

(19) World Intellectual Property Organization
International Bureau



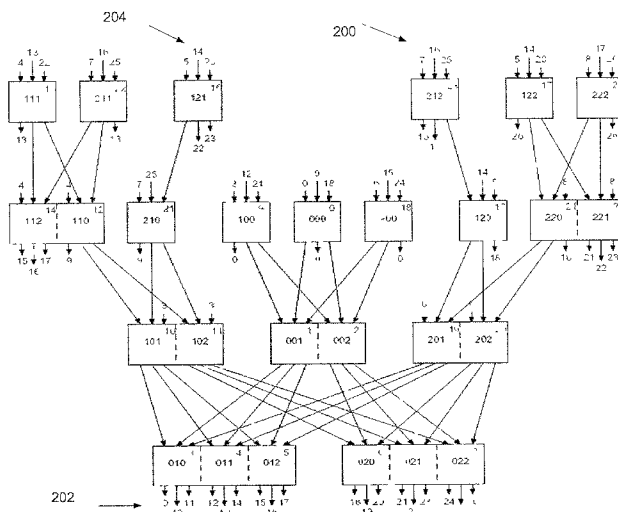
(43) International Publication Date
15 May 2008 (15.05.2008)

PCT

(10) International Publication Number
WO 2008/057828 A3

- (51) **International Patent Classification:**
G06F 15/177 (2006.01)
 - (21) **International Application Number:**
PCT/US2007/082851
 - (22) **International Filing Date:** 29 October 2007 (29.10.2007)
 - (25) **Filing Language:** English
 - (26) **Publication Language:** English
 - (30) **Priority Data:**
11/594,416 8 November 2006 (08.11.2006) US
11/594,423 8 November 2006 (08.11.2006) US
 - (71) **Applicant (for all designated States except US):** **SICOR-TEX, INC.** [US/US]; Three Clock Tower Place, Suite 210, Maynard, MA 01754 (US).
 - (72) **Inventors; and**
 - (75) **Inventors/Applicants (for US only):** **LEONARD, Judson, S.** [US/US]; 220 Dorset Road, Newton, MA 02468 (US). **REILLY, Matthew, H.** [US/US]; 7 Conant Drive, Stow, MA 01775 (US). **STEWART, Lawrence, C.** [US/US]; 7 Erwin Road, Wayland, MA 01778 (US). **TAYLOR, Washington** [US/US]; 460 Huron Street, Cambridge, MA 02138 (US).
 - (74) **Agents:** **DICHIARA, Peter, M.** et al; Wilmer Cutler Pickering Hale And Dorr LLP, 60 State Street, Boston, MA 02109 (US).
 - (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, **BR**, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, **HR**, HU, **ID**, IL, IN, IS, **JP**, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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, IS, IT, LT, LU, LV, MC, MT, 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).
- Published:**
— with international search report
- (88) **Date of publication of the international search report:**
12 September 2008

(54) **Title:** COMPUTER SYSTEM AND METHOD USING EFFICIENT MODULE AND BACKPLANE TILING



(57) **Abstract:** Computer systems and methods using efficient module and backplane tiling to interconnect computer nodes via a Kautz-like digraph. A multinode computing system includes a large plurality of computing nodes interconnected via a Kautz topology having order O , diameter n , and degree k . The order equals $(k+1)^{n-1}$. The interconnections from a node x to a node y in the topology satisfy the relationship $y = (-x^k-j) \bmod O$, where $1 \leq j \leq k$, and the computing nodes are arranged onto a plurality of modules. Each module has an equal plurality of computing nodes on it. A majority of the inter-node connections are contained on the plurality of modules and a minority of the inter-node connections are inter-module connections. Inter-module connections are routed among modules in parallel on an inter-module connection plane.

WO 2008/057828 A3

INTERNATIONAL SEARCH REPORT

International application No

PCT/US 07/82851

A CLASSIFICATION OF SUBJECT MATTER IPC(8) - G06F 15/177 (2008 01) USPC - 709/220 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) USPC G06F 15/177 (2008 01) IPC(8) 709/220		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC 709/218, 220, 223, 224, 229, 370/254, 255, 257		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) USPTO WEST (PGPB, USPT, EPAB, JPAB), GOOGLE SCHOLAR Search Terms Used Kautz, De Bruijn, Hamiltonian, Eulerian, parallel, computer, network, topology, node, diameter, edge, disjoint, graph, route, buffer, transmit, availability, downstream etc		
C DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X ---	SMIT et al "An Algorithm for Generating Node Disjoint Routes in Kautz Digraphs" Parallel Processing Symposium, 1991 Proceedings, Fifth International May 1991 [retrieved on 2008-03-03] Retrieved from the Internet <URL http://doc.utwente.nl/18709/1/Kautz_digraphs-smitt.pdf>, entire document	1 and 12-15 -----
Y		2-1 1 and 16-17
Y	US 5,513,371 A (CYPHER et al.) 30 April 1996 (30 04 1996), entire document, especially col 4, ln 1 to col 5, ln 54 and col 8, ln 60 to col 10, ln 12	2-1 1
Y	US 2006/0056308 A1 (GUSAT et al.) 16 March 2006 (16 03 2006), abstract and para [0066], [0075]-[0076]	16-17
A	US 5,134,690 A (SAMATHAM) 28 July 1992 (28 07 1992)	1-17
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input type="checkbox"/>		
* Special categories of cited documents	"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	
"A" document defining the general state of the art which is not considered to be of particular relevance	"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	
"E" earlier application or patent but published on or after the international filing date	"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	
"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)	"&" document member of the same patent family	
"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		
Date of the actual completion of the international search 03 March 2008 (03 03 2008)	Date of mailing of the international search report 26 MARCH 2001	
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 Lee W Young PCT Hq/tpdesk 571 272-4300 PCTOSP 571 272 7774	