



A DHT-inspired clean-slate approach for the Next Generation Internet

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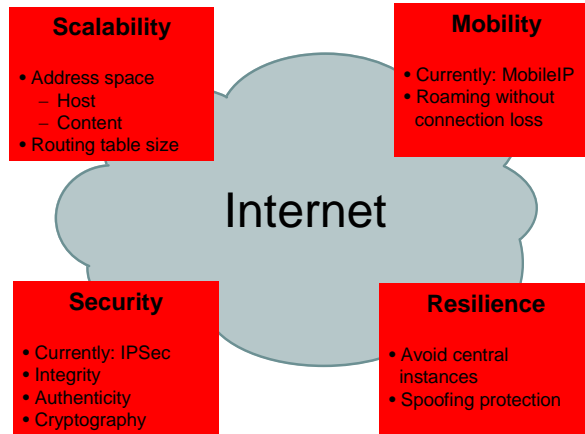
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Outline

- **Critical issues**
- **Concept**
- **Load estimation**
- **Related work**

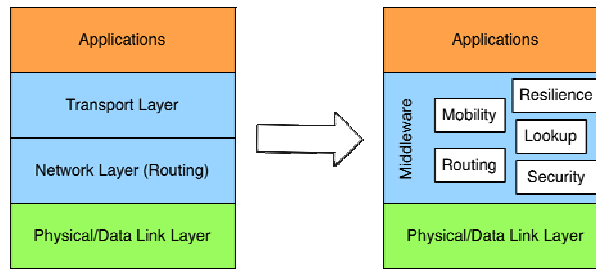
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Next Generation Internet“, ICN 09



- **Locator/ID Separation**
 - Global accessibility through unique identifier
 - Identifier is node's public key
 - Easy realization of authenticity, integrity and cryptography with PKI
 - Locator is the node's position in the network
- **Two-tier DHT-hierarchy**
 - Mapping between identifier and locator
 - Mapping between DomainName and locator
 - Mapping between ContentID und locator
 - Resilience and spoofing protection of the mapping system
 - Location awareness
- **Hierarchical addressing scheme in the core network**
 - Reduce size of routing tables
 - Autonomous Systems (AS) remain untouched



- **Modifications in OSI layers 3 and 4**
- **Modular building blocks instead of inflexible layers**

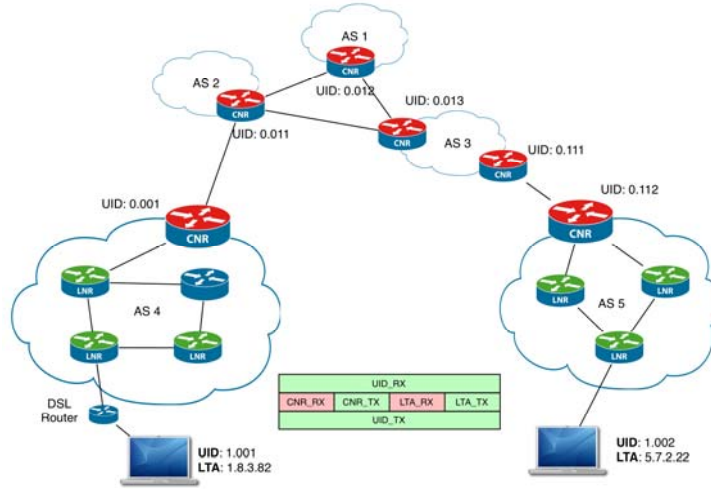


- **UID: unique ID (128 bit)**
 - Unique, never changing identifier for hosts/content
 - Not routable
 - Reserved UIDs for CNRs (first 96 Bit are 0)
- **LTA: local temporary address (variable length)**
 - Temporary routable address in a specific AS
 - Can be any addressing scheme depending on the provider (IPv4, IPX, ...)
- **CNR: core network router**
 - Gateway at the edge of an AS (former BGR)
 - Handles global address mapping
- **LNR: local network router**
 - Router inside an AS
 - Handles local address mapping





Topology

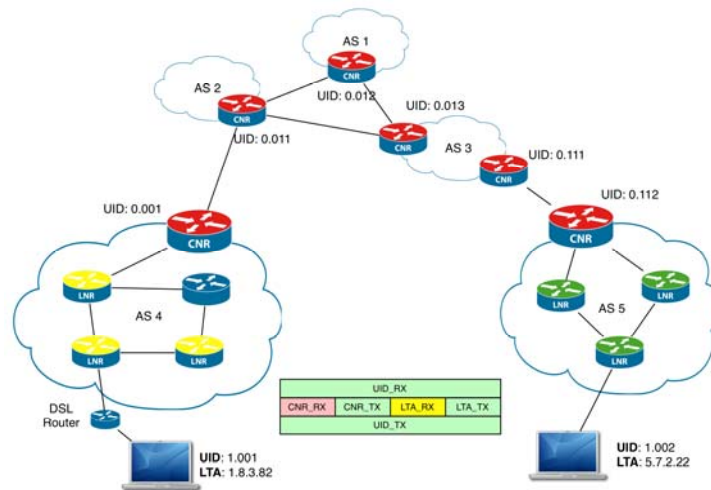


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Step 1

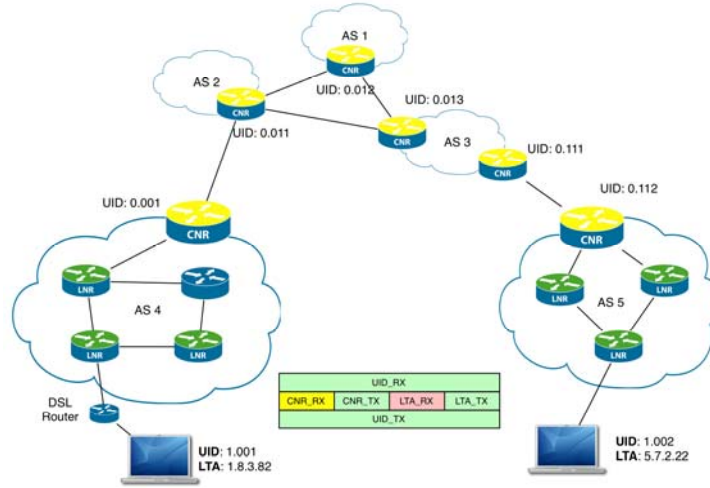


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Step 2

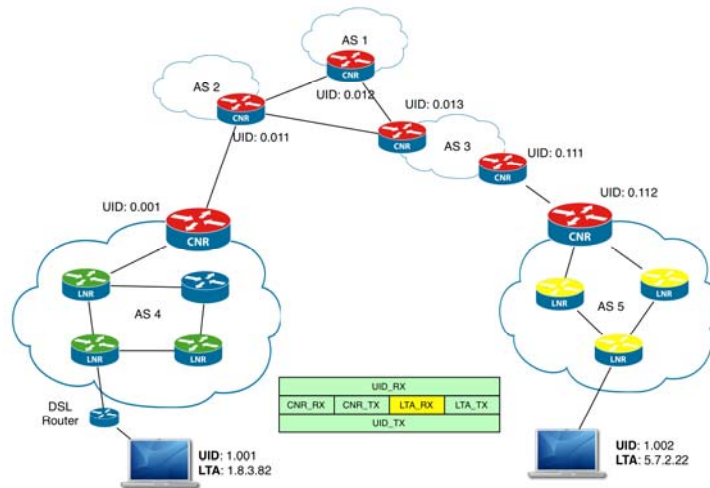


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Step 3

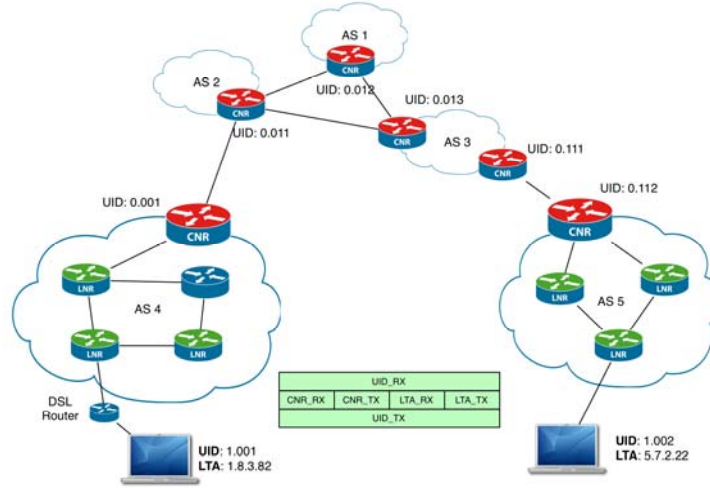


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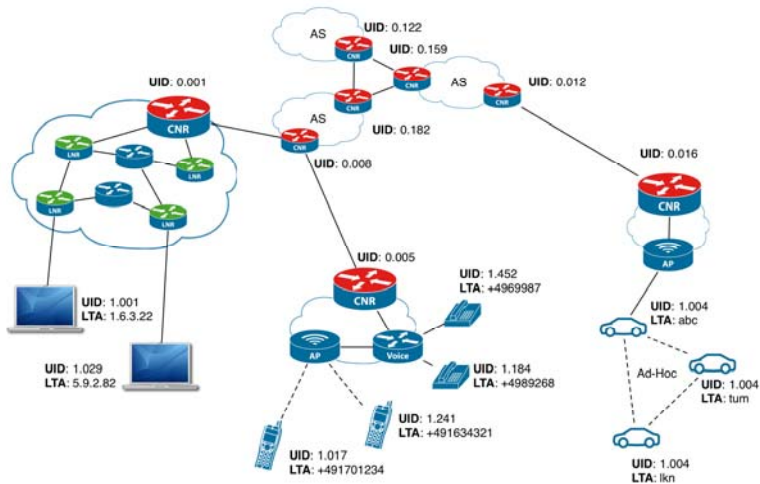
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SYN ACK

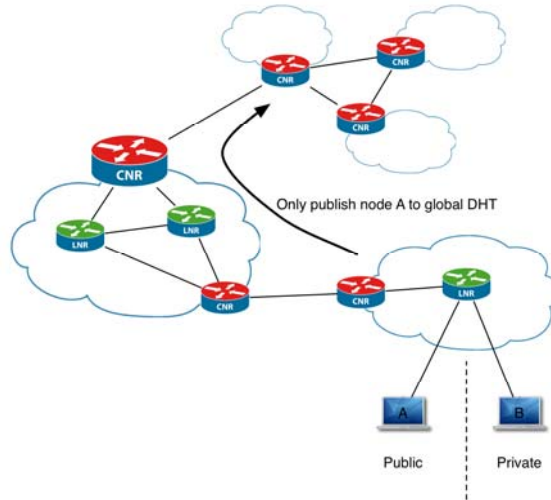


Addressing scheme





Private AS



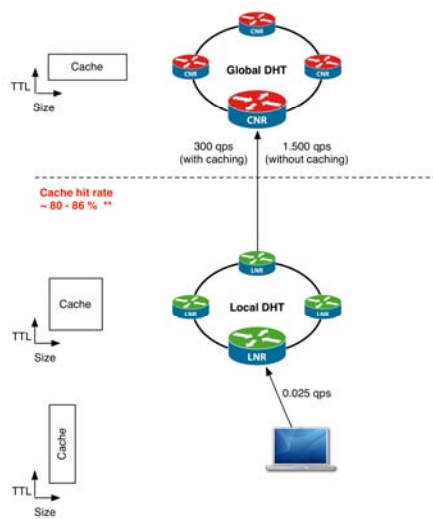
Load estimation



• Load of the core network's DHT:

- Assumptions:
 - 6 billion devices
 - 100000 CNRs in the core network
 - 80%-86% cache-hit-rate for DNS queries at local resolvers **
 - Packet size: ca. 200 byte
 - 4 packets per query
- LRZ DNS-Query measurements:
 - ca. 1000 queries/sec (qps) for ca. 40000 nodes
 - 0.025 qps per node in the mean => 1500 qps per CNR *without caching*
 - *With caching*: about 300 qps
 - Factor 10 because of content addressing

$$200 \text{ byte} * 3000 \text{ qps} * 4 = 20 \text{ Mbit/s}$$





- **Comparison with HIP BONE:**

	Loator/ID split	Heterogeneous networks	Mapping scalability	Locality awareness	Security	Mobility
HIP BONE	++	o	o	o	+	+
Our approach	++	++	+	++	++	++

Others: DONA, LISP



- **Conclusions:**

- DHT-based 2-tier hierarchy
- Addresses all critical issues
- Meets customer and provider requirements

- **Next Steps:**

- DHT implementation for emulation
- Further measurements of DNS traffic to substantiate content addressing