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支持EJB动态分布的组件迁移模型与算法

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Abstract

Web application servers (WASs) provide a web computing infrastructure for distributed components. The component structure of statically configured distribution prevents web applications from being adaptive to the changing environmental conditions at runtime. To meet the requirement of dynamic redistribution, WASs should provide the capability to support component migration. The most challenging problem is to maintain component consistency during such a component migration. To resolve this inconsistency problem, some kinds of component migration constrains (CMC) are defined in this paper. A component migration model for J2EE (Java 2 platform enterprise edition) application servers is proposed, and SLB_Copy, SFB_Copy and EB_Copy component migration algorithms are presented. It is proved that SLB_Copy, SFB_Copy and EB_Copy migration algorithms all satisfy the CMC constrains. At present, the migration model is implemented in a J2EE application server, referred to as WebFrame 2.0, and these algorithms are applied to provide numerous services such as the adaptive load balancing service and the failover service.

Fan GC, Wei J, Zhong H, Feng YL. Migration model and algorithms for dynamic redistribution of enterprise Java bean components. *Journal of Software*, 2004,15(3):404~413.

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摘要

Web应用服务器是Web计算环境下的新型中间件,为基于组件的分布式Web应用提供了基础运行平台.组件静态分布限制了事务性Web应用在运行期间适应执行环境变化的能力.为了满足Web应用的动态分布需求,Web应用服务器需在底层为组件提供一种动态迁移的能力.如何维持组件迁移前后的一致性,是组件迁移中最棘手的问题之一.为解决此问题,定义了组件迁移一致性约束CMC(component migration constrains),并给出了在J2EE(Java 2 platform enterprise edition)应用服务器中支持EJB(enterprise Java Bean)动态分布的组件迁移模型和SLB_Copy,SFB_Copy,EB_Copy 3个迁移算法.分析得出SLB_Copy,SFB_Copy和EB_Copy均满足CMC约束.迁移模型和算法已在自主研制的Web应用服务器WebFrame2.0中实现,并已应用到自适应负载平衡、失效恢复等多个方面.

用服务器WebFrame2.0中实现,并已应用到自适应负载平衡、失效恢复等多个方面.

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References:

[1] Fan GC, Zhong H, Huang T, Feng YL. A survey of Web application servers. *Journal of Software*, 2003,14(10):1728~1739 (in Chinese with English abstract). <http://www.jos.org.cn/1000-9825/14/1728.htm>

[2] Richmond M. Component migration with enterprise JavaBeans. In: ACM SIGPLAN, ed. Proc. of the Conf. on Object-Oriented Programming, Systems, Languages, and Applications. New York: ACM Press, 2000. 79~80.

[3] Fan GC, Zhu H, Huang T, Feng YL. Towards adaptive load balancing services for Web application servers. Journal of Software, 2003,14(6):1134~1141 (in Chinese with English abstract). <http://www.jos.org.cn/1000-9825/14/1134.htm>

[4] Astley M, Sturman DC, Agha GA. Customizable middleware for modular distributed software. Communications of the ACM, 2001,44(5):99~107.

[5] Blair GS, Coulson G, Robin P, Papathomas M. An architecture for next generation middleware. In: Proc. of the IFIP Int'l Conf. on Distributed Systems Platforms and Open Distributed Processing. New York: Springer-Verlag, 1998. 191~206.

[6] Truyen E, Jørgensen BN, Matthijs F, Joosen W, Verbaeten P. Component architecture for dynamic reconfiguration of object request brokers. In: Sventek J, ed. Proc. of the IFIP/ACM Middleware 2000, Workshop on Reflective Middleware. New York: Springer-Verlag, 2000. 14~17.

[7] Forman GH, Zahorjan J. The challenges of mobile computing. IEEE Computer, 1994,27(4):38~47.

[8] Litiu R, Prakash A. DACIA: A mobile component framework for building adaptive distributed applications. Operating Systems Review, 2001,35(2):31~42.

[9] SUN Microsystems. Enterprise java beans 2.1 specification, 2001. <http://java.sun.com/products/ejb>

[10] Miloicic DS, Douglass F, Paindaveine Y, Wheeler R, Zhou SN. Process migration. ACM Computing Surveys, 2000,32(4):241~299.

[11] Richmond M, Hitchens M. A new process migration algorithm. ACM SIGOPS Operating Systems Review, 1997,31(1):31~42.

[12] PrismTech Corporation. OpenFusion Trading Service white paper, 2001. http://www.prismtechnologies.com/English/Products/CORBA/CORBA_services/trading/whitepaper/1_Trading_may01.html

[13] ExoLab Group. The OpenORB Trading Service. 2001. <http://dog.intalio.com/trading.html>

[14] Object Management Group. CORBA services: Common Object Services Specification. 1998.

[15] Object Management Group. The Common Object Request Broker: Architecture and Specification Minor Revision 2.3.1. 1999.

[16] Villoldo EJ. Component migration supported. <http://moriarty.dif.um.es/pipermail/ccm/2002-July/000153.html>

[17] Frénot S, Avin MS, Almasri N. EJB components migration service and automatic deployment. Technical Report, 2002. <http://www.inria.fr/rrrt/rr-4480.html>

[18] Richmond M. Support for dynamic distribution in component systems. In: Landherr S, ed. Proc. of the Workshop on Component-Oriented Software Engineering '98 in Conjunction with Australian Software Engineering Conference (ASWEC'98). Adelaide: IEEE Computer Society Press, 1998. 5~8.

附中文参考文献:

[1] 范国闯,钟华,黄涛,冯玉琳.Web应用服务器研究综述.软件学报,2003,14(10):1728~1739. <http://www.jos.org.cn/1000-9825/14/1728.htm>

[3] 范国闯,朱寰,黄涛,冯玉琳.Web应用服务器自适应负载均衡服务.软件学报,2003,14(6):1134~1141. <http://www.jos.org.cn/1000-9825/14/1134.htm>