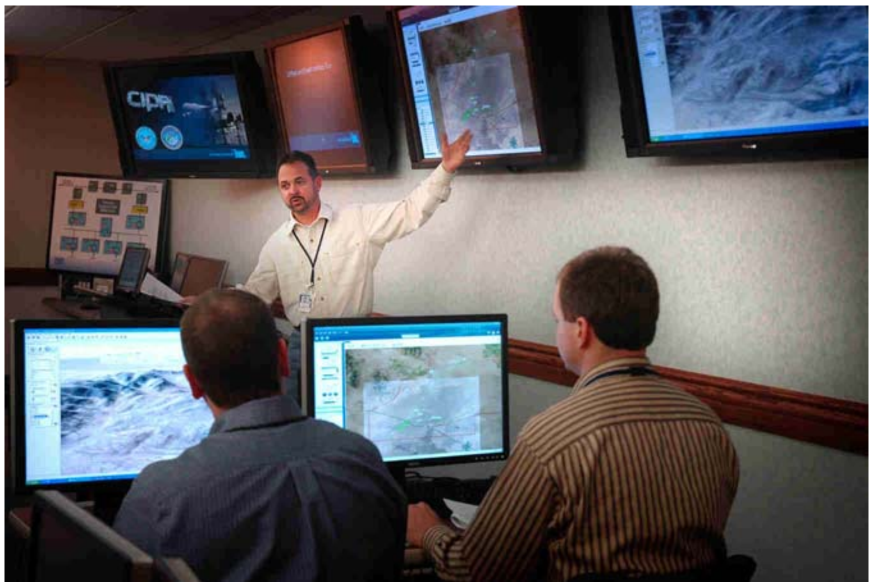
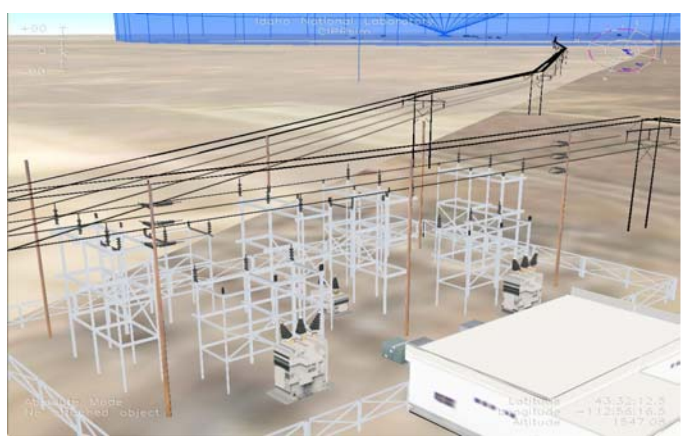
Object Raku Supports Critical Infrastructure Modeling and Simulation Capability

In cooperation with the U.S. Department of Defense, scientists and engineers at Idaho National Laboratory developed an advanced simulation environment – the Critical Infrastructure Protection and Resilience Simulator (CIPRsim) – to help first responders and decision makers prepare for the effects that natural disasters or man-made events may have on infrastructure resources such as the electric power grid and telecommunication networks. This capability aids emergency planners and responders in analyzing and visualizing the real-time cascading effects of multiple infrastructure failures before an actual emergency occurs.

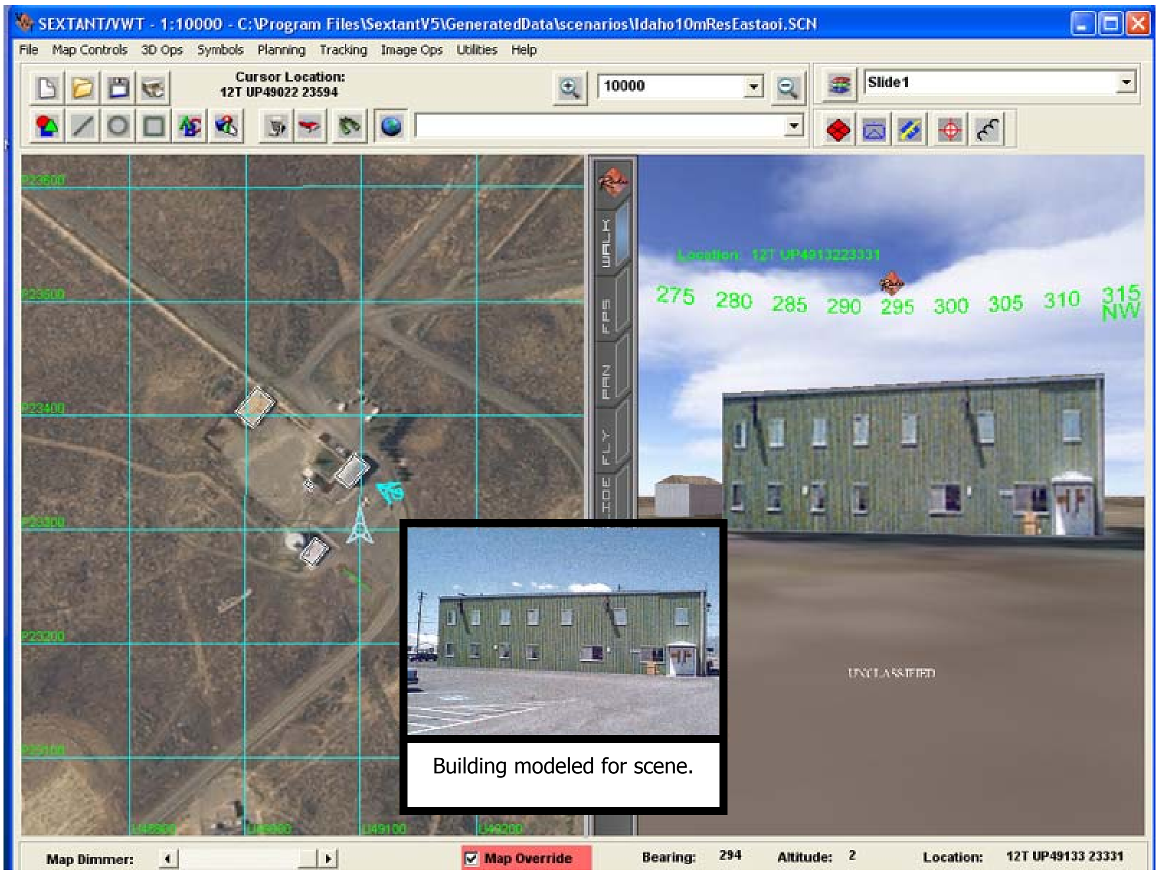
At right, the INL team presents CIPRsim to Office of Assistant Secretary of Defense - Homeland Defense and America's Security Affairs (OASD-HD&ASA) personnel.



The CIPRsim framework provides the capability for linking disparate models and analysis capabilities through a distributed environment utilizing the IEEE 1516 High Level Architecture (HLA) standard for simulation communication and time/event management. This allows for scalable integration of existing and proven models for potential hazards such as hurricanes, earthquakes, and wild fires; physics-based models for infrastructures such as cellular communications and electrical transmission and distribution networks; damage assessments due to effects of hazards on infrastructure components; and methods to determine and simulate infrastructure interdependencies in a robust, high-fidelity, intuitive graphical user interface. The result is a highly accurate situational awareness portrait of how a disaster scenario is likely to play out and what infrastructures will be affected throughout the course of the incident.



Object Raku Technology provided essential support to this effort by developing a series of 3D geo-referenced visualization environments depicting terrain and multiple infrastructure components key to the simulation. Chief among these was a highly detailed and geographically precise set of electrical sub-stations and 90 km of power lines. Along with the 1181 geo-positioned power pole models and the 17 substation models were several thousand buildings of varying complexity. "The project was interesting for me personally due to the time line for Phase II and the very specific accuracy requirements. The INL team was great to work with", said Jamie Renwick, Object Raku's modeling specialist.



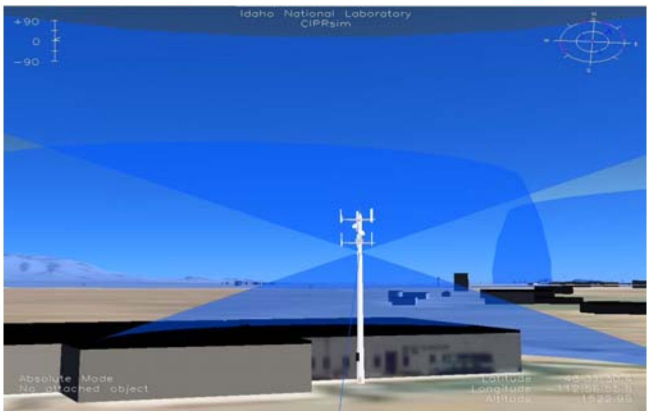
Building modeled for scene.

Above, for the buildings in Idaho data set 1, the goal was to model all buildings to closely match the actual buildings in the terrain zone as closely as possible. As a result, each model was textured with imagery when available. Buildings in this data set existed across approx 2000 square kilometers of terrain.

The terrains were created from geotiffs and DTED 2 while the power lines and models were geo-positioned using shape files provided by INL. Individual buildings and substations were created based on imagery and specifications defined by INL. Each tower and substation model was delivered in three versions: operational (natural photo texture), damaged (yellow tint to photo texture) and inoperable (red tint to photo texture).

To improve response and restoration efforts, the integration of advanced simulation and visualization technology into first responder practices is an important step forward. The development of technology such as CIPRsim enables first responders to run multiple scenarios of various disasters in their infrastructure sectors of interest. Consequently, crisis action plans are more accurate and complete, logistics support plans are refined, and the communities are better prepared for emergencies.

The scenes and infrastructure models developed by Object Raku were used to support the real-time modeling, simulation and visualization of critical infrastructure components and their status during an event. "This 3D visualization capability allows analysts, planners and responders the ability to view, in simulation-time, the aspects of the occurring event in a fluid and animated visual, similar to popular gaming environments involving 3D graphics models and their autonomy," says Shane Cherry of INL.



Above, a screen capture of the simulation in run-time. Note the transmitter model. It was created based on a supplied image (right) and schematics.