

# Effects-Based Course of Action Analysis & Comparison



**Bill McKeever**  
**Chad DeStefano**  
**Stephen Colenzo**



# Agenda



- **Anticipatory Environments Technical Area**
- **Technology Limitations**
- **Required Capabilities**
- **Questions**



# Anticipatory Environments



***Interactive environment to enhance the decision makers ability to anticipate, shape and dominate the future battlespace***

- Where high-fidelity models (red / gray / blue) are dynamically produced and updated
- Where many candidate courses of action (COAs) are automatically produced and continuously evaluated
- Where simulations are conjoined with live operations for dynamic situational assessment

***To enable***

- Better understanding of the mission space - past, present & future
- A capability to ‘get inside’ an adversary’s decision loop to anticipate behaviors and events
- Generation of plan(s) / options that will “virtually checkmate” the adversary

***Can I anticipate their next move? How can I use this anticipation to my strategic advantage?***



# Technology Limitations



- **Models of red / gray / blue are static and low fidelity**
- **COA development is predominantly a manual process**
- **Dynamic COA analysis is manpower intensive (blue / red teaming)**
- **Automated COA analysis technology**
  - **Static, adversary is pre-scripted**
  - **Attrition based, force-on-force**
  - **Utilized to study scenarios well in advance of operations**
- **Tracking engagement results with objectives is difficult**
- **Current technologies can not support real-time dynamic capabilities**
  - **Adversaries act / react / adapt too quickly**
  - **Need an “always on” capability**



# Required Capabilities



## ***Capability to...***

- **Model individuals / groups (red, gray, blue) with high fidelity**
- **Model & simulate effects**
- **Automatically generate candidate COAs**
- **Automatically grade / evaluate COAs against objectives**
- **Support multiple parallel COA analysis**
- **Continuously assess engagement results vs. predictions**
- **Measure & manage uncertainty**

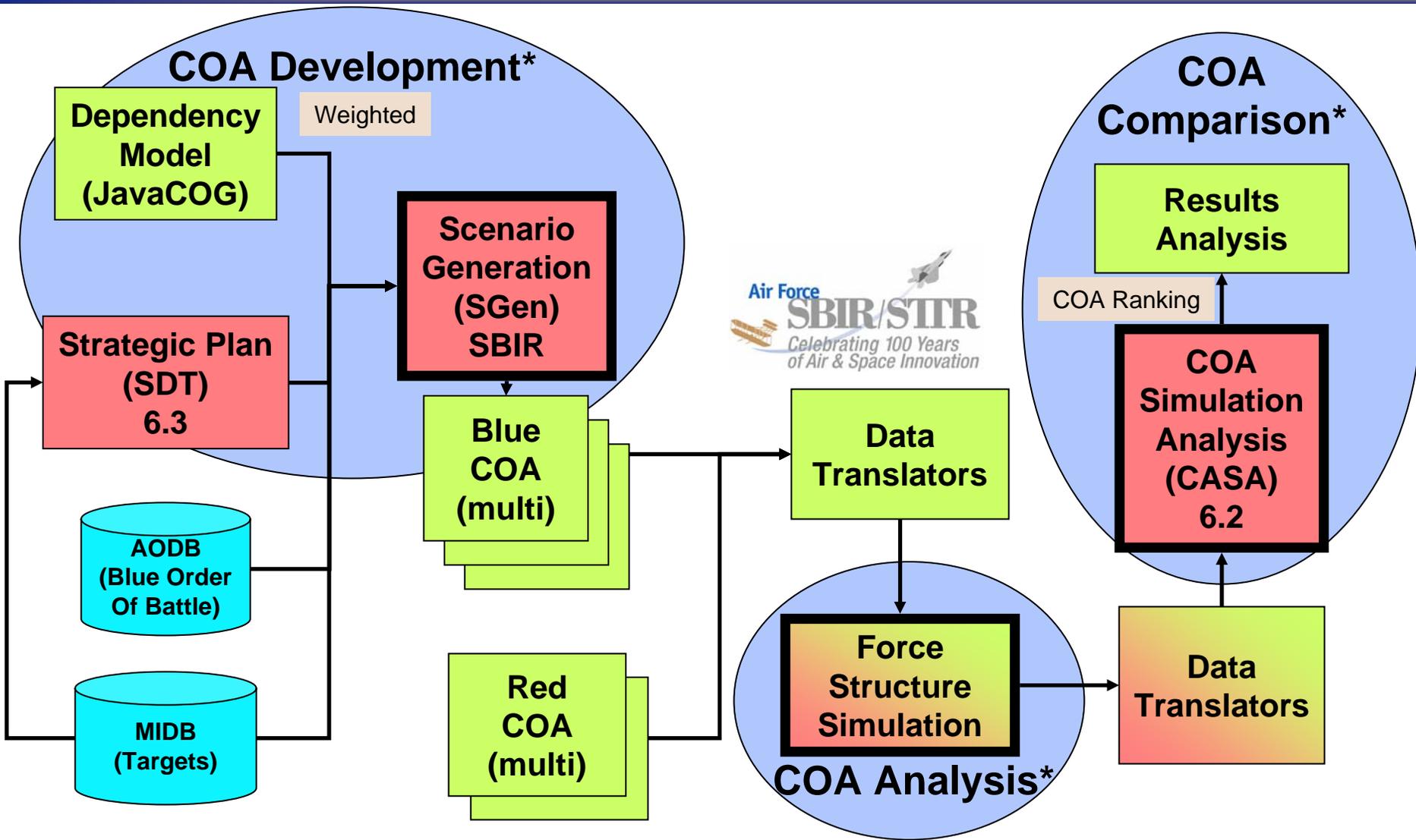
***... faster than real-time***

## Reference Documents

- **Air Force Capability-Based Planning FY08 C2 Functional Needs Analysis Report**
- **AOC Capability Development Document**
- **USAF SAB Report “PBA to Improve Military Effectiveness”**



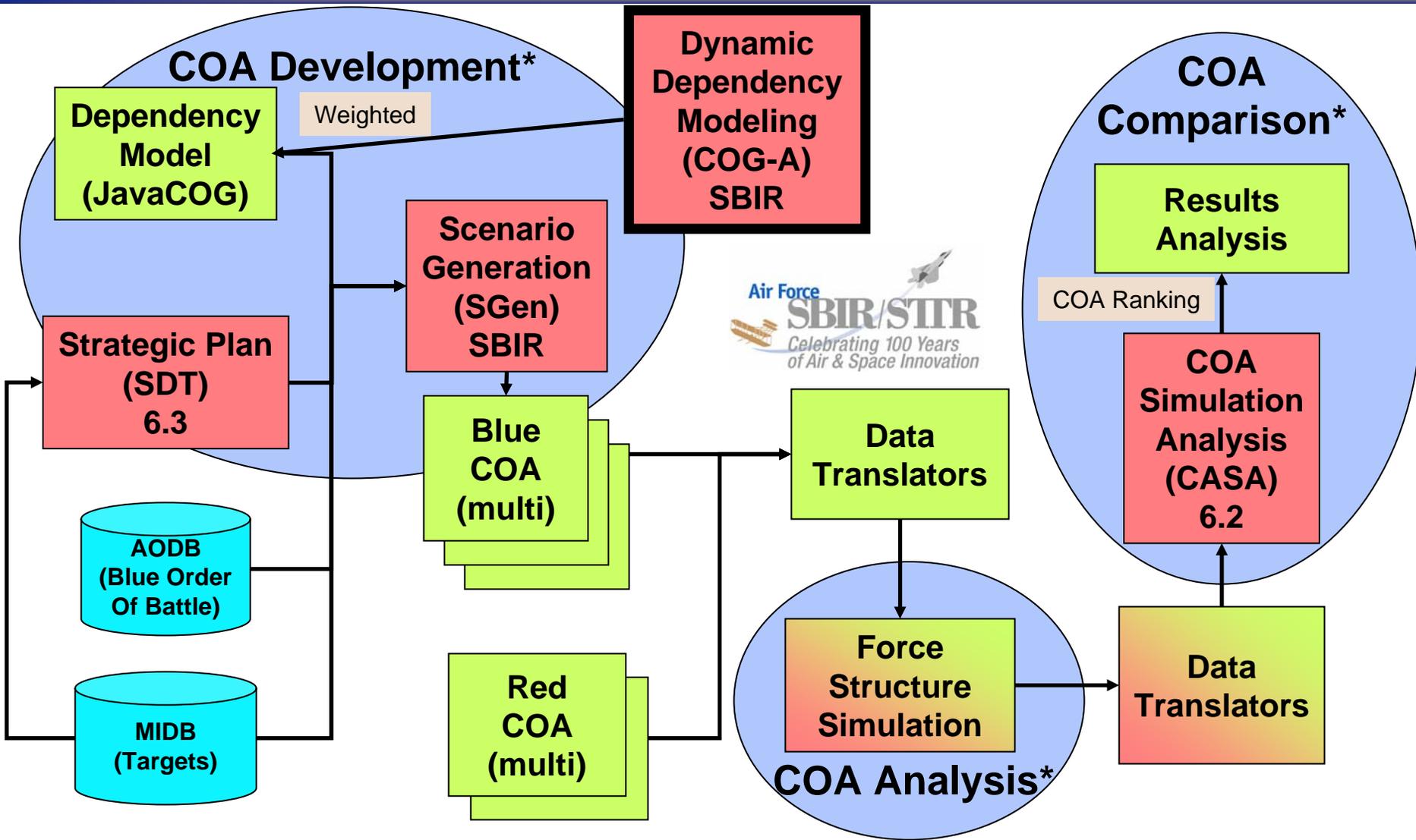
# Anticipatory Environment Demo (COA Development, Analysis & Comparison)



\*JP 3-30, C2 for Joint Air Operations



# Dynamic Dependency Modeling



\*JP 3-30, C2 for Joint Air Operations

Legacy Databases

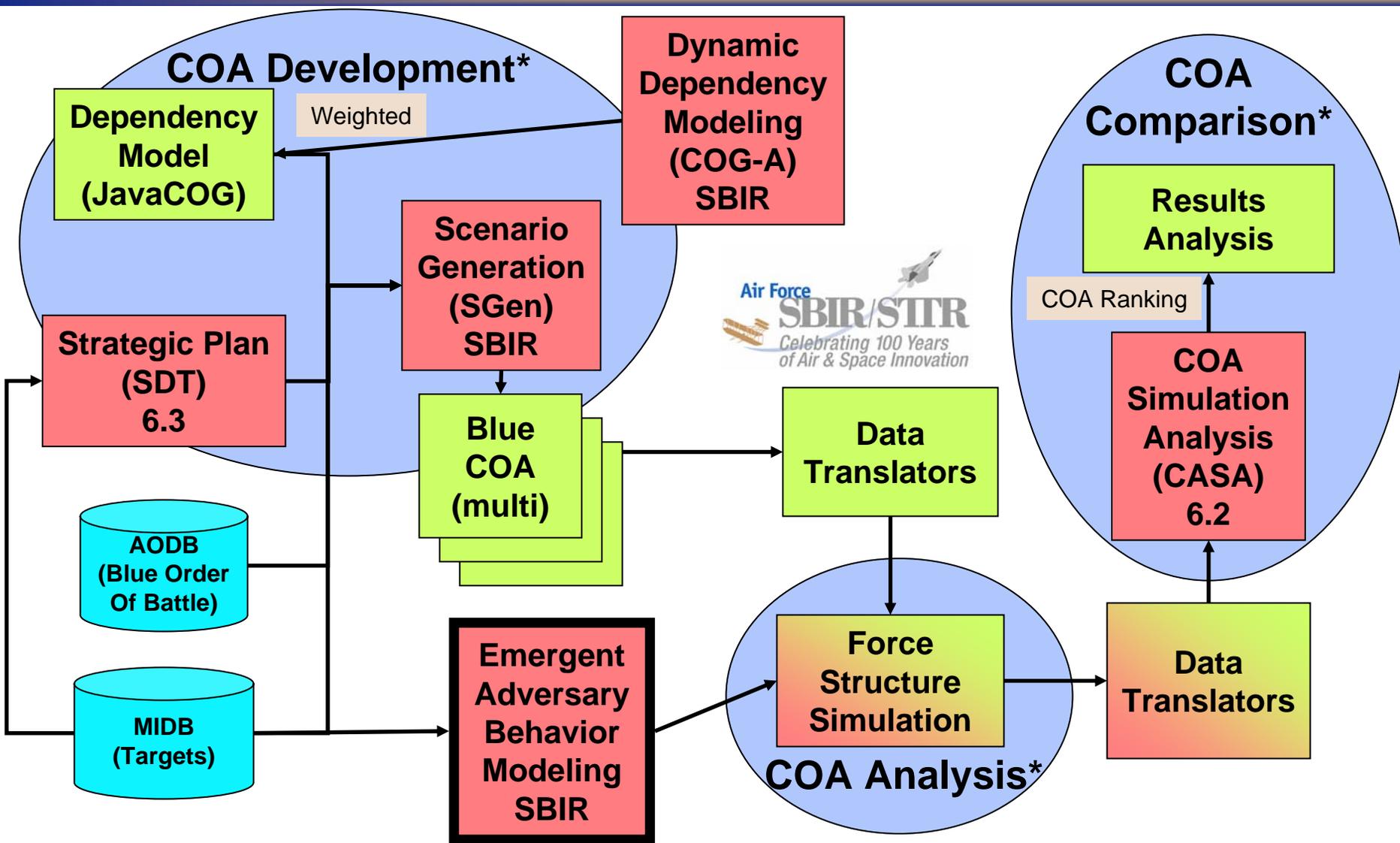
In-House

Contractor

Mixed



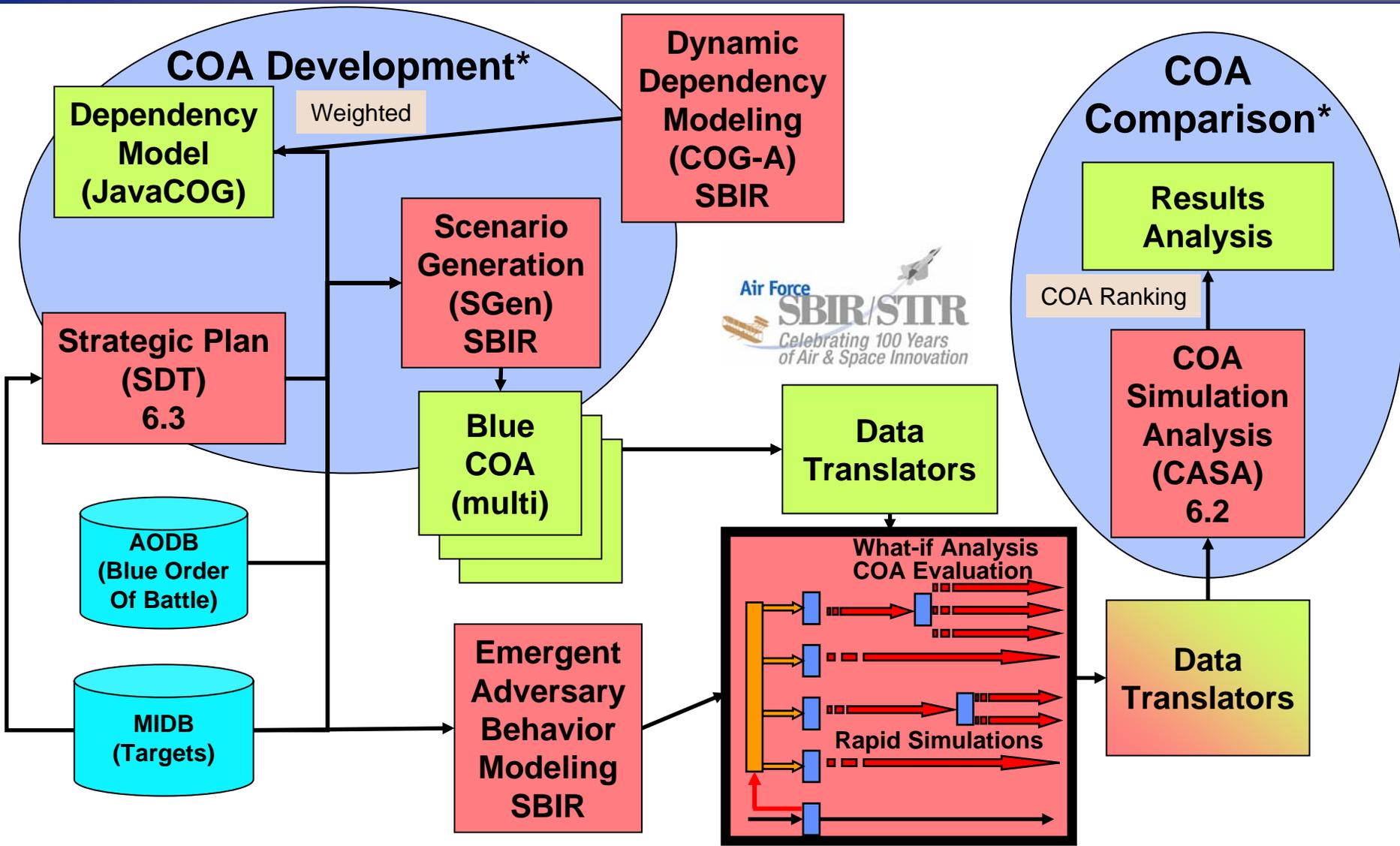
# Emergent Adversary Behavior Modeling



\*JP 3-30, C2 for Joint Air Operations



# HPC Framework for Real-Time Parallel COA Analysis



\*JP 3-30, C2 for Joint Air Operations



# Accomplishments



- **Force structure simulation – first COA analysis capability to simulate direct, indirect, complex, cascading, and recovery events**
- **Automated scenario generation capability – COAs produced in minutes / hours vs. days**
- **COA comparison demonstration – comparisons produced in seconds vs. hours**
- **Automated COA / enemy COA analysis – initial demonstration of dynamic COA analysis incorporating unscripted adversary actions**
- **Publications: published 9 technical papers, 4 additional abstracts in consideration**
- **Briefs and demonstrations: USJFCOM, USSTRATCOM, AFC2ISRC, OSD Office of Net Assessment, AFAMS**



# Anticipatory Environment Demonstration



## *Capability to...*

- Model individuals / groups (red, gray, blue) with high fidelity
- **Model & simulate effects**
- **Semi-automatically generate candidate COAs**
- **Automatically grade / evaluate COAs against objectives**
- Support multiple parallel COA analysis
- Continuously assess engagement results vs. predictions
- Measure & manage uncertainty

*... faster than real-time*

## Reference Documents

- Air Force Capability-Based Planning FY08 C2 Functional Needs Analysis Report
- AOC Capability Development Document
- USAF SAB Report “PBA to Improve Military Effectiveness”



# Questions?

