Term Project

Student Name: 王虹博 **Student ID:** 18098532-I011-0018

Topology

There are 4 separate networks connected with various WAN technologies:

1. **ISP Access Network**
2. **Main Campus**
3. **Data Center**
4. **Home**

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1. ISP Access Network

1) Hosts

- Internet PC: it is connected to the ISP router directly, with an IP addresses of 202.175.10.156/29

It provides 3 types of network accesses:

- **Serial connection:** offering network addresses of 202.175.10.128/29 for Main Campus
- **Ethernet connection:** offering network addresses of 202.175.10.136/29 for Data Center
- **PPPoE via DSL connection:** offering network addresses of 202.175.10.144/29 for Home

2. Main Campus

Its configuration is as follows:

1) Hosts

- 1 Admin PC: the PC used by the network administrator of the campus
- 2 student PCs
- 1 Web server
- 1 FTP server

2) Network devices

In addition to a Gateway Router R1 connected to the ISP Access Network, you can deploy any other network devices (including Routers, Switches, DSL modems, etc) in the network if necessary.

3) VLANs

Note: you can create additional VLANs according to your need (e.g., VLANs for interconnected routers and switches)

- VLAN 10: for 1 Admin PC that can access the Internet
- VLAN 20: for 2 student PCs that can access the Internet
- VLAN 30: for an internal FTP server that cannot be accessed from Internet
- VLAN 40: for a Web server that can be accessed from Internet

4) Internet connection

The main campus connects the ISP Access Network through its Gateway Router R1 via Serial connection:

5) Private IP Addresses

- The Gateway Router R1 in the Main Campus provides DHCP service for the Admin PC with network prefix 192.168.10.0/24
- The Gateway Router R1 in the Main Campus provides DHCP service for the 2 student PCs with network prefix 192.168.20.0/24
- The FTP server has static private IP address: 192.168.30.10
- The Web server has static private IP address: 192.168.40.10

6) NAT service

The Gateway Router R1 in the Main Campus provides NAT service for 3 PCs, the FTP server and the Web server in the following ways:

- FTP server: static NAT type service with a public IP address 202.175.10.129
- Web server: static NAT type service with a public IP address 202.175.10.130
- Admin PC: PAT address translation, with a public IP 202.175.10.133
- Student PCs: PAT address translation, with a shared public IP 202.175.10.134

7) Access control

- The Web server allows access to its WWW service from all sites, including the Internet, but it only allows full access to it from the Admin PC.
- The FTP server does not allow access from Internet, but it allows FTP access to it from the three sites: Main Campus, Data Center, and Home. Note that accesses to the FTP server from the Data Center or Home must go through VPN. In addition, the FTP server also allows full access to it from the Admin PC.

3. Data Center

The Data Center is hosted by the ISP provider, and it has the following configuration.

1) Hosts

The Data Center has just 1 server, with private IP address 192.168.90.10, and public IP address 202.175.10.140

2) Network devices

In addition to a Gateway Router R6 connected to the ISP Access Network, you can deploy any other network devices (including Routers, Switches, DSL modems, etc) in the network if necessary.

3) Internet connection

The Data Center connects to the ISP Access Network through its Gateway Router R6 via Ethernet connection

5) VLANs

None

6) NAT service

The Gateway Router R6 in the Data Center provides static NAT service, which translates the private IP address 192.168.90.10 of the Data Center server to public IP address 202.175.10.140

7) Access control

- The Data Center can only be accessed by hosts within the Main Campus or by the Home PC. Note that accesses from the Main Campus to the Data Center must go through the site-to-site VPN setup between the Main Campus and the Data Center, and accesses from Home to the Data Center must go through the remote-access VPN setup between the Main Campus and the Home PC.

4. Home

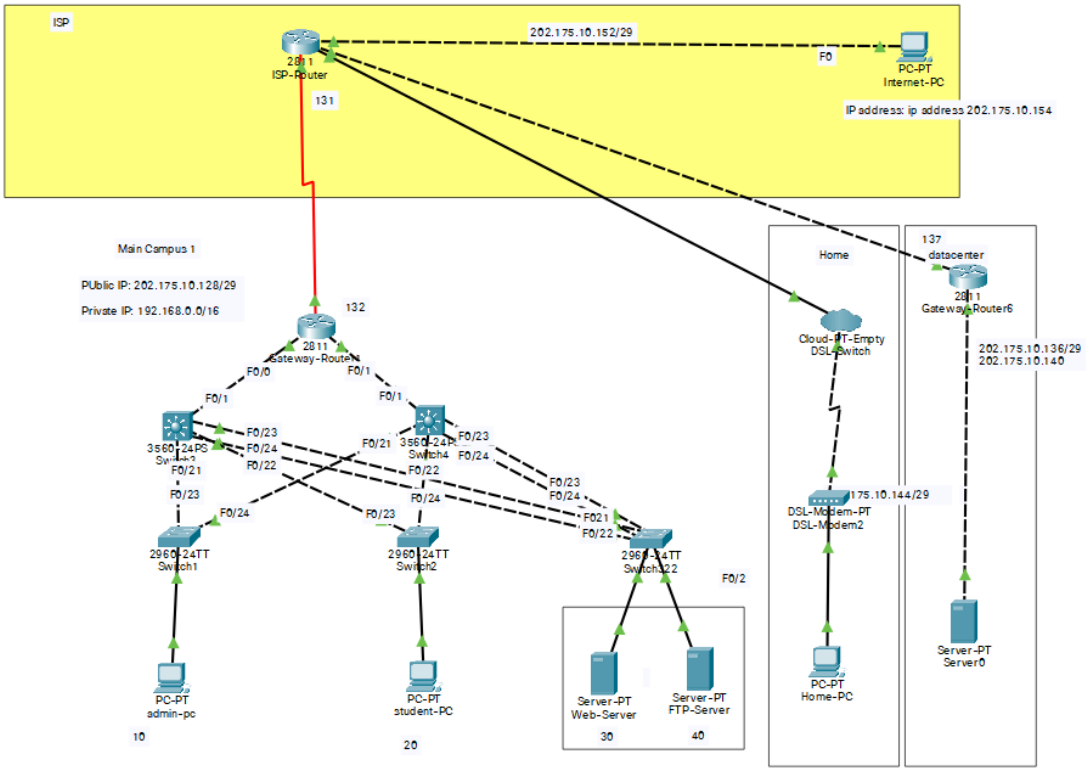
There is a Home PC that is connected to the ISP Access Network with PPPoE via a DSL modem, and it will be assigned an IP address from the address pool 202.175.10.148/29. The Home PC can access hosts within the Main Campus or Data Center via remote-access VPN.

Tasks

Part 0: Construction of Topology

1) Network topology construction

Please construct the network topology in Cisco Packet Tracer, and paste the screenshot of the topology in this report.



Part 1: ISP Access Network & Main Campus

In this part, you only need to configure the hosts and network devices in the ISP Access Network and the Main Campus, and perform a set of tests.

1) Please list your configuration commands of the steps in a table：

Step	Device	Command
1	Switch1	interface FastEthernet0/1
2	Switch1	switchport access vlan 10
3	Switch1	switchport mode access
4	Switch1	interface FastEthernet0/2
5	Switch1	switchport access vlan 10
6	Switch1	switchport mode access
7	Switch1	interface Vlan1
8	Switch2	interface FastEthernet0/1
9	Switch2	switchport access vlan 20
10	Switch2	switchport mode access
11	Switch2	interface FastEthernet0/2
12	Switch2	switchport access vlan 20
13	Switch2	switchport mode access

14	Switch3	interface Port-channel3
15	Switch3	switchport trunk encapsulation dot1q
16	Switch3	switchport mode trunk
17	Switch3	interface FastEthernet0/1
18	Switch3	switchport access vlan 101
19	Switch3	switchport mode access
20	Switch3	switchport nonegotiate
21	Switch3	interface FastEthernet0/21
22	Switch3	switchport trunk encapsulation dot1q
23	Switch3	switchport mode trunk
24	Switch3	interface FastEthernet0/22
25	Switch3	switchport trunk encapsulation dot1q
26	Switch3	switchport mode trunk
27	Switch3	interface FastEthernet0/23
28	Switch3	switchport trunk encapsulation dot1q
29	Switch3	switchport mode trunk
30	Switch3	channel-protocol lacp
31	Switch3	channel-group 3 mode active
32	Switch3	interface FastEthernet0/24
33	Switch3	switchport trunk encapsulation dot1q
34	Switch3	switchport mode trunk
35	Switch3	channel-protocol lacp
36	Switch3	channel-group 3 mode active
37	Switch3	interface Vlan10
38	Switch3	mac-address 000b.be7b.8a01
39	Switch3	ip address 192.168.10.1 255.255.255.0
40	Switch3	ip helper-address 192.168.101.1
41	Switch3	standby version 2
42	Switch3	standby 10 ip 192.168.10.254
43	Switch3	standby 10 preempt
44	Switch3	interface Vlan20
45	Switch3	mac-address 000b.be7b.8a02
46	Switch3	ip address 192.168.20.1 255.255.255.0
47	Switch3	ip helper-address 192.168.101.1
48	Switch3	standby version 2
49	Switch3	standby 20 ip 192.168.20.254
50	Switch3	standby 20 preempt
51	Switch3	interface Vlan30
52	Switch3	mac-address 000b.be7b.8a03
53	Switch3	ip address 192.168.30.1 255.255.255.0
54	Switch3	standby version 2
55	Switch3	standby 30 ip 192.168.30.254
56	Switch3	standby 30 priority 99

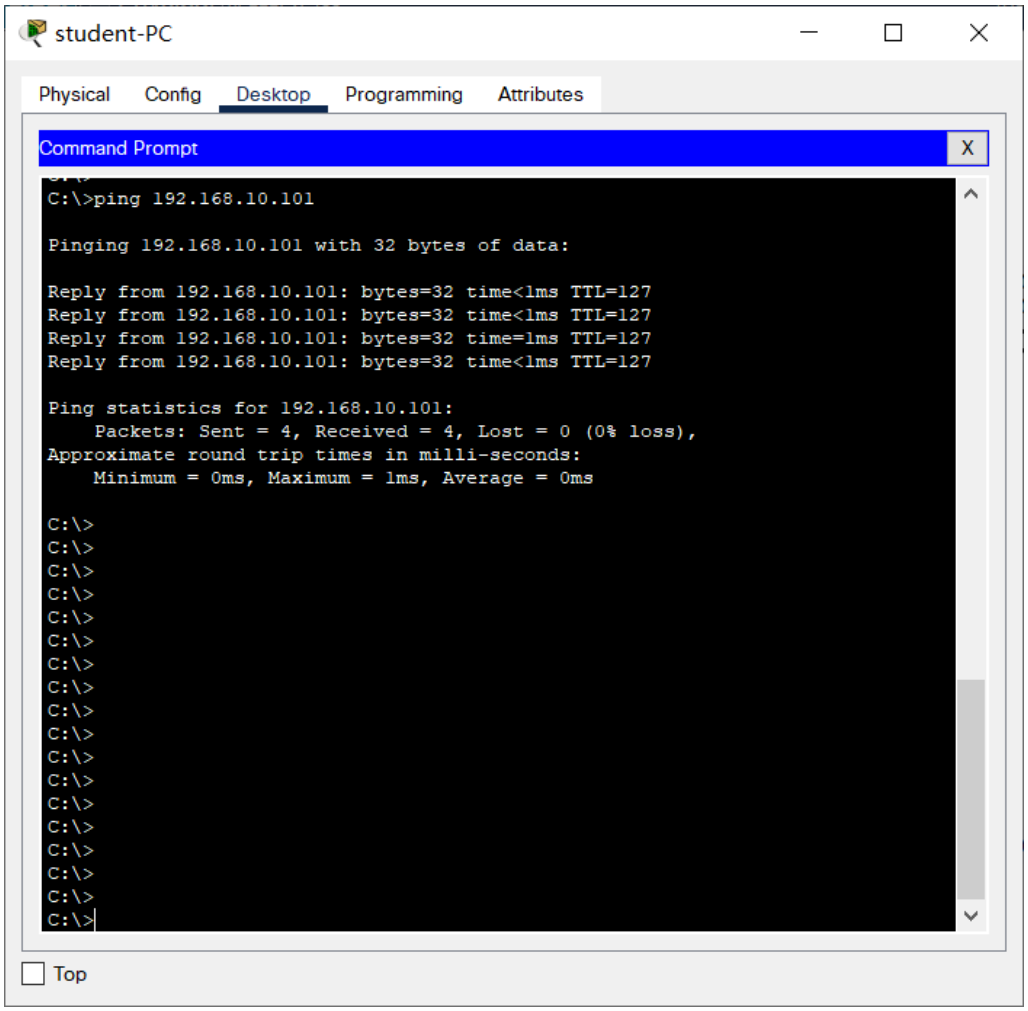
57	Switch3	standby 30 preempt
58	Switch3	interface Vlan40
59	Switch3	mac-address 000b.be7b.8a04
60	Switch3	ip address 192.168.40.1 255.255.255.0
61	Switch3	standby version 2
62	Switch3	standby 40 ip 192.168.40.254
63	Switch3	standby 40 priority 99
64	Switch3	standby 40 preempt
65	Switch3	interface Vlan101
66	Switch3	mac-address 000b.be7b.8a05
67	Switch3	ip address 192.168.101.2 255.255.255.0
68	Switch3	ip classless
69	Switch3	ip route 0.0.0.0 0.0.0.0 192.168.101.1
70	Switch3	ip route 202.175.10.136 255.255.255.248 192.168.101.1
71	Switch3	ip route 202.175.10.144 255.255.255.248 192.168.101.1
72	Switch3	ip route 192.168.90.0 255.255.255.0 192.168.101.1
73	Switch4	interface FastEthernet0/1
74	Switch4	switchport access vlan 102
75	Switch4	switchport mode access
76	Switch4	switchport nonegotiate
77	Switch4	interface FastEthernet0/21
78	Switch4	switchport trunk encapsulation dot1q
79	Switch4	switchport mode trunk
80	Switch4	interface FastEthernet0/22
81	Switch4	switchport trunk encapsulation dot1q
82	Switch4	switchport mode trunk
83	Switch4	interface FastEthernet0/23
84	Switch4	switchport trunk encapsulation dot1q
85	Switch4	switchport mode trunk
86	Switch4	channel-protocol lacp
87	Switch4	channel-group 4 mode active
88	Switch4	interface FastEthernet0/24
89	Switch4	switchport trunk encapsulation dot1q
90	Switch4	switchport mode trunk
91	Switch4	channel-protocol lacp
92	Switch4	channel-group 4 mode active
93	Switch4	interface Vlan10
94	Switch4	mac-address 0010.1135.5801
95	Switch4	ip address 192.168.10.2 255.255.255.0
96	Switch4	ip helper-address 192.168.102.1

97	Switch4	standby version 2
98	Switch4	standby 10 ip 192.168.10.254
99	Switch4	interface Vlan20
100	Switch4	mac-address 0010.1135.5802
101	Switch4	ip address 192.168.20.2 255.255.255.0
102	Switch4	ip helper-address 192.168.102.1
103	Switch4	standby version 2
104	Switch4	standby 20 ip 192.168.20.254
105	Switch4	standby 20 priority 99
106	Switch4	standby 20 preempt
107	Switch4	interface Vlan30
108	Switch4	mac-address 0010.1135.5803
109	Switch4	ip address 192.168.30.2 255.255.255.0
110	Switch4	standby version 2
111	Switch4	standby 30 ip 192.168.30.254
112	Switch4	standby 30 preempt
113	Switch4	interface Vlan40
114	Switch4	mac-address 0010.1135.5804
115	Switch4	ip address 192.168.40.2 255.255.255.0
116	Switch4	standby version 2
117	Switch4	standby 40 ip 192.168.40.254
118	Switch4	standby 40 preempt
119	Switch4	interface Vlan102
120	Switch4	mac-address 0010.1135.5805
121	Switch4	ip address 192.168.102.2 255.255.255.0
122	Switch4	ip classless
123	Switch4	ip route 0.0.0.0 0.0.0.0 192.168.102.1
124	Switch4	ip route 202.175.10.136 255.255.255.248 192.168.102.1
125	Switch4	ip route 202.175.10.144 255.255.255.248 192.168.102.1
126	Switch4	ip route 192.168.90.0 255.255.255.0 192.168.102.1
127	Gateway router1	interface FastEthernet1/0
128	Gateway router1	ip address 202.175.0.2 255.255.255.0
129	Gateway router1	ip nat pool admin-pcPool 202.175.10.133 202.175.10.133 netmask 255.255.255.255
130	Gateway router1	ip nat pool student-pcPool 202.175.10.134 202.175.10.134 netmask 255.255.255.255
131	Gateway router1	ip nat inside source list 11 pool admin-pcPool overload
132	Gateway router1	ip nat inside source list 12 pool student-pcPool overload

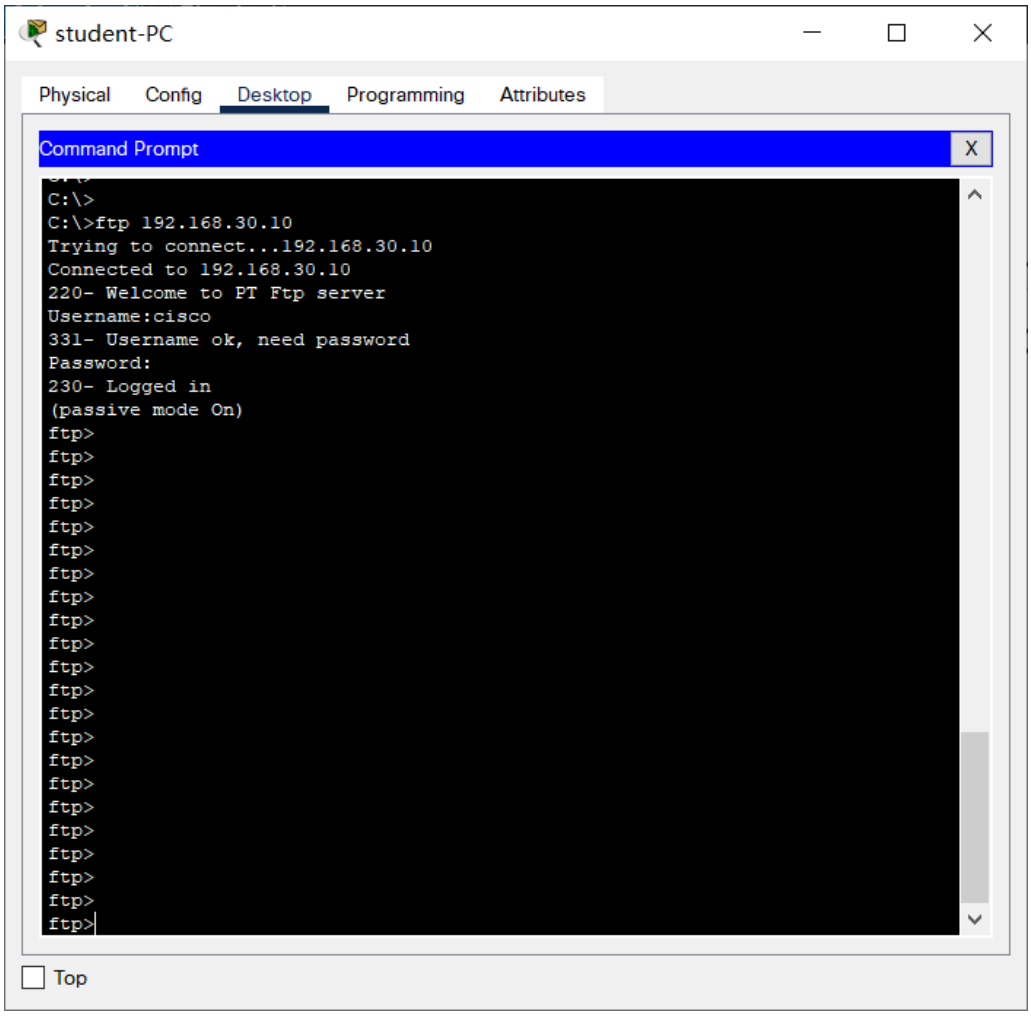
133	Gateway router1	ip nat inside source static 192.168.30.10 202.175.10.129
134	Gateway router1	ip nat inside source static 192.168.40.10 202.175.10.130
135	Gateway router1	ip dhcp excluded-address 192.168.10.1 192.168.10.100
136	Gateway router1	ip dhcp excluded-address 192.168.20.1 192.168.20.100
137	Gateway router1	ip dhcp excluded-address 192.168.30.1 192.168.30.100
138	Gateway router1	ip dhcp excluded-address 192.168.40.1 192.168.40.100
139	Gateway router1	ip dhcp pool admin-pc
140	Gateway router1	network 192.168.10.0 255.255.255.0
141	Gateway router1	default-router 192.168.10.254
142	Gateway router1	ip dhcp pool student-pc
143	Gateway router1	network 192.168.20.0 255.255.255.0
144	Gateway router1	default-router 192.168.20.254
145	Gateway router1	ip dhcp pool ftp-ser
146	Gateway router1	network 192.168.30.0 255.255.255.0
147	Gateway router1	default-router 192.168.30.254
148	Gateway router1	ip dhcp pool web-ser
149	Gateway router1	network 192.168.40.0 255.255.255.0
150	Gateway router1	default-router 192.168.40.254
151	ISP-Router	interface FastEthernet0/0
152	ISP-Router	ip address 202.175.10.153 255.255.255.248
153	ISP-Router	no shutdown
154	ISP-Router	interface Serial1/0/0
155	ISP-Router	ip address 202.175.10.131 255.255.255.248
156	ISP-Router	encapsulation ppp
157	ISP-Router	clock rate 2000000
158	ISP-Router	no shutdown

2) Please perform the following tests, and paste their results.

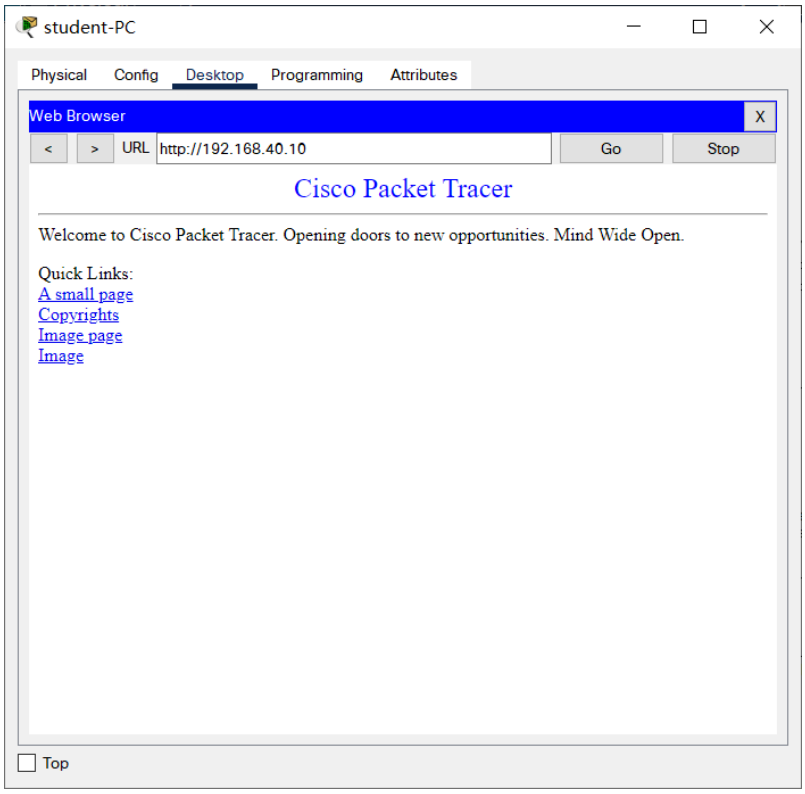
a. Ping results from a student PC to the Admin PC



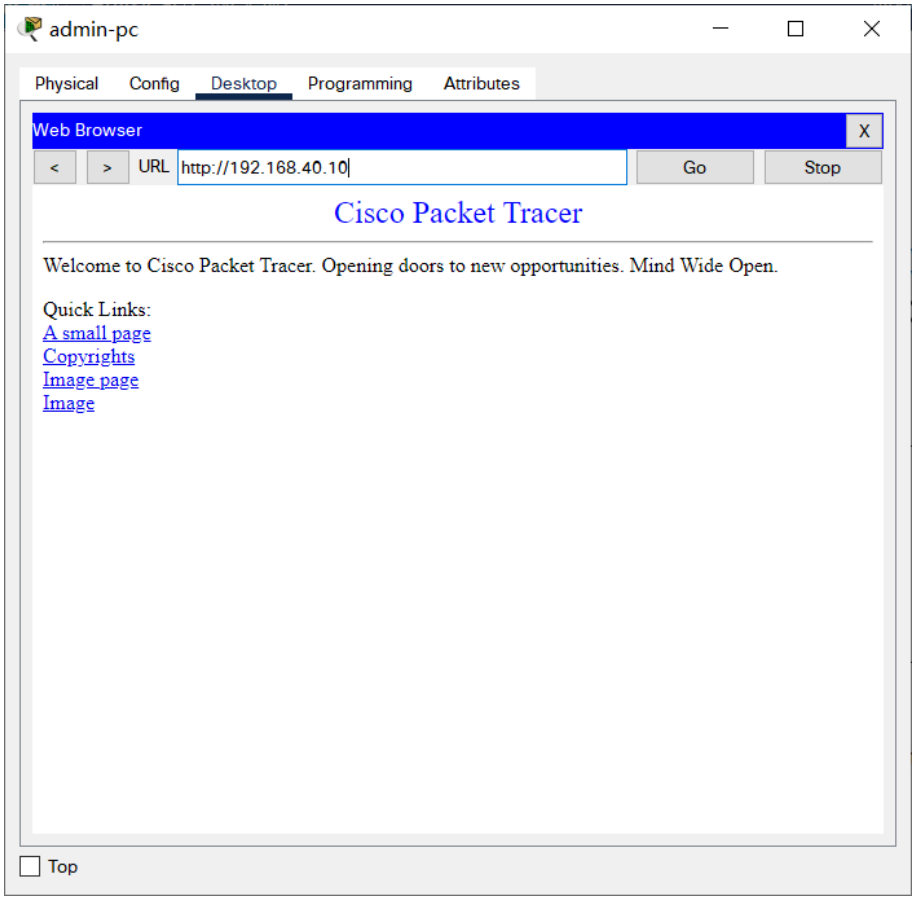
b. FTP access results from a student PC to the FTP server



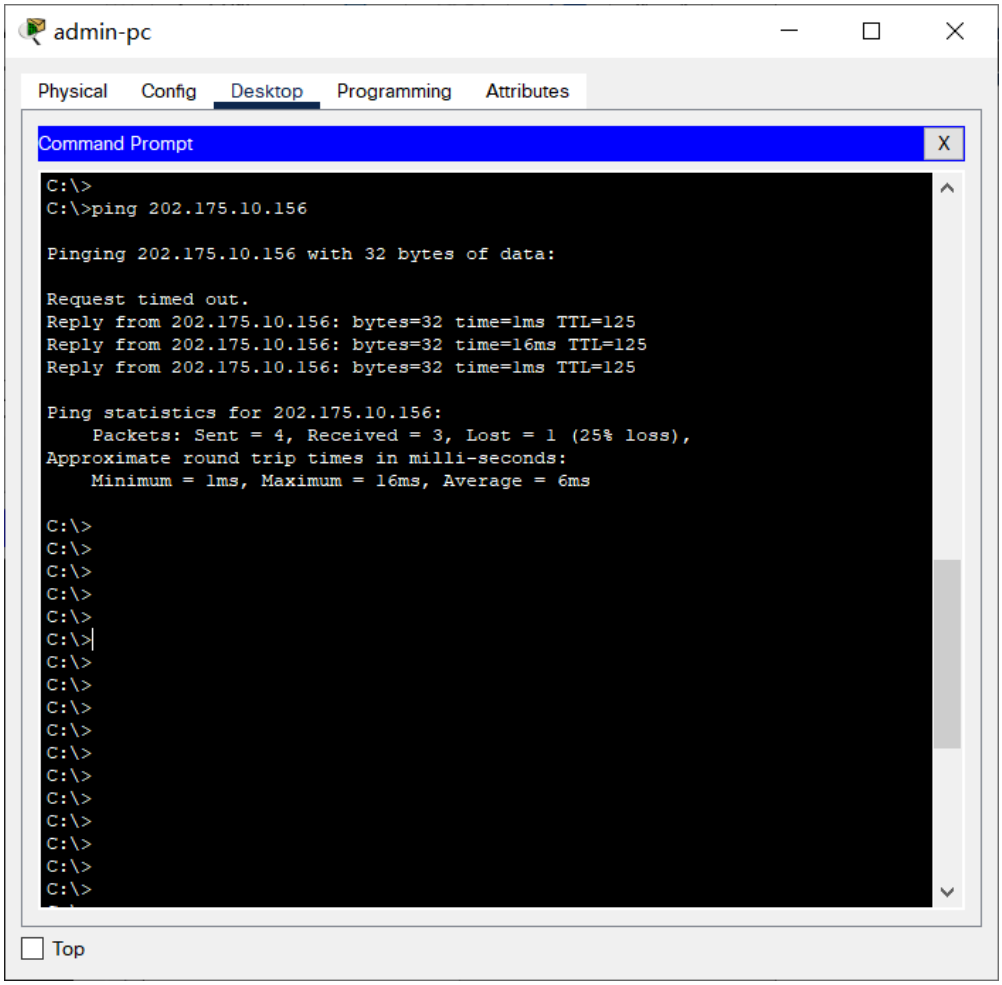
c. HTTP access results from a student PC to the Web server



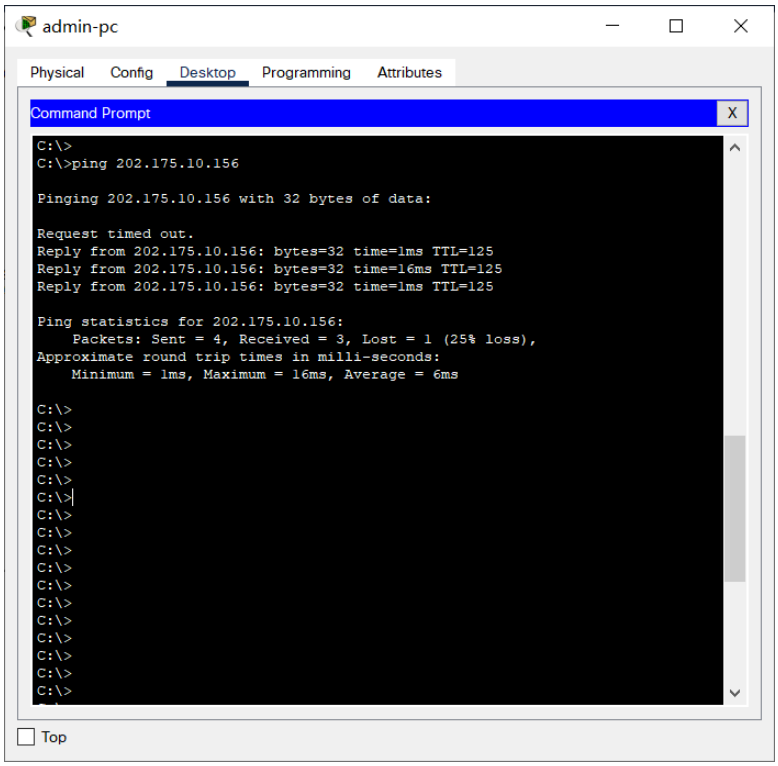
d. HTTP access results from the Admin PC to the Web server



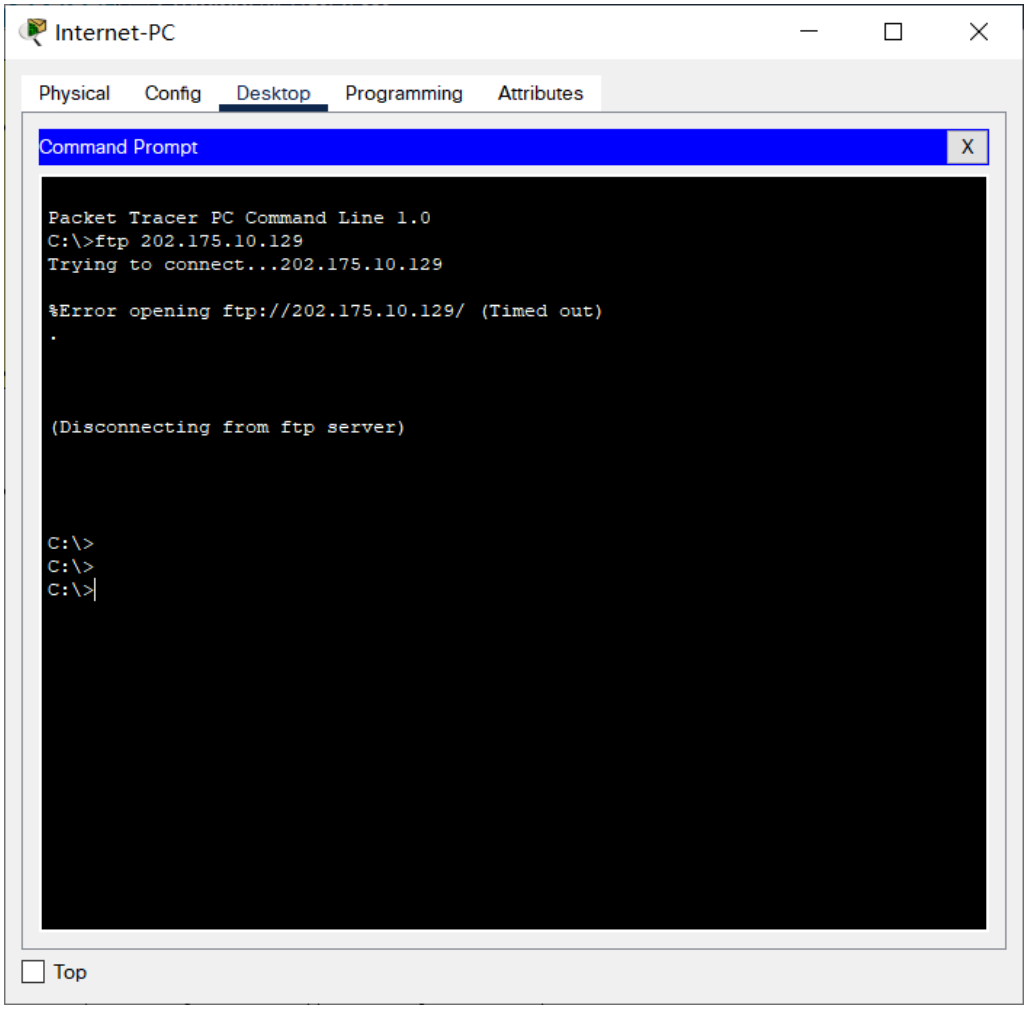
e. Ping results from a student PC to the Internet PC



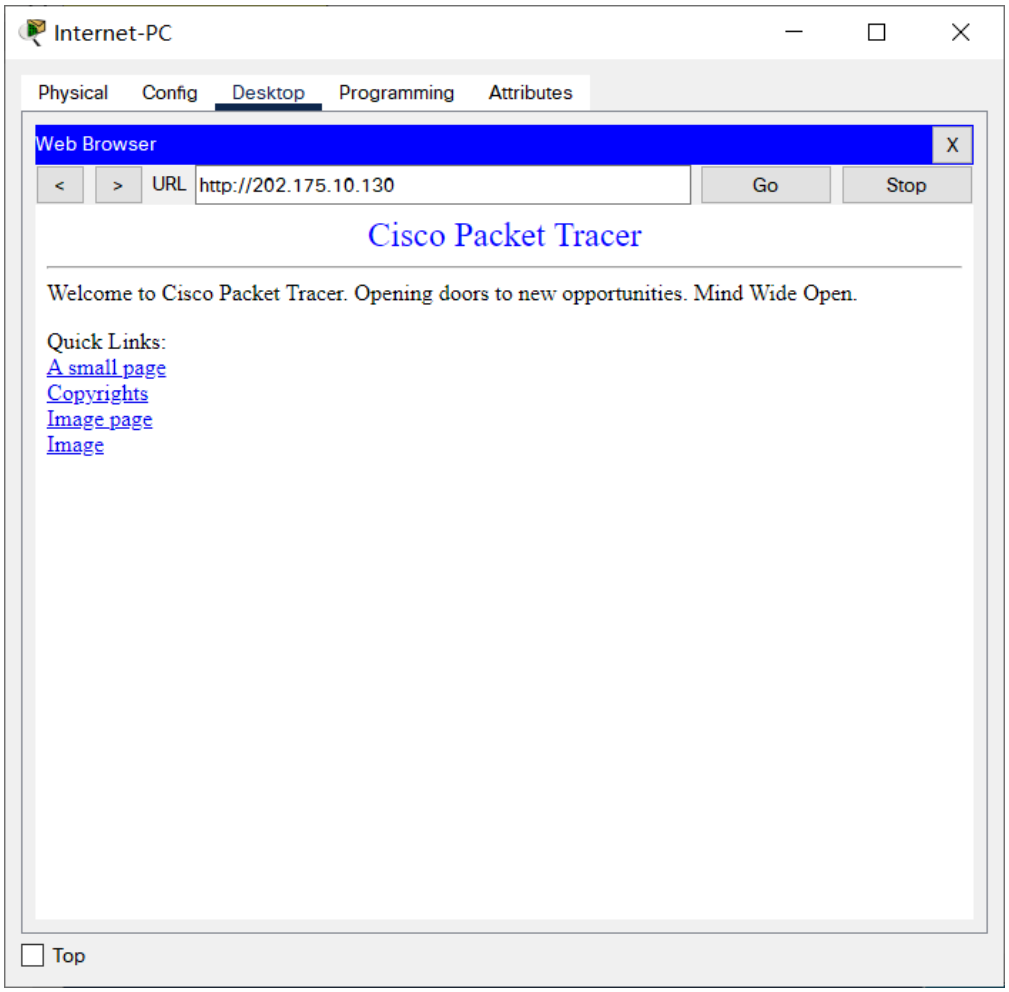
f. Ping results from the Admin PC to the Internet PC



g. FTP access results from the Internet PC to the FTP server



h. HTTP access results from the Internet PC to the Web server



Part 2: Data Center

In this part, you will configure the site of the Data Center based on the configuration of Part 2, and perform a set of tests.

1) Please list your configuration commands of the steps in a table：

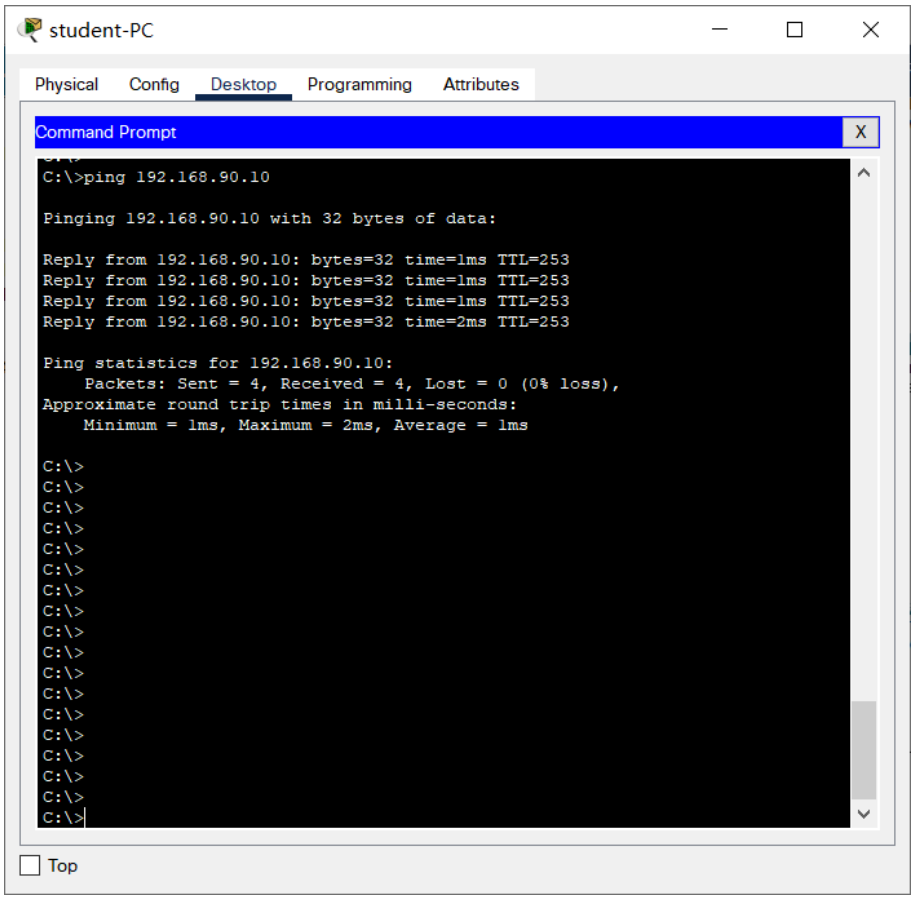
Step	Device	Command
1	Gateway Router6	crypto isakmp policy 10
2	Gateway Router6	encr 3des
3	Gateway Router6	hash md5
4	Gateway Router6	authentication pre-share
5	Gateway Router6	group 2
6	Gateway Router6	crypto isakmp key SITE-VPN-KEY address 202.175.0.2
7	Gateway Router6	crypto isakmp key SITE-VPN-KEY address 202.175.10.132

8	Gateway Router6	crypto ipsec transform-set SITE-VPN-TRANSFORM esp-3des esp-md5-hmac
9	Gateway Router6	crypto map SITE-VPN-MAP 10 ipsec-isakmp
10	Gateway Router6	set peer 202.175.10.132
11	Gateway Router6	set transform-set SITE-VPN-TRANSFORM
12	Gateway Router6	match address SITE-VPN-INTERESTING-TRAFFIC
13	Gateway Router6	interface FastEthernet0/0
14	Gateway Router6	ip address 192.168.90.1 255.255.255.0
15	Gateway Router6	ip nat inside
16	Gateway Router6	duplex auto
17	Gateway Router6	speed auto
18	Gateway Router6	interface FastEthernet0/1
19	Gateway Router6	no ip address
20	Gateway Router6	duplex auto
21	Gateway Router6	speed auto
22	Gateway Router6	shutdown
23	Gateway Router6	interface FastEthernet1/0
24	Gateway Router6	ip address 202.175.10.137 255.255.255.248
25	Gateway Router6	pppoe enable
26	Gateway Router6	ip nat outside
27	Gateway Router6	duplex auto
28	Gateway Router6	speed auto
29	Gateway Router6	crypto map SITE-VPN-MAP
30	Gateway Router6	ip nat pool nat 202.175.10.141 202.175.10.142 netmask 255.255.255.248
31	Gateway Router6	ip nat inside source list 10 pool nat overload
32	Gateway Router6	ip nat inside source static 192.168.90.10 202.175.10.140
33	Gateway Router6	ip classless
34	Gateway Router6	ip route 202.175.10.128 255.255.255.248 202.175.10.138
35	Gateway Router6	ip route 0.0.0.0 0.0.0.0 202.175.10.138
36	Gateway Router6	ip route 202.175.10.129 255.255.255.255 202.175.10.138
37	Gateway Router6	ip route 202.175.10.130 255.255.255.255 202.175.10.138
38	Gateway Router6	ip route 192.168.10.0 255.255.255.0 202.175.10.138
39	Gateway Router6	ip route 192.168.20.0 255.255.255.0 202.175.10.138
40	Gateway Router6	ip route 192.168.30.0 255.255.255.0 202.175.10.138
41	Gateway Router6	ip route 192.168.40.0 255.255.255.0

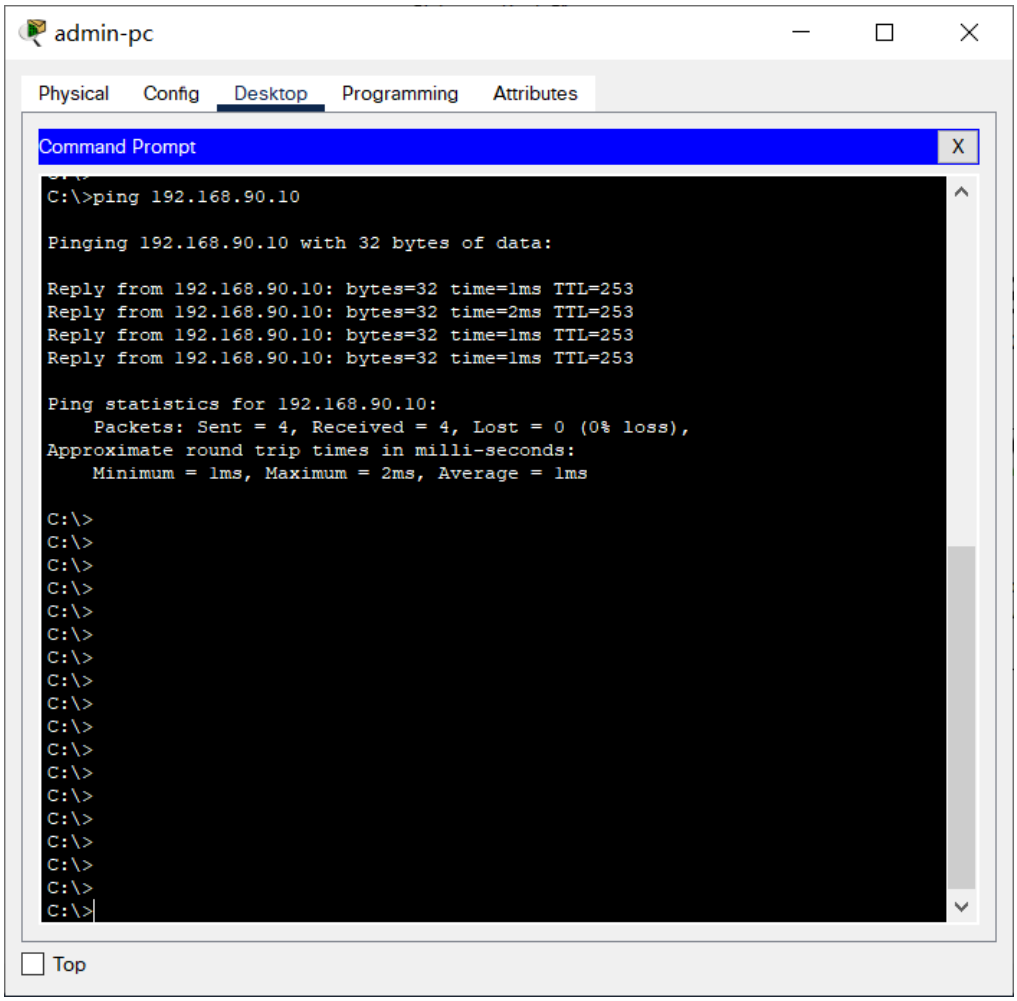
		202.175.10.138
42	Gateway Router6	ip nat pool nat 202.175.10.141 202.175.10.142 netmask 255.255.255.248
43	Gateway Router6	ip access-list extended SITE-VPN-INTERESTING-TRAFFIC
44	Gateway Router6	permit ip 192.168.90.0 0.0.0.255 192.168.0.0 0.0.255.255
48	Gateway Router6	access-list 10 permit 192.168.90.0 0.0.0.255
46	ISP-Router	ip route 192.168.90.0 255.255.255.0 202.175.10.139
47	ISP-Router	ip route 202.175.10.136 255.255.255.248 202.175.10.139

2) Please perform the following tests, and paste their results.

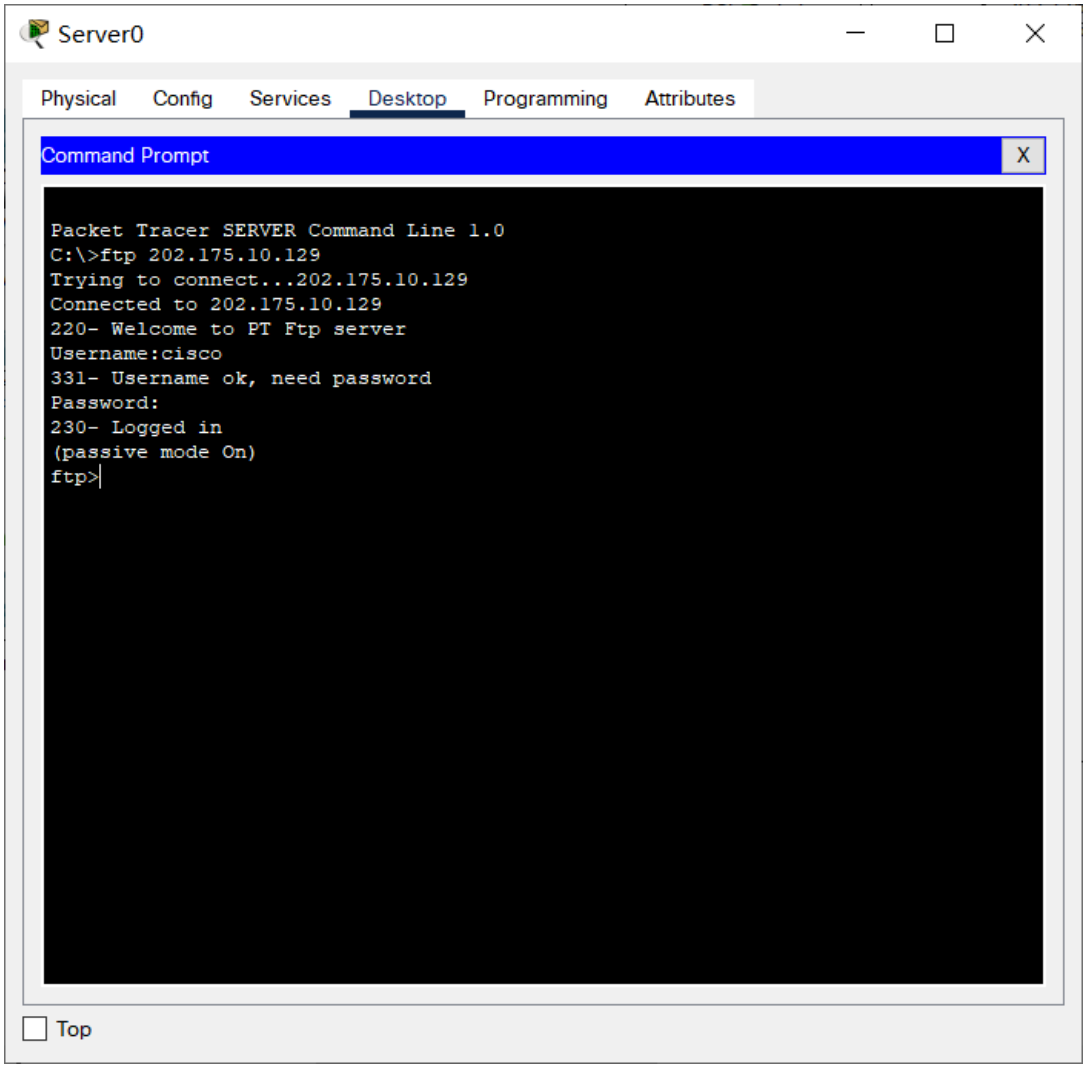
a. Ping results from a Student PC to the Data Center server
(*Recall that access from Main Campus to Data Center must go through the site-to-site VPN setup between the Main Campus and the Data Center*)



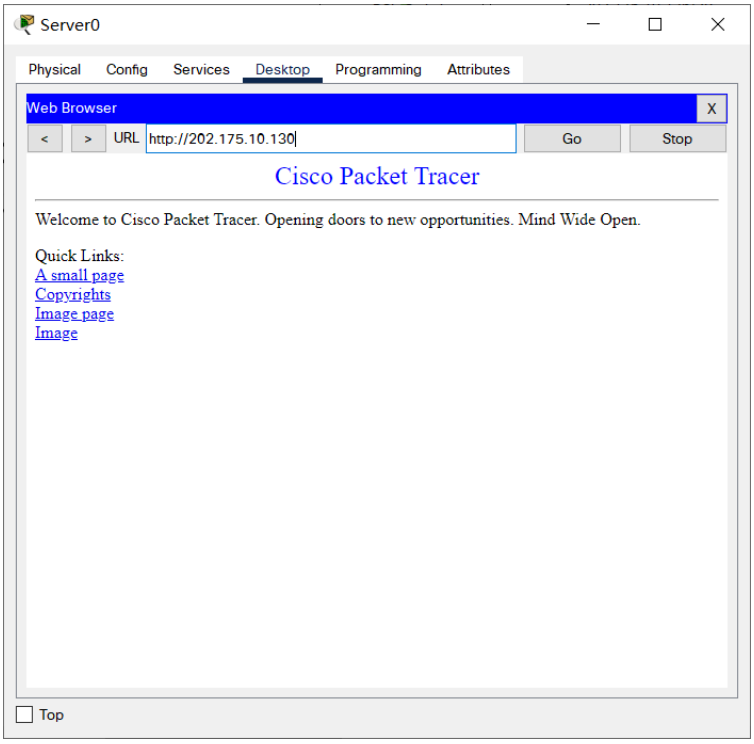
b. Ping results from the Admin PC to the Data Center server



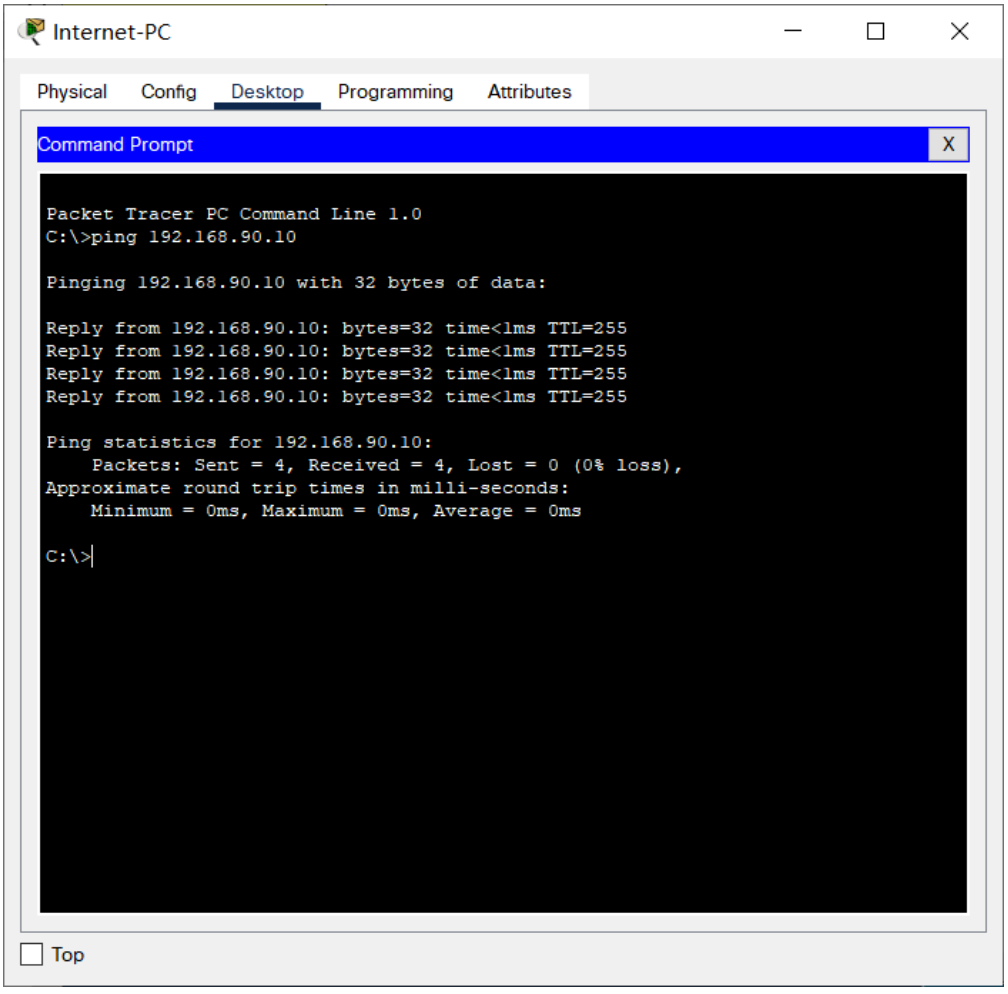
c. FTP access results from the Data Center server to the FTP server



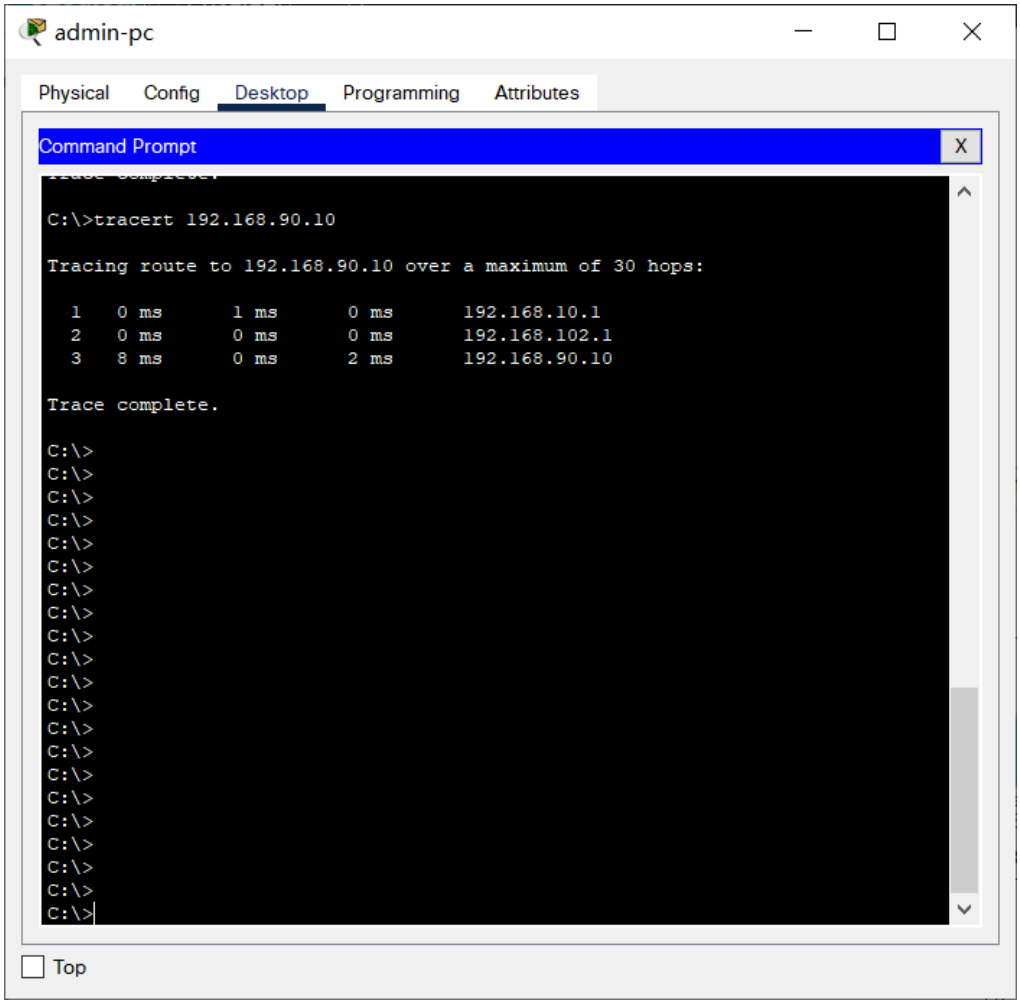
d. HTTP access results from the Data Center server to the WWW server



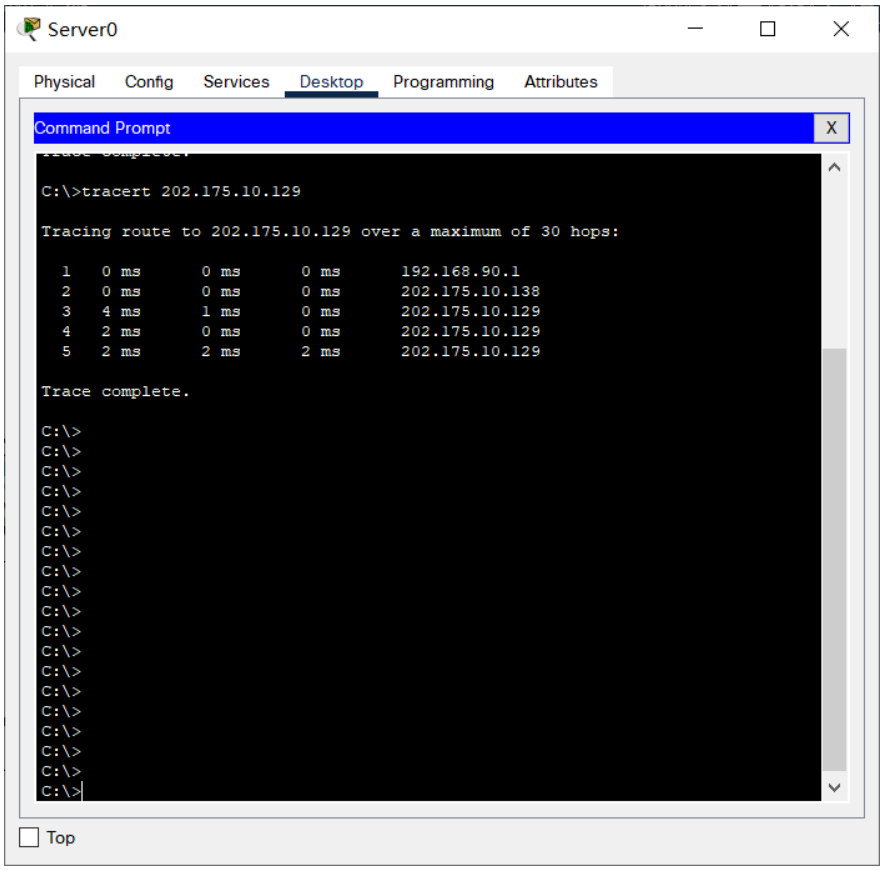
e. Ping results from the Internet PC to the Data Center server



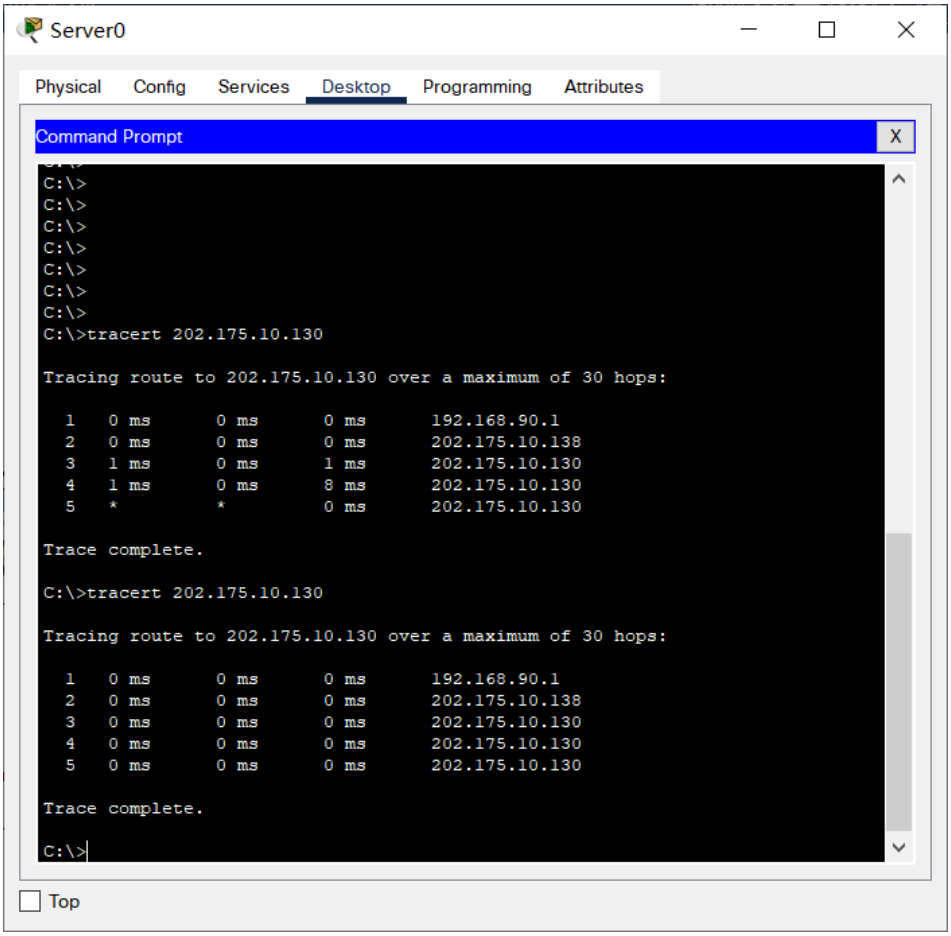
f. tracert results from the Admin PC to the Data Center server



g. tracert results from the Data Center server to the FTP server



h. tracert results from the Data Center server to the WWW server



Part 3: Home

In this part, you will configure the site of the Home based on the configuration of Part 2, and perform a set of tests.

1) Please list your configuration commands of the steps in a table：

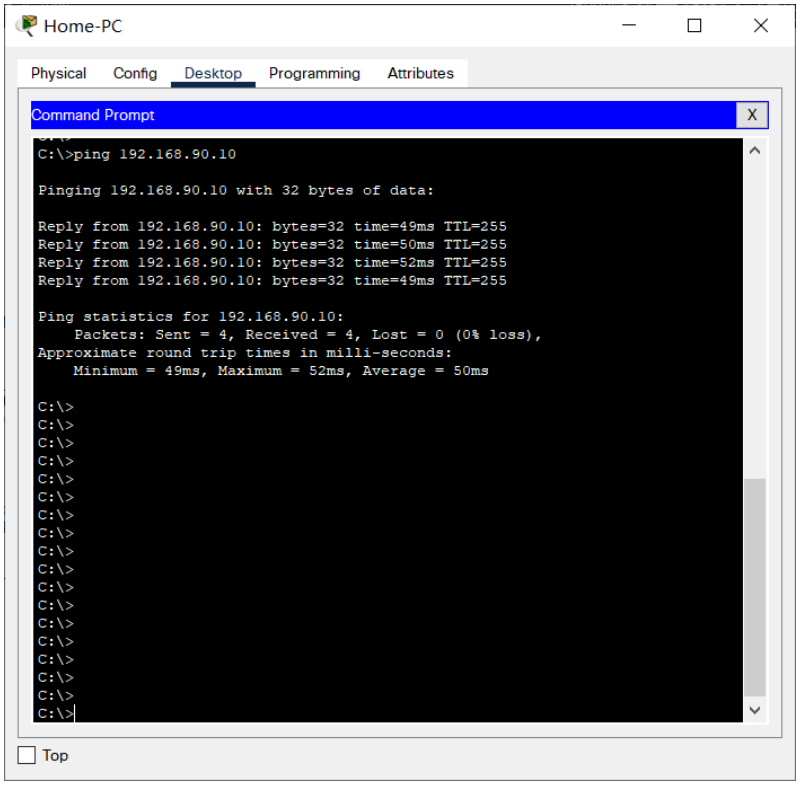
Step	Device	Command
1	ISP-Router	interface FastEthernet 1/0
2	ISP-Router	peer default ip address pool Personal-PPPoEPool
3	ISP-Router	ppp authentication chap
4	ISP-Router	ip unnumbered FastEthernet1/0
5	ISP-Router	encapsulation ppp
6	ISP-Router	ppp authentication chap
7	ISP-Router	username User1 password Hello
8	ISP-Router	bba-group pppoe MyGroup
9	ISP-Router	interface FastEthernet 1/0

10	ISP-Router	ip address 202.175.10.145 255.255.255.248
11	ISP-Router	pppoe enable group MyGroup
12	ISP-Router	duplex auto
13	ISP-Router	speed auto
14	ISP-Router	no shutdown
15	Gateway-Router1	aaa new-model
16	Gateway-Router1	aaa authentication login remote-vpn-auth local
17	Gateway-Router1	aaa authorization network remote-vpn-auth local
18	Gateway-Router1	ip cef
19	Gateway-Router1	no ipv6 cef
20	Gateway-Router1	username student password 0 student
21	Gateway-Router1	crypto isakmp policy 10
22	Gateway-Router1	encr 3des
23	Gateway-Router1	hash md5
24	Gateway-Router1	authentication pre-share
25	Gateway-Router1	group 2
26	Gateway-Router1	crypto isakmp policy 20
27	Gateway-Router1	encr aes 256
28	Gateway-Router1	authentication pre-share
29	Gateway-Router1	group 2
30	Gateway-Router1	crypto isakmp key SITE-VPN-KEY address 202.175.10.137
31	Gateway-Router1	crypto isakmp client configuration group remote-vpn-group
32	Gateway-Router1	key remote-vpn-key
33	Gateway-Router1	pool remote-vpn-clients
34	Gateway-Router1	netmask 255.255.255.248
35	Gateway-Router1	crypto ipsec transform-set SITE-VPN-TRANSFORM esp-3des esp-md5-hmac
36	Gateway-Router1	crypto ipsec transform-set remote-vpn-transform esp-3des esp-sha-hmac
37	Gateway-Router1	crypto dynamic-map remote-vpn-dynamic-map 20
38	Gateway-Router1	set transform-set remote-vpn-transform
39	Gateway-Router1	reverse-route
40	Gateway-Router1	crypto map SITE-VPN-MAP 10 ipsec-isakmp
41	Gateway-Router1	set peer 202.175.10.137
42	Gateway-Router1	set transform-set SITE-VPN-TRANSFORM
43	Gateway-Router1	match address SITE-VPN-INTERESTING-TRAFFIC
44	Gateway-Router1	crypto map remote-vpn-map client authentication list remote-vpn-auth
45	Gateway-Router1	crypto map remote-vpn-map isakmp authorization list remote-vpn-auth
46	Gateway-Router1	crypto map remote-vpn-map client configuration address respond
47	Gateway-Router1	Crypto map remote-vpn-map 20 ipsec-isakmp dynamic

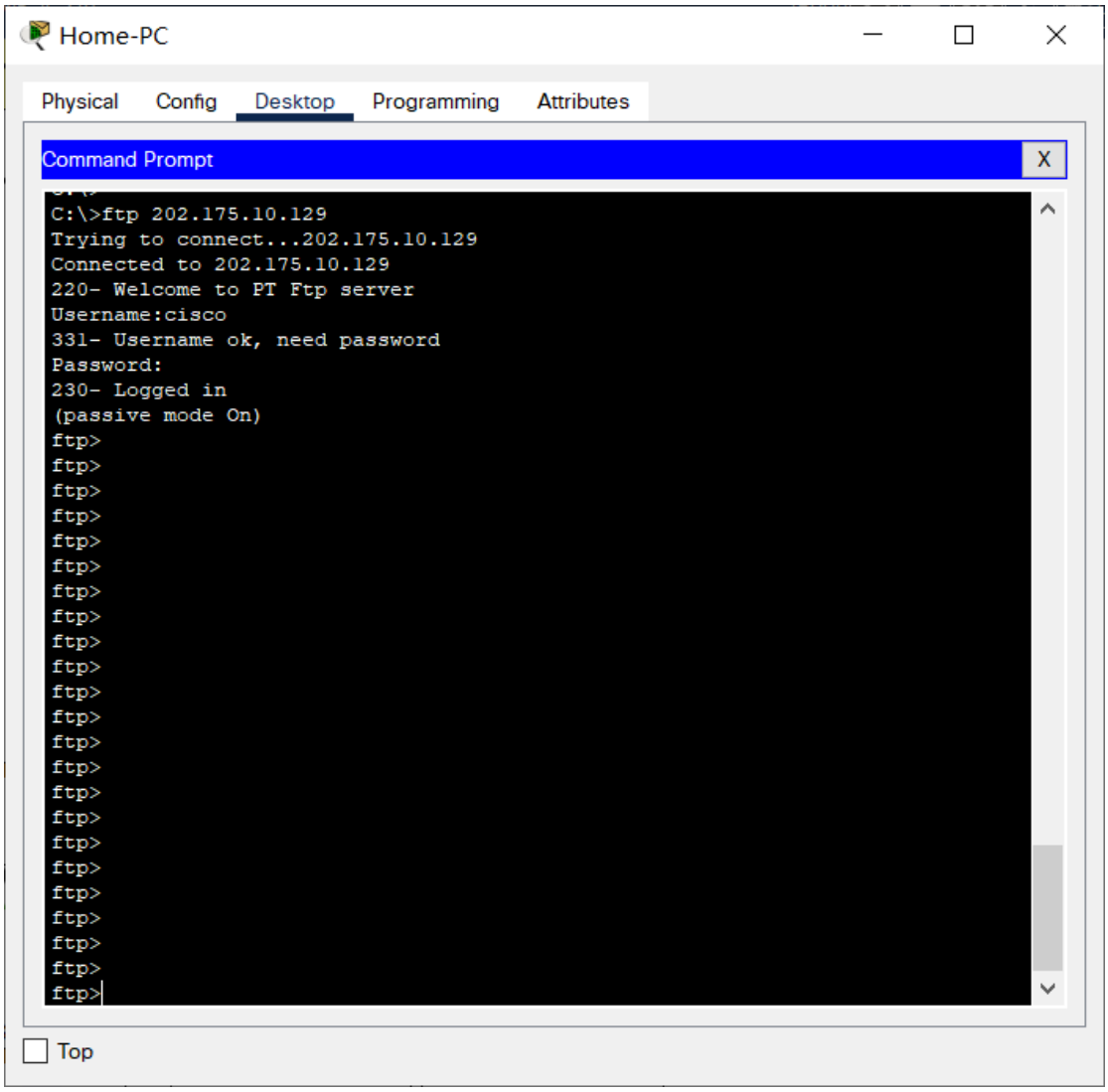
		remote-vpn-dynamic-map

2) Please perform the following tests, and paste their results.

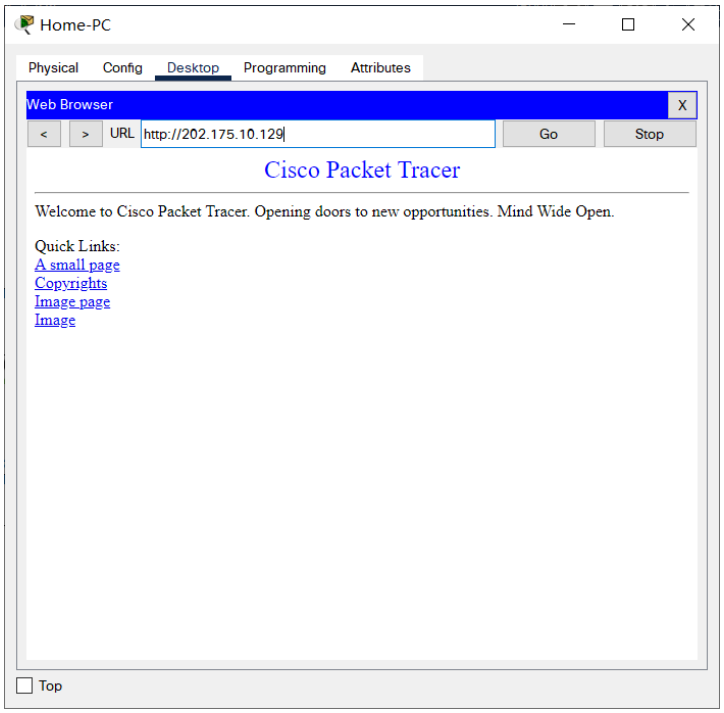
a. Ping results from Home PC to the Data Center server
(*Recall that access from Home PC to Data Center or Main Campus must go through the remote-access VPN*)



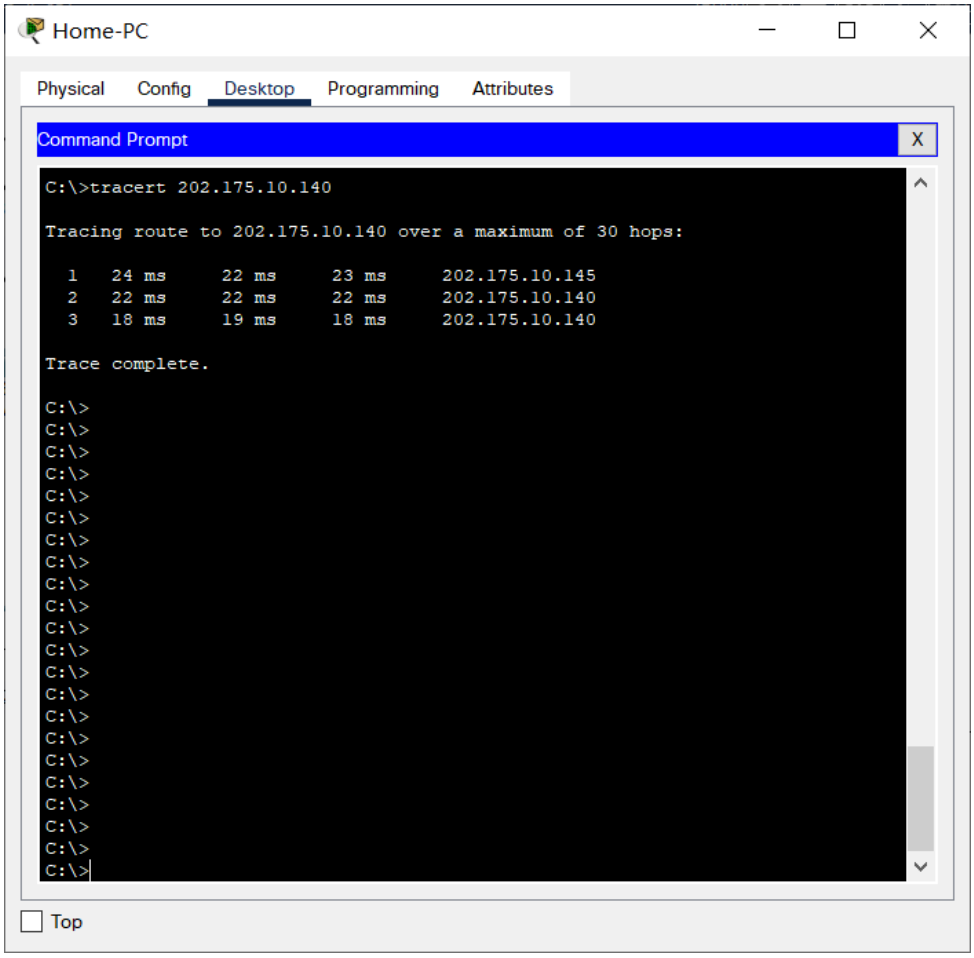
b. FTP access results from Home PC to the FTP server



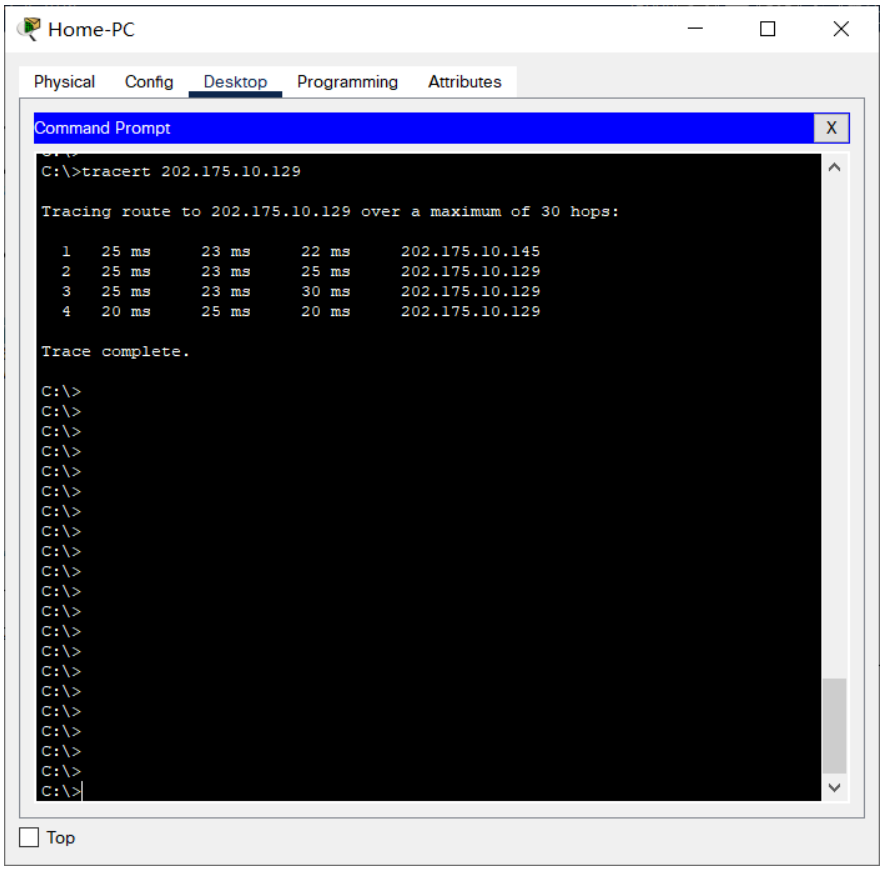
c. HTTP access results from Home PC to the WWW server



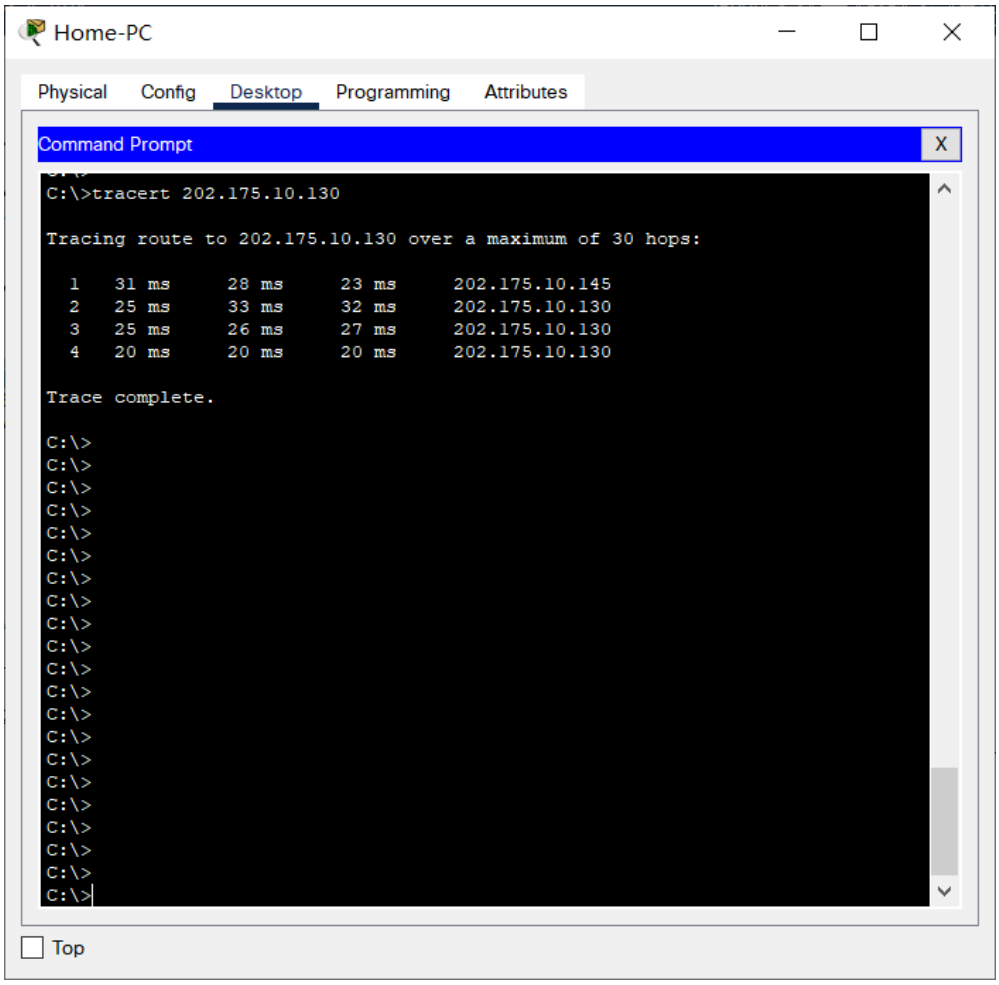
d. tracert results from Home PC to the Data Center server



e. tracert results from Home PC to the FTP server



f. tracert results from Home PC to the WWW server



Submissions

Your submission includes the following files:

1) This report

2) The following packet files

- A packet file named **Part0.pkt**, which has not been configured with any commands yet
- A packet file named **Part1.pkt**, which has been configured with commands in Part 1.
- A packet file named **Part2.pkt**, which has been configured with commands in Part 2.

- A packet file named **Part3.pkt**, which has been configured with commands in Part 3.

3) Submission Link (Deadline: 2021/12/31/23:55)

https://workspace.jianguoyun.com/inbox/collect/39bf5e6565ac4f31ba4fa3099fc01620/submit