Appendices

Developing A Framework and An Instrument For Measuring System Openness

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Abstract

This document shows the goals, questions and metrics (detailed in the tables below) that were developed as part of the framework and instrument for measuring the degree of openness of a system. It starts with the questions and metrics that can be applied to measuring the openness of an organisation's culture and that of its employees.

It goes on to describe the goals and metrics for ascertaining the openness of the components of the factors of Architecture, Design, Data, and Implementation.

A Questionnaires

Culture - Organisation The **goal** of the factor of Culture of the Organisation is to assess the Openness of the culture of the organisation. Tables 1 and 2 describe the questions and metrics that can be used for this assessment.

Item No	Question	Scale				
CO.1	**Is the organisation committed to openness principles?**	No	Specialist staff only	Senior Members	The Board	All employees
Evidence: the answers to the questions above, give cross reference to documentation. Is it possible to provide an example, e.g. from Training Manuals or Awarded Contracts.						
Guidance: e.g. references from System Design Document; System Engineering Plan, Employee Training Materials.						
CO.2	**Where possible are contracts and agreements with customers written with the openness principles in mind?**	No	Only where customer specifies	Normally written, but not enforced	Normally written, and enforced	Always written and enforced
Evidence: the answers to the questions above, give cross reference to documentation. Is it possible to provide an example, e.g. from Training Manuals or Awarded Contracts.						
Guidance: e.g. references from System Design Document; System Engineering Plan, Employee Training Materials.						
CO.3	**Where possible, do the design, implementation and sustained operation environment of a project provide complete and sufficient information for the customer to operate in an openness principle way?**	No	Only where customer specifies	Only the design and implementation environments provide these	Only the sustained operation environments provides these	Design, Implementation and Sustained environments provide these
Evidence: the answers to the questions above, give cross reference to documentation. Please provide example(s).						
Guidance: Systems Engineering Plan, Initial Capabilities Document (ICDs))						

Table 1: Culture - Organisation

Item No	Question	Scale				
CO.4	**At the start of a new project are staff reminded of the openness principles (including procurement and sales)?**	None exist	Only higher level staff are reminded	Only middle level staff are reminded	Only lower level staff are reminded	All pay scales are reminded
Evidence: the answers to the questions above, give cross reference to documentation. Please provide some examples.						
Guidance: e.g. references from Employee Induction Materials.						
CO.5	**Where possible, are openness principles required from the supply chain?**	No	Only when customer specifies	Normally written into contracts, but not enforced	Normally written into contracts, and enforced	Always written into contracts, and enforced
Evidence: the answers to the questions above, give cross reference to documentation.						
Guidance: e.g. references from Awarded Contracts, Inventory Register, etc.						

Table 2: Culture - Organisation (contd.)

Culture - Employees The **goal** of the factor of Employee Culture is to assess the Openness of the culture of existing with the employees. Tables 3 and 4 describe the questions and metrics that can be used for this assessment.

Item No	Question	Scale				
CE.1	**Do all engineering staff receive training in open architecture design?**	No training received	Training in place but not mandatory	Open architecture training received by 50% or less of employees	Open architecture training received by more than 50% employees	Open architecture training received by more than 50% employees, and monitored
Evidence: the answers to the questions above, give cross reference to documentation. Is it possible to provide an example, e.g. from Training Manuals or Certificates awarded to Employees						
Guidance: e.g. references from System Design Document; System Engineering Plan, Employee Training Materials						
CE.2	**Are all engineering staff trained to use open standards, where possible?**	No training received	Training in place but not mandatory	Open architecture training received by 50% or less of employees	Open architecture training received by more than 50% employees	Open architecture training received by more than 50% employees, and monitored
Evidence: the answers to the questions above, give cross reference to documentation, and maybe some example system modules						
Guidance: e.g. references from System Design Document; System Engineering Plan, Employee Training Materials						
CE.3	**Are openness principles used throughout the product or service lifecycle?**	None used	Some principles used but not enforced	Principles used and enforced on less than 50% of lifecycle	Principles used and enforced on more than 50% of lifecycle	Principles used and enforced on all of the lifecycle
Evidence: the answers to the questions above, give cross reference to documentation. Please provide example(s).						
Guidance: Systems Engineering Plan, Initial Capabilities Document (ICDs))						

Table 3: Culture - Employees

Item No	Question	Scale				
CE.4	**At the start of a new project are staff reminded of the openness principles (including procurement and sales)?**	None exist	Only higher level staff are reminded	Only middle level staff are reminded	Only lower level staff are reminded	All pay scales are reminded
Evidence: the answers to the questions above, give cross reference to documentation. Please provide some examples.						
Guidance: e.g. references from Employee Induction Materials						
CE.5	**Are openness principles part of the induction training for staff?**	None exist	Only higher level staff are given this training	Only middle level staff are given this training	Only lower level staff are given this training	All pay scales are given this training
Evidence: the answers to the questions above, give cross reference to documentation.						
Guidance: e.g. references from Employee Induction Materials.						

Table 4: Culture - Employees (contd.)

Architecture: The fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution [ISO/IEC/IEEE 42010].

In this appendix, we describe the relative importance of factors that contribute to the Openness of an Architecture in a System. These include: Configurability, Portability, Extensibility, and Vendor-agnosticity,

Interfaces: An interface can be defined as shared boundary across which information is passed. An interface can also be defined as a method of connecting two or more components for the purpose of passing information from one to the other. [IEEE 610.12-1990 - IEEE Standard Glossary of Software Engineering Terminology].

In this appendix, we describe the relative importance of factors that contribute to the Openness of System Interfaces.

Design: This can be defined as the process of developing, expressing, documenting, and communicating the realization of the architecture of the system through a complete set of design characteristics described in a form suitable for implementation [Guide to the Systems Engineering Body of Knowledge (SEBoK)].

In this appendix, we describe the relative importance of factors that contribute to the Openness of System Design.

Data: A representation of facts, concepts, or instructions in a manner suitable for communication, interpretation, or processing by humans or by automatic means. [IEEE 610.12-1990 - IEEE Standard Glossary of Software Engineering Terminology]

In this appendix, we describe the relative importance of factors that contribute to the Openness of the Data of a System.

Implementation: The process of translating a design into hardware and/or software components [IEEE 610.12-1990 - IEEE Standard Glossary of Software Engineering Terminology].

In this appendix, we describe the relative importance of factors that contribute to the Openness of the Implementation of a System.

Configurability: the ease with which a system's configurations (or its subsystems) can be changed or modified after development or design, e.g., for different platforms and/or usages						
Item No	Question	Scale				
C.1	**How much of the architecture addresses obsolescence?**	Not addressed	Less than 50% of Architecture address obsolescence	50% of Architecture address obsolescence	More than 50% of Architecture address obsolescence	All of the Architecture address obsolescence
Evidence: the answers to the questions above. Also, do give cross reference to documentation.						
Purpose of Question: The difficulty in upgrading a system derives directly from how well the functional and infrastructure elements are modularised and grouped according to their system roles. If this is done clearly, then the ripple effects of changing it to a different platform or usage is minimised. Therefore, this question assesses the ease of the configuration of the architecture to address technology obsolescence.						
Guidance: References from Systems Engineering Plan, Information Support Plan, MoD/Authority Architecture products and standards, etc.						
C.2	**How much of the architecture addresses technology refresh?**	Not addressed	Less than 50% of Architecture address technology refresh	50% of Architecture address technology refresh	More than 50% of Architecture address technology refresh	All of the Architecture address technology refresh
Evidence: the answers to the questions above. Also, do give cross reference to documentation.						
Purpose of Question: The difficulty in upgrading a system derives directly from how well the functional and infrastructure elements are modularised and grouped according to their system roles. If this is done clearly, then the ripple effects of changing it to a different platform or usage is minimised. Therefore, this question assesses the ease of the configuration of the architecture to address technology refresh.						
Guidance: References from Systems Engineering Plan, Information Support Plan, Authority Architecture products and standards, etc.						
C.3	**How much of the architecture addresses unplanned maintenance?**	Not addressed	Less than 50% of Architecture address unplanned maintenance	50% of Architecture address unplanned maintenance	More than 50% of Architecture address unplanned maintenance	All of the Architecture address unplanned maintenance
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: The difficulty in upgrading a system derives directly from how well the functional and infrastructure elements are modularised and grouped according to their system roles. If this is done clearly, then the ripple effects of changing it to a different platform or usage is minimised. Therefore, this question assesses the ease of the configuration of the architecture to address unplanned maintenance, e.g. to address zero-day exploits, etc.						
Guidance: Systems Engineering Plan, Information Support Plan, Company/Authority Architecture products and standards, Change Management Plan.						

Table 5: Architecture - Configurability

Configurability: the ease with which a system's configurations (or its subsystems) can be changed or modified after development or design, e.g., for different platforms and/or usages						
Item No	Question	Scale				
C.4	**How much of the architecture addresses planned upgrades?**	Not addressed	Less than 50% of Architecture address planned upgrades	50% of Architecture address planned upgrades	More than 50% of Architecture address planned upgrades	All of the Architecture address planned upgrades
Evidence: the answers to the questions above. Also, do give cross reference to documentation						
Purpose of Question: The difficulty in upgrading a system derives directly from how well the functional and infrastructure elements are modularised and grouped according to their system roles. If this is done clearly, then the ripple effects of an upgrade to a part of the system are minimized. This results in faster upgrades and lower costs. Therefore, this question assesses the ease of the configuration of the architecture to address planned upgrades.						
Guidance: References from Systems Engineering Plan, Information Support Plan, Company/Authority Architecture products and standards, etc.						

Table 6: Architecture - Configurability (contd.)

Portability: architecture expressed in standardised models, such as XMI, UML, SysML, MoDAF						
Item No	Question	Scale				
P.1	**To what extent is the system's architecture based on related industry or other standard reference models and architectural frameworks?**	None used	Used, no syntax-checking, no model-checking	Used, syntax-checked, no model-checking	Used, syntax-checked, fair model-checking	Used, syntax-checked, and consistent model-checking
Evidence: the answers to the questions above. Also, do give cross reference to documentation.						
Purpose of Question: To assess the degree to which the system's architecture matches or aligns with architectural patterns (e.g., ISO/IEC 10746 Reference Model - Open Distributed Processing) that are well established in industry.						
Guidance: References from Systems Engineering Plan, Information Support Plan, MoD/Authority Architecture products and standards, etc.						
P.2	**To what extent is an architectural description language (ADL) used to define system modules?**	Not used	Less than 50% of modules defined using an ADL	50% of modules defined using an ADL	More than 50% of modules defined using an ADL	All system modules defined using an ADL
Evidence: the answers to the questions above. Also, do give cross reference to documentation.						
Purpose of Question: To assess the degree to which the system modules are well-defined and understandable.						
Guidance: References from Systems Engineering Plan, Information Support Plan, MoD/Authority Architecture products and standards, etc.						
P.3	**To what extent is an architectural description language used to define system interfaces?**	Not used	Less than 50% of system interfaces defined using an ADL	50% of system interfaces defined using an ADL	More than 50% of system interfaces defined using an ADL	All system modules defined using an ADL
Evidence: the answers to the questions above, and please do give cross reference to documentation.						
Purpose of Question: To assess the degree to which the system interfaces are well-defined and understandable.						
Guidance: References from Program documentation (e.g., System's architecture, Systems Engineering Plan, Information Support Plan, etc).						

Table 7: Architecture - Portability

Extensibility: the ease with which the architecture can be modified to increase its functional capacity, e.g. facilitating new technology insertion						
Item No	Question	Scale				
E.1	**To what extent is the system's architecture capable of adapting to evolving requirements?**	Not capable and/or may inhibit	Less than 50% of architecture easy to extend	50% of architecture easy to extend	More than 50% of architecture easy to extend	All of architecture easy to extend
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the system's architecture enables ease of change, mitigates technological obsolescence, and provides long-life supportability.						
Guidance: References from the system's architecture documentation, technical data package, contracts, etc.						
E.2	**To what extent does the architecture development process follow a well-defined System Engineering process for implementing capability extension?**	Does not follow and/or difficult to implement change requests	Less than 50% of architecture easy to implement capability extension	50% of architecture easy to implement capability extension	More than 50% of architecture easy to implement capability extension	All of architecture easy to implement capability extension
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Creating an extensible architecture requires careful coordination of concerns in design, architectural principles, work product specification and activities to make sure that decisions made throughout the process does not inadvertently create inhibitors to extensibility.						
Guidance: References from Program documentation (e.g., System's architecture, Systems Engineering Plan, Information Support Plan, etc).						

Table 8: Architecture - Extensibility

Vendor-agnostic: the ease with which a system or component can be transferred and run from one hardware or software environment to another						
Item No	Question	Scale				
V.1	**To what extent is the program free of system components that have proprietary characteristics?**	Not free of proprietary interfaces	Less than 50% of system components are free of proprietary interfaces	50% of system components are free of proprietary interfaces	More than 50% of system components are free of proprietary interfaces	All system components are free of proprietary interfaces
Evidence: the answers to the questions above, and please do give cross reference to documentation.						
Purpose of Question: In an open systems approach, if proprietary elements are needed, their use cannot preclude their replacement with or interface to other, non-proprietary solutions or elements. The concern is that system elements will include proprietary or program unique features/requirements that preclude alternative solutions. This question evaluates how much freedom the Authority has to tender these components these components for competitive selection or re-assignment to other vendors.						
Guidance: References from System Architecture Documents; System Engineering Plan, etc.						
V.2	**To what extent is the program free of system components that have restrictive licensing?**	Not free of restrictive licensing	Less than 50% of system components are free of restrictive licensing	50% of system components are free of restrictive licensing	More than 50% of system components are free of restrictive licensing	All system components are free of restrictive licensing
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: In an open systems approach, if proprietary elements are needed, their use cannot preclude their replacement with or interface to other, non-proprietary solutions or elements. The concern is that system elements will include proprietary or program unique features/requirements that preclude alternative solutions. This question allows the Authority to plan how much they may need to pay for continual access to the system components						
Guidance: References from System Architecture Documents; System Engineering Plan, etc.						

Table 9: Architecture - Vendor-agnostic

Vendor-agnostic: the ease with which a system or component can be transferred and run from one hardware or software environment to another						
Item No	Question	Scale				
V.3	**To what extent is the Program's data sets capable of adapting to evolving requirements?**	Not capable of adapting	Less than 50% of data sets can adapt to new change requests	50% of data sets can adapt to new change requests	More than 50% of data sets can adapt to new change requests	All data sets can adapt to new change requests
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the system's data sets enable ease of change, mitigates technological obsolescence, and provides long-life supportability.						
Guidance: References from Data Design Documents, technical data package, contracts, etc.						
V.4	**To what extent is the program free of prohibitive cost that could limit or preclude the reuse of the components**	Not free of prohibitive costs	Less than 50% of system components are free of prohibitive cost	50% of system components are free of prohibitive cost	More than 50% of system components are free of prohibitive cost	All system components are free of prohibitive cost
Evidence: the answers to the questions above, and please do give cross reference to documentation.						
Purpose of Question: This measures the ease (or lack) of competitive selection or re-assignment of these components to other suppliers and vendors, by the Authority.						
Guidance: References from Systems Engineering Plan, Information Support Plan, Authority Architecture products and standards, etc.						

Table 10: Architecture - Vendor-agnostic (contd.)

Standardised: interfaces from this system, and across system modules are Standardised, according to industry and/or community-of-practice norms, and easily transferred across systems						
Item No	Question	Scale				
S.1	**How much of the interface can be traceable to the Program's architecture and design elements?**	No traceability	Traceability for less than 50% of Interfaces	Traceability for 50% of Interfaces	Traceability for more than 50% of Interfaces	Traceability for all Interfaces
Evidence: the answers to the questions above, give cross reference to documentation. Is it possible to provide an example, e.g. from Architecture to Interfaces?						
Purpose of Question: To evaluate the degree of system requirements accountability of the Program.						
Guidance: e.g. references from System Design Document; System Engineering Plan.						
S.2	**How much of the interface are standardised across systems modules?**	No standardisation	Standardisation for less than 50% of Interfaces	Standardisation for 50% of Interfaces	Standardisation for more than 50% of Interfaces	Standardisation for all Interfaces
Evidence: the answers to the questions above, give cross reference to documentation, and maybe some example system modules.						
Purpose of Question: This evaluates the degree of modularisation or componentisation of the system. This is useful for system understanding and ease of change						
Guidance: e.g. references from System Design Document; System Engineering Plan.						

Table 11: Interfaces - Standardised

Standardised: interfaces from this system, and across system modules are Standardised, according to industry and/or community-of-practice norms, and easily transferred across systems						
Item No	Question	Scale				
S.3	**To what extent are there established criteria for designating key interfaces?**	No criteria	Established criteria exist to designate less than 50% of key interfaces	Established criteria exist to designate 50% of key interfaces	Established criteria exist to designate more than 50% of key interfaces	Established criteria exist to designate all of key interfaces
Evidence: the answers to the questions above, give cross reference to documentation. Please provide example(s).						
Purpose of Question: To assess the degree to which the program has established criteria (e.g., criticality of function, ease of integration, frequency of change, interoperability, commonality) as the basis for designating key interfaces.						
Guidance: Systems Engineering Plan, Initial Capabilities Document (ICDs)), interface control and configuration management documentation, Information Support Plan, Architecture Framework products and standards.						
S.4	**To what extent are open standards selected for key interfaces?**	None exist	Open standards are selected for less than 50% of key interfaces	Open standards are selected for 50% of key interfaces	Open standards are selected for more than 50% of key interfaces	Open standards are selected for all of key interfaces
Evidence: the answers to the questions above, give cross reference to documentation. Please provide some examples.						
Purpose of Question: To assess the degree to which the program has established standards selection criteria that give preference to open interface standards.						
Guidance: e.g. references from Interface control and configuration management documentation, contractual documents.						

Table 12: Interfaces - Standardised (contd.)

Non-proprietary published according to industry and/or community-of-practice standards						
Item No	Question	Scale				
N.1	**To what extent are proprietary interfaces well-defined and limited in scope so that others are not precluded from interfacing with these or from developing and providing interfaces with comparable or improved performance and form, fit and function?**	None exist	Definitions exist for less than 50% of proprietary interfaces	Definitions exist for 50% of proprietary interfaces	Definitions exist for more than 50% of proprietary interfaces	Definitions exist for all proprietary interfaces
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: In most cases, the total replacement of "in-service interfaces" with new interfaces is not a fiscally sound option. Upgrading existing systems to modular open system designs for all or portions is, however, possible and desirable. To achieve this goal, upgrading existing systems to become modular and open must be planned for, as part of the technology refresh/insertion process and work plans must be structured to enable the process						
Guidance: Please state percentage of COTS supply or provision in the Program. And, references from System Design Document; System Engineering Plan.						
N.2	**To what extent has the Program assessed the feasibility of using open or non-proprietary standards for key interfaces?**	No assessment	Feasibility studies done for less than 50% of proprietary key interfaces	Feasibility studies done for 50% of proprietary key interfaces	Feasibility studies done for more than 50% of proprietary key interfaces	Feasibility studies done for all proprietary key interfaces
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the program uses feasibility studies (i.e., market, economic, operational, and technological) to evaluate the appropriateness of using open standards for key interfaces.						
Guidance: Trade-studies, market research findings, Technology Readiness Assessment, Affordability Assessment.						

Table 13: Interfaces - Non proprietary

Non-proprietary published according to industry and/or community-of-practice standards						
Item No	Question	Scale				
N.3	**To what extent does the program use widely-accepted and supported standards to define interface definitions or key interfaces that are published and maintained by recognized organizations?**	None used	Standards adoption and usage exist but no enforcement	Standards adoption and usage exist but little enforcement	Standards adoption and usage exist and fairly enforced	Standards adoption and usage exist and consistently enforced
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: The key to Open Systems and modular designs and acquisition flexibility is the ability of third parties to participate in or compete for functional modules or components. Using disciplined partitioning and clearly defined, preferably widely-accepted Community-of-practice Interfaces, use widely-accepted and supported standards are a key attribute of the Open Systems process.						
Guidance: e.g. references from Systems Engineering Plan, Initial Capabilities Document (ICDs)), interface control and configuration management documentation, Information Support Plan, Architecture Framework products and standards.						
N.4	**To what extent are there established mechanisms to migrate key interfaces that are proprietary or closed to key interfaces that are open?**	None exist	Plan exist but no timetable for plan enactment	Plan and timetable exist for less than 50% of key interfaces	Plan and timetable exist for more than 50% of key interfaces	Plan and timetable exist for all key interfaces
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the program has established a plan to migrate from proprietary to open interfaces.						
Guidance: e.g. references from Interface control and configuration management documentation, Systems Engineering Plan						

Table 14: Interfaces - Non proprietary (contd.)

User-base: How large is the user base, the more eyes, the higher the probability many errors/bugs have been eliminated						
Item No	Question	Scale				
U.1	**To what extent does the Program have policies that control adding specifications that limit the use of widely-available interface standards?**	No control policy exists	Some control policies exist but not enforced	Some control policies exist but lightly enforced	Some control policies exist but fairly enforced	Some control policies exist and consistently enforced
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: In some cases, vendors have used widely-supported commercially available interface standards but modified or implemented them in such a way that the ability of third parties to provide alternative solutions is restricted or precluded. Therefore, this question measures the ease by which third parties can easily provide alternative solutions to the system's components.						
Guidance: e.g. references from Interface control and configuration management documentation, Systems Engineering Plan.						
U.2	**To what extent does the Program have processes that control adding options or extensions that limit the use of openly available interface standards?**	No control policy exists	Some control policies exist but not enforced	Some control policies exist but lightly enforced	Some control policies exist but fairly enforced	Some control policies exist and consistently enforced
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: In some cases, vendors have used widely-supported commercially available interface standards but modified or implemented them in such a way that the ability of third parties to provide alternative solutions is restricted or precluded. Therefore, this question measures the ease by which third parties can easily provide alternative solutions to the system's components.						
Guidance: e.g. references from Interface control and configuration management documentation, Systems Engineering Plan.						

Table 15: Interfaces - User base

User-base: How large is the user base, the more eyes, the higher the probability many errors/bugs have been eliminated						
Item No	Question	Scale				
U.3	**To what extent does the Program include Lifecycle Support for the interfaces?**	No support	Support exists for less than 50% of interfaces	Support exists for 50% of interfaces	Support exists for more than 50% of interfaces	Support exists for all of the interfaces
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To evaluate the Program's commitment, and the system's support, to adapt to evolving requirements, mitigating technological obsolescence and provisioning for long-life supportability.						
Guidance: e.g. references from Systems Engineering Plan, Initial Capabilities Document (ICDs)), interface control and configuration management documentation, Information Support Plan, Architecture Framework products and standards.						
U.4	**Are the development environment tools for interface definition openly available?**	None open	Less than 50% of IDE open	50% of the IDE open	More than 50% of IDE open	All IDEs open
Evidence: the answers to the questions above, give cross reference to documentation. Please state some example tools used in the program.						
Purpose of Question: Evaluates ease of adapting to evolving requirements and mitigating technology obsolescence.						
Guidance: e.g. references from Systems Engineering Plan, Initial Capabilities Document (ICDs)), interface control and configuration management documentation, Information Support Plan, Company/Architecture Framework products and standards.						

Table 16: Interfaces - User base (contd.)

Extensibility: How easy can the interface be extended to accommodate changes or augmentation						
Item No	Question	Scale				
E.1	**To what extent have the proprietary or unique non-commercial interfaces been limited or well defined such that they do not hinder others from interfacing or developing any part of the system?**	Proprietary interfaces scope not well defined	Less than 50% of proprietary interfaces have well defined scope	50% of proprietary interfaces have well defined scope	More than 50% of proprietary interfaces have well defined scope	All proprietary interfaces have well defined scope
Evidence the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Since using proprietary or vendor unique solutions on occasion at a component or module level and within contracts cannot be uniformly prohibited, and since few functions, components or modules are truly mission unique, the use of proprietary or unique non-commercial interfaces should be minimised in order to maximise re use, transportability, and extensibility						
Guidance: e.g. references from System Engineering Plan.						
E.2	**To what extent are there established mechanisms to migrate key interfaces that are proprietary or closed to key interfaces that are open?**	No migration mechanism exists	Migration mechanisms in place for less than 50% of all key interfaces	Migration mechanisms in place for 50% of all key interfaces	Migration mechanisms in place for more than 50% of all key interfaces	Migration mechanisms in place for all key interfaces
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the Program has established a plan to migrate from proprietary to open interfaces.						
Guidance: e.g. references from System Design Document; System Engineering Plan.						

Table 17: Interfaces - Extensibility

Extensibility: How easy can the interface be extended to accommodate changes or augmentation						
Item No	Question	Scale				
E.3	**To what extent is the Program's interfaces capable of adapting to evolving requirements?**	No capability to extend	Less than 50% of interfaces are easy to extend	50% of interfaces are easy to extend	More than 50% of interfaces are easy to extend	All interfaces are easy to extend
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the system's interfaces enables ease of change, mitigates technological obsolescence, and provides long-life supportability.						
Guidance: e.g. references from System Design Document; System Engineering Plan.						
E.4	**Does the Program use widely-accepted and supported standards to define interface definitions or key interfaces that are published and maintained by recognized organizations?**	None exist nor used	Standards exist but used sparingly	Standards exist, used for 50% of interfaces	Standards exist, used for more than 50% of interfaces	Standards exist, used for all interfaces
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the system's interfaces enables ease of change, mitigates technological obsolescence, and provides long-life supportability.						
Guidance: e.g. references from the system's architecture, technical data package, contracts, etc.						

Table 18: Interfaces - Extensibility (contd.)

Accessibility: Ability to access interfaces' functions and data. Is the accessibility mechanism proprietary or based on industry or community-of-practice standards?						
Item No	Question	Scale				
A.1	**To what extent is the accessibility mechanism proprietary or based on industry or community-of-practice standards?**	All access proprietary	More than 50% of access proprietary	50% of access proprietary	Less than 50% access are proprietary	None is proprietary
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: A proprietary accessibility mechanism may add to ongoing costs of data access and its maintenance during the lifecycle support of the Program. An industry-based access mechanism reduces costs of on-going maintenance. If the access mechanism is proprietary, is there a migration path from this proprietary mechanism to one based on industry standard?						
Guidance: e.g. references from Interface control and configuration management documentation, Systems Engineering Plan.						
A.2	**To what extent does the configuration management process encompass changes to key interfaces and corresponding standards?**	No version control	Less than 50% version controlled	50% are version controlled	More than 50% version controlled	All are version controlled
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the program has incorporated key interface designations, selected standards and related design modifications in the change management process						
Guidance: e.g. references from Interface control and configuration management documentation, etc.						

Table 19: Interfaces - Accessibility

Module coupling: degree of dependency on other modules to achieve purpose. Is the module loosely-coupled, i.e. has, or makes use of, little or no knowledge of other modules? or a tightly-coupled module, i.e. it has knowledge, or makes use of many other modules						
Item No	Question	Scale				
MP.Q1	**How much of the design is loosely-coupled?**	No loose coupling	Less than 50% of modules are loosely-coupled	50% of modules are loosely-coupled	More than 50% of modules are loosely-coupled	All modules are loosely-coupled
Evidence: the answers to the questions above, give cross reference to documentation, and if possible, do provide an example.						
Purpose of Question: To assess the degree to which the system can ensure that changes to one module will not necessarily require extensive changes to other modules, so that evolving requirements can be easily accommodated by changing a minimum number of modules.						
Guidance: e.g. reference from System Engineering Plan; System Design Documents.						
MP.Q2	**How much of the design is tightly-coupled?**	No tight coupling	Less than 50% of modules are tightly-coupled	50% of modules are tightly-coupled	More than 50% of modules are tightly-coupled	All modules are tightly-coupled
Evidence: the answers to the questions above, give cross reference to documentation. If possible, do provide an example from your designs.						
Purpose of Question: To assess the degree to which the system can ensure that changes to one module will not necessarily require extensive changes to other modules, so that evolving requirements can be easily accommodated by changing a minimum number of modules.						
Guidance: e.g. reference from System Engineering Plan; System Design Documents.						

Table 20: Design - Module coupling

Module cohesion: degree of Discrete and identifiable functionalities with well-defined responsibilities						
Item No	Question	Scale				
MH.Q1	**To what extent has the Program used incentives to promote modular designs?**	None used	Used for less than 50% of modules	Used for 50% of modules	Used for more than 50% of modules	Used for all modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: This measures effectiveness of incentives used by the Program to promote modular designs on all major aspects of the Program						
Guidance: e.g. reference from System Engineering Plan; Program Design Documents.						
MH.Q2	**To what extent has the Program used incentives to promote modular commonality**	None used	Used for less than 50% of modules	Used for 50% of modules	Used for more than 50% of modules	Used for all modules
Evidence: the answers to the questions above, providing reference to pertinent documentation.						
Purpose of Question: This measures effectiveness of incentives used by the Program to promote modular commonality on all major aspects of the Program						
Guidance: e.g. reference from System Engineering Plan; Program Design Documents						
MH.Q3	**To what extent has the Program used incentives to promote modular designs, commonality and component reuse?**	None used	Used for less than 50% of modules	Used for 50% of modules	Used for more than 50% of modules	Used for all modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Program incentives are tools used to motivate and incentivise (sub) contractors and/or their team to meet performance standards of the contract. This question measures effectiveness of incentives used by the Program to promote modular designs, commonality and component reuse on all major aspects of the Program. Combining these three characteristics provides fiscal incentive for the prime system integrator to support the Open Systems Business Model.						
Guidance: e.g. reference from System Engineering Plan; Program Design Documents.						

Table 21: Design - Module cohesion

Design - Re-use: Community-of-practice understanding of Design Patterns, Reference models and architectures						
Item No	Question	Scale				
DR.Q1	**To what extent does the design process stress the use of widely-accepted and supported standards, such as those maintained by recognized organizations (e.g. IEEE) and domain community, to define both internal and external modules?**	None used	Adoption present but not widely used on Program	Adoption present, consistently used on 50% of modules	Adoption present, consistently used on more than 50% of modules	Adoption present, consistently used on all modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: The key to Open Systems and modular designs and acquisition flexibility is the ability of third parties to participate in or compete for functional modules or components. Using disciplined partitioning and clearly defined, preferably widely-accepted Community-of-practice Design Patterns, Reference models and architectures standards is a key attribute of the Open Systems process.						
Guidance: e.g. reference from Program Design Documents, etc.						
DR.Q2	**To what extent is a Design Reuse strategy in place?**	None in place	In place and used on less than 50% of modules	In place and used on 50% of modules	In place and used on more than 50% of modules	In place and used on all modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the system enables ease of change, and mitigates technological obsolescence.						
Guidance: e.g. reference from System Engineering Plan; Program Design Documents						

Table 22: Design - Re-use

Design - Re-use: Community-of-practice understanding of Design Patterns, Reference models and architectures						
Item No	Question	Scale				
DR.Q3	**To what extent does the design process include Lifecycle Support for the designed modules?**	No Lifecycle Support in place	Lifecycle Support in place for less than 50% of modules	Lifecycle Support in place 50% of modules	Lifecycle Support in place for more than 50% of modules	Lifecycle Support in place for all modules
Evidence the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the system enables ease of change, mitigates technological obsolescence, and provisioning for long-life supportability.						
Guidance: e.g. reference from System Engineering Plan; Program Design Documents						
DR.Q4	**To what extent does the design process include Funding for the designed modules?**	None exists	Funding exists for less than 50% of modules	Funding exists for 50% of modules	Funding exists for more than 50% of modules	Funding exists for all modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Successful implementation of Open Systems requires Programs to include support and funding to enable an ongoing commitment to maintain and even improve that Program's level of openness. If Open Systems were addressed only during initial implementation, the Program's designs would likely grow more closed over time as they become more complex and technical insertions were performed.						
Guidance: One way to assess the degree to which Open Systems has been included as a critical element of the lifecycle is to consider if the system is open enough to incorporate regular upgrades and whether or not the program plan includes funding for these upgrades throughout the lifecycle. Please do provide an example of how the design process supports/includes funding for the designed modules.						

Table 23: Design - Re-use (contd.)

Design - Re-use: Community-of-practice understanding of Design Patterns, Reference models and architectures						
Item No	Question	Scale				
DR.Q5	**To what extent does the design process criteria require that, other things being equal, priority be given to software modules that have the least restrictive rights associated with them?**	No requirement	Priority given to less than 50% of modules	Priority given to 50% of modules	Priority given to more than 50% of modules	Priority given to all modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: This evaluates the degree to which the program uses selection criteria that generally favour maximizing the Authority's rights. These rights are typically ranked in descending order from least to most restrictive. The primary goal is to maximise the Authority's flexibility and minimise costs by reusing available designs that satisfy the operational needs of the Authority.						
Guidance: e.g. reference from System Engineering Plan; System Integration Plan; Program Design Documents						
DR.Q6	**To what extent are non-mission unique (NMU) capabilities supplied using either components reused from other programs or available from the commercial market?**	Not supplied	Supply available to less than 50% of (NMU) capabilities	Supply available to 50% of (NMU) capabilities	Supply available to more than 50% of (NMU) capabilities	Supply available to all (NMU) capabilities
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Since using proprietary or vendor unique design solutions on occasion at a component or module level and within contracts cannot be uniformly prohibited, and since few functions, components or modules are truly mission unique, the use of proprietary or unique non-commercial designs should be minimised in order to maximise re use, transportability, and extensibility of the program's design evolution						
Guidance: e.g. reference from System Engineering Plan; Program Design Documents						

Table 24: Design Re-use (contd.)

Design - Layering: Good separation of concerns of applications and infrastructure, e.g. hardware, operating system, etc.						
Item No	Question	Scale				
DL.Q1	**To what extent have the proprietary or unique non-commercial (UNC) elements been limited or well defined such that they do not hinder other developers from interfacing or developing any part of the system?**	Not well-defined	Well-defined for less than 50% of UNC elements	Well-defined for 50% of UNC elements	Well-defined for more than 50% of UNC elements	Well-defined for all UNC elements
Evidence: the answers to the questions above, give cross reference to documentation. Please provide examples and/or numbers to justify your answer.						
Purpose of Question: In most cases, the total replacement of "in-service designs" with new designs is not a fiscally sound option. Upgrading existing systems to modular open system designs for all or portions is, however, possible and desirable. To achieve this goal, upgrading existing systems to become modular and open must be planned for as part of the technology refresh/insertion process and work plans must be structured to enable the process						
Guidance: Percentage of COTS supply or provision in the Program. Program Design Documents						
DL.Q2	**To what extent are multiple third parties directly contracted to develop components of the system, giving the Authority the flexibility to compete or reassign module development?**	No third-party contractors	Third parties are invited to apply but not many get through	Third parties supply less than half of system components	Third parties supply half of system components	Third parties supply all of system components
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: This assesses the degree of openness of system components.						
Guidance: e.g. reference from System Engineering Plan; System Design Documents.						

Table 25: Design - Layering

Design - Layering: Good separation of concerns of applications and infrastructure, e.g. hardware, operating system, etc.						
Item No	Question	Scale				
DL.Q3	**To what extent is the system's design capable of adapting to evolving requirements?**	Design evolution plan does not exist	Design evolution plan exists but not enforced.	Design evolution plan exists for less than 50% of designed modules	Design evolution plan exists for 50% of designed modules	Design evolution plan exists for all designed modules
Evidence: the answers to the questions above, give cross reference to documentation, if possible, provide a designed module example.						
Purpose of Question: To assess the degree to which the system enables ease of change, mitigates technological obsolescence, and provisioning for long-life supportability.						
Guidance: e.g. reference from System Design Document; System Engineering Plan.						
DL.Q4	**To what extent is the system's design capable of leveraging new technologies?**	No capability exists	Design capability extension plan exists but not enforced	Design capability extension plan exists for less than 50% of modules	Design capability extension plan exists for 50% of modules	Design capability extension plan exists for all modules
Evidence: the answers to the questions above, give cross reference to documentation, if possible, provide an example from one or more of the designed modules.						
Purpose of Question: To assess the degree to which the system enables ease of change, mitigates technological obsolescence, and provisioning for long-life supportability.						
Guidance: e.g. references from System Design Document; System Engineering Plan.						

Table 26: Design - Layering (contd.)

Data Management Strategy [DMS]: DMS reflects an assessment of the long-term technical data needs of the system, including the data required to design, manufacture and sustain the system						
Item No	Question	Scale				
D.1	**To what extent does the Program include a data management strategy ensuring that when the Authority exercises its intellectual property rights to obtain any developmental artefacts for anything it paid to develop with either complete or partial funding, the Contractor can at most charge a nominal fee covering the marginal cost of the effort to provide that documentation**?	Program has no DMS	Program has DMS in place for less than 50% of its Data Sets	Program has DMS in place for 50% of its Data Sets	Program has DMS in place for more than 50% of its Data Sets	Program has DMS in place for 100% of its Data Sets
Evidence: the answers to the questions above, and please do give cross reference to documentation.						
Purpose of Question: It enables the Contractor or the Prime System Integrator to know if the Authority has a DMS in place. If these is a DMS in place, it allows both parties, the Authority and the Contractor, to be aware of their contractual obligations during the lifetime of the project, maintenance and support.						
Guidance: e.g. from Design Disclosure Documents, etc.						
D.2	**To what extent is the DMS a part of the Authority's Acquisition Strategy?**	Takes no part in Strategy	Strategy only mentions DMS	50% of DMS is part of Strategy	More than 50% of DMS is part of Strategy	100% of DMS fully incorporated in Strategy
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which DMS is integrated into the acquisition strategy as a means to achieving program objectives and benefits such as affordable and sustainable system development; system adaptability and flexibility; ease of integration; vendor and technology independence; insertion of new commercial technologies; reuse and commonality of components; interoperability.						
Guidance: e.g. references from DMS in Acquisition Strategy, Technology Development Strategy, Systems Engineering Plan						

Table 27: Data - Data Management Strategy [DMS]

Data Management Strategy [DMS]: DMS reflects an assessment of the long-term technical data needs of the system, including the data required to design, manufacture and sustain the system						
Item No	Question	Scale				
D.3	**To what extent does the DMS include the data required to design the system?**	Not included	DMS has less than 50% of data included	DMS has 50% of data included	DMS has more than 50% of data included	DMS includes all the data required
Evidence: the answers to the questions above, and please provide reference to documentation.						
Purpose of Question: To evaluate the completeness and fitness of the DMS.						
Guidance: e.g. references from DMS Design Document; DMS Document; System Engineering Plan, etc.						
D.4	**To what extent does the DMS include the data required to develop the system?**	Not included	DMS has less than 50% of data included	DMS has 50% of data included	DMS has more than 50% of data included	DMS includes all the data required
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To evaluate the completeness and fitness of the DMS.						
Guidance: e.g. references from DMS Design Document; DMS Document; System Engineering Plan.						

Table 28: Data - Data Management Strategy (contd.)

Data Management Strategy [DMS]: DMS reflects an assessment of the long-term technical data needs of the system, including the data required to design, manufacture and sustain the system						
Item No	Question	Scale				
D.5	**To what extent does the DMS include the data required to sustain the system?**	Not included	DMS has less than 50% of data included	DMS has 50% of data included	DMS has more than 50% of data included	DMS includes all the data required
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Evaluates the DMS' ability to adapt to evolving requirements and provisioning for long-life supportability.						
Guidance: e.g. references from DMS Design Document; DMS Document; System Engineering Plan, etc.						
D.6	**To what extent does the DMS include the data to support re-competition for production, sustainment or upgrade of the system?**	Not included	DMS has less than 50% of data included	DMS has 50% of data included	DMS has more than 50% of data included	DMS includes all the data required
Evidence: the answers to the questions above, and please do provide reference to documentation.						
Purpose of Question: Evaluates DMS' ability to adapt to evolving requirements, ease of leveraging new technologies, and ease of mitigating technological obsolescence, and provisioning for long-life supportability.						
Guidance: e.g. references from DMS Design Document; DMS Document; System Engineering Plan, etc.						

Table 29: Data - Data Management Strategy (contd.)

Standardised Data Schema: Established community-of-practice understanding of data semantics						
Item No	Question	Scale				
SD.1	**To what extent are the data described in open data description format?**	None	Less than 50% of data sets described in open format	50% of data sets described in open format	More than 50% of data sets described in open format	All data sets described in open format
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To evaluate the ability of the design and architecture of the data to adapt to evolving requirements, ease of mitigating technological obsolescence, and provisioning for long-life supportability. There may already be present existing interfaces that the data sets need to be in conformance with (e.g. data at interface boundaries intra-platform is governed by the pre-existing intra-platform interface control protocols (ICPs); at an inter-platform level by the supported data links; and at the user-interface by the required/accepted operator terminologies). In such cases, please do state.						
Guidance: e.g. references from DMS Design Document; DMS Document; System Engineering Plan, etc.						
SD.2	**To what extent are the data described in community-of-practice (COP) data description format?**	None	Less than 50% of data sets described in COP format	50% of data sets described in COP format	More than 50% of data sets described in COP format	All data sets described in COP format
Evidence: All data sets described in COP format						
Purpose of Question: To evaluate the ability of the design and architecture of the data to adapt to evolving requirements, ease of mitigating technological obsolescence, and provisioning for long-life supportability. There may already be present existing interfaces that the data sets need to be in conformance with (e.g. data at interface boundaries intra-platform is governed by the pre-existing intra-platform interface control protocols (ICPs); at an inter-platform level by the supported data links; and at the user-interface by the required/accepted operator terminologies). In such cases, please do state.						
Guidance: e.g. references from DMS Design Document; DMS Document; System Engineering Plan.						

Table 30: Data - Standardised Data Schema

Standardised Data Schema: Established community-of-practice understanding of data semantics						
Item No	Question	Scale				
SD.3	**To what extent are the data described in proprietary data description format (PDDF)?**	100% of data sets described in PDDF	Less than 50% described in PDDF	50% described in PDDF	More than 50% described in PDDF	No data or dataset described in PDDF
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To evaluate the ability of the design and architecture of the data to adapt to evolving requirements, ease of mitigating technological obsolescence, and provisioning for long-life supportability.						
Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.						
SD.4	**To what extent does the Program enable orderly migration of proprietary data formats to open or non-proprietary data schema alternatives?**	None exist or Migration mechanisms exist but no timetable for enactment	Migration mechanisms and enactment timetable exist, for less than 50% of datasets	Migration mechanisms and enactment timetable exist, for 50% of datasets	Migration mechanisms and enactment timetable exist, for more than 50% of datasets	Migration mechanisms and enactment timetable exist, for all datasets
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the Program has established a plan to migrate from proprietary to open data formats.						
Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.						

Table 31: Data - Standardised Data Schema (contd.)

Standardised published formats: data is published in industry and/or community-of-practice standardised formats						
Item No	Question	Scale				
SP.1	**To what extent is there demonstrable traceability from the architecture and design to the published data sets?**	None exist	Demonstrable traceability for less than 50% of datasets	Demonstrable traceability for 50% of datasets	Demonstrable traceability for more than 50% of datasets	Demonstrable traceability for all datasets
Evidence: the answers to the questions above, give cross reference to documentation. Is it possible to provide an example, e.g. from Architecture to Data?						
Purpose of Question: To evaluate the degree of system requirements accountability of the Program.						
Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.						
SP.2	**To what extent are the data published in openly-available or community-of-practice standardised formats (COPF)?**	No data or dataset described in COPF	Less than 50% described in COPF	50% described in COPF	More than 50% described in COPF	100% of data sets described in COPF
Evidence: the answers to the questions above, give cross reference to documentation, if possible, do provide an example.						
Purpose of Question: To evaluate the Program's commitment to the maxim of Open Systems.						
Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.						

Table 32: Data - Standardised published formats

Standardised published formats: data is published in industry and/or community-of-practice standardised formats						
Item No	Question	Scale				
SP.3	**To what extent does the Program include Lifecycle Support for the published data?**	No Lifecycle Support included	Lifecycle Support included for less than 50% of datasets	Lifecycle Support included for 50% of datasets	Lifecycle Support included for more than 50% of datasets	Lifecycle Support included for all of the datasets
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To evaluate the Program's commitment, and the system's support, to adapt to evolving requirements, mitigating technological obsolescence and provisioning for long-life supportability.						
Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.						
SP.4	**To what extent does the Program include Funding for the published data?**	Program includes No Funding	Program includes Funding for less than 50% of datasets	Program includes Funding for 50% of datasets	Program includes Funding for more than 50% of datasets	Program includes Funding for all of the datasets
Evidence the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Successful implementation of Open Systems, including the Program's Data, requires the Program to include support and funding to enable an ongoing commitment to maintain and even improve the level of openness for the published data.						
Guidance: e.g. reference from Data Design Document. System Engineering Plan. System Implementation Plan. System Lifecycle Development Plan						

Table 33: Data - Standardised published formats (contd.)

Data Extensibility: ease of extending data across modules and/or platforms						
Item No	Question	Scale				
D.1	**To what extent have the proprietary or unique non-commercial data sets been limited or well defined?**	No proprietary or unique non-commercial data set is well-defined	Less than 50% of proprietary or unique non-commercial data sets are well-defined	50% of proprietary or unique non-commercial data sets are well-defined	More than 50	All proprietary or unique non-commercial data sets are well-defined
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Since using proprietary or vendor unique solutions on occasion at a component or module level and within contracts cannot be uniformly prohibited, and since few functions, components or modules are truly mission unique, the use of proprietary or unique non-commercial datasets should be minimised in order to maximise re use, transportability, and extensibility of the program's datasets						
Guidance: e.g. reference from System Engineering Plan; Data Design Documents						
D.2	**To what extent are there established mechanisms to migrate key interfaces that are proprietary or closed to key interfaces that are open?**	No mechanism exists	Migration mechanisms exist for less than 50% of proprietary key interfaces	Migration mechanisms exist for 50% of proprietary key interfaces	Migration mechanisms exist for more than 50% of proprietary key interfaces	Migration mechanisms exist for 100% of proprietary key interfaces
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the Program has established a plan to migrate from proprietary to open interfaces.						
Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.						

Table 34: Data - Extensibility

Data Extensibility: ease of extending data across modules and/or platforms						
Item No	Question	Scale				
D.3	**To what extent is the Program's data sets capable of adapting to evolving requirements?**	No dataset is capable	Less than 50% of datasets are capable	50% of datasets are capable	More than 50% of datasets are capable	100% of datasets are capable
Evidence: the answers to the questions above, give cross reference to documentation, and if possible, do provide an example.						
Purpose of Question: To assess the degree to which the system enables ease of change, mitigates technological obsolescence, and provisioning for long-life supportability						
Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.						
D.4	**Does the program follow a well-defined System Engineering process for implementing data capability extension?**	None exist	Processes exist but not uniform	Uniform processes exist	Uniform processes exist and are followed	Uniform processes exist, are followed, and consistently applied
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the program employs systems engineering processes (e.g. ISSO 15288, IEEE 1220, IEEE 1016) in its data engineering						
Guidance: e.g. reference from Systems Engineering Plan, Data Design Plan, Data Engineering Plan.						

Table 35: Data - Extensibility (contd.)

Accessibility: Ability to access the data. Is the accessibility mechanism proprietary or based on industry or community-of-practice standards?						
Item No	Question	Scale				
A.1	**To what extent is the accessibility mechanism proprietary or based on industry or community-of-practice standards?**	All proprietary	Less than 50% proprietary	50% proprietary	More than 50% proprietary	None is proprietary
Evidence: the answers to the questions above, give cross reference to documentation, and if possible provide an example data accessibility procedure (e.g. a data query, etc.)..						
Purpose of Question: A proprietary accessibility mechanism may add to ongoing costs of data access and its maintenance during the lifecycle support of the Program. An industry-based access mechanism reduces costs of on-going maintenance. If the data access mechanism is proprietary, is there a migration path from this proprietary mechanism to one based on industry standard.						
Guidance: e.g. reference from Data Design Document; System Engineering Plan						
A.2	**To what extent does the configuration management process encompass changes to key interfaces and corresponding standards?**	No configuration management process exists	Configuration management process exists and covers less than 50% of key interfaces	Configuration management process exists and covers 50% of key interfaces	Configuration management process exists and covers more than 50% of key interfaces	Configuration management process exists and covers all key interfaces
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which the program has incorporated key interface designations, selected standards and related design modifications in the change management process						
Guidance: e.g. reference from Interface control and configuration management documentation.						

Table 36: Data - Accessibility

Accessibility: Ability to access the data. Is the accessibility mechanism proprietary or based on industry or community-of-practice standards?						
Item No	Question	Scale				
A.3	**To what extent are data (or licensing) rights well-specified in a standard and open manner?**	No data (or licensing) right exists	Data (or licensing) rights exist for less than 50% of data sets	Data (or licensing) rights exist for 50% of data sets	Data (or licensing) rights exist for more than 50% of data sets	Data (or licensing) rights exist for all data sets
Evidence: the answers to the questions above, give cross reference to documentation, if possible, do provide an example.						
Purpose of Question: Data or Licensing rights regarding the use of that data need to be explicitly specified, so that the parties consuming the data know what rights are associated with the data to be consumed. If these rights are not specified in standard or open manner, it will be difficult for all parties involved to know the kind of rights associated with the date being supplied and consumed.						
Guidance: e.g. reference from Data Design Documents; Published Data Licensing Format.						

Table 37: Data - Accessibility (contd.)

Programming Language Portability: implementation is not programming language specific						
Item No	Question	Scale				
PL.Q1	**To what extent have the proprietary or unique non-commercial elements been limited or well defined such that they do not hinder other developers from interfacing or developing any part of the system?**	Proprietary elements scope not well defined	Less than 50% of proprietary elements have well defined scope	50% of proprietary elements have well defined scope	More than 50% of proprietary elements have well defined scope	All proprietary elements have well defined scope
Evidence: the answers to the questions above, give cross reference to documentation. And, if possible, please provide an implementation example						
Purpose of Question: Since using proprietary or vendor unique solutions on occasion at a component or module level and within contracts cannot be uniformly prohibited, and since few functions, components or modules are truly mission unique, the use of proprietary or unique non-commercial implementations should be minimised in order to maximise re use, transportability, and extensibility of the program's code base						
Guidance: e.g. references from System Engineering Plan; Code Design Documents						
PL.Q2	**What programming language characteristics address obsolescence?**	None addresses obsolescence	The Interface to the Networking Layer addresses obsolescence	The Interface to the Operating System/Platform Layer addresses obsolescence	The Interface to the HCI Layer addresses obsolescence	All layers address obsolescence
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: The difficulty in upgrading a system derives directly from how well the functional elements are modularised and grouped according to their fundamental system roles (a.k.a. separation of concerns). If this is done clearly, and dependencies between modules and across roles are minimal, then the ripple effects of an upgrade to a part of the system are minimised. When it comes to the programming languages used on the program, what characteristics are used to mitigate or prevent obsolescence?						
Guidance: e.g. references from System Engineering Plan; System Implementation Plan.						

Table 38: Implementation - Programming Language Portability

Programming Language Portability: implementation is not programming language specific						
Item No	Question	Scale				
PL.Q3	**Are the development environment tools industry-standard or community-of-practice, and openly available?**	None open	Less than 50% of IDE open	50% of the IDE open	More than 50% of IDE open	All IDEs open
Evidence: the answers to the questions above, give cross reference to documentation. Please give some examples of some in-house development environment tools.						
Purpose of Question: This measures the scope of unique development within the program, and the program's flexibility in its ability to change from one development tool to another based on program need.						
Guidance: e.g. references from System Engineering Plan; System Implementation Plan.						
PL.Q4	**To what extent is their demonstrable traceability from the Program's Architecture, Interfaces and Design elements to Implementation?**	No traceability	Traceability for less than 50% of Implementation	Traceability for 50% of Implementation	Traceability for more than 50% of Implementation	Traceability for all Implementation
Evidence: the answers to the questions above, give cross reference to documentation. Is it possible to provide an example, e.g. from Architecture to Implementation?						
Purpose of Question: To evaluate the degree of system requirements accountability of the Program						
Guidance: e.g. references from System Design Document; System Engineering Plan.						

Table 39: Implementation - Programming Language Portability (contd.)

Implementation Infrastructure Portability: the degree of specificity of implementation to a particular operating system, middleware, or hardware						
Item No	Question	Scale				
IP.Q1	**To what extent is the implementation infrastructure design-specific?**	All are design-specific	Less than 50% are design-specific	50% of implementation are design-specific	More than 50% are design-specific	None is design-specific
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: To assess the degree to which design-specific solutions are imposed in the implementation. Such solutions may impede the implementation or emergence of Open Systems if they require vendor-specific software or hardware						
Guidance: e.g. references from Capabilities Development Document, Systems Engineering Plan, Implementation Infrastructure Plan						
IP.Q2	**To what extent is the implementation infrastructure (Operating System, Databases, Communications, Interfaces, Tools, etc.) in its sustained operation environment open?**	None	Less than 50%	50% of implementation infrastructure	More than 50%	All implementation infrastructure in their sustained environment are open
Purpose of Question: This evaluates the degree to which the program's implementation infrastructure can be easily swapped and/or evolved.						
Guidance: e.g. references from System Engineering Plan; System Infrastructure Plan.						
IP.Q3	**Are the development environment tools industry-standard or community-of-practice, and openly available?**	None open	Less than 50% of IDE open	50% of the IDE open	More than 50% of IDE open	All IDEs open
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: This measures the scope of unique development within the program, and the program's flexibility in its ability to change from one infrastructure development tool to another based on program need.						
Guidance: e.g. references from System Engineering Plan; System Implementation Plan; System Infrastructure Plan.						

Table 40: Implementation - Infrastructure Portability

Implementation Infrastructure Portability: the degree of specificity of implementation to a particular operating system, middleware, or hardware						
Item No	Question	Scale				
IP.Q4	**To what extent does the implementation infrastructure in its sustained operation environment address obsolescence?**	None	Less than 50%	50% of implementation infrastructure	More than 50%	All implementation infrastructure in their sustained environment address obsolescence
Evidence: the answers to the questions above, give cross reference to documentation, if possible, provide an example.						
Purpose of Question: The difficulty in upgrading a system derives directly from how well the infrastructure elements are modularised and grouped according to their fundamental system roles (a.k.a. separation of concerns). If this is done clearly, and dependencies between modules and across roles are minimal, then the ripple effects of an upgrade to a part of the system are minimised. When it comes to the system infrastructure used on the program, what characteristics are used to mitigate or prevent obsolescence?						
Guidance: e.g. references from System Engineering Plan; System Implementation Plan; System Infrastructure Plan.						
IP.Q5	**To what extent does the implementation infrastructure address planned maintenance?**	None	Less than 50%	50% of implementation infrastructure	More than 50%	All implementation infrastructure in their sustained environment address planned maintenance
Evidence: the answers to the questions above, give cross reference to documentation, if possible, provide an example.						
Purpose of Question: This evaluates the existence of an open and credible maintenance process for the implementation infrastructure. By open, it is meant that the maintenance process is carried out (i.e. provided) from more than one single source or provider.						
Guidance: e.g. references from System Integration Plan; System Infrastructure Plan.						
IP.Q6	**To what extent does the implementation infrastructure address unplanned patches?**	None	Less than 50%	50% of implementation infrastructure	More than 50%	All implementation infrastructure in their sustained environment address unplanned patches
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: This evaluates the existence and evidence of a credible continual maintenance procedure, such as continual backup procedures, for the implementation infrastructure.						
Guidance: e.g. references from System Engineering Plan; System Infrastructure Plan.						

Platform agnosticity of development toolchains, such as compilers, IDEs, etc.						
Item No	Question	Scale				
PA.Q1	**How much of the implementation infrastructure are platform agnostic?**	All of the implementation infrastructure are platform-specific	More than 50% of the implementation infrastructure are platform-specific	50% of the implementation infrastructure are platform-specific	Less than 50% of the implementation infrastructure are platform-specific	All of the implementation infrastructure are platform-agnostic
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: This measures the openness of the Contractor's development environment toolchains, e.g. is the C compiler used by the Contractor a Unix C compiler (e.g. gcc) or Visual C compiler for Windows or compatible with both?						
Guidance: e.g. references from System Engineering Plan; Change Management Plan.						
PA.Q2	**To what extent will the implementation accommodate change in infrastructure elements?**	No capacity to accommodate change	Less than 50% of implementation can accommodate change in infrastructure elements	50% of implementation can accommodate change	More than 50% of implementation can accommodate change	All of the implementation can accommodate change
Evidence: the answers to the questions above, give cross reference to documentation, providing examples.						
Purpose of Question: This measures if the program has an effective and open change management in place. Without an effective change management process downstream, changes to the infrastructure elements can lead to less-than-open results.						
Guidance: e.g. references from Change Management Plan.						
PA.Q3	**To what extent does the Implementation process include Lifecycle Support for the implemented modules?**	Program includes No Lifecycle Support	Program includes Lifecycle Support for less than 50% of Implementation	Program includes Lifecycle Support for 50% of Implementation	Program includes Lifecycle Support for more than 50% of Implementation	Program includes Lifecycle Support for all of the Implementation modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Successful implementation of Open Systems requires Programs to include support and funding to enable an ongoing commitment to maintain and even improve that Program's level of openness. If Open Systems were addressed only during initial implementation, the Program's designs would likely grow more closed over time as they become more complex and technical insertions were performed.						
Guidance: One way to assess the degree to which Open Systems has been included as a critical element of the lifecycle is to consider if the system is open enough to incorporate regular upgrades and whether or not the program plan includes funding for these upgrades throughout the lifecycle.						

Table 42: Implementation - Platform agnosticity

Platform agnosticity of development toolchains, such as compilers, IDEs, etc.						
Item No	Question	Scale				
PA.Q4	**To what extent does the Implementation process include Funding for the implemented modules?**	Program includes No Funding	Program includes Funding for less than 50% of Implementation	Program includes Funding for 50% of Implementation	Program includes Funding for more than 50% of Implementation	Program includes Funding for all of the Implementation modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: Successful implementation of Open Systems requires Programs to include support and funding to enable an ongoing commitment to maintain and even improve that Program's level of openness. If Open Systems were addressed only during initial implementation, the Program's designs would likely grow more closed over time as they become more complex and technical insertions were performed.						
Guidance: One way to assess the degree to which Open Systems has been included as a critical element of the lifecycle is to consider if the system is open enough to incorporate regular upgrades and whether or not the program plan includes funding for these upgrades throughout the lifecycle.						
PA.Q5	**To what extent does the Program enable orderly migration of proprietary or platform unique implemented modules to open system alternatives?**	No migration plan exists	Migration plan exists but not enforced	Migration plan exists and enforced for 50% or less of proprietary modules	Migration plan exists and enforced for more than 50% of proprietary modules	Migration plan exists and enforced for all proprietary modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: In most cases, the total replacement of "in-service systems" with new code is not a fiscally sound option. Upgrading existing systems to modular open system designs for all or portions is, however, possible and desirable. To achieve this goal, upgrading existing systems to become modular and open must be planned for as part of the technology refresh/insertion process and work plans must be structured to enable the process						
Guidance: e.g. state percentage of COTS supply or provision in the Program; Code Implementation Process						

Table 43: Implementation - Platform agnosticity (contd.)

Inter-operability: ease of which this system's implemented modules can operate with other system's implemented modules, compatibility with underlying supporting infrastructure, such as virtualisation						
Item No	Question	Scale				
IO.Q1	**What is the scope of interoperability of the implementation?** i.e. is it method/function, or class, or module, or component?	No defined scope of interoperability	Scope of interoperability defined but not enforced	Scope of interoperability defined and enforced on 50% or less of the Program modules	Scope of interoperability defined and enforced on more than 50% of the Program modules	Scope of interoperability defined and enforced on all of the Program modules
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: The "scope of interoperability" is the level at which a module, within a system, can or will interoperate with other modules. At the extremes: standalone reflects a module that does not interoperate with another module; it shares no data or capabilities; and has no need of either from other units. This measures the ease of compositionality of the implementation; the more granular the scope, the easier it is to compose with other (sub) systems						
Guidance: e.g. from references System Engineering Plan; System Implementation Plan.						
IO.Q2	**To what extent will the implementation infrastructure accommodate extensibility of the Implementation scope of interoperability?**	No ability to accommodate extensibility	Ability to accommodate extensibility on less than 50% of Implementation	Ability to accommodate extensibility on 50% of Implementation	Ability to accommodate extensibility on more than 50% of Implementation	Ability to accommodate extensibility on all of the Implementation
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: The extensibility may be downward, i.e. from coarse to more granular, or upwards, i.e. from granular to coarse (or less granular); how much effort need to be expended on the infrastructure to cope with this?						
Guidance: e.g. references from Change Management Plan; System Engineering Plan.						
IO.Q3	**To what extent is the scope of interoperability capable of adapting to evolving requirements?**	Unable to adapt	Less than 50% Implementation can adapt	50% Implementation can adapt	More than 50% Implementation can adapt	Scope of interoperability of all Implementation modules can adapt
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: This measures how much effort the Authority need to expend on the scope of inter-operability extensibility if requirements (e.g. architecture, etc.) change.						
Guidance: e.g. references from System Engineering Plan; Change Management Plan.						

Table 44: Implementation - Inter-operability

Inter-operability: ease of which this system's implemented modules can operate with other system's implemented modules, compatibility with underlying supporting infrastructure, such as virtualisation						
Item No	Question	Scale				
IO.Q4	**To what extent is the established scope of inter-operability mechanism capable of leveraging new technologies?**	Unable to leverage new technologies	Less than 50% Implementation can leverage	50% Implementation can leverage	More than 50% Implementation can leverage	Scope of inter-operability of all Implementation modules can leverage new technologies
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: In an open systems approach, the more modular the implementation, the easier it will be to take advantage of new technology insertions.						
Guidance: e.g. references from System Engineering Plan; Change Management Plan.						
IO.Q5	**To what extent are the components of the scope of inter-operability implemented and independently deployable as packages?**	Unable to be deployed as packages	Less than 50% of the components can be deployed as packages	50% of the components can be deployed as packages	More than 50% of the components can be deployed as packages	All of the components can be deployed as packages
Evidence: the answers to the questions above, give cross reference to documentation.						
Purpose of Question: This measures the modular decomposition of the implementation to well partitioned packages. The key to Open Systems and acquisition flexibility for the Authority is the ability of third parties, or other COTS (Commercial Off The Shelf) or GOTS (Government Off The Shelf) products, to participate in or compete for packages' implementation.						
Guidance: e.g. references from System Engineering Plan; System Implementation Plan; System Design Documents.						

Table 45: Implementation - Inter-operability (contd.)