UNIVERSITY OF PIRAEUS - DEPARTMENT OF COMPUTER SCIENCE
MSc "Informatics"

Coursework
"Computer Networks"

1º Laboratory: *Static Routing*	
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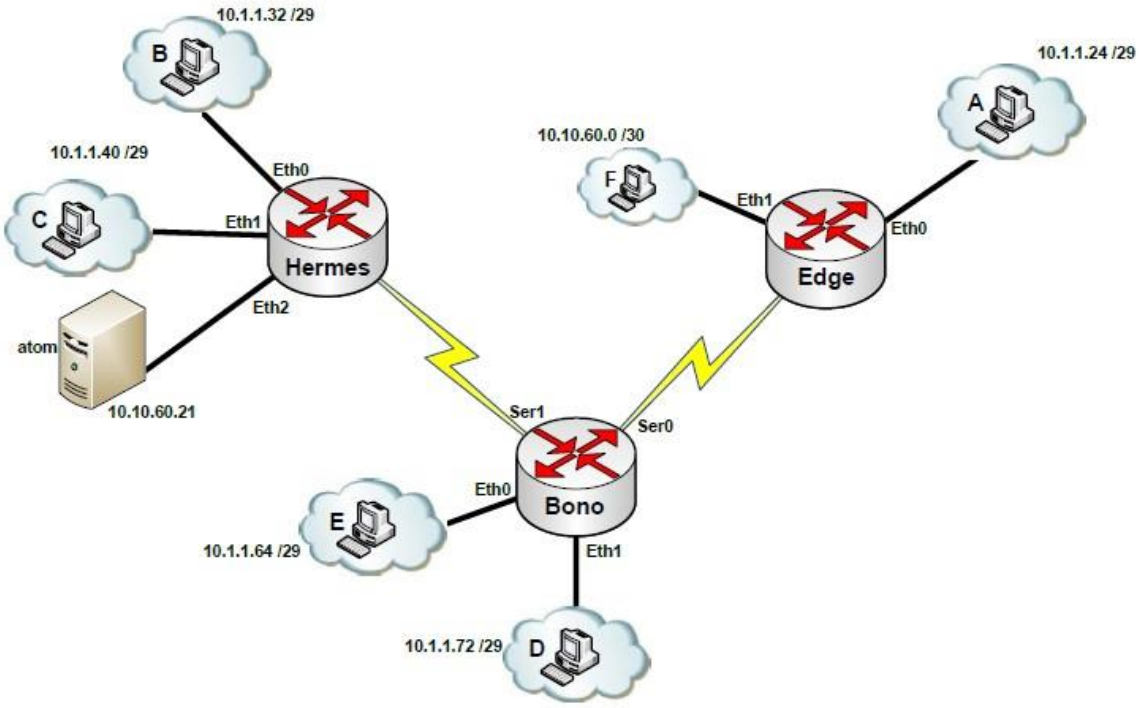
Work	**Assign4E**
Delivery date	21/1/2023

Requests

Δίνεται η παρακάτω τοπολογία:

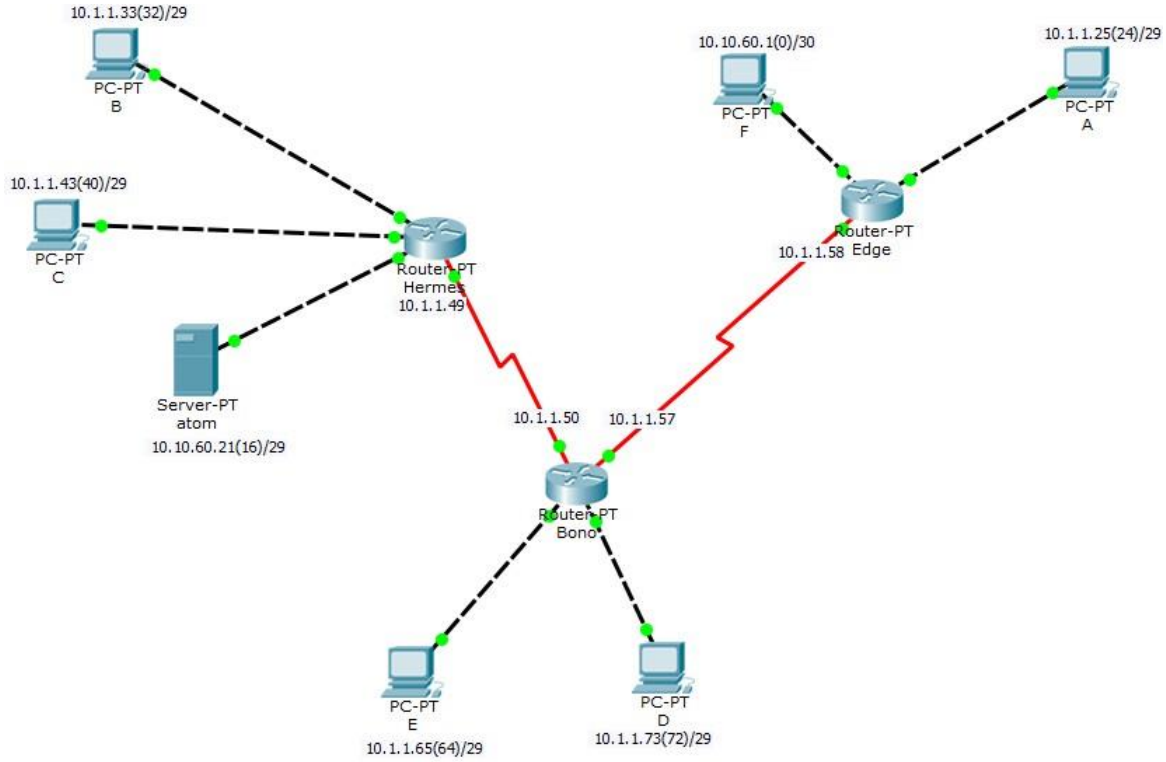


Ζητούμενα:

1) Υλοποιήστε την τοπολογία με το λογισμικό που σας δόθηκε. Σε περιπτώσεις όπου δεν δίνονται IP διευθύνσεις θα πρέπει να υπολογισθούν από εσάς και να αποδοθούν στα αντίστοιχα interface των δρομολογητών. Σημειώστε ότι οι δοθείσες IP διευθύνσεις ανταποκρίνονται στις IP των δικτύων της τοπολογίας –εξαιρείται η IP διεύθυνση του διακομιστή *atom*.
2) Για να ελέγξετε τη διασυνδεσιμότητα μεταξύ των σταθμών της τοπολογίας χρησιμοποιείστε το εργαλείο *ping* από τη γραμμή εντολών (command line interface – CLI).
3) Να υπολογισθεί το μέγεθος των δικτύων της τοπολογίας (ως το προς διαθέσιμο πλήθος IP διευθύνσεων).
4) Ο διακομιστής *atom* εξυπηρετεί την υπηρεσία HTTP. Τοποθετήστε του τον κατάλληλο κώδικα (index.html) έτσι ώστε να εμφανίζει μια απλή ιστοσελίδα με τον τίτλο του μεταπτυχιακού, του πανεπιστημίου, τον ΑΜ και τον τίτλο του 1ου πτυχίου σας.

Question 1ο

Screenshot of the topology.

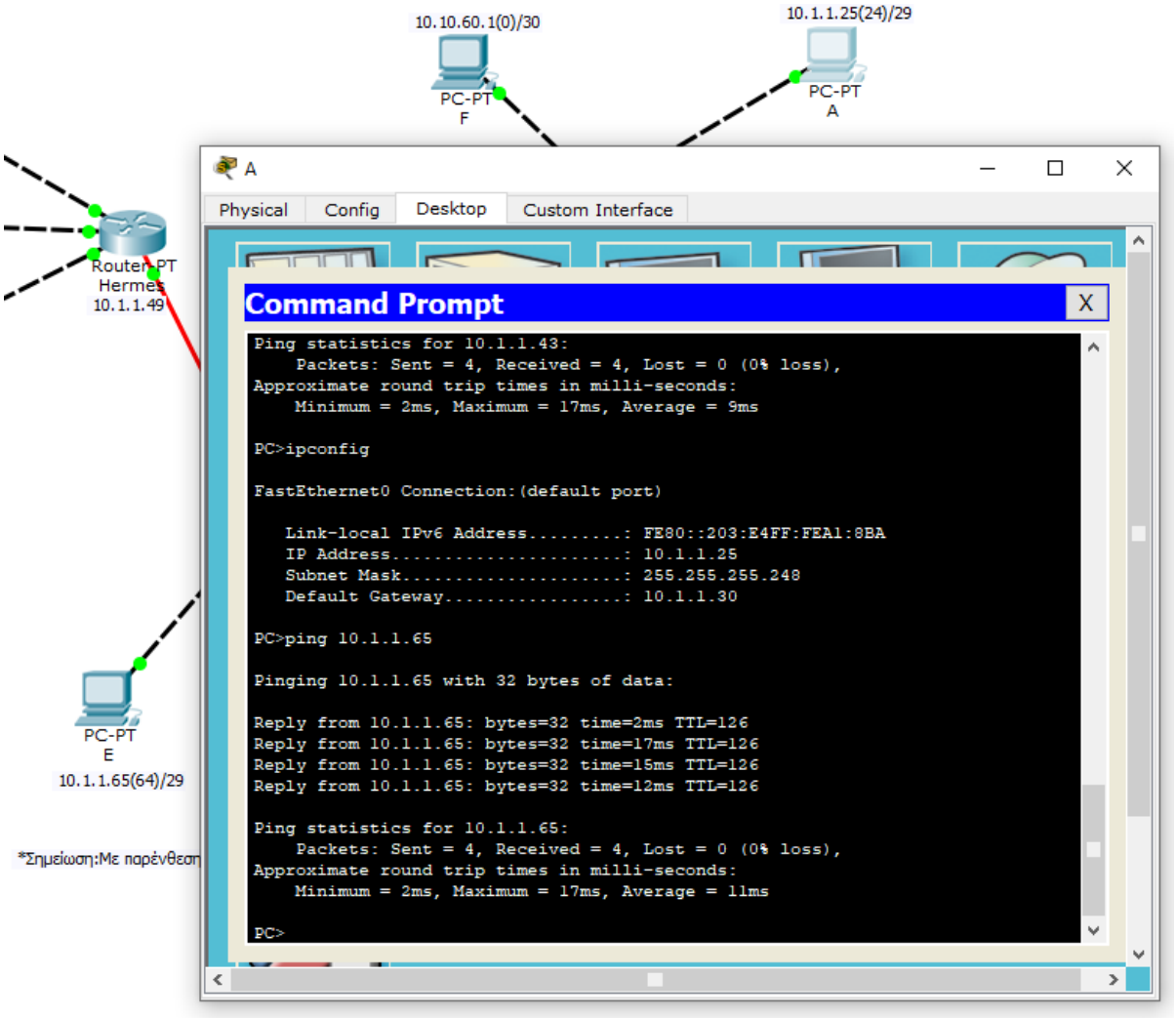


*Σημείωση:Με παρένθεση παριστάνονται οι IP των υποδικτύων.

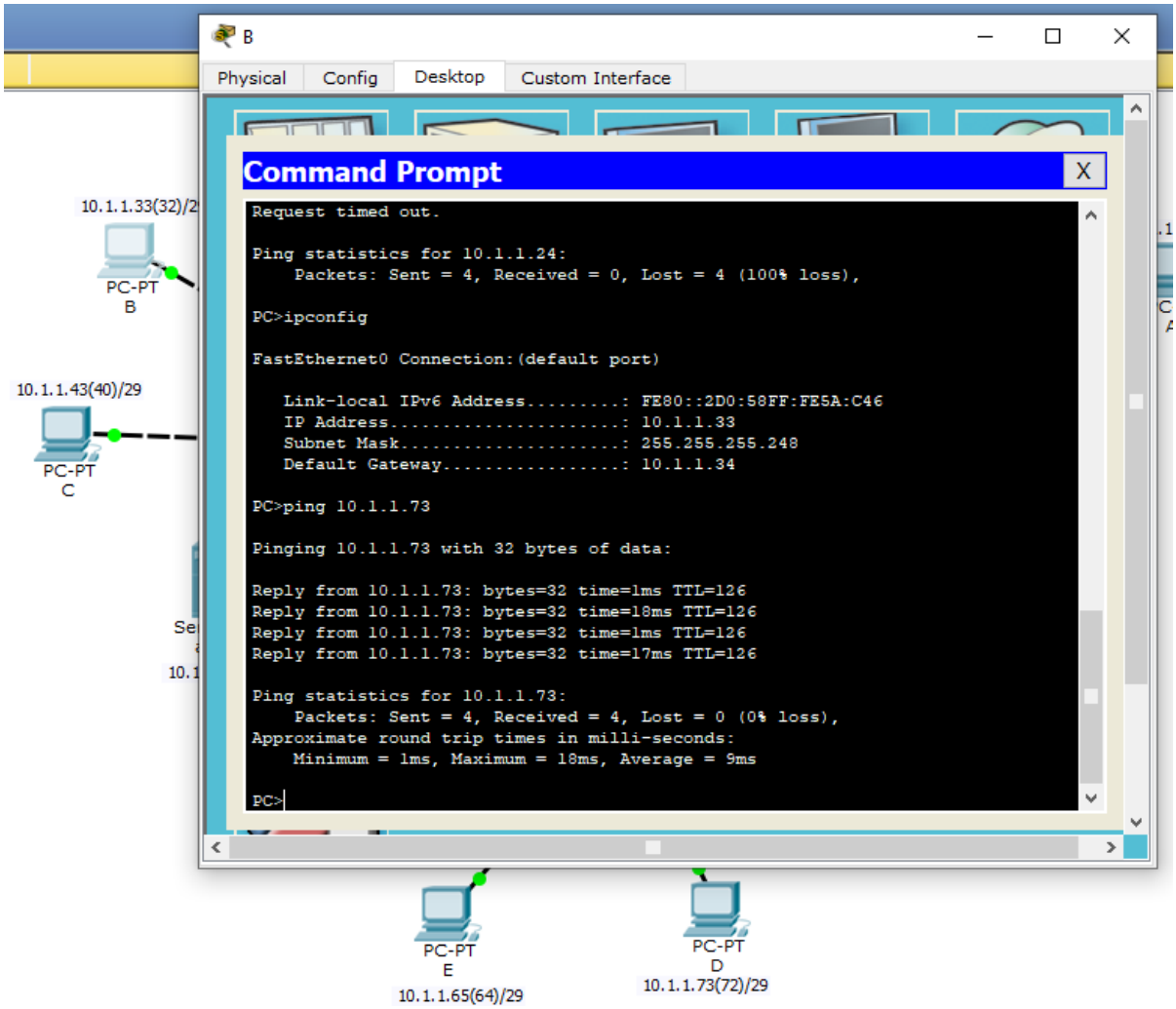
Question 2ο

To check the interconnectivity between the stations in the topology use the ping tool from the command line interface (CLI) and show three cases with Screenshot.

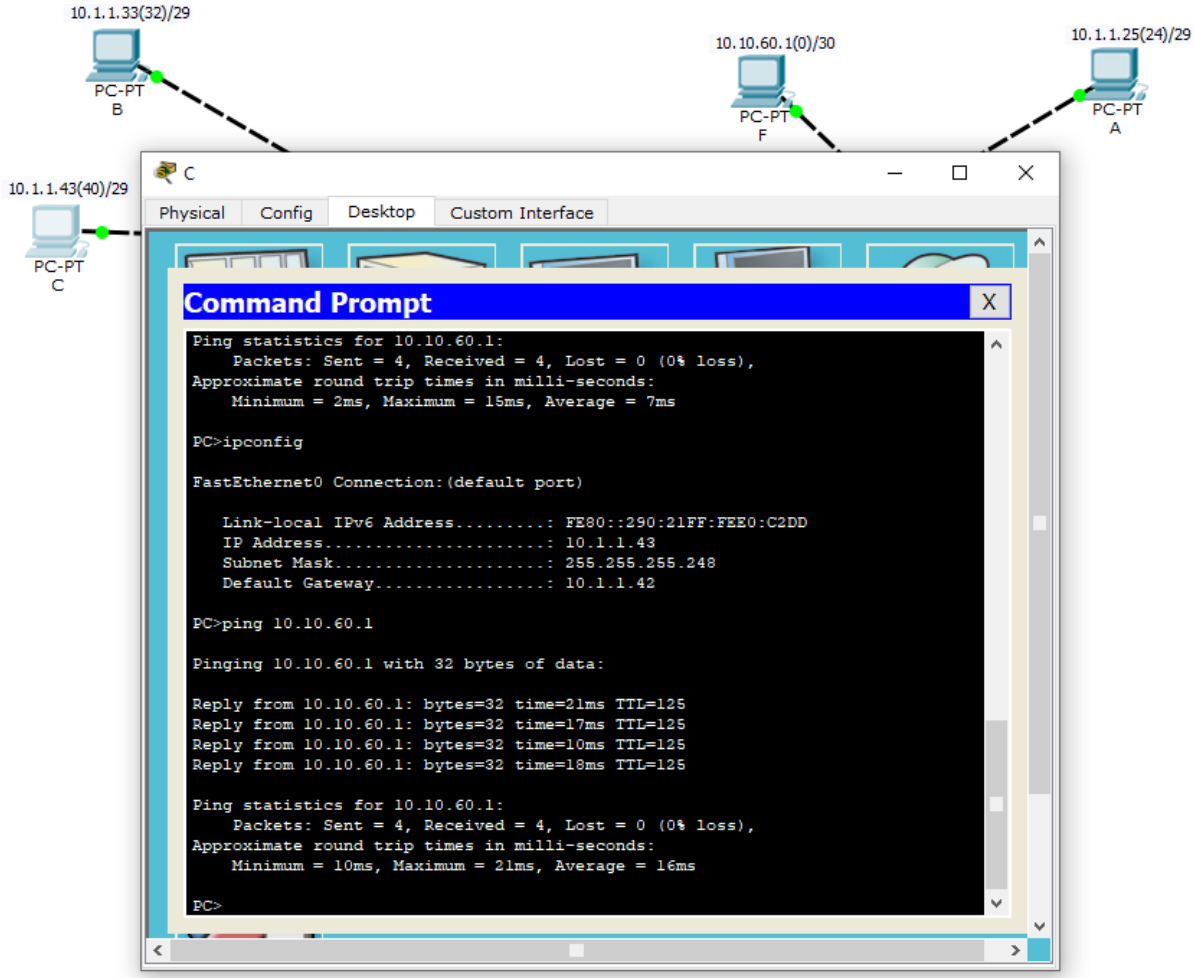
Control between PC-A with PC-E:



Control between PC-B with



Control between PC-C with



Extra test:

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num
	Successful	A	E	ICMP		0.000	N	0
	Successful	A	atom	ICMP		0.000	N	1
	Successful	A	F	ICMP		0.000	N	2
	Successful	B	atom	ICMP		0.000	N	3
	Successful	C	Edge	ICMP		0.000	N	4
	Successful	Hermes	E	ICMP		0.000	N	5
	Successful	E	F	ICMP		0.000	N	6
	Successful	D	A	ICMP		0.000	N	7
	Successful	Hermes	Edge	ICMP		0.000	N	8

Question 3º

Calculate the size of the networks in the topology (in terms of the available number of IP addresses).

Router Hermes

The IP address is 10.1.1.32/29 from the table we see that our network mask in binary will be 255.255.255.248.

	DEC	**BIN**
Mask	255.255.255.248	11111111. 11111111. 11111111. 11111000
Prefix		3 * 8 + 5 = 29
Subnet Step(step)	256 - 248= 8	32- 29 = 3.2^3 =8
Number of IP Addresses (host IPs)	256 - 248 = 8 , 8 - 2 =	32- 29 = 3, 2^3 =8, 8 - 2=
IP ADDRESS	10.1.1.32	00001010.00000001. 00000001.00100000
IP NETWORK	10.1.1.32	00001010.00000001. 00000001.00100000

So, if we apply an operation between the IP address and the subnet mask, we get:

00001010.00000001.00000001.00100000 &
11111111.11111111.11111111.11101000 =
00001010.00000001.00000001.00100000

A network address is the first IP address in a series of IP addresses and that this IP address cannot be assigned to a host or device on the network.

NETWORK:10.1.1.32 /29	
SUBNETWORK STEP (STEP): 8	NUMBER OF IP ADDRESSES (HOST IPs): 6
Network address	10.1.1.32
HOST IP	10.1.1.33
.	.
.	.
.	.
HOST IP	10.1.1.38
Address Broadcast	10.1.1.47

The inverted subnet mask for /29 is:

00000000.00000000.00000000.00010111

If we apply a bitwise* OR operation between the network address and the inverted subnet mask, we get:

00001010.00000001.00000001.00100000 |
00000000.00000000.00000000.00010111 =
00001010.00000001.00000001.00101111

Thus, the **Broadcast Address** for this network is 10.1.1.47

We will work in a similar way for the rest of the routers and for each subnet we will need. For network functionality we will need to assign
new network addresses as listed in the table below:

Network	Network address	Address Broadcast	Available from IP addresses
PC A - Edge	10.1.1.24/29	10.1.1.31	10.1.1.25 - 10.1.1.30
PC B - Hermes	10.1.1.32/29	10.1.1.39	10.1.1.33 - 10.1.1.38
PC C - Hermes	10.1.1.40/29	10.1.1.47	10.1.1.41 - 10.1.1.46
PC E - Bono	10.1.1.64/29	10.1.1.71	10.1.1.65 - 10.1.1.70
PC D - Bono	10.1.1.72/29	10.1.1.79	10.1.1.73 - 10.1.1.78
PC F - Edge	10.10.60.0/30	10.10.60.3	10.10.60.1- 10.10.60.2
Hermes -Bono	10.1.1.48/29	10.1.1.55	10.1.1.49 - 10.1.1.54
Bono - Edge	10.1.1.56/29	10.1.1.63	10.1.1.57 - 10.1.1.62
Atom - Hermes	10.10.60.16/29	10.10.60.23	10.10.60.17- 10.10.60.22

In the table below you will find the final IP Addresses of the Network:

Name	IP address
PC A	10.1.1.25
PC B	10.1.1.33
PC C	10.1.1.43
PC E	10.1.1.65
PC D	10.1.1.73
PC F	10.10.60.1
Atom	10.10.60.21/29
Hermes	10.1.1.49
Edge	10.1.1.58
Bono	10.1.1.57 & 10.1.1.50

Calculating the size of the topology networks

The size of subnets with computers A with F in the topology can be calculated as follows:

- 10.1.1.32 /29: This subnet allows 6 useful IP addresses, with the the first address is 10.1.1.33 and the last address is 10.1.1.38.
- 10.1.1.40 /29: This subnet allows 6 useful IP addresses, with the the first address is 10.1.1.41 and the last address is 10.1.1.46.
- 10.1.1.64 /29: This subnet allows 6 useful IP addresses, with the first address being 10.1.1.65 and the last address being 10.1.1.70.
- 10.1.1.72 /29: This subnet allows 6 useful IP addresses, with the the first address is 10.1.1.73 and the last address is 10.1.1.78.
- 10.1.1.24 /29: This subnet allows 6 useful IP addresses, with the the first address is 10.1.1.25 and the last address is 10.1.1.30.
- 10.10.60.0 /30: This subnet allows 2 useful IP addresses, with the first address is 10.10.60.1 and the last address is 10.10.60.2.

Based on the given topology we have a total of 32 available IP addresses but for the implementation of the network we added 2 more subnets as follows:

- 10.1.1.48 /29: This subnet allows 6 useful IP addresses, with the the first address is 10.1.1.49 and the last address is 10.1.1.54.
- 10.1.1.156 /29: This subnet allows 6 useful IP addresses, with the the first address is 10.1.1.157 and the last address is 10.1.1.162.

Finally, if we add /29 netmask to the subnet the Server belongs to, which by extension means 6 more addresses available. Then, we will have a **total of 50** (32+12+6)

Mask selection for the atom server.

The best subnet mask for a server with an IP address of 10.10.60.21 depends on the number of devices that need to connect to the network and the number of IP addresses available on the network.

- A /30 subnet mask is good for point-to-point connections, where only two devices are connected to the network. This is because it only provides 2 usable IP addresses.

- A /29 subnet mask is good for small networks with up to 6 devices. This is because it provides 6 useful IP addresses.

- A /28 subnet mask is good for small networks with up to 14 devices. This is because it provides 14 useful IP addresses.

- The /27 subnet mask is good for small networks with up to 30 devices. This is because it provides 30 useful IP addresses.

- A /26 subnet mask is good for medium networks with up to 62 devices. This is because it provides 62 useful IP addresses.

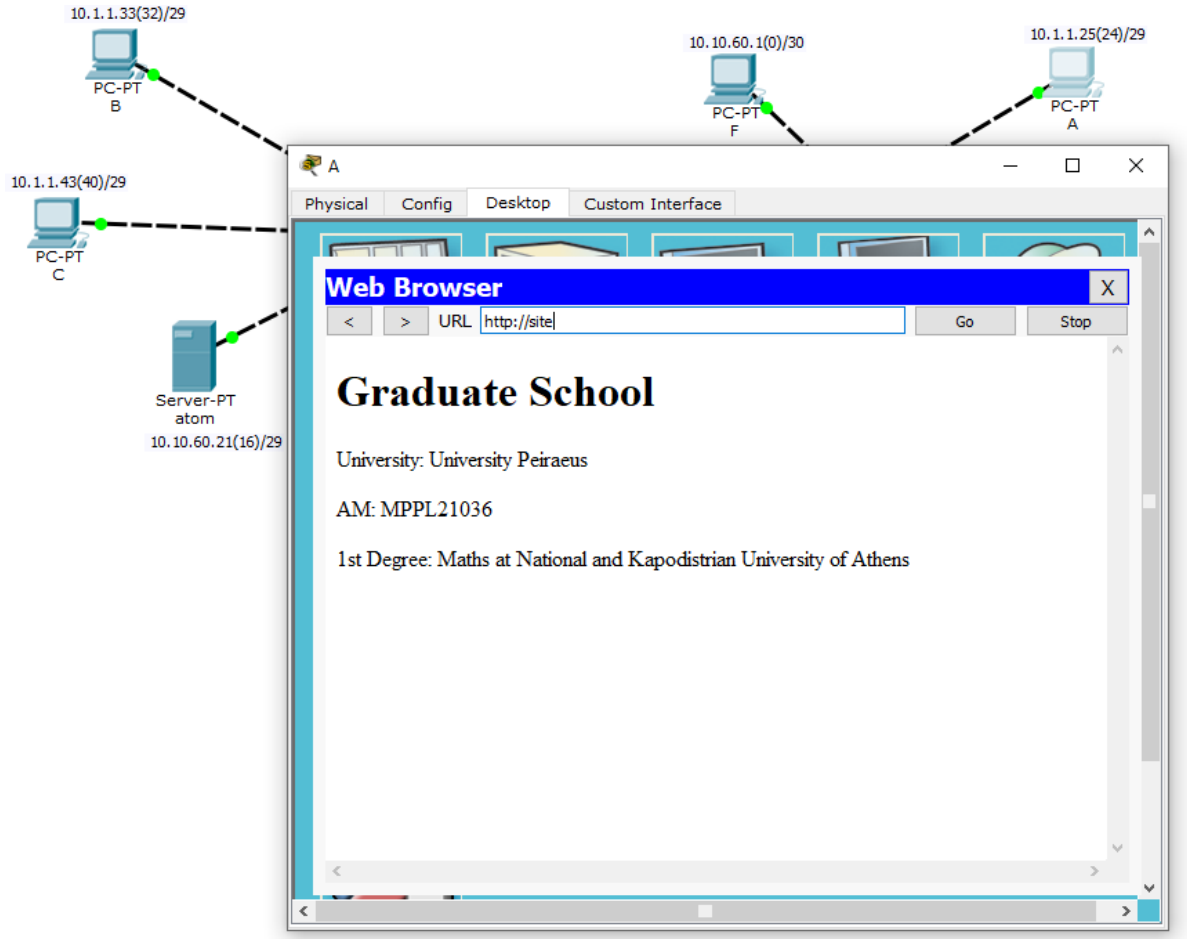
- A /25 subnet mask is good for large networks with up to 126 devices. This is because it provides 126 useful IP addresses.

It is important to note that these are general guidelines and the best mask subnet for your needs may vary depending on the exact number of devices and IP addresses you need to work with. Finally, a /29 subnet mask can be a good choice for a server with a small number of devices and limited IP addresses available. However, it is always important to evaluate and customize the subnet mask based on your specific needs and your network requirements.

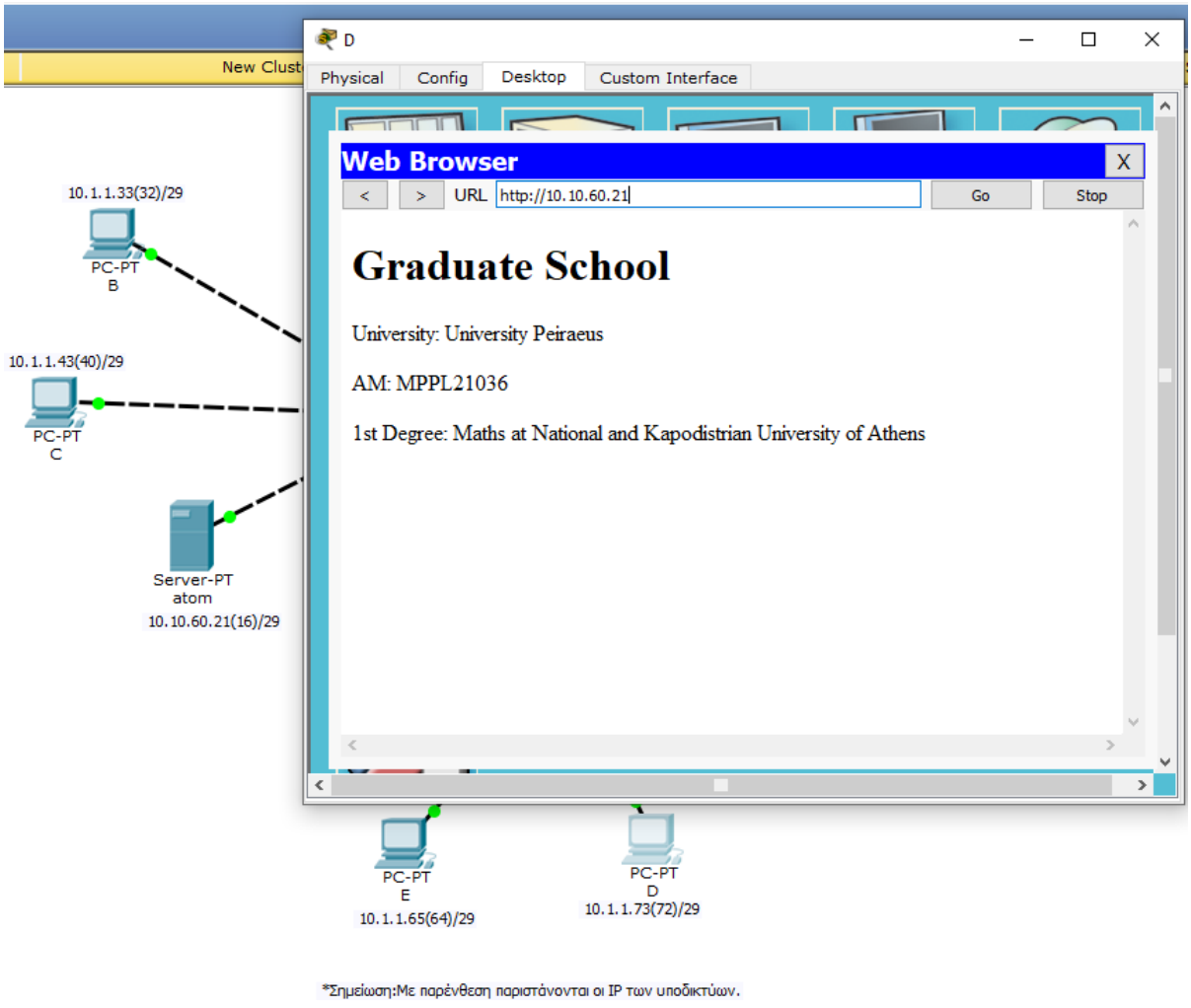
Question 4ο

The atom server is serving the HTTP service. Install the HTTP server on it. appropriate code(index.html) so that it displays a simple webpage with the title of your master's degree, the university, the AM and the title of your 1ου degree. Provide a suitable Screenshot from the browser of any topology PC that reads the atom's index.html.

Search from the PC-A browser by typing the word "site".



Search from the PC-D browser by typing the IP of Server 10.10.60.21.



Extras:

Μάσκες

MASK, PREFIX		MASK, PREFIX		MASK, PREFIX		MASK, PREFIX	
128.0.0.0	/1	255.128.0.0	/9	255.255.128.0	/17	255.255.255.128	/25
192.0.0.0	/2	255.192.0.0	/10	255.255.192.0	/18	255.255.255.192	/26
224.0.0.0	/3	255.224.0.0	/11	255.255.224.0	/19	255.255.255.224	/27
240.0.0.0	/4	255.240.0.0	/12	255.255.240.0	/20	255.255.255.240	/28
248.0.0.0	/5	255.248.0.0	/13	255.255.248.0	/21	255.255.255.248	/29
252.0.0.0	/6	255.252.0.0	/14	255.255.252.0	/22	255.255.255.252	/30
254.0.0.0	/7	255.254.0.0	/15	255.255.254.0	/23	255.255.255.254	/31
255.0.0.0	/8	255.255.0.0	/16	255.255.255.0	/24	255.255.255.255	/32

DEC	BIN
128	10000000
192	11000000
224	11100000
240	11110000
248	11111000
252	11111100
254	11111110
255	11111111