Ansys

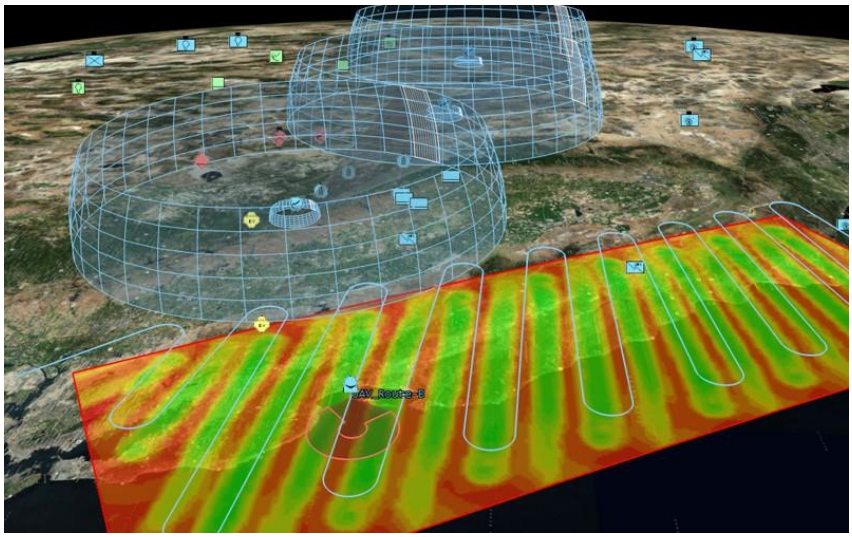
MISSION

STK Pro

Modeling and simulation software for digital mission engineering and systems analysis.

STK Pro provides a foundation for analyzing and visualizing complex systems in the context of their missions. Create multi-domain scenarios that extend simulation beyond systems to an interactive model of the operational environment. Simulate your intended missions and communicate your results with reports, graphs, and stunning 3D animations. Work directly with STK's graphical user interface or use STK Pro's robust, documented APIs to automate workflows, integrate with other applications, or create customized tools.

For over 30 years, our customers have relied on STK to inform their designs and support critical mission operations.



Sample Use Cases

- Space Mission Systems Design
- Space Operations
- Air Mission Systems Design.
- Advanced RF Systems Design
- Multidomain Concept of Operations
- Telecommunications Network Planning and Design

Core Functionalities

- **Analysis and Output**
- **RF Modeling and Analysis**
- **Integration Interfaces**
- **Custom Application Development**

Specifically, you can:

- Model facilities, aircraft, ships, missiles, and satellites
- Attach subsystems such as antennas and sensors
- Visualize your scenario in a time-dynamic 3D environment
- Analyze system performance across coverage grids
- Model vehicle and sensor fields of view
- Create custom analysis functions
- Analyze RF, optical, and radar system performance
- Integrate with third party tools via a robust API
- Develop custom apps with the *STK Engine* software development kit

Learn more
ansys.com

Key Value Points

- Includes comprehensive common capabilities that you can use immediately and effectively to reduce costs — as opposed to in-house or contract development projects.
- Includes customer support that connects you directly to an engineer and access to on-demand and instructor-led training.
- Empowers engineers to continuously validate system capabilities and verify that mission requirements will be met.
- Provides a common environment for teams creating authoritative models throughout the engineering life cycle.
- Connects disparate digital engineering tools and data formats across enterprise and organizational boundaries.
- Engages all stakeholders and decision-makers with easy-to-understand, mission-focused analysis, reporting, and visualizations.
- Creates 2D and 3D graphics that enable you to communicate complex physical relationships easily, through compelling images and animations.
- Analyzes the performance of a system or system of systems in a single modeling environment.
- Turns information into intelligence, enabling you to deliver highly complex systems to market more rapidly, and with greater confidence.
- Connects all your engineering decisions to the mission.

Core Functionalities

Analysis and Output

STK Pro is built for comprehensive analysis, enabling you to define and understand complex relationships between objects and analyze their performance over time. You can generate output to convey results in the form of reports, graphs, color-graded maps, images, and videos.

Access

The *Access* tool enables you to determine the time(s) that one object can "access" (i.e., see or communicate, with) another object(s), while considering mission and environmental constraints.

Sample Use Cases:

- Assess lighting, terrain, and position to calculate when you can see the International Space Station (ISS).
- Validate mission requirements by assessing the operational environment to confirm that a vehicle will always be within sight of at least three communication nodes.
- Compute a dynamic link budget to determine when your carrier to noise ratio constraint has been met.

Analysis Workbench

STK's *Analysis Workbench* capability, made up of the Time, Vector Geometry, Calculation, and Spatial Analysis tools is designed to extend the fundamental computational capabilities of STK. Use them to create powerful calculation functions using time, custom vectors, or physical positions as conditional variables. These calculations and functions seamlessly integrate into STK's reports, graphs, and visualizations, or can be exported and shared between different scenarios. *Analysis Workbench* also comes with an extensive selection of predefined functions to immediately solve your most difficult problems.

Sample Use Cases:

- Use a volumetric grid around a transmitter to determine the signal to noise ratio of a receiver at each grid point.
- Determine the angle between the Sun and a satellite's onboard camera to keep it from staring into the Sun.
- Generate a custom pointing vector from a UAV to dynamically target an object or vehicle of interest.

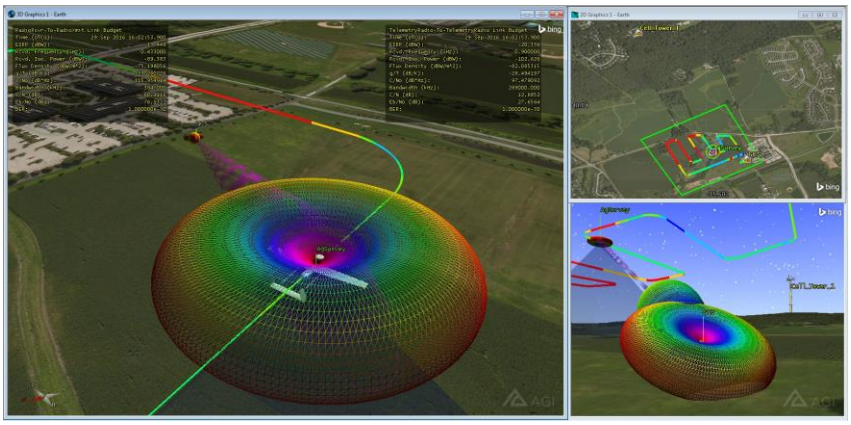
Coverage

STK's *Coverage* capability takes point-to-point analysis to the next level. *Coverage* computes the quality of access from an object to each grid point in an area of interest — for example, the minimum number of GPS satellites visible to a ground asset over the mission duration. Use *Coverage* to analyze and visualize your system's performance anywhere in a coverage grid. Conduct visibility or RF analysis in discrete, distributed areas, as seen from one object or a collection of them. Summarize your analysis in terms of traditional metrics such as response and revisit times, or customizable qualitative measures such as average elevation angle. Review reports and graphs of the analysis directly on screen, displayed either as cumulative values over a period or instantaneous values. Then, communicate your results with illuminating 2D and 3D visualizations.

Sample Use Cases:

- Validate coverage and redundancy requirements for a satellite constellation, including the impact of changing the number of assets.
- Select the best aircraft flight path to maximize navigation accuracy.
- Optimize the placement of ground terminals to meet mission communication requirements.

RF Modeling and Analysis



In addition to comprehensive, all-purpose modeling and analysis capabilities, STK also includes domain-specific *Communications* and *Radar* capabilities. With the *Communications* and *Radar* capabilities, you can add industry-standard RF and optical modeling to your STK mission scenario. You can also model and analyze propagation losses due to elevation and urban terrain data using STK's *TIREM* and *Urban Propagation* capabilities.

Communications

STK's *Communications* capability enables you to quickly build high fidelity models of communication systems for mission modeling and analysis. Define or import detailed transmitter, receiver, and antenna models, conduct comprehensive link budget analyses, and immediately visualize the impact of communications system performance on the mission. You can use this analysis to identify effective antenna placements and orientations, plan for link outages, determine asset redundancy, inform flight or vehicle routes, and more.

Sample Use Cases:

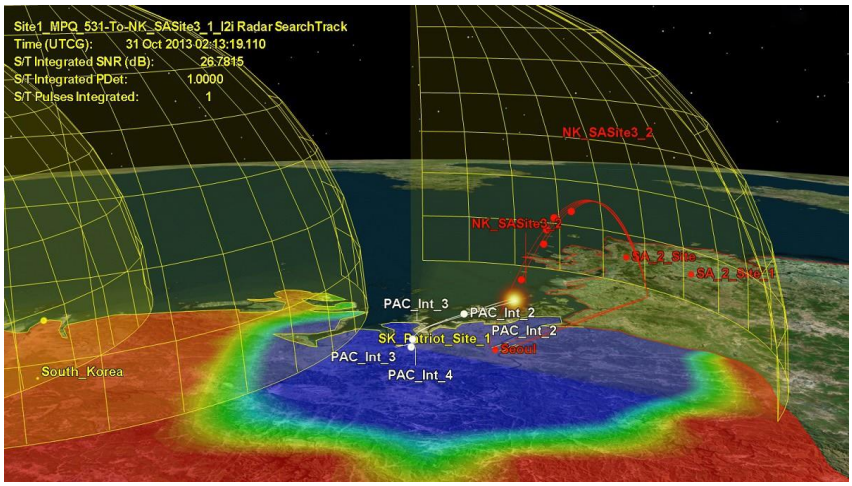
- Attach transmitters and receivers to STK objects such as satellites and aircraft to analyze link budget performance in a dynamic mission environment.
- Conduct jamming and interference analysis.
- Include GPS and communications signal strength in aircraft mission planning.
- Analyze network architectures in operational mission environments.
- Demonstrate mission impacts of a new antenna's technology before it's ever built.
- Analyze the impact of vehicle structures on antenna patterns, antenna placement, and signal performance to decrease in-flight testing costs.
- Create an animation of communication system performance for a compelling presentation.

Communications includes numerous RF and optical environment models and more than 60 antenna model types. You can also import custom and third-party models (ITU, REMCOM, Ansys), and edit the included models. Time-varying constraints — such as Doppler shift and bit error rate, linked with its full range of environmental models — enable *Communications* to provide link performance analysis that no spreadsheet can match.

Communications is fully integrated with most of STK's other analytic capabilities, including 2D coverage and 3D volumetric analysis, the advanced computational power of Analysis Workbench, and STK's detailed reports and graphs. 3D displays of RF variables — including signal performance contours and beam volumes — enable you to immediately understand communications system behavior. Easily integrate with MATLAB and other third-party applications with multiple interface options.

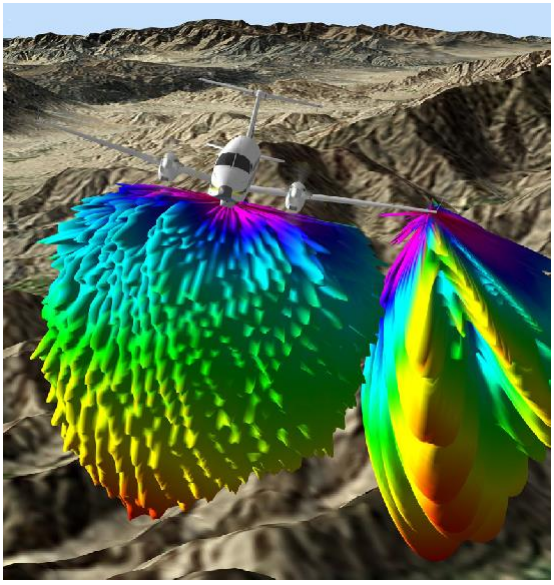
/ Radar

STK's *Radar* capability simulates monostatic, bistatic, and multifunction radar systems in a variety of modes, including synthetic-aperture radar (SAR) and search and track. You can attach radar objects in STK to other "platform" objects, such as satellites, vehicles, and facilities. *Radar* objects inherit the parent object's position, orientation, and motion so that you can build your scenario quickly and start analyzing.



Radar provides several antenna models, and you can import your own custom models. *Radar* supports Ansys HFSS far-field antenna patterns, and externally defined antenna patterns — either static or time dynamic. *Radar* also includes an element designer for configuring phased arrays. To visualize performance, you can display the contours and beam volumes for antenna gain patterns and RCS patterns in STK's 2D and 3D graphics windows. *Radar* also works with STK's *Coverage* and *Analysis Workbench* to compute and display jamming and interference analyses on planar coverage grids and spatial volume grids, respectively.

With time-varying constraints such as Doppler shift, signal-to-noise ratio (SNR) and P_{Det}, linked with a full range of environmental models, you can analyze the performance of a complete radar system.

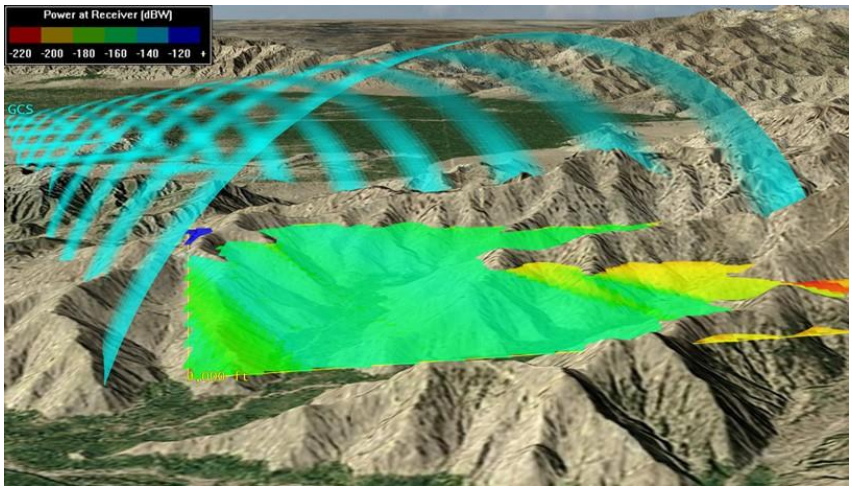


Sample Use Cases:

- Predict radar system performance in a dynamic environment and evaluate against mission requirements.
- Compute radar access to determine which beam offers the best SNR or P_{Det} to detect a target while tracking other assigned objects.
- Define optimal placement of sensors.
- Conduct inference studies.
- Model Sun, Earth, cosmic, and other environmental impacts on signal attenuation and radar receiver temperatures.
- Determine latencies from deep space.
- Beam steer and/or null steer phased array radar elements to detect a target or mitigate interference.

/ Terrain Integrated Rough Earth Model (TIREM)

STK's *TIREM* capability adds fidelity to RF calculations and dynamic modeling by enabling you to consider propagation loss due to irregular terrain, seawater, and non-line-of-sight effects for ground-based and airborne transmitters and receivers. *TIREM* has been the U.S. government standard since 1967.

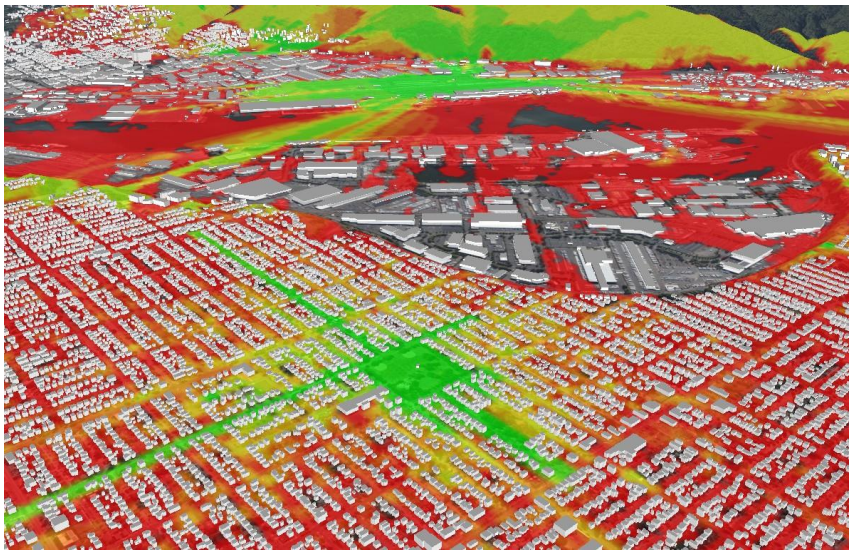


Sample Use Cases:

- Model near-field effects and power density.
- Examine the elevation profiles and, based on the geometry, select the optimum model for the calculations
- Select appropriate modes of propagation for paths based on the geometry of the profile — such as multiple knife-edge diffraction and troposcatter.

/ Urban Propagation

STK's *Urban Propagation* capability, powered by REMCOM's Wireless InSite® Real-Time propagation algorithms, computes diffraction losses in urban environments. This capability offers an unmatched combination of fidelity and speed compared to empirical and full-physics alternatives, across a broader range of frequencies and link geometries. These attributes make it ideal for defense and intelligence applications involving trade studies, time-based scenarios, and coverage analysis.



Sample Use Cases:

- Compute diffraction losses in an urban environment and apply them to your link budget, accounting for the impacts of buildings, terrain, and ground reflections.
- Plan for link outages and asset redundancy.
- Determine optimal placement of antennas, flight routes, and test locations.

Parallel Computing

As the level of detail required for a calculation grows, so does the amount of time and memory needed to compute it. STK's *Parallel Computing* capability accelerates computations by enabling STK to distribute its most resource intense tasks across multiple computing cores. STK Pro includes the ability to scale using up to eight local cores, with additional cores, server, cluster, and cloud options available with additional licensing.

Parallel Computing also includes software development kits (SDK) for .NET, Java, and Python. These SDKs make it easy to parallelize the execution of custom models and algorithms.

Key Value Points

- Reduces design time and maximizes fidelity.
- The number of cores is configurable, ensuring control over reused worker processes.
- Automatically turns on and off for all supported computations.
- The Integrated Job Monitor tracks status and progress of parallel jobs as they execute.

Integration Interfaces

STK Pro's extensive integration capabilities enable you to automate repetitive tasks, such as large-scale trade studies, import data from external sources, build custom workflows or user interfaces, or integrate STK directly with other applications.

STK includes two APIs — the *Object Model* and *Connect*. The *Object Model* is a traditional object-oriented programming interface that follows common API coding practices. *Connect* provides a simple syntax-driven library of commands that you can execute via TCP/IP and COM methods for easy scripting and automation. Use *Connect* to quickly build tools in any environment that supports standard COM automation.

All interfaces are fully documented, and AGI maintains a GitHub repository of code samples to help you get started.

Additional Highlights:

- **MATLAB** - Directly integrate with MATLAB out-of-the-box, using STK's two-way communications pathway and more than 150 native MATLAB-formatted commands.
- **ArcGIS** - With STK Pro and the ArcGIS Tracking Analyst, you can receive, process, analyze, and display real-time data in both STK and ArcGis.

Custom Application Development

STK Pro includes access to STK's native software development kit, *STK Engine*. *STK Engine* gives you access to STK's analytical and visualization capabilities without the full processing overhead and fixed workflows of STK's graphical user interface. Using the *Connect* or *Object Model* APIs, you can create seamless integrations with existing applications or design an entirely new *Engine* application to support a specific workflow. And, to achieve even more efficient computation speeds, you can deactivate visualization.

Sample Use Cases:

- Create a script that automatically builds a scenario to use as a template.
- Accelerate large studies by running STK analysis and repetitive workflows without visualization.
- Use STK analytics on Linux and clusters.
- Combine the included development license with deployment licenses (purchased separately) that can be sublicensed to support third-party customers with full, custom applications.

STK Engine is available for Microsoft Windows and Linux and includes documentation and tutorials to help jump-start development efforts. Once your application is complete, deployment packages help you build an installer to distribute the application.

Supported Languages: