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## 3-D Visualization and Post Analysis Tool for JSAF Scenarios

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# Agenda



- JSAF (Joint Semi-Automated Forces)
- Clutter simulation
- ModStealth
- HLA/RTI
- STK Gateway
- STK performance optimization
- Conclusion



# JSAF (Joint Semi-Automated Forces)



- Toolkit for joint experimentation
- Distributed, interactive, human-in-the-loop simulation of joint battle-space
- Entity-level simulation
- Multiple levels of resolution and control
  - Surface, subsurface, ground, and air
- High level of detail
  - Physical components, vehicle behavior components, unit leader behavior



# Clutter Simulation



- Provides background vehicles and civilians to serve as sensor clutter
- ClutterSim simulates different types of clutter:
  - Ground vehicle clutter
  - Pedestrian clutter
- ClutterSim simulates different behaviors of clutter:
  - Static clutter
  - Commuter clutter
  - Source/Sink clutter
  - Crowd clutter
  - Commuter clutter



# ModStealth



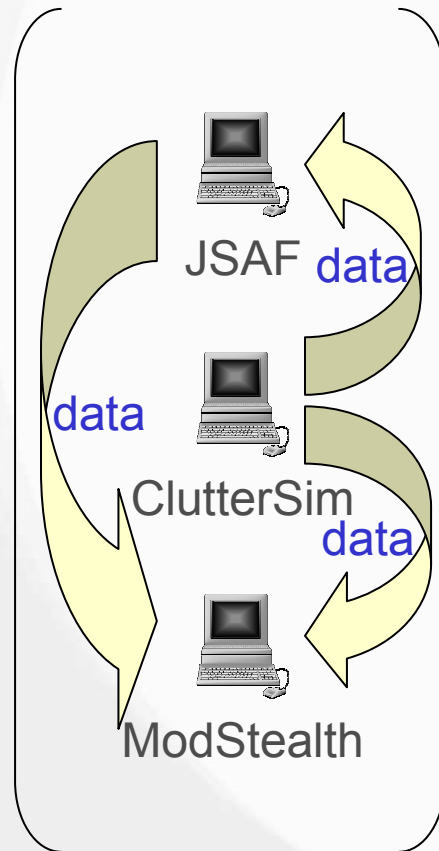
- ModStealth is a modular stealth visualization tool for the real-time depiction of the Synthetic Battlespace
- Displays the simulation of entities
- Displays sensor footprints
- Displays environmental phenomena such as:
  - battlefield smoke
  - explosions and weapon effects
  - atmospheric transmittance
  - varying illumination with time of day
  - signal and illumination flares
  - atmospheric clouds and fog
  - precipitation



# HLA (High Level Architecture) RTI (Run Time Infrastructure)



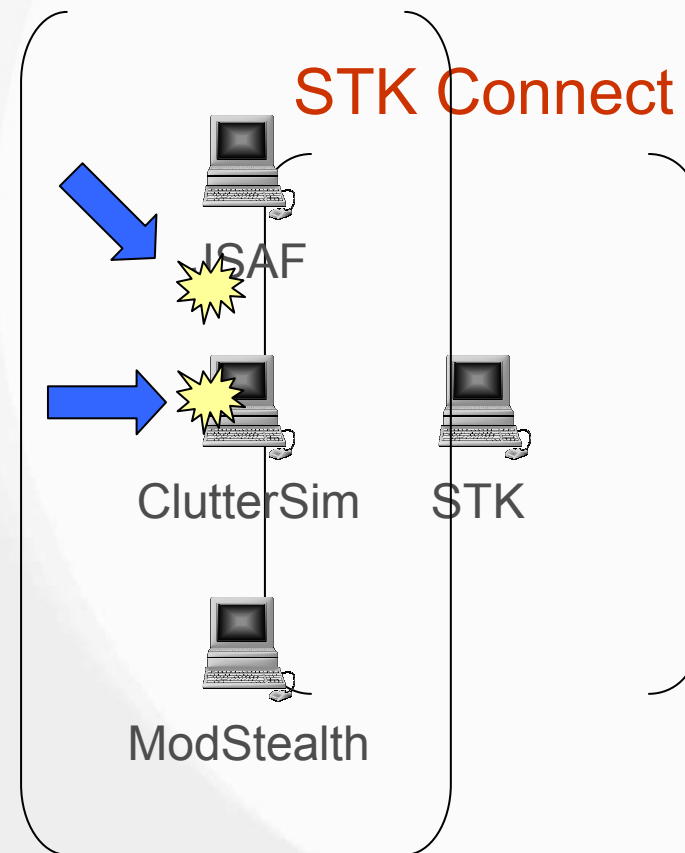
## HLA Federation



# STK Gateway



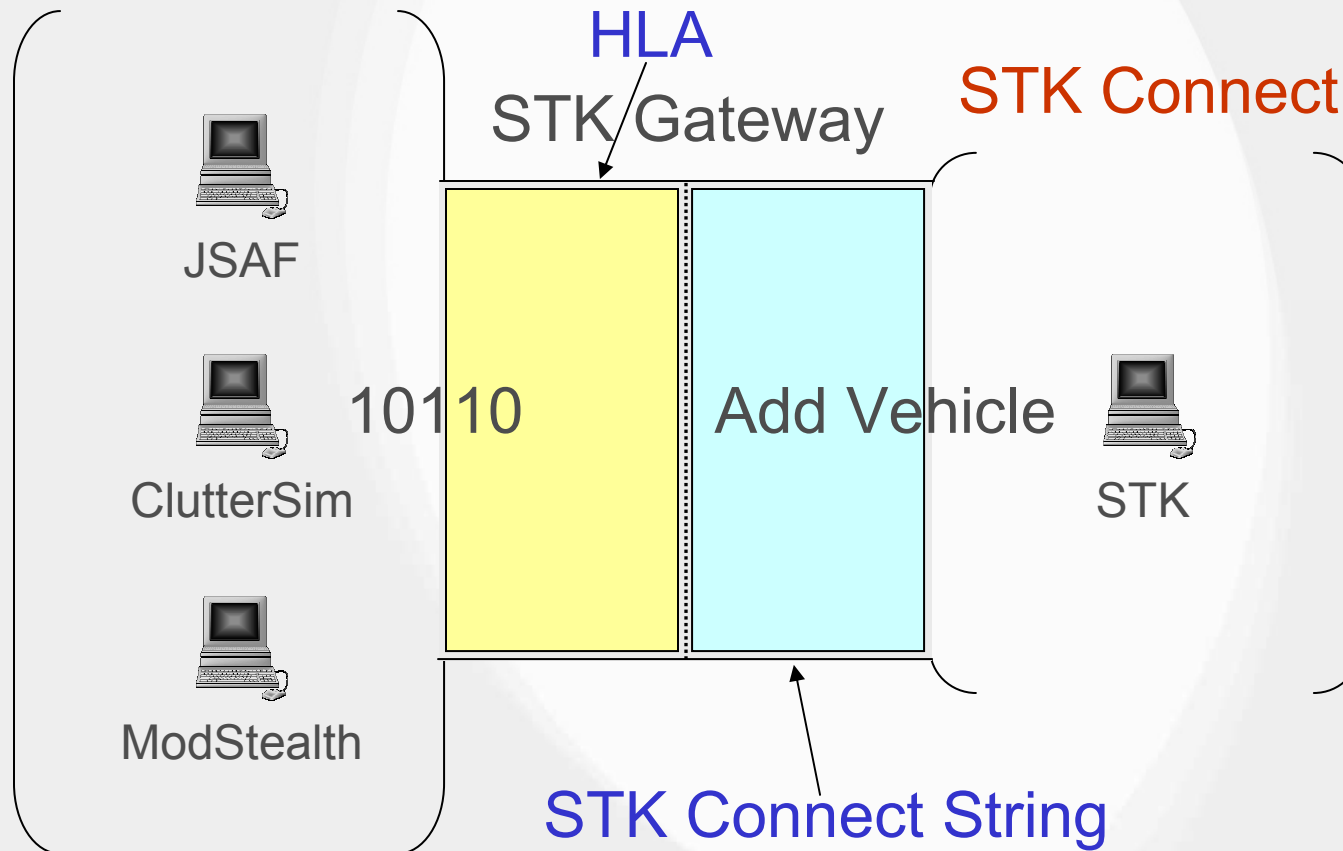
## HLA Federation



# STK Gateway



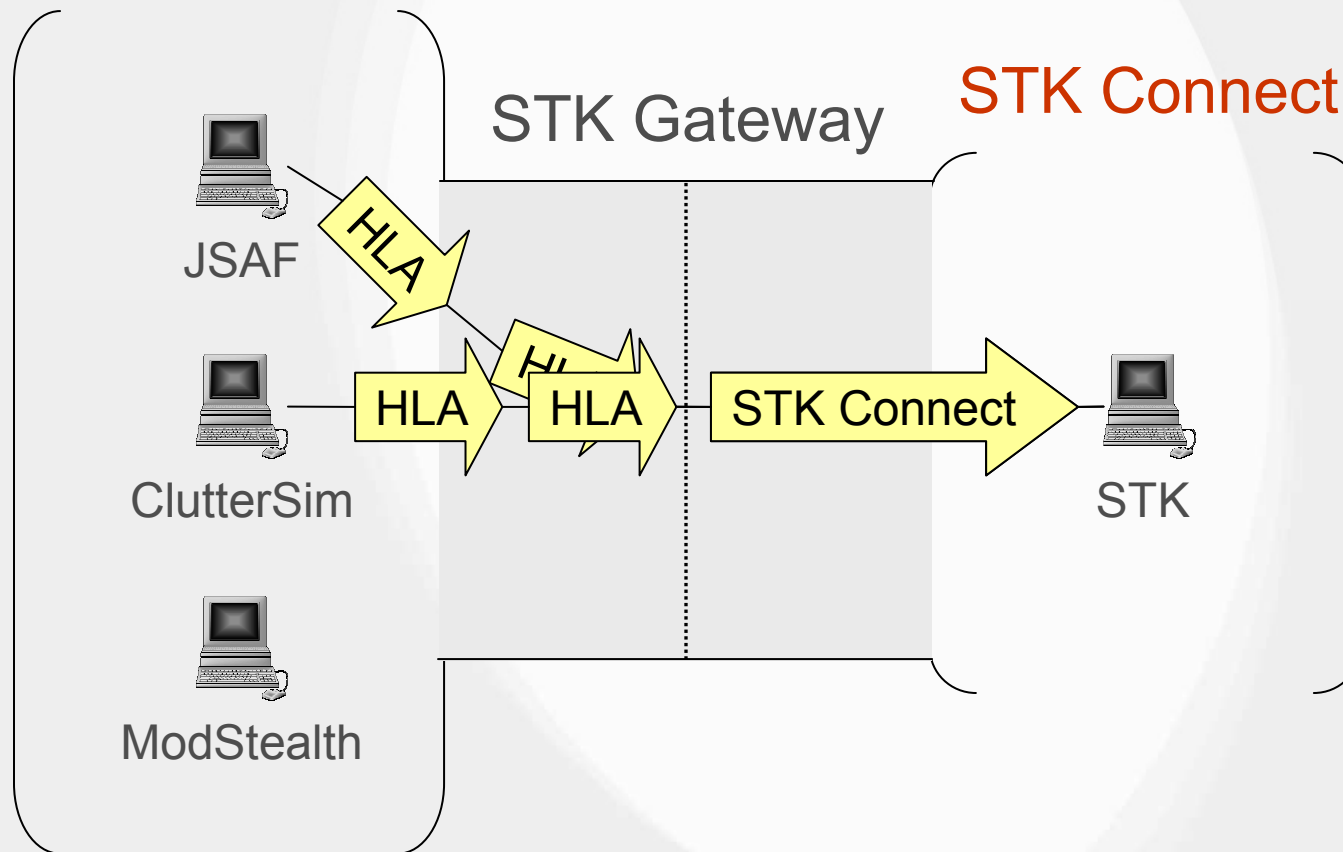
## HLA Federation



# STK Gateway



## HLA Federation



# Performance Optimization: Overall



- To improve STK's overall performance for both
  - “vehicles of interest”, and
  - “background vehicles”
- The following were used:
  - Turn off Acknowledgement Control
  - Turn off Verbose modes
  - Turn off Connect Command Logging
  - Used Refresh Delta mode (max 30 fps)
  - Used SetAsDefault to store common entity attributes
  - Closed/minimized the 2-D map window



# Performance Optimization: Background Vehicles



- Adjusted the Connect Polling period to 10 milliseconds
- Used STK's Multi-Track Object (MTO)
- Used BatchGraphics mode
- Assigned a short viewable range for a background vehicles 3-D model
- Assigned a short lead and trail track time for a background vehicles track lines
- Removed all articulations from models that were being modeled as background vehicles



# Conclusion



- Simulation tools like JSAF and STK complement each other:
  - JSAF is a popular simulation tool used by the military for research and training.
  - STK provides a unique space-based sensor point of view with tools to record and analyze scenarios.

