Communication Network in Remote Areas

Team members: Chokote Kamdeu, Cody Hinther, Lauren Gleichman, Jeremy Cantu
Advising faculty: Dr. Richard Furuta
Client: Mr. Rodney Boehm
EPICS - Texas A&M University

Project Objective/Purpose

The focus of this project will be to design a low-cost, easily expandable system which will enable people isolated in remote areas to communicate with the rest of the world.

Project Overview/Introduction & Background

Most of the 2.5 billion that live in rural areas are school age children and women. Most rural and remote regions have low internet penetration. A system must be energy efficient and not relying on electric power. This system must enable remote regions to dispatch and retrieve information to and from the rest of the world. This system must be cost-effective in both the long and short term, as well as efficient enough to make a sizable impact in terms of services offered to the region.

Benefits: Provide access to local news updates, health information, and educational supplements, allow community development, human rights protection (i.e. Syria) and facilitate disaster relief work (i.e. Philippines).

Needs Assessment/Requirement Analysis

There is a need to design an inexpensive communication network device that will enable remote regions to dispatch and retrieve information to and from the rest of the world. This system must be energy efficient and not relying on electric power.

- **Challenges:** low population density, low network penetration, climate constraints, population income, energy constraints, remote regions
- **System Network:** cheap, avoid military band, conform to local needs such as climate and communication policies
- **Access points:** affordable devices, sponsors and governmental subsidies
- **Energy constraints:** battery life and powering solutions of the equipment

Research Findings

- **Energy Solution:**
  - Solar Energy: 250 W
  - High initial cost estimates: $450 - $625
  - Low maintenance Cost
  - Environmentally friendly
  - Few moving part
  - Battery

- **Solar Panel:**
  - 120Ah battery cap
  - 850 Hours Standby
  - Cooperation with One Laptop per Child

- **Network System:**
  - Ubiquiti Networks, Inc
  - Possible partnership
  - Manufacturer of low cost network hardware
  - Open Shortest Path Protocol (RFC 5340)

- **Access Point:**
  - Samsun galaxy Y
  - 1200Ah battery
  - 17Hours talk time

Case Study: Santa Catarina, Guanajuato in Mexico

- **Climate:** Dry and Mountainous
- **Agricultural-based economy**
- **General minimum wage:** $4.27 per hour or about 95.92 pesos
- **Population Demographics:**
  - Total population: 5,128 (40.1% males, 59.9% females)
  - 25% of population age between 15 and 29 years old
  - 15% of population 10 years old and under
  - 65% of Students in preschool = 146, Students in elementary school = 104, Students in high school = 33
- **Assumption:** Backcountry internet access from nearby city San Luis de Potosí

Priority Targets: School and Community Center

Network Access Solution: Hardware and cost Estimation

- **Laptops:**
  - 25% of the students have access to a laptop
  - Cost estimated between $550 - $940

- **AirMax:**
  - Cost estimated between $800 - $1,200

- **Solar Panel:**
  - Cost estimated between $1,100 - $1,500

Challenges to bringing internet access to remote areas such as terrain, distance, cost, and energy consumption were overcome with the conglomeration of a multitude of technologies.

Energy Solution: Solar Energy

Meet the estimated energy need of the system

Natural resource that is readily available across the world

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Access Points:

- **Power:**
  - Samsung Galaxy Y
  - Samsun

- **Energy:**
  - 120Ah battery
  - 1700mAh battery

- **Talk time:**
  - 850 Hours

- **Standby:**
  - 850 Hours

- **Samsun:**
  - Samsun galaxy Y
  - 120Ah battery

- **Talk time:**
  - 850 Hours

- **Standby:**
  - 850 Hours

- **Manufacturers:**
  - Ubiquiti Networks, Inc
  - Possible partnership

- **Battery:**
  - Open Shortest Path Protocol (RFC 5340)

Implementation of network in Santa Catarina is both cost-effective in both the long and short term, as well as efficient enough to make a sizable impact in terms of services offered to the region.

- **Cellular devices with long battery life**

Network hardware manufacturer: Ubiquiti Networks Inc

- **Challenges:**
  - Refinement of overall system to improve upon usability and lower overall cost of the network.
  - **Simulation of the implemented network.**
  - **Research into providing “pedestal” node around large centers of community that provide both power to the node and handset and connection to the network base station.
  - **Functional model of this pedestal for testing and display.**
  - **Tailor the service plan to other region**
  - **Research current technology for battery solutions**

References

http://dl.unb.com/datasheets/picostationnmpicomp2hp_DS.pdf

Future Work

- Research into providing “pedestal” node around large centers of community that provide both power to the node and handset and connection to the network base station.
- Functional model of this pedestal for testing and display.
- Refine the service plan to other regions.
- Research current technology for battery solutions.