Evaluating the Benefits of the Locator/Identifier Separation

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Agenda

- Introduction
- Locator / Identifier Separation
- Benefits
  - FIB Size Reduction
  - Route Diversity Exploitation
- Conclusion
Introduction
Problem 1: Routing Table Growth

Main Causes:
- Provider Independent (PI) prefix assignment
- Multihoming
- Traffic Engineering
- ISP Switch-over
- Mobile ISPs
- ...

Source: http://www.cidr-report.org
Problem 2: Limited Route Diversity

- Path-Vector nature of BGP

A BGP router C redistributes a single route for a prefix P to its neighbor D!

- Impact on Route Diversity

Consequence: A source A might “see” only one ingress ISP B1 for dest. B
Locator / Identifier Separation to the Rescue ?
Locators and Identifiers

- **IP addresses**
  - **Overlapping semantics**
    - **Identifier** function: the mean to identify a network interface in the Internet.
    - **Locator** function: the mean to identify where in the Internet topology a device interface is located.

Separated Spaces ⇒ Less complex and more scalable architecture!
LISP

IETF draft: draft-farinacci-lisp-00 (January 2007)
Benefit 1:
FIB Size Reduction
Shrinking the FIB (1)

• Objectives
  – Evaluate how the locator/id split allows reducing the routing table size in the global Internet.
  – Use of two separate address spaces allows new strategies for assigning routing locators
    • More topologically driven assignment
    • Less prefix independent (PI) prefixes allow tighter aggregation

• Metric
  – Number of FIB entries per domain
Shrinking the FIB (3)

- **Evaluation methodology**
  
  Simulation setup:
  - Two synthetic topologies generated by **GHITLE**
  - Hierarchical with business relationships

![Diagram](image)

- **LARGE**
  - 2 Tier-1s
  - 2707 transits
  - 11986 stubs
  - (14965 ASes)

- **SMALL**
  - 50 Tier-1s
  - 11873 stubs
  - (11923 ASes)
A.2.1  B.1.1

Only Tier-1s are assigned a PI prefix. Each provider delegates non-overlapping fractions to its customers.
FIB Size: S2 Case

All transit domains are assigned a **PI prefix**. Delegation is done as in S1.
Benefit 2:
Improving the Route Diversity
Route diversity (1)

- Objective
  - Evaluate number of paths that could be leveraged using various combinations of RLOCs.

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<th>Dataset</th>
<th>Routes</th>
<th>Peers</th>
<th>Pairs</th>
<th>M-h stubs</th>
<th>M-h prefixes</th>
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</table>

Simulated dual-homed stub

Providers (RV peers)

Internet core

Multi-homed prefixes

2 ingresses learned for prefix P1

Single ingress learned for prefix P2
Route diversity (2)

Rule of thumb:
Route diversity is \( N \times M \)

\( N \): num. prov. src.
\( M \): num. prov. dst.

RouteViews
(same for RIPE RCC)
Conclusion
Conclusion

The Locator / Identifier Separation allows

- Better prefixes aggregation and \textit{reduction of the RIB/FIB sizes}!
- \textbf{Higher route diversity by using different RLOCs.} End-to-end paths with better characteristics (e.g. Latency) are available!

Further work

- Design/evaluate RLOC/EID mapping schemes
- Implementation of LISP protocol
- Cost of Mappings Caching/Lookup
Thank you for your attention!

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