2002年11月7日—9日
November 7-9,2002

第八届联合国际计算机会议

Proceedings of the 8th Joint International Computer Conference

论文集

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中国计算机学会 香港电脑学会

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信息创造价值
科技开创未来

周光召

二〇〇二年七月

序

由中国计算机学会、香港电脑学会主办，宁波市科学技术协会、宁波大学、宁波市科学技术局、宁波市政府信息化办公室承办的第八届联合国际计算机会议（The 8th Joint International Computer Conference, JICC2002）于 2002 年 11 月 7 日—9 日在宁波市举行。宁波市作为国家电子商务试点城市、制造业信息化试点城市、现代物流发展试点城市和第一批 CAD 应用工程重点示范城市，近几年来，城市信息化和信息产业化有了长足的发展。JICC2002 在宁波举行必将对宁波 IT 业的发展及学术水平的提高起到积极的推动作用。

会议经过近一年的筹备，在北京、香港、宁波三方的共同努力下，各项准备工作已经就绪。届时将有 200 多位国内外代表出席本次会议。此次会议还特别邀请了多位国内外学术界权威和产业界知名人士到会作特邀报告和专题报告。

会议的论文征集工作得到了国内外有关专家学者的积极响应，截至 2002 年 9 月底，共收到稿件 270 余篇。经各相关专家组初审和本次会议程序委员会终审，有 160 余篇论文入选本次会议论文集。入选的论文内容题材广泛，几乎涵盖了当今信息产业界从理论到应用的各个方面，反映了该领域的最新成果，其中包括网络及应用、图形与图像处理、信息安全技术、人工智能及应用、数据库与软件工程、企业信息化技术等。

当今世界，信息化水平和网络经济的发展程度，已经成为衡量一个国家综合国力强弱的关键性因素，以计算机技术和信息网络技术为代表的高新技术将成为推动新经济发展和社会进步的重要力量。因此，加强国际信息技术交流，必将有力地推动现代经济发展和社会文明，促进世界共同繁荣。

本次会议以“信息创造价值”为主题，有其鲜明的时代特色，也充分体现当今世界，信息化已渗透到经济生活和社会生活的方方面面，信息化、知识化、智能化已经成为 21 世纪科技革命的新潮流。我们编辑这本论文集，目的正是为了给国内外同仁提供一个相互交流、相互切磋、共同提高的机会。由于我们水平有限，编辑工作难免差错和纰漏，敬请各位谅解并赐教。

谨此，向对本次会议论文集编辑工作提供帮助的所有朋友致以最衷心的感谢！

第八届联合国际计算机会议组委会
2002 年 10 月

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Network and Applications

A Kind of Service Management Integrated Framework Based on Mobile IPv6 and QoS

YUAN Man[1], LUO Jun [1], HU Jian-ping [1], KAN Zhi-gang [2], Ma Jian[2]

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Abstract: The Internet is rapidly evolving all over the world. In the future, IP network, Telecom network and Mobile network will be merged into an ALL-IP network. In such a network, it will provide all kinds of abundant differentiated services with users at anywhere and anytime. IPv6 and mobile IPv6 have become standards, these protocols may provide enough IP address space. In this paper a kind of novel service management framework model is proposed, which is based on mobile IPv6 and support QoS during the service is transported. In this architecture, service location protocol and AAA protocol are extended to support service request and binding registering etc operation. In addition, a good idea, namely, all service such as DHCP, Bandwidth broker and AAA service and so on are all considered as service agent, they can register services with Directory Agent. Finally, some signal is analyzed.

Keywords: AAA, DiffServ, Mobile IPv6, QoS, Service Location Protocol, SLA/SLS

1. Introduction

The Internet is rapidly evolving all over the world. In the future, IP network, Telecom network and Mobile network will merge into an ALL-IP network. In such a network, it will provide all kinds of abundant differentiated services with users at anywhere and anytime. IPv6 and mobile IPv6 have become standards, these protocols provide enough IP address space. In the future, entire network communication protocol must adopt IPv6. IPv6 and mobile IPv6 will provide limitless business chance with people. Currently, much QoS aspect work mainly focus on wired network. However, according to author's knowledge, so far, nobody proposed a kind of framework model based mobile IPv6 supporting QoS, which integrates authentication, authorization, DiffServ, Mobile IP and Service Location Protocol etc techniques, we give the detailed signal. Designing this framework model's idea is to migrate the complicated computing into the access network which MH access and it will provide mobile IPv6 service management. In this architecture, our contributions include below several aspects:

- Layered service management model is proposed, see Fig. 1[25].
- The framework model Designed, which integrates authentication management, authorization management, QoS management, mobile IPv6 service management and service discovery management etc.

Service location protocol is extended, which includes authentication message object.

Service location protocol is extended, which includes authorization message object.

Service location protocol is extended, which includes SLA(Service Level Agreement)-SLS(Service Level Specification)/QoS object.

Service location protocol is extended, which includes mobile IPv6 binding register message object and so on.

AAA protocol is extended, which includes mobile IPv6 binding register message object.

AAA protocol is extended, which includes QoS object, and so on.

In addition, in this paper, a kind of novel idea is proposed, all the services, such as DHCP, BB or FA entity can all be considered as service agent, these agents can register their services with directory agent. In this way, we can utilize DA to centralizely manage these entities. The content is organized: in section 2,3,4,5, we overview service location protocol, DiffServ information model, Bandwidth Broker and Mobile IP, respectively. Section 6 gives the framework model and interaction signal etc. Section 7 gives conclusion and further work.

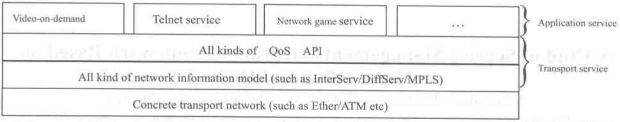

Fig. 1 the relationship between transport service and application service

2. IETF's Service Location Protocol

2.1 Overview of Service Location Protocol

Currently one of the most burdensome tasks in computer maintenance is location and configuration of networked services such as printers or mail servers. As the number of network services increases, so does the need for a network service discovery mechanism. A scalable, light-weight, IP based, service discovery method has not been ready for mainstream deployment until now. The Service Location Protocol (SLP)[1] is a new IETF[2] standards-track protocol designed to simplify the discovery and use of network resources such as printers, Web servers, fax machines, video cameras, filesystems, backup devices (tape drives), databases, directories, mail servers, calendars, and the unimaginable future variety of services coming our way. It is particularly well suited for client-server applications and establishing connections between network peers that offer or consume generic services. Typical configuration is showed below, see Fig. 2[3].

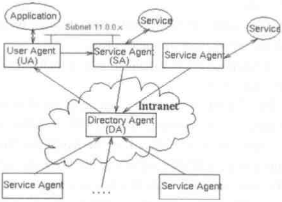

Fig. 2 SLP enterprise deployment Model

2.2 Components in service location protocol

SLP establishes a framework for resource discovery that include three "agents" that operate on behalf of the network-based software:

- User Agents(UA) performs service discovery on behalf of client software.
- Service Agents(SA) advertises the location and attributes on behalf of services.
- Directory Agents(DA) aggregates service information into what is initially a stateless repository.

Fig. 3 depicts SLP normal operation. In this example, a client program seeks an overhead projection server to display a presentation to an assembled audience. The SA registers the service' location with the DA in a Service Reply message.

Note that the SLP agents depicted may or may not reside on separate networked computers, but only one DA or SA can be on any given machine, due to the rules of the multicast convergence algorithm.

The networked service process advertises itself by registering with a DA, using an internal Service Protocol API[4]. An SA on the same computer as the network service registers service information by sending a Service Acknowledgment in reply.

Service registration have lifetimes no greater than 18 hours, so the SA must register the service periodically, or the lifetime expires. In the event that the service terminates, the SA can optionally send a Service Deregister message to the DA; but even in the worst case, when the service fails, the registration will age out. This ensures that stale information will not persist with the DA.

Client software can use the standard Service Location Protocol API to find the particular service it requires. In this case, a UA sends the DA a Service request that includes a search filter that is syntactically identical to the request format used by version 3 of the Lightweight Directory Access Protocol[5]. SLP thereby provides a directory-like lookup of all services that

Fig. 3 messages exchanged between UA,SA and DA

match the client's requirements. The DA returns a Service Reply messages containing Service URLs and enough information for the client to contact each service that matches the request.

3. Differentiated Services—DiffServ

Differentiated services (DiffServ) has been proposed by the IETF with scalability as the main goal. Diffserv[6,7] is a per-aggregate-class based service discrimination framework using packet tagging[8]. Packet tagging uses bits in the packet header to mark a packet for preferential treatment. In IPv4,the type-of-service(TOS) byte[9], which for IPv4 is Type-of-Service (TOS) octet and for IPv6 is the Traffic Class octet. consist of 3-bit precedence field, a 4-bit field indicating requests for minimum delay, maximum throughout, maximum reliability and minimum cost, and one unused bit. However, these bits were never widely used. DiffServ redefines this byte as the DS field, of which six bits make up the DSCP(Differentiated Service code Point)field ,and the remaining two bits are unused. The interpretation of the DSCP field is currently being standardized by the IETF.

Diffserv uses DSCP to select the per-hop behavior (PHB) a packet experiences at each node. A PHB is an externally observable packet forwarding treatment which is usually specified in a relative format compared to other PHBs, such as relative weight for sharing bandwidth or relative priority for dropping. The mapping of DSCPs to PHBs at each node is not fixed. Before a packet enters a diffServ domain, its DSCP field is marked by the end-host or the first-hop router according to the service quality the packet is required and entitled to receive. Within the Diffserv domain each router only needs to look at DSCP to decide the proper treatment for the packet. No complex classification or per-flow state is needed.

Currently, DiffServ provides two service models besides best effort. Premium service[10] is a guaranteed peak rate service, which is optimized for very regular traffic patterns and offers small or no queuing delay. This model can provide absolute QoS assurance. One example of using it is to create "virtual leased lines", with the purpose of saving the cost of building and maintaining a separate network. Assured service[11] is based on statistical provisioning. It tags packets as In or Out packets are unlikely to be dripped, while Out packets are dropped first if needed. This service provides a relative QoS assurance. It can be used to build "Olympic service" which has gold, silver and bronze service levels. DiffServ technique can be used in environment to support mobile host QoS.

4. Bandwidth Brokers

Admission mechanism includes admission control[12,13], policy control[14], and bandwidth broker[15,16]. Here, only bandwidth broker is discussed. Fig. 4[17]. A bandwidth broker (BB) is a logical resource management entity that allocates inter-domain resources and arranges inter-domain agreements. A bandwidth broker for each domain can be configured with organizational policies. And control the operations of edge routers. In the view of policy framework, a bandwidth broker includes the function of PDP and policy database, while routers serve as PEPs.

In its inter-domain role, a bandwidth broker negotiates with its neighbor domains, sets up bilateral agreement with each of them, and sends the appropriate configuration parameters to the domain'sedge router (Fig 4). Bilateral agreement means that a bandwidth broker only needs to coordinate with its adjacent domains. End-to-end QoS

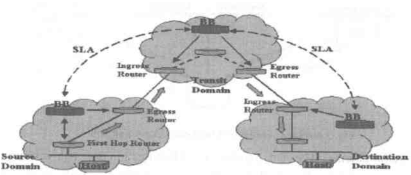

Fig. 4 Bandwidth broker implements admission control

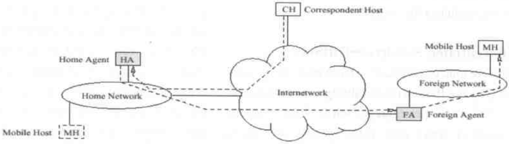

Fig. 5 Mobile IP entities and their relationship

is provided by the concatenation of these bilateral agreements across domains, together with adequate intra-domain resource allocation.

5. IETF Mobile IP

The IETF Mobile IP working group has defined a protocol to support mobility for mobile hosts in a TCP/IP Internetwork. In Mobile IP[18], a mobile host(MH) is assigned an IP address on its home network, called the MH's *home address*. Packets from a correspondent host (CH) to the MH are always addressed to the home address of the MH. If the CH is aware that the MH is mobile, Then the CH can encapsulate its packets and forward them directly to the MH' s new location without traversing the home network .

In general, when the MH connects to a foreign network, it identifiers and registers with a Foreign Agent (FA),or registers directly with its Home Agent (HA). When registering, the MH acquires a care-of address defining its current location. The combination of the MH' s home address and the care-of address is known as a binding. The MH can acquire its care-of address either from a foreign agent or through auto-configuration methods (such as DHCP[19]) designed for assigning of the FA itself. If the address is assigned an auto-configuration, it is said to be *co-resident* with the MH, and will be some unused address on the foreign network. When the care-of address for the foreign network using link-layer protocols. The FA must also serve as the MH' s default router. If the address is co-resident, the MH itself must de-capsulate datagram. An example scenario is illustrated in Fig. 5.

When MH moves to foreign network, he may use the services provided by foreign ISP. Before using these available services, these MHs must be authenticated and authorized, in order to obtaining certain level QoS, these MHs must negotiate with the foreign ISP.

6. Service Management Framework to Support Mobile Qos

Some technique related to mobile IP and QoS are discussed above. These different models are separated each other. If a client wants to using QoS-Enable-service, he/she must negotiate with ISP, After negotiation, a kind of SLA(Service Level

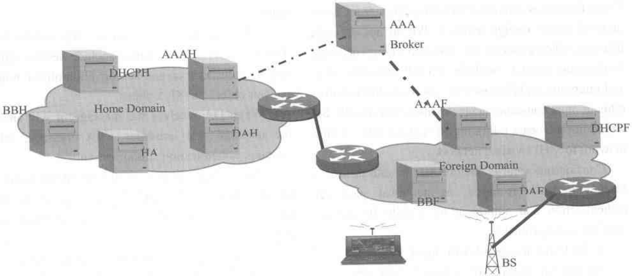

Fig. 6 Service management architecture to support mobile IPv6 QoS

Agreement) has been built. But, before he/she negotiates with his/her ISP, he/she must obtain authorization to access the network and be able to discovery the services provided by ISP and so on. In order to implement these functions, a kind of service management model based on mobile IPv6 is proposed. See Fig 6.

6.1 Entities in the Architecture

In this architecture, there exist main entities: DA,BB,AAA[20,21,22],HA and so on. Among these entities, AAA, BB, HA can be regarded as SA(Service Agent). Now that these entities are SA accept DA entity. These SA must resister service with DA according to service location protocol specification. Bandwidth Broker (BB) performs negotiation and resource allocation.

Directory Agent (DA) responsible for collecting services from all SAs and advertising services registered. All SAs, such as AAA service, BB service and DHCP service etc, must be registered with DA. Because of adding DA service, enormously reducing bandwidth overhead due to SAs and UAs' s advertising.

AAA (Authentication Authorization Accounting) perform authentication, authorization and accounting for all kinds of users (including fixed users and mobile users). For example, when a MH move foreign domain from home domain, If he/she wants to access services provided by the foreign domain ISP, he/she must be authenticated and authorized. Therefore, AAA service is able to assure ISP network security.

AAA Broker is an intermediary AAA server, it likes a bridge to connect AAAH and AAAF.

MH/UA (Mobile Host/User Agent) request service to DA and SA, if MH wants to obtain certain service, he/she must send service request to DA, DA can send back response according to the request. After MH obtains SA' s location, MH can use the services.

6.2 Communication between Entities

Due to wireless resource bandwidth is much limited, the architecture designed must be considered to push the complicated computing into the core network and reduce the number of interaction between mobile hosts and some entities in the core network. Therefore, based on these requirements, we try our best to process all kinds of signals and some computing in core (access) network.

6.2.1 Extension of Service Location Protocol

In order to reduce network overhead and interaction number between mobile host and entity in the architecture. Service request message of service location protocol can be extended to carry service request message, mobile host binding register message, authentication and authorization messages and service level agreement object message (QoS object). In such way, a mobile host needs to send only once service request message to DA. After that, mobile host only wait to use services provided by foreign network ISP.