CENG 422 Network Design & Management

Final Project

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1.a) The design phase of the Project

The network schematic, which is desired, is produced with standard methods. Network design, chosen of IP addresses, and network masks are realized on paper. After that, implementation is done using GNS3. Each instance was checked to see if it satisfied the criteria. There is a switch whose name is “switch4” in the middle. There are 2 branches of “switch4” Office and Factory which are defined in the project description. A router is used to ensure better connectivity between those 2 buildings. Moreover, one router is added for BranchOffice in order to make PPP connection between Office and BranchOffice. There are 2 routers for Floor1 and Floor2 of the Office because there are many routings that are needed. For each floor, two switches to obtain four Ethernet ports in the Office. Moreover, for the factory, one switch is used for each floor. 8 ethernet ports for each floor are determined as specified in the project description.

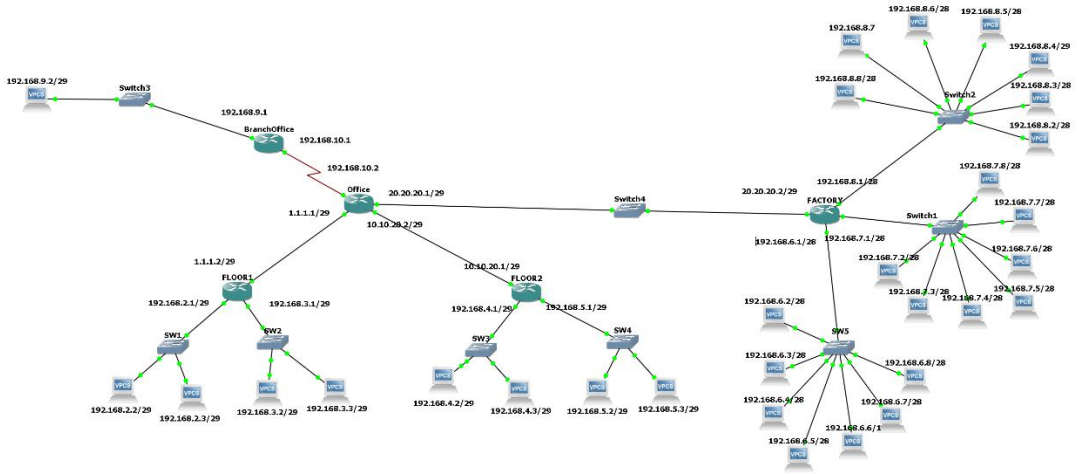

Figure 1: Designed Schematic

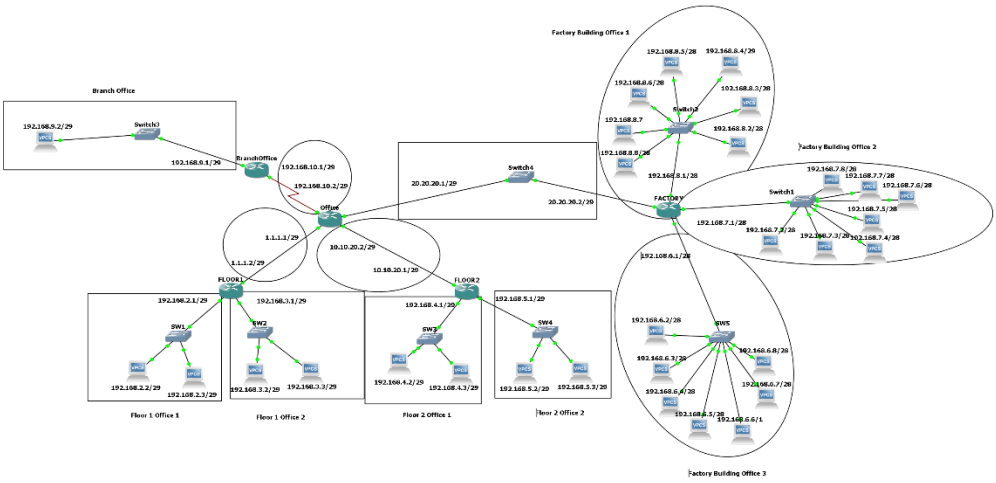

Figure 2: Shown of design with subnets according to IP’s with respect to subnet masks

1.b)Building Step of the Project

GNS3 and the needed images of routers(c3725 and c7200) have been installed. One router is needed for PPP connection, another is needed for other devices. Actually, c3725 was enough for every connection but I first try with c7200 and it does not enough to use for PPP. Thus, I needed to use c3725. The simulation environment is then updated to include the required router. The network that was designed on paper is built using GNS3. After establishing the necessary connection between devices and PCs, the next stage can be passed. I'll attempt to order the phases in a logical manner. After that, I created my design using GNS3's capabilities. I had a few problems when I first started adding a routing setup. It worked after I grasped the design's overall logic and how to implement it.

• Each router interface's configuration

• Assigning designed IP addresses to computers

• Creating a link between the IP group and the router interface

• Establishing connection between router and router

IP Address Identification:

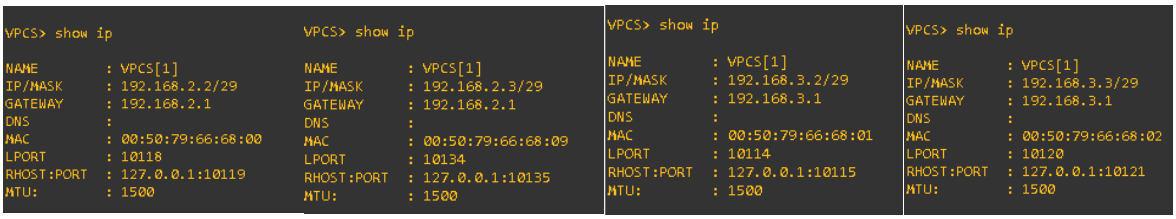

Figure 3: Ip Addresses for Office Floor 1 PC's

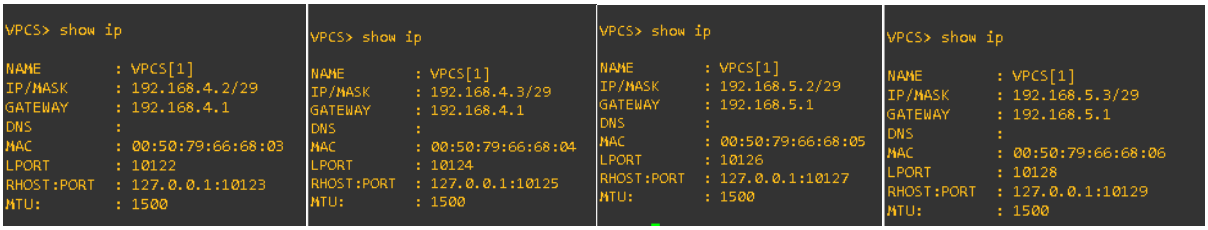

Figure 4: Ip Addresses for Office Floor 2 PC's

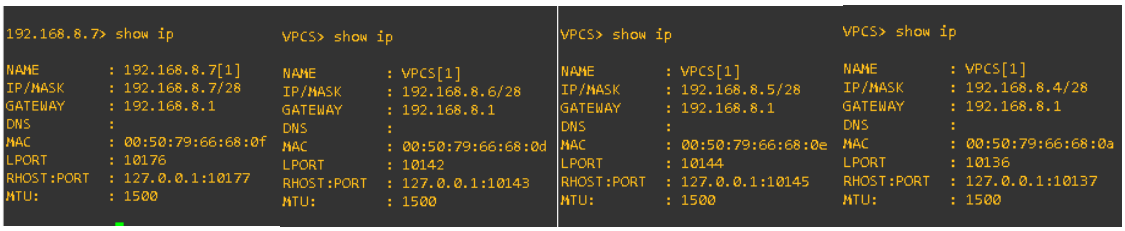

Figure 5: Ip Addresses for Factory Building Office 1 PC's

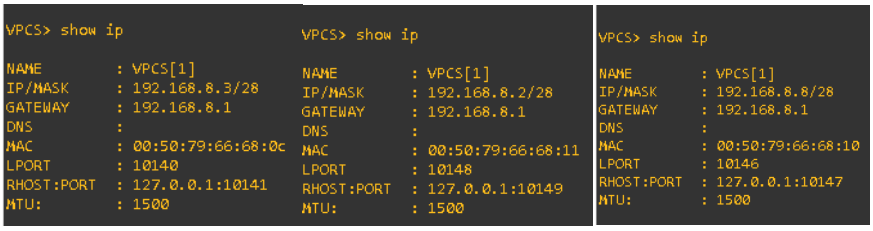

Figure 6: Ip Addresses for Factory Building Office 1 PC's

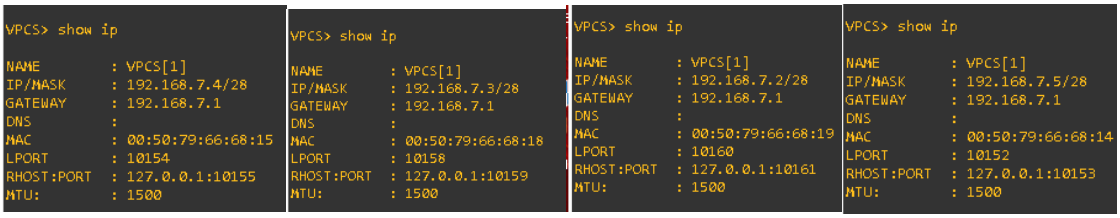

Figure 7: Ip Addresses for Factory Building Office 2 PC's

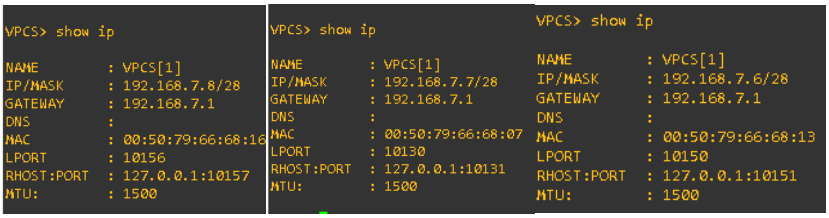

Figure 8: Ip Addresses for Factory Building Office 2 PC's

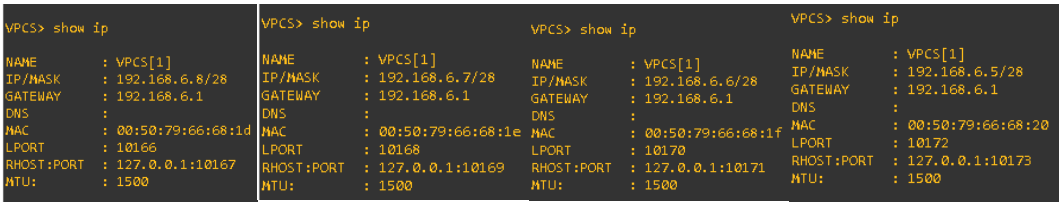

Figure 9: Ip Addresses for Factory Building Office 3 PC's

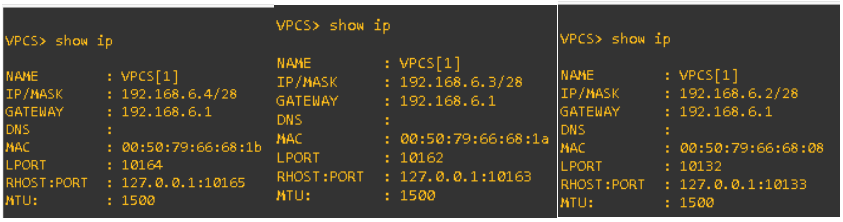

Figure 10: Ip Addresses for Factory Building Office 3 PC's

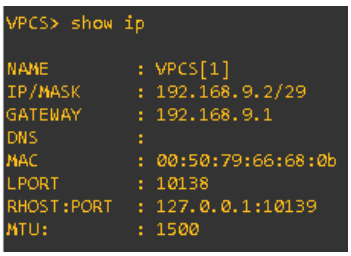

Figure 11: Ip Address for Branch Office PC

Connection between the IP group and the router interface and between router and router:

```
Office(config)#ip route 20.20.20.0 255.255.255.248 20.20.20.2
Office(config)#ip route 1.1.1.0 255.255.255.248 1.1.1.2
Office(config)#ip route 10.10.20.0 255.255.255.248 10.10.20.1
Office(config)#ip route 192.168.2.0 255.255.255.248 1.1.1.2
Office(config)#ip route 192.168.3.0 255.255.255.248 1.1.1.2
Office(config)#ip route 192.168.4.0 255.255.255.248 10.10.20.1
Office(config)#ip route 192.168.5.0 255.255.255.248 10.10.20.1
Office(config)#ip route 192.168.6.0 255.255.255.248 20.20.20.2
Office(config)#ip route 192.168.7.0 255.255.255.248 20.20.20.2
Office(config)#ip route 192.168.8.0 255.255.255.248 20.20.20.2
Office(config)#ip route 192.168.10.0 255.255.255.0 192.168.10.1
Office(config)#ip route 192.168.9.0 255.255.255.0 192.168.10.1
```

Figure 12: Configuration for Office

```
BranchOffice(config)#ip route 20.20.20.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 1.1.1.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 10.10.20.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 192.168.2.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 192.168.3.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 192.168.4.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 192.168.5.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 192.168.6.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 192.168.7.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 192.168.8.0 255.255.255.248 192.168.10.2
BranchOffice(config)#ip route 192.168.10.0 255.255.255.248 192.168.10.2
```

Figure 13: Configuration for BranchOffice

```
FLOOR1(config)#ip route 20.20.20.0 255.255.255.248 1.1.1.1
FLOOR1(config)#ip route 1.1.1.0 255.255.255.248 1.1.1.1
FLOOR1(config)#ip route 10.10.20.0 255.255.255.248 1.1.1.1
FLOOR1(config)#ip route 192.168.4.0 255.255.255.248 1.1.1.1
FLOOR1(config)#ip route 192.168.5.0 255.255.255.248 1.1.1.1
FLOOR1(config)#ip route 192.168.6.0 255.255.255.248 1.1.1.1
FLOOR1(config)#ip route 192.168.7.0 255.255.255.248 1.1.1.1
FLOOR1(config)#ip route 192.168.8.0 255.255.255.248 1.1.1.1
FLOOR1(config)#ip route 192.168.10.0 255.255.255.0 1.1.1.1
FLOOR1(config)#ip route 192.168.9.0 255.255.255.0 1.1.1.1
FLOOR1(config)#  ip route 192.168.10.0 255.255.255.248 1.1.1.1
FLOOR1(config)#ip route 192.168.10.0 255.255.255.248 192.168.10.2
FLOOR1(config)#ip route 192.168.9.0 255.255.255.248 1.1.1.1
```

Figure 14: Configuration for Floor1 of the Office

```
FLOOR2(config)#ip route 20.20.20.0 255.255.255.248 10.10.20.2
FLOOR2(config)#ip route 1.1.1.0 255.255.255.248 10.10.20.2
FLOOR2(config)#ip route 10.10.20.0 255.255.255.248 10.10.20.2
FLOOR2(config)#ip route 192.168.2.0 255.255.255.248 10.10.20.2
FLOOR2(config)#ip route 192.168.3.0 255.255.255.248 10.10.20.2
FLOOR2(config)#ip route 192.168.6.0 255.255.255.248 10.10.20.2
FLOOR2(config)#ip route 192.168.7.0 255.255.255.248 10.10.20.2
FLOOR2(config)#ip route 192.168.8.0 255.255.255.248 10.10.20.2
FLOOR2(config)#ip route 192.168.10.0 255.255.255.0 10.10.20.2
FLOOR2(config)#ip route 192.168.9.0 255.255.255.0 10.10.20.2
FLOOR2(config)#ip route 192.168.10.0 255.255.255.248 10.10.20.2
FLOOR2(config)#ip route 192.168.9.0 255.255.255.248 10.10.20.2
```

Figure 15: Configuration for Floor 2 of the Office

```
FACTORY(config)#ip route 20.20.20.0 255.255.255.248 20.20.20.1
FACTORY(config)#ip route 1.1.1.0 255.255.255.248 20.20.20.1
FACTORY(config)#ip route 10.10.20.0 255.255.255.248 20.20.20.1
FACTORY(config)#ip route 192.168.2.0 255.255.255.248 20.20.20.1
FACTORY(config)#ip route 192.168.3.0 255.255.255.248 20.20.20.1
FACTORY(config)#ip route 192.168.4.0 255.255.255.248 20.20.20.1
FACTORY(config)#ip route 192.168.5.0 255.255.255.248 20.20.20.1
FACTORY(config)#ip route 192.168.10.0 255.255.255.0 20.20.20.1
FACTORY(config)#ip route 192.168.9.0 255.255.255.0 20.20.20.1
FACTORY(config)#ip route 192.168.10.0 255.255.255.248 20.20.20.1
FACTORY(config)#ip route 192.168.9.0 255.255.255.248 20.20.20.1
```

Figure 16: Configuration for Factory

2.Testing of the project

Pinging of each machine with a different IP group is done. Everything appeared to be in working order. When it comes to the final product, there are a lot of challenges to solve and a lot of debugging to do. At the time, carelessness manifested itself in IP overlaps and simple errors such as setting. I structured the network and added some aesthetics to the simulator environment after the testing was concluded to make it more aesthetically pleasing. I had a terrific time working on and finishing the project.

2.1. From Office Building Floor 1 Office 1

2.1. a) From Office Building Floor 1 Office 1 to➔ Office Building Floor1 Office 1:

```
VPCS> ping 192.168.2.3
84 bytes from 192.168.2.3 icmp_seq=1 ttl=64 time=0.869 ms
84 bytes from 192.168.2.3 icmp_seq=2 ttl=64 time=0.957 ms
84 bytes from 192.168.2.3 icmp_seq=3 ttl=64 time=1.685 ms
84 bytes from 192.168.2.3 icmp_seq=4 ttl=64 time=0.982 ms
84 bytes from 192.168.2.3 icmp_seq=5 ttl=64 time=0.937 ms
```

2.1.b) From Office Building Floor 1 Office 1 to ➔Office Building Floor1 Office2:

```
VPCS> ping 192.168.3.2
84 bytes from 192.168.3.2 icmp_seq=1 ttl=63 time=30.362 ms
84 bytes from 192.168.3.2 icmp_seq=2 ttl=63 time=19.389 ms
84 bytes from 192.168.3.2 icmp_seq=3 ttl=63 time=15.119 ms
84 bytes from 192.168.3.2 icmp_seq=4 ttl=63 time=18.839 ms
84 bytes from 192.168.3.2 icmp_seq=5 ttl=63 time=20.413 ms
```

2.1.c) From Office Building Floor 1 Office 1 to ➔Office Building Floor2 Office1:

```
VPCS> ping 192.168.4.2
84 bytes from 192.168.4.2 icmp_seq=1 ttl=61 time=54.457 ms
84 bytes from 192.168.4.2 icmp_seq=2 ttl=61 time=59.502 ms
84 bytes from 192.168.4.2 icmp_seq=3 ttl=61 time=55.618 ms
84 bytes from 192.168.4.2 icmp_seq=4 ttl=61 time=64.037 ms
84 bytes from 192.168.4.2 icmp_seq=5 ttl=61 time=58.465 ms
```

2.1.d) From Office Building Floor 1 Office 1 to ➔Office Building Floor2 Office2:

```
VPCS> ping 192.168.5.3
84 bytes from 192.168.5.3 icmp_seq=1 ttl=61 time=64.733 ms
84 bytes from 192.168.5.3 icmp_seq=2 ttl=61 time=56.605 ms
84 bytes from 192.168.5.3 icmp_seq=3 ttl=61 time=61.222 ms
84 bytes from 192.168.5.3 icmp_seq=4 ttl=61 time=56.236 ms
84 bytes from 192.168.5.3 icmp_seq=5 ttl=61 time=56.072 ms
```

2.1.e) From Office Building Floor 1 Office 1 to ➔Factory Building Office3:

```
VPCS> ping 192.168.6.5
84 bytes from 192.168.6.5 icmp_seq=1 ttl=61 time=93.001 ms
84 bytes from 192.168.6.5 icmp_seq=2 ttl=61 time=61.963 ms
84 bytes from 192.168.6.5 icmp_seq=3 ttl=61 time=55.451 ms
84 bytes from 192.168.6.5 icmp_seq=4 ttl=61 time=62.375 ms
84 bytes from 192.168.6.5 icmp_seq=5 ttl=61 time=57.485 ms
```

2.1.f) From Office Building Floor 1 Office 1 to ➔Factory Building Office2:

```
VPCS> ping 192.168.7.6
84 bytes from 192.168.7.6 icmp_seq=1 ttl=61 time=58.990 ms
84 bytes from 192.168.7.6 icmp_seq=2 ttl=61 time=57.623 ms
84 bytes from 192.168.7.6 icmp_seq=3 ttl=61 time=54.453 ms
84 bytes from 192.168.7.6 icmp_seq=4 ttl=61 time=60.540 ms
84 bytes from 192.168.7.6 icmp_seq=5 ttl=61 time=59.996 ms
```

2.1.g) From Office Building Floor 1 Office 1 to ➔Factory Building Office1:

```
VPCS> ping 192.168.8.1
84 bytes from 192.168.8.1 icmp_seq=1 ttl=253 time=64.581 ms
84 bytes from 192.168.8.1 icmp_seq=2 ttl=253 time=51.571 ms
84 bytes from 192.168.8.1 icmp_seq=3 ttl=253 time=48.274 ms
84 bytes from 192.168.8.1 icmp_seq=4 ttl=253 time=50.645 ms
84 bytes from 192.168.8.1 icmp_seq=5 ttl=253 time=46.471 ms
```

2.1.h) From Office Building Floor 1 Office 1 to ➔Branch Office:

```
VPCS> ping 192.168.9.2
84 bytes from 192.168.9.2 icmp_seq=1 ttl=61 time=35.929 ms
84 bytes from 192.168.9.2 icmp_seq=2 ttl=61 time=44.046 ms
84 bytes from 192.168.9.2 icmp_seq=3 ttl=61 time=36.221 ms
84 bytes from 192.168.9.2 icmp_seq=4 ttl=61 time=34.354 ms
84 bytes from 192.168.9.2 icmp_seq=5 ttl=61 time=33.375 ms
```

2.2) From Branch Office

2.2.a) From Branch Office ➔Factory Office Building Floor 2 Office 2:

```
VPCS> ping 192.168.5.2
84 bytes from 192.168.5.2 icmp_seq=1 ttl=61 time=50.306 ms
84 bytes from 192.168.5.2 icmp_seq=2 ttl=61 time=35.556 ms
84 bytes from 192.168.5.2 icmp_seq=3 ttl=61 time=29.028 ms
84 bytes from 192.168.5.2 icmp_seq=4 ttl=61 time=39.392 ms
84 bytes from 192.168.5.2 icmp_seq=5 ttl=61 time=28.473 ms
```

2.2.b) From Branch Office ➔Factory Building Office2:

```
VPCS> ping 192.168.7.4
84 bytes from 192.168.7.4 icmp_seq=1 ttl=61 time=46.570 ms
84 bytes from 192.168.7.4 icmp_seq=2 ttl=61 time=33.378 ms
84 bytes from 192.168.7.4 icmp_seq=3 ttl=61 time=33.441 ms
84 bytes from 192.168.7.4 icmp_seq=4 ttl=61 time=40.700 ms
84 bytes from 192.168.7.4 icmp_seq=5 ttl=61 time=40.943 ms
```

2.3) From Factory Building Office1

2.3.a) From Factory Building Office1➔ Factory Building Office3:

```
VPCS> ping 192.168.6.5
84 bytes from 192.168.6.5 icmp_seq=1 ttl=63 time=16.383 ms
84 bytes from 192.168.6.5 icmp_seq=2 ttl=63 time=18.624 ms
84 bytes from 192.168.6.5 icmp_seq=3 ttl=63 time=19.876 ms
84 bytes from 192.168.6.5 icmp_seq=4 ttl=63 time=16.808 ms
84 bytes from 192.168.6.5 icmp_seq=5 ttl=63 time=11.511 ms
```

2.3.b) From Factory Building Office1➔Office Building Floor1 Office2:

```
VPCS> ping 192.168.3.3
84 bytes from 192.168.3.3 icmp_seq=1 ttl=61 time=83.787 ms
84 bytes from 192.168.3.3 icmp_seq=2 ttl=61 time=60.202 ms
84 bytes from 192.168.3.3 icmp_seq=3 ttl=61 time=62.342 ms
84 bytes from 192.168.3.3 icmp_seq=4 ttl=61 time=63.732 ms
84 bytes from 192.168.3.3 icmp_seq=5 ttl=61 time=63.804 ms
```