Key Open Sub Systems (KOSS) Tool: KOSS Description and Application

Naval Open Architecture

Identifying Key Interfaces and Focusing Long term Investments in Complex Systems

5 August 2009

Outline

- Drivers for KOSS
- What Is KOSS?
- KOSS Tool Overview
- KOSS Tool Walk-Through
- KOSS Within a Consistent & Repeatable Process at NAVAIR
- Summary

Drivers for KOSS

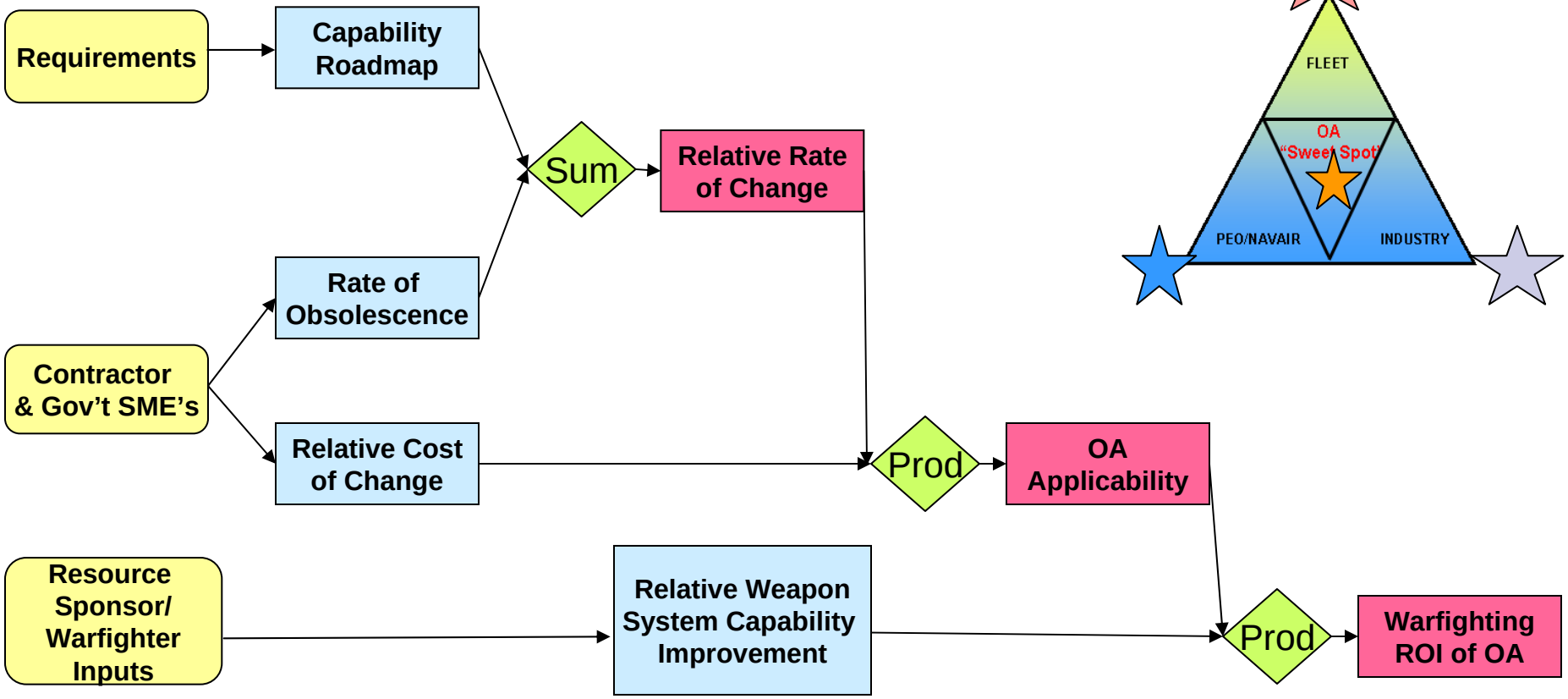
- May be used to comply with DoD 5000.02 MOSA Requirement, specifically MOSA Principle #3: Designate Key Interfaces
- NAVAIR and industry partners co-developed a tool (hereafter KOSS) in 2008 as a starting point to develop a business & technical strategy for OA within programs
  - KOSS is being used by some NAVAIR Integrated Program Teams (IPTs) as well as global industry partners and is under consideration for adoption elsewhere in DoD
- The KOSS process has been designed to support Program Managers in identifying the volatile Subsystems/Components that would yield the greatest benefit to lifecycle affordability by applying MOSA/NOA principles
  - Best places to invest limited resources in improving openness

What Is KOSS?

- NAVAIR uses KOSS to communicate with three stakeholders groups:
  - Warfighter/Resource Sponsor
  - Acquisition/Buyer
  - Industry/Original Equipment Manufacturers (OEMs)

- KOSS provides a mechanism for:
  - Identifying and providing transparency into components that will have volatility over a long period of time (e.g. System Life Cycle)
  - Identifying factors of component volatility:
    - Capability requirements and roadmap
    - Corporate competitive technologies – market share drivers
    - Unplanned changes: obsolescence, Gov't. mandates, component costs
    - Flight Plan (NAVAIR)
  - Designating the interfaces on either side of that volatile component or sub-system as a KEY INTERFACE
    - Key Interfaces are common, but not all common interfaces are key

Tool Overview: Input and Output Flowchart



Color Key	
Analysis	Upfront analysis work to determine Tool Input parameter values
Tool Input	Tool input parameter values
Function	Arithmetic function performed on inputs (either product or sum)
Output	Tool output values

Shape Key

Team Process | Tool Value | Tool Math

Tool Overview

- Rules of Engagement:
  - Gov't and Industry stakeholders engage in a real-time KOSS exercise
  - Participants collectively must have significant Capability Roadmap, weapon system, and product/sub-system domain knowledge
- KOSS spreadsheet takes a set of program developed inputs from the participants and calculates a few simple outputs that can help guide future investment decisions in openness
- Inputs:
  - Set of major components grouped by Hardware, Software, Middleware, and Operating Systems
  - Capability Roadmaps-Flight Plans/Competitive Business Initiatives
    - Indicates which components are expected to add capability in the future
    - Addresses capabilities over a 10 to 15 year period
  - Obsolescence
    - Qualitative measure of the periodicity of obsolescence within the time period covered by the Roadmap
  - Relative Cost of Change
    - Qualitative measure of the cost of changes compared to the original cost of the component
  - Relative Weapon System Capability Improvement
    - Qualitative measure of the OA Value to the Warfighter of the given component

Tool Overview (cont)

- Outputs:
  - Relative Rate of Change
    - Qualitative output providing a relative measure of how rapid changes are expected to occur within the given component during the timeframe covered by the Capability Roadmap, Plus changes due to obsolescence
    - Sum of Capability Upgrades + Obsolescence
  - OA Applicability
    - Qualitative output indicating a starting place for where Open Architecture principles should be applied to those components.
    - Product of the Rate of Change X Cost of Change.
  - Warfighting ROI of OA
    - Qualitative output that factors in the relative Return on Investment to the Warfighter and the OA Applicability score for a given component
    - Product of OA Applicability X Relative Weapon System Improvement Capability

Tool Walkthrough

OA ROI Score is based on 3 Major Factors

1) Relative Rate of Change

2) Relative Cost of Change

3) Relative Weapon Systems Capability Improvement

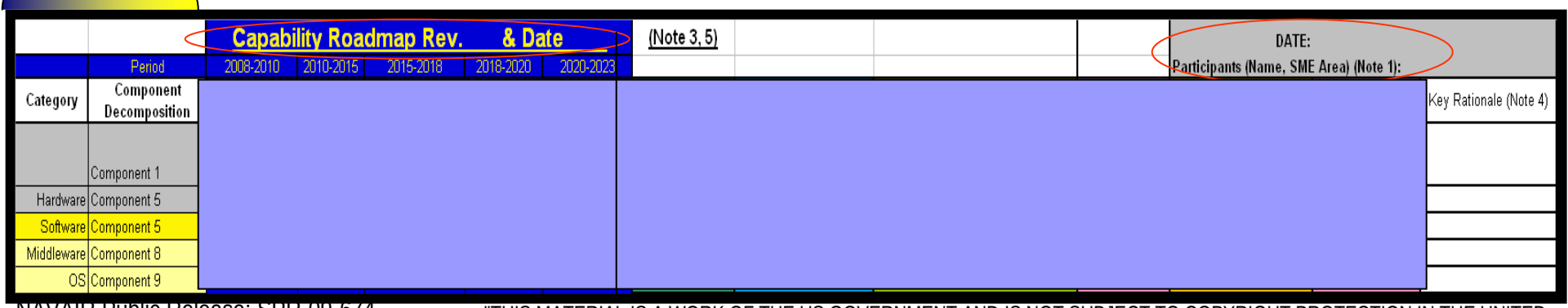
		Capability Roadmap Rev. & Date					(Note 3, 5)				DATE: Participants (Name, SME Area) (Note 1):		
	Period	2008-2010	2010-2015	2015-2018	2018-2020	2020-2023							
Category	Component Decomposition	Capability 1	Capability 2	Capability 3	Capability 4	Capability 5	Obsolescence	Relative Rate of Change	Relative Cost of Change (Note 7)	Relative Weapon	OA Applicability Total Score (Note 6)	Warfighting ROI of OA	Key Rationale (Note 4)
	Component 1	N	N	N	N	N	L	0	L	H	0	0	
Hardware	Component 5	N	N	N	Y	N	L	1	L	L	1	1	
Software	Component 5	N	Y	Y	Y	N	L	3	M	L	9	9	
Middleware	Component 8	N	Y	Y	Y	N	L	3	L	L	3	3	
OS	Component 9	N	N	N	Y	N	M	2	L	L	2	2	

Tool Walkthrough: System Decomposition

1. **Participants collectively must have significant Capability Roadmap, weapon system, and product/sub-system domain knowledge.**
2. **KOSS should be re-run each time the Capability Roadmap is updated**
3. **Rationale must be provided**

Decompose System into major components:

- Hardware
- Software
- Middleware
- Operating System



Tool Walkthrough: Capability Roadmap

1. **Identify Relative Rate of Change, using Capabilities and Obsolescence**
2. **Scores must be driven by Capability and Sustainment of the Program vice Technology, per se. [Commercial updates for a capability may be more frequent than those adopted by the Program.]**

Relative Rate of Change Key

Rating	Condition	Score
Y	Yes, change is needed	1
N	No change needed	0

		Capability Roadmap Rev. & Date				
	Period	2008-2010	2010-2015	2015-2018	2018-2020	2020-2023
Category	Component Decomposition	Capability 1	Capability 2	Capability 3	Capability 4	Capability 5
	Component 1	N	N	N	N	N
Hardware	Component 5	N	N	N	Y	N
Software	Component 5	N	Y	Y	Y	N
Middleware	Component 8	N	Y	Y	Y	N
OS	Component 9	N	N	N	Y	N

Y is scored 1
N is scored 0

Tool Walkthrough: Rate of Obsolescence

1. **Obsolescence is entered as a qualitative value (L,M,H) as described in the key (shown at right).**
2. **Embedded logic will use this value as an input to calculate final score**

Rating (Note 2)	Obsolescence Condition	Score
Low (L)	Low probability to go obsolete w/in roadmap time period	0
Medium (M)	Probability of one (1) change obsol. driven w/in roadmap time period	1
High (H)	Probability of two (2) or more changes obsol. driven w/in roadmap time period	2

		Capability Roadmap Rev. & Date					(Note 3, 5)
	Period	2008-2010	2010-2015	2015-2018	2018-2020	2020-2023	
Category	Component Decomposition	Capability 1	Capability 2	Capability 3	Capability 4	Capability 5	Obsolescence
	Component 1	N	N	N	N	N	L
Hardware	Component 5	N	N	N	Y	N	L
Software	Component 5	N	Y	Y	Y	N	L
Middleware	Component 8	N	Y	Y	Y	N	L
OS	Component 9	N	N	N	Y	N	M

Y (1) M (1)

L is scored 0
M is scored 1
H is scored 2

Tool Walkthrough: Relative Rate of Change

Relative Rate of Change:
Capability Upgrades
+
Obsolescence Only

Calculate a sum with the N's scored as 0's.

Y (1) + M (1) = 2

		Capability Roadmap Rev. & Date					(Note 3, 5)	
	Period	2008-2010	2010-2015	2015-2018	2018-2020	2020-2023		
Category	Component Decomposition	Capability 1	Capability 2	Capability 3	Capability 4	Capability 5	Obsolescence	Relative Rate of Change
	Component 1	N	N	N	N	N	L	0
Hardware	Component 5	N	N	N	Y	N	L	1
Software	Component 5	N	Y	Y	Y	N	L	3
Middleware	Component 8	N	Y	Y	Y	N	L	3
OS	Component 9	N	N	N	Y	N	M	2

Tool Walkthrough: Cost of Change

1. **Cost of change referenced to the time period of the Capability Roadmap that addresses relative score between various components per the decomposition list in the second column. Cost of Change should be defined as any and all cost differentials over the life cycle of the component and not just NRE-type cost differentials**

Rating (Note 2)	Change Condition	Score
Low (L)	Cost of change <10%	1
Medium (M)	10% <Cost of change <33%	3
High (H)	Cost of change >33%	6

		Capability Roadmap Rev. & Date					(Note 3, 5)		
	Period	2008-2010	2010-2015	2015-2018	2018-2020	2020-2023			
Category	Component Decomposition	Capability 1	Capability 2	Capability 3	Capability 4	Capability 5	Obsolescence	Relative Rate of Change	Relative Cost of Change (Note 7)
	Component 1	N	N	N	N	N	L	0	L
Hardware	Component 5	N	N	N	Y	N	L	1	L
Software	Component 5	N	Y	Y	Y	N	L	3	M
Middleware	Component 8	N	Y	Y	Y	N	L	3	L
OS	Component 9	N	N	N	Y	N	M	2	L

Tool Walkthrough: OA Applicability

1. **OA Applicability = Relative Rate of Change x Relative Cost of Change**

Rating (Note 2)	Change Condition	Score
Low (L)	Cost of change <10%	1
Medium (M)	10% <Cost of change <33%	3
High (H)	Cost of change >33%	6

3 x 3 = 9

		Capability Roadmap Rev. & Date					(Note 3, 5)				DATE:
	Period	2008-2010	2010-2015	2015-2018	2018-2020	2020-2023					Participants (Name, SME
Category	Component Decomposition	Capability 1	Capability 2	Capability 3	Capability 4	Capability 5	Obsolescence	Relative Rate of Change	Relative Cost of Change (Note 7)		OA Applicability Total Score (Note 6)
	Component 1	N	N	N	N	N	L	0	L		0
Hardware	Component 5	N	N	N	Y	N	L	1	L		1
Software	Component 5	N	Y	Y	Y	N	L	3	M		9
Middleware	Component 8	N	Y	Y	Y	N	L	3	L		3
OS	Component 9	N	N	N	Y	N	M	2	L		2

Tool Walkthrough: Relative Weapon + Warfighter ROI for OA

Relative Weapon System Capability Improvement:

OA Value to Warfighter (Note 8)	
Weapon System Condition	Score
Infrastructure changes	1
Improvement to current capability at platform level, Evolutionary change	2
Large increase (or new) in warfighting capability (i.e threats that can be prosecuted)	4

Use this column to obtain the Warfighter perspective for the relative value the end user places on a component.
The Warfighter/Req'ts Officer sees at the same time that while some of the "key" components may only support infrastructure changes, they are required to field a roadmap capability and the funding for modifying all the "key" components needs to be defended.

		Capability Roadmap Rev. & Date					(Note 3, 5)				DATE: Participants (Name, SME Area) (Note 1):		
	Period	2008-2010	2010-2015	2015-2018	2018-2020	2020-2023							
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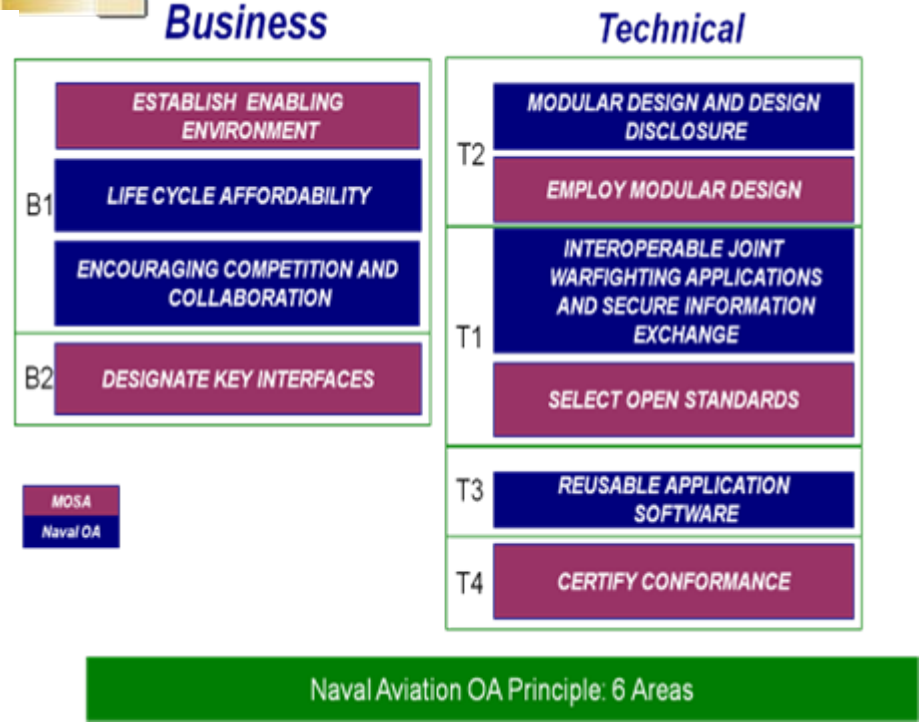
Software	Component 5	N	Y	Y	Y	N	L	3	M	L	9	9	
Middleware	Component 8	N	Y	Y	Y	N	L	3	L	L	3	3	
OS	Component 9	N	N	N	Y	N	M	2	L	L	2	2	

Relating KOSS to Business Strategy

- Use the KOSS OA Applicability & Warfighting ROI of OA scores to designate key interfaces
  - This is the starting point for addressing the OA life cycle strategy
  - Establishes agreement on component interfaces
    - NAVAIR refers to this as a “tri-lateral agreement”

- Leads into strategy development of Where-When-How to apply MOSA/NOA principles:
  - WHERE – Only the most costly volatile components demand openness
  - WHEN – Controlling mechanism scaling from cradle to grave through the normal Systems Engineering Process
  - HOW - Prioritization of business and technical trade space

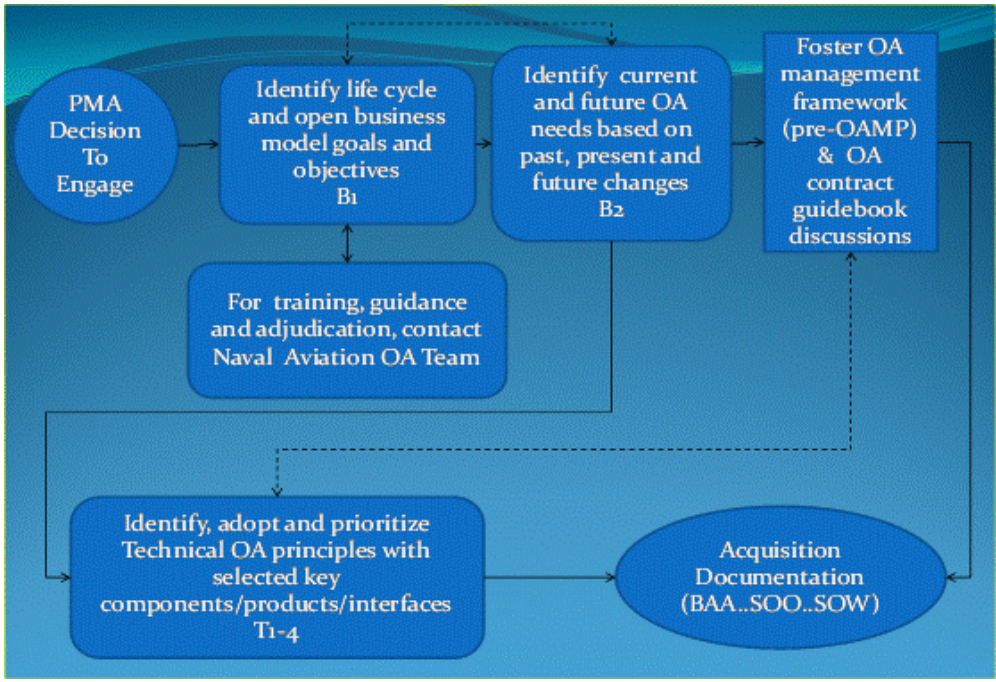
KOSS (B2) Fits within a Consistent and Repeatable Process at NAVAIR



- Integrate MOSA & NOA
  - 2 Business (B1 & B2)
  - 6 Technical (T1-4)
- Business precedes Technical

Roles

- B1 – PEO/PMA/Level 1
- B2 – PMA & Prime
- T1 – N88/NAVAIR/Prime
- T2/3/4 – ASPO/ASPE/Level 1-2



Summary

- KOSS Takeaways
  - KOSS OA Applicability and ROI Scores provide a starting point for a MOSA/NOA business strategy
  - The KOSS Tool can be used to determine where and when to make improvements in enhancing technical openness, based on component volatility and life cycle cost
  - Shifts stakeholders from defining WHAT towards defining WHEN-WHERE-HOW OA principles are applied
  - Provides a transparent, consistent and repeatable process
- Other Domains and Industry are encouraged to use the KOSS tool to meet the MOSA/NOA requirement to Designate Key Interfaces
  - KOSS can be part of a broader OA strategy, much as NAVAIR does today
- If changes to the KOSS tool are required, please contact below personnel for configuration control
- For more information about KOSS please contact Gerard.Walles@navy.mil or Joan.C.Marano@navy.mil