Network Centric Engineering Use of NCOIC Processes and Tools in a Logistics Example

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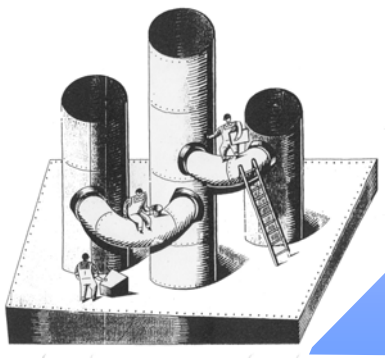
22 OCT 2008

SenseResponder LLC Goal

Net-Enabled Logistics Future



Stovepiped Systems, Point-to-Point Networks

NCOIC Membership Comes From These Countries


Australia


Belgium


Canada


Denmark


Finland


France


Germany


Ireland


Israel


Italy


Poland


Spain


Netherlands


Romania


South Korea


Switzerland


United Kingdom


Sweden


Turkey


United States

NCOIC welcomes global membership

Sample NCOIC Members

Members are Global Leaders:

- **Academic institutions**
- **Air Traffic Management providers**
- **Service providers**
  - Consulting
  - Engineering
  - Logistics
- **Defense suppliers**
  - All military services
  - Multinational
- **Government agencies**
- **Human service agencies**
- **Integrators**
  - Commercial systems
  - Defense systems
- **IT firms**
  - Communications
  - Data management
  - Human-Machine interface
  - Information assurance
- **Standards bodies**

Just a few of the names that you might recognize…

Current Composition of Advisory Council

AC Chairman	Honorable Keith Hall
AC Vice Chairman	General (Ret) Harald Kujat
Swedish MoD	BG Hakan Bergstrom
Joint Staff	VADM Nancy E. Brown, USN
UK MoD	AVM Stuart D. Butler, RAF
Department of Homeland Security	Honorable Jay M. Cohen
Defense Information Systems Agency	Lt Gen Charles E. Croom, Jr., USAF
Italian MoD	Maj. Gen. Pietro FINOCCHIO, ITAF
German Mod	Dr. Gerhard van der Giet
Allied Command Transformation	MGen Koen Gijsbers, RNLA
Assistant Sec of Def/NII	Honorable John Grimes Mr. Jack Zavin
NATO Headquarters C3 Staff	Maj Gen Georges D'Hollander, BE AR
Australian Defence Organisation	RADM Peter Jones
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Former ASD/NII	Honorable John Stenbit
US Army	LTG Jeffrey Sorenson
NATO C3 Agency	Mr. Dag Wilhelmsen
NATO CISSA	LtGen Ulrich Wolf
US Joint Forces Command	LTG John R. Wood, USA

*First time attendee

Current S&RL Global Government Participants/CRADA Holders/Members

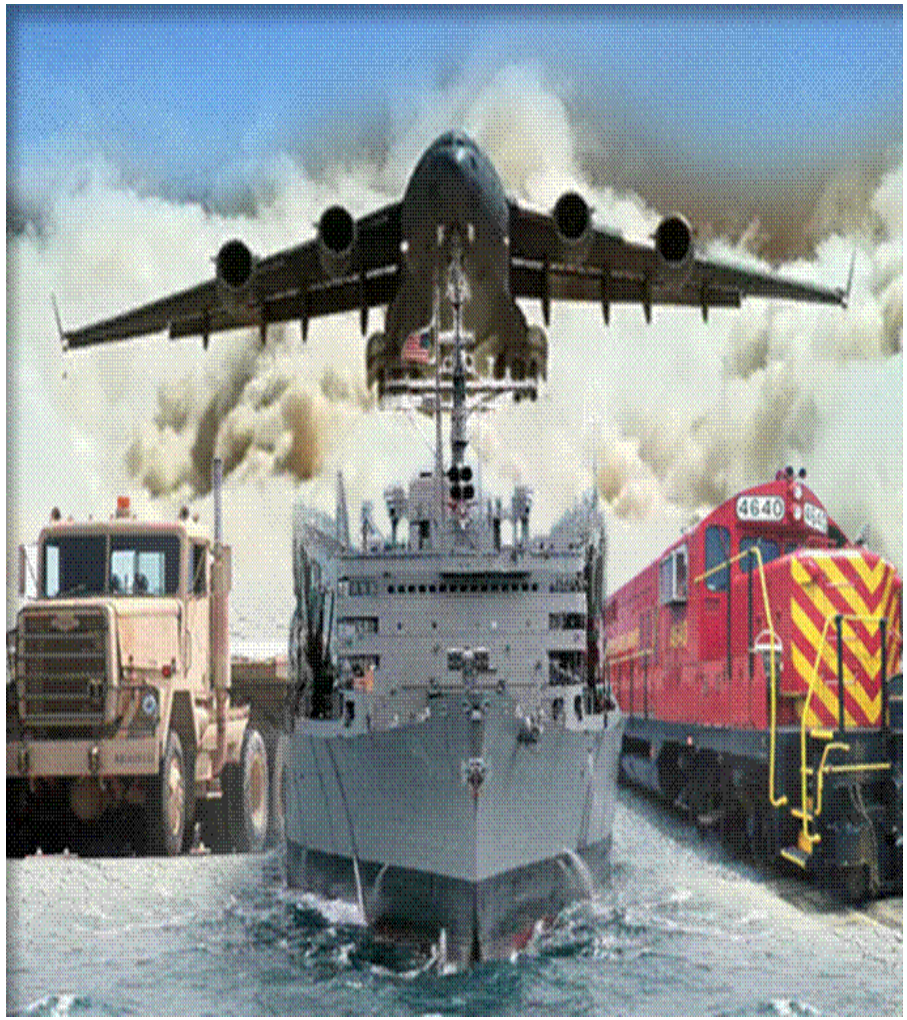
- OSD – ATL (Acquisition Technology & Logistics)
- DISA (Defense Information Services Agency)
- JFCOM (Joint Forces Command)
- NNWC (Naval Network Warfare Command)
- MARCORSYSCOM (Marine Corps Systems Command)
- NATO (North Atlantic Treaty Organization)
- EDA (European Defense Agency)
- ACT (Allied Command Transformation)
- NC3A (NATO C3 Architecture)
- DAU (Defense Acquisition University)
- ONR (Office of Naval Research)
- DLA (Defense Logistics Agency)
- BTO (Business Transformation Office)
- Force Transformation Office (Sense & Respond Logistics)
- DOD Australia

Discussion Objectives

- Show the Strategic Plan to develop a Global Network Centric Logistics Environment.
- Introduce Network Centric Engineering and its application on various projects.
- Designing a Logistics NCE using Operational Descriptions, Standards, Patterns, and Building Blocks.
  - Requirements Validation
    - Operational Descriptions; SCOPE; Well Formed Requirement
  - Standards
  - Patterns
  - Building Blocks

Network Centric Logistics Strategic Plan

1. Identify & Enhance Network Centric Logistics Requirements, Standards, Patterns, and Building Blocks.
2. Build on this framework for a global, commercial & government, logistics community of interest focused on collaboration.
3. Apply the processes & toolset to integrate global network super nodes.
   A. SCLA/DOD: JDDSP (Joint Power Projection Support Platform)
   B. US DOD/NATO/AUSCANNZUKUS: Joint & Coalition SeaBase
   C. NATO: NRF TC (NATO Response Force Training Center)
   D. Commercial Global Logistic Distribution Centers



"Just in Time Delivery" to the Military, Using Commercial Transport Mechanisms (Wal-Mart and FedEx style delivery)

Network Centric Engineering Core Competencies

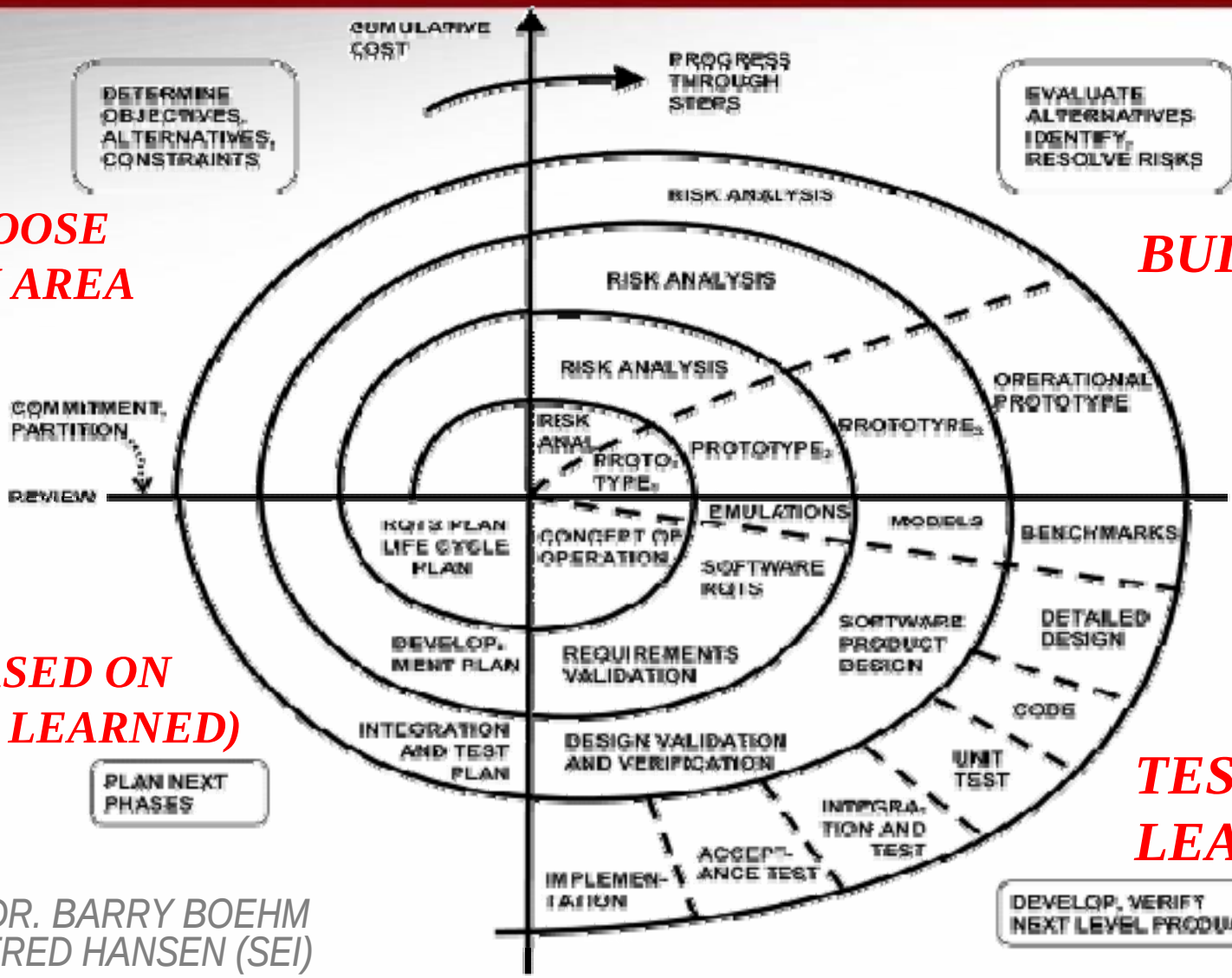
- Requirements Capture
  - Operational Description
  - CONOPS
  - JCIDS Processes and Documents
  - SCOPE (Systems-Capabilities-Operations- Programs- Enterprises) Analysis
  - WFR (Well Formed Requirement) Model
  - Business Process Mapping
  - Other Tools (SCOR, NCAT, etc.)
- Architecture and Lexicon Development
- Modeling and Simulation
- Standards Framework Design and Development
  - Data Sharing Concept and Design
- Operational and Technology Capability Patterns and Guidance
- System and Network Selection from the Building Blocks Repository
- Prototype Building
- Test and Experimentation (Build a little, Test a little, Learn a Lot)
  - Human Systems Integration (DOTMLPF)

Network Centric Engineering for JDDSP Example

- Requirements Capture (Business Process Analysis)
  - CONOPS => Initial Capabilities Documents
- Process Mapping & Modeling Operations Activities
  - SYSML and Other Models for Various Use Cases and Scenarios
- Architecture Design & Development (Service Oriented Architecture Artifacts)
  - Standards Selection-Integration (NSWG, DISR, SCOPE Analysis, PFC, …)
  - Service Oriented Architecture: GIG Integrated, Open Standards, XML, ...
- Site Physical and Cyber Site Security Plan (Information Assurance)
- JDDSP Experimentation Plan Development (Operational Test-bed Activity)
  - Pacific Northwest Corridor (Force Deployment) Experiment
  - Dole Pacific Shipping (Commercial Distribution) Experiment
  - TATRC Class VIII (Force Sustainment – Sense & Respond Logistics) Experiment
- Sea-Basing Template (JDDSP Interface)
- Prototype Build (System of Systems Integration)
- Execute Experiment to Fill Gaps in Rationale
- Perform Demonstration
  - Human System Integration: DOTMLPF
  - Mission Capability Packages

TRACK #1: EXPERIMENTATION

Risk Reduction through Experimentation



CHOOSE RISK AREA

BUILD

PLAN (BASED ON LESSONS LEARNED)

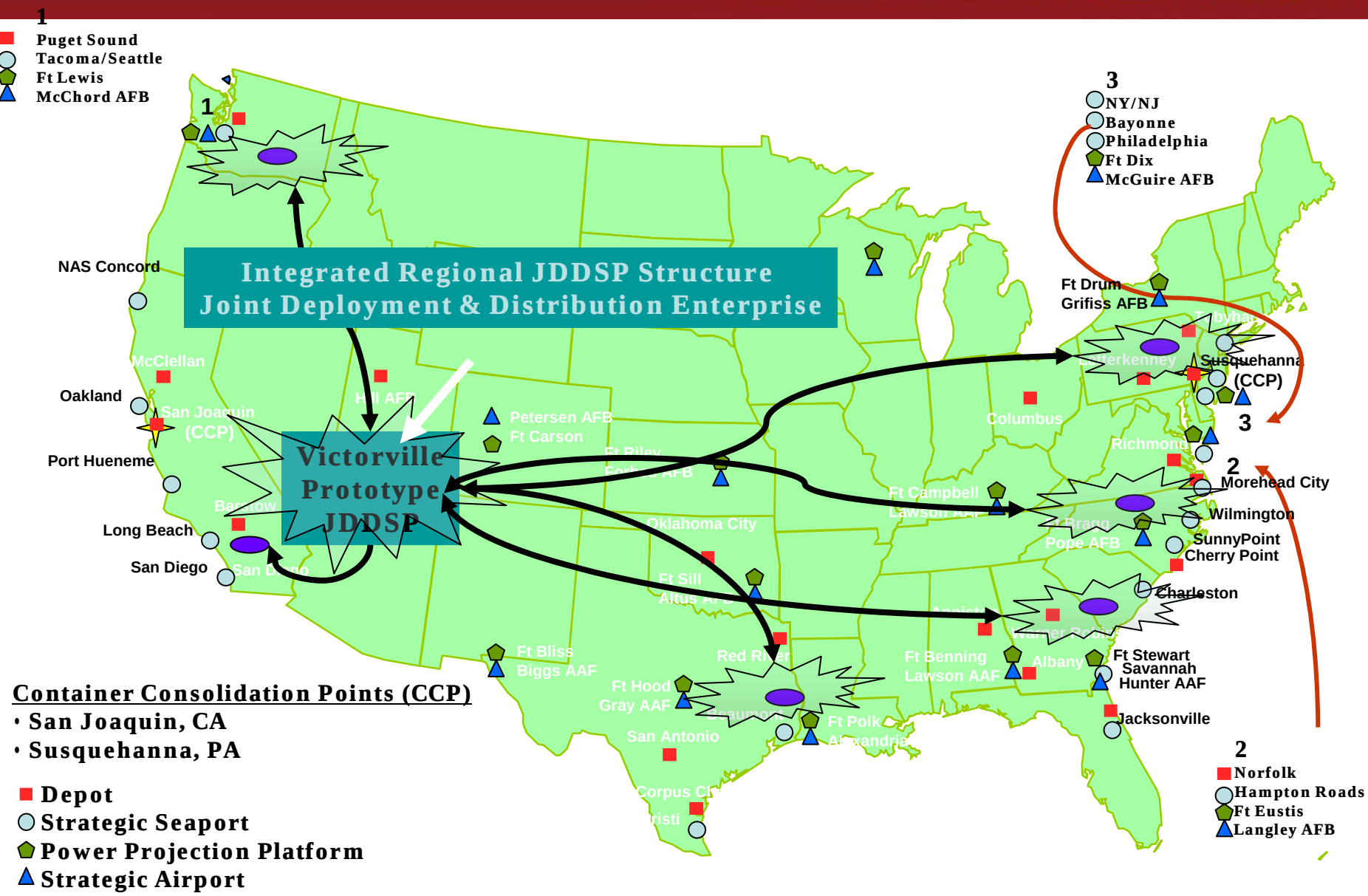
TEST & LEARN

CREDIT TO: DR. BARRY BOEHM (USC) & WILFRED HANSEN (SEI)

NCL Operational Capability at the JPPSP

JDDSP Developed to Support:

POWER PROJECTION PLATFORMS, STRATEGIC AIR PORTS, SEAPORTS, & DOD DEPOTS

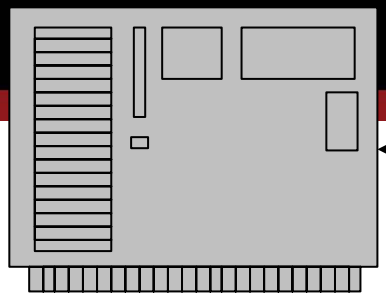


Container Consolidation Points (CCP)

- San Joaquin, CA
- Susquehanna, PA

- Depot
- Strategic Seaport
- Power Projection Platform
- Strategic Airport

SCLA Business Community SOA



SCLA Certification Authority (CA)

1. Publish standard service specifications

Standardized Support
Application Support: Plug-ins

SM21 Business Community Registry (UDDI)

SM21 Business Community Authority

3. Issues certificate to Provider

2. Apply for registration

Get certificate from CA

4. Search service; search Provider

Get Provider's certificate

IP-MTOPS

Business Community Operator

5. SCLA-JDDSP data exchange; access to Web Services; exchange of signed and secured documents.

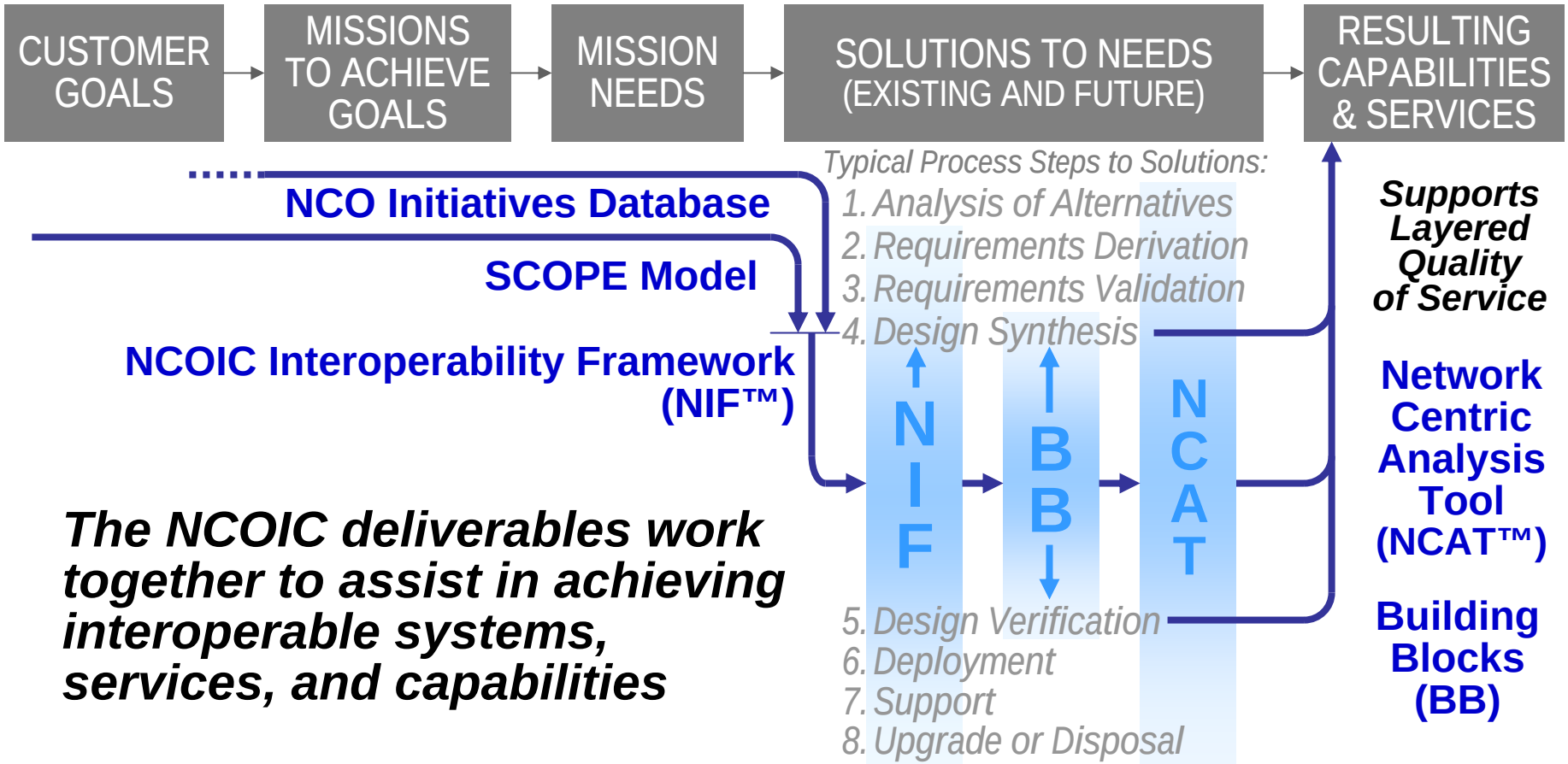
Data exchange over secured channel (HTTPS/SMTPS)

Military Community Operator

ITS-TCOS

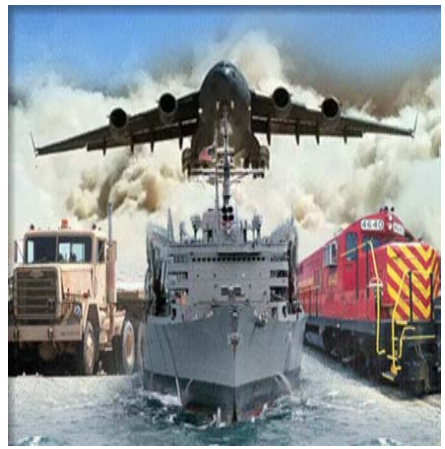
Regional Tracking Data Input Through TCOS to JDDSP

The Process, Tools, and Guidance



Expeditionary Force Deployment Operational Description

- NCOIC - ONR JDDSP – SR LLC Subject Matter Experts develop an Expeditionary Force Deployment Operational Description (EFD OD), Mission Threads, Scenarios, and CONOPS.

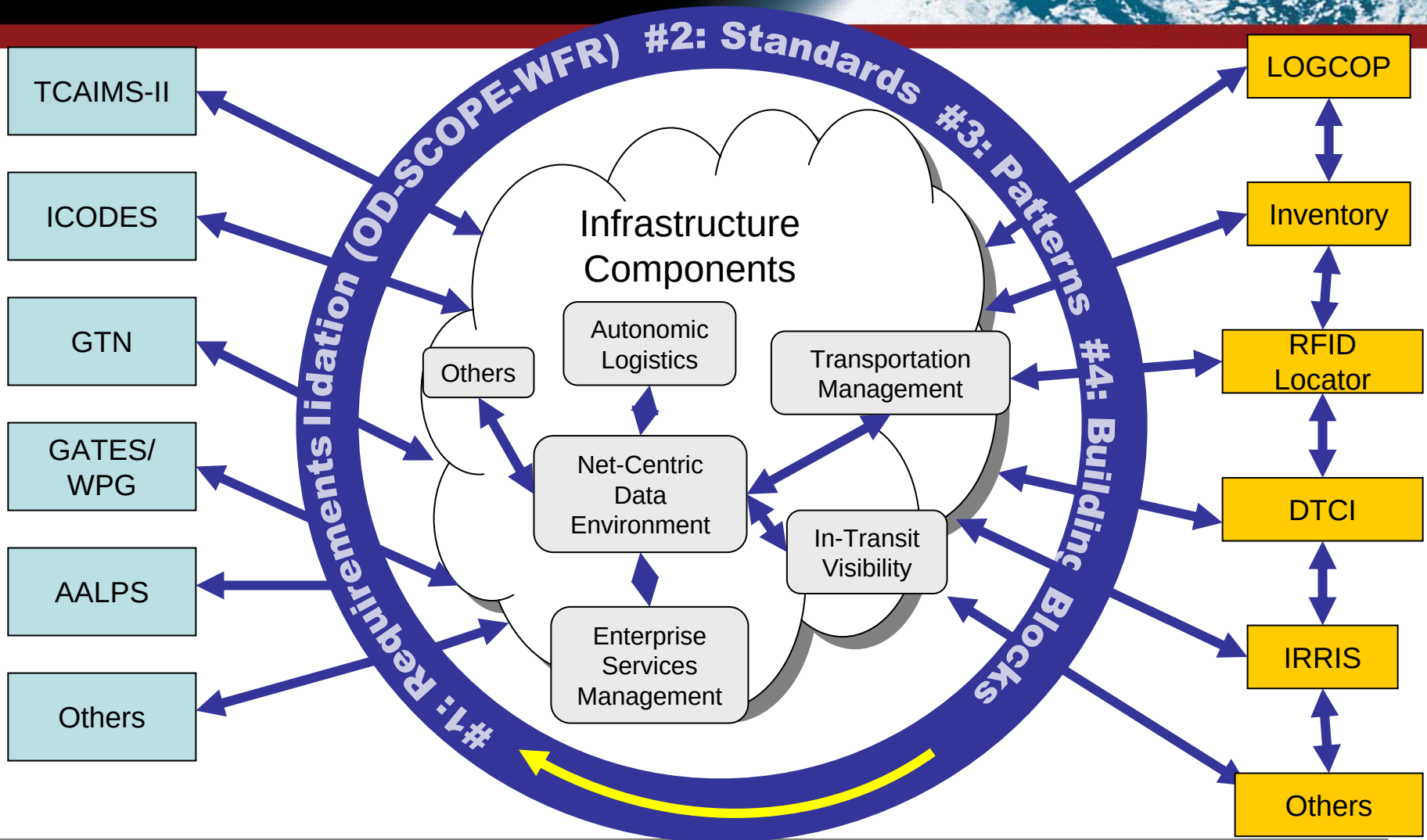


- EFD OD informs the list of standards and application processes on information security and other functions for IT network design.
  - Defined the Potential Patterns to Define Log Domain.
  - Initiated Building Blocks Database for Log Domain.

- Develop NIF patterns that describe Interoperability Criteria to accomplish the Logistics “Total Asset Visibility” mission and use existing commercial infrastructure to deploy/sustain, without disrupting commercial enterprise.
  - e2e visibility replaces 30-day “Iron-Mountain”.
  - Logistics UDOP picture provides max collaboration.

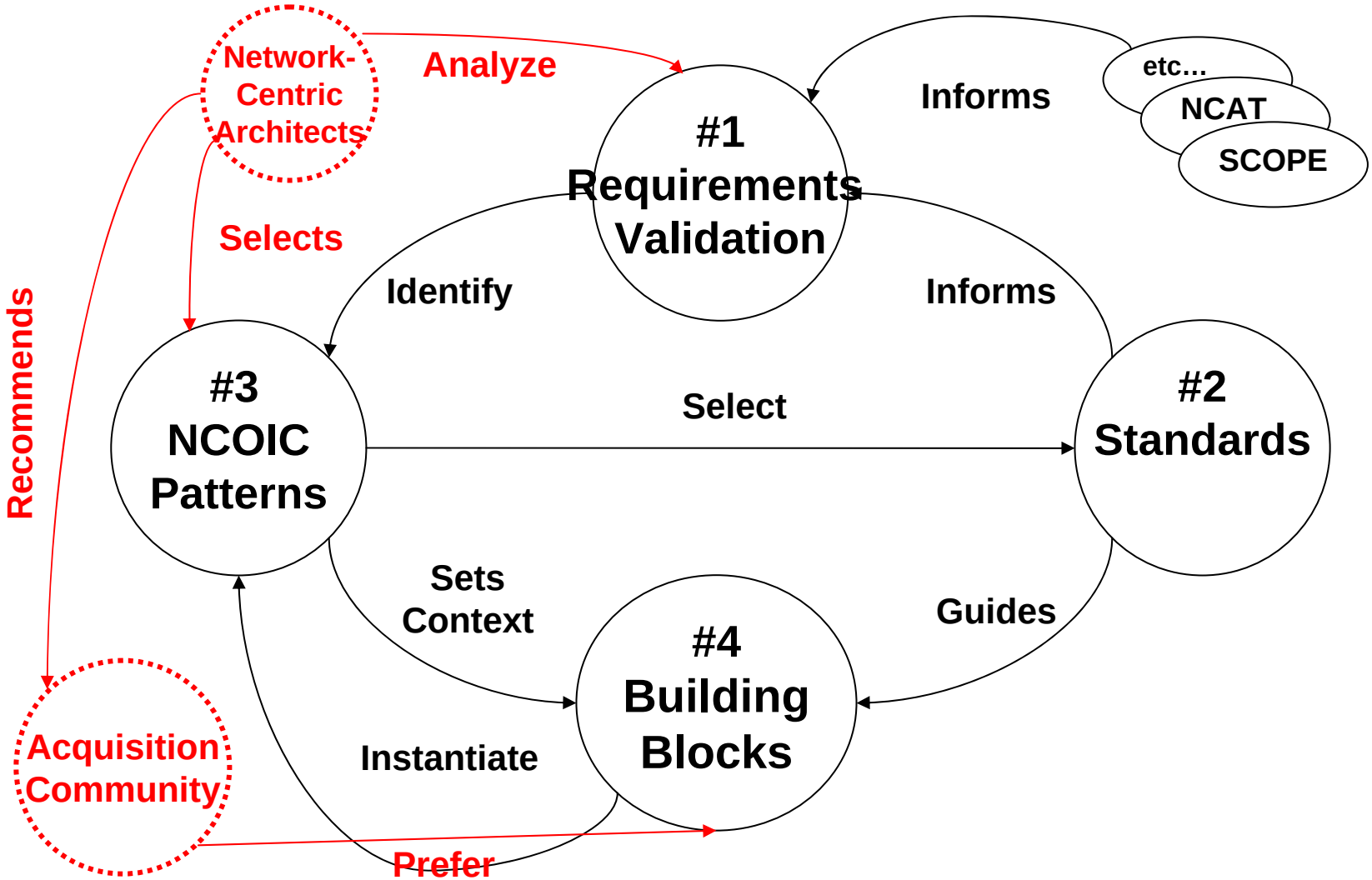
“Just in Time Delivery” to the Military, Using Commercial Transport Mechanisms (Wal-Mart and FedEx style delivery)

Combining Legacy and New Systems in a Network Centric Logistics Node



SenseResponder LLC assists in Requirements Validation; Standards Identification and Cross Linking; Pattern Development for Interoperability Guidance; and a COTS/GOTS Products & Services "Building Blocks" Repository.

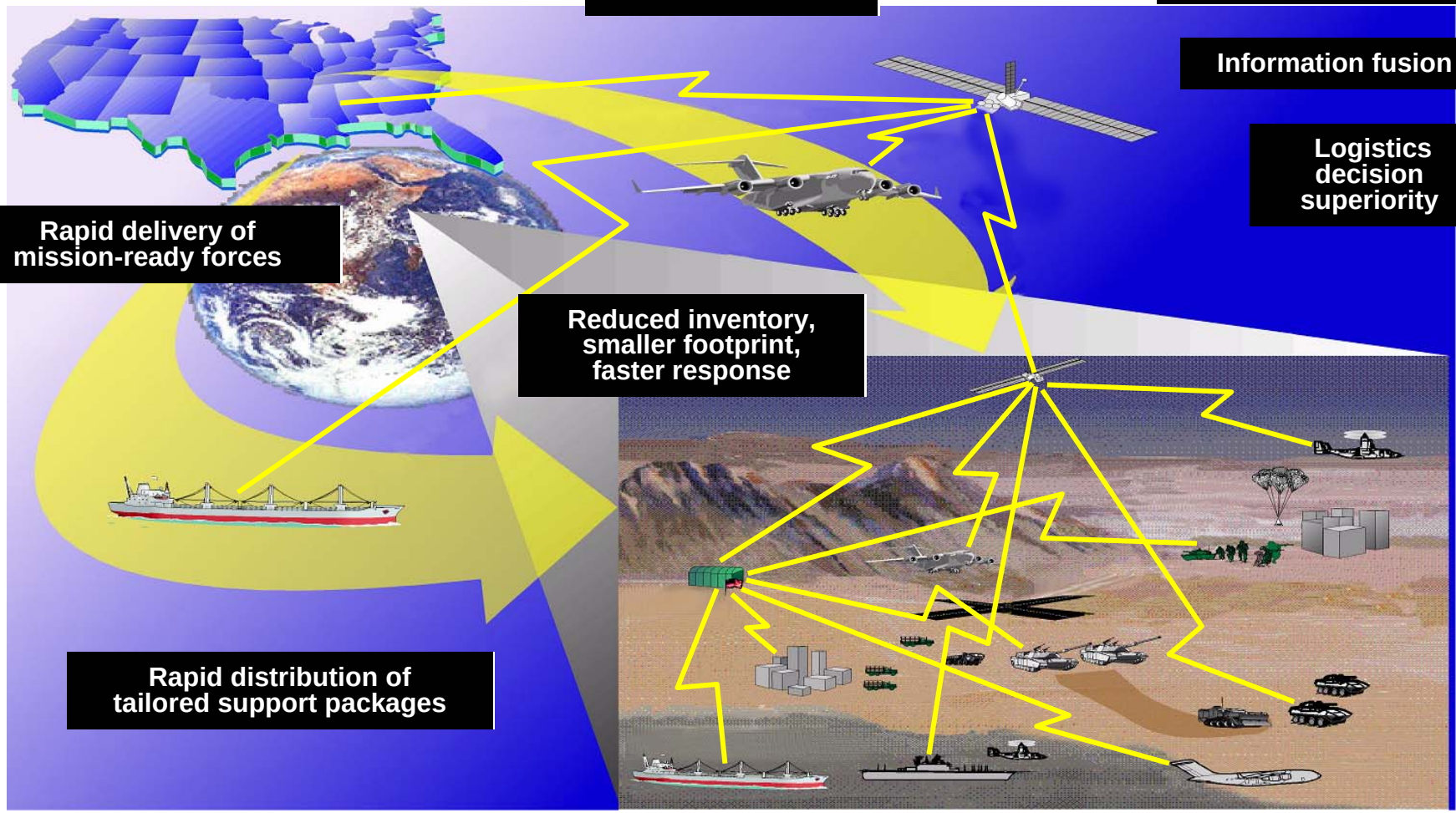
Designing an NCE (Network Centric Environment)



#1: Requirements Validation

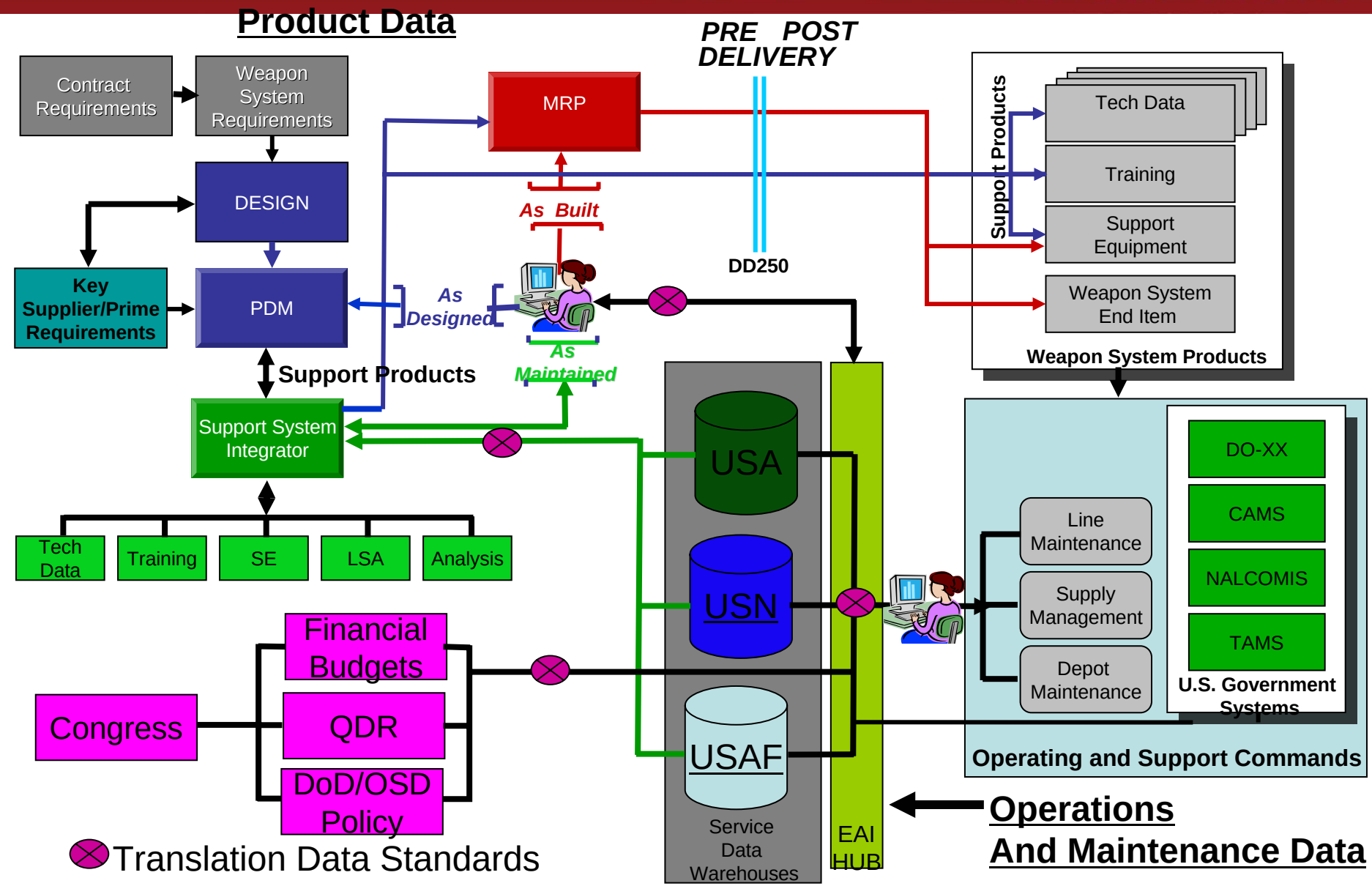
- OD (Operational Description)
- SCOPE (Systems - Capabilities - Operations - Programs - Enterprises) Analysis
- WFR (Well Formed Requirement) Model

Logistics "Operational" Capability

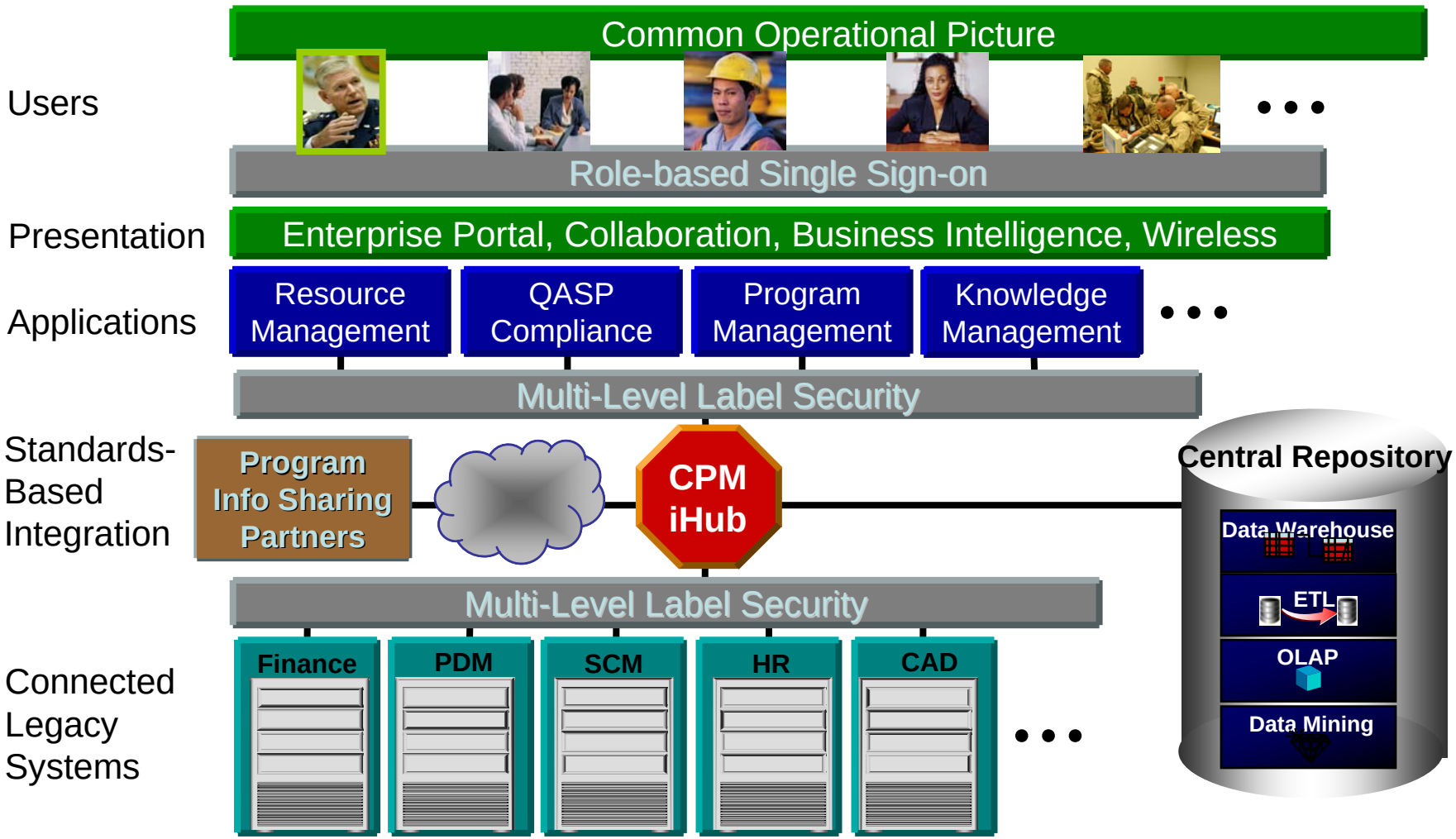


Bottom line: Forces in theater — whether forward-stationed or deployed — deliver more capability, require less support

Logistics "Technical" Capability



Logistics Architecture Solution



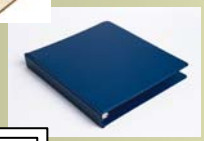
Sample Sense & Respond Logistics Operational Description Document

1. Introduction
2. Architecture Principles and Artifacts
3. S&RL Problem Description
4. S&RL Interoperability Solutions
5. Attributes or Global Aspects
6. Enabling Technology Patterns
7. Interoperability
8. S&RL Open Protocols and Standards
9. Business Model Implications
10. Applicable NCOIC PFCs and External References
11. Network Centric Engineering the JDDSP (Joint Deployment Distribution Support Platform)

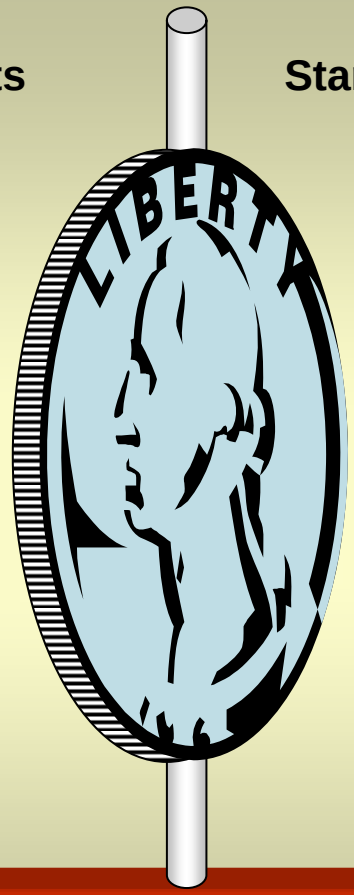
Well Formed Requirement

CUSTOMERS

Well Formed Requirements



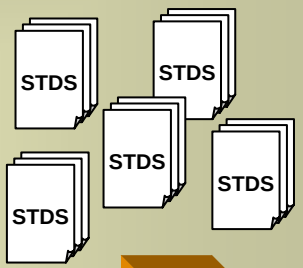
- Coherence
- Conformance
- Consensus
- Convergence
- Collaboration

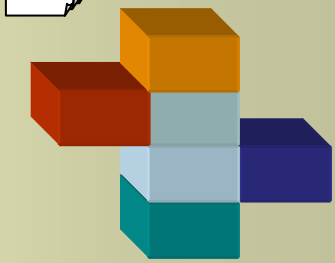


INDUSTRY

Standards, Patterns and Building Blocks

- Coherence
- Conformance
- Consensus
- Convergence
- Collaboration





Two Sides of the Same Coin

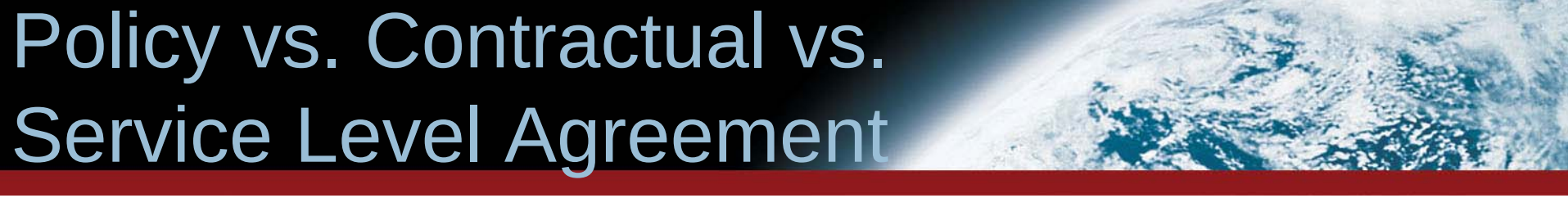
Dimensions of a Requirement

- **Function**
  - **what is to be done**
  - **Usually text description today, but could be a video, simulation, animation, etc.**
  - **Granularity can be from a capability to a service**
- **Constraints –what tolerances must be met**
  - **Measures of Effectiveness (MOE)**
  - **Measures of Performance (MOP)**
  - **Measures of Net-Centricity (MON) – new and analyzed in NCOIC SCOPE model**
  - **Measures of Satisfaction (MOS) – new to DoD**
  - **Size, Weight, And Power (SWAP)**
  - **Costs and Schedules**
  - **Risk Tolerance (TRL - Technology Readiness Level)**
  - **Miscellaneous (a.k.a. the “ilities”**
- **Operational Context**
  - **Physical Environment**

From Requirements to Solution

- **Function and Operational Context are usually well understood and unchangeable [*without doctrine or CONOPs rework]**
- **Solution usually requires trade-offs among the multiple constraint dimensions**
  - **For example trading reduced durability for lighter weight**
- **Some constraints are more inflexible than others or have tighter range of values in different Operational Contexts**
  - **Reliability (MTBF) for space-based radio transmitter on a missile launch early detection satellite much higher and less negotiable than for a tower-based radio transmitter for the Voice of America**
- **Selected solution is often the alternative that:**
  - **performs the function…**
  - **in the operational context…**
  - **and "best fits" the customer and contractor "agreed upon" blend of constraints resulting from trade-offs determined during architecture or system design**

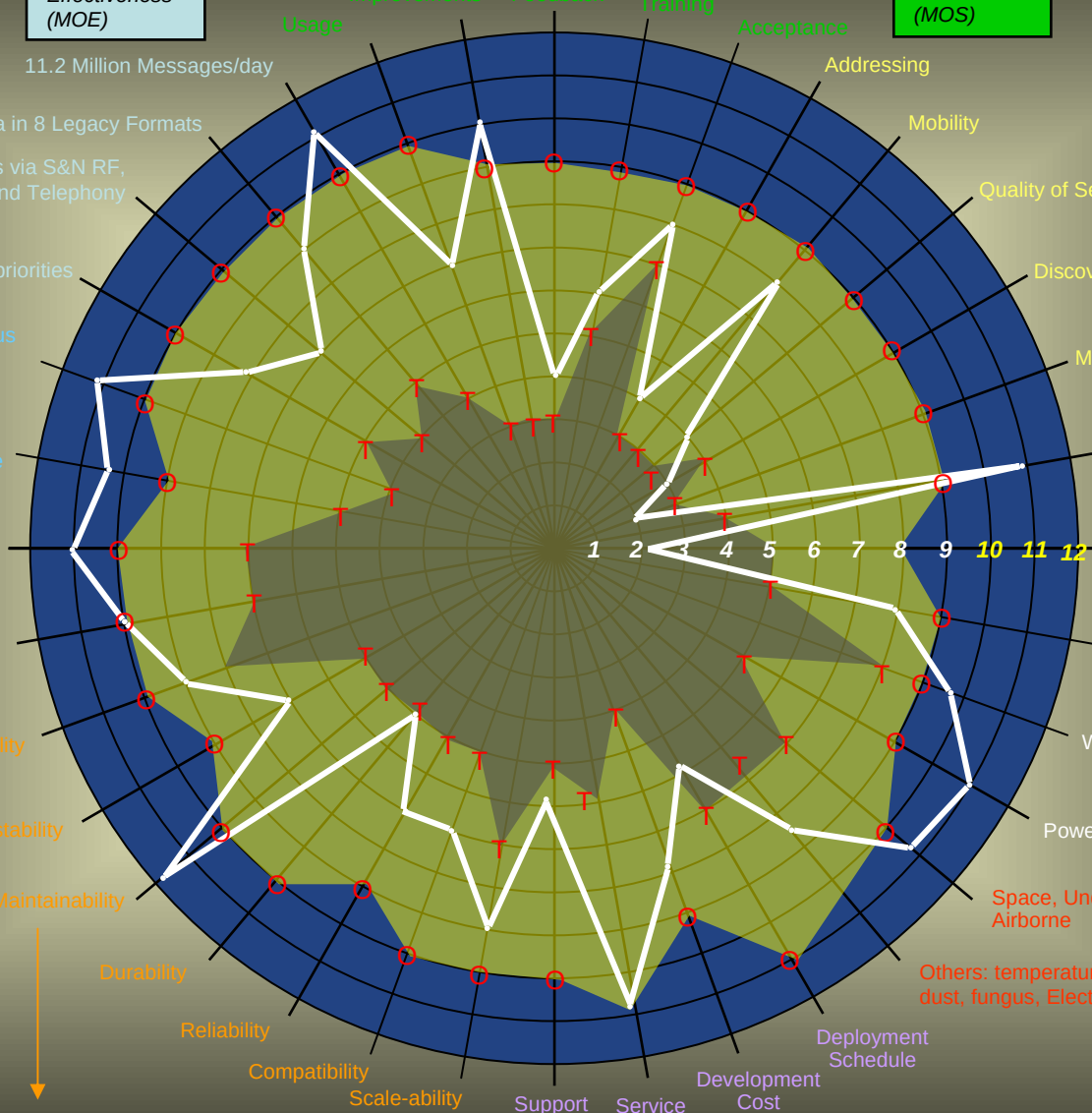
Policy vs. Contractual vs. Service Level Agreement



- **For a given Function In a given Operational Context:**
  - **Some requirement dimensions will be best specified as contractual obligations such as acceptance criteria or incentive fee items**
  - **One time measurement against specification**
- **Some requirement dimensions will be best specified as Service Level Agreements (SLAs)**
  - **Continuous measurement against specification**
- **Some requirement dimensions will be consensus globally, some nationally, some military vs. commercial, and some within COI**

Well Formed Requirement – Kiviat Chart

MOE and MOP in this example are from Integrated Broadcast Service (IBS) Sources Sought RFI from USAF ESC March 20, 2006 and are provided strictly as an example.



Others: buoyancy, balance, aerodynamics, vibration, thermal dissipation, crash load factors, air worthiness certificate

Others: temperature, humidity, pressure, salt, sand & dust, fungus, Electronic Attack (EA), EMP, CBRN

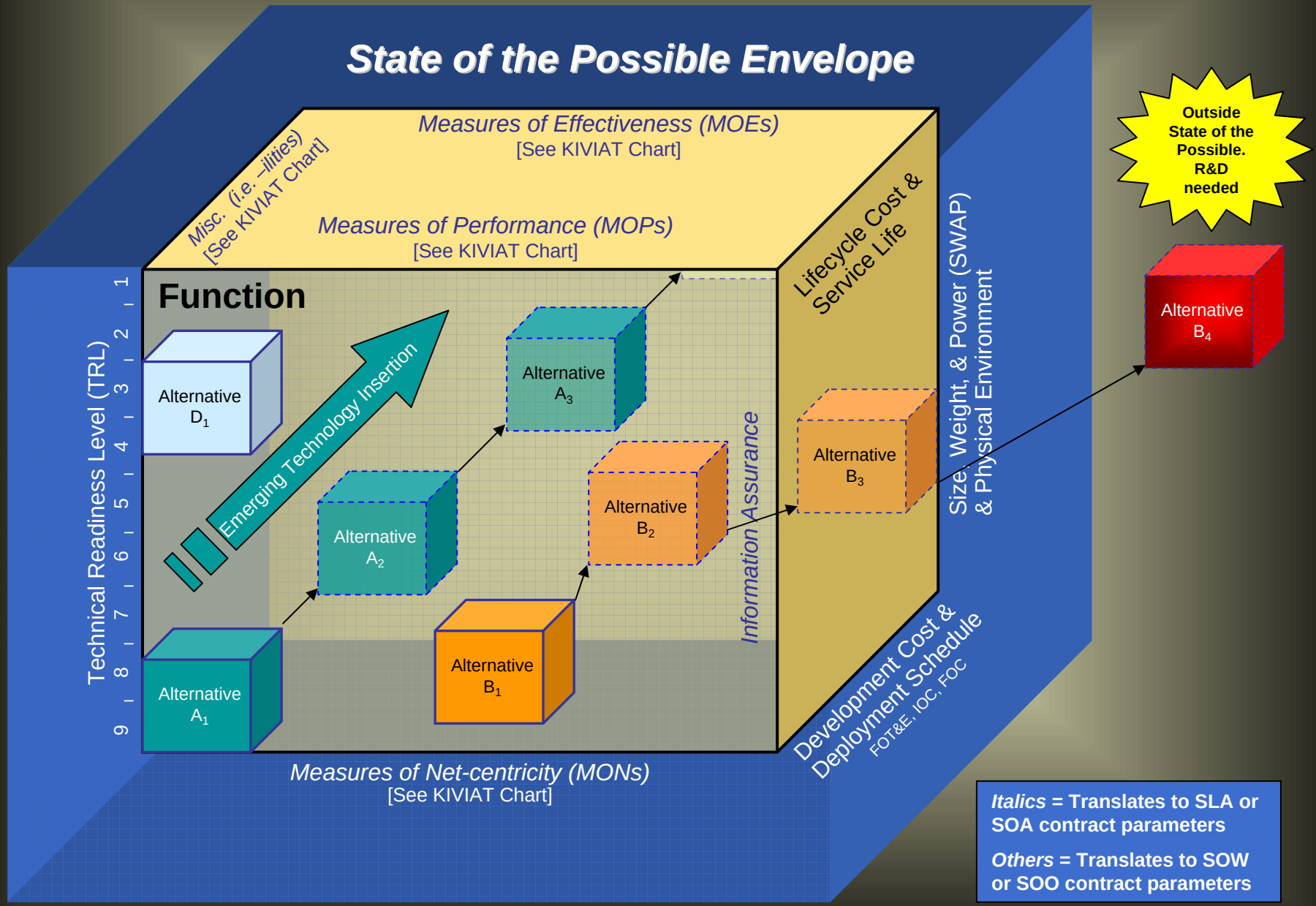
Others: Controllability, Manageability, Electro-magnetic Compatibility

AF SAB Report: "SoSE for Air Force Capability Development" Configurability, Re-configurability, Evolve-ability, Emerge-ability, Subscribe-ability

Mean Time Between Failures (MTBF), Mean Time Between Maintenance (MTBM), Mean Repair Time

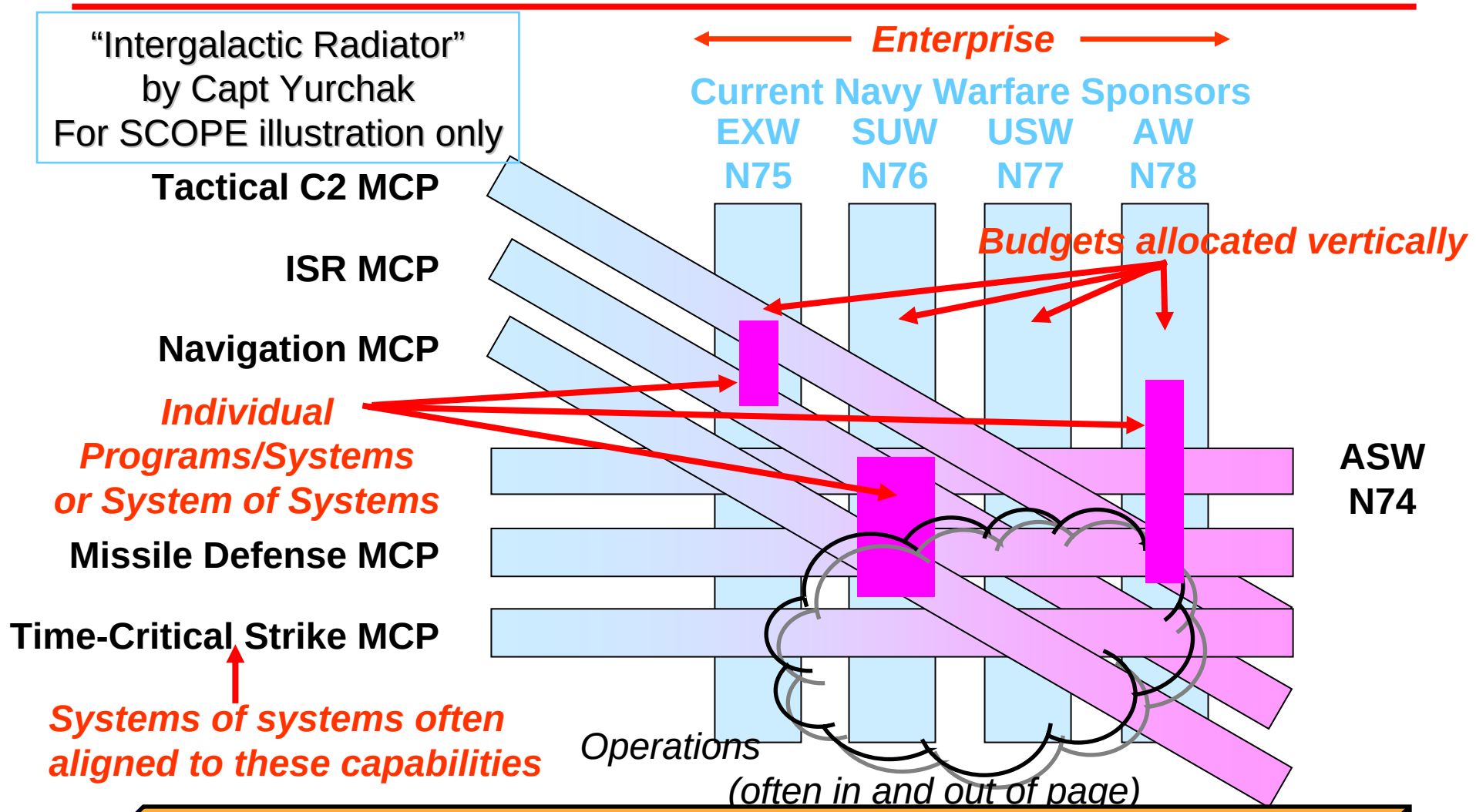
NOTE: *This chart is notional. No Function would have all the dimensions shown here. It is simply a convenient place to capture dimensions as they are discovered.*

ANALYSIS of ALTERNATIVES



Relating Systems, Capabilities, Operations, Programs, and Enterprises (SCOPE)

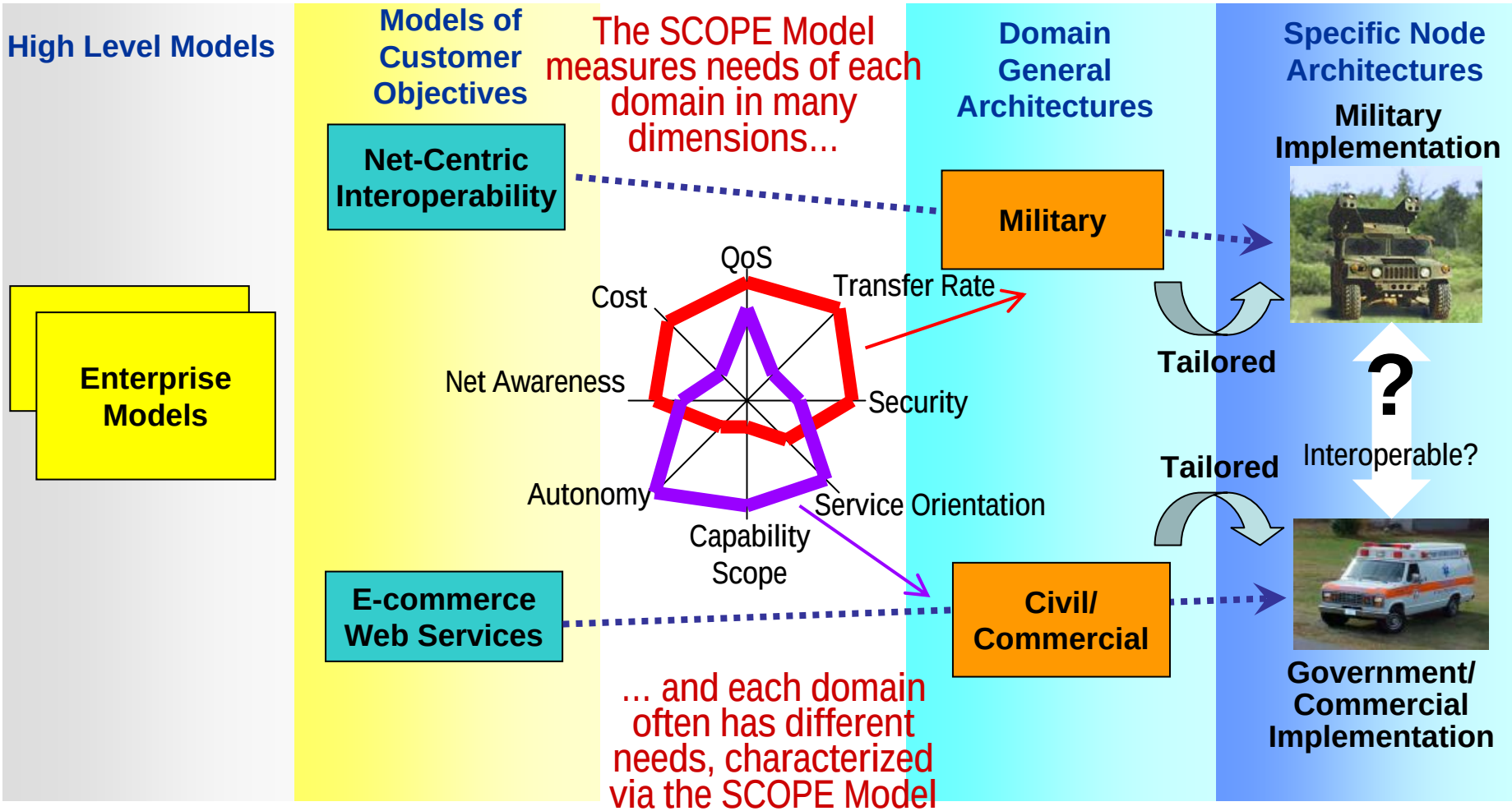
"Intergalactic Radiator"
by Capt Yurchak
For SCOPE illustration only



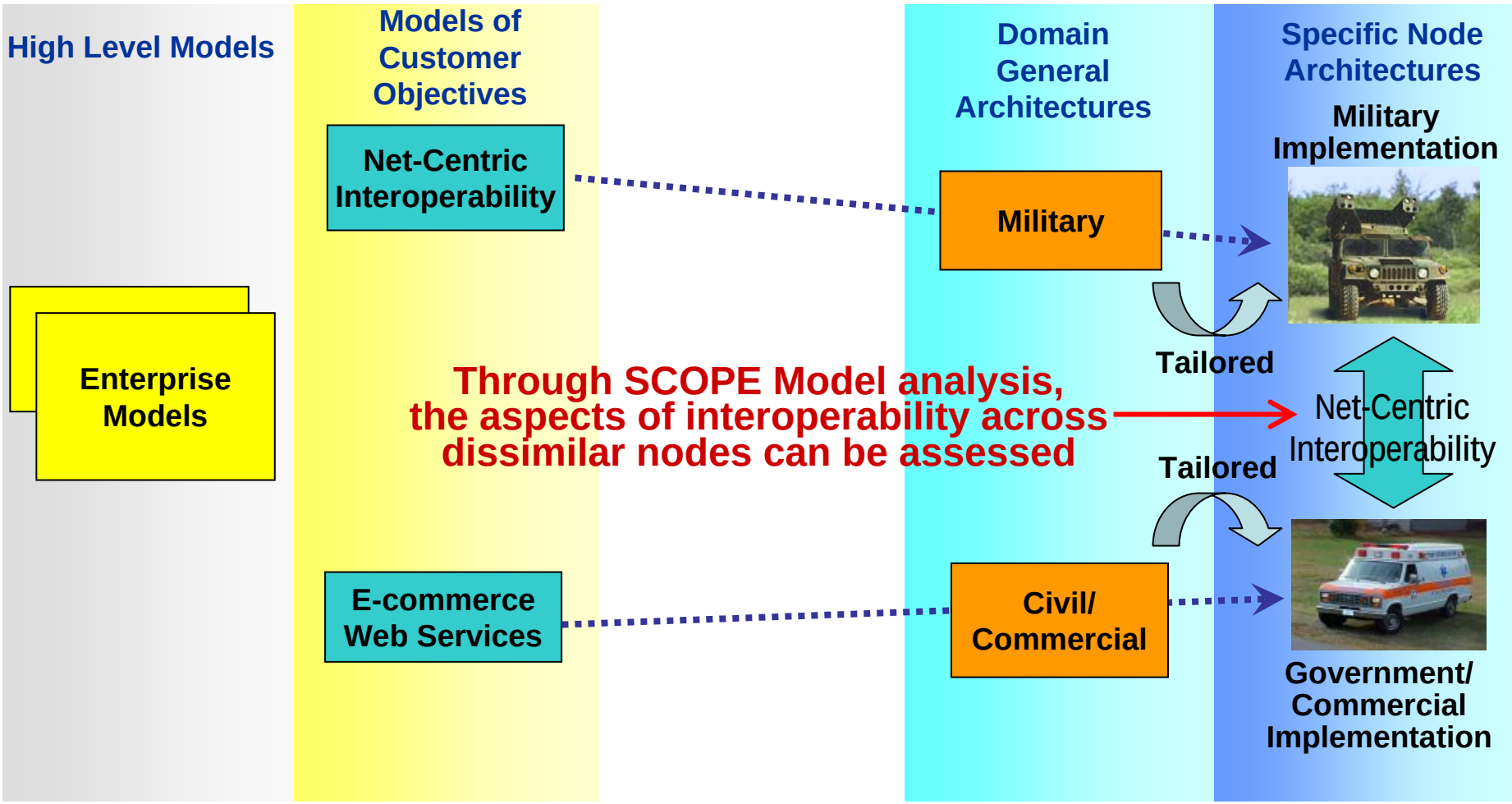
Illustrates Complex Dependencies in Capability Acquisition

The Role and Value of the SCOPE Model

SCOPE: ***S***ystems, ***C***apabilities, ***O***perations, ***P***rograms, and ***E***nterprises



The Role and Value of the SCOPE Model



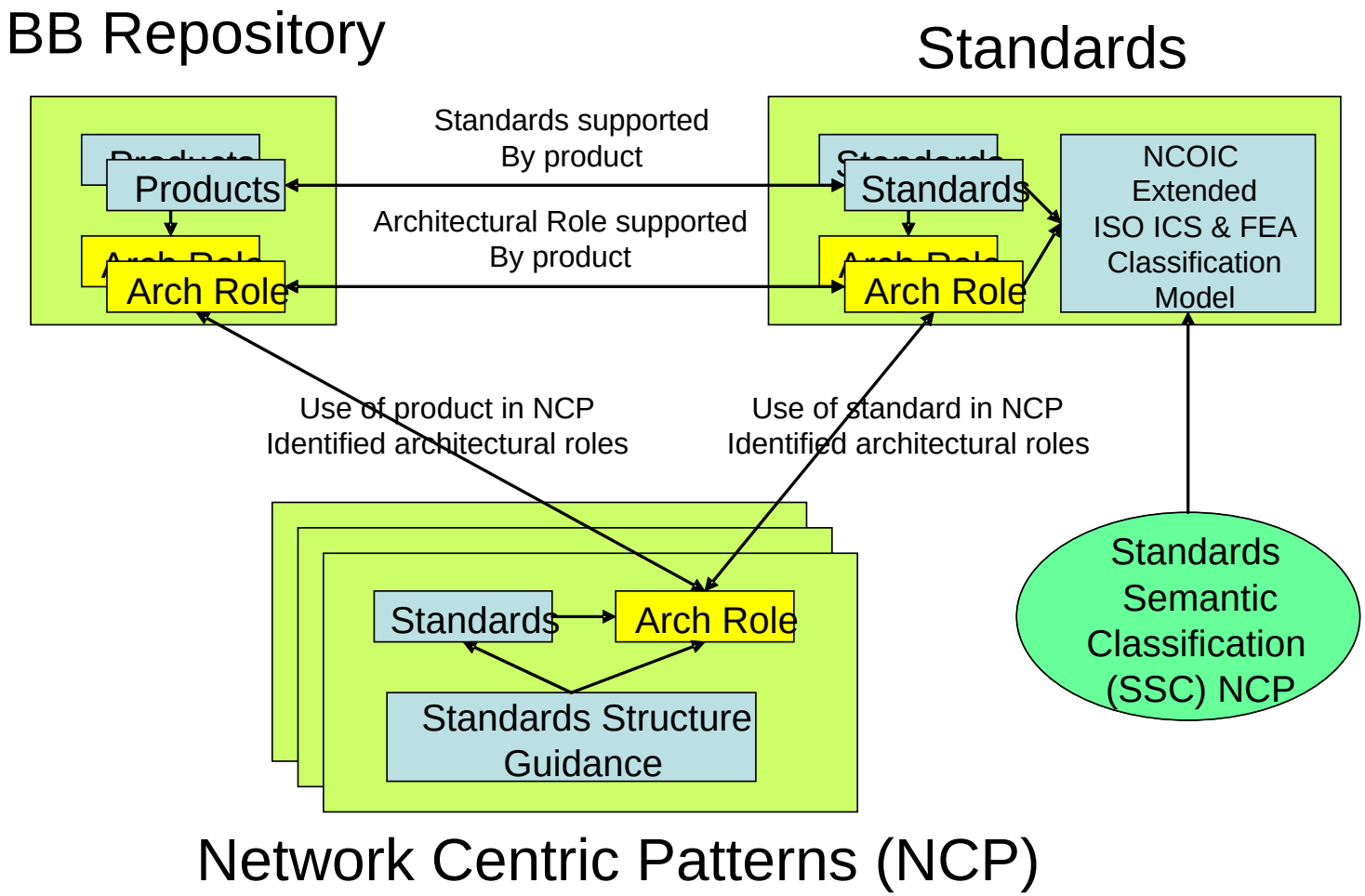
Capability Scope Dimensions

Value / Dimension	Narrower Scope			Broader Scope
Overall Scope and Types of Enterprise	**Single Unit**	**Single Service or Agency**	**DoD-Wide**	**World-Wide**
Capability Breadth	**Single Functional Domain/Service**	**Multi-Domain, Multi-Service**	**Multi-Dept, NGO, Industry**	**Coalition, Multi-Enterprise Type**
Capability Depth	**Single Level**	**Two Levels**	**Three Echelons**	**Four or More Echelons**
Organizational Model and Culture	**Rigid Hierarchy, Vertically Integrated**	**Adaptive Hierarchy, Interact Horizontally**	**Flat, Empowered, Open to Partnering**	**Adaptive, Social, Interdependent**
Unity of Life Cycle Control/Alignment	**Single DoD Acquis. Exec**	**Multiple DoD Acquis. Exec**	**DoD & US Syst. Owners**	**Multi-National Syst. Owners**
Acquisition Congruence (SD)	**All Systems on Same Timeline**	**Timeline within 2 years**	**Timeline within 5 years**	**Timelines >5 years apart**
Semantic Interoperability	**Single Domain Vocabulary**	**Multi-Domain Vocabulary**	**Single Language**	**Multiple Languages**
Operational Context (SD)	**Single Ops Context**	**Multiple Ops Contexts**	**Future/Past Integration**	**Hypothetical Entities**

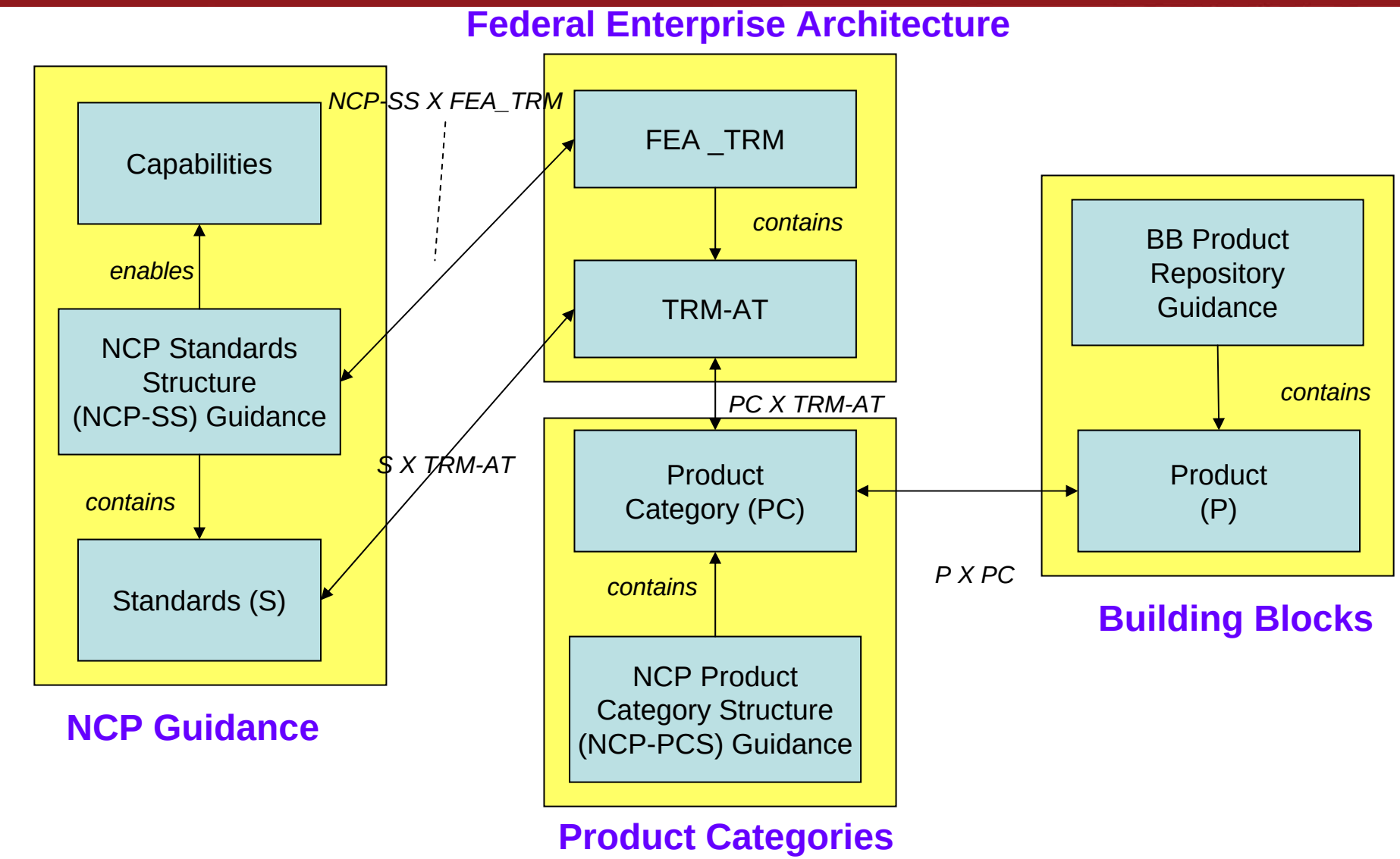
#2: Standards

- Identification
- Analysis
- Linked to Architecture Role, Products, Guidance

Linking Network Centric Guidance and Technology with Standards



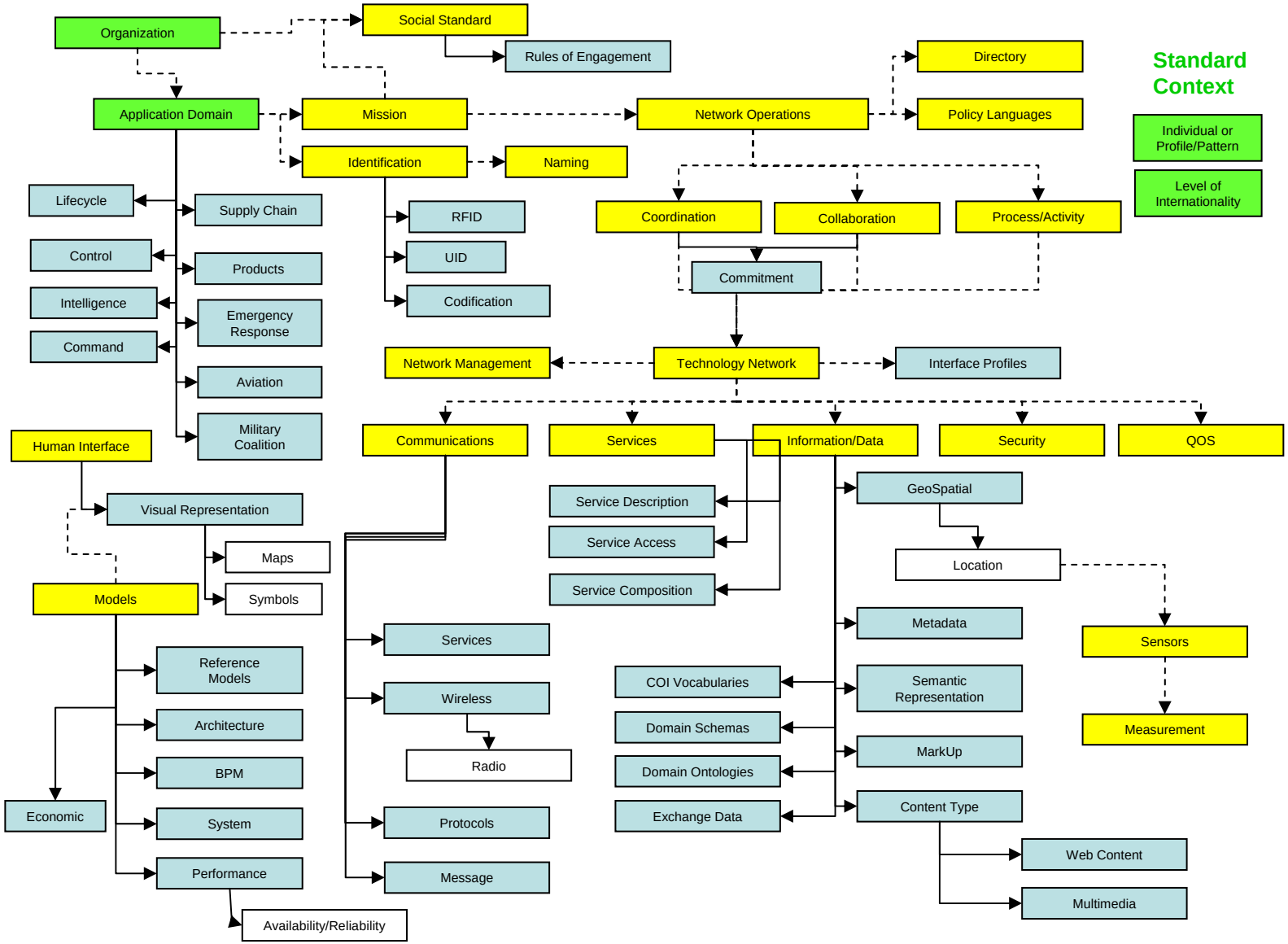
Direct Product Mapping of Standards, Product Categories and Products



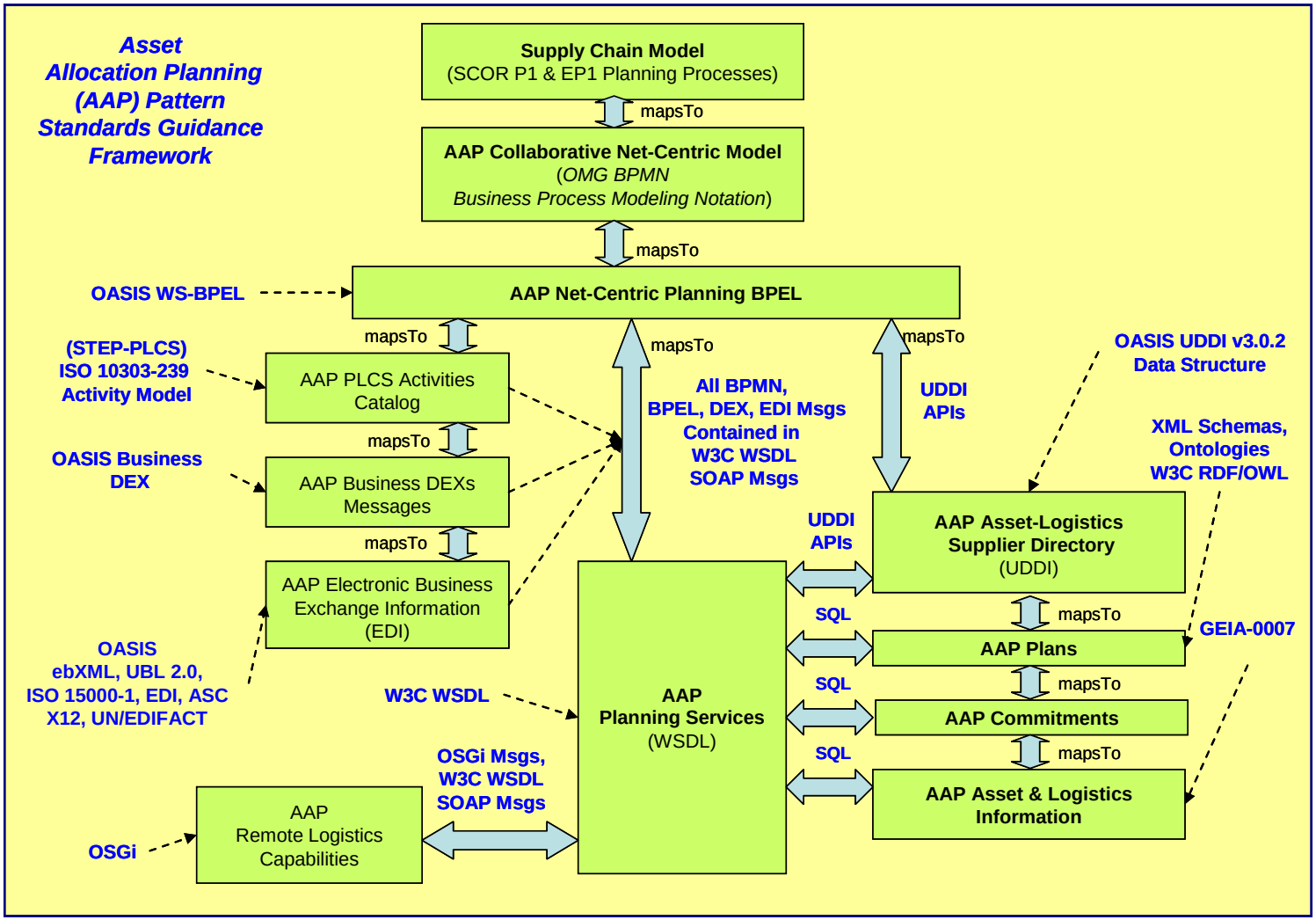
Benefits of Standards Classification

- Aggregation of knowledge by the international community about the architectural uses of standards for Network Centric Operations.
- Enables any organization to contribute to and discover architectural uses of standards.
- Evolution of a standards framework about concepts of architectural roles, a vocabulary to label them, and a model to relate them.
- Enables Product Managers to determine if their products support the NCP standards guidance and discover International uses of standards for the architectural roles of their products.
- Enables your organizations products and services with standards applications to be integrated into Federal Enterprise Architecture reference models and thereby the architectural and implementation plans of organizations complying with the FEA.

Architectural Role/Technology Classification Model

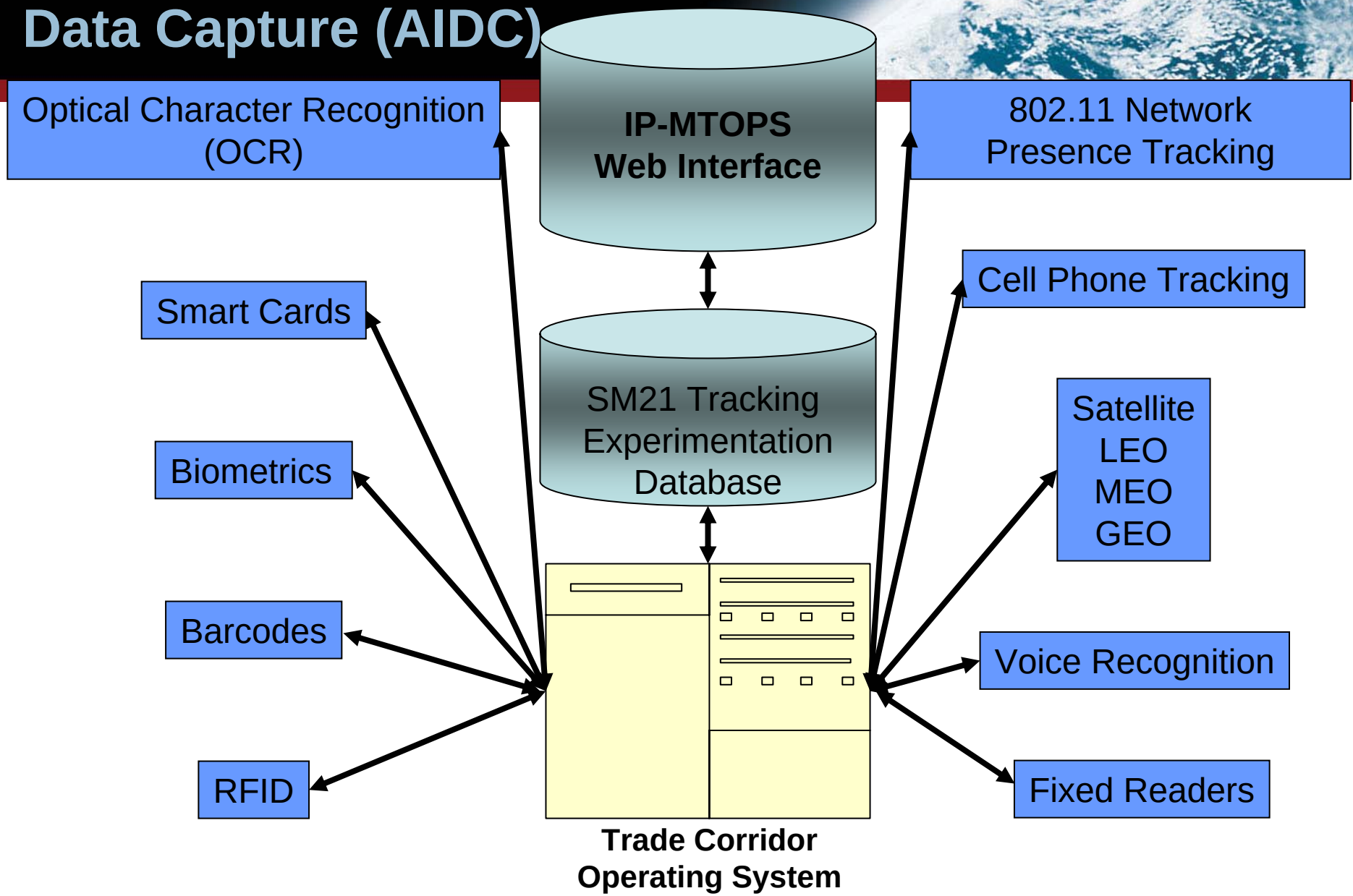


AAP Standards Framework for Logistics Domain



- Architectural Guidance
- Standards Guidance

Automatic Identification and Data Capture (AIDC)

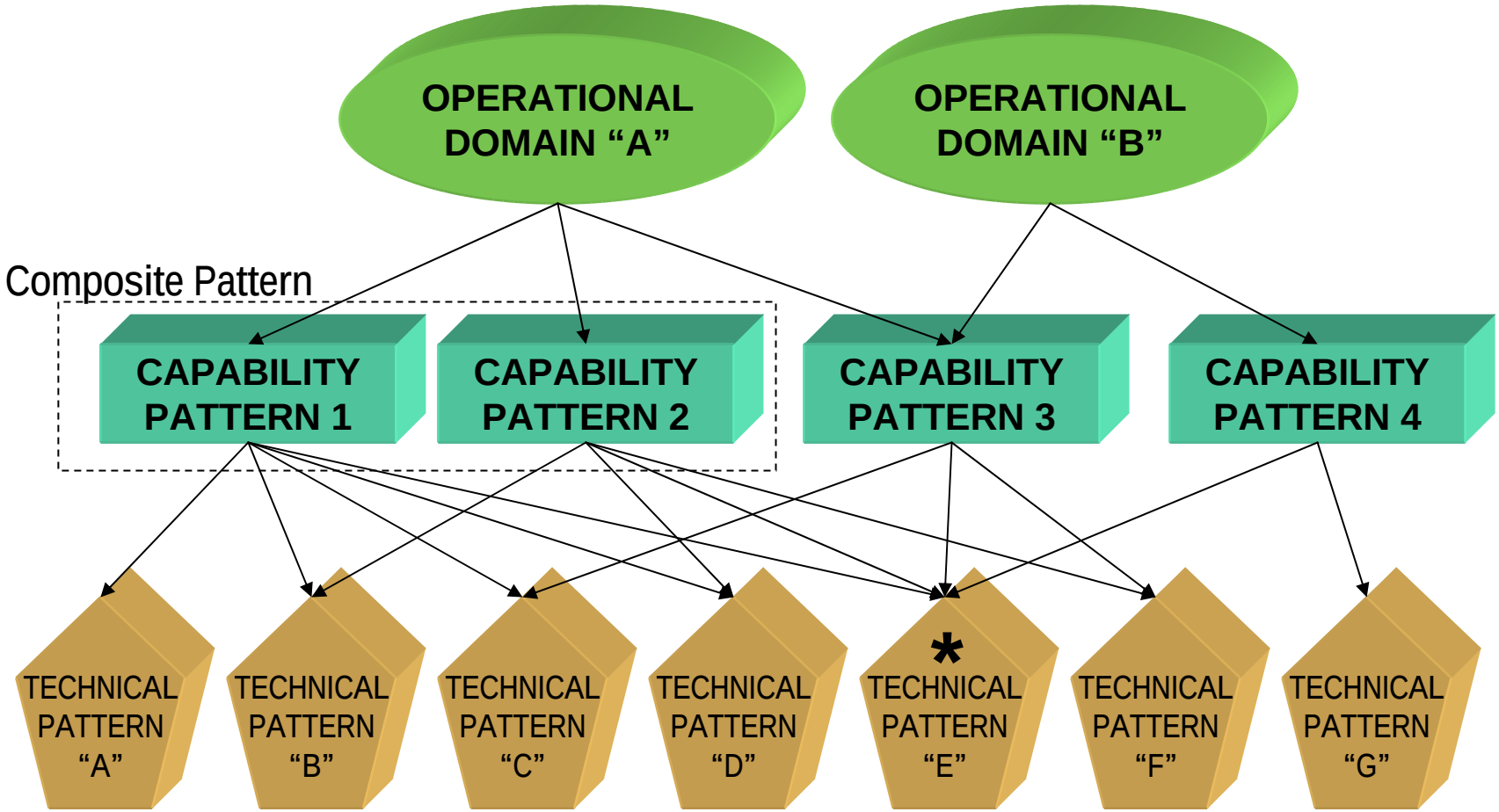


Note: This is an illustrative concept diagram. Firewalls and other details are omitted from the depiction

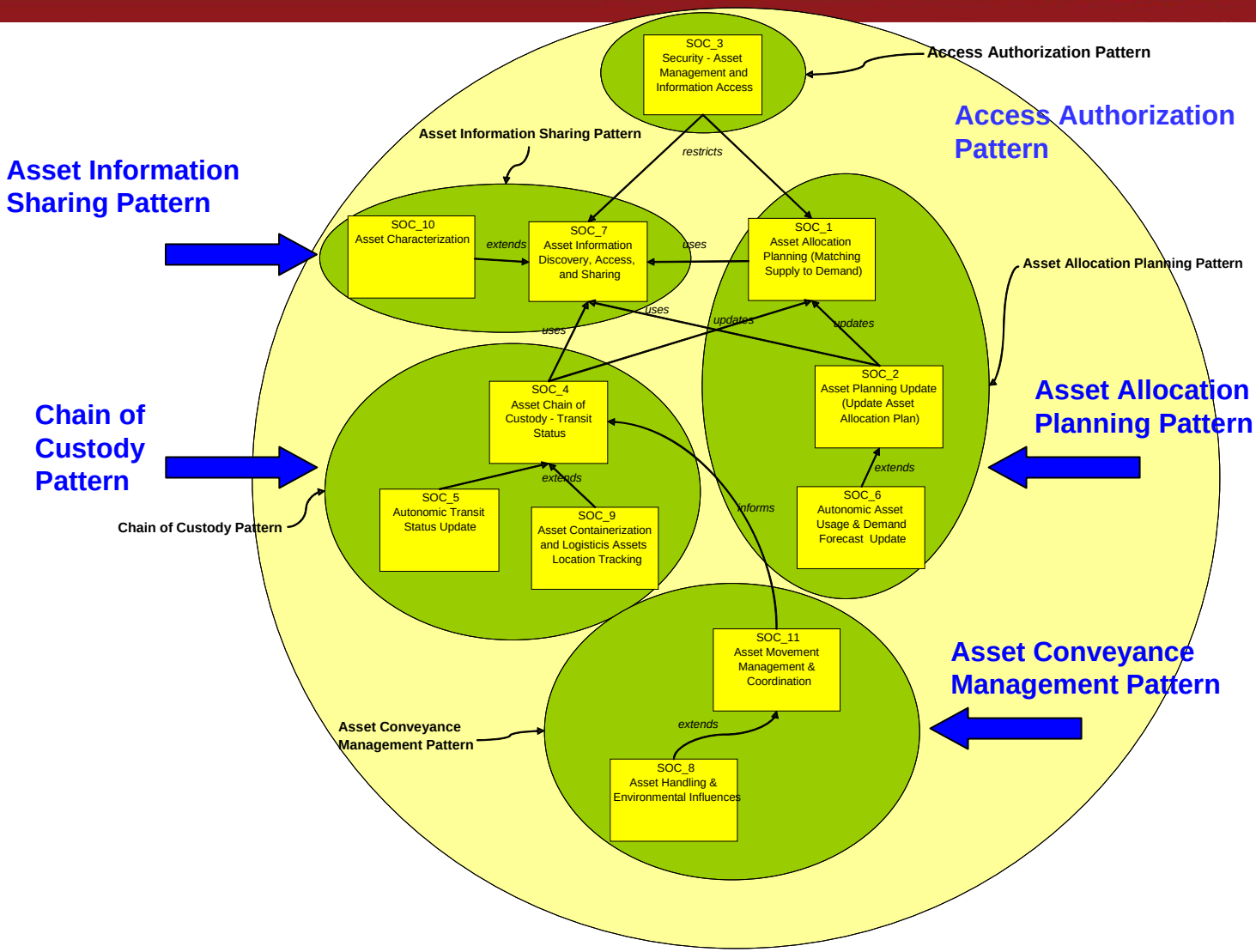
#3: Patterns

- Net-Centric Pattern Technology
- Specialized Frameworks
  - Information, Communications, Services, Security
- Interoperability Criteria and Guidance
  - Building Codes

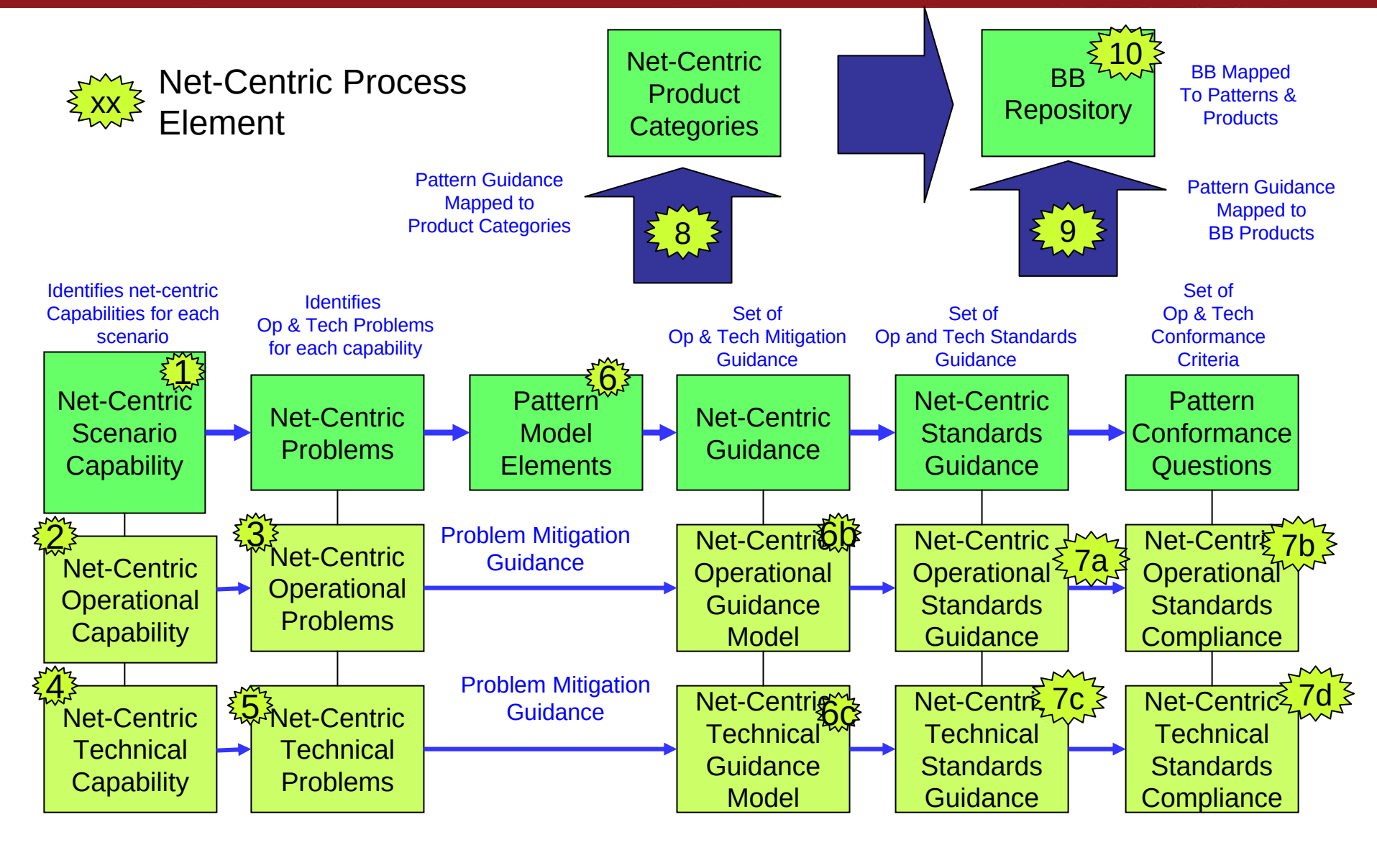
Three Major Categories of NCOIC Patterns



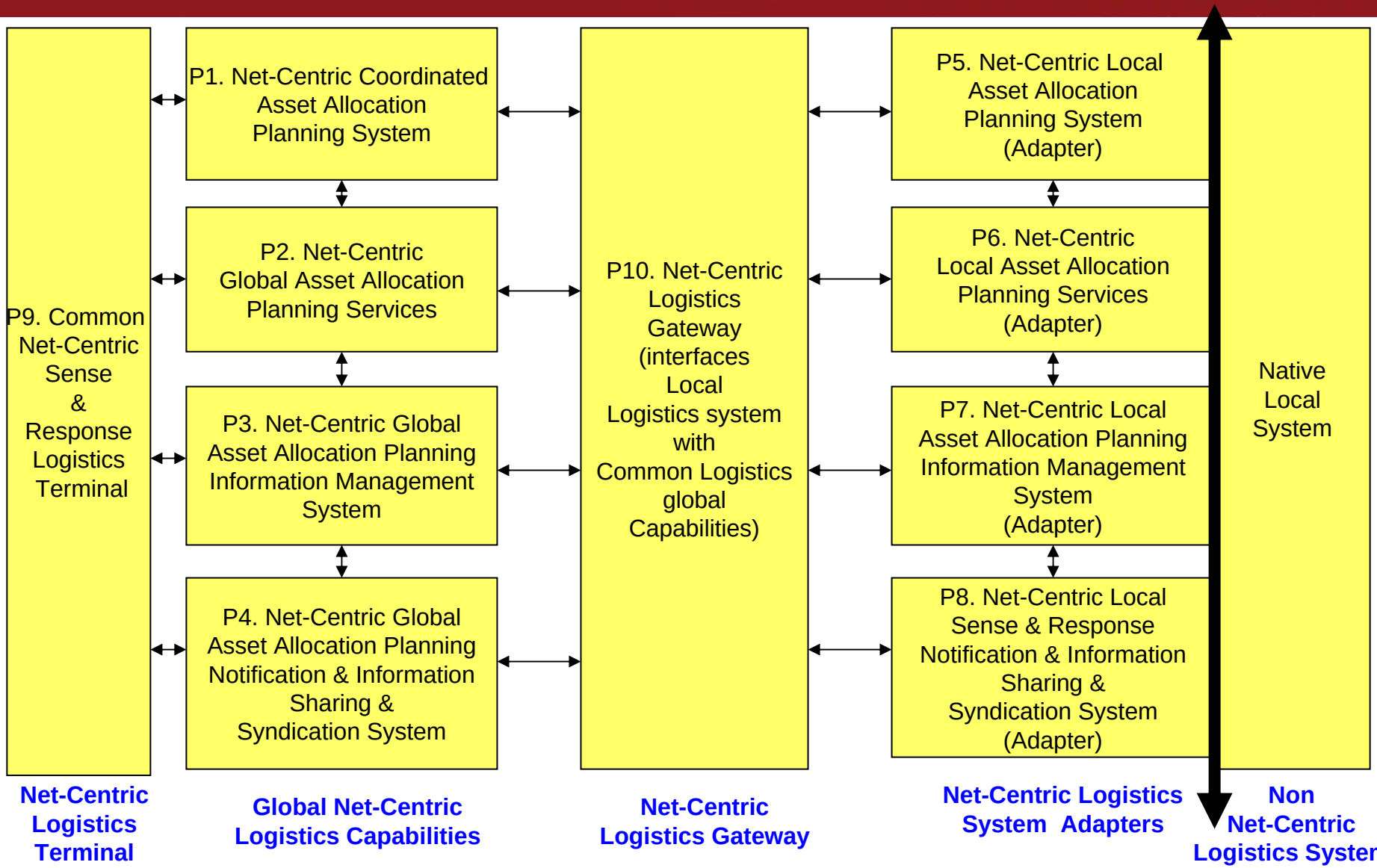
Net-Centric Total Asset Visibility Composite Pattern and Component Capability Clusters



Net-Centric Pattern Guidance



Network Centric Logistics Environment Product Categories (P1-P10)



Framework to Pattern to Guidance Matrix

AAP Standards Framework Element	Role in AAP Pattern	Standards Guidance
Supply Chain Model	The SOCR model identifies typical supply chain AAP business level processes and activities defined which are then supported by the processes and activities in the BPMN model.	Supply Chain Council – SCOR Supply Chain Operations Reference model P1 and EP1 Planning Operations
AAP collaborative Net-Centric Model	This business process model describes the net-centric interactions across a set of business activities for multiple organizations participating in a joint asset and logistics planning operation. The model is specified in BPMN standard notation and is exchangeable across BPMN tools using the WfmC XPDL standard. The top level coordination planning messages associated with synchronized business process activities are defined in the AAP BPMN model as well as the relevant scoep ofteh passed data objects.	OMG - BPMN Business Process Model Notation WFMC - XPDL XML Process Definition Language
AAP Net Centric Planning BPEL	This set of BPEL processes are derived from the AAP BPMN model and control the orchestration of AAP Planning services.	OASIS - WS-BPEL Web Services Business Process Execution Language
AAP Planning Services	This is a set of common planning services that enable collaboration in joint asset and logistics planning activities for multiple systems and organizations. The intent is that each native local system will provide adapters to interact with a set of common AAP planning services. The generic interactions to the AAP web services are specified with WSDL soap messages, while the service itself is described by WSDL. The data exchanged in the AAP services is defined appropriate to the type of service and the content specified by AAP PLCS Activities catalog, AAP Business DEX messages, and AAP EDI content to support the BPEL processes and the BPMN process message synchronization. One of the services supports access to the UDDI Logistics and Asset Directories	W3C WSDL W3C SOAP BPMN BPEL DEX EDI UDDI APIs

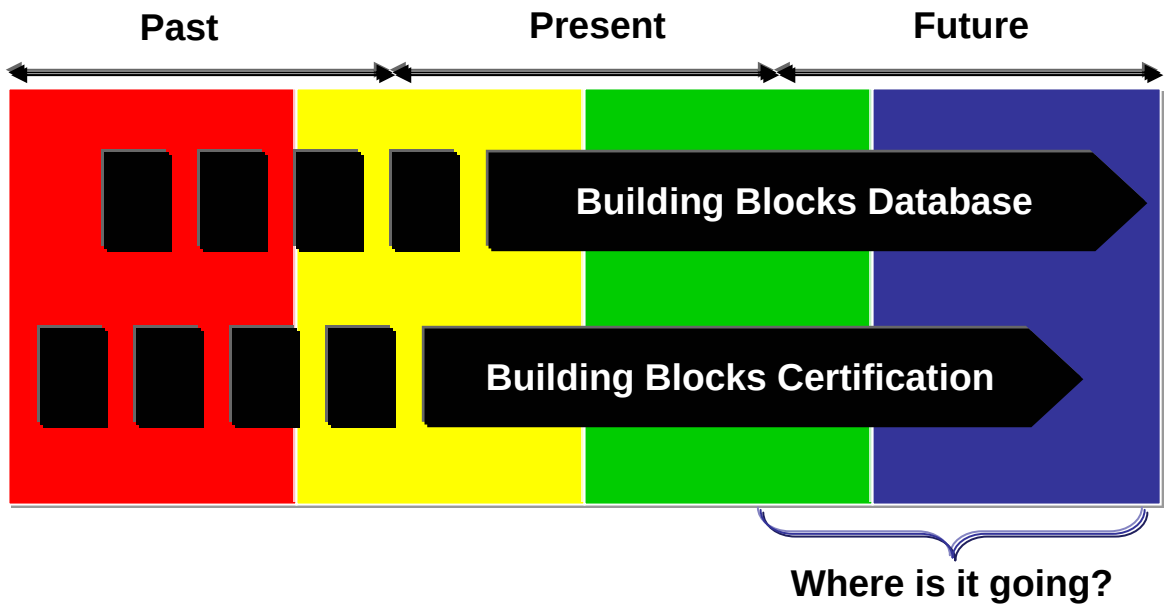
#4: Building Blocks

- COTS & GOTS Repository
- Building Block GUI and Algorithm
- Impartial 3rd Party Certification

Building Blocks

NCOIC aides customers in achieving design synthesis & design verification via the work of the Building Blocks (BB) Functional Team

- **BB database is a public catalog of pattern-compliant building blocks available for inquiry by member and public entities**
- **BB self-verification criteria for candidate re-usable off-the-shelf products**

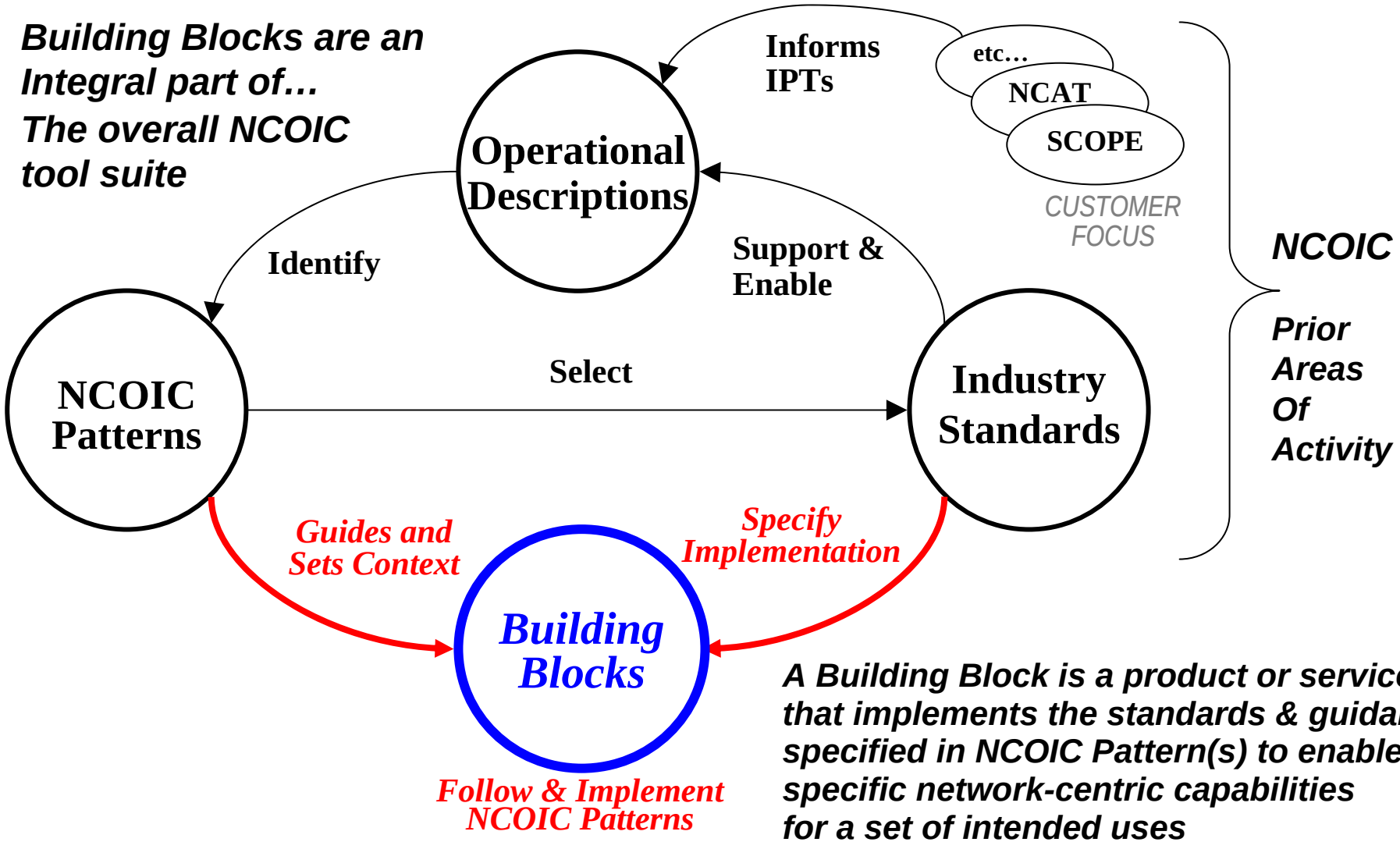


Integration of products of interest to NATO will increase the efficacy of the BBdb.

Products achieving certification will reinforce NCOIC value chain

- ***SCOPE – characterize interoperability dimensions***
- ***NIF (v2) - patterns & guidance for potential solutions***
- ***BBdb - catalog of NIF-Compliant OTS products***
- ***NCAT - assessment of reaching interoperability goals***

The Building Blocks Perspective



What are the problems that the NCOIC is solving?

- The acquisition community wants to know how (and to what extent) vendors' offerings may work together
- Vendors need to understand how their products and services may be used in network-centric systems needed by the overall customer community
- Both should recognize which standards and guidance to use in order to assure:
  - Desired network-centric capability
  - Interoperability between and among other products

Building Blocks help solve these problems with real products and services that can be effectively used to achieve network-centric capabilities

What Are Building Blocks?

- A Building Block is:
  - A product or service that implements the standards and guidance specified in NCOIC Pattern(s) to enable specific network-centric capabilities for a set of intended uses
- Building Blocks ARE NOT:
  - An architecture
  - A stand-alone, complete solution
  - A self-proclaimed sales pitch
  - Future “vaporware”, promised but not yet available

Value of Building Blocks: They identify real products or services that enable specific network-centric capabilities in order to use them with confidence

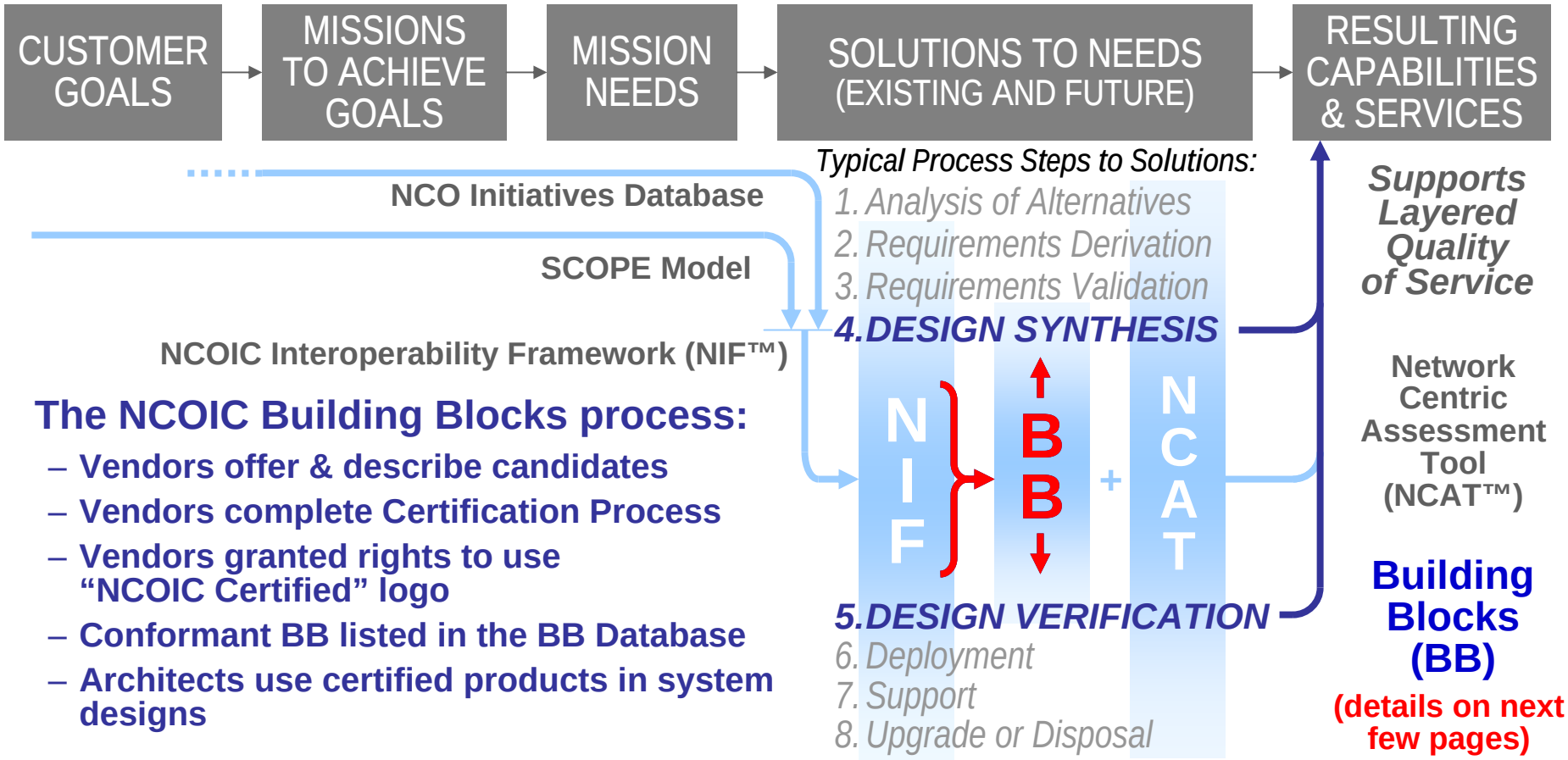
The Value of Building Blocks

Building Blocks help to match Buyer and Supplier Expectations

- Provides a registry of real products and services that allows procurement activities and system integrators to identify which items meet the NCOIC criteria
  - A means for products to be visible across multiple functional areas and markets
- Provides a Certification and Trademarking program to promote the identification and procurement of conformant network-centric components and services

Our customers are asking for NCOIC guidance– Building Blocks provides this

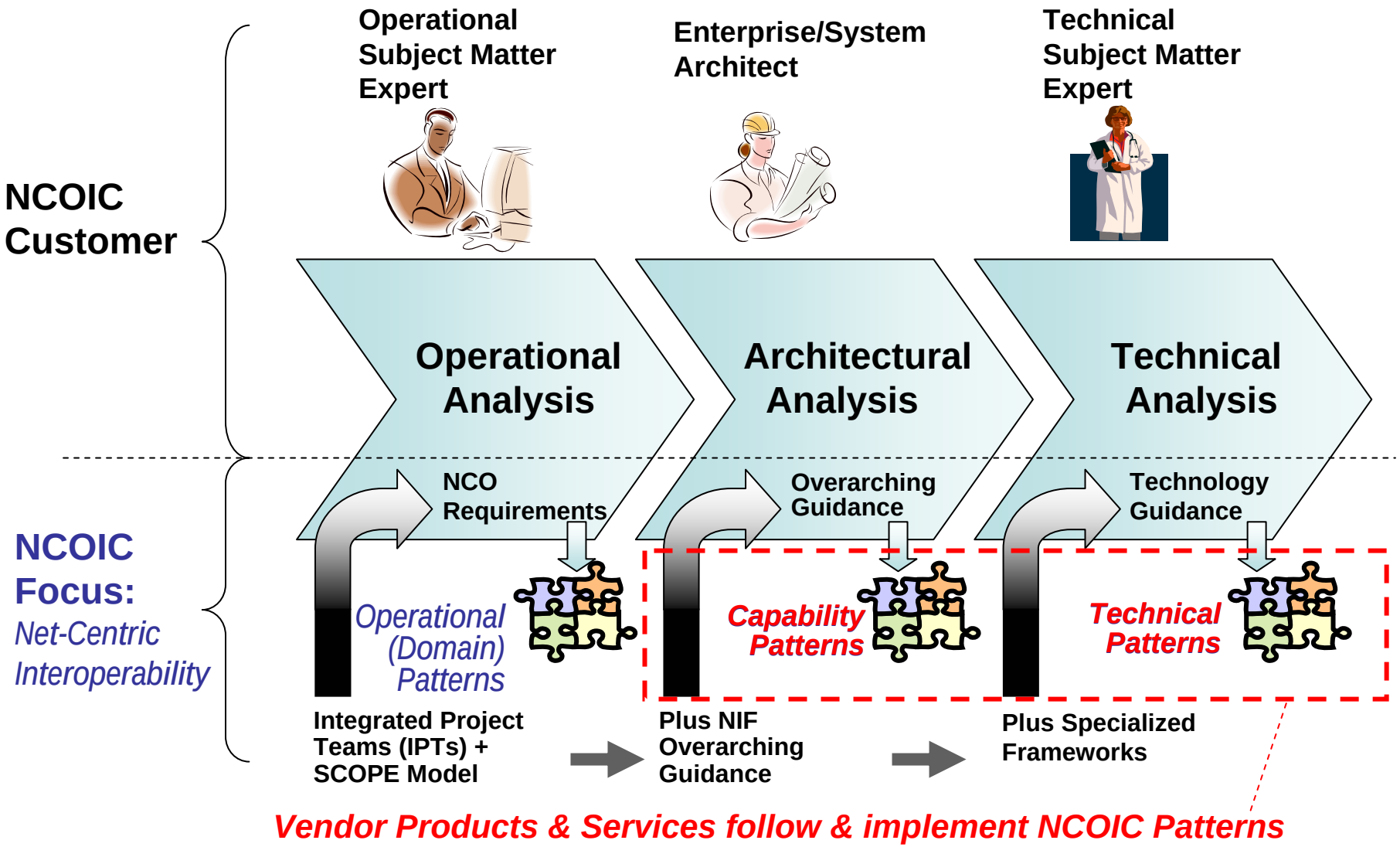
Building Blocks Promote NCOIC-Compliant Off-The-Shelf Products



The NCOIC Building Blocks process:

- Vendors offer & describe candidates
- Vendors complete Certification Process
- Vendors granted rights to use "NCOIC Certified" logo
- Conformant BB listed in the BB Database
- Architects use certified products in system designs

Building Blocks Implement NCOIC Patterns: Standards & Guidance



The Benefits of Building Blocks

- Exposes products to a broader market base
- Promotes entry into new Network-Centric markets with specific products and services
  (from a Product Manager's perspective)
- Reduces risk in all phases of the capability acquisition lifecycle
  (including use of vendor products in network-centric system designs)
- Potential business value of reducing cost and risk of certification effort
- Adds focus to standards compliance strategy
- Accelerates implementation of network-centric solutions
- Provides NCOIC guidance for use in procurements

Helps all stakeholders to achieve the benefits of the NCOIC Patterns

Sample Logistics Building Block Repository

STANDARDS:

- SCOR Supply Chain Operations Model
- OMG Business Process Modeling Notation
- AAP UDDI (Log Asset Supplier Directory)
- OASIS WS BPEL (Business Process Execution Language)
- OASIS Business DEX (Data Exchange)
- AAP WSDL (Web Services Description Language)
- EDI (Electronic Data Interchange)
- Others

PRODUCTS AND SERVICES (NOTIONAL):

- CDM ICODES (Integrated Cooperative Decision Making)
- Transcore eZGO and 3sixty
- Hewlett Packard Real Time Enterprise ZLE
- US TRANSCOM GTN (Global Transportation Network)
- Others

Way Forward

- Unite Diverse Logistics Communities of Interest Stakeholders by Leveraging the NCOIC Processes and Tools.
- Further develop the Logistics Standards Framework in union with DOD, NATO, Commercial, and other Stakeholders.
- Develop remaining identified Patterns for the global logistics application domain.
- Certified products for the Global Logistics Products and Services Repository.

SUPPORT SLIDES

Building Blocks Certification

- "NCOIC Certified" logo on a product or service
  - **Gives buyers assurance that vendor promises of “network-centric capabilities” are backed up by specific conformance to NCOIC Patterns**
  - **Allows conforming vendors to advertise this assurance to their customers while ensuring that non-conforming vendors cannot**
  - **Does not change existing company and industry certification programs**
- Vendors complete an application process to certify products and services against the specifications in an NCOIC Pattern
  - **NCOIC's Certification Authority reviews application for completeness**
  - **If OK, then the product or service is listed as being certified in the Building Blocks database**
  - **A formal challenge process allows anyone to dispute a particular vendor's compliance claim**
  - **Vendors must enter into a Trademark License Agreement to use the "NCOIC Certified" logo**
- Architects and designers consult the NCOIC Building Blocks database for NCOIC Certified products and services

Next Steps for Building Blocks

- We have several NCOIC Operations Patterns in work, e.g.:
  - For Sense & Respond Logistics: Asset Allocation Planning (AAP)
  - For NATO/Coalition: Friendly Force Tracking Interoperability (FFTI)
  - For Emergency Response: Hastily-Formed Networks
- We anticipate that many Technical Patterns will be developed to support these and other operational domains
- Implement pilot process for Building Blocks
  - Prior demos and discussions about Building Blocks database, now ready for actual use
  - Vendors to vet the above patterns and associated standards by submitting candidate products into the BB process
  - Acquisition community feedback on how Building Blocks benefits the acquisition process
  - Incorporate “lessons learned” to improve the BB process

Value Add… if you so choose

Building Block Demonstration

GLOBAL COMMERCIAL AND GOVERNMENT,

COTS AND GOTS,

HARDWARE AND SOFTWARE,

PRODUCTS.