IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT TRIAL & APPEAL BOARD

In re Patent of:	Peter Dickinson
U.S. Patent No.:	6,738,799
Issue Date:	May 18, 2004
Appl. No.:	10/452,156
Filing Date:	June 2, 2003
Title:	Methods and Apparatuses for File Synchronization and Updating Using a Signature List

DECLARATION OF DR. ANDREW GRIMSHAW, PH.D.

I, Dr. Andrew Grimshaw, Ph.D., declare as follows:

(1.) I am currently a Professor of Computer Science at the University of Virginia's School of Engineering and Applied Science and Chief Architect for the NCSA-led eXtrem Science and Engineering Discovery Environment (XSEDE) project. XSEDE is the cornerstone of the National Science Foundation's cyber-infrastructure program for science and engineering in the United States.

(2.) For more than 30 years, I have studied, designed, and worked in the field of computer science and engineering. My experience includes more than 25 years of teaching and research, with research interests in distributed systems including client-server and peer-2-peer interaction, grid computing, high-performance parallel computing, compilers for parallel systems, and operating systems, just to name a few.

(3.) I received a Bachelor of Arts degree in Political Science and Economics from the University of California, San Diego in 1981, a Master of Science degree in Computer Science from the University of Illinois at Urbana-Champaign in 1986, and a Doctor of Philosophy degree in Computer Science from the University of Illinois at Urbana-Champaign in 1988.

(4.) Over the last three decades, I have architected, developed, and released to customers five large distributed systems: two in industry (Open Access at SPI and the Avaki Data Grid at Avaki), two in academia (Mentat and Gensis II), and one that spanned both environments (Legion).

(5.) In 1999 I co-founded Avaki Corporation, which offered enterprise level grid computing software solutions. I served as Avaki's Chairman and Chief Technical Officer until 2005 when Avaki was acquired by Sybase.

(6.) I am a member of the Global Grid Forum (GGF) Steering Committing and the Architecture Area Director of the GGF. I have also served on the National Partnership for Advanced Computational Infrastructure (NPACI) Executive Committee, the DoD MSRC Programming Environments and Training (PET) Executive Committee, the Center of Excellence in Space Data and Information Sciences (CESDIS) Science Council, the National Research Counsel (NRC) Review Panel for Information Technology, and the Board on Assessment of National Institute of Standards and Technology (NIST) Programs.

(7.) I have served on the Editorship and Program Committees for over 35 scientific conferences and symposiums covering the fields of distributed computing, parallel computing, grid-based computing, and supercomputing. I have also served on over 20 professional panels and working groups in the same fields for the National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), and the NRC, among others.

(8.) I have presented as a panelist in over 30 conferences throughout the United States and across the globe regarding grid computing, parallel computing, and distributed computing.

(9.) I am the author or co-author of over 50 publications and book chapters in the field of distributed computing, and over 65 articles from conference proceedings and standards

documents. Many of these publications describe distributed computing systems, some of which are directed specifically to client-server interaction and replication. These publications highlight my familiarity with client-server file synchronization. Below is a list of my publications that are particularly relevant to the above topics:

- Nguyen-Tuong and A.S. Grimshaw, "Using Reflection for Incorporating Fault-Tolerance Techniques into Distributed Applications," *Parallel Processing Letters, vol. 9, No. 2 (1999)*, 291-301.

- Michael J. Lewis, Adam J. Ferrari, Marty A. Humphrey, John F. Karpovich, Mark M. Morgan, Anand Natrajan, Anh Nguyen-Tuong, Glenn S. Wasson and Andrew S. Grimshaw, "Support for Extensibility and Site Autonomy in the Legion Grid System Object Model" Journal of Parallel and Distributed Computing, Volume 63, pp. 525-38, 2003.

- A.S. Grimshaw, A. Natrajan, "Legion: Lessons Learned Building a Grid Operating System", *Proceedings of the IEEE*, vol. 93, number 3, March, 2005, pp. 589-603.

- S. Grimshaw, Mark Morgan, Karolina Sarnowska, "WS-Naming: Location Migration, Replication, and Failure Transparency Support for Web Services," *Concurrency and Computation: Practice and Experience*, vol. 21, issue 8, pp. 1013-1028.

- Sal Valente and Andrew Grimshaw, Replicated Grid Resources, *Grid 2011: 12th IEEE/ACM International Conference on Grid Computing*, September, 2011, Lyon, France.

- K. Sarnowska, A. Grimshaw, E. Laure. "Using Standards-based Interfaces to Share Data across Grid Infrastructures," *38th International Conference on Parallel Processing* (ICPP09), Page(s):254 – 260, Vienna, AU, Sept. 22-25, 2009.

- Sosa, C. and A.S. Grimshaw, Bringing the Grid home, in Proceedings of the 2008 9th IEEE/ACM International Conference on Grid Computing. 2008, IEEE Computer Society.

- H. Huang, and A. S. Grimshaw, "The Cost of Transparency: Grid-Based File Access on the Avaki Data Grid," International Symposium on Parallel and Distributed Processing and Applications 2006, pp. 642-659, LNCS 4330, December 3-6 2006, Sorrento, Italy.

- White, M. Walker, M. Humphrey, and A. Grimshaw "LegionFS: A Secure and Scalable File System Supporting Cross-Domain High-Performance Applications", *Proceedings SC 01*, Denver, CO. www.sc2001.org/papers/pap.pap324.pdf

- J.F. Karpovich, A.S. Grimshaw, and J. C. French, "Extensible File Systems (ELFS): An Object-Oriented Approach to High Performance File I/O," *Proceedings of OOPSLA '94*, Portland, OR, Oct 1994: 191-204.

- A.S. Grimshaw and E.C. Loyot Jr., "ELFS: Object- Oriented Extensible File Systems," *Proceedings 1991 Parallel and Distributed Information Systems Conference*, Miami, FL, Dec 1991: 510-513.

- A.S. Grimshaw and J. Prem, "High Performance Parallel File Objects,'' *Proceedings of the Sixth Distributed Memory Computing Conference*, Portland, OR, April 1991: 720-723.

(10.) A copy of my curriculum vitae, which describes in further detail my qualifications, responsibilities, employment history, honors, awards, professional associations, invited presentations, and publications is attached to this declaration as Appendix A-1.

(11.) I have reviewed United States Patent No. 6,739,799[1] ("the '799 patent") to Peter Dickinson as well as the patents and applications referenced in the section of the '799 patent entitled "Related U.S. Application Data." I have also reviewed the publications cited in the footnotes of this declaration and referenced in the *inter partes* review petition submitted herewith. Additionally, I have reviewed the petitions and related documents in IPR2012-00073, IPR2013-00261 and IPR2013-00586. I note that I maintain my previous opinions provided in IPR2012-00073 and IPR2013-00261, and agree with the Petitioners' other experts in those proceedings and share many of the same opinions below. Because my independent analysis of the claims and prior art led to the same conclusions as the previous experts, I have incorporated many of their arguments and characterizations below as my own.

STATE OF THE ART AS OF 1999

(12.) From the 1970s until the present day, a substantial body of research has reported on the advent and subsequent advancement in distributed computing systems. In its simplest

[1] Dickinson, P., "Methods and Apparatuses for File Synchronization and Updating Using a Signature List." *U.S. Patent No. 6,738,799*, filed June 2, 2003, claiming priority to May 3, 1999.

form, a distributed system is a collection of stand-alone computing machines (servers, client-PCs, etc.) that are connected through a network, such as the internet or a corporate intranet. One area of distributed system research which is of particular relevance to the '799 patent is commonly referred to as event-based notification.

(13.) Generalized in the 1990s, event-based notification systems utilized a publish/subscribe mechanism to push notifications from a publisher to a subscriber regarding a specified event. In a publish/subscribe system, clients subscribe to events in which they are interested and, when that event occurs, the publisher (a server) notifies the subscribers with a notification message[2]. The notification message lets subscribers know that the event occurred and may also contain arbitrary data, such as a document of interest that triggered the event notification.[3] For instance, by 1995, Stanford University had developed the SIFT system which automatically disseminated text documents (specifically, news articles) that matched the profile of a subscribed client.[4] By 1996, the publish/subscribe push methodology was in widespread use and being used to automatically deliver web content (such as news headlines, weather forecasts, etc.) to subscribed clients.[5] The methodology was also being used during this time period to transparently deliver software updates to subscribed clients.

(14.) Developing in parallel to these advancements was a body of research regarding efficient mechanisms for synchronizing copies of files. The concept of constructing delta files

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[2] Franklin, M. et al., "A Framework for Scalable Dissemination-Based System," *Proceedings of the 12th ACM SIGPLAN Conference on Object-oriented Programming, Systems, Languages, and Applications*, 94-105, 96-97 (1997). (*See* A-3).

[3] *Id.* at 101-102, § 4.3.

[4] *Id.*; *see also* Yan, T.W., et al., "SIFT – A Tool for Wide-Area Information Dissemination," *Proceedings of the USENIX 1995 Technical Conference*, 176-186 (1995). (*See* A-4).

[5] Franklin, M., et al., "Data In Your Face:" Push Technology in Perspective," *SIGMOD '98 Proceedings of the 1998 ACM SIGMOD International Conference on Management of Data*, 516-519, 516 (June 1-4, 1998). (*See* A-5).

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