(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 July 2003 (24.07.2003)

PCT

(10) International Publication Number
WO 2003/060705 A3

(51) International Patent Classification[7]: G06F 9/46

(21) International Application Number:
PCT/US2003/000876

(22) International Filing Date: 10 January 2003 (10.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/347,773	11 January 2002 (11.01.2002)	US
60/373,359	17 April 2002 (17.04.2002)	US

(71) Applicant: **SUN MICROSYSTEMS, INC.** [US/US]; 4150 Network Circle, Santa Clara, CA 95054 (US).

(72) Inventors: **MOIR, Mark, S.**; 108 Liberty Road, #2, Somerville, MA 02144 (US). **LUCHANGCO, Victor**; 29A Lewis Ave., Arlington, MA 02474 (US). **HERLIHY, Maurice**; 18 Russell St, Brookline, MA 02446 (US).

(74) Agents: **ZAGORIN O'BRIEN & GRAHAM LLP, O'BRIEN, DAVID, W. ET AL.** et al.; 401 West 15th Street, Suite 870, Austin, TX 78701 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.

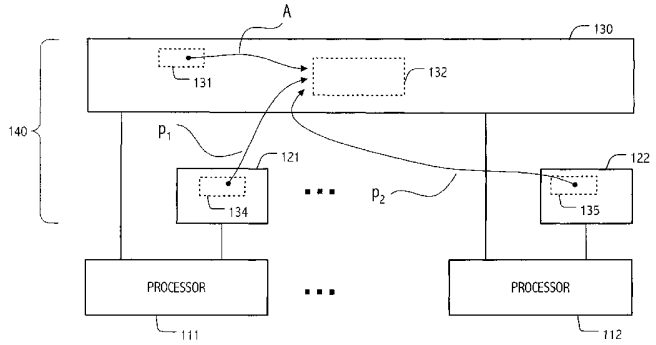
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
1 July 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: LOCK-FREE IMPLEMENTATION OF DYNAMIC-SIZED SHARED DATA STRUCTURE



(57) Abstract: Solutions to a value recycling problem that we define herein facilitate implementations of computer programs that may execute as multithreaded computations in multiprocessor computers, as well as implementations of related shared data structures. Some exploitations of the techniques described herein allow non-blocking, shared data structures to be implemented using standard dynamic allocation mechanisms (such as malloc and free). A variety of solutions to the proposed value recycling problem may be implemented. A class of general solutions to value recycling is described in the context of an illustration we call the Repeat Offender Problem (ROP), including illustrative Application Program Interfaces (APIs) defined in terms of the ROP terminology. Furthermore, specific solutions, implementations and algorithm, including a Pass-The-Buck (PTB) implementation are also described. Solutions to the value recycling problem can be applied in a variety of ways to implement dynamic-sized data structures. For example, specific solutions are illustrated in the context of particular shared data structures and algorithms, e.g., a lock-free FIFO queue for which we demonstrate true dynamic sizing. In some cases, data structure implementations may be directly coded in ways that exploit the value recycling techniques described herein. In others, a single-word lock-free reference counting (SLFRC) technique (which builds on a value recycling solution) may be employed to transform, in a straight-forward manner, many lock-free data structure implementations that assume garbage collection (i.e., which do not explicitly free memory) into dynamic-sized data structures.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/00876

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06F9/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AGESEN O ET AL: "DCAS-BASED CONCURRENT DEQUES" SPAA 2000. 12TH. ANNUAL ACM SYMPOSIUM ON PARALLEL ALGORITHMS AND ARCHITECTURES. BAR HARBOR, ME, JULY 9 - 12, 2000, ANNUAL ACM SYMPOSIUM ON PARALLEL ALGORITHMS AND ARCHITECTURES, NEW YORK, NY : ACM, US, 9 July 2000 (2000-07-09), pages 137-146, XP002172095 ISBN: 1-58113-185-2 abstract page 138, left-hand column, line 18 - line 37 page 141, right-hand column, line 9 - page 142, right-hand column, line 20 page 143, right-hand column, line 9 - line 21 figure 11 ----- -/--	1-32

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
6 May 2004	18/05/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Archontopoulos, E

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

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PCT/US 03/00876

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 319 778 A (CATINO ROBERT J) 7 June 1994 (1994-06-07) abstract column 2, line 5 - line 18 column 5, line 15 - line 67 column 11, line 5 - column 12, line 23	1-32
A	ARORA N S ET AL: "THREAD SCHEDULING FOR MULTIPROGRAMMED MULTIPROCESSORS" SPAA '97. 10TH. ANNUAL ACM SYMPOSIUM ON PARALLEL ALGORITHMS AND ARCHITECTURES. PUERTO VALLARTA, MEXICO, JUNE 28 - JULY 2, 1998, ANNUAL ACM SYMPOSIUM ON PARALLEL ALGORITHMS AND ARCHITECTURES, NEW YORK, NY : ACM, US, 28 June 1998 (1998-06-28), pages 119-129, XP002172092 ISBN: 0-89791-989-0 paragraph '03.2! - paragraph '03.3! abstract	1-32

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 03/00876

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5319778 A	07-06-1994	NONE	