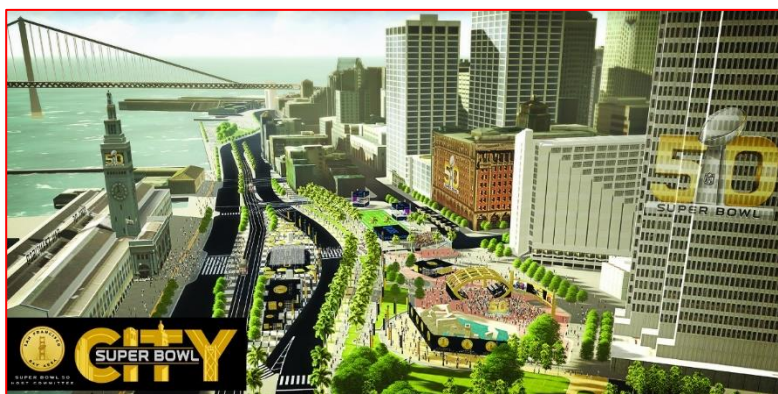


CASE STUDY

- Market:** BROADCAST TV
- Partners:** KOVR TV Sacramento, CA (CBS Owned & Operated)
KPIX TV San Francisco, CA (CBS Owned & Operated)
- Event:** Super Bowl 2016 “Super Bowl City”
Justin Herman/Embarcadero Plaza (San Francisco, CA)
- Venue Size:** Approximately 4.3 acres



Parameters:

Morning + Evening live newscasts from “Super Bowl City” during week prior to the game

Overview:

Deploy a multiple HD wireless cameras mesh system, using Silvus MN-MIMO technology, operating in the 5GHz ISM frequency band

Scope:

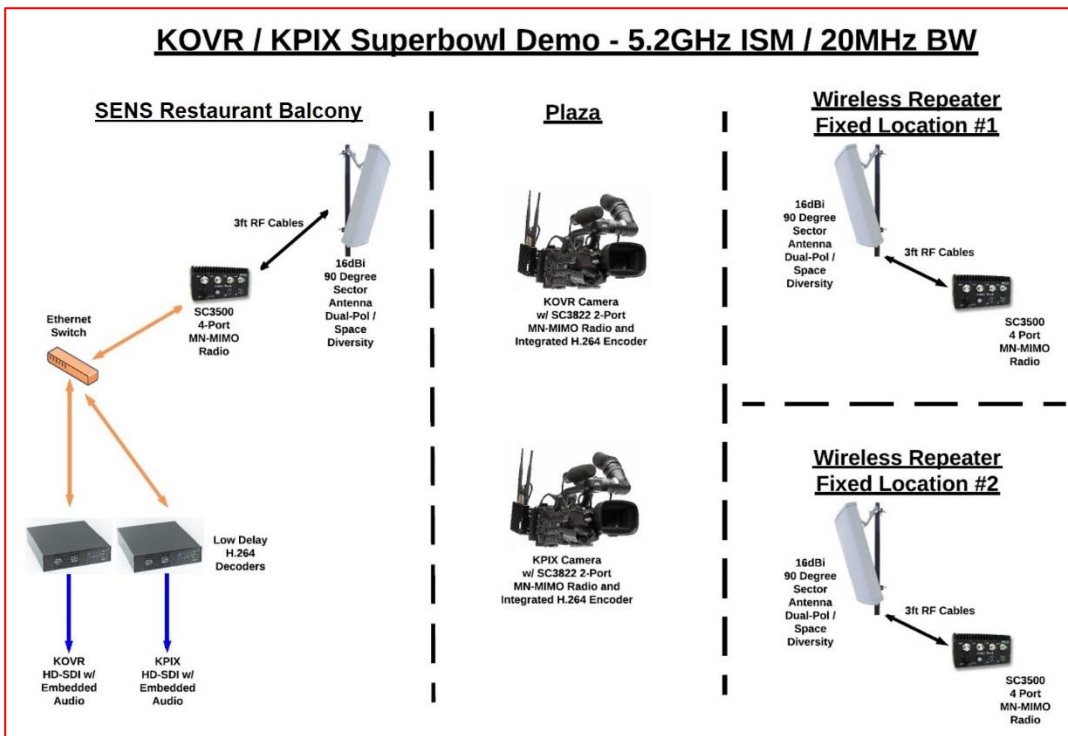
Both stations hosted their local newscasts from a restaurant balcony above “Super Bowl City”. Through the use of Silvus MN-MIMO™ technology, they also had reporters and cameras roaming around the entire “Super Bowl City” venue with complete freedom of movement to give their viewers a rich experience of the event and all of the major activities taking place during the week.

Challenges:

- Urban setting could reduce network signal strength
- Use of bonded cellular systems to transmit live HD video compromised due to bandwidth use by general public
- Distance to temporary “studio” location (up to ½ mile, partially non-line-of-sight)

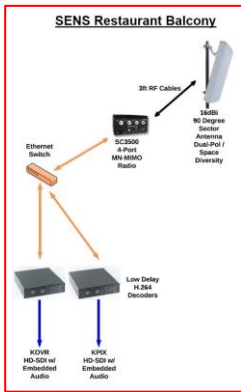
- Cabled cameras in the Plaza not feasible due to public crowds and safety + security concerns

Equipment:



Studio Location

- 1 StreamCaster 3500 4x4 Rx radio outfitted with 16 dBi 90-degree MIMO sector antenna + 3-foot RF cable
- 1 Ethernet switch
- 1 low delay H.264 decoder connected to HD-SDI w/embedded audio (KPIX)
- 1 low delay H.264 decoder connected to HD-SDI w/embedded audio (KQVR)



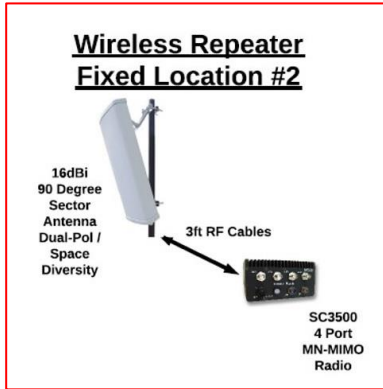
Wireless Repeater Location #1

- 1 StreamCaster 3500 4x4 radio outfitted with 16 dBi 90-degree MIMO sector antenna + 3-foot RF cable



Wireless Repeater Location #2

- 1 StreamCaster 3500 4x4 radio outfitted with 16 dBi 90-degree MIMO sector antenna + 3-foot RF cable



ENG Camera #1 (KQVR)

- 1 StreamCaster 3822 2x2 Tx radio + integrated H.264 encoder mounted on back of camera



ENG Camera #2 (KPIX)

- 1 StreamCaster 3822 2x2 Tx radio + integrated H.264 encoder mounted on back of camera



Highlights:

- Both stations used the same Silvus MN-MIMO mesh network concurrently which lowered overall production budgets and infrastructure needs for both stations
- No need for extensive and time-consuming cable run setups + breakdowns to cameras
- Single radio system for live HD video transmission and bi-directional IP connectivity
- Two separate wireless camera systems were able to operate simultaneously over the same mesh network using a single video receive infrastructure
- Extremely low latency HD video/audio, allowing for seamless live interviews between the anchors on the restaurant balcony and reporters down in the venue
- Operating in the 5GHz frequency range using StreamCaster 3500s, without the need for a license (the system has the capability to switch to a 2GHz BAS frequency when StreamCaster 3800s are used)
- Wireless Repeater locations were installed to increase the range of the mesh network without the need to run cable/fiber to those locations
- Bi-directional IP connectivity provides an upgrade path for IFB communications, camera control, return video, and other user data (FTP, etc.)

Summary:

Through the deployment of the Silvus Technologies mobile network multiple input/multiple output (MN-MIMO) mesh network, CBS O&Os KOVR (Sacramento) and KPIX (San Francisco) were able to integrate wireless HD video and audio from roving cameras into twice-daily newscasts originating from a temporary “studio” during the week prior to the Super Bowl.

The secure and private Silvus mesh network was comprised of a Silvus StreamCaster 3500 4x4 MN-MIMO radio (for HD video RX), two Silvus StreamCaster 3822 2x2 MN-MIMO radios (for HD video TX), and two Silvus StreamCaster 3500 4x4 MN-MIMO radios (for repeater antennas). Each of the five StreamCaster radios were paired with either omnidirectional or 90-degree sector MIMO antennas, based on their requisite task (e.g. transmit, receive, and signal repeats). Additional equipment included an Ethernet switch, low delay H.264 encoders, and integrated H.264 decoders.

Both TV stations were able to seamlessly integrate “reporter in the crowd” live shots and interviews *on the same mesh network* without the use of coax cables and fiber runs. Not only did this reduce labor-intensive cable/fiber runs, it reduced the liability of potential incidents involving people tripping over cable runs throughout the venue.

Additionally, both stations were able to achieve bi-directional paths *on the same mesh network* for the roving cameras to enable an upgrade path for IFB communications, return video, and user data for future events.