A Broadcast Streams Solution for Delivery of Focused Content

Introduction

The developing world is facing incredible economic and social challenges that are aggravated by the evolution of the world economies into a single global economy driven by information and knowledge. The more the developed nations of the world advance, the more the developing nations and their citizens appear to be left behind in education, health care, social services, business development, and overall standard of living. This chasm is the so-called "digital divide."

While there is no single solution to this problem, it is clear that any solution has to be comprehensive and specifically tailored to the needs of the country, its regions, and its populations. At the same time, we speculate that the Internet and the Web are part of the solution, but in reality, they are just one manifestation of a technology evolution that presents useful de-facto and global standards for information dissemination. Just like the printing press created a revolution in the dissemination of the printed word and brought the world out of the dark ages, we postulate that similar and perhaps more aggressive solutions for developing nations have to be created to begin to bridge the digital divide.

The key to the solutions is in the dissemination of information and knowledge using the same standards but without requiring that entire countries or regions become infrastructure ready overnight nor that they follow the same consumerist model of the developed world (e.g. massive monthly consumer subscription outlays for infrastructure or information utility access; highly commercialized content; and ever evolving PC hardware platforms, PC software, and networking options). The solution has to have some very fundamental elements: be able to leapfrog the infrastructure problem; provide its own locally originated and developed content; stimulate its own local economy by participation of the pubic and private sectors; and create a self-reinforcing replicating cycle.

The Beginning of a Solution

The founders and consultants at InViVoVision (VVV) have been in systems, applications research, development business and education with decades of combined commercial and academic experience. We are committed to advanced solutions for dissemination of focused content to disadvantage populations, disadvantaged regions, and people in developing nations via broadcast streams. The spectrum of our solutions ranges from e-coaching all the way to one-way interactive and the from K-16 education to industrial vocational training, health education, social services, government services, environmental awareness, HIV-AIDS awareness, etc.

We begin by describing the elements of a content dissemination solution comprised of the following: digital libraries, servers, network infrastructure, and receiver appliances using digital broadcasting.

Mapping Focused Web Content to Broadcast Streams

As shown in Figure 1, the first step is to create focused content in the form of a curriculum website with a very specific style as exemplified in Figure 2 and Figure 3. Figure 1 shows that a website comprised of web pages, hyperlinks, and highlighted hot buttons is converted into MPEG frames and MPEG transport information and presented as a cycled sequence of MPEG frames and associated MPEG transport information that gets cyclically repeated and transmitted over the satellite infrastructure medium during a scheduled period of time such as a K-16 class period. A satellite signal can be received by any MPEG digital settop box receiver appliance connected to a satellite antenna and then presented onto a TV. The interactivity can be local to each TV and occurs between the teacher, facilitator or student driving the interactivity from the digital settop box remote control and controlling the order of the viewed frames from the broadcast stream containing the curriculum website pages. The solution can also be implemented as a download to a PC receiver. The properties of the MPEG streams and the MPEG transport make it possible to deliver video sequences, audio, images, graphics, animation, and text in a fully interactive way in either case.

Content Enablement Process

Content courseware in video, Power Point or HTML form is enabled to make it suitable for transmission as data over an MPEG broadcast channel (or any kind of broadcast channel that supports IP multicast packets even if not based on MPEG). A receiving PC is or settop box is configured to access the courseware in real-time and/or download mode (as it would be used in a traditional setting over a LAN or the Internet.) This includes integrating all the required software and hardware for transmission and decoding as well as providing the data-broadcast platform for the demonstration. The demonstrated approach will be an instantiation of how the courseware will be enabled.

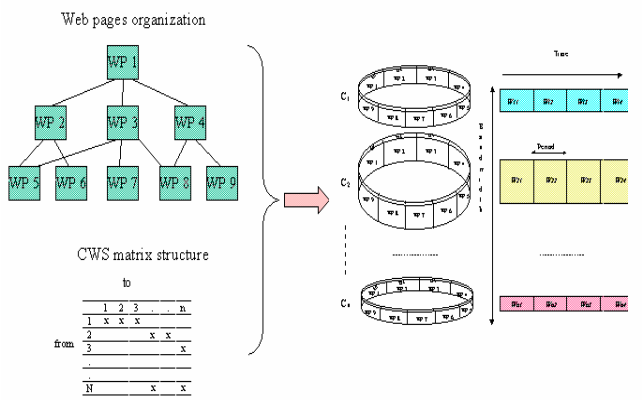

Figure 1: Mapping of Curriculum Website into MPEG Streams

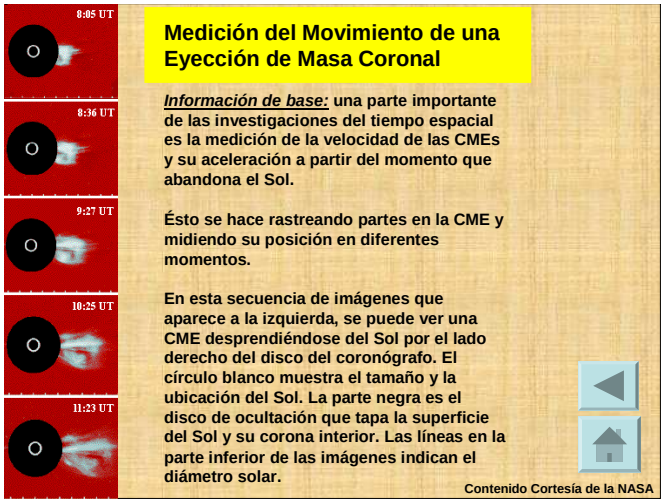

Figure 2: Sample Curriculum Web Page transformed into MPEG Streams

Since the solution is delivered from a server, this provides us with much flexibility in terms of current content. For example, imagine that you are teaching a class on solar eclipses. In the morning the latest news, video or data can be made available on the server and be used to teach a class in the afternoon. This is shown in Figure 3.

Furthermore, because of its interactivity, the MPEG stream can be used for testing, exercises, and reviews as illustrated in Figure 4, which shows a solar emission speed calculation exercise based on actual satellite data measurements obtained from the latest updated readings loaded to the server the day before.

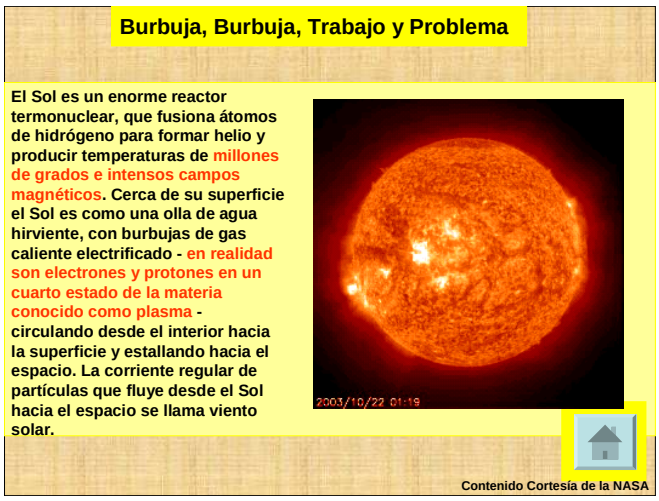

Figure 3: Sample Web Page with an Updated Video Sun Sequence Showing the Latest Solar Video Seen from the Satellite

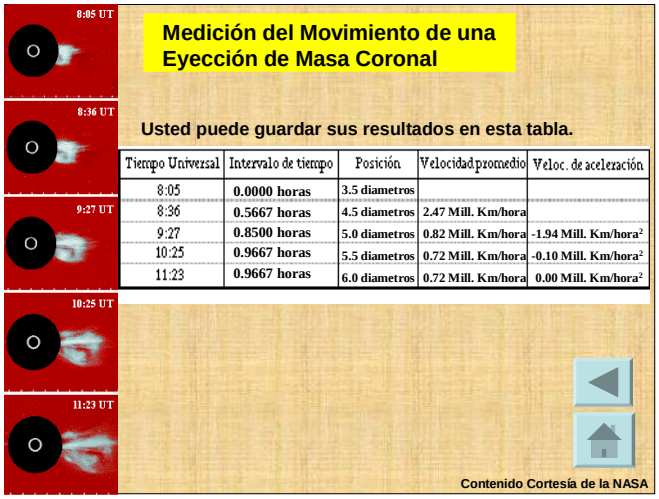

Figure 4: Exercise to Measure the Speed of the Solar Emission

An end-to-end Solution for Delivery of Focused Content in Broadcast Streams

The end-to-end solution is comprised of the following pieces:

1. A library of curriculum websites developed in a particular style using any website development tool.
2. A content transformation tool provided by VVV to turn Curriculum Websites into MPEG Streams.
3. A server scheduler to deliver the MPEG Streams over the satellite infrastructure.
4. A satellite infrastructure with leased channels or transponders that cover the delivery region.
5. Receiver appliances in the form of digital settop boxes with satellite antennas.
6. A television for the end user.

Why the Broadcast Solution?

As we mentioned before, the broadcast solution is only a first step. But it is an important step to make focused content in a web style available to the masses using a simplified broadcast infrastructure in a novel interactive way. More importantly, this is a content-preserving solution that allows for other infrastructure improvements, using the same web-ready content, while information and knowledge dissemination is made available over a wide area of coverage as large as the satellite can cover.

Using this solution, developing nations do not have to wait for wired or wireless infrastructure to be deployed everywhere to be able to get focused interactive web content delivery (especially in remote areas). They do not have to wait for the latest PCs with software and their associated extensive support requirements. They do not have to wait for CD-ROM or videotape distributions with content that becomes obsolete when created. And, they do not have to wait for consumer oriented connectivity and content charges.

An Evolutionary Approach in Content, Infrastructure, Deployment, and Interactivity

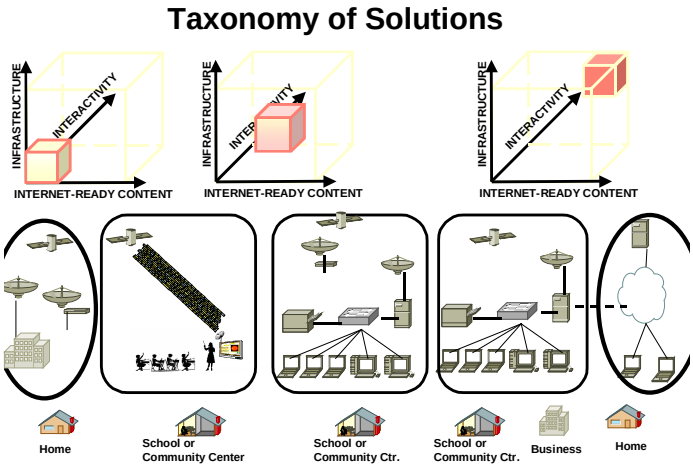

Figure 5: A Taxonomy of Solutions Available to Developing Nations

Figure 5 shows the spectrum of solutions that VVV envisions encompassing the possible solutions to be used by both developed and developing nations. We show that at the ends of the spectrum are the satellite broadcast solution and the fully interactive solution with full Internet and web access.

The progress in developing nations and other hard to reach content access scenarios will be opportunistic. This means massive deployments with wide satellite coverage using broadcast streams, and islands of Internet and Web access deployments in some urban and business hubs.

Conclusion

The developing world is at a crossroads and must begin the deployment of information and knowledge to educate, train, inform and provide life-enhancing services for its communities to close the “digital divide”. Because we know that education is the key to economic development, the future of the developing world rests on Information and Communication Technologies (ICT) based education.

The kind of infrastructure needed to educate the largest part of the world cannot be built by repeating the evolutionary process that was used to create the “developed” nations. We must develop a revolutionary solution in a class of its own. This will require a focus on content, teaching resources and the cultural and social conditions that determine the best human factors approach to user interaction. We have studied the problem for years and defined the parameters for an appropriate solution.

Our solution centers on people and education. We allow people, communities, nations and economies to immediately advance to the level of access to information and knowledge that the developed nations enjoy. We do this by adapting existing technologies to the fundamental requirements of what we know about the desired outcomes for the prescribed goals. In some way we have the advantage of knowing what the desired results are. We can bring the world to the end of the road without having to traverse all the crossroads. It is the future of people that we are concerned with. What the future holds for ICT in the developing world is not where ICT-based education should be guided.

Summary

The type of solution proposed here is very much a manifestation of a new methodology for “distance e-learning” that focuses on the distribution of content enabled for transmission as MPEG streams.

The broadcast solution proposed as described above therefore consists of three fundamental elements:

1. A transmitter that can organize, enable and deliver the content as MPEG streams.
2. A broadcast communications subsystem that can schedule the MPEG streams.
3. A receiver that has access to receive the MPEG streams.