Pricing for Content in the Internet

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Panelists:
Kevin Almeroth, University Santa Barbara, U.S.A.
Jörn Altmann, Hewlett-Packard Labs, Cupertino, U.S.A.
Lee McKnight, Tufts University, Medford, U.S.A.
Maximilian Ott, Semandex Networks, Princeton, U.S.A.
Introduction

- Content charging determines *the* challenge:
  - Increased commercial offer/usage of content.
  - Popular e-content in various forms.

- A.o., *problems*:
  - Interactions between technology and economy.
    - Charging mechanisms and pricing models
    - Complex market and network models.
  - Customization in a 1:1 fashion: e-news, e-journal, ...

- Old systems:
  - Credit card-based payments or paper bills
Tasks and Roles

- Pricing
- Usage
- Network Technology

Feedback: economic/technical

Contracts:
- Contract 1
- Contract 2
- Contract 3

Customer

Content Provider

E-content Charging System

Metering Service Differentiation
Mechanisms

Mechanisms required for Internet content:

– Basic:
  • Deployment, offering, advertizing, indexing, search ...
  • Resource allocation
  • Management of content

– Advanced:
  • Service fusion
  • Payment schemes
  • Charging of content
  • Valuation of content
  • Reputation of content
  • Security support
Position Statements

- Kevin Almeroth:  
  *A Market for E-content*

- Jörn Altmann:  
  *A Network and Content Service Differentiation Arch*

- Maximilian Ott:  
  *Proposal for an Information Network*

- Lee McKnight:  
  *NN*
Questions

– Suitable business models for e-content?
– Is pricing for content the right way to go?
– Will a mix of factors and technology induce users to become consumers, e.g., buy content?
– How do protocols for content delivery look like?
– Which roles do play peer-to-peer networks and systems in content pricing?
– Will content management principles provide applicable systems and solutions?
– How about security concerns?
Tenets

• Content is independent of connectivity

• Dynamic pricing is a necessity
  – Important factor in load vs utilization
  – Widely used in other markets

• Dynamic pricing may be hard to accept
  – Should be coupled with subscription
  – Truly dynamic is a difficult to accept paradigm
    • Ways to disguise (fixed pricing with var. “discount”)

Will Become a Reality At Some Point
Mechanisms

• Factors: Budget, Willingness, Load

– Establish theoretical price (guess at behavior)
– Identify price to charge over coming interval
– Measure customer accept/reject rate
– Adjust price for next interval

• Basic: price is driven by load
  – Below stability, price based on user behavior
  – Above stability, price based on load
Evaluation

• Scenarios
  – Single item
  – Batching
  – Multiple Levels-of-Service
  – Competition

• Lessons Learned
  – Not knowing behavior is key
  – Algorithms work quite well
  – Customers better be ready for new paradigms!
• Primary author: Srinivasan Jagannathan (jsrini@cs.ucsb.edu)

• Pricing and Resource Provisioning for Delivering E-Content On-Demand with Multiple Levels-of-Service, Internet Charging and QoS Technologies, October 2002


• E-Content Pricing: Analysis and Simulation, ACM SIGKDD, July 2002

• The Dynamics of Price, Revenue and System Utilization, IFIP/IEEE International Conference on Management of Multimedia Networks and

• An Adaptive Pricing Scheme for Content Delivery Networks, IEEE Globecom, November 2001
Pricing for Content in the Internet: The New Revenue Stream for the Internet

Jörn Altmann
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Boston, July 2002
Problem: The Current Revenue Stream is not Sufficient

- Internet infrastructure (backbone, content distribution networks, broadband access) is paid by
  - Advertisement
  - Retailing
  - Flat-rated Internet access fees
  - Transaction fees / flat-rate fees for news articles

- It hardly covers the cost for the current Internet
  - Bankruptcy of connectivity provider: AtHome, Covad, Northpoint, WorldCom

- For guaranteeing further growth of the Internet
  ➢ More revenue from content and usage-based charging for Internet resources are necessary
The Challenge: How to Price and Charge?

- Charge for broadband content
  - Live sport events
  - Video on demand
  - Gaming
  - Peer-2-peer applications

- Charge on a usage basis for hardware resources used
  - Network, server, and storage

- You need
  - Charging system
  - Payment system between stakeholders
  - Understanding of pricing of content and hardware resources
What are the Requirements for Pricing, Charging, and Payments?

• Pricing has to consider the value of content and the cost of transportation for the content
  • Bundling of transport services and content services (end-user makes a contract with one of them)

• Charging system should be able to analyze and account all chargeable events between different stakeholders

• Payment system should support splitting of charges between different providers
We Need: A Flexible Service Provider Ecosystem

- Future infrastructure has to
  - support different business models of service providers
  - be highly adaptable to changes in demand
We Need: A Flexible Service Provider Ecosystem

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- **Data collection** and processing is essential to the service provider ecosystem
We Need: A Flexible Service Provider Ecosystem

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- Data collection and processing is essential to the service provider ecosystem

- Financial and capacity planning tools are important for revenue management and cost reduction
We Need: A Flexible Internet Architecture

The New Revenue Stream for the Internet

Internet Data Center

- Server 1
- Server 2
- Server 3
- Server 4

Content Service Provider (Video Provider)

- Video-on-Demand
- Quality Controller

- Excellent: $5
- Good: $4
- Regular: $3

Network Quality Controller

- Priority Levels at Different Prices:
  - 1: at $0
  - 2: at $1
  - 3: at $2
  - 4: at $4
  - 5: at $8
  - 6: at $16
  - 7: at $32
  - 8: at $64

Peak Bandwidth Traffic Shaper

End-User

NSP: Access Service Provider

NSP: Backbone Service Provider

NSP: tier-2

NSP: Backbone Service Provider

NSP: tier-2 (Metropolitan Area Network)

Jörn Altmann – Hewlett-Packard Laboratories
We Need: A Flexible Service Provider Ecosystem

Service Provider Ecosystem

End-users / Enterprises

Network Service Providers

Content Service Providers

Technology

Stakeholder

Jörn Altmann – Hewlett-Packard Laboratories
Proposal for an Information Network

Maximilian Ott
Pricing the Network

- Cost pricing doesn’t work
  - Late-comers have “unfair” advantage
- Need to get to value pricing
Creating Networks That Know™

- Semantic Networking is the next evolution of the Net
  - Information extraction, distributed computing and XML technology come together to increase the value of the network

<table>
<thead>
<tr>
<th>Content</th>
<th>XML Routing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>URL Routing</td>
</tr>
<tr>
<td>Address</td>
<td>IP Routing</td>
</tr>
</tbody>
</table>
Tailoring Information to the User’s Needs

- XML profiles filter information within the network, meeting interest, resource constraints, and security.
Finding Information & Keeping it Current

1. Repository
2. Update
3. Live Document
Scalable Real-time Information Delivery

- Publish/Subscribe system where XML descriptors define virtual channels

http://www.semandex.net/library.html
We Pay for Value, not Bits

- Network needs to provide value higher up
  - Not just pipes for Yahoo, MSN, Disney, …

- Network-centric services, not edge-centric
  - Tremendous value in aggregation of many

- Move from data to information
  - Consumers value the Web, not TCP/IP

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Show Me the Money:
Agents, Pricing, and Contracts for Internet Content

Associate Professor Lee W. McKnight
Syracuse University School of Information Studies
Visiting Professor of Computer Science, Tufts University
Visiting Scholar, MIT Engineering Systems Division
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• ’91: SMPTE Header/Descriptor Task Force
  - Universal Identifiers: Label Your Bits
• ’93: MIT/Harvard Workshop on Protecting Intellectual Property in the Networked Multimedia Environment
  - Gerovac/Solomon: ‘Protect Revenue Not Bits’
• ’95 MIT Internet Economics Workshop
  - Internet as Low-Friction But Poorly Defined Marketplace
• ’96: SMPTE H/D as part of the (H)DTV Standard
  - Can’t Win’em All
• ’01: Napster/SDMI/DRM (R.I.P)
  - But We Told You So!!!
Contracts and Agents in Internet Content Markets

• Assume Parties Can Understand and Communicate Terms for:
  - Service Discovery
  - Pricing
  - Payment
  - Fulfillment
• Whole Internet Content Transaction Process Must Be Transparent, Not Just Pricing Model
• Need to Aggregate Industries Around Base Set of Content Labeling/IPR ID Protocols and Processes
  - Economies of Scale and Scope Enable Network Effects
• Near-Infinite Variety of Pricing Schemes
  - Next Set of Research Challenges: Integrating Policy and User Perspectives With Technical Approaches and Business Objectives
  - So Far: More Losers than Winners
  - Try, Try Again! (Further research is required ; )
Further Reading


• Lee W. McKnight and Diana Anius “Virtual Markets in Wireless Communication and Computation Grids,” SCI/ISAS Multiconference on Systemics, Cybernetics and Informatics, Orlando, Florida, July 14-18, 2002

• Lee W. McKnight and John Wroclawski, Internet Services. Quality of Service in Networks and Markets, MIT Press (in press)