



VoD Streaming in P2P Environment

Presented by 江文德

[Outline]

- Introduction
- P2Cast
- P2VoD
- Collusions and Future Work
- References

Introduction

- Video Streaming

- Live

- On-Demand

- Fundamental differences

- End-to-end delay

- The streaming starting from joining time vs. the whole video

- The correlations (i.e. QoS)

Introduction

- Several approaches to deal with VoD
 - Traditional client/server unicast model
 - IP multicast
 - Proxy caching and the use of content distribution networks (CDN)
 - P2P
 - Applicable method : P2Cast, P2VoD

P2Cast - Overview

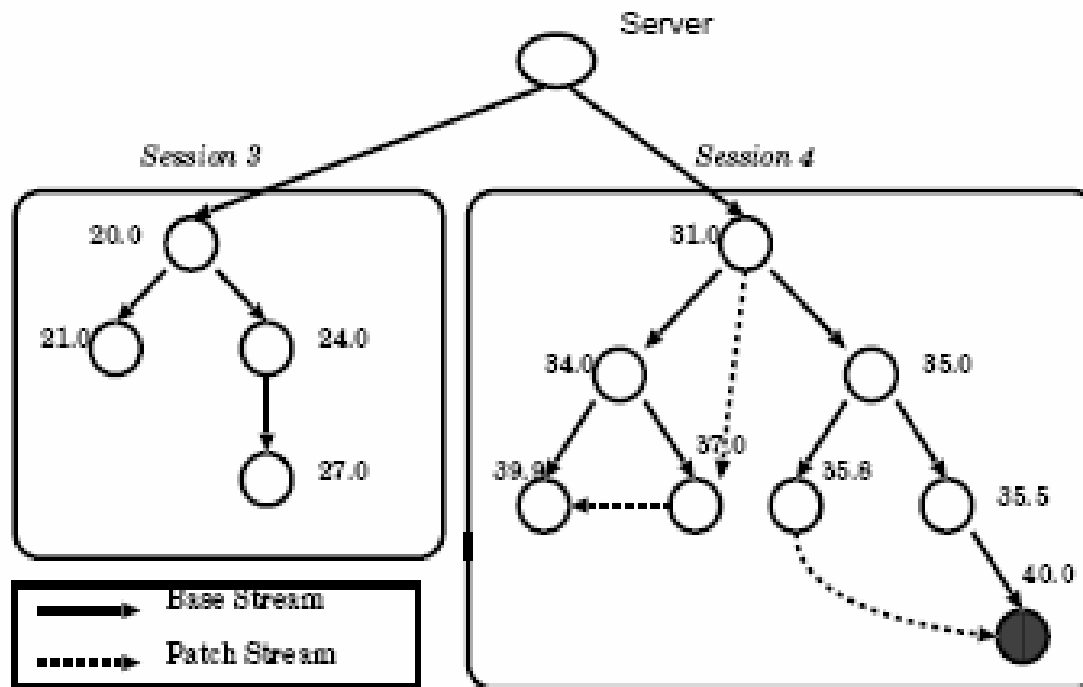


Figure 1: A snapshot of P2Cast at time 40. Clients in a session form an application-level multicast tree together with the server. All clients in session 3 have finished patch retrieval; while 3 clients in session 4 are still receiving the patch stream from their parent patch servers.

P2Cast - Overview

- Associated with P2Cast is a threshold T . The clients that arrive within the threshold constitute a session.
- Clients belongs to the same session form an application-level multicast tree, denoted the base tree.
- P2Cast clients provide two functions
 - Base Stream Forwarding
 - Patch Serving

[P2Cast - Operations]

- New client admission
 - Join or be rejected
- Base tree construction
 - Bandwidth first principle
 - Local info. only principle
- Patch server selection
- Failure Recovery
 - Base stream recovery
 - Patch recovery

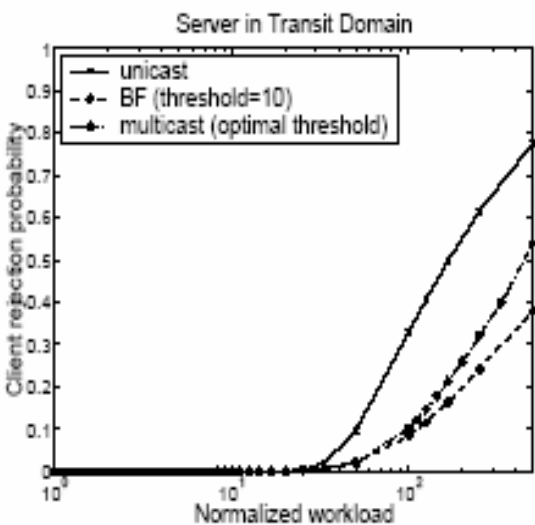
P2Cast - Operations

- Best Fit algorithm for base tree construction and patch server selection
 - BF Algorithm
 - Step1. the requesting client N contacts a candidate parent P , starting with the server.
 - Step2. P estimates the bandwidth from P to N , $B(P,N)$. Meanwhile, it sends messages to its children, denote $C(P)$, asking for their respective bandwidth to the requesting client.

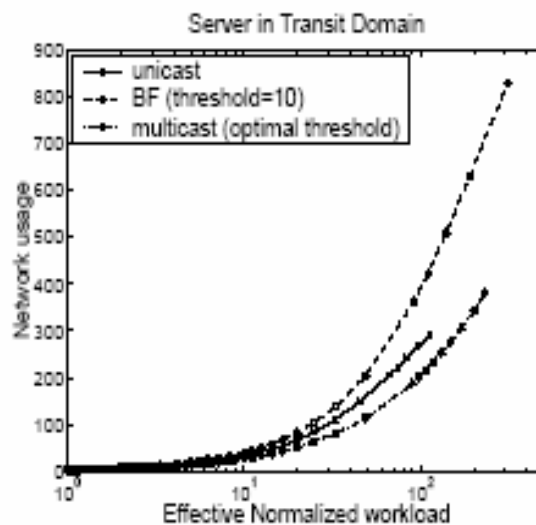
[P2Cast - Operations]

- Step3. P collects the measured bandwidth from its children, and identifies the child node C_{max} that has the fattest pipe to N. A tie is broken arbitrarily. Depending on the measurement reported back to P, there are two scenarios :
 - $B(P,N) > B(C_{max},N) \rightarrow$ P becomes the parent of N or N is re-directed to C_{max}
 - $B(P,N) \leq B(C_{max},N) \rightarrow$ N is re-directed to C_{max}
- BF-delay-approx

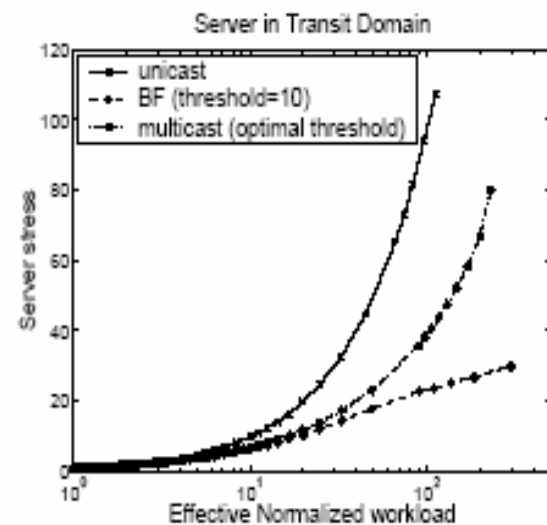
P2Cast – Performance



(a) Rejection probability comparison



(b) Workload comparison



(c) Server stress comparison

Figure 4: Performance comparison of P2Cast, unicast, and IP multicast-based patching

P2Cast – Contributions

- Propose P2Cast that scales better than a unicast-based patching approach in providing VoD service.
- Develop a series of overlay construction algorithms suitable for video streaming service.
- Investigate the techniques to provide continuous playback in the face of disruptions.

P2VoD - Overview

- P2VoD is different from P2Cast :
 - Clients in P2VoD always cache the most recent content of the video stream, while P2Cast only cache the initial part.
 - P2Cast has to get the source involved whenever a failure occurs, thus vulnerable to disruption due to server bottleneck at the source.
 - Orphaned peers reconnect by using the join algorithm, resulting in long blocking time before their service can resume.

P2VoD - Overview

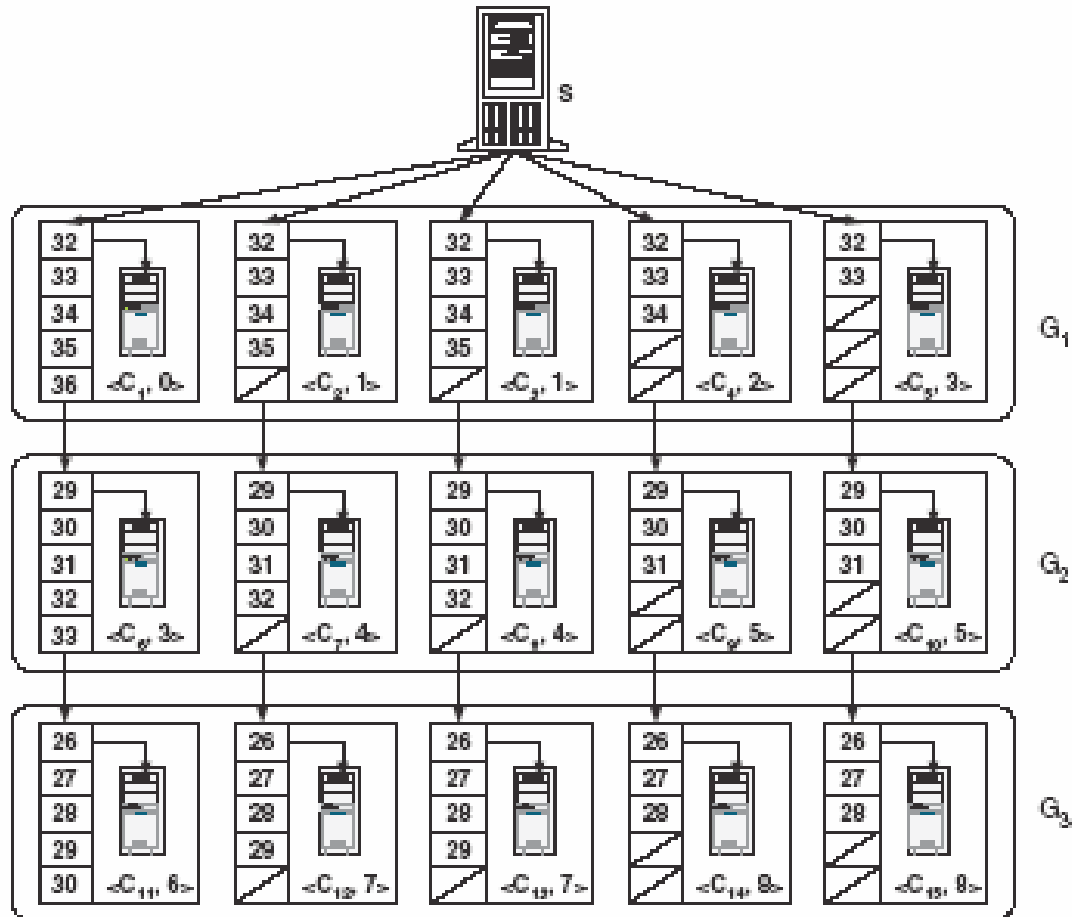


Fig. 1. A snapshot of the P2VoD system at time 36.

P2VoD - Overview

TABLE I
NOTATIONS

Symbol	Meaning
MB	Maximum cache size of a client
ab_X	Actual storage buffer used by a client X
t_{jX}	Joining time of a client X
add_X	IP address of a client X
$G(X)$	The generation a client X belongs to

[P2VoD - Operations]

- Data Caching and Generation
- Control Protocol
- Join
- Failure Recovery
 - Detecting failures
 - Recovering from failures

P2VoD - Performance

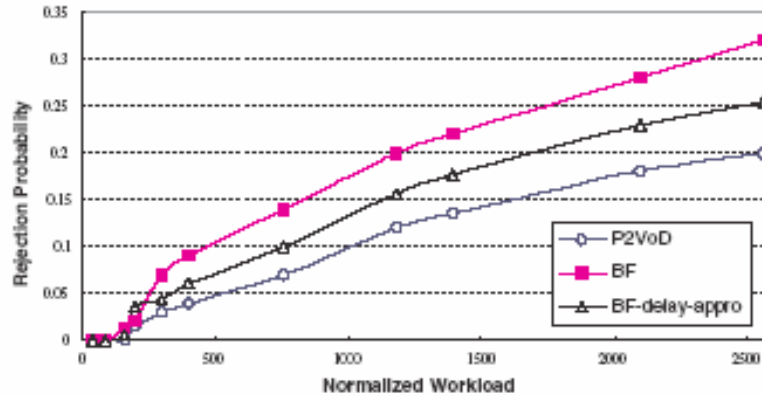


Fig. 5. P2VoD vs. P2Cast: Client rejection probability.

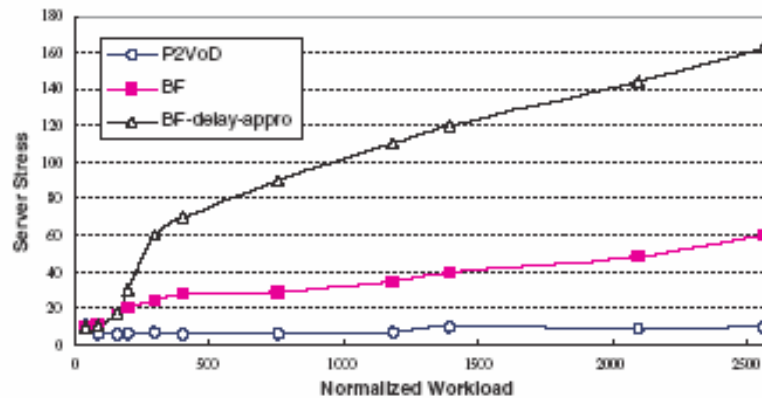


Fig. 6. P2VoD vs. P2Cast: Server Stress.

P2VoD - Performance

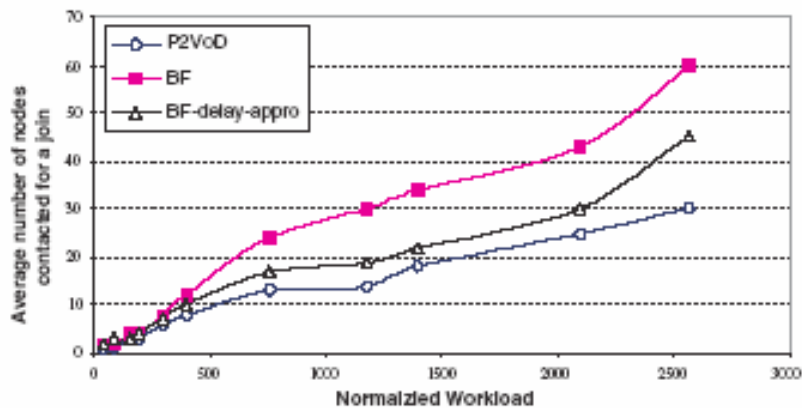


Fig. 7. P2VoD vs. P2Cast: Join overhead.

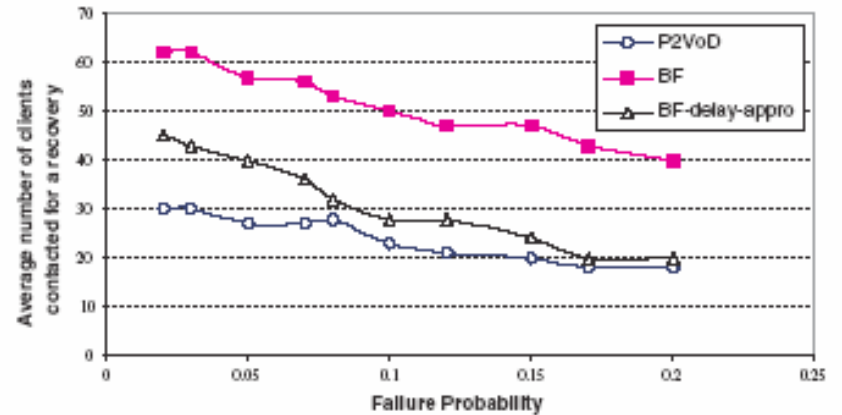


Fig. 8. P2VoD vs. P2Cast: Failure overhead.

[P2VoD - Conclusions]

- Introducing the concept of generation and a novel caching scheme to provide an efficient failure recovery protocol
- Designing an efficient application multicast tree appropriate for VoD streaming
- With the same underlying network and workload, P2VoD is very competitive with P2Cast.

[Conclusions and Future Work]

- Compared with P2Cast, the structure of P2VoD is more flexible.
- Except for normally playback, there are still some functions which could be implemented, e.g. re-wind, start at somewhere in video...

Reference

- P2VoD: providing fault tolerant video-on-demand streaming in peer-to-peer environment, Do, T.T.; Hua, K.A.; Tantaoui, M.A.; Communications, 2004 IEEE International Conference on Volume 3, 20-24 June 2004 Page(s):1467 - 1472 Vol.3
- P2Cast: Peer-to-Peer Patching Scheme for VoD Service, Y. Guo, K. Suh, J. Kurose, D. Towsley, WWW 2003