

Establishing Global University System in Ethiopia (GUS/Ethiopia)

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Prepared
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Abstract

The Global University System (GUS) is a worldwide initiative to establish broadband Internet infrastructure for enhancing e-learning and e-healthcare across national and cultural boundaries for global peace. The philosophy of GUS is based on the belief that global peace and prosperity would only be sustainable through education. The prime objective is to achieve “education and healthcare FOR ALL,” anywhere, anytime and at any pace.

To attain its goal, the GUS will create a worldwide consortium with partnerships of educational and healthcare institutions and NGOs, particularly benefiting those in remote/rural areas of developing countries for the eradication of poverty and isolation. Learners in those countries will be able to take their courses, via advanced broadband Internet, from member institutions around the world to receive a GUS degree. Both the learning (students or lifelong learners) and teaching (professors) societies of partner institutions will also form a global forum for exchange of ideas and information and for conducting collaborative research and development with the emerging global GRID computer network technology. Thus, the higher education institutions will close the digital divide, act as the knowledge center of their community and lead their development.

With this in mind, concerned and far-sighted professionals from different corners are now working hard to establish GUS in Ethiopia, so that the Ethiopian learning society could benefit not only from the Information and Communication Technologies (ICTs), but also from the global knowledge by creating global system for collaboration.

This short paper gives highlight on the GUS in general and the establishment of GUS/Ethiopia in particular. The framework of the global broadband wireless and satellite Internet Virtual Private Network (VPN) will also be discussed. Furthermore, a short overview on the roadmap to the GUS/Ethiopia establishment and the stakeholders to create the local consortium will be underlined.

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1. Introduction

Economic interdependence among nations and cultures is spawning a global economy. Globalisation also highlights clashes of divergent cultures and belief systems, both political and religious. If global peace is ever to be achieved, global-scale education, with the use of the modern digital telecommunications, will be needed to create mutual understanding among nations, cultures, ethnic groups, and religions. Internet is the future of telecommunications and can be a medium for building peace.

The mission GUS promotes (Utsumi, et al, 2003) has triple or even more meaning to African countries, in particular Ethiopia, where low level of education, poor healthcare and recurrent social unrest are main factors to the all prevailing ills.

Ethiopia, the cultural, political and economical center of Africa, had once a unique environment envied by many on the continent. As population pressure intensified, deforestation, drought, poverty, food insecurity, HIV/AIDS, loss of biodiversity became serious problems. The recurrent drought and the inability of even to feed the whole population, which leads to look for international food aid, leaves Ethiopia one of the poorest countries of the world. These problems are a clear manifestation that the country is suffering from consequences of human activities. These handicaps can be indeed substantially minimized if these problems are well addressed followed by integrated actions. One of the urgent measures is boosting investment in education and healthcare and awareness to prospects of ICTs.

This short paper gives highlight on the GUS in general and the establishment of GUS/Ethiopia in particular. The project GUS/Ethiopia will build broadband wireless and satellite Internet, available to universities, schools and hospitals, and will promote the interaction among communities from different areas of Ethiopia with other communities from the rest of the world. In line with it the framework of the global broadband wireless and satellite Internet Virtual Private Network (VPN) will also be discussed. Furthermore, a short overview on the roadmap to the GUS/Ethiopia establishment, the stakeholders to create the local consortium and financing will be underlined.

2. The Global University System (GUS)

a. Objectives

GUS is a worldwide initiative to create satellite/wireless telecommunications infrastructure and educational programs for access to educational resources across national and cultural boundaries. It has a long history⁴ of concept development and testing of multiple hardware configurations suitable for remote Internet access.

The most underlining objectives of the GUS are to build a higher level of humanity with mutual understanding across national and cultural boundaries for global peace. Thereby, GUS helps higher educational institutions in remote/rural areas of developing countries to deploy broadband Internet in order for them to close the digital divide and act as the

⁴ These initial steps are summarized in our recent book, [Global Peace Through the Global University System](#), University of Tampere, Finland, 2003 (ISBN 951-44-5695-5) (Varis, et al, 2003). The purpose of this book is to make internationally known the philosophy, past and present actions, as well as future plans of the GUS, which have resulted from years of development and a seminal working conference at the University of Tampere in 1999.

knowledge centre of their community for the eradication of poverty and isolation. They will also have an important role acting as the gateway to the world for collaboration of creating new knowledge in global knowledge society of the 21st Century. Hence the GUS education will promote world prosperity, justice, and peace, based on moral principles rather than political or ideological doctrines. It has been clear that education and skills are the basis for the new form of knowledge economy, and are the keys in determining a nation's wealth.

The GUS has task forces working in the major regions of the globe with partnerships of higher education and healthcare institutions. Learners in these regions will be able to take their courses, via advanced broadband Internet, from member institutions around the world to receive a GUS degree. These learners and their professors from participating institutions will form a global forum for exchange of ideas and information and for conducting collaborative research and development with the emerging global GRID computer network technology.

b. Organization

GUS is headquartered at the Global E-learning Center at the University of Tampere in Finland, under the direction of the UNESCO/UNITWIN Networking Chair, held by Dr. Tapio Varis. Currently, institutions with faculty members who are participating in GUS development projects include the University of Tampere, UK Open University, 6 federal universities of Amazonia, Havana Institute of Technology, University of Malawi, Uganda National Council for Science and Technology, McGill University in Canada, University of Tennessee in Knoxville, Cornell University, Texas A&M University, Maui Community College, University of Milan, University of Salerno, University of Twente, Catalunyan Open University, several federal and private universities in Nigeria, and many others. GUS will serve as an educational broker for universities, thus helping them gain international influence and access to students that they would otherwise not reach. Those institutions affiliated with GUS become members of the GUS/UNESCO/UNITWIN Networking Chair Program.

c. Current Projects

Currently the GUS runs several projects, among which, the Amazon Project is major one, which will connect six federal universities in the Amazon region by broadband satellite Internet, and Community Development Networks. Coupled with interconnecting universities, this project will then connect the universities with secondary and elementary schools, libraries, hospitals, local government offices and NGOs, etc., by broadband wireless Internet at drastically discounted rates or free of charge. Similar projects are now starting in Cuba, Bolivia, Ethiopia, Malawi, Nigeria, Uganda, and have received inquiries for the same from Bangladesh, India, Cambodia and others.

3. The Proposed GUS Infrastructure and Technology

a. The Infrastructure

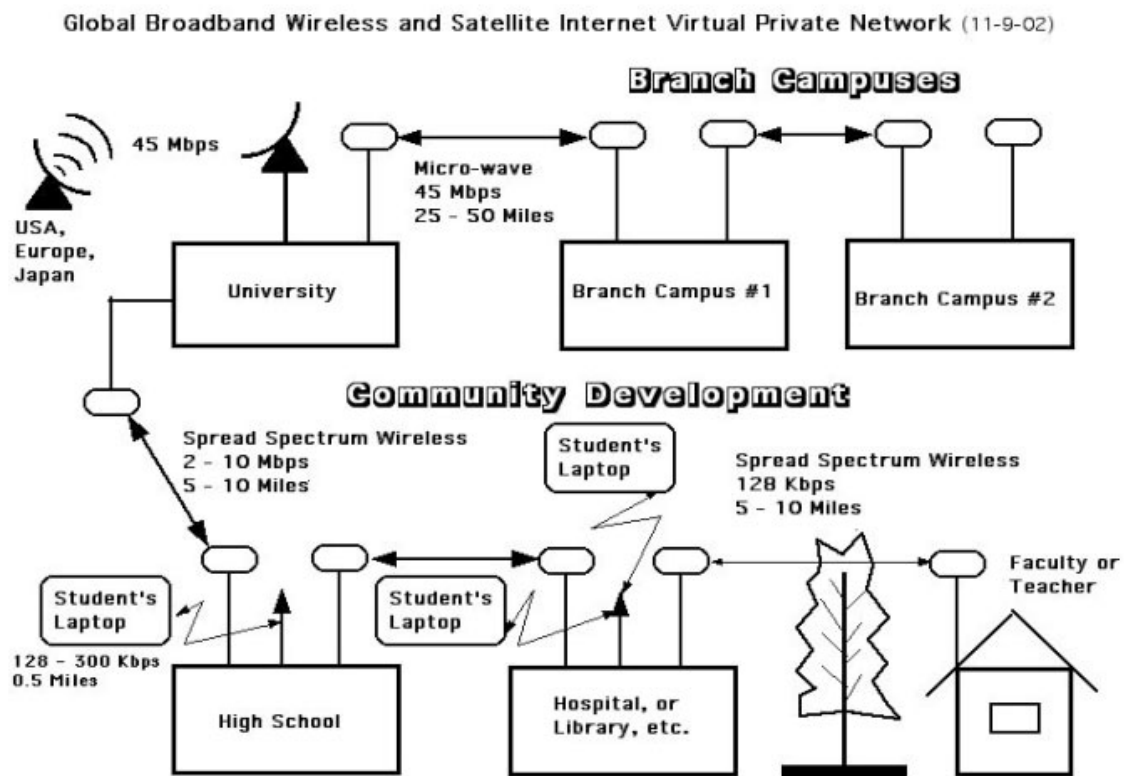
Modern e-learning and telemedicine require high-speed access to the World Wide Web. Multi-media requirements might include two-way audio, full-motion videoconferencing up to MPEG4 quality, television-quality net-casting, and high-resolution image transfer for telemedicine. The objective of increasing quality of audio/video delivery, high interactivity, and broadband throughput can be seen as a global objective of

closing the digital divide to improve e-learning and e-healthcare services in order to eradicate poverty and isolation in rural/remote areas of developing countries.

As diagrammed in Figure 1, GUS programs and services will be delivered via regional satellite hubs, typically located at a major university, that connect via high-speed satellite (~ 45 Mbps) to educational resource cites in the E.U., U.S., Japan, Canada, Australia, etc. In a sense, the regional satellite hub is to be the major Internet Service Provider (ISP) for not-for-profit organizations in the region and the gateway to the outside world.

Regional hubs link to branch campuses or other regional educational institutions via microwave (~ 45 Mbps) over relatively short distances (25-50 miles), if there is no optical fiber network. Communication from the hub and branch campuses to local sites, over distances up to 10 miles, is to be achieved by spread-spectrum wireless (~ 2-10 Mbps) Internet networks, which do not require licenses in most countries.

Figure 1



The buildings with a broadband Internet connection will then also become relay points for the low-cost "Wi-Fi (wireless fidelity)" networks at 10 Mbps that are now rapidly appearing in Japan, USA and Europe. This advanced wireless communication with laptop computer will make e-learning possible for anyone, anywhere, and anytime with capabilities of Internet telephony, fax, voice mail, e-mail, Web access, videoconferencing, etc. This is not only to help local community development, but also to assure close cooperation among higher, middle and lower levels of education.

GUS is not limiting its efforts to university-level education. Some major U.S. universities are heavily involved in K-12 education as a means to assure quality in their student pipeline. The K-12 education in many underdeveloped nations is poor to non-existent,

and they produce few students who are qualified to master a university education. The seeds of poverty and terrorism are sown in children through ignorance and propaganda. What could be a more important global problem to address? Leadership must come from the universities -- including, hopefully, GUS.

b. The GRID Technology

Many now consider GRID technology as the next generation Internet, which concept was initiated by a co-author Utsumi almost three decades ago (McLeod, 2000). It has demonstrated all of the effectiveness in the scientific domains as becoming a de-facto e-Science technology infrastructure.

This technology promises to do what the Internet has done with data on the applications. GRID computing extends the scope of distributed computing to encompass large-scale resource sharing, including massive data-storages, high-performance networking and powerful computers, highly expansive equipments (i.e., microscopes, telescopes, 3D Cave), etc.

GRID technology defines a new powerful computing paradigm by analogy to the electric Power Grid. At the heart of Grid Computing is a computing infrastructure that provides dependable, consistent, pervasive and inexpensive access to computational capabilities. By pooling federated assets into a virtual system, a grid provides a single point of access to powerful distributed resources⁵. Users of the GRID will then be able:

- (a) to use his/her private workplace to invoke any application from a remote system,
- (b) to use the best suited system for executing their desired particular application,
- (c) to access data securely and consistently from remote sites,
- (d) to exploit multiple systems to complete complex tasks in an economical manner, or
- (e) to use multiple systems to solve large problems that exceeds the capacity of a single one. In this vision, the sharing doesn't mean simply exchange of data or files but rather a concrete access to resources (e.g., computers, software, data, etc.).

E-mail and multimedia World Wide Web of Internet so far contributed significantly to the world society on the dissemination of information. The next phase of the Internet development with global neural (or GRID) computer networks should be the globally collaborative experiential (the so-called "hands-on") learning and constructive creation of wisdom with interactive actions on virtual reality simulation models of joint global research and development projects on various subjects.

4. The GUS/Ethiopia

a. Objective

The Global University System in Ethiopia (GUS/Ethiopia) aims to technological alternatives to promote access and use of the available technology for e-learning in educational and e-healthcare in medical fields with the Official Development Assistance (ODA) fund of the Japanese government. GUS/Ethiopia will be a representative of the Global University System of UNECSO, which is responsible to coordinate this project and

⁵ Grid Technology-Overview: <http://www.sun.com/software/grid/overview.html>

other activities in promoting the principles of Global University System. The GUS/Ethiopia consists of:

- a.) EthioNet: A broadband Internet network (with a project name EthioNet), which is planned to enhance interaction among higher education institutions. The network shall interlink these institutions within themselves and with communities in their vicinity, nationwide and that of international (with the Global University System). The network, by paving the venue to communication, will ultimately enable life-long learning and e-learning in higher education. EthioNet will, by the same token, promote e-healthcare in hospitals, health centers and clinics.
- b.) LCDN: Local Community Development Networks (LCDNs) which is to link diverse rural communities for knowledge sharing through exchange of experiences. In short, the LCDN fosters public services supported by ICTs.

The consortium (EthioNet and LCDN) will play a major role in this initiative because they are located in regions where application of ICT is growing steadily. Some of the benefits of this project are depicted below.

b. Technological innovation

The main focus of the proposed broadband Internet (see Figure 1) is either or both of satellite and terrestrial (microwave and/or spread-spectrum) wireless approach in viewpoints of the region's geographical constraints and their cost effectiveness. At the main campuses of the affiliated universities, the spread-spectrum with 802.11b (or g) protocol will be the most cost-effective option for their local area networking. The community development network in the cities of the affiliated colleges and universities will also be connected with this technology. Students of the universities and all schools in the cities will then be able to access Internet at high speed wherever they are within the coverage of its antenna. This is to provide e-learners with self-pacing, interactive, and customized courses that are perfect fit to learner motivation and target language environment.

The technologies GUS/Ethiopia promotes are introducing new technologies to the education and health sectors, but the linkage effect they produce will have an overwhelming technological innovation, especially to rural areas. To mention few:

(i). Use of broadband Internet connection:

- Teleconferences, based on text
- Videoconferences
- Web-based instructions
- Local experts assistance to medium size enterprises
- Multimedia web-based educational course development
- Scientific knowledge creation and exchange

(ii). Two-way interactive use in e-healthcare, environmental education and training:

- Access to environmental databases and monitoring information
- Access to medical data bases
- Medical training
- Remote diagnostics
- Emergency support, like in floods and fire situations

- Prevention care

After successful experimental installation of these technologies for interconnecting in some schools in Addis Ababa, we plan to emulate and expand it in the cities of other colleges and universities in the project sites, as well as the vicinity.

c. Socio-economic benefits

Social benefits are indeed the development objective to be attained (including the results of technological and economical benefits directly or indirectly). This project of deploying EthioNet and LCDNs is a community development approach, as firstly connecting non-profit organizations (higher and secondly educational institutions, libraries, hospitals, local governmental agencies, etc.), and, at later stage, with profit-making organizations (investors in these sectors), depending on the regulation of the federal government of Ethiopia, in order to have global E-Rate. Subsequently, all applicable groups in the cities of the affiliated colleges and universities are inclusive. This will, in the long run, attract domestic and international investors particularly to education sector. For sustaining application of e-learning and e-healthcare, more participants can share the cost of expensive digital satellite trunk line better⁶. The use of broadband wireless Internet for the LCDN will make their participation easy so that the so-called "last-mile" problem to reach individual end-users can more effectively be solved. This approach will not only contribute to the problem of digital literacy among poor, but also create new job opportunities to the graduates of the universities.

d. Cost Effectiveness of Wireless Broadband Internet

The cost effectiveness of this project of deploying community development networks is;

1. The proposed activities provide the most cost effective method to promote the use of advanced broadband Internet for the benefit of societies residing in and around the pilot projects and later can reach the whole remote/rural areas of Ethiopia.
2. The wireless Internet requires
 - a. less regulations,
 - b. less initial investment,
 - c. less operating costs. (After initial investment in transceivers and antennas, expensive recurring cost for leasing broadband Internet does not need to be paid.)
3. E-learning and e-healthcare can thus provide;
 - a. more flexibility,
 - b. more enhanced content and
 - c. more accessibility.

e. Replicability

This activity is to be a model replicable to other regions and localities, as leading the use of the advanced Internet in various sectors of societies. The local higher educational institution participants will have the broadband Internet satellite earth station, and will become the major Internet Service Provider (ISP) to the local community of non-profit organizations. The higher education institution will then provide teacher training to secondary and elementary schools and promotion of digital literacy with training

⁶ This is a long term goal, which depends on the country's policy and regulations of ICT.

courses/seminars at public library, hospitals and healthcare facilities, local governmental offices, etc., and also act as facilitators and technical supporters to other non-profit organizations. This teacher-training and technical support can be the on-the-job training of the graduate students of the universities, thus creating new job opportunities after their graduation in local communities.

It is expected that interaction among the affiliated universities will contribute to the dissemination of information about alternatives to promote sustainable development in Ethiopia. At the same time, the region's population will have better access to healthcare information, which will contribute to a better quality of life. In addition, a number of e-learning courses will be developed which will decrease isolation and offer better opportunities for those living in Ethiopia.

In a nutshell, we hope the scheme of this EthioNet and LCDNs projects will be replicated elsewhere in African and other countries of developing world. Moreover, GUS/Ethiopia could serve as a hub for coordinating universities in eastern African region.

5. Financing

a. Community Project Assistance Fund (CPAF)

This fund of the Japanese government (about US\$80,000 per one application) will be used to deploy Local Community Development Network (LCDN) around the EthioNet affiliated universities and colleges to connect them with their nearby secondary and elementary schools, hospitals, libraries and local non-profit organizations and governmental agencies, with the use of fixed spread spectrum wireless broadband Internet. The LCDN in Addis Ababa will be the first one to deploy with this fund.

b. The Japanese Social Development Fund (JSDF)

Application will be made for the Japanese Social Development Fund (JSDF)/Seed Fund (US\$50,000) for the initial activities, i.e., for the fact-finding and assessment and organizing mini-workshop, and then for preparing a full proposal for up to US\$2 to 3 million. This fund, when approved, will be used;

1. To deploy the LCDNs which are not covered by the CPAF mentioned above,
2. To deploy the EthioNet to connect its affiliated colleges and universities and other institutions of higher learning with the use of broadband digital microwave network,
3. To initiate global e-learning and e-healthcare to the Ethiopia sites,
4. To initiate joint content development, research and development, global forum for idea and information exchange with counterparts in Asia, America, Europe, and other parts of the world for deployment of LCDN and EthioNet.

c. Official Development Assistance (ODA) fund of the Japanese Government:

This fund will be used to implement the ultimate project objectives, i.e., the infrastructure to e-learning and e-healthcare. The non-cultural aid grant out of the ODA fund will be used, if approved, not only for conducting the same as above which are not covered by the JSDF, but also to connect selected colleges and universities to the outside world with the use of broadband digital satellite.

The strategy here is to make broadband Internet available to many communities and the broadband trunk line connection among the local universities as soon as possible with the

use of low cost wireless Internet units and microwave network. The broadband satellite Internet connection from selected universities to the outside world will be made later with the Japanese ODA fund. In a sense, this is a bottom-up approach since the process of getting the Japanese ODA fund takes a long time. This approach has been taken in other African countries.

During the Okinawa Summit in July 2000, the Japanese government pledged US\$15 billion to close the digital divide in developing countries and for the eradication of poverty and isolation. During the G8 Summit in Canada in June of 2002, and at the Environment Summit in South Africa in September of 2002 they also pledged US\$2 billion to aid education and healthcare in developing countries, respectively.

GUS projects will combine

1. the Japanese government's ODA funds and
2. Japanese electronic equipment (computers, transceivers, dish antennas, etc.)
with
 - (a) the Internet technology and
 - (b) content development of North America and Europe, to help underserved people in rural and remote areas of developing countries by closing the digital divide.

GUS will emulate this approach in other developing countries around the world in the future.

6. Conclusions

The GUS program is a comprehensive and holistic approach to building smart communities in developing countries for e-learning and e-healthcare/telemedicine. Initiatives are underway to create the necessary infrastructure and educational liaisons, and some near-term educational access is expected.

GUS is clearly an ambitious program, one that cannot be achieved by any one group, university, or national government. The program requires substantial collaborative contribution of ideas, expertise, technology resources, and funds from multiple sources. Those who value the vision of GUS are invited to join this great and noble enterprise.

In summary, the expected benefits of GUS/Ethiopia are:

- To create a technological culture by means of e-learning in educational and medical fields through broadband wireless Internet;
- To develop indigenous educational software applications on e-learning and e-healthcare for Ethiopia addressed to schools, universities, adult education and post-graduate courses;
- Public and private schools will have the opportunity to use the technology providing more content and teaching alternatives for their students;
- To help member universities build a network of facilitators to support e-learners;
- Hospitals and clinics located in the poverty stricken areas of Ethiopia will have the opportunity to access information and practice of e-healthcare;
- The demonstrative effect will stimulate communities of Ethiopia to consider the use of the broadband Internet technology to help satisfy their needs;
- The need for knowledge will induce the creation of adequate content for e-learning, which will promote the use of local human capital to support;

- Professors and students in technical and vocational schools and universities will have opportunities for training and knowledge multiplication;
- To promote doctors and nurses training and access to modern technology in order to offer better services for the communities;
- To promote e-healthcare practices among universities hospitals, and among them and local public clinics in small towns or communities;
- To use natural resources from the region in a sustainable manner and benefit local and global populations;
- To enhance indigenous knowledge systems in all aspects by integrating them with modern knowledge systems so that they are made more accessible for application and learning purposes;
- Learners may take courses from different member universities, obtaining their degree from the GUS, thus freeing them from being confined to one academic culture of a single university or country;
- Learners and faculties can promote the exchange of ideas, information, knowledge, and joint research and development of Web-based teaching materials;
- Researchers in Ethiopia can partner with colleagues in more advanced countries, and perform joint collaborative research and development with the use of virtual reality/virtual laboratories for experiential/constructive learning and creation of knowledge through the emerging global GRID computer networking technology;
- Learners, faculties, and public policy makers can promote community development and many other advances at a local, regional and even on a global scale.

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