

Should network operators fear peer-to-peer?

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P2P is great for users ...

P2P File Sharing



P2P Video Streaming

CoolStreaming
PPLive
PPStream
Etc.



Commercial P2P

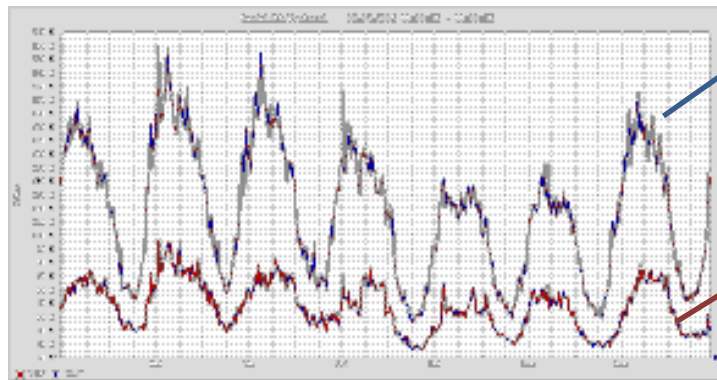


BBC iMP



Collaborative P2P Applications

... but difficult to manage



Peer-to-Peer

Other Traffic

>60% of Internet's traffic is P2P
(Source: CacheLogic)

P2P traffic in a University
(Source: www.ipoque.com)

P2P Streaming + P2P VoD will further increase P2P traffic
□ Lot of capacity "donated" by university users



Massive copyright infringement.

Skype also benefits from university bandwidth

Typical Objections

- P2P does not bring enough value (especially relative the risk)!
- I know how to deploy servers, why learn something new?
- How do I control it?
- How will I monitor it?
- How can I provision my network?



Market Perception of P2P

- P2P is a potentially interesting new technology
- No legitimate use
- P2P apps poorly engineered
 - Insecure
 - Poor traffic engineering
- Apps are hard to write
 - Many toolkits with limited distribution
 - No standards, common programming models, etc.
- Hard to deploy



Why Care About P2P?

Reduce Reliance
on Servers



- Eliminate bottlenecks, improve scalability
- Lower deployment costs and complexity

Direct Client
Connections



- Faster data transmission
- Support ad-hoc and disconnected networks

P2P Systems



- Better resilience – no single point of failure
- Powerful social interactions

A P2P Platform in Windows?

- Well-engineered, supported protocols
 - Secure by default, scale without limits, no servers required
- Let applications focus on end-user value
 - Platform does the heavy lifting
- Simplify deployment
 - Broad reach
 - Enterprise management

P2P In Microsoft Windows

June 2003: P2P
toolkit first released
for Windows XP SP1

August 2004: P2P
toolkit integrated
into Windows XP
SP2

2006/2007:
Windows Vista



Windows XP

Windows Vista

- P2P Name Resolution Protocol (PNRP)
- P2P Graphing and Grouping
- Peer Identity Manager

- P2P Name Resolution Protocol (PNRP)
- P2P Graphing and Grouping
- Peer Identity Manager
- P2P Contacts
- People Near Me
- Serverless Presence and Publishing
- P2P Application Invitation

Windows Communication Foundation

- Peer Channel

Can P2P Provide Value?

Windows Meeting Space

- Effective in-person meetings
 - File exchange and replication
 - Screen/app sharing
 - Note passing
- Why P2P?
 - Easy to deploy and use
 - Use anywhere, even without Internet connectivity
 - Resilience
- However
 - Secure
 - Manageable by enterprise network policy

P2P is a very exciting research topic

Sample of work done at Microsoft Research

- Content Distribution
 - File Swarming:
 - Avalanche, MutualCast
 - Video Streaming:
 - SplitStream, CoopNet, ReWind TV, PeerStreaming
 - Video-on-Demand
 - RedCarpet
 - Software Update Distribution
- Collaborative Applications
 - Pastry, Scribe, Squirrel, etc, etc.
 - P2P Folder Sharing, FriendShare, etc.
- Wireless mesh networking
 - VRR: Routing borrowing ideas from Pastry
 - Multipath Code Casting

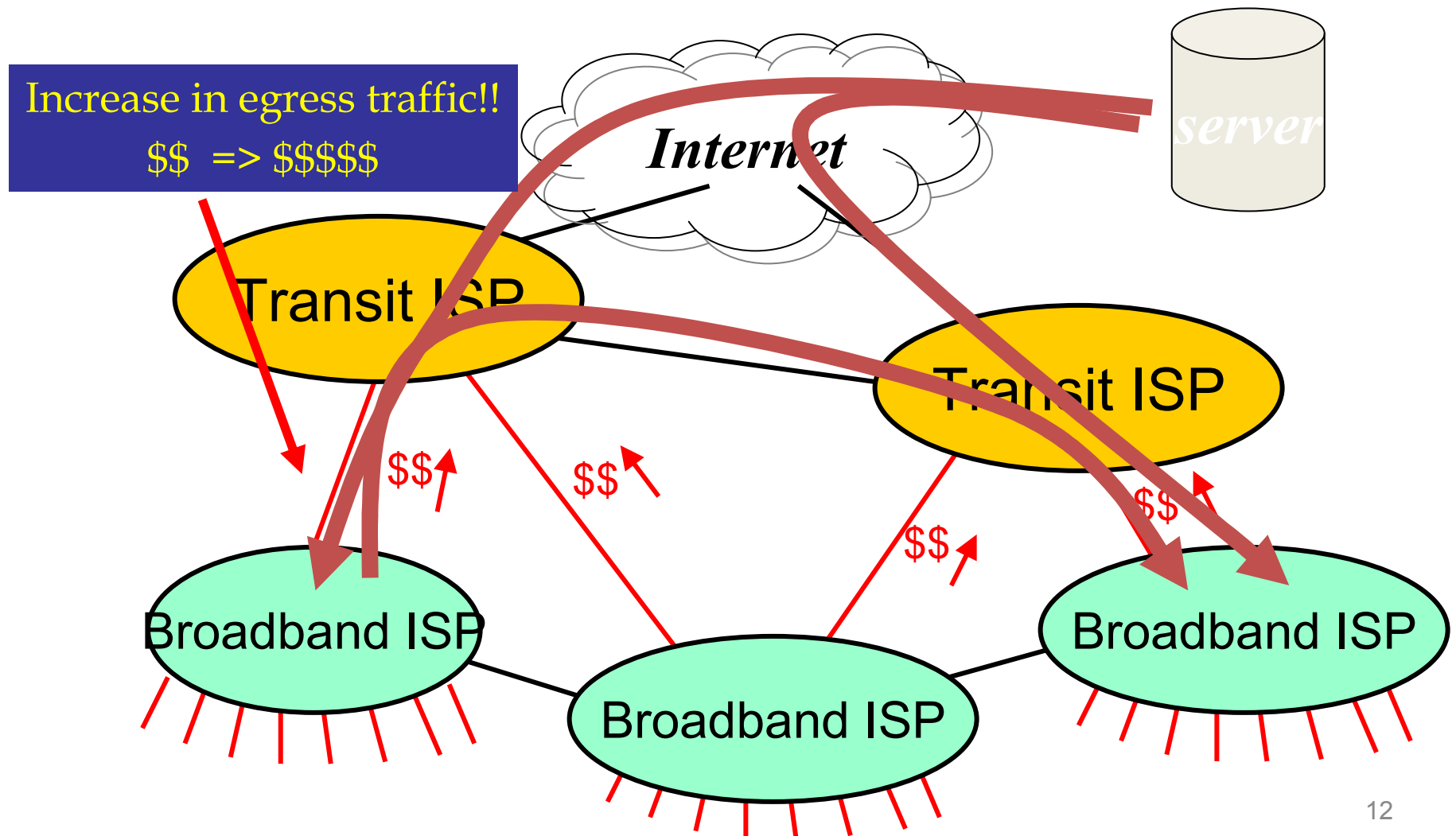
Caveat: Not necessarily of interest to MS product group

+ Lots of analytical, modeling, and measurement-based work

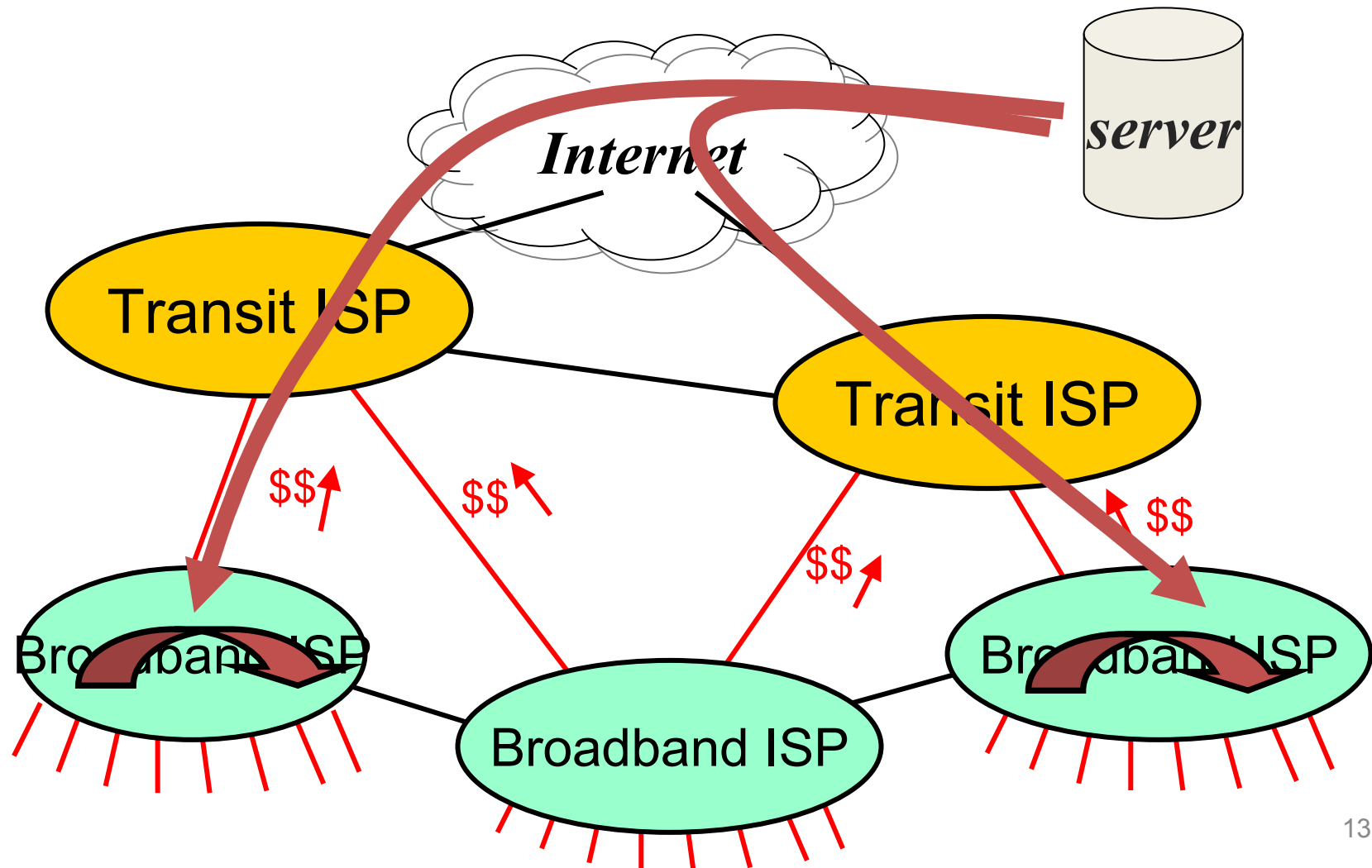
Common themes

- P2P provides **scalable** communication mechanism for:
 - File distribution, video streaming, Video-on-Demand
 - Collaborative applications
 - Scalable = K's and M's of users
- P2P promises great savings for content providers and service owners
 - Faster deployment of new applications & services
- Locality is an effective mechanism to reduce traffic:
 - In particular, it reduces inter-ISP traffic to the minimum
 - Current solutions push the distribution costs from the content owners to network operators

Effect of P2P on inter-ISP traffic



Does locality work?



Benefits of locality for current P2P scenarios

Each ISP is required to upload just over a copy of the file (1.9 GB)

Average uploaded data (in MB) by each ISP.

	AS1 (avg)	AS2 (avg)	AS1 (95 th)	AS2 (95 th)
Client/Server	-	-	-	-
P2P Random	17239	18188	750	789
P2P BitT	17551	18538	759	808
P2P Locality savings	2827 84%	2971 84%	238 68%	248 69%

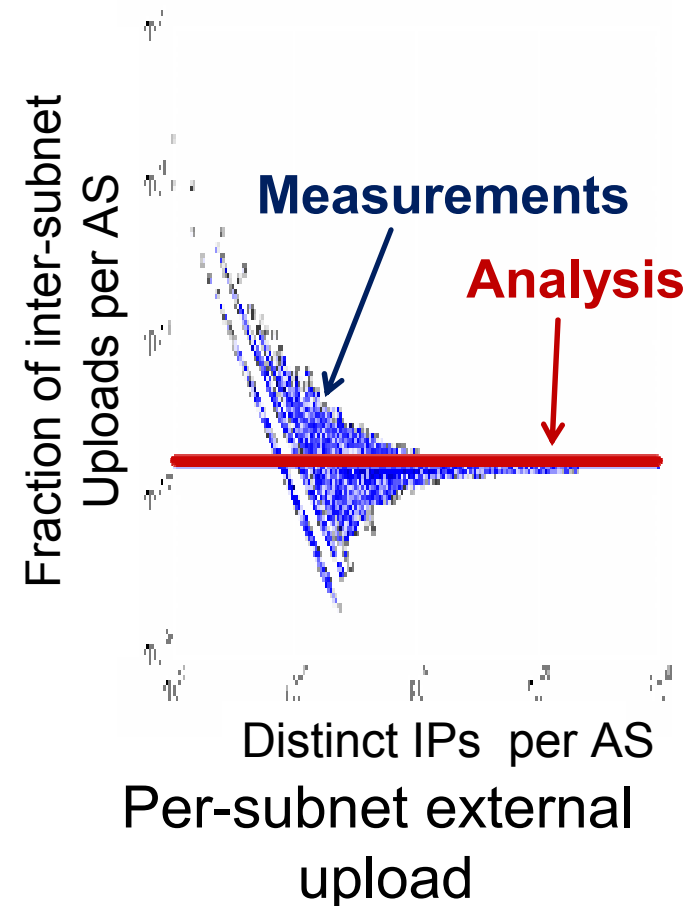
May require internal
re-engineering

Benefits of locality for universal P2P deployment

Scenario: Use P2P to deliver content to the entire population

- E.g. software update to 500M MS Windows users

With locality, inter-subnet traffic reduces to **1.5%** for large subnets.



Summary

- Peer-to-peer is here to stay:
 - Great new experiences for users:
 - Easier, faster, cheaper access to **content**
 - Collaborative applications.
 - Reduces resilience on servers
- Managing P2P applications is challenging:
 - Currently not many available tools
 - However, we expect a proliferation of managing tools
 - Managing of P2P file sharing: CacheLogic, iPoque, Sandvine
 - Domain policies in Windows Vista
- The P2P Ecosystem is very complex:
 - Users, content owners, network operators, ISPs, regulators, application writers, etc.
 - **Goal:** Develop a healthy P2P Ecosystem