



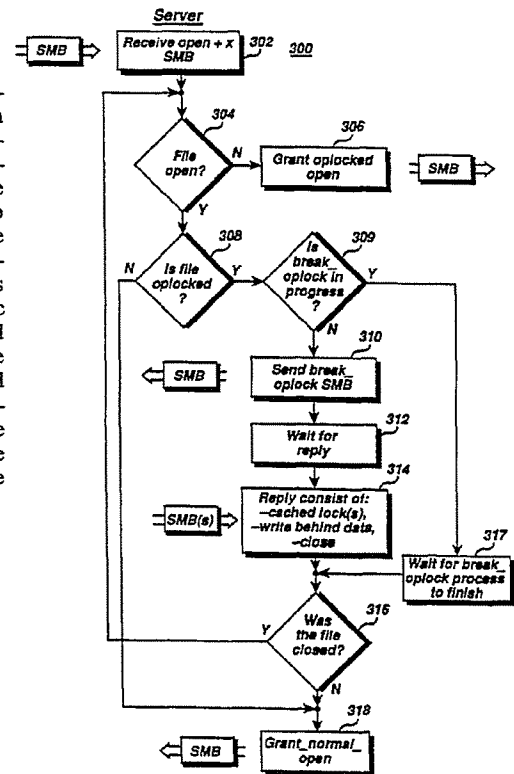
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<p>(21) International Application Number: PCT/US90/04570 (22) International Filing Date: 14 August 1990 (14.08.90) (30) Priority data: 394,324 14 August 1989 (14.08.89) US (71) Applicant: MICROSOFT CORPORATION [US/US]; One Microsoft Way, Redmond, WA 98052-6399 (US). (72) Inventors: MASDEN, Kenneth, E. ; 14504 N.E. 77th Street, Redmond, WA 98052 (US). SMIRL, John, D. ; 8215 N.E. 115th Place, Kirkland, WA 98034 (US). KING, John, W. ; 1942 3rd Street, Kirkland, WA 98033 (US). RUBIN, Darryl, E. ; 17707 N.E. 141st St., Redmond, WA 98052 (US).</p>	<p>(74) Agents: JACOBSON, James, E., Jr. et al.; Seed and Berry, 6300 Columbia Center, Seattle, WA 98104-7092 (US). (81) Designated States: AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH (European patent), CM (OAPI patent), DE (European patent)*, DK (European patent), ES (European patent), FI, FR (European patent), GA (OAPI patent), GB (European patent), HU, IT (European patent), JP, KR, LK, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL (European patent), NO, RO, SD, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent). <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	

(54) Title: METHOD AND SYSTEM FOR OPPORTUNISTIC LOCKING IN A NETWORKED COMPUTER SYSTEM

(57) Abstract

The present invention contemplates a method and means for improving the performance of distributed computer systems including a file server and a plurality of remote workstations. In operation, a request is issued from one of the remote workstations to open a file or record resident on the file server in a sharing mode. The system of the present invention automatically converts the sharing mode request into a request to open the file or record in an opportunistic locked exclusive mode. The file server then determines whether the requested file or record has been opened by another workstation. If the file or record is not currently open, the file or record is opened in the opportunistic locked exclusive mode and the file or record is processed and cached locally in a system workstation. If the file or record is already open, the file is opened in the conventional sharing mode. If the file or record opened in the opportunistic locked exclusive mode is requested by another client, the locally cached data is written to the file server and the system reverts to the conventional sharing mode. The system of the present invention is also compatible with conventional exclusive mode operation which may be manually requested by a client.



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## Description

### METHOD AND SYSTEM FOR OPPORTUNISTIC LOCKING IN A NETWORKED COMPUTER SYSTEM

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#### Field of the Invention

This invention relates to the field of computer networks and, more specifically, to a method and means for improving the speed and performance of a networked computer system.

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#### Background of the Invention

Computer networks are a well-known computer architecture wherein users of the network are typically located in many diverse locations. Computer networks are adapted for use with independent computer systems, each having local file storage capability, as well as diskless terminal-type systems wherein master files are stored on a single file server.

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One popular use for distributed computer systems is database management. In a multiuser environment, it is important that all users of the database have access to current information as each user of the system is permitted to make changes to the database at will. Therefore, database files are typically resident on a single-system file server. When accessing a database with remote workstations, the remote workstations typically issue requests to the system file server to retrieve the desired information. As an entry in the file is updated or modified, the new information is sent from the workstation to the file server so that all "clients" in the system have access to current information. For example, in multiuser database applications, many clients have access to all records in the database. If a client reads and updates a record, and a second client reads the same record before the master file is updated, each client will have

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inconsistent versions of the same record. Most database applications include some provision to avoid the problem of inconsistent data. Typically, while operating in a sharing mode, a client issues a request to open and lock  
5 specified records in the database. The specified records are then read and modified. The modified records are then written to the master file on the server and the records are then unlocked and closed. While the records are locked, no other client has access  
10 to the record. While this technique prevents inconsistent data, the process of opening, locking, reading, writing, closing, and unlocking files or records may result in as many as eight messages across the computer network.

15 In many computer networks, it is common for only a single user to be using the network at any one time and inconsistent data is not possible. In this situation, the process of opening, locking, reading, writing, unlocking, and closing files or records results  
20 in wasted time and increased system overhead.

The present invention overcomes the above-mentioned problem by allowing network workstations to automatically operate in an opportunistic locked exclusive mode when files are only used by single  
25 clients and by automatically switching to a conventional sharing mode when file data is required by multiple clients. In the opportunistic locked exclusive mode, files or records are processed and cached locally, thus eliminating a large portion of network messaging  
30 traffic. If another client requires access to the file, the locally cached data is written to the file server, and the system reverts to sharing mode operation.

#### Summary and Objects of the Invention

35 In summary, the present invention contemplates a method and means for improving the performance of distributed computer systems including a file server and

a plurality of remote workstations. In operation, a request is issued from one of the remote workstations to open a file or record resident on the file server in a sharing mode. The system of the present invention  
5 automatically converts the sharing mode request into a request to open the file or record in an opportunistic locked exclusive mode. The file server then determines whether the requested file or record has been opened by another workstation. If the file or record is not  
10 currently open, the file or record is opened in the opportunistic locked exclusive mode and the file or record is processed and cached locally in a system workstation. If the file or record is already open, the file is opened in the conventional sharing mode. If the  
15 file or record opened in the opportunistic locked exclusive mode is requested by another client, the locally cached data is written to the file server and the system reverts to the conventional sharing mode. The system of the present invention is also compatible  
20 with conventional exclusive mode operation which may be manually requested by a client.

Accordingly, it is an object of the present invention to provide a method and means for improving the performance of a networked computer system.

25 It is another object of the present invention to eliminate the system overhead of workstations operating in a sharing mode when file services are only required by a single workstation at a given point in time.

30 It is another object of the present invention to provide a method and means for automatically switching workstations between an opportunistic locked exclusive mode and a sharing mode based on the number of users requiring access to files resident on a file  
35 server.

It is another object of the present invention to provide opportunistic exclusive locked mode operation

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