A Tool for Making T&E Itself Net-Centric: *Net-Centric Adapter for Legacy Systems (NCALS)*

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Net-Centric Concepts & Benefits

• Key Concepts:
  – Information sharing
  – Geographic dispersion
  – Effective linking

• Benefits:
  – Shared awareness and knowledge
  – Collaboration and self-synchronization
  – Increased tempo and responsiveness
  – Lower risk and cost
  – Increased effectiveness

1 Alberts, Garstka and Stein, Network Centric Warfare, 1999
A Challenge and an Opportunity

**Challenge:** Testing and evaluating net-centric services and Systems of Systems
- *Simulation*
- *Data observation and recording*
- *Data analysis*

**Opportunity:** Enabling T&E to become net-centric
- *Sharing T&E information and assets*
- *Supporting T&E collaboration*
- *Enabling distributed testing, data collection and analysis*
- *Making the T&E process more dynamic, responsive and effective*
Net-Centric Test & Evaluation (T&E)

Net-Centric Environment Under Test

- System Under Test
- Service Under Test
- System Under Test
- Service Under Test

- Test Control
- Simulation
- Data Recording
- Test Monitoring
- Simulation

Net-Centric T&E Environment

Data Analysis

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Net-Centric T&E Challenges

• T&E System Constraints:
  – Computationally intensive processing
    • Simulations
    • Analysis tools
  – Real-time simulation processing
  – Data recording

• Legacy T&E System Architectures
• Legacy Data Access
• Legacy Data Formats
• Legacy Point-to-Point Interfaces
Net-Centric Adapter for Legacy Systems (NCALS) is . . .

A common, highly configurable software technology that automatically . . .

- Provides data and services from a web-enabled network to legacy systems, and

- Exposes legacy system data and services to such a network

Can be used to enable net-centric T&E

Government-owned, mature prototype
NCALS as a Net-Enabler

Net-Centric Environment

NCALS Software

Legacy System Software Components

• Legacy Software Interfaces (public or private)
• Legacy Data and Services

Configure
Common NCALS Software

Domain A
System 1

Domain B
System 2

... 
System N

Cost Savings: $

Domain Z
NCALS Design Objectives

• Compliant with net-centric standards
• Common to reduce cost to enterprises
• Lightweight
  — *Does not require adoption of large S/W infrastructure*
• Configurable for many different applications
• Portable across computing platforms
• Extensible to new I/Fs, formats, and connections
• Scalable to maximize performance
• Transparent to minimize legacy system impacts
• Automated to not increase user workload
• Supports dynamic data packaging
Dynamic Data Packaging

Packaged or Unpackaged “on the fly”

Dynamically access and repackage data from multiple software interfaces
Example NCALS Application to T&E

Net-Centric Environment Under Test

System Under Test
Service Under Test

Net-Centric T&E Environment

- Test Control
- Simulation
- Data Recording
- Test Monitoring
- Simulation
- Data Analysis
- Data Analysis

= Potential T&E application of NCALS

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NCALS Prototype Design

- Implemented in Java (portable)
- Supports eXtensible Markup Language (XML)
- Supports XML or customized data transforms:
  - eXtensible Stylesheet Language Transformations (XSLT)
  - Custom transforms (class-based)
- Supports variety of software interface types:
  - Web Services and SOAP
  - Socket-based Application Program Interfaces (APIs)
  - Common Object Request Broker Architecture (CORBA)
  - Java Messaging Service (JMS)
  - Files (triggered on changes)
  - Custom interfaces (class-based)
Summary

• Net-Centric T&E Concepts
  – Testing and evaluating net-centric systems
  – Enabling T&E to become net-centric:
    • Sharing T&E information and assets
    • Supporting T&E collaboration
    • Enabling distributed testing, data collection and analysis
    • Making the T&E process more dynamic, responsive and effective

• NCALS
  – A highly configurable software technology
  – Can enable T&E systems to work in net-centric environments
  – Is a mature prototype
  – Is government-owned
For More Information on NCALS . . .

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Read:
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Net-Centric Adapter for Legacy Systems
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TABLE 1

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
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<tbody>
<tr>
<td>New Model</td>
<td>Innovative data sharing and exchange</td>
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These challenges require timely, complete, and accurate information available to all forces. The purpose of net-centric operations is that the "whole of an integrated and notional force is more than the sum of its parts." (2) This concept of operations advocates that we provide warfighters access to timely, relevant and accurate information, some component attributes required to support NC and are noted in Table 1 [15]. A communications infrastructure, the Global Information Grid (GIG), will enable the DoD to use its resources to serve as a key enabler for net-centric operations [19].

In 2003 the DoD established the Net-Centric Data Strategy for managing data in a net-centric environment. The key tenets of the strategy include [17]; (a) ensuring data is secure and available to the GIG when and where needed for decision-making, (b) ensuring all data with metadata to enable data discovery, (c) publishing of data where possible in a "shared space" on the GIG, (d) ensuring availability of data within the network and (e) moving from a unique "point-to-point" interface between individual systems to "many-to-many" exchanges on the GIG. The DoD systems must ensure the data and data access services to support these tenets.

The DoD is working to improve communications capabilities through an ORI initiative, to capture warfare requirements through communications initiatives, to provide common "infrastructure," and to identify supporting technical standards through the DoD Information Technology Standards Registry (DITSR) [15], [19], [31]. These technical standards are aligned with business and commercial engineering standards and will support the DoD infrastructure. The key security and standards are shown in Table I [15]. The authors have observed that one of the most significant obstacles to realization of net-centric operations is the existence of legacy systems within the DoD Enterprise. The core of these systems, which is often not designed to support net-centric standards, is the core infrastructure of the Navy for Research, Development and Acquisition in 2005 identified 133 legacy systems, 42% of the total number of systems, in the Navy and Marine Corps that will
Questions ?
Backup Slides
Configurability & Extensibility

**Configurable:**
- Software interfaces
- Data formats
- Data transformation
- Complex adapters

**Extensible:**
- Software interface types
- Data formats
- Data transformations
- Plug-in customization
- Network connection types

API = Application Programming Interface
CORBA = Common Object Request Broker Architecture
JMS = Java Messaging Service
NCALS as an Enterprise Integrator

System X

System Z

NCALS

System Y

S/W Component 1

S/W Component 2

S/W Component N

Scalable & Distributed

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NCAL S as a System/SoS Integrator: Examples

Component 1

Component 2

Component 3

LAN

System 1

System 2

System 3

Wide-Area Network

NCAL S

NCAL S

NCAL S
NCALS as a Data Translator: Examples

NCALS as a Data Translator:

- **System 1**
- **System 2**
- **System 3**

**LAN**

**Wide-Area Network**

**System 1**

**System 2**

**System 3**