

Low-Cost Intranet: Bringing Communication Infrastructure to Developing Nations

Jeeth Suresh and Daniel Gardner - ECE398PSC Project Proposal - 9/23/15

The Problem

The majority of the world does not have a proper communication network. In many developing nations, phone lines are scarce, and the only internet available is through costly cell phone data subscriptions. These subscriptions range from \$10/month (calls only) to \$50/month (limited data). WiFi-enabled tablets, laptops, and smartphones are currently much cheaper than the cost of connecting them to the global internet or phone network; but these devices lose significant potential when they cannot interface with other devices. Google has begun to test balloon-hosted 4G networks for rural and underdeveloped areas, but they still bring a high subscription cost for even the smallest amount of data.

Our Solution

A small community could host its own intranet. A central server would host a large library of educational material such as Wikipedia. This server could connect to the global internet through the fastest connection available at the time – we envision this being a low-bandwidth 4G or satellite connection. Most importantly, it would only connect to the internet if a website is requested that is not stored within its library, or if it needed to update information (weather, current events, etc.) within a template.

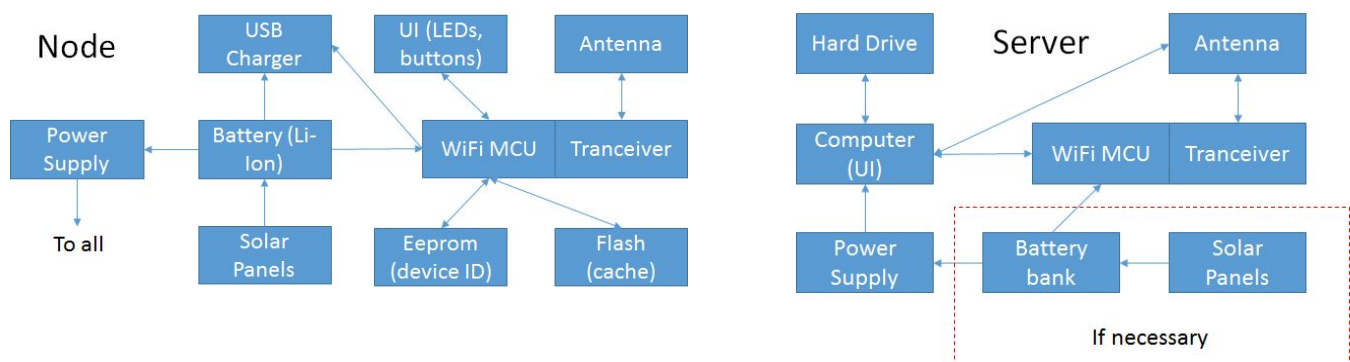
This server would also host a slew of tools for the community. Since it is hosted on-site, members could use messaging, scheduling, or other communication tools at the internet speeds we are used to. For most tasks, there is no need to communicate with the global internet. To reach all facets of the community, solar-powered nodes could be distributed around the area. Essentially, these nodes would be WiFi repeaters with a significant flash memory cache to save the most popular pages for each node. These nodes will also be able to connect to each other, speeding up the propagation of information within the intranet.

This solution allows people to use old or cheap WiFi-enabled devices, which are donated through several organizations, as powerful educational and communication tools. As long as we continue to use WiFi, these devices will remain effective. We feel that this ‘intranet’ solution is by far the best use of the few resources available to those in remote, impoverished areas.

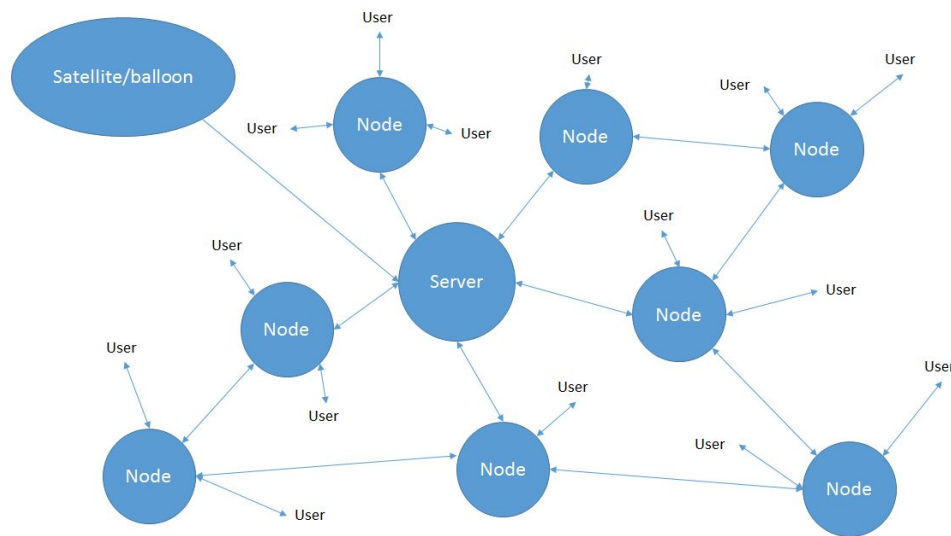
Market

People in subsistence economies are our target audience. More broadly, people that would otherwise not have access to any kind of communications network would benefit from the information shared by others in their position. Studies have shown that even a 10% increase in internet penetration in developing countries results in a 1.7% increase in exports and a 1.1% increase in imports. This kind of technology can also be an invaluable teaching tool. By hosting books, scholarly articles, and teaching resources on the central server, we make it easy for educators in developing nations who don't have access to physical resources to teach the kids with the technology already available to them. These tools can be updated and upgraded wirelessly over time via the central server's communication with the global internet - for example, a language learning tool originally created with just an english program may be updated to include french, without disrupting the experience for those who want to continue learning english.

Block Diagram



Example of Network:



Novelty and intellectual property

What we're doing is very similar to the way the internet works today. Our system, instead of relying on underground cabling, is entirely wireless. Projects like Outernet's Lantern and Lighthouse are using satellites to beam data down to developing nations, but you need to purchase hardware (Lantern is almost \$200USD) and there doesn't seem to be a way to create or contribute to the community. The data is also mostly unnecessary for daily use, meaning that a lot of space is wasted on things a subsistence farmer in Africa may not care about.

Regulatory and legal issues

Because we are implementing a mesh net, we don't directly control the access or the data given to those who connect to the intranet. We can control what the central server stores, and what is easy to reach for each user with the caching done by the nodes, but we can't control a pirated ebook (for example) being shared by the users of the mesh net. Because the network itself is a text-based platform (images would be a pain to deliver over a decentralized network, and would take up too much space on the central server) the possibility for pirated or illegal content is reduced. However, we are going to need to find a balance between what is possible for users to upload and what is best for the network without degrading quality.

Team

Jeeth Suresh and Daniel Gardner

Timeline

1. Research (2-3 weeks)
2. Design (2-3 weeks)
3. Acquire funds (???)
4. Prototype (3-8 weeks)
5. Testing and troubleshooting (2-4 weeks)

<https://www.indiegogo.com/projects/lantern-one-device-free-data-from-space-forever#/story>

<https://outernet.is/lighthouse>

<http://www.infodev.org/articles/wireless-internet-opportunity-developing-countries>

<http://www.pewglobal.org/2015/03/19/1-communications-technology-in-emerging-and-developing-nations/>

<http://www.brookings.edu/blogs/brookings-now/posts/2014/02/how-the-internet-and-data-help-the-developing-world>

<http://www.globalmediajournal.com/open-access/bringing-the-world-wide-web-into-third-world-countries-integrating-technology-across-the-globe.pdf>