ENSC427: Communication Netwroks

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Analysis of Video Streaming Over the BitTorrent Protocol
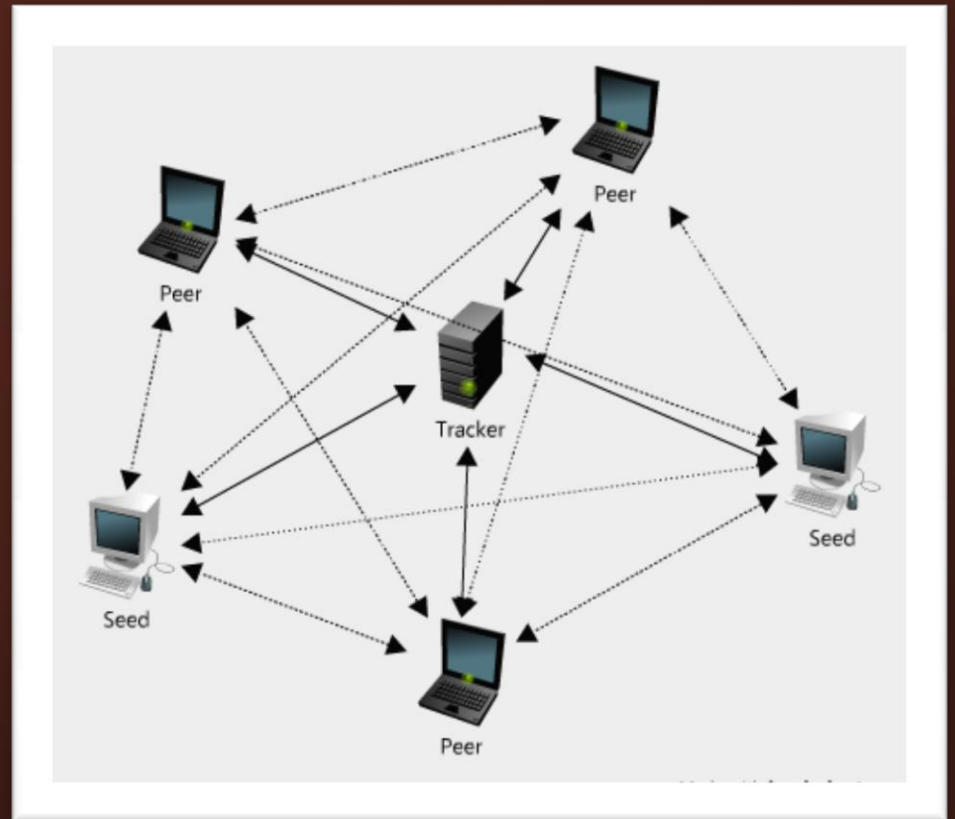
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Overview

- Introduction

- Technical Information

- ns-2 Implementation
  - Reference models
  - New models and changes
  - Goddard Streaming

- Results of simulations

- Conclusion

- Questions

Introduction

What is BitTorrent?

- Peer-to-Peer Network

- Seeds

- Peers

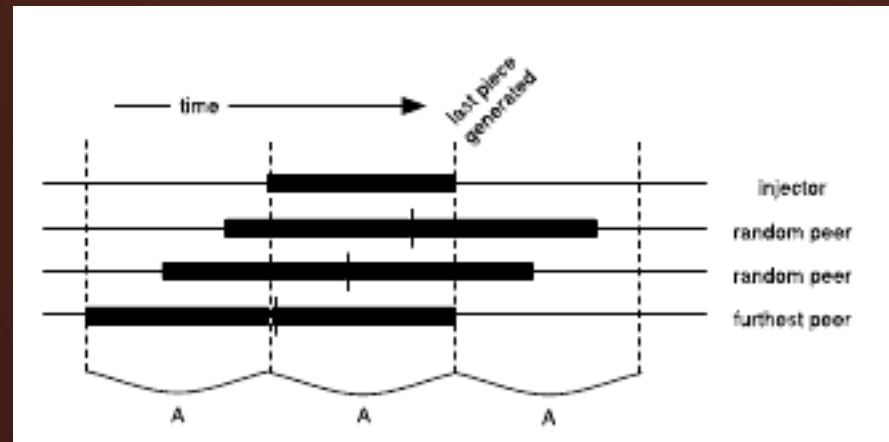- Tracker

Introduction Cont'd

Our Project Idea

- Video Streaming with BitTorrent

    - Unlimited File Length
    - Data Validation*
    - Live playback
    - Redefinition of Seeders

Unlimited File Length

- Peers cannot decide which chunks to download

- A new peer might be forced to download a very old chunk

- Each peer and seeder will delete chunks after a specific time

Live Playback

- Peers have to request pieces sequentially
  - BitTorrent's default is rarest piece first

- Chunks with the least pieces should have priority
  - To allow smooth playback of the stream

Redefinition of Seeders

- Peers will never take on the role of seeding

- "Seeders" are trusted peers who are directly connection to the media server

ns-2 Implementation

- ## Why ns-2?

  - ns-2 is open-source and is growing rapidly
  - Larger community and more resources are available

- ## BitTorrent Streaming vs. Standard Windows Media Streaming

  - Our Implementation of video streaming over BitTorrent
  - The Goddard protocol

Reference Models

- ## Kolja Eger's implementation of BitTorrent in ns-2
    - ### Includes Flow and Packet level implementation of Peers, Seeders, and a tracker

- ## Jae Chung's implementation of Goddard Streaming Server in ns-2
   - ### Goddard is designed based on the behaviors of Windows Stream Media

Implementation

- New chunk selection algorithm for peers

- Peers have to delete old chunks

- Seeder algorithm to generate new chunks based on time
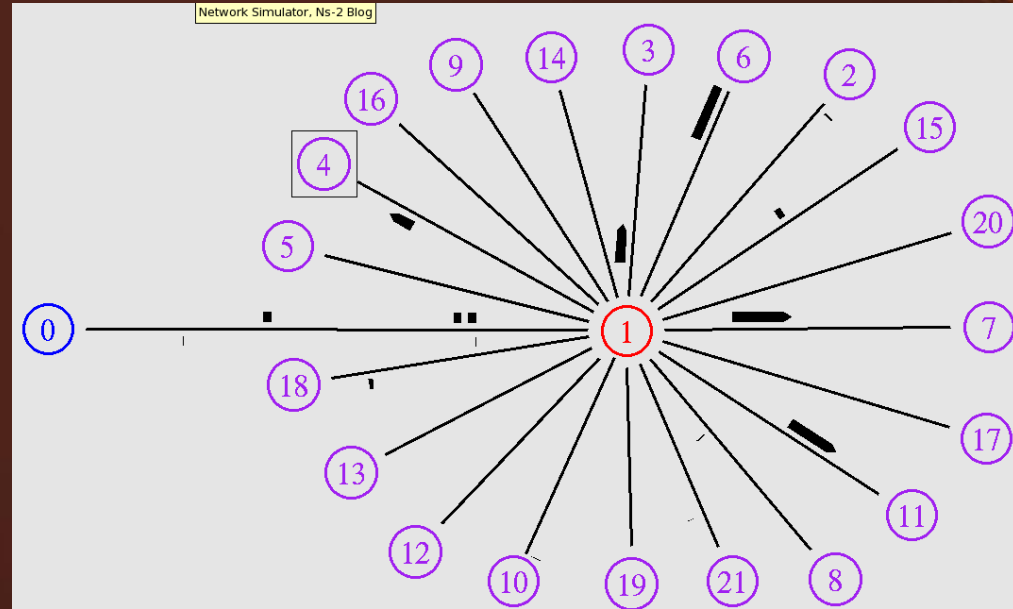
- Fixed number of chunks on the Tracker

Implementation

- Modified Goddard to use only TCP for Media Streaming

- Changed the Goddard topology to a star network

- Added Timers for graphing purposes
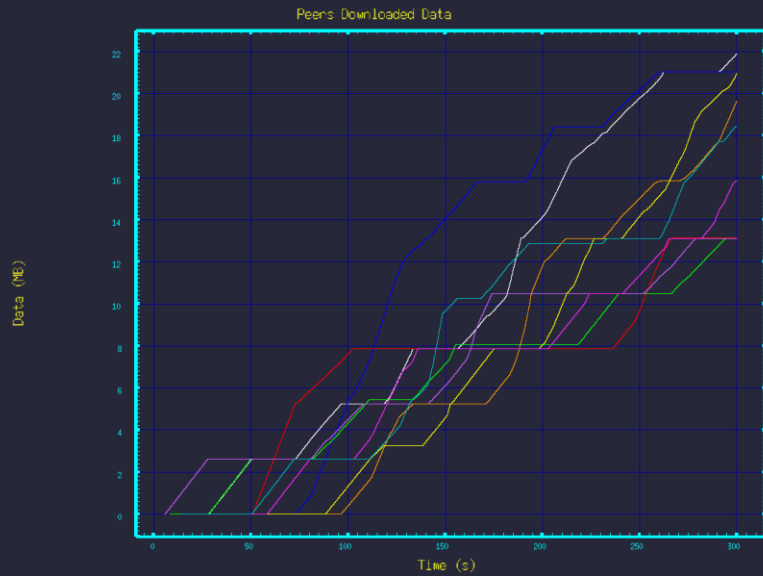
Simulation Image
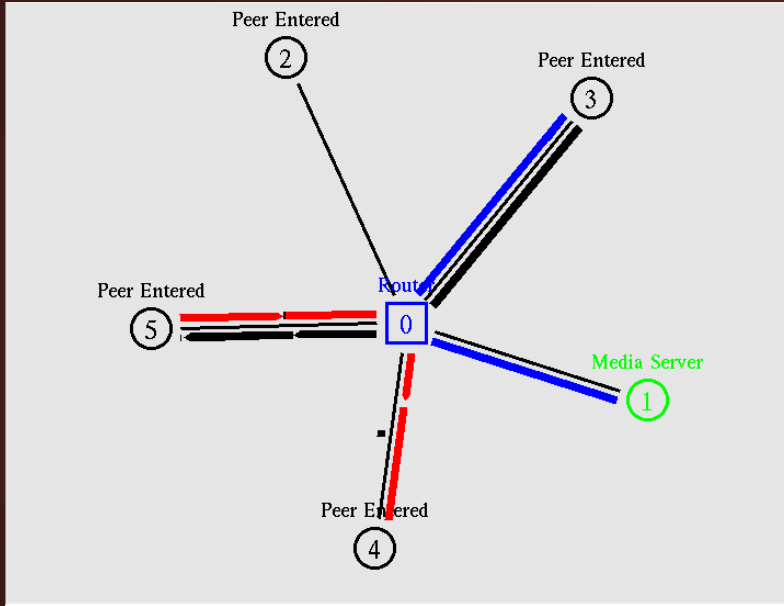
BitTorrent Simulation

Goddard Simulation

Simulation Video

- Goddard simulation video
  - One main Server
  - 20 nodes
  - Star Topology
  - Random downloading speeds for clients

- BitTorrent simulation video
  - One main server
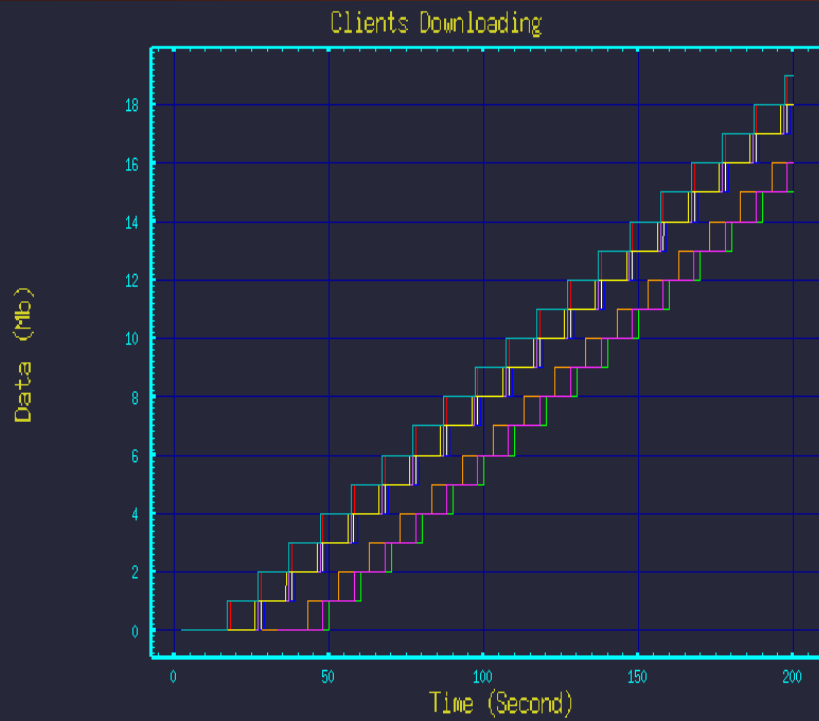 - 4 nodes
  - Peer-to-Peer Topology
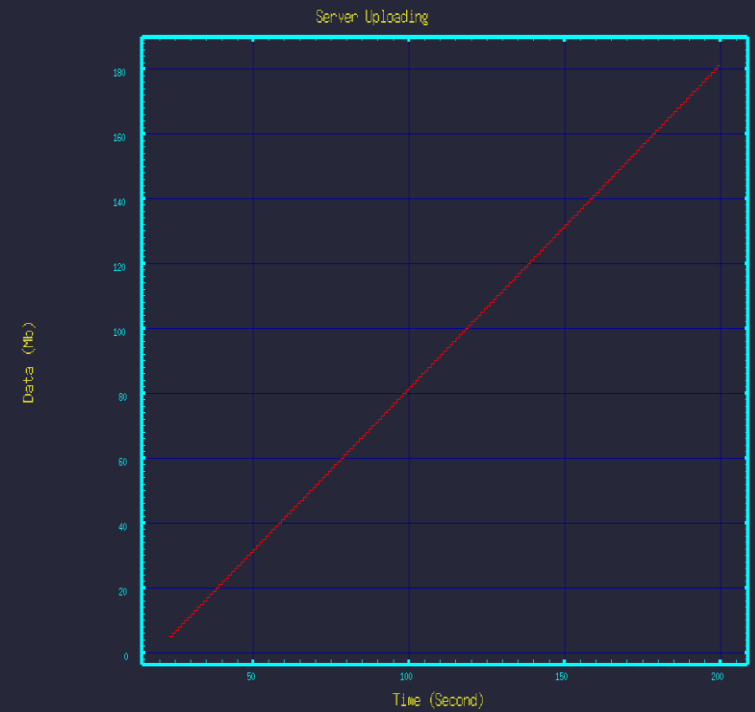
Results

10 Peers 1 Seeder

Results

20 peers 1 server

Results

- Advantages of using BitTorrent

  - Lower load on the main server

  - Lower bandwidth needed for media streaming

  - Performance improve as number of seeders grow

- Disadvantages of using BitTorrent

  - More downloading delay for clients

  - Needs high number of seeders for best performance

Conclusion

Difficulties

- Finding Chao to solve "Out of Space" problem

- Installing NS-2 on Windows and Linux

- Defining new search algorithm for finding proper peers

- Defining new algorithm to remove old chunks

- Editing Goddard application to simulate star topology network

- Adding Xgraph function to final code to analyze the result

Conclusion

Pros of using BitTorrent over the standard media streaming

- Lower load on the server

- Decrease the cost

- More efficiency

- Lower bandwidth usage by clients

- Better performance by increasing number of clients

Cons of using BitTorrent.

- Higher buffering time for new clients

- Poor performance when number of clients is low

Sources

- [1] Chung Jae, Mark Claypool, and Robert Kinicki. MTP: A Streaming-Friendly Transport Protocol, Technical Report WPI-CS-TR-05-10, Computer Science Department, Worcester Polytechnic Institute, May 2005.

- [2] Chung, Jae. "Goddard Streaming Media." Network Simulator, Ns-2 Blog. May 2008. Web. 10 Apr. 2011. <http://ns-2.blogspot.com/2007/05/streaming-media-system-for-ns-2.html

- [3] Tewari,, Saurabh, and Leonard Kleinrock. "Analytical Model for BitTorrent-based Live Video Streaming." Computer Science Department University of California at Los Angeles Los Angeles, U.S.A, May 2008. Web. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.74.9846&rep=rep1&type=pdf

Sources

- [4] K. Eger, T. Hoßfeld, A. Binzenhöfer, G. Kunzmann, "Efficient Simulation of Large-Scale P2P Networks: Packet-level vs. Flow-level Simulations", 2nd Workshop on the Use of P2P, GRID and Agents for the Development of Content Networks (UPGRADE-CN'07) in conjunction with IEEE HPDC, Monterey Bay, USA, June 2007