RURAL MESH FOR EDUCATION

by

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:A Regional  HRD Center for Internet Engineers

- Established on 15 December 2003

- IntERLab aims to be center of AP region
  - Center of Internet Initiatives Information
  - Center of Human Resource Development
  - Center of Internet Research
On-going Research Activities

- DUMBO: Post-disaster ad hoc networks
  - Network Coding and DTN
- TakNet: Community Wireless Mesh Network
  - RuralMesh4EDU
- HazeMon: IoT for Environment Monitoring
  - ICN/Named Data Network
Objectives

- To deploy cost-effective multimedia WMN in rural communities and schools for educational content distribution.

- To research and develop some enabling technologies. For example, micro-caching of multimedia contents in rural WMN.

- To explore other beneficial uses of low-cost WMN in developing countries. Few examples include Post-Disaster Emergency Communication and Rural Healthcare.
The Problem of Content Distribution in Rural Schools and Communities

This is the bottleneck

The Internet

4 - 10 Mbps Gateway

EDU contents
Our Proposed Solution:
EDU Content Distribution via Low-cost WMN routers

- Low-cost and locally available hardware running customizable embedded Linux.
- 802.11n 2.4GHz Wi-Fi services with maximum link speed of 150Mbps.
- Self-configuring, self-healing OLSR mesh networking.
- USB flash storage: 16GB or 32GB per router for content caching (video or ebook files).
- Low power consumption (max 5W). Grid electricity cost is < US$ 0.70 per router per month.
- Optionally solar-powered (at an additional cost).
- Internal battery can be optionally installed to operate without grid/solar electricity for 4+ hours.
- Easy to use and maintain. Users can just switch the routers off-and-on to resolve most problems.
- Robust -- high temperature tolerance (when battery is removed), no moving parts.
Deployment of WMN routers

• We can deploy a number of WMN routers in a community or at a school. The distance between any two routers can be approximately 100 meters or more.

• Temporary and permanent installations are possible to serve changing user demands.

• Long-distance point-to-point links can be established in the mesh network using simple device adaptation. The point-to-point distance of up to 300 meters may be achieved.
Example of WMN topology deployed at Thai-Samakhi village in Tak province

• Sixteen (16) WMN routers, with a total storage capacity of more than 250GB, have been installed in various houses and public locations.

• These WMN routers automatically form a multi-hopped wireless mesh network among the routers that are within range.

• Web GUI manage is available for topology and status monitoring.
Services provided to WMN users

- Web services, through a built-in web server in each WMN router.
- Download large ebooks or watch videos directly on user’s devices (e.g. a tablet).
- Voice over IP (VoIP)
- Adaptive micro-caching services (being planned)
Original EDU contents can be retrieved from public Internet during off-peak hours.
Micro-caching can then be activated at each WMN router.
Then the routers can perform day-time content delivery services to nearby client devices.
Lessons

• Rural EDU content delivery should be to both schools and directly to homes.

• Content production must be of quality with improvements and updates.

• High demand for YouTube.

• Open access to content on the Internet should also be made feasible.
Summary

• A proof-of-concept prototype has been deployed in one rural village of Thailand.

• We wish to seek research funding and collaboration from interested organizations

• We wish to get partners: EDU content producers, training the trainers, deployment volunteers, and more.

In the Photo: Instructors and volunteers of THNG Camp#3 who deployed WMN in Tak province, Thailand. March 2013. Sponsored by the THNIC Foundation
Thank You
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