



A Global Mapping System for Identifiers Assigned in Prefix Blocks by Authorities

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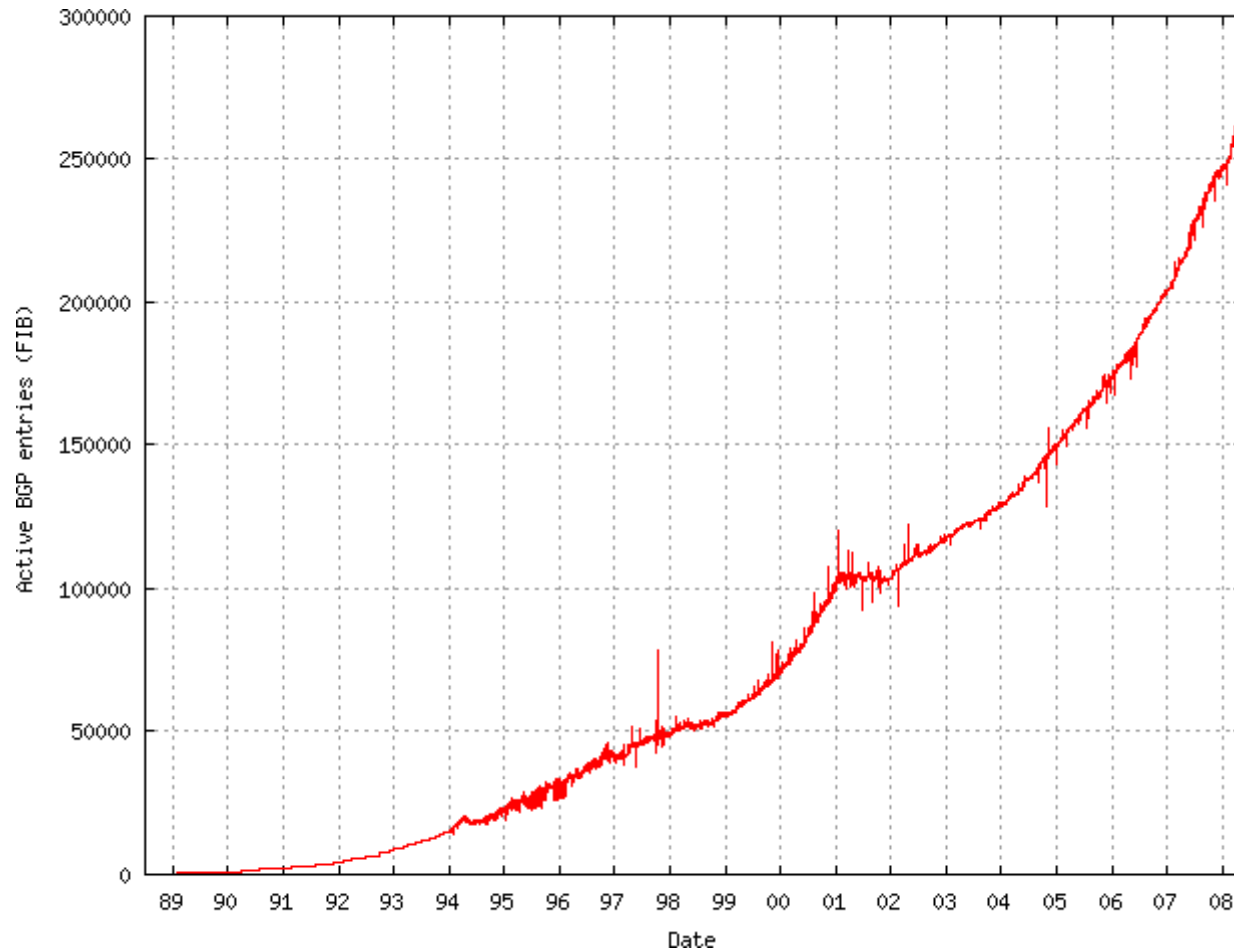


Overview

- ▶ Routing scalability problem and Loc/ID
- ▶ A new mapping system
 - Architecture
 - Handling of mapping delay
 - Security
 - Resilience
- ▶ Summary

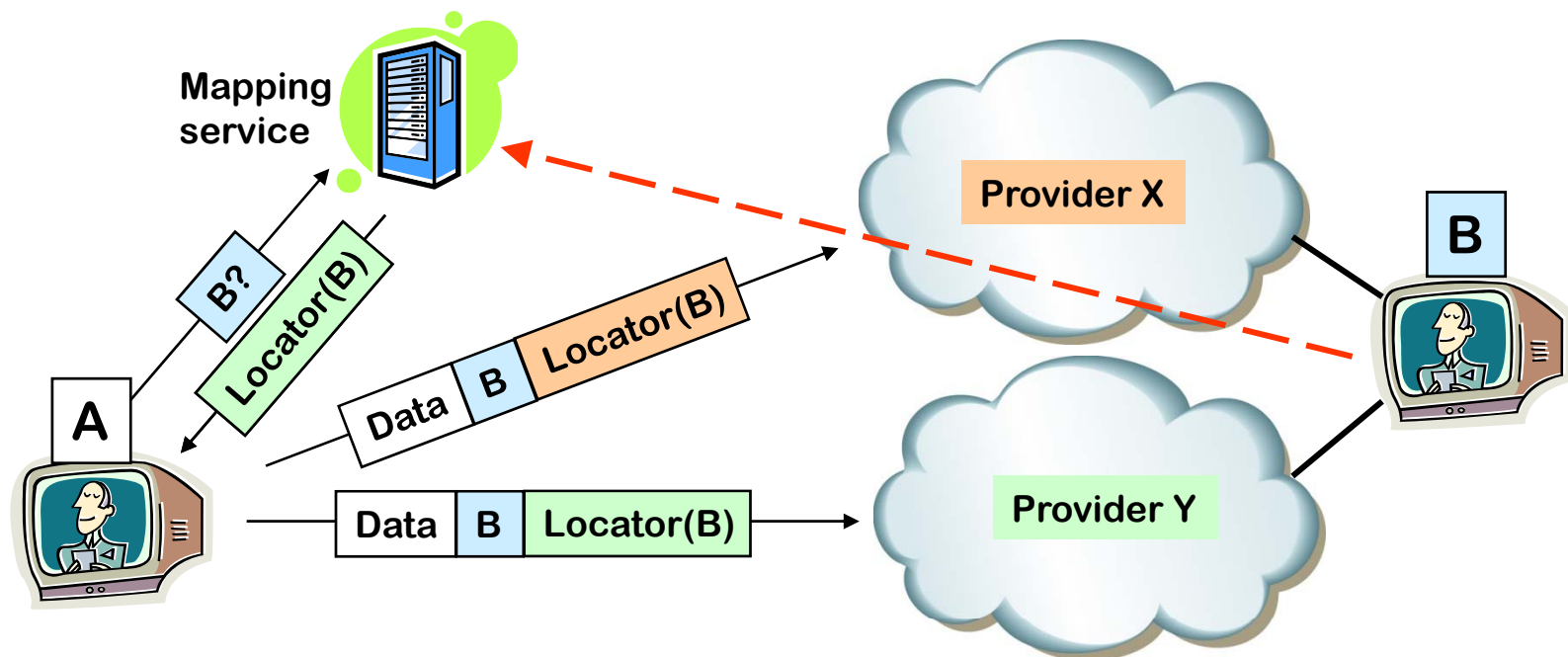
Problem: Growth of Routing Table Sizes in the DFZ

- ▶ IPv4 FIB entries from 01.07.1988 – 16.05.08 (AS2)



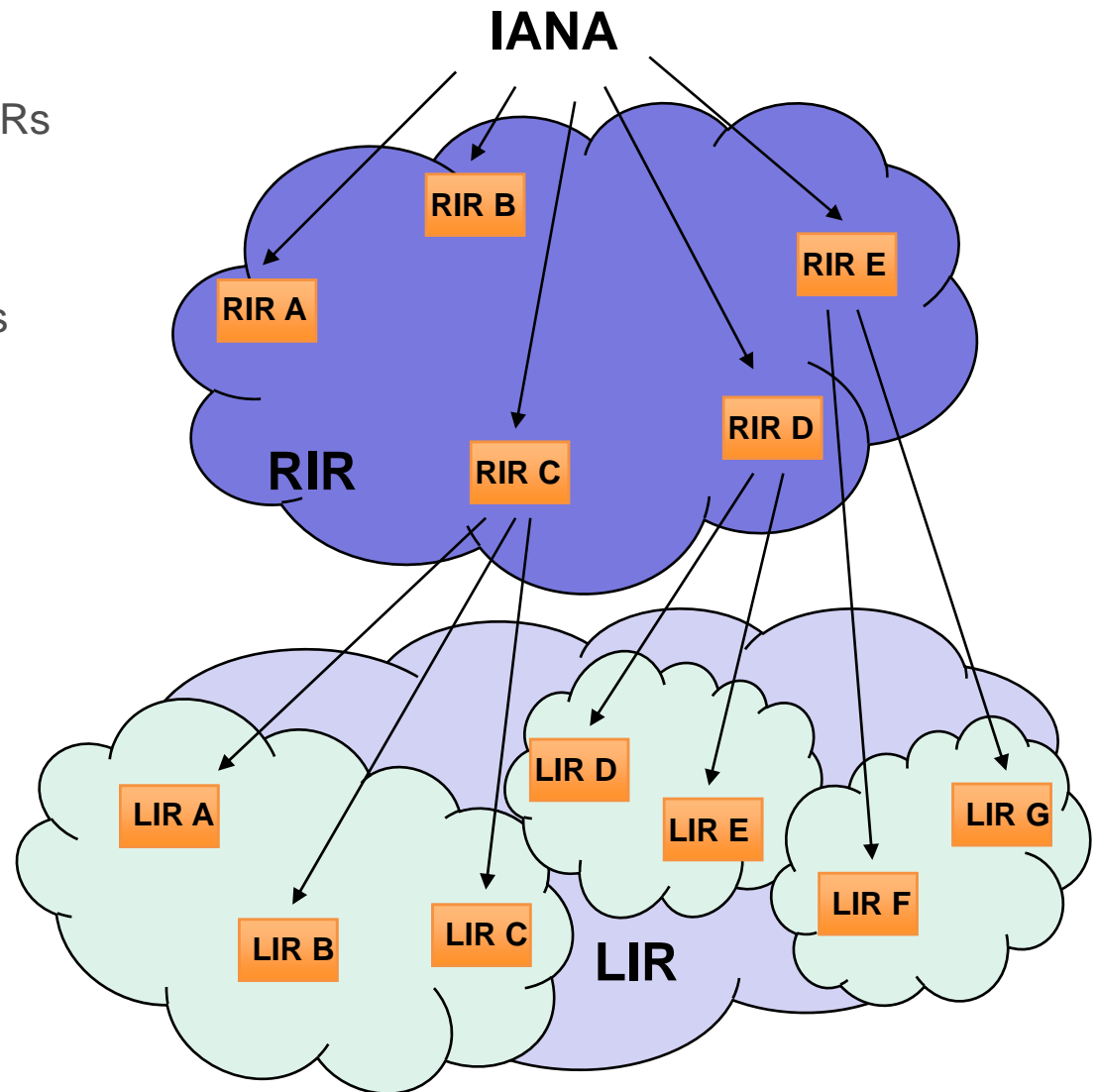
Solution: Locator/Identifier Split

- ▶ Separation of IP addresses
 - Identifier
 - Locator
- ▶ Mapping function
 - Identifier → locator
- ▶ Objective
 - Limit growth of routing tables
- ▶ Open issues
 - Mapping system
 - Exact implementation of Loc/ID



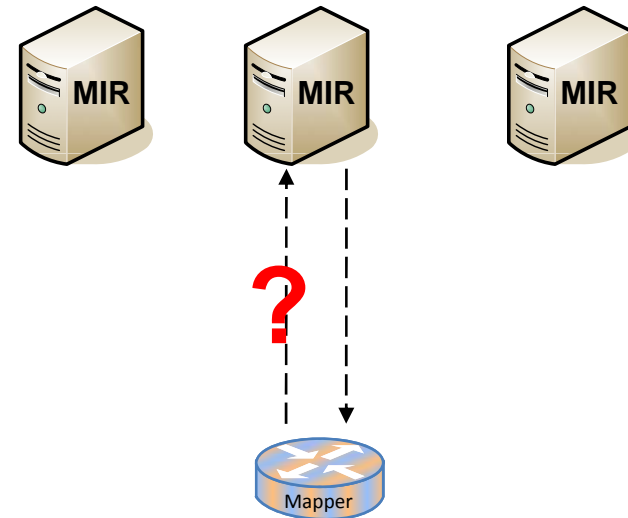
ID Assignment Structure (Example)

- ▶ IANA
 - Delegates ID ranges to 5 RIRs
- ▶ RIR
 - Assigns ID ranges to users
 - Delegates ID ranges to LIRs
- ▶ LIR
 - Associated with single RIR
 - Assigns ID ranges to users



Basics of the Mapping System

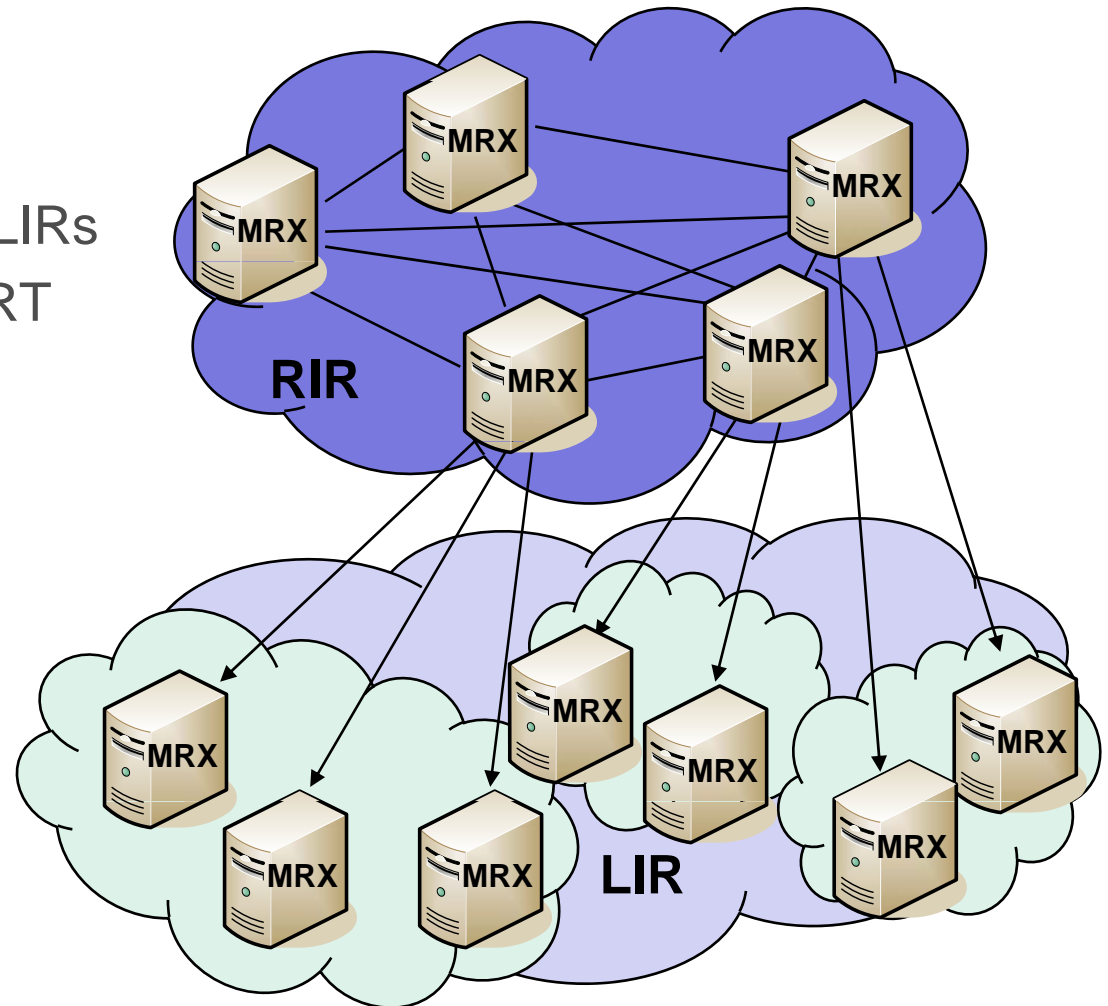
- ▶ Mapping information (MI)
 - (ID/ID prefix → locator list)
 - MI controlled by ID owner or trusted agent (e.g. ISP)
- ▶ MI responder (MIR)
 - Holds MI for ID prefix
 - Returns MI on request for specific ID
- ▶ Mapper
 - Retrieves MI from MIRs
 - Caches MI for further requests



- ▶ MIR for a specific identifier?
 - Mapping responsibility (MR)
 - (ID prefix → MIR list)
 - Global MR table (GMRT)
 - MR for all assigned ID prefixes
 - Mapper has copy of GMRT

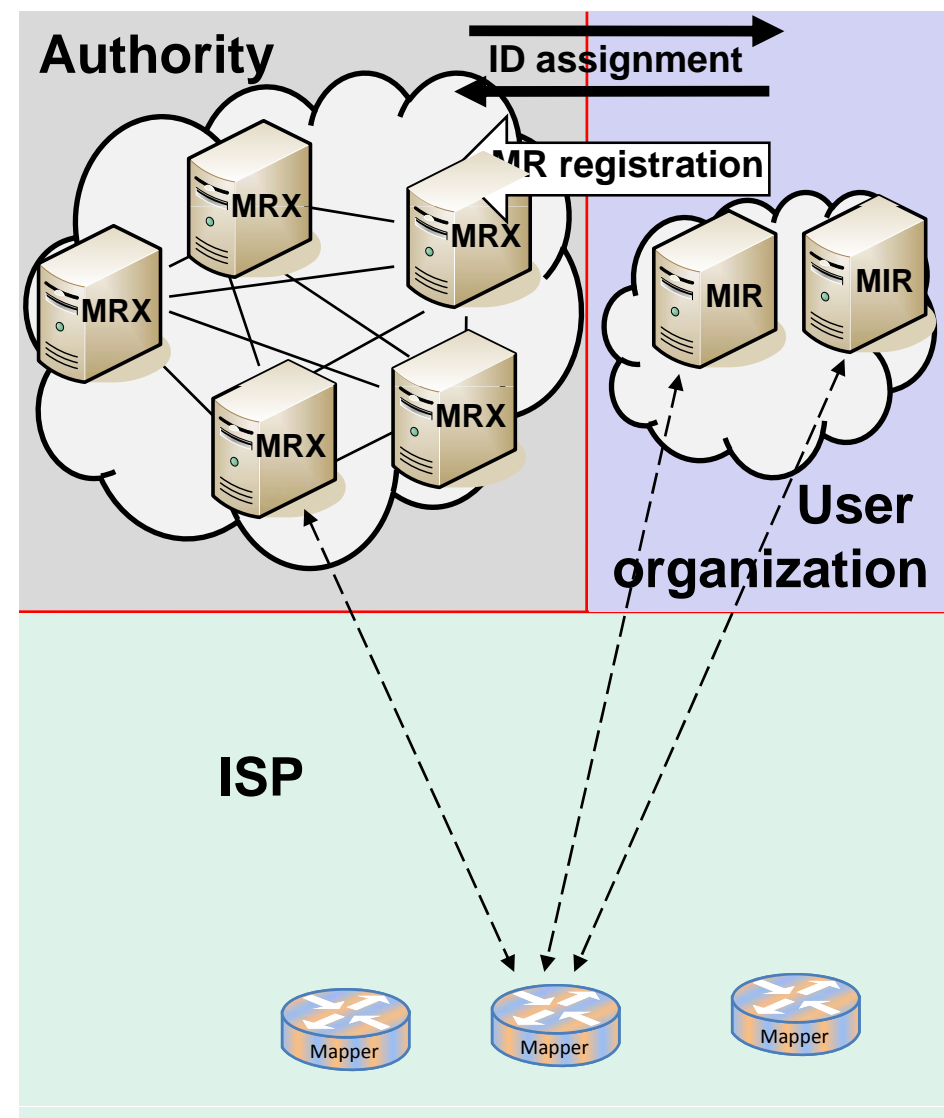
Composition of Global Mapping Responsibility Table (GMRT)

- ▶ RIRs/LIRs have mapping responsibility exchange nodes (MRX)
- ▶ MRXs combine MR information from all RIRs/LIRs
⇒ MRX holds complete GMRT



Global View on the Mapping System

- ▶ Authority
 - Sets up MRXs
 - Connects them for MR distribution
- ▶ User organization
 - Gets ID prefixes from RIRs/LIRs
 - Sets up MIRs
 - Tells MRs to RIRs/LIRs (ID prefix → MIR list)
 - Gets locators from ISPs
 - Configures MIRs with MI (ID/ID prefix → locator list)
- ▶ ISP
 - Provides mappers
 - Configures them with MRXs



Packet Handling during Mapping Retrieval

▶ Problem

- Mapper does not have required mapping in cache
- Mapping delay occurs – what to do with the packet?

▶ Solutions

- Discard packet ☹️
- Store packet until mapping is available 😊
- Tunnel packet to entity that has the mapping 😊

▶ Packet tunneling

- Mapper tunnels packet to MIR
- MIR forwards packet to destination

▶ Why does that work?

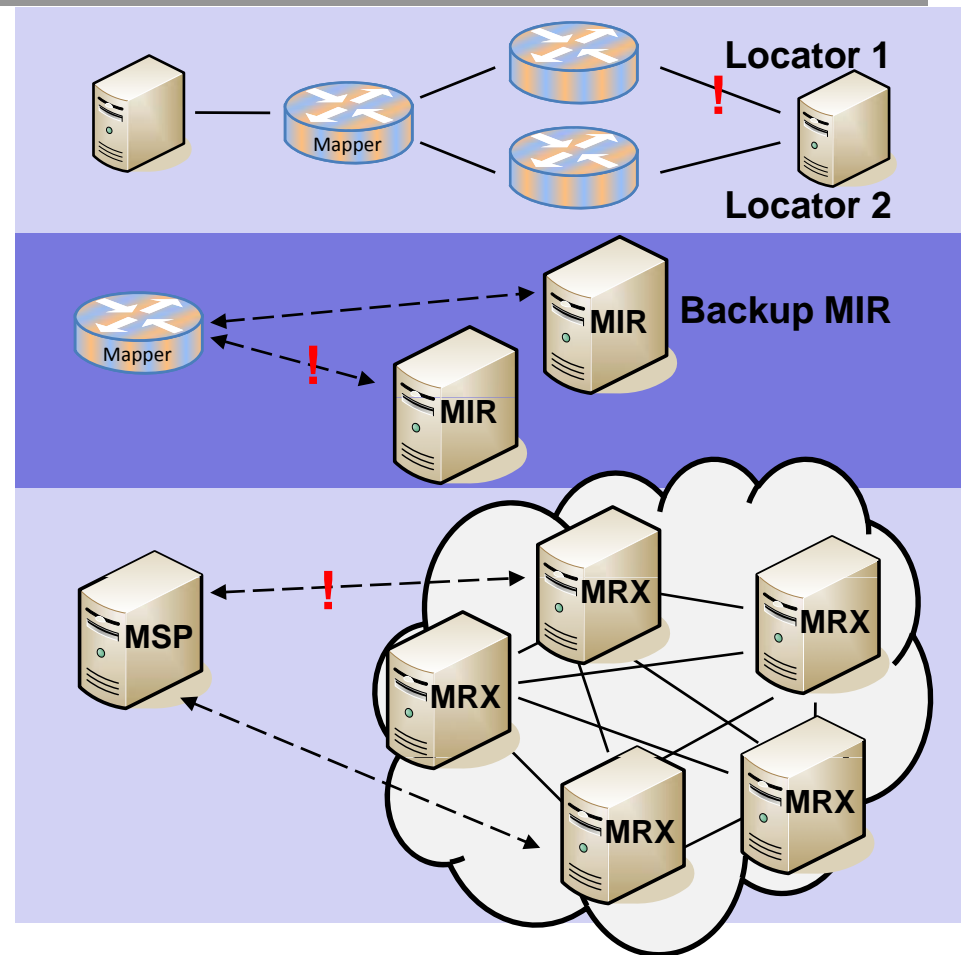
- Mapper part of source network
- MIR part of destination network
- Both interested in that traffic

Security Aspects

- ▶ Is MR trustworthy?
 - Addition: MR contains issuing RIR and is signed by this RIR
 - Mappers know public keys of 5 RIRs
 - ⇒ Mappers can validate MR
- ▶ Is MI trustworthy?
 - Additions
 - MI signed by MIRs
 - MR contains public key of MIRs
 - Mappers get public key of MIRs through trusted MR
 - ⇒ Mappers can validate MI

Resilience Aspects

- ▶ Locator failure
 - MI contains list of locators
 - Mappers use other default locator
- ▶ MIR failure
 - MR contains list of MIRs
 - Mappers use other default MIR
- ▶ MRX failure
 - Mappers configured with list of MRXs
 - Mappers use other default MRX
- ▶ General
 - MRT available in multiple MRXs
 - MRs of RIRs/LIRs can be recovered



Summary

- ▶ Assumption: ID prefixes assigned by authorities
- ▶ Components of the mapping system
 - Mappers (ISP)
 - MIRs (user)
 - MRXs (authority)
- ▶ Properties
 - Simple handling of mapping delay
 - Strong trust
 - Strong resilience
- ▶ Further steps
 - Protocol simulation in Omnet
 - Prototype in G-Lab

