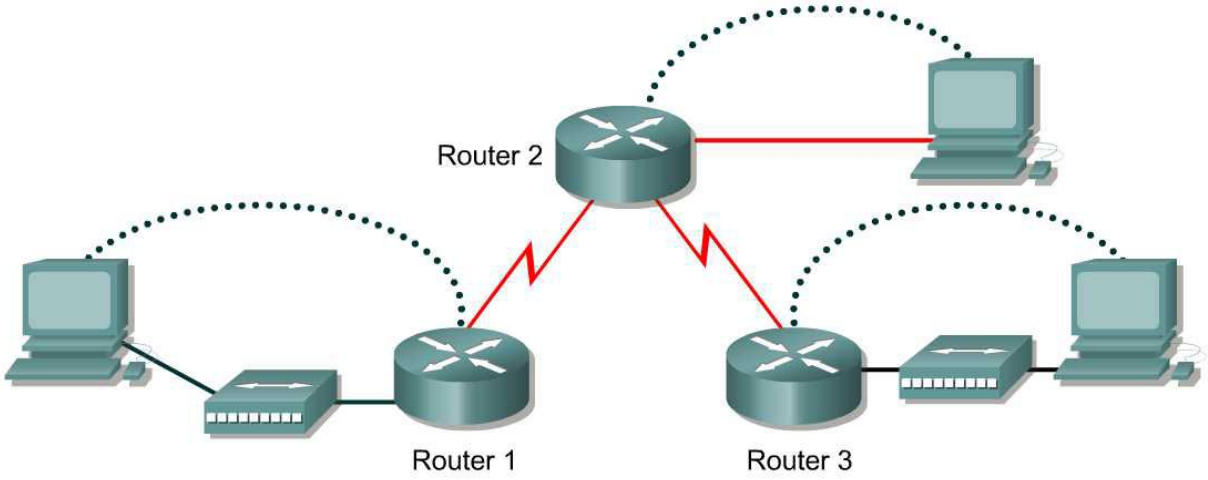
Lab 9.3.4 Troubleshooting Using `traceroute` – Instructor Version 2500



Straight-through cable	
Serial cable	
Console (Rollover)	
Crossover cable	

Router Designation	Router Name	Enable secret password	Enable, VTY and console password	Routing protocol	RIP network statements
Router 1	GAD	class	cisco	RIP	192.168.14.0 192.168.15.0
Router 2	BHM	class	cisco	RIP	192.168.15.0 192.168.13.0 192.168.16.0
Router 3	PHX	class	cisco	RIP	192.168.13.0 192.168.17.0

Router Designation	Fast Ethernet 0 Address	Interface type Serial 0	Serial 0 Address	Interface type Serial 1	Serial 1 Address	Subnet mask all addresses	IP host table entries
Router 1	192.168.14.1	DCE	192.168.15.1	NA	No address	255.255.255.0	BHM, PHX
Router 2	192.168.16.1	DTE	192.168.15.2	DCE	192.168.13.1	255.255.255.0	GAD, PHX
Router 3	192.168.17.1	NA	No address	DTE	192.168.13.2	255.255.255.0	GAD, BHM

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Objective

Use the **traceroute** Cisco IOS command from source router to destination router. Use the **tracert** MS-DOS command from source workstation to destination router. Verify that the network-layer between source, destination and each router along the way is working properly. Retrieve information to evaluate the end-to-end path reliability.

Cable the network in the diagram. Any router that meets the interface requirements displayed on the above diagram such as 800, 1600, 1700, 2500, 2600 routers, or a combination, may be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. The following steps are intended to be executed on each router unless specifically instructed otherwise.

Start a HyperTerminal session as performed in the Establishing a HyperTerminal session lab.

Erase and reload all routers in this lab assignment before continuing. If there are problems in accomplishing this, go to lab 4.2.6 and use those erase and reload instructions.

Step 1 Configure the GAD, PHX, and BHM routers

a. On the routers, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable passwords. If there are problems doing this, refer to the Configuring router passwords lab. Next configure the interfaces and routing according to the chart. If there are problems doing this, refer to the Configuring Host Tables lab and the Configuring RIP lab. Make sure to copy the **running-config** to the **startup-config** on each router so the configuration will not be lost if the router is power recycled.

b. This lab requires that IP hostnames are configured.

c. Verify the routers configurations by performing a **show running-config** on each router. If not correct, fix any configuration errors and verify.

Step 2 Configure the workstations with appropriate IP address subnet mask and default gateway

Step 3 Ping from the workstations

a. From a Windows host click on **Start** > **Programs** > **Accessories**> **MS-DOS**. This will open a Command Prompt window. (If this not the correct location see the instructor for the proper location on this computer.)

b. To test that the TCP/IP stack and default gateway on the workstation are configured and working properly, use the MS DOS window to ping the routers by issuing the following commands:

```
C:\>ping 192.168.14.1
```

The ping should respond with successful results. If not, check the configurations on the host and directly connected router.

```
C:\>ping 192.168.14.1

Pinging 192.168.14.1 with 32 bytes of data:

Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255

Ping statistics for 192.168.14.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms
```

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```
BHM#ping 192.168.17.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.17.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/32/36 ms
```

Step 4 Test Layer 3 connectivity

Using the command prompt enter **ping** and the IP address of all routers interfaces.

This will test Layer 3 connectivity between the workstation and the routers.

a. Is the output from the workstation **ping** command the same as the output from the **ping** command from a router?

No. It is different. The router display indicates a successful ping with an exclamation point (!). The host OS indicates with a "Reply" statement, size, and time for each ICMP datagram. Both show the summary results.

Step 5 Login to the router in user mode

a. Login to the GAD router, and enter the Privileged EXEC mode.

Step 6 Discover the trace options.

a. Enter **traceroute** at the router prompt.

b. What did the router respond with?

Protocol [ip]:, Target IP address:, Source address:, Numeric display [n]:, Timeout in seconds [3]:, Probe count [3]:, Minimum Time to Live [1]:, Maximum Time to Live [30]:, Port Number [33434]:, Loose, Strict, Record, Timestamp, Verbose[none]:

Step 7 Use the traceroute command

a. Enter **traceroute ip xxx.xxx.xxx.xxx** where xxx.xxx.xxx.xxx is the IP address of the target destination.

> **Note:** Use one of the end routers and **trace IP** to the other end host. The router will respond with:

```
GAD#traceroute ip 192.168.16.2
Type escape sequence to abort.
Tracing the route to 192.168.16.2

 1 BHM (192.168.15.2) 16 msec 16 msec 16 msec
 2 192.168.16.2 16 msec 16 msec 12 msec
GAD#
```

If the output is not successful, check the router and host configurations.

Step 8 Continue using traceroute

Repeat Step 5 with all other routers on the network.

Step 9 Use the tracert command from a workstation

a. From the console workstation click on **Start** > **Programs** > **Command Prompt**. An MS-DOS Command Prompt window will open up.

b. Enter **tracert** and the same IP address used in Step 5.

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c. The first hop is the default gateway or the near side router interface on the LAN that the workstation is connected to. List the host name and IP address of the router that the ICMP packet was routed through.

Host Name	IP Address
GAD	192.168.14.1
BHM	192.168.15.1
PHX	192.168.13.1
192.168.17.2	192.168.17.2

d. There is one more entry in the output of the **tracert** command when the trace is from the computer command prompt to the target host.

Why? It must go through the first router hop.

Upon completion of the previous steps logoff by typing **exit** and turn the router off.

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~~OUTPUT~~

```
GAD#show running-config
!
hostname GAD
!
enable secret 5 $1$y1DP$MXP29Gcxj.lB9Xf/Kky3n1
!
ip subnet-zero
ip host GAD 192.168.14.1 192.168.15.1
ip host PHX 192.168.17.1 192.168.13.2
ip host BHM 192.168.16.1 192.168.15.2 192.168.13.1
!
interface Ethernet0
 ip address 192.168.14.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0
 ip address 192.168.15.1 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 clock rate 64000
!
interface Serial1
 no ip address
 no ip directed-broadcast
 shutdown
!
router rip
 network 192.168.14.0
 network 192.168.15.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```


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```
BHM#show running-config
!
hostname BHM
!
enable secret 5 $1$y1DP$MXP29Gcxj.lB9Xf/Kky3n1
!
ip subnet-zero
ip host GAD 192.168.14.1 192.168.15.1
ip host PHX 192.168.17.1 192.168.13.2
ip host BHM 192.168.16.1 192.168.15.2 192.168.13.1
!
interface Ethernet0
 ip address 192.168.16.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0
 ip address 192.168.15.2 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
!
interface Serial1
 ip address 192.168.13.1 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 clock rate 64000
!
router rip
 network 192.168.13.0
 network 192.168.15.0
 network 192.168.16.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```


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```
PHX#show running-config
!
hostname PHX
!
enable secret 5 $1$y1DP$MXP29Gcxj.lB9Xf/Kky3n1
!
ip subnet-zero
ip host GAD 192.168.14.1 192.168.15.1
ip host PHX 192.168.17.1 192.168.13.2
ip host BHM 192.168.16.1 192.168.15.2 192.168.13.1
!
interface Ethernet0
 ip address 192.168.17.1 255.255.255.0
 no ip directed-broadcast
!

interface Serial0
 no ip address
 no ip directed-broadcast
 shutdown

interface Serial1
 ip address 192.168.13.2 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache

!
router rip
 network 192.168.13.0
 network 192.168.17.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```

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```
C:\>ping 192.168.14.1

Pinging 192.168.14.1 with 32 bytes of data:

Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255

Ping statistics for 192.168.14.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

BHM#ping 192.168.17.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.17.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/32/36 ms


C:\>tracert 192.168.17.2

Tracing route to WWESERVER [172.25.0.134]
over a maximum of 30 hops:

  1    <10 ms    <10 ms    <10 ms  192.168.14.1
  2    <10 ms    <10 ms    <10 ms  192.168.15.1
  3    <10 ms    <10 ms    <10 ms  192.168.13.1
  4    <10 ms    <10 ms    <10 ms  192.168.17.2

Trace complete.
```

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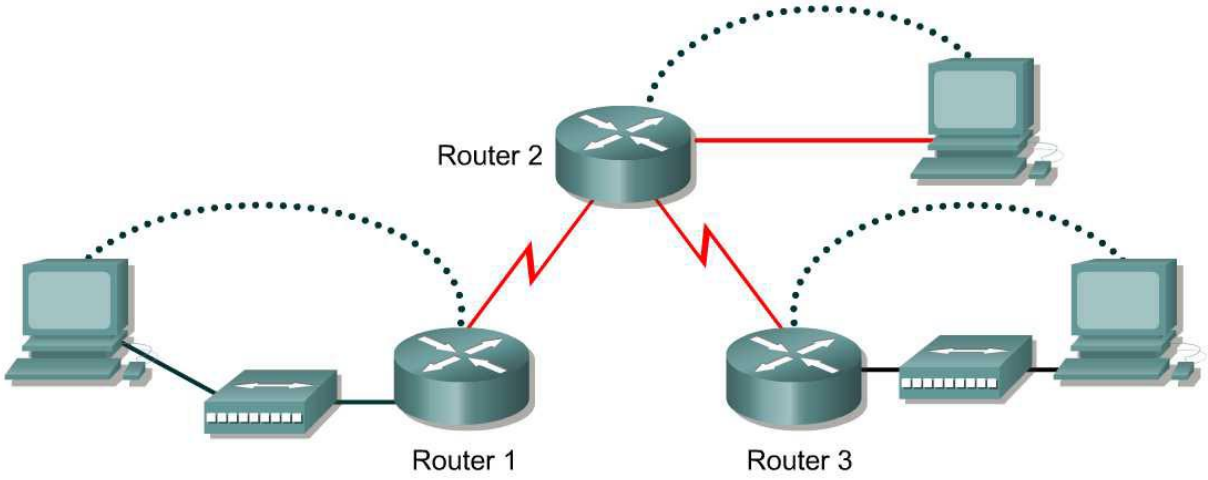
Lab 9.3.4 Troubleshooting Using `traceroute` – Instructor Version 2600



Straight-through cable	
Serial cable	
Console (Rollover)	
Crossover cable	

Router Designation	Router Name	Enable secret password	Enable, VTY and console password	Routing protocol	RIP network statements
Router 1	GAD	class	cisco	RIP	192.168.14.0 192.168.15.0
Router 2	BHM	class	cisco	RIP	192.168.15.0 192.168.13.0 192.168.16.0
Router 3	PHX	class	cisco	RIP	192.168.13.0 192.168.17.0

Router Designation	Fast Ethernet 0 Address	Interface type Serial 0	Serial 0 Address	Interface type Serial 1	Serial 1 Address	Subnet mask all addresses	IP host table entries
Router 1	192.168.14.1	DCE	192.168.15.1	NA	No address	255.255.255.0	BHM, PHX
Router 2	192.168.16.1	DTE	192.168.15.2	DCE	192.168.13.1	255.255.255.0	GAD, PHX
Router 3	192.168.17.1	NA	No address	DTE	192.168.13.2	255.255.255.0	GAD, BHM

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Objective

Use the **traceroute** Cisco IOS command from source router to destination router. Use the **tracert** MS-DOS command from source workstation to destination router. Verify that the network-layer between source, destination and each router along the way is working properly. Retrieve information to evaluate the end-to-end path reliability.

Cable the network in the diagram. Any router that meets the interface requirements displayed on the above diagram such as 800, 1600, 1700, 2500, 2600 routers, or a combination, may be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. The following steps are intended to be executed on each router unless specifically instructed otherwise.

Start a HyperTerminal session as performed in the Establishing a HyperTerminal session lab.

Erase and reload all routers in this lab assignment before continuing. If there are problems in accomplishing this, go to lab 4.2.6 and use those erase and reload instructions.

Step 1 Configure the GAD, PHX, and BHM routers

a. On the routers, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable passwords. If there are problems doing this, refer to the Configuring router passwords lab. Next configure the interfaces and routing according to the chart. If there are problems doing this, refer to the Configuring Host Tables lab and the Configuring RIP lab. Make sure to copy the **running-config** to the **startup-config** on each router so the configuration will not be lost if the router is power recycled.

b. This lab requires that IP hostnames are configured.

c. Verify the routers configurations by performing a **show running-config** on each router. If not correct, fix any configuration errors and verify.

Step 2 Configure the workstations with appropriate IP address subnet mask and default gateway

Step 3 Ping from the workstations

a. From a Windows host click on **Start** > **Programs** > **Accessories**> **MS-DOS**. This will open a Command Prompt window. (If this not the correct location see the instructor for the proper location on this computer.)

b. To test that the TCP/IP stack and default gateway on the workstation are configured and working properly, use the MS DOS window to ping the routers by issuing the following commands:

```
C:\>ping 192.168.14.1
```

The ping should respond with successful results. If not, check the configurations on the host and directly connected router.

```
C:\>ping 192.168.14.1

Pinging 192.168.14.1 with 32 bytes of data:

Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255

Ping statistics for 192.168.14.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms
```

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```
BHM#ping 192.168.17.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.17.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/32/36 ms
```

Step 4 Test Layer 3 connectivity

Using the command prompt enter **ping** and the IP address of all routers interfaces.

This will test Layer 3 connectivity between the workstation and the routers.

a. Is the output from the workstation **ping** command the same as the output from the **ping** command from a router?

No. It is different. The router display indicates a successful ping with an exclamation point (!). The host OS indicates with a "Reply" statement, size, and time for each ICMP datagram.

Step 5 Login to the router in user mode

a. Login to the GAD router and enter the Privileged Exec mode

Step 6 Discover the trace options.

a. Enter **traceroute** at the router prompt.

b. What did the router respond with? Protocol [ip]:, Target IP address:, Source address:, Numeric display [n]:, Timeout in seconds [3]:, Probe count [3]:, Minimum Time to Live [1]:, Maximum Time to Live [30]:, Port Number [33434]:, Loose, Strict, Record, Timestamp, Verbose[none]:

Step 7 Use the traceroute command

a. Enter **traceroute ip xxx.xxx.xxx.xxx** where xxx.xxx.xxx.xxx is the IP address of the target destination.

Note: Use one of the end routers and **trace IP** to the other end host. The router will respond with:

```
GAD#traceroute ip 192.168.16.2
Type escape sequence to abort.
Tracing the route to 192.168.16.2

 1 BHM (192.168.15.2) 16 msec 16 msec 16 msec
 2 192.168.16.2 16 msec 16 msec 12 msec
GAD#
```

If the output is not successful, check the router and host configurations.

Step 8 Continue using traceroute

Repeat Step 5 with all other routers on the network.

Step 9 Use the tracert command from a workstation

a. From the console workstation click on **Start** > **Programs** > **Command Prompt**. An MS-DOS Command Prompt window will open up.

b. Enter **tracert** and the same IP address used in Step 5.

c. The first hop is the default gateway or the near side router interface on the LAN that the workstation is connected to. List the host name and IP address of the router that the ICMP packet was routed through.

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Host Name	IP Address
GAD	192.168.14.1
BHM	192.168.15.1
PHX	192.168.13.1
192.168.17.2	192.168.17.2

d. There is one more entry in the output of the **tracert** command when the trace is from the computer command prompt to the target host.

Why? It must go through the first router hop.

Upon completion of the previous steps logoff by typing **exit** and turn the router off.

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```
GAD#show running-config
!
hostname GAD
!
enable secret 5 $1$y1DP$MXP29Gcxj.lB9Xf/Kky3n1
!
ip subnet-zero
ip host GAD 192.168.14.1 192.168.15.1
ip host PHX 192.168.17.1 192.168.13.2
ip host BHM 192.168.16.1 192.168.15.2 192.168.13.1
!
interface FastEthernet0/0
 ip address 192.168.14.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0/0
 ip address 192.168.15.1 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 clock rate 64000
!
interface Serial0/1
 no ip address
 no ip directed-broadcast
 shutdown
!
router rip
 network 192.168.14.0
 network 192.168.15.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```


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```
BHM#show running-config
!
hostname BHM
!
enable secret 5 $1$y1DP$MXP29Gcxj.lB9Xf/Kky3n1
!
ip subnet-zero
ip host GAD 192.168.14.1 192.168.15.1
ip host PHX 192.168.17.1 192.168.13.2
ip host BHM 192.168.16.1 192.168.15.2 192.168.13.1
!
interface FastEthernet0/0
 ip address 192.168.16.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0/0
 ip address 192.168.15.2 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
!
interface Serial0/1
 ip address 192.168.13.1 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 clock rate 64000
!
router rip
 network 192.168.13.0
 network 192.168.15.0
 network 192.168.16.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```

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```
PHX#show run
!
hostname PHX
!
enable secret 5 $1$y1DP$MXP29Gcxj.lB9Xf/Kky3n1
!
ip subnet-zero
ip host GAD 192.168.14.1 192.168.15.1
ip host PHX 192.168.17.1 192.168.13.2
ip host BHM 192.168.16.1 192.168.15.2 192.168.13.1
!
interface FastEthernet0/0
 ip address 192.168.17.1 255.255.255.0
 no ip directed-broadcast
!

interface Serial0/0
 no ip address
 no ip directed-broadcast
 shutdown

interface Serial0/1
 ip address 192.168.13.2 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache

!
router rip
 network 192.168.13.0
 network 192.168.17.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```

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```
C:\>ping 192.168.14.1

Pinging 192.168.14.1 with 32 bytes of data:

Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255
Reply from 192.168.14.1: bytes=32 time<10ms TTL=255

Ping statistics for 192.168.14.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

BHM#ping 192.168.17.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.17.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/32/36 ms


C:\>tracert 192.168.17.2

Tracing route to WWESERVER [172.25.0.134]
over a maximum of 30 hops:

  1    <10 ms    <10 ms    <10 ms  192.168.14.1
  2    <10 ms    <10 ms    <10 ms  192.168.15.1
  3    <10 ms    <10 ms    <10 ms  192.168.13.1
  4    <10 ms    <10 ms    <10 ms  192.168.17.2

Trace complete.
```


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