IPv6 @ free

Native IPv6 to the User

Alexandre Cassen, <acassen@freebox.fr>

Free.fr R&D

Corporate Profile

- Second largest ISP in France
- 4+ Millions broadband subscribers
- ADSL & FTTH
- Triple play
- STBs (freebox) and DSLAM home cooked
- HW & SW designed by Internal R&D

IPv6 statement until 6rd

- Not really needed
- Our DSLAM didn’t support IPv6
- Stuck with regular 6to4 transition design
- Prefer service activation rather than migration

IPv6 after 7th Nov. 2007

- Nov. 7th, 2007: Rémi Desprès knocks on our door
- Nov. 9th, 2007: Got IPv6 prefix from RIPE
- Nov 10th, 2007: First prototype of 6rd GW & CPE support
- Dec. 11th, 2007: Opt-in made available to all of our customers
- March 2008 : First IPv6-only service : « Telesite »

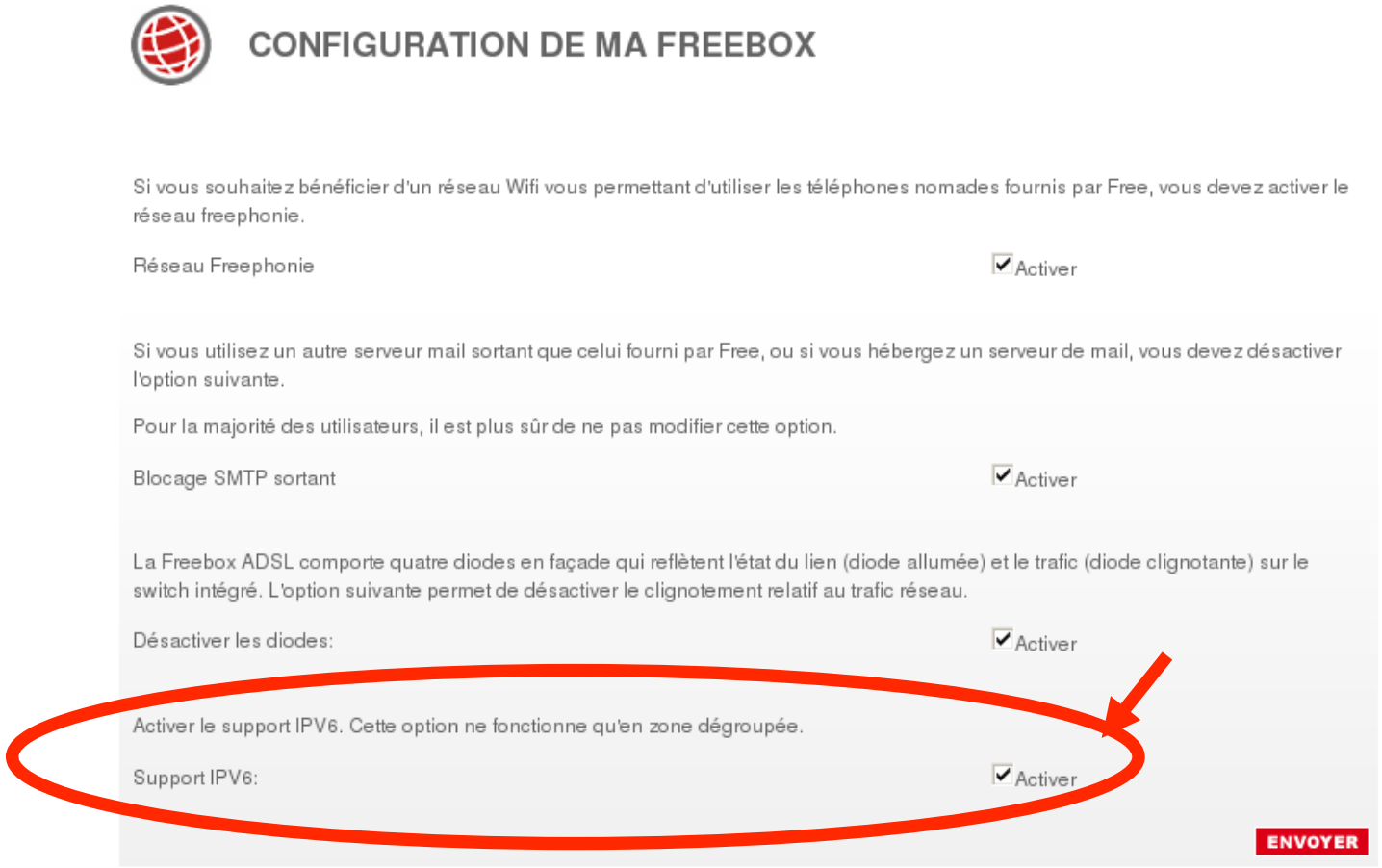
6rd idea

- Like 6to4:
  - Stateless IPv6 in IPv4 encapsulation
- Unlike 6to4:
  - **IPv6 prefix** rather than fixed 6to4 prefix
  - Packets from IPv6 Internet entering 6rd GW are only for 6rd customer sites

Provides control over routing return path
Provides native IPv6 access to home user

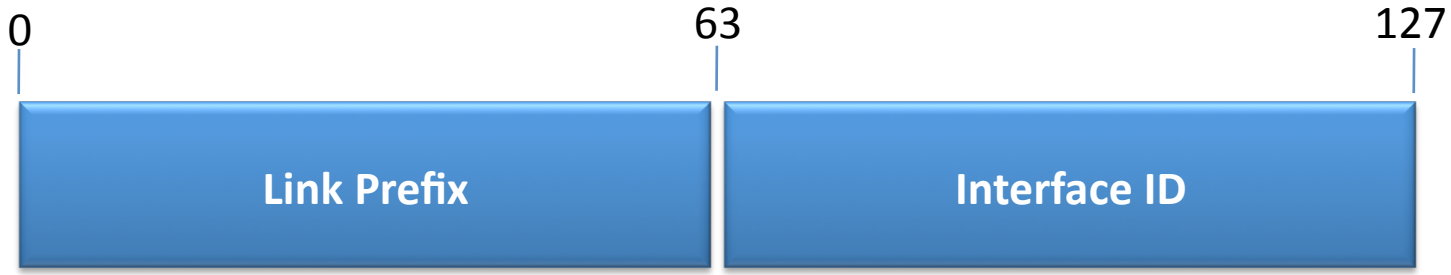
IPv6 Activation

- Through customer self-care : http://adsl.free.fr

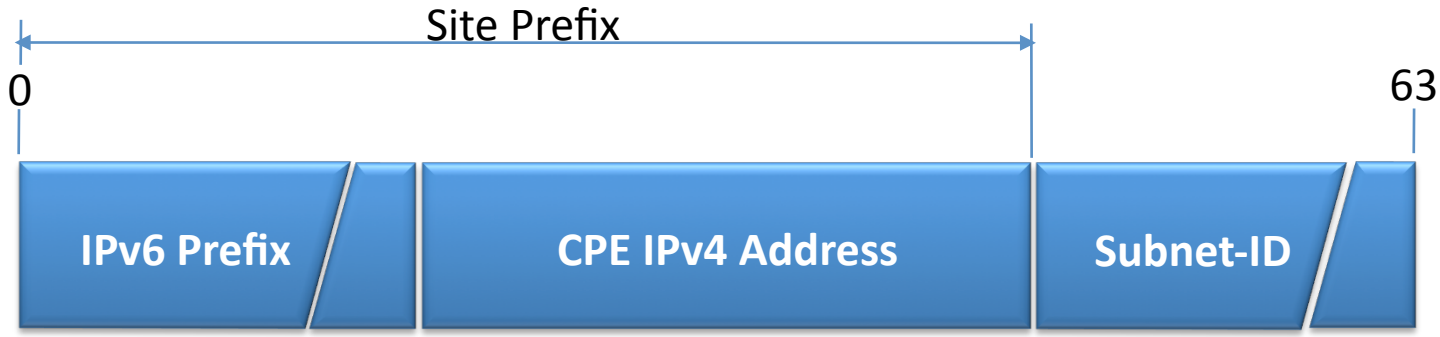


6rd Addressing

- IPv6 Address reminder :

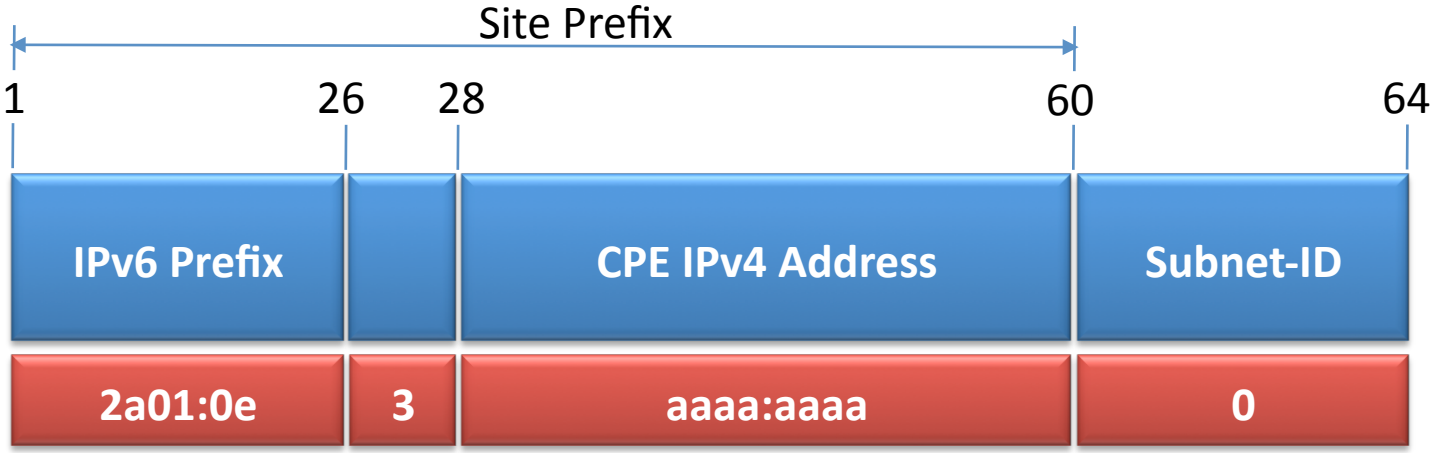


- 6rd Address specification (Link Prefix) :

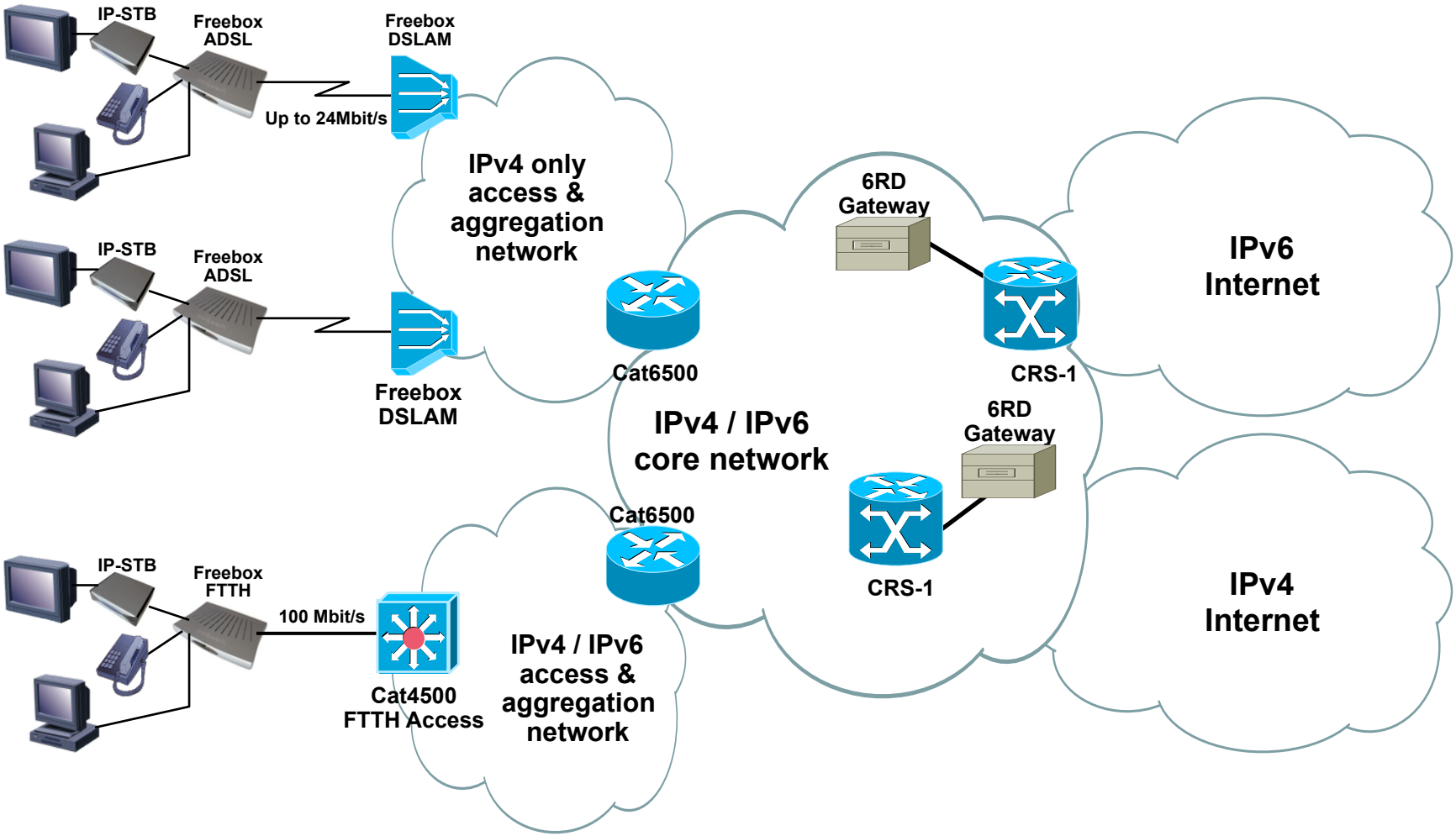


Our IPv6 Addressing policy

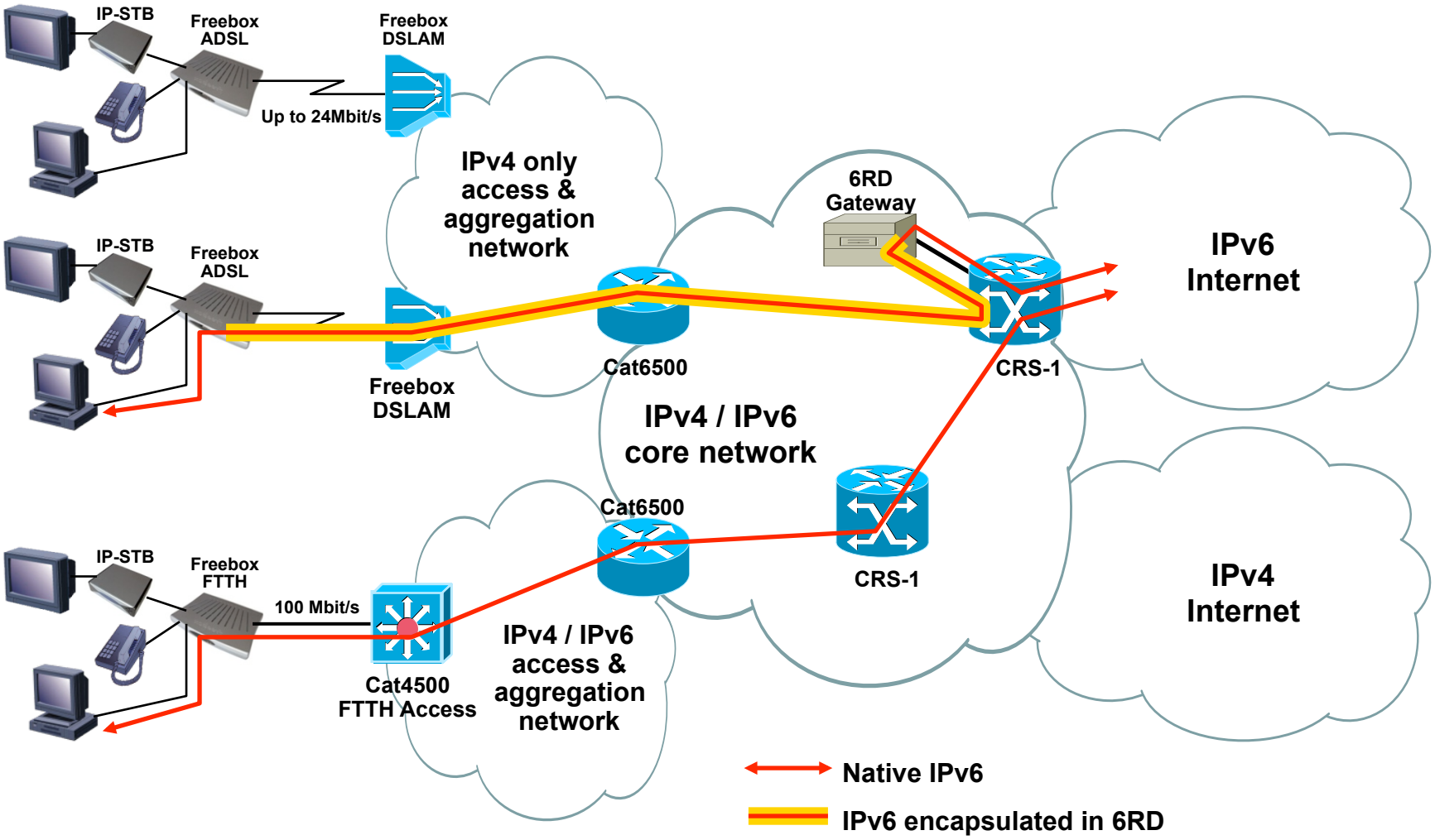
- RIPE prefix : 2a01:0e00::/26
- bits 27 & 28 are reserved and meaningful :
  - 0 : network admin reserved
  - 1 & 2 : reserved for future use
  - 3 : Dedicated to 6rd (ie: 2a01:0e30::/28)



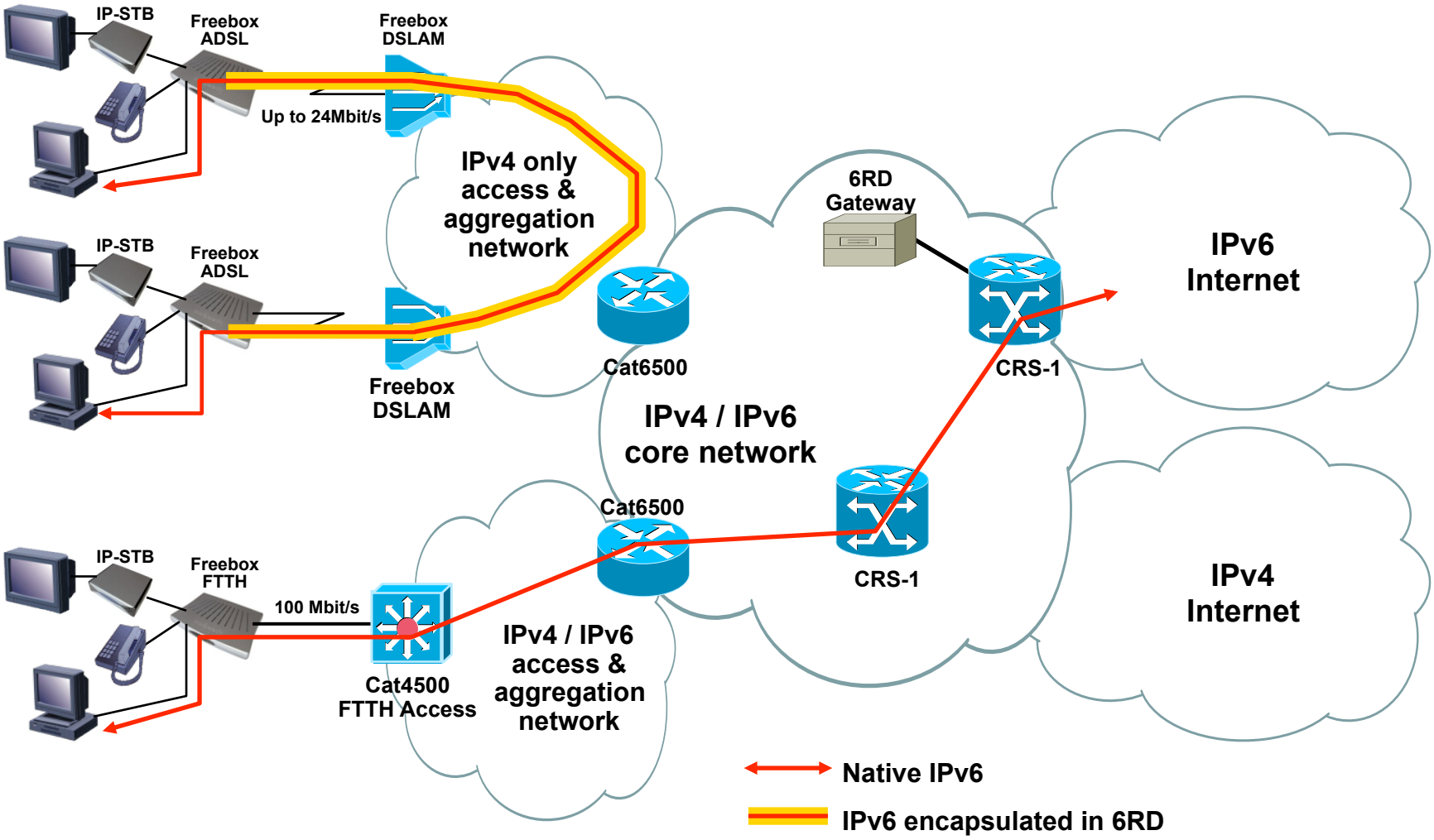
Network Environment



6rd Use-Case 1: From/to Internet



6rd Use-Case 2: site-to-site



Techy at CPE side 1/2

- IPv6 Router Advertisement - RADVD for Linux :

```
interface br0 {
        IgnoreIfMissing off;
        AdvSendAdvert on;
        UnicastOnly off;
        AdvManagedFlag off;
        AdvOtherConfigFlag off;
        AdvLinkMTU 1480;
        prefix 2a01:e3x:xxxx:xxx0::/64 {
                AdvOnLink on;
                AdvAutonomous on;
                AdvValidLifetime 86400;
                AdvPreferredLifetime 86400;
        };
        RDNSS 2a01:e00::2 2a01:e00::1 {
        };
};
```

Supporting RDNSS IETF RFC 5006

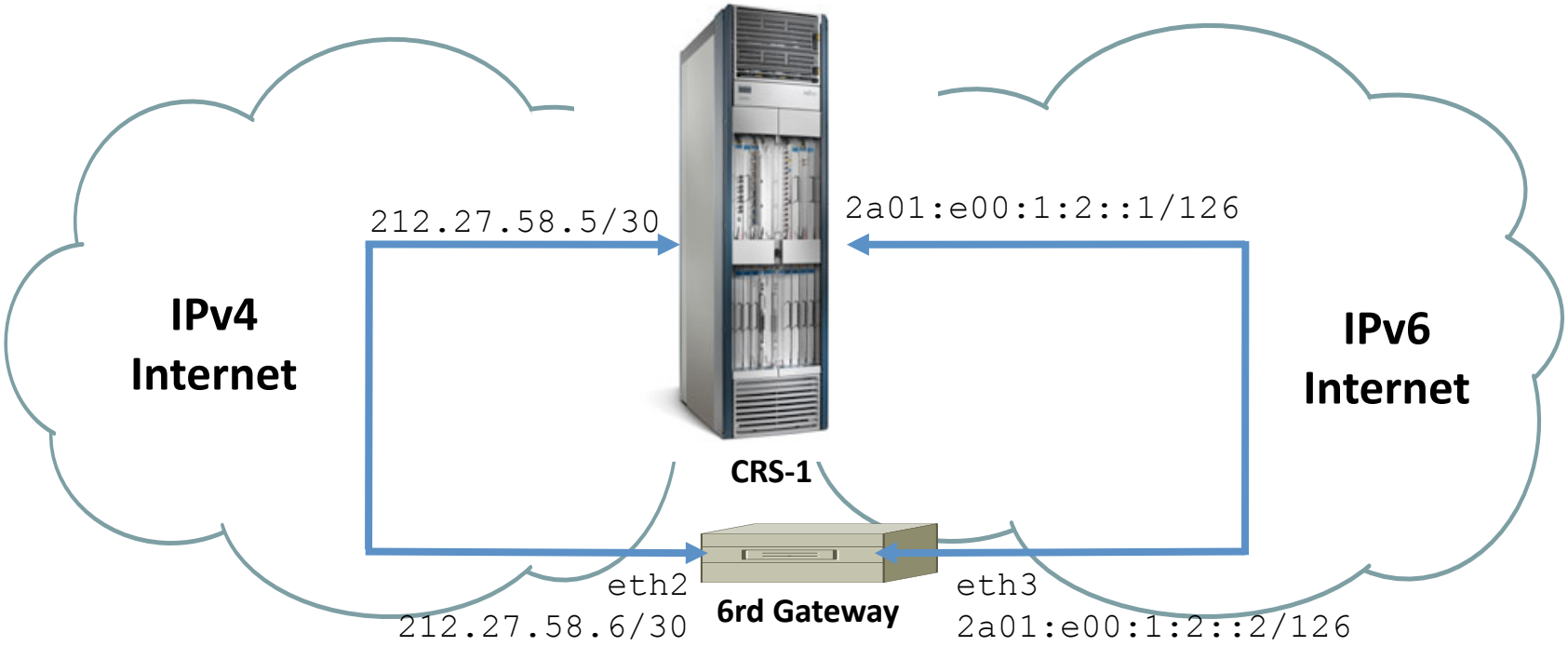
Techy at CPE side 2/2

- 6rd Tunneling playground :

```
# ip tunnel add sit2 mode sit local xx.xx.xx.xx \
                6rd_prefix 2a01:e30::/28 ttl 64

# ip link set dev sit2 up

# ip -6 addr add 2a01:e3x:xxxx:xxx0::1/128 dev sit2

# ip -6 addr add 2a01:e3x:xxxx:xxx0::1/64 dev br0

# ip -6 route add default via ::192.88.99.201 \
                  dev sit2 metric 1
```

Techy at 6rd GW side 1/2

- 6rd GW inter-connection :



Techy at 6rd GW side 2/2

- 6rd GW configuration :

```
# ip addr add 212.27.58.6/30 dev eth2
# ip route add default via 212.27.58.5 dev eth2
# ip link set dev eth2 up

# ip -6 addr add 2a01:e00:1:2::2/126 dev eth3
# ip -6 route add default via 2a01:e00:1:2::1 dev eth3
# ip link set dev eth3 up

# ip addr add 192.88.99.201/32 dev dummy0
# ip link set dev dummy0 up

# ip tunnel add sit1 mode sit local 192.88.99.201 \
                6rd_prefix 2a01:e30::/28 ttl 64
# ip -6 addr add 2a01:e00:1:2::2/126 dev sit1
# ip -6 route add 2a01:0e30::/28 via 2a01:e00:1:2::1 dev sit1
# ip link set dev sit1 up
```

Techy at CRS-1 Side 1/2

- CRS-1 Interface configuration :

```
interface TenGigE1/1/0/5
 description 6rd eth2
 ipv4 address 212.27.58.5 255.255.255.252
!
interface TenGigE1/1/0/7
 description 6rd eth3
 ipv6 address 2a01:e00:1:2::1/126
!
router static
 address-family ipv4 unicast
  192.88.99.201/32 TenGigE1/1/0/5 212.27.58.6 tag 5002
 address-family ipv6 unicast
  2a01:e00::/26 Null0
  2a01:e30::/28 TenGigE1/1/0/7 2a01:e00:1:2::2 tag 5002
!
```

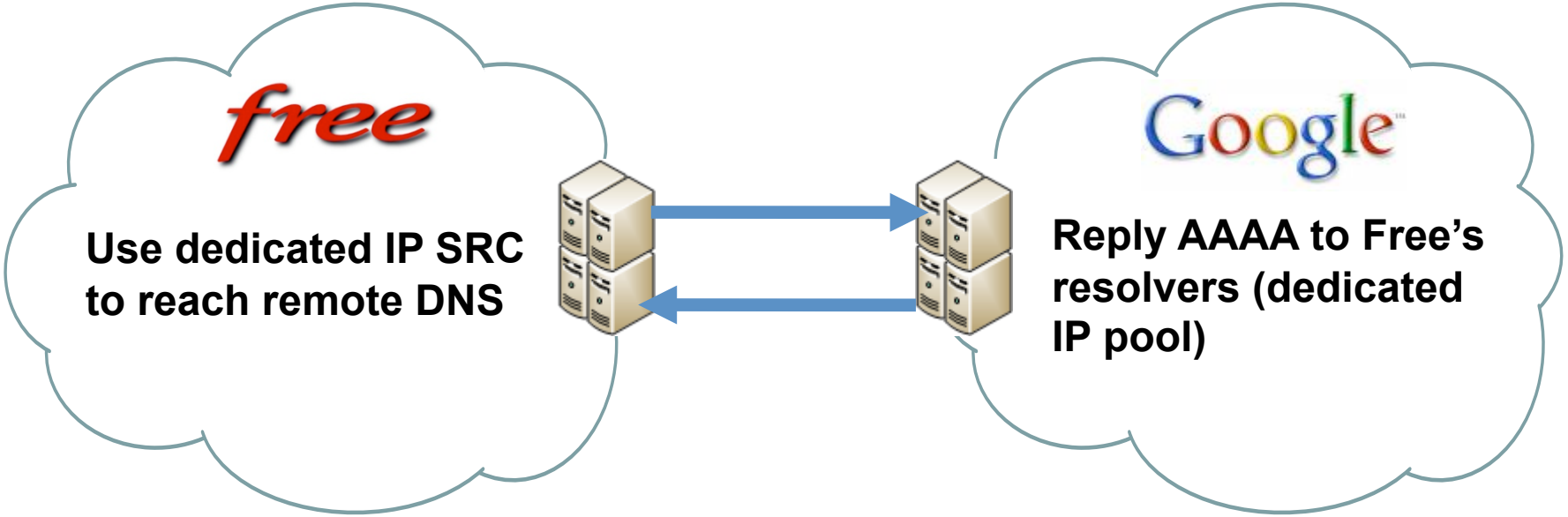
Techy at CRS-1 Side 2/2

- CRS-1 Routings configuration :

```
bgp confederation identifier 12322
 bgp router-id yy.yy.yy.yy
 bgp cluster-id zz.zz.zz.zz
 bgp graceful-restart
 bgp as-path-loopcheck
 bgp bestpath med always
 bgp bestpath med confed
 address-family ipv4 unicast
. . . .
  redistribute connected route-policy connected_to_bgp
  redistribute static route-policy static_to_bgp
 address-family ipv6 unicast
  network ::/0 route-policy default_to_bgp
  network 2a01:e00::/26 route-policy network_to_bgp
  redistribute connected route-policy connected_to_bgp
  redistribute static route-policy static_to_bgp
 !
```

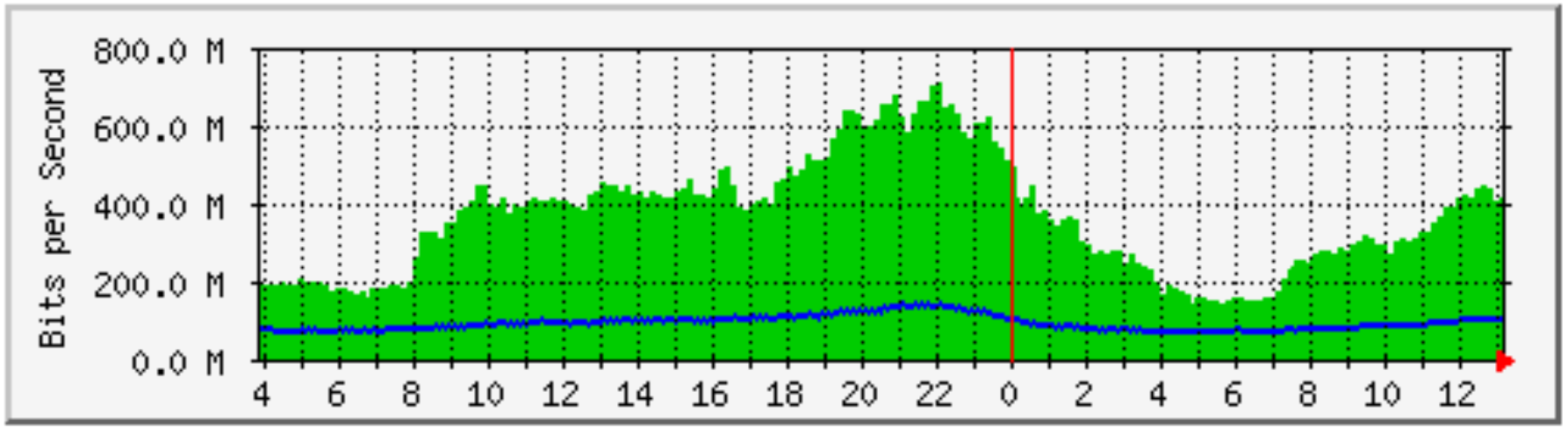
Hands on Reversibility

- Goal 1 : Provide progressive IPv6 traffic shift
- Goal 2 : Provide a 2 levels flexibility
- How : Reply AAAA by resolver source IP



Some Stats 1/3

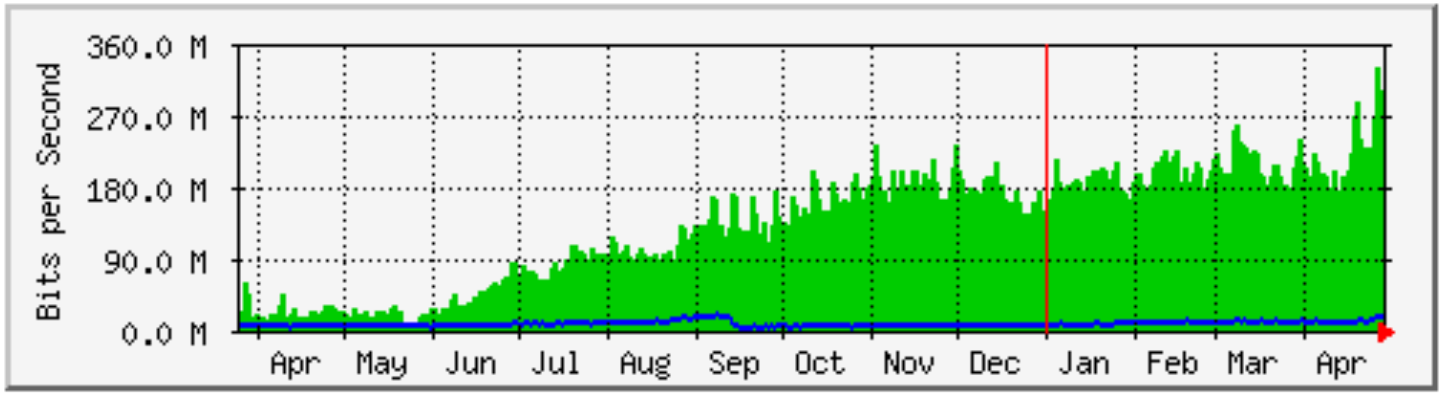
- Customers : 310K
- Global Daily traffic (5min AVG) :



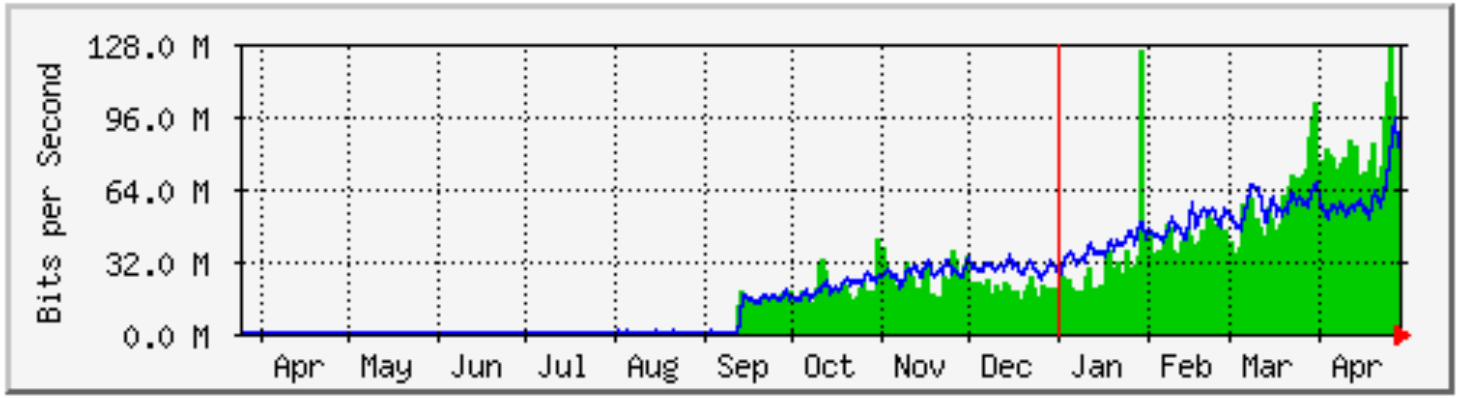
	Max	Average	Current
In	706.3 Mb/s (3.7%)	335.9 Mb/s (1.8%)	414.4 Mb/s (2.2%)
Out	138.9 Mb/s (0.7%)	89.9 Mb/s (0.5%)	101.6 Mb/s (0.5%)

Some Stats 2/3

- 6rd-gw1 Yearly Traffic (1Day AVG) :

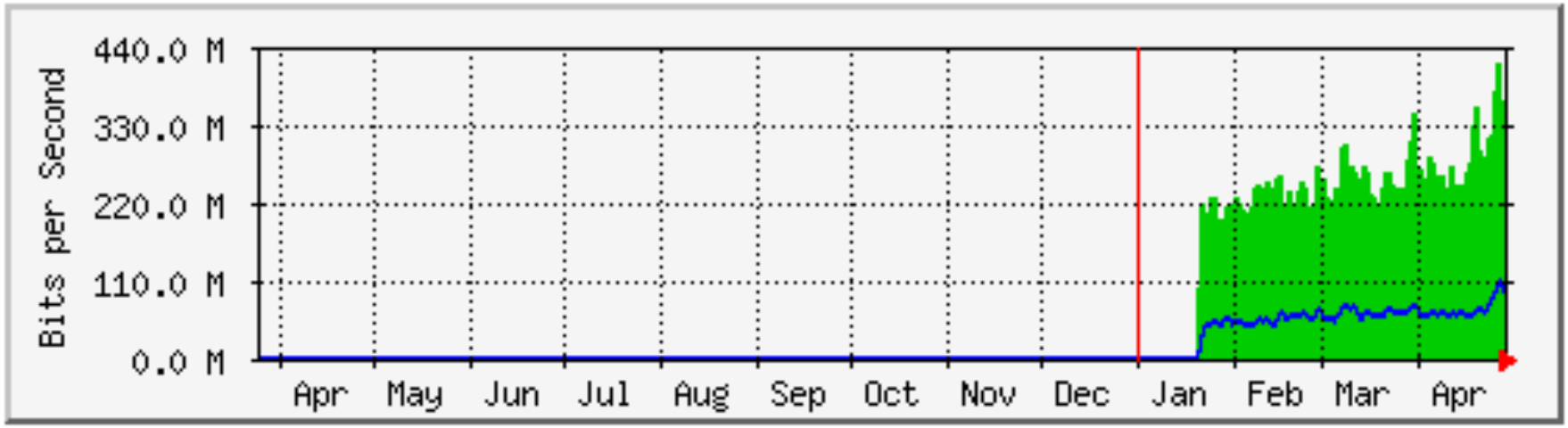


- 6rd-gw2 Yearly Traffic (1Day AVG) :



Some Stats 3/3

- Global Yearly Traffic (1Day AVG) :



	Max	Average	Current
In	414.5 Mb/s (2.2%)	248.2 Mb/s (1.3%)	348.2 Mb/s (1.8%)
Out	105.8 Mb/s (0.6%)	60.3 Mb/s (0.3%)	96.0 Mb/s (0.5%)

Resources

- IETF Draft : **draft-despres-6rd-03** (targeting INFO RFC)
- Upcoming new standards track draft :
  - *Rémi Després* & *Mark Townsley*
  - Targeting Standards Track
  - Extensions for CGNs, DHCP & TR69, …
- Upcoming CISCO Book : **ISBN N°0470193387**
- Stay tuned on :
  http://news.gmane.org/gmane.linux.network