FIRE CLAIM

The disk file claim mechanism provides a primitives which can be used to interlock access to disk files. The claim mechanism is not logically independent of all other disk system functions and requires user cooperation if it is to work properly.

Two types of claim on an open disk file are allowed. The exclusive claim is issued to one user and only if there are no other outstanding claims on the file. The shared claim can be issued to any number of users at once. The intention of the claim mechanism design is that the exclusive claim be used to interlock file writing.
to interlock file reading. Thus, several users may safely read a file using the shared claim.

A successful exclusive claim, on the other hand, permits the user to read and write the file knowing that no other user can succeed in making any claim on the file.

The file claim mechanism is implemented using a doubly linked waiting queue. This claim wait queue is used to queue up claims which cannot be honored due to outstanding claims on the file. Whenever a claim is relinquished, the claim wait queue is checked, and a file claim is honored if the claim wait queue is non-empty, for either a single exclusive claim is honored from
the head of the queue or a sequence of shared claims is processed from the beginning of the queue. To avoid locking up a user process in the disk system, a time limit is enforced in the claim wait queue. If a claim cannot be satisfied after a wait of (one to two minutes) in the claim wait queue, an the user is removed from the queue and an error is returned from the disk system claim mechanism.

Finally, the claim wait mechanism permits only one claim per user. Any attempt to make more than one claim by a single user will cause an error to be returned.
Release Claim

IP1 C : ECS file capability for open disk file (OR REL

If there is a local claim on the file, the

global claim status is updated to reflect the

release of the claim. If the global claim status

becomes zero (i.e. no claims), the claim wait queue

is processed. Either one exclusive claimer or a

sequence of shared claimers are awakened from

the claim wait queue.

Errors

E: files, E: not file
E: files, E: no claim

E: disk index too large
E: disk index negative

type or options back

no such open disk file

no local claim
Shared Claim

TP1 C: ECS file capability for open disk file (e8.scm)

If there is no current local file claim and the file is not currently exclusively reserved, another shared claim is issued. Otherwise, the user is added to the end of the claim wait queue.

Errors:
- E-file, E: nofil
- E-file, E: exclam
- E-file, E: shalam
- E-file, E: timeout
Exclusive Claim

IP1 C: tcs file capability for open disk file

If there is no current local claim and no global claim, an exclusive claim is honored. Otherwise, the user is added to the end of the claim wait queue.

Errors:

- E.file, E.nofile
- E.file, E.oddam
- E.file, E. Khalam
- E.file, E.TIMOUT
- E.file, E. funnel
- E.file, E.oddam
- E.file, E. Khalam
- E.file, E.TIMOUT
- E.file, E. funnel
Disk File Claim

Local Data

Local File Header (LFH)

Frozen Flag  Exclusive Flag  Shared Flag

Global Data

File Header Record (FHR)

Claim Counter = 0 ⇒ No Claim
Claim Counter = -1 ⇒ Exclusive Claim
Claim Counter > 0 ⇒ Shared Claim(s)

Fr. Claim

Claim Counter  Queue Tail  Queue Head

Claim Queue

Suspense Word

Type Claim
0 = Shared
1 = Exclusive

Process Idents ('MYIDENT')

Fr. Claim

Suspense Words

-0-

-0-
ENTRY

CONVERT
GET DISK SYS
DATA
LOCK FILE

NO SUCH
OPEN FILE

ERROR
(E.FILES, E.NODFIL)

LOCAL
CLAIM ALREADY?

YES
ERROR
(E.FILES, E.EXCLAIM)
or
(E.FILES, E.ESCLAIM)

NO

ENQUE
WAIT ON CLAIM
QUEUE FOR
WAKE-UP

GLOBAL
CLAIM CSTR = 0?

NO

GLOBAL CLAIM ← 1
LOCAL EXCLUSIVE
CLAIM ← True

GLOBAL CLAIM ←
LOCAL EXCLUSIVE
CLAIM ← False

UNLOCK
UNLOCK FILE

EXIT

EXCLUSIVE CLAIM
ENTRY (TYPE CLAIM)

PLACE SELF AT END OF CLAIM QUEUE (TYPE CLAIM)

UNLOCK

UNLOCK FILE

WAIT FOR CLAIM WAKE UP OR TIME OUT

GOT CLAIM WAKE UP?

YES

LOCK

LOCK FILE

EXIT

NO

CLAIM WAKE UP ARRIVED?

YES

REMOVE SELF FROM CLAIM QUEUE

UNLOCK

UNLOCK FILE

ERROR (E.FILES, E.TIMEOUT)

ENQUE