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Solutions and Support for a Changing World



**Using JCIDS DoDAF Architecture Primitives
to
Assemble a Repository
for
Enterprise-wide Analysis and Decision-Making**

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Overview

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- **Thesis**
- **Background**
 - **NR-KPP**
 - **Difficulties in producing Enterprise Architectures**
- **Enterprise Architecture via Amalgamation Methodology**
- **Governance**
- **Application to Other Fields/Related Work**
- **Conclusion**



WBB Corporate Overview

- **210 Experienced Leaders**

- Joint / Combat Operations
- Senior DoD Executives
- All Services
- Special Operations
- Coast Guard

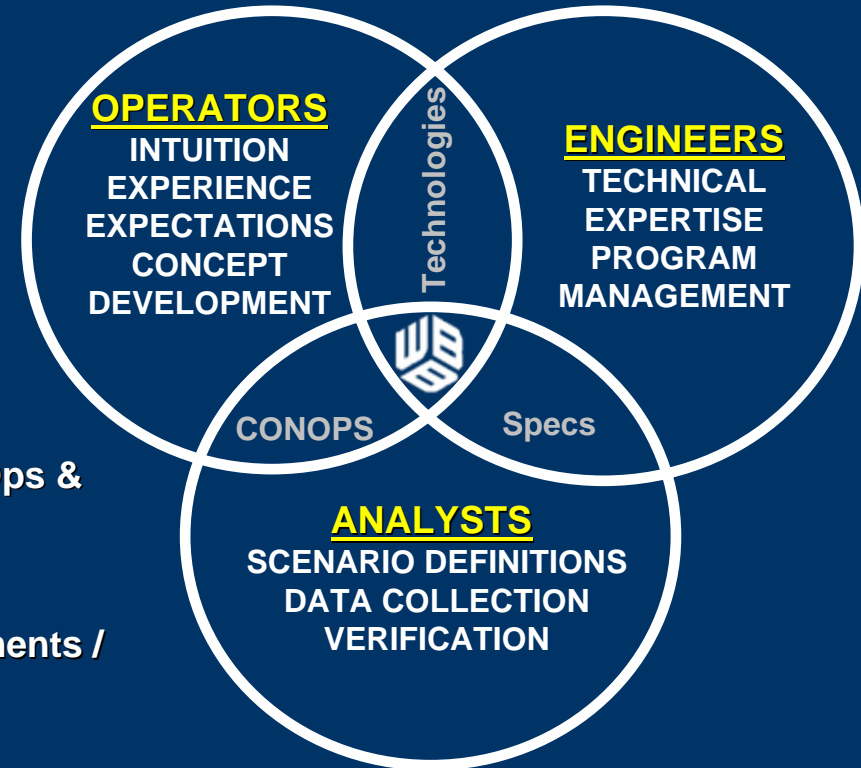
- **Founded in 1981 with offices in:**

- VA: Vienna, Hampton, VA Beach;
- CA: San Diego; MD: Patuxent River
- AL: Huntsville

- **Expertise in:**

- Concept Development and Experimentation (Ops & Logistics)
- Operations Analysis
- Manpower Assessment / Analysis
- Program Management / Acquisition / Requirements / Roadmap Development
- Strategic Planning, Facilitation, Org Change Management, Decision Analysis
- Training

Clients: 70% Government, 30% Commercial

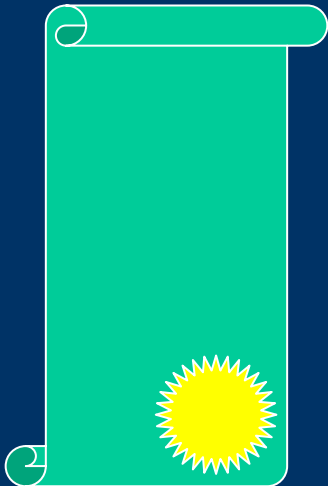


Mission: To improve the operational and business performance of both government and commercial clients



WBB DoDAF/JCIDS Pedigree

- **Prior and Current Architectures:**
 - **MV/CV-22, E-2C/D, F-22A, B-2, E-6, JLTV, Harpoon Blk III**
 - MV/CV-22: Joint Staff/J-6I lauded as “best seen to date”
 - E-2C/D: JS/J-6I – “You’ve done it again...”
 - F-22A, JLTV : currently in staffing
 - B-2, E6-B: finishing architectures prior to staffing
 - **JFMCC/MOC, FORCEnet, JTF C2, GIG**
 - **Several other smaller efforts (ADS, JTE, P5CTS, RITPO, JIEDDO, and industry IR&D efforts)**
- **Initial cadre:**
 - **Provided Telelogic SA initialization files DoD-wide**
 - **Created Activity Based Methodology (ABM)**
- **Authors’ Team Experience:**
 - **Program management, AF C2, Army C2, AF Communications, Systems/Software Engineering, M&S, Training**





Thesis

- **DoDAF Architecture Artifacts, developed to support NR-KPP's for CDD, CPD, and ISPs contain a plethora of data about individual systems**
- **This data can be very useful in support of analysis**
 - **Architectures describe system functionality, operational use, and data flow**
 - **M&S can provide operational laydown to exercise architecture precepts**
 - **Resultant information feeds back into information that can be reused by subsequent efforts**
- **Not proposing “the mother of all data stores”**
 - **Amalgamated architectures directed at specific analyses**
 - **Centralized repository can make use of resultant primitives and data generated as part of this process**



Background: Primitive Definition

- **Primitive (Encarta Dictionary):**
 - ... a simple element of a computer program or graphic design from which larger programs or images can be constructed
 - ... something such as a concept, feature, or formula from which something else is derived
- **Within this presentation, what we mean:**
 - Discrete, composable parts, which can be reused across multiple domains for architecture creation and in analysis:
 - Activities, System Functions, Nodes, Exchanges
 - Doctrine: Universal Joint Task List [UJTL], Service Task Lists
 - Lists: CSFL, COAL, NCOW RM, etc.
 - Numbers: throughput, bandwidth, etc. (e.g., Link 16)



Background:

Net-Ready Key Performance Parameter (NR - KPP)

- **Net-Ready KPP required in:**
 - **Requirements documents (CJCSI 3170.01)**
 - Capabilities Development Document (CDD)
 - Capabilities Production Document (CPD)
 - **Acquisition Documents (CJCSI 6212.01 and DoDI 4630.8)**
 - Information Support Plan (ISP)
- **The NR-KPP is comprised of the following:**
 - **Compliance with:**
 - Net-Centric Ops and Warfare (NCOW) Ref Model (RM)
 - Applicable Global Information Grid (GIG) Key Interface Profiles (KIPs)
 - DOD information assurance requirements (DITSCAP/DIACAP)
 - Integrated architecture; mandatory products:
 - OV-1, OV-2, OV-5, OV-6c, OV-7
 - SV-2, SV-4, SV-5, SV-6, SV-11
 - TV-1, TV-2



Background:

Difficulties in Developing Enterprise Architectures



- Despite having a common taxonomy the above depicts what we've ended up with...
- Applies to Architectures as well...

*Used with the Permission of Jim Klossner



Background:

Difficulties in Developing Enterprise Architectures

- **NR-KPP implementation – a good idea, but...**
 - **JCIDS Process still “relatively new”**
 - **Steep learning curve regarding DoDAF Architectures**
 - **“Homework checking” organizations only checking internal consistency of the architecture**
 - **Internal consistency definitely an a priori requirement, but...**
 - **Ability to determine platform’s effects on the enterprise should be the focus (i.e., what happens when it “plugs in...?”)**
 - **Bottom line: Platform architectures’ external touch points and their effects aren’t being checked**
 - **Requires analysis across multiple architectures**
 - **One person’s enterprise is another persons system: architectures need to be composable across the enterprise**
 - **Facility/technology for accomplishment hasn’t been there...**



Background:

Difficulties in Developing Enterprise Architectures

Need to Turn *Unfriendly, Dirty* Data into *Friendly, Clean* Data*

Air Mission
Air Mission
Air-Mission
Air_Mission
AirMission
Airmission
AirMsn

Ft Hood
Ft. Hood
Ft. Hood
Ft Hood
Fort Hood
FTHOOD

AT & T	American Telephone and Telegraph
A T & T	Amer. Tel. and Tel.
ATT	Bell Telephone
AT and T	The AT&T Company
A.T. and T.	AT & T Corp
A. T and T	AT & T Corporation
A. T. & T.	A.T. & T. Corporation

Air Mission

Fort Hood

AT&T

**Authoritative
Architecture Data**

Synonyms

different names mean same things
("location" and "loc", "Target" and "tgt")

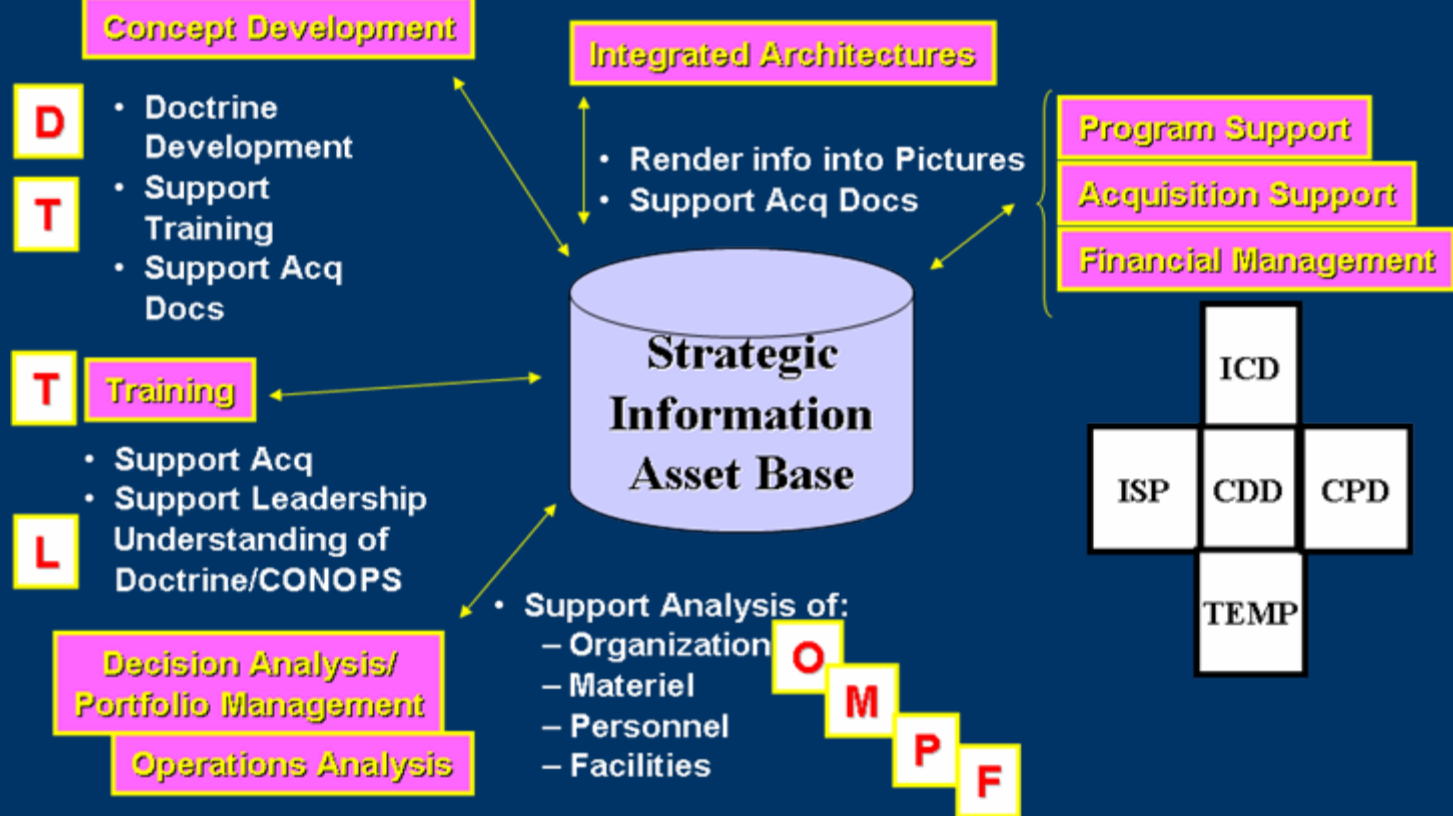
Homonyms

same name means different things ('mission', 'tank')

*Cleaning is a manual operation



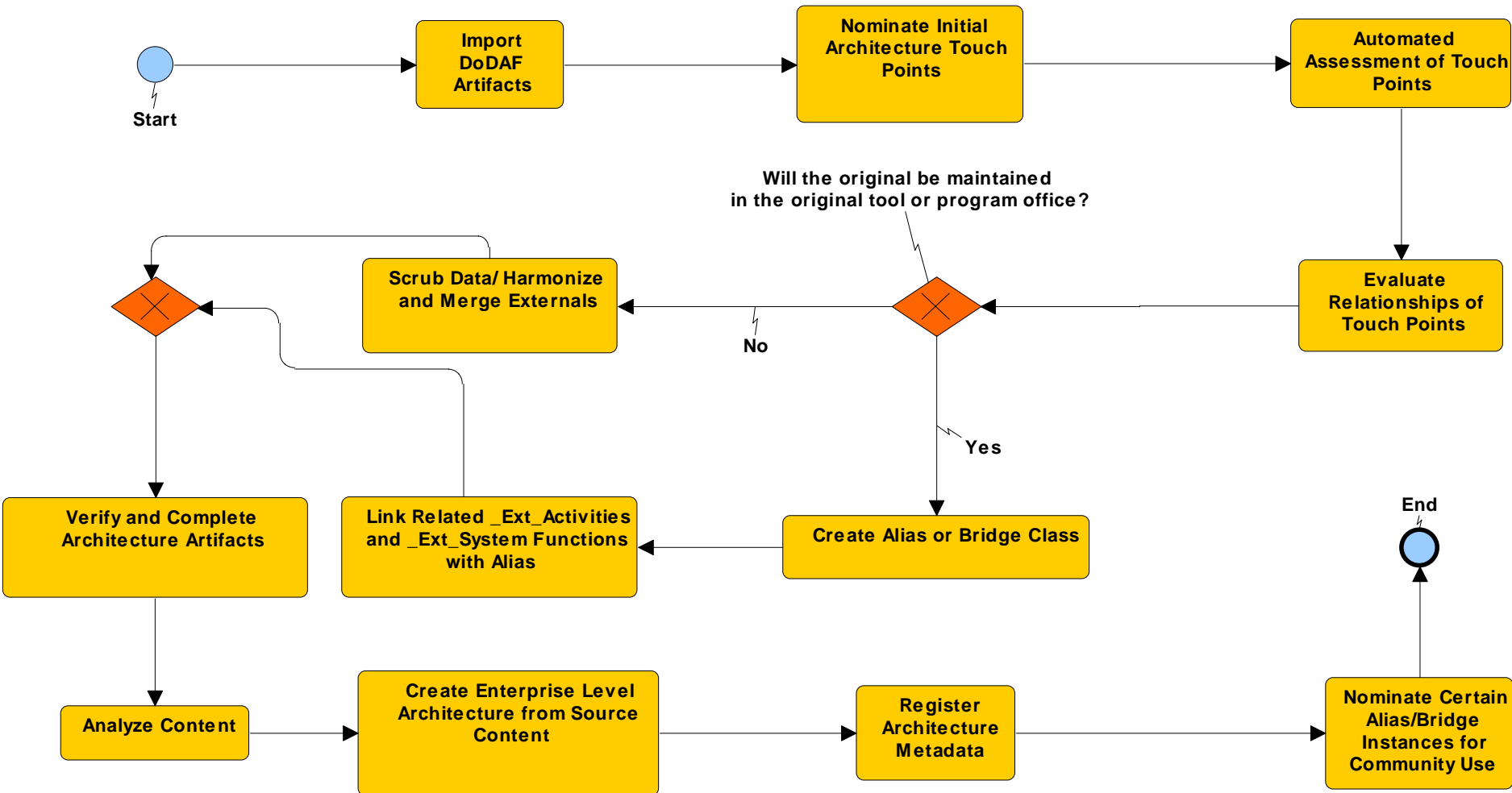
Background: Difficulties in Developing Enterprise Architectures



- Implies “mother of all data stores” and/or data model requirement
- Too impractical... we’re suggesting something “in between...”
 - Ability to create architectures from smaller architectures to feed analysis
 - Made available to a wider audience upon completion/feedback of analysis
 - Primitives created can be nominated for use in larger reference architectures

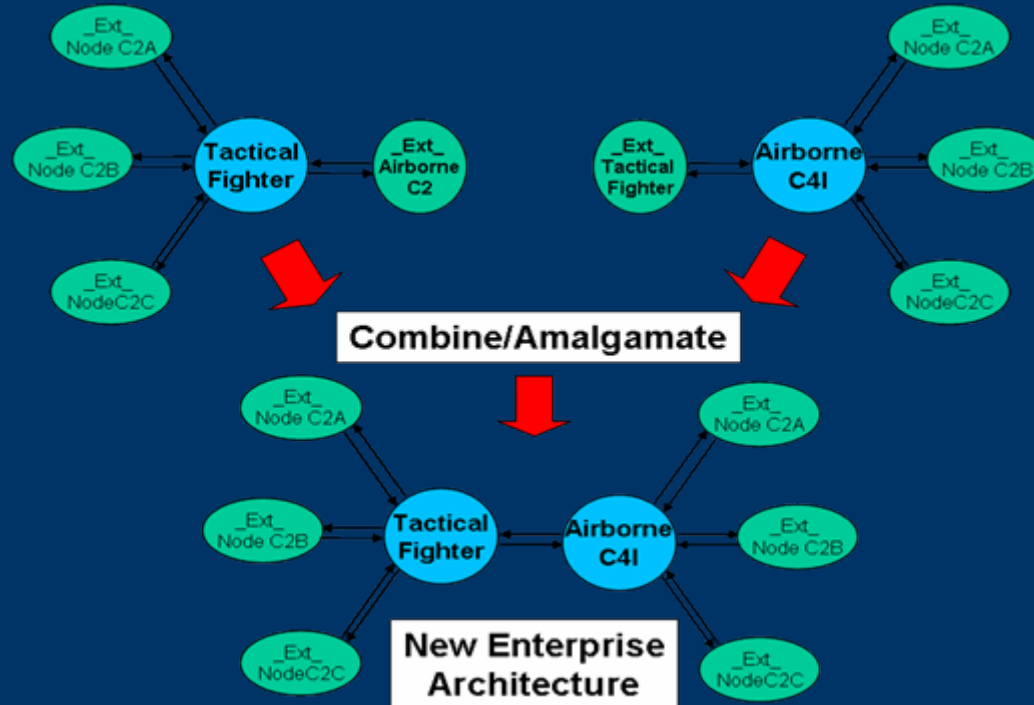


Nominal Workflow





Easy, But Not Trivial Case...



- **Not trivial... why? Need to reconcile (either via scrubbing or bridging):**
 - Node Names
 - Activity Names
 - Exchanges (names, numbers, underlying data)
- **Automation assists, but definitely a manual process**
 - One needs both Operational and “Geek” expertise
 - Most organizations unqualified in one or the other capacity...



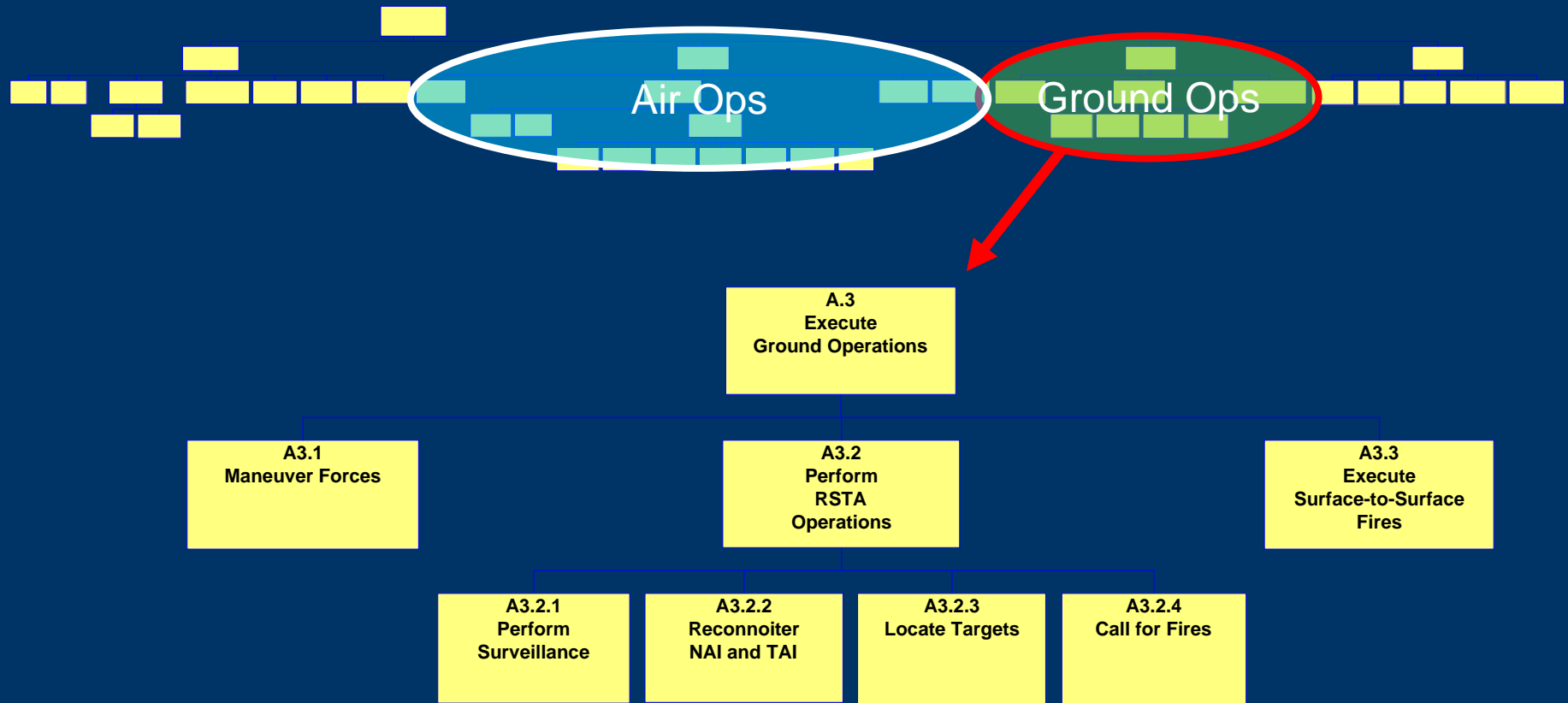
More Difficult Case

- **Combine 2 Architectures:**
 - **A Joint Fires Architecture**
 - Only AF support to Army units is depicted,
 - Army RSTA (Reconnaissance, Surveillance, and Target Acquisition) units being depicted as internal to the architecture because they are part of the joint fires chain-of-events (i.e., Enlisted Terminal Air Controllers within the UA are who initiates the Call for Fires).
 - **An Army Combined Arms Unit of Action Architecture: within which all facets of the UA are detailed**



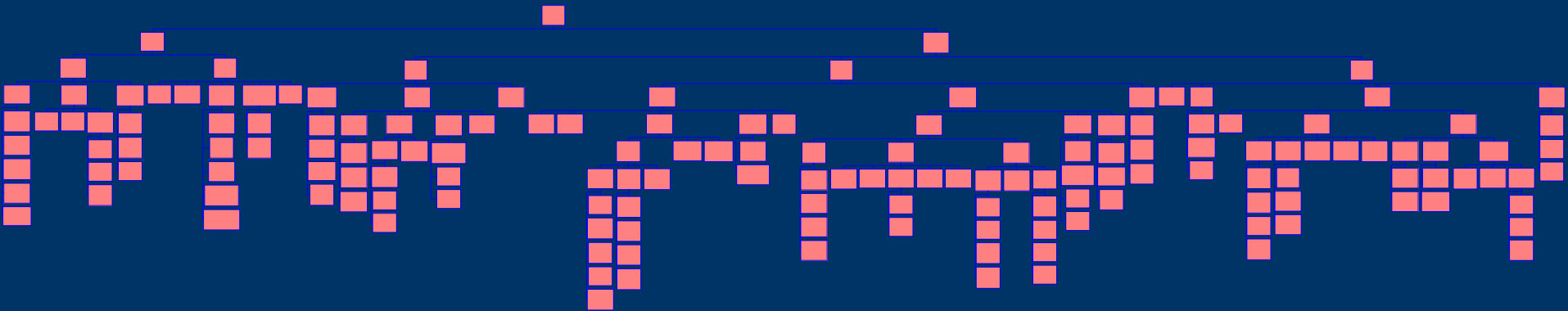
Joint Fires Architecture

(AF support to Army UA only)



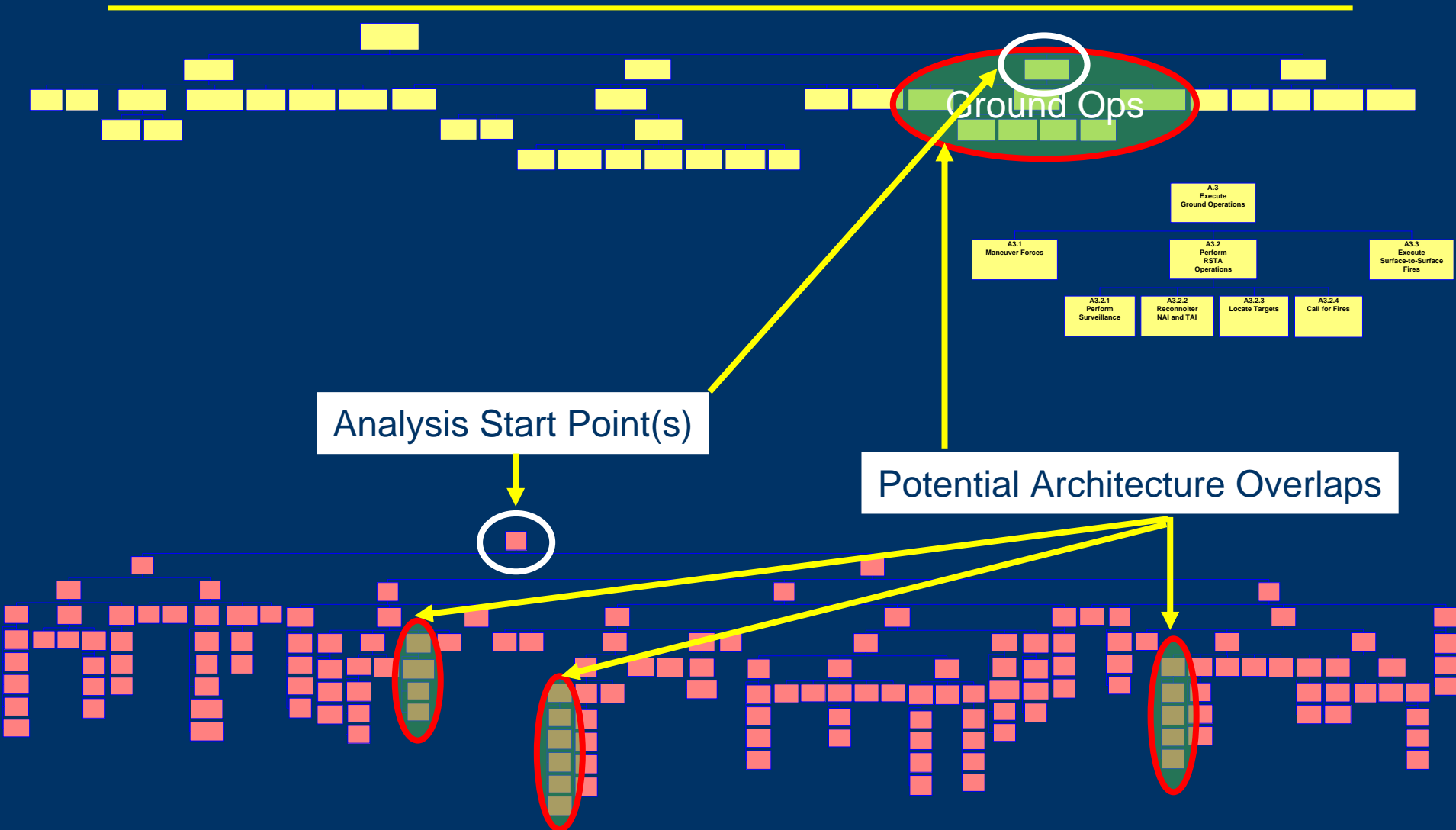


Army Combined Arms UA Operational Arch (Notional)





Analysis





Analysis

- **Joint Fires Arch:**
 - Army activities “oversimplified”
 - But appropriate to scope of architecture
- **UA Arch**
 - Activities that match Joint Fires UA depiction widely dispersed in the architecture
 - Requires fuzzy search capability for analysis
 - Matching Activities/Exchanges
 - Unmatched Activities/Exchanges
- **Tool should do the above, plus:**
 - Facilitate merge of Architectures
 - Assist in the nomination of new primitives to other architectures
 - Assist in submitting arch to higher-level federated datastored (DARS, etc.)
 - Potential for expansion to include tailoring/filtering of information provided based on user profiles



Governance

- **Governance***: a method or system of government or management
- **Current Problems**
 - **No codified governance structure for DARS, DoD Metadata Registry, NCES - instructions in work currently at NII**
 - **Observations:**
 - **COIs need to be centrally managed – extreme inconsistency just within NCES, DARS, and DoD Metadata Registry**
 - **Tools are “user hostile...”**
 - **They aren’t designed with the end user (i.e., architects) in mind**
 - **Can’t find information quickly**
 - **Architecture Federation doesn’t allow for sharing of primitives**

**The American Heritage® Dictionary of the English Language, Fourth Edition.*



Governance

- **What's needed? Carrot and Stick...**
 - **Architecture Administration and Stewardship (the Stick):**
 - **Codified and Enforced: SLAs, etc. to determine “who changes” their architectures as inconsistencies found**
 - **Recommendations:**
 - **Product centers (e.g., Navy: NAVAIR; AF: ASC; Army: Aviation and Missile Command) as place to keep intermediate “for analysis” architectures built by amalgamation of platform architectures**
 - **Primitives hosted at product centers, but submitted “up chain” to service architecture repositories and DARS, for hosting**
 - **Why would a program office “sign up” for this?**

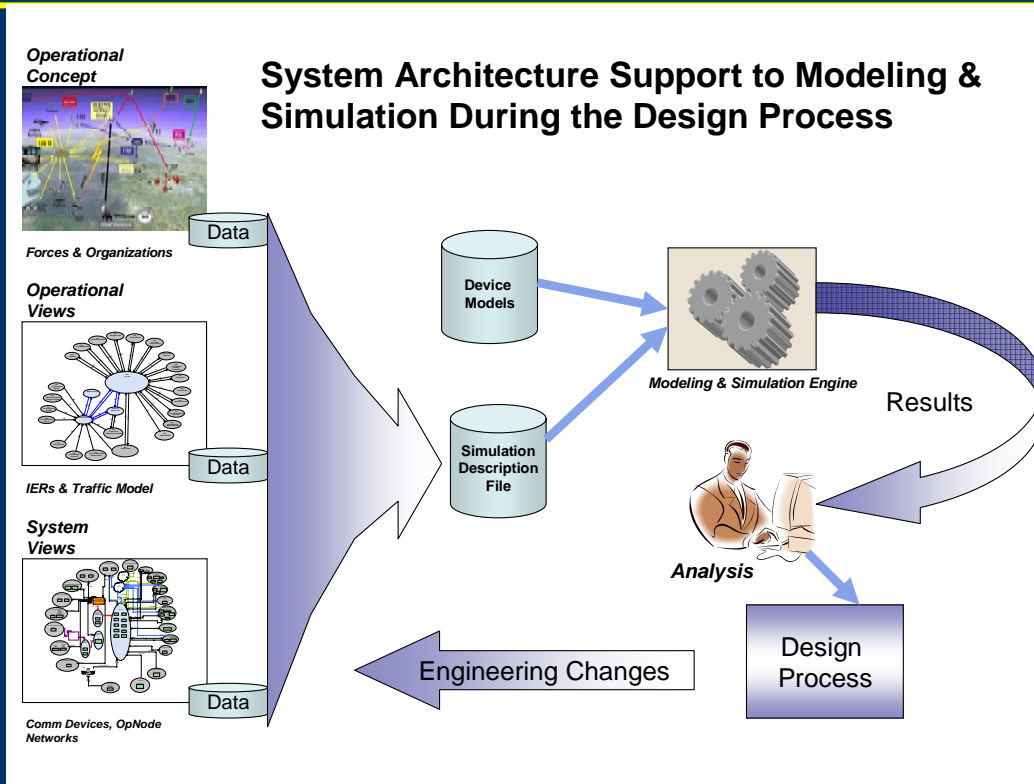


Governance

- **What's needed? Carrot and Stick... (cont.)**
 - **Useable Interfaces and Tools need to be developed (Carrot):**
 - **Architecture Seeding (drop-down based, by mission area) eases program office burden**
 - Needs to provide architecture primitives as well as standards-based seed data available to SV-6
 - Example: platform = airplane, automatically prepares nodes, activities, and exchanges related to flying for download
 - Implications:
 - Interface, tools, and management structures need \$
 - SLA's determine where hosted, and who is the "adjudicator"
 - "Adjudicator" needs to know Ops and "Geeky Stuff..." (rare)
 - **Tools must not be user hostile**
 - User Hostile tools = class revolt (they won't be used...)



Application to Other Fields / Related Work



- **Obvious Applicability to seed M&S Efforts**
 - Arch provides primitives, data
 - M&S provides analysis
 - Note: need feedback mechanism for M&S as well as empirical observations for architectures



Application to Other Fields / Related Work

- **M&S:**
 - **Steve Ring (MITRE):** architecture feeds Bonaparte and off-the-shelf comm model
 - **SBA Toolbox:** Swedish Defence Materiel Administration commissioned Front End AB to develop an M&S tool that interfaces with Arch tools
 - **Data Interchange Formats (DIFs):** Defense Modeling and Simulation Office – allows exchange of artifacts between simulations
- **Governance: DoD Enterprise Architecture Federation Strategy (DRAFT)**
- **SYSCOM Architecture Development & Integration Environment (SADIE)**
 - **SPAWAR-managed Application Portal (Telelogic SA, DOORS, and Citrix MetaFrame Conferencing, MS Access, etc.)**
 - **Collaborative environments built on top of Enterprise Elements**
 - **Implementation of methodologies contained herein could achieve order-of-magnitude change in utility of using architectures to provide seed data for analysis**



Conclusion

- **Monolithic Architecture/Data Standardization efforts have failed due to implementation realities**
- **Enterprise architectures assembled from JCIDS “platform architectures” a viable alternative**
 - Provide seed data for analyses
 - Provides primitives and reusable data for subsequent efforts
 - Require methodology and tools - tools emerging that can assist
- **Research must be applied to this area; when viable solutions found:**
 - Implementation must be codified in executable governance (DoDI's, CJCSI's, SLAs, etc.)
 - User friendly tools will facilitate development
 - Regardless of solution, the “tool driver” must have expertise in both Operations and Engineering/Architecture disciplines