



Streaming Medical Education to the Mideast

Envivio's MPEG-4-based Mindshare system lets Cornell's med school professors teach students in Qatar

By Mark Fritz

With streaming video, people are accomplishing things they could never accomplish before. Take, for example, Cornell University's project to transport American-style medical education to the other side of the world—to Qatar, the tiny country on the west coast of the Arabian Gulf. Three years ago, thanks (at least partially) to streaming video technology, Cornell's medical school, the Weill Cornell Medical College was able to open a branch in faraway Qatar. It is the first time that an American university has offered its MD degree overseas.

Although the Weill Cornell Medical College-Qatar (WCMC-Q) branch has its own onsite faculty and facilities, an important part of the curriculum is delivered from the U.S. through video-streamed elearning. With this project Cornell is exporting expert medical training, without the hassle and expense of air travel. Many classes in the Qatar medical program are taught by U.S. professors who never leave the comfort of their classrooms in Manhattan and Ithaca, NY. When they travel to Qatar, they travel through cyberspace.

Thanks to the fact that Qatar sits upon a virtual ocean of natural gas, the country is flush with cash, and it has funneled much of this cash into its education infrastructure. The Cornell branch is housed in Education City, an ultra-modern multi-institutional 2500-acre campus near in Qatar's capital city of Doha.

Qatar's government has provided the Cornell medical school with a dedicated high-speed fiber optic connection (STM-1) between Education City and the U.S. The Qatar branch can use this to connect to either the Cornell University main campus in Ithaca, where the pre-med curriculum originates, or to the Weill Cornell Medical College facility, which is on Manhattan Island. This puts the Cornell faculty and staff in the enviable position of not having to ever worry about the inherent problems associated with the public Internet.

At each end of this optical bridge, Cornell has state-of-the-art lecture hall facilities that are jam-packed with the

latest AV and computer technology. Each lecture hall has a projection system, an Apple G5 computer, and an AMX controller built into the lectern, which provides access to an integrated system of electronic teaching tools. This system allows presenters to use a variety of equipment simultaneously. Included in this setup is a document camera for projection of high-quality, 3D color images, as well as CD, DVD, and VCR playback equipment. Internet access is also available from the lectern, which means that material from a Website also can be displayed during a lecture. During streamed distance learning sessions, these lecture halls serve as virtual broadcast centers.

Underlying Cornell's distance learning project is MPEG-4 streaming technology from Envivio—specifically, the company's Mindshare Presentation system.

Unlike Webcasting solutions that are based on many different technologies (HTML, Java, etc.), Mindshare takes advantage of a MPEG-4 BIF (Binary Format for Scenes) engine to deliver all the elements of the presentation (video, audio, still images, text, screen captures, etc.) as part of the same multi-track MPEG-4 stream. Thus Mindshare overcomes the usual limitations of synchronization, scalability, latency, and reliability that typically plague hybrid Webcasting systems.

Located in each Cornell classroom or lecture facility, Mindshare Composer can capture and record two video streams simultaneously. The first stream is usually video of the teacher/presenter. The second video stream is captured from the teacher's computer, a document camera, whiteboard, endoscope, microscope, or any display device with a VGA output. All the media objects are synchronized and packed into a single, standards-based MPEG-4 file.

Mindshare captures the VGA signal at native resolutions up to 1600x1200. In medical applications, high resolution is needed to faithfully render the detailed images from X-rays, MRIs, endoscopes, etc. In the medical field, missing a detail can result in the death of a patient, so

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every effort is made to display visual information in as high a resolution as possible.

When Cornell University launched its Qatar medical school branch, its first inclination, naturally, was to try to accomplish its distance education goals through the use of the more traditional technology of video conferencing. Such a solution would have the advantage of real-time student-teacher interaction, and the teaching process could mimic the familiar classroom style.

For a number of reasons, however, Cornell decided to implement a non-realtime streaming solution. Classroom lectures are captured and encoded in the medical school's classroom/lecture hall facilities in New York City and stored. These "canned" linear programs are then played back to Qatar students at scheduled times during the school week.

According to Dr. Steven Erde, senior director of the office of Academic Computing and chief security officer at WCMC, the main reason for going with a non-realtime solution was the 8-hour time difference between the U.S. and Qatar campuses. Cornell didn't want to force Qatar students come to classes in the middle of the night or other odd hours. Not only is there a time zone difference, but there's also a weekend difference, says Erde. In Qatar, the workweek runs from Sunday to Thursday, with the weekend consisting of Friday and Saturday.

The Qatar program supplements these canned lectures with end-of-week live review sessions, during which Qatar students can ask questions of their U.S. professors. These live sessions are accomplished using the school's Polycom video conferencing equipment.

But the Envivio Mindshare solution has become the workhorse driving this distance learning initiative. Erde is currently using the equipment to capture 15 hours of medical instruction per week (3 hours per day) and says he will soon double that amount.

Erde likes Mindshare's ability to deliver high resolution and says that it is actually capable of delivering better resolution than the school's Polycom video conferencing equipment. He says the system's ability to deliver 640x480, as well as up to 1600x1200 VGA, "hits the sweet spot" of Cornell's needs.

Erde also likes the way the solution "provides two separate MPEG-4 video streams wrapped in a container." This allows the user to capture two streams at two different bandwidths. For example, the less important talking-head video of the presenter can be captured at a lower bandwidth, thus allowing you to save your bandwidth for

the other more crucial video stream, which might be an image of a CAT scan, for example. Erde says he routinely uses two encoders in his classrooms, so he can capture at two different bandwidths.

Erde says that with Envivio Mindshare, you can even create a third window that plays back video after a 30-second delay, similar to a TV sports-style instant replay, as a picture within a picture.

But Erde says best thing about Envivio Mindshare is that way it has streamlined his workload. "With Envivio, the video is out the door with no work," says Erde. In contrast, the school's previous Webcasting solution (a cobbled-together "Rube Goldberg system," according to Erde) required 2-3 hours of postproduction for each hour captured. That was intolerable, according to Erde, who says that, "Without Envivio's labor-saving realtime encoding, this whole project would not be cost effective."

The only downside to the system that Erde can think of is that during PowerPoint presentations, the laser pointer doesn't show up, so "We have to train our medical faculty presenters how to use a mouse."

One obvious question that crops up regarding this project is why MPEG-4? Why not Microsoft Media or Real Networks?

"I have a normal bias toward open standards and an inborn phobia of Microsoft," says Erde.

MPEG-4 suits Cornell well because the medical school uses a lot of Apple workstations. "We needed an architecture that was flexible, standards-based, and supported the wide range of desktop and server platforms that we use at Cornell," says Erde. But he says that even if the school wasn't heavy on the Macs, he'd still be using MPEG-4, simply because it is an open standard. He says that, three to five years from now, he doesn't want to have a huge archive of video content and have to struggle to find a proprietary player that can play it.

Erde also is enamored of MPEG-4's flexibility. "Its different profiles enable new capabilities, it provides good resolution, and it scales up well," he says. "It is the right technology," he concludes.

Half a world away from Erde's New York office, Qatar students will continue to benefit from Erde's use of the "right technology" over the next three years. The first class of students at the Weill Cornell Medical College-Qatar branch are currently in year three of the six-year medical degree program. The school will graduate its first streaming video-trained doctors in 2008.

—Mark Fritz