

CS 202: Advanced Operating Systems

Andrew File System

AFS: Andrew File System



Main Motivation: Scalability!!!

- > Basic idea: whole-file caching
 - Fetch the whole file for the first time
 - Update on close

AFS version 1



- When open a file for the first time, cache it
- Next time, TestAuth to determine if the file has changed

- > Performance is poor. Why?
 - Path-traversal costs are too high
 - Too many TestAuth messages

AFS version 2



- Solution
 - File identifier
 - Similar to file handle in NFS

- A callback mechanism to reduce client/server interactions
 - An analogy to polling vs. interrupts

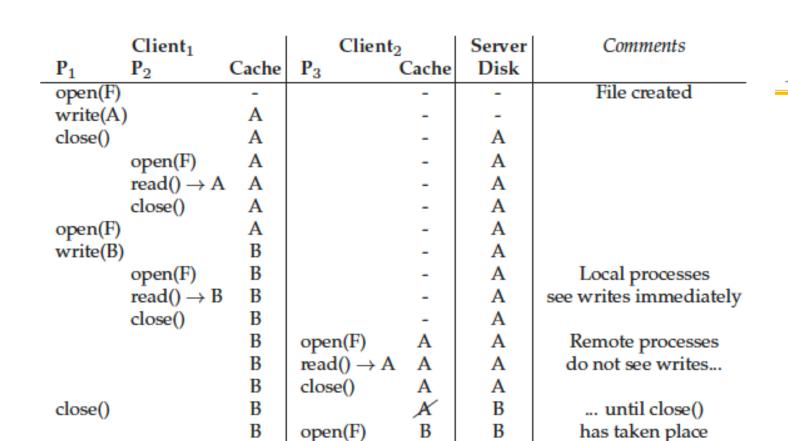
Client (C₁) Server fd = open("/home/remzi/notes.txt", ...); Send Fetch (home FID, "remzi") Receive Fetch request look for remzi in home dir setup callback(C1) on remzi return remzi's content/FID Receive Fetch reply write remzi to local disk cache record callback status of remzi Send Fetch (remzi FID, "notes.txt") Receive Fetch request look for notes.txt in remzi dir setup callback(C_1) on notes.txt return notes.txt's content/FID Receive Fetch reply write notes.txt to local disk cache record callback status of notes.txt local open () of cached notes.txt return file descriptor to application read(fd, buffer, MAX); perform local read() on cached copy close(fd); do local close () on cached copy if file has changed, flush to server fd = open("/home/remzi/notes.txt", ...); Foreach dir (home, remzi) if (callback(dir) == VALID)use local copy for lookup(dir) else Fetch (as above) if (callback(notes.txt) == VALID) open local cached copy

return file descriptor to it

Fetch (as above) then open and return fd

else





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D

D

D

open(F)

write(D)

close()

 $read() \rightarrow B$

close()

open(F)

write(C)

close()

open(F)

close()

 $read() \rightarrow D$



Unfortunately for P₃ the last writer wins

AFS Crash Recovery



If a client crashes, it treats all cache contents as suspect. Send TestAuth to the server.

If the server crashes, it asks all clients to reconstruct the callback states

Discussion Again



- Throughput
- Latency
- Scalability
- Crash Recovery
- Fault Tolerance