Universidade Federal de Campina Grande – UFCG
Centro de Engenharia Elétrica e Informática – CEEI
Departamento de Sistemas e Computação – DSC
Professor: Reinaldo Gomes
Disciplina: Interconexão de Redes

Prática 04 – Endereçamento e Roteamento Estático

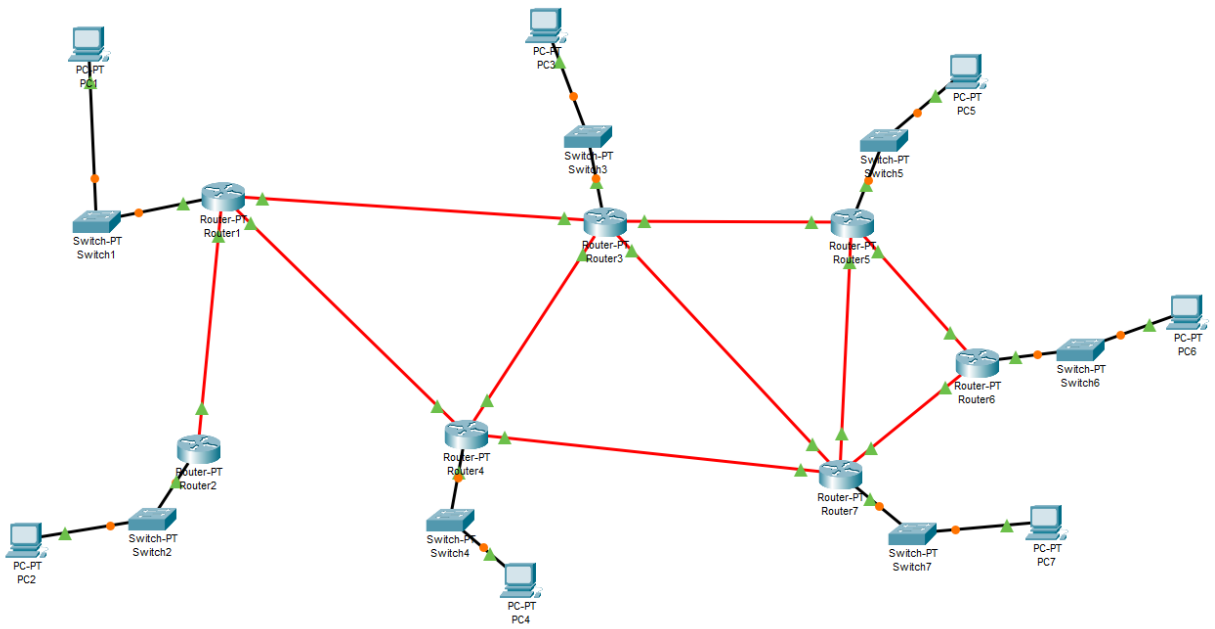
Recomendações:

- **A atividade pode ser realizada em dupla.**
- **Considere duas faixas de IP para endereçamento dos dispositivos: X.0.0.0/16 (redes para sistemas finais) e Y.0.0.0/16 (redes entre roteadores).**
- **No lugar de X considere os últimos 3 algarismos da matrícula de um dos componentes da dupla e para Y os últimos 3 algarismos da matrícula do outro componente.**
- **Se for apenas um aluno X deve usar os últimos 3 algarismos da matrícula e Y os últimos 3 algarismos da matrícula+1.**

Material a ser entregue:

- Documento com os prints e respostas dos questionamentos
- Projeto do Packet Tracer gerado pela dupla.
- Alunos: Huggo Parcelly da Silva - 120210155
  Mariane Maira Santos Zeitouni - 120210789

1. Interligue todos os roteadores de tal forma que a seguinte topologia seja estabelecida:



Utilize as seguintes interface para realizar a ligação entre os elementos.

- Roteadores devem ser conectados entre si através de enlaces de fibra óptica (apresentados em vermelho)
- PC, switches e interfaces locais dos roteadores devem ser interligados através de enlaces de cabos de par trançado.

2. Defina a estrutura de endereçamento das redes para os sistemas finais considerando as seguintes restrições:

Rede	Quantidade de Hosts	Endereço Atribuído
Rede 1	X+Y = 144	55.0.0.0/24
Rede 2	X = 55	55.0.1.0/26
Rede 3	Y = 89	55.0.2.0/25
Rede 4	X mod Y = 55	55.0.3.0/26
Rede 5	11	55.0.4.0/28
Rede 6	22	55.0.5.0/27
Rede 7	28	55.0.6.0/27

3. Defina as faixas de endereço que serão utilizadas para a interligação dos roteadores que fazem parte da infraestrutura do sistema.

PREENCHA A TABELA COM AS INDICAÇÕES DAS REDES E DOS ENDEREÇOS USADOS POR CADA ROTEADOR

Faixa de endereços alocada	Roteador origem/Endereço	Roteador destino/Endereço
89.0.0.0/30 - 89.0.0.3/30	RT-1 / 89.0.0.1/30	RT-2 / 89.0.0.2/30
89.0.0.4/30 - 89.0.0.7/30	RT-1 / 89.0.0.5/30	RT-3 / 89.0.0.6/30
89.0.0.8/30 - 89.0.0.11/30	RT-1 / 89.0.0.9/30	RT-4 / 89.0.0.10/30
89.0.0.0/30 - 89.0.0.3/30	RT-2 / 89.0.0.2/30	RT-1 / 89.0.0.1/30
89.0.0.4/30 - 89.0.0.7/30	RT-3 / 89.0.0.6/30	RT-1 / 89.0.0.5/30
89.0.0.12/30 - 89.0.0.15/30	RT-3 / 89.0.0.13/30	RT-4 / 89.0.0.14/30
89.0.0.16/30 - 89.0.0.19/30	RT-3 / 89.0.0.17/30	RT-5 / 89.0.0.18/30
89.0.0.20/30 - 89.0.0.23/30	RT-3 / 89.0.0.21/30	RT-7 / 89.0.0.22/30
89.0.0.8/30 - 89.0.0.11/30	RT-4 / 89.0.0.10/30	RT-1 / 89.0.0.9/30
89.0.0.12/30 - 89.0.0.15/30	RT-4 / 89.0.0.14/30	RT-3 / 89.0.0.13/30
89.0.0.24/30 - 89.0.0.27/30	RT-4 / 89.0.0.25/30	RT-7 / 89.0.0.26/30
89.0.0.16/30 - 89.0.0.19/30	RT-5 / 89.0.0.18/30	RT-3 / 89.0.0.17/30
89.0.0.28/30 - 89.0.0.31/30	RT-5 / 89.0.0.29/30	RT-6 / 89.0.0.30/30
89.0.0.32/30 - 89.0.0.35/30	RT-5 / 89.0.0.33/30	RT-7 / 89.0.0.34/30
89.0.0.28/30 - 89.0.0.31/30	RT-6 / 89.0.0.30/30	RT-5 / 89.0.0.29/30
89.0.0.36/30 - 89.0.0.39/30	RT-6 / 89.0.0.37/30	RT-7 / 89.0.0.38/30
89.0.0.20/30 - 89.0.0.23/30	RT-7 / 89.0.0.22/30	RT-3 / 89.0.0.21/30
89.0.0.24/30 - 89.0.0.27/30	RT-7 / 89.0.0.26/30	RT-4 / 89.0.0.25/30
89.0.0.32/30 - 89.0.0.35/30	RT-7 / 89.0.0.34/30	RT-5 / 89.0.0.33/30
89.0.0.36/30 - 89.0.0.39/30	RT-7 / 89.0.0.38/30	RT-6 / 89.0.0.37/30

4. Configure todas as redes locais dos sistemas finais de tal forma que o endereço do roteador seja sempre o primeiro endereço disponível para host na faixa estabelecida e o endereço do PC da rede seja o último endereço disponível para host.

- Realize ping entre o PC de cada uma das redes e a interface local do roteador da sua rede

Rede 01

```
C:\>ping 55.0.0.1

Pinging 55.0.0.1 with 32 bytes of data:

Reply from 55.0.0.1: bytes=32 time<1ms TTL=255
Reply from 55.0.0.1: bytes=32 time<1ms TTL=255
Reply from 55.0.0.1: bytes=32 time<1ms TTL=255
Reply from 55.0.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 55.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Rede 02

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 55.0.1.1

Pinging 55.0.1.1 with 32 bytes of data:

Reply from 55.0.1.1: bytes=32 time<1ms TTL=255
Reply from 55.0.1.1: bytes=32 time<1ms TTL=255
Reply from 55.0.1.1: bytes=32 time<1ms TTL=255
Reply from 55.0.1.1: bytes=32 time<1ms TTL=255

Ping statistics for 55.0.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Rede 03

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 55.0.2.1

Pinging 55.0.2.1 with 32 bytes of data:

Reply from 55.0.2.1: bytes=32 time<1ms TTL=255
Reply from 55.0.2.1: bytes=32 time<1ms TTL=255
Reply from 55.0.2.1: bytes=32 time<1ms TTL=255
Reply from 55.0.2.1: bytes=32 time<1ms TTL=255

Ping statistics for 55.0.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Rede 04

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 55.0.3.1

Pinging 55.0.3.1 with 32 bytes of data:

Reply from 55.0.3.1: bytes=32 time=18ms TTL=255
Reply from 55.0.3.1: bytes=32 time<1ms TTL=255
Reply from 55.0.3.1: bytes=32 time<1ms TTL=255
Reply from 55.0.3.1: bytes=32 time=1ms TTL=255

Ping statistics for 55.0.3.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 18ms, Average = 4ms

C:\>
```

Rede 05

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 55.0.4.1

Pinging 55.0.4.1 with 32 bytes of data:

Reply from 55.0.4.1: bytes=32 time<1ms TTL=255
Reply from 55.0.4.1: bytes=32 time<1ms TTL=255
Reply from 55.0.4.1: bytes=32 time<1ms TTL=255
Reply from 55.0.4.1: bytes=32 time<1ms TTL=255

Ping statistics for 55.0.4.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Rede 06

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 55.0.5.1

Pinging 55.0.5.1 with 32 bytes of data:

Reply from 55.0.5.1: bytes=32 time<1ms TTL=255
Reply from 55.0.5.1: bytes=32 time<1ms TTL=255
Reply from 55.0.5.1: bytes=32 time<1ms TTL=255
Reply from 55.0.5.1: bytes=32 time<1ms TTL=255

Ping statistics for 55.0.5.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Rede 07

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 55.0.6.1

Pinging 55.0.6.1 with 32 bytes of data:

Reply from 55.0.6.1: bytes=32 time<1ms TTL=255
Reply from 55.0.6.1: bytes=32 time<1ms TTL=255
Reply from 55.0.6.1: bytes=32 time<1ms TTL=255
Reply from 55.0.6.1: bytes=32 time<1ms TTL=255

Ping statistics for 55.0.6.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

- Realize ping entre o PC1 e os demais PCs

PC1 -> ping PC2

```
C:\>ping 55.0.1.62

Pinging 55.0.1.62 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 55.0.1.62:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

PC1 -> ping PC3

```
C:\>ping 55.0.2.126

Pinging 55.0.2.126 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 55.0.2.126:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

PC1 -> ping PC4

```
C:\>ping 55.0.3.62

Pinging 55.0.3.62 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 55.0.3.62:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

PC1 -> ping PC5

```
C:\>ping 55.0.4.14

Pinging 55.0.4.14 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 55.0.4.14:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

PC1 -> ping PC6

```
C:\>ping 55.0.5.30

Pinging 55.0.5.30 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 55.0.5.30:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

PC1 -> ping PC7

```
C:\>ping 55.0.6.30

Pinging 55.0.6.30 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 55.0.6.30:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

- A comunicação foi bem-sucedida? Por quê?

R: A comunicação não foi bem sucedida porque as configurações nos outros roteadores, assim como no gateway de cada PC não foram realizadas, logo não tem como as máquinas se comunicarem.

5. Configure todas as interfaces entre os roteadores que fazem a infraestrutura de acordo com as faixas alocadas para cada um dos segmentos.

- Realize ping entre o Roteador 1 e todos os seus vizinhos para verificar se todos possuem conectividade

```
Router>ping 89.0.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/3/15 ms

Router>ping 89.0.0.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.6, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms

Router>ping 89.0.0.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.10, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

- Realize ping entre o Roteador 2 e todos os seus vizinhos para verificar se todos possuem conectividade

```
Router>ping 89.0.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

- Realize ping entre o Roteador 3 e todos os seus vizinhos para verificar se todos possuem conectividade

```
Router#ping 89.0.0.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/5/25 ms

Router#ping 89.0.0.14

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.14, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Router#ping 89.0.0.18

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.18, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Router#ping 89.0.0.22

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.22, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

- Realize ping entre o Roteador 4 e todos os seus vizinhos para verificar se todos possuem conectividade

```
Router>ping 89.0.0.9

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.9, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Router>ping 89.0.0.13

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.13, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Router>ping 89.0.0.26

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.26, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

- Realize ping entre o Roteador 5 e todos os seus vizinhos para verificar se todos possuem conectividade

```
Router>ping 89.0.0.17

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.17, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/3/17 ms

Router>ping 89.0.0.30

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.30, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms

Router>ping 89.0.0.34

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.34, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

- Realize ping entre o Roteador 6 e todos os seus vizinhos para verificar se todos possuem conectividade

```
Router#ping 89.0.0.38

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.38, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms

Router#ping 89.0.0.29

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.29, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

- Realize ping entre o Roteador 7 e todos os seus vizinhos para verificar se todos possuem conectividade

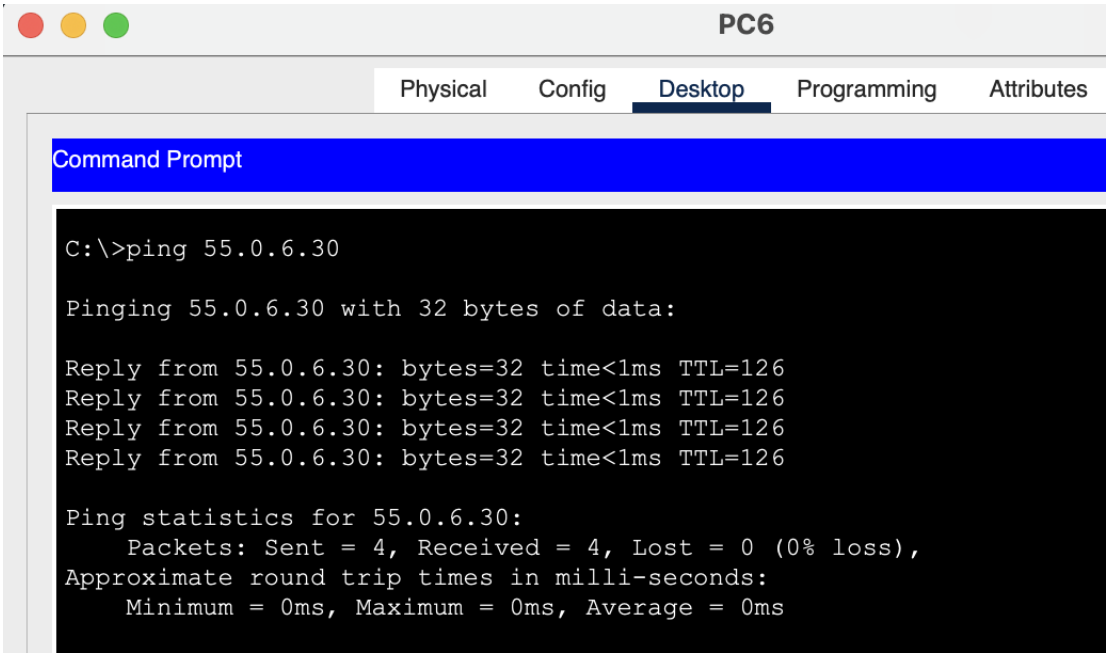
```
Router#ping 89.0.0.21

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.21, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Router#ping 89.0.0.25

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.25, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/3/19 ms

Router#ping 89.0.0.33

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.33, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/7 ms

Router#ping 89.0.0.37

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 89.0.0.37, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

- Realize ping entre o PC1 e os demais PCs
    - Houve alguma mudança no comportamento observado antes de realizar a configuração de endereçamento dos roteadores? Por quê?

R: Não, exatamente pelo mesmo motivo da questão anterior. Os PCs ainda não foram configurados e as rotas dos roteadores também não, então não tem como cada roteador saber com que se comunicar.

obs: não adicionamos os prints porque seria muito repetitivo já que as configurações necessárias ainda não foram realizadas até este ponto.

6. Configure as rotas necessárias para estabelecer comunicação entre a Rede 6 e a Rede 7
    - Realize ping entre o PC 6 e o PC 7



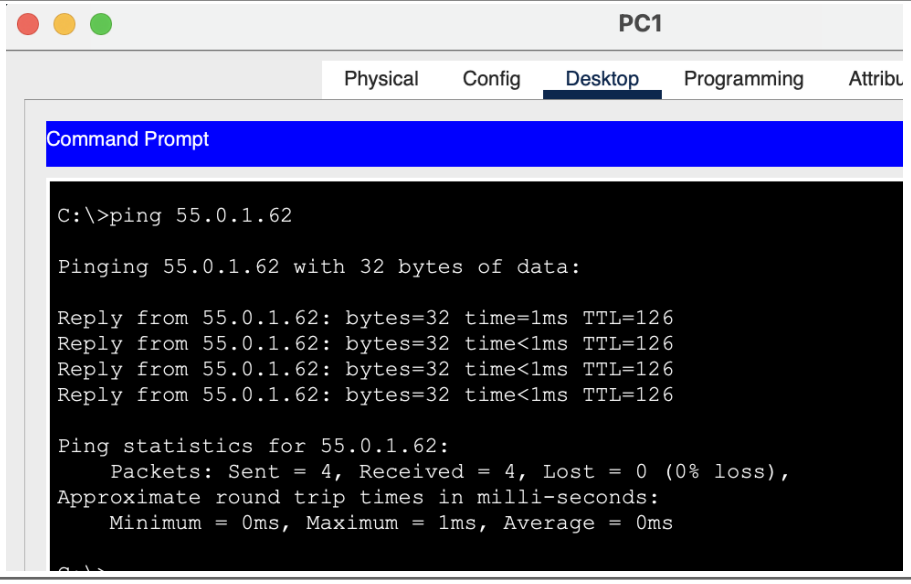
- A comunicação foi bem-sucedida? Por quê?
  R: Sim, porque as configurações necessárias para a comunicação entre redes diferentes foram realizadas no PC e no Router. Adicionamos o endereço do Router em seu respectivo PC, e também configuramos no Router a rota necessária para se comunicar com a outra rede distinta.

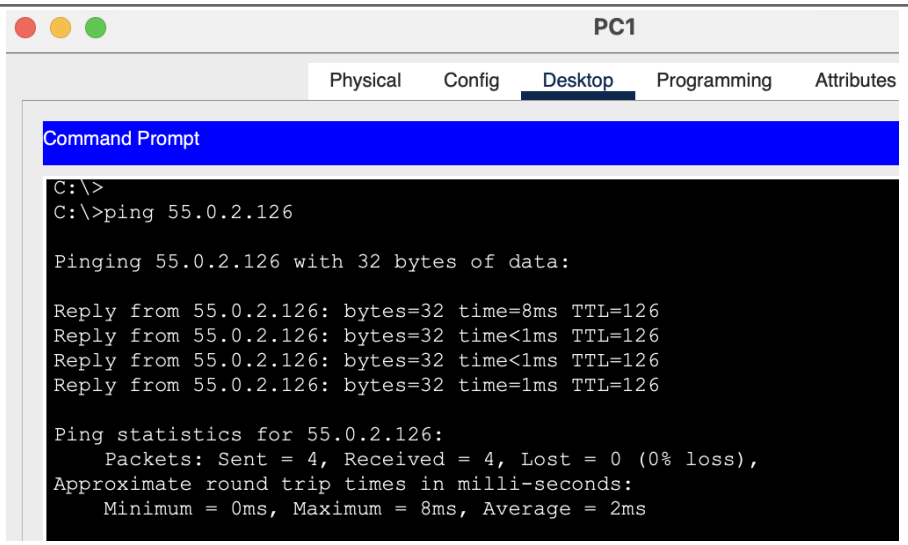
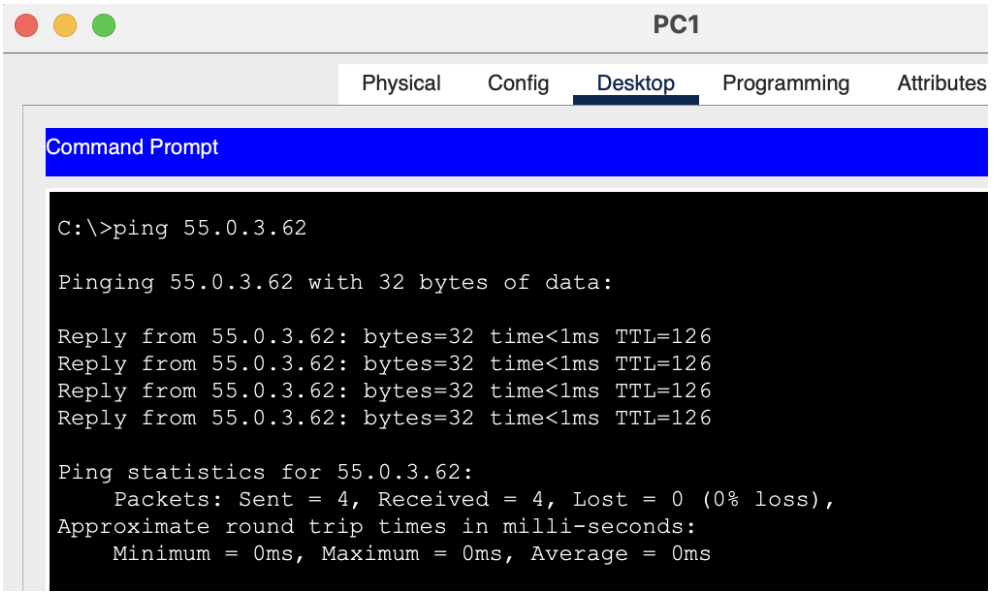
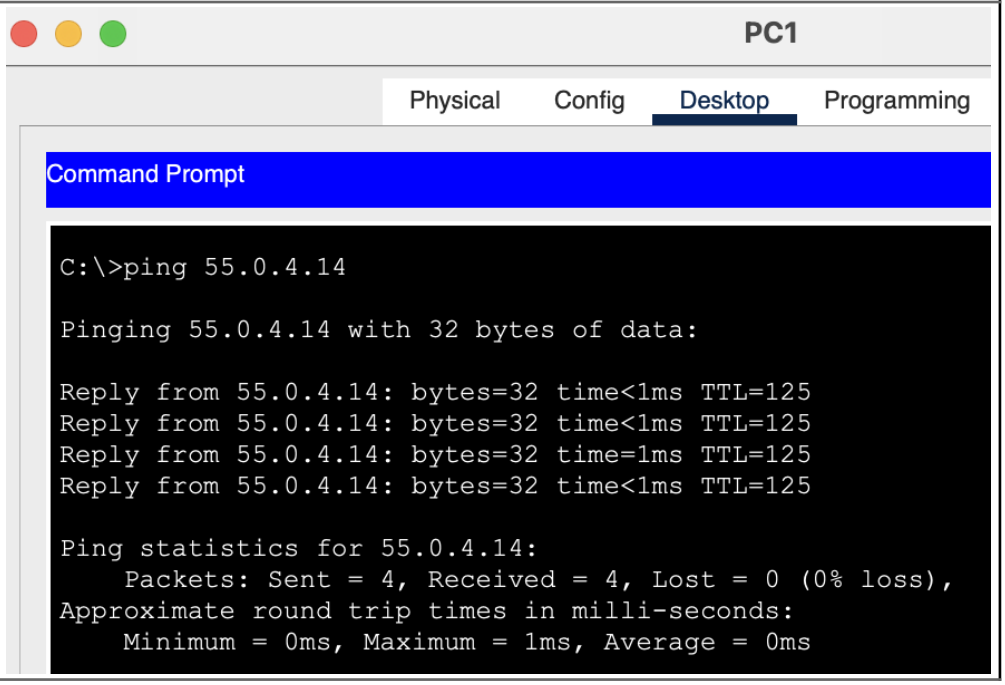
- Realize ping entre o PC1 e os demais PCs
  - Houve alguma mudança no comportamento observado antes de realizar a configuração de endereçamento dos roteadores? Por quê?

R: Ainda não, as rotas configuradas foram apenas as da Rede 6 e 7, então apenas essas duas estão se comunicando. O restante das redes serão configuradas na próxima questão.

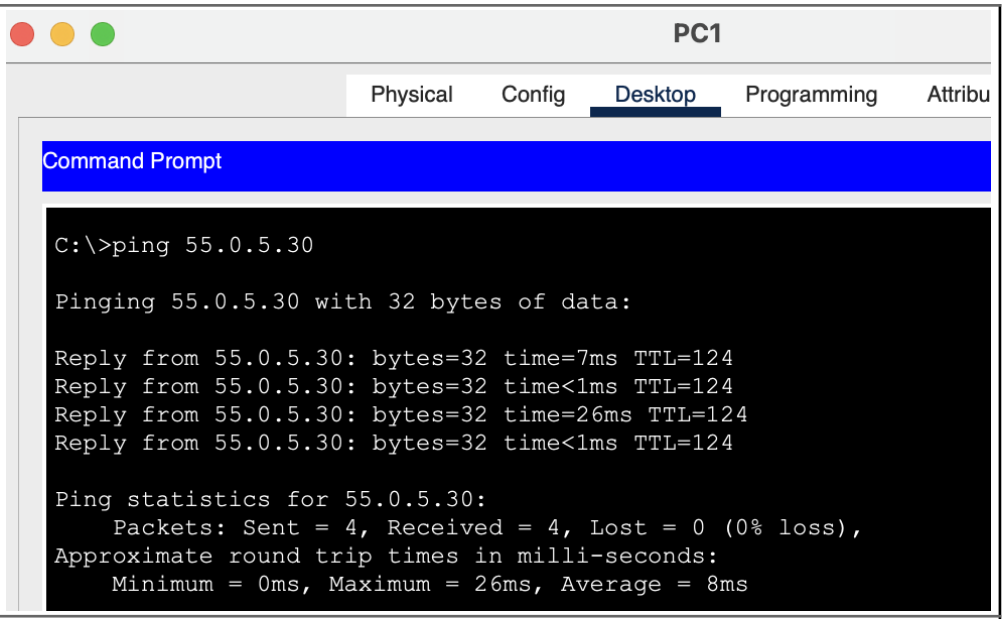
7. Configure as rotas necessárias para estabelecer comunicação entre as demais redes do sistema

- Realize ping entre todos os PCs do sistema

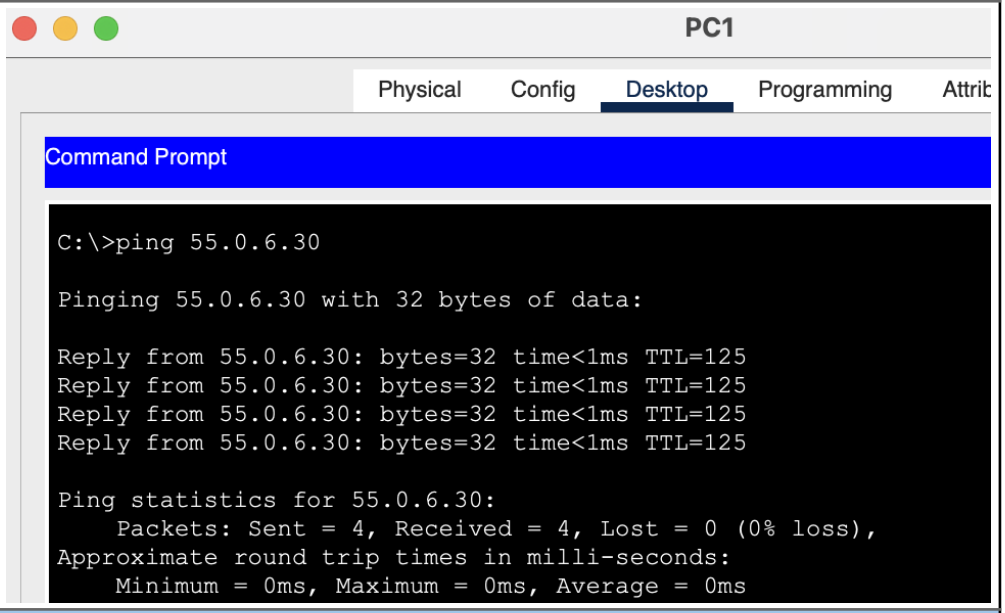
Dispositivos	Ping
PC1-PC2	

PC1-PC3	
PC1-PC4	
PC1-PC5	

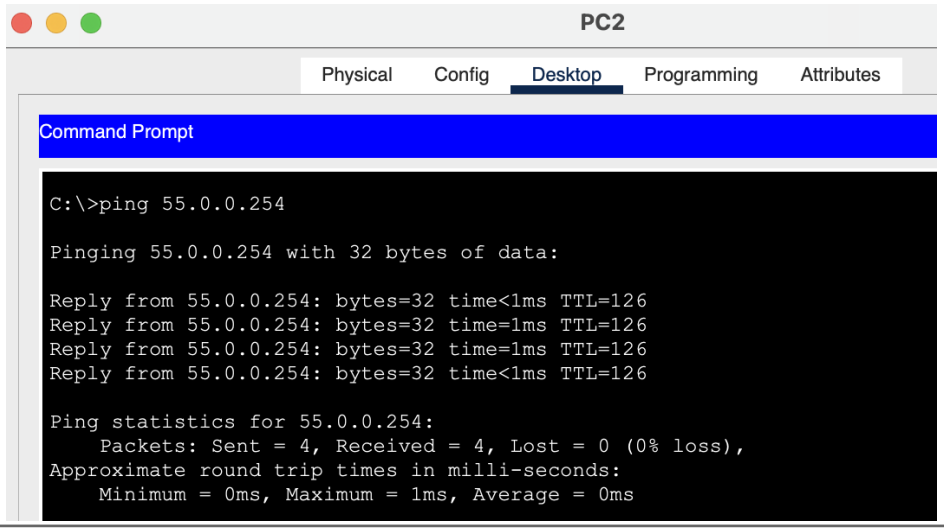
PC1-PC6



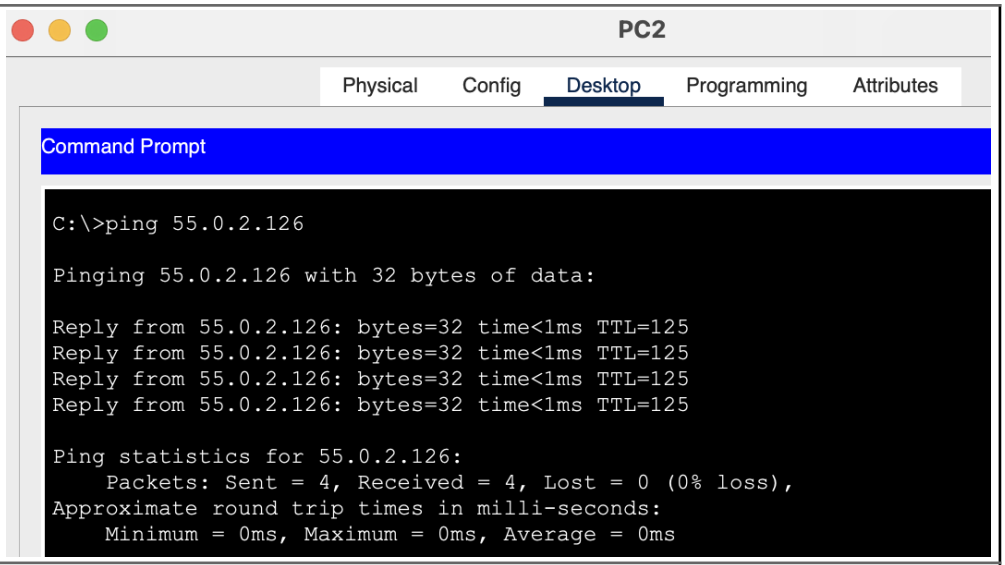
PC1-PC7



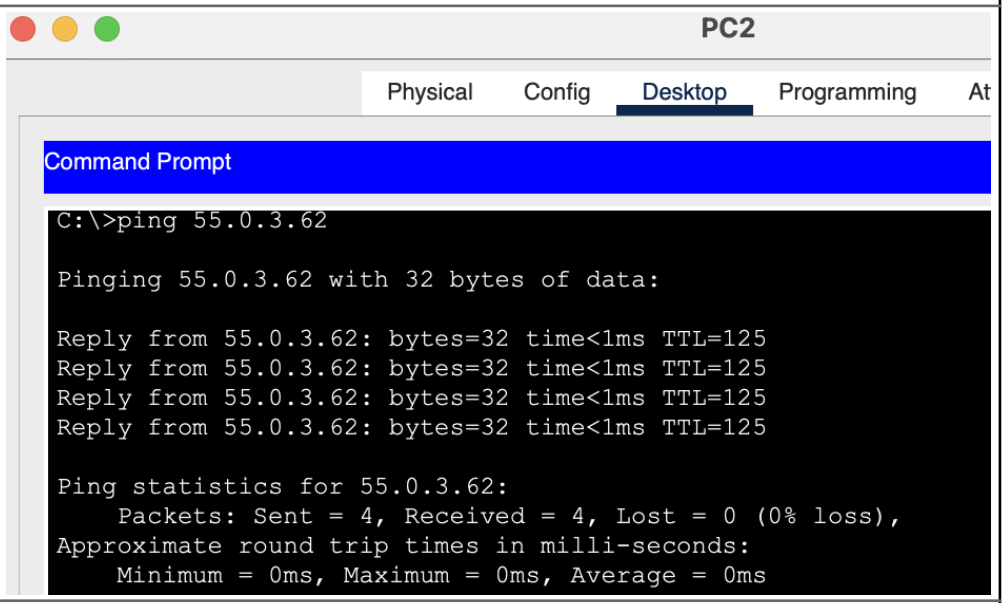
PC2-PC1



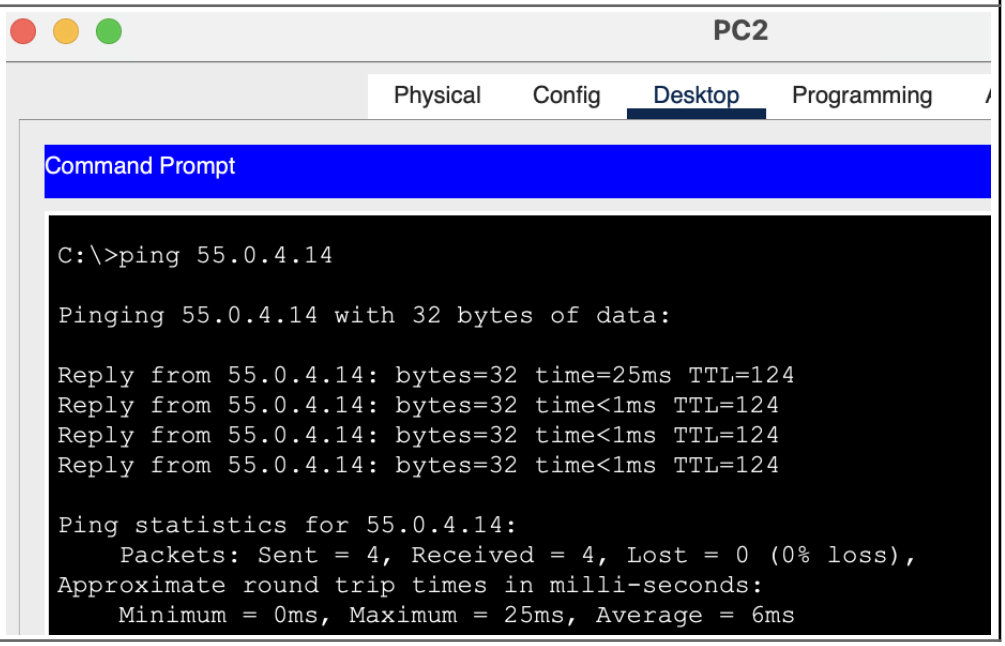
PC2-PC3



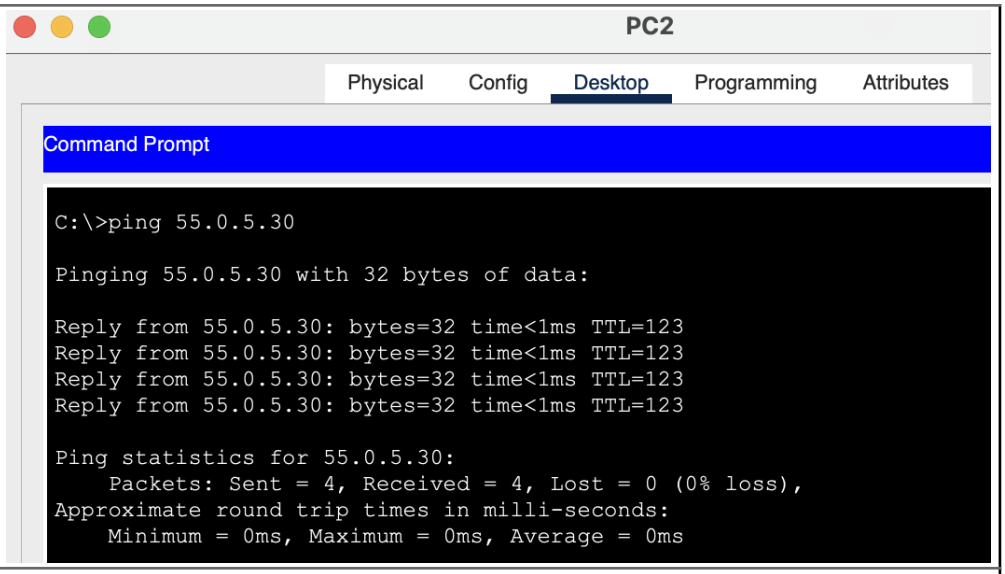
PC2-PC4



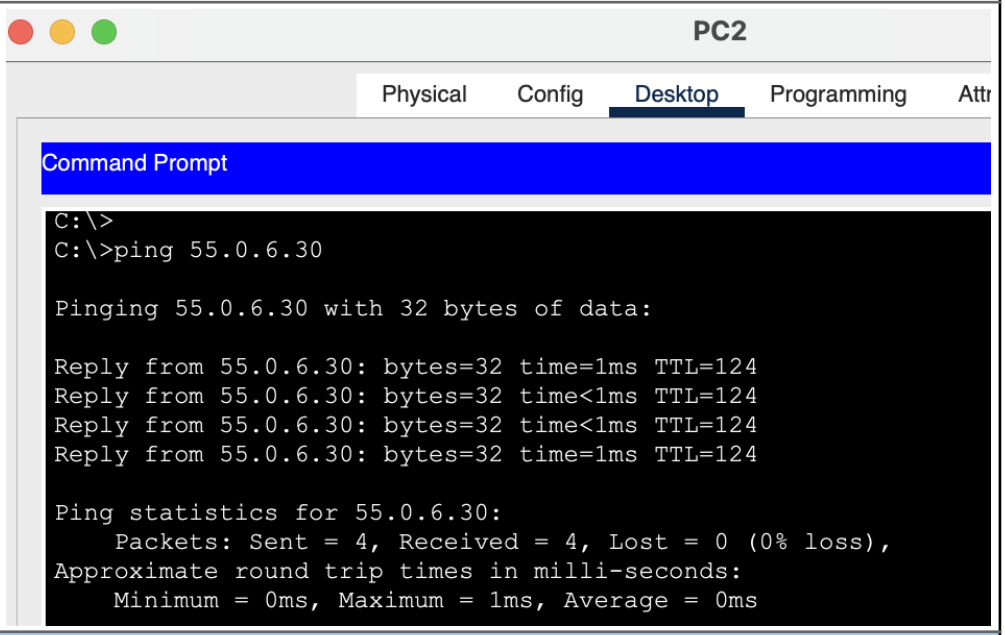
PC2-PC5



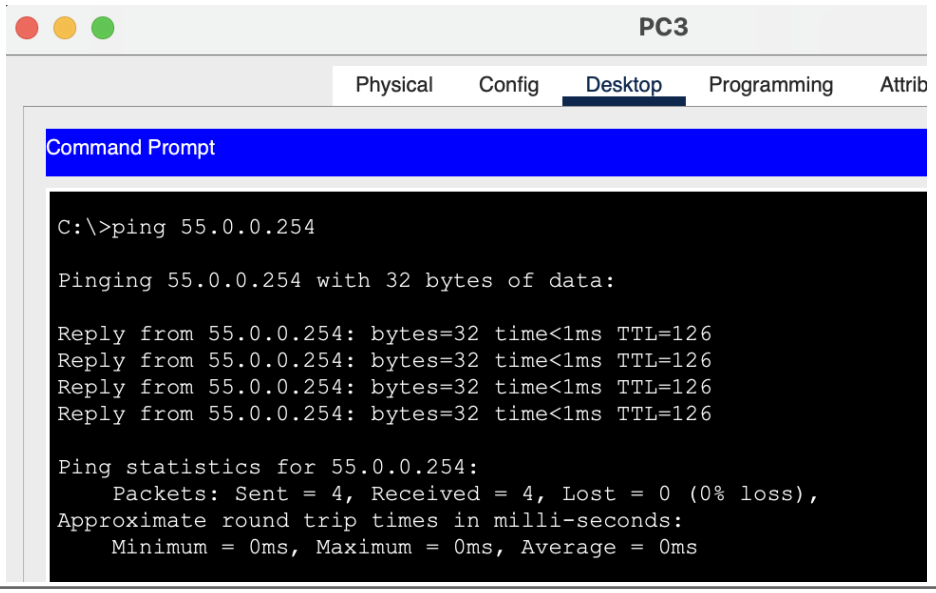
PC2-PC6



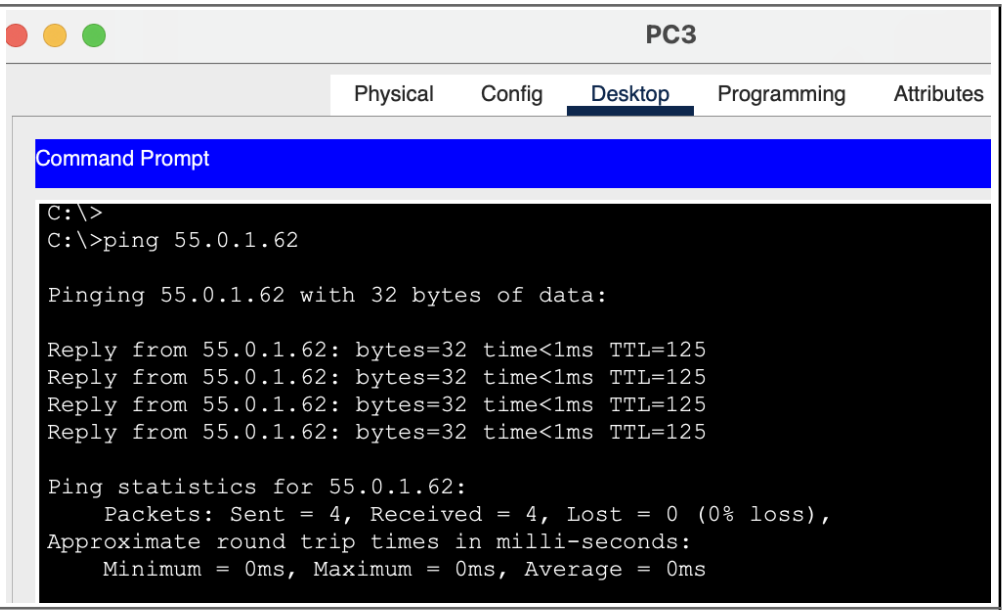
PC2-PC7



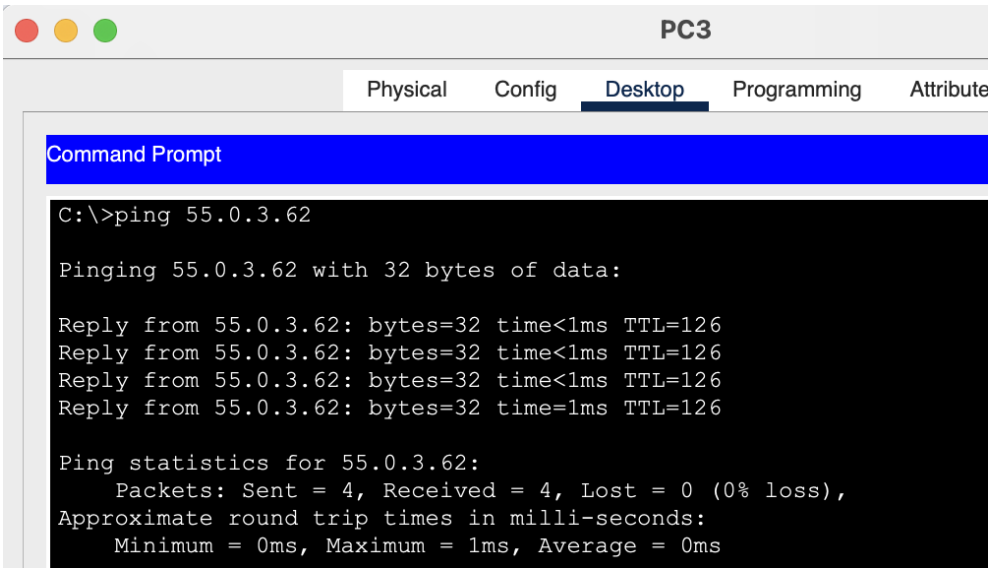
PC3-PC1



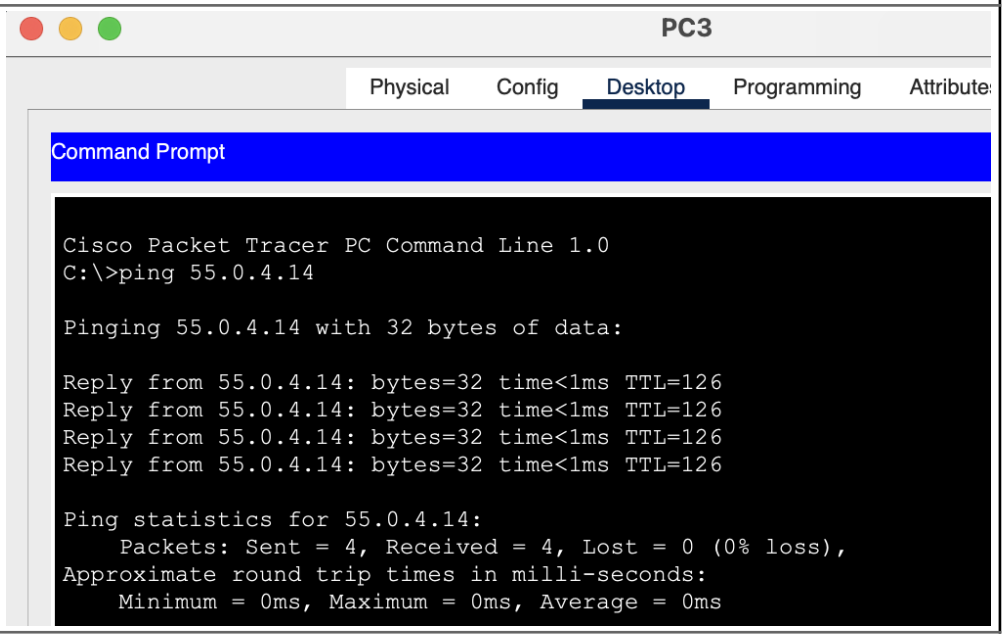
PC3-PC2



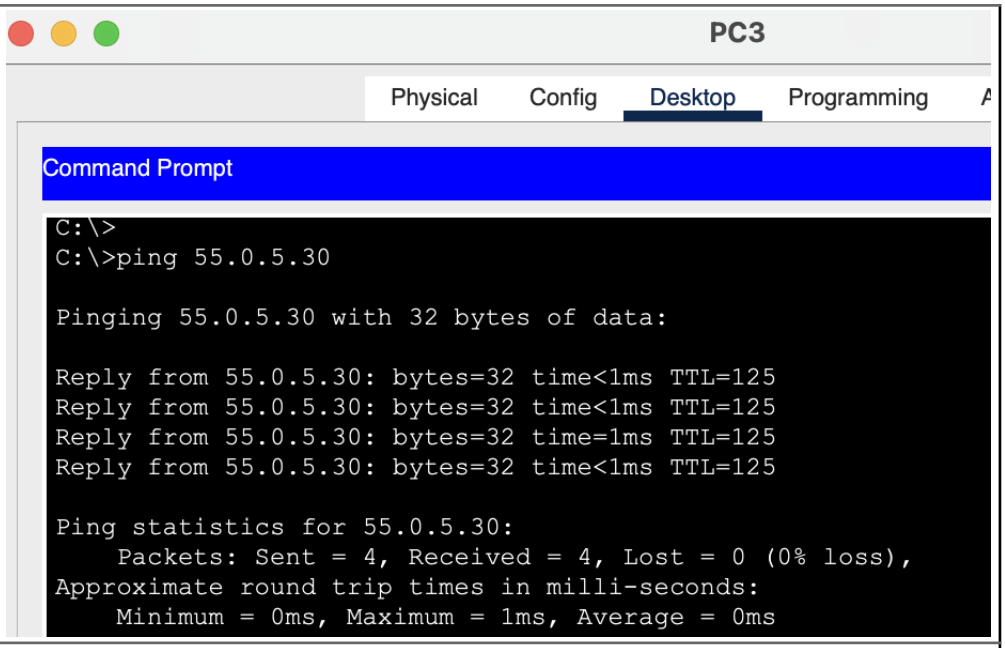
PC3-PC4



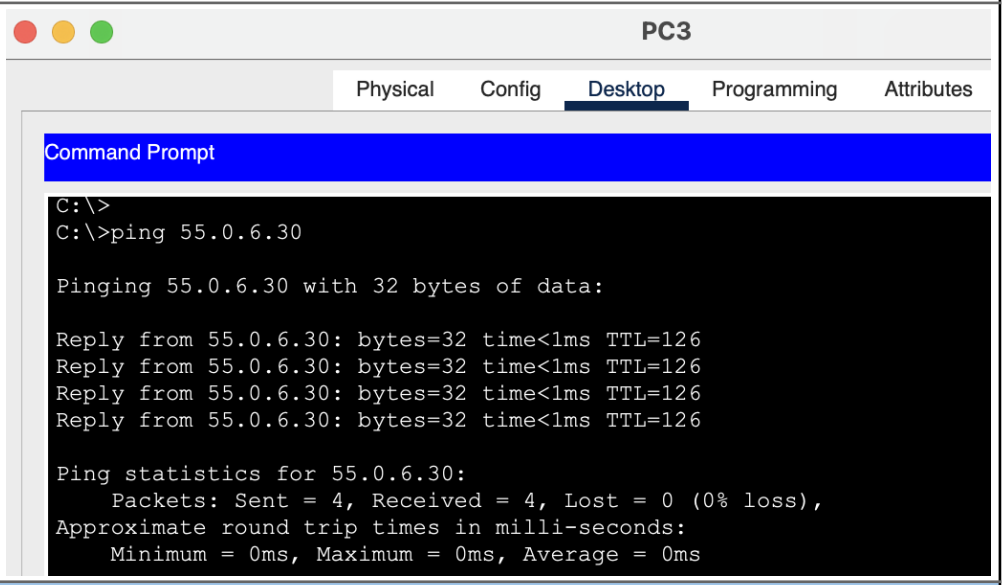
PC3-PC5



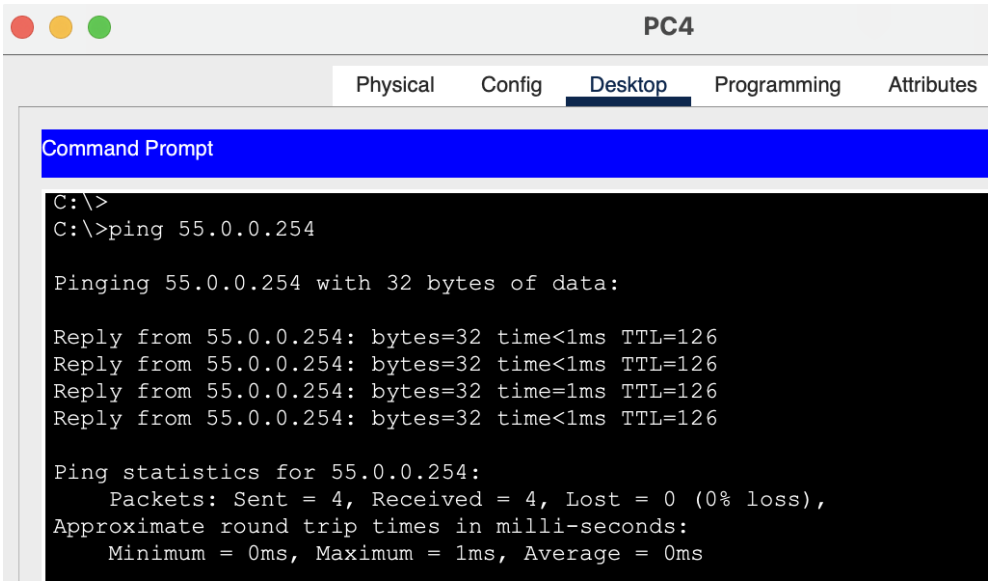
PC3-PC6



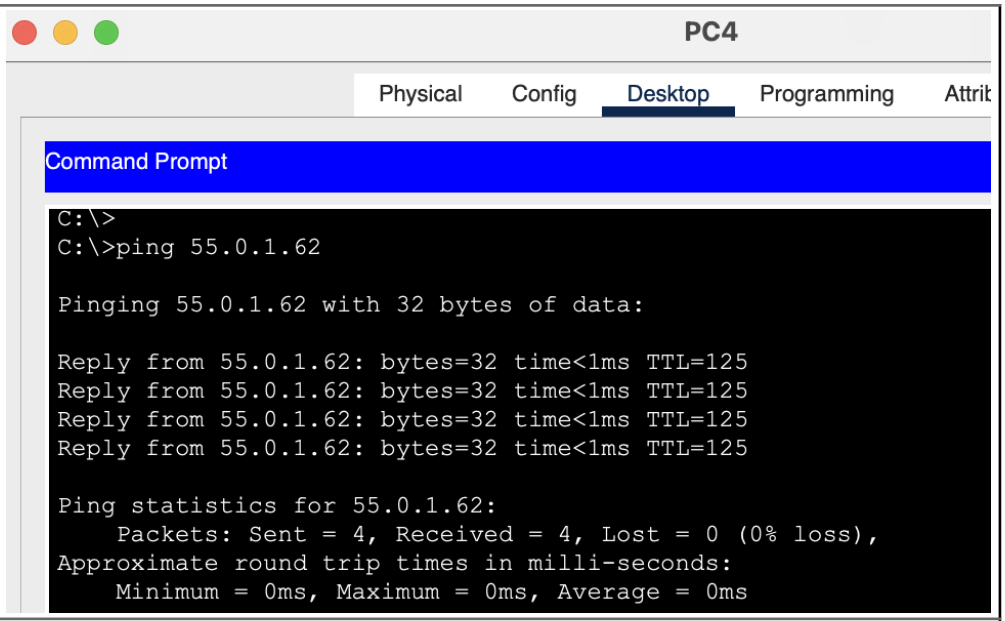
PC3-PC7



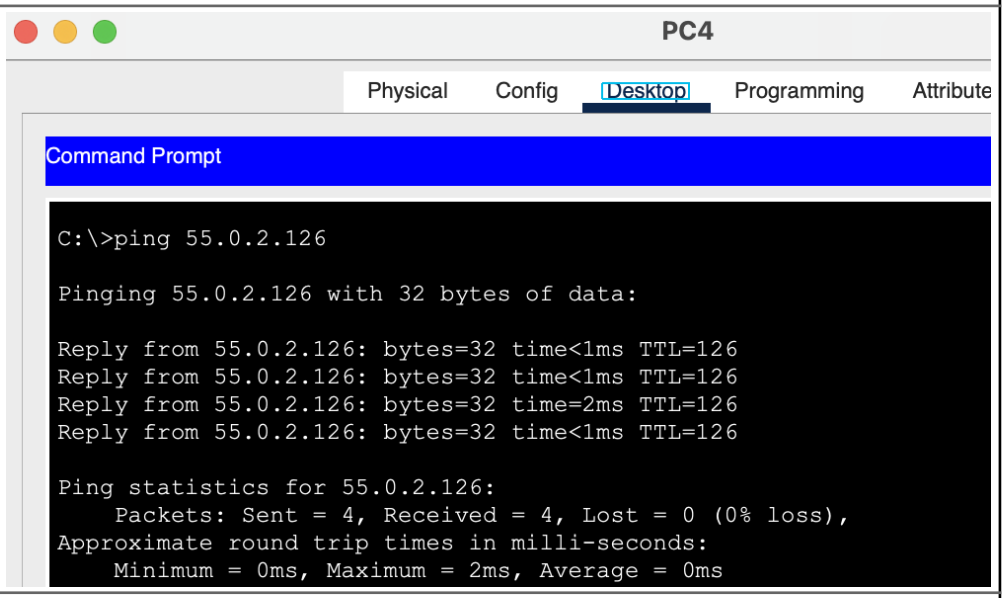
PC4-PC1



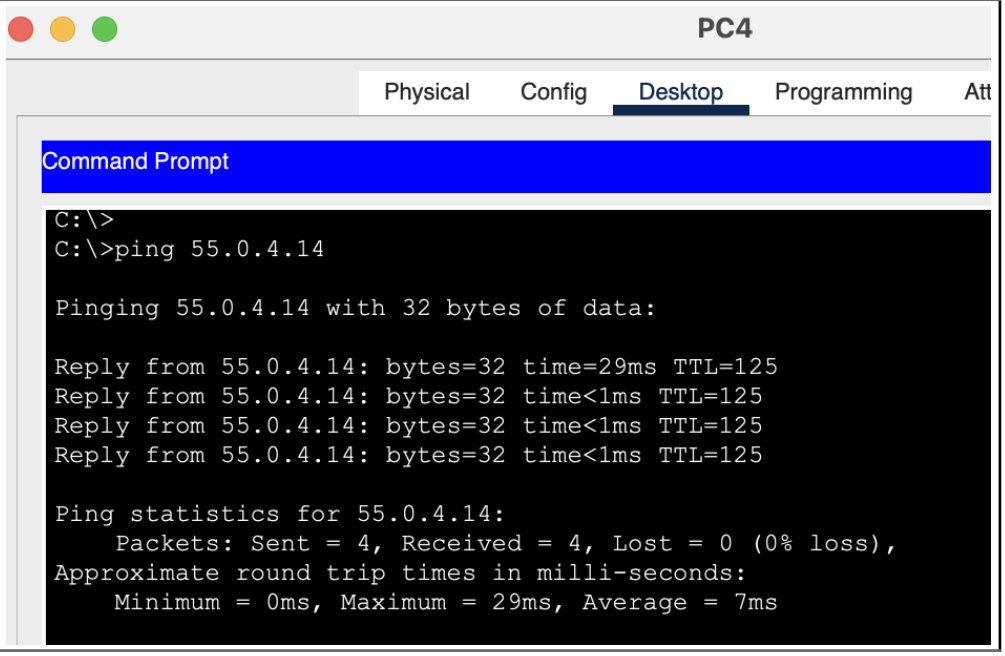
PC4-PC2



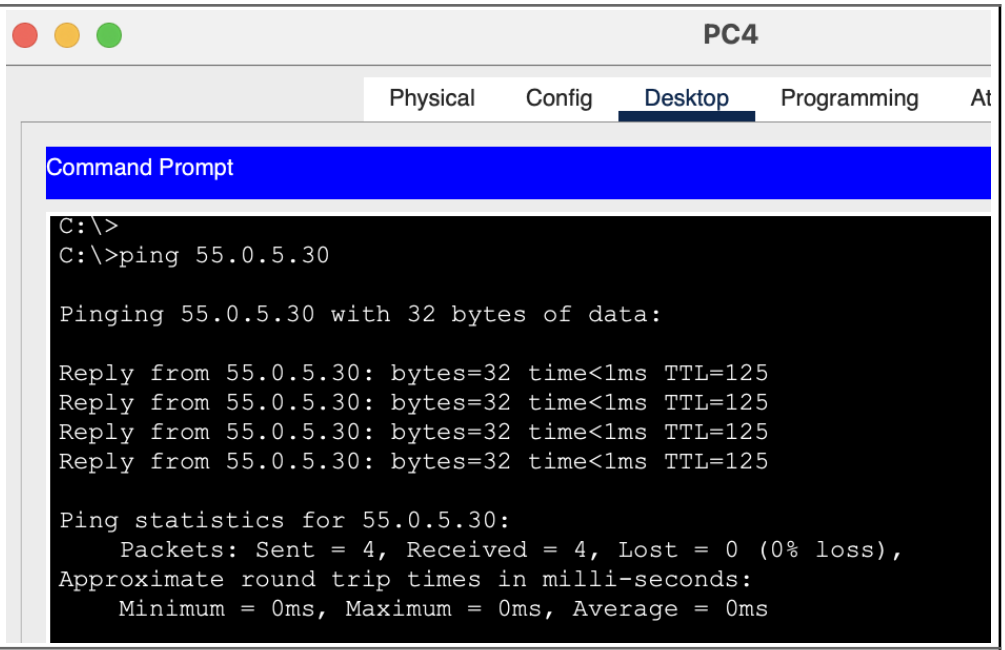
PC4-PC3



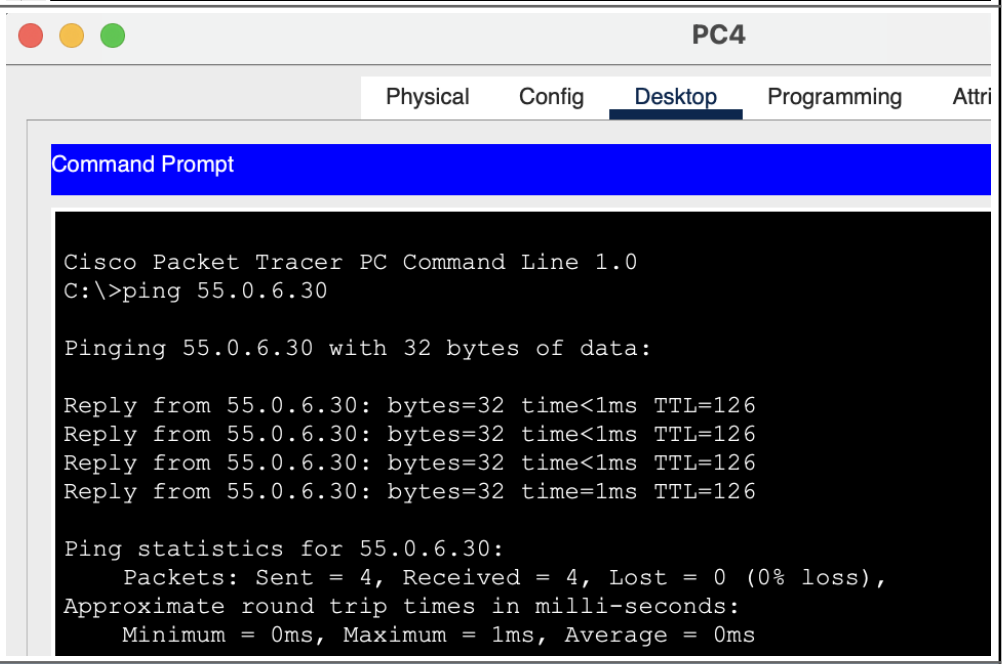
PC4-PC5



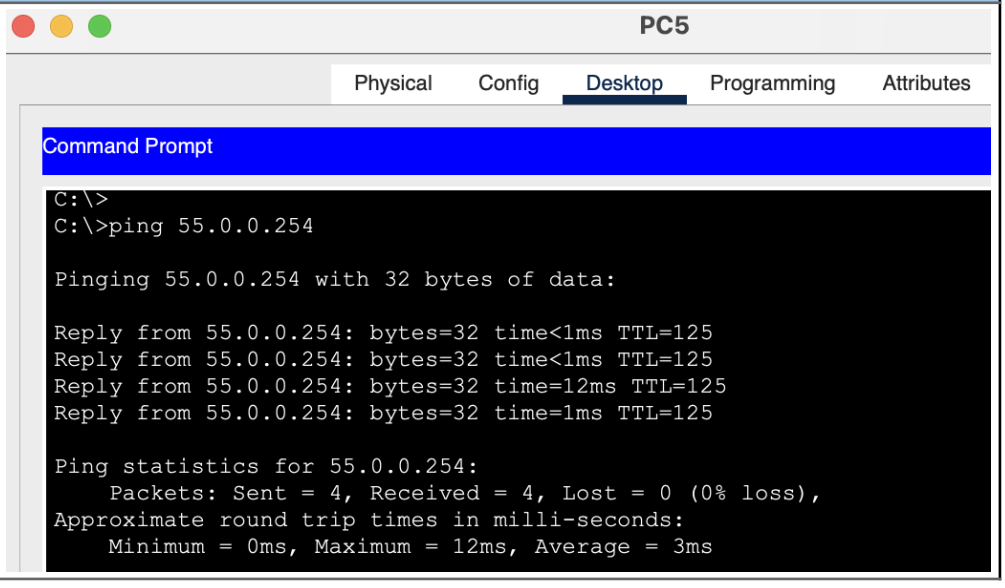
PC4-PC6



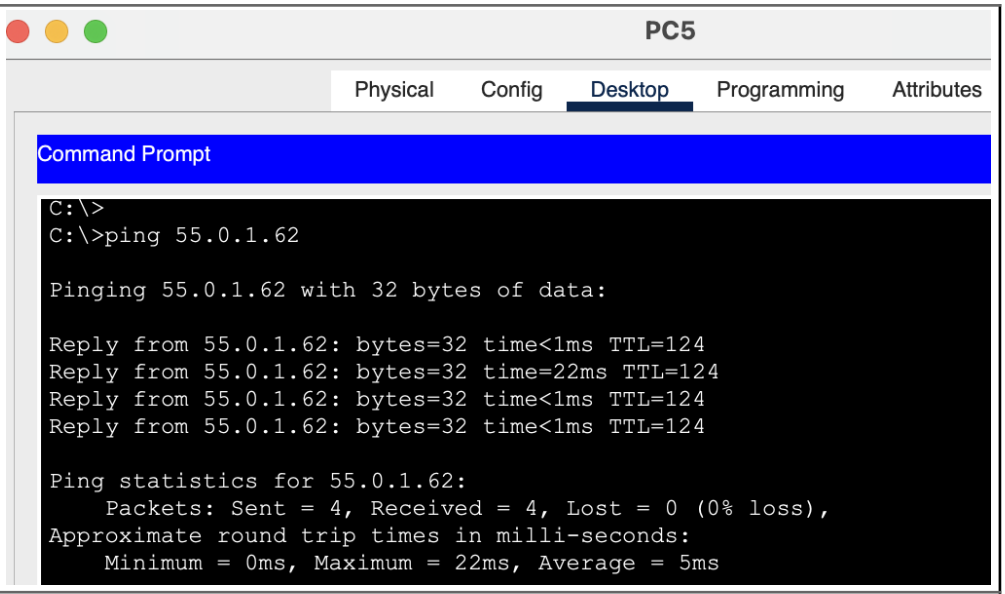
PC4-PC7



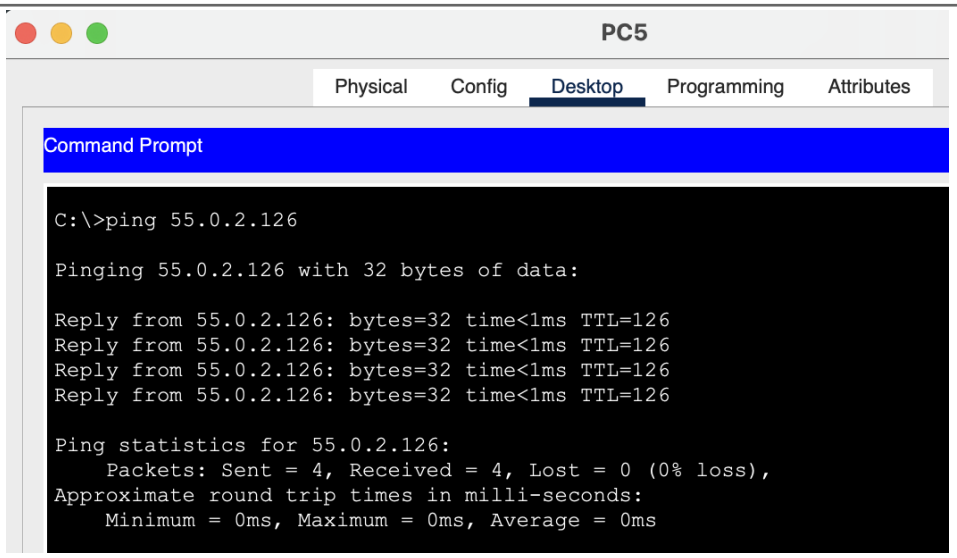
PC5-PC1



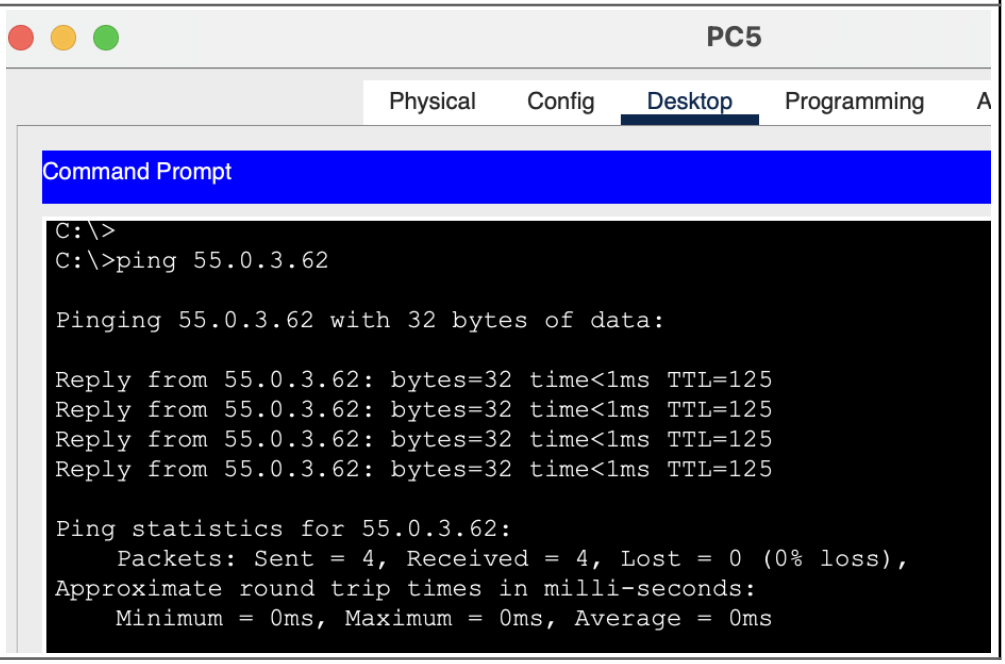
PC5-PC2



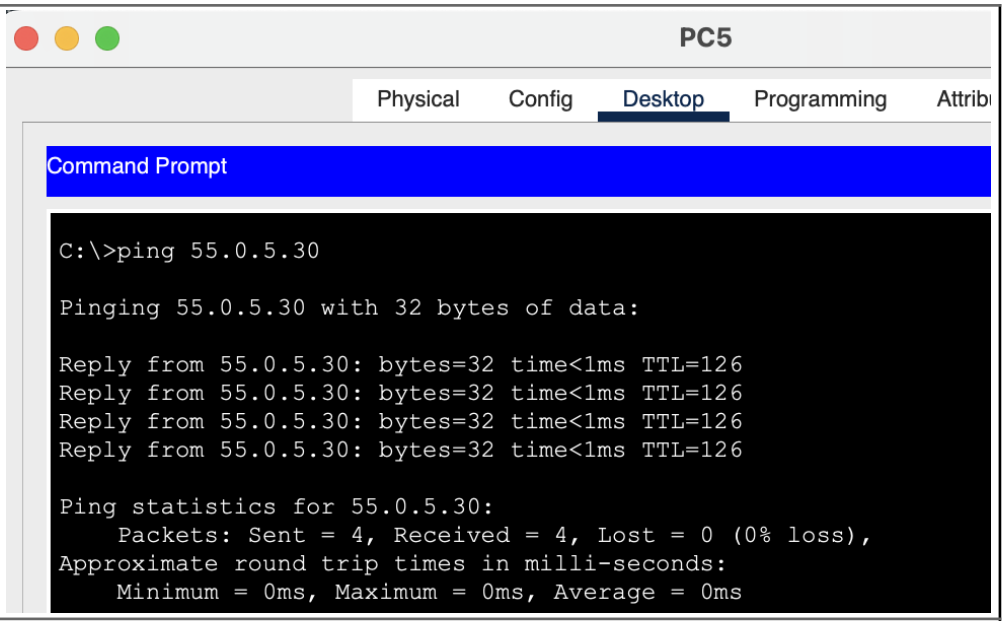
PC5-PC3



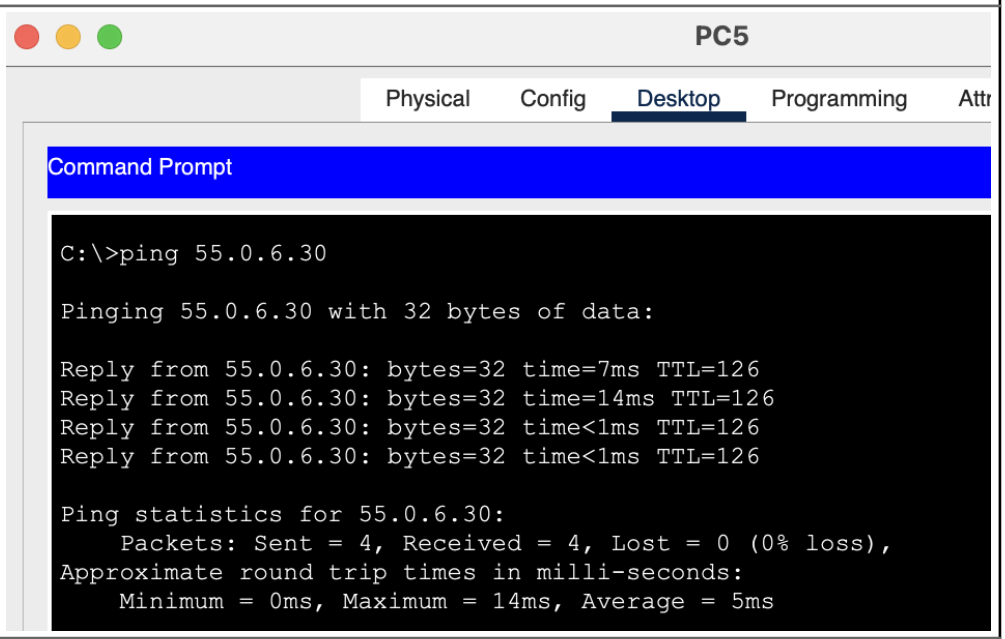
PC5-PC4



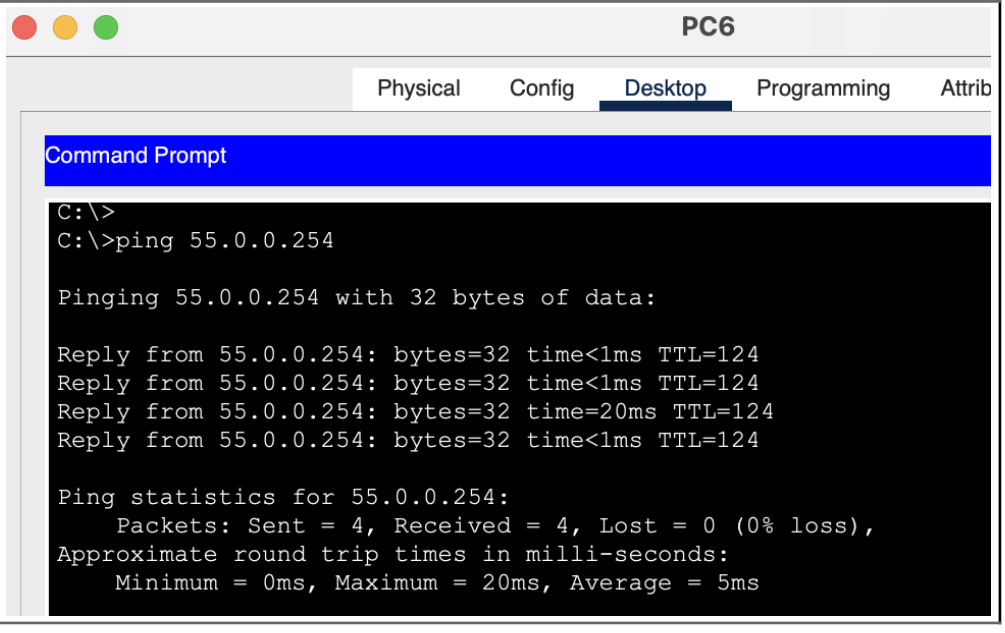
PC5-PC6



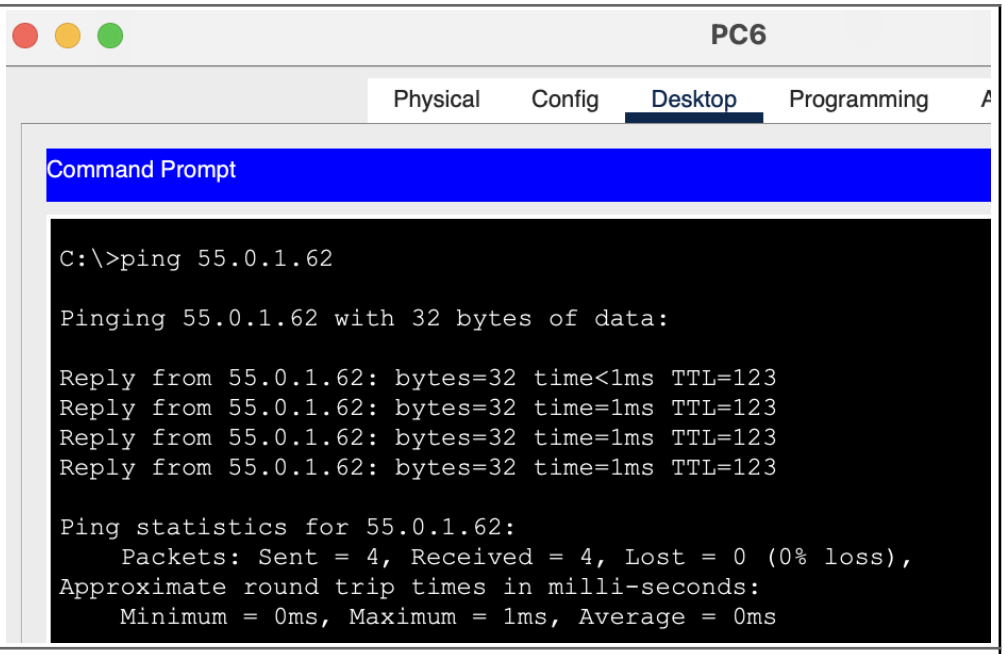
PC5-PC7



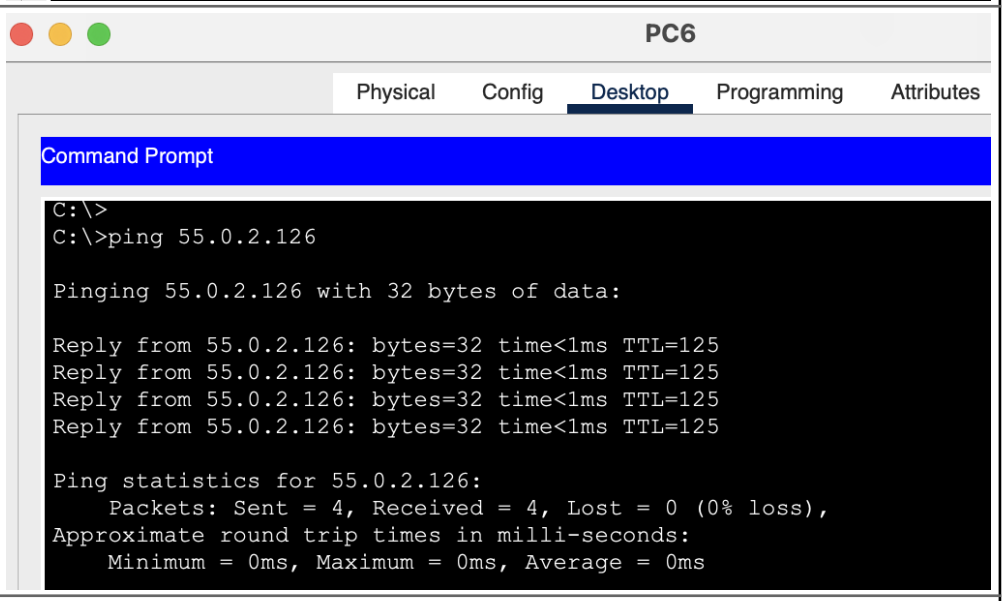
PC6-PC1



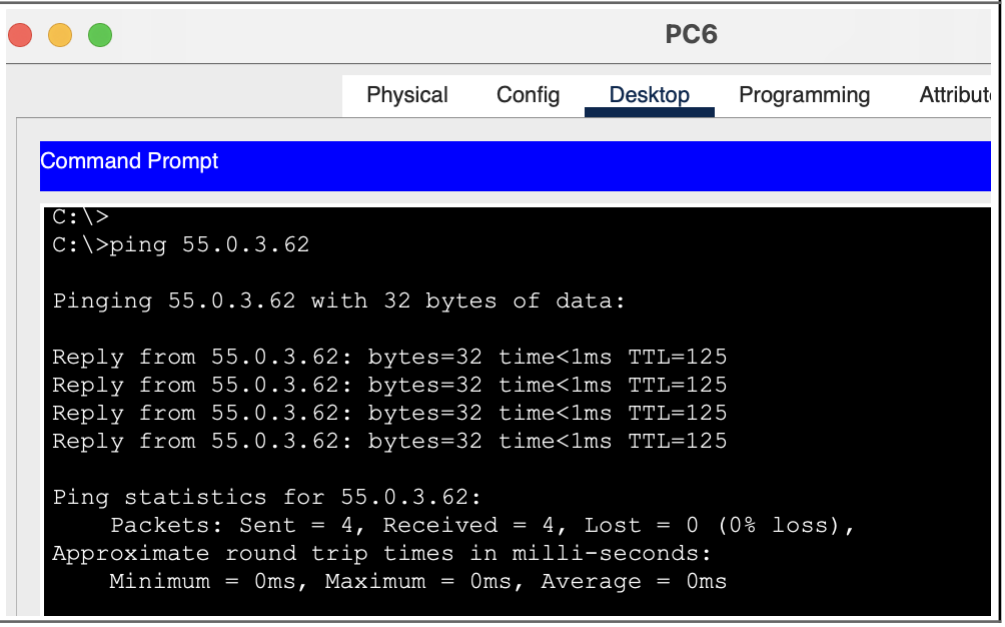
PC6-PC2



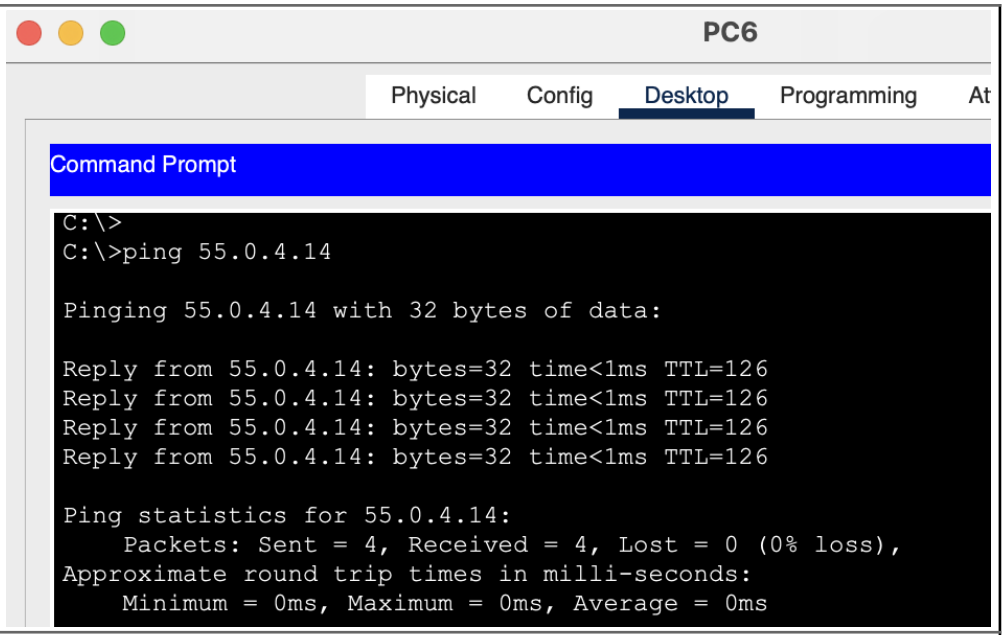
PC6-PC3



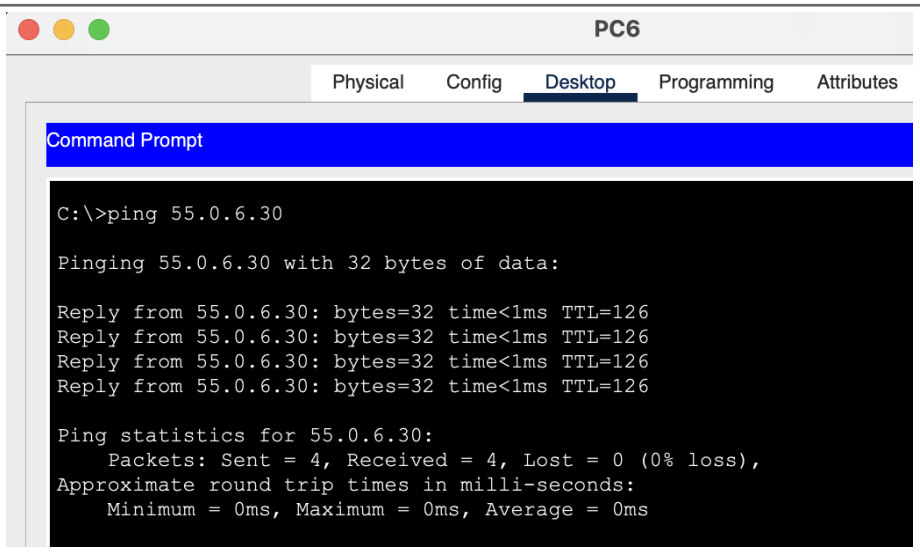
PC6-PC4



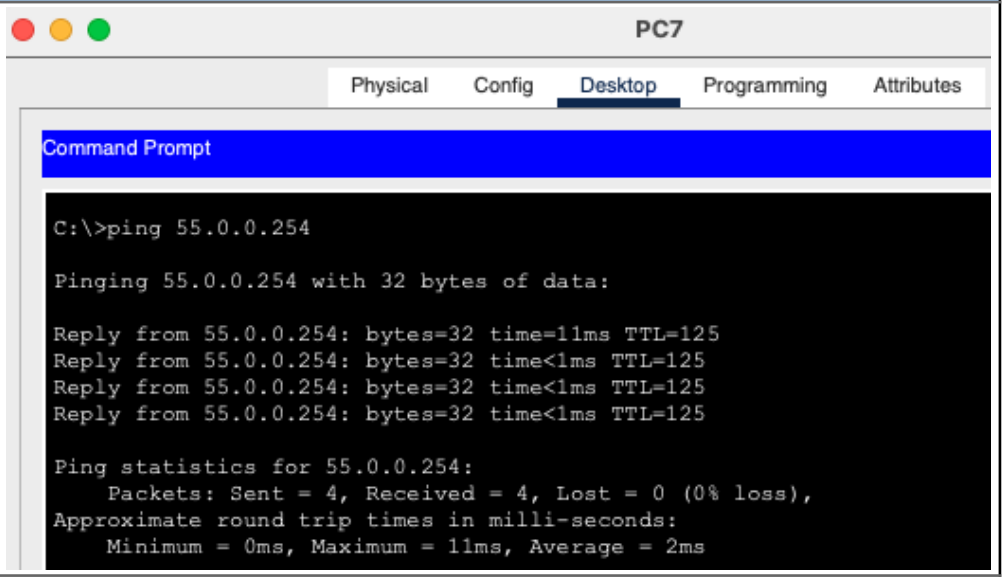
PC6-PC5



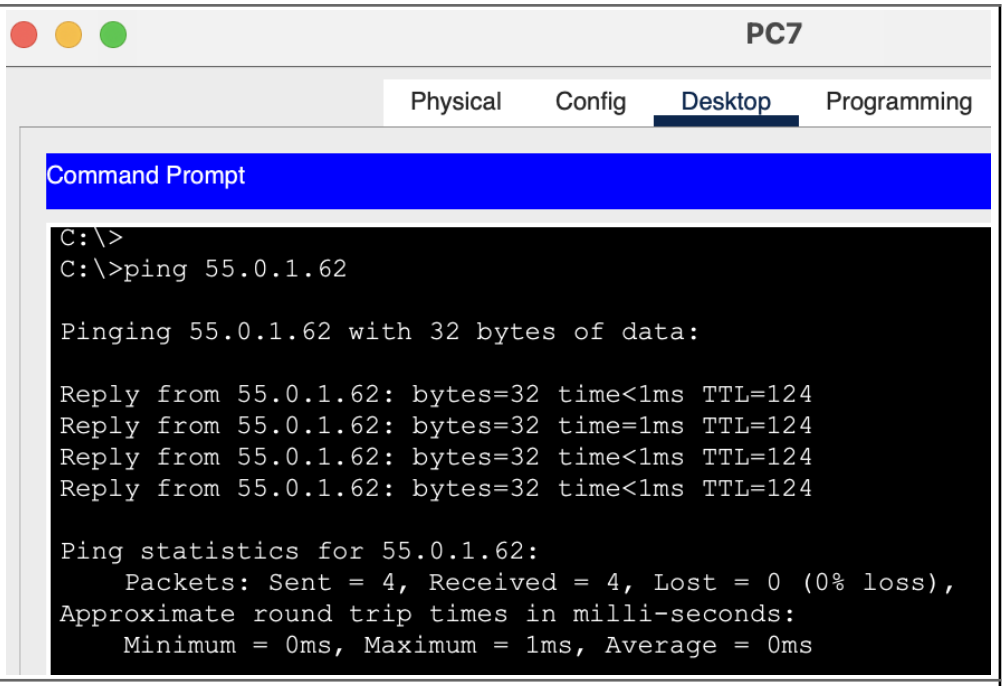
PC6-PC7



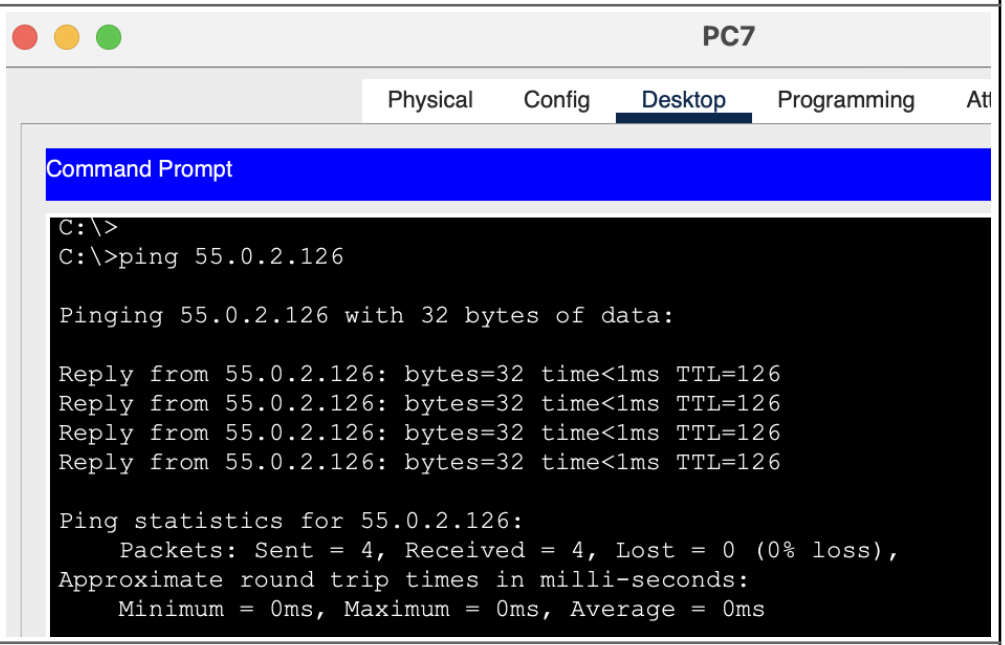
PC7-PC1



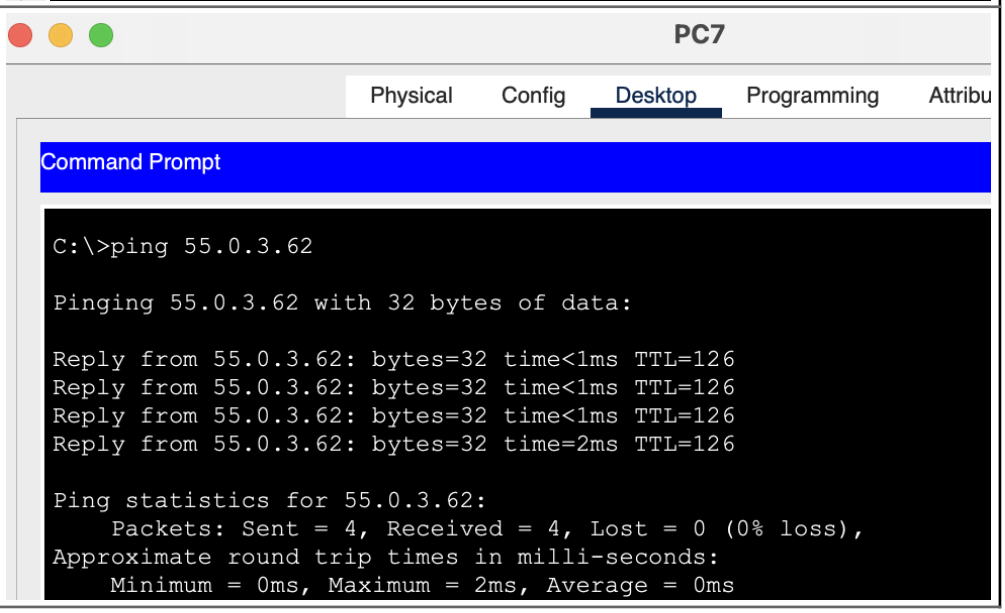
PC7-PC2

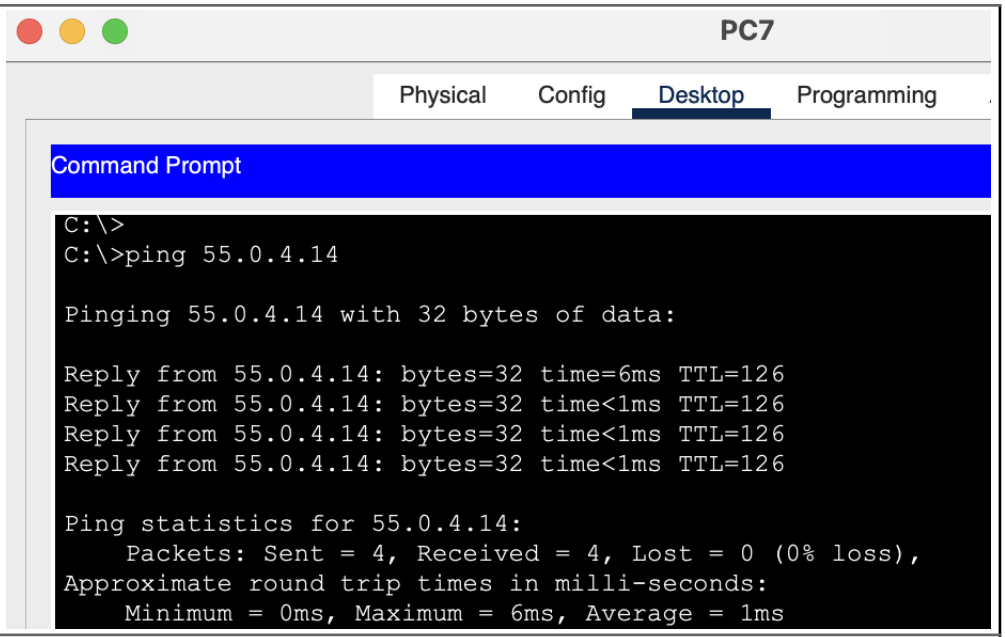


PC7-PC3



PC7-PC4



PC7-PC5	
PC7-PC6