

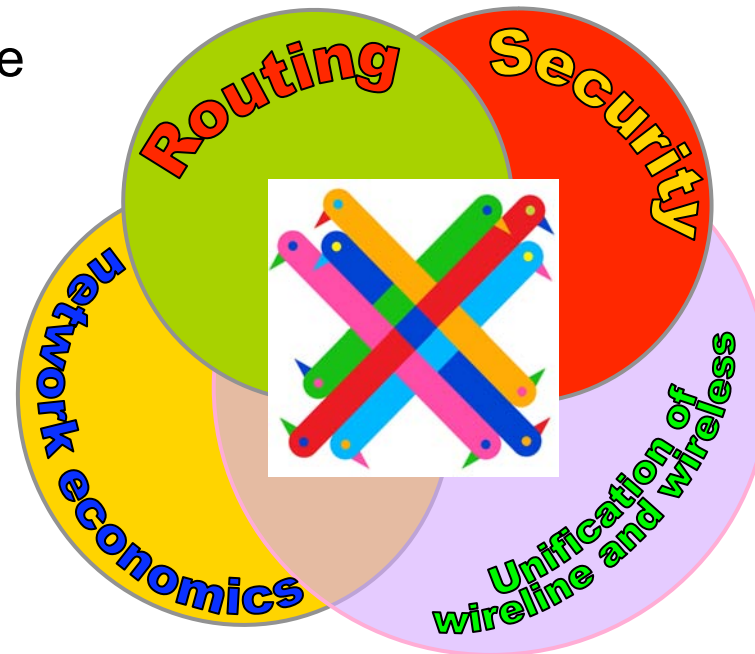
Publish-Subscribe Internet Routing Paradigm - PSIRP

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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

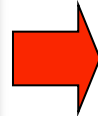
...with late binding (to reality)

- 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?

It's All About Information

Internet Today:

- In 2006, the amount of digital information created was 1.288×10^{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



Hypothesis: Increased Information Requires Information-centric Network Approaches

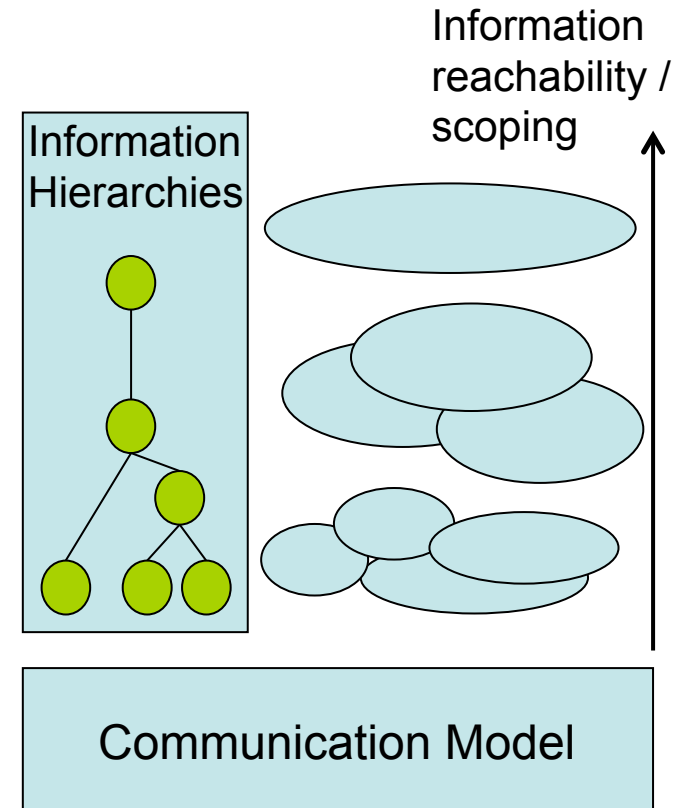
Application developers care about information concepts

- 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?

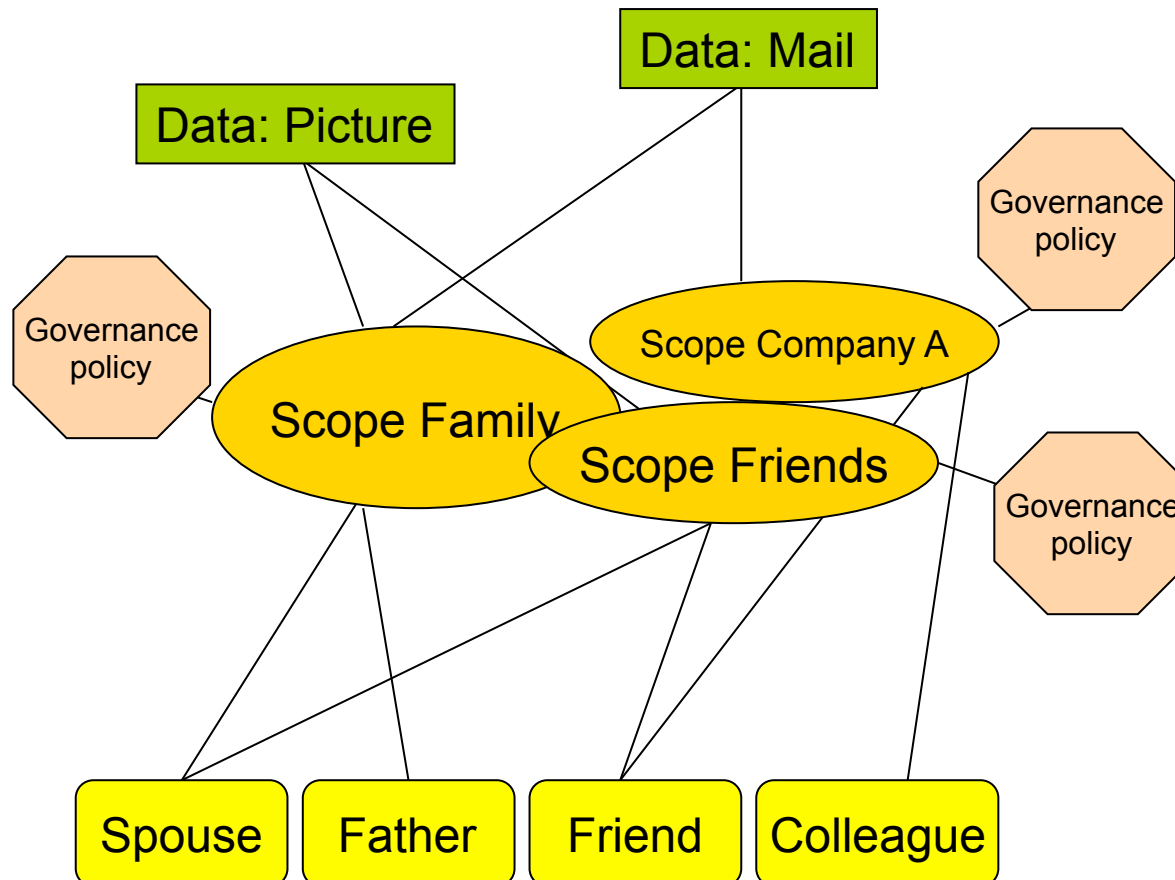
Main Design Principles

- 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

Project Coordinator

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Partners:

- Helsinki University of Technology
Helsinki Institute for Information Technology (FI)
- RWTH Aachen University (DE)
- British Telecommunications Plc (GB)
- 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 Magyarország Kommunikacios
Rendszerek K.F.T. (HU)

Duration: January 2008 – June 2010

Total Cost: €4.1m

EC Contribution: €2.5m

Contract Number: INFISO-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