Equitable Access to Educational Resources: Comparing Possible Solutions

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Abstract

In this paper we present rationale for comparison of several content dissemination approaches. They comparison support the argument that a universal digital broadcast approach can provide the kind of equitable distribution of resources needed for a equity access to educational opportunity worldwide. Technical implications of the broadcast solution used as contrast are outlined.

Introduction

Direct Broadcast Satellite (DBS) implemented in the form of Digital Data Broadcast (DDB) "carousels" can be used to provide a solution for equitable access to educational resources. As described in previous research reports [1, 2 & 3], this solution can provide universal and global education services and applications that can be deployed alone over the broadcast infrastructure, or as a complement to the Internet. The solution can leverage content that has been developed for the Internet, as well as other educational material, from text to rich multimedia. More detail on how content can be organized for this solution is provided in several other research reports [4 & 5]. The focus of this paper is on comparison of this to other possible solutions.

The DBS-DDB Approach

A new broadcast system for true equity access and quality content can become a powerful and efficient educational infrastructure, that can be deployed at moderate cost, and can reach remote locations with or without coupling with the Internet. It can turn the huge interest that young people have on television into an educational force. For this solution, the use of digital broadcast was anticipated for the purpose of global reach, the growth of the Internet taken into consideration, and the Web used as the standard for interacting with content. But, unlike the point to point connectivity model of the Internet, the digital broadcast medium can be used in real-time or in download mode to broadcast, multicast, and PointCast a set of educational material and content. Methodologies to capitalize on the broadcast medium also include the use of cable and wireless broadcasts called "wireless" cable. Broadcasting can fully complement access to the Internet or can be deployed stand-alone. With the infrastructure in place, the investment required by a school can be as low as a single PC or TV with a Digital Set Top Box

(DSTB). This makes the infrastructure feasible and physically accessible to students anywhere, even from their homes.

The following are the delivery options available to the EduPort/DBS Infrastructure:

1. A single stand-alone PC or TV client with access only to DBS
2. A single PC or TV client with access to both DBS and the Internet
3. A PC or other Gateway/Server connected to DBS, which in turn enables an intranet within the school to interconnect to a set of PCs via a LAN
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Motivation for Comparing

In order to support emerging education infrastructures worldwide, particularly in developing countries, it is necessary to achieve solutions that maximize access and minimize cost. A central part of access relates to content dissemination. Various models for content and/or courseware dissemination are possible. We are interested in those solutions that attempt to provide vast quantities of content to large populations of users. This paper presents comparisons of such models, contrasting them with the DBS-DDB solution proposed in papers cited earlier. This paper also argues for the feasibility of an effective global education infrastructure. In support of that belief, not only has a solution been presented but also the argument is made by way of these comparisons, that this is the shortest path to achieving worldwide education.

Other Possible Solutions

In order to assess the viability of the proposed DBS-DDB solution, we should compare it against other solutions that might be considered to achieve the same large-scale goals.

Such solutions are:

- ✓ Courseware distribution over CD-ROMs
- ✓ Courseware distribution and connectivity over a wired terrestrial network
- ✓ Passive broadcasting of educational courses over a TV channel

We did the analysis of each of the above-mentioned solutions taking as evaluation criteria the following:

- ✓ Technical feasibility of the solution
- ✓ Cost factors involved
- ✓ Potential benefits to endusers

NOTE: We based our evaluation on a solution for ten thousand schools.

COURSEWARE DISTRIBUTION OVER CD-ROMS

Technical feasibility

In this solution multimedia courseware is centrally produced, for example, by a vendor or by a commission from a ministry of education, and put on CD-ROMs. The CDs are then distributed, by means of conventional methods, nationwide. This solution is technically feasible. However, bearing in mind the frequency of updates necessary for courseware titles due to possible changes in the school curriculum, as it is continuously being upgraded, and necessary updates to the developed multimedia courseware titles due to feedback coming from the endusers, the feasibility of this solution will suffer from serious coordination drawbacks.

For example:

Schools may loose track of the frequent different CD updates, resulting in deployment of the wrong curriculum. A central agency will need to inventory CD collections in each school, which may be damaged or lost with negative impact on the stability of the educational system. Distribution of CDs sent by the central agent to schools should require following the inventory administrative procedures in each school prior to using them, therefore a lag period of at least a week would be expected before using the updated CDs
The proposed DBS-DDB solution has the advantage of maintaining a single central courseware repository, where all updates and courseware maintenance are immediately reflected and applied for all schools, avoiding all the previously mentioned drawbacks in the CD distribution solution.

Cost factors

If a vendor or ministry of education develops 100 different multimedia courses, for example, to cover the entire school curriculum, each copy of a multimedia course will need one CD. Therefore, the ten thousand schools will need on million CDs. Assuming a cost of L.E. 60 per CD production (without taking development cost into consideration) the total cost will be L.E. 60 millions (the equivalent of US $ 17.6 millions at the current exchange rate). Of course, each change in the school curriculum will cost as much. It is also important to point out that the CD distribution solution necessitates a larger technology investment in hardware and software, at the endusers sites.

Benefit to endusers

The CD distribution solution provides interactivity to endusers with the courseware. However, the endusers must identify the relevant CD for each course, in this case this would have to be managed by a teacher, since there is a limited number of CDs to share among students. In the proposed DBS-DDB solution, endusers will have greater flexibility in selecting the desired course from a course menu, allowing for opportunities for student selections.

COURSEWARE DISTRIBUTION AND CONNECTIVITY OVER A WIRED TERRESTRIAL NETWORK

Technical feasibility

In this solution, schools are connected via a communications network to a centralized or distributed courseware resources environment. Schools would either download courses or if the communication line bandwidth permits, connect directly to the available resources. Giving the fact that the vast majority of schools around the world are not connected to communications lines, and that high quality multimedia courseware would require high bandwidth (i.e., at least 1.5 mb/sec), we conclude that this solution is very limiting and only partially feasible. Schools in remote locations will never, or at least not realistically in the near future, have the chance to benefit from this solution. The proposed DBS-DDB solution has the advantage of reaching all schools irrespective of their location, including those geographically isolated, or underprivileged.

Cost factor

If we examine the cost of connecting schools through leased 9.6 kb/sec lines, for example, to just download courses, then the cost per year would be equals to:

10000 schools * 2500L.E./year or 25 million L.E. or the equivalent of US $7.35 millions.

The cost of connecting the schools through high speed leased lines (2mb/sec) will be too great, as the cost per km for a leased line is L.E. 1000 L.E. per year. Again, pointing out, that downloading of courseware necessitates larger investments in hardware and software.

Benefit to endusers

The wired terrestrial network solution through leased 9.6 kb/sec cannot provide direct connectivity to the schools and its use will be limited to downloading courses. The proposed DBS-DDB solution will allow endusers at the schools to interact with the courseware.

PASSIVE BROADCASTING OF EDUCATIONAL COURSES OVER A TV CHANNEL

Technical feasibility

In this solution the courses are broadcasted via an analog TV channel within a time schedule affecting each course. The broadcast, sequential (linear) in this case, is limited to the maximum 24 hours of the day, which means that the 100 courses cannot be broadcasted daily, unless many channels are used. Courses have to be distributed over the weekdays that will limit their use. In the proposed DBS-DDB solution, courses can be simultaneously broadcasted, and it is possible to broadcast all 100 courses daily.

Cost factor

The proposed DBS-DDB solution allows broadcasts of about 6 digital channels on the equivalent bandwidth of one analog channel, making the cost per channel much lower.

Benefit to endusers

Passive broadcasting has the disadvantage of not allowing endusers to interact with the courseware. Interactivity is a key factor in education. The proposed DBS-DDB solution allows students to interact with the courseware, select exercises, navigate the content and select from menus. These are major advantages over passive broadcasting.

Concluding Remarks

Abundant arguments have been presented in this other research reports in support of a universal, cost effective, and high quality solution for educational equity worldwide. A solution is at hand. Further arguments must give way to pilot deployments that will prove the vision true.

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