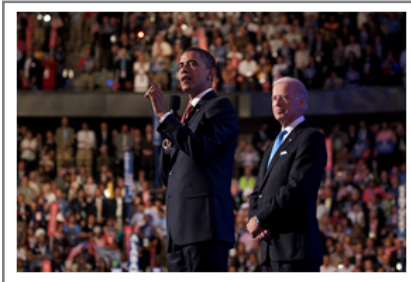


Behind the Scenes: The Technology Driving Television-Quality Live Streaming at the 2008 Democratic National Convention



Customer Profile

The Democratic National Convention, held August 25-28 in Denver, Colorado, officially kicked off the Obama-Biden 2008 presidential campaign. Hosting delegates from all 50 states, the event aimed to be a celebration of the Democratic Party's diversity, shared values and vision for America. The DemConvention.com site served as the hub for live and on-demand information, photos and video for the event.

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Overview

CHALLENGE

Reach a broader audience of voters by delivering "the most technologically savvy event of its kind."

SOLUTION

The partnership between Level 3 Communications and Move Networks married the most advanced live streaming technologies available today.

BENEFITS

High-definition live streaming at DemConvention.com helped connect voters with the message from the Convention floor and positioned the 2008 Democratic National Convention as a technology leader. The site saw 350,000 hours of video viewing time, with an average time of 80.4 minutes per viewer for Convention week.

Live HD – A First for a Political Convention

Approximately 75 million American adults are registered Democrats. Yet, only a relative handful can attend the political party's flagship event, the Democratic National Convention, held every four years to nominate the presidential and vice presidential candidates and energize the Party.

Internet technology, specifically live streaming video, has the power to bring down the walls of events such as this. Historically, live streaming experiences have too often

disappointed viewers. Frequent stops and starts limit average viewing times to only about seven minutes.

The 2008 Democratic National Convention changed all that with live streaming video – in high definition (HD) – on DemConvention.com. Fulfilling its commitment to bring more people into the Convention experience than ever before, the Democratic National Convention Committee (DNCC) put on what it called "the most technologically-savvy event of its kind."

During the last Democratic National Convention event in 2004, the technology to empower seamless streaming just wasn't available at that time. Today, the public has come to expect live streaming and high definition that provides a more interactive viewing experience and access to more information.

The 2008 Convention did not let them down. During Convention week, DemConvention.com received 3.2 million visits with more than 350,000 hours of viewing time. By week's end, the average Web video viewer had watched 80.4 total minutes of coverage – an indication that viewers truly enjoyed a smooth, quality viewing experience.

Viewers experienced crisp, seamless high-definition streaming video of Barack Obama's and Joe Biden's acceptance speeches in real time and available later as video-on-demand (VoD), as well as dozens of other speakers, interviews and presentations not available on TV.

The Convention's Technology Strategy



As viewers arrived at DemConvention.com, they could begin watching live or on-demand videos of their choice in high definition in seconds. While the experience proved simple for those watching online, some of the most advanced technology available today made it possible.

The Democratic National Convention Committee's (DNCC) planning was two years in the making. The DNCC formed a Technology Advisory Council, comprised of leading technology companies and city and state officials, to advise Convention planners on a technology strategy.

Live video was central to the group's objectives of reaching a broader audience of voters. But quality was a top concern. Creating the flawless live and on-demand video that viewers see would require a number of key steps: pure native high-definition video feed, a fiber-optic delivery network, a well-connected IP Transit network, intelligent encoding of video streams, the ability to respond to network congestion dynamically, a media player that selects bit rates in real time, network load balancing and efficient caching.

To enable all that, the DNCC chose to partner with Level 3

Communications. Level 3 was the official Live Video and Content Delivery Services provider for the event, offering the network infrastructure and services to support both the TV broadcast and online viewing.

"The Democratic National Convention picked Level 3 to be an official provider because of Level 3's experience in large events and their experience on how to help us really bring down the walls of the Convention using the new technology which they have a strong history in," Colangelo said. "They were the backbone for us to provide high-definition streaming of the Convention, and that's a Convention first."

In partnership with Level 3, Move Networks delivered its industry leading Move Adaptive Streaming technology to give viewers live video – with the highest-quality Internet television viewing experience possible.

Move Networks' services were chosen based on the company's track record supporting high-profile events with some of the world's largest broadcasters. Move Adaptive Streaming enables broadcasters and content owners the unique ability to deliver high-quality video whether live or on-demand to large audiences around the world. Move technology leverages HTTP Web servers rather than dedicated streaming servers, which allows for unrivaled scalability to handle large crowds.

Microsoft was the Convention's official provider of software and high-definition Web content. The Convention site and player – the end user experience – were enabled by Silverlight, Microsoft's technology

for developing interactive Web applications and delivering high-definition video via the Web. Vertigo Software, Inc. created the Microsoft Silverlight 2 application that streamed live and on-demand video.

"Working with Level 3 and Microsoft to deliver an unprecedented level of online video quality, access and interactivity for such a significant event gives us a preview of what is possible when technology leaders work together," said John Edwards, CEO of Move Networks. "We plan to continue pushing the boundaries of what is possible with Internet television."

Behind the Curtains

In a close partnership, Level 3 Communications and Move Networks combined their technologies to power the exceptional viewing experience for the event.

Well before the event began, Level 3 began laying the groundwork. The company built more than five miles of fiber optic cable to connect both the Pepsi Center and Invesco Field to the Level 3 Gateway. Level 3 also established fiber route diversity from each venue, redundant video encoding facilities and enhanced network security to ensure network performance throughout the event.

From the time the first gavel sounded to open the event, Level 3 provided native high-definition video feeds from the Convention floor at the Pepsi Center and then from Invesco Field on the last day. Significantly contributing to video quality, Level 3 used a single codec from the camera across the network to the Move streaming encoder.



“Level 3 accessed all levers driving video quality,” said Mark Taylor, Senior Vice President, Business Development and Strategy, at Level 3. “That gave us exceptional control over the end-to-end distribution chain, which resulted in the eye-popping video viewers saw.”

In total, Level 3 delivered 40 digital video connections in/out of the Pepsi Center and up to 48 analog video connections – about 15 times the number of feeds usually required at the Pepsi Center or Invesco Field. At its highest, the Level 3 Content Delivery Network hit around 60 Gbps of traffic.

To prepare video for live streaming, Move Networks deployed its Simulcode technology to encode the video content for streaming. Move Simulcode breaks ingested content into segments called “streamlets” and encodes the HD feeds simultaneously at 10 different bit rates for multiple bandwidths and platforms.

Those 10 bit rates are available every four seconds for a single frame. That allows Move to respond dynamically to deliver video seamlessly based on the bandwidth available on each end viewer’s Internet connection. Called Adaptive Stream, the stream automatically adapts to network congestion, and end-user CPU conditions – enabling the highest-quality viewing experience possible. Viewers experience a

near-instantaneous start and see improvements in the resolution, without distracting buffering. The Move Media Player, a browser plug-in on the viewer’s computer, determines the bit rate to select in real time, making it more in tune with local PC and network conditions.

Typically, other technologies rely on a single TCP session, which slows buffering over time. Instead, Move opens multiple sessions to the viewer, so viewers don’t see a change in image quality if one session is slowed down.

Level 3’s Content Delivery Network cached the DemConvention.com site, making it available globally by distributing a copy of the site at Level 3 CDN caching clusters. Contributing to superior video quality, Level 3’s CDN also cached the Move streamlets, ensuring viewers were connected to the optimum location to deliver their video, and that end user requests and storage use were balanced in real time. That resulted in lower latency, faster performance and lower packet loss.

Level 3 also optimizes video delivery for long form content with the most connected IP Transit network in the world – more directly connected networks than any other.

Together, all these moving pieces provided by the Level 3 CDN and Move Networks technology created the seamless HD pictures that viewers enjoyed.

Video Viewers Watch 80.4 Minutes Convention Week

As the event took place, Level 3 and Move Networks both collected

real-time data on viewing, including number of visitors, average view times, bit rates, and more. They provided impressive feedback to the DNCC:

- Viewers in 116 countries
- 2.6 billion hits
- 3.2 million site visits
- 80.4 minutes of viewing time per Web video viewer during Convention week
- 350,000 hours of video viewing time
- Average bit rates of 1.2 Mbps
- Peak traffic at 60 Gbps during Barack Obama’s acceptance speech

During and after the event, press coverage hailed the DemConvention.com site for its video quality. According to an article by paidContent.org (Aug. 25, 2008, Rafat Ali), “Every major site and TV network is streaming it online in full...But the most awesome ...online video feed is on the official Democratic Convention site...it certainly shows how great HD video can look online...”

“Streaming in high definition was a Convention ‘first’ for either Party,” said Aaron Myers, Director of Online Communications for the DNCC. “Thanks to the capacity of Level 3’s network, and their close teamwork with Move Networks, Microsoft and Vertigo, everything worked flawlessly. We know that the majority of end users were able to stream all of the major speeches at 1 Mbps or greater, enjoying a truly high definition experience. This is the first time that a political event has captured this much attention online – with as many as 55,000 users streaming the Convention at peak – which proves that the streaming quality Level 3 delivered now rivals that of television.”

JOINT LEVEL 3/MOVE NETWORKS DNC CASE STUDY – TECHNICAL

