Network Architecture Res. Group

Multimedia Information System Lab.

Cooperative Video Streaming Mechanisms with Video Quality Adjustment

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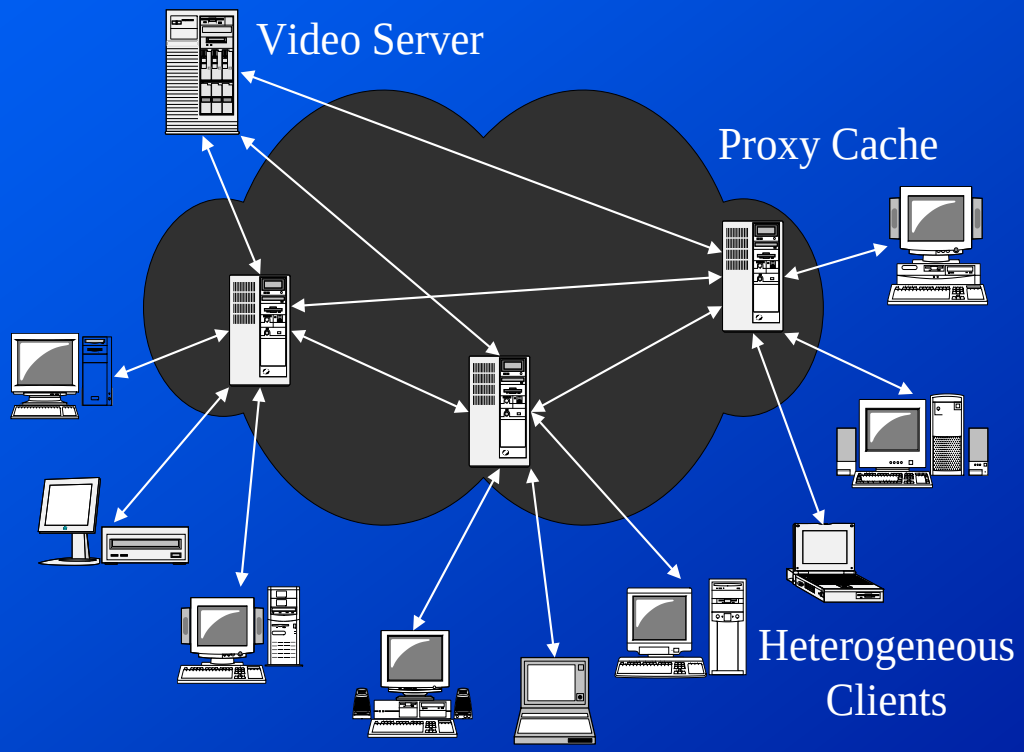
Video streaming system with proxies

- To provide low-delay and high-quality streaming service

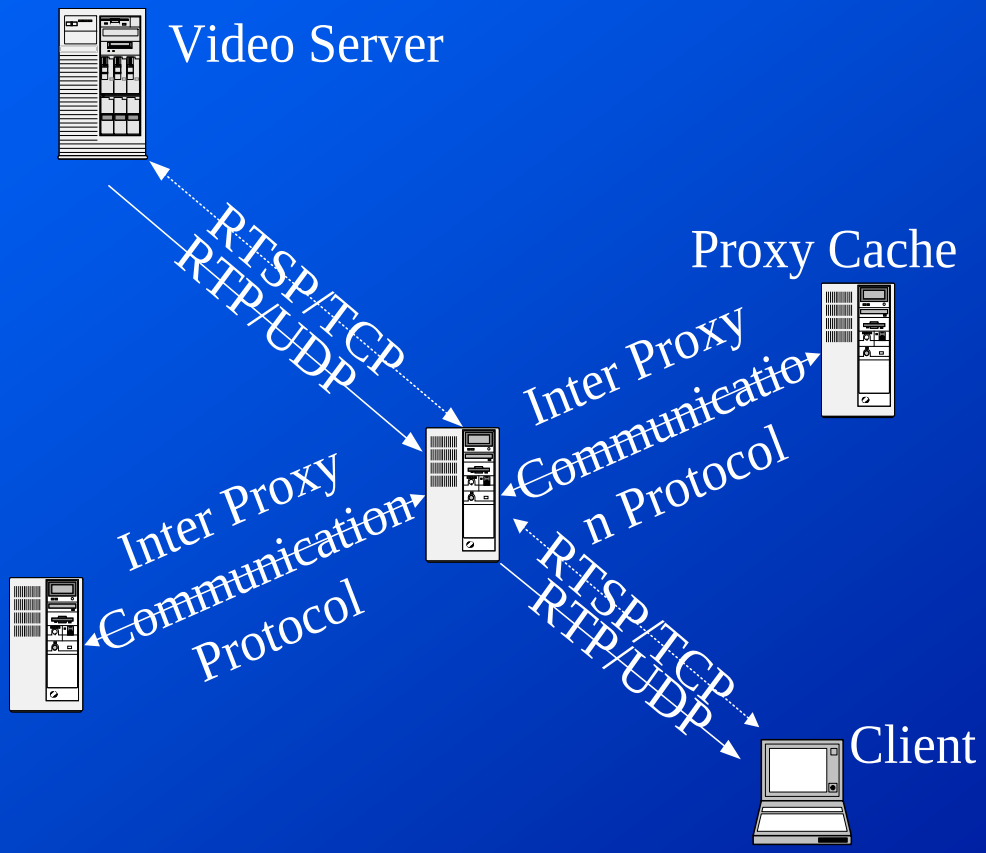


Issues

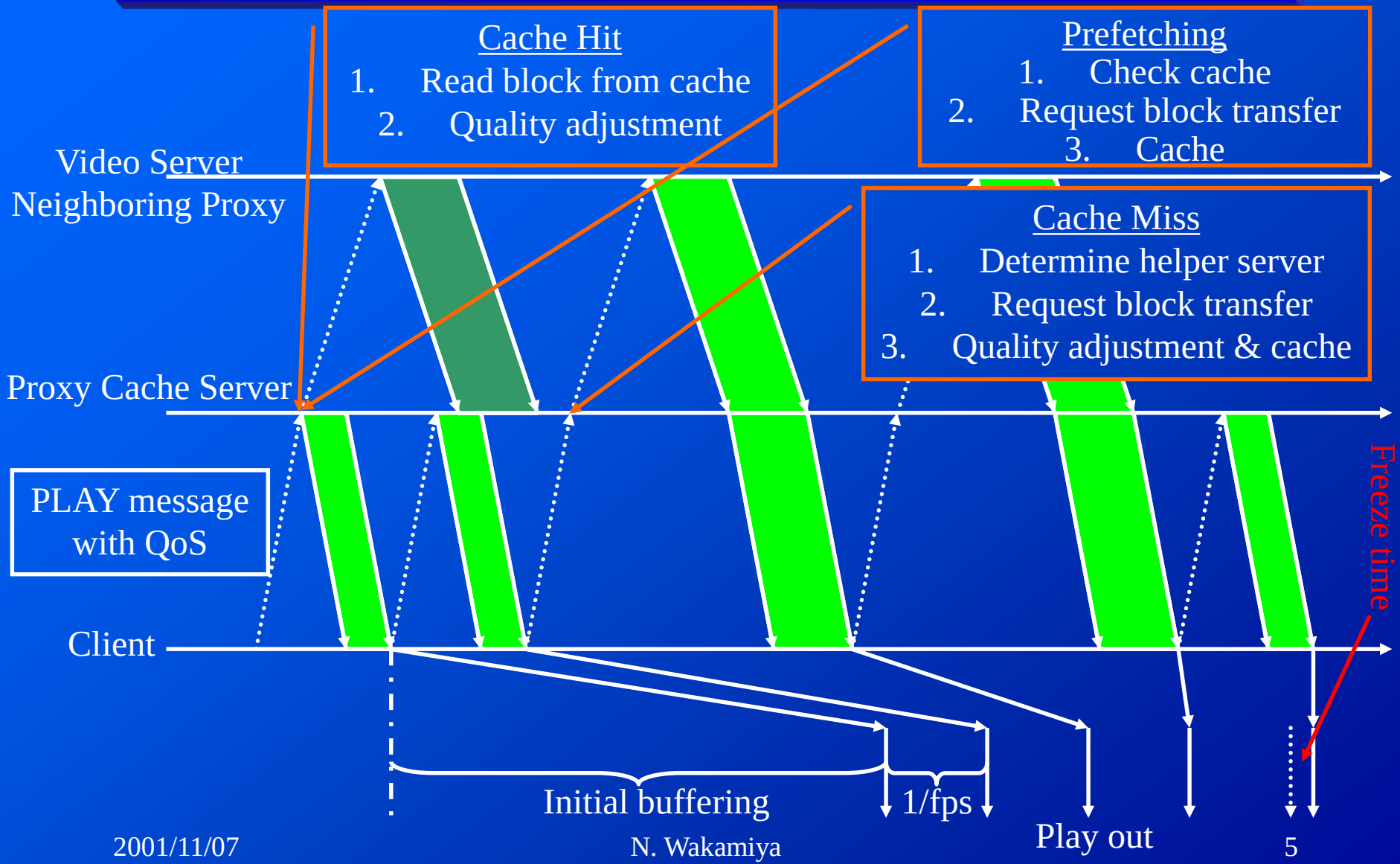
- Segmentation of video streams
- Video quality adjustment
- Locating the appropriate server
- Cache management
- Prefetching

Protocols

- Each system entity communicates with each other



Video block transfer



Cache table

- Cache table is used to maintain information of locally cached blocks
  - block number i
  - quality of cached block $q(i)$
  - marker $M(i)$
- Marker is used to imply the possibility that the block will be required by the other proxies
- Range of marking is limited by inquiry window I
- QUERY and REPLY messages are exchanged to update markers

Remote table

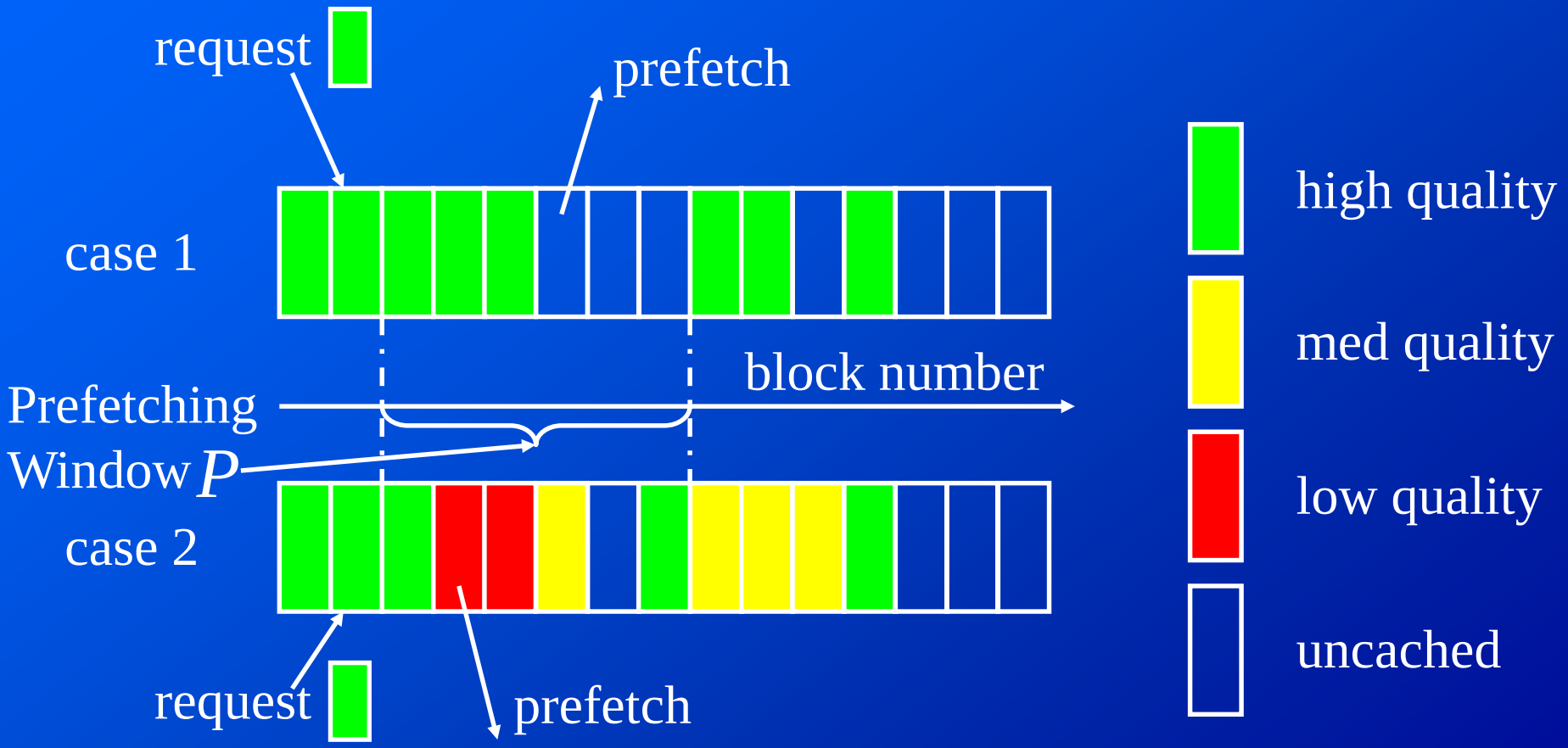
- Remote table is used to maintain information of blocks cached at the other servers (video server, proxies)
  - estimated one way delay d_k^S
  - estimated throughput r_k^S
  - quality of offerable block $O_k(i)$
- Delay and throughput are estimated using measurement tools or TCP-friendly control mechanisms
- QUERY and REPLY messages are exchanged to update remote tables

Block retrieval algorithm

- the proxy determines the quality of block i to offer to client j based on
  - request $q_j(i)$
  - cache and remote tables
  - estimations d_j^C ,r_j^C
  - the number of blocks in the client's prefetch buffer p_j
  - parameter β_j
- If the quality of block offerable using cache $q_j^P(i)$ satisfies $q_j^P(i) > \beta_j q_j(i)$, it is regarded as "cache hit"

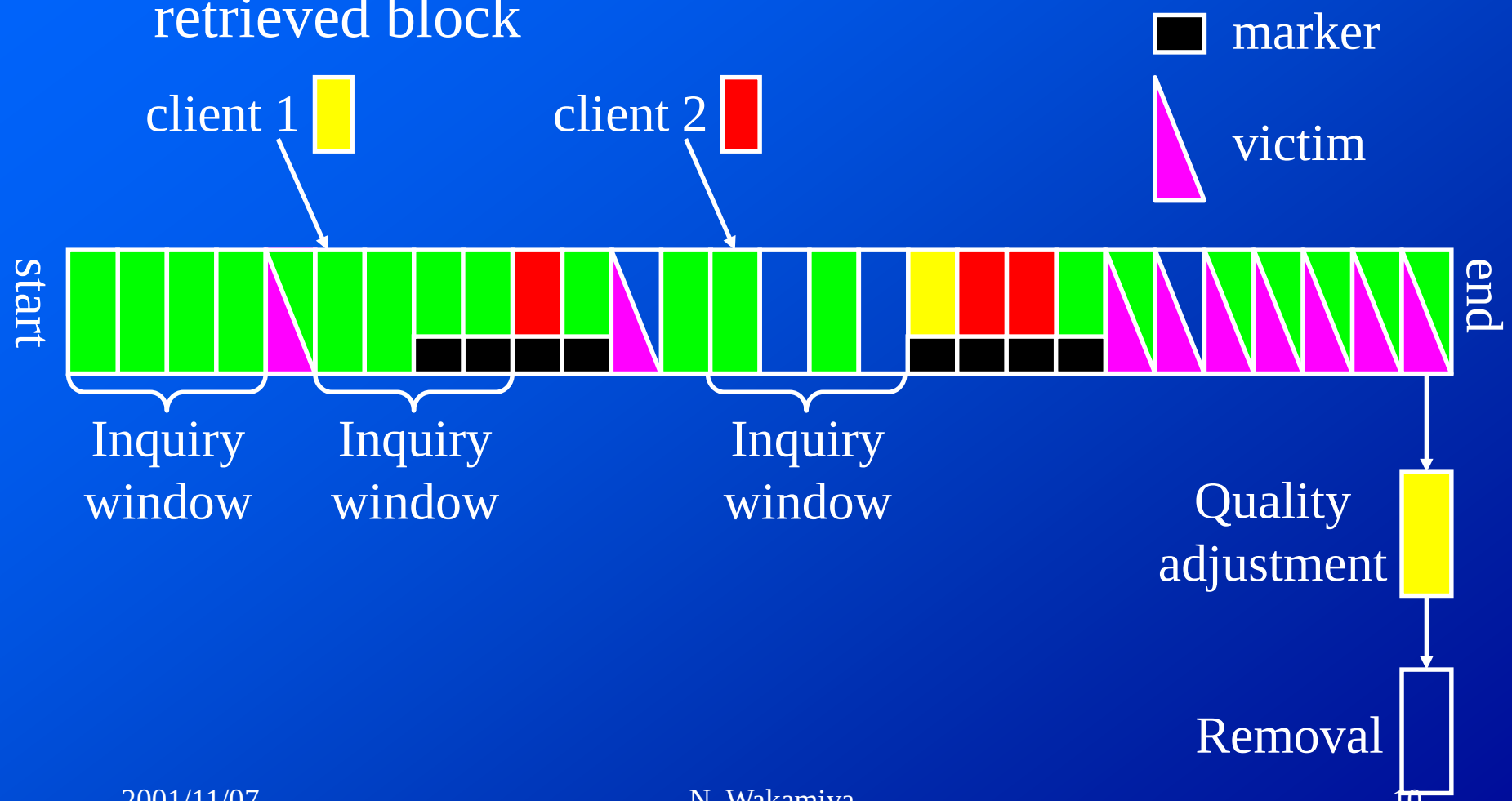
Block prefetching algorithm

- The proxy retrieves the block preparing for the future cache miss



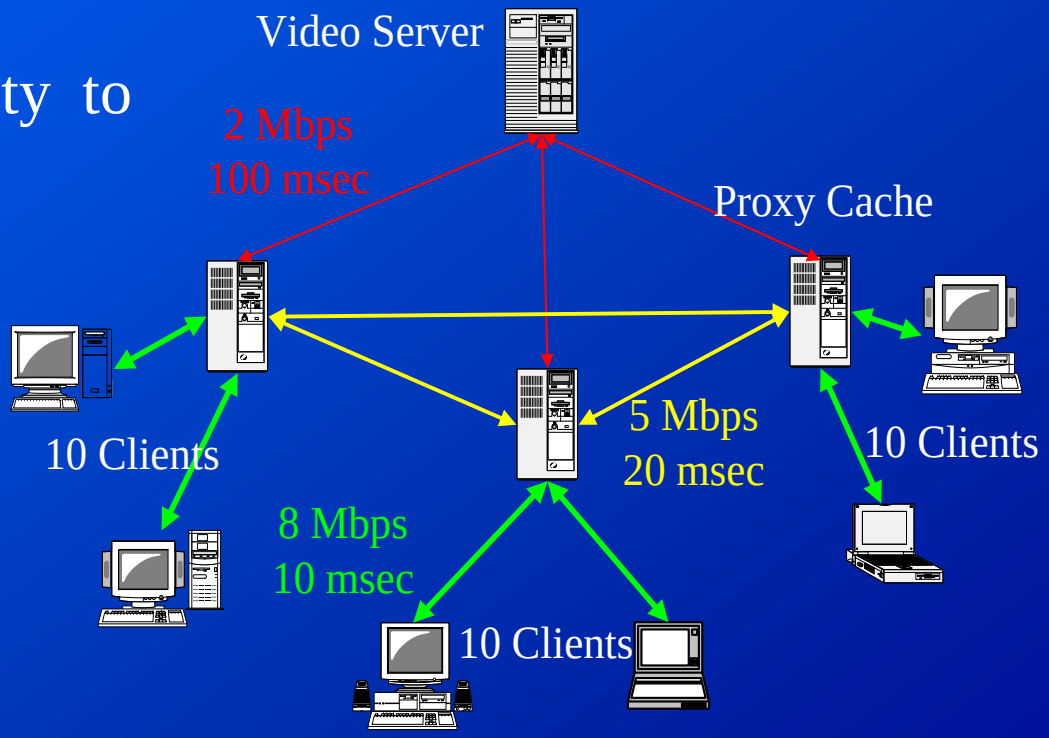
Cache replacement algorithm

- Some blocks might be replaced with a newly retrieved block



Evaluation

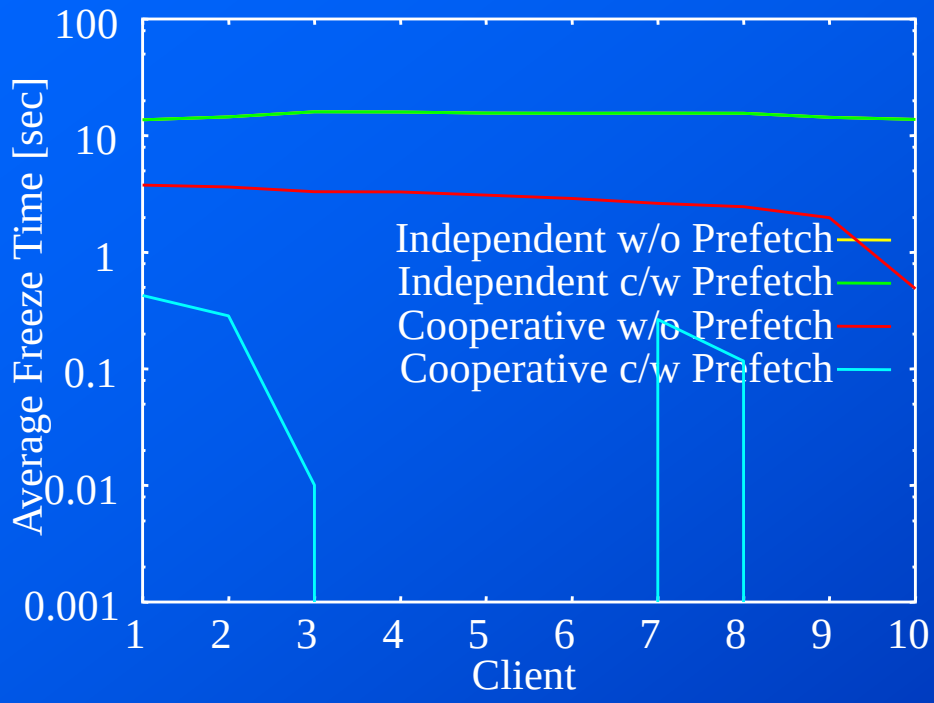
- Measurements
  - average freeze time
  - required buffer size
  - degree of satisfaction
    ratio of provided quality to requested quality

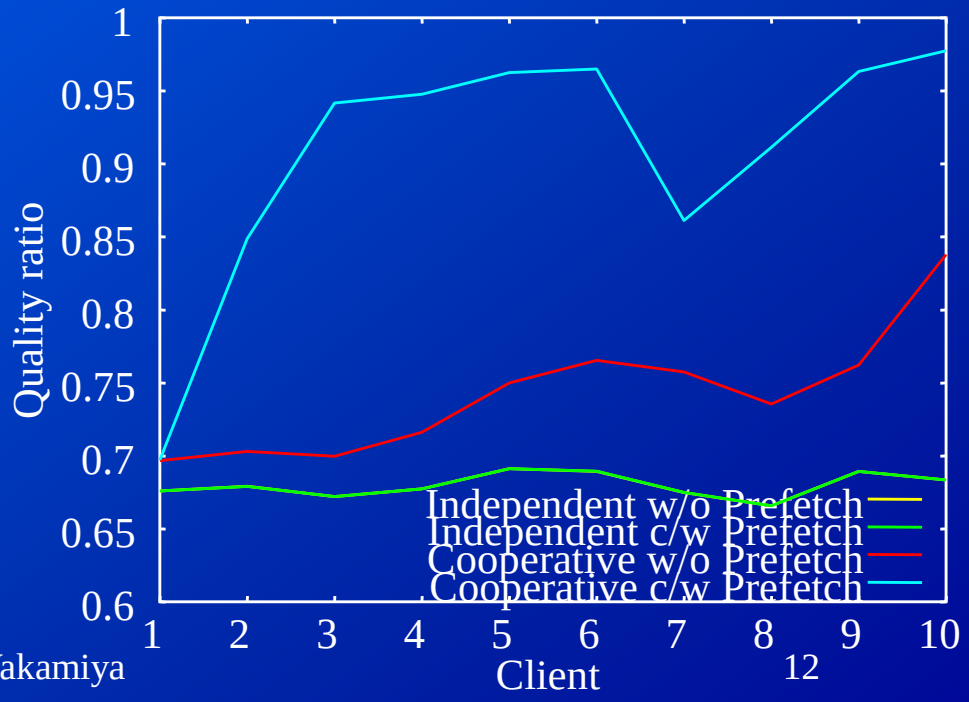


- 1 sec block
- P=10, I=20
- initial wait 4 sec
- parameter $\beta_j = 0.6$
- 35 Gbit buffer

Comparison

- Four mechanisms are compared





Conclusion

- The low-delay and high-quality video streaming service is accomplished

- Further efficient control is required
- We have to consider implementation issues