



Representing System Architectures using the C4ISR* Architecture Framework

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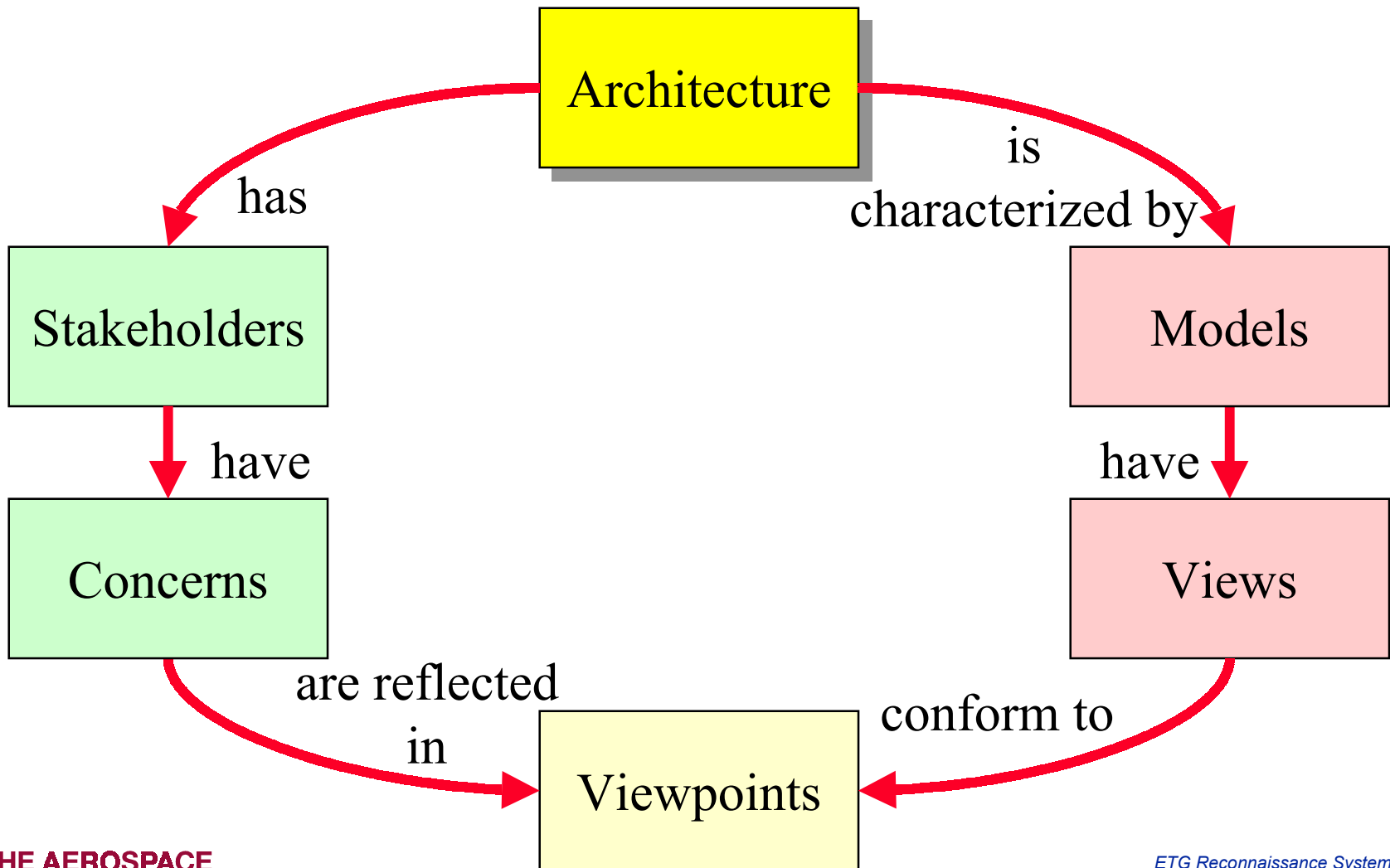
* C4ISR = Command, Control, Communications, Computers,
Intelligence, Surveillance, and Reconnaissance

Why develop Architecture Models?

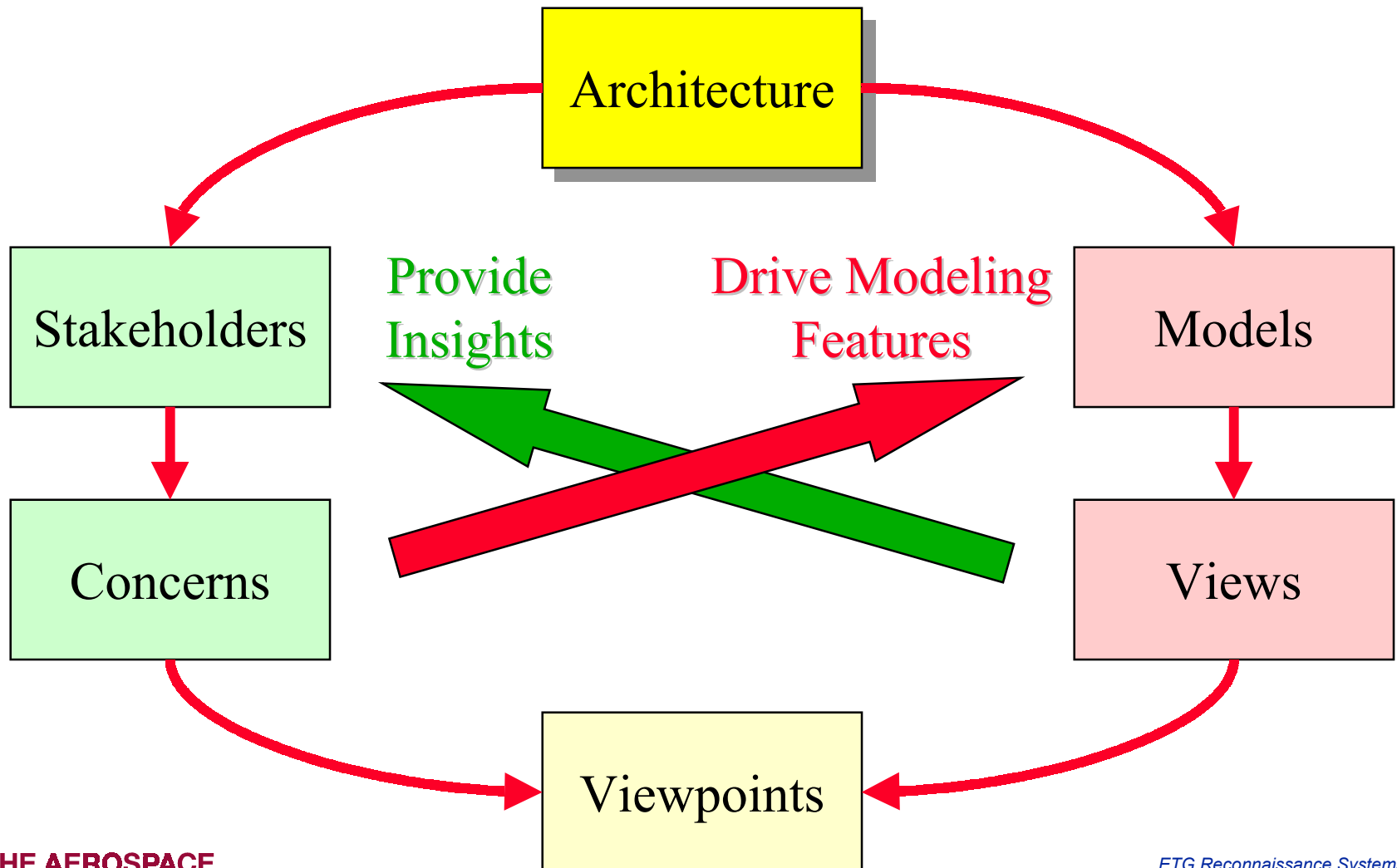
“The purpose of modeling is to relentlessly expose the inevitable consequences of your assumptions”

– Anonymous

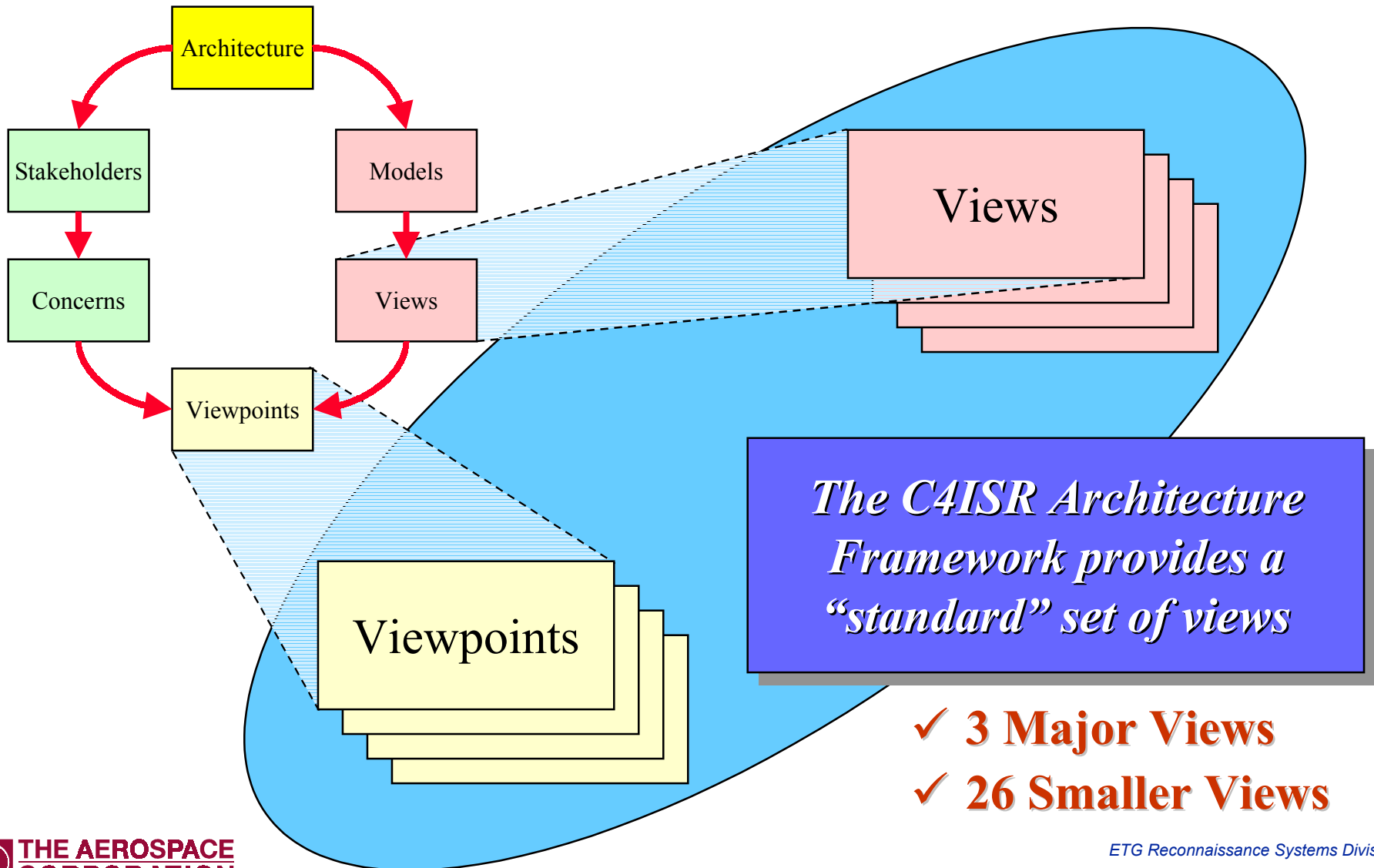
The Context of Architecture



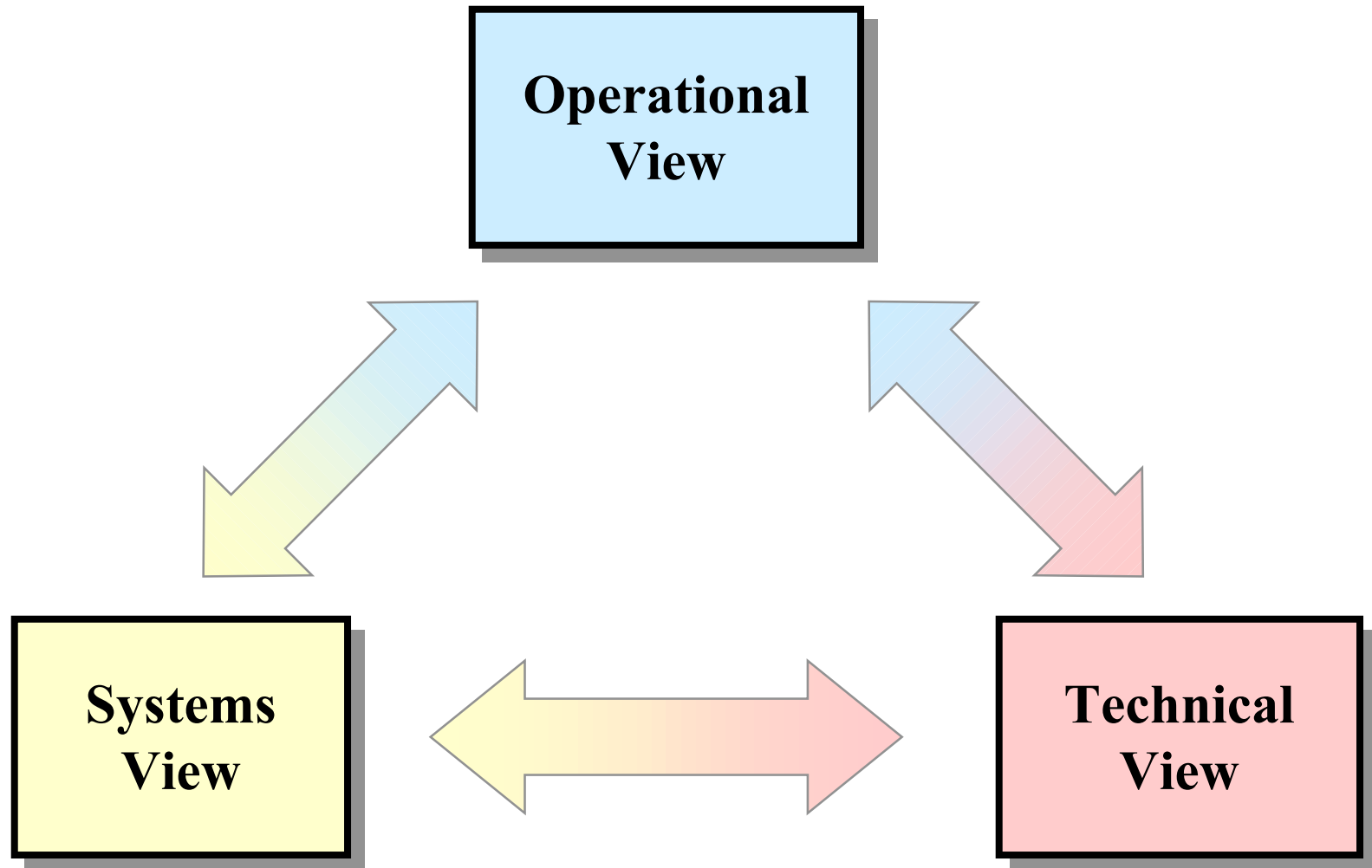
Architectural Insights



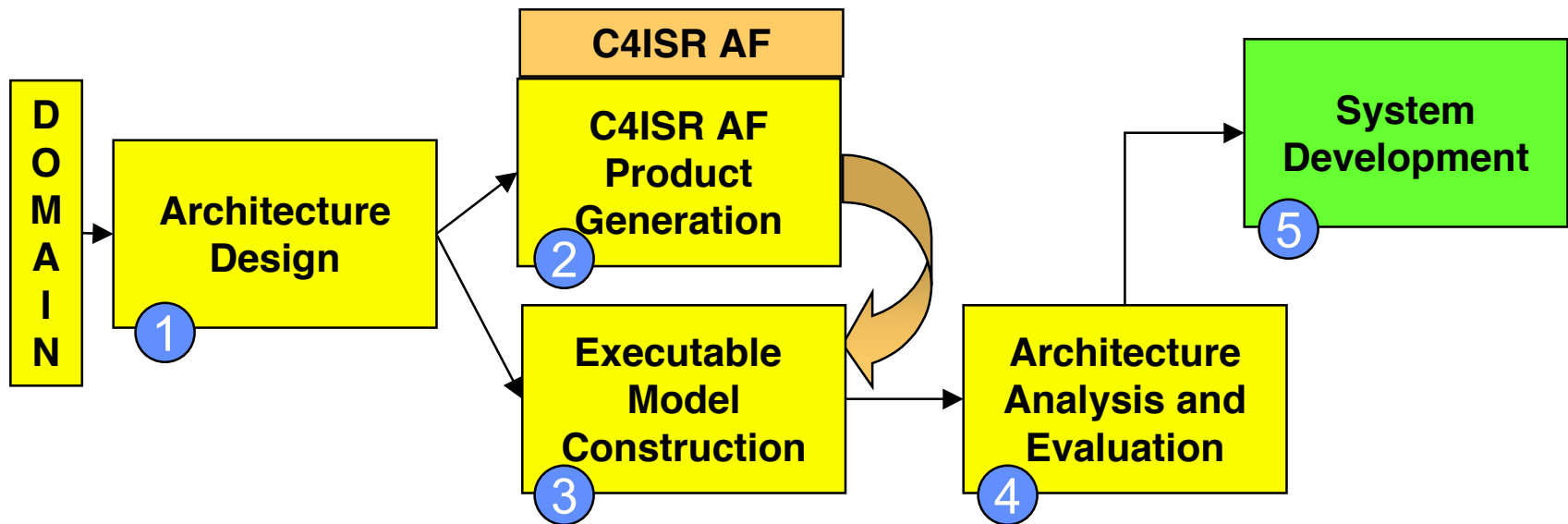
C4ISR Architecture Framework



The 3 Views in the C4ISR Framework



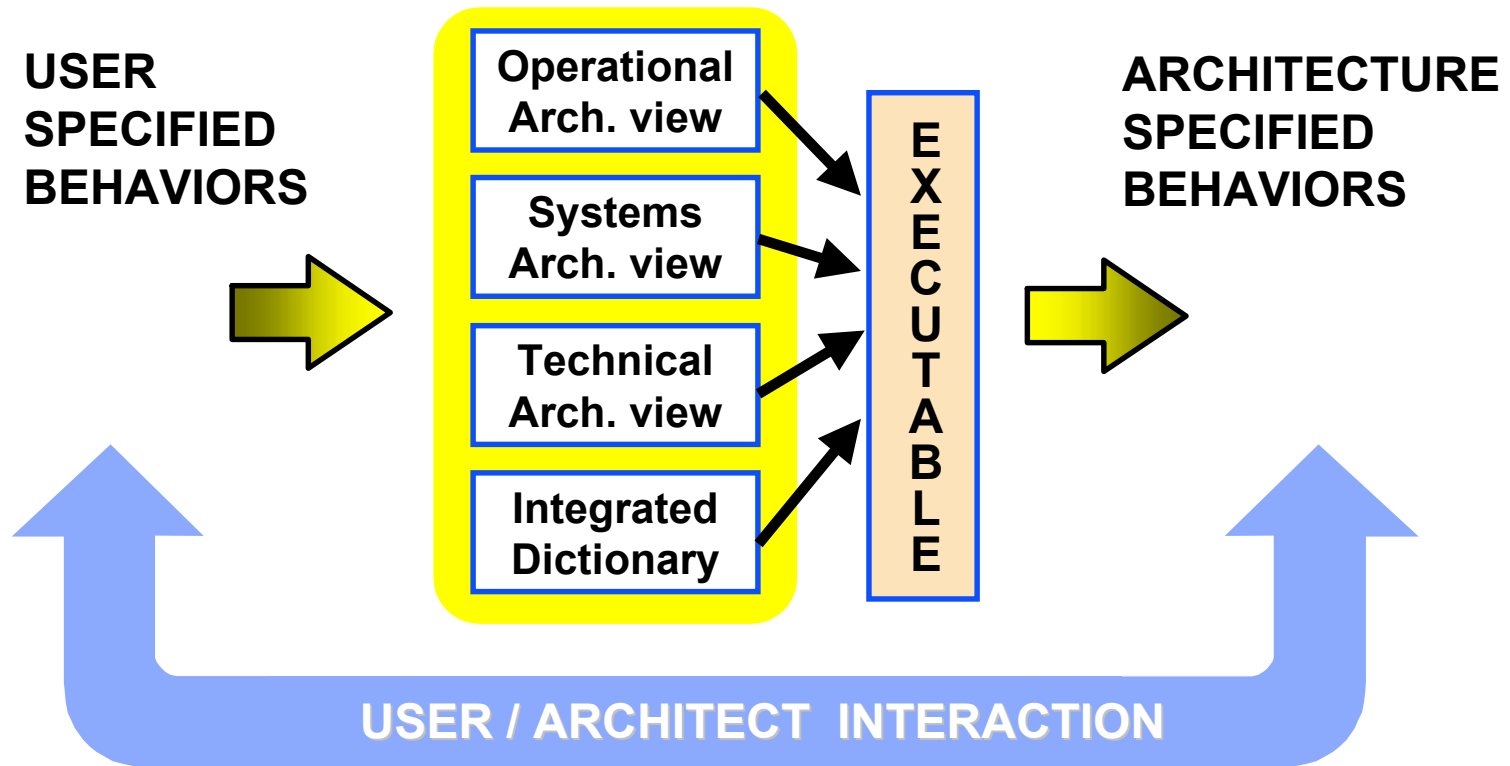
Five Steps



- Alternative approaches and tools can be used to generate the C4ISR architecture views (Step #2)
- Alternative approaches and tools can be used to develop the executable model (Step #3)
- Measures of Performance (MOPs) and Effectiveness (MOEs) are needed to evaluate and compare architectures

**Breakout
Session**

Architecture Methodology



From Alex Levis,
Course Notes at GMU

Summary

- **Modeling is Important**

- But must be aligned with key stakeholder concerns
- And must be “portrayed” using the proper views

- **Architecture Views are Important**

- The right views give the right “insights” into the situation
- Architecture frameworks try to standardize on a common set of views and viewpoints

- **Static vs. Dynamic Models**

- Static models give limited insight
- Dynamic models give more insight, but are more difficult to develop and use

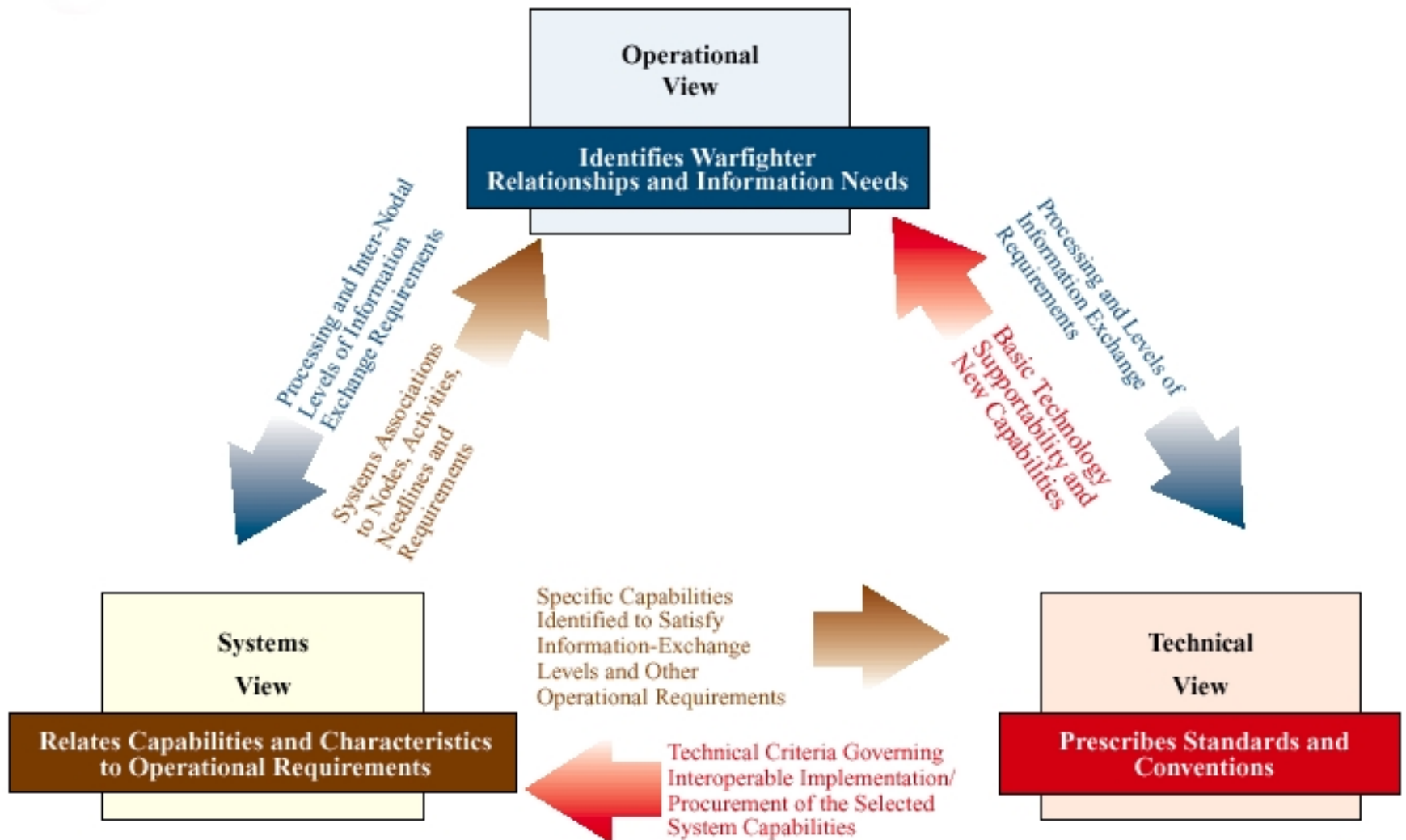
Backup Slides

- Why model?
- Operational, systems, and technical views
- Integration of architecture views
- 6-step guidance on development and use of architectures
- Purpose of an architecture
- The C4ISR architecture framework
(as the silver bullet)
- DOD strategic direction regarding the C4ISR architecture framework
- IEEE 1471 data model

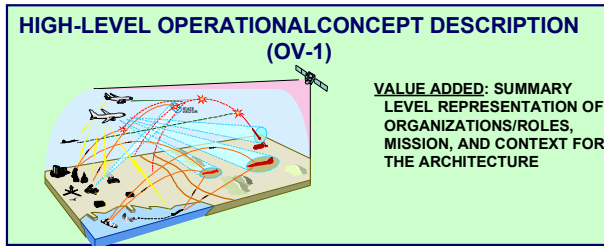
Why Model?

- Models describe, specify and communicate
- Models can be modified and manipulated
- Models provide analytical insight for decision making
 - Performance, cost and utility can be modeled
 - Models of alternate architectures can be compared
- Models inform various architecture views

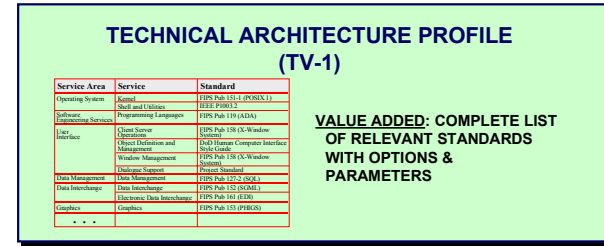
Operational, Systems & Technical Views



Integration of Architecture Views

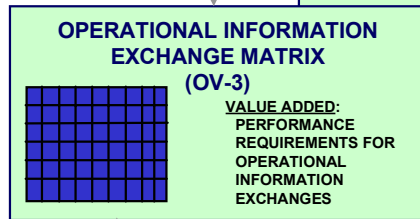


- OPERATIONAL CONCEPT ROLES & MISSION MAP TO OPERATIONAL NODES ROLES & MISSIONS
- OPERATIONAL CONCEPT CONNECTIVITY & INFORMATION EXCHANGES, IF SHOWN ON OV-1, MAP TO OPERATIONAL NODE CONNECTIVITY DESCRIPTION NEEDLINES & INFORMATION EXCHANGES

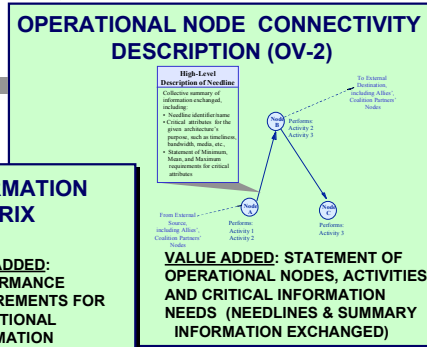


- STANDARDS APPLY AT
- SYSTEM TO SYSTEM INTERFACES
- SYSTEM ELEMENT TO SYSTEM ELEMENT INTERFACES
- SYSTEM COMPONENT TO SYSTEM COMPONENT INTERFACES

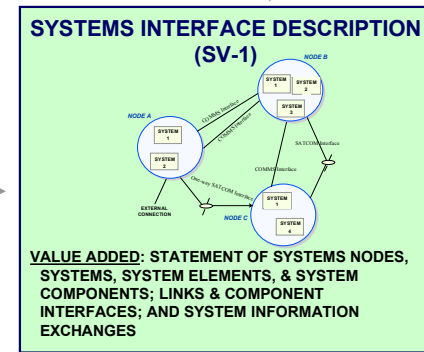
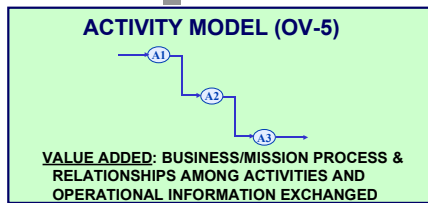
- INFORMATION EXCHANGES DETAILED IN OV-3



- I/O LABELS MAP TO OPERATIONAL INFORMATION EXCHANGES



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



- 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

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

Purpose of an Architecture

“The purpose of C4ISR architectures is to improve capabilities by enabling the quick synthesis of “go-to-war” requirements with sound investments leading to the rapid employment of improved operational capabilities, and enabling the efficient engineering of warrior systems.”

**- C4ISR Architecture Framework,
Version 2.0**

The Silver Bullet

- To deal with the real challenges of change we must look for Problem Invariants
 - The Architecture is the right invariant
 - A series of studies recommended that DOD undertake the development of architectures as the basis for acquisition
 - ◆ USAF Scientific Advisory Board study of summer '93
 - ◆ Army Science Board study, early '94
 - ◆ Defense Science Board study, 94-95
- The C4ISR Architecture Framework (version 2.0) was issued in December 97; a DOD directive was signed in February 98.
 - Memorandum dated 21 March 2000 broadens scope of C4ISR AF to DOD AF
 - The DOD Architecture Framework, version 2.1, is under review; expected release in the near future

DOD Strategic Direction

*“We see the C4ISR Architecture Framework as a critical element of the strategic direction in the Department, and accordingly direct that **all on-going and planned C4ISR or related architectures be developed in accordance with Version 2.0.** Existing C4ISR architectures will be redescribed in accordance with the Framework during appropriate revision cycles.”*

- **USD (A&T), ASD (C3I), Joint Staff Director for C4 Systems
23 February 1998 Memorandum,
Subject: Strategic Direction for a DoD Architecture Framework**

Schema from the IEEE 1471 standard on architecture descriptions

