

JCSS Web Demo Transcript

Slides 1-2

In this web demo we will present the high level details of JCSS and the supporting Project. It will take roughly 25 minutes to complete.

The demo will consist of several topics of discussion:

- The Background of JCSS,
- An Overview of the software and Project,
- The Mission,
- The software Capabilities and Features,
- Who uses the software?
- And, additional information such as how to obtain the software.

Slides 3-4

The Joint Communication Simulation System (JCSS) formerly known as NETWARS is the Joint Staff directed and DISA endorsed Commercial Off the Shelf (COTS)-based Modeling and Simulation (M&S) tool. It was initiated as the result of the 1997 Quadrennial Defense Review (QDR) to address communication M&S gaps.

JCSS is a desktop software application that provides modeling & simulation capabilities for measuring and assessing the information through strategic, operational, and tactical military communication networks.

It is developed to provide integrated ability to analyze communication networks in a validated simulation capability with database and underlying models, so that studies can be consistent throughout the Unified Combatant Commands and Services, and others within the C4 community. It allows users to construct a virtual representation of a communications network infrastructure by:

- Building network topologies
- Conducting what-if type analysis, and
- Analyzing network performance

JCSS is a Full Life Cycle project that supports:

- Continuous yearly software releases
- New model development and user model integration
- Model IV&V, user training and tech support
- Software updates and maintenance, and
- Software training & assistance to users performing studies

JCSS is a free network communication M&S tool for all DoD users. This includes military, civilian, and DoD contractors. The software is available upon official request. Coalition partners and other groups must acquire the software through Foreign Military Sales procedures and/ or purchase agreements.

Slides 5-6

The goals of the JCSS Project are
To enable C4 planners and analysts to
Conduct high-level planning and
Conduct end-to-end performance assessments

As well as,
Enable the R&D community to
Perform interoperability studies and
Develop technical standards

The focus areas of the Project are
Network traffic analysis,
Evaluation of emerging technologies,
Rapid contingency planning support, and
Wargaming (force-on-force) support

The JCSS Project has the following usability objectives
Provide a common modeling environment,
Model military and commercial communication systems, and
Be readily accessible to the Defense community

Slides 7-8

This diagram shows the structure of the JCSS Project
The following Project sections are critical to the Project and user community:

- Requirements definition
- Architecture and Standards, and
- Verification and Validation (V&V)

An official DISA submission process is used to request additional JCSS software features
If approved, DISA will solicit the user for subject matter experts and additional information. Secondly, the JCSS Project office provides the user with methodologies on how to perform studies using JCSS. The Project office provides standards on how to develop models inside the JCSS software to promote model reusability. These standards are promoted through a Model Development Guide, Model User Guides and Standardized programming APIs. Finally, the JCSS Project office provides independent V&V for all developed or contributed models. This ensures that the user is aware of all the supported features and limitations of the JCSS models

Slides 9-10

The JCSS Communities of Interest are the actual warfighter community, and the supporting organizations to the warfighter.

- An example warfighter user is the FA24 Signal officer training school. JCSS is taught as a part of the schoolhouse course curriculum

There are several supporting groups to the warfighter using JCSS. This includes:

- C4 acquisition activities utilized to support end-to-end net-centric assessments
- Major exercise support such as Combined Endeavor, DICE, and JUICE
- Incorporation of communications effects into federated wargames through HLA such as NAVAIR MASE and VR-Forces and
- Communication device model development. Some examples are
 - SPAWAR San Diego's development of Link 16 and SPAWAR Charleston's UHF Dama model

In addition, several foreign communities utilize JCSS.

A partial list of users can be seen to the right, showing the diversity of the JCSS user community. In total, JCSS has over 400 registered organizations and over 1000 active users.

Slides 11-12

JCSS simulates realistic battlefield communication systems and networks

The tool helps assess communications at all levels of conflict and organizational constructs

It facilitates validation for current and future joint and service acquisitions

It allows for

Rapid construction,

“Battle drills”, and

Modifications to war fighter architectures and Operations Plans (OPLAN)

JCSS components are built to be compatible between services, agencies, and allies.

JCSS contains a single repository of DoD device models that can be found in no other product. The model library is continually updated and new models are integrated as new DoD technologies and capabilities become available.

Slides 13-14

Some of the JCSS Military Models available from the CDM Library are

- Satellite technologies such as GBS and Bentpipe including TSSP, UHF Dama and Generic
- Tactical radios including EPLRS, SINCGARS, Link 16, Falcon 2 among others
- Multiplexers including Promina and FCC-100
- Gateways such as N.E.T devices and Media Gateways

- Tactical Circuit Switches
- Encryption Devices such as HAIPE, KG and KIV series
- Transmission Devices such as TRC-170
- Transport Layer Devices including PEP which uses SCPS-TP protocol
- Support for H.323 and SIP VoIP protocols

Slide 15

JCSS provides a common modeling environment that promotes the re-use of Service and Agency developed M&S capabilities. In addition, the JCSS Project Office provides:

- A Model Development Guide (MDG) which gives guidelines and standards for creating interoperable communication models.
- A Communications Device Model V&V Plan which provides a repeatable process for the development, submission, and independent assessment of joint models.
- Standardized Interfaces using XML, HLA, and Excel formats, among others, which enable interoperability with other tools. Examples include the DISN-IFmodel, STK, and PET.
- Software Problem Reports. The JCSS Project Office tracks all software and model related issues identified by the User Community. Users can report problems by emailing or calling the JCSS Technical Support.

The JCSS Project encourages users to contribute models for use in the software. This approach ensures that models get properly verified and documented using a standardized process. Models are then maintained and upgraded for free by DISA for each release. It also provides model sharing and promotes reuse between DoD organizations.

Slides 16-17

Based on the operational scenario and the anticipated communications traffic load, the software is able to predict communications performance based on the information provided. This allows for more precise mission planning and informed acquisition decisions.

Slide 18

Scenario Builder is an interface for development of a complete communications study. In Scenario Builder a communication study is mapped to a project or a set of projects. Each project can contain multiple scenarios.

A typical scenario in Scenario Builder integrates both:

- Network Topology - created by deploying devices and infrastructure and,
- Network Traffic

A set of libraries is available to users to facilitate network topology and traffic deployment.

From within Scenario Builder users run simulations and analyze results using both:

- Discrete Event Simulation and

- Capacity Planner

Other capabilities are available to easily import or export information, and visualize the network.

Slide 19

On JCSS startup, the System Editor gets launched automatically

It is an entry point for all other editors including Scenario Builder

It facilitates the management of user profiles and licensing

Users can also access extensive documentation such as User Manuals, Software Release Notes, and Models User Guides.

We are now going to open a project named Iraq_Tactical_Network

This project opens in the Scenario Builder Editor.

Slide 20

The Iraq_Tactical_Network project contains several scenarios

The currently selected scenario is Mossul_Battalion

The network topology deployed as a part of the Mossul_Battalion scenario consists of the following operational facilities (*select each*):

- Baghdad Command Center
- STEP
- Mossul Command Center
- Five Dismounted Troops and a Tactical Vehicle

Each operational facility (OPFAC) represents a collection of devices that are located and move together

- The Baghdad Command Center contains 2 Workstations, a Router, a Promina and a Satellite Terminal (*drill into each*)
 - Workstations represent real users of the network and are the source of the traffic. The workstation data is multiplexed by the Promina, so that it can be sent over the satellite backbone
- The STEP contains a Promina and a Satellite Terminal so that the remaining tactical members of the network have a connection to the satellite backbone
- The Mossul Command Center contains a workstation, a router, and a radio device. It acts as a temporary command center for the troops deployed in the field.
- The dismounted troops 1 to 4 and the tactical vehicle each contain a workstation and a radio device.
- Soldier_Unequipped represents a dismounted troop with no devices.

Slide 21

JCSS contains a library of both JCSS and OPNET COTS models of devices and links

The library is accessible through the Object Palette

The Object Palette Tree displays:

- Pre-defined palettes of related models

- For example the JCSS Standard Models palette contains commonly used JCSS models of devices, links among others

We will now add a workstation and a PRC radio to Soldier_Unequipped using drag-and-drop technique

Joint symbols are default for JCSS devices and are modifiable. The Icon Palette contains a set of icon databases from which symbols can be selected.

From the right-click menu of the deployed objects it is possible to:

- View and modify object attributes
 - Attributes determine the behavior of the device during simulation
 - For example the Workstation TCP behavior can be modified using TCP Parameters such as Receive Buffer, Maximum ACK Segments, and so on

A wide range of Communications Device Models (CDMs) are available to JCSS users.

Slide 22

We will now connect the two devices with a serial PTP link that has a 64kbps bandwidth
Two methods are available for infrastructure deployment:

- The Link Deployment Wizard or the
- Object Palette as discussed earlier

The Link Deployment Wizard implements an easy to follow workflow (*add a link*). The user will select devices and navigate to the menu option. In this case, we will accept the defaults for the port group, link type, device ports, and bandwidth.

JCSS supports a number of infrastructure types (*next slide*)

Slide 23

JCSS supports the following infrastructure types:

- Wired Links such as Sonet, Ethernet, and Token Ring, among others.
- Wireless Connections such as
 - Point-to-point Radio
 - Broadcast Network
 - SHF and GBS Satellite
- Generic Circuits including
 - Promina
 - TSSP
 - Multiplexers
 - CTP, SCREAM, and SHOUTip

Slide 24

The dismounted troops and tactical vehicle operational facilities need to communicate with the Mossul_Command_Center over a radio broadcast network

The Broadcast Network Wizard facilitates deployment of broadcast networks (*at this point deploy the broadcast network*):

- Operational facilities to be connected by the broadcast network are Dismounted Troops 1 to 5, the Tactical Vehicle and the Mossul_Command_Center

- Name and attributes can be set at this point.

Secondly, JCSS contains several types of devices which use circuits:

- Promina
- N.E.T. SCREAM and SHOUTip
- Juniper CTP
- TSSP Satellites, and
- Multiplexers

The Baghdad_Command_Center and STEP both contain Promina devices

Circuits are configured using the Generic Circuit Wizard (*demo circuit deployment*)

- Again operational facilities that use circuits should be selected
- The wizard sets the circuit type, ports and relevant attributes. In this case we are going to accept the defaults

Other infrastructure wizards available in JCSS (*show menus*):

- The UHF DAMA Wizard,
- Cut-through Mechanism, and the
- Link-16 Wizards

JCSS offers link consistency verification functionality and cross classification checks (*show button*):

- This identifies improperly connected devices, and lists links and errors.

At this point we have deployed and configured the network topology for the Mossul_Battalion scenario. Next step is traffic deployment.

Slide 25

The traffic models in JCSS convey messages and data through a network

Supported traffic types are:

- Information Exchange Requirements (IERS)
- Applications such as HTTP, FTP, and Email,
- Flows, and
- Device/Link Loads

Traffic is represented by a Traffic Flow object

- The attributes set on the Traffic Flow object are used to create packets in DES or loads in CP

Slide 26

IERS stand for Information Exchange Requirements

- They are based on the Core Architecture Data Model (CADM) standards and are used extensively by the DoD to represent traffic
- IERS are considered a “high level” traffic for Planners
 - Some examples are regular position updates and air support requests.
 - Deployment of IERS can be between military objects such as tanks and planes instead of actual communications devices, allowing a planner to abstract away a level of detail.

JCSS IERs

- Use a portion of the entire IER schema to model military communications
- They are designed to work with every JCSS device model and custom models
- JCSS also supports IER Threads
 - IER Threads represent a chain of IERs, with a causal relationship among individual IERs
- IERs can be:
 - Deployed manually
 - Imported from a text file, or
 - Imported from an IER Report

Slide 27

We will model an example communication from a Dismounted Troop giving a position update to the command center using IERs, where Dismounted Troop 1 will act as an IER Producer and Mossul_Command_Center will act as an IER Consumer (*select OPFACS*) To configure IERs to reflect the appropriate traffic definition we will use the IER Deployment Wizard (IDW) (*start the wizard and configure the traffic*)

- The first step is to select the producer and consumer options.
- Secondly, the user will configure the IER attributes.
- Once we hit the OK button an IER will be created in the scenario and presented as a Traffic Flow object (*show the object*)

Slide 28

JCSS supports standard applications such as email, FTP, web, video, VoIP, as well as, custom applications

It comes with preconfigured profiles that represent various application use patterns and number of users (*show the app profile table*)

We will deploy an FTP application between Mossul_Command_Center and Baghdad_Command_Center using the Application Deployment Wizard

- Workstation in the Mossul_Command_Center represents the FTP client
- Workstation_1 in the Baghdad_Command_Center represents the FTP server.

Flows are used to model background traffic.

In this scenario, we have already deployed the background traffic between the Mossul_Command_Center Router and Baghdad_Command Center Router to represent a realistic load on the satellite backbone. This is shown as a blue dotted line.

Attributes such as bits per second and packets per second are used to define the background traffic

Slides 29-30

JCSS offers two different simulation engines, Capacity Planner (CP) and Discrete Event Simulation (DES).

CP assesses networks or scenarios by creating a topology graph and routing traffic loads analytically.

CP is an analytical engine suitable for:

- Failure Studies,
- Utilization Studies,
- Network Configuration Troubleshooting, and
- Network Optimization

The results of the simulation are provided in a web report format.

Slide 31

Capacity Planning has two modes (*demo the selection menu*):

- Evaluation mode gives a snapshot of scenario performance
- Optimization mode suggests network optimization changes

The Capacity Planning Evaluation engine routes all traffic taking in consideration:

- Special properties of military devices such as circuits and wireless links,
- Utilization,
- Hop Count,
- Link Capacity, and the
- Number of unroutable demands.

Routes are calculated based on shortest path criteria

The findings are presented in the Capacity Planning Report (*demo*)

The Report has an executive summary, as well as, detailed reports that cover:

- Traffic routes,
- Link utilization,
- Residual bandwidth, and
- Circuit Switch, among others.

As a result of running CP, links are color coded in Scenario Builder based on link utilization.

Slide 32

Discrete Event Simulation is a state machine based engine and is used to model communications behavior of networks in detail. At both the protocol and packet levels.

The results of the simulation provide detailed and accurate information for metrics such as jitter, latency, queuing delay, utilization, and the amount of traffic sent or received on a device, among others.

Slide 33

Before running DES, we need to specify criteria required to analyze performance of the network.

We refer to this criteria as statistics

JCSS comes with thousands of statistics available including flow, link, and IER specific statistics (*at this point select statistics*)

DES offers a number of configuration items such as (*at this point configure DES*):

- Failure and Mobility Studies that include Simulation Efficiency and Terrain Modeling,
- Protocol Reporting,
- Inputs such as Environment Files, and
- Debugging

During the simulation, values for selected statistics get collected and upon the completion of the simulation can be viewed as graphs and exported to spreadsheets (*demo results*) JCSS also supports 64-bit simulation

Slides 34-35

The Department of Defense Architecture Framework (DoDAF)

- Provides a standard for description, development, presentation, and integration of systems for the DoD.

As JCSS provides the ability to model communications effects in simulations, and DoDAF provides the ability to specify new system architectures, there is a natural synergy between the two.

As part of DoDAF, a user is required to create communications views to show how the components of a new system will interact. In particular, JCSS utilizes two views:

- The OV-3 (Operational Information Exchange Matrix) and the
- SV-6 (Systems/Services Data Exchange Matrix)

The information from OV-3 and SV-6 DoDAF views is mapped into JCSS IERs, as the standard explicitly calls out IERs to be used in these views.

Slides 36-37

JCSS offers several ways to import or export information. This allows users to integrate information from third party sources.

The supported formats are shown:

- The network topology formats allow for a user to import or export devices and infrastructure into JCSS.
- Where as, the network traffic formats allow a user to import or export traffic into JCSS.

Slides 38-39

There are two JCSS Websites that are maintained and updated.

The JCSS Project Office website contains the latest information regarding JCSS including FAQs and how to obtain the software.

The JCSS Support website provides User Forums and Technical Support.

Slide 40

Free training is provided by the JCSS Project Office. Users who attend the training receive a hands-on experience constructing moderately sized communication networks, and performing network analyses using a variety of network models.

The JCSS Annual User Conference allows for information exchange between the Military Services, Agencies, and Coalition partners in areas such as communications model sharing, lessons learned, source information, verification and validation, techniques, and communication M&S success stories.

Free software technical support is available to registered DoD JCSS users and is provided on a first come first serve basis or as the JCSS Project Office deems necessary. All Non-DoD JCSS users pay for technical support with the purchase agreement or Foreign Military Sales.

Slides 41-42

Any further information is available through the JCSS Project Office or Technical Support. The contact information is shown.

This concludes the JCSS demo.