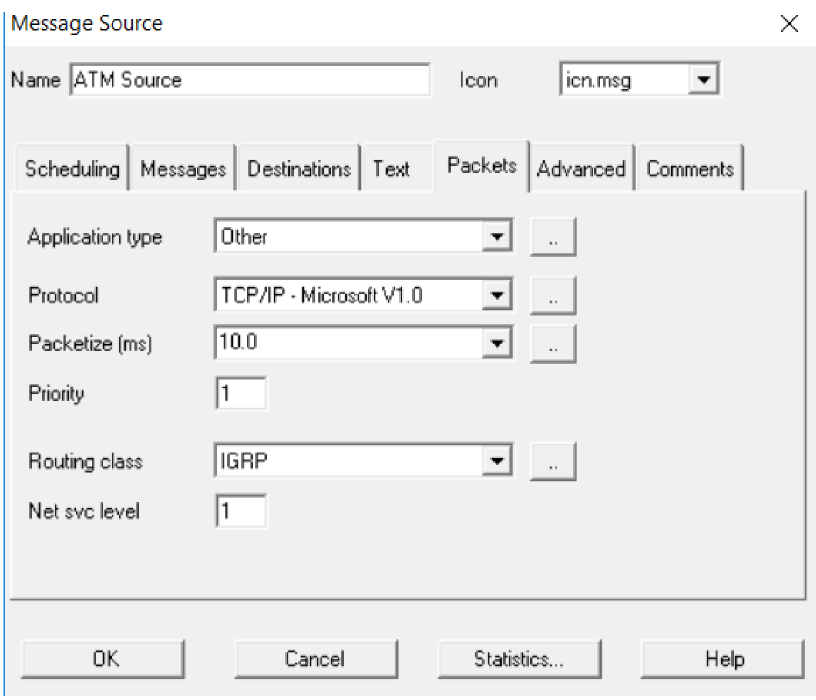


Figure 30 Parameters of Pokhara LAN ATM Source-Packets

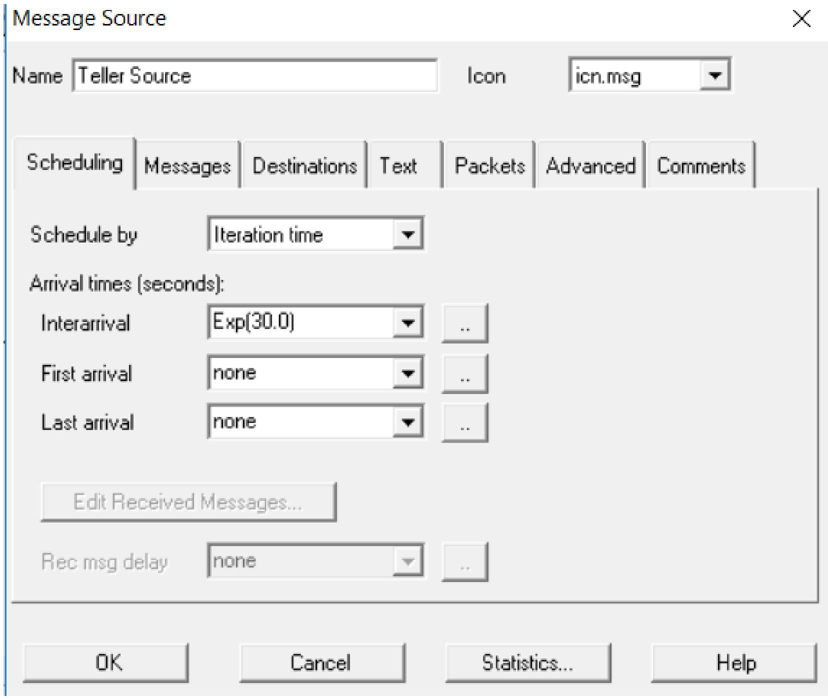


Figure 31 Parameters of Pokhara LAN Teller Source-Scheduling

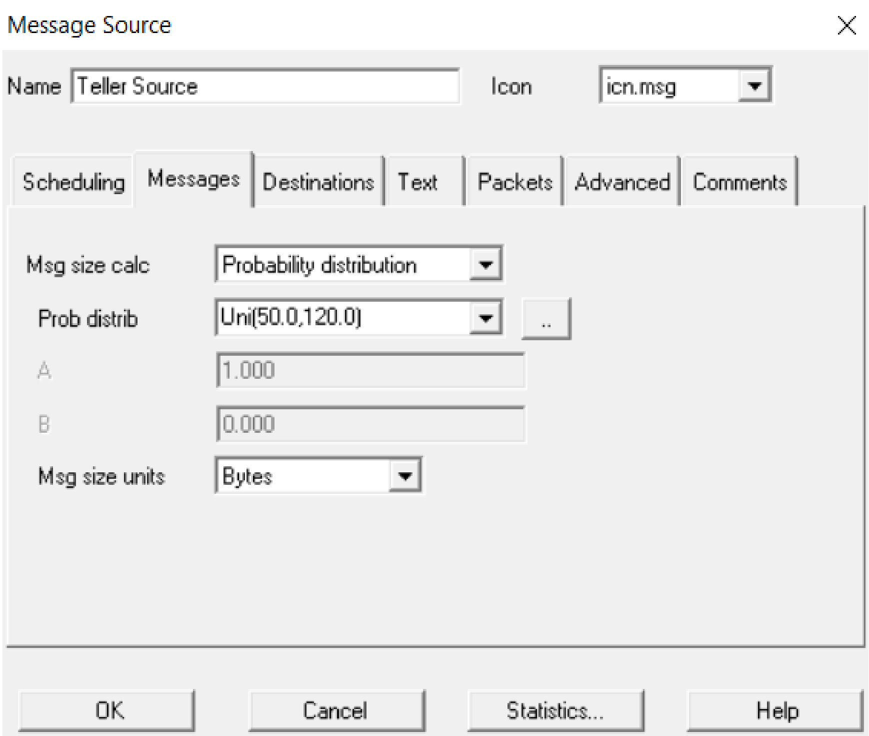


Figure 32 Parameters of Pokhara LAN Teller Source-Messages

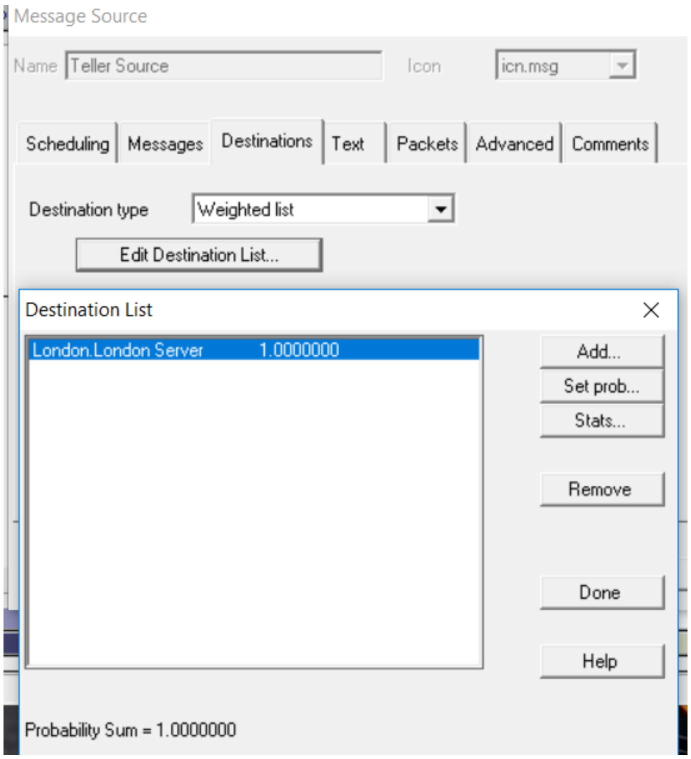


Figure 33 Parameters of Pokhara LAN Teller Source-Destinations

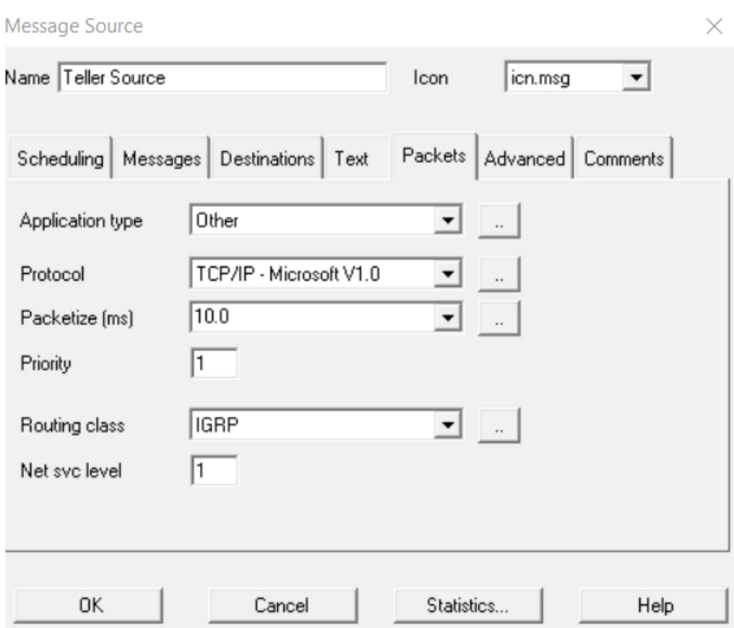


Figure 34 Parameters of Pokhara LAN Teller Source-Packets

2.4 WAN Cloud

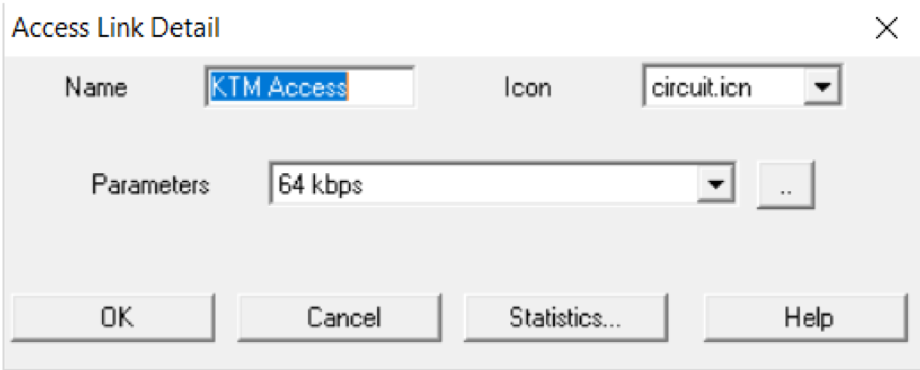


Figure 35 Parameters of WAN Cloud KTM Access

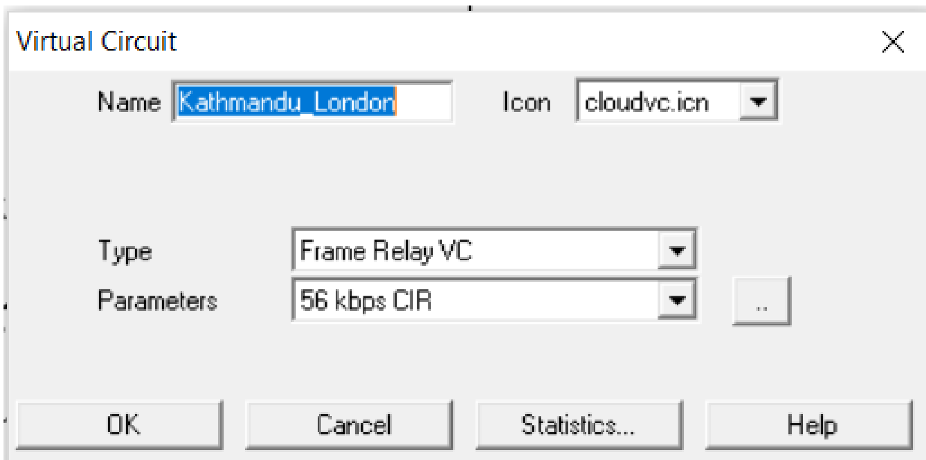


Figure 36 Parameters of WAN Cloud-Kathmandu_London VC

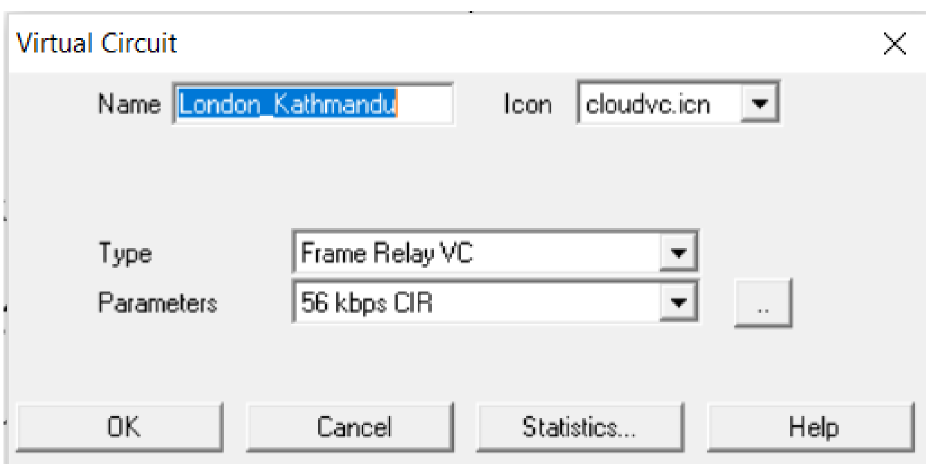


Figure 37 Parameters of WAN Cloud-London_Kathmandu VC

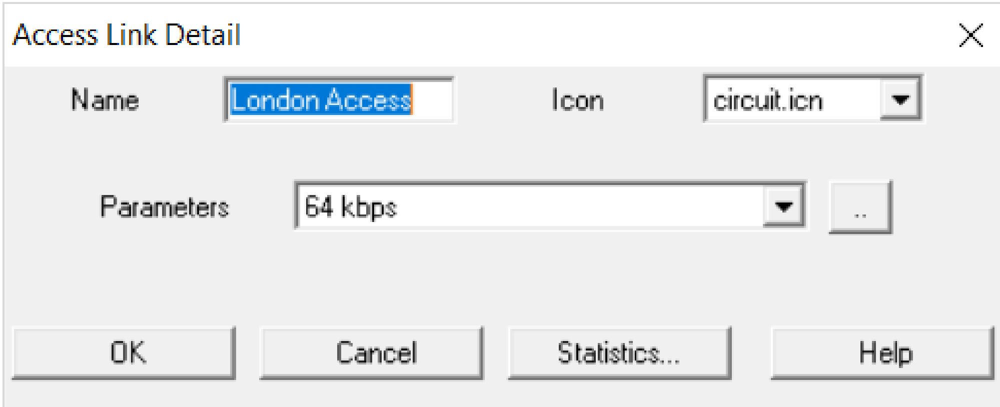


Figure 38 Parameters of WAN Cloud-London Access

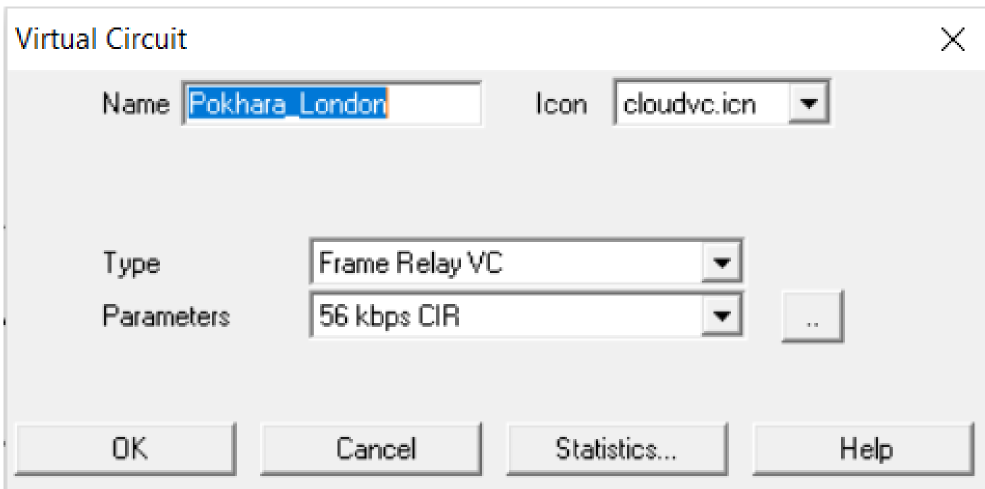


Figure 39 Parameters of WAN Cloud-Pokhara_London VC

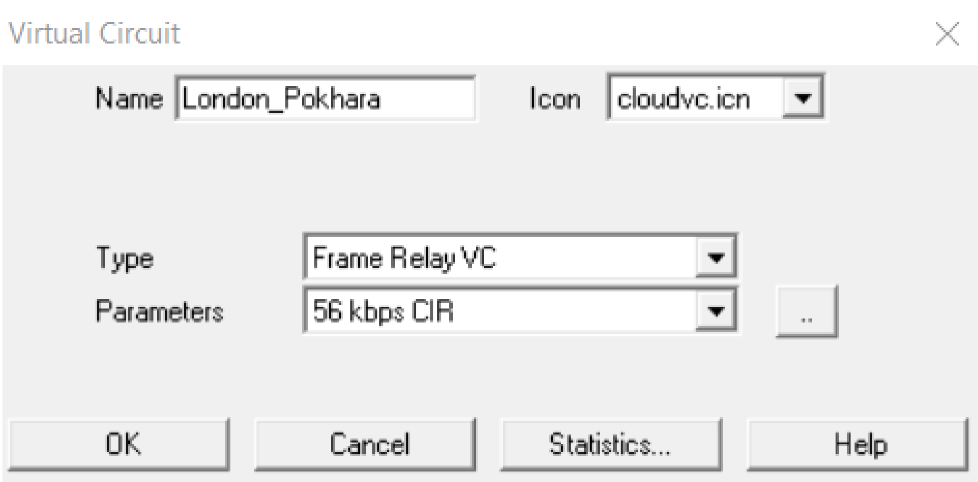


Figure 40 Parameters of WAN Cloud-London_Pokhara VC

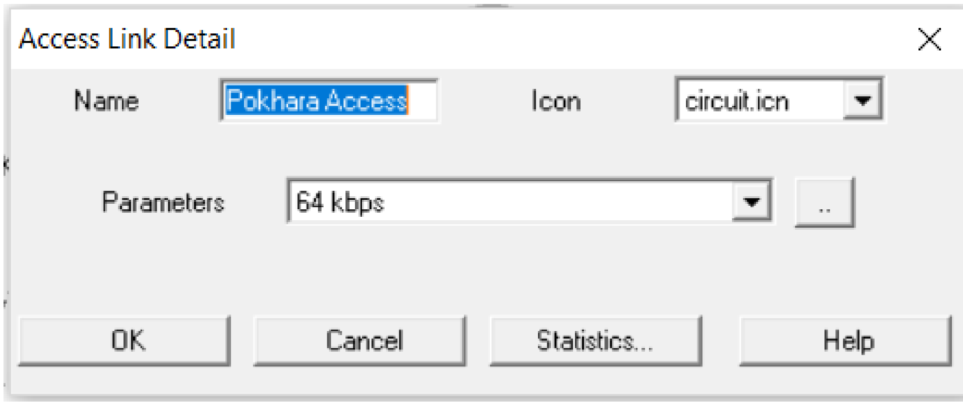


Figure 41 Parameters of WAN Cloud-Pokhara Access

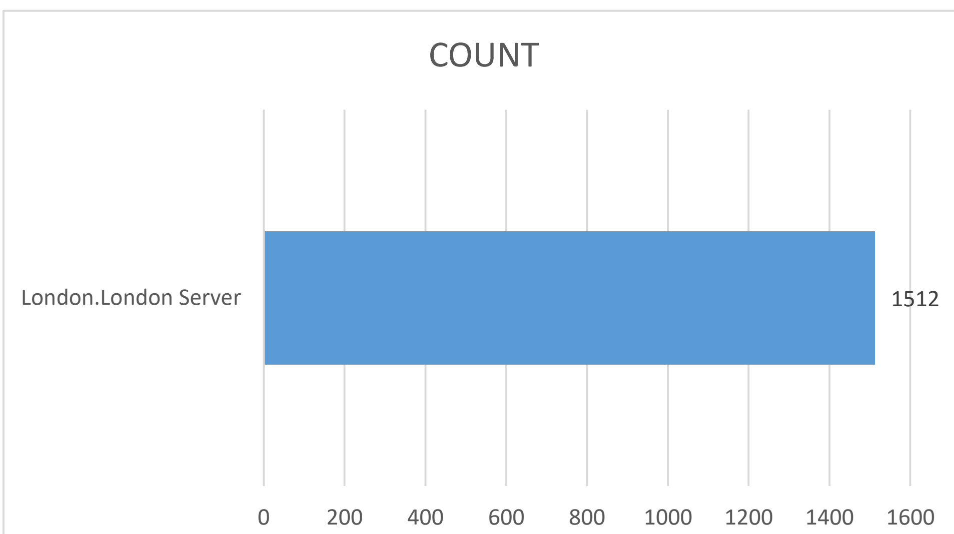
3. Discussion of the following reports:

a. Node reports: Received message counts for all nodes

After the simulation is completed, the reports were browsed and the received message counts table was obtained.

RECEIVER	COUNT	MESSAGE NAME	

RECEIVER	COUNT	MESSAGE NAME
London.London Server	1512	ATM SOURCE

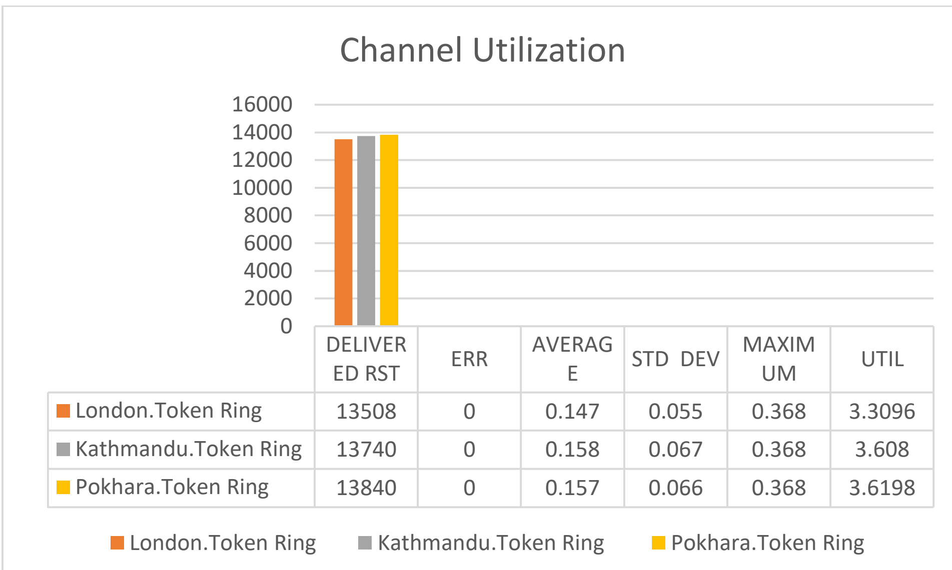


As shown in the above table the message count for the London server is 1512.

b. Link reports: channel utilization of all links

Transmission delay is the amount of time required to transfer all bits in a packet on to the transmission medium (Transmission Delays).

	FRAMES		TRANSMISSION DELAY (MS)			%
LINK	DELIVERED RST	ERR	AVERAGE	STD DEV	MAXIMUM	UTIL
London.Token Ring	13508	0	0.147	0.055	0.368	3.3096
Kathmandu.Token Ring	13740	0	0.158	0.067	0.368	3.608
Pokhara.Token Ring	13840	0	0.157	0.066	0.368	3.6198

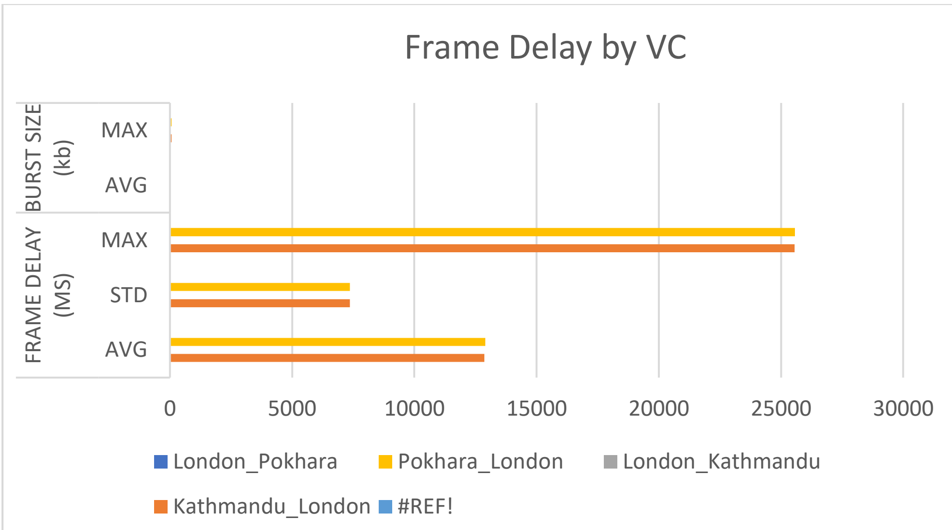


As indicated by the above table, 13508 frames have been delivered in the London Token Ring, 13740 in the Kathmandu Token Ring and 13840 in the Pokhara Token Ring. Err in all rings is 0. The average transmission delay in London Token Ring is 0.147, standard being 0.055 and maximum being 0.368. In the Kathmandu Token Ring, average transmission delay is 0.158, standard is 0.067 and the maximum delay is 0.368. In the Pokhara Token Ring, the average is 0.157, standard is 0.066 and the maximum is 0.368. UTIL percentage is 3.3096, 3.608 and 3.6198 for London, Kathmandu and Pokhara Token Rings respectively.

c. WAN cloud reports: Frame Delay by VC, Frame count by VC, and access link stats.

After the frame delay by VC was turned on, the following table was obtained:

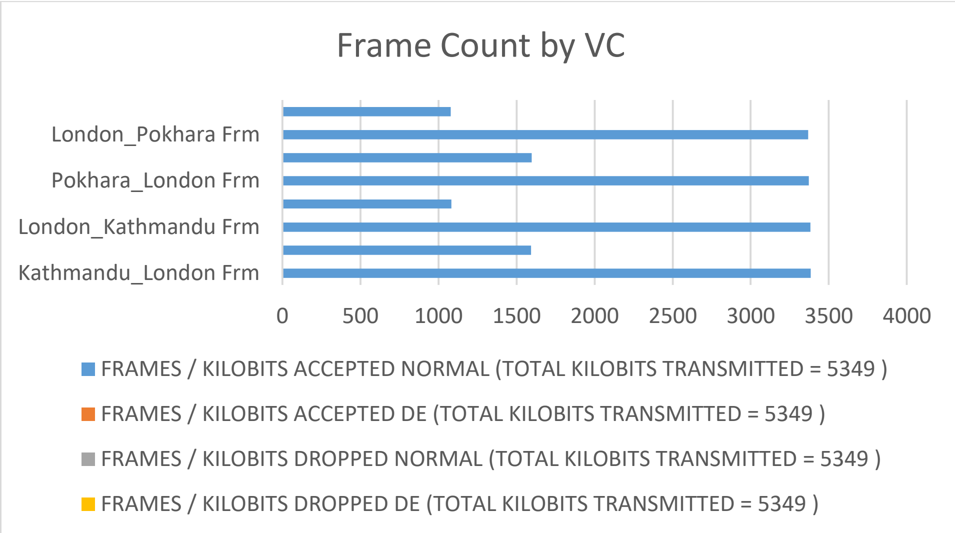
CLOUD	FRAME DELAY (MS)			BURST SIZE (kb)	
VC	AVG	STD	MAX	AVG	MAX
Kathmandu_London	12867	7360	25550	32	65
London_Kathmandu	23	0	23	12	27
Pokhara_London	12906	7360	25575	32	65
London_Pokhara	23	0	23	12	27



The average frame delay, in MS, 12867, 23, 12906 and 23 for Kathmandu_London, London_Kathmandu, Pokhara_London and London_Pokhara VCs respectively. The standard frame delay, in MS, 7360, 0, 7360 and 0 for Kathmandu_London, London_Kathmandu, Pokhara_London and London_Pokhara VCs respectively. The maximum frame delay, in MS, 25550, 23, 25575 and 23 for Kathmandu_London, London_Kathmandu, Pokhara_London and London_Pokhara VCs respectively. The average burst size (in kb) is 32, 12, 32 and 12 for Kathmandu_London, London_Kathmandu, Pokhara_London and London_Pokhara VCs respectively. The maximum burst size (in kb) is 65, 27, 65 and 27 for Kathmandu_London, London_Kathmandu, Pokhara_London and London_Pokhara VCs respectively.

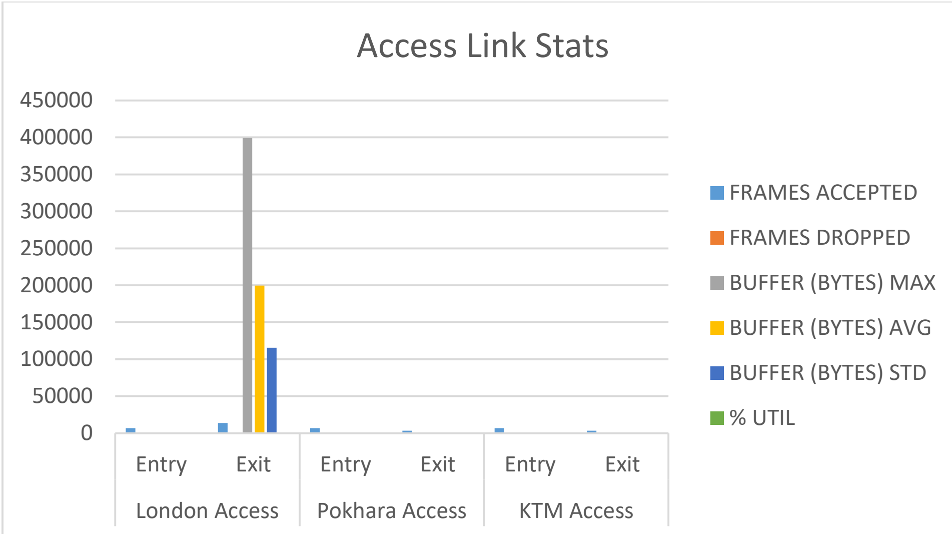
After the Frame count by VC was turned on, the following table was obtained;

CLOUDS	FRAMES / KILOBITS			
VC: FRAMES	ACCEPTED		DROPPED	
KILOBITS	NORMAL	DE	NORMAL	DE
WAN CLOUD	(TOTAL KILOBITS TRANSMITTED = 5349)			
Kathmandu_London Frm	3384	0	0	0
kb	1592	0	0	0
London_Kathmandu Frm	3382	0	0	0
kb	1082	0	0	0
Pokhara_London Frm	3373	0	0	0
kb	1597	0	0	0
London_Pokhara Frm	3368	0	0	0
kb	1078	0	0	0



After the Access link stats were turned on, the following table was obtained:

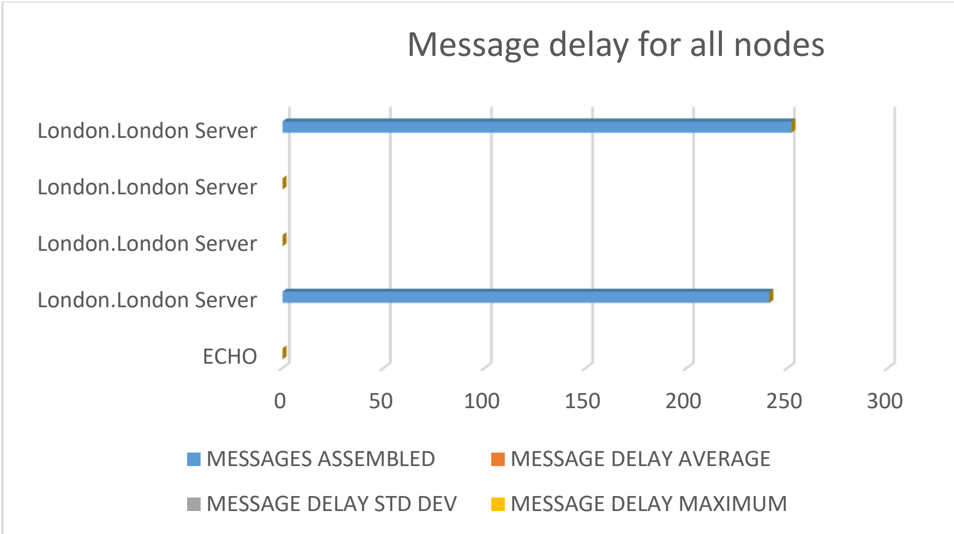
CLOUD		FRAMES		BUFFER (BYTES)			% UTIL
ACCESS LINK		ACCEPTED	DROPPED	MAX	AVG	STD	
WAN CLOUD							
London Access	Entry	6750	0	N/A	N/A	N/A	73.13
	Exit	13464	0	399474	199562	115292	99.97
Pokhara Access	Entry	6753	0	N/A	N/A	N/A	100
	Exit	3368	0	80	15	19	36.49
KTM Access	Entry	6713	0	N/A	N/A	N/A	100
	Exit	3382	0	80	15	19	36.64



d. Message and Report response: Message delay for all nodes.

After the message and report response was turned on, the following table was obtained:

ORIGIN / MESSAGE SRC NAME:	MESSAGES	MESSAGE DELAY		
DESTINATION LIST	ASSEMBLED	AVERAGE	STD DEV	MAXIMUM
London.London Server / src Response Source:				
ECHO	0	0.000MS	0.000MS	0.000MS
Kathmandu.KTM ATM / src ATM Source				
London.London Server	241	30801.123 MS	15810.755 MS	57038.915 MS
Kathmandu.Teller / src Teller Source:				
London.London Server	0	0.000MS	0.000MS	0.000MS
Pokhara.Teller / src Teller Source				
London.London Server	0	0.000MS	0.000MS	0.000MS
Pokhara.ATM PKR / src ATM Source:				
London.London Server	252	29292.070 MS	16301.803 MS	57005.031 MS



4. Conclusion

While creating this report, I learnt a lot about COMNET III, which is a very handy tool for creating model networks. It can be used to stimulate both LANs and WANs. Through simulation, we can determine the real-time performance of the network. We can also learn about the various network devices that might be useful to boost the performance of the actual network before its creation. It can also be used for analyzing the problems of the network.

The use of COMNET III in this report, the time invested while understanding and implementing the scenario in this project was very fruitful to me as a Networking student.

TASK B

1. Introduction

In this report, the study of the data operations in the Network layer, Data Link layer and the Physical layer of the OSI Reference Model, which was the first ever networking reference model having a universal acceptability and not being a seller specific model (a popular trend in the past), along with a brief discussion about the OSI Reference Model have been provided. The TCP/IP Model and its structure have also been studied briefly. The layers of the TCP/IP Model; Application layer, Transport layer, Internet layer and Network Access Layer, along with their functions have also been studied briefly. Lastly, the relationship between the OSI Reference Model and the TCP/IP model has also been explored. The relationship has been studied in form of the similarities and dissimilarities between the OSI Reference Model and the TCP/IP Model.

The relationship between the OSI Reference Model and the TCP/IP Model has been studied in depth along with the working mechanism and flow of data in the Network, Data Link and Physical layers of the OSI Model. To create this report a mixture of sources including: books, journals, research outputs of organizations, reliable web resources, etc. had been studied and referenced. Our module leader, lecturer and tutor also helped and guided me while I was preparing this report.

2. The OSI Reference Model

The Open Systems Interconnection (OSI) model was introduced by the International Standards Organization (ISO) in 1974 in order to standardize network layout and to inspire dealers to develop network equipment such that it would avoid monotonous single platform designs (Wetteroth). It consists of 7 layers: physical, data link, network, transport, session, presentation and application layer. This model is used to define a networking framework for the implementation of protocols in seven layers. It is a reference to define how messages are to be transmitted in a network. This also makes troubleshooting errors in the network easier. The OSI Model is also compatible with most hardware and software, so must users can use it (Gaurav Bora, 2014).

3. Layers of the OSI Reference Model

The layers of the OSI Model are in two groups. The upper four layers are used when the message is being transmitted between two users while the lower three layers are used when the message is passing through the host computer. So, the network, data link and physical layer all operate within the host computer.

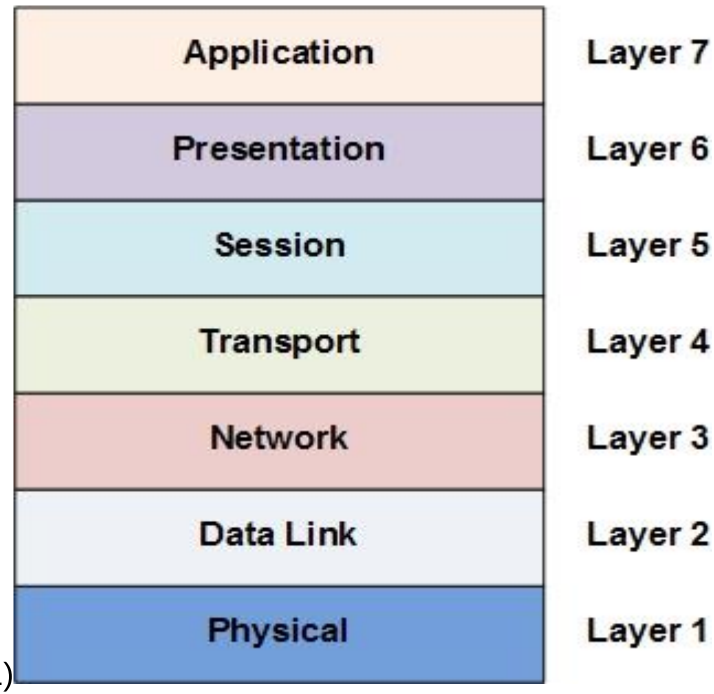
(Wilkins, 2011) 

Figure 42 Layers of the OSI Model

3.1 Physical Layer

The physical layer of the OSI model is concerned with the setup of a physical connection between network devices and to the network itself. But it is not dealing with the literal physical medium but is instead concerned with the physical devices of the network. It is only a part of the LAN model. Bits of 0s and 1s transfer from one device to another in this network. The bits are transferred in a controlled manner so that the end user can assemble the bits to obtain a meaningful message. This layer handles the flow of data by using flow control and start-stop signaling. Hubs, repeaters, adapters, cables, Network Interface Card (NIC), etc. are some of the devices used in this layer. Some standards developed for this layer are IEEE, ANSI, EIA/TIA, etc. (Simoneau, 2006).

3.2 Data Link Layer

The data link layer of the OSI Model allows a device access to the network in order to communicate. Data transfers from one device to another in form of frames. This layer works by addressing the physical address of nodes to the required message and sending it through the network. This layer allows a device's data to be sent on the network by providing a physical address. It is also capable of detecting errors and ensuring successful transfer of information. Data flow is controlled using flow control which limits the amount of messages that can be sent at a given time. Network interface cards, switches, bridges are some of the devices used in this layer. Using the MAC address, a switch filters and forwards the messages and also minimize collisions in a network (Simoneau, 2006).

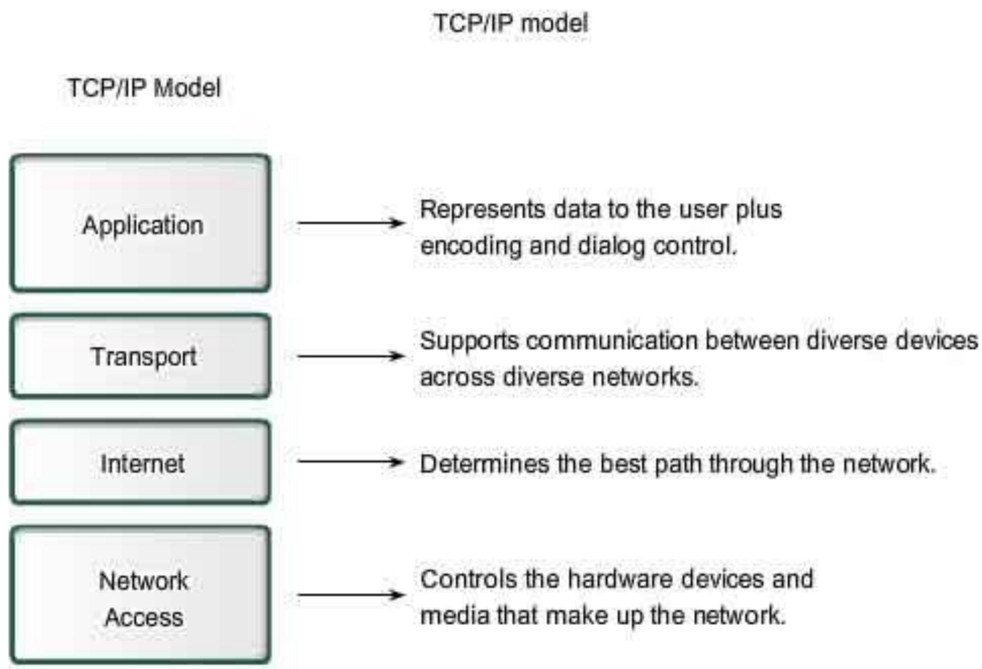
3.3 Network Layer

The network layer of the OSI Model allows messages to be transferred from one layer 2 network to another. It is the network which provides paths of routing for network communication. Data transfers in the form of packets. Data is sent across nodes through the best logical path. Data forwarding and routing are the main functions of this layer. It is also required to carry out error handling, IP addressing, internetworking, packet sequencing and congestion control. This layer makes use of routers. Routers communicate with each other using various routing protocols such as Routing Information Protocol (RIP) and Open Version of Shortest Path First (OSPF), to determine the best route for packets. While a packet is being transmitted through different networks, there might be a need to adjust their size based on the layer 2 protocol being used. The network layer does this by breaking the packet into smaller pieces known as fragments. This process is known as fragmentation. The fragmented pieces are pieced together later in the network layer of the receiver (Simoneau, 2006).

4. TCP/IP

TCP/IP (Transmission Control Protocol/Internet Protocol) model is a data communications model, composed of four layers, namely: network access, internet, transport and application. It is a two layered model, the higher layer, the TCP, manages the messages and fragments it into smaller packets for transmission over a network and the TCP of the receiver again reassembles the packets to obtain a meaningful message. The lower layer, IP, deals with packets to make sure that each packet reaches the accurate destination according to the address. It uses a client/server model for communication (Hunt, 1997).

5. Layers of the TCP/IP Model and its Structure



(Communication over the Network , n.d.)

Figure 43 Structure of TCP/IP Model with a brief description of each layer

5.1 Application Layer

The Application layer has the task of the task of creating data for the user and to transmit data to other applications in the same or another host. It uses protocols such as: HTTP, FTP, SMTP, etc. Processes in this layer are carried out via ports. (Pranab Bandhu Nath, 2015).

5.2 Transport Layer

The Transport layer is responsible for maintaining host to host communication between same or multiple hosts on either the same network or networks separated by routers. Some of the protocols used in this layer are the connection oriented TCP and connection-less UDP. While the UDP provides an unreliable data allow service, the TCP provides reliable, flow of data. (Pranab Bandhu Nath, 2015).

5.3 Internet Layer

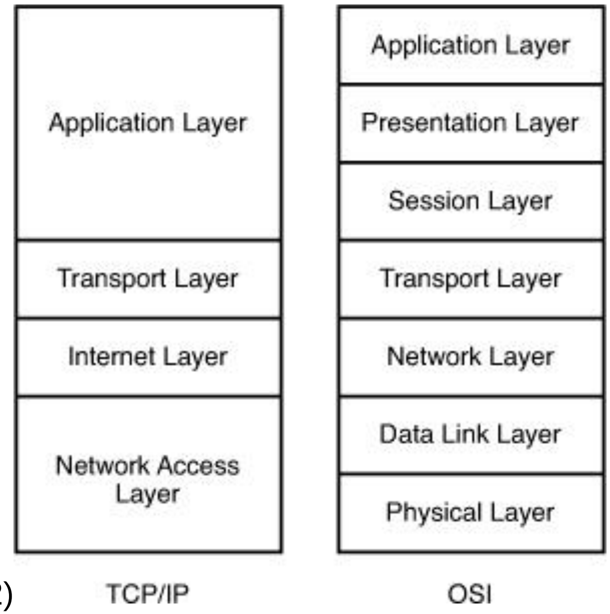
The Internet layer is responsible for transferring data and messages between networks. It is the layer that establishes internetworking. IP and Internet Control Message Protocol (ICMP) are the primary protocols used in this layer. Using the IP, it transports messages through routers, simultaneously determining the optimal path through the network. While the ICMP is used to detect and report errors (Pranab Bandhu Nath, 2015).

5.4 Network Access Layer

The Network Access layer is the layer of the TCP/IP model where the data is transmitted through the physical network. This layer makes use of Ethernet, Frame Relay, Wireless (802.11A, 802.11B, 802.11G and 802.11N), etc. Encapsulation of IP information into frames transmitted through the network and charting of IP addresses to physical addresses (as it is compulsory to convert IP addresses into usable format for the physical network) are some of the tasks carried out in this layer (Thompson, 1998) .

6. Relationship between OSI Model and TCP/IP Model

By the above mentioned descriptions of the OSI Model and TCP/IP Model, it is quite clear to understand that there is a relationship between the two models.



(Casad, 2012)

Figure 44 Relationship between the layers of TCP/IP and OSI Model

6.1 Similarities between the OSI Model and TCP/IP Model

Both the TCP/IP and OSI models have been arranged in a layer wise, architectural model. Both models have sets of protocols arranged into each layer. Also, some sets of protocols used have been used in both OSI and TCP/IP models (Jubitha.I, 2018). From figure 3, we can also see how the four layers of the TCP/IP model and the OSI model are interlinked, the Application layer of the TCP/IP model is mapped to the Application, Presentation and Session layers of the OSI model, the Transport layer of the TCP/IP model is mapped directly to the Transport layer of the OSI model, the Internet layer of the TCP/IP model is mapped directly to the Network Layer of the OSI model and finally, the Network Access Layer of the TCP/IP model is mapped to the Data Link and Physical layers of the OSI model. Similarly the devices and protocols used in the layers of the TCP/IP model and their correspondents in the OSI model are also similar. DNS, DHCP, FTP, SMTP, IMAP, HTTP are some protocols used in both the Application layer of the TCP/IP model and the Application, Presentation and Session layer of the OSI model. TCP and UDP are used in the Transport layer of both TCP/IP and OSI Model. Similarly, IPv4 and IPv6 are used in the Network and Internet layer of the OSI and TCP/IP model respectively. Ethernet, Token Ring, Frame Relay, ATM, etc. are used in the Data Link and Physical layer of the OSI model and the Network Access layer of the TCP/IP model (Sravya Mundra, 2015).

6.2 Dissimilarities between the OSI Model and TCP/IP Model

Though there are many similarities between the OSI and TCP/IP model, they are vastly different in many ways. The TCP/IP model has 4 layers while the OSI model has 7 layers. The OSI model is just a reference model whereas, the TCP/IP model is an implementation of the OSI model. When compared to the OSI model, the TCP/IP model is considered to be more reliable. The OSI model follows a horizontal approach whereas, the TCP/IP model follows a vertical approach. For the development of the OSI model, the model was developed before the protocols whereas, in the TCP/IP model the protocols has been developed before the model. While the OSI model supports connectionless and connection oriented communication in the network layer, the TCP/IP model only supports connectionless communication in the network layer. The OSI model is a protocol independent standard but the TCP/IP model is a protocol dependent standard (Ravali, 2015). The OSI model defines functions of all the layers and also provides layer functioning whereas, the TCP/IP model us based on protocols and protocols cannot be flexible with other layers. The Transport layer of the OSI model makes sure of the delivery of packets while the Transport layer of the TCP/IP model does not guarantee the delivery of packets. While the OSI can be described as a general model, other applications cannot make use of the TCP/IP model (Rachit Gupta, 2014).

7. Conclusion

On the basis of the study done in this report, knowledge on how data and messages are transmitted across the physical, data link and network layers of the OSI Model, as well as, a brief discussion on the subject of the OSI Reference Model. The topic of TCP/IP Model, along with a brief study of its various layers, was explored in this report. Doing study on both the OSI Reference Model and TCP/IP Model, also indicated at the importance of these models for internetworking. Comparative study, relationship; similarities and dissimilarities, between the two mentioned models were also indicated in this report. It can also be concluded that the OSI Model is just a reference, while the TCP/IP Model is an implementation of the concepts mentioned in the OSI Model. Hence, the TCP/IP Model is more reliable when compared to the OSI Reference Model.

From this report, we can conclude that for the smooth and rapid development and growth of networking, some sort of implementation of the concepts described in the OSI Reference Model and the TCP/IP Model should be carried out.

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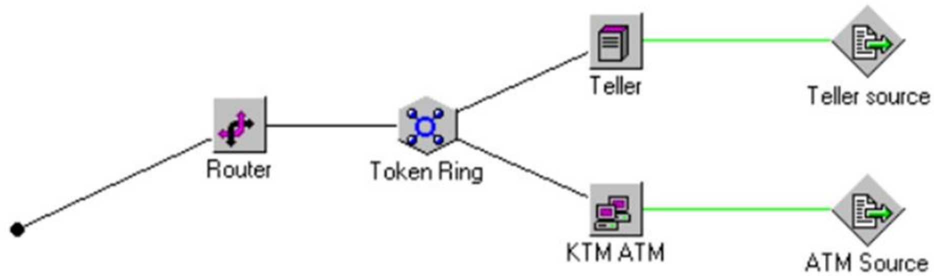
<u>Appendix</u>

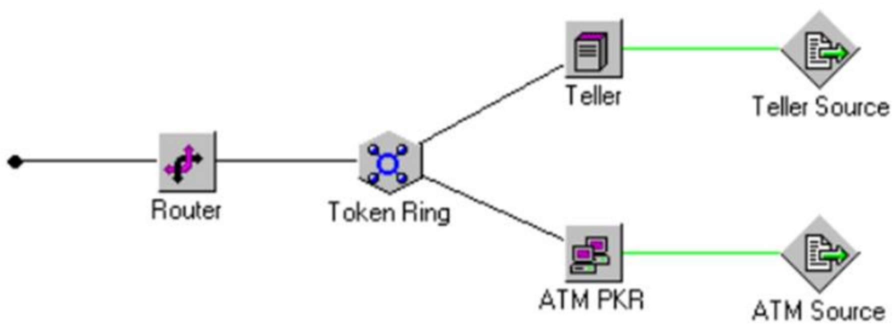
The screen copies of the developed models are:

i) Topology of London LAN

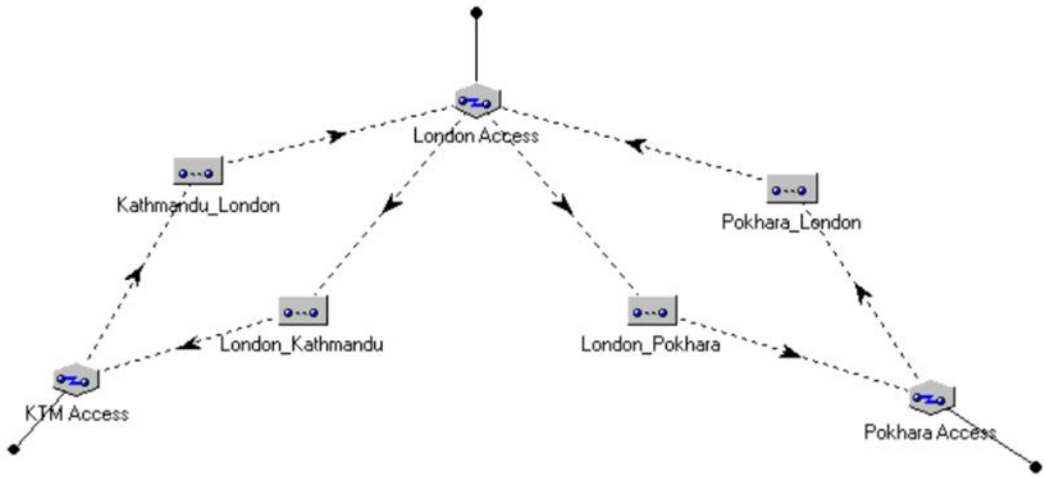
ii) Topology of Kathmandu LAN



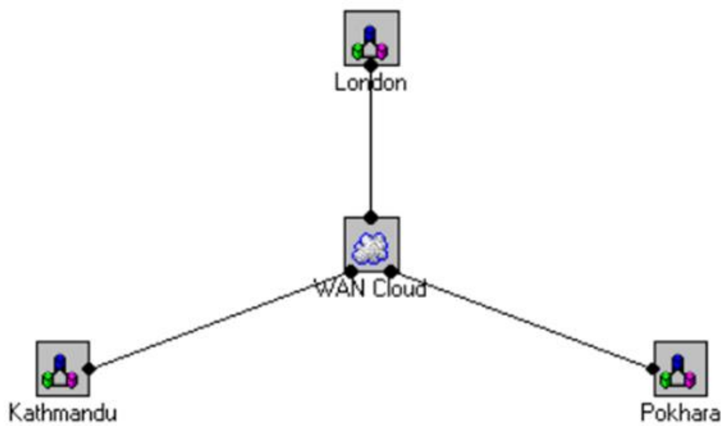
iii) Topology of Pokhara LAN



iv) WAN Model



v) WAN Topology



The screen copies of the simulation results are given below:

NODES: RECEIVED MESSAGE COUNTS

REPLICATION 1 FROM 0.0 TO 60.0 SECONDS

RECEIVER	COUNT	MESSAGE NAME
London.London Server	1512	ATM Source

LINKS: CHANNEL UTILIZATION

REPLICATION 1 FROM 0.0 TO 60.0 SECONDS

	FRAMES		TRANSMISSION DELAY (MS)			%
LINK	DELIVERED	RST/ERR	AVERAGE	STD DEV	MAXIMUM	UTIL
London.Token Ring	13508	0	0.147	0.055	0.368	3.3096
Kathmandu.Token Ring	13740	0	0.158	0.067	0.368	3.6080
Pokhara.Token Ring	13840	0	0.157	0.066	0.368	3.6198

WAN CLOUDS: FRAME DELAY BY VC

REPLICATION 1 FROM 0.0 TO 60.0 SECONDS

CLOUD:	FRAME DELAY (MS)			BURST SIZE (kb)	
VC	AVG	STD	MAX	AVG	MAX
WAN Cloud					
Kathmandu_London	12867	7360	25550	32	65
London_Kathmandu	23	0	23	12	27
Pokhara_London	12906	7360	25575	32	65
London_Pokhara	23	0	23	12	27

WAN CLOUDS: FRAME COUNTS BY VC

REPLICATION 1 FROM 0.0 TO 60.0 SECONDS

CLOUD: VC: FRAMES / KILOBITS		FRAMES / KILOBITS ACCEPTED NORMAL	ACCEPTED DE	DROPPED NORMAL	DROPPED DE
WAN Cloud		(TOTAL KILOBITS TRANSMITTED =		5349)	
Kathmandu_London	Frm	3384	0	0	0
	kb	1592	0	0	0
London_Kathmandu	Frm	3382	0	0	0
	kb	1082	0	0	0
Pokhara_London	Frm	3373	0	0	0
	kb	1597	0	0	0
London_Pokhara	Frm	3368	0	0	0
	kb	1078	0	0	0

WAN CLOUDS: ACCESS LINK STATS

REPLICATION 1 FROM 0.0 TO 60.0 SECONDS

CLOUD: ACCESS LINK	(ENTRY) (EXIT)	FRAMES ACCEPTED	FRAMES DROPPED	BUFFER (BYTES) MAX	BUFFER (BYTES) AVG	BUFFER (BYTES) STD	% UTIL
WAN Cloud							
London Access	Entry	6750	0	N/A	N/A	N/A	73.13
	Exit	13464	0	399474	199562	115292	99.97
Pokhara Access	Entry	6753	0	N/A	N/A	N/A	100.00
	Exit	3368	0	80	15	19	36.49
KTM Access	Entry	6713	0	N/A	N/A	N/A	100.00
	Exit	3382	0	80	15	19	36.64

MESSAGE + RESPONSE SOURCES: MESSAGE DELAY

REPLICATION 1 FROM 0.0 TO 60.0 SECONDS

ORIGIN / MSG SRC NAME: DESTINATION LIST	MESSAGES ASSEMBLED	MESSAGE DELAY AVERAGE	STD DEV	MAXIMUM
London.London Server / src Response Source:				
ECHO	0	0.000 MS	0.000 MS	0.000 MS
Kathmandu.KTM ATM / src ATM Source:				
London.London Server	241	30801.123 MS	15810.755 MS	57038.915 MS
Kathmandu.Teller / src Teller source:				
London.London Server	0	0.000 MS	0.000 MS	0.000 MS
Pokhara.Teller / src Teller Source:				
London.London Server	0	0.000 MS	0.000 MS	0.000 MS
Pokhara.ATM PKR / src ATM Source:				
London.London Server	252	29292.070 MS	16301.803 MS	57005.031 MS

MESSAGE + RESPONSE SOURCES: MESSAGE DELIVERED

REPLICATION 1 FROM 0.0 TO 60.0 SECONDS

ORIGIN / MSG SRC NAME: DESTINATION LIST	MESSAGES ASSEMBLED	MESSAGE DELAY AVERAGE	STD DEV	MAXIMUM
London.London Server / src Response Source:				
ECHO	0	0.000 MS	0.000 MS	0.000 MS
Kathmandu.KTM ATM / src ATM Source:				
London.London Server	750	26085.906 MS	14906.291 MS	51928.960 MS
Kathmandu.Teller / src Teller source:				
London.London Server	0	0.000 MS	0.000 MS	0.000 MS
Pokhara.Teller / src Teller Source:				
London.London Server	0	0.000 MS	0.000 MS	0.000 MS
Pokhara.ATM PKR / src ATM Source:				
London.London Server	762	25689.975 MS	14702.056 MS	51377.938 MS