

Project Loon: Glimpse of a New Revolution

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Abstract: *Project Loon is a Project by Google with the aim of providing high speed internet access to rural and remote areas of the world via a balloon powered internet system. The project uses specially designed super – pressure balloons powered by solar energy, which are placed and maneuvered in the stratosphere to create a wireless network up there to connect the rural and remote parts of the world with rest of the world. The project can be viewed as a stepping stone towards connecting marginalized world to the mainstream making it truly global.*

Keywords: internet access, rural and remote areas, high altitude balloon – powered network, stratosphere, solar powered LTE technology.

1. Introduction

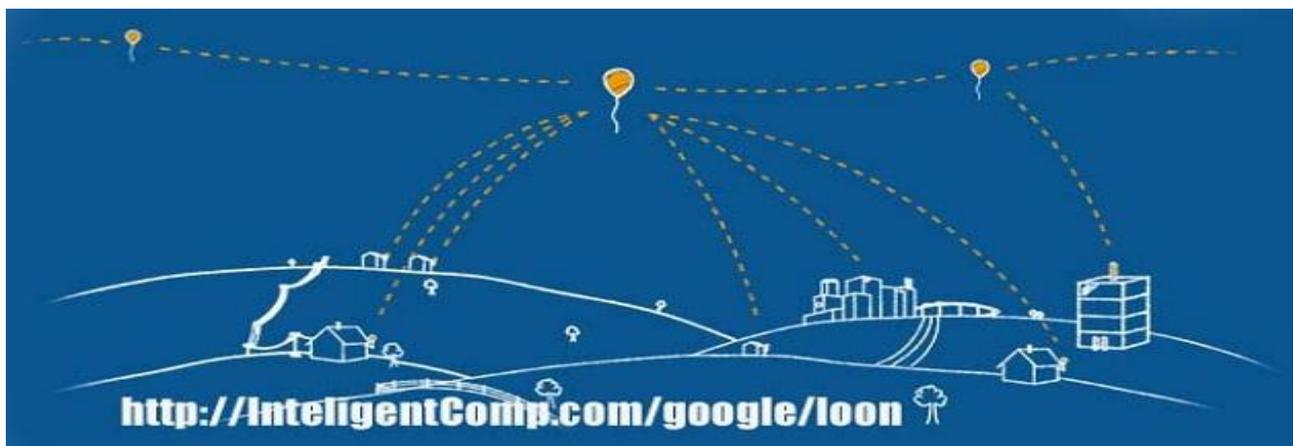
Internet has been the biggest revolution of last few decades. It would not be wrong to say that internet has dissolved the notion of physical boundaries and we now belong to a global environment, enabling us to communicate with the people living far away from us in the matter of seconds and with extreme ease.

It can be said that internet has become an integral part of our modern lives playing vital role in numerous fields. Be it internet banking, seeking job, buying or selling a product, getting entertainment or getting education online with the help of reference books, study oriented material and blogs filled with views and comments of expert's of the domain, everything from pin to plane is available on the internet. In short, internet has brought information to our doorstep. But do all these facilities available to one and all? Certainly the answer is 'No'. Two- third of the world population

comprising mostly the rural and remote areas, does not yet have access to internet. Consider yourself living without your smart phones and ipads for a week, certainly frightening, isn't it?

2. The Ray of Hope: Project Loon

In this regard a ray of hope can be seen in the launch of a project by Google which aims to provide high speed internet access to such areas. The project is named "LOON". This project promises to connect people having no internet access at all to the rest of the world via a balloon powered internet system which is a network of balloons in the sky floating all over the world to provide faster easier and cheaper internet access to each and everyone on the planet. The project started in June 2013 with the pilot test flight of around thirty balloons in Christchurch and parts of Canterbury in New Zealand.



The balloon network: communicating with each other and with the antennas on ground.

3. Key Component: The Balloon

The project uses super-pressure balloons that float in the stratosphere i.e. approximately 20Km above the surface of the Earth. So if you are thinking, in your next flight you might see a balloon flying in the air around, it's not going to happen, they will be well above you. Stratosphere is the portion of the earth's atmosphere that has got many layers of wind; each layer having wind with different direction and speed. The balloons are arranged to form one large

communication network with the help of software algorithms which determines where the balloon needs to go and accordingly moves the balloon in a particular layer of wind blowing in the right direction. For the transmission of signals from the balloon to the consumer, a special antenna is mounted to the side of a building or home. The signals are transmitted to the consumer grade router via this antenna.

The balloons used are 15m wide and 12m tall when fully inflated. Their envelopes are specially designed using sheets of Polyethylene plastic to withstand low temperature (~ -80°C) and low pressure (~ 1 atm) conditions in the

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stratosphere. The envelope also protects the balloon against the large temperature fluctuations and from the intense UV radiations, as the stratospheric layer is very thin. Such a balloon can last up to around 100 days in the stratosphere. When the balloon has done its job and is ready to be taken down, gas is released from the envelope to bring it down to earth in a controlled manner. A parachute is attached at the top of the balloon to bring it down smoothly in case it drops too fast. Measures have also been taken to avoid water landing. But still in the case of a balloon landing in water accidentally, some extra gas is provided in the balloon which makes it float on the surface of water; making it easy to locate and collect such a balloon.

4. Location and Collection of Balloons:

For the location and collection of the landed balloons there is a recovery team. The balloons are monitored continuously while in flight and after landing, using Global Positioning System (GPS). When a balloon is landing, the recovery team locates its landing point and reaches the location point and collects it. The collected balloons can be reused or their parts can be recycled or, if a balloon has been used a number of times and cannot be used further, it can be disposed off in an environment friendly way. The team also envisions making the balloons land at specified safe points only so that it becomes much easier to collect them.

Another facet of this project that needs acclaim is its environment friendly approach. The balloons are powered using solar energy (solar panels are installed on every balloon) which is, of course, a renewable source of energy. And in near future it could also be possible to have balloons made up of biodegradable material.

5. Wireless Communication:

All the electronics of the balloon viz. circuit boards that control the system, radio antennas to communicate with other balloons and with internet antennas on the ground, GPS system to track the balloons, lithium ion batteries to store solar power so that the balloon can operate throughout

the night, are contained in a small box that hangs underneath the balloon. Each balloon carries two radio transceivers; one is used for communication from one balloon to another and the other is used for balloon to ground communication. There is another radio transceiver that is used as a backup for the communication with the balloon from ground in case the main transceivers fail to work.

Each balloon has been designed for providing connectivity to a ground area measuring roughly about 40Km in diameter beneath the balloon at information transfer rate of around 200 kbit/s, as good as 3G data transfer rate. Consider the astounding achievements of the project Loon team if they are able to provide stable and cheaper internet facilities in the areas into which other infrastructure developments have not yet taken place, areas which the so called Internet providers consider economically unviable. With this instauration of technology like the first drop of rains in the barren deserts the face of such remote and farfetched areas would change forever for good.

6. Use of LTE Technology

Recently Project loon took one more step forward in expanding the world by testing its new LTE radio technology in the rural outskirts of North east Brazil at a rural Brazilian school, Linoca Gayoso which currently doesn't have any internet access. LTE (Long Term Evolution) is a wireless broadband technology designed to support roaming Internet access via mobile phones and other devices. The benefits of this 4G technology are its long range of operation along with high speed. The other important advantage that this technology has is that it uses the same type of signals that telecom companies use for the cellphones. "This means that when Loon partners with telecoms to deliver last-mile connectivity, we will be able to use the telecommunications companies' existing infrastructure, which will allow us to deliver service to rural and remote users seamlessly and quickly," Google said. So in the near future it would also be possible to provide internet access directly on the mobile phones.



Ray of Hope: Google Team with students at Linoca Gayoso School [courtesy: www.google.co.in]

7. Benefits to the Society

With the enumerable benefits to the farmers (including round the clock weather information), aspiring students and for general public for that matter, this project would be considered a milestone in the era of wireless communication. It would also make it possible to bring people back online after disasters to coordinate with rest of the world for aid and relocation which could help them come back to their normal lives faster. The dream of modern societies of inclusion of the marginal in the mainstream of the society could become a reality in the years to come.

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