



Introduction to IPv6

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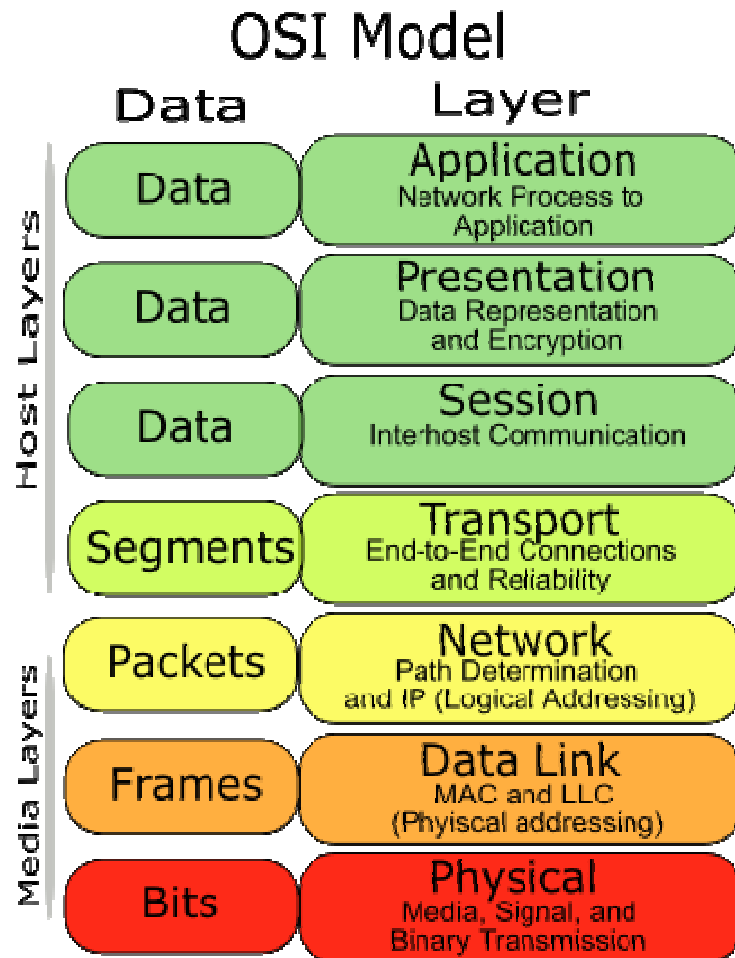
<http://achmad.glclearningcenter.com>

Agenda



- Networking overview
- Current Network Condition
- Intro to IPv6
- Intro to GLC
- Demo
- Q/A

Networking overview

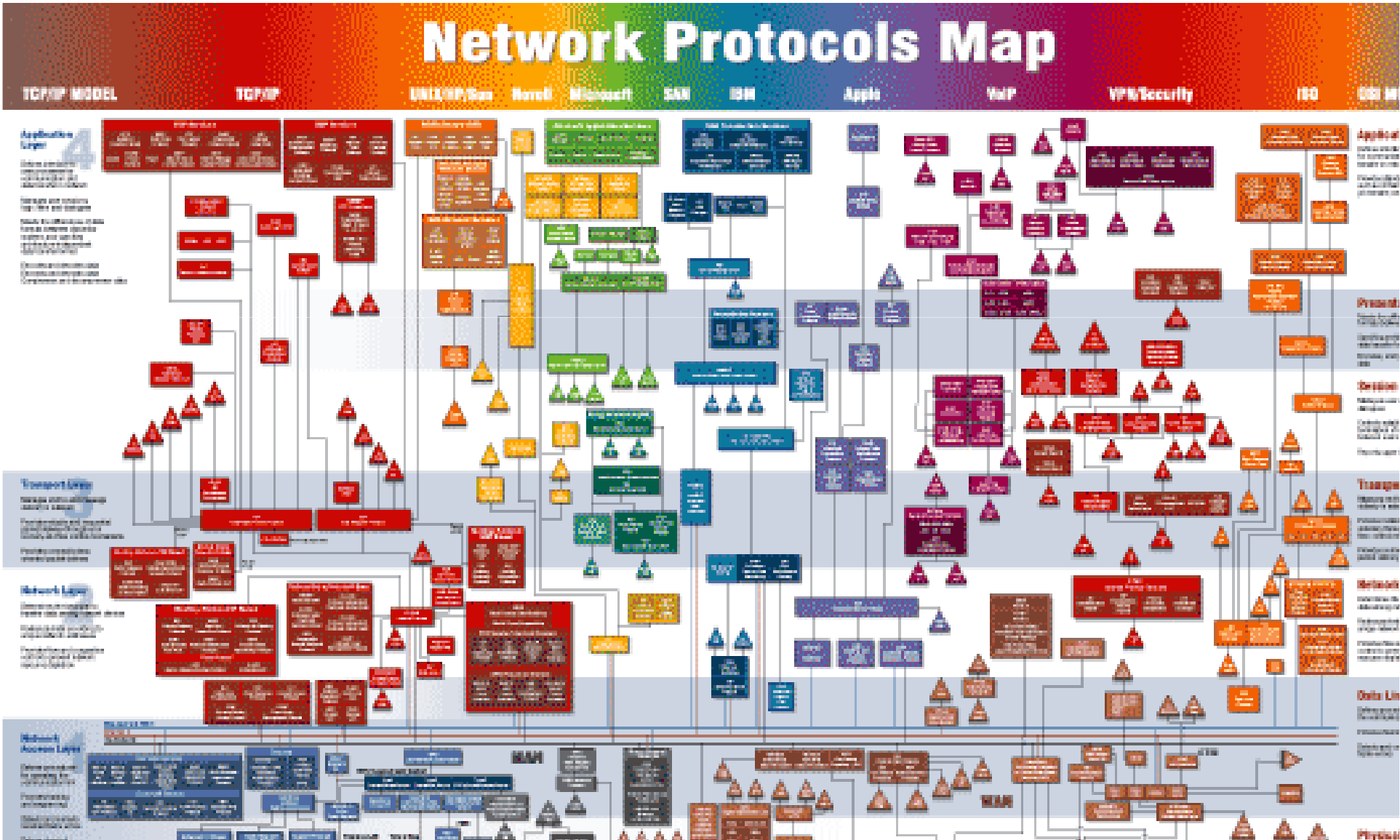


Source: wikipedia

- You need to be able to think abstractly!
- OSI layer as reference model
- Ideal model
- Each layer is independent, working with API

Protocol suite, familiar...?

source: Javvin.com

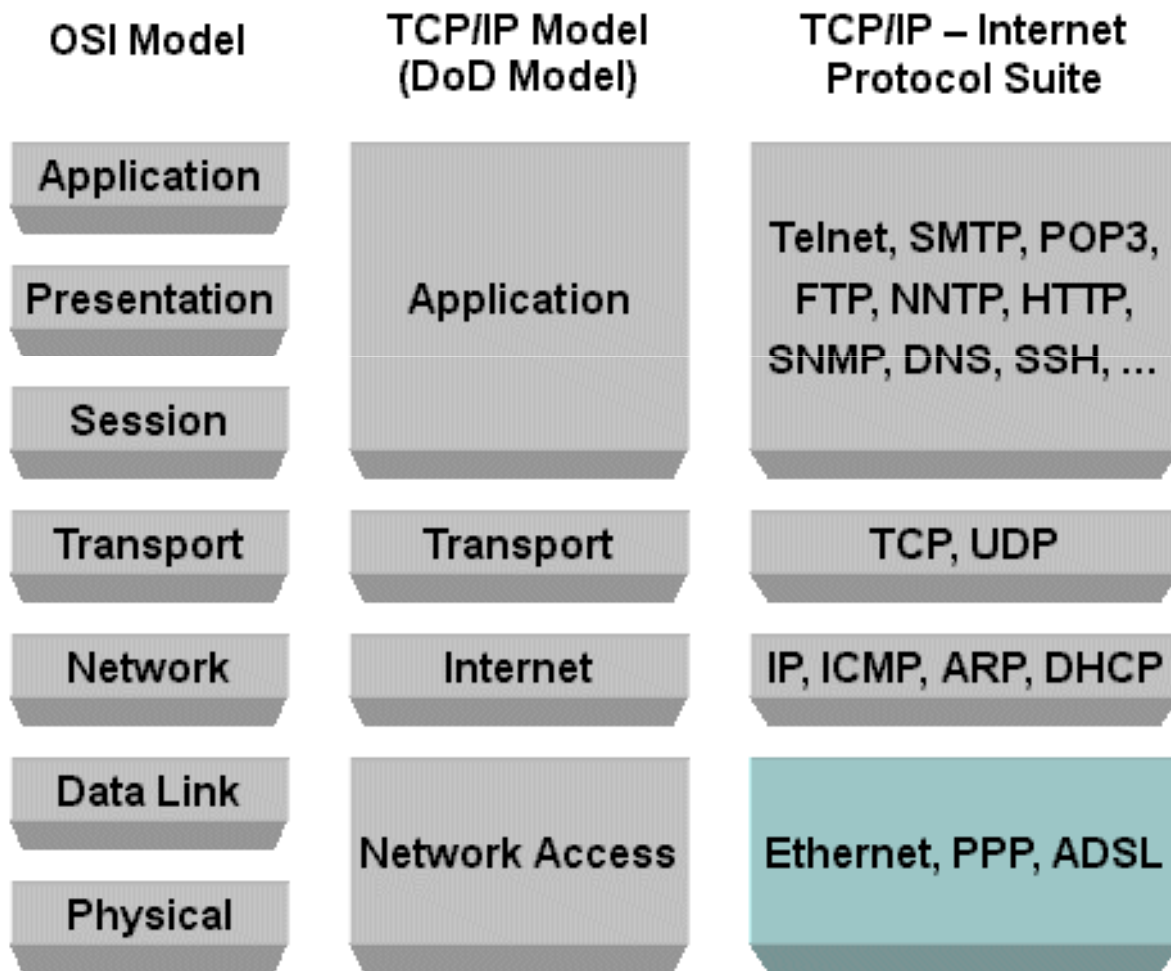


Familiar...?



- Layer7: DNS, FTP, HTTP, NTP, SMTP, DHCP, SIP
- Layer6: MIME, TLS, SSL
- Layer5: NetBIOS, SQL, all messaging services
- Layer4: TCP, UDP, SCTP
- Layer3: IP, ICMP, IPX, AppleTalk, IPsec
- Layer2: Ethernet, ARP, ISDN, ADSL, ATM, wifi
- Layer1: RJ-45, RJ11, wifi, bluetooth

DOD model

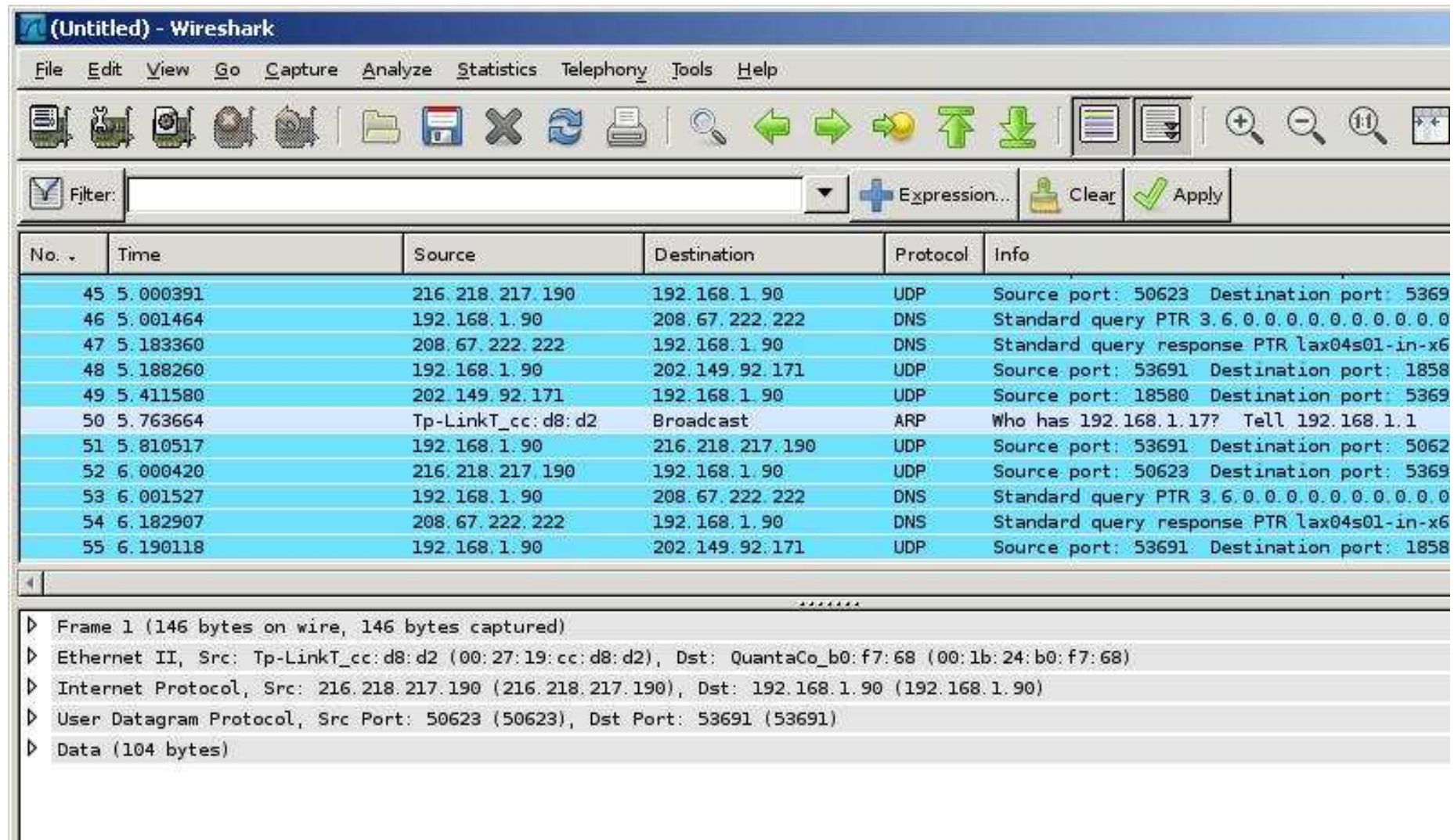


- Current worldwide implementation model

Source:
bit.kuas.edu.tw/~csshie/teach/np/tcpip/index.html

Protocol analyzer

- A network engineer's **must-have** tool.. Right?



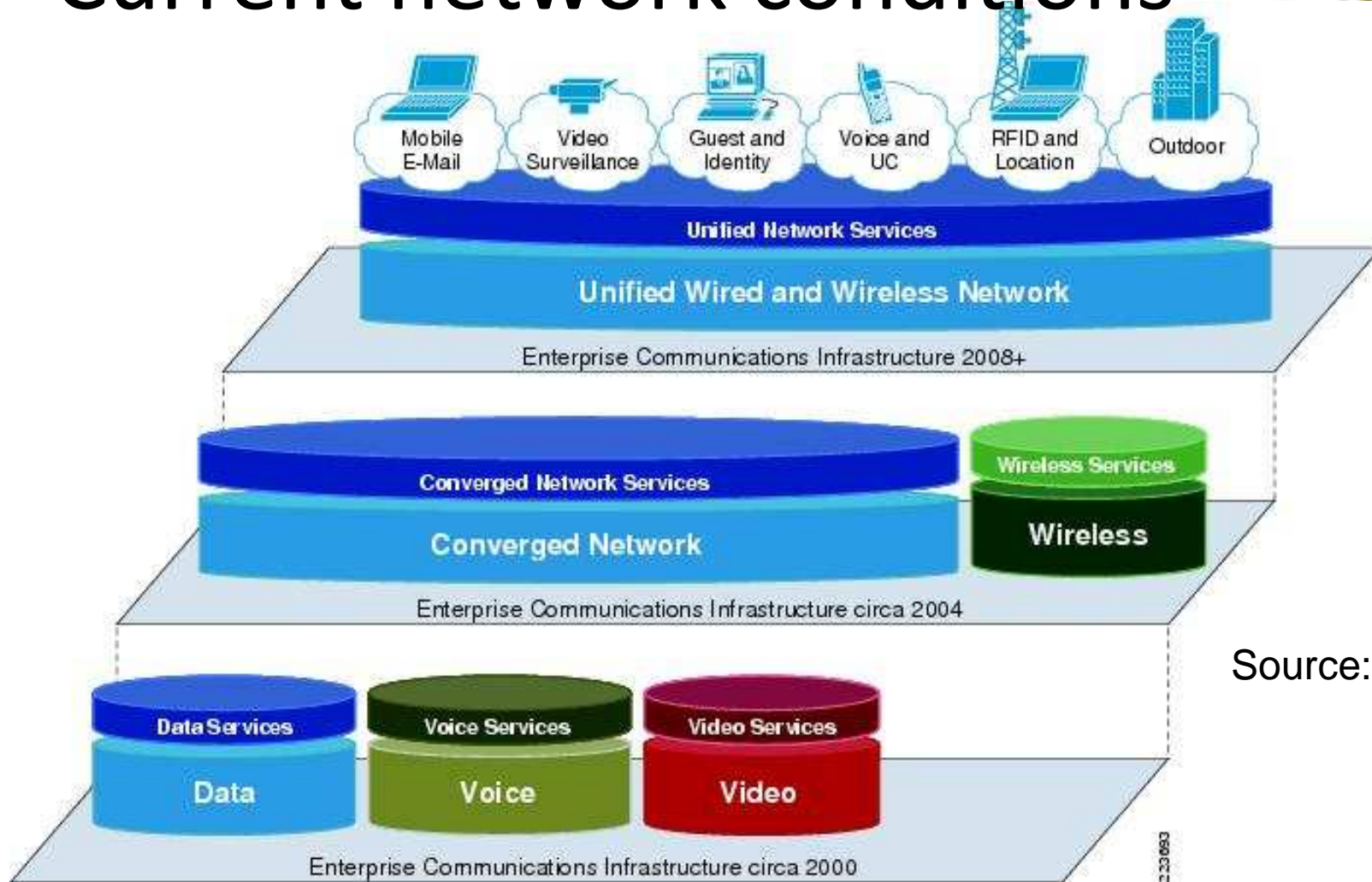
The screenshot shows the Wireshark interface with a packet capture table and packet details. The table lists 11 packets (No. 45 to 55) with their respective times, source and destination IP addresses, protocols, and information. Packet 50 is highlighted, and its details are shown in the bottom pane.

No.	Time	Source	Destination	Protocol	Info
45	5.000391	216.218.217.190	192.168.1.90	UDP	Source port: 50623 Destination port: 5369
46	5.001464	192.168.1.90	208.67.222.222	DNS	Standard query PTR 3.6.0.0.0.0.0.0.0.0.0
47	5.183360	208.67.222.222	192.168.1.90	DNS	Standard query response PTR lax04s01-in-x6
48	5.188260	192.168.1.90	202.149.92.171	UDP	Source port: 53691 Destination port: 1858
49	5.411580	202.149.92.171	192.168.1.90	UDP	Source port: 18580 Destination port: 5369
50	5.763664	Tp-LinkT_cc:d8:d2	Broadcast	ARP	Who has 192.168.1.1? Tell 192.168.1.1
51	5.810517	192.168.1.90	216.218.217.190	UDP	Source port: 53691 Destination port: 5062
52	6.000420	216.218.217.190	192.168.1.90	UDP	Source port: 50623 Destination port: 5369
53	6.001527	192.168.1.90	208.67.222.222	DNS	Standard query PTR 3.6.0.0.0.0.0.0.0.0.0
54	6.182907	208.67.222.222	192.168.1.90	DNS	Standard query response PTR lax04s01-in-x6
55	6.190118	192.168.1.90	202.149.92.171	UDP	Source port: 53691 Destination port: 1858

Packet 50 details:

- Frame 1 (146 bytes on wire, 146 bytes captured)
- Ethernet II, Src: Tp-LinkT_cc:d8:d2 (00:27:19:cc:d8:d2), Dst: QuantaCo_b0:f7:68 (00:1b:24:b0:f7:68)
- Internet Protocol, Src: 216.218.217.190 (216.218.217.190), Dst: 192.168.1.90 (192.168.1.90)
- User Datagram Protocol, Src Port: 50623 (50623), Dst Port: 53691 (53691)
- Data (104 bytes)

Current network conditions



Source: cisco.com

Network converged: Telco, Data, Television. All to **data** network

Internet Protocol, current

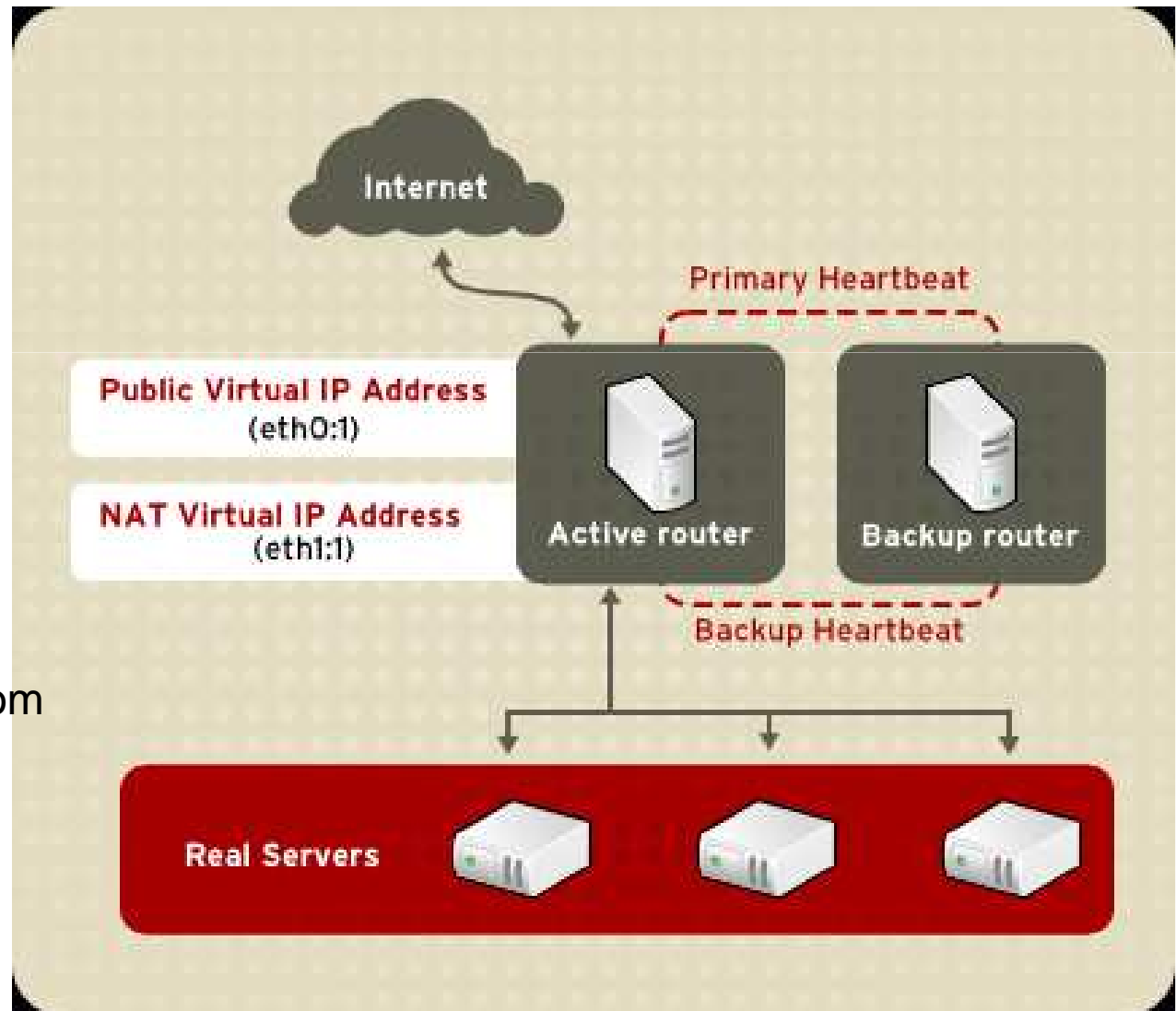


- Managed by IANA
- Version: 4
- Hierarchical structure (prefix): net id & host id
- address length: 32 bit
- Two types: public & private
- **Official IPv4 become rare**
- Need to establish **end-to-end connection**
- Need solution: IPv6

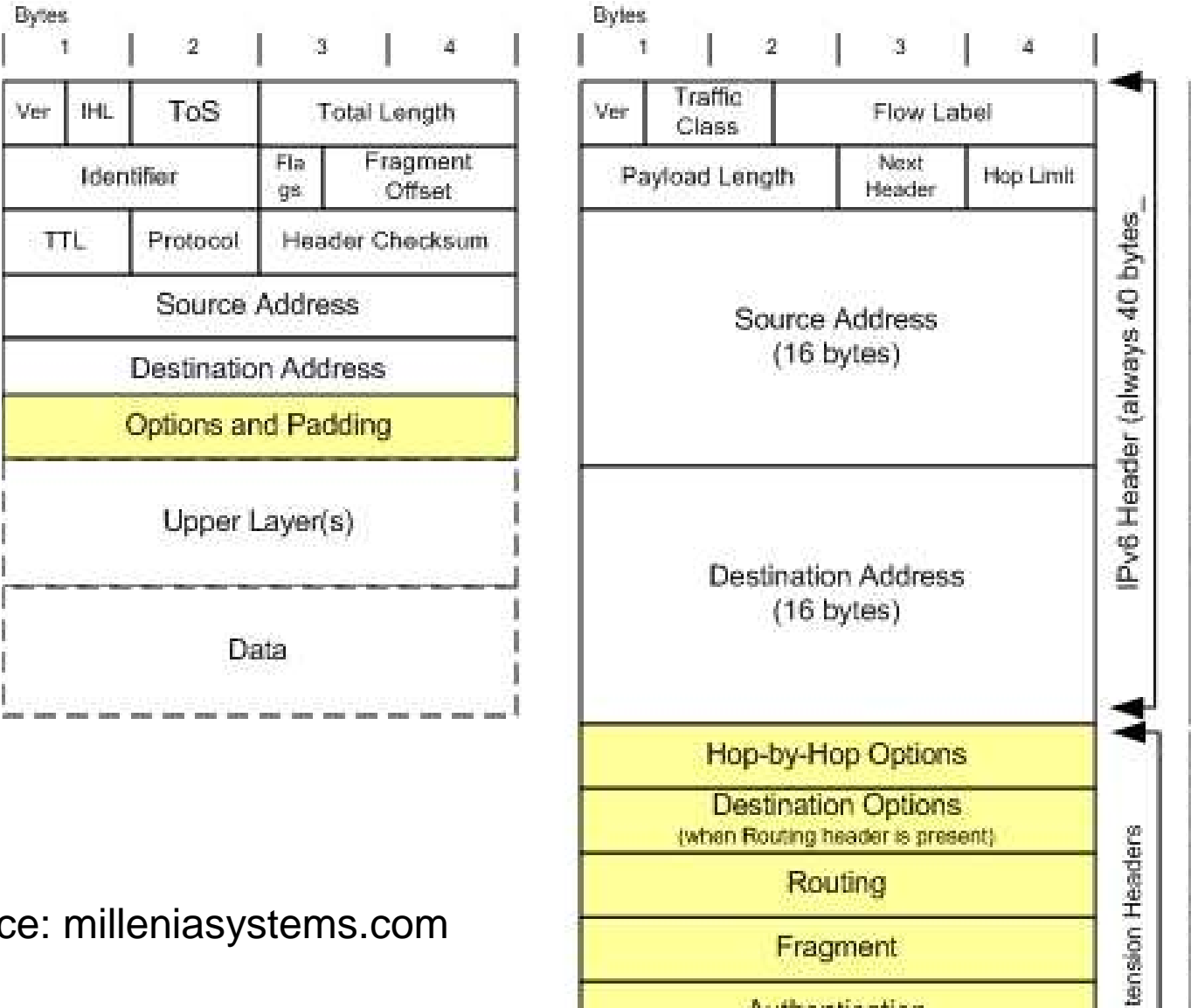
techniques to reserve IPv4

- NAT
- Tunnelling
- Proxy

Source: redhat.com



IPv4 – IPv6 head to head



Source: milleniasystems.com

Break...



Intro to GLC Learning Center



www.gclearningcenter.com

GLC Learning Center



- **What:** an organization that provides online training, workshop, and webinar.
- **When:** since january 2008
- **Vision:** provide affordable training, workshop, and webinar for indonesians
- **Benefits:** flexible, online, saving transport

GLC background



- Meningkatkan skill engineer indonesia.
- “lulusan IT banyak yang **mengecewakan**” ref: detik.com, 16 january 2010
- Beberapa lulusan IT memang mengecewakan.
Anak informatika ngak ngerti netmask?
OMG...!! Ref: pengalaman pribadi
- Masih sedikit orang indo yang jadi **expatriate**
- Masih sedikit orang indo yang **certified engineer**

GLC training & workshop



- **Operating System:** fundamental, system admin, network & security admin. Setara dengan Sun, RH training
- **Networking & Telco:** CCNA fast-track, GSM fundamental, UMTS, Signalling
- **Database:** SQL fundamental, oracle, mysql, postgresql
- **Programming:** Java, shell programming, php-mysql

How the online training looks like?



- Online presentation
- Online materials
- Online demo
- Online access to GLC server in the internet.

Demo.....

Next events...



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Now back again...

How IPv6 looks like?



- Example: `www6.glclearningcenter.com`

`2001:0:53aa:64c:1877:b76b:356a:a354`

- Written in hex
- Grouped with (:), 8 groups total, 16bits@
- Has CIDR notation (prefix): host & net id

ipV6 example



- Unspecified address -> 0:0:0:0:0:0:0:0 or ::/128
- Loopback -> 0:0:0:0:0:0:0:1 or ::1
- Mapped IPv4 to IPv6 -> ::ffff:11.46.2.128 (for the last 2 groups) using /96 prefix
- Default route -> ::/0
- Teredo tunneling: 2001:db8::/32

IPv6 is awesome, let's move...!



Filter: + Expression... Clear

No.	Time	Source	Destination	Protocol	Info
13	3.004304	2001:0:53aa:64c:462:2	2001:0:53aa:64c:1877:	ICMPv6	Echo request
14	3.201837	2001:0:53aa:64c:462:2	2001:4860:8011::63	ICMPv6	Echo request
15	3.293109	2001:0:53aa:64c:1877:	2001:0:53aa:64c:462:2	ICMPv6	Echo reply
16	3.391173	2001:4860:8011::63	2001:0:53aa:64c:462:2	ICMPv6	Echo reply
17	4.005147	2001:0:53aa:64c:462:2	2001:0:53aa:64c:1877:	ICMPv6	Echo request
18	4.169583	2001:0:53aa:64c:1877:	2001:0:53aa:64c:462:2	ICMPv6	Echo reply
19	4.202212	2001:0:53aa:64c:462:2	2001:4860:8011::63	ICMPv6	Echo request
20	4.392319	2001:4860:8011::63	2001:0:53aa:64c:462:2	ICMPv6	Echo reply

```

Internet Protocol Version 6
  0110 .... = Version: 6
  .... 0000 0000 .... = Traffic class: 0x00000000
  .... 0000 0000 0000 0000 = Flowlabel: 0x00000000
  Payload length: 64
  Next header: ICMPv6 (0x3a)
  Hop limit: 64
  Source: 2001:0:53aa:64c:462:2e44:8cb9:aeda (2001:0:53aa:64c:462:2e44:8cb9:aeda)
  Destination: 2001:0:53aa:64c:1877:b76b:356a:a354 (2001:0:53aa:64c:1877:b76b:356a:a354)
Internet Control Message Protocol v6
  Type: 128 (Echo request)
  Code: 0
  
```

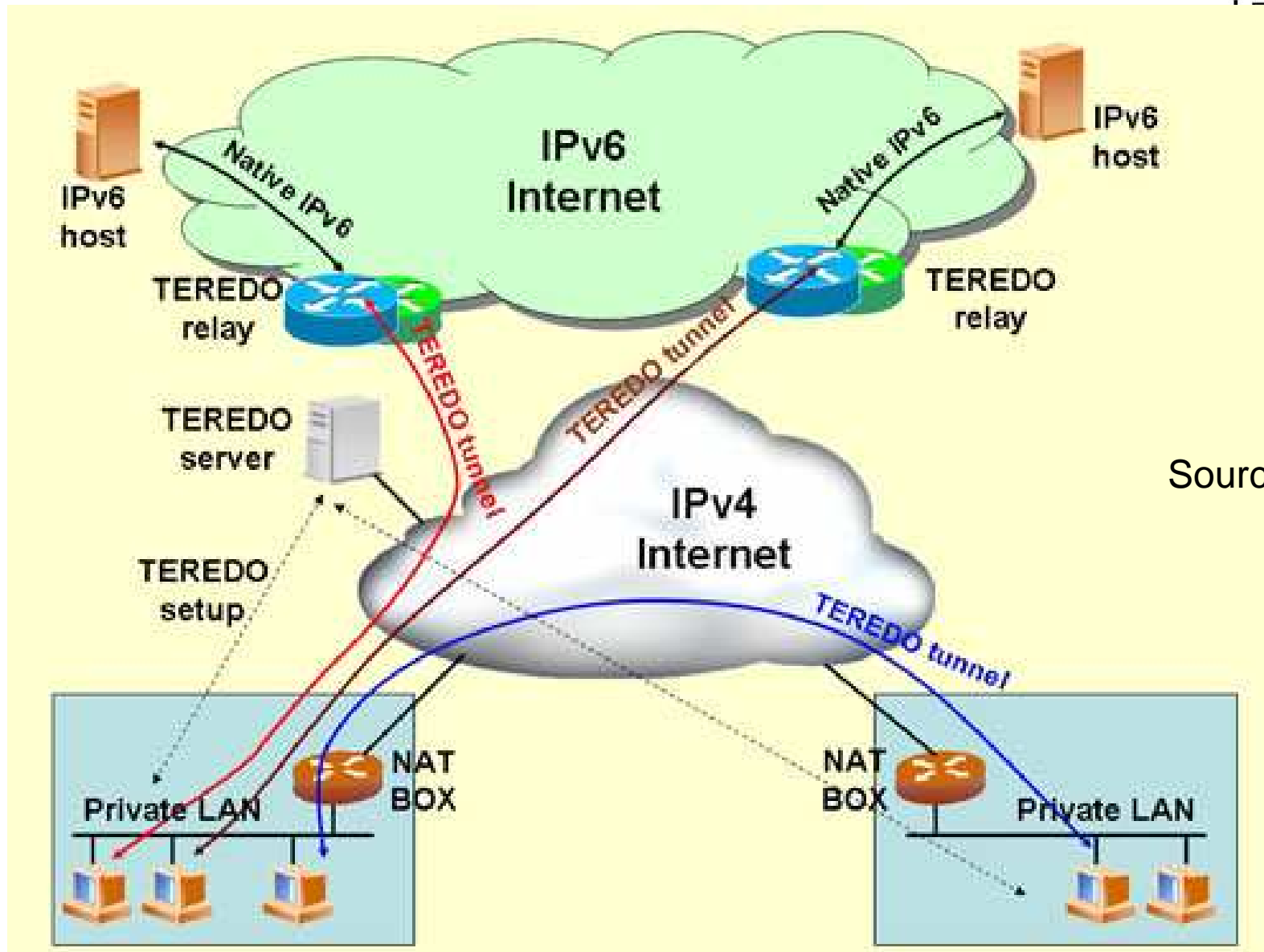
0000 60 00 00 00 00 40 3a 40 20 01 00 00 53 aa 06 4c ... @: @ ... S..L
 0010 04 62 2e 44 8c b9 ae da 20 01 00 00 53 aa 06 4c ... h D ... S I

Wait.. How to connect?



- Create your own IPv6 network
- Ask your ISP. Tell them you need IPv6!!
- Use IPv6 tunnel provider (aka broker):
 - Gogoclient
 - Gw6
 - **Teredo**
 - Etc...

What is Teredo? (RFC4380)



Source: ipv6tf.org

Teredo... action!! (1)



```
# /etc/init.d/miredo start
```

```
# ifconfig
```

```
...
```

```
teredo    Link encap:UNSPEC  HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
          inet6 addr: fe80::ffff:ffff:ffff/64 Scope:Link
          inet6 addr: 2001:0:53aa:64c:3c3d:27c0:8cb9:aeda/32 Scope:Global
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1280  Metric:1
          RX packets:1032 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1108 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:500
          RX bytes:120953 (120.9 KB)  TX bytes:115467 (115.4 KB)
```

Teredo... action!! (2)



```
C:\>ipconfig
Windows IP Configuration
Tunnel adapter Teredo Tunneling Pseudo-Interface:
```

```
    Connection-specific DNS Suffix  . :
    IP Address. . . . . :
    2001:0:4137:9e76:0:fb8b:8cb9:aeda
    IP Address. . . . . : fe80::ffff:ffff:fffd%5
    Default Gateway . . . . . : ::
```

```
Tunnel adapter Automatic Tunneling Pseudo-Interface:
```

```
    Connection-specific DNS Suffix  . :
    IP Address. . . . . : fe80::5efe:192.168.188.52%2
    Default Gateway . . . . . :
```

```
C:\>
```

However, Migrating to IPv6 is...



- A very **slow** adoption rate, But **sure..!** IPv4 be depleted in a few years from **now**.
- **It also affects other layers** ☹️.
- **Applications** should aware of the presence of IPv6: DNS, telnet, ping, webserver, CMS, SMTP, whatever...
- Applications must be **re-engineered** to support IPv6

Accessing IPv6, ping6



```
C:\>ping6 www6.glclearningcenter.com
```

```
Pinging www6.glclearningcenter.com
```

```
[2001:0:53aa:64c:1877:b76b:356a:a354]
```

```
from 2001:0:4137:9e76:0:fb8b:8cb9:aeda with 32 bytes  
of data:
```

```
Reply from 2001:0:53aa:64c:1877:b76b:356a:a354:  
bytes=32 time=670ms
```

```
Reply from 2001:0:53aa:64c:1877:b76b:356a:a354:  
bytes=32 time=194ms
```

See...?

Accessing IPv6, DNS



```
# dig -t AAAA www6.glclearningcenter.com
;; QUESTION SECTION:
;www6.glclearningcenter.com.      IN      AAAA
;; ANSWER SECTION:
www6.glclearningcenter.com. 3600 IN      AAAA
2001:0:53aa:64c:1877:b76b:356a:a354
```

See...?

Accessing IPv6, HTTP



why don't you try by yourself?

- <http://www6.glclearningcenter.com>
- [http://\[2001:0:53aa:64c:1877:b76b:356a:a354\]](http://[2001:0:53aa:64c:1877:b76b:356a:a354])

See...?

More apps to be modified..



- SSH server & client: Putty?
- Webserver, FTP, filezilla?
- Routing, firewall?
- And more....



Needs more energy to adapt. What if **IPv8** is coming?

Related GLC course



- CCNA fast-track
- UNIX network administrator
- IPv6 implementation (UNIX, windows, cisco)

Thank You



- Q & A

Please put your suggestions, ideas, or any other input about GLC or webinar

here:

<http://www.gclearningcenter.com/saran/>