



OASD(NII) Architecture Development and Analysis Survey

The State of DOD Architecting

Winter 2005

**Command Information Superiority Architectures (CISA)
Worldwide Conference, Omaha, NE**

December 1, 2005



Overview

"A DoD-wide OSD/NII Enterprise Architecture survey was recently completed. It was sent to over 1500 DoD government, military, contractor, and industry-wide people involved with DoD architectures with 120 respondents. This is the first time an architecture survey of this nature has ever been undertaken within the DoD. The results of survey will enable OSD/NII to ensure that their priorities, educational efforts, and programs are aligned with and meet the needs and goals of the DoD architecting community.

A profile of a typical DoD Architect was obtained from the survey that identifies how and where they were educated on architectures, how familiar they are with DARS, CADM, NCOW, DoDRM, and the values they see in architectures.

Project and funding decisions that were made based on architectures and their success stories where "architectures made a difference" were obtained.

The survey enabled OSD/NII to learn of all the various architecture development projects that are being worked on today and who the project customers are and the environments in which their architecture are being developed (including tool usage).

A very important feature of the survey was to get an assessment of DoDAF strengths and weakness and the relevancy of the 26 DoDAF products. Ideas for streamlining and simplifying architecture development were identified.

Finally, a set of recommendations were presented, based on the survey results, with (vendor neutral) architecture education targeted at three different levels of architecture users - developers, project leaders and upper management - being the most important recommendation."



Topics

- **Profile of a DoD Architect**
 - Organization, Education, training
 - Familiarly with DARS, CADM, NCOW, DoDRM
- **Values of architectures**
 - Decisions made, quality metrics, successes
- **Architecture development environment**
- **Architecture projects**
- **DoDAF products**
 - Relevance, strengths, weaknesses
- **RECOMMENDATIONS**
 - Ideas for streamlining and simplifying architecture development



Survey Form (online)

This is a Department of Defense (DoD) computer system classified to the level of UNCLASSIFIED. [More information.](#)

UNCLASSIFIED//FOUO



OASD(NII) Architecture Development and Analysis Survey

<https://extranet.itis.osd.mil/enterprisearchitectures/dodeasurvey.nsf>

Tell us about You ● Indicates required field

Name:

Phone number:

E-mail address:

Title:

Company or Business:

Street Address:

City, State, Zip:

1. Are you a...
- Member of Armed Forces
 - Civilian employee of government agency
 - Contractor (e.g. CSC, Lockheed-Martin, ...)
 - Other (explanation required)
 - Government employee
 - Federally Funded Research and Development Center (FFRDC) employee (e.g. MITRE, IDA, ...)
 - Self-employed

Other:

2. How many years of architecture experience do you have?
- 1-5 yrs
 - 11-15 yrs
 - 21-25 yrs
 - 6-10 yrs
 - 16-20 yrs
 - 26-30 yrs
 - Other (explanation required)

Other:

About Your Architecture Training/Education

3. Have you had any training on architecture development? Yes No
4. Have you had any training on the DoD Architecture Framework (DoDAF)? Yes No

5. If so, was your architecture training from

- Architecture tool vendor training on use of a tool either at their facility or yours
- College/University
- Internal company training by outside professional staff
- AFCEA
- Other (explanation required)
- In-house by company staff
- Professional Seminars
- None - learned it all on my own

Other:

6. How would you rate your overall assessment of the training you were provided?

- Excellent
- Fair
- Don't Ask
- Good
- Poor

7. Do you have any ideas for how to train architects and what type of training/education you would like to see provided?

DoD Architecture Repository Server (DARS)

8. Have you heard of the DoD Architecture Repository Server (DARS)? Yes No

9. Are you a registered user of DARS? Yes No

10. Do you know who to contact to register as a user? Yes No

11. Do you think there is a need for an architecture repository? Yes No

Core Architecture Data Model (CADM)

12. Have you heard of the Core Architecture Data Model (CADM)? Yes No

13. How familiar are you with CADM?

- Expert
- Somewhat
- Not at all
- Other (explanation required)
- Very
- Heard of it

Other:

Net-Centric Operations and Warfare (NCOW)

14. Have you heard of Net-Centric Operations and Warfare (NCOW)? Yes No

15. How familiar are you with NCOW?

- Expert
- Somewhat
- Not at all
- Other (explanation required)
- Very
- Heard of it

Other:

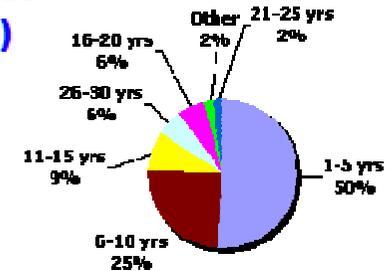
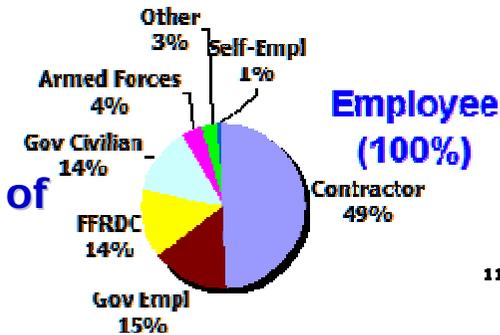


Profile of a DoD Architect



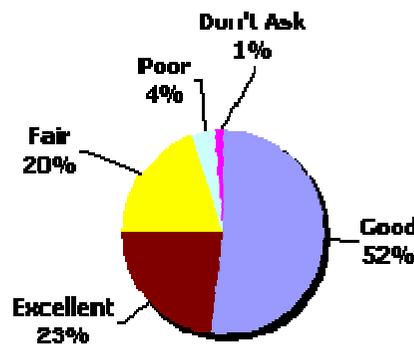
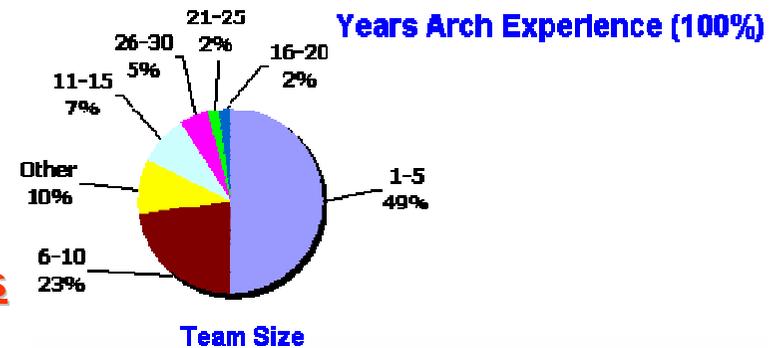
Employee

- Contractor
- 1-5 yrs experience
- Team environment of 1-5 people

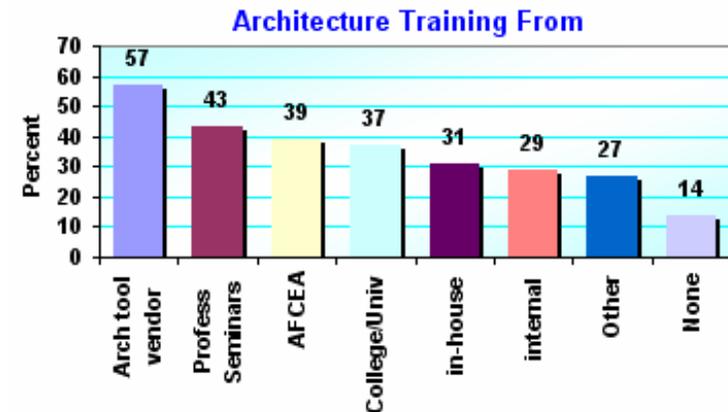


Training/Education

- Has **Architecture (84%)** and **DoDAF (79%)** training
- Primarily (57%) from **architecture tool vendors**
 - Professional Seminars, AFCEA, ...
- 1/2 (52%) feel assessment of Training is **Good**
 - 23% Excellent (1/4)
 - 20% Fair



Assessment of Training





Training Ideas

- Other sources of training
 - Air Force Institute of Technology (AFIT), SYS-283 Intro to Architecture
 - CISA Conferences, peer-to-peer learning
 - FEAC Institute
 - Academic architecting training - National Defense University (NDU) - DoD sponsored certificate program for architecture practitioners

- Training ideas
 - OJT do not grow architects fast enough
 - Apprentice like relationships where AN architect-to-be works directly under a qualified architect for 60-90 days?) to learn detailed nuances of architecture technique
 - Better DoDAF examples or classes that address specific expectations of acquisition community (JCIDS)
 - Train DoD military and civilian involved in the **core decision making process** (PPBES, IT Pfm, Acqn, JCIDS...)
 - more emphasis on the art of architecting
 - vendor-neutral
 - **High level explanations** of what the products mean, and how they relate to each other
 - How to present architectural lessons to decision makers (management view?)
 - Online seminars to cut travel costs and time spent on the road



Who DoD Architect's Are?

- **Architect** {Analyst, Branch Chief, Development Team Lead, Lead, Expert, Certified Federal Enterprise}
- **Chief** {Architect, Architecture Division, Enterprise Architecture & Standards Branch, Operational Support Enterprise Architecture, Technology Advisor}
- **Deputy** {Chief Architect, Program Manager, Joint Services Division}
- **Engineer** {Manager, Communications, Network}
- **Enterprise** {Architect, Information Manager}
- **Lead** {Engineer, Scientist, Software Systems Engineer, Staff, Systems Architect, Info Systems}
- **Principal** {Architect, CISA Engineer, Engineer, Staff, Systems Architect / Program Manager, Systems Engineer}
- **Project** {Engineer, Manager Enterprise Systems}
- **Specialist** (Quality Assurance, Process, Intelligence)
- **Senior** {Architect, Business Engineer, Consultant, Engineer, Information Systems Engineer, IT Analyst, Military Analyst, Project Manager, Site Analyst, System Architect, Systems Engineer}
- **Software** {Engineer, Developer}
- **Systems** {Engineer, Analyst}
- **Other**
 - Database Analyst
 - Technical Integration Manager
 - Transformation Advisor
 - University Professor
 - Planning consultant



Organizations Where DoD Architects Work

- Aerospace Corporation
- AF Comm Agency/EALS
- AFIT/LSS (USAF)
- Alion Science and Technology
- Anteon Corporation
- Army National Guard
- AT&T GSI
- BAE Systems
- BMMP/TSO
- Booz Allen Hamilton
- BTAS, Inc.
- CERDEC SED/ABSD
- CIFA
- Contractor Support JTRS JPO
- CSC/Federal Sector
- Data Networks Corporation
- Defense Information Systems Agency (DISA)
- Defense Logistics Agency J6CIP
- delphi consulting, LLC
- Department of National Defence (Canada)
- DTAO
- EG&G
- General Dynamics - Network Systems
- George Mason University
- Jacobs Sverdrup Inc. United and Special Operations Group
- Joint Information Operations Center (JIOC)
- Joint Staff J2P-3
- Joint Systems Integration Command (JSIC)
- JPEO-CBD SSA
- L3 GSI
- Lockheed Martin Information Technology (LMIT)
- Marine Corps Tactical Systems Support Activity
- MITRE
- National Security Space Office
- Naval Surface Warfare Center
- NETWARCOM
- Northrop Grumman IT / TASC
- NSWPC Code A84
- PEO Soldier
- SAIC
- SPAWAR CIPO
- SRA International
- SYColeman
- Systems and Proposal Engineering Company
- Titan Corporation
- Trident Systems
- US Army {civilian}
- US Air Force
- USFK {J36 KOIN, J6 Architecture and Interoperability}
- USJFCOM
- White House Comms Agency
- Whitney, Bradley, & Brown
- Windmill International Inc.



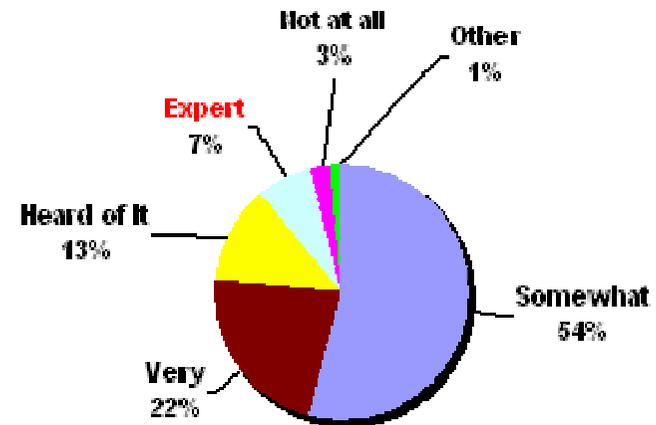
DoD Architecture Repository (DARS) Core Architecture Data Model (CADM)

■ DARS – All heard of DARS (96%)

- Know who to contact (77%), 58% are registered users
- Overwhelmingly (96%) feel an architecture repository is needed
 - “We can't even manage to collect the basic information, much less the hundreds of attributes CADM would like to collect”

■ CADM – All heard of CADM (96%)

- Most (54%) are only somewhat familiar
 - 7% Expert



How Familiar w/CADM



Net-Centric Operations and Warfare (NCOW) DoD Reference Models (DoD RM)

■ NCOW – All heard of NCOW (98%)

– Most are either **Very** (41%) or **Somewhat familiar** (40%)

– **10% Expert, 1% Not at all**

- “Too many overlapping/ similar initiatives toward interoperability/ net centricity”
- “Streamline to one or two means to the end, to improve probability of success and to decrease complexity and duplication”

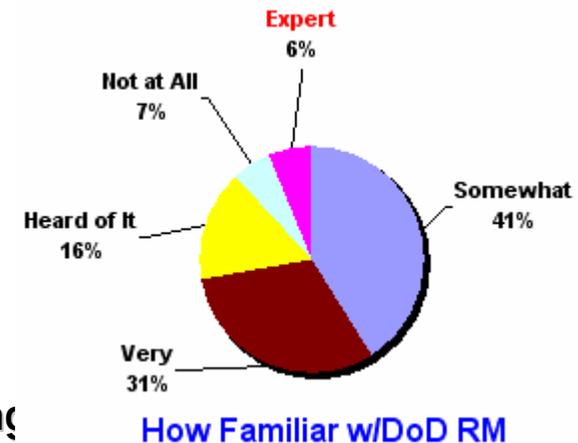


■ DoDRM – All heard of DoDRM (95%)

– Most are **Somewhat** or **Very familiar**

– **6% Expert, 7% Not at all**

- Know about FEA RMs in general, but information has not flowed down on the DoD and AF instantiations.
- Need to become more familiar -- this is the direction Enterprise Architecture work is taking





Values, Benefits And Impacts Attributed To Organization's Use Of Architectures

■ Values

- Changed our business processes to use architecture development in early phases of program definition and to use resulting architecture products as basis for proposal efforts
- Products determine equipment placement and networking catalyst for process improvement... and to examine current "business processes"

■ Impacts

- Prevention of duplication of capability
- Assistance with drafting migration plans and capital equipment replacement plans
- Common frame of reference for all manner of discussions and decision-making
- Reduced cost during development & integration, more accurate proposals, identifying gaps in current state, and clearer communication, assist with alignment of strategies

■ Decision support

- Help sponsoring organizations to make sound acquisition decisions, examine programs (PSYOP, for example) for strategic investment decisions
- Supports decision making and identification of issues ...improves organizational processes and optimization of IT portfolio

■ Educational/understanding/awareness

- Educational benefit for decision makers...gives them an idea of size and complexity of enterprise
- Understanding how we are enabling operational capabilities to the Warfighter, how our technology roadmaps will impact these capabilities and what type of trade off/decisions we can do given we are developing architecture products (OVs and SVs) to support federation of systems (FEDOS) testing...results can influence decisions made in system development and fielding, and how systems are employed
- Improved and extended awareness of the strategic purpose and reasons for transformation to much lower levels within the organization



Decisions Expected To Be Made Based On Architecture Analysis

- **Better organizational alignment**, documentation of existing processes and impetus to develop new processes, better alignment of resources
- **Correct alignment** of Component missions with proposed capabilities, programming priorities
- **Decisions** relating to what IT initiatives are funded and what functionality is allocated to each IT system.
- **Helps** to negotiate MOAs and communicated requirements with contractors and users.
- **Answers** how many equipments of which type needed to field a digitized unit, in which platforms must be the equipment be mounted, and with which other equipments and platforms must equipment be networked?
- **Identify** capability gaps, **measure** and report capabilities based on requirements for both as-is and target architectures, **prioritize projects** based on business objectives, integrated picture of all projects
- Investment Review, Legacy Systems analysis, IT Portfolio Management
- Organizational structures, IT investment decisions, strategic IT plans
- **Process improvement areas**, changes in policy, changes in doctrine, changes in ROEs, organizational structure, training, skill set mixes, role assignments to activities, technology changes, acquisition trade offs, etc.
- **Recommendations** for business process streamlining, and efficient systems acquisition.
- **Reducing** functional overlaps and associated redundant funding, which can then be applied to funding the gaps
- **Net-centric Assessments** currently ongoing at enterprise level will enable commands to focus policies, procedures, and supporting system implementation to transitioning to operations within a net-centric environment
- Current and vision architectures and accompanying compliance documents will **provide a roadmap** for transitioning from the current architecture to the vision.
- What systems...
 - Are **Replicating** functions and need to be cut or reduced
 - Are **Filling** critical functions and need to get more funding
 - Have functions **available** in other systems and should be cut from a specific system contract



Metrics And Measurements Established To Assess Quality of Architectures

- **Accuracy** of Information Exchange Requirements (IERs) both inside the system and external to the system
- **Compliance to DoDAF**; Use of standards, such as the NCOW RM and GiG Checklist; Executability for performance assessment
- **Consistency** between architecture elements; i.e. op activities, op nodes, info elements,...
- Most metrics are drawn from SV-6 and SV-10x...these metrics lead to sound KPP descriptions and expectations
- **Multiple internal quality checks** to determine correct relationships among capabilities, systems, MOEs, etc.
- **Performance measurements** (response time, etc...) at a systems level and inverse cascading of reports to the enterprise level or network operating center for enterprise level monitoring for predictive loading and preventative
- Our Value Model contains about 80 mission activities, supported by over **600 Measures of Effectiveness, stated in measurable, testable terms**
 - These MOEs then traced back to stated capability needs (legacy performance requirements).
- Command is currently developing **compliance documents** to ensure programs and projects are in compliance with the vision architecture...also, the command uses EAMMF to measure architecture maturity
- Using **Air Force developed metrics**
- We **measure concordance**...how well did all the pieces fit?



Architecture Successes

Where “Architectures Made A Difference”

- Documentation of systems external schemas, matched/ mapped to data production showed **10% underproduction and 30% unneeded data production** (at same time)
- AF-DCGS used object oriented design to ensure that contractor fully understood government expectations...in IDR a **major problem with expectations was discovered** because the architecture presented only represented the old TPED process and had not accommodated the vision of a TPPU solution
- Development of the CENTRIXS Architecture **justified 1.1B dollar support** to development of coalition supporting comms network
- **Each of the Army's digitized units** is a success story ...beginning with 4ID and extending through the force that won OIF...presence of reliable digital tactical communications is a HUGE success story
- **Immediate configuration management** successes with Information Operations Navigator (ION)'s large database...Allowed contract scoping of versioning support needed...Isolated job down to the table level. New version produced in 3 months vs previous version in 3 years. **Saved multiple \$100K's and obviously time**
- NAVAIR Logistics Architecture resulted in **cost savings** from eliminating duplicate systems
- Operational and system architectures developed for Joint Intelligence Interoperability Board (JIIB) Systems Baseline Assessment **validated solutions** proposed to close CENTCOM JQRR deficiencies in FY04 and FY05
- SATCOM architecture led to MIM architecture that led to Transformational Communications Architecture Space Situational Awareness Architecture used to **save/upgrade** of "Fence" ground radar...better integrate our current SSA capabilities (taking recommendations straight from SSA report)
- Several instances where new programs were able to **reduce ceiling** of program by eliminating requirement for contractor to build new Info Service - since that Info Service was available elsewhere within the environment. Talking 'millions', however, not tens or hundreds of millions
- CARDSS (Commands' Architecture Repository and Decision Support System) developed by and for NORAD and USNORTHCOM has **supported needs** of the Portfolio Management Teams
- Command realized a **600% increase in POM funding** directly as a result of having a completed architecture to support its request
- Joint Information Capability Enhanced Environment (JICEE) enabled us to successfully develop, understand and **field required capabilities needed for New PACOM Headquarters in Hawaii**
- **Secure \$4 Million increase** in funding for SOCKOR IT requirements based on development of operational views



DoD Policies And Directives Most Aligned With Which Have Most Directly Influenced Architecture Efforts

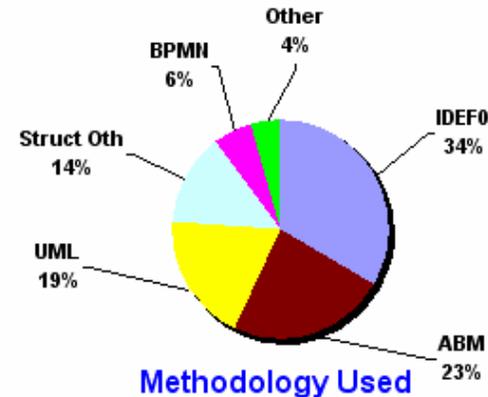
- **CJCSI/M 3170.01 - for JCIDS architectures**
- **CJCSI 6212.01 - for ISPs ...Both influence what products are created to support the JCIDS process.**
- **Clinger/Cohen**
- **DoD Architectural Framework Vol 1/II and Desktop versions has greatest impact**
- **AF Instruction 33-124, Enterprise Architectures**
- **DODAF, DOD 5000,TRIM**
- **JBMC2**
- **NCOW-RM Ensure compliancy with DODAF and NCOW-RM**
- **DoDD 8530.1 and DoDI 8530.2. Looking to implement 8320.2**
- **DoD 5000.1, DoD I5000.2, DoD D4630.5**
- **NDAAs for 2005 DoDAF guidelines**



Architecture Development Methodologies

■ Methodology Used

- **Structured methodologies (80%)**
 - 1/3 IDEF0, 1/4 ABM, BPMN & Other 1/5
- **Object methodologies (20%)**
 - 1/5 UML

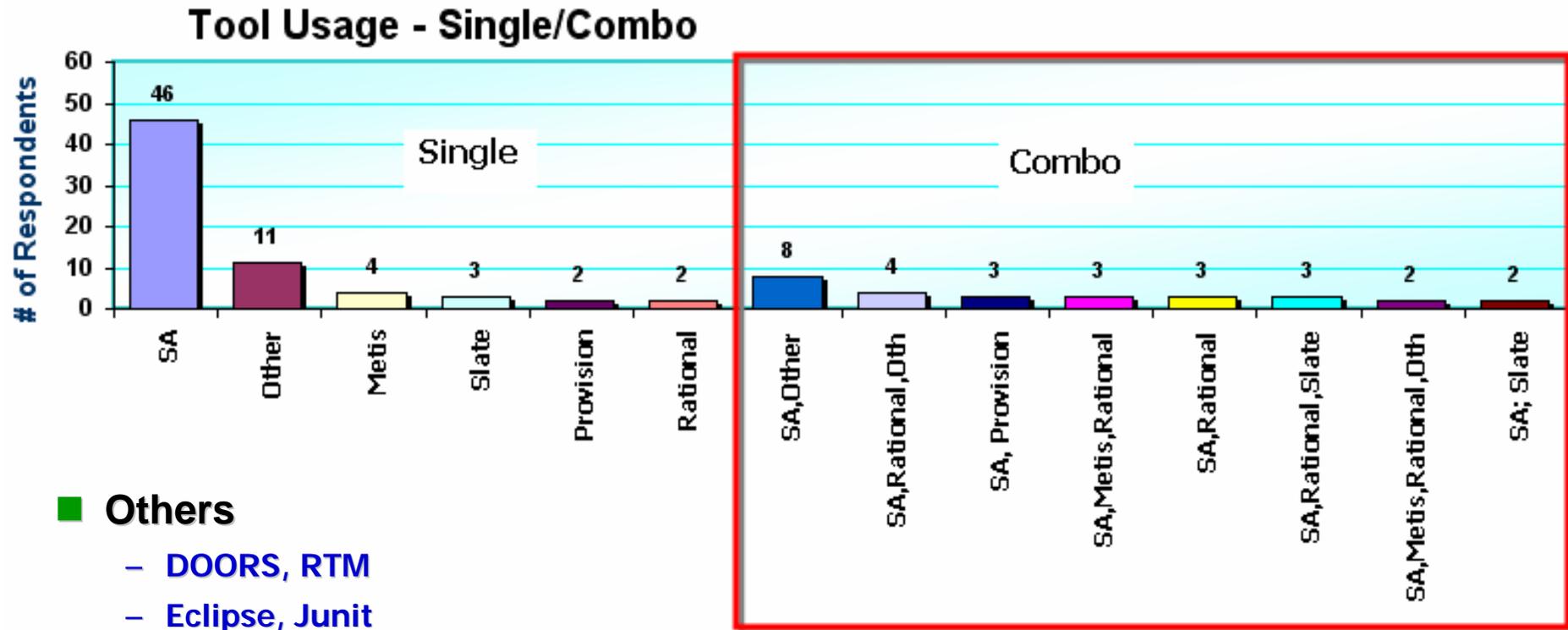


■ Other methodologies

- **IDEF1X** data modeling tools
- Try to remain method and tool agnostic, and tailor to the specific need
- Use view formats, data standards, repositories, etc. to achieve architecting interoperability
- We have been working with a proprietary adaptation of **Venkatramen** modeling that we call the Business Alignment Methodology.
- We use a **combination of approaches** - all focused on the underlying architecture data (based on the DoDAF Object Model) - not the format of the artifacts.
- We use a **mix** of structured - OO methodology. warfighters better understand the structured methodology for describing their business process - but the existing framework does not delve deep enough to get insight into design. UML/OO is used at the design level



COTS Architecture Development Tools



Others

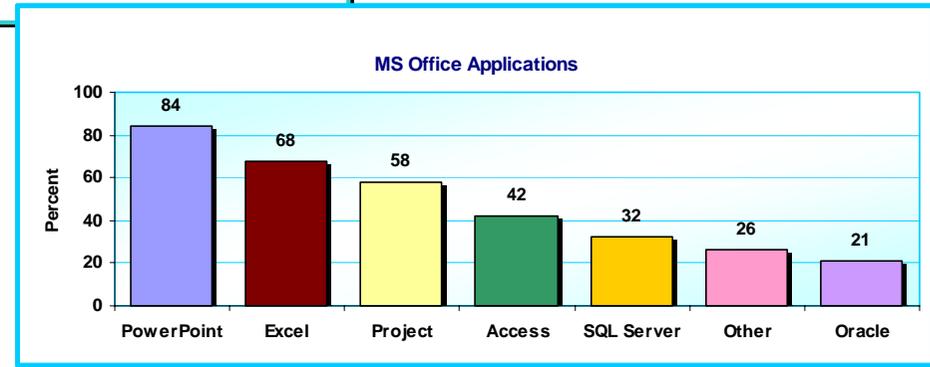
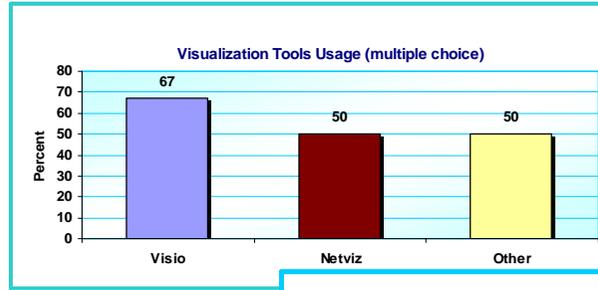
- DOORS, RTM
- Eclipse, Junit
- Computer Associate's AllFusion/BPWin, /ERWin
- Vitech CORE for Systems Engineering and executable models
- Enterprise Architect by SPARX Systems
- Gensym ReThink and PIKOS Bonapart process simulation tools
- I hope to develop our architecture to the point that we need to migrate to Telelogic's Tau tool
- We drive Metis from a SQL Server database



If Not Using COTS Architecture Tool

■ Other Tool Usage

- Visualization
 - Visio then Netviz
- MS Office
 - MS Project
 - Frontpage
- Macromedia's Dreamweaver for web site



■ Architecture Databases

- Where not using COTS tool but using CADM DB directly
 - 1/4 ARCADM
- Other
 - AIMD's AARMS and POPKIN repository
 - CADIE/AARMS (TRADOC) AMES (PEO C3T)
 - CARDSS
 - FIBL
 - MCASE



Frameworks

■ Almost all (91%) use DoDAF

- Federal Enterprise Architecture Framework (FEAF)
- DoDAF products, tempered by knowledge of the Zachman levels.
- **Business Alignment Methodology** has its own framework that is a superset of the above frameworks.
- We have heavily leveraged the DoDAF, the UK **MoDAF**, FEAF (and their 5 reference models), TOGAF, Zachman (only as a measurement of completeness check).
- We use DoDAF data objects and their relationships, but extend in using the AF EA Framework to reflect a hierarchy of architectures within the AF and the use of a set of reference models at the enterprise level to create a "federated" AF Enterprise Arch



Architecture Projects – 1/2

- ADS, GCCS (Marine Corps), LCS, LHA(R), CJR, J-HSV, MPF(F), TCO, Tac-Mobile
- AEA, JTSTAI and JBFSA
- AF ISR Mission Area Architecture
- AF Operational Support Enterprise Architecture
- AIA Enterprise Architecture
- Air and Space Operations Center Weapon System
- Air Force Enterprise Architecture
- Air Force SRM/TRM Repository
- Architecture Management Engineering Suite (AMES)
- ARH JCIDS, LUH JCIDS, CH-47F, HEAVY AVN BDE, etc
- Army Enterprise Architecture
- BAMS UAV
- BEA BMMP
- C2 Constellation
- Capability Integration Framework (now HIA)
- CFC/USFK Enterprise Architecture
- CISA - OPLAN Based Enterprise Architecture Development
- CND Architecture
- COCOM Collection Management
- Combatant Commanders Integrated Command and Control
- Combined Forces Command /US Forces Korea Integrated Operational Architecture
- Command C4ISR Architecture
- Command Information Superiority Architecture (CISA) Program
- COSMOS (ACTD)
- CVN-21
- DARS
- DCAPES, Enterprise Architecture for Procurement, REMIS
- DJC2 Increment 2
- DLA Enterprise Architecture
- D-NET
- DoD Business Enterprise Architecture
- Enterprise Architecture Viewer (EAV)
- Enterprise Modeling Center
- FD21
- FORCEnet Integrated Architecture
- FORCEnet Operational Architecture and the JBFSA Integrated Architecture
- Future Combat System (FCS)
- Grants Assistance System (GAS)
- Group Business Operations Architecture
- HRM Core Business Mission Area Enterprise Architecture



Architecture Projects – 2/2

- IAJCBDIS
- Information Operations Planning Capability - Joint (IOPC-J)
- ISPAN
- JICEE
- Joint Command and Control
- Joint Mission Area Analysis Technique
- Joint Task Force Headquarters Core Architecture
- JSBA-CM
- JTF Core
- JTRS Networking
- Mission Assurance Division Defense Critical Infrastructure Program
- N/A -- Critique others architectures
- Naval Enterprise Architecture
- NCES Integrated Architecture
- Net-Centric Assessment and Transformation Architecture
- Net-Centric Enterprise Services Architecture
- Not releasable
- Numerous Proposal/Pre-proposal
- Presidential Helicopter Focused Logistics
- Responsive Space Operations Architecture
- Responsive Strike C2
- SCJ2/Intelligence Systems Division Enterprise Architecture
- Sea Warrior Enterprise Architecture
- SECNAVINST 5000.36
- Several... (V-22, E-2C/D, Joint Threat Emitter, F/A-22, etc.)
- Soldier Systems Architecture
- Space Situation Awareness Enterprise Architecture Development
- Space Situation Awareness Integration Office
- SYS 283 Intro to Architectures Course
- TRADOC AIMD
- USFK Enterprise Architecture
- USNORTHCOM Net-Centric Assessment and Transformation Plan
- USOG Segment Enterprise Systems Architecture
- USSTRATCOM Enterprise Architecture
- Varied, Primarily Combat Operations Architecture Council (ESC), but currently just AF-DCGS and IBS
- Various: "IWF Operational Architecture 2006" is one
- We consider a project to part of the architecture, not an architecture project.
- WHCA Enterprise Architecture
- White House Communications Agency EA



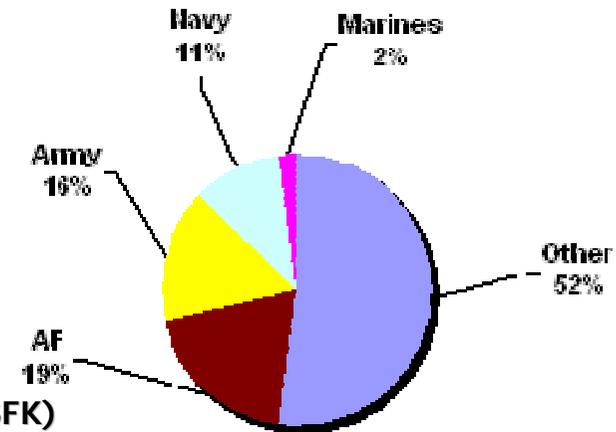
Customer Organizations

■ 50% Service related

(Army, AF, Navy, Marines)

■ 50% Non-Service related

- All ACAT and non-ACAT programs.
- BEA-Log
- CIFA and the CI Community (at least 2 architectures)
- Combined Forces Command (CFC) and US Forces Korea (USFK)
- Defense Commissary Agency
- Defense Logistics Agency
- DISA
- DoD and IC (Interagency)
- EOP-WHMO-WHCA
- Joint (JTF) with Navy as lead, Joint CND Architecture, Joint Staff – Korea, Joint Staff J2
- National level - including all services, civil agencies, and commercial/foreign entities
- NORAD and USSTRATCOM
- NSA - Multiple GIG Programs
- U.S. Joint Forces Command
- U.S. Southern Command, Intelligence Directorate, Intelligence Systems Division
- White House Communications Agency
- Working for USFK and the Combined Forces Command, the organization includes both Joint Forces and Coalition forces in day-to-day operations and contingencies



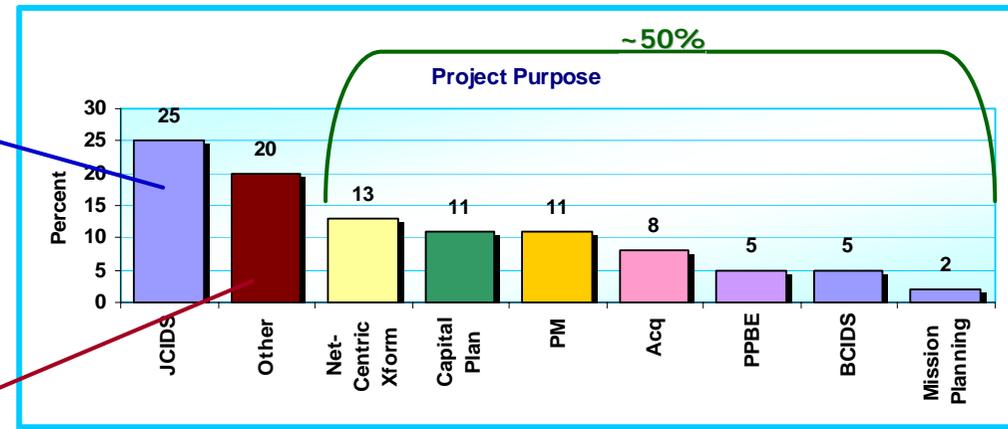
Service or Gov Agency



Reasons Doing Architectures

■ 25% JCIDS

- NetCentric Xform (13%)
- Capital Plan, PM (11%)
- Acquisition (8%)
- PPBE (5%)



■ 20% Other reasons...

- Acquisition, Net-Centric Transition, PPBE, Portfolio Management, Analysis, Design
- Architecture Continuing Education
- Because we serve so many customers, our architectures are used for a variety of purposes.
- C2ISR Integration
- Capabilities Based Planning, Development of solutions for Capabilities Gaps.
- Documentation, acquisition, planning, forecasting
- Federation of Systems (FEDoS) Testing
- Identify enterprise activities and processes across the Services and Agencies within DoD
- Investment Review Board, but also JCIDS/BCIDS/PfM/CPIC/Acquisition and Net-Centric
- Organization-PPBE Personal-Information management planning
- Support of Unit Set Fielding and Force Modernization
- Systems Engineering Process
- There is no single reason... JCIDS is one. Mission Planning is another. Laws such as Clinger-Cohen Act, of 1996, OMB Circular A- 130 and A-11 are others. However, adherence to sound systems engineering practice is also a significant driver
- To support all types of decision making related to Operational Support modernization



AV-2 Acronyms, Terms, Definitions

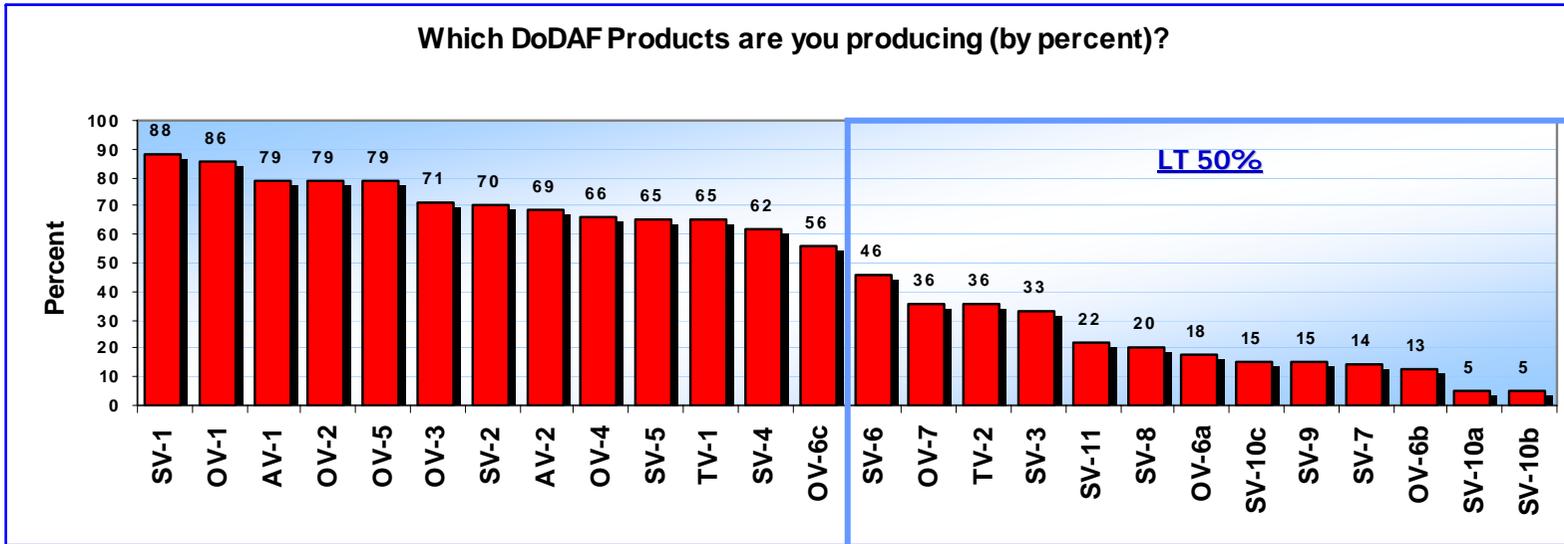
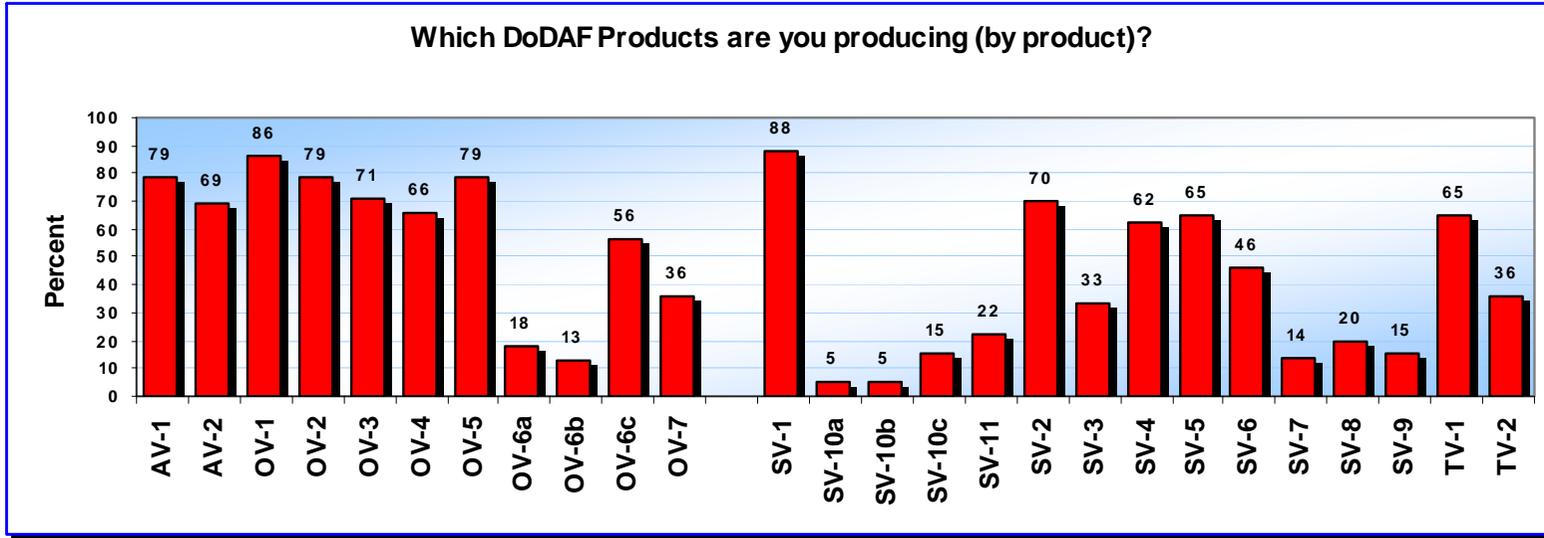
■ 60% have AV-2s

■ AV-2 Sources

- approved and published Joint Publications.
- Architecture products: TV-1/2, OV-1, OV-2, OV-5 (so far)
- at this time we are leveraging existing architectures - notably JTF and JC2
- CADM DAU Acq Definition Engineering Standards
- CFC Publications, many, many sources.
- Combination of many sources (Joint, Service pubs), local documents that collectively provide a clear explanation about the terms and their usage.
- DoD and Army standard terms
- DODAF Systems Views, Operational Views and Technical Views
- FORCenet Architecture, UNTL, UJTL, DIHMRS
- Joint Information Operations (IO) doctrine and UJTL & JMETL
- Joint Publications (JP 1-02), Air Force Publications.
- Subject Matter Experts, Policy and other documentation
- We draw from OSD sources such as the DISRonline and NCOW and from lower level AF architectures as well - primarily the C2 Constellation, ConstellationNet, and Operations Support Enterprise architectures. We also use a variety of authoritative data sources
- We will be creating an AV-2 for the USNORTHCOM Net-centric Assessment and Transformation Plan that will be integrated into the overall NORAD and USNORTHCOM AV2



DoDAF Products Being Produced (%)





Non-DoDAF Products Being Produced

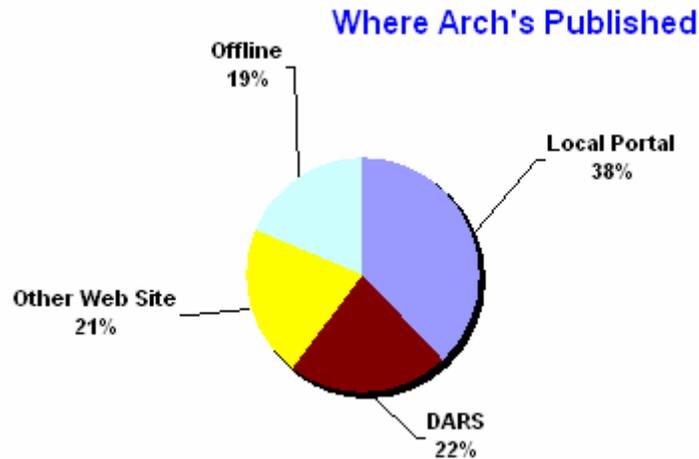
- **Executable engineering models and simulations** to assess the architectures
- Simulation and models driven from the UML 2.0 models as necessary, OpNet, LMSAS, etc.
- FEAF, Zachman Framework extended
- **JMAAT**
- **LISA** profile on DISA SIPR Website
- NCOW Transformation Plan, NCOW, GIG IA
- NetViz model (combined OV-1, OV-2) "**Horseblanket**" equipment lay down (combined OV-4, SV1)
- **Network Models** using Modeling and Simulations Tools
- Our architecture products are **not standard DoDAF**, because of the use of **UML**, and also because we are trying to model an SOA which has very different characteristics from a traditional system...also, we produce EFFBDs for executable models.
- **Process workflow diagrams** (in IDEF format)... Metrics spreadsheet Worker Information Flow (query from database)
- Reports, Requirements Analysis, Design Analysis, Domain abstractions, integration abstractions
- **Service Views (SVs)**
- Single database of all SSA Capability Needs (legacy performance requirements) and an SSA Value Model (update) for assessing SSA Architectures. Also, a cost database for each system, capability, and function segmented into various components suitable for d
- Some basic block diagrams and AS IS (our current infrastructure), TO BE (Planned and Programmed (funded) and OBJECTIVE (What we reasonably expect with projected technology trends and business trends).
- **Super SV-5 that shows traceability from Capabilities to Activities to System Functions to Info Services**



Where Architectures Are Published

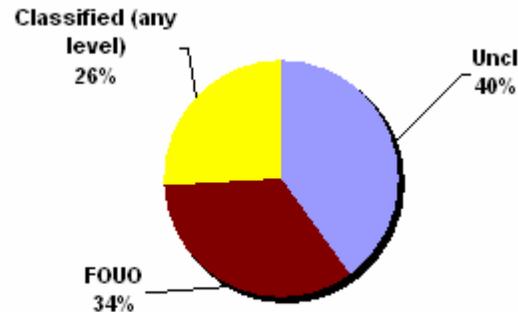
Mixed publishing sites

- Local – 38%
- DARS – 22%
- Other – 21%
- Offline – 19%



Security Classification

- 40% Unclassified
- 60% Some classification
 - 34% FOUO
 - 26% CLASSIFIED

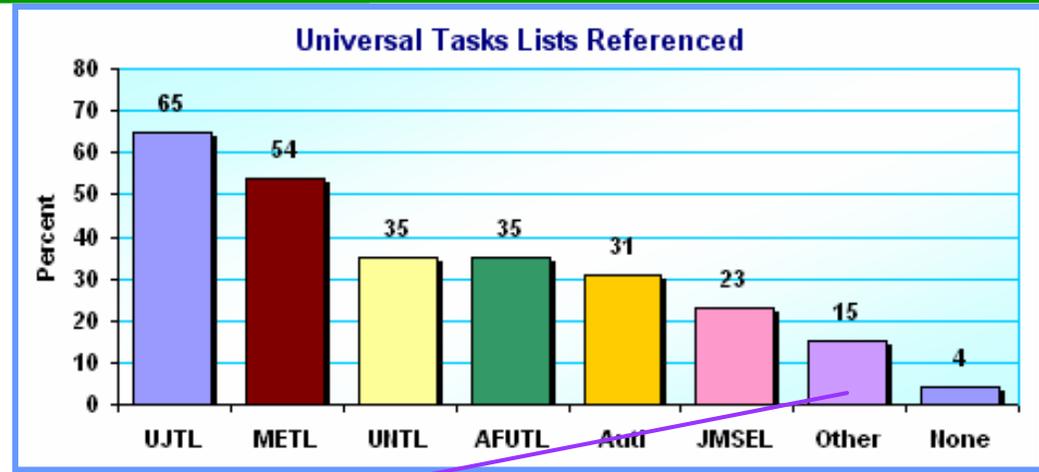


Classifications of Architectures



Referencing Universal Tasks Lists

- **UJTL**
most referenced (65%)



- **15% Other**

- AF Master Capabilities Library (MCL) CINC 57 Requirements and AFTL
- FORCENet Functional Concept; NCOW Reference Model; Naval Power 21 documentation
- JMETL
- MCTL, NTA
- NCOW, GIG IA, Multiple GIG Programs



DoDAF Products In General

■ DoDAF products

- 2/3 feel provide **sufficient detail** for architecture development and analysis needs

■ COTS Architecture Tools

- 2/3 feel provide **sufficient support** for DoDAF products

■ Other architecture products that should be part of DoDAF?

- **Capabilities view and products** based on systems requirements traced to UJTLs
- **Service Views** (concept has been championed by SPAWAR 05 - they have not been created, because they are not in DoDAF)
- Products that emphasizes need to address Operations and Sustainment (O&S);
- Acquisition View, **Cost view** (portray cost-benefit tradeoffs), **Risk view**, **logistics view**
- Better support for **SOA**, operational performance requirements, 4+1 views for software
- Data View, architectural templates and Portfolio Management Matrix and Schemas
- **Requirements** mapping; **Funding** information
- Value Model, some **MODAF** elements - Strategic and Acquisition viewpoints
- We need some new way, other than the OV-4, to **show relationships in a netcentric environment**. It's too limiting the way it is now
- Need to be able to represent enterprise services as well as the **role of humans in the architecture**



DoDAF Strengths

- **Structured, standardized approach** to architecture
 - offers guidelines, consistent ontology and commonality to support development of integrated architectures across DoD
 - organizes & compiles into one package all needed views to make investment decisions, develop new systems, etc.
 - **logical approach** to capture and express capabilities for DOTMLPF
 - Provides **overarching guidance** for all services, rules, and product descriptions
 - Accepted as a **standard** by the DoD architecture community
- **Common**
 - means to enable communications, ...interchangeable formats/specifications, ...language for comparing architecture, ...Lexicon and Framework across DOD and for architects supporting the DoD.
 - set of standards for what each product should look like.
 - starting point for architecture artifact contents and meaning and views
 - **definition** of what comprises an architecture and allows commands the flexibility to develop products they deem important for their needs
- **Mature framework** for arch modeling of a system of systems
- Industry and systems engineering professional and standard societies (OMG, INCOSE) have decided to adopt it because of these strengths
- Relationships between 26 FW products...when built correctly, the differing products **complement and reinforce** the information found in individual products.
- When **combined** with a comprehensive architecture development methodology such as ABM, building DoDAF products ensures that the architect is developing a **uniform set of data** that can be used in multiple architecture products in multiple formats



DoDAF Weaknesses - 1/2

- Lack of an architectural development process (see ABM)
 - Emphasis on architecture products and **not analytical process** (fundamental IM and IT analysis)
 - Not enough emphasis on **architecture data**...Lack of enforcement
 - **integration among the products**, products lack information about action timing and sequencing
 - Requiring products instead of focusing on the underlying data of entities and their relationships
 - As the values in architectures are **not standardized**, analytical capability across the enterprise is extremely reduced
 - DOTLMPF analysis techniques of integrated architectures is lacking
 - Higher echelons don't understand the value of DoDAF architectures - therefore there is a constant battle to kill the requirement for DoDAF products
- Architectures need to be **capability focused**...decision maker needs to know that if I cut these funds I will lose this capability that is planned to be used by this group of individuals at a glance
- **Diagrams too complex** to present to senior leadership and strategic planners without modification
- **DoDAF, OMG and MOSA need to work together** with technical community to minimize documentation needed to set the structure for system development, test and implementation
- Focus is on just a single architecture...no discussion on **best practices to defining architectures** to insure they can be integrated into the enterprise
- **Focused on stovepipe systems...needs** to focus on enterprise services including humans



DoDAF Weaknesses – 2/2

- Lack of common lexicon, taxonomy....e.g. COAL/UTL and CSFL issues
- Services "stovepipes" and opponents with agendas tend to amplify DODAFs weaknesses
- Need visible and vocal flag level advocates to get us beyond the "baby-steps" pace and the Level 1 (EAMMF) maturity level
- Need DODAF certifications..Also need open standard "Plug-n-Play" analysis frameworks off of DARS
- Lack of direction on how net-centric arch products should be developed ==> metadata, xml schema, services
- Lack of good tools that facilitate distributed configuration managed concurrent development as part of the development environment – **GOOD POINT – TOOL ISSUE NOT DoDAF ISSUE**
- Does not enable one to answer the question "so what?" as in, "we've spent \$XXX to collect the info necessary to describe our XX architecture--so now what?"
 - Just describing an architecture is not adequate and, while DoDAF makes it clear up front that one should have a reason for describing an architecture, it still does not help make the leap to what one should do with it, once it's been described
- Needs to move to "top-down" (capabilities) approach vice "bottom-up (requirements) believe 2.0 will address this
- Clearer guidance on **using UML**
- Does not address new layer of Service Oriented Architecture...the **Service Views**
- Very little emphasis on **requirements development** as entry criteria for design of an architecture, and how to translate requirements into design of the DoDAF views

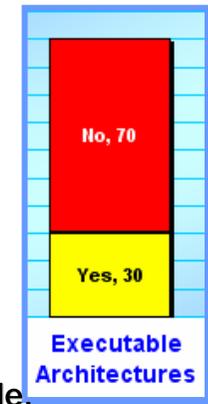


Executable Architectures

■ Mostly (70%) not developing executable architectures

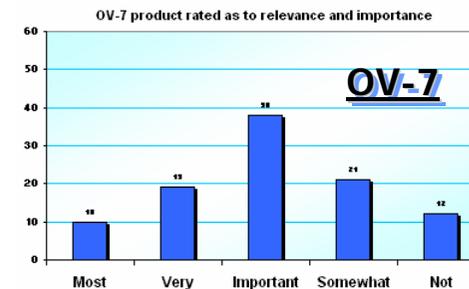
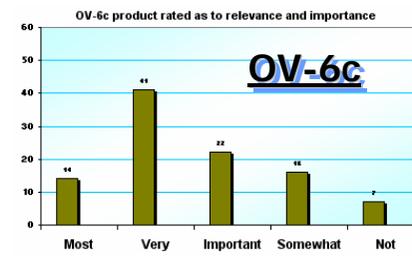
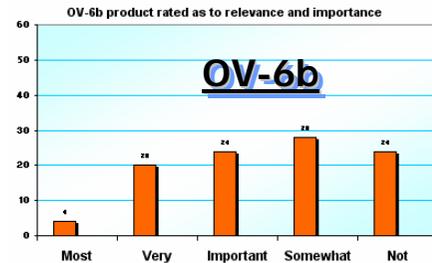
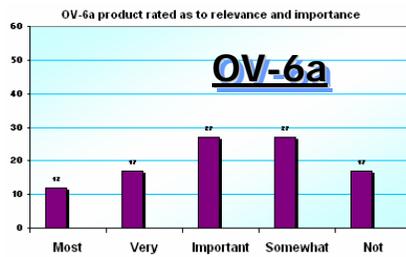
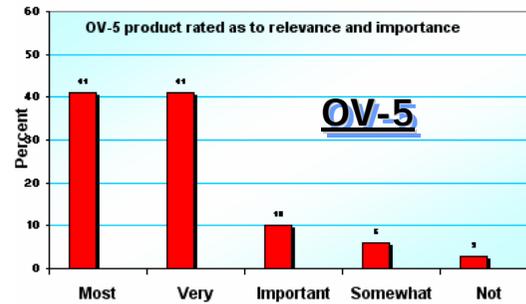
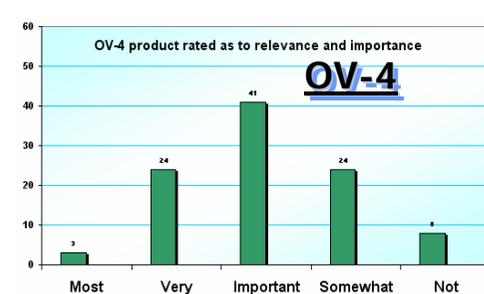
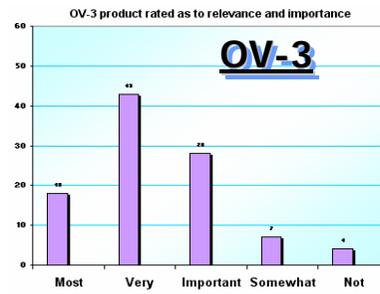
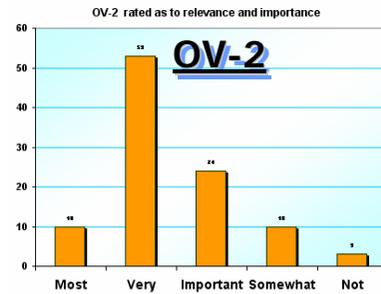
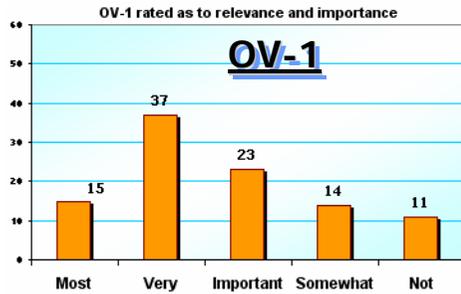
■ Comments

- **OPNET** for simulations. Determine solutions to capability gaps
- **CORE...** It has a built-in discrete event simulator and all the necessary logical constructs to obtain a valid analysis.
- depends on use, most in tools like **Rhapsody**, but have used **Bonapart** as well
- **Extend...** Dynamic models capable of providing decision level data on capability of technology to improve process or identify areas and best means for process improvement.
- Just at the front end of this. Hoping to generate a significant portion of our executable code. However, as mentioned above, seems there is no support/understanding from the Program offices. Also seems DoDAF and MDA are disconnected. For instance, there is nothing that helps map DoDAF artifacts to the CIM, PIM or PSM
- Actually, we're trying to develop a model driven architecture (MDA) development environment. We envision an enterprise repository (**Provision**, perhaps) fed by any number of modeling tools including **ERWin**, **BPWin**, **Autonomy**, **Unicorn**, **Popkin**, others). We intend to use **CA Advantage** as the data administration piece. We are exploring the CA Advantage Gen program generator on the delivery end. Also mixed in there would be various data integration tools (**Webmethods**, **BizTalk**) and workflow tools (**Captaris**, **K2.net** maybe).
- Petri nets. Modeling data flow and collisions from competing inputs to the same operational nodes. System performance, what reductions from manning can be done with better systems.
- **SLATE-based**; demonstrate link between joint doctrine and activity with the JTF Core architecture; good response from COCOM's who see value in the product.
- **Telelogic - TAU**
- Utilizing **Eclipse** to develop UML and Enterprise application for deployment in a J2EE environment.
- Various COTS simulation environments (**ReThink**, **G2**, **Bonapart**) looking at GOTS as well (**JMACE**, **JCATS**, **OneSAF**)
- We don't limit it to one tool. We provide a number of tools that can provide execution capability (e.g. **Core**, **CPN Tools**, **OPNET**) depending on the question being asked. We are also looking into linking the repository for capturing architectures to a synthetic environment to provide M&S support



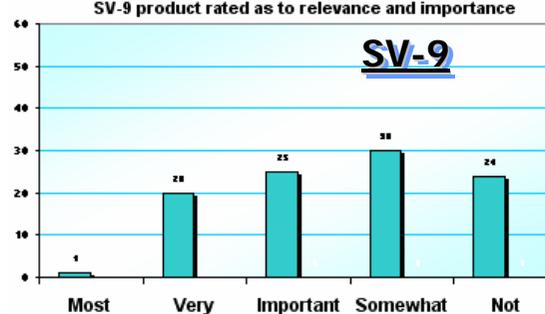
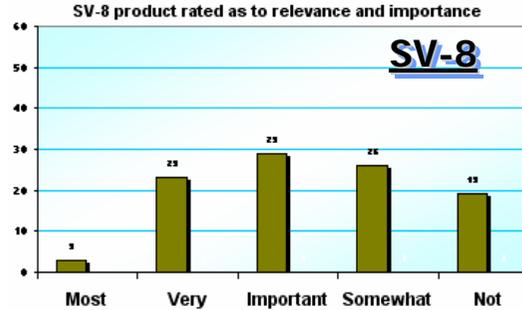
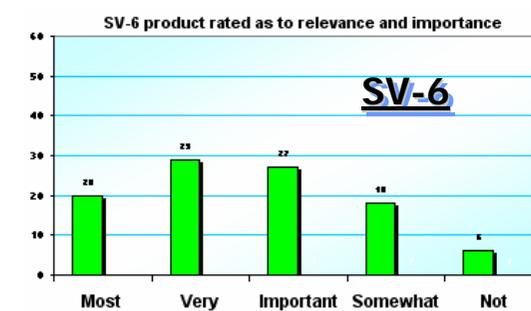
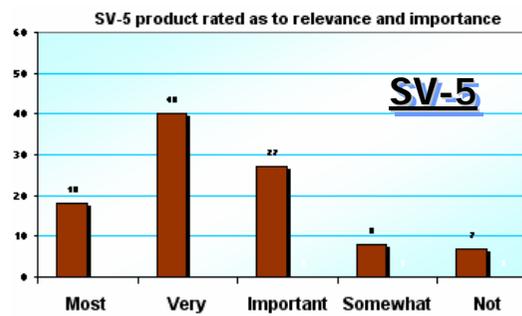
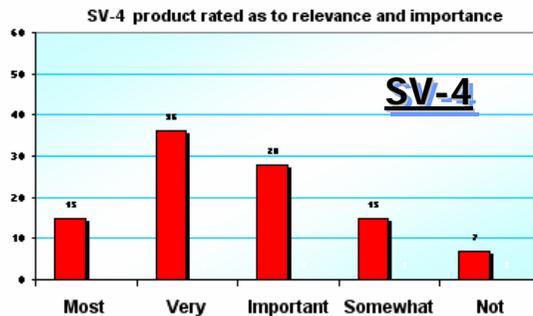
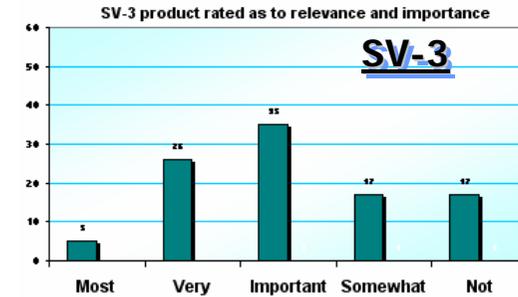
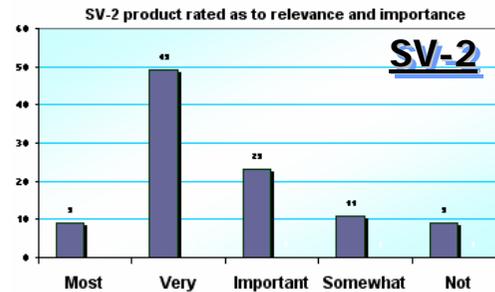
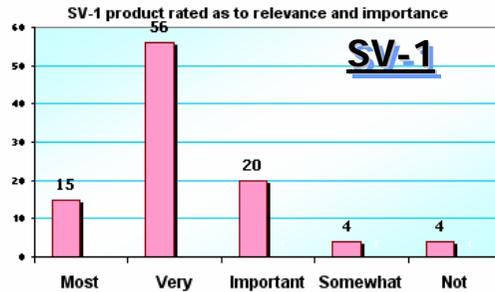


OV Products Rated as to Relevance and Importance





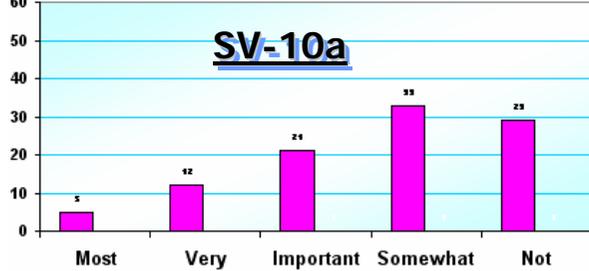
SV Products Rated as to Relevance and Importance – 1/2



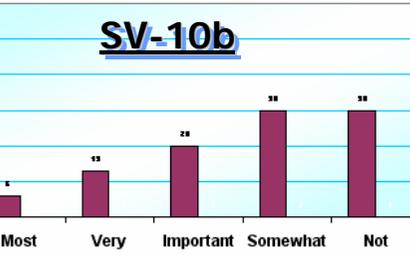


SV Products Rated as to Relevance and Importance – 2/2

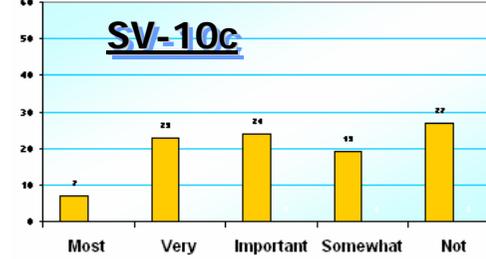
SV-10a product rated as to relevance and importance



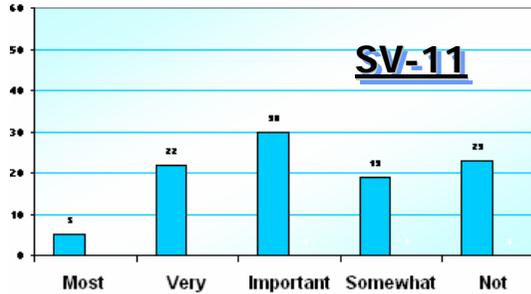
SV-10b product rated as to relevance and importance



SV-10c product rated as to relevance and importance



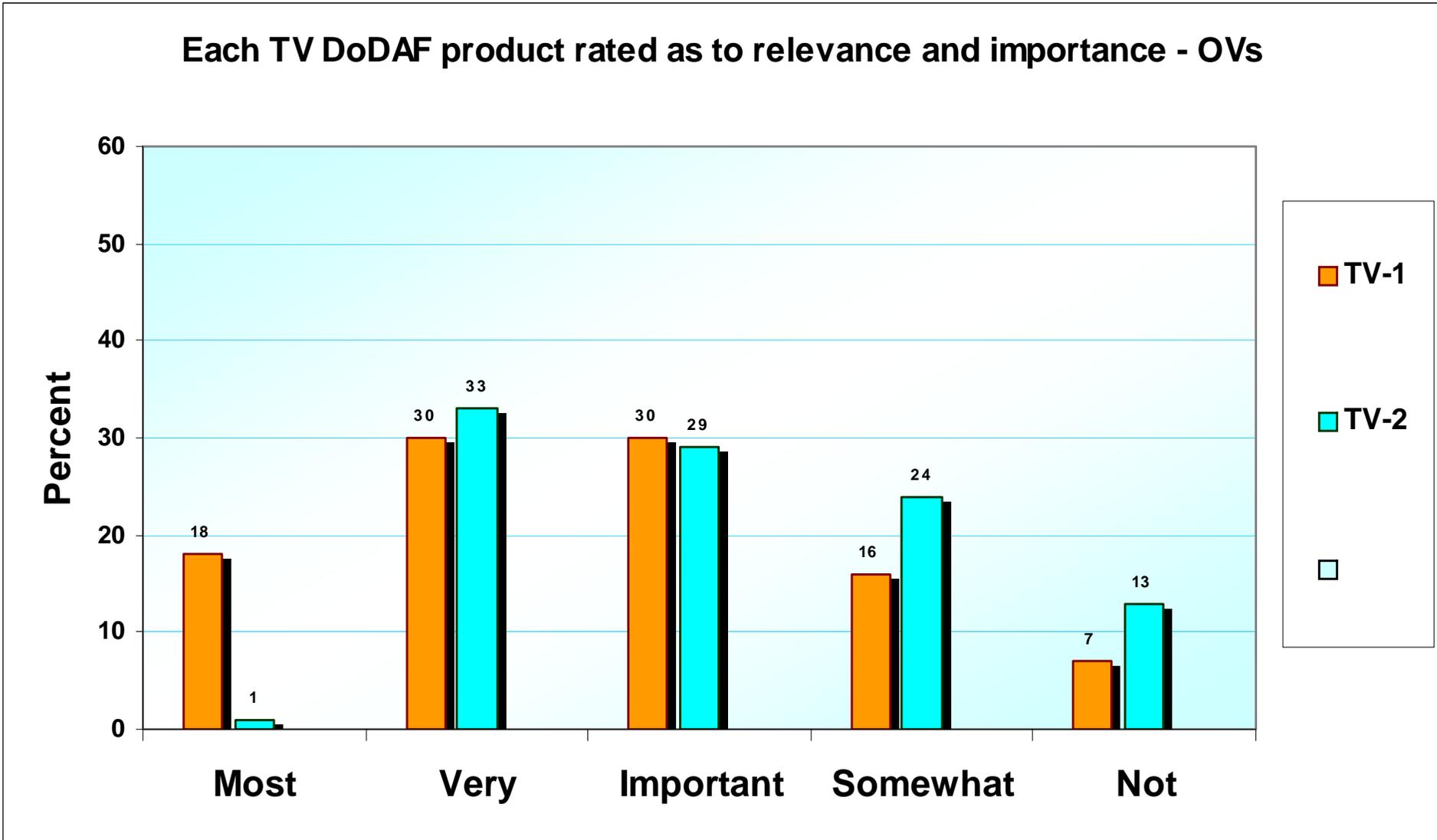
SV-11 product rated as to relevance and importance





TV Product Ratings

Each TV DoDAF product rated as to relevance and importance - OVs





Recommendations – 1/2

■ EDUCATION-EDUCATION-EDUCATION

- Vendor neutral
- Aimed at 3 different levels:
 - ◆ ground-level (architects), ◆ mid-level (project managers),
 - ◆ high-level (upper management...GS-15/O-6 & above)
- Concentrate on training young architects on **analysis** that provides answers to acquisition and program management...give architecture value that users can see
- Institutionalize architecture certification as a core element for development of Services or any agency development of architectures
- Training ideas suggested - *apprentices*
- Required that architectures be developed by a DOD certified architect as part of DoD approval process
- “Management View”...presenting architectures to upper management in their language [Richard Burk “OUTCOMES” – analysis results]
 - Simple AS IS, TO BE and OBJECTIVE Architectures at a high level to **brief FLAG officers and Senior management** who have no IT/architecture background
- DOTLMPF analysis methodologies & techniques lacking
- Continue evolving DARS interoperability specification and continue certifying COTS's tools based on the spec



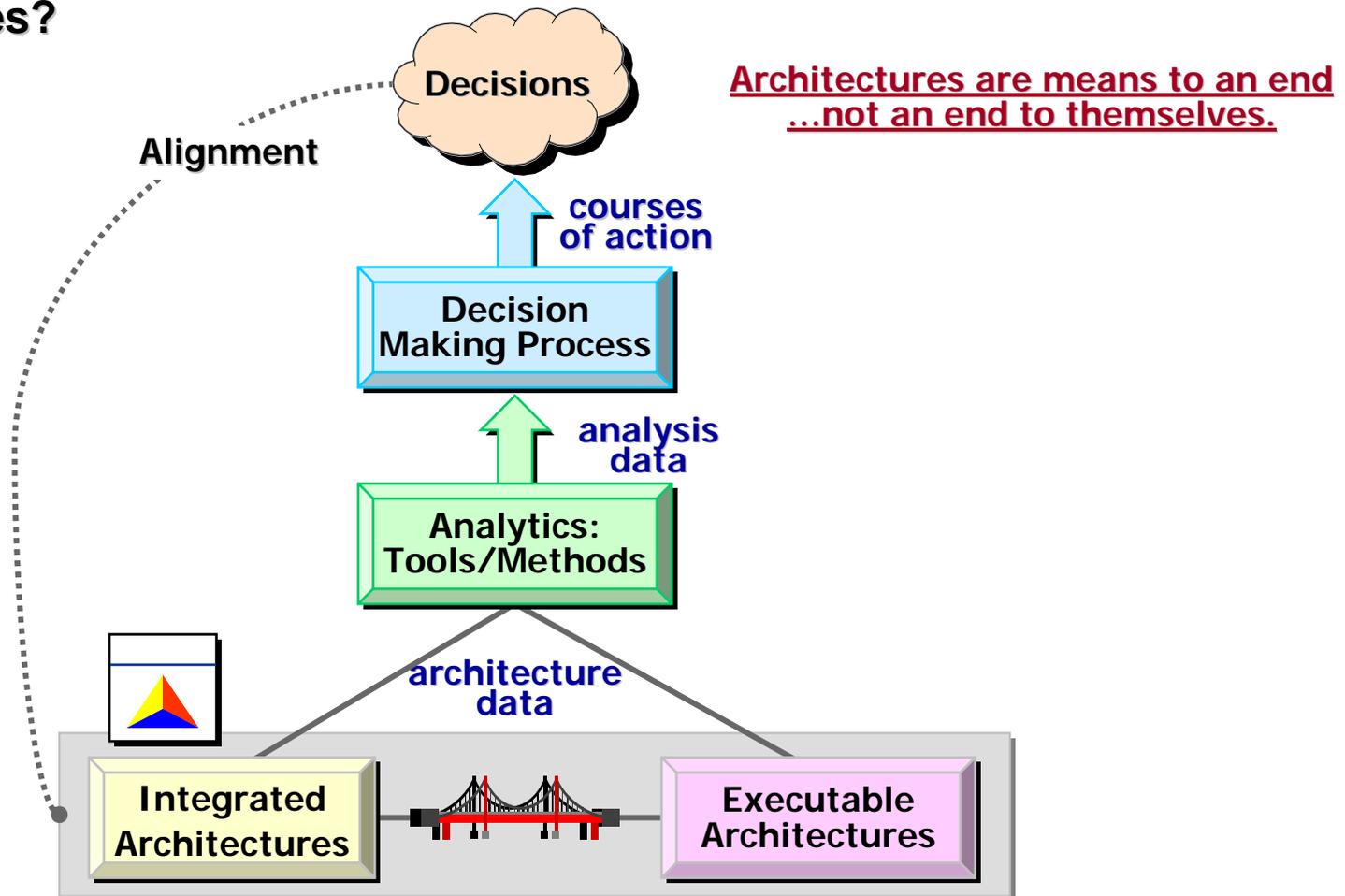
Recommendations – 2/2

- Increase collaborative efforts on architecture products (**Arch Federation effort**)
- Develop Joint Common Operational Activity List (**COAL**) and Joint Common System Function List (**CSFL**) to enable common context and content of architecture products across all Services architectural efforts
- Tool interoperability...tools that work well to adopt directives to mandate DoDAF and DAR
- DoD “version” of JP 1-02 Acronyms and Abbreviations (or an extension, update?)
- Promote architecture success stories
- Address DoDAF weakness issues
- Increase awareness of value and need for Executable Architectures in the full spectrum of DOTLMPF analysis and DoDAF v2.0 overlays
- Emphasis must be shifted away from “**Product-Centered**” architectures to “**Data Centric**” architectures
 - Need disciplined approach to developing fully integrated, unambiguous, and consistent architectures
 - Aligning integrated architectures to the decision making process can only be achieved by defining the core architecture data elements, their views, how they are all related together, and the resulting analysis used in the decision making process
 - Investigate DoDAF products that are being least produced (SV-10a, SV-10b), maybe reduce or even add new products??



Conclusion - the Roadmap to Decisions

- How do I develop integrated architectures?
- How do I analyze integrated architectures?
- How do I make decisions based on analysis from integrated architectures?





Actions



- DoDAF Vol I, II, III currently being rewritten to address issues presented here

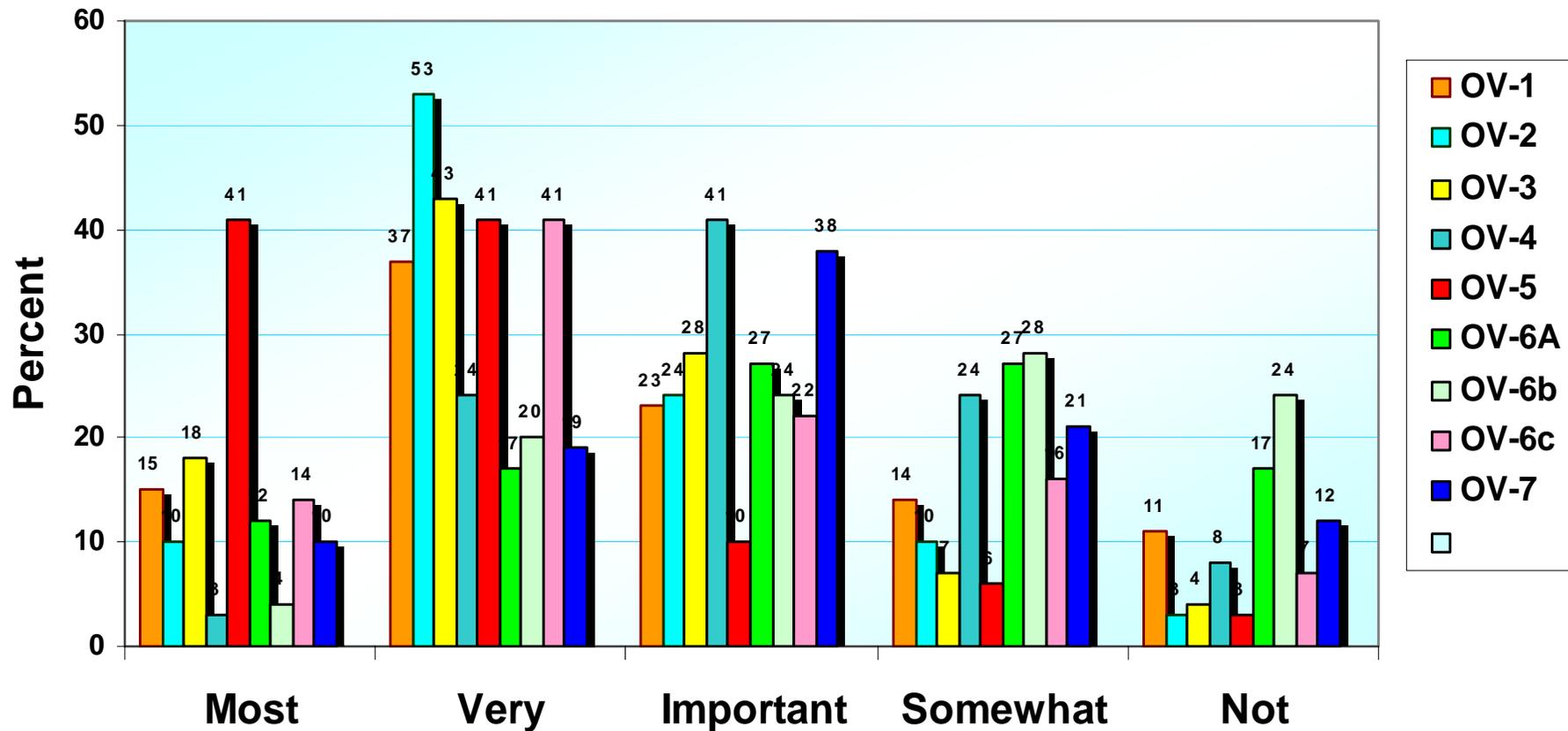


BACKUP



OV Product Ratings

Each DoDAF product rated as to relevance and importance - OVs





SV Product Ratings

Each SV DoDAF product rated as to relevance and importance

