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Analysis of Mobile Ad-Hoc Networking Technology for Pervasive Computing

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Abstract – In the near future, a pervasive computing environment can be expected based on the recent progresses and advances in computing and communication technologies. Next generation of mobile communications will include both prestigious infrastructure wireless networks and novel infrastructure less mobile ad hoc networks (MANETs). A MANET is a collection of wireless nodes that can dynamically form a network to exchange information without using any pre-existing fixed network infrastructure. The special features of MANET bring this technology great opportunities together with severe challenges. This paper describes the fundamental problems of ad hoc networking by giving its related research background including the concept, features, status, and applications of MANET. Some of the technical challenges MANET poses are also presented, based on which the paper points out some of the key research issues for ad hoc networking technology that are expected to promote the development and accelerate the commercial applications of the MANET technology. Special attention is paid on network layer routing strategy of MANET and key research issues include new X-cast routing algorithms, security & reliability schemes, QoS model, and mechanisms for interworking with outside IP networks.

The introduction of pervasive computing in the last decade has made content adaptation an important research focus. Many content adaptation approaches have been proposed for pervasive computing environments. They are, however, fully or partially centralized which makes them unsuitable to a dynamic pervasive environment such as a Mobile Ad hoc NETwork (MANET). In this paper, we propose ConAMi, a Collaboration-Based Content Adaptation Middleware, for this type of environment. In this middleware, content adaptation is performed by the collaboration between co-located devices and is done by composing available services in the vicinity. The middleware implements a novel service composition algorithm which takes the dynamicity of services into consideration.

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INTRODUCTION

Delivering information in an appropriate format is an important challenge in a dynamic pervasive computing environment such as a Mobile Ad-hoc NETwork (MANET) where a variety of devices is involved. Content adaptation is considered as an effective solution to face this challenge. Content adaptation refers to the process of customizing or tailoring information according to the user's preferences, device capabilities and network condition.

Since faults such as disconnections of devices are a very nature of MANETs, ConAMi is equipped with a mechanism to recover from faults. This work doesn't address the problem of security and confidentiality of data access. However, there is another group in our laboratory working on security for pervasive systems. In future, the security features will be incorporated into our middleware by using the result of the mentioned work.

The people's future living environments are emerging, based upon information resource provided by the connections of various communication networks for users. New small devices like Personal Digital Assistants (PDAs), mobile phones, handhelds, and wearable computers enhance information processing and accessing capabilities with mobility.

Moreover, traditional home appliances, e.g. digital cameras, cooking ovens, washing machines, refrigerators, vacuum cleaners, and thermostats, with computing and communicating powers attached, extend the field to a fully pervasive computing environment. With this in view, modern technologies should be formed within the new paradigm of pervasive computing, including new architectures, standards, devices, services, tools, and protocols.

Mobile networking is one of the most important technologies supporting pervasive computing. During the last decade, advances in both hardware and software techniques have resulted in mobile hostsand wireless networking common and miscellaneous.

Generally there are two distinct approaches for enabling wireless mobile units to communicate with each other:

1) Infrastructured. Wireless mobile networks have traditionally been based on the cellular concept and relied on good infrastructure support, in which mobile devices communicate with access points like base stations connected to the fixed network infrastructure. Typical examples of this kind of wireless networks are GSM, UMTS, WLL, WLAN, etc.

2) Infrastructureless. As to infrastructureless approach, the mobile wireless network is commonly known as a mobile ad hoc network (MANET). A MANET is a collection of wireless nodes that can dynamically form a network to exchange information without using any pre-existing fixed network infrastructure. This is a very important part of communication technology that supports truly pervasive computing, because in many contexts information exchange between mobile units cannot rely on any fixed network infrastructure, but on rapid configuration of a wireless connections on-the-fly. Wireless ad hoc networks themselves are an independent, wide area of research and applications, instead of being only just a complement of the cellular system.

In this paper, we describes the fundamental problems of ad hoc networking by giving its related research background including the concept, features, status, and applications of MANET. Some of the technical challenges MANET poses are also presented, based on which the paper points out the related kernel barrier. Some of the key research issues for ad hoc networking technology are discussed in detail that are expected to promote the development and accelerate the commercial applications of the MANET technology.

As data accessibility in a MANET s is influenced by mobility and power constrain of the servers and clients, data in MANET‟s be replicated. The IEEE 802 standards are devoted to the structure of MANs and LANs. Eminent component of this grouping are the IEEE802.3 and the now almost over and done 802.5 on the other hand the majority of the rising standards in this family arrangement with networking over the wireless medium.

The 802.15, of which blue-tooth is part of, are planned to communicate private procedure over a small area Wireless personal area network (WPAN). For the making of the Wireless corresponding of a LAN (i.e., a Wireless Local Area Network or WLAN), the IEEE planned the 8o2.11 standard; while the 802.16 (Wimax) take in hand the difficulty of city area Network or Wireless Metropolitan area Network (WMAN). Those 3 standards have in familiar the detail, which they are powerfully sustain on some types of communications. In a Wireless Personal Area Network (WPAN) - a master device focuses the entire interchange. For a WLAN, the access point shows a vital job; by depend the entire traffics between contributing wireless networks.

Furthermore, WiMax is as well communications bound; its central node is a controlling and practical base station. Although still simple to organize when evaluate to their wired corresponding item, those equipment are not practical in situation where no communications at all is accessible. For example is a tragedy region where a normal disaster or fanatic bother entirely damaged some communications. Although here is a huge deal of further frequent situation wherever communications- open network be desirable. The rising and cost-effectively test area wherever no reserves survive to put together or preserve an operational communications. A no communications or Ad-hoc Network might be the influential digital addition device desirable to lessen deficiency by way of expanding right to use to information and learning stuffing. An Ad-hoc Network is a self-forming, self-configuring network, which allots some communications, even an access point. In such a network a node is capable to correspond with several additional nodes inside collection and as well by nodes out of instantaneous radio range. To execute the later, an Ad-hoc network based on the nodes to communicate traffic s for benefit of other nodes. An additional significant class of multihopes nodes networks is in general call Mesh Networks. In a Mesh Networks a few of the nodes are devoted to the advance of traffic s of the other nodes form a Nodes backhaul, which might be, measured its „communications‟. A review of such methods is able to be initiated in and an explanation of the routings protocols and metrics.

BACKGROUND

MANET Concept: A mobile ad hoc network is a collection of wireless nodes that can dynamically be set up anywhere and anytime without using any pre-existing network infrastructure. It is an autonomous system in which mobile hosts connected by wireless links are free to move randomly and often act as routers at the same time. The traffic types in ad hoc networks are quite different from those in an infrastructure wireless network, including:

1) Peer-to-Peer. Communication between two nodes which are within one hop. Network traffic (Bps) is usually consistent.

2) Remote-to-Remote. Communication between two nodes beyond a single hop but which maintain a stable route between them. This may be the result of several nodes staying within communication range of each other in a single area or possibly moving as a group. The traffic is similar to standard network traffic.

3) Dynamic Traffic. This occurs when nodes are dynamic and moving around. Routes must be reconstructed. This results in a poor connectivity and network activity in short bursts.

MANET Features: MANET has the following features:

1) Autonomous terminal. In MANET, each mobile terminal is an autonomous node, which may function as both a host and a router. In other words, besides the basic processing ability as a host, the mobile nodes can also perform switching functions as a router. So usually endpoints and switches are indistinguishable in MANET.

2) Distributed operation. Since there is no background network for the central control of the network operations, the control and management of the network is distributed among the terminals. The nodes involved in a MANET should collaborate amongst themselves and each node acts as a relay as needed, to implement functions e.g. security androuting.

3) Multihop routing. Basic types of ad hoc routing algorithms can be single-hop and multihop, based on different link layer attributes and routing protocols. Single-hop MANET is simpler than multihop in terms of structure and implementation, with the cost of lesser functionality and applicability. When delivering data packets from a source to its destination out of the direct wireless transmission range, the packets should be forwarded via one or more intermediatenodes.

4) Dynamic network topology. Since the nodes are mobile, the network topology may change rapidly and unpredictably and the connectivity among the terminals may vary with time. MANET should adapt to the traffic and propagation conditions as well as the mobility patterns of the mobile network nodes. The mobile nodes in the network dynamically establish routing among themselves as they move about, forming their own network on the fly. Moreover, a user in the MANET may not only operate within the ad hoc network, but may require access to a public fixed network(e.g. Internet).

5) Fluctuating link capacity. The nature of high bit-error rates of wireless connection might be more profound in a MANET. One end-to-end path can be shared by several sessions. The channel over which the terminals communicate is subject to noise, fading, and interference, and has less bandwidth than a wired network. In some scenarios, the path between any pair of users can traverse multiple wireless links and the link themselves can be heterogeneous.

6) Light-weight terminals. In most cases, the MANET nodes are mobile devices with less CPU processing capability, small memory size, and low power storage. Such devices need optimized MANET Status: Ad hoc networking is not a new concept. As a technology for dynamic wireless networks, it has been deployed in military since 1970s. Commercial interest in such networks has recently grown due to the advances in wireless communications. A new working group for MANET has been formed within the Internet Engineering Task Force (IETF), aiming to investigate and develop candidate standard Internet routing support for mobile, wireless IP autonomous segments and develop a framework for running IP based protocols in ad hoc networks. The recent IEEE standard 802.11 has increased the research interest in the field.

Many international conferences and workshops have been held by e.g. IEEE and ACM. For instance, MobiHoc (The ACM Symposium on Mobile Ad Hoc Networking & Computing) has been one of the most important conferences of ACM SIGMOBILE (Special Interest Group on Mobility of Systems, Users, Data and Computing). Research in the area of ad hoc networking is receiving more attention from academia, industry, and government. Since these networks pose many complex issues, there are many open problems for research and significant contributions.

MAIN RESEARCH PROBLEMS

This part analysis main research problems pertaining to MANET network layer routing strategies, consisting of four chosen main issues in MANET: X-cast routing, security & reliability, QoS, and networking with outside IP networks. These issues are presently main disputes of Ad-hoc wireless networks. The need of robust solutions to these issues avoids MANET from wide commercial deployment.

X-cast Routing Algorithms: As in the infrastructure wireless networks, all kinds of X-cast communication methods should be sustained in an Ad-hoc mobile environment. These consist of unicast, anycast, multicast, and broadcast. MANET also gets fresh X-cast modes into communications, for example geocast and content-based. In particular, multicast is desirable to sustain multiparty wireless communications. As the multicast tree is no longer Static (i.e., its topology is subject to vary over time), the multicast routing protocol has to be capable to cope with mobility, consisting of multicast membership dynamics (e.g., leave and join).

In a Multihop Ad-hoc context, the routing issue becomes more difficult because of the mobility of both hosts and routers. The random movement of the nodes and the ambiguity of path quality render the conventional routing protocols not practical. Trade-off between reactive and proactive methods in terms of latency and overhead of route discovery and

preservation are to be measured depending on different traffic and mobility models. Issues to be taken into explanation consist of routing discovery and flooding, caching, data delivery, location-aided and power-aware, broadcast storm issue, route request and reverse path.

QoS Maintaining Model : Just like in wired networks, QoS protocols can be used to prioritize data within Ad-hoc networks in order to reserve better links for high data rate applications while still sustaining sufficient bandwidth for lower bit rate communication. The sustainability of multimedia services will very likely be needed within and all the way through the MANET, for which different QoS classes (for example voice, video, audio, web, and data stream) are needed to assist the use of multimedia applications.

Security, Reliability and Availability Schemes : Security, reliability, and availability are three critical feature of MANET, particularly in security-sensitive applications. As Ad-hoc depends on wireless communication medium, it is significant to employ a security protocol to defend the confidentiality of transmissions. The needs concerning secrecy, uprightness, and availability are the same as for any other open communication networks. On the other hand, the execution methods of main management, verification, and permission are fairly different because there is no assist of trusted third-party documentation superiority to make trusted relations by exchanging private/public keys. Different types of intimidation and hits in opposition to routing in MANET are supposed to be examined leading to the need of Ad-hoc routing security, and highly developed explanations are needed for the protected routing of MANET.

RELATED WORK

A number of content adaptation approaches have been proposed for a pervasive computing environment. We classify these approaches into two categories: those which use the concept of service composition to perform content adaptations and others without using this concept. We further classify the second category as client based, server-based and proxy-based adaptation approaches. In the client-based adaptation approach, the client device itself is responsible to adapt the contents according to the context of the user and his/her environment. However, this approach is difficult to be implemented in a dynamic pervasive computing environment because the client device has limited capabilities and it may not have all the required tools to carry out the appropriate adaptation.

In the server-based adaptation approach and the proxy-based adaptation approach, the server and the proxy perform content adaptations respectively. These approaches are not suitable to a dynamic pervasive computing environment since in this environment finding a device that acts as a server or a proxy is difficult.

Ref. has proposed a content adaptation approach which lies in the first category, i.e., service composition based. In this approach, content adaptations are performed by a chaining of Internet accessible adaptation services. Performing adaptation with the use of service composition is suitable to a dynamic pervasive computing environment because it allows collaboration between devices. However, in a MANET, getting adaptation services from the web is not always a valid assumption since there are places where accessing the Internet is not possible. Furthermore, this approach is based on a client-proxy-server architecture which is not applicable for a dynamic pervasive computing environment.

Service composition-based content adaptation is an appropriate approach for a dynamic pervasive computing environment because it allows collaboration between co-located devices. However, there are few works in the area of service composition for a MANET. In this work, services involved to form a composite service as well as their sequences are predetermined. The environment considered by this approach is quite different with ours where different general devices (PDA, Smart Phone, Laptop, etc) are involved.

As compared to the above works, the proposed content adaptation middleware composes services in a different way. First, the service composition is done by only knowing the description of input and output of a composite service which corresponds to the content adaptation process. Second, the middleware implements a content adaptation tree construction algorithm which considers the dynamicity of the services.

CONCLUSION

This paper illustrates and examines the main research issues of MANET. Initially, the backgrounds information of MANET is established, consisting of the MANET notion, features, present position, and application regions. Then the major disputes of MANET are explained that guide to the study of related kernel barrier. In conclusion, four main network layer research issues of MANET routing strategies are illustrated in detail. The work and highly developed solutions to these issues are essential to perform the need of wide commercial employment of MANET.

The mobile Ad-hoc networking is one of the very significant and necessary technologies that sustain future pervasive computing situation. The particular characters of MANET get these technology huge opportunities together with rigorous disputes. Presently MANET is becoming further and further attractive research subject and there are numerous research schemes deployed by academic and

companies. MANET s can be exploited in an extensive part of applications, from military, emergency rescue, law enforcement, commercial, to local and personal contexts.

This article describes the fundamental issues and analyses key research problems of MANET. Firstly, the background information of MANET are introduced, including the MANET concept, features, current status, and application areas. Then the main challenges of MANET are discussed that lead to the analysis of relevant kernel barrier. Finally, four key network layer research issues of MANET routing strategies are described in detail. The novel and advanced solutions to these issues are necessary to fulfil the requirements of wide commercial deployment of MANET.

Mobile ad hoc networking is one of the most important and essential technologies that support future pervasive computing scenario. The special characters of MANET bring this technology great opportunities together with severe challenges. Currently MANET is becoming more and more interesting research topic and there are many research projects employed by academic and companies all over the world. Various interesting issues are investigated that cover all aspects of ad hoc wireless networks. Meanwhile, many routing protocols designed for ad hoc networks have been proposed as Internet Draft and RFC of IETF. MANETs can be exploited in a wide area of applications, from military, emergency rescue, law enforcement, commercial, to local and personal contexts.

We have proposed ConAMi, a Collaboration-Based Content Adaptation Middleware, for a dynamic pervasive computing environment such as Mobile Ad-hoc NETworks (MANETs). It allows co-located devices to collaborate with each other in order to perform content adaptation. Content adaptation is done by composing services which are distributed on devices in the vicinity. To compose services efficiently, we propose an algorithm which arranges services in a colored tree. The use of a colored tree is a novel idea in the area of service composition. The algorithm considers the dynamicity of the services during a tree construction, i.e., a service is considered if its time to leave allows it to participate on performing a content adaptation. A service, however, may disappear before the specified time to leave. To stand this challenge, our middleware includes a module for fault detection and recovery.

We developed a preliminary prototype to evaluate the efficiency of the proposed colored tree construction algorithm. The result of the experiment shows that the proposed algorithm is appropriate for MANETs. We plan to develop a complete prototype in order to implement the proposed middleware.

REFERENCES

H. K. SONI (2011-03-22). "Ad hoc Network", DoS attack in MOBILE AD-HOC NETWORK.

T.O. Krag and Sebastian Büettrich (2004-01-24). "Wireless Mesh Networking", O'Reilly Wireless Dev Center. Retrieved 2009-01-20.

M. Frodigh, P. Johansson, and P. Larsson. “Wireless ad hoc networking: the art of networking without network,” Ericsson Review, No.4, 2000, pp. 248-263.

IETF Working Group: Mobile Ad-hoc Networks (MANET). Ad hoc Networking Extended Research Project. Online Project.

S.R. Das, R. Castaneda, and J. Yan, “Simulation-based performance evaluation of routing protocols for mobile ad-hoc networks,” Mobile Networks and Applications, 2000, 5, pp. 179-189.

S.-J. Lee, M. Gerla, and C.-K. Toh, “A simulation study of table-driven and on-demand routing protocols for mobile ad-hoc networks,” IEEE Network, 1999, 13(4), pp. 48-54.

M. Joa-Ng and I.-T. Lu, “A peer-to-peer zone-based two-level link state routing for mobile ad hoc networks,”. IEEE Journal on Selected Areas in Communications, 1999, 17(8), pp. 1415-1425.

L. Ji, M. Ishibashi, and M.S. Corson, “An approach to mobile ad hoc network protocol kernel design,” In Proceedings of IEEE WCNC’99, New Orleans, LA, Sep. 1999, pp. 1303-1307.

Y.-B. Ko and N. H. Vaidya, “Geocasting in mobile ad hoc networks: Location-based multicast algorithms,”. Technical Report TR-98-018, Texas A&M University, Sep. 1998.

Berhe, G. Brunie, L. and Pierson, J-M., 2004. Modeling service-based multimedia content adaptation in pervasive computing. ACM Proceedings of the first conference on computing frontiers (CF’04). Ischia, Italy, pp. 60-69.

Chakraborty, D. Joshi, A. Finin, T. and Yesha, Y., 2005. Service composition for mobile environments. Journal on Mobile

Networking and Applications, Special Issue on Mobile Services, Vol. 10, No. 4, pp. 435-451.

Held, A. Buchholz, S. and Schill, A., 2000. Modeling of context information for pervasive computing applications Proc. Of the 6th World Multiconference

on Systemics, Cybernetics and Informatics (SC12002). Orlando, FL, USA.

Kim, J.-G. Wang, Y. and Chang, S-F, 2003. Content-adaptive utility-based video adaptation. In Proc. of IEEE International Conference on Multimedia & Expo (ICME). pp. 281-284.

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