Beyond Technical Interoperability

Context for the Net Centric Operations & Interoperability Track
@ 2014 NDIA SE Conference
26 – 29 October 2015

Jack Zavin
Chair
NCO/I Track
jack.e.zavin.civ@mail.mil
(703) 614-7945

AGENDA

- Describe Interoperability and related matters

- Describe Net Enabled Operations.

Describe Interoperability and related matters

Achieving Interoperability : A perpetual motion machine

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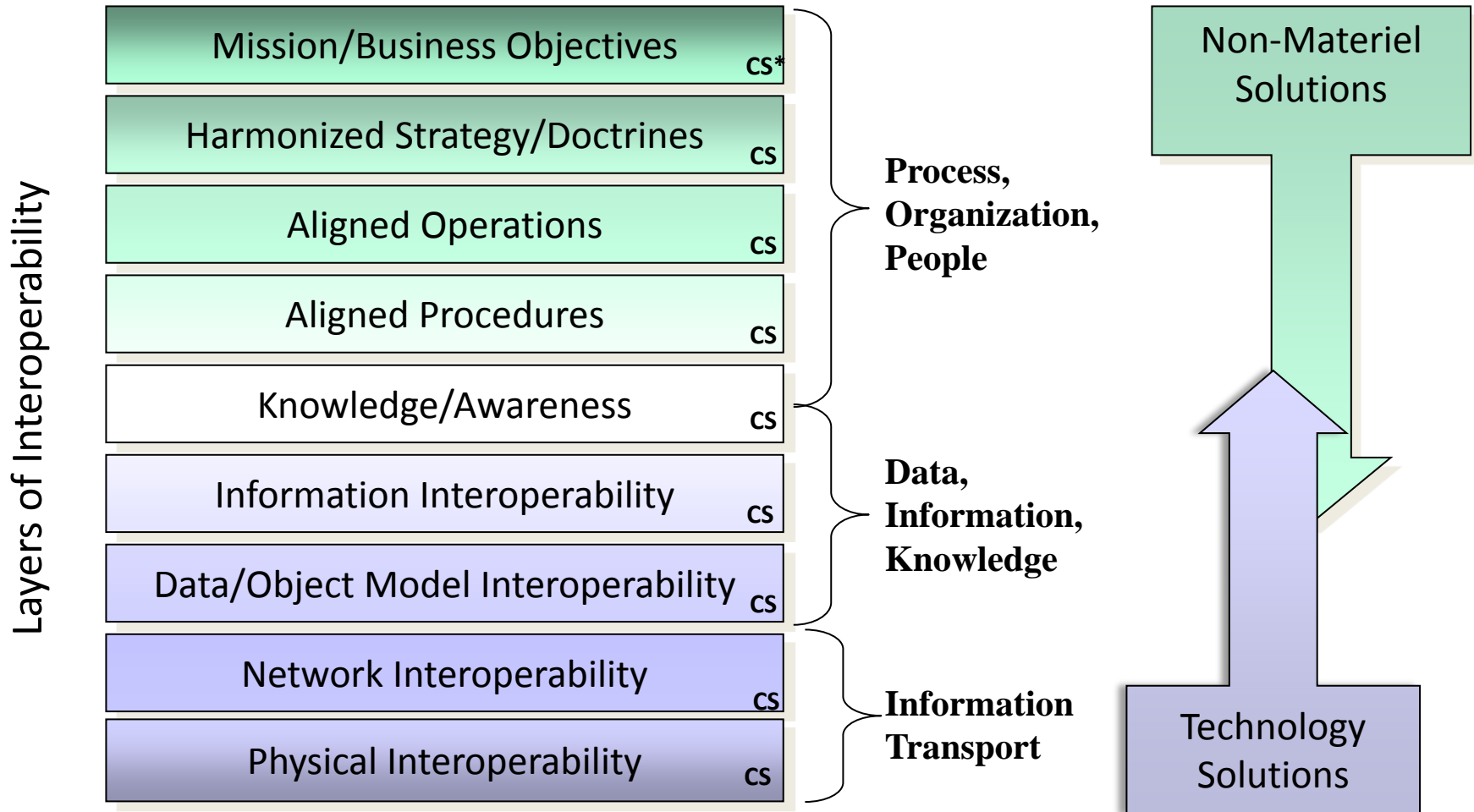
<u>Cybersecurity:</u>
Prevention of damage to, protection of, and restoration of computers, electronic communications systems, electronic communications services, wire communication, and electronic communication, including information contained therein, to ensure its availability, integrity, authentication,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

<u>Information Assurance:</u>
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.
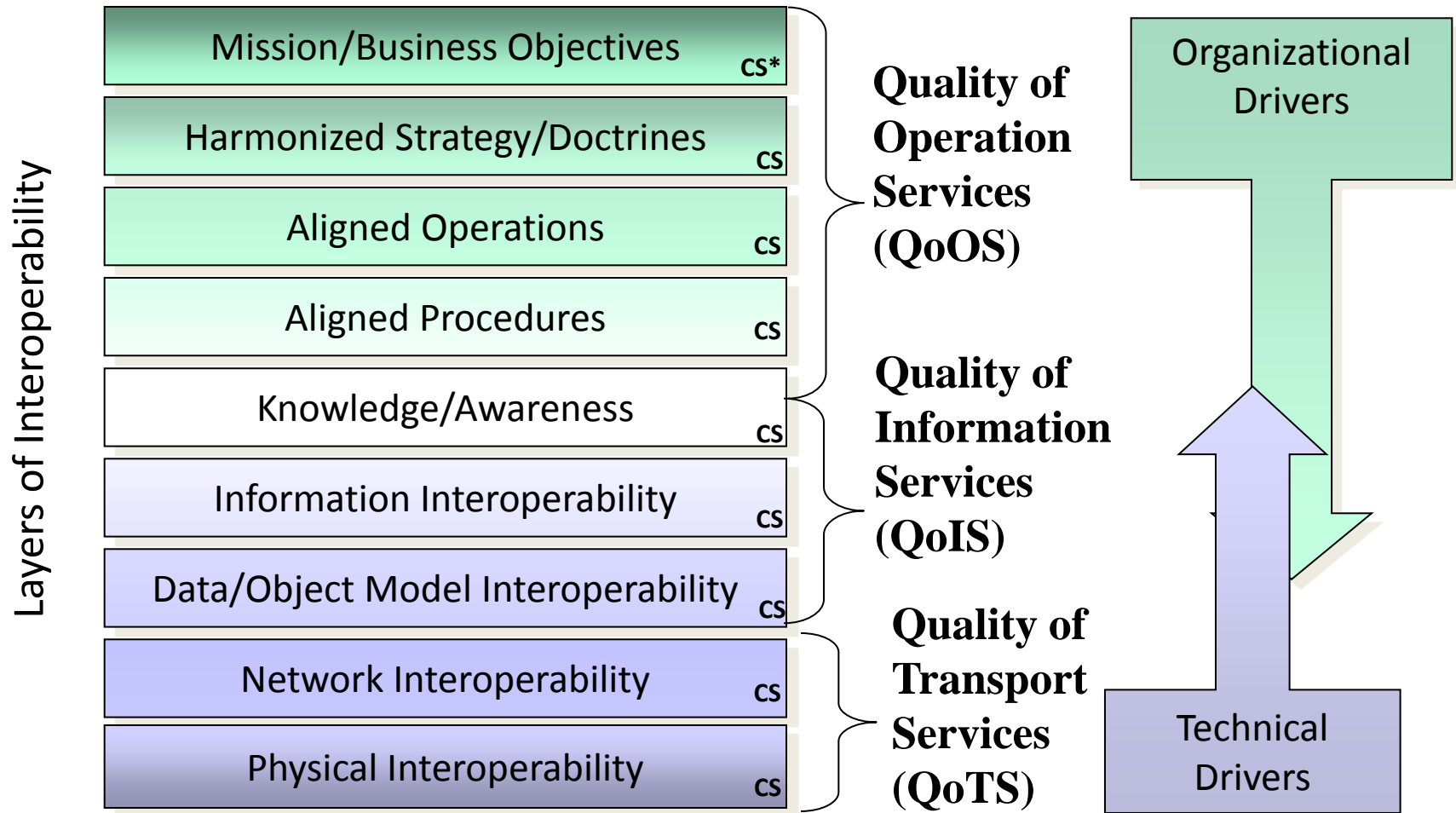
Interoperability Model:
A composite of Materiel & Non-materiel solutions

Layers of Interoperability

Mission/Business Objectives	cs*
Harmonized Strategy/Doctrines	cs
Aligned Operations	cs
Aligned Procedures	cs

Process, Organization, People

Knowledge/Awareness	cs
Information Interoperability	cs
Data/Object Model Interoperability	cs

Data, Information, Knowledge

| Network Interoperability | cs |
| Physical Interoperability | cs |

Information Transport

Non-Materiel Solutions

Technology Solutions

CS = Cyber Security [formerly Information Assurance]

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

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

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]

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

End-to-End Quality of Service

End-to-End Quality of Service =

Quality of Operation Services + Quality of Information Services + Quality of Transport Services

Quality of Operation 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

Quality of Information Services

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
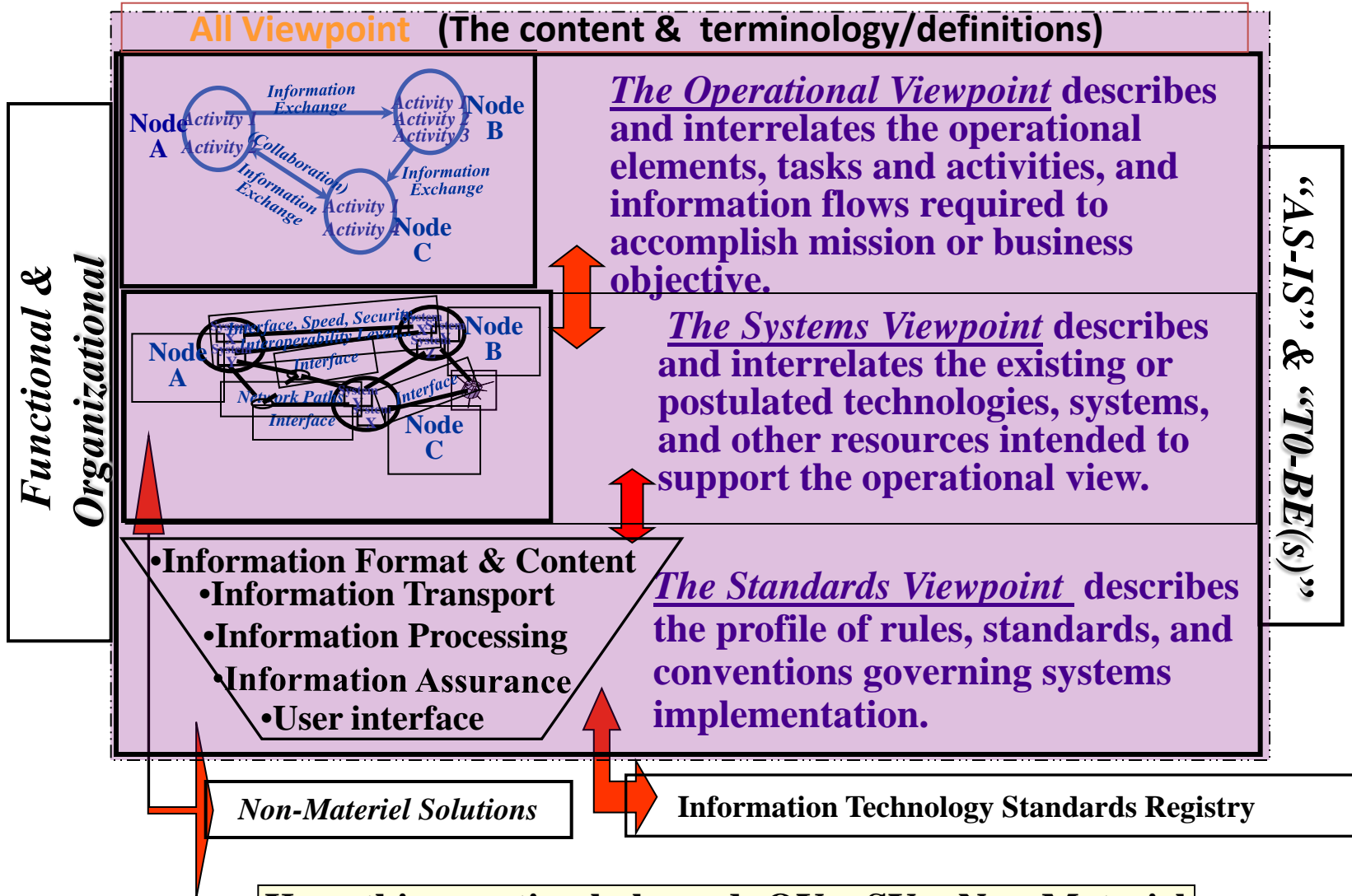
Quality of Transport Services

Key Needs:
- Network interoperability
- Physical 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
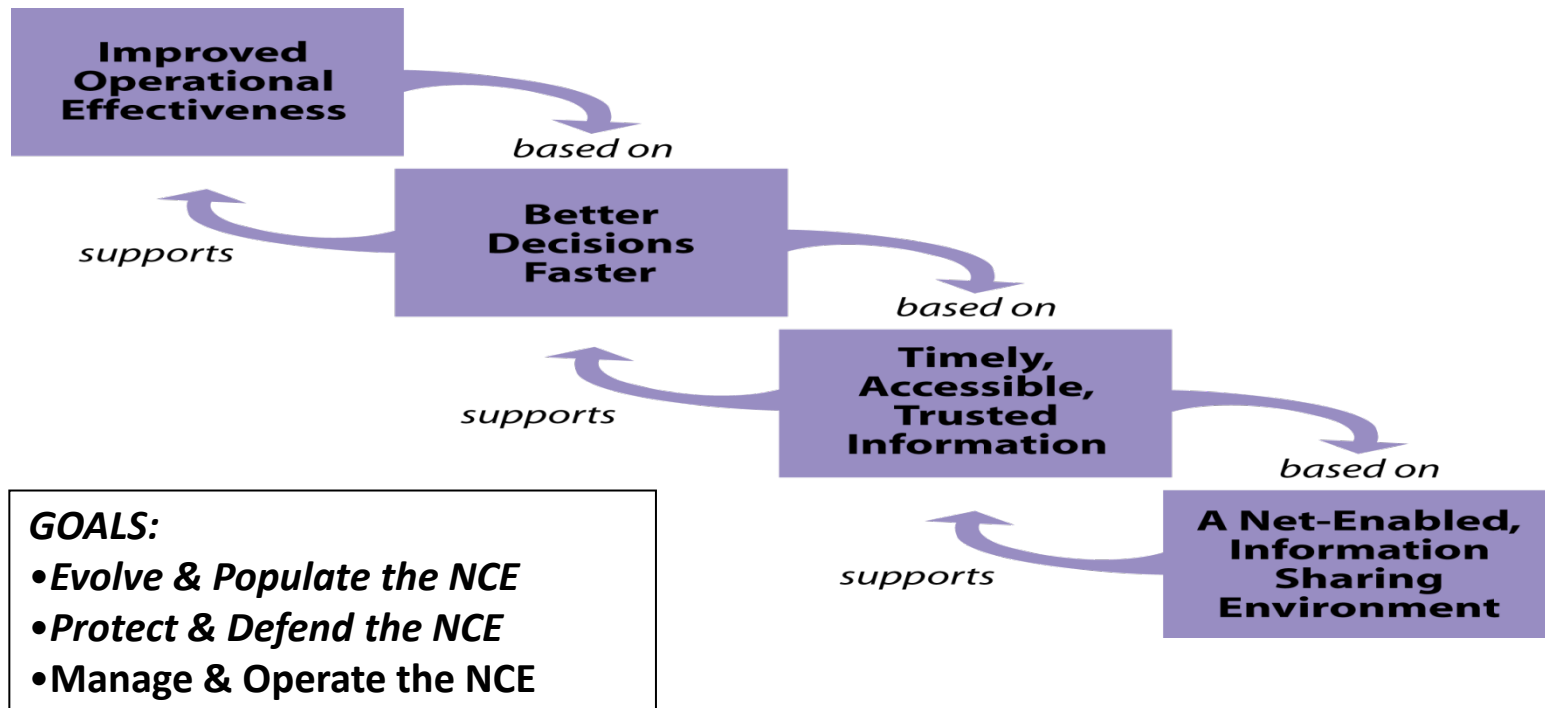
The A Word & Components

All Viewpoint (The content & terminology/definitions)

Functional & Organizational

Node A — Activity — Information Exchange — Activity, Activity, Activity 3 — Node B — Collaboration — Information Exchange — Information Exchange — Activity 1, Activity X — Node C

Interface, Speed, Security, Interoperability Level — Node A — Node B — Interface — Network Path — Interface — Interface — Node C

- Information Format & Content
- Information Transport
- Information Processing
- Information Assurance
- User interface

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.

"AS-IS" & "TO-BE(s)"

Non-Materiel Solutions

Information Technology Standards Registry

Keep this equation balanced: OV = SV + Non-Materiel
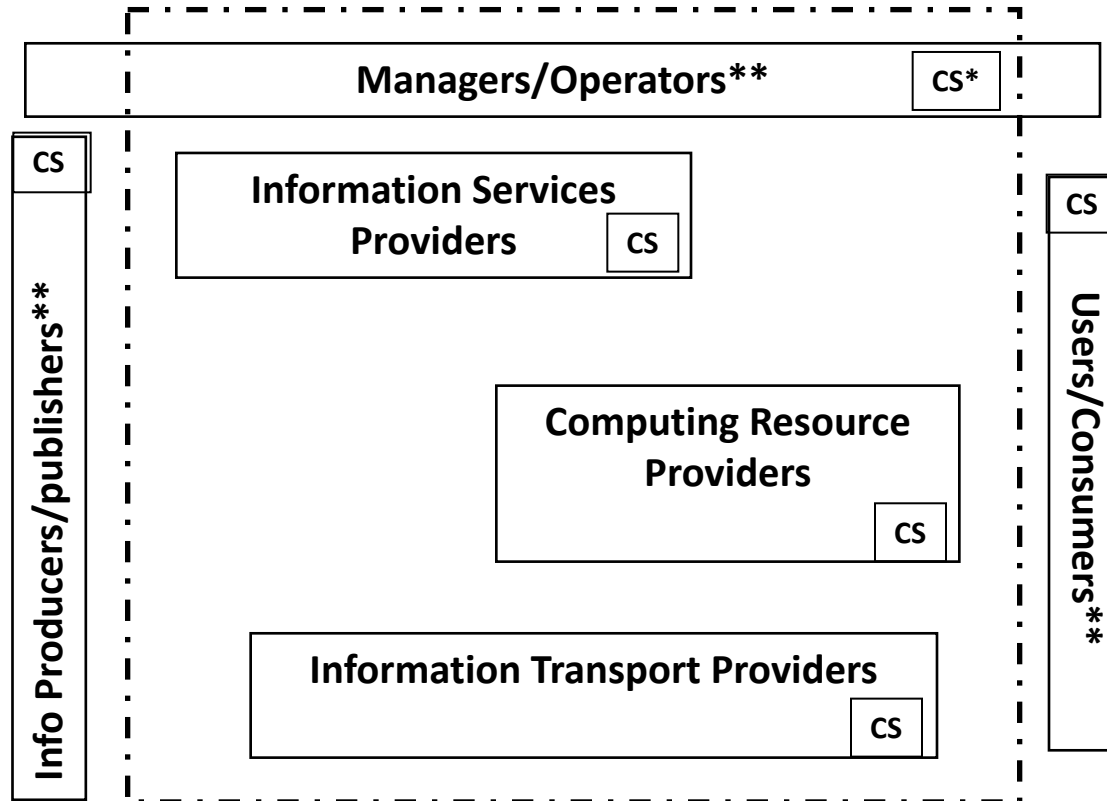
8

Net Enabled Operations

Net Centric Environment (NCE): Objective, Goals & Description

*Objective: A*ll users, whether known or <u>unanticipated</u>, 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.

Improved Operational Effectiveness

based on

Better Decisions Faster

supports

based on

Timely, Accessible, Trusted Information

supports

based on

A Net-Enabled, Information Sharing Environment

supports

GOALS:
- *Evolve & Populate the NCE*
- *Protect & Defend the NCE*
- **Manage & Operate the NCE**

The NCE is implemented with evolving balanced & synchronized sets of <u>P</u>rocess, <u>O</u>rganization, <u>P</u>eople, <u>I</u>nformation & <u>M</u>ateriel (POPIM) Solutions.

Net Centric Environment: Functional Performers

Managers/Operators**   CS*

CS

Info Producers/publishers**

Information Services Providers   CS

Computing Resource Providers   CS

Information Transport Providers   CS

CS

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 in a Net Centric Environment
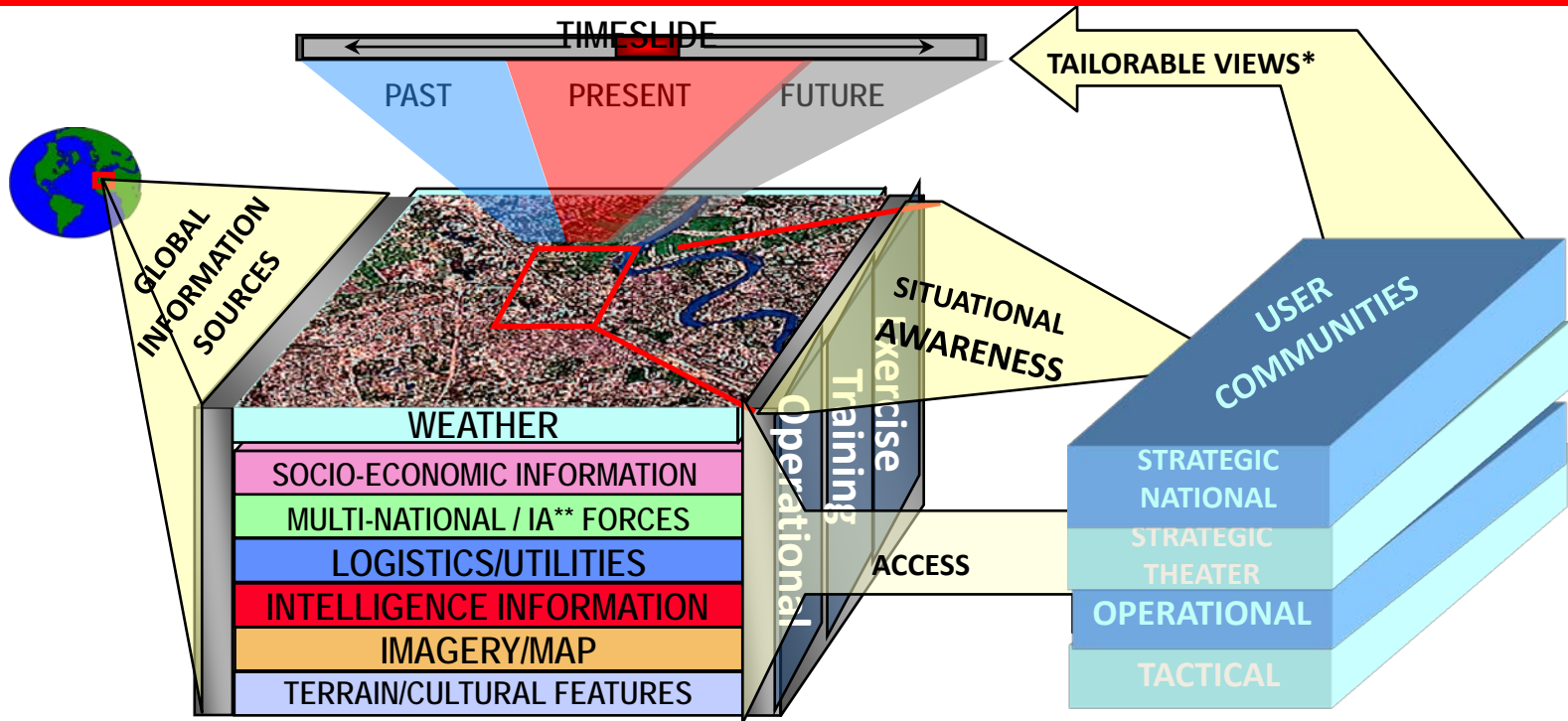
Situational awareness is tailored*, timely, comprehensive, and accurate knowledge of the battlespace (or area of interest) that provides the Warfighter (Commander/Decisionmaker) a consistent view of all militarily relevant information on friendly (blue) and adversary (red) forces, non-combatants (gray personnel), and the battlespace (or area of interest).

(Notes: *"User Defined Operational Picture": ** IA=Inter-Agency)

Net Centric Attributes

Attribute	Description
Internet & World Wide Web Like	Adapting Internet & World Wide Web constructs & standards with enhancements for mobility, surety, and military unique features (e.g. precedence, preemption) .
Secure & available information transport	Encryption initially for core transport backbone; goal is edge to edge; hardened against denial of service.
Information/Data Protection & Surety (built-in trust)	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.
Post in parallel	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).
Smart pull (vice smart push)	Users can find and pull directly, subscribe or use value added services (e.g. discovery). User Defined Operational Picture vice Common Operational Picture.
Information/Data centric	Information/Data separate from applications and services. Minimize need for special or proprietary software.
Shared Applications & Services	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.
Trusted & Tailored Access	Access to the information transport, info/data, applications & services linked to user's role, identity & technical capability.
Quality of Transport service	Tailored for information form: voice, still imagery, video/moving imagery, data, and collaboration.

QUESTIONS?

Definitions of Functional Performers (1 0f 2)

<u>Computing Resource Provider:</u>
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.

<u>Information Service Provider:</u>
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.

<u>Information Provider (i.e., Producer or Publisher):</u>
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.

Definitions of Functional Performers (2 0f 2)

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.