Streaming Overlays

- Exactly *what* are streaming overlays? (idk)
  - Håkon Ulvestad
  - Roger Bystrøm
  - Hans Vatne Hansen
Streaming Overlays

- Peer-to-peer overlay networks used to stream media data to users
- Each peer helps to redistribute content/files to other peers in the network
- Reduces load on centralized publisher servers
  - Bandwidth
  - CPU
  - Cost
Streaming Overlays

- Examples of streaming overlay
  - Splitstream
  - Coopnet
  - Magellan (AquaLab)
  - Coolstreaming
  - Joost
Coolstreaming

- No longer seems to be a streaming overlay application
- Closed down due to copyright issues (2005)
Splitstream
Splitstream

- Content streaming/distribution system
- Based on Pastry and Scribe
- Tree-based multicast is problematic
  - Duplicating and forwarding done by small subset of peers
  - High bandwidth applications may cause problems
  - Intermediate nodes may not have capacity to perform as intermediate nodes in the multicast tree
  - Does not distribute load evenly, leaves are pure leeches
Splitstream
Solution: Striping of content

- Source splits a file into $k$ stripes
- Each stripe is multicast using a separate tree
- Forest of multicast-trees
- Each node is:
  - intermediate node in only 1 tree (redistributes one stripe)
  - leaf node in all trees (receives all stripes, the whole file)
- Load is evenly distributed
Example: File is split into two stripes

Multicast tree for stripe 1 + Multicast tree for stripe 2 = Multicast forest
Not all peers have the same outbound bandwidth
Increase $k$ to accommodate difference in bandwidth
Lowest bandwidth requirement: $B/k$ (B is inbound BW)
Each peer may control outbound BW by limiting the # of children nodes it adopts
Splitstream

- **Source:**
  - “SplitStream: High-Bandwidth Multicast In Cooperative Environments”
    Castro, Druschel, Kermarrec, Nandi, Rowston, Singh
  
  - “SplitStream: High-bandwidth content distribution in a cooperative environment”
    Castro, Druschel, Kermarrec, Nandi, Rowston, Singh
CoopNet

- Designed to distribute media content
  - Live and on-demand
  - Alleviate flash crowds
- Complement traditional client-server framework
  - Send redirect to clients when resources exhausted
- Centralized organization scheme to build distribution trees
CoopNet - MDC

- Uses Multiple Description Coding
  - Splits stream into separate streams
  - Whole or parts reassembled at receiver
CoopNet
  - Not published papers since February 2004

CoolStreaming (P2PTV)
  - Stopped in June 2005 due to copyright issues

Aqualab
  - Last paper published September 2006

SplitStream
  - Last paper published October 2003
“Designed to address the needs of cooperative, group communication applications in large-scale, heterogeneous environments”

- Nodes are expected to contribute resources
- Forwards multicast data over a forest of interweaved trees

(a) The ‘black’ tree.  
(b) The ‘white’ tree.  
(c) Both trees overlayed.
Magellan

- **Routing:**
  - Selects neighbors based on a shortest-wide-enough path algorithm
  - Keeps track of lost packets to avoid overloading a peer (cost penalty)
  - Cost penalty to secondary peers
- Latency between 450-600ms.
- Wikipedia
  - http://en.wikipedia.org/wiki/Multiple_Description_Coding
- Magellan: Performance-based, Cooperative Multicast
  - Stefan Birrer and Fabián E. Bustamante,
- Distributing Streaming Media Content Using Cooperative Networking
  - V. N. Padmanabhan, H. J. Wang, P. A. Chou, and K. Sripanidkulchai
Joost

- Joost, originally known as The Venice Project
- Peer-to-peer technology created by the founders of Skype and KaZaA
- Delivers television-quality, licensed video content
System requirements

- Pentium 4, 1 Ghz
- 512 MB RAM
- 500 MB HDD
- ADSL (1Mbit down / 512 Kbit up stream)
Program

- GUI: Mozilla XULRunner
- Video: CoreAVC H.264 by CoreCodec
- Demonstration?
Content

- Channels with "Programs"
- Cartoons & Animation, Comedy, Documentary, Drama, Entertainment, Film, Lifestyle, Music, Entertainment, News, Sports & Games
- Not too much content. Just small clips
- No user generated content
- Content owner page for submission and entering metadata
- On demand
- Medium quality
Quality comparison 1
Session initializing

- HTTPS to theveniceproject.com
- HTTPS to tolbiac.ops.theveniceproject.com
- HTTPS to adengine.ops.theveniceproject.com
- HTTPS to tracker.ops.theveniceproject.com
- Finally establish connection to supernode and swarm
- Access video content!
Servers

- Maintains servers in data centers in
  - Belgium (212.8.163.0/24)
  - Netherlands (89.251.0.0/23 & 213.207.101.128/25)
  - United Kingdom (212.187.185.0/24)
  - Los Angeles, California (4.71.105.0/24)
Boring facts

- **Usage:**
  - USA 35%
  - Europe 17%
  - Rest 17%
  - Unknown 31%
- Approx. 700 kbps down and 100 kbps up
- Fairness ratio $\frac{1}{2}$
- Lack of locality awareness
Conclution

- Still beta
- Low picture quality
- Poor interface performance
- Okey content, could be more
Resources

- Joost: A Measurement Study
  - Carnegie Mellon University (May 14, 2007)
- Presentation from developer C. MacCarthaigh
  - http://www.scaryideas.com/video/2362/
- Joost Webpage
  - http://www.joost.com/
- Wikipedia
- Misc reviews and newspaper articles