Déployer IPv6

petit guide à l'usage des "netadmins"

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- La mise en place des services
  - DNS
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Introduction

- Rapide aperçu de la démarche
- Étapes préliminaires
  - La technologie (formations)
  - Inventaire
- Pas traité ici
  - La sécurité
  - Le routage
    - Plate-formes d'exercices + manuels

Plan d’adressage

Campus Addressing

Most sites will receive /48 assignments:

Network Prefix	Subnet ID	Interface ID
48 bits	*16bits*	*64 bits*

16 bits left for subnetting - what to do with them?

Two main questions to answer:

⇒ **How many topologically different "zones" can be identified ?**

- Existing ones or new ones to be created for whatever (good) reason

⇒ **How many networks (subnets) are needed within these zones ?**

Network « zones »

Zone description	Nb of subnets
Upstream interco and infrast	16
Administration services	4
Medical Sciences dept	32
Dept A	16
Dept B	16
…	

Campus Addressing - site level subnetting

Sequentially, e.g.

- 0000
- 0001
- …
- FFFF

- 16 bits = 65535 subnets

⇒ *Reserve prefixes for further allocations*

0020/60
0030/60

Subnet ID	Zone description
0000 / 60	BB Infrastructure
0010 / 60	Administration
0020 / 59	Medical Sciences dept
0040 / 60	Dept A
0050 / 60	Dept B
…	…

IPv6 subnet prefix allocations (ex.)

Subnet ID	Subnet prefix allocation	Description
0000 / 60		BB Infrastructure
	0000/64	Upstream interconnection
	0001/64	Campus architecture (DMZ)
	…	
	000B/64	Campus architecture
	…	
	000F	…
0010 / 60		Administration
	0010/64	Campus interco
	0011/64	Registration
	0012/64	Finance dept
	…	…

IPv6 subnet prefix allocations /2

Subnet ID	Subnet prefix allocation	Description
0020 / 60		Medical Sciences dept
	0020/64	Upstream interconnection
	0021/64	Nobel group
	…	
0030 / 60	***Reserved***	***Medical Sciences dept***
0040 / 60		Dept A
…		…

New Things to Think About

You can use "all 0s" and "all 1s"! (0000, ffff)

You're not limited to 254 hosts per subnet!

- Switch-rich LANs allow for larger broadcast domains (with tiny collision domains), perhaps thousands of hosts/LAN…

No "secondary address" (though >1 address/interface)

No tiny subnets either (no /30, /31, /32)

- plan for what you need for backbone blocks, loopbacks, etc.

You should use /64 per links

- Especially if you plan to use autoconfiguration!
- Even for the interconnection networks

New Things to Think About /2

Every /64 subnet has far more than enough addresses to contain all of the computers on the planet,

and with a /48 you have 65536 of those subnets

- use this power wisely!

With so many subnets your IGP may end up carrying thousands of routes

- consider internal topology and aggregation to avoid future problems.

New Things to Think About /3

Renumbering will likely be a fact of life. Although v6 does make it easier, it still isn't pretty. . .

- Avoid using numeric addresses at all costs
- Avoid hard-configured addresses on hosts except for servers (this is very important for DNS servers) – use the feature that you can assign more than one IPv6 address to an interface (IPv6 alias address for servers)
- Anticipate that changing ISPs will mean renumbering

Campus IPv6 address allocation

Next question to solve :

- **Which address allocation method to use ?**

⇒ **Stateless address autoconfiguration**

⇒ **Statefull address allocation (DHCPv6)**

⇒ **Or a mix of these 2 methods**

DHCP (1)

IPv6 has stateless address autoconfiguration but DHCPv6 (RFC 3315) is available too

- Many vendors don't implement yet a DHCPv6 client (MacOS X, …)

DHCPv6 can be used both for assigning addresses and providing other information like nameserver, ntpserver etc

If DHCPv6 is not used for address allocation, no state is required on server side and only part of the protocol is needed.

This is called *Stateless DHCPv6* (RFC 3736)

Some server and client implementations only do Stateless DHCPv6 while others do the full DHCP protocol

The two main approaches are

- Stateless address autoconfiguration with stateless DHCPv6 for other information
- Using DHCPv6 for both addresses and other information to obtain better control of address assignment

DHCP (2)

One possible problem for DHCP is that DHCPv4 only provides IPv4 information (addresses for servers etc) while DHCPv6 only provides IPv6 information. Should a dual-stack host run both or only one (which one)?

Several vendors working on DHCP but only a few implementations available at the moment

- DHCPv6 http://dhcpv6.sourceforge.net/
- dibbler http://klub.com.pl/dhcpv6/
- NEC, Lucent etc. are working on their own implementations
- KAME – only stateless

Cisco routers have a built-in stateless server that provides basic things like nameserver and domain name (also SIP server options).

DHCP can also be used between routers for prefix delegation (RFC 3633). There are several implementations. E.g. Cisco routers can act as both client and server

Mise en place des services réseau

DNS

Cf. le module 6DEPLOY : IPv6 DNS

- Renseigner les fichiers de zones
  - Directes: RR AAAA
  - Inverses: RR PTR
    - PTR v6: basé sur ½ octet !
    - Ex.: 2001:660 …

    ⇒… .0.0.6.6.1.0.0.2.ipv6.arpa

    ⇒ *la zone ipv6.int n'existe plus !*
- valider le fichier de zone
  - *named-checkzone*
- Eviter de créer des sous zones IPv6
  - Laisser "jouer" les applications avec le protocole de leur choix

DNS /2

- *Extrait du fascicule de TP 6DEPLOY: DNS hands-on.doc*
- Configurer un serveur DNS
  - Installer BIND 9.x (éviter tous les autres « trains » : 4.x, 8.x)
  - Configurer *named.conf* …
    - Déclarer les zones
- Démarrer le serveur
  - Rndc (re)start …
- Mises à jour automatiques (DDNS)
  - *Cf le site de IPv6 Adire (dans les références)*

Serveur web

Extrait du fascicule de TP 6DEPLOY: Services hands-on.doc

- Installer un serveur Apache2
  - Vérifier qu'il écoute sur les sockets IPv4 et IPv6
  - Lancer le *daemon* Apache2
- Remarques
  - La configuration des *virtual hosts* est identique à celle d'IPv4
    - Renseigner le fichier de config Apache
    - ET le DNS avec les adresses des *v.hosts*
  - Il est possible de n'accepter que les transactions sur IPv6 …
    - Listen [adresse IPv6]:80

Service de Messagerie

Serveurs compatibles IPv6 (ex.)

- Qmail
- Sendmail (+ Kit Jussieu ?)
- Exim

Clients (ex.)

- Thunderbird
- Seamonkey
- Inframail

Service de Messagerie /2

- Renseigner les MX des fichiers de zone
  - ma.zone.fr IN MX 10 “@-IPv6-server”
  - ma.zone.fr IN MX 20 “@-IPv4-server”
- Ou
  - ma.zone.fr IN MX 10 nom-server-smtp
  - nom-server-smtp AAAA @-IPv6-server
  - nom-server-smtp A @-IPv4-server

⇒Permet d’échanger le trafic de mails au-dessus d’IPv6 entre serveurs

⇒N’impose pas IPv6 aux clients de messagerie

Monitoring / supervision

- Disponibilité des MIBs et des applications de supervision
  - *cf Module 6DEPLOY: IPv6 management (et … d'autres sources)*
- Outils / Applications
  - ⇒ Quels outils / méthodes utilisez vous ?
  - ⇒ En existe t-il une version pour IPv6
  - ⇒ Distinguer :
    - L'information sur le trafic IPv6
    - Du transport de cette information sur IPv6
  - NAGIOS, ARGUS, NTOP, …
  - Renetcol (collecteur Netflow v9)
  - AS_PATH tree, Looking Glass, …
- Installation des outils
  - *Cf. Module TP 6DEPLOY: Management tools hands-on.doc, qui donne un exemple de fichier de configuration pour ARGUS*

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Mécanismes de transition

Cf. Module 6DEPLOY: IPv6 transition

- Distinguer
  - Interne au site
    - ISATAP, NAT-PT, …
  - Extérieur au site
    - **Dual Stack** (si le réseau de l'ISP le supporte)
    - Tunnel Broker, Tunnel p2p
  - ⇒ Éviter : 6to4
- Mécanismes de traduction
  - Couche 3: NAT-PT : *NAT … Protocol Translation* (déconseillé !)
  - Couche 4: TRT (relai TCP) : *Transport Relay Translator*
  - Couche 7: **ALG** (proxys) : *Application Layer Gateway*

Conclusions

- L'ordre des opérations n'est pas indifférent
  - ⇒*Planifier l'ensemble des opérations = gain de temps*
- bcp d'exemples et de documents en ligne …
  - ⇒*Ne pas chercher « Midi » à 14 heures !*
- Mais ! Votre site est unique
  - ⇒Adapter les bonnes pratiques des autres …
- Documenter (à votre tour) et partager l'expérience
- 'Last, but':
  - Formations (CiRen ou autres) permettent de gagner bcp de temps

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Références

- IPv6 Adire website
  - https://ipv6.u-strasbg.fr/doku.php
- Le livre du G6
  - http://livre.g6.asso.fr/index.php/Main_Page
- 6Deploy web site
  - http://www.6deploy.org
- Les “applications” disponibles
  - http://www.ipv6-to-standard.org/