LANES: An Inter-Domain Data-Oriented Routing Architecture

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Dual Paradigms

Data-centric

Identifier

Value

Receive data from <id, address>

Server

Data

Message-oriented

Identifier

Continuation

Send <id, data> to address

Server

Session state
Adding the missing half of the Internet

- A data-oriented network layer would have many advantages:
  - Lower latency because of caching
  - Native asynchronous multicast → efficiency, no flash crowd bottleneck
  - Less layers
  - No unwanted traffic
- P2P overlays have efficiency, incentive, and security problems
- Patching Internet with CDNs is also a bit unsatisfactory
  - interworking of different systems, adaptation to demand generated by subscribers, limited to web semantics, optimality of network resource allocation, unwanted traffic still possible
- → Lots of research: CCN, DONA, ROFL, TRIAD, ..
- A clean-slate pub/sub network architecture is being developed in the PSIRP EU project
  - Bloom filter based forwarding [Jokela et al. 2009]
  - Hierarchical DHT-based rendezvous architecture (paper submitted)
- In this paper we try to bridge these two layers with an intermediate routing layer
Identifiers, Scopes, and Security

Subscriber

Home rendezvous network * is connected to 1-n Rendezvous interconnect

How? 0-1
Scope (owner)

Label L 1 * Identifier 1 * Namespace P(owner)

0.1 is identified by

Subscription 1

Publication

What? 1

Data value

* has value

Publisher 1

* creates

* stores

Data source
Phases of Communication

1. (Potential) Publication is registered to a rendezvous network

2. Subscriber rendezvous with the publication

3. Subscription forms a delivery tree

4. Publication data is delivered to the subscriber using constructed Fld
Delivery Tree Formation Example
Multirate Multicast Congestion Control with Caches

\[ x_r(t) = k_r(x_r)(w_r - x_r(t)q(t) - c_r(t)) \]

Data source B

Data source A

\[ p_1(t) = f_1(y_1(t)) \]

Subscriber A

Subscriber B

Subscriber A

Forwarding node

Forwarding node

Branching node

w_b

w_a

w_b1

w_b2
Future Work

- We are currently working on implementing a simulation of the system and will report results in a coming paper.
  - efficiency, stability ..
  - analysis of the congestion control
- We are also writing a paper about the roles and security in the architecture.
- Open problems: multipath forwarding, bursts etc.
- Questions?