

# LISP update

*RIPE-59 Lisbon, October 2009*

*Vince Fuller*

*(for the rest of the LISP crew: Noel Chiappa, Dino Farinacci, Darrel Lewis, Dave Meyer, Andrew Partan, and John Zwiebel)*

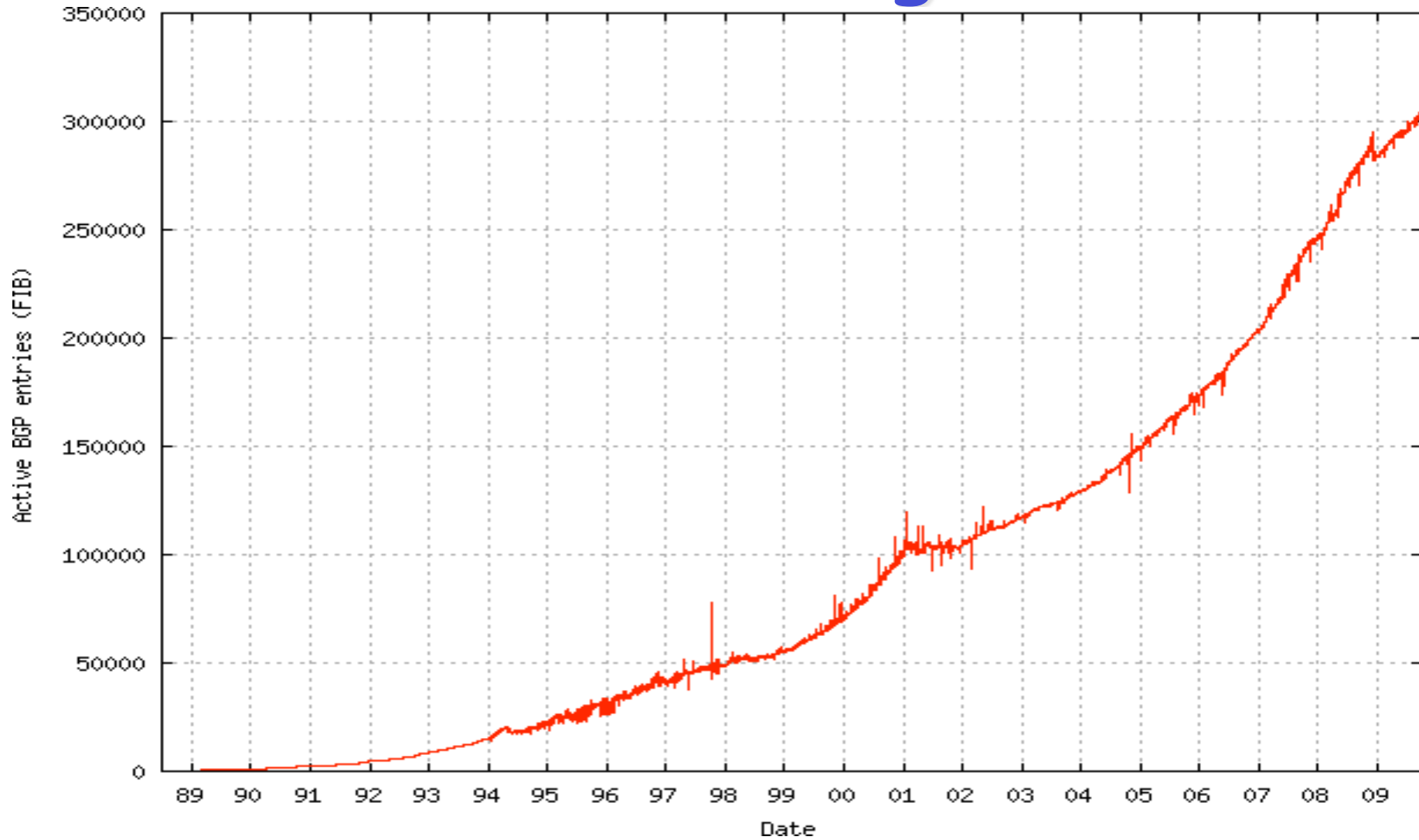
# Agenda

- Problem Statement - good news & bad news
- Brief review of LISP and LISP+ALT
- LISP-MS map server/map resolver - an easier way to access the mapping database
- LISP-MN mobility
- What's happening in the IETF?
- Implementation & Deployment Status
- Spec References
- Q & A

# Review: Problem Statement

- What provoked this?
  - Stimulated by problem statement effort at the Amsterdam IAB Routing Workshop on October 2006
    - RFC 4984
  - More info on problem statement:
    - <http://www.vaf.net/~vaf/apricot-plenary.pdf>
- First and foremost - scale the Internet
  - Growth trends in global routing system state

# Internet Routing State



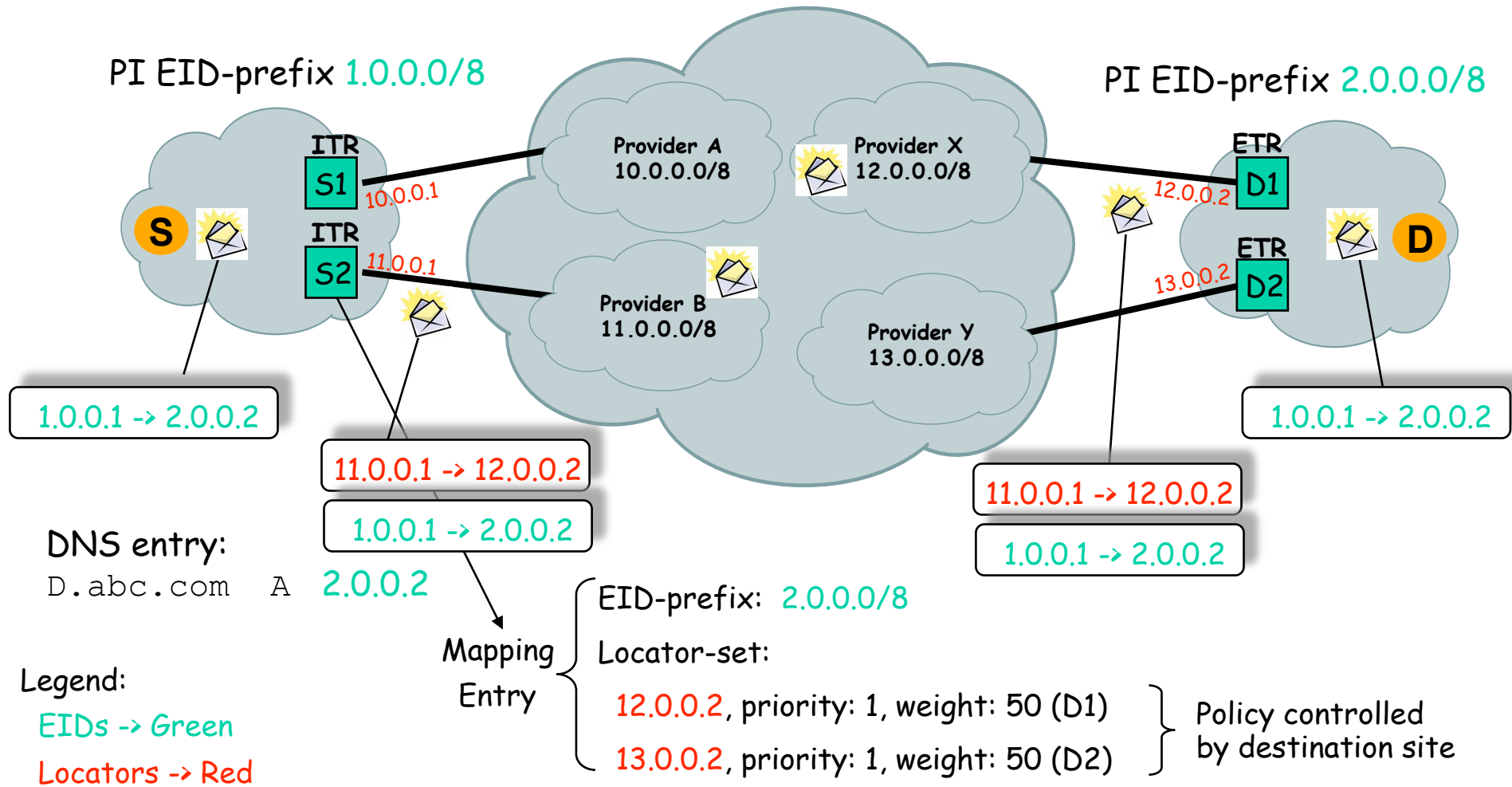
# Good news & bad news

- + Recent analysis work by Geoff Huston suggests that stability (update & withdrawal rate) may be improving  
<http://www.potaroo.net/presentations/2009-05-06-bgp2008.pdf>
- Trend is still "up & to the right"
- Multi-homing is still hard
  - + LISP makes it easier and adds functionality
- Long-term trends are unclear

# Review: What is LISP?

- Locator/ID Separation Protocol
  - EIDs for hosts, topological RLOCs for "core"
  - Separate numbering allows routing to scale
- Ground rules for LISP
  - Network-based solution
  - No changes to hosts whatsoever
  - No new addressing changes to site devices
  - Minimal configuration file changes
  - Imperative to be incrementally deployable
  - Address family agnostic

# Unicast Packet Forwarding



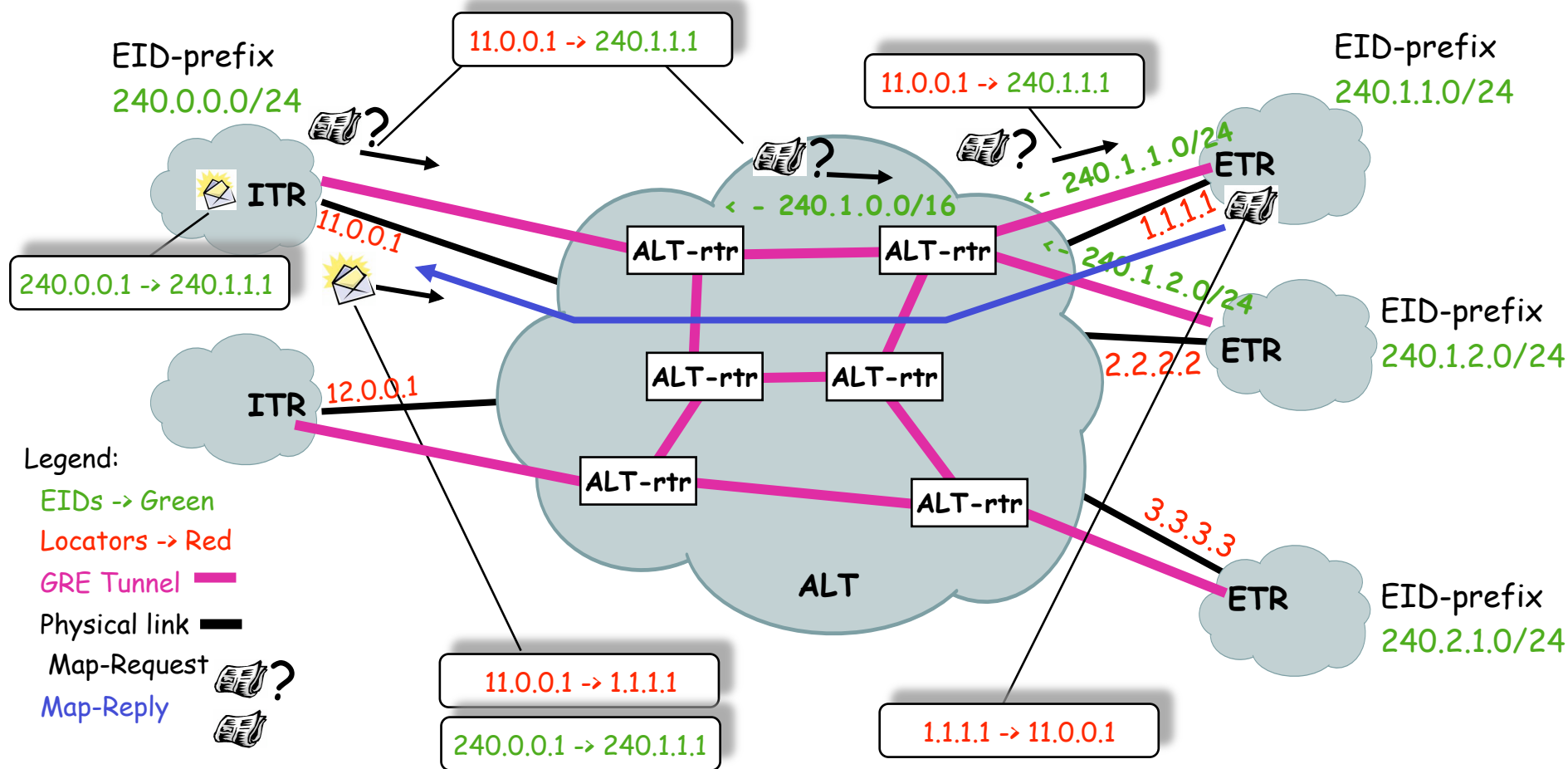
# Review: What is LISP+ALT?

- Mechanism for an ITR to find the ETR for an EID
- Advertise EID-prefixes in BGP on an alternate topology of GRE tunnels
- An ALT Device is:
  - An xTR configured with GRE tunnels
  - A Map-Server (new)
  - A Map-Resolver (new)
  - A pure ALT-only router for aggregating other ALT peering connections
- An ALT-only device can be off-the-shelf gear:
  - Router hardware, commodity Linux host, etc.
  - Just needs to run BGP and GRE



# Using ALT to find an ETR

Original way: extend ALT to xTRs for policy control

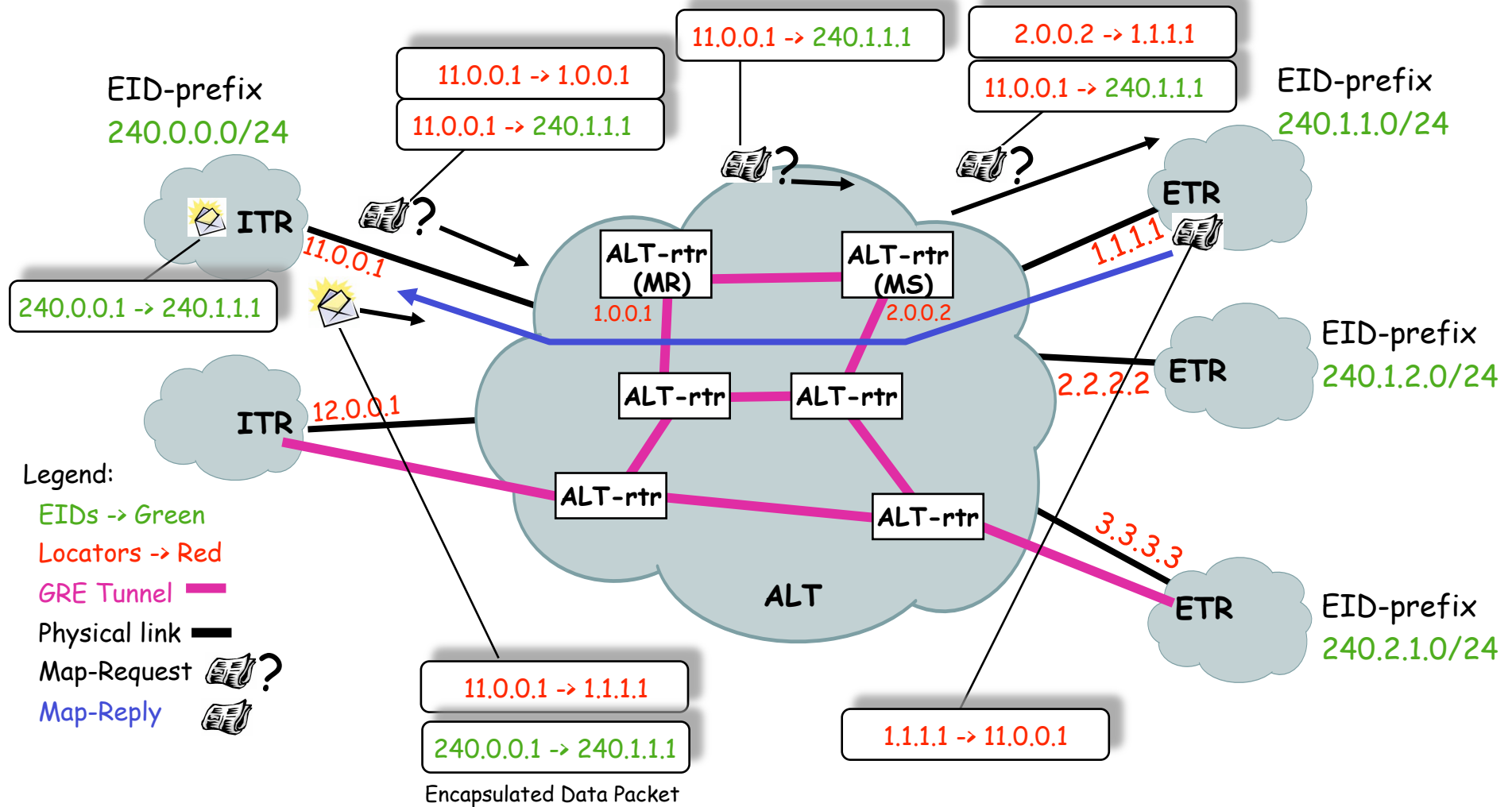


# New: LISP Map Server

- ETRs register site EID-prefixes with Map-Servers
  - Securely with pair-wise trust model (no PKI needed)
  - Policy can be applied on Map-Servers before EID-prefix accepted into mapping service
  - ETR is still authoritative for its database mappings
- Map-Servers advertise EID-prefixes in to the ALT on behalf of their client ETRs
- ITRs send encapsulated Map-Requests to Map-Resolvers instead of connecting to ALT
- Map-Server/Map-Resolver functionality may be in existing ALT router (most likely) or separate box
- draft-ietf-lisp-ms-03.txt

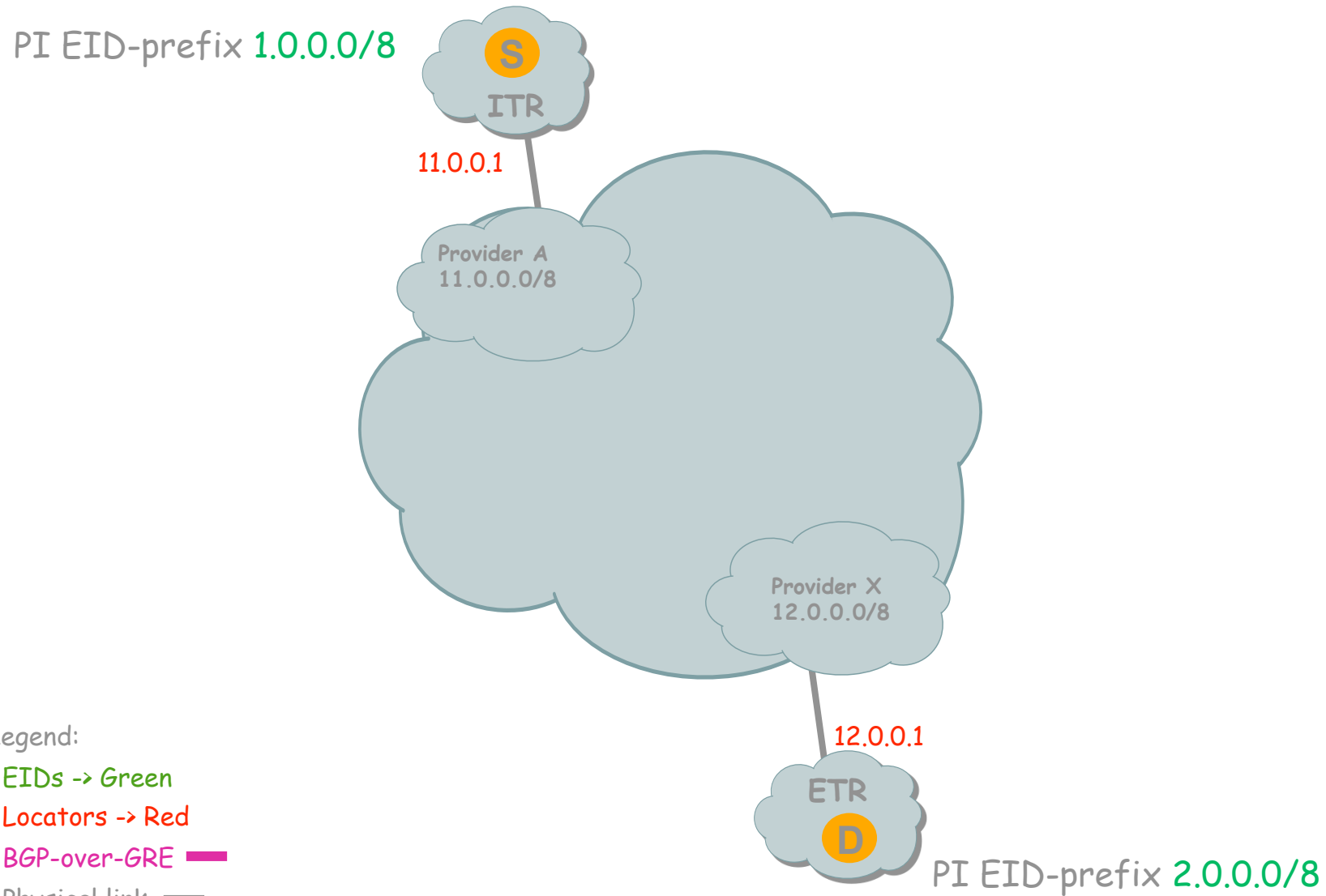
# Using LISP-MS to attach xTRs

Easy way: xTR uses Map-Server/Map-Resolver



# LISP-MS Detailed Example

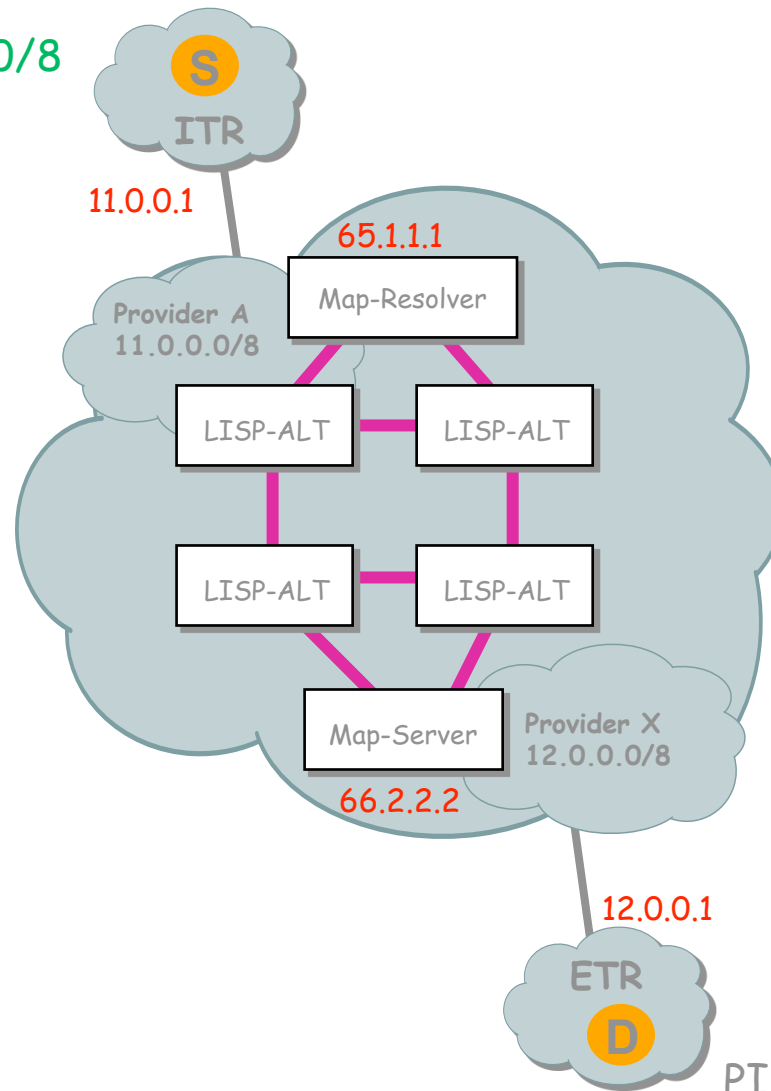
EID Topology



- Legend:
- EIDs -> Green
  - Locators -> Red
  - BGP-over-GRE —
  - Physical link —
  - LISP Update

# Map-Resolver, Map-Server and ALT Infrastructure

PI EID-prefix 1.0.0.0/8



Legend:

EIDs -> Green

Locators -> Red

BGP-over-GRE —

Physical link —

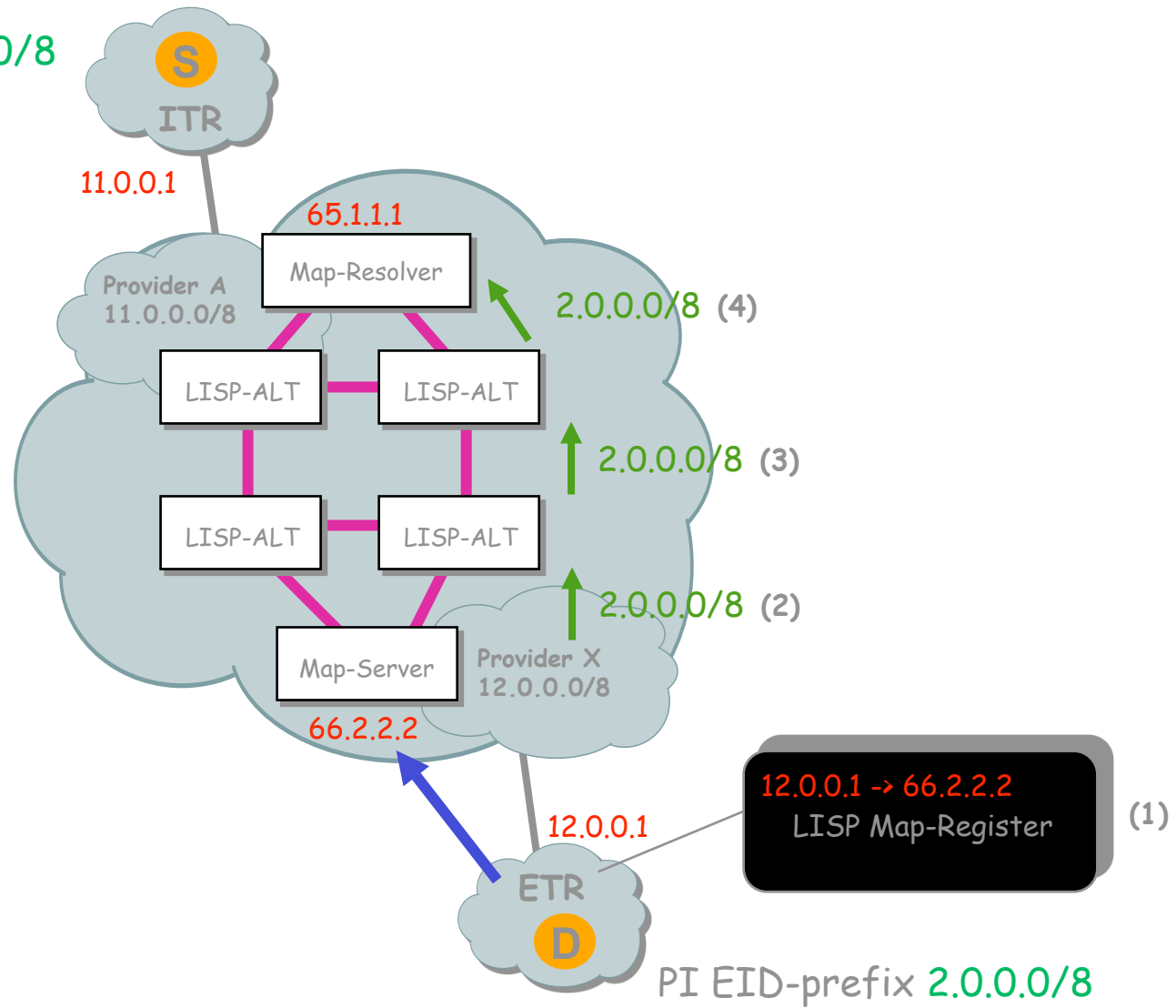
LISP Update

RIPE-59 Lisbon, October 2009

Slide 13

# [1] Map-Server Registration

PI EID-prefix 1.0.0.0/8



Legend:

EIDs -> Green

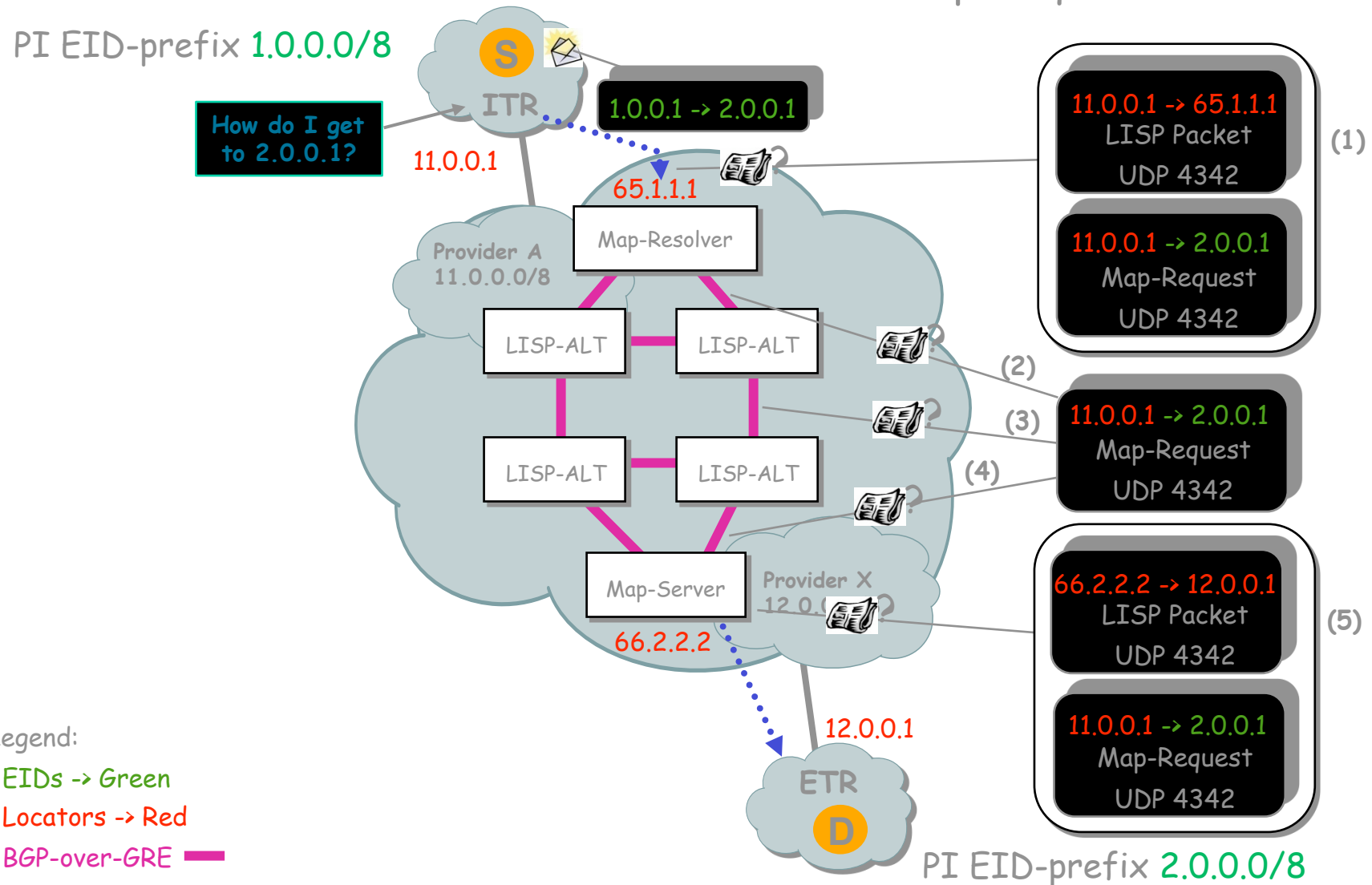
Locators -> Red

BGP-over-GRE █

Physical link █

LISP Update

## [2] Data request Triggers Map-Request



Legend:

EIDs -> Green

Locators -> Red

BGP-over-GRE —

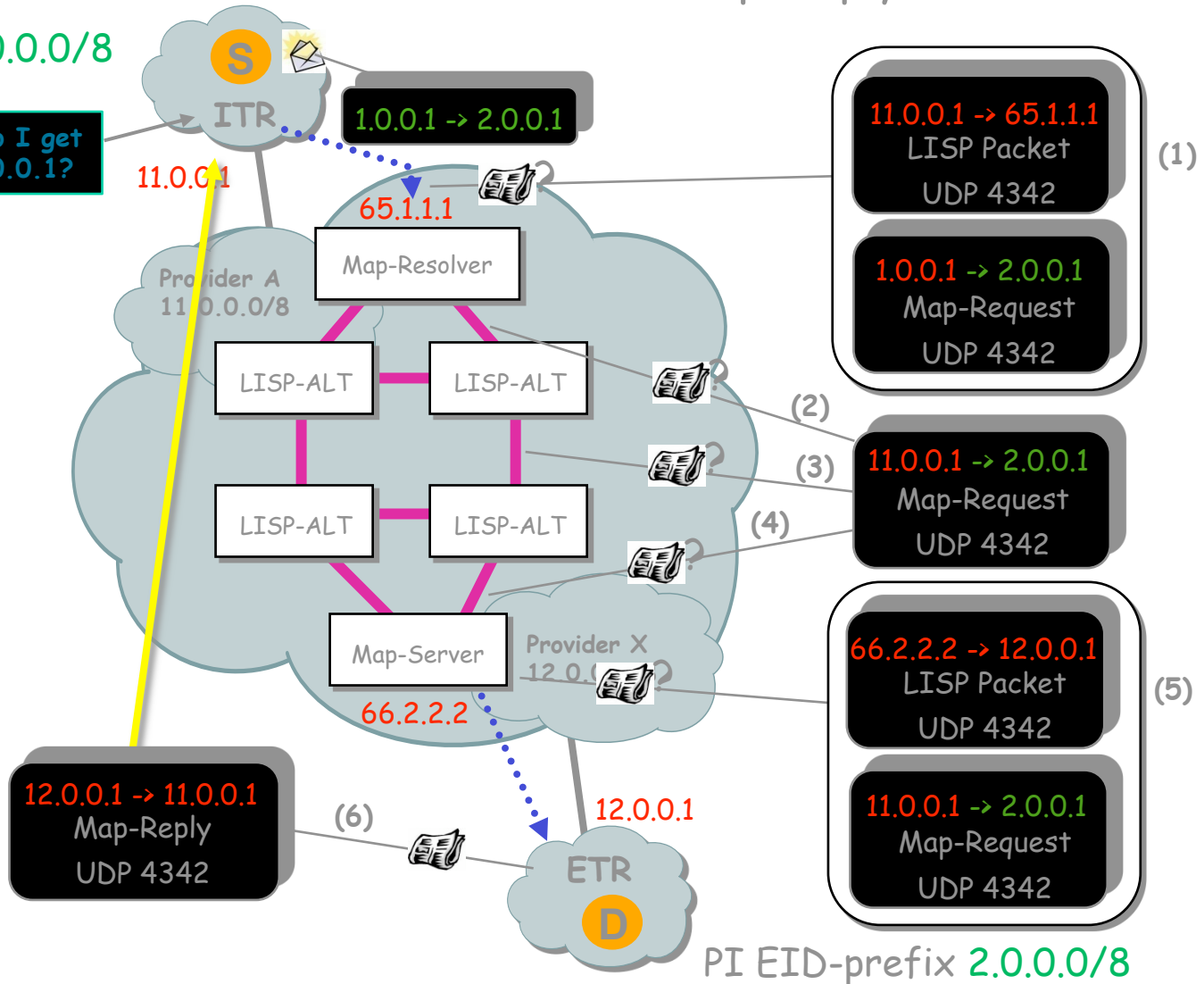
Physical link —

LISP Update

# [3] Map-Request Evokes Map-Reply

PI EID-prefix 1.0.0.0/8

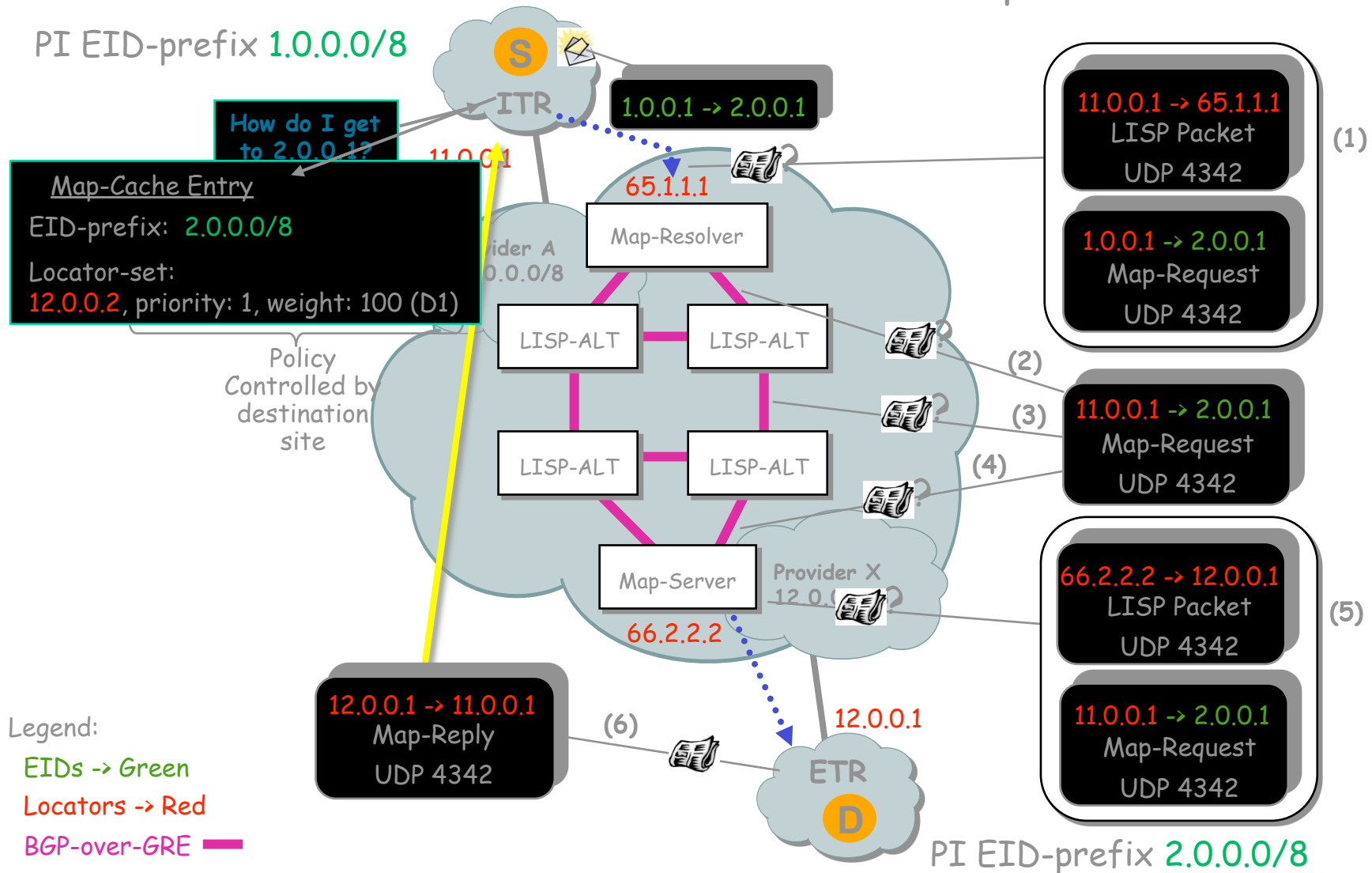
How do I get to 2.0.0.1?



Legend:  
 EIDs → Green  
 Locators → Red  
 BGP-over-GRE —  
 Physical link —  
 LISP Update —



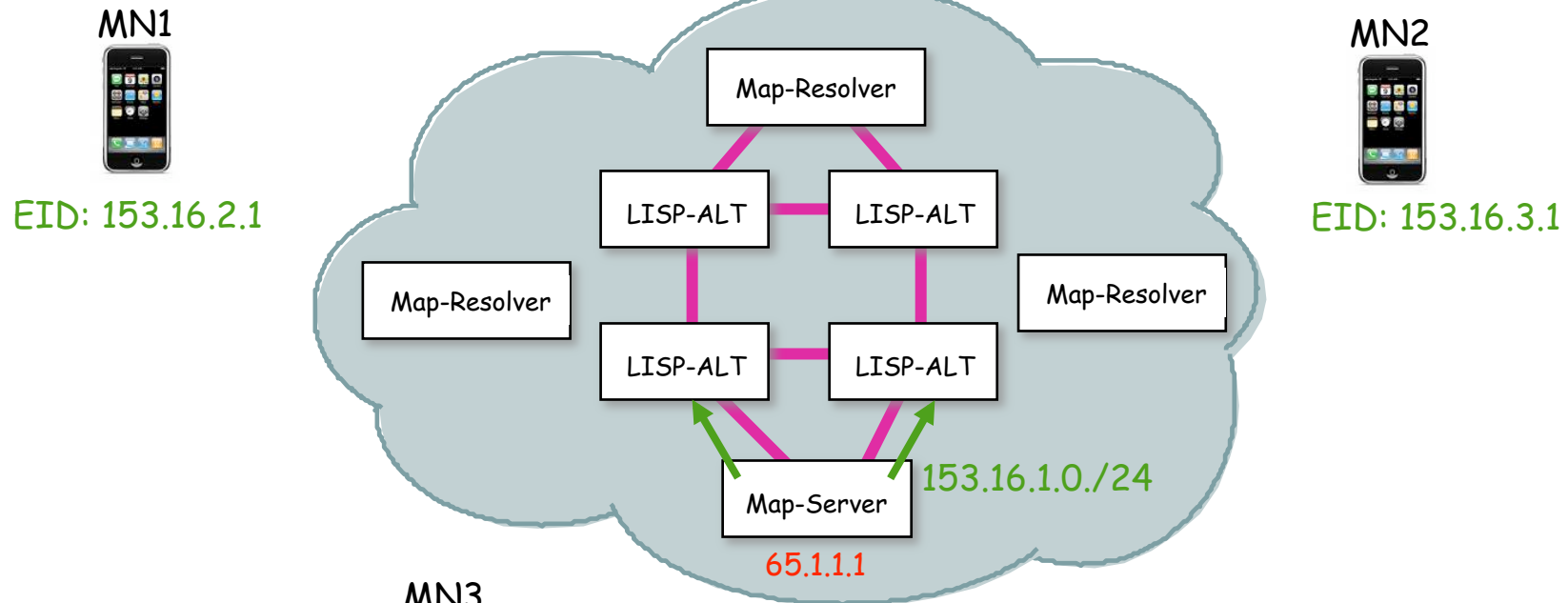
[4] Map-Cache Populated, data packets can flow



# New: LISP Mobile Node

- Simple host ITR/ETR implementation for mobile node
- MN registers with "home" Map-Server for assigned EID
  - Map-Server will "proxy" answer Map-Requests
- MN uses Map-Resolver at its current location (roaming)
- MN encapsulates all traffic using LISP
- Use of Map-Server/Map-Resolver service interface
  - Enables scalable roaming with same LISP infrastructure used for multi-homing and route scaling
- Map-Request flows to "home" Map-Server
- User data flows to RLOCs, so no "stretch" latency
- Map cache management slightly different for MN
  - Shorter TTLs, use of Solicit Map Requests, etc.
- See: draft-meyer-lisp-mn-00.txt (future WG document)

# Roaming - Control Plane



Legend:

EIDs -> Green, RLOCs -> Red

3G network -> 3.0.0.0/8

4G network -> 4.0.0.0/8

BGP-over-GRE

Map-Register

BGP update

LISP Update

MN3



EID: 153.16.1.1

3.3.3.3 -> 65.1.1.1

LISP Map-Register

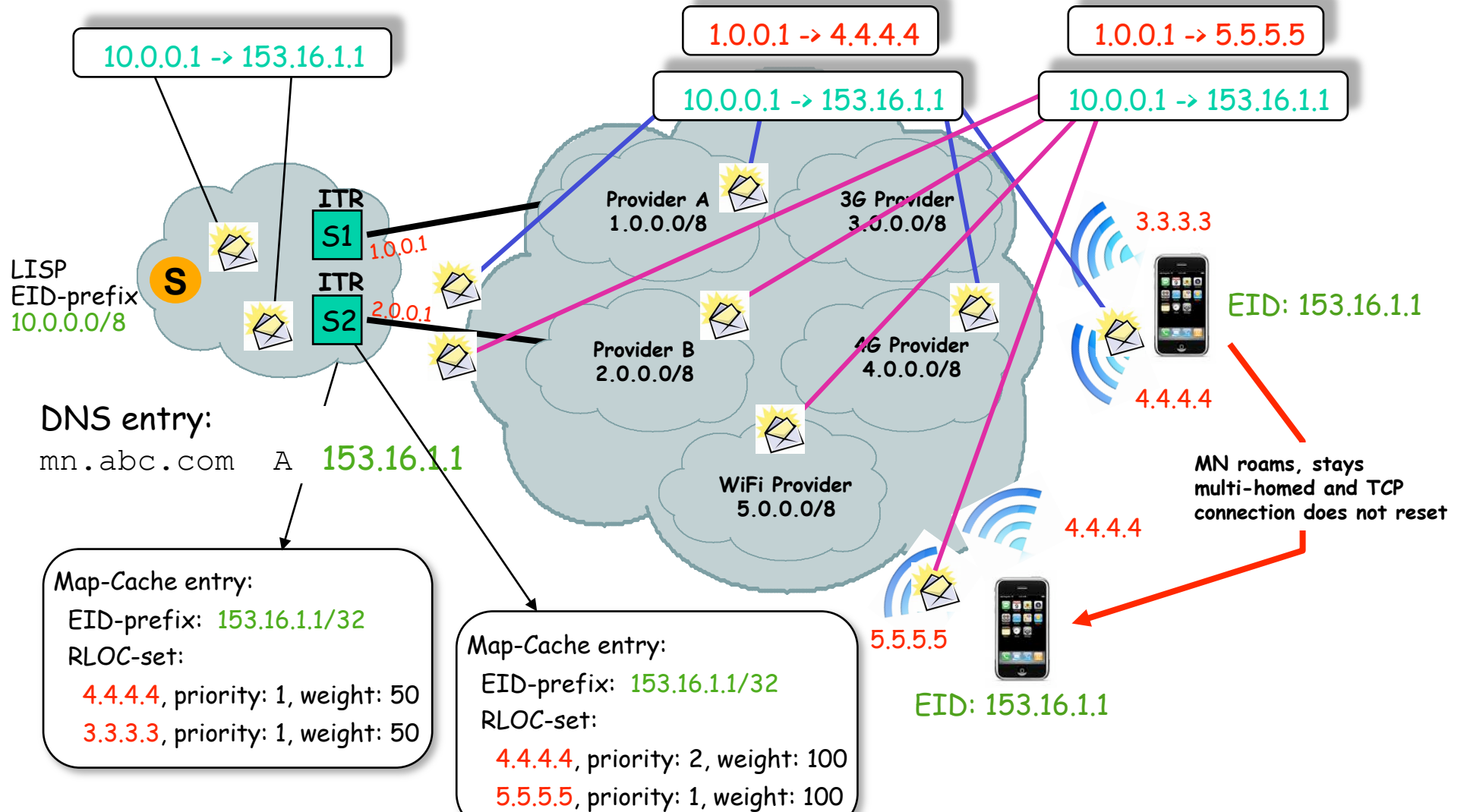
153.16.1.1 -> (3.3.3.3, 4.4.4.4)

(1) No matter where MN3 roams, MN1 and MN2 can find it's locator by using the database mapping system.

(2) Only the Map-Server will store 153.16.1.1/32 state with the latest set of RLOCs.

(3) Data always travels on shortest path to and from MN.

# Roaming - Data Plane



# Review: LISP/IETF timeline

- Created over dinner at IAB RAWS (Oct '06)
- Lunch discussions at San Diego IETF (Nov '06)
- RRG in Prague (March '07)
- RRG and "lunch BOF" in Vancouver (Dec '07)
  - Tutorial and start of "LISP test center"
- RRG in Philadelphia (March '08)
- IETF (grow, rtgarea, idr) in Dublin (July '08)
  - EXPLISP BOF "process experiment"
- IETF (grow) in Minneapolis (Nov '08)
- IETF BOF in San Francisco (March '09)

# LISP in the IETF now

- Much deliberation on RRG list, etc.
- LISP BOF in San Francisco (March '09)
- First WG meeting in Stockholm (July '09)
  - Darrel Lewis & Sam Hartman co-chairs
  - Core LISP documents are now WG I-D's
    - Adoption of LISP-MN is still pending
- Discussion on WG list: [lisp@ietf.org](mailto:lisp@ietf.org)

# Prototype Implementation

- Cisco NXOS, on NX7000 and Titanium
  - Underlying Linux code base
- Includes LISP, ALT, Interworking, and Map-Server/Map-Resolver functionality
  - "lig" diagnostic tool
- Software switching only
- Supports LISP for both IPv4 and IPv6
  - ITR, ETR, and PTR
  - LISP-NAT for IPv4 only

# Other Coding Efforts

- IOS implementation under-way
  - Loc/ID split functionality
- Considering IOS-XR implementation
  - TE-ITR/TE-ETR functionality
- OpenLISP implementation for FreeBSD; available and for a while and being updated
  - For testing the specs
- Considering native Linux implementation (and recently learned of preliminary work on one)
- Any other efforts?

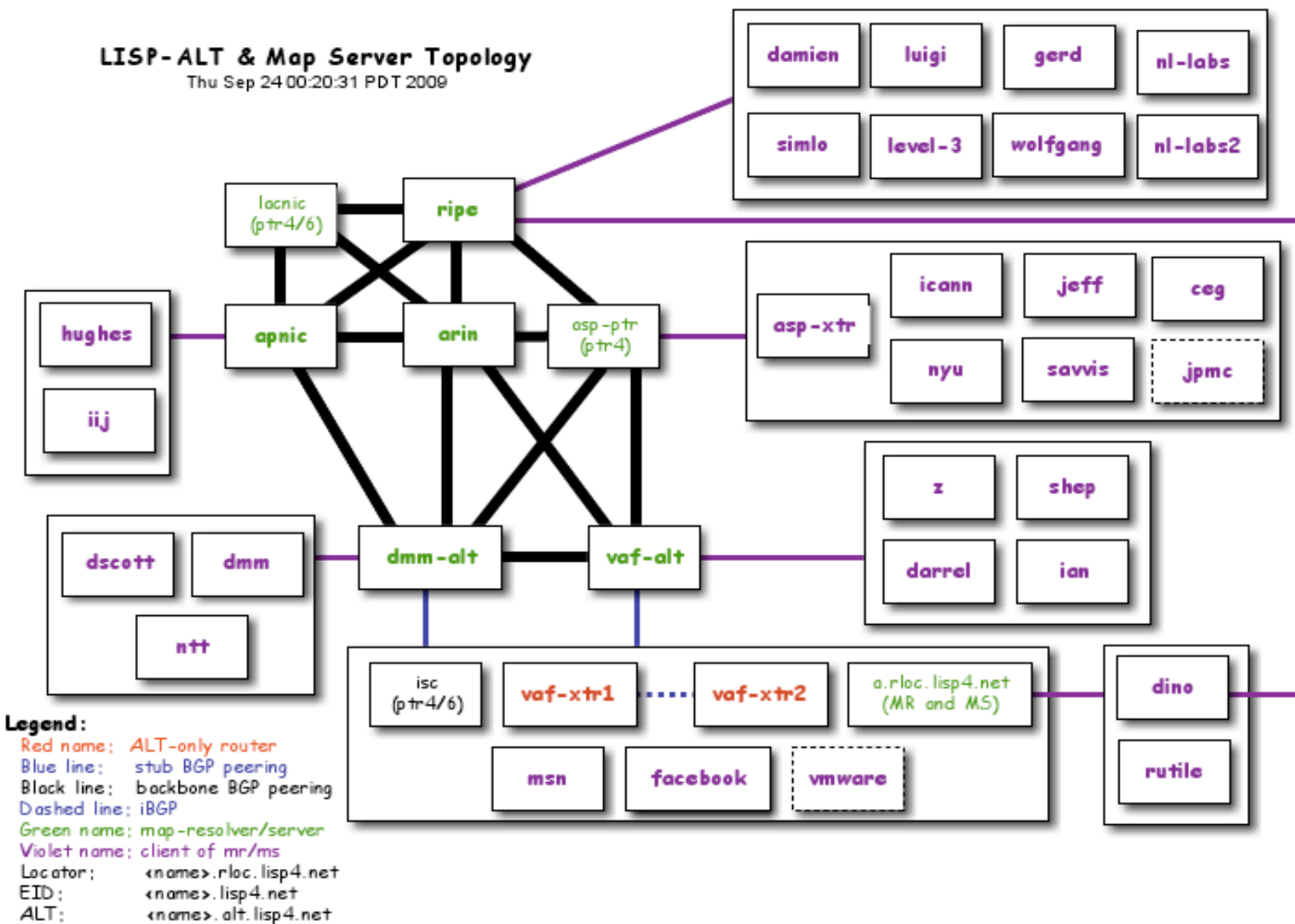


# LISP Deployment

- LISP Pilot Network Operational
  - Incrementally deployed during the last 2 years
  - 30+ sites across 7 countries
    - US, UK, BE, JP, UY, AU, DE
  - Uses the NX-OS Titanium Platform
    - IOS and OpenLISP platforms to be added
  - EID-Prefixes used
    - 153.16.0.0/16 and 2610:00d0::/32
    - GRE tunnels out of 240.0.0.0/4, 32-bit ASNs
  - RLOCs used
    - Current site attachment points to the Internet

# LISP-ALT & Map Server Topology

Thu Sep 24 00:20:31 PDT 2009



# LISP Deployment

- LISP Interworking Deployed
  - Have LISP 1-to-1 address translation working
    - <http://www.translate.lisp4.net>
  - Proxy Tunnel Router (PTR)
    - IPv4 PTRs:
      - Andrew, ISC, and UY
    - IPv6 PTRs:
      - Dave (UofO), ISC, and UY
    - <http://www.lisp6.net> reachable through IPv6 PTR
    - <http://www.ptr.lisp4.net> reachable through IPv4 PTR

# Open Policy for LISP

- It's been almost 3 years since the IAB Routing & Addressing Workshop
- This is not a Cisco only effort
  - We have approached and recruited others
  - There are no patents (cisco has no IPR on this)
  - All documents are Internet Drafts
- We need and seek designers, implementors, testers, and researchers
- As always, please let us know if you are interested

# Internet Drafts

`draft-ietf-lisp-05.txt`  
`draft-ietf-lisp-multicast-02.txt`  
`draft-ietf-lisp-alt-01.txt`  
`draft-ietf-lisp-ms-03.txt`  
`draft-ietf-lisp-interworking-00.txt`  
`draft-meyer-lisp-eid-block-01.txt`  
`draft-meyer-loc-id-implications-01.txt`  
`draft-meyer-lisp-mobility-00.txt`  
`draft-farinacci-lisp-lig-00.txt`

`draft-mathy-lisp-dht-00.txt`  
`draft-iannone-openlisp-implementation-02.txt`  
`draft-brim-lisp-analysis-00.txt`  
`draft-meyer-lisp-cons-04.txt`  
`draft-lear-lisp-nerd-04.txt`  
`draft-curran-lisp-emacs-00.txt`

# References

- **Public mailing list:** `lisp@ietf.org`
- **Core LISP team:** `lisppers@cisco.com`
- **More info at:**  
`http://www.lisp4.net`  
`http://www.lisp6.net`