

Übungsprotokoll – NWT – Übung 02

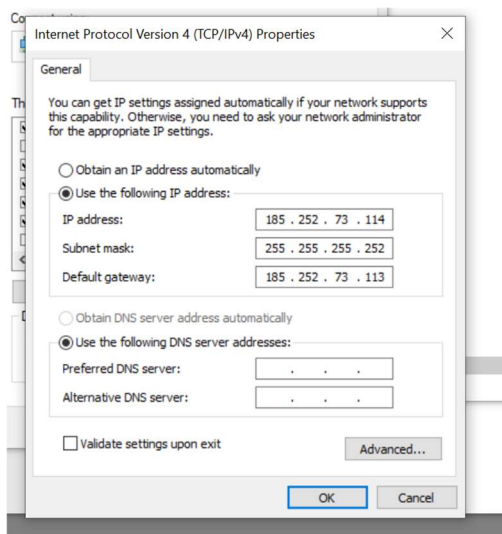
Zu Beginn des Übungsprotokolls möchten wir hiermit erklären, dass die Übung am Freitag, den 28.04.23, nicht fertiggebracht wurde. Aus diesem Grund haben wir die Übung am Dienstag, den 02.05.23, nochmal selbstständig im SIN-Lab durchgeführt (eigenständig verkabelt, etc.). Aufgrund dessen, dass zu diesem Zeitpunkt auch eine andere Gruppe von unserem Jahrgang im Lab war, könnten wir die Pings untereinander durchführen, um die gegenseitige Erreichbarkeit zu testen.

2.2 Konfigurieren der Adressen der PCs und Router laut Netzplan

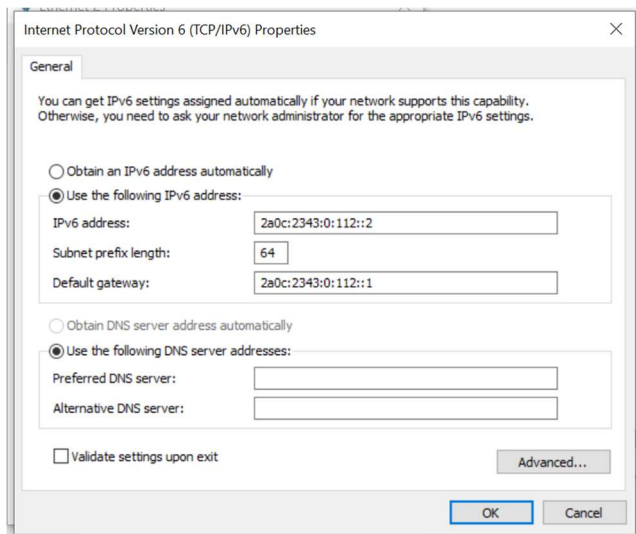
In der folgenden Übung haben wir die PCs 4.1 und 4.2 benutzt, somit sind die Netze 4.x verwendet worden. Die IP-Konfiguration wird folgendermaßen vergeben: Klick auf „Network“ in der Taskleiste -> „Network & Internet Settings“ -> „Change adapter options“ -> gewünschtes Netzwerk Interface auswählen, in diesem Fall Ethernet 2 -> „Properties“ -> Doppelklick auf „Internet Protocol Version 4“ bzw. „Internet Protocol Version 6“ und folgende Fenster poppen auf:

In diesen Fenstern ist folgende Konfiguration zu vergeben:

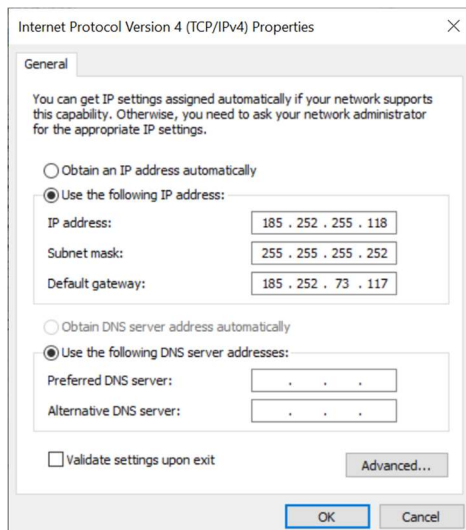
PC 4.1 IPv4-Konfiguration



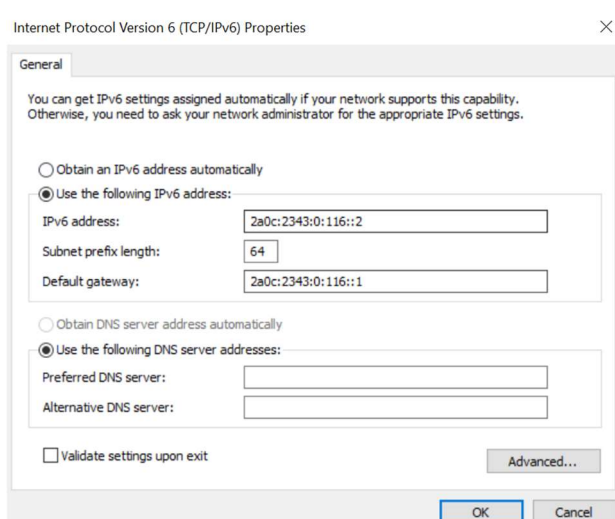
PC 4.1 IPv6-Konfiguration



PC 4.2 IPv4-Konfiguration

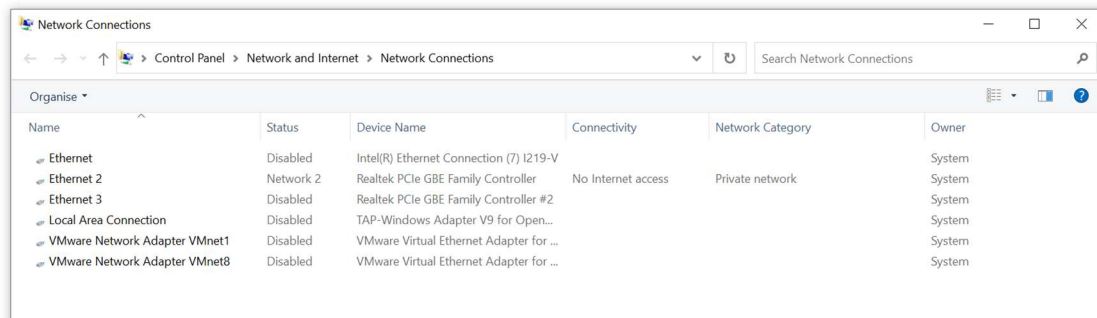


PC 4.2 IPv6-Konfiguration



Frage 1: Wie erkennt man nicht verbundene Interfaces in Windows PCs?

Antwort 1: Über den Ausführen-Dialog in Windows (Windows-Taste + R) ist Folgendes einzugeben "ncpa.cpl". Daraufhin werden alle Netzwerkverbindungen bzw. Netzwerkinterfaces angezeigt. Verbundene, nicht verbundene sowie deaktivierte Netzwerk-Interfaces können so erkannt werden. Meldungen wie z.B. "Not connected", "Network cable unplugged", "Enabled", "Disabled", "No Internet access" können somit eingesehen werden. So erkennt man nicht verbundene Interfaces in Windows PCs.



Die Gruppenrouter haben von uns in der Übung die Namen "GR40", "GR41" und "GR42" erhalten. "GR" steht hierbei für Gruppenrouter.

Testen der Verbindungen zwischen benachbarten Geräten:

Im Folgenden werden die Pings nur "einseitig" durchgeführt, also z.B. von PC 4.1 zu GR41, aber nicht von GR41 zu PC 4.1, da der Ping sowieso nur funktioniert, wenn bidirektionale Kommunikation möglich ist.

Ping PC 4.1 -> GR41 (IPv4)

```
C:\Users\admin_SIN>ping 185.252.73.113

Pinging 185.252.73.113 with 32 bytes of data:
Reply from 185.252.73.113: bytes=32 time<1ms TTL=255
Reply from 185.252.73.113: bytes=32 time<1ms TTL=255
Reply from 185.252.73.113: bytes=32 time<1ms TTL=255
Reply from 185.252.73.113: bytes=32 time<1ms TTL=255

Ping statistics for 185.252.73.113:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\admin_SIN>
```

Ping PC 4.1 -> GR41 (IPv6)

```
C:\Users\admin_SIN>ping 2a0c:2343:0:112::1

Pinging 2a0c:2343:0:112::1 with 32 bytes of data:
Reply from 2a0c:2343:0:112::1: time<1ms
Reply from 2a0c:2343:0:112::1: time<1ms
Reply from 2a0c:2343:0:112::1: time<1ms
Reply from 2a0c:2343:0:112::1: time<1ms

Ping statistics for 2a0c:2343:0:112::1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\admin_SIN>
```

Ping GR41 -> GR40 (IPv4 und IPv6)

```

GR41#ping 185.252.73.121
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 185.252.73.121, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
GR41#ping 2a0c:2343:0:120::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2A0C:2343:0:120::1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
GR41#

```

Ping GR40 -> GR42 (IPv4 und IPv6)

```

GR40#ping 185.252.73.126
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 185.252.73.126, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
GR40#ping 2a0c:2343:0:124::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2a0c:2343:0:124::2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms

```

Ping PC 4.2 -> GR42 (IPv4 und IPv6)

```

C:\Users\admin_SIN>ping 185.252.73.117

Pinging 185.252.73.117 with 32 bytes of data:
Reply from 185.252.73.117: bytes=32 time<1ms TTL=255
Reply from 185.252.73.117: bytes=32 time<1ms TTL=255
Reply from 185.252.73.117: bytes=32 time<1ms TTL=255
Reply from 185.252.73.117: bytes=32 time<1ms TTL=255

Ping statistics for 185.252.73.117:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\admin_SIN>ping 2a0c:2343:0:116::1

Pinging 2a0c:2343:0:116::1 with 32 bytes of data:
Reply from 2a0c:2343:0:116::1: time<1ms
Reply from 2a0c:2343:0:116::1: time<1ms
Reply from 2a0c:2343:0:116::1: time<1ms
Reply from 2a0c:2343:0:116::1: time<1ms

Ping statistics for 2a0c:2343:0:116::1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\admin_SIN>

```

Somit ist jeweils für IPv4 und IPv6 getestet, dass die Kommunikation zwischen alle Nachbarn, also zwischen PC 4.1 und GR41, zwischen GR41 und GR40, zwischen GR40 und GR42 und zwischen GR42 und PC 4.2 funktioniert.

Frage 2: Wie weit kommt man, wenn man weiter entfernte Geräte pingen will?

Warum ist das so?

Antwort 2: Grundsätzlich sollten alle Geräte, die sich im selben Netzwerk befinden, pingbar sein, sofern sie eine korrekte Netzwerkkonfiguration aufweisen und miteinander verbunden sind.

Wenn man zum Beispiel von PC-41 (über GR41) auf GR40 pingen will, kommt der Ping-Request zwar beim Router GR40 an (Request wird gesendet von PC-41 im Netz 4.1 an das Default-Gateway (GR41). Daraufhin sendet GR41 den Request an GR40 über das direkt verbundene Netz 4.3 weiter).

Jedoch kann der Router 40 keinen Ping-Reply zurücksenden, da im hierfür eine statische Route fehlt zum Quellnetzwerk fehlt. GR40 möchte den Reply zu PC41 zurücksenden, jedoch ist das Netz 4.1 nicht direkt verbunden, ein Default Gateway ist nicht vorhanden und eine Route zu diesem Netz ist ebenfalls nicht vorhanden. Dementsprechend schlägt der Ping fehl.

Konfiguration der Gruppenrouter

Beschreibung der Vorgehensweise zur Konfiguration der Router:

1. Verbinden mit den Routern via Serieller – Konsolenschnittstelle
2. Zurückstellen auf Werkseinstellungen mit folgenden Befehlen:

erase startup-config	Dieser Befehl löscht die "startup-config" (persistent gespeicherte Konfiguration) (alternativ kann auch write erase verwendet werden).
delete flash:vlan.dat	Da nach dem Löschen der Konfiguration die VLANs noch vorhanden sind, müssen diese extra aus dem Flash gelöscht werden.
reload	Dieser Befehl startet den Router neu, Einstellungen aus der Running-Config sind somit verloren.

*Bei erstmaligen Start sollen keine Passwörter gesetzt werden, sondern direkt in den „normalen“ Dialog gesprungen werden.

3. Konfigurieren der Interfaces:

Um ein interface zu konfigurieren muss wie folgt von dem „konfiguration mode“ (configure terminal) in den „interface configuration mode“ gewechselt werden:

interface <interfacename/number>

Im „interface configuration mode“ müssen folgende Konfigurationen vorgenommen werden:

ip address <ip-address> <mask>	IPv4 Adresse für das Interface mit zugehöriger Netzmaske
ipv6 address <ip-address>/<mask>	IPv6 Adresse für das Interface mit zugehöriger Netzmaske
ipv6 enable	
no shutdown	Bringt interface „up“ (nur mit shutdown - down)

4. Konfigurieren globaler Einstellungen:

hostname GRxx	Setzt den hostname für den jeweiligen router.
ipv6 unicast-routing	Steht am Anfang der running/startup-config und aktiviert „unicast-routing“

5. Konfigurieren von OSPF

router ospf <number> network <address> <inverted subnet mask> area <area-number>	Router für IPv4 Verbindet ein Netzwerk mit einem „RIP“ Routing Prozess
router ospfv3 1	Router für IPv6
ipv6 ospf1 area <area-number>	Hinzufügen der ospf-area zu jedem interface im jeweiligen „interface configuration mode“

Dokumentation des Routings

Gemäß der Aussage von Herrn Veichtlbauer müssen wir in der Übung, sofern diese nicht mehr am Freitag, den 28.04.23, abgeschlossen werden kann, die Pings zu PC0 nicht mehr testen. Es reichen die Pings zu einer anderen Gruppe vollkommen aus, um die Erreichbarkeit zu testen.

Erreichbarkeit der Endsysteme untereinander:

Ping PC41 -> PC42 (IPv4)

```
Command Prompt

C:\Users\admin_SIN>ping 185.252.73.118

Pinging 185.252.73.118 with 32 bytes of data:
Reply from 185.252.73.118: bytes=32 time<1ms TTL=125
Reply from 185.252.73.118: bytes=32 time<1ms TTL=125
Reply from 185.252.73.118: bytes=32 time<1ms TTL=125
Reply from 185.252.73.118: bytes=32 time<1ms TTL=125

Ping statistics for 185.252.73.118:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\admin_SIN>
```

Ping PC41 -> PC42 (IPv6)

```
C:\Users\admin_SIN>ping 2a0c:2343:0:116::2

Pinging 2a0c:2343:0:116::2 with 32 bytes of data:
Reply from 2a0c:2343:0:116::2: time<1ms
Reply from 2a0c:2343:0:116::2: time<1ms
Reply from 2a0c:2343:0:116::2: time<1ms
Reply from 2a0c:2343:0:116::2: time<1ms

Ping statistics for 2a0c:2343:0:116::2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\admin_SIN>
```

Ping PC42 -> PC41 (IPv4 & IPv6)

```
Command Prompt

C:\Users\admin_SIN>ping 185.252.73.114

Pinging 185.252.73.114 with 32 bytes of data:
Reply from 185.252.73.114: bytes=32 time<1ms TTL=125
Reply from 185.252.73.114: bytes=32 time<1ms TTL=125
Reply from 185.252.73.114: bytes=32 time<1ms TTL=125
Reply from 185.252.73.114: bytes=32 time<1ms TTL=125

Ping statistics for 185.252.73.114:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\admin_SIN>ping 2a0c:2343:0:112::2

Pinging 2a0c:2343:0:112::2 with 32 bytes of data:
Reply from 2a0c:2343:0:112::2: time<1ms
Reply from 2a0c:2343:0:112::2: time<1ms
Reply from 2a0c:2343:0:112::2: time<1ms
Reply from 2a0c:2343:0:112::2: time<1ms

Ping statistics for 2a0c:2343:0:112::2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\admin_SIN>
```

Zwei ausgewählte Pings zu PCs anderer Gruppen (PC81 & PC82).

Ping PC41 -> PC81

```
C:\Users\admin_SIN>ping 185.252.73.178

Pinging 185.252.73.178 with 32 bytes of data:
Reply from 185.252.73.178: bytes=32 time=1ms TTL=124
Reply from 185.252.73.178: bytes=32 time=1ms TTL=124
Reply from 185.252.73.178: bytes=32 time=1ms TTL=124
Reply from 185.252.73.178: bytes=32 time=1ms TTL=124

Ping statistics for 185.252.73.178:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\admin_SIN>ping 2a0c:2343:0:176::2

Pinging 2a0c:2343:0:176::2 with 32 bytes of data:
Reply from 2a0c:2343:0:176::2: time=1ms
Reply from 2a0c:2343:0:176::2: time=1ms
Reply from 2a0c:2343:0:176::2: time=1ms
Reply from 2a0c:2343:0:176::2: time=1ms

Ping statistics for 2a0c:2343:0:176::2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\admin_SIN>
```

Ping PC41 -> PC82

```
C:\Users\admin_SIN>ping 185.252.73.182

Pinging 185.252.73.182 with 32 bytes of data:
Reply from 185.252.73.182: bytes=32 time=1ms TTL=124
Reply from 185.252.73.182: bytes=32 time=1ms TTL=124
Reply from 185.252.73.182: bytes=32 time=1ms TTL=124
Reply from 185.252.73.182: bytes=32 time=1ms TTL=124

Ping statistics for 185.252.73.182:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\admin_SIN>ping 2a0c:2343:0:180::2

Pinging 2a0c:2343:0:180::2 with 32 bytes of data:
Reply from 2a0c:2343:0:180::2: time=1ms
Reply from 2a0c:2343:0:180::2: time=1ms
Reply from 2a0c:2343:0:180::2: time=1ms
Reply from 2a0c:2343:0:180::2: time=1ms

Ping statistics for 2a0c:2343:0:180::2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\admin_SIN>
```

Ping PC42 -> PC81

```
Command Prompt

C:\Users\admin_SIN>ping 185.252.73.178

Pinging 185.252.73.178 with 32 bytes of data:
Reply from 185.252.73.178: bytes=32 time=1ms TTL=124
Reply from 185.252.73.178: bytes=32 time=1ms TTL=124
Reply from 185.252.73.178: bytes=32 time=1ms TTL=124
Reply from 185.252.73.178: bytes=32 time=1ms TTL=124

Ping statistics for 185.252.73.178:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\admin_SIN>ping 2a0c:2343:0:176::2

Pinging 2a0c:2343:0:176::2 with 32 bytes of data:
Reply from 2a0c:2343:0:176::2: time=1ms
Reply from 2a0c:2343:0:176::2: time=1ms
Reply from 2a0c:2343:0:176::2: time=1ms
Reply from 2a0c:2343:0:176::2: time=1ms

Ping statistics for 2a0c:2343:0:176::2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\admin_SIN>
```

Ping PC42 -> PC82

```
Command Prompt

C:\Users\admin_SIN>ping 185.252.73.182

Pinging 185.252.73.182 with 32 bytes of data:
Reply from 185.252.73.182: bytes=32 time=1ms TTL=124
Reply from 185.252.73.182: bytes=32 time=1ms TTL=124
Reply from 185.252.73.182: bytes=32 time=1ms TTL=124
Reply from 185.252.73.182: bytes=32 time=1ms TTL=124

Ping statistics for 185.252.73.182:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\admin_SIN>ping 2a0c:2343:0:180::2

Pinging 2a0c:2343:0:180::2 with 32 bytes of data:
Reply from 2a0c:2343:0:180::2: time=1ms
Reply from 2a0c:2343:0:180::2: time=1ms
Reply from 2a0c:2343:0:180::2: time=1ms
Reply from 2a0c:2343:0:180::2: time=1ms

Ping statistics for 2a0c:2343:0:180::2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\Users\admin_SIN>
```


Anzeigen weiterer Informationen auf den Gruppenroutern:

Vorab wird der folgende Output der Befehle allgemein beschrieben:

Show ip route: Zeigt die IPv4-Routingtabelle des Routers an.

Show ipv6 route: Zeigt IPv6-Routingtabelle des Routers an.

Show ip(v6) ospf neighbor: Zeigt die OSPF-Neighbor-Beziehungen des Routers an, einschließlich der Router-ID des Nachbarn, der Priorität, des Status, der Zeit seit der letzten Aktivität und der IP-Adresse des Nachbarn.

Show ip(v6) protocols: Dieser Befehl gibt verschiedene Informationen aus, einschließlich der Routing-Protokolle, die auf dem Router ausgeführt werden und deren Konfigurationseinstellungen. z. B. Router-ID, Routing-Protokolle, Schnittstellen, Netze, Verteilungsliste, Automatische Summarisierung, Metrik-Berechnung

GR40 – show ip route

```
GR40#show ip route
Codes: L - local, C - connected, S - static, 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
       I - IS-IS, su - IS-IS summary, 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, H - NHRP, I - ISIS
       a - application route
       + - replicated route, % - next hop override, p - overrides from PF
Gateway of last resort is not set

185.252.0.0/16 is variably subnetted, 12 subnets, 3 masks
C       185.252.73.0/29 is directly connected, GigabitEthernet0/0
L       185.252.73.4/32 is directly connected, GigabitEthernet0/0
O       185.252.73.112/30
        [110/2] via 185.252.73.122, 01:03:22, GigabitEthernet0/1
O       185.252.73.116/30
        [110/2] via 185.252.73.126, 01:10:50, GigabitEthernet0/2
C       185.252.73.120/30 is directly connected, GigabitEthernet0/1
L       185.252.73.121/32 is directly connected, GigabitEthernet0/1
C       185.252.73.124/30 is directly connected, GigabitEthernet0/2
L       185.252.73.125/32 is directly connected, GigabitEthernet0/2
O       185.252.73.176/30
        [110/2] via 185.252.73.8, 01:00:07, GigabitEthernet0/0
O       185.252.73.180/30
        [110/3] via 185.252.73.8, 00:15:26, GigabitEthernet0/0
O       185.252.73.184/30
        [110/2] via 185.252.73.8, 01:11:00, GigabitEthernet0/0
O       185.252.73.188/30
        [110/2] via 185.252.73.8, 01:11:00, GigabitEthernet0/0
```

GR40 – show ipv6 route

```
GR40#show ipv6 route
IPv6 Routing Table - default - 13 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2
       IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external
       ND - ND Default, NDp - ND Prefix, DCE - Destination, NDR - Redirect
       RL - RPL, O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1
       OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       a - Application
C       2A0C:2343::/64 [0/0]
L       via GigabitEthernet0/0, directly connected
L       2A0C:2343::4/128 [0/0]
O       via GigabitEthernet0/0, receive
O       2A0C:2343::112::/64 [110/2]
        via FE80::26:63FF:FE1B:900, GigabitEthernet0/1
O       2A0C:2343::116::/64 [110/2]
        via FE80::FA7:3AFF:FE1F:7920, GigabitEthernet0/2
O       2A0C:2343::120::/64 [0/0]
        via GigabitEthernet0/1, directly connected
L       2A0C:2343::120::1/128 [0/0]
        via GigabitEthernet0/1, receive
C       2A0C:2343::124::/64 [0/0]
        via GigabitEthernet0/2, directly connected
L       2A0C:2343::124::1/128 [0/0]
        via GigabitEthernet0/2, receive
O       2A0C:2343::176::/64 [110/3]
        via FE80::242:68FF:FE7B:3C0, GigabitEthernet0/0
O       2A0C:2343::180::/64 [110/3]
        via FE80::242:68FF:FE7B:3C0, GigabitEthernet0/0
O       2A0C:2343::184::/64 [110/2]
        via FE80::242:68FF:FE7B:3C0, GigabitEthernet0/0
O       2A0C:2343::188::/64 [110/2]
        via FE80::242:68FF:FE7B:3C0, GigabitEthernet0/0
L       FF00::/8 [0/0]
        via Null0, receive
```

GR40 – show ip(v6) ospf neighbor

```
GR40#show ip ospf neighbor

Neighbor ID    Pri   State           Dead Time   Address          Interface
185.252.73.121 1     FULL/BDR        00:00:31   185.252.73.122  GigabitEtherne
t0/1
185.252.73.189 1     FULL/DR         00:00:33   185.252.73.8    GigabitEtherne
t0/0
185.252.73.126 1     FULL/DR         00:00:38   185.252.73.126  GigabitEtherne
t0/2
GR40#show ipv6 ospf neighbor

OSPFv3 Router with ID (185.252.73.4) (Process ID 1)

Neighbor ID    Pri   State           Dead Time   Interface ID      Interface
185.252.73.126 1     FULL/DR        00:00:33    6                 GigabitEtherne
t0/2
185.252.73.121 1     FULL/DR        00:00:37    3                 GigabitEtherne
t0/1
185.252.73.189 1     FULL/DR        00:00:35    3                 GigabitEtherne
t0/0
GR40#
```

GR40 – show ip protocols

```

GR40#show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "application"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 4)

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 185.252.73.4
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    185.252.73.0 0.0.0.15 area 0
    185.252.73.120 0.0.0.3 area 0
    185.252.73.124 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 110)
    185.252.73.126      110      01:13:42
    185.252.73.121      110      01:06:15
    185.252.73.189      110      01:13:52
    185.252.73.190      110      00:18:19
    185.252.73.186      110      01:03:00
  Distance: (default is 110)

GR40#show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "application"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "ospf 1"
  Router ID 185.252.73.4
  Number of areas: 1 normal, 0 stub, 0 nssa
  Interfaces (Area 0):
    GigabitEthernet0/2
    GigabitEthernet0/1
    GigabitEthernet0/0
  Redistribution:
    None
GR40#

```

GR41 – show ip route

```

GR41#show ip route
Codes: L - local, C - connected, S - static, 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
       I - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - OGP, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from FRR

Gateway of last resort is not set

185.252.0.0/16 is variably subnetted, 10 subnets, 3 masks
O        185.252.73.0/20
O        [110/2] via 185.252.73.121, 00:46:43, GigabitEthernet0/0
C        185.252.73.112/30 is directly connected, GigabitEthernet0/1
C        185.252.73.113/32 is directly connected, GigabitEthernet0/1
O        185.252.73.116/30
O        [110/3] via 185.252.73.121, 00:46:43, GigabitEthernet0/0
C        185.252.73.120/30 is directly connected, GigabitEthernet0/0
O        185.252.73.122/32 is directly connected, GigabitEthernet0/0
O        185.252.73.124/30
O        [110/2] via 185.252.73.121, 00:46:43, GigabitEthernet0/0
O        185.252.73.176/30
O        [110/4] via 185.252.73.121, 00:43:32, GigabitEthernet0/0
O        185.252.73.184/30
O        [110/3] via 185.252.73.121, 00:46:43, GigabitEthernet0/0
O        185.252.73.188/30
O        [110/3] via 185.252.73.121, 00:46:43, GigabitEthernet0/0
GR41#

```

GR41 – show ipv6 route

```

GR41#show ipv6 route
IPv6 Routing Table - default - 12 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDP - ND Prefix, DCE - Destination
       NDR - Redirect, RL - RPL, O - OSPF Intra, OI - OSPF Inter
       OE1 - OSPF ext 1, OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1
       ON2 - OSPF NSSA ext 2, a - Application

2A0C:2343::/64 [110/2]
  via FE80::242:68FF:FE84:FEB1, GigabitEthernet0/0
2A0C:2343:0:112::/64 [0/0]
  via GigabitEthernet0/1, directly connected
2A0C:2343:0:112::1/128 [0/0]
  via GigabitEthernet0/1, receive
2A0C:2343:0:116::/64 [110/3]
  via FE80::242:68FF:FE84:FEB1, GigabitEthernet0/0
2A0C:2343:0:120::/64 [0/0]
  via GigabitEthernet0/0, directly connected
2A0C:2343:0:120::2/128 [0/0]
  via GigabitEthernet0/0, receive
2A0C:2343:0:124::/64 [110/2]
  via FE80::242:68FF:FE84:FEB1, GigabitEthernet0/0
2A0C:2343:0:176::/64 [110/4]
  via FE80::242:68FF:FE84:FEB1, GigabitEthernet0/0
2A0C:2343:0:180::/64 [110/4]
  via FE80::242:68FF:FE84:FEB1, GigabitEthernet0/0
2A0C:2343:0:184::/64 [110/3]
  via FE80::242:68FF:FE84:FEB1, GigabitEthernet0/0
2A0C:2343:0:188::/64 [110/3]
  via FE80::242:68FF:FE84:FEB1, GigabitEthernet0/0
FF00::/8 [0/0]
  via Null0, receive
GR41#

```


GR41 – show ip ospf neighbor

```
GR41#show ip ospf neighbor
Neighbor ID      Pri   State           Dead Time   Address        Interface
185.252.73.4     1    FULL/DR         00:00:36   185.252.73.121 GigabitEthernet0/0
GR41#show ipv6 ospf neighbor
OSPFv3 Router with ID (185.252.73.121) (Process ID 1)
Neighbor ID      Pri   State           Dead Time   Interface ID    Interface
185.252.73.4     1    FULL/BDR        00:00:36   4               GigabitEthernet0/0
GR41#
```

GR41 – show ip protocols

```
GR41#show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "application"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 4)

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 185.252.73.121
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    185.252.73.112 0.0.0.3 area 0
    185.252.73.120 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
  185.252.73.126     110          00:51:21
  185.252.73.189     110          00:51:21
  185.252.73.190     110          00:03:29
  185.252.73.186     110          00:48:10
  Distance: (default is 110)

GR41#
GR41#show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "application"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "ospf 1"
  Router ID 185.252.73.121
  Number of areas: 1 normal, 0 stub, 0 nssa
  Interfaces (Area 0):
    GigabitEthernet0/1
    GigabitEthernet0/0
  Redistribution:
    None
GR41#
```

GR42 – show ip route

```
GR42#show ip route
Codes: L - local, C - connected, S - static, 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, n - OMP
       n - NAT, N1 - NAT inside, No - NAT outside, Nd - NAT D1A
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       Ia - IS-IS inter area, * - candidate default, U - per-user static route
       R - RRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PFR

Gateway of last resort is not set

185.252.0.0/16 is variably subnetted, 11 subnets, 3 masks
O   185.252.73.0/28
    [110/2] via 185.252.73.125, 01:06:42, GigabitEthernet0/0/0
O   185.252.73.112/30
    [110/3] via 185.252.73.125, 00:59:14, GigabitEthernet0/0/0
C   185.252.73.116/30 is directly connected, GigabitEthernet0/0/1
L   185.252.73.117/32 is directly connected, GigabitEthernet0/0/1
O   185.252.73.120/30
    [110/2] via 185.252.73.125, 01:06:42, GigabitEthernet0/0/0
C   185.252.73.124/30 is directly connected, GigabitEthernet0/0/0
L   185.252.73.126/32 is directly connected, GigabitEthernet0/0/0
O   185.252.73.128/30
    [110/4] via 185.252.73.125, 00:56:04, GigabitEthernet0/0/0
O   185.252.73.180/30
    [110/4] via 185.252.73.125, 00:11:18, GigabitEthernet0/0/0
O   185.252.73.184/30
    [110/3] via 185.252.73.125, 01:06:42, GigabitEthernet0/0/0
O   185.252.73.188/30
    [110/3] via 185.252.73.125, 01:06:42, GigabitEthernet0/0/0
GR42#
```

GR42 – show ipv6 route

```
GR42#show ipv6 route
IPv6 Routing Table - default - 12 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDP - ND Prefix, DCE - Destination
       Ndr - Redirect, RL - RPL, O - OSPF Intra, OI - OSPF Inter
       OE1 - OSPF ext 1, OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1
       ON2 - OSPF NSSA ext 2, a - Application, m - OMP

O   2A0C:2343::/64 [110/2]
    via FE80::242:68FF:FE84:FEB2, GigabitEthernet0/0/0
O   2A0C:2343:0:112::/64 [110/3]
    via FE80::242:68FF:FE84:FEB2, GigabitEthernet0/0/0
C   2A0C:2343:0:116::/64 [0/0]
    via GigabitEthernet0/0/1, directly connected
L   2A0C:2343:0:116::1/128 [0/0]
    via GigabitEthernet0/0/1, receive
O   2A0C:2343:0:120::/64 [110/2]
    via FE80::242:68FF:FE84:FEB2, GigabitEthernet0/0/0
C   2A0C:2343:0:124::/64 [0/0]
    via GigabitEthernet0/0/0, directly connected
L   2A0C:2343:0:124::2/128 [0/0]
    via GigabitEthernet0/0/0, receive
O   2A0C:2343:0:176::/64 [110/4]
    via FE80::242:68FF:FE84:FEB2, GigabitEthernet0/0/0
O   2A0C:2343:0:180::/64 [110/4]
    via FE80::242:68FF:FE84:FEB2, GigabitEthernet0/0/0
O   2A0C:2343:0:184::/64 [110/3]
    via FE80::242:68FF:FE84:FEB2, GigabitEthernet0/0/0
O   2A0C:2343:0:188::/64 [110/3]
    via FE80::242:68FF:FE84:FEB2, GigabitEthernet0/0/0
L   FF00::/8 [0/0]
    via Null0, receive
GR42#
```

GR42 – show ospf neighbor

```
GR42#show ip ospf neighbor

Neighbor ID      Pri   State           Dead Time   Address        Interface
185.252.73.4     1    FULL/BDR        00:00:36    185.252.73.125 GigabitEthernet0/0/0

GR42#show ipv6 ospf neighbor

OSPFv3 Router with ID (185.252.73.126) (Process ID 1)

Neighbor ID      Pri   State           Dead Time   Interface ID    Interface
185.252.73.4     1    FULL/BDR        00:00:31    5               GigabitEthernet0/0/0
GR42#
```

GR42 – show ip protocols

```
GR42#show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "application"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 4)

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 185.252.73.126
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    185.252.73.116 0.0.0.3 area 0
    185.252.73.124 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
  185.252.73.4      110           01:08:48
  185.252.73.121    110           01:01:20
  185.252.73.189    110           01:08:48
  185.252.73.190    110           00:13:25
  185.252.73.186    110           00:58:11
  Distance: (default is 110)

GR42#show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "application"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "ospf 1"
  Router ID 185.252.73.126
  Number of areas: 1 normal, 0 stub, 0 nssa
  Interfaces (Area 0):
    GigabitEthernet0/0/1
    GigabitEthernet0/0/0
  Redistribution:
    None
GR42#
```