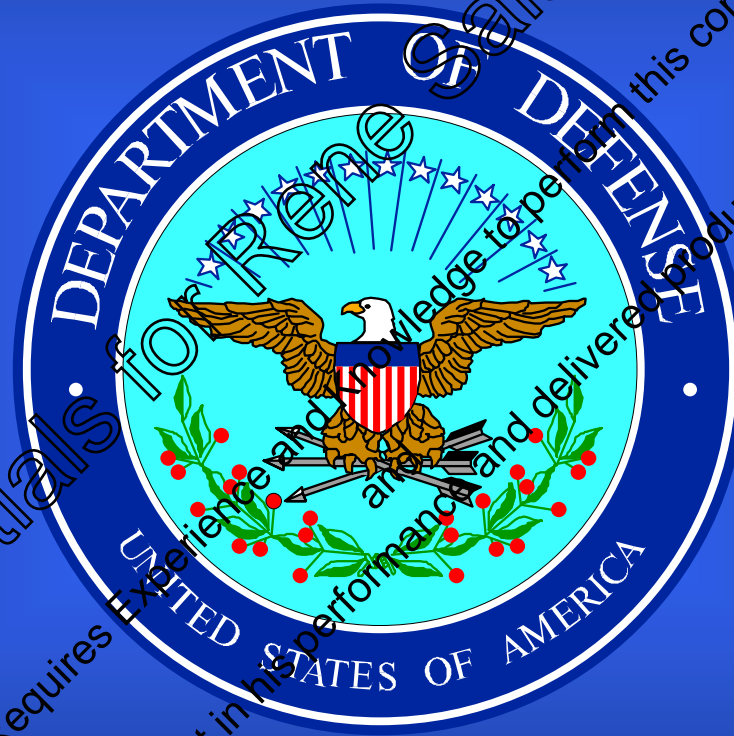




Tri-Service

Open System Architecture



Credentials for Rene Salazar
Requires Experience and performance and delivered products
Peers trust in his performance and delivered products

Working Group





Who We Are

Tri-Service Open System Architecture Working Group

- Convened at the request of the three Service Secretariats
- Membership comprised of personnel from:
 - Army
 - Navy
 - Air Force
 - Office of the Secretary of Defense
 - DISA
 - NSA
 - Industry - invited to present opinions
- Addressed Warfare and Warfare Support Systems (I.E. Re systems)

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Why We Came Together

- **Modular Open Systems Architecture Standards (MOSAS) industry-council briefings to:**
 - **Three Services -- many echelons**
 - **Office of the Under Secretary of Defense (Acquisition)**
- **Very positive response**
- **Secretariats chartered Tri-Service Working Group to:**
 - **Define open systems architecture and develop a coordinated transition plan such that the DOD can leverage the commercial market throughout a systems life cycle**

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Additional Background Information

- Working Group endorsed by SAF/AQ (Wincup) 18 Nov 92
- ASC/SM Tasked by Gen Yates through AFMC/EN to lead Air Force participation
- Composition of Working Group
 - 40% Navy (C3I, AWAR, C3I)
 - 40% Air Force (C3I, Avionics, Space, HQ AFMC, ALCs)
 - 20% Other (Army, NSA, DISA, OSD)
 - Predominantly a C3I group
- Prepared final report with 16 recommendations





Charter

- Implement an executive level steering group that will:
 - Define Open Systems Architecture
 - Identify Open Systems Architecture attributes and criteria for establishing standards
 - Define standards areas to be used as the framework for systems design
 - Identify a process to develop, adopt, or minimally extend open systems standards

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Charter

(Continued)

- **Implementation (continued)**

- Draft a DOD Directive for the use of open-system architecture and standards
- Prepare a framework to guide the services in developing service-specific strategic plans to facilitate the use of open systems standards in existing and future Mission-Critical Computer Resources (MCCR) systems

- **Office of Primary Responsibility**

- Army: SAIS-ZS, Mr. Jim Hess
- Navy: SPAWAR 231, Mr. John Machado, Chair
- Air Force: HQ AFMC/EN, Lt Col Izzy Caro





Final Report

● ACTIVITY TO DATE

- ASC/SM provided info brief/strategy discussion with AFMC/EN 6 July 93
- Strategy session with ASC/CA (M. Sutton) 15 Jul 93
- Briefing to Mosemann (SAF/AQK) 21 Jul 93
- Briefing to AFMC/CV (Lt Gen Thompson) 30 Jul 93
- Briefings to Navy & Army first part of Aug

● PROPOSED APPROACH

- Recommend balloting report throughout AFMC to determine command position
- Forward command position to SAF/AQ

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Agenda

- Open Systems ?
- Methodology
- Definitions of Open Systems Concepts
- Domains and Reference Models
- Process for Open System Standards
- Attributes and Criteria of Open Systems
- Framework for Services' Strategic Transition Plans
- DoD Directive and Policy
- Findings of Industry Responses
- Conclusions and Recommendations
- Summary

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Definition Open System

Open System -- Based on IEEE POSIX Definition

- A System that implements sufficient open specifications for interfaces, services, and supporting formats to enable properly engineered components to be utilized across a wide range of systems with minimal changes, to interoperate with components on local and remote systems, and to interact with users in a style which facilitates portability. An open system is characterized by the following:
 - Well defined, widely used non-proprietary interfaces/protocols
 - Use of standards which are developed/adopted by industrially recognized standards bodies
 - Definition of all aspects of system interfaces to facilitate new or additional systems capabilities for a wide range of applications
 - Explicit provision for expansion or upgrading through the incorporation of additional or higher performance elements with minimal net impact on the existing system





Open Systems ?

- **The DOD (Services and Agencies) is moving to adopt the OPEN SYSTEMS paradigm for the development of all Warfare and Warfare Support Systems (a.k.a. Mission-Critical Computer Resources)**

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Open Systems ?

(continued)

- **The use of the open systems paradigm in WWSS**
 - Presupposes the existence of industry open system standards that meet DOD requirements
- Majority of existing industry open systems standards based on the **AIR SHARE** model (i.e. client server)
- “Real-time systems seldom built using the client-server model. Client-server based systems are unpredictable with regard to satisfying deadlines





Open Systems ?

(continued)

- Commercial industry standards developed/maintained by national and international standards bodies (ISO, ANSI, IEEE, SAE, etc.)
- If the DOD is serious about the use of the open systems paradigm in the development of WWSS,

Then...

DOD “real-time” requirements must be strongly advocated in the industry standards development and maintenance process

*Watermark text: Credentials for Rene Salazar
Requires Experience and Knowledge to perform this complex task
Peers trust in his performance and delivered products*





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Working Group Methodology

- Divided work among sub-groups and individuals
- Reviewed and refined products to get working group consensus
- Solicited industry comments (DEC, Intel, IBM, Northrop, etc)
- Tabulated findings
- Provided interim briefings to chartering officials
- Attempted to develop products that blend with DOD acquisition Directives and the Defense Standardization Program
- Only dealt with Warfare and Warfare Support Systems





Definitions

- **Common definitions to aid common understanding**
 - **Adopted or modified existing definitions:**
 - ✓ **Open specifications**
 - ✓ **Open systems**
 - ✓ **Open system architecture**
 - **Working group defined:**
 - ✓ **Warfare and Warfare Support Systems**
 - ✓ **Domains**
 - ✓ **Reference Models**

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Definitions (Continued) Domains

Domains

- Groupings of related items within a certain area of interest.
- Examples of DOD domains include:
 - Operational Domains (e.g. Joint Littoral, Joint Strike, Strategic Defense), and
 - Functional Domains (e.g. Navigation, Fire Control Communications)

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Definitions (Continued) Reference Model

Reference Model

- Generally accepted abstract representation used to establish definitions, build common understandings, and identify issues
- Establishes a context for understanding how disparate technologies (or force structures) and standards (or missions) relate to each other
- Mechanism for identifying key issues associated with portability, modularity, scalability, and interoperability





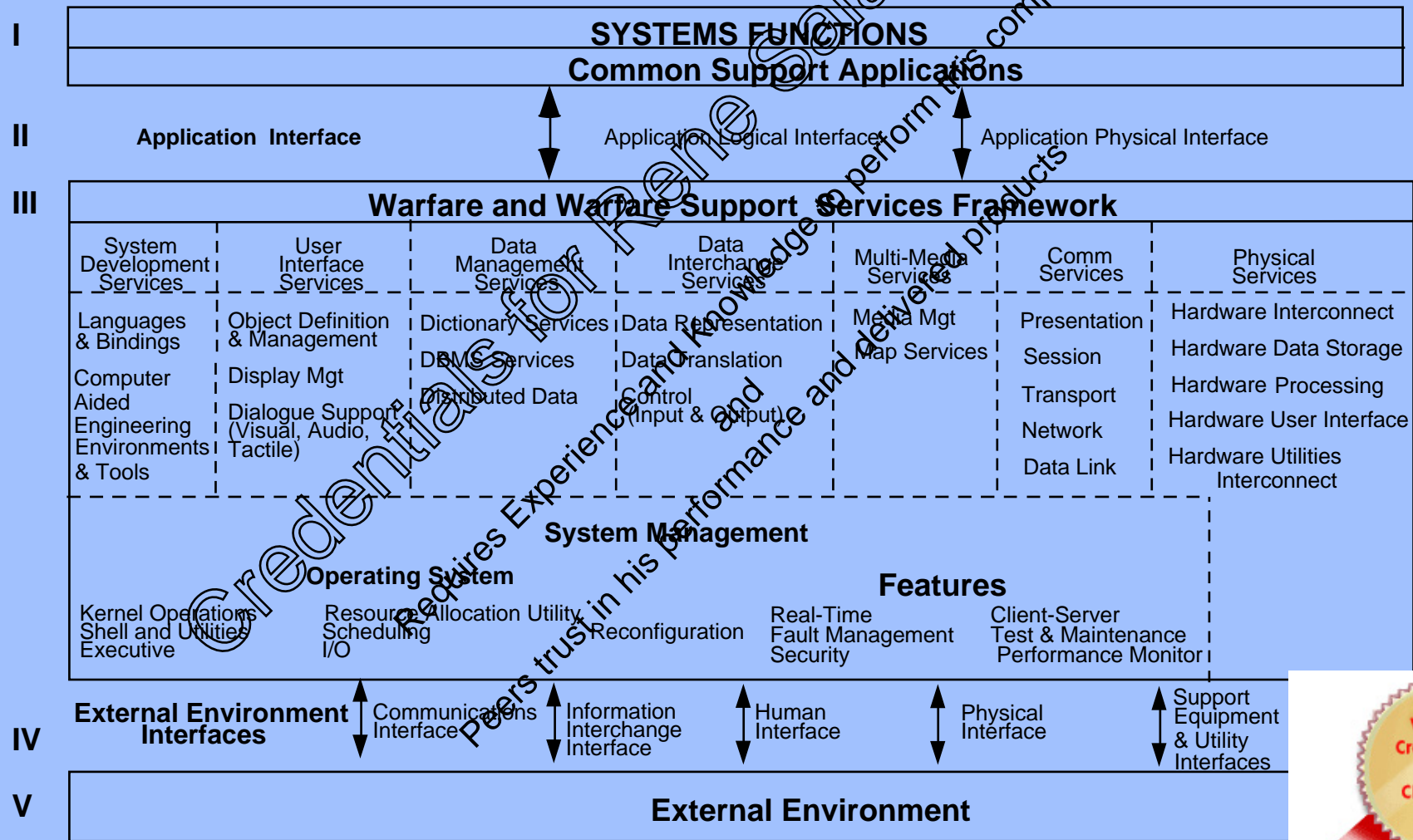
Reference Models and Domains

- The tasking, “Define standards areas to be used as a framework for systems designs” led to:
 - Identification of the concept of “Domain Specific Architectures”
 - Development of a Technical Reference Model for analyzing WWSS
- Used DISA Corporate Information Management (CIM) Model as a starting point for the WWSS Technical Reference Model
- Used the WWSS TRM and WWSS Domains in development of a framework for systems designs



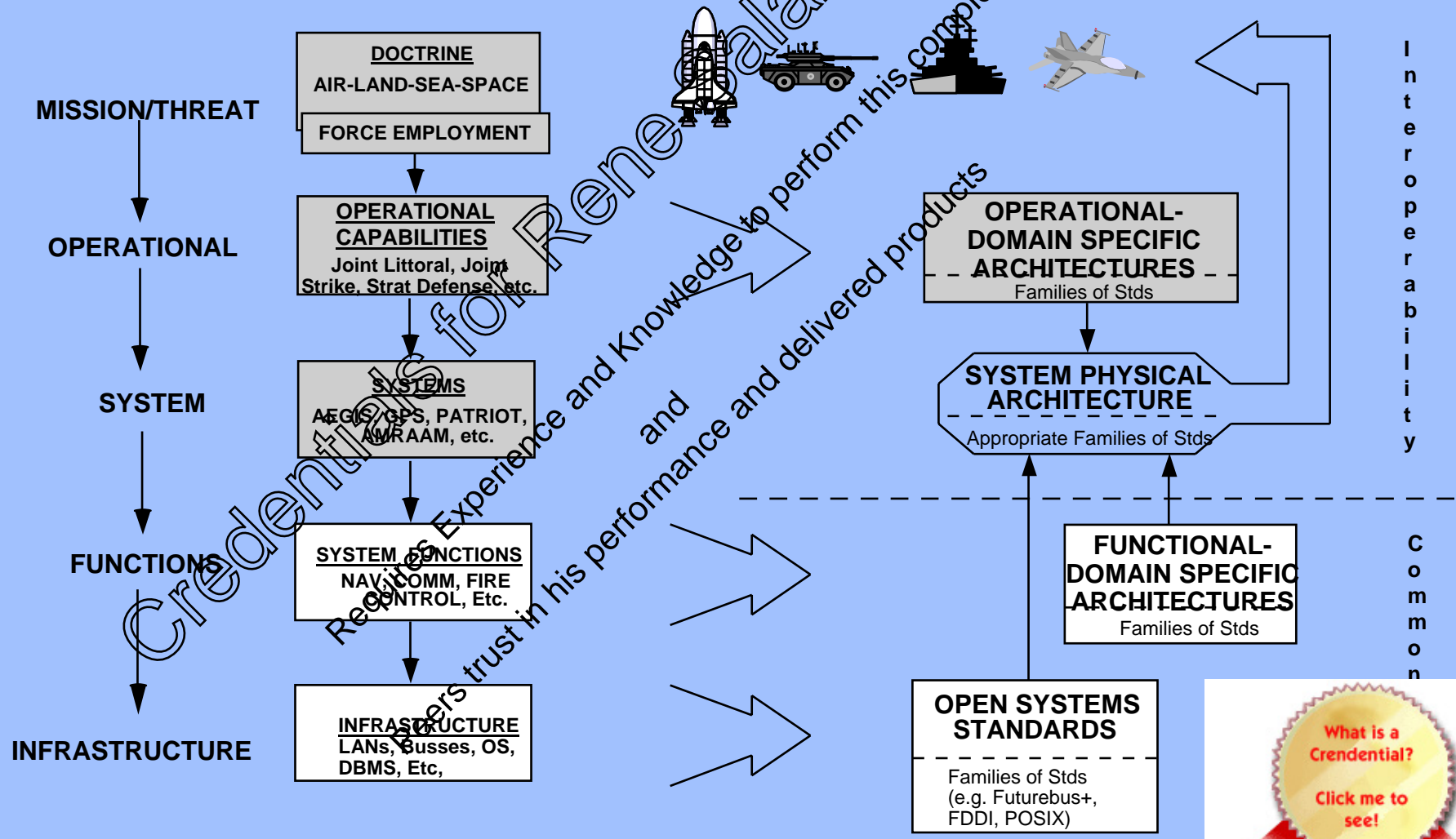


WWSS Technical Reference Model



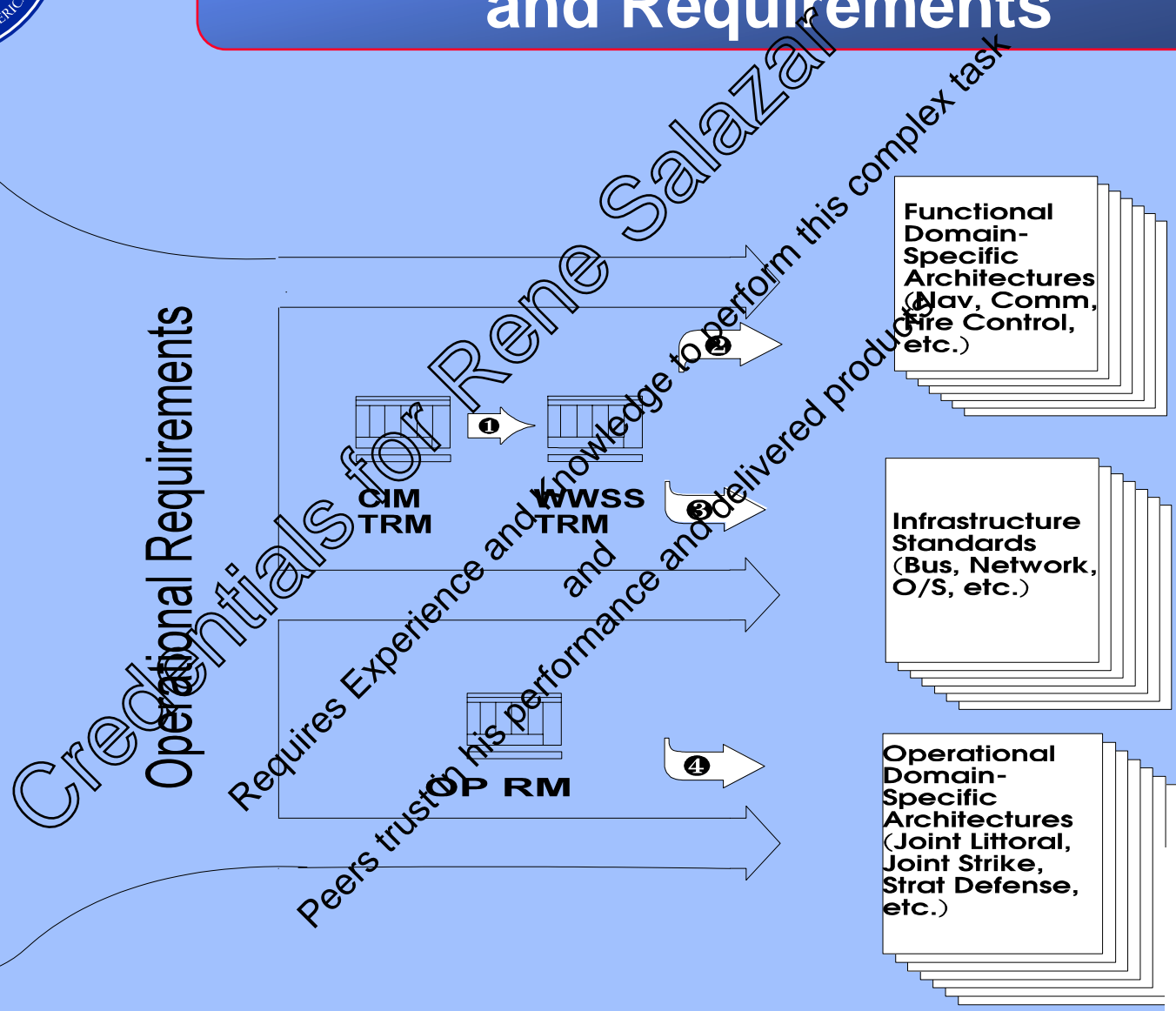


Relationships between Domains and Requirements



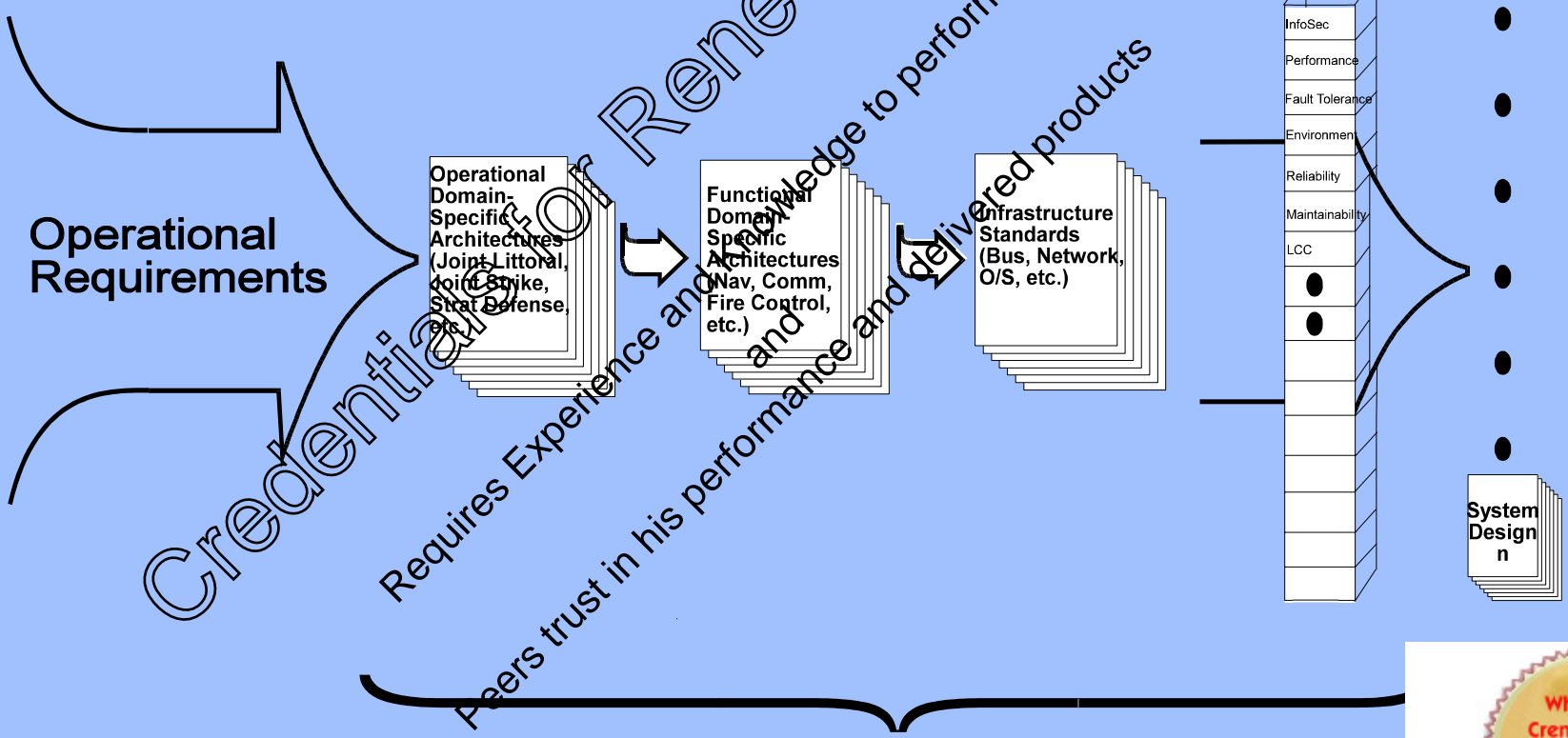


Process for deriving Domain-Specific Architectures from TRMs and Requirements





Process for Deriving Systems Designs from Domain-Specific Architectures, Infrastructure Standards, and Operational Requirements



SYSTEM ENGINEERING PROCESS





Process for Deriving Systems from TRMs and Requirements -- Process Summary

- **Standards for Domain-Specific Architectures are easier to develop/identify than generic standards applicable to all systems**
- **Each WWSS domain will require a family of open system standards which should compliment or overlap other WWSS domain families of open system standards**
- **Systems need to interoperate across WWSS domains; Cooperation among groups preparing Domain-Specific Architectures is essential**
- **Transition to open systems is possible**





Processes for Use of and Definition of Open System Standards

- Two processes were identified and linked through a standards repository and feedback mechanism
 - The Mil-Std-199B (draft) for systems development
 - A new process defined to describe how DOD should work with industry to ensure availability of adequate open system standards

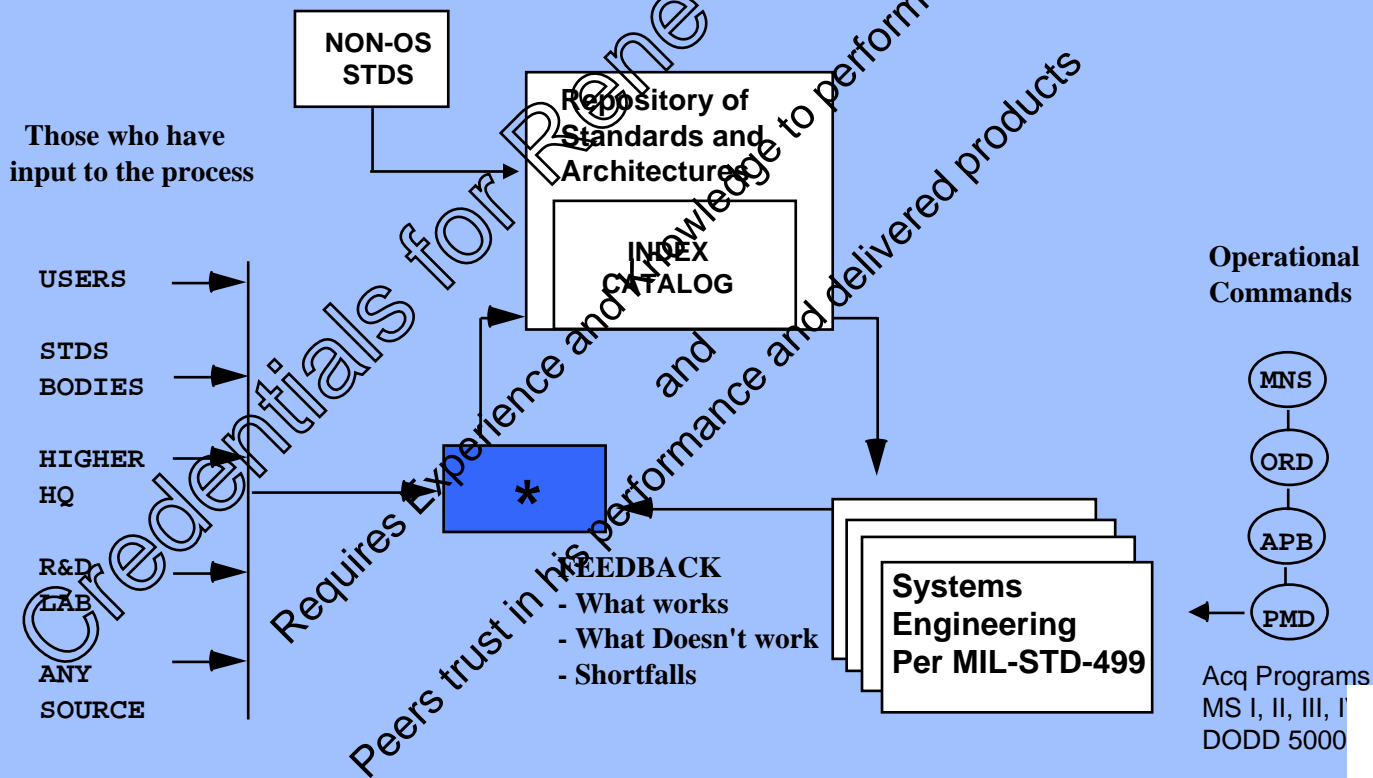
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Processes for Use of and Definition of Open System Standards

Identified Top Level Scheme Defining the Roles of Players

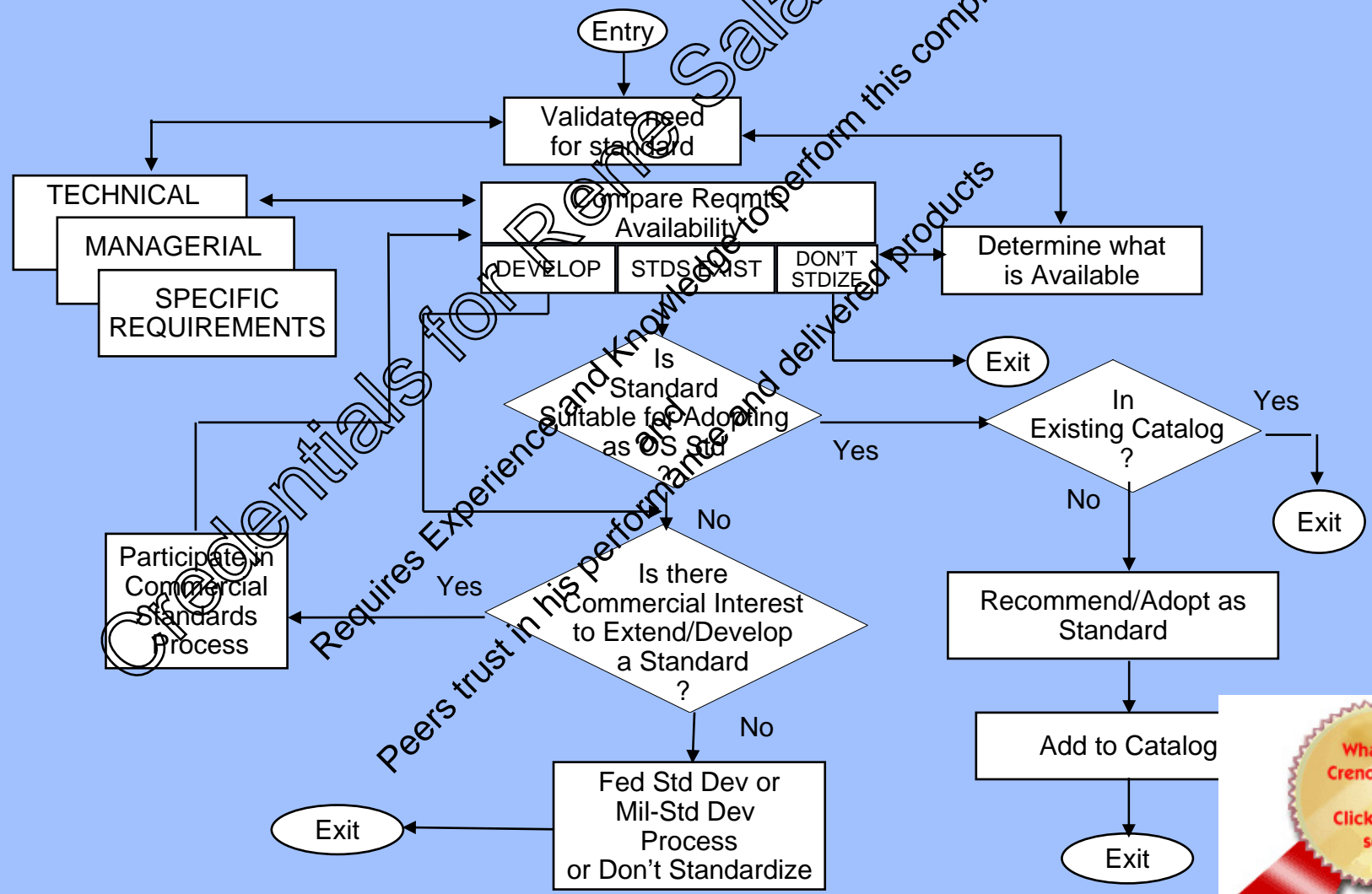


* PROCESS FOR DEVELOPING, ADOPTING OR MINIMALLY EXTENDING OPEN SYSTEM





Process for Developing, Adopting, or Minimally Extending Open System Standards





Attributes and Criteria

- Working group discussed attributes and criteria at great length
 - Attributes difficult to define in unambiguous terms
 - Developed qualitative rather than quantitative measures
- Still considered useful to program managers
 - Not all open systems possess all attributes to the same degree
- Criteria incorporated into process for developing, adopting, or minimally extending open systems standards
 - Defines “exit criteria” based on OS attributes
 - Process harmonizes with DODD 5000.1





Framework for Component Transition Plans

- Developed so that all the Components could benefit from the working group's experience and lessons learned, including key findings in the following areas:
 - Training
 - Programs
 - Process
 - Infrastructure
 - Standards
 - Funding
- Provides all the Components with a common point of departure in preparing their transition plans
- Tied the transition plan's delivery to the POM cycle

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DOD Directive

- **Establishes policy and responsibilities for use of open systems in WWSS acquisitions**
 - Use open systems concepts and standards on WWSS acquisitions
 - Directs DOD Components to support the development of open system standards
 - Promotes the use of commercial open systems technologies and products including life cycle support and services
- **Is consistent with DODD 5000.1 and DODI 5000.2**
 - Open systems to be addressed at milestones
- **Complements DODD 8000.1, Defense Information Management Program**



Findings of Industry Responses

- Industry fully supportive of open system approach
- Open systems will allow DOD to leverage industry investment
- Open systems will facilitate systems upgrades, interoperability and commonality
- Numerous organizations are already stepping out with open systems procurements
- No legal barriers identified to use of open systems
- Will require a cultural change in government and industry



Findings of Industry Responses (continued)

- Open systems standards are not a panacea for WWSS
- No single set of open systems standards will satisfy everyone
- Open systems standards will not cover 100% of DOD requirements, but may cover the majority of DOD needs
- Industry standards do not adequately address real-time, fault management, security, etc. requirement of DOD
- Doubtful MIS and WWSS standards will ever completely merge



Conclusions

- **Open Systems in WWSS is not yet here for broad applications**
- **Gradual migration to OSA is the preferred strategy**
 - Full benefit of open systems is many (8-10) years away
 - Some benefit available now through the use of NDI
- **DOD will have to capitalize the implementation of open systems architectures**
 - Training
 - Infrastructure
 - Standards development
- **Active DOD involvement in open systems standards development is required**



Recommendations

The major recommendations are:

- **DOD issue and implement the proposed DOD Directive on open systems**
- **DOD establish training for acquisition personnel on the use of open systems concepts and standards**
- **OSD establish a program element to support the open systems standards activities**



Recommendations (continued)

Major recommendations (continued)

- **DOD establish a joint service program to manage the WWSS open systems standardization process and incorporate into the Defense Standardization Program**
- **The Services should start using Operational and Functional Domains and the WWSS TRM to create Domain-Specific Architectures to address interoperability and commonality requirements**



Strategy for Implementing Open Systems

- **Gradual migration from federated to integrated open systems**
- **Modifications should be planned with this migration in mind**
- **DOD must actively support industry standards bodies to influence the development of standards useful to DOD**
 - **Forward compatibility**
 - **Backward compatibility**
- **Products must be certified**
- **Interchangability must be emphasized**



Backup Slides



Definitions

Open System Architecture

- A physical and logical organization of system functions, structures, and operations necessary to meet requirements which establishes the attributes and properties of an open system



Definitions

- **Specification**

- A document that prescribes, in a complete, precise, verifiable manner, the requirements, design, behavior, or characteristics of a system or system component

- **Open Specification**

- Public specifications that are maintained by a public consensus process to accommodate new technologies over time and that are consistent with national and/or international standards



Definitions

- **Standards**

- Documents, established by consensus and approved by a recognized body, that provide, for common and repeated use, rules, guidelines, or characteristics for activities or their results

- **Profile**

- A set of one or more base standards, and where applicable, the identification of the chosen classes, subsets, options, and parameters of those base standards, necessary for accomplishing a particular function