Preliminary Report on the IAB Workshop on Routing and Addressing

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reported by
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Purposes of Workshop

- stimulate interaction among various communities working on Internet routing & addressing issues
- identify current and future routing & addressing problems (both unicast and multicast)
- identify means of understanding and solving those problems (e.g., measurements, simulation, bug fixes, education, IETF working groups, IRTF research group, etc.)

Structure of Workshop

- 30 people (14 IAB / IESG members, 16 invited experts)
- 2.5 days
- 1 room

Topics

- scaling of unicast routing
- scaling of multicast routing
- NAT
- ToS / QoS routing
- routing security
- routing policy
- making net properties visible to applications
- multi-stranded links
- mgmt & diagnostic tools
- automatic numbering & organization of hierarchy
- anycast addressing
- load-sensitive routing

Scaling of Unicast Routing

- most current scaling problems can be fixed with improved implementation
- long-term concern about systematic issues:
  - volatility grows with size of default-free zone
  - multi-homed sites threaten aggregation
  - knowledgeable network operators are a scarce resource
- need more research into what's breaking (not just more data, but more/better analysis)

  => IRTF Routing Research Group

Scaling of Multicast Routing

- dimensions #sources, #receivers, #groups, amount of data, burstiness, duration, topological distribution, …
- reviewed current approaches (DVMRP, MOSPF, PIM, CBT, BGMP)
- …and possible different approaches (single-source multicast, registry of group-RP bindings, replicated unicast, application-layer multicast)
- not yet clear that current approaches scale adequately in all desired dimensions

  => needs further study

NAT (Network Address Translation)

- identified yet more problems introduced by NAT,
  e.g., sessions that span multiple TCP connections, effects of inter-ISP NAT on trust boundaries
- discussed options: no NAT, fix NAT, fix apps, don't do certain things (like IPsec)

  => will pass our detailed findings to the NAT working group

  => IAB will continue to worry about NAT

ToS / QoS Routing

- definitions:
  - ToS: hop-by-hop routing based on destination + ToS bits
  - QoS: routing of set-up packets (to make path for subsequent data packets) according to resources requested and available
  - both are examples of “constraint-based” routing
- discussion revealed demand for some sort of constraint-based routing both within and, eventually, between ISPs

  => recommend Routing AD consider IETF work in this area

Routing Security

- routers need to improve their “host” security — getting console access enables all sorts of harm
- we may or may not have discussed other security vulnerabilities of current Internet routing :-)
- identified a few important areas of work, e.g., wire-speed authentication

Routing Policy

- reviewed what can and cannot be done with BGP
- some policies not supported by BGP can be accomplished by tunnels & static routes
- symmetric routing deemed not a realistic goal, so “get over it”
- router configuration languages very complex & error-prone; need better router policy language

  => refer to RPSL working group

Making Network Properties Visible to Applications

- example desired services:
  - “nearest” of N addresses?
  - from multi-homed host, which outgoing interface to use?
  - MTU to destination?
- identified two general classes of solution:
  - on-demand, like current Path MTU Discovery
  - pre-computed, like unicast routes

  => hold a BOF —> WG?

Multi-Stranded Links

- to get more BW between a pair of routers, sometimes use multiple, parallel links, treated as:
  - individual links, visible to IP routing, or
  - “multi-stranded link”, appearing as one link to IP routing
- multi-stranded approach is preferred, but need “richer” metric to reveal “how much” of link is up

  => L2 work (maybe not IETF)

  => L3 routing support for richer metrics in IGPs
  —> OSPF and other routing WGs

Management & Diagnostic Tools

- database of prefix–AS bindings
- SNMPv3 with better authentication & scoping & rate-limiting
- remotely-controlled traffic sources
- tools for pro-active problem detection
- combined traceroute+ping with “intelligent analysis” rather than just data dump
- distributed probing system
- more analytic DNS diagnostic tools

Automatic Renumbering & Organization of Hierarchy

- discussed
- no conclusions

Anycast Addressing

- work needed:
  - characterizing scaling properties
  - host-to-router protocol to allow host usage
  - pre-TCP handshake protocol?
- need to understand domains of applicability (as compared to multicast, svrloc, DHCP, DNS,…)

  => BOF —> WG (if torchbearer can be found)

Load-Sensitive IGP Routing for Best-Effort Traffic

- believed to be a demand for this
- believed not to work

  (oscillation/stability problems, excessive routing overhead)
- may be time to revisit

  => IRTF Routing Group or Routing AD:
  do something (or not)

Concluding Comments

- full workshop report will be published as an RFC
- our thanks to:
  - Cyndi Jung for local arrangements
  - Sue Hares & Charlie Perkins for recording the discussions
  - all the attendees for contributing their time, effort, and insights