Interim Report (ISOC)

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EduScope: A New Learning System

The project called "EduScope: A New Learning System" has obtained funding from ISCO in November 2009, under the community development program. The work on the project was initiated in January 2010. Below is a detailed description of the work and effort that has been put on this project.

The project aims to provide interactive learning environment for the children living in less privileged areas of Pakistan, develop in them a self learning ability through Internet and allow them to explore things with an open mind. The project is trying to compensate for computer & Internet illiteracy by developing a strong friendship bond between the Internet and the children. This will help these less privileged children to excel in different fields of life.

The main theme of the project is to provide a KIOSK style computer workstation for under-privileged children. Each workstation provides access to a pool of information, organized and arranged in a manner that could be easily understandable by children, without and through the Internet. As the system would be installed in a an open environment, it needs to be robust enough to withstand long usage periods and the underlying software must be efficient and interesting enough to engage children, maintain their interest and contribute toward building their character and knowledge base.

The project is divided into various inter-related tasks or phases, grouped into a number of project modules. Following are the main modules of the EduScope system:

- **EduScope Steel Case & Computer Hardware:** This module is concerned with building a kiosk machine which is robust, and provides enough resources for our software to work properly. All the selection and buying of computer hardware also comes under this project module.

- **EduScope Content Search :** This part of the project is concerned with designing, finding and organizing the educational content related to the children aged between 5-12 years.
- **EduScope Network:** This modules is concerned with the connectivity of the systems with each other and with the Internet.
- **EduScope Software:** Specially designed software / portal is a part of this learning system. It involves a light weight OS, customized according to our needs, and a custom built Content Management System (CMS), a kind of encyclopedia or library, which holds the content categorized in a meaningful manner.

The work started on the above mentioned four modules of the system in parallel. A team of four people was formulated to work on this project, the details of the team members can be found on the link http://corenet.org.pk/eduscope/team.php

The details of each individual module is us under:

1. EduScope Hardware

The first task was the identification of suitable computer hardware for EduScope work stations. It should be kept in mind that the EduScope system is designed to be installed by making a hole in a wall, where the system is placed inside the wall but it is accessible to the users from the outside. Some basic research and market surveys were done, and we came up with the following recommendations:

a) LCD Screen
- LCD screen will be placed inside a wall
- The screen will be facing outward, in order to give access from outside (street side)
- The backside of the screen will be inside the wall, connected with the computer system
- A high grade glass will be put over the LCD screen, to protect the screen

b) Keyboard and Mouse/Trackball
- These two peripherals will be outside and accessible to the users
- The users will use them to the full extent
- The keyboard will be placed slightly below the surface so that its keys do not pop out of the surface
- Two options for keyboard are:
  - Either we buy cheap keyboard and track pad in bulk quantity, and then replace them whenever needed
  - Or we buy a high-end, industrial grade keyboard and track pad (we opted for this choice)

c) PC Components

- Surveying the local market, we've found that the price difference between Atom based system and Core 2 Duo is not too much. So we opted for Core 2 Duo systems in order to facilitate the computing needs
- Hard disk space can be between 160 GB to 320 GB. We opted for 320GB in order to allow sufficient space to store educational and multimedia content, if required
- RAM should be 2GB min, to facilitate memory hungry multimedia applications
- Graphics Card with option of 256 to 512 MB memory. We opted for higher memory to facilitate smooth graphics display

d) Steel/Iron Case

- We must build a sturdy metal case for our system, to protect the system from damage and avoid the risk of theft
- The metal case should be fixed in the wall opening
- All the peripherals + PC should be placed in the metal case
- Easy access to keyboard and track pad should be provided in this metal case

List of components of EduScope systems purchased

Components for EduScope System ONE		Components for EduScope System TWO	
Item	**Quantity**	**Item**	**Quantity**
Processor Intel - E7500	01 – Purchased	Processor Intel – E7500	01 - Purchased
Motherboard Intel - DG41RQ	01 – Purchased	Motherboard Intel - DG41RQ	01 - Purchased
RAM – 2GB	01 – Purchased	RAM – 2GB	01 - Purchased
Hard Disk – 320GB	02 – Purchased	Hard Disk – 320GB	02 - Purchased
LCD Monitor – 18.5"	01 – Purchased	LCD Monitor – 18.5"	01 - Purchased
Casing - Gladiator 600	01 – Purchased	Casing – Elite 335	01 - Purchased
Speakers - Creative A-35	01 – Purchased	Speakers - Creative A-35	01 - Purchased
Web Cam - Creative – 1.3MP	01 – Purchased	Web Cam - Creative – 1.3MP	01 - Purchased
*Waterproof Keyboard + Trackball	01 – Purchased	Waterproof Keyboard + Trackball	01 - Purchased
UPS	01	UPS	01
Batteries	01	Batteries	01
Steel Case	01	Steel Case	01

*Special keyboards were imported for this project from China.

EduScope Metal Case

3-D Image of the EduScope Steel Case

Metal cases are built keeping in mind the hardware it will contain and the environment where the EduScope will be deployed. The metal cases are sturdy and vandal proof. Special emphasis is made to keep them water and dust proof as well. The hardware components will be placed securely inside the metal case and will not be accessible to the users. The only hardware that the users will be directly accessing is the metal keyboard and its integrated trackball. The LCD screen will be secured by mounting a thick 12mm clear glass on the front side.

The figure below shows the basic structure of the metal case. There will be a metal cover/canopy on top of the system, which will serve two purposes:

1.It will serve as a secure lock option for the EduScope system. When the system will be switched off, this cover can be locked making LCD and keyboard inaccessible.

2.As the EduScope system is intended only for children, this metal canopy hanging above the system horizontally will make it difficult for adults and tall users to use the EduScope system without bending their knees.

The speakers will be placed on both sides of the EduScope system, inside the metal case to audio. There will also be a web camera just above the LCD screen for capturing pictures or video of the children activity for statistical, monitoring or even identification purposes.

All the system components will be easily placed inside the metal case and will have proper ventilation for trouble free operation. The components can be locked inside the metal case offering proper security. Currently, most of the installation of the steel case has taken place successfully, Given below are some latest pictures.

Site Before the Steel Case is Installed

Site After the Steel Case is Installed

After the steel case is installed but without the computer inside. When the EduScope will be opened, the screen will be visible and the keyboard will be accessible from here.

Behind the wall and inside the building. Inside these orange cases the CPU and the UPS will be placed.

2) EduScope Content Search

The work on this part is in the process, The content that will be part of the EduScope software is very carefully designed, keeping in view the age of the children, the language understanding of the children and the educational background of the children.

A significant portion of the content that is made part of the EduScope software consist of flash movies, helping children learn about different subjects like History, Geography, Sciences,

Mathematics etc. There is also content related to teaching children about discipline in the society and home. It is tried that maximum content is available through the EduScope software in both English and Urdu language.

A hierarchy of categorizes is made and followed which will help the children of all ages to easily search the content of their interest, using the EduScope software.

3) EduScope Network :

Although the word "EduScope Network" was not part of the initial design but during our work, the design evolved based on the problems faced and the concern of providing maximum flexibility to children. Updating and changing the content of the EduScope software was a consideration because if this task is not properly handled it can lead to the failure of EduScope learning system.

As per the current design, there is a central server and all the EduScope workstations are connected to this central server, EduScope software is running on all the EduScope systems. All the content of the EduScope which mostly comprise of educational flash movies and flash games is placed on central EduScope server, from where it is replicated to all the workstations.

Instead of downloading the content from the EduScope server every time a user wants to access any particular content through the EduScope software, the contents will be downloaded only once on the local hard disk of the EduScope client system. The client systems will then work as stand alone systems, providing complete functionality to the users. Therefore, every time a user wants to view a particular content, it will load it from the local hard disk. For this client-server architecture, it is designed in such a way that the contents of the local hard disk are periodically updated and synchronized with the main EduScope server.

Every EduScope system will periodically update itself on weekly basis (or daily basis, if required) and download any new/modified contents from the EduScope server to make sure that it has all the latest material and content present on its hard disk.

The main objective of this design is to make the response time of the EduScope software as quick as possible and also to remove the dependency of availability of content from the Internet connection. In this design, even if the Internet connection is down for some time, children will be able to access and enjoy the EduScope systems.

Secondly, this design will help to update and upgrade the EduScope learning systems without having to go to each computer system personally and updating the information on it. This is particularly useful from the point of view of logistics and flexibility in future, when we will be deploying the EduScope systems in many remote areas of Pakistan.

4) EduScope Software:

Specially designed software / portal is part of this learning system. The software is designed keeping in view the learning abilities and learning trends of the children of Pakistan.

a) Operating System Architecture

- The operating system is a key aspect of our system. We needed a robust, light weight, simple yet customizable OS. After going through a number of open source light weight OS, we chose Edubuntu Linux. The choice was made because of the following reasons:
- It is light weight yet robust (built on Ubuntu).
- It hosts a number of educational packages for kids. This greatly diversifies the content we will be able to provide.
- Edubuntu has been successfully deployed in schools around the world. The experience shared by those already using it greatly help us to improve our own system
- It can be customized according to our needs and policies.
- It is open source operating system and freely available.
- The Edubuntu (Education Suit + Ubuntu) was thus selected and deployed. The OS was customized according to our requirements which are detailed in a later section. The OS is composed of two parts:

i) The Ubuntu OS : Ubuntu is an open source Linux based OS. It has a very friendly user interface. It provides a lot of options for customization of its interfaces. It supports a large variety of hardware and software. In our system, we have used Ubuntu 10.04 released in April 2010

ii) Educational Suit (Edubuntu) : Edubuntu is a Linux distribution targeted for schools and other educational environments. It is a complete operating system, built on the popular Ubuntu distribution that includes an office suite, web browser and many educational applications. It includes educational games and fun stuff for children, pre-school and primary school kids.

b) Eduscope Content Management System (CMS) Architecture

The second key component of our system is a Content Management System. This CMS provides content to users according to their age and interest. The system is targeted towards children of age 5-12 years. So the CMS was designed to be helpful: self-explanatory icons and graphics are used to make the CMS user friendly. The CMS is composed of 2 interfaces:

- One is the user interface which provides access to the children to view content stored in the system.
- Second is the admin panel which provides access to the administrator to update the CMS, upload the contents, etc.

- The CMS also has the option to be updated automatically and remotely. The data is stored in a remote server and workstations can synchronize themselves with the remote server regularly. The CMS has the following responsibilities:
- Provides a GUI for user interaction
- Able to contain and present diverse type of data (text, multimedia, web etc)
- Extensible, upgradeable and update-able from both locally and remotely.
- Provides login option for different groups of users
- Designed to be robust, efficient and fault tolerant

c) CMS Composition

CMS is a web based system developed using PHP / MySQL. It can be accessed through any web browser. Apache server is installed locally. PHP and MySQL server are also hosted on the local system. Apache server serves PHP pages when requested through any web browser. All the data comes from MySQL database. The main reason behind deploying each service locally is to make the system workable, even if no Internet or network connection is available. The system also has a remote update and control feature. The system synchronizes itself with a remote server, when scheduled. This way, the system can be updated regularly without physically accessing the system. The CMS holds different types of data files which include:

- Text Files (UTF-8, PDF, DOC etc)
- Video Files (flv, avi, mpg, mov)
- Audio Files (mp3, wav, fla)
- Images (jpg, bmp, png, gif)
- Flash Games and Applications (swf)

For each category of files, specific player is built or embed into our CMS:

- Mplayer, for video files (flv, avi, mpg)
- VLC, for video and audio files (mov, mp3)
- Flash Player 10.04 (swf)
- Images and pdf files are natively supported by the browser
- A custom JQuery Gallery (Image set)

Few of the screen shoots of the portal are given below

This is the very first screen that is displayed to the user, The user will enter his age, and the next screen that will be shown contain the contents according to his age.
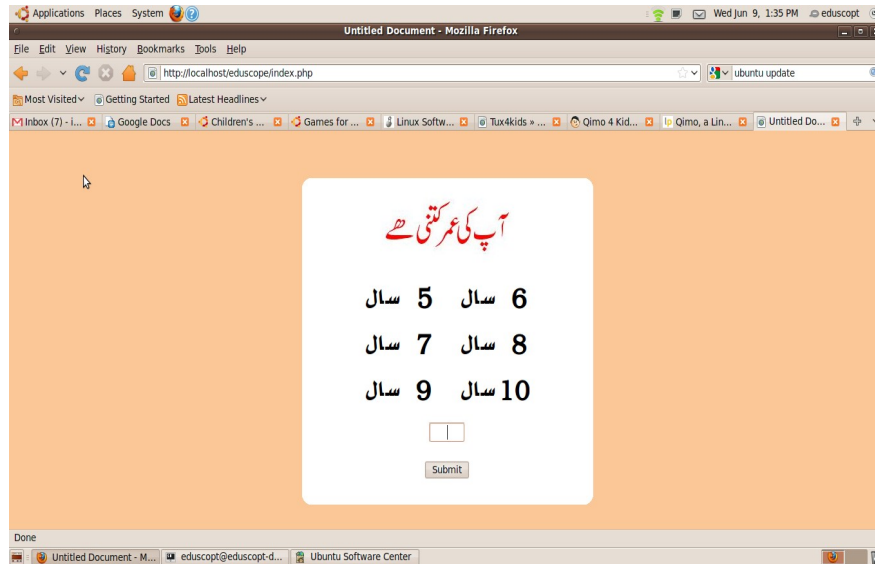

This next screen shows the different "subjects" like encyclopedia, poems, cartoon movies etc, these subjects will be different depending on the age selected by the user. The user will click on the subject of his own choice to actually view the content.

In response to the click on the above screen the following screen shot will display the different videos that are present in the selected category.

Now the user will click on the "name/icon" of his choice to view the particular videos, The video will be displayed in the following form, the screen shot below displays a video being played.
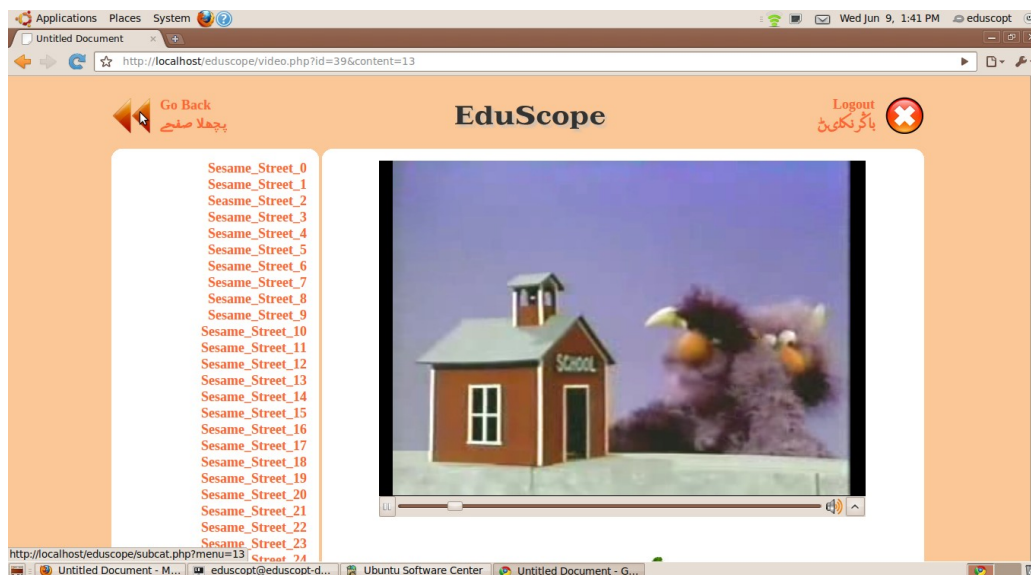
5) Current State of the Basic Four Modules:

EduScope Steel Case & Computer Hardware: All the computer hardware has been bought for the work stations, and the installation of the EduScope steel case is almost complete; only minor finishing touches are left.

EduScope Software: The software is complete and is running. It is in a form of a web portal.

EduScope Network: A temporary server has been build and the workstations have been connected to it for the test purposes. A permanent server is yet to be bought. The process of buying a dedicated server is at halt due to the lack of funds.

EduScope Content Search: This part of the project is currently underway. Due to the lack of monetary resources, the work is a bit slow on this module.