Exp 1:-

IPv4 32 bit

2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9
4	8	16	32	64	128	256	512

9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
128	64	32	16	8	4	2	1 (bit)
128	192	224	240	248	252	254	255

- Excluded +2 for lan +2 for wan (Network address + Brand cast)

- Excluded +2 for Wan +3 fo lan → (" + " + lan interface)

- Cider notation = 32 - # of bits required.

- what is the number of Braodcast domains in the topology ?

the same number of subnets without the subnet of (ISP with internet).

Exp 2 :-

Ipv6 128 bit

- 128 bit
  - 64 bit
    - 48 — for global routing prefix
    - 16 — for subnetting
      - إذا ما كفو اخذ من ال host
  - 64 bit — for host-interface id

- 8 octet of 16 bits

EUI-64

- given prefix (64 bit) + Interface ID
- given mac address (48 bit)

what is the interface ID ?

اقسم ال mac address للنص وحط بالنص FFFF وبعدين

اقلب ال bit السابعة من الشمال وضيف الناتج للـ prefix

بنصير عنا ال Global unicast address.

- loopback address for Ipv6 = ::1
- loopback address for Ipv4 = 127.0.0.1

---

given global local unicast what is the Solicited and mac address?

from global → solicited (128 bit)

- Soliceted-Node ff02:0:0:0:0:1:ff[illegible]::/104

104 + 24 → 128 bit

24 ↓ from global unicast (128 bit).

from soliceted → mac address (48 bit)

16 bit + 32 bit

3333 ↓ from soliceted

---

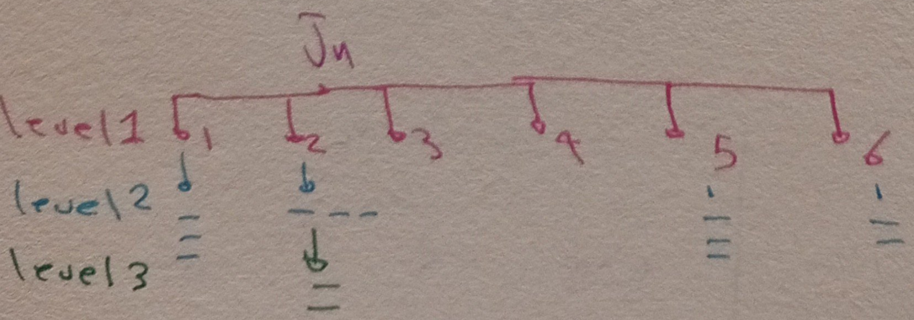
given Ipv6 prefix 2001:AAAA:BBBB:8000::/52

48 bit prefix (2001:AAAA:BBBB)

16 for Subnetting (8000)

بس ناخذ 4

↳ اعمل subnetting لهاي الشبكة ووزعهم



كل ما تنزل level بناخذ 4 bit وإذا زاد عنهن

Borrow نعمل level من ال host

3 level × 4 bit = 12 bit

48 + 12 = 64 b

* Example on level 1?

2001:AAAA:BBBB:8100::/56

Static

Exp 4:-

Routing

- Static
  - → manually
  - بتدخل الطريق لل Router اللي رايح عليه
- Dynamic
  - → Router بتدخل على كل
  - جميع الشبكات الموجودة عليه وإذا انقطع طريق لحاله بعمل update لطريق ثاني

AD: تمثل الثقة بالبروتوكول، كل ما كان الرقم أقل كل ما كان أحسن

AD for connected → 0

AD for Static (remote machine) → 1

RIP → 120

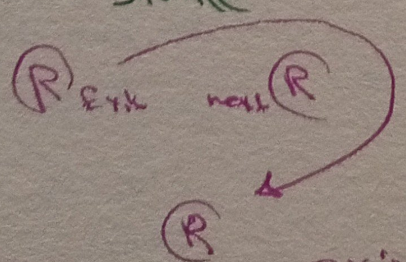
Eigrp → 90

ospf → 110

هلأ حيختار طريق ال Static أولاً لأنه أقل AD ولو انقطع الطريق بيختار Eigrp

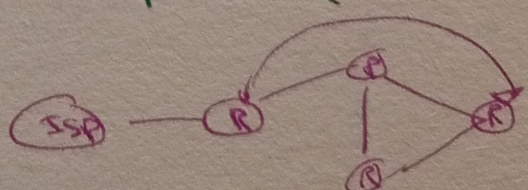
---

Static



ip route __ __ exit / next hop

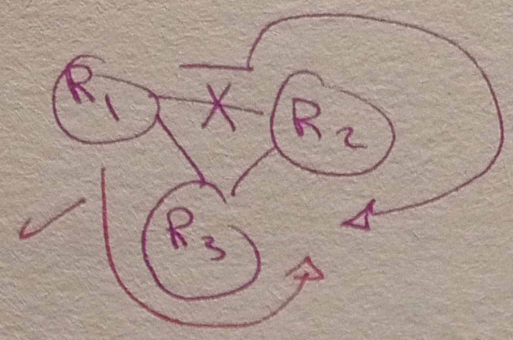
Default



من خلال ال ISP هو عارف كل اشي

Ip route 0.0.0.0 0.0.0.0 exit or next

Float (Backup)



ip route — — exit / or / next — AD 100 50

أي اسمي (الأقل)

Summarize → عشان ما أدخل كل الشبكات

IPv4

Exp1:-
172 . 20 . 0 . 0
172 . 21 . 0 . 0
172 . 22 . 0 . 0
172 . 23 . 0 . 0

(20)
172 . 0001 0100 — 20
" . 0001 0101 — 21
" . 0001 0110 — 22
" . 0001 0111 — 23

same = 20
6 bit

172 . 20 . 0 . 0
8 6

14 bit

255 . 252 . 0 . 0

Exp 2:-
192 . 168 . 0 . 0 /24
192 . 168 . 1 . 0
192 . 168 . 2 . 0
192 . 168 . 3 . 0

0000 0000
0000 0001
0000 0010
0000 0011

same = 0

192 . 168 . 0 . 0 /22
255 . 255 . 252 . 0

For **Ipv6** :-

2001 : 0DB8 : ACAD : 1 :: /64
" " " 2
" " " 3
" " " 4

⟹ 001
010
011
100

64 − 3
→ 61 bit

⟹ 2001 : 0DB8 : ACAD :: /61

- Directly attached static route → exit interface
- Recursive static route → Next hop
- fully specified static route → exit + Next

Exp 5 :-

Dynamic Routing

protocol	AD	(best path) metric
RIP	120	hop count
eigrp	90	delay/BW
ospf	110	BW

hop count → كم راوتر مرّ عشان يوصل للشبكة

Routing loop in RIP
→ triggered updates
every 30 sec

Main timers :-

الراوتر كل 30 ثانية بيبعت hello لـ اللي عنده اتصال بالراوترات
يشوف لسه عايشين ولا لا

1- periodic update → every 30 sec
2- route invalid timer → every 90 sec.
3- route flush timer → every 270 sec

- Passive Interface :-

Allows a router to recieve routing updates on an interface but not send updates via that interface

---

Exp 6 :- Eigrp

- Hello packet every 5 seconds.

5 x 3 → 15 seconds if no reply there is no connection. (hold time)

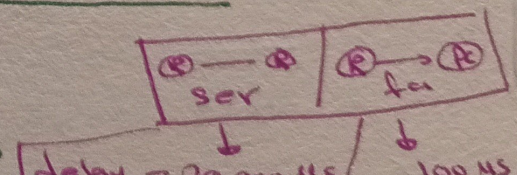
- multipoint nonBroadcast multi-access networks (NBMA) such X.25 / Frame Relay / ATM interfaces with access link of T1 (60 sec)

60 x 3 → 180 sec (hold time)

Bw	Example link	Hello interval	hold time
1.544 Mbps	Multi point Frame Relay	60 sec	180
Greater than 1.544 Mbps	T1, Ethernet	5 sec	15

---

metric (Best الأول Bath) ⇒



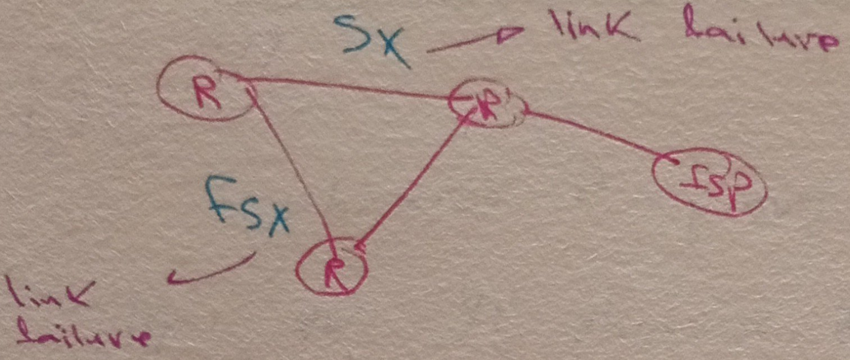
$$\frac{10^7}{Bw} \times 256 + \frac{\text{sum of delay}}{10} \times 256$$

- best bath is the successor. (FD)

Fc = RD < FD → FS (BackUp route)

Eigrp Neighbor table

Routing table	Neighbor table
successor	Successor FS



- إذا انقطعت كل الطرق عندي لا ISP بصير يبعث Query packet

RTO :- Retransmit timeout
SRTT :- smooth Round trip timer

وهاي بتعتمد على ال RTO

$$RTO = 6 \times SRTT$$

Min = 200ms / Max = 5000 ms

Exp:-

- first try = 200 then 15 try × 1.5
- the n^{th} try

$$\rightarrow 1.5^{n-1} \times (6 \times SRTT)$$

- Wild mask

Exa:-

	255 . 255 . 255 . 255
Subnet mask	255 . 255 . 248 . 0 −
	= 0 . 0 . 7 . 255

OSPF

Exp 7 :-

$$metric = \frac{10^8}{BW\ (bit/sec)}$$

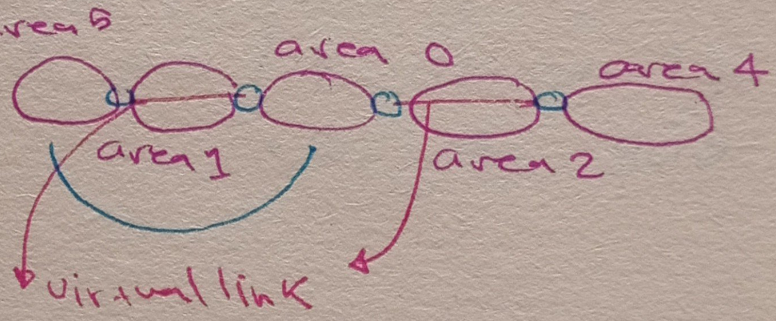
- بحسب بجمع وبختار ال metric الاقل من الطرق بكون هو ال best path .

---

virtual link

- ال ospf تعتمد على ال Backbone area

لازم كل ال areas ⟹ مشبوكة على area 0 (BackBone area).



- Internal Router

⟶ All interfaces (routers) in single area (ospf).

+ any router connects area of eigrp or ospf or (not in)

- BackBone Router

⟶ Any router in Area 0 or direct connect with area 0

- ABR - Area Border Routers
→ routers connect ospf ~~routers~~ areas with each other

- ASBR - Autonomous System Border routers
→ routers connect eigrp or rip.

DR (Designated router) and BDR (Backup " ")

Election process

DR → highest priority.

BDR → 2nd highest priority.

priority = 0
مش مهم

* وإذا كلهم متساويين ← أعلى Router-ID هو DR
والثاني هو BDR

Good luck