

# V6FIX

**Akira Kato, Kazu Yamamoto, Hiroshi Esaki, and  
others**



**WIDE Project**  
kato@wide.ad.jp

## **Motivation**

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- ☆ **Users feel bad even if only a minor fault happens**
- ☆ **There are something bad even if not using IPv6**

## Background

### ☆ **When a gentlemen checked in a hotel**

- Connect his Window/XP laptop to the Internet
- But failed to get access to the web with a browser
- Hotel employee suggested to perform "ipv6 uninstall"
- This was caused a buggy implementation in the hotel

### ☆ **Smoothness in Internet access lost**

- Once an ISP introduced BIND9 for DNS operation
- Users claimed that smoothness in access was lost
- A implementation issue in BIND9 caused this

### ☆ **Another example**

- Timeout happens on particular pages
  - with Mozilla 1.7 on Fedora core 2
- Release note in Mozilla 1.7 suggests:
  - disable the IPv6 in kernel
- IPv6 specification caused this.

## The goal

### ☆ **To fix the minor IPv6 faults**

- Specification, implementation, operation

### ☆ **Discourage to going back to IPv4 only world**

- Not to give bad impression
  - "I tried with IPv6 but not useful"
  - "My environment is IPv6 ready but it is BAD"

### ☆ **Fix the specifications**

### ☆ **Fix the implementations**

- Notify the malfunctions to the vendors

### ☆ **Fix the configuration/operation**

## Connection Establishment Phase

### 1) Resolve the name with DNS

- Obtain the target IPv4 address

### 2) Try to connect the TCP

- Search "working" combination of src/dst addresses

### 3) Exchange the data

- Path MTU discovery

## 1) Resolve the name with DNS

### ☆ Query A RR and AAAA RR

- If both of IPv4 and Ipv6 are available

### ☆ An issue in the resolver

- Try to resolve AAAA RR when no IPv6 is available

### ☆ An issue in the DNS server

- 1) "bogus" response to query of AAAA RR
- 2) try to use IPv6 transport even if not available
  - These are the reasons of loosing the smooth access
  - It might be a load balancer with DNS function

### ☆ An issue in EDNS0 transparency

- Some firewalls drop queries with EDNS0

## 2) Try to connect the TCP

### ☆ Search a workable pair of src/dst address

- For each destination address,
  - Pick an appropriate source address
  - If connection is established, it's OK
  - Try the next possible source address
  - Repeat until connection is established

### ☆ Issue in on-link assumption (RFC 2461 section 5.2)

- Assumes the target is on the same link when
  - IPv6 global is the Target
  - IPv6 link-local in the Source
  - no "default" route exists
- Need to timeout the TCP to fall back to IPv4
  - reason of irritated

## 2) Try to connect the TCP

### ☆ Operational issue

- The servers who don't accept connections in IPv6
  - There are IPv6 connectivity
  - Their AAAA RRs are registered in the DNS
  - Example: Email is IPv6-ready while the web isn't
- Need to wait for returning back the TCP RST

### 3) Data Exchange

#### ☆ For a smooth communication

- Use an appropriate route
- Make sure if ICMPv6 is functional
  - destination unreachable
  - packet too big
  - time exceeded

#### ☆ Issues in the quality of IPv6 connectivity

- Experimental operation where nobody monitors anymore
- Stupid tunnels, sometimes spawns over multiple ASs
  - Should have a better route
- ICMPv6 issue
  - Some firewalls discard ICMPv6

### Summary of our activities

#### ☆ IPv6 Specification

- Online assumption to be removed

#### ☆ Operational issues

- DNS Servers and Resolvers

#### ☆ Quality of communication

- IPv6
- TCP
- Firewalls
  - ICMPv6
  - EDNS0

#### ☆ Product information

- BIND 9
- Hotel systems, etc

## Operational Issues

### ☆ Email is IPv6 ready while the web isn't

- Example) Change the OS to OpenBSD
  - Apache 1.3 doesn't support IPv6
- Wrong config:

```
server.example.com. IN A    192.0.2.1
                    IN AAAA 2001:DB8::1
www.example.com.   IN CNAME server.example.com.
mail.example.com.  IN CNAME server.example.com.
```
- Correct config:

```
www.example.com.  IN A    192.0.2.1
                  IN AAAA 2001:DB8::1
mail.example.com. IN A    192.0.2.1
```

## Issues in the DNS servers

### ☆ When there *is* a name but no AAAA record

- The right response is
  - RCODE 0 (NOERROR)
  - Null answer section (ancount==0)

### ☆ Some wrong responses:

- 1) Ignore queries with AAAA RR
  - Need a timeout to fall back to asking A RR
- 2) Respond with RCODE 3(Name Error)
  - No A RR will be queried
- 3) Respond with other RCODE
  - No negative-cache works well
- 4) Respond with broken answer
  - RCODE 2(Server Failure) disables NCache
  - No A RR will be queried
- 5) Lame Delegation
  - Failure in resolving A RR

## Examine JP DNS servers

### ☆ Procedure

- Got a domain list of .jp from JPRS
- Identify the DNS server for a particular domain
- Query "www" or "ftp" A records for the domain
- If got a response, query AAAA to the same server

### ☆ Result (2004.11.22)

	Domain	Server
No problem	0.04%	0.11%
w/ problem	82.16%	84.39%
Unknown	17.80%	15.50%

### ☆ Problems:

- 1) Ignore queries w/ AAAA RR : 4.7%
- 2) Respond with RCODE 3 : 4.7%
- 3) Respond with other RCODE : 8.5%
- 4) respond with broken answer : 0.0%
- 5) Lame Delegation : 82.1%

## Quality of IPv6 connectivity

### ☆ Issues

- Bad query due to experimental operation
- Improper tunnel is still used

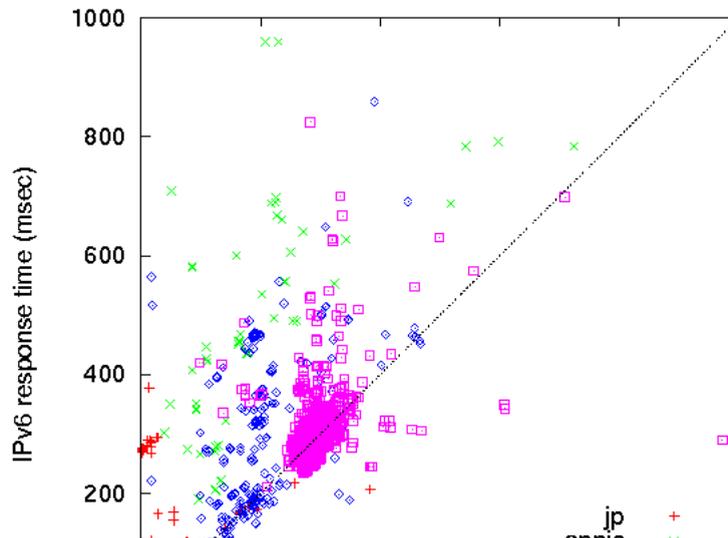
### ☆ Examine quality of IPv6 connectivity

- Measurement of RTT by ping
- Compare RTT in IPv4 and in IPv6
- Measurement by traceroute
- Identify tunnels which are not match with topology

## Result of ping

### ☆ RTT for IPv4 and IPv6 on Aug 23, 2004

- Data from Kenjiro Cho <kjc@ijilab.net>



## ICMPv6 and Firewall

### ☆ Issues in Firewalls

- Drop ICMPv6 packets
- Drop DNS queries w/ EDNS0

### ☆ Need a tool

- Generate packets which trigger ICMPv6
- Generate packets which trigger queries w/ EDNS
- Examine if they can reach the target

### ☆ Future plans

- Shall WIDE examine proactively?
- Shall we leave examination to the users
  - The tools need to be disclosed

## Contacts

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☆ **Point of Contact**

- [contact@v6fix.net](mailto:contact@v6fix.net)

☆ **Document and other information**

- <http://v6fix.net/>