Interim Report on

Evaluation of Different Addressing Proposals

by Lixia Zhang

The story
- the problem: routing too flat
- solution: add more hierarchies in addressing & routing
- how: different opinions, different proposals
- action item from IAB:
  set up a study group to evaluate each proposal
- held the first meeting at Danvers IETF, continued with weekly conference calls since then, expect to wrap up by Dallas IETF

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Group members:
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Disclaimer:
- This is a report on work in progress
- This report does not represent IAB positions
- Individual group members hold different positions on various technical issues

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What We've Done

- categorization of all the proposals: basically
  1. provider-based address assignment
     1.1 static provider binding in the address
     1.2 dynamic provider binding
  2. metro-based address assignment
- created a list of objectives
- compared the proposals against the objective list

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What We've Done (cont')

In the process,
- refined the objective list
- better understanding of
  – the commonality and differences between alternative proposals
  – strength, weakness, and open issues of each
- confirming the need for further studies
  – all proposals cause pain somewhere, must identify what and where they are as input to the decision process

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Objective List

- facilitating provider selection
  – being able to change connected providers easily
  – being able to utilize multiple provider connections simultaneously
- maximizing market competition
  – avoid difficult requirements on providers
  – avoid difficult requirements on subscribers
  – let market forces control providers, not regulations
- scaling well with #providers, #routers, #hosts

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Objective List (cont')

- being consistent with the IP architectural principles
  – we do not preclude changes to current architectural principles, if such changes can be justified
- avoiding circular dependencies on DNS
- IP address unchanged at the source and the destination

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Issues

- should universal connectivity be listed as one of the evaluation objectives?
- importance and impact of mobility
- importance and impact of multicast

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Non-Issues/Clarifications

- The argument is not about hierarchical vs. flat routing
  - There exist other possibilities for hierarchical address assignment other than the provider based approach
- The argument is not about address ownership
  - Labeling concerns with difficulties in renumbering as "wanting address ownership" is a misleading statement

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Clarifications (cont')

- An Internet with dynamically changing addresses changes the architecture we used to know
  - Labeling applications as "brain-damaged" does not help solve the problem
  - Users face real problems; each case needs to be studied and handled with care.

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Some Relevant Elements in the Current IP Architecture

- (invariant) unique identification of the end host
  - used by other protocols
- topological location information of the end host
  - used by routing
- in IPv4, both functions are overloaded in the address field
  - e.g. TCP design uses IP address as UID, assuming that the address will not change over the period of connections lifetime

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Elements in the Current IP Architecture (cont')

- Multihoming: Architecture vs. Implementation
  - IP architecture allows multiple addresses per network interface
  - common practice: single address per interface
  - no usage guideline has ever been specified on how the host may choose among its multiple addresses

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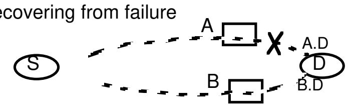
Provider-based Address Assignment

- change of providers → change of addresses
  - as a result of long term planning, or
  - as a result of recovering from failure



- require host renumbering
  - may happen during the life time of applications
  - the address may no longer be able to serve as a dependable(fixed) identifier

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Provider-based Address Assignment (cont')

- some of the possible consequences: impact on
  - TCP connections, or any higher level protocols/ sessions using IP addresses
  - firewall traffic filtering?
  - IP security work?
- multiple providers -> multiple addresses per interface
  - no existing effort looking into this issue yet

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Dynamic Provider Addresses

- divide the address into two parts
  - provider prefix
  - unique & invariant lower portion
- each site may have multiplex provider prefixes
- manage addresses (prefixes) in separate device
  - e.g. border router

difficulties/open issues:

- change higher level protocols
- need an authority to manage the unique portion of the addresses

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Some Common Issues in Provider-Based Assignment

(potentially) all addresses may change some time

- require automated, dependable autoconfiguration tools
- require changes to high level protocols
- rely on DNS keeping up-to-date address information
- require special and careful handling of DNS servers to avoiding circular dependency
  - root servers need to be assigned provider-independent addresses
  - root servers need to be assured reachability (perhaps by specially arranged locations/interconnections?)
  - there may exist potential dynamics that is yet to be fully understood

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Deering's slides

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Summary

- alternative proposals on the table today
- our study shows that each proposal has its own strengths, weakness, and list of open issues
- further studies are warranted

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What's Next

- write up our understanding so far
- full documentation of each of the approaches
- go through a thorough evaluation cycle of individual proposals
  - performance, cost, feasibility, scaling property
- report to IAB our findings and recommendations
- publish the results as informational RFC

We welcome inputs from the community

The study group email address: address@parc.xerox.com

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