

IPv6 Deployment Status in Taiwan



Taiwan Network and Information Center (TWNIC)
APNIC IPv6 Technical SIG@Taipei, Taiwan

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27 February, 2008

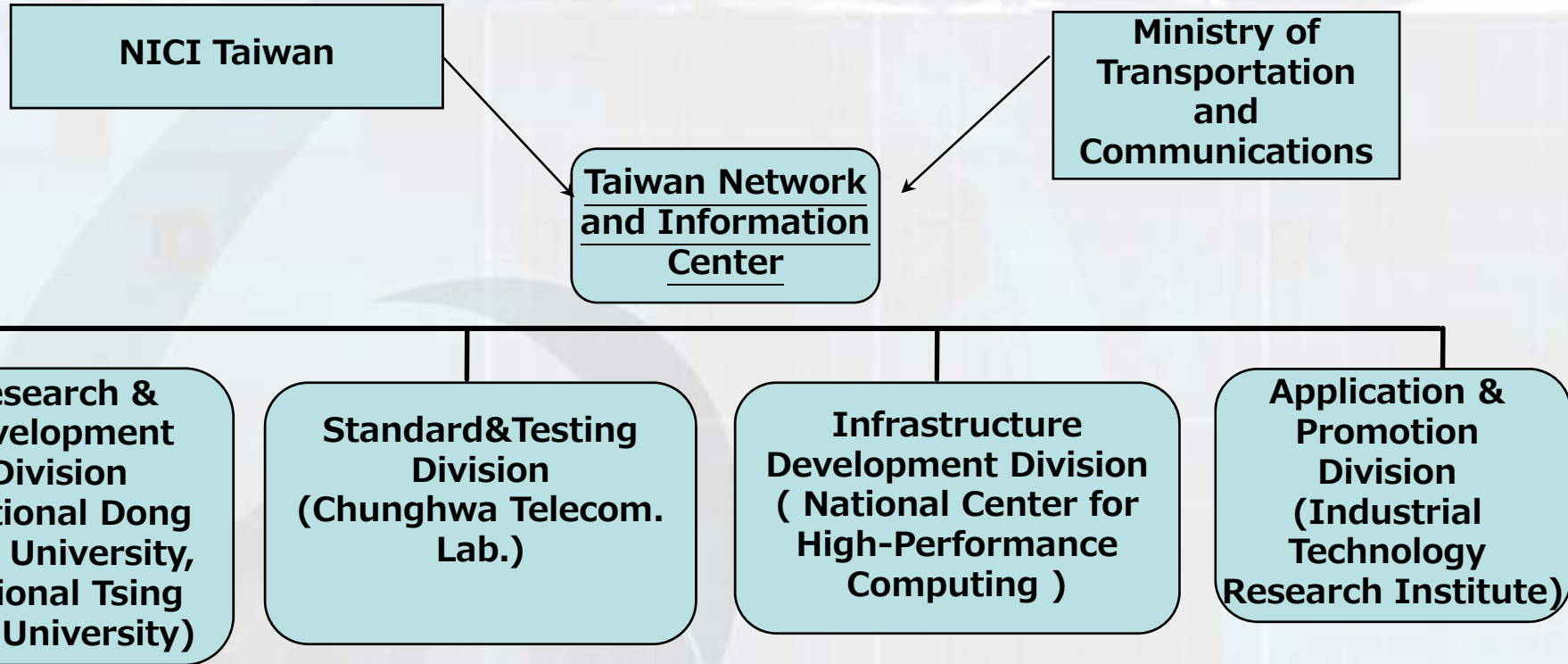
- Surrounding Air
- IPv6 Deployment and Development Program in Taiwan
 - IPv6 Infrastructure
 - IPv6 Access services
 - IPv6 Ready Products
 - IPv6 Application Services
 - IPv6 Application Exhibitions

Surrounding Air

- IPv4 address Depletion is **indeed** approaching.
- Personal Communication (Data/Voice) Explosive growth.
- All-IP era blooming (U-Japan, U-Korean, U-Taiwan, ...)



IPv6 Project Execution Organization



Project Involved:

1. Biggest ISP R&D department (Chunghwa Telecom. Lab.)
2. Ten Universities (National Taiwan University, Tsing Hua University,...)
3. Industrial promotion and Development (Industrial Technology Research Institute)
1. Academic Internet (National Center for High-Performance Computing)



IPv6 Network Infrastructure in Taiwan

- **Moving steadily towards IPv6**
 - 27 IPv6 address blocks allocated
 - Total 2309 /32 address allocated
- **IPv6 Backbone in Taiwan**
 - Academic & Research Networks
 - TWAREN / TANet2 (Support IPv6 since Mar. 2004)
 - TANet (Enabling IPv6 in the Backbone)
 - Commercial Networks
 - Most major ISPs (HiNet, Sparq, APOL, SeedNet, TTN, Taiwan NTT, TFN, Gigamedia, So-net) already got IPv6 addresses
 - 7 ISPs provide IPv4/IPv6 tunnel services
 - 2 ISPs provide native IPv6 commercial services HiNet, TTN
 - 2 IPv6 exchange points available, HiNet, Academic Sinica
 - Government network
 - GSN starts to deploy IPv6 in 2005, 4 trial nodes established



Taiwan ISP IPv6 Access services

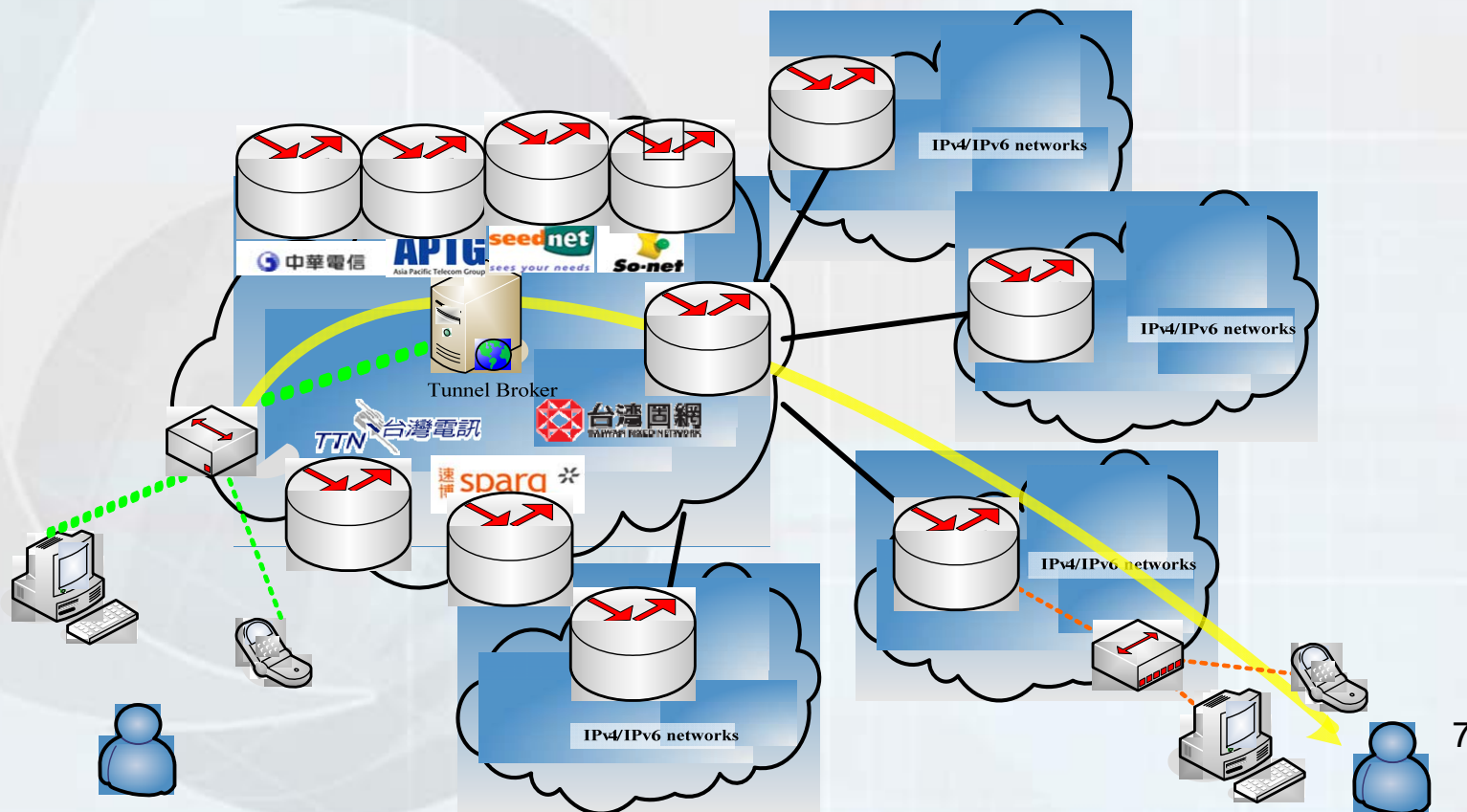
- Native IPv6 service (Lease Line)
- IPv4/IPv6 Tunnel broker service
 - Next-generation Internet Connectivity Environment (NICE)
- IPv4/IPv6 Dual stack service in FTTx

7 ISPs provide IPv6 access Service by IPv6 Tunnel Broker

Next-generation Internet Connectivity Environment (NICE)

- **IPv6 Tunnel Broker Service**

- TWNIC + 7 major ISPs join project
- They provide their users to use free IPv6 tunnel broker service since 9 November, 2007.





News Conference for beginning of ISP IPv6 Tunnel Broker Services



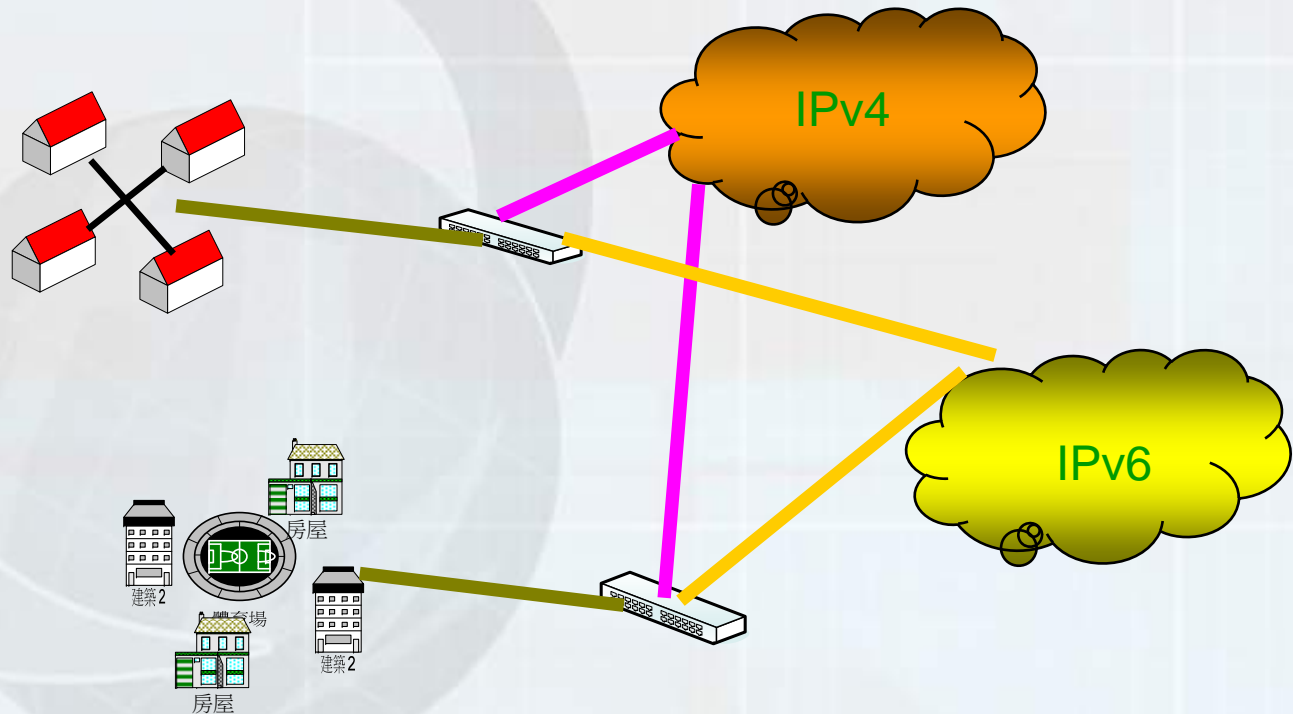
November 9, 2007 in Taipei, Taiwan





IPv4/IPv6 Dual Stack service in FTTx

- **Optical Fiber plus Dual Stack Services v4/v6 in specific communities**
 - Expect to provide FTTx v4/v6 dual stack services on Q2 2008





IPv6 Products by Taiwan Industries

- Home Gateway
- ADSL Wireless IAD
- Enterprise Security Multimedia Router
- Firewall Client Software
- IPv6 IPsec Router
- IPv6 SoC
- IPv6 Video Phone

ZyXEL

ALPHA[®]

明泰科技
Alpha Networks Inc.



ASKEY COMPUTER

AMBIT

Ambit Microsystems Corporation

DMtek
Partnership Now & Future

Leadtek[®]
We Make Dreams a Reality

Accton
Making Partnership Work.

LOOPCOMM
Technology Inc.



National IPv6 Standard & Interop. Testing Lab

- Established in July 2003
- Official delegate of IPv6 Logo Committee, IPv6 Forum
 - IPv6 Ready Logo Phase 1
 - IPv6 Ready Logo Phase 2



Phase I Logo

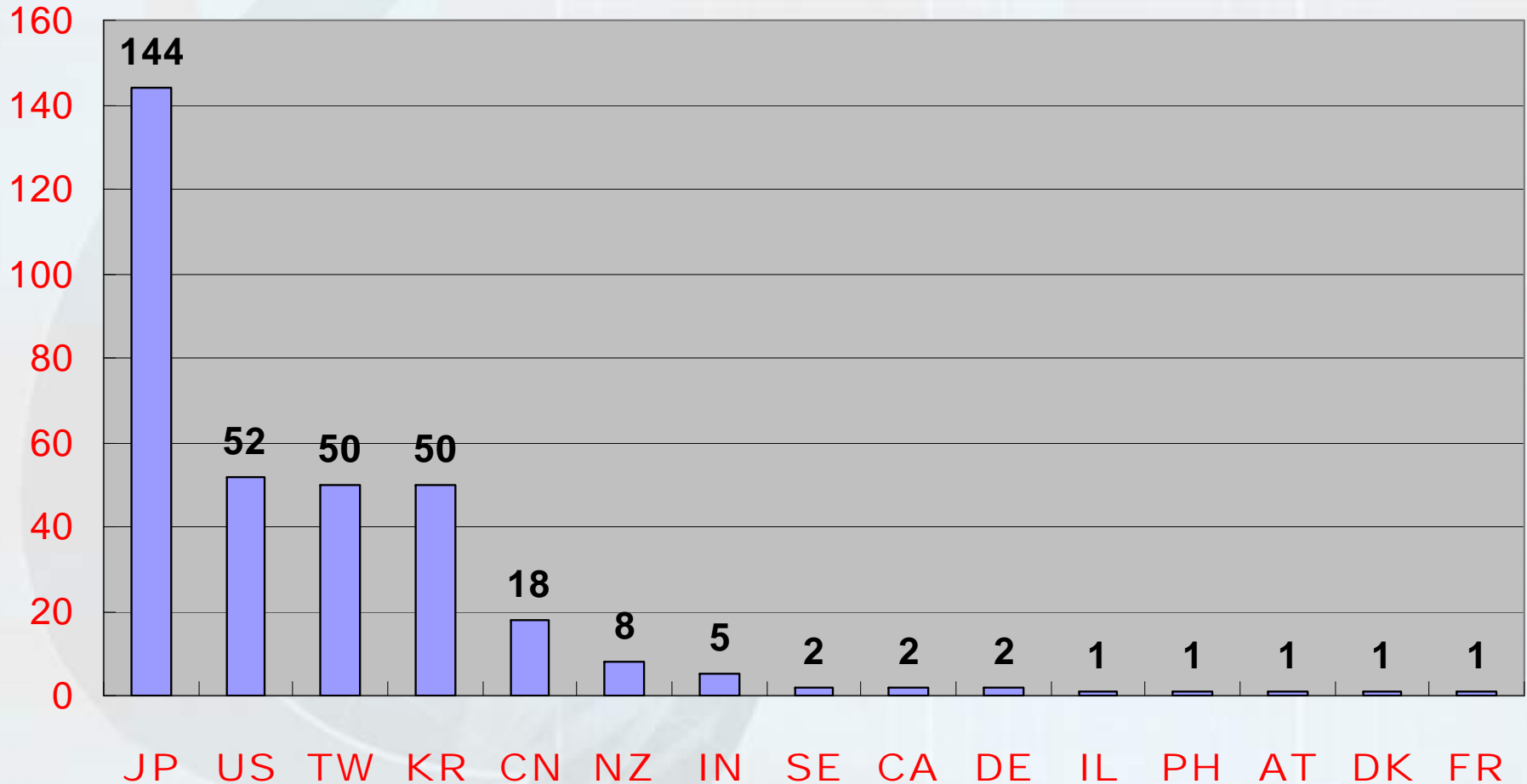


Phase II Logo



IPv6 Ready Logo I (statistic data)

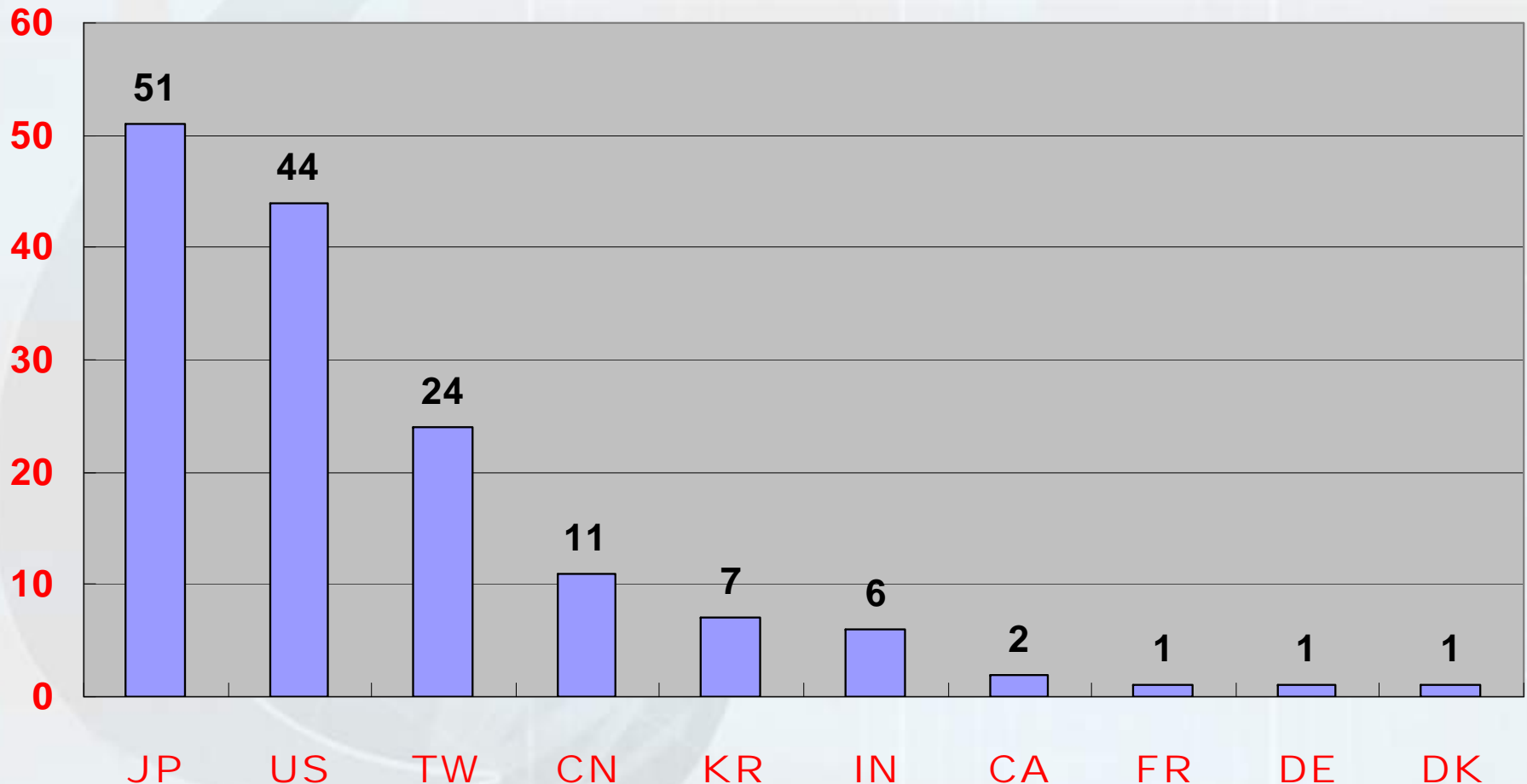
IPv6 Ready Logo Phase I (~20080216)





IPv6 Ready Logo II (statistic data)

IPv6 Ready Logo Phase II (~20080216)



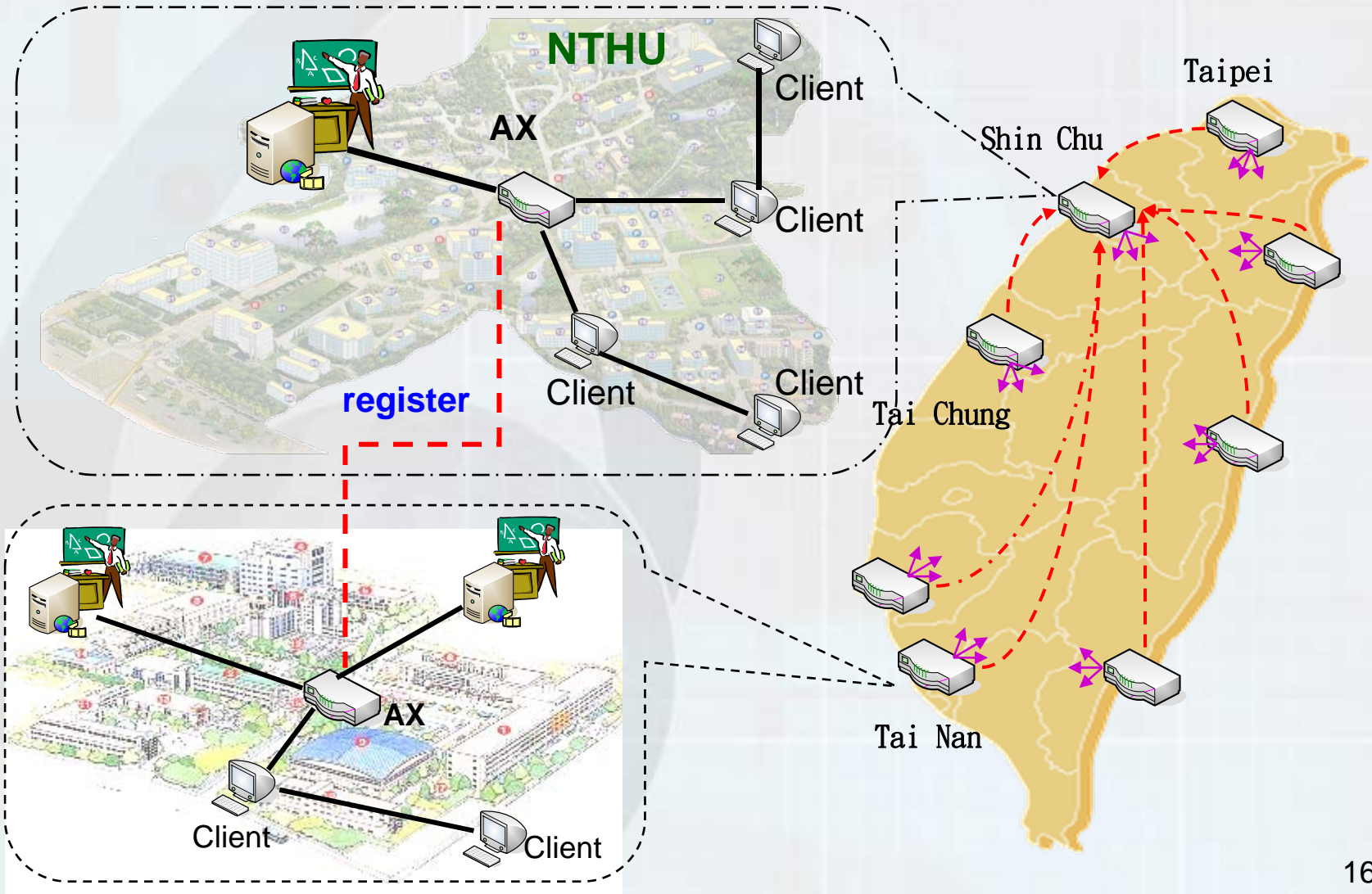


IPv6 Application in Taiwan

- **IPv6 Application**
 - P2P video streaming
 - Integrated Multi-Protocol VoIP Platform
 - Ubiquitous Healthcare
 - IPv6 in elementary school E-Learning (in Tai-Nan City)
 - Real time Weather Observation
 - IPv6 MoD



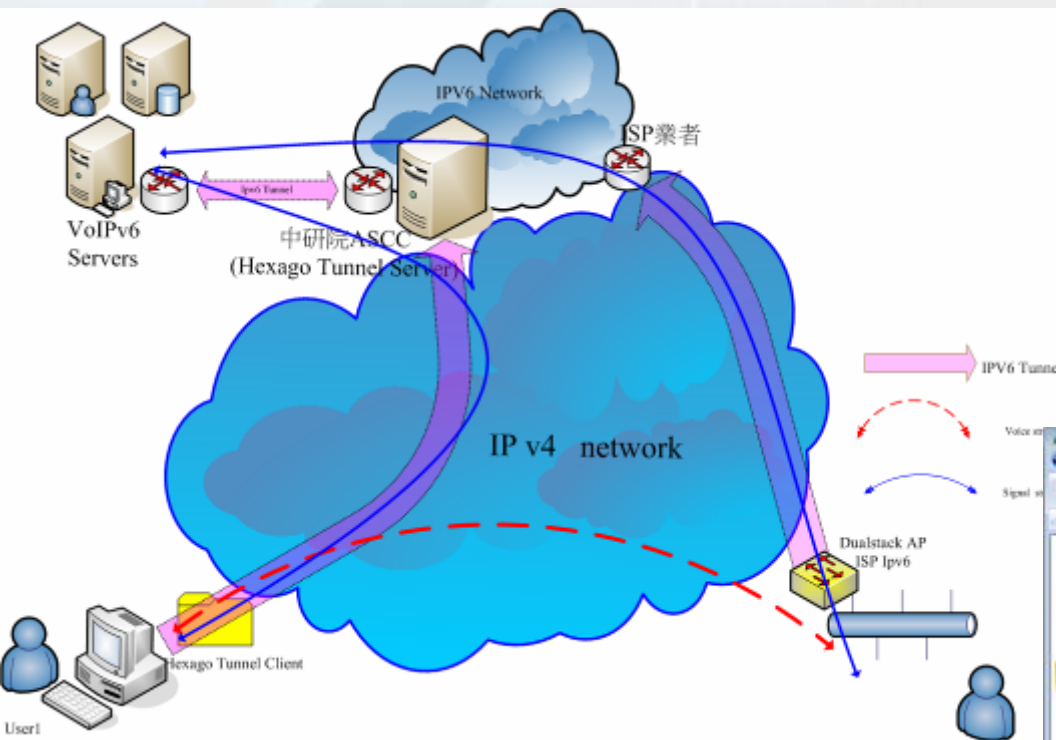
IPv6 Peer2Peer video streaming





Integrated Multi-Protocol VoIP Platform

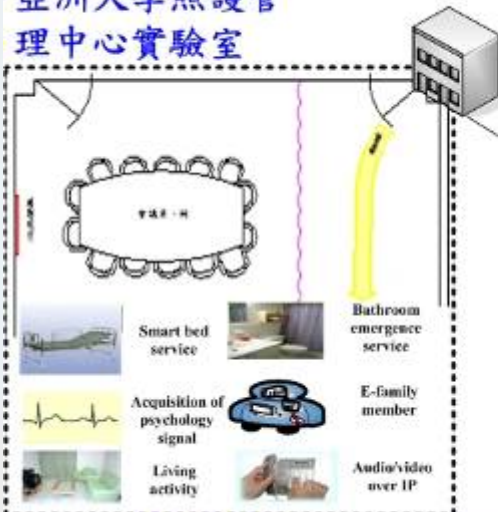
- <http://www.voipv6.artdio.com.tw/Service.aspx>





Ubiquitous HealthcareV6 - in Tai-Chung

亞洲大學照護管
理中心實驗室



服務平台

RFID辨識
整合系統
視訊照
護系統
睡眠照
護系統



亞洲大學健康照護生活示範空間

Future works



IPv6/IPv4 Router

Internet

IPv6/IPv4 Router

IPv6/IPv4 Router



Hospital
(中國醫藥大
學附設醫院)

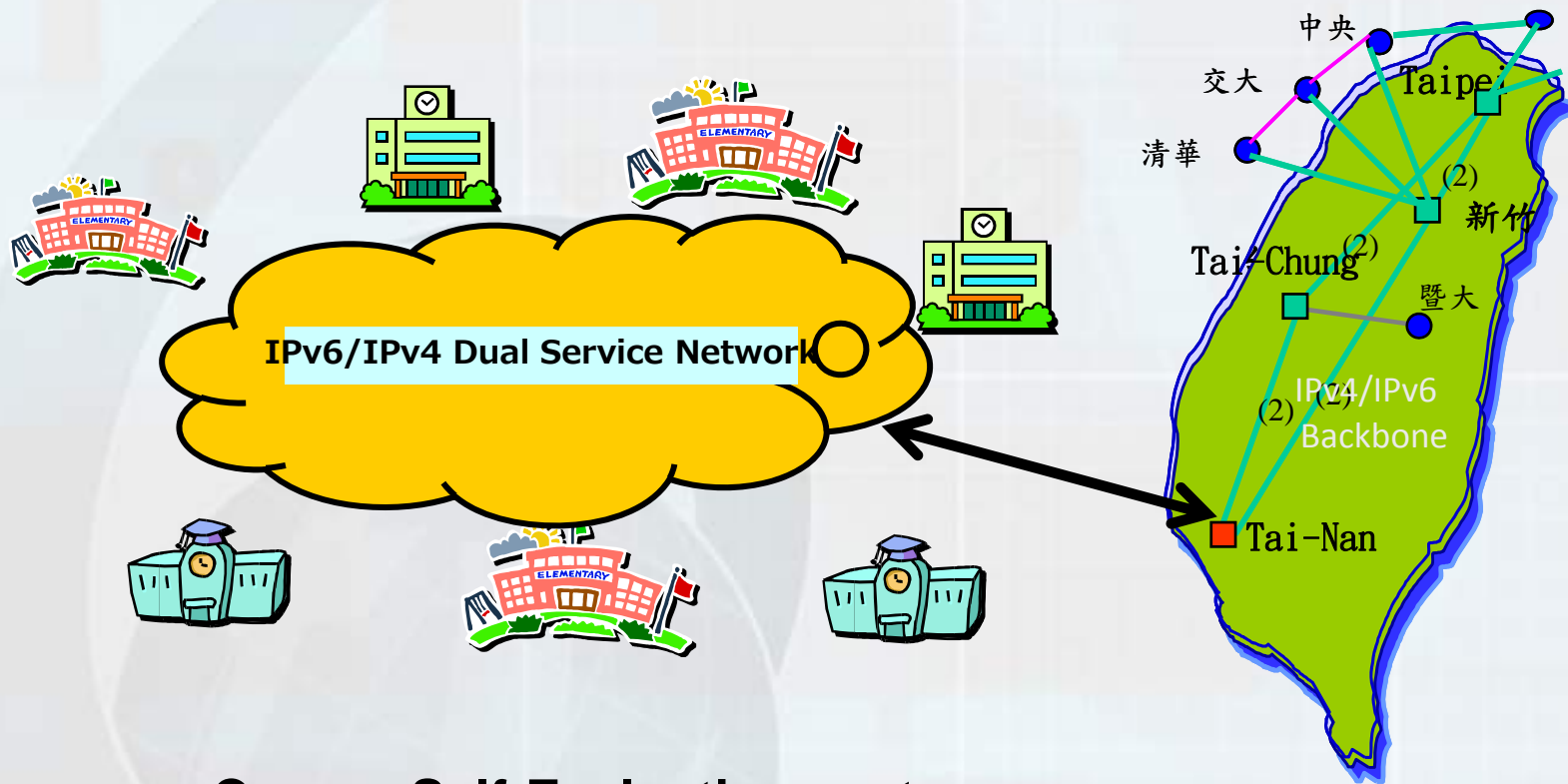
Tai-Chung

Shi-Tou

Tai-Nan

Taipei

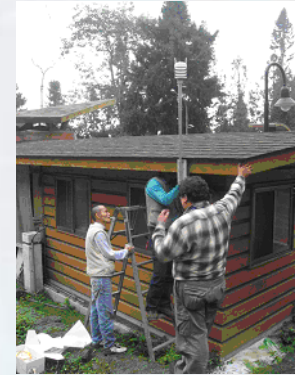
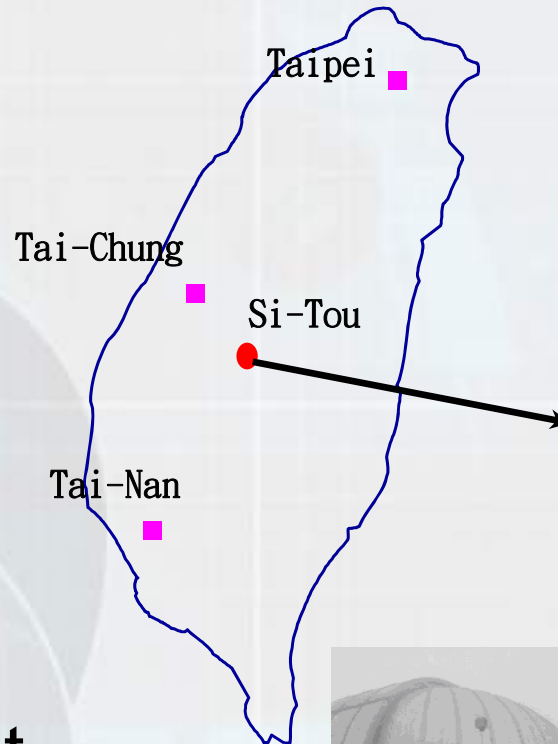
IPv6 in elementary school E-Learning (in Tai-Nan City)



- Language Course Self-Evaluation system
- Social Course Self-Evaluation system
- Language Testing system for Teacher and students

Real time Weather Observation –in Si-Tou

- Joint Project with Japan's Live E! project
- Objects:
 - Research on small scale real time Weather Vibration
 - Educational for Earth preservation
- <http://trace.twnic.net.tw/weather/sensor.php>





Chunghwa Telecom IPv6 MoD (IPv6 Only)

- <http://ipv6.taco.hinet.net>



IPv6 Application Exhibitions

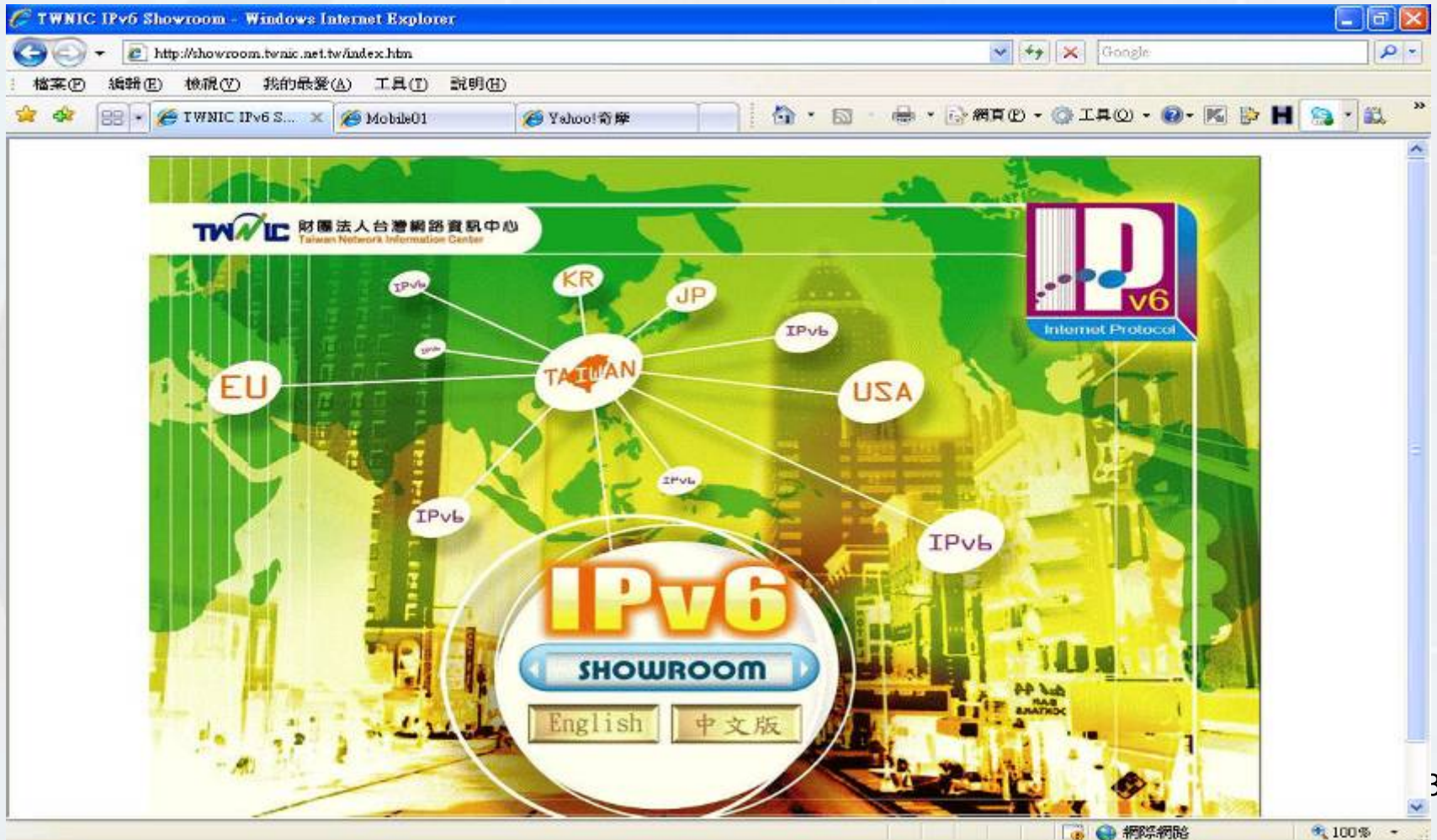


- IPv6 Show Room
- IPv6 Pavilion
 - The exhibition of IPv6 application in further life



TWNIC IPv6 Showroom

- <http://showroom.twnic.net.tw>





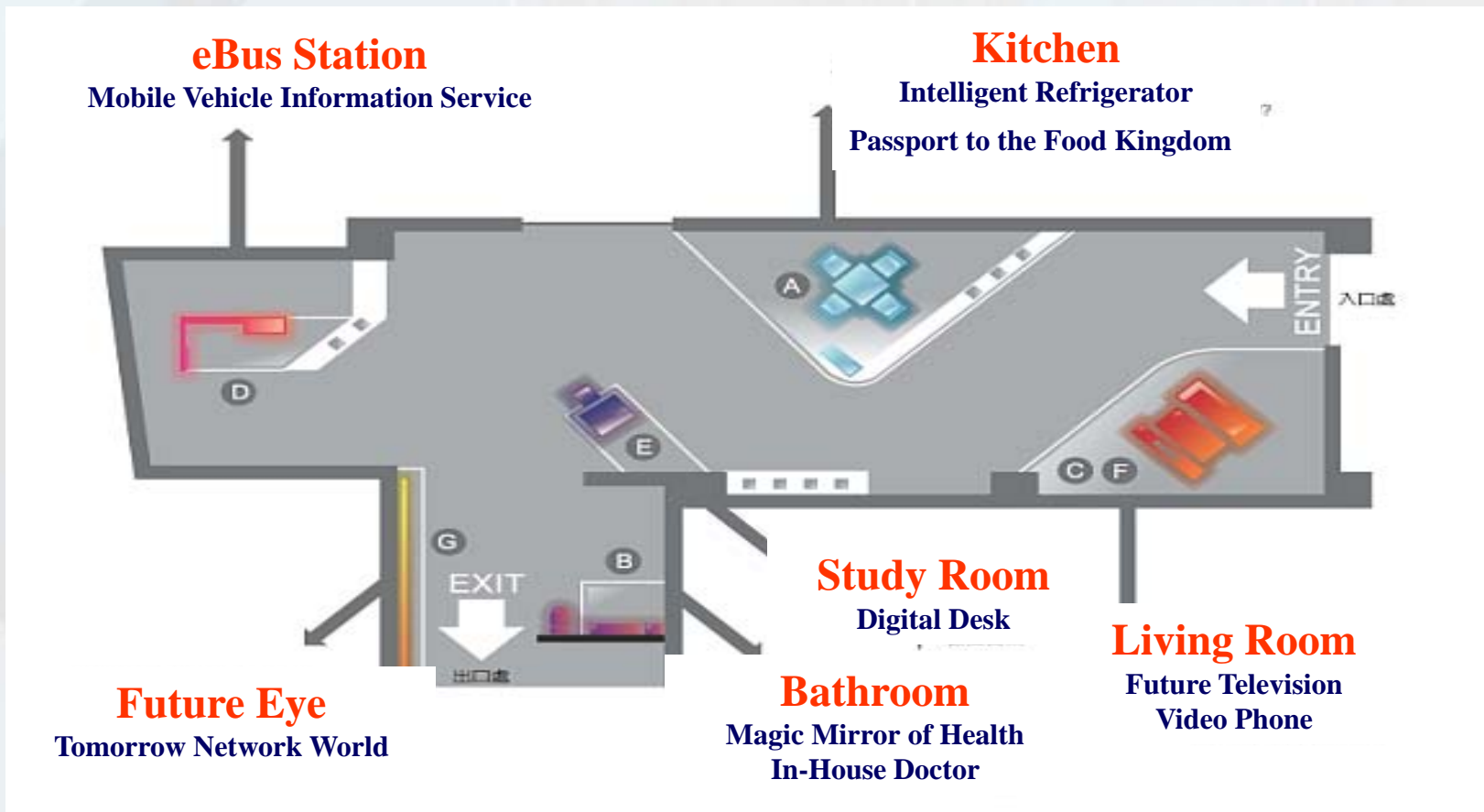
TWNIC IPv6 Showroom Website

- TWNIC-Showroom IPv6 Real-Time Video
- Remote Illumination & Air Conditioning Control
- IPv6 Meteorological Measurement System
- IPv6 News-Ctinews Voicetel VoIPv6
- IPv6 MoD Hinet IPv6



IPv6 Pavilion

- To provide scenario of IPv6 application in future life in National Taiwan Science Education Center (NTSEC), Taiwan, started on 17st, January, 2008.





News Conference for beginning of IPv6 Pavilion

17, January 2008 in
Taipei, Taiwan





TWNIC IPv6 Pavilion

Exhibition of IPv6 Applications in Future Life



2008/ 1/10



2008/ 1/17



Exhibition of IPv6 Applications in Future Life

- The exhibition covers IPv6 applications in daily life such as food supply, medical care, residence, transportation, education and entertainment.





Exhibition of IPv6 Applications in Future Life

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Native IPv6 DNS testing

- IANA adds AAAA records for the IPv6 addresses of six of the 13 root name servers on 4 February 2008, making it possible for two internet hosts to find each other without using the old IPv4 protocol.
- Use Native IPv6 to contact internet on Windows Vista



IP status on Windows Vista(IPv4/IPv6)

```
系統管理員: 命令提示字元
C:\>ipconfig

Windows IP 設定

Ethernet 介面卡 區域連線:

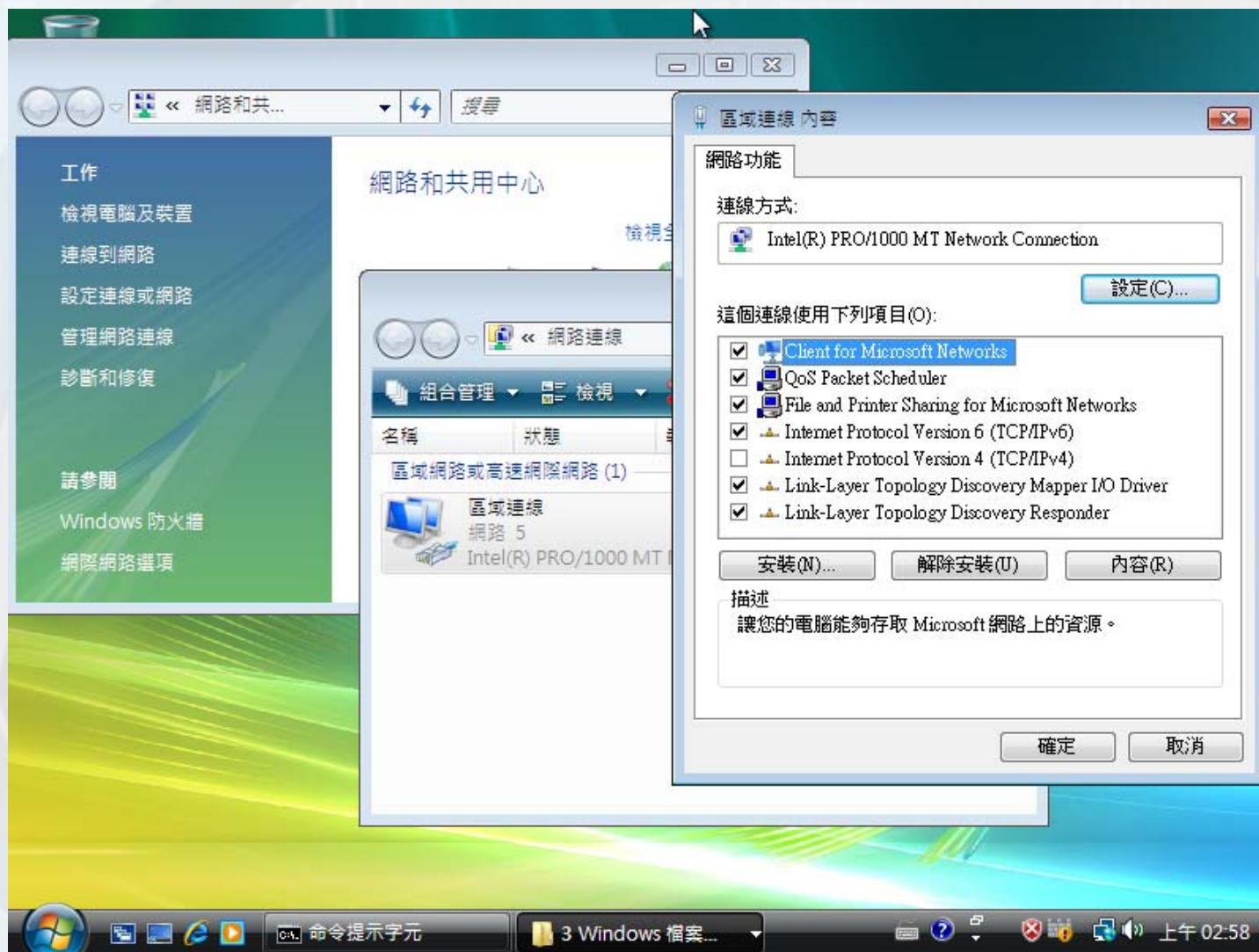
    連線特定 DNS 尾碼 . . . . . : localdomain
    IPv6 位址 . . . . . : 2404:80:20:0:bda9:311e:932a:34f1
    臨時 IPv6 位址 . . . . . : 2404:80:20:0:d1b1:e1af:dacc:24b8
    連結-本機 IPv6 位址 . . . . . : fe80::bda9:311e:932a:34f1%8
    IPv4 位址 . . . . . : 192.168.40.132
    子網路遮罩 . . . . . : 255.255.255.0
    預設閘道 . . . . . : fe80::250:56ff:fec0:8%8
                        192.168.40.2

通道介面卡 區域連線* 6:

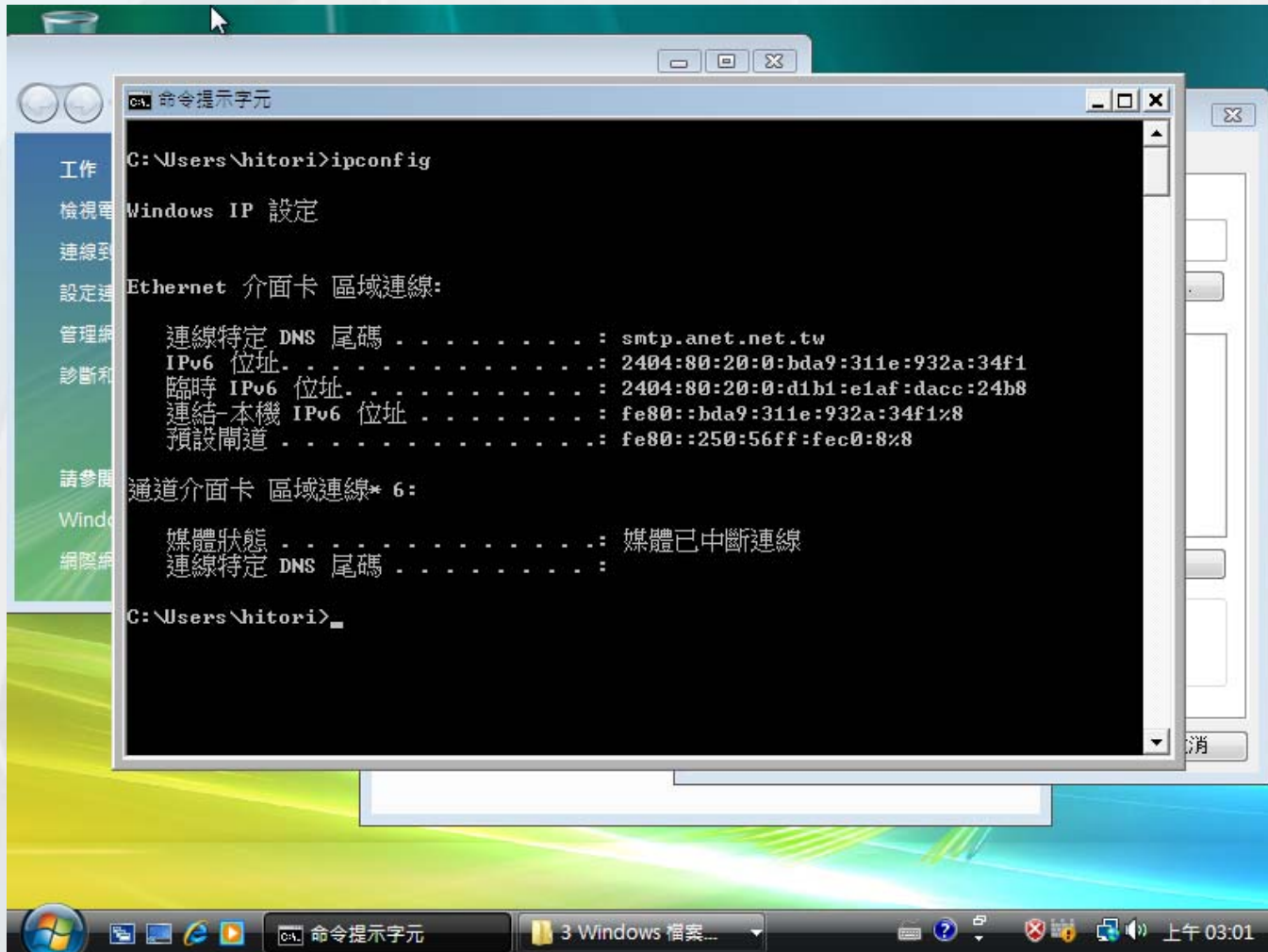
    媒體狀態 . . . . . : 媒體已中斷連線
    連線特定 DNS 尾碼 . . . . . :

C:\>_
```

Disable IPv4

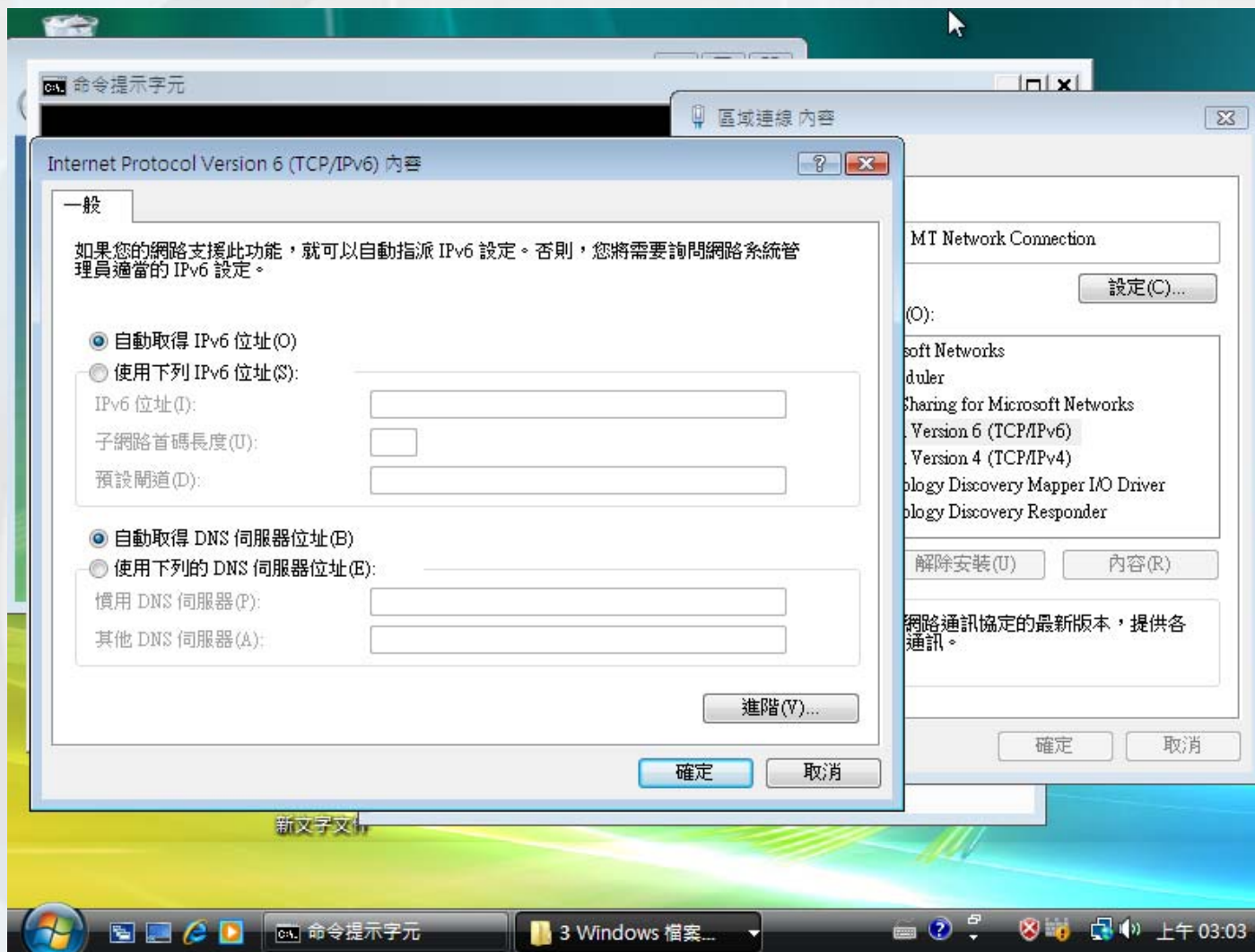


IP status (Native IPv6)





IPv6 DNS setting (Default is to get automatically)





IP status without DNS Server(Native IPv6)

```
命令提示字元
C:\Users\hitori>ipconfig /all

Windows IP 設定

主機名稱 . . . . . : hitori-PC
主要 Dns 尾碼 . . . . . :
節點類型 . . . . . : 交互式
IP 路由啟用 . . . . . : 否
WINS Proxy 啟用 . . . . . : 否
DNS 尾碼搜尋清單 . . . . . : smtp.anet.net.tw

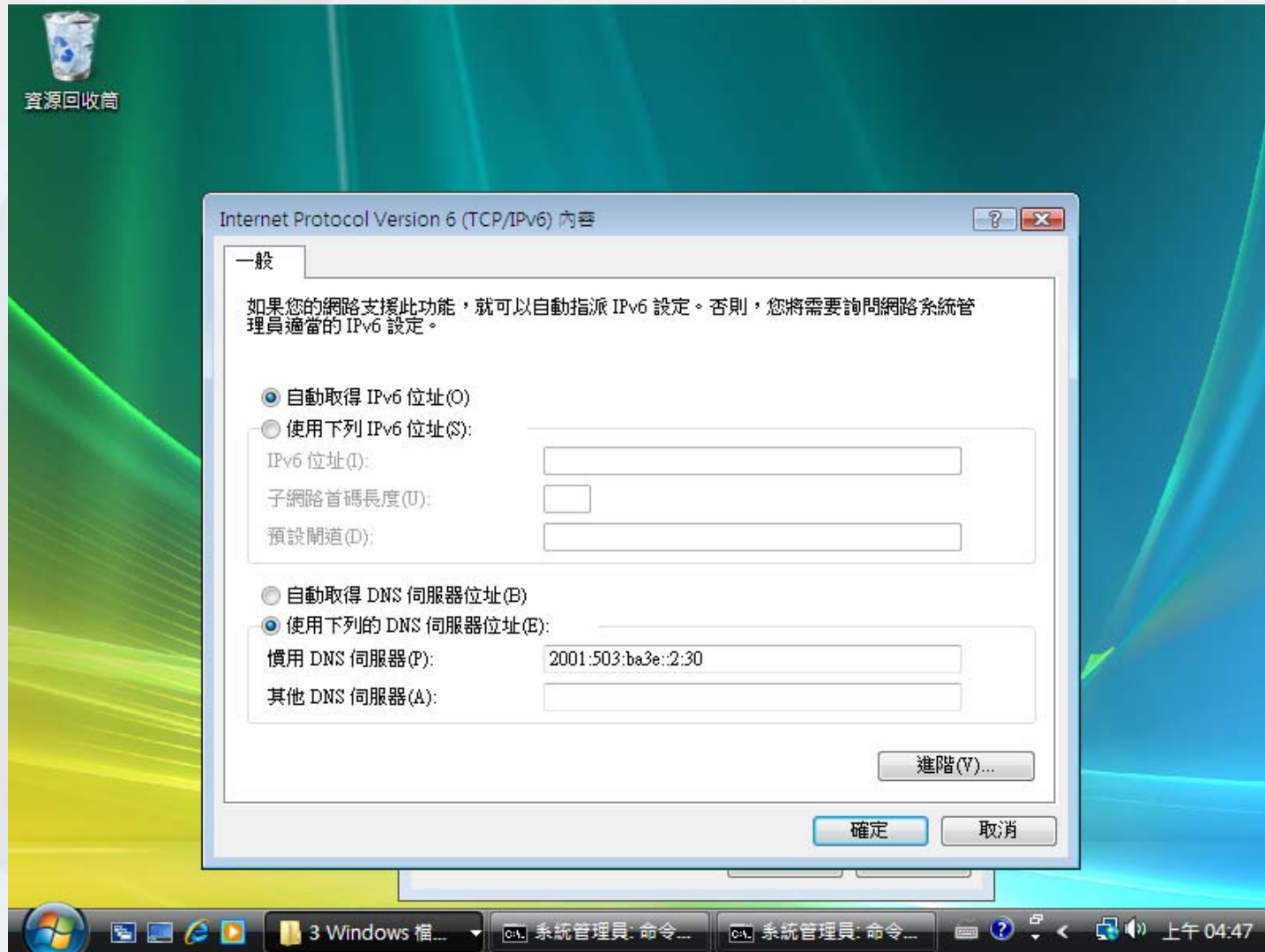
Ethernet 介面卡 區域連線:

連線特定 DNS 尾碼 . . . . . : smtp.anet.net.tw
描述 . . . . . : Intel(R) PRO/1000 MT Network Connection
實體位址 . . . . . : 00-0C-29-2A-7C-F5
DHCP 啟用 . . . . . : 是
自動設定啟用 . . . . . : 是
IPv6 位址 . . . . . : 2404:80:20:0:bda9:311e:932a:34f1<偏好選項>
>
臨時 IPv6 位址 . . . . . : 2404:80:20:0:d1b1:e1af:dacc:24b8<偏好選項>
>
連結-本機 IPv6 位址 . . . . . : fe80::bda9:311e:932a:34f1%8<偏好選項>
預設閘道 . . . . . : fe80::250:56ff:fec0:8%8
DHCPv6 Iaid . . . . . : 201329705
DNS 伺服器 . . . . . : fec0:0:0:ffff::1%1
                          fec0:0:0:ffff::2%1
                          fec0:0:0:ffff::3%1
NetBIOS over Tcpip . . . . . : 停用

通道介面卡 區域連線* 6:

媒體狀態 . . . . . : 媒體已中斷連線
```

Setting up DNS server manually to a .root-servers.net





IP status with DNS (Native IPv6)

```
系統管理員: 命令提示字元

C:\>ipconfig /all

Windows IP 設定

主機名稱 . . . . . : hitori-PC
主要 Dns 尾碼 . . . . . :
節點類型 . . . . . : 交互式
IP 路由啟用 . . . . . : 否
WINS Proxy 啟用 . . . . . : 否
DNS 尾碼搜尋清單 . . . . . : smtp.anet.net.tw

Ethernet 介面卡 區域連線:

    連線特定 DNS 尾碼 . . . . . : smtp.anet.net.tw
    描述 . . . . . : Intel(R) PRO/1000 MT Network Connection
    實體位址 . . . . . : 00-0C-29-2A-7C-F5
    DHCP 啟用 . . . . . : 是
    自動設定啟用 . . . . . : 是
    IPv6 位址 . . . . . : 2404:80:20:0:bda9:311e:932a:34f1<偏好選項>
    >
    臨時 IPv6 位址 . . . . . : 2404:80:20:0:d1b1:e1af:dacc:24b8<偏好選項>
    >
    連結-本機 IPv6 位址 . . . . . : fe80::bda9:311e:932a:34f1%8<偏好選項>
    預設閘道 . . . . . : fe80::250:56ff:fec0:8%8
    DHCPv6 IAID . . . . . : 201329705
    DNS 伺服器 . . . . . : 2001:503:ba3e::2:30
    NetBIOS over Tcpip . . . . . : 停用

通道介面卡 區域連線* 6:

    媒體狀態 . . . . . : 媒體已中斷連線
    連線特定 DNS 尾碼 . . . . . :
```



Test native IPv6 connection

```
系統管理員: 命令提示字元 - nslookup
連結-本機 IPv6 位址 . . . . . : fe80::bda9:311e:932a:34f1%8
預設閘道 . . . . . : fe80::250:56ff:fec0:8%8

通道介面卡 區域連線* 6:

媒體狀態 . . . . . : 媒體已中斷連線
連線特定 DNS 尾碼 . . . . . :

C:\>ping a.root-servers.net

Ping a.root-servers.net [2001:503:ba3e::2:30] 從 2404:80:20:0:d1b1:e1af:dacc:24b8 具有 32 位元組的資料:

回覆自 2001:503:ba3e::2:30: 時間=221ms
回覆自 2001:503:ba3e::2:30: 時間=223ms
回覆自 2001:503:ba3e::2:30: 時間=240ms
回覆自 2001:503:ba3e::2:30: 時間=219ms

2001:503:ba3e::2:30 的 Ping 統計資料:
    封包: 已傳送 = 4, 已收到 = 4, 已遺失 = 0 (0% 遺失),
    大約的來回時間 (毫秒):
        最小值 = 219ms, 最大值 = 240ms, 平均 = 225ms

C:\>nslookup
ip6.arpa      nameserver = NS.LACNIC.NET
ip6.arpa      nameserver = SEC1.APNIC.NET
ip6.arpa      nameserver = NS-SEC.RIPE.NET
ip6.arpa      nameserver = TINNIE.ARIN.NET
ip6.arpa      nameserver = NS.ICANN.ORG
預設伺服器:  UnKnown
Address:  [2001:503:ba3e::2:30]:53
>
```



Try to query IPv6 host

```
系統管理員: 命令提示字元

媒體狀態 . . . . . : 媒體已中斷連線
連線特定 DNS 尾碼 . . . . . :

C:\>ping a.root-servers.net

Ping a.root-servers.net [2001:503:ba3e::2:30] 從 2404:80:20:0:d1b1:e1af:dacc:24b8 具有 32 位元組的資料:

回覆自 2001:503:ba3e::2:30: 時間=341ms
回覆自 2001:503:ba3e::2:30: 時間=459ms
回覆自 2001:503:ba3e::2:30: 時間=285ms
回覆自 2001:503:ba3e::2:30: 時間=295ms

2001:503:ba3e::2:30 的 Ping 統計資料:
    封包: 已傳送 = 4, 已收到 = 4, 已遺失 = 0 (0% 遺失),
    大約的來回時間 <毫秒>:
        最小值 = 285ms, 最大值 = 459ms, 平均 = 345ms

C:\>nslookup a.root-servers.net
ip6.arpa          nameserver = NS.ICANN.ORG
ip6.arpa          nameserver = NS.LACNIC.NET
ip6.arpa          nameserver = SEC1.APNIC.NET
ip6.arpa          nameserver = NS-SEC.RIPE.NET
ip6.arpa          nameserver = TINNIE.ARIN.NET
伺服器:           UnKnown
Address:          [2001:503:ba3e::2:30]:53

名稱:             a.root-servers.net
Address:          198.41.0.4

C:\>
```



Try to connect other IPv6 host

```
cmd 系統管理員: 命令提示字元
ip6.arpa      nameserver = TINNIE.ARIN.NET
伺服器: UnKnown
Address: [2001:503:ba3e::2:301:53

名稱: a.root-servers.net
Address: 198.41.0.4

C:\>nslookup b.root-servers.net
ip6.arpa      nameserver = TINNIE.ARIN.NET
ip6.arpa      nameserver = NS.ICANN.ORG
ip6.arpa      nameserver = NS.LACNIC.NET
ip6.arpa      nameserver = SEC1.APNIC.NET
ip6.arpa      nameserver = NS-SEC.RIPE.NET
伺服器: UnKnown
Address: [2001:503:ba3e::2:301:53

名稱: b.root-servers.net
Address: 192.228.79.201

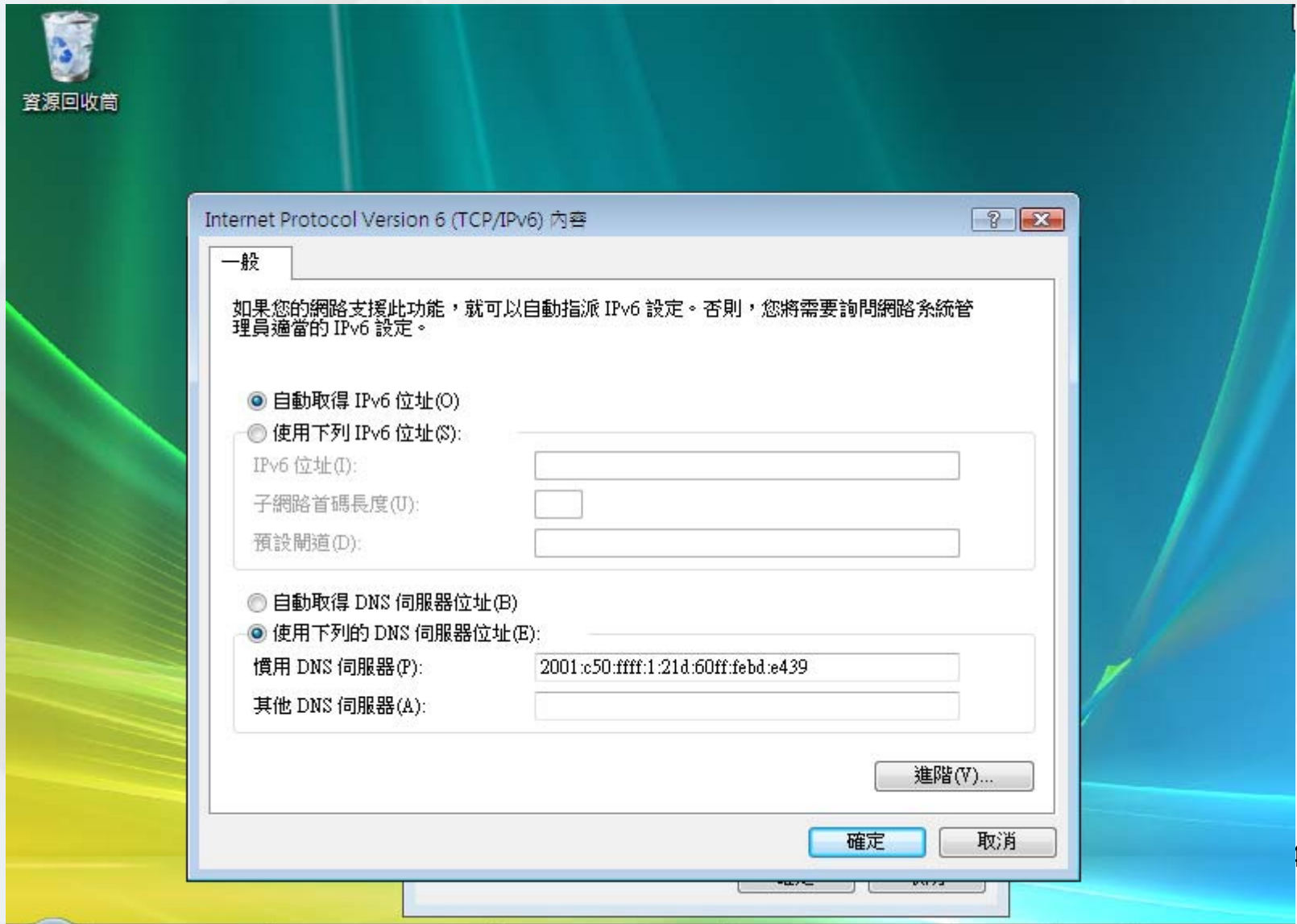
C:\>nslookup a.dns.tw
ip6.arpa      nameserver = NS-SEC.RIPE.NET
ip6.arpa      nameserver = TINNIE.ARIN.NET
ip6.arpa      nameserver = NS.ICANN.ORG
ip6.arpa      nameserver = NS.LACNIC.NET
ip6.arpa      nameserver = SEC1.APNIC.NET
伺服器: UnKnown
Address: [2001:503:ba3e::2:301:53

*** UnKnown 找不到 a.dns.tw: BAD ERROR VALUE

C:\>
```



Setting up DNS server manually to another server we built





IP status with DNS (Native IPv6)

```
系統管理員: 命令提示字元
C:\>ipconfig /all

Windows IP 設定

主機名稱 . . . . . : hitori-PC
主要 Dns 尾碼 . . . . . :
節點類型 . . . . . : 交互式
IP 路由啟用 . . . . . : 否
WINS Proxy 啟用 . . . . . : 否
DNS 尾碼搜尋清單 . . . . . : smtp.anet.net.tw

Ethernet 介面卡 區域連線:

連線特定 DNS 尾碼 . . . . . : smtp.anet.net.tw
描述 . . . . . : Intel(R) PRO/1000 MT Network Connection
實體位址 . . . . . : 00-0C-29-2A-7C-F5
DHCP 啟用 . . . . . : 是
自動設定啟用 . . . . . : 是
IPv6 位址 . . . . . : 2404:80:20:0:bda9:311e:932a:34f1<偏好選項>
>
臨時 IPv6 位址 . . . . . : 2404:80:20:0:d1b1:e1af:dacc:24b8<偏好選項>
>
連結-本機 IPv6 位址 . . . . . : fe80::bda9:311e:932a:34f1%8<偏好選項>
預設閘道 . . . . . : fe80::250:56ff:fec0:8%8
DHCPv6 IAID . . . . . : 201329705
DNS 伺服器 . . . . . : 2001:c50:ffff:1:21d:60ff:febd:e439
NetBIOS over Tcpip . . . . . : 停用

通道介面卡 區域連線* 6:

媒體狀態 . . . . . : 媒體已中斷連線
連線特定 DNS 尾碼 . . . . . :
```

IPv6 nslookup

```

C:\>nslookup a.root-servers.net
伺服器: UnKnown
Address: [2001:c50:ffff:1:21d:60ff:febd:e439]:53

未經授權的回答:
名稱: a.root-servers.net
Address: 198.41.0.4

C:\>nslookup
預設伺服器: UnKnown
Address: [2001:c50:ffff:1:21d:60ff:febd:e439]:53

> set type=aaaa
> a.root-servers.net
伺服器: UnKnown
Address: [2001:c50:ffff:1:21d:60ff:febd:e439]:53

未經授權的回答:
名稱: a.root-servers.net
Address: 2001:503:ba3e::2:30

> a.dns.tw
伺服器: UnKnown
Address: [2001:c50:ffff:1:21d:60ff:febd:e439]:53

未經授權的回答:
名稱: a.dns.tw
Address: 2001:cd8:800::8

> exit

C:\>
  
```



It works well on native IPv6 network

```
系統管理員: 命令提示字元
C:\>ipconfig

Windows IP 設定

Ethernet 介面卡 區域連線:

    連線特定 DNS 尾碼 . . . . . : smtp.anet.net.tw
    IPv6 位址. . . . . : 2404:80:20:0:bda9:311e:932a:34f1
    臨時 IPv6 位址. . . . . : 2404:80:20:0:d1b1:e1af:dacc:24b8
    連結-本機 IPv6 位址 . . . . . : fe80::bda9:311e:932a:34f1%8
    預設閘道 . . . . . : fe80::250:56ff:fec0:8%8

通道介面卡 區域連線* 6:

    媒體狀態 . . . . . : 媒體已中斷連線
    連線特定 DNS 尾碼 . . . . . :

C:\>ping www.apnic.net

Ping www.apnic.net [2001:dc0:2001:0:4608:20::] 從 2404:80:20:0:d1b1:e1af:dacc:24b8 具有 32 位元組的資料:

回覆自 2001:dc0:2001:0:4608:20:: 時間=293ms
回覆自 2001:dc0:2001:0:4608:20:: 時間=465ms
回覆自 2001:dc0:2001:0:4608:20:: 時間=990ms
回覆自 2001:dc0:2001:0:4608:20:: 時間=799ms

2001:dc0:2001:0:4608:20:: 的 Ping 統計資料:
    封包: 已傳送 = 4, 已收到 = 4, 已遺失 = 0 (0% 遺失),
    大約的來回時間 (毫秒):
        最小值 = 293ms, 最大值 = 990ms, 平均 = 636ms

C:\>
```



Native IPv6 internet connection

The screenshot displays a Windows XP desktop environment. On the left, a command prompt window shows the execution of the `ipconfig` command, displaying IPv6 configuration for the Ethernet interface. On the right, an Internet Explorer browser window shows the APNIC website with the user's IPv6 address highlighted in a red box.

Command Prompt Output:

```
CA: 系統管理員: 命令提示字元
C:\>ipconfig

Windows IP 設定

Ethernet 介面卡 區域連線:

    連線特定 DNS 尾碼 . . . . . : smtp.
    IPv6 位址 . . . . . : 2404:
    臨時 IPv6 位址 . . . . . : 2404:
    連結-本機 IPv6 位址 . . . . . : fe80:
    預設閘道 . . . . . : fe80:

通道介面卡 區域連線* 6:

    媒體狀態 . . . . . : 媒體已
    連線特定 DNS 尾碼 . . . . . :

C:\>ping www.apnic.net

Ping www.apnic.net [2001:dc0:2001:0:4608:20:
b8 具有 32 位元組的資料:

    回覆自 2001:dc0:2001:0:4608:20:: 時間=293ms
    回覆自 2001:dc0:2001:0:4608:20:: 時間=465ms
    回覆自 2001:dc0:2001:0:4608:20:: 時間=990ms
    回覆自 2001:dc0:2001:0:4608:20:: 時間=799ms

2001:dc0:2001:0:4608:20:: 的 Ping 統計資料:
    封包: 已傳送 = 4, 已收到 = 0, 已遺失 = 0
    大約的來回時間 <毫秒>:
    最小值 = 293ms, 最大值 = 990ms, 平均 = 6

C:\>
```

Internet Explorer Browser Window:

Welcome to APNIC - Windows Internet Explorer
http://www.apnic.net/
Welcome to APNIC

Your IP: 2404:80:20:0:d1b1:e1af:dacc:24b8

Asia Pacific Network Information Center
APNIC
Addressing the challenge of providing a responsible Internet resource in the Asia Pacific region

Popular links:
How to apply for Internet number resources
Help tracking spam & hacking
APNIC Whois Database

Policy:
Mailing lists
Major policies
How are policies developed?

Training:
APNIC 25/APRICOT 2008
APNIC Helpdesk Chat Live!

THANK YOU !