Update on NCO, SOA, Grids

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Update on Network Centric Operation, SOA, Web Services

- Maturing of NCO technologies and initiatives
- NCO Consortiums Review
  - Available Products
- Publication of government guidance documents
- Commercial adoption of Grid, SOA, web services technologies
  - Web Services and Grid Build-out
  - Rich Product availability
- Example Network Centric , data centric service, System of system service

Network Centric Operation Consortiums

- **NCOIC** (Net-Centric Operations Industry Consortium)
- http://www.ncoic.org/home/
- Consortium fee
- **Working Groups**

- AFEI **NCOIF** (Association for Enterprise Integration) Net-Centric Operations Industry Forum NCOIF
- http://www.afei.org/news/Industry_forum.cfm
- Volunteers
- **Working groups**

- **W2CoG** (World Wide Consortium of the Grid)
- http://www.w2cog.org/index.html
- DOD funded : Consortium fee
- **Netcentric Incubator**
- **Education : Excellent informative web site**
- Hastily Formed Network deployed for Tsunami and Katrina relief
- W2COG field lab = “fly away” kit of COTs SATCOM, Microwave, and WIFI tools, with embedded C2.
- Prototype of HFN + C2 web services is on track for demo 30 Oct for World Vision and other NGOs
- Partners: NPS, CSUMB, CISCO, Rajant, Redline, Microsoft, SKYPE

- AIAA NCO PC (Network Centric Operation Program Committee)
- Education
- Conference

Consortium Products

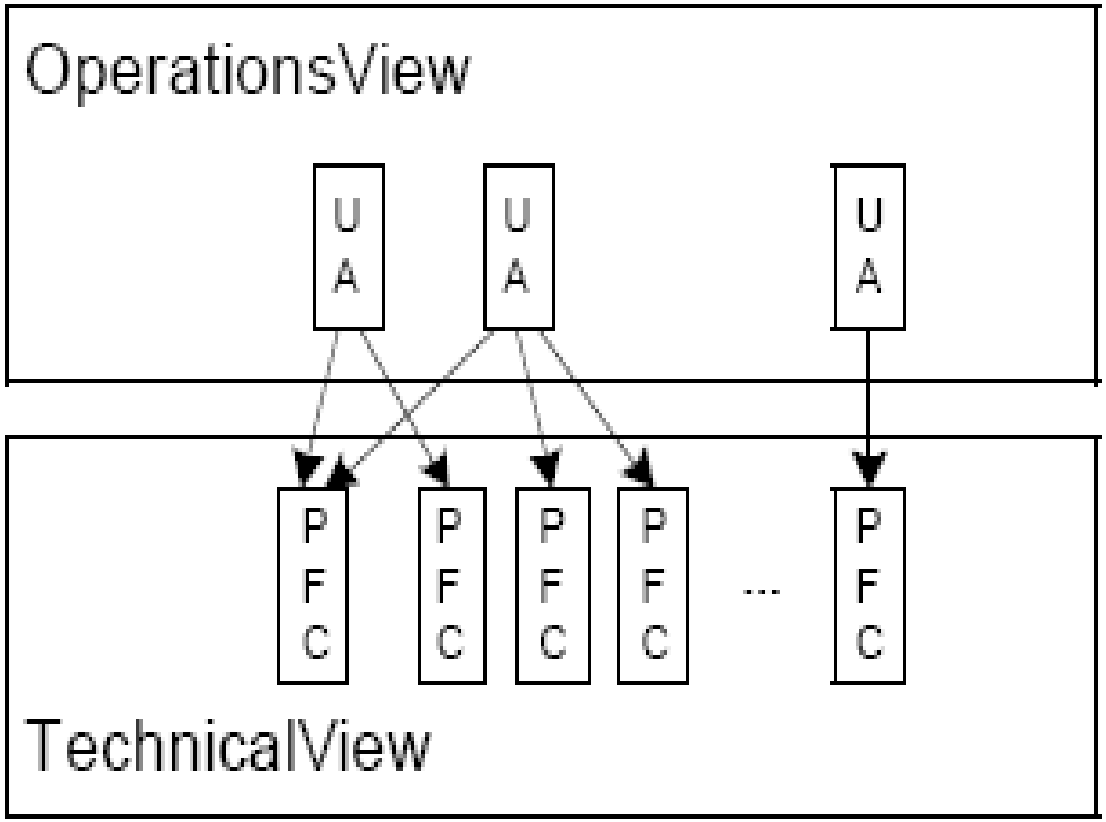
- SOA Best Practices White Paper (AFEI NCOIF) http://www.afei.org/news/documents/IndustryBestPracticesforAchievingSOA_000.pdf
- Shared Services White Paper (AFEI NCOIF) http://www.afei.org/news/documents/DS3SharedServicesPaperFinalVersion021206c.pdf
- Review of NCOW RM (Net-centric Operations and Warfare)
  - Reference Model V0.9 December 8, 2003) by AFEI http://www.afei.org/news/documents/NCOWReview_000.pdf
  - Version NCOW RM1.1 at NCOIC and AFEI
- Interop Framework NIF Feb 2006 (NCOIC) http://ana-3.lcs.mit.edu/~jnc/tech/archd/NCOIC_Interoperability_Framework_v1.pdf
- NCO Analysis Tool (NCAT)

NCOIC Technical Deliverables (Jan)

- **Architectures and Standards Analysis**
  - NCO Lexicon V4.1
  - NCOIC Position Paper V.2.0
  - NCAT Beta Development
  - NCAT Consortium Release
  - Initial NCOW RM Analysis
  - Final US DoD Tri-service Analysis
  - NCOIC Interoperability Framework (NIF) Initial Draft
  - NCOIC Interoperability Framework (NIF) Final Draft
  - Mobility Analysis Initial Draft
  - Mobility Analysis Released
- **Building Blocks**
  - Product Category requirements defined
  - Web-services Application Deployed (Beta)
- **Education**
  - COG / NCOIC Collaborative Roadmap
- **Engineering Processes**
  - Lab Interconnectivity Capability Requirements (draft)
- **Customer Requirements**
  - 10 Major Initiatives Quicklook Report
  - Stakeholder / Initiatives Database Structure

Approved by Boeing Export, Authorization # JGL0951

- Communications, Services, and Information Interoperability.
- The NIF Communications Framework document provides the overall description of the NIF Framework itself.
- NIF Operational Descriptions (ODs).
  - Operations View is targeted at describing "**what**" Network-Centric Systems are being used for. This portion of the Framework is intended to provide motivation for the design of Network-Centric System Elements.
- NIF Protocol Functional Collections (PFCs).
  - The Technical View describes "**how**" Network-Centric Systems communicate with each other in an interoperable manner.
  - Protocol Functional Collection (PFC) is a collection of protocols that spans some set of the protocol layers and targets a particular functional area. A PFC is a set of protocols chosen from relevant layers that are profiled and described in the context of the Global Aspects that apply to their usage.
  - A PFC collects communications protocols and data that implement a set of communications functions. These PFC "building blocks" are aggregated as components of UAs to implement integrated, higher-level functions.



UA (User Application) is defined as some hardware & software element that makes use of various communications protocols. A UA may be a standalone program running on a computer system or a component of a larger distributed application. While a UA specifies requirements to use one or more PFCs, its primary purpose is to detail a specific capability whose implementation supports a larger operational scenario

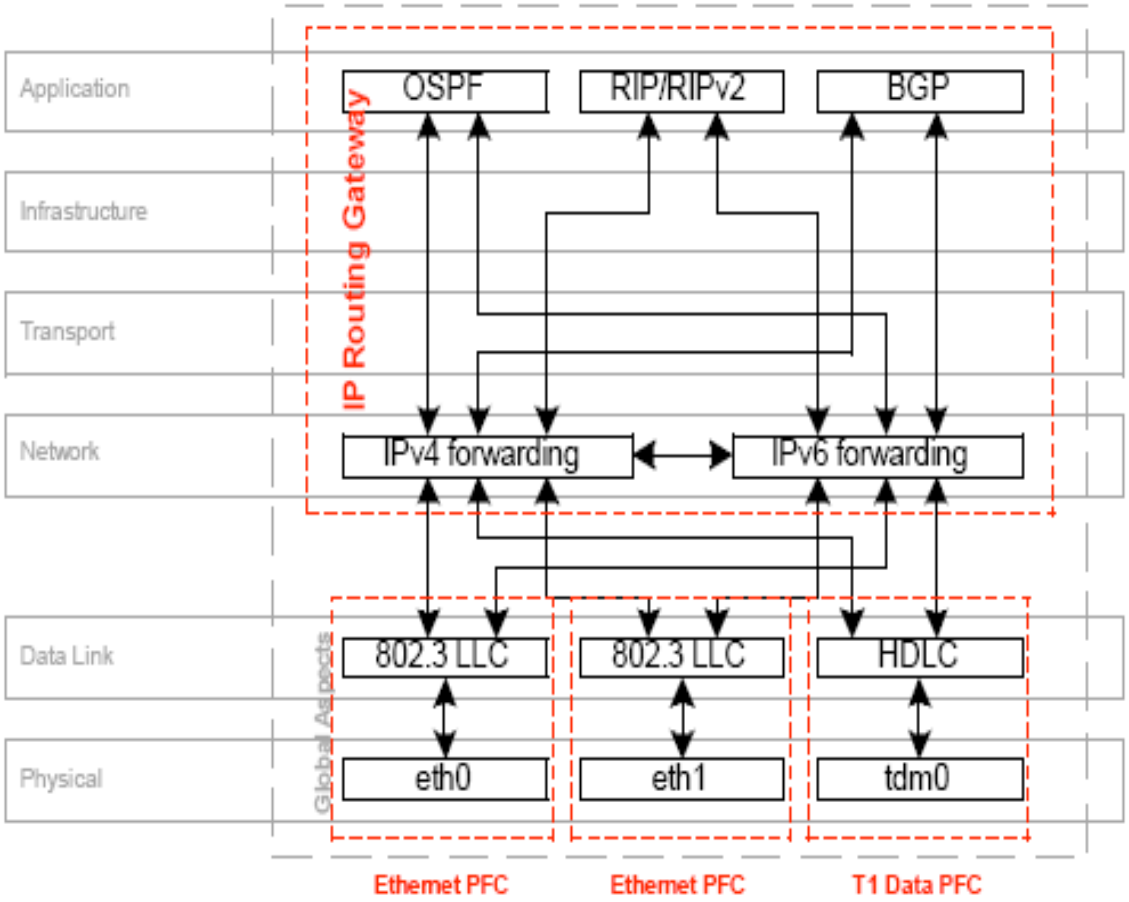
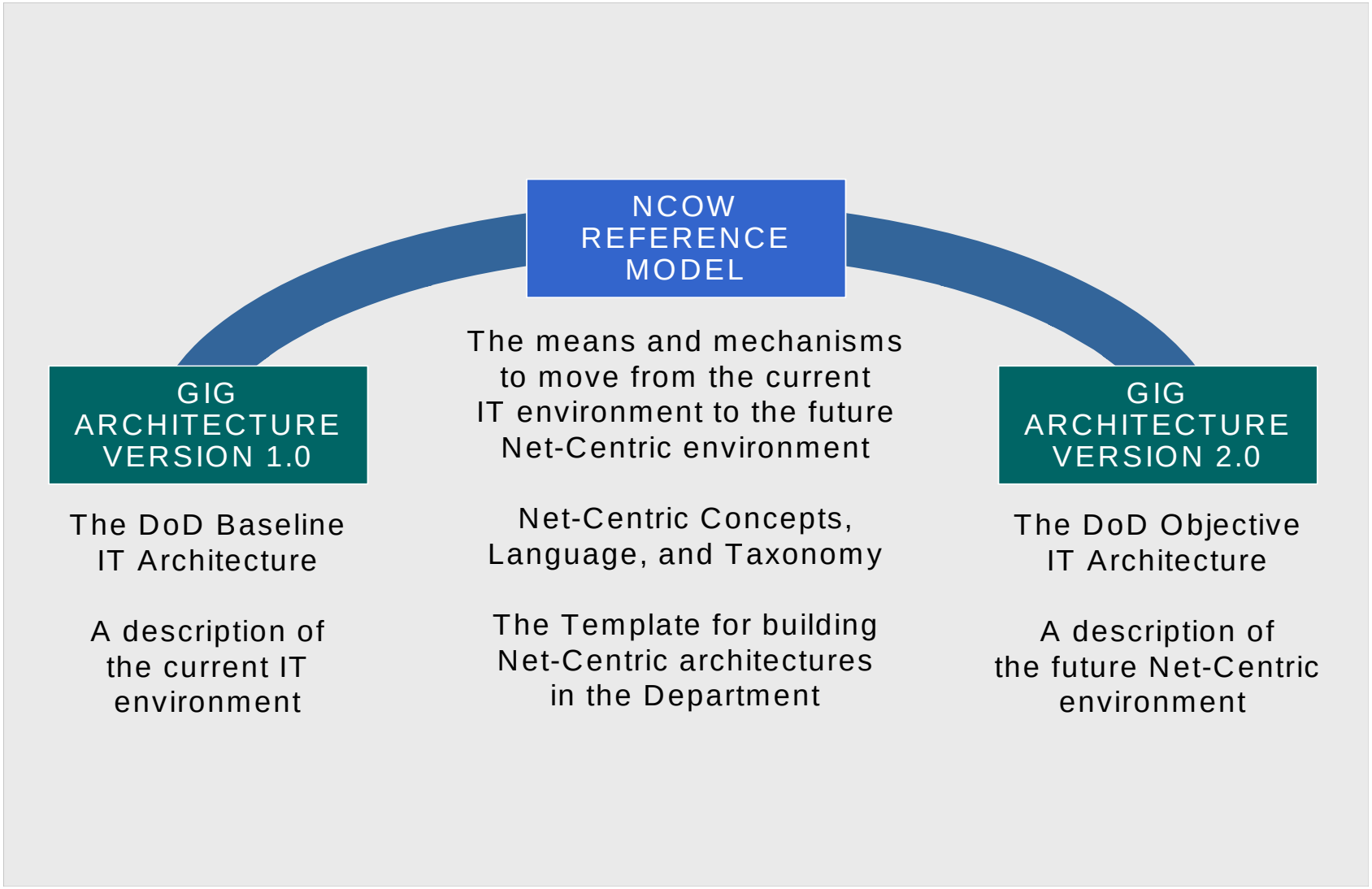


Figure 6: A Wide-Area Network Router Described Using the NIF Model

- NCOW RM 1.1 https://disain.disa.mil/ncow.html (need CA)
- GIG 2.0 Future Arch (GIG 1.0 as – is Arch)
- DoD Net-Centric Data Strategy May 2003 http://www.afei.org/pdf/ncow/DoD_data_strategy.pdf
- Net-Centric Data Visibility: Tagging and Advertising Data Assets with DoD Discovery Metadata Standard 1.2 Jan 2005 http://www.afei.org/news/documents/DDMS-v1_2.pdf
- Net-Centric checklist 2.1.3 May 2004 http://www.defenselink.mil/nii/org/cio/doc/NetCentric_Checklist_v2-1-3_May12.doc
  - Data, Services, Information Assurance, Transport
  - Net-Centric Attributes
  - Describe how the program is making use of Web service standards (e.g., SOAP, WSDL, UDDI) to make its data assets visible.
- NESI Netcentric Enterprise Solutions for Interoperability http://nesipublic.spawar.navy.mil/
- Federated Development and Certification Environment (FDCE) Whitepaper: A Strategy for Managing the Development and Certification of Net-Centric Services within the Global Information Grid, August 6, 2005, version 0.94, http://fdce.netcentriclab.com/FDCE_Portal/appmanager/FDCE/FDCE

- WSTAWG Weapon System Tech Architecture http://wstawg.army.mil/

Net-Centric Operations & Warfare Reference Model



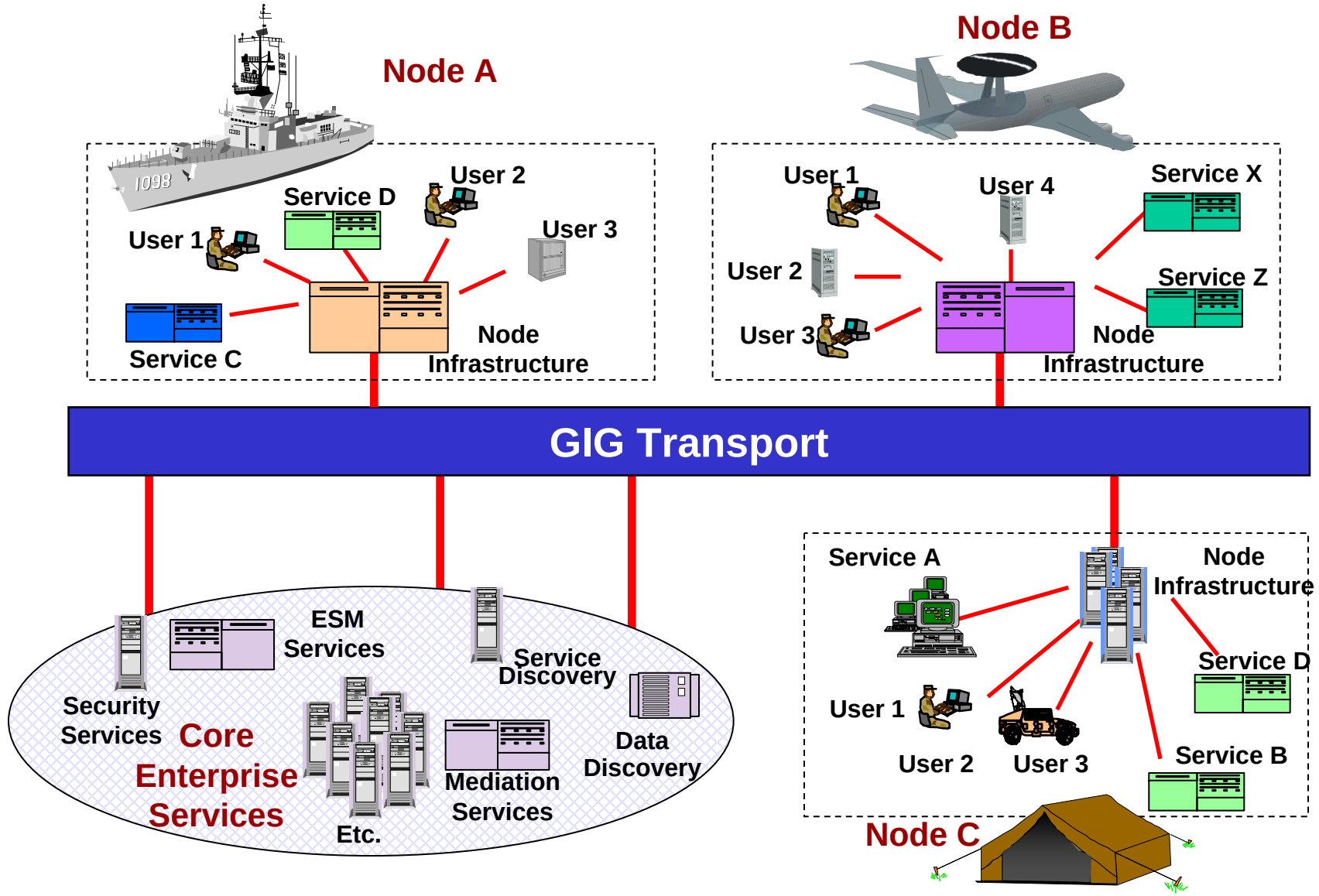
NCOW Reference Model

- NCOW RM describes activities required to use, operate, and manage the net-centric enterprise information environment
- Describes a selected set of key standards that will be needed as the NCOW capabilities of the GIG become realized
- NCOW RM integrates and is, in part, derived from three distinct, but mutually supportive DoD net-centric strategies: the DoD Enterprise Services Strategy, the DoD Net-Centric Data Strategy, and the DoD Information Assurance (IA) Strategy. In addition to providing an overview of these strategies and articulating how they interrelate in defining the EIE, the NCOW RM describes the following in detail in a series of appendices:
- set of architectural views and a collection of compliance instruments
- Nine core services
  - User Assistant Service
  - Collaboration Service
  - Mediations Services
  - Application Service
  - Discovery Service
  - Messaging Service
  - Storage Service
  - Security Service
  - ESM Service
- NCOW 1.1 reviews in progress
  - NCOIC & AFEI NCOIF

NESI Netcentric Enterprise Solutions for Interoperability

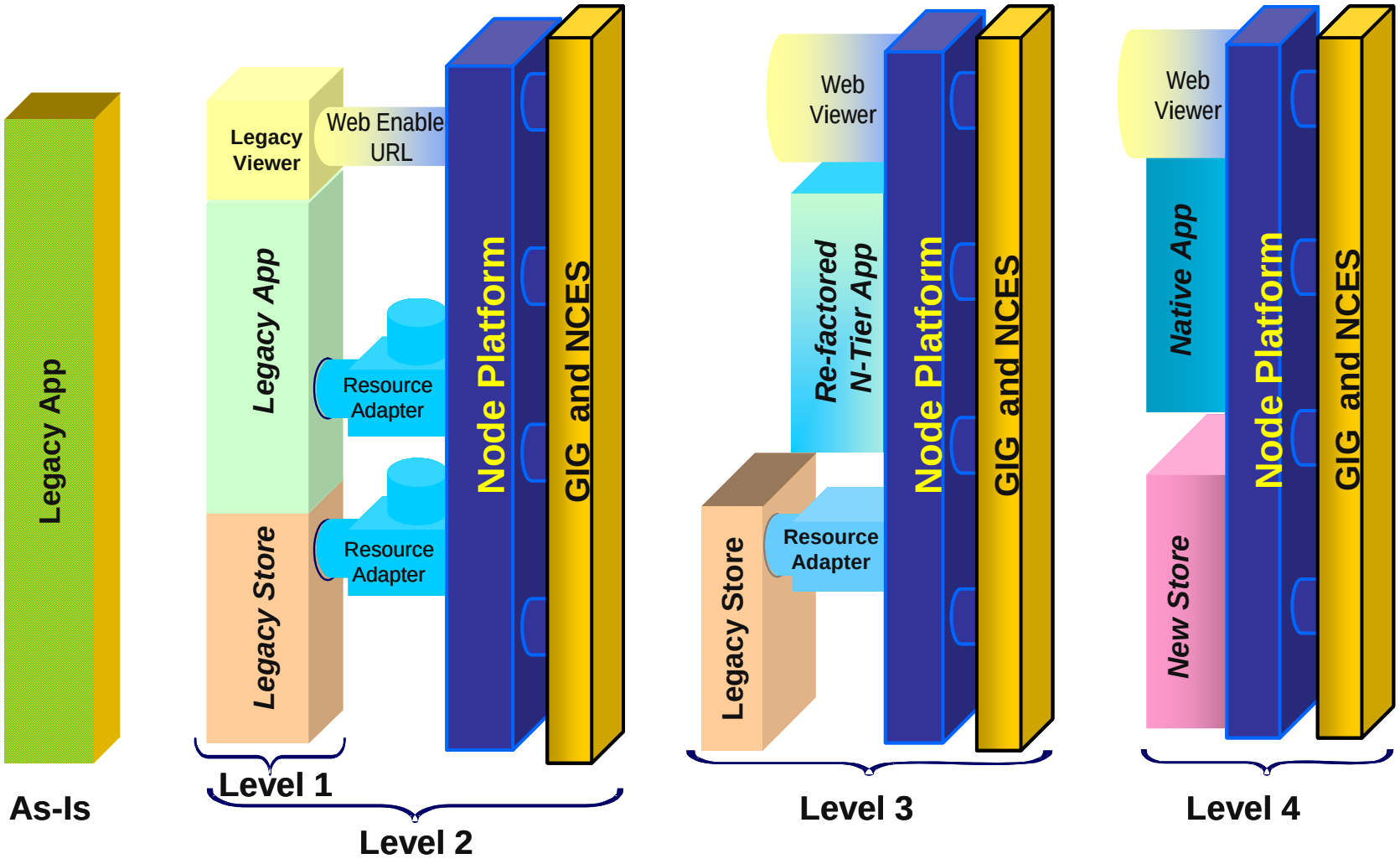
- NESI provides implementation guidance to facilitate the design, development and usage of information systems for net-centric warfare
- A Cross-Service effort
  - Air Force (ESC) and Navy (PEO C4I & Space) MOU
  - Army CIO/G6-AAIC informal participation
  - Extends Air Force and Navy net-centric initiatives (RAPIDS/C2ERA)
- Overview: Introduction and vision
- ASD/NII Checklist Guidance: “How to implement” guidance
- Migration Guidance: Guidance for maintenance / upgrade activities leading to net-centric systems
- Node Design Guidance: Guidance for developing nodes and their infrastructure to support net-centric applications and services
- Developer’s Guidance: Detailed development guidance focusing on new starts and major updates
- Acquisition Guidance: Incorporating NESI during the acquisition process
- http://nesipublic.spawar.navy.mil/

NESI Net-Centric Enterprise



NESI Migration Levels

Provide Flexibility through Multiple Levels of Migration



- Net-Centric Checklist May 12, 2004
  Version 2.1.3

- NCO Analysis tool NCATs

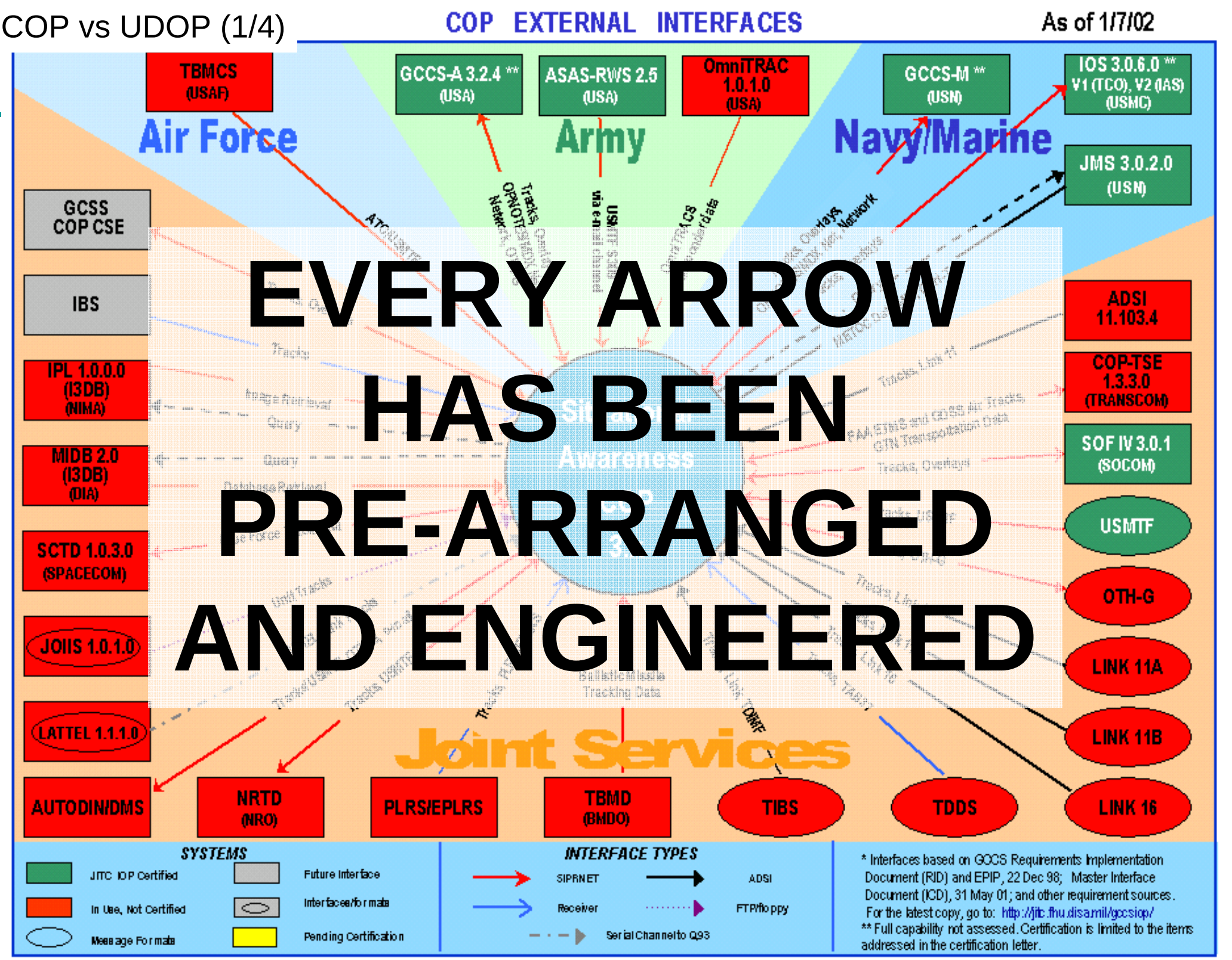
Example Data Centric Service : COP vs UDOP

- COP = Common Operational Picture
- UDOP = User-Defined Operational Picture

- A COP is a visual representation of a common database shared by some community
  - The information available is limited to pre-arranged data sources

- A UDOP is a visual representation of data sources *which are available in common to the community*
  - The information available is not pre-determined

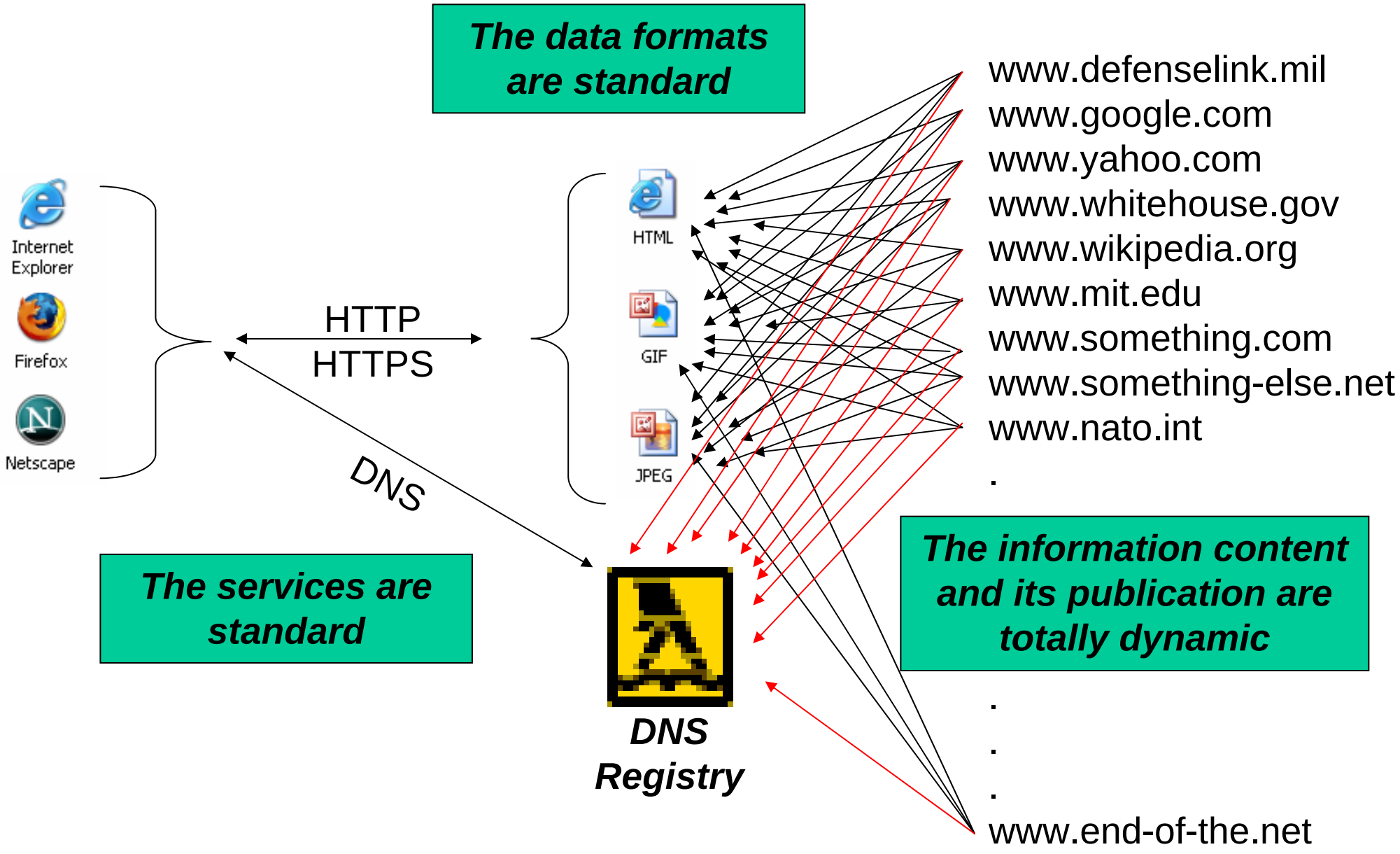
COP vs UDOP (1/4)



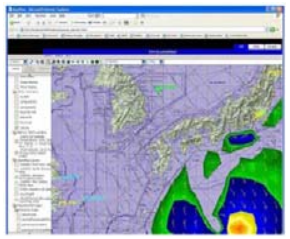
EVERY ARROW HAS BEEN PRE-ARRANGED AND ENGINEERED

Web Browser Interfaces

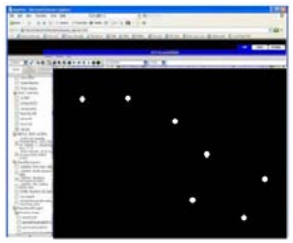
a counter-example



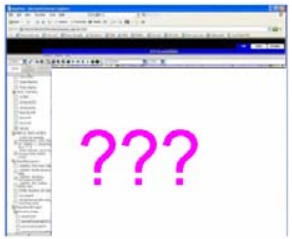
COP vs UDOP (3/4)
UDOP Interfaces



WebCOP-NG



SISP



Other UDOP App

The services and data formats need to be defined and agreed upon

SOAP

UDDI

Tracks

Orbital Elements

Map background

Service Registry

Army Data Provider
Navy Data Provider
USAF Data Provider
USMC Data Provider
NRO Data Provider
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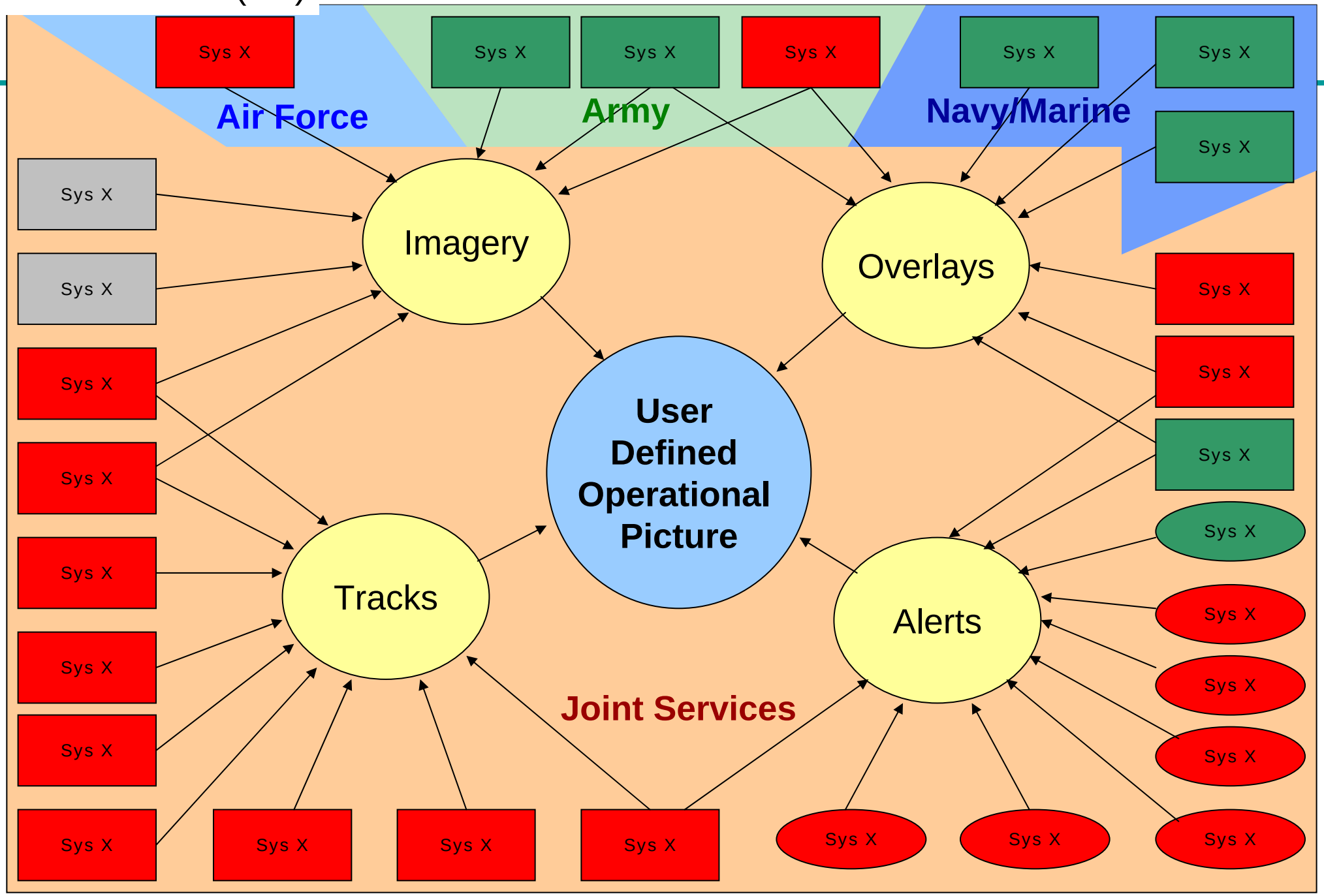
Data You Needed Last Week

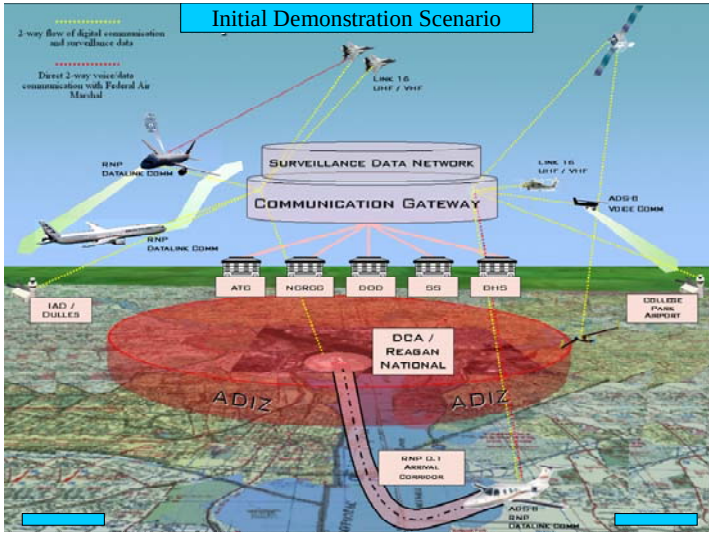
COP vs UDOP (4/4)

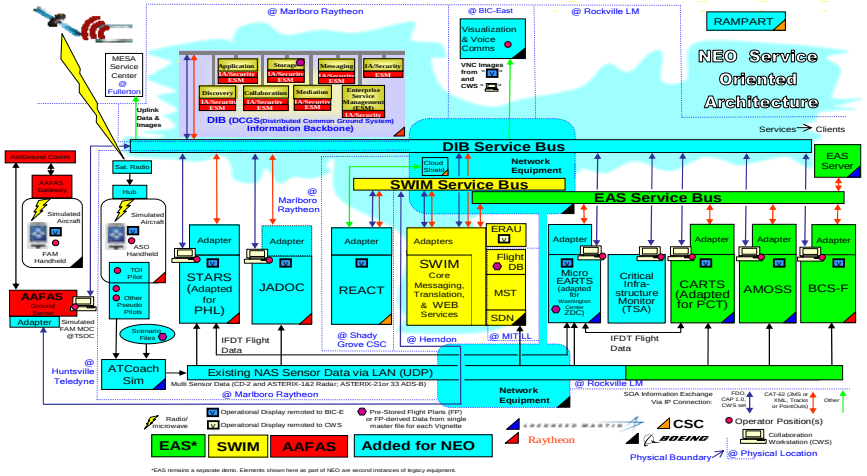


Data providers publish to the GIG in standard formats
Users select what they want on their UDOP

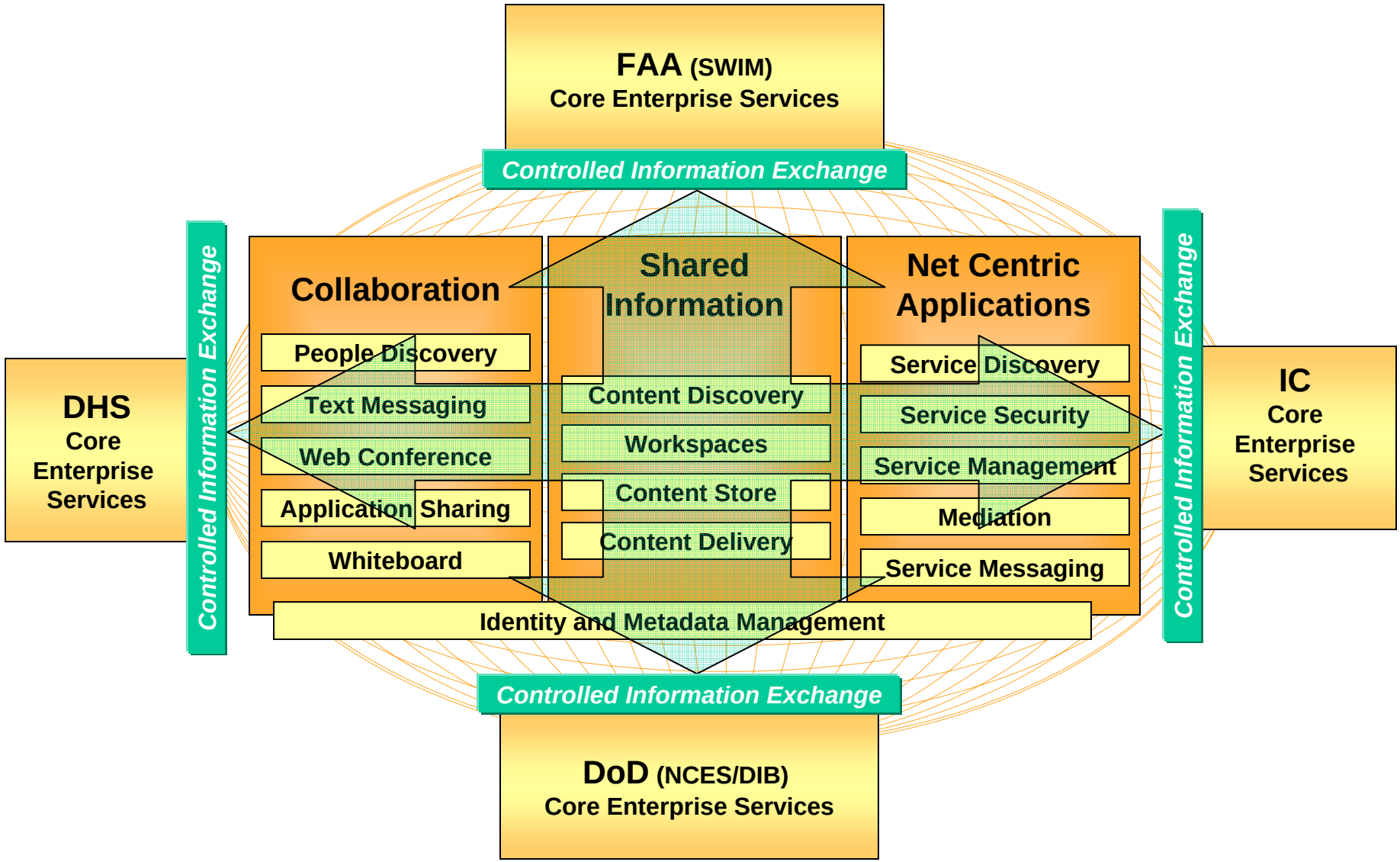
Example: Air Traffic : NEO Project (Network-Enabled Operations (NEO) Airspace Security Demonstration

- **Concept exploration of a network enabled approach connecting real ATM and security systems**
- **Extensible in capabilities/functions, scale, geography**
- **In nine months:**
  - **4 Government agencies**
  - **+ 4 Industry partners**
  - **+ 12sites**
  - **+ 1 network centric architecture**
- **Equals:**
  - ***Information sharing* across 7 legacy security and ATC systems**
  - **Shared situational awareness**
  - **Faster, more accurate responses**
  - **First project milestone for NGATS**





"Integrated Sky"


FAA (SWIM)
Core Enterprise Services
Controlled Information Exchange
DHS
Core
Enterprise
Services
Controlled Information Exchange
Collaboration
People Discovery
Text Messaging
Web Conference
Application Sharing
Whiteboard
Shared
Information
Content Discovery
Workspaces
Content Store
Content Delivery
Net Centric
Applications
Service Discovery
Service Security
Service Management
Mediation
Service Messaging
Identity and Metadata Management
Controlled Information Exchange
IC
Core
Enterprise
Services
Controlled Information Exchange
DoD (NCES/DIB)
Core Enterprise Services

Service DCGS Elements

DCGS – A

- Common Ground Station (CGS)
- Integrated Processing Facility (IPF)
- Guardrail Information Node (GRIFN)
- All Source Analysis System (ASAS)
- Counter intelligence/Human Intelligence Information Management Systems (CHIMS)
- Home Station Operations Center (HSOC)
- Tactical Exploitation Systems (TES)

DCGS-N

- Battle Group Passive Horizon Extension System (BGPHES)
- Joint Service Imagery Processing Systems – Naval (JSIPS-N)
- Ships Signal Exploitation Equipment (SSEE)
- Tactical Exploitation Systems – Naval (TES-N)

DCGS – MC

- Common Ground Station (CGS)
- Intelligence Analysis System (IAS)
- Technical Control and Analysis Center (TCAC)
- Tactical Exploitation Group (TEG)

AF-DCGS

- Deployable Ground Intercept Facility (DGIF)
- Deployable Shelterized Systems (DSS)
- Deployable Transit-Cased Systems (DTS)
- Ground Control Processor (GCP)
- Main Operating Locations
  - DGS-1 Beale AFB, CA
  - DGS-2 Langley AFB, VA
  - DGS-3 KCOIC Osan Korea
  - DGS-4 Ramstein AB, GE
  - Plus 17 remote locations
- ISR Management/C2 of ISR
  - ISRM, ISRW, Remote CSP
- MOBSTR/Extended Tether Program (ETP)
- Wide-Area, Campus-Area, Local-Area Networks/Comms

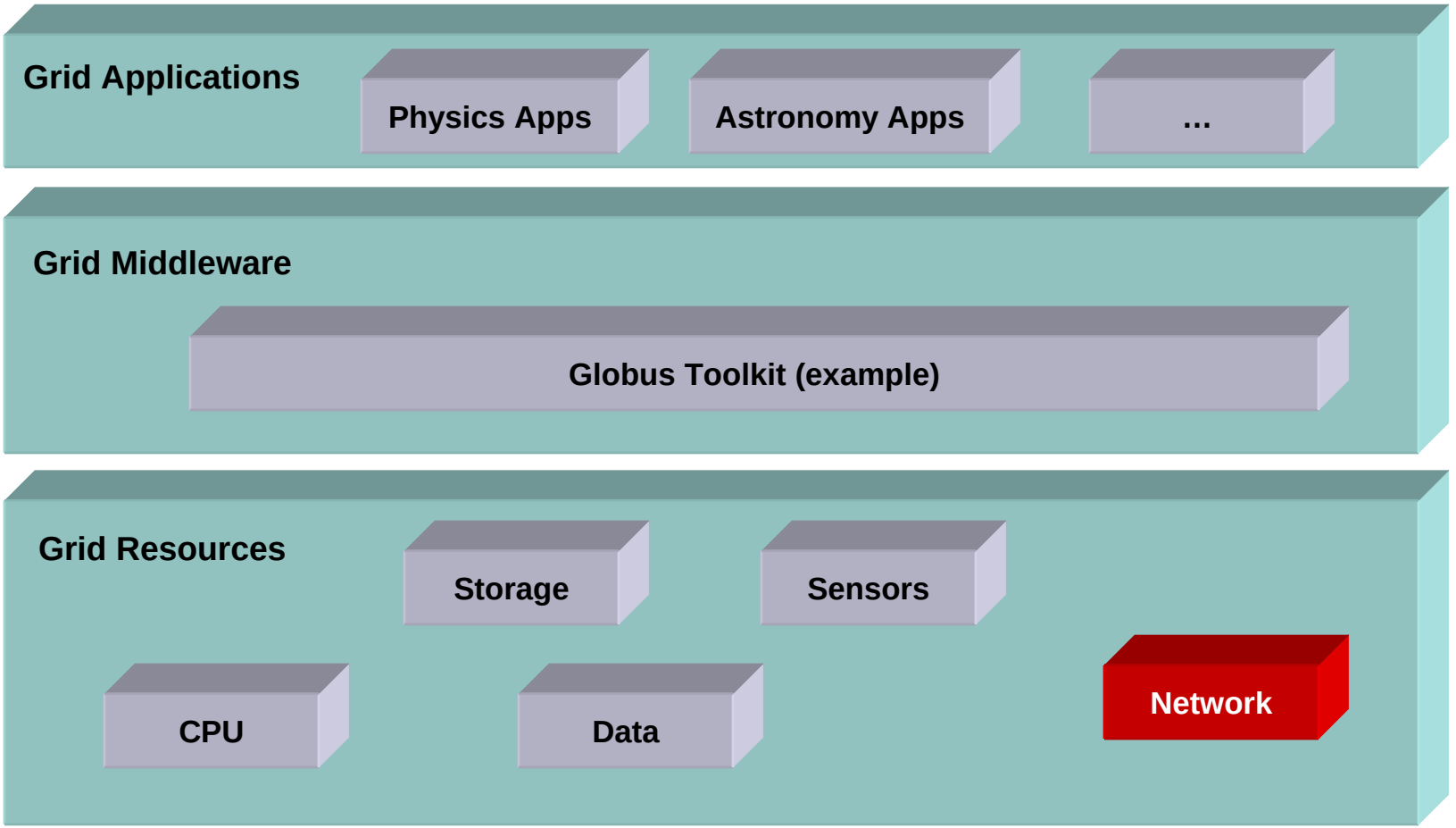
Commercial COIs

- Global Grid Forum GGF 14
  - COI

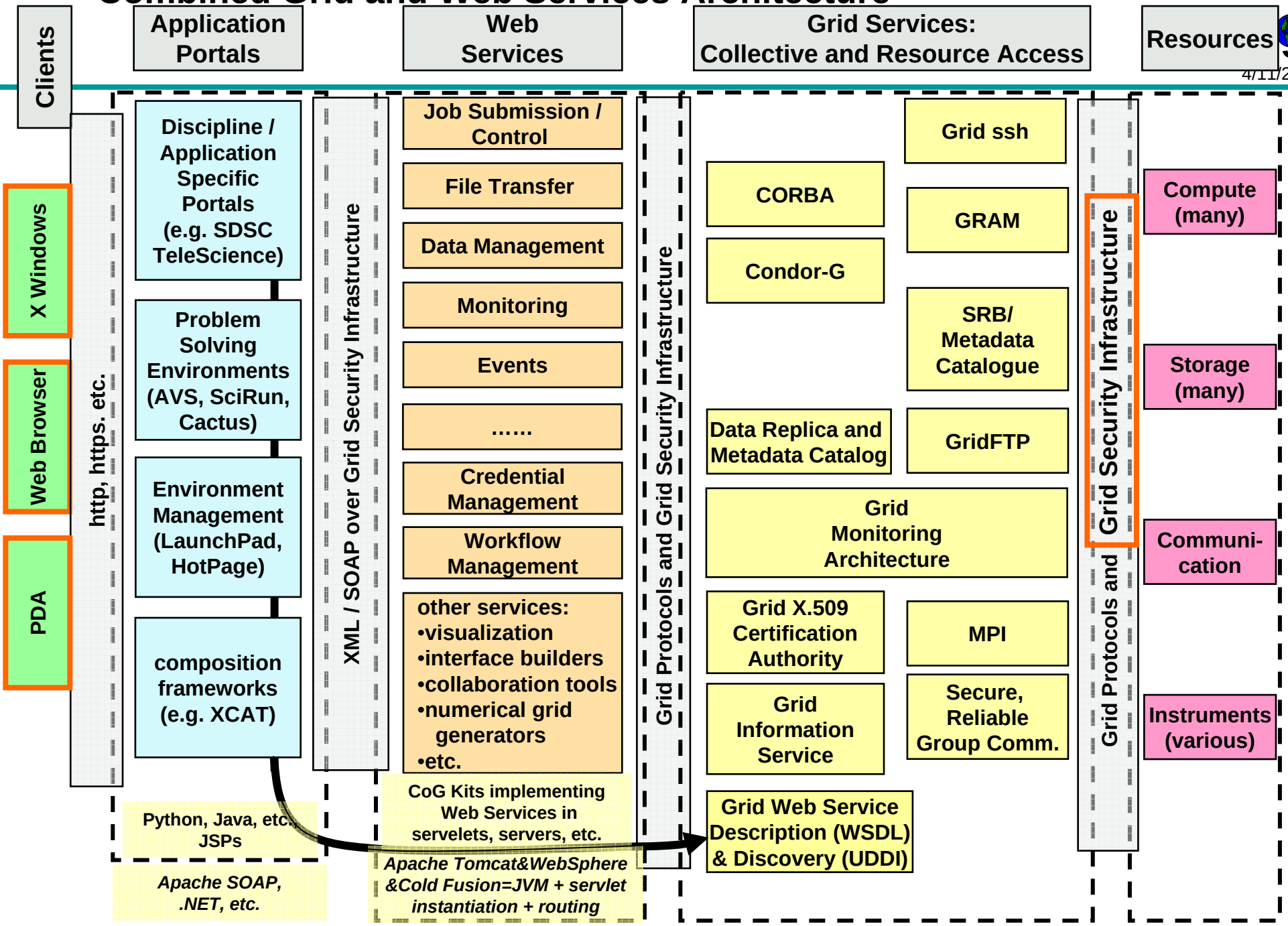
- GGF 16 http://www.ggf.org/gf/event_schedule/?event_id=3
  - NCW Grid http://www.ggf.org/GGF16/materials/DefiningTheGrid/FOX_GGF16DefineGridFeb14-06.ppt

- Dr. Geoffrey Fox web site http://grids.ucs.indiana.edu/ptliupages/publications/index.html

Grid Reference Model



Combined Grid and Web Services Architecture



So: GGF4 Arch WG presentation http://grid.lbl.gov/GPA/GPA.GGF-4.1.ppt

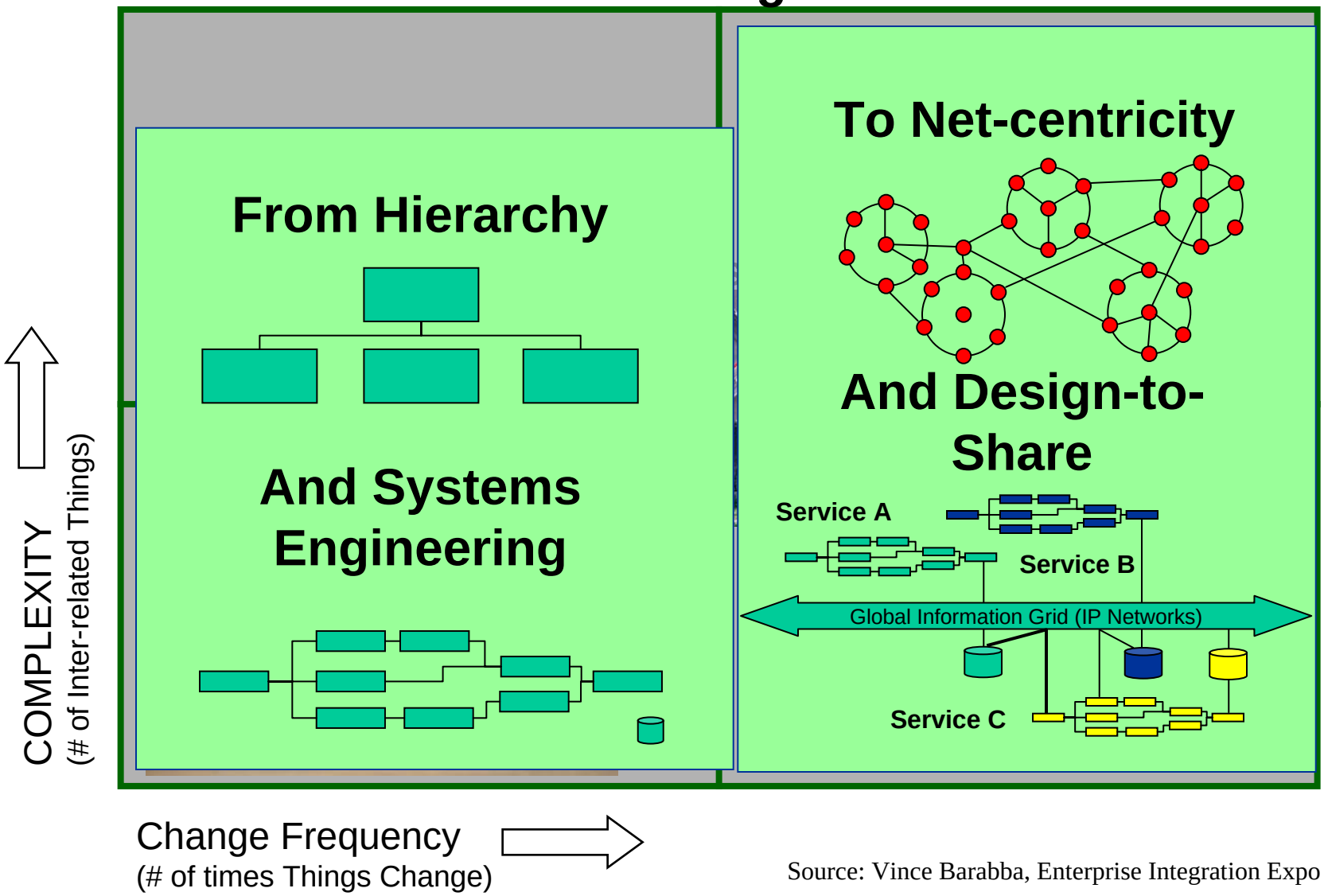
Yahoo Discussion Group

- Email reflector and file sharing
- http://groups.yahoo.com/group/GSAWDistComputing/
- Post email to GSAWDistComputing@yahoogroups.com

-

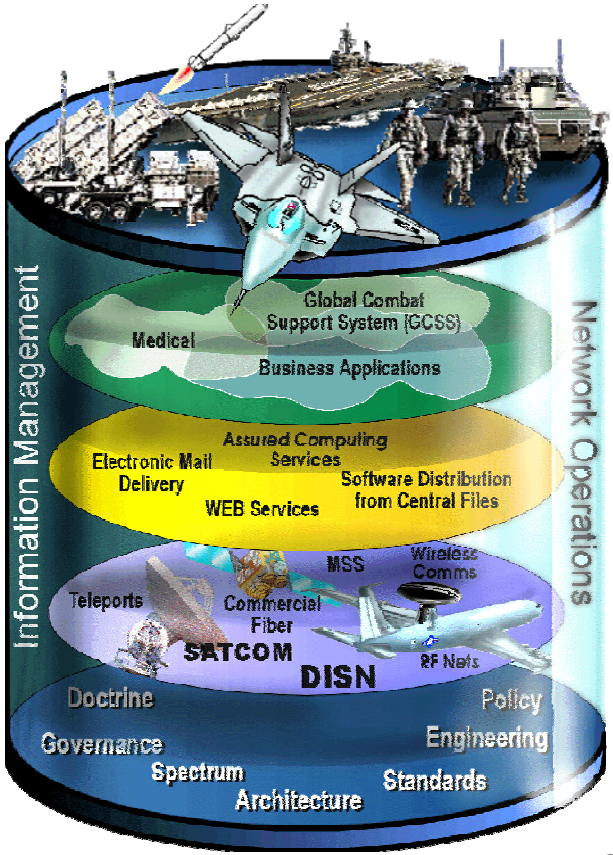
backups

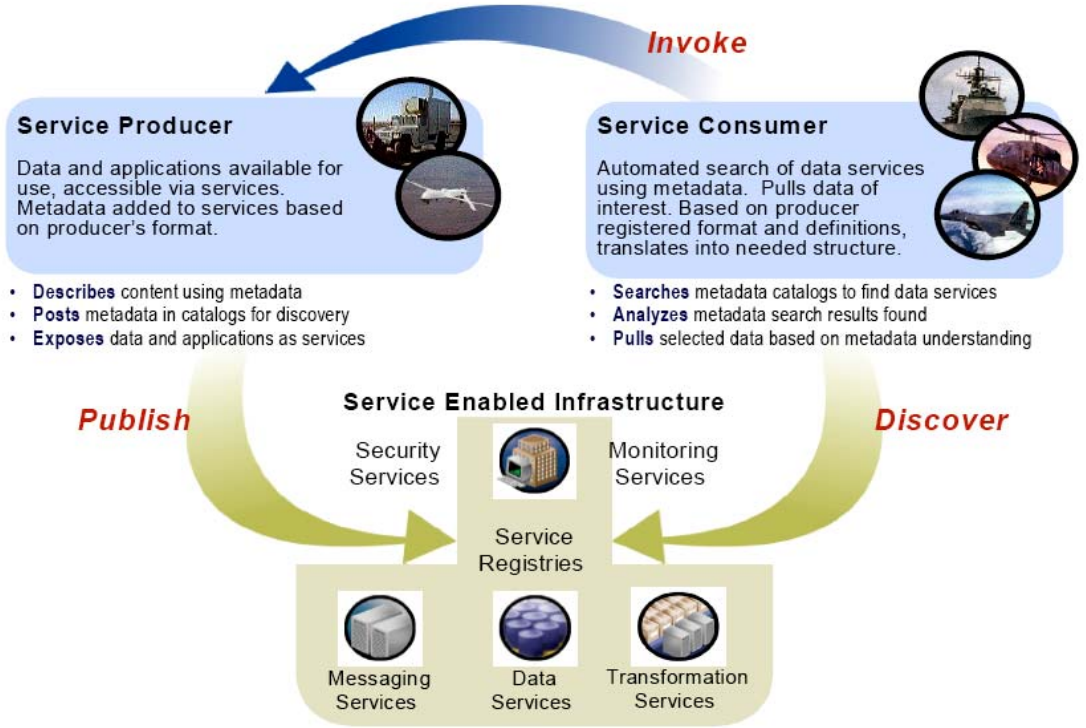
General IT Paradigm Shift



Source: Vince Barabba, Enterprise Integration Expo 04

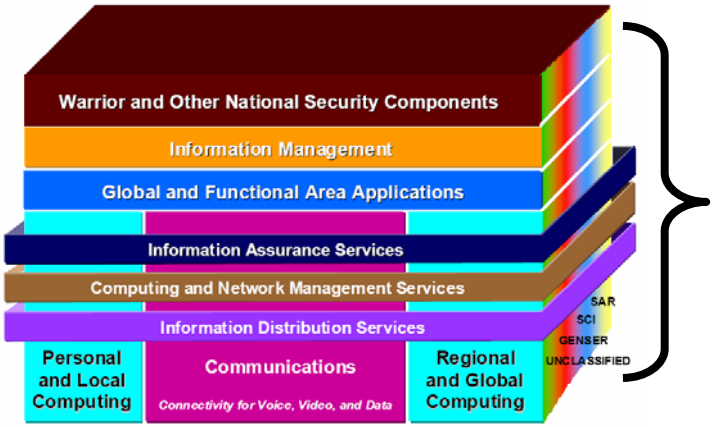
"It's All About Playing In The GIG As A Service-Oriented Architecture!"





Net-Centric Enterprise Services (NCES) Security Core Enterprise Services (CES) Architecture Version 0.4 (Pilot) -- March 26, 2004 DISA Doc Produced By Booz Allen Hamilton

Service-Oriented Architectures Supporting GIG IA & Security



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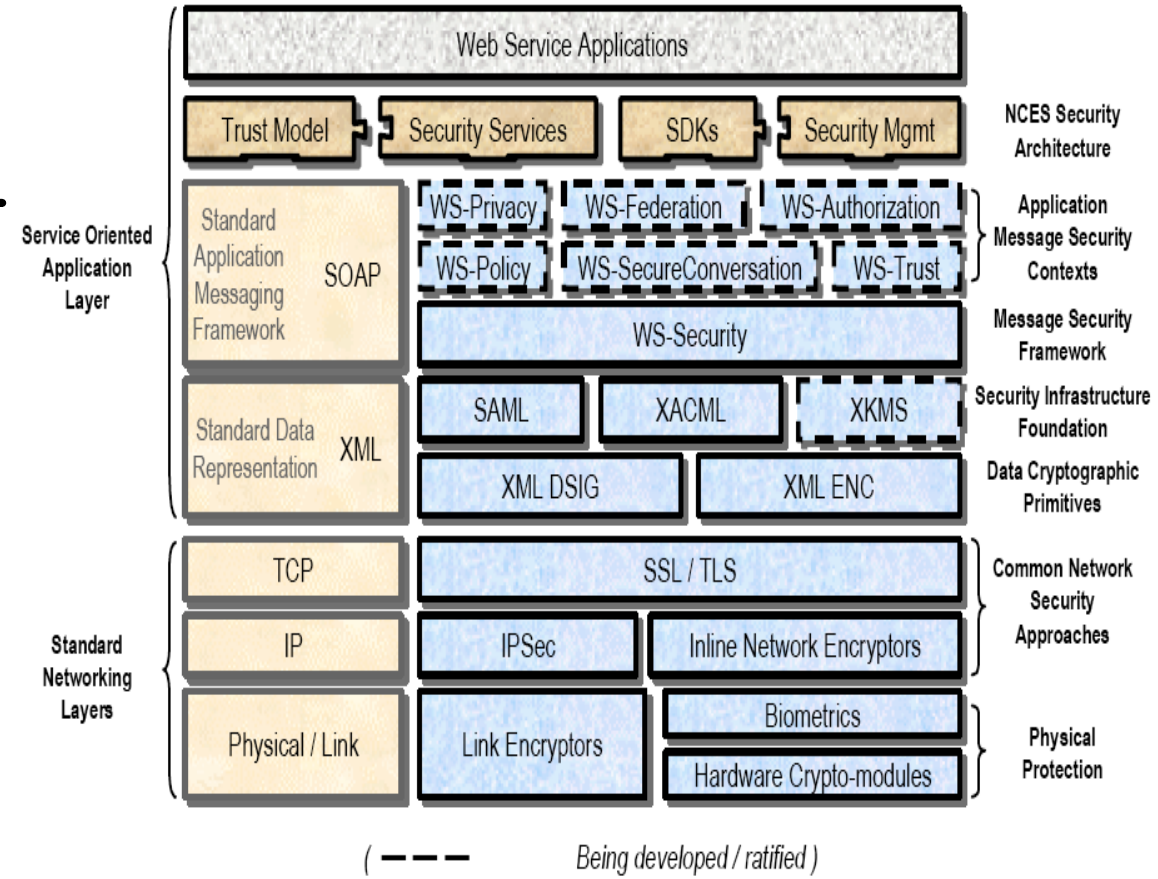
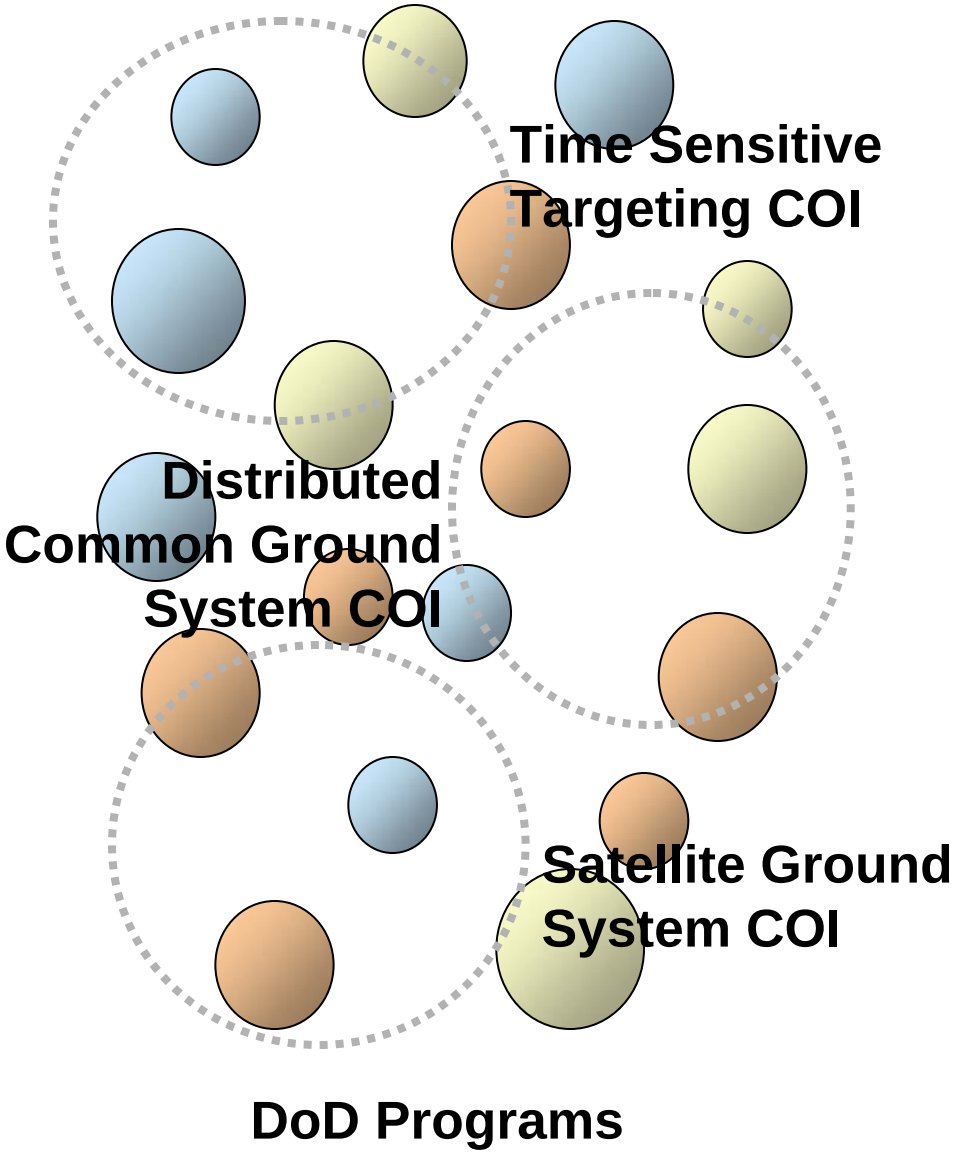


Net-Centric Enterprise Services (NCES) Security Core Enterprise Services (CES) Architecture Version 0.4 (Pilot) -- March 26, 2004 DISA Doc Produced By Booz Allen Hamilton

- **DoD Net-centric Strategy**
  - **Making data visible, available, and useable**
  - **Management of Data within Communities of Interest**
  - **CJCSI 6212.01C Interoperability and Supportability of Information Technology and National Security systems; NRKPP, Key Interface Profiles, Compliance with NCOW RM**
- **• Global Information Grid**
  - **Foundation for Net-centricity**
  - **Global interconnection**
  - **Personnel and Processes for:**
    - **Collecting ,processing, storing, disseminating and managing Info to Warfighter**
- **• Communities of Interest and Namespace**
  - **Collaborative group of users who must exchange data**
  - **Standardization of data at the community level**

Within the DoD, the term 'COI' has been carefully defined to include any group who performs net-centric information sharing activities…



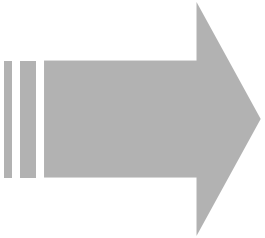
"Communities of Interest (COI) is the inclusive term used to describe collaborative groups of users who must exchange information in pursuit of their shared goals, interests, missions, or business processes and who therefore must have a shared vocabulary for the information they exchange"

From the DoD Net-Centric Data Strategy, DoD CIO

DoD Net-Centric Data Strategy Implementing the key goals

Key Goals

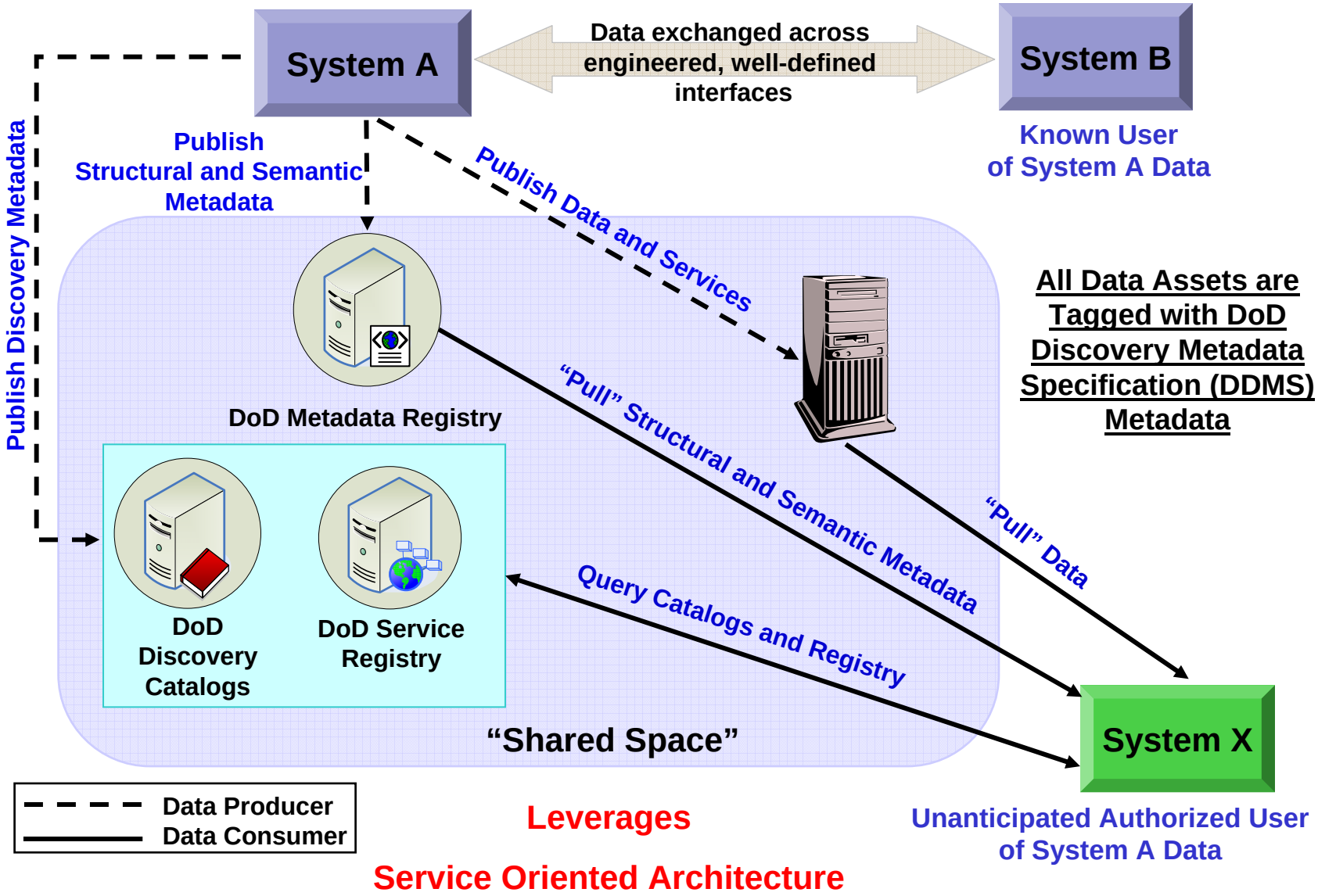
- **Make Data Visible**
- **Make Data Accessible**
- **Enable Data to be Understandable**
- **Enable Data to be Trusted**
- **Enable Data Interoperability**



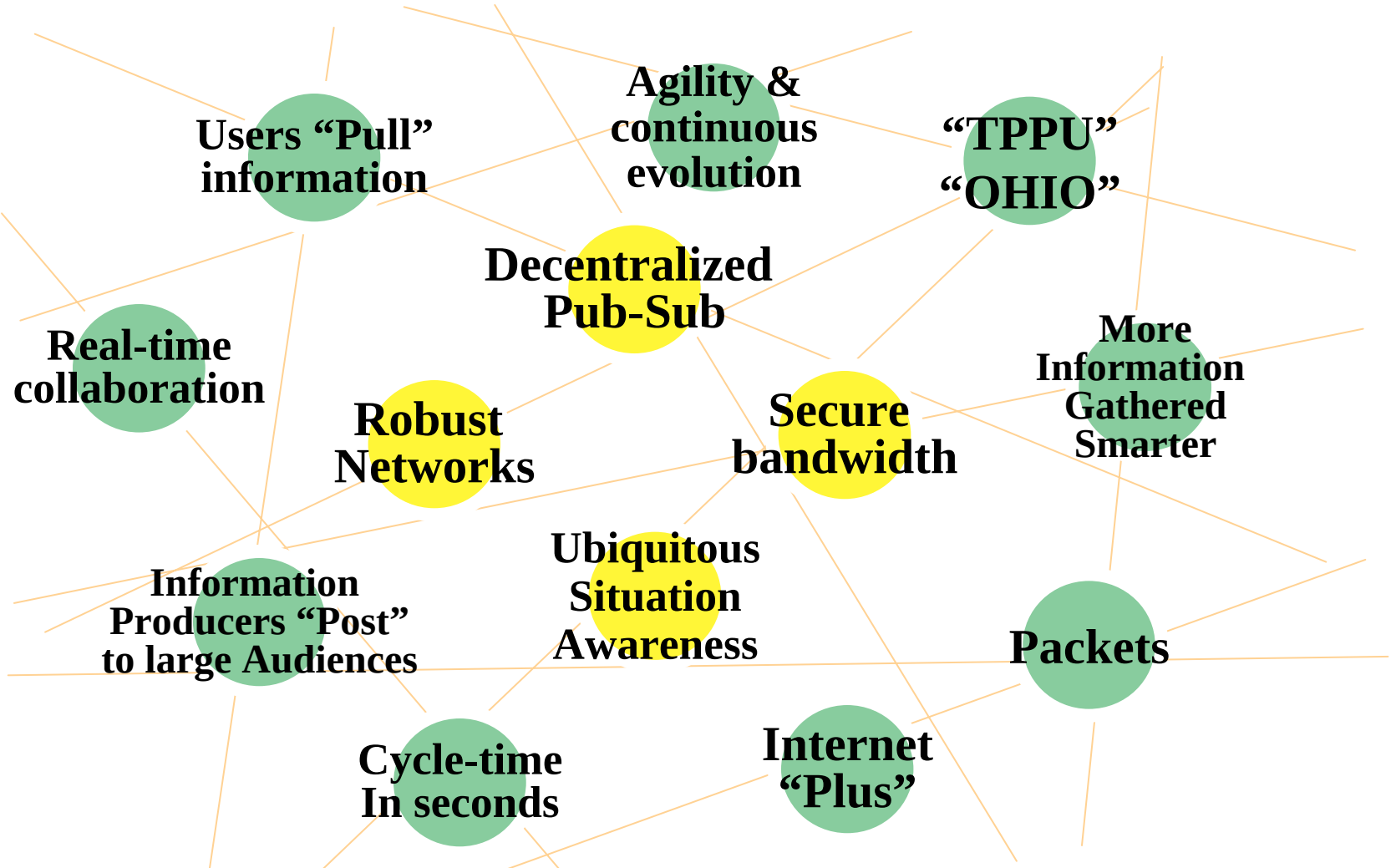
Key Actions:

- Make data assets available to the enterprise:
  - Use metadata to describe and advertise data assets (e.g., documents, web pages, images, etc)
  - Create data asset catalogs and organize by community-defined structure (ontology)
  - Make data assets available to "shared space" where enterprise users can access it
- Make system data and processes available to the enterprise:
  - Define and register the format and semantics of system data and processes
  - Provide reusable/easy-to-call access services to make system data and processes available to the Enterprise

Supporting Both Known and Unanticipated Authorized Users



What Is Net-Centricity ?



Global Information Grid (GIG) Characteristics

netCentric Objectives

- **Responsive** –can respond to changes in need, matching tempo to the operational situation
- **Robust** –remaining effective in the face of depletion of its resources or capabilities
- **Broad** –able to operate effectively over a wide range of situations and missions
- **Flexible** –capable of achieving effects in many ways, using agile resource groupings
- **Adaptable** – learning from its operating environment and acting accordingly
- **Scalable** –capable of operating in large or small deployments

- **Interoperable** – operating jointly across all levels
- **Synchronized** – Working coherently to deliver coordinated effects and avoid internal conflicts
- **Proactive** – rapidly generating and deploying missic groups, and achieving aims quicker
- **Responsible** – operating with minimal fratricide or unintended effects
- **Cost Effective** -delivering effective capability at lower cost.

http://www.dodccrp.org/publications/pdf/journal_defence_science.pdf

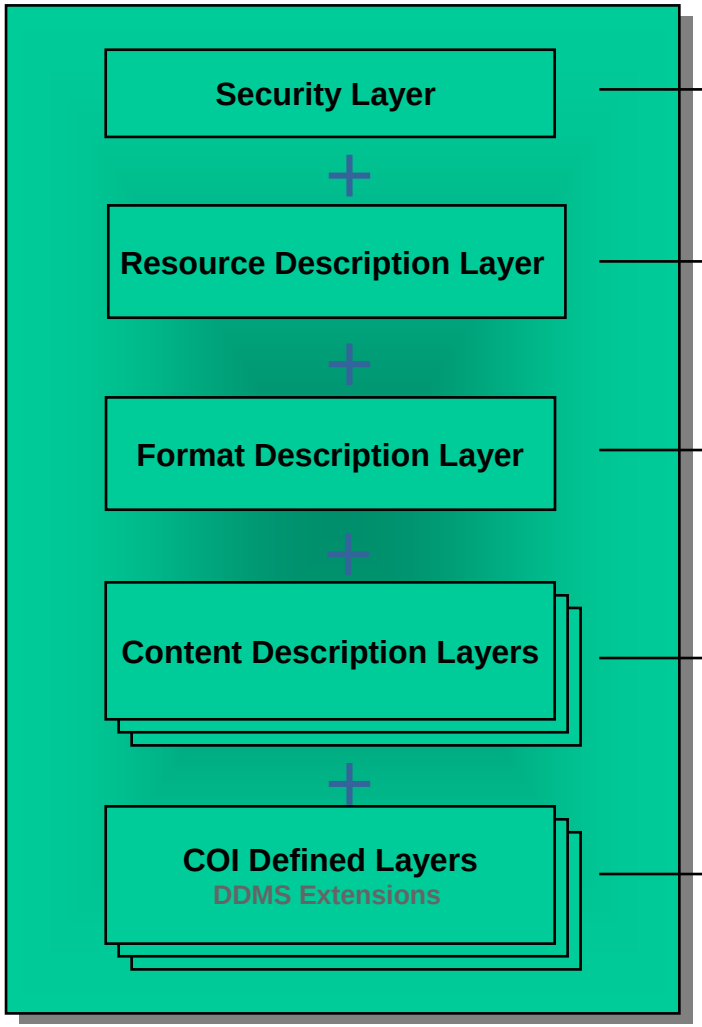
"Attributes"

- **Visible** Users and applications can discover the existence of data assets through catalogs, registries, and other search services. All data assets (intelligence, non-intelligence, raw, and processed) are advertised or "made visible" by providing metadata, which describes the asset.
- **Accessible** Users and applications post data to a "shared space." Posting data implies that (1) descriptive information about the asset (metadata) has been provided to a catalog that is visible to the Enterprise and (2) the data is stored such that users and applications in the Enterprise can access it. Data assets are made available to any user or application except when limited by policy, regulation, or security.
- **Understandable** Users and applications can comprehend the data, both structurally and semantically, and readily determine how the data may be used for their specific needs.
- **Trusted** Users and applications can determine and assess the authority of the source because the pedigree, security level, and access control level of each data asset is known and available.
- **Interoperable** Many-to-many exchanges of data occur between systems, through interfaces that are sometimes predefined or sometimes unanticipated. Metadata is available to allow mediation or translation of data between interfaces, as needed.
- **Responsive to User Needs** Perspectives of users, whether data consumers or data producers, are incorporated into data approaches via continual feedback to ensure satisfaction.
- **Institutional** Data approaches are incorporated into Department processes and practices. The benefits of Enterprise and community data are recognized throughout the Department.

Source: DoD Data Net-Centricity

DoD Discovery Metadata Specification (DDMS)

4/11/2006



Security markings layer.

Resource maintenance and administration metadata (e.g., date created, author, publisher, title etc). Largely derived from Dublin Core.

Format-specific metadata (e.g., picture size, database record count, multimedia stream duration, file size, etc.)

Rich content descriptive metadata structure. Structured approach to provide robust method for discovery.

Community of Interest defined metadata extensions. Must be registered with DoD Metadata Registry for integration with Enterprise-wide capabilities.

- net-centricity
- service orientation