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

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

Will not match!

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2001:db8:0:1::1:9d6:7</td>
</tr>
<tr>
<td>2</td>
<td>2001:db8:0:1::1:9d6:8</td>
</tr>
</tbody>
</table>
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...
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
   \[2001:0\text{db8}:0001\] \(2001:\text{db8}::1\)

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
   \[2001:\text{db8}:0:0:1::1\] \(2001:\text{db8}::1:0:0:1\)
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

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?

Thank you!!!