

CLAIMS

1. A computer implemented method for a dual mode reader writer lock, the computer implemented method comprising:

5 determining a contention condition in using an original lock, the original lock corresponding to a resource available on a data processing system, the original lock managing read access and write access to the resource by a plurality of processes executing in the data processing system;

10 creating a set of expanded locks for use in conjunction with the original lock, the original lock and the set of expanded locks forming the dual mode reader writer lock, the dual mode reader writer lock operating to manage the read access and write access to the resource;

15 indexing using an index within the original lock, each expanded lock in the set of expanded locks such that each expanded lock is locatable using the index; and

resolving the contention condition by distributing requests for acquiring and releasing the read access and write access to the resource by the plurality of processes across the original lock and the set of expanded locks.

2. The computer implemented method of claim 1, wherein the original lock is a modified form of a preexisting reader writer lock such that the preexisting reader writer lock can hold a set of identifiers usable in operating in conjunction with the set of expanded locks, the computer implemented method further comprising:

25 designating an expanded lock in the set of expanded lock as a reader lock whereby the designated expanded lock is usable for acquiring, holding, and releasing only a read lock on the resource.

3. The computer implemented method of claim 1 or 2, further comprising:

receiving from a process, a request to one of (i) acquire, and (ii) release, a read lock on the resource; and

30 assigning the request to an expanded lock in the dual mode reader writer lock.

4. The computer implemented method of claim 3, wherein a second request from the process to one of (i) acquire, and (ii) release, a write lock on the resource is assigned to the original lock.

5. The computer implemented method of claim 3 or 4, wherein the expanded lock is selected from the set of expanded locks by computing an index value from an identifier associated with the process, the index value resolving to the expanded lock.

6. The computer implemented method of claim 3, 4 or 5, wherein the expanded lock is selected from the set of expanded locks such that the expanded lock has an affinity to a processor of the data processing system.

7. The computer implemented method of any preceding claim, further comprising: receiving a request to one of (i) acquire, and (ii) release, a write lock on the resource; and assigning the request to the original lock in the dual mode reader writer lock.

8. The computer implemented method of any preceding claim, wherein the dual mode reader writer lock operates in a first mode using only the original lock when the contention condition does not exist, wherein the dual mode reader writer lock operates in a second mode using the original lock and the set of expanded locks when the contention condition exists, wherein the dual mode reader writer lock switches from the first mode to the second mode when the contention condition arises, and wherein the dual mode reader writer lock switches from the second mode to the first mode when the contention condition abates.

9. The computer implemented method of claim 8, wherein the switching from the first mode to the second mode removes the contention condition by allowing a plurality of atomic operations for locks on the resource to concurrently execute on one of (i) the original lock and an expanded lock in the set of expanded locks, and (ii) two expanded locks in the set of expanded locks.

10. The computer implemented method of any preceding claim, further comprising:
allocating a region in a memory for use as locks, wherein the creating the set of
expanded locks designates a set of spaces for the set of expanded locks in the region.

5 11. A computer usable program product comprising a computer usable storage medium
including computer usable code for a dual mode reader writer lock, the computer usable
code comprising:

computer usable code for determining a contention condition in using an original
lock, the original lock corresponding to a resource available on a data processing system, the
10 original lock managing read access and write access to the resource by a plurality of
processes executing in the data processing system;

computer usable code for creating a set of expanded locks for use in conjunction with
the original lock, the original lock and the set of expanded locks forming the dual mode
reader writer lock, the dual mode reader writer lock operating to manage the read access and
15 write access to the resource;

computer usable code for indexing using an index within the original lock, each
expanded lock in the set of expanded locks such that each expanded lock is locatable using
the index; and

computer usable code for resolving the contention condition by distributing requests
20 for acquiring and releasing the read access and write access to the resource by the plurality
of processes across the original lock and the set of expanded locks.

12. The computer usable program product of claim 11, wherein the original lock is a
modified form of a preexisting reader writer lock such that the preexisting reader writer lock
25 can hold a set of identifiers usable in operating in conjunction with the set of expanded
locks, the computer usable program product further comprising:

computer usable code for designating an expanded lock in the set of expanded lock
as a reader lock whereby the designated expanded lock is usable for acquiring, holding, and
30 releasing only a read lock on the resource.

13. The computer usable program product of claim 11 or 12, further comprising:

computer usable code for receiving from a process, a request to one of (i) acquire, and (ii) release, a read lock on the resource; and

computer usable code for assigning the request to an expanded lock in the dual mode reader writer lock.

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14. The computer usable program product of claim 13, wherein a second request from the process to one of (i) acquire, and (ii) release, a write lock on the resource is assigned to the original lock.

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15. The computer usable program product of claim 13 or 14, wherein the expanded lock is selected from the set of expanded locks by computing an index value from an identifier associated with the process, the index value resolving to the expanded lock.

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16. The computer usable program product of claim 13, 14 or 15, wherein the expanded lock is selected from the set of expanded locks such that the expanded lock has an affinity to a processor of the data processing system.

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17. The computer usable program product of any of claims 11 to 16, further comprising:
computer usable code for receiving a request to one of (i) acquire, and (ii) release, a write lock on the resource; and
computer usable code for assigning the request to the original lock in the dual mode reader writer lock.

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18. The computer usable program product of any of claims 11 to 17,
wherein the dual mode reader writer lock operates in a first mode using only the original lock when the contention condition does not exist,

wherein the dual mode reader writer lock operates in a second mode using the original lock and the set of expanded locks when the contention condition exists,

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wherein the dual mode reader writer lock switches from the first mode to the second mode when the contention condition arises, and

wherein the dual mode reader writer lock switches from the second mode to the first mode when the contention condition abates.

19. The computer usable program product of claim 18, wherein the switching from the first mode to the second mode removes the contention condition by allowing a plurality of atomic operations for locks on the resource to concurrently execute on one of (i) the original lock and an expanded lock in the set of expanded locks, and (ii) two expanded locks in the set of expanded locks.

20. The computer usable program product of any of claims 11 to 19, further comprising: allocating a region in a memory for use as locks, wherein the creating the set of expanded locks designates a set of spaces for the set of expanded locks in the region.

21. The computer usable program product of any of claims 11 to 20, wherein the computer usable code is stored in a computer readable storage medium in a data processing system, and wherein the computer usable code is transferred over a network from a remote data processing system.

22. The computer usable program product of any of claims 11 to 21, wherein the computer usable code is stored in a computer readable storage medium in a server data processing system, and wherein the computer usable code is downloaded over a network to a remote data processing system for use in a computer readable storage medium associated with the remote data processing system.

23. A data processing system for a dual mode reader writer lock, the data processing system comprising:

a storage device including a storage medium, wherein the storage device stores computer usable program code; and

a processor, wherein the processor executes the computer usable program code, and wherein the computer usable program code comprises:

computer usable code for determining a contention condition in using an original lock, the original lock corresponding to a resource available on a data processing system, the original lock managing read access and write access to the resource by a plurality of processes executing in the data processing system;

computer usable code for creating a set of expanded locks for use in conjunction with the original lock, the original lock and the set of expanded locks forming the dual mode reader writer lock, the dual mode reader writer lock operating to manage the read access and write access to the resource;

5 computer usable code for indexing using an index within the original lock, each expanded lock in the set of expanded locks such that each expanded lock is locatable using the index; and

10 computer usable code for resolving the contention condition by distributing requests for acquiring and releasing the read access and write access to the resource by the plurality of processes across the original lock and the set of expanded locks.

24. The data processing system of claim 23, wherein the original lock is a modified form of a preexisting reader writer lock such that the preexisting reader writer lock can hold a set of identifiers usable in operating in conjunction with the set of expanded locks, the data
15 processing system further comprising:

computer usable code for designating an expanded lock in the set of expanded lock as a reader lock whereby the designated expanded lock is usable for acquiring, holding, and releasing only a read lock on the resource.

20 25. The data processing system of claim 23 or 24, further comprising:

computer usable code for receiving from a process, a request to one of (i) acquire, and (ii) release, a read lock on the resource; and

25 computer usable code for assigning the request to an expanded lock in the dual mode reader writer lock.

26. The data processing system of claim 25, wherein a second request from the process to one of (i) acquire, and (ii) release, a write lock on the resource is assigned to the original lock.

30 27. The data processing system of claim 25 or 26, wherein the expanded lock is selected from the set of expanded locks by computing an index value from an identifier associated with the process, the index value resolving to the expanded lock.

28. The data processing system of claim 25, 26 or 27, wherein the expanded lock is selected from the set of expanded locks such that the expanded lock has an affinity to a processor of the data processing system.

5 29. The data processing system of any of claims 23 to 28, further comprising:
computer usable code for receiving a request to one of (i) acquire, and (ii) release, a write lock on the resource; and
computer usable code for assigning the request to the original lock in the dual mode reader writer lock.

10 30. The data processing system of any of claims 23 to 29,
wherein the dual mode reader writer lock operates in a first mode using only the original lock when the contention condition does not exist,
wherein the dual mode reader writer lock operates in a second mode using the
15 original lock and the set of expanded locks when the contention condition exists,
wherein the dual mode reader writer lock switches from the first mode to the second mode when the contention condition arises, and
wherein the dual mode reader writer lock switches from the second mode to the first mode when the contention condition abates.

20 31. The data processing system of claim 30, wherein the switching from the first mode to the second mode removes the contention condition by allowing a plurality of atomic operations for locks on the resource to concurrently execute on one of (i) the original lock and an expanded lock in the set of expanded locks, and (ii) two expanded locks in the set of
25 expanded locks.

32. The data processing system of any of claims 23 to 31, further comprising:
allocating a region in a memory for use as locks, wherein the creating the set of expanded locks designates a set of spaces for the set of expanded locks in the region.

CLAIMS

1. A computer implemented method for a dual mode reader writer lock, the computer implemented method comprising:

determining a contention condition in using an original lock, the original lock corresponding to a resource available on a data processing system, the original lock managing read access and write access to the resource by a plurality of processes executing in the data processing system;

creating a set of expanded locks for use in conjunction with the original lock, the original lock and each of the expanded lock elements in the set of expanded lock elements operates as a lock associated with the resource, the original lock and the set of expanded locks forming the dual mode reader writer lock such that data of the read access and write access to the resource is maintained in a combination of the original lock and an expanded lock, the dual mode reader writer lock operating to manage the read access and write access to the resource, modes of operating of the dual mode reader writer lock comprising a first mode of operating by using only the original lock as a reader writer lock (RWL) and a second mode of operating by using a combination of the original lock and at least one expanded lock from the set of expanded locks;

indexing using an index within the original lock, each expanded lock in the set of expanded locks such that each expanded lock is locatable using the index; and

resolving the contention condition by distributing requests for acquiring and releasing the read access and write access to the resource by the plurality of processes across the original lock and the set of expanded locks.

2. The computer implemented method of claim 1, wherein the original lock is a modified form of a preexisting reader writer lock such that the preexisting reader writer lock can hold a set of identifiers usable in operating in conjunction with the set of expanded locks, the computer implemented method further comprising:

designating an expanded lock in the set of expanded lock as a reader lock whereby the designated expanded lock is usable for acquiring, holding, and releasing only a read lock on the resource.

3. The computer implemented method of claim 1 or 2, further comprising:
receiving from a process, a request to one of (i) acquire, and (ii) release, a read lock on the resource; and
assigning the request to an expanded lock in the dual mode reader writer lock.
4. The computer implemented method of claim 3, wherein a second request from the process to one of (i) acquire, and (ii) release, a write lock on the resource is assigned to the original lock.
5. The computer implemented method of claim 3 or 4, wherein the expanded lock is selected from the set of expanded locks by computing an index value from an identifier associated with the process, the index value referring to the expanded lock.
6. The computer implemented method of claim 3, 4 or 5, wherein the expanded lock is selected from the set of expanded locks such that the expanded lock has an affinity to a processor of the data processing system.
7. The computer implemented method of any preceding claim, further comprising:
receiving a request to one of (i) acquire, and (ii) release, a write lock on the resource;
and
assigning the request to the original lock in the dual mode reader writer lock.
8. The computer implemented method of any preceding claim,
wherein the dual mode reader writer lock operates in a first mode using only the original lock when the contention condition does not exist,

wherein the dual mode reader writer lock operates in a second mode using the original lock and the set of expanded locks when the contention condition exists,

wherein the dual mode reader writer lock switches from the first mode to the second mode when the contention condition arises, and

wherein the dual mode reader writer lock switches from the second mode to the first mode when the contention condition abates.

9. The computer implemented method of claim 8, wherein the switching from the first mode to the second mode removes the contention condition by allowing a plurality of atomic operations for locks on the resource to concurrently execute on one of (i) the original lock and an expanded lock in the set of expanded locks, and (ii) two expanded locks in the set of expanded locks.

10. A computer usable program product comprising a computer usable storage medium including computer usable code for a dual mode reader writer lock, the computer usable code comprising:

computer usable code for determining a contention condition in using an original lock, the original lock corresponding to a resource available on a data processing system, the original lock managing read access and write access to the resource by a plurality of processes executing in the data processing system;

computer usable code for creating a set of expanded locks for use in conjunction with the original lock, the original lock and each of the expanded lock elements in the set of expanded lock elements operates as a lock associated with the resource, the original lock and the set of expanded locks forming the dual mode reader writer lock such that data of the read access and write access to the resource is maintained in a combination of the original lock and an expanded lock, the dual mode reader writer lock operating to manage the read access and write access to the resource, modes of operating of the dual mode reader writer lock comprising a first mode of operating by using only the original lock as a reader writer lock (RWL) and a second mode of operating by using a combination of the original lock and at least one expanded lock from the set of expanded locks;

computer usable code for indexing using an index within the original lock, each expanded lock in the set of expanded locks such that each expanded lock is locatable using the index; and

computer usable code for resolving the contention condition by distributing requests for acquiring and releasing the read access and write access to the resource by the plurality of processes across the original lock and the set of expanded locks.

11. A data processing system for a dual mode reader writer lock, the data processing system comprising:

a storage device including a storage medium, wherein the storage device stores computer usable program code; and

a processor, wherein the processor executes the computer usable program code, and wherein the computer usable program code comprises:

computer usable code for determining a contention condition in using an original lock, the original lock corresponding to a resource available on a data processing system, the original lock managing read access and write access to the resource by a plurality of processes executing in the data processing system;

computer usable code for creating a set of expanded locks for use in conjunction with the original lock, the original lock and each of the expanded lock elements in the set of expanded lock elements operates as a lock associated with the resource, the original lock and the set of expanded locks forming the dual mode reader writer lock such that data of the read access and write access to the resource is maintained in a combination of the original lock and an expanded lock, the dual mode reader writer lock operating to manage the read access and write access to the resource, modes of operating of the dual mode reader writer lock comprising a first mode of operating by using only the original lock as a reader writer lock (RWL) and a second mode of operating by using a combination of the original lock and at least one expanded lock from the set of expanded locks;

computer usable code for indexing using an index within the original lock, each expanded lock in the set of expanded locks such that each expanded lock is locatable using the index; and

computer usable code for resolving the contention condition by distributing requests for acquiring and releasing the read access and write access to the resource by the plurality of processes across the original lock and the set of expanded locks.

12. The invention of claim 10 or 11, wherein the original lock is a modified form of a preexisting reader writer lock such that the preexisting reader writer lock can hold a set of identifiers usable in operating in conjunction with the set of expanded locks, the data processing system further comprising:

computer usable code for designating an expanded lock in the set of expanded lock as a reader lock whereby the designated expanded lock is usable for acquiring, holding, and releasing only a read lock on the resource.

13. The invention of claim 10, 11 or 12, further comprising:

computer usable code for receiving from a process, a request to one of (i) acquire, and (ii) release, a read lock on the resource; and

computer usable code for assigning the request to an expanded lock in the dual mode reader writer lock.

14. The invention of claim 13, wherein a second request from the process to one of (i) acquire, and (ii) release, a write lock on the resource is assigned to the original lock.

15. The invention of claims 13 or 14, wherein the expanded lock is selected from the set of expanded locks by computing an index value from an identifier associated with the process, the index value referring to the expanded lock.

16. The invention of any of claims 13, 14, or 15, wherein the expanded lock is selected from the set of expanded locks such that the expanded lock has an affinity to a processor of the data processing system.

17. The invention of any of claims 10-16, further comprising:
 - computer usable code for receiving a request to one of (i) acquire, and (ii) release, a write lock on the resource; and
 - computer usable code for assigning the request to the original lock in the dual mode reader writer lock.

18. The invention of any of claims 10-18,
 - wherein the dual mode reader writer lock operates in a first mode using only the original lock when the contention condition does not exist,
 - wherein the dual mode reader writer lock operates in a second mode using the original lock and the set of expanded locks when the contention condition exists,
 - wherein the dual mode reader writer lock switches from the first mode to the second mode when the contention condition arises, and
 - wherein the dual mode reader writer lock switches from the second mode to the first mode when the contention condition abates.

19. The invention of claim 18, wherein the switching from the first mode to the second mode removes the contention condition by allowing a plurality of atomic operations for locks on the resource to concurrently execute on one of (i) the original lock and an expanded lock in the set of expanded locks, and (ii) two expanded locks in the set of expanded locks.

20. The invention of any of the preceding claims, further comprising:
 - allocating a region in a memory for use as locks, wherein the creating the set of expanded locks designates a set of spaces for the set of expanded locks in the region.