Metro-Based Addressing
— Steve Deering

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

FP	country	metro	site	intra-site part

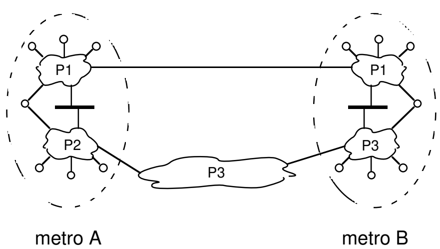
FP format prefix

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



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

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Routing at the MIX

a couple of possibilities:

» multicast query across the MIX; cache answer

» pre-exchange of site databases

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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

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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

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Stuff I Don't Have Time to Explain Today

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

an internet draft is in preparation…

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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?

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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 om 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

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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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