streaming media.com

FIELD GUIDE

FEATURING A VIDEO TUTORIAL

Platinum Sponsors

TERADEK

LiveU
Portable Uplink Solutions

LIVE GEAR

Gold Sponsors

livestream

ATCi

MobileViewpoint

COMREX

Channel Bonding Revolutionizes News & Sports Coverage

Channel bonding allows multiple network connections to be combined to create a single, higher speed end-to-end connection. The idea was first widely used in 1990s under the name of "inverse multiplexing" to combine multiple circuit-switched 56 and 64kbps phone network channels into a higher speed wideband connection.

Nowadays in the broadcast industry this technique is used to deliver high quality video feeds through multiple connections, often wireless ones, such as cellular modems. The use of multiple simultaneous connections provides the following advantages:

Bandwidth Aggregation—Typically, for a high-quality HD broadcast, a connection with 4-8Mbps of sustained bandwidth is needed. While in some areas 4G cellular modems can provide this bandwidth, in many places it is still not possible. Using and aggregating several slower connections will achieve that bandwidth and dramatically improves the quality of the video feed in comparison to single modem systems.

Mobility Support—Every cellular network operator has different coverage areas, which means one company's modems may not work as fast as others in any given area. By always keeping alternative communication paths available via multiple modems, you eliminate the delay associated with handoff between from various operators.

Reliability and Stability—When a low-delay broadcast is required, there might not be enough time to retransmit packets that got dropped or delayed by one of the cellular modems. For such applications, some or all packets can be duplicated and sent out simultaneously on the multiple paths. The packets that reach the destination first are used. In other scenarios, multiple links can be used as backups for each other. For example, if a cheaper LAN connection (typically Wi-Fi or Ethernet) breaks, transmission can automatically switch to more expensive mobile connections.

In addition to using channel bonding for video feeds, it can also be used to speed up video file uploads and downloads.

THE TERADEK APPROACH

By combining the Cube video encoder with the Bond video transmitter, video producers can capture, encode, and deliver video from locations and in situations that would have heretofore either been impossible or required expensive and unwieldy satellite delivery.

Teradek Cube

Cube is an award-winning, wireless H.264 video encoder that can stream 1080p over Ethernet, dual-band WiFi, and 3G/4G cellular networks. Cube encoders are offered in HDMI and HD-SDI varieties and can transmit directly to the web, content delivery networks (CDN), iOS devices, and IPTV decoders. With the new x55 models, Cube encoders and decoders now include MIMO WiFi, an internal Li-Ion battery, micro SD for on-board proxy recording, and an OLED display for rapid configuration and status updates.

Teradek Cube

Teradek Bond

The Teradek Bond is a hardware addition for the Cube encoder that enables

Teradek Bond, sitting atop the Cube

streaming 1080p HD video over up to five 3G and 4G USB modems simultaneously from most cellular carriers worldwide. Whether you are streaming directly to the internet or back to your control room, the Teradek Bond can transmit video to nearly any platform. Bond's revolutionary Adaptive Internet Streaming technology constantly adjusts the video bit rate and buffering in real time to adapt to varying network conditions. This will ensure that your content is delivered reliably and at the highest quality possible to its destination.

Live Coverage of Super Bowl XLVI using the Teradek Bond

By Michael Artsis, Video Journalist

When I started my career a decade and a half ago as an anchor and reporter, I quickly learned that I liked shooting my own stories. I dreamed of the day when my cell phone and pro video camera would be one and I could go live from the field easily, inexpensively, and quickly. This was just a dream in those days, but my style of presenting news wasn't and I was racking up the awards for my coverage. My theory is that I need to serve as a tour guide for the audience; to inform them while entertaining them. I knew even back then that going live immediately from anywhere inexpensively would one day be very important.

Fast-forward almost exactly 14 years: I am working for *The New York Post* assigned to cover Super Bowl XLVI. This coverage was set to be completely live from the host city, Indianapolis, and the stadium, Lucas Oil. I was scheduled to do a bevy of live shows with celebrity and player interviews every day for the entire week leading up to the big game, in addition to pre- and post-game coverage. Here is the kicker: I would be doing all of this solo. No cameraperson, audio person, producer, helper, schlepper, or even an intern. Now, 14 years earlier, this would have been impossible, but I had two secret weapons in my bag that made this possible. The first was the Teradek Cube, which is an H.264 encoder that broadcasts live video over Wi-Fi, Ethernet, or cellular modems.

I had been using the Cube successfully for about 6 months at this point. I used it for broadcasting live coverage of the Yankees playoff games for the *New York Post* as well as the 1986 Mets 25th anniversary party, Occupy Wall Street coverage, my nephew's Bar Mitzvah, celebrity parties, red carpet coverage, multi-camera live shows and a whole lot more. The Cube worked great for me, but I was still concerned about a number of potential issues that could arise from my Super Bowl coverage:

1. The amount of gear was getting to be a lot for one person to tote around
2. Lack of available electrical outlets leaving me using nothing but batteries
3. Durability of the gear
4. Ability to be setup, broken down and moved quickly and often
5. Reliability
6. Ease of Use
7. Flexible setup
8. Most importantly—I needed to be able to get a cellular connection in Indianapolis so I could use my USB modem for live broadcasting

The Cube satisfied every potential problem I had imagined on that list except one. I had been to Indianapolis many times to watch football so I already knew that cellular coverage for the city was pretty poor. Verizon is the best for the area, but even its 4G speeds were only 4Mbps down and 1Mbps up, which is not enough for a nice 720p video. To circumvent this bandwidth issue, I had to use my second secret weapon: the Teradek Bond. Bond sits on top of the Teradek Cube and allows you broadcast live over up to 5 cellular modems at one

time; something that was necessary in a city with so little available bandwidth.

I flew to Indianapolis and immediately went to work after landing. I only had two 4G Verizon Pantech USB modems and one Clearwire USB modem to get me through the long week ahead. However, the Clearwire modem didn't get any service in Indianapolis, which left me with only two modems for my Teradek Bond. I started to

Michael Artsis' setup, including the Teradek Cube and Bond, inside Lucas Oil Stadium on Media Day for Super Bowl XLVI

sweat. My entire reputation was being put on the line for this live broadcast. Everything I had worked for up until this point was dependent on two small pieces of Teradek technology working without a hitch in an environment that was going to be very challenging. After setting up, I noticed crews from FIOS 1 News in New York with cellular bonding equipment from another company. They were telling me how they couldn't get it to work and that they couldn't get a strong cellular signal anywhere in the vicinity. The pressure was on.

The New York Post, the 5th largest newspaper in the U.S., decided to place my live feed front and center on their home page. This was huge. Not only were the *Post*'s top brass going to watch my feed, the American public was going to as well.

Within minutes of setting up we were ready to go live. Using a cellphone, I coordinated with the guys back at the *Post*. The countdown began, "5-4-3-2-1 and you're on!"

Shortly after going live, I hear in my ear, "Looks great, sounds great, you're doing fine." I was thrilled and breathed a huge sigh of relief. It appeared that the Teradek gear was going to pull me through this challenging broadcast, even though I was still concerned about the signal holding up over the course of a week. From the corner of my eye, I noticed that the FIOS 1 crew was still scrambling to go live, even after I had been interviewing various people for nearly an hour.

"My entire reputation was being put on the line for this live broadcast. Everything I had worked for up until this point was dependent on two small pieces of Teradek technology …"

At the end of the broadcast everyone was happy. Viewership numbers were far greater than expected on the *Post*'s webpage and the entire broadcast was nearly flawless. But would the gear hold up for until Super Bowl Sunday?

Thankfully, the Bond did its job time and time again. It always worked and never stopped working. I interviewed countless people that week from six different locations, seven times a day. I even put the *New York Post* writers on once a day by themselves in a roundtable-type discussion. No issues.

On Media Day, every broadcast station you can think of turned up with all of their gear. There was plenty of RF around, which had me worried. Fortunately, the Bond pulled through and the broadcast for that day went on without any problems. In fact, we decided to switch the workflow up a bit so we could stream to a decoder back at the Post's office for adding overlay content before it was sent to the CDN. The switch took only three minutes and the video stream looked fantastic.

Toward the end of the week, I expected to encounter at least a couple issues with the broadcast, but I never did. In fact, none of the other crews that had a Teradek Bond, including a Fox affiliate, had any issues. We all had a good chat about how the Teradek gear was working out and everyone had nothing but positive experiences.

Super Bowl Sunday finally came and as the minutes ticked away in the fourth

Michael Artsis interviews New York Giants tackle Kareem McKenzie after Super Bowl XLVI

quarter, I went to the designated press interview area to setup all of my gear. The location was deep in the stadium, which made me nervous about cellular connectivity. The idea here is that the players will come in and each sit at one of two dozen podiums to do a small press conference where reporters fire off questions in rapid succession. After the first group of players finish, a new group of players come in and repeat the process.

As each player wrapped up answering questions, I pulled them aside for one-on-one interviews. So here I am with no dedicated cameraperson, interviewing Mario Manningham, Justin Tuck, and Kenny Philips live on the home page of the *New York Post*. This was a huge coup for a journalist with very little gear and no production team. Despite the potential for disaster with a lack of cellular connectivity, the Teradek Bond pulled through and made a professional live broadcast possible with a one-man team. The viewership numbers were through the roof and the top management for the *Post* were ecstatic.

I continue to use Bond all the time. It helps me do my job better, faster, and it always gets HD video directly to my audience with ease. The device is empowering and I feel confident going live from areas I never would have dreamed of before. I can't recommend Bond enough. It's the future and the future is here now.

Breaking News with the Teradek Bond Cellular Transmitter

By Van Applegate, Photojournalist

As a photojournalist for a local television station (WTKR) in the highly competitive market of Norfolk, Virginia, oftentimes my success is judged on speed. The ability to be the first live crew on scene gives me command of the news story overall. Like most television news photographers these days, I find myself arriving on scene juggling duties ranging from getting the most compelling video to establishing a microwave or satellite shot. Dealing with cumbersome ENG equipment and finding a safe place to run a live shot often prevent me from getting that ever important video that makes the news story truly connect with our viewing audience.

Teradek has changed the way we gather news. As quickly as I can turn on my camera, I am streaming live back to the station.

On the afternoon of April 6, I was called to a reported jet crash in Virginia Beach. Knowing the military installations nearby, I knew this could be a serious incident with national media attention. I was equipped with my camera, two batteries, and our cellular bonding solution, the Teradek Bond. Racing down the interstate, I was listening to the IFB feed of my station as they broke out of scheduled programming to bring the breaking news to our viewers. They were airing fuzzy video from a nearby traffic camera, which showed smoke rising over the horizon. I knew I had to get there fast to provide a more complete picture of what was happening on the ground.

> ***"Teradek has changed the way we gather news. As quickly as I can turn on my camera, I am streaming live back to the station."***

Traffic was backed up on the interstate. I parked my car on the shoulder and proceeded to run to an exit ramp with my camera and Teradek in hand. I flipped on the camera as I started running through the

smoke filled intersections to get to the crash site. The jet had crashed into an apartment complex, which was everyone's worst fear. The sense of urgency set in.

At the scene I met my reporter, who was already doing a live phone interview. Within moments, the station had begun receiving my live video feed via Teradek. We were live on the ground in less than 15 minutes after a jet crashed into a crowded complex. I began shooting everything I saw, providing the audience at home with the same sights and sounds I was seeing and hearing as I got them. Fire trucks were flooding the streets. It was impossible for a news truck to penetrate the sea of emergency vehicles. We roamed the crash site for hours, sharing the scene live the entire time. We interviewed emergency responders and shared valuable information to residents nearby about evacuation orders.

The Teradek Bond and Cube mounted on Van Applegate's camera, ready for action

"Other wireless solutions would have been too bulky to carry around all day. The Teradek Bond … revolutionized the way we think about live television."

And then it happened ... that moment we photojournalist live for. A crowd of bystanders rushed to help the fire department move a heavy hose so special teams could gain access to the crash site. People jumping in to help emergency responders—the human element. It put faces on a story that until then had been about the fire, the smoke, and the horrible sounds of screaming sirens. It was a moment I may have missed had I needed to man a satellite dish, run cable, or tune in a standard ENG live shot. But because I was streaming with the Teradek Bond, it was a moment shared with thousands of viewers as it happened in real time. It gave everyone hope that in the most trying times, people will join together and help one another.

We remained live on the scene the entire afternoon and evening, eventually with two Teradek Bonds, and later with traditional transmission methods. But it was our dominating three and a half hours of exclusive live coverage with Teradek that kept our viewing audience for the entire day. The other stations had to wait for the emergency crews to clear before their trucks could send a live signal from the site.

CNN broke into their own coverage to take our feed outright. They were broadcasting what WTKR was displaying via Teradek, sharing this local news story to the great national and international audiences live. It was a proud moment for me, one that would prove to be a pivotal part of my progression forward in the industry. CNN's Brooke Baldwin conducted a phone interview with me on CNN later that afternoon, curious about what it was like to be broadcasting live from such a scene.

Behind the firehoses, you can see Van Applegate shooting with the Teradek Bond and Cube

Other wireless solutions would have been too bulky and heavy to carry around all day. The Teradek Bond sat like deck of cards on my camera, allowing me to move freely about the crash site for hours on end. It truly revolutionized the way we think about live television.

That is just one success story. Teradek has proved time and again to give us a clear edge in breaking news. The moment we arrive on scene we are beaming our video and sound back to the station to provide a complete picture as quickly as possible. And, like I said, it's all about speed.