Carnegie Mellon
Software Engineering Institute

NDIA 2008 Systems Engineering Conference

Building net-ready information interoperability performance indicator widgets for DoDAF 2.0 dashboards

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Agenda

Motivation
Goal Driven Measurement – GQIM
Workshop Outcomes
Case Example: Mission-Architecture IPT
Next Steps

HSDII Committee Objective

Benefit ITAA/GEIA members, government sponsors, builders, developers, and users of …

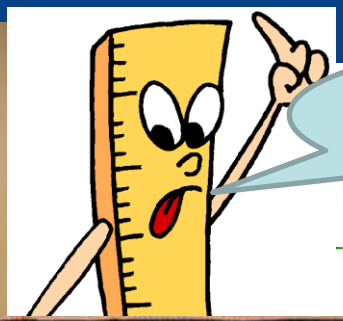
Products, Processes and Tools related to …

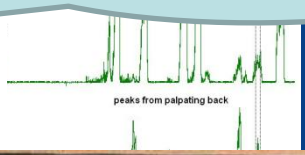
Information Interoperability by …

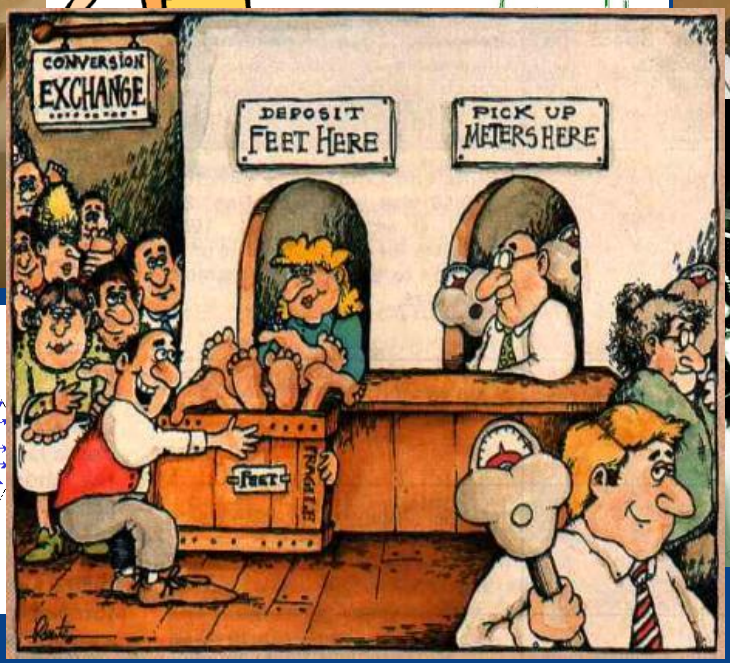
Filling critical gaps,
Improving performance, and
Reducing costs.

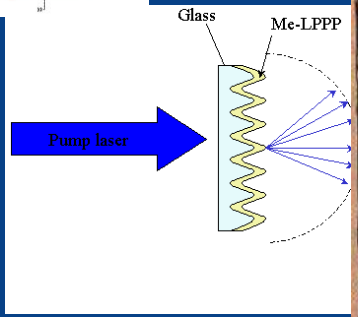
But How Do We Judge?

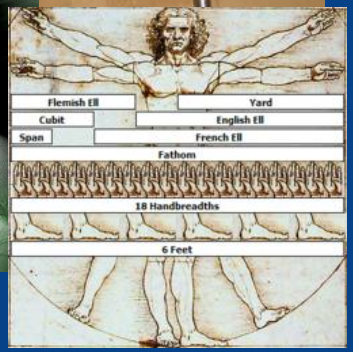
Information Technology Association of America











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Case Example: DODAF 2.0

Next Steps

Goal-Driven Measurement

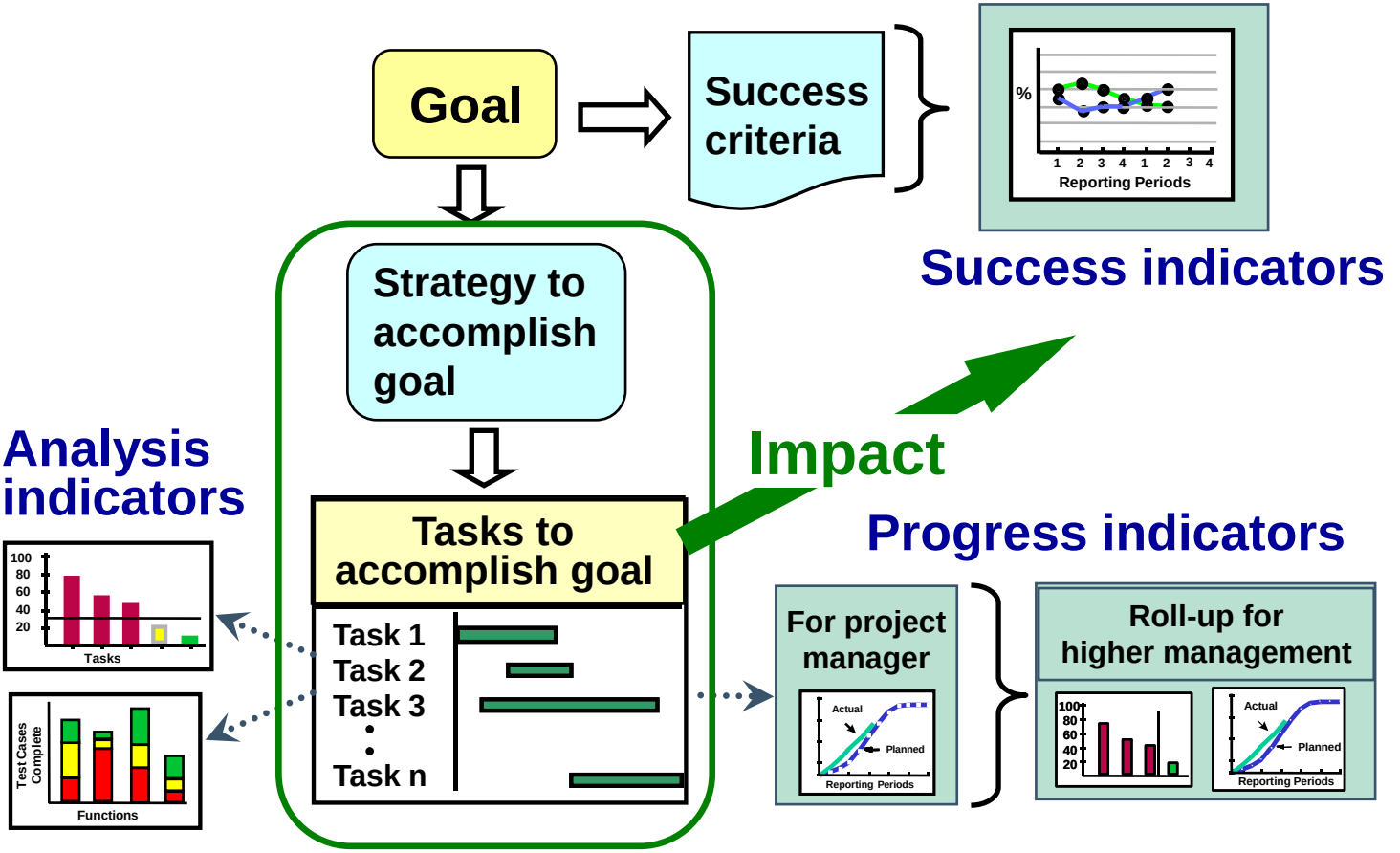
When using goal-driven measurement, the primary question is not:

"*What metrics should I use?*"

rather, it is:

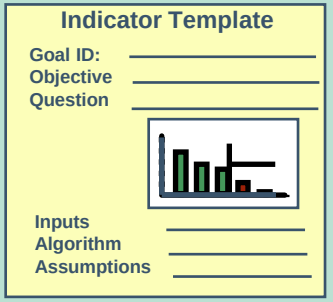
"What do I want to know or learn?"

Measuring Goal Achievement



Workshop Steps

Indicator Template



Step 1: Goals

Components of good goal statements

Step 2: Clarify Questions to refine the goal

Step 3: Decomposing Goals

Subgoals by perspective

Step 4: Operationalize Goals

Operationalize goal statement

Step 5: Success Criteria

Clear articulation of the criteria you will use to decide if the goal has been met.

Step 6: Success Indicators

Postulate Success Indicators

Step 7: Strategies & Activities

Step 8: Identify the data elements

Data Elements
Size
Defects

Avail	Source
+	QA
0	CM
-	?
0	Etc.
+	•
- -	•

Step 9: Identify the actions needed to implement your measures

Planning Tasks	Data Elements 1	2	3	4	5
Task 1		50	N		Y
Task 2		Y		Y	Y
Task 3	Y		Y		
Task n		N		Y	

Step 10: Prepare a plan

Verification and action plans

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Workshop Outcomes: Top Three Goals

- Enable precision information sharing among stakeholders
  - Minimal ambiguity
- Measure the “goodness” for information interoperability standards
  - Then standards in general
  - “Goodness” for information interoperability
  - How effectively are users getting & using information exchanges
- Systems and enterprise’s achieve more effective collaboration and/or achieve greater success by enabling inter-enterprise collaboration

Enable information sharing among stakeholders with minimal ambiguity.

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ID	Theme (Stakeholder, Info, Std)	Type of Indicator (Success, Progress, Analysis)	Questions	Atomic' Indicator	Roll-up Indicator	DoDAF Product & Other Sources	CADM Data Elements
	Stakeholder		Who are the stakeholders?			OV-2, OV-3	OperationalNode
	Stakeholder		What information do the stakeholders need?	**Completeness** Is there an information architecture that defines the stakeholders and context for the information sharing?	**Completeness** What percentage of information exchanges (IERs) are defined in the information architecture?	OV-2, OV-3	InformationExchangeRequirement/ InformationExchange/ Needline
I1	Information	Success	Was the correct information provided where and when needed?	**Visibility** Did the Info Provider publish availability of the info? Can the Info Consumer discover needed info?	**Visibility** What percentage of IERs are published?	SV-4a/b, Enterprise Catalog Service (ECS) & Service Registry, Content Discovery and Delivery (CD&D)	InformationExchange/ Information Element
I2	Information	Success	Does the info exchange enable traceability back to the original context	**Understandable** Is metadata published with the information that defines its source/context/pedigree?	**Understandable** What percentage Info Providers create and publish metadata for IERs/Services?	AV-2, SV-11, DDMS, Metadata Registry (MDR)	InformationExchange/ Information Element
I3	Information	Success	Can we verify information integrity?	**Unambiguous** Does the Info Provider claim/advertize that the information conforms to a 'verifiable' standard?	**Unambiguous** What percentage of IERs conformed to adopted Standard(s)?	TV-1, MDR	Information Element, Operational Nodes, Technology Areas, Technical Standards, Performance Parameters
I4	Information	Progress	Is the information standardized?				
	Standard	Analysis	Are technical requirements in the standard stated clearly and understandable?	**Extensible** Does the standard contain normative statements that define conformance to compliance points?		DISR, TV-1	Technology Areas, Technical Standards, Performance Parameters
	Standard	Analysis	Are the requirements in the standard(s) implementable?	**Implementable** Do normative statements in the standards conflict?		DISR, TV-1	Technology Areas, Technical Standards, Performance Parameters
	Standard	Analysis	Does the standard define verification of conformance?	**Testable** Are the normative statement verifiable?		DISR, TV-1	Technology Areas, Technical Standards, Performance Parameters
	Standard		Will the standard support sharing with unanticipated stakeholders?				

Quality Evaluation

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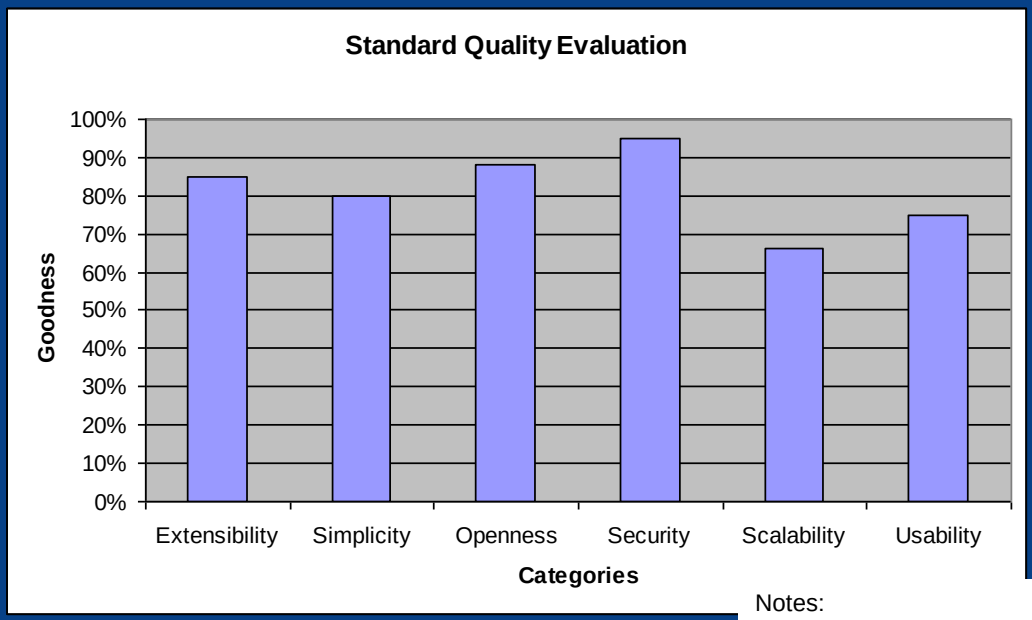

Notes:

Each category is graded on a scale of 1-5 and weighted to a total of 100%.
Data is based on a survey of stakeholders.

Users of the indicator include:
- standard developers and associated marketing
- potential adopters
- actual users

Scalability means across multiple domains

Usability means by multi-functions (non-IT experts)

Interface Maintenance

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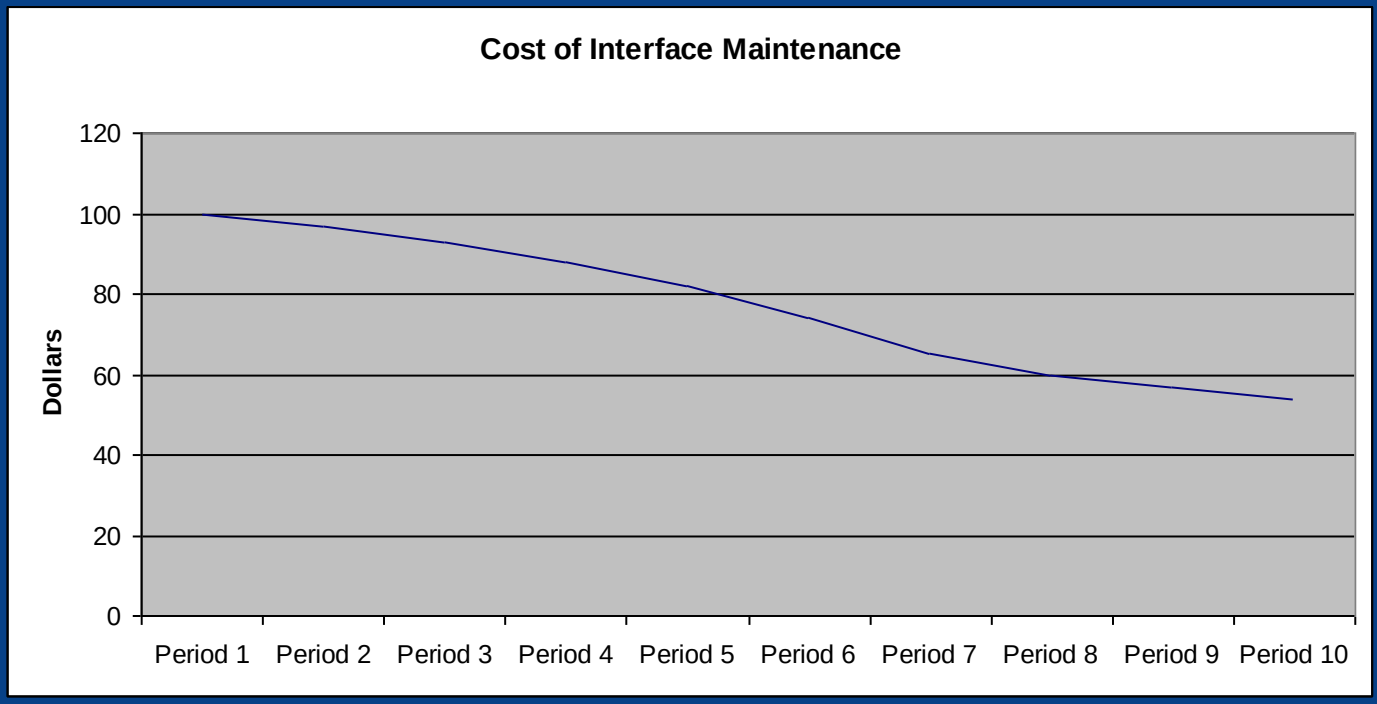

Adoption

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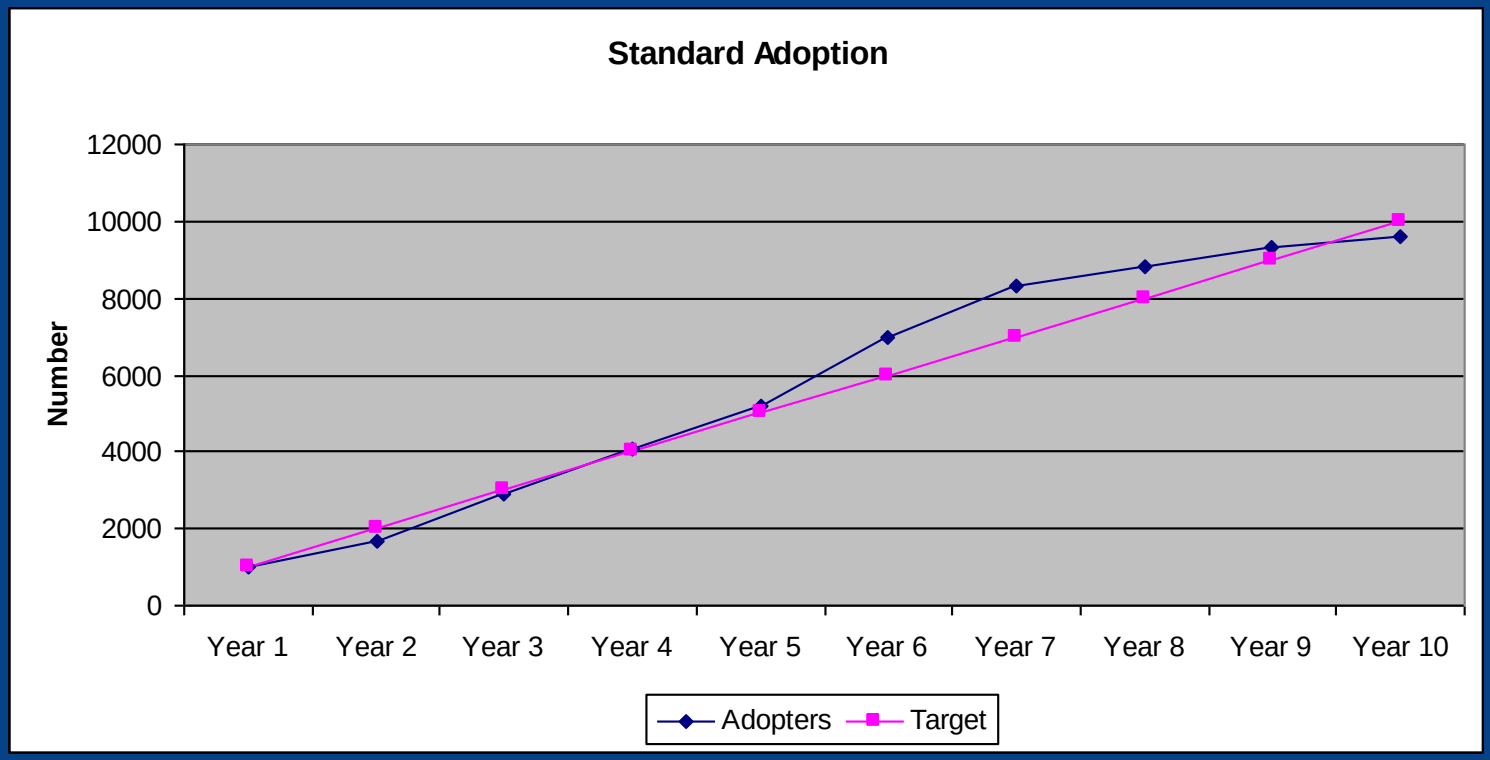
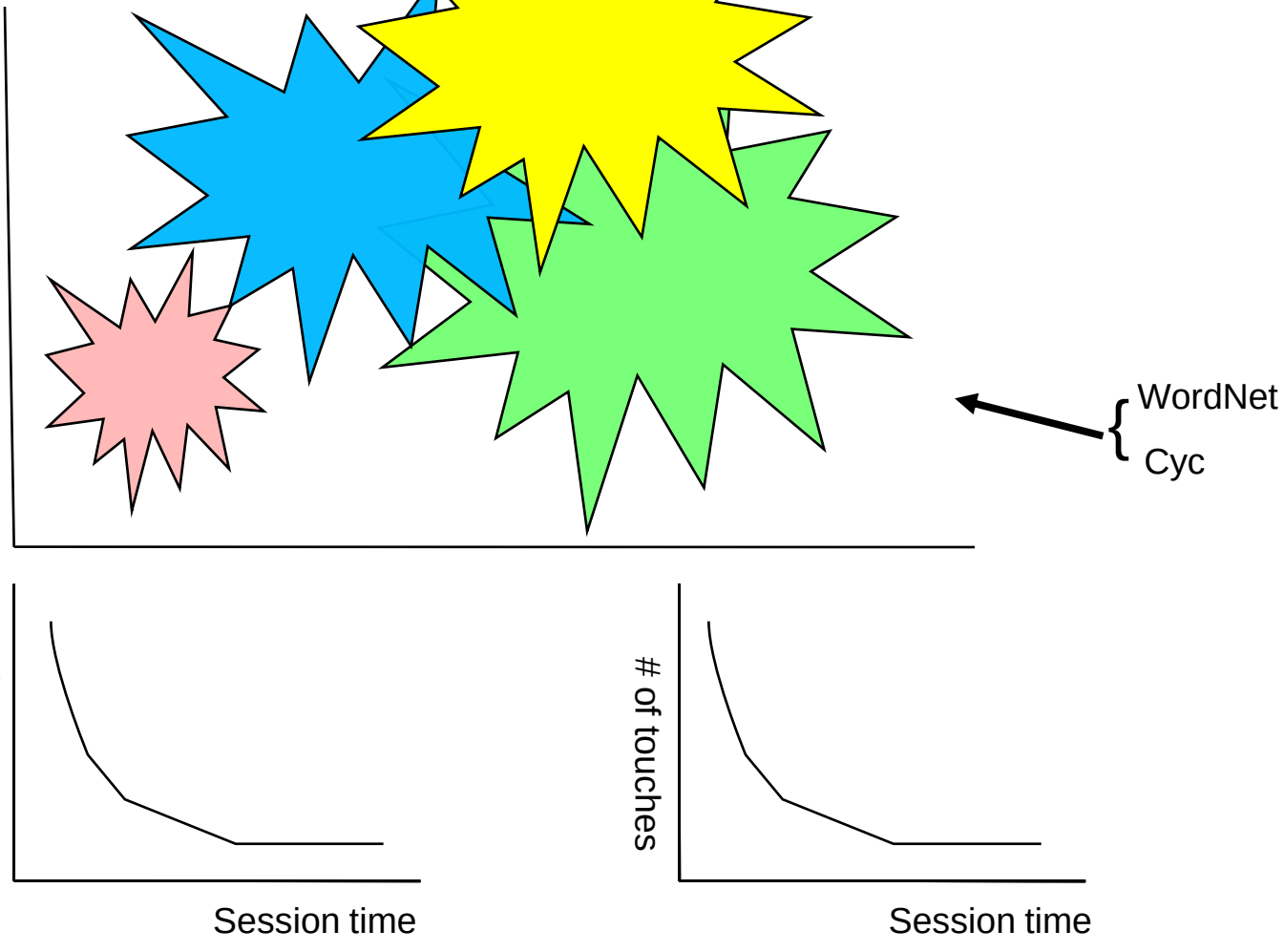


Semantic Alignment



DoDAF 2.0 “Dashboards”

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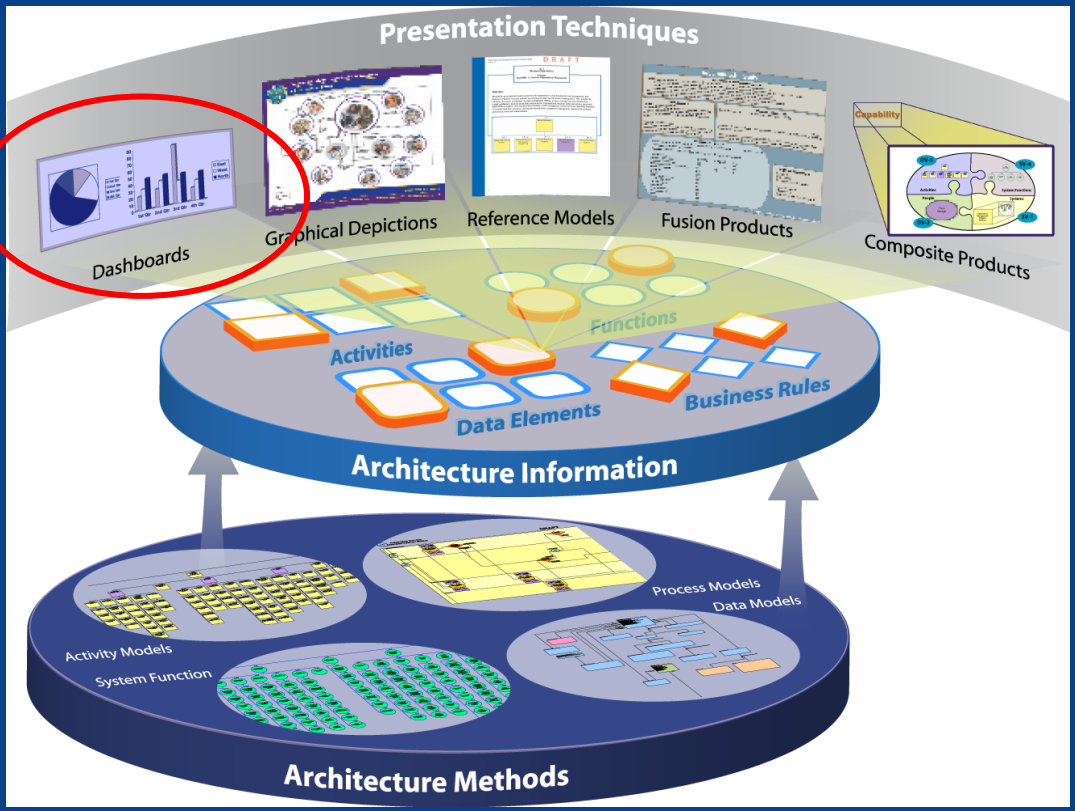

Defining indicator widgets for dashboards

Workshop Outcomes: Conclusions

- The SEI GQ(I)M provides a viable methodology to develop information interoperability indicators
- We identified a preliminary set of indicators for measuring the “goodness” of information exchange standards relative to business goals
- We concluded
    - Enterprise architecture frameworks with an explicit focus on services (transactions) provide a means of implementing and improving Information Interoperability
    - Indicators provide a means for establishing a standardized set of reusable dashboard elements (‘indicator widgets’) in these frameworks

Workshop Outcomes: Observations

- The DoDAF 2.0 presentation technology working group has set forth dashboards as a category of presentation views
- Baseline indicators for information interoperability need to be developed (similar to baseline KPI's for enterprise architecture frameworks)
- Existing work from assessment, performance, and other model based efforts provide valuable resources for developing information interoperability (as well as other) indicator widgets

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Architecture Models: Background
Tenets of Network Centric Warfare (NCW)

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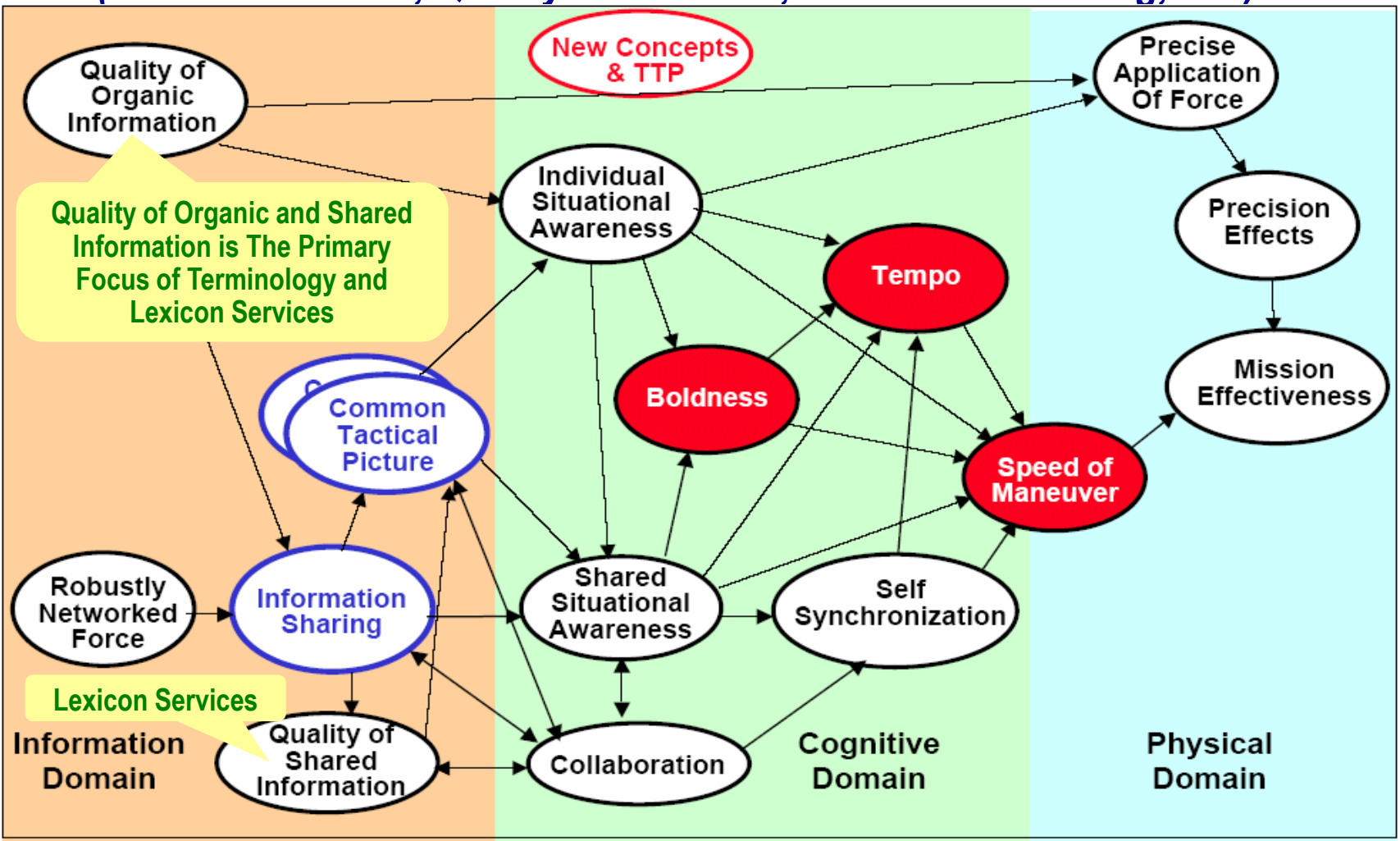
(Networked Force, Quality Information, Information Sharing, etc.)



Source: "Fighting The Networked Force," Network Centric Warfare 2005, John J. Garstka, 27 January 2005

Terminology Services: Challenge
Semantic Interoperability Scoping

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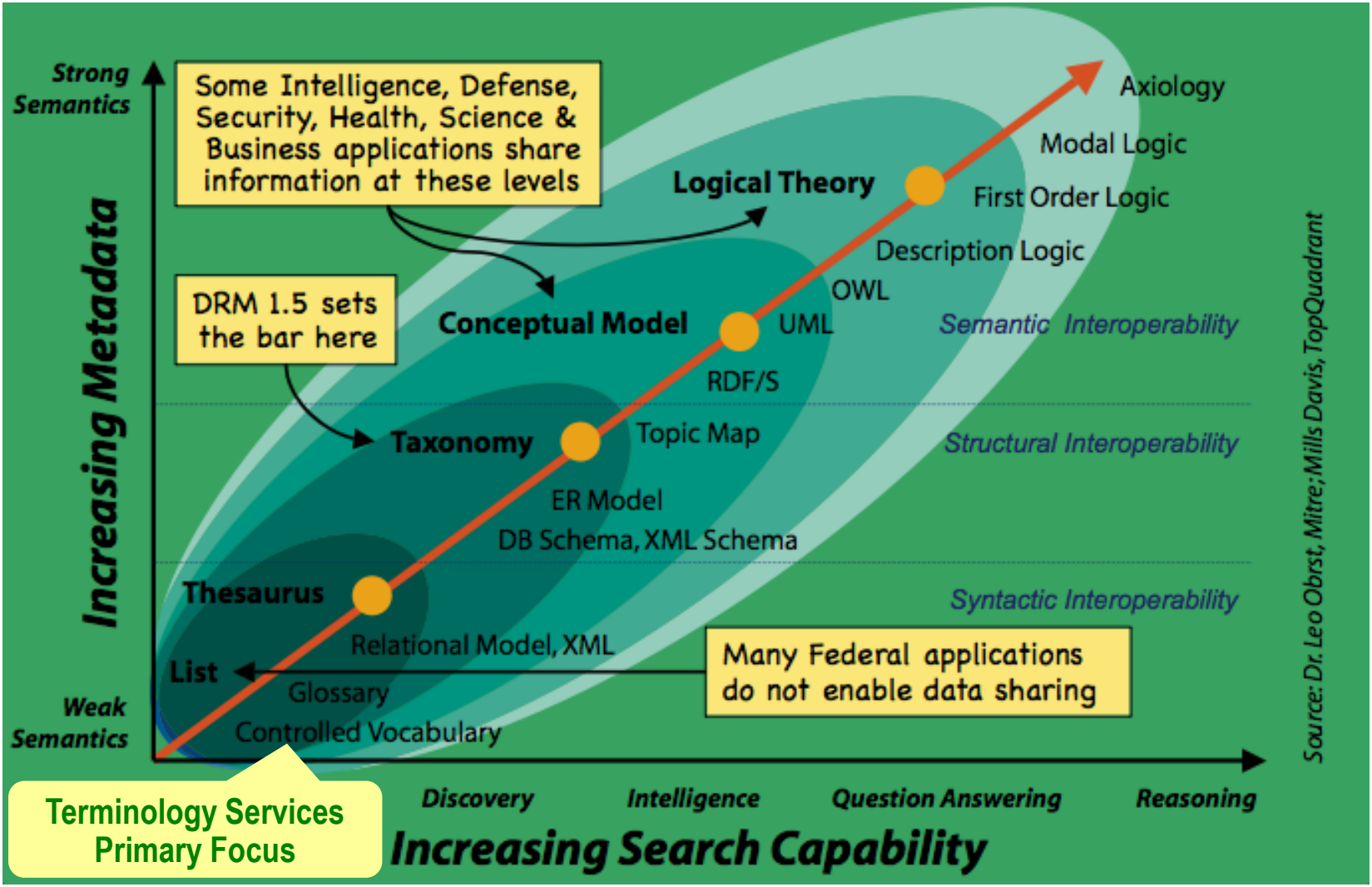

Terminology Services: Challenge
Information Interoperability

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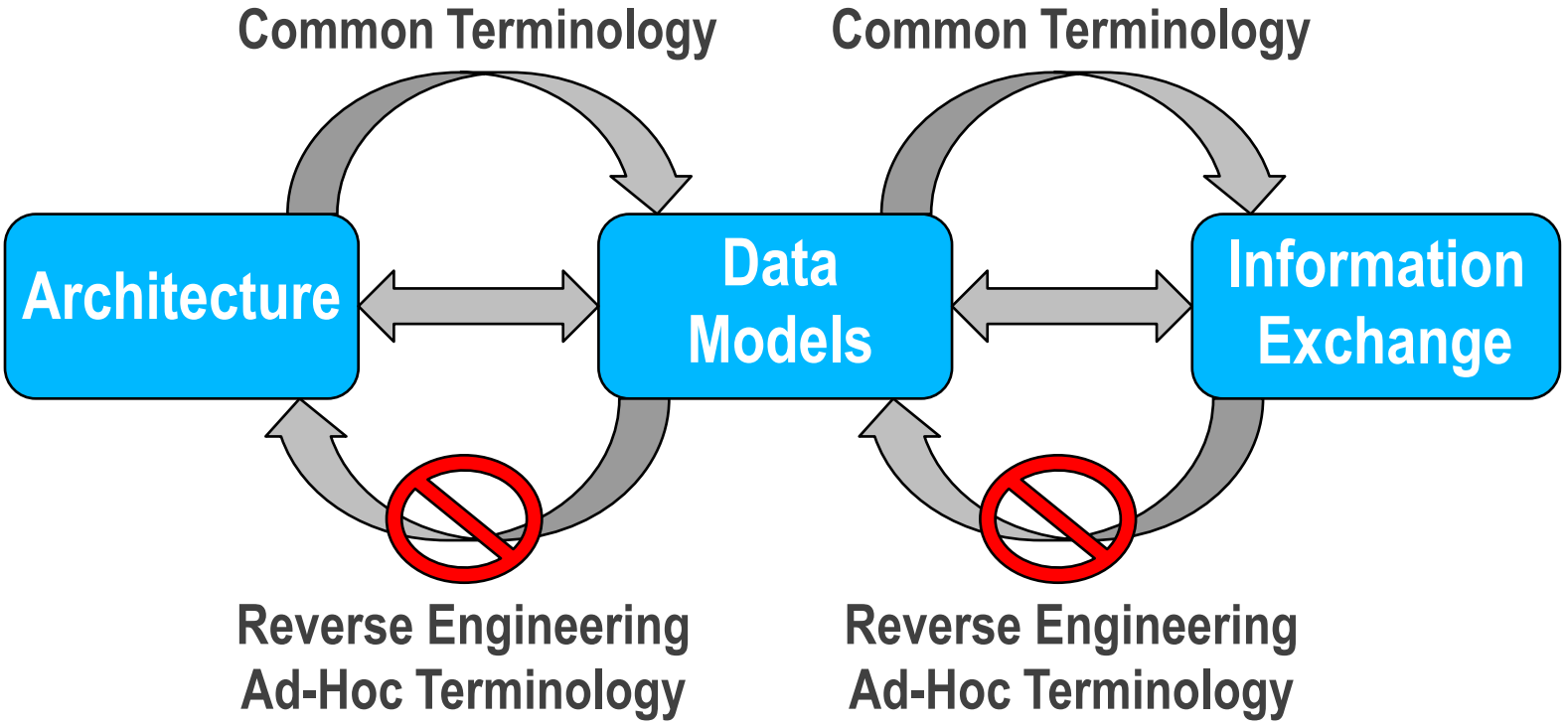
Common Lexicon vs Ad-Hoc Reverse Engineering

Common Terminology Makes Information Interoperability Possible



Reverse Engineering is Expensive, Difficult, and Often Not Feasible

Terminology Services: Related Work

Capability-Based Systems-of-Systems Engineering (SOSE)

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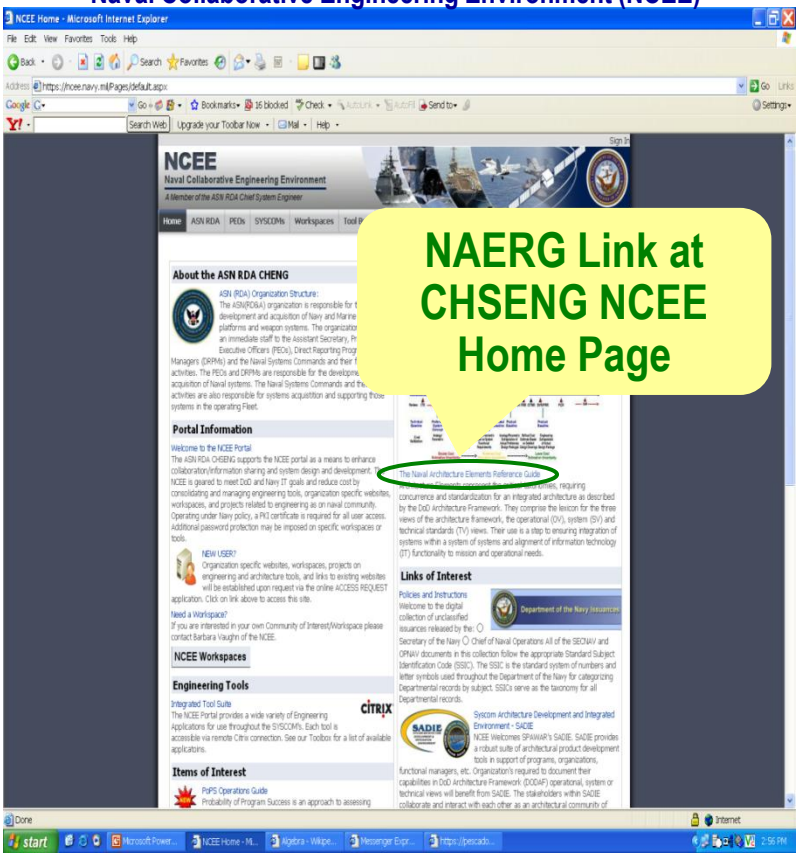
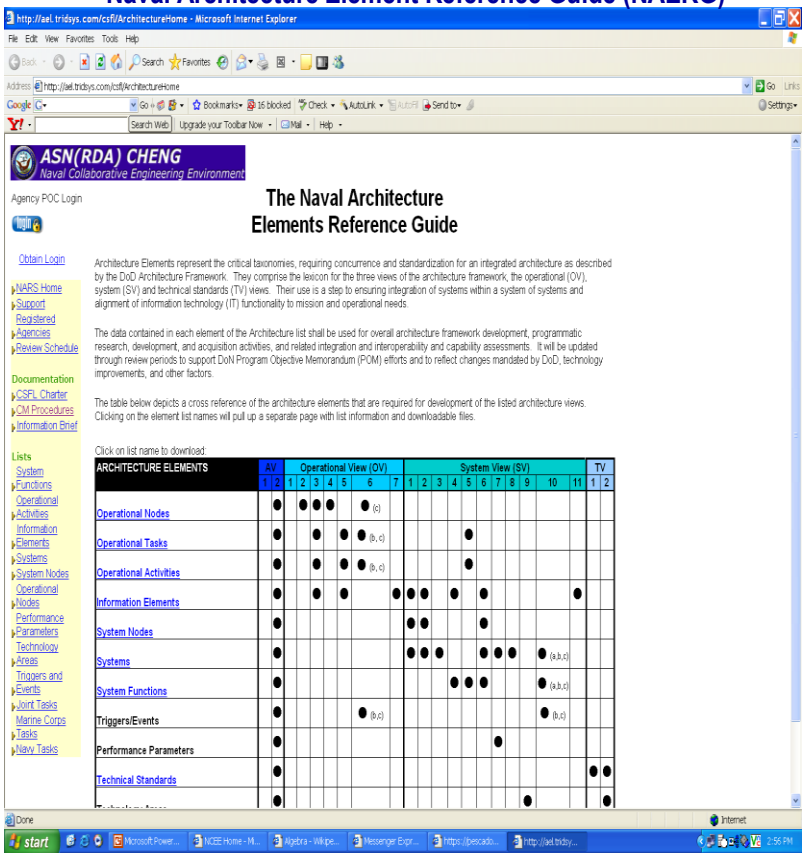
NCEE

Naval Collaborative Engineering Environment (NCEE)



NAERG

Naval Architecture Element Reference Guide (NAERG)



Common Access Card (CAC) Enabled Websites

https://ncee.navy.mil/Pages/default.aspx ***https://stalwart.spawar.navy.mil/naerg***

Architecture Frameworks: Current Work
Mission Architecture Dashboard

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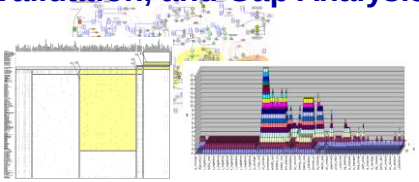
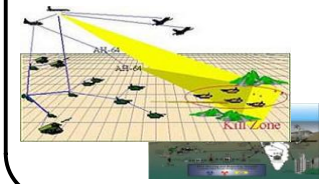
Capability Tracing, Assessment, Validation, and Gap Analysis



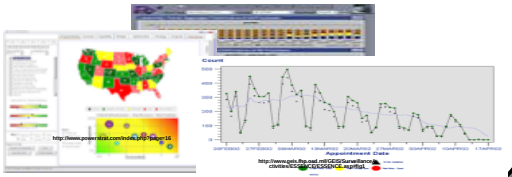
Threat Scenarios



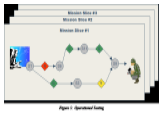
Inter-Agency
Cross-Domain
Information-Sharing
Supply-Chain

Enterprise Framework -
Policies, Rules, Metrics
Processes, Architectures, ...

Mission Architecture Dashboard



Operational Mission-Threads



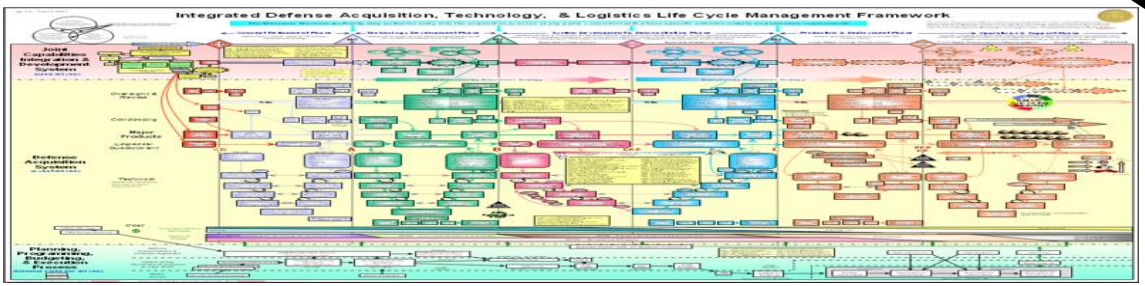
Operational Plans (OPlans)

Mission Operations

Systems

Devices

Integrated AT&L Life Cycle Management Framework



Common Terminology - Managed Vocabulary - Enterprise Lexicon Services (ELS)

Architecture Models: Emerging Standards
DoD Architecture Framework 2.0 Example

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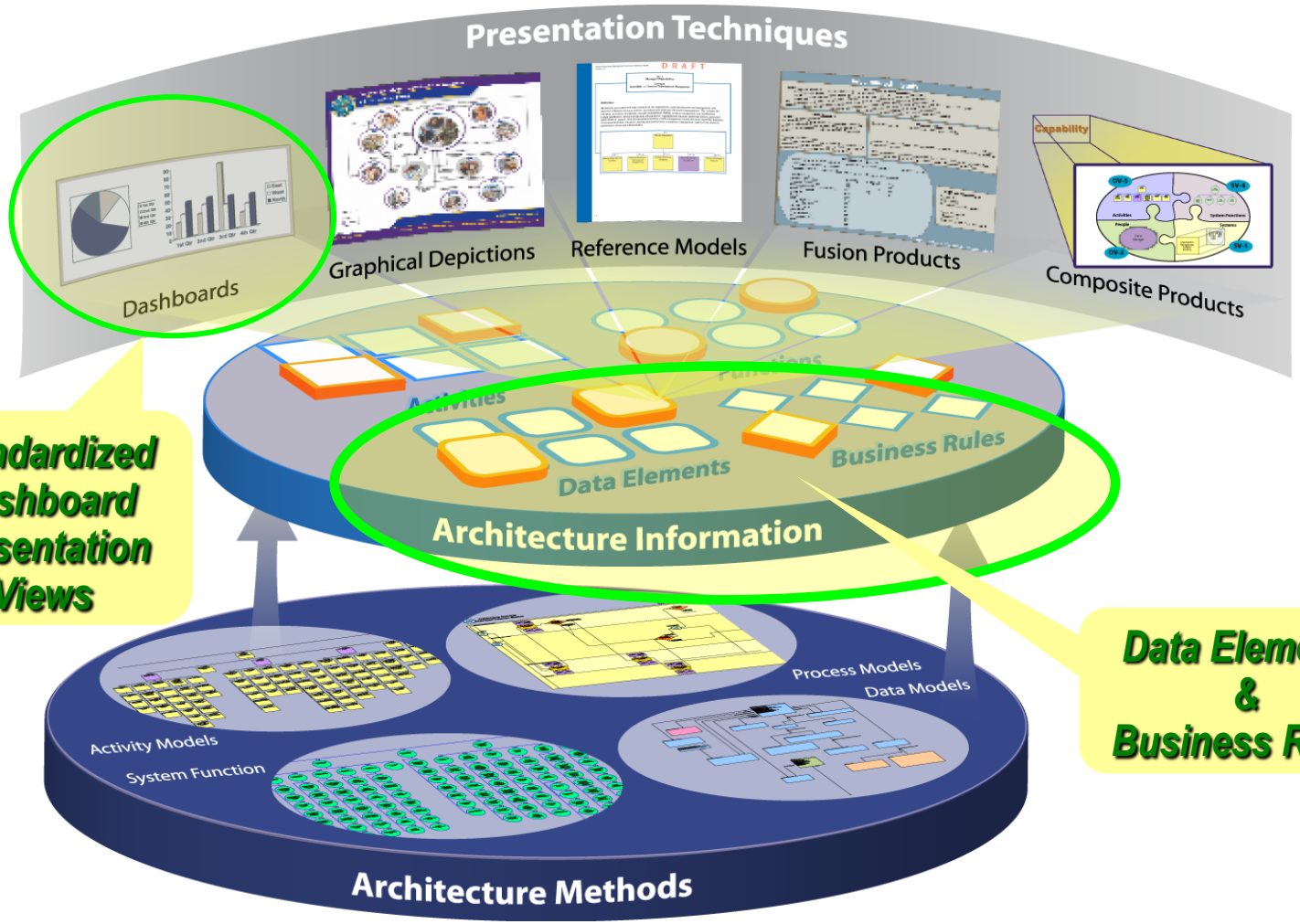
Standardized Dashboard Views, Data Elements, Business Rules, etc.



Architecture Frameworks: Emerging Focus

Enterprise Dashboards and Widgets

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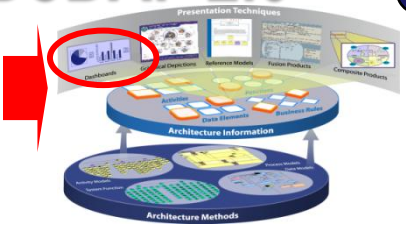
DoDAF 2.0

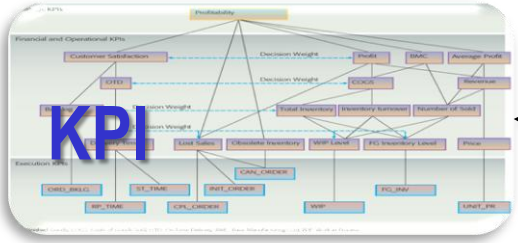


Roles & Responsibilities

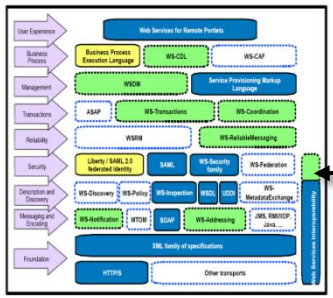
Decision Makers

Dashboards

Multiple Dashboards & Decision Makers



KPI



SOA

Notation:

Enterprise Lexicon Services

Presentation Layer

Business Logic

Data Resources

KPI – Key Performance Indicator

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Way Ahead

- Further explore leveraging DoDAF 2.0 to help define an open standard for indicator widgets
- Produce an exemplar reference implementation for a set of indicator widgets
- Produce guidance on how to go from existing standards to the indicator widget paradigm

Questions?

Resources Related to Information Interoperability Indicator and Assessment

Information Technology Association of America

- DOD Net-Centric Checklist, Version 2.1.4, July 30, 2004
  - Assists program managers in understanding the net-centric attributes that their programs need to implement to move into the net-centric environment as part of a service-oriented architecture in the Global Information Grid.
- NCIOC Network Centric Analysis Tool (NCAT) & SCOPE model
  - NCAT is a metric measurement tool developed by the NCOIC for use in evaluating the ability of a system/subsystem/component to operate in a network centric environment. Designed to leverage complementary tools developed by DISA and others, the NCAT is highly flexible, easily adaptable, and can be tailored for specific requirements.
- DOD's Modular Open Systems Approach (MOSA) Program Assessment and Rating Tool (PART)
  - An analytical tool to aid DoD Program Managers assess their approach to open systems throughout the acquisition life cycle.
- Navy Open Architecture Assessment Tool (OAAT)
  - A Navy tool to assess the openness of a systems or program.
- DOD's Data and Service Exposure Verification Tracking Sheets
  - Used to measure net-centricity in support of the DOD's Net-Centric Data Strategy.

A catalog of reusable indicators can be readily derived

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