Beyond Technical Interoperability

Net Centric Operations
Context for the Interoperability & Net Centric Operations Track
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AGENDA

• Describe Interoperability and related matters

• Describe Net Enabled Operations
Describe Interoperability and related matters
Achieving Interoperability:
A perpetual motion machine

Interoperability: The ability to operate in synergy in the execution of assigned tasks.

Interoperability is more than just the technical exchange of information.

Solutions Sets must cover Process, Organization, People, Information, and Materiel across the range of DoD operations.

Interoperability must be balanced & synchronized with Cyber Security.

Cybersecurity: Prevention of damage to, protection of, and restoration of computers, electronic communications systems, electronic communications services, wire communication, and electronic communication, including information contained therein, to ensure its availability, integrity, authentication, confidentiality, and nonrepudiation.

Information Assurance: Measures that protect and defend information and information systems by ensuring their availability, integrity, authentication, confidentiality, and non-repudiation. This includes providing for restoration of information systems by incorporating protection, detection, and reaction capabilities.
Interoperability Model:
A composite of Materiel & Non-materiel solutions

Layers of Interoperability

- Mission/Business Objectives
- Harmonized Strategy/Doctrines
- Aligned Operations
- Aligned Procedures
- Knowledge/Awareness
- Information Interoperability
- Data/Object Model Interoperability
- Network Interoperability
- Physical Interoperability

*CS = Cyber Security [formerly Information Assurance]

Non-Materiel Solutions

Process, Organization, People

Data, Information, Knowledge

Information Transport

Technology Solutions

Adapted from “Beyond Technical Interoperability – Introducing a Reference Model for Measure of Merit for Coalition Interoperability’. Dr. Andreas Tolk, VMASC, ODU. 8th CCRTS, NDU, June 2003
Interoperability Model & QoS

Layers of Interoperability

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Quality of Operation Services (QoOS)
Quality of Information Services (QoIS)
Quality of Transport Services (QoTS)

Organizational Drivers
Technical Drivers

*CS = Cyber Security [formerly Information Assurance]

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End-to-End Quality of Service

\[ \text{End-to-End Quality of Service} = \text{Quality of Operation Services} + \text{Quality of Information Services} + \text{Quality of Transport Services} \]

**Key Needs:**
- Mission or business objectives
- Harmonized strategy or doctrines
- Aligned operations
- Aligned procedures
  - Knowledge/awareness of actions by people and processes

**Key Metrics:**
- Urgency:
  - Timeliness
- Priority:
  - Degree of cooperation
- Cyber Security (CS)
  - Fluidity of response
  - Clarity of understanding
  - Ubiquity or extent of influence
  - Accuracy

**Key Needs:**
- Discoverability & availability
- Transport interoperability
- Data/object model interoperability

**Key Metrics:**
- Urgency:
  - Data/topic latency, service response time, application timeliness
- Priority:
  - Precedence of user requests, data, and services
- Cyber Security (CS)
  - Data Trust: integrity & availability, fault tolerance, accessibility
  - Security: data confidentiality, authentication, non-repudiation

**Key Needs:**
- Network interoperability
- Physical interoperability

**Key Needs:**
- Discoverability & availability
- Transport interoperability
- Data/object model interoperability

**Key Metrics:**
- Urgency:
  - Transport lag or delay, jitter, packet loss, packet errors
- Priority:
  - Class of service, differentiated service, precedence, preemption, guaranteed service
- Cyber Security (CS):
  - Data Trust: Availability, Connectivity (fixed, mobile)
  - Security: encryption, intrusion detection, authentication, authorization, access control
The A Word & Components

The Operational Viewpoint describes and interrelates the operational elements, tasks and activities, and information flows required to accomplish mission or business objective.

The Systems Viewpoint describes and interrelates the existing or postulated technologies, systems, and other resources intended to support the operational view.

The Standards Viewpoint describes the profile of rules, standards, and conventions governing systems implementation.

Keep this equation balanced: OV = SV + Non-Materiel
Net Enabled Operations
Net Centric Environment (NCE): Objective, Goals & Description

**Objective:** All users, whether known or unanticipated, are able to easily discover, access, trust, and use the data/information that supports their mission objectives unconstrained by their location or time of day.

**GOALS:**

- Evolve & Populate the NCE
- Protect & Defend the NCE
- Manage & Operate the NCE

The NCE is implemented with evolving balanced & synchronized sets of Process, Organization, People, Information & Materiel (POPIM) Solutions.
Net Centric Environment: Functional Performers

- Managers/Operators**
- Information Services Providers
- Computing Resource Providers
- Information Transport Providers
- Users/Consumers**

Behavior and relationship characteristics include: Quality of Service; Quality of Protection; Addressing; Tagging of content & roles/Identities;

Information Forms include voice, video, images, text, graphics....

* CS = Cyber Security
** Includes Software Applications whether hosted locally or by a computing resource provider.
Situational awareness is tailored*, timely, comprehensive, and accurate knowledge of the battlespace (or area of interest) that provides the Warfighter (Commander/Decisionmaker) a consistent view of all militarily relevant information on friendly (blue) and adversary (red) forces, non-combatants (gray personnel), and the battlespace (or area of interest).

(Notes: **“User Defined Operational Picture”: ** IA=Inter-Agency)
# Net Centric Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
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<tbody>
<tr>
<td>Internet &amp; World Wide Web Like</td>
<td>Adapting Internet &amp; World Wide Web constructs &amp; standards with enhancements for mobility, surety, and military unique features (e.g. precedence, preemption).</td>
</tr>
<tr>
<td>Secure &amp; available information transport</td>
<td>Encryption initially for core transport backbone; goal is edge to edge; hardened against denial of service.</td>
</tr>
<tr>
<td>Information/Data Protection &amp; Surety (built-in trust)</td>
<td>Producer/Publisher marks the info/data for classification and handling; and provides provisions for assuring authenticity, integrity, and non-repudiation. Includes encryption for data at rest.</td>
</tr>
<tr>
<td>Post in parallel</td>
<td>Producer/Publisher make info/data visible and accessible without delay so that users get info/data when and how needed (e.g. raw, analyzed, archived).</td>
</tr>
<tr>
<td>Smart pull (vice smart push)</td>
<td>Users can find and pull directly, subscribe or use value added services (e.g. discovery). User Defined Operational Picture vice Common Operational Picture.</td>
</tr>
<tr>
<td>Information/Data centric</td>
<td>Information/Data separate from applications and services. Minimize need for special or proprietary software.</td>
</tr>
<tr>
<td>Shared Applications &amp; Services</td>
<td>Users can pull multiple applications to access same data or choose same apps when they need to collaborate. Applications on “desktop” or as a service.</td>
</tr>
<tr>
<td>Trusted &amp; Tailored Access</td>
<td>Access to the information transport, info/data, applications &amp; services linked to user’s role, identity &amp; technical capability.</td>
</tr>
<tr>
<td>Quality of Transport service</td>
<td>Tailored for information form: voice, still imagery, video/moving imagery, data, and collaboration.</td>
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QUESTIONS?
Definitions of Functional Performers (1 of 2)

**Computing Resource Provider:**
A capability that can respond to a request from a user or another service to store, process, manage, and control data or information (shared and/or distributed) through an external interface.

**Information Service Provider:**
A capability that can respond to a request from a user or another service to provide a specific functionality, such as the ability to post, discover, access, process and display hosted information and data (including positioning, navigation, and timing services) across an “enterprise” based on established data standards.

**Information Provider (i.e., Producer or Publisher):**
A capability that produces information and data, based on established data standards, and provides that information and data using any of a number of distribution methods, which include bilateral distribution to known users, broadcast, and publish/post or subscribe/pull models, for use in accomplishing a mission.
Manager/Operator:
A capability that provides the ability to monitor, manage, control, protect, and configure information transport, information services, and the underlying computing resources that provide end-user services, as well as connectivity to “enterprise” application services.

User/Consumer:
A capability that utilizes or consumes information transport, computing resources, or information services to perform its intended function.

Information Transport Provider:
A capability that provides the ability to transport information and services via assured end-to-end connectivity across the operational environment.