Mobile & Wireless Technology

CT090-3-2 & VD01

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The Future Li-Fi

Topic & Structure of The Lesson

- Light fidelity (Li-Fi): towards all-optical networking
- Li-Fi internet (2015): First real-world usage boasts speed 100 times faster than Wi-Fi

Learning Outcomes

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At the end of this topic, You should be able to

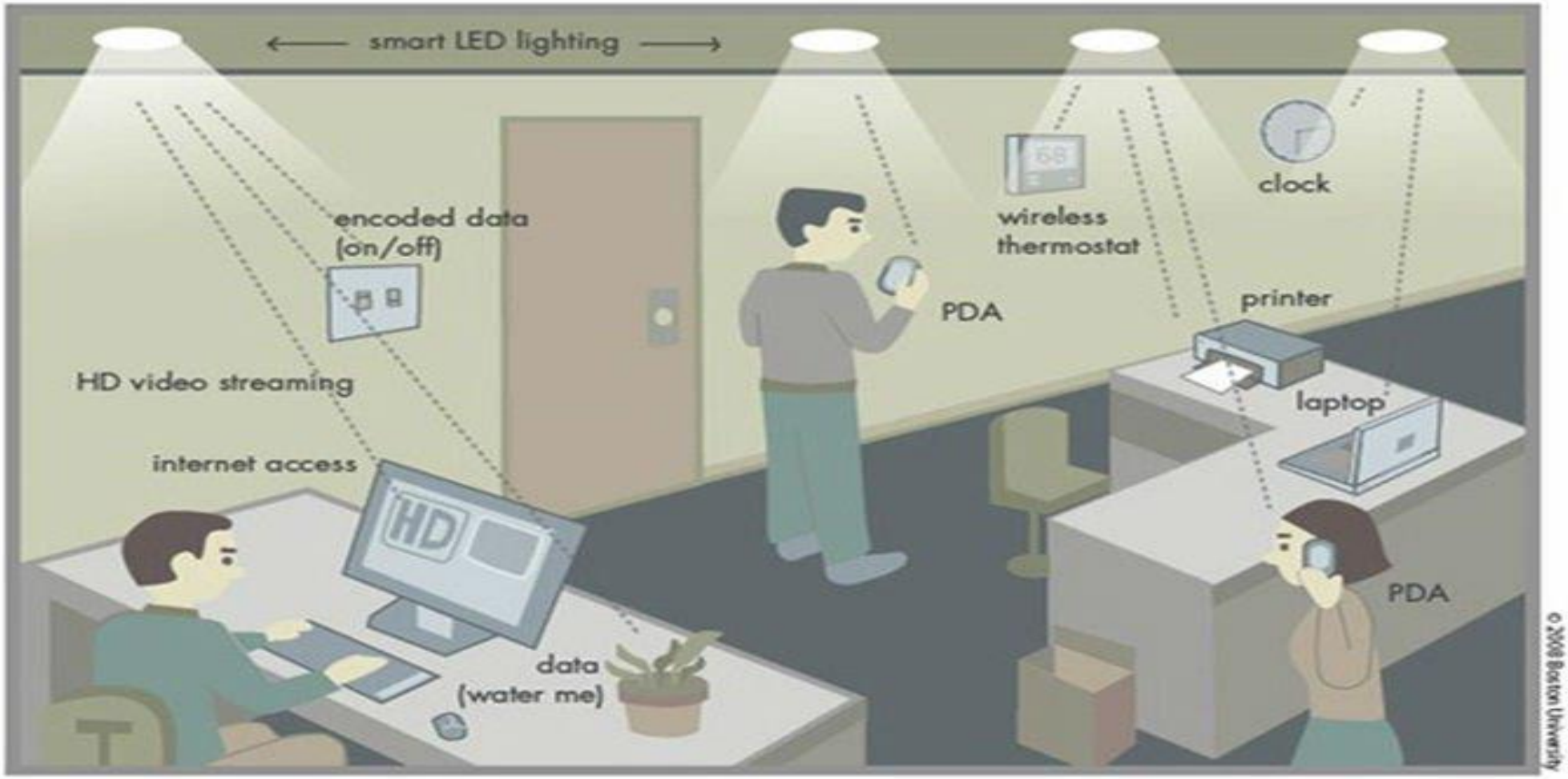
- Be familiar with Li-Fi and its working principle
- Compare Li-Fi with Wi-Fi

Key Terms You Must Be Able To Use

If you have mastered this topic, you should be able to use the following terms correctly in your assignments and exams:

- Li-Fi
- VLC
- LED
- Exabyte

Li-Fi – Light Fidelity



Li-Fi

The term was first coined by **German physicist Harald Haas** at a **TED talk** back in **2011,** where he discussed the idea of using light bulbs as routers.

He took this idea and, together with a group from the University of Edinburgh, founded pure LiFi a year later.

The idea behind Li-Fi is to use a form of visible light communication (VLC – not to be confused with the popular media player) **instead of radio waves like conventional Wi-Fi routers,** enabling much faster data transfer speeds.

Li-Fi

VLC technology delivers high-speed, bi-directional mobile communications similar to Wi-Fi, but in a much more secure way.

Li-Fi technology is able to increase bandwidth by 100 times and recently managed to achieve 1Gbps real-world results during testing, **while boasting a theoretical top speed of 224Gbps.**

This means that user **able to download 18 1.5GB movies in a single second**.

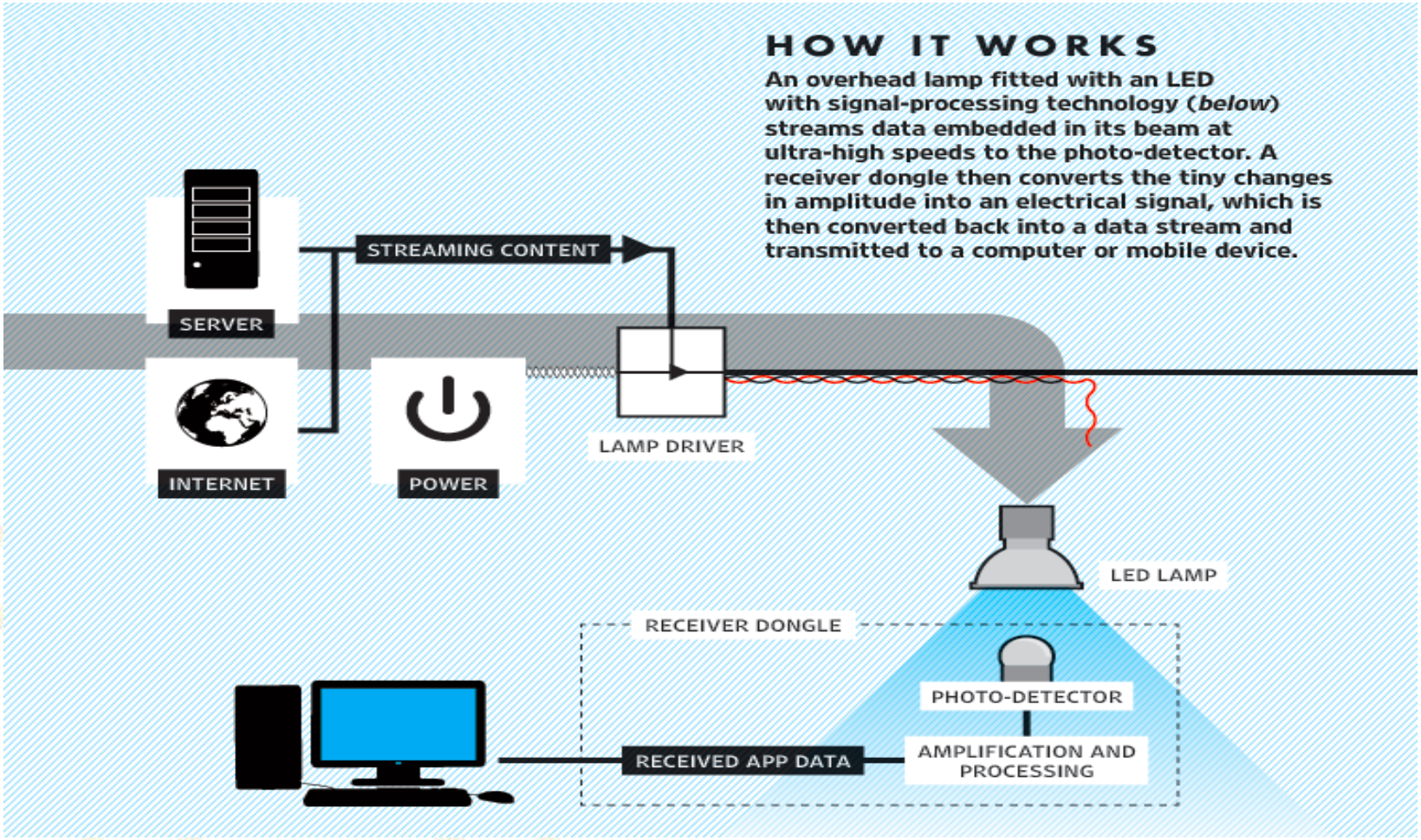
The technology is not affected by the number of devices using the signal either, a massive bonus when compared to traditional Wi-Fi technology.

Li-Fi – How does Li-Fi work?

Standard LED light bulbs use a constant current, **which emits a constant stream of photons perceived by us as visible light.**

Li-Fi is different because the **current it uses varies, meaning that the output intensity of the light fluctuates.**

Li-Fi – How does Li-Fi work?



Li-Fi – Benefits & Limitations

Aside from its superior speed, Li-Fi also boasts a number of other benefits over Wi-Fi. For instance, the fact that the signal is carried by **optical light means that it cannot travel through walls, therefore enhancing the security of local networks.**

Obviously, this **produces a number of limitations as well**, since it suggests **that connection will be lost if a user leaves the room**, representing a major hurdle that must be overcome if the technology is to be successfully implemented.

Li-Fi – Benefits & Limitations

However, if this barrier can be surmounted, then the use of the visible spectrum could allow Li-Fi to send messages across a much wider range of frequencies than Wi-Fi, which operates between the frequencies of 2.4 gigahertz and 5 gigahertz.

As such, it has been suggested that Li-Fi could provide the answer to increasing frequency congestion as Internet usage continues to rise across the world.

Li-Fi – Benefits & Limitations

According to the Cisco Visual Networking Index Global Mobile Data Traffic Forecast, global monthly **data usage is expected to exceed 24.3 exa-bytes by 2019 – a volume which current wireless connections are not able to handle.**

In a recent TED talk, **Haas insisted that household LED light bulbs could easily be converted into Li-Fi transmitters**, providing Internet users with more efficient connections.

Li-Fi

"All we need to do is **fit a small microchip to every potential illumination device** and this would then **combine two basic functionalities: illumination and wireless data transmission,"** he said.

It is also worth mentioning that the **speed at which these LEDs flicker in order to relay data is too fast for the human eye to perceive, so users will not have to worry about annoying flashes** in their ambient light.

Li-Fi Versus Wi-Fi

While Li-Fi with its 224 gigabits per second leaves Wi-Fi in the dust, Li-Fi's exclusive use of visible light could halt a mass uptake.

Li-Fi signals cannot pass through walls, so in order to **enjoy full connectivity,**

capable LED bulbs will need to be placed throughout the home.

Not to mention, **Li-Fi requires the light bulb is on at all times to provide**

connectivity, meaning that the lights will need to be on during the day.

Additionally, **where there is a lack of light bulbs, there is a lack of Li-Fi internet so**

Li-Fi does take a hit when it comes to public Wi-Fi networks.

An extension of standard Wi-Fi is coming and it's called Wi-Fi HaLow.

Quick Review Question

- What is LiFi? How does LiFi work?
- Compare LiFi with WiFi.

Summary of Main Teaching Points

- Discussed Li-Fi and its working principle
- Compared Li-Fi with Wi-Fi

Question and Answer Session

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Q & A

What we will cover next

- IoT and Wireless Sensor