Integrated Architecture-Based Portfolio Investment Strategies

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The Future of C2

Assessment, Tools, and Metrics, #343

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Agenda

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- Present DoD Governance, Policies, and Directives
- Discuss gap in integrated architecture-based investment decisions
- Present our approach to fill this gap
  - Start with integrated architectures
  - Transition to executable architectures
- Present Portfolio Investment Analysis
  - PALMA™ – *an investment analysis tool*
- ***Present linking integrated and executable architecture analysis with investment portfolio selection***
  - ***6 step process***
- Summary

DoD Transformation Governance and Policy

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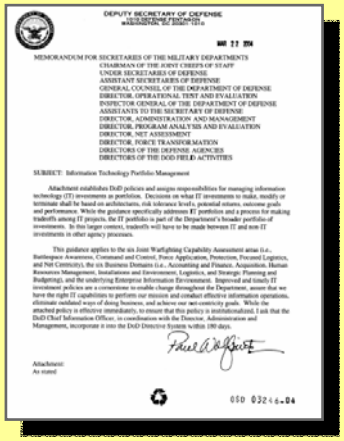
Information Technology Portfolio Management: ITPM

Establishes DoD policy for managing Information Technology (IT) investments as portfolios to improve business and warfighting outcomes and capabilities

OSD 03246-04



DEPUTY SECRETARY OF DEFENSE
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MAR 22 2004

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
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DIRECTOR, PROGRAM ANALYSIS AND EVALUATION
DIRECTOR, NET ASSESSMENT
DIRECTOR, FORCE TRANSFORMATION
DIRECTORS OF THE DEFENSE AGENCIES
DIRECTORS OF THE DOD FIELD ACTIVITIES

SUBJECT: Information Technology Portfolio Management

Attachment establishes DoD policies and assigns responsibilities for managing information technology (IT) investments as portfolios. Decisions on what IT investments to make, modify or terminate shall be based on architecture, risk tolerance level s, potential returns, outcome goals and performance. While the guidance specifically addresses IT portfolios and a process for making tradeoffs among IT projects, the IT portfolio is part of the Department's broader portfolio of investments. In this larger context, tradeoffs will have to be made between IT and non-IT investments in other agency processes.

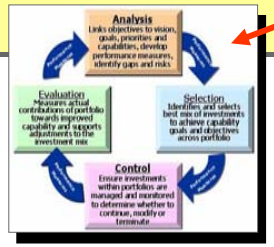
This guidance applies to the six Joint Warfighting Capability Assessment areas (i.e., Battlespace Awareness, Command and Control, Force Application, Force Protection, Focused Logistics, and Net Connectivity), the six Business Domains (i.e., Accounting and Finance, Acquisition, Human Resources Management, Installations and Environment, Logistics, and Strategic Planning and Budgeting), and the underlying Enterprise Information Environment. Improved and timely IT investment policies are a cornerstone to enable change throughout the Department, assure that we have the right IT capabilities to perform our mission and conduct effective information operations, eliminate outdated ways of doing business, and achieve our net-centricity goals. While the attached policy is effective immediately, to ensure that this policy is institutionalized, I ask that the DoD Chief Information Officer, in coordination with the Director, Administration and Management, incorporate it into the DoD Directive System within 180 days.

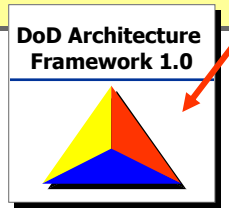
Attachment:
As stated

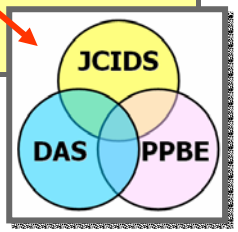
OSD 03246-04

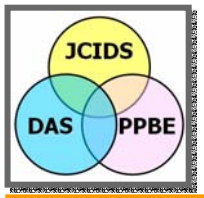
March 2004

"IT [Information Technology] investment policies are a cornerstone to enable change throughout the Department. …It is DoD policy that IT investments shall be *managed as portfolios*…using integrated strategic planning, *integrated architectures*, *measures of performance*, risk management techniques, transition plans, and *portfolio investment strategies*...*Portfolio management processes* shall be comprised of *core activities*: *Analysis, Selection, Control, Evaluation* and leverage principal *Decision Support Systems* (JCIDS, PPBE, and DAS)"









Three DoD Decision Support Systems

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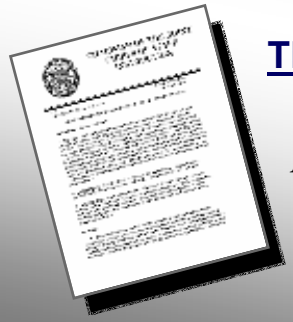
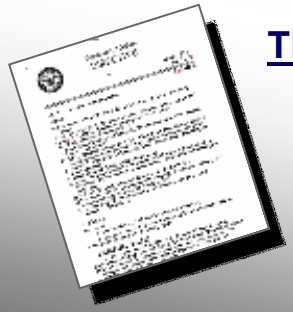


The Defense Acquisition System (DAS) - DoDD 5000.1 & DODI 5000.2

"Exists to manage the nation's investments in technologies, programs, and product support necessary to achieve the National Security Strategy and support the United States Armed Forces"….Assigns roles and responsibilities for "developing joint integrated architectures for capability areas as agreed to by the Joint Staff"

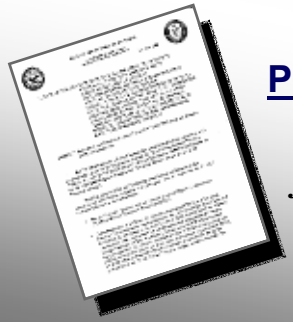
DAS



The Joint Capabilities Integration and Development System (JCIDS) - CJCSI&M 3170

"JCIDS implements a capabilities-based approach …. to identify improvements to existing capabilities and to develop new warfighting capabilities…. requires a collaborative process that utilizes joint concepts and integrated architectures to identify prioritized capability gaps and integrated DOTMLPF solutions .. to resolve those gaps."

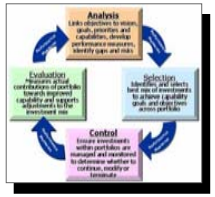
JCIDS



Planning, Programming, Budgeting, and Execution (PPBE) – MID 913

*The DoD Resource Allocation System to "provide warfighter with best mix of forces, equipment and support attainable under fiscal constraints….new emphasis on using performance metrics to focus on output, return on investment"**

PPBE



Portfolio Management Process

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Analysis
Links objectives to vision, goals, priorities and capabilities, develop performance measures, identify gaps and risks

Performance Measures

Selection
Identifies and selects best mix of investments to achieve capability goals and objectives across portfolio

Performance Measures

Control
Ensure investments within portfolios are managed and monitored to determine whether to continue, modify or terminate

Performance Measures

Evaluation
Measures actual contributions of portfolio towards improved capability and supports adjustments to the investment mix

Performance Measures

Ref: OSD 03246-04

Integrated Architectures Integral Component of ITPM

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ITPM

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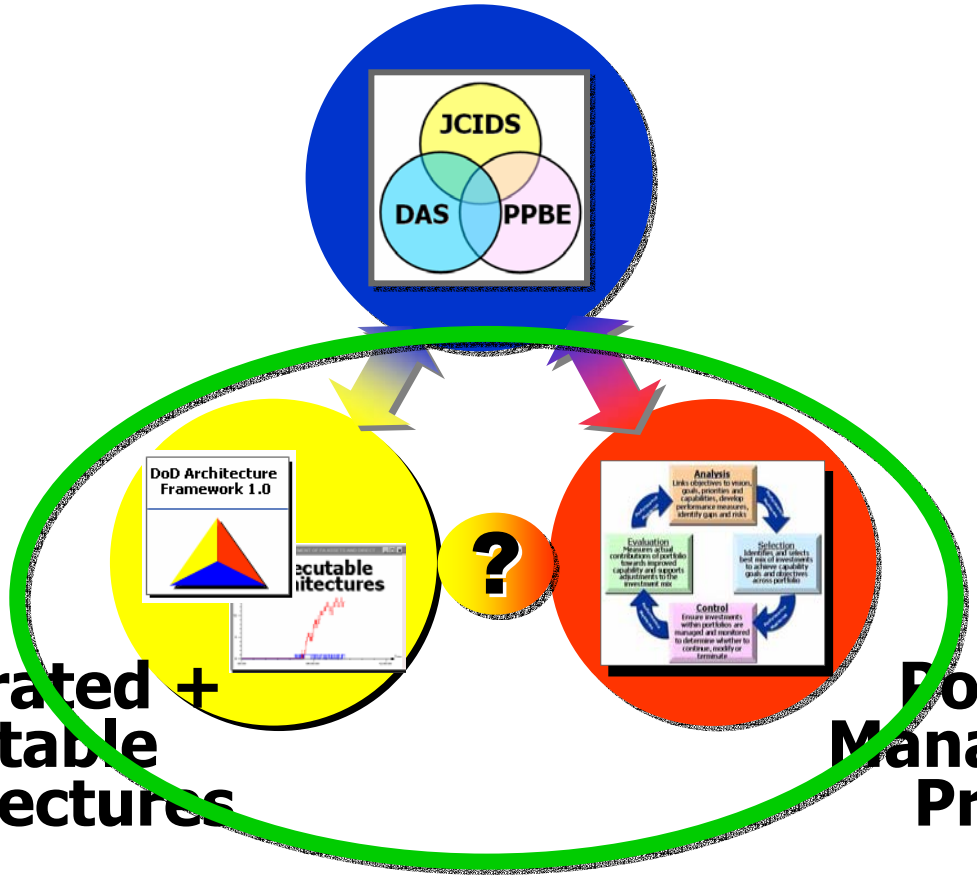
Decision Support Systems



Integrated + Executable Architectures

Portfolio Management Process

Currently, architecture-based investment decisions are not prevalent in DoD

We Seek To Fill This Gap

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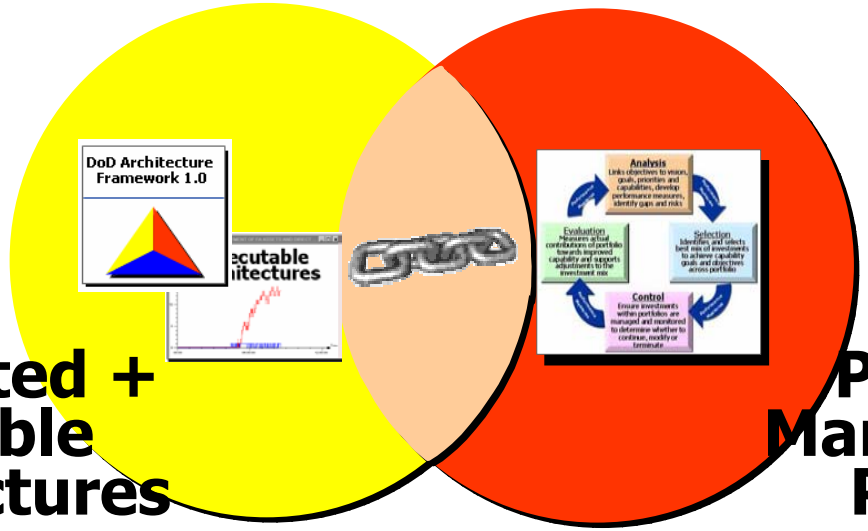
- By linking integrated architecture modeling and performance analyses with analytical methods and models used to identify optimal portfolios of investments
  - Will enable a robust analytical foundation for capability and architecture-based investment decisions
  - Will fully support critical DoD transformation goals, policies, and directives



Integrated + Executable Architectures

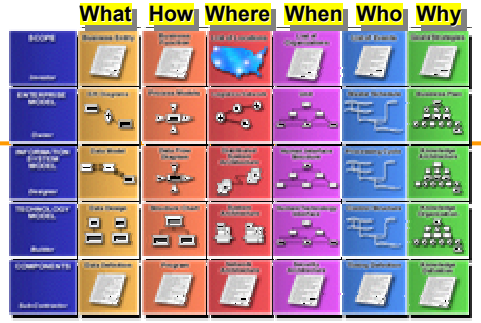
Portfolio Management Process

Developing Integrated Architectures (IA)

- Start with fully integrated, unambiguous, and consistent DoDAF views using Activity-Based Methodology (ABM)*
- ABM is new paradigm for developing Integrated Architectures
  - Enables both "As-Is" (now) and "To-Be" (future) architecture development, gap-analysis, and assessment
  - Uses data centric architecture elements and product renderings and cross-product relationships based on core set of symmetrically aligned architecture elements
  - Incorporates built-in automation that
    - Ensures data consistency leading to quality architecture data and products
    - Results in more accurate and valuable architecture analysis not subject to misinterpretation
- ABM captures sufficient representations of "static" architectures to transition to "dynamic" executable process models

* Activity-Based Methodology is a concept developed by The MITRE Corporation and Lockheed-Martin, Copyright © 2003

ABM Abstract Core



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How by Who

Who at Where

Where
Nodes

groups

How
Functions

controls

Why
Rules

groups

accomplishes

produces

consumes

selects

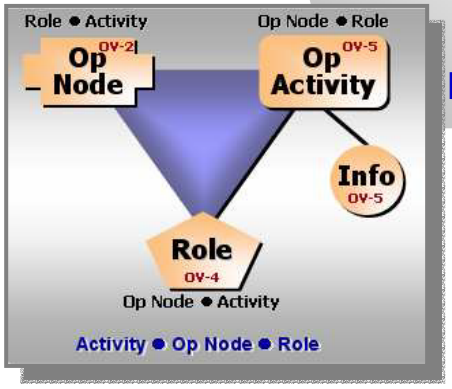
Who
Resources

What
Products

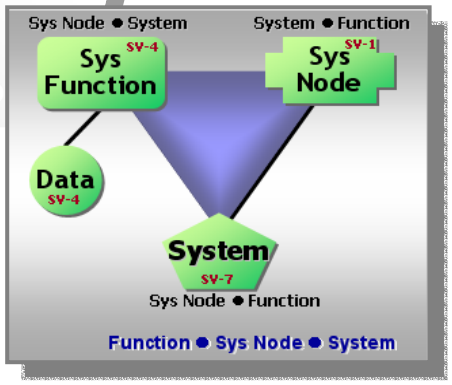
When
Events

How at Where

How at Where by Who



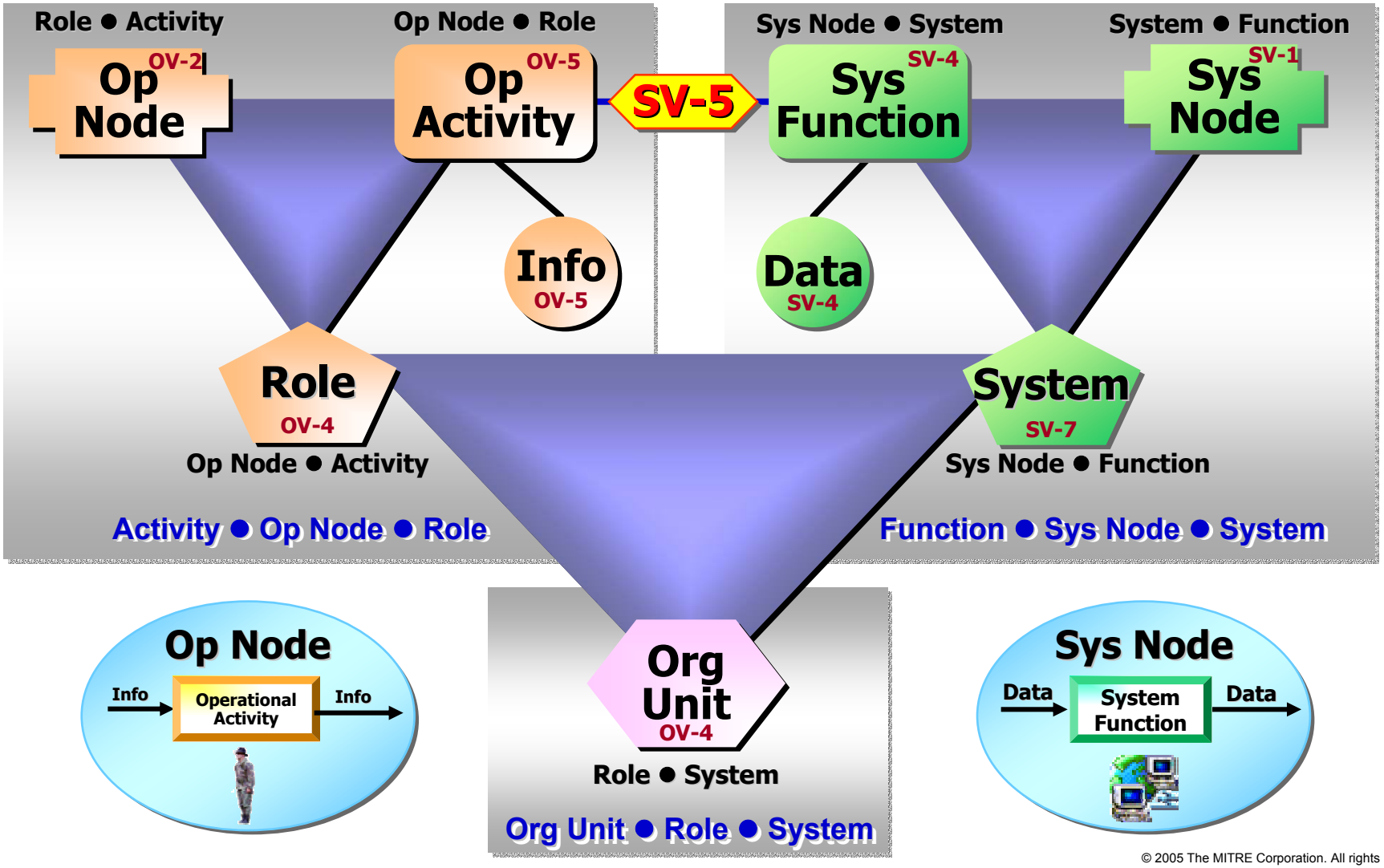
Operational



System

Foundation of an Integrated Architecture

ABM Triple 3-Way Associations Between Core Elements



Integrated Architecture Represented as Conceptual *Architecture Specification Model – "ASM"*

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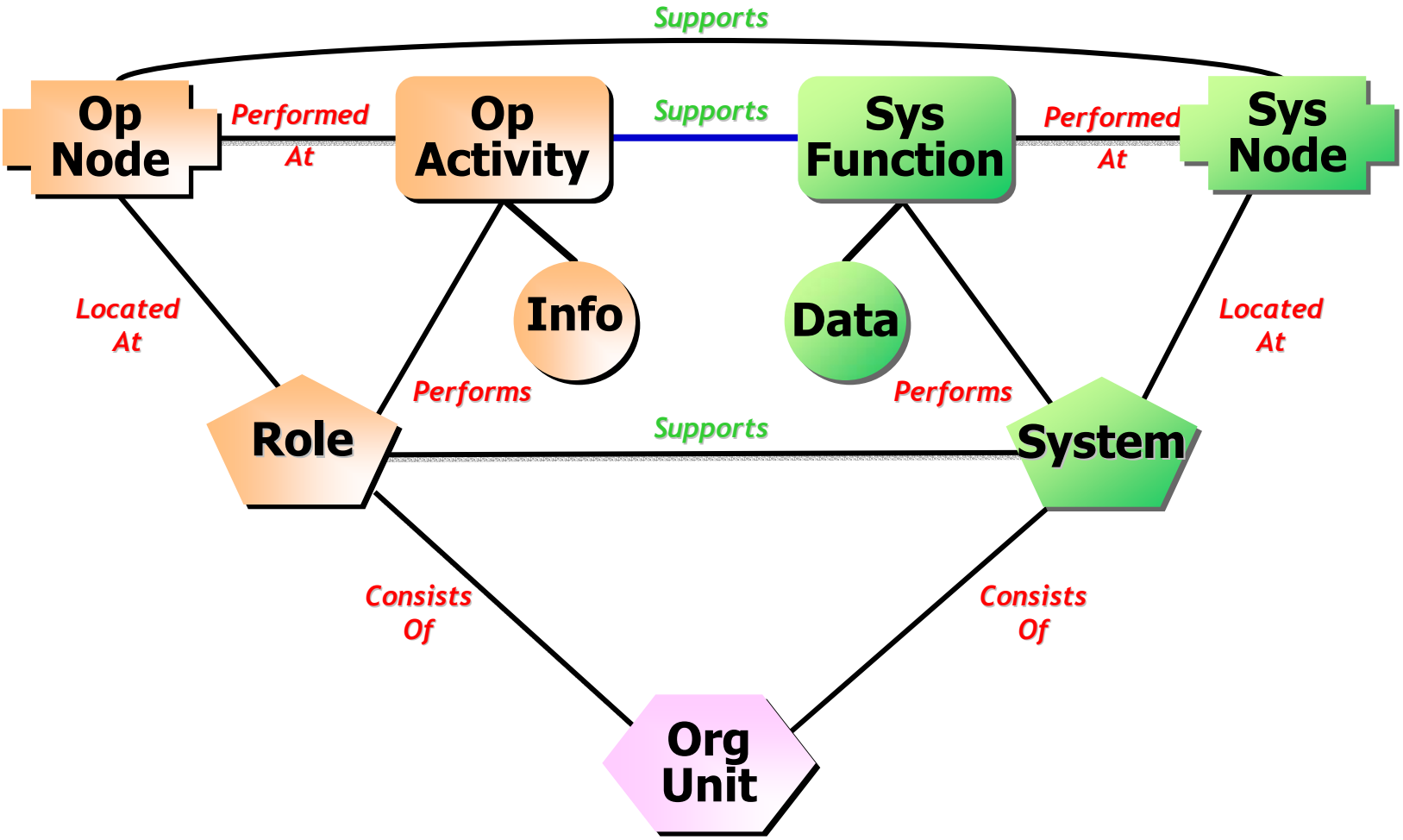

ABM Workflow Steps to IA - Operational

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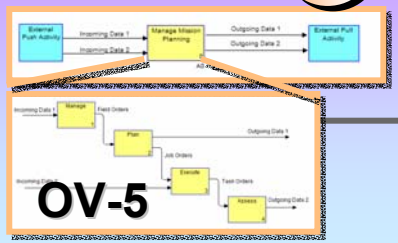
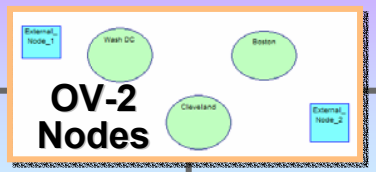
Activity

Info

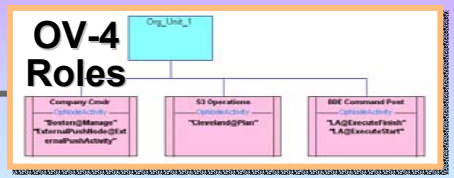


Op Node



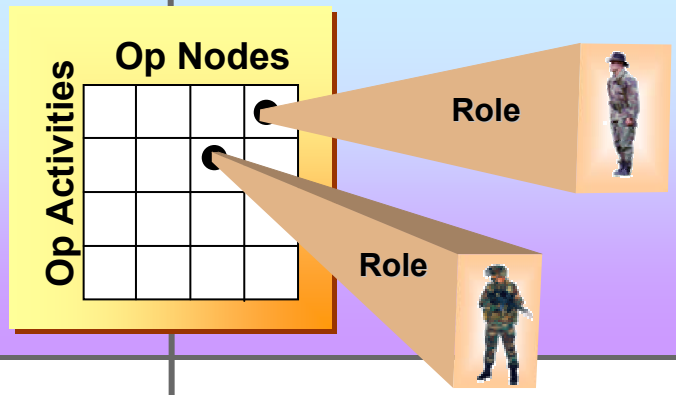
Data Entry

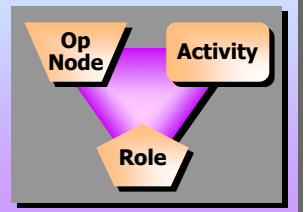
Role



Art of Architecture

Manual 3-way Associations





Act1
"NodeA~RoleX"

NodeA
"Act1~RoleX"

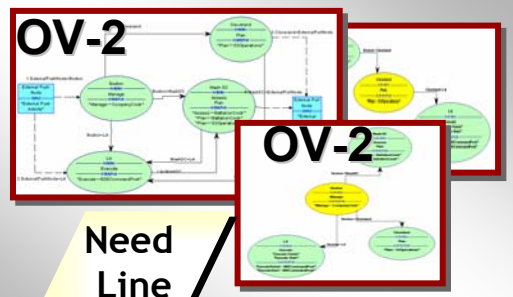
RoleX
"NodeA~Act1"

Auto form 3-way associations

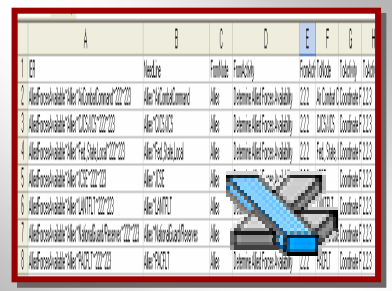
Automation

Info Exchange

Render Information Exchanges



Complete OV-2



Generate OV-3

What Are Executable Architectures?

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Integrated "Static" Architectures → **Executable "Dynamic" Architectures**

Only shows that Activities "*must be capable of*" producing and consuming Information

Goes *beyond* "*must be capable of*" producing and consuming Information

No Details on…

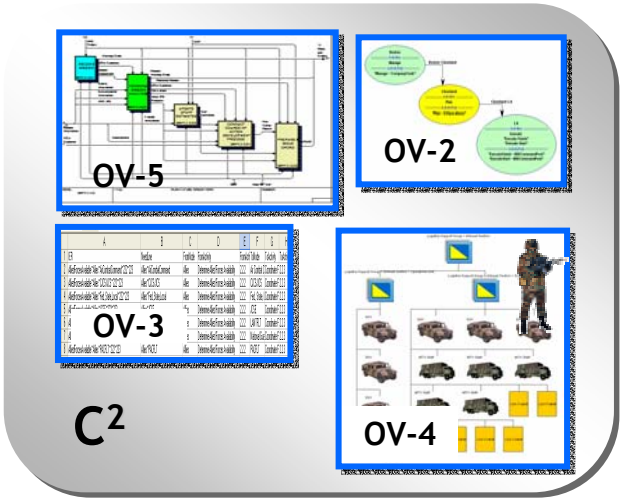
- Event sequencing and ordering
- How or what conditions information is produced and consumed
- Producers/ consumers or other resources used

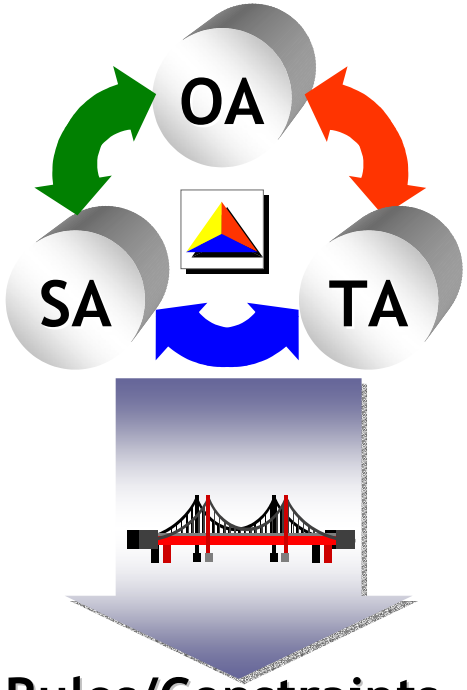
Defines precise…

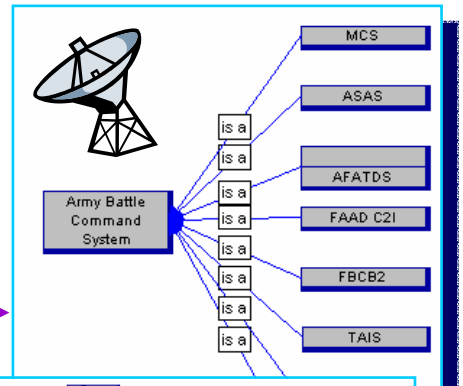
- ✓ Sequential/ concurrent event flows, ordering & timing
- ✓ Rules and conditions on which Information is produced and consumed
- ✓ Details on producers and consumers – their numbers, process ordering, and when [not] available

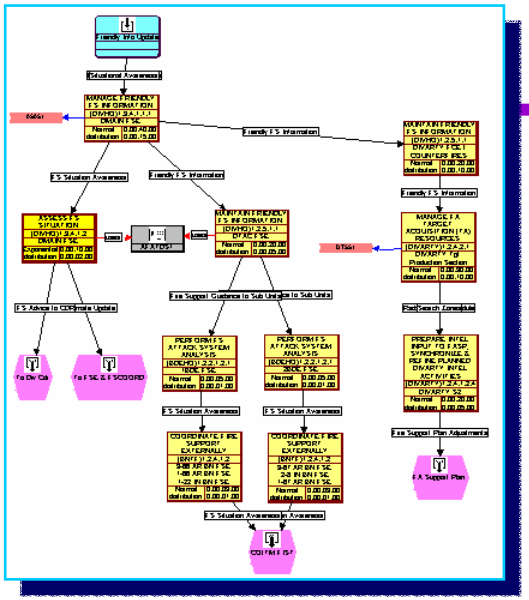
***Defn**: Dynamic model of Activities and their event sequencing performed at Operational Nodes by Roles (within Organizations) using Resources (Systems) to produce and consume Information*

Transforming DoDAF Views to "Dynamic" Views





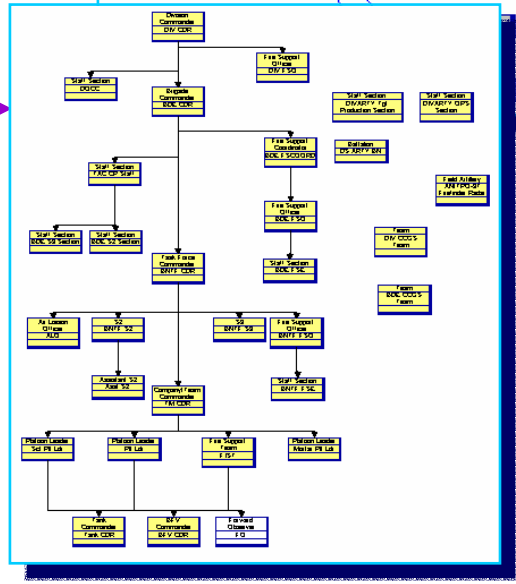




Rules/Constraints

Process View

Resource Views



Roadmap to *Actionable Portfolio Investment Strategies*

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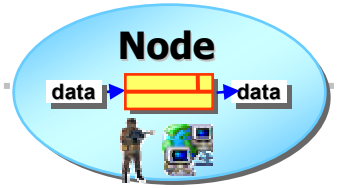
- Activities
- Roles
- Systems
- Nodes



System Architect™

DoDAF
+ Architecture Tools

Bonapart™

M&S Tools
+ Mission Scenarios

Integrated Architectures

OV3 SV5 SV6

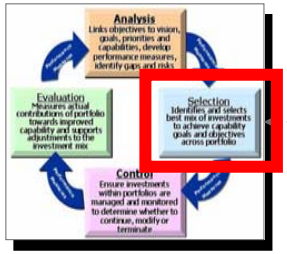
Executable Architectures

Analytical Tools
+ Analysis Methods

PALMA™

Portfolio Analysis Tools

Actionable Architectures



Actionable Portfolio Investment Strategy

So What is A Portfolio Investment Analysis?

Investment

- Something on which I can expend funds

Portfolio

- DOTMLPF investments in the form of materiel resources (person, facility, equipment, platform, …) or non-materiel resources (training, education, etc) required to accomplish a mission or outcome

Portfolio Investment Analysis

- Process for assessing pros and cons of different combinations of investments based on specific mission goals

***Defn**: Methods or processes to help decision makers select the "best" combination of investments from a set of potential investment options that will achieve mission-level performance objectives and outcomes in an efficient manner*

PALMA™*
A Portfolio Investment Analysis Tool

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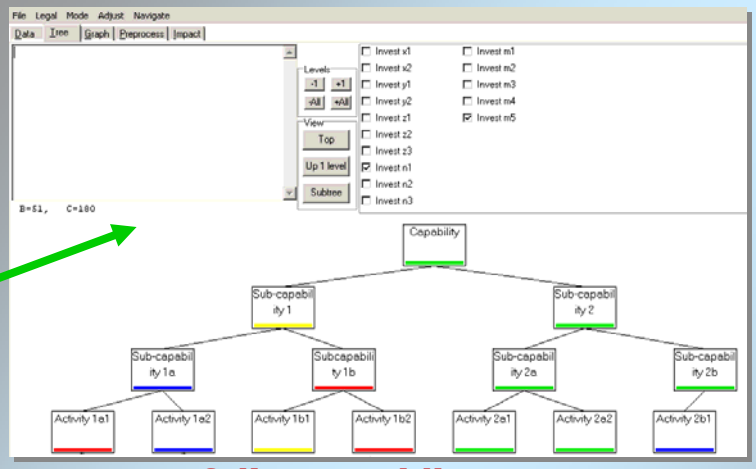
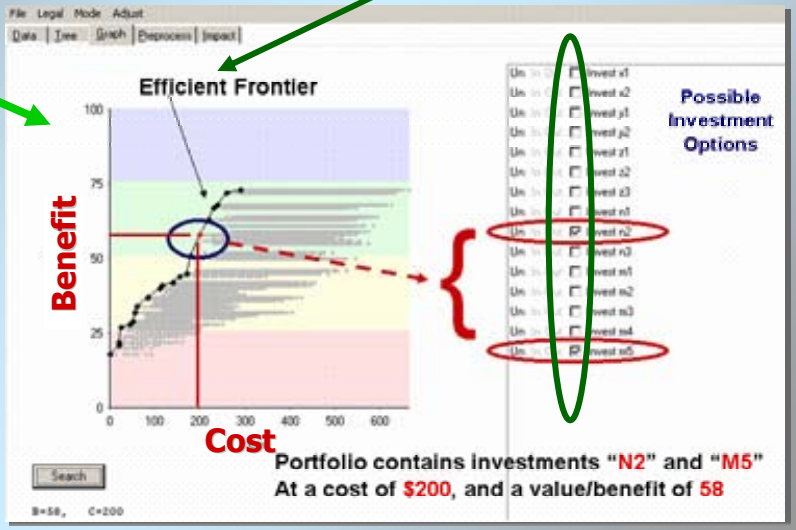
- Decision support tool developed by MITRE that facilitates Capability-Based investment analysis
- Brings together
  - Investment options
    - Costs and what they do for you (detailed impacts)
  - How each fits into your overall goals (hierarchical decomposition of mission needs)
- Develops "Efficient Frontier"
  - Identifies unique portfolios options (and elements in each) providing most benefit at a specific budget or funding level
- Strengths
  - Sophisticated search algorithms derive optimal benefit/ cost portfolio
  - Investment options planned over multiple years and separated by "colors" of money
  - Can conduct variety of "what-if" scenarios
  - Ability to identify critical paths so that for any model, one can determine where to direct a new investment to create the greatest marginal benefit



Portfolios providing greatest benefit for least cost



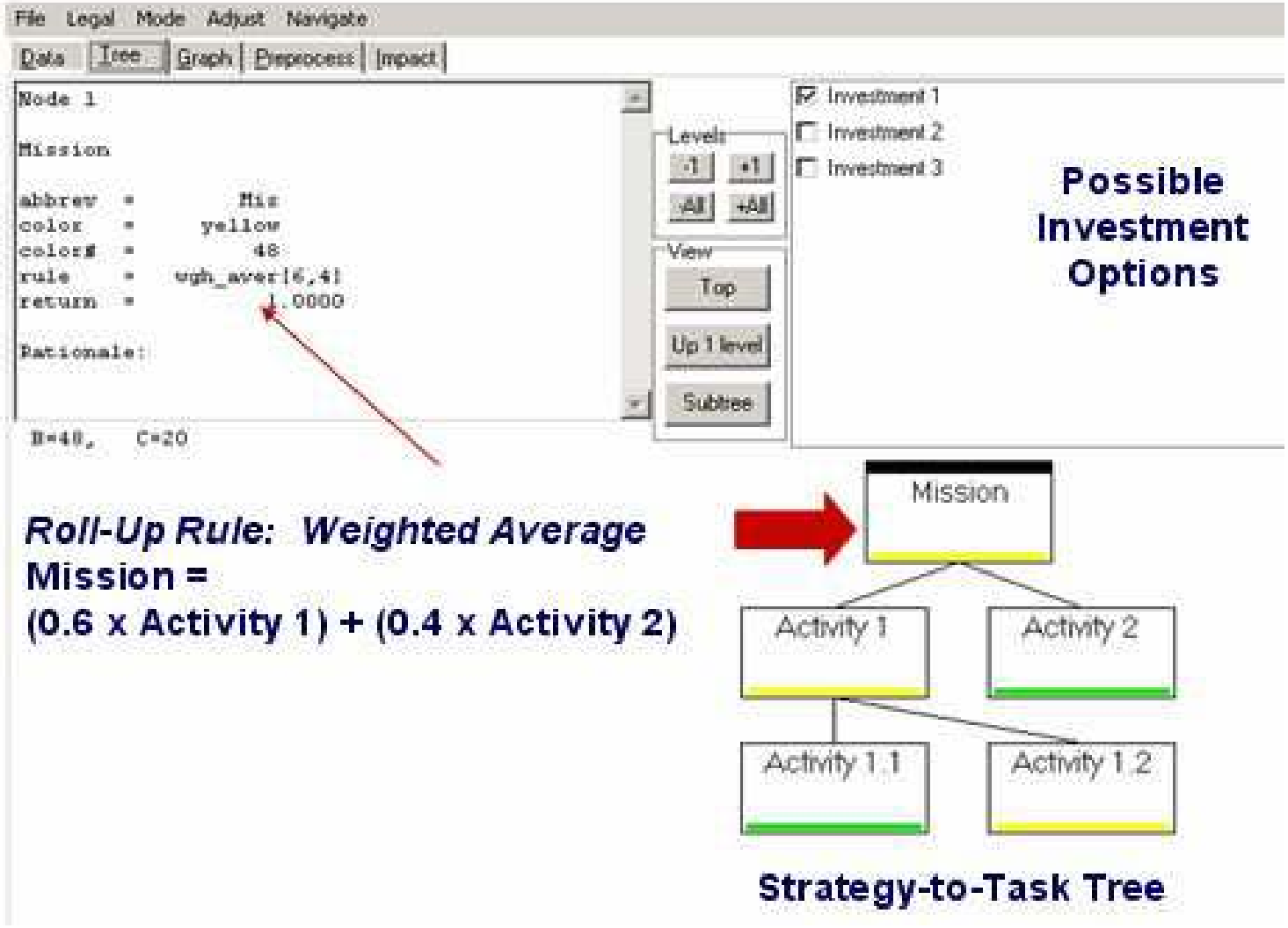
** Portfolio Analysis Machine*

Building the PALMA "Strategy-to-Task" Tree

- Mission goal decomposed into its constituent activities, creating hierarchical decomposition or "strategy-to-task" tree
- "As-is" conduct of activities is related to "baseline" (or current) *value* they provide to the mission through a "scoring" process
  - Assessed as the lowest level of the tree
- Each activity is measured on a value scale of 0-100 based on how well it meets some criteria (i.e. *requirements, success, risk*,…)
  - Color representations for different score regions
    - 76-100 – exceeds criteria
    - 51-75 – meets criteria
    - 26-50 – partially meets criteria
    - 0-25 – does not meeting criteria

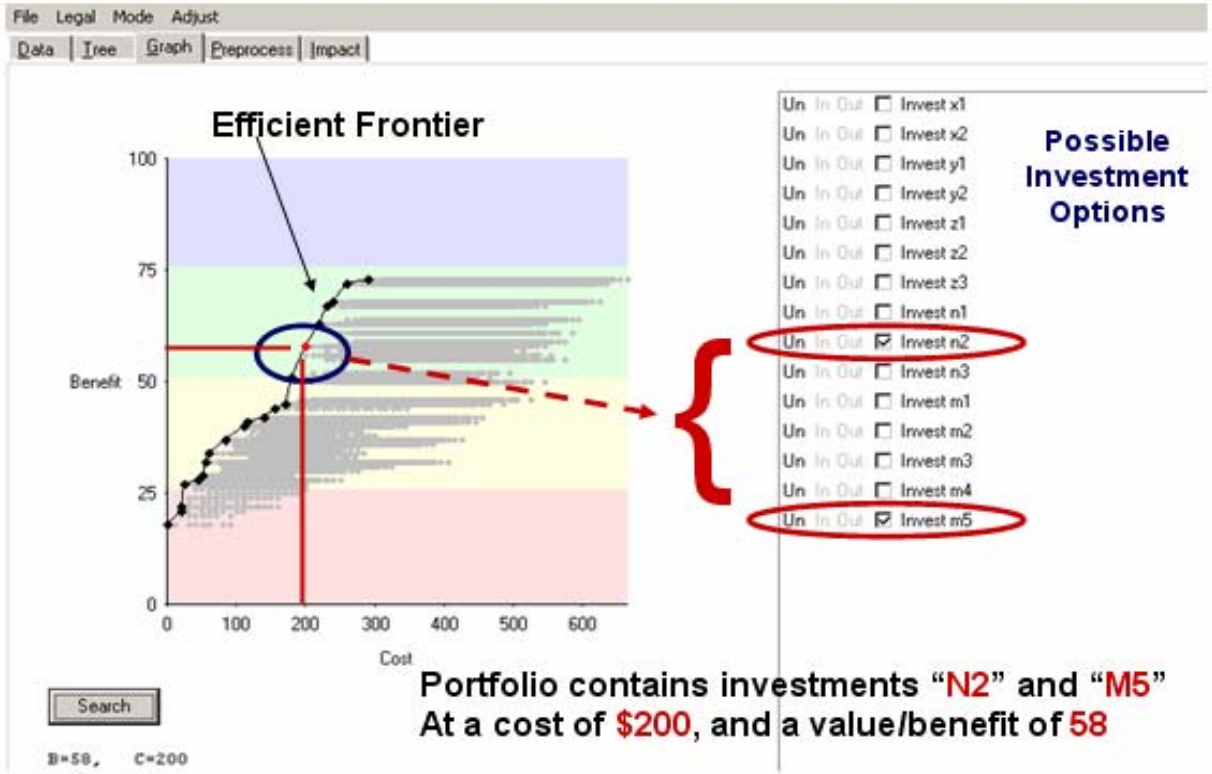
- "Roll-up rules" assessed to determine overall mission score based on individual activity scores
  - Roll up rules identify mathematical relationship between the "parent task" and its "children" in the "strategy-to-task" tree

Example PALMA "Strategy-to-Task" Tree



Generate the "Efficient Frontier"

- For each investment
  - Understand both cost and increase in value that would occur for each activity the investment impacts (e.g., if investment 1 is funded, the value of activity 1.1 will change from 30 to 60)
- PALMA optimization algorithms generate the "Efficient Frontier"
  - Portfolios that provide the greatest overall benefit (y axis) for a specific budget or funding level (x-axis)



Workflow Steps to an IA-Based Portfolio Investment Strategy

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Integrated Architectures

System Architect

1

Bonapart

Executable Architectures

2 Warfighter Value

"Manage Plan"

"Perform Event"

SME Value Assessment Functions

"Manage Plan"

Value

β_1

Performance (time)

3

"Perform Event"

Value

β_2

Performance (time)

β = Related to how well activity meets criteria (Value) vrs how long it takes (Performance)

6

Palma

5

3

4

Capability

Sub-capability 1

Sub-capability 2

Sub-capability 1a

Sub-capability 2a

Sub-capability 2b

Activity 1a1

Activity 1a2

Activity 1b1

Activity 1b2

Activity 2a1

Activity 2a2

Activity 2b1

Portfolio Analysis Model (PALMA)

Summary

- Wide applicability within DoD and other Government Agencies
- Demonstrates way-ahead and shows value for an architecture-based investment decision-making process directly linked to mission objectives and their outcomes
- Provides a robust analytical foundation for capability and architecture-based portfolio investment decisions
  - Relate impact of any set of investment options to achievements of high level "strategic" objectives
- Architecture-based portfolio measurements and assessment of outcomes can help identify
  - Critical mission capabilities (keep)
  - Unnecessary duplication of mission elements (eliminate)
  - Gaps, overlaps, and deficiencies (recommend alternates [new?])
- Fully supports DoD transformation goals, guidelines, and policies
  - Showed how to transform and evolve organizations, processes and modes of operation to adapt to new roles, relationships, technologies, and capabilities