Rural Telecommunications
(8) Information Technology & Case Study

Jun-ichi TAKADA

Department of International Development Engineering

Tokyo Institute of Technology

Digital Divide

- Socio-economic difference between communities in their access to computers and the Internet.
- Gaps between groups in their ability to use ICTs effectively, due to differing literacy and technical skills, and the gap in availability of quality, useful digital content.

http://en.wikipedia.org/wiki/Digital_divide

Computers for Rural Application

- Difficulty about the bandwidth
- Difficulty about the energy
- Difficulty about the cost
- Needs and choices of applications

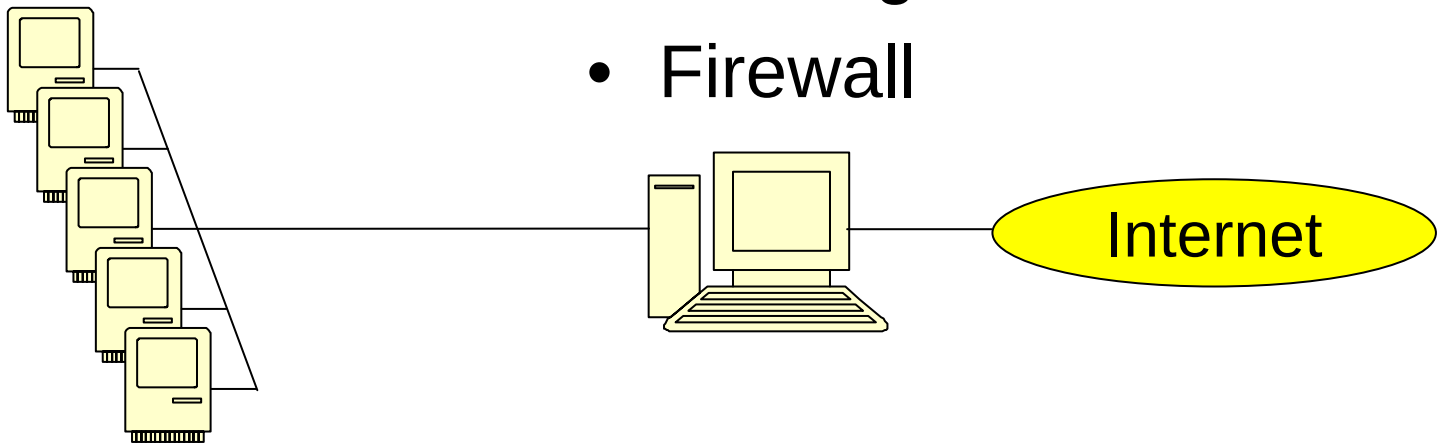
Potential Applications

Client

- E-mail
- Web browsing
- Messaging (chat)
- VoIP

Server (if necessary)

- SMTP/POP
- HTTP
- Database
- DHCP
- Routing
- Firewall



Desktop PC

- Pros
  - Relatively cheap (~$500)
  - Flexible configuration
  - Ease of repair
  - Variation of peripherals
- Cons
  - Large power consumption (>200W)
  - Fragile to voltage drop
    => use of UPS and serge absorber
  - External display and keyboard

http://www1.us.dell.com/content/products/productdetails.aspx/basdt_b110?c=us&cs=19&l=en&s=dhs

Laptop/Notebook PC

- Pros
  - Modest power consumption (~50W)
  - Built-in display and keyboard
  - Internal battery
- Cons
  - Relatively expensive (>$1,000)
  - Difficulty of repair
  - Threat of being stolen more easily

http://www-131.ibm.com/webapp/wcs/stores/servlet/CategoryDisplay?storeId=10000001&catalogId=-840&langId=-1&categoryId=2035724

Specially Designed PC for Rural Application

One Laptop Per Child (OLPC) project

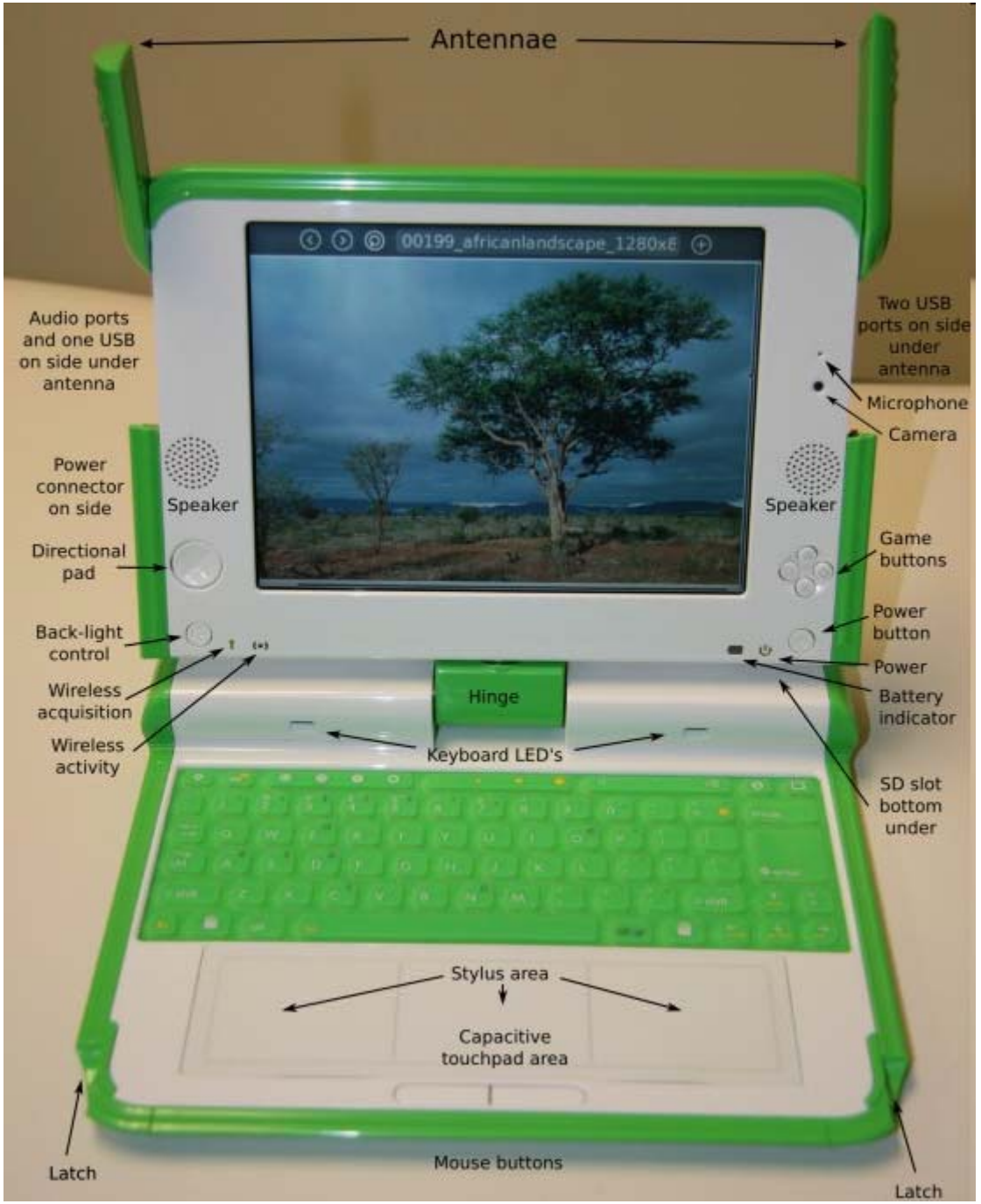
- Known as $100 Laptop by MIT Media Lab
- “… a potent learning tool created expressly for the world's poorest children living in its most remote environments.”
- “… a flexible, ultra low-cost, power-efficient, responsive, and durable machine with which nations of the emerging world can leapfrog decades of development—immediately transforming the content and quality of their children's learning.”

http://www.laptop.org/

OLPC

http://www.flickr.com/photos/melamut/347867154/

OLPC



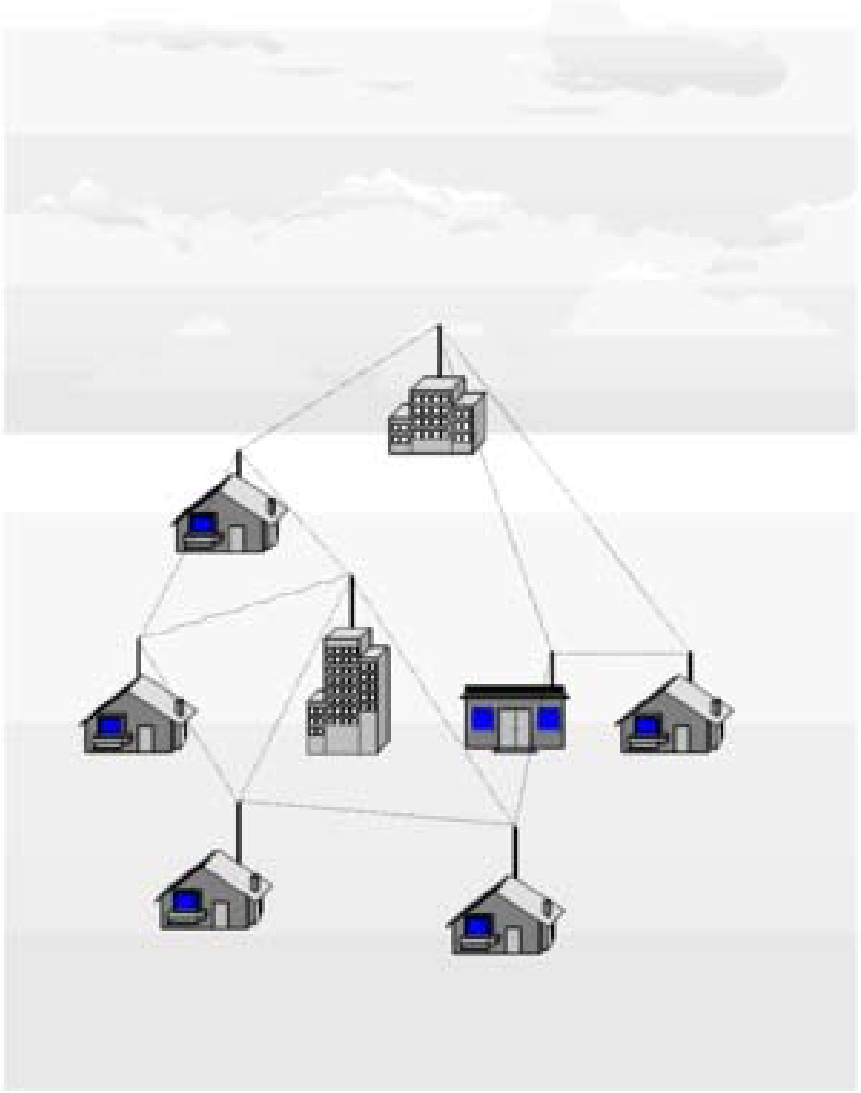
http://wiki.laptop.org/go/BTest-1_Release_Notes

OLPC

- Linux-based
- Dual-mode display
  - Full-color, transmissive DVD mode
  - Black and white reflective and sunlight-readable
- 500MHz processor, 128MB RAM, 500MB of Flash (no HDD)
- Wireless broadband incl. mesh network (IEEE 802.11s)
- Innovative power (including wind-up)

http://www.laptop.org/faq.en_US.html

Wireless Mesh Network



- Interconnection between wireless equipments
  - Multihop communications
  - Decentrarized
  - Nodes act as repeaters

http://en.wikipedia.org/wiki/Wireless_mesh_network

IEEE Standards on Mesh Network

- IEEE 802.11s
  - Extended Service Set (ESS) Mesh Networking
  - Self configuring multi-hop network

Terms and Definitions

WLAN Mesh

- IEEE 802.11-based Wireless Distribution System
- Set of two or more Mesh Points interconnected via IEEE 802.11 links
- support zero or more Mesh Portals
- automatic topology learning and dynamic path selection

Mesh AP

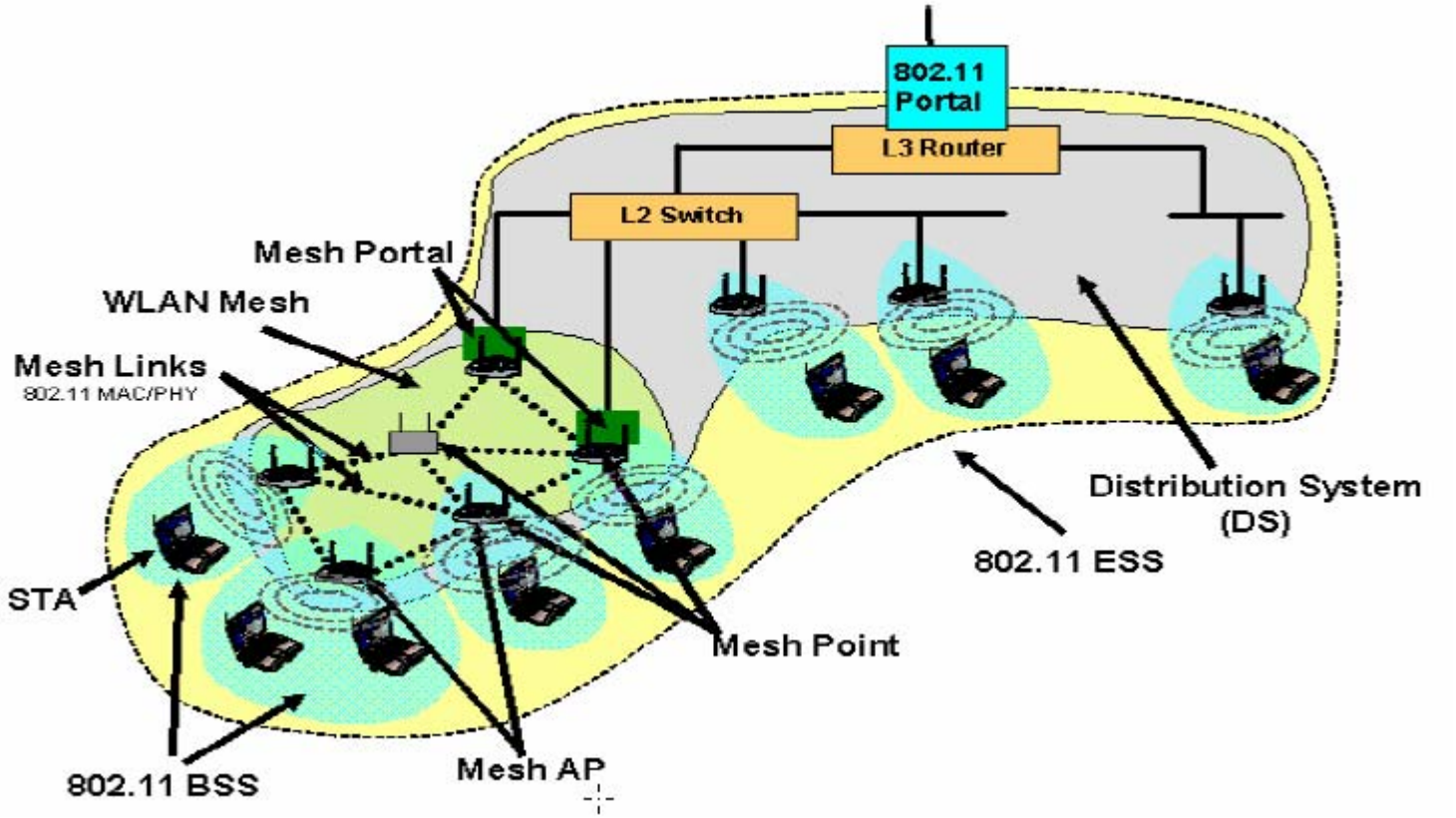
- Any Mesh Point that is also an Access Point

Mesh Portal

- Interface node between mesh and non-mesh network

http://www.ieee802.org/16/sg/mmr/contrib/C80216mmr-05_014r1.pdf

IEEE 802.11s



http://www.ieee802.org/16/sg/mmr/contrib/C80216mmr-05_014r1.pdf

OLPC

Why not a desktop computer, or—even better—a recycled desktop machine?

- Mobility: taking the computer home at night
- Recycled machines: 100 million available used desktops require 45,000 work years if only one hour of human attention to refurbish.

How is it possible to get the cost so low?

- Lowering the cost of the display
  - inexpensive DVD players ~ $35
- Getting the fat out of the systems
- Very large numbers (millions)

http://www.laptop.org/faq.en_US.html

OLPC

How will these be marketed?

- The laptops will be sold to governments.
- They will be issued to children by schools on a basis of one laptop per child.
- Initial discussions have been held with China, India, Brazil, Argentina, Egypt, Nigeria, and Thailand.
- A commercial version of the machine will be explored in parallel.

http://www.laptop.org/faq.en_US.html

OLPC

Recent trend

- $200 instead of $100
- Success of very low cost small notebook PC owing to OLPC, eg. ASUS Eee PC
- Failure of OLPC in battle with Microsoft and Intel
  - Dual boot between Windows and Linux
  - Intel “Classmate” for same purpose but with Windows
- Criticism against optimism to IT in education ~ local language support

OLPC in Classroom

- Observation of use of OLPC in Mongolia
  - October 2009
  - Bayankhongor no. 1 school, Bayankhongor
  - 3rd year primary class

Interview of Teacher

- Most of software packages are localized in language.
- Children can acquire use of PC without difficulty, and they like PCs very much.
  - They use both in school and home.
  - They extensively connect to one another for communication.

Case of Mongolia

- 10,000 OLPCs are distributed to rural schools.
  - Only one school per province
  - Parents in other schools envy so much
- Not all the provinces are utilizing.
  - In Selenge province, OLPCs are not distributed until gateway server is ready.

Special Education Software

- Fedora-based Linux system
- Sugar user interface
- Applications for children: very user friendly
  - Drawing
  - Word processing
  - Searching (if internet is ready)
  - Video chat (supporting mesh connection)

Free and Open Source Software

- UNIX OS
  - Developed in AT&T Bell Lab in 1969.
  - Source code was distributed freely.
  - Branch to commercial (System V) and free (BSD) versions.
  - Many applications developed on BSD UNIX are freely distributed.

Reference: http://www.unesco-ci.org/portals/foss/custom/open_history.shtml

Free and Open Source Software

- GNU (GNU is Not UNIX)
  - Free Software Foundation in 1984 to develop UNIX-like OS
  - Free Software guarantees freedom of programming
    - Permission of reuse
    - Duty of source code provision
    - GNU Public License (GPL)
  - Major free software are under GPL (e.g. Linux).

Free and Open Source Software

- Open source software
  - Open Source Initiative in 1998
  - Difficulty to apply GPL to commercially developed software, e.g. Netscape (now Firefox)
  - Certification by OSI

VoIP and Video Communication

- ITU-T H323 standard
  - Polycom and other video conferencing systems
- Proprietary
  - Skype
- PBX
  - Asterisk: very cheap solution for local PBX

Case Presentation

- Rural telecommunication development in Indonesia (Risvan)

Case Assignment

Revision request

- I will comment to slides and revision should be submitted again to TA by January 26.

Schedule

January 28

- Case presentation of 4 selected students, or supplemental topic