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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 April 2005 (28.04.2005)

PCT

(10) International Publication Number
WO 2005/038630 A3

(51) International Patent Classification:
G06F 9/45 (2006.01)

(21) International Application Number:
PCT/US2004/034422

(22) International Filing Date: 18 October 2004 (18.10.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/511,649	17 October 2003 (17.10.2003)	US
pct/us/04/30029	15 September 2004 (15.09.2004)	US
10/964,830	15 October 2004 (15.10.2004)	US

(71) Applicant and
(72) Inventor: **PLUM, Thomas, S.** [US/US]; 3 Waihona Box 44610, Kamuela, HI 96743 (US).

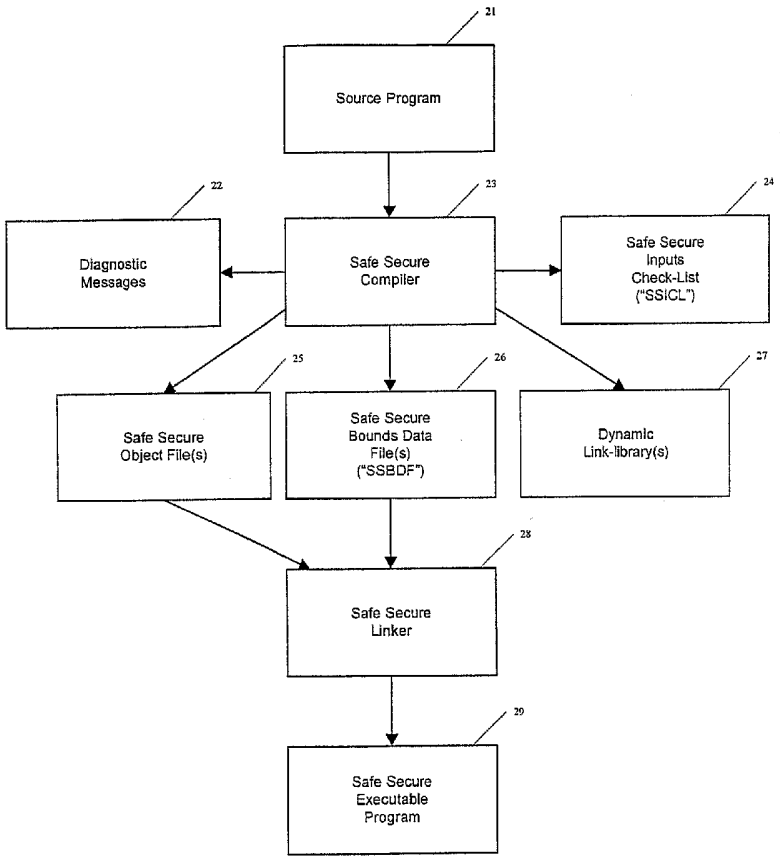
(74) Agent: **FARIS, Robert, W.**; Nixon & Vanderhye P.C., 901 North Glebe Road, Arlington, VA 22203 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, 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, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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

[Continued on next page]

(54) Title: AUTOMATED SAFE SECURE TECHNIQUES FOR ELIMINATING UNDEFINED BEHAVIOR IN COMPUTER SOFTWARE



(57) Abstract: Automated (e.g., compiler implemented) techniques provide safe secure software development addressing undefined behaviors in C and C++ programming languages used source input files. A secure compiler (23) automatically identifies and/or eliminates all undefined behaviors of the input files (21) by maintaining a bounds data file as records (26) of requirements for the behavior of the programm constructs at link time. The compilor also uses a parse tree and cheksum information in order to determine the above bounds requirements and guarantees the appropriate behavior for the symbols of the object file (25) to be produced. Such link time (28) determination includes generating of fatal diagnostic messages (22) in situations that undefined behaviors would result.

WO 2005/038630 A3

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:
11 May 2006

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.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US04/34422

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **G06F 9/45**(2006.01)

USPC: 717/145
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)
U.S. : 717/145; 717/126-131,146,152,159,168; 712/227,228; 714/35,38

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EAST, ACM, citeseer.ist.psu.edu, IEEE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,149,318 (CHASE et al) 21 November 2000 (21.11.2000), ALL	1-31, 33
Y	US 6,542,990 B1(TREMBLAY et al) 1 April 2003 (01.04.2003), Fig. 2-5 and related text; col. 7, line 47- col. 8, line 2	32
Y	US 6,634,023 (KOMATSU et al) 14 October 2003 (14.10.2003); col. 8, lines 35-55	32

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
01 March 2006 (01.03.2006)

Date of mailing of the international search report
30 MAR 2006

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (571) 273-3201

Authorized officer
Tuan Vu for Dale Hall

Telephone No. (571) 272-3735

Form PCT/ISA/210 (second sheet) (April 2005)