p'3 a'1
JMB

Concurrent systems 2001 Solution

Isolation: naively: a tx may not see uncommitted state. (STRICT)
in practice: a tx may not commit until all the object values it
(2) has used are committed by prior transactions.

2PL - no difference on invocation - objects are locked by tx's
- to enforce isolation, must keep objects locked until commit (STRICT)
(5) - if isolation is not enforced, cascading aborts may occur.
Tradeoffs - delayed unlocking - vs - delay on commit & complexity of casc. abort.

TSO - non-strict - tx may be rejected as too late if timestamp (ts)
less than latest conflicting invocation ts - otherwise proceeds immediately
The tx system must then manage cascading aborts and undo
affected operation invocations. Objects need to have a commit operation
strict TSO: will still reject if "too late". If timestamp is OK - will
delay until previous conflicting operation is committed. - so object,
as before, needs a commit operation.
(5) Tradeoff is whether to delay tx on invocation or on commit

OCC - tx's work on "shadow copies" ie. different object versions
If the system used atomic commitment such shadows would
be of committed state - so isolation enforced in implementation.
But Atomic commitment is not "optimistic" - we may need fast
access to objects + conflict may be v. rare.

OCC - validation of a tx when commit is requested:
(i) are its set of object versions consistent?
- look at timestamps and time shadows were taken.
(ii) have conflicting updates been made (by other tx's) to the objects
since the shadows were taken?

Tradeoff - if (i) is false (isolation not enforced) abort tx - work/time wasted
vs. immediate access

OCC - commitment

Committed tx's values/version of objects applied with timestamp
(8) at commit.

state (object versions after commit)

$T_1(A, B, C, D, E) \rightarrow (A_1\ B_1\ C_1\ D_1\ E_1)$ (the discussion
$T_2(\ \ B, C, D\ \ ) \rightarrow (A_1\ B_2\ C_2\ D_2\ E_1)$ may use such an example).
$T_3(A,\ \ C,\ \ E) \rightarrow (A_3\ B_2\ C_3\ D_2\ E_3)$
$T_4(\ \ C, D\ \ ) \rightarrow (A_3\ B_2\ C_4, D_4\ E_3)$

(20)