Special Report: Super Bowl LIII

The Technology Behind the Broadcast

Image credit: Mercedes Benz Stadium.

Special Report: Super Bowl LIII—See the Technology Behind the Broadcast

Once again America's NFL Super Bowl game created a level of excitement, at least in the US, unequalled by most sporting events. Some would claim that both of this year's two Super Bowl LIII teams, the New England Patriots and Los Angeles Rams, were in the final competition because of questionable officials' calls in their previous playoff games. One result is that many fans had score grudges to settle. And there is no better place to do so than the 2019 Super Bowl football game.

A common theme with each Super Bowl broadcast is the originating network's drive to find newer and better ways to tell the story of the game as it is played. That often comes down to creative use of technology, and this year's game was no exception.

Supported by dozens of 4K cameras, IP and network-based audio, graphics systems, augmented reality, bonded cellular and a massive video router, all staged in an assortment of broadcast trucks, the event was viewed by more than 149 million fans.

The Broadcast Bridge now provides an inside look at what it takes to bring this super television event to life. From trucks to Telestrator, from cameras, to fiber cable, learn about the people and technology that make this super event possible.

Brad Dick
Editor

Image credit:
Mercedes Benz Stadium.

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Special Report: Super Bowl LIII—See the Technology Behind the Broadcast

Almost 90,000 fans crowded Mercedes Benz Stadium for the 2019 Super Bowl. Image credit: Mercedes Benz Stadium.

Contents   Page

Super Bowl LIII Set To Dazzle On CBS

by Michael Grotticelli

Atlanta's Mercedes Benz Stadium will host the 2019 Super Bowl and millions will be watching on CBS Sports.

This year's Super Bowl LIII telecast on CBS will be produced and broadcast into millions of living rooms by employing the usual plethora of traditional live production equipment, along with a few wiz bang additions like 4K UHD and an 8K camera for replays, and specially equipped wireless handheld cameras supporting augmented reality graphics and motion tracking on the field. The network said that 115 cameras would be used, 86 for the main broadcast alone, giving viewers an unprecedented television viewing experience.

"We've premiered some of the most amazing technology in our previous Super Bowls," said Sean McManus, CBS Sports Chairman. "This year will be no different. Before the game, you never really know which piece of technology is going to shine. If you look at [the technology] collectively, the broadcast will look as innovative as any broadcast in history."

Even the end zones will be covered like never before. Viewers will see plays from virtually every angle being captured by 25 cameras in each end zone. This includes HD cameras with, six 4K cameras, three goal post cameras shooting the back lines (all with Super SloMo capability) and 14 UHD pylon cameras.

While the main game will be captured with Sony HDC-2500 HD cameras. Replays will be shot with 16 Sony HDC-4800 (4K/HD Ultra High Frame Rate/Slow Motion) cameras as well a Panasonic (AK-SHB810) 8K camera that uses a single "organic" film sensor capable of shooting 8K/60p video—with wide dynamic range and global shutter scanning to reduce distortion while maintaining maximum detail and clarity in the moving image. This camera's OPF/CMOS image sensor combines an organic photosensitive film that sits atop CMOS circuitry.

All of these HFR/SloMo cameras will be strategically placed around the stadium to add to the HD broadcast by allowing the crew to shoot a 4K/8K image and then extract an HD (1080p/60) replay in captivating detail. Most of these 4K cameras will include large Fujinon DigiPower (2/3-inch) and smaller handheld HD and 4K lenses. Canon 4K and HD lenses will also be used in some areas of the production.

A single Panasonic 8K camera will join a host of 4K cameras that will be used for Super Slow Motion replays, maybe the best-looking images live sports viewers have ever seen.

CBS will also use five cameras (including a SkyCam system) to support live augmented reality graphics on the field, plus an additional 10 cameras with trackable first-down-line technology. In all, 14 cameras creating virtual graphic elements that are completely computer generated will be seamlessly blended into the main game broadcast.

However, when you talk to Jim Rikhoff, Lead Producer for this year's big game on CBS Sports, he's more interested in how all of this technology can help tell the story of the game. This will be Rickoff's seventh Super Bowl, and his first as lead producer (in the last four he served as Replay Producer).

"While everything is bigger than last year's game, it's still very important to use the equipment properly and stay focused on the football game," he said, adding that nearly 500 people will work on this year's Super Bowl production. "I have one golden rule: You want to enhance a broadcast, not detract from it. We've tried things in years past that didn't work and so we didn't use them for the live game telecast. At the end of the day we're here to tell the story of the game."

To rehearse for the big game, the NFL has hired a local football team, which will come into Benz Stadium in Atlanta on the Friday before Super Bowl Sunday. The crew will test the camera angles and other technology as they follow the players that will be running through a number of plays that most likely will occur in the big game.

Used by CBS during this year's NFL regular season, the heart of the Super Bowl broadcast will be NEP Broadcast's SSCBS mobile unit "compound", which is actually made up of three double-expanding 53-ft. trailers and a fourth small rig. The ever-popular half-time show will be produced by a separate NEP Denali truck, which will also provide the Super Bowl world feed.

The A unit has a 15- x 21-ft. production area and a 15- x 18-ft. graphics area (each with 12 positions) and features a 192-input Grass Valley Kayenne Elite production switcher, a large monitor wall made up of multiple Boland Communications 31x32-inch flat screen displays, a full complement of EVS XT3 (HD) and XT4 (4K) replay devices, and Calrec Audio Apollo and Artemis audio mixing consoles. There's also an Evertz EXE Series IP routing switcher (576 inputs x 540 outputs) used to distribute signals between the three mobile units. In fact, the on-site units will all feature IP connectivity all the way out to the stadium and back.

Dante audio networking is used to deliver uncompressed, multichannel, low-latency audio over a standard Ethernet network. There's also a RTS Adam Intercom System with 460 ports, which is operated on the onsite network.

NEP's SSCBS compound of trucks will be onsite in Atlanta. CBS Sports has used the trucks to televise the past two NFL regular seasons. NEP will supply a total of 11 production trucks in Atlanta, many doing work for other networks as well as domestic and international media outlets.

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The audio mixing area of the SSCBS A truck features a Dante-networked Calrec Apollo console.

SSCBS' B unit houses most of the computer/servers needed to process the graphics and other tasks. Besides the engineering and video area, the B unit also includes the main audio room (measuring 15 x 8 ft.) and the audio submix room (10 x 10 ft.), both with three operator positions. Key equipment in the main audio room is a Calrec Apollo console with 72 faders and Bluefin2 signal processing to provide 1,020 channels. A Calrec Artemis console with Bluefin and 64 faders will be used in the truck's submix room. The crew will also use Day Sequerra audio processors, Bowers & Wilkins surround-sound speakers and an RTW digital audio scope. A mix of Audio-Technica, Sennheiser, Shure and Sony mics are also being employed.

The C unit houses a 15- x 27-ft. replay area with 20 EVS replay operators, with two 12-channel XT3 units, four eight-channel XT3 units, a six-channel XT3 SpotBox, and five XHub3 sharing networks. The C unit also has IP and Cisco connectivity back to the B unit [which houses the EVS XT3 servers] and a ThinkLogical KVM system with 320 ports and support for 6.5 Gbps data throughout.

A full complement of Cobalt Digital gear—including up/down/cross conversion, frame syncs, color correctors, multiviewers, MADI embedders/de-embedders, and assorted 3G video DA's, audio DA's, MADI DA's, audio embed and de-embedders—is also on board the compound's machine room, along with Tektronix SDI and IP signal monitors and AJA Video Systems signal converters.

The SSCBS Replay Area inside the C truck includes 20 EVS operators, with two 12-channel XT3 units, four eight-channel XT3 units, a six-channel XT3 SpotBox, and five XHub3 media sharing network devices—which allow multiple XT3 production and playout servers to be interconnected through a central hub offering the CBS Sports crew a bandwidth of up to 1.5 Gbps.

There will also be a 58-foot long, non-expanding D trailer that will be used for overflow EVS operators (as many as 25 operators will work the Super Bowl) as well as additional edit facilities and voiceover requirements.

"I never want to do something just for the sake of doing something different," said CBS Sports' Rikhoff. "It has to enhance the experience of the viewer. It's always a balance of bringing new technology in while also staying true to the core coverage. The exciting part is that every live event has the potential for something to go wrong, [remember when the lights went out in the Superdome during the 2013 Super Bowl telecast?], but we always seem to overcome it. It gets your adrenaline going."

This year marks CBS Sports' 20th Super Bowl telecast in its long and storied history; beginning with the very first Super Bowl I on January 15, 1967 live from Los Angeles, CA where the Green Bay Packers beat the Kansas City Chiefs 35-10. Interestingly, NBC also televised that game live, as they had the exclusive contract for the fledgling AFL while CBS was contracted to produce the NFL's games.

The SSCBS Replay Area inside the C truck includes 20 EVS operators, with two 12-channel XT3 units, four eight-channel XT3 units.

Super Bowl to Use IP and Network-Based Audio

by Frank Beacham

Every Super Bowl is a showcase of the latest broadcast technology, whether video or audio. For the 53rd Super Bowl broadcast, CBS Sports will use almost exclusively IP and network-based audio.

Mike Francis, CBS vice president of Remote Engineering and Planning, said IP and networked audio is being used for external communications, IFB and microphone acquisition. "We are moving away from traditional analog cabling for audio transport for a variety of reasons," he said. "We get a much cleaner sound.

"Old or failing copper can create cross talk across channels making troubleshooting issues very time consuming, Francis continued. "Also using network audio makes the sharing and distribution of sources much easier and more scalable."

CBS Sports, Francis said, will be using 138 wired and 38 wireless microphones between the game and studio. The audio van, Francis said, is NEP's SSCBS with one Calrec Apollo for main mix and one Calrec Artemis for tape release.

The Calrec systems feature Bluefin 2 high density signal processing, 1,020 channels with full signal processing, 128 mix busses, 96 multi-track busses, 48 aux busses and six MADI inputs and six MADI outputs.
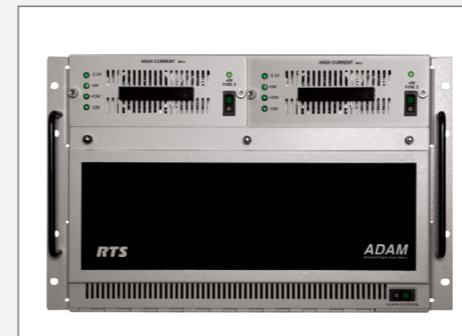
The truck has 12 announcer headsets, six short shotgun mics, eight long shotguns mics, 12 stick mics and 12 lavaliere mics. The truck carries a mixture of Sennheiser, Sony, Shure and Audio-Technica mics onboard.

Mike Francis, CBS vice president of Remote Engineering and Planning.

SSCBS audio control room relies on a Calrec Apollo console for main mixing and a Calrec Artemis for tape release.

SSCBS is a double expando unit 64 feet long and 21 feet wide expanded with a 460-port RTS Adam intercom system. Day Sequerra upmix, downmix, loudness meter, and stereo synthesizer gear is also in place alongside B&W surround-sound speakers and an RTW digital audio scope.
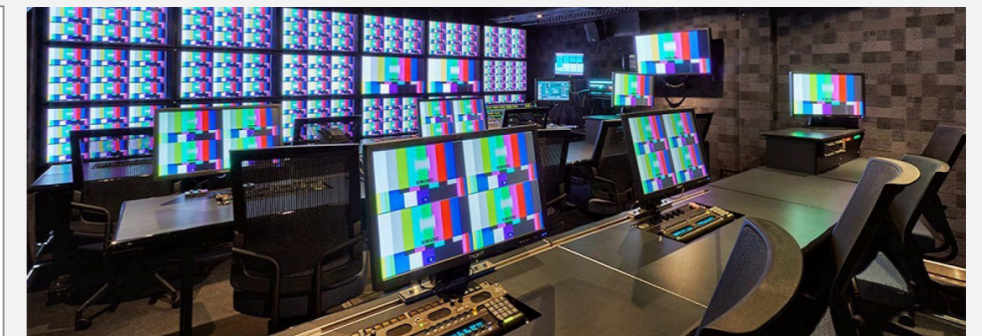
NEP launched the SSCBS in 2015 and entered the era of IP-based routing at the Wyndham Golf Championship in Greensboro, N.C. The truck uses the Evertz IP routing system, which has been refined since the product's launch.

Shure's Bill Ostry, Regional Sales Manage - Pro Division, said CP Communications of New York City is providing Shure's Axient Digital wireless microphones for the sidelines and Professional Wireless Systems of Orlando, Fl is providing similar digital mics for the referees and halftime show.

Game tape release for CBS will be out of the F&F GTX 18 mobile unit. It is equipped with one Calrec Artemis console with 72 channels, Francis said. That truck features a Genelec 5.1 surround monitoring system. It also features 14 Sennheiser MKH 416 shotgun mics, two Sennheiser MKE 44-P stereo mics, six Sennheiser MD 46 stick mics, two MKH 70 shotgun mics and six Sony ECM 77B lavalier microphones.

RTS ADAM is a full-size modular matrix intercom.

F&F GTX 18 Mobile Truck.

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DiGiCo S21 Digital Mixer.

Studio shows will be produced out of Game Creek Video Encore trucks each equipped with an Calrec Artemis Bluefin mixer. There are three 53-foot double expanding high-definition production units. Encore A is the audio unit which features multi-purpose edit and transmission rooms.

Finally, Francis said the CBS RF Mix will use an S21 digital mixer from DiGiCo. The S21's surface is laid out in two side-by-side main sections, providing direct hands-on control of up to 48 mono or stereo input channels, the master bus, 16 busses in mono or stereo, 10 VCAs and a 10x8 matrix router.

Each of the two surface control sections has a bank of 10 fully assignable motorized faders and a TFT LCD display that hosts 10 additional sets of assignable on-screen channel controls, physically aligned and integrated with the channel strips.

Ed Soltis will be mixing his sixth Super Bowl for CBS Sports and Peteris Saltans will mixing the studio show, Francis said.

Graphics to Virtually Enhance the CBS Super Bowl LIII Broadcast

by Jay Ankeney

It will be a match-up of the New England Patriots and Los Angels Rams in the 2019 Super Bowl game.

During Super Bowl LIII, the football action will be on the field. But a lot of the action will be enhanced by incredible new graphics, some virtual, that CBS is using to super charge the screen.

Everyone expects the Super Bowl to be one of the greatest spectacles on TV every year, but this year's 53rdedition in Atlanta is going to be extra special.

Not just because of the grudge Rams/Patriots matchup—the first time since 1969 when teams from the same two metro areas (NY and Boston) met in the NFL's football championship and the MLB World Series in the same year—but also due to CBS's determination to reach into their growing bag of graphics magic to adorn this presentation like sparkling jewels on a crown.

It may be lost in the mists of time that CBS pioneered the use of an isolated camera in the third annual NFL Playoff Bowl (Lions/Steelers) at the Orange Bowl in 1963, but who can forget that CBS was the first to air an NFL Championship game in color back in 1966 (Packers/Browns), or John Madden's electronic chalkboard, the Telestrator, (see The Telestrator Celebrates 35 Years at the Super Bowl) in 1982 (49ers/Bengals), or even simultaneous SD and HD broadcasts in 2004 (Patriots/Panthers).

This year, during the Big Game we are going to for the first time be treated to live augmented reality (AR) graphics from multiple cameras. CBS will also deploy multiple 4K and even one 8K camera, which will allow more crisply selective close-ups of the action. Add to the mix a total of 28 pylon cameras as part of the 50 end zone feeds including three goal post super slo-mo cameras, all there to capture all the action in eye-grabbing detail.

Add Augmented Reality

"We are indeed going to be adding a significant amount of AR graphics to this year's Super Bowl LIII broadcast from Atlanta's Mercedes-Benz Stadium," said Mike Francis, VP of remote engineering and planning for CBS Sports. "This will go far beyond 1st & 10 lines from multiple angles. For the first time we are going to be employing virtual graphics in conjunction with mobile, wireless cameras such as our Steadicam, the SkyCam and a TechnoJib."

While Francis was reluctant to give away too many secrets, it is reasonable to assume this means we will be seeing virtual graphics added to moving shots of players taken either right on the field or from directly above it. That will add a whole new dimension to the information flow of the game.

What he could reveal was, "This will give viewers a different perspective on the game than they have ever previously seen," he said. "We've never been able to add virtual graphics to shots taken right on the field before."

As you can imagine, multiple vendors will be involved with providing the technology creating these graphics including SMT (winner of 32 Emmys), The Future Group, NCam and EA Sports, famed for the Madden NFL simulation game.

But the Super Bowl Sunday experience will begin long before the 6:30 east coast kick off. CBS plans a full day of warm-up, starting with "That Other Pregame Show (TOPS" with Adam Schein at 11:30 AM ET.

Then at noon, "Road To The Super Bowl", which debuted following the 1969 season, will look back at the greatest plays of the 2018 NFL season.

At 1:00 PM, Tony Romo who is covering his first Super Bowl game, will talk with heroes of past NFL championship matches such as Len Dawson, John Elway, Tom Brady, Ben Roethlisberger and Drew Brees, followed by "The Super Bowl Today" at 2:00 PM presenting detailed game analysis, features and interviews with the players and coaches we'll all be rooting for during the game.

Can Brady do it again? The Las Vegas odds makers think he can.

He also described how the new Super Bowl LIII logo was built using ChyronHego equipment just for this broadcast.

In addition to all this, CBS Sports' 24-hour cable outlet, CBS Sports Network, will be streaming over 75 hours of original Super Bowl LIII programming featuring James Brown, Boomer Esiason, Bill Cowher, Phil Simms and Nate Burleson from the Atlanta stadium's Game Day Fan Plaza, finishing up with extended post game coverage.

Francis promised this would be a Super Bowl to be remembered, with lots of graphical eye candy on the screen providing as much excitement as the action on the field.

This will lead up to the "Super Bowl On CBS Kick-Off Show" at 6:00.

"We'll have several teams of editors cutting packages for all these shows," Francis said, "with some systems on site in Atlanta, all working on Avid NLE's, and a major post-production set-up back in New York. Thanks to a 10 gigabit fiber connection they will all be able to work together collaboratively."

The average asking price for Super Bowl LIII tickets was reported to be $8,130 after the AFC and NFC championships

Super Bowl LIII: Intel's True View Ready for Kickoff

by Adrian Pennington

The Intel True View allows a production team to recreate selected clips in 3D from any vantage point in a stadium or even from a player's perspective.

The NFL has been able to call on 360-degree replays from the Intel True View system at select football stadia for the past two years including an install at Atlanta's Mercedes-Benz Stadium since last summer.

Host broadcaster CBS could take advantage of the tech to enhance its Super Bowl LIII coverage across digital and mobile platforms.

The venue, like twelve other NFL stadiums across the AFC and NFC, is equipped with 38 5K ultrahigh-definition cameras, as well as Intel Core i7 servers and PCs that can process up to 1 terabyte of data for volumetric presentation (height, width and depth) per 15- to 30-second clip.

The volumetric video is fed through more than five miles of fibre-optic cables to the control room where it is processed.

Using voxels (pixels with volume), the technology renders dynamic replays in multi-perspective 3D to create 360-degree reconstructions of plays that can be viewed from any angle.

Content has been accessible via NFL. com/trueview, the NFL Mobile app, the NFL channel on YouTube and other endpoints. Fans will also experience the enhanced replays in-stadiums for closer views of the action on the field.

The production team virtually re-creates a selected clip in 3D from an ideal vantage point or player's perspective.

By providing immersive replays, sports fans can see highlights from every vantage point, even from the players' perspective, without using a helmet camera. Other applications include analysis to determine what really happened by reviewing the call from multiple perspectives and studying form and technique from various angles.

Game strategy and tactics can be analysed with added commentary and graphics overlaid to provide a deeper understanding and appreciation of the game.

"With the expansion of Intel True View into more stadiums, we have the opportunity to let fans experience game-changing plays on sports' biggest stage," said James Carwana, vp and general manager of Intel Sports. "We're redefining the way that fans can watch games, as Intel True View brings unique perspectives and insights for everyone, from the casual follower to the die-hard fanatic."

Behind a Wall of High Tech Gadgetry, CBS Super Bowl's Anchors Focus on Old-School Storytelling

by Frank Beacham
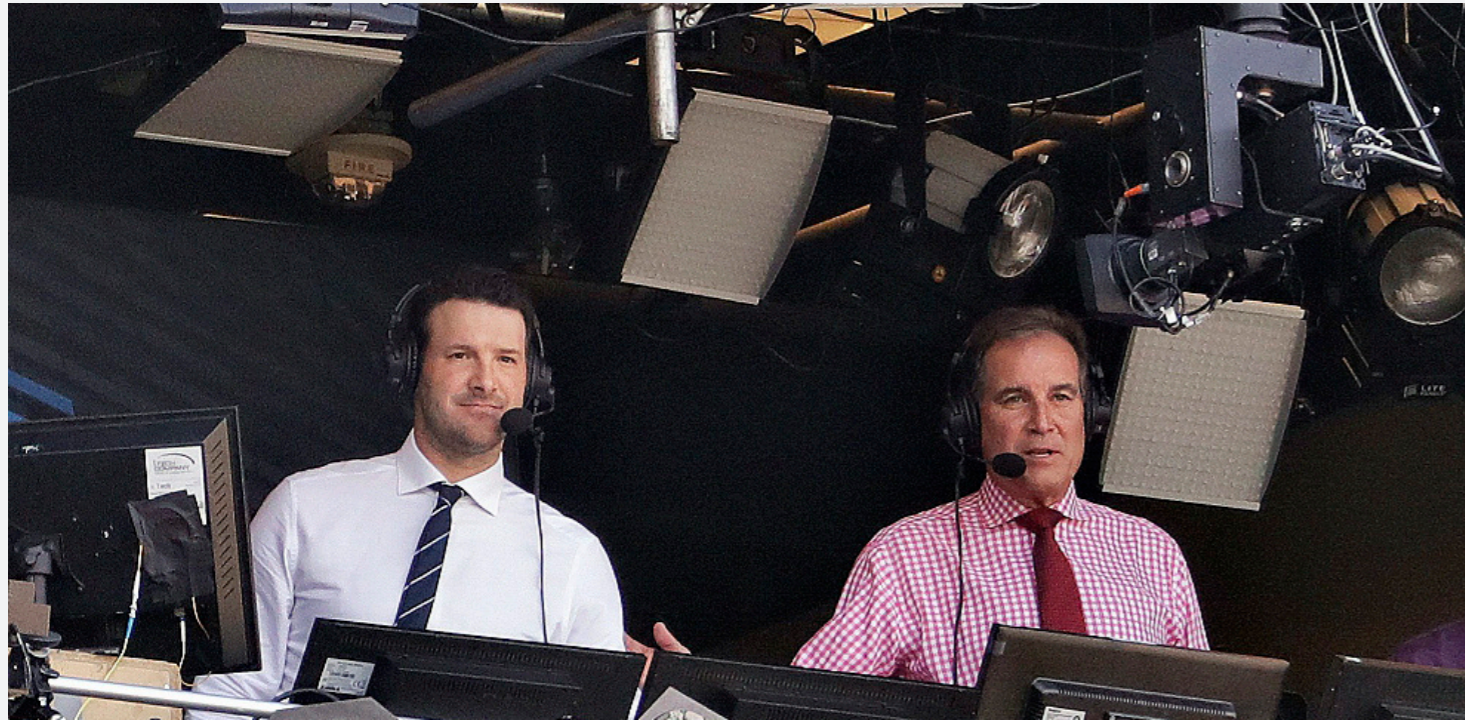
Tony Romo (left) and Jim Nantz calling a game.

Behind the more than 100 television cameras and an arsenal of the most advanced broadcast technology ever assembled, the anchors reporting the 53rd Super Bowl will concentrate on the ancient art of storytelling.

The CBS on-air Super Bowl team will be Jim Nantz and Tony Romo calling the game, with Tracy Wolfson on the sidelines. For four hours, before kickoff, on-air hosts James Brown and Bill Cowher of NFL Today will host Super Bowl Today. These five key on-air hosts (joined by many others) are not only skilled storytellers, but two have played or coached in the National Football League.

Tony Romo (left) and Jim Nantz will provide 2019 CBS Super Bowl play-by-play and commentary.

"One area that is hard to describe is how the Super Bowl affects the players' and coaches' lives," said Romo. "They all work hard to get to the Super Bowl and they may make it or not. Getting to the game is what they wake up to and do every single day.

"All this is right in front of these people. It becomes the highest level of drama played out in front of the whole world," Romo continued. "You can't really grasp how big it is directly to the owner and the head coach. This guy has ten years left if he wins this game. If not, he's got about two. Everyone's jobs are a stake. It is so huge. And everybody knows it. The wives of each player know it. And their kids, dad and brothers know it. Everyone's nerves are to the nth degree. I want to make sure the public feels that emotion during the game."

Jim Nantz is a veteran who has worked on telecasts of the National Football League, National Collegiate Athletic Association Division I men's basketball and the PGA Tour for CBS Sports since the 1980s. He was mentored by all the great CBS sportscasters through the years, beginning with Ray Scott, Jack Whitaker and Frank Gifford who called Super Bowl 1 in 1967.

Jim Nantz will again be co-broadcasting the 2019 CBS Super Bowl.

Nantz has, in turn, mentored his analyst, Tony Romo, a former quarterback who played 14 seasons with the Dallas Cowboys. Tracy Wolfson began as a researcher at CBS in 1997 and has become one of the top NFL whizzes at CBS.

A host on NFL Today, James Brown, commonly called J.B., is a Harvard graduate and veteran of sports broadcasting since 1984. He joins Bill Cowher, former head coach of the Pittsburgh Steelers, on the pre-game Super Bowl broadcast. Cowher was coach at two Super Bowls, losing the first game and winning the second. He resigned after winning the Super Bowl and joined CBS as a sports analyst in 2007.

James Brown is a Harvard graduate and veteran of sports broadcasting.

Sean McManus, president of CBS Sports, said the anchors, who are working together for the first time on the 53rd Super Bowl broadcast, are the best in broadcast television. "I think the chemistry between Jim and Tony in the booth is unsurpassed in today's world. I can't wait to hear them call a Super Bowl."

Romo retired after the 2016 season from the Cowboys, following a preseason back injury that caused him to lose his starting position. Upon retiring, he was hired by CBS Sports to become the lead color analyst after the mentoring of Jim Nantz, who recognized his on-air talent early on.

"The first time we put headsets on together was May 17, 2017 at CBS, in a little sound booth the day of the CBS upfronts," recalled Nantz. "We sat before a monitor calling a game on videotape... one that I had actually broadcast a year before. We played it like it was real and the first quarter went along fine. We didn't have producer cues or graphics and we didn't know exactly when the replays were coming in. But by the fourth quarter, I thought Tony was good enough to be on the air. That first day.

Sean McManus, president of CBS Sports.

"There were a lot of practice sessions after that. We practiced until we went on the air on Sept. 10, 2017," Nantz continued. "It has been a blast. It's a great thing in my career to see a young guy in the dynamics of a booth relationship. I'm now a generation older than Tony. It reminded me how good those mentors were in my past and I try to be more of that in regard to Tony. He loves this industry passionately. He is going to be the best for a long, long time."

Cowher, the CBS analyst, started coaching in 1992. During his tenure with the Steelers, he both lost and won Super Bowls. "I know about the journey to get to the Super Bowl," he recalled. "I remember walking on the field the first time. I was 38 years old, the youngest coach ever in a Super Bowl. We lost, but I had a chance to go back ten years later. My wife said at the time: 'You know, you really need to win this thing. Thanks, hun,' I said. If you win the Super Bowl, it's a place in history.

I learned that winning it does change your life. After winning the game, I had a chance to step down. I came to CBS in 2007 and I've been here for 12 years.

Bill Cowher, former head coach of the Pittsburgh Steelers.

"You are going to see a football game," Cowher continued. "But we want to give you the storyline of the people's journey to the game. We try to give insight into the human element of what you see on the field. These coaches and players are special. The game defines their lives. It resonates throughout sports history. Right now we are talking to coaches and players to find out about their experience and what they want to achieve. I've been in their shoes. There are so many great storylines. That's what makes the Super Bowl such a very special event."

Brown said part of the goal of Super Bowl Today is beyond football and includes more traditional news reporting. "Part of our job is to showcase the city as well. Atlanta is now considered Hollywood East. Many films are being made there. Also music is growing there. Atlanta also represents a major place in our civil rights history.

"I'm excited to explore that civil rights history," said Brown. "I like to talk about things that are very significant in our country. As opposed to the very divisive landscape of what we have right now. We will talk about Atlanta in the form of what it gave to this country in terms of dealing with issues. It's a city that moved the social meter forward. We'll have a chance to talk about these things before the game.

CBS Sports Looks To Raise The Graphics Bar For Super Bowl LIII

by Michael Grotticelli
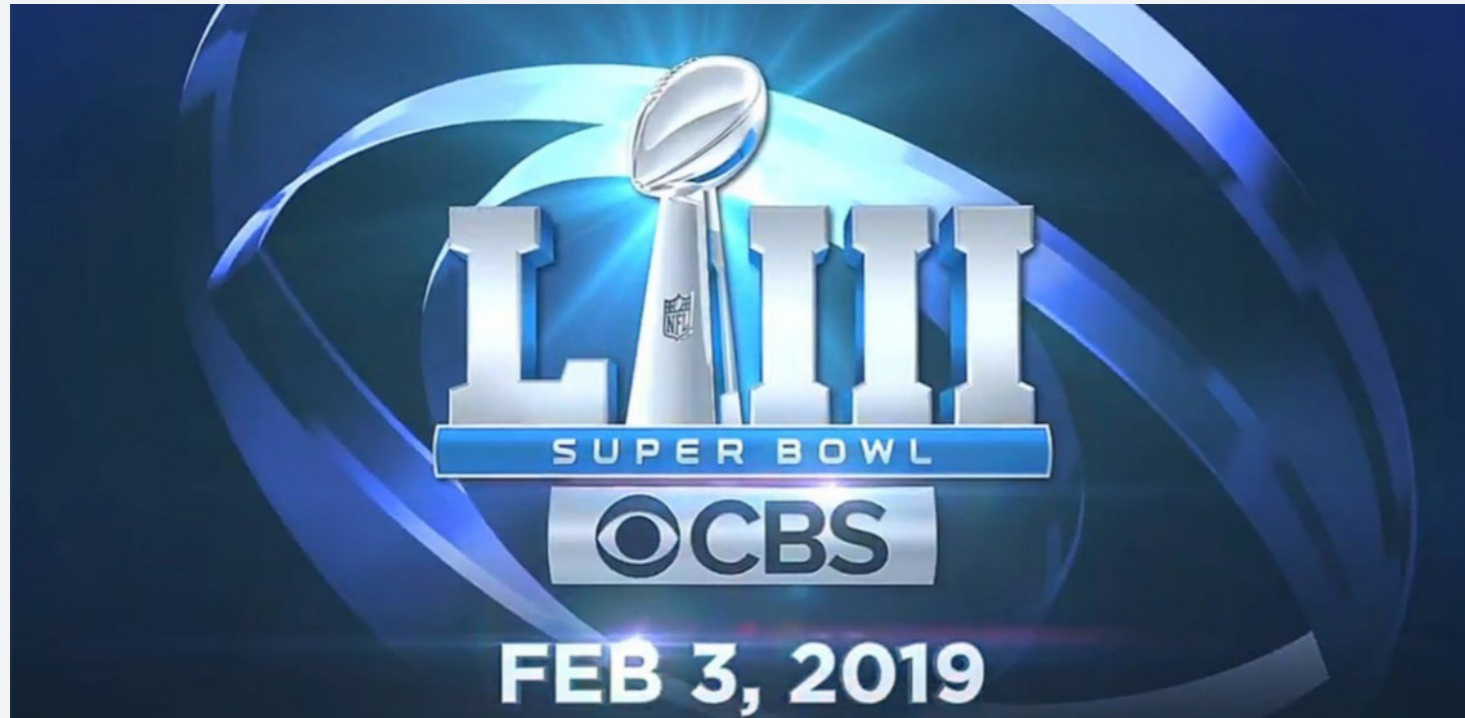
CBS Sports will use a lot of motion graphics, AR and pre-produced animations for its Super Bowl LIII telecast.

Captivating 3D graphics and electronically inserted field images have become a hallmark of every major live sporting event, but CBS Sports hopes to raise the bar during this year's NFL Super Bowl LIII telecast on February 3, 2019. The sports network's graphics team has prepared unique animations and on-field augmented reality (AR) graphic elements that are sure win over viewers in a big way.

More than 30 people will work on the graphics packages for the game, utilizing an in-house (in New York City) staff of 12 Adobe After Effects/Cinema 4D artists and ten insert graphics people, Another six artists will be onsite in Atlanta for last-minute titles and graphic elements.

"It's all hands on deck," said J.P. LoMonaco, vice president of On-Air Graphics & Design for CBS Sports. "It's our night to shine."

The usual on-air titles and lower third scoreboard/clock will be generated with ChyronHego graphics and CG systems while the AR graphics will be created with The Future Group's Universe real-time compositing software, in tandem with wireless camera-mounted motion capture technology from NCam and a Skycam camera with tracking software from a company called Sports Media Technology (SMT).

Signals from the handheld and Skycam cameras will be sent back to the onsite NEP SSCBS C mobile unit, where it will be processed and then inserted into the main broadcast feed.

For each camera that is tracked there is a corresponding graphics engine (for real-time compositing). That tracker is then sending its tracking information to the engine. The software runs on quad-processor COTS hardware and is processed with The Unreal Engine developed by Epic Games. This allows CBS to have full gaming power AR models can be much more complex and realistic looking.

These graphics will be delivered by ChyronHego systems for the insert graphics and also SMT's SportCG product for the lower-third CBS in-game eyebar (designed by Reality Check Systems). Full motion animations will be pre-produced at CBS in New York using Adobe After Effects and Maxon Computer's Cinema 4D software. A graphics design company called Troika was also brought in to help creatively.

"We're here to tell the story of the game," LoMonaco said. "Are Is AR graphics necessary? Maybe not, but this is the state of the art in graphics and the Super Bowl is the place to showcase our talents as a Sports Network. For us, it's got to be on the screen for a reason and have practicality to it. We're not big believers in just throwing things onto the screen to fill it up just because. We try and stay to the edges of the screen and let the game action entertain the viewer. The game is the center point and we simply enhance that with our graphics packages.

"I'm hoping for some positive buzz from viewers," he said. "If the broadcast is successful and my team is successful, then that's a huge win for us. And if we get some thumbs up from our peers, that's gravy on top."

CBS Sports has used augmented reality graphics sparingly in the past but will up its AR game for the Super Bowl, using Sports Media Technology software in tandem with camera-mounted motion capture systems.

"We're tracking five cameras running around the field, so it will be a challenge," said LoMonaco. "AR is still finding its way, but the general attraction is that its eye candy for viewers. So, we're trying to find a way to raise the bar a bit and create images that are captivating yet a bit more practical to utilize during a major live TV broadcast."

He said the goal is to make AR graphics of half-time stats and QB comparisons already seen on other networks and make it a little more exciting for the viewer.

"The approach here from an execution standpoint, in terms of the level of complexity of the scenes, its going to be different than viewers have seen before," LoMonaco said. "I think they will like what they see and that it will positively add to the overall broadcast."

The basic on-air graphics that will be seen throughout the main game telecast will not be drastically different from what CBS Sports has been using throughout the 2018-19 NFL regular season. In fact, CBS Sports —with the help of design firm Troika—rebranded its on-air look in 2016, its first in 35 years, which debuted for Super Bowl 50.

"We did a massive rebrand for Super Bowl 50 and are still pleased with how it looks," LoMonaco said. "It has redefined the personality of CBS Sports.There's a lot of love for the look and it solves a lot of esthetic and practicality issues for us as designers, so we were not quick to walk away from but enhance the look and make it extra special for the Super Bowl telecast."

For the 2018-19 NFL season CBS Sports let the game speak for itself, choosing to place graphic elements on the edges of the screen. This year's Super Bowl telecast will feature a similar graphic treatment.

TV Director Treats Super Bowl Telecast Like Any Other Game

by Michael Grotticelli

CBS lead NFL director Mike Arnold (left) will direct the AFC Championship game and Super Bowl LII for CBS Sports. (Photo: CBS Sports).

Like many professional football players themselves, CBS Sports Lead television director Mike Arnold tries to treat the Super Bowl as he would a regular season game, calling the same shots and camera angles—albeit with many more cameras at his disposal, augmented reality graphics on the field and virtually every part of the playing field mic'd up.

A veteran of the past four Super Bowl telecasts on CBS, Arnold said he will approach this year's Super Bowl LIII show on February 3, live from Atlanta's Mercedes Benz Stadium, as he would any other he has directed in his illustrious career.

"The key for me is not get caught up in the hype and focus on the core game itself," Arnold said. "I try to do the same preparation, memorize the players' names and numbers, and go through my shot lists so I am ready. After so many years of doing this, if I approach it any other way, it could be a disaster."

Arnold will also direct the preceding AFC Championship game on January 20 live from Arrowhead Stadium in Kansas City. For both games he'll be perched in the same mobile production truck, NEP's SSCBS mobile unit—complete with more than three-dozen Sony 14x HDC-2500 cameras, about a dozen Sony HDC-4300 4K SuperSloMo cameras and, new this year, a Panasonic 8K camera for super high resolution HD replays—and conduct the games in the same way he always does. All will utilize Fujinon's latest 4K lenses.

The physical configuration of the unit is three double-expanding 53-ft. trailers and a fourth truck for game related activities. The A unit has a 15- x 21-ft. production area and a 15- x 18-ft. graphics area (each with 12 positions). The large monitor wall that Arnold and his team will be closely watching those camera feeds on is made up of numerous Boland Communications 31x32" flat screen displays.

NEP's SSCBS truck, which was used for the NFL regular season, features a wide array of live production equipment, including a Grass Valley Kayenne switcher and multiple EVS XT3 replay servers.

Story telling, he said, is most important and Arnold helps create that with close-ups of the players and then also wide shots of the stadium so the audience can get a feel for what it's like to actually be there at the game.

"I look for a player's anguish if they drop a pass, the elation of a quarterback after throwing a touchdown pass and also the running back that just scored," he said. "I think that close-ups really help the director tell the story of the game. That's along with the replays we use to analyze a play. In the end it's all about capturing the emotion of the game and making sure we have all of the key plays covered from the right angles."

NEP's SSCBS also features a 192-input Grass Valley Kayenne Elite production switcher, along with supporting the "B" and "C" trucks, will handle the 115 total cameras (86 dedicated to game play itself), the on-air graphics, a full complement of EVS XT3 (HD) and XT4 (4K) replay devices, and Calrec Audio Apollo and Artemis audio mixing consoles.

Arnold said this year his shot selection will often shadow CBS Sports on-air announcer Tony Romo's commentary, because the former quarterback has gained a reputation for seeing the entire field from a player's perspective and how plays develop.

"When [Tony Romo] says 'That's a great block' by a player, I try to quickly focus on that player and follow his perspective," Arnold said. "We've worked together all year long and have formed an unspoken bond that viewers have really taken to.

"I try to my focus on my key 20 cameras and let other people worry about the rest," he said. "A lot of those extra cameras are for replays and alternate angles that I might use, but only in select situations. Like seeing if a player has kept his feet in bounds on a catch. Otherwise I have my key cameras that cover the game."

Many of those replays will capture end zone action and super slow-motion replays with 16 Sony 4K cameras (HDC-4800) 4K/HD Ultra High Frame Rate systems and one Panasonic (AK-SHB810) 8K camera system. The later uses a single "organic" film sensor capable of shooting 8K/60p video, with wide dynamic range (HDR) and global shutter to prevent image distortion.

This year's telecast will also feature augmented reality graphics on the field, complete with a roving camera operators that will enable viewers at home to see the planned player stats and game analysis in a while new way. It sounds cool, but Arnold is a bit nervous about how it will all work. He'll get a rehearsal with it the week before the Super Bowl and hopefully become comfortable with it by (AFC Championship) game time on January 20th.

"One of the biggest challenges is bringing in new technology like the AR graphics and crossing your fingers that it will all work," Arnold said. "I'm working with a highly experienced crew who cover NFL games all season, so the main broadcast is the part we all know how to do very well. It's the "first time ever" things that make me a bit nervous. But I know our guys will get it right and I am confident this year's Super Bowl telecast going to be an exciting show. It always is."

Routers Link Mobile Units to Provide Hugh IP Connectivity for Super Bowl

by Frank Beacham
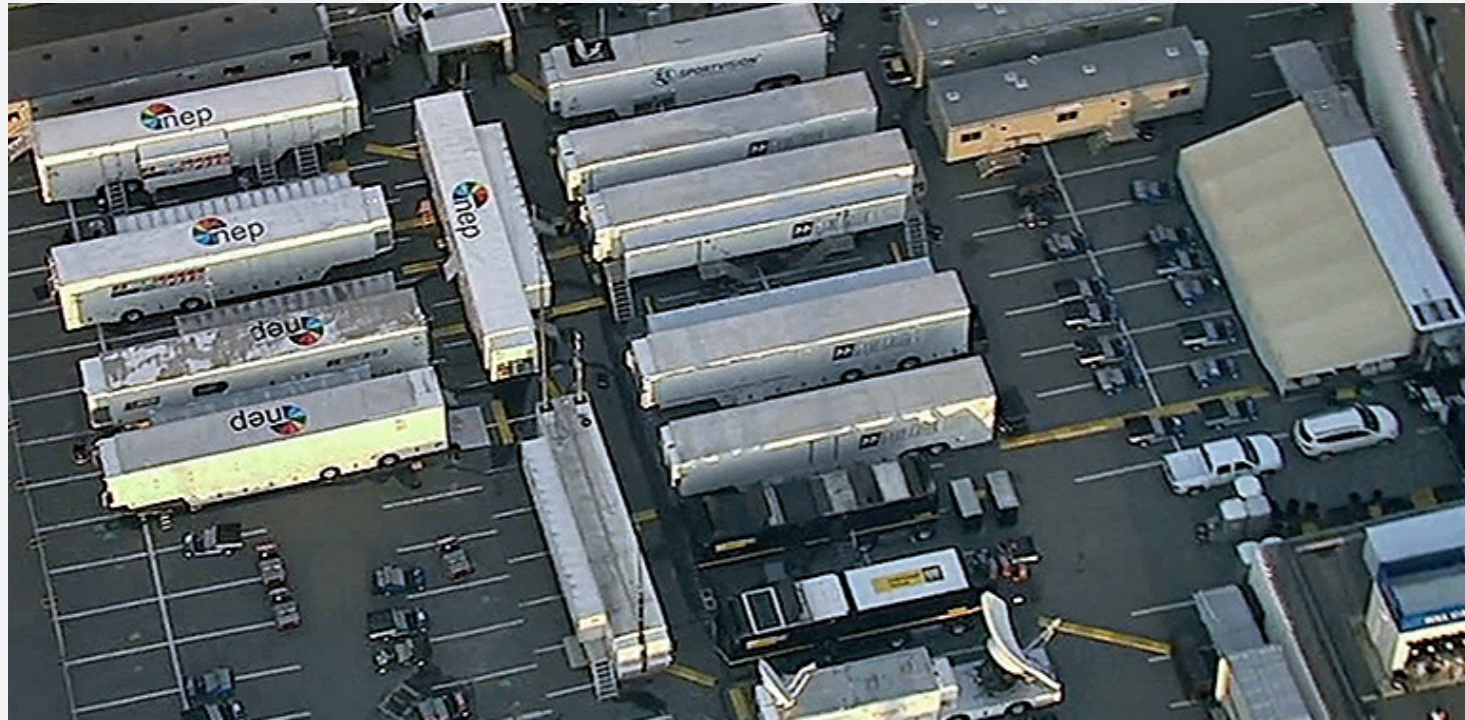
Broadcast of a NASCAR race (shown here) requires multiple TV trucks, but nothing equals the the Super Bowl. Image NASCAR 2017.

Evertz EXE IP routers will be linked together in NEP's SSCBS and Game Creek's Encore mobile units to provide at least 2,000 inputs and 4,000 outputs for this year's Super Bowl coverage.

It's one of the largest displays of IP routing technology ever assembled. Even the new Mercedes-Benz Stadium in Atlanta relies on an Evertz EXE IP router to handle all of its internal video feeds.

IP Router in SSCBS Mobile Unit.

"One thing that is relatively new at this Super Bowl is tying EXE routers together from different mobile vehicles," said Pamela Dittman, Director of Customer Support for Live Sports Production at Evertz. "We've done it with CBS a couple of times. At this point, we have it down to plug and play."
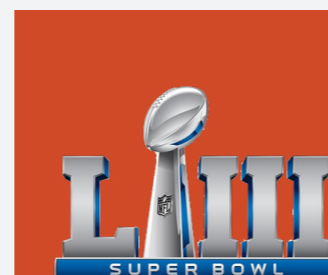
Evertz's Magnum Unified Control System software is used to tie the trucks together. "Once we plug it in, we tell the software to connect to another truck. We are then able to route any signals around."

Of the staggering 2,000 inputs and 4,000 outputs, most are being used in the production of the Super Bowl, Dittman said. "Those feeds are sent all over the world...ranging from the International Broadcast Compound to various edit bays at many locations. "From IP we can easily take the signal back to SDI."

Evertz is not supplying any of the outboard IP conversion gear ranging from IFB, microphones or even 8K video cameras. Those are provided by third parties, depending on the conversion function. "Our router is pretty much format agnostic," Dittman said. "It can take about anything we hand it. In fact, we've been doing 8K and HDR for a while. Everything being used at the Super Bowl has been tested and proven on other productions."

Technician pulling fiber.

IP Routing has taken hold, said Dittman, "simply because we can pass a lot more signals than we ever could imagine with baseband. Also, using a lot of fiber has advantages over coax cable in mobile environments. The weight is lower, you can go greater distances and the integrity of the signal is much greater. You can do things with fiber that you can't with coax."

Evertz's IP routers allow media companies to scale their system to any size, across all geographic regions, while handling any new formats and platforms that come in the future. Facilities or mobile units using IP routing provide the agility for broadcasters to add or remove services quickly.

IP also allows facilities to be format agnostic and to support various content types, multiple standards and streams for both compressed and uncompressed video.

In addition to IP routing, Evertz will be providing IP gateways for the distribution units. These gateways offer a way to transition from IP to SDI. The company has a range of IP gateways that provides IP encapsulation and de–capsulation for video, audio and metadata. "These gateways will allow IP to routed from SSCBS to those other locations. From there they can take it back to SDI. The advantage of that is we can pass a lot more signals with a lot less fiber."

With its routing systems being integral to the Super Bowl production and the new stadium, "We have a support team in Atlanta making sure everything is flawless in the operation of our equipment," said Dittman.
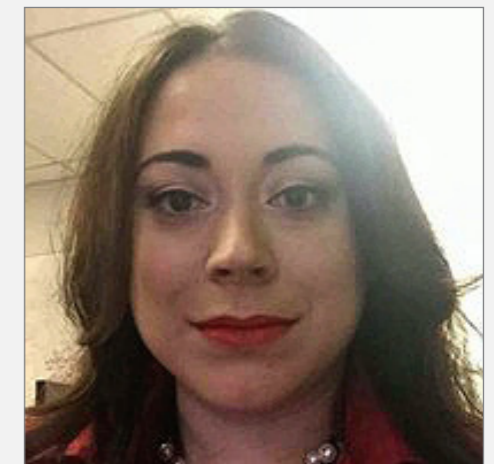
Pamela Dittman.

CBS Trumpets Augmented Reality and 8K at Super Bowl 2019

by Philip Hunter

Super Bowl 2019 will use use 8K camera technology at the big game. Image: By Thomson200 - Own work, CC0.

Super Bowl 2019 will raise the bar for live broadcasting technology with innovations in augmented reality (AR) and use of at least one 8K camera, while also highlighting past innovations that have fallen out of favor.

The event rotates between the broadcast networks, CBS Sports, NBC and Fox, which intensifies the competitive tension and increases pressure on each broadcaster to make its mark in the knowledge that it will have to wait three years for the next opportunity. NBC Sports made a splash at Super Bowl 2018 with its 200 hours of 4K coverage drawing on 106 cameras, including two SkyCam computer-controlled cable-suspended systems which will also feature this year.

CBS Sports has gone one better for Super Bowl 2019 by featuring a single 8K camera for the first time at a live commercial broadcast event in the US, capturing video at 4320 x 7680 pixels per screen, or double 4K resolution. Although very few screens can display that resolution today, capturing 8K footage enables the camera to zoom in closer while sustaining adequate resolution. This will enable CBS to deliver more dramatic close-ups of the action from the end zone, including possible game changing plays. If whole frames are captured at 8K, a cropped section of the image will still have good resolution when expanded.

AR to Showcase at Super Bowl
The other major feature of Super Bowl 2019 will be AR for enhancing the video content, which has been used before so that the interest lies in how far CBS has progressed. The broadcaster has been coy about details in the hope that its AR will wow viewers with the impact on the day, but it will certainly go beyond mere incorporation of player statistics and other data.

New stadia help improve the broadcast experience, according to Harold Bryant, Executive Producer and Senior Vice President, Production, CBS Sports.

The appeal of AR lies in the ability to integrate immersive aspects of a scene that are perceived as part of the environment, so in the sporting context that could mean incorporating "what if scenarios" by digitally changing the footage. For example, during replays, it will be possible to model what might have happened if a given event had not taken place, or players could be kitted out digitally with a different uniform representing say their college team. In future viewers will be able to select alternative versions of the replay and perhaps even further ahead invent scenarios of their own for incorporation. The distinction between the real and virtual worlds will become increasingly blurred.

This year CBS is utilizing four cameras, including the SkyCam, for the live AR graphics, plus an additional 10 cameras that have trackable first down line technology. Pioneered by Sportsvision, the latter augments televised coverage of the sport by inserting graphical elements such as lines on the field of play as if they were physically present. The inserted element is fixed within the coordinates of the playing field and is consistent with real vision by obeying rules such as disappearing behind closer objects like occluding the view, such as the players themselves.

The bedrock of innovation for CBS is still be 4K coverage, featuring 16 cameras with 4K capabilities, as well as nine Sony 4800 camera systems suitably located around the stadium. The latter provides additional live game camera angles, while allowing the production team to replay key moments of the game in super slo-motion. Even 4K boosts close-up capability significantly and CBS features an HD cut-out with zoomed-in perspectives at only slight resolution loss.

Viewers can see plays from every angle as over 25 cameras flank each end zone, including the HD cameras with super slo-motion capabilities, as well as six 4K cameras and three goal post super slo-motion cameras shooting the backlines and 14 cameras embedded in pylons each side of the field. There are 28 pylon cameras in total contributing to the 50-plus camera feeds from the end zones.

This year the Mercedes-Benz Stadium itself has contributed to the technical improvements, admitted Harold Bryant, Executive Producer and Senior Vice President, Production, CBS Sports. "New stadiums just make the setup better," said Bryant. "They're wired better, ready for the technology. Once you get the base in place, then you can make sure all the new toys and gadgets are working." This, said Bryant, made it possible for CBS to deploy cameras "in places that you wouldn't normally put cameras," including high in the stadium's overhead, circular video board.

There has been less emphasis this year on streaming or local communications via Wi-Fi and cellular multicast. For several years, LTE Broadcast was demonstrated at Super Bowl, by Verizon for example, but CBS confirmed it is not featuring this year.

Bonded Cellular Action at Super Bowl LIII

by Ned Soseman

Murphy's Law: The most crucial piece of technology is the one most likely to fail during a live broadcast, like the Super Bowl. Image LiveU

New technologies with more bandwidth make the bonded cellular video connections at Atlanta Super Bowl more reliable and stable.

Super Bowl LIII will be broadcast on CBS February 3rd at Mercedes-Benz Stadium in Atlanta, home of the Falcons. It is the first Super Bowl to be hosted at the new stadium that opened only two years ago and will be the third Super Bowl played in Atlanta. The extravaganza will also be augmented with live, local and on-site reports from sports reporters and sports directors from TV stations across the USA.

While major sports events and venues like the new Mercedes-Benz Stadium in Atlanta have added new technologies that provide higher bandwidths for fans' smartphones during an event, broadcasters need a bit more advance planning to ensure high-quality links.

Anyone planning to broadcast from the Atlanta site needs to have a conversation with their bonded-cellular equipment provider to determine what steps may be needed to ensure easy setup and reliable links. Here is a look at three of the equipment providers and what their Super Bowl plans include.

Dejero is providing local equipment rental and on-site support for the February 3rd game. Dejero field sales engineers are available and even have extra units on site for game day. As always, customers have phone access to 24/7 technical support.

This year, Dejero will offer and showcase its CellSat solution on-site. CellSat provides reliable connectivity in congested RF environments, which is exactly what's expected during and around game day at Mercedes-Benz Stadium.

CellSat is a blended cellular and Ku-band IP satellite solution that takes the best attributes of both transmission paths and fuses them into one. Dejero CellSat combines HEVC-capable products and services with the Ku-band IP satellite connectivity from Intelsat. The result is one of the most innovative broadcast connectivity solutions available.

Said Kevin Fernandes, Dejero VP of Sales, "We're ready to support our customers to ensure they have the reliable, live connectivity needed to capture one of the biggest games of the year in Atlanta."

Cellular networks will bring in Cell on Light Trucks (COLTs) and Cell on Wheels (COWs) in anticipation of intense cellular traffic. Photo courtesy ATT.

Last November, Dejero received a Technology & Engineering Emmy for 'excellence in engineering creativity,' honoring a decade of achievements in the field of live transmission.

At LiveU, Pierre Kawka, Director of Strategic Projects says the company has a private Wi-Fi hotspot location covering the NFL Experience at the CNN Parking Deck, which faces the Atlanta Mercedes Benz Stadium. The company will also offer a Wi-Fi hotspot outside of the NFL area secure zone.

"LiveU will also have credentialed professional services engineers available all week to support customers at all the venues and press areas," he said. "I will be onsite at the game to provide support on the field."

"It's not too late to rent a LiveU unit for the big game. We will have additional equipment onsite in Atlanta to help support last minute needs. Spare units will be available," said Kawka.

TVU Networks will be present and highly visible at the Super Bowl 2019 as has been customary.

Chris Bell, TVU Networks SVP Technical Operations said "TVU will be offering rental equipment to customers as usual. This year is shaping up like previous years and we have the local market well equipped and prepped in plenty of time, but of course it is common for last moment requests from the teams' local markets. We have hardware pre-allocated to handle this."

"We will have a fully credentialed technical staff of three in theatre starting 6 days prior to the game. The field team will have spares and loaners and will be patrolling the venues and the press areas around the stadium checking in with our customers and offering advice and assistance as needed," Bell said.

The Focus is Making Everything Work

"On game day we will be in the domestic compound and in the stadium itself. We will have someone on the field pregame and postgame to ensure that things go smoothly for our users," he said. "During Super Bowl 50, I ended up assisting KUSA with a spare pack and carrying cables so they could grab an interview with Payton after the game. When things get hectic, we will literally do whatever it takes."

"Experience has lead us to avoid putting in fixed infrastructure. We have provided extra bandwidth services in prior years but we learned some important lessons," Bell said.

"1: It's simply not necessary, the packs work beautifully. I've personally seen a pack laying on the field as the confetti lands running pristine HD at 1 second latency.

2: The users don't want to be fixed to a locale. Since the packs are operating beautifully, no-one wants to mess around with the complexity of infrastructure."

According to TVU's Eric Chang, "We've been providing comprehensive support to our customers at large scale events for some number of years now. In addition to multiple Super Bowls, we've also provided extensive support at summer and winter Olympic games and World Cups. Our expertise in these types of events is worldwide."
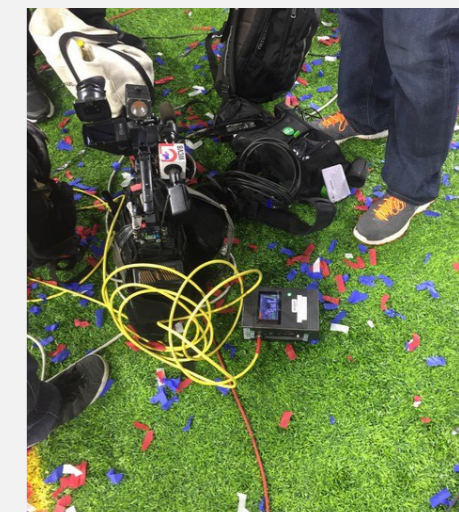
TVU was literally on the field for Super Bowl LII postgame reports.

Streaming Competes with Broadcast at Super Bowl LIII

by Jay Ankeney
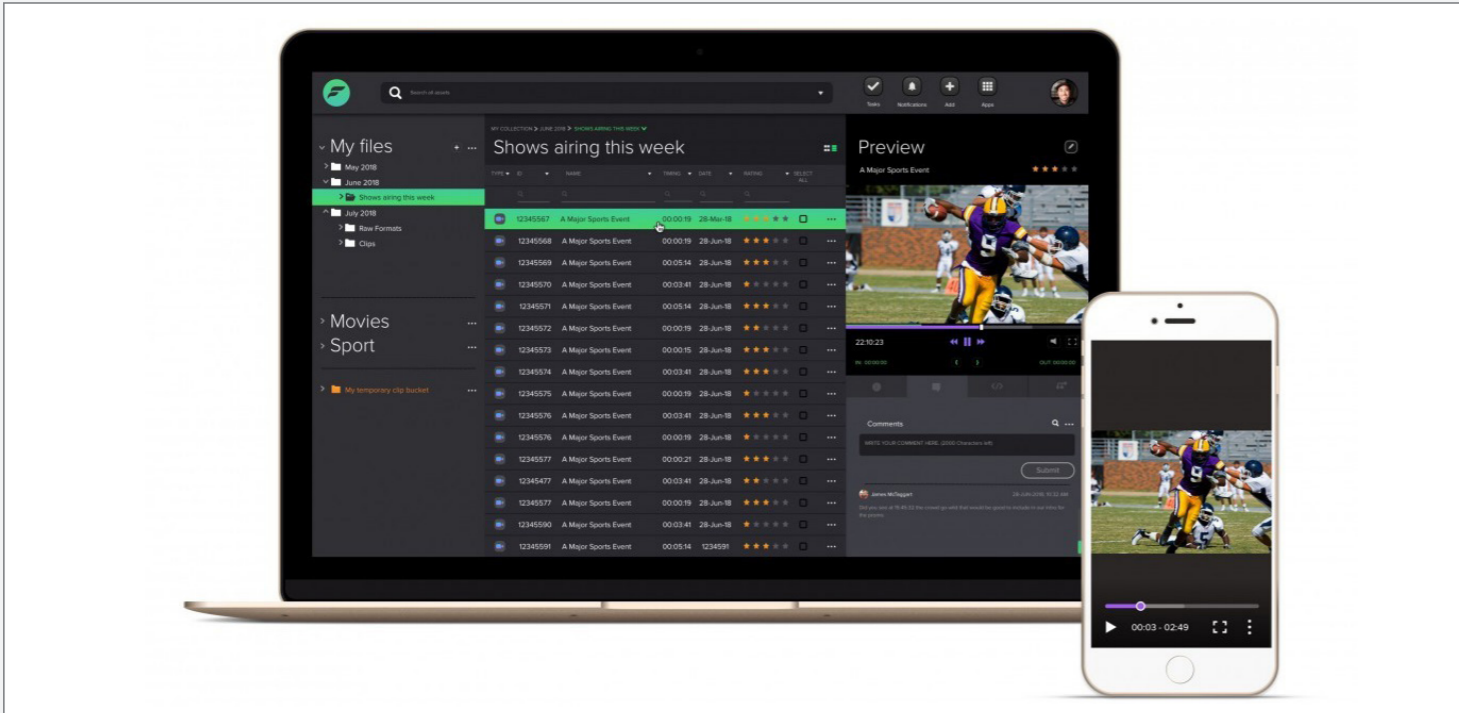
More people are choosing to watch even major events on a small screen.

Thanks to improved streaming technology, a lot more fans are going to be watching the Super Bowl on mobile screens.

It is amazing how well the Big Game fits on small screens, according to Ooyala, a company leading the content supply chain revolution as a provider of OTT, content production, and digital streaming distribution.

According to Ooyala's principal analyst, Jim O'Neill, "A recent NFL report shows a 65% viewing increase on digital devices over the past year and a 147% 2018 season boom in smartphone NFL content consumption."

O'Neill also said, "With the Super Bowl being streamed across platforms-- including iOS and Android devices, Roku, Apple TV and Amazon Fire TV--it potentially will draw a bigger than usual audience, a diverse one that may justify the whopping $5.1 million to $5.3 million a 30-second ad reportedly costs this year."

That's one reason I appreciated O'Neil granting me a one-on-one interview shortly before Super Bowl Sunday. But it was especially gratifying because it turns out I knew one streaming trick that even he had not stumbled across yet.

I'll reveal it at the end of this article.

"We saw huge numbers for Word Cup Soccer online views," O'Neil said, "almost triple between 2014 and 2018 even though much of it was played on workdays. This year's championship football game from Atlanta will be seen on all streaming platforms, which should help keep viewing numbers high. The problem is that Nielson still can't keep track of eyes on 2nd screens which makes it hard to evaluate the payback on commercials."

Of course, not all streaming fans will see the same commercials as those watching CBS.

"I'll be viewing it on You Tube which will have most of the same ads, except for those who specifically asked to be excluded from the streaming version," he said. "ESPN, for example, may substitute just a network billboard for spots they don't want to carry."

The question, of course, is whether this will add to—or detract from—the broadcast feed.
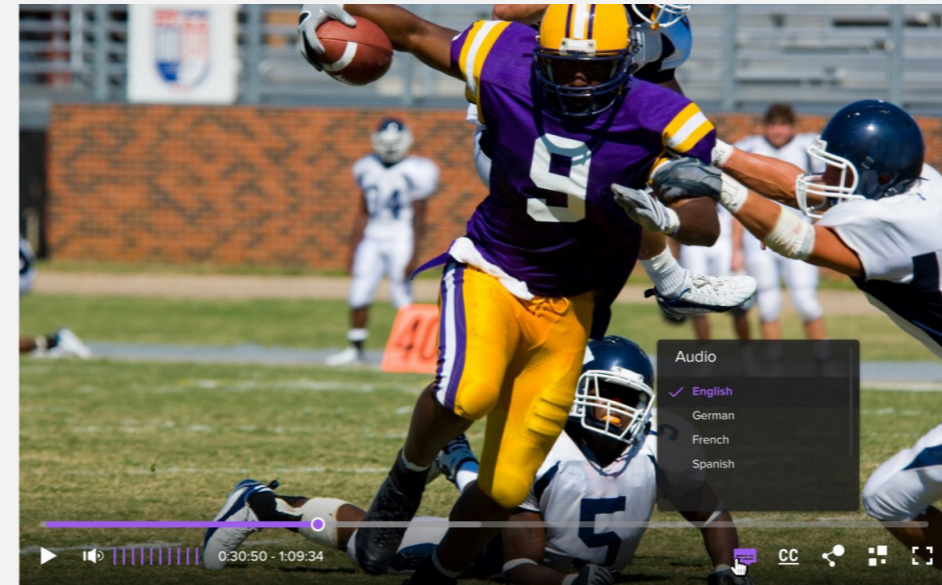
With the advent of 5G we may soon see alternative language commentary offered.

"Just as baseball has been finding out, digital is a great way for traditional broadcasters to bring back a lot of the younger audiences they may have been losing," O'Neil told me. "There is no question that sports leagues are looking at going over the top as a great way to reach at-risk audiences they may have otherwise have missed."

A lot of this is a result of people increasingly wanting to cut the cable cord.

"Now fans have the option of watching events like the Super Bowl on telephones, tablets and connected TV's," he said, "and people are taking advantage of these much lower cost options."
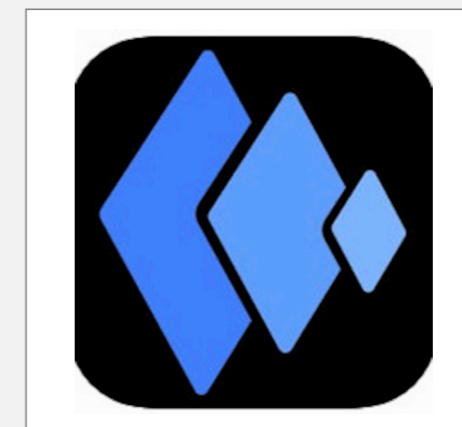
The statistics from Ooyala's own research bears this out. ("Ooyala", by the way, pronounced"oo-YAH-la", is the word from India for "cradle.")

In their "Regional Mobile Video Viewing Trends" report it states, "In North America, mobile plays increased to 56% of all video starts (i.e. someone clicked on it), up 4% year-over-year and up 14% since Q2 2016; mobile starts in North America have exceeded 50% for eight quarters; long-form time watched on smartphones topped 75%."

O'Neill told me that idea of "starts" should be taken in context.

"Watching on a cell phone is most appealing at the beginning of an event, but for long term viewing even Millennials usually turn to a big screen," he said. "Especially with sporting events, viewers have a tendency to wander. We've found that connected TV has the longest engagement, tablets follow, and cell phones come in third, although often as a 2ndscreen experience for looking up background information and stats during the game and half time."

At the end of our chat, I mentioned the great streaming trick I'd discovered to enhance the Super Bowl (or TV watching in any noisy room) called Tunity.

It's a free app for iOS or Android you can download from Google Play, theApp Store or iTunes. With this brilliant little software on a smart phone, you aim your camera at the TV being drowned out, hit "scan", and it searches the Internet for the audio associated with the video you are watching.

Then you can plug in your earphones and hear the game (or any other of 250+ channels on its list) and listen to the play-by-play in private.

If you find me at Summer's Sports Bar in the South Bay standing in the middle of a screaming beach crowd yelling for the Rams, you'll know why I have at least one headphone stuck in my ear.

Frankly, I don't know why every sports bar with multiple muted TV's doesn't have a sign recommending patrons utilize Tunity to hear the games not on the big speakers.

Tunity even provides adjustment for audio latency.

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