Rapid and accurate simulated space events for Test, Training, and Exercise (TTX) support.

SEG allows non-expert operators to quickly develop accurate, physics-based scenarios of common space events, from single object maneuvers to complex, linked, multi-object interactions, using simple, GUI-based operator workflows.


Use cases supported

- Repeatable, tailorable operator procedure training
- "Day in the life" training
- System performance tests
- Exercise support
- Simulated over live
- Proof of concept studies (e.g., adding sensors)
- Mission planning
- Tactics development

Key value points

- Doesn't require operators with extensive astrodynamics expertise to create accurate, realistic space events
- Enables rapid generation of simulated tracking observations and "truth" ephemeris
- Easier to use and more accurate than morphed historical data

Enterprise Workflow

- Copy state data from SSA database for exercise/training
- Build scenario(s) in SEG:
    - Define events
    - Define sensor cadence
- Run scenario(s) in SEG to create obs
- Use obs in SSS/other for exercise or training (can layover real data if desired)
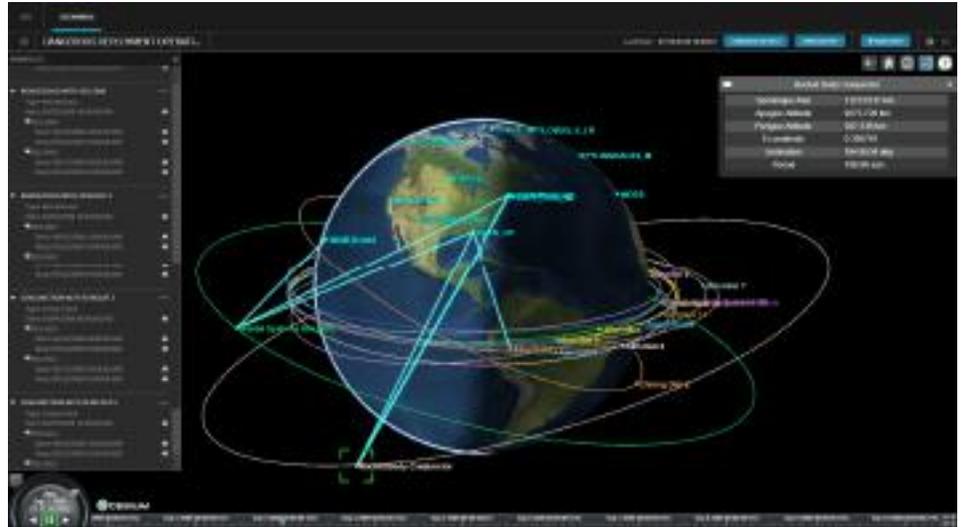
Core capabilities

- **Time independent**. Events and observations can be synchronized to run in current time, or in past or future epochs, and can be combined on a user-defined timeline to generate a complete exercise scenario.
- **Robust 3D visualization**. A 3D visual interface provides an easy way to visualize the scenario events.
- **Accuracy**. SEG accounts for space weather effects, sensor performance models (including lighting and elevation constraints), and force models based on orbit class.
- **SOA Architecture**. SEG's Service Oriented Architecture with clearly documented API's enables the use of web services for direct integration with customer architectures or COMSPOC's SSA Software Suite.
- **User workflows**. SEG includes a variety of pre-defined event types out of the box and easy to use, operator workflows, enabling rapid scenario creation.

Supported space events

- Proximity Operations
- Conjunctions
- Docking & Separation
- Orbital Intercept
- Deployment
- Maneuvers
- Rendezvous
- Deorbit
- Launch
- ASAT
- Reentry
- Breakup

Technical Details

Enterprise architecture

- Multi-user: share scenarios and results across the enterprise via a single, common database
- Security: integrates with enterprise authentication services
- Scalable: supports large scale simulations; scales calculations across compute nodes
- Browser-based UI

Sensors

- Sensor access calculated and visualized in the Scenario view
- Supported sensor types: optical, RADAR, space-based
- User-defined sensor cadences: tracks/day, observations/track, trackers, timestep, and revisit time

Catalog Event

User-defined list of 1 to n (no limit) RSOs propagated over the scenario time span. These background objects provide additional realism and complexity to the simulated scenario.


Maneuvers

- Users can model maneuvers as either impulsive or finite
- Finite maneuvers are modeled using engines with constant thrust and Isp
- Users can define their own engine models or select from those provided

Ephemeris Event

The ephemeris event allows users to directly define a SEG event using externally provided ephemeris. This allows creation of more complex events using external tools such as STK.

Objects

- SEG enables use of real world, SSN catalog objects and simulated, user-defined objects in concert
- This approach supports simulated over live operations
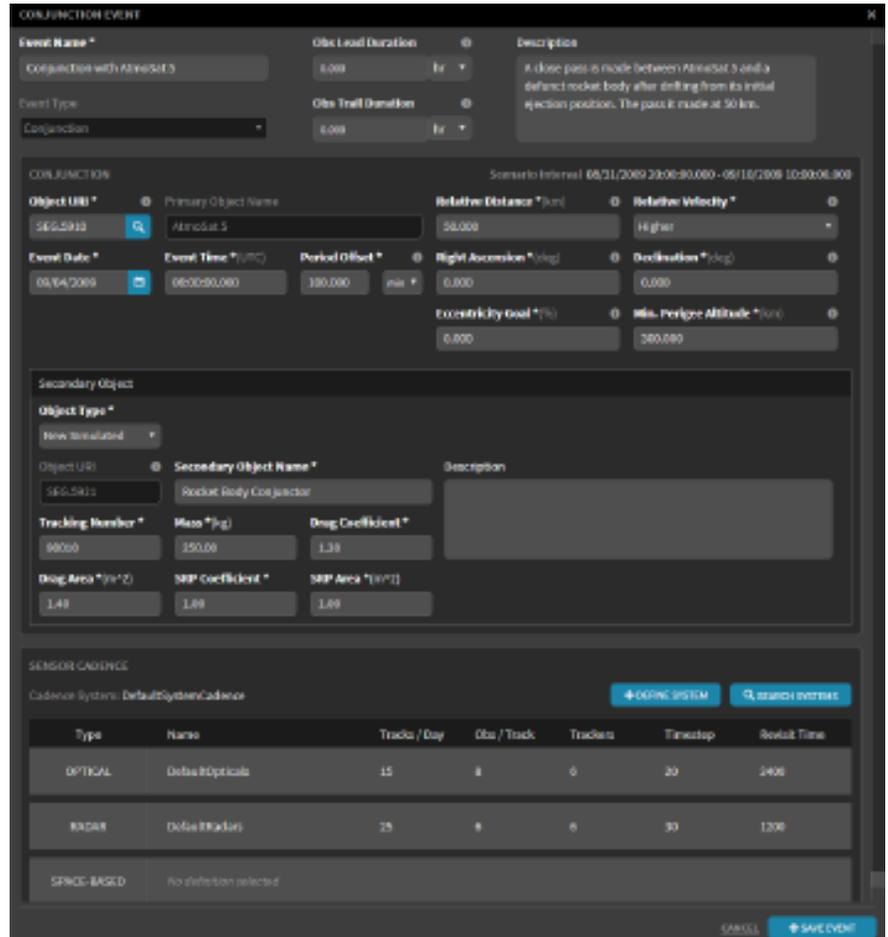
Scenarios

- A container for a collection of events over a span of time
- Users can combine and reuse existing events into different scenarios

Linked Events

- Users can link multiple events without having to manually solve for the intermediate maneuvers
- SEG automatically calculates the requisite maneuvers using Lambert's solution to link the events
- These orbit transfer maneuvers may be modeled as either impulsive or finite

Outputs

- B3 observations
- Ephemeris
- Can then be fed into a flight dynamics or catalog processing system
- Segment reports
- VDFs for use in STK