

Future Internet Architecture Panel Discussion

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Challenges

- Design a network for applications yet to be invented!
- Ideal architecture needs to be:
 - Flexible to allow innovation at the application layer
 - “Lightweight” – strongpoint of current Internet design.
 - Address shortcomings
 - Security
 - Real time applications
 - Others?

What makes problem easier?

- Don't worry about:
 - Problems decoupled from network layer
- (Innovation can happen independently of network architecture.)

Issues:

- Quality of Service over wireless
 - co-existence of TCP and traffic from real time applications



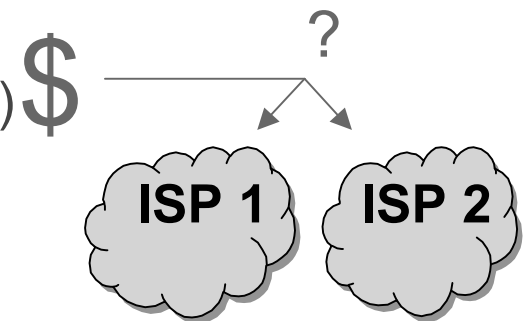
- Pricing granularity



- Security
 - Current Internet designed for community of “colleagues”
 - Enable markets for security



- Revenue sharing
 - Between transport providers
 - Between Transport and Content Providers
 - (May or may not require architectural changes.)



- Markets for service quality
 - Current Internet often inadequate for high-bit rate real time apps.

Possible Non Issues?

- Problems that are best dealt with at the application layer
 - New to Peer to Peer architectures?
 - Multicast
 - Functionality achieved through CDNs and application layer multicast.
- Physical and Link Layers of wired links
 - Innovation can happen independent of transport and network layers
 - However wireless can benefit from more cross-layer communication.
 - Balance between cross layer coordination vs. “spaghetti architecture.”

Issues specific to our project on Market-Enabling Network Architecture

NSF-Find: Market-Enabling Network Architecture (9/2006 -8/2009)



Jean Walrand
Venkat Anantharam

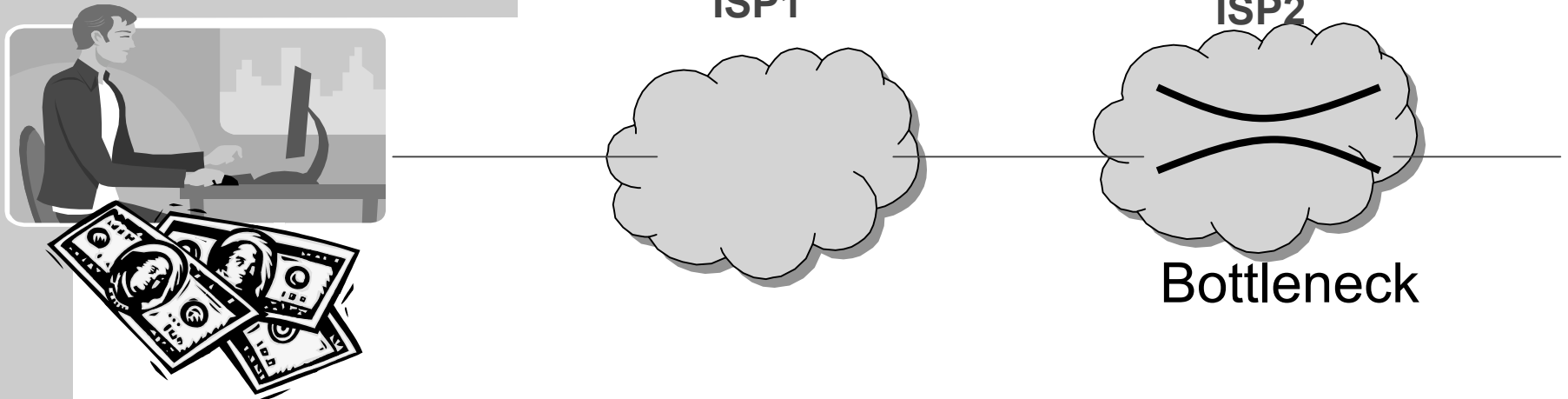


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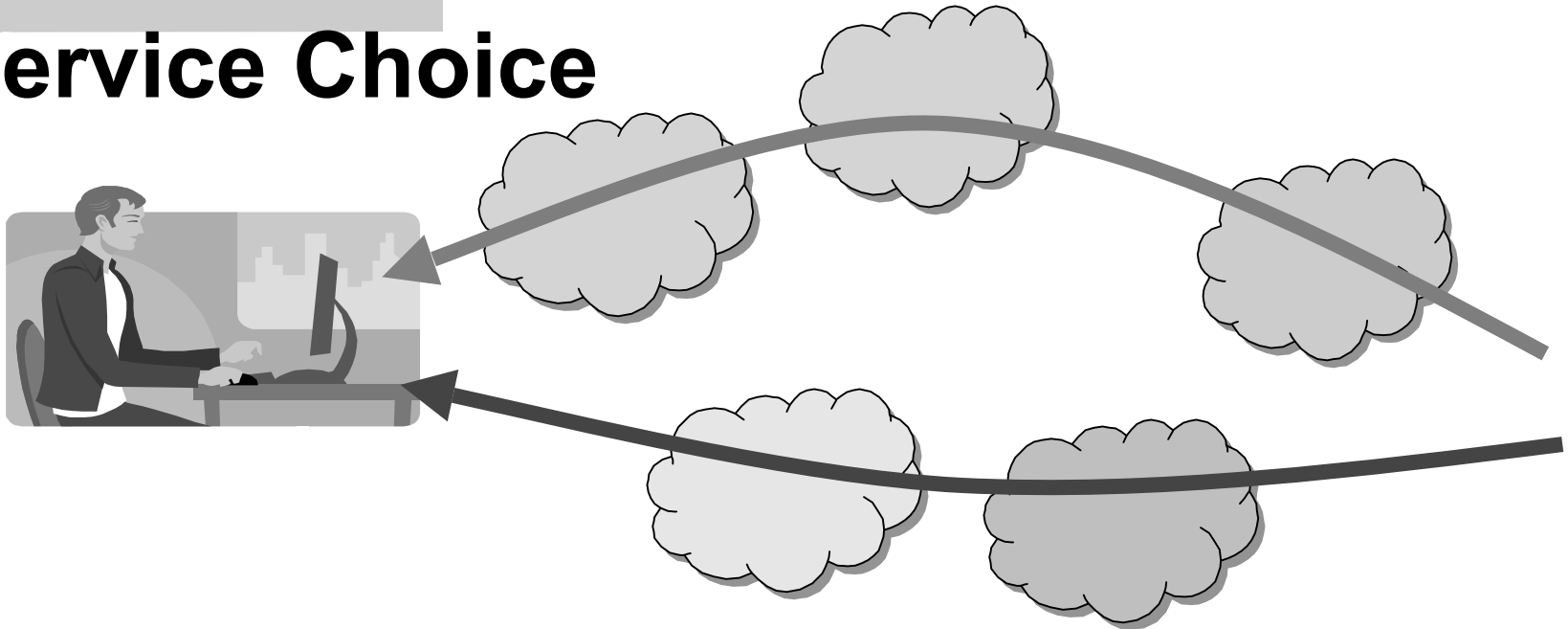
Internet Today – Service Inadequacy



USER with High willingness to pay
For high rate, real time service.

- Problems:
 - User has no
 - visibility to bottlenecks.
 - means to go around bottleneck.
 - way to signal willingness to pay to bottleneck.
 - Bottleneck ISP has little incentive to upgrade.
 - Some of the benefits of upgrade may accrue to other providers.

Service Choice



- Idea: Users offered real-time choice: “red” and “blue”
 - “red” and “blue” not specified to users in detail;
 - Users decide based on which they think gives better performance
 - Market will push providers to make improvements, and offer services more suitable for intensive real-time applications.
 - No need to dictate QoS parameters a “standard.” Let the market decide!

Internet Today – Security Inadequacy

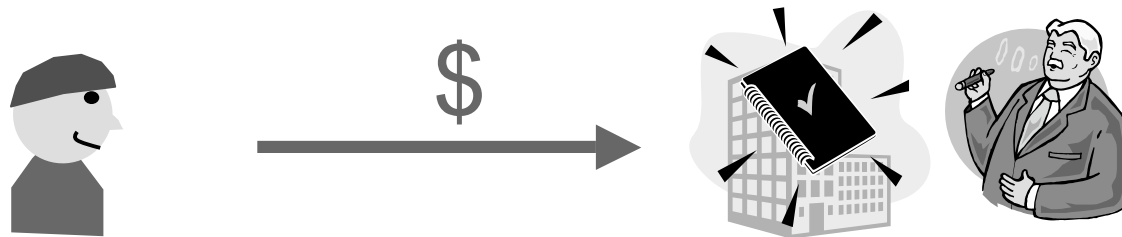
- Users do not see full cost of poor computer and network maintenance
 - Example
 - By failing to update my antivirus software, my computer can spread viruses to others.

ANALOGY

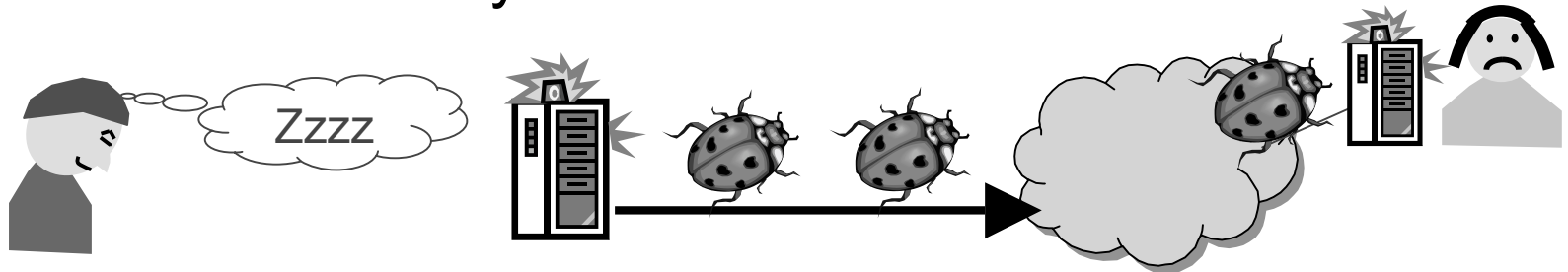
- Drivers do not see full cost of reckless driving.
- By forcing drivers to get liability insurance, drivers incentivized to be careful.

Markets for Security

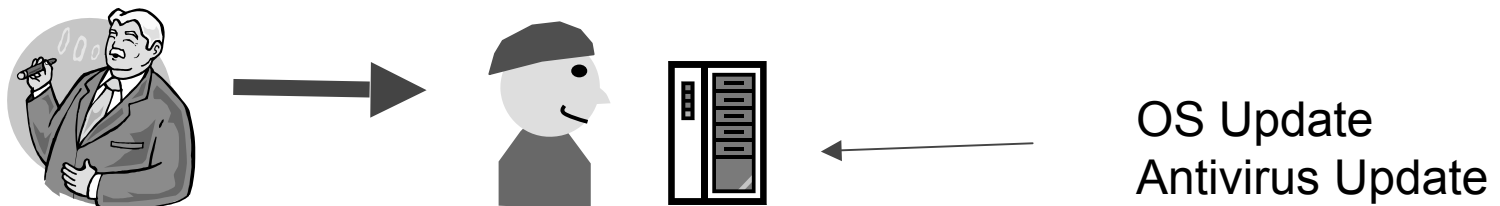
- Use power of markets to improve network security.
- Example:
 - Users pay to be certified by a Certification Agency (CA)



- CA takes on liability for attacks traced back to user



- CA incentivized to encourage users to take due care



Markets for Security

- Possible incentives for users to go to CA
 - Make it Mandated? (probably not realistic)
 - Network drops discards uncertified packets in crisis.
- Architectural Requirements:
 - Improve traceability of attacks
 - Mechanism for dropping uncertified packers