



TEL3214 Computer Communication Networks

Lecture 7c

Routing - Exterior Gateway Protocol

BGP-4

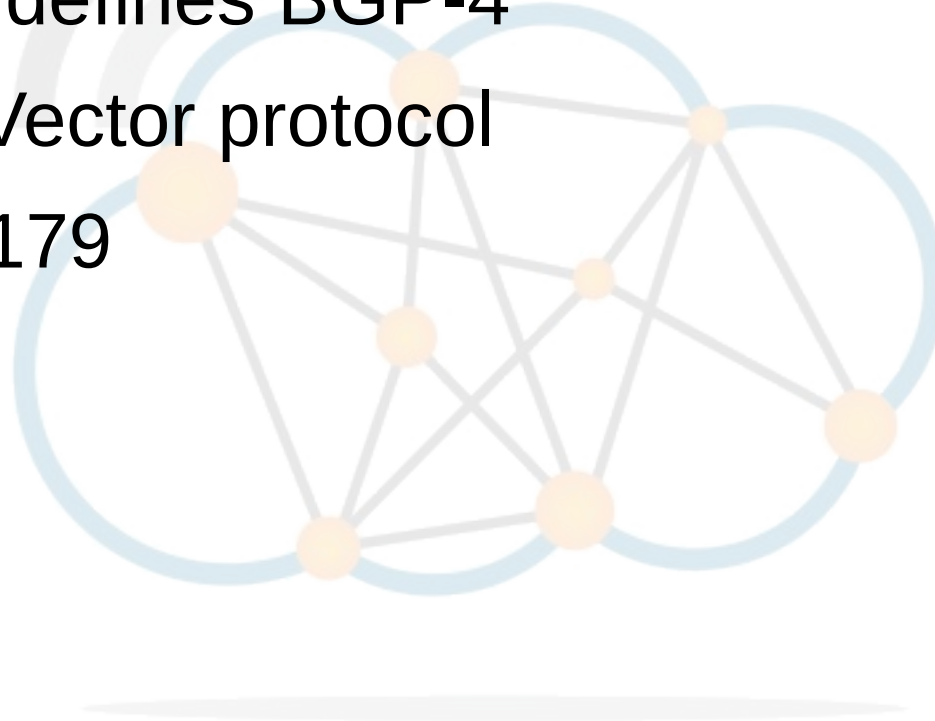
Diarmuid Ó Briain

CEng, FIEI, FIET, CISSP

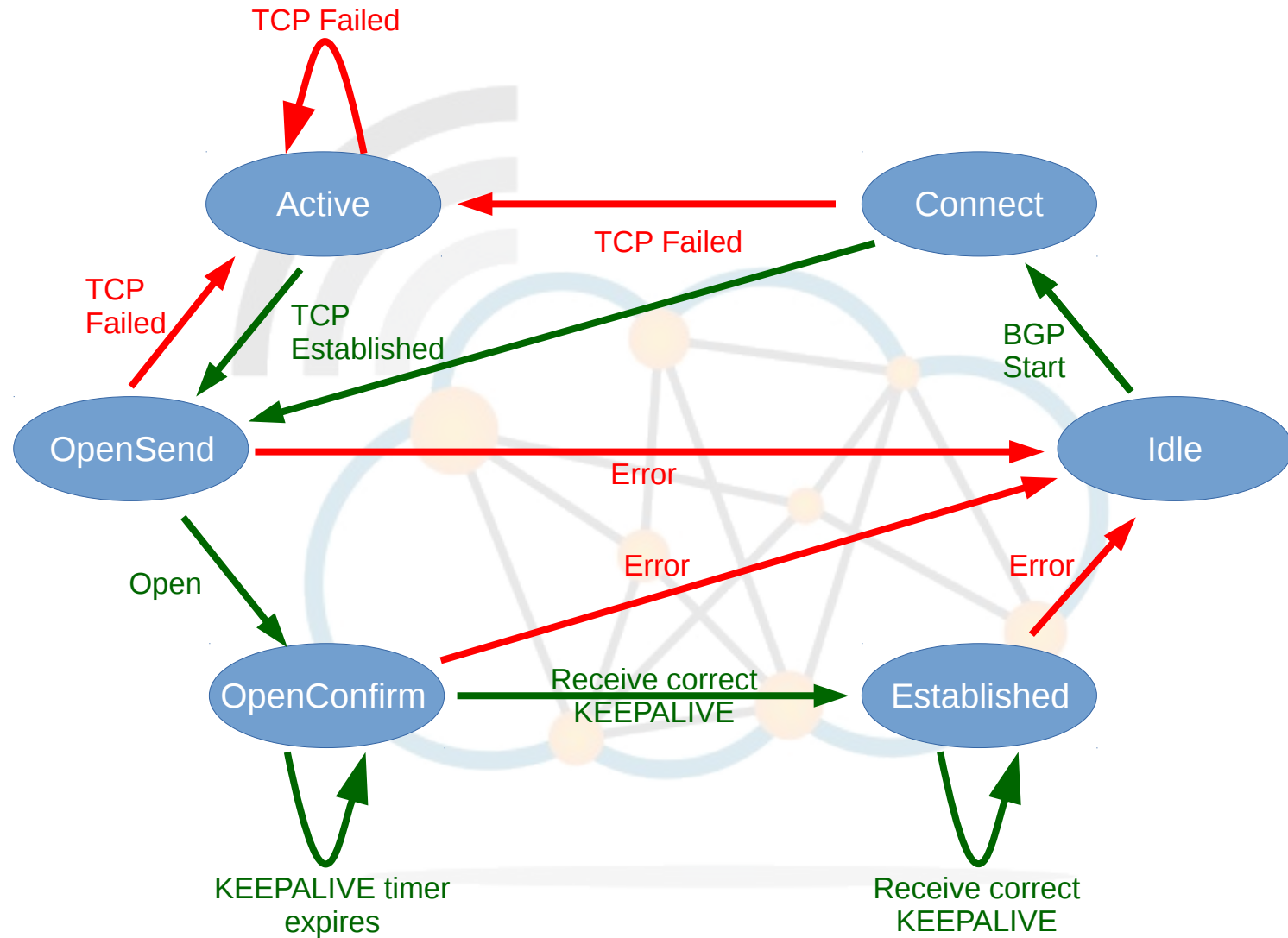
diarmuid@obriain.com



- EGP provide routing information between AS
- RFC1105 BGP from June 1989
- RFC4271 defines BGP-4
- Distance Vector protocol
- TCP port 179



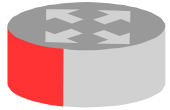
BGP Finite State Machine (FSM)



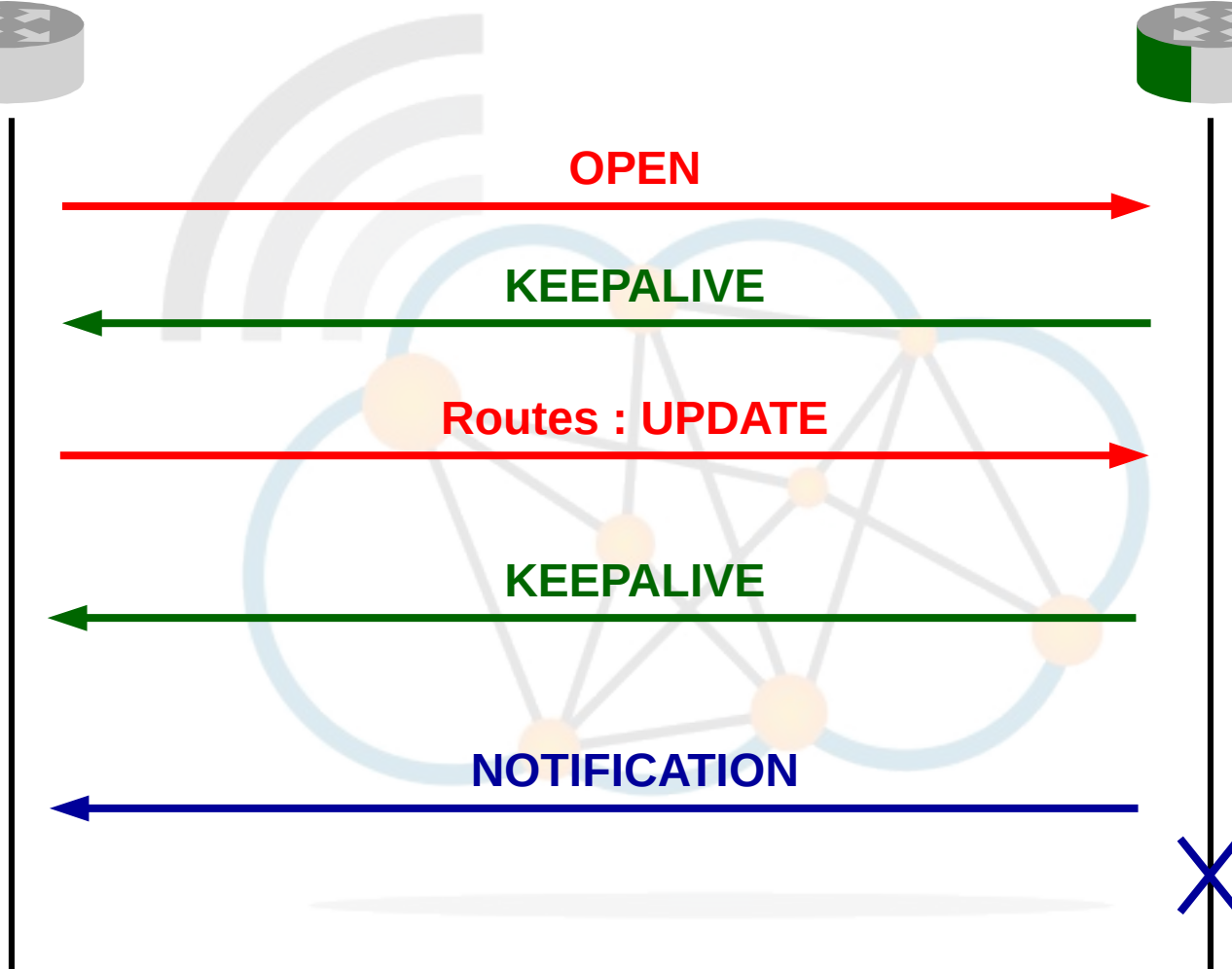
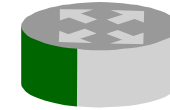
BGP-4 messages



AS: 1111



AS: 2222





```
Border Gateway Protocol - UPDATE Message
Marker: ffffffffffffffffffffffffffffffffffff
Length: 56
Type: UPDATE Message (2)
Withdrawn Routes Length: 0
Total Path Attribute Length: 25
Path attributes
  Path Attribute - ORIGIN: IGP
  Path Attribute - AS_PATH: 2222 1111
  Path Attribute - NEXT_HOP: 195.5.5.2
Network Layer Reachability Information (NLRI)
  210.0.7.0/24
    NLRI prefix length: 24
    NLRI prefix: 210.0.7.0
  210.0.8.0/24
    NLRI prefix length: 24
    NLRI prefix: 210.0.8.0
```

BGP-4 UPDATE



Border Gateway Protocol - UPDATE Message

Marker: ff

Length: 103

Type: UPDATE Message (2)

Withdrawn Routes Length: 0

Total Path Attribute Length: 80

Path attributes

Path Attribute - MP_REACH_NLRI

Address family identifier (AFI): IPv6 (2)

Subsequent address family identifier (SAFI): Unicast (1)

Next hop network address (32 bytes)

Next Hop: **2005:5::1**

Next Hop: **fe80::200:ff:feaa:16**

Number of Subnetwork points of attachment (SNPA): 0

Network layer reachability information (18 bytes)

2201:9::/64

MP Reach NLRI prefix length: **64**

MP Reach NLRI IPv6 prefix: **2201:9::**

2201:10::/64

MP Reach NLRI prefix length: **64**

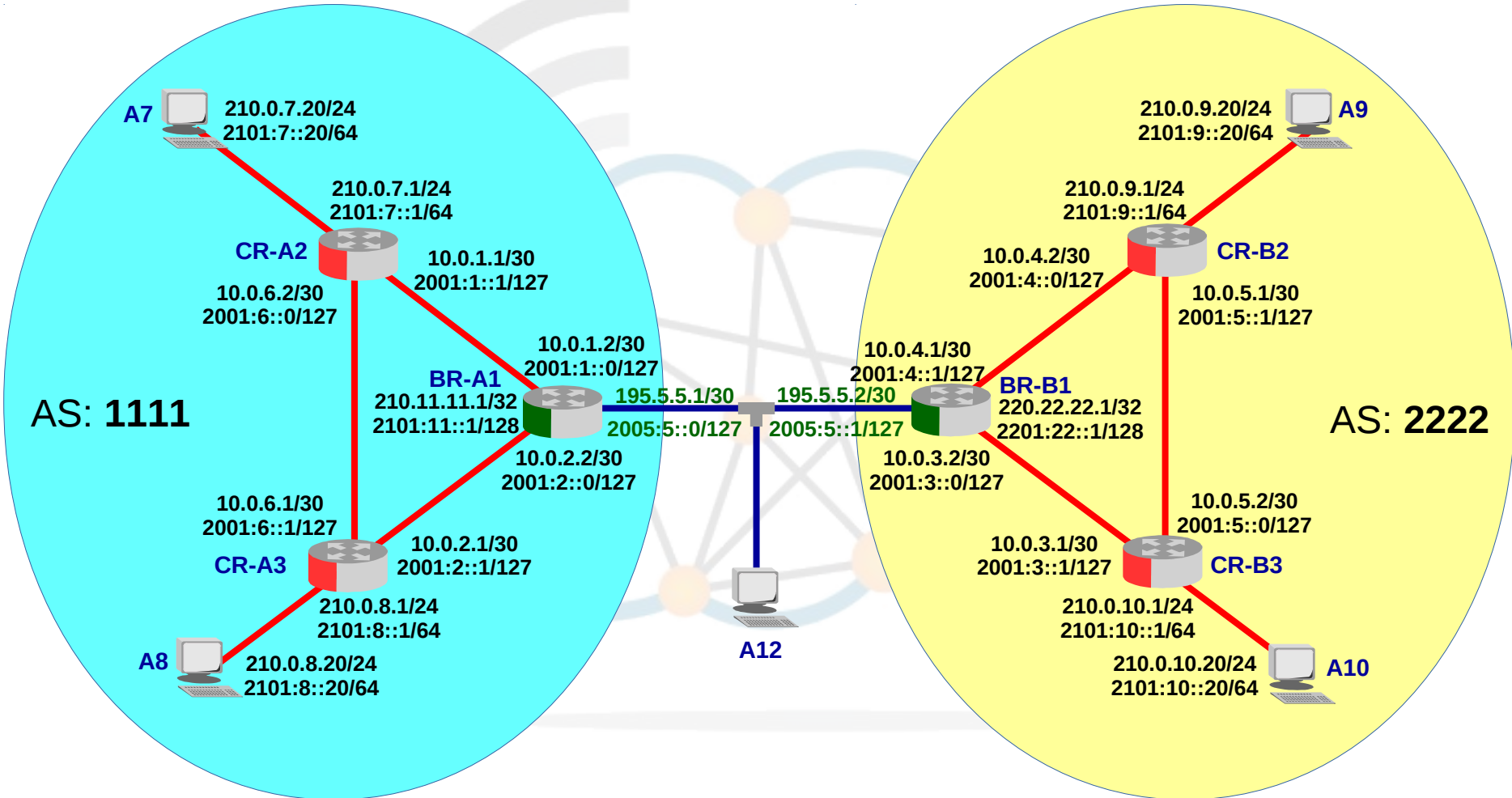
MP Reach NLRI IPv6 prefix: **2201:10::**

Path Attribute - ORIGIN: IGP

Path Attribute - **AS_PATH: 2222**

Path Attribute - MULTI_EXIT_DISC: 0

BGP+



Interface Configuration



BR-A1

```
interface lo
  ip address 210.11.11.1/32
  ipv6 address 2101:11::1/128

interface eth0
  ip address 195.5.5.1/30
  ipv6 address 2005:5::/127
  ipv6 nd suppress-ra

interface eth1
  ip address 10.0.1.2/30
  ipv6 address 2001:1::/127
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast

interface eth2
  ip address 10.0.2.2/30
  ipv6 address 2001:2::/127
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
```

BR-B1

```
interface lo
  ip address 220.22.22.1/32
  ipv6 address 2201:22::1/128

interface eth0
  ip address 195.5.5.2/30
  ipv6 address 2005:5::1/127
  ipv6 nd suppress-ra

interface eth1
  ip address 10.0.3.2/30
  ipv6 address 2001:3::/127
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast

interface eth2
  ip address 10.0.4.1/30
  ipv6 address 2001:4::1/127
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
```


BGP+ Configuration



BR-A1

```
router bgp 1111
  bgp router-id 210.11.11.1
  network 210.0.7.0/24
  network 210.0.8.0/24
  redistribute static metric 30
  neighbor 195.5.5.2 remote-as 2222
  neighbor 2005:5::1 remote-as 2222

  address-family ipv6
    network 2101:7::/64
    network 2101:8::/64
    redistribute static metric 30
    neighbor 2005:5::1 activate

ip route 210.0.7.0/24 Null0 250
ip route 210.0.8.0/24 Null0 250
ipv6 route 2101:7::/64 null0 250
ipv6 route 2101:8::/64 null0 250
```

BR-B1

```
router bgp 2222
  bgp router-id 220.22.22.1
  network 220.0.9.0/24
  network 220.0.10.0/24
  redistribute static metric 30
  neighbor 195.5.5.1 remote-as 1111
  neighbor 2005:5:: remote-as 1111

  address-family ipv6
    network 2201:9::/64
    network 2201:10::/64
    redistribute static metric 30
    neighbor 2005:5:: activate

ip route 220.0.9.0/24 Null0 250
ip route 220.0.10.0/24 Null0 250
ipv6 route 2201:9::/64 null0 250
ipv6 route 2201:10::/64 null0 250
```

OSPF Configuration



BR-A1

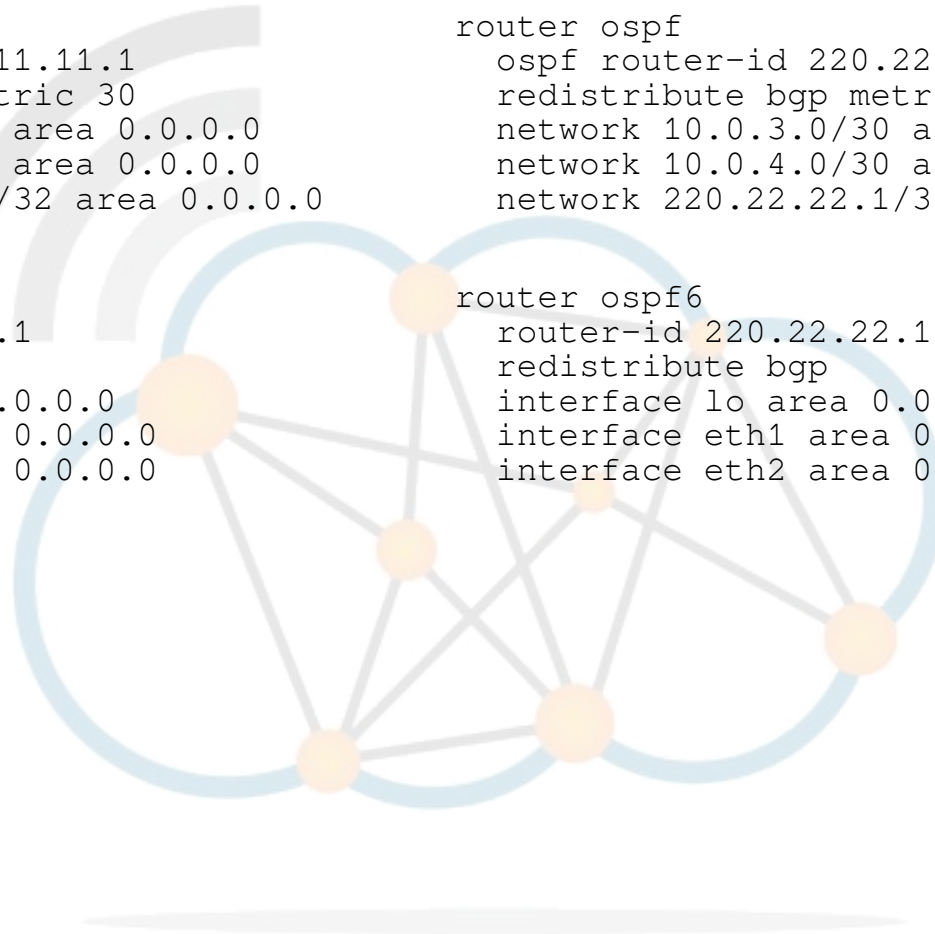
```
router ospf
  ospf router-id 210.11.11.1
  redistribute bgp metric 30
  network 10.0.1.0/30 area 0.0.0.0
  network 10.0.2.0/30 area 0.0.0.0
  network 210.11.11.1/32 area 0.0.0.0
```

```
router ospf6
  router-id 210.11.11.1
  redistribute bgp
  interface lo area 0.0.0.0
  interface eth1 area 0.0.0.0
  interface eth2 area 0.0.0.0
```

BR-B1

```
router ospf
  ospf router-id 220.22.22.1
  redistribute bgp metric 30
  network 10.0.3.0/30 area 0.0.0.0
  network 10.0.4.0/30 area 0.0.0.0
  network 220.22.22.1/32 area 0.0.0.0
```

```
router ospf6
  router-id 220.22.22.1
  redistribute bgp
  interface lo area 0.0.0.0
  interface eth1 area 0.0.0.0
  interface eth2 area 0.0.0.0
```



Testing the network



```
A12# tshark -i eth0 -w myBGPtrace.pcapng -F pcap  
Capturing on 'eth0'  
16 ^C
```

```
A12# ls  
myBGPtrace.pcapng
```

```
A7# fping 220.0.9.20  
220.0.9.20 is alive
```

```
A7# fping6 2201:9::20  
2201:9::20 is alive
```

```
A7# fping 220.0.10.20  
220.0.10.20 is alive
```

```
A7# fping6 2201:10::20  
2201:10::20 is alive
```

```
A10# fping 210.0.7.20  
210.0.7.20 is alive
```

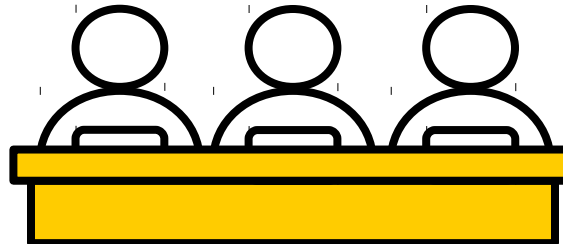
```
A10# fping6 2101:7::20  
2101:7::20 is alive
```

```
A10# fping 210.0.8.20  
210.0.8.20 is alive
```

```
A10# fping6 2101:8::20  
2101:8::20 is alive
```



Routing Lab Assignment



Diarmuid Ó Briain

CEng, FIEI, FIET, CISSP

diarmuid@obriain.com



Thank you

Diarmuid Ó Briain

CEng, FIEI, FIET, CISSP

diarmuid@obriain.com