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Research Notes – Openness and Evolvability - Interface Assessment

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ABSTRACT

These Research Notes form part of a series of notes extracted from work undertaken by Innovation Science in the establishment of Openness and Evolvability assessment Methods and Processes. This set of Research Notes focusses on Interface Assessment. This work was undertaken from the late 1990s to 2007 and focussed on the application to Submarine Combat Systems.

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1.   Introduction

These Research Notes have been extracted from work undertaken by Innovation Science under contract to Defence Science and Technology Group during the period from the late 1990s until early 2007.

In entirety the Research Notes form a subset of the overall assessment Methodology and Processes developed to assess system level Openness and Evolvability.

The Research Notes within this report focus on Interface Assessment.

2.   Interface Assessment

An interface is the port through which an operation on a granule can be conducted (when dealing with distributed objects), or where data can enter or leave the granule. Interfaces require an Infrastructure to transport the information between granules.

Interfaces and Infrastructures are separated for the purposes of assessment because the custodianship of the two categories of specification is likely to be different within an open system. It may be acceptable for certain granule vendors to maintain custodianship over their own granules' interfaces — particularly when their granules are publishing data. However, unless every interconnection between two granules relies on a separate infrastructure, multiple vendors will need to share the same infrastructure specification to facilitate an interoperable system.

Note that if the system incorporates a shared database, the database should be considered a granule and one or more interfaces would be defined to enable other granules to access, search and contribute to the database.

The interface assessment comprises a series of yes/no questions. Each question defines the maximum score that can be allocated to the interface assessment if the question is answered in the negative. If all questions are answered in the affirmative, then the interface assessment is awarded full marks.

The flowchart shown in Figure 1 summarises the assessment process. Each question within the flowchart is explained in greater detail in the sections that follow.
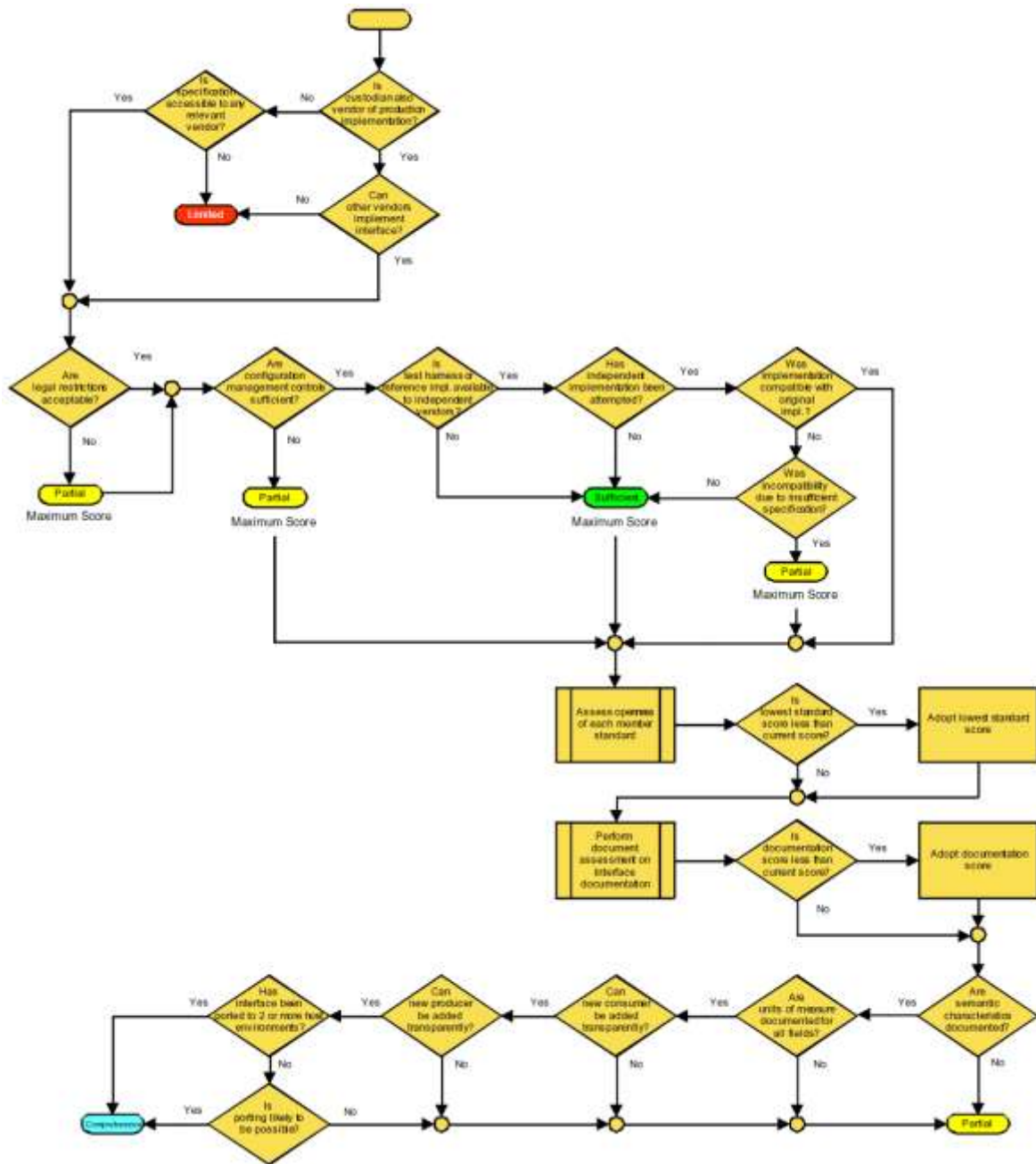
Figure 1. Interface Assessment Flowchart

2.1   Interface Assessment Questions

2.1.1   Is custodian also vendor of production implementation?

Does the same organisation that is responsible for maintaining the interface specification implement their own production implementations of the interface?

2.1.2   Can other vendors implement interface?

Is there anything obvious within the specification or access restrictions that would prevent third-party vendors from independently implementing the interface?

2.1.3   Is specification accessible to any relevant vendor?

Are any access restrictions imposed to limit who can obtain and implement the interface specification?

2.1.4   Are legal restrictions acceptable?

Third-party access to interface specifications will usually be by way of a licence agreement. Is there anything within the licence agreement that appears unreasonable or unworkable within the context of the desired deployment? For example, a licence agreement that required all implementations of the interface to be published to the public domain is unlikely to be acceptable if implementing sensitive components for military use.

2.1.5   Are configuration management controls sufficient?

Are the configuration management processes for the interface sufficient and equitable to ensure no bias for or against any implementing vendor (including the custodian, if they are also a vendor of production implementations)?

2.1.6   Is test harness or reference implementation available to independent vendors?

A test harness or reference implementation of the interface can assist independent vendors to verify their own implementation prior to integration. However, any implementation of an interface will first require the selection of an associated infrastructure. A test harness or reference implementation (regardless of selected infrastructure) that is made freely available to third-party organisations who are implementing the interface, can act as a second source of documentation, thereby completing the written specification, if omissions exist.

2.1.7   Has independent implementation been attempted?

An independent implementation of the interface (i.e. one implemented by a vendor other than the custodian of the interface specification) can verify the completeness of the interface specification.

2.1.8   Was implementation compatible with original implementation?

Were incompatibilities found between the original and independent implementations of the interface specification?

2.1.9   Was incompatibility due to insufficient specification?

There may be reasons other than specification sufficiency that cause an independent implementation to be incompatible with the production implementation. If it can be

determined that the implementation failed simply because of poor engineering or an incomplete implementation, and provided there is no evidence suggesting the specification was insufficient to allow a complete implementation, then the lack of a viable independent implementation should be considered a minor risk. If however, the incompatibility could have been caused because of an insufficient interface specification, then the risk to openness is considerably higher.

2.1.10   Assess openness of each member standard

Identify each individual standard that combines to form the interface and assess each standard using the assessment defined reference [1]. Note that the interface may be defined by only one standard (the interface document itself). However, many interfaces will rely on pre-defined standards to address issues of data representation (e.g. eXternal Data Representation (XDR)).

2.1.11   Is lowest standard score less than current score?

If the worst "score" awarded to a member standard using the "standard assessment", [1], is less than the current "maximum score" for the interface, then the worst score given to one of the interface's standards must be adopted as the "maximum score" for the overall interface.

2.1.12   Adopt lowest standard score

Set the "maximum score" for the interface to the worst score that was achieved for any of the interface's member standards assessed via the "standard assessment", [1].

2.1.13   Perform documentation assessment on Interface documentation

Use the "Documentation Quality Assessment" process described in reference [2], assess the interface specification documentation. Note that if particular documentation has been assessed via the standards assessment, the assessment does not need to be duplicated. However, interface specifications should comprise a "wrapper" document that nominates how the relevant member standards are combined and configured to derive the overall interface. This step is where such documentation is assessed.

2.1.14   Is documentation score less than current score?

If the worst "score" awarded to any of the interface documentation using the Documentation Quality Assessment, [2], is less than the current "maximum score" for the interface, then the worst score given to the documentation must be adopted as the "maximum score" for the overall interface.

2.1.15   Adopt documentation score

Set the "maximum score" for the interfaces to the worst score that was achieved for any documentation assessed via the Documentation Quality Assessment, [2], for the interface specification documentation.

2.1.16   Are semantic characteristics documented?

Does the interface specification include explanations of semantic information that is necessary to correctly interpret the information being passed by the interface?

2.1.17   Are units of measure documented for all fields?

Does the interface specification completely nominate units of measure for all field values, and are all enumerations adequately explained?

2.1.18   Can new consumer be added transparently?

Considering the interface in isolation of the infrastructure that may have already been chosen to implement the interface, is it possible to add a new consumer end for the interface without making changes to any other granule already integrated into the system? For example, if one or more consumer versions of this interface already exist within the system, is it likely that a further consumer implementation could be integrated in parallel to the existing consumer implementations without requiring changes to existing granules within the system?

2.1.19   Can new producer be added transparently?

Considering the interface in isolation of the infrastructure that may have already been chosen to implement the interface, is it possible to add a new producer end for the interface without making changes to any other granule already integrated into the system? For example, if one producer of this interface already exists in the system, is it likely that a second producer implementation could be integrated in parallel to the existing producer implementation without requiring changes to either the existing producer or other granules that already exist within the system?

2.1.20   Has interface been ported to 2 or more host environments?

Has the interface been implemented using different programming languages or deployed on different types of operating systems?

2.1.21   Is porting likely to be possible?

Is there anything within the interface specification that is likely to prevent the interface from being implemented using different programming languages or deployed on different operating systems?

3.   References

1. Haddy, M. and Sbrana, A. (ed) (2016) *Research Notes – Openness and Evolvability – Standards Assessment* DST-Group-TN-1542
2. Haddy, M. and Sbrana, A. (ed) (2016) *Research Notes – Openness and Evolvability – Documentation Assessment* DST-Group-TN-1545

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