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ENHANCING MULTI-HOP LOCATION AWARE HARMONY BASED COVER FOR WIRELESS MESH NETWORKS WITH A RING OVERLAY

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ABSTRACT

Our analysis shows that WRing improves the performance of a WMN significantly by reducing the interference and contention. In recent years, wireless mesh networks have become a popular solution for a wide range of scenarios because of their flexibility, reliability and fast deployment. In particular, in the context of providing network connectivity to mass transit vehicles, wireless mesh networks are often preferred to cellular networks because they allow custom network deployments. However, when high mobility is involved, an efficient handoff procedure is of paramount importance to ensure seamless connectivity. Propose a wireless location-aware Chord-based overlay mechanism for WMNs (WILCO) based on a novel geographical multilevel identification (ID) mapping and an improved finger table. The proposed scheme exploits the location information of mesh routers (MRs) to decrease the number of hops that the overlay messages traverse in the physical topology.

KEYWORDS: Wireless Mesh Network (WMN), Wireless Location-aware Chord based overlay (WILCO), Mesh Routers, Mesh Clients, Vehicular Ad-Hoc Network (VANET).

INTRODUCTION

Wireless Mesh Network (WMN) has become popular access network architecture. But because of its multi-hop nature, co-channel interference and contention, the attainable capacity of a wireless node in a WMN is significantly less than the radio capacity. We propose overlay architecture for a WMN, where a wireless-ring (WRing) is deployed over the regular mesh for carrying wireless mesh traffic only. Low cost wireless routers are revolutionizing the way people connect to the Internet. The ease of deployment on the one hand, and the freedom in the ability to connect on the other hand, has made these wireless routers ubiquitous. Wireless mesh networks extend the connectivity area of mobile devices beyond the limited range of a single access point. These networks can be easily deployed inside a building, campus, on a large geographical area or at a disaster site without requiring every access point to be physically connected to the Internet. They are also very affordable when implemented with off-the-shelf low cost wireless routers. This paper is an effort of several years towards making mesh networks a reality.

Most wireless network installations today involve a set of access points with overlapping coverage zones, each access point being connected to a wired network tap. Mesh networks are a paradigm shift. They remove the wired connectivity requirement by having only a few of the access points connected to a wired network, and allowing the others to forward packets over multiple wireless hops. This thesis is in the area of wireless mesh networking. Low cost wireless routers are changing the way people connect to the Internet. The ease of deployment at home or office on one hand, and the freedom in the ability to connect that they provide on the other hand, have made these wireless routers ubiquitous. Implementing mesh networks using off-the-shelf low cost wireless routers makes these installations affordable and very appealing.

These networks can be easily deployed inside a building, campus, on a large geographical area, or at a disaster site without requiring every access point to be physically connected to the Internet. A great deal of research has been conducted on wireless mesh networks. Some of them got extensive attention. Typically, the systems that we currently see in academic world and in industry are experimental testbeds (tailored to evaluate special kind of protocols), they use expensive hardware for mesh nodes, or have limited (or none) support for mobility. The model we chose for a mesh network is the following. The network is comprised of mesh routers (mesh nodes), which are stationary, and mesh clients, which can be mobile. Few of the mesh nodes are connected to the Internet (Internet gateways), while the rest of the nodes rely on multi-hop wireless paths to reach Internet connected nodes.

In a practical setting, a mesh network needs to:

- Provide seamless access to its users.
- Maintain user connections and handoff them quickly from one access point to another when users roam in the coverage area of the mesh.
- Be easy to deploy.
- Be robust and continue to operate even if part of the network is not available.
- Be cost-effective, i.e., it must perform well using off-the-shelf low cost wireless routers.

LITERATURE REVIEW

Off-the-shelf wireless routers provide good performance when functioning as regular access points; however, their limited CPU capacity is a performance bottleneck when these routers are part of a mesh infrastructure. The reason is that a mesh network requires routing services that are not natively supported by current operating systems. This lack of support limits the routing mechanisms that can be used in such networks to user-level implementations. Routing the entire traffic through user space is very convenient but becomes problematic for routers with limited processing power. It is widely known that forwarding packets through user space results in higher CPU utilization when compared to kernel space.

The overhead can be attributed to two primary factors:

- Memory copies,
- Context switches.

Each routing node must copy the packets from kernel space to user space in order to determine the next hop. After a routing decision is made, the packet must be returned to kernel space where it is sent on the network. That is, the user-kernel boundary must be crossed a minimum of two times per hop. This thesis presents the architecture of the first high-throughput wireless mesh network that provides seamless connectivity to mobile clients using off-the-shelf low cost wireless routers.

The design captures the flexibility of user-level based systems without the performance degradation that is normally associated with using such systems on resource limited devices. Specifically, the mesh packet routing is controlled from user space by an overlay system, while the actual packet forwarding is done at the kernel level.

To accomplish this separation while preserving seamless mobility, we introduce a novel redundant multipath routing mechanism. Our approach requires minimal additions to the kernel (essentially a loadable kernel module), preserving portability, a very much desired property of overlay systems.

EXISTING SYSTEM

These nodes do not keep or maintain routing tables but rather stores information about the network in a form of pointers for easy referencing. AODV is able to do this by discovering the routes along which messages can be transmitted. This protocol sees to it that paths that are required for transmitting and receiving data does not repeat itself over and over again termed loop and tries to find the most shortest path if the need be. Unlike the client-server architecture, the peer-to-peer resource sharing-based approach relies on building up an overlay in which all members contribute their resources to the network in return for other resources from other members. This overlay has no centralized control, being fully distributed, self-organized, and supporting joining/leaving of members, self-healing following peer failure, etc. These benefits have made peer-to-peer a promising candidate for many applications such as distributed storage, resource sharing, distributed processing, and searching. However, these solutions are proposed for wired networks where bandwidth and connection stability are not important issues.

Different from wired networks, wireless multi-hop networks are bandwidth limited, error prone and time varying. These critical characteristics of wireless multi-hop networks make scalability a big issue when applying existing overlay protocols "as is" as a high maintenance traffic will eventually overwhelm the network capability. Moreover, in wireless multi-hop networks, it is well known that data delivery quality degrades significantly in terms of bandwidth and delay with an increase in number of hops between the two peers. As a result, it is beneficial for the constructed overlay to be somehow aware of the physical topology.

DRAWBACKS IN EXISTING SYSTEM

Mobile nodes in this network are able to detect the presence of nodes that are in close proximity. Due to the limited transmission range of wireless network interfaces, multiple networks "hops" may be needed for one node to exchange data with another across the network.

PROPOSED SYSTEM

Many vehicular applications would benefit from such location-aware overlays. In the context of vehicular networking, location-aware overlays could support smart traffic control systems in which real-time information about current road and/or traffic conditions is collected from the vehicles and disseminated to the drivers, reducing the probability of congestion and improving the overall driving experience. In addition, as the coverage of MRs is generally large, location-aware overlays could enable better data delivery by retrieving the content from the nearest service point, greatly enhancing user quality of service levels, even when user positions change in a highly dynamic fashion. In this context, Chord is a very popular solution to building the overlay, mostly due to its simplicity and relatively high efficiency. In this thesis, the focus is on further improving Chord lookup efficiency and reducing the overlay overhead when employed over WMN by using location information.

This idea proposes a Wireless Location aware Chord-based Overlay mechanism for WMN (WILCO). The location-awareness of the proposed mechanism is realized through a novel geographical multi-level Chord-ID assignment to the MRs on grid WMNs. An improved finger table is proposed to make use of the geographical multi-level ID assignment to minimize the underlay hop count of overlay messages. An analytical framework is developed to analyze the lookup efficiency of the proposed scheme.

BENEFITS OF PROPOSED SYSTEM

Wireless ad-hoc networks have some properties such as the dynamic network topology, limited bandwidth and energy constraint in the network. Mobile ad hoc network (MANET) is useful for different purposes e.g. military operation to provide communication between squads, collaborative and distributed computing, wireless mesh control, wireless sensor networks, hybrid network, medical control.

These functions are as follows:

1) The Sequence Numbering Process and Periodic Hello Messaging from the DSDV routing protocol.
2) The Route Discovery Process from the DSR routing protocol.

METHODOLOGY

WILCO FOR WMN IN VIDEO SHARING

Network architecture

To accommodate resource sharing on WMN, a two layer architecture is employed. The service layer includes MCs, which share services and resources as well as use those shared by other MCs. The backbone layer includes stationary, power-unlimited MRs with some of the MRs having wired Internet connectivity. These MRs run a Chord-based DHT to build up an overlay for locating resources and services within the WMN to serve the MCs.

For P2P video distribution, when sharing by a server, each video will be assigned a unique key according to the HASH algorithm and is managed by a MR according to the Chord protocol. To support efficiently video delivery on peer-to-peer overlay, the server divides each video into equal size segments and assigns consecutive segment IDs to them in the order of playback. During the distribution process, many segments of the video become available in several places within the WMN. These segments are registered and periodically updated at the MR which manages the video and are stored in a database in the structure of , - where is the ID of the MR under which the MC connects to; is the start segment ID and is the number of segments the node stores. In order to protect from single node failures, the successor of the MR which manages the key also stores and updates a copy of this database.

When a peer requests segment , the MR searches its database for the set of peers that has the segment and replies to the requesting peer with this set. Based on the ID of the requesting and destination peers, the geographical segment algorithm is performed and the requesting peer selects the destination peer with the closest distance in terms of hop count to retrieve the segment.

WILCO location-aware ID mapping

Consider a planned WMN deployment over an approximately square area with stationary MRs laid out in a grid manner: i.e. MRs are almost equally distanced between each other. This grid-like WMN is used since a random topology is unsuitable for large-scale mesh deployment and the grid topology provides the best balance between MR density, backbone connectivity and network capacity. We use m-bit binary addressing scheme where the location of the MR is encoded as follows.

We first assume that is even (the topology represents a square grid). The deployment area is divided into equal areas each containing a single MR in steps. Each step subdivides the deployment area into 4 subareas, dividing along the vertical axis (y axis) and the horizontal axis (x axis). We assign two bits of the ID space to the MRs according to this division as follows and recursively use the subdivisions to assign a unique -bit address to each MR.

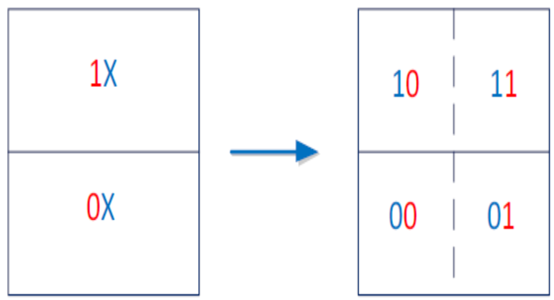

Figure 1.Wilco Location Control

In the first step, the division on the axis separates the deployment area into two halves and all the MRs residing on the upper half have the most significant bit set to 1. Likewise, all of the MRs residing on the lower half have the most significant bit set to 0. Next, the division on the axis partitions each of these two halves into two areas; MRs on the left side get their second significant bit set to 0 and the MRs on the right side have their second significant bit set to 1.

In the subsequent steps, each of the four areas from the previous step will be partitioned further into four smaller areas following the same mechanism as in the first step. After steps, the deployment network is divided into areas, each containing one MR with a unique -bit ID. For odd m, in the first step, a single bit is added to the ID, then the process continues similarly with the case of is even.

We refer to the areas produced after step as level areas with the area at level 0 being the whole WMN deployment area containing all the MRs and the areas at level each contain a single MR.

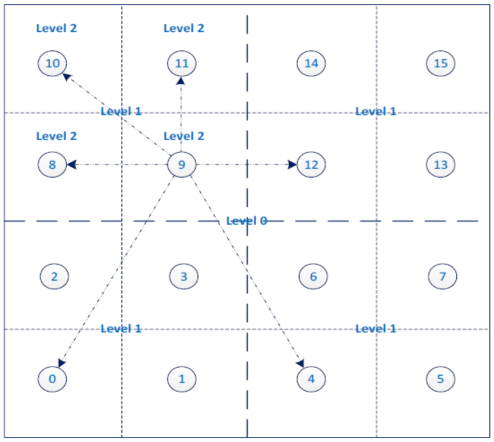

Figure 2: WILCO location-aware ID mapping for *m*=4.

Figure 2 illustrates WILCO location aware ID mapping for 16 MRs and the resulting areas at level 0, 1 and 2. We denote the number of areas at level i by N_i. An intuitive interpretation of the address produced is that when consideration level i, the high $\log_2 N_i$ bits represent a unique identification of the area within the level and the low ($m-\log_2 N_i$) bits represent a unique identification of a MR within a given area. Note that in each step, each of the areas considered in the previous step is divided into 4 equal-sized areas, and hence, the number of MRs in an area at level is $N_i=4^{(n/2)-i}$.

It is remarked that after the ($\log_4 2^{m}-^{i}$)-th step, there are only 4 MRs in each area and all but the last two ID bits are determined. Since the last 2 bits are decided in the next step, those MRs have consecutive IDs. This ensures that MRs that are close together in physical topology stay also close to each other in the overlay. The last, but not the least important remark is that each area at level contains a quarter of the number of MRs of an area at level (i-1), and hence, the maximum number of physical hops between two MRs from the same area at level is half of that between two MRs reside in the same area at level.

This fact plays a central role in our location-aware ID mapping in reducing the underlay hop count and hence, improving the lookup time. It is noted that the location of each MR can be determined easily with a location-based solution such as using a GPS for example. Since MRs are assumed stationary, the mapping of IDs needs to be done only once at the planning stage and remains unchanged thereafter.

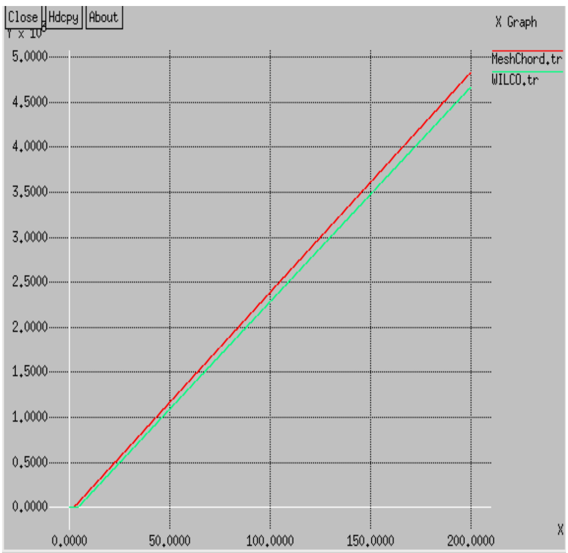

Figure.3.Results Comparisition

CONCLUSION

Our simulation results show that in comparison with two other schemes WILCO significantly improves video delivery quality in both average and in terms of distribution across different users by choosing the geographically closer located peers to retrieve the video segments from. In particular, we emphasize the cross-layer optimization of multicast routing with network coding and power control with game theoretic method, where efficient and distributed solutions are derived and illustrated. Finally, we show that the wireless multicast advantage can be incorporated into the optimization framework.

Looking forward, we believe that significant additional work is required for building efficient and practical network-layer broadcasting and multicasting protocols for MR2-MC WMNs. In particular, robustness remains a key challenge: given the dynamically varying loss rates on individual links and the lack of link-layer reliability for broadcast transmissions, we are exploring the idea of developing forwarding "meshes" (that nevertheless incorporate channel and rate diversity) that ensure higher rates of packet delivery without significant increases in latency.

REFERENCES

[1] D. Benyamina, A. Hafid, M. Gendreau, "Wireless Mesh Networks Design – A Survey", IEEE Communications Surveys and Tutorials, Vol. 14 (2), pp.299-310, 2012.
[2] N. Nandiraju, D. Nandiraju, L.Santhanam, B. He, J.Wang, D. P. Agrawal, "Wireless Mesh Networks: Current Challenges and Future Directions of Web-in-the-Sky", IEEE Wireless Communications, Vol.14 (4), pp.79-89, Aug. 2007.
[3] A. S. Reaz, V. Ramamurthi, D. Ghosal, J. Benko, W. Li, S. Dixit, B. Mukherjee, "Enhancing Multi-hop Wireless Mesh Networks with a Ring Overlay", IEEE Annual Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks Workshops, pp. 1-6, 2008.
[4] A. Moldovan, C. H. Muntean, "Personalisation of the multimedia content delivered to mobile device users", IEEE Broadband Multimedia Systems and Broadcasting Symposium, Bilbao, Spain, 2009
[5] H. Venkataraman, A. d'Ussel, T. Corre, C. H. Muntean, G. M. Mutean, "Performance analysis of real-time multimedia transmission in 802.11 p based multihop hybrid vehicular networks", ACM International Wireless Communications and Mobile Computing Conference, Caen, France, 2008.
[6] Y. Amir, C. Danilov, M. Hilsdale, R. Musaloiu-Elefteri, N. Rivera, "Fast Handoff for seamless Wireless Mesh Networks", International Conference on Mobile Systems, Applications and Services, 2006.
[7] P.Gupta, P.R. Kumar, "The Capacity of Wireless Networks", IEEETransaction on Information Theory, Vol. 46 (2), 2000.
[8] I. Stoica, R. Morris, D. L. Nowell, D. R. Karger, M. F. Kaashoek, F. Dabek, H. Balakrishnan, "Chord: A Scalable Peer-to-Peer Lookup Protocol for Internet Applications", IEEE Transactions on Networking, Vol. 11, pp. 17-32, 2003.
[9] S. Ratnasamy, P. Francis, M. Handley, R. Karp, S. Shenker, "A Scalable Content-Addressable Network", Conference on Applications, Technologies, Architectures, and Protocols for Computer Communications, pp. 161-172, 2001.
[10] A. Rowstron, P. Druschel, "Pastry: A Scalable, Decentralized Object Location and Routing for Large Scale Peer-to-Peer System", IFIP/ACM Middleware, pp.329-350, 2001.
[11] D. Malkhi, M. Naor, D. Ratajczak, "Viceroy: A Scalable and Dynamic Emulation of the Butterfly", Symposium on Principles of Distributed Computing, 2002.
[12] G. Ding, J. Vicente, S. Rungta, D. Krishnaswamy, W. Chan, K. Miao, "Overlays on Wireless Mesh Networks: Implementation and cross- Layer Searching", IEEE International Conference on Management of Multimedia and Mobile Networks and Services, 2006.
[13] P. Desnoyers, D. Ganesan, P. Shenoy, "TSAR: A two tier sensor storage architecture using Interval Skip Graphs", International Conference on Embedded Networked Sensor Systems, 2005.
[14] S. Ratnasamy, B. Karp, S. Shenker, D. Estrin, R. Govindan, L. Yin, F. Yu, "Data-centric storage in sensornets with GHT, A Geographic Hash table", Mobile Networks and Applications, Vol.8 (4), pp. 427-442, 2003.
[15] O. Landsiedel, S. Gotz, K. Wehrle, "Towards Scalable Mobility in Distributed Hash Tables", IEEE International Conference on Peer-to-peer Computing, pp. 203-209, 2006.