High Efficient Li-Fi and Wi-Fi Technologies in Wireless Communication by Using Finch Protocol

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Abstract: Li-Fi or optical Wi-Fi, Li-Fi Technology is the milestone in the history of Wireless Communication. In the past few years Wi-Fi have gained a lot of popularity. This technology comes to be ten times cheaper than the Wi-Fi and also much safer, because regardless of access control systems and passwords. FINCH is a complementary protocol to Mobile IP (MIP), which deals with inter-domain (inter-CSN) mobility management in mobile Wi-MAX. FINCH can reduce not only the handover latency but also the end-to-end latency for MIP. The proposed FINCH is especially suitable for real-time services in frequent handover environment, which is important for future mobile Wi-MAX networks. In addition, FINCH is a generic protocol for other IEEE 802-series standards. In Li-Fi, light pulses cannot penetrate on walls. The electric light does not disturb or interfere with communication, without taking the frequency bands. The light sources are providing you internet access at very high speed. Yes, Li-Fi technology transmits data wirelessly in the use of LED.The results show that FINCH can support fast and efficient link layer and intra-domain handovers. The numerical results can also be used to select proper network configurations.

I. INTRODUCTION

The market for wireless communication has grown rapidly since the introduction of 802.11b[1] wireless local area networking(WLAN) standards, which offer performance nearly comparable to that of Ethernet. WLAN or Wi-Fi was created specially to operate as a wireless Ethernet. It is an open-standard technology that enables wireless connectivity betweenequipment's and local area networks. Public access WLAN services are designed to deliver LAN services over short distances, typically 50 to 150 meters. In these cases, WLANs are to a local database, and give the end user access through a kiosk or portable device. Internet access through public Wi-Fi is a new and very hot trend, providing many benefits and conveniences over types of mobile internet access. First, performance is 50 to 200 times faster than dial-up internet connections or cellular data access. Second, users do not have to worry about cords, wires or sharing an access point, such as a phone jack. A global directory that would provide users with a search engine to locate the closest access point. Even without the directory, WLAN devices make it very easy to connect. Most WLAN-enabled devices have a software utility that indicates a user`s proximity to a WLAN access point. Service providers place an antenna, or access point, at a designated hotspot. The antenna transmits a wireless signal to the adapter card in a user`s computer or device. Users connect to the WLAN through a page in their internet browser. The growing number of conventional WLAN users, increasingly combine to strain existing Wi-Fi networks [2][3] and it can be connected through the bridges and routers. A flexible architecture for hybrid wireless mesh network where both Wi-Fi and wi-MAX technologies are deployed in complementary way was presented in [4]. Also the concept of wireless city is present in [5].

What if, all lights in your rooms will communicate each other and creates a bridge of wireless networks to provide internet access? , Li-Fi Technology would be the best optimum solution over Wi-Fi technology. it can also be used to extend wireless networks at your home, office or university for data transfer at 10 Gbps, “on the move" data transfer rate at 100 Mbps, home wireless data network with local cloud & server. In literature survey, how the internet will connect to the laptop using Li-F i[7, 8, and 9]. The virtue of operating at such high frequencies in hundreds of terahertz, in a well beyond the sticky tentacles of the wireless spectrum crunch and regulatory licensing. But, Li-Fi can be used in areas where there's extensive RF noise is generally prohibited (hospitals, airplanes).

The IEEE 802.16 standard [10] is a promising standard fornext-generation broadband wireless access networks. Itprovides last mile solution and supports high-speed multimediaservices. The IEEE 802.16e amendment [11] enhancesIEEE 802.16 with mobility support for users moving atvehicular speeds.

Like other IEEE 802-series standards,802.16 standardize physical (PHY) layer and Media AccessControl (MAC) layer only. To build a complete system,higher layers are still necessary. One of the major objectivesof Wi-MAX Forum [12], thus, is to promote conformance andinteroperability of the IEEE 802.16 standards. The networkreference model proposed by Wi-MAX Forum is depicted in Fig. 1 [13]. The Access Service Network (ASN) provides radioaccess to Wi-MAX subscribers. It consists of one or moreASN Gateways (ASN GWs) and Base Stations (BSs). ASNsare connected by Connectivity Service Network (CSN), whichprovides Internet Protocol (IP) connectivity services. Tosupport IP mobility, Mobile IP (MIP, IETF RFC 3344) isadopted by Wi-MAX Forum [14]. The Home Agent (HA) of aMobile Station (MS) is located in the CSN of the MS's HomeNetwork Service Provider (H-NSP). ASN GW supports theForeign Agent (FA) functionality. For intra-ASN mobility,there is no need to update MS's care-of-address (CoA).Mobile Wi-MAX has been designed to support usersmoving at vehicular speeds. In addition, real-time servicessuch as voice and multimedia applications are expected tobe important services in future mobile Wi-MAX networks.Because MIP is adopted, mobile Wi-MAX is likely to inheritthe MIP deficiencies discussed above. Although IPv6 mightbe more efficient than IPv4, it, however, is not widelydeployed. Because we aim to provide an immediatesolution for current deployment of mobile Wi-MAX networks,this paper only focuses on the IPv4 over Ethernet-likelink model [6]. In IPv4 over Ethernet, the Address ResolutionProtocol (ARP) can incur significant delay for both packetdelivery and HO. We propose to use MIP in mobile Wi-MAXfor inter-domain mobility (inter-CSN mobility) only. Wepropose a new protocol, Fast Intra-Network and Cross-layerHandover (FINCH), for intra-domain mobility (intra-CSNmobility), which can achieve fast HO, especially for realtimeservices. FINCH limits frequent HOs within CSN. Itcooperates with MIP, which serves as the inter-domainmobility management protocol. FINCH intends to localizelocation update to reduce the HO latency in MIP. It alsoreduces end-to-end latency because packets are delivered ina shorter path than that in MIP.

II. SYSTEM DESIGN MODEL

A. Mobility Management in Wi-MAX

Before presenting the proposed FINCH, we first review theHO and mobility management defined in 802.16e [2] andWiMAX [4], [5], [20].When an MS is moving, the Signal-to-Interference-plus-Noise Ratio (SINR) to the serving BS may be below thesustainable level. Therefore, the MS needs to perform HO.As defined in 802.16e [2], a BS will periodically broadcastinformation about the network topology. The serving BSalso allocates time intervals, which are called scanningintervals to the MS. The MS then can seek and monitorsuitable neighboring BSs as the target BSs. The HO processincludes several stages. The basic idea is similar to the Hosin other systems. The HO initiation in 802.16e can beoriginated either at the MS or the serving BS. In addition tohard HO, 802.16e also supports Macro Diversity HO (MDHO)and Fast BS Switching (FBSS). The MDHO essentially is softHO. An MS can communicate with multiple BSs at the sametime. The list of active BSs for the MS is maintained in theDiversity Set. In FBSS, however, the MS can only communicatewith one BS of the diversity set at any given time. TheMS uses a fast switching technique to change the serving BSdynamically to improve link quality.Many intra-domain mobility management protocols havebeen proposed to take advantage of the hierarchy of treenetwork topology. However, suboptimal problem [12] mayhappen in a non-tree network topology. Besides, most of theprotocols operate on or above the IP layer. They do notaddress link-layer mobility.

B. Cross-Layer Design

Based on our previous paper [21], we utilize a two-levelmobility management technique for fast HO. MIP is usedfor inter-domain (inter-CSN) mobility management. Theproposed FINCH is used for intra-domain (intra-CSN)mobility management. Besides, FINCH handles the Hosin both IP layer and link layer. As a generic protocol,FINCH deals with location update in the link layer andcooperates with the L2 HO procedure. That is, an MSperforms the HO procedure specified in the L2 standardsfirst, which could be 802.16e or other standards.After that,FINCH uses a special table-lookup technique for both linklayer and IP layer to update the location. Based on the table,location updates in the link layer and IP layer are coupledtogether. Consequently, ARP is no longer necessary.Comparing with those using two different mobilitymanagement protocols in the link layer and IP layer, theproposed scheme can reduce the overhead and latencysignificantly. Because the proposed mobility managementprotocol is compatible with the IP layer, it can work withany protocols and applications in higher layers. FINCH isparticularly suitable for real-time applications such asmobile voice-over-IP (VoIP), which requires fast HO.

C. Handover and Location Update

In order to forward packets to an MSsuccessfully, the FT should be properly updated each timewhen an MS moves. This section discusses the HO andlocation update.The HO procedure in 802.16e has been presented.

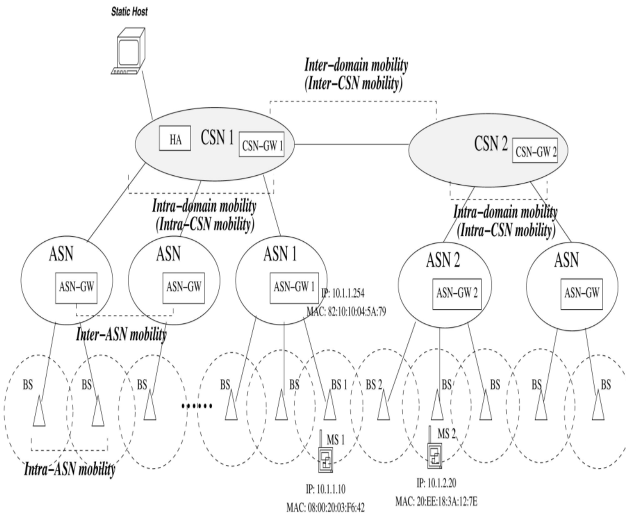

Fig. 1. Generic mobile Wi-MAX network architecture.

In Fig. 1, assume that initially MS 1 iscommunicating with BS 1. When MS 1 moves away fromBS 1, at a certain point in its movement, MS 1 will hand overto a new BS. Assume that BS 2 in Fig. 1 is the new BS. OnceMS 1 receives the permission from BS 2 to associate with,MS 1 will send a MAC frame to BS 2 to update the FT entryof the MS. BS 2 then replicates and forwards the MACframe to all adjacent nodes including BSs, routers, and othernodes in the same domain. All nodes that received the MACframe also replicate and forward the MAC frame to theiradjacent nodes in the same domain. The payload of theMAC frame carries the frame generation time (time stamp),which indicates what time the original MAC frame wasgenerated in the MS. The MS's MAC address, which is usedto search FTs to find the corresponding entry of the MS, isalso carried. The header of the MAC frame contains, ofcourse, the source MAC address of the node, whichreplicates and forwards this frame.

D. Li-Fi Technology

Li-Fi is a new way to establish wireless communication links using the Led lighting networks. The Li-Fi protocols are defined by the international standard IEEE 802.15 established since 2011 by the IEEE comity. This is the same comity that has defined previously the Ethernet 802.3 and Wi-Fi 802.11 standards. For numerous specialists, Li-Fi is a major breakthrough technology for the mobile Internet community and for the connected objects domain. After more than 4 years of scientific research at the University of Versailles, OLEDCOMM is the first European company that starts to commercialize Li-Fi communication solutions a worldwide level.

E. Li-Fi Communication

Li-Fi communication is modeled after communication protocols established by the IEEE 802 workgroup. This standard defines the physical layer (PHY) and media access control (MAC) layer. The standard is able to deliver enough data rates to transmit audio, video and multimedia services. It takes count of the optical transmission mobility, its compatibility with artificial lighting present in infrastructures, the defiance which may be caused by interference generated by the ambient lighting. The MAC layer allows to use the link with the other layers like the TCP/IP protocol. The standard defines three PHY layers with different rates.

The modulation formats preconized for PHY I and PHY II are the coding on-off keying (OOK) and variable pulse position modulation (VPPM). The Manchester coding used for the PHY I and

PHY II layers include the clock inside the transmitted data by representing a logic 0 with a OOK symbol "01" and a logic 1 with a OOK symbol "10", all with a continue component. This is an important point because they continue component allows avoiding the light extinction in case of an extended line of logic 0. The new high-speed optical wireless usage models both indoors and outdoors. The Li-Fi provides resources for OEM and ODM developers to create exciting new products. With the emergence of high-speed cable connections like Thunderbolt and USB 3.0, the stage is set for a wireless equivalent. While Wi-Fi is very popular for pervasive 100+ Mbps service, multi- Gigabit short-range optical wireless interconnects provide an alternative to the proposed Wi-Gig Gigabit RF solution.

F. Wi-Fi technology

Today there are a lot of standards used for wireless networking, the attention of this section is to give a brief overview of the 802.11 standards defined by IEEE, but with focusing on the most popular standard which is IEEE 802.11b. The IEEE 802.11 specifications are wireless standards that specify an "over-the-air" interface between a wireless client and a base station or access point, as well as among wireless client. IEEE 802.11 standard primarily addresses two separate layers of the ISO networking model:

- Physical network layer
- The media access control layer

These IEEE 802.11 standards are specifying 9 standards: IEEE 802.11a (Also called Wi-Fi5), IEEE 802.11b (also called Wi-Fi), IEEE802.11c, IEEE 802.11d, IEEE 802.11e, IEEE 802.11f, IEEE 802.11g, IEEE 802.11h and IEEE 802.11i (security).

G. How Li-Fi Works

Li-Fi using visible light instead of gigahertz radio waves. How Li-Fi works is very simple You have a light on one end (an LED in this case), and a photo detector (light sensor) on the other. If the LED is on, the photo detector registers a binary one; otherwise it's a binary zero. Flash the LED enough times and you build up a message. Use an array of LEDs, and perhaps a few different colors, and very soon you are dealing with data rates in the range of hundreds or megabits per second, This is accomplished by the flickering of LED light bulbs to create binary code (on = 1, off = 0), and is done at higher rates than the human eye can detect. The more LEDsin your lamp, the more data it can process. In figure 2 shows how the Li-Fi cloud will get communicated with others devices.

Figure: 2. the model of li-fi led lights.

How about a highway lighting that illuminates the road, provides up-to-date traffic info/warnings, and provides internet access to your car, plus all of the devices on-board? Figure 2 is the model of li-fi led lights, on a more general level; Li-Fi might be used to extend wireless networks throughout the home, workplace, and in commercial areas. Li-Fi is restricted by line of sight, so it won't ever replace Wi-Fi, but it could augment it nicely. Instead of trying to find the perfect sweet spot for your home's Wi-Fi router, it would be much simpler if every light in your house simply acted as a wireless network bridge. Its shown in the figure 3.

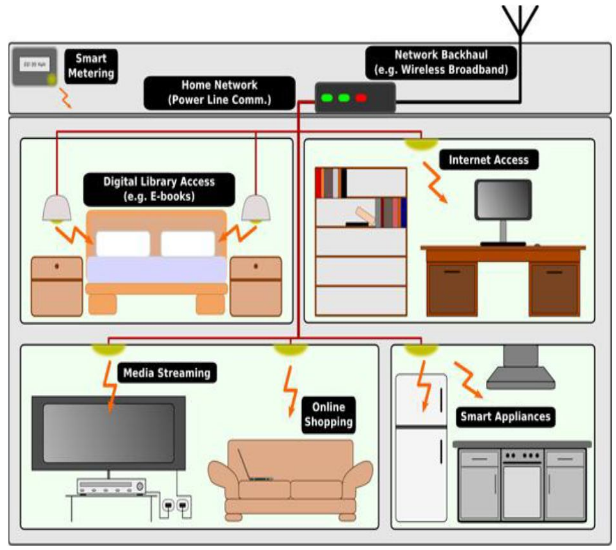

Figure: 3.wireless network bridge of Li-Fi.

III. SIMULATION RESULTS

The Li-Fi is used for many emissions sources with a particular modulation method called color shift keying (CSK). Li-Fi can deliver rates from 12 Mb/s to 96 Mb/s. Li-Fi is restricted by line of sight, so it won't ever replace Wi-Fi, but it could augment it nicely. Instead of trying to find the perfect sweet spot for your home's Wi-Fi router, it would be much simpler if every light in your house simply acted as a wireless network bridge.

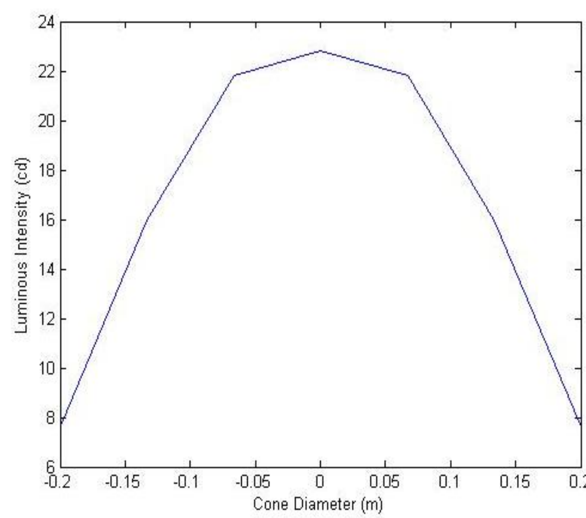

Figure: 4. Luminous intensity li-fi led lights.

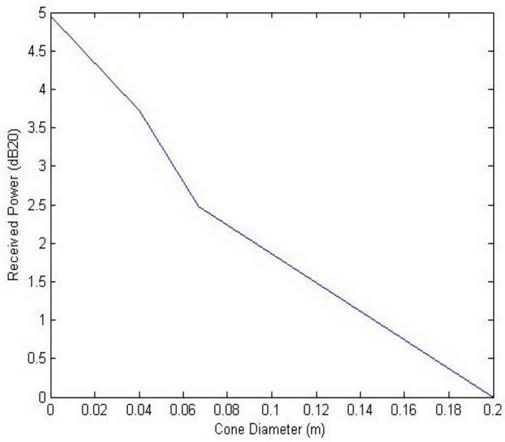

Figure: 5. Received power (dB) of Li-Fi.

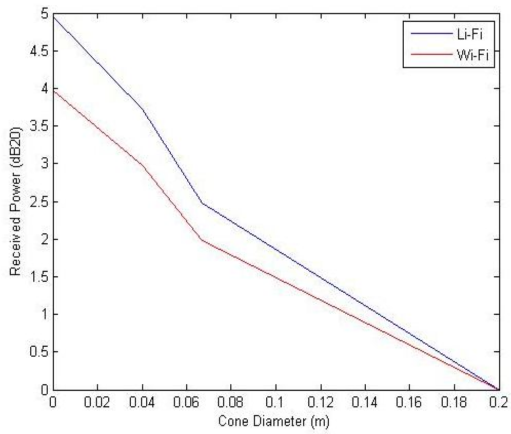

Figure: 6. Received power comparisons of Li-Fi and Wi-Fi.

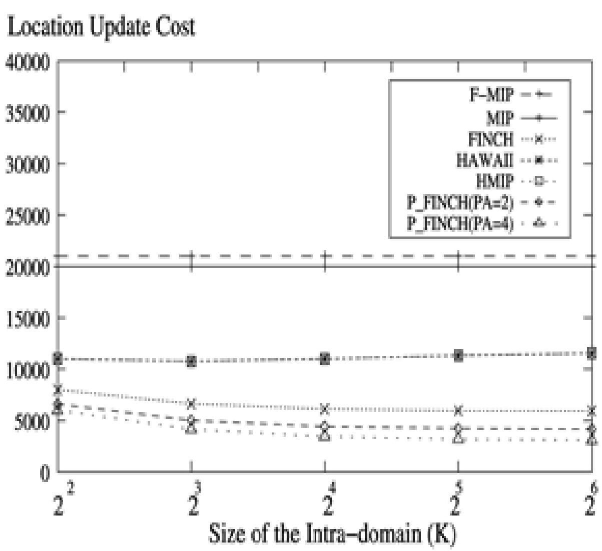

Fig. 7. Location update cost versus size of the intra-domain.

To demonstrate that the paging extension of FINCH couldreduce the overhead of location update, we construct theanalytical model for P-FINCH based (21). Although an MSstill needs to perform both MIP and intra-domain locationupdateswhenentering a CSN,theMSonly needs to update itslocation while moving into a new PG. We assume the PC iscollocated with the root node of the PG.First, we derive the location update cost of the proposedFINCH. When an MS enters a new CSN, it should performintra-domain registration, which is combined with the MIPregistration.

IV. CONCLUSION

This study proposed an overview of the technical portion of the Wi-Fi network and the architecture of the Li-Fi network setup. Finally compares the performances of both Li-Fi and Wi-Fi. The proposed protocol is a complement to MIP inwhich MIP deals with inter-domain mobility managementin mobile Wi-MAX. Comparing with MIP, the proposedFINCH does not need IP encapsulation and does nothave triangular routing problem. It also reduces theoverhead caused by registering CoA with the HA. Byunifying the mobility management in layer 2 and layer 3,the overhead and latency in interfacing conventionalmobility management protocols in the two layers areeliminated as well.

V. REFERENCES

[1] Ieee802.11 ;Amendement 6: Medium Access Control(Mac) Security Enhancements April2004.
[2] Introduction To Wi-Fi Technology, Retrieved On September 2006
[3] Broadcom, 802.11n: Nextgeneration Wireless Lan Technology, White Paper April 2006
[4] S.AbedEllah: A.Miloud,"Security AndAaa Architecture For Wi-Fi Wimax Mesh.
[5] C. Yu-Tso, "Achieve User Authentication And Seamless Connectivity On Wi-Fi And Wimax Networked Wireless City", In Con!Rec 2007 Ieee And Ifi? Wireless Optical Communication Networks, Singapore
[6] Ming-ChiehWu : A Comparision Of Wi-Fi And Wimax With Case Studies.
[7]Http://Www.Youtube.Com/Watch?V=Gjqsgskbagq
[8] Http://Lificenter.Net/Solutions/Lifi-Solutions
[9] Http://Lighting.Com/Led-Lights-Lifi.
[10] IEEE Std. 802.16-2004, Air Interface for Fixed Broadband WirelessAccess Systems, IEEE, Oct. 2004.
[11] IEEE Std. 802.16e-2005, Part 16: Air Interface for Fixed and MobileBroadband Wireless Access Systems—Amendment 2: Physical andMedium Access Control Layers for Combined Fixed and MobileOperation in Licensed Bands, IEEE, Feb. 2006.
[12] Wi-MAX Forum, http://www.wimax.org/, 2008.
[13] Stage 2: Architecture Tenets, Reference Model and Reference Points.Part 1: Network Reference Model, Wi-MAX Forum NetworkArchitecture, Jan. 2008.
[14] Stage 2: Architecture Tenets, Reference Model and Reference Points.Part 2, WiMAX Forum Network Architecture, Jan. 2008.