Open Source Software and Wireless Technologies For ICT Development and Deployment In Africa

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1 AUTHOR:

Sami Mohamed Sharif
University of Khartoum

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OPEN SOURCE SOFTWARE AND WIRELESS TECHNOLOGIES FOR ICT DEVELOPMENT AND DEPLOYMENT IN AFRICA

Sami M. Sharif
Professor of Communication and Information Systems
Department of Electrical and Electronic Engineering
University of Khartoum
ABSTRACT

Africa is the second largest content in the world, with population 967 million people (as of 2008) in 61 territories, which accounts for about 14% of the world's human population. About 300 million people live in poverty in Africa and the World Bank estimates that African economies would need to grow by five percent a year just to keep this number from rising. Thus, sustainable development is essential and critical to improve the quality of life in the content. Information and Communication Technology (ICT) provides a good support and opportunity for sustainable development. However, Africa’s ICT infrastructure is the least developed in the world, it has the lowest growth in teledensity of any developing region in the world. The main barriers for development, deployment and implement ICT services are the level of prices, level of incomes, and the transmission and access infrastructure. The limited finance and human resources, makes technologies selection very critical. Open source software and wireless technologies may provide low cost and efficient solutions for ICT development and deployment in Africa. The features and potentials of these technologies are discussed in this lecture.

AFRICA: POPULATION

- The second largest content in the world
- Population: 967 million people (as of 2008) in 61 territories,
  - accounts for about 14% of the world's human population
- Most people live where water is available
  - Nile Valley, the coasts of North and West Africa, along the Niger, in the eastern highlands, and in South Africa
AFRICA ECONOMICS

- Around 60 percent of African workers are employed by the agricultural sector.
  - About 60% of African farmers being subsistence farmers.
- Africa's most valuable exports are minerals and petroleum.
- Africa is the least industrialized continent;
  - Nearly all of the continent's natural resources are exported for secondary refining and manufacturing.
- Banking in Africa has long been problematic.
  - Because local banks are often unstable and corrupt, governments and industry rely on international banks.

POVERTY IN AFRICA

- About 300 million people live in poverty in Africa.
  - The World Bank estimates that African economies would need to grow by five percent a year just to keep this number from rising.
- Is preventing the continent from realizing its vast potential.

% of People living on < $2 per day
SUSTAINABLE DEVELOPMENT

A dynamic process which enables all people to realise their potential and improve their quality of life in ways that simultaneously protect and enhance the earth’s life-support systems.

one of the greatest challenges for African counties create long-term economic stability, but does not create short-term profits.

THE CONCEPT OF SUSTAINABLE DEVELOPMENT

- Economic sustainability
  - economic growth without making undue demands on social or natural resources

- Environmental sustainability
  - minimising impacts and building / safeguarding natural resources

- Social sustainability
  - building and not undermining social justice and equity
ICT INNOVATION

- Technological innovation is essential for human development.
- ICT involves innovations in
  - microelectronics, computing (hardware and software),
  - telecommunications and opto-electronics, microprocessors, semiconductors, fiber optics, etc.
- These innovations enable
  - the processing and storage of enormous amounts of information
  - rapid distribution of information through communication networks.
  - low-cost, open, instantaneous and unrestricted communication and interaction between people across vast distances
- ICT innovation offers organization, government, etc. opportunities to meet their objectives more swiftly and cost-effectively.
  - Seizing these opportunities is not always straightforward.

BENEFITS FROM ICT

- Can be a powerful tool to facilitate and enable affordable solutions for
  - Infrastructure development
    - water & sanitation, energy and transportation, etc.
  - Basic human needs and development
    - healthcare, water, agriculture and basic education, etc.
    - reducing vulnerability to natural disasters
  - Economic development
    - job creation, poverty alleviation, e-commerce, agriculture and higher education, enhanced competitiveness, increased business opportunities, access to market for rural communities.
  - Empowerment
    - alienation, peace, transparency, democracy, e-governance and gender, etc.
    - increased civil society participation
    - allowing the poor to better communicate their concerns
Great disparity in basic telecommunication services in the region vary according to levels of sophistication, availability, quality, and national spread.

The telecommunication sector is steadily growing in Africa. Considerable development has been made specifically in mobile communications, characterized by low penetration, due to:
- lack of investment,
- investment inefficiencies,
- inadequate private sector involvement,
- foreign exchange scarcity,
- poor management incentives and insufficient regional development.

Providing new opportunities for growth.
ICT UTILISATION IN AFRICA

- 1 in 4 have a radio
- 1 in 13 have a TV
- 1 in 40 have a fixed line
- 1 in 35 have a GSM line
- 1 in 130 have a PC
- 1 in 160 use the Internet
- 1 in 400 have pay-TV

INTERNET USAGE STATISTICS FOR AFRICA

<table>
<thead>
<tr>
<th></th>
<th>Africa</th>
<th>Rest of World</th>
<th>Word Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (2008 Est.)</td>
<td>967,206,348</td>
<td>5,720,913,940</td>
<td>6,676,120,288</td>
</tr>
<tr>
<td>Pop. % in World</td>
<td>14.3 %</td>
<td>85.7 %</td>
<td>100.0 %</td>
</tr>
<tr>
<td>Internet Users, Latest Data</td>
<td>51,065,630</td>
<td>1,412,566,731</td>
<td>1,463,632,361</td>
</tr>
<tr>
<td>Penetration (% Population)</td>
<td>5.3 %</td>
<td>24.7 %</td>
<td>21.9 %</td>
</tr>
<tr>
<td>% Users in World</td>
<td>3.5 %</td>
<td>96.5 %</td>
<td>100.0 %</td>
</tr>
<tr>
<td>Use Growth (2000-2008)</td>
<td>1,031.2 %</td>
<td>296.3 %</td>
<td>305.5 %</td>
</tr>
</tbody>
</table>

THE ACCESS CHALLENGE

- Bandwidth costs is very high
- Bandwidth is extremely limited and insufficient to meet demand
  - Internet links are usually congested/running at maximum capacity
- Decision-makers are inundated with demands for more bandwidth
- Under-utilisation of national ICT and economic resources - expensive investments are wasted
- Only 20-24 million Internet users (2.5% penetration)

TECHNOLOGY SELECTION ISSUES

FOR THE GOVERNMENT
- Allocated budget
- Economic implications
- Community segment to be

FOR INVESTORS
- Return on investment
- Government, international institution support
- Level of risk
- Exit strategy?

FOR THE BUSINESS
- Actual demand and the returns
- Regulatory framework?
- Local partner: resources/network/influence
- Competitors
- Existing infrastructure in the country
WIRELESS OPPORTUNITY

- Provide a tool to overcome the difficult environment to develop information and communication technology
  - due to lack of infrastructure, political and economic instability, remote areas and natural disasters
- Can handle the tremendous suppressed demand for services and offers many service that addressed Customer daily communication needs, and is:
  - affordable
  - easily accessible
  - easy to use
- continues to fill a communication vacuum and at a substantially reduced cost (whether in transport, time, etc)
- Is the technology of choice to address the opportunity in rural areas in Africa.
- Cellular based data to be the catalyst for that growth and piloting sites in:
  - Education Institutions, Hospitals, Government Institutions
- Provide a fast and cost effective deployment method
- Relatively cheap to set up

CURRENT INTERNET ACCESS TECHNOLOGIES

- There are three possible ways to access internet.
  - Broadband access
    - Uses DSL or cable modem at home and E1 or E3 line at office
  - WiFi
    - Uses WiFi routers at home and hotspots on the road
  - Dial Up Connection
- Broadband access is too expensive and WiFi coverage is very sparse.
WIRELESS BROADBAND

- 3G and WiMAX starting to emerge as viable broadband solution for Africa
- Provide promising alternative to shortage of fixed broadband options
- Countries with both wired and wireless broadband options have lower prices and higher broadband take-up

WHAT IS WIMAX?

- WIMAX stands for **Worldwide Interoperability for Microwave Access**
- WiMAX refers to broadband wireless networks that are based on the IEEE 802.16 standard,
  - ensures compatibility and interoperability between broadband wireless access equipment

WiMAX, which will have a range of up to 31 miles, is primarily aimed at making broadband network access widely available without
  - the expense of stringing wires (as in cable-access broadband) or
  - the distance limitations of Digital Subscriber Line (DSL).
WIMAX HIGHLIGHTS

- Speed
  - Faster than broadband service
- Wireless
  - Not having to lay cables reduces cost
  - Easier to extend to suburban and rural areas
- Broad coverage
  - Much wider coverage than WiFi hotspots
WHY FREE AND OPEN SOURCE SOFTWARE (FOSS)?

- Spend less money in buying proprietary software
  - Reducing the cost of ICT systems
- Less dependent on outside software producers and developers
- Security issues
  - Right to make our own choice
- To enter into the information age as a developer and not only as a consumer

DEFINITION: OPEN SOURCE SOFTWARE (OSS) / FREE SOFTWARE (FS)

- Open Source Software / Free Software (OSS/FS) programs have licenses giving users the freedom:
  - to run the program for any purpose,
  - to study and modify the program, and
  - to freely redistribute copies of either the original or modified program (without royalties, etc.)
- Not non-commercial, not necessarily no-charge
  - Often supported via commercial companies
MORE THAN THE LINUX OS

- Operating Systems
  - Linux (Fedora, SuSe, Debian, others), FreeBSD, etc.
- Server Applications
  - Apache, MySQL, PostgreSQL, SendMail, Samba
- Desktop Applications
  - OpenOffice, Evolution, Mozilla, KDE, GNOME, etc.
- Development Tools
  - Perl, PHP, Python, various Content Management
- Others
  - WikiPedia, Linux Terminal Server, ERP, CRM, Messaging

BENEFITS OF FOSS

- Purchasers (Businesses):
  - Usually lower license cost,
  - Flexible support options – no vendor lock-in
  - Freedom to modify
  - Often easier for planning purposes
- Content (data) Owners
  - FOSS provides longevity to support content, less chance of data extinction
  - FOSS often uses open file and data formats (e.g., XML)
  - Easier to localise due to open source code
BENEFITS OF FOSS CONT’D

- **End-Users (Employees)**
  - Can help themselves or get help from friends
  - Can modify software if they have skills
  - Are not limited to PS “Retry, Reboot and Reinstall” options

- **Software Developers**
  - Openness of source code allows more focus on innovation - they can borrow and reuse easily.
  - Small companies find it easier to sell software discontinuation of support is less likely

- **Security**
  - Open source receives more scrutiny so vulnerabilities are likely to be found faster
  - Code can be inspected easily for weaknesses

- **National Capacity Building**
  - Education institutions can improve students skills by using FOSS for instruction
  - Better ICT capacity expected to improve investor interest
  - We’ll rely less on external technical support
  - Will help create jobs rather than export jobs
  - Local support will add value to the local economy

- **Piracy – zero – difficult to “pirate” FOSS – it’s open and usually free of license fees**
CHALLENGES OF IMPLEMENTING FOSS

- High level of skill required is usually quite high
- Need to be able to evaluate options
- Need to get internal or external support system (developers)
- Often runs on FOSS OS so skill in Linux or BSD may be critical
- Internet connectivity a must

SUMMARY

WiMax and Open Source Software may provide alternative low cost and efficient solutions for ICT development and deployment in Africa.
THANK YOU