Revolutionizing Aerospace Simulations, Modeling & Digital Twins

Sim Dot Space is a next generation Simulation framework that allows rapid creation of scalable high-fidelity system of systems simulations, Hardware in the Loop (HIL) hybrid labs and Digital Twins. Sim Dot Space's technology has been trusted and utilized by leading aerospace companies for UAVs, satellites and other spacecraft.

Rapid high-fidelity simulation development

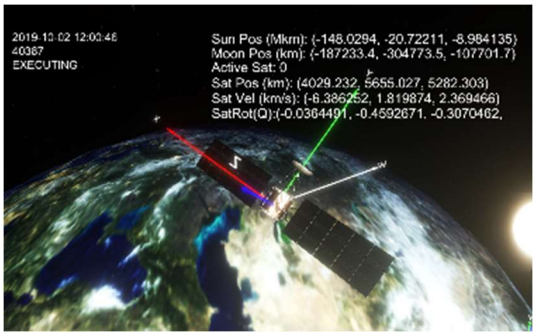
Our **simulator generator tool** and field-proven generic high-fidelity aerospace related **algorithmic models library** (off the shelf models marketplace) will reduce your simulation & modeling development efforts, increase your productivity, simulation reliability, maintainability and code consistency.

Supporting large swarms of drones and satellites

(Picture: Alarmy)

Harnessing the power of parallel processing and cloud computing

As one of the pioneers in this field, Sim Dot Space harnesses the power of parallel processing, distributed simulation technology and (private) cloud computing. This allows users to efficiently handle large-scale simulations of **thousands of satellites or UAVs**, and/or complex Monte-Carlo analyses. Our technology is platform agnostic (both Windows and Linux) and can run on any topology, such as Laptops/Workstations, Virtual Machines, Dockers, Kubernetes and HPC (High Performance Computing).



Built-in interface for visualization software

Leveraging existing models, algorithms and simulation assets

Sim Dot Space facilitates integration and orchestration of our customers' existing legacy assets. This means that valuable investments made by the customer in simulation software, models, algorithms and data can be easily integrated and utilized within Sim Dot Space's framework while benefiting from advanced features and scalability.

Unified Software SIL / HIL / Digital Twins

Sim Dot Space brings together Software (or Model) In the Loop (SIL/MIL), Hardware In the Loop (HIL) testing and Digital Twins within a unified dynamic simulation environment. This provides a holistic approach to system testing and validation. With Sim Dot Space, the same scenarios and training methodologies are leveraged in both SIL and HIL, ensuring consistency, reliability and reducing the learning curve for simulation users and operators of the spacecraft or aircraft.

Unified SIL / HIL / Digital Twins simulation

Sim Dot Space framework main features

: https://sim.space | Phone: +972 (0) 54-5679-222 | Email: info@sim.space

Rapid Simulation Development

- Simulation code generator tool
- Comprehensive training material including sample code, unit tests, and documentation
- Extensive field-proven high-fidelity generic space-related algorithmic models' toolkit library, fully extendable by customer
- Extensive mathematical & physics library

Micro-services & parallel processing

- Scalable from a simulation of a single satellite, to a constellation of thousands of satellites
- Parallel processing via container orchestration platforms, such as Kubernetes / Openshift
- Parallel processing via HPC
- Distributed parallel processing on server cluster
- Distributed processing via Dockers
- Distribution down to the single model level

Simulation Execution features

- Simulation control via web user interface
- Command line simulation execution
- Batch simulation execution
- Step by step simulation execution
- Continuous execution until end conditions
- Fast forward or slow-motion execution
- Real-time simulation execution
- Execution of multiple concurrent instances
- Ability to reproduce any specific run
- Monte-Carlo execution and analysis
- Save "Snapshot" of simulation
- Restore simulation from saved "Snapshot"
- Scenario scripting and automation
- Configurable model fidelity levels
- Configurable model debug level
- Configurable model execution frequencies
- Configurable model Enabled / Disabled

Flexible execution topology

- Sub-systems and models can run in a single process or as separate processes
- Sub-systems and models can be executed across multiple bare metal machines or Virtual machines
- Sub-systems and models can be executed in Dockers or Pods
- Sub-systems and models can run in on GPUs (such as AI/ML models)
- Sub-systems and models can run in software / hardware emulators (such as flight software)

Open Simulation Architecture

- Open simulation architecture via REST API
- Runs on both Windows and Linux
- Simulations and models data publishing via Kafka for simple integration
- Flexible IDE (Visual Studio, Eclipse, etc.)
- Simply integration of existing customer simulation assets (such as models developed in Matlab / Simulink or other modeling tools)
- Orchestration of entire existing customer simulations (such as a constellation of existing customer satellite simulations)

Dynamic Hardware in The Loop (HIL)

- Extensive set of ready-to-use hardware interfaces (serial, analog, digital I/O, etc.)
- Software controlled switching of HIL hardware configurations and power
- Hard real-time using external clock / counter
- Configurable per-model testing mode: Digital model, Real Hardware or Augmented
- Combined hardware and software models
- Unified digital simulation and HIL environment

Digital Twins

- Real-time synchronization of data between the physical satellite and its digital twin
- High fidelity representation of the entire system (energy & power, communication, sensors, actuators, dynamics, environment, FSW, etc.)
- Performance analysis via Monte Carlo
- Ability to simulate various scenarios: failure modes, operational conditions, maintenance

Debugging logging and recordings

- Visual debug, using any debugger
- Pause the entire simulation upon break-point
- Execution time, CPU load and memory analysis
- Log collection (across distributed architecture)
- Global and per model log level configuration
- Configurable model(s) recorded data
- Configurable model(s) recording frequency
- Event based and/or conditional recordings
- Multiple concurrent recordings
- Data recording and (open loop) playback

Miscellaneous

- Built in Unit-Testing framework
- Freedom from end-use limitations
- Bidirectional interface to 3D visualization
- Multi-project environment

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