



ITU-T Kaleidoscope 2009 Innovations for Digital Inclusion

An ID/Locator Split Architecture of Future Networks

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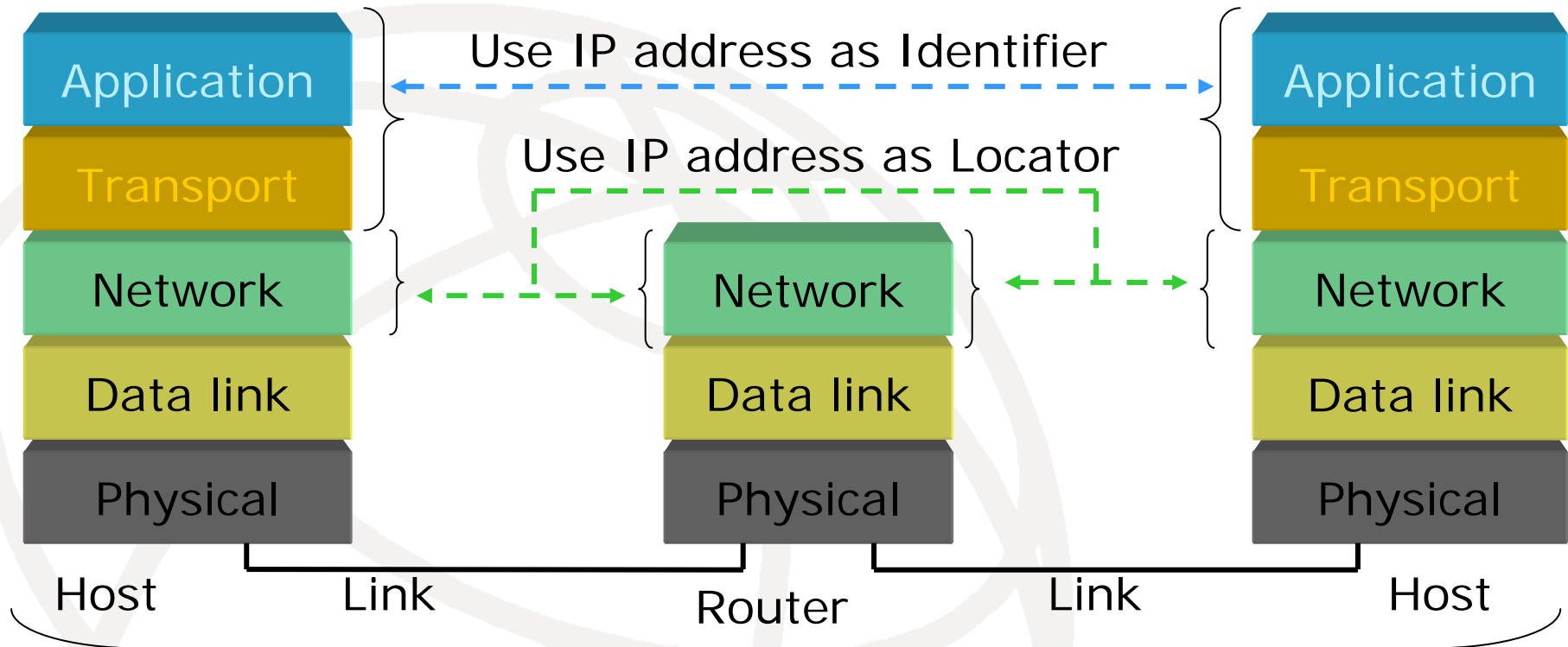


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Presentation Layout

- Background and Motivation
- Related Work
- Host Name and Identifier System
- Network Architecture Components
- Mobility, Scalable Routing Support
- Implementation
- Conclusion and Future Work

Background and Motivation



IP address functions as both ID and Locator

Current network demands ID and Locator split

- For mobility and multihoming: change locators without changing identifiers
- Scalable routing, traffic engineering: use different scoped locators, dynamically map them

Related Work

- **AKARI Project:** (NICT's initiation to clean-slate design of New Generation Network)
 - Includes research on ID/locator split architectures

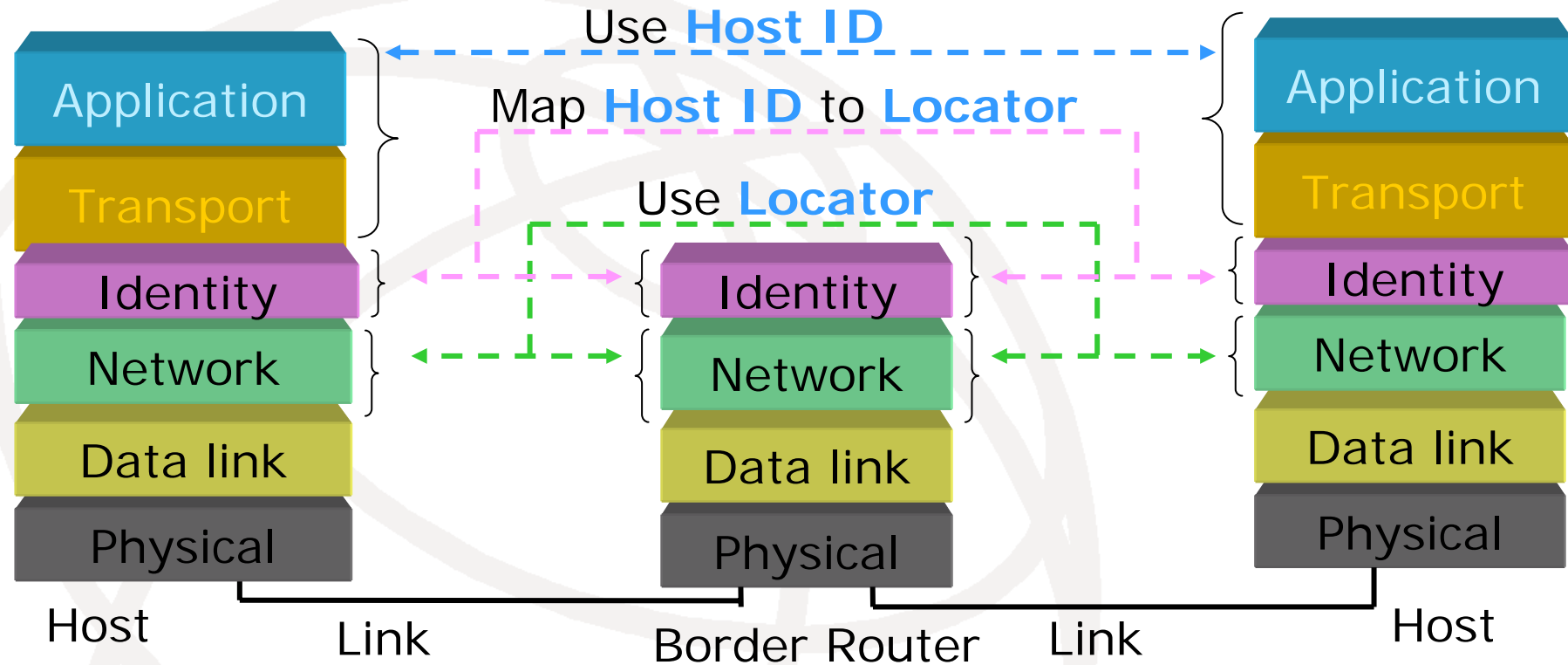
- **ITU-T**
 - Study Group 13
 - Y.2015 (2009): General requirements for ID/locator separation in NGN
 - Y.FAid-loc-split (Q.5/13), Y.ipv6split (Q.7/13)

- **IRTF/IETF**
 - Routing Research Group (RRG)
 - developing a technical framework for ID/locator split-based routing architectures

 - Host Identity Protocol (HIP) Research/Working Groups
 - developed a number of RFCs (5201-5205) on ID/locator split-based host protocols for secure mobility and multihoming

 - SHIM6 Working Group
 - developing protocols to support site multihoming in IPv6

ID/locator Split Architecture Overview

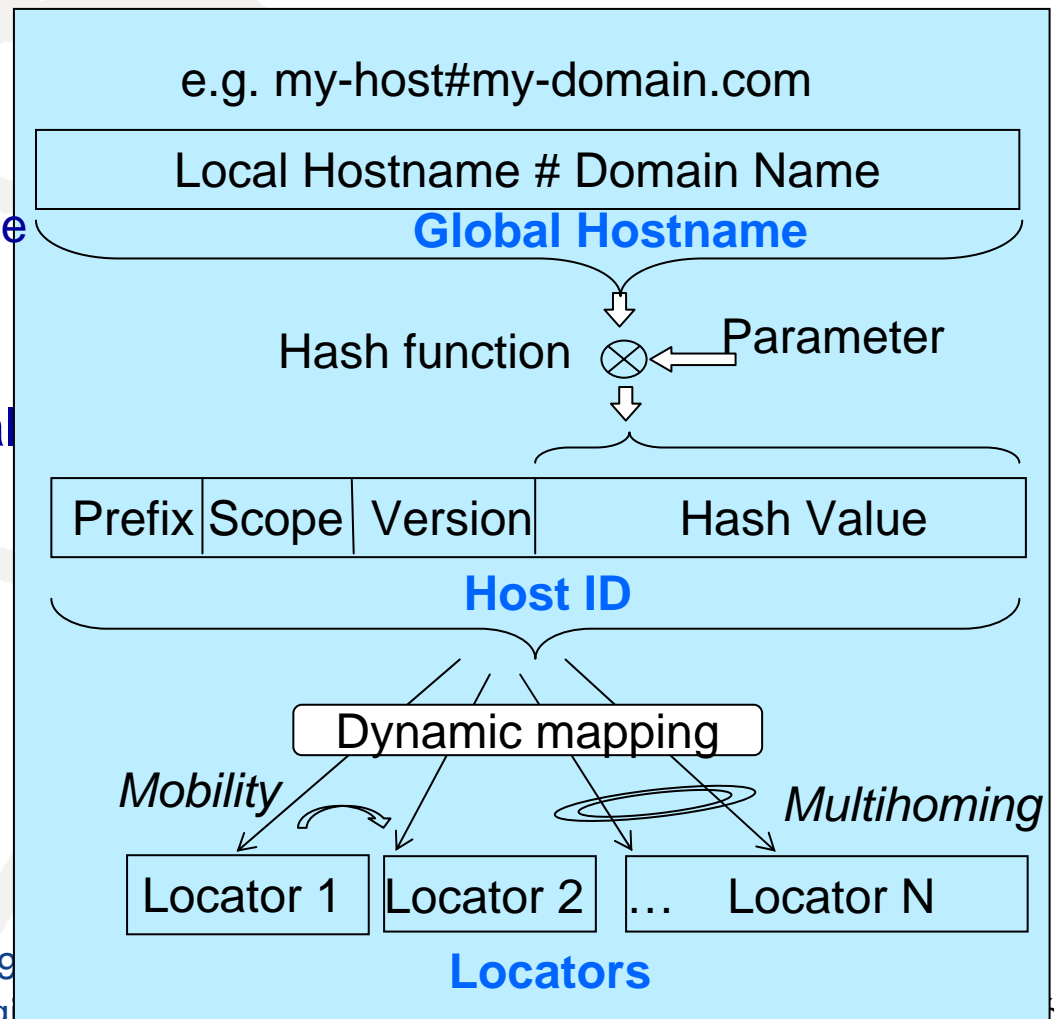


■ Issues to be resolved:

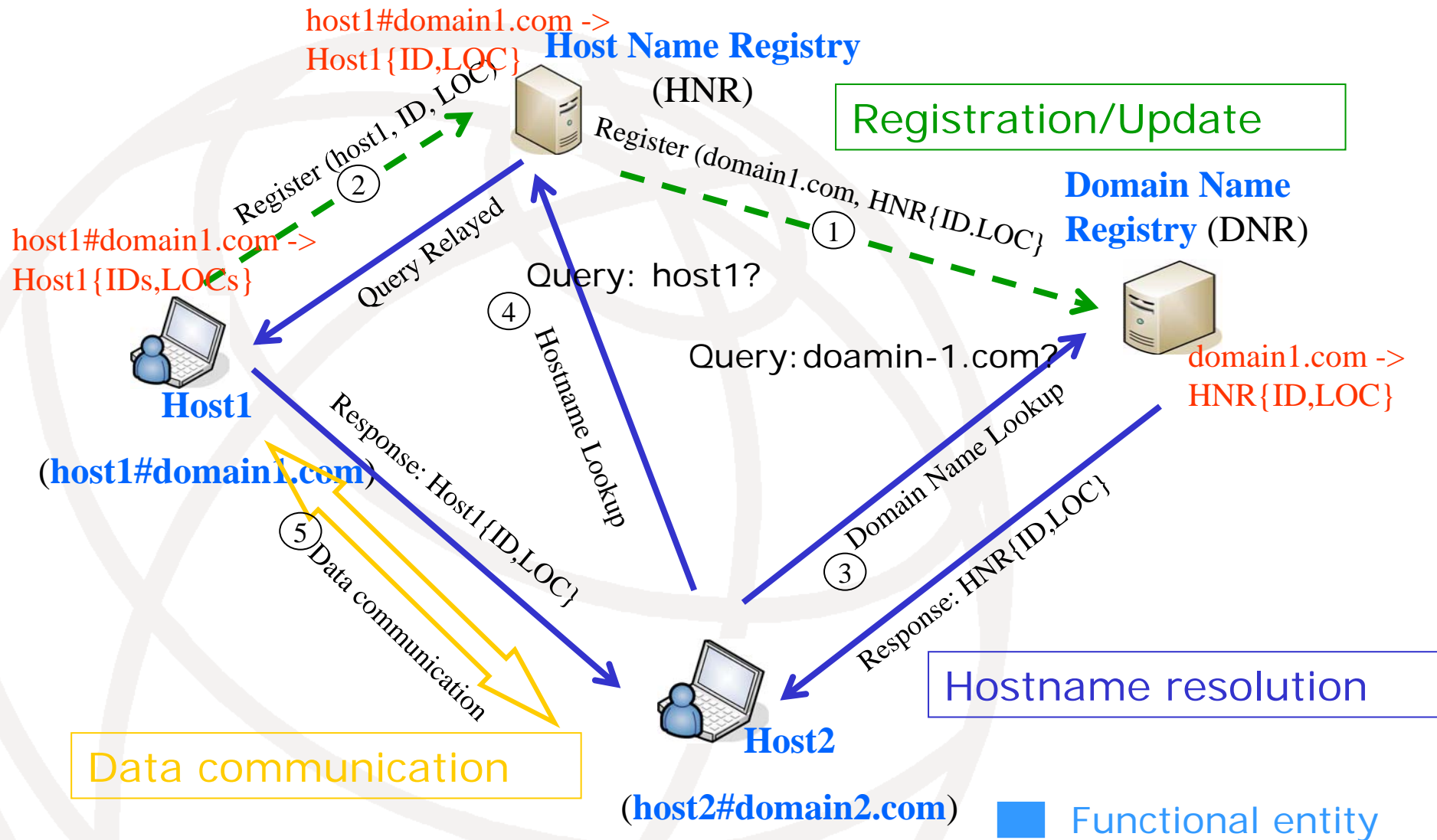
- 1) Host IDs and mechanisms to generate them. (Locators can be current IP addresses, using them only in L3 protocols)
- 2) Mechanisms for host ID to locator binding storage and distribution
- 3) Functions for host ID to locator mapping in gateways or border routers

Host Name and Identifier System (HNIS)

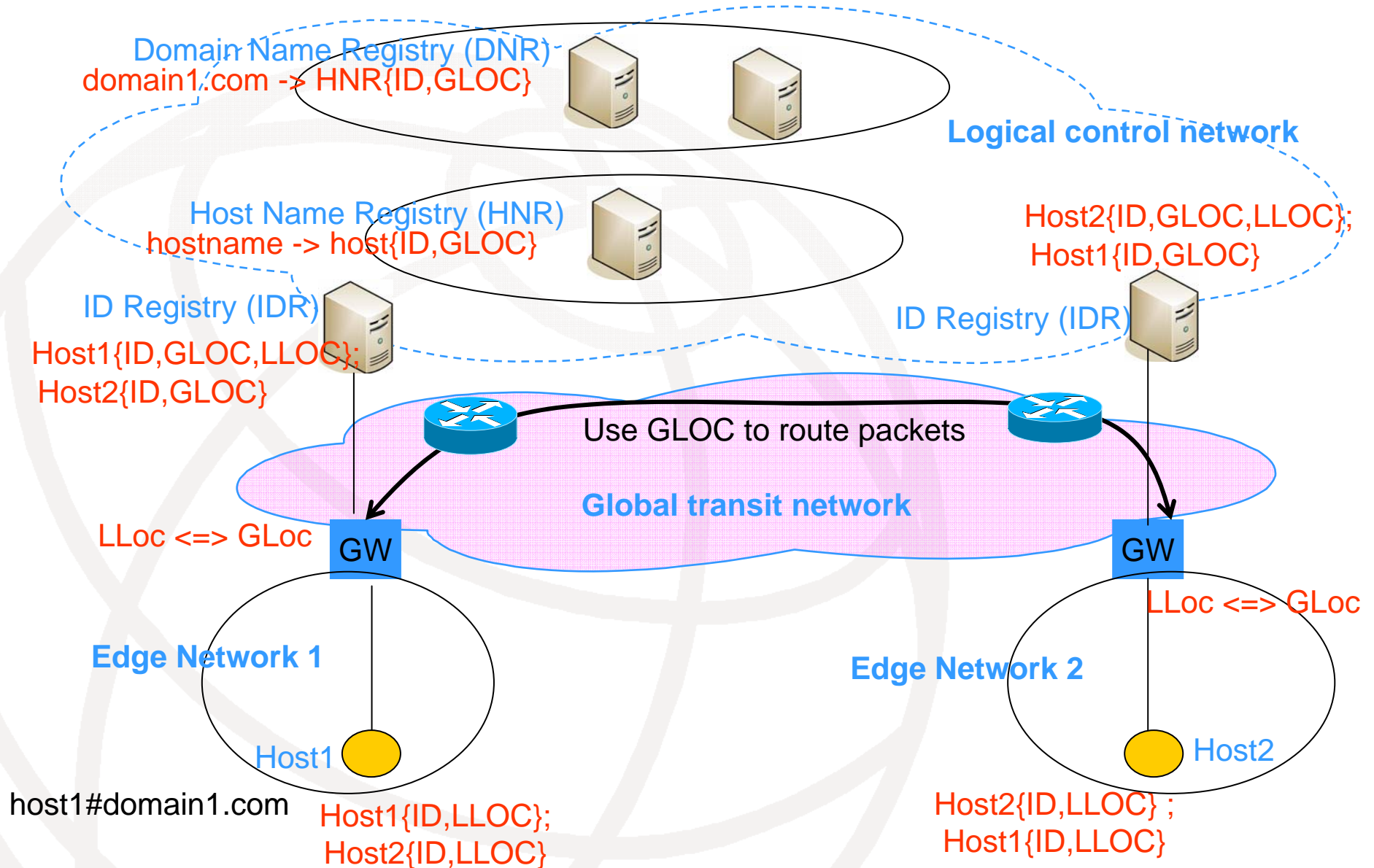
- Host name generation
 - ➔ Local hostname
 - Generated from feature words
 - ➔ Global hostname
 - Combination of local hostname and domain name
- Host ID formation
 - ➔ Generated by hashing global hostname
- Two-layered name resolution system
 - ➔ Domain Name Registry
 - ➔ Host Name Registry



Host name, ID to Locator Resolution

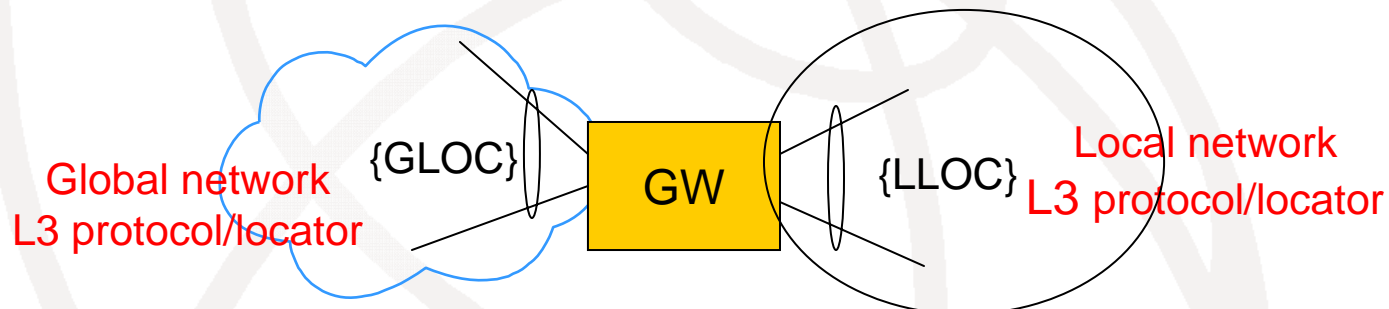


Network Architecture Components



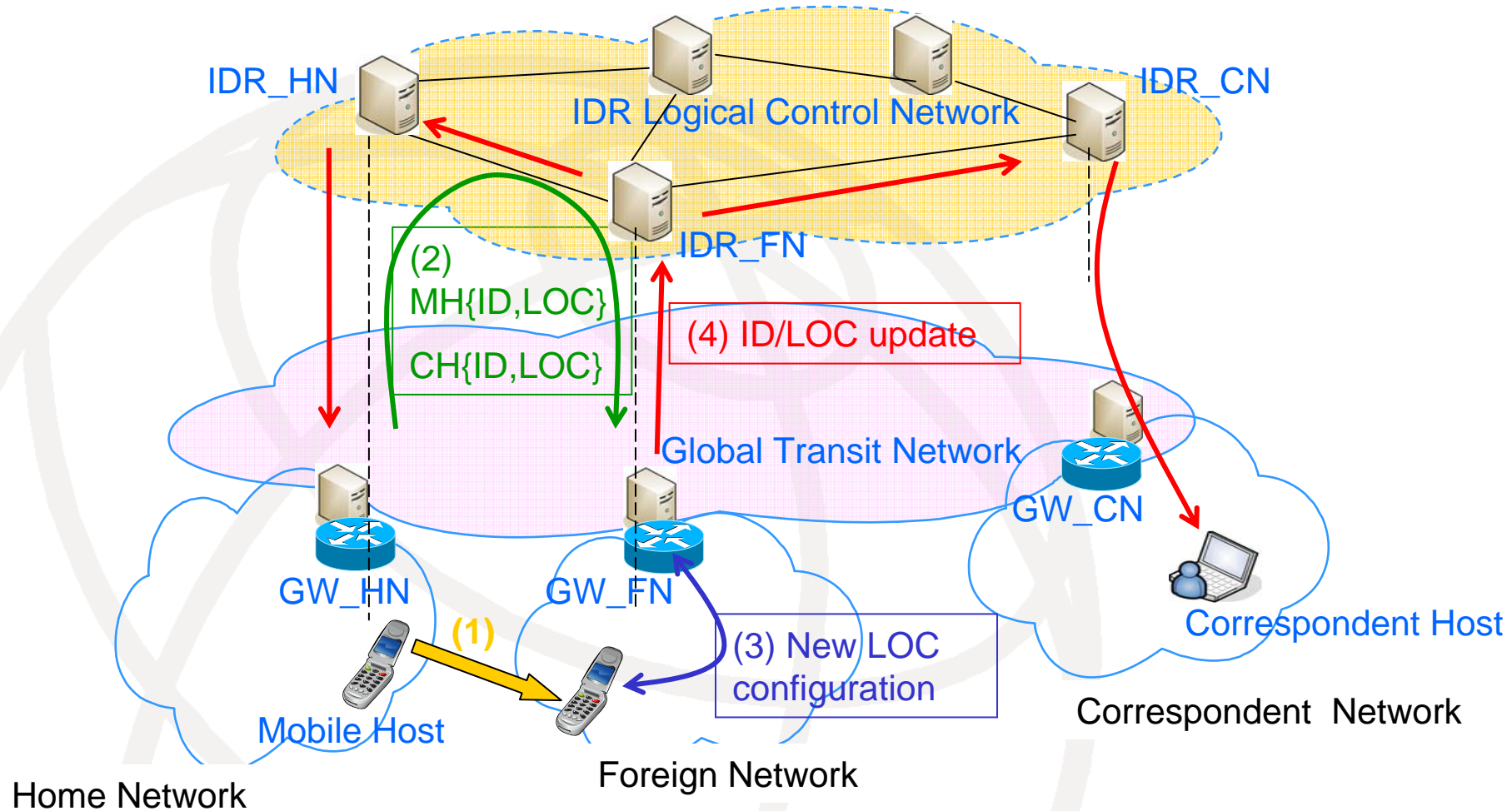
Network Architecture Components (Cont'd)

- Host, GW, Name Registry (HNR +DNR), ID Registry and Routers are the architectural components
- GWs perform L3 protocol/locator translation if
 - L3 protocols used in each edge network differ
 - L3 protocols used in edge networks and global transit network differ



- Host can have in general one hostname, one or more host IDs, and one and more locators depending the number of interfaces and available networks
- Name Registry (HNR+DNR) used for hostname resolution at the beginning of a communication
- ID Registry used for storing, updating and distributing ID to locator and other information mappings for supporting mobility, multihoming, and scalable routing. It can be collocated with GW.

Mobility Management



- ID Registry (IDR) control network is used for propagating ID/LOC mapping updates

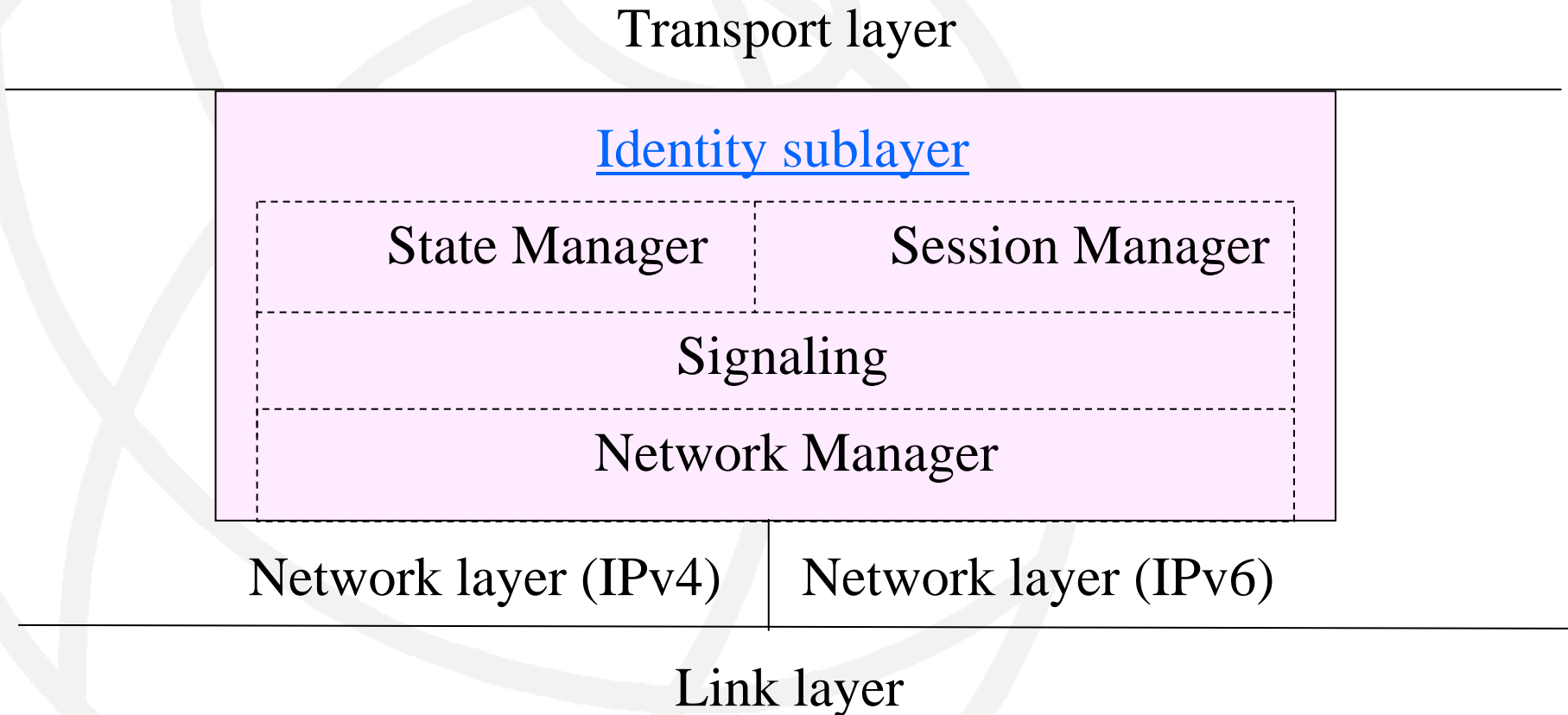
Scalable Routing

- Using different locator spaces at global transit and edge networks
- Having ID/locator mapping functions in GW
- Using ID Registry to obtain or propagate ID to global locator (GLOC) mapping records

* Approach is similar to what is currently being discussed in IRTF RRG.

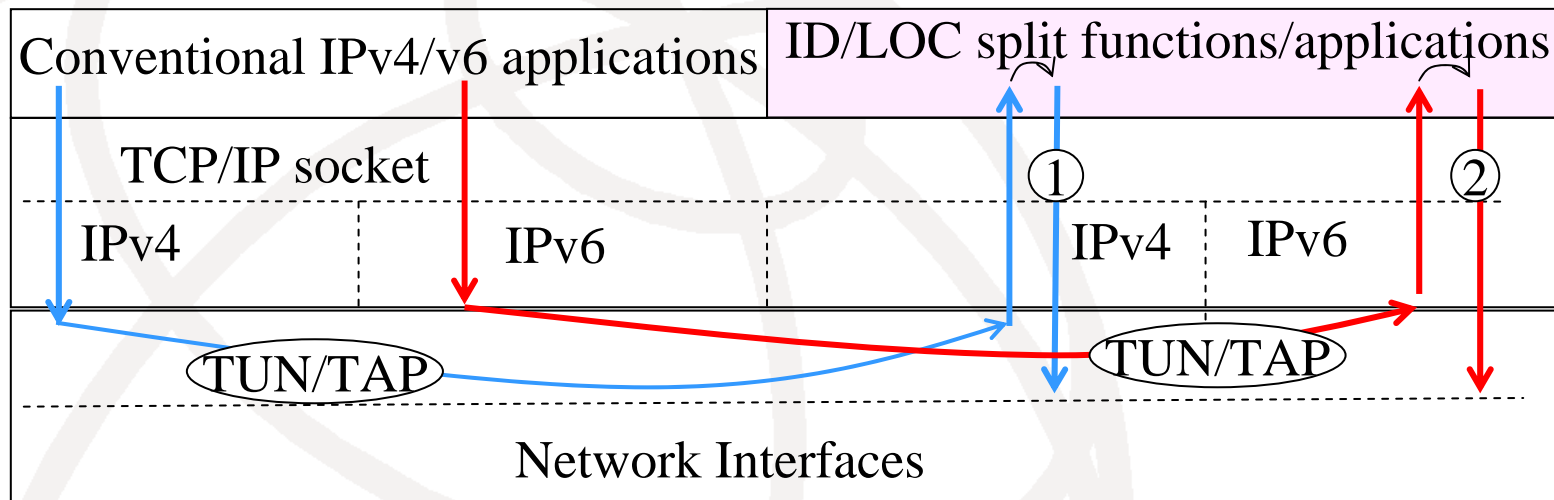
Implementation Layout

- To verify the basic functions of the architecture, it is implemented in Linux



Implementation Layout (cont'd)

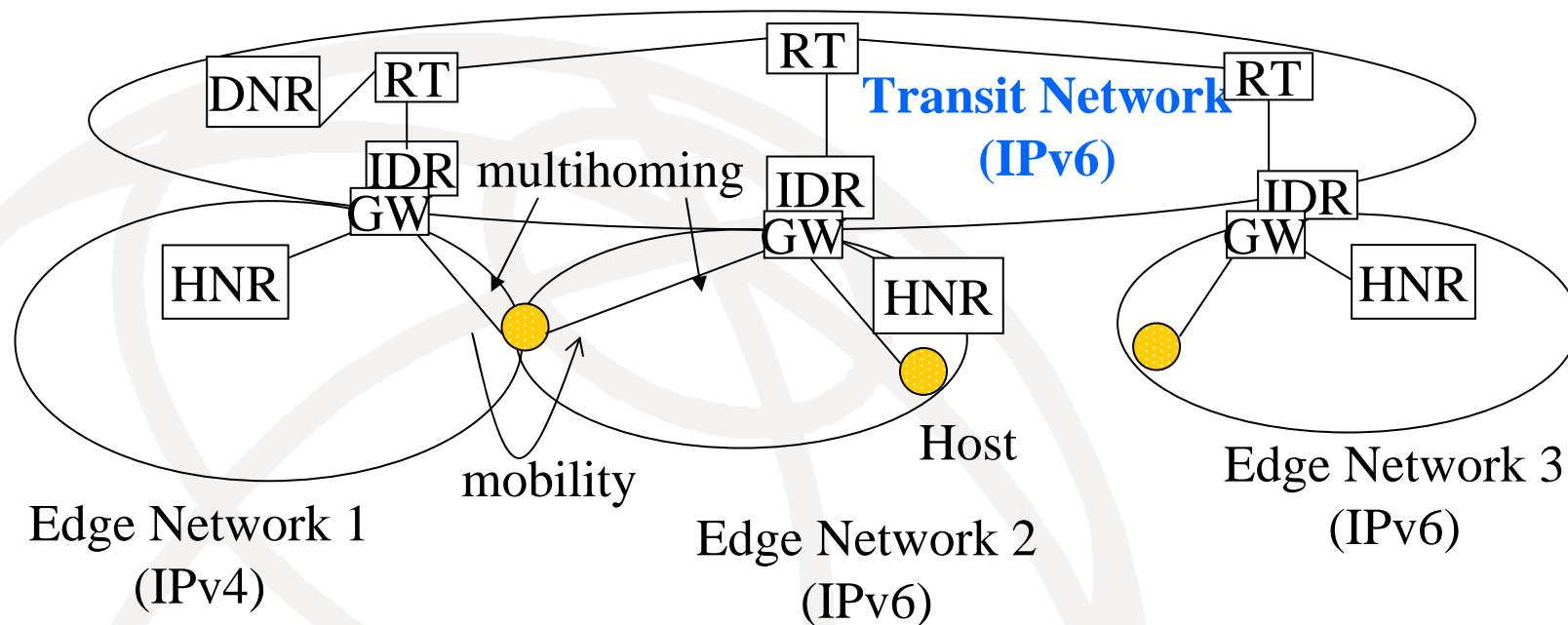
- ID/locator split functions supporting conventional protocol stack



TUN/TAP Ether frame exchange between conventional and ID/LOC split applications through TUN/TAP

- ① IPv4 packet sent through *raw socket*
- ② IPv6 packet sent through *raw socket*

Architecture Functions Verification



- Verified basic functions for name resolution, mobility, multihoming, security
- Tested mobility: session continuity while moving interface
 - L3 handover time = 12ms (L2 switching time = several seconds)
- Tested multihoming: session continuity while changing interfaces
 - L3 interface switching time = 12ms
- Security: encryption of control signals and data packets
 - OpenSSL's RSA library used; could not cipher heavy traffic such as video promptly

Summary and Future Work

- Presented the ID/locator split-based architecture of future networks
 - new host name and ID system, two-layered name resolution system
 - logical control network for name resolution and ID/locator mapping updates and distribution
- Verified the basic functions in a local scale testbed
 - As a common platform for mobility, multihoming, scalable routing, and security
 - For integrating different L3 protocols (IPv4 & IPv6)
- Future work
 - Extend and evaluate the architecture in larger scale testbed, e.g., over PlanetLab
 - Extend the logical control network functions to support mobile routers and resource discovery in heterogeneous networks



Thank you for your attention !