

# **Integration of Information Assurance (IA) into DoDAF Architectures**

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# Agenda

- ▶ Enterprise Architecture Overview
- ▶ Problem Statement & Solution Approach
- ▶ Candidate Techniques to Integrate IA into DoDAF architectures
- ▶ Final Thoughts

# Architecture Defined

**"An architecture is the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution."**

*IEEE STD 1471-2000*

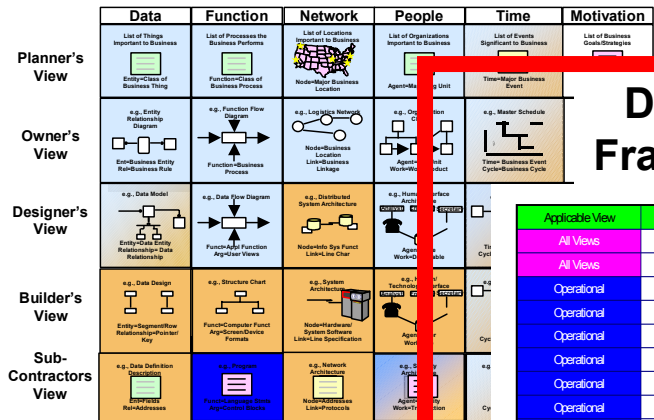


# Purpose of the Enterprise Architecture

- ▶ *Inform*, *guide*, and *constrain* decisions for the enterprise
- ▶ Specifically:
  - Capture facts in an understandable way to promote better planning and decision making (IT investments)
  - Promote better communication (architectural views)
  - Improve consistency, accuracy, timeliness, integrity, quality of information
  - Achieve economies of scale, re-use, standardization, collaboration, shared services
  - Expedite integration of legacy, transition, target systems
  - Ensure legal and regulatory compliance

# These Frameworks Are Focused on the Commercial, DoD/IC, and Federal Domains

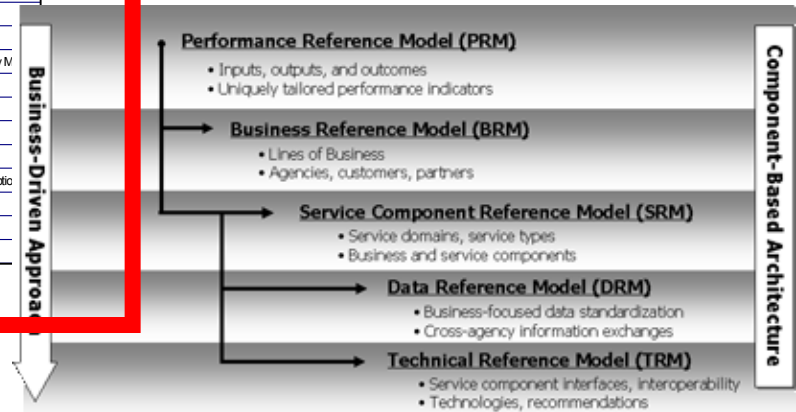
## Zachman Framework



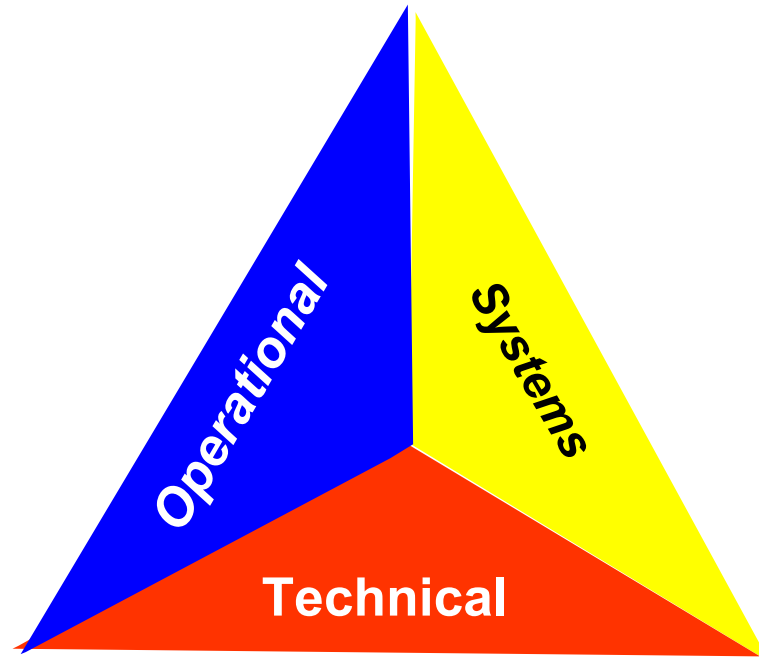
## DoD Architecture Framework (DoDAF)

Applicable View	Framework Product	Framework Product Name
All Views	AV-1	Overview and Summary Information
All Views	AV-2	Integrated Dictionary
Operational	OV-1	High-Level Operational Concept Graphic
Operational	OV-2	Operational Node Connectivity Description
Operational	OV-3	Operational Information Exchange Matrix
Operational	OV-4	Organizational Relationships Chart
Operational	OV-5	Operational Activity Model
Operational	OV-6a, b, c	Operational Activity Sequence and Timing Descriptions
Operational	OV-7	Logical Data Model
Systems	SV-1	Systems Interface Description
Systems	SV-2	Systems Communications Description
Systems	SV-3	Systems-Systems Matrix
Systems	SV-4	Systems Functionality Description
Systems	SV-5	Operational Activity to Systems Function Traceability I
Systems	SV-6	Systems Data Exchange Matrix
Systems	SV-7	Systems Performance Parameters Matrix
Systems	SV-8	Systems Evolution Description
Systems	SV-9	Systems Technology Forecast
Systems	SV-10a, b, c	Systems Functionality Sequence and Timing Descriptio
Systems	SV-11	Physical Schema
Technical	TV-1	Technical Standards Profile
Technical	TV-2	Technical Standards Forecast

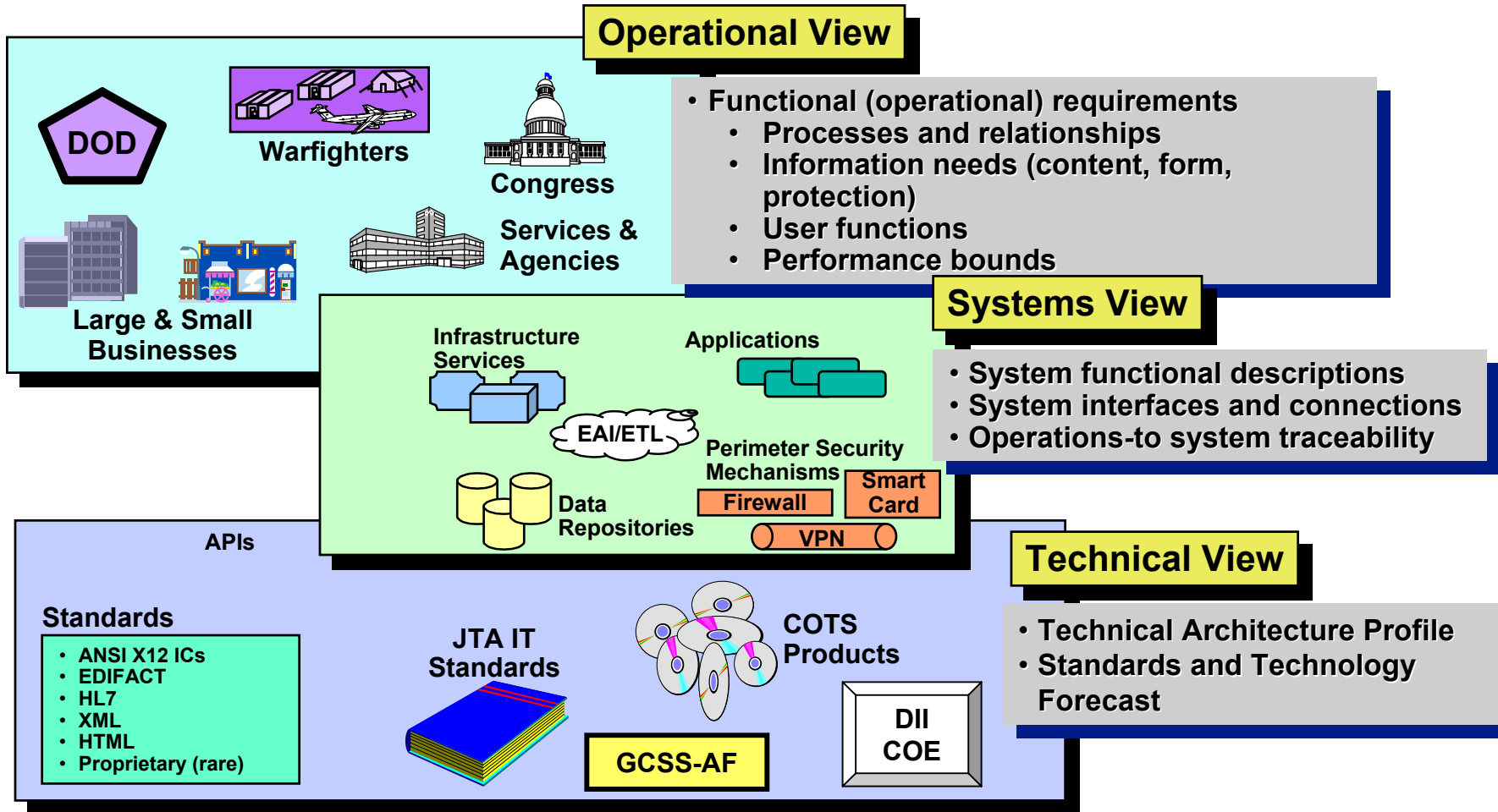
## Federal Enterprise Architecture Framework (FEAF)



# DoDAF Overview



# DoDAF Architecture Views

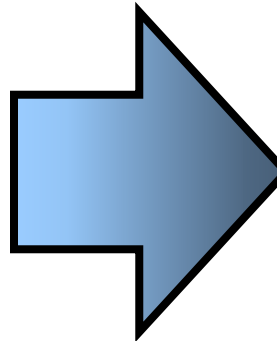


# Problem Statement

DoD System Development  
Efforts Require Development  
Of DoDAF Architecture  
Early in the Life Cycle

+

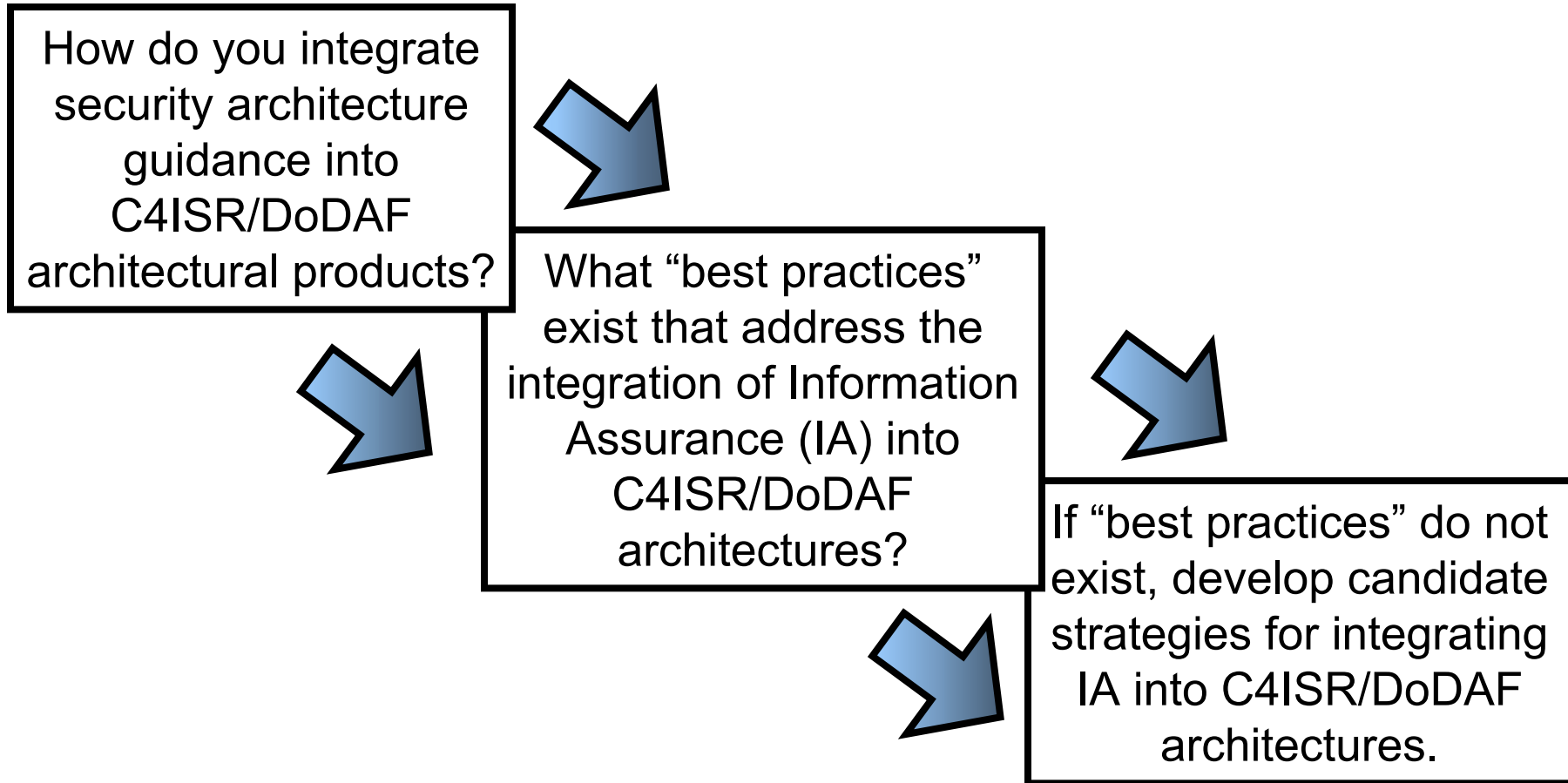
“Secure systems are  
developed most effectively  
by considering & integrating  
security early in the  
development life cycle”



How do you integrate  
security architecture  
guidance into  
C4ISR/DoDAF  
architectural products?



# Approach to Solving Problem



# Approach to Solving Problem

- ▶ Search for examples of efforts to integrate IA into C4ISR/DoDAF compliant architectures in public domain
- ▶ Search for guidance from DoDAF and C4ISR architecture government documentation
- ▶ Intra-company & community search for feedback on this topic
- ▶ Draw from personal exposure to assignments related to C4ISR/DoDAF products

# Initial Findings

- ▶ Very limited information found via Web searches
  - In some instances “IA is important...” but that was all
- ▶ Search through DoDAF also yielded limited information/guidance
  - OV-2/3: Security/IA attributes included for needlines
  - TV-1: Inclusion of Security/IA standards
  - OV6b/c: Capture security activities & events

# Initial Findings (cont.)

- ▶ One approach was to develop stand-alone narrative documents that describe the application of security services to the architecture and the identification of security oriented components
  - Not **integrated** into DoDAF framework
- ▶ Another employed approach was to identify some security services (SV-4), some limited OV-5 activities, and some security components (SV-1/2)
- ▶ One framework, TEF (Treasury Enterprise Architecture Framework), includes some security constructs

Not Much Found

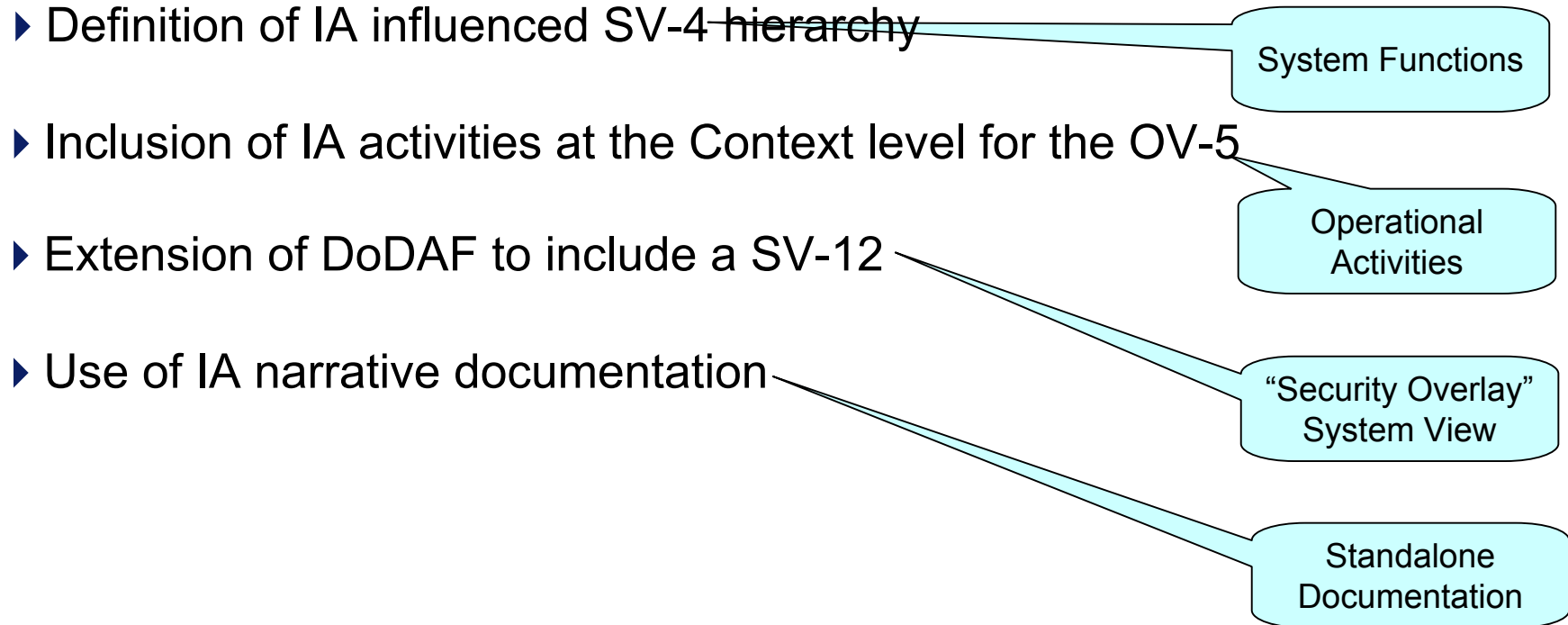
# So the question remains...

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Systems	SV-1	System Interface Description
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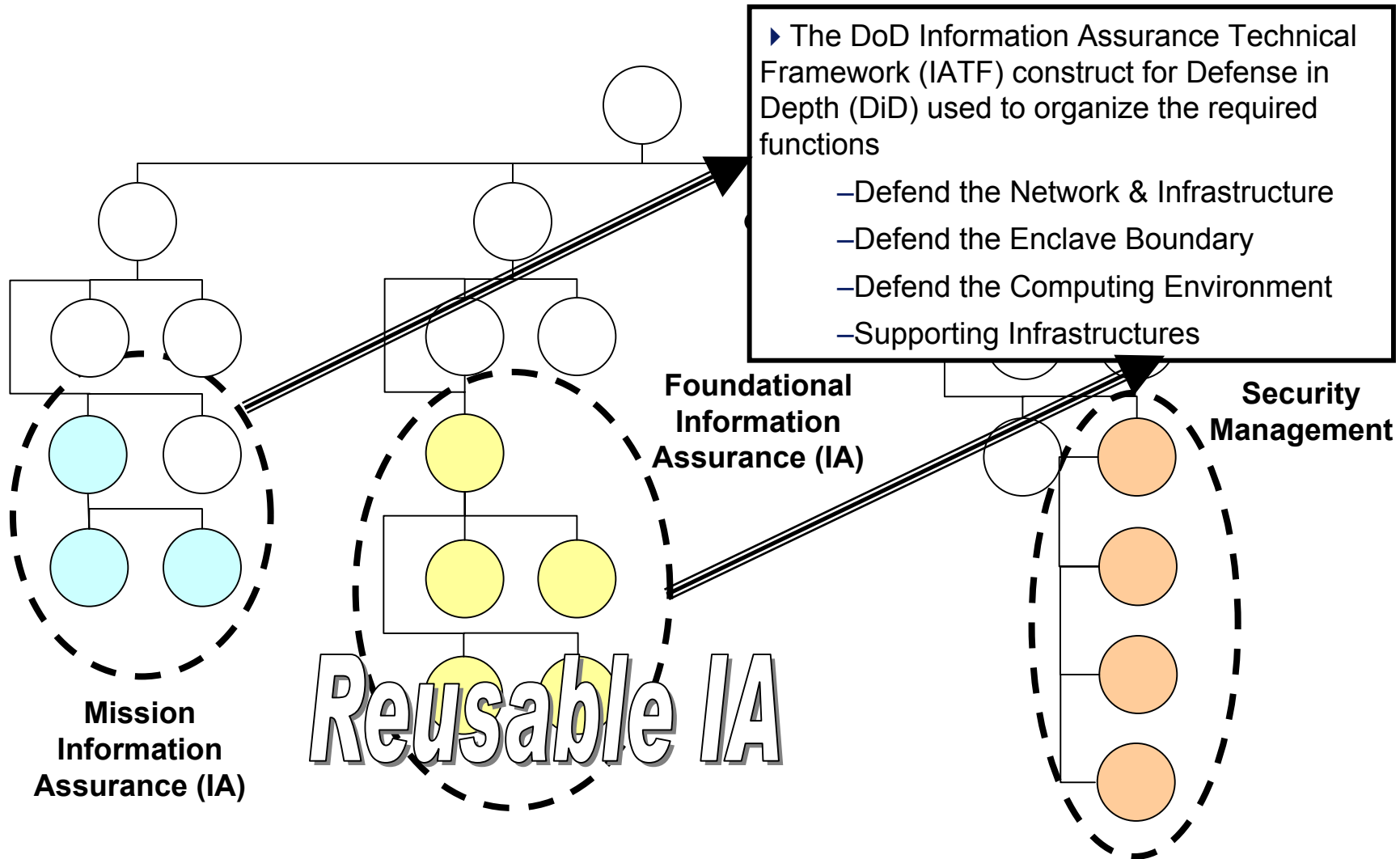
**C4ISR/DoDAF**

$$+ \text{IA} = ?$$

# Proposed Practices for IA Integration into C4ISR/DoDAF Architectures

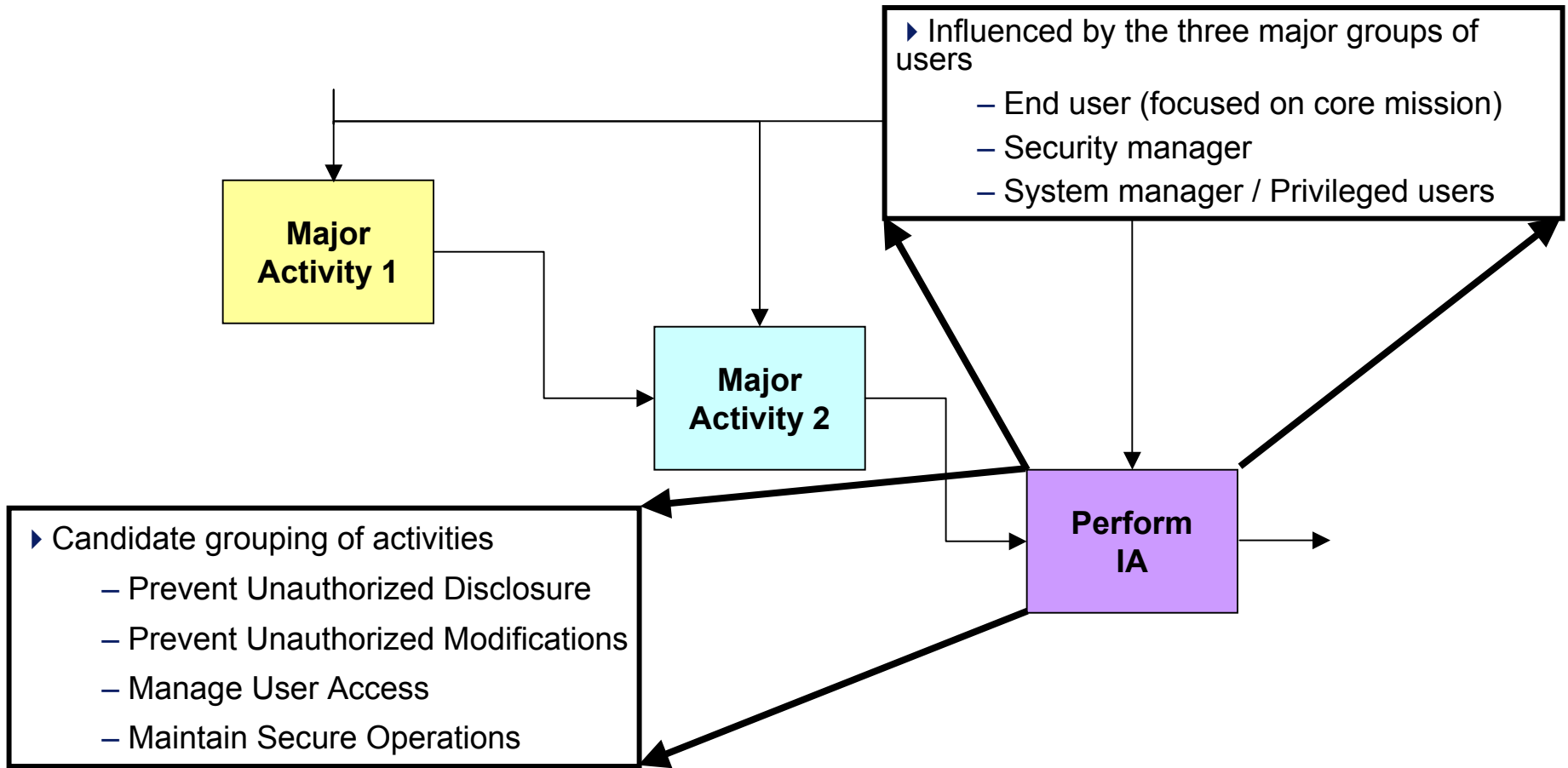


# IA Influenced SV-4 Hierarchy



# IA Influenced OV-5 Construct

- ▶ Inclusion of IA activities at the Context level

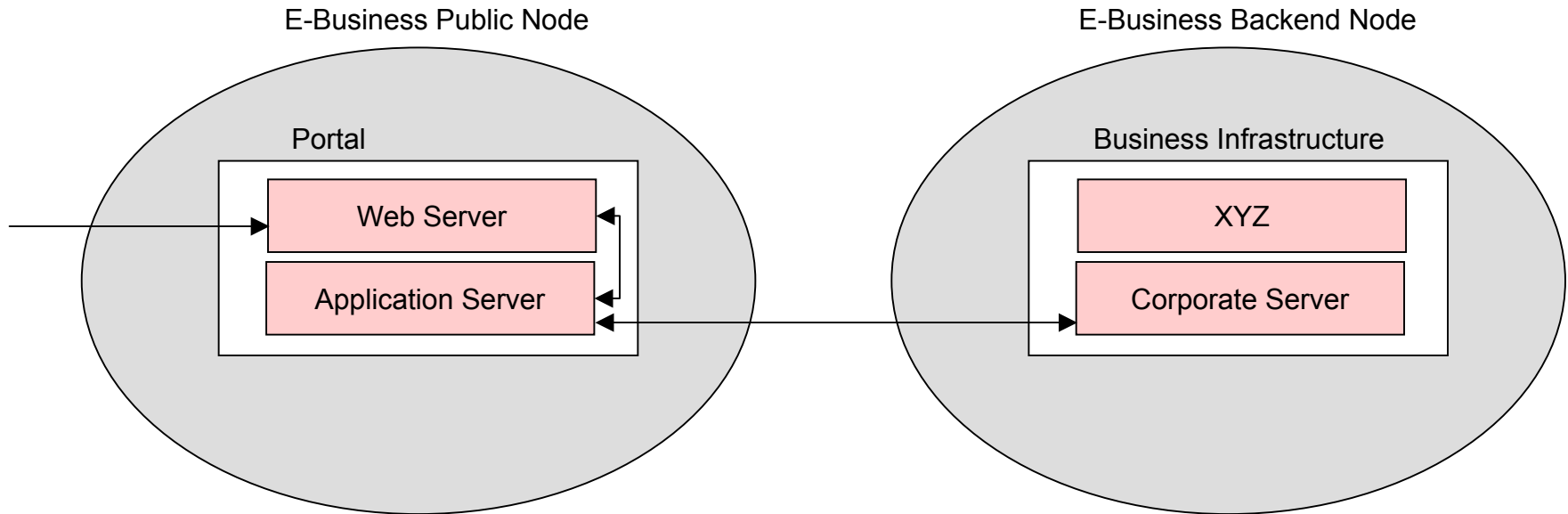




# Extension of DoDAF to include a SV-12

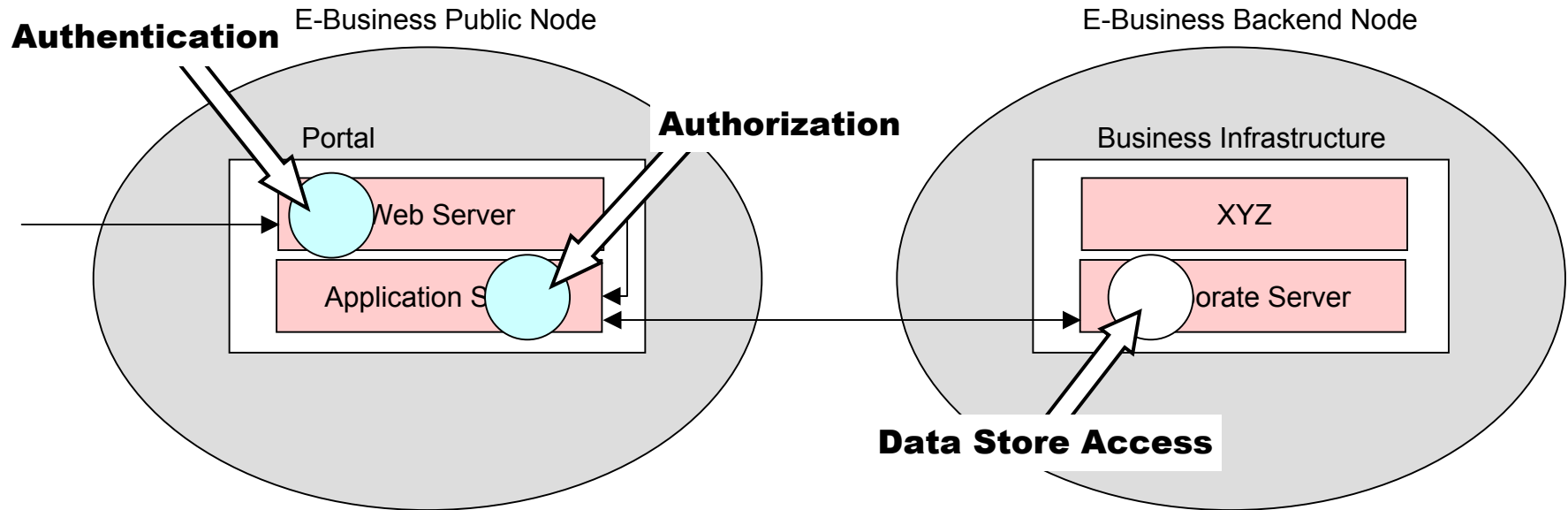
- ▶ DoDAF allows the definition of additional views
- ▶ SV-12, Security Overlay, is a supplemental view focused on IA specific characteristics of the system
  - Uses only data elements currently defined by existing System Views
  - Allow a security oriented view consistent with the rest of the DoDAF architecture
- ▶ Initially performed via “Powerpoint™ Engineering”
  - Not an **integrated** architecture approach
  - Therefore, arguably, not in compliance with DoD direction/guidance regarding the development of “integrated architectures”

# Notional SV-12 – User Login



**SV-1 View provides a perspective associated with the physical dimension of the system**

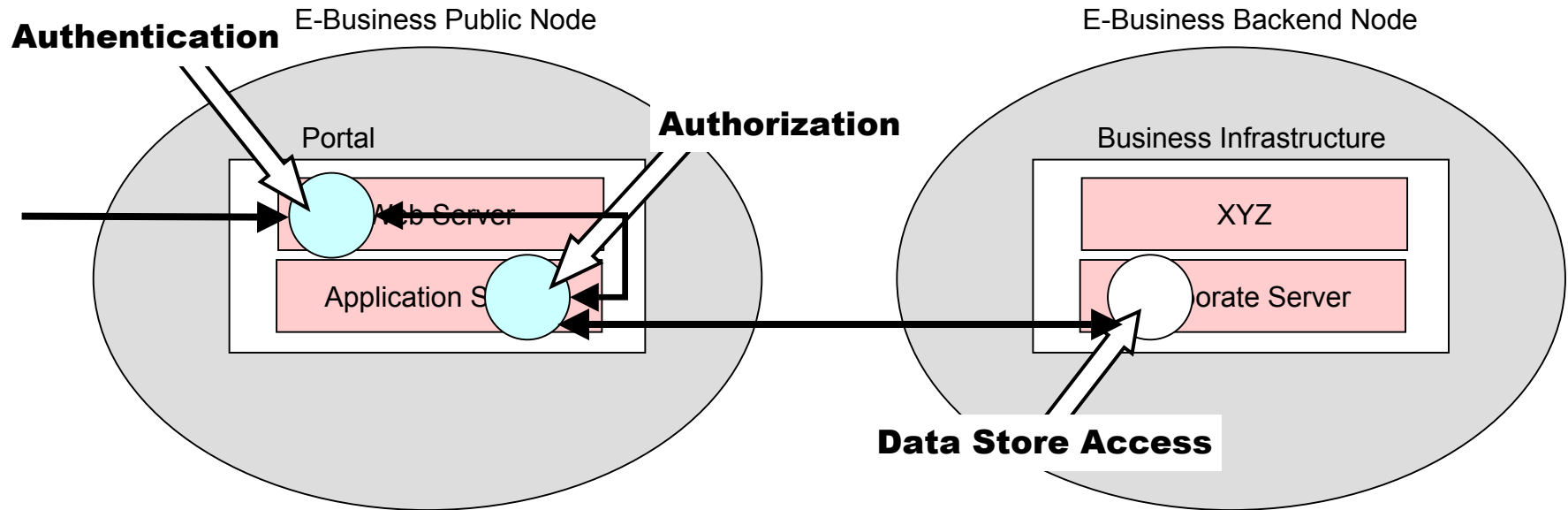
# Notional SV-12 – User Login



**SV-4 functions used to accomplish a particular security related activity are overlay on the system elements where the functions are executed**

***For some security functionality, it matters where the function is performed***

# Notional SV-12 – User Login



**SV-4 data flows specifically used by the selected functions to accomplish the particular security related activity are added**

***Where functions are fairly complex, it is important to define specific data flows  
Note: sequencing information not included... Separate SV-10c diagram required***

# SV-12 Usage

- ▶ Useful to create views for the various topics that Certification and Accreditation (C&A) staff require information and knowledge on
  - Authentication
  - Login for General Users
  - Login for Privileged Users
  - System auditing
  - Etc.
- ▶ Powerful to discuss these topics with artifacts that are consistent and **integrated** with the overall architecture and underlying data models
  - Also helps to explain how the security requirements are to be met
- ▶ Refinement of SV-12 concept likely as feedback from various stakeholders is received and lessons learned applied

# Use of IA Narrative Documentation

- ▶ Narrative documentation may still be required for those stakeholders that are uncomfortable with C4ISR/DoDAF views
- ▶ May be required to support C&A documentation requirements
  - Nonetheless, opportunity to couple Security documents (e.g., Security CONOPS) to key C4ISR artifacts

# Final Thoughts

## Why hasn't Security Been More Integrated Into Enterprise Architecture Frameworks?

- ▶ Historically, security awareness has lagged behind emphasis on functionality and performance
- ▶ The importance / business value of security is not easily quantifiable
  - How do you calculate ROI?
- ▶ Other possible hypotheses
  - Limited input by the security community in regards to **what is important** to capture from an architectural perspective
  - Limited input by the security community in regards to **how to capture** what is important within the existing architectural frameworks

# Final Thoughts

- ▶ Just a few steps to hopefully move DoDAF community in a constructive direction in the area of integrating IA into C4ISR/DoDAF architectures
- ▶ If security knowledgeable professionals don't actively seek out opportunities to integrate the IA dimension into main stream system engineering processes then it won't naturally happen
- ▶ These ideas are not the product of any one individual, so thanks and acknowledgements are due:
  - Tom Vander Vlis
  - Barry Lewis
  - Frank Kroll



# Thanks

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