# 32-bit ASNs

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Dunedin
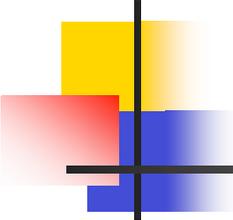
ASN status

- The pool of 16-bit ASNs will soon be exhausted
    - Current allocations up to 45055 have been made to the RIRs
    - Analysis at http://www.potaroo.net/tools/asns/
    - Estimates are that the 16-bit ASN pool will be exhausted late 2010
- Work started in 2001 to extend the ASN pool to 32-bits

Source: http://www.potaroo.net/tools/asns/fig28.png
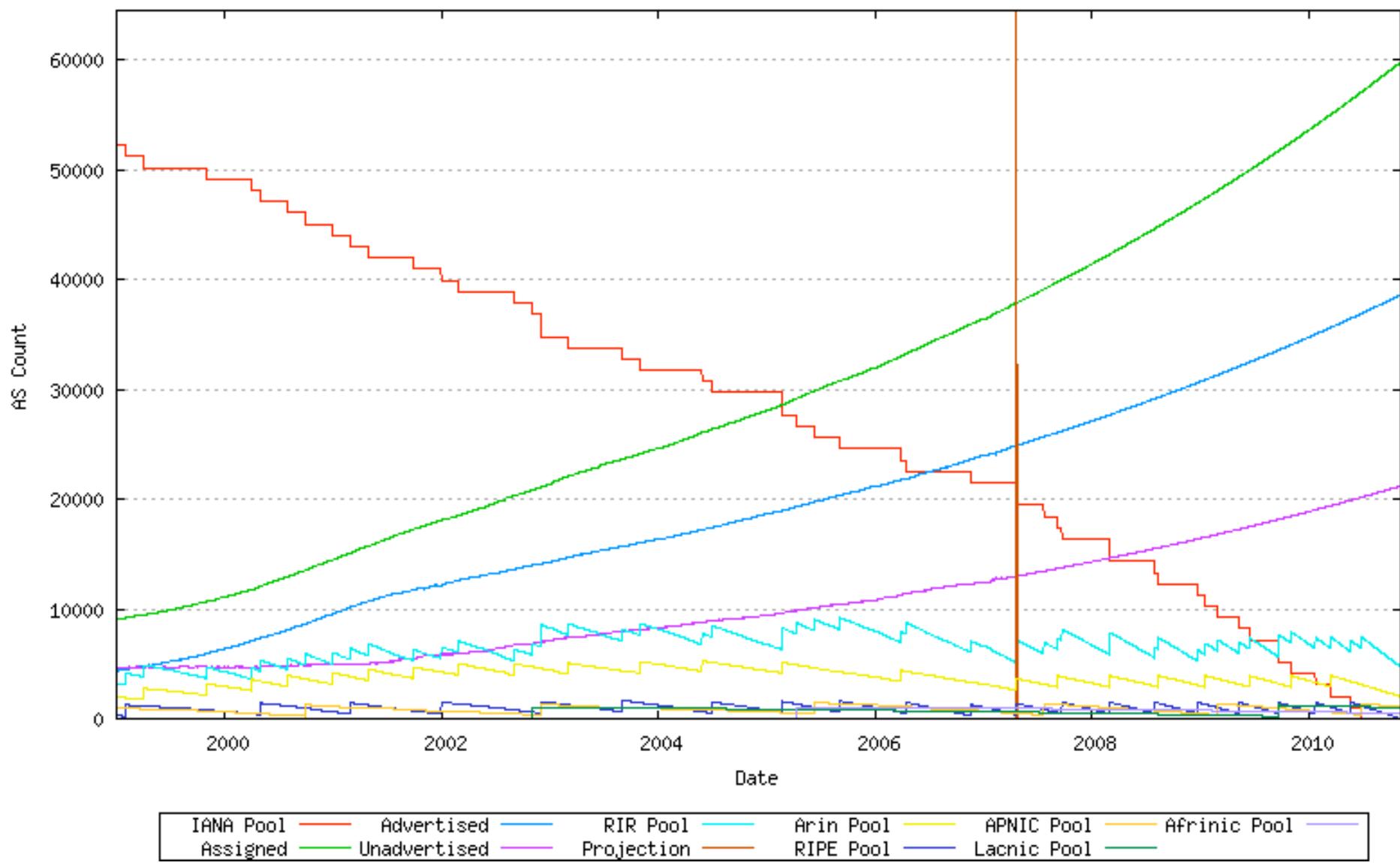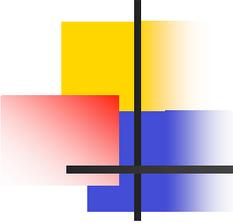
32-bit ASNs

- **Various documents**
  - 32-bit ASN Standard
    - www.rfc-editor.org/rfc/rfc4893.txt
  - Proposal for the representation of 32-bit ASNs
    - www.ietf.org/internet-drafts/draft-michaelson-4byte-as-representation-05.txt
  - New extended community
    - www.ietf.org/internet-drafts/draft-rekhter-as4octet-ext-community-01.txt
- **AS 23456 is reserved as interface between 16-bit and 32-bit ASN world**
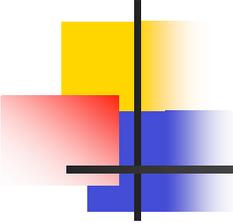
Getting a 32-bit ASN

- **Sample RIR policy**
  - www.apnic.net/docs/policy/asn-policy.html
- **From 1st January 2007**
  - 32-bit ASNs available on request
- **From 1st January 2009**
  - 32-bit ASNs assigned by default
  - 16-bit ASNs only available on request
- **From 1st January 2010**
  - No distinction – ASNs assigned from 32-bit pool
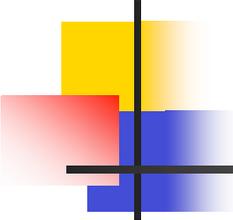
Representation

- 32-bit ASNs extend the pool:
  - 0-65535 extended to 0-4294967295
- Still discussion about representation of 32-bit range: some favour X.Y:
  - For 65536-4294967295, or
  - For 0-4294967295
  - But how will regular expressions work?
- Some favour traditional format
  - But gets bulky to handle when numbers get v big
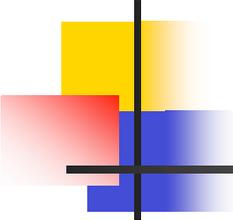
IANA Assignments

- 0.0 - 0.65535   16-bit ASN block
- 2.0 - 2.1023   APNIC
- 3.0 - 3.1023   RIPE NCC
- 4.0 - 4.1023   LACNIC
- 5.0 - 5.1023   AfriNIC
- 6.0 - 6.1023   ARIN
- Remainder are reserved or held by IANA
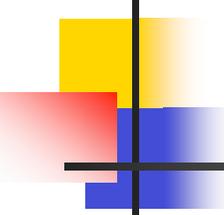
Changes (1)

- 32-bit ASNs are backwardly compatible with 16-bit ASNs

- There is no flag day

- You do NOT need to:
  - Throw out your old routers
  - Replace your 16-bit ASN with a 32-bit ASN
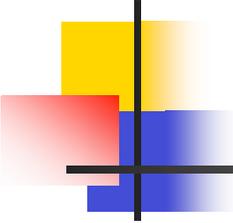
Changes (2)

- You do need to be aware that:
    - Your customers will come with 32-bit ASNs
    - ASN 23456 is not a bogon!
    - You will need a router supporting 32-bit ASNs to use a 32-bit ASN
- If you have a proper BGP implementation, 32-bit ASNs will be transported silently across your network
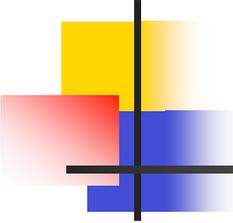
How does it work (1)?

- Local router only supports 16-bit ASN
- Remote router uses 32-bit ASN
- BGP peering initiated:
  - Remote asks local if 32-bit supported (BGP capability negotiation)
  - When local says "no", remote then presents AS23456
  - Local needs to be configured to peer with remote using AS23456
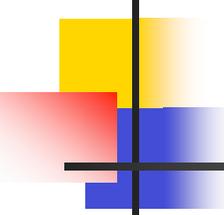
How does it work (2)?

- BGP peering initiated (cont):
  - BGP session established using AS23456
  - 32-bit ASN included in a new BGP attribute called AS4_PATH
    - (as opposed to AS_PATH for 16-bit ASNs)
- Result:
  - 16-bit ASN world sees 16-bit ASNs and 23456 standing in for 32-bit ASNs
  - 32-bit ASN world sees 16 and 32-bit ASNs

Example:

- Internet with 32-bit and 16-bit ASNs
- AS-PATH length maintained
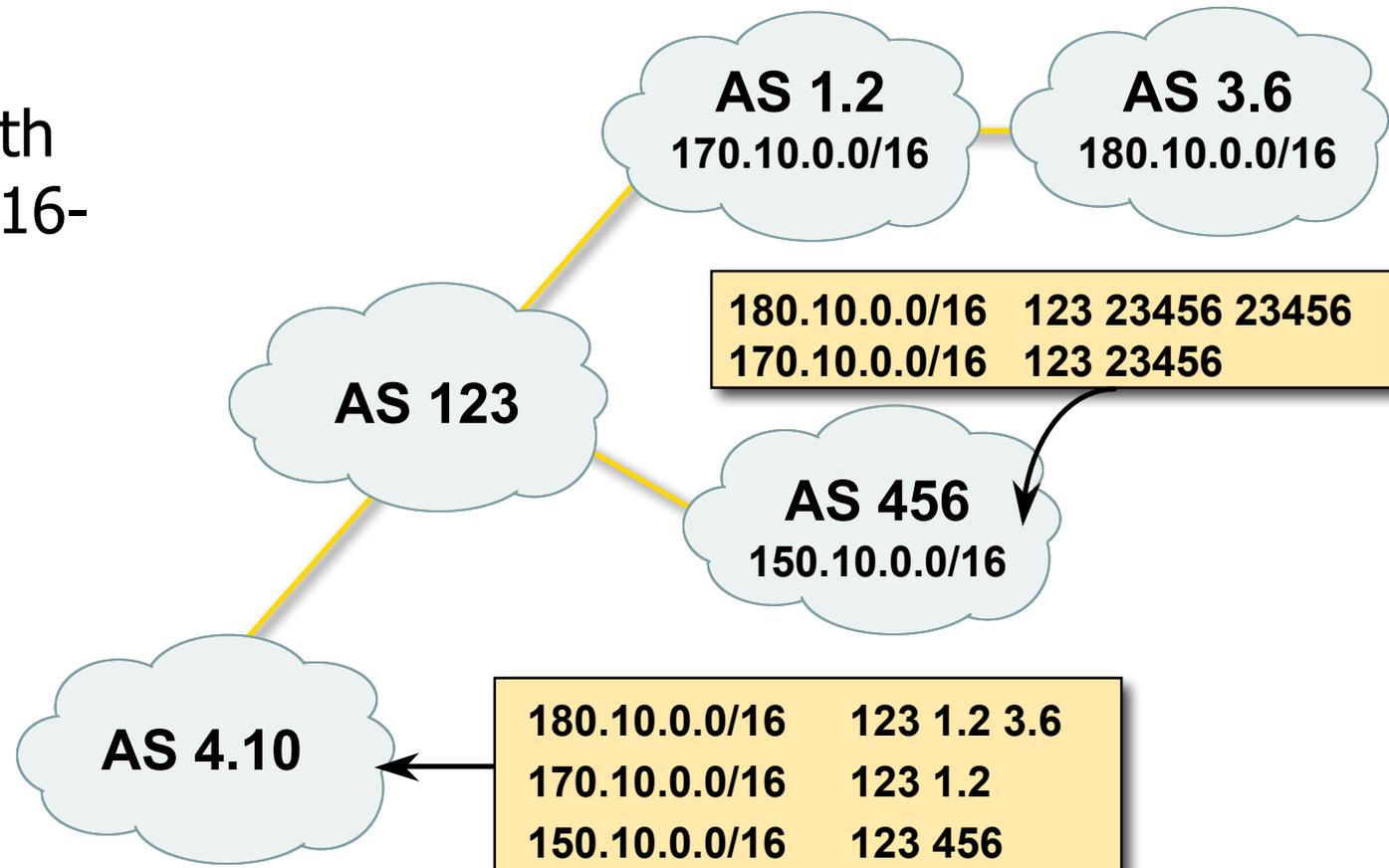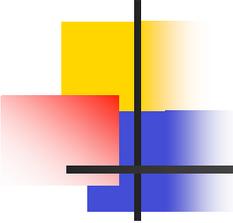
What has changed?

- Two new BGP attributes:
  - AS4_PATH
    - Carries 32-bit ASN path info
  - AS4_AGGREGATOR
    - Carries 32-bit ASN aggregator info
  - Well-behaved BGP implementations will simply pass these along if they don't understand them
- AS23456 (AS_TRANS)
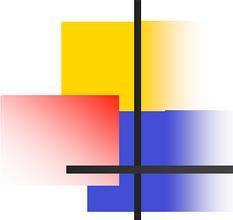
What do they look like?

- **IPv4 prefix originated by AS 1.202**
  - **In 32-bit ASN world:**

```
# bgpctl show rib 203.10.62.0/24
flags: * = Valid, > = Selected, I = via IBGP, A = Announced
origin: i = IGP, e = EGP, ? = Incomplete

flags destination     gateway    lpref med aspath origin
*>     203.10.62.0/24  147.28.0.1  100    0 0.3130 0.1239 0.4637 0.1221 1.202 i
```

  - **In 16-bit ASN world:**

```
router# sh ip bgp 203.10.62.0

   Network              Next Hop              Metric LocPrf Weight Path
*> 203.10.62.0          202.249.2.169                      0 2497 4637 1221 23456 i
```
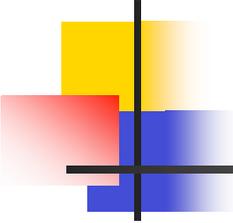
What do they look like?

- IPv6 prefix originated by AS 2.9

```
RP/0/0/CPU0:as4byte#sh bgp ipv6 uni 2403:2000::/32
BGP routing table entry for 2403:2000::/32
Versions:
  Process               bRIB/RIB  SendTblVer
  Speaker                     93          93
Paths: (1 available, best #1)
  Not advertised to any peer
  Path #1: Received by speaker 0
  109 6175 2497 2500 18146 2.9
    2001:420:0:8001::1 from 2001:420:0:8001::1 (204.69.200.22)
      Origin IGP, localpref 100, valid, external, best
RP/0/0/CPU0:as4byte#
```
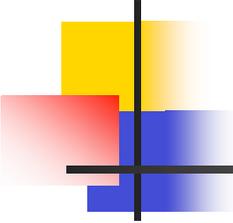
Implementations (Dec 07)

- Cisco IOS-XR 3.4 onwards
  - Cisco IOS – 12.5T, late 2008
- Quagga (patches for 0.99.6)
- OpenBGPd (patches for 3.9 & 4.0)
- JunOSe 4.1.0 (ERX only)
  - M and T series – no plans known
- Redback
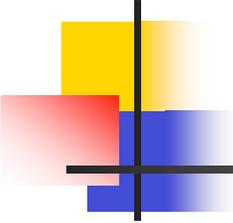
What next?

- Pester your router vendors for 32-bit ASN support
  - Do you really want to run beta software in your core network?
  - October 2010 is not far away
    - Stable software, deployment cycles &c
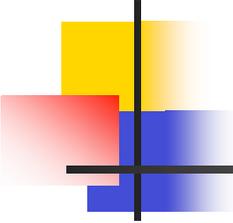
Conclusion

- The Internet will not break
- Your network will not break

- If you have an ASN today:
  - You don't need to change anything
  - 32-bit ASNs appear as AS 23456
- If you have no ASN today:
  - Your routers will need 32-bit ASN support after 1st January 2009