Annotated Bibliography: MSE Project

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General References - Web Caching

The resources listed in the section cover several topics related to web caching, including overview papers that survey the problem space and potential solutions, as well as in depth papers that are interesting from the perspective of analyzing a problem space and either modifying existing approaches based on specialize workloads, or challenging existing assumptions. The papers cover cooperative cache networks, content distribution and request routing protocols, benchmarking, performance measures, and so forth.

Adam D. Bradley, Azer Bestavros Assaf J. Kfoury. "Safe Composition ofWeb Communication Protocols." *Proc. of the 7th International Workshop on Web Caching and Content Distribution (WCW'02).* **2002**

This paper discusses the complexities that arise with HTTP when extending protocols in more complex topologies that may involve several proxies and other layers between client and server. A method for analyzing protocols and architectures using SPIN is presented.

Anawat Chankhunthod, Peter B. Danzig, Chuck Neerdaels, Michael F. Schwartz, Kurt J. Worrell. "A Hierarchical Internet Object Cache." IN PROCEEDINGS OF THE 1996 USENIX TECHNICAL CONFERENCE, pp 153 – 166, 1995.

This paper presents a hierarchical cache implementation designed for serving high volumes of concurrent requests.

Barish, G.; Obraczke, K. "World Wide Web Caching: Trends and Techniques." IEEE Communications Magazine, Volume 38, No. 5, May 2000

Good overview paper of web caching.

Christian Grimm, Marc Neitzner, Helmut Pralle, Jens-S. Vöckler. "Request routing in cache meshes." Journal of Computer Networks and ISDN Systems - Selected papers of the 3rd international caching workshop. Volume 30 Issue 22-23, Nov. 25, 1998

This paper presents a hierarchical cache solution and associated request routing protocols for WWW access from a geographically distributed research network in Germany.

David Karger, Eric Lehman, Tom Leighton, Matthew Levine, Daniel Lewin, Rina Panigrahy. "Consistent Hashing and Random Trees: Distributed Caching Protocols for Relieving Hot Spots on the World Wide Web." In Proc. 29th ACM Symposium on Theory of Computing (STOC), pp 654 – 663, 1997.

This paper presents the use of consistent hashing for distributing cache entries among a set of servers. Consistent hashing has seen a surge in popularity in the implementation of infrastructure behind web scale applications such as Facebook, Foursquare, Amazon, etc.

Erich M. Nahum. "Deconstructing SPECweb99." IBM T.J. Watson Research Center, Yorktown Heights, NY. 2002

This paper examines an industry benchmark, and gives insight into some of the subtleties of designing a good web server benchmark.

Houda Lamehamedi, Zujun Shentu, and Boleslaw Szymanski. "Simulation of Dynamic Data Replication Strategies in Data Grids." Proceedings of the 12th Heterogeneous Computing Workshop, Nice, France, April 2003.

Presentation of caching and replication of data within large scale data grids.

Jia Wang. "A Survey ofWeb Caching Schemes for the Internet." ACM SIGCOMM Computer Communication Review, Volume 29 Issue 5, October 1999.

This paper surveys web caching solutions, and presents the research areas related to web caching at that point in time.

JoAnne Holliday , Divyakant Agrawal , Amr El Abbadi . "The Performance of Database Replication with Group Multicast." In Proceedings of IEEE International Symposium on Fault Tolerant Computing (FTCS29), pp 158 – 165, 1999.

This paper examines the performance of database replication using multicast protocols, presenting parameters when such a solution is practical.

Lee Breslau, Pei Cao, Li Fan, Graham Phillips, Scott Shenker. "Web Caching and Zipf-like Distributions: Evidence and Implications." IEEE INFOCOM, VOL. XX, NO. Y, MONTH 1999

This paper looks at the distribution of web requests from a fixed community, as well as properties of those requests obtained from proxy traces and whether the properties reflected via proxy traces represent reality or not.

Mikhail Mikhailov, Craig E. Wills. "Exploiting Object Relationships for Deterministic Web Object Management.")." Proc. of the 7th International Workshop on Web Caching and Content Distribution (WCW'02). 2002

This paper presents a cache invalidation scheme that combines characteristics related to object change with referencing objects that compose dynamic content, with a cache invalidation scheme generated based on the aforementioned characteristics.

Michael Rabinovich and Oliver Spatscheck . "Web caching and replication." Addison Wesley 2002

This book provides a very thorough treatment of web caching and replication, with relevant information regarding web and network protocols, performance measurement, and various caching components used in web architectures such as forward proxies, content delivery networks, etc.

Microsoft Corp. Whitepaper. "Cache Array Routing Protocol and Microsoft Proxy Server 2.0." http://oldsite.mcoecn.org/WhitePapers/Mscarp.pdf, 1997.

This whitepaper presents the implementation of the Cache Array Routing Protocol in the Microsoft Proxy Server 2.0 product. This is interesting from a historical perspective as an example of a vendor looking to provide web products designed to be integrated together to provide a large scale solution.

P. Krishnan, Binay Sugla. "Utility of co-operating Web proxy caches." Computer Networks and ISDN Systems, Volume 30, Issues 1-7, April 1998, Pages 195-203

This paper presents a caching proxy solution where the caching nodes cooperate with each to provide a better overall solution compared to caching nodes that work in isolation.

Pablo Rodriguez, Christian Spanner, and Ernst W. Biersack. "Analysis of Web Caching Architectures: Hierarchical and Distributed Caching." IEEE/ACM TRANSACTIONS ON NETWORKING, VOL. 9, NO. 4, AUGUST 2001

Nice overview paper of distributed and hierarchical caching architectures, and the associated performance parameters used to evaluate different caching mechanisms.

Renu Tewari, Michael Dahlin, Harrick M. Vin and Jonathan S. Kay. "Beyond Hierarchies: Design Considerations for Distributed Caching on the Internet." UTCS Technical Report: TR98-04

This paper presents design principles for large scale distributed caches derived from examining different caching systems and workloads.

Sarut Vanichpun Armand M. Makowski . "Comparing strength of locality of reference –Popularity, majorization, and some folk theorems." Proceedings IEEE INFOCOM 2004, The 23rd Annual Joint Conference of the IEEE Computer and Communications Societies, 2004

This paper examines request stream characteristics and their influence on the performance of various caching solutions.

Weisong Shi , Y Wright , Eli Collins , Vijay Karamcheti. "Workload characterization of a personalized Web site and its implications for dynamic content caching (2002)." Proc. of the 7th International Workshop on Web Caching and Content Distribution (WCW'02). 2002

This paper looks at web caching from the perspective of a web portal, where content might be composed dynamically based on personalization. The workload characteristics of a specific portal are used to provide some concrete examples to examine the problem and various potential techniques to provide a suitable caching solution.

References Related to System Design and Construction

Barry Boehm, Bradford Clark, Ellis Horowitz, Ray Madachy, Richard Shelby, Chris Westland, "Cost Models for Future Software Life Cycle Processes: COCOMO 2.0," Annals of Software Engineering, (1995).

The paper describing the cost estimation model used for this project.

Business Process Modeling Notation, V1.1, Object Management Group, January 2008. Available from http://www.bpmn.org

The current version of the specification is 2.0 beta 2; 1.1 was the version that was current as of the visioning phase of this project.

COCOMO II Model Definition Model, Center for Software Engineering, University of Southern California, http://csse.usc.edu/csse/research/COCOMOII/cocomo2000.0/CII_modelman2000.0.pdf **(last accessed 10/24/2008).**

Model behind the estimation software (see below).

COCOMO II.2000.0 Software, Center for Software Engineering, University of Southern California.

Software used to produce estimates for this project based on the COCOMO II model.

Data Access Object, Core J2EE Patterns Catalog, Sun Microsystems, http://java.sun.com/blueprints/corej2eepatterns/Patterns/index.html **(last accessed 8/12/2008)**

Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma et. al., Addison Wesley, 1995.

Hazelcast In-Memory Data Grid. http://www.hazelcast.com

Hibernate Reference Documentation, Version: 3.2.2. Hibernate Project, http://www.hibernate.org/hib_docs/v3/reference/en/pdf/hibernate_reference.pdf **(last accessed 8/12/2008).**

IEEE Std 829-1998 IEEE Standard for Software Test Documentation, The Institute of Electrical and Electronics Engineers, 1998.

Used in structuring the quality assurance and test plans associated with the project.

Jos B. Warmer, Anneke G. Kleppe. "The Object Constraint Language: Precise Modeling with Uml." Addison-Wesley Object Technology Series 1998.

Book covering the use of the UML object constraint language. This was useful in conjunction with the USE software package in producing the formal specification for the project.

Reliable Multicasting with the JGroups Toolkit, Bela Ban,
http://www.jgroups.org/javagroupsnew/docs/manual/html/index.html **(last accessed 8/22).**

soapUI WebService Testing Tool - http://www.soapui.org/

Software Estimation: Demystifying the Black Art, Steve McConnell, Microsoft Press, 2006.

Excellent resource on software estimation; the cone of uncertainty from the book was used to show the potential variance between the estimate and the project phase.

The Spring Framework – Reference Documentation, Version 2.5, Rod Johnson et al,
http://static.springframework.org/spring/docs/2.5.x/spring-reference.pdf **(last accessed 8/12/2008).**

USE: A UML-based Specification Environment. http://www.db.informatik.uni-bremen.de/projects/USE/

The USE software package was used for the formal specification associated with this project.