A Study of the Service Interoperability for OSGi and Bluetooth

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ABSTRACT

With the flourishing of the Internet, many network-capable devices have been created with different communication protocols hindering the interoperability of them. In addition, the disparity of their service protocols also makes it difficult to exchange and share services among them. Fortunately, OSGi and Jini are proposed as the open software architectures that enable the delivery and management of multiple applications and services to all types of networked devices. Therefore, this thesis proposes an OSGi-Jini gateway model to solve the problem of service interoperability between OSGi and Bluetooth devices using the Jini as the middleware. This way, OSGi fixed services and Bluetooth mobile services are interchangeable and the utilization of network resources is maximized. The proposed OSGi-Jini gateway is composed of OGSi server, Jini server, OSGi translator, and Jini translator to manage the device connection and service translation between OSGi requests and Jini requests. Furthermore, a Jini-Bluetooth gateway is employed in addition to an OSGi-Jini gateway to solve the problem of service interoperability among OSGi and Bluetooth devices. Finally, a prototype system of the proposed OSGi-Jini gateway is built as a testbed for the interoperability of a Jini-based MP3 player application and an OSGI-based English dictionary application. The result shows the proposed OSGi-Jini is both feasible and satisfactory.

Keywords : OSGi, Bluetoth, Jini, gateway, interoperability

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REFERENCES

[1] 禹帆，無線藍芽技術的深入探討最新版，文魁資訊股份有限 公司，民國90 年。
[2] 徐國偉，HAVi 與Jini 之間軟體閘道器的設計與實作，台灣 大學資訊工程學系暨研究所碩士論文，民國90 年。
[3] 高卉芸（Horstmann, C.S. and Cornell, G. 著），台灣培生教育 出版股份有限公司，民國91 年。
[4] 張裕益 譯（Booch, G., Rumbaugh, J. and Jacobson, I. 著）， UML 使用手冊，博碩文化股份有限公司，民國90 年。
[5] 鄒修銘、吳俊儀、胡凱智 譯（Robinson, M. and Vorobiev, P. 著），Swing 實作手冊—Java UI 最完整的參考 第二版，博碩 文化股份有限公司，民國92 年。
[6] 鄭玄哲，藍芽與Jini 服務互通框架之研究，大葉大學資訊管 理學系暨研究所碩士論文，民國92 年。
[7] Atinav, AveLink Embedded Gateway (OSGi Framework) http://www.atinav.com/osgi/index.htm, 2003.
[8] Cervantes, H., The Concept of Service, http://www-adele.imag.fr/BEANOME/serviceconcept.htm,2003.
[9] Chemishkian, S.,“ Building Smart Services for Smart Home, ” in Proceedings of the 2002 IEEE 4th International Workshop on Networked Appliances, pp.215-224, 2002.
[10] Chen, K. and Gong, L., Programming Open Service Gatewayswith Java Embedded Server Technology, Addison Wesley, 2001.
[11] Condry, M., Gall, U. and Delisle, P.,“ Open Service Gateway Architecture Overview, ” in IECON ’99 Proceedings of the 25th Annual Conference of the IEEE on Industrial Electronics Society, Vol. 2, pp.735-742, 1999.
[12] Dobrev, P., Famolari, D., Kurzke C. and Miller, B.A.,“ Device and Service Discovery in Home Networks with OSGi, ” IEEE Communications Magazine, Vol. 40, Issue 8, pp.86-92, 2002.
[13] Edwards, W. K. and Tom, R., Jini Example by Example, Prentice Hall PTR., 2001.
[14] Edwards, W.K., Core Jini second edition, Prentice Hall PTR, 1999.
[15] Jini Network Technology Specifications, http://wwws.sun.com/software/jini/specs/, 2003.
[16] Joong-Han Kim, Sung-Su Yae and Ramakrishna, R.S.,“ Context-Aware Application Framework based on Open Service Gateway, ” in Proceedings of the 2001 International Conferences on Info-tech and Info-net, Vol. 3, pp. 209-213,2001.
[17] Marples, D. and Kriens, P.,“ The Open Services Gateway Initiative: An Introductory Overview, ” IEEE Communication Magazine, Vol. 39, Issue 12, pp.110-114, 2001.
[18] Newmarch, J., A Programmer ’s Guide for Jini Technology, Apress, 2001.
[19] Oscar Bundle Repository, http://oscar-osgi.sourceforge.net/, 2004.
[20] OSGi Alliance, Specification Overview, http://www.osgi.org/resources/spec_overview.asp, 2003.
[21] RMI, http://java.sum.com/j2se/1.3/docs/guide/rmi/activation/activati on.1.htm, 1999.
[22] Stang, M. and Whinston, S.,“ Enterprise Computing with Jini Technology, ” IT Professional, Vol. 3, No. 1, pp.33-38, 2001.
[23] Sumi, H., Choonhwa Lee and David, N.,“ Enabling Smart Spaces with OSGi, ” IEEE Pervasive Computing, Vol. 2, Issue 3, pp. 89-94, 2003.
[24] Sun MicroSystems, Jini Network Technology, http://www.sun.com/jini, 2001.
[25] Tai-Yeon Ku, Dong-Hwan Park and Kyeong-Deok.Moon,“ A Java-Based Home Network Middleware Architecture Supporting IEEE1394 and TCP/IP, ” IEEE Transactions on Consumer Electronics, Vol. 48, No. 3, pp. 496-504, 2002.
[26] UML, http://www.omg.org/uml/, 1997.
[27] Widcomm SDK, http://www.widcom.com/, 2002.