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Supporto servizi in IPv6

...la gioia di ogni sysadmin

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We don't care about

- Tipologie di configurazione:
 - Native IPv6
 - Dual stack
 - Nella connessione ad un altro host l'info su quale stack usare (v4 o v6) viene data dal DNS
 - IPv6 6to4

- **Andiamo con ordine:**
 - Come gli OS supportano IPv6
 - Windows
 - Linux
 - BSD
 - TRUE64
 - Come 'alcuni' servizi supportano IPv6

Servizi

- NTP
- Ssh
 - openssh
- Posta
 - Sendmail/Postfix/Exim + cyrus/dovecot
- Web
 - Apache/Lighthttp & IIS
 - Squid
- Authentication systems
 - NIS, OpenLDAP
- Radius
 - Freeradius, Radiator
- Dns
 - BIND
- Active Directory
 - Windows 2003

- Database
 - Mysql / PostgreSQL / Oracle / DB2
- System log
 - Syslog-ng
- DHCP
- FTP
 - vsftpd
- Servizi federati
 - Shibboleth AAI
- Flow Analyzer
 - NETFLOW
- VoIP
 - Asterisk, SER
- CMS
 - Moodle

Supporto di IPv6 nei Sistemi Operativi

- Windows
 - NT4 SP6 Beta version
 - Windows 2000 SP3
 - Windows XP SP1
 - Windows 2003 Server
 - **Da abilitare**
 - Windows VISTA installed and enabled by default
 - Caratteristiche supportate
 - Autoconfiguration, IPv4 tunnel, 6to4 tunnel, 6to4 relay, ISATAP tunnel, IPSEC
 - IPv6 File and Printer sharing e IIS supportati su Windows

Configurazione IPv6 – Windows XP

- Configurazione
 - **Abilitare/disabilitare IPv6**
 - `Netsh interface ipv6 install[uninstall]`
 - **Visualizzare indirizzo IPv6**
 - `netsh interface ipv6 show address`
 - **Assegnare[rimuovere] indirizzo**
 - assegnare IPv6 alla Local Area Network (sostituire 2001:0760:0:158::178 con il proprio indirizzo IPv6 e 4 con l'index dell'interfaccia di rete cui lo si vuole assegnare come individuato dal precedente comando)
 - `netsh interface ipv6 add[delete] address interface=4 address=2001:0760:0:158::178 store=persistent`
 - **Routing table**
 - **aggiungere route**
 - `netsh interface ipv6 add route prefix=2001:760::11/64 interface=4 2001:760::11 store=persistent`
 - **Visualizzare routing table**
 - `netsh interface ipv6 show routes`
 - **Configurare DNS**
 - **aggiungere DNS**
 - `netsh interface ipv6 add dns interface=4 2001:760::202:a5ff:fe20:12d0`

Configurazione IPv6 – Windows XP

- Configurazione
 - **Aggiungere/rimuovere default route**
 - `netsh interface ipv6 add[delete] route ::/0 "Local Area Connection" fe80::209:c0ff:fe30:4357`
 - Visualizzare route
 - `netsh interface ipv6 show route`
 - Abilitare/disabilitare firewall IPv6
 - `Netsh firewall set adapter "Local Area Connection" filter=disable[enable]`
 - Visualizzare statistiche di rete connessioni IPv6
 - `netstat -avn -p IPv6`

- [http://technet.microsoft.com/it-it/library/bb878123\(en-us\).aspx](http://technet.microsoft.com/it-it/library/bb878123(en-us).aspx)
- [http://technet.microsoft.com/it-it/library/bb878057\(en-us\).aspx](http://technet.microsoft.com/it-it/library/bb878057(en-us).aspx)

Supporto di IPv6 nei Sistemi Operativi

- LINUX

- Tutte le distribuzioni con kernel ≥ 2.2
(preferibile $> 2.4.8$ - 8/11/2001)

- Caratteristiche supportate:

- Autoconfiguration, IPv4 tunnel, 6to4

- Check for IPv6 support in the current running kernel

```
[root@mon ~]# cat /proc/net/if_inet6
00000000000000000000000000000001 01 80 10 80  lo
20010760000000000224e8fffe4cfb91 02 40 00 00  eth0
fe800000000000000224e8fffe4cfb91 02 40 20 80  eth0
```

Configurazione IPv6 – Linux Kernel

- Configurazione – principali comandi
 - Verificare il supporto IPv6 lato kernel
 - **Compilare con supporto IPv6 nativo (incluso nel kernel) o modulare**
 - **cd /usr/local/src/linux-2.6.29**
make menuconfig (richiede ncurses e ncurses-dev)
- Networking support -> Networking options -> The IPv6 protocol ->
- ```
x x --- The IPv6 protocol x x
x x [*] IPv6: Privacy Extensions support x x
x x [] IPv6: Router Preference (RFC 4191) support x x
x x [] IPv6: AH transformation x x
x x [] IPv6: ESP transformation x x
x x [] IPv6: IPComp transformation x x
x x [] IPv6: IPsec transport mode x x
x x [] IPv6: IPsec tunnel mode x x
x x [] IPv6: IPsec BEET mode x x
x x [*] IPv6: IPv6-in-IPv4 tunnel (SIT driver) x x
x x [*] IPv6: IP-in-IPv6 tunnel (RFC2473) x x
```
- <http://tomoyo.sourceforge.jp/cgi-bin/lxr/source/net/ipv6/Kconfig>

# Configurazione IPv6 – Linux Kernel

- altrimenti nel .config del kernel devono essere abilitate:
  - supporto per IPv6:  
CONFIG\_IPV6=y
  - Privacy Extensions for Stateless Address Autoconfiguration in IPv6  
CONFIG\_IPV6\_PRIVACY=y
  - per router advertisement:  
CONFIG\_IPV6\_ROUTER\_PREF=y
  - IPv4 in IPv6:  
CONFIG\_IPV6\_SIT=y  
CONFIG\_IPV6\_NDISC\_NODETYPE=y
  - IPv6-in-IPv6 and IPv4-in-IPv6:  
CONFIG\_IPV6\_TUNNEL=y
  - per IPsec v6:  
CONFIG\_INET6\_AH=y CONFIG\_INET6\_ESP=y  
CONFIG\_INET6\_IPCOMP=y CONFIG\_INET6\_XFRM\_MODE\_TRANSPORT=y  
CONFIG\_INET6\_XFRM\_MODE\_TUNNEL=y  
CONFIG\_INET6\_XFRM\_MODE\_BEET=y
- Caricare il modulo del kernel per il supporto IPv6
  - **modprobe ipv6**

# Configurazione IPv6 - Linux

- Abilitare/disabilitare il supporto per l'autoconfiguration
  - `echo "0"["1"] > /proc/sys/net/ipv6/conf/eth0/accept_ra`
  - `echo "0"["1"] > /proc/sys/net/ipv6/conf/eth0/autoconf`

```
[root@mon ~]# more /etc/protocols | grep ipv6
hopopt 0 HOPOPT # hop-by-hop options for ipv6
ipv6 41 IPv6 # IPv6
ipv6-route 43 IPv6-Route # Routing Header for IPv6
ipv6-frag 44 IPv6-Frag # Fragment Header for IPv6
ipv6-icmp 58 IPv6-ICMP # ICMP for IPv6
ipv6-nonxt 59 IPv6-NoNxt # No Next Header for IPv6
ipv6-opts 60 IPv6-Opts # Destination Options for IPv6
```

```
[root@mon ~]# ifconfig
eth0 Link encap:Ethernet HWaddr 00:24:E8:4C:FB:91
 inet addr:193.206.158.49 Bcast:193.206.158.255 Mask:255.255.255.0
 ##### inet6 addr: 2001:760::224:e8ff:fe4c:fb91/64 Scope:Global
 inet6 addr: fe80::224:e8ff:fe4c:fb91/64 Scope:Link
```

# Configurazione IPv6 - Linux

```
[root@ ~]# route -A inet6
```

```
Kernel IPv6 routing table
```

| Destination                      | Next Hop                        | Flags | Metric | Ref   | Use | Iface |
|----------------------------------|---------------------------------|-------|--------|-------|-----|-------|
| 2001:760::/64                    | *                               | UA    | 256    | 17870 | 0   | eth0  |
| fe80::/64                        | *                               | U     | 256    | 0     | 0   | eth0  |
| */0                              | <b>fe80::213:7fff:fe74:91c9</b> | UGDA  | 1024   | 2480  | 0   | eth0  |
| localhost6.localdomain6/128      | *                               | U     | 0      | 38555 | 1   | lo    |
| 2001:760::224:e8ff:fe4c:fb91/128 | *                               | U     | 0      | 9092  | 1   | lo    |
| fe80::224:e8ff:fe4c:fb91/128     | *                               | U     | 0      | 12    | 1   | lo    |
| ff02::1/128                      | ff02::1                         | UC    | 0      | 1     | 0   | eth0  |
| ff00::/8                         | *                               | U     | 256    | 0     | 0   | eth0  |

```
ghost#show arp | inc c9
```

```
Internet 193.206.158.249 - 0013.7f74.91c9 ARPA FastEthernet0/1.2
```

# Configurazione IPv6 - Linux

- **RPM based** - Fedora/Redhat/CentOS/ScientificLinux
  - Abilitare IPv6
    - `/etc/sysconfig/network`
      - NETWORKING\_IPV6=yes
      - IPV6\_DEFAULTGW=2001:760:0:106::242
  - Assegnare l'indirizzo IPv6 alla macchina:
    - Vi `/etc/sysconfig/network-scripts/ifcfg-eth0`
      - IPV6ADDR=2001:760:0:159::212
      - IPV6INIT=yes
  
- **DPKG based** – Debian/Ubuntu (<http://wiki.debian.org/DebianIPv6>)
  - Assegnare indirizzo IPv6, gw
    - Vi `/etc/network/interfaces`
      - auto eth0
      - iface eth0 inet6 static
        - address 2001:760:0:159::131
        - netmask 64
        - gateway 2001:760:0:159::242
  - PPP users may have to add `+ipv6` to `/etc/ppp/options`, as not all PPP RAS servers advertise IPv6 support, even if they will negotiate it upon request.

# Configurazione IPv6 - Linux

- Aggiungere/rimuovere route
  - verso un host
    - `route -A inet6 add[del] 2001:800:40::1 gw fe80::209:c0ff:fe30:4357 dev eth0`
  - Verso network
    - `route -A inet6 add[del] 2001:800:40::/48 gw fe80::209:c0ff:fe30:4357 dev eth0`
- Aggiungere/rimuovere default route
  - `route -A inet6 add[del] ::/0 gw fe80::209:c0ff:fe30:4357 dev eth0`

# Configurazione UNIX – HPTRUE64

- Determinare versione del OS
  - Sizer -v
- Eseguire il setup dell'indirizzo IPv6 dell'host (permanente, attivo anche al reboot)
  - /usr/sbin/ip6\_setup
- Controllare il setup sul file di configurazione della macchina
  - Vi /etc/rc.config
    - IPV6="yes"
    - export IPV6
    - IP6DEV\_0="ee0"
    - export IP6DEV\_0
    - IP6IFCONFIG\_0\_0="ipv6 up"
    - export IP6IFCONFIG\_0\_0
    - NUM\_IP6CONFIG="1"
    - export NUM\_IP6CONFIG
    - IP6ROUTER="no"
    - export IP6ROUTER
    - IP6RTRD="no"
    - export IP6RTRD
    - IP6RTRD\_FLAGS=""
    - export IP6RTRD\_FLAGS
    - ND6HOSTD="yes"
    - export ND6HOSTD
    - ND6HOSTD\_FLAGS=""
    - export ND6HOSTD\_FLAGS



- HPTRUE64
  - Testare l'IP appena assegnato
    - # /usr/sbin/ip6\_testaddr -n dxgarr
      - dxgarr => ::ffff:127.0.0.1

# Configurazione BSD

- FreeBSD
- The FreeBSD release 6.1 implements KAME from an unknown date and version (no references or hints were found on both sides).
  - **Verificare il supporto per IPv6 nel kernel**
    - `cd /usr/src/sys/i386/conf`
    - `vi DEFAULTS`
      - `options INET6 # IPv6 communications protocols`
  - **Abilitare il supporto per IPv6 nel file di configurazione della macchina**
    - `Vi /etc/rc.conf`
      - `ipv6_enable="YES" (di DEFAULT e' NO)`
      - `ipv6_network_interface="bge0"`
      - `ipv6_ifconfig_bge0="2001:.... prefixlen 64"`
      - `ipv6_ifconfig_bge0_alias0="2001:ffff:0:2::2 prefixlen 64"`
      - `ipv6_defaultrouter="fe80::1%bge0"`

- FreeBSD
  - **Principali operazioni**
    - Aggiungere/rimuovere IPv6 a[da] una interfaccia
      - `ifconfig bge0 inet6 add 2001:918:fffc:12:1::2 prefixlen 64 [delete]`
    - Abilitare/disabilitare l'autoconfiguration
      - `Sysctl -w net.inet6.ip6.accept_rtadv=1`
      - `Sysctl -w net.inet6.ip6.accept_rtadv=0`
    - Aggiungere una static route IPv6 ad un host
      - `route add -inet6 2001:800:40::1 fe80::209:c0ff:fe30:4357%bge0`
    - Aggiungere una static route ad una network
      - `route add -inet6 2001:800:40::/48 fe80::209:c0ff:fe30:4357%xl0`

# Configurazione BSD

- FreeBSD
  - **Principali operazioni**
    - Rimuovere una static route
      - `route delete -inet6 2001:800:40::/48 fe80::209:c0ff:fe30:4357%bge0`
    - aggiungere/rimuovere default route
      - `route add[delete] -inet6 ::/0 fe80::209:c0ff:fe30:4357%bge0`

[http://wiki.freebsd.org/IPv6\\_Userland\\_and\\_Kernel\\_issues](http://wiki.freebsd.org/IPv6_Userland_and_Kernel_issues)

# Other OS

- Windows 7 e Windows 2008 r2 avranno supporto per ipv6-only (per windows xp le queries al DNS vanno solo su ipv4, quindi non si pu; usare solo il trasporto ipv6)
- OpenBSD dalla versione 2.7 supporta ipv6 (anche netbsd ha implementazione dello stack kame)
- MAC OS dalla versione 10.2 ha lo stack ipv6 incluso (ma non c'e' supporto ipv6 per mac os 9)
- Solaris dalla versione 8 e' ipv6-ready
- AIX e' ipv6 ready

- Eccoci ai servizi...

- NTP e' cruciale per l'operativita' di servizi di networking (OWD, central syslog collector...)
  - Lista di NTP servers IPv6 compliant
    - [http://wiki.go6.net/index.php?title=IPv6\\_NTP](http://wiki.go6.net/index.php?title=IPv6_NTP)
      - **Stratum 1**
        - \* ntp.hexago.com
        - \* ntp.rhrk.uni-kl.de
        - \* ntp6.remco.org
        - \* chime3.ipv6.surfnet.nl
        - \* ntp1.ipv6.lrz-muenchen.de
      - **Stratum 2-3**
        - \* ntp.pouf.org
        - \* ntp6.space.net
        - \* ntp.ipv6.linux.ee
        - \* noc.sixxs.net
        - \* nlams01.sixxs.net
        - \* ntp1.bit.nl
        - \* ntp2.bit.nl
        - \* ntp.doubleukay.com
        - \* ntp1.ipv6.teleport-iabg.de
        - \* ntp2.ipv6.teleport-iabg.de
        - \* time.sn4wd.com
        - \* ntp6.axu.tm

- Configurare un NTP server con supporto IPv6
  - Il supporto per IPv6 in ntpd e' garantito dalla versione 4.2.0 (prod. di 4.1.74)
    - It *must be mentioned* that NTP <= at least v4.2.0a does NOT support listening on IPv6 IPs.
    - ntp-dev-4.2.5p16 can
  - In caso di multicast /etc/ntp.conf
    - manycastclient ff05::101 autokey iburst
    - manycastserver ff05::101
  - IANA has assigned the multicast group address IPv4 224.0.1.1 and IPv6 [ff05::101](#) (site local)



# SSH (OpenSSH)

- Ho già un servizio SSH attivo in IPv4 e nella mia rete ho implementato IPv6, cosa devo fare per renderlo IPv6 compliant?
  - Nulla 😊
  - Eventualmente in `/etc/ssh/sshd_config` specificare l'address family inet6 per listening solo su IPv6
- **AddressFamily** inet6
- **AddressFamily** any (IPv4 e IPv6)
- **#ListenAddress** 0.0.0.0
- **ListenAddress** ::

# ...scp...

---

- `root:~# scp ups.py root@[2001:760:224:e8ff:fe4c:fb91]:`

- Ho già' un servizio di posta elettronica attivo in IPv4 e nella mia rete ho implementato IPv6, cosa devo fare per renderlo IPv6 compliant?
  - SMTP
    - Sendmail
    - Postfix
    - EXIM
  - IMAP
    - Cyrus
    - Uw-imap
    - Dovecot

- SMTP IPv6 configuration:
  - Sendmail
    - **Sendmail supporta IPv6 a partire dalla versione 8.10**
    - **Installazione dai sorgenti**
      - Abilitare in devtools/Site/site.config.m4 il supporto per IPv6
        - APPENDDEF(`confENVDEF', `-DNETINET6')dnl
    - **Configurazione:**
      - Abilitare listening IPv6 in sendmail.mc
        - DAEMON\_OPTIONS(`port=smtp,Addr>:::1, Name=MTA-v6, Family=inet6')dnl
      - Abilitare listening IPv4 e IPv6 in sendmail.mc
        - DAEMON\_OPTIONS(`Name=MTA-v4, Family=inet, Name=MTA-v6, Family=inet6')dnl
      - Rigenerare il cf con m4 /etc/mail/sendmail.mc > /etc/mail/sendmail.cf
      - Controllare I parametri nel .cf
        - RIPv6:::1                    \$@ RELAY                    originated locally
        - R\$\* [ IPv6 : \$+ ] <@>   \$: \$1 [ IPv6 : \$2 ]                    unmark IPv6 addr

- SMTP IPv6 configuration :
  - Postfix
    - Il supporto per IPv6 e' incluso nella major release 2.2 (Gennaio 2005)
    - Configurazione nel file main.cf
      - [inet\\_protocols](#) = all (enable IPv4, and IPv6 if supported)
      - [inet\\_protocols](#) = ipv4, ipv6 (enable both IPv4 and IPv6) [inet\\_protocols](#) = ipv6 (enable IPv6 only)
      - [smtp\\_bind\\_address6](#) =  
2001:240:587:0:250:56ff:fe89:1

- SMTP IPv6 configuration :
  - EXIM
    - Exim supporta IPv6 dalla versione 4.30

- SMTP IPv6 configuration :
  - Microsoft Exchange
    - Exchange NON supporta IPv6 ne' nella versione 2003 ne' la versione 2007
      - SOLO IPv6 Support in Exchange 2007 SP1 e Windows Server 2008
        - <http://technet.microsoft.com/en-us/library/bb629624.aspx>
        - *IPv6 is only supported in Exchange 2007 SP1 when it is installed on a Windows Server 2008 computer that has both IPv4 and IPv6 enabled. If you disable the IPv4 protocol, Exchange 2007 SP1 can't support IPv6.*

- Spamassassin
  - Di default spamassassin supporta nativamente IPv6
  - Controllare che nello script di avvio non sia disabilitato l'uso della risoluzione DNS IPv6
    - `--ipv4only`, `--ipv4-only`, `--ipv4` Disable attempted use of ipv6 for DNS



- IMAP IPv6 configuration:
  - Uw-imap
    - Il supporto per IPv6 va abilitato a livello del superdaemon inetd (o xinetd) che avvia il processo imapd
      - Si modifica il file di configurazione /etc/inetd.conf
        - Imap stream tcp6 nowait root /usr/sbin/tcpd  
imapd
      - Per loggare le connessioni IMAP IPv6 si utilizza TCP WRAPPERS modificando il file di configurazione /etc/hosts.allow
        - Imapd: ALL: severity mail.info : allow

- IMAP IPv6 configuration:
  - Cyrus
    - Il supporto nativo per IPv6 e' garantito dalla versione 2.2.0
      - \* Thu Aug 22 2002 Simon Matter <simix@datacomm.ch> - included IPv6 patch from Hajimu UMEMOTO
    - nella versione 2.1.x bisogna specificare nel file di configurazione cyrus.conf il parametro tcp (e non tcp6, che abilita soltanto il supporto per IPv6)

- IMAP IPv6 configuration:
  - Dovecot
    - Per abilitare il supporto nativo in dovecot modificare il file di configurazione aggiungendo le righe sotto riportate:

```
imap_listen = [::]
pop3_listen = [::]
```

- Apache
  - [Apache1](#) does support IPv6 only with external patch (for versions 1.3.11 - 1.3.33)
  - Apache2 supporta nativamente IPv6
  - Configurazione
    - Il file di configurazione e' httpd.conf in cui occorre specificare l'indirizzo IPv6 su cui si fara' il listening (SEMPRE square brackets!)
      - Listen [::]:80
      - Listen [2001:e30::DEAD:BEEF]:80

- Apache2
  - Network/IP Access Control
    - In httpd.conf

```
<Directory /var/www>
 Order deny,allow
 Deny from all
 Allow from 2001:db8:0:1::/64
</Directory>
```

# Lighttpd

- Lighttpd supports both IPv6 and IPv4 protocol out of box.
- You need to compile lighttpd with IPv6 support.
- First, see compile-time features (find out if IPv6 is enabled or not), enter:
  - `lighttpd -V`
    - **Features: + IPv6 support**

Changelog: 25.12.2003 16:01

some compile fixes for FreeBSD have been applied and new switch has been added to choose between IPv4 and IPv6 on FreeBSD.

(cmdline: `-6`, configfile: `server.use-ipv6`)

- IIS (Windows Server 2003)
  - Configurazione
    - Se IPv6 e' gia' installato e configurato sulla macchina, IIS rispondera' a queries IPv6 senza necessita' di ulteriori configurazioni applicative
    - Riavviare IIS se si configura IPv6 quando IIS e' up and running
  - Browsers IPv6 compliant
    - Internet Explorer does not support [RFC 2732](#) style literal IPv6 addresses in URL, only IPv6 addresses
  - La console di gestione di IIS (IIS Manager) non supporta indirizzamento IPv6

- Starting with the Dec 16th 2007 daily snapshot of squid3-HEAD includes the long-awaited squid3-ipv6 branch of squid.
  - <http://www.squid-cache.org/Versions/v3/HEAD/>
- To build the feature just add `–enable-ipv6` to your configure options.



# NIS - Servizi di autenticazione centralizzata

- Support for IPv6 Protocol  
full support for client and server
- The maps that store host information for NIS are  
**hosts**  
**ipnodes**

The **/etc/hosts** file contains both **IPv4** and **IPv6** information. When NIS maps are built, NIS filters the IPv4 information from the **/etc/hosts** file to build the **hosts** maps that contain only IPv4 information. It also filters **/etc/hosts** to build the **ipnodes** maps, such as **ipnodes.byaddr** and **ipnodes.byname**, that contain both IPv4 and IPv6 information.

**ipnodes** are a superset of **hosts** and act as the **hosts** database for **IPv6** information.

- **# ypcat protocols**

|            |    |            |                                             |
|------------|----|------------|---------------------------------------------|
| ipv6-opts  | 60 | IPv6-Opts  | # Destination Options for IPv6              |
| ipv6-nonxt | 59 | IPv6-NoNxt | # No next header extension header for IPv6  |
| ipv6-icmp  | 58 | IPv6-ICMP  | # IPv6 internet control message protocol    |
| ah         | 51 | AH         | # Authentication Header for IPv6            |
| esp        | 50 | ESP        | # Encap Security Payload for IPv6           |
| ipv6-frag  | 44 | IPv6-Frag  | # Fragment header for IPv6                  |
| ipv6-route | 43 | IPv6-Route | # Routing header for IPv6                   |
| ipv6       | 41 | IPv6       | # IPv6 in IP encapsulation                  |
| rdp        | 27 | RDP        | # "reliable datagram" protocol              |
| xns-idp    | 22 | XNS-IDP    | # Xerox NS IDP                              |
| hmp        | 20 | HMP        | # host monitoring protocol                  |
| udp        | 17 | UDP        | # user datagram protocol                    |
| pup        | 12 | PUP        | # PARC universal packet protocol            |
| egp        | 8  | EGP        | # exterior gateway protocol                 |
| tcp        | 6  | TCP        | # transmission control protocol             |
| ggp        | 3  | GGP        | # gateway-gateway protocol                  |
| icmp       | 1  | ICMP       | # internet control message protocol         |
| ip         | 0  | IP         | # internet protocol, pseudo protocol number |

# LDAP - servizi di autenticazione centralizzata

- LDAP

OpenLDAP Version 2.0, released in August, 2000, included major enhancements including LDAP version 3 (LDAPv3) support, Internet Protocol version 6 ([IPv6](#))

```
root:~# man 8 slapd
```

```
Reformatting slapd(8), please wait...
```

```
NAME
```

```
slapd - Stand-alone LDAP Daemon
```

```
OPTIONS
```

```
-4 Listen on IPv4 addresses only.
```

```
-6 Listen on IPv6 addresses only.
```

# Autenticazione RADIUS

- FreeRADIUS
  - FreeRADIUS 1.1.x does not particularly care if the host it runs on is dual-stack. It will work just fine, but only use the IPv4 stack of the machine. It will also transport IPv6 RADIUS attributes just fine but will NOT send packets over IPv6.
  - *FreeRADIUS Server 2.0.0 and greater has full support for both IPv6 attributes and IPv6 network packets.*
- Radiator (<http://www.open.com.au/radiator>)
  - Supports IPV4 and IPV6 on RADIUS, proxy, TACACS , SNMP connections etc.
  - BindAddress 10.x.x.x,127.0.0.1, **ipv6:2001:y:y:y::y**

# DNS – considerazioni generali

- La risoluzione di indirizzi IPv6 e' indipendente dal protocollo di trasporto delle richieste di risoluzione
  - si puo' usare IPv4 per richiedere record AAAA
- Il client sceglie che tipo di query DNS fare sulla base del DNS presente in /etc/resolv.conf
  - Se questo e' un indirizzo IPv6, il client fa solo richieste di risoluzione IPv6
- Per PC sotto Windows NON e' possibile usare IPv6 per trasporto DNS

- BIND9
  - Come abilitare/disabilitare il supporto IPv6 (non e' abilitato di DEFAULT)

- Nel file di configurazione /etc/bind/named.conf

```
options {
 listen-on-v6 [port ip_port]{ any[none]; };
};
```

- Semplici ACL di base

```
acl internal-net {
 127.0.0.1;
 10.10.10.0/24;
 2001:0db8:100::/64;
 ::1/128;
 ::ffff:10.10.10.10/128;
};
acl ns-internal-net {
 10.10.10.1;
 10.10.10.2;
 2001:0db8:100::4/128;
 2001:0db8:100::5/128;
};
```

- BIND9

- ACL di base – uso:

```
options {
 # sure other options here, too
 listen-on-v6 { none; };
 allow-query { internal-net; };
 allow-transfer { ns-internal-net; };
};
```

- Usare un IPv6 address source specifico per lo zone transfer
      - `transfer-source-v6 <ipv6addr|*> [port port];`
    - Indirizzo IPv6 per le notifiche (transfer di zone etc..)
      - `notify-source-v6 <ipv6addr|*> [port port];`

- BIND9

- ACL di base – uso:

```
options {
 # sure other options here, too
 listen-on-v6 { none; };
 allow-query { internal-net; };
 allow-transfer { ns-internal-net; };
};
```

- Usare un IPv6 address specifico per lo zone transfer
    - `transfer-source-v6 <ipv6addr|*> [port port];`



- BIND8
  - Il supporto di IPv6 RR e' garantito dalla release 8.0
  - La libreria di risoluzione in BIND8 supporta il trasporto IPv6 dalla versione 8.3.0
  - Il server in BIND8 supporta il trasporto IPv6 a partire dalla versione 8.4.0
  - Per la sintassi e la configurazione valgono le stesse regole in uso per BIND9

# DNS – esempi di configurazione

## ▪ Zona diretta

```
$TTL 86400
$ORIGIN iitk.ipv6.ernet.in.
@ IN SOA ns.iitk.ipv6.ernet.in. navi@iitk.ac.in. (
 2005031701 ; serial
 3H ; refresh
 15M ; retry
 1W ; expiry
 1D) ; minimum

 IN NS ns.iitk.ipv6.ernet.in.
; IN NS ns.iitk.ernet.in
 IN MX 10 mail.iitk.ipv6.ernet.in.
;*.ipv6.ernet.in. IN MX 0 mail.iitk.ipv6.ernet.in.
$ORIGIN iitk.ipv6.ernet.in.
proxy IN A 202.141.43.129
mail IN A 202.141.43.130
mail IN AAAA 2001:e30:1400:1:212:79ff:fe95:d21b
ns IN CNAME mail
```

# DNS – esempi di configurazione

- Zona inversa

```
$TTL 3d ; Default TTL
@ IN SOA 0.3.e.0.1.0.0.2.ip6.arpa. navi.iitk.ac.in. (
 200503160 ; Serial number (YYYYMMdd)
 24h ; Refresh time
 30m ; Retry time
 2d ; Expire time
 3d ; Default TTL
)

 ; Name server entries
IN NS ns.iitk.ipv6.ernet.in.

; IPv6 PTR entries

; Subnet #1 IIT - Kanpur
$ORIGIN 1.0.0.0.0.0.4.1.0.3.e.0.1.0.0.2.ip6.arpa.

b.1.2.d.5.9.e.f.f.f.9.7.2.1.2.0 IN PTR mail.iitk.ipv6.ernet.in.

; Subnet #2 ERNET Delhi
$ORIGIN 1.0.0.0.1.0.8.1.0.3.e.0.1.0.0.2.ip6.arpa.

3.0.2.f.5.9.e.f.f.f.9.7.2.1.2.0 IN PTR mail.eis.ipv6.ernet.in.
; End of zone file.
```

# Windows Active Directory

- AD in configurazione IPv6 only e' supportata solo in Windows Server 2008
- Nel 2003 Server solo supporto per dual stack
  - Per un elenco delle caratteristiche IPv6 supportate da Windows Server 2003 si veda
    - <http://technet.microsoft.com/en-us/library/cc776103.aspx>

- MySQL
  - At <http://www.ngn.euro6ix.org/IPv6/mysql> you will find a patch to make the last stable version on MySQL, (4.0.8) ready to run on the new protocol IPv6. (05 Jul 2004 )
  - Installazione dai sorgenti
    - **Compilare con l'opzione `-with-ipv6`**

# Support in other DBMSs

## PostgreSQL

On Fri, 2002-11-29 at 02:35, Nigel Kukard wrote: > We have just finished porting the old KAME **IPv6** patch over to > **postgresql** version 7.3, but yea... this patch adds full **IPv6** > support to postgres.

Allows storage of IPv6 in its cidr and inet data types:  
<http://www.postgresql.org/docs/current/static/datatype-net-types.html> but in the authentication section we read that ... "entries in IPv6 format will be rejected if the system's C library does not have support for IPv6 addresses".

**Oracle Tuxedo 10g Release 3 (10.3)** only supports IPv6 basic functionality in this release. Advanced IPv6 features (for example, QoS and flow control) are not supported.

**11g Release 2** is ok ([Note 287176.1](#) for instructions on 11i, R12 doesn't need additional work on this )

**SQL Server 2005** can connect with ipv6, according to  
[http://blogs.msdn.com/sql\\_protocols/archive/2005/10/12/480192.aspx](http://blogs.msdn.com/sql_protocols/archive/2005/10/12/480192.aspx)

**DB9 IBM DB** dalla versione 9

- “Stateful” autoconfiguration for IPv6 is provided by DHCPv6.

**Server File : /etc/dhcp6s.conf**

```
interface eth0 {
server-preference 255;
renew-time 60;
rebind-time 90;
prefer-life-time 130;
valid-life-time 200;
allow rapid-commit;
link <link name> {
 pool{
 range 2001:0E30:1402:2::4 to 2001:0E30:1402:2::ffff/64;
 prefix 2001:0E30:1402::/48;
 };
};
};
```

- **Sunday, April 23, 2006**
  - [Committed IPv6 support for syslog-ng](#)
  - I have finished IPv6 support for syslog-ng, I'm wondering how this will improve the number of people actually using the new syslog-ng 1.9.x tree.
    - <http://bazsi.blogs.balabit.com/2006/04/committed-ipv6-support-for-syslog-ng.html>



# File Transfer Service (FTP)

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- Vsftpd
  - Per abilitare il supporto IPv6 (dalla versione 1.2) inserire nel file di conf. `/etc/vsftpd.conf` la direttiva
    - `Listen_ipv6`

- Se compilati dai sorgenti, IdP, SP e DS/WAYF devono specificare il supporto IPv6
  - `./configure .... --enable-ipv6`
- IPv6 deve essere configurato (dual stack) sia su IdP che su SP (e ovviamente su DS/WAYF)
- Se non si sicuri che l'intera chain (client+IdP+SP+DS) supporti il dual stack, disabilitare l'address checking sul SP (file */etc/shibboleth/shibboleth.xml*) per evitare problemi di risoluzione dei nomi
  - `checkAddress = "false"`
    - Note that if the value of checkAddress is set to "false", this has a slightly negative impact on the security of the SP. This security feature checks the user's IP address at the SP and compares it with the IP address used at the IdP. If they don't match, an error is thrown. This rather strict security feature can cause problems for users behind proxies or for users with IPv6 addresses.

- Shibboleth 2.x:
  - Debian package precompilato IPv6:
    - **Stable 2.0**
    - **Unstable 2.1**
      - *shibboleth-sp2-schemas* (version *2.1.dfsg1-2*)
      - *Libapache2-mod-shib2* (2.1.dfsg1-2)

- Nota di rilascio Fedora Core 8:
  - Ever since Fedora 8, the Fedora curl packages have been [linked against NSS rather than OpenSSL](#). For a reason I don't fully understand, this [breaks](#) how Shibboleth, specifically the [xmltooling package](#), uses curl for the attribute exchange process.

Long story short, **recompiling an up to date curl SRPM** with the spec file edited to use OpenSSL again appears to work. This should allow an upgrade path to Fedora 9+10.

- Workaround:
  - **Ricompilare le libcurl con il supporto IPV6**
    - `./configure --enable-ipv6`

- Netflow v5 - Fixed record format, no support for IPv6
  - Supported by Cisco, Juniper, Alcatel
- Netflow v9 - Variable record format/template, supports IPv6
  - Supported by Cisco and Juniper although Juniper doesn't yet support IPv6 traffic reporting in cflowd v9

# Analisi dei flussi - NETFLOW

- Cisco IPv6 netflow v9 configuration
  - ipv6 flow-export version 9
  - Ipv6 flow-export destination <ip-address> <port-no>
  - Ipv6 flow-export template refresh-rate <rate-value>
  - Ipv6 flow-export template timeout <timeout-value>
- Interface specific commands
  - Ipv6 flow ingress
  - Ipv6 flow egress
- CLI commands
  - Show ip cache flow
  - Clear ip flow stats

- Perche' VoIP beneficera' di una rete IPv6
  - Meno NAT (introducono ulteriori problemi nella diagnostica delle comunicazioni VoIP)
  - IPv6 implementa QoS nativamente

# VOIP – Asterisk, SER

- Porting di Asterisk su IPv6 (Viagenie)
  - <http://www.asteriskv6.org>
- Known issues:
  - only SIP (and the relevant auxiliary libs: rtp, netsock,...) is ported to IPv6.
  - IAX is not yet ported to ipv6.
- Known VoIPv6 clients:
  - Most [Snom phones](#) support IPv6.
  - [linphone](#)
  - [Kphone](#) Kphone [IPv6 version \(old\)](#)
  - [Counterpath](#) Eyebeam Windows version. [Click here](#) to download a test version.
- Known VoIPv6 test tools
  - <http://sipp.sourceforge.net/> SIPP SIP performance tool
  - <http://www.tahi.org> TAHI IPv6 Test suite.



- Problemi noti
  - MOODLE 1.9.x (database field length bug):
    - Con server con indirizzo IPv6, the "Live Logs" feature no longer displays a correct address
    - Risolto in MOODLE 2.x
  - chatd.php doesn't allow use of ipv6 addresses

# File systems

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- nfsd su ipv6: nfsv4 e kernel  $\geq$  2.6.29
- AFS doesn't support IPv6 (2009/05/05 )
- GFS, GPFS, Lustre ???

- [Iperf](#) supports IPv6 from Version 1.7.0
- **Server IRC**
  - UnrealIRCd supports IPv6, since beta15 it seems to be stable. Enable IPv6 support in UnrealIRCd during ./Config as well.
- **Jabber**
  - Ejabberd - add the option 'inet6' to the listened socket on ejabberd.cfg
- **Samba**
  - <http://www.litech.org/samba/> from 20020419
- **VMware**
  - ESX Server 3i and version 3.5 support virtual machines configured for IPv6.
    - [http://www.vmware.com/files/pdf/technology/ipv6\\_support\\_vi3.pdf](http://www.vmware.com/files/pdf/technology/ipv6_support_vi3.pdf)

# ...how to disable IPv6

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- Windows Vista
  - [http://wiki.williams.edu/download/attachments/17035/Disable\\_IPV6\\_Vista.pdf](http://wiki.williams.edu/download/attachments/17035/Disable_IPV6_Vista.pdf)
- RHEL, CentOS, Fedora
  - <http://www.g-loaded.eu/2008/05/12/how-to-disable-ipv6-in-fedora-and-centos/>
- Debian
  - <http://fips.at/how-to-disable-ipv6-in-debian.html>