

NETWARS Standard Military Models

- **Data:** Workstation/Computer (SLIP/Ethernet), Cisco 2514, Cisco 4500, Cisco 7505, Cisco 7513, IP Cloud, ATM Cloud, FR Cloud, Accelerator 4000, IP Cisco switches, Hubs, Firewall, LAN, FoundryNetIron Switches, Multi-homed Server
- **Tactical Voice and Circuit Switches:** AN/TTC-39A(V)3, AN/TTC-39A(V)4, AN/TTC-39D, AN/TTC-39E (CDS), AN/TTC-42, AN/TTC-46 (LEN), AN/TTC-47 (NCS), AN/TTC-48(SEN), SB-3865, SMU, DNV, DSVT, STU-III, Redcom HDX, Redcom IGX, SB-3865, DSS, CDS
- **Satellites & Earth Terminals:** AN/FSC-78, AN/GSC-39, AN/GSC-52, AN/TSC-85B, AN/TSC-85C, AN/TSC-93B, AN/TSC-93C, AN/TSC-94A, AN/TSC-100A, AN/TSC-152, AN/USC-59, AN/USC 60A, AN/WSC-6(V)*, DSCS, CSCSI, UHF DAMA*, STEP, Teleport, GBS, Generic Terminal and Space Segment, AN/USC-65, QDHT, AN/TSR-4 (GBS), Down-sized Deployable Terminal (DDT), SOFTACS, Timeplex CX-1500
- **Transmission Devices:** AN/GRC-226, AN/GRC-239, AN/MRC-142, SRC-57, AN/TRC-170(V)2*, AN/TRC-170(V)3*, AN/TRC-173B, AN/TRC-175
- **Encryption Devices:** KG-82, KG-84, KG-84A, KG-84C, KG-94, KG-94A, KG-194, KG-194A, KIV-7, KIV-7HS, KIV-7HSB, KIV-19, KIV-19A, KG-75, KG-95-2, KG-175 (TACLANE), KY-57, Motorola NES, KG-235, KG-250, Red Eagle-1NE-100, KG-235 (Motoric INE), KIV-19M
- **Multiplexers:** AN/FCC-100(V)7, AN/FCC-100(V)9, IDNX-20, IDNX-90, Promina 100, Promina 200, Promina 400, Promina 800, Timeplex Link/2+*, SHM-1337
- **Tactical Radios:** SINGGARS, INC, EPLRS, HaveQuick, JTIDs*, AN/ARC-114, AN/ARC-190*, AN/ARC-204*, AN/ARC-230*, Link 11, Generic UHF/VHF/HF Radios, Falcon II, Harris-6210
- **Video Teleconferencing:** DVS-G Bridge, PCS-100, MC-6000, RadVision Bridge, Venue 2000, VIXS Bridge, Zydacron, ISDN MCU, ISDN_VTC_Terminal
- **ATM and Frame Relay:** Alcatel 7270, Alcatel 7470, Alcatel 7750, Cabletron SS2200, Cabletron SS6000, Cabletron SS9000, Marconi PH6000, Marconi PH7000, Marconi PH8000, Omni Switches, FoundryNetIron Routers

OPNET COTS Model Library

- **Data Link Layer Technologies:** ATM, Ethernet (10BaseT, 100BaseT, 1000BaseX), FDDI, Frame Relay, LANE, Token Ring, X.25
- **Network Protocols:** IP, IPX, RSVP
- **Routing Protocols:** OSPF, BGP, IGRP, RIP, EIGRP
- **Transport Layer Protocols:** TCP, NCP, UDP
- **Physical Layer Technologies:** SONET, xDSL, ISDN
- **Vendor Devices:** 3Com, Avici Systems, Cabletron, Cisco, Extreme Networks, Foundry Networks, Hewlett-Packard, Juniper, Lucent & Ascend, Marconi Systems (Fore Systems), Newbridge, Nortel & Bay Networks

*Note: Model Developed by Service Organization (SPAWAR, AFCA)

NETWARS is the Joint Communications Modeling & Simulation tool developed to enable C4 planners and analysts to:

- Conduct high-level planning
- Conduct end-to-end performance assessments

Focus areas:

- Address Network Traffic Analysis
- Evaluation of emerging technologies
- Support to rapid contingency planning
- Support to wargaming (force-on-force)*

Usability objectives:

- Support reuse of Service and Jointly developed models
- Provide common modeling environment
- Model military and commercial communications systems
- Be readily accessible to C4 community
- Reduce time to conduct analysis
- Use COTS

*Support to wargaming (force-on-force) is through HLA Federation, a supplemental component of NETWARS.

Configuration Requirements:

- Windows 2000/XP Operating System
- 1 GHz Pentium CPU
- 512 MB of RAM (recommended 1 GB)
- 1 GB of hard disk space
- NETWARS software and license (provided by NETWARS PMO)

NETWARS

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NETWARS

Network Warfare Simulation (NETWARS) is the Joint Chiefs of Staff standard for modeling military communications networks. It is a desktop software application that provides modeling and simulation capabilities for measuring and assessing the information flow through Strategic, Operational, and Tactical military communications networks.

During the 1997 Quadrennial Defense Review (QDR), the Joint Staff discovered that the effects of improved communications on battle outcome could not be adequately represented by any of the current models. The Director for Command, Control, Communications and Computer (C4) Systems (DJ6) initiated NETWARS to address this shortfall.

NETWARS Capabilities

- Realistically simulates battlefield communications
- Allows for rapid construction, "what-if" drills, and modifications to warfighter communication architectures in support of operation plans (OPLAN) development, modification, and execution
- Users can configure organizational structure, scenarios, architectures, communication device models, and information exchange requirements (IER)
- Promotes interoperability of communication device models and traffic models built by individual Services and Agencies.
- Provides guidelines for model development
- Advances the ability to validate current and future acquisitions
- Has the flexibility to assess communications at all levels of conflict and organizational constructs

Warfighters and Operational Planners

- High-level planning and performance assessments of military networks
- Rapidly construct, update and visualize network plans
- Collaboratively plan network topologies
- Develop reusable device and traffic models
- Share network plans and information (e.g., HTML and PowerPoint)
- Develop network plans based on equipment inventories

Analysts and Acquisition Specialists

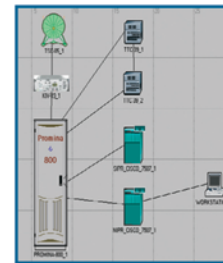
- Assess the impact and performance of applications, network layer technology, and deployment strategies
- Advance common network modeling and simulation framework and standards
- Develop and promote interoperability of device models and traffic models
- Support wargaming and the evaluation of emerging technologies
- Validate current and future acquisitions

Modeling Methodology

Scenario Builder

Provides capabilities to help users develop network topologies that include detailed communication system representations; point-to-point, wireless, broadcast and/or SATCOM connections; and traffic information.

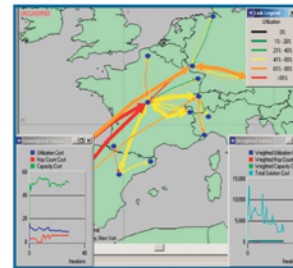
- Organization and Operational FACility (OPFAC) Libraries
- Communication device model libraries
- Semi-collaborative planning features
- XML-based importation of scenarios and OPFACs
- Importation of TMAPS+ data
- Importation of network topology, traffic, and router configuration from network management systems (i.e., Cisco Works, Concord eHealth, Netflow, Sniffer/ Sniffer Pro, NetScout/ NetScout nGenius, ACE)
- Customized exportation of Visio and PowerPoint presentations, web report, screen captures and text-based formats
- Customized network visualization methods (i.e., Logical Views, System Views, Operational Views)
- Terrain Modeling Module (TMM)
- Joint standard and commercial symbology



Capacity Planning

Provides capabilities to assess networks or scenarios developed in the Scenario Builder in terms of analytical calculated link and/or broadcast network utilizations. The Capacity Planning feature provides optimization capabilities and suggests alternate link capacities based on user-defined network performance targets (such as desired average link utilization).

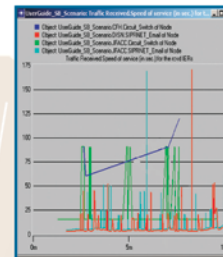
- Visualization of network performance
- Capacity optimization functions
- Link and broadcast network utilization reports
- Traffic routing reports
- Failure analysis



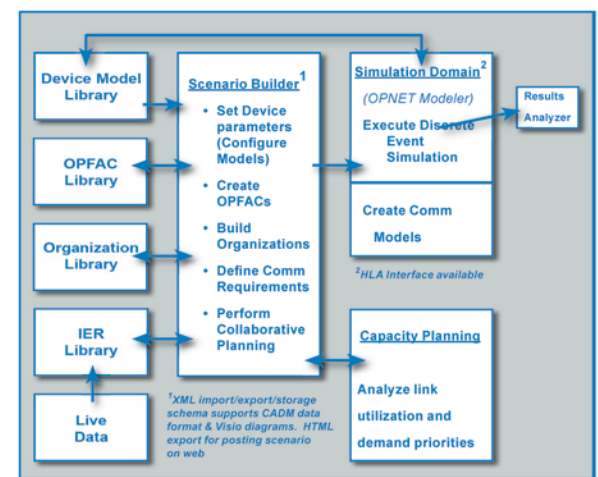
Simulation Domain and Results Analysis

Provides capabilities to execute discrete event simulation (DES) of networks or scenarios developed in the Scenario Builder. DES is based on the OPNET Modeler® product and provides detailed packet level representation of network behavior. Simulation output such as latency, completion percentage, and link utilization can be examined and compared via the results analysis interface.

- Detailed network representation
- Transport, network, link and physical layer overheads (e.g., TCP/IP, BGP, EIGRP)
- Performance metrics (e.g., latency, jitter, completion percentage)
- System performance metrics (e.g., buffer usage, interface overflows, TCP retransmissions)
- Quality of Service (QoS) and IPv6 analysis
- Exportation of Scenario and Simulation Data to PowerPoint Presentations, Visio, XML and Text-Based Formats



Architecture



Features of NETWARS

Comprehensive Device Model Library

The Device Model Library includes hundreds of military and commercial communication device models, including transmission systems, multiplexers, circuit switches, routers, switches, and workstations

Template Organizations and OPFACs

Choose pre-built organizations, OPFACs, and utility nodes from a vast library of templates.

Pre-Configured IERs

Create, manage, and modify IERs in the SQL database

Ace Whiteboard

Create multi-tier traffic applications and perform end-to-end application analysis

Device Configuration

Configure device attributes that control model functionality, behavior, and physical characteristics

Device Configuration Information (DCI) Importation

Import router configuration information collected by network management tools to replicate network topologies in NETWARS

Scenario Development

Add organizations and OPFACs to develop topologies that accurately represent communications plans and architectures

Collaborative Environment

The collaborative planning features of NETWARS allow lead planners to designate portions of the planning process/topology building to subordinate planners.

Network Simulation

Run discrete event simulations and employ comprehensive tools to display simulation results

Capacity Planning

Evaluate and optimize network performance; given a network and the traffic, NETWARS optimizes the network and provides suggestions for optimal link and network bandwidth capacities

Results Analysis

Analyze the results of a simulation session in graphs called Measures of Performance (MOPs)

High Level Architecture

Support to wargaming (force-on-force) via HLA Federation