

**DECOMPOSING USING SOA ON FILE SHARING AND WEB
SERVICE ON WINDOWS AND MOBILE ENVIRONMENTS**

Abdulkarim Kanaan Jebna

UNIVERSITI UTARA MALAYSIA 2010

**DECOMPOSING USING SOA ON FILE SHARING AND WEB SERVICE ON
WINDOWS AND MOBILE ENVIRONMENTS**

A project submitted to Dean of Postgraduate Studies and Research in partial
Fulfillment of the requirement for the degree
Master of Science of Information Technology
Universiti Utara Malaysia

By
Abdulkarim Kanaan Jebna



KOLEJ SASTERA DAN SAINS
(College of Arts and Sciences)
Universiti Utara Malaysia

PERAKUAN KERJA KERTAS PROJEK
(Certificate of Project Paper)

Saya, yang bertandatangan, memperakukan bahawa
(I, the undersigned, certifies that)

ABDULKARIM KANAAN JEBNA
(805728)

calon untuk Ijazah
(candidate for the degree of) **MSc. (Information Technology)**

telah mengemukakan kertas projek yang bertajuk
(has presented his/her project of the following title)

DECOMPUSING USING SOA ON FILE SHARING AND WEB
SERVICE ON WINDOWS AND MOBILE ENVIRONMENTS

seperti yang tercatat di muka surat tajuk dan kulit kertas projek
(as it appears on the title page and front cover of project)

bahawa kertas projek tersebut boleh diterima dari segi bentuk serta kandungan
dan meliputi bidang ilmu dengan memuaskan.
*(that this project is in acceptable form and content, and that a satisfactory
knowledge of the field is covered by the project).*

Nama Penyelia
(Name of Supervisor) : **DR. MASSUDI MAHMUDDIN**

Tandatangan
(Signature) : mand Tarikh (Date) : 20/10/10

Nama Penilai
(Name of Evaluator) : **MR. RUSDI MD. AMINUDDIN**

Tandatangan
(Signature) : [Signature] Tarikh (Date) : 20/10/2010

PERMISSION TO USE

In presenting this project in partial fulfillment of the requirements for a postgraduate degree from the Universiti Utara Malaysia, I agree that the University Library may make it freely available for inspection. I further agree that permission for copying of this project in any manner in whole or in part, for scholarly purposes may be granted by my supervisor(s) or in their absence by the Dean of Postgraduate Studies and Research. It is understood that any copying or publication or use of this project or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my project.

Requests for permission to copy or to make other use of materials in this project, in whole or in part, should be addressed to

Dean of Postgraduate Studies and Research
College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman
Malaysia

Abstract

There has been great progress in the development of miniaturized devices and their demand have increased as well. In addition, people look forward to having similar programs on their stand-alone computers to run on their mobile phones' screens. As a result, the complexity of building a program has increased in this case because same programs are needed to run on two different platforms. One of the common programs among users is the file sharing system. In this paper, we will look at how decomposition architecture can be used for file sharing system in both desktop and mobile phone environments. In addition, we will explore on how to decrease the complexity of building systems on stand-alone computers as well as mobile devices. As a result, we have a file sharing system which is be able to run on windows and mobile environment using the decomposition approach.

Acknowledgment

Firstly, I would like to thank my parents for everything that they have done for me. I offer my thanks to Mr. Ismail Enjreny for his help and concern in providing the expertise on how to develop programs. I also want to express my gratitude to my supervisor, Dr. Massudi Mahmuddin. In addition, I would like to thank Miss Chan Saw Cheng for helping me to proofread the first chapter. Last but not least, I give my thanks to Mr. Fadi Abdelqader who answered my questions about developing the program of this project.

Lastly, I offer my regards and blessings to all of those who supported me in any respect during the completion of the project.

Abdulkarim Kanaan Jebna

Table of Content

Abstract	iii
Acknowledgment	iv
List of Figures	ix
List of Tables	xi
Abbreviation	xii
Chapter 1 Introduction	1
1.1. Background	1
1.2. Problem Statement	3
1.3. Research Questions	5
1.4. Objective of Study	5
1.5. Scope of Study	6
1.6. Significance of Study	6
1.7. Problem and Limitations	7
1.8. Organizations of the Report	7
Chapter 2 Literature Review	8
2.1. Introduction	8
2.2. Mobile Phone Development	8
2.3. File Sharing Systems	9
2.3.1. Downloading from Websites	10
2.3.2. Downloading from FTP Sites	10
2.3.3. Instant File Transfer: Instant Messaging	11
2.3.4. File Sharing Networks	12
2.3.5. Trading Files Manually	14
2.4. The Peer-to-Peer File Sharing Networks	14
2.4.1. How File Sharing Works	14
2.4.2. Searching for Files	15
2.5. Types of P2P Network	16

2.5.1.	Pure P2P	16
2.5.2.	Hybrid P2P	17
2.5.3.	Mixed P2P	17
2.6.	Microsoft .NET	17
2.6.1.	.NET Framework	18
2.6.2.	Microsoft .NET Framework Compact.....	18
2.6.3.	Device Emulator for Windows Mobile	18
2.7.	Web Services	19
2.7.1.	Web Services Interaction Types	21
2.7.1.1.	Traditional Web Service Interaction	21
2.7.1.2.	Two Ways Web Service Interaction.....	22
2.7.2.	Web Service Framework	22
2.8.	Application Architecture.....	24
2.8.1.	Distributed Applications.....	24
2.8.2.	Service-Oriented Architectural (SOA)	25
2.8.2.1.	SOA Definition	25
2.8.2.2.	Presentation Layer.....	26
2.8.2.3.	Service Layer (Web Services).....	28
2.8.2.4.	Business Logic Layer (BLL).....	29
2.8.2.5.	Data Access Layer.....	30
2.8.2.6.	Data Source	31
2.9.	Object Relational Mapping.....	31
2.10.	LINQ (Language INtegrated Query).....	34
2.11.	ADO.NET	36
2.12.	FileStreams in Database Management System	37
2.13.	Summary	37
Chapter 3 Research Methodology.....		39
3.1.	Overall Work	39
3.2.	Preliminary Study	41
3.3.	Prototype Development	41

3.3.1.	The Architecture of the System	41
3.3.2.	Building Database.....	43
3.3.3.	Mapping Tables	43
3.3.4.	Data Access Layer	43
3.3.4.1.	Interface Data Access Layer (IDAL)	43
3.3.4.2.	SQL DAL	44
3.3.4.3.	Data Access Layer Factory (DAL Factory)	44
3.4.	Business Logic Layer (BLL)	45
3.5.	Service Layer (Web Service).....	46
3.6.	Designing Interface.....	47
3.6.1.	UI Components.....	47
3.6.2.	Managers	48
3.7.	Test.....	49
3.8.	Overall Activates	49
3.9.	Summary	51
Chapter 4 Findings.....		52
4.1.	Important Components.....	52
4.1.1.	Service Layer.....	52
4.1.2.	Interface Data Access Layer (IDAL).....	53
4.1.3.	DAL Factory (DAL Factory).....	53
4.3.	System Prototypes.....	57
4.4.	Database Diagram.....	61
4.4.1.	Users Table	62
Chapter 5 Conclusion and Future Work		63
5.1.	Conclusion	63
5.1.1.	Advantages and Disadvantages	64
5.1.1.1.	Advantages	64
5.1.1.2.	Disadvantages.....	64
5.1.2.	Objectives	64

5.2. Future Work.....	65
Appendix A Class Diagrams of the System.....	66
Appendix B Implementation of Some Classes	70
References.....	90

List of Figures

Figure 2.1: Screen shot of FileZilla program, http://filezilla-project.org/images/screenshots/fz3_win_main.png	11
Figure 2.2: Screen shot of BitTorrent 6.1 Program http://images.snapfiles.com/screenfiles/bittorrent.gif	13
Figure 2.3: Gnutella Architecture (Kim J.).....	16
Figure 2.4: Napster Architecture (Kim J.).....	17
Figure 2.5: Client and server with unidirectional Firewalls (Liu, Wang, Li, & Chou, 2006)	21
Figure 2.6: Two-way interaction patterns of client/server (Liu, Wang, Li, & Chou, 2006)	22
Figure 2.7: Basic Web services architecture (Newcomer & Lomow, 2004).....	23
Figure 2.8: Sample of SOAP message for IsExist(Guid) method	23
Figure 2.9: Structure of a distributed system. (Puder, Römer, & Pilhofer, 2006)	25
Figure 2.10: Service-Oriented Architectural Style (SOA) (Somasegar, Guthrie, & Hill, 2009)	26
Figure 2.11: XML Sample Represents Files Table in the Database by Mapping Relational Object Technique.....	32
Figure 2.12: FileInfo class which is mapped by the XML notation in Figure 2.12 by C# code.....	33
Figure 2.13: Sample of using LINQ	36
Figure 3.1: Overall the Work.....	40
Figure 3.2: The Architecture of the System.....	42
Figure 3.3: Interface IUser (C#) as a sample of IDAL layer	44
Figure 3.4: Sample of using reflection in building DAL Factory layer (C#)	45
Figure 3.5: Overall activities at run-time.....	50
Figure 4.1: Shows how XML configuration file has declared the SQL DAL name	54
Figure 4.2: The chart of time cross the size of files on desktop computer in different packet size.....	56

Figure 4.3: The chart of the time cross the size of files on mobile devices in different packet size.....	56
Figure 4.4: Main tab (Windows Application).....	57
Figure 4.5: Shared Resources tab (Windows Application).....	58
Figure 4.6: Main tab (Mobile Application).....	59
Figure 4.7: Search Files tab (Mobile Application)	60
Figure 4.8: Database diagram of the system.....	61

List of Tables

Table 4.1: Time cost (ss.ms) of uploading files from Windows environment to the database.....	55
Table 4.2: Time cost (mm:ss.ms) of downloading files from mobile environment	55

Abbreviation

1G	First Generation
BLL	Business Logic Layer
CDMA	Code Division Multiple Access
DAL	Data Access Layer
DAL Factory	Data Access Layer Factory
DBMS	Database Management System
DLINQ	Data Language INtegrated Query
EDGE	Enhanced Data rates for GSM Evolution
Gbps	Giga bit per second
GPRS	General Packet Radio Service
HTTP	Hypertext Transfer Protocol
IDAL	Interface Data Access Layer
LINQ	Language INtegrated Query
Mbps	Mega bit per second
ORM	Object-Relational Mapping
P2P	Peer to Peer
RPC	Remote procedure call
SOA	Service-Oriented Architecture
SOAP	Simple Object Access Protocol

SQL DAL	SQL Data Access Layer
UDDI	Universal Description Discovery and Integration
UI	User Interface
UMTS	Universal Mobile Telecommunications System
WCDMA	Wideband Code Division Multiple Access
Wi-Fi	Wireless Fidelity
WSDL	Web Services Description Language
XML	eXtensible Markup Language

Chapter 1

Introduction

1.1. Background

Mobile phone networks started with 1G which was the first generation of mobile technology that was introduced in early of 1980's (Jamil, Shaikh, Shahzad, & Awais, 2008). The milestone of it is that it used analog cellular service, circuit-based, and narrowband. The only main service that it had was voice communication (Lawton, 2005). Then, the 2G (second generation) was launched as the upgrade technique to 1G. The main change in 2G is that it uses digital signals instead of the analog. However, 2G does not have any huge improvements in terms of services, which are voice communication and limited data transmission. Some improvements applied to 2G resulted in 2.5G which has better data transmission; General Packet Radio Service and Enhanced Data GSM Environment (Lawton, 2005). The 3G network was launched soon after which provides improved speed of data transformation and wideband CDMA (WCDMA), used in the Universal Mobile Telecommunications System (UMTS). Even though, it was faster than 2.5G, many communication industries were frustrated by 3G because it is costly in terms of implementation and it does not supply the services they need. 4G is currently the most anticipated and best mobile environment. It has a very high speed which reaches 100 Mbps and fixed rates of 1 Gbps. 4G will support multimedia as 3G does. The speed of 4G will be 260 times better than 3G since it will surpass 100 Mbps. One important advantage is that the implementation of 4G will be cheaper than 3G (Jamil, Shaikh, Shahzad, & Awais, 2008).

The demand of mobile phone applications is increased by the rapid developments of mobile devices as well as their operating systems. In the past, transferring short text messages and making calls were the only features mobile phones had (Yang, Chen, Chen,

The contents of
the thesis is for
internal user
only

References

- Beauchemin, B. (2009, May). *Programming with FileStreams in SQL Server 2008*. Retrieved September 29, 2010, from MSDN Magazine: <http://msdn.microsoft.com/en-us/magazine/dd695918.aspx>
- Biström, J., & Partanen, V. J. (2004). *Mobile P2P - Creating a mobile file-sharing environment*. Telecommunications Software and Multimedia Laboratory. Helsinki University of Technology.
- Chappell, D. (2006). *Understanding .NET, Second Edition* (2nd ed.). United States of America: Addison Wesley Professional.
- Crosse, S., Wilson, E., Walsh, A., Coen, D., & Smith, C. (2003). *P2P Networks*. Retrieved September 15, 2010, from Networks and Telecommunications Research Group (NTRG): <http://ntrg.cs.tcd.ie/undergrad/4ba2.02-03/p4.html>
- Curbera, F., Duftler, M., Khalaf, R., Nagy, W., Mukhi, N., & Weerawarana, S. (2002). Unraveling the Web services web: an introduction to SOAP, WSDL, and UDDI. *Internet Computing, IEEE*, 6(2), 86-93.
- Emekci, F., Sahin, O. D., Agrawal, D., & Abbadi, A. E. (2004). A Peer-to-Peer Framework for Web Service Discovery with Ranking. *Web Services, 2004. IEEE International Conference* (pp. 192-199). IEEE.
- Esposito, D., & Saltarello, A. (2008). *Architecting Microsoft® .NET Solutions for the Enterprise*. Washington: Microsoft Press.
- Ferris, C., & Farrell, J. (2003). What Are Web Services? *Communications of the ACM*, 46(6), 31.

- Gehlen, G., & Pham, L. (2005). Mobile Web services for peer-to-peer applications. *Consumer Communications and Networking Conference, 2005. CCNC. 2005 Second IEEE*, (pp. 427-433).
- Hammad-ul-Hasnain. (2005). Building Mobile Application with .NET Compact Framework. *Engineering Sciences and Technology, 2005. SCONEST 2005. Student Conference*, (pp. 1-6). Karachi.
- Hassan, M. (2009). Mobile Web Service Provisioning in Peer to Peer Environments. *Service-Oriented Computing and Applications (SOCA), 2009 IEEE International Conference* (pp. 1-4). Taipei: IEEE.
- Hofeld, T., Tutschku, K., & Andersen, F.-U. (2005). Mapping of file-sharing onto mobile environments enhancement by UMTS. *Pervasive Computing and Communications Workshops, 2005. PerCom 2005 Workshops. Third IEEE International Conference* (pp. 43-49). IEEE.
- Jamil, M., Shaikh, S. P., Shahzad, M., & Awais, Q. (2008). 4G: The Future Mobile Technology. *TENCON 2008 - 2008 IEEE Region 10 Conference*, (pp. 1 - 6). Hyderabad.
- Johnsrud, L., Hadzic, D., Hafssøe, T., Johnsen, F. T., & Lund, K. (2008). Efficient Web Services in Mobile Networks. *ECOWS '08. IEEE Sixth European Conference* (pp. 197-204). Dublin: IEEE.
- Kan, W., & Yujun, Z. (2009). Using LINQ as an Instructional Bridge Between Object-Oriented and Database Programming. *Proceedings of 2009 4th International Conference on Computer Science & Education*, (pp. 1464-1468). Nanning.
- Kim, J. (n.d.). *Peer-to-Peer Overlay Networks*. Retrieved September 10, 2010, from FSU Computer Science: <http://ww2.cs.fsu.edu/~jungkkim/P2P.html>
- Kim, R. (2006, February 27). *The world's a cell-phone stage*. Retrieved June 21, 2010, from SFGate: <http://www.sfgate.com>
- Lawton, G. (2005). What Lies Ahead for Cellular Technology? *Computer*, 14-17.

- Liu, F., Wang, G., Li, L., & Chou, W. (2006). Web Service for Distributed Communication Systems. *Service Operations and Logistics, and Informatics, 2006. SOLI '06. IEEE International Conference* (pp. 1030-1035). Shanghai: IEEE.
- Marguerie, F., Eichert, S., & Wooley, J. (2008). *LINQ in Action*. Greenwich, United States of America: Manning Publications Co.
- Mehta, V. P. (2008). *Pro LINQ Object Relational Mapping with C# 2008*. United States of America: Apress.
- Microsoft. (n.d.). *FILESTREAM Overview*. Retrieved October 1, 2010, from TechNet: <http://technet.microsoft.com/en-us/library/bb933993.aspx>
- MSDN. (2010, August 4). *Device Emulator for Windows Mobile*. Retrieved October 1, 2010, from MSDN: <http://msdn.microsoft.com/en-us/library/bb158519.aspx>
- Neable, C. (2002). The .NET Compact Framework. *Pervasive Computing, IEEE*, 84-87.
- Newcomer, E., & Lomow, G. (2004). *Understanding SOA with Web Services*. United States of America: Addison Wesley Professional.
- Palazzi, C. E., Bujari, A., & Cervi, E. (2009). P2P file sharing on mobile phones: Design and implementation of a prototype. *Computer Science and Information Technology, 2009. ICCSIT 2009. 2nd IEEE International Conference* (pp. 136-140). Beijing: IEEE.
- Peng, T., Wei, F., Rai-ping, S., & Yong-sheng, C. (2010). Reference: An Enterprise Flexible Object-Relational Mapping Framework based on Metadata and Property-Separation Storage. In T. Peng, F. Wei, & H.-p. Si (Ed.), *Educational and Network Technology (ICENT), 2010 International Conference*, (pp. 263-266). Qinhuangdao, China.
- Puder, A., Römer, K., & Pilhofer, F. (2006). *Distributed Systems Architecture*. San Francisco: Morgan Kaufmann Publishers.

- Qu, Z., Ge, Y., Jiang, K., Lu, T., & Wang, Z. (2007). A Study on the Model of Mobile P2P File-Sharing System in 3G Network. *Semantics, Knowledge and Grid, Third International Conference*, (pp. 306-309). Shan Xi.
- Schmelzer, R., Vandersypen, T., Bloomberg, J., Siddalingaiah, M., Hunting, S., Qualls, M., et al. (2002). *XML and Web Services Unleashed* (1st ed.). United States of America: SAMS Publishing.
- Schmidt, A., Stuhr, T., & Gellersen, H. (2001). Context-Phonebook - Extending Mobile Phone Applications with Context. *In 3rd Mobile Human-Computer Interaction Workshop*, (pp. 1-6).
- Sears, R., Ingen, C. V., & Gray, J. (2006). *To BLOB or Not To BLOB: Large Object Storage in a Database or a Filesystem?* Microsoft Research.
- Selvarani, R., Nair, T., & Prasad, V. (2009). Estimation of Defect proneness Using Design complexity Measurements in Object- Oriented Software. *2009 International Conference on Signal Processing Systems*, (pp. 766-770). Singapore.
- Somasegar, S., Guthrie, S., & Hill, D. (2009). *Microsoft Application Architecture Guide (Patterns & Practices)*. Microsoft Corporation.
- Steele, R. (2003). A Web Services-based system for ad-hoc mobile application integration. *Proceedings of the International Conference on Information Technology: Computers and Communications (ITCC'03)* (pp. 248-252). IEEE.
- Thomas, J. P., Thomas, M., & Ghinea, G. (2003). Modeling of Web Services Flow. *E-Commerce, 2003. CEC 2003. IEEE International Conference* (pp. 391-398). IEEE.
- Titus, T., Gilani, S. F., Gillespie, M., Hart, J., Mathew, B. K., Olsen, A., et al. (2005). *Pro .NET 1.1 Remoting, Reflection, and Threading*. United States of America: Apress.

- Ventä, L., Isomursu, M., Ahtinen, A., & Ramiah, S. (2008). "My phone is a part of my soul" – How People Bond with Their Mobile Phones. *The Second International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies* (pp. 311-317). Valencia: IEEE.
- W3C. (2004, February 11). *Web Services Architecture Requirements*. Retrieved September 2, 2010, from W3C: <http://www.w3.org/TR/wsa-reqs>
- Wang, W. (2004). *Steal this file sharing book: What They Won't Tell You About File Sharing*. San Francisco: No Strach Press, Inc.
- Wang, Y. (2006). Cognitive Complexity of Software and its Measurement. *Cognitive Informatics, 2006. ICCI 2006. 5th IEEE International Conference* (pp. 226-235). Beijing: IEEE.
- Yang, C. T., Chen, C. J., Chen, H. Y., & Hsu, C. H. (2008). A Peer-to-Peer File Resource Sharing System for Mobile Devices. *Grid and Pervasive Computing Workshops, 2008. GPC Workshops '08. The 3rd International Conference*, (pp. 275-280). Kunming.
- Yu, S., & Zhou, S. (2010). A Survey on Metric of Software Complexity. *Information Management and Engineering (ICIME), 2010 The 2nd IEEE International Conference* (pp. 352-356). Chengdu: IEEE.
- Zaplata, S., Dreiling, V., & Lamersdorf, W. (2009). Realizing Mobile Web Services for Dynamic Applications. *GITO-Publishing*, 3-12.