Wireless "BitTorrent TV" for Disseminating Lesson Videos to Disadvantaged Rural Schools

We run a project called Digital StudyHall. It uses community-generated video to help poor schools: we recruit the best teachers in urban areas, digitally record them, store the videos in a large distributed database, and send DVDs to poor schools, where teachers don't just play the video in front of kids, but are trained to actively participate in interacting with children as the video is played and paused. We give these schools simple, cheap, and practical equipment: TVs, DVD players, batteries, inverters, solar panels, etc. Think of it as "YouTube" for poor schools.

The project has been in existence for the past three and a half years. A recently published study shows dramatically higher student scores and improved teacher pedagogy and knowledge in the under-served schools that we work with. DSH won the 2007 ACM Eugene Lawler Award for Humanitarian Contributions within Computer Science and Informatics, and won the top education category prize of the 2008 Tech Awards run by the Tech Museum of Innovation.

Recently, we started some discussion on potentially exploring with the CSR arm of Idea on helping more schools with DSH. Then a thought came up during the discussion that, in addition to the pure CSR angle, it might be possible that we may want to do a technical R&D collaboration that plays into Idea's core business and strengths...

In particular, in one of our projects, we're in the process of building a cheap Linux-based video player to replace our purely DVD-based distribution mechanism in village schools today. DVDs have a number of disadvantages: among them, discs get scratched easily and it takes considerable man power to burn and replenish them, particularly at scale; a big stack of discs is simply a poor way of organizing a large video library that already numbers in the thousands of videos today.

We are exploring a better video player, armed with a wireless connection, for use in slum and rural school classrooms for the purpose of sharing DSH video lessons. This player will be an inexpensive embedded Linux device, equipped with a large amount of disk storage and a cellular data card. Instead of DVDs, the thousands of DSH lesson videos will be stored on the internal hard drive, accessed through a database interface written in a local language, and organized as a "video Wiki." The lessons on these devices will be refreshed through the use of a combination of "sneaker nets" (an approach that we use today) and the cellular connection.

One may question the feasibility of using the wireless connection to exchange these lesson videos. There are three considerations that argue in its favor. First, judging by the 10-15KB/s bandwidth that we have observed here in India, we estimate that 2-3 lessons of acceptable quality can be exchanged per day, a rate that is satisfactory for DSH. Second, the DSH pedagogy model relies on an asynchronous delivery model: the local teachers only play and pause locally stored videos; there is no strict requirement on communicating videos on demand while someone waits anxiously; and we may be able to exploit less expensive airtime (say, during nights). Third, we will implement a peer-to-peer exchange protocol so that the whole network of these devices is not bound by a small number of centralized hub bottlenecks.

In addition to transmitting at least a fraction of the DSH lesson videos, the wireless connection on these devices also enables other functionalities of the video players. For example, village teachers and students may rank the videos in the system; the usage information communicated to hubs can enable community-based monitoring and quality-
control programs; network-wide tests or competitions based on the video lessons may be conducted through these devices to complement the curriculum. In short, the wireless connection on these devices enables us to knit the individual devices into a coherent global whole, allowing the under-served children and teachers to be exposed to superior education resources that have been long out of their reach.

What are the potential roles that Idea could perhaps play? We believe there might be both publicity and business prospects...

(1) One of the things Idea could help with is, for example, to provide discounted or donated bandwidth during off-peak hours (like the middle of the night) for lessons to be asynchronously pushed to village devices. This is asynchronous so it assumes no high-quality connection. Idea could be known for powering this "school network"—unlike the current fake Idea commercials on TV, this could be realistic and feasible on a fairly large scale.

(2) In the even longer run, such a network of low-cost peer-to-peer video devices, catering to a large lower-tier than the current Internet crowd, could have potentially important business (profit-making) implications: the obvious play here is that Idea might be potentially able to profit from better use of "dead-hour" bandwidth that we might be able to put to better use for interesting content and applications beyond our education videos. In addition to targeting a segment not traditionally associated with conventional Internet/computer use, a peer-based video sharing system has a number of important advantages compared to a centralized cloud-based (YouTube-like) approach... The goal of making the most out of the substantial investment made in an infrastructure has driven carriers everywhere to carefully examine innovative approaches of squeezing more utilization out of the network---the asynchronous use cases discussed here could be a promising way of getting more out of the network.
(3) Independent of Idea's potential role, we will continue to go ahead with developing a Linux-based player for DSH. If Idea is not too keen in a more in-depth collaboration, perhaps one thing Idea could consider is to fund a modest development effort here at DSH-Lucknow. We have a strong team working on it.

In summary, the idea is that there might be three key benefits here: poor kids and schools getting helped, PR for Idea, and business potential in the form of new devices and services for Idea down the road. Even if one or two of these benefits don't pan out, hopefully *some* of these might!

The purpose of this note is to explore potential interest. If there is interest, we could perhaps arrange a face-to-face meeting for some more in-depth discussion.