Publish-Subscribe Internet Routing Paradigm

PSIRP

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Vision

Envision a system that dynamically adapts to evolving concerns and needs of their participating users

• Publish–subscribe based internetworking architecture restores the balance of network economics incentives between the sender and the receiver
• Recursive use of publish-subscribe paradigm enables dynamic change of roles between actors
Approach

Clean-slate design…
• Question ALL fundamentals
• Challenge our thinking
• Take nothing for granted, including industry structures
• Clear vision

…with late binding (to reality)
• Consider migration and evolvability in separate work items
  – How to get our design into real deployments, e.g., overlay vs. IP replacement?
• Even consider necessary evolution of industry (& regulatory) structures
  – How do industries need to evolve in certain scenarios?
### Internet Today:

- In 2006, the amount of digital information created was $1.288 \times 10^{18}$ bits
- 99% of Internet traffic is information dissemination & retrieval (Van Jacobson)
  - HTTP proxying, CDNs, video streaming, …
- Akamai’s CDN about 15% of traffic
- Between 2001 and 2010, information will increase 1 million times from 1 petabyte ($10^{15}$) to 1 zettabyte ($10^{21}$)
- Social networking is information-centric
- Most solutions exist in silos
  - overlays over IP map information networks onto endpoint networks

### Internet Tomorrow:

- Proliferation of dissemination & retrieval services, e.g.:
  - context-aware services & sensors
  - aggregated news delivery
  - augmented real life
- Personal information tenfold in the next ten years (IBM, 2008)
- Increase of personalized video services
  - e.g., YouTube, BBC iPlayer
- Vision recognized by different initiatives & individuals
  - Internet of Things, Van Jacobson, D. Reed
- Lack of interworking of silo solutions will slow innovation and development speed
Application developers care about information concepts
  – Creation of information topologies of various kinds
-> Endpoint-centric networking structures are inadequate
  – Topological network changes too slow in timescale
  – Topological network boundaries too restrictive
  – Topological network boundaries often not aligned with information topologies
  – Overlaying possible but restricted in (developer) scalability

-> If it is all about information, why not route on information?
Main Design Principles

• Information is multi-hierarchically organised
  – Information semantics are constructed as directed acyclic graphs (DAGs)

• Information scoping
  – Mechanisms are provided that allow for limiting reachability of information to parties

• Scoped information neutrality
  – Within each information scope, data is only delivered based on a given (rendezvous) identifier.

• The architecture is receiver-driven
  – No entity shall be delivered data unless it has agreed to receive those beforehand.
Information-Centrism is Key

• Information is everything and everything is information
  – Bootstrap other concepts, e.g., identity, policy, …,

• Scopes build information networks

• Policy is metadata
  – So is scope!

• Producers and consumers need no internetwork-level addressing!
Project overview

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Partners:
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• Oy L M Ericsson Ab (FI)
• Nokia Siemens Networks Oy (FI)
• Institute for Parallel Processing of the
  Bulgarian Academy of Science (BG)
• Athens University of Economics and Business (GR)
• Ericsson Magyarorszag Kommunikacios
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Duration: January 2008 – June 2010
Total Cost: €4.1m
EC Contribution: €2.5m
Contract Number: INFSO-ICT-216173

WP1 Management (TKK-HIIT)
WP2 Architecture Design (TKK-HIIT)
WP3 Implementation, Prototyping & Testing (LMF)
WP4 Validation and Tools (BT)
WP5 Dissemination and Exploitation (NSNF)

Project website: www.psirp.org
Conclusions

• PSIRP is an ambitious project!
• It challenges our thinking but will not neglect migration & deployment!
• Vision, design principles, and concepts are sound and aim for the Future Internet
• Major tasks are well underway
  – Major deliverables on architecture, implementation and evaluation already delivered
• Community engagement through public deliverables and (to-be-released-soon) open source code