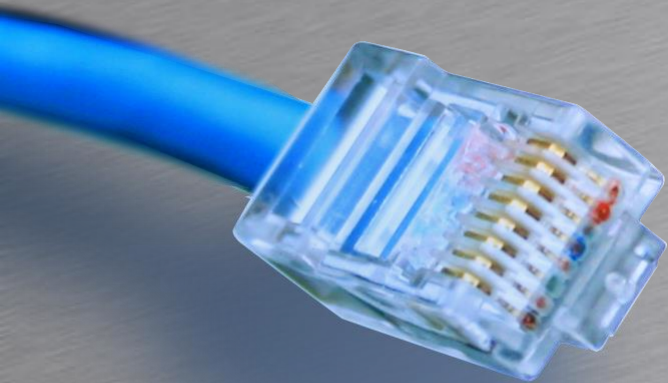


Dynamisk Routing



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A row of ten colored circles: blue, purple, green, blue, green, purple, green, purple, green, blue.

- en del af **mercantec**⁺

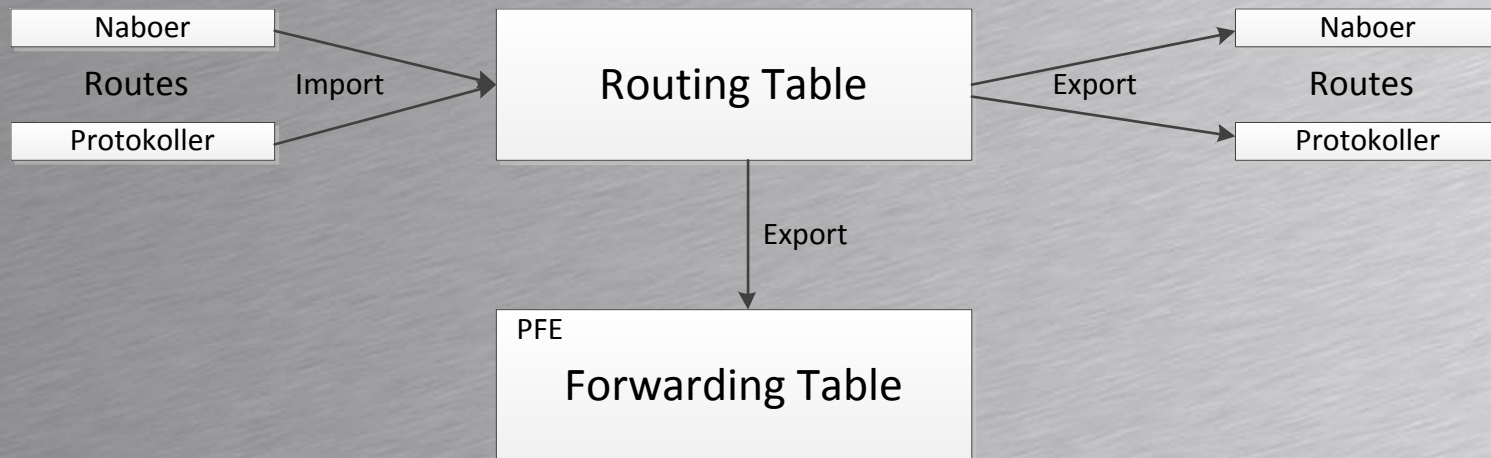
OSPF

Rasmus Elmholt V1.0



Routing Politikker

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





Routing Politikker

- 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

- 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

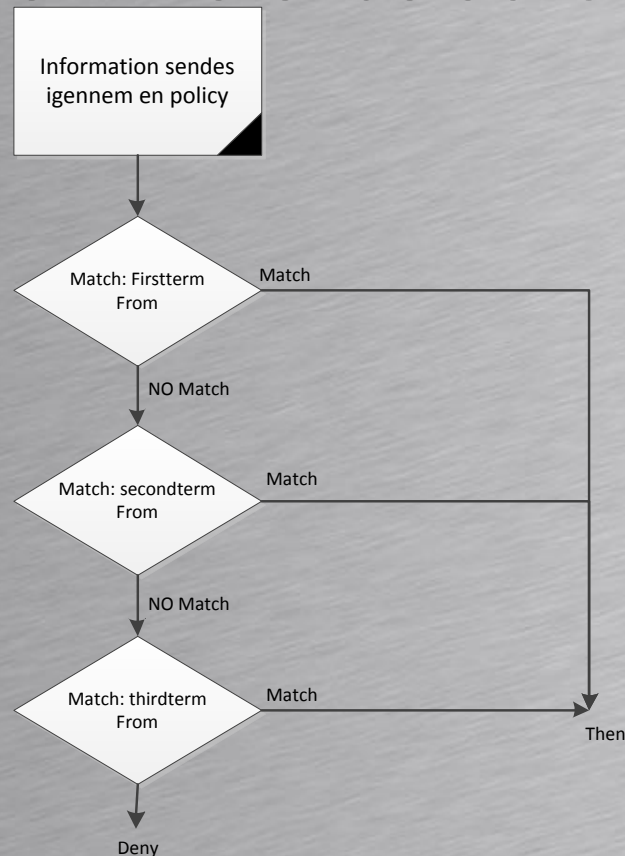
- Eksempel – Redistribute Default Route

```
[edit]
rael@SRX240# show
policy-options {
  policy-statement DEFAULT_ORIGINAT {
    term DEFAULT_ROUTE {
      from {
        route-filter 0.0.0.0/0 exact;
      }
      then accept;
    }
  }
}
protocols {
  ospf {
    export DEFAULT_ORIGINAT;
  }
}
```



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



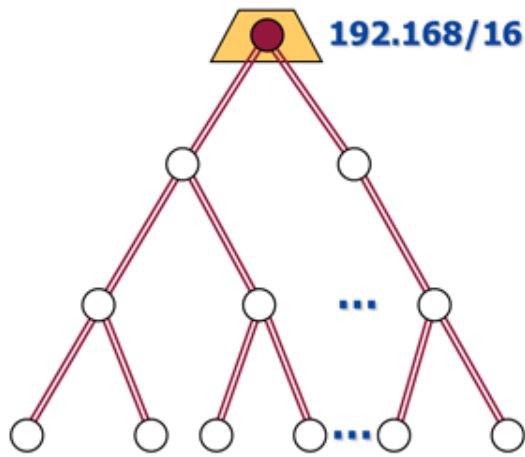
Prefix Lister

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

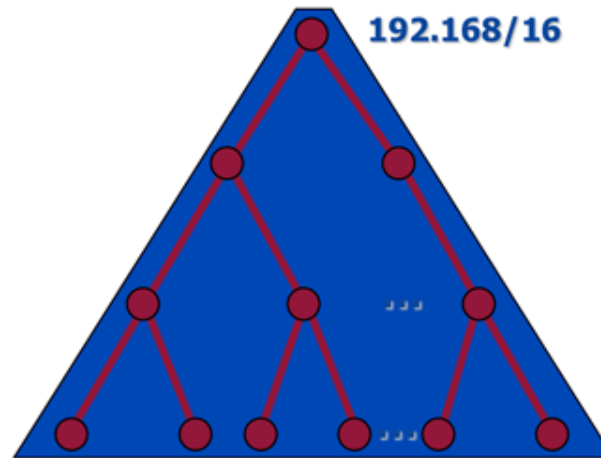
```
[edit policy-options]
rael@SRX240# show
Prefix-list rfc1918 {
  10.0.0.0/8;
  172.16.0.0/12;
  192.168.0.0/16;
}
Policy-statement rfc1918-policy {
  from {
    prefix-list-filter rfc1918 orlonger;
  }
  then reject;
}
```



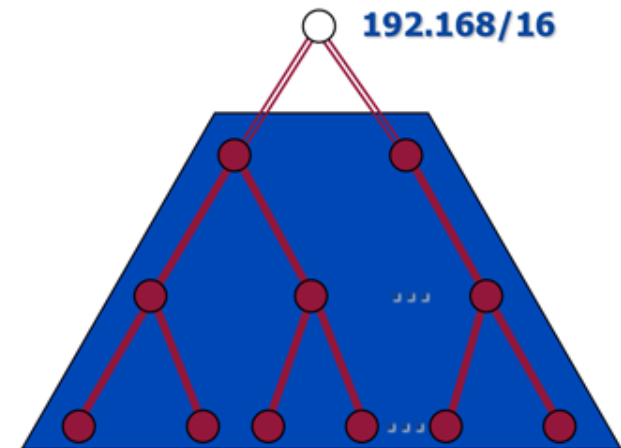

Match Types



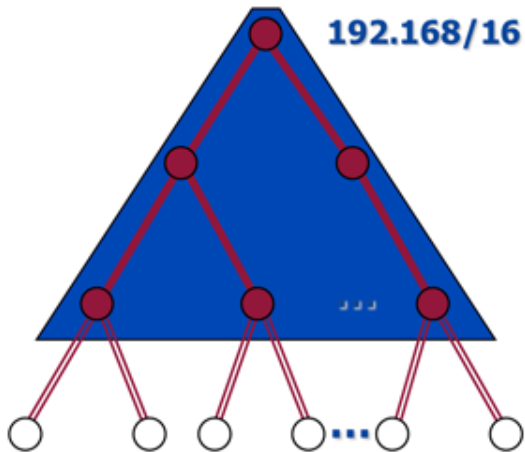
exact



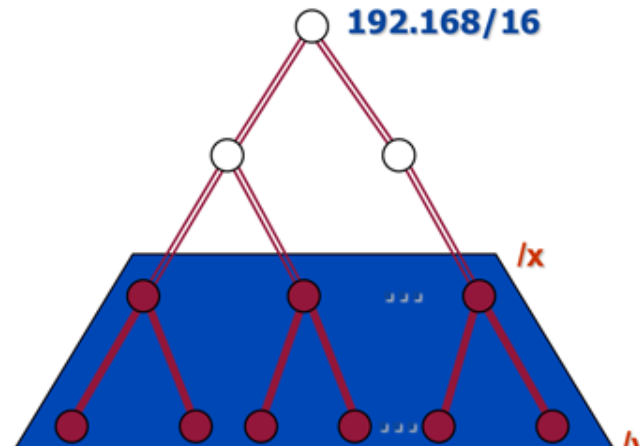
or longer (down to /32)



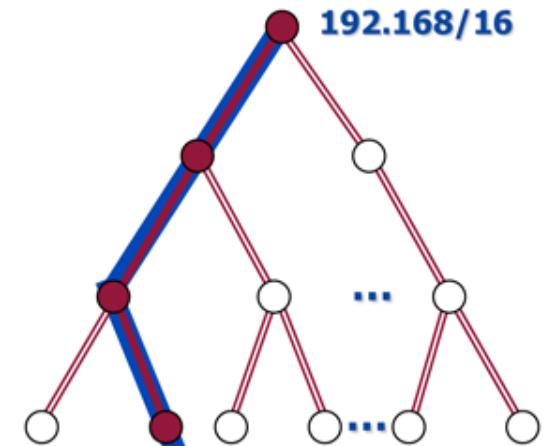
longer (down to /32)



upto

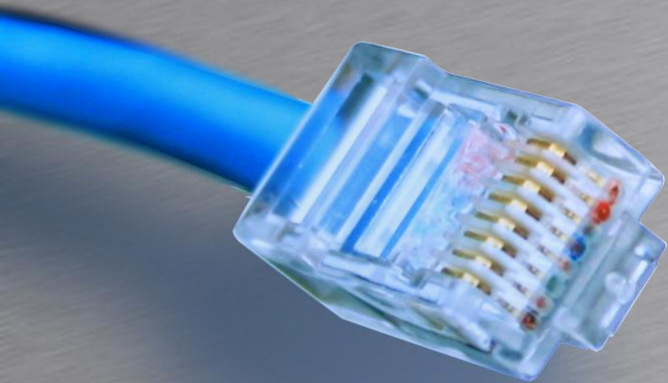


prefix-length-range /x-/y



through

OSPF



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A row of ten colorful circles. From left to right: a blue circle with a yellow center, a purple circle, a green circle with a yellow center, a blue circle with a yellow center, a green circle, a purple circle, a green circle with a yellow center, a purple circle, a green circle, and a blue circle with a yellow center.

- en del af **mercantec**⁺

Open Shortest Path First



OSPF

- Link-State IGP routing protokol
- Sender LSA til hele netværket
 - Gemmer LSA'er i link state databasen
 - Alle Routers har en kopi af databasen
 - Bruger Dijkstra's Open Shortest Path First algoritme
 - Cost beregnes ud fra Bandwidth
 - Husk reference bandwidth
 - `set protocol ospf reference-bandwidth 1000000000`

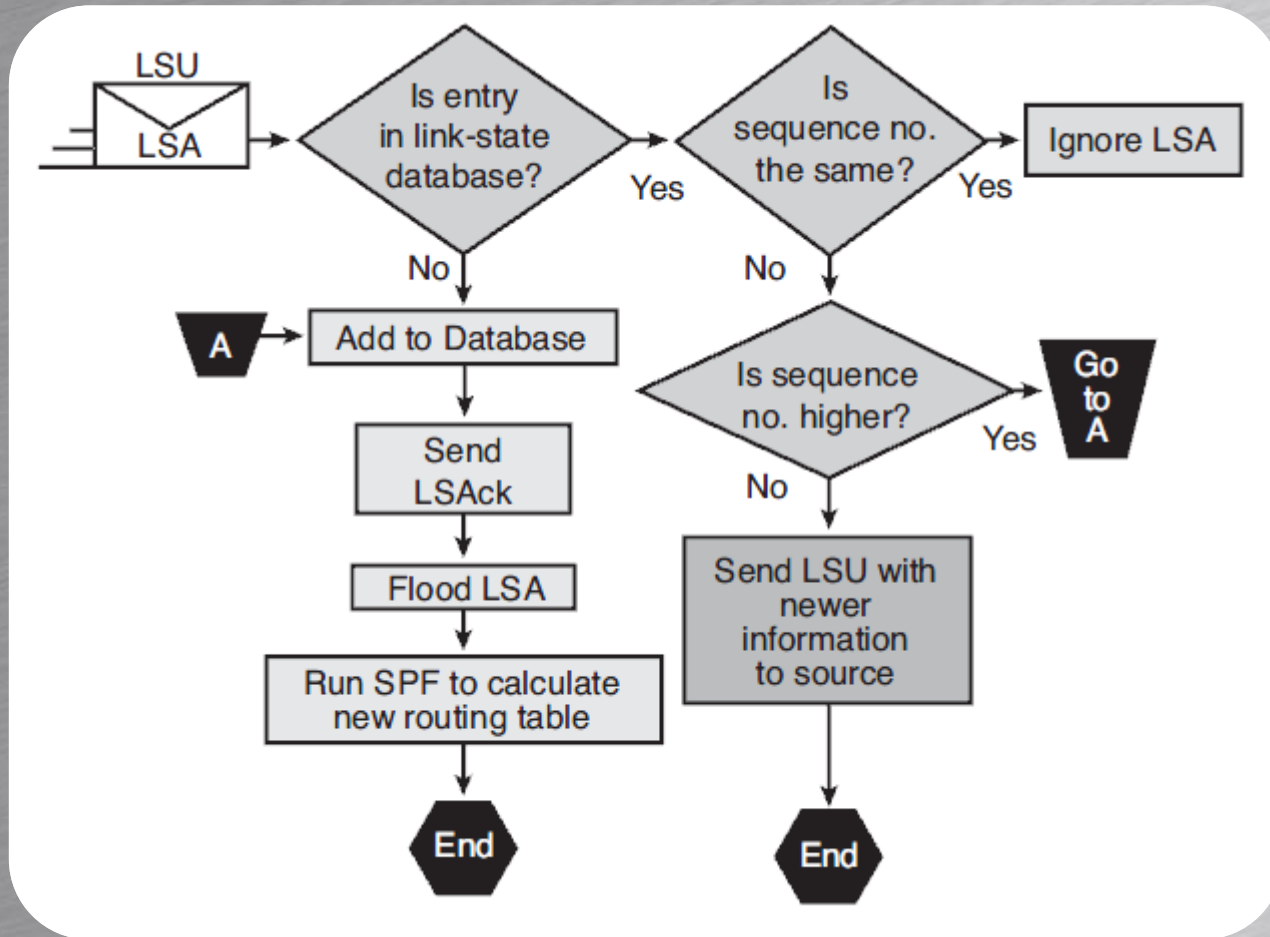


OSPF

- 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





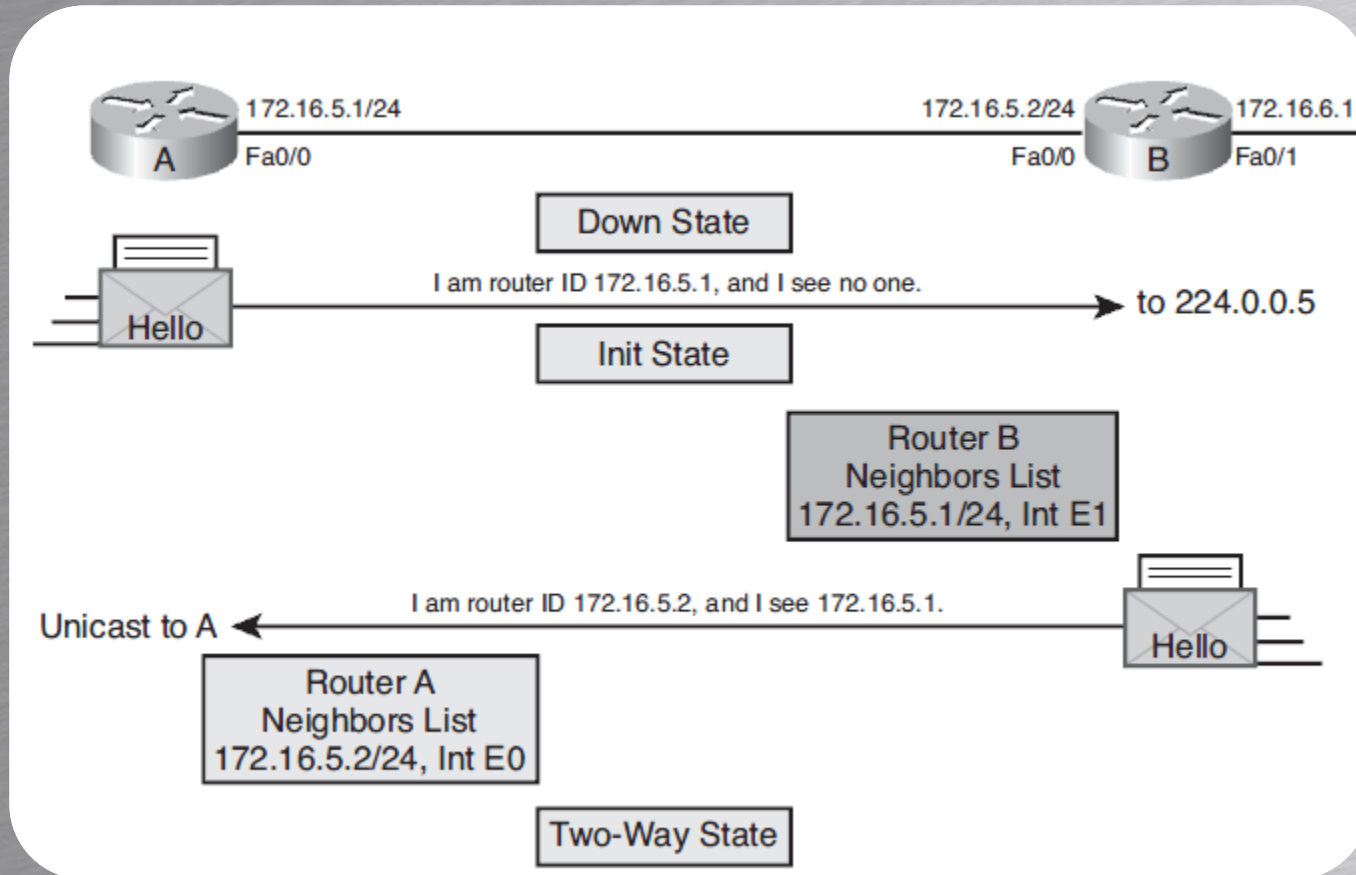
OSPF Operation

- 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



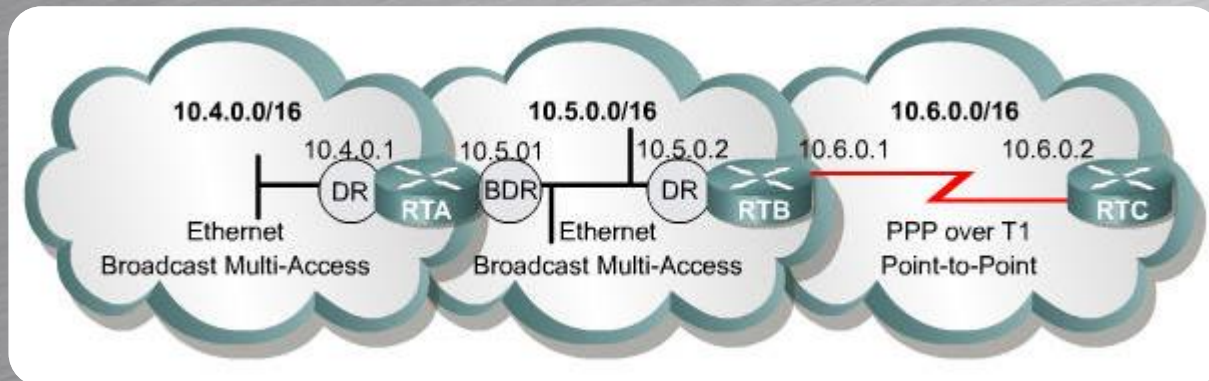
Two-Way State

172.16.5.2/24, Int E0



OSPF Operation

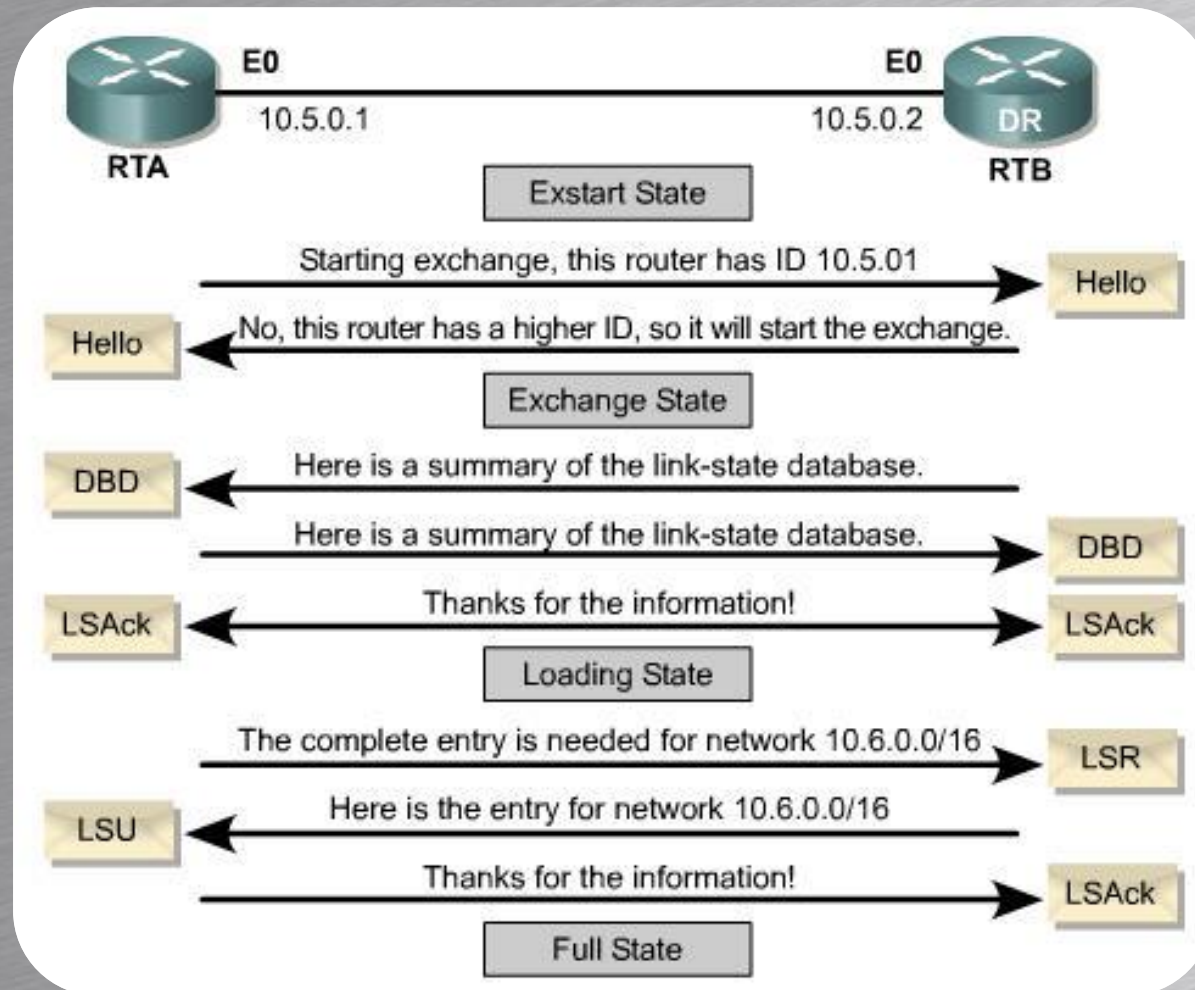
- DR Udvælgelse
 - Prioritet – Højeste vinder
 - Mellem 0-255
 - Default 128
 - Højeste RID
 - Set routing-options router-id 192.168.0.1





OSPF Operation

- Step 3: Discover routes





OSPF

- 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

- 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;
  }
}
```

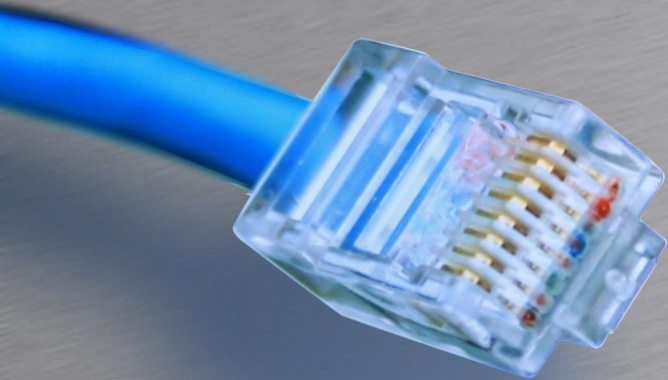


OSPF

- 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;
    }
}
```

BGP



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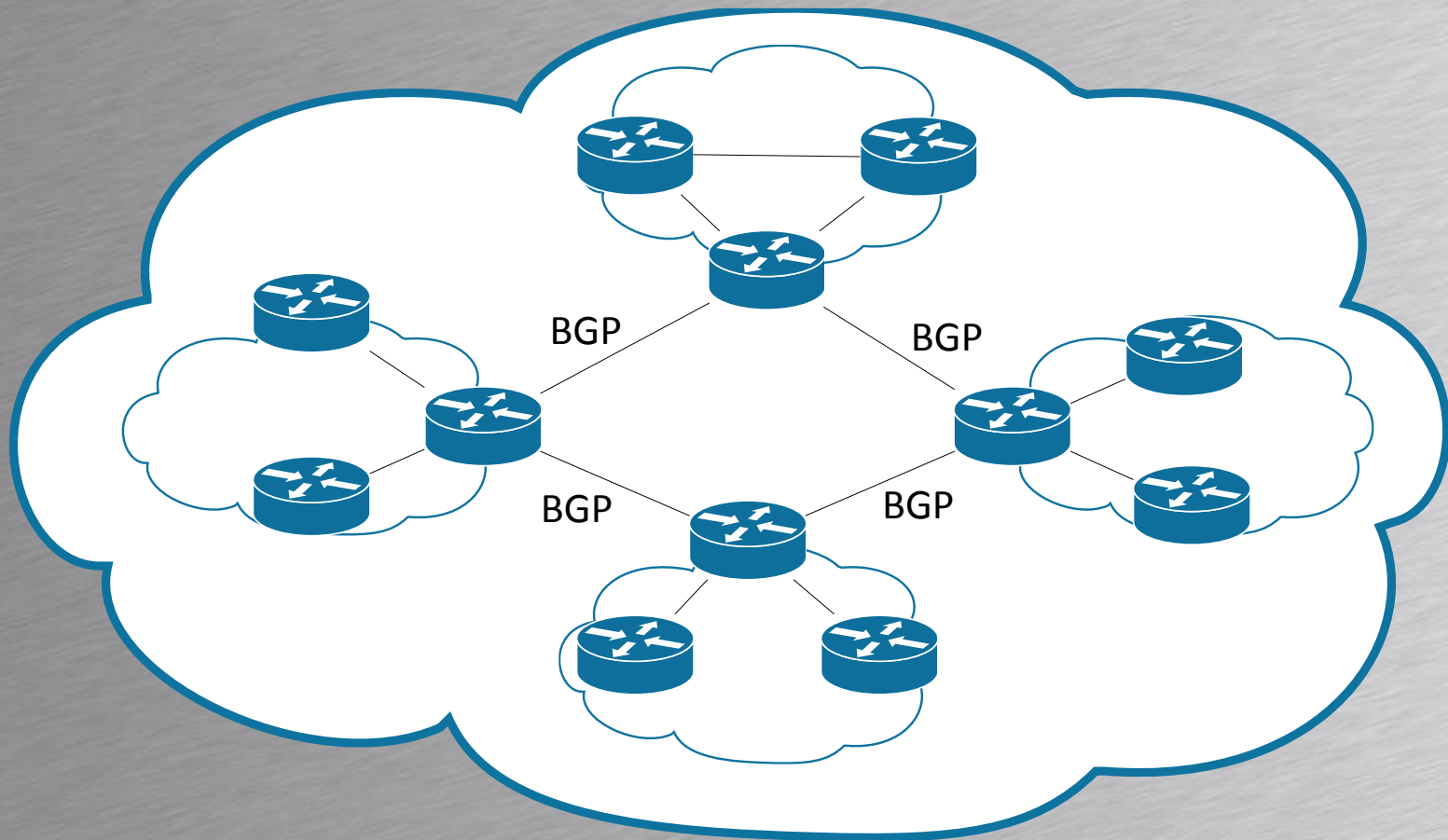
Border Gateway Protocol



BGP



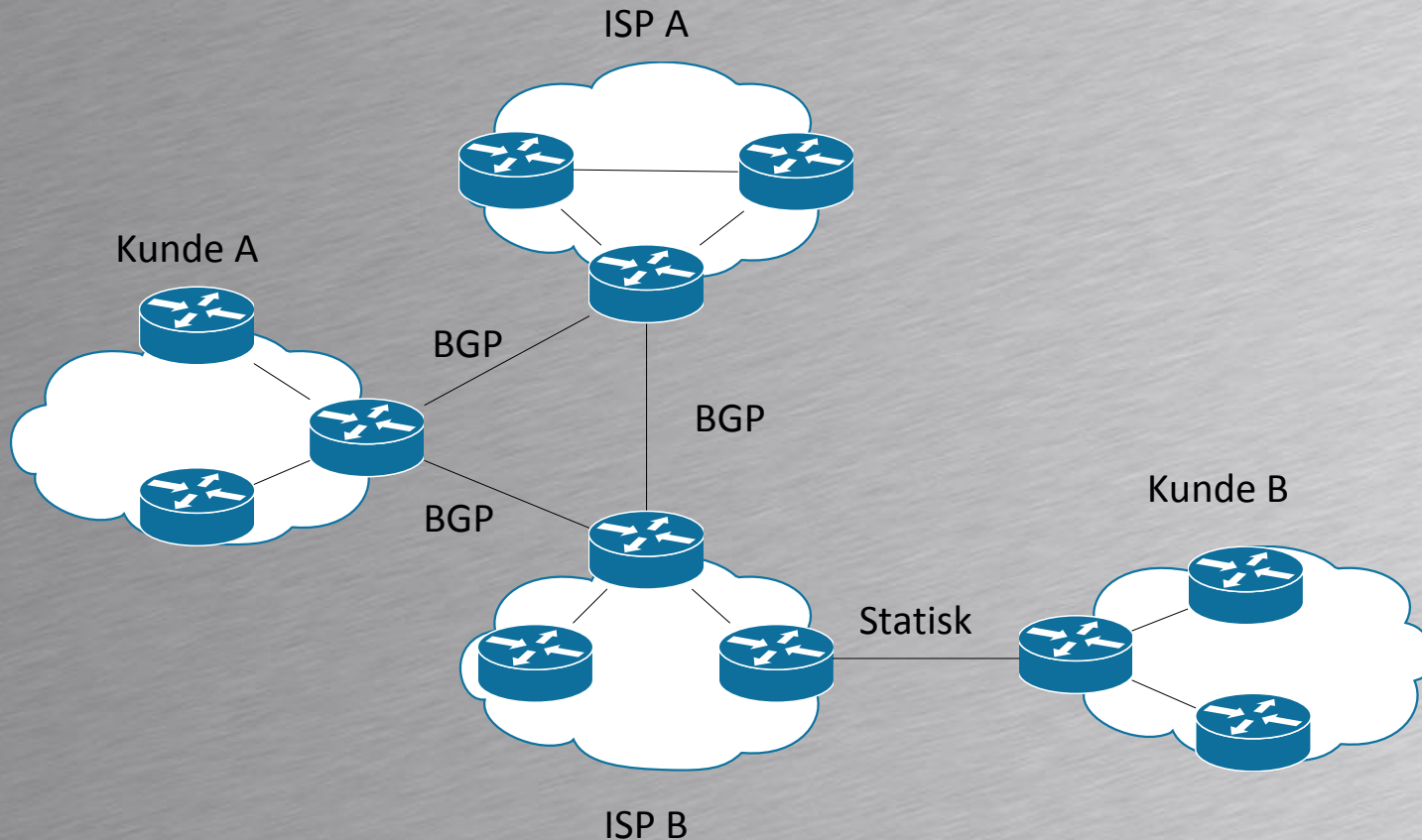
- Skaber forbindelse på internettet





BGP

- Hvornår skal man bruge BGP

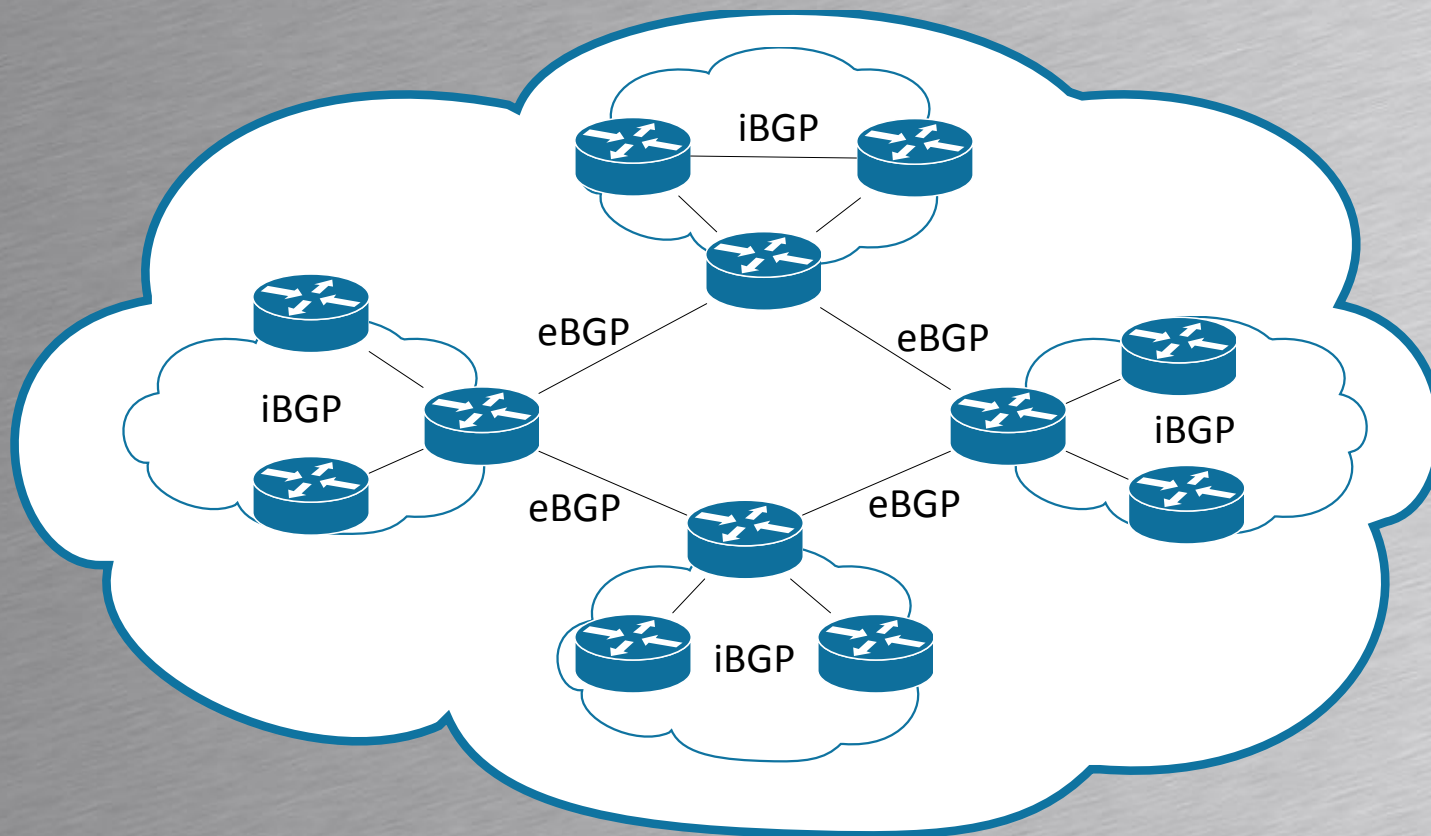




BGP



- 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



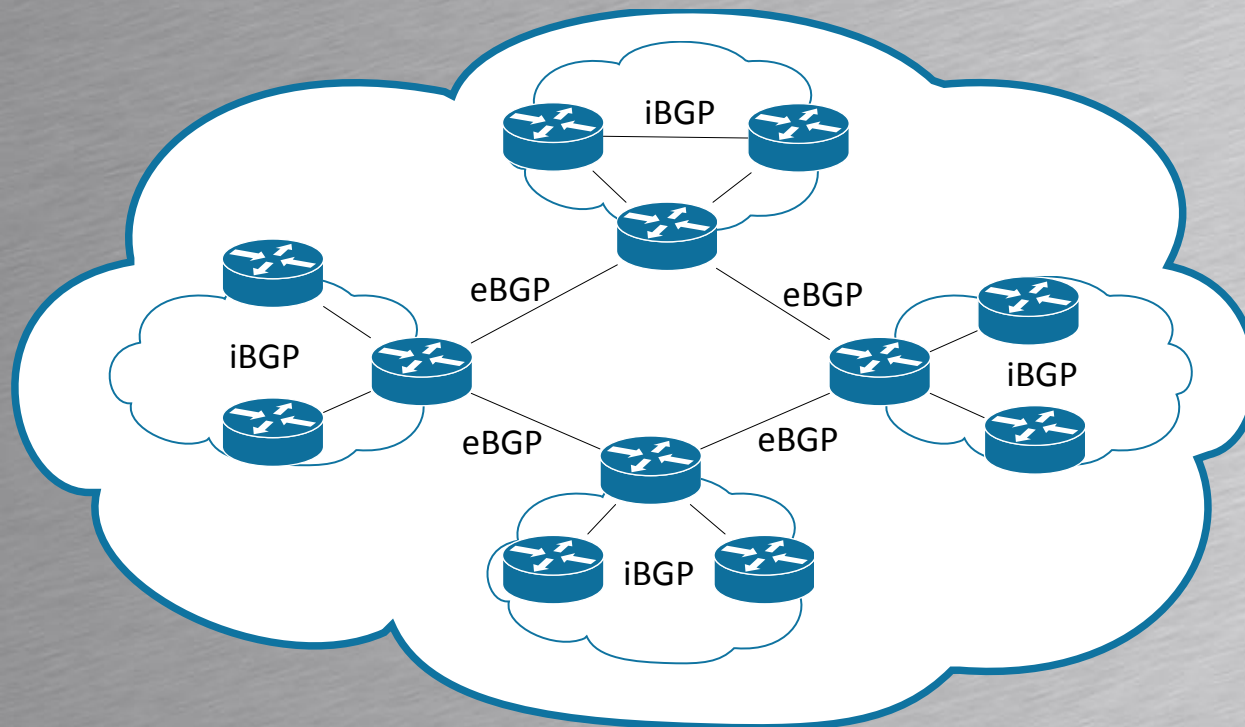
BGP Route Selection

- 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

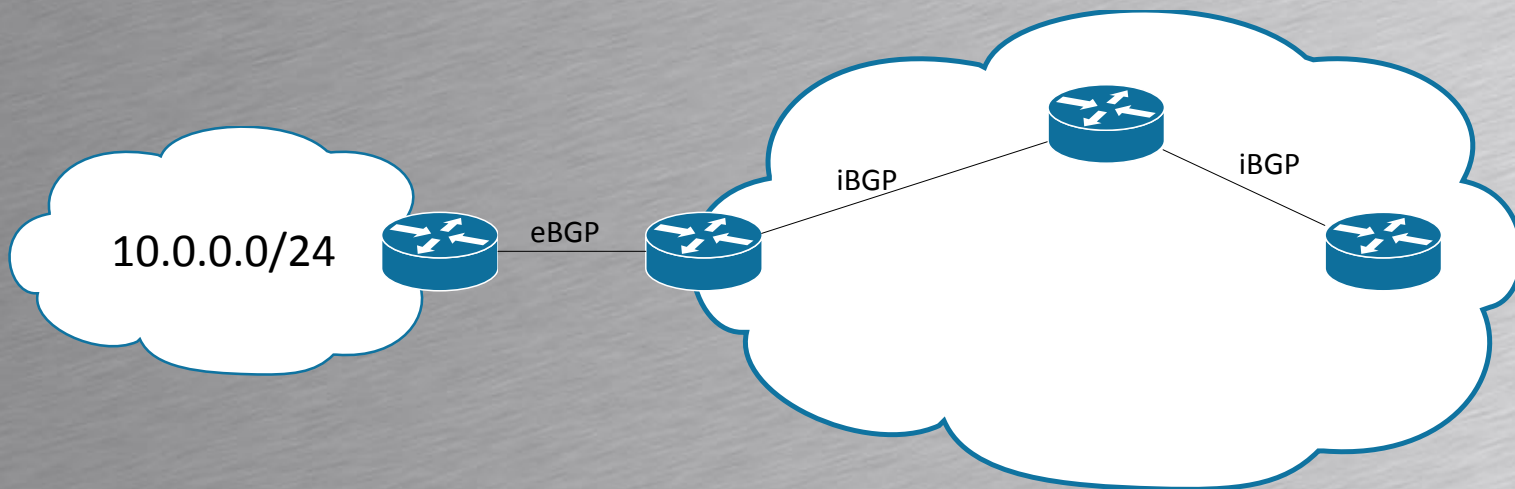
- iBGP naboskaber konfigureres normalt mellem loopback interfaces
 - Kræver en IGP til routing mellem Loopback interfaces
- eBGP konfigureres normalt på interface IP adressen





iBGP Udveksling

- 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;
}
```