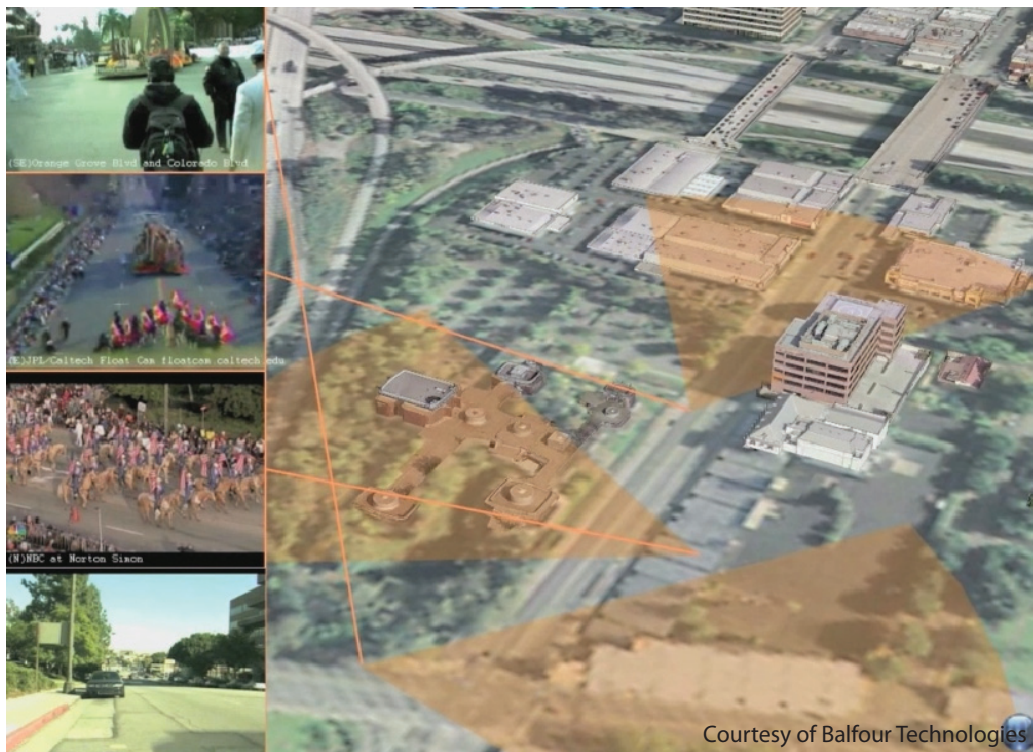


# EYES IN FOUR DIMENSIONS

## Surveillance Technology Helps First Responders Assess Events in Real Time

First responder and government agencies have various ideas about what a common operating picture (COP) should be. The U.S. Joint Forces Command defines a COP as “a single identical display of relevant information shared by more than one command. [It] facilitates collaborative planning and assists all levels to achieve situational awareness.” Yet most COPs are nothing more than electronic push-pin situational awareness maps, based on the same technology used by civilians to get driving directions.

Upon arrival at the incident scene, first responders need to have an abundance of data available to them, as well as access to real-time sensors such as cameras, radiation detectors, and air quality monitors that continually feed data. Correlating, integrating, and effectively fusing all of the raw data and alerts into a cohesive and easy-to-understand COP is a tremendous challenge.

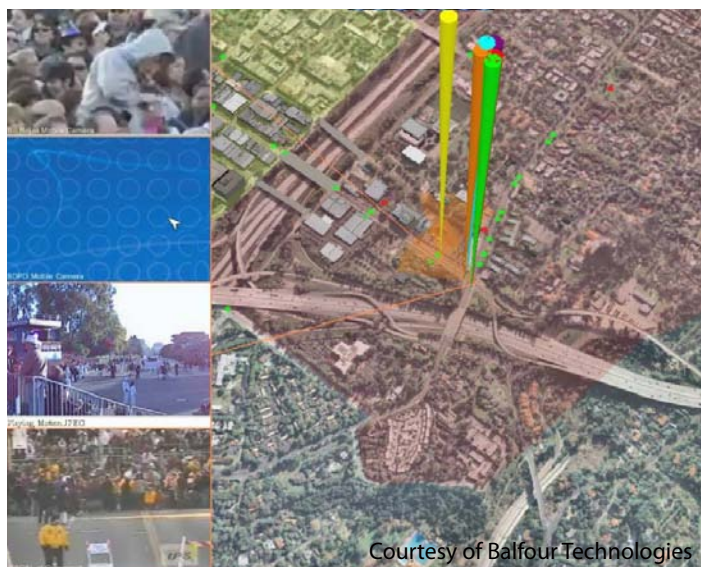


Courtesy of Balfour Technologies

The fourDscape technology manages a large number of cameras and sensors and then displays the information in a high-resolution, four-dimensional view.

In response to this challenge, the U.S. Department of Homeland Security Science and Technology Directorate (DHS S&T) is sponsoring an innovative technology that can make this view relevant in a geographic context. The technology, named fourDscape, will help first responders quickly analyze situations in real time, interact with people on the scene, and coordinate a response to a clearly defined mission.

The fourDscape, developed by Balfour Technologies under a Small Business Innovation Research Program (SBIR) contract with DHS S&T, is able to manage a large number of cameras and other sensors in a virtual, high-resolution, four-dimensional (4-D) display on a computer. A “4-D display” includes the three traditional dimensions of space as well as the fourth dimension of time. The system goes farther than a basic satellite map of an incident scene overlaid with additional data layers, such as street names and building locations. First responders using fourDscape can also monitor video cameras at the incident scene, review the status of sensor networks, participate in video conferences with colleagues, and set alerts to receive contextual and interactive updates. The updates can help incident commanders make tactical decisions



Courtesy of Balfour Technologies

fourDscape COP at the '09 Rose Bowl Parade in Pasadena CA, providing fully integrated crowd surveillance of the parade route, tactical plan GIS datasets, and geo-tracking of mobile cameras and sheriff assets and personnel.

*Eyes In Four Dimensions (continued)*

and understand the sum of an event while remaining on location. The system also allows for instant replay, enabling a forensic analysis of what has occurred in the past.

The fourDscope technology was tested in early 2008 during Operation Lupercal, a planning and emergency response exercise involving DHS and the Los Angeles County Sheriff's Department (LASD). The test simulated a scenario in which a car bomb and a radiological dispersion device, similar to a dirty bomb, were released during a large public event such as the 2008 Tournament of Roses Parade. Other groups involved in the test included the LASD Bomb Squad, the Hazardous Material Response Team, and other resources in the surrounding area of the County Emergency Operations Center of East Los Angeles.

For this test, the first responders used a 4-D virtual view of Pasadena. This view included publicly available county images taken from different and complex angles called *ortho* and *oblique*. Next, clear 3-D models of the parade route were added to the layered image. These were followed by simulations of float traffic, information from a police deployment plan, prerecorded traffic videos and images from wireless helmet cameras and a web camera on one of the floats.

"The fourDscope management engine took all of the data from those sensors and seamlessly fused them together

into a single 4-D scene that was meaningful and useful to the police," said Stephen Dennis, project manager of the fourDscope at S&T's Homeland Security Advanced Research Projects Agency (HSARPA). "It gave us a chance to see what it would be like to have true situational awareness during a major, real-world event. It gave us, well, a not-so-common COP," he said.

fourDscope was also well received by the LASD. Lt. John Sullivan was one of the responders involved in Project Lupercal. He said, "The technology demonstrated the value of integrated visualizations for a variety of specialized responders and command elements."

Sullivan's agency has continued to test fourDscope. The technology was recently integrated into a practical field test during the 2009 Tournament of Roses Parade, which included the integration of global positioning system (GPS) tracking of select parade floats and LASD personnel. Real-time video feeds of the event were also integrated. Sullivan was pleased with the results of using fourDscope again. "The viewer performed well and again demonstrated the value of 4-D visualization for tactical and operational applications," he said.

For more information on Balfour Technologies and the fourDscope technology, visit [www.bal4.com](http://www.bal4.com).



3D building model geo-located on a campus, aerial imagery with floor plans overlaid, and responders being tracked through the building.