IPRO 305

Impact of Emerging Internet Trends on the Media Space

INTERPROFESSIONAL PROJECTS PROGRAM

Comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Group Statement

"Conduct a plausible and honest study while maintaining integrity with all groups at all times."

comcast.

ILLINOIS INSTITUTE OF TECHNOLOGY

IPRO 305

Impact of Emerging Internet Trends on the Media Space
INTERPROFESSIONAL PROJECTS PROGRAM

Advisors:
Matthew Bauer, Senior Professor, Computer Science
Jay Fisher, Adjunct Professor, Chemical Engineering

Team Members:
Nick Cantoni, Computer Science
Ryan Cunningham, Computer Science
William Foret, Information Technology and Management
Evan Kruger, Humanities
 Michael Lagioia, Information Technology and Management
Angus Lazenby, Electrical Engineering
Jonathan Mikesell, Electrical Engineering
Janusz Nosek, Computer Science
Stephen Schreiner, Computer Info. Systems
Grant Shindo, Psychology,
Yevgen Solodkyy, Electrical Engineering
Meng Zhang, Information Technology and Management

Comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Purpose

- Understand the current and emerging internet applications and trends over next 3-5 years.
- Internet has exploded In usage due to many factors.
- We have moved well beyond basic tasks for as a primary use for the internet.

comcast.

ILLINOIS INSTITUTE OF TECHNOLOGY

Objectives

• To conduct a study to predict the trend in internet traffic

• To conduct a survey to IIT students

• Research into new internet applications

• To analyze the data of the survey

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

About our Sponsor

Comcast was founded in 1963 as a single system cable operation.

Today, it is the largest cable providing company delivering entertainment and communications products and services, with 24.6 million cable customers, 14.4 million high-speed Internet customers and 5.6 million voice customers (Comcast 2008).

Comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Organization

• Divided the group into three separate teams
   • Primary Research
   • Secondary Research
   • Collection/Interpretation

• Assigned group leaders
   • Nick Cantoni
   • Michael Lagioia
   • Grant Shindo

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

The Process
•Primary Research

Survey current internet users

Contact relevant IT specialists and conduct interviews

Identify new technologies

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

The Process
- ## Secondary Research

Determine the most high profile and relevant applications and their progressing use.

Gather actual technical data

Keep track of future technology advancements.

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

The Process
- Collection/Interpretation

Different attempts at modeling the data were made

Collection and Interpretation team generated the resulting report

comcast.

ILLINOIS INSTITUTE OF TECHNOLOGY

Secondary Research

- Collected data pertaining to current state of the Internet
- Identified bandwidth intensive programs
- Collected third party documents with projections of bandwidth use in the next 3-5 years

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

What are we looking at?

- VOIP
- Online Gaming
- Social Networking
- Streaming Video
- P2P

ILLINOIS INSTITUTE
OF TECHNOLOGY

VOIP

- Voice Over IP
- Applications like Skype and Vonage
- Internet telephone with features like call waiting, caller ID, video conferencing, chat.

VONAGE®
THE BROADBAND PHONE COMPANY®

skype™

comcast.

ILLINOIS INSTITUTE OF TECHNOLOGY

Yobobear
<On Cooldown>

Online Gaming

- Everything from Counter Strike and Halo to World of Warcraft
- Small bandwidth use in comparison to other applications- mostly packet and positional data (small)
- Many users, small transfer of data

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Social Networking

- Applications such as Facebook and Myspace
- Text, photos, video, instant messaging
- Many users, variable bandwidth consumption

Streaming Video

- Ranging from watching House M.D. on Fox.com (in HD) to watching the Rolling Stones Live in Concert on YouTube.

- Largest growth rate of all applications

- Implications of increased size and quality of streaming media

ILLINOIS INSTITUTE OF TECHNOLOGY

Peer-to-Peer (P2P)

- Azureus, BitTorrent, Limewire all use P2P
- Often used for large file transfers (Music, games, software, movies)
- Use of swarms accommodate timely transfers of information
- Copyright issues, piracy

ILLINOIS INSTITUTE
OF TECHNOLOGY

What is a petabyte (PB)?

- 1,000,000,000,000,000 bytes
- 1 Hour TV show = 350Mb = 3 million TV shows
- 1 Typical Movie = 700Mb
- 1PB = 5.7 million episodes of the Simpsons
- Monthly Internet traffic approaching 4,000 PB in 2008

THE SIMPSONS

comcast.

ILLINOIS INSTITUTE OF TECHNOLOGY
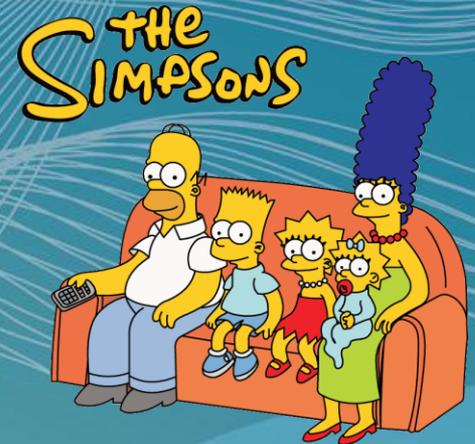
Prevalence of Applications(Current)

CacheLogic Research
Internet Protocol Trends 1993 to 2006

Legend: Email, FTP, P2P, Web
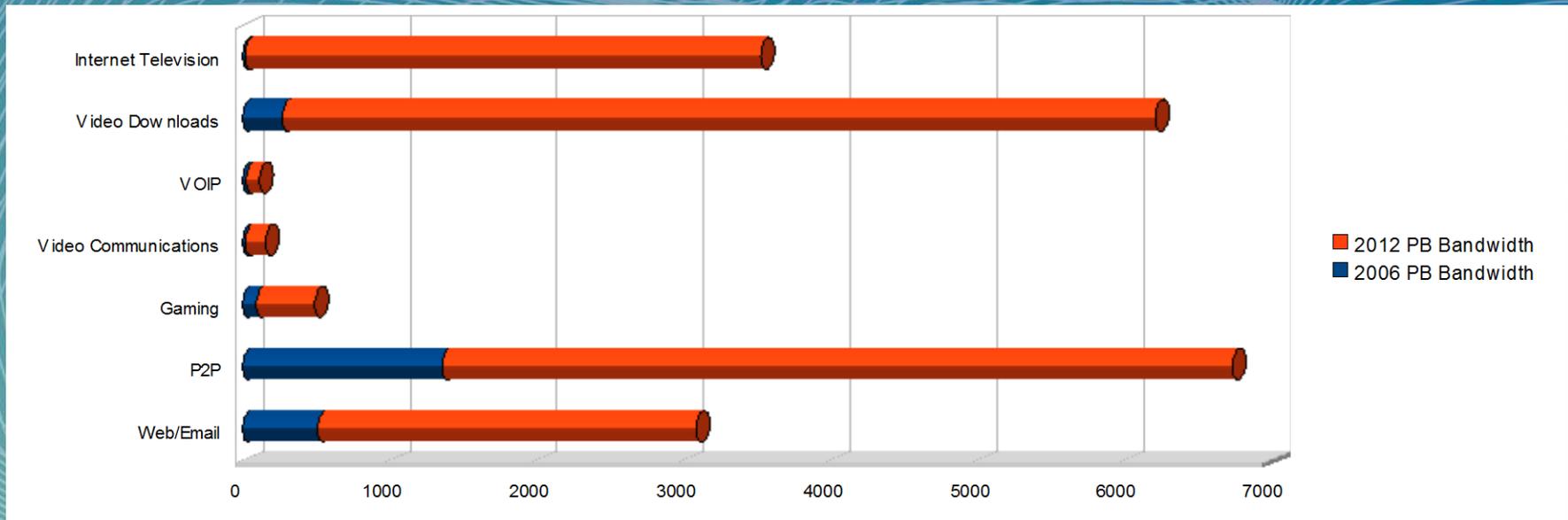
Growth Percent from 2006-2012
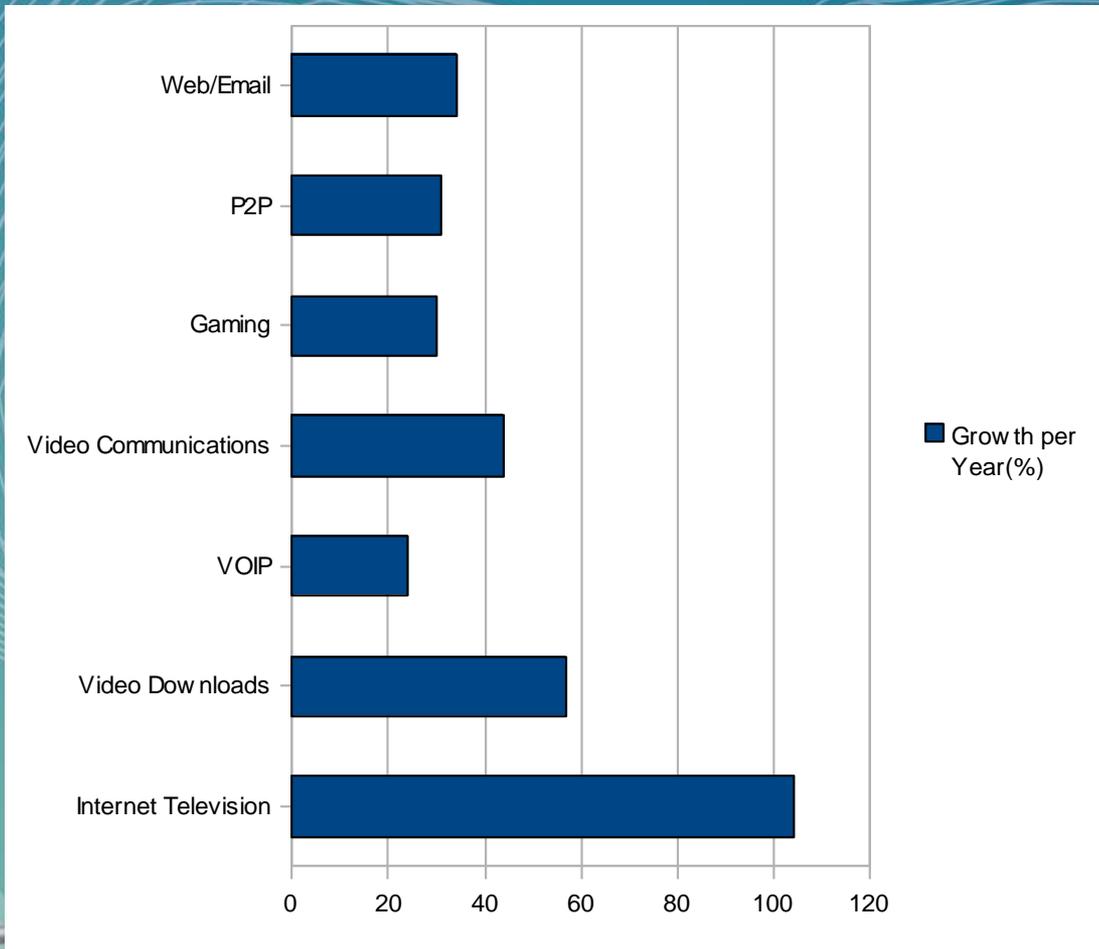
Secondary Research - Conclusions

- Steady growth in use of mature applications like Web Browsing, Email and Social Networking, with increased average bandwidth by imbedding of video

- Emerging use of VOIP, Online Gaming, Video Conferencing, but still relatively small in adoption or small in bandwidth.

- Large growth in users, and in average bandwidth for Streaming Video caused by the shift from a few media providers, to a market where everyone is a media provider, and an increase in quality (HD).

- P2P has the largest growth potential in users; currently a small percentage of users, but the largest average bandwidth. Copyright issues may delay.

- Need to confirm ideas with primary research survey.

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Primary Research - Survey Methodology

- Incentive
- Administration Methods
  - Offline
    - Bridge
    - RHA
  - Online
    - Facebook
    - Mailing Lists
- Demographic Focus
  - 15-25

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Survey Results
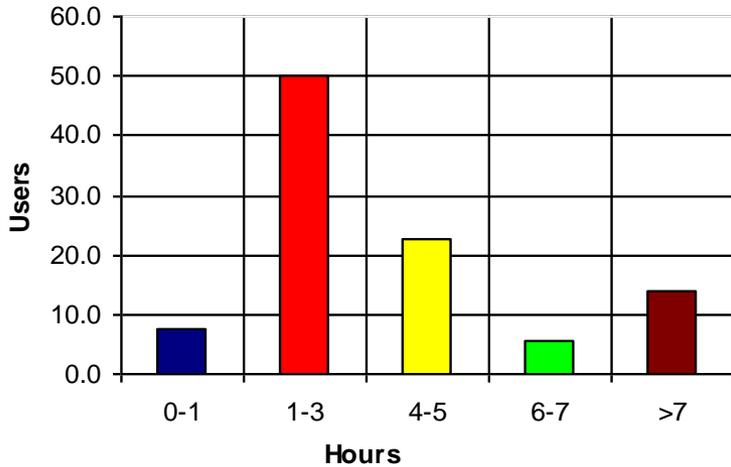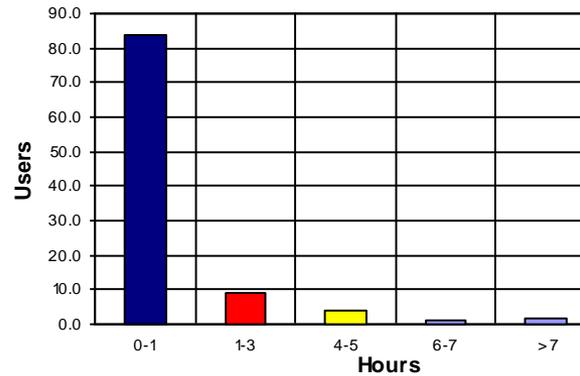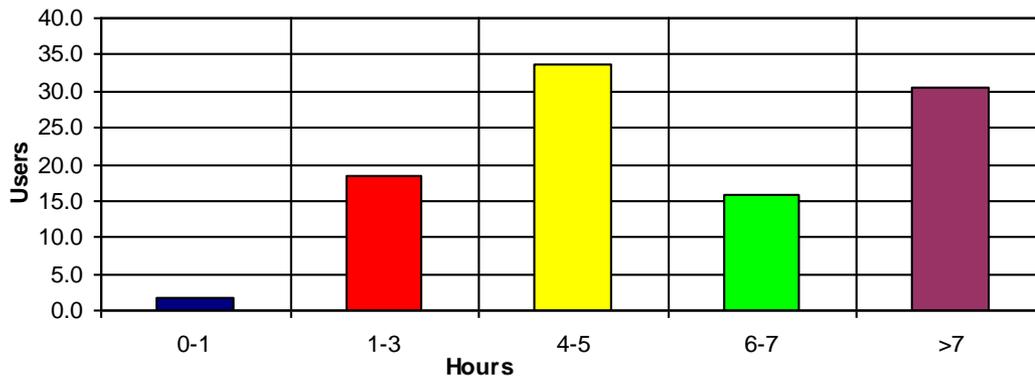
Patterns

– Truncated Bell Curve
  • Maturity

– Truncated Exponential Decay
  • Immaturity
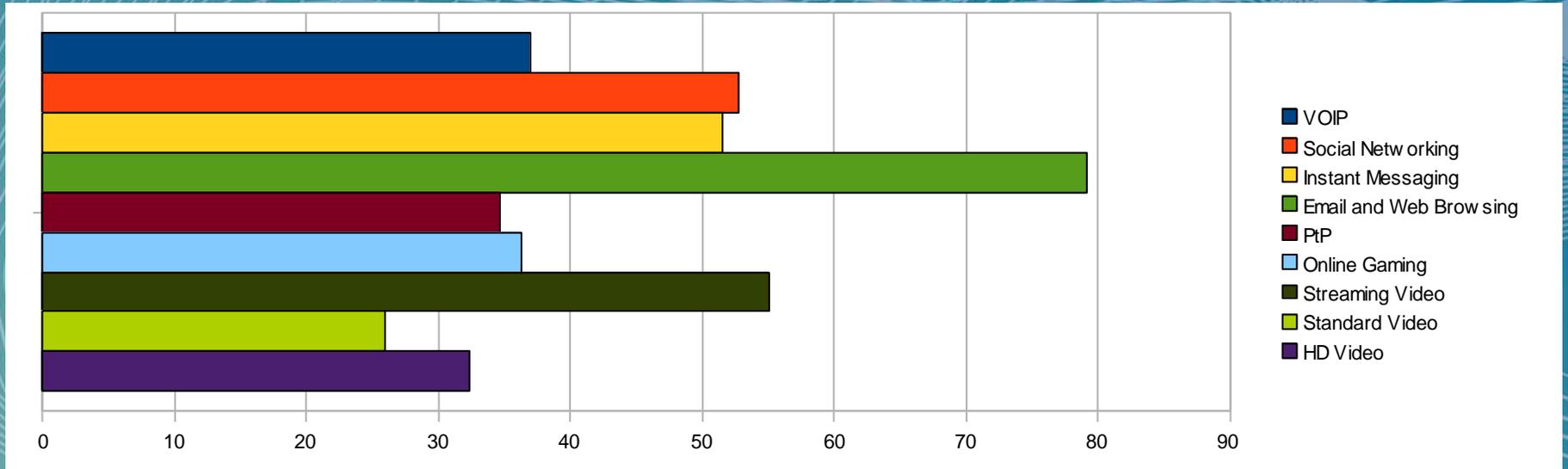
Survey-based Conclusions

- Email/Web Browsing is the only mature application
  - Other areas expected to grow greatly
- Most usage occurs during a brief period each day
  - Not ideal from provider's perspective

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Survey vs IIT OTS Inquiry

- Network Administrator data indicates that:
  - 50-55% of peak bandwidth volume is P2P
  - 20-25% is Streaming Video (Source: IIT OTS Dept. 2008)
- So, if our survey data is accurate, then either:
  - a very small number of users consumes the majority of capacity (only 32% use P2P at all!)
  - most consumption occurs during a brief time period
  - both.

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Default Solution

- Increase bandwidth capacity to meet projected peak by 2012
  - Guaranteed legality
  - All users get desired bandwidth
  - Requires most capital investment

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Alternative Solutions

- Scheduling Programs/Utilities
  - Download Scheduling
  - Macros
  - Aid user is making the most of non-peak times
  - May be programmed to further motivate non-peak usage
  - Guaranteed legality; optional, helpful use

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Alternative Solutions

Smart Pricing Program

- Quasi-real time price
- Automatic Disconnect when price exceeds user bid
  – Short, guaranteed access period
- Capped Bandwidth Percentage
  – High (~10% of line)

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Ethical Issues

- Communication with Comcast
- Business Contacts
- Survey Participants

Comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY

Acknowledgements

Our whole team would like to thank the following for support and participation, without which we could not have made any progress:

Comcast
Sherita Ceasar and Amit Garg, Product Engineering & Engineering Analysis

IIT Housing Administration
Jennifer Luttig-Komrosky, Housing Director

Hulu.com	Microsoft's Xbox Live Division
Yahoo!	Genentech
PicoChip	Comtech Communications
j2 Global Communications	Boeing
Sears	Walgreens Motorola
Caterpillar	Archer Daniels Midland Co.
Allstate	Kraft Foods

Acknowledgements

Survey Participants:
In particular, we would like to thank Phi Kappa Sigma Fraternity, Triangle Fraternity, Alpha Sigma Alpha Sorority, Alpha Sigma Phi Fraternity, Sigma Phi Epsilon Fraternity and many others.

We would especially like to thank professors Matthew Bauer and Jay Fisher for guiding us on this project throughout the semester and providing us with valuable feedback, which allowed our whole team to be more productive as a result.

comcast.

ILLINOIS INSTITUTE
OF TECHNOLOGY