Metro-Based Addressing

a proposed addressing scheme
for the IPv6 Internet

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Design Goals

• scalable routing
  » no more than a few hundred entries per routing table

• no renumbering when changing providers (among providers serving same locale)
  » minimize disincentive to change providers
  » avoid need for new host technology
Metro Address Structure

<table>
<thead>
<tr>
<th>FP</th>
<th>country:metro</th>
<th>site</th>
<th>intra-site part</th>
</tr>
</thead>
</table>

**FP** format prefix

**metro** geographical region centered on major metropolitan area

**site** office site, private residence, campus, etc. (up to millions per metro)

note: no provider ID anywhere in address
Illustrative Example

metro A

metro B
Inter-Metro Routing

• conventional longest-match on country + metro
• bilateral agreements for inter-metro carriage
• a provider may serve any number of sites in any number of metros in any number of countries
Intra-Metro Routing

• all providers serving a metro must be connected within that metro (either directly or indirectly)

• simplest form of interconnect is the MIX (metropolitan internet exchange)
  » high-speed LAN or a layer-2 MAN service
  » can use multiple, redundant MIXes for robustness & load-splitting
  » operated as joint venture of providers or by a third party, with fair and equal access rules
Intra-Metro Routing (cont.)

to support up to millions of sites, a provider’s intra-metro routers do 2-step route lookup:

(1) look up dest. site in customer database to learn site-connected router

(2) if found, look up site-connected router in conventional routing table, and forward

else

forward towards nearest MIX

(do normal caching to avoid lookups on every pkt)
The Customer Database

- has to be maintained by a provider anyway, for billing, maintenance, etc. purposes
- updates distributed to all intra-metro routers once a day => can change providers within 24 hours
- distributed to a provider’s local routers only
Routing at the MIX

a couple of possibilities:

» multicast query across the MIX; cache answer

» pre-exchange of site databases
Metro Address Assignment

• metro prefixes assigned to metros by ISOC-IANA (possibly delegated to national ISOC chapters)
• blocks of site prefixes distributed to intra-metro providers for assignment to new sites
• site prefix stays with site when it changes providers
Provider Selection
(Packet-by-Packet)

outbound packets:
  » by source hosts, using source routing or
     encaps
  » by site boundary routers, using encaps (plus
     optional source routing)

inbound packets:
  » by info placed in DNS, or
  » by reply info included in packets
Stuff I Don’t Have Time to Explain Today

• rerouting around failed connections to sites, for multi-homed sites
• addressing and routing within multi-metro private networks

an internet draft is in preparation…
Open Issues

• how to achieve required intra-metro connectedness?
  » market demand?
  » contract between ISOC and providers, placing conditions on use of metro address prefixes?
  » note: can co-exist with provider-based addressing

• can multiple, competing MIXes be supported?
The Downside

• need for provider connectedness within each metro (eventually)
  can phase in MIXes by having one MIX serve multiple nearby metros until density warrants separate MIXes, but to avoid future renumbering, must assign addresses based on metro, not MIX

• need for two-step route lookup within metros (eventually)
  until provider has many thousands of customers within a single metro, can use existing routing technology
The Upside

• can do scalable routing without site renumbering

• a number of secondary benefits:
  » usually only one address per interface
  » “non-surprising” routing (short deliver paths => low delay, possibly higher throughput)
  » can determine rough distance (~=> delay) between addresses by examination
  » hard to discriminate against providers
  » simplified inter-provider coordination
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