

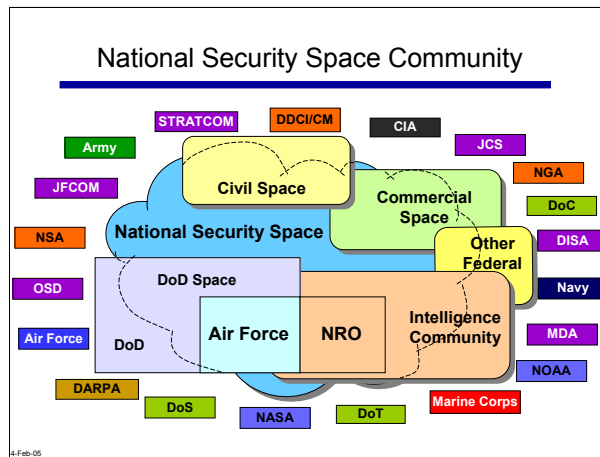


National Security Space Office



Strategic Focus and Unity of Effort Across National Security Space

National Security Space Architecting



This chart illustrates the complexity of “national security space” from an organizational perspective. It is not just the DoD and Intelligence Community. Valuable, and in some cases, indispensable support for national security space comes from a variety of federal and even commercial sources.

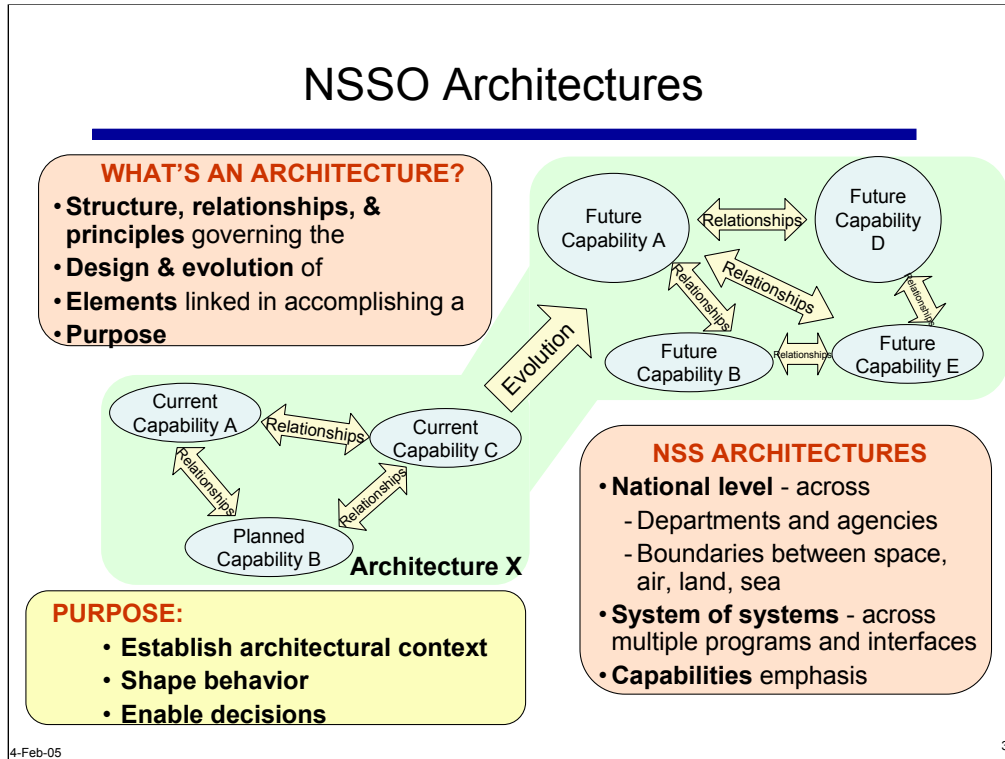
Civil space: NASA launches and operates satellites; they also use and develop space and space-related technologies. NOAA is building our future environmental monitoring space architecture.

Commercial space: A large amount of our national security communications comes from commercial providers. Industry also builds and launches our satellites and develops new technologies for space capabilities.

Other Federal agencies: State, Transportation, and Commerce have licensing and export control responsibilities. Homeland Security is going to be a big new customer for national security space capabilities.

Intelligence Community: Clearly, the NRO develops key national security space capabilities, but DIA, NSA, and NGA have critical processing, dissemination, and intelligence production responsibilities without which the information provided by some satellite systems is effectively useless.

DoD: The services all have interest in and various investments in space capabilities or the ability to use space derived information. The Air Force spends the bulk of the dollars because of the expense of the space systems themselves, but other services and agencies contribute to or use these capabilities.



Everyone has a different definition or opinion of what an architecture is and what a system is. To the integrated circuit chip designer, the circuit board may be the system. To the circuit board designer, the computer may be the system. To the computer designer, the network might be the system, and so on. So, the term "system" can only be understood within the context of the specific application. The same can be said of architectures – one person's architecture is another's system.

So how do we define architectures?

In the upper left of this chart you can see NSSO Architectures are:

- Structure, relationships, & principles** governing the
- Design & evolution** of
- Elements** linked in accomplishing a
- Purpose**

Architectures provide framework and context, and allow an understanding of choices before we have to make them. NSSO's architecture development is much like city planning, defining patterns and the balance of major elements, as opposed to designing a specific building or road. The focus is more on capabilities than specific systems.

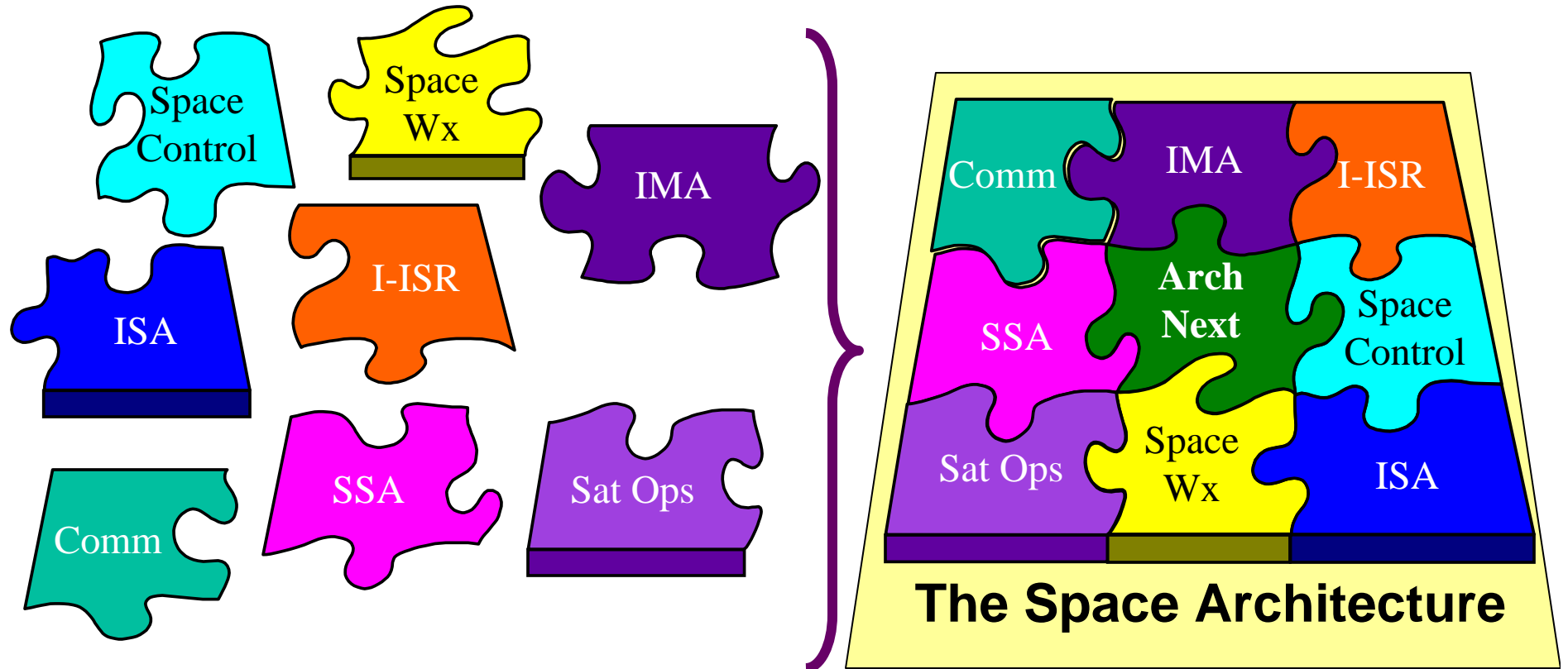
NSSO architectures define far-term (~2020) objectives (the desired end state). They focus on the ultimate destination – a set of desired capabilities – and provide a foundation for informed decisions. In addition, these architectures include recommendations that guide near- & mid-term decisions, through planning near- & mid-term steps on how to achieve the desired end state.

NSSO Architectures are similar to concept development in Systems Engineering. The architecture analysis process is focused on determining relative values of capabilities, not capabilities of systems.

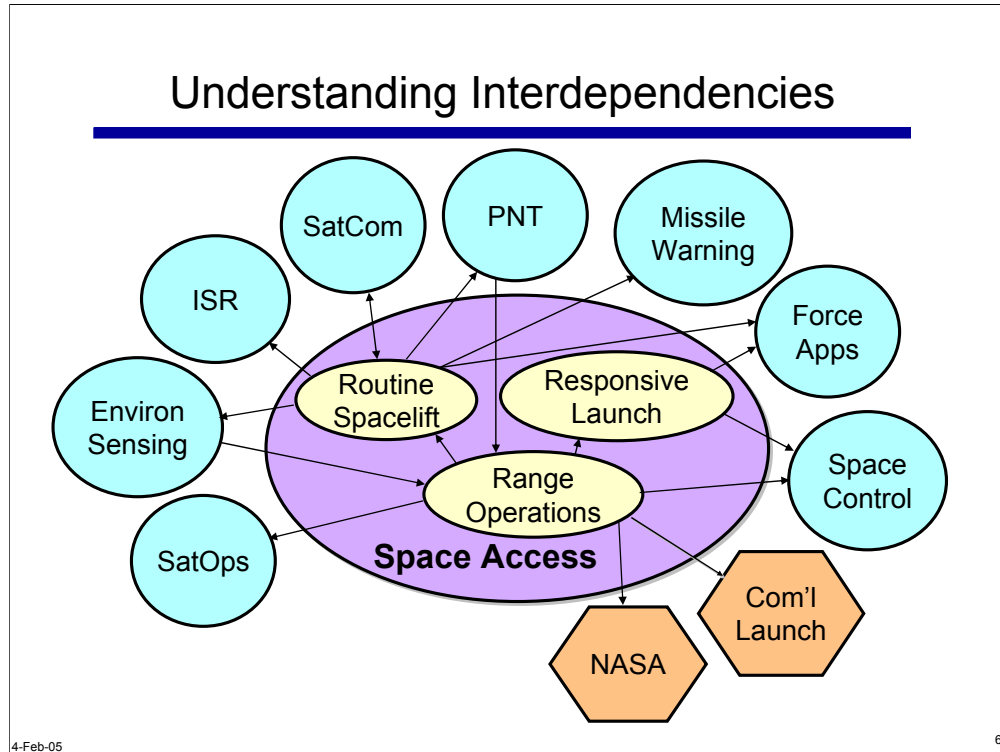
Why NSS Architectures?

- Multiple, expensive, space-related activities within the nation compete for limited support
 - Each activity contributes capabilities; each competes against others for resources; which to choose?
 - Reasonable approach: reduce cost by developing, implementing and maintaining integrated plans and architectures
- Multi-use of information, hardware, software, and projects among DoD, Intelligence Community, NASA, and industry may reduce cost and generate support

Towards “The Space Architecture”



- Define each element
- Understand the linkages and relationships



Understanding interdependencies is a challenge

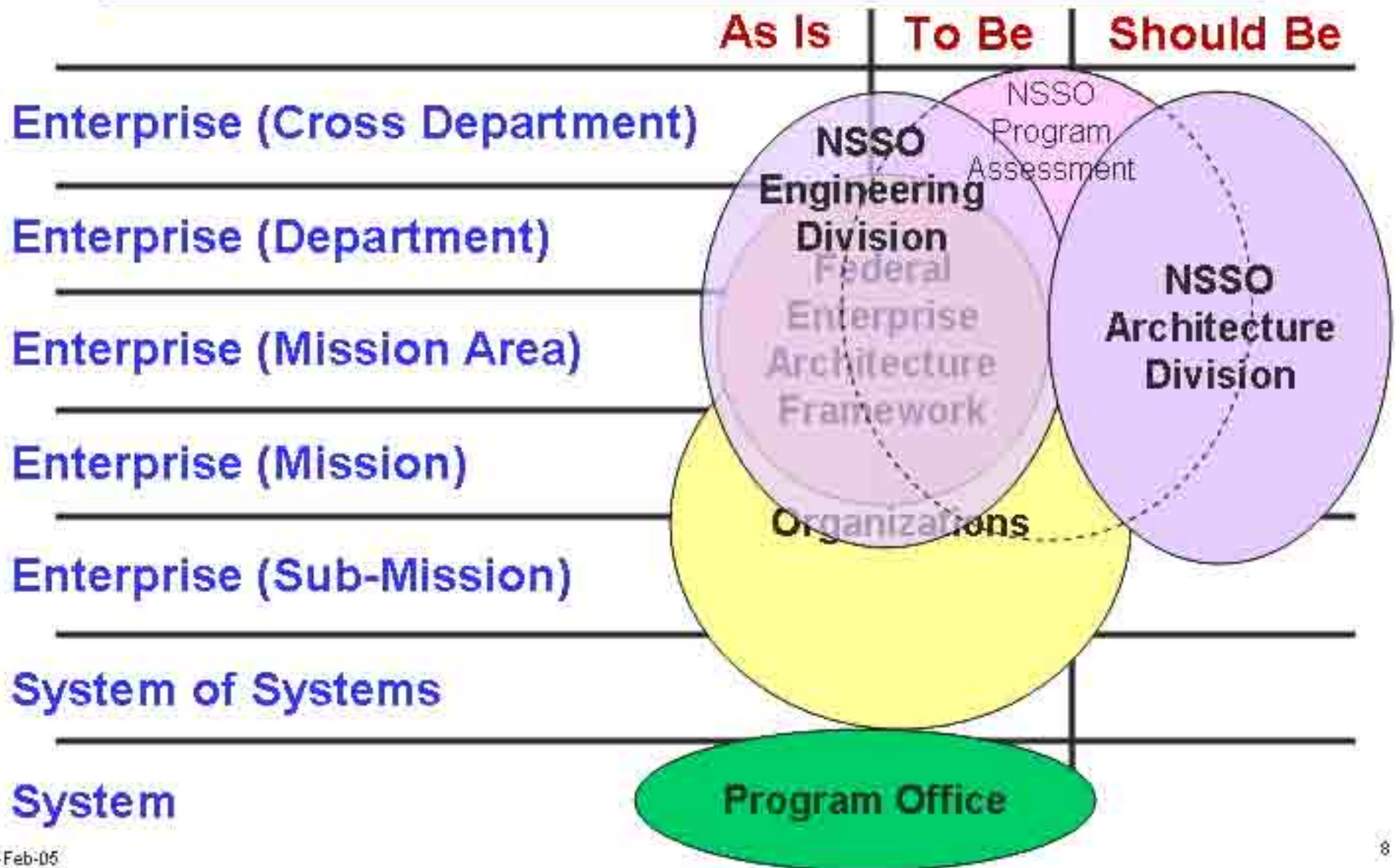
- Decisions in one area impact other areas
- New or changed capabilities in one area impact others
- Future capabilities depend on linkages with a variety of other capabilities

Architecture Types

(Not a Comprehensive List)

- NIST Enterprise Architecture Model
 - Business
 - Information
 - Information Systems
 - Data
 - Delivery Systems
 - Fed Enterprise Arch. Framework
 - Current (As Is)
 - Target (To Be)
 - C4ISR Framework
 - Capability (?)
 - Operational
 - System
 - Technical
 - Joint Staff
 - Integrated
 - Operational
 - Air Force
 - Vision
 - Program
 - Node
 - Levels/Tiers/ Hierarchy
 - Enterprise
 - System of Systems
 - System
 - Sub-System
 - Component
 - Level 0,1,2,3,4...
 - Other
 - Domain
 - Functional
 - Should Be
 - Mission/ Mission Area
 - Cross-Mission Area
 - Mission Area Integrated
- System=Program=Node
Enterprise=System of Systems
Mission, Mission Area
Cross Mission Area
Business, Information, Information Systems

Architecture Taxonomy



Integrated Architectures

- Provide a standardized approach which is repeatable and independent of the personalities executing it and independent of their past mission experiences
- Provide a structured approach which supports analysis—comparing and contrasting
- Provide an integrated approach which helps link operational concepts and needs to the providing systems with their technical standards

National Security Space Architectures

(What They Are & What They Aren't)

- **NSSA Architectures provide framework and context**

- Much like city planning
- Versus designing a specific building



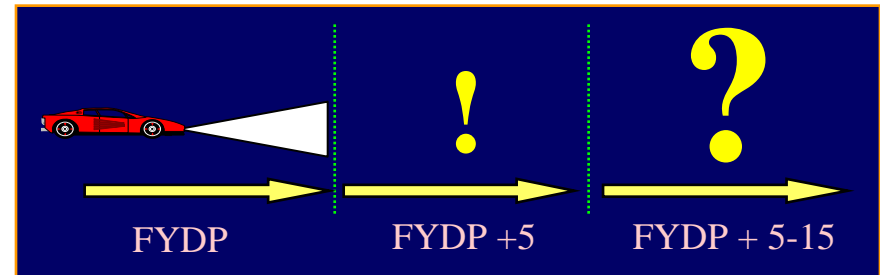
Defines pattern and balance of major elements

Defines interface relationships

Provides long term framework to guide detailed planning

- **Recommendations that guide long term actions**

- Focus on ultimate destination
- Versus the next exit & meal stops or what's within range of the headlights



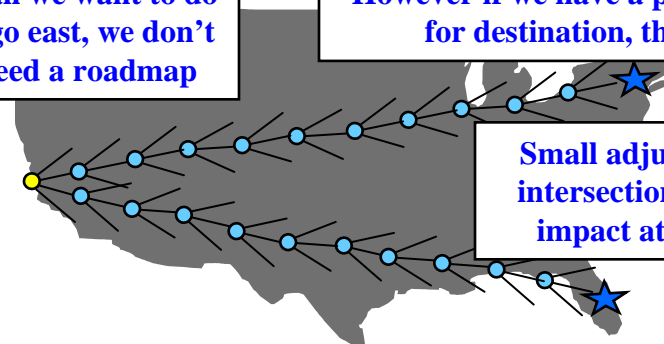
- **Characteristics or objectives that influence decisions**

- Allows flexibility in moving towards objective
- Versus specific system implementations

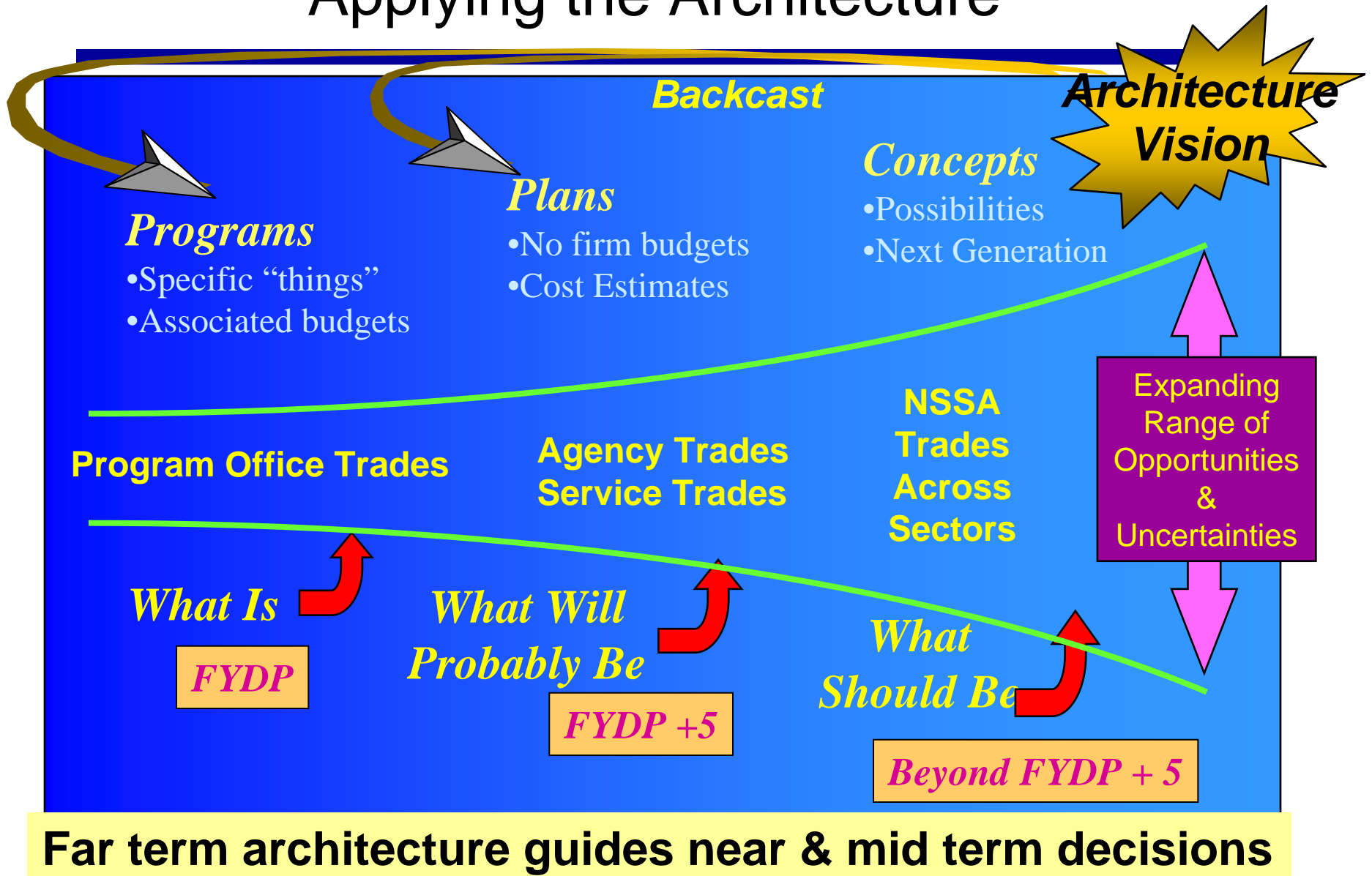
If all we want to do is go east, we don't need a roadmap

However if we have a preference for destination, then...

Small adjustments at each intersection can have a big impact at journey's end



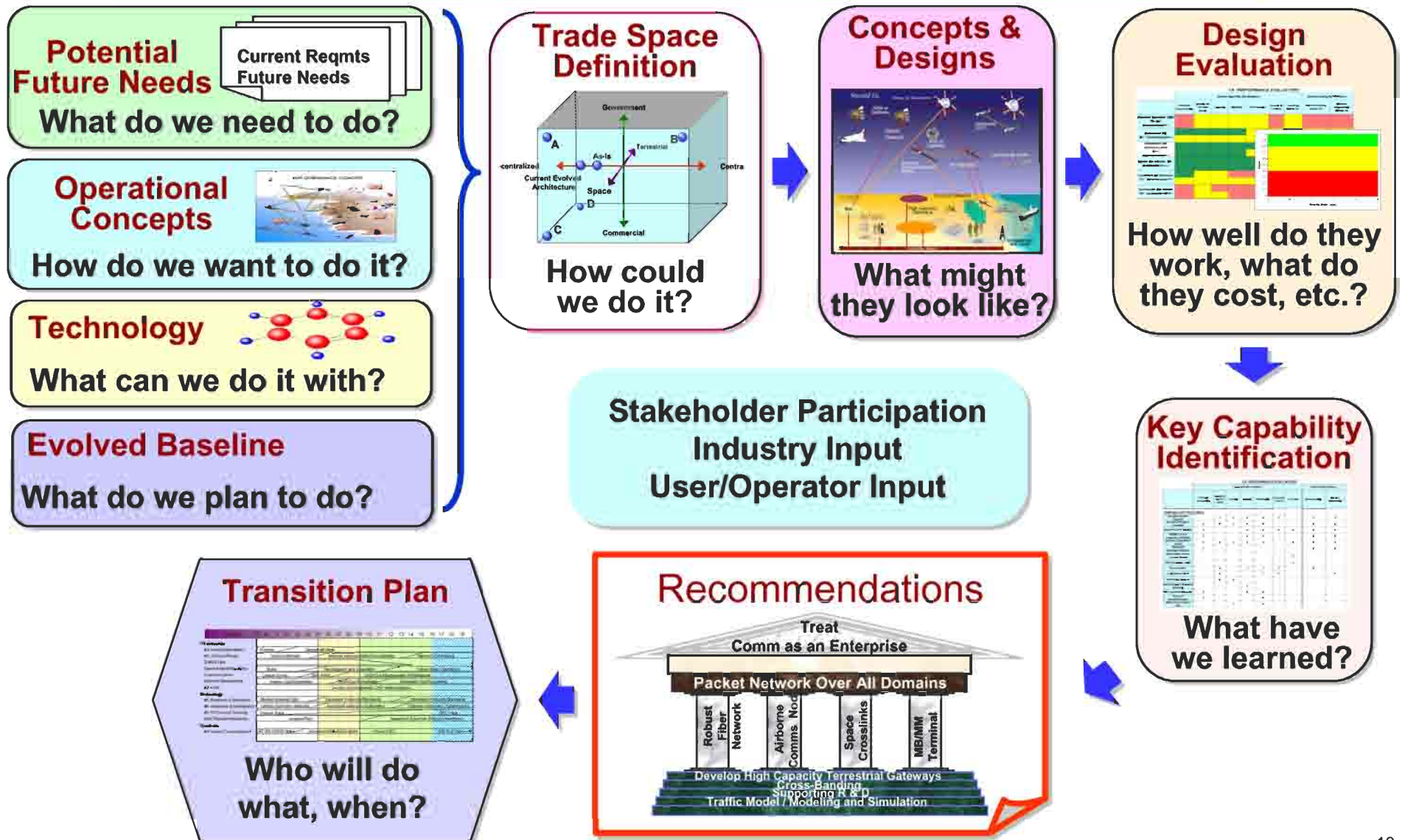
Applying the Architecture



Architecting

- Role of an Architect:
 - Understand scope, environment, context, stakeholders and purpose
 - Understand stakeholder requirements
 - Develop a broad-based “big picture” view of multiple aspects of a system
 - Develop key insights into the basic nature of the system
 - Document the key aspects of the system
 - Apply their insight and documentation to help successfully resolve key issues
- Architects capture and facilitate use
- Stakeholders provide the content

NSSO Architecting Process – Functional View

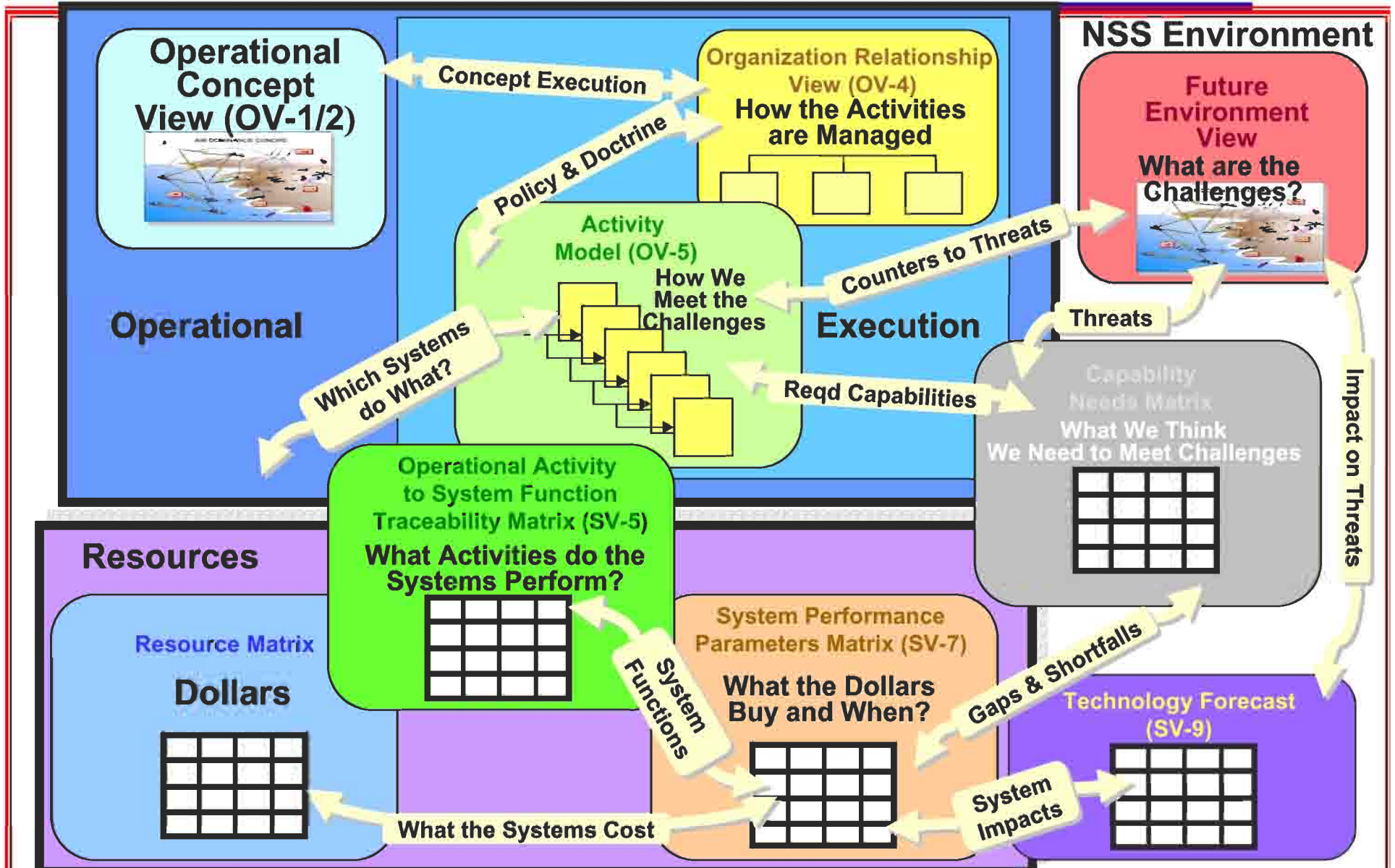


Architecting Views

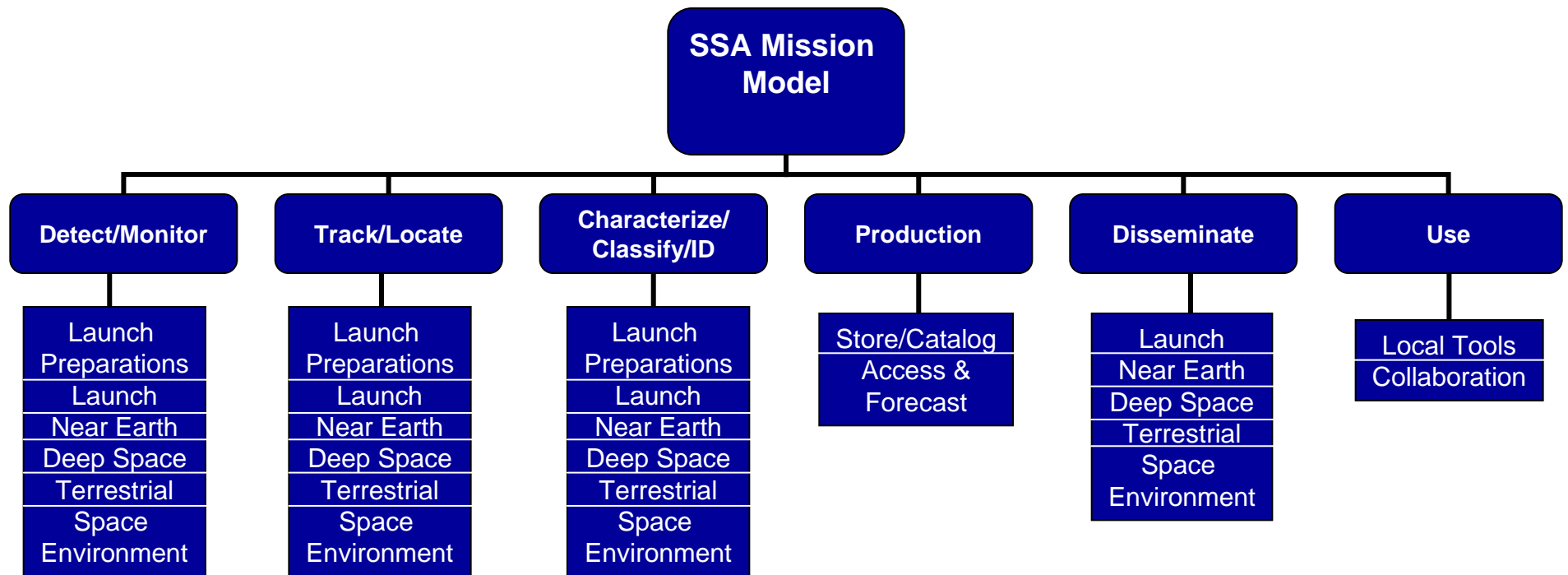
- According to the DoD Architectural Framework (DoDAF), there are three major views, providing different perspectives on the same architecture:
 - Operational View (Citizens' view): intended uses and processes (place to work, shop, raise a family, entertain, etc.); infrastructure is taken for granted
 - Systems View (Builder's view): physical structure (electrical, water, sewer, roads, etc.); various systems must be carefully specified, designed and installed
 - Technical Standards View (Inspector's view): building codes and standards; provide the foundation upon which every process and system is based

NSSO Architecture Views

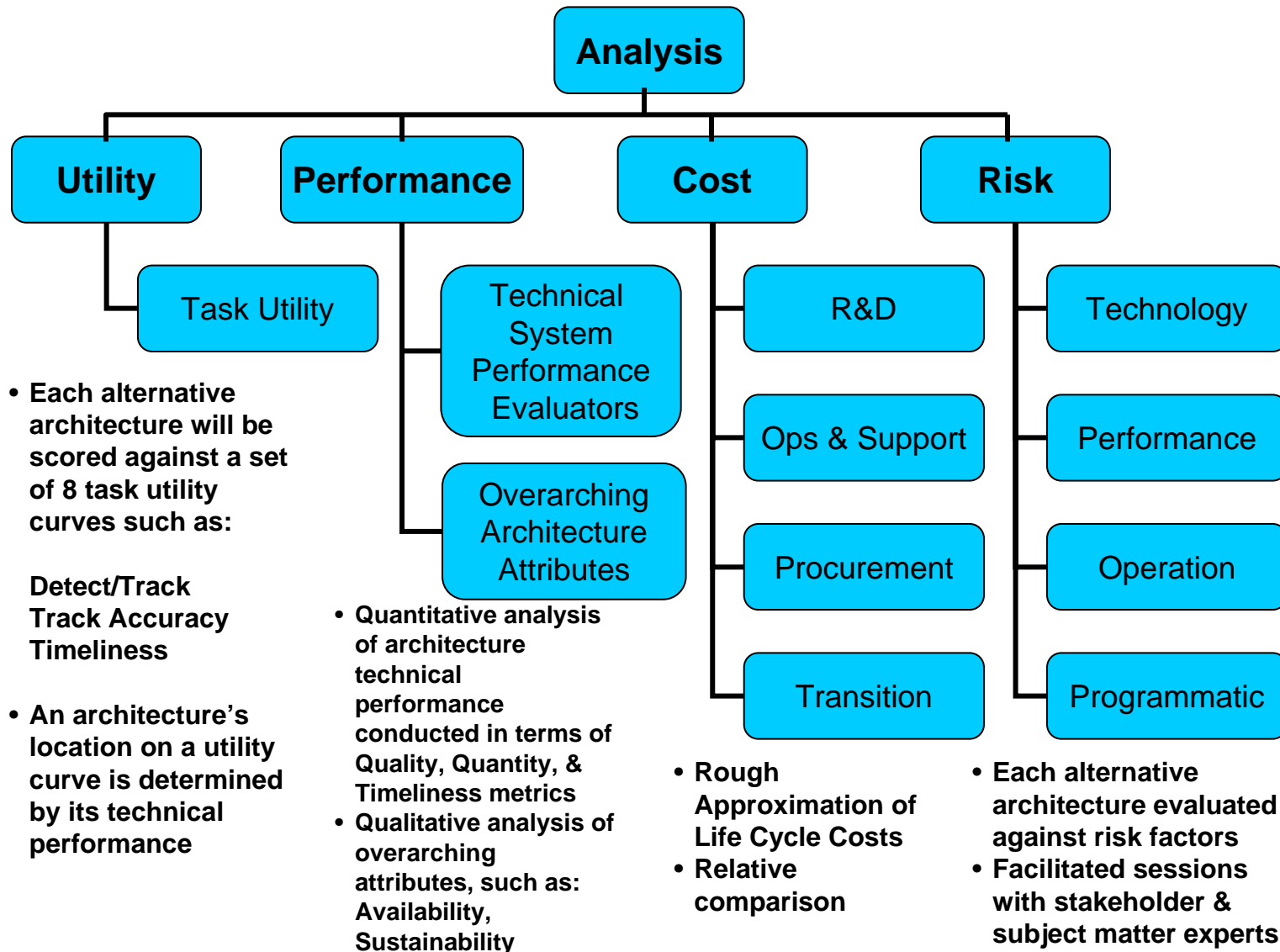
Relationships and Domains From a NSSO Perspective



SSA Top Level Architecture Functional Breakdown

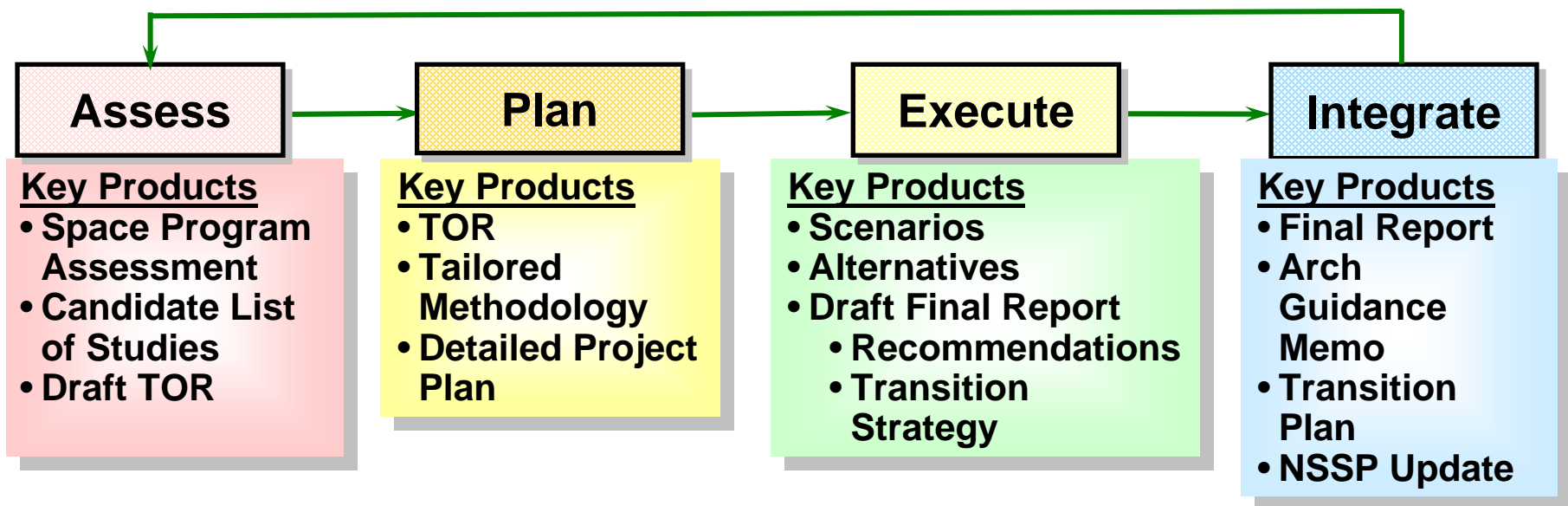


Architecture Evaluation Work Breakdown

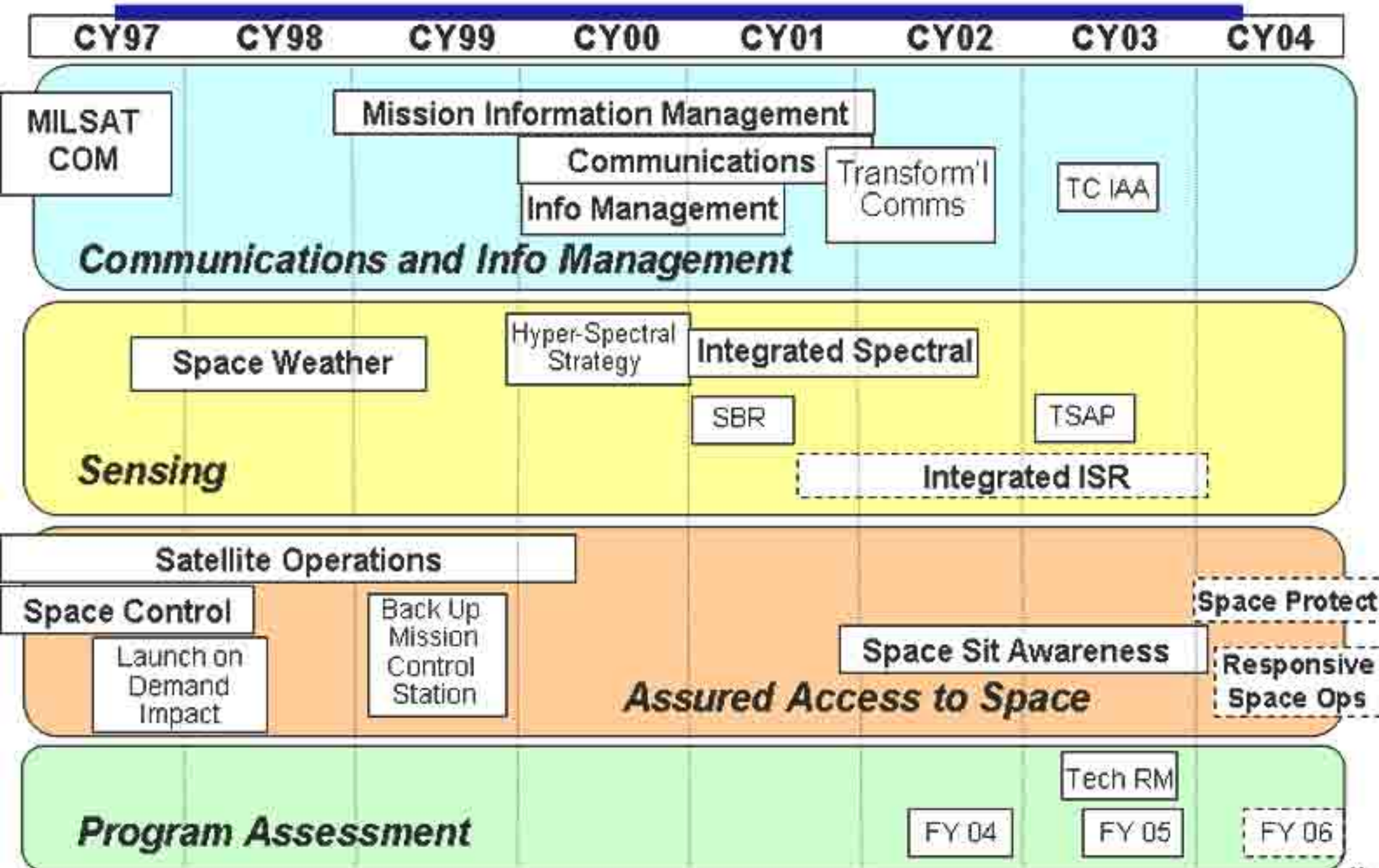


Architecture Products/Process

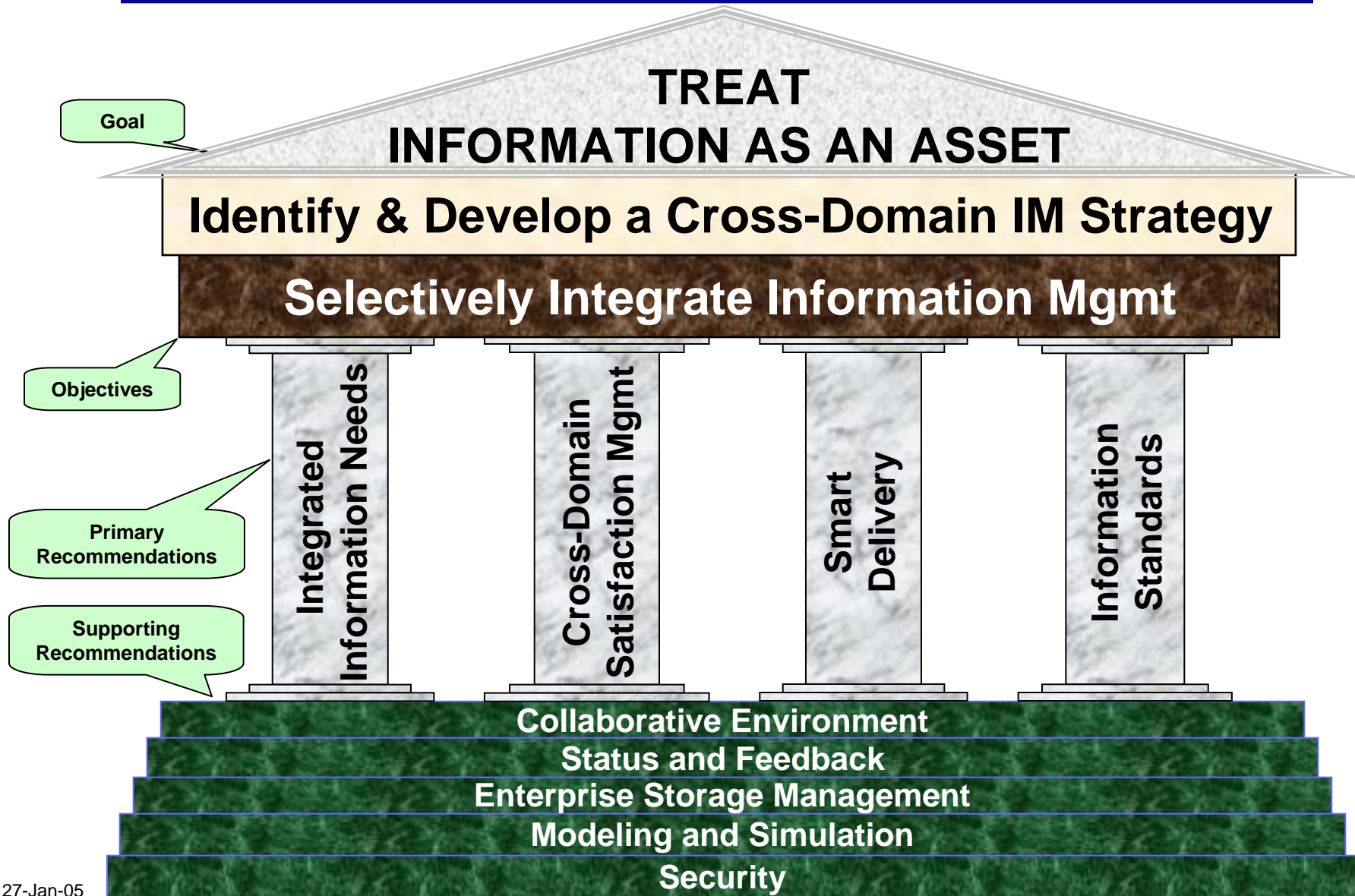
- User Needs and Essential Capabilities
- Technology Assessment
- Future “Should-Be” Candidate Architecture
- Investment Strategy
- Roadmap/Transition Plan



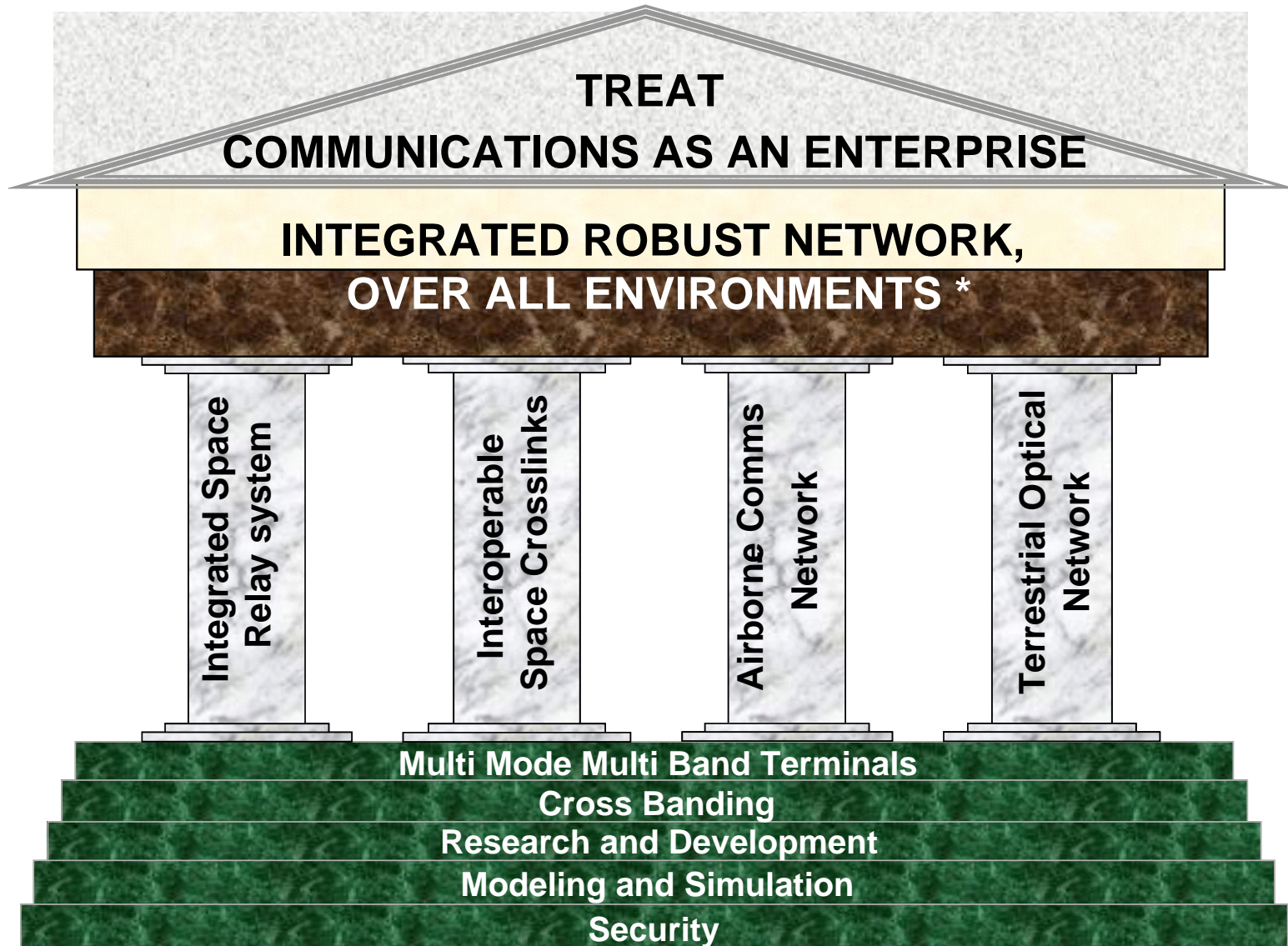
NSSO Architectures and Studies



Information Management Architecture Recommendations



Communications Architecture Recommendations



Notional Communications Architecture Vision

Connections to non-communications satellites

Space Crosslinks



Wideband Communication Functions



Space Network



Narrowband Communication Functions



Protected Communication Functions



NASA & NOAA Communications/Relay Support

Commercial



For Deployed High-Density Users

Air Backbone



Commercial ACNs



Airborne Communications Network

User links not shown

LEO&A



CONUS



Fiber

SSC/NEO



High Capacity Gateways



IMA

MSE, WIN/T



MTW



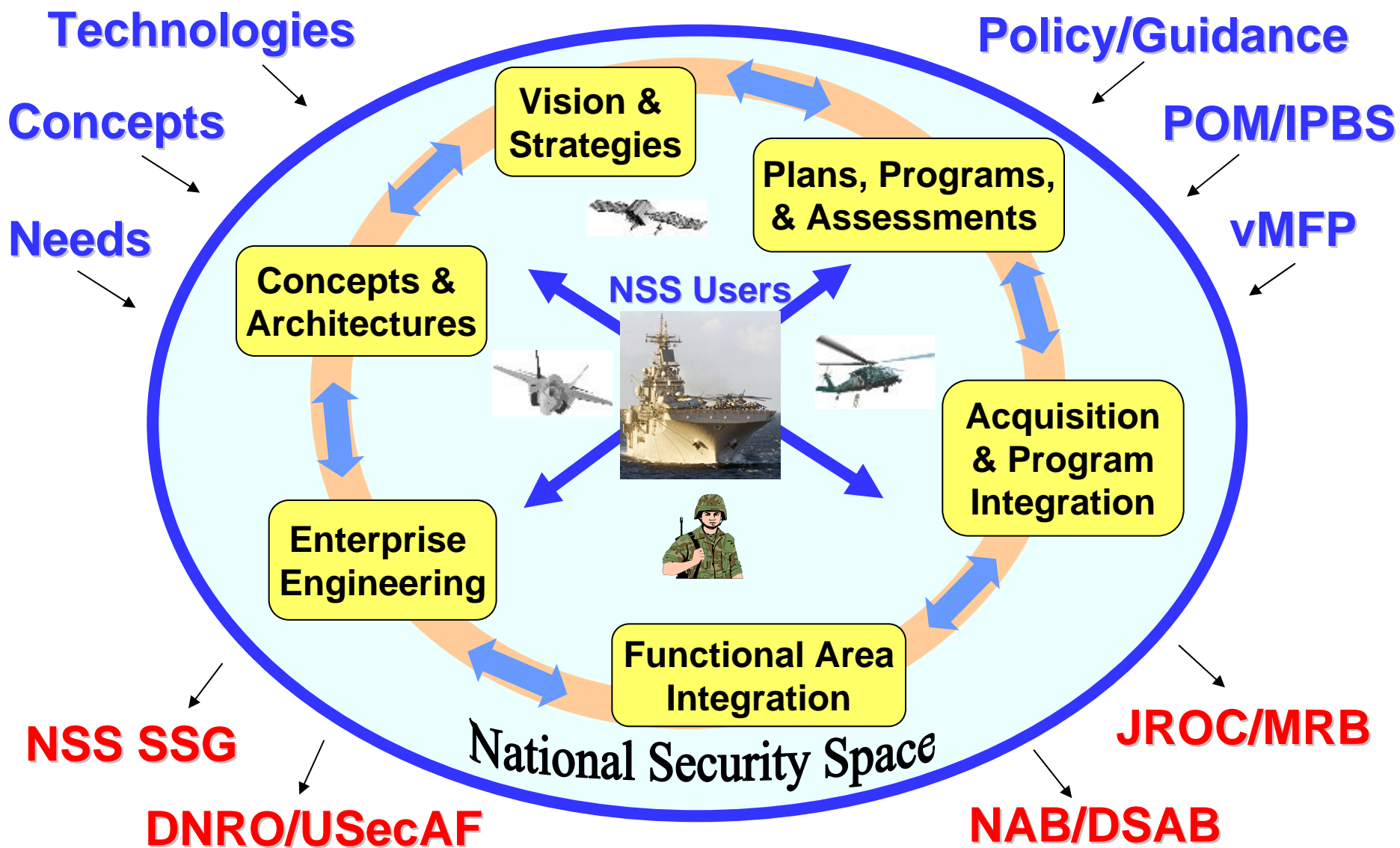
JTRS

In-theater fiber entry points

Ground Backbone

Global Fiber Network

National Security Space Office



National Security Space Organization

