



AFCEA HITCHHIKER GUIDE

to the

DIGITAL ENGINEERING “GALAXY”

Thomas A. Lockhart, SES
Director of Engineering AFNWC
21 Jan 2020



-Hitchhiker Guide-

AS WITH ARTHUR DENT (MAIN CHARACTER IN HITCHHIKER GUIDE TO THE GALAXY), A MILD MANNERED, OUT TO LIVE HIS LIFE, BUT NOT WANTING TO BE DEMOLISHED TO MAKE ROOM FOR A "NEW ENGINEERING GALAXY"?
SO ARE WE IN OUR CURRENT SITUATION?
TODAY, WE ARE SEEING A COLLECTIVE THINKING THAT NEEDS TO BE EXPLORED (SOURCED CULTURE). TO WHAT? AT THE "DIGITAL CAMPAIGN" DRAWING NO CONCLUSIONS OTHER THAN THAT WE ARE IN THE BEGINNING OF OUR DIGITAL ENGINEERING JOURNEY.



– THE ULTIMATE ANSWER is “42” –
WHAT IS THE QUESTION TO THE ULTIMATE ANSWER?

❖❖ *The Hitchhiker Guide the Digital Engineering Galaxy*
(Body of Knowledge (BOK) – "1" Integrated Digital Environments (IDE))

❖❖ *The Restaurant at the End of the Universe*
(BOK - "2" Framing IDE for Acquisitions)

❖❖ *Life, The Universe and Everything*
(BOK - "3" Cultural- Natives, Scouts, and Dinosaurs)

❖❖ *So Long, and Thanks for All the Fish*
(BOK - "3.14.." Exciting IDE Future)



Lines of Effort Goals



-
- **Workforce recruitment, coaching and advancement in critical digital skills, data science and modeling competencies**
 - **Strengthen engineering and all functional expertise, empowering tradespace exploration with early model-based assessments using threat informed mission analysis, for decision making at lowest level**
 - **Secure cloud-based modeling environment bringing together tools and communities for continuous operational, acquisition, and system analysis across the lifecycle**
 - **Enterprise data architecture with continuous Authoritative Data Source (ADS)/Authorization (AA) data sharing for paperless reviews; audits; certifications; decisions; and digital thread throughout product lifecycle and enable operations with artificial intelligence (AI) to improve accuracy at machine speed**
 - **Government and domain reference architectures for accelerated iterative development, enhanced competition, interoperability, system agility, and rapid tech insertion**
 - **Transform and optimize processes across assessments, systems engineering, intel, test and evaluation, and logistics and maintenance**
-



The Hitchhiker Guide the Digital Engineering (DE) Galaxy

BOK - "1"

What is Integrated Digital Environment?

Big "4"

- ✓ **Model Based**
- ✓ **Product Management**
- ✓ **Analysis**
- ✓ **Visualization**

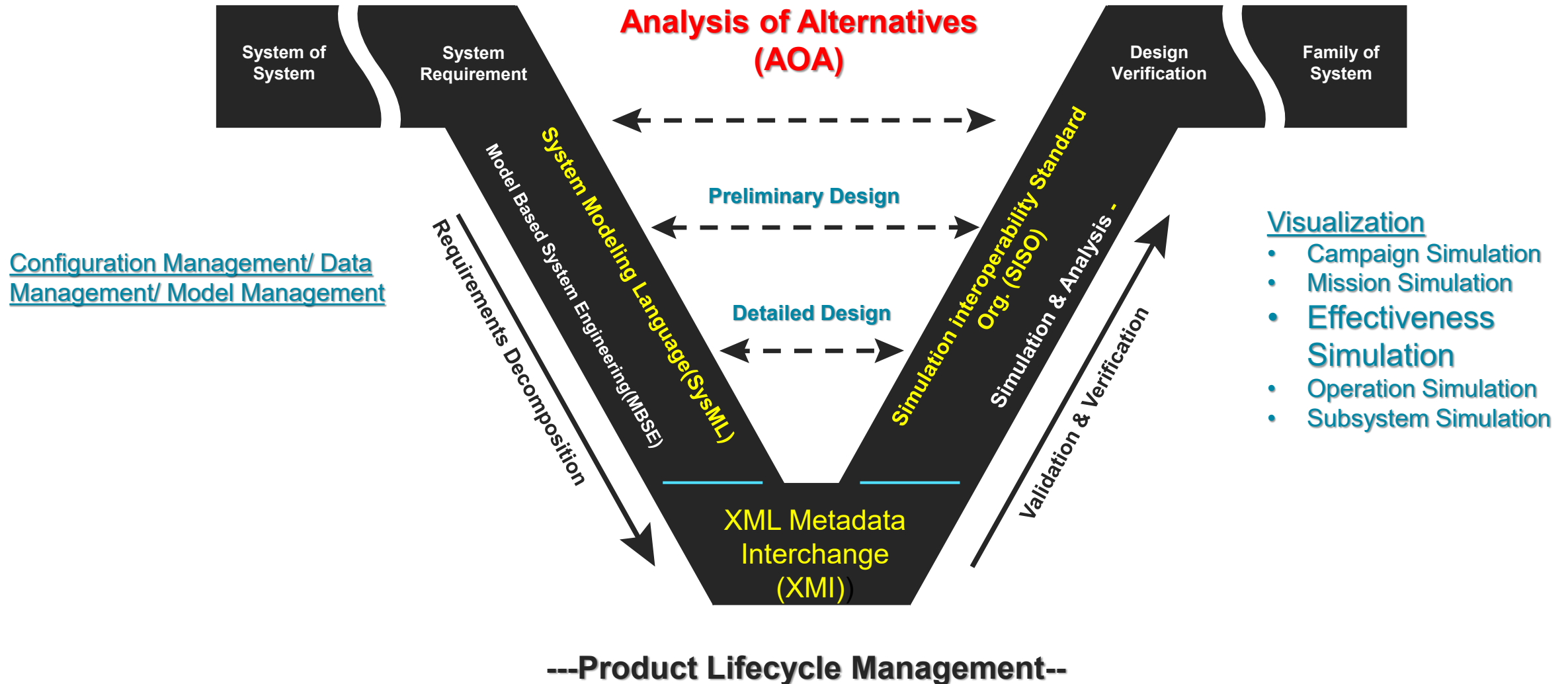
Multiple Tool Vendors
Interoperability w/Open Standards

- ❑ **Distributed Workforce**
- ❑ **Multi-Level Security**
- ❑ **Continuous Authority To Operate**
- ❑ **Own & Access to Program Baseline**

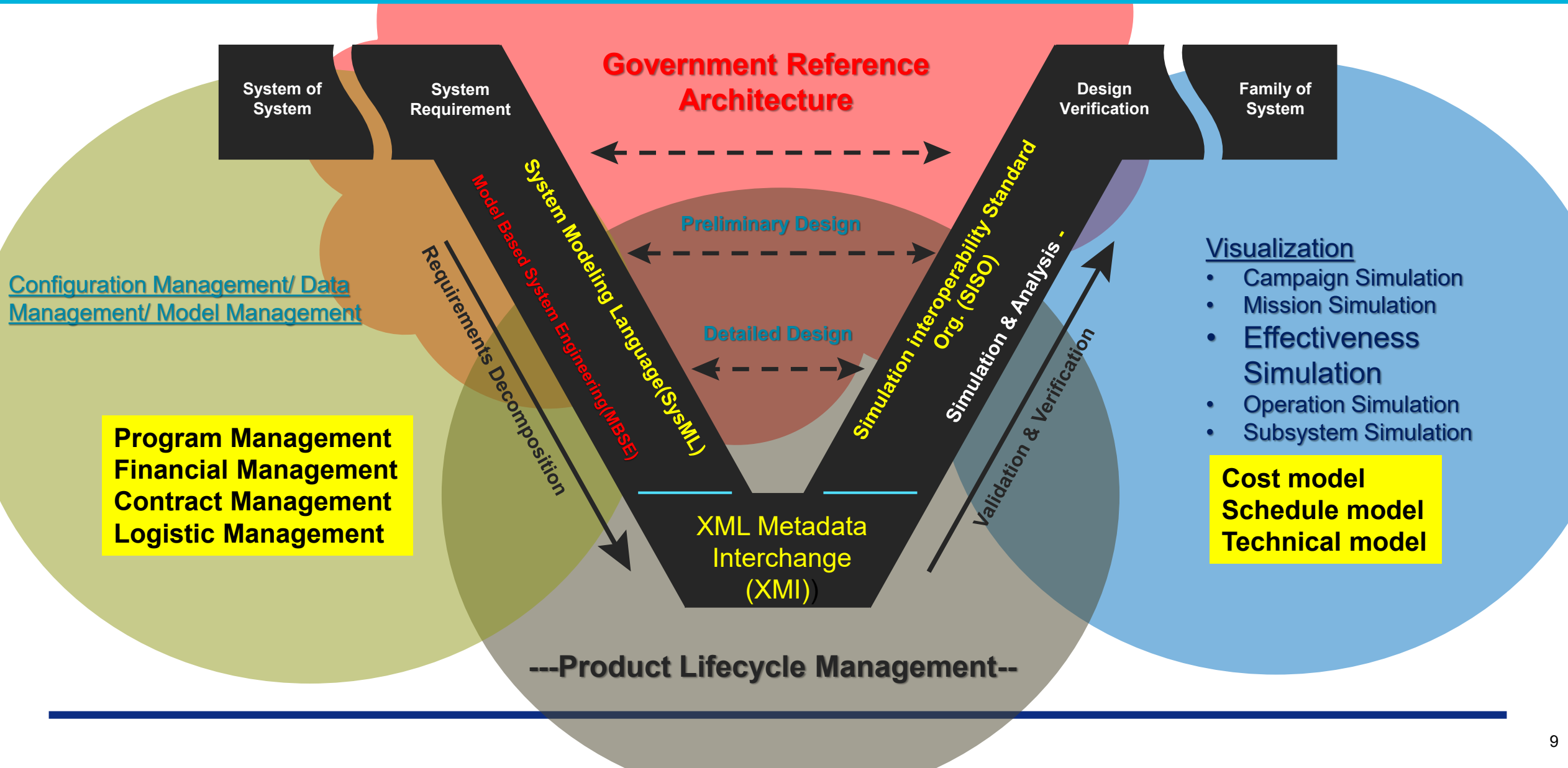
Complexity Science (DEV/*/OPS)



Bede Systems Engineering “Vee” Framework



Digital Galaxy



Build the Digital GALAXY Ecosystem **Data** Architecture



Align

Current MBSE work (best of the best)

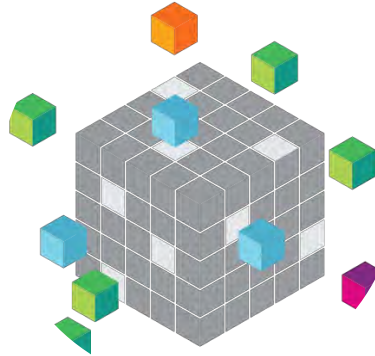
DoD DevSecOps Reference Design

Real-time/Embedded Systems

Standardized data formats

Government Reference Architectures

Cultural and Mindset Changes



Leverage Cloud Infrastructure

CloudOne/PlatformOne Foundation

Leading edge agile software processes

Automate what we can

Machine Learning/Artificial Intelligence – New ways of handling/validating/managing/applying data



Development

Open Source/Common Tools

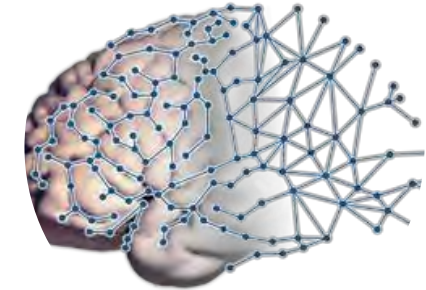
Configuration management, data health, data checking

Near Continuous Design Reviews

Understand SoS Level Interfaces

Assess System Performance

Virtual Dress Rehearsal Missions



Manage, Share, and Curate Data

Make Data Accessible to the People Who Need It

Pre-program activities to program of record to operations

Living data repository – allows customization for program & Operational needs

Establish the pipeline to the warfighter!

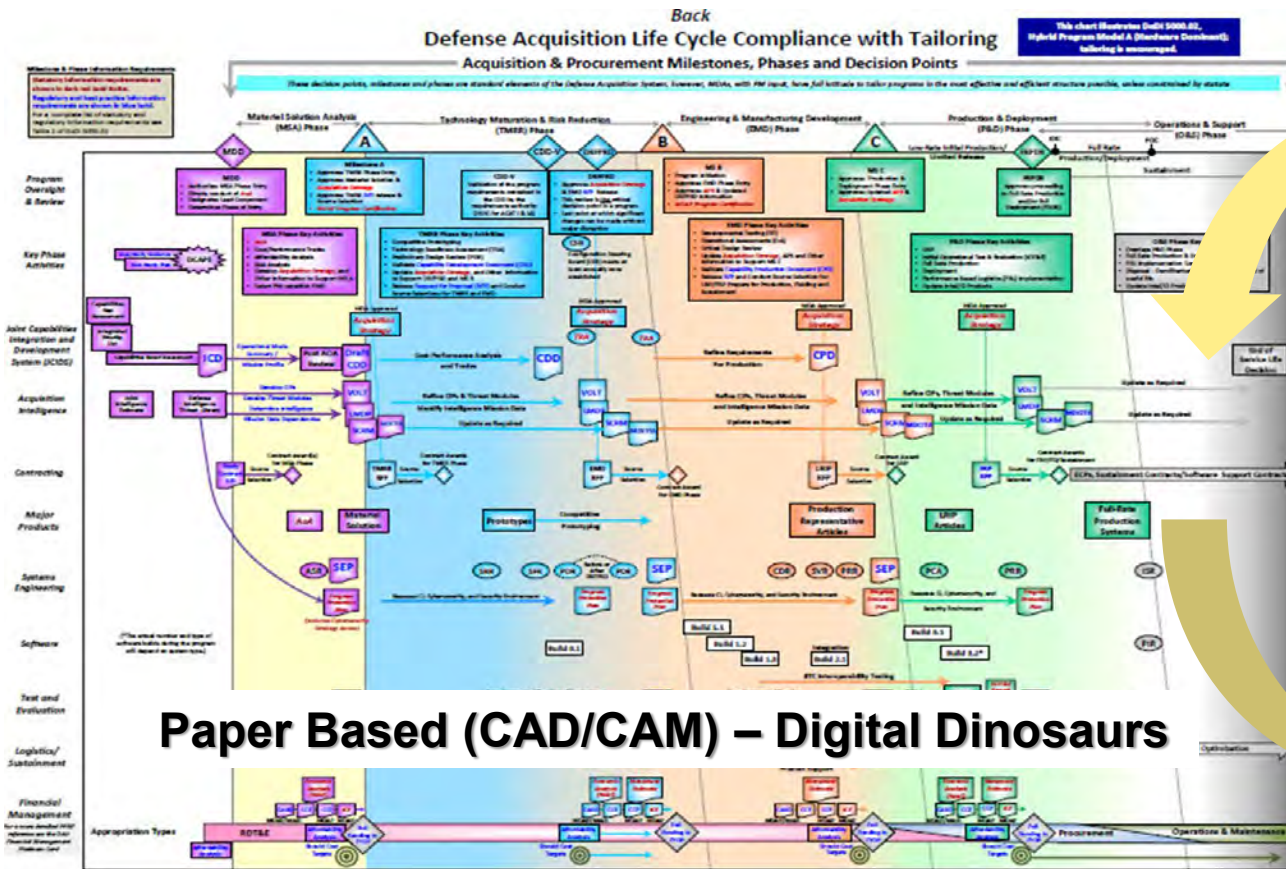
A person is shown from the chest up, wearing a VR headset and large headphones. The image has a strong red and orange color cast. A white diagonal striped graphic is overlaid on the lower right. The text 'The Restaurant at the End of the Universe' is in yellow, and 'BOK - "2"' is in blue.

The Restaurant at the End of the Universe

BOK - "2"

Evolving Acquisition Processes

Strategy: Systematically identify and promote digital enhancements to acquisition processes using Agile methodology—data, tools, infrastructure, policy

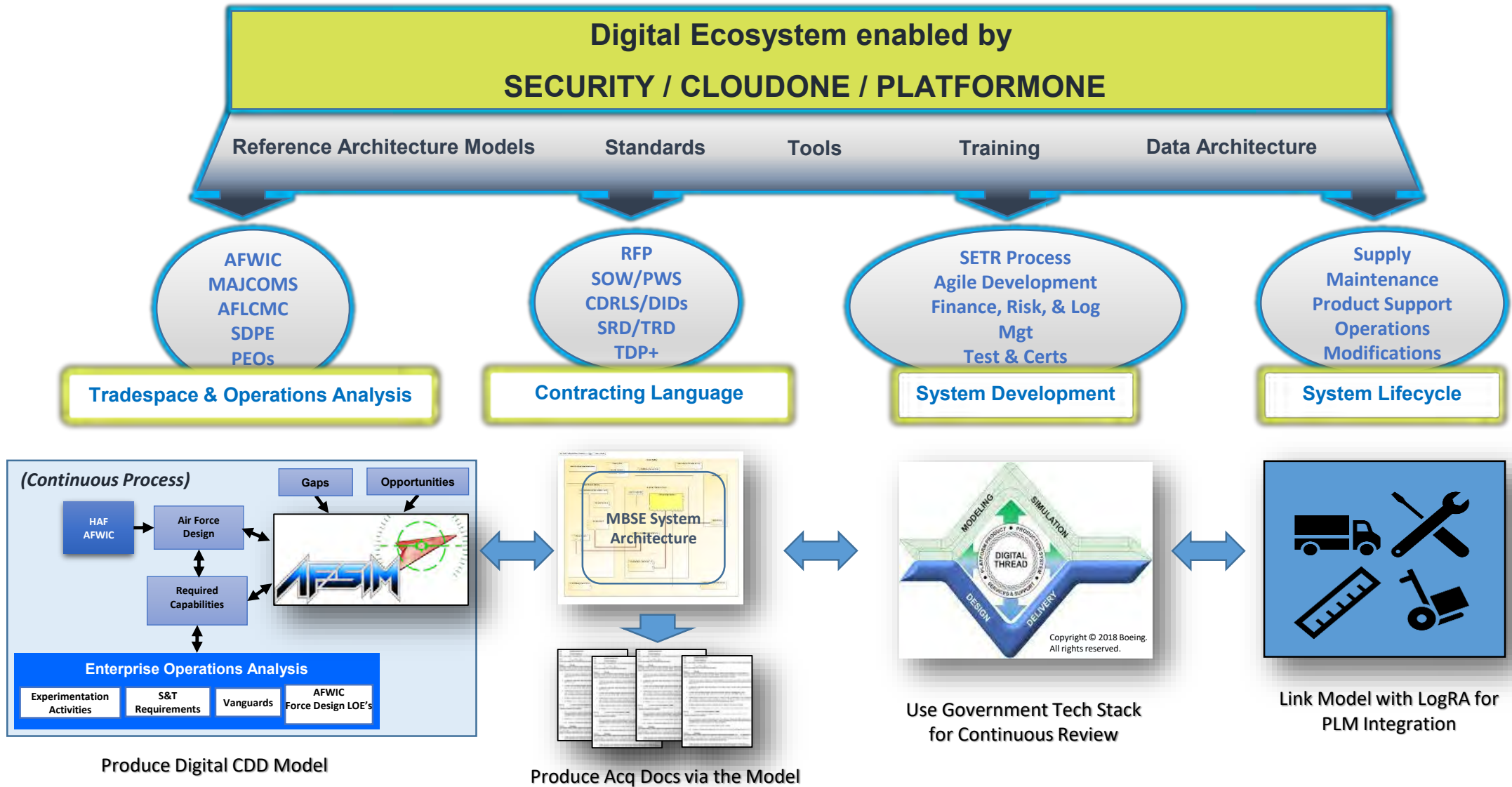


Model Based– Digital Scouts and Native



Encompass AF enterprise...from requirements generation through Operations and Sustainment


Integrated Digital Galaxy and Processes



Galaxy – Digital Native, Digital Scout, & Digital Dinosaurs

-We need to explain that modeling isn't that bad to everyone-



A person is shown from the chest up, wearing a VR headset and large headphones. The image has a warm, reddish-orange color cast. Overlaid on the image are several geometric shapes: a large, semi-transparent triangle in the upper right, a horizontal band across the middle, and a series of parallel white diagonal lines forming a triangular shape in the lower center. The text is positioned in the upper right area, partially overlapping the VR headset.

Life, The Universe and Everything *BOK* - “3”

Workforce and Culture: Career and Leadership

Create a single profile for Command-wide workforce “career progression/leadership development”
Tracking workforce from **recruitment to retirement**.



A DIGITAL TWIN FOR ALL OF OUR DIGITAL AIRMEN

- “Digital 971” Employee Record
- Career Progression and Leadership Development
- **Competency Management**
- Repository of Knowledge Management

Proficiency Management 2210/1550/801 & Military 1X/2X/6X

❑ Blending Career Fields- S&E and Communication/Electronics

- Secure Infrastructure Specialist – HS/Certificate (Cert)
- Secure Cloud Professional – HS/Cert
- Security Analytics Professional – BS/Cert
- Network Vulnerability Assessment – HS/Cert
- Network Security Professional- BS/Cert
- Software Programmer- HS/Cert
- Software Designer – CS/Cert
- Software Engineer-BS/MS/Cert
- Cyber Engineering – BS/MS/Cert



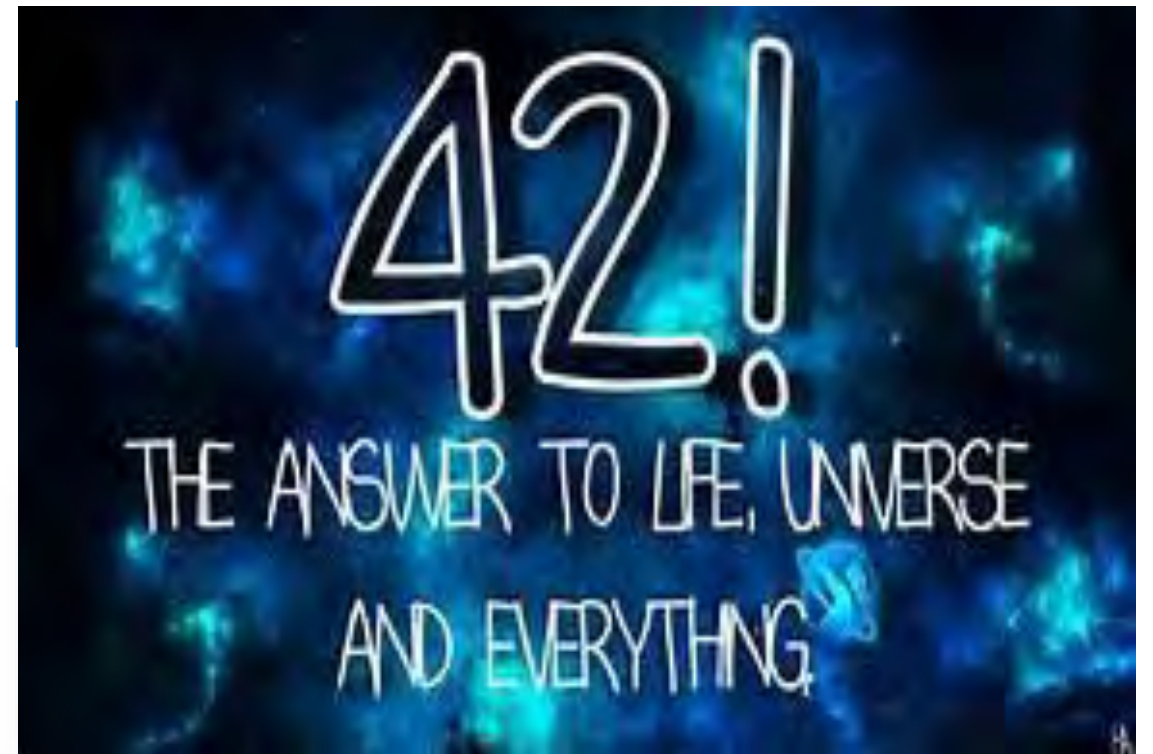


So Long, and
Thanks for All
the Fish

BOK - "3.14..."

The DE Galaxy is Changing – Why Now?

(Technology Convergence)



A grayscale photograph of a person wearing a VR headset and large headphones, looking upwards. The image is semi-transparent, serving as a background for the text.

Questions?

-Thanks-

Digital Campaign Points of Contact

MGen William Cooley, AFMC

william.cooley@us.af.mil

Chris Garrett, AFLCMC/EN-EZ

christopher.garrett.17@us.af.mil

Jeffrey Mayer, SAF/AQR

jeffrey.mayer@us.af.mil

John Morris, USSF, SMC/PCE

john.morris.1@us.af.mil

Mark Kassan, AFMC/ENS

mark.kassan.2@us.af.mil

LOE 0: Rich Kutter, AFLCMC/EN-EZ

richard.kutter@us.af.mil

LOE 1: Tom Lockhart, AFNWC/EN-EZ

thomas.lockhart@us.af.mil

LOE 2: Mitch Miller, AFLCMC/EZ

mitchel.miller@us.af.mil

LOE 3: Lansen Conley, AFLCMC/LG-LZ

lansen.conley.1@us.af.mil

LOE 4: Tom Doyon, AFMCLO/CL

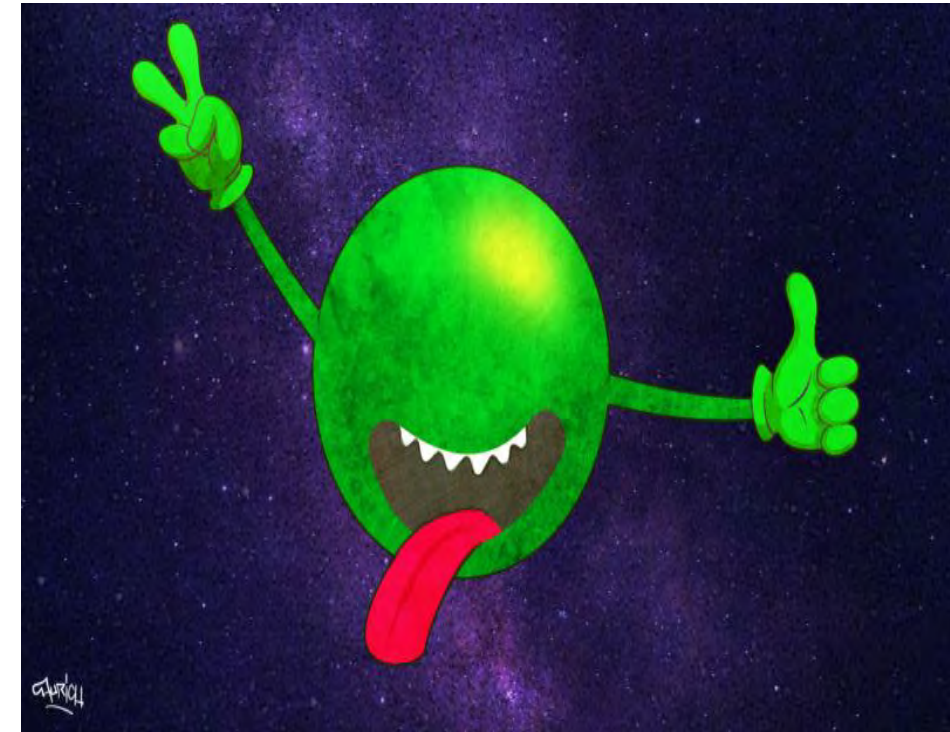
thomas.doyon.1@us.af.mil

LOE 5: Jackie Janning-Lask, AFRL/RV

jacqueline.janning-lask@us.af.mil

Food For Thought: Data & Data Rights

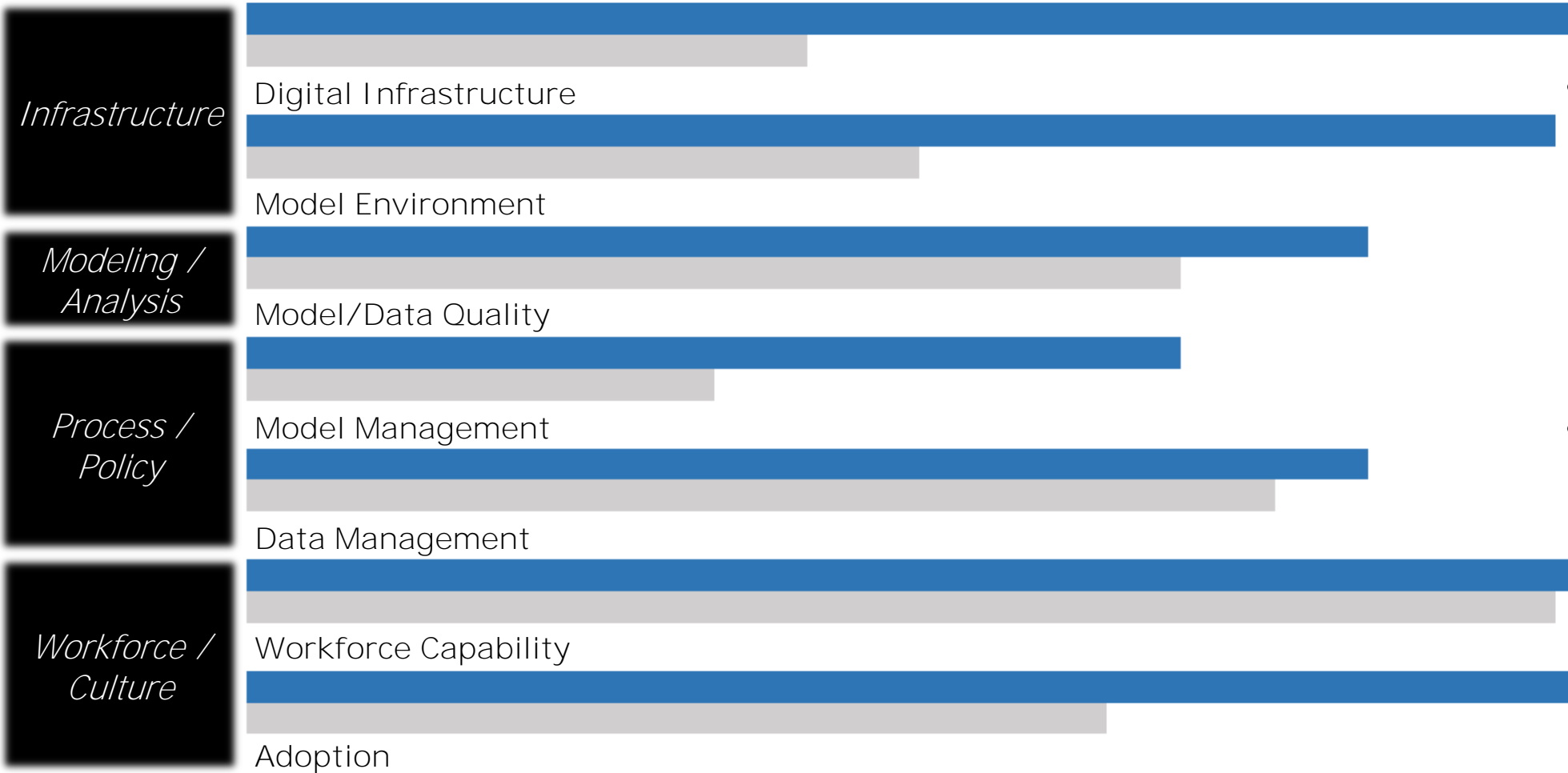
- Evaluated as part of Policy and Guidance
- One of Five Focus Areas
 - Most complex area of the five
 - Imperative to balance contractor rights with government rights and needs
- Key Issues:
 - Determine optimal extent of data sharing in a digital ecosystem
 - Determine needed license rights
 - 10 USC § 2320(f): Preference for specially negotiated licenses
 - DFARS 215.470(b); DoDI 5000.85; DoD 5010.12-M: DD Form 1423s
- Recognition that current Data Rights regime had inception in hardware-centric world and we now live in a software-centric world
- Way Forward
 - Continue to assess necessary license rights to implement the **USAF's digital transformation**
 - **USAF can't do this alone; we need open and transparent dialogue with industry**



Notional AF Digital Transformation Galaxy Metrics

Digital Transformation: Target vs Baseline

■ Target ■ Baseline



- *Draft* Threads & Subthreads based upon an AF adaptation of the INCOSE Capabilities Matrix

- To be applied periodically to engineering labs,

