NORTHROP GRUMMAN

DS3

Distributed Simulation and Stimulation System

Northrop Grumman's Distributed Simulation and Stimulation System, also known as DS3, provides high fidelity sensor simulation for a multitude of sensors, including rotating radars; phased array radars; and identification, friend or foe transponders.

DS3's tactical environment simulator stimulates combat systems with sensor, navigation and weapon system inputs. An adaptable, modular and scalable DS3 architecture accommodates emerging requirements brought about by the need to test, train and certify combat system evolutions in response to rapidly-changing threats.

How It Works

DS3 shares high-fidelity simulations of air, surface, and ballistic missile tracks over a Distributed Interactive Simulation (DIS)-compliant network and communicates with tactical systems in real time. The DIS interface enables additional DS3s to accommodate other interfaces or multiple platforms under test with the same simulated environment, and interconnects with other DIS-compliant simulations.

The DS3 simulates motion and activities of thousands of air and surface tracks simultaneously and models sensors and the environmental effects on them. These effects include terrain track masking; display and sensor effects such as track suppression, multipath, ducting, and radar accuracy; clutter such as storm cloud, surface clutter and specular clutter (short-duration tracks).

Operators can develop simulations prior to an event via a scripted scenario file and also can control the system online. Scenarios can be created or modified during runtime, then saved and reused. Multiple individual scenarios can be executed at once, or combined into larger, more complex scenarios.

DS3 is used for:

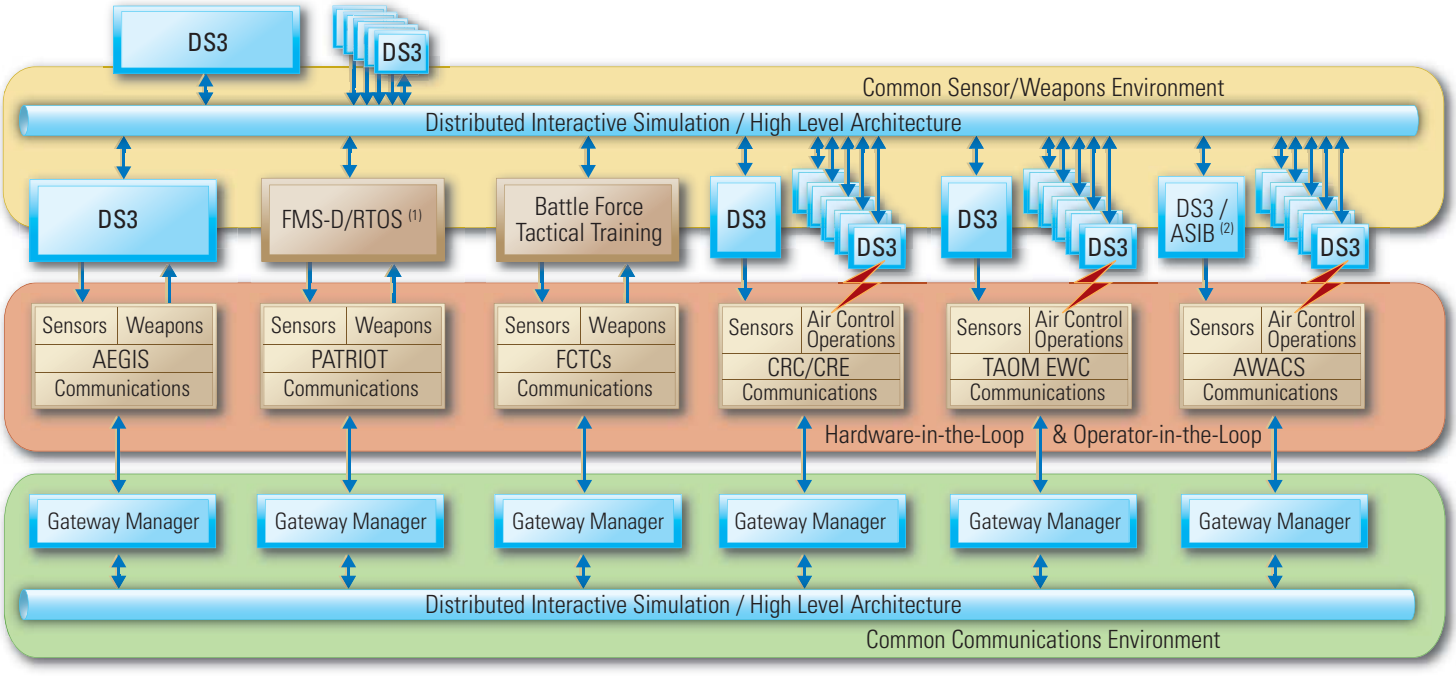
- ✓ System-Level Testing and Training
- ✓ Multiple-Platform Testing and Training
- ✓ Battle Group Testing
- ✓ Element-Level Testing
- ✓ Special-Purpose Engineering Applications
- ✓ Data Link Interoperability Testing

DS3 in a Distributed Environment

DS3's distributed design inherently allows for system growth and customization. Because of DS3's modular architecture, new capabilities and interfaces can be inserted seamlessly. For example, if a new rotating radar simulation is required, the sensor unit can be designed, developed, integrated and tested with little impact to the core databases and functionality of the system.

DS3's scalable architecture means you won't outgrow it. Additional transportable systems can be networked together to meet more complex architecture requirements.

DS3 can participate in large-scale distributed test and training infrastructures. By using DS3 as the "ground truth," common sensor data is presented to all platforms that are DIS/High Level Architecture capable. Additional DS3s can be added to the network architecture to act as pseudopilot control stations. Using other Northrop Grumman connectivity tools, such as the Gateway Manager and the Multi-Link System Test and Training Tool, produces a controlled closed loop test and training environment.



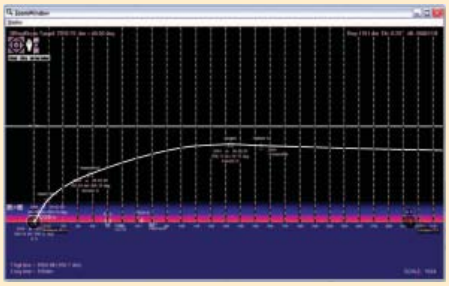
DS3 in a distributed environment

(1) Flight Mission Simulator-Digital / Reconfigurable Tactical Operation Simulation
(2) Advanced Simulation Interface Buffer

Flexible graphical user interface supports multi-functional capabilities of DS3

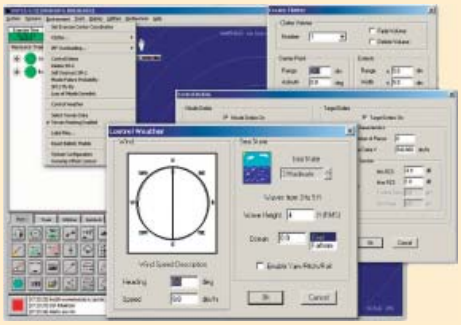
Weapon System Simulation

DS3 provides comprehensive weapon system simulation. This includes the Fire Control Systems, Vertical Launch Systems and Remote Launch Enable Panels. DS3 also replicates system failure faults such as missile misfires, battleshort faults, gyro data faults, etc., all of which add a layer of realism for the training and test communities. DS3 also provides a simulated weapons inventory that is easily reconfigurable to suit a specific weapon system.



Ballistic Missile Models

DS3 can support Ballistic Missile training and test events by providing high-fidelity ballistic missile models. These models implement earth forces effects such as gravity, friction/drag and coriolis effects to ensure that ballistic munitions fly a real-world trajectory. Models include both theatre and intercontinental ballistic missile models and, like any DS3 entity, can be tailored to simulate particular threats. For a near 3-D picture, the operator can monitor flight trajectory using the range/height display.



Environment Control

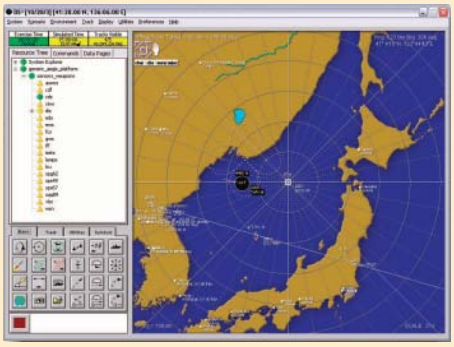
DS3 provides comprehensive control of the simulated environment. It enables the operator to replicate change in the environment for weather conditions, terrain masking, entity debris and environment clutter. This adds invaluable realism by presenting radar coverage based on real-world conditions. Each of the environment controls can be turned off if a pristine test environment is required.

Vehicle Control Program

The Vehicle Control Program (VCP) Plug-in presents a pseudopilot display that provides the operator complete control of the aircraft. As scenario events direct, the operator takes control of a particular entity (typically an air asset) and performs the directed action, such as Pursue, Intercept or Engage. Upon intercept the operator can engage a target with an appropriate weapon assigned by the motion model table. The VCP provides accurate real-world simulation of range and angle limitations of specific munitions and aircraft.

Motion Model

DS3's spreadsheet-based motion model table provides exceptional flexibility in defining entities that can participate in an event. The operator assigns characteristics of a specific entity based upon its DIS enumeration. Characteristics include flight parameters such as turn and dive rates, minimum and maximum altitudes, and minimum and maximum speeds. It also includes available weapons load outs and specific weapons characteristics, such as guided or ballistic munitions. The table is dynamic and can be altered as events dictate.



Sensor Simulation and Operator Control

DS3 simulates a variety of sensor systems including radar, IFF and EW. The operator uses a user-friendly resource tree to control and monitor each individual interface. A standard "Stop Light" color scheme provides instant feedback of interface status. The operator controls the DS3 via standard pull-down menus or shortcut icons. The wide variety of graphic user interface controls enables display of land masses, cities, coastlines, etc. Standard Navy tactical data system symbology is used, and enhanced symbology is available to display platform, country flag, DIS enumeration data and sensor visibility status.

The DS3 Advantage

COTS Technology

The DS3 resides on commercial off-the-shelf computer workstations and its graphical user interface implements commercial Windows conventions, all of which result in several advantages:

- Microsoft Windows based systems are familiar and easy to operate, reducing training time
- PC based platforms result in lower hardware costs and use many existing drivers, utilities and analysis applications
- Spares and technology upgrades are readily available from numerous vendors
- Manufacturer warranties convey to the system owners

DS3 Current Interfaces

Sensor Interfaces:
AN/SPY1-A/Aordalt/B/D Signal Processors
AN/UPX-29 Interrogator System
AN/SPS-49 (V)5, (V)7, (V)8
AN/SPS-55
AN/SPS-67 (V)3
AN/SLQ-32 (V)2
LAMPS Mk III
Integrated Sub Element Test System
AN/FPS-117 Radar
AN/TPS-75 Radar
Navigation Interfaces:
AN/WSN-5
AN/WSN-7
MK13/18 and MK38/39 Gyro Data Converter and Environment Data Converter
Ownship Navigation Analog Synchro Speed and Heading interfaces
NMEA 0183 compliant messages over RS-232

Weapon Interfaces:
MK-41 Vertical Launching System Mod 2&7
MK-99 Fire Control System Mod 3&5
MK-40 Vertical Launching System Converter
MK-428 Remote Launch Enable Pane
MK-165 Firing Inhibit Switch
MK-160 Gun Weapon System Mod 4
MK-116 Underwater Weapon System Mod 7
Phalanx Weapon System Blk 1A/1B
MK-15 Mod 0/SPG-62 Fire Control Illuminator
Other Interfaces:
Sweep and Video (AN/SPY-1, AN/SPS-49/67, AN/UPX-29)
MK38/39 Clock Output
High Level Architecture
DS3 DIS Gateway Connections:
CEP WASP
ACSIS
TPS-75 radar to a tactical data system interface unit
APY-2 radar to a tactical data system interface unit
FPS-117 radar to a remote front end
APY-3 radar to a remote front end

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