Transition Technologies

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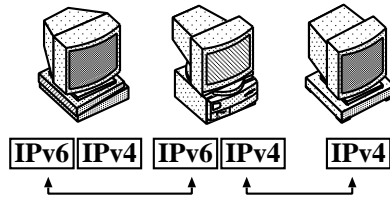`kazu@iijlab.net`

Transition story

Early stage   Late stage

IPv6   IPv6   IPv4   IPv4

IPv4   IPv6

IPv6   IPv6   IPv4   IPv4
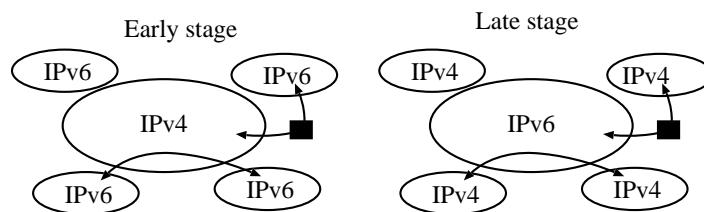
□ **Transition technologies**
  ○ **Dual stack**
  ○ **Tunnel**
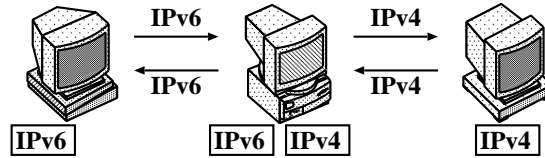 ○ **Translator**

Dual stack

|IPv6|IPv4| |IPv6|IPv4| |IPv4|

☐ **Supporting both IPv4 and IPv6**
- ○ **Dual stack is a MUST in the early stage**

☐ **IPv4 and IPv6 can co-exist**
- ○ **Like IPv4 and AppleTalk**

☐ **BITS (Bump In The Stack)**
- ○ **Dual stack functionality without OS installation**
  - ▷ **Replacement of a driver of IPv4 node**
- ○ **IPv4 applications are available without modifications**

IPv6 in IPv4 tunnels

IPv6 IPv4 IPv6 IPv6

IPv6 site

IPv6 site

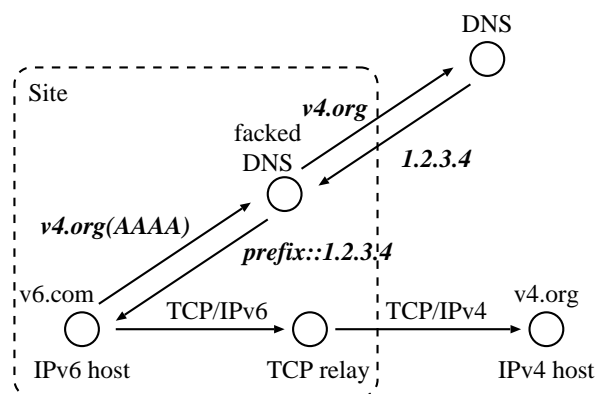**IPv4 Internet**
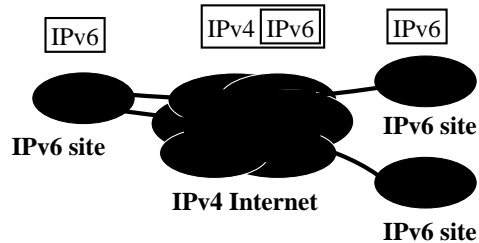
IPv6 site

☐ **IPv6 sites are island in the IPv4 ocean**

☐ **Connecting IPv6 islands**
- ○ **IPv4 as datalink**
- ○ **Encapsulating an IPv6 packet into an IPv4 packet**

☐ **6bone is an example**
- ○ **About 50 countries**
- ○ **IPv6 Internet, currently**

Translator

IPv6 → IPv6 → IPv4 → IPv4

|IPv6| |IPv6| |IPv4| |IPv4|

☐ **The early stage**
  ○ **IPv4 nodes exist, of course**
  ○ **IPv6 nodes appeared**
    ▷ **Not enough IPv4 addresses are assigned**
☐ **The late stage**
  ○ **IPv4 notes will remain**
  ○ **IPv6 nodes**
    ▷ **IPv4 addresses will be unavailable**

☐ **Co-existence of IPv4 nodes and IPv6 nodes**
  ○ **Translators are necessary**

TCP relay translator

DNS

Site

v4.org

facked DNS

1.2.3.4

v4.org(AAAA)

prefix::1.2.3.4

v6.com

TCP/IPv6 → TCP/IPv4 → v4.org

IPv6 host   TCP relay   IPv4 host

☐ **Translator in the early stage**

  ○ **Site is IPv6**
  ○ **The Internet is IPv4**

TCP relay mechanism

- ☐ **Precondition**
  - ○ **IPv6 site has also small number of IPv4 addresses**
  - ○ **Both fake DNS and TCP relay are dual stack**
    - ▷ **A special prefix is installed on them statically**

- ☐ **Connection from v6.com to v4.org**
  - ○ **v6.com asks faked DNS to resolve AAAA record of v4.org**
  - ○ **Faked DNS asks DNS to resolve A record of v4.org**
  - ○ **DNS returns 1.2.3.4**
  - ○ **Faked DNS embeds 1.2.3.4 into special prefix and tells v6.com it**
  - ○ **v6.com tries to make a TCP/IPv6 connection to prefix::1.2.3.4**
  - ○ **TCP relay catches the connection**
  - ○ **TCP relay also make a TCP/IPv4 connection to 1.2.3.4**