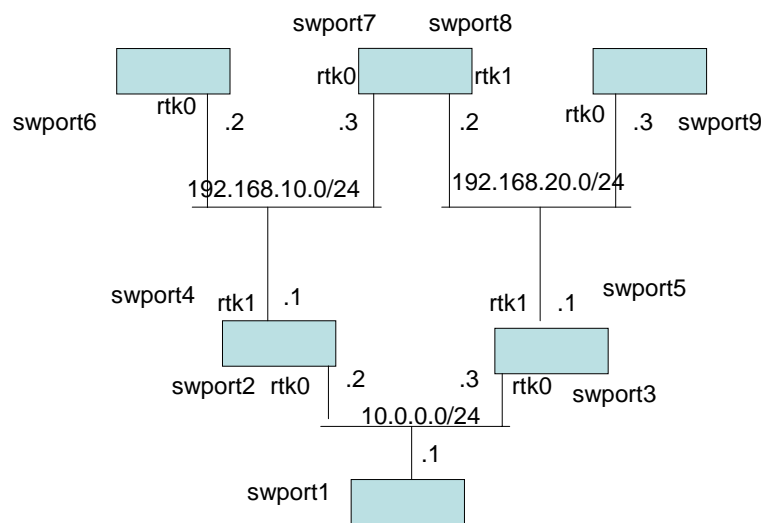


# IT-Operation routing course day-3

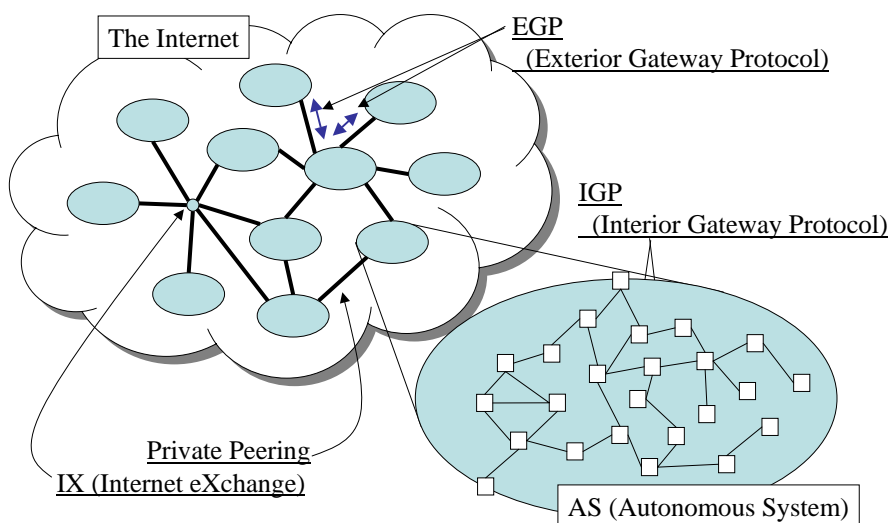
## iBGP fullmesh



## Day-3 topic

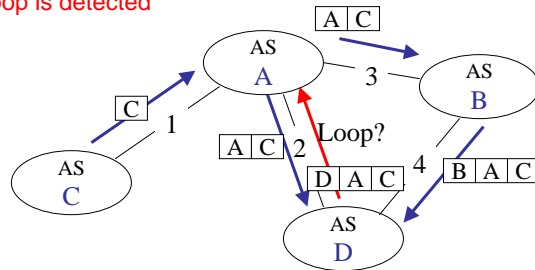
- BGP (Path vector) Principle
- Best Path Selection
- BGP Configuration
  - eBGP and iBGP
  - Route Reflector
  - Filtering (access-list, prefix-list, route-map)
  - Next-hop self, soft-reconfiguration inbound, AS path prepend, BGP community
  - Martian Prefix
- Nanog

## AS Hierarchy



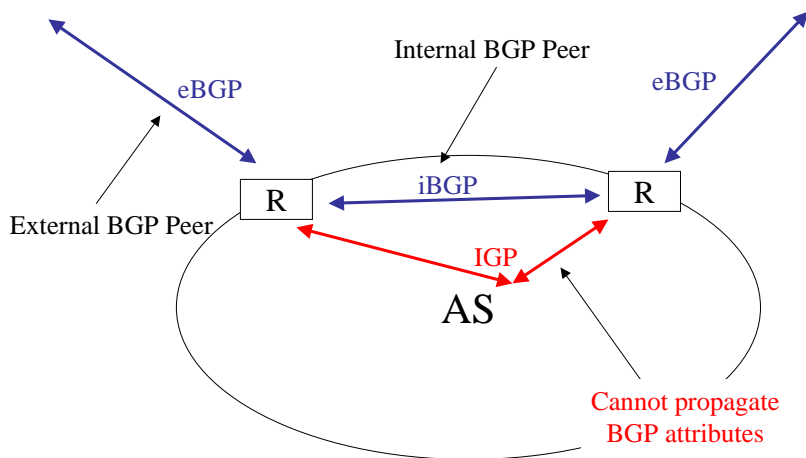
# Path Vector Algorithm

`D A C` includes `A` already  
So the **Loop is detected**



You can choose path from `A C` & `B A C`  
on any arbitral reason

# Internal BGP peer



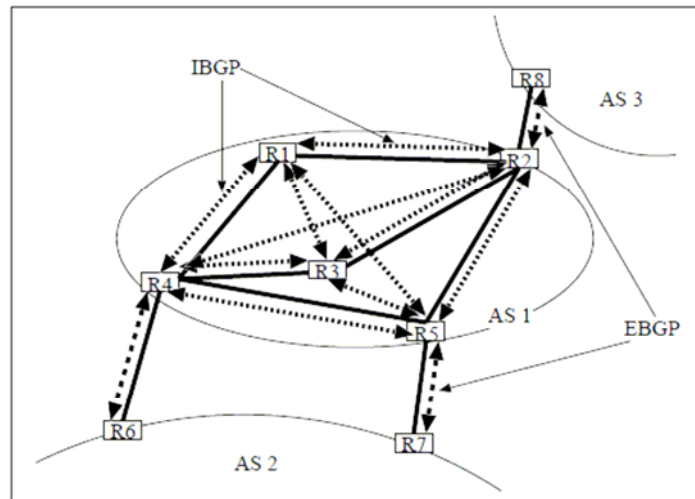


Figure 1: iBGP and eBGP

## BGP State

- Idle
- Connect
- Active
- OpenSent
- OpenRecieve
- Established

## Bgp process, router-id

図 7 show running-config の実行結果

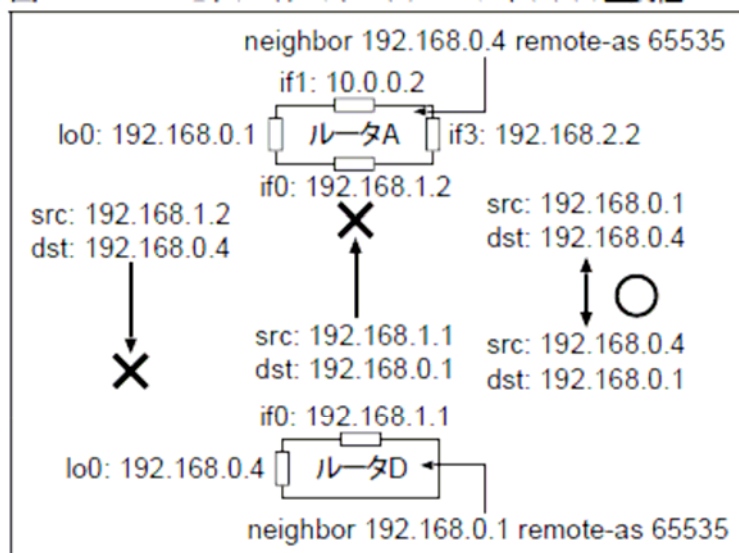
```
router bgp 65535
  bgp router-id 192.168.0.1
  network 192.168.1.0/24
  network 192.168.2.0/24
  aggregate-address 192.168.0.0/16 summary-only
  redistribute ospf
```

## neighbor

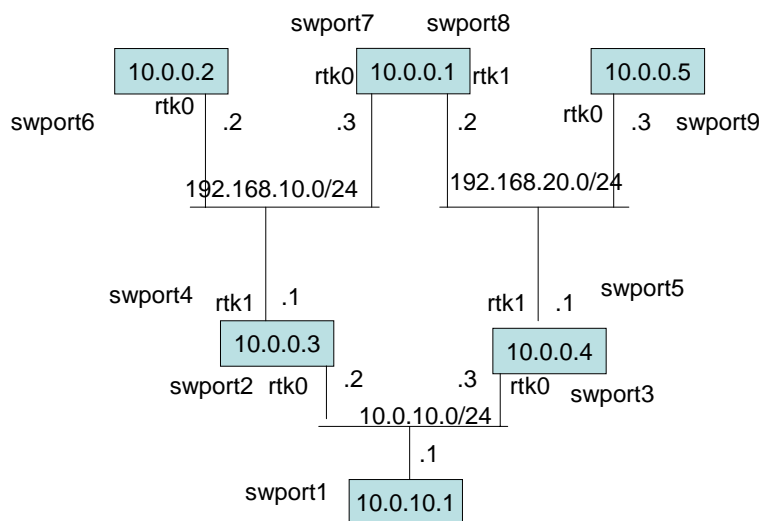
図 10 BGP セッションに関する設定例

```
1 bgpd(config-router)# neighbor 192.168.0.4 remote-as 65535
2 bgpd(config-router)# neighbor 192.168.0.4 update-source lo0
3 bgpd(config-router)# neighbor 192.168.0.4 next-hop-self
4 bgpd(config-router)# neighbor 10.0.0.1 remote-as 64512
5 bgpd(config-router)# neighbor 10.0.0.1 update-source if1
6 bgpd(config-router)# neighbor 10.0.0.1 next-hop-self
```

## Update-source



## iBGP fullmesh



# Route reflector

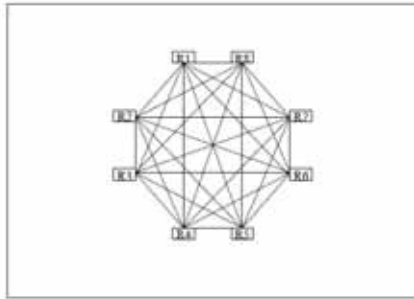


Figure 2: fullmesh iBGP session

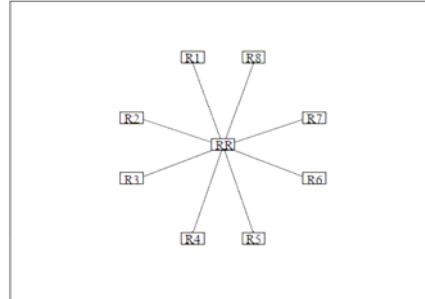


Figure 3: RR model

# Reflector and cluster

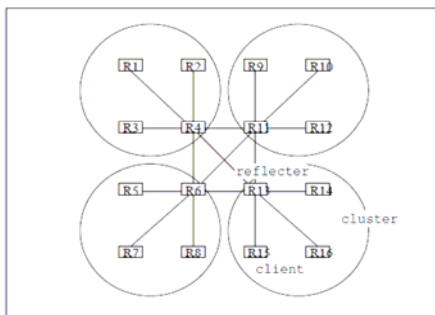


Figure 4: RR and cluster

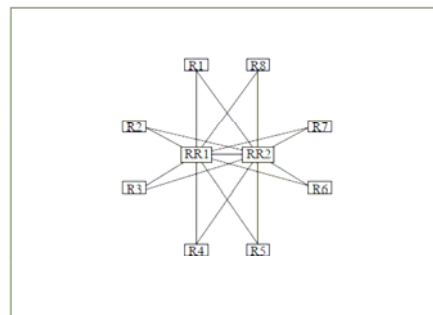


Figure 5: redundant RR

## Todo

- Next-hop self
- Update-source
- Soft-reconfiguration inbound
- Address-family

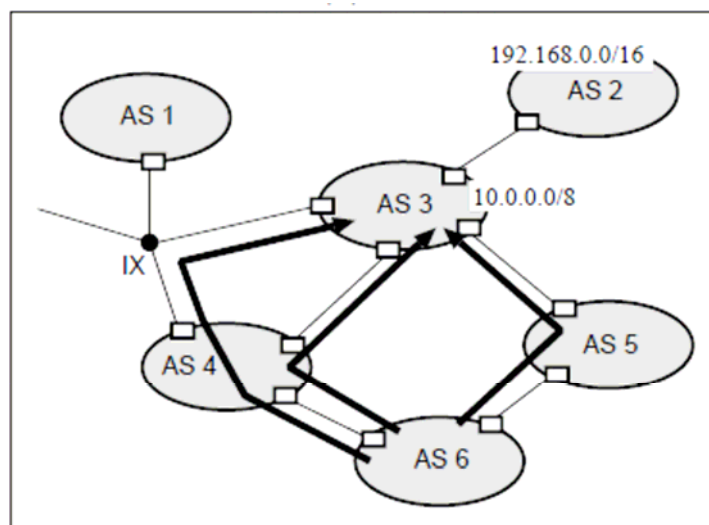
## Attributes

- AS\_PATH
- NEXT\_HOP
- LOCAL\_PREF
- MED
- ORIGIN

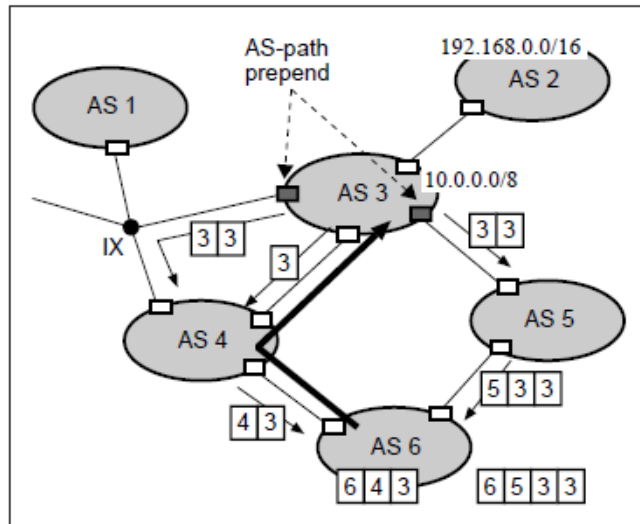
## BGP Best Path Selection Algorithm

1. Highest WEIGHT
2. Highest LOCAL\_PREF
3. Prefer local routes (network/redistribute/aggregate)
4. Shortest AS\_PATH
5. Lowest origin: igp<egp<incomplete
6. Lowest MED
7. Prefer eBGP over iBGP
8. Lowest IGP metric
9. Multiple path ? Or ! Bestpath ?
10. Prefer first received (the older one)
11. Lowest BGP router-ID
12. Minimum cluster-list length
13. Prefer lowest neighbor address

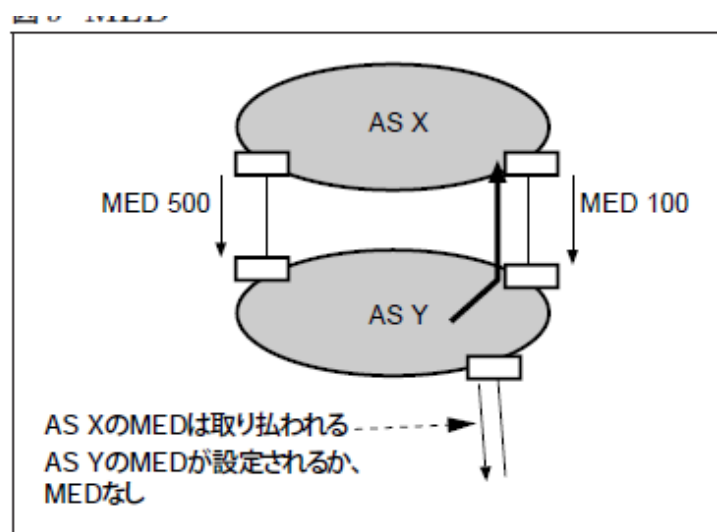
## As-path prepend



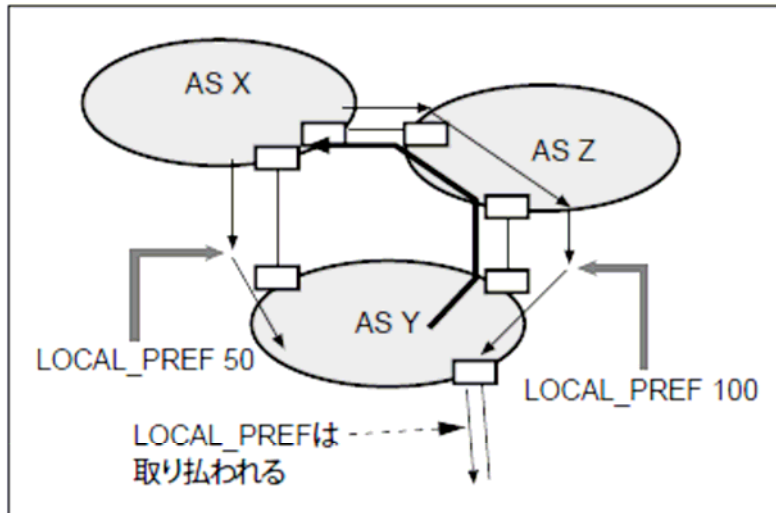
## As-path prepend



## MED



## Local Pref



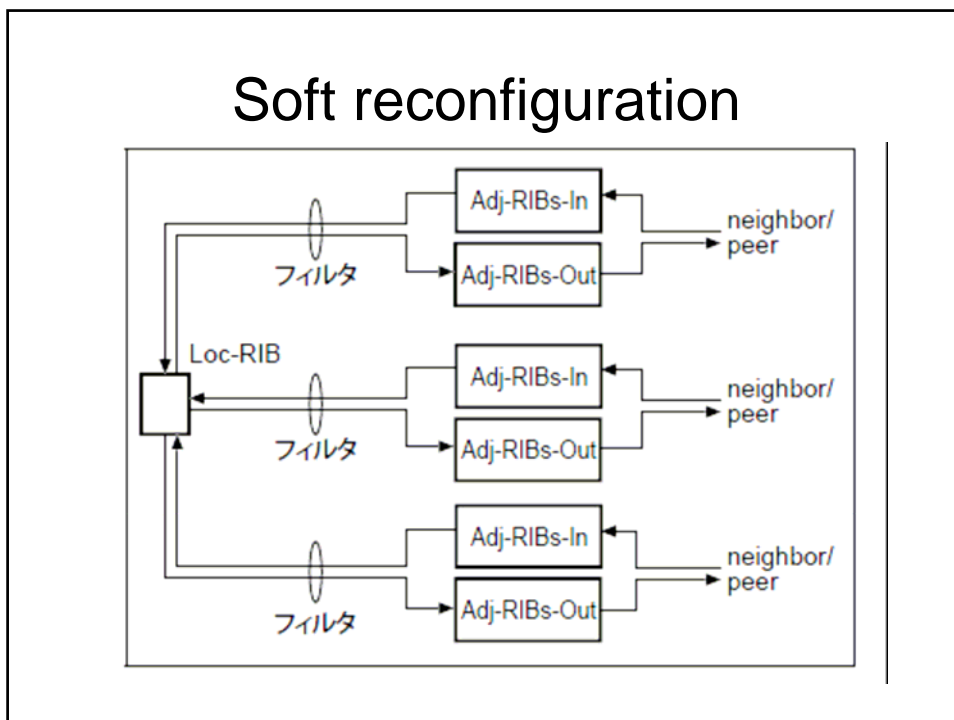
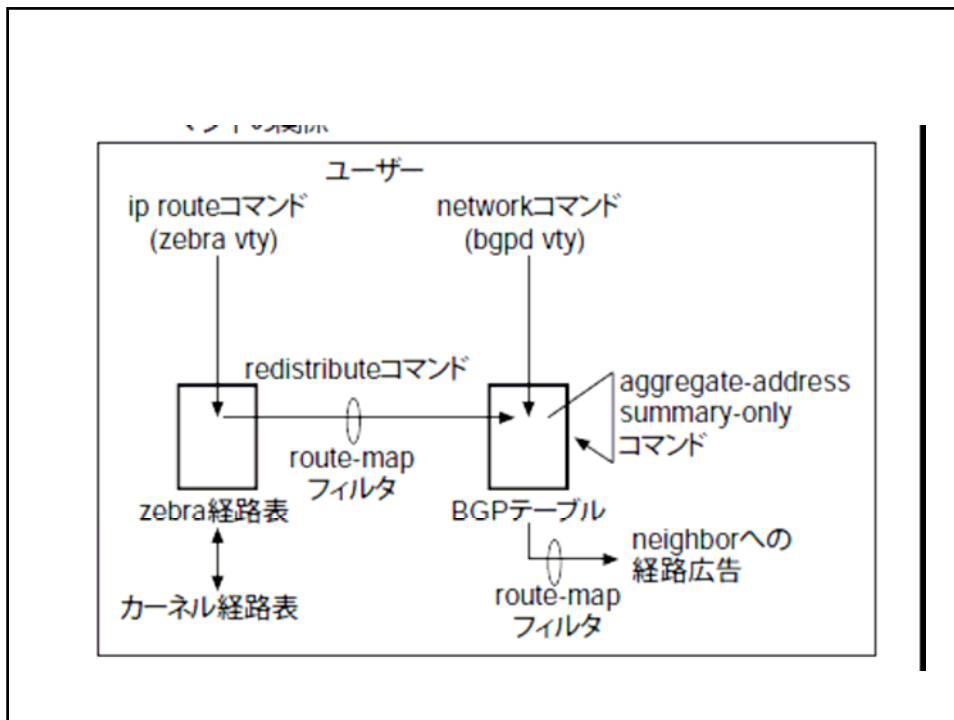
## Network, redistribute, aggregate

図7 show running-config の実行結果

```
router bgp 65535
  bgp router-id 192.168.0.1
  network 192.168.1.0/24
  network 192.168.2.0/24
  aggregate-address 192.168.0.0/16 summary-only
  redistribute ospf
```

図5 network、redistribute、aggregate コマンド

```
1 bgpd(config-router)# network 192.168.1.0/24
2 bgpd(config-router)# network 192.168.2.0/24
3 bgpd(config-router)# redistribute ospf
4 bgpd(config-router)# aggregate-address 192.168.0.0/16 summary-only
```



# Route-map

```
1 bgpd(config)# route-map route-map-name {permit|deny} 5
2 bgpd(config-route-map)# match ip address prefix-list prefix-listname
3 bgpd(config-route-map)# match as-path as-path-access-listname
4 bgpd(config-route-map)# match metric med-value
5 bgpd(config-route-map)# set as-path prepend as-path-string
6 bgpd(config-route-map)# set ip next-hop {A.B.C.D|peer-address}
7 bgpd(config)# route-map route-map-name {permit|deny} 10
8 bgpd(config-route-map)# match origin {egp|igp|incomplete}
9 bgpd(config-route-map)# match ip next-hop prefix-list prefix-listname
10 bgpd(config-route-map)# set local-preference local-pref-value
11 bgpd(config-route-map)# set metric {+|-|}med-value
12 bgpd(config-route-map)# set origin {egp|igp|incomplete}
13 bgpd(config-router)# redistribute {connected|kernel|ospf|rip|static} route-map route-map-name
14 bgpd(config-router)# neighbor A.B.C.D route-map route-map-name {in|out}
```

# Prefix-list

## 3 ip prefix-list の例

```
ip prefix-list as64512-in seq 5 permit 10.0.0.0/8 ge 16 le 24
ip prefix-list as64512-in seq 10 deny 192.168.0.0/16 le 32
ip prefix-list as64512-in seq 15 permit 0.0.0.0/8 le 24
ip prefix-list as64512-out seq 5 permit 192.168.0.0/16
```

## 4 ip prefix-list の適用例

```
bgpd(config-router)# neighbor 10.0.0.1 prefix-list as64512-in in
bgpd(config-router)# neighbor 10.0.0.1 prefix-list as64512-out out
```

# Prefix-list

図 12 ip prefix-list、neighbor prefix-list の書式

```
1 bgpd(config)# ip prefix-list listname [seq seq-value] {permit|deny} A.B.C.D/M [ge ge-value] =>
  [le le-value]
2 bgpd(config-router)# neighbor A.B.C.D prefix-list listname {in|out}
```

# As-path access-list

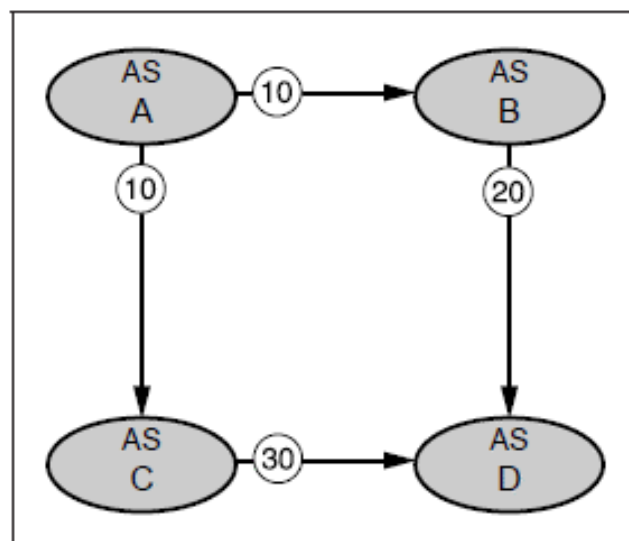
図 15 ip as-path access-list、neighbor filter-list コマンドの書式

```
1 bgpd(config)# ip as-path access-list listname {permit|deny} as-regexp
2 bgpd(config-router)# neighbor A.B.C.D filter-list listname {in|out}
```

図 16 ip as-path access-list の適用例

```
1 bgpd(config)# ip as-path access-list aspath-regexp permit ^(64512_)+(64514_)+$
2 bgpd(config)# router bgp 65535
3 bgpd(config-router)# neighbor 10.0.0.1 filter-list aspath-regexp in
```

DPS?



# eBGP

