

# G-Lab ASP2: Activities in Future Internet Routing (FIR)

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## Overview

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- ▶ ASP2: partners & mode of operation
- ▶ Future Internet routing (FIR)
  - Motivation
  - Loc/ID split
- ▶ Work in ASP2: proposals for
  - FIR architectures
  - Mapping systems
- ▶ Future work

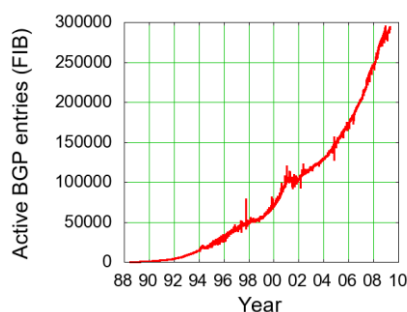
## ASP2: Partners & Mode of Operation

- ▶ Partners
  - TU Berlin
    - Dr. Steve Uhlig
  - TU Munich
    - Dipl.-Ing. Oliver Hanka, Dipl.-Ing. Christopher Spleiß, Dr. Gerald Kunzmann
  - University of Würzburg
    - Dr. Michael Menth, Dipl.-Inform. Matthias Hartmann, M.S. Michael Höfling
- ▶ Mode of operation
  - Biweekly telcos (1-2 hours)
  - Initial idea
    - Joint development & performance evaluation of a P2P-based mapping system
    - Outcome: not a reasonable architecture, performance study questionable, work was already covered in literature
  - Development of different mapping approaches & analysis of BGP data
    - Early discussion of own proposals & feedback
    - Vision: interworking prototypes



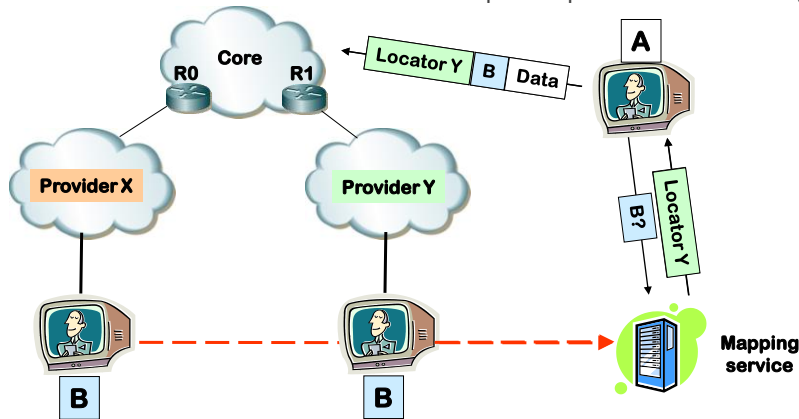
## Future Internet Routing – Motivations and Insights

- ▶ Observation
  - Increasing size of BGP forwarding tables in DFZ
  - Scalability problem
- ▶ Other insufficiencies of today's Internet
  - Almost no support for multihoming
  - Almost no support for advanced interdomain traffic engineering
  - Expensive renumbering after provider change
  - Many others
- ▶ Dilemma after provider change
  - Customer keeps old IP addresses, routing changes  $\Rightarrow$  increasing routing tables
  - Keep routing, customers change IP addresses  $\Rightarrow$  renumbering required
- ▶ Problem
  - IP addresses fulfill locator (Loc) and identifier (ID) function
  - Decoupling required: Loc/ID split



## Locator/Identifier Split

- ▶ Split addresses in
  - Globally routable locator
  - Globally unique identifier
- ▶ Completion of full addresses
  - Mapping system provides ID-to-Loc mapping
  - Map&encaps or address rewriting



## Proposals for FIR Architectures

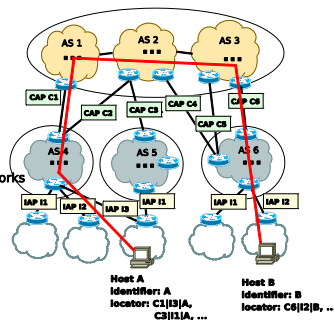
- ▶ Evolutionary approaches
  - LISP (Cisco)
    - Solution for IPv4 and IPv6
    - Routing on identifiers in edge networks
    - Already operational pilot networks <http://www.lisp4.net/>
  - GLI-Split (UniWue)
    - Solution for IPv6 only
    - Multiple benefits, *see demo!*
  - Many others ...
- ▶ Clean-slate approaches
  - TU Berlin: „HAIR: Hierarchical Architecture for Internet Routing”
    - Hosts compose complete addresses instead of gateways
  - TU Munich: A Novel DHT-Based Network Architecture for the Next Generation Internet
  - Many others ...



CORE:  
tier-1 ASs  
large Providers

INTS:  
access provider  
enterprise networks

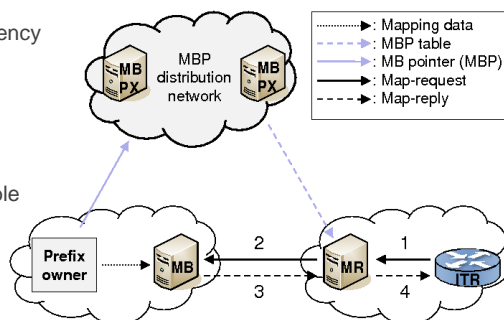
EDGES:  
Ethernet



## Proposals for Mapping Systems

- ▶ Requirements
  - Scalability
  - Security & resilience
  - High performance & low latency
  - Packet forwarding

- ▶ FIRMS (UniWü)
  - Map-base (MB)
  - MB pointer (MBP), MBP table
  - Map-resolver (MR)
  - **See demo!**



- ▶ HiiMap (TUM)
  - Global mapping system: ID-to-regional-prefix
  - Regional mapping systems: ID-to-Loc



## Future Work

- ▶ Implementation of prototypes
  - HAIR (TUB)
  - FIRMS (UniWü)
  - HiiMap (TUM)
- ▶ Test of the prototypes in G-Lab
  - Functionality tests
  - Interworking of the mapping systems with HAIR
  - Joint report on experimentation
- ▶ Further issues
  - Other mapping system approaches
  - Analysis of BGP data
  - Traffic engineering with FIR

