1 Especificación

$[PROCESS]$

$state ::= locked \mid unlocked$

$response ::= ok \mid cantBeLessThanOne \mid cantAllowMoreReaders$
$\mid cantLockWithNullProcess \mid lockedByReader \mid errorReadNotAcquired$
$\mid lockedByWriter \mid cantSetLessThanActualReaders$
$\mid errorWriteLockedByOtherProcess \mid errorWriteNotLocked$

$\mid \; nullProcess : PROCESS$

ReadersWriterLock

$readers : \mathbb{P}\, PROCESS$
$writerLockState : state$
$writer : PROCESS$
$maxReaders : \mathbb{Z}$

InvMaxReadersPositive

$ReadersWriterLock$

$maxReaders > 0$

InvReadersLessThanMaxReaders

$ReadersWriterLock$

$\#readers \leq maxReaders$

InvNoReadersWhileWriter

$ReadersWriterLock$

$writerLockState = locked \Rightarrow readers = \emptyset$

ReadersWriterLockInit

$ReadersWriterLock$

$readers = \emptyset$
$writerLockState = unlocked$
$writer = nullProcess$
$maxReaders = 1$

– BLOQUE SET READER MAX

SetMaxReadersOk

$\Delta ReadersWriterLock$
$n? : \mathbb{Z}$
$res! : response$

$n? \geq 1$
$\#readers \leq n?$
$maxReaders' = n?$
$res! = ok$

MaxReadersIncorrectValue

$\Xi ReadersWriterLock$
$n? : \mathbb{Z}$
$res! : response$

$n? < 1$
$res! = cantBeLessThanOne$

LessThanActualReaders

$\Xi ReadersWriterLock$
$n? : \mathbb{Z}$
$res! : response$

$n? \geq 1$
$n? < \#readers$
$res! = cantBeLessThanActualReaders$

$SetMaxReadersErrors == LessThanActualReaders$
$\quad \lor\ MaxReadersIncorrectValue$

$SetMaxReaders == SetMaxReadersOk \lor SetMaxReadersErrors$

– ERRORES GENERICOS

ProcessIsWriting

$\Xi ReadersWriterLock$
$res! : response$

$writerLockState = locked$
$res! = lockedByWriter$

ProcessIsReading

$\Xi ReadersWriterLock$
$res! : response$

$readers \neq \emptyset$
$res! = lockedByReader$

CantLockWithNullProcess

$\Xi ReadersWriterLock$
$p? : PROCESS$
$res! : response$

$p? = nullProcess$
$res! = cantLockWithNullProcess$

– BLOQUE ACQUIRE READ

AcquireReadOk

$\Delta ReadersWriterLock$
$p? : PROCESS$
$res! : response$

$writerLockState = unlocked$
$\#readers + 1 \leq maxReaders$
$readers' = readers \cup \{p?\}$
$res! = ok$

MaxReadersReached

$\Xi ReadersWriterLock$
$res! : response$

$\#readers = maxReaders$
$res! = cantAllowMoreReaders$

$AcquireReadError == MaxReadersReached \lor ProcessIsWriting$
$\lor CantLockWithNullProcess$

$AcquireReader == AcquireReadOk \lor AcquireReadError$

– BLOQUE ACQUIRE WRITE

AcquireWriteOk

$\Delta ReadersWriterLock$
$p? : PROCESS$
$res! : response$

$writerLockState = unlocked$
$readers = \emptyset$
$writer' = p?$
$writerLockState' = locked$
$res! = ok$

$AcquireWriteError == ProcessIsReading \lor ProcessIsWriting \lor CantLockWithNullProcess$

$AcquireWrite == AcquireWriteOk \lor AcquireWriteError$

– BLOQUE RELEASE READ

ReleaseReadOk

$\Delta ReadersWriterLock$
$p? : PROCESS$
$res! : response$

$p? \in readers$
$readers' = readers \setminus \{p?\}$
$res! = ok$

ReadNotAcquired

$\Xi ReadersWriterLock$
$p? : PROCESS$
$res! : response$

$p? \notin readers$
$res! = errorReadNotAcquired$

$ReleaseRead == ReleaseReadOk \lor ReadNotLocked$

– BLOQUE RELEASE WRITE

ReleaseWriteOk

$\Delta ReadersWriterLock$
$p? : PROCESS$
$res! : response$

$writerLockState = locked$
$writer = p?$
$writerLockState' = unlocked$
$writer' = nullProcess$
$res! = ok$

WriteNotLocked

$\Xi ReadersWriterLock$
$res! : response$

$writerLockState = unlocked$
$res! = errorWriteNotLocked$

LockedByOtherProcess

$\Xi ReadersWriterLock$
$p? : PROCESS$
$res! : response$

$writerLockState = locked$
$writer \neq p?$
$res! = errorWriteLockedByOtherProcess$

$ReleaseWriteError == WriteNotLocked \lor LockedByOtherProcess$
$ReleaseWrite == ReleaseWriteOk \lor ReleaseWriteError$