Air Force Special Operations Command

When Worlds Collide: Leveraging MBSE/SysML for DoDAF Architectures in Programs and Formal Requirements

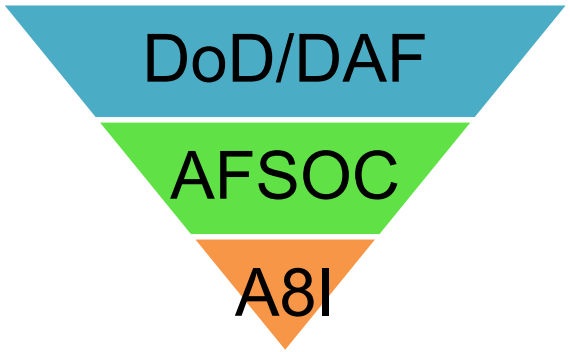
Brandon Froberg

Overview

- Rapid Fire Background
- Motivation
- Lessons Learned
- Future

Rapid Fire Background:

The AFSOF Process Maps to the DoD/DAF Process

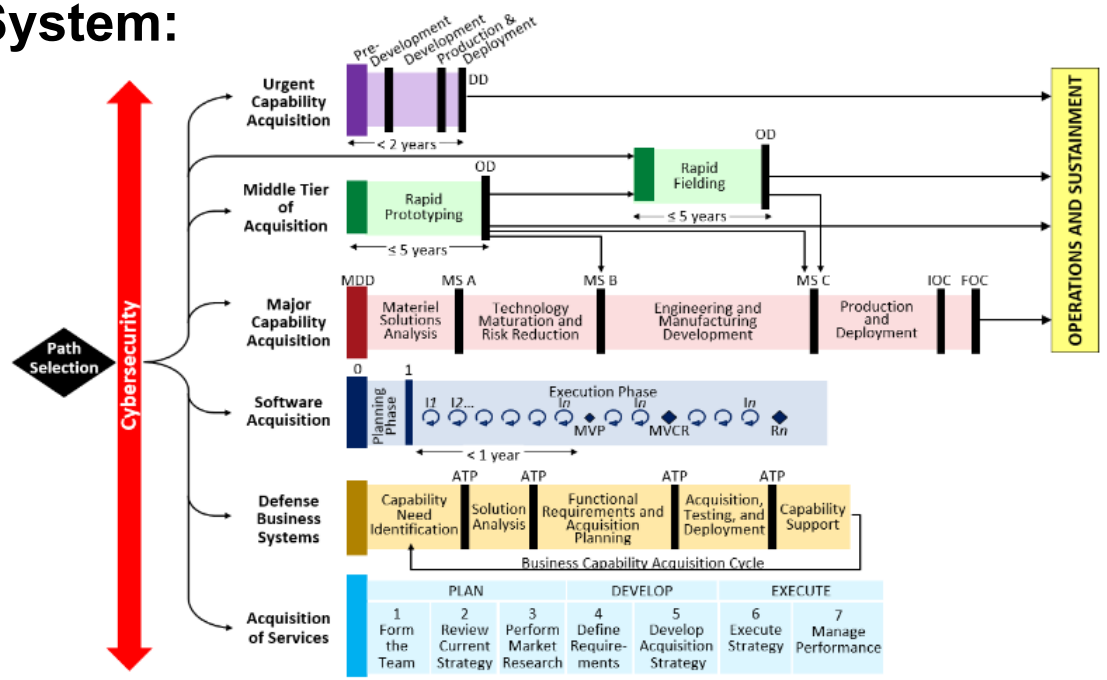


Map to Acquisition Process

- **"Classic" Acquisitions: (Defense Acquisition System):**

Material Solution Analysis	*Tech Maturation & Risk Reduction*	*Engineering & Manufacturing Development*	*Production & Deployment*	*Operations & Support*

- **Adaptive Acquisition System:**



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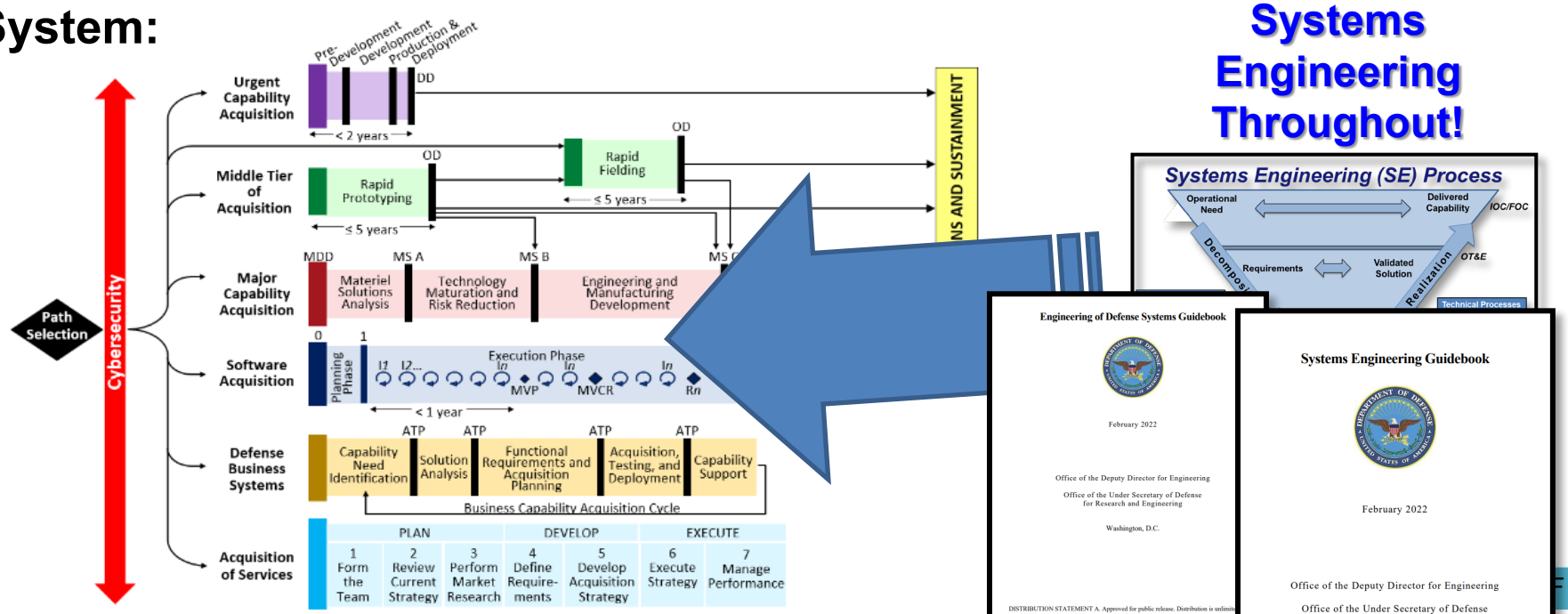
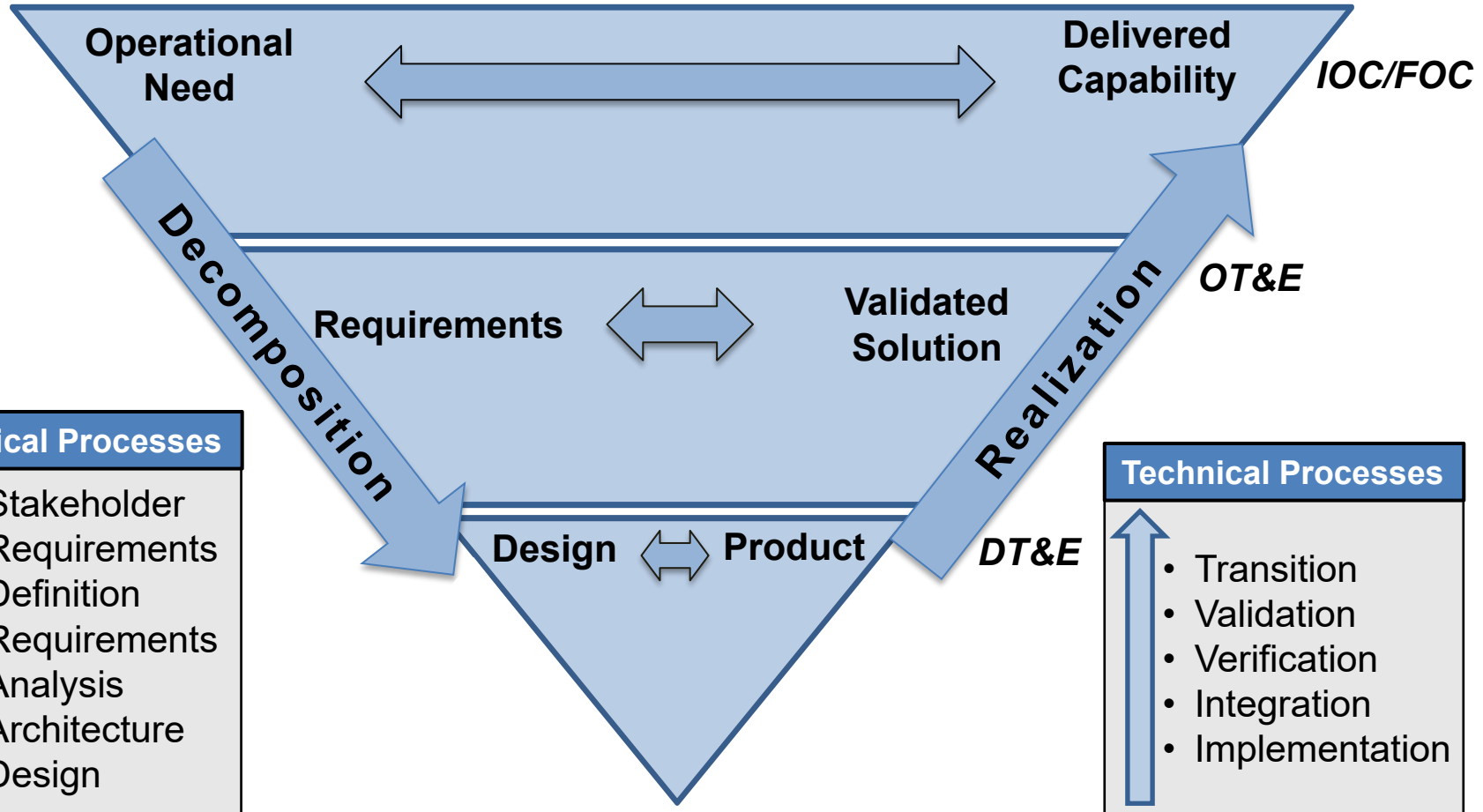


Systems Engineering (SE) Process



Technical Processes

- Stakeholder Requirements Definition
- Requirements Analysis
- Architecture Design

Technical Processes

- Transition
- Validation
- Verification
- Integration
- Implementation

Technical Management Processes

- Decision Analysis
- Technical Planning
- Technical Assessment
- Requirements Management
- Risk Management
- Configuration Management
- Technical Data Management
- Interface Management

Enables a balanced approach for delivering capability to the warfighter

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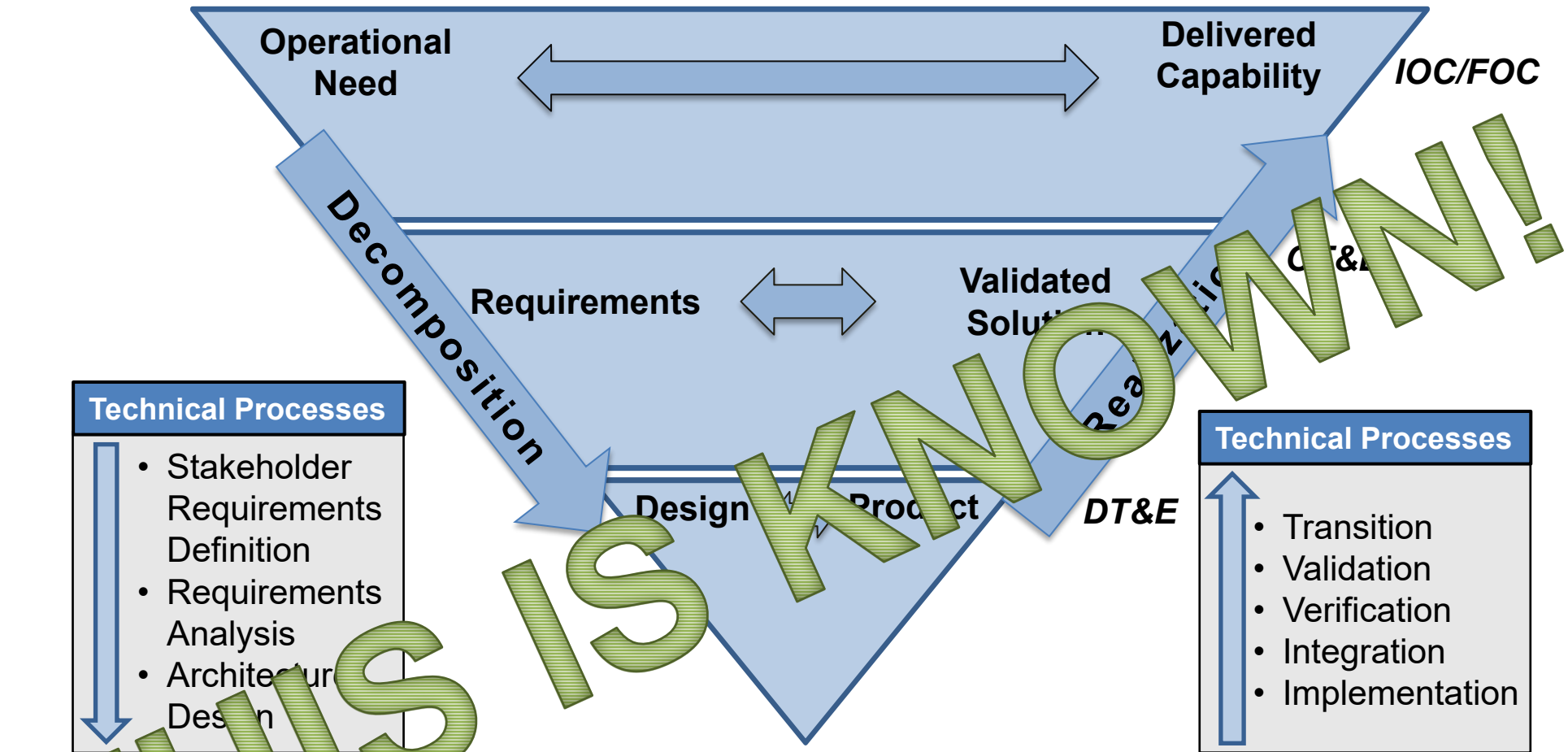
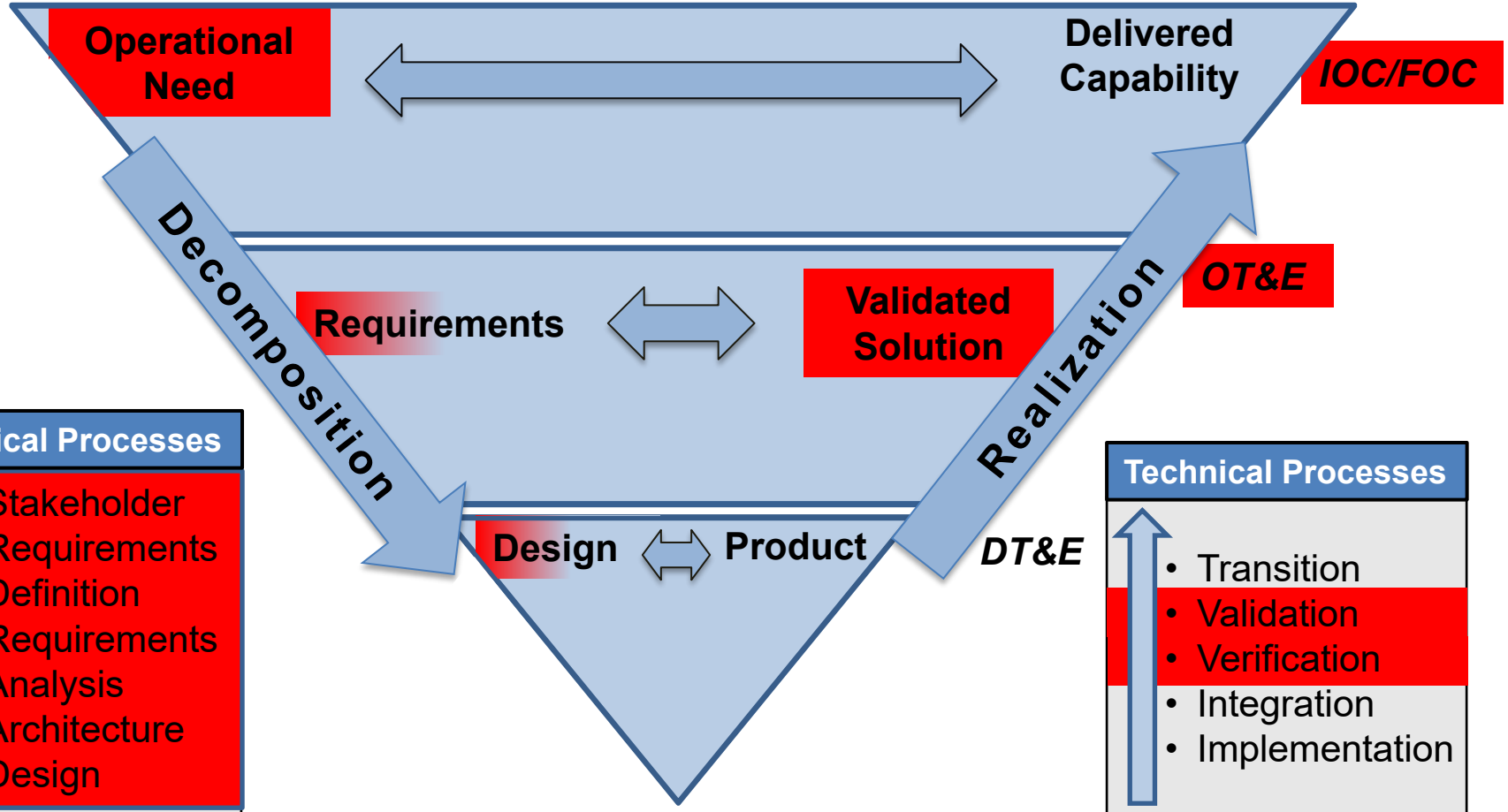


THIS IS KNOWN!

DoD/DAF
AFSOC
A8I

External Development – AFSOC Play



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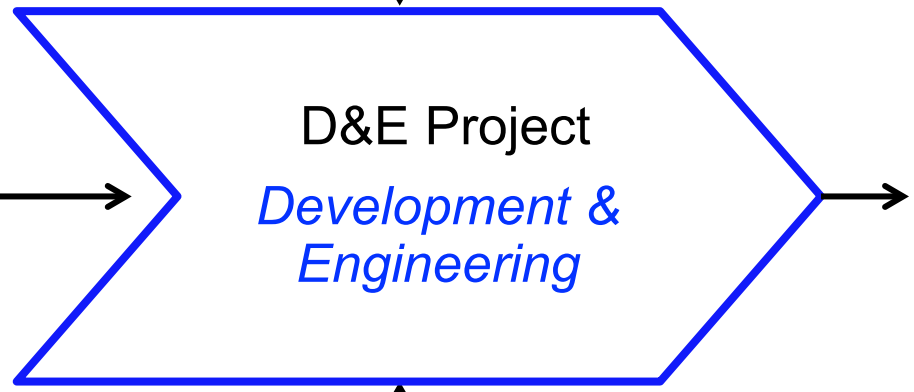
Example Project: Development & Engineering (D&E)

Controls & Guidance

- ❑ Gov Pubs (DoD, SOCOM, AF, Other)
- ❑ AFSOC STIS, Open, Industry, & Military Standards
- ❑ DoD, AF, USSOCOM, AFSOC Strategy & Guidance

Inputs

- ❑ Commander's Guidance
- ❑ Approved Project Analysis
- ❑ Project Tasker (IPT Charter, SYSTASKORD, other)
- ❑ Previous S&T, IA&E Outputs



Outputs

- ❑ Fielded Systems
- ❑ 5 Balls System Plan covering training, support, lifecycle sustainment
- ❑ Systems Architecture (DoDAF)
- ❑ Support Program
- ❑ Training Program, Materials & Courseware
- ❑ Information Support Plan
- ❑ Requirements Document
- ❑ COA Analysis
- ❑ Design Documents
- ❑ Fielding Plan
- ❑ Authority to Operate
- ❑ New Policy
- ❑ Post Implementation Review

Mechanisms & Resources

- ❑ HQ Directorate Functional Lead
- ❑ Systems & Technology Oversight
- ❑ HQ Directorate Supporting Reps
- ❑ Stakeholder Subject Matter Experts

The MOST Complex Project Type!

DoDAF Viewpoints per Phase

Artifacts Required at End of Phase	AV-1	AV-2	CV-1	CV-2	CV-3	CV-4	CV-5	CV-6	CV-7	DIV-1	DIV-2	DIV-3	OV-1	OV-2	OV-3	OV-4	OV-5a	OV-5b	OV-6a	OV-6b	OV-6c	PV-1	PV-2	PV-3	SV-1 or SvcV-1	SV-2 or SvcV-2	SV-3	SvcV-3a	SvcV-3b	SV-4 or Svcv-4	SvcV-5	SV-5a	SV-5b	SV-6 or SvcV-6	SV-7 or SvcV-7	SV-8 or SvcV-8	SV-9 or SvcV-9	SV-10a or SvcV-10a	SV-10b or SvcV-10b	SV-10c or SvcV-10c	StdV-1	StdV-2
Requirements Review	D	D		D	D			D					D	D		D	D	D							D																	
COA Analysis	D	D		D	D			D					D	D		D	D	D	D						D										D							
Preliminary Design	F	F		F	F			F		D	D	D	F	F	D	F	F	F	F		D		D		F	D				D	D	D	D	D	F	D				D	D
Detailed Design	F	F		F	F			F		F	F	F	F	F	F	F	F	F	F		F		F		F	F				F	F	F	F	F	F	F				F	F
Development & Test	F	F		F	F			F		F	F	F	F	F	F	F	F	F	F		F		F		F	F				F	F	F	F	F	F	F				F	F
Fielding, Operation, & Sustainment	F	F		F	F			F		F	F	F	F	F	F	F	F	F	F		F		F		F	F				F	F	F	F	F	F	F				F	F

D = Draft, F = Final

VARIES! But this is the "max" overlay

DoD/DAF
AFSOC
A8I

A8II: Support AFSOC's SE Needs

- **Integration & Interoperability Branch; Science, Systems, Technology, & Innovations (SST&I) Division**
- **A Key activity: Systems & Technology Interoperability Standards (STIS)**
- **Aiming at: Systems Engineering Guidebook's "Goal #1: Formalize the development, integration, and use of models to inform enterprise and program decision making."**
  - **Digital Engineering**
  - **Model-based Systems Engineering (MBSE)**

Bottomline: A8II is attempting to standardize the usage of the System Modeling Language (SysML) to standardize our DoDAF views for AFSOC/A8I projects

NOT YET for the COMMAND nor FORMAL Requirements!

Motivation

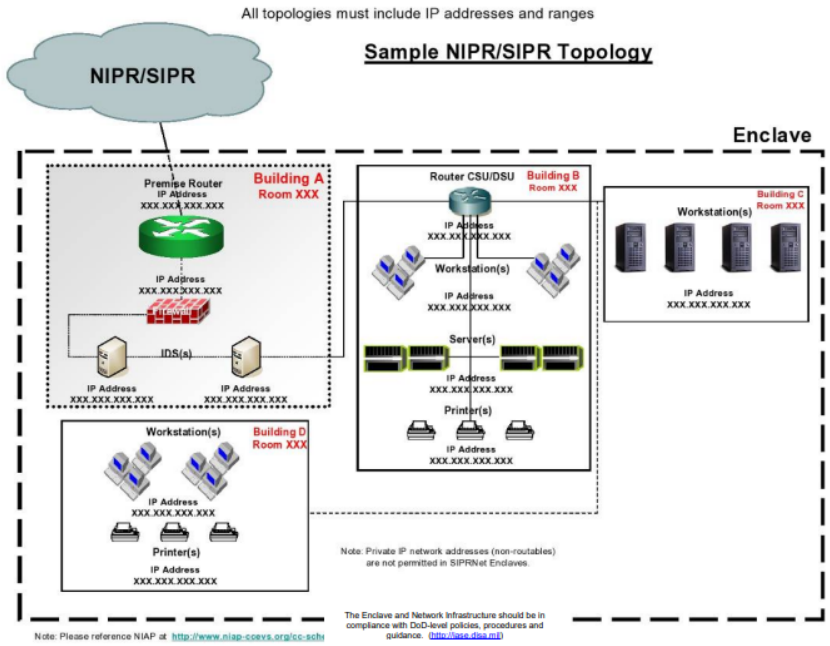


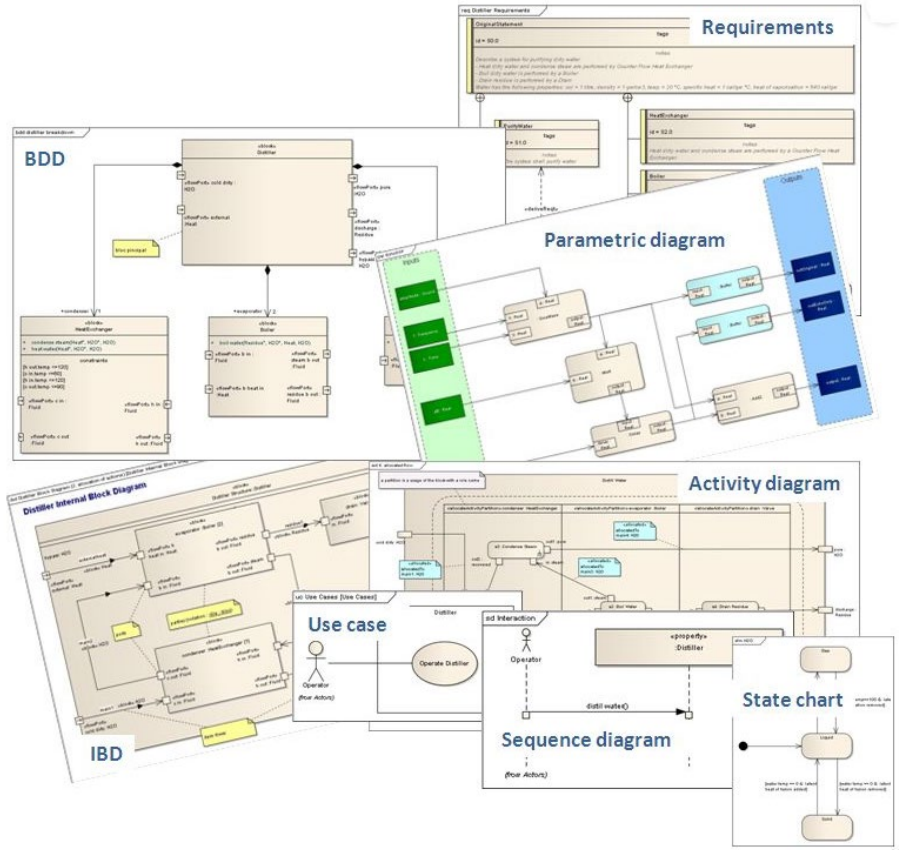
Figure 1 NIPRNET/SIPRNET Topology Sample

There's no standardization of "how to draw" in DoDAF

Why SysML?

- SysML can enable DoDAF creation to assist, educate, & inform construction TTPs

- SysML provides
  - Drawing standardization
  - Tool-based formatting
  - Variety of external training resources
  - An open standard
  - “As needed” the ability to go “Full Nerd” with MBSE



Lessons Learned

UNCLASSIFIED

Systems, Technology, & Interoperability Standard

AFSOC SST&I Architecture and Systems Engineering Enterprise Standard

AFSOC STIS-0301

3 August 2022

Alison Group
Systems, Technology, & Innovation Development Office

UNCLASSIFIED

UNCLASSIFIED

Lessons Learned

- Good
  - First editions of the STIS are published on Intelink
  - Contract renewal restarted work in October
- Bad
  - Open-source tools are powerful, but have a learning curve
    - Diagrams-as-Code (e.g. PlantUML) & free tools (e.g., http://diagrams.net/) *may* work
  - The STIS work needs a SysML AND DoDAF SME – very rare!
    - We eventually found good synergy when placing two SMEs together
- Ugly
  - NO TOOLS (A8I lacked funding for licenses
    - Ask for budgeting, leverage other organization tools as appropriate
  - New material for us, lack of DAF-wide (or known to us) training
    - Local training events; possible to leverage Gov't sources (e.g., AFIT/LS)

Future/Questions

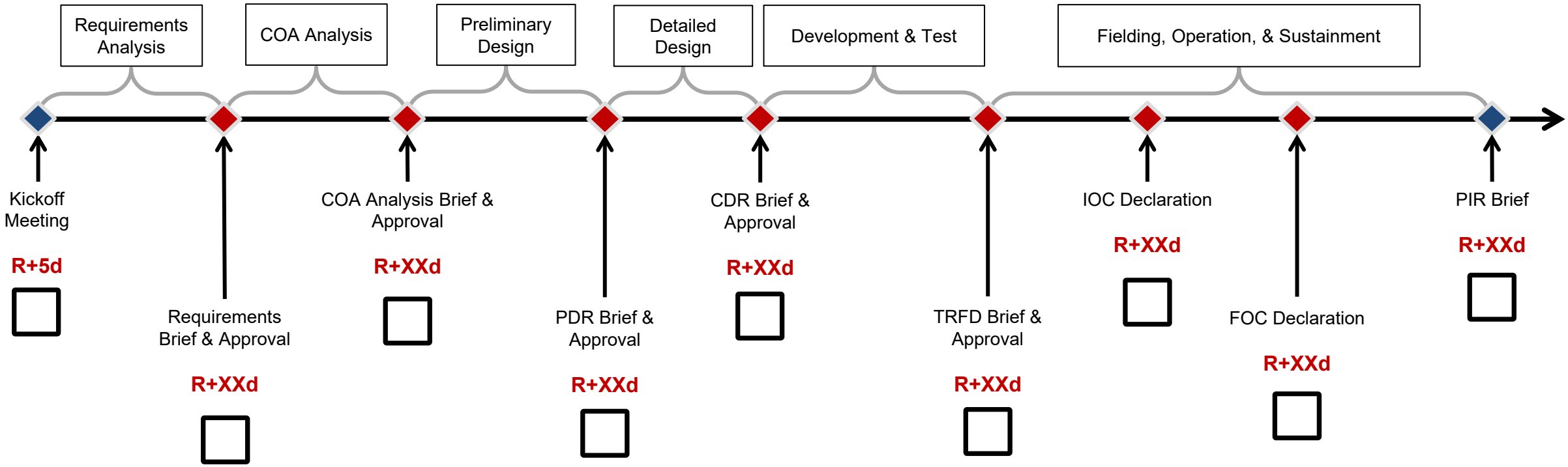
- Future
  - Contractor support is our main implementor
  - Releasing incremental updates of our STIS on Intelink
  - Need to ID methods to integrate into larger DAF and SOCOM processes for MBSE

- Note: Send email for links/information to: brandon.froberg.1@us.af.mil

QUESTIONS?

Backup

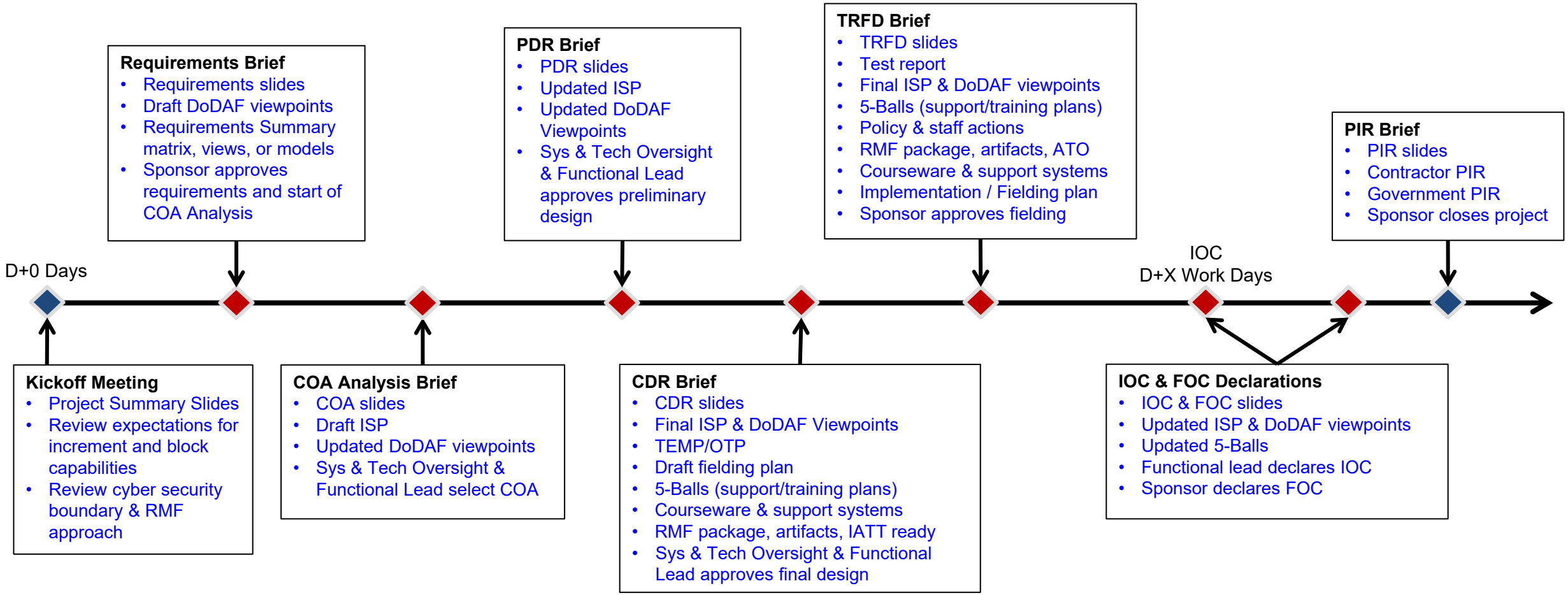
AFSOF D&E Events & Timeline



Relative timeline from R day

Date Completed		CDR	Critical Design Review	PDR	Preliminary Design Review
Current Phase		COA	Course of Action	PIR	Post Implementation Review
Date Planned		d	Days	R	Resources Available Day
Decision Pt		FOC	Full Operating Capability	TRFD	Test Report & Fielding Decision
Event		IOC	Initial Operating Capability		

Project XXX – Events & Deliverables



ATO – Approval to Operate
CDR – Critical Design Review
COA – Course of Action
DoDAF – DoD Architecture Framework
FOC – Full Operating Capability
GS – Government Sponsor
IATT – Interim Approval to Test
IOC – Initial Operating Capability
ISP – Information Support Plan
OTP – Operational Test Plan
PDR – Preliminary Design Review
PIR – Post Implementation Review
RMF – Risk Mitigation Framework
TEMP – Test & Evaluation Master Plan
TRFD – Test Report & Fielding Decision