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BBM 453 Computer Networks Lab - Static Routing
**Group ID: 1**

Note : Our group number is 1 that's why we use 10.101.x.x and 10.201.x.x

What is DTE and DCE?

       Data Terminal Equipment (DTE) is equipment that is either a destination or source for digital data. Examples of DTE's are computers, printers, application servers, file servers, routers and bridges, dumb terminals...etc. DTE do not generally communicate with each other. In order to do so they need to use DCE to carry out the communication. DTE does not need to know how data is sent or received; the communications details are left to the DCE.DTE produces the data and transfers them to a DCE, with essential control characters. No coordination is required between DTE devices.

       Data Communications Equipment (DCE) can be classified as equipment that transmits or receives analogue or digital signals through a network. DCE works at the physical layer of the OSI model taking data generated by Data Terminal Equipment (DTE) and converting it into a signal that can then be transmitted over a communications link. A common DCE example is a modem which works as a translator of digital and analogue signals.In a complex network which uses directly connected routers to provide serial links, one serial interface of each connection must be configured with a clock rate to provide synchronisation. A modem is the most common kind of DCE.
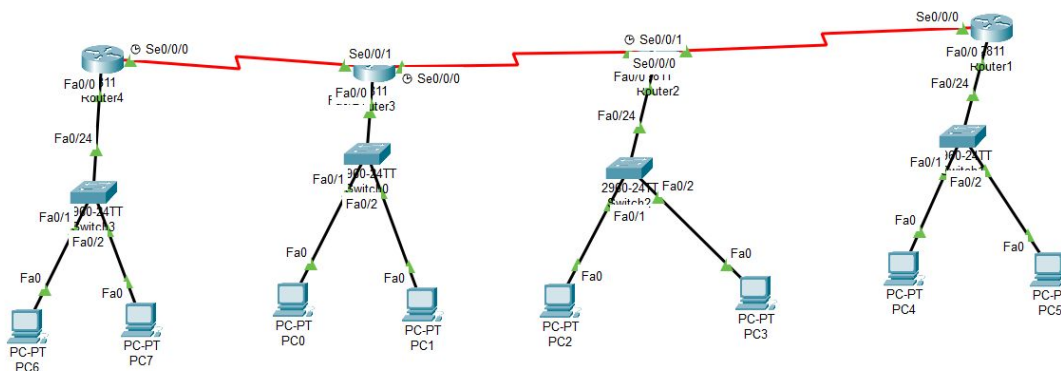
We created our topology as you can see above.
Router1 network address: 10.101.3.0,
Router2 network address: 10.101.1.0,
Router3 network address: 10.101.2.0,
Router4 network address: 10.101.4.0,
Router1 - Router 2 Network Address(Red line between router 1 and router 2) 10.201.1.0,
Router2 - Router 3 Network Address(Red line between router 2 and router 3) 10.201.2.0,
Router3 - Router 4 Network Address(Red line between router 3 and router 4) 10.201.3.0.

→ Configuring communication protocol for serial interfaces.

HDLC is a point-to-point protocol that can only be used on serial links or leased lines between two Cisco devices.HDLC is the default encapsulation on serial links in Cisco routers.

```
Group1Router2(config-if)#encapsulation hdlc
Group1Router2(config-if)#
```
For Router2

```
Group1Router3(config-if)#encapsulation hdlc
Group1Router3(config-if)#
```
For Router3

```
Group1Router1(config-if)#encapsulation hdlc
Group1Router1(config-if)#
```
For Router1

```
Group1Router4(config-if)#encapsulation hdlc
Group1Router4(config-if)#
```
For Router4

→ Setting IP address of the interface.

We set each router ip addresses and subnet masks as follows;

```
Group1Router4(config-if)#ip address 10.201.3.2 255.255.255.0
Group1Router4(config-if)#
```
For Router4

```
Group1Router3(config-if)#ip address 10.201.2.2 255.255.255.0
Group1Router3(config-if)#
```
For Router3

```
Group1Router2(config-if)#ip address 10.201.1.2 255.255.255.0
Group1Router2(config-if)#
```
For Router2

```
Group1Router1(config-if)#ip address 10.201.1.1 255.255.255.0
Group1Router1(config-if)#
```
For Router1

→ Determining serial cable property that is attached to your routers serial interface whether DCE or DTE.

The show controllers <serial interface> command is used to determine which side of the cable is the DCE side.

```
Group1Router1#show controllers serial 0/0/0
Interface Serial0/0/0
Hardware is PowerQUICC MPC860
DTE V.35 TX and RX clocks detected
idb at 0x81081AC4, driver data structure at 0x81084AC0
SCC Registers:
General [GSMR]=0x2:0x00000000, Protocol-specific [PSMR]=0x8
Events [SCCE]=0x0000, Mask [SCCM]=0x0000, Status [SCCS]=0x00
Transmit on Demand [TODR]=0x0, Data Sync [DSR]=0x7E7E
Interrupt Registers:
Config [CICR]=0x00367F80, Pending [CIPR]=0x0000C000
Mask   [CIMR]=0x00200000, In-srv  [CISR]=0x00000000
Command register [CR]=0x580
Port A [PADIR]=0x1030, [PAPAR]=0xFFFF
       [PAODR]=0x0010, [PADAT]=0xCBFF
Port B [PBDIR]=0x09C0F, [PBPAR]=0x0800E
       [PBODR]=0x00000, [PBDAT]=0x3FFFD
Port C [PCDIR]=0x00C, [PCPAR]=0x200
       [PCSO]=0xC20,   [PCDAT]=0xDF2, [PCINT]=0x00F
Receive Ring
        rmd(68012830): status 9000 length 60C address 3B6DAC4
        rmd(68012838): status B000 length 60C address 3B6D444
Transmit Ring
        tmd(680128B0): status 0 length 0 address 0
        tmd(680128B8): status 0 length 0 address 0
        tmd(680128C0): status 0 length 0 address 0
        tmd(680128C8): status 0 length 0 address 0
        tmd(680128D0): status 0 length 0 address 0
        tmd(680128D8): status 0 length 0 address 0
        tmd(680128E0): status 0 length 0 address 0
        tmd(680128E8): status 0 length 0 address 0
        tmd(680128F0): status 0 length 0 address 0
        tmd(680128F8): status 0 length 0 address 0
        tmd(68012900): status 0 length 0 address 0
        tmd(68012908): status 0 length 0 address 0
        tmd(68012910): status 0 length 0 address 0
        tmd(68012918): status 0 length 0 address 0
        tmd(68012920): status 0 length 0 address 0
        tmd(68012928): status 2000 length 0 address 0

tx_limited=1(2)

SCC GENERAL PARAMETER RAM (at 0x68013C00)
Rx BD Base [RBASE]=0x2830, Fn Code [RFCR]=0x18
Tx BD Base [TBASE]=0x28B0, Fn Code [TFCR]=0x18
Max Rx Buff Len [MRBLR]=1548
Rx State [RSTATE]=0x0, BD Ptr [RBPTR]=0x2830
Tx State [TSTATE]=0x4000, BD Ptr [TBPTR]=0x28B0

SCC HDLC PARAMETER RAM (at 0x68013C38)
CRC Preset [C_PRES]=0xFFFF, Mask [C_MASK]=0xF0B8
Errors: CRC [CRCEC]=0, Aborts [ABTSC]=0, Discards [DISFC]=0
Nonmatch Addr Cntr [NMARC]=0
 --More--  |
```

Router1 serial 0/0/0 is the DTE side as you can see from the above screenshot.

```
Group1Router2#show controllers serial 0/0/0
Interface Serial0/0/0
Hardware is PowerQUICC MPC860
DTE V.35 TX and RX clocks detected
idb at 0x81081AC4, driver data structure at 0x81084AC0
SCC Registers:
General [GSMR]=0x2:0x00000000, Protocol-specific [PSMR]=0x8
Events [SCCE]=0x0000, Mask [SCCM]=0x0000, Status [SCCS]=0x00
Transmit on Demand [TODR]=0x0, Data Sync [DSR]=0x7E7E
Interrupt Registers:
Config [CICR]=0x00367F80, Pending [CIPR]=0x0000C000
Mask   [CIMR]=0x00200000, In-srv  [CISR]=0x00000000
Command register [CR]=0x580
Port A [PADIR]=0x1030, [PAPAR]=0xFFFF
       [PAODR]=0x0010, [PADAT]=0xCBFF
Port B [PBDIR]=0x09C0F, [PBPAR]=0x0800E
       [PBODR]=0x00000, [PBDAT]=0x3FFFD
Port C [PCDIR]=0x00C, [PCPAR]=0x200
       [PCSO]=0xC20,  [PCDAT]=0xDF2, [PCINT]=0x00F
Receive Ring
         rmd(68012830): status 9000 length 60C address 3B6DAC4
         rmd(68012838): status B000 length 60C address 3B6D444
Transmit Ring
         tmd(680128B0): status 0 length 0 address 0
         tmd(680128B8): status 0 length 0 address 0
         tmd(680128C0): status 0 length 0 address 0
         tmd(680128C8): status 0 length 0 address 0
         tmd(680128D0): status 0 length 0 address 0
         tmd(680128D8): status 0 length 0 address 0
         tmd(680128E0): status 0 length 0 address 0
         tmd(680128E8): status 0 length 0 address 0
         tmd(680128F0): status 0 length 0 address 0
         tmd(680128F8): status 0 length 0 address 0
         tmd(68012900): status 0 length 0 address 0
         tmd(68012908): status 0 length 0 address 0
         tmd(68012910): status 0 length 0 address 0
         tmd(68012918): status 0 length 0 address 0
         tmd(68012920): status 0 length 0 address 0
         tmd(68012928): status 2000 length 0 address 0

tx_limited=1(2)

SCC GENERAL PARAMETER RAM (at 0x68013C00)
Rx BD Base [RBASE]=0x2830, Fn Code [RFCR]=0x18
Tx BD Base [TBASE]=0x28B0, Fn Code [TFCR]=0x18
Max Rx Buff Len [MRBLR]=1548
Rx State [RSTATE]=0x0, BD Ptr [RBPTR]=0x2830
Tx State [TSTATE]=0x4000, BD Ptr [TBPTR]=0x28B0

SCC HDLC PARAMETER RAM (at 0x68013C38)
CRC Preset [C_PRES]=0xFFFF, Mask [C_MASK]=0xF0B8
Errors: CRC [CRCEC]=0, Aborts [ABTSC]=0, Discards [DISFC]=0
Nonmatch Addr Cntr [NMARC]=0
```

Router2 serial 0/0/0 is the DTE side as you can see from the above screenshot.

```
Group1Router2>show controllers serial0/0/1
Interface Serial0/0/1
Hardware is PowerQUICC MPC860
DCE V.35, clock rate 64000
idb at 0x81081AC4, driver data structure at 0x81084AC0
SCC Registers:
General [GSMR]=0x2:0x00000000, Protocol-specific [PSMR]=0x8
Events [SCCE]=0x0000, Mask [SCCM]=0x0000, Status [SCCS]=0x00
Transmit on Demand [TODR]=0x0, Data Sync [DSR]=0x7E7E
Interrupt Registers:
Config [CICR]=0x00367F80, Pending [CIPR]=0x0000C000
Mask   [CIMR]=0x00200000, In-srv  [CISR]=0x00000000
Command register [CR]=0x580
Port A [PADIR]=0x1030, [PAPAR]=0xFFFF
       [PAODR]=0x0010, [PADAT]=0xCBFF
Port B [PBDIR]=0x09C0F, [PBPAR]=0x0800E
       [PBODR]=0x00000, [PBDAT]=0x3FFFD
Port C [PCDIR]=0x00C, [PCPAR]=0x200
       [PCSO]=0xC20,  [PCDAT]=0xDF2, [PCINT]=0x00F
Receive Ring
        rmd(68012830): status 9000 length 60C address 3B6DAC4
        rmd(68012838): status B000 length 60C address 3B6D444
Transmit Ring
        tmd(680128B0): status 0 length 0 address 0
        tmd(680128B8): status 0 length 0 address 0
        tmd(680128C0): status 0 length 0 address 0
        tmd(680128C8): status 0 length 0 address 0
        tmd(680128D0): status 0 length 0 address 0
        tmd(680128D8): status 0 length 0 address 0
        tmd(680128E0): status 0 length 0 address 0
        tmd(680128E8): status 0 length 0 address 0
        tmd(680128F0): status 0 length 0 address 0
        tmd(680128F8): status 0 length 0 address 0
        tmd(68012900): status 0 length 0 address 0
        tmd(68012908): status 0 length 0 address 0
        tmd(68012910): status 0 length 0 address 0
        tmd(68012918): status 0 length 0 address 0
        tmd(68012920): status 0 length 0 address 0
        tmd(68012928): status 2000 length 0 address 0

tx_limited=1(2)

SCC GENERAL PARAMETER RAM (at 0x68013C00)
Rx BD Base [RBASE]=0x2830, Fn Code [RFCR]=0x18
Tx BD Base [TBASE]=0x28B0, Fn Code [TFCR]=0x18
Max Rx Buff Len [MRBLR]=1548
Rx State [RSTATE]=0x0, BD Ptr [RBPTR]=0x2830
Tx State [TSTATE]=0x4000, BD Ptr [TBPTR]=0x28B0

SCC HDLC PARAMETER RAM (at 0x68013C38)
CRC Preset [C_PRES]=0xFFFF, Mask [C_MASK]=0xF0B8
Errors: CRC [CRCEC]=0, Aborts [ABTSC]=0, Discards [DISFC]=0
Nonmatch Addr Cntr [NMARC]=0
Retry Count [RETRC]=0
```

Router2 serial 0/0/1 is the DCE side as you can see from the above screenshot and clock rate set to 64000.

```
Group1Router3#show controllers serial 0/0/0
Interface Serial0/0/0
Hardware is PowerQUICC MPC860
DCE V.35, clock rate 64000
idb at 0x81081AC4, driver data structure at 0x81084AC0
SCC Registers:
General [GSMR]=0x2:0x00000000, Protocol-specific [PSMR]=0x8
Events [SCCE]=0x0000, Mask [SCCM]=0x0000, Status [SCCS]=0x00
Transmit on Demand [TODR]=0x0, Data Sync [DSR]=0x7E7E
Interrupt Registers:
Config [CICR]=0x00367F80, Pending [CIPR]=0x0000C000
Mask    [CIMR]=0x00200000, In-srv  [CISR]=0x00000000
Command register [CR]=0x580
Port A [PADIR]=0x1030, [PAPAR]=0xFFFF
       [PAODR]=0x0010, [PADAT]=0xCBFF
Port B [PBDIR]=0x09C0F, [PBPAR]=0x0800E
       [PBODR]=0x00000, [PBDAT]=0x3FFFD
Port C [PCDIR]=0x00C, [PCPAR]=0x200
       [PCSO]=0xC20,   [PCDAT]=0xDF2, [PCINT]=0x00F
Receive Ring
        rmd(68012830): status 9000 length 60C address 3B6DAC4
        rmd(68012838): status B000 length 60C address 3B6D444
Transmit Ring
        tmd(680128B0): status 0 length 0 address 0
        tmd(680128B8): status 0 length 0 address 0
        tmd(680128C0): status 0 length 0 address 0
        tmd(680128C8): status 0 length 0 address 0
        tmd(680128D0): status 0 length 0 address 0
        tmd(680128D8): status 0 length 0 address 0
        tmd(680128E0): status 0 length 0 address 0
        tmd(680128E8): status 0 length 0 address 0
        tmd(680128F0): status 0 length 0 address 0
        tmd(680128F8): status 0 length 0 address 0
        tmd(68012900): status 0 length 0 address 0
        tmd(68012908): status 0 length 0 address 0
        tmd(68012910): status 0 length 0 address 0
        tmd(68012918): status 0 length 0 address 0
        tmd(68012920): status 0 length 0 address 0
        tmd(68012928): status 2000 length 0 address 0

tx_limited=1(2)

SCC GENERAL PARAMETER RAM (at 0x68013C00)
Rx BD Base [RBASE]=0x2830, Fn Code [RFCR]=0x18
Tx BD Base [TBASE]=0x28B0, Fn Code [TFCR]=0x18
Max Rx Buff Len [MRBLR]=1548
Rx State [RSTATE]=0x0, BD Ptr [RBPTR]=0x2830
Tx State [TSTATE]=0x4000, BD Ptr [TBPTR]=0x28B0

SCC HDLC PARAMETER RAM (at 0x68013C38)
CRC Preset [C_PRES]=0xFFFF, Mask [C_MASK]=0xF0B8
Errors: CRC [CRCEC]=0, Aborts [ABTSC]=0, Discards [DISFC]=0
Nonmatch Addr Cntr [NMARC]=0
Retry Count [RETRC]=0
```

Router 3 serial 0/0/0 is the DCE side as you can see from the above screenshot and clock rate set to 64000.

```
GroupRouter3(config)#interface Serial0/0/1
GroupRouter3(config-if)#exit
GroupRouter3(config)#exit
GroupRouter3#
%SYS-5-CONFIG_I: Configured from console by console

GroupRouter3#show controllers serial0/0/1
Interface Serial0/0/1
Hardware is PowerQUICC MPC860
DTE V.35 TX and RX clocks detected
idb at 0x81081AC4, driver data structure at 0x81084AC0
SCC Registers:
General [GSMR]=0x2:0x00000000, Protocol-specific [PSMR]=0x8
Events [SCCE]=0x0000, Mask [SCCM]=0x0000, Status [SCCS]=0x00
Transmit on Demand [TODR]=0x0, Data Sync [DSR]=0x7E7E
Interrupt Registers:
Config [CICR]=0x00367F80, Pending [CIPR]=0x0000C000
Mask   [CIMR]=0x00200000, In-srv  [CISR]=0x00000000
Command register [CR]=0x580
Port A [PADIR]=0x1030, [PAPAR]=0xFFFF
       [PAODR]=0x0010, [PADAT]=0xCBFF
Port B [PBDIR]=0x09C0F, [PBPAR]=0x0800E
       [PBODR]=0x00000, [PBDAT]=0x3FFFD
Port C [PCDIR]=0x00C, [PCPAR]=0x200
       [PCSO]=0xC20,  [PCDAT]=0xDF2, [PCINT]=0x00F
Receive Ring
       rmd(68012830): status 9000 length 60C address 3B6DAC4
       rmd(68012838): status B000 length 60C address 3B6D444
Transmit Ring
       tmd(680128B0): status 0 length 0 address 0
       tmd(680128B8): status 0 length 0 address 0
       tmd(680128C0): status 0 length 0 address 0
       tmd(680128C8): status 0 length 0 address 0
       tmd(680128D0): status 0 length 0 address 0
       tmd(680128D8): status 0 length 0 address 0
       tmd(680128E0): status 0 length 0 address 0
       tmd(680128E8): status 0 length 0 address 0
       tmd(680128F0): status 0 length 0 address 0
       tmd(680128F8): status 0 length 0 address 0
       tmd(68012900): status 0 length 0 address 0
       tmd(68012908): status 0 length 0 address 0
       tmd(68012910): status 0 length 0 address 0
       tmd(68012918): status 0 length 0 address 0
       tmd(68012920): status 0 length 0 address 0
       tmd(68012928): status 2000 length 0 address 0

tx_limited=1(2)

SCC GENERAL PARAMETER RAM (at 0x68013C00)
Rx BD Base [RBASE]=0x2830, Fn Code [RFCR]=0x18
Tx BD Base [TBASE]=0x28B0, Fn Code [TFCR]=0x18
Max Rx Buff Len [MRBLR]=1548
Rx State [RSTATE]=0x0, BD Ptr [RBPTR]=0x2830
```

Router 3 serial 0/0/1 is the DTE side as you can see from the above screenshot.

```
Group1Router4#show controllers serial 0/0/0
Interface Serial0/0/0
Hardware is PowerQUICC MPC860
DCE V.35, clock rate 64000
idb at 0x81081AC4, driver data structure at 0x81084AC0
SCC Registers:
General [GSMR]=0x2:0x00000000, Protocol-specific [PSMR]=0x8
Events [SCCE]=0x0000, Mask [SCCM]=0x0000, Status [SCCS]=0x00
Transmit on Demand [TODR]=0x0, Data Sync [DSR]=0x7E7E
Interrupt Registers:
Config [CICR]=0x00367F80, Pending [CIPR]=0x0000C000
Mask   [CIMR]=0x00200000, In-srv  [CISR]=0x00000000
Command register [CR]=0x580
Port A [PADIR]=0x1030, [PAPAR]=0xFFFF
       [PAODR]=0x0010, [PADAT]=0xCBFF
Port B [PBDIR]=0x09C0F, [PBPAR]=0x0800E
       [PBODR]=0x0000, [PBDAT]=0x3FFFD
Port C [PCDIR]=0x00C, [PCPAR]=0x200
       [PCSO]=0xC20,  [PCDAT]=0xDF2, [PCINT]=0x00F
Receive Ring
        rmd(68012830): status 9000 length 60C address 3B6DAC4
        rmd(68012838): status B000 length 60C address 3B6D444
Transmit Ring
        tmd(680128B0): status 0 length 0 address 0
        tmd(680128B8): status 0 length 0 address 0
        tmd(680128C0): status 0 length 0 address 0
        tmd(680128C8): status 0 length 0 address 0
        tmd(680128D0): status 0 length 0 address 0
        tmd(680128D8): status 0 length 0 address 0
        tmd(680128E0): status 0 length 0 address 0
        tmd(680128E8): status 0 length 0 address 0
        tmd(680128F0): status 0 length 0 address 0
        tmd(680128F8): status 0 length 0 address 0
        tmd(68012900): status 0 length 0 address 0
        tmd(68012908): status 0 length 0 address 0
        tmd(68012910): status 0 length 0 address 0
        tmd(68012918): status 0 length 0 address 0
        tmd(68012920): status 0 length 0 address 0
        tmd(68012928): status 2000 length 0 address 0

tx_limited=1(2)

SCC GENERAL PARAMETER RAM (at 0x68013C00)
Rx BD Base [RBASE]=0x2830, Fn Code [RFCR]=0x18
Tx BD Base [TBASE]=0x28B0, Fn Code [TFCR]=0x18
Max Rx Buff Len [MRBLR]=1548
Rx State [RSTATE]=0x0, BD Ptr [RBPTR]=0x2830
Tx State [TSTATE]=0x4000, BD Ptr [TBPTR]=0x28B0

SCC HDLC PARAMETER RAM (at 0x68013C38)
CRC Preset [C_PRES]=0xFFFF, Mask [C_MASK]=0xF0B8
Errors: CRC [CRCEC]=0, Aborts [ABTSC]=0, Discards [DISFC]=0
Nonmatch Addr Cntr [NMARC]=0
Retry Count [RETRC]=0
```

Router4 serial 0/0/0 is the DCE side as you can see from the above screenshot and clock rate set to 64000.

→ You have to configure the clock rate to your serial interface which has a cable attached with DCE end.

The clock rate command in the interface configuration mode enables the router at the DCE end of the cable to provide the clock signal for the serial link

We put **64000** to serial interfaces.

```
Group1Router4(config-if)#clock rate 64000
Group1Router4(config-if)#
```

```
Group1Router3(config-if)#clock rate 64000
Group1Router3(config-if)#
```

```
Group1Router2(config-if)#clock rate 64000
Group1Router2(config-if)#
```

→ `no shutdown` command is used to put an interface into the active state.

```
no shutdown
Group1Router1(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
```

For Router1 interface serial0/0/0

```
no shutdown
Group1Router2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
```

For Router2 interface serial0/0/0

```
no shutdown
Group1Router2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up
```

For Router2 interface serial0/0/1

```
no shutdown
Group1Router3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
```

For Router3 interface serial0/0/0

```
no shutdown
Group1Router3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up
```

For Router3 interface serial0/0/1

```
no shutdown
Group1Router4(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
```

For Router4 interface serial0/0/0

→ After all configurations are completed, check your interface settings using show command.

show ip interface brief command can be used to view a summary of the router interfaces. This command displays the IP address, interface status, and additional information.

```
Group1Router1#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        10.101.3.254    YES manual up                    up
FastEthernet0/1        unassigned      YES unset  administratively down down
Serial0/0/0            10.201.1.1      YES manual up                    up
Serial0/0/1            unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
```
For Router1.


```
Group1Router2#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        10.101.1.254    YES manual up                    up
FastEthernet0/1        unassigned      YES NVRAM  administratively down down
Serial0/0/0            10.201.1.2      YES manual up                    up
Serial0/0/1            10.201.2.1      YES manual up                    up
Vlan1                  unassigned      YES NVRAM  administratively down down
```
For Router2


```
Group1Router3#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        10.101.2.254    YES manual up                    up
FastEthernet0/1        unassigned      YES unset  up                    down
Serial0/0/0            10.201.2.2      YES manual up                    up
Serial0/0/1            10.201.3.1      YES manual up                    up
Vlan1                  unassigned      YES unset  administratively down down
```
For Router3


```
Group1Router4#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        10.101.4.254    YES manual up                    up
FastEthernet0/1        unassigned      YES unset  administratively down down
Serial0/0/0            10.201.3.2      YES manual up                    up
Serial0/0/1            unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
```
For Router4

→ `show ip route` **command is used for displaying the routing table.**

To display the current state of the routing table, use the show ip route command.
S means static. Indicates entries that are configured by the user.
C shows routing entries about networks directly connected to router's interfaces.

```
Group1Router4#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 7 subnets
S       10.101.1.0 is directly connected, Serial0/0/0
S       10.101.2.0 is directly connected, Serial0/0/0
S       10.101.3.0 is directly connected, Serial0/0/0
C       10.101.4.0 is directly connected, FastEthernet0/0
S       10.201.1.0 is directly connected, Serial0/0/0
S       10.201.2.0 is directly connected, Serial0/0/0
C       10.201.3.0 is directly connected, Serial0/0/0
```

For router 4.

```
Group1Router3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 7 subnets
S       10.101.1.0 is directly connected, Serial0/0/0
C       10.101.2.0 is directly connected, FastEthernet0/0
S       10.101.3.0 is directly connected, Serial0/0/0
S       10.101.4.0 is directly connected, Serial0/0/1
S       10.201.1.0 is directly connected, Serial0/0/0
C       10.201.2.0 is directly connected, Serial0/0/0
C       10.201.3.0 is directly connected, Serial0/0/1
```

For router3.

```
Group1Router2>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 7 subnets
C       10.101.1.0 is directly connected, FastEthernet0/0
S       10.101.2.0 is directly connected, Serial0/0/0
S       10.101.3.0 is directly connected, Serial0/0/1
S       10.101.4.0 is directly connected, Serial0/0/0
C       10.201.1.0 is directly connected, Serial0/0/1
C       10.201.2.0 is directly connected, Serial0/0/0
S       10.201.3.0 is directly connected, Serial0/0/0
```

For router 2.

```
Group1Router1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 7 subnets
S       10.101.1.0 is directly connected, Serial0/0/0
S       10.101.2.0 is directly connected, Serial0/0/0
C       10.101.3.0 is directly connected, FastEthernet0/0
S       10.101.4.0 is directly connected, Serial0/0/0
C       10.201.1.0 is directly connected, Serial0/0/0
S       10.201.2.0 is directly connected, Serial0/0/0
S       10.201.3.0 is directly connected, Serial0/0/0
```

For Router1.

Testing Connections

Note: *traceroute* command allows you to determine the path a packet takes in order to get to a destination from a given source by returning the sequence of hops the packet has traversed

```
Group1Router4#ping 10.101.3.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.101.3.254, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/9/17 ms
```

We pinged from Router4 to Router1. If we didn't set up the static connections on above step this would be failed.

```
Group1Router4#traceroute 10.101.3.254
Type escape sequence to abort.
Tracing the route to 10.101.3.254

  1    10.201.3.1      11 msec    0 msec    11 msec
  2    10.201.2.1      15 msec    0 msec    11 msec
  3    10.201.1.1      12 msec   33 msec    6 msec
```

Traceroute from Router4 to Router1.

```
Group1Router4#ping 10.101.2.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.101.2.254, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/8/13 ms
```

We pinged from Router4 to Router 2.If we didn't set up the static connections on above step this would have failed.

```
Group1Router4#traceroute 10.101.2.254
Type escape sequence to abort.
Tracing the route to 10.101.2.254

  1    10.201.3.1      16 msec    0 msec    2 msec
```

Traceroute from Router4 to Router3

```
Group1Router4#ping 10.101.1.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.101.1.254, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/12/28 ms
```

We pinged from Router4 to Router 2.If we didn't set up the static connections on above step this would have failed.

```
Group1Router4#traceroute 10.101.1.254
Type escape sequence to abort.
Tracing the route to 10.101.1.254

  1    10.201.3.1      0 msec     0 msec     0 msec
  2    10.201.2.1      19 msec    8 msec     7 msec
```

Traceroute from Router4 to Router2

```
Group1Router4#ping 10.101.3.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.101.3.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/12/26 ms
```

We pinged from Router4 to PC4. We pinged from Router4 to Router 2.If we didn't set up the static connections on above step this would have failed.

```
Group1Router4#traceroute 10.101.3.1
Type escape sequence to abort.
Tracing the route to 10.101.3.1

  1    10.201.3.1      11 msec    0 msec     2 msec
  2    10.201.2.1      6 msec     15 msec    14 msec
  3    10.201.1.1      1 msec     3 msec     2 msec
  4    10.101.3.1      3 msec     8 msec     2 msec
```

Traceroute from Router4 to Router1.

PC0

Physical Config Desktop Programming Attributes

GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth

FastEthernet0

Port Status ☑ On
Bandwidth ○ 100 Mbps ○ 10 Mbps ☑ Auto
Duplex ○ Half Duplex ● Full Duplex ☑ Auto
MAC Address 0030.F23B.21C7

IP Configuration
○ DHCP
● Static
IPv4 Address 10.101.2.2
Subnet Mask 255.255.255.0

IPv6 Configuration
○ Automatic
● Static
IPv6 Address [ ] / [ ]
Link Local Address: FE80::230:F2FF:FE3B:21C7

☐ Top

PC4

Physical Config Desktop Programming Attributes

GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth

FastEthernet0

Port Status ☑ On
Bandwidth ○ 100 Mbps ○ 10 Mbps ☑ Auto
Duplex ○ Half Duplex ● Full Duplex ☑ Auto
MAC Address 0040.0B45.D523

IP Configuration
○ DHCP
● Static
IPv4 Address 10.101.3.1
Subnet Mask 255.255.255.0

IPv6 Configuration
○ Automatic
● Static
IPv6 Address [ ] / [ ]
Link Local Address: FE80::240:BFF:FE45:D523

☐ Top
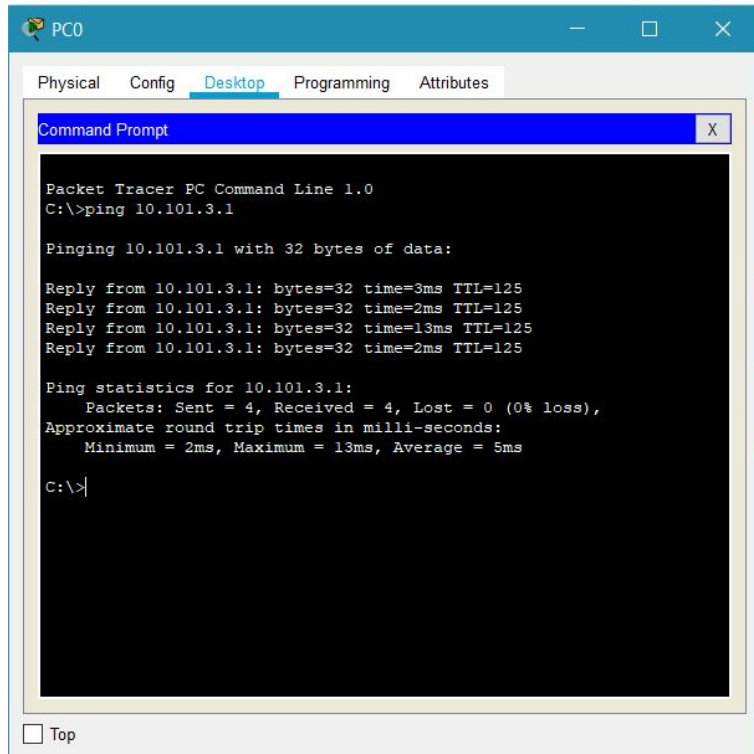
We pinged from PC0 to PC4.

Traceroute from PC0 to PC4.

PC7

Physical | Config | Desktop | Programming | Attributes

GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth

FastEthernet0

Port Status ☑ On
Bandwidth ○ 100 Mbps ○ 10 Mbps ☑ Auto
Duplex ○ Half Duplex ● Full Duplex ☑ Auto
MAC Address 00E0.B044.2605

IP Configuration
○ DHCP
● Static
IPv4 Address 10.101.4.1
Subnet Mask 255.255.255.0

IPv6 Configuration
○ Automatic
● Static
IPv6 Address [ ] / [ ]
Link Local Address: FE80::2E0:B0FF:FE44:2605

☐ Top

PC5

Physical | Config | Desktop | Programming | Attributes

GLOBAL
Settings
Algorithm Settings
INTERFACE
FastEthernet0
Bluetooth

FastEthernet0

Port Status ☑ On
Bandwidth ○ 100 Mbps ○ 10 Mbps ☑ Auto
Duplex ○ Half Duplex ● Full Duplex ☑ Auto
MAC Address 000C.CF42.5DA0

IP Configuration
○ DHCP
● Static
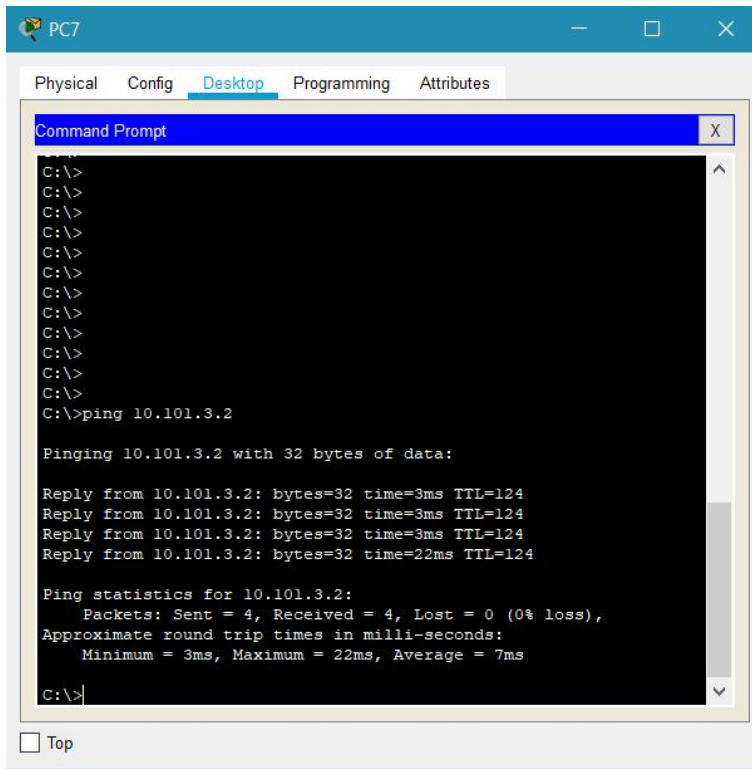IPv4 Address 10.101.3.2
Subnet Mask 255.255.255.0

IPv6 Configuration
○ Automatic
● Static
IPv6 Address [ ] / [ ]
Link Local Address: FE80::20C:CFFF:FE42:5DA0

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We pinged from PC7 to PC5.

Traceroute from PC7 to PC5.