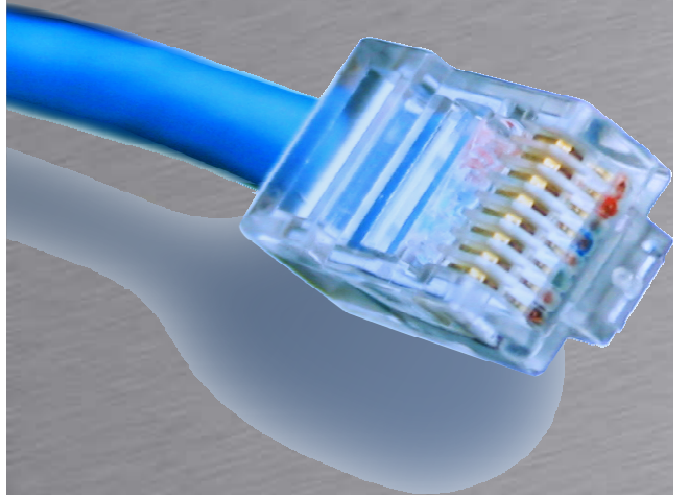


# Dynamisk Routing



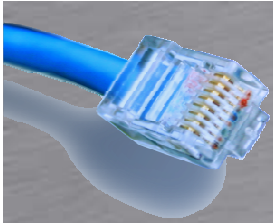
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- en del af **mercantec<sup>+</sup>**

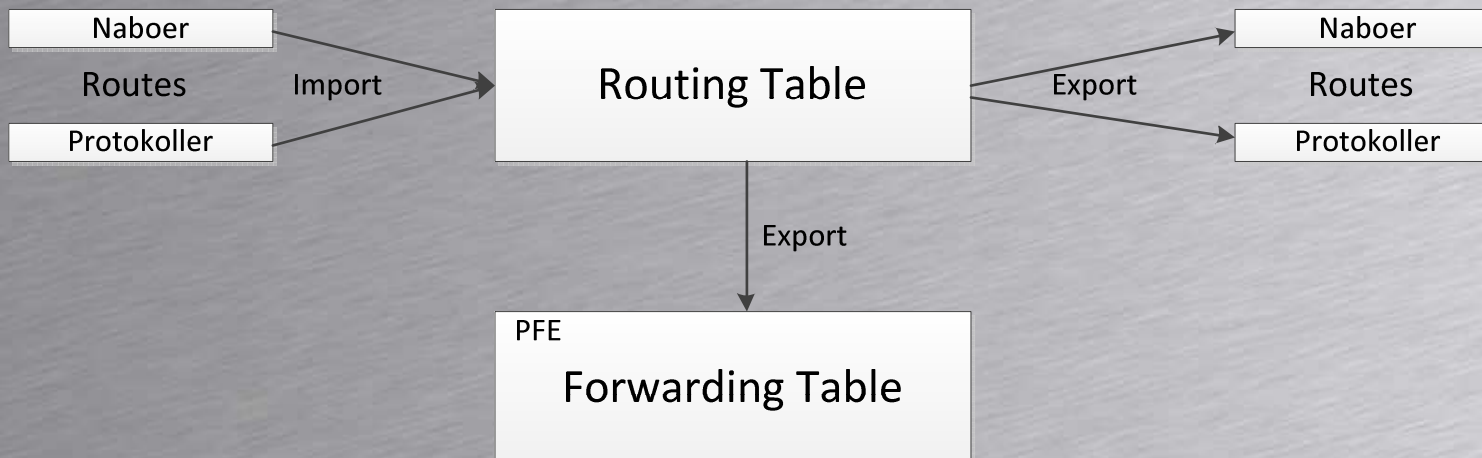
## OSPF

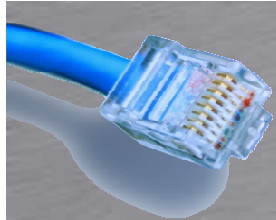
Rasmus Elmholt V1.0



# Routing Politikker

- Routing politikker bestemmer hvilket information der rammer og forlader route tabellen.





# Routing Politikker

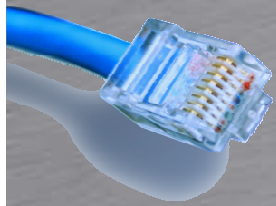
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- Eksempel – Redistribute Static

```
[edit]
rael@SRX240# show
policy-options {
    policy-statement export-static-routes {
        term match-static-routes {
            from protocol static;
            then accept;
        }
    }
}
protocols {
    ospf {
        export export-static-routes;
    }
}
```



# Routing Politikker

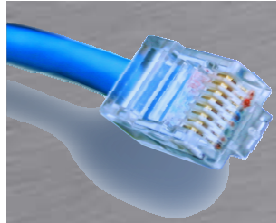
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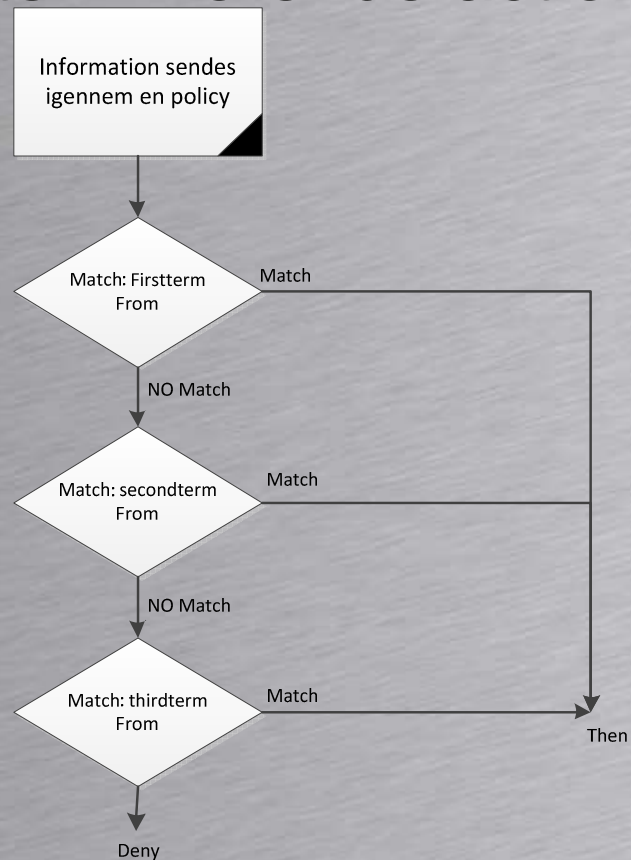
- Eksempel – Redistribute Aggregate

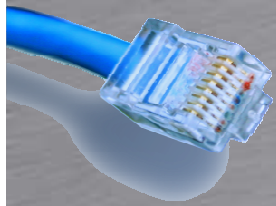
```
[edit]
rael@SRX240# show
policy-options {
    policy-statement export-static-routes {
        term match-static-routes {
            from protocol aggregate;
            then accept;
        }
    }
}
protocols {
    ospf {
        export export-static-routes;
    }
}
```



# Routing Politikker

- Forsætter til de rammen en match
  - Implicit deny
  - Stopper ved terminerende actions
    - Drop
    - Reject

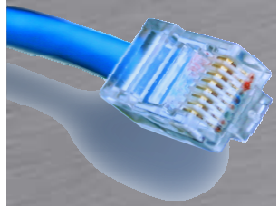




# Routing Politikker

- Default Routing Politik per protokol

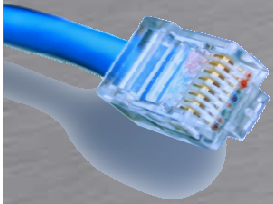
| Protokol | Import   | Export   |
|----------|--|--|
| BGP      | Accept all BGP routes                                      | Accept all active BGP routes                   |
| OSPF     | Accept all OSPF Routes                                     | Reject everything (Protocol floods by default) |
| IS-IS    | Accept all IS-IS Routes                                    | Reject everything (Protocol floods by default) |
| RIP      | Accept all RIP routes from explicitly configured neighbors | Reject everything                              |



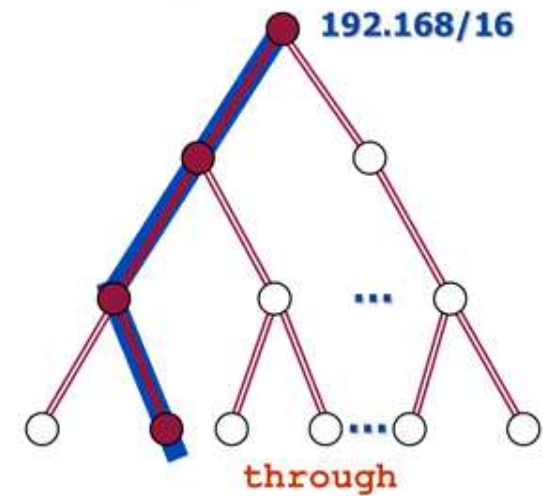
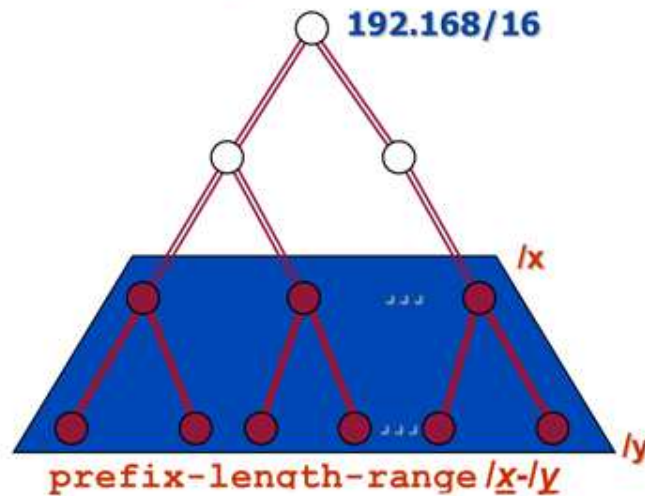
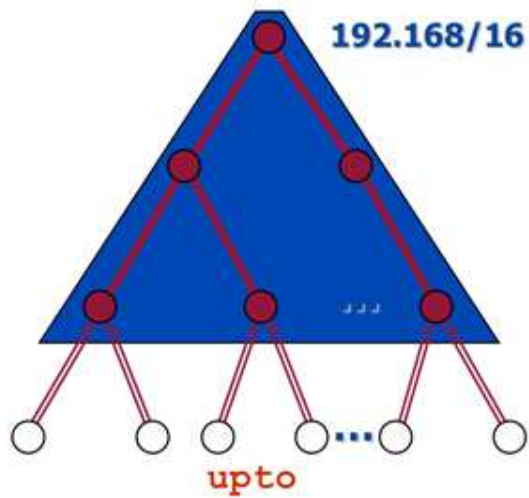
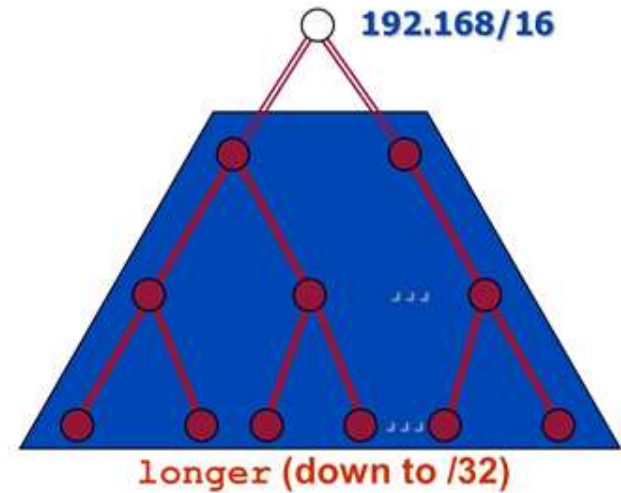
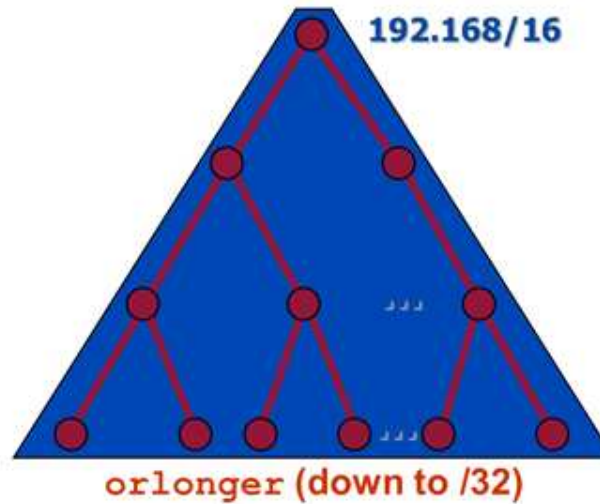
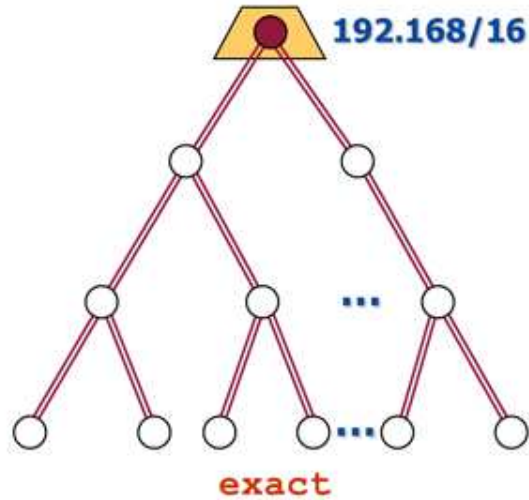
# Prefix Lister

- Indeholder en liste af prefixer
  - Kan bruges i firewall sætninger
  - Kan bruges i routing politikker

```
[edit policy-options]
rael@SRX240# show
Prefix-list rfc1918 {
  10.0.0.0/8;
  172.16.0.0/12;
  192.168.0.0/16;
}
Policy-statement rfc1918-policy {
  from {
    prefix-list-filter rfc1918 orlonger;
  }
  then reject;
}
```

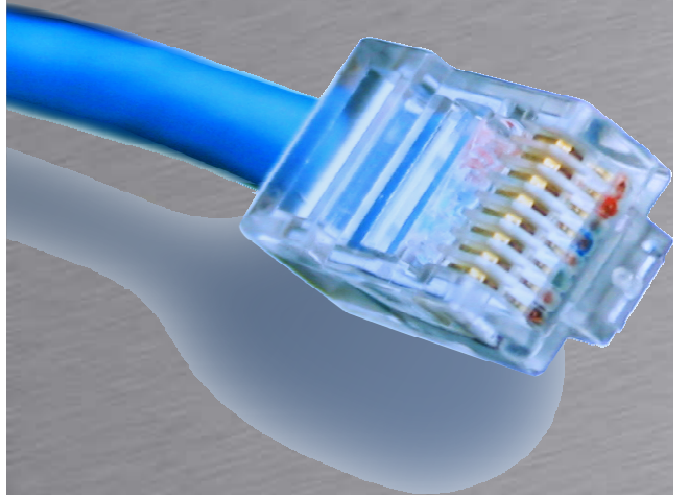


# Match Types





# OSPF

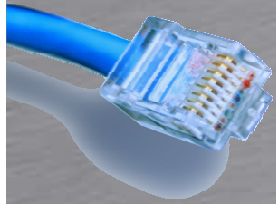


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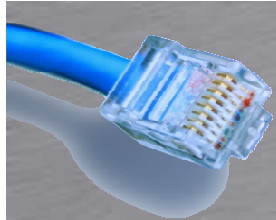
- en del af **mercantec<sup>+</sup>**

Open Shortest Path First



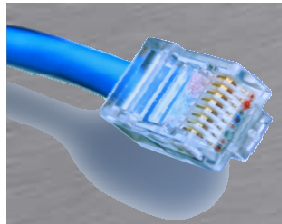
# OSPF

- Link-State IGP routing protokol
- Sender LSA til hele netværket
  - Gemmer LSA'er i link state databasen
  - Alle Routere har en kopi af databasen
  - Bruger Djikstras Open Shortest Path First algoritme

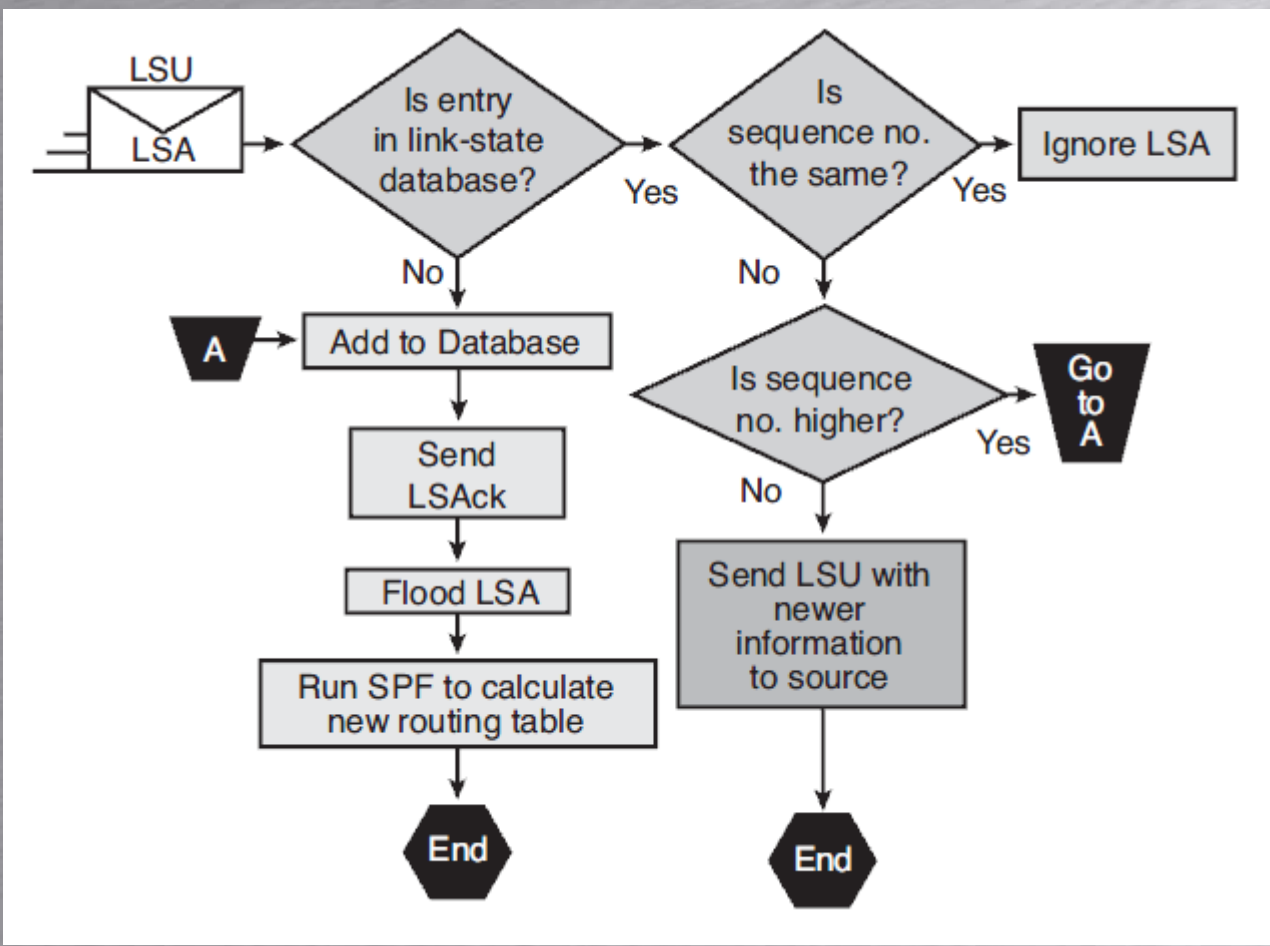


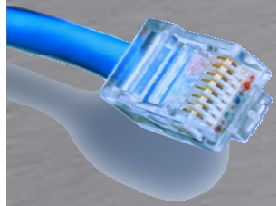
# OSPF

- OSPF Pakke typer
  - Hello – Opretter og vedligeholder naboskaber
  - DBD – Indeholder en liste over kendte LSA'er
  - Request – Requester LSA'er
  - Update – Indeholder LSA'er
  - Acknowledgment – Svar på tiltale



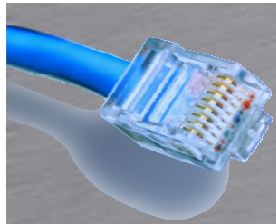
# OSPF





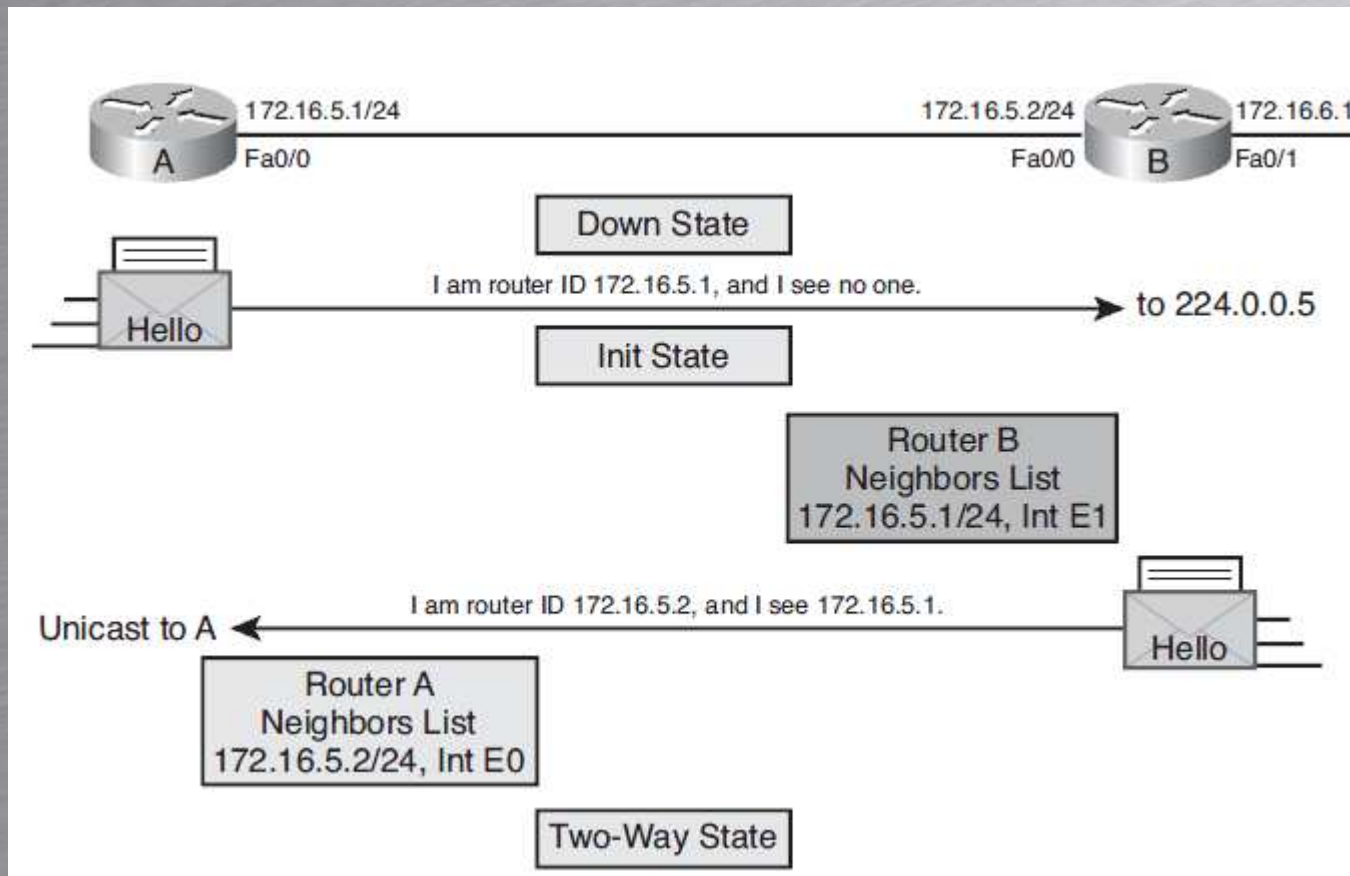
# OSPF Operation

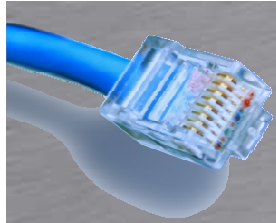
- OSPF Operation
  - Step 1: Establish router adjacencies
  - Step 2: Elect a DR and a BDR
  - Step 3: Discover routes
  - Step 4: Select appropriate routes
  - Step 5: Maintain routing information



# OSPF Operation

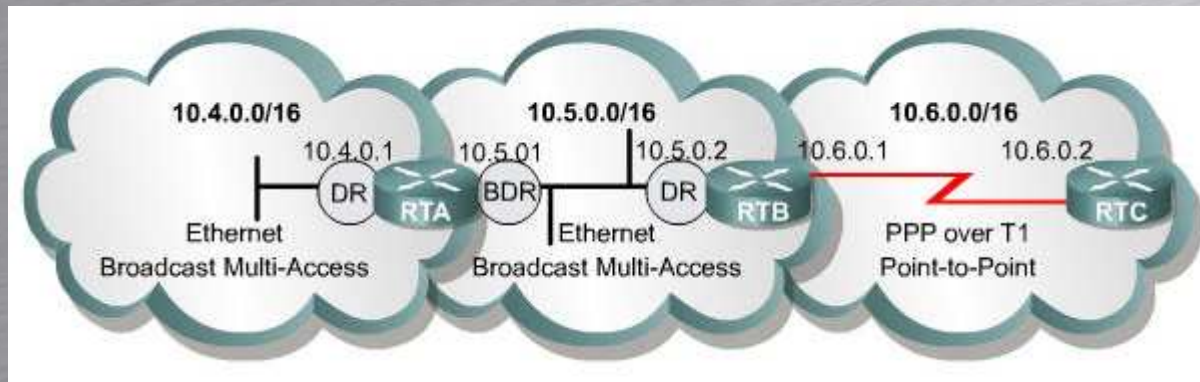
- Step 1 - Naboskab

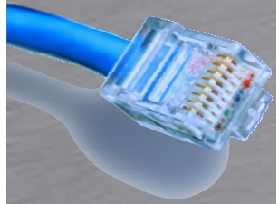




# OSPF Operation

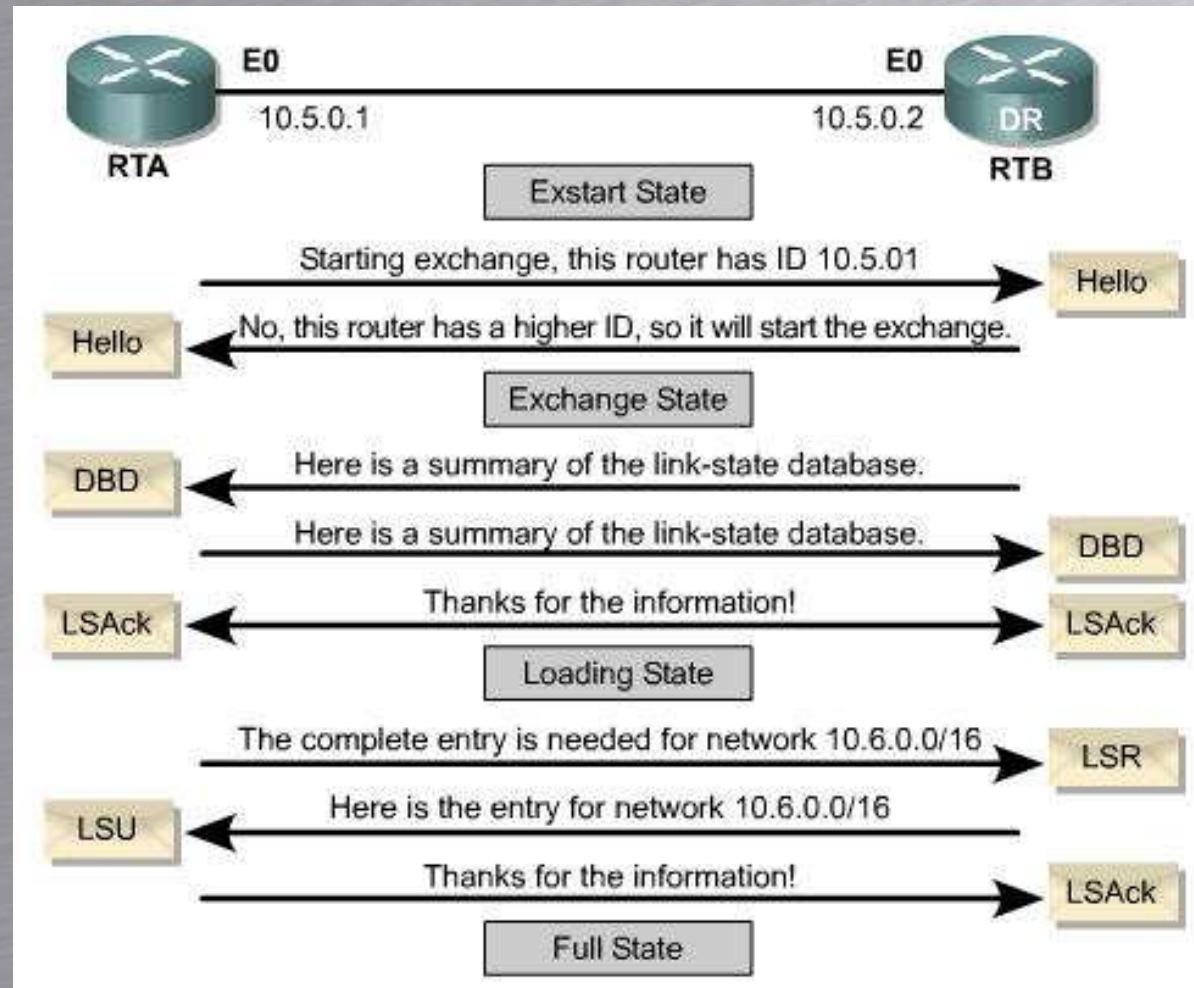
- DR Udvælgelse
  - Prioritet – Højeste vinder
    - Mellem 0-255
    - Default 128
  - Højeste RID
    - Set routing-options router-id 192.168.0.1



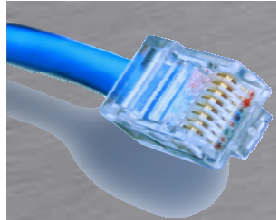


# OSPF Operation

- Step 3: Discover routes







# OSPF

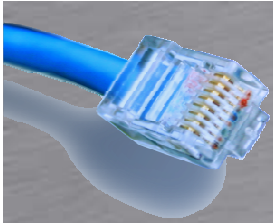
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- Eksempel

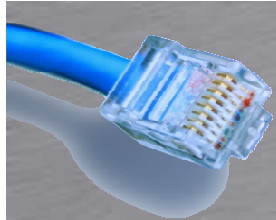
```
[edit protocols]
rael@SRX240# show
Ospf {
  export ospf-export-policy;
  area 0.0.0.0 {
    interface ge-0/0/0 {
      metric 100;
    }
    interface ge-0/0/1 {
      passive;
    }
  }
}
```



# OSPF

- Fejlfinding på OSPF
  - Show route
  - Show ospf neighbor
  - Show ospf interface
  - Show ospf route
  - Show ospf database
  - Show ospf statistics
  - Show ospf log

```
[edit protocols]
rael@SRX240# show
Ospf {
  traceoptions {
    file trace-ospf;
    flag error detail;
    flag event detail;
  }
}
```



# OSPF

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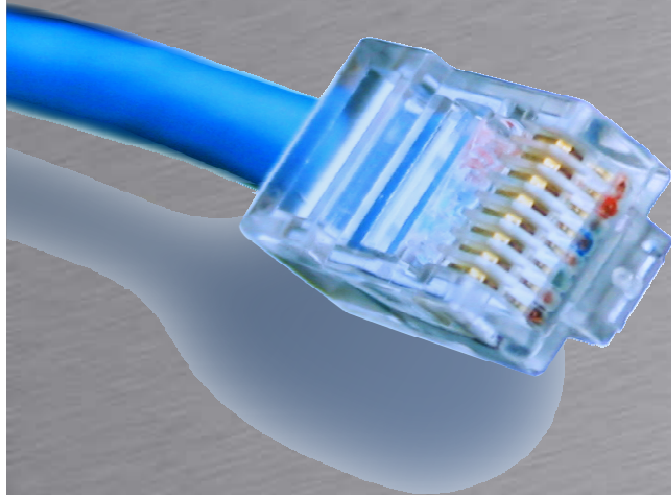


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- Brug traceoptions til at fejlfinde på naboskaber

```
[edit protocols]
rael@SRX240# show
Ospf {
  traceoptions {
    file trace-ospf;
    flag error detail;
    flag event detail;
  }
  area 0.0.0.0 {
    interface ge-0/0/0;
  }
}
```

# BGP

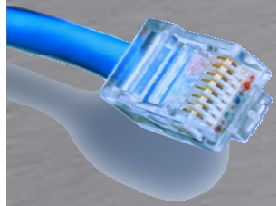


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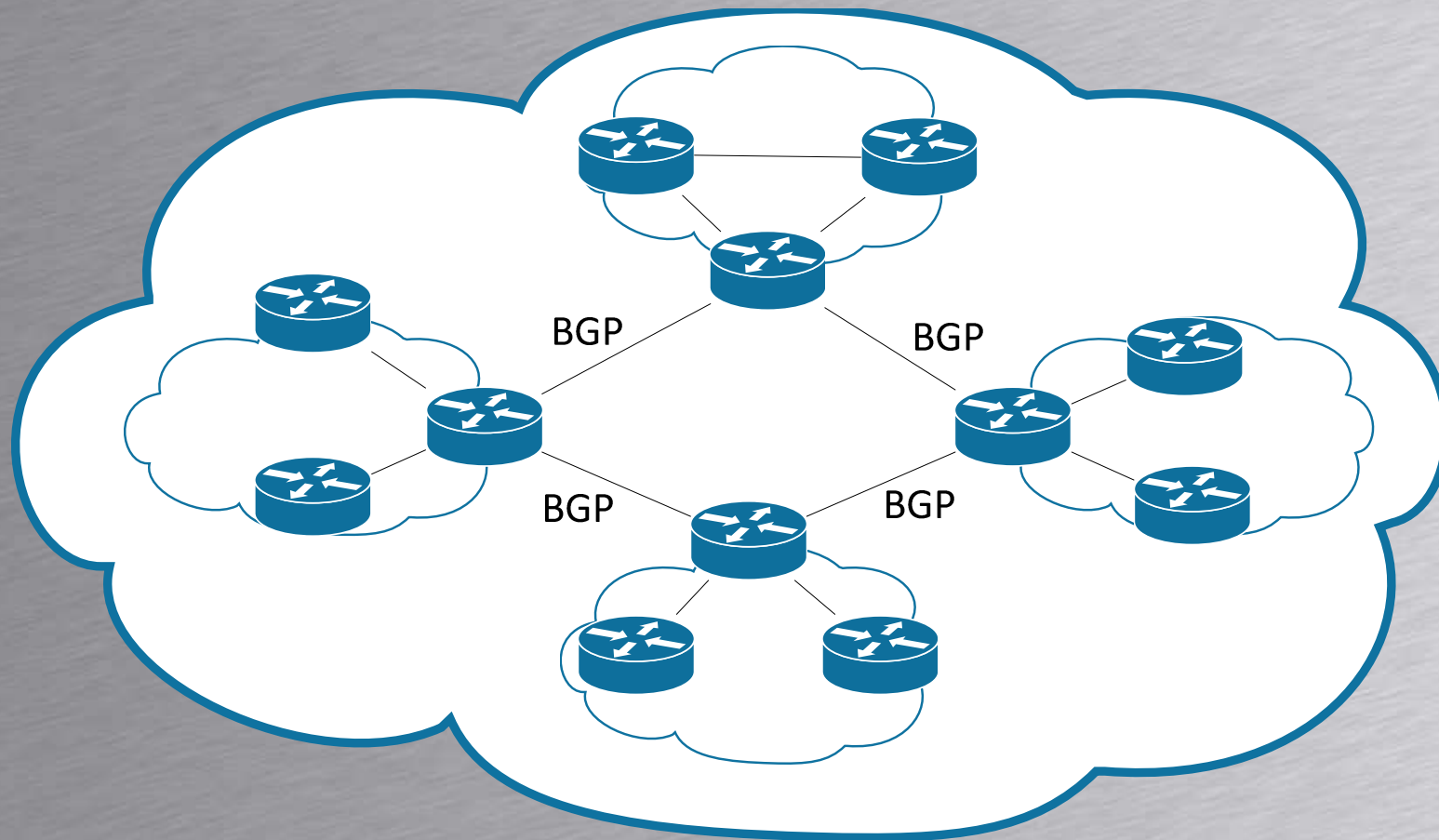
- en del af **mercantec<sup>+</sup>**

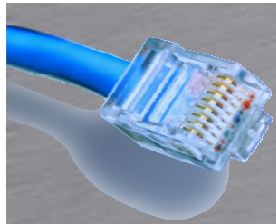
Border Gateway Protocol



# BGP

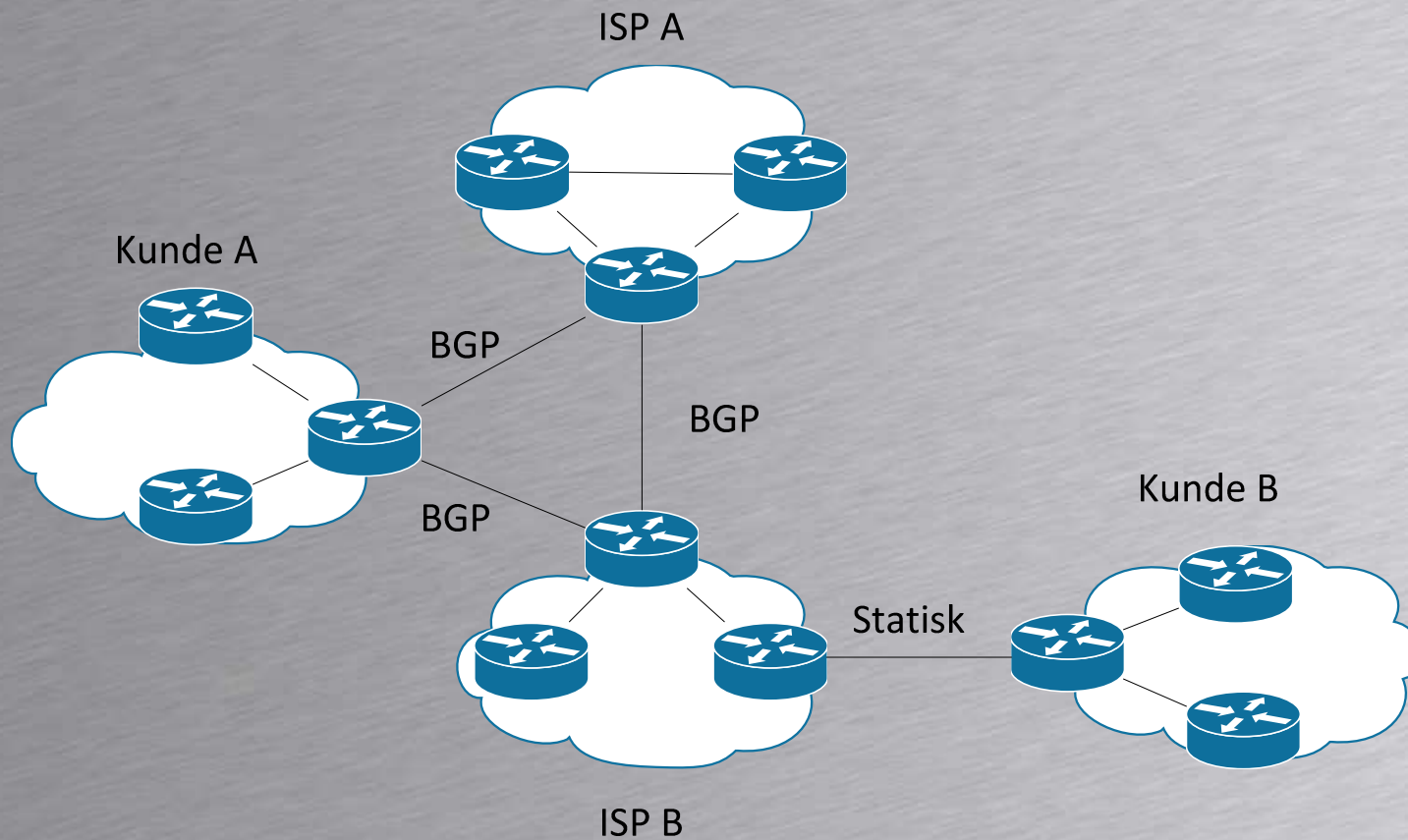
- Skaber forbindelse på internettet

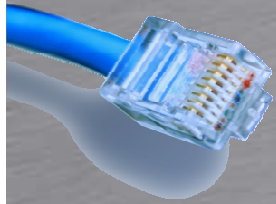




# BGP

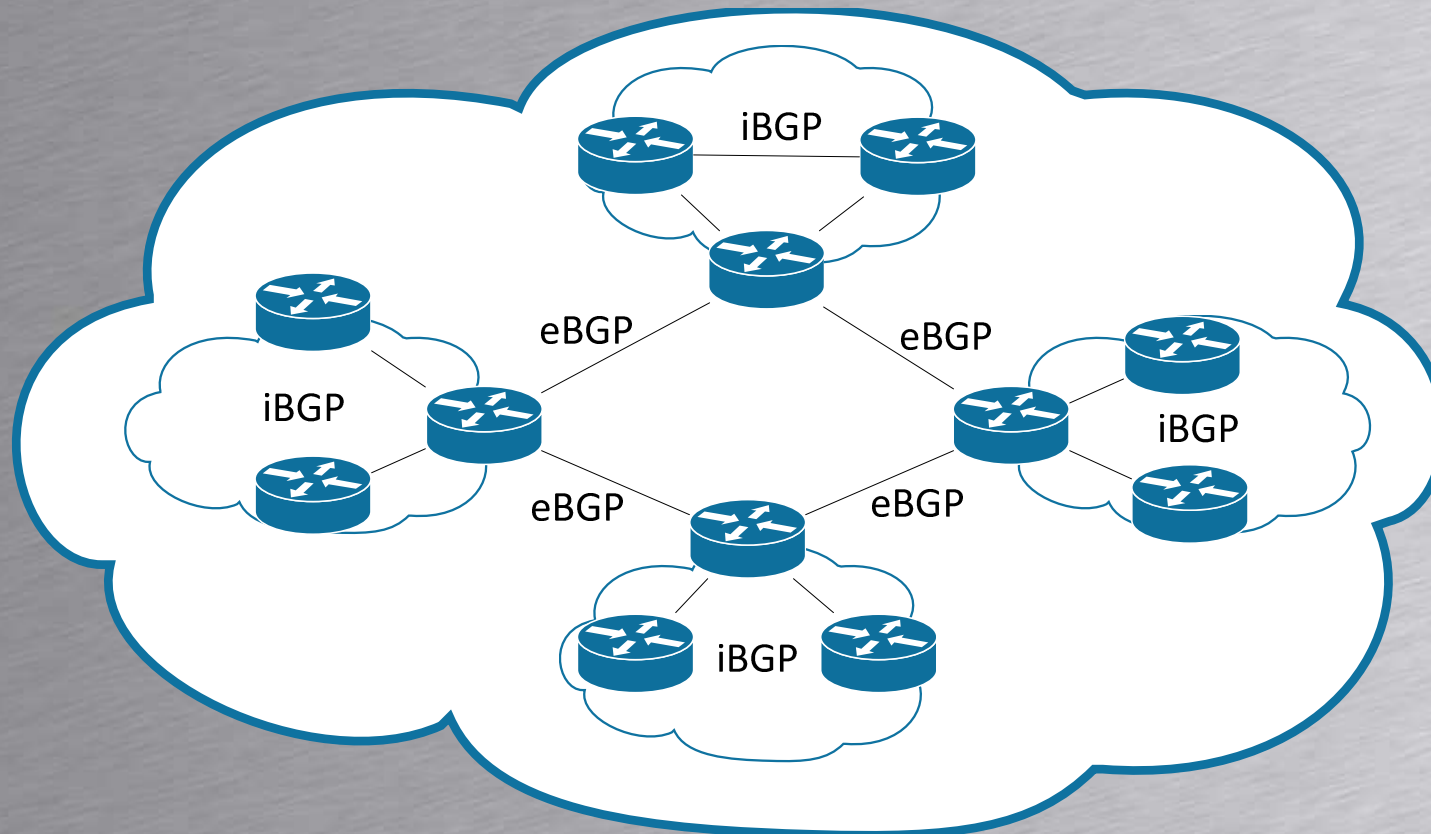
- Hvornår skal man bruge BGP

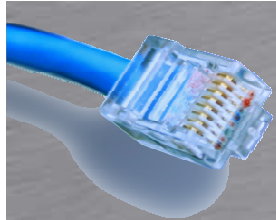




# BGP

- BGP Naboer findes i 2 typer
  - Peers i fælles AS kører iBGP
  - Peers i forskellige AS kører eBGP

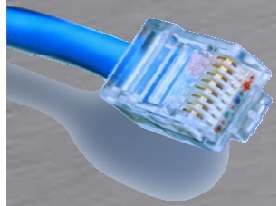




# BGP

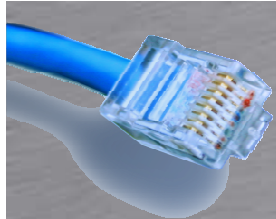
- BGP Naboskaber
  - Bruger TCP port 179 til at interface sammen
  - Naboer skal konfigureres manuelt
  - Finder selv ud af om det er eBGP og iBGP ud fra remote AS





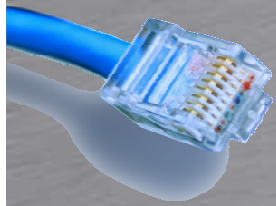
# BGP Attributes

- Next Hop
  - Ip adresse på next-hop router
- Local Preference
  - Bestemmer den bedste vej ud af AS(iBGP)
- AS Path
  - AS vejen tilbage til destinationen
- Origin
  - Hvor kommer routen fra? IGP/EGP/?
- MED – Multi-Exit Discriminator
  - Bestemmer den bedste vej ind i et AS(eBGP)
- Community
  - Et tag der bruges til at identificere routes



# BGP Route Selection

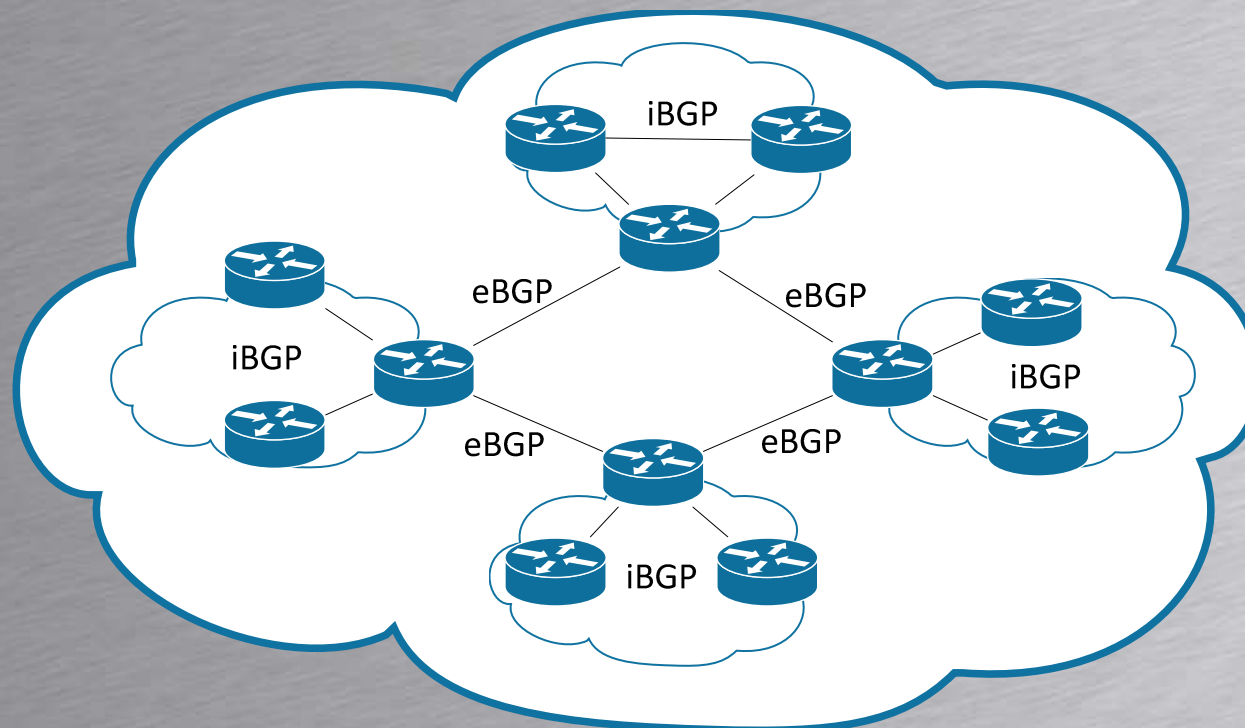
- Når en route har en nexthop vælges efter:
  - 1: Højeste Local-preference
  - 2: Korteste AS-Path
  - 3: Laveste Origin værdi
  - 4: Laveste MED værdi
  - 5: Routes fra eBGP over iBGP
  - 6: Bedste interne metric til next-hop
  - 7: Peer med laveste router-id
  - 8: Korteste Cluster længde
  - 9: Laveste Peer ID

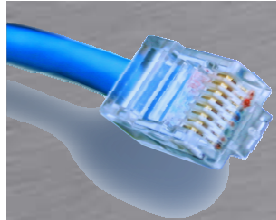


# BGP Peering



- iBGP naboskaber konfigureres normalt mellem loopback interfaces
  - Kræver en IGP til routing mellem Loopback interfaces
- eBGP konfigureres normalt på interface IP adressen





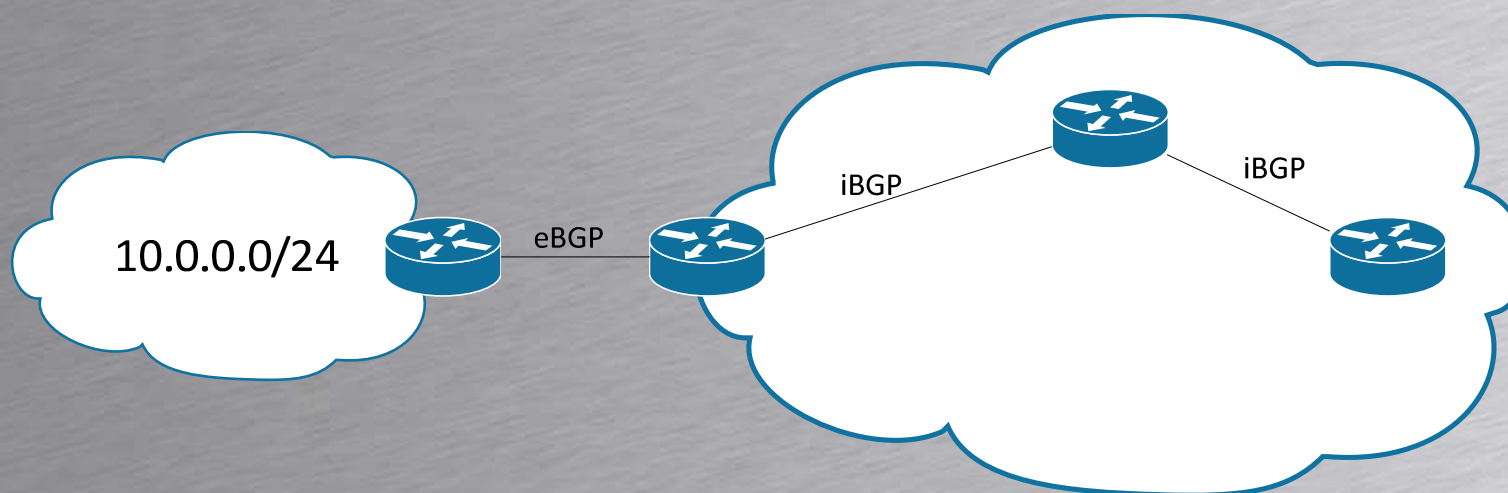
# iBGP Udveksling

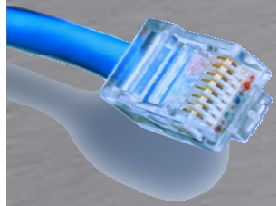
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- iBGP naboer sender kun egne routes til naboer
  - Bruges for at undgå loops
  - Sender ikke Routes fra en iBGP nabo videre
  - Sender stadig eBGP Routes til naboer, både iBGP og eBGP
  - Kræver full mesh mellem alle naboer





# BGP



- Eksempel

```
[edit routing-options]
```

```
rael@SRX240# show
```

```
Router-id 192.168.0.1;
```

```
Autonomous-system 65001;
```

```
[edit protocol bgp]
```

```
rael@SRX240# show
```

```
Group int-65001 {
```

```
    type internal;
```

```
    local-address 192.168.0.1;
```

```
    neighbor 192.168.0.2;
```

```
}
```

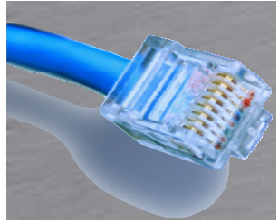
```
Group ext-65002 {
```

```
    type external;
```

```
    peer-AS 65002;
```

```
    neighbor 172.16.0.1;
```

```
}
```

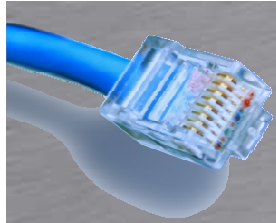


# BGP

- Eksempel – Next-hop self

```
[edit policy-options]
rael@SRX240# show
Policy-statement next-hop-self-policy {
  term change-next-hop {
    then next-hop self;
  }
}
```

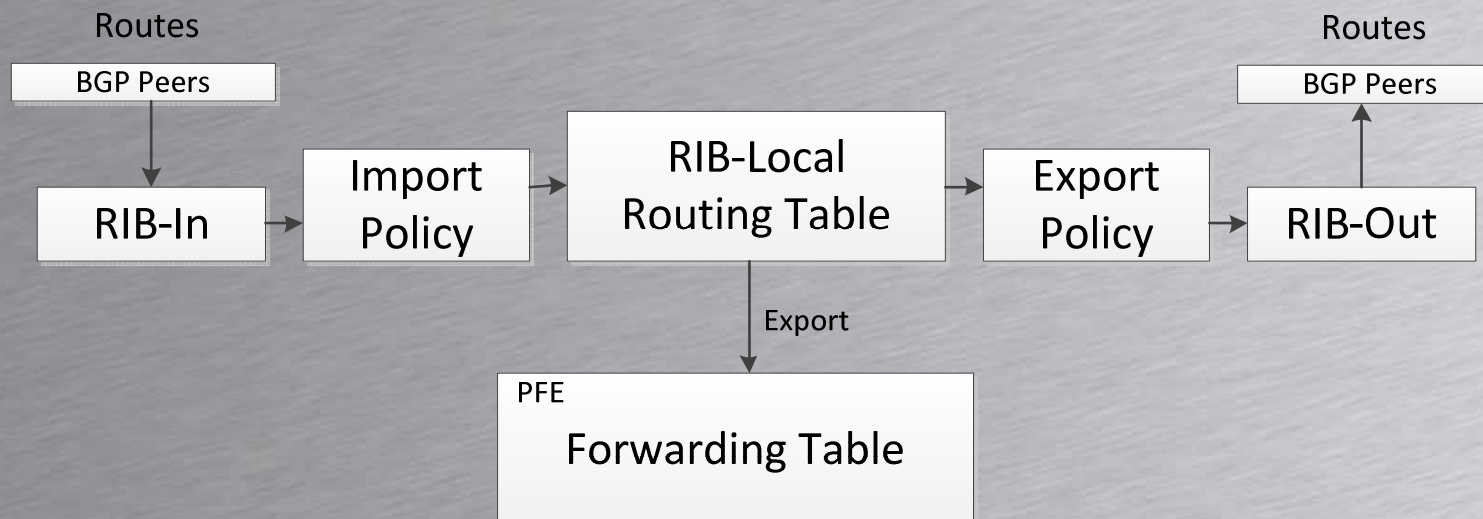
```
[edit protocol bgp]
rael@SRX240# show
Group int-65001 {
  type internal;
  local-address 192.168.0.1;
  export next-hop-self-policy;
  neighbor 192.168.0.2;
}
```

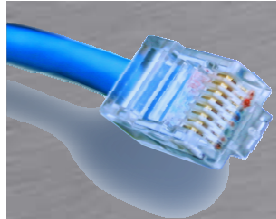


# BGP

- Fejlfinding

- Show route receive-protocol bgp
- Show route advertising-protocol bgp





# BGP

- Fejlfinding på BGP
  - Show bgp summary
  - Show bgp neighbor
  - Show bgp group
  - Show route protocol bgp

```
[edit protocols bgp]
rael@SRX240# show
traceoptions {
    file trace-bgp size 512k files 10 world-readable;
    flag update detail;
    flag open detail;
}
```