



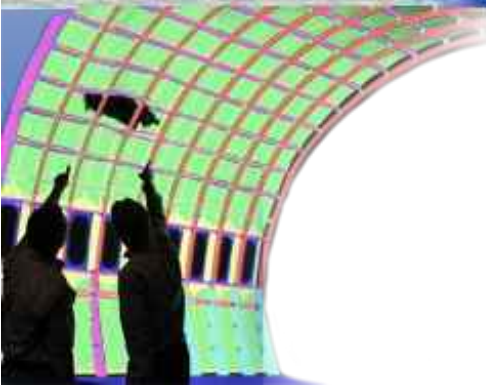
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Border Security: Systems Modeling, Simulation, & Analysis

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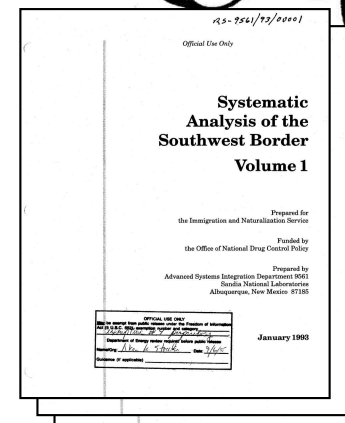
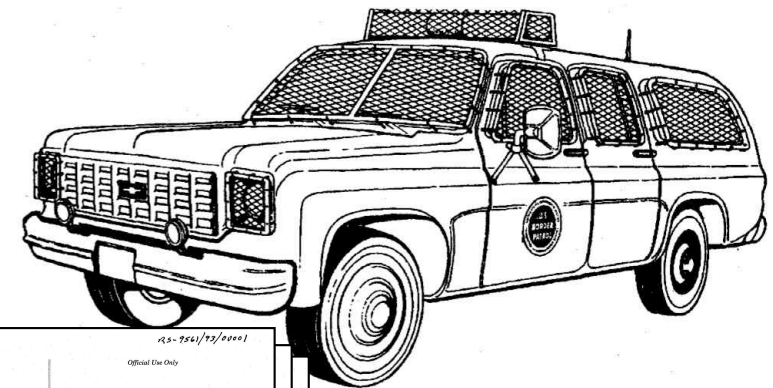
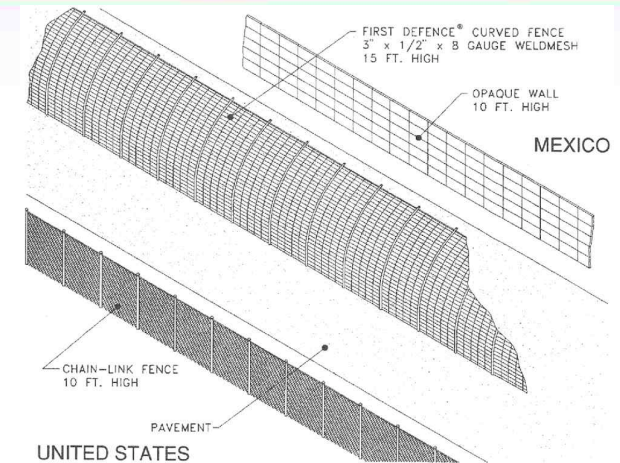


Border security requires a wide range of policies and technical decision making to be effective

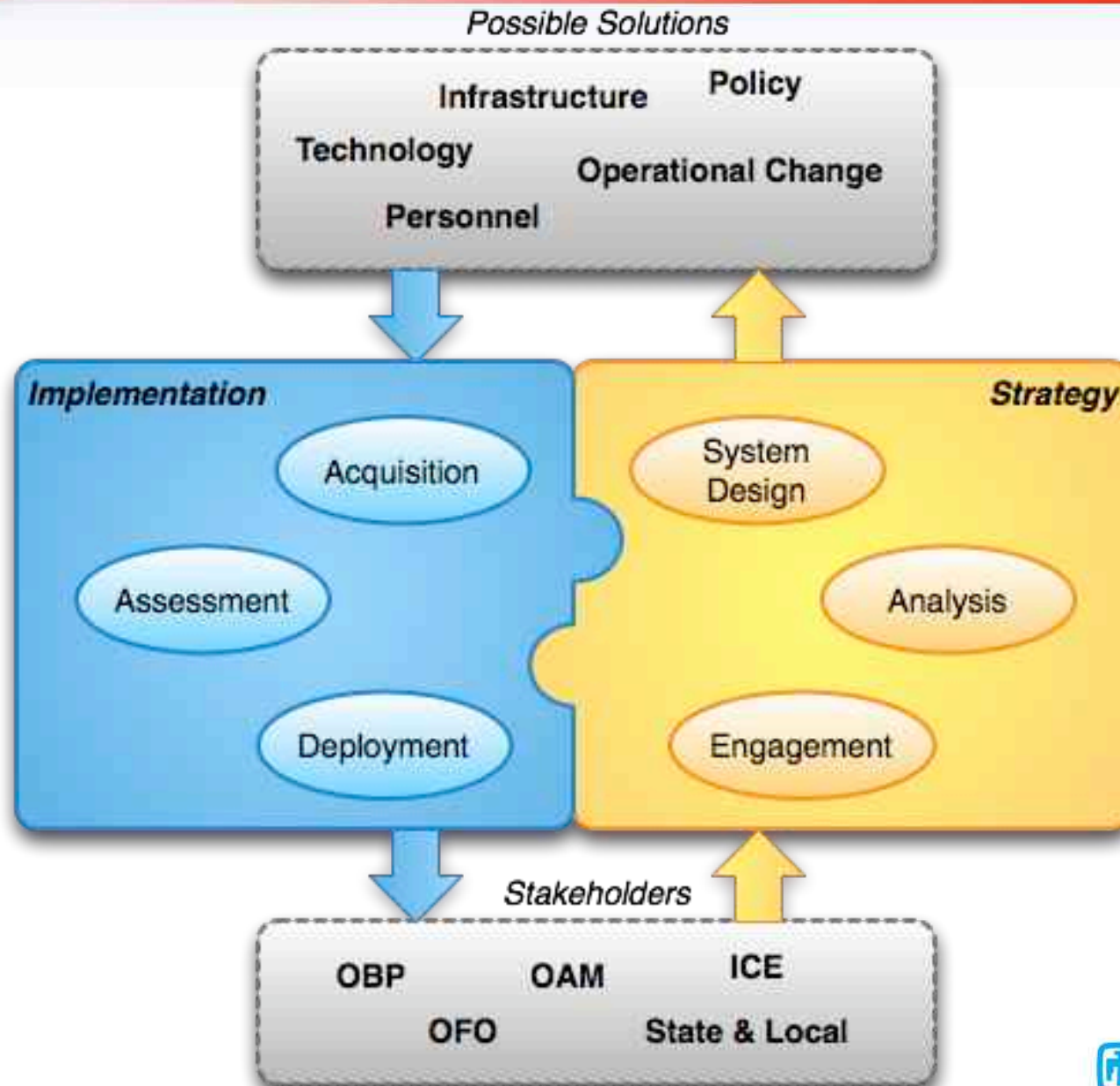


The 1993 Southwest Border Study applied an analytical approach to enhancing border control

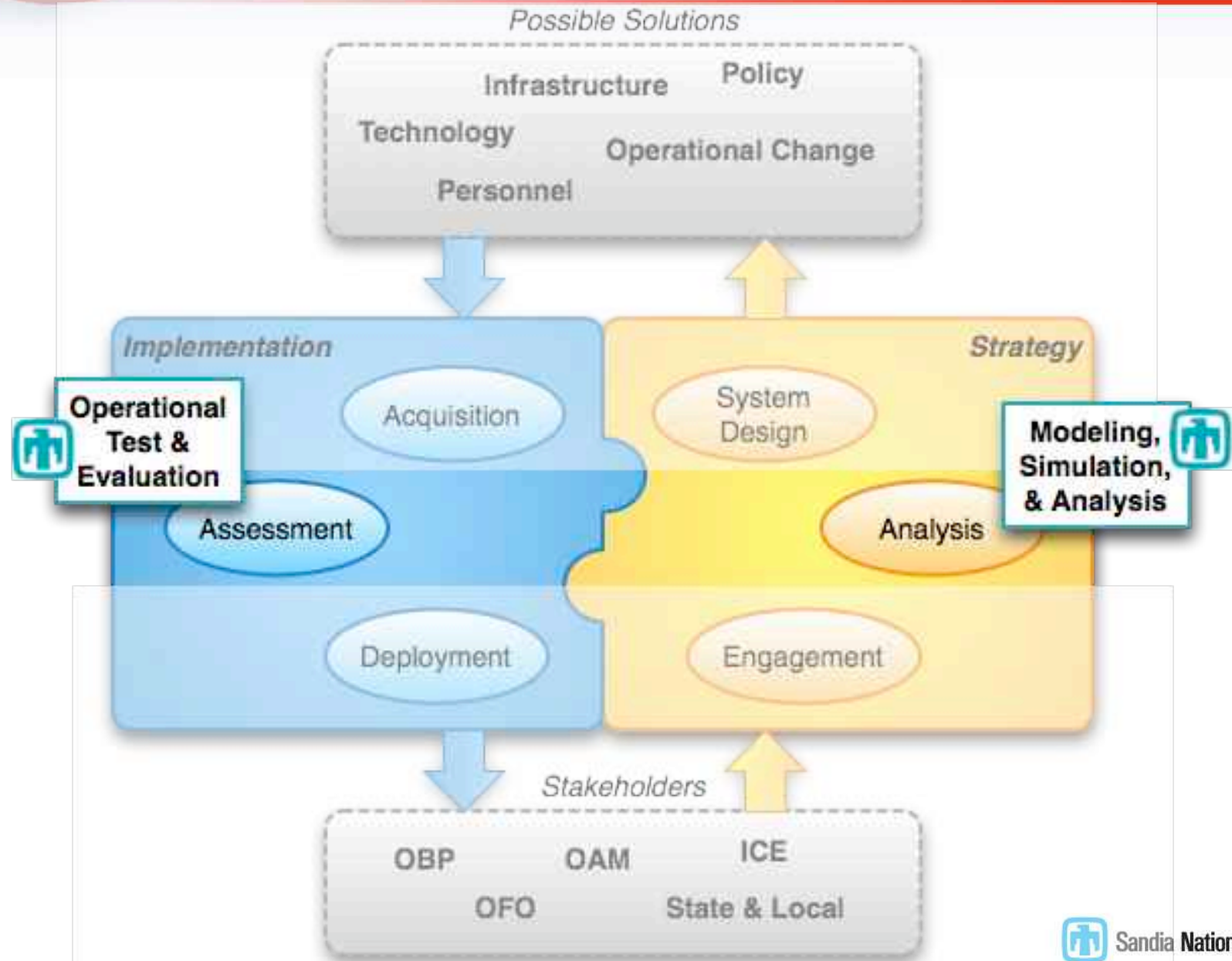
- Commissioned in 1991 by the (INS)
- Immigration and Naturalization Service
“Conduct a systematic analysis of the security along the United States & Mexico border between Ports of Entry (POEs) and to recommend measures by which control of the border could be improved.”
- Resulting report consisted of 3 volumes
 - Approach and recommendations (90 pages)
 - Archival description of border sectors with rationale for recommendations (406 pages)
 - Catalog of potentially applicable physical security equipment (199 pages)



Systematic approaches enable robust border solutions



Sandia builds on technical expertise to support a systems approach



Ground Truth: Borders uses serious gaming and MS&A to enable robust borders systems solutions

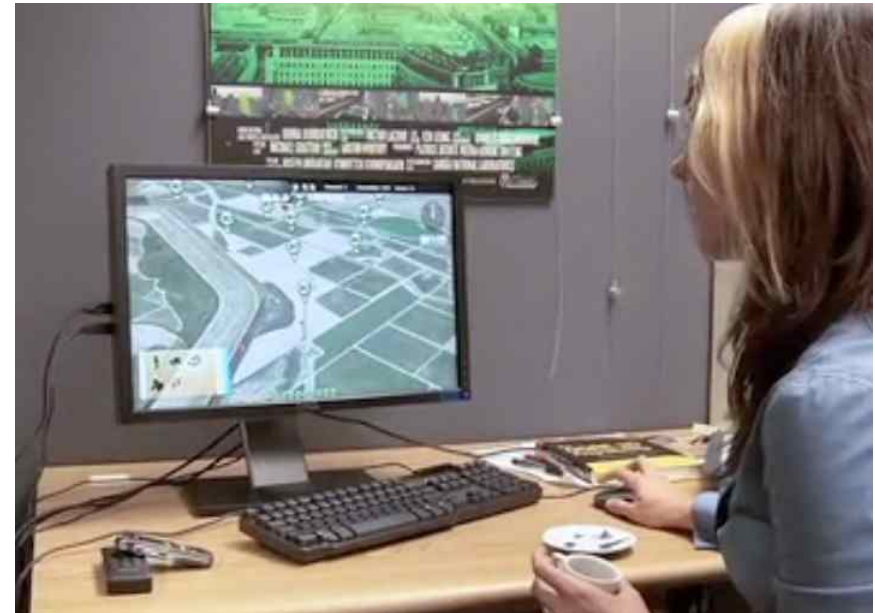
S&L LEOs OBP OFO OTIA



Engagement

Serious Gaming

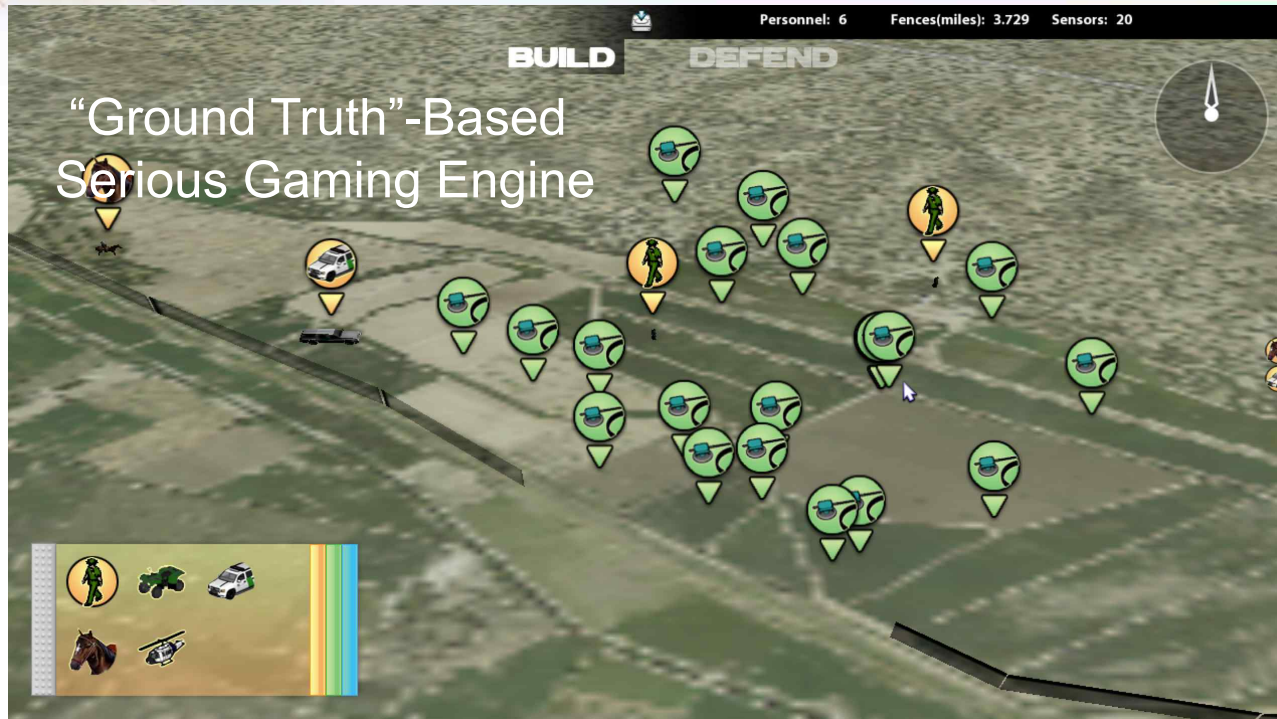
Analyst



Systems Studies

Modeling, Simulation, & Analysis

Serious Gaming and robust Physical Security MS&A in a border context



**Built-in
Analytical
Tools**

**DANTE-Based Physical
Security Simulation System**

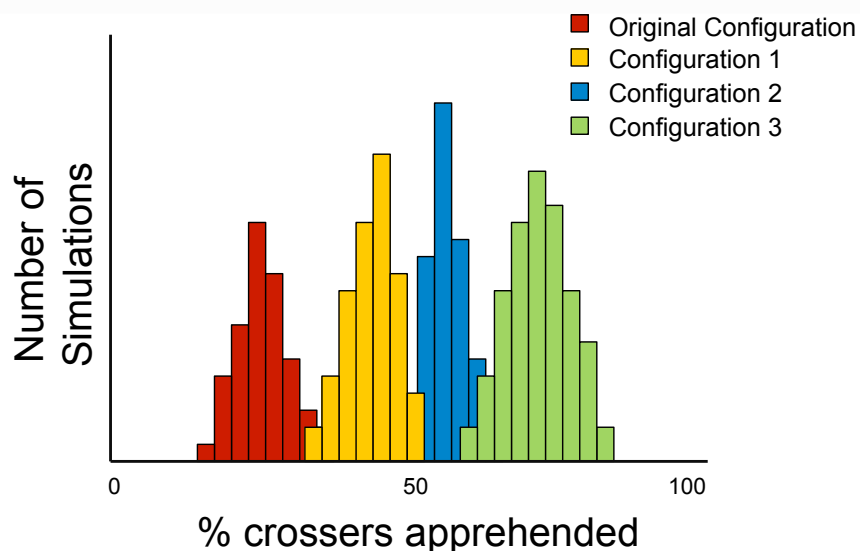
Paused 0 StepSize(0.01)
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**Path
Finding**

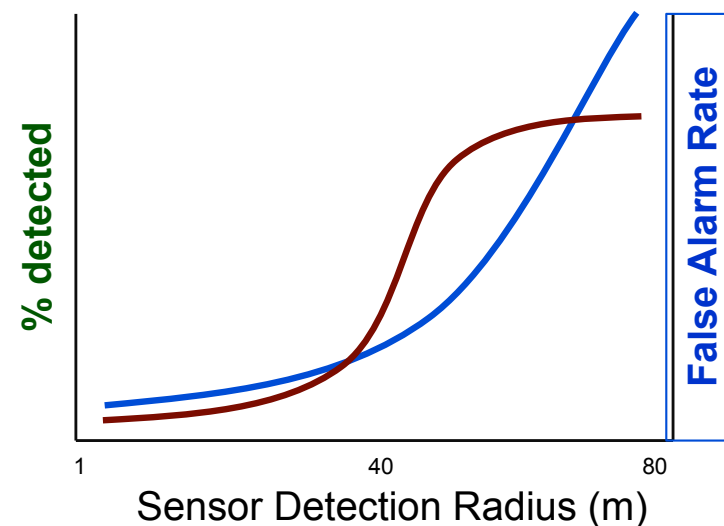
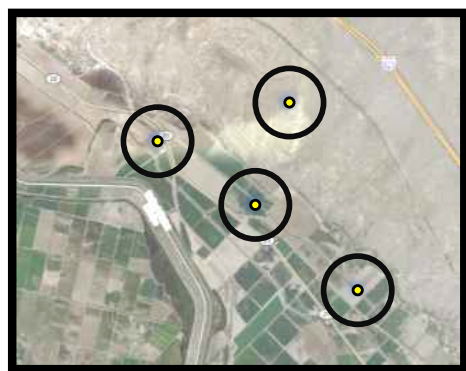
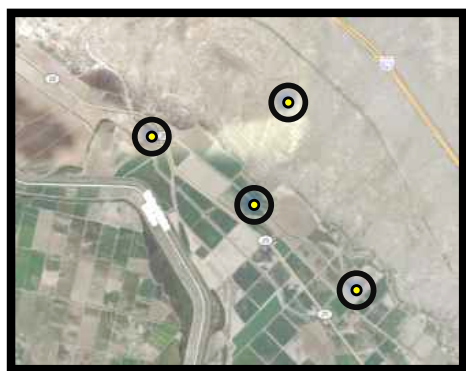
**Behavior
Models**


**Sensor
Models**

Ground Truth: Borders can help develop rigorous, defensible, analytical, results



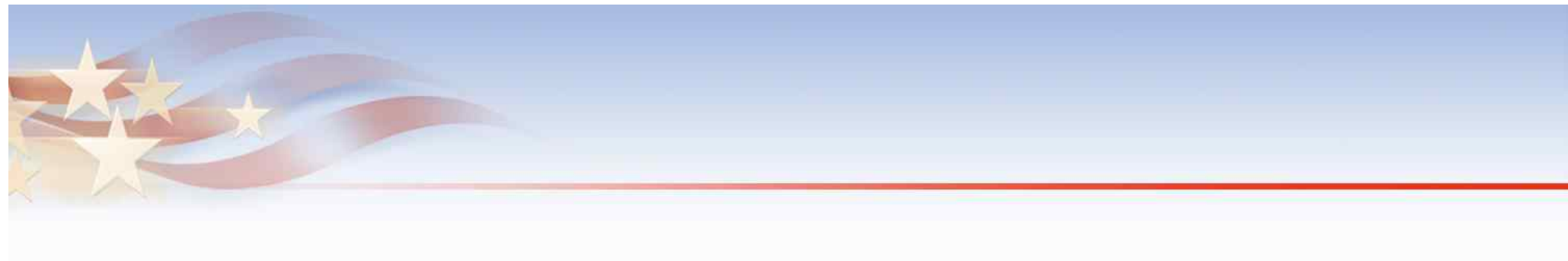
- Overall proposed architecture performance
- Changes in ConOps
- Infrastructure enhancement or degradation
- New or enhanced technologies





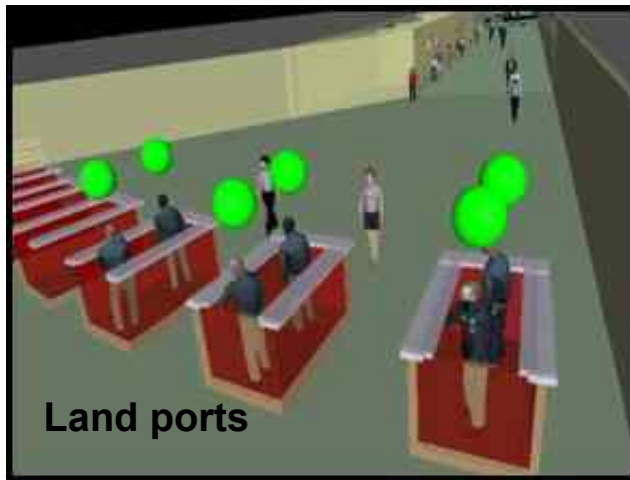
Sandia brings a systems approach to national security problems like border control

- **Conduct Systems Analysis to frame and understand the problem**
 - 1993 *Systematic Analysis of the Southwestern Border*, INS
 - 2005 *Improving Radiological and Nuclear Detection on the U.S. Border Between the Ports of Entry*, DNDO
 - 2010 *Southbound Interdiction*, LDRD
 - 2010 *Green Borders PRND for State and Local LEAs*, DNDO
 - 2010 *International Rail Crossing RN Detection Study*, DNDO
 - 2011 *Mexico and Latin America GNDAs Options Study*, DNDO
 - 2011 *Inbound Threat Study*, DHS Office of Policy
- **Perform and integrate R&D in serious gaming, modeling, and simulation**
 - 2005 *Borders Grand Challenge*, LDRD
 - 2007 *Ground Truth: Incident Commander*, LDRD
 - 2010 *Borders HLM*, DHS / CBP
- **Establish Strategic Technical Partnerships:**
 - University of Southern California, University of Utah, Ideum, Happynin' Games, Cortexnology, *University of Texas Austin*



Backups

The Borders Grand Challenge investigated the use of federated models to facilitate analysis



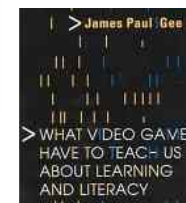
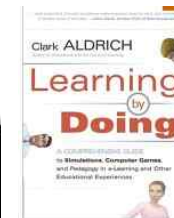
Integrated SoS Models and Analysis



Economic Models

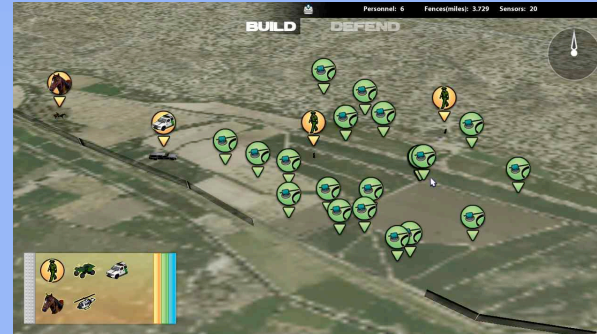
Serious Gaming exploits the human-interactive element of Modeling Simulation and Analysis

- Learn by doing
 - Authentic experience
 - Self-experiment within complex systems
- Leverages a huge industry
 - Driving technology
 - \$12.5 billion per year in software sales
 - World of Warcraft has 11.5 million subscribers worldwide
- Growing discipline
 - Conferences
 - Literature
 - Degree Programs



HLM enables the Engagement / Analysis process for border enforcement systems development

- Framing and Elicitation
- Baseline Performance Estimation
- Gap Analysis
- Options and Alternatives Development
- Analyses of Trade-offs
- Results and Recommendations



Engagement



Analysis

