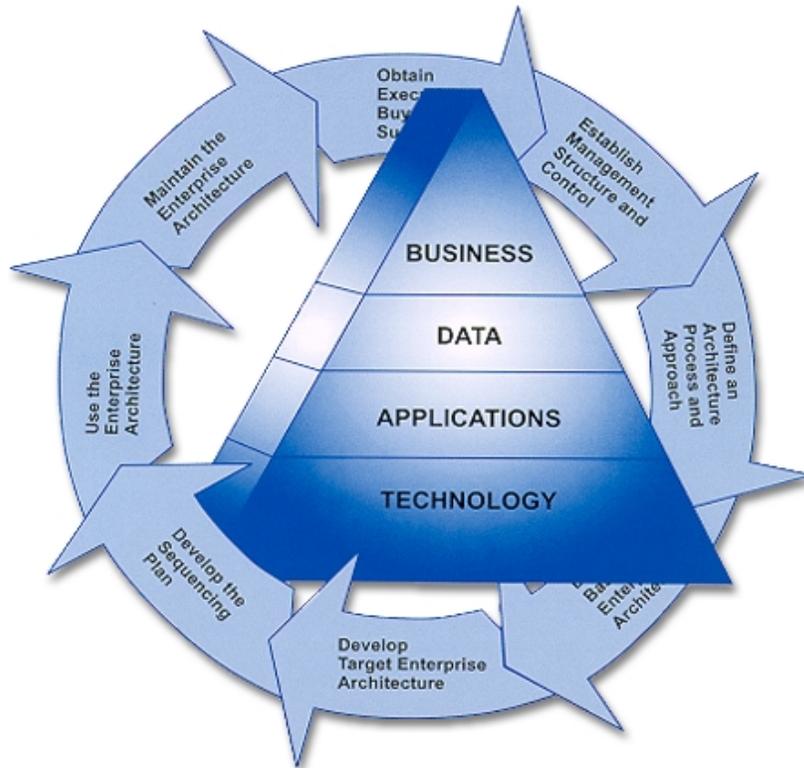




Practical Guide to Federal Enterprise Architecture

Version 1.0, February 2001



Software Technology Conference Tutorial:

28 April 2002

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Background



What Is the Federal CIO Council?

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- **Authority**

- Executive Order 13011, Federal Information Technology, establishes a Chief Information Officers Council (the CIO Council) as the principal interagency forum to improve agency practices for the management of information technology

- **Purpose**

- The CIO Council serves as the principal forum for executive agency CIOs to
 - ❖ Develop recommendations for overall federal ITM policy, procedures, and standards
 - ❖ Share experiences, ideas, and promising practices
 - ❖ Identify opportunities, make recommendations for, and sponsor co-operation in using information resources



Federal CIO Council Membership

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- **Chair, Deputy Director of Management, OMB**
- **Vice-Chair**
- **CIOs and Deputy CIOs from agencies listed in the Executive Order**
- **Administrator, Office of Federal Procurement Policy, OMB**
- **Administrator, Office of Information and Regulatory Affairs, OMB**
- **Controller, Office of Federal Financial Management, OMB**
- **Senior Representative of the Office of Science and Technology Policy**
- **Chair of the Government Information Technology Services Board**
- **Chair of the Information Technology Resources Board**
- **Two Small Agency Council representatives**
- **Ex officio members**
 - GAO
 - Chief Financial Officers Council representative
 - Others designated by vote of the CIO Council



The Home of the *Practical Guide*

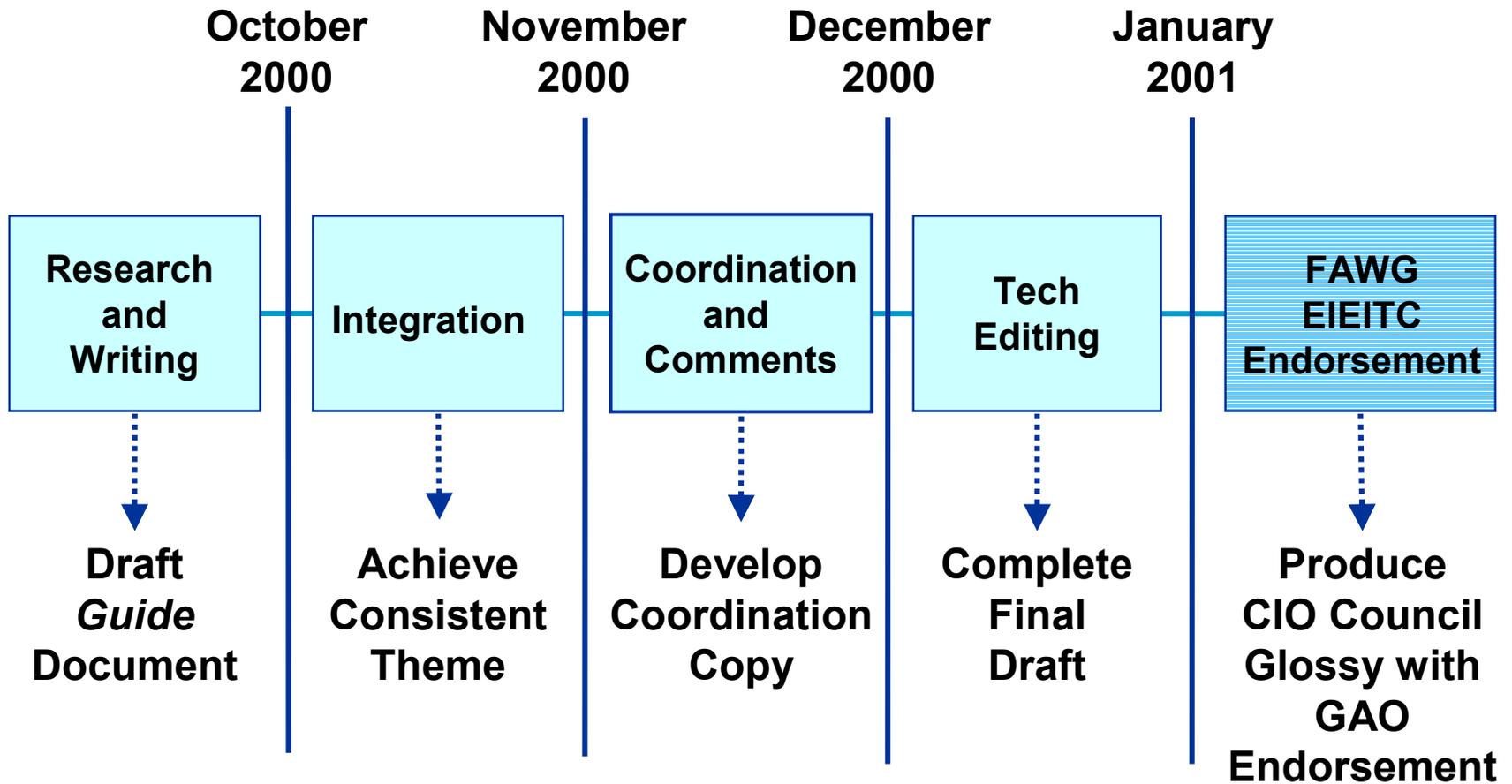
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- **The CIO Council has the authority to establish standing committees and working groups as necessary to consider items of concern**
 - EIEITC: original focus infrastructure and interoperability
 - Because of significant focus on architecture, name was changed to Federal Architecture and Infrastructure Committee (FA&IC)
- **Federal Architecture and Infrastructure Committee**
 - Federal Architecture Working Group (FAWG)
 - ❖ *Federal Enterprise Architecture Framework*, v.1.1, September 1999
 - ❖ *Architecture Alignment and Assessment Guide*, October 2000
 - ❖ *A Practical Guide to Federal Enterprise Architecture*, v.1.0, February 2001



Development Timeline for *Practical Guide*

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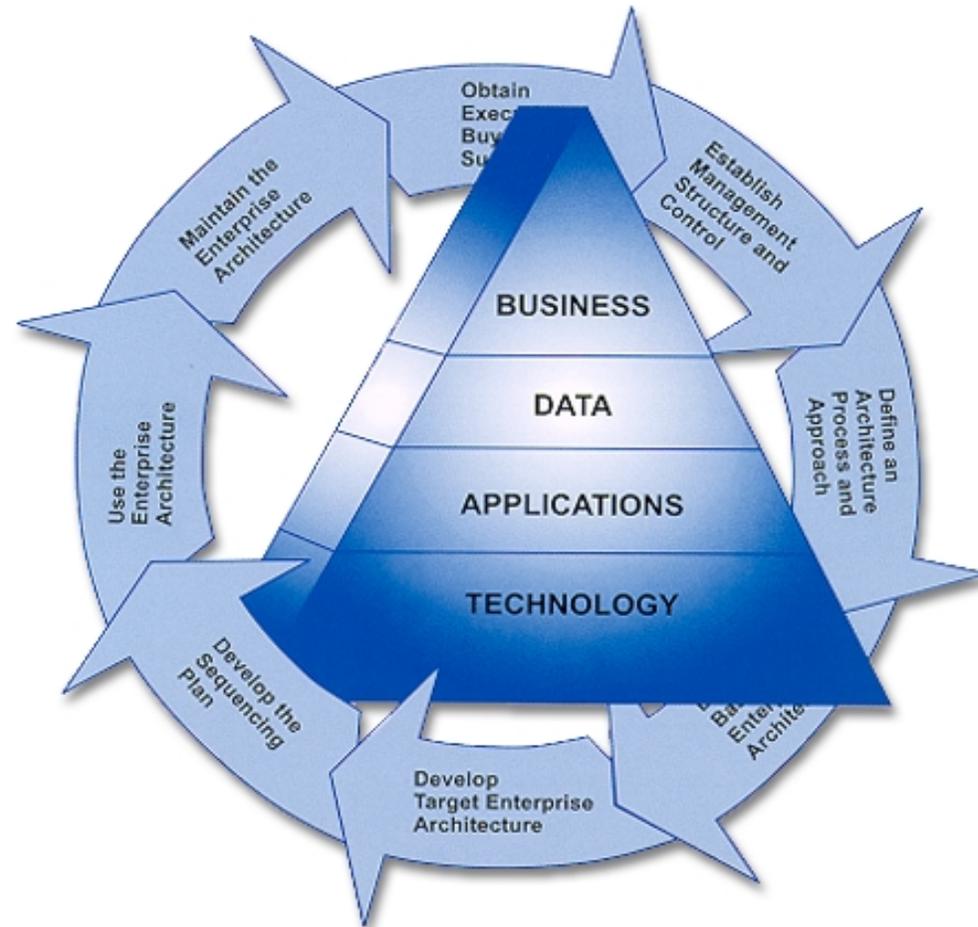




Practical Guide Key Concepts

MITRE

Cover Graphic



Central Theme

- Architecture facilitates Change
- Architects are Change Agents

Lessons Learned

- Must follow all phases
- Live by Principles

Processes within Processes

- EA Processes within ELC
- EA Process supports CPIC Process
- EA Process supports SDLC
- 6-step EA Development Process



Section 1 – Introduction

- **Purpose**

- Provide guidance to federal agencies in initiating, developing, using, and maintaining an Enterprise Architecture (EA)

- **Scope**

- Guide focuses on the EA process, products, and roles and responsibilities while relating to CPIC process

- **Audience**

- All federal agencies and their executives and staff who need to engage the EA process

- **How to Use**

- Steps to follow for most efficient use

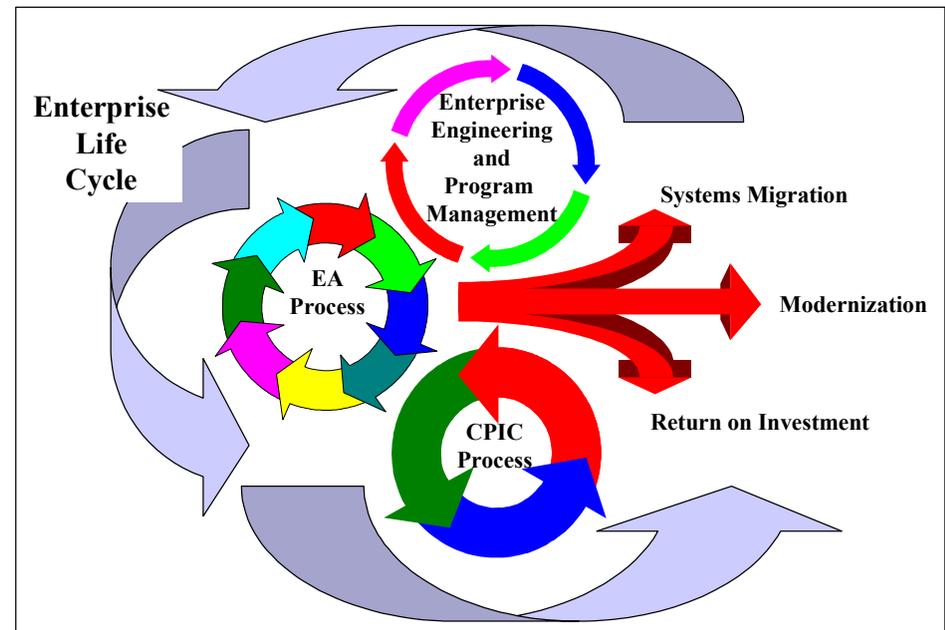
- **Related Documents**

- OMB Circular A–130
- AAAG
- FEAF
- Smart Practices in Capital Planning



Section 2 – Definitions, Drivers, and Principles

- Key definitions
- EA principles
- Enterprise Life Cycle
- Uses and benefits of an EA
- Legislation and other guidance
- The EA process





Key Definitions

- **Architecture**

- The structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time

- **Enterprise**

- An organization (or cross-organizational entity) supporting a defined business scope and mission. An enterprise includes interdependent resources (people, organizations, and technology) who must coordinate their functions and share information in support of a common mission (or set of related missions).

- **EA products**

- The graphics, models, and/or narrative that depict the enterprise environment and design



Need for an EA

An EA is

- **A strategic information asset base that defines the**
 - **Mission**
 - **Information necessary** to perform the mission
 - **Technology necessary** to perform the mission, and
 - **Transitional processes** for implementing new technologies in response to the changing mission needs
- **An EA includes a baseline architecture, target architecture, and a sequencing plan**

The EA defines where the enterprise is today... and where it plans to be in the future



Enterprise Architecture

Baseline Architecture

Operational
View

Systems
View

Target Architecture

Operational
View

Systems
View

Technical View

Sequencing Plan/Release Architecture



Key Definitions

- **Baseline architecture**

- The set of products that portray the existing enterprise, the current business practices, and technical infrastructure. Commonly referred to as the “As-Is” architecture.

- **Target architecture**

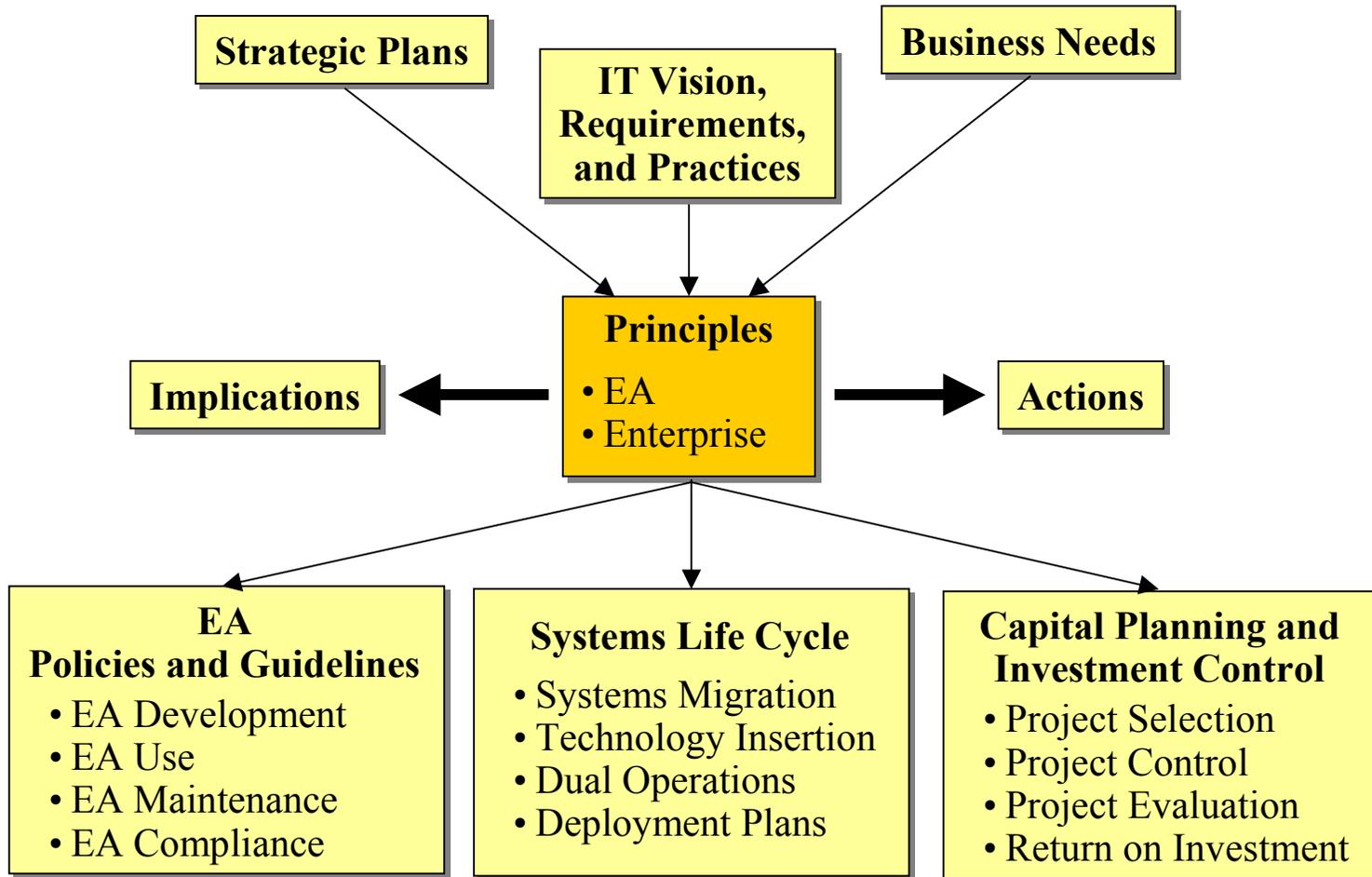
- The set of products that portray the future or end-state enterprise, generally captured in the organizations’ strategic thinking and plans. Commonly referred to as the “To-Be” architecture.

- **Sequencing Plan**

- A document that defines the strategy for changing the enterprise from the current baseline to the target architecture. It schedules multiple, concurrent, interdependent activities, and incremental builds that will evolve the enterprise.



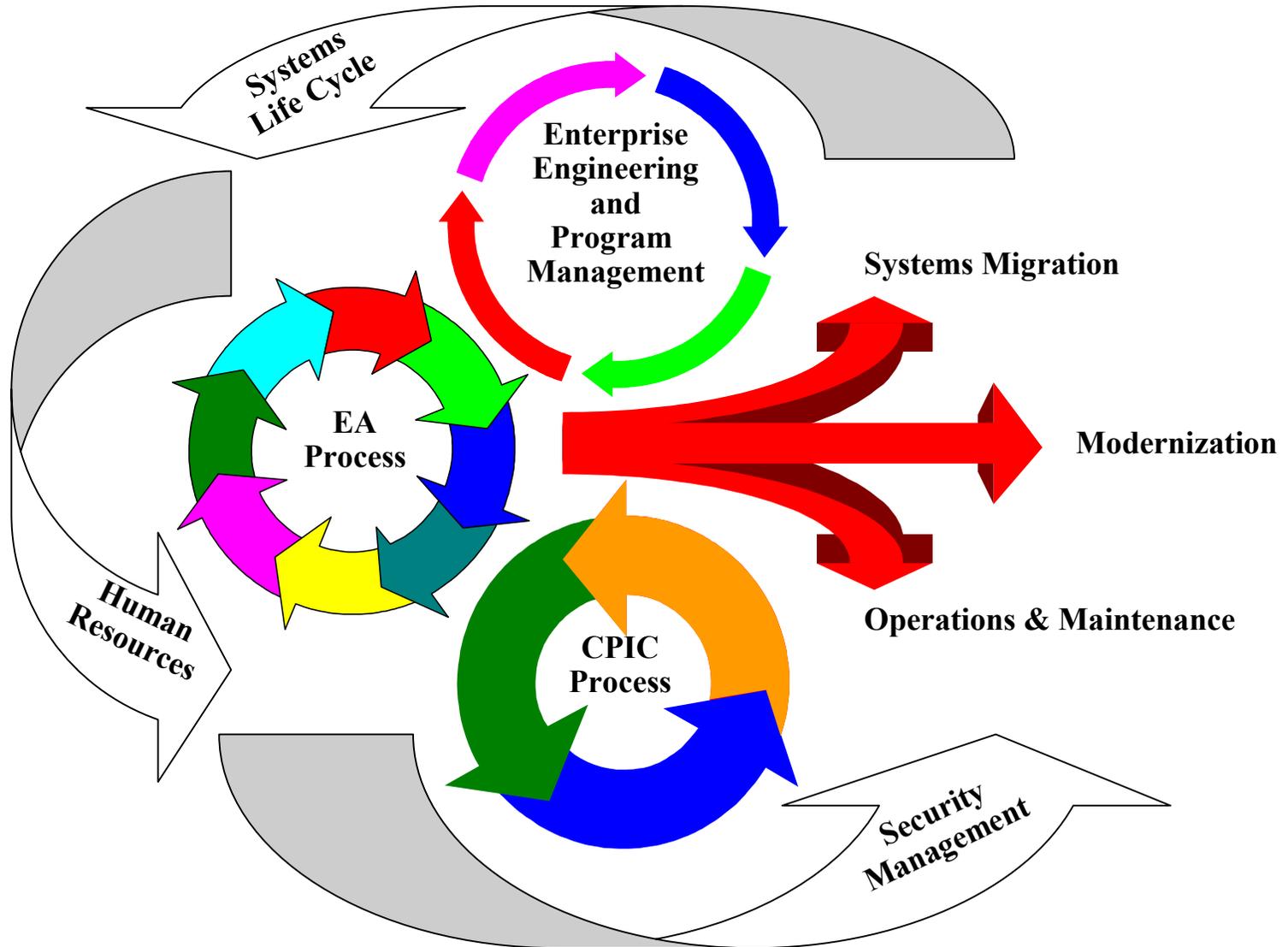
Role of Architecture Principles





The Enterprise Life Cycle

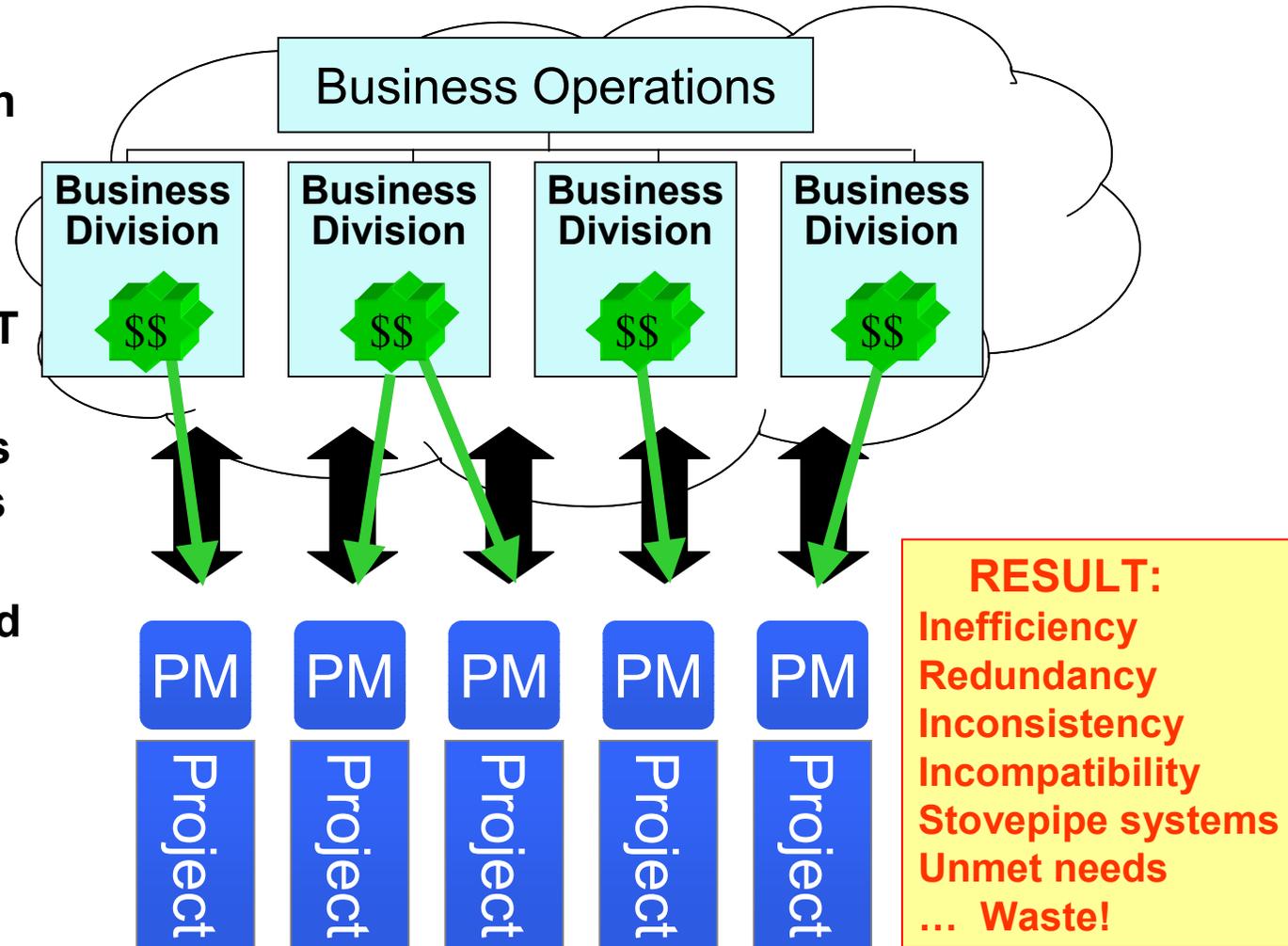
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Why Do You Need an EA?

- IT initiatives often justified on their own merits
- Autonomous management of IT budgets
- Interface to SMEs and operations is project driven
- Projects managed individually
- Contracts *and* development is based on system life cycle

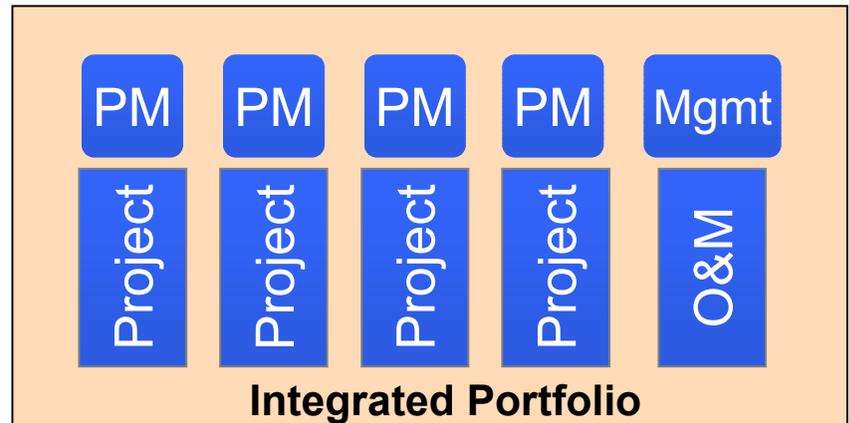
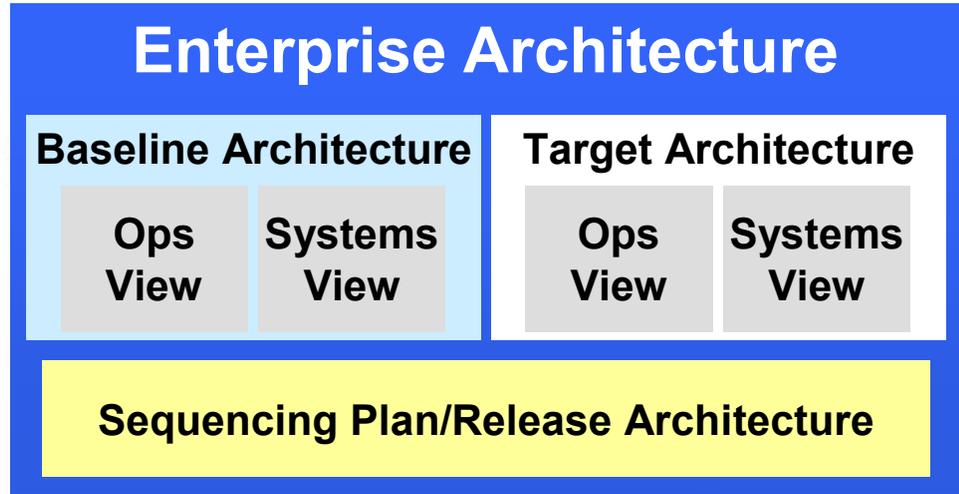




EA: Integrating the IT Budget With Operations



Business Operations





EA Uses

- **Alignment**

- Ensuring the reality of the implemented enterprise is aligned with management's intent

- **Integration**

- Business rules, data, interfaces, information flow, connectivity, and interoperability

- **Change**

- Facilitating and managing change to any aspect of the enterprise

- **Time-to-Market**

- Reducing systems development, applications generation, modernization time frames, and resource requirements

- **Convergence**

- Striving toward a standard IT product portfolio



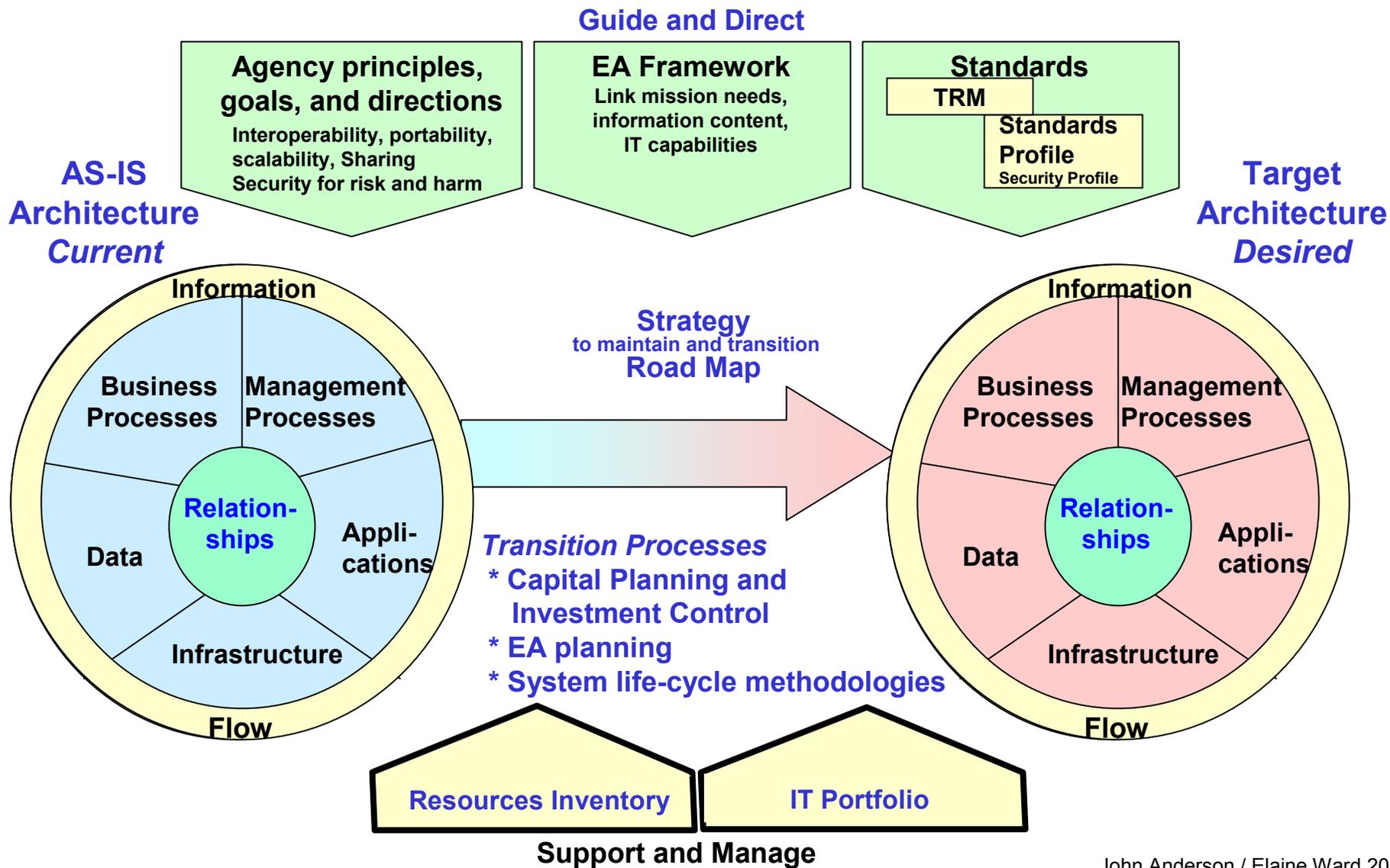
EA Benefits

The EA can:

- **Promote better planning and decision making**
- **Improve communication among business and IT organizations**
- **Provide architectural views that communicate the complexity of large systems of systems**
- **Focus on strategic use of emerging technologies**
- **Support the Capital Planning & Control processes**
- **Achieve economies of scale**
- **Expedite integration of legacy, migration, and new systems**
- **Ensure legal and regulatory compliance**



OMB A-130 View of EA





Issues Addressed by EA

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Technical

Redundancy

Consistency / Standardization

Integration

Interoperability

“Good” Design

* **Shared Vision**

Management

Acquisition

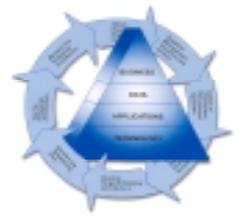
Systems linked to Mission and Strategy

Planning and Sequencing

Effective Investment

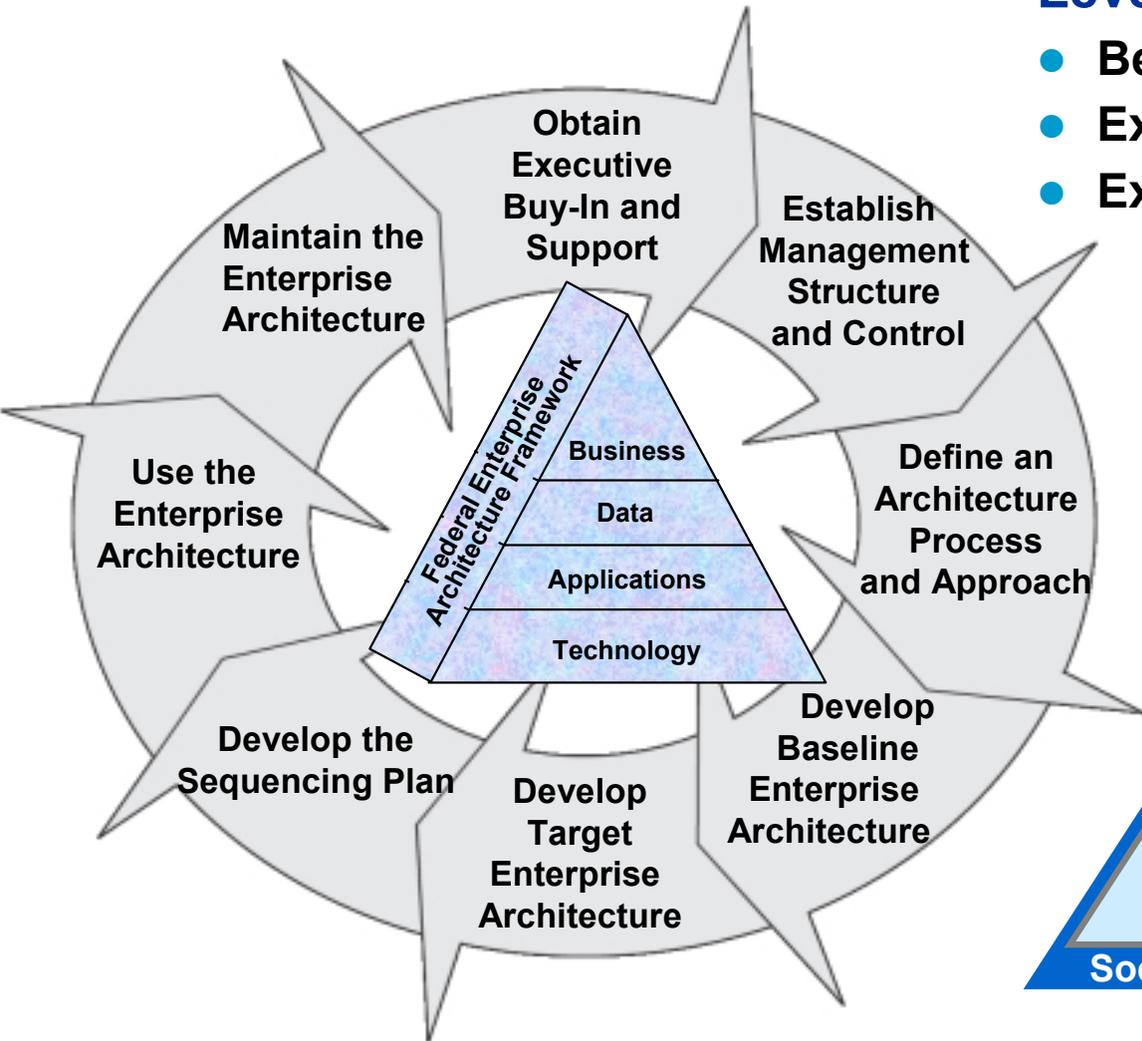
* **Management Visibility and Control**

What are the highest priority issues to be addressed?



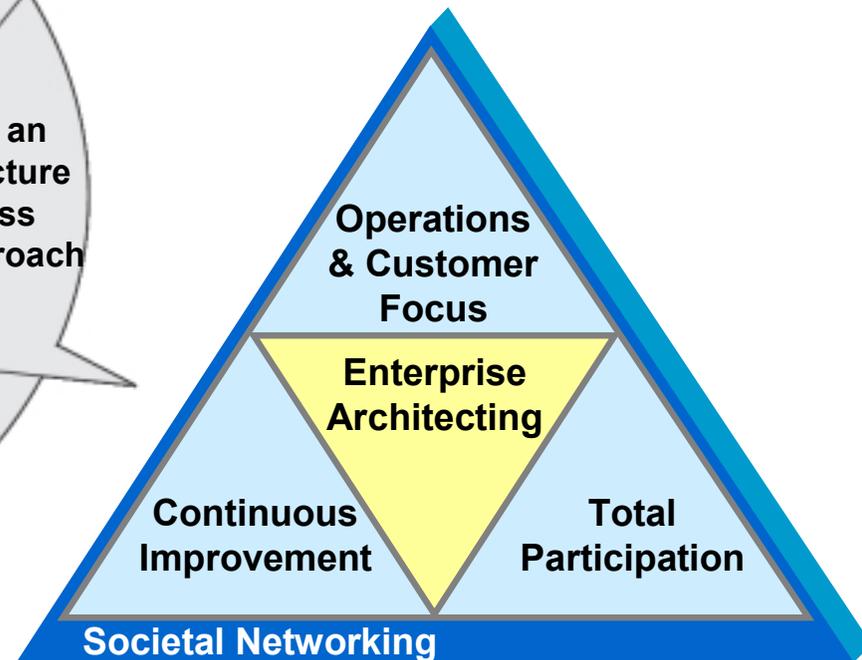
The Enterprise Architecture Process

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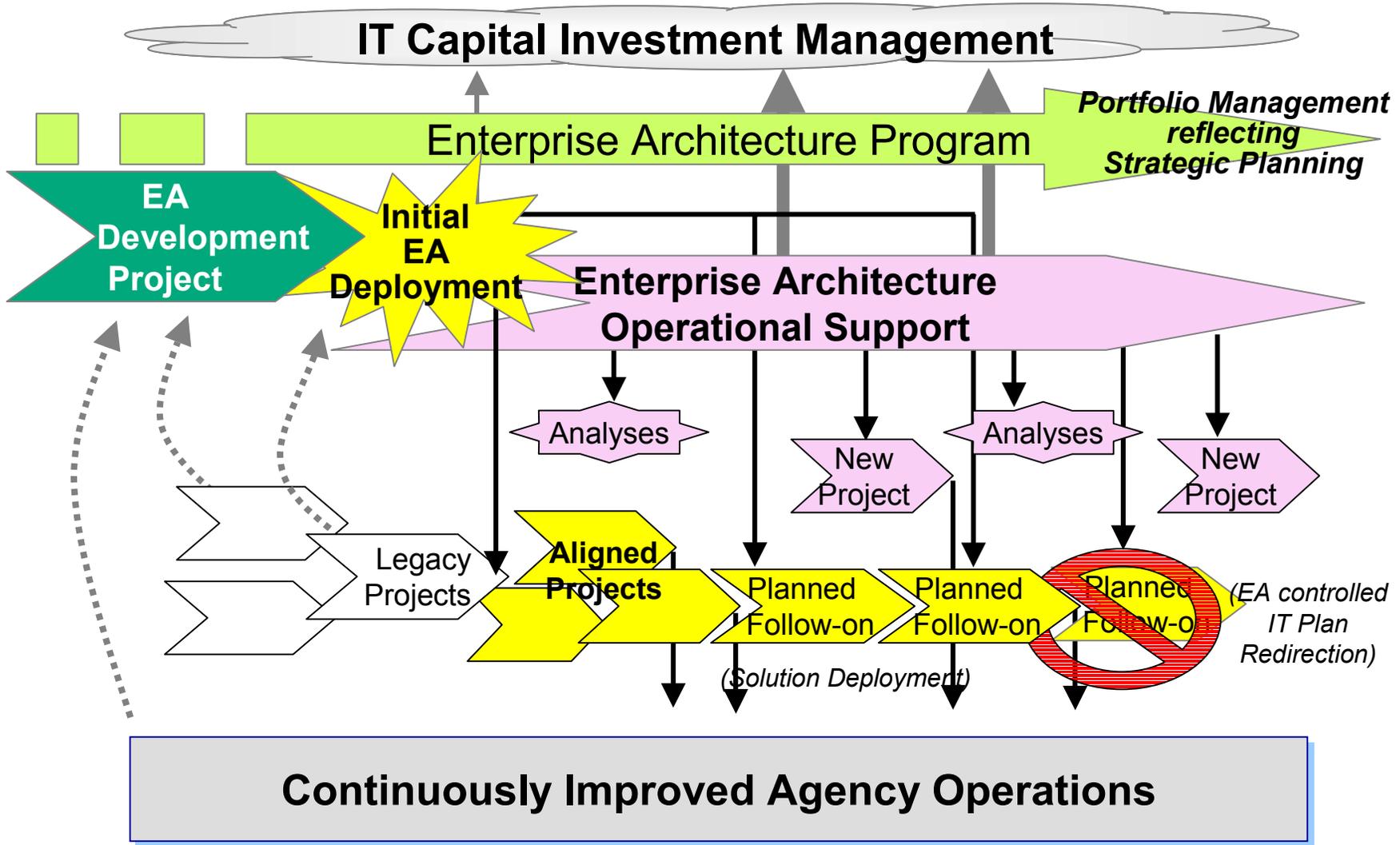
Leveraging:

- Best Practices
- Existing Architecture Activities
- Existing Ownership





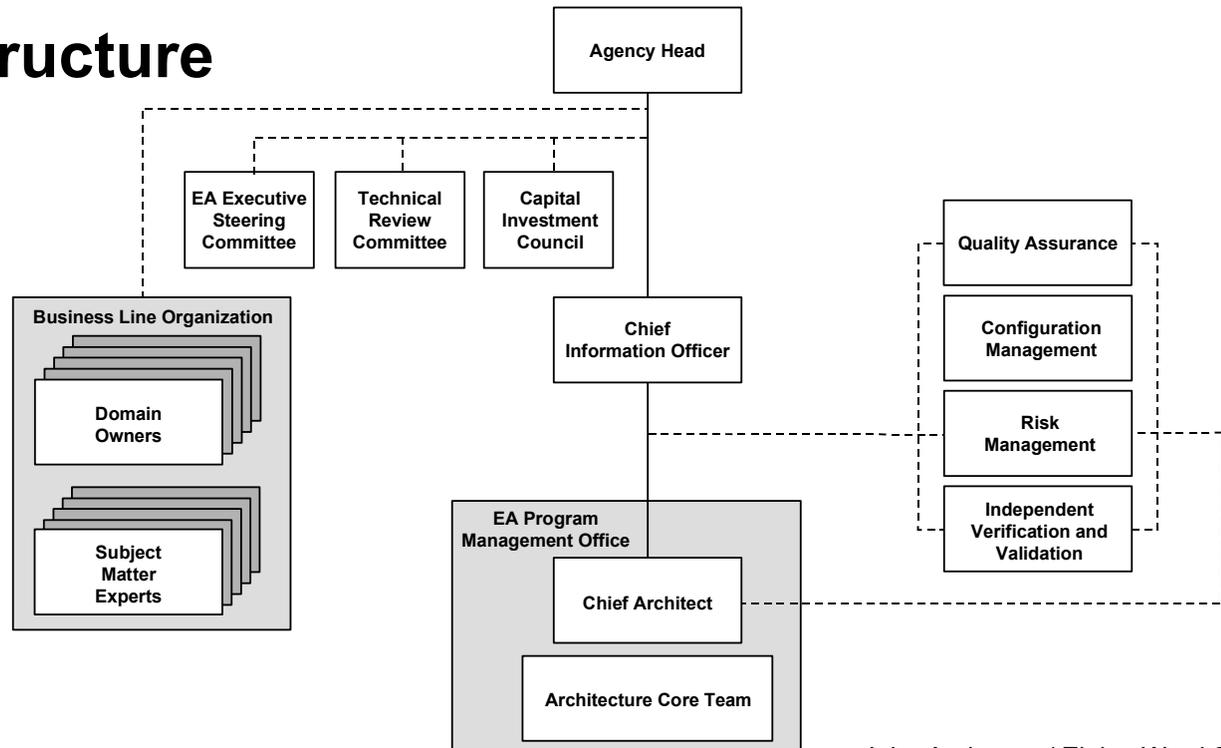
EA Life Cycle—The Big Picture





Section 3 – Initiate EA Program

- Executive and Staff Buy-In and Commitment
- EA Policy
- Roles & Responsibilities
- Agency Architecture
- Organization Structure





Enterprise Engineering: Implementing the Cultural Changes

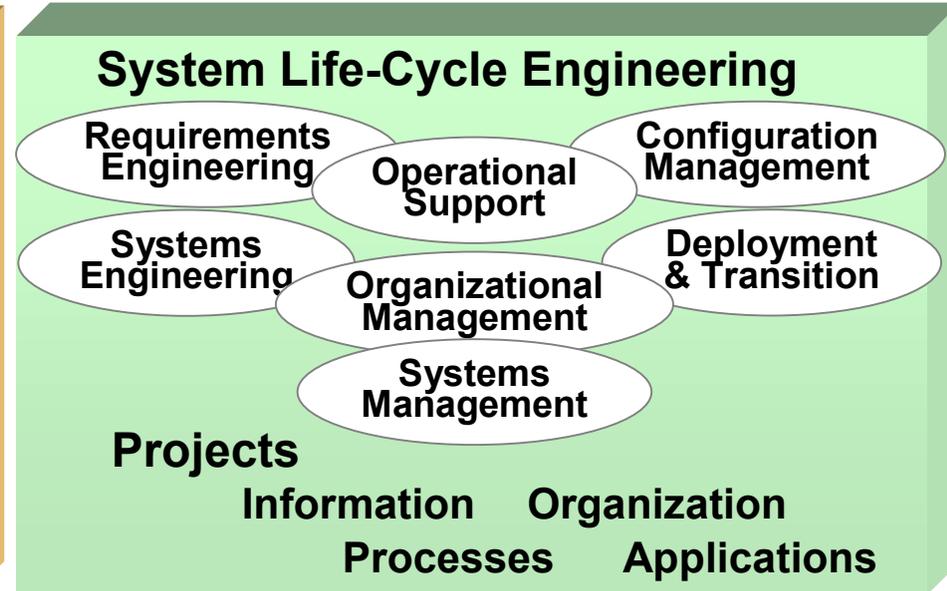
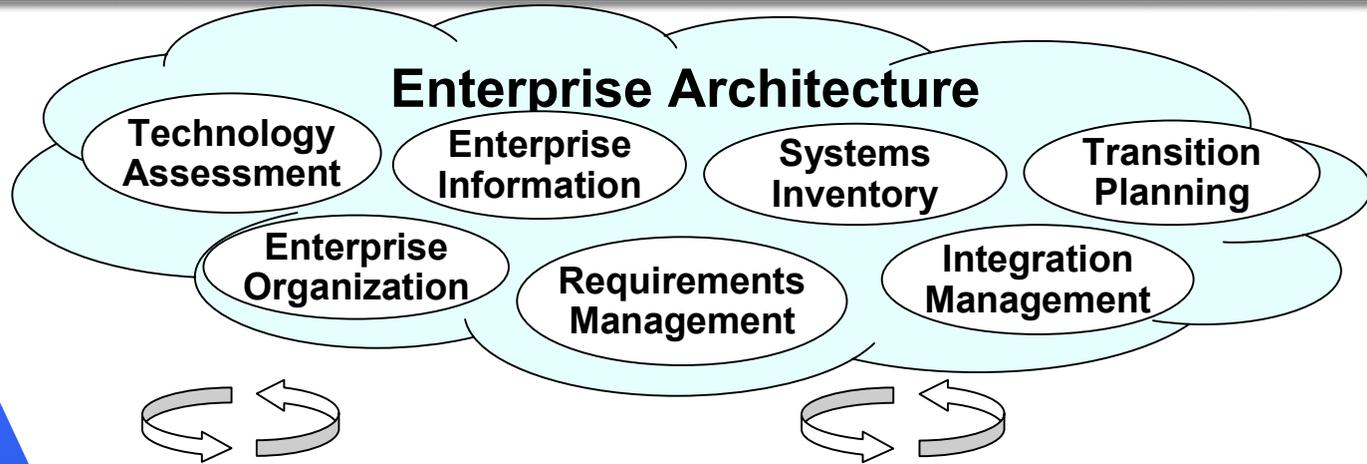
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Strategic
Planning

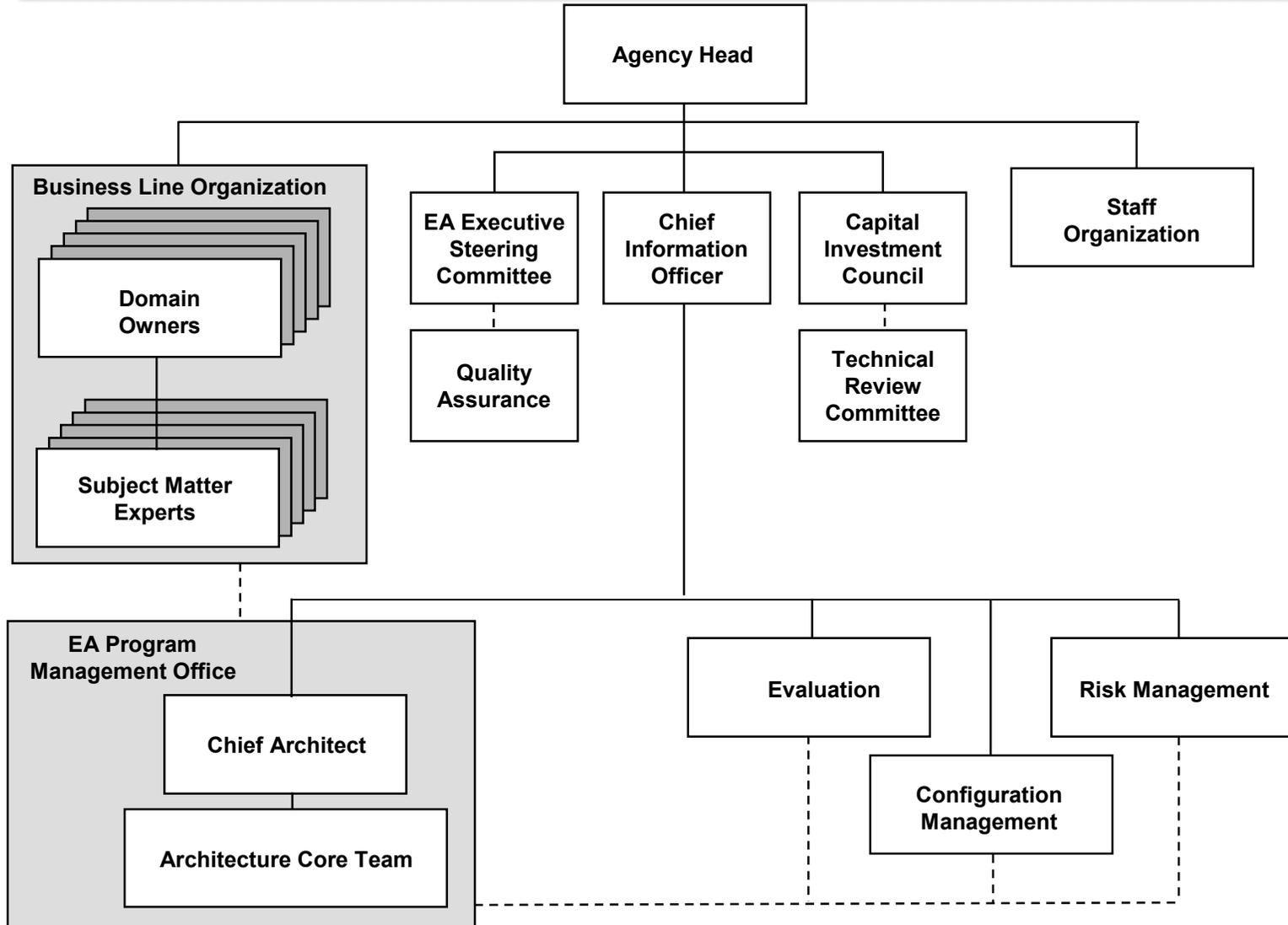


Investment
Management





Notional EA Organization





Establishing Management and Control (1 of 2)

- **Develop Architecture Principles and Guidance**
 - Architectural principles
 - Concept of Operations for EA application
- **Develop EA Program Management Plan**
 - Road map to accomplish goals of the EA Executive Steering Committee (EA ESC)
 - Includes agency-wide architectural objectives
 - Includes EA Program requirements and performance measures
- **Establish EA governance and management procedures**
 - Determine Government and DoD standards that apply
 - Establish responsibilities, authority, and ownership
 - Integrate EA compliance policy and processes with investment decision cycle



Establishing Management and Control (2 of 2)

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- **Develop Architecture Development Plan**
 - Determine information required
 - Determine products desired
 - Determine information capture and storage strategy
 - Exploit existing authoritative sources
 - Sequence information collection and product building
 - Produce Architecture Development Plan



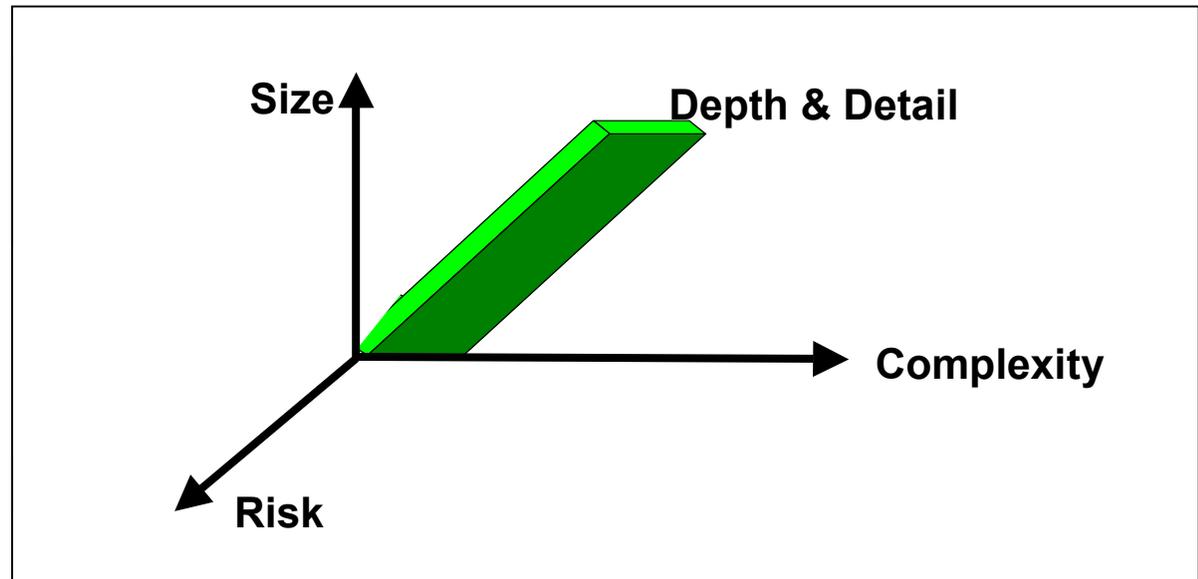
EA Team Responsibilities

Role	Responsibilities
Chief Architect	Heads the EAPMO, organizes and manages the EA core team; directs development of the baseline and target architecture.
Senior Architecture Consultant	Provides architecture strategy and planning consultation to the Chief Architect.
Business Architect	Analyzes and documents business processes, scenarios, and information flow.
Applications Architect	Analyzes and documents systems, internal and external interfaces, control, and data flow.
Information Architect	Analyzes and documents business information (logical and physical) and associated relationships.
Infrastructure Architect	Analyzes and documents system environments, including network communications, nodes, operating systems, applications, application servers, web and portal servers, and middleware.
Security Systems Architect	Oversees, coordinates, and documents IT security aspects of the EA, including design, operations, encryption, vulnerability, access, and the use of authentication processes.
Technical Writer	Ensures that policies, guidebooks, and other documentation within the EA repository are clear, concise, usable, and conform to configuration management standards.
Quality Assurance	Ensures that all established program and project standards, processes, and practices are met.
Risk Management	Identifies, monitors, and controls risks in light of environmental factors and constraints.
Configuration Control	Assures that all changes are identified, tracked, monitored, and appropriately documented.



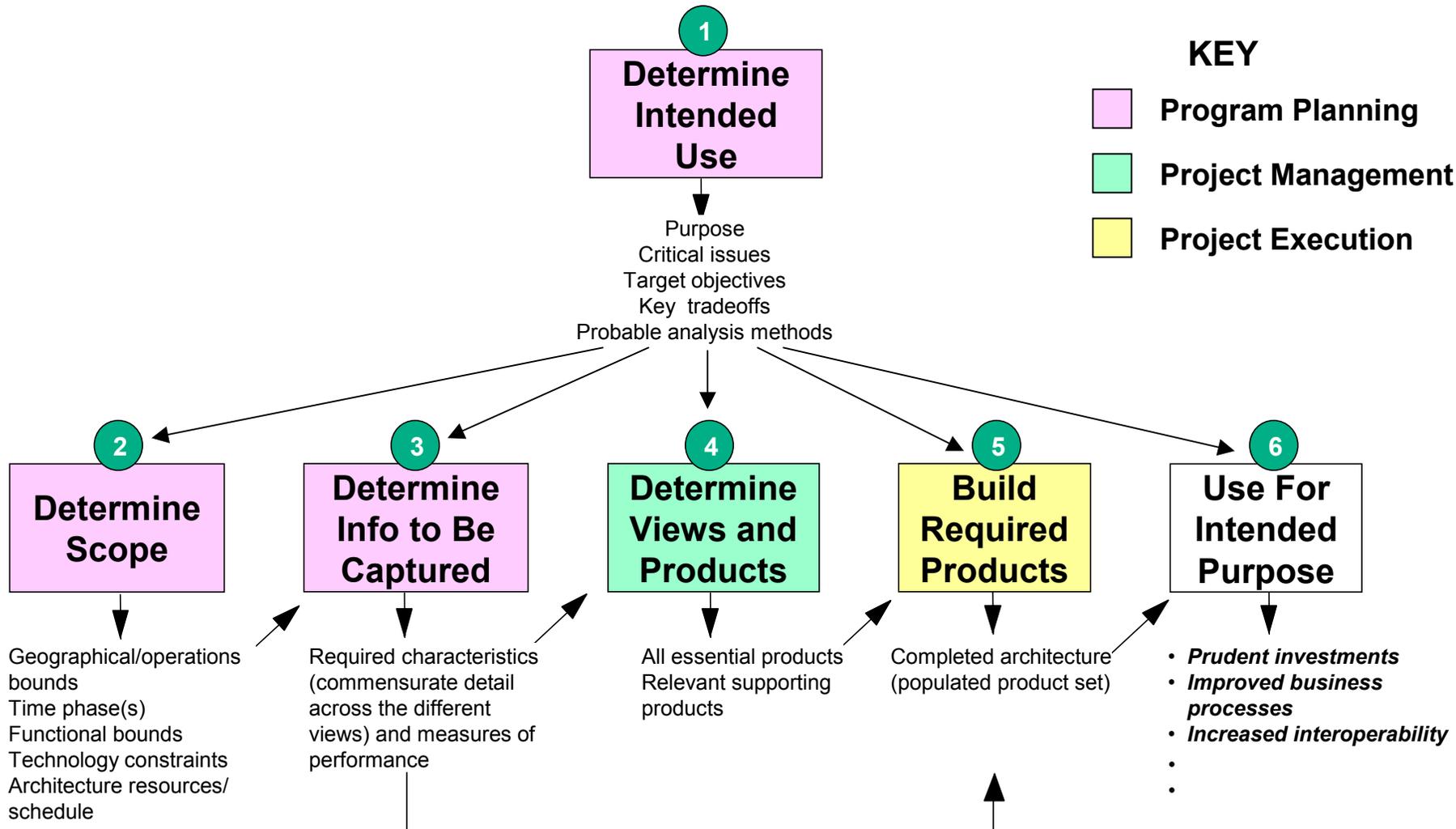
Section 4 – Define an Architecture Process and Approach

- Establish Intended Use and Scope
- Select Architecture Frameworks
- Identify Appropriate EA Products
- Repositories and Tools





Architecture Description Process: Understanding Intended Purpose





Establishing Intended Use

Mission-driven decisions

Top-down perspective

Enterprise Engineering

Integrates many disciplines

Common basis for decision making and coordination

Enterprise Architecture

Repository of current state, decisions, and plans

Strategic Planning

...

IDM

...

BPR

...

Information Assurance

...

Process Improvement

...

Systems Engineering

Configuration Management

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Transition Planning

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Organizational Development

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Data Administration

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Enterprise-wide coordination

Enterprise-wide impact assessment



Establishing Scope and Depth

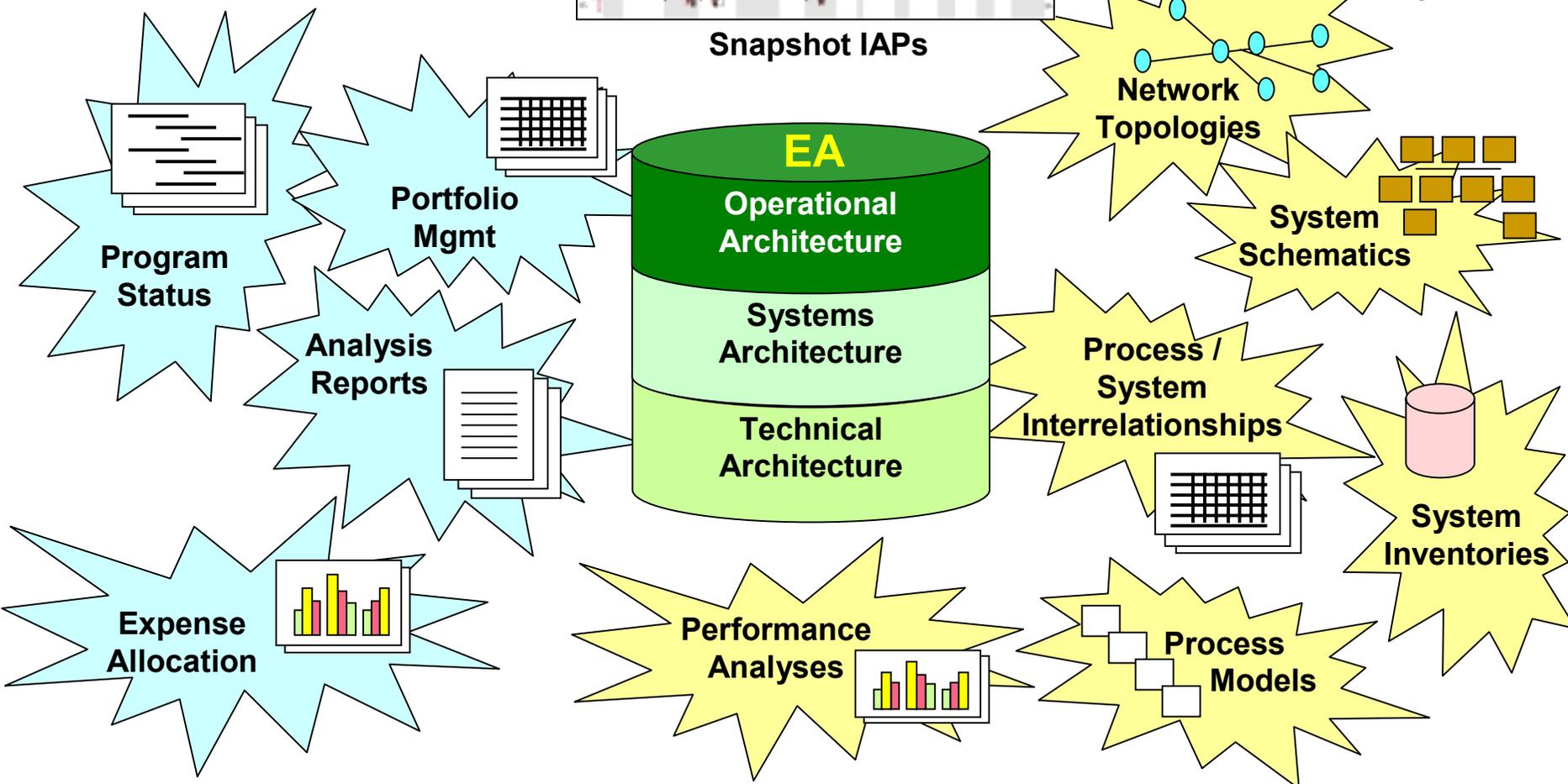
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Executive Decision Support System



Snapshot IAPs

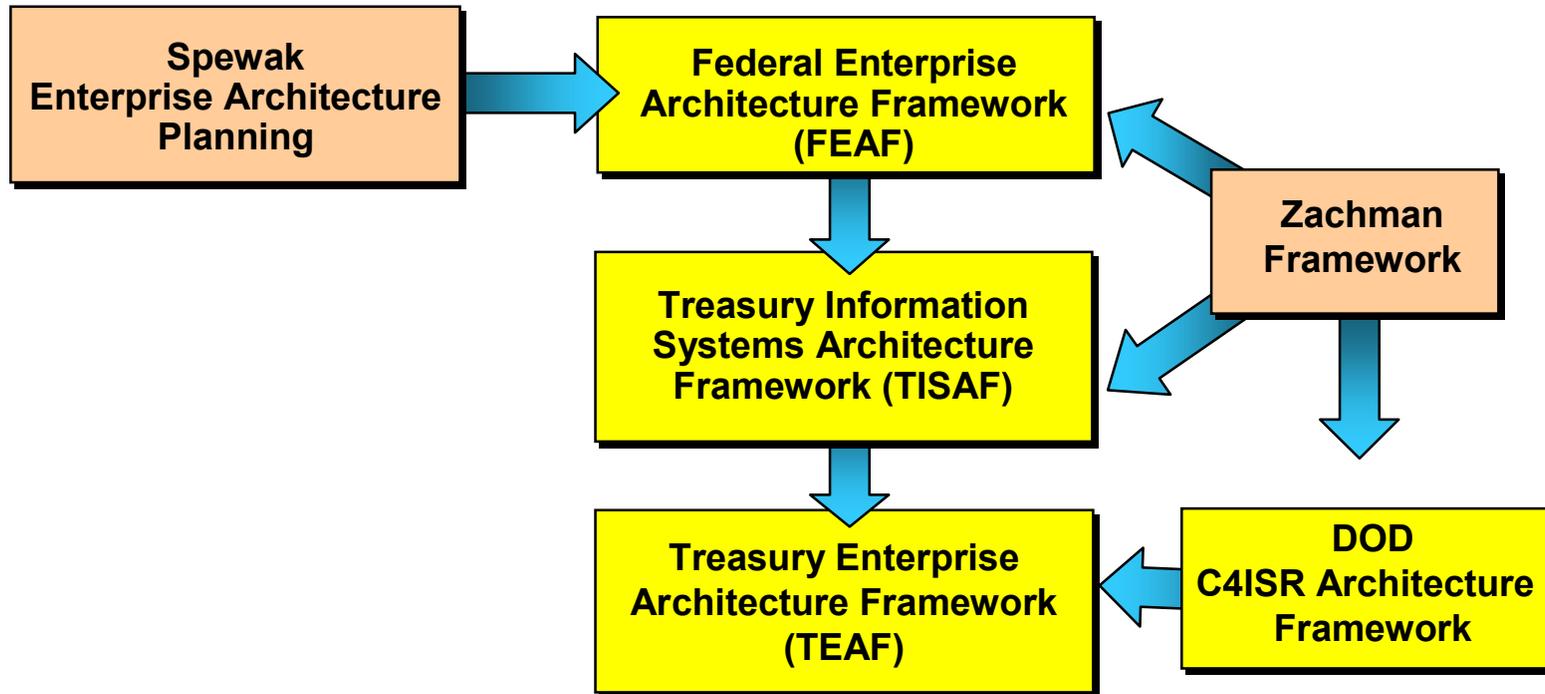
Engineering Support System





Frameworks: History and Influence

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Zachman Framework: Bridging Business and Technology



Multiple User Abstractions

Planner's View

Owner's View

Designer's View

Builder's View

Subcontractor's View

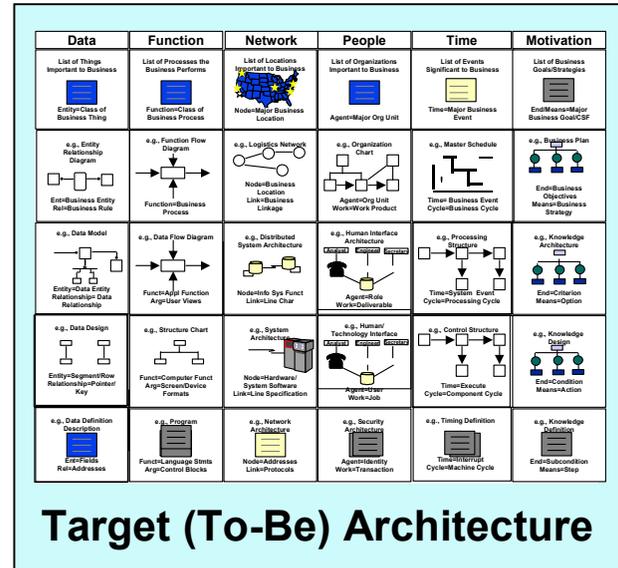
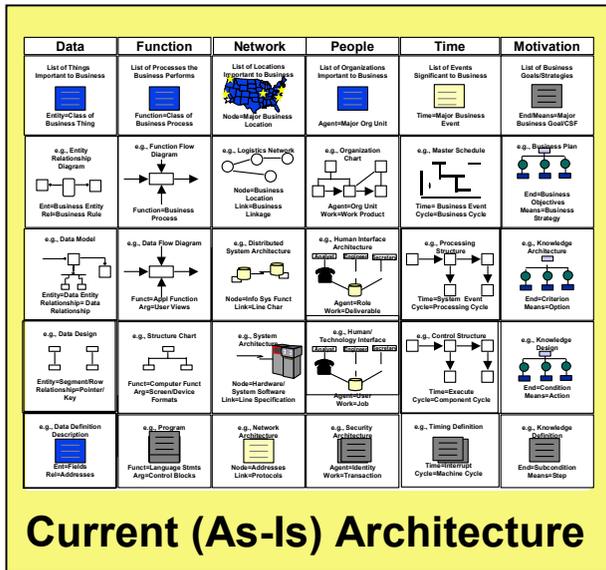
Data	Function	Network	People	Time	Motivation
<p>List of Things Important to Business</p> <p>Entity=Class of Business Thing</p>	<p>List of Processes the Business Performs</p> <p>Function=Class of Business Process</p>	<p>List of Locations Important to Business</p> <p>Node=Major Business Location</p>	<p>List of Organizations Important to Business</p> <p>Agent=Major Org Unit</p>	<p>List of Events Significant to Business</p> <p>Time=Major Business Event</p>	<p>List of Business Goals/Strategies</p> <p>End/Mean=Major Business Goal/CSF</p>
<p>Architectural Views of Multiple Domains</p>					
<p>Ent=Business Entity Rel=Business Rule</p>	<p>Function=Business Process</p>	<p>Node=Business Location Link=Business Linkage</p>	<p>Agent=Org Unit Work=Work Product</p>	<p>Time= Business Event Cycle=Business Cycle</p>	<p>End=Business Objectives Means=Business Strategy</p>
<p>e.g., Data Model</p> <p>Entity=Data Entity Relationship= Data Relationship</p>	<p>e.g., Data Flow Diagram</p> <p>Funct=Appl Function Arg=User Views</p>	<p>e.g., Distributed System Architecture</p> <p>Node=Info Sys Funct Link=Line Char</p>	<p>e.g., Human Interface Architecture</p> <p>Agent=Role Work=Deliverable</p>	<p>e.g., Processing Structure</p> <p>Time=System Event Cycle=Processing Cycle</p>	<p>e.g., Knowledge Architecture</p> <p>End=Criterion Means=Option</p>
<p>e.g., Data Design</p> <p>Entity=Segment/Row Relationship=Pointer/Key</p>	<p>e.g., Structure Chart</p> <p>Funct=Computer Funct Arg=Screen/Device Formats</p>	<p>e.g., System Architecture</p> <p>Node=Hardware/ System Software Link=Line Specification</p>	<p>e.g., Human/ Technology Interface</p> <p>Agent=User Work=Job</p>	<p>e.g., Control Structure</p> <p>Time=Execute Cycle=Component Cycle</p>	<p>e.g., Knowledge Design</p> <p>End=Condition Means=Action</p>
<p>e.g., Data Definition Description</p> <p>Ent=Fields Rel=Addresses</p>	<p>e.g., Program</p> <p>Funct=Language Stmt Arg=Control Blocks</p>	<p>e.g., Network Architecture</p> <p>Node=Addresses Link=Protocols</p>	<p>e.g., Security Architecture</p> <p>Agent=Identity Work=Transaction</p>	<p>e.g., Timing Definition</p> <p>Time=Interrupt Cycle=Machine Cycle</p>	<p>e.g., Knowledge Definition</p> <p>End=Subcondition Means=Step</p>



EA: Basic Components

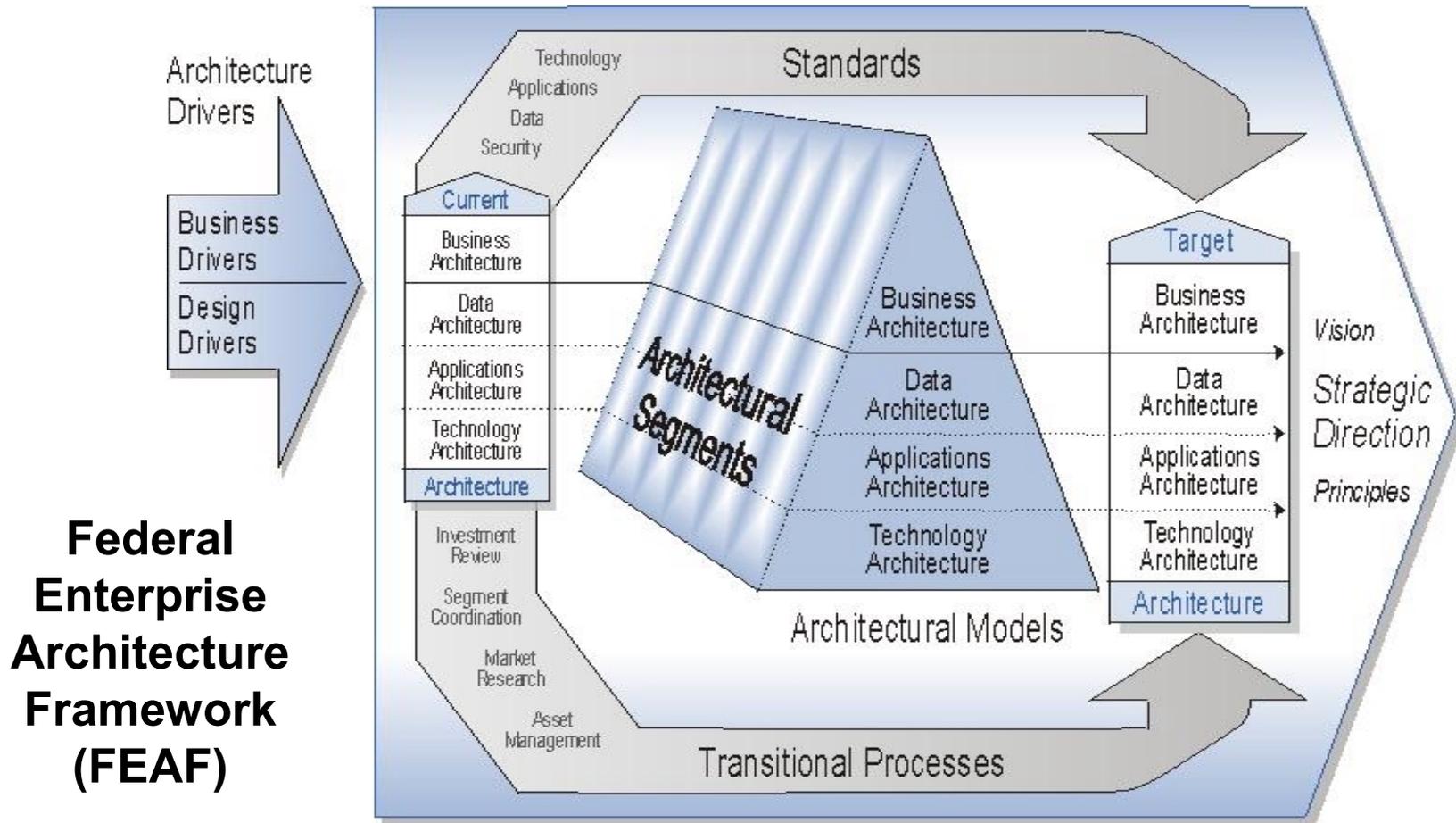


Blueprint for Modernization





Define an Architecture Process and Approach: Selecting a Framework



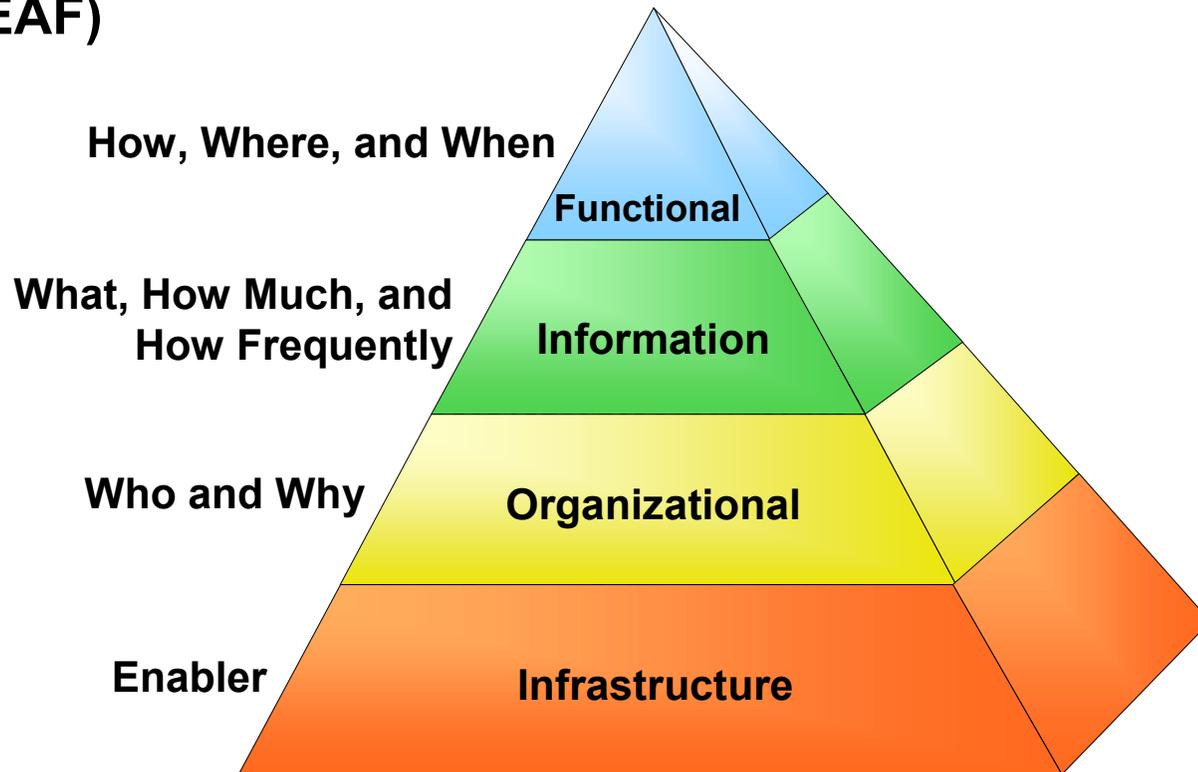
Structure of the FEAF Components



TEAF: General Framework Structure



Treasury Enterprise Architecture Framework (TEAF)





TEAF Products

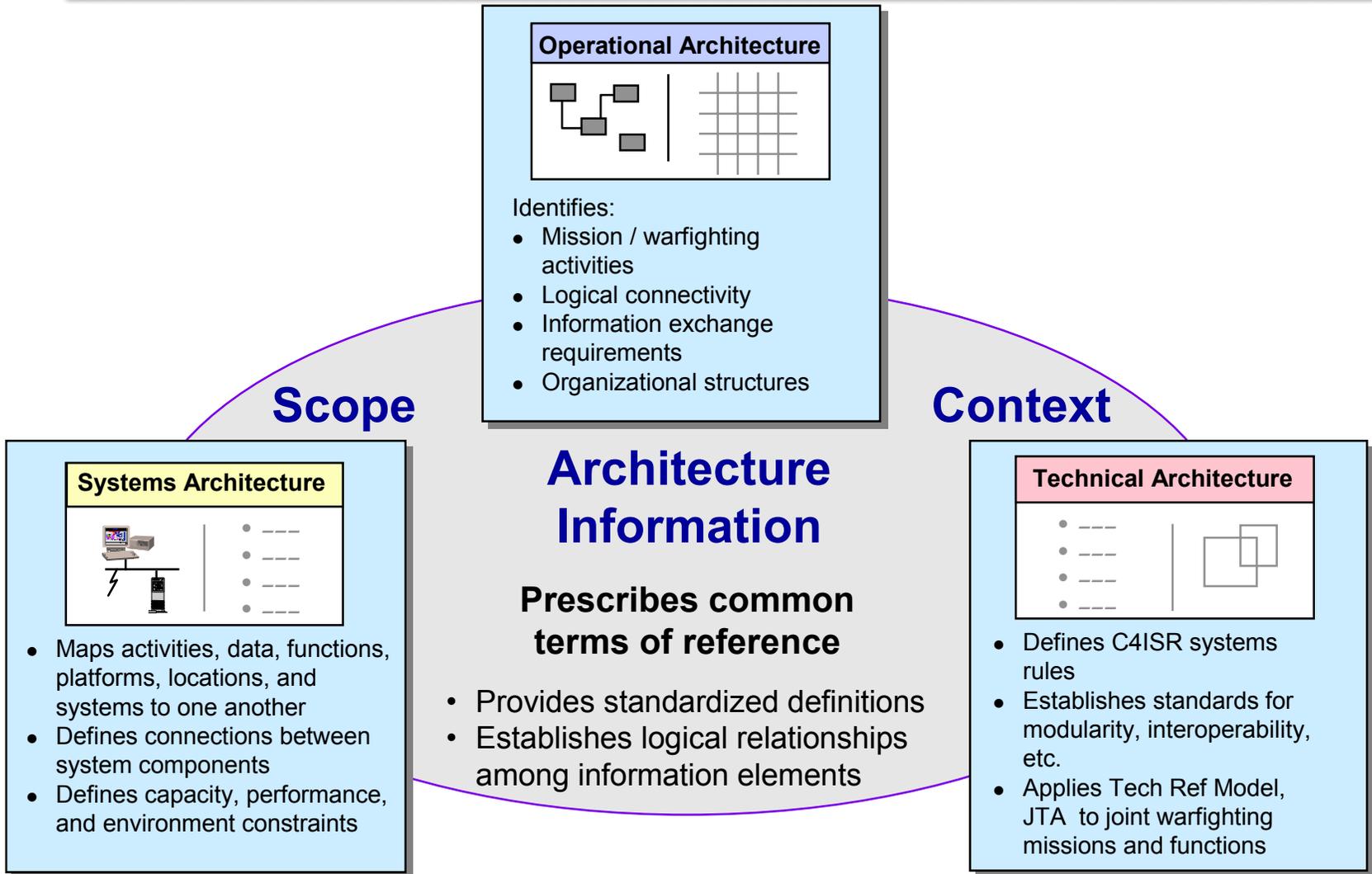
	Functional View	Information View	Organizational View	Infrastructure View
Planner Perspective	Mission & Vision Statements	Information Dictionary	Organization Charts	Technical Reference Model Standards Profile
Owner Perspective	Activity Model Info Assurance Trust Model	Information Exchange Matrix (Conceptual)	Node Connectivity Description (Conceptual)	Info Assurance Risk Assessment System Interface Description (Level 1)
Designer Perspective	Business Process/System Function Matrix Event Trace Diagrams State Charts	Information Exchange Matrix (Logical) Logical Data Model Data CRUD Matrices	Node Connectivity Description (Logical)	System Interface Description (Level 2 & 3)
Builder Perspective	System Functionality Description	Information Exchange Matrix (Physical) Physical Data Model	Node Connectivity Description (Physical)	System Interface Description (Level 4) System Performance Parameters Matrix

Essential Work Products

Supporting Work Products

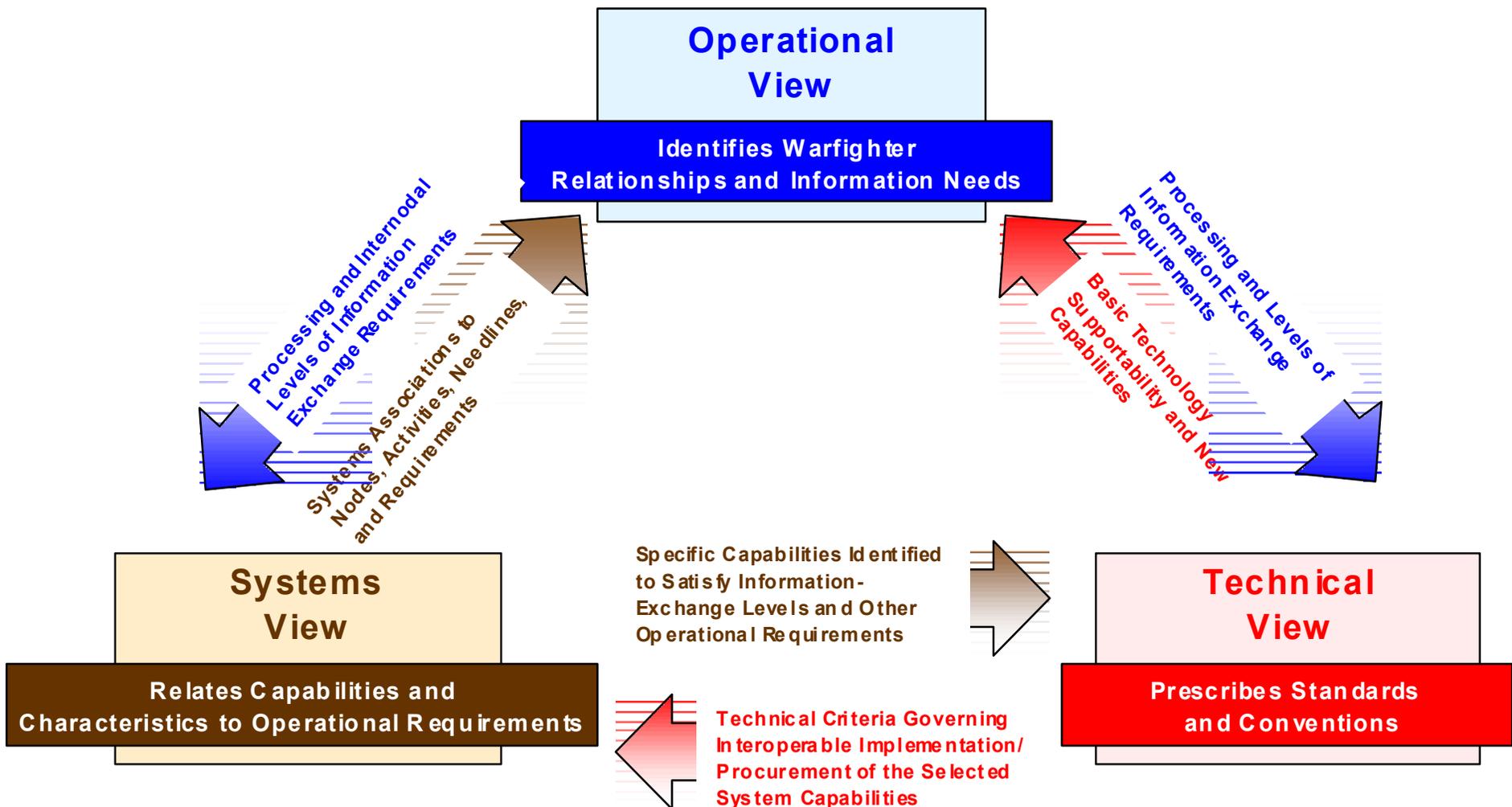


C4ISR Architecture Framework Overview





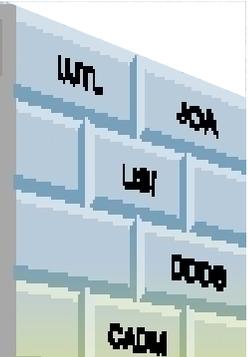
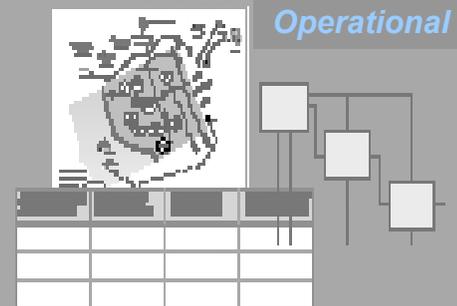
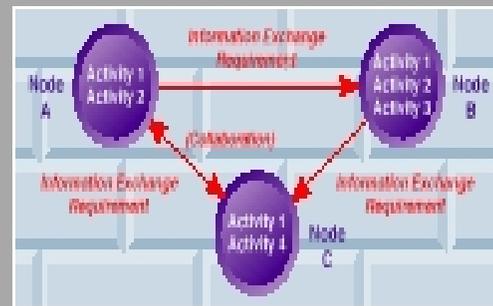
DoD C4ISR Architecture Framework



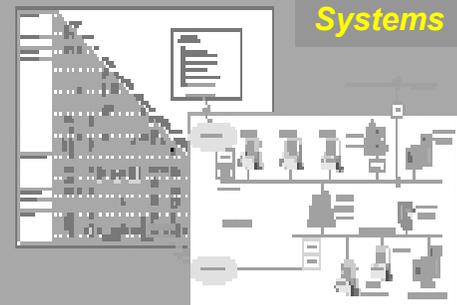
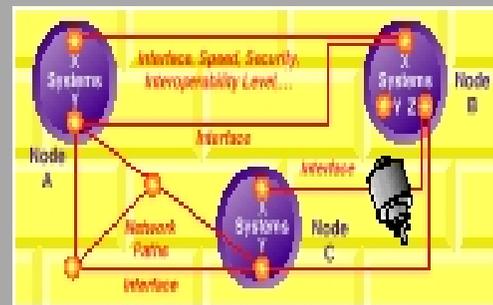


One Architecture: Three Views

The Operational View describes and interrelates the operational elements, tasks and activities, and information flows required to accomplish mission operations

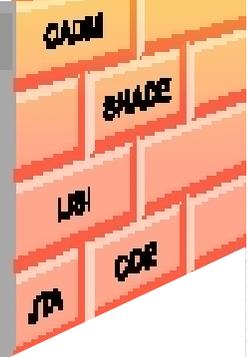
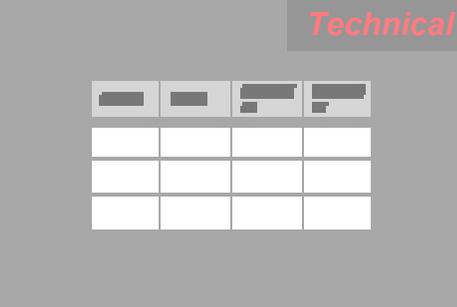


The Systems View describes and interrelates the existing or postulated technologies, systems, and other resources intended to support the operational requirements



The Technical View describes the profile of rules, standards, and conventions governing systems implementation

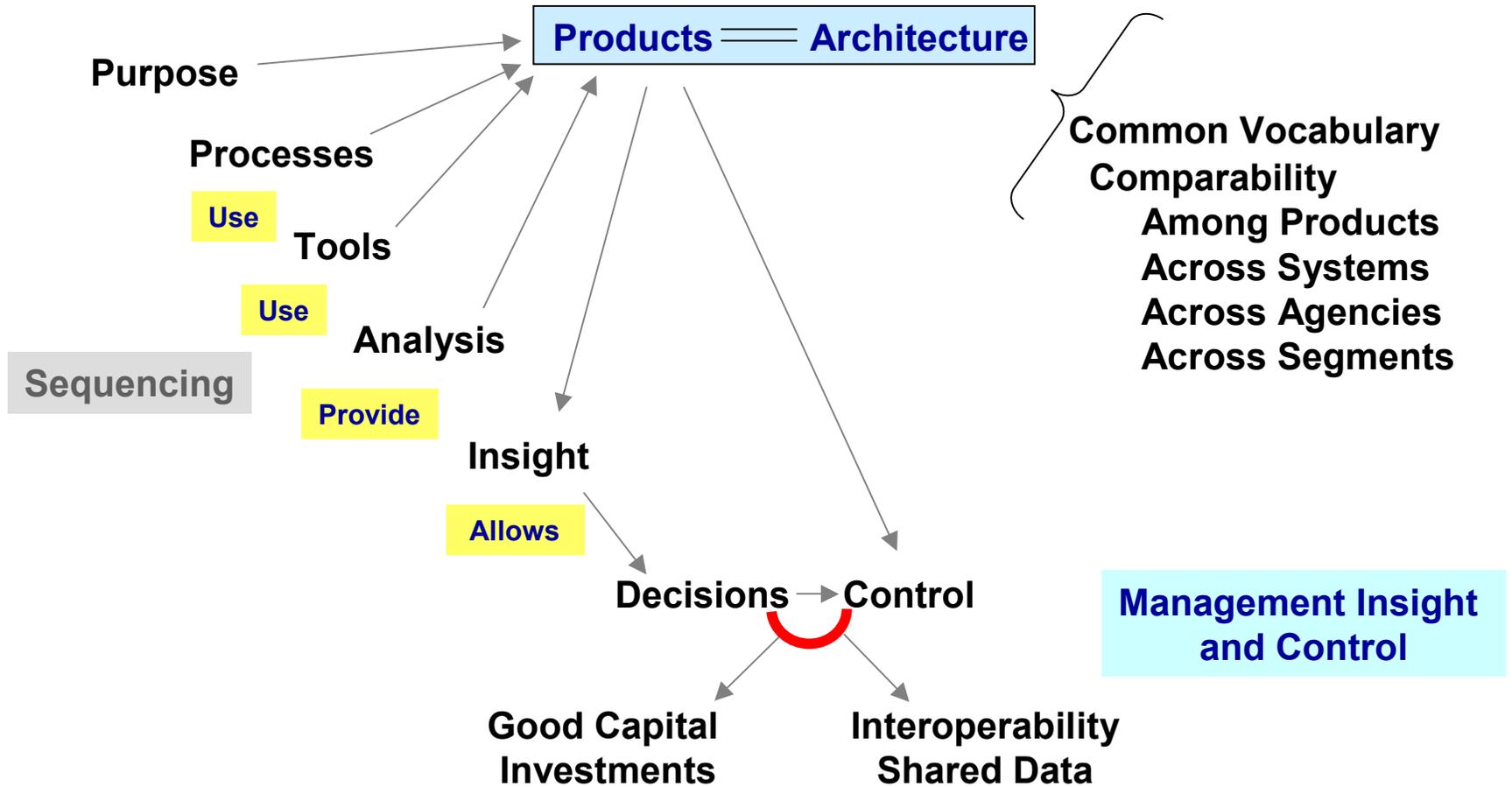
Service Area	Service	Standard





From Framework to Architecture Use

Framework: Organizes Information Categories into/to Create Products





Descriptions May Be as Important as Their Contents

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- **Guiding principles**

- Architecture descriptions should be built with a purpose in mind
- Architecture descriptions should facilitate, not impede, communication among humans
- Architecture descriptions should be relatable and comparable across DoD
- Architecture descriptions should be modular, reusable, and decomposable

- **Effective description using standard notations facilitates**

- Understandability and review
- Effective application of system and reuse



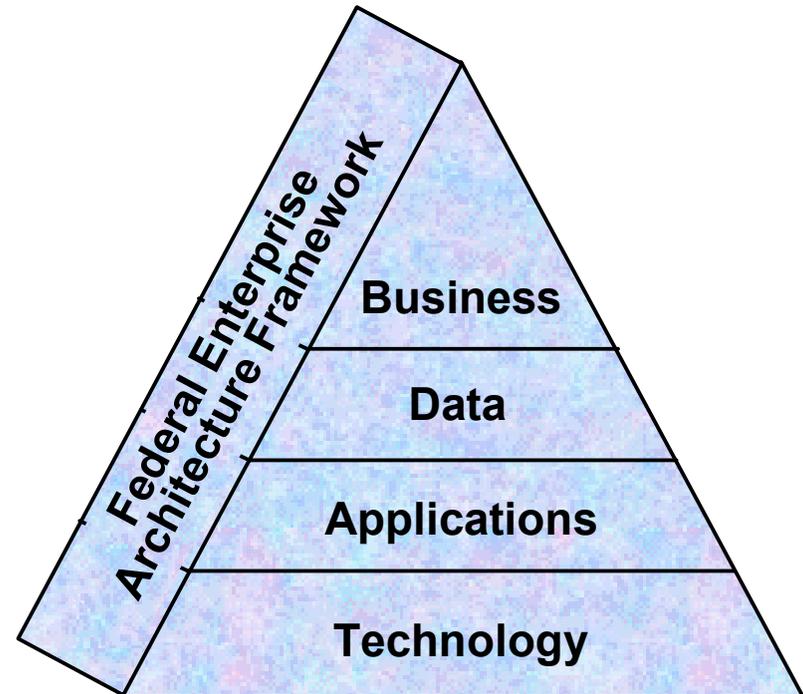
EA Tools and Repositories

- **Determine tool criteria based on work products selected and architecture process/methodology**
- **Some tools support specific frameworks**
 - Leaders:
 - ❖ System Architect
 - ❖ Metis
 - ❖ NetViz
 - ❖ Rational Suite
 - ❖ Ptech



Section 5 – Developing the EA

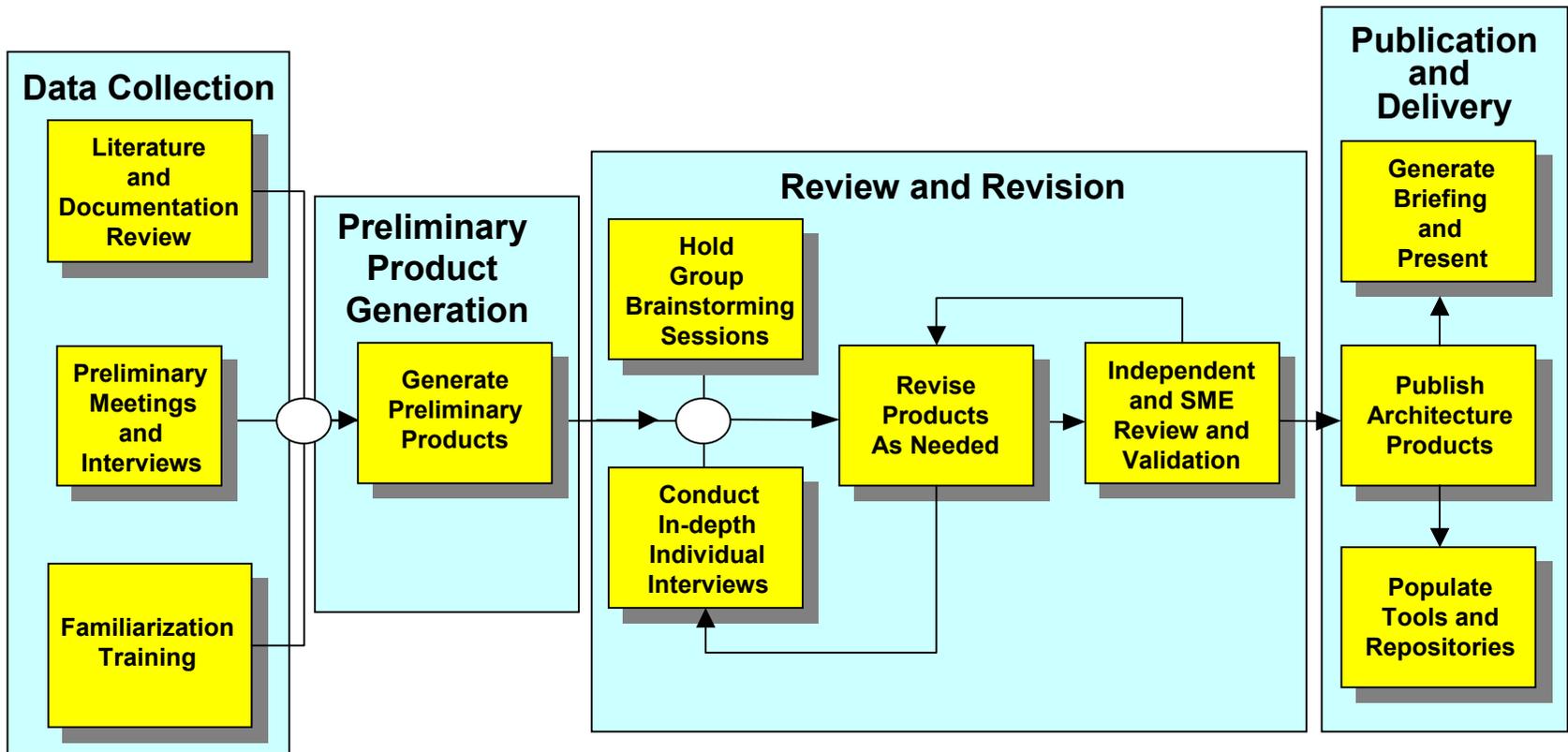
- **Data Collection**
 - Subject Matter Experts
 - Domain Owners
- **Developing the Enterprise Architecture**
 - Baseline
 - Target
- **The Sequencing Plan**
- **Products**





Develop the EA

Baseline Architecture, Target Architecture, and Sequencing Plan



Example Approach for EA Development



Building in DoD Framework Compliance

- **Build mandatory products**
- **Use standardized supporting products when needed or helpful**
- **Use common terms and definitions**
- **Describe Joint and Multi-National relationships in a standard way**
- **Describe Interoperability requirements in a standard way**

Mandatory Products: Key Relationships

HIGH-LEVEL OPERATIONAL CONCEPT DESCRIPTION (OV-1)

VALUE ADDED: SUMMARY LEVEL REPRESENTATION OF ORGANIZATIONS/ROLES, MISSION, AND CONTEXT FOR THE ARCHITECTURE

TECHNICAL ARCHITECTURE PROFILE (TV-1)

Service Area	Service	Standard
Operating System	Kernel	IEEE Std 1553 (POSIX.1)
	Shell and Utilities	IEEE P1002.2
Software	Programming Languages	IEEE Std 1181 (ADA)
Engineering Services	Client Service Operations	IEEE Std 158 (X-Window System)
	Object Definition and Management	IEEE Std 159 (X-Window System)
	Window Management	IEEE Std 158 (X-Window System)
	Dialogue Support	IEEE Std 159 (X-Window System)
Data Management	Data Management	IEEE Std 152.2 (GDM.2)
Data Interchange	Data Interchange	IEEE Std 152 (GDM.1)
	Electronic Data Interchange	IEEE Std 164 (EDC)
Graphics	Graphics	IEEE Std 151 (PHIGS)
...

VALUE ADDED: COMPLETE LIST OF RELEVANT STANDARDS WITH OPTIONS & PARAMETERS

- OPERATIONAL CONCEPT ROLES & MISSION MAP TO OPERATIONAL NODES ROLES & MISSIONS
- OPERATIONAL CONCEPT CONNECTIVITY & INFORMATION EXCHANGES, IF SHOWN ON OV-1, MAP TO OPERATIONAL NODE CONNECTIVITY DESCRIPTION NEEDLINES & INFORMATION EXCHANGES
- INFORMATION EXCHANGES DETAILED IN OV-3

- STANDARDS APPLY AT
 - SYSTEM TO SYSTEM INTERFACES
 - SYSTEM ELEMENT TO SYSTEM ELEMENT INTERFACES
 - SYSTEM COMPONENT TO SYSTEM COMPONENT INTERFACES

OPERATIONAL NODE CONNECTIVITY DESCRIPTION (OV-2)

High-Level Description of Needlines
 Collection summary of information exchanged including:
 • Node-to-Node Information
 • Critical Architecture for the great architecture
 • Information, such as functions, methods, needs, etc.
 • Statement of Minimum, State, and Maximum requirements for critical activities

VALUE ADDED: STATEMENT OF OPERATIONAL NODES, ACTIVITIES AND CRITICAL INFORMATION NEEDS (NEEDLINES & SUMMARY INFORMATION EXCHANGED)

OPERATIONAL INFORMATION EXCHANGE MATRIX (OV-3)

VALUE ADDED: PERFORMANCE REQUIREMENTS FOR OPERATIONAL INFORMATION EXCHANGES

SYSTEMS INTERFACE DESCRIPTION (SV-1)

VALUE ADDED: STATEMENT OF SYSTEMS NODES, SYSTEMS, SYSTEM ELEMENTS, & SYSTEM COMPONENTS; LINKS & COMPONENT INTERFACES; AND SYSTEM INFORMATION EXCHANGES

- OPERATIONAL NODES MAP TO SYSTEMS NODES
- OPERATIONAL NEEDLINES MAP TO SYSTEMS LINKS
- OPERATIONAL ACTIVITIES ARE SUPPORTED BY SYSTEMS
- OPERATIONAL INFORMATION ELEMENTS MAP TO SYSTEMS INFORMATION ELEMENTS

ACTIVITY MODEL (OV-5)

VALUE ADDED: BUSINESS/MISSION PROCESS & RELATIONSHIPS AMONG ACTIVITIES AND OPERATIONAL INFORMATION EXCHANGED

- ACTIVITIES MAP TO OPERATIONAL NODES
- I/Os MAP TO NEEDLINES
- ORGANIZATIONS, IF SHOWN ON OV-5, MAP TO ORGANIZATIONS ASSOCIATED WITH OPERATIONAL NODES

NOTE: THE DIRECTION OF ARROWS IS NOT MEANT TO INDICATE THE ORDER OF BUILDING PRODUCTS



Mandatory and Supporting DoD Arch Framework Products(1/4)

MITRE

Applicable View	Ref.	Architecture Product Name	Mandatory or Supporting	General Description
All Views (Context)	AV-1	Overview & Summary Information	Mandatory	Scope, purpose, intended users, environment depicted, analytical findings, if applicable
All Views (Terms)	AV-2	Integrated Dictionary	Mandatory	Definitions of all terms used in all products
All Views (Capabilities)	AV-3	Capability Maturity Profile	Supporting	Description of focus areas in terms of incremental capability levels
Technical	TV-1	Technical Architecture Profile	Mandatory	Extraction of standards that apply to the given architecture
Technical	TV-2	Standards Technology Forecast	Supporting	Description of emerging standards that are expected to apply to the given architecture



Mandatory and Supporting DoD Arch Framework Products (2/4)



Applicable View	Ref.	Architecture Product Name	Mandatory or Supporting	General Description
Operational	OV-1	High-level Operational Concept Description	Mandatory	High-level graphical/ textual description of operational concept
Operational	OV-2	Operational Node Connectivity Description	Mandatory	Nodes, activities performed, & information flow among nodes
Operational	OV-3	Operational Information Exchange Matrix	Mandatory	Information exchanged among nodes and the relevant attributes of those exchanges
Operational	OV-4	Organizational Relationships Chart	Supporting	Command, control, coordination, other relationships among organizations
Operational	OV-5	Activity Model	Mandatory	Activities, relationships among activities, inputs and outputs.
Operational	OV-6a	Operational Rules Model	Supporting	One of three products used to describe operational activity sequence and timing
Operational	OV-6b	Operational State Transition Description	Supporting	One of three products used to describe operational activity sequence and timing
Operational	OV-6c	Operational Event/Trace Description	Supporting	One of three products used to describe operational activity sequence and timing
Operational	OV-7	Logical Data Model	Supporting	Data requirements and structural business process rules of the Operational View



Mandatory and Supporting DoD Arch Framework Products (3/4)



Applicable View	Ref.	Architecture Product Name	Mandatory or Supporting	General Description
Systems	SV-1	System Interface Description Systems	Mandatory	Identification of systems and system components and their interfaces
Systems	SV-2	Communications Descriptions	Supporting	Physical nodes and their related communications laydowns
Systems	SV-3	Systems-Systems Matrix	Supporting	Relationships among systems in a given architecture
Systems	SV-4	Systems Functionality Description	Supporting	Functions performed by systems and the information flow among system functions
Systems	SV-5	Op Activity to Systems Function Trace Matrix	Supporting	Mapping of system functions back to operational activities
Systems	SV-6	System Data Exchange Matrix	Supporting	Data exchanges among system elements, applications and HW
Systems	SV-7	System Performance Parameters Matrix	Supporting	Performance characteristics of each system hardware and software elements



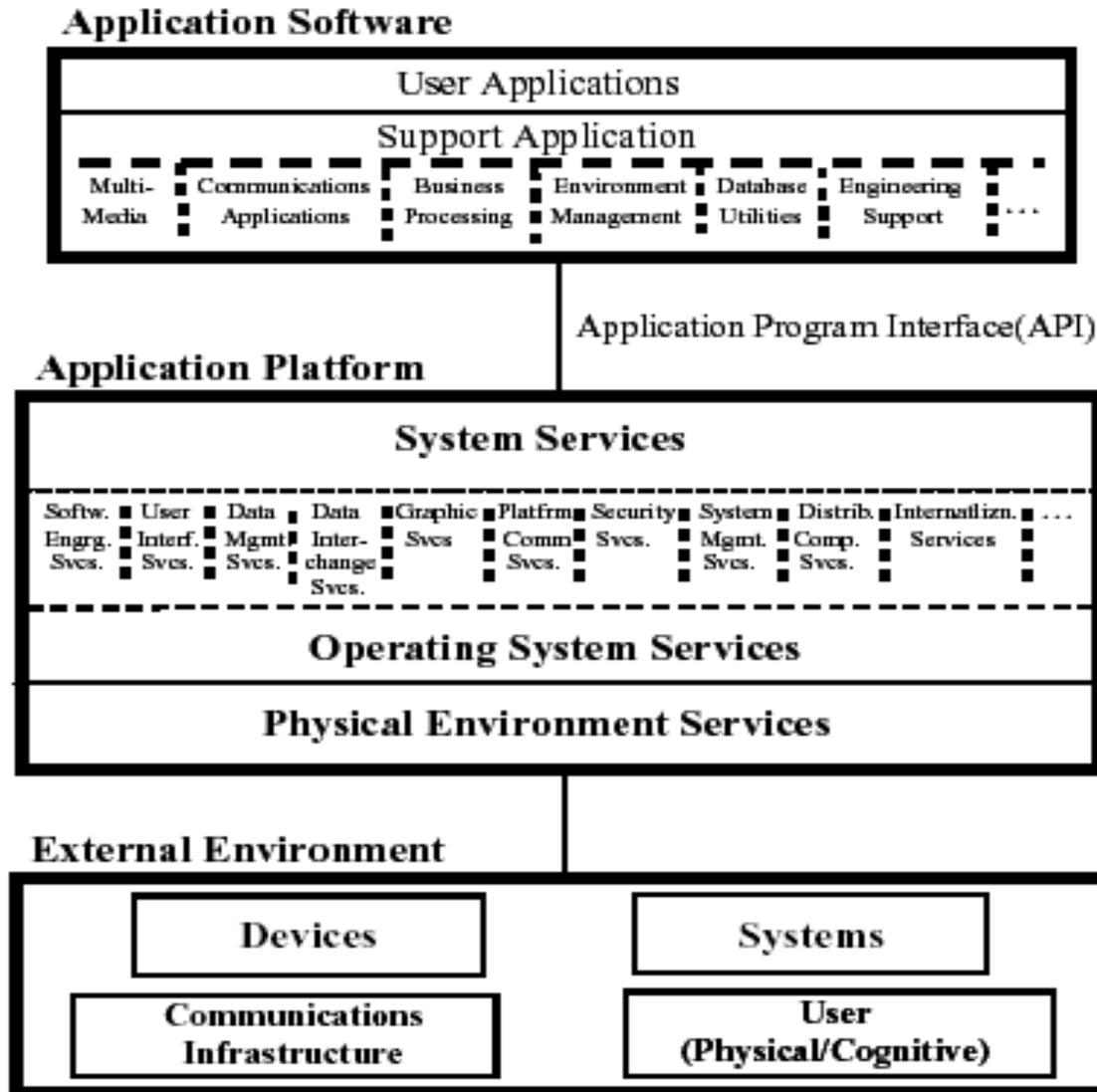
Mandatory and Supporting DoD Arch Framework Products (4/4)



Applicable View	Ref.	Architecture Product Name	Mandatory or Supporting	General Description
Systems	SV-8	System Evolution Description	Supporting	Planned incremental steps toward migrating a suite of systems to a more efficient suite
Systems	SV-9	System Technology Forecast	Supporting	Emerging technologies and software/hardware products that are expected to be available
Systems	SV-10a	Systems Rules Model	Supporting	One of three products used to describe system activity sequence and timing
Systems	SV-10b	Systems State Transition Description	Supporting	One of three products used to describe system activity sequence and timing
Systems	SV-10c	Systems Event/Trace Description	Supporting	One of three products used to describe system activity sequence and timing
Systems	SV-11	Physical Data Model	Supporting	Physical implementation of the information of the Logical Data Model



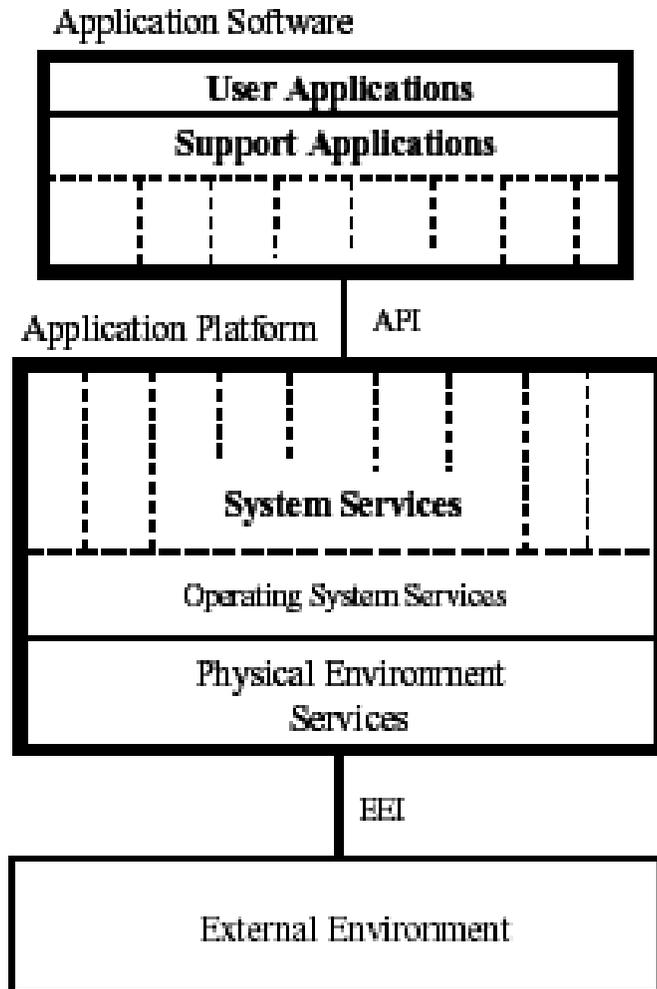
Technical Reference Models (TRM)



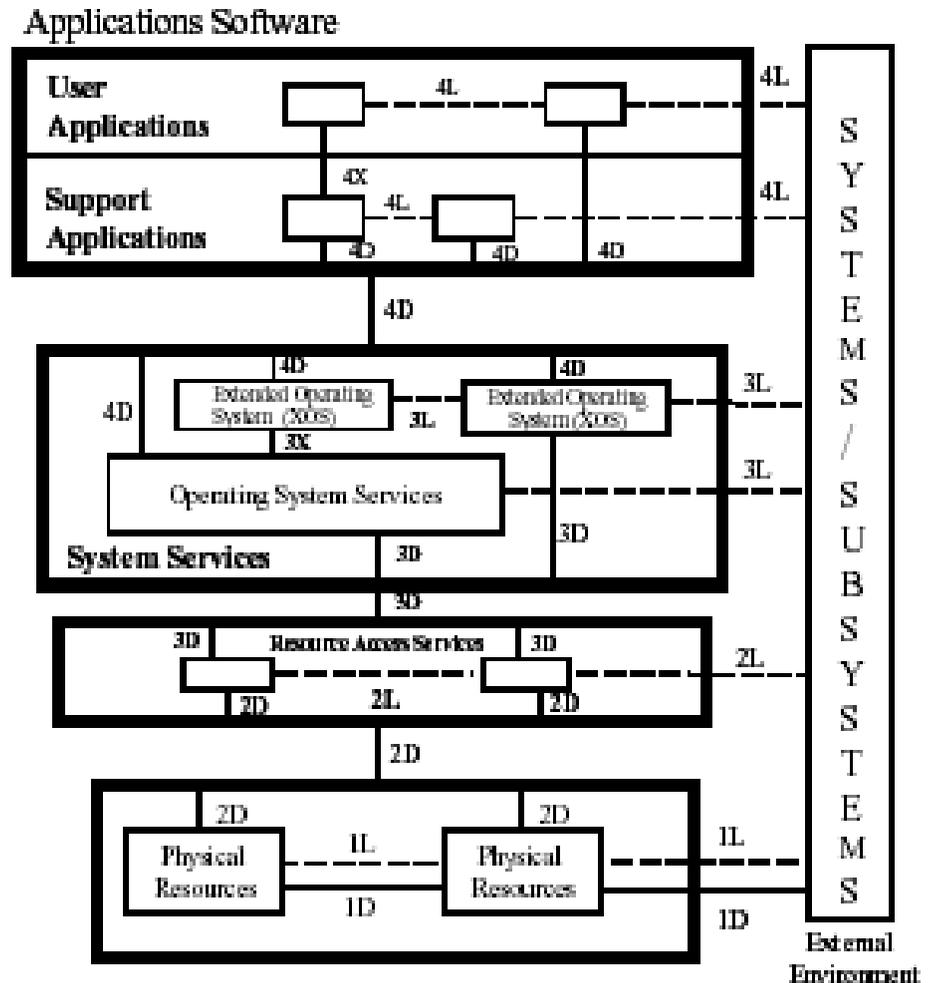


DoD Technical Reference Model

Services View

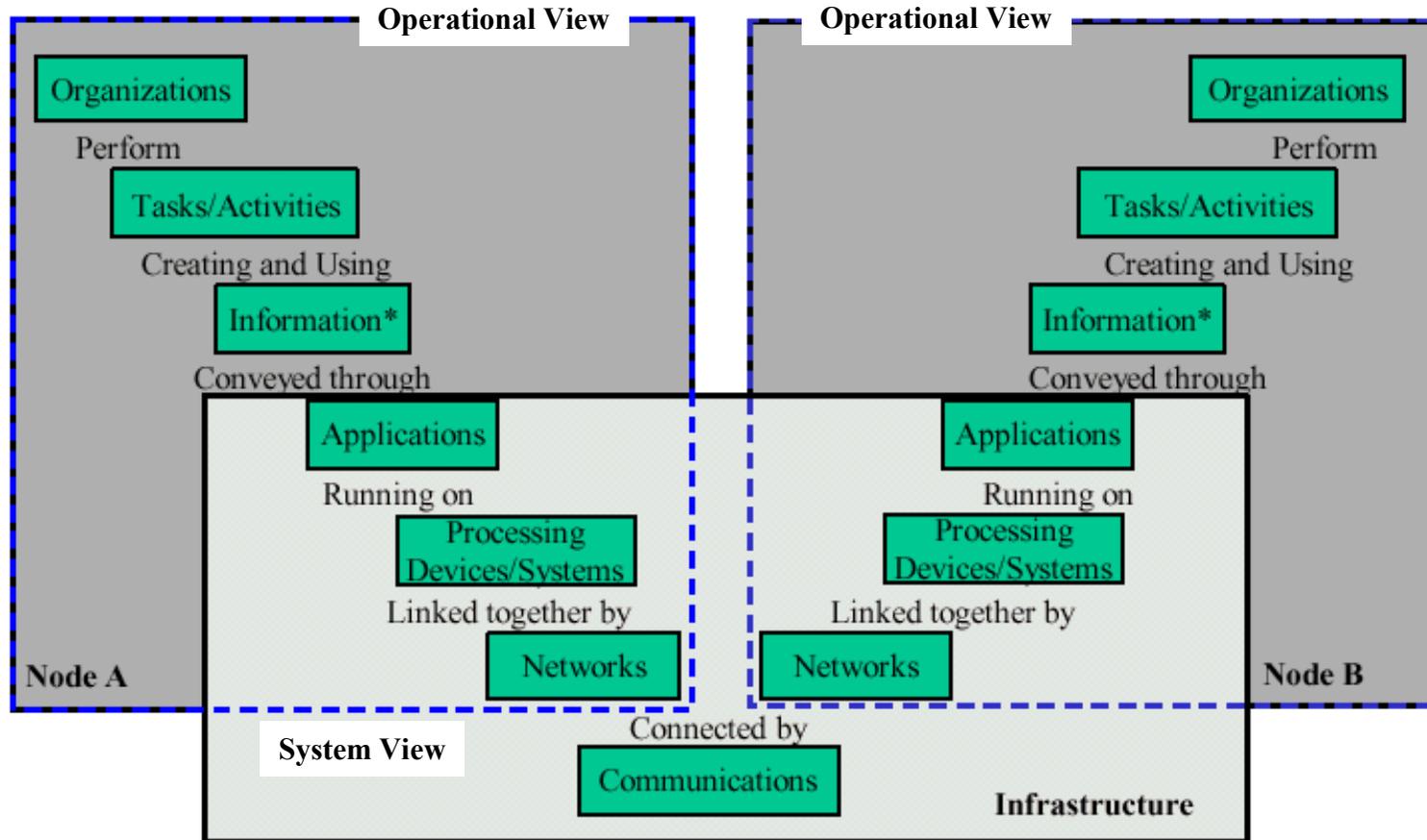


Interfaces View





Relating the Operational and Systems Views



Systems Architecture development and management requires intimate relationship with operational architecture



Target Architecture Development

- **Develop “To-Be” Architecture that integrates enterprise vision and key initiatives**
- **Level of detail may vary from Baseline Architecture**
- **Execute the same EA process and approach**
 - 1.0 Define the Intended Use of the Architecture
 - 2.0 Define the Scope of the Architecture
 - 3.0 Determine the Depth of the Architecture
 - 4.0 Select Appropriate EA Products
 - 5.0 Evaluate and Select a Framework
 - 6.0 Select an EA Toolset

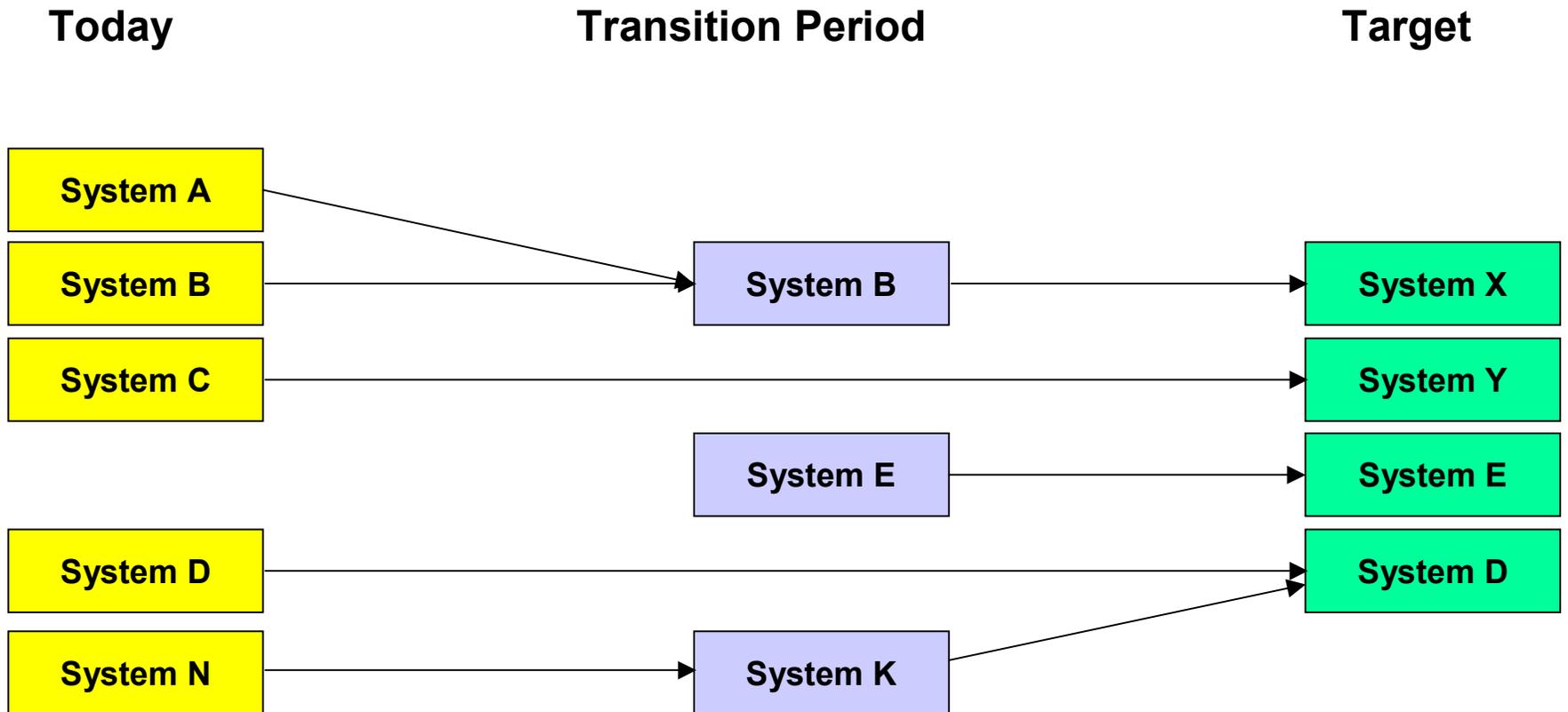


Developing the Sequencing Plan

- **Plan for moving from the “As-Is” to the “To-Be”**
 - Must define and differentiate legacy, migration, and new
 - Needs to incorporate enterprise, system, and increment perspectives
 - ❖ Supported by Increment and Release Architectures
 - ❖ Contains end user capabilities in transitional environment (including manual business processes)
 - ❖ Contains new, legacy, and transitional systems component
 - ❖ Addresses geographical deployment strategy
- **Identify gaps**
- **Often causes refinement to “As-Is” and “To-Be” enterprise and system architectures**



System Migration





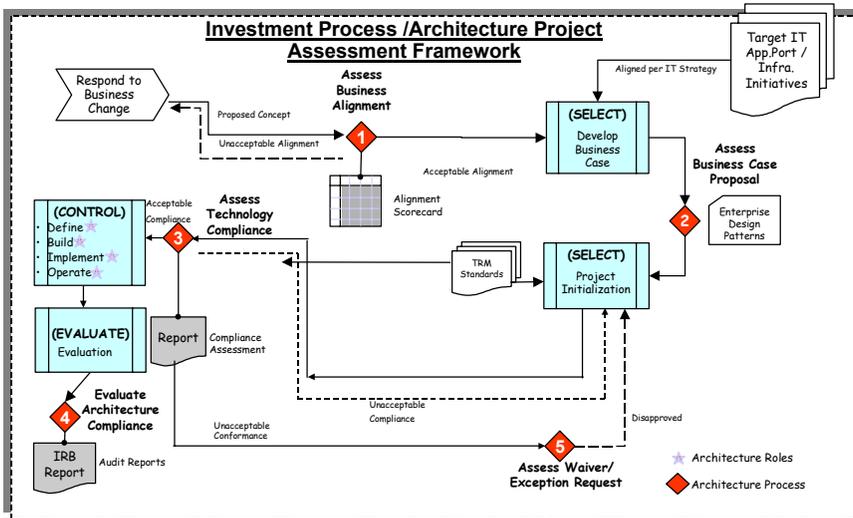
Approve, Publish, and Disseminate the EA

- **EA approval process may be cumbersome and requires a strong EA governance process**
 - Functional Proponency—domain owners
 - SME participation vs. approval/signoff authority
 - Certification
- **EA publishing and dissemination is critical to successful application of EA**
 - Need executive-level presentations of high-level EA concepts
 - Certain EA products may be appropriate as constructed, e.g., Mission and Vision Statement or User Scenarios
 - Keep in mind intended audience(s) and stakeholders



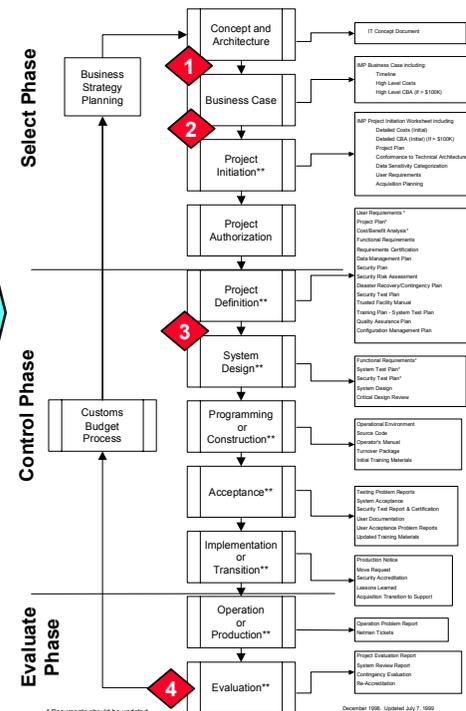
Section 6 – Using the EA

- Using the EA within the Agency’s Enterprise Life Cycle
- EA and Capital Planning and Investment Control



High Level IMP

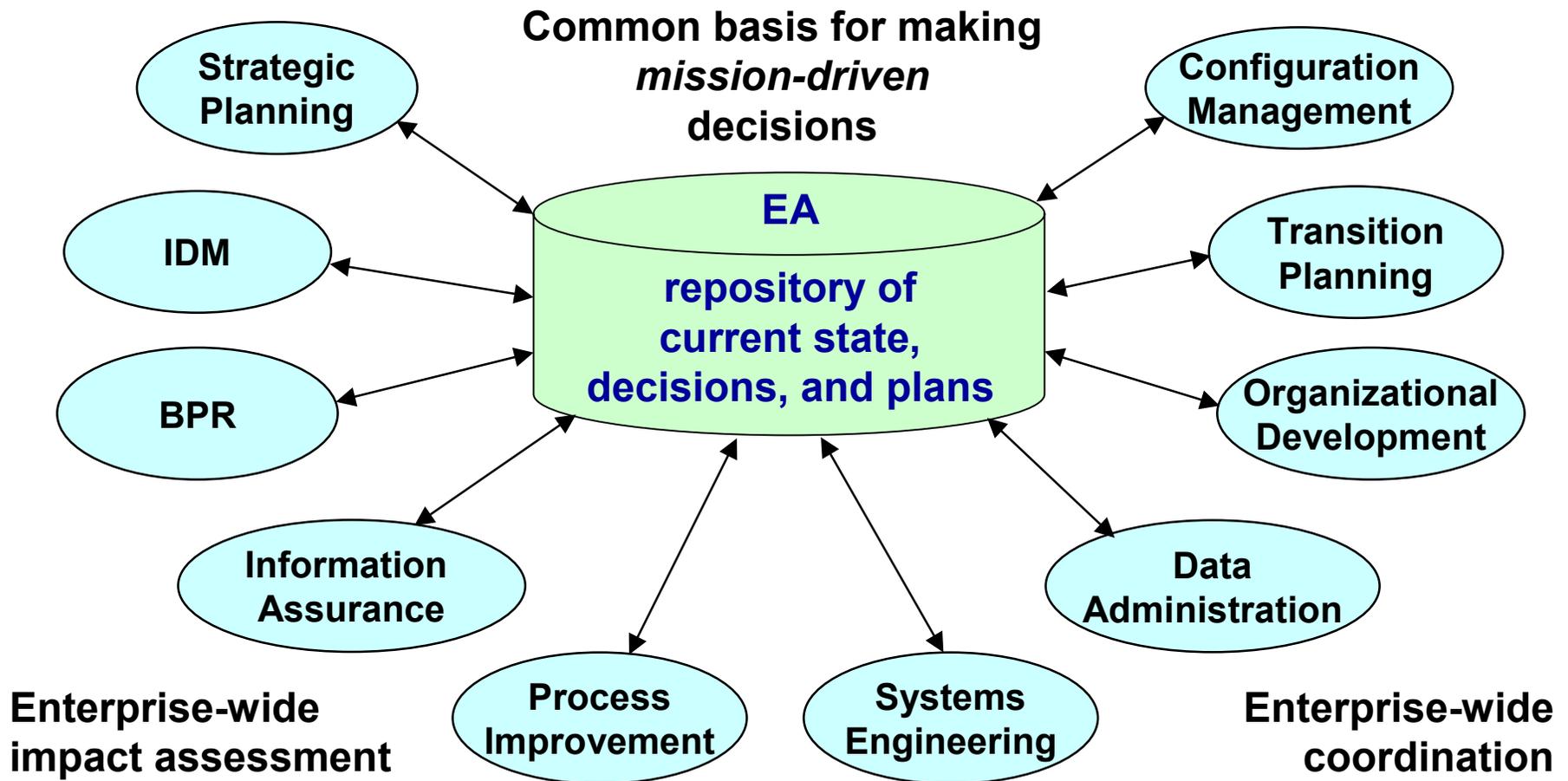
Flow and Deliverables



* Documents should be updated
 ** SDLC Defined
 December 1998, Updated July 7, 1999



Stakeholder Goals Determine the Content and Views

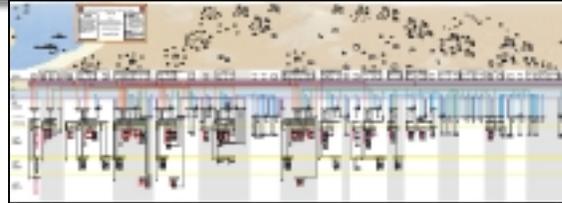




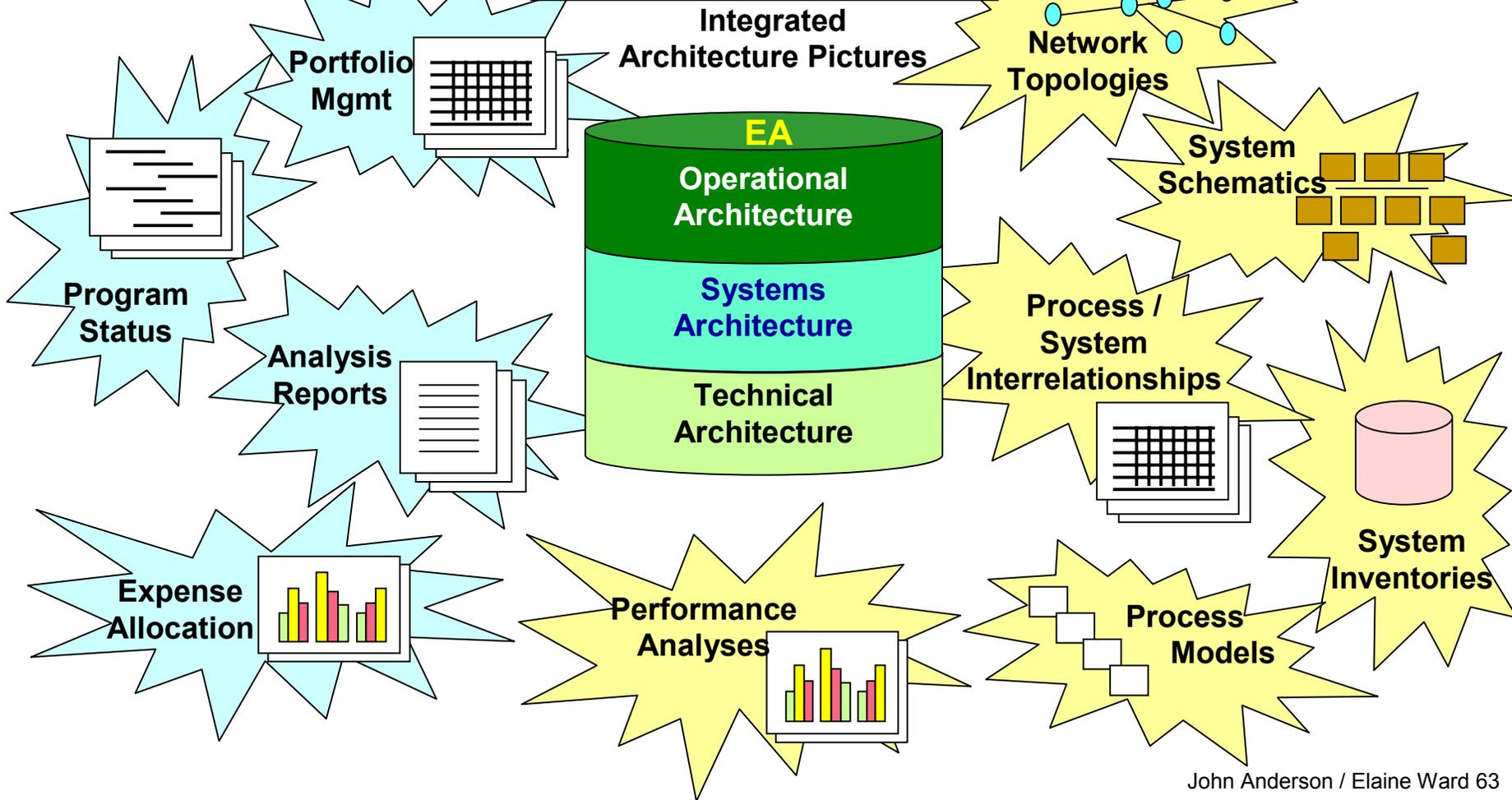
Using the EA: A Strategic Information Asset Base

MITRE

Executive
Decision
Support System



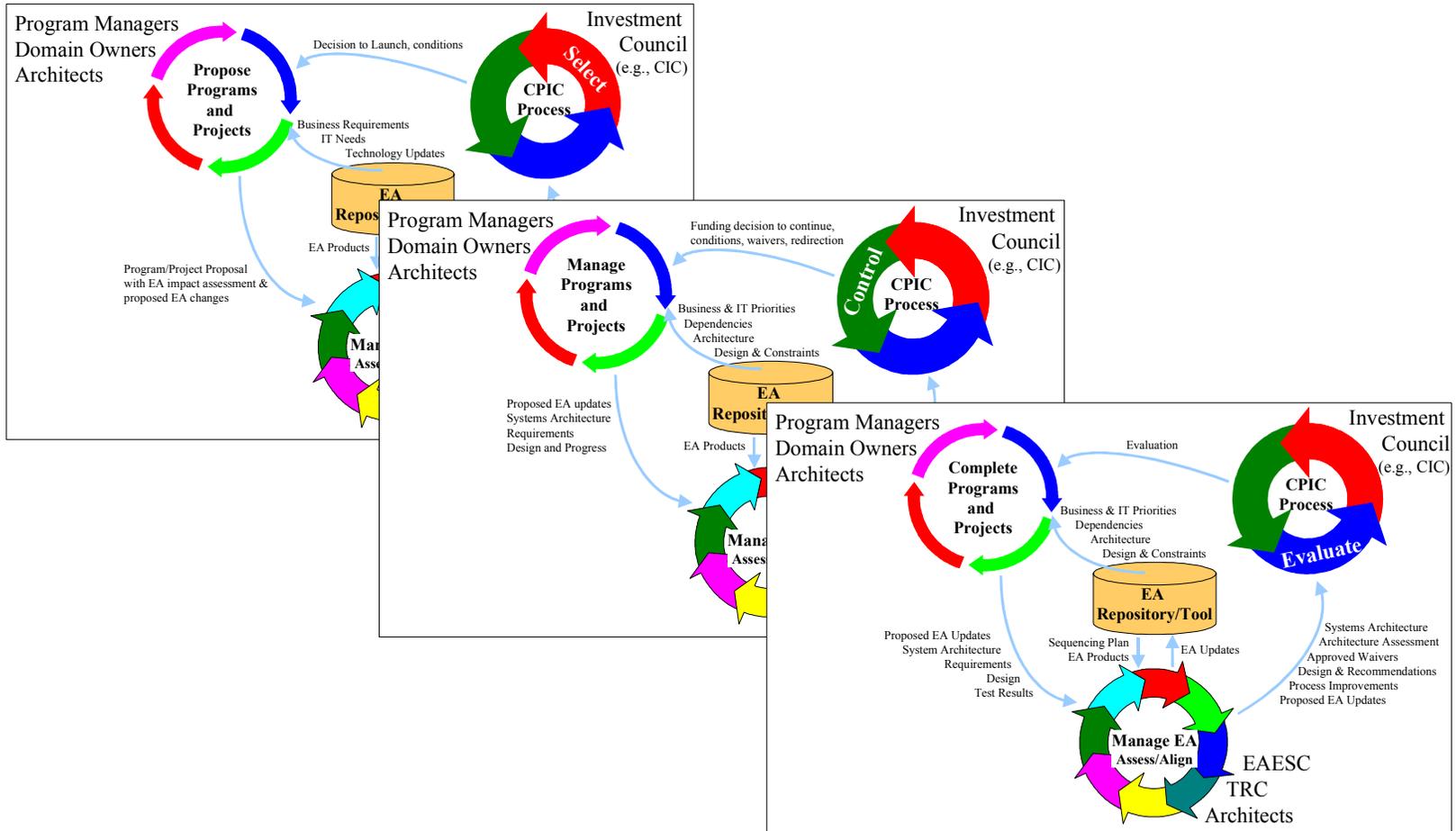
Engineering
Support System





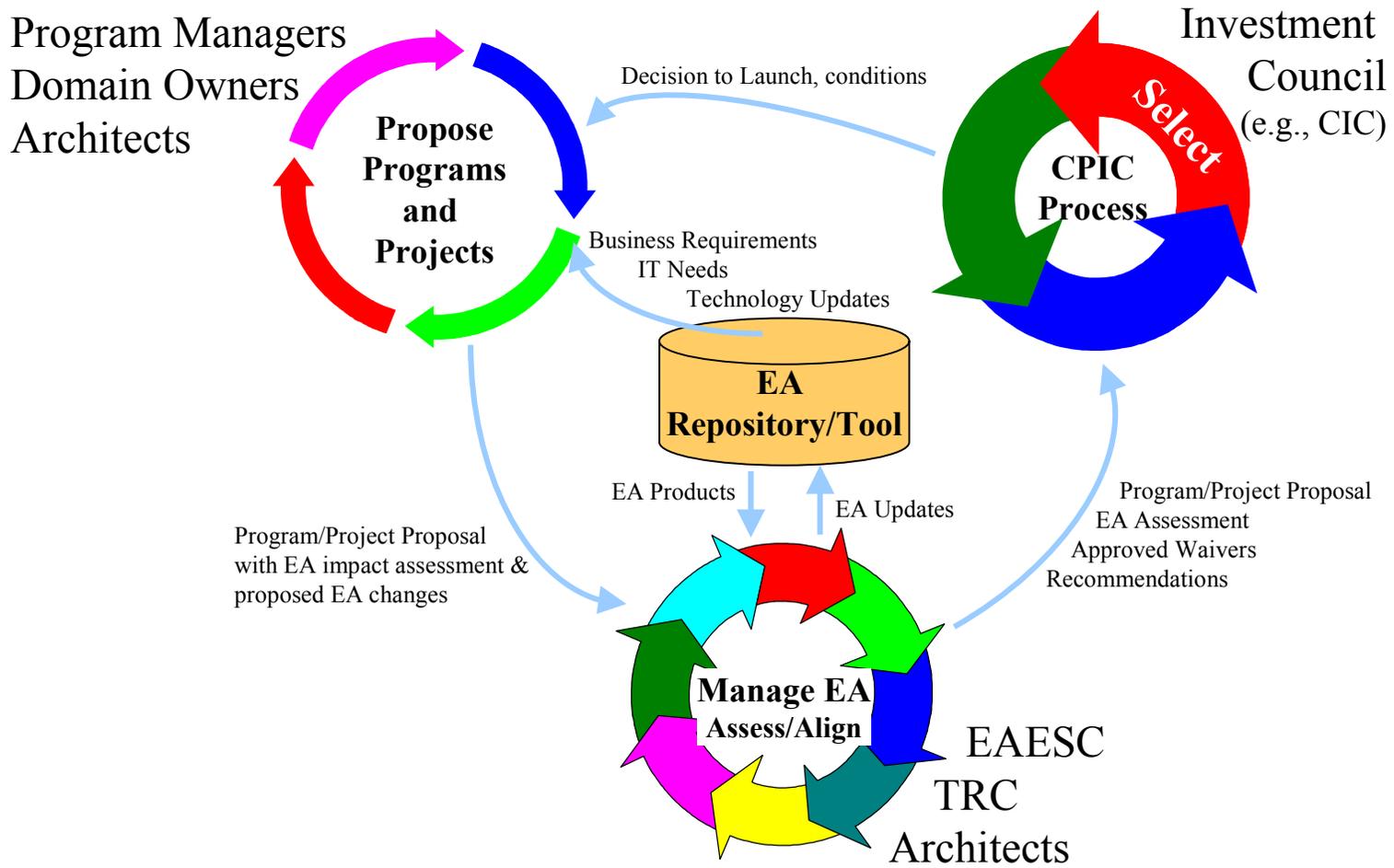
Executing the Integrated Processes: Information Flow & Decision Making

MITRE





Use the EA: Program/Project Selection

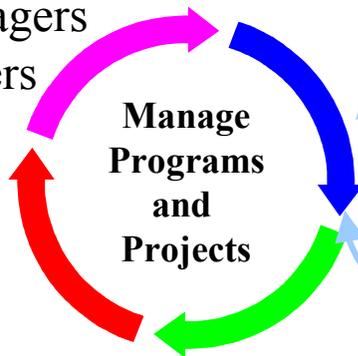


Defining New and Follow-on Programs/Projects



Use the EA: Program/Project Execution

Program Managers
Domain Owners
Architects

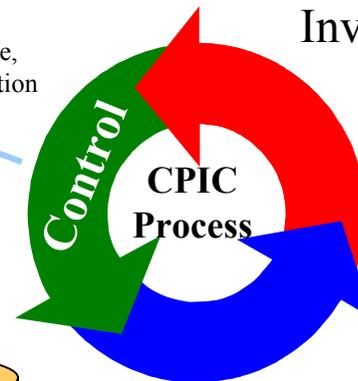


Manage Programs and Projects

Funding decision to continue, conditions, waivers, redirection

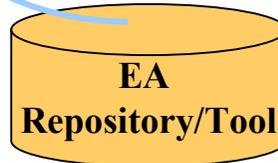
Business & IT Priorities
Dependencies
Architecture
Design & Constraints

Investment Council
(e.g., CIC)



Control CPIC Process

Proposed EA updates
Systems Architecture
Requirements
Design and Progress



EA Repository/Tool

EA Products

EA Updates

Program/Project Progress
Systems Architecture
Requirements and Design
Architecture Assessment
Recommendations



Manage EA Assess/Align

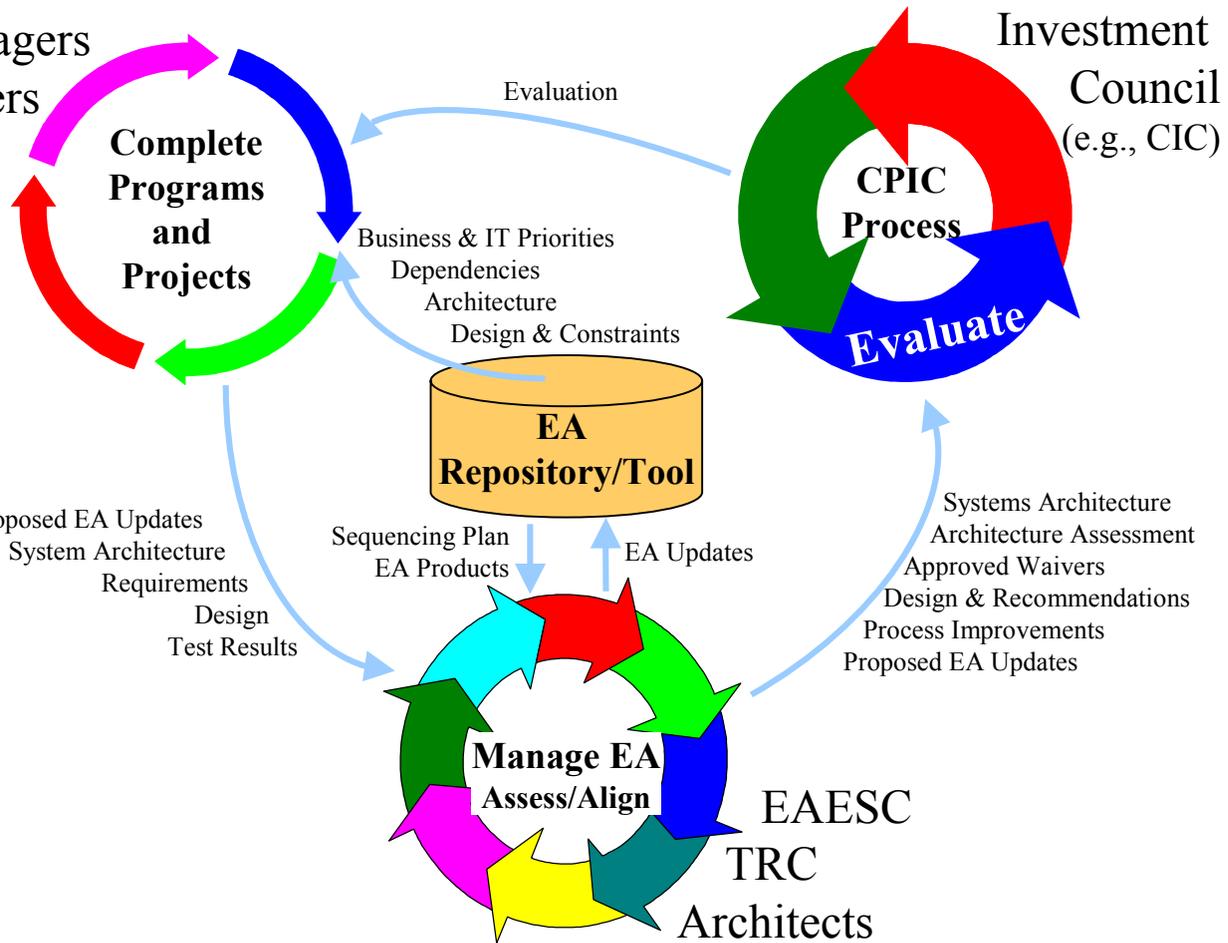
EAESC
TRC
Architects

Execute Programs/Projects



Use the EA: Program/Project Evaluation

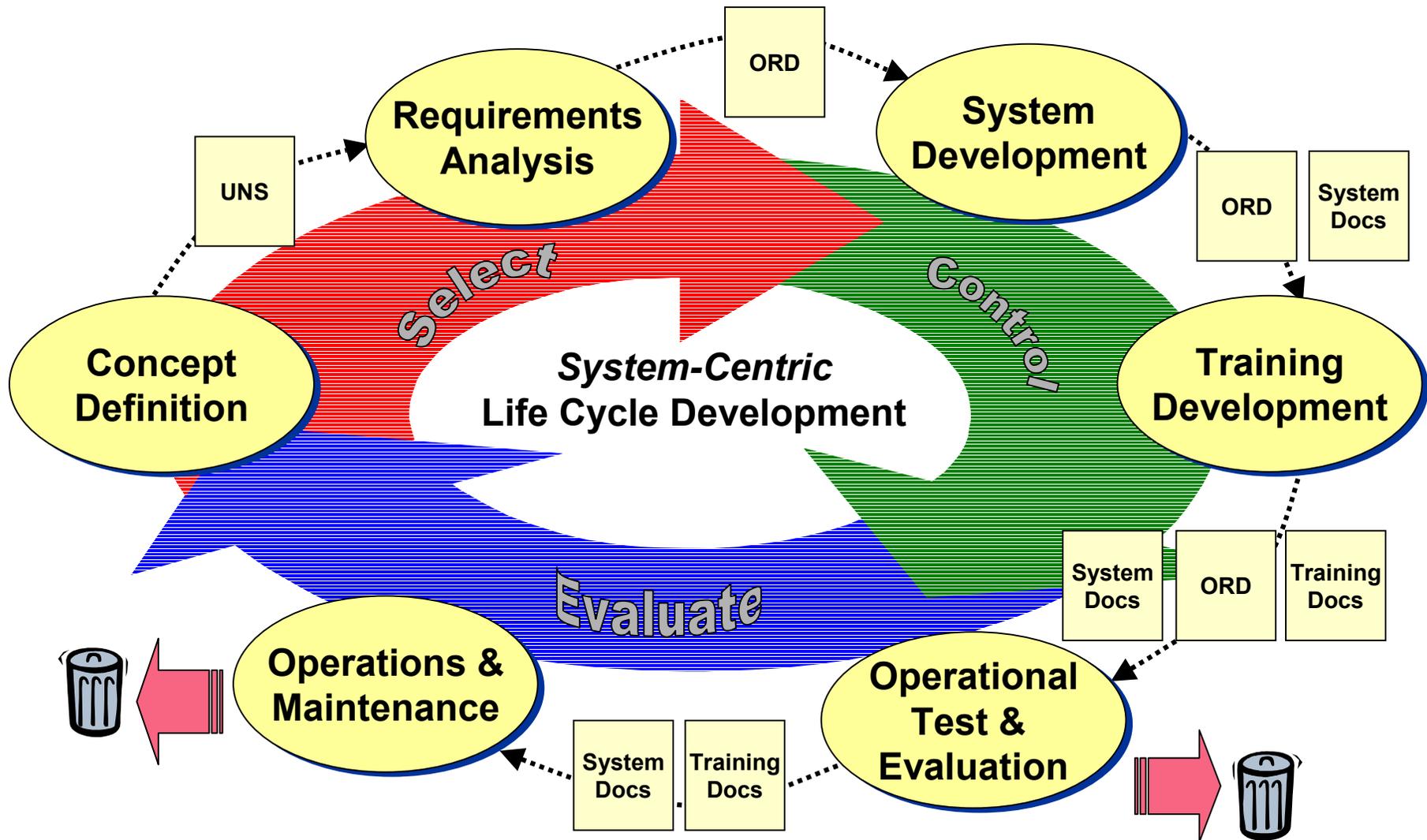
Program Managers
Domain Owners
Architects



Evaluate Programs/Projects

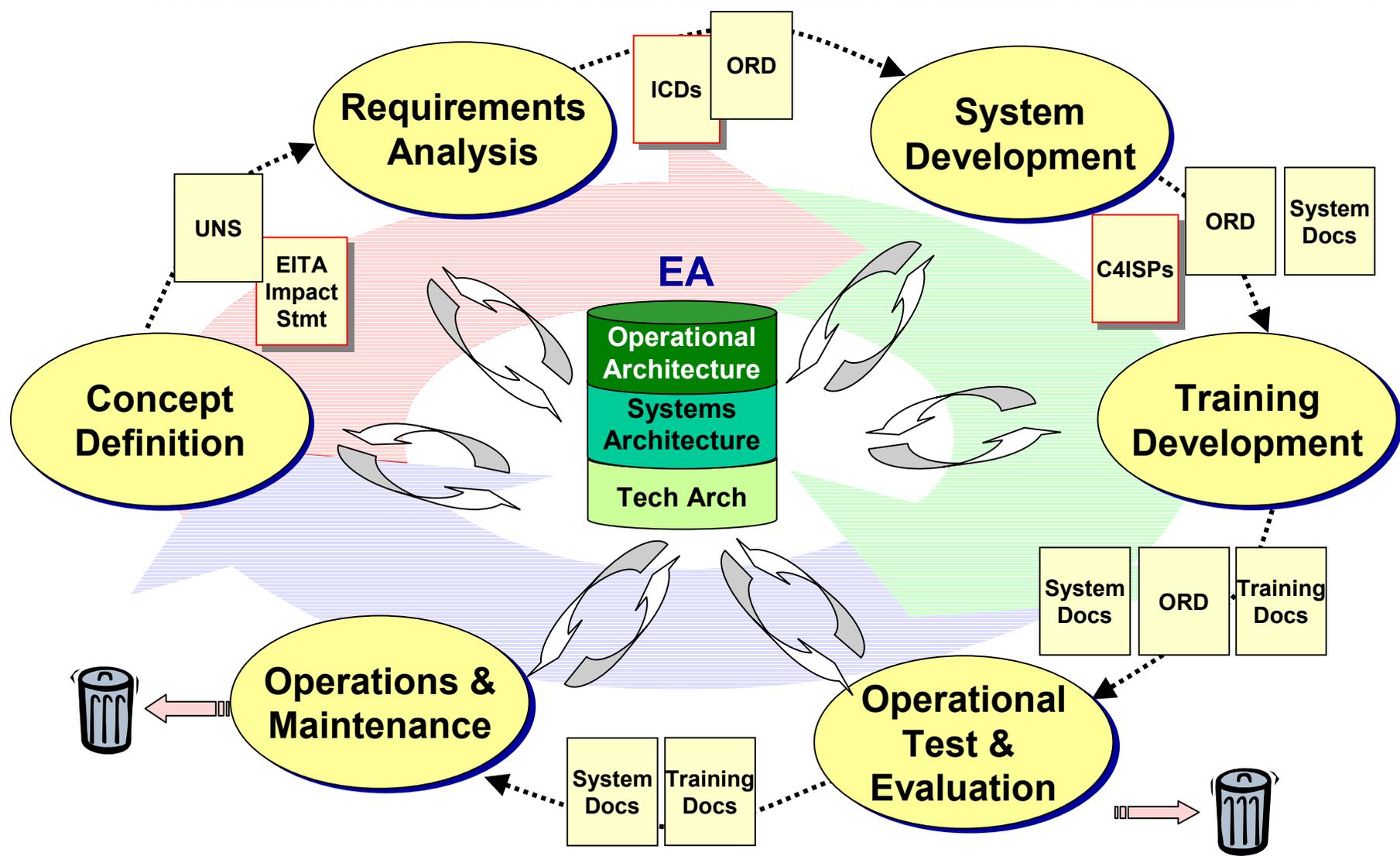


Traditional System Development





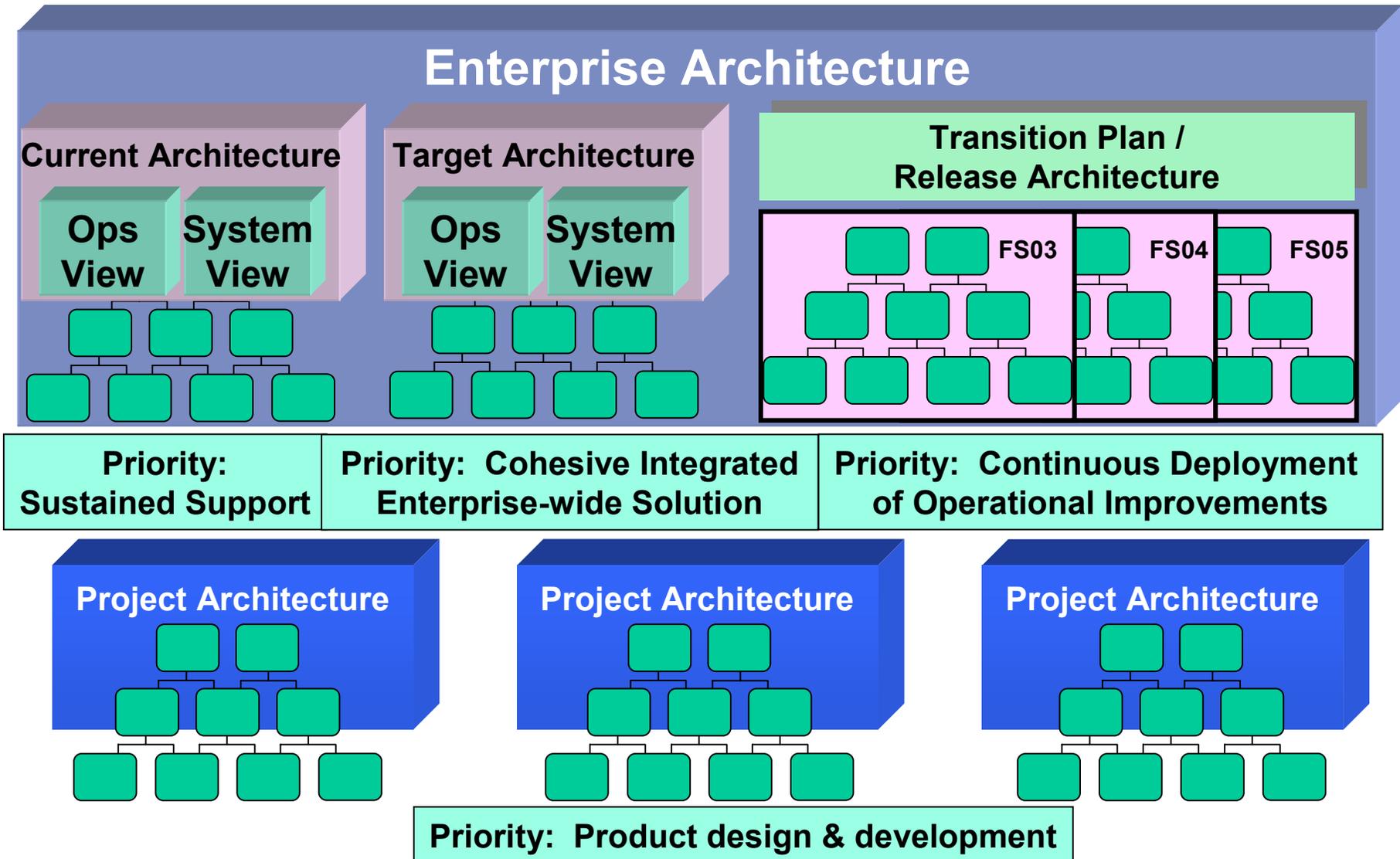
EA Throughout the Acquisition Life Cycle





Different Architectures: Various Purposes and Priorities

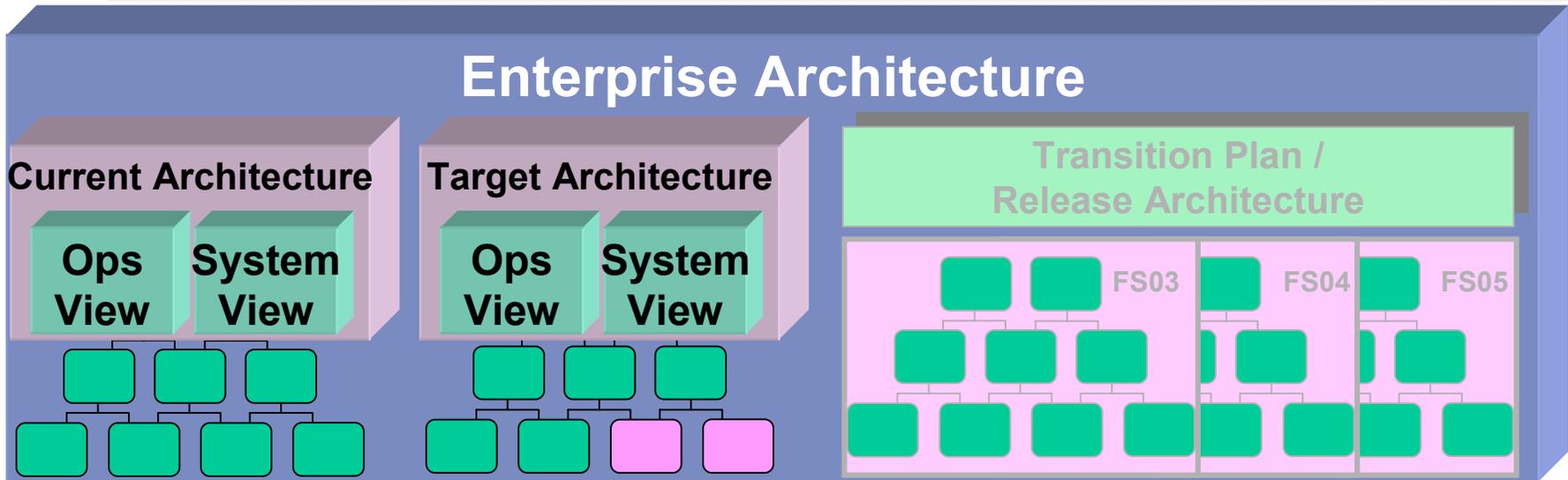
MITRE



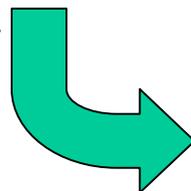


EA Compliance and Project Life Cycle: EA-Driven Program Initiation

MITRE



*EA requirements
allocated to projects*

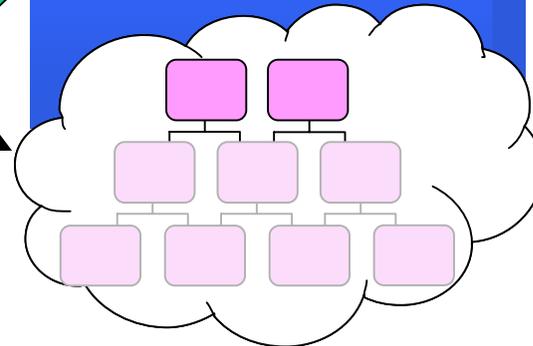


MS1: EA may establish project

Project must confirm:

- Impact on enterprise (systems and business processes)
- Information to be managed

Project Architecture

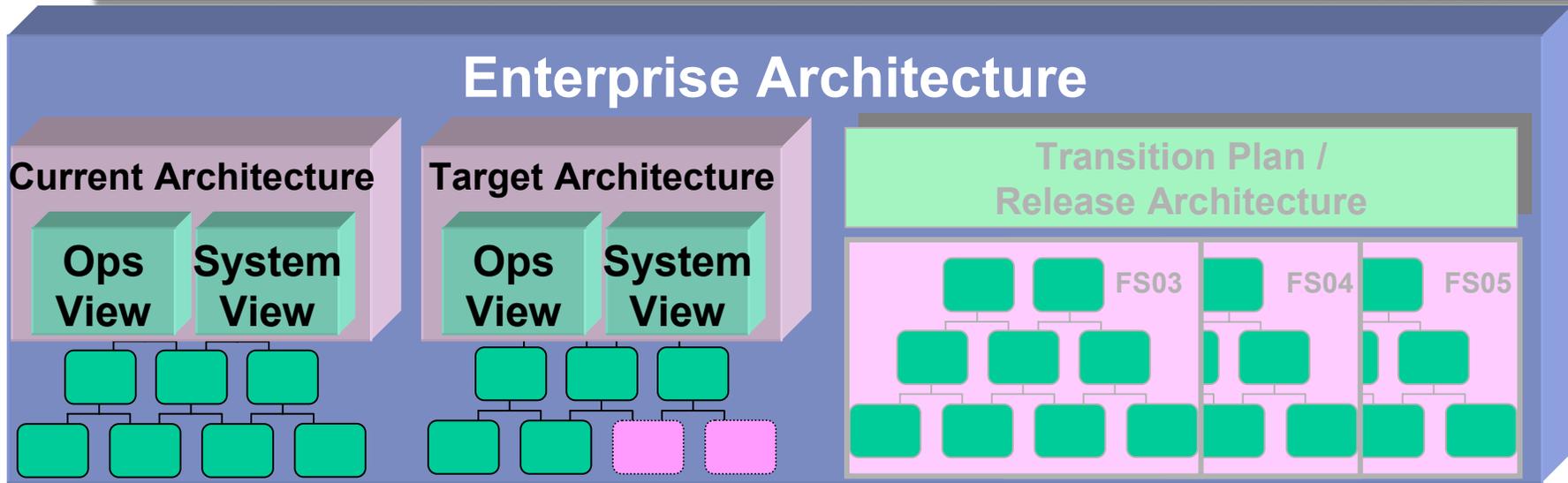


*Lower-level
design may
not yet exist*

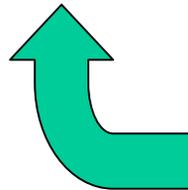


EA Compliance and Project Life Cycle: Program-Driven Initiation

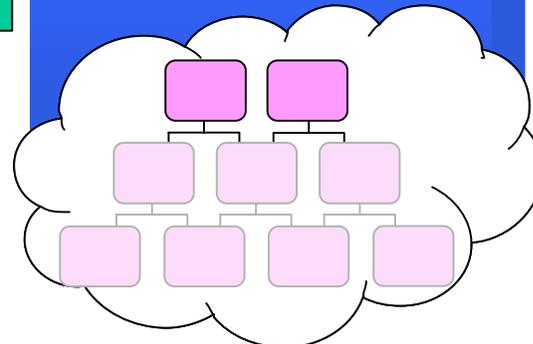
MITRE



*Cooperative
integration into
enterprise
architecture*



Project Architecture



MS1: Project must document:

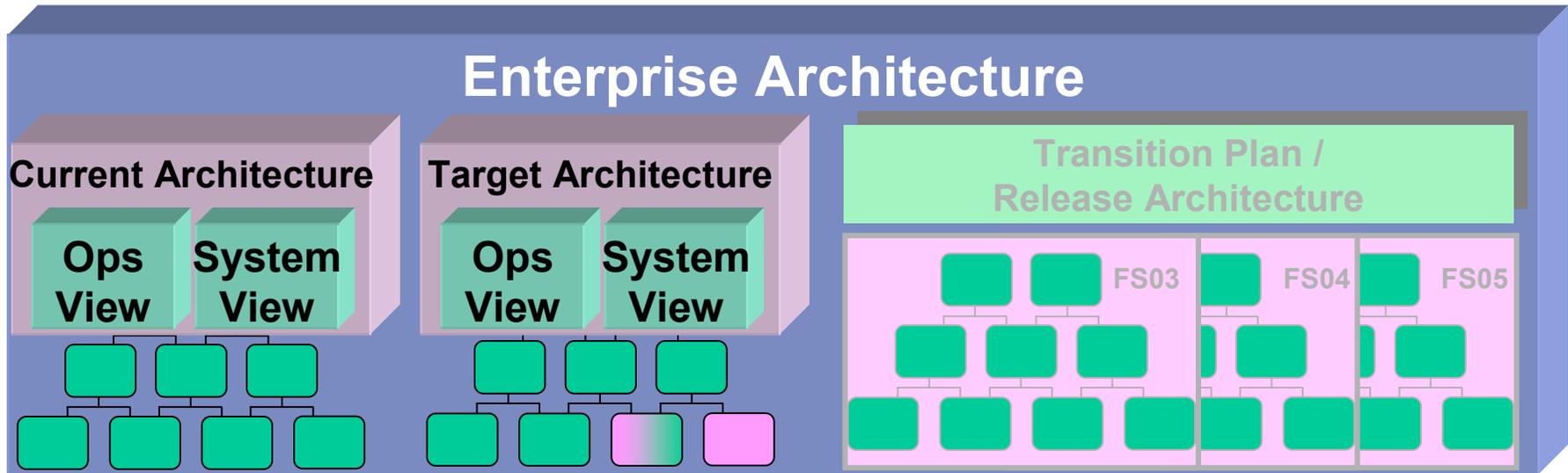
- Impact on enterprise (systems and business processes) and EA
- Information to be managed

*Lower-level
design may
not yet exist*



EA Compliance and Project Life Cycle: Milestone 2

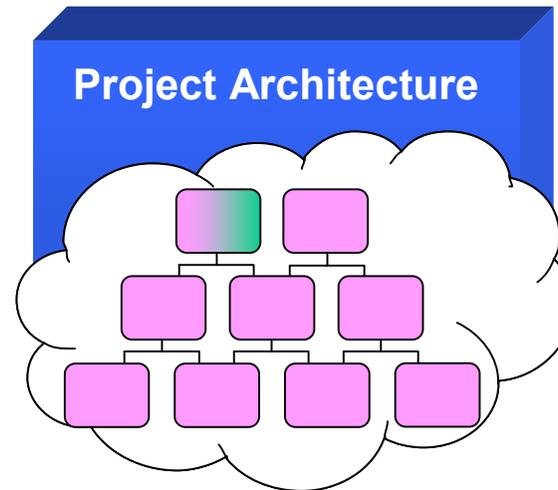
MITRE



*Cooperative design work
ensuring consistent outcome*

MS2: Projects must define:

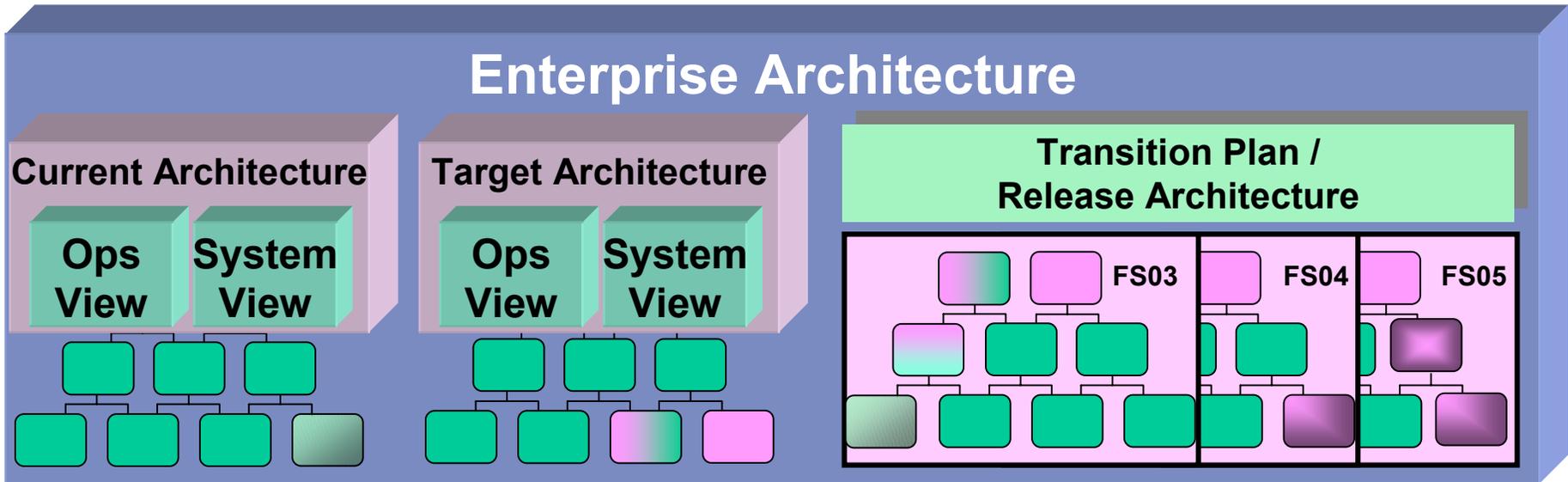
- Reference Requirements
- Business processes supported/changed
- Changes to EA
- Interfaces and/or IERs
- Impact on other projects





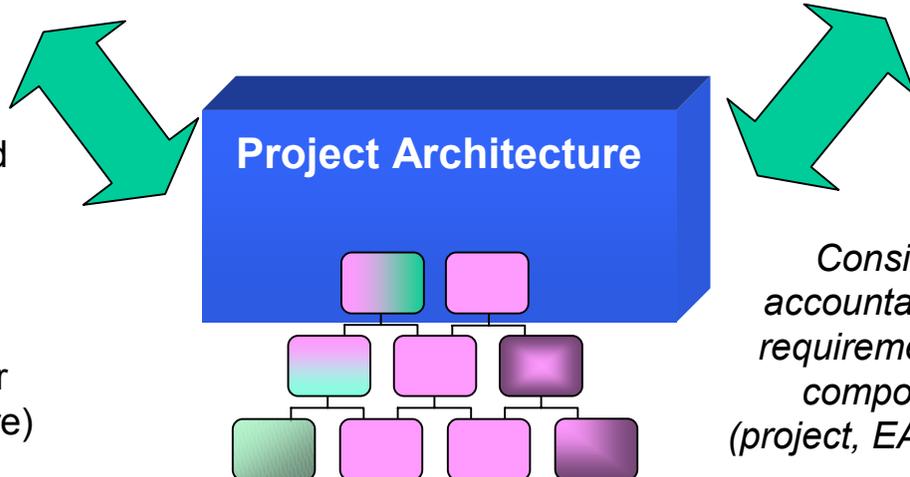
EA Compliance and Project Life Cycle: Milestone 3

MITRE



MS3: Projects must satisfy MS2 commitments:

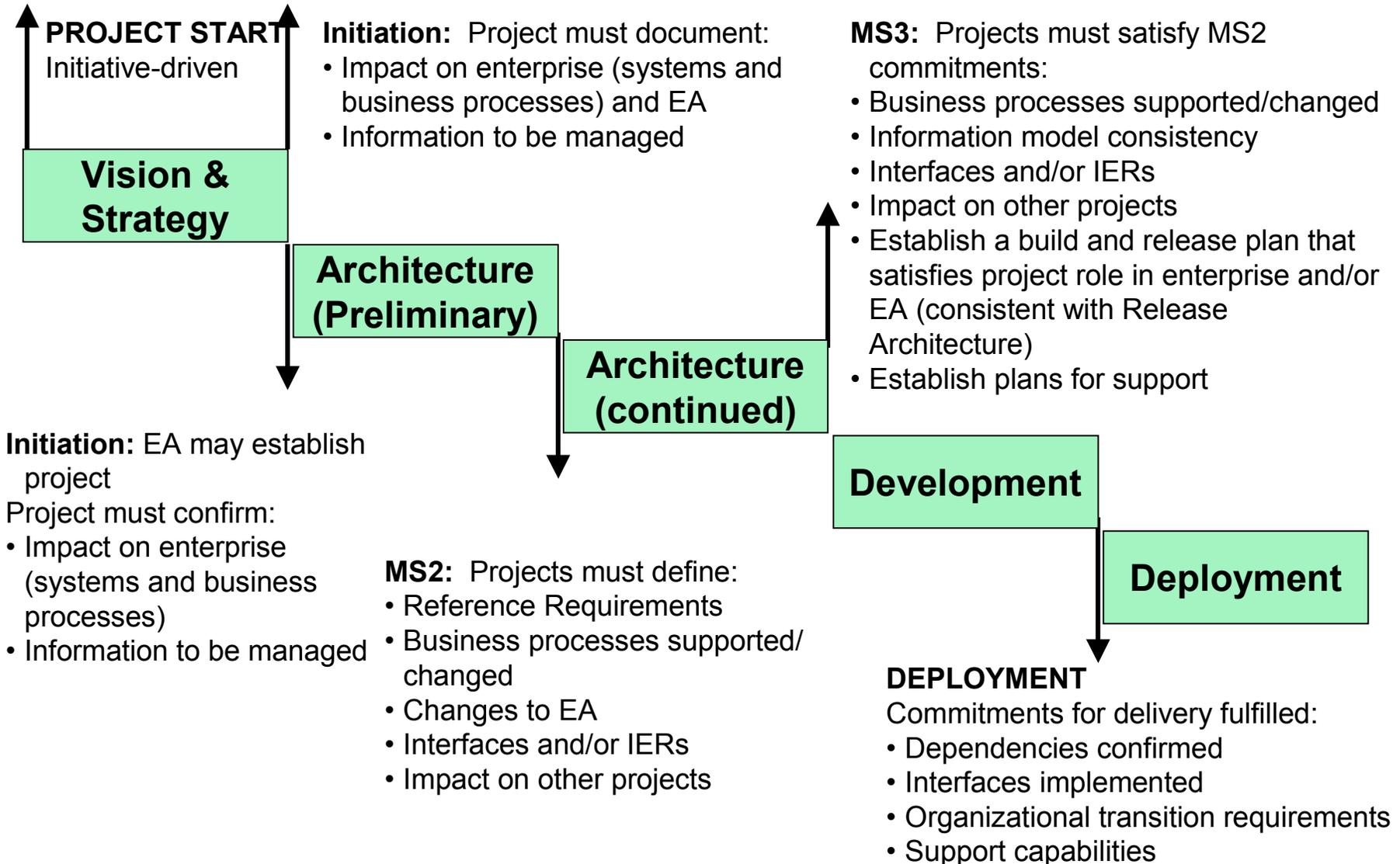
- Business processes supported/changed
- Information model consistency
- Interfaces and/or IERs
- Impact on other projects
- Establish a build and release plan that satisfies project role in enterprise and/or EA (consistent with Release Architecture)
- Establish plans for support



Consistent accountability for requirements and components (project, EA, and RA)



EA Guidance, Compliance, and the Project Life Cycle





Use of Increment Architectures: Incremental Transition Strategies

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- **Dual operations**

- Maintaining coexisting legacy, transitional components, evolutionary components, and new components
- Moving “As-Is”, increment, and “To-Be” views
- Handling retirement of legacy
- O&M
- Ensuring new technology is not outdated before modernization is completed

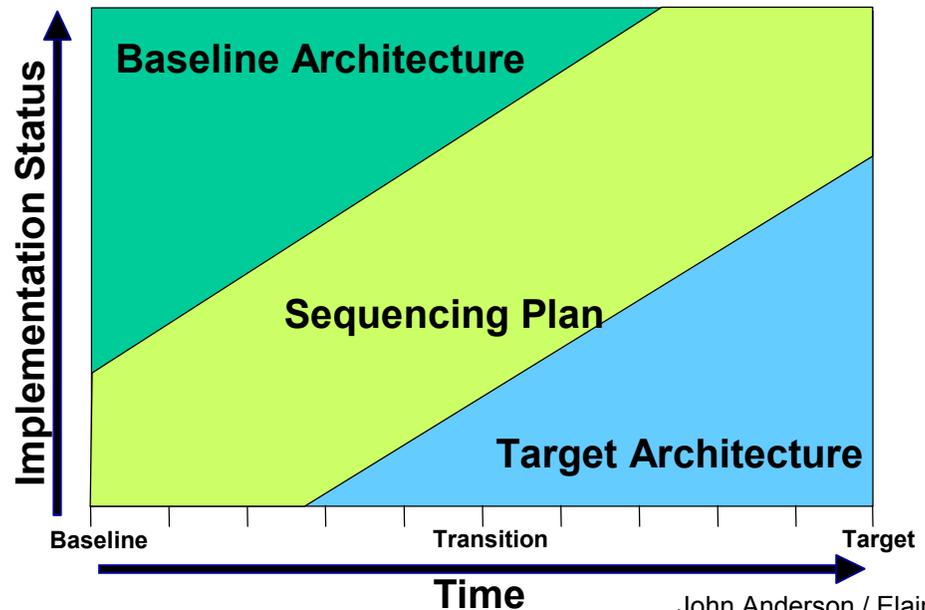
- **Contingency plans**

- Ability to change EA based on new or changing business, legislative, technical, cost drivers
- Use of alternative scenarios



Section 7 – Maintaining the EA

- **Enforcement policies**
 - Maintain and control the EA as it evolves
- **Periodic EA Reassessment**
 - Is the EA still fulfilling its purpose?
- **Manage products to reflect “reality”**
 - Is the EA responsive to ever-changing business and legislative drivers?

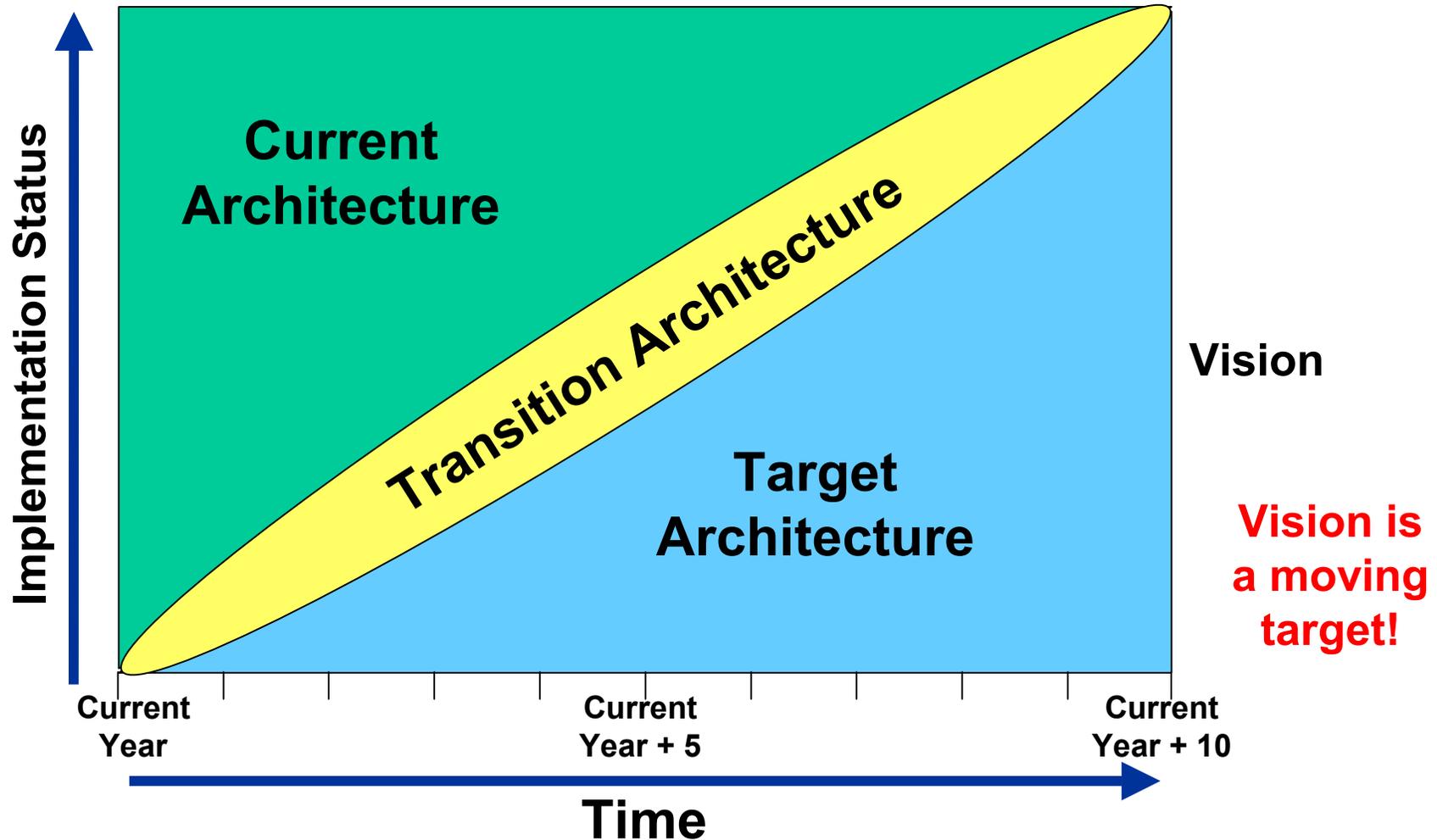




EA Maintenance: Maintaining the Vision

MITRE

Enterprise Architecture





Section 8 – Control and Oversight

MITRE

- **Change and Configuration Control**
- **Quality Assurance, Risk Management, and Independent Verification & Validation**
- **Continuous Improvement**



Continuous Control and Oversight

MITRE

- **Maintain the EA as the enterprise evolves**
 - Reassess the EA periodically
 - Manage EA products to reflect reality
 - Continue to consider proposals for EA modifications
- **Ensure necessary EA program controls and Governance are in place and functioning**
- **Identify where EA program expectations are not being met**
- **Take appropriate action to address deviations**
- **Ensure continuous improvement**



- **EA can act as the “Rosetta Stone” for impact analysis**
 - Across projects
 - Across the enterprise
- **(De)composition is the primary tool for management**
 - Project architectures are components of the Enterprise architecture
 - EA integrates projects into a cohesive enterprise solution
 - Components define elements for cost estimation and risk management
- **Integrated CM is critical for effective management**
 - EA baseline
 - Project baselines and delivery packages
 - Enterprise release management



- **EA imposes explicit and implied requirements upon the projects**
 - Allocation of business systems and interfaces
 - Enterprise-wide data models
 - Dependencies across systems and project boundaries
 - Operational requirements (e.g., processes, performance criteria)
 - Release schedules
 - Standards and conventions (e.g., languages, tools, hardware, protocols)
 - Security and Privacy requirements and strategies



EA Impact Area Risk Management

- **EA provides projects with guidance necessary to reduce technical, schedule, and cost risks**
 - Justification of systems based on business process (technical / system acceptance)
 - System of systems context (technical / interoperability)
 - Integration of systems and components (technical / interoperability)
 - Delivery strategy (schedule / system dependencies)
 - Standards and conventions (cost / development and O&M)
- **EA Waivers are used to mitigate project risk**
 - Only used as a justified last resort
 - Permits management of short-term and/or project-specific risks



- **Investment decisions should consider compliance and project role in the EA/Target Architecture**
 - EA Compliance as a prerequisite for projects above thresholds
 - ❖ Limited funding until integrated into EA
 - ❖ Compliance required for continued funding
 - Projects certified as compliant should get priority over new starts and projects not considered in EA
 - ❖ Part of the architecture and integral part of strategic plan
 - Tradeoffs should consider status of the project and the role within the EA. For example:
 - ❖ Relationship of project to Strategic Plan
 - ❖ Relationship of project to critical business processes
 - ❖ Enabling technologies
 - ❖ Dependencies of other projects requiring critical capabilities



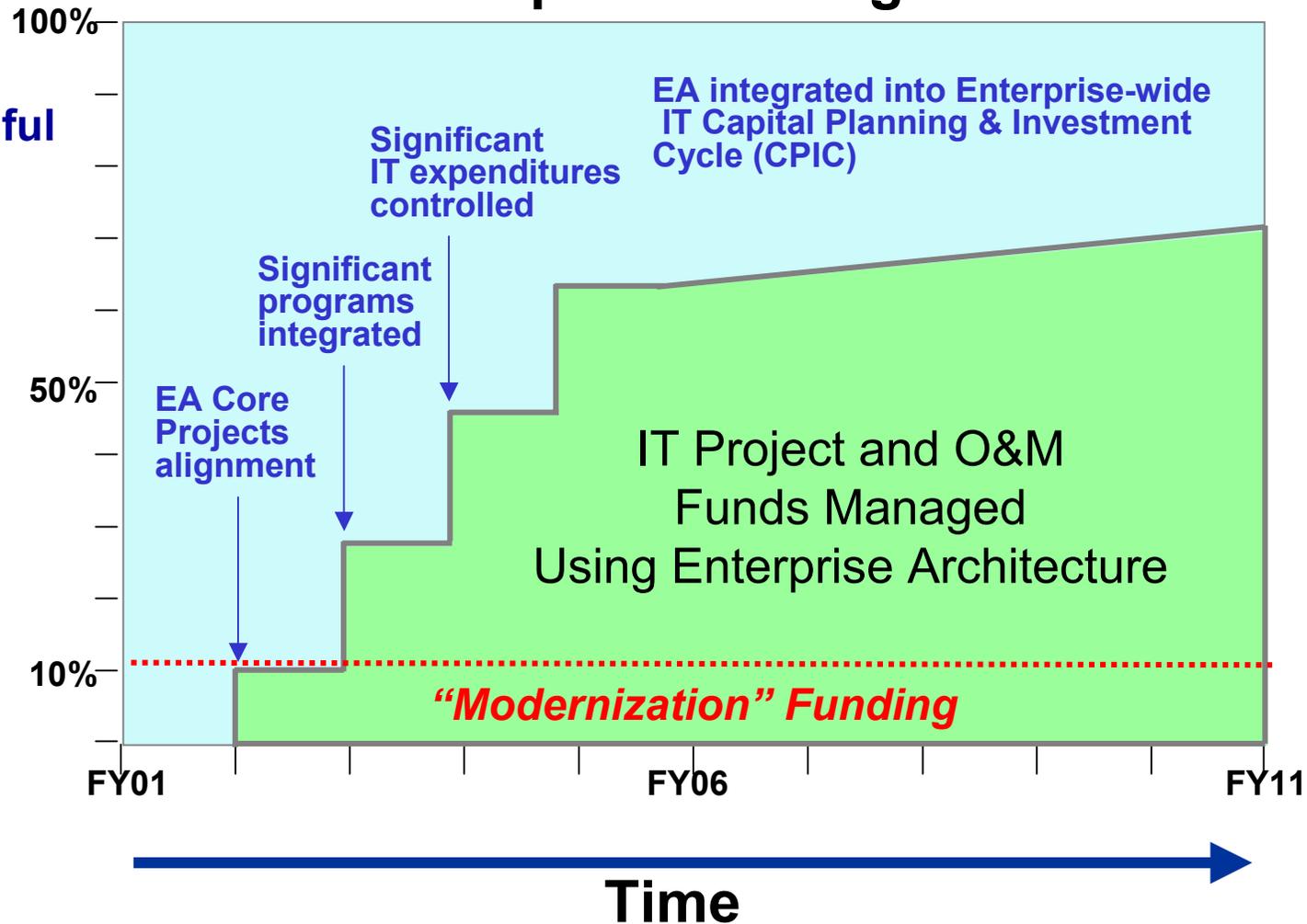
Measure of Effectiveness: EA Alignment vs. Enterprise IT Budget

MITRE

If EA is to be the basis for a successful modernization program, it must incorporate and be used to manage virtually all of the IT budget

EA Program must consider how to gain authority and control over IT budget

Enterprise IT Budget





Section 9 – Summary

- **Reiterates Central Themes**
- **Process of Processes**
- **Reason for EA Development**
- **Tailorable for all Agencies (S, M, L)**
- **EA grounded in Business Case and Frameworks**
- **Don't Suffer Alone**



Appendices

- **Summary of Roles and Responsibilities**
- **Glossary**
- **Acronym List**
- **Example Principles**
- **Example Architecture Products**
- **Zachman Framework**
- **Bibliography**



Resources

- CIO Page → <http://www.cio.gov/> (home of the *Practical Guide*)
- TEAF → <http://www.ustreas.gov/teaf/>
- National Defense Univ → <http://www.nduknowledge.net/index.htm/> (CIO and DoD resources for architecture, capital planning, etc.)
- DoD/C4ISR AF → http://www.c3i.osd.mil/org/cio/i3/AWG_Digital_Library/
- DoD JTA → <http://www-jta.itsi.disa.mil/> (Joint Tech Arch)
- DoD TRM → <http://www-trm.itsi.disa.mil/> (Technical Ref. Model)
- Zachman → <http://www.zifa.com/>
- Spewak (EAP) → <http://www.eap.com/eaphome.html/>
- EWITA → <http://www.ewita.com/> (Enterprise-wide IT Architectures)

Tools

- Popkin SA Tool → <http://www.popkin.com/>
- Ptech Tool → <http://www.ptechinc.com/>