

# NIEM MILOPS

## STAKEHOLDER ENGAGEMENT



Wednesday, 08 June 2022

# OPENING REMARKS / INTRODUCTIONS

Katherine Escobar

Time	Topic	Presenter
1000-1010	Opening Remarks	Mrs. Katherine Escobar
1010-1020	NMO Status	Mrs. Katherine Escobar
1020-1030	MOMS Release	Mr. Chuck Chipman
1030-1050	DCSA SF86 IEPD	Ms. Maryann Wronko
1050-1110	JSJ2 Cogent Way	
1110-1125	Open Discussion	All
1125-1130	Closing Remarks	Mrs. Katherine Escobar

# NMO STATUS

Katherine Escobar

- Continue OASIS Transition
  - NIEMOpen.org Web Presence
  - OASIS - Jira & Confluence Tools
  - Updating NIEM Documentation Congruent with OASIS Open Project
  - Cataloguing NIEM Capital/Equities for Transfer
  - Soliciting NIEMOpen Sponsors
- ✓ DAMA Portland Chapter (5/19/22)
- ✓ “Ask-an-Expert” May roundtable Q&A
- ✓ May instructor led NIEM Technical Training sold out, next instructor led training planned for 14-16 June
- ✓ Preparing DVIDS videos for July/Aug self-paced, expert monitored “new” training venue pilot
- ✓ Restricted Registry/Repository (R2) IOC <https://wmaafip.csd.disa.mil/Account/Login?ReturnUrl=%2f>
- ✓ MEP Builder Tool IOC <https://sourceforge.net/projects/niem-mep-builder/>
- Positioning NIEM for inclusion in DAMA DMBOK
- National Science Foundation Open Knowledge Network Sprint (Mar - Jul 22)
- Next ESC – 13 June
- ESC Face-to-Face – October (TBD)
- NTAC/NBAC Annual Meetings 15-19 August @ GTRI Rosslyn & broadcast on TEAMS

# MILITARY OPERATIONS MISSION SPECIFIC (MOMS)

## Chuck Chipman

- Separate release for distribution restricted content, typically published 3 months after public release; currently includes:
  - Distribution Statement C – Federal gov't and contractors
  - Distribution Statement D – DoD and contractors
  - Potential option for Controlled Unclassified Information (CUI) content
- MOMS content/sources include: ASW COI, DCSA, JP 3-52 (Airspace Control), Link-16, USMTF, VMF, and more; totaling 1,358 properties, 1,458 types, and 17,696 codes
- MOMS Distribution Statement D release includes the Distribution Statement C content since D is more restrictive
- MOMS content is and can be separated by namespaces; for example, DCSA and USMTF have sub-namespaces in the MOMS release
- MOMS content submissions are provided to the MilOps Domain steward in the form of a change request that gets reviewed by the NIEM lead developer and approved by the MilOps CCB
- MOMS releases include restricted content versions of the Conformance Testing Assistant (ConTesA) and the Schema Subset Generation Tool (SSGT), which are available upon request due to file size
- Effective May 2022 with MOMS 5.1 (Apr 22), MOMS releases are available on the NIEM Restricted Repository hosted on the Warfighting Mission Area – Architecture Federation and Integration Portal (WMA-AFIP) at <https://wmaafip.csd.disa.mil/NIEM>

## Status

### DCSA PEO “Person” Model Effort:

- Developed “Person” Model that captures all SF86 concepts.
- Conducted mapping analysis of “Person” Model against NIEM (*core and domains*)
  - Started with portion of “Demographics” (*182 concepts*):
    - ✓ 39 = Direct one-to-one match between SF86 concept and NIEM
    - ✓ 12 = In-direct match between SF86 concept and NIEM
    - ✓ 89 = No match between SF86 concept and NIEM
    - ✓ 42 = Feedback required to determine if direct one-to-one match or in-direct match.

### DCSA PEO & CDO Partnership:

- Planned and participated in NIEM Training.
- Participated in review of DD254 IEPD (*conducted by NIEM Team*) for understanding of how the package is developed/assembled.
- Coordinated introductions and established bi-weekly sessions with NIEM Managing Director’s Team to:
  - Review work conducted (*i.e., data mappings, IEPD development, etc.*)
  - Request guidance:
    - ✓ NIEM processes, best practices and tools
    - ✓ MILOPS Domain.

## Next Steps

- 1. Roadmap/Milestones:** PEO and CDO will develop (*in partnership*) for the effort.
- 2. Mapping Analysis:** PEO and CDO will (*in partnership*) continue the mapping analysis between the SF86 (*“Person” Model*) and NIEM (*core and domains*).
  - A. Reuse DD254 mappings (*where applicable*).
  - B. Develop specific extensions where required.
- 3. IEPD Development:** Using the DD254 IEPD as a resource, develop SF86 specific IEPD.
- 4. Bi-Weekly Touchpoint with DoD NIEM Team:** Present work accomplished, questions, and issues (*as needed*) to DoD NIEM Team for review, discussion, and guidance.

# OPEN DISCUSSION / CLOSING REMARKS

Next Meeting Wednesday July 13, 2022 @ 1000





# Closing Remarks

## Co-MilOps Domain Steward Representatives

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# Data & Mission Modernization

## Introducing Target Mission Architecture & Cogent Way Project Dual-use Title 10/50 Data Modernization

Joint Staff J2F/J28

08 June 2022



# Overview



- **Description**
- **Emphasis**
- **Scoping & Implementation**
- **Discussion**



# Description



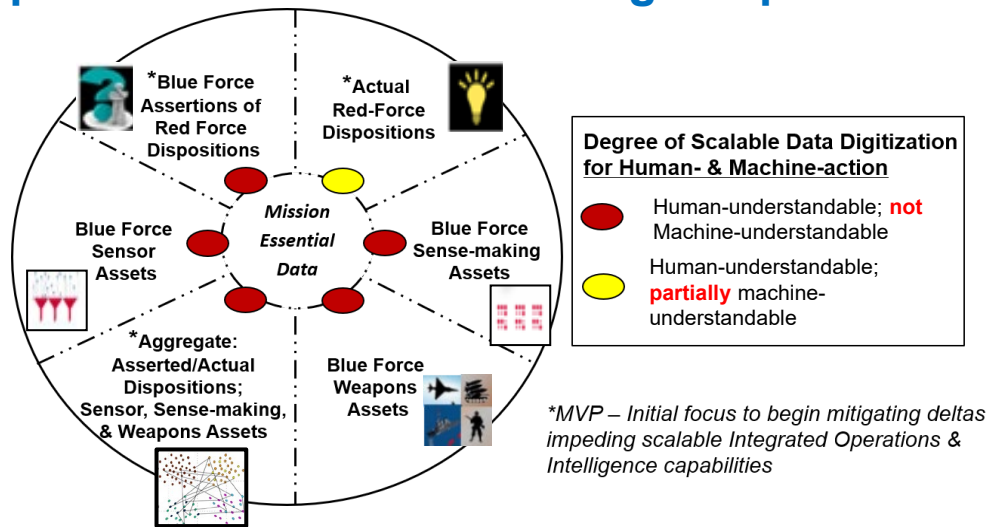
- Target Mission Architecture – Cogent Way conveys an envisioned end-state for cross-cutting DOD and IC mission environment; JADC2 is “an” ecosystem among multiple in this context
- Design affords dual-use Title 10/50 concentration-of-force and economy-of-scale impact
- Imperative for machines to understand and act on aggregate information derived from disparate data currently stored in siloed systems and domains . . . on par with how people understand and act
- Combined instantiation of Dictionaries, Ontologies, and Linked Data and Semantic Web standards and technologies – essential for scalable data fabric and Artificial Intelligence (AI) enabling integrated operations and intelligence (IO&I) at scale and speed
- Tailorable in scope for interagency and intra-agency capabilities
- Diverse government, military, industry, and academia Team transforming DOD and IC data, systems, and tradecraft in support of Joint Fires-, Information-, and Decision Advantage expectations



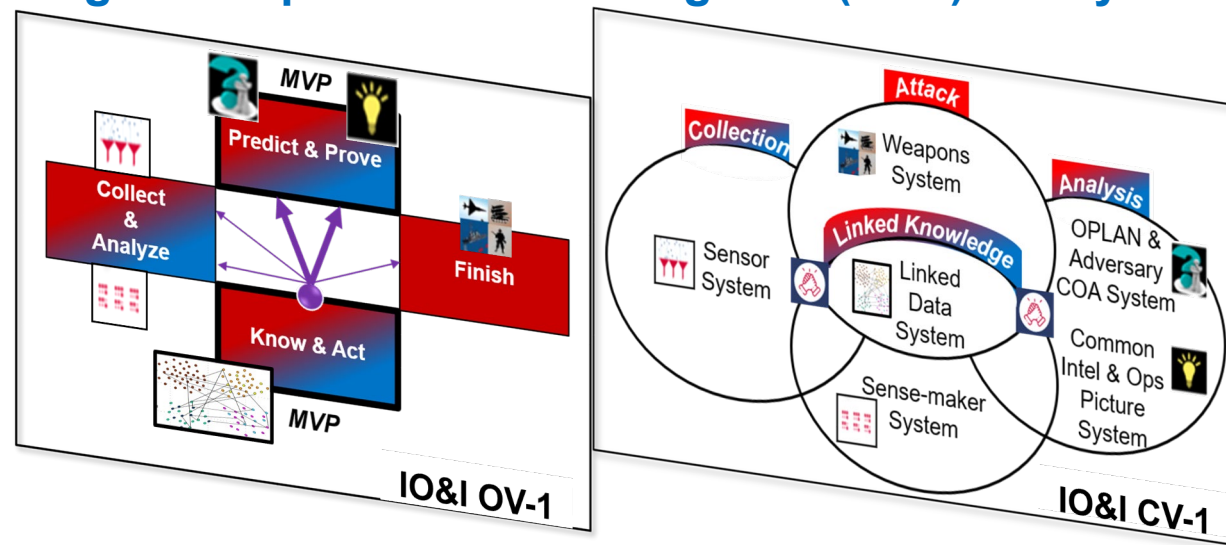
# Target Mission Architecture – Cogent Way



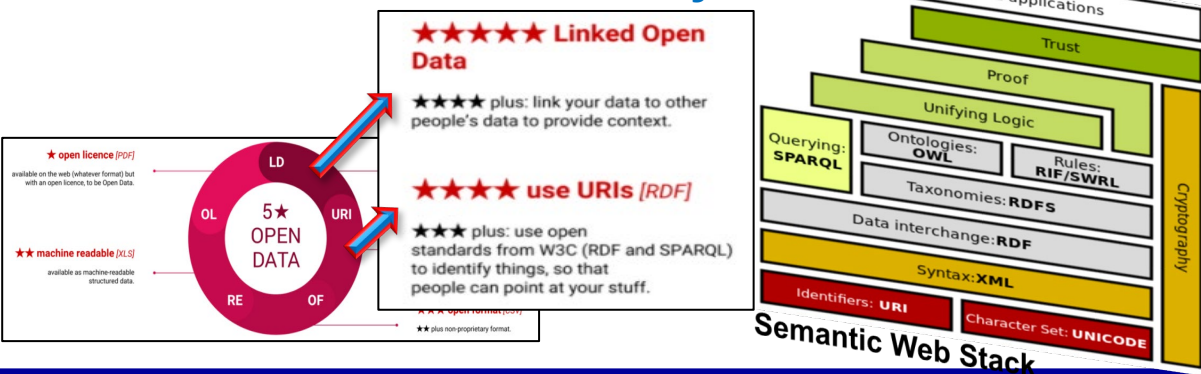
## • Emphasis on Data-to-Knowledge Capabilities Gaps



## • Integrated Operations & Intelligence (IO&I) Ecosystem



## • World Wide Web Consortium Approach – Adapting 4 & 5-Star Linked Data Quality



- **Oversight:** Joint Staff Futures (JS J2F)
- **Minimum Viable Product (MVP):** System-of-systems NIPR & JWICS prototype; IO&I Target Mission Architecture portfolio
- **Initial Data Digitization:** Blue Force assertions (OPLANs & Adversary COAs); actual Red Force dispositions (CIP/COP)
- **Informs Modernization:** DOD Data Strategy; Herald; CIP/COP; JADC2; AI Data Acceleration; DTRA, CCMDs, . . .



# Context: Linked Data/Semantic Web



- Commercial sector investments since 2009 are realizing value of a machine-actionable world-wide semantic web
- Driven largely by World Wide Web Consortium (W3C) standards and technologies
- Technology companies and government institutions amass actionable knowledge from data silos and fuel AI with it
- Motivation:

➤ Data efficiency – minimizes data duplication

- “According to IDC [International Data Corporation] over 60 zettabytes of data were produced last year [2020], and this is forecast to increase at a CAGR [Compound Annual Growth Rate] of 23 percent until 2025. **Worse, the ratio of unique to replicated data is 1:10**, which implies that most organizations’ data management methods are **based on copying data.**”  
[Improving Machine Learning: How Knowledge Graphs Bring Deeper Meaning to Data | 7wData](#)

➤ AI and Machine Learning Scale: Siri, Alexa, Hey Google, Uber Eats, Linked-In, Facebook, Netflix, You-Tube, Biomedical Industry, and more employ this approach

- Google: Google Knowledge Graph powers “Hey Google” and “Knowledge Panel” returns on web queries that derive knowledge from Internet silos – conveys **500 billion facts about 5 billion entities** [Google’s Knowledge Graph and Knowledge Panels \(blog.google\)](#)
- Uber Eats: Equips customers with dynamic decision-enabling for cuisines, dishes and restaurants from **320,000 restaurants in 500 cities across 36 countries** [Food Discovery with Uber Eats: Using Graph Learning to Power Recommendations - Uber Engineering Blog](#)

## Google Knowledge Panel Output from their Knowledge Graph

The screenshot shows a Google search for "Lake Anna". The Knowledge Panel on the right provides detailed information about the reservoir, including its location, area, length, and elevation. It also lists nearby activities and a map. A blue arrow points to the Knowledge Panel, and another blue arrow points to the bottom right corner of the screenshot.

**Google Knowledge Panel Output from their Knowledge Graph**

Google Knowledge Panel for Lake Anna, showing details such as location, area, length, and elevation. The panel includes a map, a description, and a list of nearby activities.

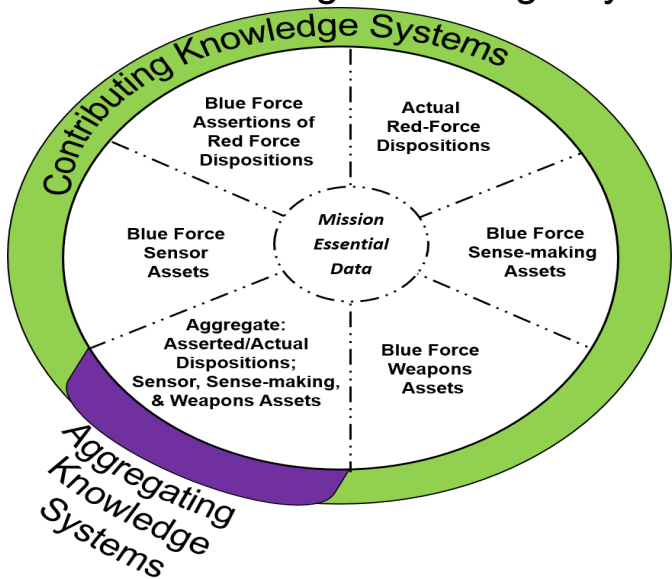
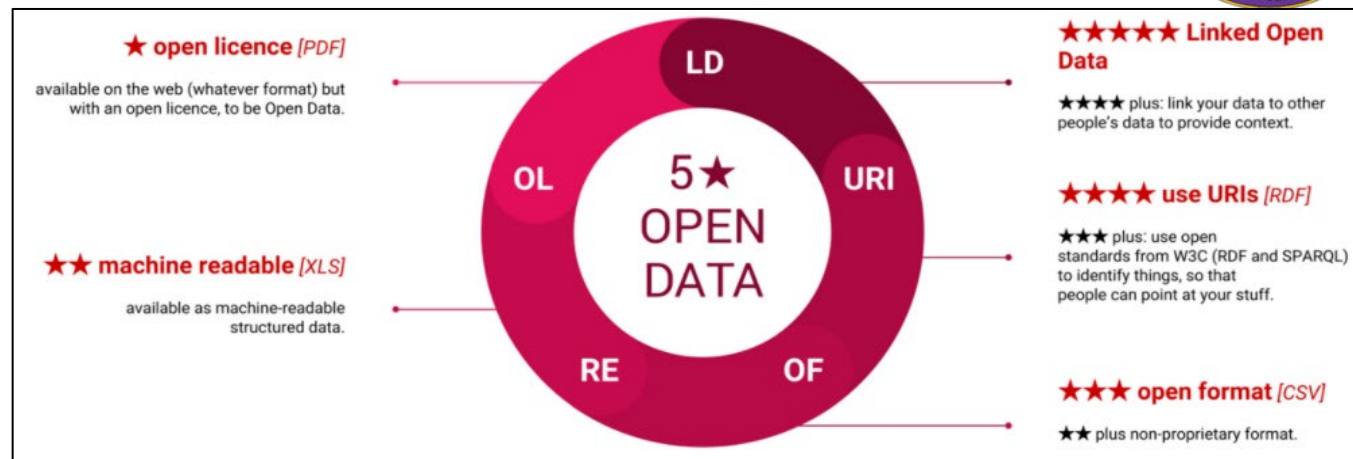
**Knowledge Panel Data:**

- Location:** Louisa / Spotsylvania / Orange counties, Virginia, US
- Area:** 20.31 mi<sup>2</sup>
- Length:** 16.78 mi
- Surface elevation:** 237
- Shoreline length:** 200 miles
- Water temperature:** [Dropdown]
- Town:** [Dropdown]
- Entrance fee:** [Dropdown]
- Building:** [Dropdown]

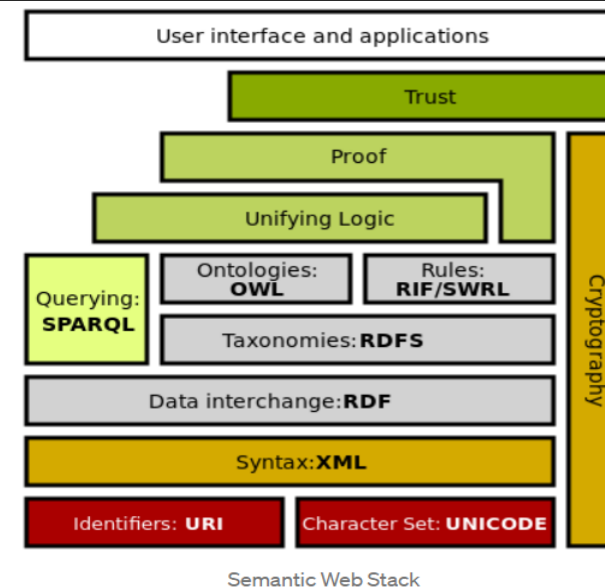


# Getting to Semantic Web State

- DOD and IC can capitalize on progress
- Getting to this state:
  - Set sights on 4- and 5-star states
  - Work the Semantic Web Stack for machine-actionable, interconnected data
  - Introduce new “Aggregating Knowledge System” -- interoperable with existing “Contributing Knowledge System” . . .



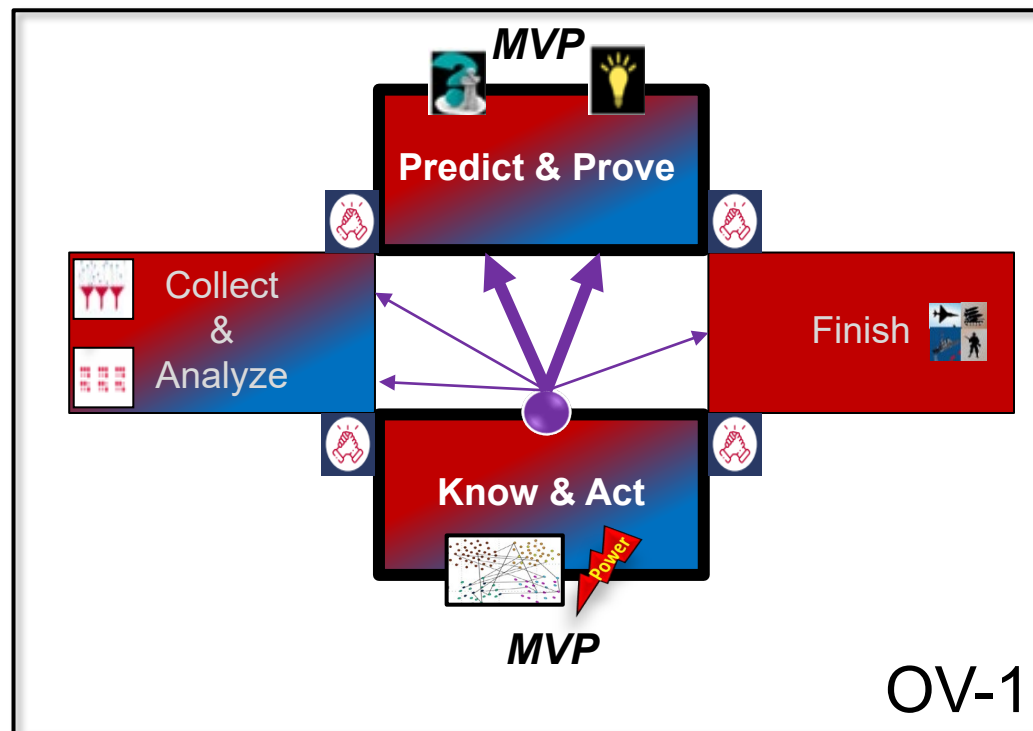
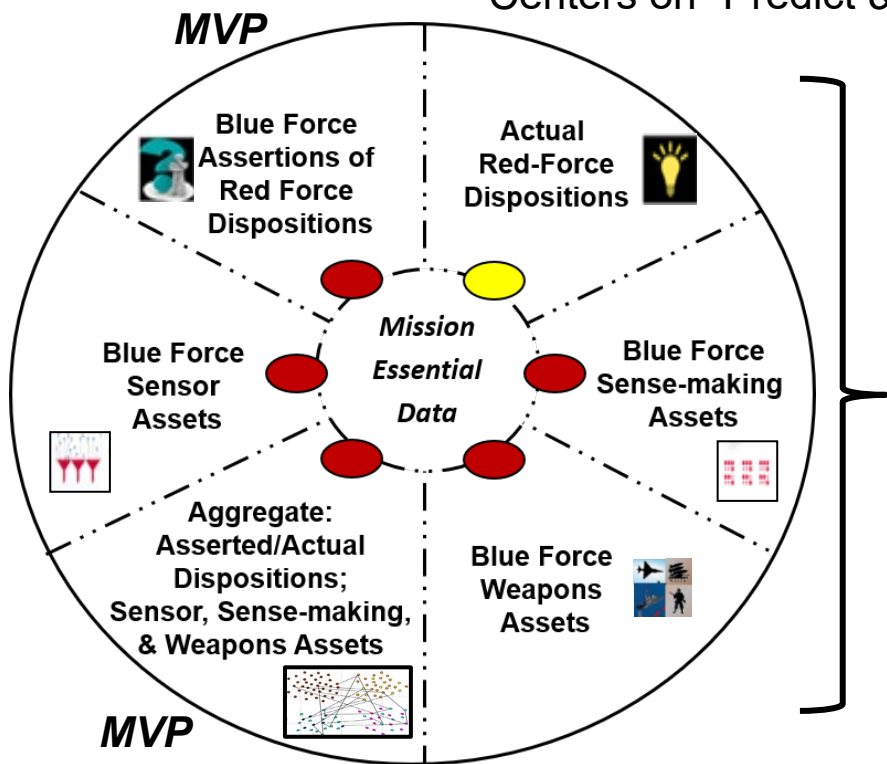
- . . . In conjunction with National Information Exchange Model (NIEM) compliance, instantiate Linked Data & Semantic Web standards
- Develop new Aggregating Knowledge System
  - Linked Data Environment (LDE)
    - LDE is system-of-systems construct
    - No monopoly provider or single hub & spoke constraints
- Adjust existing Contributing Knowledge System





# Initial Focus

- MVP takes initial steps to mitigate data gaps impeding machine-action
- Centers on “Predict & Prove” and “Know & Act” OV-1 components of TMA



- Tacit Knowledge Prediction (OPLAN & Adversary Course of Action)
- Truths: Patterns-of-Life (Object Based Production)
- Linked Data Environment / Semantic Web
- Human-Machine Teaming
- Sense-making Assets--Analytics
- Sensor Assets Collection
- Title 10
- Dual-use Title 10/50
- Shooter Assets Weapons
- Decision Advantage

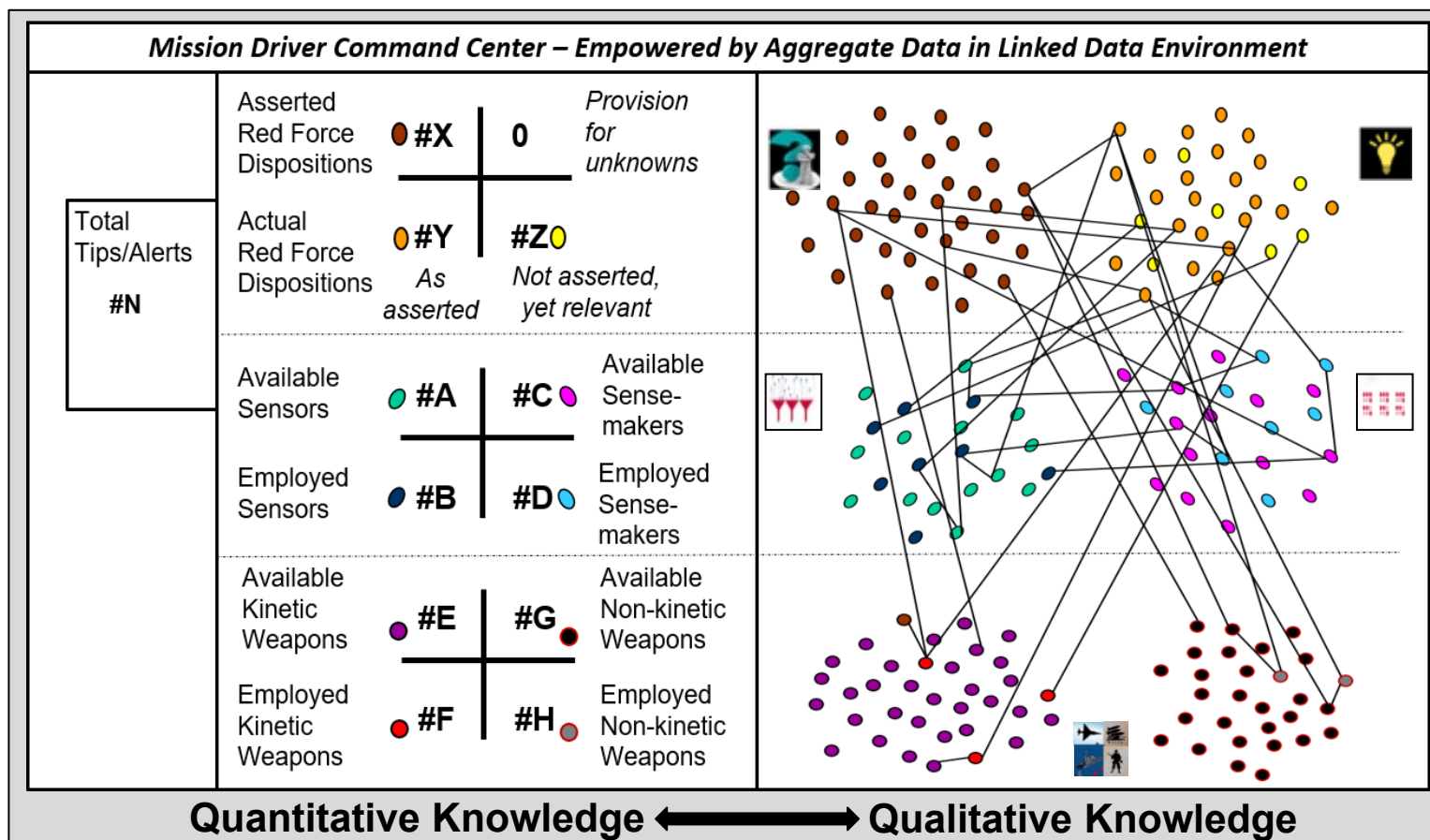
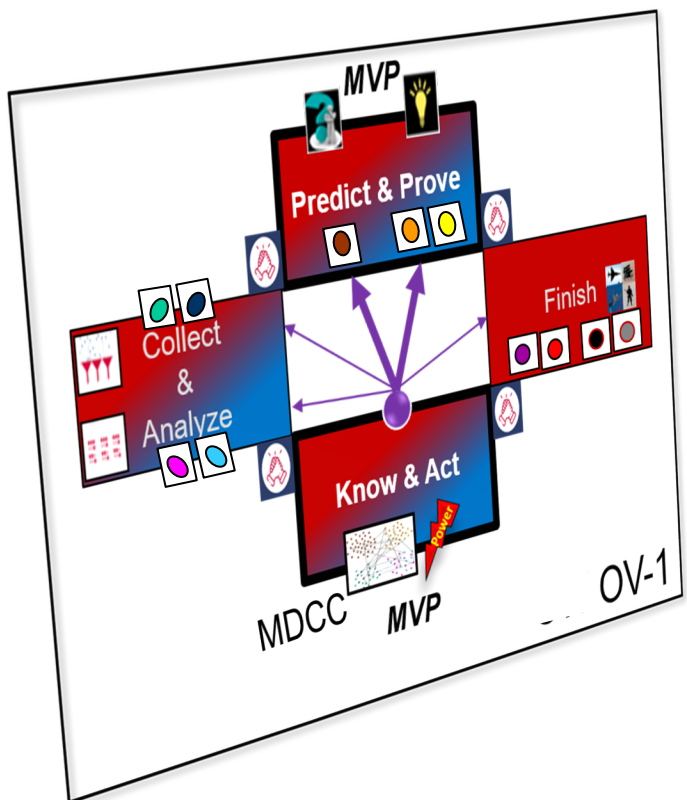




# Bringing it Together: Mission Impact



- Introduces Mission Driver Command Center (MDCC) innovation – powered by LDE
- Leverages aggregate information for human- and machine-action

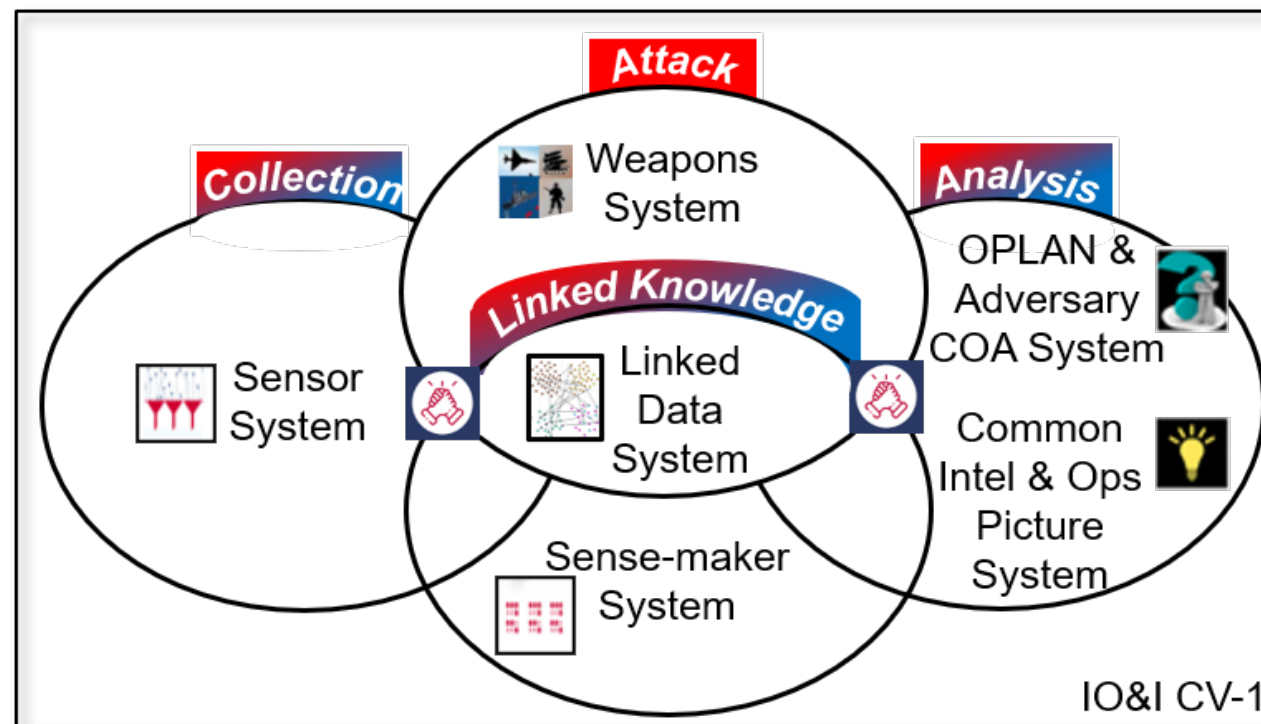
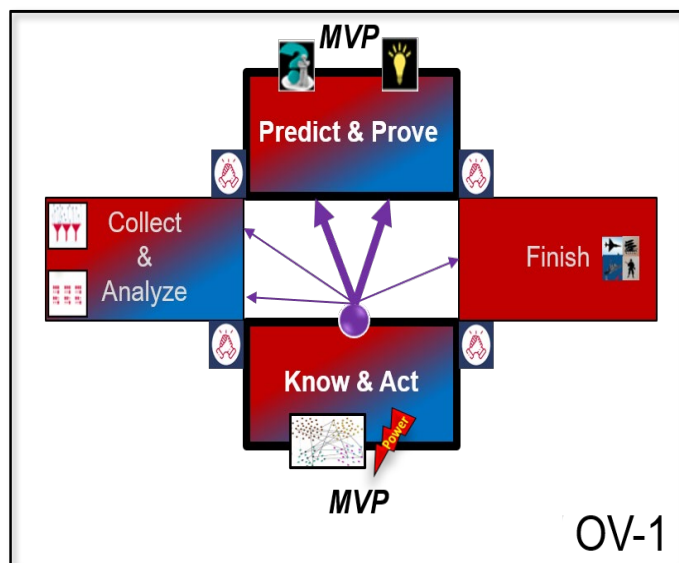


\*MVP focus – Asserted vs. Actual Red Force Dispositions via MDCC hosted in Linked Data Environment Prototype



# System Enabling

- CV-1 TMA component brings into focus material solution investments and priorities
- Initial engagement with JADC2 Partners offer opportunity for cross-cutting machine-actionable ecosystem enabling comprehensive Collection, Analytics, and Weapons orchestration








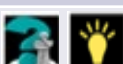



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# Scoping and Implementation



- Lines of Effort (LOEs) aligned to the TMA help to define and scope work
- Progress from tangible products within each LOE supports TMA-derived needs
- LOEs are designed so that respective product deliverables enable seamless workflows for people and machines

Lines of Effort (LOE)	
LOE-1: Knowledge Aggregation	
LOE-2: Decision Enabling	
LOE-3: Analytics Orchestration	
LOE-4: Collection Orchestration	
LOE-5: Weapons Orchestration	
LOE-6: Problem-space Data Enablement	
LOE-7: Model-driven Operations	
LOE-8: Integrated Workflow	
LOE-9: Title 10/50 and Non-Title 10/50 Integration	



*Tacit Knowledge Prediction  
(OPLAN & Adversary  
Course of Action)*



*Truths:  
Patterns-of-Life  
(Object Based Production)*



*Linked Data Environment /  
Semantic Web*



*Human-Machine  
Teaming*



*Sense-making  
Assets--  
Analytics*



*Sensor Assets  
Collection*



*Title 10*



*Dual-use Title 10/50*



*Shooter Assets  
Weapons*



*Decision  
Advantage*



# Discussion

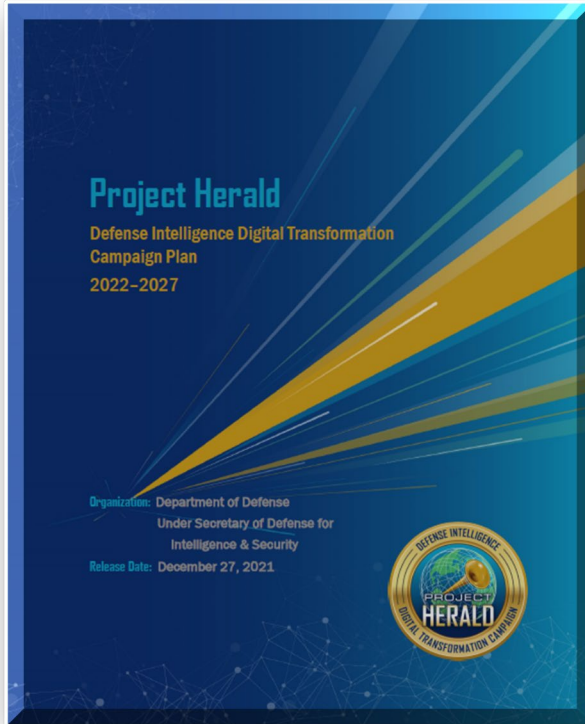


# Additional Reference



# Description

- Supports DOD/IC-Wide Interagency Modernization



USD (I&S): Dec 2021  
 2022-2027 Defense Intelligence Digital Transformation Campaign

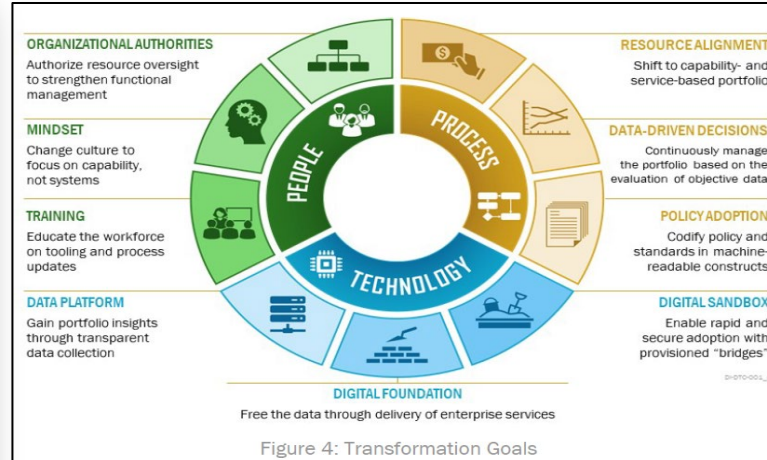
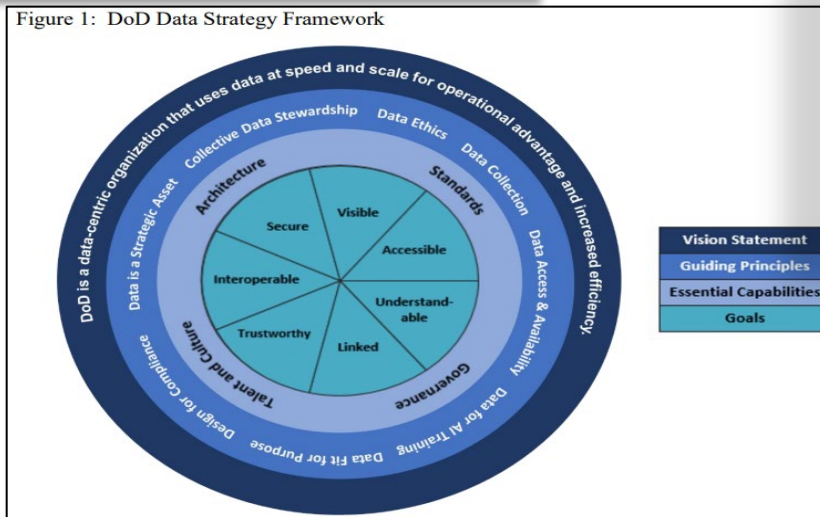


Figure 1: DoD Data Strategy Framework



DEPSECDEF: Oct 2020  
 Unleashing Data to Advance the National Defense Strategy  
[DOD Data Strategy \(defense.gov\)](https://www.defense.gov)

# Emphasis

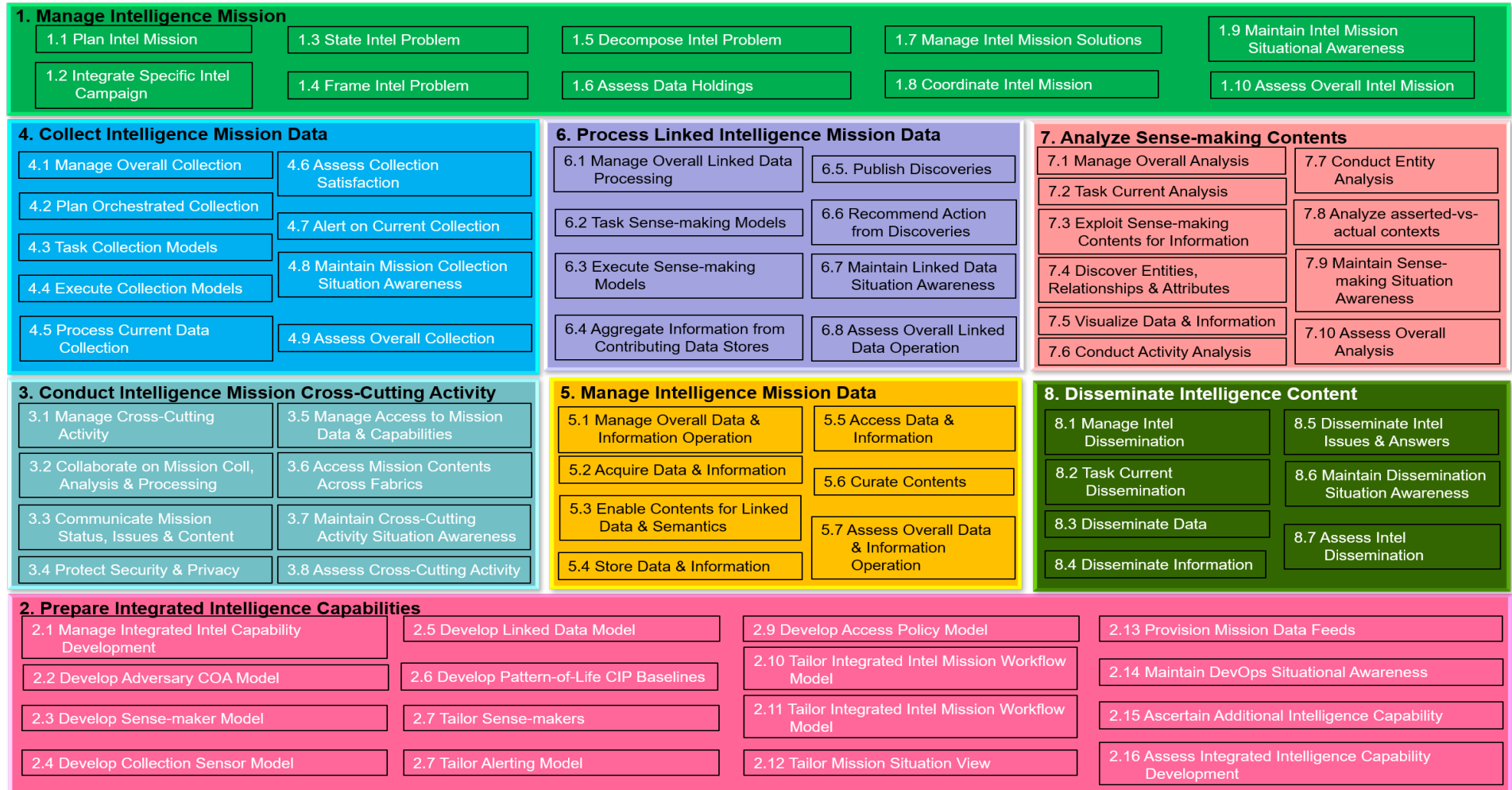


- Aligned with the OV-1 and CV-1, the OV5a shown here introduces 8 Functional Groups & 76 Activities

Mission Management

Operations

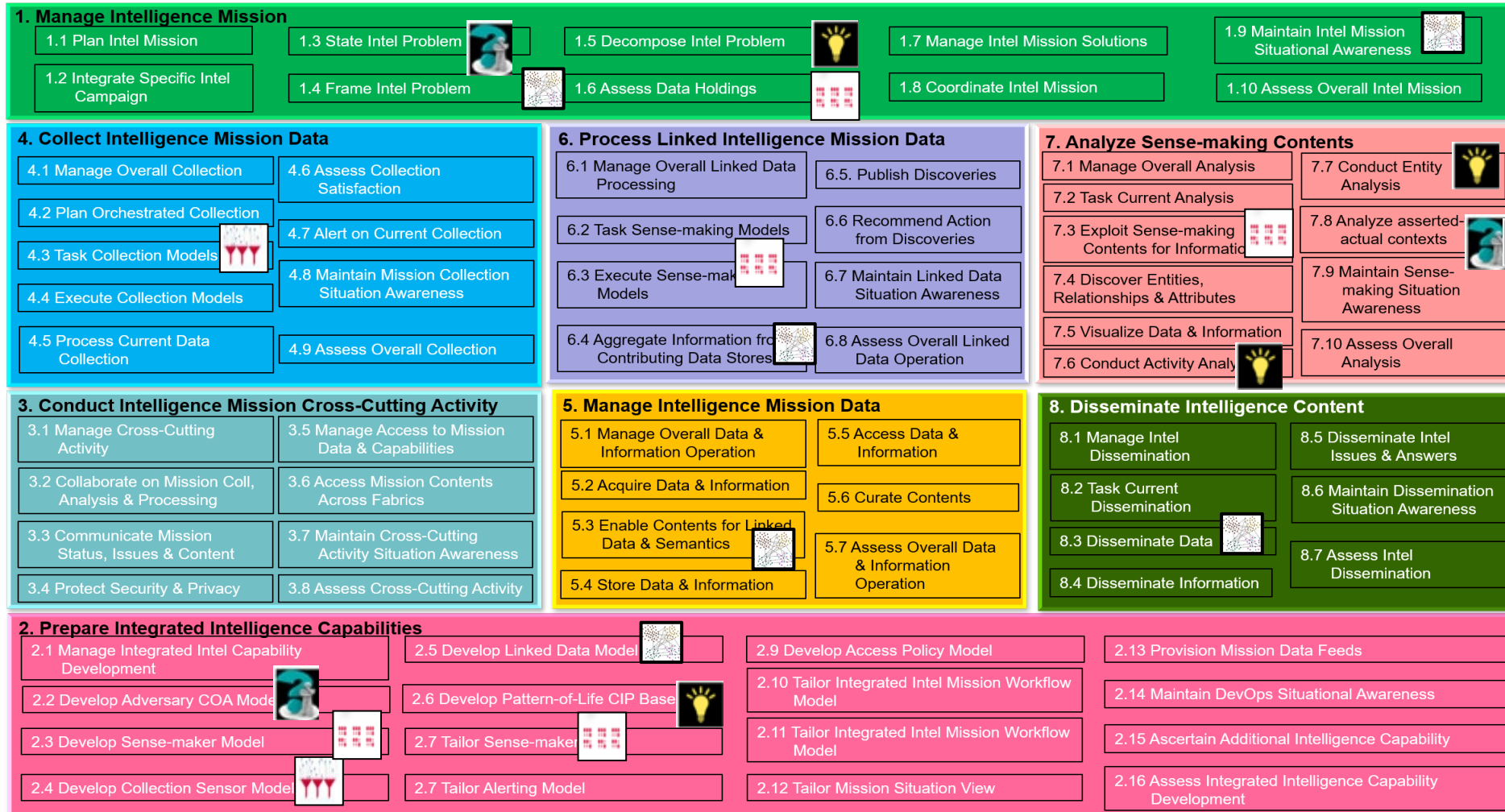
DevSecOps



# Emphasis



- **OV5a guides investments and focus in context of seamless end-to-end capabilities**



- Tacit Knowledge Prediction (OPLAN & Adversary Course of Action)**
- Truths: Patterns-of-Life (Object Based Production)**
- Linked Data Environment / Semantic Web**
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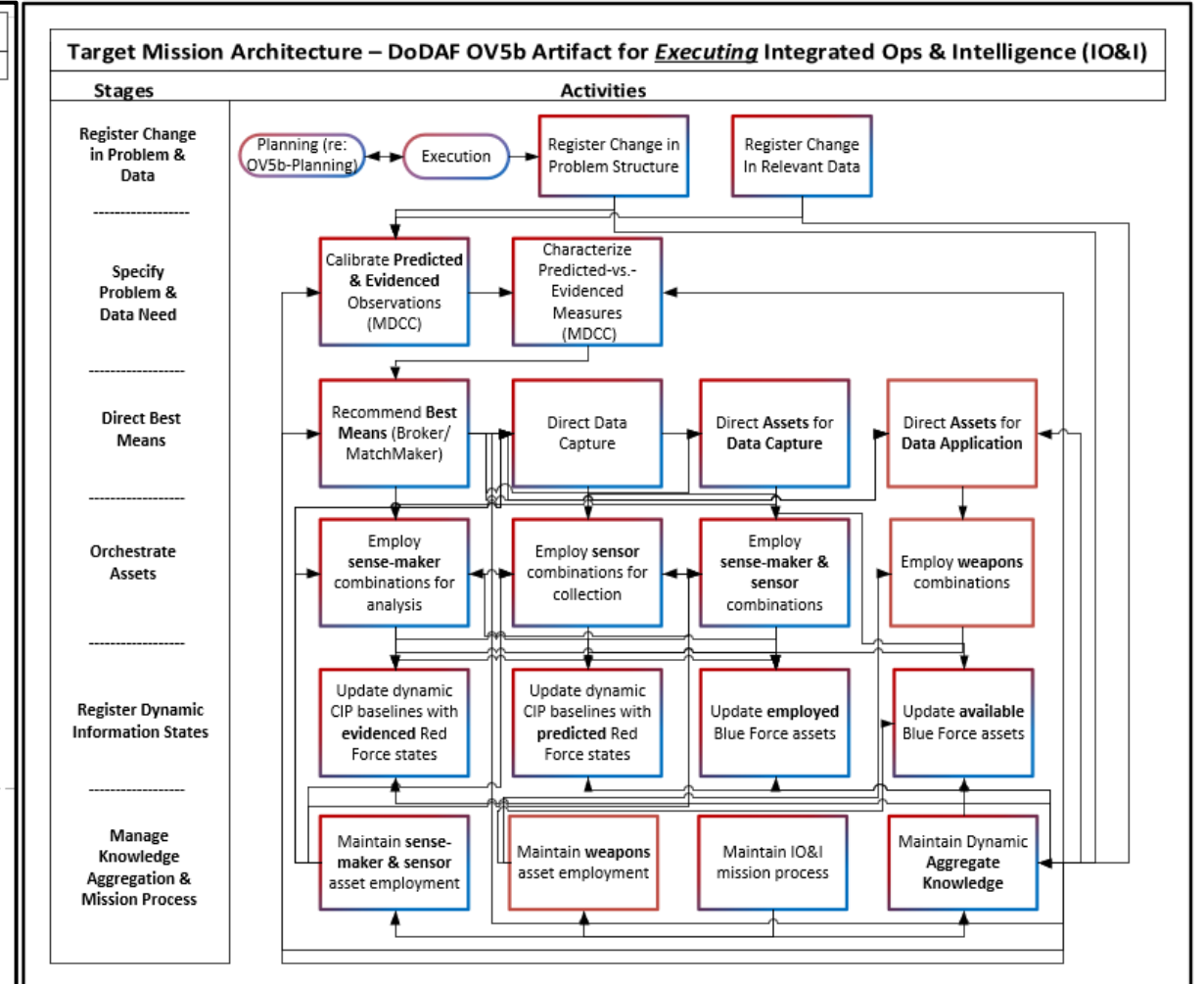
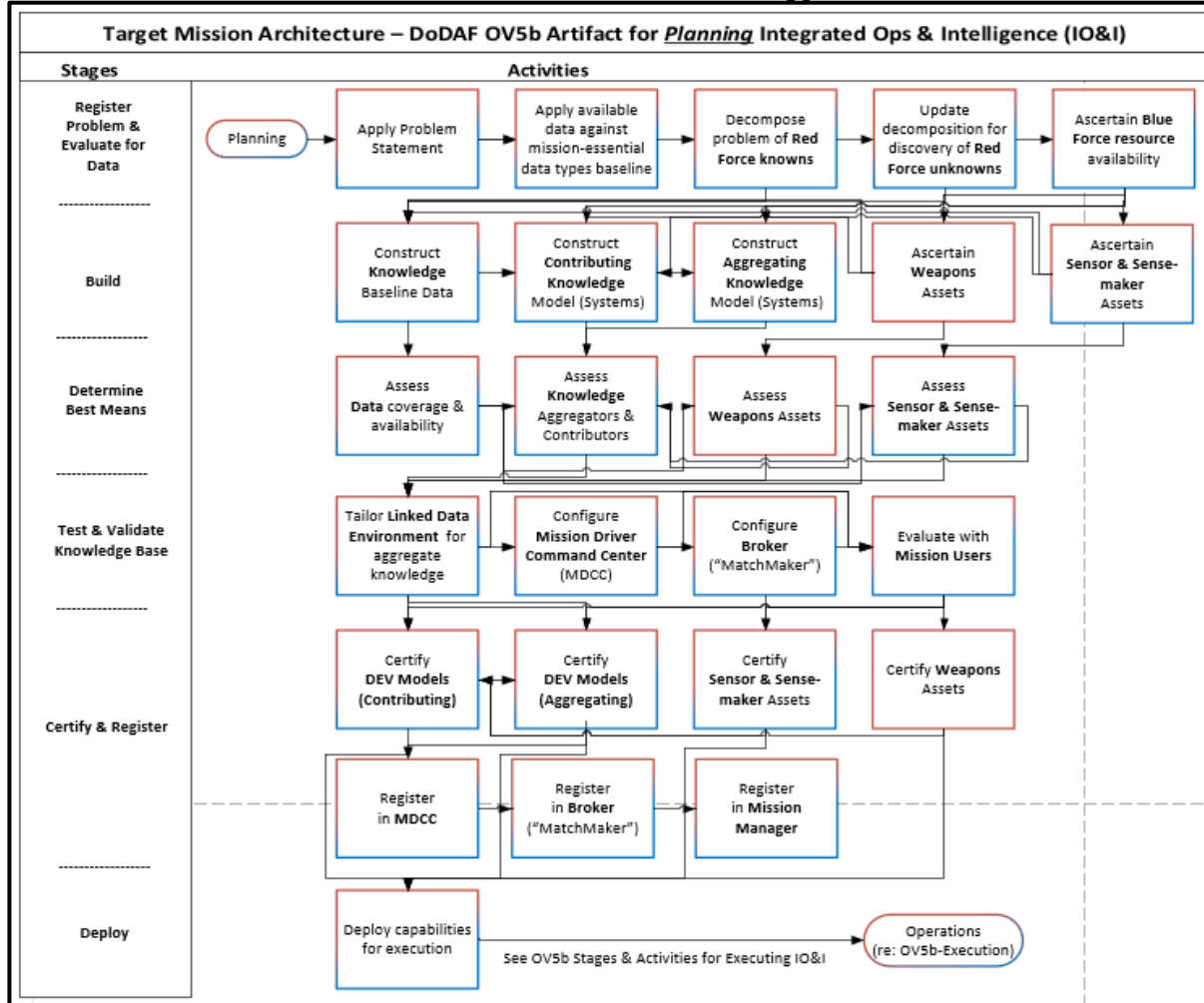




# Emphasis



- **OV5b introduces workflow Stages & Activities – modernizes legacy TCPED & Find/Fix/Track Finish**

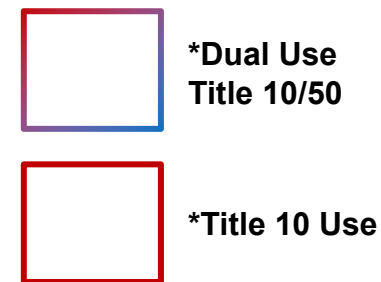
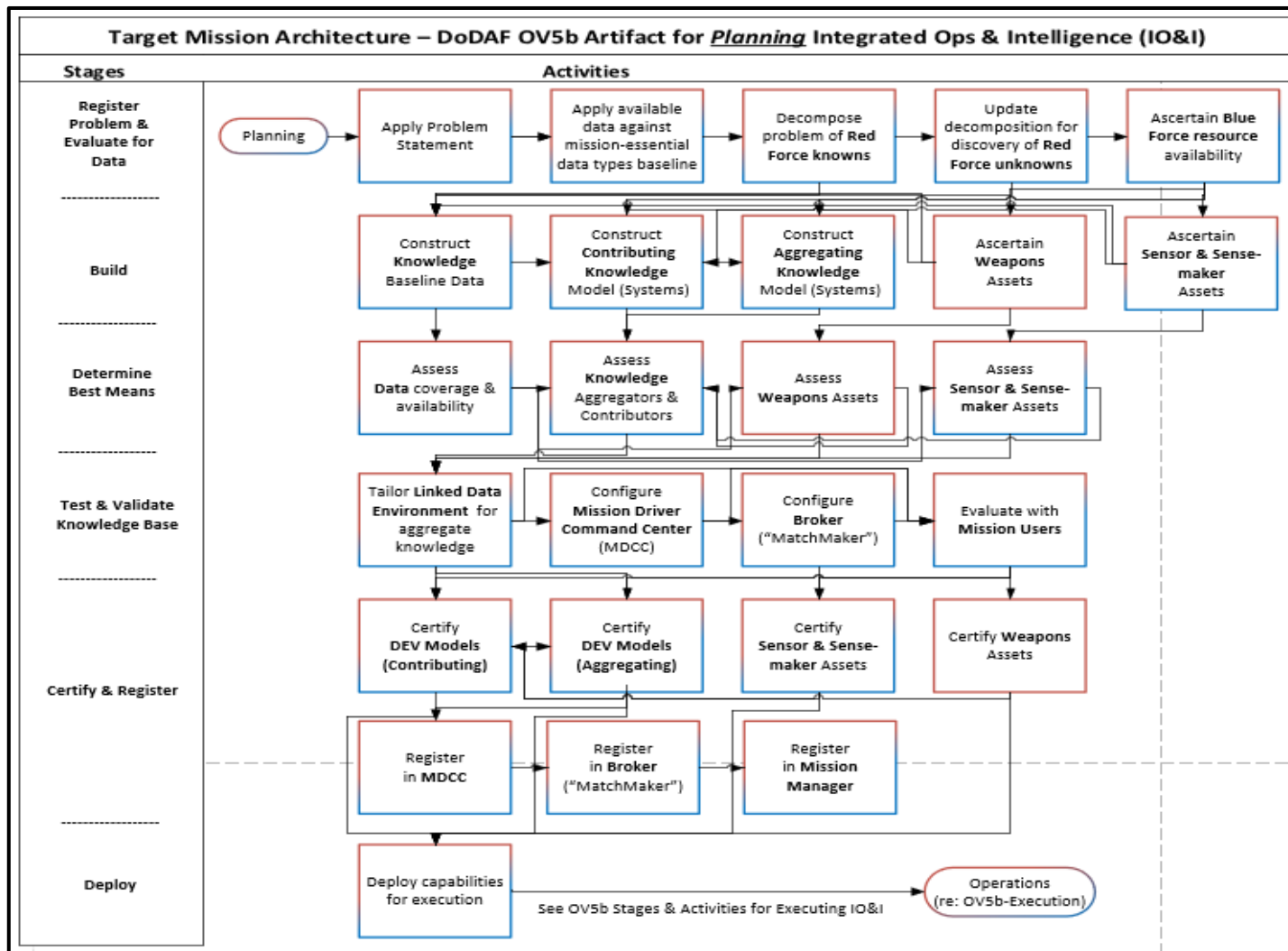


Note: OV5b Execution (Right) updated 10 Feb 2022 – OV5b-Planning updated 16 Feb 2022

# Emphasis



- OV5b for **Planning Stages & Activities for IO&I**
- Expectation for rapid set-up and deployment/re-deployment between DevSecOps Planning & Ops Execution Mission Flow



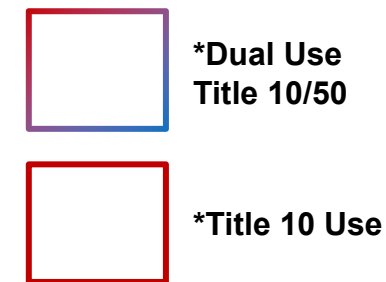
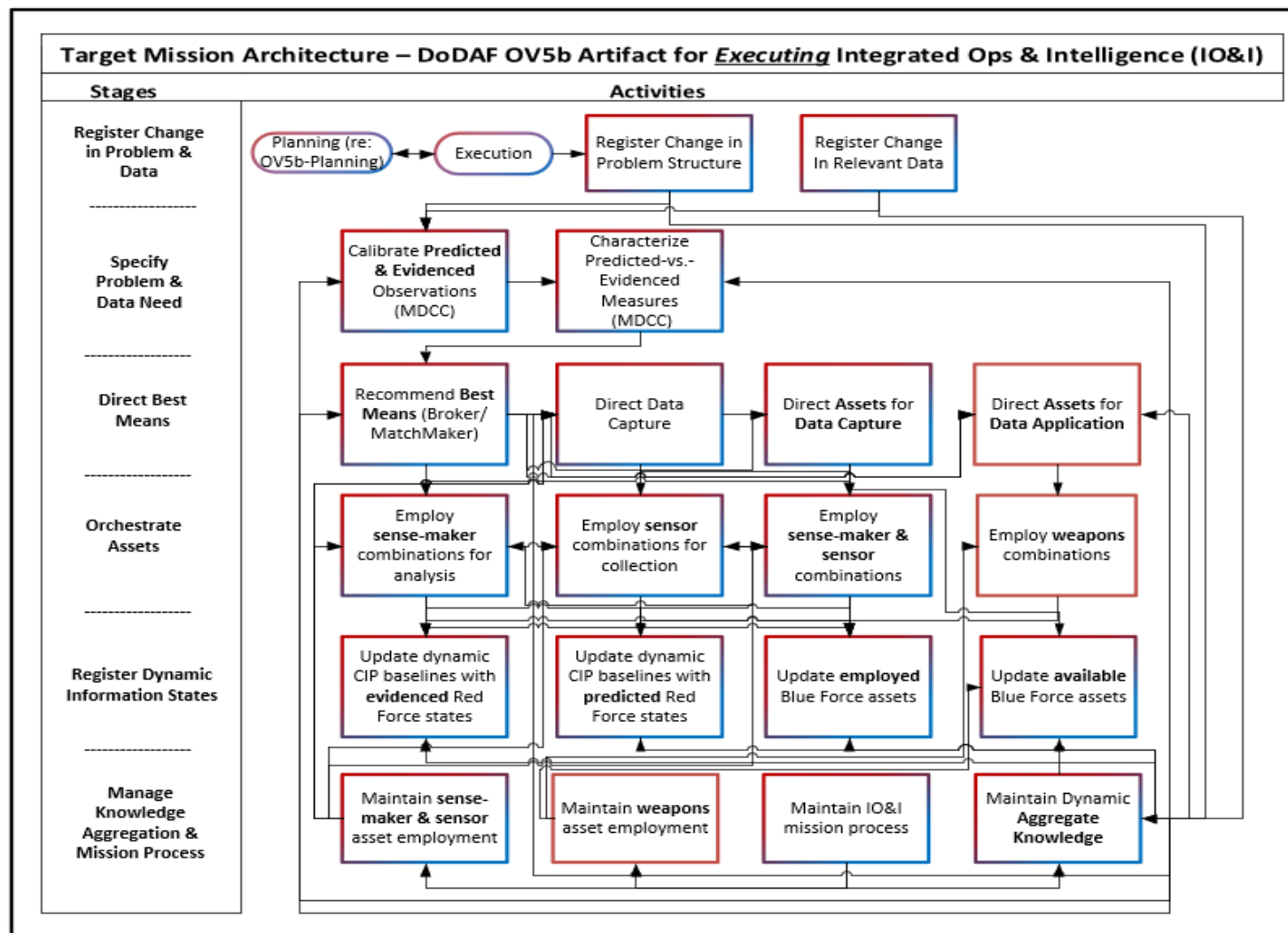
\*Consistent Process & Technology for Economy-of-Scale Concentration-of-Force Title 10/50 capabilities

Note: Draft OV5b-Planning shown here current as of 16 Feb 2022 (historical reference in back-up slides)



# Emphasis

- OV5b for **Execution Stages & Activities for IO&I**
- Expectation for rapid set-up and deployment/re-deployment between DevSecOps Planning & Ops Execution Mission Flow



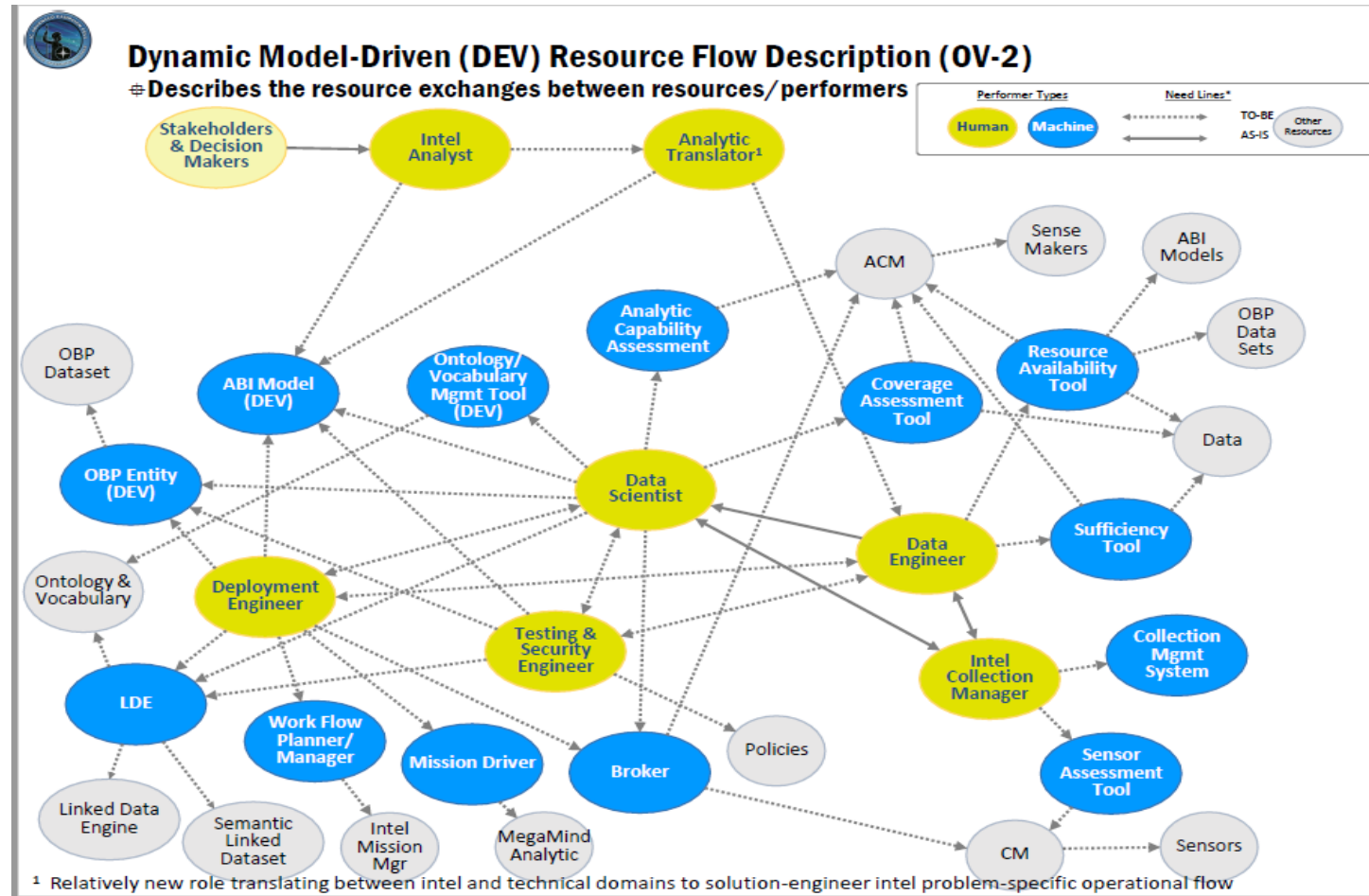
\*Consistent Process & Technology for Economy-of-Scale Concentration-of-Force Title 10/50 capabilities

Note: Draft OV5b-Execution shown here current as of 10 Feb 2022 (historical reference in back-up slides)



# Emphasis

- OV2 places emphasis on workflow roles of human and machine performers



Note: OV2 shown here in process of being updated to align with IO&I portfolio updates – in work as of 25 Jan 2022



# Data Modernization



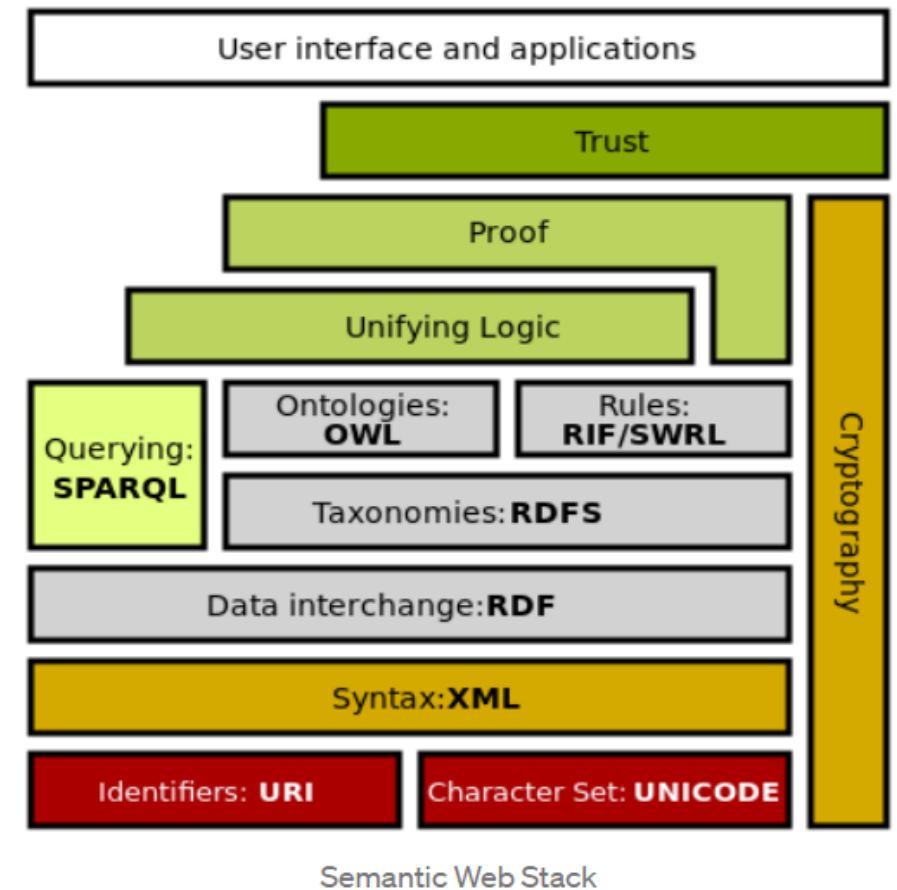
- **Data modernization activities guided by TMA introduces interdependencies for workforce, infrastructure, and enterprise architecture innovation**
  - Linked Data and Semantic Web Practices compliant with W3C standards and technologies
  - Information Technology composition for On-premise and Cloud infrastructures
  - Classes of systems aligned to at least two main categories: Contributing Knowledge systems; and Aggregating Knowledge systems
  - Knowledge Engineering talent with emphasis on Ontologies
  - Data Engineering talent with emphasis on Graph Analytics
  - Policy for sharing models comprising knowledge gained by accessing and deriving meaning from disparate systems in data silos hosted in On-premise and Cloud infrastructures



# Data Modernization

- **Data strategy and implementation introduces compliance with W3C standards for Linked Data and Semantic Web**

- Includes and is not limited to components of the “Semantic Web Stack”:
  - Uniform Resource Indicators (URI)
  - Ontology
  - Ontology implementation technologies
  - Semantic enablers
- Knowledge Engineering Talent is integral to achieving this data transformation and establishes meaning to contents via Ontology and URI implementation for machines to understand contents like their human Partners do





# Data Modernization

- DevSecOps and Production Environments are configured to support system-of-systems compute and storage of data types hosted in siloed On-premise and Cloud infrastructures

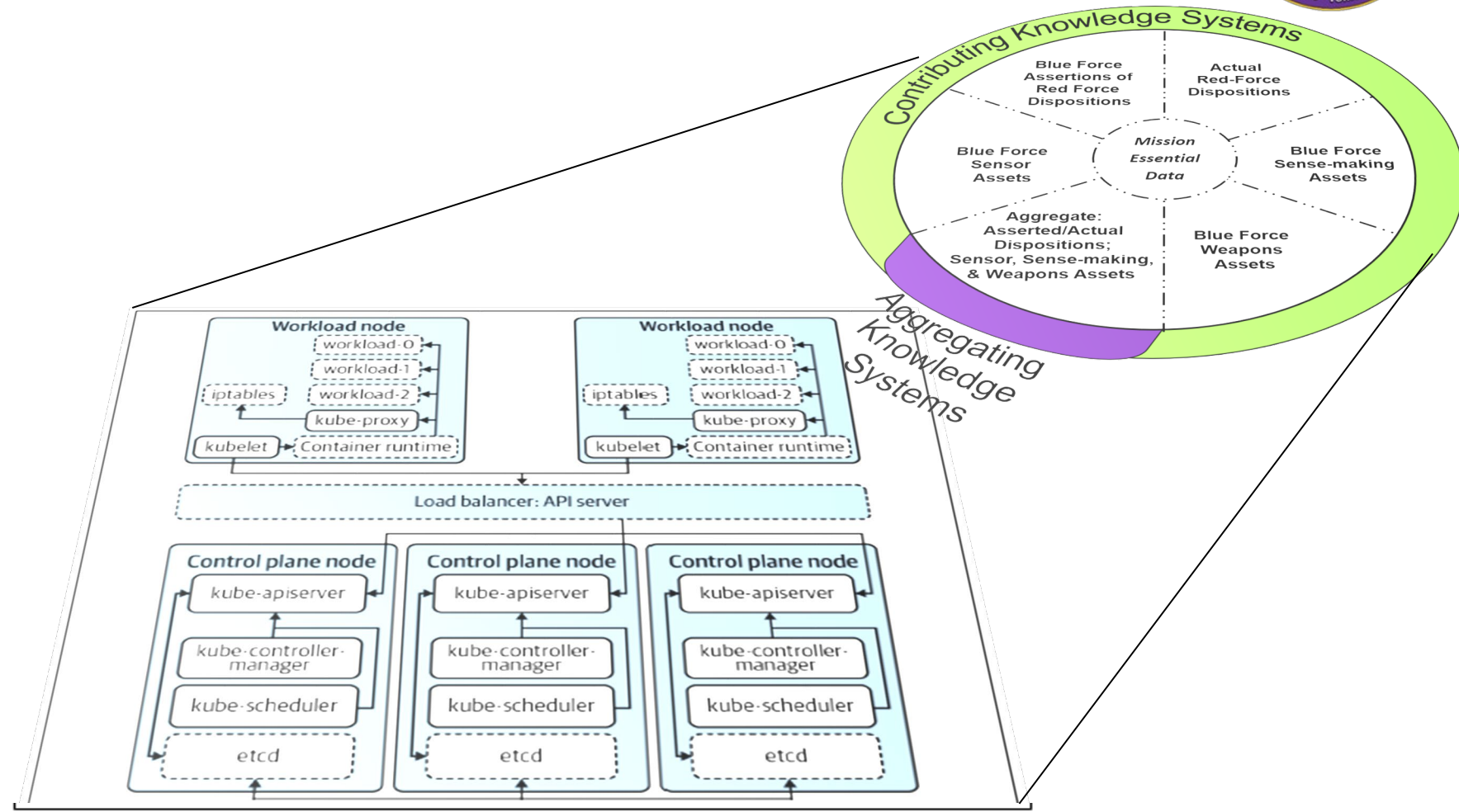


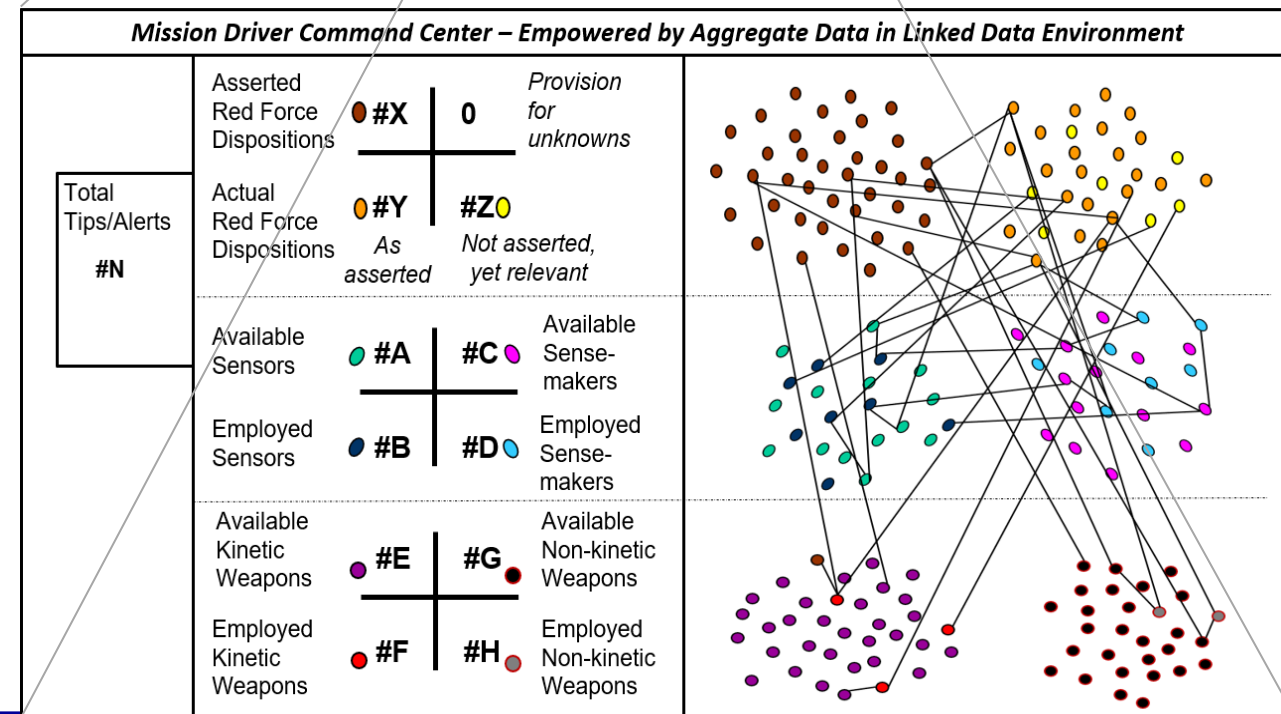
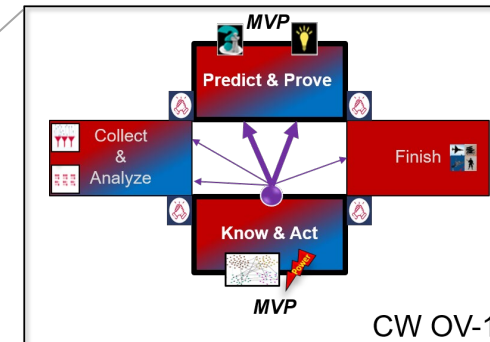
Figure 1-1. The primary components that make up the Kubernetes cluster. Dashed borders represent components that are not part of core Kubernetes.



# Data Science Modernization



- Multi-Tiered, multi-faceted sense-making analytics run against unstructured and structured data in horizontal and vertical workflows
- Data Scientists/Engineers build and deploy these sense-making analytics to augment human mission managers and operators
- The MDCC serves as a starting point, concentrating on deriving actionable knowledge from Linked Data to “Know & Act”:
  - Anticipated vs. actual adversary dispositions
  - Available vs. employed collection & analytics assets
  - Available vs. employed weapons assets
- Graph Analytics Talent is integral to achieving actionable knowledge from the complex contents available in Linked Data Environment







# Data Science Modernization



- **Graph Analytics Types**

- Path Analysis
- Connectivity Analysis
- Centrality Analysis
- Community Analysis
- Link Prediction

- **Graph Applications**

- Directed
- Undirected
- Weighted
- Cyclic
- MultiGraph
- HyperGraph
- HyperNodes

- **Graph Network Architectures**

- Spectral Method
  - Graph Convolutional Network
- Spatial Method
  - Message Passing Neural Network
  - Graph Attention Network
- Sampling Method
  - Graph Sage
  - Pin Sage
- Dynamic Method
  - Temporal Graph Network

- Which types, applications, and network architectures are applied to contents hosted in **Contributing Knowledge Systems** and **Aggregating Knowledge Systems**?
- Which **mission-essential data** types are machine-actionable and being sense-made via these Graph Analytics practices?
- To what degree are contents being contributed, aggregated, and sense-made using these practices in **Interagency** and **Intra-agency** contexts?



# Data Science Modernization



- **Interagency Opportunity for Data Scientists/Engineers in collaboration via CW (non-inclusive)**
  - DOE Los Alamos National Laboratories
  - SOUTHCOM Enhanced Domain Awareness (EDA) Team
  - Air Force Intelligence Systems Support Office (ISSO)
  - Air Force Air Combat Command Analysis Enterprise Management
  - NSA Chief Data Architect and Combat Support Modernization initiative
  - DIA Object Based Production Committee and related Common Intelligence Picture (CIP) modernization initiatives
  - NRO Mission Integration Directorate and related CIP modernization initiative
  - CCMDs including INDOPACOM, AFRICOM, STRATCOM, NORTHCOM, and SOUTHCOM (mentioned above)
  - ODNI Augmenting Intelligence Using Machines (AIM) iHUB modernization initiatives
  - JAIC Artificial Intelligence Data Acceleration
  - DOD Chief Data Officer – DOD-IC Ontology Working Group (DIOWG)
    - DTRA CXQ Lead Engineer leads the new DIOWG Subgroup: W3C Linked Data & Semantic Web



# Data Science Modernization



- **Intra-Agency Opportunity for Data Science/Engineering leveraging Target Mission Architecture (TMA) guiding CW innovation**
  - Collaboration with:
    - R&D Directorate: Linked Data Contents and Graph Analytics innovation
    - Operations: WMD Use Cases and Mission User engagement
    - Information Technology: Compute, Storage, Security, Access
    - Policy: Expectations for compliance to W3C standards for Linked Data; modernized implementation of Joint Doctrine (e.g., Joint Pub 2-01.3 (JIPOE); traceability/support to Project Herald, DOD Data Strategy, and DTRA Strategy
  - Use TMA CONOPs, DoDAF Systems Engineering Portfolio for Integrated Operations & Intelligence (IO&I), and MDCC
    - CONOPs: Proposed Mission and Technical Capabilities
    - IO&I: Initial emphasis on OV-1, CV-1, OV5a, OV5b (8 Functional Groups and 76 Activities transcending Mission Management, Operations, and DevSecOps)
    - MDCC: Implementation of CONOPs and DoDAF Portfolio coalescing our Linked Data Contributing Knowledge & Aggregating Knowledge components (CW MVP)



# Scoping and Implementation



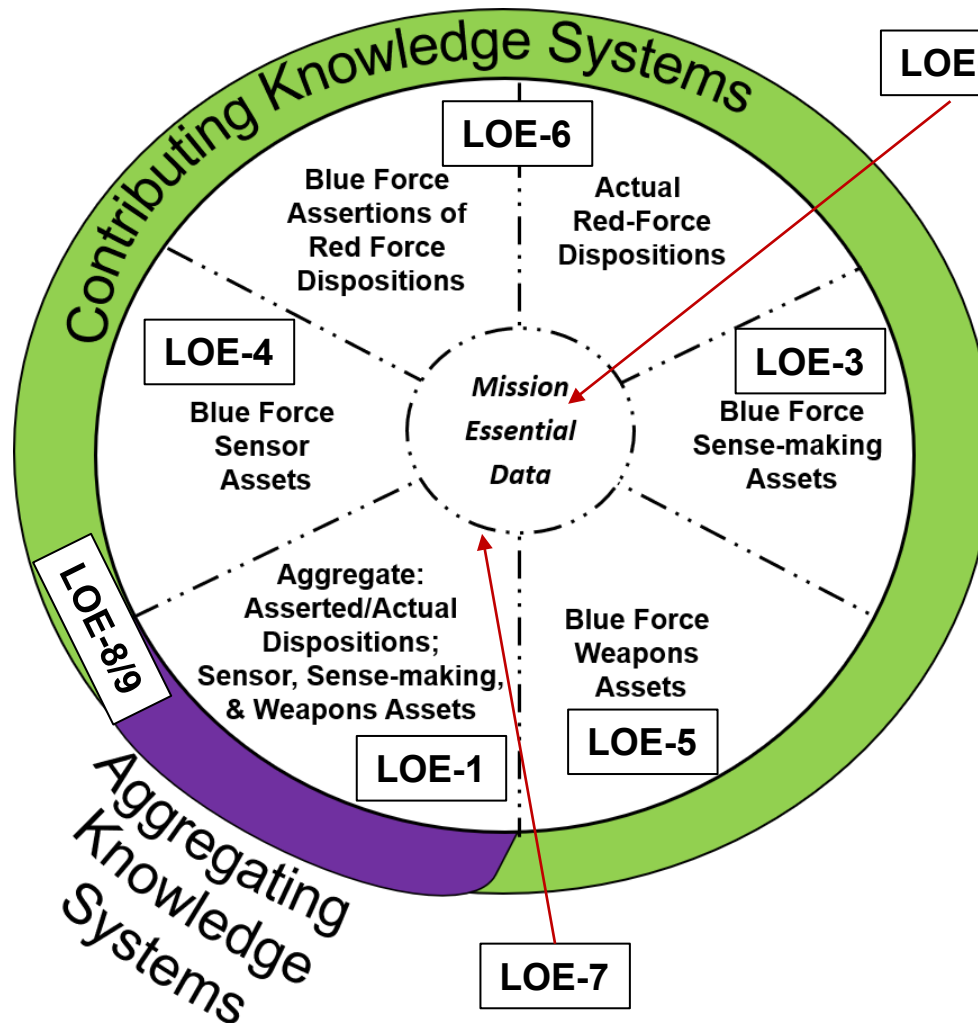
LOE	Description
LOE-1: Knowledge Aggregation	Information derived from semantically-enabled data in siloed contributing knowledge systems is available in scalable Enterprise aggregating knowledge systems – Enterprise Knowledge Graph and Semantic Web capabilities
LOE-2: Decision Enabling	User-facing applications visualize insights from contributing and aggregating knowledge systems for alerting, situational awareness, and decision-making by people
LOE-3: Analytics Orchestration	Information about Artificial Intelligence (AI), Machine Learning (ML), Analytic Models, and Analytics and contributing knowledge systems hosting this information that drive nomination, prioritization, synchronization and use of AI/ML combinations in support of adversary and environmental issues
LOE-4: Collection Orchestration	Information about sensors and contributing knowledge systems hosting this information that drive nomination, prioritization, synchronization and use of sensor combinations in support of adversary and environmental issues
LOE-5: Weapons Orchestration	Information about kinetic and non-kinetic assets and contributing knowledge systems hosting this information that drive nomination, prioritization, synchronization and use of weapons combinations in support of adversary and environment issues
LOE-6: Problem-space Data Enablement	Information and contributing systems hosting the information about OPLAN and Adversary Course of Action decomposition conveying anticipated/predicted adversary and environment issues in context of evidenced/actual dispositions as revealed through Common Intelligence and Operations Picture baselines
LOE-7: Model-driven Operations	Transaction capabilities among aggregating and contributing knowledge systems and respective hosted information for dynamic coverage of anticipated-vs.-actual and available-vs.-employed Red and Blue Force dispositions
LOE-8: Integrated Workflow	User engagement comprising two areas of emphasis in context of exercising Model-driven Operations workflows. First areas is the practical application of tradecraft and processes, irrespective of specific tools and services available – helping Mission Users experience approach. Second area is the systems engineering activity guided by the novel TMA that conveys envisioned Integrated & Operations Intelligence state.
LOE-9: Title 10/50 and Non-Title 10/50 Integration	Technically consistent approaches designed for economy-of-scale and concentration-of-force capabilities within and across enterprises serving operations under various U.S. Code Title authority. Purpose-built for problem agnostic, domain agnostic capabilities viable for myriad Operations, Intelligence, and Law Enforcement issues at whole-of-government scale



# LOE Alignment to Data Types



Lines of Effort (LOE)	
LOE-1: Knowledge Aggregation	
LOE-2: Decision Enabling	
LOE-3: Analytics Orchestration	
LOE-4: Collection Orchestration	
LOE-5: Weapons Orchestration	
LOE-6: Problem-space Data Enablement	
LOE-7: Model-driven Operations	
LOE-8: Integrated Workflow	
LOE-9: Title 10/50 and Non-Title 10/50 Integration	



- Tacit Knowledge Prediction (OPLAN & Adversary Course of Action)
- Truths: Patterns-of-Life (Object Based Production)**
- Linked Data Environment / Semantic Web
- Human-Machine Teaming
- Sense-making Assets-- Analytics
- Sensor Assets Collection
- Title 10
- Dual-use Title 10/50
- Shooter Assets Weapons
- Decision Advantage



# LOE Alignment to OV-1

## Lines of Effort (LOE)

LOE-1: Knowledge Aggregation



LOE-2: Decision Enabling



LOE-3: Analytics Orchestration



LOE-4: Collection Orchestration



LOE-5: Weapons Orchestration



LOE-6: Problem-space Data Enablement



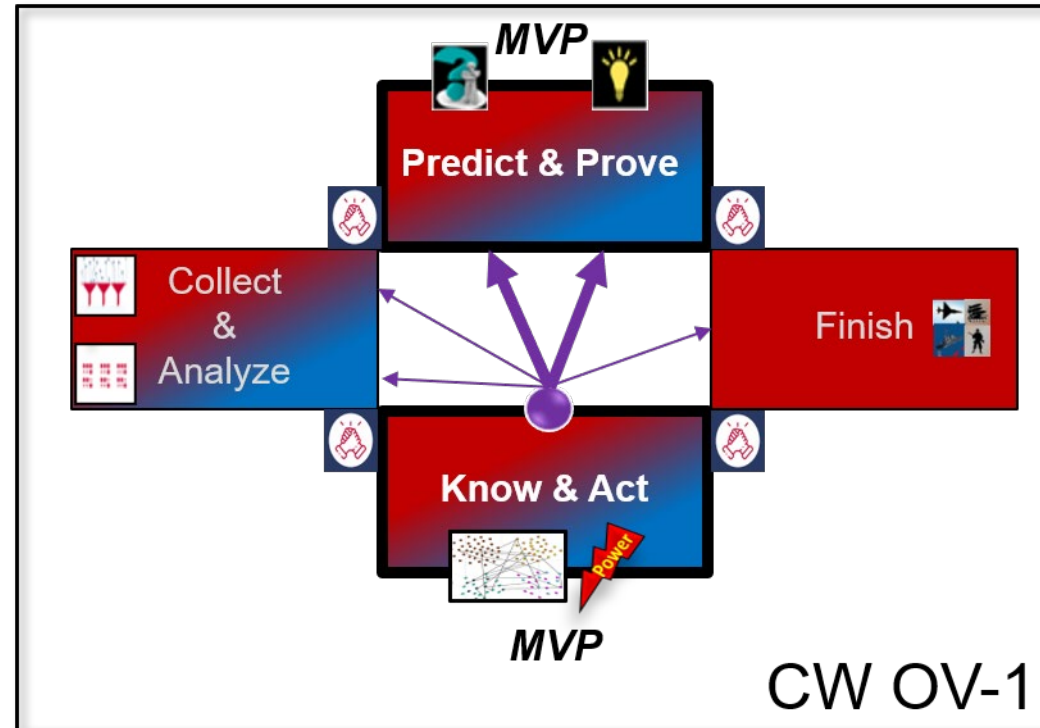
LOE-7: Model-driven Operations



LOE-8: Integrated Workflow



LOE-9: Title 10/50 and Non-Title 10/50 Integration



- Tacit Knowledge Prediction (OPLAN & Adversary Course of Action)
- Truths: Patterns-of-Life (Object Based Production)
- Linked Data Environment / Semantic Web
- Human-Machine Teaming
- Sense-making Assets-- Analytics
- Sensor Assets Collection
- Title 10
- Dual-use Title 10/50
- Shooter Assets Weapons
- Decision Advantage



# LOE Alignment to CV-1

## Lines of Effort (LOE)

LOE-1: Knowledge Aggregation



LOE-2: Decision Enabling



LOE-3: Analytics Orchestration



LOE-4: Collection Orchestration



LOE-5: Weapons Orchestration



LOE-6: Problem-space Data Enablement



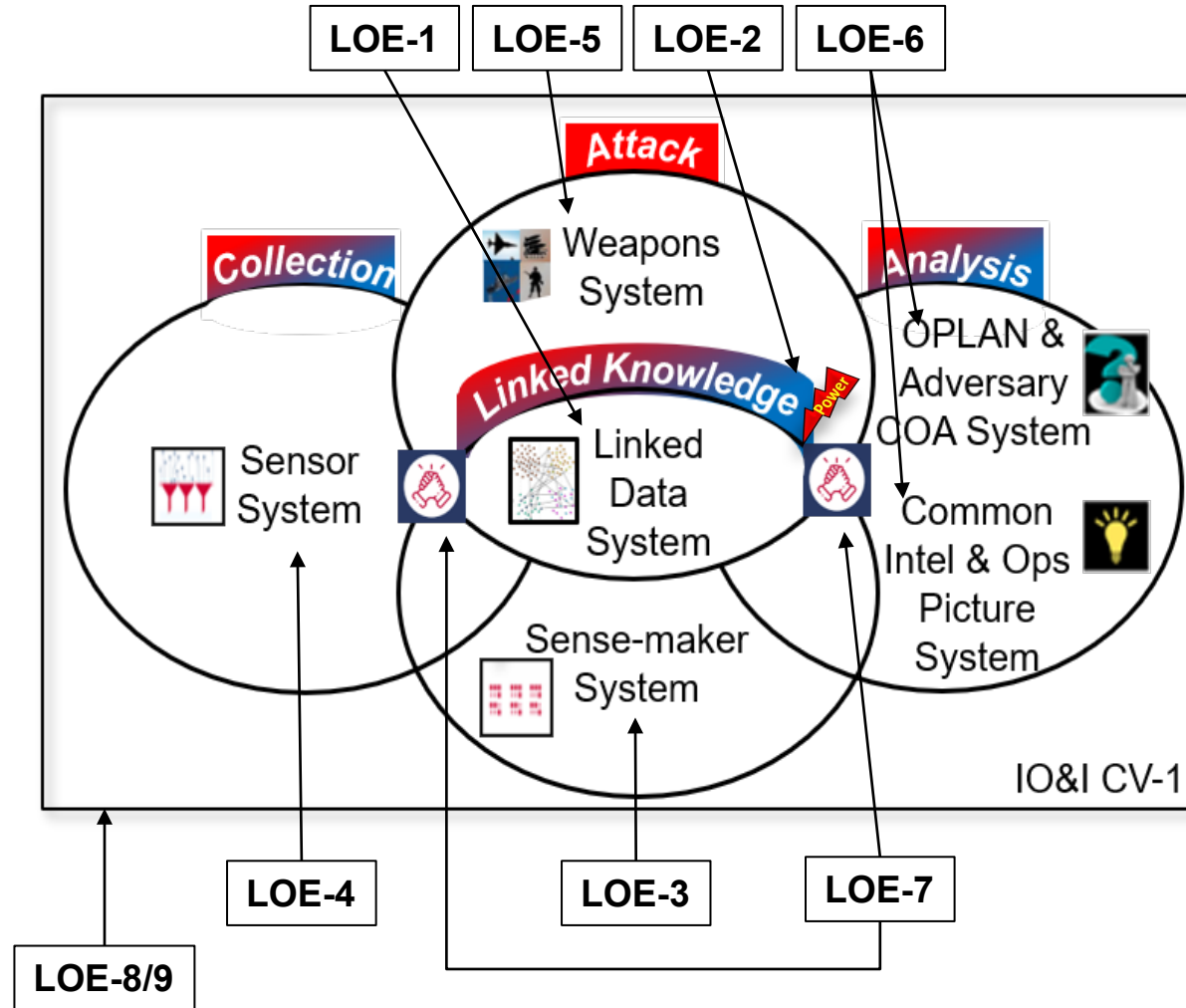
LOE-7: Model-driven Operations



LOE-8: Integrated Workflow



LOE-9: Title 10/50 and Non-Title 10/50 Integration



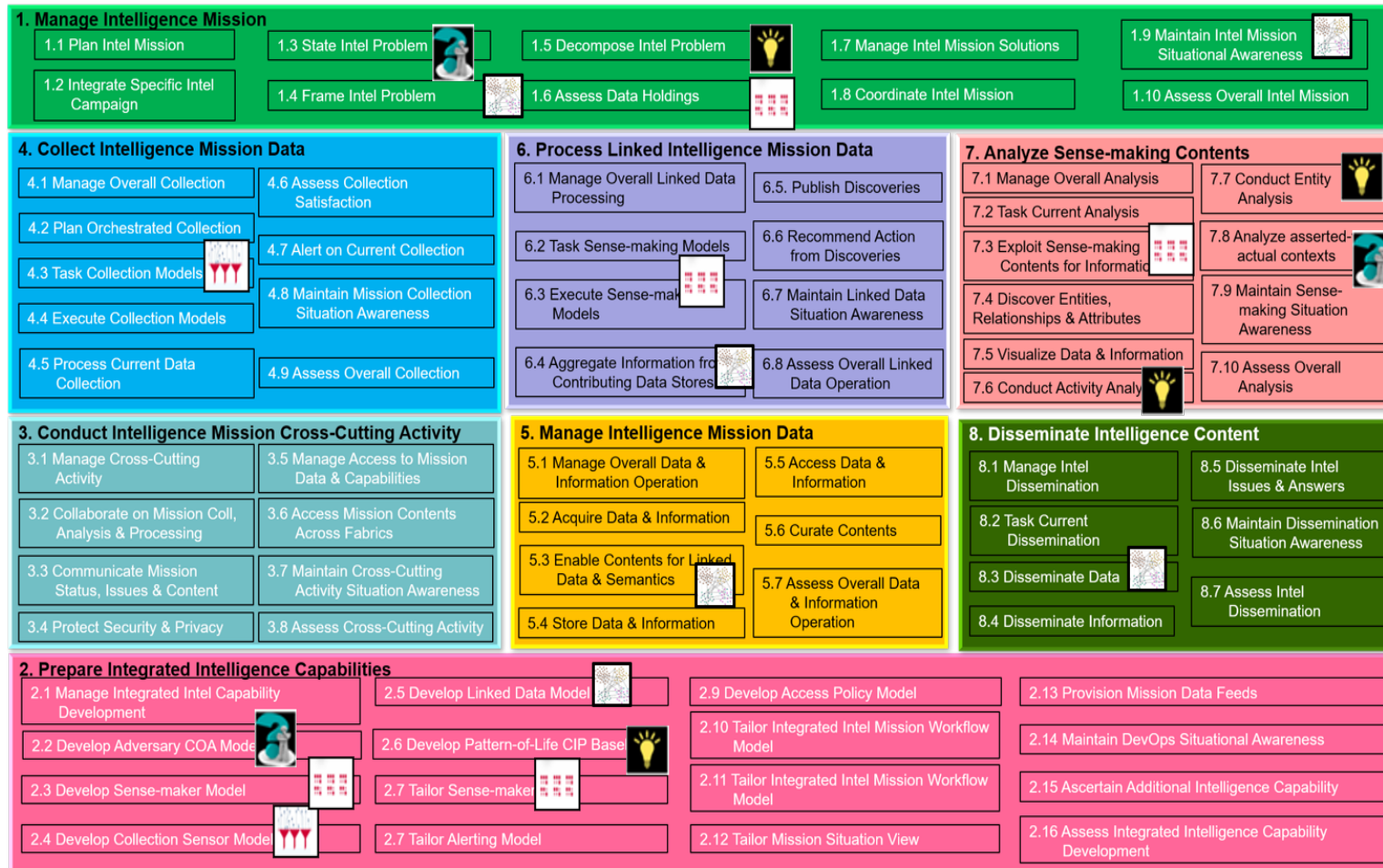
- Tacit Knowledge Prediction (OPLAN & Adversary Course of Action)
- Truths: Patterns-of-Life (Object Based Production)
- Linked Data Environment / Semantic Web
- Human-Machine Teaming
- Sense-making Assets-- Analytics
- Sensor Assets Collection
- Title 10
- Dual-use Title 10/50
- Shooter Assets Weapons
- Decision Advantage



# LOE Alignment to OV5a

In-work (as of 07 Feb)

Lines of Effort (LOE)	
LOE-1: Knowledge Aggregation	
LOE-2: Decision Enabling	
LOE-3: Analytics Orchestration	
LOE-4: Collection Orchestration	
LOE-5: Weapons Orchestration	
LOE-6: Problem-space Data Enablement	
LOE-7: Model-driven Operations	
LOE-8: Integrated Workflow	
LOE-9: Title 10/50 and Non-Title 10/50 Integration	



- Tacit Knowledge Prediction (OPLAN & Adversary Course of Action)
- Truths: Patterns-of-Life (Object Based Production)
- Linked Data Environment / Semantic Web
- Human-Machine Teaming
- Sense-making Assets--Analytics
- Sensor Assets Collection
- Title 10
- Dual-use Title 10/50
- Shooter Assets Weapons
- Decision Advantage