Integrity - Service - Excellence

Digital Acquisition

Guidance on Model-Based Strategic Contract Guidance Package

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Air Force Material Command

Digital Campaign

Oct 2021

Topics

- **Link for a verbal recording of this briefing presentation:**
  - https://web.microsoftstream.com/video/c10e5112-cfed-4b34-8932-8c5af14ef5c3
- **Bottom Line Up Front**
- **Reference Sources**
- **Proposed Approach to Apply DE RFP Example Language**
- **Snapshot of Digital Engineering (DE) Features – Excel Spreadsheet**
- **DE Trace Across Acquisition Products**

Bottom Line Up Front

- **This briefing is part of a guidance package which also includes:**
  - An Excel file mapping features, a chart deck aligning DE features and CDRLs, and a recording of this briefing presentation
- **The guidance package is intended to aid acquisition execution teams in critically thinking through the application of digital engineering features as they develop contracting language**
  - Unique features have been identified that any acquisition may utilize. Acquirers may use one or more of the DE feature choices and may add additional features to meet their DE objectives
  - The Excel file associated with this presentation contains the DE features, choices, sample SOW language, definitions, and sources used to define the features, standards, and mapping to the draft AF Digital Maturity Metrics
  - An associated set of CDRL/DID material (in development by AFMC Digital Campaign) will provide guidance for DE-enabled data delivery
  - The DE features were identified by benchmarking across services and acquisitions as well as reviewing leading edge research and professional society work to identify patterns resulting in the DE features
  - The DE features were validated by assessing them across four use cases, by industry RFI feedback, and by alignment with the AF Digital Maturity Metrics
- **Various acquisitions have begun applying this guidance**
- **This package was originally produced by the Digital Campaign LOE 3.3 team in early 2021 and has been updated to align terminology to the Acquisition and Sustainment Data Package (ASDP)**

Reference Sources

- **Acquisition and Sustainment Data Package (ASDP)**
- **HQ AFMC Digital Campaign Industry Exchange Day**
  - Ground Based Strategic Deterrent (GBSD), Weapon One, Protected Anti-jam Tactical SATCOM (PATS)
- **Acquisition references**
  - F-15EX (18 May 20) – Standing up PLM capability (some Open Architecture)
  - Ground Based Strategic Deterrent (GBDS) (22 May 20) – MBSE and IDE
  - Simulator Common Architecture Requirements and Standards (SCARS) (28 May 20) – MBSE
  - MILSATCOM (PTES) (29 May 20) – MBSE, architecture tools, and visualization
  - T-7 Redhawk (1 Jun 20) – PLM, Open Architecture, and contractor interaction
  - Resilient-Embedded GPS/INS (3 Jun 20) – Standards/Architecture/DevSecOps/Certs
  - B-52 (5 Jun 20) – PLM experience and system in sustainment and modernization
  - Weapons Digital Environment (8 Jun 20) – IDE and fully digital practices for POR
  - A-10 (12 Jun 20) - PLM experience and system in sustainment
  - PLM (2 Jul 20) – PLM as a capability
  - Skyborg (9 Jul 20) – Leverage Lab-to-POR digital foundation and certification process
- **OSD sponsored efforts**
  - OMG, NDIA, INCOSE – Acquisition Reference Model
  - Digital engineering Information Exchange Working Group (DEIXWG) – Digital Viewpoint Model

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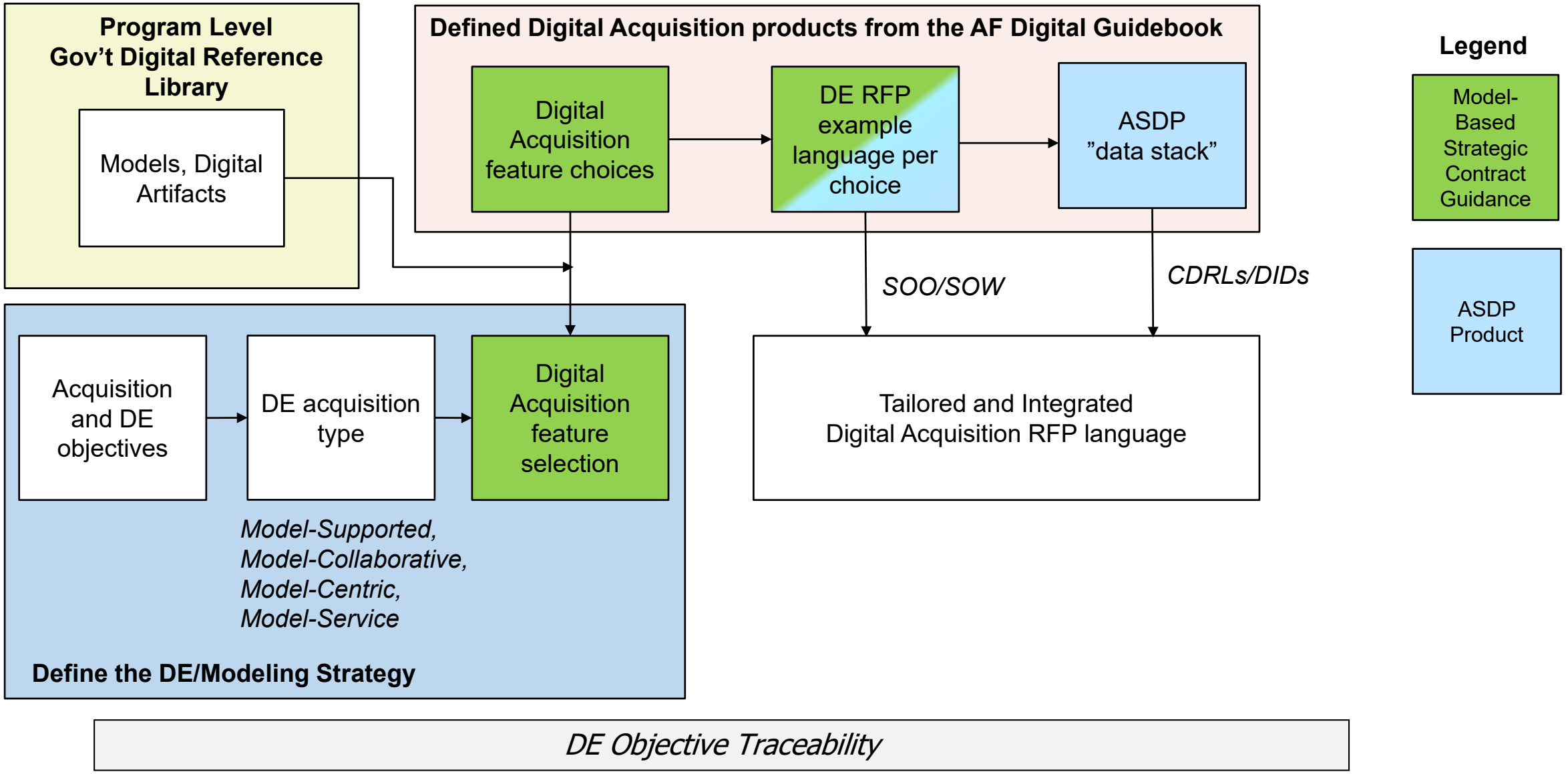
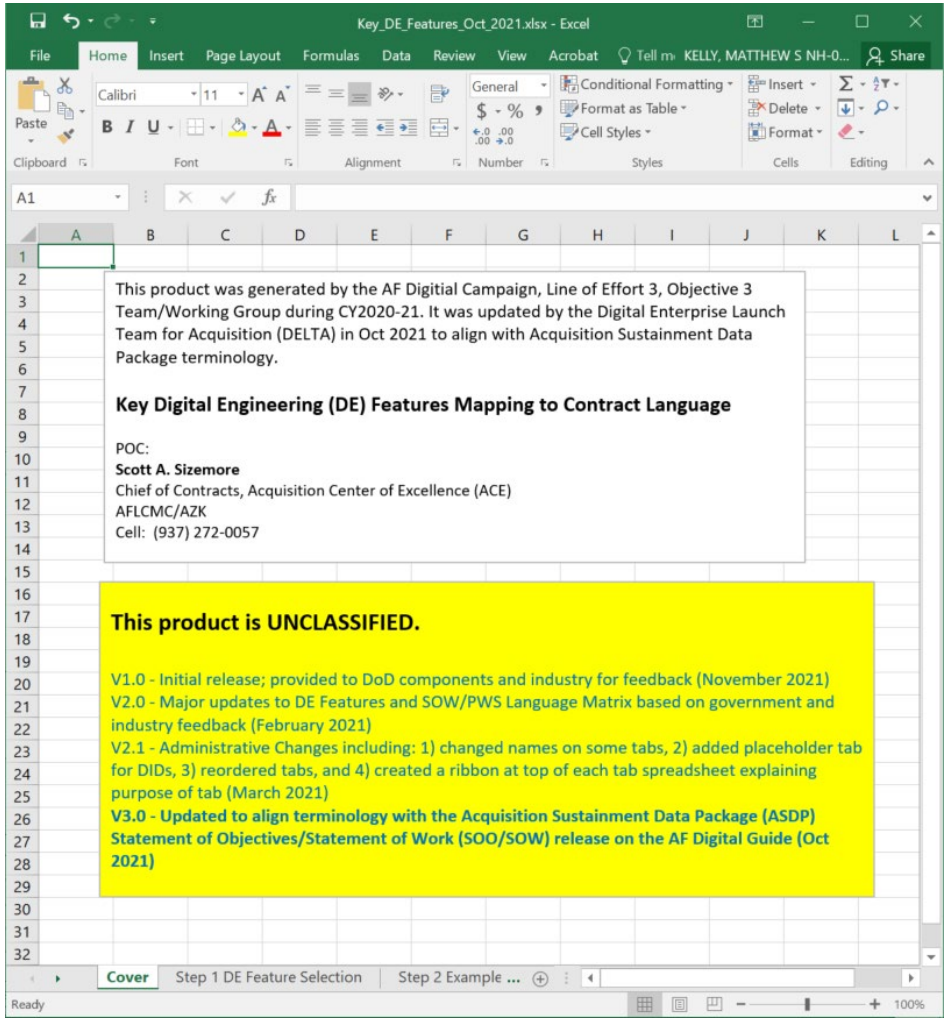
Proposed Approach to Apply RFP Example Language



Matrix
Mapping of Key Features to Contract Language

- **Excel spreadsheet guidance/reference tool**
  - Outlines and maps DE feature considerations to requirement contract language development
  - Spreadsheet includes tabs for: DE Feature Selection, Example SOW PWS language, Standards, and Metrics Map
  - Development of specific DE DIDs/CDRLs have not been completed
  - Tab for DIDs/CDRLs will be added in future



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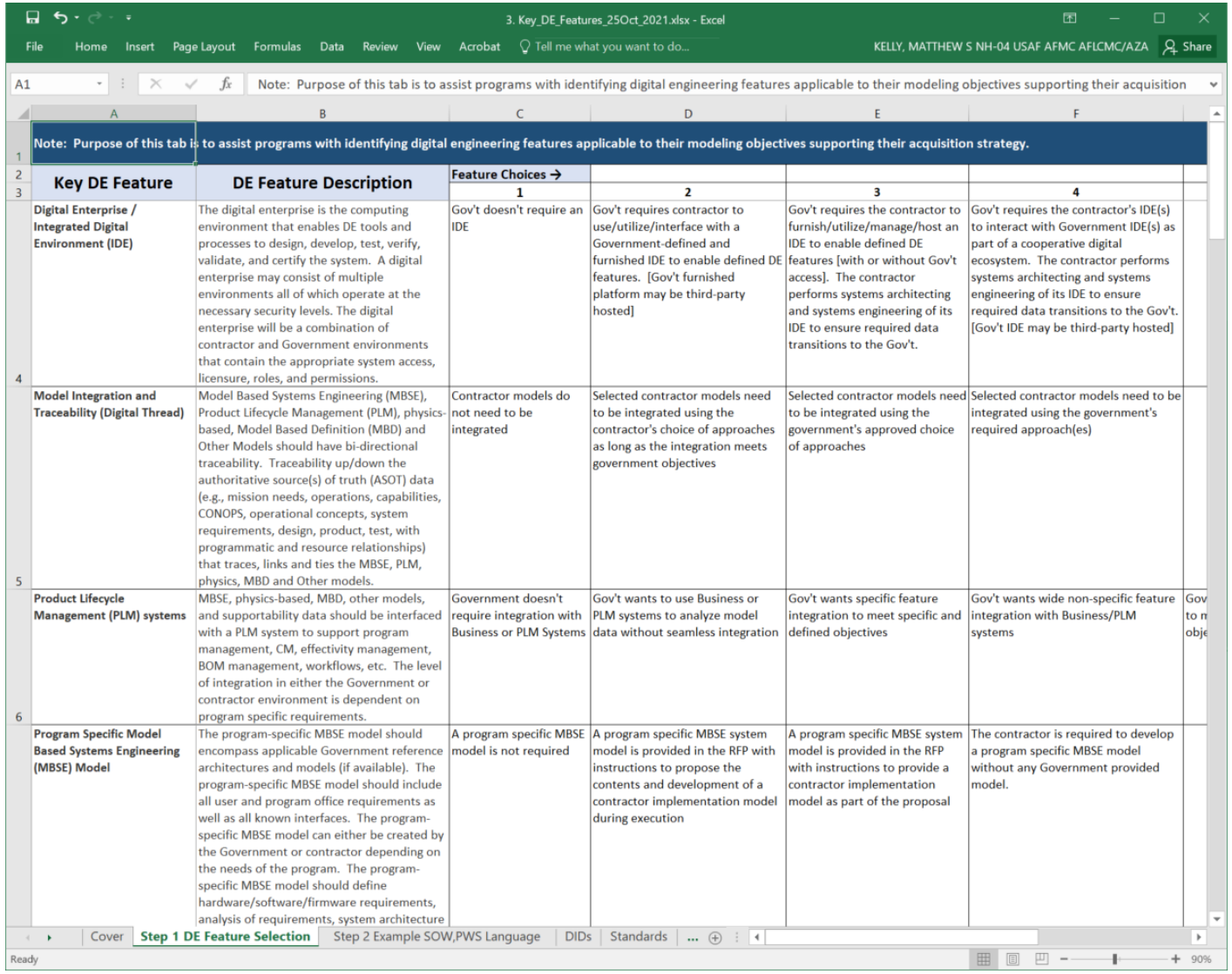
"Key Features" tab
Mapping of Features to Feature Choices


3. Key_DE_Features_25Oct_2021.xlsx - Excel

File Home Insert Page Layout Formulas Data Review View Acrobat Tell me what you want to do... KELLY, MATTHEW S NH-04 USAF AFMC AFLCMC/AZA Share

A1 Note: Purpose of this tab is to assist programs with identifying digital engineering features applicable to their modeling objectives supporting their acquisition

	A	B	C	D	E	F
1	Note: Purpose of this tab is to assist programs with identifying digital engineering features applicable to their modeling objectives supporting their acquisition strategy.					
2	Key DE Feature	DE Feature Description	Feature Choices →			
3			1	2	3	4
4	Digital Enterprise / Integrated Digital Environment (IDE)	The digital enterprise is the computing environment that enables DE tools and processes to design, develop, test, verify, validate, and certify the system. A digital enterprise may consist of multiple environments all of which operate at the necessary security levels. The digital enterprise will be a combination of contractor and Government environments that contain the appropriate system access, licensure, roles, and permissions.	Gov't doesn't require an IDE	Gov't requires contractor to use/utilize/interface with a Government-defined and furnished IDE to enable defined DE features. [Gov't furnished platform may be third-party hosted]	Gov't requires the contractor to furnish/utilize/manage/host an IDE to enable defined DE features [with or without Gov't access]. The contractor performs systems architecting and systems engineering of its IDE to ensure required data transitions to the Gov't.	Gov't requires the contractor's IDE(s) to interact with Government IDE(s) as part of a cooperative digital ecosystem. The contractor performs systems architecting and systems engineering of its IDE to ensure required data transitions to the Gov't. [Gov't IDE may be third-party hosted]
5	Model Integration and Traceability (Digital Thread)	Model Based Systems Engineering (MBSE), Product Lifecycle Management (PLM), physics-based, Model Based Definition (MBD) and Other Models should have bi-directional traceability. Traceability up/down the authoritative source(s) of truth (ASOT) data (e.g., mission needs, operations, capabilities, CONOPS, operational concepts, system requirements, design, product, test, with programmatic and resource relationships) that traces, links and ties the MBSE, PLM, physics, MBD and Other models.	Contractor models do not need to be integrated	Selected contractor models need to be integrated using the contractor's choice of approaches as long as the integration meets government objectives	Selected contractor models need to be integrated using the government's approved choice of approaches	Selected contractor models need to be integrated using the government's required approach(es)
6	Product Lifecycle Management (PLM) systems	MBSE, physics-based, MBD, other models, and supportability data should be interfaced with a PLM system to support program management, CM, effectivity management, BOM management, workflows, etc. The level of integration in either the Government or contractor environment is dependent on program specific requirements.	Government doesn't require integration with Business or PLM Systems	Gov't wants to use Business or PLM systems to analyze model data without seamless integration	Gov't wants specific feature integration to meet specific and defined objectives	Gov't wants wide non-specific feature integration with Business/PLM systems
	Program Specific Model Based Systems Engineering (MBSE) Model	The program-specific MBSE model should encompass applicable Government reference architectures and models (if available). The program-specific MBSE model should include all user and program office requirements as well as all known interfaces. The program-specific MBSE model can either be created by the Government or contractor depending on the needs of the program. The program-specific MBSE model should define hardware/software/firmware requirements, analysis of requirements, system architecture	A program specific MBSE model is not required	A program specific MBSE system model is provided in the RFP with instructions to propose the contents and development of a contractor implementation model during execution	A program specific MBSE system model is provided in the RFP with instructions to provide a contractor implementation model as part of the proposal	The contractor is required to develop a program specific MBSE model without any Government provided model.

Cover | Step 1 DE Feature Selection | Step 2 Example SOW,PWS Language | DIDs | Standards | ...

Ready 90%

- Acquisitions select the appropriate DE Features to meet their acquisition DE objectives
- One or many feature choices may be appropriate for an acquisition
- The feature selection is used to consider the applicable SOW/PWS language, standards, and definitions

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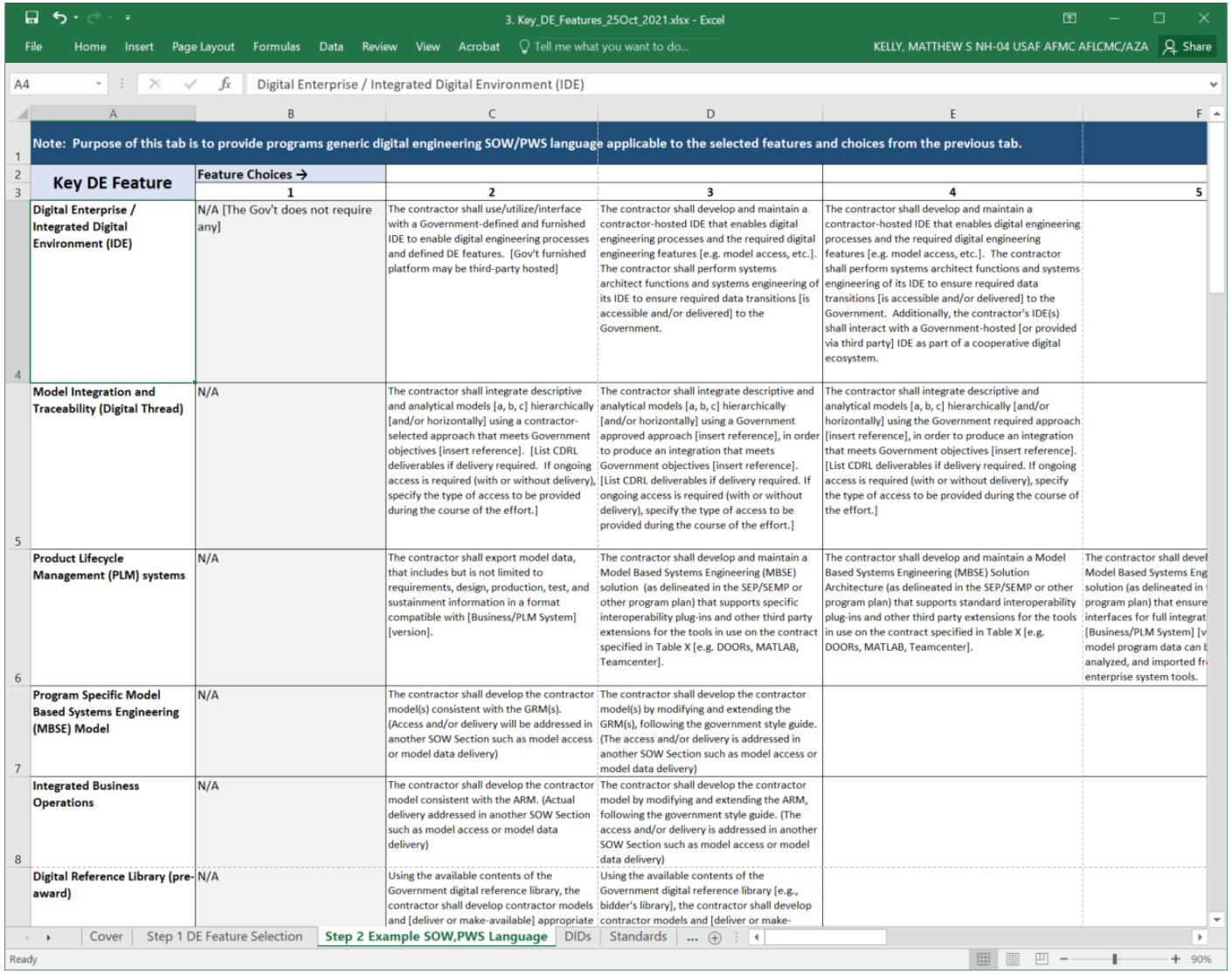
"SOW Matrix" tab

Mapping of Feature Choices to Contract Language



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A4 Digital Enterprise / Integrated Digital Environment (IDE)

	A	B	C	D	E	F
1	Note: Purpose of this tab is to provide programs generic digital engineering SOW/PWS language applicable to the selected features and choices from the previous tab.					
2	Key DE Feature	Feature Choices →				
3		1	2	3	4	5
4	Digital Enterprise / Integrated Digital Environment (IDE)	N/A [The Gov't does not require any]	The contractor shall use/utilize/interface with a Government-defined and furnished IDE to enable digital engineering processes and defined DE features. [Gov't furnished platform may be third-party hosted]	The contractor shall develop and maintain a contractor-hosted IDE that enables digital engineering processes and the required digital engineering features [e.g. model access, etc.]. The contractor shall perform systems architect functions and systems engineering of its IDE to ensure required data transitions [is accessible and/or delivered] to the Government.	The contractor shall develop and maintain a contractor-hosted IDE that enables digital engineering processes and the required digital engineering features [e.g. model access, etc.]. The contractor shall perform systems architect functions and systems engineering of its IDE to ensure required data transitions [is accessible and/or delivered] to the Government. Additionally, the contractor's IDE(s) shall interact with a Government-hosted [or provided via third party] IDE as part of a cooperative digital ecosystem.	
5	Model Integration and Traceability (Digital Thread)	N/A	The contractor shall integrate descriptive and analytical models [a, b, c] hierarchically [and/or horizontally] using a contractor-selected approach that meets Government objectives [insert reference]. [List CDRL deliverables if delivery required. If ongoing access is required (with or without delivery), specify the type of access to be provided during the course of the effort.]	The contractor shall integrate descriptive and analytical models [a, b, c] hierarchically [and/or horizontally] using a Government approved approach [insert reference], in order to produce an integration that meets Government objectives [insert reference]. [List CDRL deliverables if delivery required. If ongoing access is required (with or without delivery), specify the type of access to be provided during the course of the effort.]	The contractor shall integrate descriptive and analytical models [a, b, c] hierarchically [and/or horizontally] using the Government required approach [insert reference], in order to produce an integration that meets Government objectives [insert reference]. [List CDRL deliverables if delivery required. If ongoing access is required (with or without delivery), specify the type of access to be provided during the course of the effort.]	
6	Product Lifecycle Management (PLM) systems	N/A	The contractor shall export model data, that includes but is not limited to requirements, design, production, test, and sustainment information in a format compatible with [Business/PLM System] [version].	The contractor shall develop and maintain a Model Based Systems Engineering (MBSE) solution (as delineated in the SEP/SEMP or other program plan) that supports specific interoperability plug-ins and other third party extensions for the tools in use on the contract specified in Table X [e.g. DOORs, MATLAB, Teamcenter].	The contractor shall develop and maintain a Model Based Systems Engineering (MBSE) Solution Architecture (as delineated in the SEP/SEMP or other program plan) that supports standard interoperability plug-ins and other third party extensions for the tools in use on the contract specified in Table X [e.g. DOORs, MATLAB, Teamcenter].	The contractor shall devel Model Based Systems Eng solution (as delineated in program plan) that ensure interfaces for full integrat [Business/PLM System] [v model program data can b analyzed, and imported fr enterprise system tools.
7	Program Specific Model Based Systems Engineering (MBSE) Model	N/A	The contractor shall develop the contractor model(s) consistent with the GRM(s). (Access and/or delivery will be addressed in another SOW Section such as model access or model data delivery)	The contractor shall develop the contractor model(s) by modifying and extending the GRM(s), following the government style guide. (The access and/or delivery is addressed in another SOW Section such as model access or model data delivery)		
8	Integrated Business Operations	N/A	The contractor shall develop the contractor model consistent with the ARM. (Actual delivery addressed in another SOW Section such as model access or model data delivery)	The contractor shall develop the contractor model by modifying and extending the ARM, following the government style guide. (The access and/or delivery is addressed in another SOW Section such as model access or model data delivery)		
	Digital Reference Library (pre-award)	N/A	Using the available contents of the Government digital reference library, the contractor shall develop contractor models and [deliver or make-available] appropriate	Using the available contents of the Government digital reference library [e.g., bidder's library], the contractor shall develop contractor models and [deliver or make-		

Cover | Step 1 DE Feature Selection | Step 2 Example SOW,PWS Language | DIDs | Standards | ...

Ready 90%

- The SOW material was vetted with AFMC DC General Counsel
- The SOW verbiage for each DE feature is provided to incorporate into the comprehensive SOW or PWS
- One or many SOW choices may be appropriate for an acquisition

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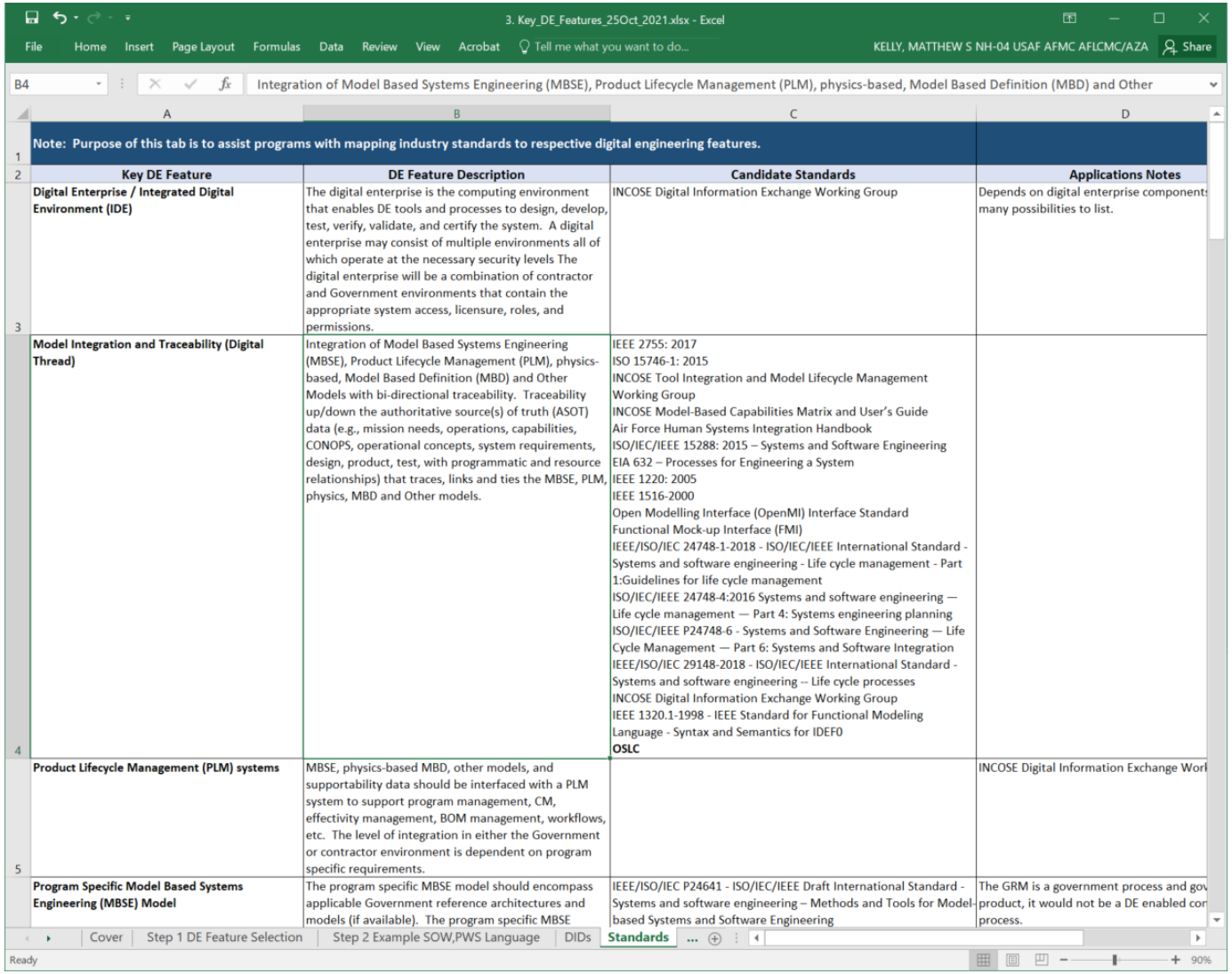
"Standards" tab
Mapping of Features to Open Standards



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B4: Integration of Model Based Systems Engineering (MBSE), Product Lifecycle Management (PLM), physics-based, Model Based Definition (MBD) and Other

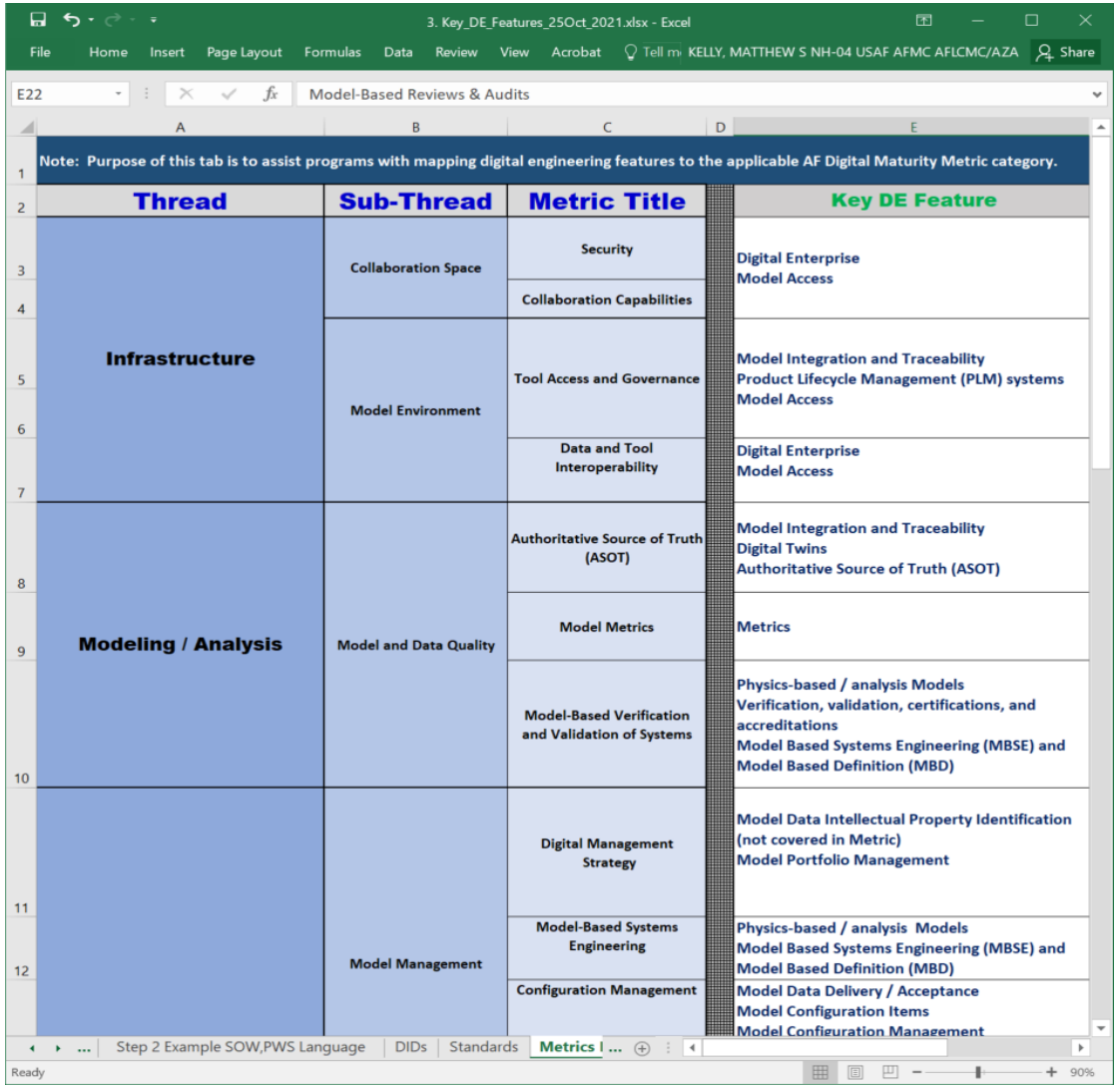
	A	B	C	D
1	Note: Purpose of this tab is to assist programs with mapping industry standards to respective digital engineering features.			
2	**Key DE Feature**	**DE Feature Description**	**Candidate Standards**	**Applications Notes**
3	**Digital Enterprise / Integrated Digital Environment (IDE)**	The digital enterprise is the computing environment that enables DE tools and processes to design, develop, test, verify, validate, and certify the system. A digital enterprise may consist of multiple environments all of which operate at the necessary security levels The digital enterprise will be a combination of contractor and Government environments that contain the appropriate system access, licensure, roles, and permissions.	INCOSE Digital Information Exchange Working Group	Depends on digital enterprise component many possibilities to list.
4	**Model Integration and Traceability (Digital Thread)**	Integration of Model Based Systems Engineering (MBSE), Product Lifecycle Management (PLM), physics-based, Model Based Definition (MBD) and Other Models with bi-directional traceability. Traceability up/down the authoritative source(s) of truth (ASOT) data (e.g., mission needs, operations, capabilities, CONOPS, operational concepts, system requirements, design, product, test, with programmatic and resource relationships) that traces, links and ties the MBSE, PLM, physics, MBD and Other models.	IEEE 2755: 2017 ISO 15746-1: 2015 INCOSE Tool Integration and Model Lifecycle Management Working Group INCOSE Model-Based Capabilities Matrix and User's Guide Air Force Human Systems Integration Handbook ISO/IEC/IEEE 15288: 2015 – Systems and Software Engineering EIA 632 – Processes for Engineering a System IEEE 1220: 2005 IEEE 1516-2000 Open Modelling Interface (OpenMI) Interface Standard Functional Mock-up Interface (FMI) IEEE/ISO/IEC 24748-1-2018 - ISO/IEC/IEEE International Standard - Systems and software engineering - Life cycle management - Part 1:Guidelines for life cycle management ISO/IEC/IEEE 24748-4:2016 Systems and software engineering — Life cycle management — Part 4: Systems engineering planning ISO/IEC/IEEE P24748-6 - Systems and Software Engineering — Life Cycle Management — Part 6: Systems and Software Integration IEEE/ISO/IEC 29148-2018 - ISO/IEC/IEEE International Standard - Systems and software engineering -- Life cycle processes INCOSE Digital Information Exchange Working Group IEEE 1320.1-1998 - IEEE Standard for Functional Modeling Language - Syntax and Semantics for IDEF0 **OSLC**	
5	**Product Lifecycle Management (PLM) systems**	MBSE, physics-based MBD, other models, and supportability data should be interfaced with a PLM system to support program management, CM, effectivity management, BOM management, workflows, etc. The level of integration in either the Government or contractor environment is dependent on program specific requirements.		INCOSE Digital Information Exchange Wor
	Program Specific Model Based Systems Engineering (MBSE) Model	The program specific MBSE model should encompass applicable Government reference architectures and models (if available). The program specific MBSE	IEEE/ISO/IEC P24641 - ISO/IEC/IEEE Draft International Standard - Systems and software engineering – Methods and Tools for Model-based Systems and Software Engineering	The GRM is a government process and gov product, it would not be a DE enabled cor process.

Cover | Step 1 DE Feature Selection | Step 2 Example SOW,PWS Language | DIDs | Standards

Ready 90%

- Standards and guidance document have been mapped to the DE features
- For DE features selected, consider the associated standards and guidance (or additional ones) for use on contract
- Organizations using selected features apply critical thinking to determine the standards and guidance to apply on a contract as compliance or reference documents

"Metrics Map" tab
Mapping of Features to Digital Maturity Metrics



- Application of the DE Features and DE Maturity Metrics are independent
  - Apply the DE Maturity Metrics to characterize the current and desired state of an organization's DE implementation
    - Recommended at the start of an acquisition or yearly to assess DE progress against organizational DE objectives.
  - Apply the DE Features when developing acquisition strategy and RFPs
- Useful to know that the DE features align with the DE Maturity Metrics
- Instituting DE features correlate with improves scores for the metrics

Digital Engineering Trace Across Acquisition Products

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- Define DE/Modeling Objectives
- Trace DE/Modeling Objectives to Acquisition Document, or establish an Acquisition Reference model
- Create Government Reference Model

- Define Gov't RFP Trace Matrix
- Define Proposal Prep instructions for bidder trace matrices

- Define Bidder RFP Trace Matrix to proposal contents and the model contract

STEPS 1 2 3

Program requirements

Technical requirements

Program objectives

DE / Modeling objectives

PWBS
Program Work Breakdown Structure

DE Features

Process	1	2	3		N
Program management	X	X		X	X
…	X				
Engineering	X	X		X	X
…	X		X		
Others				X	

ASP

SEP

TEMP

LCMP

TTP

Others

Establish Gov't Approach

RFP

Model Contract

Establish Contracted Approach

Proposal

Model Contract

Ensure proposal and model contract meet Gov't modeling objectives

Summary

- **The DE feature-based approach:**
  - Applies to all acquisition types
  - Is a critical thinking process
  - Is immediately useful
- **DE objectives**
  - Drive the approach from acquisition strategy through contract award
  - Drive DE-enabled processes and data
- **Organizations aware of this approach openly welcome it**
  - Significant positive feedback received from early use
  - Easy to apply to existing pre-award processes / steps

BACK UP

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Government Trace: Program Requirements to Acq Strategy

Trace Step 1

Program Requirements	Technical Requirements	DE/Modeling Objectives	DE Features	ASP	SEP	LCMP	TEMP	TTP
Paragraph #s								

- **Identify technical requirements: capabilities, threats, operational concept, & Security Classification Guide for the acquisition**
- **Identify program requirements for the acquisition; time, budget, risk constraints**
  - This could include concepts for options, re-competition, down-select, production, prototype, etc.
  - These all impact the modeling objectives
- **From the technical requirements and program requirements, identify the modeling strategy**
  - Choose 1: model-supported, model-collaborative, model-centric, model-service
- **Identify DE/modeling objectives for the gov't team and for the acquisition**
  - Consider running workshops to define the Modeling Objectives, Problem Framing, Capabilities Assessment, and Model Elements and Data
- **Identify the DE features (from matrix) that are necessary to meet the DE/modeling objectives**
- **Trace the government modeling objectives to the family of acquisition documents (e.g. ASP, SEP, TEMP, LCSP, Technology Transition Plan)**
  - The DE/modeling objectives will then drive the contents of these

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Government Trace: Acq Strategy to RFP

Trace Step 2

DE/Modeling Objectives	DE Features	SOO SOW PWS	PWBS	System Requirements	RFP Section M	RFP Section L	CLINs	CDRLs DIDs

- **Refine the modeling objectives**
  - Refine the modeling objectives from step 1 if needed (after industry feedback – may be competitive or sole source)
  - Refining the modeling objectives from the SOO/SOW/PWS, PWBS, and system requirements ensures that models meet specific government needs to make decisions
- **Once the DE/modeling objectives are refined, map to the SOO, PWBS, and system requirements**
  - If needed (competitive acquisition) this can be used to define the selection criteria for RFP section M and then spawn the definition of the proposal preparation instructions of RFP section L
- **The trace includes CLINs and CDRLs to ensure that the RFP defines the deliverables required to meet the modeling objectives**

RFP Section L&M/Proposal Trace Instructions to Bidders

Trace Step 3

- **Provide a cross-reference matrix that traces the evaluation criteria of RFP section M to proposal paragraphs**
  - This assists the gov't source selection team that are assigned to specific evaluation criteria items
- **Provide a cross-reference matrix that traces among the PWBS-CWBS, government modeling objectives, SOO-CSOW-CPWS, CLINs, CDRLs, IMP, and IMS**
- **Provide a cross-reference matrix of all modeling tools, extensions, and plug-ins discussed in the Technical/Management volume with the unpriced bill of materials and the GFE list**
- **Provide a cross-reference matrix of all modeling software discussed in the Technical/Management volume and the unpriced basis of estimate**
- **Provide a cross-reference matrix of key system requirements in the GRM, and the contractor model if it was requested, as well as paragraphs within the Technical/Management volume**

Traceability instructions may need to be updated depending on the existence of a government reference model (GRM), or the request for a contractor model as part of the proposal