

A Recommendation for IPv6 Address Text Representation

APNIC28

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Brief review of IPv6 address notation

One single address can be text represented in many different flavors. (according to RFC4291)

examples :

2001:0db8:0000:0000:abcd:0000:0000:0001

2001:db8:0:0:abcd:0:0:1

2001:db8::abcd:0:0:1

2001:db8:0:0:abcd::1

2001:DB8::ABCD:0:0:1

2001:db8:0:0:abcd::0:1

What problems arise?

- Searching for an address in .txt .xls etc
 - searching in text files, Excels, etc will be an endless battle (especially for non-engineers)
 - addresses written in diagrams are “plain texts” as well
 - traceroute results will not match your configuration repository, address management systems, etc

Simple example part 1

```
> traceroute6 -I www.example.jp
traceroute6 to www.example.jp (2001:db8:2:b000::1:80)
from 2001:db8:10:200::2929:1129, 64 hops max, 16 byte payload

 4 2001:db8:50:1::9d6:cafe 4.343 ms * 5.000 ms
 5 2001:db8:0:1::9d6:6 5.459 ms 5.774 ms 2.880 ms
 6 2001:db8:0:1:0:1:9d6:7 4.589 ms 3.338 ms 3.230 ms
 7 2001:db8:70:1::249:1 5.109 ms 4.081 ms 3.984 ms
 8 tokyo01.example.jp 7.356 ms
   tokyo02.example.jp 6.191 ms
   tokyo03.example.jp 5.078 ms
 9 osaka01.example.jp 6.699 ms 4.332 ms 4.361 ms
10 2001:db8:1:a::29 6.607 ms
   2001:db8:1:b::29 6.587 ms
11 2001:db8:2:b000::1:80 5.985 ms
```

1. Copy the address from the terminal output.
2. paste to search box in Excel (or text editor)

Will not match!

addr_list.xls

	A	B
1	2001:db8:0:1::1:9d6:7	Router
2	2001:db8:0:1::1:9d6:8	PC

Simple example part 2

```
> less router.conf
```

```
xe-1/1/0 {  
  unit 0 {  
    description "Peer-A";  
    family inet {  
      filter {  
        input sample;  
      }  
      address 192.168.1.1/30;  
    }  
    family inet6 {  
      address 2001:0db8::0001:0:0:0001/64;  
    }  
  }  
}
```

2001:db8:0:0:1::1
2001:db8::1:0:0:1
2001:db8:0:0:1:0:0:1

searching files for an
address is not easy
even in Unix.

What problems arise?

- Log Parsing
 - daemon A tells me
2001:0db8:0000:0000:abcd:0000:0000:0001
but daemon B tells me
2001:db8::abcd:0:0:1
- Configuration Auditing
 - many tools are plain diffs.
 - if I switch to a different brand router, will I get a different output?

simple example part 3 (logs)

```
Sep 17 16:31:50 RouterA /kernel: tcp_auth_ok: Packet  
from 2001:0db8:0:0001::0999:0006:3215 unexpectedly has  
MD5 digest
```

```
Sep 17 16:32:06 RouterA rpd[4488]:  
RPD_BGP_NEIGHBOR_STATE_CHANGED: BGP peer  
2001:db8:0:1::999:6 (External AS 65123) changed state  
from OpenConfirm to Established (event RecvKeepAlive)
```

Real logs from a working router.
(BSD, Linux... same thing)

Now combine this with firewalls,
other daemons, dumps, and troubleshoot...

Our thoughts

It would be nice to have a **canonical format** that

A. is fairly well widespread

B. fully compliant with RFC4291

C. human friendly

and have an informational document that can be referenced by a wide variety of people (developers, operators, enterprise IT people, etc)

draft-ietf-6man-text-addr-representation-00

- INFORMATIONAL draft
 - originally was draft-kawamura-ipv6-text-representation-03
- Defines a canonical format. When in doubt, follow the canonical format.
simple 😊
- Not just for developers, but also for operators.
- Remember, this is about text representation.
Do NOT regulate the input.

The proposed canonical idea

1. omit leading zeros in a 16 bit field

~~2001:0db8::0001~~ 2001:db8::1

2. :: used in places that shorten address the most

~~2001::1:0:0:0:1~~ 2001:0:0:1::1

3. if there's a tie breaker for rule 2, then shorten former zeros

~~2001:db8:0:0:1::1~~ 2001:db8::1:0:0:1

The proposed canonical idea

4. :: used to shorten all consecutive zeros

~~2001:db8::0:0:1~~ — 2001:db8::1

5. :: when there are more than two zero fields

~~2001:db8::1:2:3:4:5~~ 2001:db8:0:1:2:3:4:5

6. lower case

checked with traceroute, ifconfig, ipconfig, on
major PC operating systems

Hints for operators

- Ask vendors if address representation is compatible with the draft. Be aware!
- Avoiding 0 in the first 4 fields prevents :: confusion. (reserve 2001:db8:0::/48 and 2001:db8:*:0::/64 for loopbacks, DNS, etc)
- Ask everyone in your company to TRY to represent the address in the same way.
- Make tools. inet_ntop() a good C reference.

Questions?

A stack of papers or documents, rendered in a light green color, positioned behind the text.

Thank you!!!