Technical Recapitulation on LI-FI

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Abstract— LI-FI stand for “light fidelity”, it is a wireless optical networking technology that uses light-emitting diodes (LEDs) for data transmission. LI-FI is different from Wi-Fi that transmits data by using the spectrum of visible light. As with increasing in demand for wireless application and data rates associated with it we explain the use of LI-FI as a wireless technology for large deployments, in the paper we present the introduction to LI-FI. Its history, architecture, features of LI-FI and at the last a conclusion is concluded.

1. INTRODUCTION

LI-FI stands for “light fidelity”. Like Wi-Fi it is method of transmitting data form one section to another wirelessly. But in the case of Wi-Fi uses Radio Waves for transmitting the data and in the LI-FI uses Light to communicate data/transmitting data. It is 5G[1] visible light communication systems technology which using light from light-emitting diodes (LEDs) as a medium to transport networked, mobile and the high-speed communication. All these function same as Wi-Fi and Optical fiber [2]. It leads to the Internet of things, in which every electronic devices are connected with the internet and the LED lights which used as an internet access point [3].

Today in the market of LI-FI, its annual growth rate is near about 82% from 2013 to 2018 and to be worth over $6 billion per year by 2018[4]. VLC, which means “Visible light communications”, VLC signals work by switching the bulbs on and off within nanoseconds [5]. In LI-FI bulbs are kept on to transmit end in which it transmit the data, the bulbs could be dim to the purpose that they weren’t visible to the humans and but still purposeful [6]. The light wave’s which cannot go through(penetrate) the walls which makes a much shorter range, so this features make it more secure from hacking, relative to the Wi-Fi[7][8]. In the LI-FI to transmit the signal line of sight is not necessary and light reflected off of the walls can attain 70 Mbps [9]. The advantage of LI-FI is that the actinic ray is much a lot of plentiful than the spectrum (10,000 times a lot of in fact) and may attain so much larger information density (fig1).

2. HISTORY

The University of Edinburgh in the UK, Professor Harald Haas, is the original founder of LI-FI [10]. LI-FI is a VLC (visible light communication) which includes use of the visible light section of the electromagnetic spectrum to transmit the information of the signals. At Edinburgh's Institute, the D-Light project for Digital Communications was funded from Jan 2010 to Jan 2012[11].

Professor Harald Haas, promoted this technology in his 2011 TED Global talk [12]. Pure LI-FI, formerly pure VLC, it's basically a creative instrumentality manufacturer (OEM) firm discovered to commercialize LI-FI merchandise for integration with conferred LED-lighting systems [13][14]. In the Consumer Electronics Show in Las Vegas from January 7–10 in 2014, the first LI-FI Smartphone prototype was presented. The phone uses Sun Partner’s Wysips CONNECT. it’s a way that converts light waves into useful energy and creating the phone capable of receiving and cryptography the signals simply while not drawing on its battery [15][16].

In this a flimsy layer of precious stone glass might be added to little screens like watches and cell phones that make them sun based fueled. Cell phones could build 15% more battery life throughout a regular day. This first cell phones utilizing this kind of engineering ought to show up in 2015. This screen can additionally work to acknowledge LI-FI signs thus can the cell phone Polaroid [17]. The sort screens cost for every cell phone is between $2 and $3, which is much less expensive than most new engineerin [18]. What’s more this sort innovation is introduced in display centers and organizations crosswise over France, and is continuously grasped by EDF, which is one of the country's biggest utilities [17].

For shoppers at stores, the Philips lighting company has developed a Li-Fi system. In this they can easily download an app on their smart phone and then their smart phone works with the LEDs in the store. It can pinpoint where they are at in the store and give them corresponding coupons and information based on where aisle they are on and what they are looking at [19].

3. WORKING OF LI-FI TECHNOLOGY

The working of LI-FI engineering is basic. Form the fig2 we seen that a light source toward one side like a LED and a photograph identifier (Light Sensor) on the flip side.
The point when LED begins gleaming, photograph finder or light sensor on flip side will discover light and get a paired 1 generally double (otherwise) 0. How can information be transmit by means of this new Li-Fi engineering? Blazing a LED sure times will advance a message to transmit. Blazing of light is located by the photograph indicator or light sensor and it will gain a message.[20]

When a relentless current is applied to Associate in Nursing LED light-weight bulb a relentless stream of photons area unit emitted from the bulb that is discovered as actinic radiation. If this is varied slowly the output intensity of the sunshine dims up and down. As a result of LED bulbs area unit semi-conductor devices, this, and therefore the optical output, is modulated at extraordinarily high speeds which might be detected by a photo-detector device and reborn back to electrical current. The intensity modulation is indiscernible to the human eye, and so communication is simply as seamless ad RF. mistreatment this system, high speed info is transmitted from Associate in Nursing LED light-weight bulb.Radio frequency communication needs radio circuits, antennas and sophisticated receivers, whereas Li-Fi is far easier and uses direct modulation ways kind of like those utilized in inexpensive infra-red communications devices like device units. Infra-red communication is restricted in power as a result of eye safety needs, whereas LED light-weight bulbs have high intensities and may come through terribly massive information rates [20].

Now, think about many LEDs with some totally different colours, flashing along and building a large info to transmit. it's ascertained that inexperienced optical maser with the red optical maser will transmit knowledge at one GBPS.

Binary information is made up of strings of 1’s and 0’s. Any light source can transmit this ON and OFF information but LEDs are capable of height flickering speed. Light receivers interpret the flickering LED as 1’s and 0’s and thus we have our Li-Fi, light off=0 and light on=1. Why is Li-Fi so much faster? Because visible light is far more dense than radio waves 10,000 times (fig1) more dense in fact, meaning much more data can be transferred. What is so special about Li-Fi? The speed, the highest speed yet recorded with a Li-Fi connection is 10Gbt/s which is 250 times faster than the average broadband speed [21],[22]. This estimate is with high –end instrumentality, but industrial Li-Fi being created in china is at concerning a hundred and fifty Mbps, that continues to be ten times above the typical United Kingdom of Great Britain and Northern Ireland affiliation speed. Some specialists claim that Li-Fi represents the longer term of mobile net, its reduced prices and larger potency compared with Wi-Fi [4][5].

Wi-Fi and Li-Fi each transmit information over the spectrum, however whereas Wi-Fi uses radio waves and whereas Li-Fi uses visible radiation. This is often a advantage therein the visible radiation is way additional plentiful than the spectrum (10,000 times additional in fact) and may attain way larger information density [7][8]. A venture between the universities of Strathclyde, Edinburgh, Cambridge’s Andrews and, Oxford during this analysis was administered by the Ultra Parallel visible radiation Communications project and funded by the Engineering and Physical Sciences analysis Council [23].The existing light-emitting diode lightweight bulbs can be reborn to transmit Li-Fi signals with one semiconductor device, and therefore the technology would even be of use in things wherever radio frequencies can’t be used for concern of meddling with electronic equipment.
4. ADVANTAGES
1. Li-Fi has higher speeds than Wi-Fi [4] [5].
2. It has 10000 times the frequency spectrum of radio [23].
3. Li-Fi safer than Wi-Fi with hackers unable to access unsecured net connections from out of sight of the transmitter [9].
4. Because Li-Fi does not use radio waves as Wi-Fi does. It does not interface with radio communication; this means Li-Fi can be used safely during flights [7] [8].
5. Although Wi-Fi can penetrate walls, this is not always desirable, Li-Fi can prevent internet piggybacking and may offer a more secure connection for those in for example intelligence agencies r embassies [7] [8].
6. For project that deal with massive amount of data such as at CERN with large Hadron collider. Li-Fi’s the clear winner over Wi-Fi and wired connections.

5. CONCLUSION
Li-Fi technology might change larger space of coverage than one Wi-Fi router thanks to all the lights in and around a building. The drawbacks to the technology embrace the necessity for a transparent line of sight, difficulties with quality and therefore the demand that lights continue for operation. The probabilities area unit varied and may be explored additional. If his technology may be place into sensible use, each bulb may be used one thing sort of a Wi-Fi hotspot to transmit wireless knowledge and that we can proceed toward the cleaner, greener, safer and brighter future. The thought of Li-Fi is presently attracting a good deal of interest, not least as a result of it’s going to provide a real and really economical various to radio-based wireless.

As a growing variety of individuals and their several devices access wireless net, the airwaves have become progressively clogged, creating it a lot of and tougher to induce a reliable, high-speed signal. This could solve problems like the shortage of radio-frequency information measure and additionally enable net wherever ancient radio based mostly wireless isn’t allowed like craft or hospitals. One amongst the shortcomings but is that it solely add direct line of sight.

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