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with even amount of white space  
between photos and header

## DOE/NNSA Application of Modeling and Simulation: Industry/Commercial Solutions

*SNL – Global Security Programs*

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# Modeling and Simulation for Physical Protection System Security – History

- Late 1980s, AF began using LLNL's Security Exercise Evaluation System (SEES) for FoF modeling
- SEES was a variant of the Urban Combat Computer Assisted Training System (UCCATS) – Army Simulation
- SEES was an improvement over JANUS, developed in the 1960s to model the effects of nuclear blasts on people and vehicles, later modified to include other weapons effects (leading to its use as a combat simulation)
- Early 1990s, DOE/NNSA began to use SEES for PPS Analysis to augment FoF data
- SEES/UCCATS were merged into a new SAF called the Joint Tactical Simulation (JTS) about 1994
- By 1994, most DOE/NNSA sites had begun use of JTS to augment their FoF data
- By 1996, most DOE/NNSA sites had installed their own systems, and DOE HQ had a system in Germantown
- DOE policy by 1996 included JTS as one of the approved VA tools, basing the results of the Air Force's verification, validation, and accreditation project of JTS
- JTS revised to JCATS in 1997
- Since 1997, JCATS has been the approved/accepted means of PPS Security throughout DOE/NNSA, DOD, NRC, NATO, and DOS Critical Infrastructure.

# Sandia National Labs Leadership in PPS Mod/Sim for DOE Complex

- Establishment of Mod/Sim VA lab in 1990s that would be gold standard for DOE complex
  - Analysis
  - Performance Based Approach (DOE approved databases)
  - Training - TTPS
  - Partnership with DOE/NTC
- Wrote Code/Developed Methodology for PPS path analysis
  - Path analysis (ASD) and FoF combat effectiveness simulation contribute to PPS System Effectiveness Formula
  - Two components together would be forever linked – important for 2000s Mod/Sim development
- Utilization of PPS Subject Matter Experts (SME) to drive PPS Analysis

# Evolution of Combat Effectiveness Analysis

- Force on Force – Live security exercise
  - TTPS/CONOPS
  - Battle Space – Micro Terrain
  - MILES Gear
- Table Top – Map exercise
  - ROE
  - SME Discussion
- Constructive Simulation – Human in the loop
  - Data
  - High Flexibility
  - Full Sensitivity Analysis
- Constructive Simulation – Single analyst
  - Monte Carlo (high number of runs)
  - Objectivity
  - Character AI

# Single Analyst Tool Growth

- Each tool originated from a different background/strength
- No industry standard
  - Different formats
  - Different terrain methodologies
    - Different combat models
  - Different library/database structures
  - Different interface – script based/menu based
  - Different character AI methodologies
  - Different path planners
    - Road networks
  - Different detection methodologies
  - Different vector capabilities (Air insertion, ground combat, surface water, sub-surface water)

# Sandia National Labs – Global Security Programs

## Mod/Sim Mission



- Establishment of Mod/Sim Program that would be aligned with DOE policy
  - Analysis (multiple vector, multiple targets)
  - Performance Based Approach (DOE approved databases)
  - Training - TTPS
- Establishment of Mod/Sim Program that would support mission of SNL – Integrated Security Facility (ISF)
  - COTS Solution for PPS Security
  - Exportable for International Partners
  - Established company with large portfolio
- Ability to Grow Program
  - Path analysis (ASD) and FoF combat effectiveness simulation contribute to PPS System Effectiveness Formula
  - Two components together would be forever linked – important for 2000s Mod/Sim development

# Global Security Programs Mod/Sim Mission – What was needed??

- Content Creation
  - Models (Conceptual design, Analysis)
  - Terrains (Micro Terrain – high fidelity)
- Character AI
  - Behaviors
  - CONOPS/TTPs
  - ROE
- Simulation
  - PPS
  - Red vs Blue (evaluate DBT)
  - Multiple vectors (Air, Land, Sea)
- Visualization
- HMI

# Global Security Programs Mod/Sim Mission – Solution



STAGE



Creator Pro



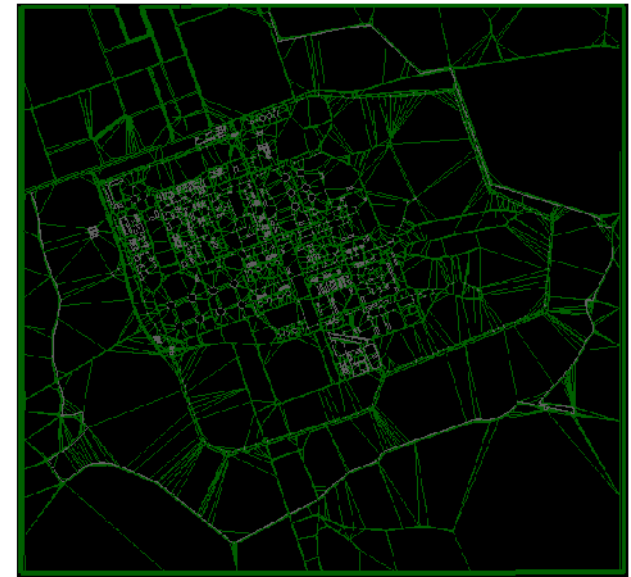
AI.implant



VAPS XT



Terra Vista





# Global Security Programs Mod/Sim Mission – Applications

- Analysis
  - PI, PN, PE, Risk
  - Detect, Delay, Respond
  - C2, Situational Awareness
  - AC&D
- Training/Planning
  - Scenario Development
- Demonstration
  - Concepts
  - Visualization
- Design
  - PPS Design
  - Procedures

# DEMOS