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Comparative study of Project Loon & Wi-Fi

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Abstract - *Project Loon is invented by Google with the mission of providing Internet access to rural and remote areas.Project loonis the balloon powered internet for everyone. Two-thirds of the world's population still does not have Internet access. The project uses high-altitude balloons. The balloons are placed in the stratosphere at an altitude of about 20 mi (32 km) to create an aerial wireless network with high speed which matches up to 3G speeds. Project Loon is a network of balloons traveling on the edge of space. It is designed for a people in rural and remote areas for internet access.It can play a big role after disaster as this type of services can be used for making connection with the remote and Rural Areas in case of disasters.*
*This paper presents detailed information about the "P**roject loon for all**" Technology and it's **comparison with Wi-Fi technology**. The main aim of this comparative study is to show which one is better and why is it is better.*

***Key Words*: Stratosphere, Envelope, Equipment, Solar Panels.**

1.INTRODUCTION

Project Loon balloons are in the stratosphere. In stratosphere there are various layers of wind. In the stratosphere, the wind flows in various direction at variable speed. Loon balloons may go in different directions. To handle this, balloons are raised or descended into a layer of blowing wind's direction of travel.
The balloons are maintained at a position by adjusting their altitude. For this purpose related data is obtained from National Oceanic and Atmospheric Administration (NOAA) which predicts weather condition and alerts about dangers. To float balloon to another wind layer, the desired speed and direction wind layer is identified from obtained data. Users need to have special internet antenna attached to their building in order to get access service to the balloon network. The signal passes from balloon to balloon within a network and reaches to ground based station connected to an Internet service provider (ISP) and finally it reaches onto global internet.

2. LITERATURE SURVEY

Google has released a number of incredible projects, including Google Glass, Self Driving Cars, and projects related to neural networks in past few years. Nowadays almost everybody carries the smart phone. During past years, nobody has predicted that the smart phone will become an integral part. Everybody having smart phone uses internet for education purpose or surfing on internet. But affordable internet connection is still out of reach. There are many cost challenges. Also there are terrestrial challenges such as jungles, mountains for internet connectivity. To simplify these challenges project loon like solution comes into picture. The project loon is developed by keeping one mission in mind that-No internet to internet for all at very high speed at less cost. Internet becomes the integral part of life. We can say Internet as a global community. But still two-thirds of the world's population does not yet have Internet access especially in rural and remote areas. In fulfilling this need project loon plays an important role. Project Loon is a network of balloons, designed to connect people in rural and remote areas, help to fill coverage gaps, and bring back people online to communicate after disasters.

3. HOW LOON WORKS?

Project Loon works on open Radio Frequency Bands. Solar energy and Wind energy are the main sources of energy to project loon. This makes sense of use as it is powered by natural sources of energy. Google X engineers studied balloon Science from NASA. To connect to the Google Balloon network, the main requirement is to have a special internet antenna at ground. A Google Balloon can cover an area of 100s of square kilometers making more number of people to connect at a time as well as service is access to the large distance.

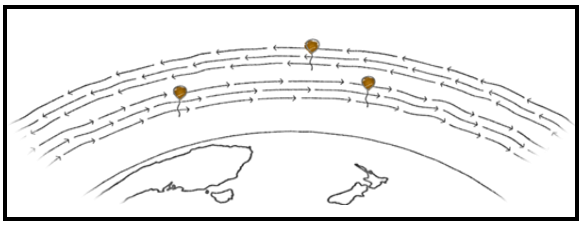

Fig 3.1 Balloon Navigation

4. DESIGN OF LOON:

The balloon has three requirements:
1)Envelope
2)Solar Panels
3)Equipment

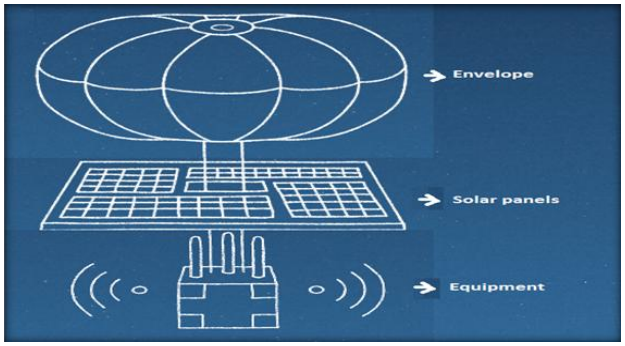

Fig4.1 Design of Project loon

Envelope:

The balloon envelope is the name for the inflatable part of the balloon. Project Loon's balloon envelopes are made up of polyethylene plastic. The envelope is of fifteen meters wide by twelve meters tall.They are specially constructed for use in superpressure balloons, which are longer-lasting than weather balloons because they can withstand higher pressure from the air inside when the balloons reach float altitude. When the balloon's validity is over and it is required to be taken out of service, it must be freed from gas. That means the gas is released from balloon envelope as a result the balloon gets down to the ground.

Solar Panels:

This is the source of providing power to balloon. It sits between envelope and hardware. The solar panel structured in array form. Array of solar panels provide power to each unit of electronics. In full sun, these panels get fully charged and produce about 100 Watts of power. This much power is enough to keep the unit in service mode while charging a battery for use at night. Project Loon is capable of power itself using only renewable energy sources namely wind and solar that is energy of sun.

Equipment:

It can be called as box containing the balloon's electronic equipment lies below solar panels. It seems to be like the basket that is carried by a hot air balloon. We can say Equipment is a control system for balloon.

This box contains:

1. electric circuit boards that control the system,
2. radio antennas are used to communicate with other balloons & Internet antennas on the ground,
3. and batteries as a power backup to store solar power so that the balloons can operate during the night also.

5. ADVANTAGES OF LOON

- It is cost-effective. The cost is comparatively lower.
- It improves communication during disaster.
- It uses renewable energy resources and thus available all time and at all places.
- It is fast and efficient and more reliable than wired connection.

6. DIS-ADVANTAGES OF LOON

- Hardware failure is the biggest problem.
- It cannot be used as a replacement of satellite communication.
- It is restricted by spectrum regulation.

7. OBJECTIVE

The main aim of this paper is to compare project loon technology and Wi-Fi technology and show better amongst them.

8. METHODOLOGY

For performing comparison, I have gone through various sites which provide me actual information about technology I am going to compare. From these sites I have listed down some parameters where I can make comparison. For each parameter I have prepared the questions such as which one is better in terms of speed? Which one is more reliable? Etc. Based on these parameters results are obtained and the conclusion is made.

9. ANALYSIS

The questions prepared in followed methodology have been analyzed in these phase in order to get better understanding of both the technology and to know which one is better to use. The analysis is

made on following parameters: The following table summarized the differences between them.

Parameter	Project Loon	Wi-Fi
Medium for data transmission	Balloon itself is a medium for data transmission.	For wireless communication, radio communication serves as a medium.
Accessible range	Each balloon is responsible for serving hundreds of people at once to a ground area about 80 km in diameter.	Wi-Fi access range is limited by distance, no. of access points, and type of access point.
Protocol	It uses LTE protocol.	It uses Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).
Reliability	Project loon is meant to be developed for reliable service.	Wi-Fi network do not seems to be that reliable.
Speed	Project loon is having the fastest speed. It's speed matches to 4G or LTE.	Wi-Fi speed varies according to no. of access points and distance. Wi-Fi speed restricts by obstacles in between.
Components	Balloon has solar panels, electric circuit, and envelope.	Wi-Fi has access points, Wi-Fi cards, and safeguards.
Infra-structure	Project loon does not require extra infrastructure.	The Wi-Fi has infrastructure mode & Ad-hoc mode.
Security Mechanism	Project loon performs encryption while in transit. And also performs authentication.	Wi-Fi also performs encryption. It uses WPA protocol for integrity check.

Table 9.1 Project Loon VS Wi-Fi

10. CONCLUSIONS

As every technology has some pros and cons loon also has cons but pros overweight the cons. The technology designed in the project loon could allow countries to avoid using expensive fiber cable so that it to allow users to connect to the Internet without underground cable installation. There are comments in the favor of project loon which shows positive response towards the new technology.

In conclusion I can say project loon is better as compared to Wi-Fi. It is very much useful in disaster for communication. In future, it will be helpful in educational fields with less cost. I hope balloon could serve more no.of people and connects remote and rural areas people for communicating with each other after disasters.

So I think it would be great Success of Project loon in Future.

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