

# Information-Centric Networking @ FIA Budapest

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5 July 2011

# What?

- ❑ Content access and distribution
- ❑ Information-Centric Networking (ICN)
  - tries to develop general infrastructure that provides in-network caching so that content is distributed in a scalable, cost-efficient & secure manner
    - Receiver-driven model – subscribe/get objects of interest
    - Support for location transparency, mobility & intermittent connectivity
    - Needs also to be able to support interactivity (e.g. voice) and node-oriented services (e.g. telnet)

# Why?

- ❑ Users are interested in named content and not in node endpoints
  - It is done over the top in overlay networks

# How?

- In network solution
  - similar to P2P/CDN-like paradigm

# Who's Business?

- ❑ EU's digital agenda **to push BW**
- ❑ Deutsche Telekom, France Telecom, Telecom Italia, Telefónica and Vodafone **to see RoI**
- ❑ **overhaul of the ISP peering system**

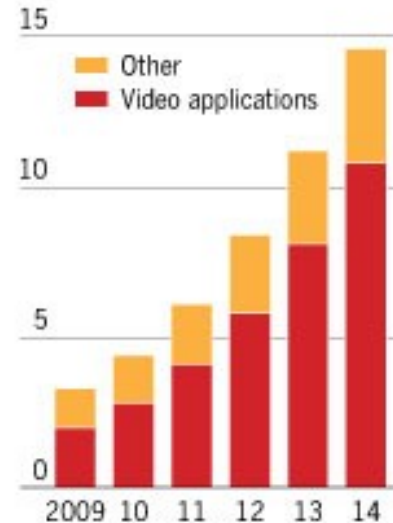
## Network operators versus Google

Fast-growing video traffic on fixed-line and mobile network infrastructure ...

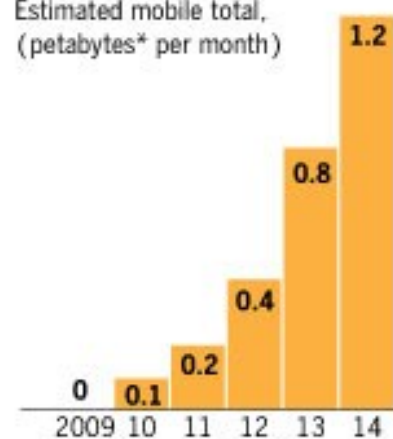
... means network operators want to levy charges on online content providers based on data volumes

### European internet traffic

Estimated fixed-line total (petabytes\* per month)

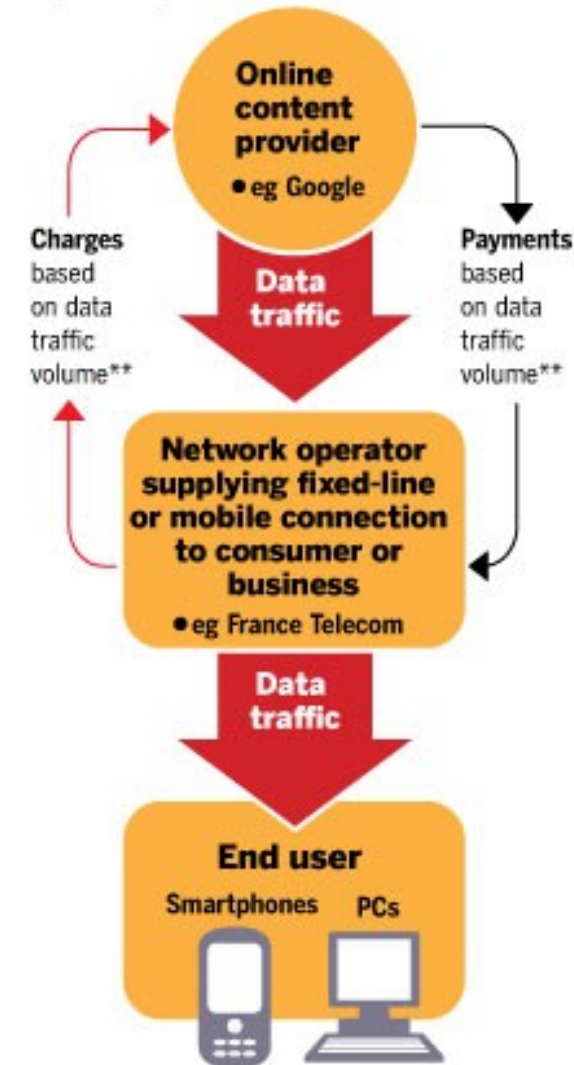


Estimated mobile total (petabytes\* per month)



Source: A.T. Kearney \*One million billion bytes

How a traffic-dependent charging regime might work



\*\* Charges and payments could also involve network operator supplying internet 'backbone'

# Incentives?

## □ Why?

- Users are interested in named content and not in node endpoints
  - It is done over the top in overlay networks

## □ How?

- In network solution
  - similar to P2P/CDN-like paradigm

## □ Who **BUT the network operators?**

# Issues: Naming

## ❑ IDs for Information Objects

- location-independent
  - all the object copies sharing a unique ID
- Security applied to information
  - Non human friendly IDs
- Name resolutions to IDs
- Search on object metadata

## ❑ Figures

- Many more than the trillion URLs ( $10^{12}$ )

**SCALING**

# Issues: Routing

- ❑ Name / ID → Locator (two phase)
  - Allows incremental deployment
- ❑ ID based routing (one phase)
  - Radical changes to the arch.

## SCALING



# Issues: Caching

## □ In-network content caching

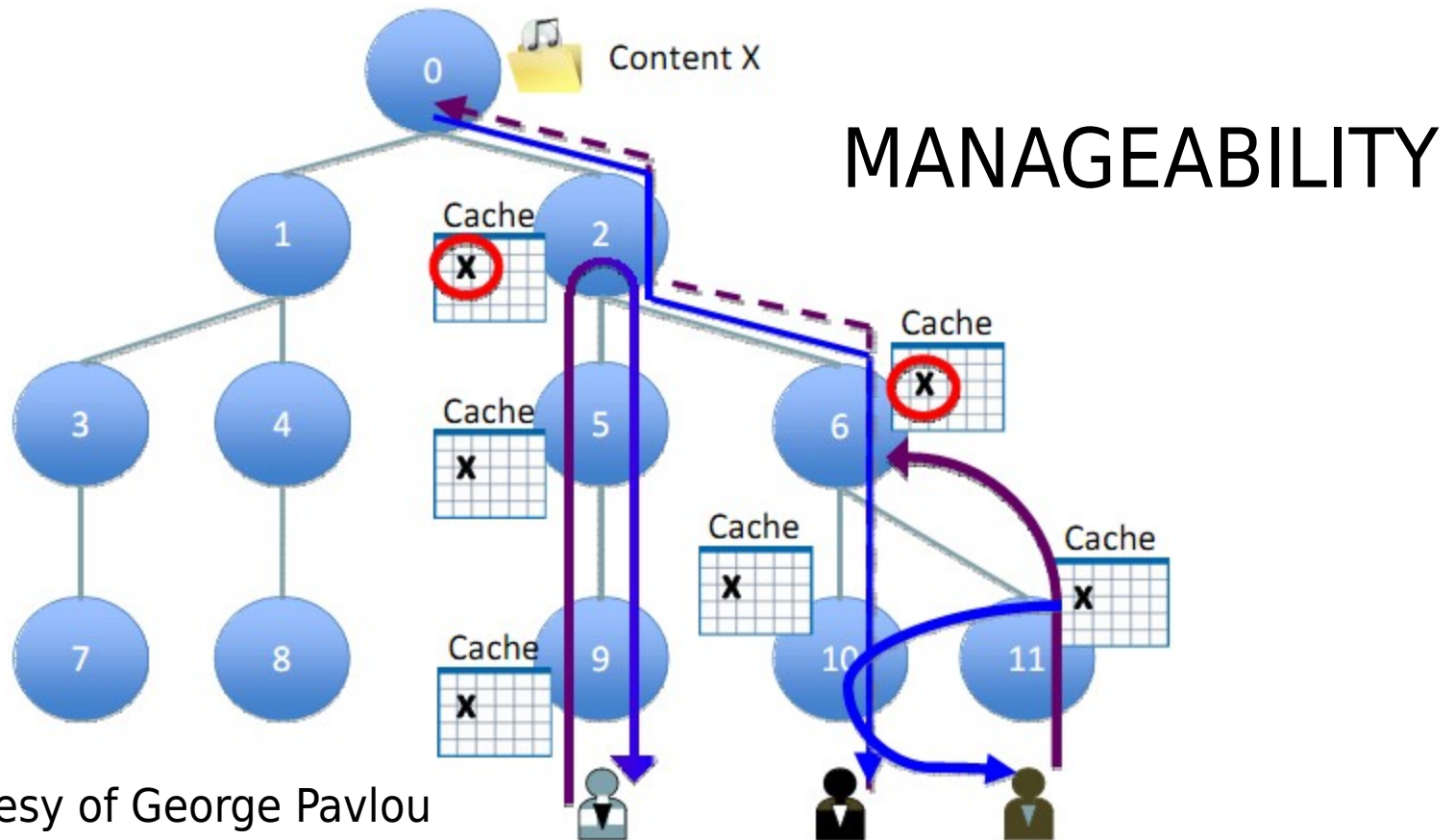


Figure: courtesy of George Pavlou

# Issues: Security

- ❑ Privacy concern
  - **network sees the object**
- ❑ Caching of illegal content

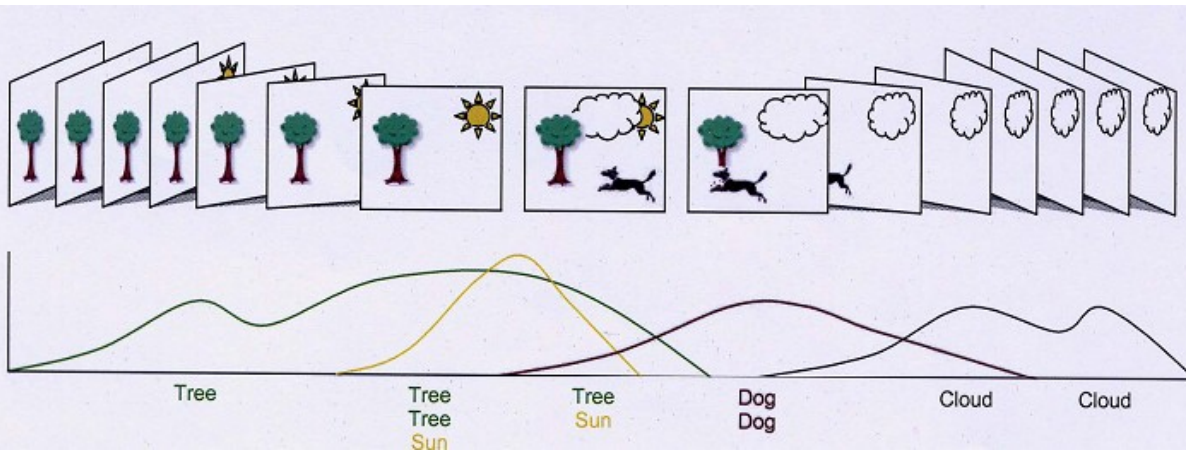
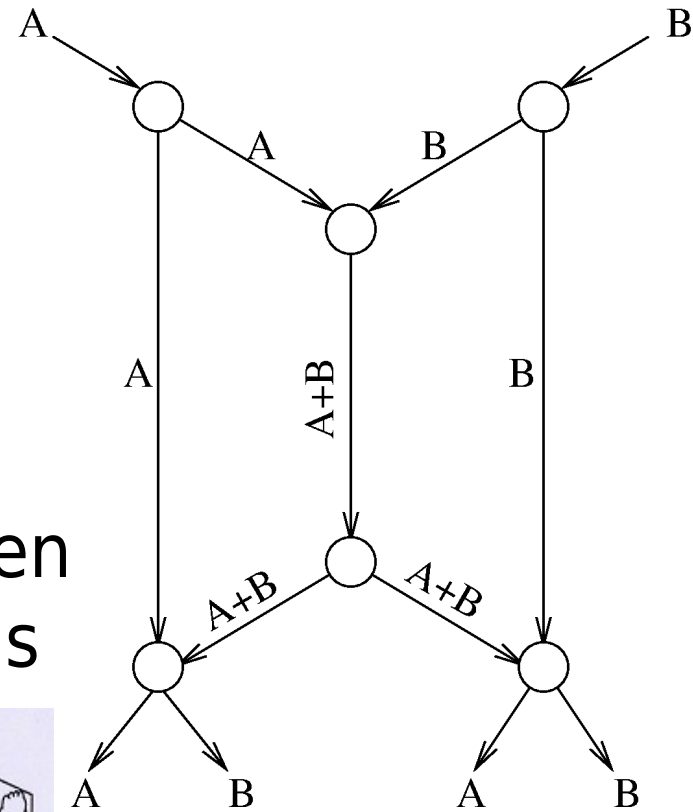
# Potentials?

## □ Intelligent nodes

- Network coding

## □ Content builds from interactions

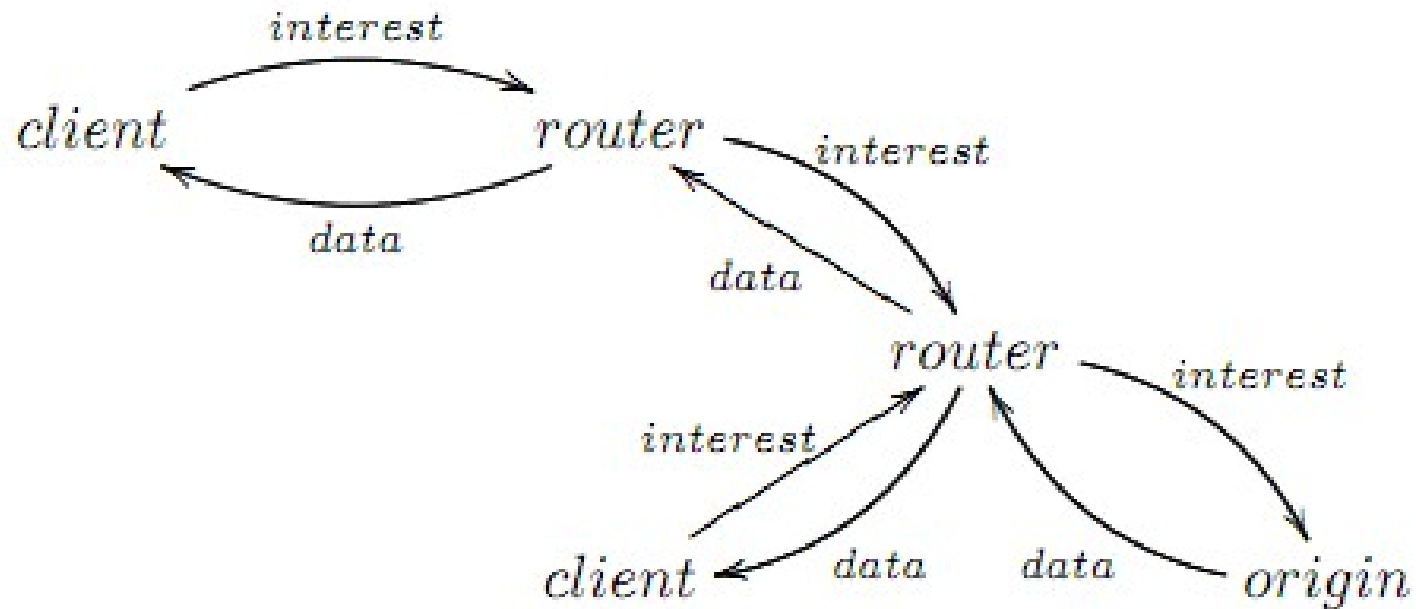
- Relationships & flows between people, groups, organizations



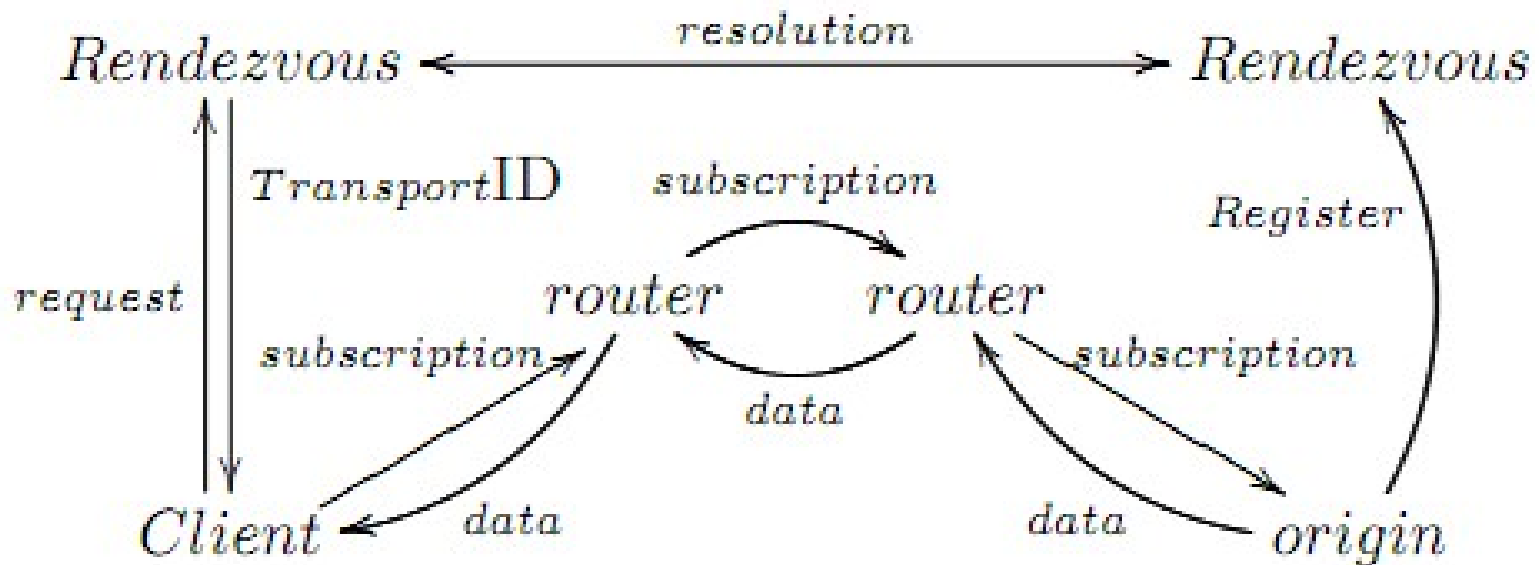
# Projects?

- UCB DONA - Data-Oriented Network Architecture
- Xerox PARC CCN - Content-Centric Networking
- 4WARD/SAIL - Network of Information**
- PSIRP/PURSUIT - Publish Subscribe Routing**
- COMET - Content Mediation Architecture
- ALICANTE - Content-aware Media Ecosystem
- CONVERGENCE - Content-centric Service Model
- COAST - Content-aware Search, Retrieval & Streaming

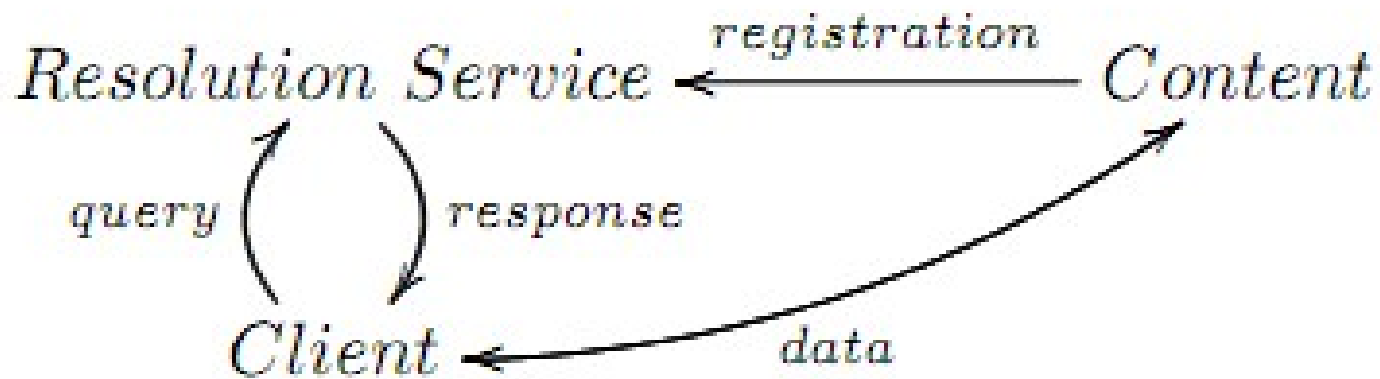
# Solutions: Content Centric Networking (CCN)



# Solutions: Publish-Subscribe Internet Routing Paradigm (PSIRP)



# Solutions: 4WARD-NetInf





Börje Ohlman, Ericsson Research

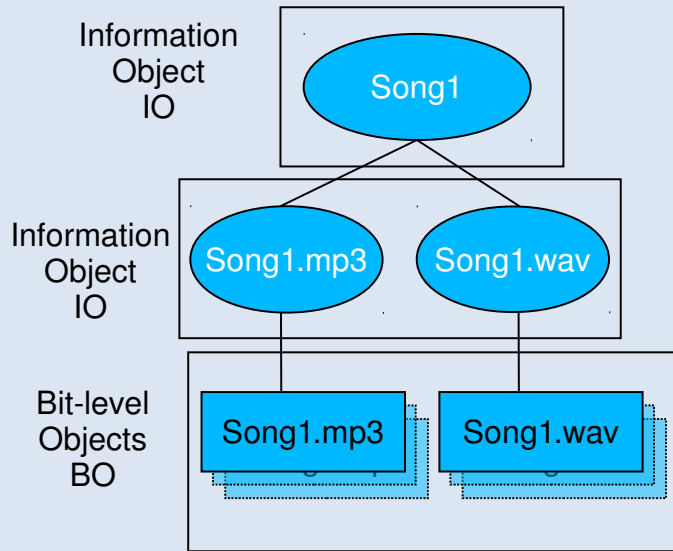
ICN Session, FIA Budapest, 18 May 2011



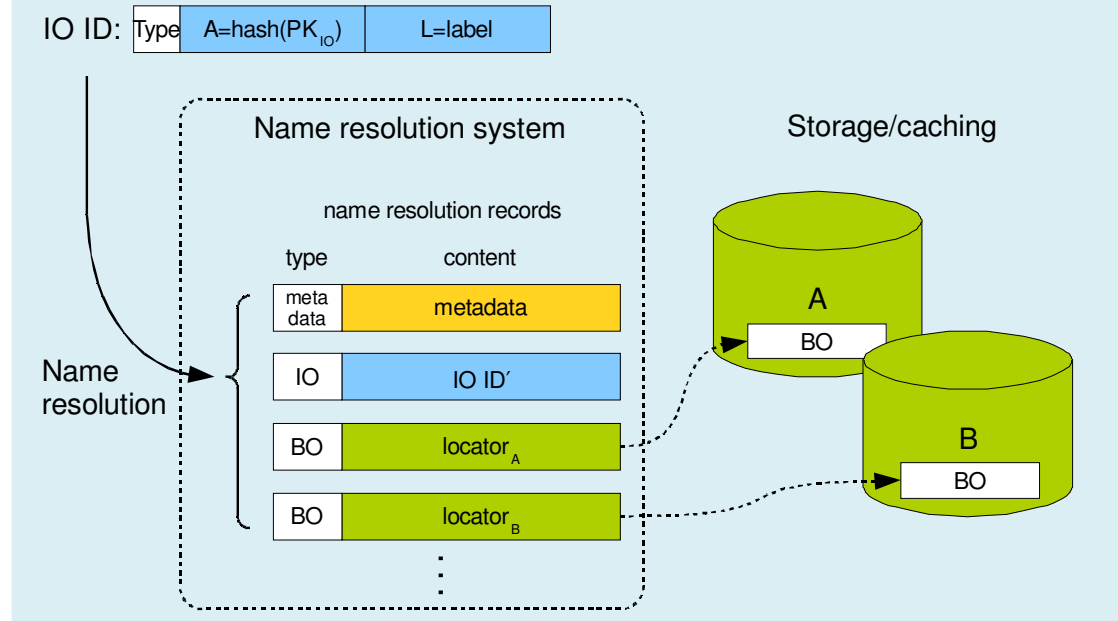


# NetInf Content Naming

## Information model



## Components of naming



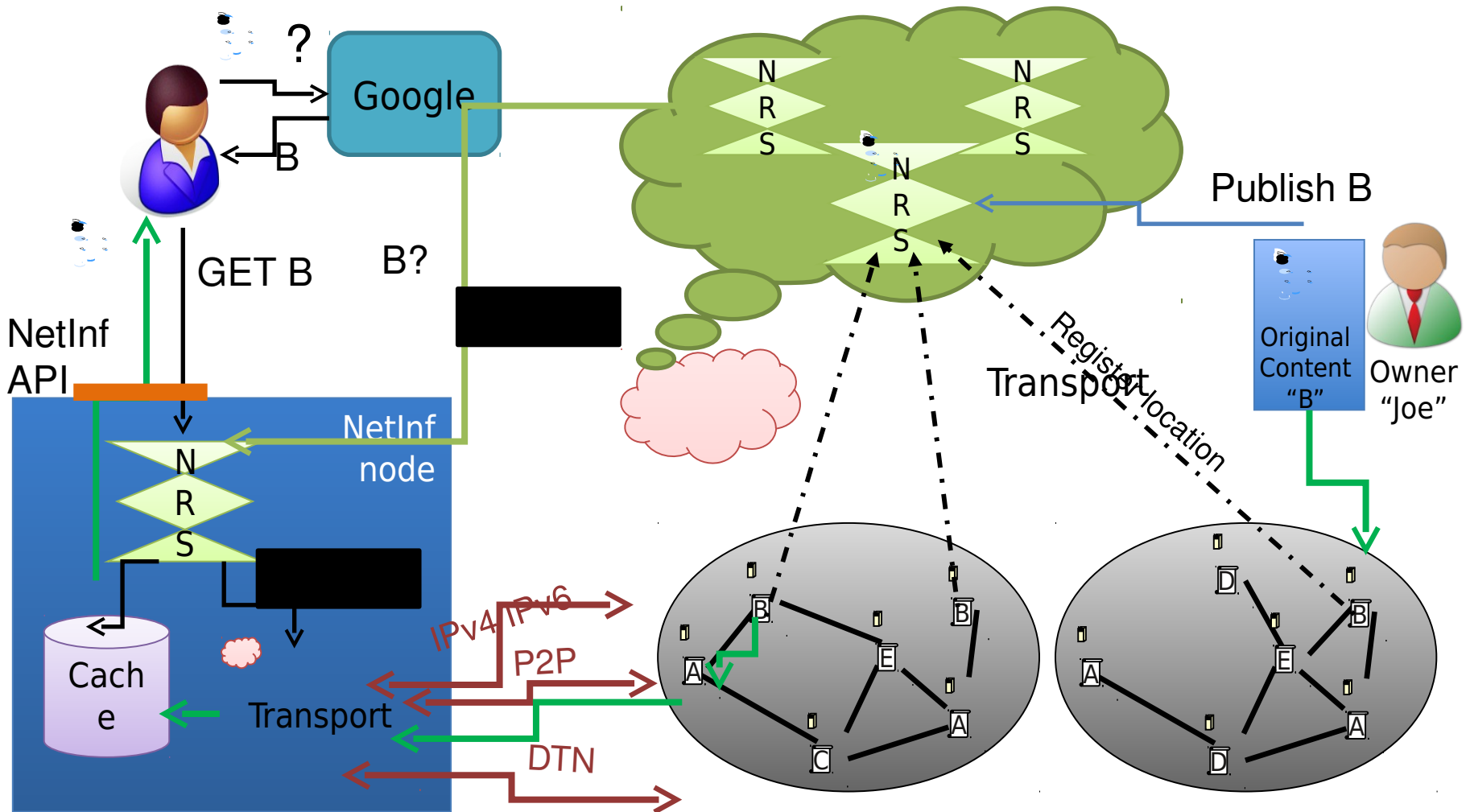
## Name URI format

`ni://stockholm.se/weather-today`

For details see:  
`draft-farrell-ni-00.txt`

`ni://tcd.ie/ssobj:jpeg:sha256:  
NDVmZTMzOGVky2JjZGQ0ZmNmZGF1ODQ5MjkyZDM0ZTg2ZDI5YzllMmU50TF1NmE2Mjc3Z`

# NetInf Content Delivery



# NetInf CDN Business Model



Role

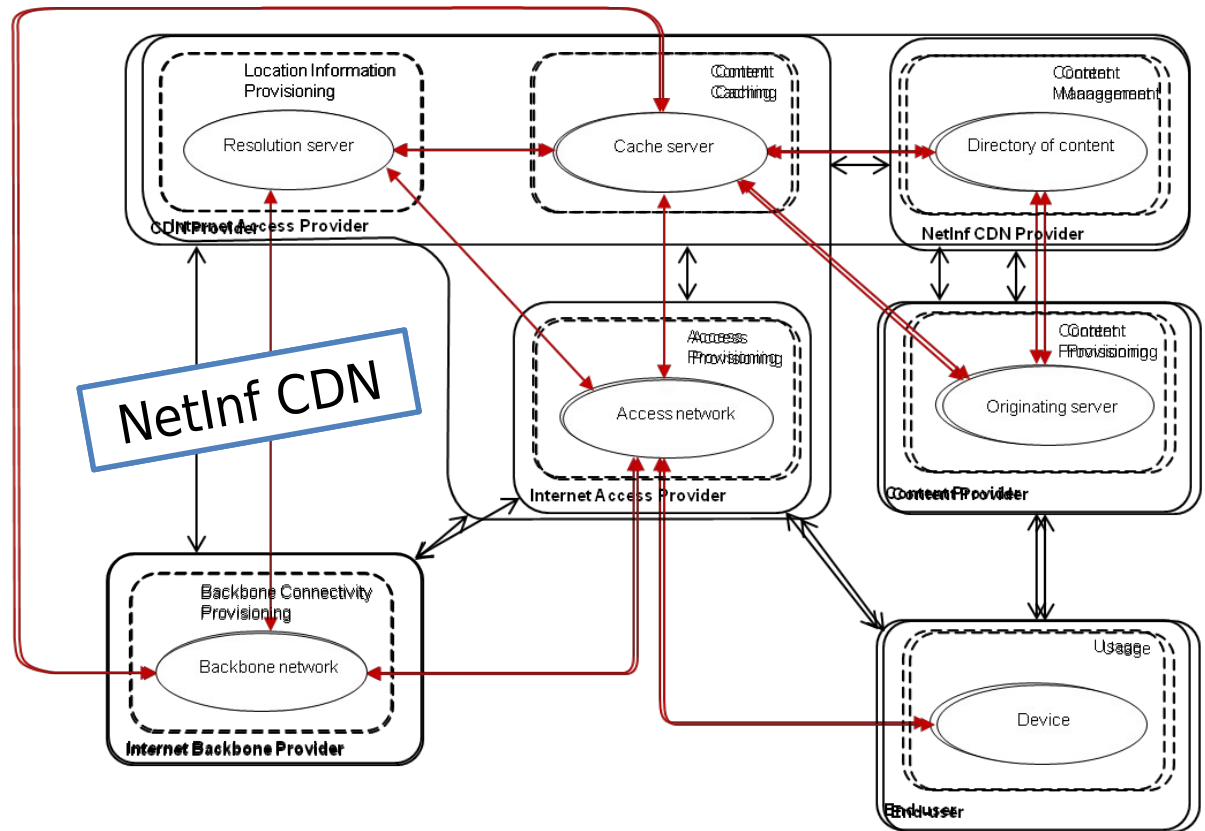
Technical component

Actor

Technical interface

Business interface

Definition: **Role** is a set of activities and technical components, the responsibility of which is not divided between separate actors



# Who's Business?

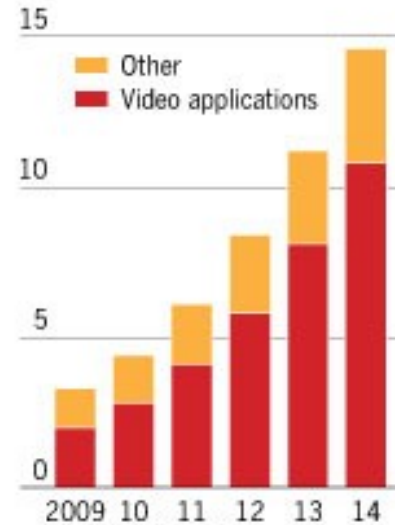
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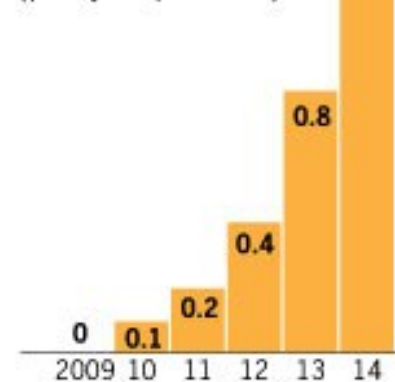
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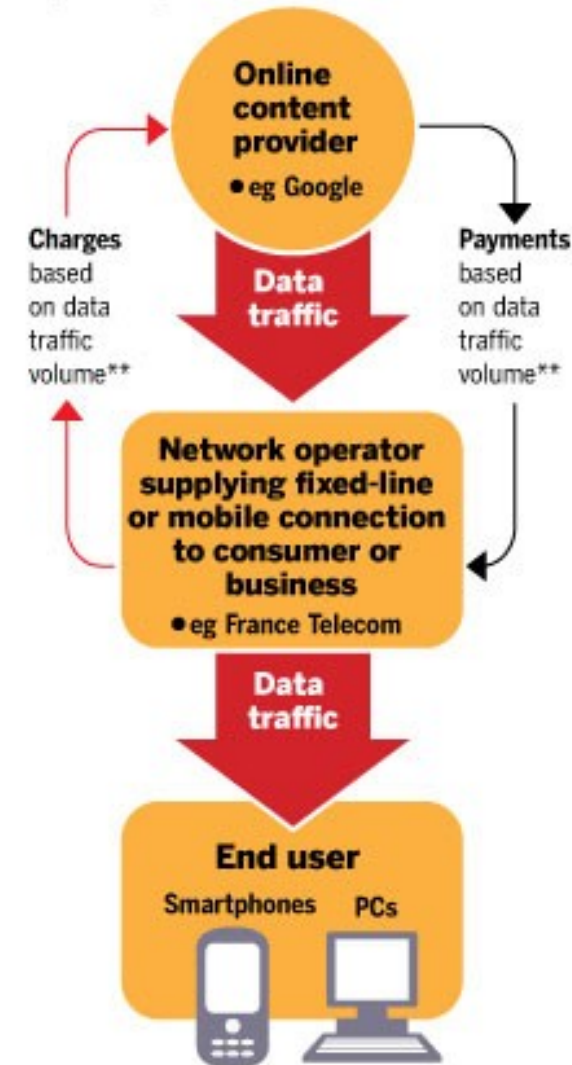
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