

# Verification and Validation (V&V)

## System of Systems (SoS) Assessment Platform

Presented To: Verification and Validation  
6<sup>th</sup> Annual Summit 2010

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Federal Aviation  
Administration



# Agenda

**Net-Centric**

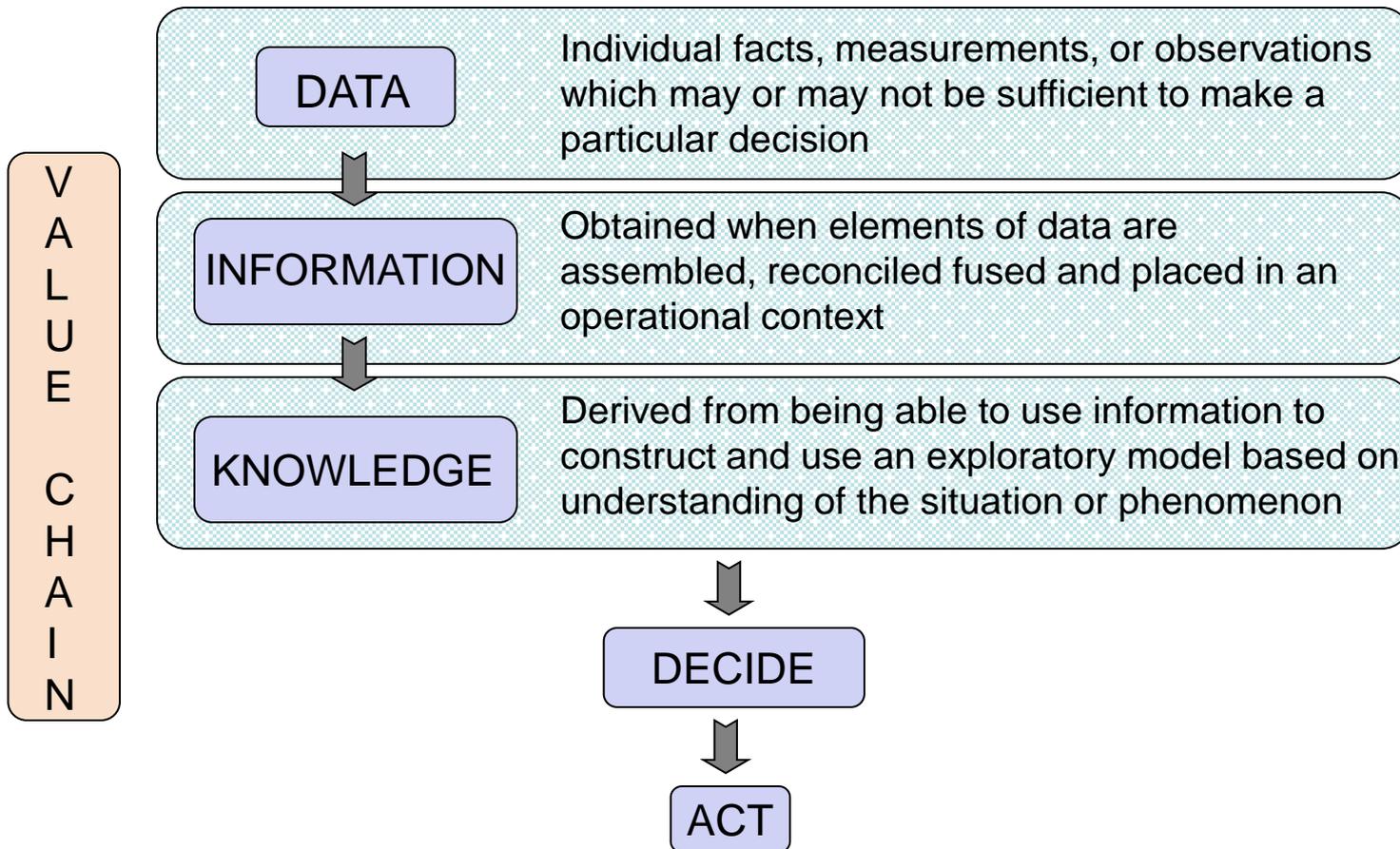
**V&V Strategies and Processes**

**System of Systems Assessment Platform**



# What is Net-Centric?

A **large set** of disparate pieces of data provided by **differing systems** and/or sensors littered across a **network** awaiting multiple users, service providers or applications to use them to create information to be used by humans to **solve problems**

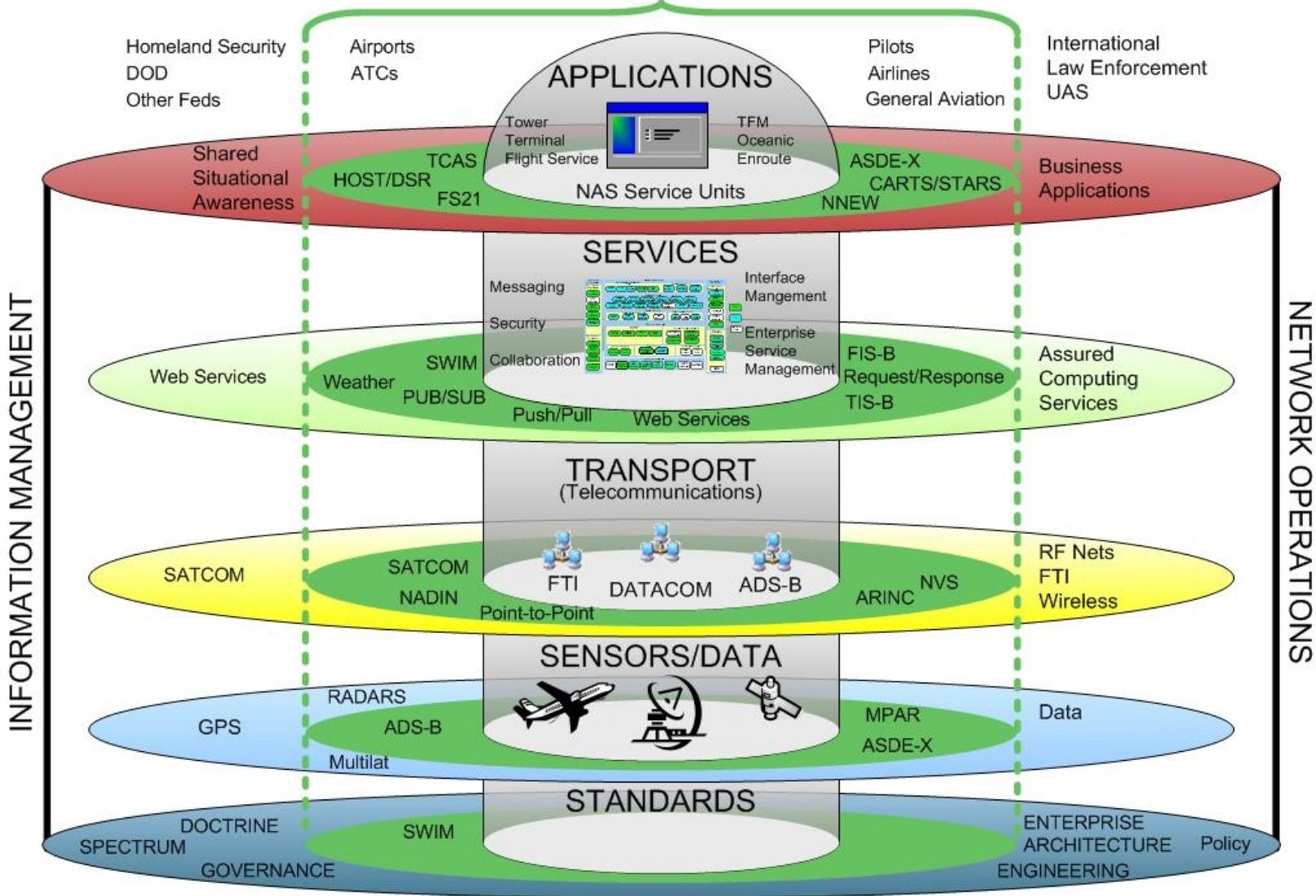


# Implications of Net-Centric

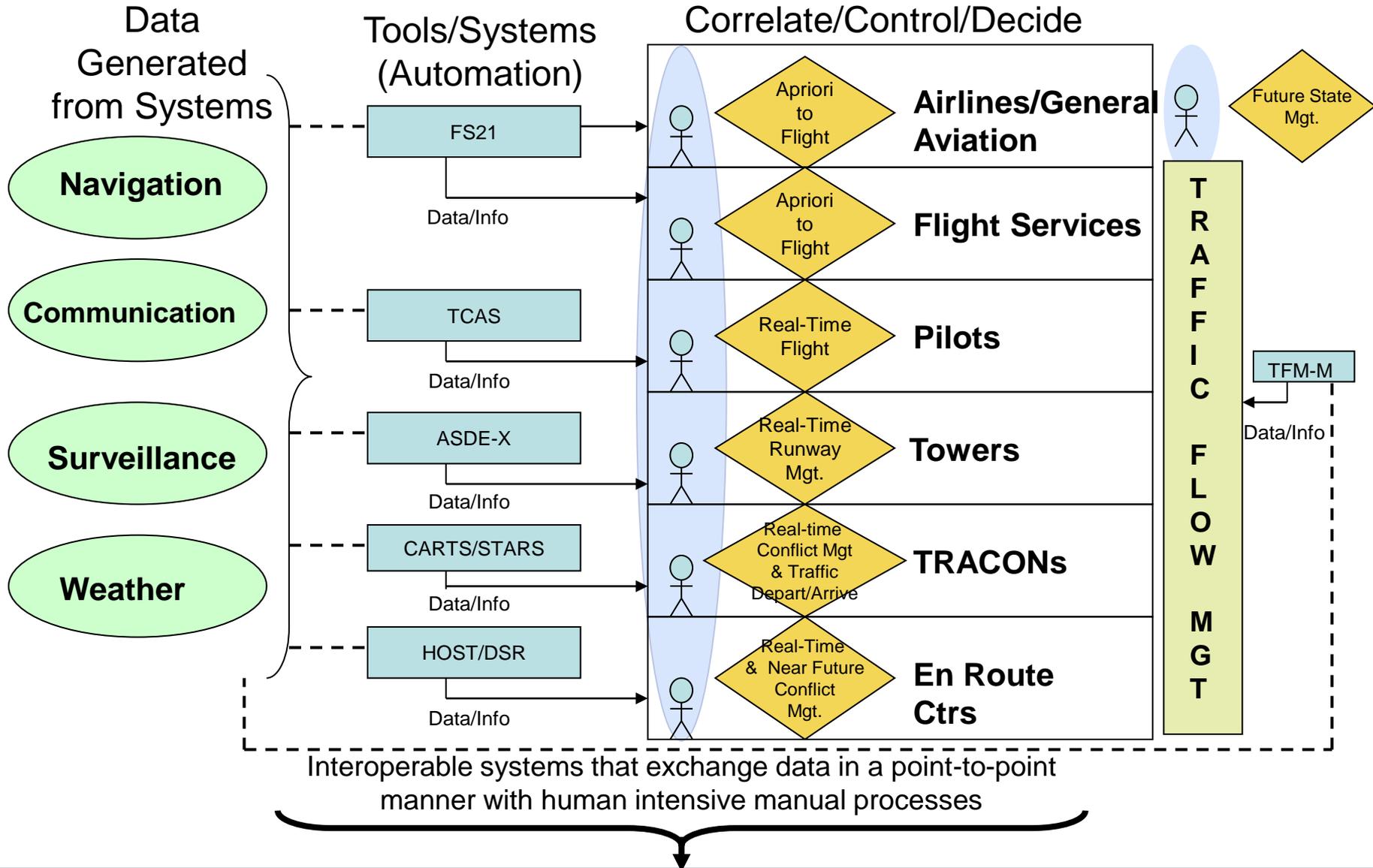
- Better situation awareness (SA) and situation understand (SU)
- Decision support tools (synthesized and analyzed information):
  - Focus on relevant information to reduce uncertainty
  - Reduce process time and clearly visualize current and future air traffic states
  - Improve/reduce decision time
  - Offload spatial and temporal integration to hardware/software environment
- Research to understand how to carve the problem space between pilots and air traffic controllers
- Scalable, adaptable, flexible, agile = effective and efficient

# NextGen

## NAS

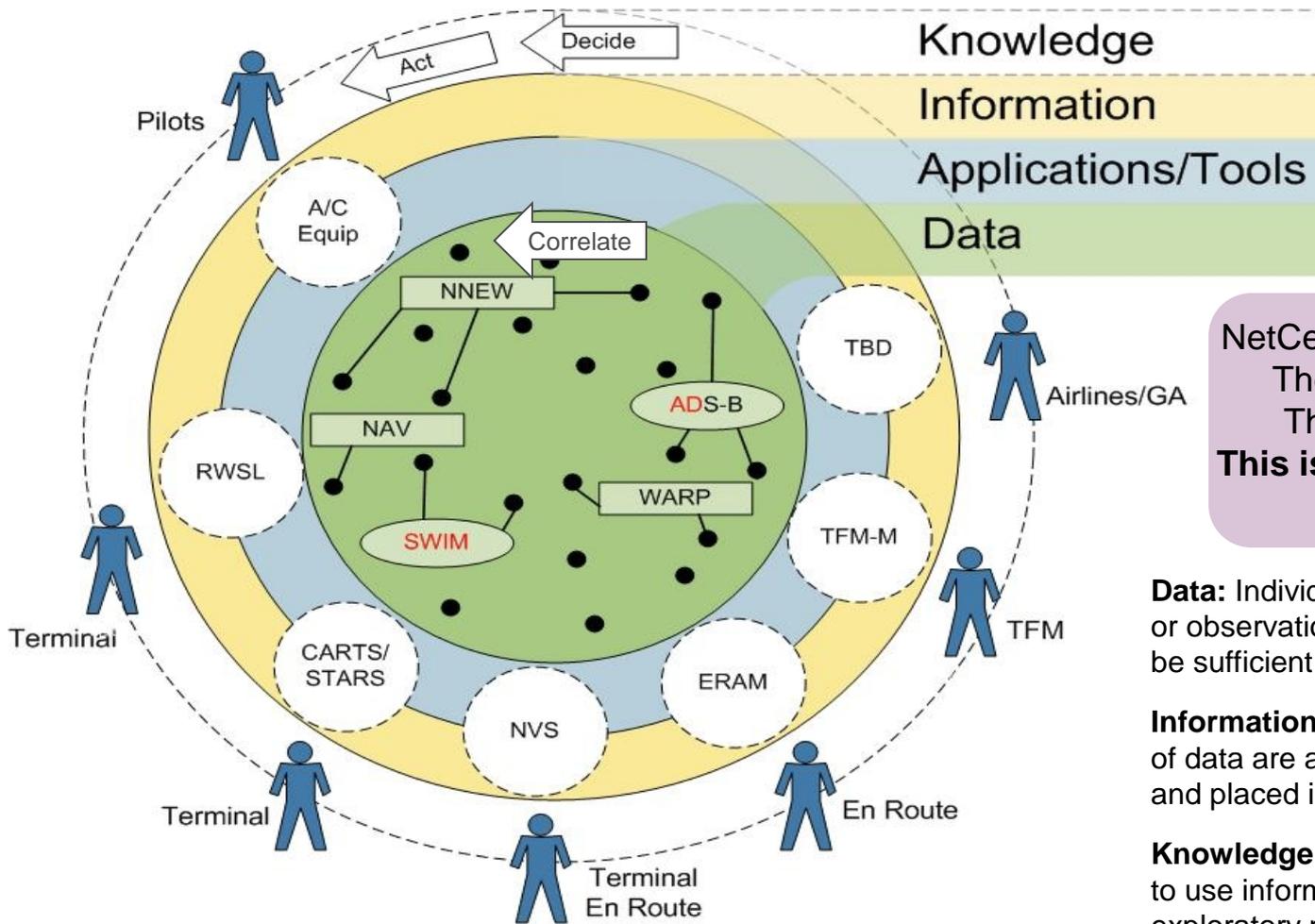


# Conceptual View of Current NAS



# Conceptual View of a Net-Centric NAS: NextGen

Net-centric systems that gather, fuse and analyze multiple pieces of data from multiple sources to meet unique user needs



NetCentric has 2 components:  
The transport layers and  
The information layers.  
**This is about the information layers**

**Data:** Individual facts, measurements or observations which may or may not be sufficient to make a particular decision

**Information:** Obtained when elements of data are assembled, reconciled, fused and placed in operational context

**Knowledge:** Derived from being able to use information to construct and use an exploratory model based on understanding of the situation or phenomenon



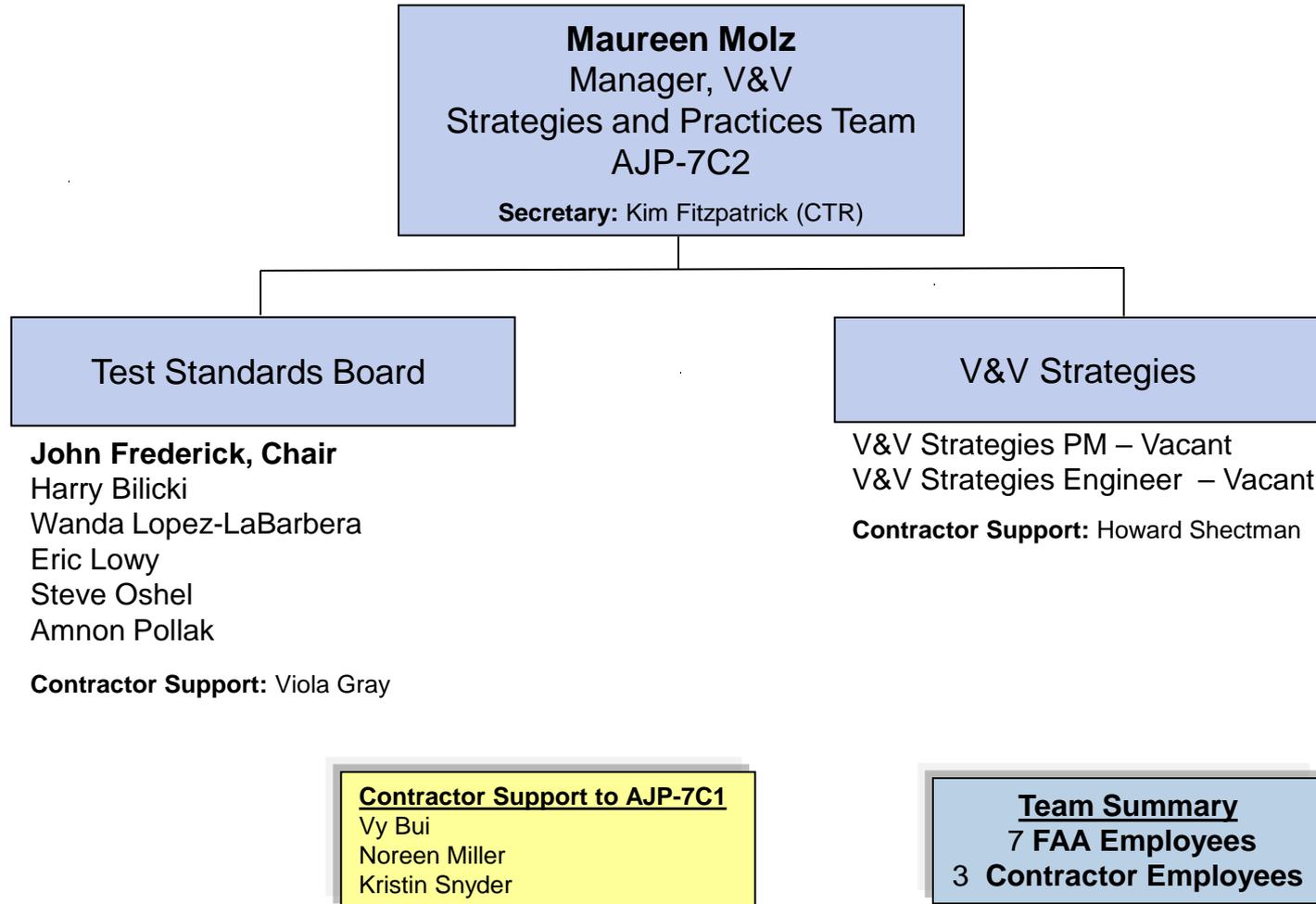
# Test for New Capabilities

- **NextGen represents a fundamental paradigm shift from:**
  - stove-piped, analog, point to point systems to ...
  - an integrated, digital, net centric architecture requiring a system of systems (SoS) development strategy that does not exist in its entirety today
- **NextGen has unique requirements which increase the need to:**
  - Verify NextGen and its systems work correctly
  - Validate NextGen and its systems work in their intended environment

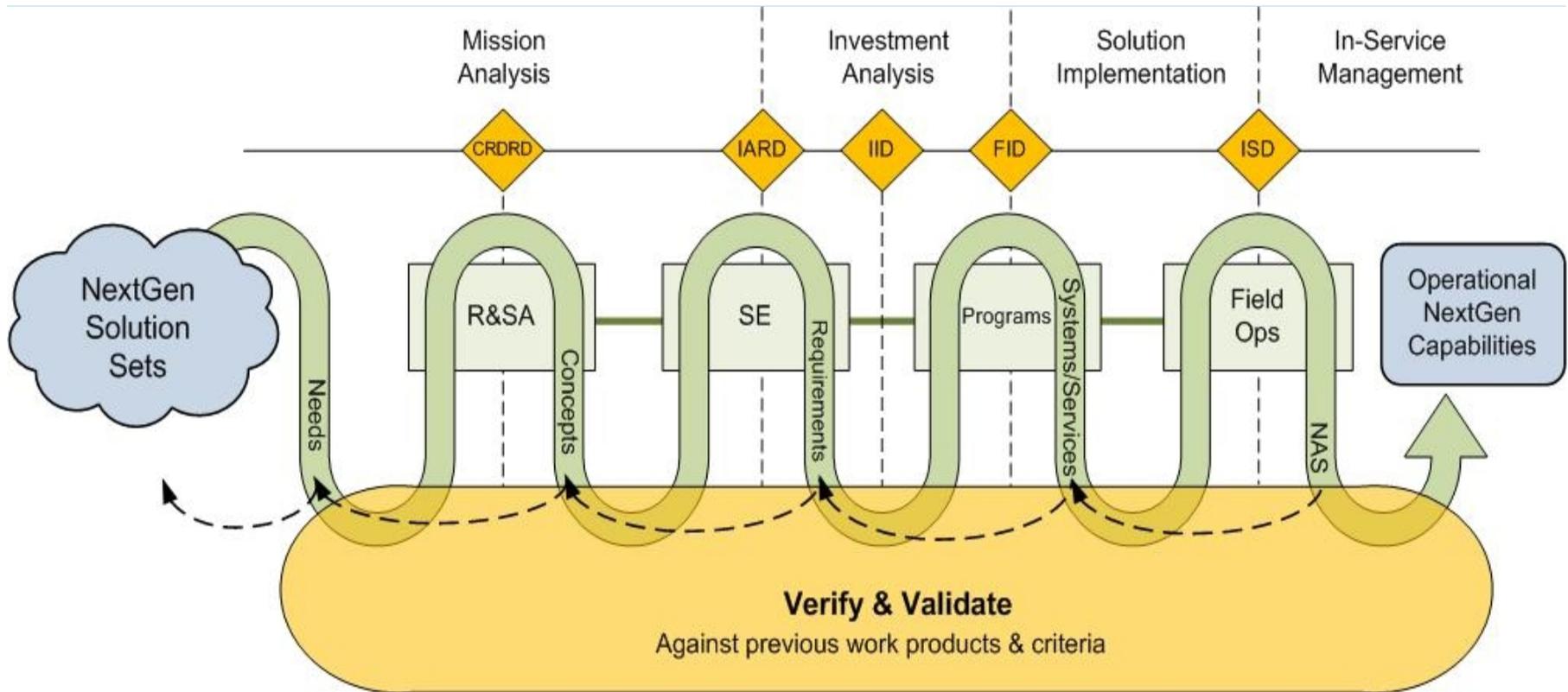
# V&V Strategies and Processes



# Team Organizational Structure



# Acquisition V&V Process



## Current:

- Stovepiped
- Limited interdependency issues

## NetCentric:

- SoS level performance
- Performance relies on data integration

# V&V Strategies and Practices Team Plan

- **Continue TSB Support**
- **Continue AEB V&V Working Group Support**
- **Begin Development of Prototype SoS Assessment Platform**
  - **Awarded Contract: 24 Sep 2010**
  - **Kick-off meeting: 6 Oct 2010**
  - **1<sup>st</sup> Working Group Meeting: Oct 2010**

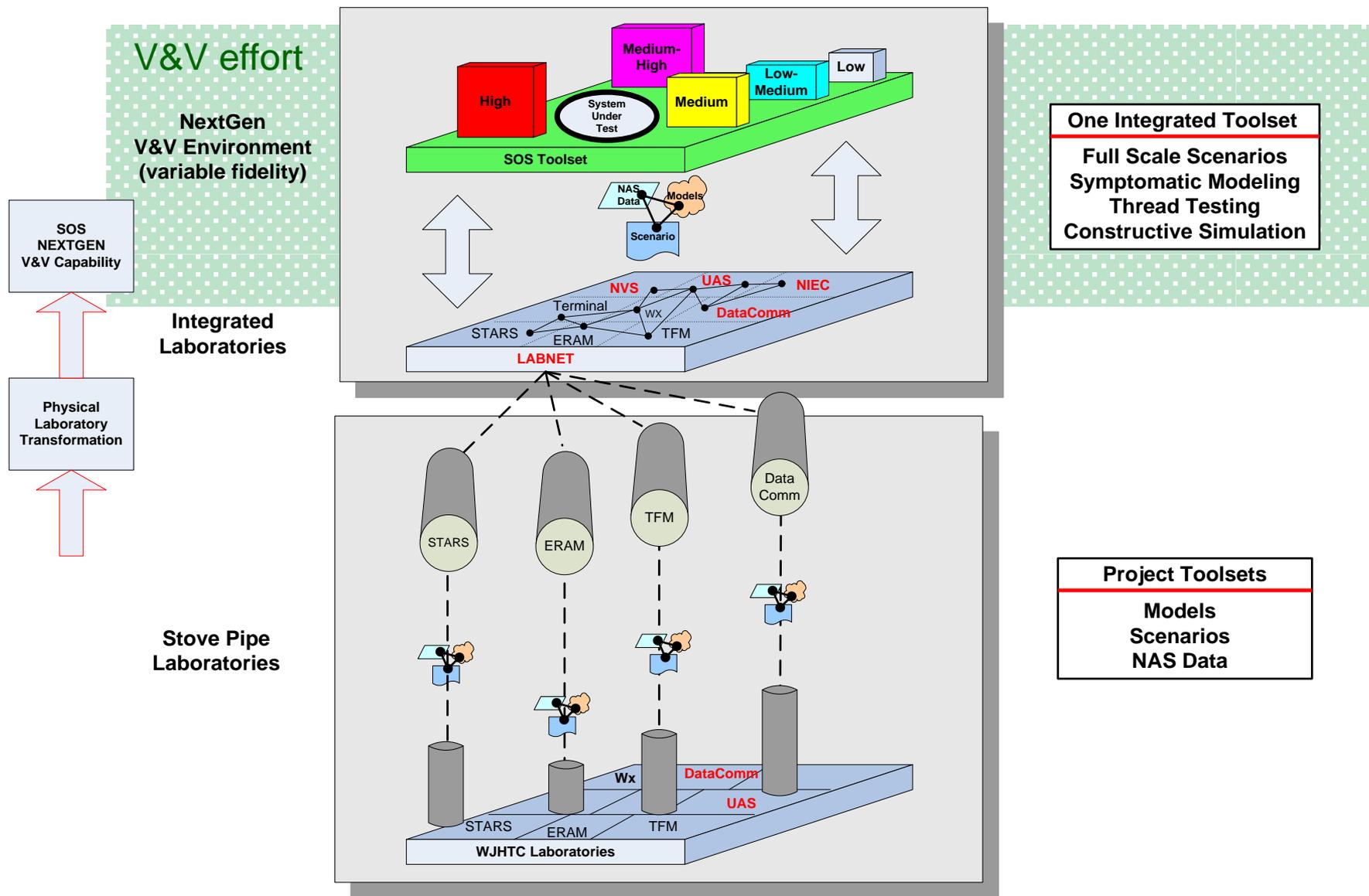
# Advantages

- **Provide acquisition decision makers more reliable information**
- **Ability to track operational improvements through out the lifecycle process**
- **Ability to mitigate risks associated with the increased system of system complexity**
- **Common set of tools (data, models, scenarios) to assess system from research through system engineering into test**

# System Of Systems Assessment Platform



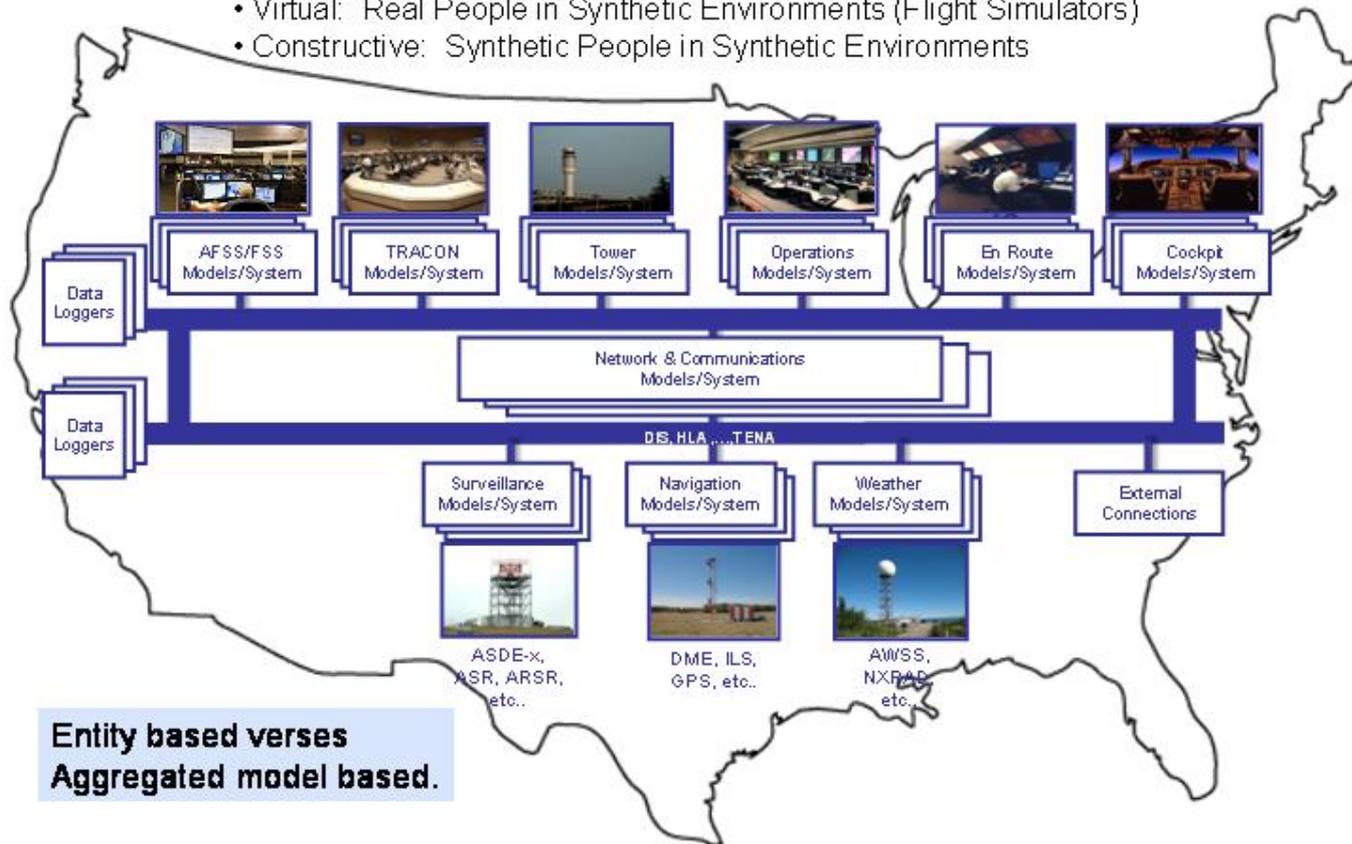
# NextGen V&V: Current & Future Capabilities



# System-of-Systems V&V Capability: NextGen Synthetic Environment

In combination, these components form the capability:

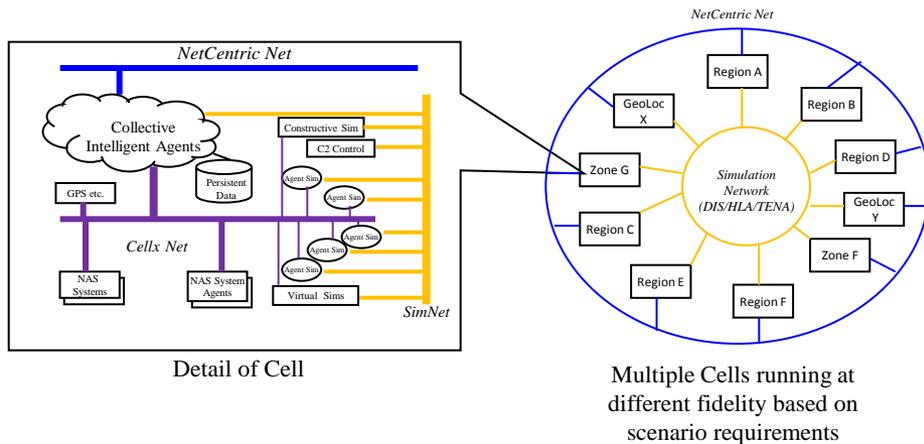
- Live: Real People in Real Environments (Laser Tag)
- Virtual: Real People in Synthetic Environments (Flight Simulators)
- Constructive: Synthetic People in Synthetic Environments



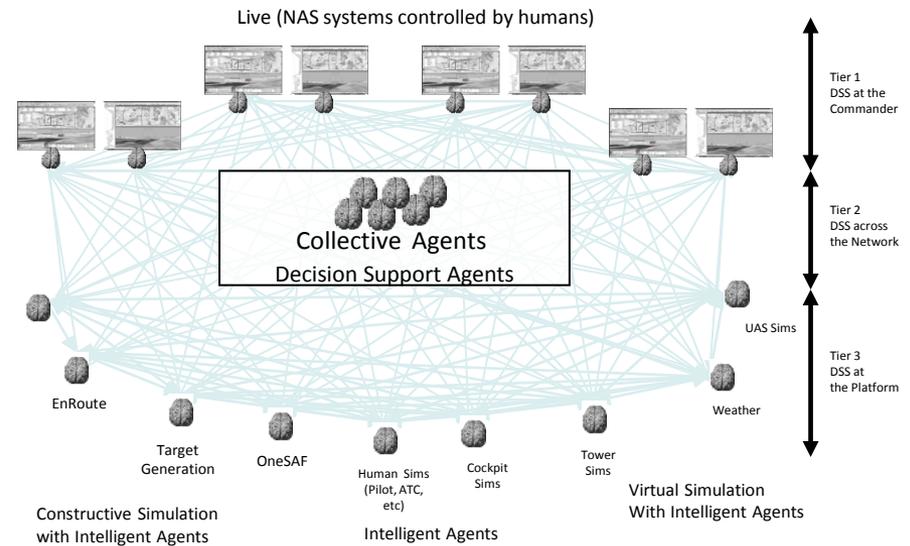
# SoS Assessment Platform

Activities	FY11	FY12	FY13	FY14	FY15
I. V&V Assessment Phase	[Bar spanning FY11 to FY15]				
II. V&V Definition Phase		[Bar spanning FY12 to FY14]			
III. V&V Design Phase			[Bar spanning FY13 to FY14]		
IV. V&V Development Phase				[Bar spanning FY14 to FY15]	

## NetCentric V&V Design



## NetCentric V&V Experience



# Backups

