

Adaptive Acquisition: An Evolving Framework for Tailoring Engineering and Procurement of Defense Systems

This is an informal collation of best practices as captured and interpreted by SAF AQ Office of Transformation Innovation. It is not an official document, and does not represent an official USAF position.

Air Force Institute of Technology, Department of Systems Engineering and Management, on behalf of
Assistant Secretary of the Air Force for Acquisition

Office of Transformational Innovation

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Executive Summary

The Defense Acquisition System, as documented in DoDI 5000.02, mandates that programs should not follow process models by rote. Rather, stakeholders should tailor program activities and documentation according to specific requirements, priorities, risks, and boundary conditions. **Adaptive acquisition** provides an evolving set of broadly applicable **adaptive engineering** and **adaptive procurement** tools and processes intended to help tailor acquisition programs per the following approach:

- Specify all critical, lifecycle, mission, system, and process objectives, i.e. “360° requirements”, as measures of performance/effectiveness within executable test cases.
- Obtain commitments by all stakeholders to the tailored approach *upfront*.
- Apply robust *360° Validation and Verification (V&V)* to select best existing capability (i.e. use mature, preferably COTS, technology for prototyping,) benchmark the state of the art as an X% solution, and measure progress going forward.
- Design systems and plan system engineering to modularize, connect, and deploy best available existing capability. Develop and deploy incremental improvements in a virtuous lifecycle process. Apply Modular Open System Approaches (MOSA) as appropriate.
- Tailor procurement vehicles to lower barriers of entry; incentivize broad competition and teaming; reduce solicitation to award timelines.
- In cases where contracting under the Federal Acquisition Regulations is too restrictive, apply “Other Transactions” Authority (10USC2371b) to: establish open consortium of pre-vetted traditional and non-traditional competitors and collaborators; streamline cost accounting and competitive process; align intellectual property rights; make direct award to transition developed capability to production.
- Streamline statutory and regulatory bureaucratic compliance documentation to concisely capture rationale for, plans for, and achievement of, the above.

Adaptive Acquisition

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Motivation and Background

The Secretary of the Air Force established the Bending the Cost Curve (BTCC) initiative to identify, nurture, and broadly instantiate processes and practices to make weapon systems acquisition more efficient and effective. The Assistant Secretary of the Air Force for Acquisition (SAF/AQ) established its Office of Transformational Innovation (OTI) to (among other things) manage BTCC. OTI's research confirms that program offices, in general, are reluctant to depart from one-size-fits-all approaches to compliance with acquisition policy. That reluctance is in spite of Federal Acquisition Regulations (FAR), Defense FAR (DFAR), DoDI 5000.02, and recent Better Buying Power, Performance Based Logistics (PBL), and "Should Cost/Will Cost" policy guidance. This guidance clearly explains that programs should tailor the standard acquisition models to align with the details of their requirements in order to maximize value returned per unit of time and money invested. Likewise, acquisition policy suggests applying Modular Open System Approaches (MOSA) to enable business models that leverage the inherent adaptability of plug-and-play designs. Recent Congressional language reiterates and in some cases

expands authority to innovate within the acquisition process. In particular, recent National Defense Authorization Act (NDAA) language emphasizes use of Rapid Prototyping, Rapid Fielding, and “Other Transactions” Authority (OTA.) However, this policy stops short of providing detailed implementation guidance. Accordingly, OTI is compiling a continuously evolving **adaptive acquisition** framework to provide an evolving set of broadly applicable tools and processes intended to help program managers, and/or prime contractors, to tailor their programs.

Adaptive Acquisition in a Nutshell

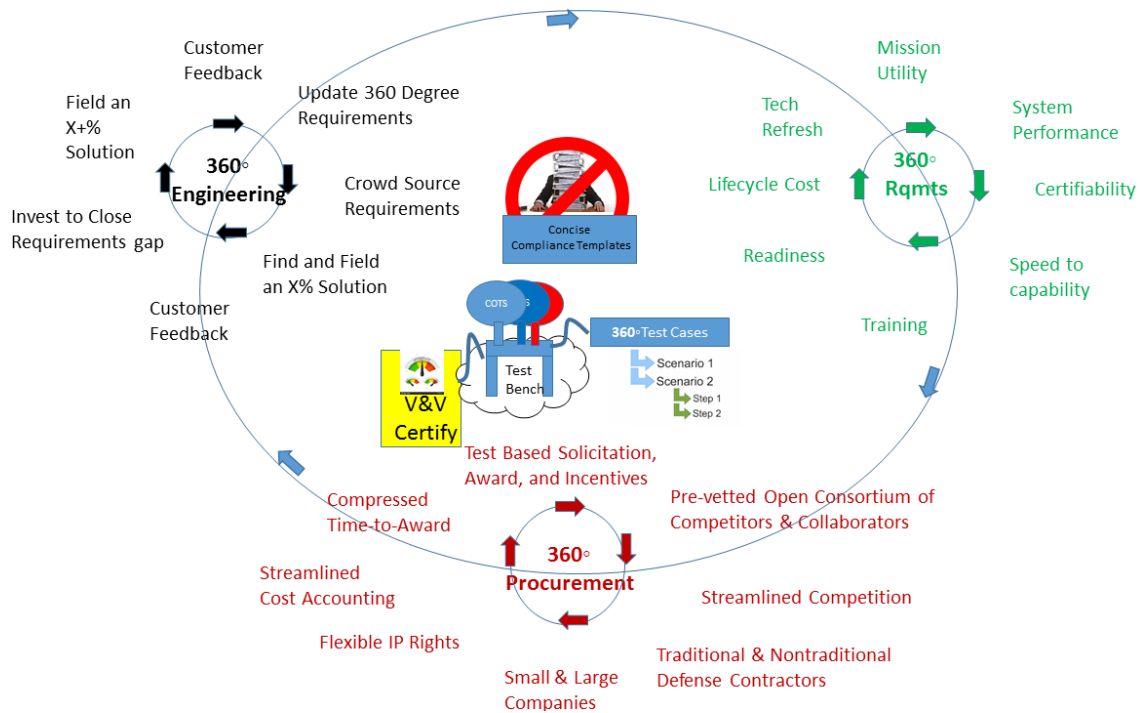


Figure 1: Virtuous cycle of incremental continuous improvement + full horizon of requirements, boundary conditions, and solutions = 360° adaptive perspective on acquisition

The 360° View of Adaptability

In general, “adaptability” is the ability to effectively react to circumstances. In the context of acquisition, “adaptability” means to reduce risk to cost, performance, and schedule, by reacting to circumstances. In a sense, adaptability is the opposite of rigidity. Rigidity, in context with acquisition process, is associated with prescribed, long, linear, piecemeal, processes; with hierarchal management structure; that emphasize bureaucratic compliance with policy. It follows that adaptive acquisition would be characterized with situationally-dependent, relatively short iterative cycles, addressing multiple opportunities and concerns in parallel; with relatively flat management structure; that emphasize achieving desired outcomes with minimally essential documentation. Thus an adaptive approach to acquisition should embrace the concepts of: 1) a virtuous 360° cycle of iterative,

continuous, improvement; and 2) simultaneous consideration of a 360° view of many desired outcomes, stakeholders, and potential solutions. (See figure: 1.)

“Adaptive acquisition” therefore includes exposing outcome-based requirements to as broad a marketplace of solution providers as possible; benchmarking of best existing capability; reactively adapting system design to take advantage of existing mature technology; and streamlining engineering, programmatic, and procurement bureaucracy accordingly. Hence, adaptive acquisition begins with specification of measurable and testable objectives for all aspects of the targeted capability. Relevant aspects for improvement include: system performance; lifecycle cost, tech refresh cycle, reliability, and maintainability; training; certifiability for safety and environmental factors; acquisition process efficiency and effectiveness including speed-to-capability, and capability-per-cost. Given clearly specified measures of performance and/or effectiveness for all these parameters – i.e. a 360° Statement of Objectives and measures (360° SOO) -- adaptive acquisition applies two perspectives to address them: **adaptive engineering**, and **adaptive procurement**.

Adaptive Engineering

Adaptive engineering embraces modularity and openness in the sense that it recognizes that building systems by integrating existing, mature, and trusted components or subsystems is one very effective approach to managing risk across system lifecycles. Adaptive acquisition also recognizes that robust test-based Validation and Verification (V&V) is essential to managing risk regardless of the risk profile. “Validation” means confirmation that achieving threshold Measures of Performance (MoP) will lead to achieving threshold Measures of Effectiveness (MoE) for the 360° targeted program outcomes. “Verification” means confirmation that specified MoP are achieved.

Thus, having identified 360° objective threshold measures of performance and effectiveness, adaptive engineering requires specifying the test cases for all system-related parameters. The set of test cases are used to specify a conceptual test bench that will provision an instance of the end-to-end target architecture together with test tools aligned with all objectives. Developing a prototype test bench is often the first engineering task. The program office should provision the test bench itself, or at minimum it’s specifications, as Government Furnished Equipment (GFE) to all potential bidders. Bids then, take the form of proposed prototyping projects that address the government’s Statement of Objectives for component, subsystem, or system technology and/or processes.

In this sense a “prototype” is simply a design model. Prototypes can be physical or virtual and represent technology or processes. Prototypes can be mature or developmental. Generally, adaptive acquisition aims to identify and perform baseline validation and verification of candidate prototypes. The more mature the prototype the better – lifecycle supported COTS is the ideal case. Regardless, following initial V&V, prototype development aims to close the gap between existing capability and all threshold requirements. This 360° V&V (i.e. objective evaluation of process and system performance in context with all lifecycle objectives for program outcomes) provides basis for tailoring Requirements Reviews (RR) and Design Reviews (DR). Indeed, an RR or DR at any scope or level of maturity takes the form of analysis of the results of associated objective V&V and need not include exhaustive and subjective pro forma review of boilerplate topics. Exit criteria for RR or DR is simply tested achievement of threshold criteria across the 360° view of process and system MoP and MoE.

Adaptive Procurement

Adaptive procurement starts by specifying requirements for procurement process efficiency and effectiveness in measurable and testable terms such as time-to-award, lifecycle-cost-per-capability; numbers and quality of traditional and non-traditional competitors; maturity and robustness of offered solutions; etc. Adaptive acquisition then exercises the letter and spirit of regulatory and statutory policy to tailor parameters such as cost accounting, intellectual property (IP) agreements, scope of competition, basis of source selection, compensation models, and associated bureaucratic compliance as appropriate.

In cases where traditional FAR-based contracting is not sufficiently flexible to achieve tailoring objectives, **adaptive procurement** employs new statutory authorities regarding rapid prototyping, rapid fielding, and use of “Other Transactions” for Prototyping Projects. Use of “Other Transactions” Authority (OTA) for Prototyping Projects, which is not subject to the Federal Acquisition Regulations (FAR), is particularly powerful. For example the program office can competitively awarded an “umbrella” OT to an open consortium of traditional and non-traditional Defense contractors with specified funding ceiling and period of performance. The consortium manager accepts risk for vetting members. Thus, consortium managers should be fire-walled from participating in the actual funded project work, but they may be for-profit or not-for-profit firms or individuals. Virtually any firm willing to sign a simple charter agreement may join quickly and easily. Membership in the consortium makes the firm a qualified Defense contractor. The program office can exercise whatever reasonable approach to cost accounting, IP, incentive model etc. it feels is appropriate to very quickly (weeks not months) award funds to develop and/or demonstrate, and V&V relevant prototypes of components, subsystems, systems, and financial models. When prototypes achieve exit criteria, the program office may immediately award a traditional contract or OT for production.

Steps of the Adaptive Acquisition Process

1. Establish 360° partnerships. Identify the broad stakeholder community, i.e. operator, procurement authorities, industrial organizations, test and evaluation authorities, certification authorities, and legal authorities critical to end-to-end program success. Identify resources required within each stakeholder community. Establish agreed “virtuous cycle” feedback loop necessary to achieve process outcomes described below.
2. Prepare a 360° Statement of Objectives (SOO). Specify the parameters of all important project lifecycle outcomes – operational performance, technical performance, interoperability, security, safety, technical refresh, lifecycle cost, training, certifiability, etc. -- in measurable ways.
3. Specify 360° Measures of Performance/Effectiveness (MoP/E). Specify test cases that deliver MoP and/or MoE, including acceptable threshold values, for each of the important parameters.
4. Employ 360° procurement vehicles. Plan and prepare procurement vehicles that: both encourage and streamline broad competition and teaming; employ 360° SOO as basis of selection and incentives; streamline cost accounting, and focus intellectual property agreements according to project priorities;

and allow parallel and symbiotic execution of developmental, procurement, and sustainment funds. If Federal Acquisition Regulations (FAR) preclude any of these objectives, employ “Other Transactions” Authority to achieve greater flexibility.

5. Provision a 360° test bench. Design and develop test resources that address all objectives, and make them as automated, integrated, and broadly available – perhaps virtually via cloud technology -- to as many potential solution providers as possible. Test bench must provision all existing architectural boundary conditions and any other government furnished resources. Test bench/process should deliver artifacts required for certification to the extent practicable.

6. Benchmark the 360° COTS baseline. Use all available crowd sourcing channels to expose the 360° SOO and solicit the broadest possible community COTS providers to demonstrate existing products and services as prototype solutions for all or some of project objectives. Perform 360° testing to down select best-of-breed. Perform Validation and Verification (V&V) to benchmark – *and as much as possible, certify* -- the specific ability of existing off-the-shelf technology to satisfy 360° objectives.

7. Align 360° solution architecture with benchmarked reality. Use knowledge of performance of existing products and services to compose an optimum solution architecture, or modify an existing solution architecture, by “connecting” best-of-breed capabilities. Tenets of MOSA apply.

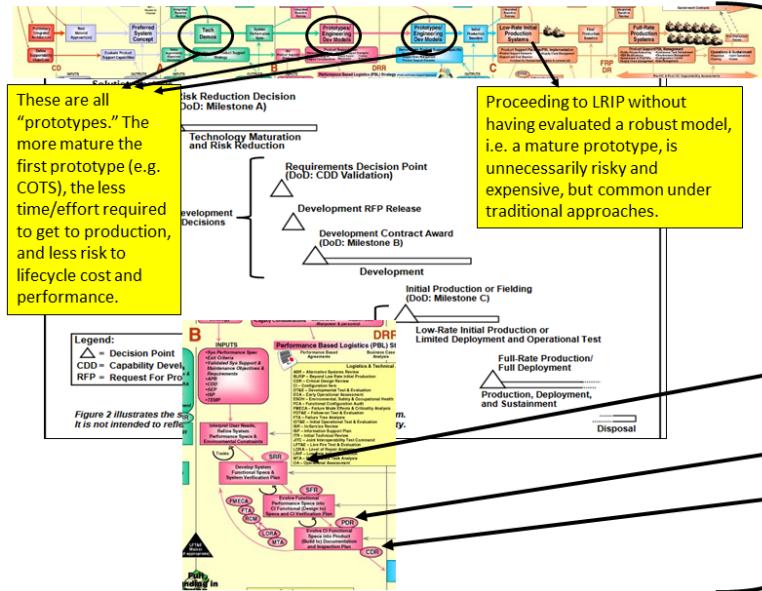
8. Tailor regulatory and statutory governance from a 360° adaptive perspective. Designate the 360° SOO as the “Tailored Requirements Document.” If it is possible to satisfy 360° requirements through adaptive lifecycle tech refresh of an existing program, do so. Otherwise, document the adaptive acquisition strategy, AoA, cost analysis, logistic support planning performed in steps above as exit/entry criteria for all or part of the required Material Solution Analysis (MSA) and Technology Maturation and Risk Reduction (TMRR). Document the 360° virtuous engineering cycle of incremental mature technology prototype V&V => deploy => incremental improvement => V&V => deploy as an adaptive Systems Engineering Plan (SEP) and Test & Evaluation Master Plan (TEMP) for Adaptive Engineering and Material Development (EMD). Document plans for use of 360° procurement vehicles, whether based on FAR or OTA, as the Acquisition Plan. Brief Acquisition Strategy Plan (ASP) accordingly, and obtain Decisions & Findings (D&F) (e.g. for use of OTA) and/or waivers as necessary. (See figure: 2.)

9. Field X% of the ideal 360° solution immediately. Compose a certified implementation of the solution architecture from mature components. Execute procurement or sustainment funds necessary to field the X% solution.

10. Perform 360° virtuous cycle prototype development to close gap across the lifecycle. Precisely define the requirements gap between benchmarked existing capability and the next incremental objective. Execute RDT&E funds to allow COTS solution providers to improve existing mature prototypes (i.e. current versions of COTS offerings.) Assure that intellectual property rights are sufficient to achieve government objectives regarding use within the program element, and reuse across program elements, across the lifecycles of interest.

11. Iterate steps 1-10 across 360° of capability lifecycle.

Adaptive Acquisition in DODI 5000 Context



Adaptive Acquisition by Prototype

- Requirements: emphasize outcomes, not design, and trade space across lifecycle
- TEMP: Leverage mature, well-documented, prototypes to streamline testing
- Risk Matrix:
 - Streamlined process reduces risk to schedule
 - Mature prototype V&V reduces risk to cost, technical performance, and schedule
 - **OTA reduces risk of protest & risk of vendor lock**
- SRR: Preliminary V&V of prototype provides basis of source selection **for OTA prototyping awards**
- PDR: Robust V&V down selects viable solutions
- CDR= Integration test of mature prototype (perhaps in lieu of LRIP): Exit criteria = production decision criteria **for direct award of follow on production**

Figure 2: Adaptive acquisition is way to approach tailoring DoD 5000.02

Adaptive Engineering Procedures to Optimize Risk-Reward

The following steps aim to add implementation detail to the engineering aspects of the conceptual description of Adaptive Acquisition provided above.

1. Consider if and how to apply Modular Open System Approaches (MOSA) to enhance programmatic lifecycle efficiency and effectiveness. (See Open System Practical [Guide](#))
2. Use of MOSA notwithstanding, parse program into a portfolio of quasi-independent, relatively short duration, engineering tasks – typically aimed at evolving prototype technology and/or processes -- and periodic integration events, with clear, objective, exit criteria. (See figure: 3.)
3. Specify testable, outcome-based threshold and objective requirements. Identify associated risk-reward factors and management actions. (See Appendix A.)
4. Adjust these requirements and risk-reward management plan iteratively and frequently. Address, at minimum, the following topics.
 - 4.1. Mission effectiveness
 - 4.2. System performance
 - 4.3. Lifecycle speed-to-capability (initial and tech refresh)
 - 4.3.1. Time to procurement award
 - 4.3.2. Incremental development cycle time
 - 4.3.3. Time to test
 - 4.3.4. Time to certify
 - 4.4. Lifecycle cost-per-capability
 - 4.5. Safety/flight worthiness, including certifiability

- 4.6. Enterprise interoperability
 - 4.6.1. Cyber security and certifiability
 - 4.6.2. Position Navigation and Time (PNT)
 - 4.6.3. Component reusability
 - 4.6.4. Information sharing
 - 4.6.5. Training
- 5. Create 360° test cases and weighting factors that address all the objectives specified per the above. Specify these test cases and weighting factors as basis of “Value Adjusted Total Evaluated Price” ([VATEP](#)) source selection criteria.
- 6. Provision any Government Furnished Information/Equipment (GFI/E) that might serve as physical or virtual models, i.e. “prototypes”, of technology or process objectives.
- 7. Publish 360° test cases, together with summary of overall acquisition project parameters such as budget, schedule, competitive considerations, risk-reward management strategy, access to GFI/E, and any architectural constraints as broadly as possible. Do not specify particular engineering solutions.
- 8. Provision 360° test cases. Solicit all potential solution providers to Validate and Verify (V&V) their offered, mature, physical or virtual models that address all mission, technological, and process objectives.
- 9. Apply V&V results to
 - 9.1. Perform trades analysis and adjust requirements.
 - 9.2. Specify the requirements gap between tested best of breed off-the-shelf capability and adjusted threshold and objective requirements.
 - 9.2.1. Use this gap analysis to specify developmental exit criteria (e.g. M/S C) prior to award for production.
- 10. Publish V&V outcomes as broadly as possible. Award funds to best-of-breed solution provider(s) to:
 - 10.1. If developmental exit criteria are not met, execute RDT&E as necessary to close a specified increment of capability requirement gap, or
 - 10.2. If developmental exit criteria are met, provision specified quantities of lifecycle-supported capability.

Structure of Prototype Project

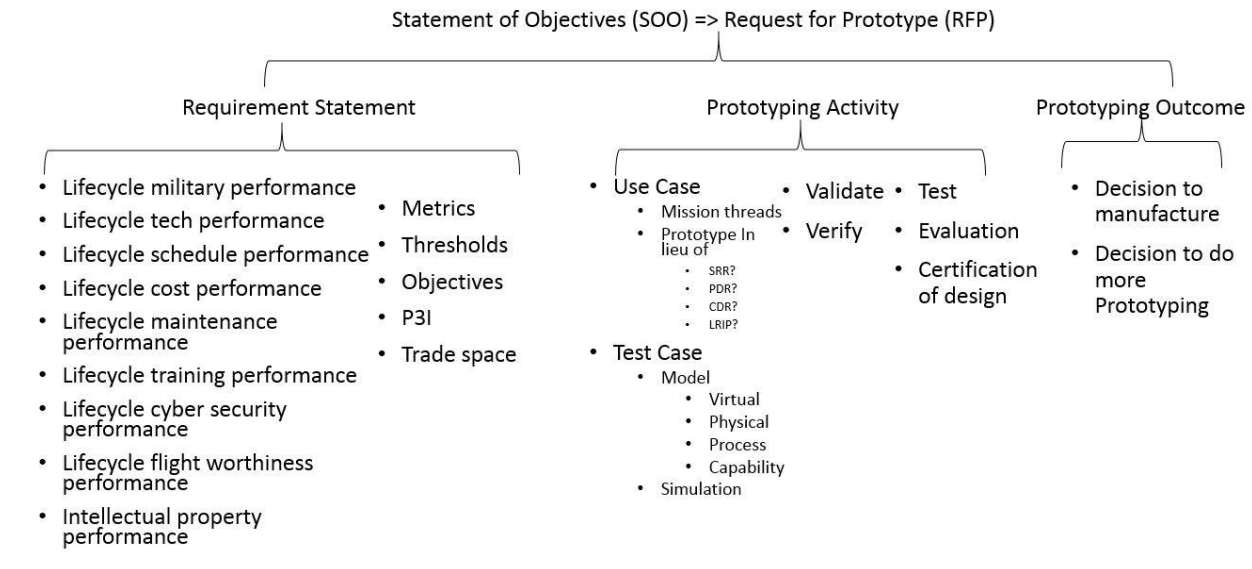


Figure 3: Each prototyping project manager should consider, at minimum, the elements portrayed in this diagram.

Adaptive Procurement Procedures to Align Competition and Incentives

Competitive procedures, as mandated by the FAR, aim to: a) attain “best value”, i.e. optimize capability-per-cost for the government through competition across the industrial base; and b) assure that government funds are allocated equitably. However, effectiveness of competitive procedures under the FAR often suffers from burdensome serial, repetitive, and subjective processes that tend to take a long time, and preclude participation by potential solution providers who are not willing to suffer what they perceive as undue bureaucracy. Adaptive acquisition aims to attain best value, lower barriers of entry, and decrease timelines by:

Reducing redundant paperwork;

Parallelizing processes;

Increasing transparency of budgets and schedules;

Catalyzing formation of open consortia of competitors and collaborators;

Employing objective test cases of both technical performance, and lifecycle acquisition processes, as basis of due diligence, selection, and awards.

The following steps aim to add implementation detail to the procurement aspects of the conceptual description of Adaptive Acquisition provided above.

1. Achieve outreach, transparency, and efficiency through open, program-centric, consortia or sub-consortia. Expand the concept of “Industry Day” to catalyze a persistent community of traditional

and non-traditional contractors. Preferably, incorporate as a not-for-profit organization with low barriers to entry.

- 1.1. Leverage existing not-for-profit organizations as appropriate. For example, explore feasibility of establishing a working group within existing trade associations or “Other Transactions” Agreement (OTA) consortia.
- 1.2. Specify that the purpose of program-centric consortium is to facilitate government-industry collaborative engineering, and equitably facilitate competition and government investment throughout the lifecycle of the program or project of interest.
 - 1.2.1. Establish frequently iterative feedback process to discuss requirements, budgets, schedules, and potential solutions; issue solicitations; and receive suggestions.
 - 1.2.1.1. Consider use of consortium-type OTA, or executing some other contractual relationship with the consortium, as means to compete and award parallel engineering activities across program/project lifecycle.
- 1.3. Employ 360° test cases as basis of competition, initial and incentive awards, and contract language generally.
 - 1.3.1. Plan to attain Best Value through Trade Off via VATEP. (In some cases trade off analysis may lead to conclusion that the best option is lowest cost, technically qualified option.)
 - 1.3.2. Create concise 360° “Statement of Objectives” (SOO) comprised of the requirements and test cases. Adjust the SOO continuously at each iterative programmatic event.
 - 1.3.3. Conduct market survey and trades analysis by publishing the SOO broadly and is far in advance of intended award as is practical. Invite respondents to demonstrate existing capability per test case. Adjust SOO per lessons learned.
 - 1.3.4. Solicit proposals for parallel engineering tasks.
 - 1.3.4.1. Specify incentive-based funding ceiling for each task, e.g. model similar to “Cost Plus Fixed Fee/Award/Incentive” or grant. (OTs are not constrained by FAR models, but may certainly leverage effective approaches.)
 - 1.3.4.1.1. If an OTA is used in lieu of FAR contract, the fee structure might be tailored beyond typical FAR models. E.g., the “plus” might be a negative number in cases where vendors agree to share project costs. “Incentives” might be in the form of favorable intellectual property rights rather than a monetary award.
 - 1.3.4.2. Specify that V&V of existing capability will serve as sole basis of both Best Value (most likely VATEF) source selection criteria, and negotiation of contractors’ bid. (E.g., the contractors’ submitted lifecycle capability-per-cost model will constitute the contractors’ bid. V&V of that model will constitute government due diligence.)
 - 1.3.4.2.1. If an OTA is used in lieu of FAR contract, the Truth in Negotiations Act (TINA) may not apply. Nevertheless, USG’s V&V of proposed cost model must be sufficiently rigorous to stand auditor’s scrutiny in context with size of award, and risk to project success.

- 1.3.5. Specify objective V&V criteria, for any or all of the topics under ***adaptive engineering*** step 4 that qualify for initial award or follow-on incentives.
- 1.3.6. Award appropriately incentivized contract or OTA for each parallel engineering task solely on basis of V&V events.
 - 1.3.6.1. Use SOO as basis of PWS.
 - 1.3.6.2. Monitor contractor performance as part and parcel of periodic V&V events and make or withhold payment as appropriate.

Further Detail

Appendices A-C provide more detail. Appendix A provides background, step by step procedures, and templates for soliciting and awarding “Other Transactions.” Appendix B explains how to measure value in context with Defense systems, and therefore optimize risk mitigation activities to maximize return on investment. Appendix C provides selected references to relevant adaptive acquisition policy together with excerpts.

“Other Transactions” Practical Guide

This a “living” informal collection of lessons and learned and effective practices. It is not an official document, and does not represent U.S. Government Policy.

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Office of Transformational Innovation

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Official Guidance

Please see the Office of the Secretary of Defense (OSD) “Other Transactions” Guide for Prototype Projects of January 2017 (embedded at page 54) for official, but also thorough and pragmatic, guidance for application of “other transactions” authority within the Department of Defense. This unofficial OT Practical Guide aims to be entirely consistent with the official guidance, but also thoroughly informed by extensive interaction with actual practitioners.

What is “Other Transactions” Authority (OTA)?

Under US Code Title 10 (10 USC 2371 and 2371b), an “other transaction,” or just “transaction,” is a legally binding procurement agreement between government and industry that is not governed by rules for “contracts” per the Federal Acquisition Regulation (FAR). Congress established “Other Transactions” Authority in recognition that, in order to achieve the US Government’s (USG) objectives for innovation, the USG must, from time to time, depart from prescriptive procurement boilerplate, which today is represented by the FAR. For example FAR bureaucratic requirements regarding *Cost Accounting Standards (CAS)*, *Intellectual Property Rights (IPR)*, and *Competitive Procedures* might be at odds with government requirements to engage and incentivize non-traditional partners, accelerate speed-to-capability, evaluate alternative business, mission, or engineering processes, etc. In those cases, government officials are trusted to respect the intent of the underlying legislation that led to FAR guidance, but are empowered to impose alternative methods to achieve that intent that are appropriate to the specific risk, priority, and expertise profile of the project of interest. Fourteen federal agencies have OTA. The first to receive it was NASA in 1958. Congress granted the authority for early phase research to DARPA in 1989, and extended it to all of DoD and expanded the scope to include prototyping projects in 1994. Congress has steadily expanded the scope of the statute over the years. See excerpts below:

10 USC 2371 – Research projects: transactions other than contracts and grants

“... The Secretary of Defense and the Secretary of each military department may enter into transactions (other than contracts, cooperative agreements, and grants) ... A cooperative agreement containing a clause under subsection (d) or a transaction authorized by subsection (a) may be used for a research project when the use of a standard contract, grant, or cooperative agreement for such project is not feasible or appropriate...”

10 USC 2371b - Authority of the Department of Defense to Carry out Certain Prototype Projects

“... Secretary of Defense may, ... carry out prototype projects that are directly relevant to enhancing the mission effectiveness of military personnel and the supporting platforms, systems, components, or materials proposed to be acquired or developed by the Department of Defense, or to improvement of platforms, systems, components, or materials in use by the armed forces.... for a prototype project ... not in excess of \$250,000,000 upon a written determination by the senior procurement executive ... (that) use of the authority of this section is essential to promoting the success of the prototype project... To the maximum extent practicable, competitive procedures shall be used when entering into agreements to carry out projects ... prototype project may provide for the award of a follow-on production contract or transaction ... without the use of competitive procedures, ... if ... competitive procedures were used for the selection ... in the transaction; and the participants.... successfully completed the prototype project ...”

Note that the authority to enter into prototype project emphasizes relevance to mission. It does not provide legal definition of “prototype.” It does not imply that “prototype projects” refer exclusively to new technology. Rather, the implication is that, consistent with common use of the term in the engineering community, a “prototype” is simply a design model. A design model can be physical or virtual. It can address technology or process. Therefore, a “prototyping project” might aim to develop or select prototype(s), or use prototype(s) to evaluate alternatives. Significantly, prototyping projects might be used to perform market research, material solution analysis, and trades studies. Prototyping is specifically included in “Technology Maturation and Risk Reduction,” and “Engineering and Manufacturing Development” phases of “The Defense Acquisition System”, per DoDI 5000.01. A prototyping project, i.e. operational evaluation of a mature prototype, might take the place of the “Limited Rate Initial Production” phase.

Use of OTA for prototyping projects with value less than \$50M need not be justified in writing. For use of OTA for projects above that threshold, the Senior Acquisition Executive (SAE) must determine and find (D&F) in writing that some aspect of the OTA approach is essential to the success of the project. E.g. if greater speed-to-capability, or outreach to non-typical vendors, is essential, and not likely to occur through the traditional approach, the SAE might determine that OTA is essential.

Intent is that performers who competitively earn the right to deliver design models, have, upon satisfactory validation and verification of the design model, earned the right to deliver production units of the design, a priori, i.e. without further competition.

A summary of the applicability of OTA follows:

- “Other” means “other than a ‘contract’ or ‘grant’”, and therefore not subject to Federal Acquisition Regulations (FAR)
- Used when flexibility in procurement agreement is paramount -- e.g. when application of FAR parts is not feasible or appropriate to achieve legitimate government objectives -- especially regarding innovative objectives

- OTA is flexible, for example:
 - FAR Cost Accounting Standards need not apply
 - FAR based competitive procedures need not apply
 - FAR standards for intellectual property rights need not apply
- The US Government (USG) may execute a transaction for a prototyping project with a single performer or a team of performers.
- USG may also execute an “umbrella” transaction with an “open” consortium of potential project performers/
- Under 10 USC 2371, purpose is basic or applied, research
- Under 10 USC 10 2371b, purpose is to conduct prototype projects, i.e. evaluation of design models
- If an OT for prototype projects is awarded under competitive procedures, and the project is successful, then the Government may make direct award for follow on OTs for prototype projects, or for OTs or contracts for production.

Rationale for Executing “Other Transactions” (OT)

Why OT?

OTA may be applied to conduct basic and applied research, and to conduct *prototyping projects*. The term “prototype” is not defined by statute, but is generally interpreted to mean any virtual or physical design model of a technology or process used to evaluate engineering solutions. Thus prototyping projects may include studies, invention, modeling, simulations, purchases of commercial solutions, test, and/or evaluation that aim to help evaluate engineering solutions, and execute associated programmatic decisions. That prototyping activity might occur during any phase of the Defense Acquisition System.

If an OT for a prototype project is awarded under competitive procedures, and the project is successful, then the government may make a direct award of a contract or transaction for follow-on production and distribution without further competition. Under that authority, a project office can efficiently manage competition based on robustly demonstrated performance with respect to cost, schedule, and technical parameters. Having achieved prototyping exit criteria, the government can directly transition the developed, or demonstrated, capability, as either a COTS product, or a purpose-built military system.

The following requirements and strategies, for example, might justify use of OTA:

- Conduct open ended basic and applied research with elite commercial and/or academic partners
- Conduct Research, Development, Test & Evaluation (RDT&E), certification, and then transition perishable technology to manufacturing and distribution before it is superseded by the next generation
- Crowdsource requirements to broad and unknown market of innovative solution providers
- Establish especially close government-industry partnership with trusted firms
- Equitably share developmental risk with industrial partners
- Conduct adaptive, evolutionary S&T and RDT&E, i.e. each preceding discovery impacts subsequent procurement approach
- Evaluate alternative procurement governance models for potential incorporation into the FAR
- Employ non-traditional incentive models, including with respect to IPR, not feasible under the FAR, for any of the above, or any other legitimate purpose

Why an OT with an open consortium instead of a single industry partner?

The USG may execute an OT for prototyping projects with an open consortium. The purpose of this arrangement is to establish a marketplace of performers who can efficiently and effectively compete and collaborate to perform in-scope prototyping projects with funding awarded by the USG. An “open

consortium” in this sense is any evolving federation of potential performers, with low barriers of entry to all comers, the purpose of which is to execute the requisite portfolio of prototyping projects. The consortium is, by definition, the sum of its members. As a practical matter, OT consortia usually have consortium managers empowered to enter into legally binding agreements, and to govern consortium activity. Typically professional consortium managers create the requisite consortium, or adapt a consortium that exists for another purpose, in response to USG solicitation. They might do that on their own initiative, or at the request of potential consortium members. The USG awards an “umbrella” OT for prototype projects-- with specified funding ceiling and period of performance -to a consortium. The USG may then efficiently solicit and award individual prototype projects to consortium members, using streamlined competitive procedures agreed under terms of consortium membership.

The Army Contracting Command invented consortium-type OTs and pioneered their use. Their many years’ experience verifies the following good outcomes:

- Low barriers to entry, simplified procedures, and clear incentives, indeed, attract innovative non-traditional performers.
- Consortia provide venues for competition among members that are consistent with FAR “free and open” intentions, low maintenance for the government, and efficient both for government and industry participants.
- The same venue that provides for competition is equally efficient for catalyzing partnerships among members.
- Solicitation-to-award timelines are much shorter than typical under the FAR.

What are risks and mitigations?

Consider the following characterization of relative risks and rewards of procurement via OTA vs. traditional FAR approaches.

Risk: Bureaucracy and rigidity of typical FAR-based contracting exacerbates the risk that programs will not achieve cost, performance, and/or schedule targets.

Discussion: Multiple watchdog report and policy initiatives acknowledge that weapon system acquisition is not sufficiently efficient or effective. The existence of this deficiency in the current acquisition process proves that the status quo approach to managing procurement risk is not adequate.

Mitigation: Use OTA to experiment with alternative procurement language to find best practices for achieving cost, performance, and schedule targets associated with harvesting value from the highly volatile commercial technology marketplace. As best practices are identified, apply them to develop new standard FAR-based contracting language.

Risk: Flexibility of OTA will lead to abuse.

Risk: Non-standard procurement language used in OTAs will lead to binding agreements, e.g. re intellectual property rights, that are unfavorable to the government.

Discussion: The following data points are relevant:

- 10 USC 2371b is basis of OTA for Prototyping Projects for DoD. The OSD 2017 *OT Guide for Prototyping Projects* explains uses and constraints in context with OSD policy. Generally:
 - Senior Acquisition Executives (SAE) of DoD departments and agencies may authorize OTs of \$50M – \$250M, and may delegate authorization authority for OTs of less than \$50M. The OSD SAE may authorize OTs for larger amounts. Authorization must explain why use of OTA is essential to project objectives, and be in writing.
 - Typically, commercial partners must pay 1/3 development costs. That requirement may be waived if the commercial team includes small business(es) or non-traditional Defense contractors. Non-traditional Defense contractors are defined as companies that have not entered into procurement agreements with DoD wherein they were required to fully comply with FAR Cost Accounting Standards (CAS) within the last twelve month period.
 - The term “prototype” is not defined by statute. Generally, it refers to how a thing is used, not what it is. “Prototypes” are design models used to evaluate potential solutions. They may be physical or virtual, and may address technology or processes.
 - By their nature prototyping projects fundamentally address Test and/or Evaluation. Hence, normally use of RDT&E funds is appropriate. However, according to the Financial Management Regulation, there are some exceptions. See Appendix C-1 for detail.
 - In addition to executing OTs with individual firms and teams, DoD departments have executed OTs with open consortia. The term “open” means that barriers to membership and dialog between government and industry are low. When an “umbrella” consortium-type OT is in place --with established funding ceiling and period of performance -- transactions for individual projects may be solicited and awarded very quickly. Thus, consortium-type OTs can effectively establish a marketplace around government requirements.
 - If an OT for prototyping has been established under competitive procedures, and the prototyping project is deemed “successful”, the Government may make a direct award of a traditional contract, or an OT, for production. Further competition is not required.
- A [Rand assessment of OTA](#) circa 2000, based on a sample of 21 of a total of 72 DoD projects executed under OTA, concluded that rewards outweighed risks. This is particularly true under certain circumstances including projects “offering DoD the opportunity to benefit from innovative business relationships.”

- 2001 [GAO](#) Congressional Testimony concludes that OTAs are effective tools for helping DoD leverage commercial innovation, that DoD has taken important steps to provide guidance for use of these tools, but that follow-on training is essential. The report describes mixed results against objectives, but makes no reference to suspected or documented abuse.
- A [2006 GAO](#) report on DoD vulnerabilities to fraud waste and abuse, performed in response to the Darleen Druyun scandal, cites interagency contractual agreements, and IDIQ contracts as risky, but does not mention OTA.
- A 2012 [Rand report](#) of lessons learned from the Future Combat System (FCS) failure noted “use of OTA in the design concept phase was clearly warranted.” The report also documented that although rationale for use of OTA for later program phases was questionable, and Congress was concerned over potential for abuse, the choice of OTA rather than FAR-based contracts was not the central issue. (Note that no actual abuse was documented.) The central issue was not effectively aligning fiscal incentives with clear value-based programmatic outcomes.
- A 2012 [GAO report](#) of DHS use of OTA concludes that while DHS finds OTA to be an important tool with enough flexibility to allow development of critical technology, DHS metrics regarding OTA effectiveness, and audit methods in general, are inadequate. The report cites DoD’s metrics and audits as an example of a better process. In this review of 58 OTAs over eight years, the report explains risk of abuse, but does not mention any issues associated with documented or suspected abuse.
- A [2016 GAO](#) report explains how OTA is employed by eleven different federal agencies.
- A 2013 article in “The [Procurement Lawyer](#)” Journal suggests that given tightening Defense budgets, and reluctance of firms in the technology sectors to enter in FAR-based contracts, OTAs provide a viable alternative means for DoD to leverage industrial innovation. The article explains legal basis and rationale for use of OTA, and provides useful cautions.
- Conversation with Denise Scott, RDECOM-ARDEC Legal Office, (circa Feb 2017) indicates that the consortium-type OTAs she has overseen for ten years, in partnership with Army Contracting Command (ACC), have been low maintenance from a legal perspective. In particular, competing vendors have not protested a single award. Meanwhile, according Kim Blancuzzi of the Army Weapon System IT Center, technical overseer of the ACC C5 Technologies OTA, typical award time is less than two months.

- The Air Force Research Laboratory, Rome NY, established the Open System Acquisition Initiative OT with the System of System Consortium (SOSEC) mid FY16 with \$100M ceiling and 5 year period of performance. This is the first USAF consortium-type OT. After less than one year's effort approximately ¼ of the ceiling was executed across a dozen or so projects, the consortium membership has grown continuously (now ~200 firms), and solicitation to award times are measured in weeks.

Mitigation: Clearly the risks associated with OTA flexibility are real. Further, lack of objectives statistics regarding historical OTA effectiveness is troubling. However, lack of clear objective statistics regarding FAR-based contracting effectiveness is equally troubling. To address these issues, the following risk mitigating actions are appropriate.

- Learn lessons by working closely with procurement professionals who have successfully managed risks and harvested rewards associated with consortium-type OTs.
- Build a Systems Engineering Plan that breaks the project into relatively small parallel efforts. Use OTA to issue small focused awards with rapid turnaround cycles. "Failures" will occur fast and cheap when they occur. Turn so-called failures into lessons learned for the next iteration.
- Handpick a team of procurement professionals to manage the OT process. Provide sufficient resources to allow them to succeed.
- Establish engaged oversight at the appropriate level, commensurate with dollar value and criticality of projects.
- Define objective adaptive acquisition metrics for validating and verifying requirements and tracking project cost, performance, and schedule. Use robust "plug testing" to collect those metrics and populate a risk/reward dashboard for review at all levels.

Senior Acquisition Executive (SAE) OTA Decision and Finding (D&F) Template (USAF)

Again, use of OTA for prototype projects with value between \$50 and \$250 million require written justification by the appropriate service SAE. Projects with greater value require approval by OSD. Consider the following template for written D&F.

SAF/AQ Letterhead

MEMORANDUM FOR _____ (Contracting Office that will Execute OT)

FROM: (For example) SAF/AQ
1060 Air Force Pentagon
Washington DC 20330

SUBJECT: Written Determination to Use an Other Transaction for Prototype Project Exceeding \$50,000, but not Exceeding \$250,000 – “ _____ ” (Name of Vehicle)

1. Pursuant to Section 845 of Public Law 103-160, as amended, I have determined that _____ (Organization requesting the D&F) may execute the _____ (Name of Vehicle) as a prototype project using “Other Transactions” Authority (OTA) under 10 U.S.C. 2371.

2. _____’s (Organization’s) proposed approach to _____ (Name of Vehicle) represents a unique methodology for obtaining capabilities directly relevant to mission effectiveness of military personnel and their supporting platforms, systems, components, and/or materials. Relevant non-traditional and commercial organizations have expressed concern with cost accounting standards, intellectual property rules, and audit requirements of Government contracting and therefore refrain from participating in traditional federal procurement opportunities. The Air Force is not able to take sufficient advantage of the research and development conducted, and the existing products, services, and processes offered by these organizations. This research and development, and these products and services, would likely add significant benefit to weapon system development and sustainment. Further, in some cases the technology involved is highly perishable, and traditional application of FAR process would likely preclude its timely deployment. Judicious application of OTA for prototyping projects (OTP) provides an effective means to alleviate these issues, and therefore will catalyze significant enhancement to warfighting capability.

3. The OTP negotiated as part of the _____ (Name of Vehicle) acquisition shall be limited to a total value of not more than _____ (no more than \$250M) (including all options). Furthermore, non-governmental awardees for projects will either include at least one nontraditional Defense contractor, or small business, participating to a significant extent, or will contribute at least one third of project costs.

4. I have found, as further provided in the attached background paper (explanation of the purpose and rationale for the requested vehicle provided by requesting organization) that: (a) the _____ (Name of Vehicle) meets the requirements of Section 845(a)(2)(A)(i) and (ii) of P.L. 103-160, as amended; and (b) such authority is essential, in view of the need to attract non-traditional Defense contractors, and to achieve sufficient speed-to-capability by promoting the success of _____ prototype projects; and (c) exceptional circumstances justify the use of OTA to provide for innovative business arrangement or structures, notably use of a consortium, that would not be feasible or appropriate under a contract. Therefore, I authorize execution of the _____ (Name of Vehicle) under OTA in accordance with Section 845(a)(2)(A) of P.L. 103-160, as amended.

Signature Block

Considerations for Establishing and Managing “Other Transactions” (OT) Consortia

The following guidance is derived from lessons learned by actual practitioners.

Prime Directives

1. Leverage the opportunity to innovate that exists because OTs need not comply with FAR.
2. Notwithstanding #1 above:
 - a. Do not reinvent existing contractual clauses, or sub clauses, that work just fine.
 - b. If you do use FAR methods and clauses, consider re-naming them to preclude invoking the kind of legacy thinking you are trying to supersede.
3. Plan to adjust terms of agreements early and often as lessons are learned; broadcast those intentions as widely as possible at every opportunity.

Humans tend to default to the familiar. Resist! As is the case in any engineering endeavor, the appropriate first step for any OTA-related project is to clearly specify desired outcomes for both governance processes and delivered capability. Next, determine how best to incentivize those outcomes given facts-of-life boundary conditions. If an existing set of contractual clauses or sub clauses -- either in government or industrial boilerplate -- serve the purpose, re-use those elements, but only those elements. (Consider using different words to express the legacy elements!) If and where adequate boiler plate procurement artifacts do not exist, invent new clauses with the intent of reusing them in the future. Regardless, accept that whatever agreements you make will not be perfect. Plan from the start to adjust downstream. Make sure OT clauses address the need for government and industry to continuously evaluate progress, and adjust details of the agreement as necessary.

Nature of “Transactions” in a Consortium Arrangement

There are essentially two kinds of transactions that occur between government and industry in an OT consortium: an “umbrella” transaction between the USG and the consortium governing body, and prototyping project transactions between the USG and actual performers. The umbrella transaction establishes the terms of reference for the envisioned prototyping activity. It will describe scope, ceiling, and period of performance for the entire envisioned body of work. It will also specify the services to be provided by the consortium governance authority --which is typically a consortium manager -- and the associated compensation. Usually compensation for the consortium manager does not occur until funds are awarded for individual projects. In that case, executing the umbrella transaction does not require transfer of funds. Alternatively, the umbrella transaction could include delivery of a retainer fee to the CM.

Once an umbrella transaction is in place, transactions for individual projects may be executed. These project transactions are legally binding procurement instruments between the USG and the actual performing firm. The consortium manager is not a party to these transactions, but will usually serve as the broker. I.e. the USG sends money to the CM. The CM takes the appropriate fee for service per terms of the umbrella transaction, and delivers the remaining funds to the performers per terms of the project transaction.

Ceilings and Scope of “Other Transactions”

Service Secretaries have authority to establish “Other Transactions” (OT) for prototyping with awards between \$50 and \$250M. Regarding consortium type OTs, these award values have typically been interpreted as a cumulative ceiling for all prototype projects executed under the OTA across a specified period of performance. Presumably, the Senior Acquisition Executive (SAE) will refresh the ceiling when circumstances dictate. It is also possible that the SAE might agree that the award limits apply to each project executed under the “umbrella” of a consortium-type OT.

Regardless, the scope of the OT will influence the amount and type of fiscal activity that occurs, and how quickly the cumulative award ceiling is reached. The scope will also influence how and whether the OTA catalyzes acquisition across program lines, which may or may not be an objective. Thus, the scope will influence the numbers and expertise of members of the contract office required to execute and monitor OTAs.

Per all the above, specifying the scope of a consortium type OT is both important and potentially difficult. Getting the right mix of manageable activity and innovative outcomes will require some trial and error. Consider options for provisioning flex and surge support by procurement experts for OTs, just as for other omnibus-type vehicles.

OT Consortium Source Selection Criteria

Government stakeholders should design the target capabilities and demographics of both the consortium members, and the consortium management structure.

Consortium members may represent different technology sectors, different sizes, and differing degrees of familiarity with government procurement process. They may provide particular managerial, engineering, and/or analytical capabilities.

The OT consortium itself is, by definition, the sum of its member. As such, the consortium, per se, should be a not-for-profit organization that exists to equitably serve government and private interests in performance of the USG mission at hand. However, OT consortia need not be formally incorporated as not-for-profit companies. They need not be legally incorporated at all. However, an OT consortium, i.e. the members of the consortium, should be bound by some governing charter that specifies alignment with the intention and scope of the government requirements. Ideally the OT consortium membership process presents low barriers to joining on the one hand, but also provides a reasonable degree of vetting to assure good standing in context with the consortium charter on the other.

Theoretically, the members of an OT consortium could agree on some management process that does not require a single point of contact to act on behalf of all the members. It is much more likely that a Consortium Manager will fill that role. Indeed, very often, professional consortium managers will respond to USG solicitations by causing OT consortia to form in the first place. Or, if a group of companies wishes to respond to an OT solicitation, the group will likely seek the services of a professional consortium manager to organize their bid.

Consortium Managers can be individuals, for profit corporations, or not-for-profit corporations. The CM serves as an independent agent of the government, and will generally not be eligible to compete for project awards. Some argue that retaining a 501.c.3 not-for-profit firm for this function reduces potential for perceived conflict of interest.

CM's should demonstrate ability in at least three categories: 1) brokering government requirements across its membership; 2) managing and documenting fiducial activities necessary to transfer funds from government to consortium; 3) provisioning value added services with respect to the government's objectives. Examples of value added services include targeted recruiting of new members, facilitating acquisition process innovation, performing/facilitating technical validation and verification, capturing evolving best practices and standards, managing events, performing training, etc. Government stakeholders should consider how they want the CM to facilitate government objectives, and if and how the CM might potentially augment governmental activity.

Accordingly, the government's Statement of Objectives (SOO) supporting the solicitation and award might address some or all of the following topics. The SOO should also specify objective measures and/or subjective evaluation factors associated with each topic.

- Number of members who are "traditional," non-traditional, large, small, foreign domestic
- Technology sectors represented by members
- Relevant services represented by members, e.g. engineering, program management, analysis, test & evaluation
- CM financial expertise
- CM technological/engineering expertise
- CM acquisition expertise
- CM training expertise
- Prior performance by members' and or CM regarding the scope of the OTA.
- Method for firewalling consortium manager from actual prototype project execution, e.g. use of 501.c.3.

Consortium Managers' Fee Structure

The government will consider multiple potential fee structures in the management of this consortium. A fixed fee per transaction is the most straightforward approach. However, the benefits of alternative structures might outweigh the value of simplicity. Ultimately, the government is seeking a fee structure that helps minimize expense to the government while maximizing competition within the consortium.

The government should consider a range of transaction fee structures, as well as incentive-based approaches that may encourage the CM to perform some or all of the value-added services discussed in the previous section, for example expanding the bidding pool to an optimal number of participating vendors (particularly non-traditional defense contractors).

Some examples of potential transaction fee structures include:

1. Fixed transaction fee (same fee regardless of price of project)
2. Tiered transaction fees (fees vary for projects that fall within different price ranges) based on project price, and/or services rendered by CM, adjusted to exclude hardware, material, and travel costs¹
3. Tiered transaction fees based on total project price
4. Percentage of price up to a maximum \$ amount based on project price adjusted to exclude hardware, materials, and travel costs
5. Percentage of project price up to a maximum \$ amount

Proposed incentive structures could be evaluated as part of an offeror's bid. It might be sufficient to explain how the proposed transaction fee approach incentivizes keeping the cost of individual efforts down in order to create greater opportunity for further transactions under the ceiling of the agreement. Government could also consider how the transaction fee might further other government objectives. For example the fee structure might incentivize higher quality competition during PlugTesting, since the CM will be compensated based on the number of PlugTest participants that receive an award.

The government's expectation might be that fixed fee plus incentive structures would result in a lower fixed fee per transaction than would occur without the incentive. Offerors who are interested in this structure should define the cost differences between the two.

The government will consider alternate fee structures to the examples provided above. However, offerors should indicate how these proposed fee structures can be practically implemented and minimize cost to the government and maximize competition for each transaction.

Intellectual Property

Following award of the agreement, the government will work with the Consortium Manager to establish a set of Intellectual Property templates that define varying degrees of government rights to products

¹The exclusion of hardware, materials, and travel from the fee calculation is intended to capture labor costs as the main indicator of risk in a given project, which may lead to more challenging management during performance of a given project. Projects that consist in large part of material, hardware, and/or travel are perceived to be less risky and require less potential for substantial involvement on the part of the Consortium Manager

acquired through the OT Consortium. Each government program that utilizes the OT Consortium will select the appropriate template to meet its needs, with input from the Consortium Manager. Government programs may choose to define Intellectual Property clauses separate from the pre-defined templates on a project-by- project basis, in consultation with the Consortium Manger.

Project Award Fee Structure

Significantly, OTAs are not constrained by FAR fee structures, intellectual property models, or cost accounting standards. Government stakeholders and CMs need not default to familiar FAR language. Rather, they may first determine the most effective way to incentivize the targeted outcome. Then align the fee structure in a way that provides the appropriate incentive. If there is any new development involved, likely the right fee structure should be some form of best effort or incentive-over-cost model. Given the option for price sharing between government and industry the “plus” might actually be a negative number in terms of the industrial contribution. The “incentive” might take the form of a lucrative intellectual property rights agreement. Most likely, fixed price models should only apply when the project demands simple delivery of existing COTs products and services.

Solicitation for Creation of an OT Consortium

Please consider the following notional example of an OT consortium solicitation as a potential template.

Notice Type: Solicitation

Added: ____

Title: _____

Synopsis:

XYZ Program Office (XPO) is releasing this notice to inform interested parties of, and seek comments and questions concerning, a potential forthcoming award of a transaction for establishing a consortium for conducting prototyping projects per 10 USC 2371b: “Other Transactions” Authority for Prototyping Projects.

XPO is exploring options regarding competitive award of an “other transaction” (OT) to an eligible new or existing not-for-profit consortium of large and small organizations representing traditional and non-traditional Defense contractors, as well as academic institutions. Consortia need not be formally incorporated, but they may be. The mission of the consortium must include performing research, development, test and evaluation within prototyping projects that address XYZ and customer requirements for X systems.

XPO may choose to award an umbrella transaction for “Adaptive Acquisition for X Systems” (A2XS). XPO would make such an award to an eligible consortium internal governing body, or its designated third party manager. Consortium managers (CM) or governing bodies must have means and legal authority to represent the interest of all the members of the organization, organize their activities, and make binding agreements on their behalf.

After establishing an “umbrella” OT with a consortium or its designated consortium manager, the USG would consider making solicitations and awarding funded transactions for an indefinite number of prototyping projects within the scope and period of performance of the umbrella transaction. It is likely that the CM, if any, would receive a portion of these awards as a service fee. However, the CM must remain independent of the internal competitive process, and may not participate as a participant in the prototyping project transactions per se. Any alternative governance structure must explicitly explain how it avoids conflict of interest in the internal competitive process.

Scope and Objectives:

XPO has found that its legacy acquisition methods tend to be inflexible and overly bureaucratic, leading too often to unsatisfactory efficiency and effectiveness with respect to cost, schedule, and system and process performance. Therefore XPO aims to take advantage of the inherent flexibility afforded by “other transactions” authority to achieve the following general objectives.

Procurement Objectives

- Expose USAF requirements to, and lower barriers for, broad community of traditional and non-traditional solution providers.
- Accelerate solicitation to award timeline.
- Employ objective, test-based, Validation and Verification as basis of Analysis of Alternatives (AoA), trades analysis, source selection, and performance monitoring.
- Develop Intellectual Property Regimes (IPR) and Data Rights that incentivize mutually beneficial government-industry partnership.
- Transition successfully tested prototype applications as vendor-supported off-the-shelf products.

Management and Engineering Objectives

- Provision continuous feedback loop with operational customers.
- Establish persistent, broadly accessible, test tools, and execute test cases to achieve Validation and Verification (V&V) in support of: market analysis, AoA, trades, development, operational transition, certification, and life cycle tech refresh as parallel activities.
- Minimize risk of technology perishability by executing rapid, iterative, evolutionary, demonstration-to-delivery cycles.
- Continuously evolve an appropriately “open” technical architecture that optimizes government investment in both leveraging best available existing commercial technology, and developing new technology in partnership with industry.

The scope of A2XS prototyping projects might include any topic generally consistent with the RDT&E of (explain scope of intended prototype projects, erring on the side of broader rather than restrictive) . Generally government sponsors with use RDT&E appropriations for these activities. However, use of procurement or O&M appropriations might be appropriate to pay for prototyping projects for testing and evaluation of non-developed items, or Commercial Off-the-Shelf (COTS) items, under conditions explained in the Financial Management Regulations.

USG is considering applying the following authorities regarding options for award, which are enumerated in 10 USC 2371b:

- \$250M accumulative funding ceiling may be apportioned across a specified period of performance.
- Contractors receiving awards under A2XS will contribute one third cost share unless one of the following applies
 - Awardee is a “small business,” “non-traditional Defense contractor,” or a team consisting entirely of small businesses and non-traditional Defense contractors, as defined in the statute.
 - Team receiving the award, which may include “traditional Defense contractors” includes at least one non-traditional Defense contractor who will contribute significantly to project objectives
- USG may choose to make direct award for production, without further competition, following prototype projects that successfully achieve defined exit criteria.

Source Selection:

USG seeks comments on, or alternatives to, the following notional source selection criteria:

- Bidding consortia must be not-for-profit organizations. They may or may not be formally incorporated as such, e.g. per under 26 USC 501(c) 3.
- Bidding consortia must designate an individual or organization to serve as consortium manager, or specify an alternative governance structure that represents the best interest of the members at large, and may serve as an independent facilitator of, but not participant in, competitions for prototyping projects.
- Consortium managers, if any, must specify how they will work closely with the government to help shape and broker prototyping projects, and represent the business interests of the consortium members without conflict of interest. Consortium managers incorporated as not-for-profit for scientific purposes under 26 USC 501(c) 3 may cite that status as evidence. However not-for-profit status is not a requirement.
- Bidding consortia should exhibit the following characteristics

- Low barrier to entry, including low membership fees and concise membership agreement that is intuitive to non-Defense industry
- Rapid membership vetting and processing
- Members provide broad coverage:
 - Of technical topics of interest to XYZ community
 - Of engineering, analysis, and management services
 - Across traditional, non-traditional, large, and small firms
- Consortium Managers might provide evidence of ability to help assist government objectives by, e.g.:
 - Performing fiduciary tasks associated with transferring funds from government to members
 - Performing targeted recruiting of new members
 - Facilitating teaming among members
 - Providing services associated with domain technological expertise such as the following
 - Performing testing and other forms of validation and verification
 - Capturing and documenting standards and best practices
 - Performing cost capability analysis
 - Performing training
 - Facilitating technical exchange
 - Assisting USG and members to leverage acquisition flexibility allowed under 10 USC 2371b
 - Suggesting innovative fee structures designed to incentives achievement of government objectives, e.g.
 - Fixed transaction fee (same fee regardless of price of project)
 - Tiered transaction fees (fees vary for projects that fall within different price ranges) based on project price, and/or services rendered, adjusted to exclude hardware, material, and travel costs^{2*}
 - Tiered transaction fees based on total project price
 - Percentage of price up to a maximum \$ amount based on project price adjusted to exclude hardware, materials, and travel costs*
 - Percentage of project price up to a maximum \$ amount

² The exclusion of hardware, materials, and travel from the fee calculation is intended to capture labor costs as the main indicator of risk in a given project, which may lead to more challenging management during performance of a given project. Projects that consist in large part of material, hardware, and/or travel are perceived to be less risky and require less potential for substantial involvement on the part of the Consortium Manager.

The Government anticipates responses to this announcement from interested parties, eligible entities or groups of entities, to include: industry, academic, non-profit, and not-for-profit organizations for research and development. The Government especially seeks feedback from organizations that may be interested in being a consortium manager. An interested parties list will be created, to include entities and groups of entities that would be considering performing the role of soliciting, awarding, and managing prototype projects, as well as individual entities that are interested in joining the resulting consortium. Responses can be sent to _____

Responses (email encouraged) should at a minimum, provide the following:

1. Name of consortium and consortium manager (if any) and website URLs.
2. Telephone number and e-mail address for each POC, CAGE Code, and any other pertinent information
3. No more than _____ (maybe 2500) words of feedback about the draft USG objectives and recommended processes and practices, including explanation of how the objectives would be addressed and outcomes measured and/or recommended alternative approaches.
4. In no more than _____ (maybe 1500) words, explain corporate competencies and past performance with respect to USG objectives and source selection criteria. Explain experience with regard to consortium management in context with government and/or commercial applications.
5. Describe experience in XYZ programs and/or any experience with XYZ related technologies and processes from current and historical sources across Government, industry, and academia; experience contributing to the XYZ domain; and experience promoting efficient and effective XYZ-related information sharing and collaboration.

Please submit all pages as a single (.doc or .pdf) file. Eliminate or minimize any proprietary information. CLEARLY MARK all proprietary information. Note that all submissions become Government property and will not be returned.

The USG anticipates an ongoing dialog with potential bidders, and expects that dialog to result in refinements to this solicitation. At any time during this process the government may choose to refer to the current version of this solicitation, and announce intentions to make awards. If and when that occurs, offerors may announce that their prior submissions serve as bids, or submit supplements or new proposals.

All information is to be submitted at no cost or obligation to the Government. The U.S. Government is not obligated to notify respondents of the results of this announcement. The U.S. Government reserves the right to reject, in whole or in part, any private sector input, as a result of this announcement. If a formal solicitation is generated at a later date, a separate solicitation notice will be published. Interested parties are responsible for adequately marking proprietary or competition sensitive information contained in their response. No sensitive or classified information will be discussed. Foreign-owned, controlled, or influenced firms are advised that security restrictions may apply that may preclude their participation in these efforts.

Contracting Office Address: _____
Primary Point of Contact: _____
Secondary Point of Contact: _____
Contract Specialist: _____

Notional Statement of Objectives (SOO) for Prototype Project Transaction

Please consider the following notional example of a SOO for a prototype project as a potential template.

Statement of Objectives for XYZ Enterprise Open System (Phase 1) Prototyping Project

Appendices:

- A. References
- B. ABC Functional Requirement Specifications
- C. Enterprise Open System Requirement Specifications for Cloud Enabled Software-as-a-Service and Platform-as-a-Service.
- D. Legacy Data Source Description and Network Topology
- E. Government Furnished Equipment/Information

Bottom Line Up Front.

The XYZ Program Office may choose to execute *Adaptive Acquisition* prototyping project(s), under “Other Transactions” Authority per US Code 2371b, as a means to incrementally evolve a cloud-enabled, Enterprise Open System. (See [Reference A](#)) Successful prototyping projects may or may not lead to direct award of transaction(s) or contract(s) for production. The first phase of the project is to provision an authorized and accredited, cloud enabled, ABC capability (ABC is some pilot service offered via the new open system). Functional requirements for the ABC capability are specified at Appendix B. Tasks for this XYZ enterprise open system prototyping project might include:

1. Develop a government reference architecture for a USG cloud enabled Enterprise Open System.

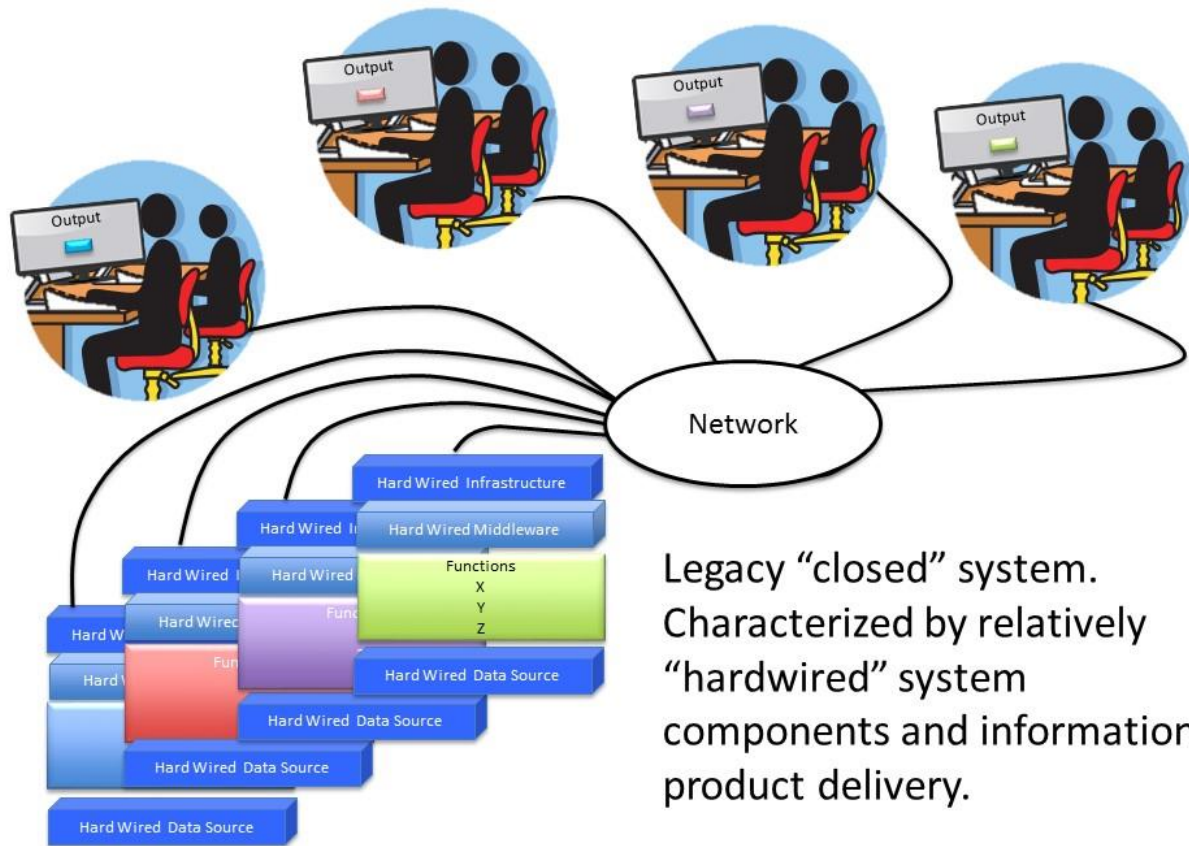
2. Provision a virtual systems integration laboratory (vSIL), including “plug test” capability, that instantiates
 - a. An early “pluggable” prototype version of the Government Reference Architecture (GRA) Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) infrastructure and middleware
 - b. ABC SaaS functionality.
 - c. Virtual Open Standard Security Services (VOS3)
3. Prepare all Risk Management Framework (RMF) artifacts required to achieve Authorization and Accreditation (A&A) to operate the prototype capability on ____ Network(s) (“____” refers to relevant operational and/or test networks)

These six tasks might be performed as either individual or combined tasks by one or more performers, or teams of performers.

Enterprise Open System Prototyping Concept

Today the US Government generally, and DoD in particular, maintain an amalgam of purpose-built networked information systems. (See notional depiction at figure: 1) The mission of the XYZ Program Office is to _____ (explain relevance of XYZ mission to developing the target system.) The standalone, redundant, structure of the legacy architecture sub optimizes opportunities for cross functional operational and fiscal efficiencies. Accordingly, the XYZ Program Office aims to apply *Adaptive Acquisition* and *Open System Acquisition* to iteratively and *continuously evolve* a cloud-enabled, interoperable, enterprise system according to observed best practices from industry and government. (See references A-__.)

As for any information system, the key to evolving effective operational interoperability will be constructing optimal abstraction layers necessary to allow disparate sub-process to efficiently find each other, and conduct high value transactions. (See figures: 2-4) The key to evolving effective engineering



Legacy “closed” system.
Characterized by relatively
“hardwired” system
components and information
product delivery.

Figure 4: Notional depiction of legacy closed system.

interoperability will be performing optimal functional decomposition and adapting the most applicable open standards to allow plug-and-play of off-the-shelf components. The discipline of mapping critical business workflows and then optimizing them with appropriate evolutionary technology choices is often called “Product Line Architecture” (PLA), and is an established effective practice in many industries including, e.g., automobile, consumer electronics, and finance.

First incremental delivery of “open system” via “one-off” adapter.

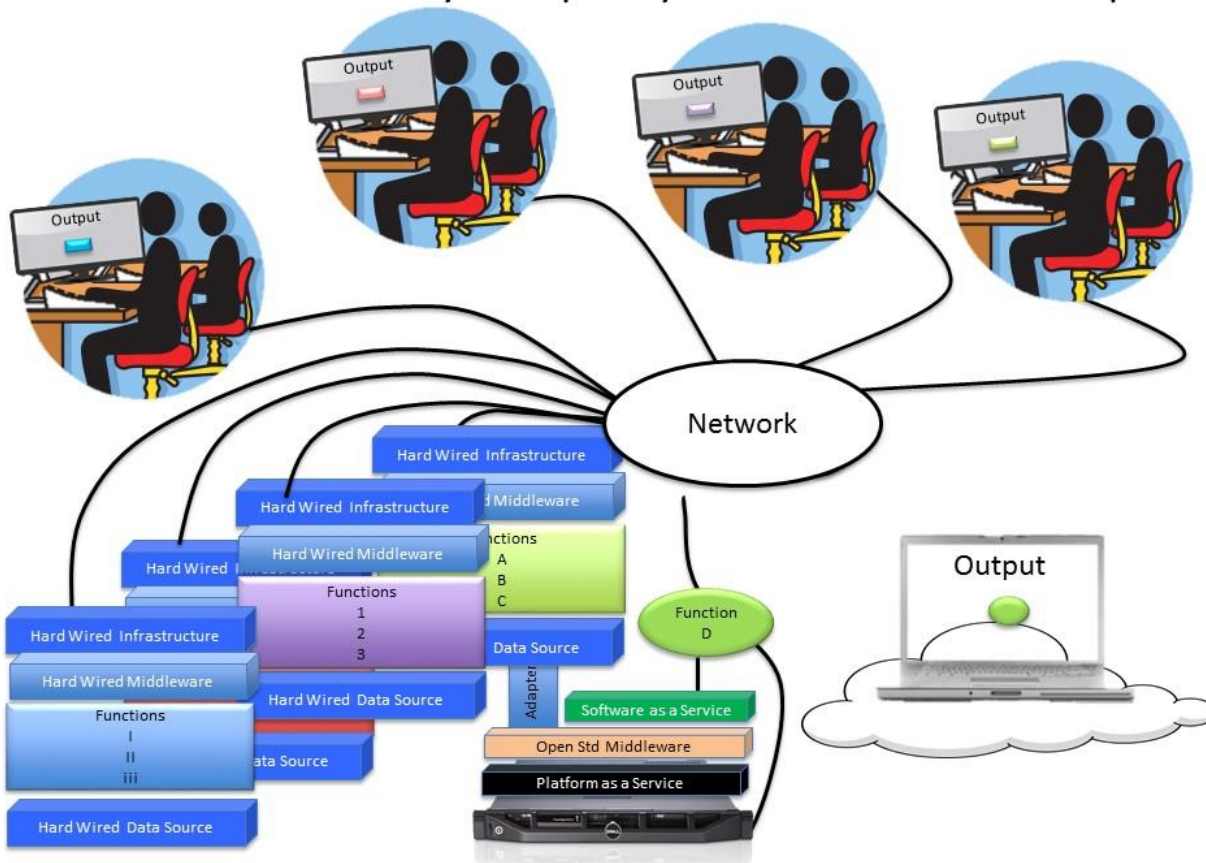


Figure 5: First incremental delivery of “open system” modular components via “one-off” adapter. May also require one-off cloud-ready hardware device(s) to provide temporary infrastructure.

In this sense “evolution” requires a “brownfield approach.” I.e. _____ (“_____” refers to the name of the enterprise of interest, e.g. USAF) will continue to operate the legacy system, while XYZ Program Office executes a series of acquisition projects that will each contribute new “DNA” to the to-be “greenfield” open system. In general, the evolutionary approach is as follows:

- Establish a target PLA aligned with _____ (name of enterprise) mission and business priorities.
- Identify worthy components of legacy architecture that might adapt to open interfaces.
- Design and budget for iterative development of modular components and open interfaces per PLA.
- Compose multiple small procurements that require performer(s) to develop the requisite interfaces for “plugging in” new capability.
- Development defined as RDT&E investment in prototyping projects that deliver interoperable COTS/GOTS.
- “Transition” is typically defined as negotiating license for improved, pre-approved, COTS/GOTS.

- “Sustainment” is defined in terms of COTS/GOTS licenses that include provisions for lifecycle tech refresh.

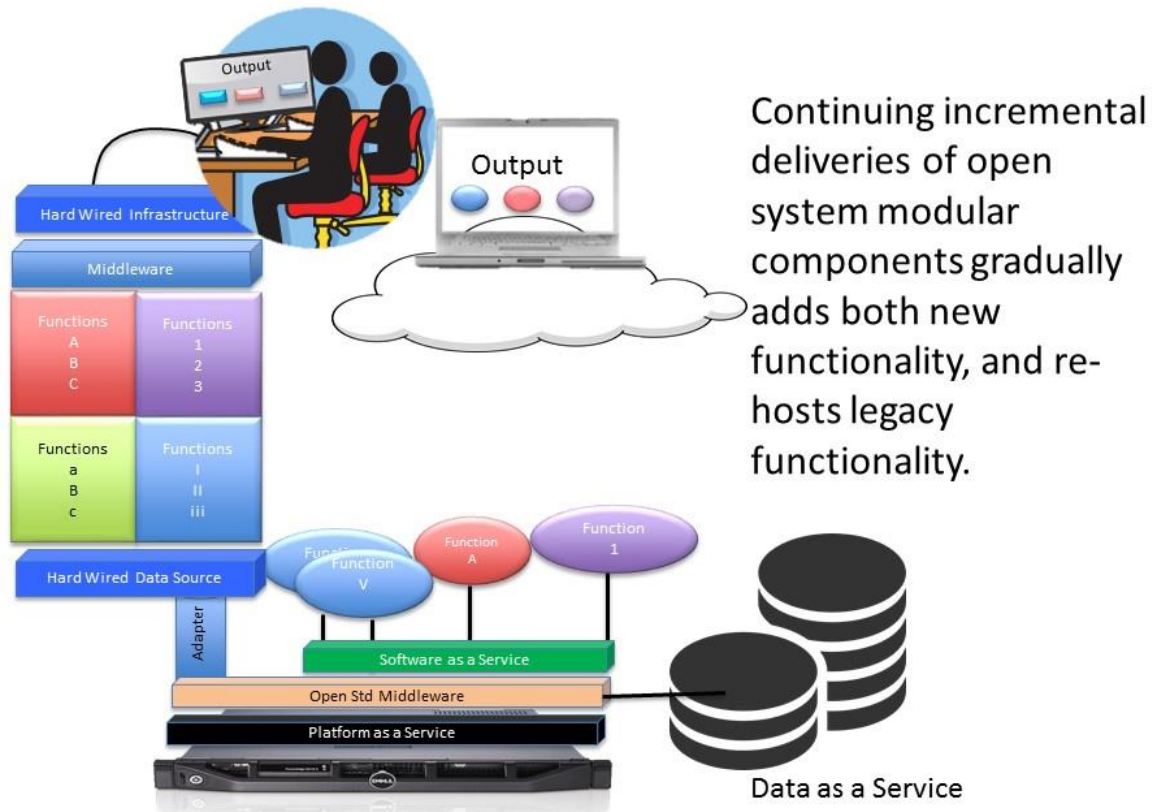


Figure 6: Continuing gradual evolution. Some stovepipe functionality continues while other functionality becomes available in the cloud. Note migration away from legacy data sources toward standard data services.

One of the critical enterprise functions is ABC capability. _____ (Describe ABC capability in

Legacy system retired. Open infrastructure, is mature.

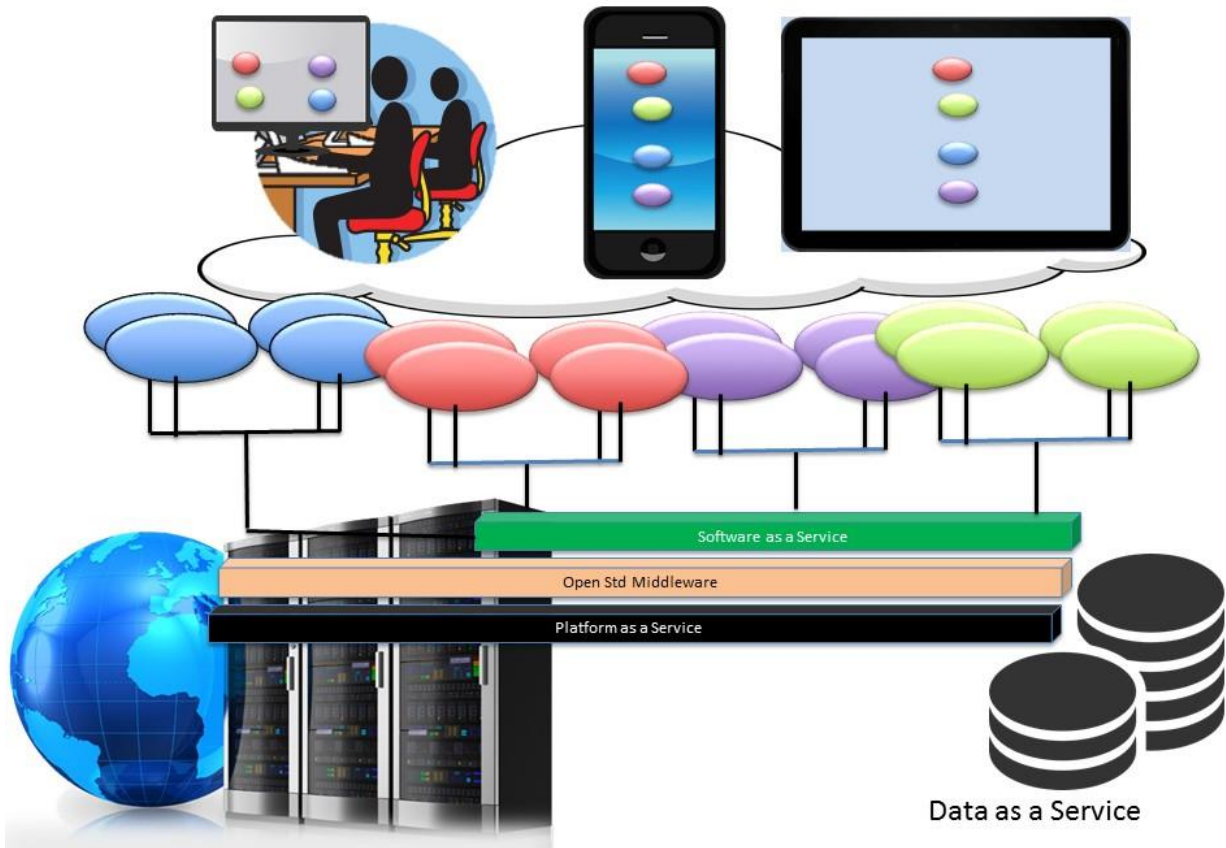


Figure 7: USG enterprise product line architecture is mature. Enterprise is fully cloud enabled. Open system is characterized by continuous, cost-effective, improvement and broad interoperability.

context with current state of the art and policy regime.) (See references ____ - ____)

Today the ____ (name of legacy enterprise capability) is an amalgam of standalone systems, which themselves are a subset of a larger group of systems that address requirements such as ____, ____... and _____. (“____” describe functions performed by relevant legacy stovepipe systems.)

The legacy ABC capability _____ (describe status quo and relevant background motivating the prototype project to instantiate ABC SaaS.)

Consistent with the evolutionary process described above, XYZ Program Office aims to field and host ABC SaaS as the first evolutionary component of the to-be enterprise open system.

Cyber Security as a Service

The USG’s and DoD’s status quo approach to security, including especially Authorization and Accreditation (A&A), will simply not support the targeted open system efficiencies. Each rapidly developed capability would be delayed at least many months and its cost increased by at least hundreds of thousands of dollars, in order to accomplish A&A.

Status quo security paradigms are based on physical separation. This clashes with modern software engineering paradigms, such as cloud, that are based on logical separation through virtual technology.

Accordingly, the proposed open system approach to implementing cyber security, i.e. Virtual Open Standard Security Services (VOS3) depends on

- Implementing open standard virtual security services based on logical separation and dynamic “need-to-share” policies.
- Introducing new A&A assurance arguments that are based on logical separation/virtual technology/need-to-share policies.

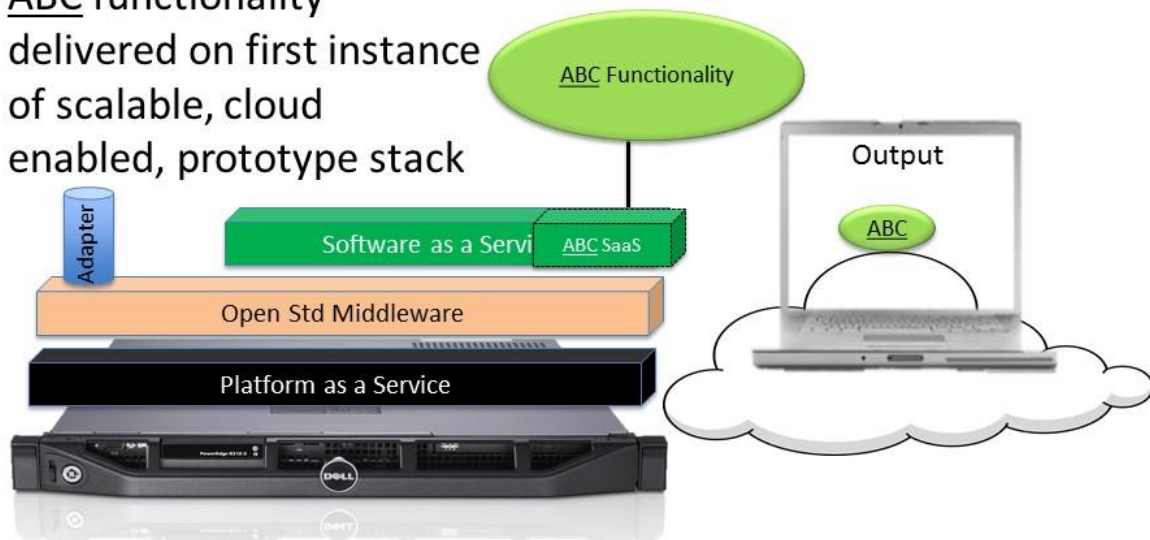
The Air Force Research Lab, Information Directorate, *SecureView* cross-domain “access solution” is a rare example of an accredited Cross Domain Solution that is based on logical separation implemented with virtual technology. Further, members of the government-sponsored aviation focused standards bodies, Unmanned System Control Segment Architecture ([UCS](#)), and Future Airborne Capability ([FACE](#)) are developing instantiations of the same approach. These efforts may provide basis for the requisite GRA cyber security layer. See references (I-K)

Prototyping Project Objectives

General descriptions of XYX Enterprise Open System (Phase 1) prototyping tasks follow:

Figure 8: First incremental delivery of USG Business Enterprise Open System will provision ABC functionality via scalable, cloud enabled, accredited and authorized prototype stack.

ABC functionality
delivered on first instance
of scalable, cloud
enabled, prototype stack



Overall XYZ Enterprise Open System Phase 1 Objectives

- 1.1. Establish commercial market incentivized to continuously improve the Enterprise Open System (EOS)
- 1.2. Architect, accredit, authorize, and implement ABC SaaS as first prototype instance of USG cloud enabled EOS architecture. (See notional depiction figure: 6.A)
- 1.3. Develop roadmap for retiring the legacy ____ systems.
- 1.4. Demonstrate:
 - 1.4.1. Customization/configuration options at all layers of the technical stack.
 - 1.4.2. Pluggable flexibility to reuse, enhance, and expand functionality and performance.
 - 1.4.3. Interoperability with legacy and non-legacy systems.

- 1.5. Develop engineering, programmatic, and business models to enable and sustain all the above.

Prototyping Procurement Objectives

- 2.1. Expose USG requirements to, and lower barriers for, broad community of traditional and non-traditional technology providers.
- 2.2. Accelerate solicitation to award timeline.
- 2.3. Perform Analysis of Alternatives (AoA), trades analysis, source selection, and performance monitoring on the basis of demonstrated, open system interoperability and functionality.
- 2.4. Develop Intellectual Property Regimes (IPR) and Data Rights that incentivize mutually beneficial government-industry partnership.
- 2.5. Transition successfully tested prototype applications as vendor-supported off-the-shelf products.
- 2.6. Establish growing catalog of pre-approved, off-the-shelf, XYZ EOS products and services

Measures:

1. Numbers of traditional and non-traditional vendors who participate and/or compete.
2. Solicitation-to-Award timeline. Target: 30 days.
3. Yes/No vendor COTS offering is available via convenient procurement vehicle following successful prototype PlugTest.
4. Yes/No agreed Data Rights captured in standard procurement language.
5. Yes/No USG receives enterprise license to COTS product in return for investment in prototype development.
6. Infrastructure maintenance cost avoided, and reinvested in business process improvement, by consolidating and modernizing IMCS functionality. (Target: \$__M from __ to __.)

Reference:

- F. Open System Acquisition [Practical Guide](#).
Q. [Adaptive Acquisition](#) Practical Guide

Prototyping Management Objectives

- 3.1. Provision continuous feedback loop with operational customers.
- 3.2. Conduct AoA, demonstration, development, Test & Evaluation (T&E), Validation & Verification (V&V), and certification in parallel.
- 3.3. Minimize risk of technology perishability by executing rapid, iterative, evolutionary, demonstration-to-delivery cycles.

Measures:

1. Yes/no, specified operational customer(s) validates prototype test results.
2. Yes/no, project execution plan documents independent schedules and budgets for specified parallel activities and integration events and accounts for dependencies.
3. Timeline from prototype initial demo to successful prototyping exit criteria. Target: 6 months.
4. Timeline from prototype exit criteria to pre-approved COTS. Target: 6 months.
5. Yes/no, acquisition risk management artifacts address speed-to-capability as critical risk factor, and explain credible mitigation factors.

Reference:

H. Open System Acquisition (OSA) Project Execution Plan (PEP) Draft Data Item Description (DID): SAF AQ OSA-DID-PEP-3-20-15.

Prototyping Engineering Objectives

- 4.1. Evolve cloud enabled EOS Government Reference Architecture (GRA). I.e. develop and document technical specifications, including Interface Control Document (ICD), for product line architecture optimized to assure “pluggable” component interoperability aligned with specific mission and business objectives consistent with reference documents.
- 4.2. Establish persistent, open, cloud-enabled, virtual system integration laboratory (vSIL) that:
 - 4.2.1. Allows dynamic provisioning of capability within virtual machines
 - 4.2.2. Dynamically partitions accessibility across virtual domain based on specified security and privacy policies
 - 4.2.3. Hosts design time, build time, and run time government-provided reference instances of target technical architectures - i.e. instantiates government reference PLA.
 - 4.2.4. Hosts PlugTest services. Includes, but not limited to:
 - 4.2.4.1. Live, Virtual and Constructive (LVC) models and simulations.
 - 4.2.4.2. Conformance test kits
 - 4.2.4.3. Online library of standard test tools
 - 4.2.4.4. Cloud provisioning dashboard(s)
 - 4.2.4.5. Test harness based on reference implementation(s)
 - 4.2.4.6. Test data sets
 - 4.2.5. Provision runtime instance of GRA within PlugTest harness.
 - 4.2.6. Provision runtime instances of item management control functionality within PlugTest harness.
- 4.3. Establish cyber security capability, authority, and documentation such that successful XYZ EOS PlugTests are tantamount to cyber security authorization and accreditation for the artifact under test.

- 4.4. Establish an XYZ EOS collaborative engineering forum, composed of experts from government agencies, and traditional and non-traditional companies, qualified and incentivized to advise development of XYZ EOS architecture and standards.
- 4.5. Instantiate XYZ EOS GRE generally, and ABC functionality specifically, into operational prototype reference implementation.

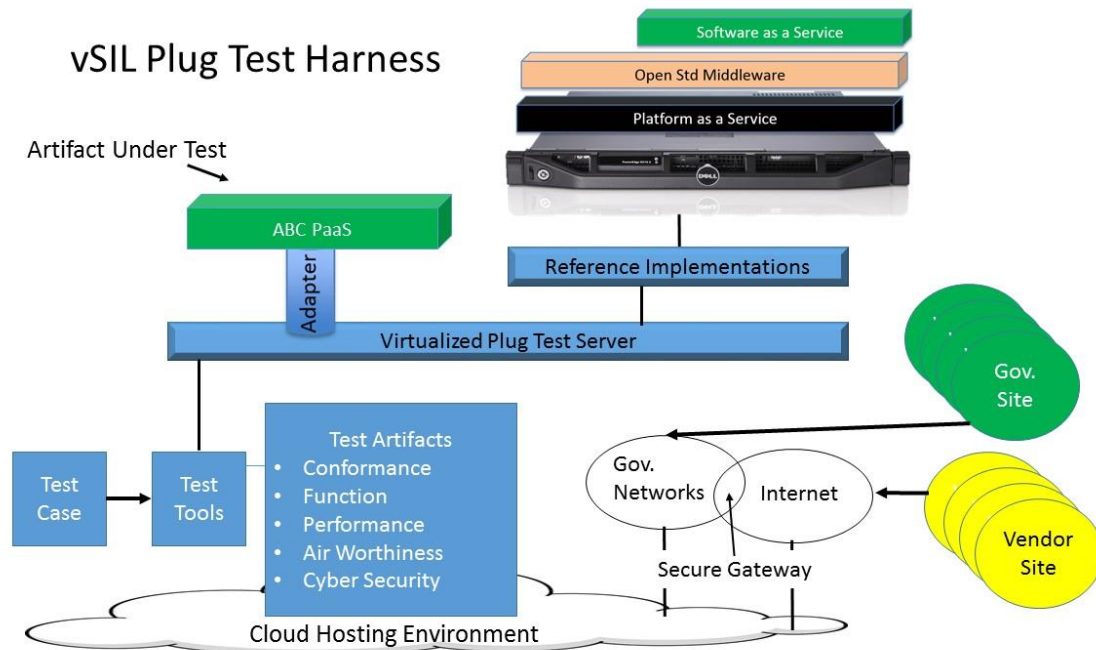


Figure 9: The virtual Systems Integration Lab includes an online, pluggable, instance of the cloud enabled Government Reference Architecture connected to test services.

Measures:

1. Yes/No consortium engineering activity results in measurable evolution of GRA and associated standards.
2. Yes/No, ICDs for GRA, PlugTest harness, and ABC SaaS, exist and specify functional modules and open standard interfaces aligned with measurable operational and system performance objectives.
3. Yes/No, design-time, build-time, and runtime instances of GRA, ABC SaaS, and PlugTest harness, exist and have been validated and verified as follows:

- a. No less than ___% (e.g. 80%) of lifecycle costs of deployed and planned systems and components shall be for purchase of COTS/GOTS items and/or services.
- b. Platform-as-a-service and software-as-a-service performance for XYZ EOS generally, and ABC SaaS in particular, shall comply with operational and system performance standards for operational availability, scalability, security, interoperability, latency, as specified in Appendix C.
- c. ABC SaaS functionality shall comply with requirements specified in Appendix B.
- d. A trained operational user shall locally update SaaS capability feature within ___ minutes. The system shall provision workflow required to validate and implement a global update within ___ day(s).
- e. A third party developer shall install a new application within PlugTest versions of XYZ EOS GRA within specified time window. (E.g. Target: 1 week.)

Reference:

- I. Open System Acquisition (OSA) Product Line Architecture (PLA) Draft Data Item Description (DID): SAF AQ OSA-DID-PLA-3-20-15
- J. Open System Acquisition (OSA) Plug Test Plan (PTP) Draft Data Item Description (DID): SAF AQ OSA-DID-PTP-3-20-15.
- G. NIST SP 500-291, Cloud Computing Standards Roadmap, chapters 6 & 7.

Logistics Objectives

- 5.1. Reduce Total Cost of Ownership per Capability
- 5.2. Conduct continuous technology refresh.
- 5.3. Provision for user and maintenance training.

Measures:

- 1. Yes/No, vendor-supported COTS applications are available on convenient procurement schedule, e.g. GSA, at known cost.
- 2. Number of vendors who deliver competing capabilities.
- 3. Yes/No, all delivered capabilities have robust user and maintenance documentation and instructions.

Reference:

- K. Open System Acquisition (OSA) Information Technology Users Guide (ITUG) Draft Data Item Description (DID): SAF AQ OSA-DID-ITUG-3-20-15.

Potential XYZ EOS Phase 1 Prototyping Tasks

T1. Develop Government Reference Architecture for a XYZ cloud enabled Enterprise Open System.

Perform:

- Collaborative engineering with other prototyping project participants
- Continuous feedback loop with operational alpha and beta community
- Market analysis
- Model Based Systems Engineering:
 - Design & documentation
 - Validation and Verification

Deliver: Product Line Architecture Interface Control Documentation and other specifications per draft Data Item Description (DID) SAF AQ OSA-DID-PLA-3-20-15. Shall addresses broad implementation and tech refresh of XYZ GRA. PLA will be sufficiently robust to support implementation of core technology into various form factors such as enterprise cloud services, and hand held mobile devices.

T2. Provision a virtual systems integration laboratory, including “plug test” capability, that instantiates an alpha version of the GRA.

Perform:

- Collaborative engineering with other prototyping project participants
- Continuous feedback loop with operational alpha and beta community
- Analysis of Alternative cloud hosting platforms
- Development and installation of,
 - Portable virtualized PaaS/SaaS middleware
 - Test cases and test services
- Test operations

Deliver

- Prototype software
- Software Test Report per draft DID SAF AQ OSA-DID-PTP-3-20-15
- Executable software application, license, user manual and Concept of Operations (CONOPS) for specified USG applications specification per draft DID SAF AQ OSA-DID-ITUG-3-20-15

T3. Develop a pluggable prototype instance of the reference architecture that provisions:

T3 (a) Generic cloud-ready PaaS and SaaS functionality

Perform:

- Collaborative engineering with other prototyping project participants
- Continuous feedback loop with operational alpha and beta community
- Fabrication of functional prototype
- Validation and Verification of required functionality and performance

Deliver

- Prototype hardware
- Software Test Report per draft DID SAF-AQ-BTCC-PT -3-18-15
- Executable software, license, user manual and Concept of Operations (CONOPS) for specified USG applications per draft SAF AQ OSA-DID-ITUG-3-20-15

T3 (b) Specific ABC SaaS functionality

Perform:

- Collaborative engineering with other prototyping project participants
- Continuous feedback loop with operational alpha and beta community
- Development of item management software application
- V&V of required functionality and performance

Deliver

- Software Test Report per draft DID SAF AQ OSA-DID-PTP-3-20-15
- Executable software application with verified functionality as demonstrated by Item Master under CTMA, with license, user manual and Concept of Operations (CONOPS) for specified USG applications per draft DID SAF AQ OSA-DID-ITUG-3-20-15

T3 (c) Cyber Security-as-a-Service.

Perform:

- Collaborative engineering with other prototyping project participants
- Continuous feedback loop with operational alpha and beta community
- Development of Cyber Security as a Service software
- V&V of required functionality and performance

Deliver

- Software Test Report per draft DID SAF AQ OSA-DID-PTP-3-20-15
- Executable software application, license, user manual and Concept of Operations (CONOPS) for specified USG applications per draft DID SAF AQ OSA-DID-ITUG-3-20-15

T4. Prepare all Risk Management Framework artifacts required to achieve authorization and accreditation to operate the prototype capability on _____ network(s).

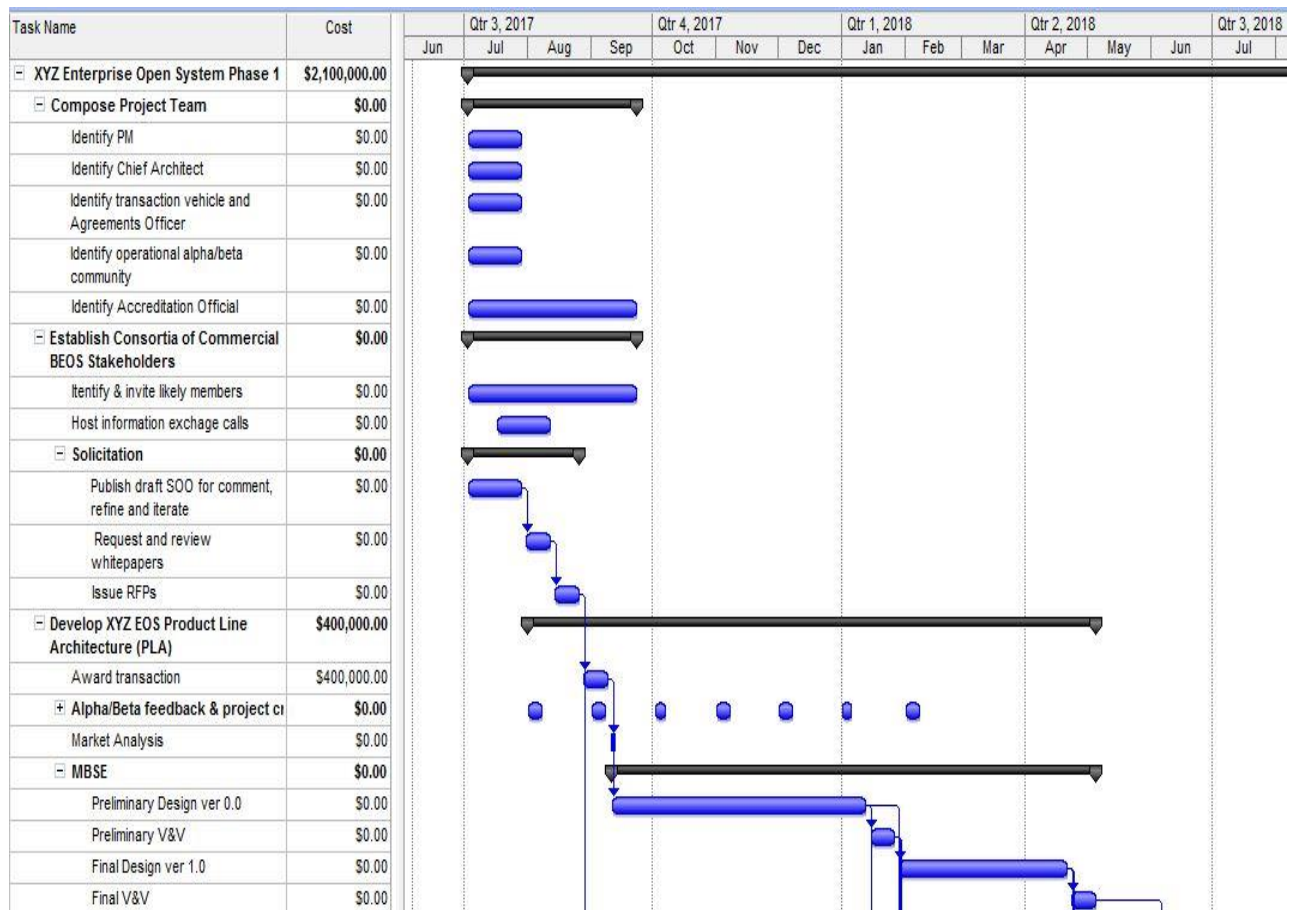
Perform:

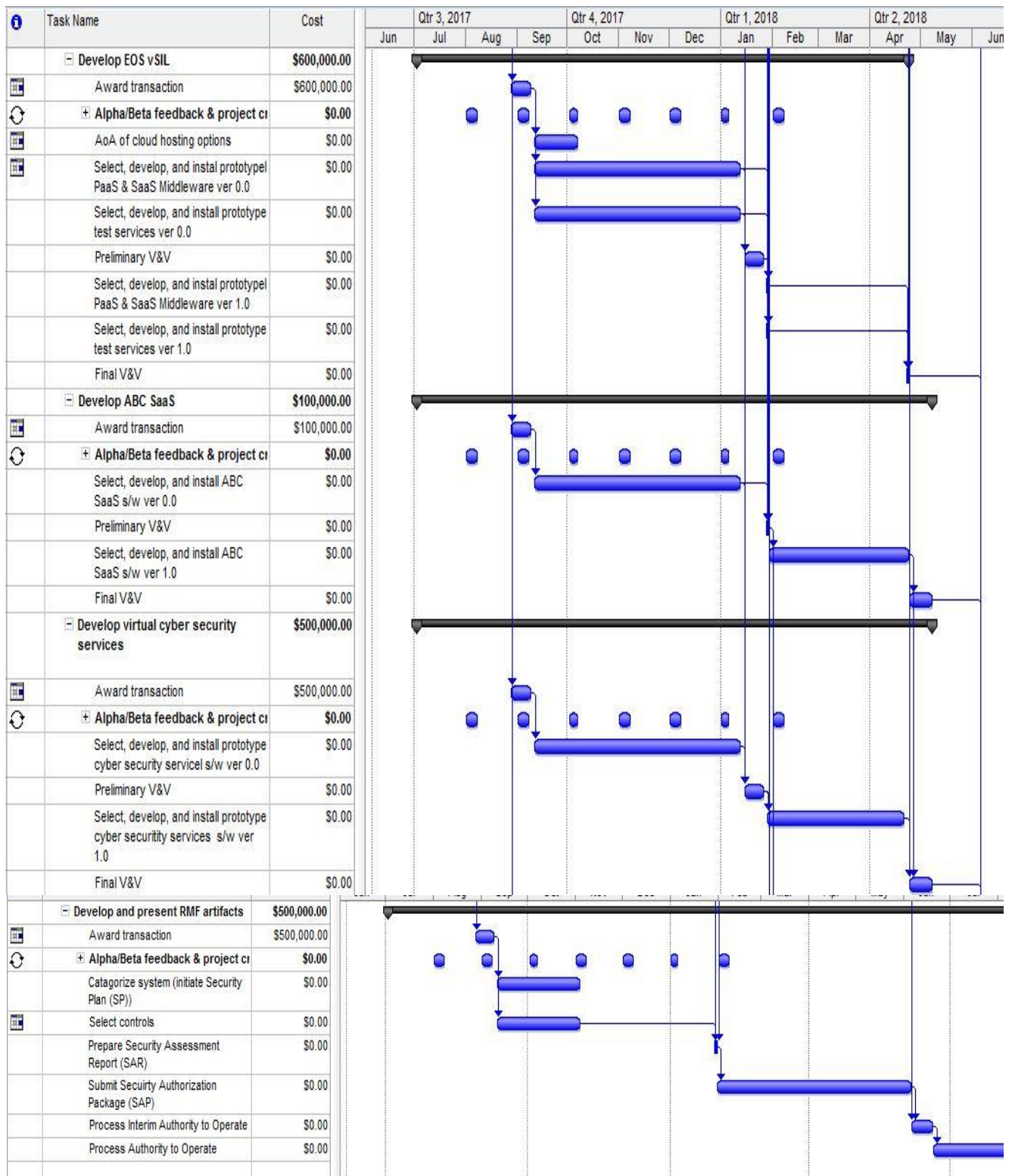
- Collaborative engineering with other prototyping project participants
- Development of assurance arguments and documentation for A&A XYZ EOS GRA based on logical separation.

Deliver

- Accreditation and Authorization plan that achieves interim authority to operate within 9 months of task start, and authority to operate within twenty-four months of task start
- RMF A&A artifacts presented as required

Conceptual Prototyping Project Execution Plan (Budget and Schedule are Notional)





APPENDIX A: References

- A. Adaptive Acquisition Practical Guide, Gunderson, Air Force Institute of Technology
- B. Open System Acquisition Practical Guide, Gunderson, Naval Postgraduate School
- C. NIST SP 500-291, current version, Cloud Computing Standards Roadmap, Chapters 6&7
- D. Open System Acquisition (OSA) Project Execution Plan (PEP) Draft Data Item Description (DID): SAF AQ OSA-DID-PEP-3-20-15.
- E. Open System Acquisition (OSA) Product Line Architecture (PLA) Draft Data Item Description (DID): SAF AQ OSA-DID-PLA-3-20-15
- F. OSA Plug Test Plan (PTP) Draft Data Item Description (DID): SAF AQ OSA-DID-PTP-3-20-15.
- G. OSA Information Technology User's Guide (ITUG) draft DID SAF-AQ-DID-ITUG -3-18-15
- H. DOD Instruction 8510.01, Risk Management Framework
- I. Cloud Friendly Virtual Information Assurance Security and Cross Domain Assurance, Gunderson Naval Postgraduate School
- J. UAS Control Segment Working Group Subgroup 6 Open System Environment for Safety and Information Assurance: Application Platform Requirements
- K. SecureView: Government/Industry Collaboration Delivers Improved Levels of Security, Performance, and Cost Savings for Mission-Critical Applications, Durante & Wood, AFRL Information Directorate
- L. Program-specific documentation
- M. ...

APPENDIX B: ABC SaaS Functional Requirement Specification

USG must do a careful job of specifying objective, testable, measures of effectiveness in terms of mission and business outcomes, and tightly correlated system and process level measures of performance.

APPENDIX C: [XYZ](#) Enterprise Open System requirement mission and system performance specifications for SaaS and PaaS.

Recommend get input from the engineering forum created by the solicitation on what these should look like:

1. Operational Availability
2. Scalability
3. Workflow latency
4. Engineering interoperability (how quickly and conveniently can new components be configured and retired?)
5. Operational interoperability (can all appropriate nodes participate in required workflows without impacting overall system efficiency?)
6. Security (RMF controls)
7. Lifecycle cost (e.g. annual lifecycle cost of all system components shall be known prior to deployment)
8. Lifecycle tech refresh frequency/method, e.g. software licenses shall include provision for continuous tech refresh.

APPENDIX D: Legacy Data Source Description and Network Topology

Need to provide detailed descriptions of legacy data types, associated interfaces, and network access information.

APPENDIX E: Government Furnished Equipment/Information

1. E.g. license for legacy ABC software
2. E.g. access to cloud hosted development environment
3. Other?

Offeror Response Format

The U.S. Government (USG) may choose to award funds currently estimated at _____, across a period of _____, to develop and field solution(s) to satisfy the accompanying Statement of Objectives (SOO). Toward that end, the USG intends to perform a “rolling solicitation” to support market analysis, analysis of alternatives, trades, and (potentially) source selection. That is, USG seeks robust, continuing, communication with potential awardees in order to refine the SOO based on discovered state of the market, and advice from industry. When and if the USG achieves a threshold comfort level, it will announce intention to conduct source selection and make an award.

Questions 1-6 are relevant to market analysis, analysis of alternatives, and source selection. Questions 7-10 are relevant for source selection when and if the USG announces intent to award. USG expects that offerors will provide essential elements of information as objectively, and succinctly as possible, without embellishment. Responses that exceed word limits may be considered non-responsive. You may, but are not required or expected to, provide hyperlinks to more detailed information. You are encouraged to ask questions and propose modifications to government concepts and approaches.

USG may or may not follow up with request to discuss, or for more information.

USG will make any information provided to one respondent available to all respondents.

1. Please identify each firm participating in your current response by name, URL, and point of contact. Indicate which, if any, team member will serve as prime. (USG recognizes that respondent teams may evolve as the solicitation evolves.)

2. Please describe your proposed approach in 500 words or less. Note that USG has strong preference to compose capability with Off the Shelf (OTS) building blocks. (See note #3 in Appendix A for definition of OTS.) Hence, to the extent it is relevant, summarize your approach in terms of how you would:

- a) Identify baseline OTS capability
- b) Identify gap between existing OTS and total requirement
- c) Rapidly compose and deploy OTS-based aspects of solution
- d) Invent new capability, transition it as OTS, and connect it to OTS-baseline
- e) Conduct continuous lifecycle tech refresh

Please include and highlight proposed changes to USG concept, objectives, and plans.

3. If your approach includes use of, or modifications to, your own existing OTS products and services (as defined in Appendix A: note #3), please identify products and services by name and hyperlink reference to ordering procedures, license, feature descriptions, lifecycle cost, tech refresh process, etc.

4. Please specify any existing government procurement vehicles through which your OTS offering(s) described above may be obtained.

5. Please specify any current and past cyber security or flight worthiness authorizations, certifications, or accreditations associated with your OTS offering(s) identified above.

6. Please explain, in 250 words or less, how you think the USG should validate, verify, and certify your solution for performance against the USG's stated objectives.

Answers to following questions are mandatory only when/if USG announces intent to make an award, and you intend to make an offer. You are welcome to submit this information at any time during the rolling solicitation. If you do so prior to USG announcement of intent to award, you will be asked to make a statement verifying that your earlier submission remains valid.

7. If member(s) of your bidding team qualify as non-traditional Defense contractors (per Appendix A: note #1), please specify which companies. Please also explain how contributions by non-traditional team members are "significant" in 100 words or less.

8. If neither you, nor any significantly contributing bidding team members qualify as nontraditional defense contractors, are you willing to contribute one third of the project costs under terms of 10 USC

2371b (see Appendix A: note #2)? If so, please summarize your proposed 1/3 contribution in 100 words or less, e.g. time and material, in kind contribution (specify contribution and value), etc.

9. Does your bid comply with all security clearance requirements specified in the solicitation?

10. If members of your bidding team have performed successfully on recent, relevant projects (government sponsored or otherwise) please concisely describe performance on no more than three of those projects. For each project description, in 200 words or less, include:

- a) Performing company(ies) name(s)
- b) Project name and period of performance
- c) Name and contact information for a sponsoring official who can verify your contribution
- d) Performing company(ies) role in the project
- e) Measures of success as defined in Appendix A: note #4, or other relevant, objective measures of success
- f) Relevance.
- g) Hyperlinks to more detail (optional.)

Regarding measures of success, different metrics apply to different project objectives and different performer tasks. USG expects that it is unlikely that any one vendor would have achieved more than a small number of the specified measures of success on any particular project. Validated relevance of performance, with quality of performance verified as objectively as possible, is more important than quantity. Lack of prior performance does not disqualify a bid.

Notional Example

- 1.a. 123 Company Inc.
- 1.b. ABC Financial Trading System upgrade circa 2014-16.
- 1.c. Mary Noesme, 555-555-5555, m.n@XYZ.com.
- 1.d. Prime contractor, and stock trading application s/w developer.
- 1.e. System achieved targeted objective of 10% reduction in time-to-decision; as prime, 123 Company was awarded bonus for early system delivery; software apps for financial trades has half-life of about 1 year, and 123 company delivered developed software as sustained, certified, cloud-enabled, operational OTS capability within 8 months of contract award, with established process for updating software no less than annually.

1.f. Although ABC Financial Trading System is a commercial application, it is essentially a highly secure, low latency, multi-node, multi-level, command and control system aimed at informing and expediting critical tactical decisions.

1.g. See: www.123/abcwhitepaper.com

APPENDIX A: Explanatory Notes

1. Definition of “nontraditional defense contractor.” US Code Title 10 Section 2302(9) defines a “nontraditional defense contractor” as: “... an entity that is not currently performing and has not performed, for at least the one-year period preceding the solicitation of sources by the Department of Defense for the procurement or transaction, any contract or subcontract for the Department of Defense that is subject to full coverage under the cost accounting standards prescribed pursuant to section 1502 of title 41 and the regulations implementing such section...”

2. Cost share requirements per 10 USC 2371b. “... no official of an agency enters into a transaction ... *unless one of the following conditions is met:*

(A) There is at least one nontraditional defense contractor participating to a significant extent in the prototype project.

(B) All significant participants in the transaction other than the Federal Government are small businesses or nontraditional defense contractors.

(C) At least one third of the total cost of the prototype project is to be paid out of funds provided by parties to the transaction other than the Federal Government.

(D) The senior procurement executive for the agency determines in writing that exceptional circumstances justify the use of a transaction that provides for innovative business arrangements or structures that would not be feasible or appropriate under a contract, or would provide an opportunity to expand the defense supply base in a manner that would not be practical or feasible under a contract...”

3. Definition of “Off the Shelf.” “Off the Shelf” (OTS) capability is defined as an existing product or service that has all of the following characteristics:

a. Is available as a standard catalog item.

b. Can be obtained through an existing convenient procurement vehicle.

c. Has a published, verified, lifecycle cost.

d. Has a published and verified lifecycle tech refresh process.

e. Configures in the target environment in a specified short period of time.

4. Measures of a successful government adaptive acquisition. A “successful” adaptive acquisition is defined as an appropriately funded, well managed, engineering project that delivers useful lifecycle supported, up-to-date technology, cost effectively, to a satisfied operational customer, in time to make a difference. Successful adaptive acquisitions may be categorized by measures such as, but not limited to, the following:

a. **Mission level Measures of Effectiveness (MOE).** Requirement is to satisfy threshold values of *improvements over baseline values* of specified MOE. Examples of MOE include: Probability of Detection, Probability of Kill, Operational Availability, Speed-to-Decision, Cycle-Time-Compression, and Accident Rate.

b. **Acquisition process level Measures of Performance (MOP).** Requirement is to satisfy threshold levels of adaptive acquisition process level MOP such as the following:

(1) Systems Engineering Plan, which addresses scheduling, risk-reward management, development, test, and certification, delivers technology within its perishability half-life, and project achieves schedule. Measures are verified estimate of technology half-life, plus scheduled vs. actual award-to-delivery time.

(2) Procurement plan includes: a) relatively small RDT&E budget and incentivized procurement vehicle(s) to encourage enhancement of OTS products and services to meet government requirements; b) relatively large O&M budget and fixed price procurement vehicle(s) to purchase life-cycle supported OTS capability. Measures are verification (yes/no) that RDT&E is completed within budget; verification (yes/no) planned capability delivered within production and distribution budget.

(3) Security plan achieves targeted initial authorization and accreditation (A&A) of system security logical layer in specified short period of time, at specified low cost. Security plan achieves follow-on A&A of system changes faster and cheaper by inheriting controls from the previously A&A'd logical security layer. Measures are time and cost to achieve A&A.

c. **Business level MOP.** Requirement is to satisfy threshold levels of adaptive business process level MOP such as the following:

(1) Competitive market of multiple vendors and COTS products exists and grows as a result of USG investment. Measures are numbers of traditional and non-traditional Defense contractors who credibly compete for developmental, production, and sustainment awards.

(2) Cost-per-capability decreases as a result of the growing marketplace of traditional and non-traditional solution providers incentivized by government investment. Measure is utility-per-cost where “utility” is defined as “measurable ability to satisfy requirements” and “cost” refers to lifecycle costs. A measure of utility might be percent improvement in a designated MOE or MOP.

(3) Time-to-value decreases as a result of the growing marketplace of traditional and non-traditional solution providers incentivized by government investment, and improved acquisition processes. Measure is time between identification of formal or informal requirement and delivery of certified, sustained (verified lifecycle plan), up-to-date (verified current version of technology), solution.

d. **System level MOP.** Requirement is to satisfy threshold levels of system level MOP such as the following:

(1) Engineering interoperability, i.e. ability to interchange components, improves as a result of the open system approach. Lagging measure is time required to acquire, install, and operationally activate component of interest. Leading measures include verified existence of SDK, verified compliance with open interface, verified existence of enterprise license.

(2) Operational interoperability, i.e. ability to effectively share operational utilities such as information, fuel, or ammunition improves as a result of the open system approach. Measures are: verified yes/no that need-to share policy exists; verified that system executes need-to-share policy transactions according to policy; validated that need-to-share policy results in improved operational MOE.

(3) Operational Availability, i.e. assurance that system will satisfy enterprise operational requirements for mission dominance at any given moment, improves as a result of acquisition strategy. Measure is the ratio of (effective “up time”) divided by ((effective “up time”) + (effective down time)) where (effective down time) = (time-system-is-broken + time-to-repair + time-system-is-out-of-date + time-between-obsolescence-and-refresh-of-technology.)

APPENDIX B: Market Analysis, AoA, Trades, and Source Selection Matrix

The following graphics illustrate a method for developing an adaptive approach to market analysis and associated source selection algorithm. The color code assigns green to blocks that require a subjective input value. Yellow indicates a calculated value. “Weights” are subjectively assigned multiplicative factors that can give more value to one category over another, or one bidder’s approach compared to other bidders.’ For example, weights of 1.1 and 0.9 indicate 10% more and less value, respectively, assigned to a particular criterion.

In this spreadsheet, the weight factor subjectively assigned to a bidder’s overall approach is applied to the sum of all the other adjusted criteria. Using the prior example, a vendor with an especially good overall approach might receive a 10% bump in source selection score compared to a vendor whose approach was considered average.

Adaptive Acquisition Market Analysis, AoA, Trades, and Source Selection Matrix					
*Note: Weights may be subjectively assigned to: 1) a success criteria in general, e.g. achieving mission objective is considered 2 X as important as complying delivering on budget - weights are 2 and 1 respectively; 2) A particular vendor's past performance is considered 10% more relevant than typical - prior performance relevance weight for that vendor = 1.1					
Entered value	Final value for category				
Calculated value	Final value overall				
Performance Category	Success Criteria		Measure	*Weight	Score
Overall approach weight factor	Subjective score assigned to overall approach.	UNSAT = 0; SAT = 1; Good = 1.1; Great = 1.2	N/A	1	1

The following panel describes mandatory performance. A score of “0” for any of these criteria results in a multiplicative qualification factor of “0”.

Performance Category	Success Criteria		Measure	*Weight	Score
Cost share or non-traditional partnership	Willing to pay 1/3 costs, or	yes = 1; no = 0	1	N/A	1
	Bidding team includes non-traditional Defense contractor.				
Requisite security clearance	Bidder has security clearance required by solicitation.	yes = 1; no = 0	1	N/A	1
Compliant with solicitation guidelines	Bid meets nominal administrative and technical requirements specified in solicitation.	yes = 1; no = 0	1	N/A	1
Qualification factor: 1=qualified; 0=not qualified	Multiplicative product of qualification indicators.	qualified = 1; not qualified = 0			1

The following “Prior Performance” panel of the spreadsheet describes criteria that intend to capture elements of successful prior performance. It does not provide an exhaustive list, or provide enough granularity to support an objective weighting scheme. Therefore, it makes sense to define a “good enough” point of diminishing return on amount of successful prior performance. The spreadsheet aims to provide a means to generally distinguish the group of bidders with reasonably significant relevant prior performance, from others. Strategy is to: 1) set a maximum achievable adjusted value that any firm with subjectively defined “significant” prior performance is likely to achieve, and: 2) subjectively assign a multiplicative factor based on perceived relevance of prior work to the current requirements.

Performance Category	Success Criteria		Measure	*Weight	Score
Prior Performance: Bidder's successful implementations in similar environments					
	Achieved mission and/or business objectives	yes = 1; no = 0	1	1	1
	Delivered on time	yes = 1; no = 0	1	1	1
	Delivered on budget	yes = 1; no = 0	1	1	1
	Similar mission domain	yes = 1; no = 0	1	1	1
	Verified conformance with relevant standard(s) X	yes = 1; no = 0	1	1	1
	Verified tech refresh frequency (time between updates)	time < technology half-life = 1; time > THL = 0	1	1	1
	Prior A&A achieved?	yes = 1; no = 0	1	1	1
	Has deployed in cloud?	yes = 1; no = 0	1	1	1
	Other: _____	XX = 1; YY = 0	0	1	0
	Other: _____	XX = 1; YY = 0	0	1	0
				SUM:	8
Max allowed value for adjusted sum of prior performance success criteria	Criteria are representative, not exhaustive or granular. Enter point of diminishing return where more no longer = better	Whole number. "3" might be a reasonable max value.		MAX:	3
Prior performance weighting factor	Prior performance relevant?	Not relevant = 0; relevant = 1.0; very relevant = 1.1	N/A	1	
Prior Performance Parameter	Weighted sum of Prior Performance success criteria scores times relevance factor				3

The “Plug Test” panel below aims to capture the measurable and testable objectives of the acquisition together with threshold values. Intent is to capture “360° requirements”, i.e. not only system performance parameters, but also mission level and business level measures of effectiveness, and acquisition process level measures of performance. In the best case, program offices will use actual test tools to perform baseline validation and verification of existing OTS capabilities in context with the new requirements. In the absence of actual test tools, USG will develop the test tools and test cases as part

of the Systems Engineering Plan. Until test tools are available, USG will use best available means to perform objective evaluation.

As offerors recommend particular architectures, technologies, products, services, and processes, and the USG evaluates them against its 360° requirements objectives, and refines them as appropriate, clarity of the art-of-the-possible will emerge. In this sense, this approach lends itself to an efficient iterative approach to market analysis, analysis of alternatives, trades, and source selection.

Again, the spreadsheet allows the option of entering a maximum possible Plug Test score in order to account for the possibility of a point of diminishing return beyond which more is not necessarily better.

Performance Category	Success Criteria	Measure	*Weight	Score
Plug Test	Specifically relevant OTS technology exists?	yes = 1; no = 0	1	1
	Inherits security controls?	yes = 1; no = 0	1	1
	Inherits safety controls?	yes = 1; no = 0	1	1
	Time required to configure in target environment?	time < threshold = 1; time > threshold = 0	1	1
	Appropriate SDK exists?	yes = 1; no = 0	1	1
	Enterprise license available?	yes = 1; no = 0	1	1
	Verified mission performance, e.g. information exchanges occur according to need-to-share policy & MOE achieved	MOE/MOP > threshold = 1; MOE/MOP < threshold = 0	1	1
	Projected lifecycle cost	\$ or \$/time < threshold = 1; \$ or \$/time > threshold = 0	1	1
	Projected tech refresh frequency (time between updates)	time < technology half-life = 1; time > THL = 0	1	1
			SUM:	9
Max allowed value for adjusted sum of Plug Test performance criteria	Criteria are representative, not exhaustive. Enter point of diminishing return where more no longer = better.	Whole number. "6" might be a reasonable max value.	MAX:	6
Plug Test Parameter	Adjusted weighted sum of Plug Test success criteria scores			6

The spread sheet panel below calculates the overall source selection score by applying the multiplicative weighting factors to the adjusted, weighted sums of the performance criteria.

Source Selection Score	(Overall approach factor) * (qualification factor) * (prior performance parameter + Plug Test parameter)			9
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Appropriate Use of Non-RDT&E Appropriations for OTA

26 Oct 2016

Memorandum for the Record

Subj: APPROPRIATE USE OF NON-RDT&E APPROPRIATIONS FOR OTA

Ref: (a) 10 USC 2371b
(b) OSD OT Guide
(c) DoD 7000.14-R, subj: Financial Management Regulation (FMR)

Reference (a) provides authority, i.e. “Other Transactions” Authority (OTA), for military services to execute financial transactions that are not generally subject to the FAR, in order to conduct “prototype projects.” According to [ACQuipedia](#) and the OSD [OT Guide](#) (reference (b)), a “prototype” (or “prototype model” such as an Engineering Design Model) is “a physical or virtual model used to evaluate the technical or manufacturing feasibility or military utility of a particular technology or process, concept, end item, or system.” In this sense, prototypes are essentially defined as test artifacts. According to the [FMR](#) (reference (c)), paying for testing and prototypes usually requires RDT&E funds. Likewise, the OT Guide explains that since OTA’s are designed to develop and/or evaluate prototypes, generally RDT&E appropriations are appropriate. However, the FMR (Volume 2A, Chapter 1, paragraph 010213 section C. 5. b. & c.) provides exceptions to the general rule. That is, testing that is not associated with RDT&E, or testing conducted after fielding should be financed with Procurement or O&M appropriations.

Thus, consistent with reference (c), since prototypes are test artifacts by definition, prototype projects used to support the following activities should be funded with O&M or Procurement appropriations:

1. Acceptance, quality control and surveillance testing of articles obtained for other than RDT&E purposes.
2. Routine testing in connection with logistic support.
3. Testing related to the operation and maintenance of equipment and material acquired for use under appropriations other than RDT&E.

Further, we should use O&M or Procurement funds to acquire commercial or non-developmental items for testing and operational evaluation that do not require RDT&E engineering, design or integration effort. However, we must use RDT&E appropriations if the commercial item is modified and requires testing prior to approval for fielding.

One important potential application of OTA is to conduct prototype projects associated with test and evaluation of COTS or NDI artifacts that may or may not satisfy requirements for life cycle tech refresh, or recapitalization of existing deployed systems. Lifecycle tech refresh is an O&M activity (not RDT&E). Re-capitalization is a procurement activity (not RDT&E). OTA prototype projects may aim to encourage vendors, including non-traditional Defense contractors, to use their own internal research efforts to evolve off-the-shelf products that simply “plug into” the fielded architecture. No engineering, design, or integration effort would be required to field such off-the-shelf capability. Thus, it is appropriate to

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execute the following classes of prototype projects, which would be used to evaluate the suitability of COTS/NDI products for tech refresh or recapitalization, under OTA, with O&M or Procurement appropriations respectively.

1. COTS/NDI products for use in testing in support of tech refresh or re-capitalization
2. Acquisition process models used in support of lifecycle tech refresh or re-capitalization
3. Test and evaluation products and services used for testing of COTS/NDI for tech refresh or re-capitalization.

However in classes of prototype projects described above, the government customer must field the refreshed technology out-of-the-box, i.e. with no further acceptance testing or certification required. This caveat forces the government customer to assure themselves that their test and evaluation methodology is a robust means to validate that their tech refresh requirements are correctly posed, and verify that vendor claims to satisfy them with off-the-shelf capability are true.

In this sense, General Counsel and/or Financial Management authorities must agree that testing is, in cases of COTS/NDI tech refresh or re-capitalization, a generic service for evaluating suitability of COTS/NDI for direct fielding. In those cases, government O&M or Procurement appropriations for prototype projects associated with testing may not be used to support government-funded development. However, it would be appropriate for commercial vendors to voluntarily spend Internal R&D funds as a result of GFI test results. Thus a GFI test service incentivizes industry to invest to evolve products that are suitable to plug directly into fielded government systems, and therefore achieve lifecycle tech refresh and recapitalization in step with the pace of COTS evolution.

OSD Other Transactions Guide for Prototype Projects



Other Transactions Guide for Prototype Projects

January 2017
(Version 1.2.0)

Appendix B: Measuring Value, and Managing Risk

USAF investments in weapon systems or other capabilities must return value, where value is measured objectively in terms of military effectiveness, and in terms of creation of wealth within the U.S. economy. The taxpayers deserve both an effective defense force and economic growth as a result in their investment in the USAF. Moreover, the USAF must deliver value to the War Fighters in order to address continuing and emerging threats. The current status quo is unsatisfactory in both regards since the DoD acquisition system has been plagued by cost and schedule overruns.

The status quo approach to measuring USAF programs captures cost overruns and schedule delays on its programs to assess performance. However, it does not provide the leading indicators and incentives necessary to effect course changes that would have precluded them. Indeed, the solution to the program managers' dilemma is to re-baseline budget and schedule, generally without considering resulting degradation to the value of the program's original value proposition. To address this issue, the DoD has implemented several acquisition reform policies but none have been generally successful.

Our approach to address these issues is to create a new metric for Return on Investment (RoI) focused on value. Generally, RoI for a Defense system is: operational utility delivered; per lifecycle monetary cost of the utility; per time increment required to turn a monetary investment into utility. Utility in this context is a measurable ability to satisfy a requirement. So, units of utility might be those of time, spatial dimension, probability, environmental factors, or quantity of good or bad things. Units of utility might also be percent change, good or bad, measured against a specified baseline. In the sense of risk vs. reward, "reward" is equivalent to the ROI earned via developing an increment of system-enabled capability.

$$\text{RoI} = V(u, c, t) = u(t) \times (c(t))^{-1} \times f(t_d^{-1}) \quad (1)$$

RoI = Return on Investment

$V(u, c, t)$ = Value of a system, or component(s) thereof, as a function of u , c , and t

$u(t)$ = Utility of a system, or component(s) thereof, as a function of time

$c(t)$ = Monetary cost of a system, or component(s) thereof, as a function of time

$f(t_d^{-1})$ = Function of the time it takes to design, develop, test, certify, and deploy an increment of utility wherein value is inversely proportional to elapsed time.

Because utility is equivalent to the degree to which a capability satisfies requirements, u can be measured and modeled the same way requirement satisfaction is measured or modeled. Consistent with established systems engineering best practice, we define measures of effectiveness (M_E) as lagging indicators, i.e. objective parameters that describe operational *outcomes*. We define measures of

performance (M_P), as leading indicators, i.e. objective parameters that describe important attributes of system or process *outputs* that are only important if they lead demonstrably to greater utility, and thus RoI. (Roedler & Jones, 2005),

Typical M_E for systems include:

- Probabilities of achieving desired outcomes
- Time required for completing tasks
- Numbers of good or bad things that happen as a result of processing information
- Proficiency scores
- Percent change associated with the above

Typical M_P for EIS include:

- Latencies
- Reliability, Availability, and Maintainability (RAM)
- Standard compliance
- Capacity
- Precision
- Size weight and power
- Percent change associated with the above

Note that the distinction between M_E and M_P can in some cases depends on where the systems boundaries are drawn. The M_E for an upstream system process might be an M_P for a downstream system process. For example, Probability of Detection might be an M_E for an upstream military surveillance subsystem, but an M_P for a downstream target selection subsystem, the M_E of which is Probability of Interdiction.

Risk-reward optimization factors, (R_X) are the most significant contributors and/or detractors to achieving critical system-level, or process-level, performance characteristics X . Consistent with best practices for investments, we select appropriate R_X and then define M_P and M_E to align with them. Heuristic analysis of historical military system success and failure cases suggests the following examples of typical R_X :

R_O = Ability to continuously capture the operational customers' perception of value within rapidly evolving operational domains (e.g. by establishing continuous feedback loop.) An M_P might be "customer contact hours." i.e. a measure of developers' performance in communicating with the customer, and a leading indicator of developers' ability to achieve greater utility in the eyes of the customer.)

R_T = Ability to continuously harvest technological value in rapidly evolving technological domains (e.g. by applying best commercial practices for open standard product line architecture.) An M_P might be "time required to configure component in the EIS technical environment," which might be a leading indicator of the M_E "time it takes to perform an increment of tech refresh.")

R_S = Ability to predict lifecycle costs for continuously evolving capability (e.g. by heavily leveraging existing off-the-shelf technologies that come with well-established life cycle tech refresh cost models. M_P might be "lifecycle costs are known and are less than 'X'.")

R_{IA} = Ability to balance the need-to-protect information and (e.g.) network resources, with the need-to-share them across security domains (e.g. by implementing need-to-share and need-to-protect with high assurance virtual technology.) An $M_{P/E}$ might be "accredited ability to execute dynamic-policy-based need-to-share decision."

R_{VI} = Ability to find and deliver valued information bits within tightly constrained decision windows, given large and growing backdrop of available information bits (e.g. by identifying critical conditions of interest and implementing automated "smart push" alerts. $M_{P/E}$ might be "run time demonstration of decision cycle time compression against use case of interest.")

R_{PS} = Availability of professional skills required for adaptive evolutionary development (e.g. by evaluating vendors' prior performance against similar adaptive evolutionary system development. M_P might be "documented success in prior performance on similar open system project.")

Efficient systems and processes should, by design, facilitate effective outcomes. That is, as new technology is deployed, the system and process efficiencies should improve, and the operational effectiveness should also improve predictably as a result. Here efficiency is defined as $(\frac{Useful\ Output}{Input})$.

Effectiveness is defined as $(\frac{Useful\ Outcome}{Input})$. Hence tested values of ME, which describe outcomes, should be highly mathematically correlated to tested values of MP, which describe outputs. Thus, the correlation coefficient (ρ_{pu}) of the leading performance indicator MP, and lagging utility indicator ME, must be greater than zero. This is simply a mathematical expression of the definition of leading and lagging indicators, namely that the leading measure of output actually has skill at predicting the lagging measure of outcome. Ideally the correlation coefficient for leading and lagging indicators should approach 1.0, i.e. the leading measure of performance should ideally perfectly predict targeted outcomes

Accordingly, modeling or testing methods should validate and verify the hypothesis that “if the EIS M_p collectively improve – through appropriate management of risk-reward factors -- then the EIS M_E will also improve.” “Validation” means confirmation that the M_E actually effectively describes outcomes valued by the customer. “Verification” means confirmation that the selected performance requirements, expressed as M_p , are satisfied, and that satisfaction of the performance requirements result in improved M_E .

$$R_T = \left(\rho_{po} = \frac{\sigma_{po}}{\sigma_p \sigma_o} \right) > 0$$

$$R_O = \left(\rho_{pu} = \frac{\sigma_{po}}{\sigma_p \sigma_o} \right) = 1$$
(2)

R_T = Threshold requirement for system RoI

R_O = Objective requirement for system RoI

ρ_{po} = Correlation coefficient of system-level and process-level performance and operational-level performance

σ_{po} = Covariance of system-level and process-level performance and EIS functional test results (normalized across family of tests)

σ_p = Standard deviation of performance tests (normalized)

σ_o = Standard deviation of operational tests (normalized)

Again, equation (2) is simply a mathematical expression suggesting that the test plan for system development projects should validate and verify that the parameters chosen to predict progress against achieving targeted RoI i.e. manage risk, actually do so. It is a mathematical re-statement of what PMI’s “quantitative” approach to risk management should achieve, and what risk models for highly assured system engineering processes, and successful financial portfolios, actually achieve.

Calculation of Probability of Success

Traditional program management doctrine suggests thoroughly framing and managing risks in terms of impact to cost, schedule, and performance. PMI suggests also categorizing positive risks in terms of potential good consequences, and the probability of their occurrence. However, in practice, PMs tend to focus on probability and consequence of negative risk. Here we suggest a fundamental shift by offering a mathematical approach for focusing on the desired good outcome, namely RoI. In general, the probability of achieving the threshold requirement for RoI ($P(V_t)$) is equal to the joint probability of achieving threshold requirements for cost (c_t), performance (p_t), and schedule (s_t):

$$P[V_t] = P(c_t \cap p_t \cap s_t)$$

If the probabilities are independent of each other, then:

(3)

$$P[V_t] = P[c_t] * P[u_t] * P[s_t]$$

$P[V_t]$ = Probability of achieving threshold level of valued outcome, i.e. RoI.

$P(c_t \cap u_t \cap s_t)$ = Joint probability of achieving threshold level of monetary budget, utility, and schedule requirements

$P[c_t]$ = Probability of satisfying threshold level of monetary budget requirements.

$P[u_t]$ = Probability of achieving threshold level of utility requirements.

$P[s_t]$ = Probability of achieving threshold level of schedule requirements.

The PM's task is to evolve algorithms that correlate risk mitigating input behaviors, to the probability of achieving measurably successful process outputs and outcomes. Given these models of risk/rewards probability and impact, PM's can credibly optimize acquisition process effectiveness using tools such as traditional risk matrices. (See figure 3.)

Risk Management

		Positive Consequences					
		Maximal	Major	Moderate	Minor	Minimal	
Assessment based on consequence for Appropriateness	5	5.5	32.4	12.5	8.8	5.5	80-100%
	4	4.10	8.8	12.5	12.5	5.5	61-80%
	3	3.15	6.32	9.8	12.5	15.3	41-60%
	2	2.20	4.10	6.32	8.8	32.4	21-40%
	1	1.25	1.20	3.15	4.10	5.5	0-20%
		Minimal	Minor	Moderate	Major	Maximal	
		Negative Consequence					
		1	2	3	4	5	

Risk factor = (magnitude of neg consequence) X (probability of occurrence)

Reward factor = (magnitude of pos consequence) X (probability of occurrence)

Assuring high payoff is as important as assuring low risk

$$P[V_t] = P([c_t], [u_t], [s_t])$$

Likelihood Rationale:

5. Almost Certain
4. Probable
3. 50/50
2. Improbable
1. Almost No Chance

$$RoI = u/c \times 1/t_d$$

Consequence Rationale:

5. Risk: $\geq 100\%$ degradation*/Reward: $\geq 100\%$ improvement*
4. +/- 80%
3. +/- 60%
2. +/- 40%
1. Risk $\leq 20\%$ degradation/Reward: $\leq 20\%$ improvement

Target technologies/processes with high reward potential

- Operators Identify critical mission threads and associated desired outcomes up front
- Establish associated testable Measures of Effectiveness (MOE) lag metrics
- Establish Measures of Performance (MOP) lead metrics that are testably coupled to MOE lag metrics
- Build iterative test plan that assures MOP lead metrics and MOE lag metrics
- Perform AoA of potential technology components per the above

Target technology portfolio with balanced risk profile

- At least 80% of technology components must exist as COTS/GOTS*
- Any developed technology has known transition path to COTS/GOTS
- All performers have prior success with Open System development
- Project scope and process must support technology onboarding within "Moore's Law" time window

*COTS/GOTS= configurable out of the box via open standards and comes with known intellectual property rights and life cycle support model

Figure 3: Optimizing RoI depends on modeling and/or measuring co-dependence and evolution of risk and reward

Cost Probability Model

If "cost" is defined as monetary lifecycle investments for developing, testing, evaluating, certifying, deploying, maintaining, and upgrading a system or component(s) thereof; then the probability of achieving threshold targets for cost depend on optimizing the combination of, for example: upfront costs including initial purchase and any required infrastructure investments; accuracy of projected upgrade and maintenance costs; and the anticipated lifetime of the system. For example:

$$P[c_t] \propto (A_{co} = \frac{c_e - \sigma_{ce}}{c_e}) \quad (4)$$

$$\sigma_{ce} = \sqrt{\frac{(c_a - c_e)^2_{\text{Upfront investments}} + (c_a - c_e)^2_{\text{Developmental Test and Cert costs}} + (c_a - c_e)^2_{\text{Maintenance and Upgrade costs}} + (c_a - c_e)^2_{\text{nth other cost}}}{n}}$$

$P[c_t]$ = Probability of achieving threshold requirement for cost

$(A_{co} = \frac{c_e - \sigma_{ce}}{c_e})$ = Availability of cost objectives

C_e = Previously estimated total system lifecycle costs including upfront costs for infrastructure and initial purchases, engineering costs, and lifecycle upgrade and maintenance costs.

σ_{ce} = Root mean square error of actual lifecycle costs vs. estimated costs

c_a = Actual costs for the “) indicated” activity

c_e = Previously estimated costs for the “) indicated” activity

Utility Probability Model

Here we suggest that the probability of achieving the targeted level of utility depends on, for example, the quality of requirements, scope of the potential solution space, efficiency of the Analysis of Alternatives (AoA), efficiency of the capability integration platform, and the quality of Test and Evaluation (T&E.)

Achieving sufficient quality of requirements demands a process that provides objective feedback from the operational customer community several times during any particular developmental cycle. Achieving sufficient scope of solution set demands a process that socializes the system project use cases broadly across the landscape of innovative industry. Achieving efficiency of AoA requires an automated process, objective measures, and incentives to allow and encourage solution providers to self-demonstrate the V_p of their offerings. Achieving efficiency in the integration platform requires well-defined architectural functions and open standard interfaces. Achieving quality of T&E requires test-based designs, persistent test frameworks, and iterative testing throughout project execution.

To maximize the probability of satisfying system threshold utility requirements, the project work breakdown should scrupulously allocate the proper relative proportions of billable time spent: processing operational customers’ feedback; evaluating evolving capabilities in the market; carefully rationing any time spent developing immature technologies; and testing; etc. The project manager should adjust this schedule optimization model at each successive developmental cycle. Assuming that process is ongoing, PMs can model the probability of satisfying threshold levels of efficiency and effectiveness by tracking both whether the critical activities occurred as scheduled, and how well the test scores aligned with targeted measures. If the right risk/reward optimization activities are scheduled and performed, test results should both improve and become more predictable as the project progresses. For example:

$$P[u_t] \propto (A_{ca} = \frac{t_a - \sigma_{ca}}{t_d}) \quad (5)$$

$$\sigma_{ca} = \sqrt{\frac{(t_a - t_s)_{test}^2 + (t_a - t_s)_{customer\ feedback}^2 + (t_a - t_s)_{develop\ new\ tech}^2 + (t_a - t_s)_{market\ outreach}^2 + (t_a - t_s)_{nt\ other\ critical\ activity}^2}{n}}$$

$P[u_t]$ = Probability of achieving threshold requirement for effectiveness/performance/utility

$(A_{ca} = \frac{t_d - \sigma_{ca}}{t_d})$ = Availability of critical scheduled activities

t_d = Originally scheduled time for designing, engineering, T&E, and certification of an incremental system capability delivery.

σ_{ca} = Root mean square error of actual time spent on critical risk-reward optimization activities compared to originally scheduled time for those activities.

t_a = Time actually spent performing the “) indicated” risk-reward optimizing activity

t_s = Time originally scheduled for the “) indicated” risk-reward activity

Schedule Probability Model

This formulation of the threshold value of “schedule” aims to assure that capability is designed, developed, tested, certified, delivered and refreshed within the “technology half-life” of the capability in question. The concept of technology half-life recognizes the value of any unit of IT is highly perishable. Technology half-life is the length of time it takes for the value of the IT unit of interest to decrease to notionally half of its original value. In practice, determining technology half-life is usually subjective. The goal is to deploy the technology standard of interest no later than midway through its optimally useful lifetime.

Achieving assurance of “schedule value” requires a schedule process that standardizes and parallelizes sub process, e.g. testing part A while with developing part B; de-conflicts resources, e.g. schedules enterprise testing resources across independent sub tasks; schedules work to include preparing independently useful capability modules that can be developed and or procured and deployed irrespective of schedule delays associated with other modules.

$$P [s_t] \propto (A_{dv} = \frac{\sum_{n=1}^f K_n(Wf_n)}{\sum_{n=1}^p K_n(Wp_n)}) \quad (6)$$

$P[s_t]$ = Probability of achieving threshold schedule requirements

A_{dv} = Availability of developed value. I.e. weighted sum of completed work units divided by weighted sum of scheduled work units.

Wf_n = Successfully completed work unit.

Wp_n = Scheduled work unit.

K_n = Weighting factor. Weighting should take into account a clear delineation of how any work unit relates to project critical path.

n = Counting index

f = Number of successfully completed and tested scheduled work units.

p = Number of scheduled work units.

Appendix C: Sample Authorities for Adaptive Acquisition

DODI 5000.02

"... The models provide baseline approaches. A specific program should be tailored to the unique character of the product being acquired... acquisition management ... (traditional or) tailored variation ... depends on ... *knowledge about the capability ... and risks and costs ... to support a sound business decision to proceed to the next phase...*"

Encl. 6:

"... Employ effective performance-based logistics (PBL) planning, development, implementation, and management in developing a system's product support arrangements. PBL is performance-based product support, where outcomes are acquired through performance-based arrangements that deliver warfighter requirements and incentivize product support providers to reduce costs through innovation..."

From November 22, 2013 ASD (L&MR) "Performance Based Logistics Comprehensive Guidance" Memo

"PBL is synonymous with performance based life cycle product support, where outcomes are acquired through performance based arrangements that deliver Warfighter requirements and incentivize product support providers to reduce costs through innovation. These arrangements are contracts with industry or inter-governmental agreements. Attributes of an effective PBL arrangement include:

- Objective, measurable work description that acquires a product support outcome.
- Appropriate contract length, terms, and funding strategies that encourage delivery of the required outcome.
- A manageable number of metrics linked to contract requirements that reflect desired Warfighter outcomes and cost reduction goals.
- Incentives to achieve required outcomes and cost reduction initiatives.
- Risks and rewards shared between government and commercial product support integrators and providers.
- Synchronization of product support arrangements to satisfy Warfighter requirements."

"Other Transactions" Authority

- 10 USC section 2371-- Research projects: transactions other than contracts and grants
- 10 USC section 2371b -- Authority of the Department of Defense to Carry on Certain Prototype projects
 - FY16 NDAA Section 815 -- expansion of 10 USC section 2371b: Authority of the Department of Defense to Carry on Certain Prototype projects. DoD officials may use

“Other Transactions” Authority for funding *prototypes of solutions that may be acquired or developed* to improve military capability per the following:

- Limit of \$50M-\$250M per prototype unless higher ceiling approved by AT&L
- At least one of the following criteria are met:
 - A least one nontraditional defense contractor participates
 - All significant non-government participants are small businesses or nontraditional
 - At least one third of the total cost provided by commercial partner
 - SAE justifies in writing that OTA allows innovative business arrangements not feasible or appropriate under a contract, or expansion of defense supply base not practical or feasible under a contract.
- To maximum extent practical, “competitive procedures” shall be used to award OTA
- Prototype provides for award of follow on *production* transaction or contract if and only if:
 - “Competitive procedures” were used for award of OTA
 - Participants in the OTA “successfully complete” the prototype

JCIDS Manual Appendix B

For sustainment of previously fielded capability solutions, a new ICD, CDD, or CPD is not required to retain or restore capabilities or perform technology refresh of fielded systems that have a validated Operational Requirements Documents (ORD), ICD, CDD, or CPD. For example, subsystems that have approved performance parameters but are no longer able to meet those parameters can be updated or replaced to meet production threshold/objective values under the authority of the previously validated capability requirement document. However, if the MDA or other decision maker requires the capability document(s) be “revalidated” prior to supporting additional production or technology refresh, the legacy documents shall be transcribed into current document formats and content prior to submitting for review and validation.

FY 16 NDAA Section 803: Expansion of Rapid Acquisition Authority

In case of urgent need, SECDEF may appoint a senior acquisition official who, with written justification:

- May waive any laws and regulations in order to satisfy requirement
- May use any color of money, not to exceed \$200M/year total
- Shall attempt to award contract within 15 days
- Shall transition to normal acquisition process within 2 years

FY 16 NDAA Section 804: Middle Tier of Acquisition for Rapid Prototyping and Rapid Fielding

AT&L shall provide guidance for two rapid acquisition paths:

- RAPID PROTOTYPING: ... use of innovative technologies to rapidly develop fieldable prototypes to demonstrate new capabilities and meet emerging military needs... prototype ... demonstrated in an operational environment ... residual operational capability within five years....
 - Merit-based process to evaluate innovative technology
 - Acquisition strategies for the program
 - Cost-sharing process with the military departments
 - Demo/evaluation process
 - Transition process
 - OSD will provision rapid prototyping fund
- RAPID FIELDING.... use of proven technologies to field production quantities of new or upgraded systems with minimal development required. ... begin production within six months and complete fielding within five years...
 - Merit-based process for evaluating existing products/proven technologies
 - Demo/evaluation process
 - Acquisition strategy
 - Process for logistics support and system interoperability

FY 16 NDAA Section 805: Use of Alternate Acquisition Paths to Acquire National Security Capabilities

SECDEF shall establish alternative acquisition pathways that shall:

- Be separate from existing acquisition procedures
- Streamline contracting, budgeting, and requirements processes
- Base alternative acquisition paths on urgency and nature of capability
- Maximize use of flexible authorities in existing law and regulation

FY16 NDAA Section 806: SECDEF Waiver of Acquisition Laws to Acquire Vital National Security Capabilities

SECDEF may waive and law or regulation regarding:

- Requirement or specification
- RDT&E
- Production, fielding, and sustainment
- Solicitation, source selection, and award of contracts

If and only if:

- Capability is vital to national security
- Waived law/reg would impede effective acquisition of the capability
- Purpose of waived law/reg can be addressed alternatively

Defense Acquisition Guide

7.10.1. The Impetus for COTS Software Solutions

One of the Department's goals is to migrate to COTS solutions to fill Information Technology capability gaps.

[Subtitle III of Title 40 of the United States Code](#) (formerly known as Division E of the Clinger-Cohen Act (CCA) (referred to as "[Title 40/Clinger-Cohen Act](#)") and [DoD Instruction 5000.02, Enclosure 2, paragraphs 4.c.\(6\) and 5.d.\(1\)\(b\)3](#), all require the use of COTS IT solutions to the maximum practical extent.

7.10.2. Definition

Commercial, Off-the-Shelf (COTS) is defined as "commercial items that require no unique government modifications or maintenance over the life cycle of the product to meet the needs of the procuring agency."

[From the Twelfth Edition of [GLOSSARY: Defense Acquisition Acronyms and Terms](#).]

7.10.3. Mandatory Policies

The following bullets quote or paraphrase sections in the DoD 5000 series that specifically address COTS:

DoD Directive 5000.01, "The Defense Acquisition System" Paragraph E1.1.18, states "...The DoD Components shall work with users to define capability needs that facilitate the following, listed in descending order of preference:

"E1.1.18.1. The procurement or modification of commercially available products, services, and technologies, from domestic or international sources, or the development of dual-use technologies;"

Hence, commercially available products, services, and technologies are a first priority for acquisition solutions.

DoD Instruction 5000.02, "Operation of the Defense Acquisition System"

- DoD Instruction 5000.02, Enclosure 2, paragraph 4.c.(6), states that "existing commercial off-the-shelf (COTS) functionality and solutions drawn from a diversified range of large and small businesses shall be considered," when conducting the Analysis of Alternatives.
- Enclosure 5, "IT Considerations," Table 8, "[Title 40, Subtitle III](#)/CCA Compliance Table," requires that, to be considered [Title 40/CCA](#) compliant, the Department

must redesign the processes being supported by the system being acquired, to reduce costs, improve effectiveness and maximize the use of COTS technology.

- Enclosure 5, "IT Considerations," Section 8, states that: "When the use of commercial IT is considered viable, maximum leverage of and coordination with the DoD Enterprise Software Initiative shall be made."

7.10.4. COTS Software--Reuse Custom Components

Modifying the core code of a COTS product should be avoided. It is possible to add code to the existing product, to make the product operate in a way it was not intended to do "out-of-the-box." This, however, significantly increases program and total life-cycle costs, and turns a commercial product into a DoD-unique product. The business processes inherent in the COTS product should be adopted, not adapted, by the organization implementing the product. Adopting a COTS product is done through business process reengineering (BPR). This means the organization changes its processes to accommodate the software, not vice versa. In many cases there will be a few instances where BPR is not possible. For example, due to policy or law, it may be necessary to build or acquire needed reports, interfaces, conversions, and extensions. In these cases, adding to the product must be done under strong configuration control. In cases where a particular COTS product does not provide the entire set of required functionality, a "bolt-on" could be used. A bolt-on is not part of the COTS software product, but is typically part of a suite of software that has been certified to work with the product to provide the necessary additional functionality. These suites of software are integrated to provide the full set of needed functionality. Using a bolt-on, however, also increases program and total life-cycle costs.

See [section 7.10.6.3](#) for a more detailed discussion of reports, interfaces, conversions, and extensions.

7.10.5. COTS Integration into the Acquisition Life Cycle

The actions below are unique to acquiring COTS Information Technology solutions. These activities should occur within a tailored, responsive, and innovative program structure authorized by DoD Instruction 5000.02. The stakeholder primarily responsible for each action is shown at the end of each bullet.

7.10.5.1. Before Milestone A

- Define strategy and plan for conducting BPR during COTS software implementation phase of the program.
(Sponsor/Domain Owner)

- Consider COTS and BPR when developing the Analysis of Alternatives. (See [section 3.3](#) and [Table 7.8.4.T1](#) of this guidebook).
(Sponsor/Domain Owner)
- Consider commercially available products, services, and technologies when defining initial user needs in the Initial Capabilities Document.
(Sponsor/Domain Owner)
- When developing the [Technology Development Strategy](#) and/or the [Acquisition Strategy](#), consider commercial best practice approaches and address the rationale for acquiring COTS.
(Program Manager (PM))

7.10.5.2. Before Milestone B

- To the maximum extent possible, redesign business processes to conform to the best practice business rules inherent in the COTS product. Define a process for managing and/or approving the development of reports, interfaces, conversions, and extensions.

7.10.5.3. Before Milestone C or Full Rate Production Decision/Full Deployment Decision Review

- Ensure scope and requirements are strictly managed and additional reports, interfaces, conversions, and extensions objects are not developed without prior authorization.
(Program Manager (PM))
- Ensure adequate planning for life-cycle support of the program. See [section 3.4, Engineering for life-cycle support, of "Commercial Item Acquisition: Considerations and Lessons Learned"](#).

7.10.5.4. After Milestone C or Full-Rate Production Decision/Full-Deployment Decision Review

Conduct ongoing engineering and integration for sustainment activities throughout the life cycle of the program.

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