P2P and Online Social Networks: The Best Has Yet to Come

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Overview

Peer-to-Peer Networks
Social Networks
Research
Hybrid Peer-to-Peer Networks

Research Projects

- Wireless Networks
  - Wireless Mesh Networks
  - Quality-of-Service (VoIP, streaming Video)
  - MIT

- Peer-to-Peer Networks
  - Scalability
  - Traffic
  - Thomson Research Labs, France

- Online Social Networks
  - New Algorithms/Applications
  - Tag-Based Search
  - Microsoft Research, Cambridge, UK
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- Peer-to-Peer Networks
- Social Networks
- Research Questions
- Hybrid Peer-to-Peer Networks
Peer-to-Peer Networks

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Peer-to-Peer Networks

[Network Diagram]

P2P and Online Social Networks: The Best Has Yet to Come
Peer-to-Peer Networks

- File Sharing (Music, Video)
- Real-Time Video Streaming
- Skype
File Sharing
File Sharing

"We Will Rock You", Queen
File Sharing
Overview
Peer-to-Peer Networks
Social Networks
Research
Hybrid Peer-to-Peer Networks

File Sharing
File Sharing
File Sharing
File Sharing
Peer-to-Peer Networks

- Pure Peer-to-Peer Networks
- Hybrid Peer-to-Peer Networks
Pure Peer-to-Peer Networks
Hybrid Peer-to-Peer Networks
Hybrid Peer-to-Peer Networks

- Peers bring Resources to Networks
- Server Can Push Load to Users (Peers)
- Skype: “Leveraging all of the available resources in the network allows us to provide high quality telephony without the need for costly centralized resources. Decentralizing our services allows us to free our resources and focus on developing cutting-edge functionality”.

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Peer-to-Peer Networks

- Dynamic: Peers Enter/Exit the System
- No Structure
- Query Flooding
- Problem: High Query Traffic

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- **Problem:** High Query Traffic
Structured Peer-to-Peer Networks
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Structured Peer-to-Peer Networks

"35"?
Structured Peer-to-Peer Networks

- High Maintenance Cost
- Can Easily be Attacked
Social Networks
"The New James Bond Movie is Great"
"A friend of mine said that the new James Bond movie is great"
"I am moving to New York"
"A friend of mine lives in New York"
Information Diffusion

- Small Talk
  - Information is Propagated throughout the Network
- “Passive” Information Diffusion
- Limited Capacity
"Do you know someone who lives in NY?"
"No, but I will ask around."
"Do you know someone who lives in NY?"
"Yes, my friend Susan just moved to NY?"
Search

- Queries get Propagated Through the Network
- “Simple” Query Propagation
- How Successful?
Recommendaions

"How is the new James Bond Movie?"
"I haven’t seen it but I will ask around."
"How is the new James Bond movie?"
"A friend of mine heard that it is great."
Recommendations

- May get More than 1 Recommendation
- Information Fusion
- How Successful?
Observations

- Social Networks are Useful
- Social Networks are Scalable
- Why?
  - Network Formation
  - Information Diffusion
  - Query Propagation
  - Information Fusion
Research Questions

- Network Formation
- Information Diffusion
- Query Propagation
- Information Fusion
Impact

- Peer-to-Peer Networks
  - Scalable Peer-to-Peer Networks
- Online Social Networks
  - Personalized Search
  - Recommendation System
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Does it Work?

- Hybrid Peer-to-Peer Networks
Content Distribution Systems
Content Distribution Systems
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Content Distribution Systems

Server traffic $\sim N$
Can we reduce server traffic?
A Hybrid Peer-to-Peer System
A Hybrid Peer-to-Peer System

First, search P2P network
A Hybrid Peer-to-Peer System

First, search P2P network
A Hybrid Peer-to-Peer System

First, search P2P network
A Hybrid Peer-to-Peer System

If successful, get file from P2P network
A Hybrid Peer-to-Peer System

If failure, get file from server
A Hybrid Peer-to-Peer System

If failure, get file from server
How Effective?
How Effective?

How much can we reduce server traffic?
Sever traffic $\sim N$
How Effective?

Sever traffic $\sim \sqrt{N}$?
How Effective?

Sever traffic $\sim \log N$?
How Effective?

Sever traffic is bounded?
How Effective?

What is the effect on users?
How Effective?

Users have fixed bandwidth.
How much can we reduce server traffic, given that traffic imposed on users has to be bounded?
Analysis

- P2P Network Topology
- Query Propagation Mechanism
- User behavior (e.g. file popularity).
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Results

Server traffic?
How much can we reduce server traffic, given that the traffic imposed on users has to be bounded?
Conclusion

- Peer-to-Peer Networks
  - Scalable Peer-to-Peer Networks
- Online Social Networks
  - Personalized Search
  - Recommendation System
Thank You!

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