An Architecture-based Enterprise Planning Process

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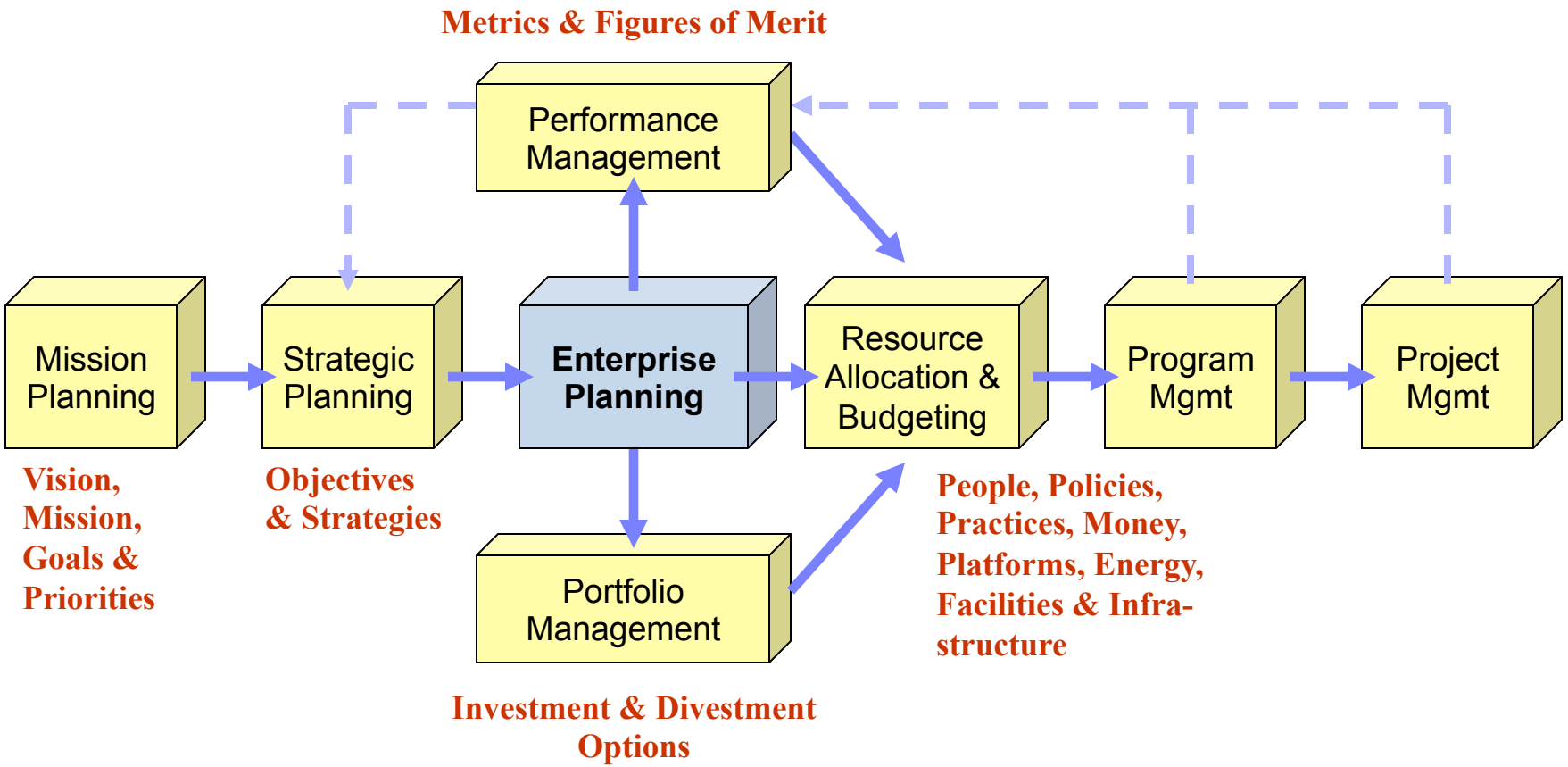
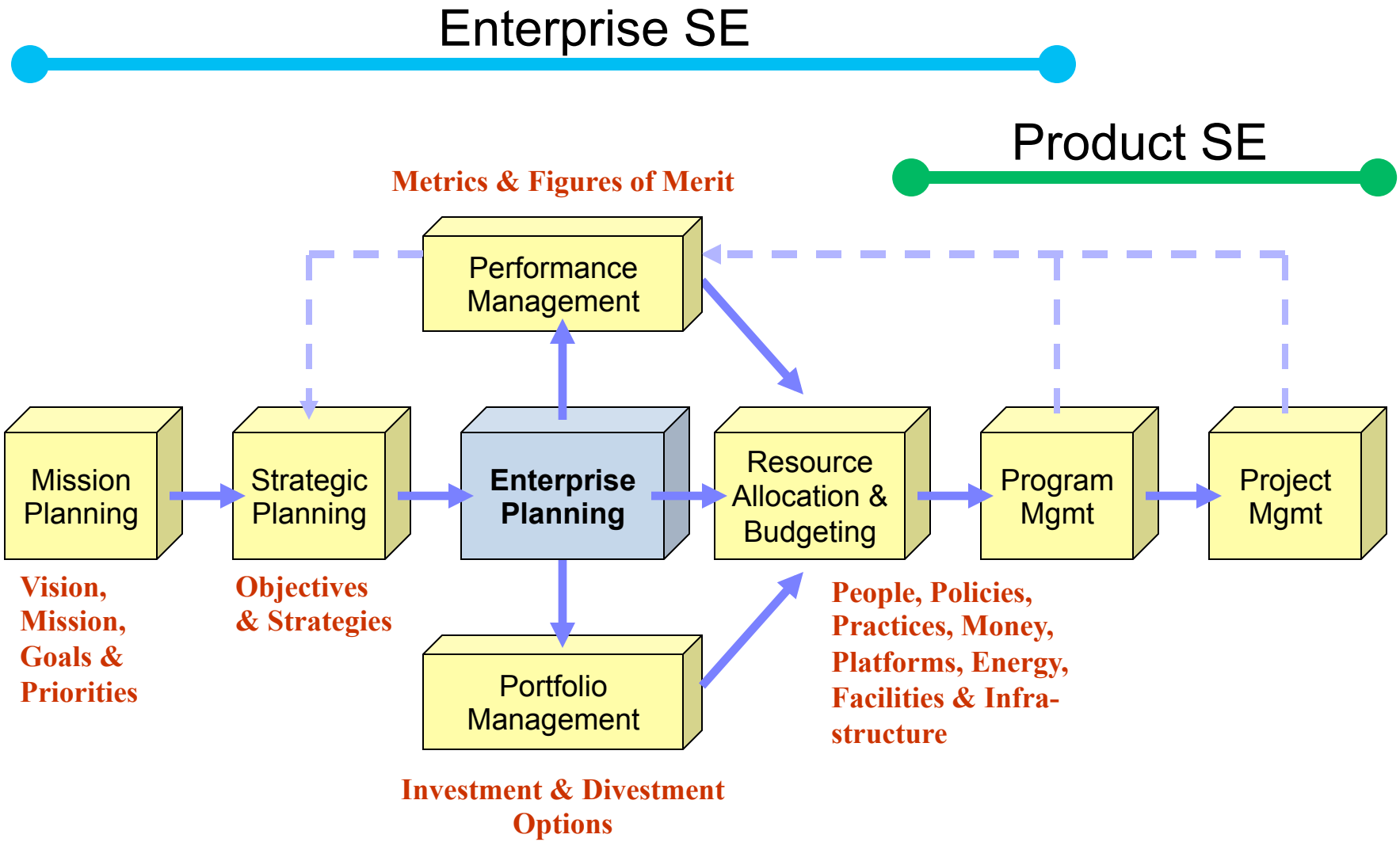
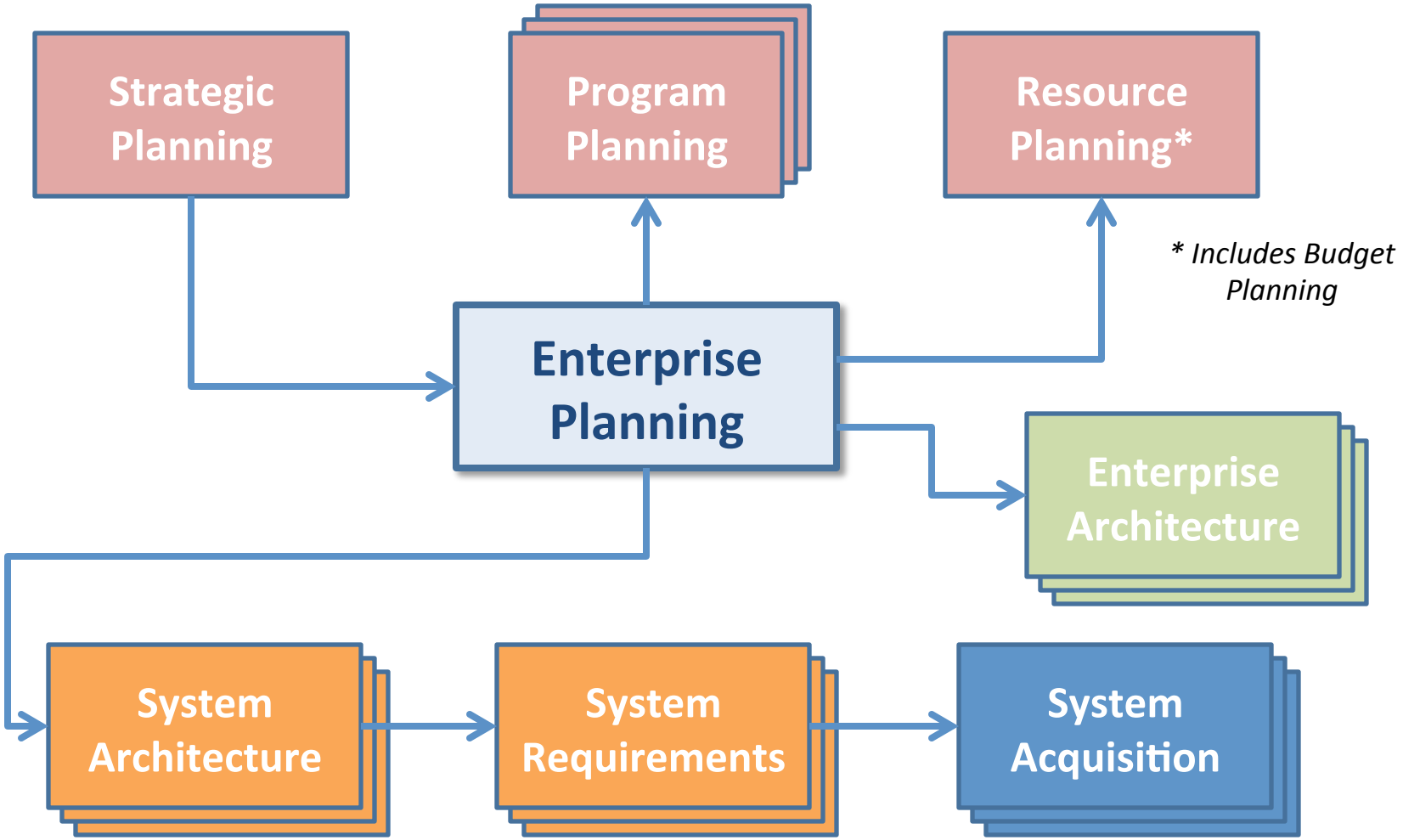
Enterprise Planning in Support of Enterprise Management Activities



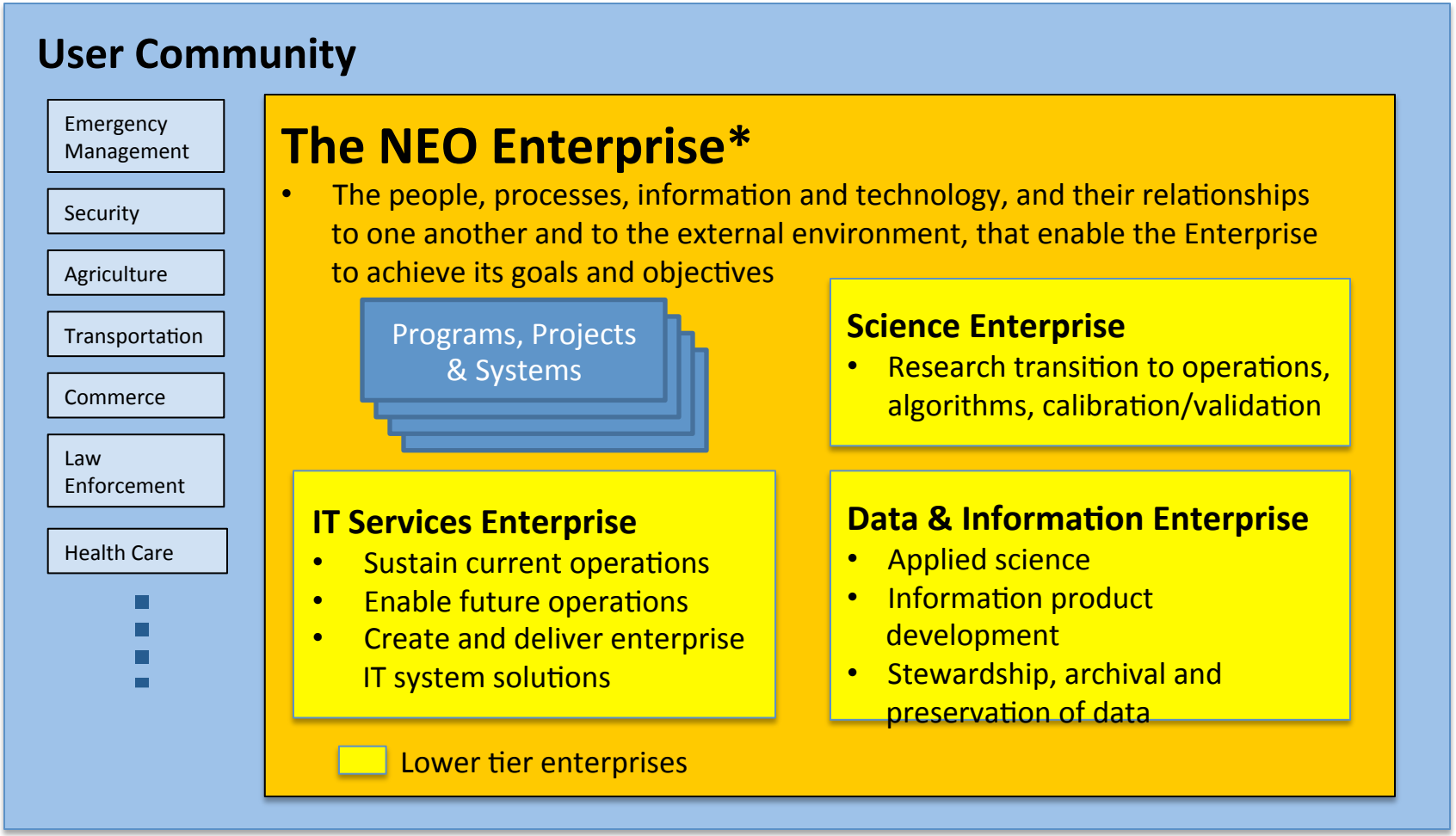
Systems Engineering at the Enterprise Level



Context for Enterprise Planning



Enterprise Architectures to be Described and Managed



** NEO is a fictional name of the Enterprise for purpose of this presentation*

Purpose and Scope of Enterprise Planning

- **Purpose:** To enable the enterprise to more efficiently and effectively
  - Identify, characterize, allocate, and acquire
  - Balanced and robust solutions
  - Given the constraints, conditions, and challenges
  - Under which the Enterprise must operate

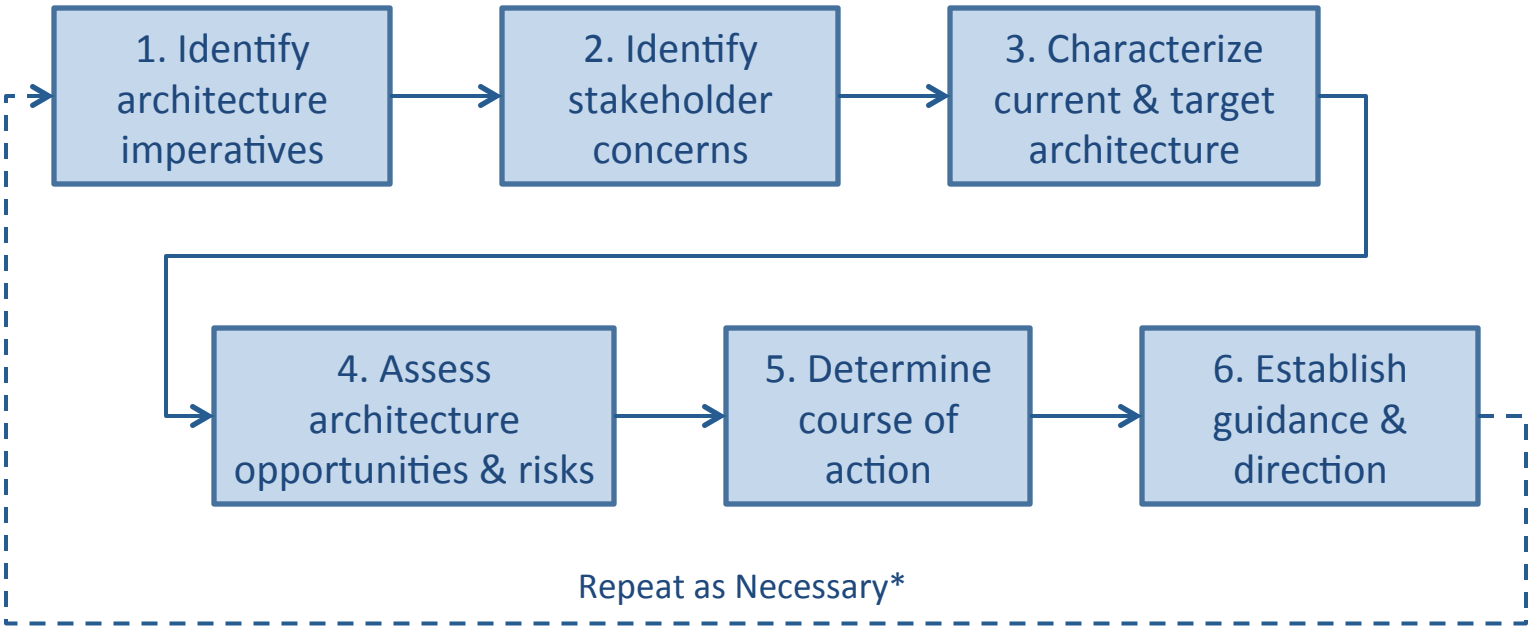
- **Scope:** Development and evolution of the Enterprise Architecture, along with the three lower-tier enterprise architectures for IT Services, Science, and Data & Information
  - Each of the primary offices responsible for these architectures will develop and coordinate them in accordance with this process
  - Facilitates Enterprise alignment and synchronization
    - With the corresponding architectures of Mission Partners
    - … and the User Community as a whole

Background

- **This process is based on a widely-employed enterprise analysis framework***
  1) Helps understand & communicate how enterprise activities support operational needs
  2) Serves as a common frame of reference for the enterprise so that all can "sing from the same sheet of music"
  3) Provides a structure for assessing tradeoffs between operational alternatives
  4) Assists in the development of new concepts for enhancing the user community's capabilities
- **Does not replace the Strategic Planning process**
  - Enterprise Planning process augments Strategic Planning by providing information that drives the Long-Term and Short-Term Strategic Plans
  - This is based on assessment and evaluation of the enterprise and system architectures individually and as a "portfolio" of systems, projects & programs
- **Depends on having a robust corporate decision process like a Strategic Resources Management Board (SRMB)**
  - Enterprise Planning process provides recommendations to the SRMB for their adjudication and approval of changes to the architecture and corresponding changes to program and project budgets and plans

** RAND Corporation, 1993. "Strategies to Tasks: A Framework for Linking Means and Ends".*

Enterprise Planning Process



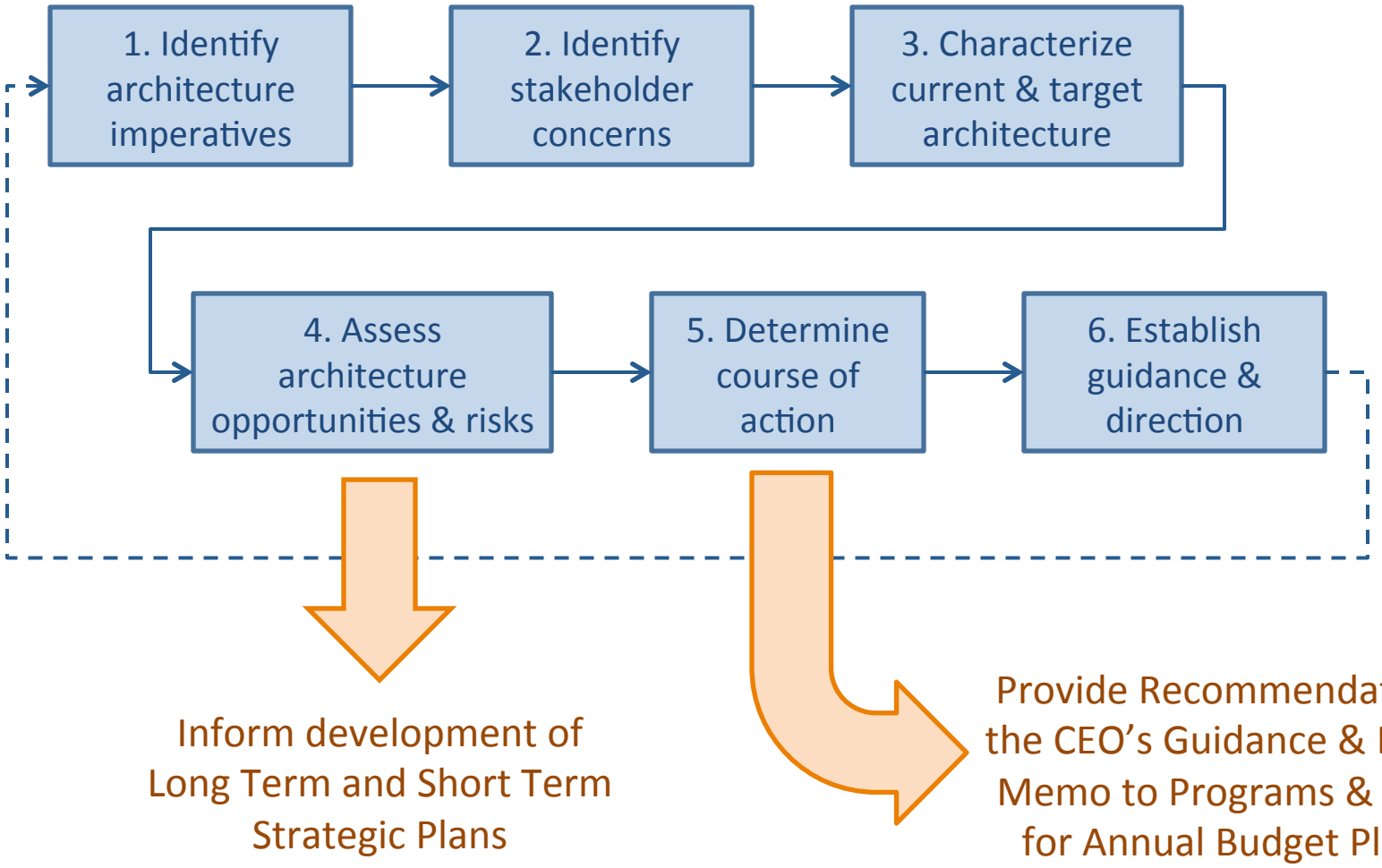
Informs the Strategic Planning Process with Enterprise Architecture-based recommendations

** Nominally repeats on an annual basis in support of Budget Planning, but can also be repeated on special occasions such as Key Decision Points, major Program Milestones, etc.*

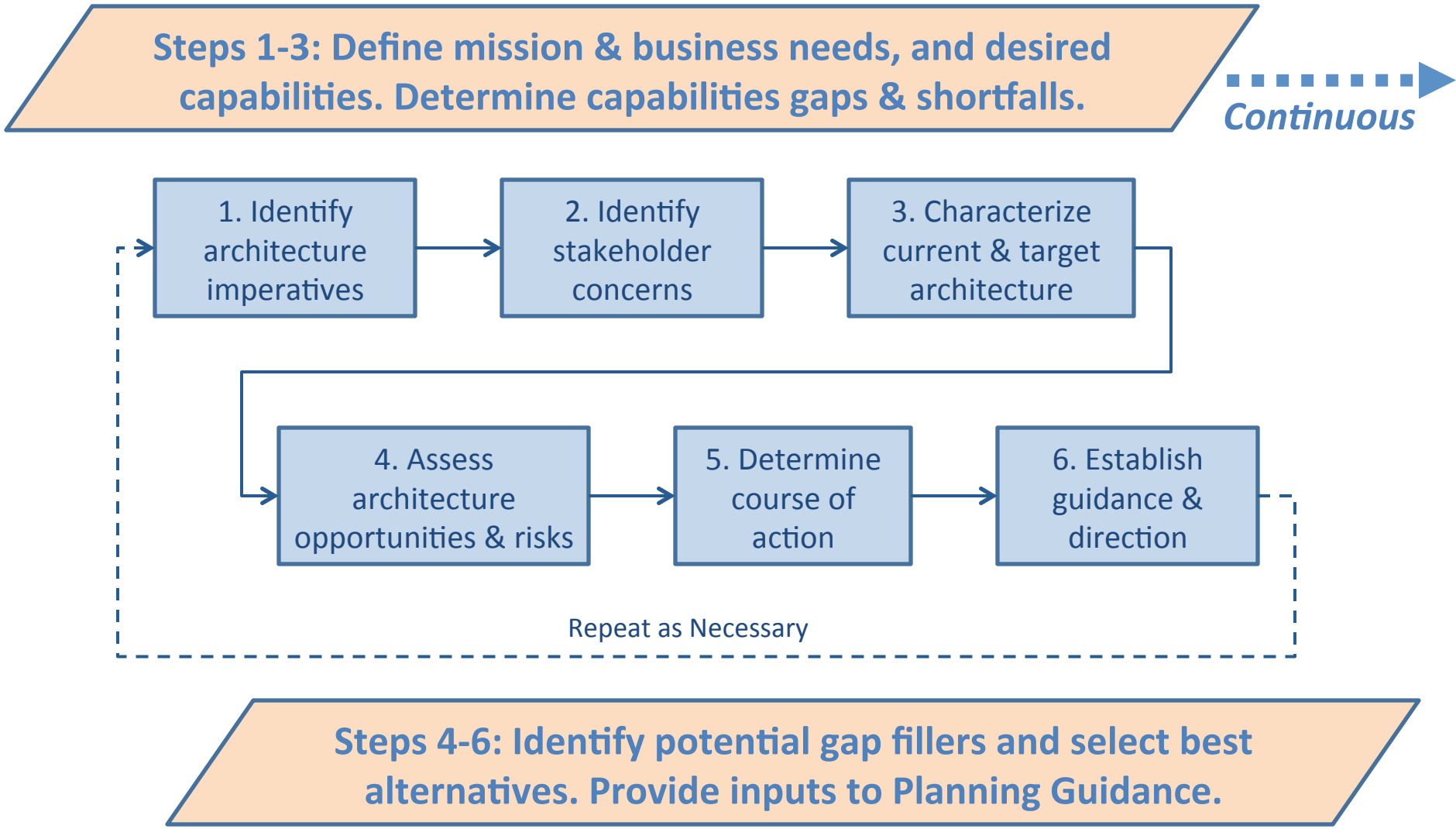
Enterprise Planning Products

Activities	Outputs
1. Identify architecture imperatives	• Relevant information (e.g. scope, reach, extent, goals, objectives, principles, focus areas & priorities) captured and documented in a form suitable for use in subsequent activities
2. Identify stakeholder concerns	• Definition of who is impacted, how they are impacted, to what degree, and relative priorities for each stakeholder & concern • Definition of **measures of success** & **key success factors**
3. Characterize current & target architectures	• Definition of **deployed baseline** and deployment plans (current architecture) and **desired future end state** (target architecture) • Definition of capabilities, capacities, coverage, and vulnerabilities
4. Assess architecture opportunities & risks	• Definition of where **advancement** and **progress** can be attained, including potential **hazards & losses**
5. Determine course of action	• Definition of best ways to gain improvements in the architecture, including **changes to plans & budgets**
6. Establish guidance & direction	• Definition of areas of emphasis or de-emphasis, new ways of doing business, and **roadmaps** for capabilities, technologies & systems • Definition of **requirements** (new and revised) and standards

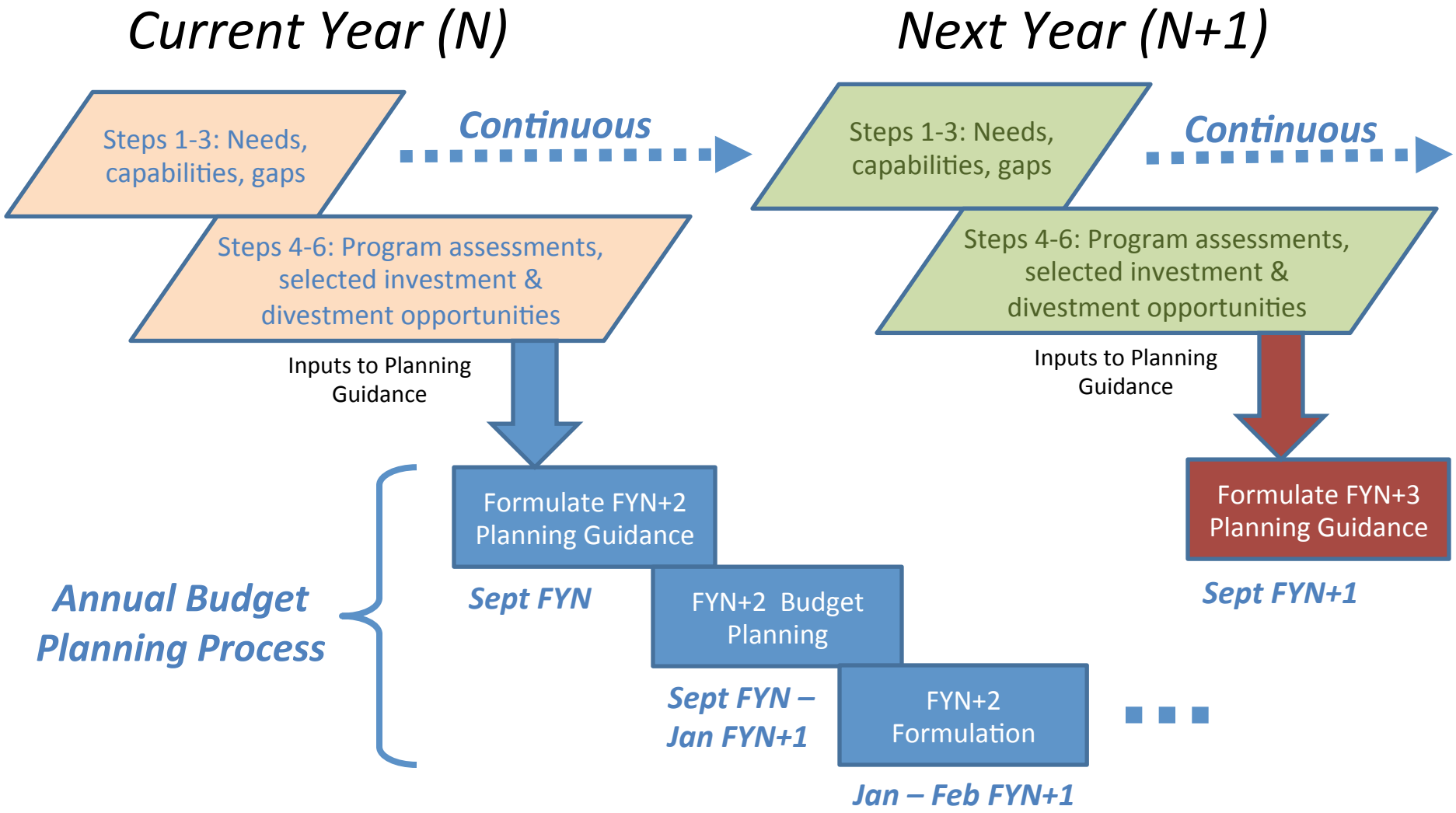
Informing the Strategic Planning Process



Enterprise Planning in Two Phases



Support of the Annual Budget Cycle

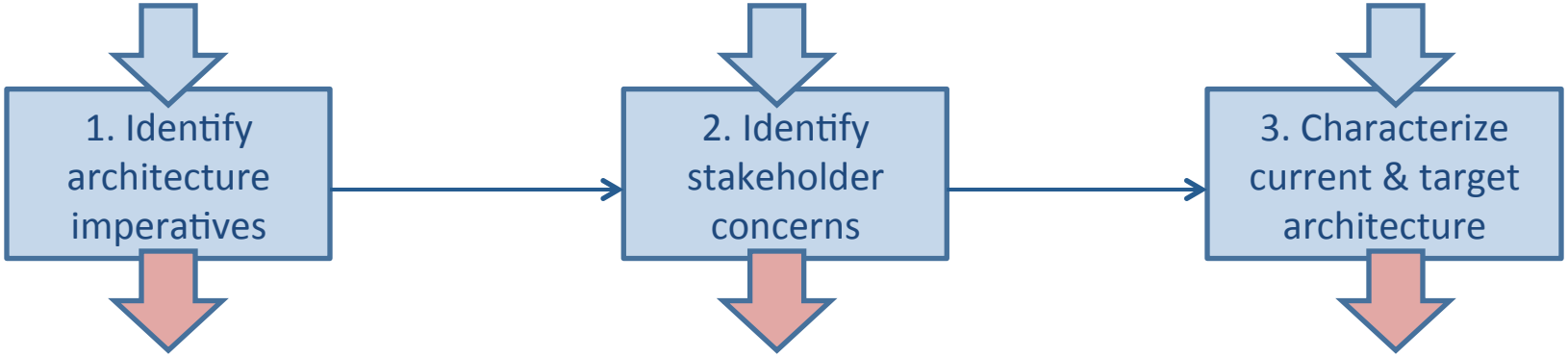


Phase 1: Steps 1-3

- National and agency policies and directives
- Strategic and operational goals and objectives
- Mission, business and IT doctrines and plans
- Mission, business and IT activities and operations

- Mission and business needs
- Desired information and data products
- Potential threats and vulnerabilities
- Desired capabilities, capacities, and coverages
- Business and interface agreements
- Internal operational and user needs
- Mission partner plans and expectations

- Deployed, planned and future capabilities, capacities & coverages
- Vulnerabilities
- Opportunities for improvement



- Imperatives database
- Priorities & focus areas

- Prioritized stakeholder concerns
- Measures of success

- Capability and capacity gaps & shortfalls
- Dependencies and critical relationships

Step 1: Identify architecture imperatives

A. Gather relevant documentation and assess these items to identify potential impacts on the Enterprise:
   - National and agency policies and directives,
   - Strategic and operational goals and objectives,
   - Mission, business and IT doctrines and plans, and
   - Mission, business and IT activities and operations.

B. Refine the relevant information (ie, imperatives for the architecture) and capture this in a form suitable for use in subsequent activities.

C. Identify priorities and focus areas for the architecture imperatives.

D. Maintain traceability to relevant documentation for these architecture imperatives.

✓ Note: Imperative is defined as "a rule, principle, or instinct that compels a certain behavior" and as "something that is urgent or essential." Essential means "basic, fundamental and necessary." In some domains these imperatives are called "architecture principles."

Step 2: Identify stakeholder concerns

A. Gather relevant documentation and other relevant information, and assess these items to identify potential impacts on the Enterprise:
   - Mission and business needs,
   - Desired information and data products,
   - Potential threats and vulnerabilities,
   - Desired capabilities, capacities, and coverages
   - Business and interface agreements,
   - Internal operational and user needs, and
   - Mission partner plans and expectations.

B. Refine the relevant information and capture this in a form suitable for use in subsequent activities.

C. Identify **stakeholders** and their **concerns** with respect to the information gathered above.

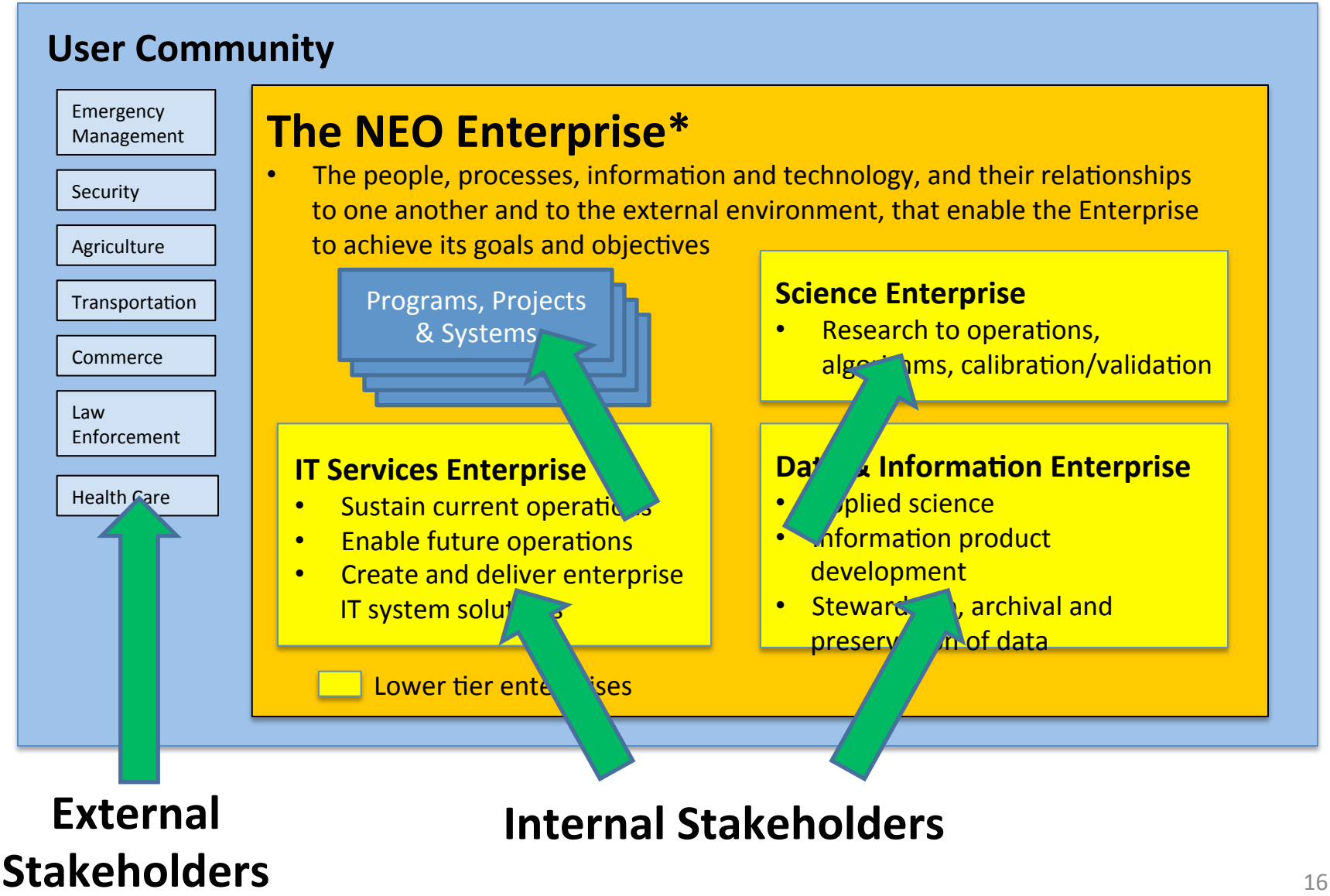
D. Identify relative priorities for and degree of architectural impact due to the stakeholder concerns.

E. Identify and define the **measures of success** that relate to the stakeholder concerns.

F. Define the stakeholder concerns in more precise terms and validate this interpretation with the stakeholders or their representatives.

G. Maintain traceability to relevant documentation for these stakeholder concerns.

Understanding of Stakeholder Concerns



Stakeholders & Concerns

- **Architecture:** fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution (ISO 42010 Standard, "Architecture Description")
- **Stakeholder:** an individual, team, organization, or classes thereof, having an interest in a system
  - Example Stakeholders: users, operators, maintainers, owners, sponsors, acquirers, developers, builders, integrators, suppliers, industrial base, labor force, third parties (eg, environmental impacts), evaluators, policy makers, certification authorities, etc.
- **Concern:** an interest in a system relevant to one or more of its stakeholders
  - Example Concerns: affordability, agility, alignment with business goals and strategies, assurance, autonomy, availability, behavior, business impact, capability, complexity, compliance to regulation, concurrency, control, cost, customer experience, …
  - data accessibility, deadlock, disposability, evolvability, feasibility, flexibility, functionality, information assurance, interoperability, inter-process communication, known limitations, maintainability, misuse, modifiability, modularity, openness, performance, …
  - privacy, quality of service, reliability, resilience, resource utilization, schedule, security, shortcomings, state change, structure, subsystem integration, system features, system properties, system purposes, usability, usage, viability, etc.

Step 3: Characterize current & target architectures

A. Examine the elements in the enterprise architecture to determine their
   - Deployed, planned and future capabilities,
   - Capacities,
   - Coverages,
   - Vulnerabilities, and
   - Opportunities for improvement.

B. Specify the degree to which each element addresses **stakeholder concerns** and **architecture imperatives**,

C. Identify and define **shortfalls and gaps** in capabilities, capacities, coverages, and vulnerability mitigation.

D. Identify **dependences** and **critical relationships** between these elements within the Enterprise and with external elements.

E. Capture key concepts and attributes of the architecture in appropriate architecture views and models.

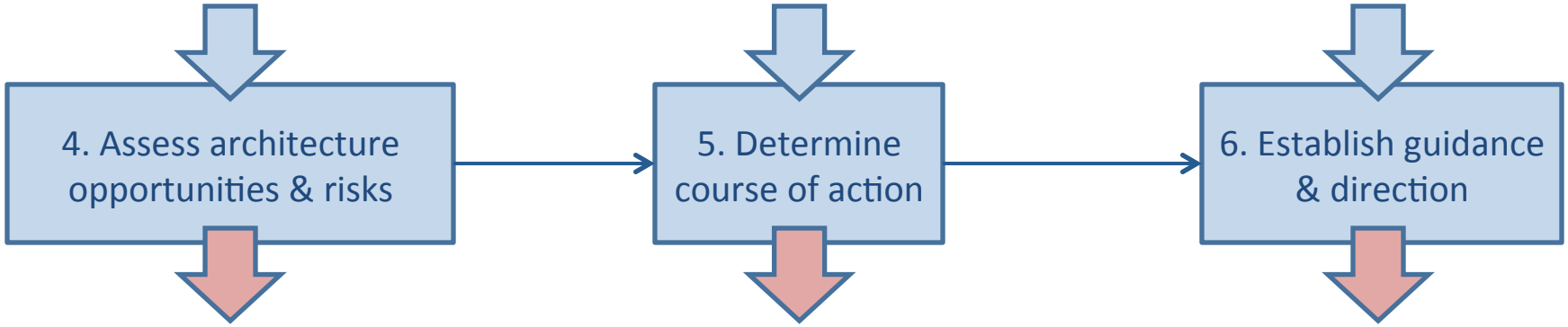
F. Make views and models available to stakeholders.

Phase 2: Steps 4-6

- Capability and capacity gaps & shortfalls
- Dependencies and critical relationships
- Relevant architecture views & models

- Investment recommendations
- Divestment recommendations
- Identified potential hazards & losses

- Approved changes
- Management direction



- Evaluation criteria
- Characterized impacts to architecture (+/-)

- Business case analysis results
- Approved changes to the current & target architectures

- Approved NEO Architecture Master Plan
- Changes to architecture views & models
- Changes to roadmaps, requirements & standards

Step 4: Assess architecture opportunities & risks

A. Establish the **evaluation criteria** for assessment of the enterprise architecture.
B. Identify potential **opportunities for improvement** to the architecture.
C. Identify potential **technologies** that could impact the architecture along with associated technology insertion points.
D. Identify the strengths and weaknesses of opportunities and technologies with respect to the current and target architectures.
E. Identify potential **threats** that could impact the architecture and possible ways and means of addressing these threats.
F. Evaluate the current and proposed architecture elements using the evaluation criteria.
G. Identify the elements with the highest benefit relative to their associated total cost of ownership.
H. Characterize expected and unexpected **impacts of investment and divestment** opportunities along with potential **hazards and losses**.

Step 5: Determine course of action

A. Determine the best changes to the architecture and
   - associated processes, procedures, education, training, organization, teams, facilities, industrial base, infrastructure, equipment, etc.
   - with proper consideration of enterprise constraints, conditions, and challenges.
B. Identify and characterize necessary **changes to plans and budgets**.
C. Conduct **business case analyses** to support selection of most promising architecture alternatives and features.
D. Establish buy-in from all impacted parties and **communicate** the anticipated costs and benefits to key decision makers.
E. Determine **key decision points** and get **approvals** from appropriate decision authorities for the proposed changes.

Step 6: Establish guidance & direction

A. Formulate **inputs to planning guidance** in support of the Budget Planning process.
B. Develop changes to the concept of operations for mission and business activities.
C. Synchronize and align the guidance and direction across the three sub-architectures of the Enterprise Architecture.
D. Define changes, deletions, and additions to capability and technology **roadmaps**; mission, business and IT architecture requirements in accordance with Requirements Management Process; and technical and business standards.
E. Develop **architecture views** to highlight the intended changes and to communicate the new guidance and direction for the architecture and associated elements in the enterprise.
F. Formalize any potential risks that were identified that are associated with the new or modified capability in accordance with Risk and Opportunity Management Process.
G. Establish an **Architecture Master Plan** for implementation of these proposed changes.
H. Get approval for the master plan from appropriate decision authorities (e.g., NEAC, BAEC, IRMAC).
I. Monitor progress against the Master Plan.

Decision Forums

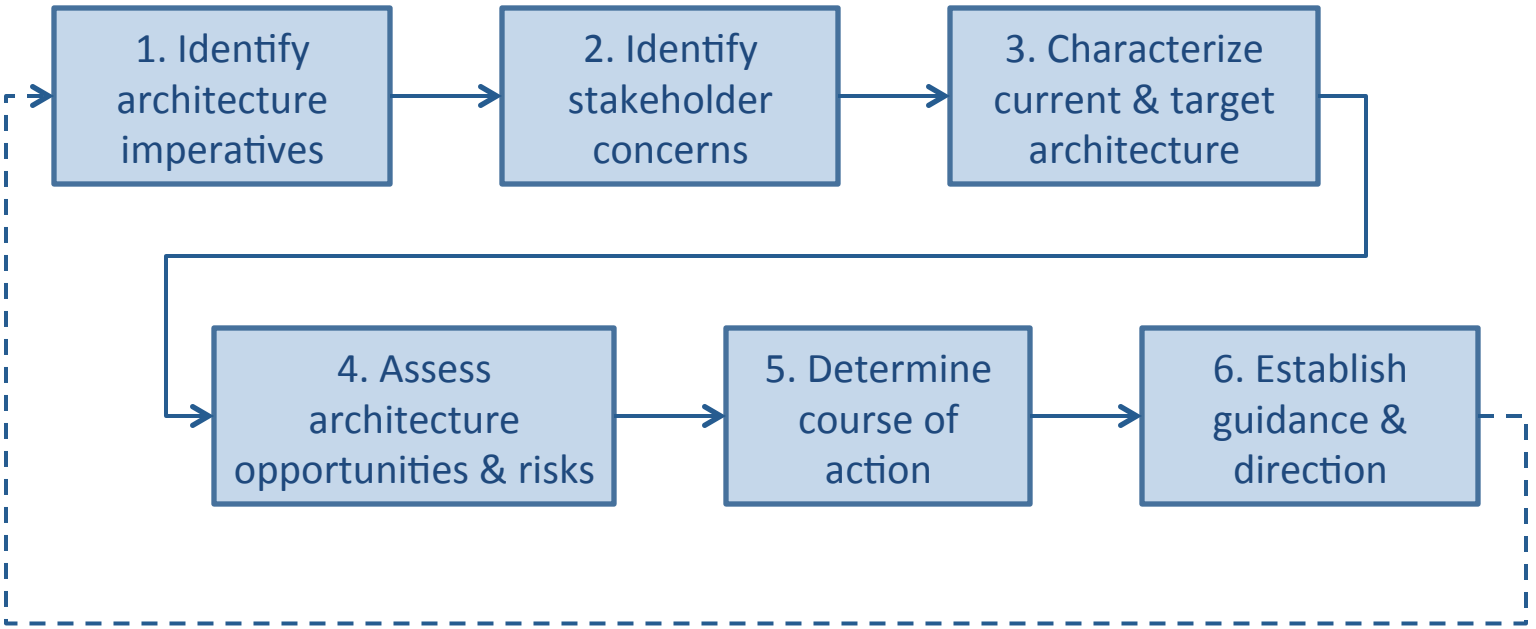
Forum Name	Description	Chair
NEO Enterprise Architecture Committee (NEAC)	Guides, directs and oversees the annual Architecture Management process for the enterprise architecture, defines and refines strategic thrusts, and provides solutions to enduring environmental observation needs to support enterprise wide mission architecture planning. Provides recommendations to SRMB for adjudication and approval.	Director of SE
Business Architecture Executive Committee (BAEC)	Reviews, prioritizes and approves initiatives which fall within the business architecture, to ensure NEO's business architecture is optimized to support the mission of NEO.	D/CFO – Director, Office of Chief Financial Officer
Information Resource Mgmt Advisory Committee (IRMAC)	Provides leadership, direction, and guidance for all Information Technology, Information Assurance, and Information Management (IT-IA-IM) programs and activities consistent with the Enterprise's strategic objectives and mission	CIO – Chief Information Officer, with co-chairs from SE and Operations
Strategy and Resource Management Board (SRMB)	Plan and develop strategies, goals, and objectives to fulfill the primary and support functions of the Enterprise; deal with Enterprise level risks and issues; and provide a forum for continual evaluation of the organization's performance.	CEO

Note: The IRMAC also ensures IT-IA-IM initiatives respond to Enterprise priorities while complying with legal and regulatory requirements, corporate policies and directives; and it represents the equities of all Enterprise organizations and functions in matters relating to IT-IA-IM both internal and external to the Enterprise.

Roles & Responsibilities

Role	Responsibilities	Position
Decision Authority	Chairs the Strategy and Resources Management Board (SRMB); Makes final determination on architecture alternatives and issues not otherwise delegated to NEAC or IRMAC, or issues with cross community implications that cannot be resolved at the NEAC level.	CEO
Process Owner	Process Owner of Systems Engineering Management Business Function. Responsible for the process of Architecture Management.	Director SE
NEAC Chair	Make final determination on architecture alternatives; Coordinate with the IRMAC on issues with IT implications; Coordinate with the BAEC on issues with business implications; Inform SRMB periodically on all NEAC decisions made.	Director SE
Architecture Committee Members	Participate in and make recommendations on strategic level architecture alternatives and investment decisions. Commit resources to Architecture Management activities. Review architecture recommendations developed by the NEAC-sponsored studies to represent various concerns and interests. Coordinate with mission partners, as appropriate.	Business Unit Directors (or their designated representatives)

Enterprise Planning Process



Informs the Strategic Planning Process with Enterprise Architecture-based recommendations

Summary

- Architecture can be useful in helping the Enterprise navigate the uncertain future while maintaining focus on Enterprise Goals & Objectives, but also keeping in mind the Systemic Possibilities
  - Needs a well structured process tied into the other enterprise processes
  - Needs a good enterprise governance approach with clear roles and responsibilities
  - Needs a governance process to facilitate systematic decision making
- Needs to bring Architecture up to the Enterprise level
  - Needs different skillsets and expertise
  - Needs a different set of tools and methods
  - Needs corporate buy-in by executive leadership
- Will take years to implement this approach
  - Demands a heavy dose of Systems Thinking
  - Patience and fortitude can lead to a healthier future
  - Can strengthen Systems Engineering throughout the enterprise

Process Execution

- **Process** defines what is to be done
  - Activities
  - Roles & responsibilities
  - Decision forums
  - Risks & risk mitigation actions
  - Value & opportunity pursuits
  - Process indicators & metrics
- **Plan** for implementing the process defines the when, who and how
  - Activities to be implemented during this planning period
  - Desired outcomes and decisions to be supported
  - Enterprise Architecture Committee meetings for decision points
  - Work elements defined and assigned to responsible individual or group
  - Schedule of activities
  - Expected deliverables
  - Methods and tools to be employed
- Depends on adequate knowledge and skills
  - Training on SE basics and on the particulars of this process
  - Guidebook available with recommended methods, tools and templates

Definitions

Term	Definition
Architecture	Fundamental concept or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution over time [ISO/IEC/IEEE 42010:2011]
Architecture imperatives	Things the architecture must do based on validated requirements, policies, directives, and strategic goals and objectives
Stakeholder concerns	Interests of those impacted by the architecture, how they are impacted, and to what degree [Ref: ISO/IEC/IEEE 42010:2011]
Current & target architectures	Current architecture includes those items already deployed plus additional items to be deployed based on program plans and budgets. Target architecture includes those items that at some future point in time will be implemented, typically beyond currently approved plans and budgets.
NEO* Enterprise Architecture (EA)	The NEO Enterprise Architecture encompasses the people, processes, information and technology of the NEO Enterprise, and their relationships to one another and to the external environment, all of the organizations, systems, resources, processes, functions and procedures that enable NEO to implement its mission, business, and safety and security obligations. The NEO Enterprise contains three lower-tier enterprises (i.e., ground, science, data & Information), and numerous other functions and activities.

** NEO is a fictional organization for purpose of this presentation*