



Content-Oriented Networking as a Future Internet Infrastructure:

Concepts, Strengths, and Application Scenarios

Multimedia & Mobile Communications Lab.
Seoul National University

Kideok Cho

(kdcho@mmlab.snu.ac.kr)

2007. 6. 20.



Contents

- **Motivation**
- **Content-Oriented Networks (CONs)**
 - Concepts of CONs
 - Strengths of CONs
 - Application Scenarios of CONs
- **Current Research Activity on CONs**
- **Conclusion**



Paradigm Shifting

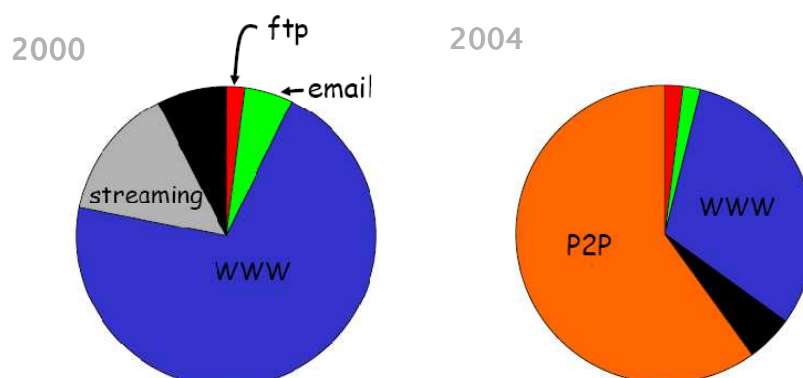
- **Traditional Internet Design**
 - Host-to-Host Paradigm
- **Real Internet Usage**
 - Content Oriented traffic is dominant
 - Ex. Content Delivery Network (CDN): cooperating networked computers providing content delivery services
 - Peer-to-Peer Network (P2P): cooperative network for file sharing

3/14



Current Status of Internet

- **Current usage of Internet is Data-centric**
 - Overwhelming use (>99% by most measurements) of today's networks is for a machine to acquire named chunks of data (like web pages or emails)

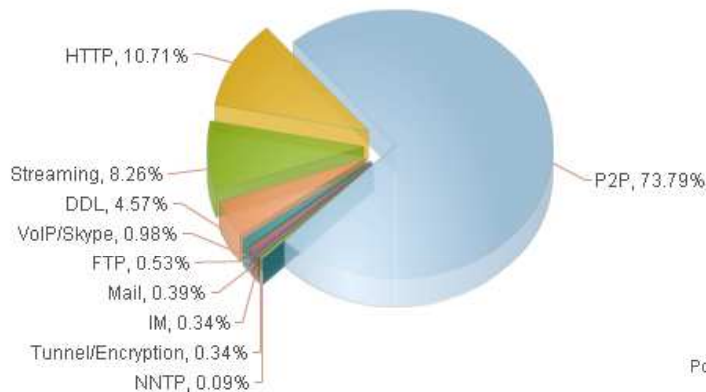


"The Internet is Flat", Don Towsley, Keynote Speech of Infocom 2007

4/14

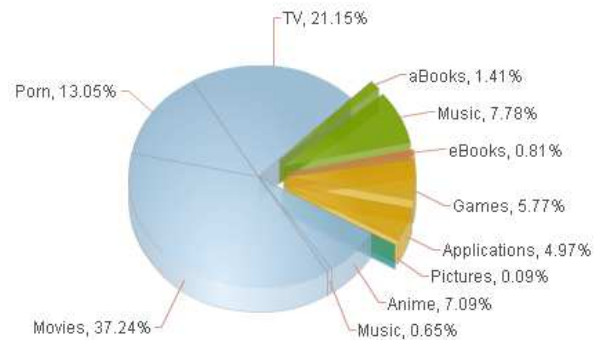


Current Status of Internet



**Protocol Type Distribution
Germany 2007**

Video	79.17%
Software	10.74%
Audio	9.19%
eBook	0.81%
Pictures	0.09%



**Traffic volume per content type
Germany, BitTorrent 2007**

* From ipoque Internet study 2007

5/14



Redesigning the Internet

- **Problem of current Internet**
 - Inconsistency between the Internet design and the real usage
 - Unnecessary indirection overhead to retrieve contents

Redesign the Future Internet
based on the content-oriented paradigm!

6/14



Concepts of CONs

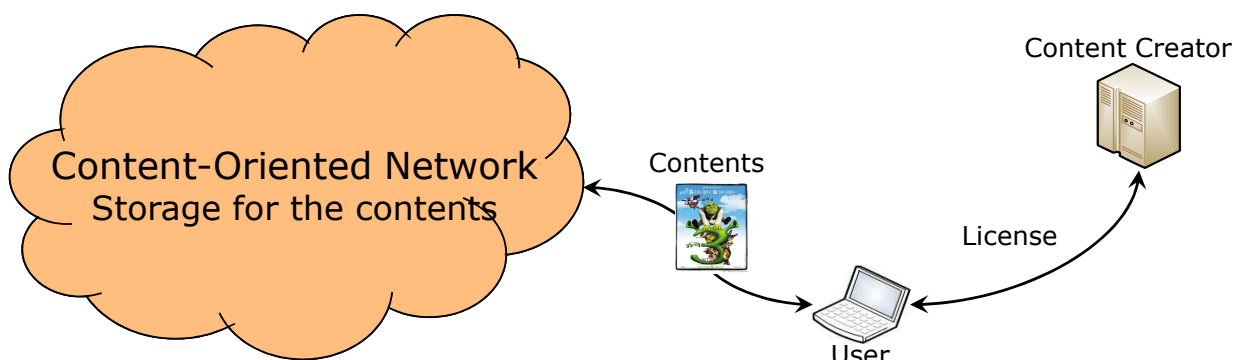
- **Content-Oriented Paradigm**
 - Only focus on the data itself, not on the communication party
- **Content-Oriented Network**
 - A network based on *Content-Oriented Paradigm*
 - Users are just specifying which data they need
 - CON will provide efficient ways to retrieve the data from one of the candidate sources
 - To support efficient retrieval, a CON may exploit caching mechanism
 - Synonyms: Content-Oriented, Content-Centric, Content-Based, Data-Oriented, Data-Centric Network

7/14



Strengths of CONs

- **Pervasive Experience**
 - CONs: a huge storage for the contents
 - Users can access the contents through CON even though they are not stored in a local system



8/14



Performance Improvement

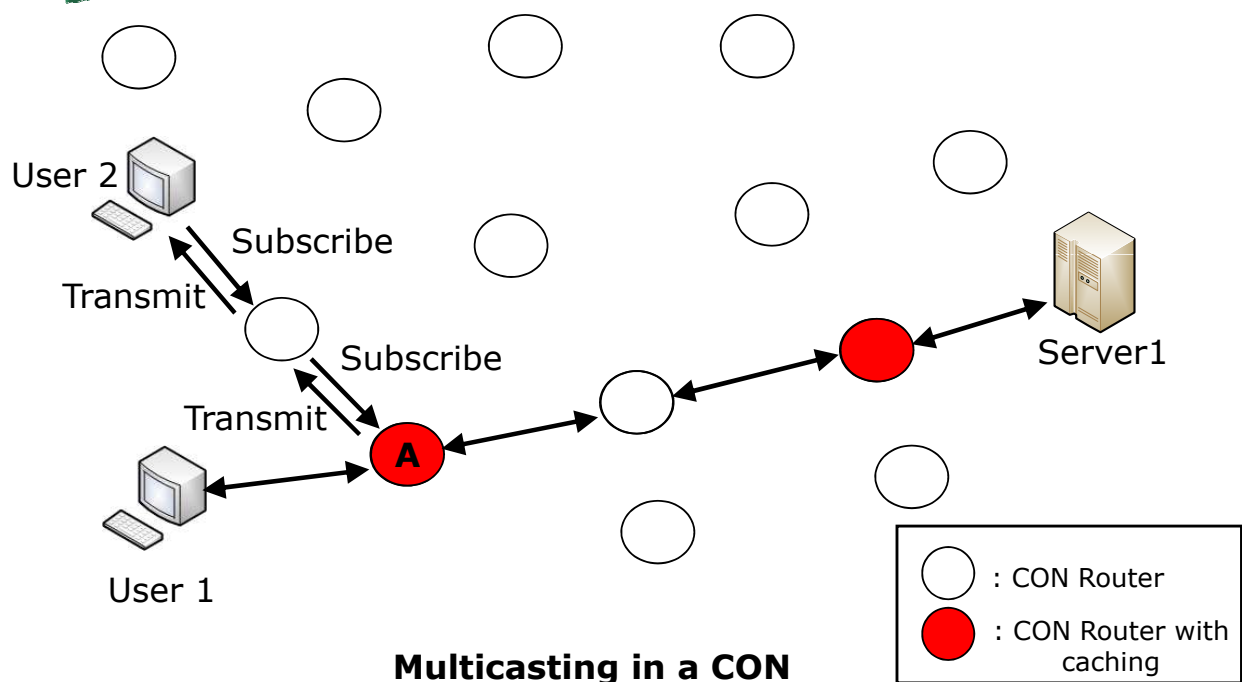
- **The more popular a content is, the more probably it will be cached/stored in the local CON router¹⁾**
 - Most of the popular contents will be served by the CON routers which is located near the users
 - The overall congestion and latency of the CON will be decreased as contents will be uniformly distributed in the network
 - Performance improvement will be achieved at the expense of storage overhead at the service providers

1) We refer to the network elements in the CON as CON routers

9/14



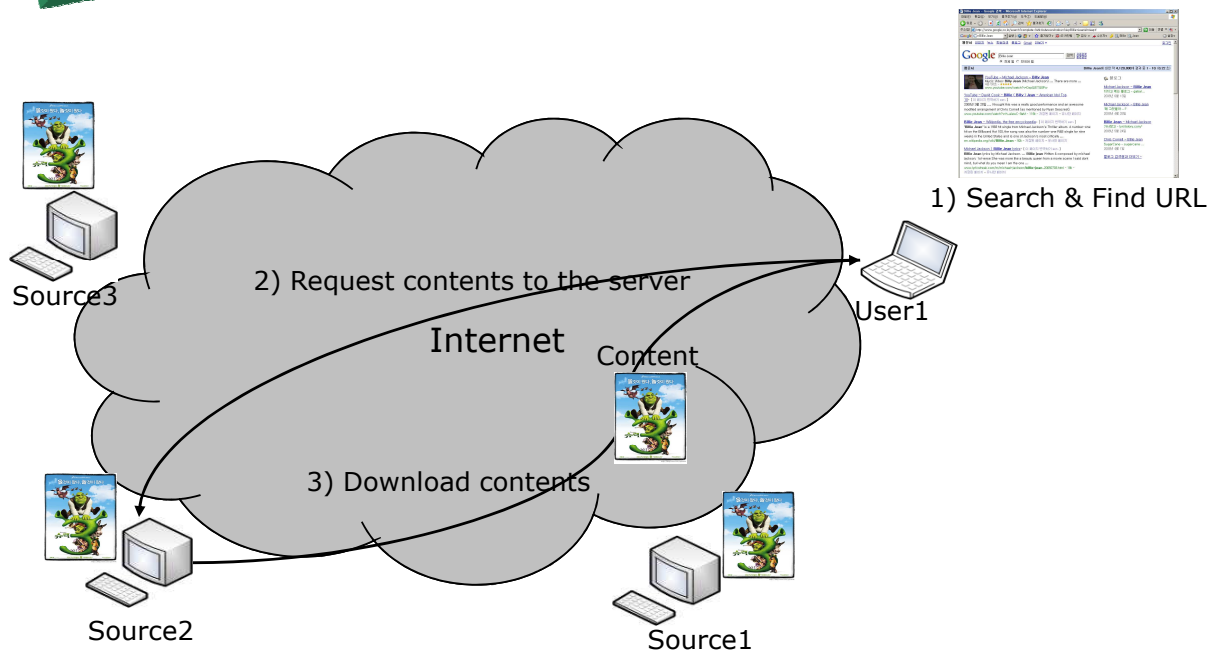
Flexible Dissemination



10/14



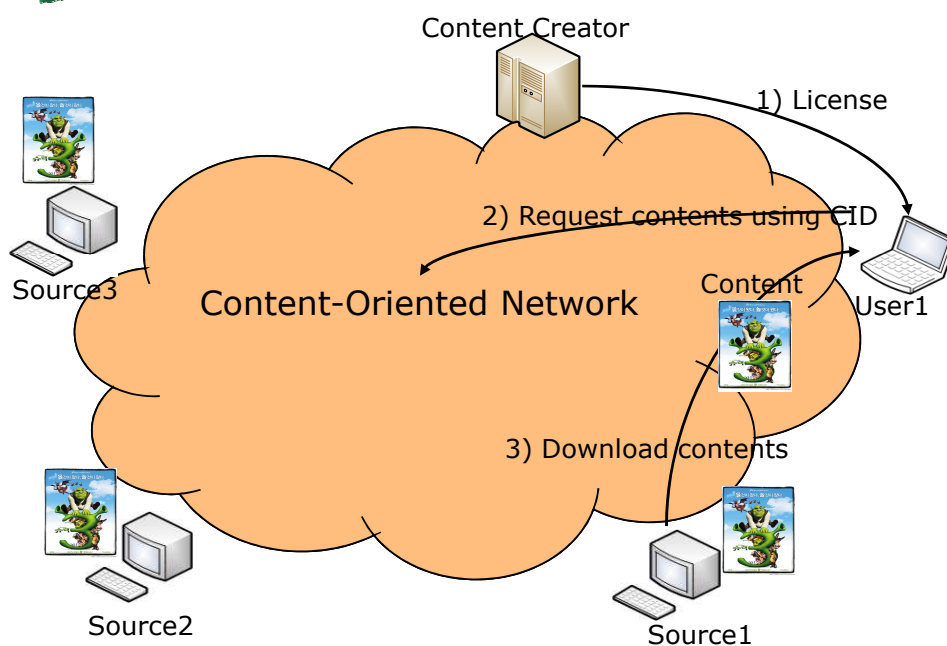
Application Scenarios of CONs



11/14



Application Scenarios of CONs

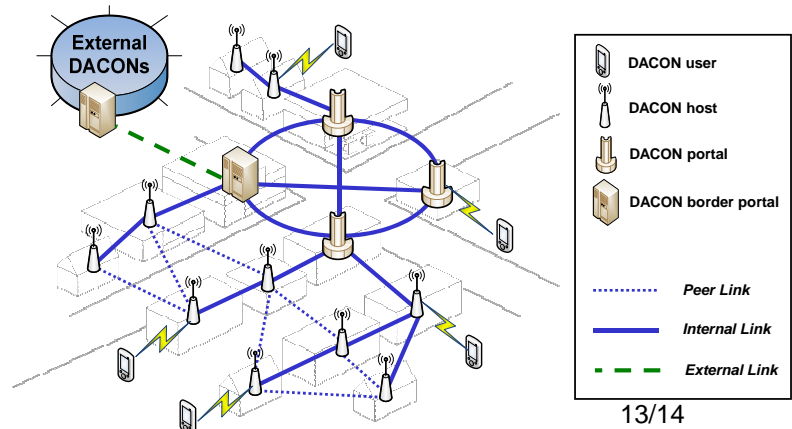


12/14



Current Research Activity

- **Our Approach: DACON**
 - Content-oriented Overlay Network
 - Formed by users' participation
 - Currently implementing the DACON testbed



Conclusion

- **The inconsistency between the Internet design and the real usage motivates us to propose Content-Oriented Networks**
- **Content-oriented paradigm**
 - Users care only about the data
 - Network should provide the requested data to the users in an efficient way
- **Strengths of CONs**
 - pervasive experience, performance improvement, flexible dissemination



Q & A

