FIRMS: Future InteRnet Mapping System

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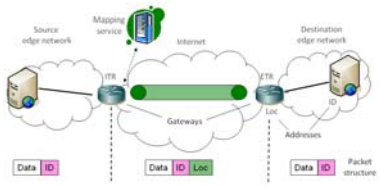
Locator/Identifier Split



Idea

- Addresses consists of decoupled IDs and locators (Locs)
- User processes communicate with IDs instead of traditional IP numbers
- Mapping system provides ID-to-Loc mapping
- Network layer entities, e.g. gateways, add source and destination Locs to packets after mapping lookup

Future Internet Mapping Systems

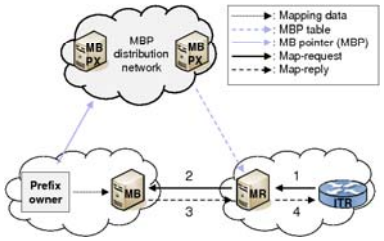
Assumptions

- Loc/ID split
- IDs assigned in prefix-blocks by authorities (RIRs, LIRs, ...)

Requirements

- Scalability
- Resilience
- Security
- High performance
- Low latency
- Forwarding of packets without locators
- Not bound to a specific routing architecture

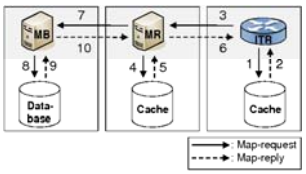
FIRMS Architecture



Components

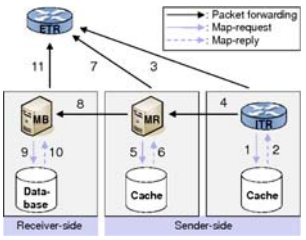
- Map-base (MB): stores ID-to-Loc mappings for all IDs of an ID prefix
- MB pointer (MBP): points to MB for specific ID prefix
- MBP distribution network: pushes global MBP table to MRs
- MBP exchange node (MBPX): element of MBP distribution network
- Map-resolver (MR): uses MBP table to retrieve ID-to-Loc mapping from appropriate MB for ITR

Cascading Mapping Retrieval



- MRs and ITRs use caches
- Retrieve mappings from caches when possible
- Minimized latency and overhead

Packet Forwarding



- Packet handling at ITRs in case of local cache miss: drop, store or forward to relay node
- Potential relay nodes: MR or MB
- Benefits
  - Almost no path stretch
  - Only sender- and receiver-side efforts required

Resilience

Potential problems

- Failures of locators, MBs, MRs, and MBPXs
- Changes of ID-to-Loc mappings

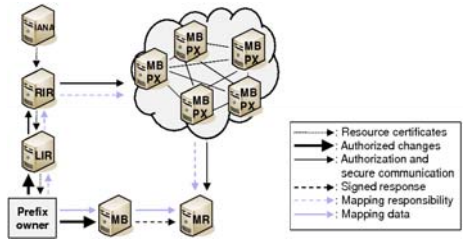
Protection against failures in FIRMS

- Locators failures: multi-homing and alternative Locs in ID-to-Loc mappings
- MB failures: replication of MBs and alternative MB entries in MBP
- MR failures : multiple MRs and configuration of ITRs with alternative MRs
- MBPX failures: configuration of MRs with multiple MBPXs

Complementary methods from LISP context

- Locator reachability bits: in-band signaling of reachable locators in LISP header of data packets
- LISP-versioning: in-band signaling of latest version of ID-to-Loc mapping in LISP header of data packets

Security



- Authorities authorize prefix owners with X.509v3 resource certificates
- RIRs and MBs authenticate prefix owners for MBP and ID-to-Loc changes
- MBs sign map-replies with private keys
- MBPs contain corresponding public keys
- MRs can validate map-replies locally

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