Mise en oeuvre d'IPv6 au CRBN

- Le Conseil Régional de Basse Normandie (CRBN)
- Architecture informatique
- Architecture réseau
- Le réseau IPv6 du CRBN
- VoIP IPv6 au CRBN
- Evolution de l'architecture IPv6 au CRBN

Le CRBN

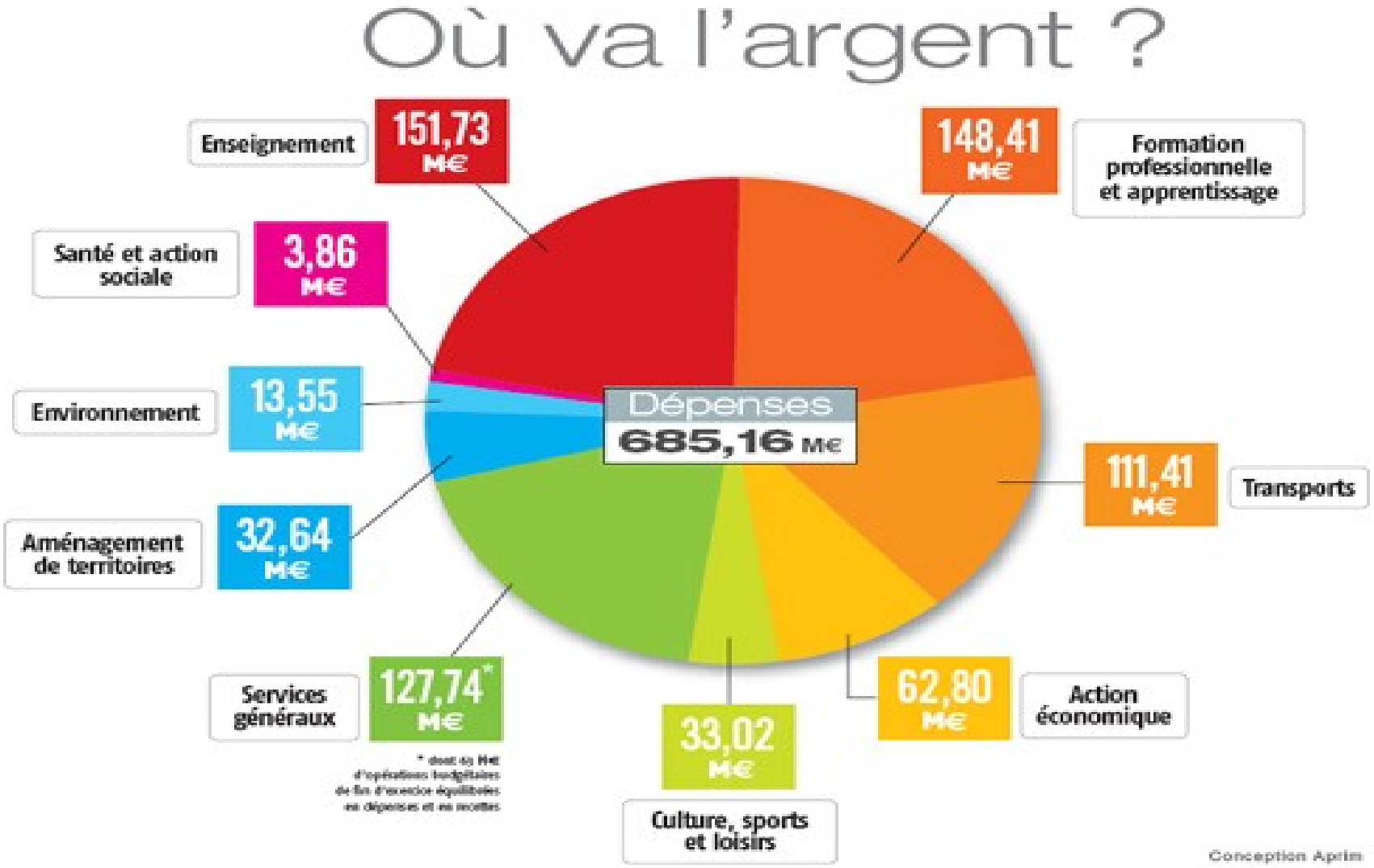
- Mission
- Quelques Chiffres

- La DSI (Direction des Systèmes d'Information)

Principales Missions

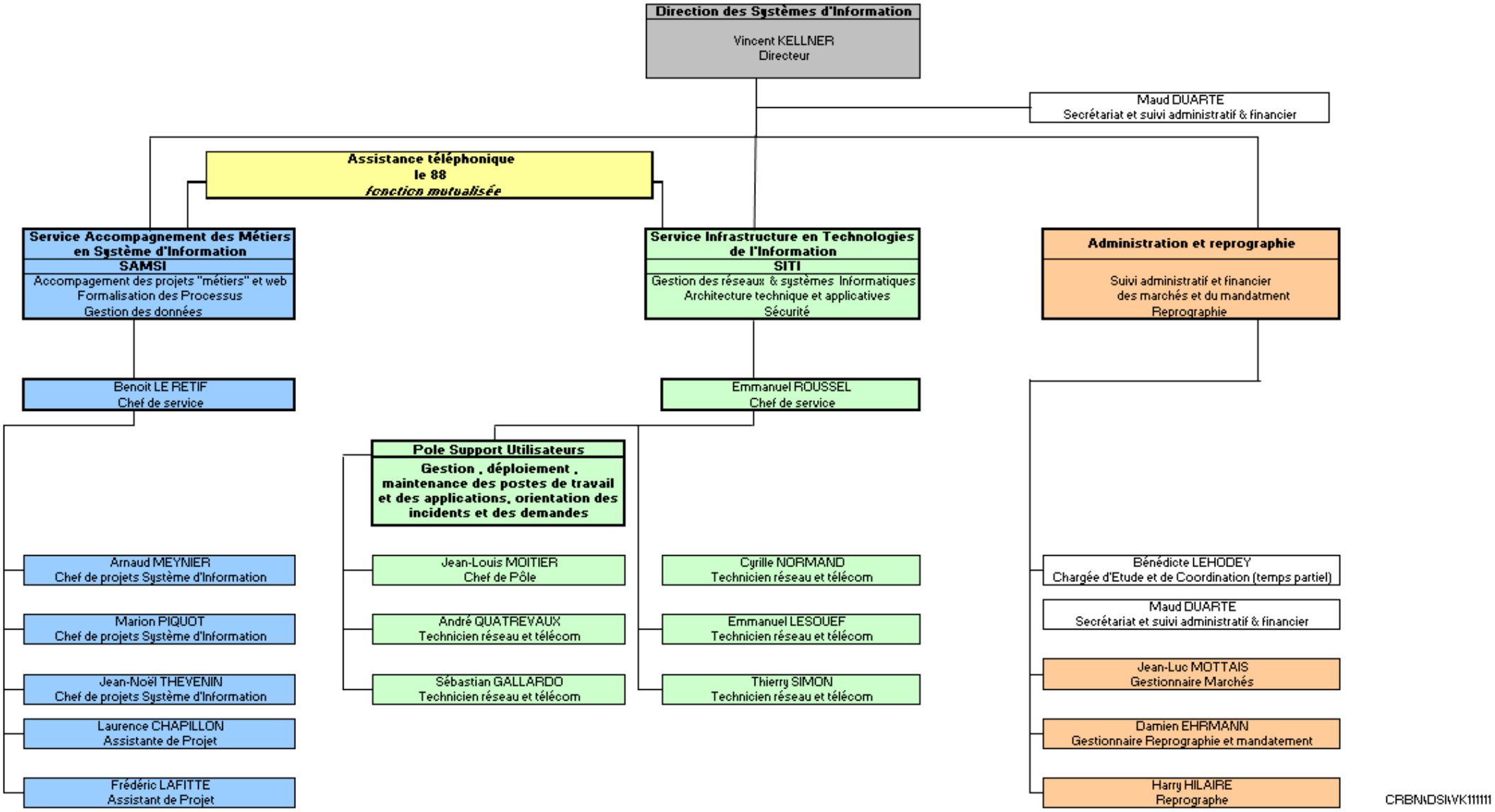
- Enseignement (Lycées, Université) et formation professionnelle
- Recherche
- Transport
- Action économique
- …
- 1850 collaborateurs
  - 500 au siège
  - 50 élus
  - 1300 répartis dans les lycées.

CRBN – Les chiffres



CRBN – La DSI

- 18 personnes
- 1 DSI
- 1 cellule administrative + reprographie (5)
- 2 services :
    - Application métiers et développements (6)
    - Système et réseau (6+1)


Direction des Systèmes d'Information
Vincent KELLNER
Directeur
Maud DUARTE
Secrétariat et suivi administratif & financier
Assistance téléphonique
le 88
fonction mutualisée
Service Accompagnement des Métiers en Système d'Information
SAMSI
Accompagement des projets "métiers" et web
Formalisation des Processus
Gestion des données
Service Infrastructure en Technologies de l'Information
SITI
Gestion des réseaux & systèmes Informatiques
Architecture technique et applicatives
Sécurité
Administration et reprographie
Suivi administratif et financier
des marchés et du mandatment
Reprographie
Benoit LE RETIF
Chef de service
Emmanuel ROUSSEL
Chef de service
Pole Support Utilisateurs
Gestion , déploiement , maintenance des postes de travail et des applications, orientation des incidents et des demandes
Arnaud MEYNIER
Chef de projets Système d'Information
Marion PIQUOT
Chef de projets Système d'Information
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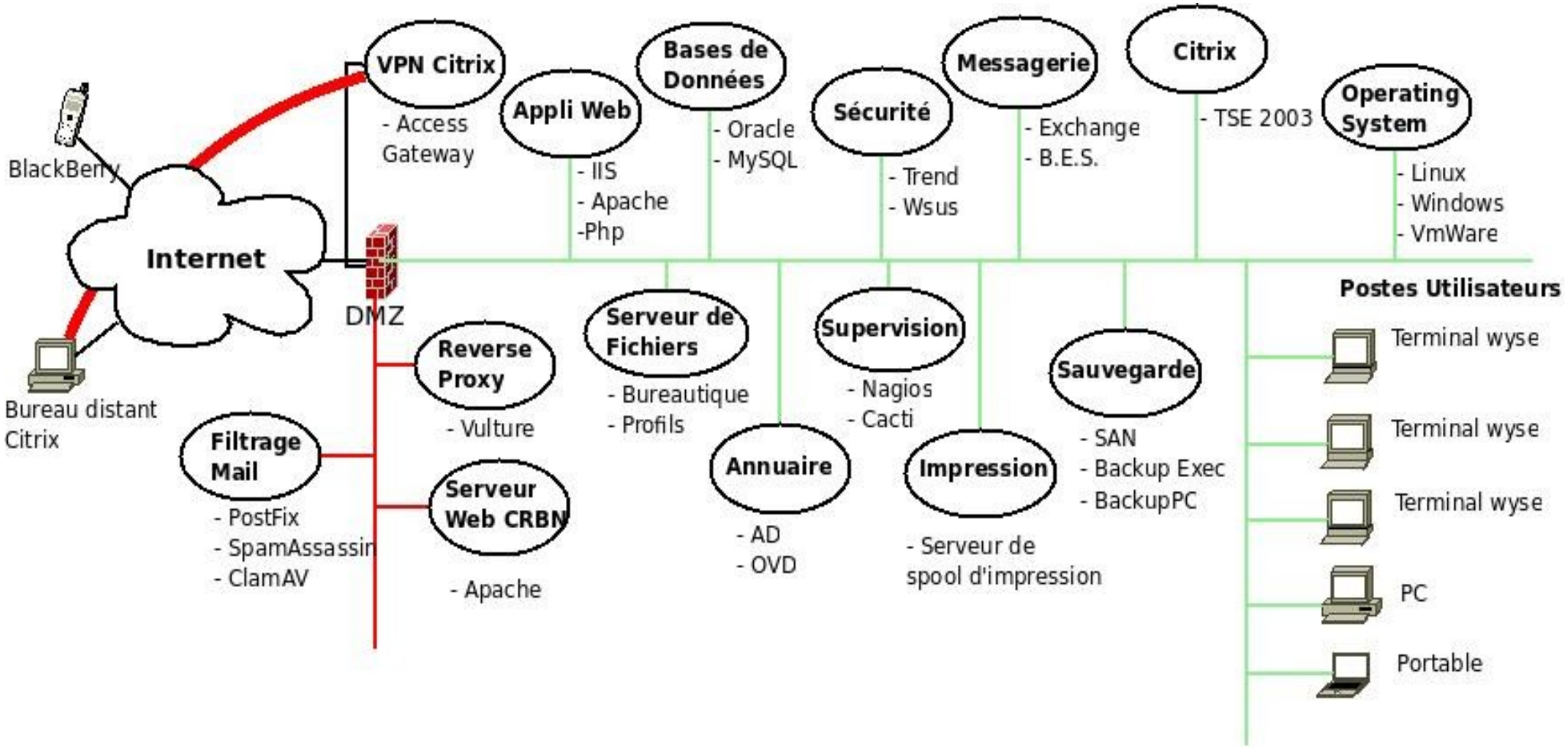
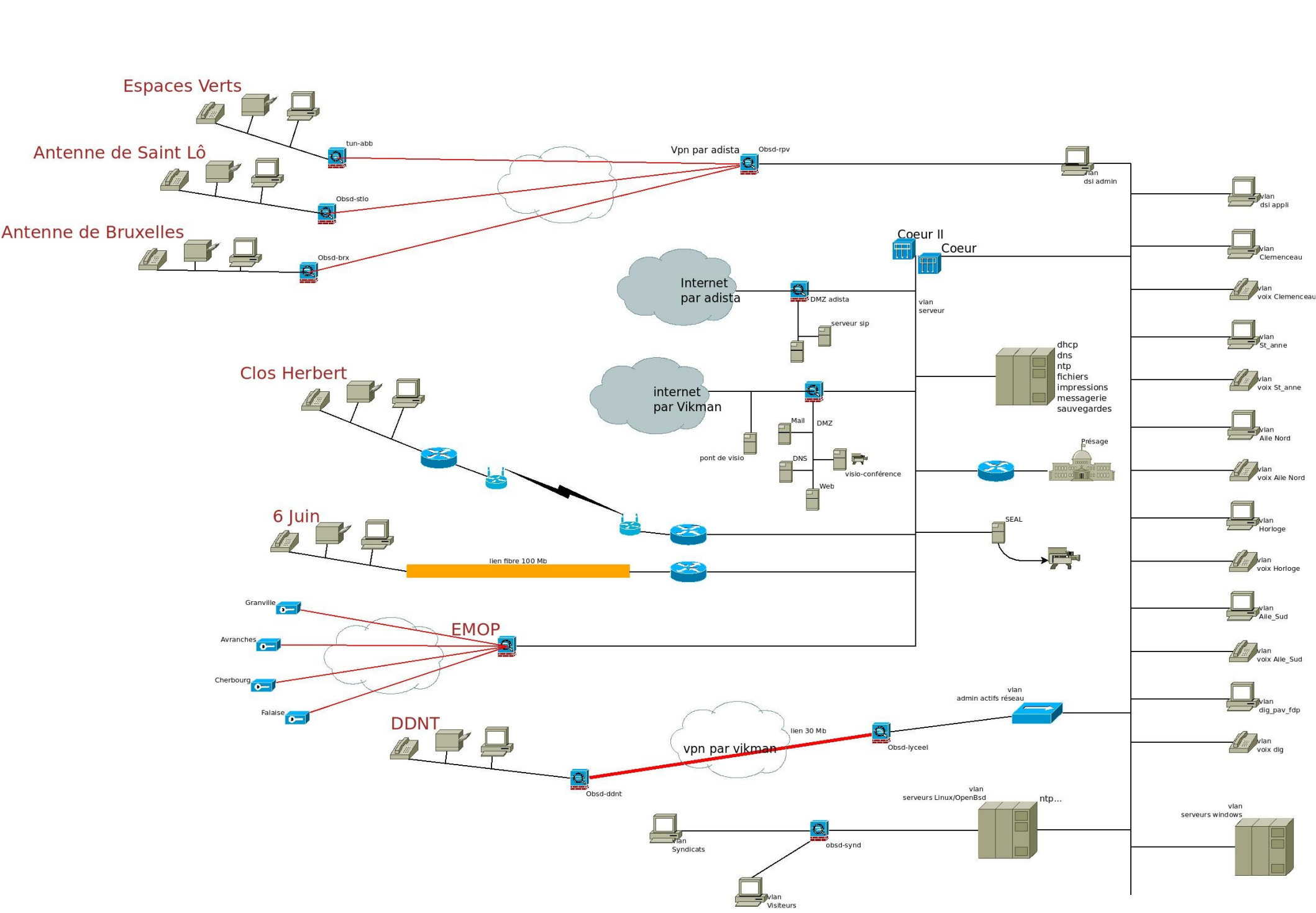
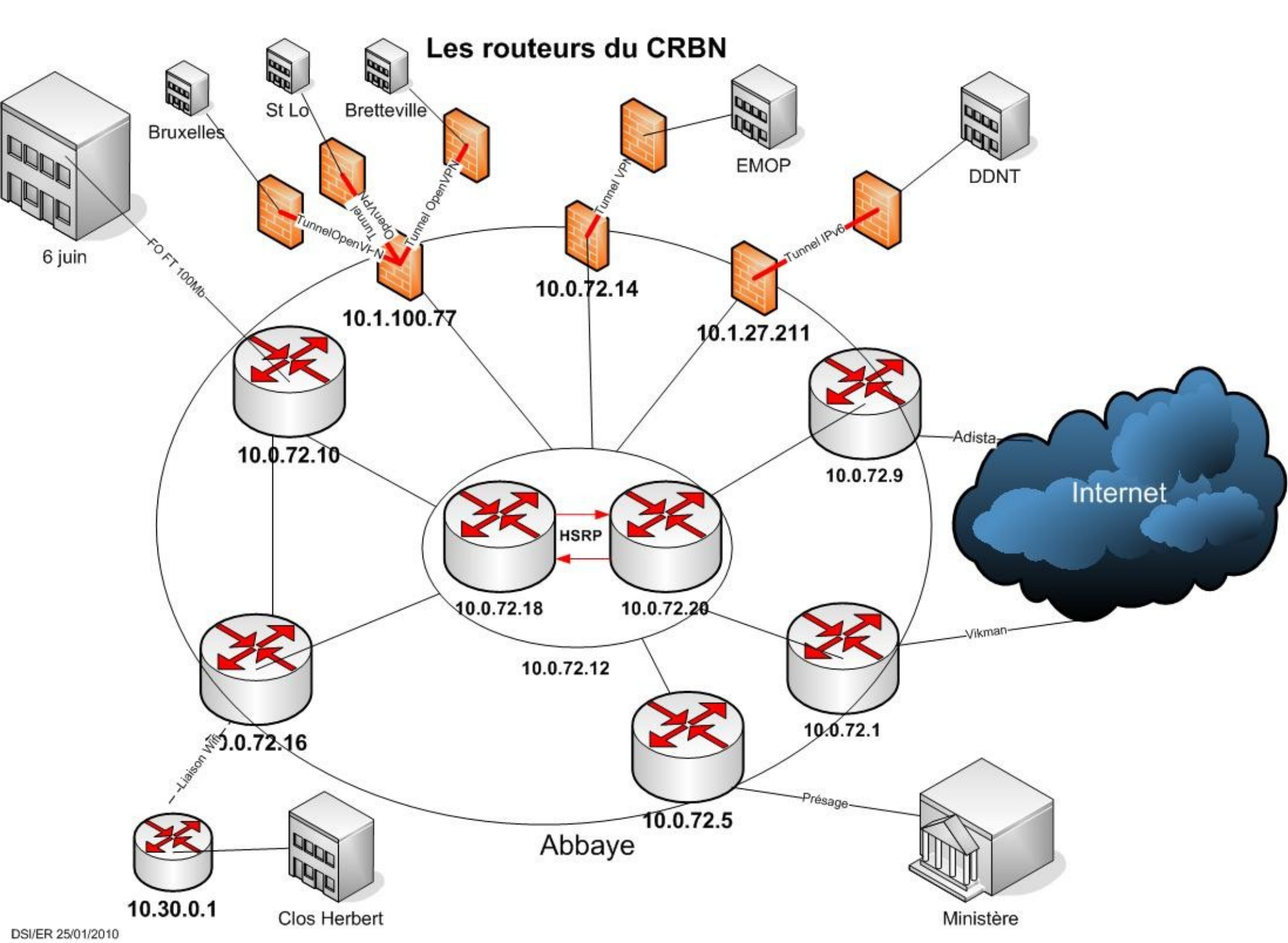
Chef de projets Système d'Information
Laurence CHAPILLON
Assistante de Projet
Frédéric LAFITTE
Assistant de Projet
Jean-Louis MOITIER
Chef de Pôle
André QUATREVAUX
Technicien réseau et télécom
Sébastian GALLARDO
Technicien réseau et télécom
Cyrille NORMAND
Technicien réseau et télécom
Emmanuel LESOUEF
Technicien réseau et télécom
Thierry SIMON
Technicien réseau et télécom
Bénédicte LEHODEY
Chargée d'Etude et de Coordination (temps partiel)
Maud DUARTE
Secrétariat et suivi administratif & financier
Jean-Luc MOTTAIS
Gestionnaire Marchés
Damien EHRMANN
Gestionnaire Reprographie et mandatement
Harry HILAIRE
Reprographe
CRBN\DSI\VK111111

Architecture Informatique - CRBN

- 200 Pc et 400 wyses/ 500 téléphones fixes
- 100 serveurs (50 physiques + 50 virtuels)
- Windows 2008 (Domaine AD)- Exchange 2010
- Linux (~50% des serveurs)
- ESX (HA - VMotion)
- Citrix
- 110 imprimantes départementales
- 70 Blackberry – 110 tél portables
- Cluster Oracle (SGBDR) -Cluster MySQL
- Outils de monitoring : Zabbix, Smokeping, Weathermap
- 2 SAN (20 To et 11 To)
- ~ 50 progiciels


BlackBerry
Internet
Bureau distant Citrix
DMZ
VPN Citrix
- Access Gateway
Appli Web
- IIS
- Apache
-Php
Bases de Données
- Oracle
- MySQL
Sécurité
- Trend
- Wsus
Messagerie
- Exchange
- B.E.S.
Citrix
- TSE 2003
Operating System
- Linux
- Windows
- VmWare
Reverse Proxy
- Vulture
Filtrage Mail
- PostFix
- SpamAssassin
- ClamAV
Serveur Web CRBN
- Apache
Serveur de Fichiers
- Bureautique
- Profils
Annuaire
- AD
- OVD
Supervision
- Nagios
- Cacti
Impression
- Serveur de spool d'impression
Sauvegarde
- SAN
- Backup Exec
- BackupPC
Postes Utilisateurs
Terminal wyse
Terminal wyse
Terminal wyse
PC
Portable


Espaces Verts
Antenne de Saint Lô
Antenne de Bruxelles
tun-abb
Obsd-stlo
Obsd-brx
Vpn par adista
Obsd-rpv
Coeur II
Coeur
Internet
par adista
DMZ adista
serveur sip
vlan
serveur
vlan
dsi admin
vlan
dsi appli
vlan
Clemenceau
vlan
voix Clemenceau
vlan
St_anne
vlan
voix St_anne
vlan
Aile Nord
vlan
voix Aile Nord
vlan
Horloge
vlan
voix Horloge
vlan
Aile_Sud
vlan
voix Aile_Sud
vlan
dig_pav_fdp
vlan
voix dig
dhcp
dns
ntp
fichiers
impressions
messagerie
sauvegardes
Clos Herbert
internet
par Vikman
Mail
DMZ
DNS
Web
pont de visio
visio-conférence
Présage
6 Juin
lien fibre 100 Mb
SEAL
Granville
Avranches
Cherbourg
Falaise
EMOP
DDNT
vpn par vikman
lien 30 Mb
Obsd-lyceel
vlan
admin actifs réseau
Obsd-ddnt
vlan
serveurs Linux/OpenBsd
ntp...
vlan
serveurs windows
vlan
Syndicats
obsd-synd
vlan
Visiteurs


Les routeurs du CRBN
Bruxelles
St Lo
Bretteville
EMOP
DDNT
6 juin
FO FT 100Mb
TunnelOpenVPN
Tunnel OpenVPN
Tunnel VPN
Tunnel IPv6
10.1.100.77
10.0.72.14
10.1.27.211
10.0.72.10
10.0.72.9
Adista
Internet
HSRP
10.0.72.18
10.0.72.20
10.0.72.12
Vikman
10.0.72.16
10.0.72.1
Liaison Wifi
10.0.72.5
Présage
Abbaye
10.30.0.1
Clos Herbert
Ministère
DSI/ER 25/01/2010

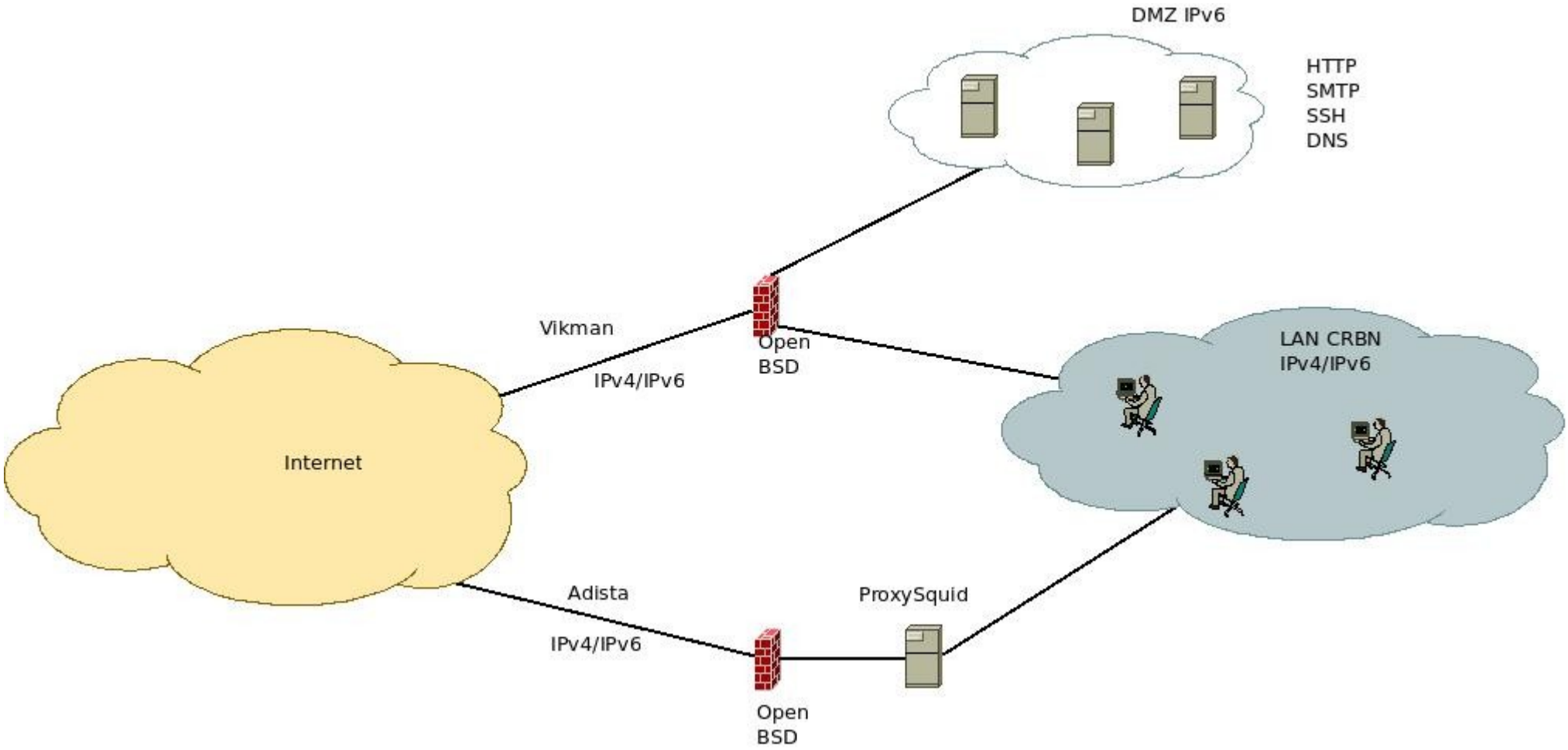
Vlan - CRBN

2	VLAN_VIKMAN	active
5	VOIP_CRBN	active
9	WIFI	active
10	Omnitech	active
11	Imprimantes	active
15	ServeurWindows	active
21	test_I	active
22	test_II	active
23	syndicats	active
24	ext_tunnels	active
25	adista	active
26	dmz-adista	active
27	adm-actifs	active
30	oracle	active
33	cluster_MySql	active
40	visiteurs	active
60	VLAN_IPV6	active
66	DSI_admin	active
67	vpn-adm	active
68	DSI_appli	active
70	clemenceau	active
71	voix_clemenceau	active
72	St_Anne	active
73	voix_St_Anne	active
74	Aile_Nord	active
75	voix_Aile_Nord	active
76	Horloge	active
77	voix_Horloge	active
78	Aile_Sud	active
79	voix_Aile_Sud	active
80	dig_pav_fdp	active
81	voix_dig	active
82	formation	active
83	voix_formation	active
90	TestIPv6tel	active
91	Tel_Ipv6	active
100	serveurs_lx	active
101	serveurs_win	active
102	serveurs_vx	active
103	ipvirt_algoria	active
106	vikman-ipv6	active
200	DMZ	active

Pourquoi IPv6 au CRBN

- Anticiper la fin d'IPv4
- Préparer l'architecture systéme et réseau
- Former les administrateurs
- Participer à l'évolution et à la recherche du protocole
- Mise en oeuvre en interne de ce que la région soutien

Architecture IPv6 - CRBN



pf.conf

```
ext_if="bge1"
dmz_if="fxp0"
lan4_if="vlan27"
lan6_if="vlan60"

table <internal_addresses> {2001:660:2008:3000::/56, 2001:660:2008:10::1 }
table <lan_addresses> {2001:660:2008:3010::/60, 2001:660:2008:3020::/60,
2001:660:2008:3030::/60, 2001:660:2008:309a::/60}
table <dmz_addresses>
{2001:660:2008:30D1::120,2001:660:2008:30D1::121,2001:660:2008:30D1::123,2001:
660:2008:30D1::125}
table <self> {self}
table <auth> {}
table <ntp_lan> {}

set block-policy return
set state-policy if-bound

set skip on lo0

scrub in all

# Defaut : Bloque tout
block log all
```

pf.conf (2)

```
#####################################################################
# ICMP IPv6 -> Neighboor discovery

pass quick inet6 proto icmp6 icmp6-type {neighbrsol,neighbradv}

#####################################################################
# Anti spoofing
block drop in quick log on ! lo0 inet6 from ::1
block drop in quick log on $ext_if inet6 from <internal_addresses>
block drop in quick log on ! $dmz_if inet6 from <dmz_addresses>
block drop out quick log on $ext_if inet6 from ! <internal_addresses>

#####################################################################
# Sortie
pass out quick on $ext_if tagged EXT keep state
pass out quick on $dmz_if tagged DMZ keep state
pass out quick on $ext_if tagged EXT_DMZ keep state
pass out quick on $dmz_if tagged EXT_DMZ keep state
pass out quick on $lan6_if tagged LAN keep state


#####################################################################
# ICMP IPv6 -> router solicitation & ping

pass in  inet6 proto icmp6 icmp6-type routersol
pass out inet6 proto icmp6 icmp6-type redir
pass inet6 proto icmp6 icmp6-type routeradv
pass inet6 proto icmp6 icmp6-type echoreq keep state
```

pf.conf

```
#####################################################################
# EXT -> DMZ

# HTTP
pass in log on $ext_if proto tcp to <dmz_addresses> port {http,https} flags
S/SA tag DMZ keep state
# DNS
pass in log on $ext_if proto tcp to <dmz_addresses> port domain flags S/SA tag
DMZ keep state
pass in log on $ext_if proto udp to <dmz_addresses> port domain tag DMZ keep
state
# SMTP
pass in log on $ext_if proto tcp to <dmz_addresses> port {smtp,smtps} flags
S/SA tag DMZ keep state
# SSH
pass in log on $ext_if proto tcp to <dmz_addresses> port ssh flags S/SA tag
DMZ keep state

#####################################################################
# EXT -> LAN

# SSH
pass in log on $ext_if proto tcp to <lan_addresses> port ssh flags S/SA tag
LAN keep state

#####################################################################
```

DNS – CRBN.FR

```
        @       IN      SOA     ns1.crbn.fr. hostmaster.crbn.fr. (
                                2009121501
                                21600
                                3600
                                604800
                                3600 )

      IN      NS      ns1.crbn.fr.
      IN      NS      ns2.crbn.fr.

@                   IN      MX      10      mx1.crbn.fr.
@                   IN      MX      50      mx2.crbn.fr.

crbn.fr.            IN      TXT     "v=spf1 ip4:193.50.79.122 a mx ~all"

mx-out      50      IN      A       193.50.79.121
mx-out      50      IN      A       193.50.79.123

ns1         IN      A       193.50.79.121
            IN      AAAA    2001:660:2008:30D1::121
ns2         IN      A       193.50.79.123
            IN      AAAA    2001:660:2008:30D1::123

mx1                 IN      A       193.50.79.123
                    IN      AAAA    2001:660:2008:30D1::123
mx2                 IN      A       193.50.79.121
                    IN      AAAA    2001:660:2008:30D1::121

@           IN      A       193.50.79.121
www                 IN      A       193.50.79.121
www                 IN      AAAA    2001:660:2008:30D1::121
```

Config HTTP et SMTP

Pour Apache :

```
<VirtualHost 193.50.79.121:80 [2001:660:2008:30d1::121]:80>

        ServerName  www.crbn.fr

        ServerAlias crbn.fr
        ServerAlias region-basse-normandie.fr
        ServerAlias www.region-basse-normandie.fr

        <Directory /var/www/crbn.fr/site_region>
                Options -Indexes FollowSymLinks MultiViews
                Order allow,deny
                Allow from all
        </Directory>

        # Essentiellement pour les stats...
        ScriptAlias /cgi-bin/ /usr/lib/cgi-bin/
        <Directory "/usr/lib/cgi-bin">
                AllowOverride None
                Options ExecCGI -MultiViews +SymLinksIfOwnerMatch
                Order allow,deny
                Allow from 212.51.x.x
                Allow from 10.0.10.0/24
                Allow from 2001:660:2008:3066::/64
        </Directory>
...

</VirtualHost>
```

et pour Postfix,

Il faut au moins :

```
mynetworks = 127.0.0.0/8,10.0.36.230,10.1.100.0/24, [::1]/128 [fe80::]/10
[2001:660:2008:30d1::]/64
```

et

```
inet_protocols = all
```

Pourquoi changer d'autocom

- Le précédent avait 10 ans

  Obsolete fonctionnellement et pour la maintenance

- Evolution fonctionnelle (réorganisation de l'accueil et des standards téléphoniques)

- Amélioration du taux de décroché.

Telephonie - CRBN

- Diminution des couts avec les sites distants
- Modularités d'une solution IP en terme de déploiement
- Réseau informatique déjà en place → pas de coût supplémentaire pour la mise en oeuvre
- Intégration avec les autres applications du SI

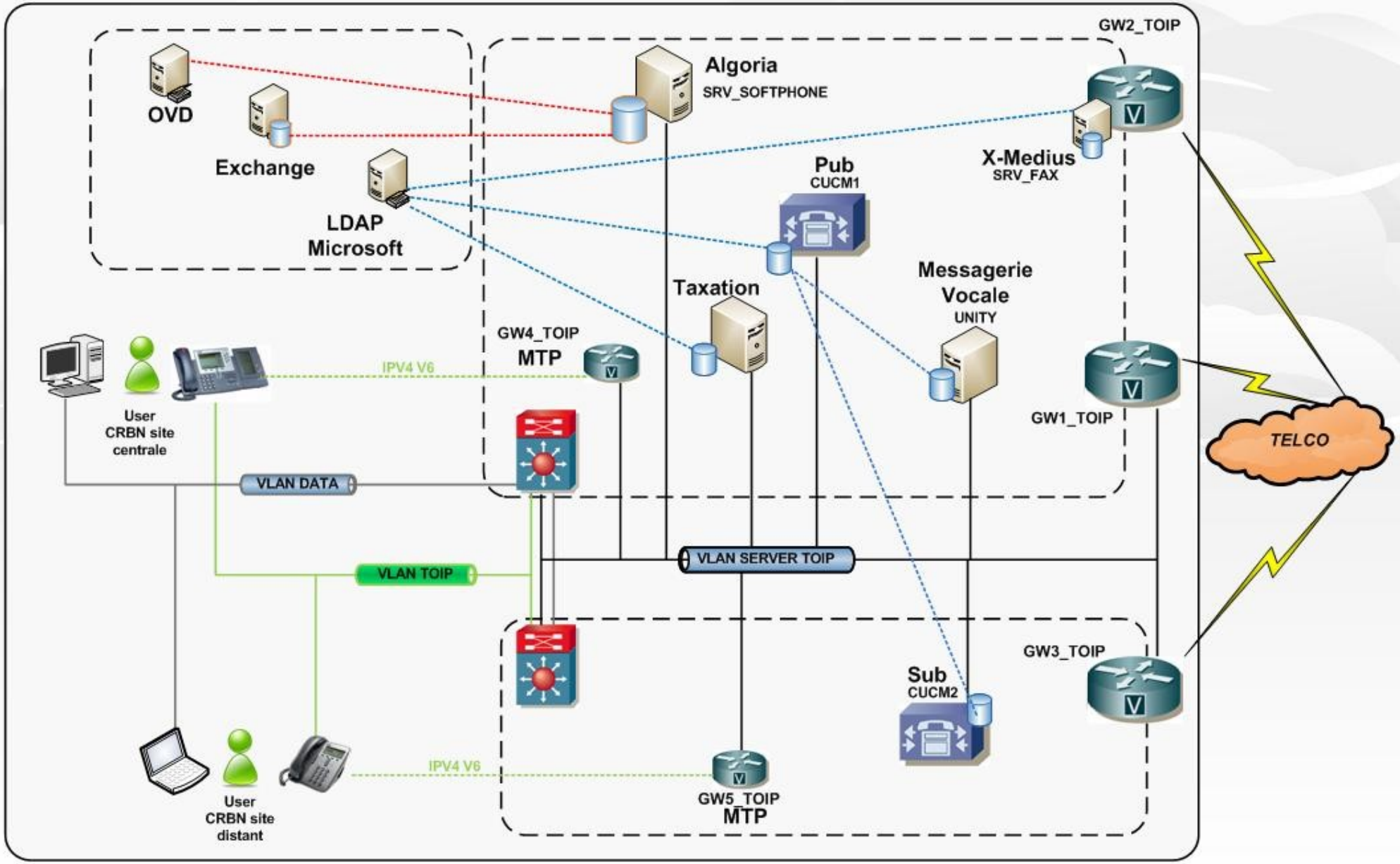
Pré requis

- Téléphonie IP doit rendre les même services que la téléphonie avec un PABX
- Fonctionnelles (renvoi, conf call, groupement, standard, MeVo…)
- Permanence (Tél tout le temps dispo)
  - Pb électrique (802.3af) PoE
  - Application informatique permettant une interconnexion avec les autres composants du Système d'Information

Préparation

- Projet d'un an !
- CCTP (Marché)
- Changement des 35 switchs (2950 → 3560)
- Mise à jour des IOS des routeurs
- Cohabitation IPv4- IPv6
    - Choix dual stack (administration plus simple)

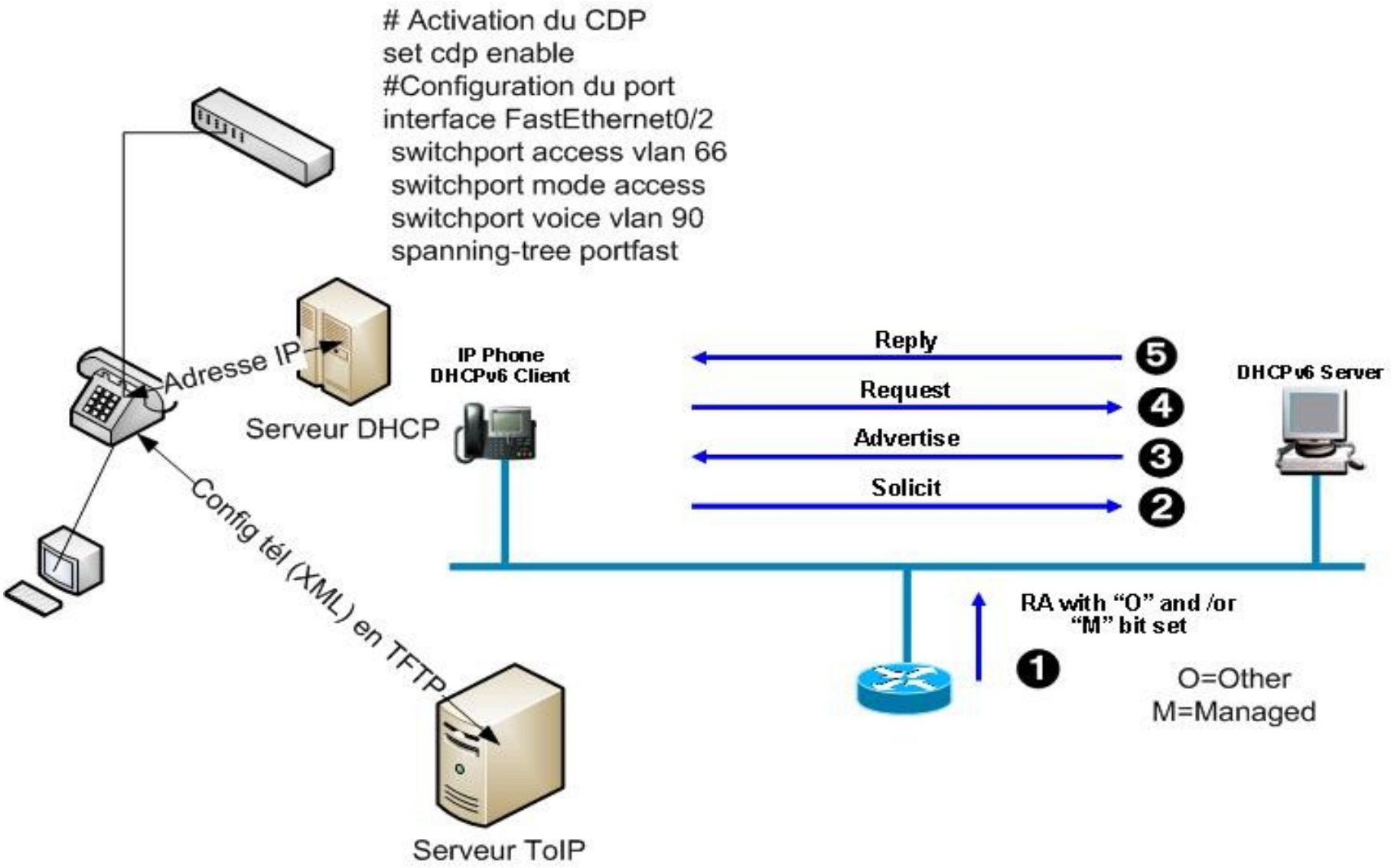
ToIP CRBN

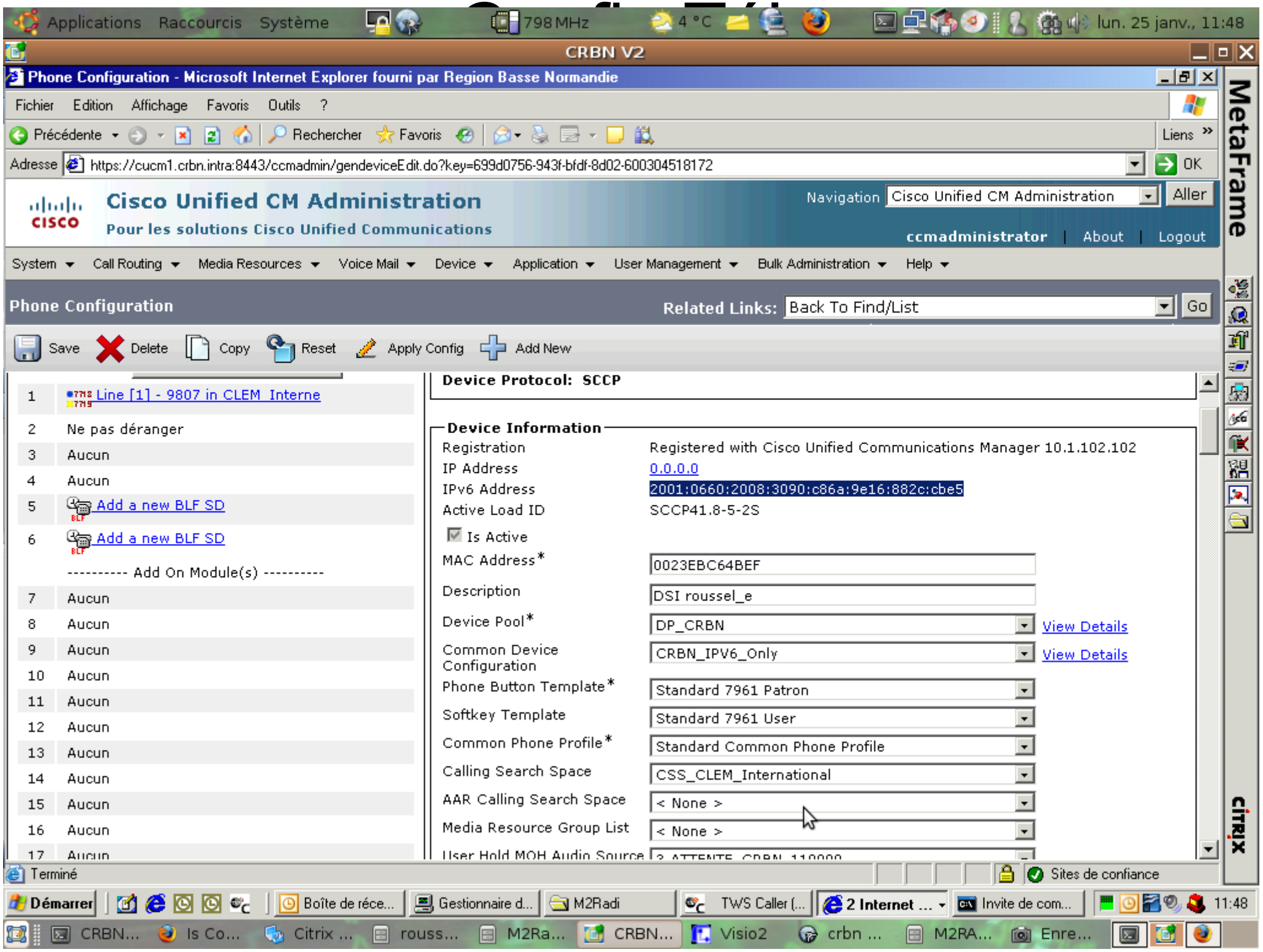

GW2_TOIP
OVD
Exchange
LDAP
Microsoft
Algoria
SRV_SOFTPHONE
Pub
CUCM1
X-Medius
SRV_FAX
Taxation
Messagerie
Vocale
UNITY
GW4_TOIP
MTP
IPV4 V6
User
CRBN site
centrale
GW1_TOIP
TELCO
VLAN DATA
VLAN SERVER TOIP
VLAN TOIP
GW3_TOIP
Sub
CUCM2
IPV4 V6
GW5_TOIP
MTP
User
CRBN site
distant

Configuration des switchs

```
interface FastEthernet0/2
 description PC E ROUSSEL
 switchport access vlan 66
 switchport mode access
 switchport voice vlan 90
 spanning-tree portfast
```

Configuration d'un téléphone IPv6




Applications Raccourcis Système
798 MHz
4 °C
lun. 25 janv., 11:48
CRBN V2
Phone Configuration - Microsoft Internet Explorer fourni par Region Basse Normandie
Fichier Edition Affichage Favoris Outils ?
Précédente
Rechercher
Favoris
Liens
Adresse https://cucm1.crbn.intra:8443/ccmadmin/gendeviceEdit.do?key=699d0756-943f-bfdf-8d02-600304518172
OK
Cisco Unified CM Administration
Pour les solutions Cisco Unified Communications
Navigation Cisco Unified CM Administration
Aller
ccmadministrator | About | Logout
System Call Routing Media Resources Voice Mail Device Application User Management Bulk Administration Help
Phone Configuration
Related Links: Back To Find/List
Go
Save Delete Copy Reset Apply Config Add New
1 Line [1] - 9807 in CLEM_Interne
2 Ne pas déranger
3 Aucun
4 Aucun
5 Add a new BLF SD
6 Add a new BLF SD
---------- Add On Module(s) ----------
7 Aucun
8 Aucun
9 Aucun
10 Aucun
11 Aucun
12 Aucun
13 Aucun
14 Aucun
15 Aucun
16 Aucun
17 Aucun
Device Protocol: SCCP
Device Information
Registration Registered with Cisco Unified Communications Manager 10.1.102.102
IP Address 0.0.0.0
IPv6 Address 2001:0660:2008:3090:c86a:9e16:882c:cbe5
Active Load ID SCCP41.8-5-2S
Is Active
MAC Address* 0023EBC64BEF
Description DSI roussel_e
Device Pool* DP_CRBN View Details
Common Device Configuration CRBN_IPV6_Only View Details
Phone Button Template* Standard 7961 Patron
Softkey Template Standard 7961 User
Common Phone Profile* Standard Common Phone Profile
Calling Search Space CSS_CLEM_International
AAR Calling Search Space < None >
Media Resource Group List < None >
User Hold MOH Audio Source
Terminé
Sites de confiance
Démarrer
Boîte de réce...
Gestionnaire d...
M2Radi
TWS Caller (...
2 Internet ...
Invite de com...
11:48
CRBN...
Is Co...
Citrix ...
rouss...
M2Ra...
CRBN...
Visio2
crbn ...
M2RA...
Enre...
MetaFrame
citrix

DHCPv6

```
ipv6 dhcp pool voix_aile_nord
 address prefix 2001:660:2008:3090::/64
 link-address 2001:660:2008:3090::/64
 dns-server 2001:660:2008:3011::37:5
 domain-name crbn.intra
 vendor-specific 9
  suboption 1 address
2001:660:2008:3050::101
```

DHCPv6 (suite)

```
interface Vlan90
 description Tel IPv6
 ip address 10.1.90.3 255.255.255.0
 ipv6 address 2001:660:2008:3090::1/64
 ipv6 enable
 ipv6 nd managed-config-flag
 ipv6 dhcp server voix_aile_nord
 standby 90 ip 10.1.90.1
 standby 90 timers 5 15
 standby 90 preempt
```

Sh ipv6 int VLAN 1 (bit M set) example 1

Vlan90 is up, line protocol is up

IPv6 is enabled, link-local address is FE80::222:BEFF:FE94:74C0

No Virtual link-local address(es):

Global unicast address(es):

2001:1::1, subnet is 2001:1::/64

Joined group address(es):

FF02::1

FF02::2

FF02::1:2

FF02::1:FF00:1

FF02::1:FF94:74C0

FF05::1:3

MTU is 1500 bytes

ICMP error messages limited to one every 100 milliseconds

ICMP redirects are enabled

ICMP unreachables are sent

ND DAD is enabled, number of DAD attempts: 1

ND reachable time is 30000 milliseconds (using 24019)

ND advertised reachable time is 0 (unspecified)

ND advertised retransmit interval is 0 (unspecified)

ND router advertisements are sent every 200 seconds

ND router advertisements live for 1800 seconds

ND advertised default router preference is Medium

Hosts use DHCP to obtain routable addresses.

Debug IPv6 nd
example 1

.Apr 24 13:49:20.558: ICMPv6-ND: Received RS on Vlan1 from FE80::221:A0FF:FE84:6FB6

.Apr 24 13:49:20.558: ICMPv6-ND: Sending solicited RA on Vlan1

.Apr 24 13:49:20.558: ICMPv6-ND: Request to send RA for FE80::222:BEFF:FE94:74C0

.Apr 24 13:49:20.558: ICMPv6-ND: Sending RA from FE80::222:BEFF:FE94:74C0 to FF02::1 on Vlan1

.Apr 24 13:49:20.558: ICMPv6-ND: **Managed address configuration**

.Apr 24 13:49:20.558: ICMPv6-ND: MTU = 1500

.Apr 24 13:49:20.558: ICMPv6-ND: prefix = 2001:1::/64 onlink a

Debug DHCPv6

example 1

.Apr 23 16:43:14.032: IPv6 DHCP: **Received SOLICIT** from FE80::221:A0FF:FE84:6FB6 on Vlan1
.Apr 23 16:43:14.032: IPv6 DHCP: detailed packet contents
.Apr 23 16:43:14.032: src FE80::221:A0FF:FE84:6FB6 (Vlan1)
.Apr 23 16:43:14.032: dst FF02::1:2
.Apr 23 16:43:14.032: type SOLICIT(1), xid 16838
.Apr 23 16:43:14.032: option CLIENTID(1), len 10
.Apr 23 16:43:14.032: 000300010021A0846FB6
.Apr 23 16:43:14.032: option IA-NA(3), len 40
.Apr 23 16:43:14.032: IAID 0x00000001, T1 0, T2 0
.Apr 23 16:43:14.032: option IAADDR(5), len 24
.Apr 23 16:43:14.032: **IPv6 address 2001:1::854F:9498:B198:802A**
.Apr 23 16:43:14.032: preferred 0, valid 0
.Apr 23 16:43:14.032: option ELAPSED-TIME(8), len 2
.Apr 23 16:43:14.032: elapsed-time 0
.Apr 23 16:43:14.032: option ORO(6), len 6
.Apr 23 16:43:14.032: DNS-SERVERS,DOMAIN-LIST,VENDOR-OPTS
Apr 23 16:43:14.032: IPv6 DHCP: Using interface pool IPv6
.Apr 23 16:43:14.032: IPv6 DHCP: Looking up pool 2001:1::/64 entry with username '000300010021A0846FB600000001'
.Apr 23 16:43:14.032: IPv6 DHCP: Poolentry for user found
.Apr 23 16:43:14.032: IPv6 DHCP: Found address 2001:1::854F:9498:B198:802A in binding for FE80::221:A0FF:FE84:6FB6, IAID 00000001
.Apr 23 16:43:14.032: IPv6 DHCP: Updating binding address entry for address 2001:1::854F:9498:B198:802A
.Apr 23 16:43:14.032: IPv6 DHCP: Setting timer on 2001:1::854F:9498:B198:802A for 60 seconds

From IP Phone
to DHCP Server

DHCP
Server

Debug DHCPv6

example 1

.Apr 23 16:43:14.032: IPv6 DHCP: **Sending ADVERTISE** to FE80::221:A0FF:FE84:6FB6 on Vlan1
.Apr 23 16:43:14.032: IPv6 DHCP: detailed packet contents
.Apr 23 16:43:14.032: src FE80::222:BEFF:FE94:74C0
.Apr 23 16:43:14.032: dst FE80::221:A0FF:FE84:6FB6 (Vlan1)
.Apr 23 16:43:14.032: type ADVERTISE(2), xid 16838
.Apr 23 16:43:14.032: option SERVERID(2), len 10
.Apr 23 16:43:14.032: 000300010022BE947480
.Apr 23 16:43:14.032: option CLIENTID(1), len 10
.Apr 23 16:43:14.032: 000300010021A0846FB6
.Apr 23 16:43:14.032: option IA-NA(3), len 40
.Apr 23 16:43:14.032: IAID 0x00000001, T1 43200, T2 69120
.Apr 23 16:43:14.032: option IAADDR(5), len 24
.Apr 23 16:43:14.032: **IPv6 address 2001:1::854F:9498:B198:802A**
.Apr 23 16:43:14.032: preferred 86400, valid 172800
.Apr 23 16:43:14.032: option VENDOR-OPTS(17), len 24
.Apr 23 16:43:14.032: **Enterprise-ID: 9**
.Apr 23 16:43:14.032: **Suboption 1**, length 16
.Apr 23 16:43:14.032: Data: **20010001000000000021CC4FFFE3A1128**

Cisco

TFTP

From DHCP Server
to IP Phone

Debug DHCPv6

example 1

.Apr 23 16:43:15.148: IPv6 DHCP: **Received REQUEST** from FE80::221:A0FF:FE84:6FB6 on Vlan1
.Apr 23 16:43:15.148: IPv6 DHCP: detailed packet contents
.Apr 23 16:43:15.148: src FE80::221:A0FF:FE84:6FB6 (Vlan1)
.Apr 23 16:43:15.148: dst FF02::1:2
.Apr 23 16:43:15.148: type REQUEST(3), xid 10113
.Apr 23 16:43:15.148: option CLIENTID(1), len 10
.Apr 23 16:43:15.148: 000300010021A0846FB6
.Apr 23 16:43:15.148: option SERVERID(2), len 10
.Apr 23 16:43:15.157: 000300010022BE947480
.Apr 23 16:43:15.157: option IA-NA(3), len 40
.Apr 23 16:43:15.157: IAID 0x00000001, T1 0, T2 0
.Apr 23 16:43:15.157: option IAADDR(5), len 24
.Apr 23 16:43:15.157: IPv6 address 2001:1::854F:9498:B198:802A
.Apr 23 16:43:15.157: preferred 86400, valid 172800
.Apr 23 16:43:15.157: option ELAPSED-TIME(8), len 2
.Apr 23 16:43:15.157: elapsed-time 0
.Apr 23 16:43:15.157: option ORO(6), len 6
.Apr 23 16:43:15.157: DNS-SERVERS,DOMAIN-LIST,VENDOR-OPTS
.Apr 23 16:43:15.157: IPv6 DHCP: Using interface pool IPv6
.Apr 23 16:43:15.157: IPv6 DHCP: Looking up pool 2001:1::/64 entry with username '000300010021A0846FB600000001'
.Apr 23 16:43:15.157: IPv6 DHCP: Poolentry for user found
.Apr 23 16:43:15.157: IPv6 DHCP: Found address 2001:1::854F:9498:B198:802A in binding for FE80::221:A0FF:FE84:6FB6, IAID 00000001
.Apr 23 16:43:15.157: IPv6 DHCP: Updating binding address entry for address 2001:1::854F:9498:B198:802A
.Apr 23 16:43:15.157: IPv6 DHCP: Setting timer on 2001:1::854F:9498:B198:802A for 172800 seconds

From IP Phone
to DHCP Server

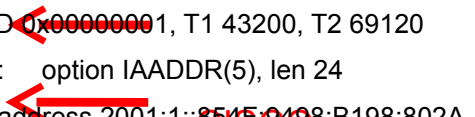
DHCP
Server

Debug DHCPv6

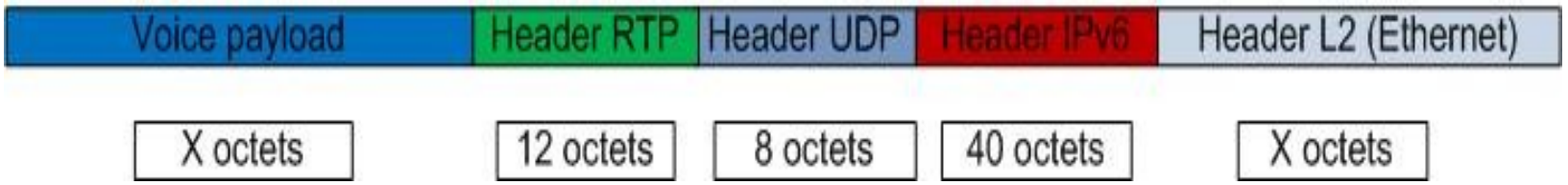
example 1

.Apr 23 16:43:15.157: IPv6 DHCP: **Sending REPLY** to FE80::221:A0FF:FE84:6FB6 on Vlan1
.Apr 23 16:43:15.157: IPv6 DHCP: detailed packet contents
.Apr 23 16:43:15.157: src FE80::222:BEFF:FE94:74C0
.Apr 23 16:43:15.157: dst FE80::221:A0FF:FE84:6FB6 (Vlan1)
.Apr 23 16:43:15.157: type REPLY(7), xid 10113
.Apr 23 16:43:15.157: option SERVERID(2), len 10
.Apr 23 16:43:15.157: 000300010022BE947480
.Apr 23 16:43:15.157: option CLIENTID(1), len 10
.Apr 23 16:43:15.157: 000300010021A0846FB6
.Apr 23 16:43:15.157: option IA-NA(3), len 40
.Apr 23 16:43:15.157: IAID 0x00000001, T1 43200, T2 69120
.Apr 23 16:43:15.157: option IAADDR(5), len 24
.Apr 23 16:43:15.157: IPv6 address 2001:1::854F:9498:B198:802A
.Apr 23 16:43:15.157: preferred 86400, valid 172800
.Apr 23 16:43:15.157: option VENDOR-OPTS(17), len 24
.Apr 23 16:43:15.157: Enterprise-ID: 9
.Apr 23 16:43:15.157: Suboption 1, length 16
.Apr 23 16:43:15.157: Data: 2001000100000000021CC4FFFE3A1128

From DHCP Server to IP Phone



Paquet Voix IPv6



Terminologie

IPv4 Only

IPv6 Only

Dual Stack – IPv4 and IPv6

Support IPv4 et IPv6

- **CUCM 7.1(2)**
  Linux OS only

- **Cisco IP Phones**
  Cisco IP Phones utilisant SCCP

- **Gateways**
  SIP Gateways (ISR 28XX & 38XX, AS5400)
  VG224 SCCP Analogue Gateway
  SCCP ISR 2811 routers
  IOS MTPs IPv4 - IPv6 RTP Media conversion

- **CUCM SIP Trunks**

IPv6 – Configuration des terminaux

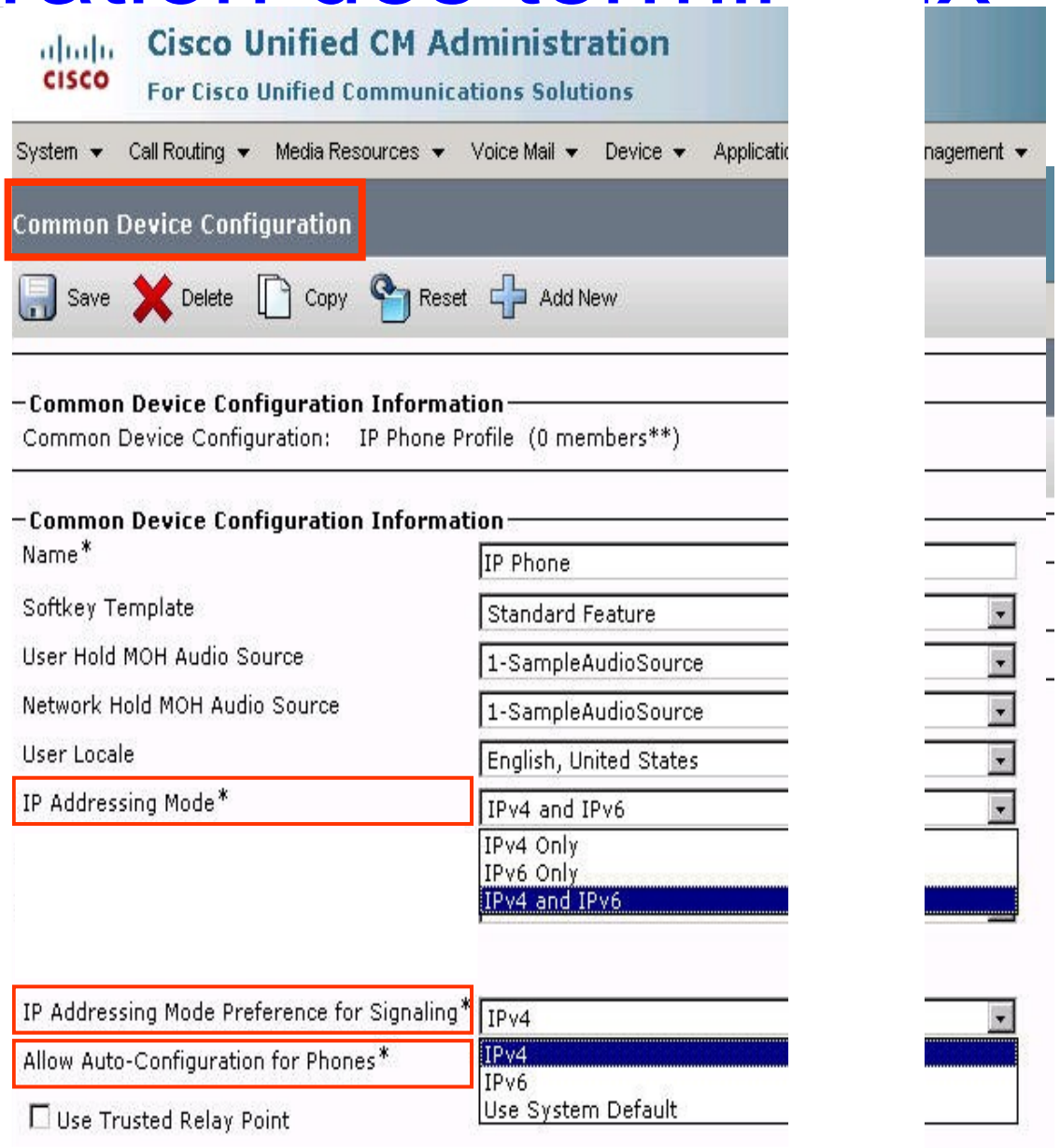
Configuration commune applicable au Tél et gateways

Pour les périphériques IPv6 ready les valeurs suivantes sont applicables :

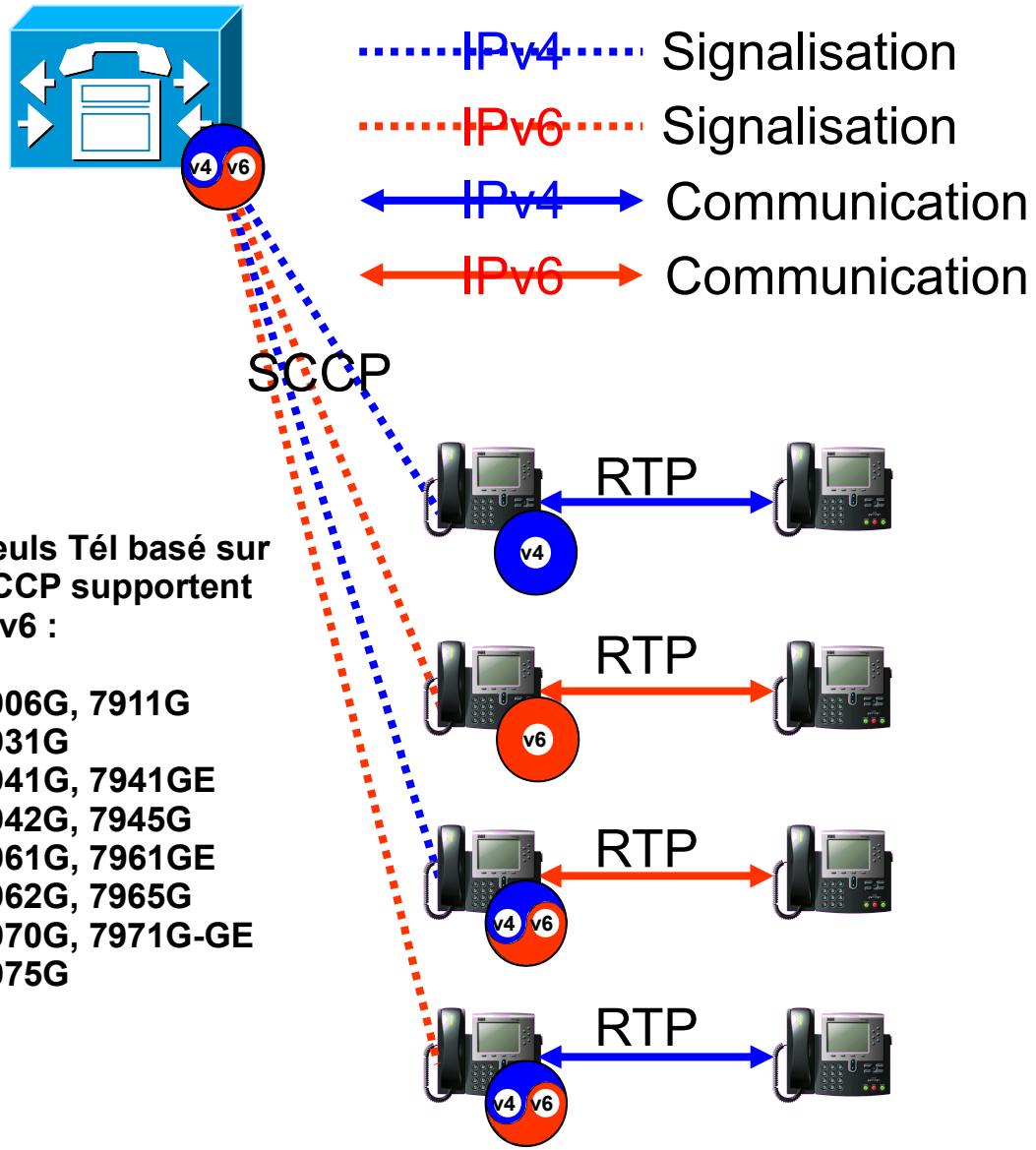
<u>IP Mode d'adressage :</u>
IPv4 Only - tél IPv4 address seul
IPv6 Only - tél **IPv6 address seul**
IPv4 et IP6 -tél avec adresse IPv4 address et une adresse IPv6

<u>IP Addressing Mode Preference for Signalling</u>:
IPv4 only
IPv6 only
System Default

<u>Allow Auto Configuration For Phones</u> :
On
Off
Default



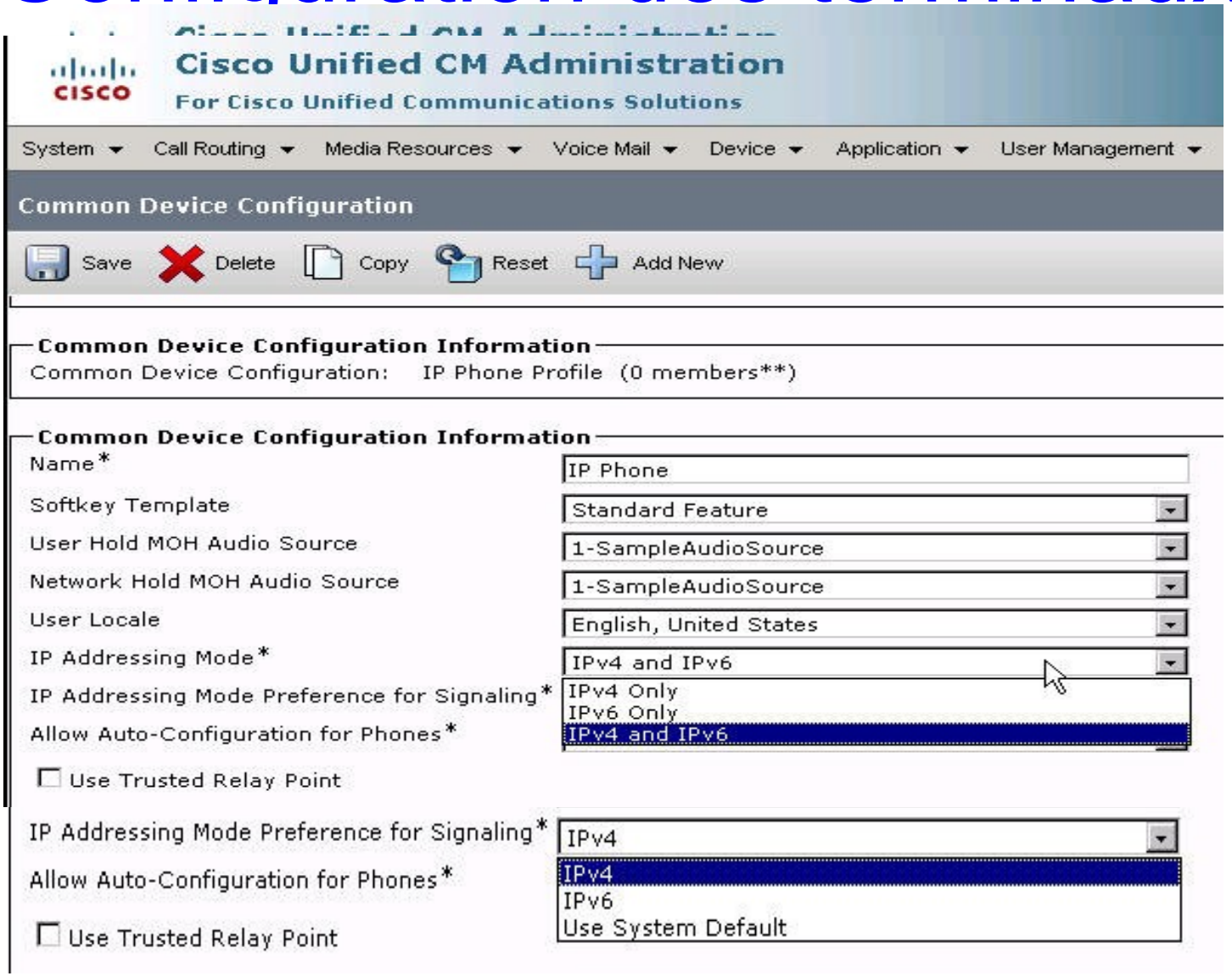
IPv6 – Signalisation & Options d'adressage



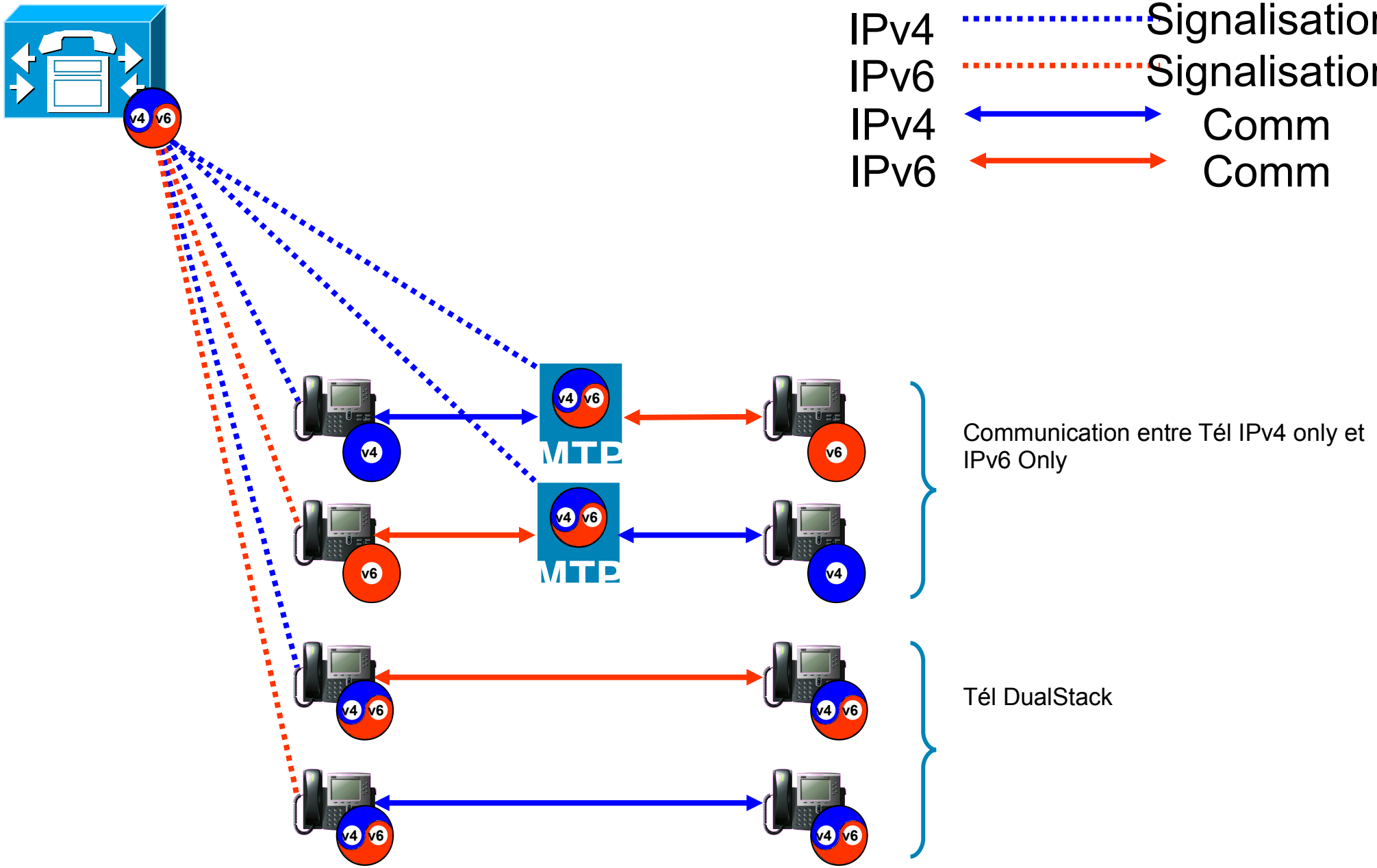
Seuls Tél basé sur SCCP supportent IPv6 :

7906G, 7911G
7931G
7941G, 7941GE
7942G, 7945G
7961G, 7961GE
7962G, 7965G
7970G, 7971G-GE
7975G

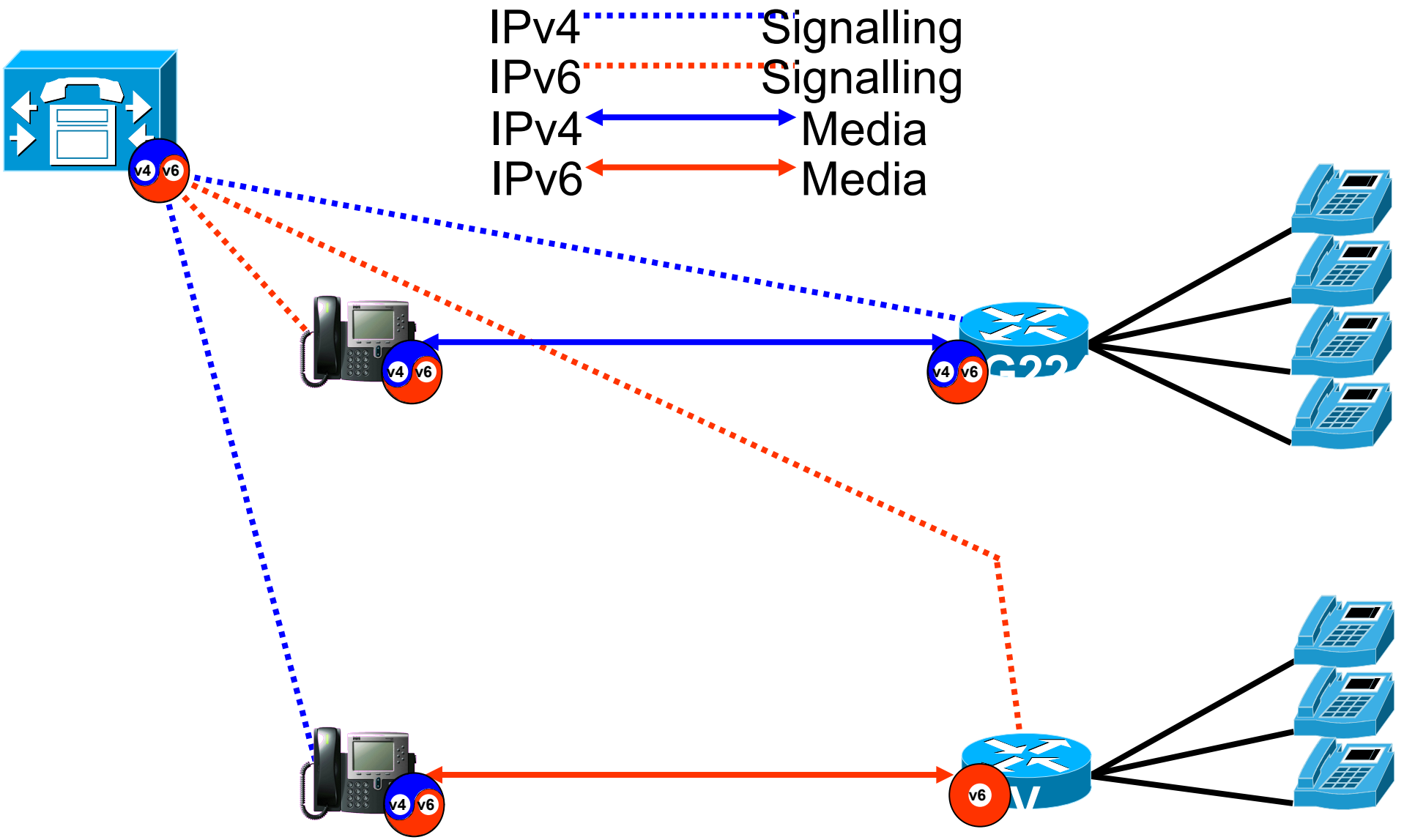
Configuration des terminaux



IPv6 – CUCM Phone Signaling and Media Options



IPv6 – VG224 & ISR SCCP FXS Analogue ports

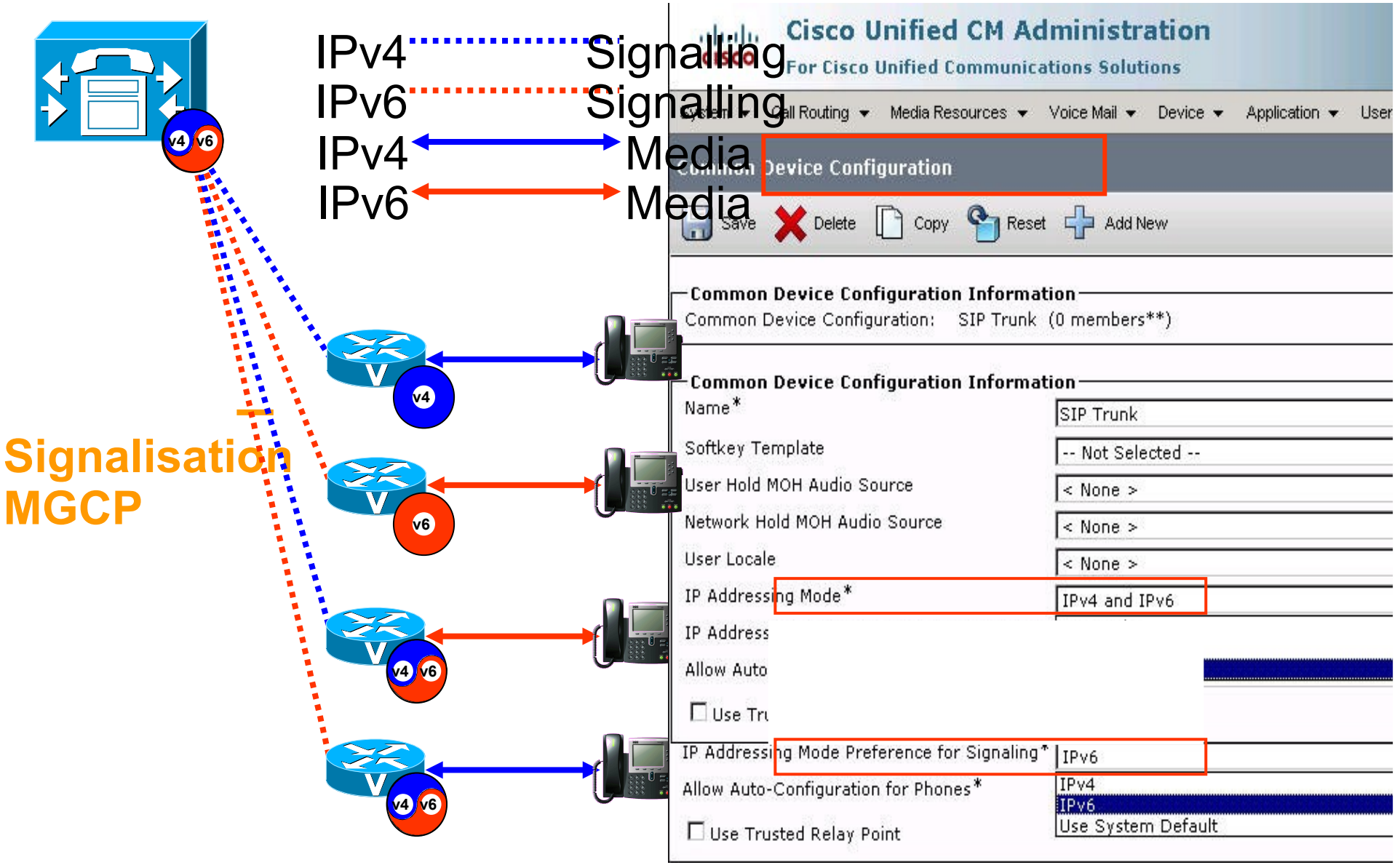


Le VG224 et ISRs utilise SCCP pour l'enregistrement individuel des ports analogues CUCM

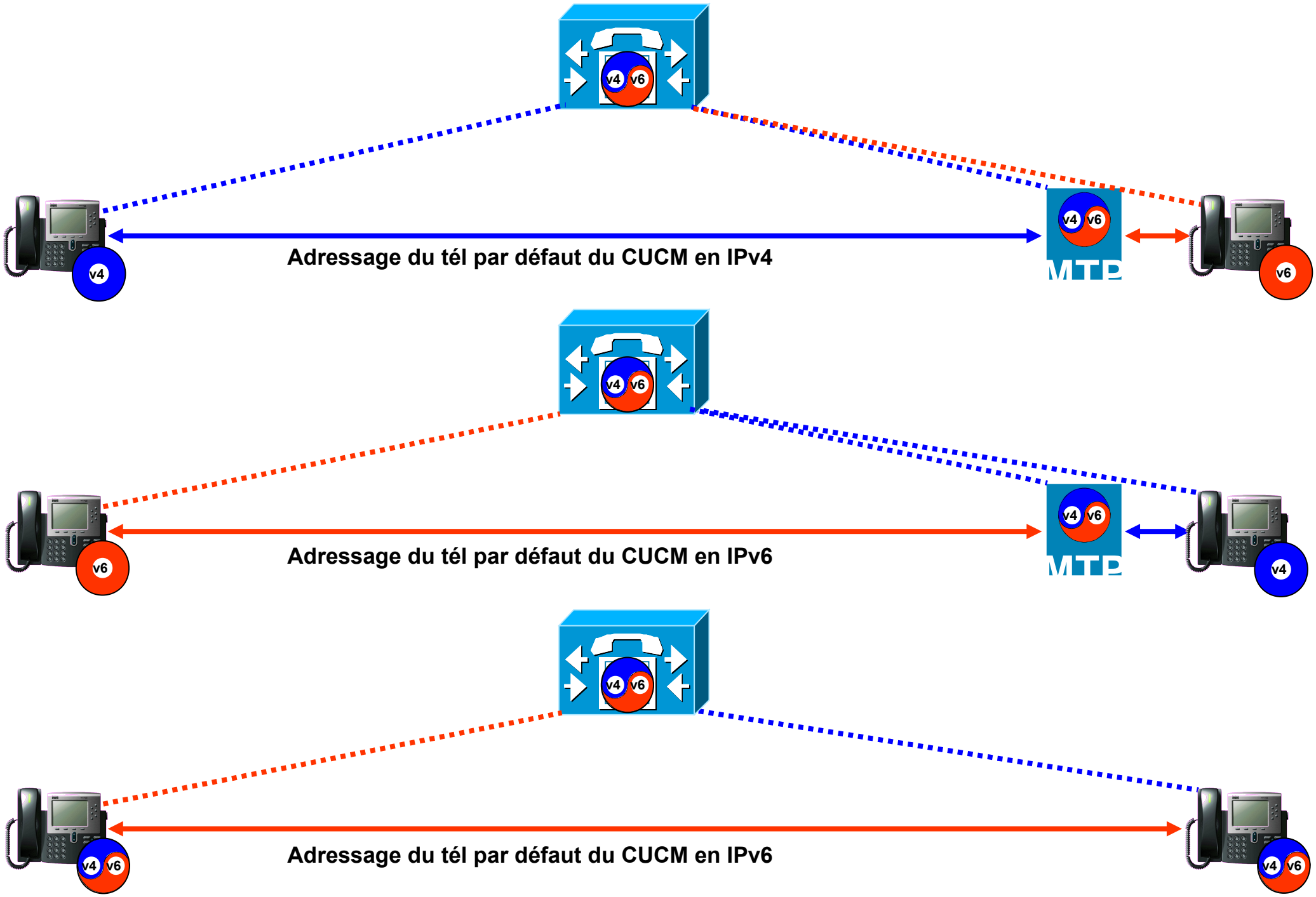
Les deux platforms supportent IPv4 et IPv4/IPv6

v4 v4 v6

IPv6 – Gateways & CUCM



MTP


v4
v6
v4
v6
MTP
v6
Adressage du tél par défaut du CUCM en IPv4
v4
v6
v6
MTP
v4
Adressage du tél par défaut du CUCM en IPv6
v4
v6
v4
v6
Adressage du tél par défaut du CUCM en IPv6

Config des Gateways

```
no ip domain lookup
ip host cucm1 10.1.102.101
ip host cucm2 10.1.102.102
!
ipv6 host cucm1 2001:660:2008:3050::101
ipv6 host cucm2 2001:660:2008:3050::102

multilink bundle-name authenticated
!!
isdn switch-type primary-net5
!!
voice service voip
 fax protocol t38 ls-redundancy 0 hs-redundancy 0 fallback cisco
 h323
  no call service stop
!
controller E1 0/0/0
 framing NO-CRC4
 pri-group timeslots 1-31 service mgcp
!
interface GigabitEthernet0/0
 ip address 10.1.102.9 255.255.255.0
 duplex auto
 speed auto
 ipv6 address 2001:660:2008:3050::102:9/64
 ipv6 enable
```

Config des Gateways (2)

```
interface Serial0/0/0:15
 no ip address
 encapsulation hdlc
 isdn switch-type primary-net5
 isdn incoming-voice voice
 isdn bind-l3 ccm-manager
 no cdp enable
!
voice-port 0/0/0:15
 cptone FR
!
ccm-manager redundant-host 10.1.102.102
ccm-manager mgcp
ccm-manager music-on-hold
ccm-manager config server cucm1
ccm-manager config
!
mgcp
mgcp call-agent 10.1.102.101 2427 service-type mgcp version 0.1
mgcp dtmf-relay voip codec all mode out-of-band
mgcp rtp unreachable timeout 1000 action notify
mgcp modem passthrough voip mode nse
mgcp package-capability rtp-package
mgcp package-capability sst-package
```

Config des Gateways (3)

```
mgcp package-capability pre-package
mgcp default-package fxr-package
no mgcp package-capability res-package
mgcp tse payload 106
no mgcp timer receive-rtcp
mgcp timer nse-response t38 250
mgcp sdp simple
mgcp fax rate 14400
no mgcp fax-relay sg3-to-g3
mgcp rtp payload-type g726r16 static
mgcp bind control source-interface GigabitEthernet0/0
mgcp bind media source-interface GigabitEthernet0/0
mgcp behavior g729-variants static-pt
!
mgcp profile default
!
gateway
```

Config MTP (gw4)

....

ccm-manager fax protocol cisco

!

mgcp fax t38 ecm

!

MTP

sccp local FastEthernet0/0

sccp ccm 2001:660:2008:3050::101 identifier 4 version 7.0

sccp ccm 10.1.102.101 identifier 3 version 7.0

sccp ccm 10.1.102.102 identifier 1 version 7.0

sccp ccm 2001:660:2008:3050::102 identifier 2 version 7.0

sccp

QoS sur routeur vers Clos Herbert

...

```
class-map match-any SDMVoice-Vlan9
 match protocol rtp audio
…

policy-map SDM-Pol-Vlan9
 class SDMVoice-Vlan9
  set dscp ef
  priority percent 20
…


interface FastEthernet0/1
 description Lien TRUNK vers RG_SWx CRBN
 bandwidth 100000
…

 service-policy output SDM-Pol-FastEthernet0/1
```

Integration des Annuaires

- Unicité des informations
- Centralisation via OVD
- Configuration sur les applications ToIP
    - Algoria
    - Cieme
    - Unity (MeVo)
    - Serveur ToIP (@mail comme référentiel unique)
- Solution IPv4 seulement :o(

Étapes suivantes

- Architecture réseau IPv6 ready
- Prochaine étape les applications ?
  - Les grands éditeurs ont fait des avancés très conséquentes durant les 24 derniers mois.
  - Les « petits » éditeurs sont très frileux pour s'engager
    - Certains n'ont pas encore étudié la conformité de leur application
  - Circulaire du 8 décembre 2011.

Quelques exemples

- Oracle 11g → IPv6 ready
- XenApp (Citrix) IPv6 ready
- Windows 2008
- Windows 7
- ESX 4
- ...