

# 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

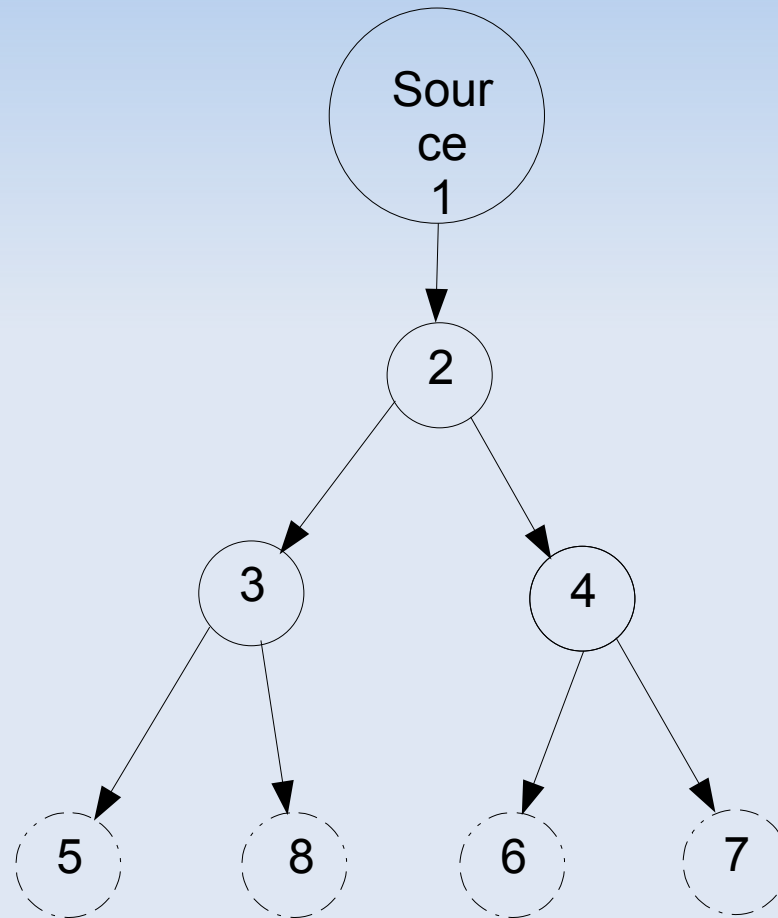
- No longer seems to be a streaming overlay application
- Closed down due to copyright issues (2005)

# 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



# Splitstream

- Solution: Striping of content
  - Source plits a file into  $k$  stripes
  - Each stripe is mulitcast using a separate tree
  - Forest of mulitcast-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



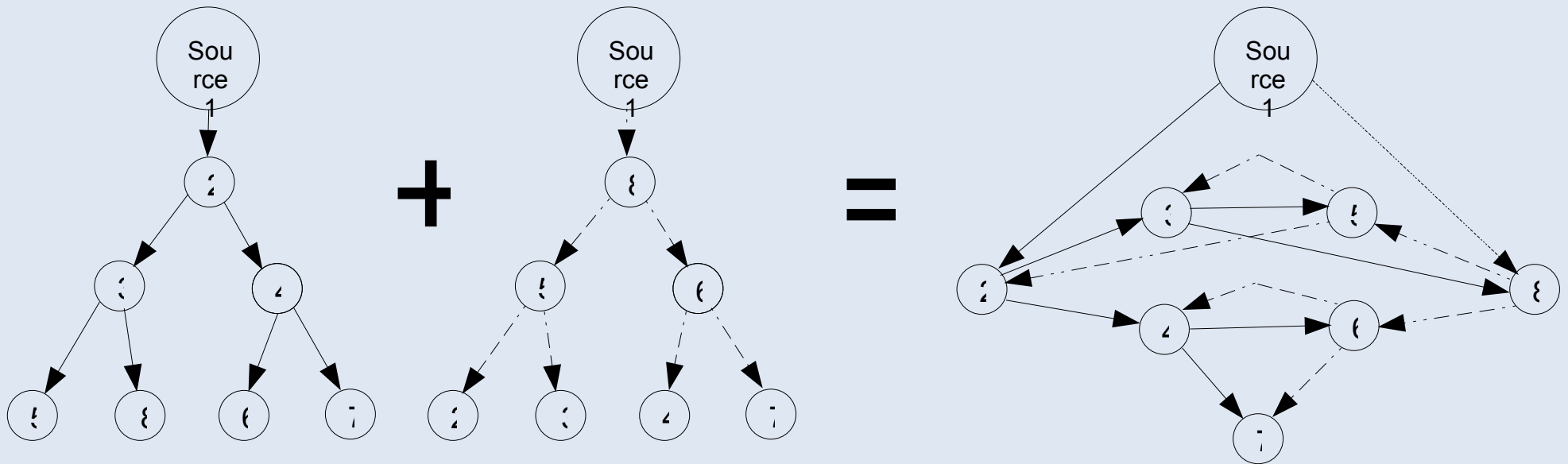
# Splitstream

Example: File is split into two stripes

Multicast tree for stripe 1

Multicast tree for stripe 2

Multicast forest



# Splitstream

- 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

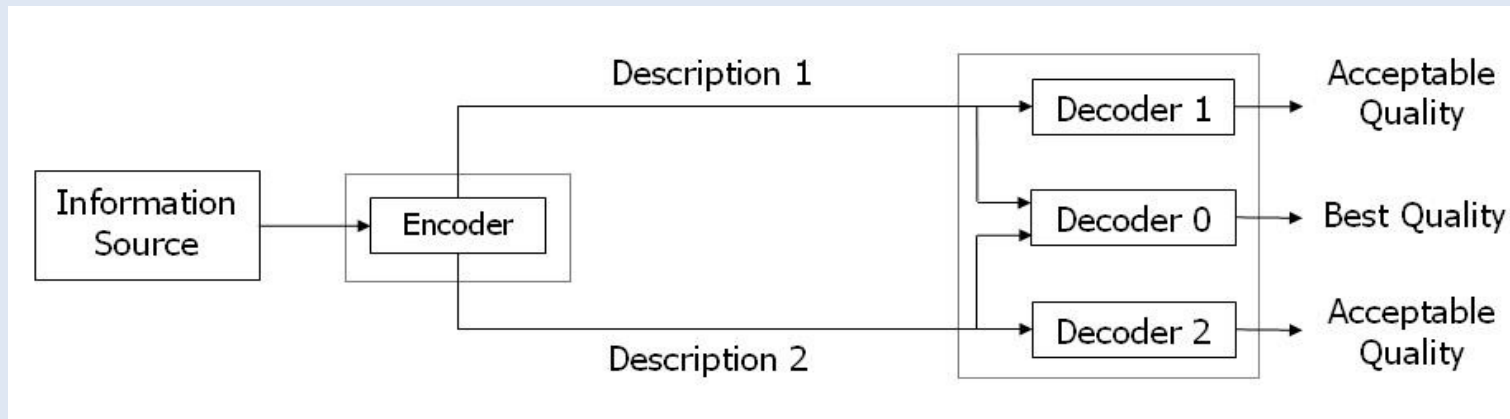
- Source:
  - “SplitStream: High-Bandwidth Multicast In Cooperative Environments”  
Castro, Druschel, Kermarrec, Nandi, Rowston, Singh  
<http://www.cs.rice.edu/CS/Systems/PAST/SplitStream-sosp.pdf>
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<http://www.cs.rice.edu/CS/Systems/PAST/SplitStream-IPTPS.pdf>

# 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



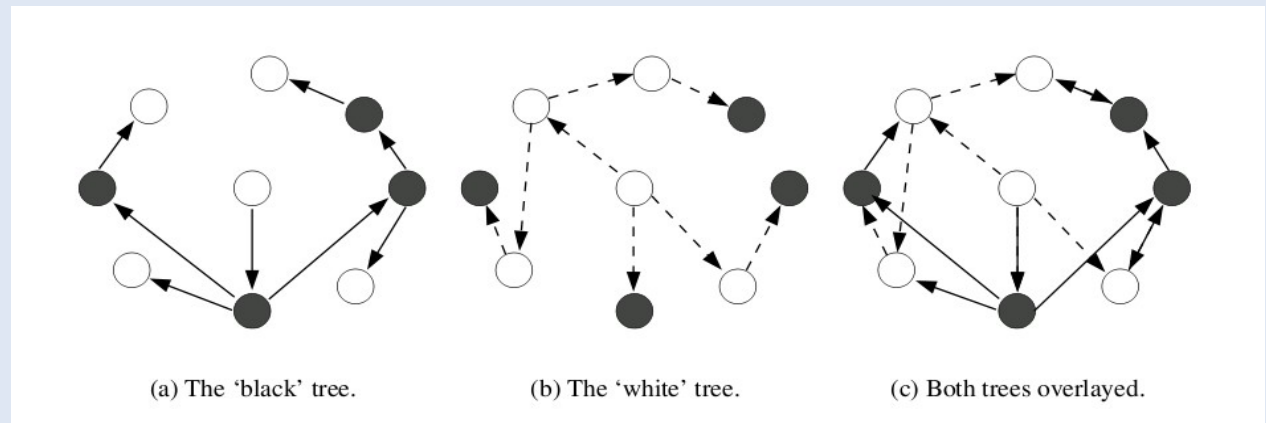
(Image stolen from wikipedia)

# Current state

- 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

# Aqualab - Magellan

- “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



# 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.



# Src

- Wikipedia
  - [http://en.wikipedia.org/wiki/Multiple\\_Description\\_Coding](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



# Quality comparison 2



# Session initializing

- [HTTPS to theveniceproject.com](https://theveniceproject.com)
- [HTTPS to tolbiac.ops.theveniceproject.com](https://tolbiac.ops.theveniceproject.com)
- [HTTPS to adengine.ops.theveniceproject.com](https://adengine.ops.theveniceproject.com)
- [HTTPS to tracker.ops.theveniceproject.com](https://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

# Conclusion

- 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
  - <http://en.wikipedia.org/wiki/Joost>
  - <http://en.wikipedia.org/wiki/H.264>
- Misc reviews and newspaper articles