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A Study on Wmn Based Handoff Management Schemes

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ABSTRACT:

Remote work systems (WMNs) have turned into an undeniably famous kind of remote access that gives high availability between clients. The quality of services (QoS) is an essential issue in WMNs. In any case, keeping in mind the end goal to give the best QoS, a few issues still should be tended to, for example, handoff. In this paper, handoff administration plot in light of WMN is proposed and assessed. The fundamental target of the proposed conspire is to diminish the handoff delay and hence, diminishes the bundle misfortune. The proposed handoff conspire chooses the most brief way between the source and goal which is maximally-jointed with the essential one. Late advances in Wireless Mesh Networks (WMNs) have beaten the disadvantages of customary wired systems and remote specially appointed systems. WMNs will assume a main part in the up and coming age of systems, and the subject of how to give smooth portability to WMNs is the main impetus behind the examination. The intrinsic attributes of WMNs, for example, generally static spines and very versatile customers, require new handoff administration answers for be composed and executed. This work is to plan and execute productive handoff administration plans to help smooth versatility in WMNs.

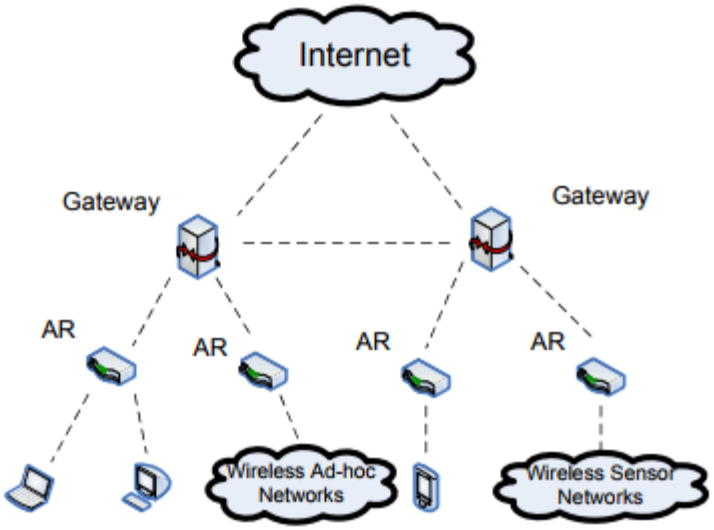
Keywords: Wireless Mesh Networks, wireless networking, Public Safety and Disaster Recovery, Handoff Management.

INTRODUCTION:

Remote Mesh Networks (WMNs) are a profoundly encouraging remote system engineering that picked up bunches of advances as of late. WMNs can utilize remote associations with develop a spine for handing-off information parcels. Contrasted with traditional wired systems, WMNs have many points of interest, for example, simple organization, minimal effort, dynamic self setup, and so forth. Because of the inalienable attributes of remote systems, for example, low transfer speed, short transmission ranges, and the high probability of blockage, the topic of how to help smooth meandering in a remote work organize, considering the customers' portability, has turned into a main thrust behind research.

In a general remote work organize, as indicated by various functionalities and parts, work hubs can be partitioned into two gatherings: work customers and work switches. Work customers are remote terminals which can join and leave the remote work organize whenever. Likewise, it is in these terminals' temperament to interface with the Internet or neighborhood arranges through the association gave by the remote work organize. Work customers can be any sort of

specialized gadgets with remote recieving wires, for example, tablets, PDAs, advanced mobile phones, remote sensors and so forth. Then again, work switches are a kind of uncommon remote hubs that give the association administration to work customers. All in all, there are three classes of work switches: portals transfer switches and get to switches. Passages are utilized to give correspondence among different hubs which are in an alternate area through Internet or some neighborhood systems.



Wireless mesh networks

HANDOFF: Handoff, which can also be called handover, is the process of switching access routers, access points or base stations during the movement of mobile nodes. During the movement, when the mesh client finds that the current wireless connection is lost, it should establish a new wireless connection with another access router. After the handoff process is completed, the mesh client can continue the interrupted network applications.

Although the handoff solves the problem of how to support free mobility in the mobile environment, it introduces another question for WMNs. This question is how to support smooth roaming in WMNs. Smooth roaming means that during a mesh client's movement, the user would not notice that the mesh client does handoffs to maintain wireless connections. During the handoff process, the mobile mesh client will disconnect with the original access router. The network communication is interrupted in this phase. The time spent to complete the handoff process is called handoff latency. If the handoff latency is too long, large jitter will appear and the quality of service will not be acceptable for users. Therefore, the handoff latency should be minimized to support smooth roaming in WMNs. In WMNs, frequent handoffs are inevitable for mobile clients to keep network connections during their movement; as a result, smooth roaming is very important in

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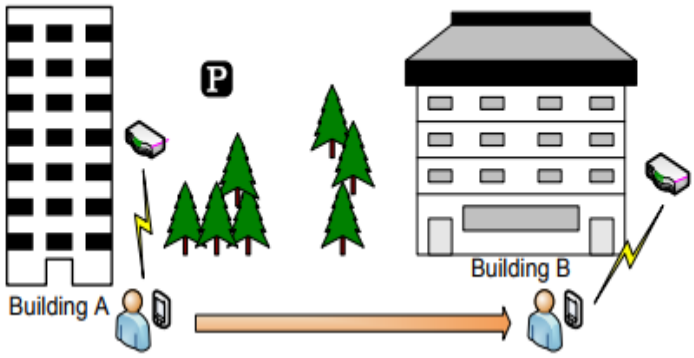
order to support real-time applications in wireless mesh networks. Real-time applications have strict requirements on time synchronization. Long handoff latency introduces long interruption time, and long interruption time causes large jitter. Large jitter is not tolerable for real-time applications because it breaks the time synchronization. As a result, the user will have a bad user experience on real-time application.



An application scenario featuring handoff

For example, as illustrated in Figure, if we have a conference call using Skype and we have to move from one building to another building in campus, large jitter caused by handoffs would harm the quality of video conference. It is possible that we cannot hear anything during the handoff process and the video would also be stuck during the movement. Smooth roaming is also very important for VMNs. In a VMN, the mesh clients which are vehicles have much higher speed compared with the clients in traditional WMNs. Consequently, the handoff occurs more frequently in vehicular mesh networks; and the quality of service is significantly affected by the handoff latency. For instance, a user takes the bus for a long distance trip, and the user would like to play an online-game during the trip, such as World of Warcraft. If there is no smooth roaming supported, when the computer has to switch access routers, large jitter is introduced; and the control of his character will be lost. The character then would lose a battle or be killed by the enemy. Thus, smooth roaming is needed to be implemented in WMNs.

Literature Review:

Ryan Wishart et al [1] Wireless mesh networks (WMN) have been identified as being ideally suited to this task. WMN offer a high-capacity wireless backhaul network, provided by mesh routers, through which clients can connect to one another or with external networks. Mobility of clients within the mesh is particularly important for Public Service and Disaster Recovery scenarios. Client handoff mechanisms provide this functionality. In this paper we provide a critical survey of client handoff approaches applicable to IEEE 802.11 WMN evaluating them based on the strict QoS requirements

established by the US Department of Homeland Security for PSDR networks.

Zhenxia Zhang et al [2] The inherent characteristics of WMNs, such as relatively static backbones and highly mobile clients, require new mobility management solutions to be designed and implemented. In this paper, a hybrid routing protocol for forwarding packets is proposed: this involves both link layer routing and network layer routing. Based on the hybrid routing protocol, a mobility management scheme for WMNs is presented. As a result, real-time applications over 802.11 WMNs such as VoIP can be supported.

Ian F. Akyildiz et al [3] Presents a detailed study on recent advances and open research issues in WMNs. System architectures and applications of WMNs are described, followed by discussing the critical factors influencing protocol design. Theoretical network capacity and the state-of the-art protocols for WMNs are explored with an objective to point out a number of open research issues. Finally, test beds, industrial practice, and current standard activities related to WMNs are highlighted.

Fawaz A. Khasawneh et al [4] An intra-domain handoff management scheme is proposed and evaluated. The main objective of the proposed scheme is to reduce the handoff delay and therefore, decreases the packet loss. The proposed handoff scheme selects the shortest path between the source and destination which is maximally-jointed with the primary one.

Nouri Omheni et al [5] proposes efficient Mac Layer handoff management scheme for WMNs. First, we describe a new approach to reduce discovery delay based on handoff prediction when MSs roam across different Wireless Mesh Routers (WMRs). Then we develop a new algorithm to select the optimal target WMR using the minimum airtime cost as metric. The simulation results show that our design may achieve better performance in terms of discovery delay and network throughput.

Handoff Schemes:

Handoff schemes are solutions to implement handoff processes. An efficient handoff scheme can reduce handoff latency and minimize packet loss ratio. Figure 1.4 illustrates components of a complete handoff scheme. In general, a handoff process can be divided into two phase: the MAC layer handoff and the network layer handoff. When a mesh client finds that the quality of the signal, which can be measured by the Received Signal Strength (RSS) or the Signal to Noise Ratio (SNR) below the predefined level in the MAC layer, the mesh client initiates the MAC layer handoff process to establish wireless connection with the new access router in the physical layer. The MAC layer handoff process includes three steps: scan, authentication and association. In the first step, the mesh client has to find the new access router that has the best quality of signal in its neighborhood. Usually, there are two scan methods that can be used to probe available access routers: passive scan and active scan. In the passive scan mode, mesh clients capture beacon messages from access routers in each channel, and select the routers with the best signal quality as the next access routers. The waiting time in a passive scan should be long enough to guarantee that mesh

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clients can receive the beacon messages. On the other hand, active scan allows mesh clients to broadcast probe request messages in different channels, and when access routers receive the request messages, they reply with response messages. Using these responses, mesh clients obtain access routers' signal strength and determine the new access routers. Compared to passive scan, active scan has

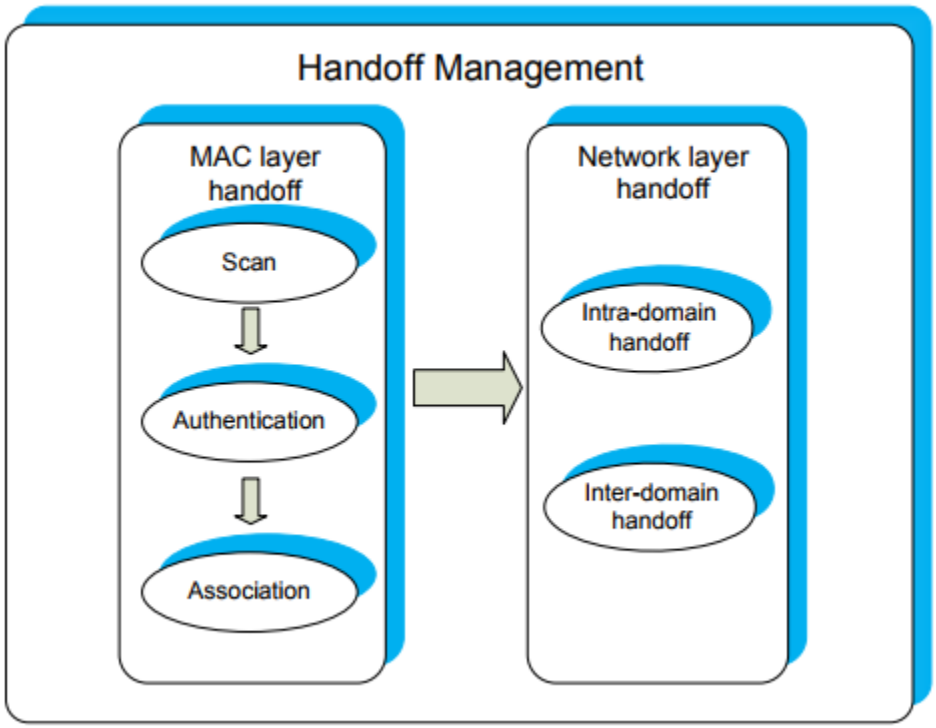
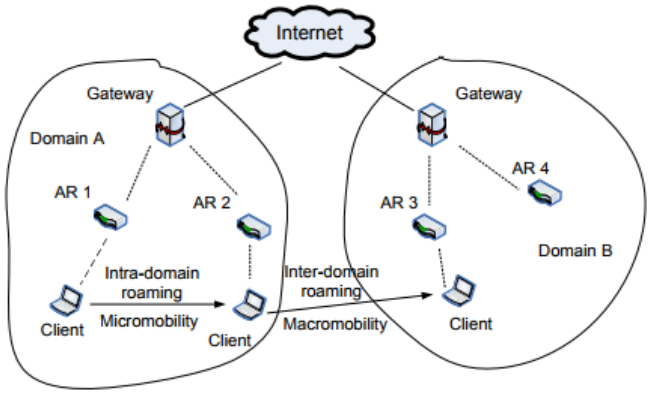


Figure 1.4: Components of a handoff management scheme

MAC layer, the mesh client initiates the MAC layer handoff process to establish wireless connection with the new access router in the physical layer. The MAC layer handoff process includes three steps: scan, authentication and association. In the first step, the mesh client has to find the new access router that has the best quality of signal in its neighborhood.



Intra-domain roaming and inter-domain roaming

Unfortunately, the original handoff schemes introduce high handoff latency and packet loss ratio in the handoff process. It causes long delays in the network and degrades the quality of time-critical applications, such as VoIP. For instance, the network layer handoff will spend more than 1 second which is not suitable for real-time applications in WMNs.

Real-time: Real-time applications are widely used in computer networks, such as VoIP, online games, etc. A long handoff process will cause large jitter and packet loss ratio, which would interrupt real-time applications and cause a bad user experience. Therefore, recovering data communication after the handoff immediately is an important objective of the thesis work. The best scenario is that during the movement, the user would not notice that the handoff process occurs, which means the mesh client switches its access router smoothly. To support smooth roaming under the real-time environment, the total handoff latency should be minimized, which includes the MAC layer handoff latency and the network layer handoff latency. The packet loss ratio should be reduced and the packet delay variation should also be controlled.

Security: The WMN is an open environment, because wireless signals are easy to be recorded by malicious nodes. Thus, how does one prevent malicious nodes from viewing data packets? How does one allow authenticated users to access data information? And how can malicious nodes be prevented from modifying data packets? These points should be considered when implementing the handoff scheme. Therefore, the authentication process is needed to be completed during the handoff. However, the authentication process introduces extra latency to the handoff. To support smooth mobility, a fast secure authentication scheme is needed to be implemented.

Micro mobility and macro mobility: According to two kinds of roaming in wireless networks, there are two kinds of mobility: micro mobility and macro mobility. Micro mobility refers to intra-domain roaming, which means the mesh client moves across different subnets in the same domain. Macro mobility refers to inter-

domain roaming, which means the mesh client moves among different domains. Figure 1.5 shows examples of the two kinds of mobility in wireless networks. For the network layer handoff, both micro mobility and macro mobility should be supported by the proposed handoff scheme.

Scalability: When the mesh network scales up, multiple mesh clients will concurrently do the handoff process. In wireless environments, the handoff management packet transmission between the access router and the mesh client will block the communication between the access router and other mesh clients. Therefore, handoff latency reduction improves the scalability of the wireless mesh network. Secondly, the transmission overhead which is caused by handoff management packets also increases when the network grows. As a result, to have high scalability, the overhead introduced by the handoff scheme should also be reduced.

Accuracy: Accuracy means the mesh client can select the optimized access router. The best case is when the mesh client selects the new access router which will maintain the wireless connection between the access router and the mesh client as long as possible. A bad sample scenario is when a mesh client completes the handoff process, it finds that the signal quality of the current access router drops quickly and it has to switch to another access router in a very short period. The high frequency of the handoff process has a negative impact on the quality of service provided by the wireless mesh network. The ping-pong effect should be erased.

High speed environment: The VMN is a special kind of WMN in which mesh clients have higher moving velocity compared with mesh clients in traditional wireless mesh networks. High speed introduces more frequent handoffs. Therefore, to support smooth mobility for VMNs, handoff schemes should be implemented based on the inherent characteristics of vehicular mesh networks, such as high speed, constrained moving paths, extra position systems, etc.

To support smooth mobility in the network layer, a hybrid routing protocol for forwarding packets is proposed: this involves both the link layer routing and the network layer routing. Based on the hybrid routing protocol, a network layer handoff scheme for WMNs is presented. Both intra-domain and inter-domain roaming have been considered to support smooth roaming in WMNs. During intra-domain handoff, gratuitous ARP messages are used to provide new routing information, thus avoiding re-routing and location updating. In addition, using layer 2 routing can minimize the cost of packet relay among the mesh routers when compared with the layer 3 routing. Moreover, unlike tunnel-based solutions, the tunneling overhead at each hierarchy is removed. For inter-domain handoff, gratuitous ARP messages are also used to update routing information. Redundant tunnels are removed in order to minimize forwarding latency.

Objectives:

- To design and implement efficient handoff management schemes to support smooth mobility in WMNs.

- To study the need of WMN implementation in present scenario.
- To study the WMN implementation.
- To study the handoff management schemes over traditional WMNs.

Scope of Work

An important direction is the implementation of vertical handoff to support smooth roaming in heterogeneous wireless mesh networks. However, in heterogeneous WMNs, different physical technologies can be used to provide wireless connections for mesh clients, and mesh clients can move among these different networks freely. Therefore, when a mesh client triggers the handoff, it would connect to another network which uses different technologies. To implement our handoff schemes in the real world, there are two possible solutions: modifying existing drivers or implementing a middleware to provide additional handoff functions.

Conclusion:

Design and implement efficient handoff management schemes to support smooth mobility in WMNs. The handoff solves the problem of how to support free mobility in the mobile environment. An efficient handoff scheme can reduce handoff latency and minimize packet loss ratio. Recent advances in wireless mesh networks (WMNs) have overcome the drawbacks of traditional wired networks and wireless ad hoc networks. WMNs will play a leading role in the next generation of networks, and the question of how to provide seamless mobility management for WMNs is the driving force behind the research.

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