Enhanced Mechanism of Automated IPv6 Site Renumbering

Present by

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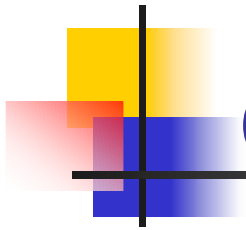
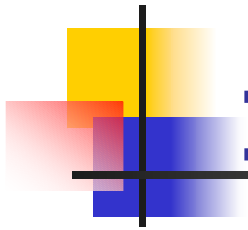


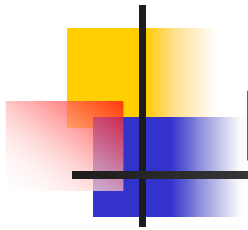
Outline

- Introduction
  - Problem and Motivation
  - Neighbor Discovery Protocol
  - Autoconfiguration Protocol
  - Router Renumbering Protocol
- Implementation
- Experimental Setup
- Experimental Results
- Conclusions



Introduction

- IPv6 is a new version of Internet protocol.
- Repair limitation of IP address problem with 128 bit address.
- The small routing table of router.
- Security
- Renumbering



Problem and Motivation

- Changing the global network address
- Changing ISP
- Large the network topology

How Renumbering get done

- Renumbering include 4 part

Host

- Neighbor Discovery and Autoconfiguration Protocol

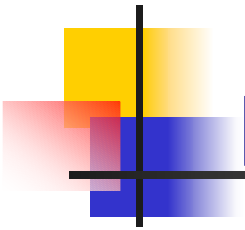
Router

- Router Renumbering Protocol

DNS Server

- Dynamic DNS Update

TCP wrapper and Firewall

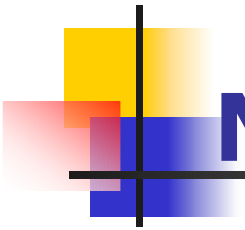


Neighbor Discovery Protocol (ND)

- IPv6 node which share the same link physical medium (link) use Neighbor Discovery
  - Determine link layer address of their neighbor
  - Find router

ICMPv6 message concern renumbering

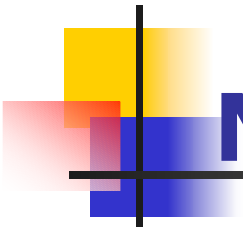
- Router Solicitation (RS)
- Router Advertisement (RA)



Neighbor Discovery Protocol (cont.)

- **Router Solicitation Message (RS)**

  The router solicitation message is transmitted by host to router to generate router advertisement message.

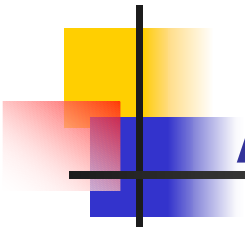


Neighbor Discovery Protocol (cont.)

- **Router Advertisement Message (RA)**

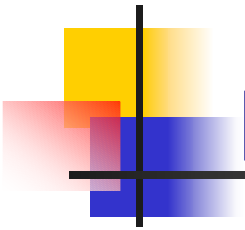
  periodic advertisement (of availability of a router) which contain

  - list of prefix use on the link
  - a possible value for Max Hop limit
  - value MTU



Autoconfiguration Protocol

- A host generates own address using two elements of information
  - The host part is called interface identifier (MAC address)
  - The router part come from address prefix



Router Renumbering Protocol

- Router Renumbering protocol used to update the routers.
- Combines with Autoconfiguration and Neighbor Discovery

Format of router renumbering command

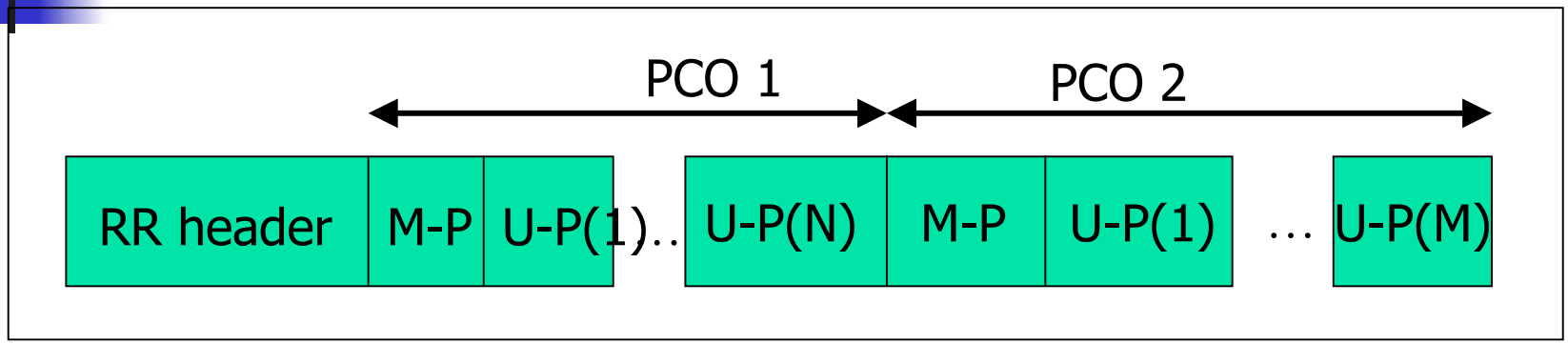
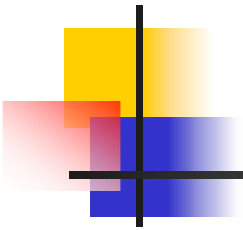


Figure1 Format of router renumbering command

Match-Prefix Part have 3 operations.

1. The ADD operation
2. The CHANGE operation
3. The SET-GLOBAL operation

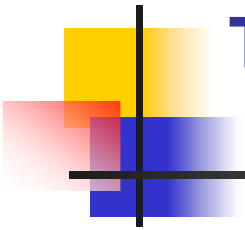


Implementation

- Management station
  - Compile kernel
    - because the old kernel have not the rrenumd (router renumbering daemon)
    - Implement the function of operations.
- Router
  - enable to receive router renumbering request packets.
  - Implement the function of operations.

Implementation (Cont.)

- DNS Server
  - Configured AAAA Record type
  - Configured to support Dynamic DNS Update
- Firewall and TCP Wrapper
  - Host must be embedded the program for automatically update the filter rule.



The relationship between renumbering IP address and DNS, Firewall and TCP Wrapper

- Add a new address
- Update DNS (Filter rules)
- Set preferred and valid lifetime to be zero
- Delete a old address

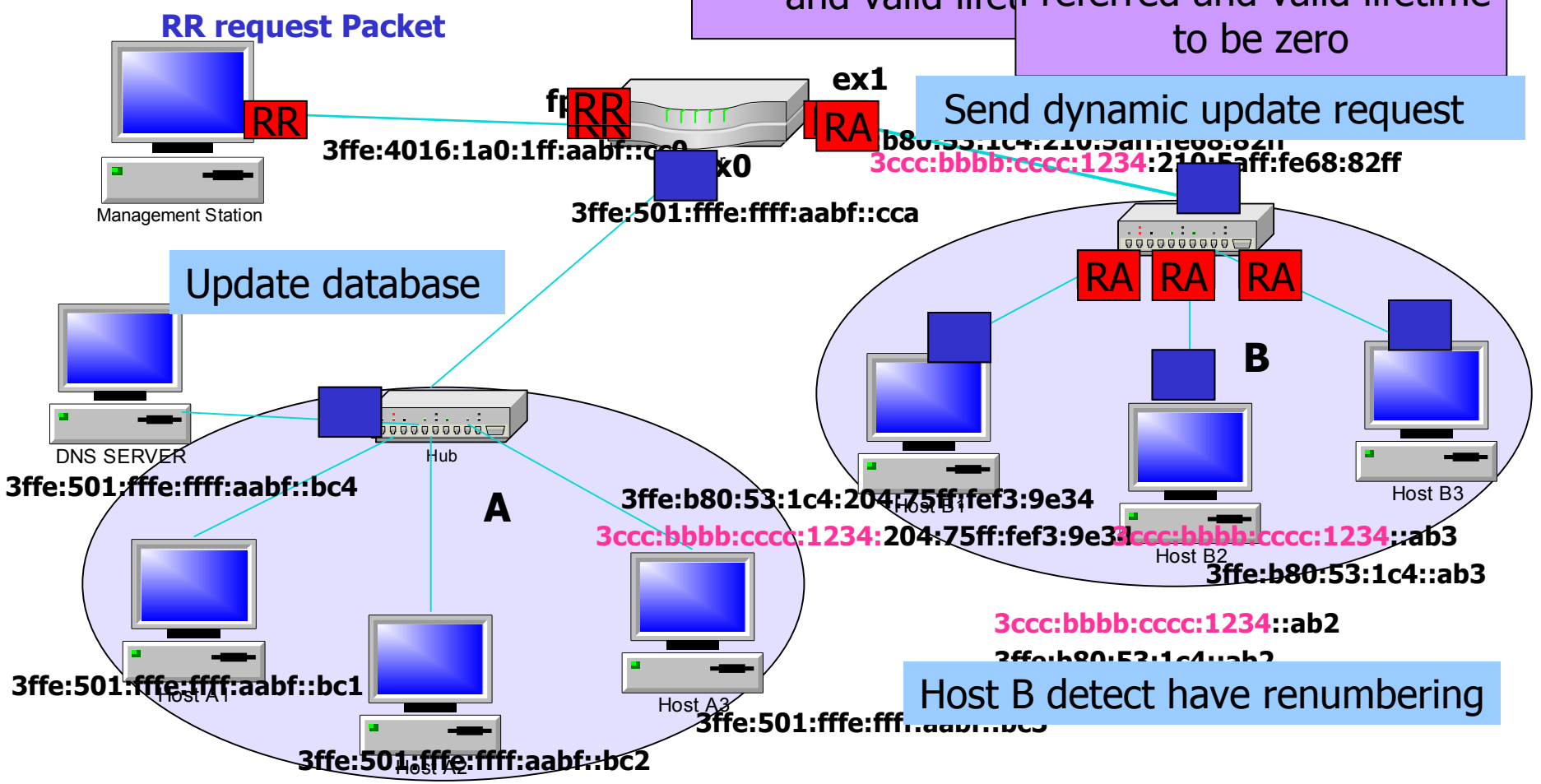
Testing Re

Change operation
Match-prefix: 3ffe:b80:53:1c4:: /64
Use-prefix: 3ccc:bbbb:cccc:1234:: /64
Keeplen

Set preferred
and valid lifet

Preferred and valid lifetime
to be zero

Send dynamic update request



Testing Router Renumbering

```
rtadvd[327]: router renumbering
rtadvd[327]: <rr_command_check> seq.seg 0.0 (last 0 [0.0.0.0.0.0.0.0]) from fe80
::250:baff:fe62:eb46
rtadvd[327]: flags is 16
rtadvd[327]: checklen is 64
rtadvd[327]: interface ex0
rtadvd[327]: addr = fe80:0001:0000:0000:0201:03ff:fe40:8b4f
rtadvd[327]: addr = 3ffe:0b80:0053:ffff:0201:03ff:fe40:8b4f
rtadvd[327]: interface ex1
rtadvd[327]: addr = fe80:0002:0000:0000:0210:5aff:fe68:82ff
rtadvd[327]: addr = 3ffe:0b80:0053:01c4:0210:5aff:fe68:82ff
rtadvd[327]: matching addr = 3ffe:0b80:0053:01c4:0210:5aff:fe68:82ff prefix = 3f
fe:0b80:0053:01c4:0210:5aff:fe68:82ff
rtadvd[327]: address is 3ccc:bbbb:cccc:1234:210:5aff:fe68:82ff
rtadvd[327]: Add address = 3ccc:bbbb:cccc:1234:0210:5aff:fe68:82ff to interface
= ex1
rtadvd[327]: My address = 3ccc:bbbb:cccc:1234:0000:0000:0000:0000 to interface =
 ex1
```

Add address to interface ex1

Figure2 The procedure of the router for check match when renumber.

Testing DNS Renumbering

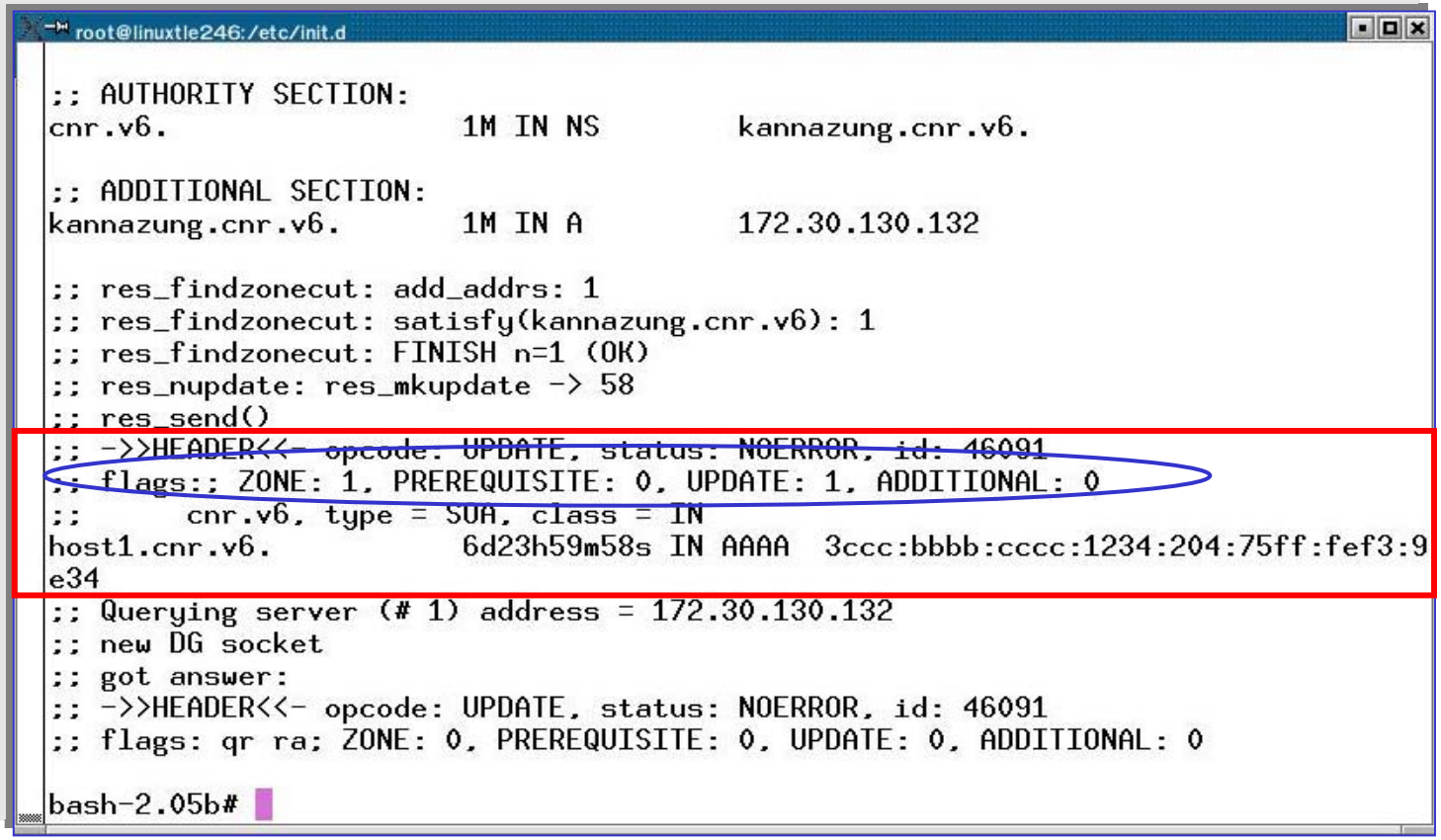


Figure3 The output of testing DNS renumbering.

Testing DNS Renumbering (cont.)

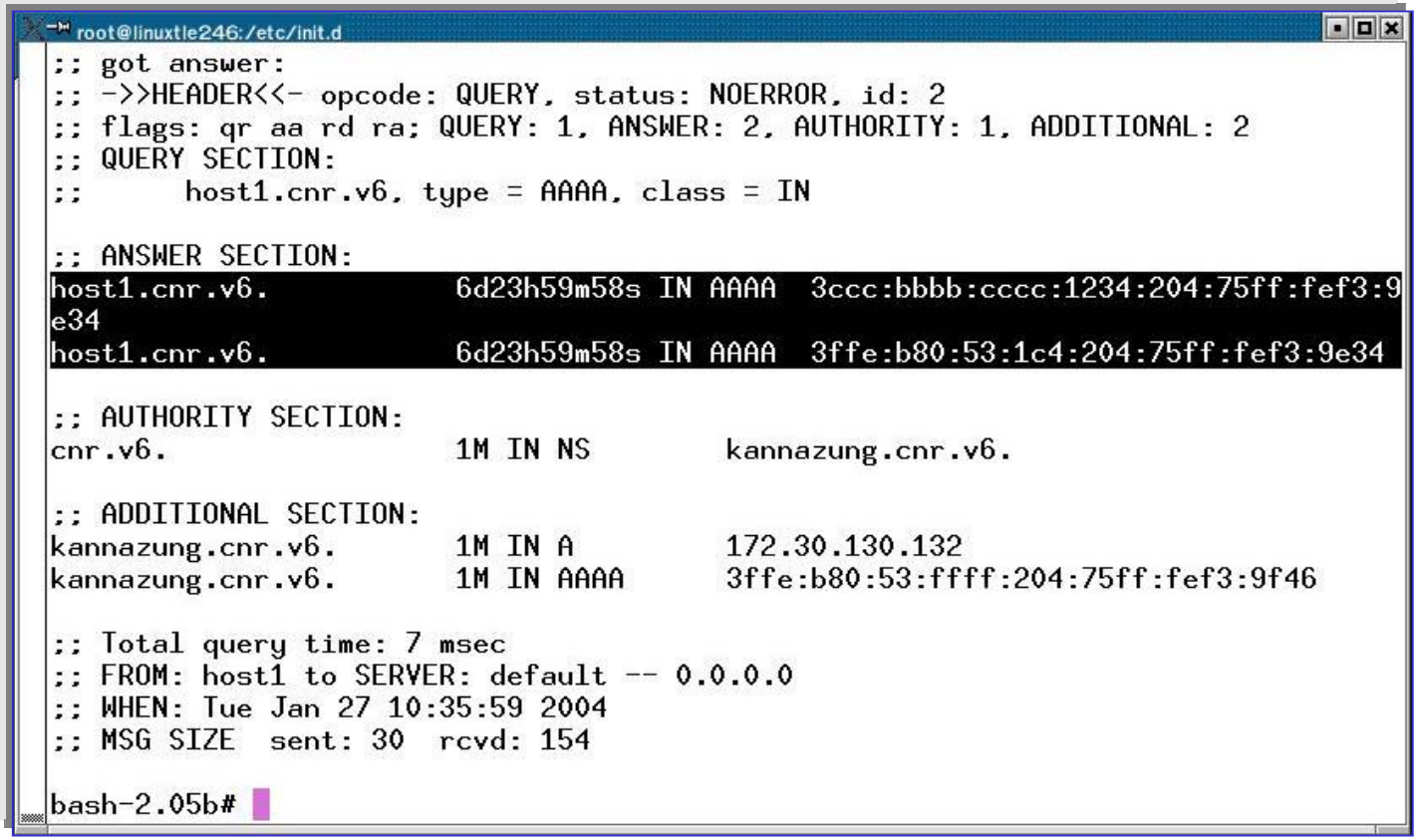


Figure4 The output when query to host1.cnr.v6

Testing Firewall and TCP Wrapper renumbering

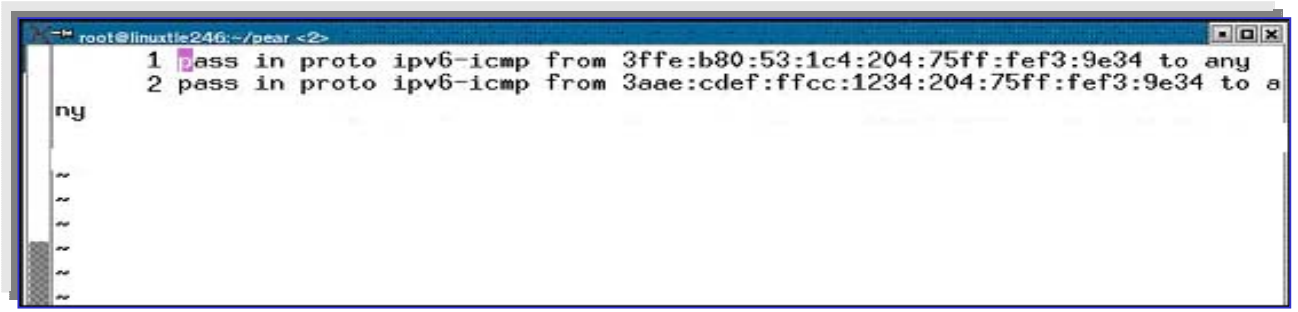


Figure5 The rules of firewall before renumbering occurred

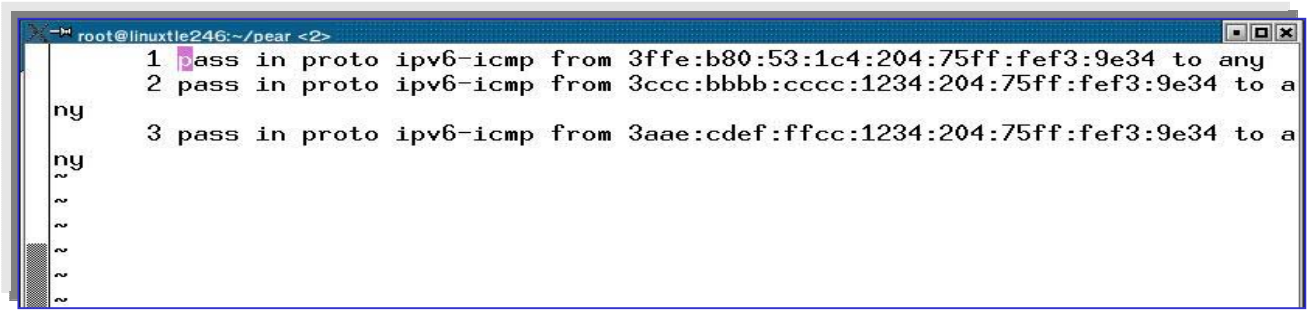


Figure6 The rules of firewall after renumbering occurred

Testing Firewall and TCP Wrapper renumbering (cont.)

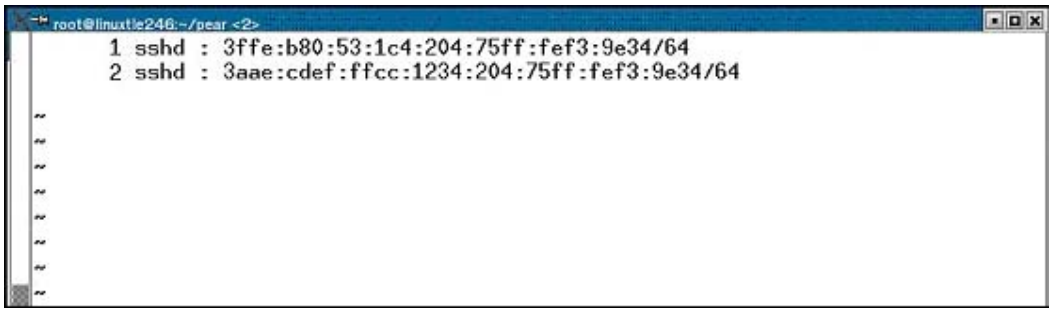


Figure7 The rules of TCP Wrapper before renumbering occurred

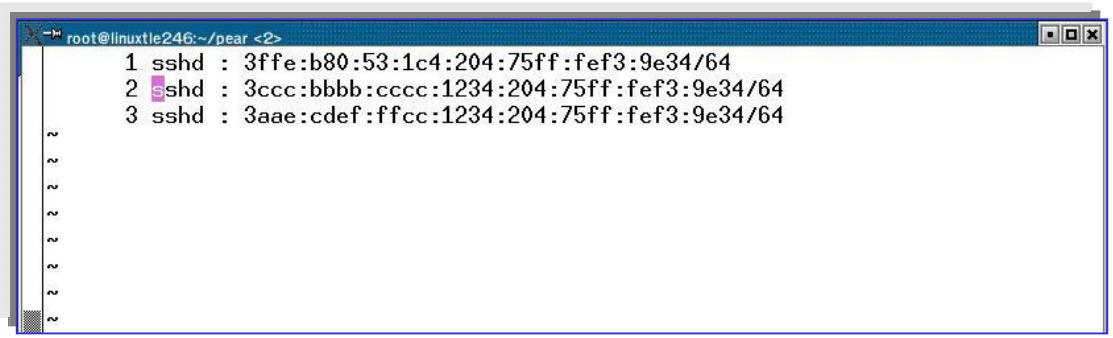


Figure8 The rules of TCP Wrapper after renumbering occurred

Testing Firewall and TCP Wrapper renumbering (cont.)

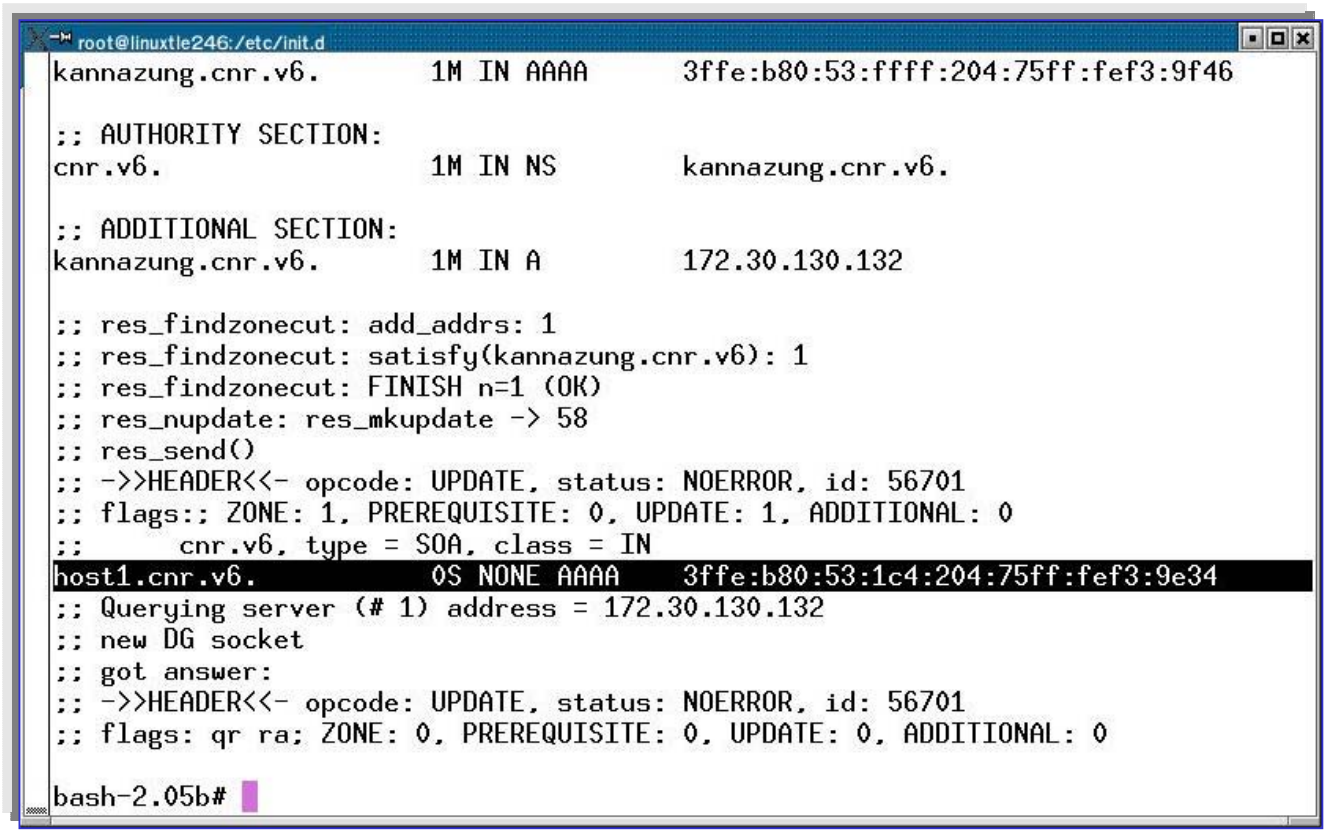


Figure9 The information after update database, when life time to be zero

Testing Firewall and TCP Wrapper renumbering (cont.)

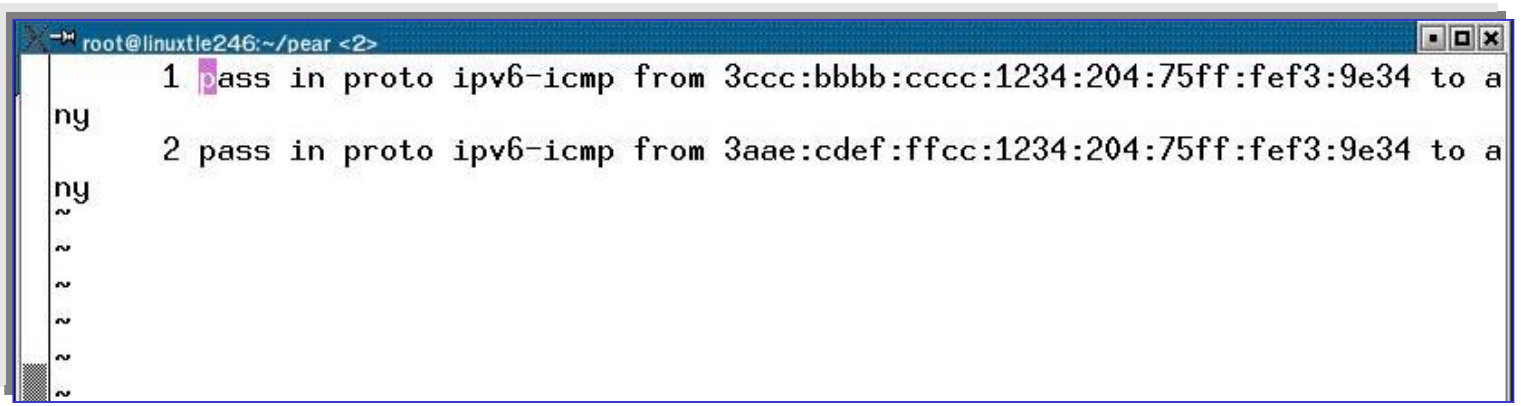
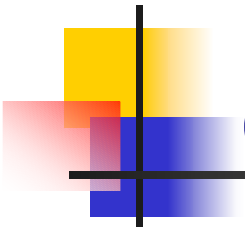


Figure10 Updating the filter firewall when the old rule was deleted.

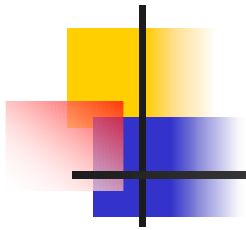
Testing Firewall and TCP Wrapper renumbering (cont.)

Figure11 Updating the TCP wrapper when the old rule was deleted



Conclusions

- Discussed the router renumbering protocol and process of renumbering IPv6 network
  - Host and Router
  - DNS
  - TCP Wrapper and Firewall
- Decreasing the task of system administrator for renumbering



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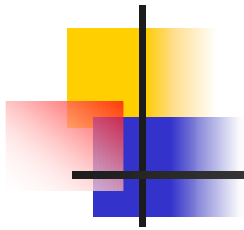

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Question and Comment

Experiment Setup