



## IETF-93 draft-menth-lisp-ha-00 – LISP Hybrid Access (LISP-HA)

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- ▶ Motivation and use cases
- ▶ Static load balancing with LISP
- ▶ LISP-HA
  - Basic concept
  - Dynamic load balancing
  - Dataplane header
  - Interworking with NATs
  - Explicit routing with LCAF
  - Deployment considerations
- ▶ Summary

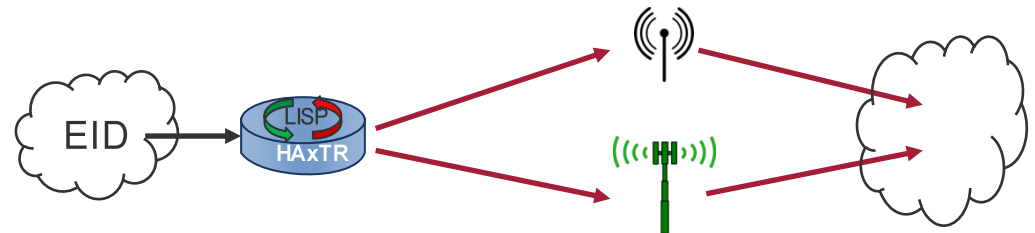


- ▶ Use all available access links
  - Increased bandwidth
  - Improved resilience
  
- ▶ Current technologies
  - MPPP (only within “local” network)
  - GRE tunnels (draft-zhang-gre-tunnel-bonding)
  - MP-TCP (only for TCP)



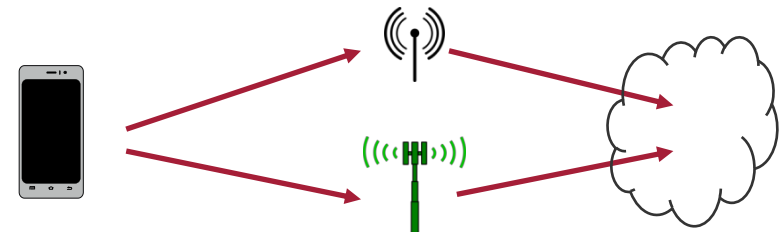
## ► Residential access

- Cable internet and LTE available for many users
- Possibly low bandwidth over cable internet
- Combine cable internet and LTE to
  - Increase bandwidth
  - Improve resilience



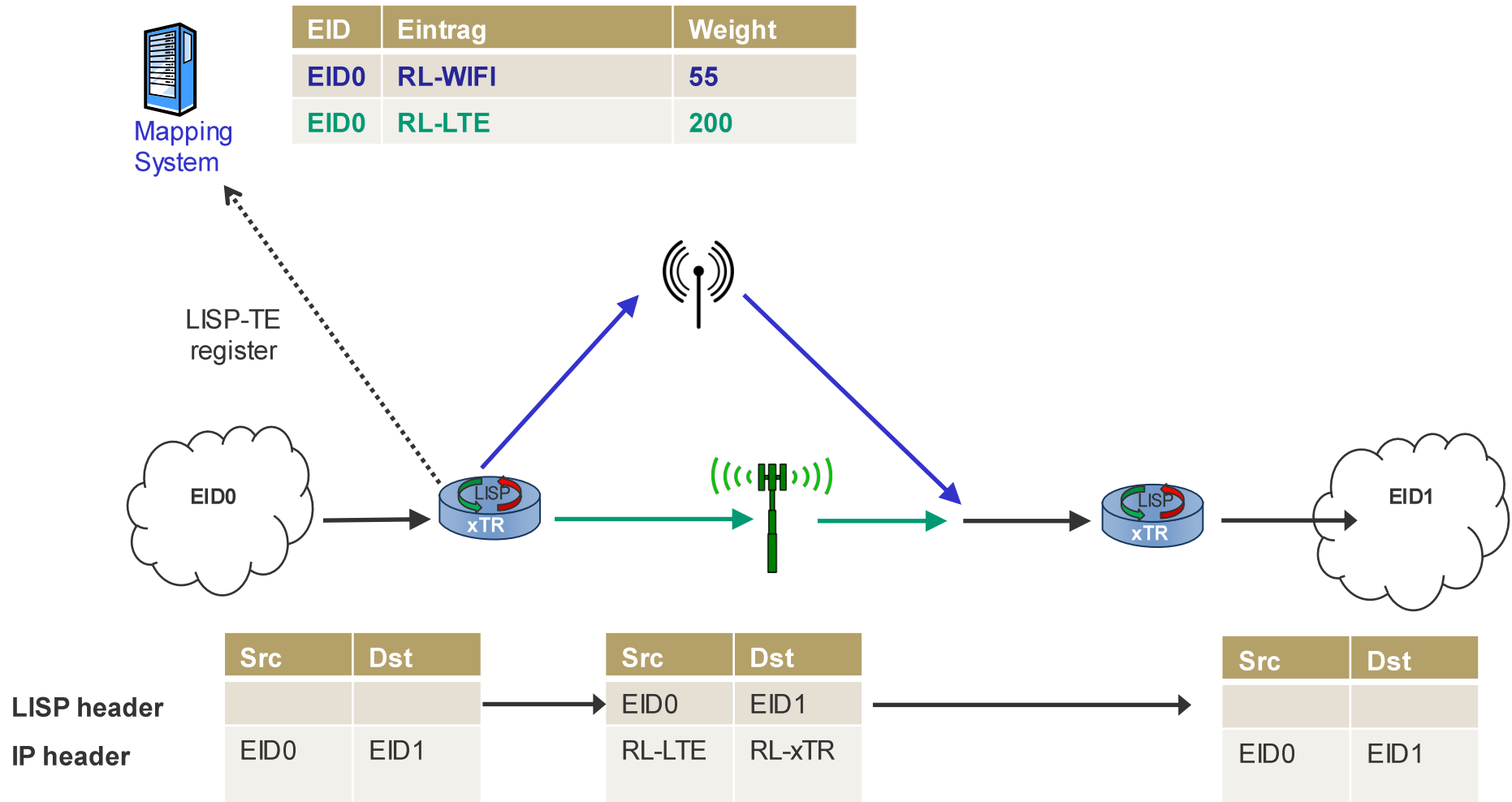
## ► Mobile access, e.g., for smartphones

- Traditional Wifi offloading
  - Exclusive use of Wifi if available
  - Bandwidth may be low
- Bundle LTE and Wifi to improve bandwidth



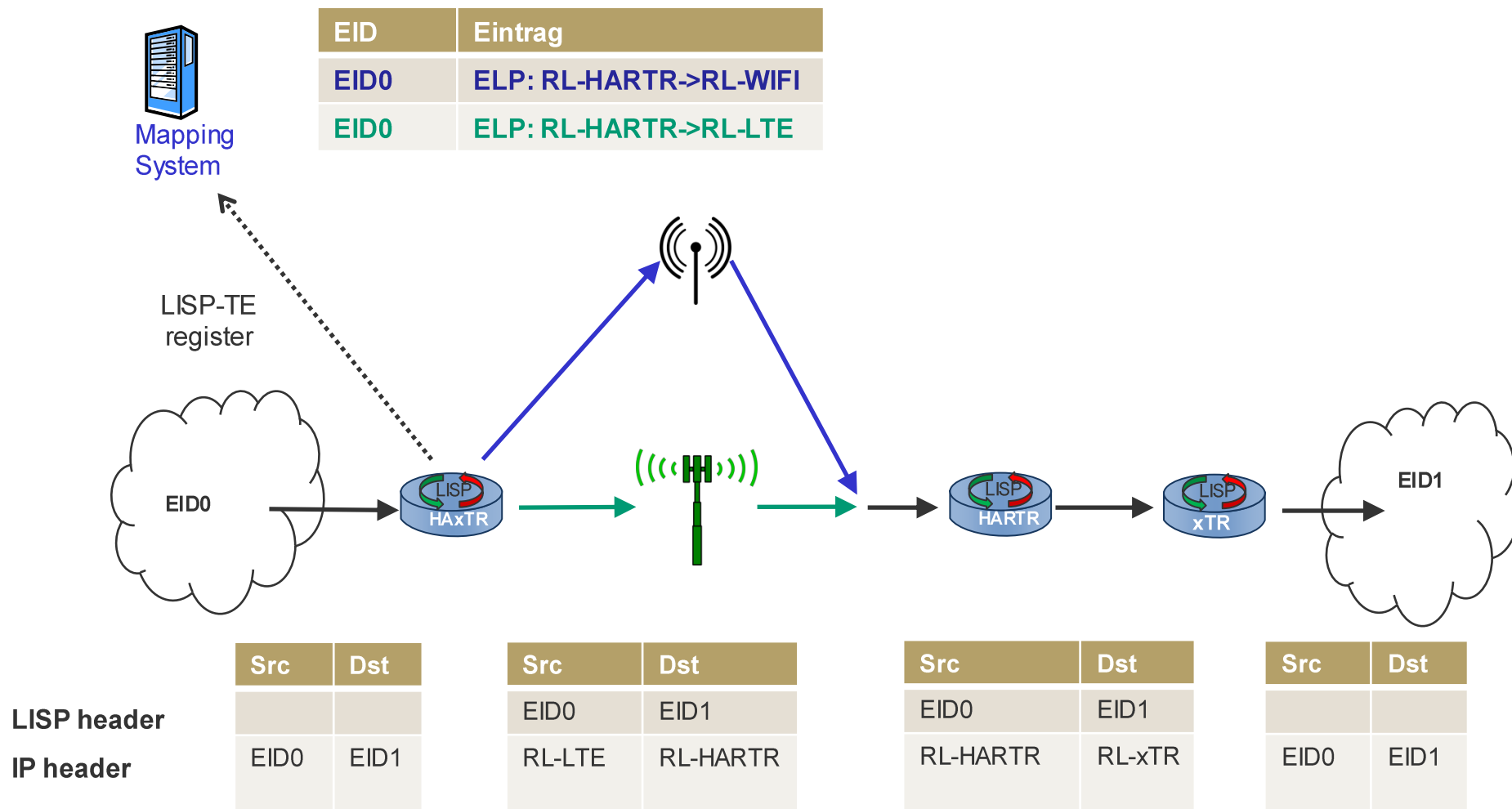


# Static Load Balancing with LISP



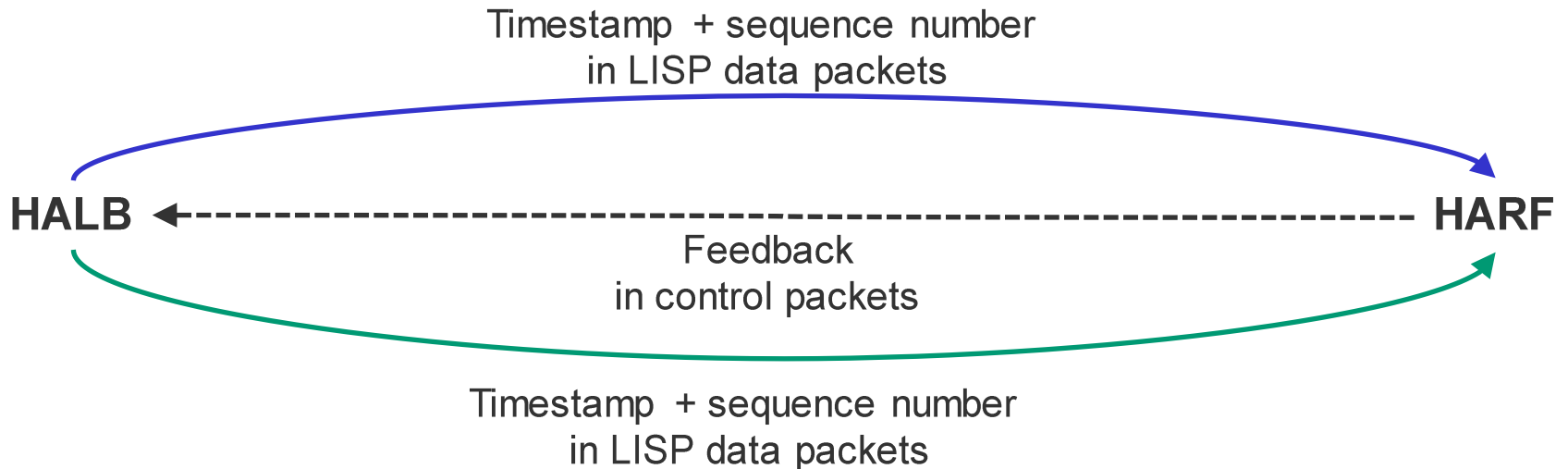


# LISP-HA: Basic Concept





# LISP-HA: Dynamic Load Balancing



## ► HALB

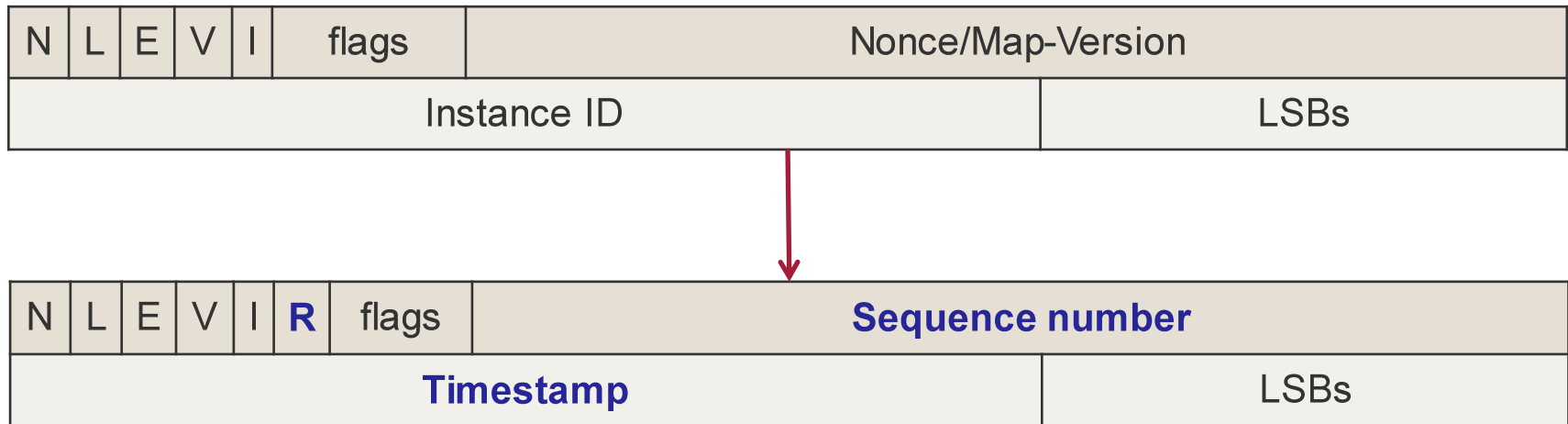
- HA load balancing function
- Load balancer
  - Dynamic load balancing respecting path quality
  - Flow- or packet-based
  - Reordering possible
- Adds timestamp and sequence number in LISP packets to HARF

## ► HARF

- HA recombination and feedback function
- Collects per-path information about
  - Packet loss
  - Relative delay
- Sends per-path feedback to HALB
- Reorders packets if needed

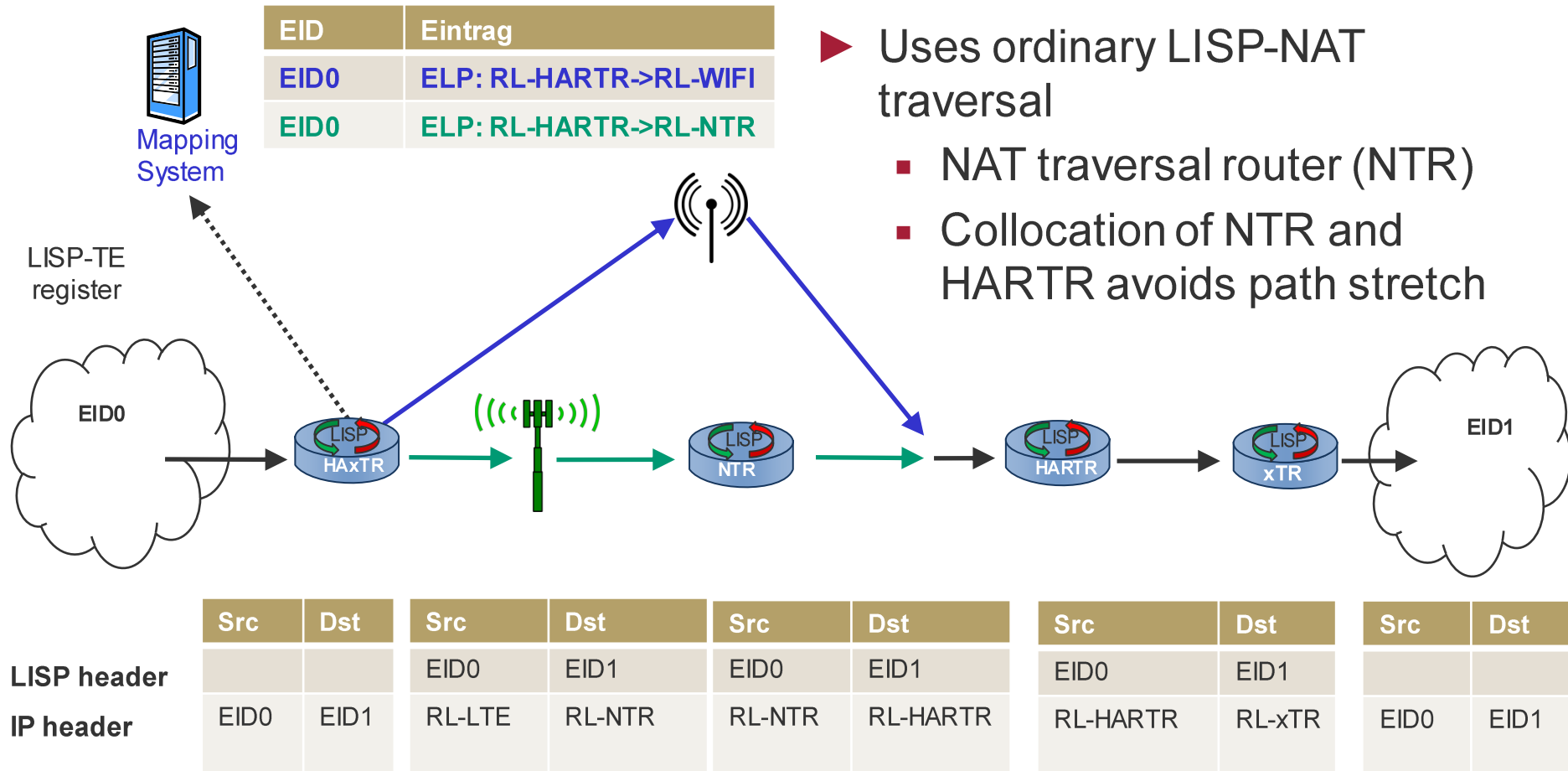


# Redefinition of LISP Dataplane Header



- ▶ Redefined fields optional or not needed in LISP-HA context
- ▶ Fields
  - R: reorder flag
  - Sequence number: global sequence number of the packet
  - Timestamp: lower 24bit of sender's timestamp
- ▶ No need for LISP nodes between HAXTR and HARTR to interpret these fields



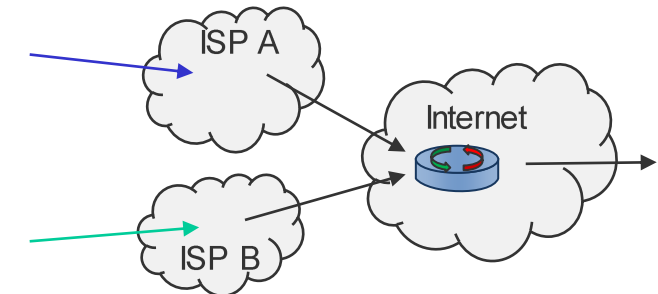
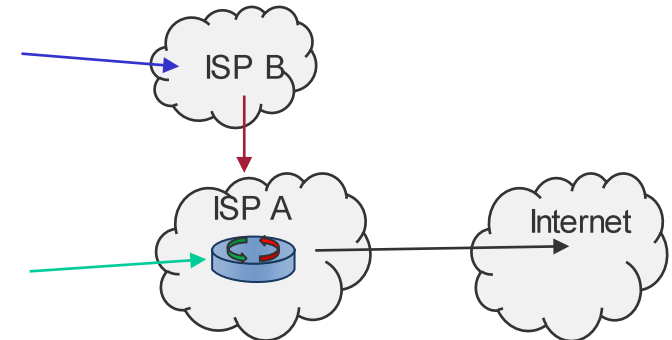
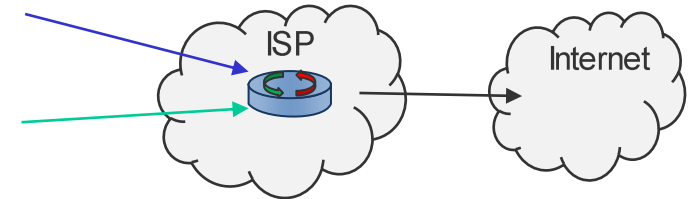






# Deployment Considerations

- ▶ HARTR provided by ISP offering two access technologies
  - Added value for customers
  - Possibility to offload traffic to other technology
  - Best load balancing results
    - Potential information advantage
  
- ▶ HARTR provided by ISP offering one access technology
  - Possibility to offload traffic to other network
  - Possibly degraded load balancing results
  - Customer may choose cheap additional provider without HA support
  
- ▶ HARTR provided by third party company
  - Charges low fee
  - Possibly worst load balancing results
  - Customer may combine two cheap ISPs without HA support





- ▶ Hybrid access useful for residential and mobile access
- ▶ Only static load balancing with existing LISP
- ▶ LISP-HA
  - Mobility support in combination with LISP-MN
  - Dynamic load balancing
  - Packet-based load balancing
  - Policy-based load balancing
  - Enforcement of preferred path
- ▶ Requires
  - Modification to xTR: HAxTR
    - On smartphone or access router
  - Additional infrastructure: HARTR
    - Various deployment options
  - Modified LISP packet header
  - Additional control packets