



D-4.1.4 End-to-End Switching Arrangements Non-Functional Requirements

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Overview:

This document sets out the end-to-end non-functional requirements for Central Data Services and Market Participant systems in the new Switching Arrangements.

The document is based on the list of non-functional system characteristics described in the standard ISO-IEC 25010. Performance and reliability requirements are given for the Central Data Services, with expected average and peak switch volumes defined. Further non-functional requirements are described for CSS at a high level. A more detailed definition of the non-functional requirements for CSS and its interfaces will be delivered as part of the detailed CSS design phase.

This document provides illustrative information on how central systems will operate. These requirements may be updated as the design progresses from the logical to the physical level. In particular, updates may be required as a result of procurement of the CSS as well as development of the changes needed to other central data services, such as UK Link and MPAS, which are being progressed under the UNC and MRA.

Associated documents

- [1] D-4.1.5 E2E Solution Architecture
- [2] D-4.1.1 DLS E2E Design Assumptions
- [3] D-4.1.6 E2E Operational Choreography
- [4] D-4.10.1.2 E2E Security Requirements
- [5] D-4.1.2 E2E Detailed Design Models (the Switching Design Repository, held in ABACUS)
- [6] D-4.2.2 CSS Non-Functional Requirements

Version control

Revision Date	Version	Summary of changes
15/02/2018	V1.0	Published for DB3.
22/06/2018	V2.0	Published for DB4. Incorporates minor amendments agreed in Change Request CR009 and CR012.
30/11/2018	V2.1	Changes in document and embedded requirements for CR-E03 and CR-E07

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Executive Summary

The End-to-End (E2E) Non-Functional Requirements is one of a number of products which contribute to the end-to-end design of the new Switching Arrangements. Its purpose is to place requirements on the Central Switching Service (CSS) and other services participating in the new Switching Arrangements regarding the characteristics of these services. An organisation responsible for provision of one of these services must ensure the service adheres to the stated requirements.

Functional requirements are described in the D-4.1.2 E2E Detailed Design Models^[5].

1. Introduction

1.1. This document sets out at a high level the end-to-end non-functional requirements for the new Switching Arrangements. Further detail on items specific to CSS and not relevant to other services will be provided during the detailed CSS design. Each requirement must be testable, and all systems and services must provide facilities for demonstrating that they meet the requirements, for example the provision of appropriate logging which allows measurement of response times.

1.2. The intended audience is any stakeholder responsible for a system or service that will operate in the new Switching Arrangements. Such a stakeholder is responsible for ensuring that its service meets the stated non-functional requirements. See D-4.1.5 E2E Solution Architecture, Figure 1 - E2E Switching Data Services Landscape and associated text.

1.3. Section 2 Characteristics of Non-Functional Requirements describes the ISO standards on which the Switching requirements have been based.

1.4. Section 3 Switching Non-Functional Requirements describes the anticipated volumes of non-functional requirements for Switching in the form of an Excel spreadsheet.

2. Characteristics of Non-Functional Requirements

2.1. The non-functional requirements defined in this document are based on the characteristics as defined in the quality framework ISO/IEC 25010 (which forms the basis for other industry best practice methodologies such as Agile and ITIL). For CSS, the requirements will be defined for the characteristics listed below. Most are defined in this document, but some will be covered in the detailed CSS design, and where this is the case a reason is provided.

2.2. Figure 1 below shows the characteristics (and sub-characteristics) from the ISO-IEC 25010 framework on which this document is based. It is followed by a description of each characteristic.

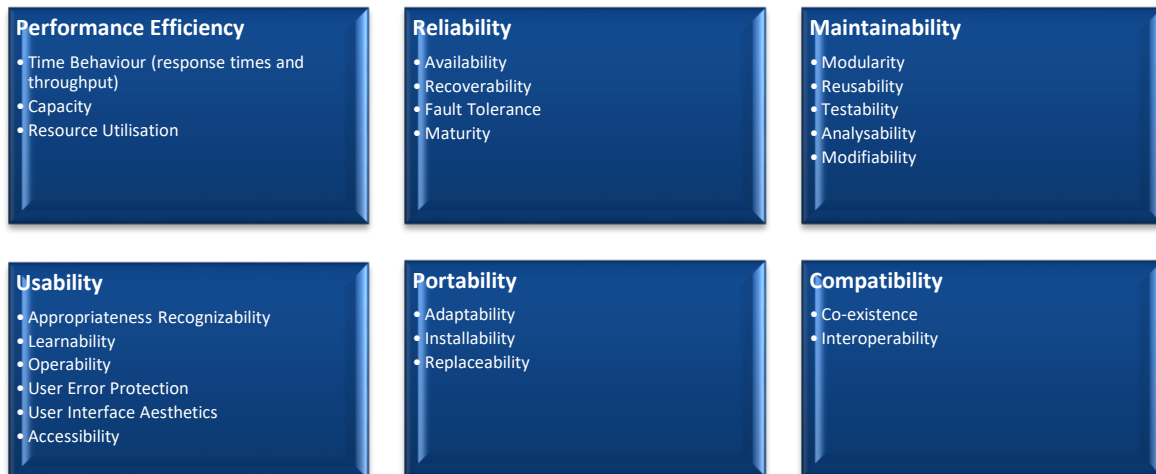


Figure 1 - Non-functional characteristics identified by ISO/IEC 25010

Performance Efficiency

2.3. Performance efficiency is performance relative to the amount of resources used under stated conditions. This covers both response times and throughput (volume of switches), as well as capacity (the number of MPxNs and associated data that the system is expected to support). Note that resources can include other software products, the software and hardware configuration of the system, and materials (e.g. print paper, storage media).

Compatibility

2.4. Compatibility is the degree to which a product, system or component can exchange information with other products, systems or components, and/or perform

its required functions, while sharing the same hardware or software environment. This covers the way in which CSS exchanges information with other systems and services.

Usability

2.5. Usability is the effectiveness, efficiency and satisfaction in a specified context of use including operability of the service. Usability can either be specified or measured as a product quality characteristic in terms of its sub-characteristics, or specified or measured directly by measures that are a subset of quality in use.

2.6. Usability requirements only affect CSS and are better defined in conjunction with more detailed design work, it is therefore covered in the D-4.2.2 CSS Non-Functional Requirements^[6], rather than in this document.

Reliability

2.7. Reliability is the degree to which a system, product or component performs specified functions under specified conditions for a specified period of time. Note that wear does not occur in software. Limitations in reliability are due to faults in requirements, design and implementation, or due to contextual changes.

2.8. Dependability characteristics include availability and its inherent or external influencing factors, such as availability, reliability (including fault tolerance and recoverability), security (including confidentiality and integrity), maintainability, durability, and maintenance support.

Maintainability

2.9. Maintainability is the degree of effectiveness and efficiency with which a product or system can be modified by the intended maintainers. Modifications can include corrections, improvements or adaptation of the software to changes in environment, and in requirements and functional specifications. Modifications include those carried out by specialized support staff, and those carried out by business or operational staff, or end users. Maintainability includes installation of updates and upgrades. Maintainability can be interpreted as either an inherent capability of the product or system to facilitate maintenance activities, or the quality in use experienced by the maintainers for the goal of maintaining the product or system.

2.10. Maintainability requirements only affect CSS and are better defined in conjunction with more detailed design work, it is therefore covered in the CSS Detailed Design documentation, rather than in this document.

Portability

2.11. Portability is the degree of effectiveness and efficiency with which a system, product or component can be transferred from one hardware, software or other operational or usage environment to another.

2.12. Portability requirements only affect CSS and are better defined in conjunction with more detailed design work, it is therefore covered in the CSS Detailed Design documentation, rather than in this document. Note that Security considerations are covered in the D-4.10.1.2 E2E Security Requirements^[4].

Description of non-functional requirement characteristics

Characteristics/sub-characteristics	Description	Where Requirement is Covered
Performance Efficiency		
Time behaviour	degree to which the response and processing times and throughput rates of a product or system, when performing its functions, meet requirements	This document
Resource utilization	degree to which the amounts and types of resources used by a product or system, when performing its functions, meet requirements	This document
Capacity	degree to which the maximum limits of a product or system parameter meet requirements	This document
Compatibility		
Co-existence	degree to which a product can perform its required functions efficiently while sharing a common environment and resources with other products, without detrimental impact on any other product	This document
Interoperability	degree to which two or more systems, products or components can exchange information and use the information that has been exchanged	This document
Usability		
Appropriateness recognizability	degree to which users can recognize whether a product or system is appropriate for their needs	D-4.2.2 CSS Non-Functional Requirements ^[6]
Learnability	degree to which a product or system can be used by specified users to achieve specified goals of learning to use the product or system with effectiveness, efficiency, freedom from risk and satisfaction in a specified context of use	D-4.2.2 CSS Non-Functional Requirements ^[6]
Operability	degree to which a product or system has attributes that make it easy to operate and control	D-4.2.2 CSS Non-Functional Requirements ^[6]
User error protection	degree to which a system protects users against making errors	D-4.2.2 CSS Non-Functional Requirements ^[6]
User interface aesthetics	degree to which a user interface enables pleasing and satisfying interaction for the user NOTE This refers to properties of the product or system that increase the pleasure and satisfaction of the user, such as the use of colour and the nature of the graphical design.	D-4.2.2 CSS Non-Functional Requirements ^[6]

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Characteristics/sub-characteristics	Description	Where Requirement is Covered
Accessibility	degree to which a product or system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use	D-4.2.2 CSS Non-Functional Requirements ^[6]
Reliability		
Maturity	degree to which a system, product or component meets needs for reliability under normal operation	This document
Availability	degree to which a system, product or component is operational and accessible when required for use NOTE Externally, availability can be assessed by the proportion of total time during which the system, product or component is in an up state. Availability is therefore a combination of maturity (which governs the frequency of failure), fault tolerance and recoverability (which governs the length of down time following each failure).	This document
Fault tolerance	degree to which a system, product or component operates as intended despite the presence of hardware or software faults	This document
Recoverability	degree to which, in the event of an interruption or a failure, a product or system can recover the data directly affected and re-establish the desired state of the system NOTE Following a failure, a computer system will sometimes be down for a period of time, the length of which is determined by its recoverability.	This document
Maintainability		
Modularity	degree to which a system or computer program is composed of discrete components such that a change to one component has minimal impact on other components	D-4.2.2 CSS Non-Functional Requirements ^[6]
Reusability	degree to which an asset can be used in more than one system, or in building other assets	D-4.2.2 CSS Non-Functional Requirements ^[6]
Analysability	an intended change to one or more of its parts, or to diagnose a product for deficiencies or causes of failures, or to identify parts to be modified NOTE Implementation can include providing mechanisms for the product or system to analyse its own faults and provide reports prior to a failure or other event.	D-4.2.2 CSS Non-Functional Requirements ^[6]
Modifiability	degree to which a product or system can be effectively and efficiently modified without introducing defects or degrading existing product quality NOTE 1 Implementation includes coding, designing, documenting and verifying changes. NOTE 2 Modularity and analysability can influence modifiability. NOTE 3 Modifiability is a combination of changeability and stability.	D-4.2.2 CSS Non-Functional Requirements ^[6]
Testability	degree of effectiveness and efficiency with which test criteria can be established for a system,	D-4.2.2 CSS Non-Functional Requirements ^[6]

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Characteristics/sub-characteristics	Description	Where Requirement is Covered
	product or component and tests can be performed to determine whether those criteria have been met	
Portability		
Adaptability	<p>degree to which a product or system can effectively and efficiently be adapted for different or evolving hardware, software or other operational or usage environments</p> <p>NOTE 1 Adaptability includes the scalability of internal capacity (e.g. screen fields, tables, transaction volumes, report formats, etc.).</p> <p>NOTE 2 Adaptations include those carried out by specialized support staff, and those carried out by business or operational staff, or end users.</p> <p>NOTE 3 If the system is to be adapted by the end user, adaptability corresponds to suitability for individualization</p>	D-4.2.2 CSS Non-Functional Requirements ^[6]
Installability	degree of effectiveness and efficiency with which a product or system can be successfully installed and/or uninstalled in a specified environment	D-4.2.2 CSS Non-Functional Requirements ^[6]
Replaceability	<p>degree to which a product can replace another specified software product for the same purpose in the same environment</p> <p>NOTE 1 Replaceability of a new version of a software product is important to the user when upgrading.</p> <p>NOTE 2 Replaceability can include attributes of both installability and adaptability. The concept has been introduced as a sub-characteristic of its own because of its importance.</p> <p>NOTE 3 Replaceability will reduce lock-in risk: so that other software products can be used in place of the present one, for example by the use of standardized file formats.</p>	D-4.2.2 CSS Non-Functional Requirements ^[6]

Table 1 - Description of non-functional requirement characteristics

3. Switching Non-Functional Requirements

3.1. The requirements described for a service or system within the new Switching Arrangements depend on the role of that service.

3.2. For Market Participants' systems, a requirement is described for:

- **Response times** for acknowledging receipt of an invitation to object to a loss from CSS.

3.3. For Central Data Services other than CSS, requirements are described for:

- **Response times** for messages and files received from CSS;
- **Response times** for messages received from Market Participants;
- **Volumes of switches**, both average and peak, as well as a “peak of peaks” associated with a Supplier of Last Resort (SoLR) event or a large collective switch; and
- **Availability and recoverability**. At this stage, only broad requirements have been stated regarding the network over which CSS will communicate with the other systems and services in Switching. More detailed requirements will be described during the CSS detailed design.

3.4. Where a requirement is stated for DES or for ECOES, it is assumed that a future MIS would be subject to the same requirement. The specific requirements that apply to the E2E Switching Arrangements are stated in the spreadsheet in Table 2 - List of Switching non-functional requirements. This spreadsheet assumes that the new Switching Arrangements go live in 2020 and contains requirements which relate to the first year of operation. It is expected that these requirements will be reviewed during the first year and adjustments made accordingly to the services and systems.

3.5. Response and throughput statistics exclude the times when relevant part(s) of the E2E Switching Arrangements are unavailable.



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Table 2 - List of Switching non-functional requirements