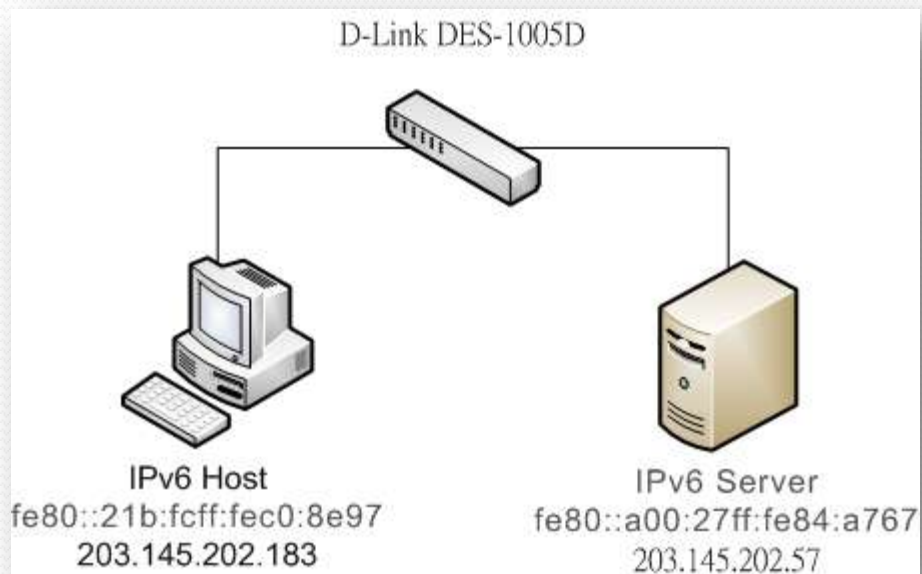# Linux 與 Windows 的 IPv6 基礎

Chapter 01

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大綱

- 系統環境
- IPv6 on Linux
- IPv6 on Windows
- Windows XP Ping測試
- Linux Ping測試(使用固定位址)

系統環境：

- IPv6 Host：安裝 Windows XP
- IPv6 Server：安裝 CentOS 5.3
- Switch：D-Link DES-1005D

D-Link DES-1005D

IPv6 Host
fe80::21b:fcff:fec0:8e97
203.145.202.183

IPv6 Server
fe80::a00:27ff:fe84:a767
203.145.202.57

IPv6 on Linux

- Linux Kernel 在 2.1.8 即加入IPv6的部份功能，現今的Linux Kernel 2.6.x 中，IPv6已經是被完整地支援。在2008年12月1日，Linux Foundation(Linux基金會)宣佈IPv6在Linux主要的Distribution(發行版)中已經相容美國國防部的標準(連結)。

- 現在只要下載任何一個常見的Distribution，都可以支援IPv6。我們以 CentOS 5.3 作為示範的作業系統。

IPv6 on Linux

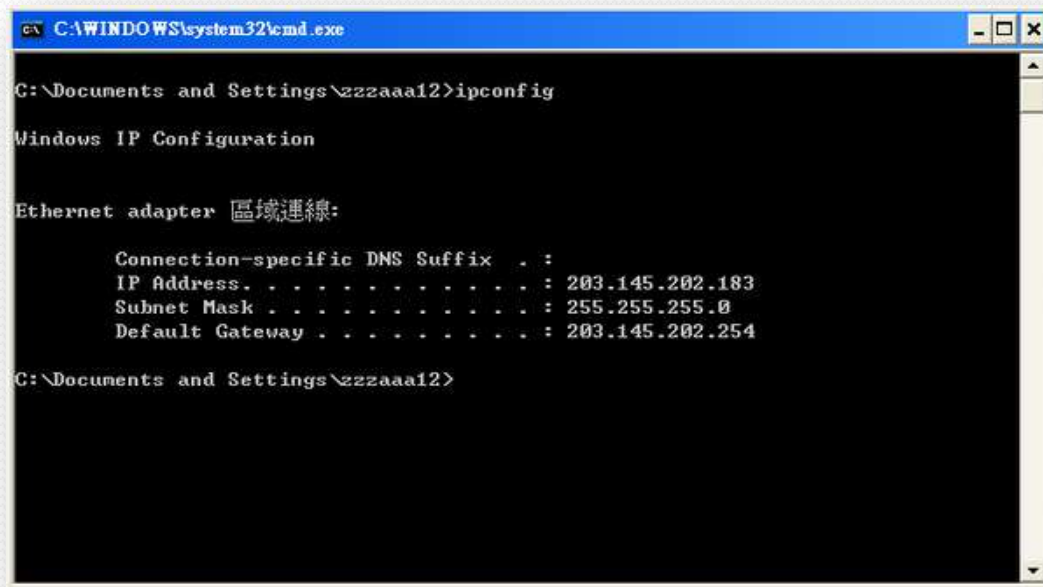- 安裝的時候，系統已經是預設啟動IPv6，如圖：

IPv6 on Linux

- 安裝完CentOS之後，我們可以下 ifconfig 指令，會發現 eth0 這個 interface 已經有了 fe80 開頭的 Link-local IPv6 位址

```
[root@localhost ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:84:A7:67
          inet addr:203.145.202.57  Bcast:203.145.202.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe84:a767/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2972 errors:10 dropped:0 overruns:0 frame:0
          TX packets:99 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:237681 (232.1 KiB)  TX bytes:19601 (19.1 KiB)
          Interrupt:11 Base address:0xd020

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:16 errors:0 dropped:0 overruns:0 frame:0
          TX packets:16 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1292 (1.2 KiB)  TX bytes:1292 (1.2 KiB)
```

IPv6 on Windows

- IPv6 在 WindowsXP之後，已經開始支援 IPv6。 不過在WindowsXP下，但仍須在命令提示字元下輸入〝ipv6 install〞才能夠啟用IPv6網路協定
- IPv6啟動前, 執行ipconfig：
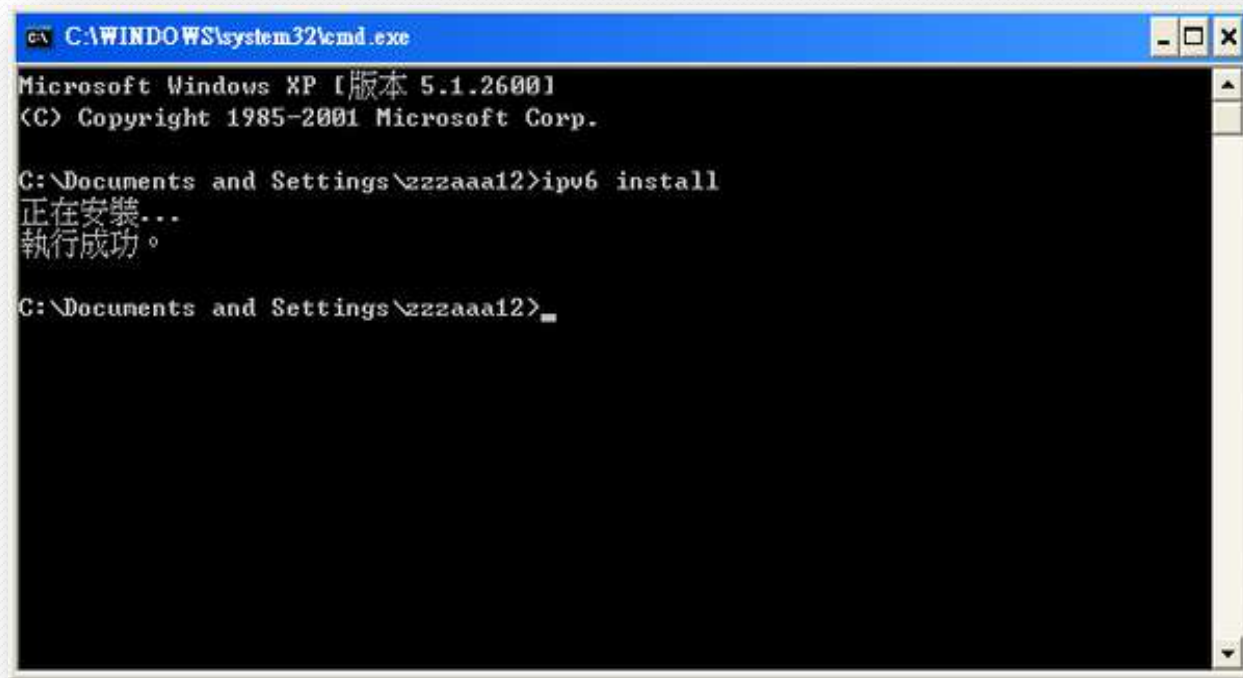
IPv6 on Windows

- 執行ipv6 install 指令：
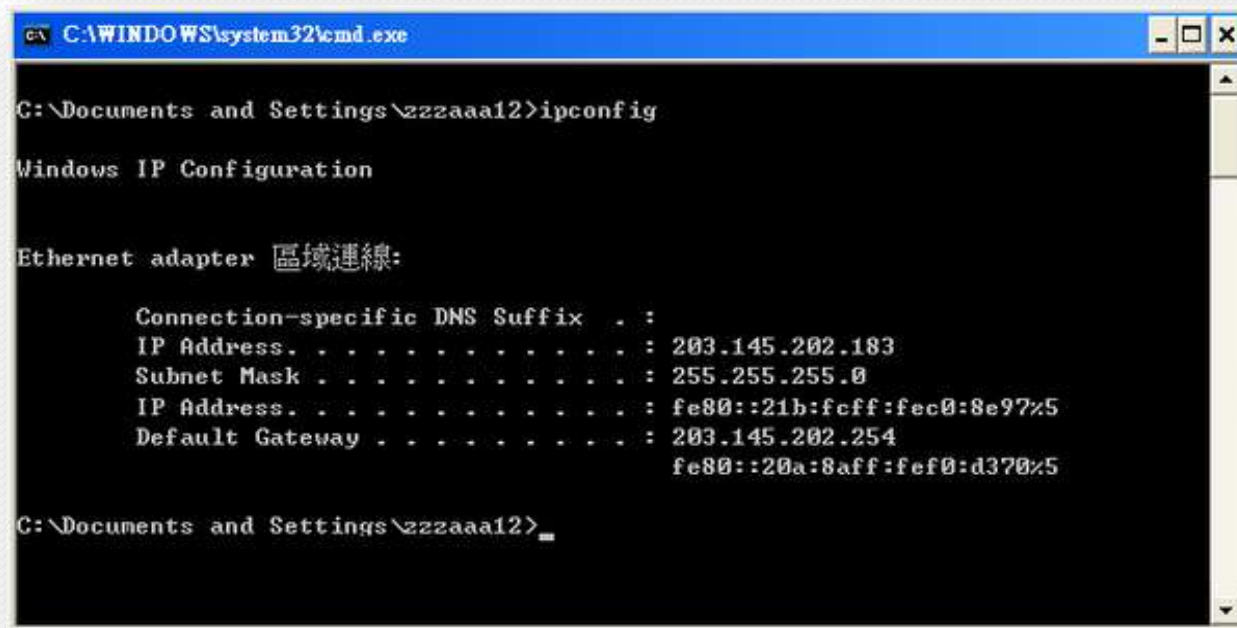
IPv6 on Windows

- 之後再執行 ipconfig ，我們會發現多了 fe80 開頭的 IPv6 位址 (Link-Local address)

這樣子就可以使用 IPv6 的位址來做通訊了！

Windows XP Ping測試

- 讓Host和Server利用ping來做一個測試，驗證設定是否正確,
- 位址設定如下：
  - Server: fe80::a00:27ff:fe84:a767
  - Host: fe80::21b:fcff:fec0:8e97

- 在使用 ping6 時，我們必須指定用哪一個 interface 去做 Ping 的動作
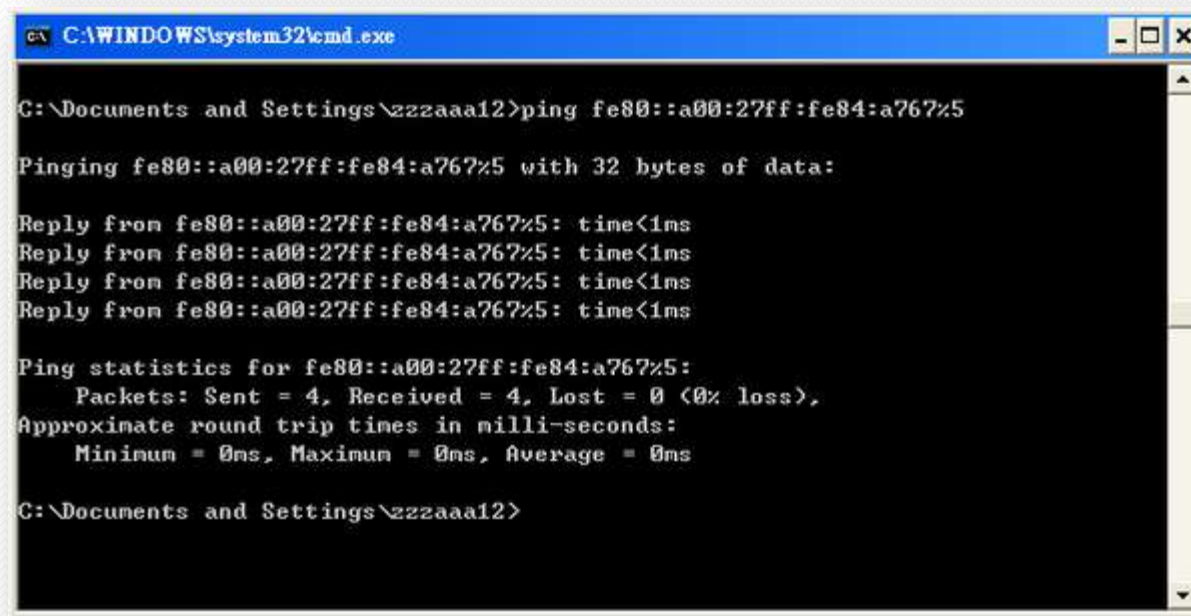 - 從上頁圖的 ipconfig 我們看到最後面的是 %5，所以等一下 Host 輸入 Server 位址的時候都加上 %5

Windows XP Ping測試

- Host to Server
  - 輸入 ping6 fe80::a00:27ff:fe84:a767%5
  - Host已經成功地Ping到Server了！

Windows XP Ping測試

- ## Server to Host
  - 輸入 ping6 -I eth0 -c 5 fe80::21b:fcff:fec0:8e97

```
[root@localhost ~]# ping6 -I eth0 -c 5 fe80::21b:fcff:fec0:8e97
PING fe80::21b:fcff:fec0:8e97(fe80::21b:fcff:fec0:8e97) from fe80::a00:27ff:fe84
:a767 eth0: 56 data bytes
64 bytes from fe80::21b:fcff:fec0:8e97: icmp_seq=0 ttl=64 time=1.80 ms
64 bytes from fe80::21b:fcff:fec0:8e97: icmp_seq=1 ttl=64 time=0.734 ms
64 bytes from fe80::21b:fcff:fec0:8e97: icmp_seq=2 ttl=64 time=0.925 ms
64 bytes from fe80::21b:fcff:fec0:8e97: icmp_seq=3 ttl=64 time=1.53 ms
64 bytes from fe80::21b:fcff:fec0:8e97: icmp_seq=4 ttl=64 time=0.906 ms

--- fe80::21b:fcff:fec0:8e97 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4048ms
rtt min/avg/max/mdev = 0.734/1.179/1.801/0.412 ms, pipe 2
```

Server 也可以成功地Ping到Host，所以整個網路環境順利的架設起來了！

Linux Ping測試(使用固定位址)

- 使用兩台Linux主機進行Ping測試，讓兩台電腦能夠透過IPv6來進行連線。
- 系統架構圖：

D-Link DES-1005D

IPv6 Host1
2222::1

IPv6 Host2
2222::2
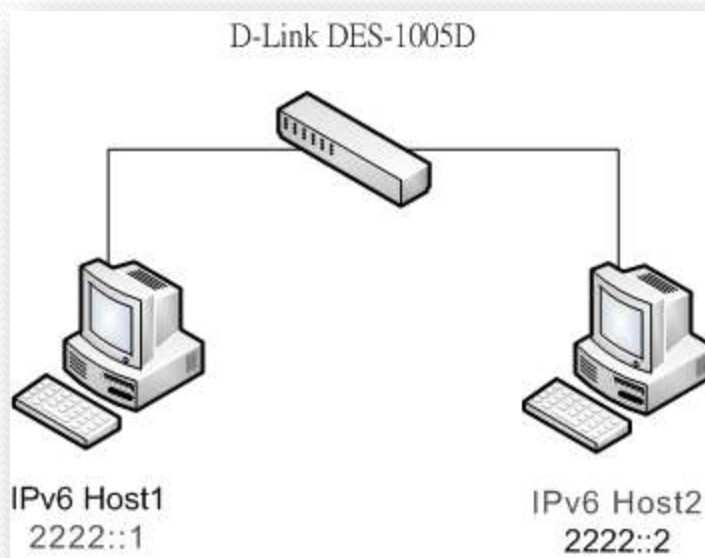
Linux Ping測試(使用固定位址)

- Host1設定
  - 先使用ifconfig查詢Host1是否有IPv6位址

```
[root@localhost sysconfig]# ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:BD:7C:3F
          inet addr:192.168.0.2  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:febd:7c3f/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:141875 errors:0 dropped:0 overruns:0 frame:0
          TX packets:6231 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:15637260 (14.9 MiB)  TX bytes:662762 (647.2 KiB)
          Interrupt:11 Base address:0xd020

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:128 errors:0 dropped:0 overruns:0 frame:0
          TX packets:128 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:18151 (17.7 KiB)  TX bytes:18151 (17.7 KiB)

[root@localhost sysconfig]# _
```

已取得IPv6位址，表示支援IPv6

Linux Ping測試(使用固定位址)

- 修改/etc/sysconfig/network-scripts/icfg-eth0
- # vim /etc/sysconfig/network-scripts/icfg-eth0

```
# Advanced Micro Devices [AMD] 79c970 [PCnet32 LANCE]
DEVICE=eth0
BOOTPROTO=dhcp
ONBOOT=yes
HWADDR=08:00:27:bd:7c:3f _




-- INSERT --                                        5,25          All
```

檔案原始設定

Linux Ping測試(使用固定位址)

- 加入下列三行IPv6設定，並存檔離開

```
# Advanced Micro Devices [AMD] 79c970 [PCnet32 LANCE]
DEVICE=eth0
BOOTPROTO=dhcp
ONBOOT=yes
HWADDR=08:00:27:bd:7c:3f
IPV6INIT=yes
IPV6ADDR=2222::1
IPV6_DEFAULTGW=2222::22




-- INSERT --                                          8,24        All
```

IPv6位址設定

Linux Ping測試(使用固定位址)

- 將network重新啟動，套用剛才輸入的位址設定

```
[root@localhost /]# /etc/init.d/network restart
Shutting down interface eth0:                          [  OK  ]
Shutting down loopback interface:                      [  OK  ]
Bringing up loopback interface:                        [  OK  ]
Bringing up interface eth0:
Determining IP information for eth0... done.
                                                       [  OK  ]
[root@localhost /]# _
```

- 用ifconfig查詢eth0，如下圖Host1的位址設定已經生效

```
[root@localhost /]# ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:BD:7C:3F
          inet addr:192.168.0.2  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: 2222::1/64 Scope:Global
          inet6 addr: fe80::a00:27ff:febd:7c3f/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:143792 errors:0 dropped:0 overruns:0 frame:0
          TX packets:6373 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:15855618 (15.1 MiB)  TX bytes:682435 (666.4 KiB)
          Interrupt:11 Base address:0xd020

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:128 errors:0 dropped:0 overruns:0 frame:0
          TX packets:128 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:18151 (17.7 KiB)  TX bytes:18151 (17.7 KiB)

[root@localhost /]# _
```

Linux Ping測試(使用固定位址)

- Host2設定

```
[root@localhost ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:0A:B8:3B
          inet addr:192.168.0.8  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: 2222::2/64 Scope:Global
          inet6 addr: fe80::a00:27ff:fe0a:b83b/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:810 errors:1 dropped:0 overruns:0 frame:0
          TX packets:89 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:79166 (77.3 KiB)  TX bytes:14636 (14.2 KiB)
          Interrupt:11 Base address:0xd020

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:8 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:560 (560.0 b)  TX bytes:560 (560.0 b)

[root@localhost ~]#
```

Linux Ping測試(使用固定位址)

- # vim /etc/sysconfig/network-scripts/ifcfg-eth0
- 加入下列三行IPv6設定，並存檔離開

```
# Advanced Micro Devices [AMD] 79c970 [PCnet32 LANCE]
DEVICE=eth0
BOOTPROTO=dhcp
ONBOOT=yes
HWADDR=08:00:27:0a:b8:3b
IPV6INIT=yes
IPV6ADDR=2222::2
IPV6_DEFAULTGW=2222::22




-- INSERT --                                              8,25         All
```

IPv6位址設定

Linux Ping測試(使用固定位址)

- 將network重新啟動，套用剛才輸入的位址設定

```
[root@localhost /]# /etc/init.d/network restart
Shutting down interface eth0:                          [  OK  ]
Shutting down loopback interface:                      [  OK  ]
Bringing up loopback interface:                        [  OK  ]
Bringing up interface eth0:
Determining IP information for eth0... done.
                                                       [  OK  ]
[root@localhost /]# _
```

- 用ifconfig查詢eth0，如下圖Host2的位址設定已經生效

```
[root@localhost ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:0A:B8:3B
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: 2222::2/64 Scope:Global
          inet6 addr: fe80::a00:27ff:fe0a:b83b/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:3970 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4452 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1421745 (1.3 MiB)  TX bytes:381100 (372.1 KiB)
          Interrupt:11 Base address:0xd020

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:128 errors:0 dropped:0 overruns:0 frame:0
          TX packets:128 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:18151 (17.7 KiB)  TX bytes:18151 (17.7 KiB)

[root@localhost ~]# _
```

Linux Ping測試(使用固定位址)

- 最後Host1與Host2互相執行Ping指令即可
  - Host1:
    - #ping6 2222::2

  - Host2:
    - #ping6 2222::1

END