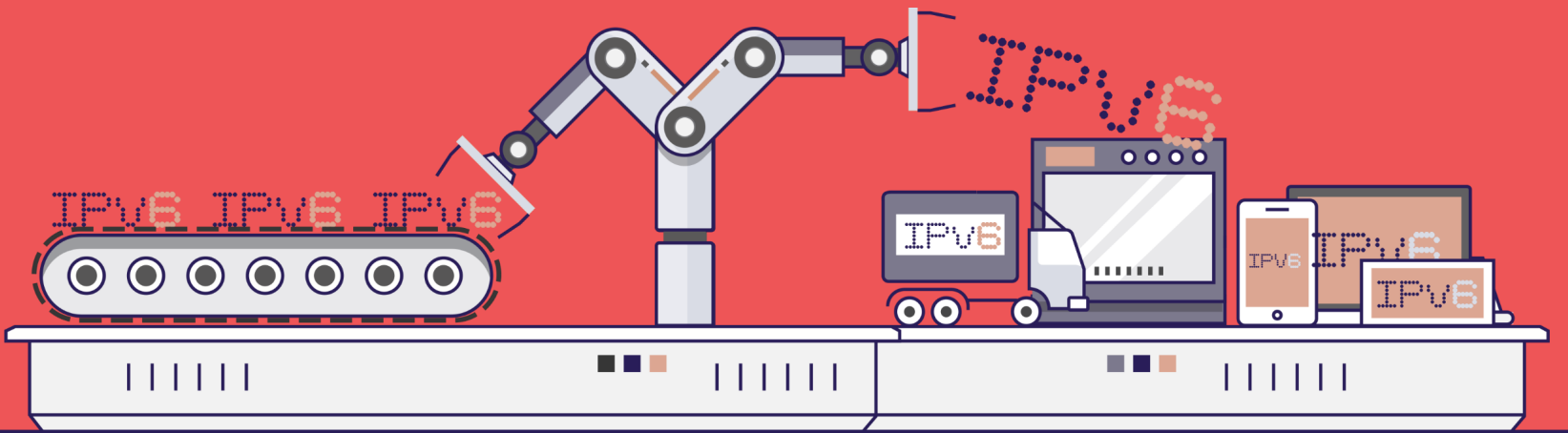


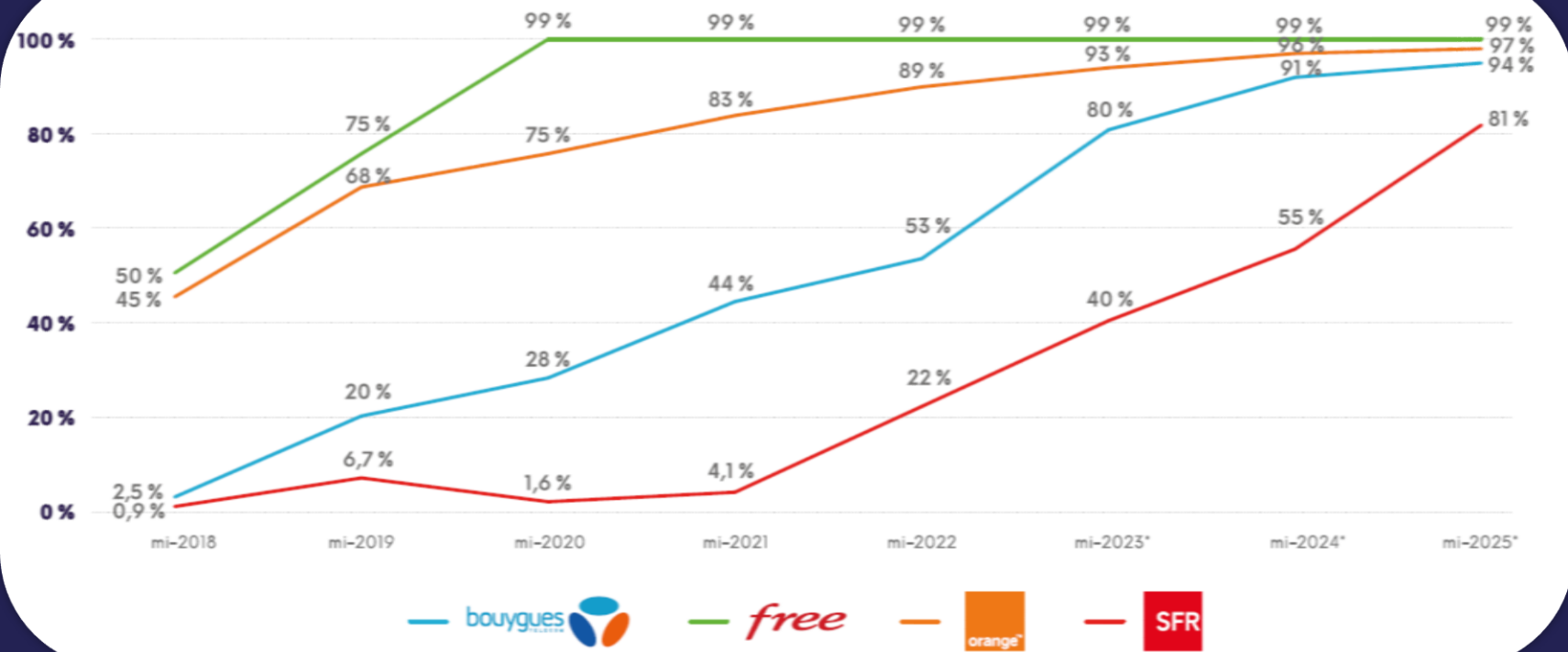
# IPv6 et la BOX, au-delà des adresses

*Jean-Charles BISECCO*

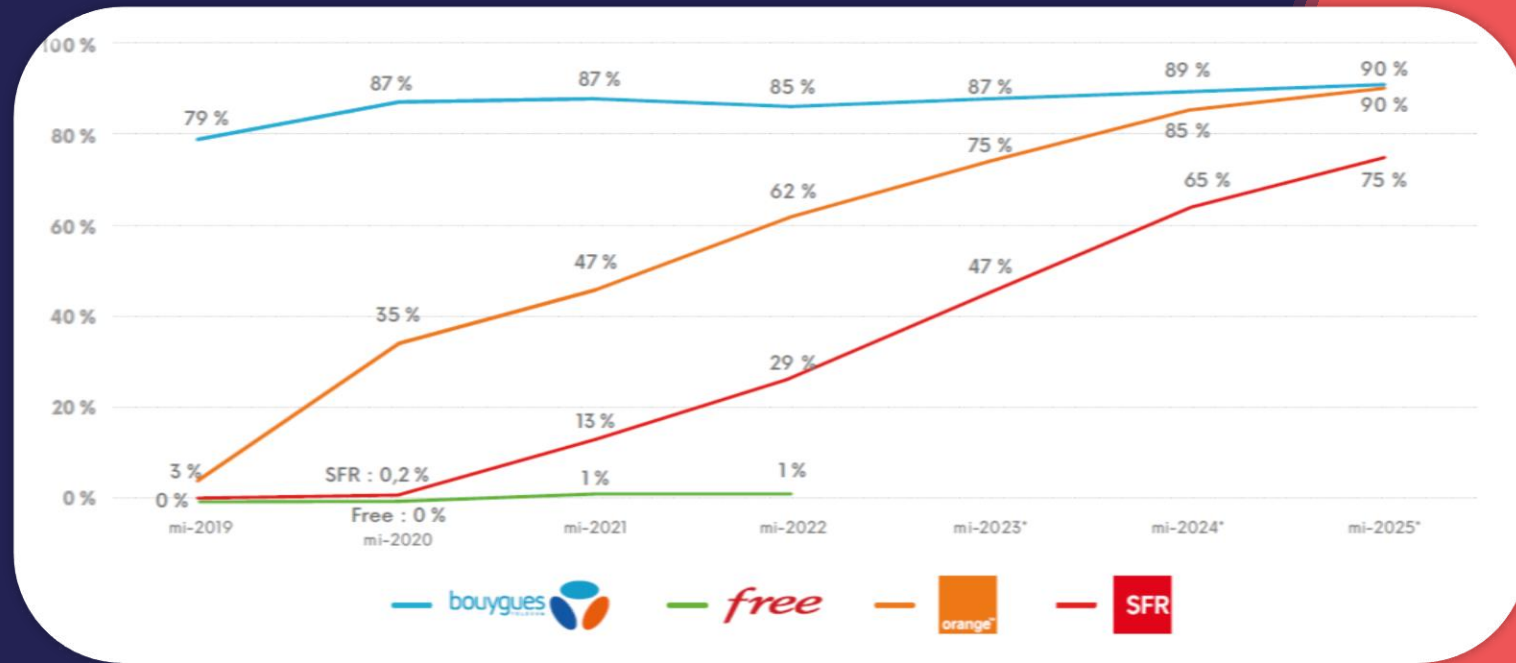
*Membre de la taskforce IPv6 France  
et IPv6 Forum*



# Fixe



# Android



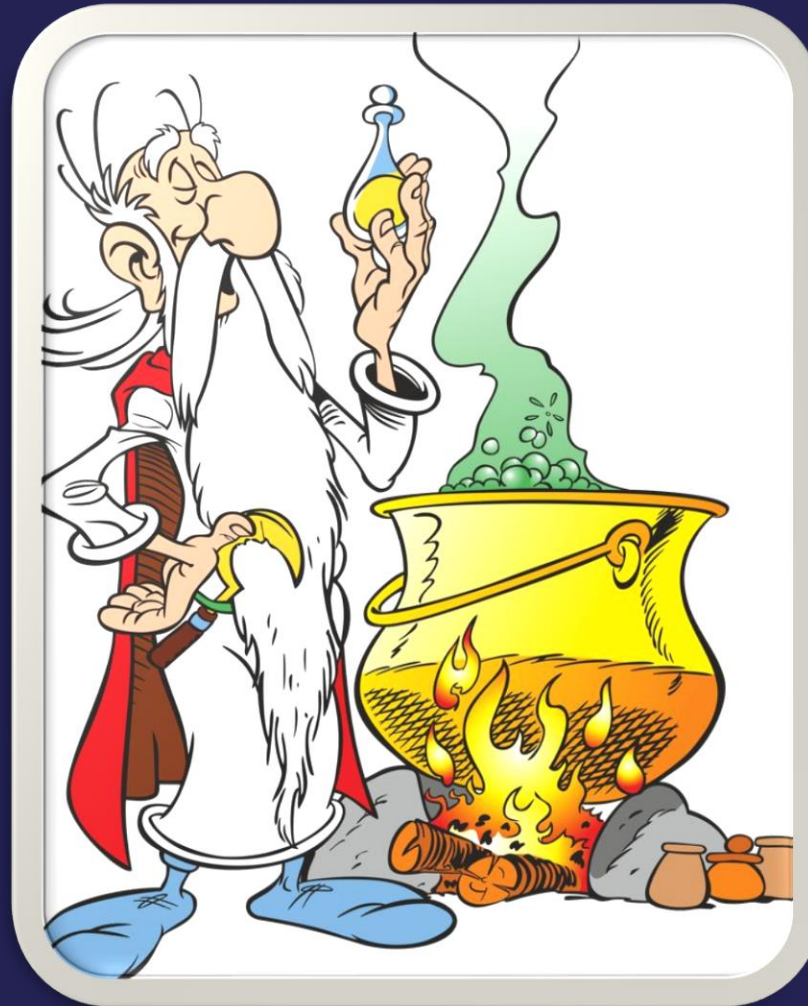


**Hourra!  
On a déployé  
IPv6 ! \***



**\* Voir verso**

*Je n'ai  
rien oublié*



**Cépasmonpréfix**  
et son SDK de BOX



# Cas d'usage

- ::A: Chainage de routeur
- ::B: Ouverture dynamique
- ::C: Ouverture manuelle
- ::D: RA lifetime



# ::A: Chainage de routeurs

- Avoir son propre routeur
  - Très difficile de se passer des routeurs FAI
  - Besoin de plusieurs préfixes
- Comment disposer de préfixes ?
  - DHCPv6-Prefix Delegation

Internet Engineering Task Force

Shin Miyakawa

INTERNET-DRAFT

NTT Communications

<draft-miyakawa-ipv6-prefix-delegation-requirement-00.txt>

Expires: December 24, 2002

June 24, 2002





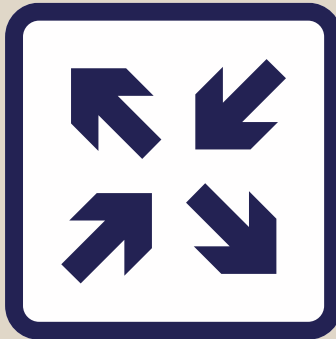
Réseau local /64



Utilisateur ~ /56

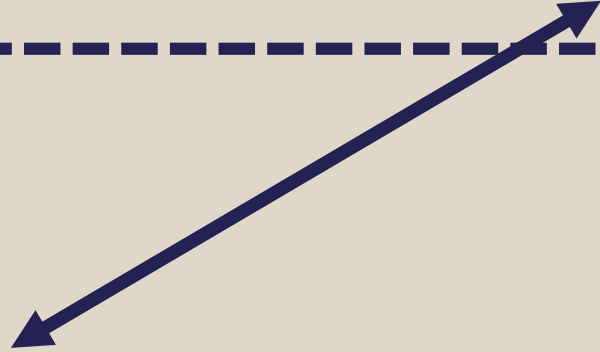


Préfixe FAI ~ /29



Réseau 1 /64

Réseau 2 /64



# ::A: Problèmes courants

- N'accepte pas de fournir plus large que /64
- Ne veut pas déléguer plusieurs /64 au même client
- Les routes correspondantes aux prefixes délégués ne sont pas installées
  - Le trafic sort vers internet et re-rentre
  - Similaire au hair-pinning NAT44 mal implémenté
- En attendant, certains en sont réduits à proposer du ND proxy dans le /64 par défaut





# ::A: La minute c'était mieux avant

- En IPv4 NAT444
  - Presque aucun FAI ne permet de router des subnets IPv4 RFC 1918
  - Parfois au moins une option d'ouverture de flux en classant le 2<sup>nd</sup> routeur comme "DMZ"



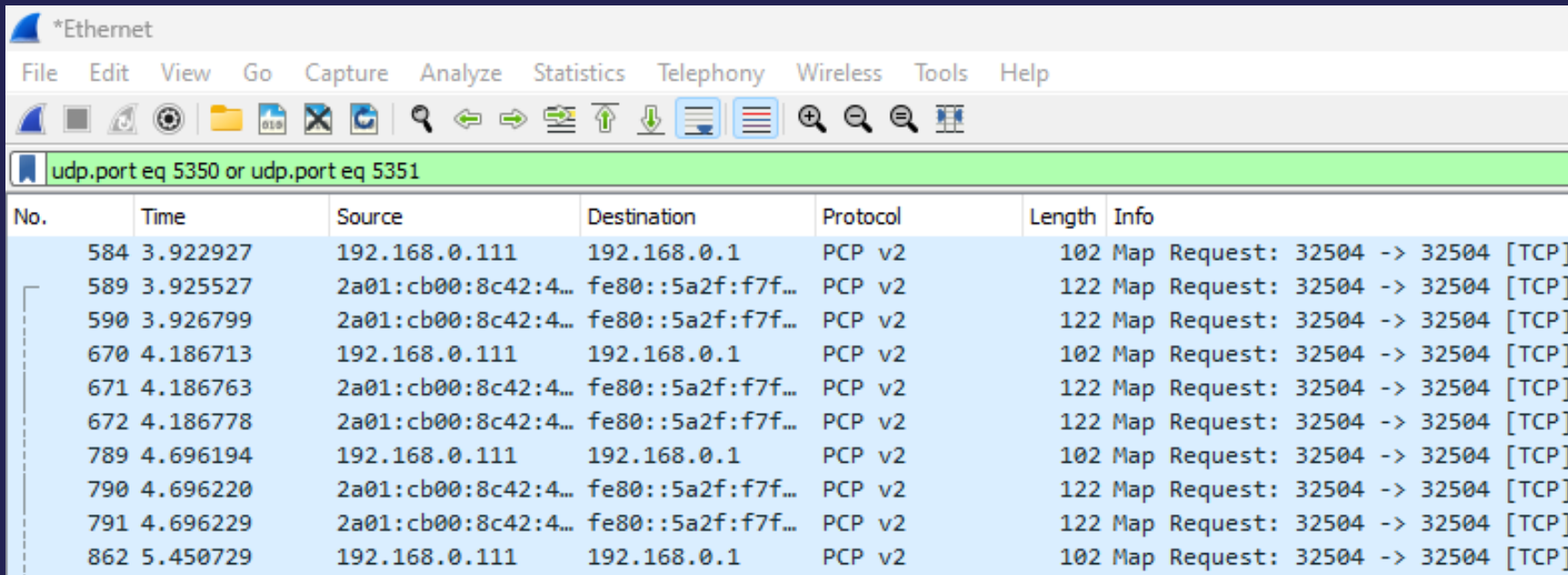
# ::B: Ouverture dynamique

- S'échapper du NAT et du stateful
- Il faut encore aller sauver *Nat Daemon*
  - "Courage Under Fire (Gulf War 1 helicopter rescue): \$300k
  - Saving Private Ryan (WW2 Europe search party): \$100k
  - Titan A.E. (Earth evacuation spaceship): \$200B
  - Syriana (Middle East private security return flight): \$50k
  - Green Zone (US Army transport from Middle East): \$50k
  - Elysium (Space station security deployment and damages): \$100m
  - Interstellar (Interstellar spaceship): \$500B
  - The Martian (Mars mission): \$200B
  - TOTAL: \$900B plus change



# ::B: Ouverture dynamique

- UPnP-IGD, NAT-PMP, PCPv2
  - Ce dernier est fait pour IPv6 avec le même port de service que NAT-PMP



The screenshot shows a Wireshark capture of network traffic on an Ethernet interface. The filter is set to 'udp.port eq 5350 or udp.port eq 5351'. The capture shows several PCP v2 Map Request packets. Each packet is 102 bytes long and is sent from either 192.168.0.111 or 2a01:cb00:8c42:4... to 192.168.0.1 or fe80::5a2f:f7f... respectively. The info field for each packet indicates a Map Request from port 32504 to port 32504 over TCP.

| No. | Time     | Source              | Destination       | Protocol | Length | Info                              |
|-----|----------|---------------------|-------------------|----------|--------|-----------------------------------|
| 584 | 3.922927 | 192.168.0.111       | 192.168.0.1       | PCP v2   | 102    | Map Request: 32504 -> 32504 [TCP] |
| 589 | 3.925527 | 2a01:cb00:8c42:4... | fe80::5a2f:f7f... | PCP v2   | 122    | Map Request: 32504 -> 32504 [TCP] |
| 590 | 3.926799 | 2a01:cb00:8c42:4... | fe80::5a2f:f7f... | PCP v2   | 122    | Map Request: 32504 -> 32504 [TCP] |
| 670 | 4.186713 | 192.168.0.111       | 192.168.0.1       | PCP v2   | 102    | Map Request: 32504 -> 32504 [TCP] |
| 671 | 4.186763 | 2a01:cb00:8c42:4... | fe80::5a2f:f7f... | PCP v2   | 122    | Map Request: 32504 -> 32504 [TCP] |
| 672 | 4.186778 | 2a01:cb00:8c42:4... | fe80::5a2f:f7f... | PCP v2   | 122    | Map Request: 32504 -> 32504 [TCP] |
| 789 | 4.696194 | 192.168.0.111       | 192.168.0.1       | PCP v2   | 102    | Map Request: 32504 -> 32504 [TCP] |
| 790 | 4.696220 | 2a01:cb00:8c42:4... | fe80::5a2f:f7f... | PCP v2   | 122    | Map Request: 32504 -> 32504 [TCP] |
| 791 | 4.696229 | 2a01:cb00:8c42:4... | fe80::5a2f:f7f... | PCP v2   | 122    | Map Request: 32504 -> 32504 [TCP] |
| 862 | 5.450729 | 192.168.0.111       | 192.168.0.1       | PCP v2   | 102    | Map Request: 32504 -> 32504 [TCP] |

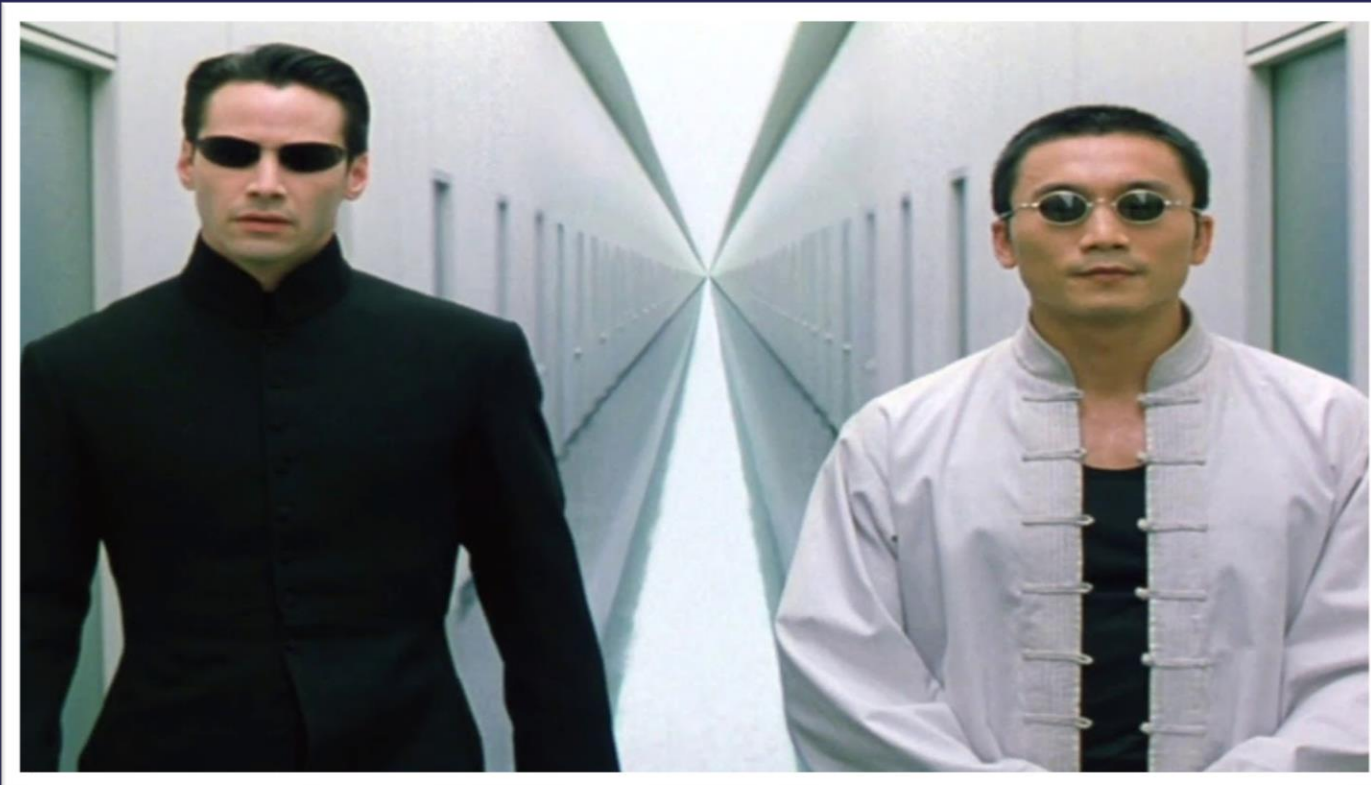
- Un simple agent empêche d'ouvrir la porte



# ::B: Ouverture dynamique

*Tous ces sauts mon cher Seraphin !*

*On est vraiment bloqué alors qu'il me reste la moitié de mes Hop Limit ?*



# ::C: Ouverture manuelle

- Héberger un service
  - En IPv4 NAT44
  - En IPv6 tracking de l'hôte et de toutes ses addresses
- Problèmes
  - Disparait parfois sur certains CPE
  - Certains ne bloquent rien par défaut, votre imprimante deviant un FAX version IP



# ::D: RA et la vie éternelle

- Timelife de préfixe trop long
- N'expire pas en cas de renumbering, n'est pas flushé par les hôtes



# ::E: Cahier de test

- Constitution d'un cahier avec les tests courants
- Utilisation de 2 produits routeurs virtualisables
  - OPNsense
  - Fortigate



- Publication du cahier début d'année prochaine par l'IPv6 Forum



# ::E: Participation des FAI

- Travaillons ensemble à lever ces problèmes
- Avec le concours de l'ARCEP et de l'IPv6 Forum
- Le last mile doit être fonctionnel





# ::E: Roadmap

- Test des box de FAI en FttH
- Test des box 4/5G
- Test des mobiles en hotspot

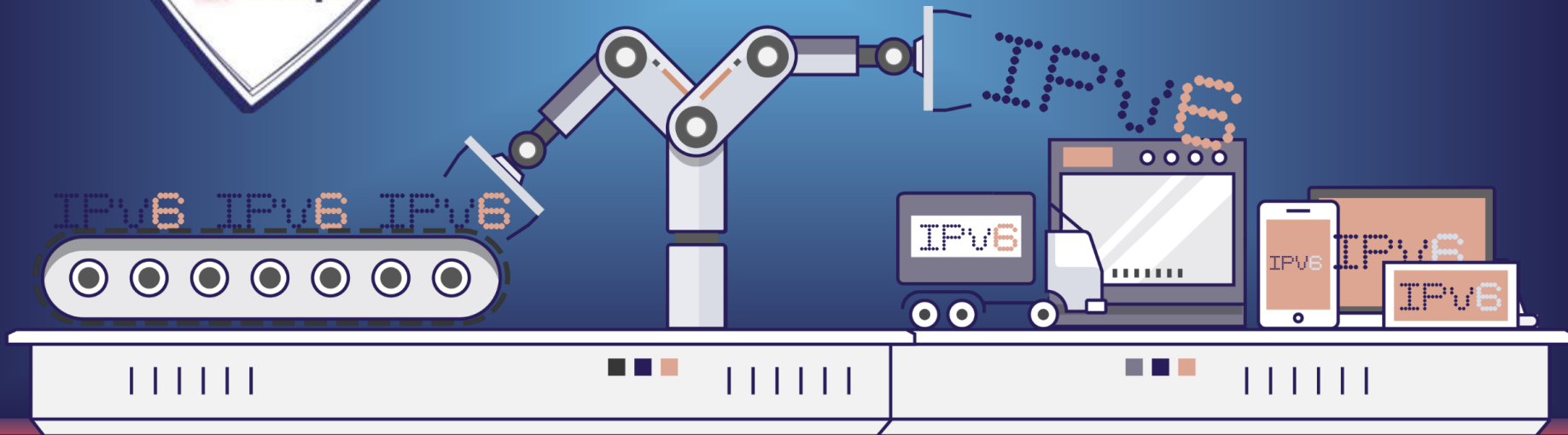


# Questions baromètre 2022

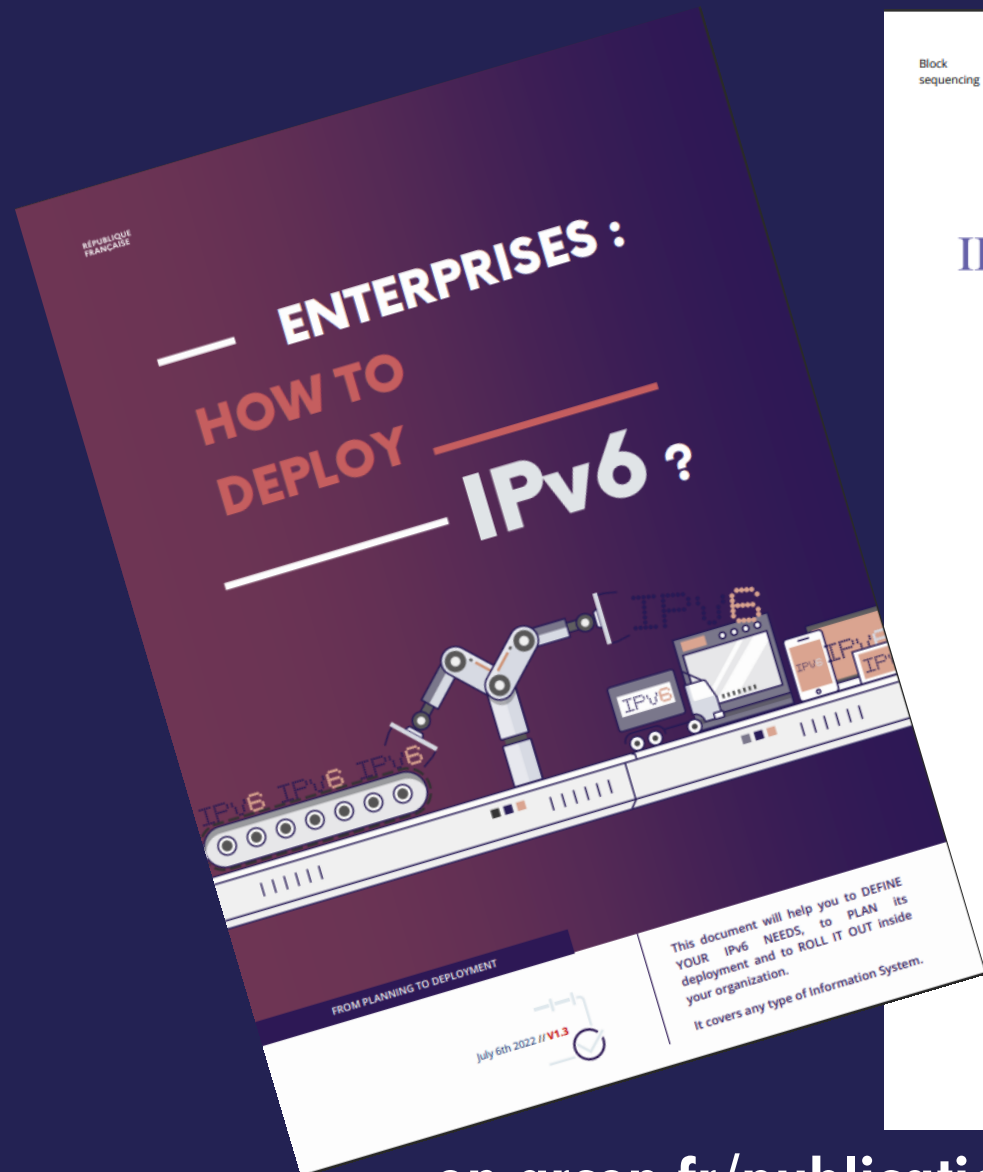
|   |            |                                       |  |                                    |                            |
|---|------------|---------------------------------------|--|------------------------------------|----------------------------|
| "Nouveaux clients : IPv6 activé par défaut ?"   | xDSL       | Oui si zone activée réseau, non sinon | Oui  | Oui                                | Non                        |
|   | FttH       |                                       | Oui  | Oui                                | "Oui, si zone CG-Nat"      |
|   | 4G/5G Fixe | Oui                                   | Pas d'IPv6                                   | Non                                | Oui                        |
| "Clients éligibles IPv6 : IPv6 activé par défaut ?"   | xDSL       | Oui                                   | Oui  | Oui                                | Non                        |
|   | FttH       | Oui                                   | Oui  | Oui                                | "Oui, si zone CG-Nat"      |
|   | 4G/5G Fixe | Oui                                   | Pas d'IPv6                                   | Oui                                | Oui                        |
| Périodicité du changement du préfixe IPv6. (sous réserve de modifications sur le réseau d'accès ou de collecte) | xDSL       | Fixe                                  | Fixe   | Dynamique                          | Fixe                       |
|   | FttH       | Fixe                                  | Fixe   | Dynamique                          | Fixe                       |
|   | 4G/5G Fixe | Dynamique                             | Pas d'IPv6                                   | Dynamique                          | Dynamique                  |
| Taille du préfixe du réseau IPv6 attribué par défaut aux clients IPv6   | xDSL, FttH | 60 bits                               | 61 bits                                      | 56 bits                            | 56 bits                    |
|   | 4G/5G Fixe | 64 bits                               | Pas d'IPv6                                   | 64 bits                            | 64 bits                    |
| Impossibilité pour le client final de désactiver IPv6 dans sa box   | xDSL       | Oui                                   | Oui  | Non                                | Non                        |
|   | FttH       | Oui                                   | Oui  | Non                                | "Oui, si zone CG-Nat"      |
|   | 4G/5G Fixe | Non                                   | Pas d'IPv6                                   | Oui                                | Oui                        |
| "Pare-feu IPv6 activé par défaut (flux entrants non sollicités bloqués par défaut)"                             | xDSL, FttH | Oui                                   | Non  | Oui                                | Oui                        |
|   | 4G/5G Fixe | "Non à date, oui dans le futur"       | Pas d'IPv6                                   | Oui                                | Oui                        |
| Pare-feu IPv6 : possibilité d'ouvrir les flux IPv6 entrants non sollicités sur la box                           | xDSL, FttH | "Manuellement et via PCP"             | Le pare-feu optionnel ne peut être configuré | "Manuellement et via PCP"          | "Manuellement et via PCP"  |
|   | 4G/5G Fixe | "Non à date, possible dans le futur"  | Pas d'IPv6                                   | Le pare-feu ne peut être configuré | Manuellement (pas via PCP) |



# Questions ?



# Handbook (124 pages)



### III. Block sequencing

IPv6 deployment is logically to be done starting with the bottom, the network layer. And before any deployment it is coherent to prototype the behavior of each component. Very few organizations have an end-to-end lab and qualification environment, both horizontally within the same layer and vertically between layers. For example, your campus, datacenter and security network prototypes may be managed by different teams and are not interconnected in a topology close to the production one, this is a horizontal break. If a qualification server is running on a network with production routers, we have a vertical break. This makes sense, otherwise how can you debug a problem if all the stack layers are in test, it would look like a multi-level rola-bola.

We will retain that each layer has its own test environments, and that those run on lower layers' production environments. In short, every qualification runs itself on an underlying production environment (except for the foundation that is network). This can be represented as follows:

#### 1. Warm up

Before you even decide where to begin, start by making sure that all of your current and future specifications / RFPs / subcontractors requests include IPv6 compatibility and guarantee its proper functioning. These processes often take a long time to change, so it is advisable to start working on them right away.

This also includes build, run, life cycle processes and everything related to them.

IPv6 Transition Guide | 40

Grasp of the subject

fleets than to migrate to IPv6. In real life, don't try it, except in the lab out of pure curiosity. Google' GCP allows to use it on VPC but mention possible OS problems: <https://cloud.google.com/vpc/docs/ipv6-validation>. Nevertheless they don't specify you might even be unable to learn such prefixes on your on premises BGP routers, although at least 2 vendors support this space via a command.

The use of one of the "cheat" scenarios described above to extend private addressing or the short horizon of reaching the end of the RFC 1918 pool appearing to be near (less than a few years at your consumption rate) should prompt you to give serious consideration to an IPv6 deployment.

Remember the time spent on past and future NAT44 and re-addressing projects related to the incorporation of newly acquired entities. Have you ever seen an IT department decide that they would start their internal addressing with the 10.255.0.0/16 block in the downstream direction because their company would be acquired one day and hopefully the new parent entity would have started their addressing with 10.0.0.0? More seriously, IP addressing conflicts during structure integration generate costs and delays that are often significant, in addition to added complexity for long-term operation in the event that NAT44 remains in place.

*In this example of mobile connection sharing, IPv4 traffic is altered 3 times!  
IPv6 traffic is simply tracked by the destination firewall.*

QR code

# Tethering / hotspot

- NAT64 Awareness ?

```
PS C:\Users\jc> Resolve-DnsName -Name ipv4only.arpa
```

| Name          | Type | TTL   | Section | IPAddress        |
|---------------|------|-------|---------|------------------|
| ipv4only.arpa | AAAA | 21600 | Answer  | 64:ff9b::c000:aa |
| ipv4only.arpa | AAAA | 21600 | Answer  | 64:ff9b::c000:ab |
| ipv4only.arpa | A    | 19188 | Answer  | 192.0.0.170      |
| ipv4only.arpa | A    | 19188 | Answer  | 192.0.0.171      |

- Move on when modern PC OSes become NAT64 aware (PCP, ipv4only.arpa, Pref64 RA option) + DHCP option 108
  - macOS now has a complete CLAT engine and is ready for IPv6 only networks, while Windows only support it on 4/5G modem



# ::FEED:BAC4:)

- Join US
- Send your ideas, new topics to cover
- Translate

[IPv6@arcep.fr](mailto:IPv6@arcep.fr)

[JC@VeeSIX.NET](mailto:JC@VeeSIX.NET)

