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**D-4.2.2 CSS Detailed Non-Functional Requirements Specification**

**Design Workstream**

**Ofgem Switching Programme**

**Document Control**

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**References**

This document is associated with the following other documents:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Ref | Title | Source | Release Date | Version Number |
| [1] | D-4.2.1 CSS User Requirements Specification | DCC | 30/11/2018 | V2.1 |
| [2] | ISO/IEC 25010:2011 (Systems and Software Engineering - SQuaRE - System and Software Quality Models)  Hyperlink: [ISO/IEC 25010:2011](https://www.iso.org/obp/ui/%23iso:std:iso-iec:25010:ed-1:v1:en) | ISO | 2011 |  |
| [3] | ISO/IEC ISO/IEC 25030:2007 (Systems and Software Engineering - SQuaRE - Quality Requirements)  Hyperlink: [ISO/IEC 25030:2007](https://www.iso.org/obp/ui/#iso:std:iso-iec:25030:ed-1:v1:en) | ISO | 2007 |  |
| [4] | D-4.1.5 Solution Architecture (referred to in requirements spreadsheet) | Ofgem | 30/11/2018 | V2.2 |
| [5] | D-4.1.4 End-to-End Switching Arrangements Non-Functional Requirements | Ofgem | 30/11/2018 | V2.1 |
| [6] | D-4.1.10 E2E Security Requirements | Ofgem | tba |  |
| [7] | D-7.2 Procurement Design Document | Ofgem | tba | V2.0 |

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# Introduction

*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.*

This product sets out the detailed non-functional requirements for the Central Switching Service (CSS) solution, which includes the Switching Network, Address Service and CSS Registration Service. In addition, the product describes the categories and definitions based on the International Standards Organisation (ISO) framework to structure and categorise the requirements.

The intended audience is any stakeholder engaged in the procurement of the CSS, Address Service, or Switching Network services that will operate in the new Switching Arrangements. Such a stakeholder is responsible for ensuring that the procured service meets the stated non-functional requirements.

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

Section 3 Non-Functional Requirements List contains the detailed non-functional requirements for Switching in the form of an embedded Excel spreadsheet. It includes performance efficiency, throughput rates and capacities that the solution must be capable of delivering, which have been calculated as shown in Section 4.

Section 4 CSS Volumetric Analysis describes the anticipated volumes of data in motion across the Switching Network and data at rest in CSS in the form of an Excel spreadsheet.

**Notes:**

NOTE 1: Security-specific requirements for the CSS solution and the Switching Network will be included in a separate product – D-4.1.10 E2E Security Requirements[6].

NOTE 2: Details regarding the interfaces integrated with the CSS solution are included in a separate product – CSS Interface Specifications, which is part of the D-4.2.1 CSS User Requirements Specification[1] document.

NOTE 3: Service Management and Operations requirements for the CSS solution and the Switching Network will be included in a separate product.

This document should be viewed in conjunction with D-4.1.4 End-to-End Switching Arrangements Non-Functional Requirements [5] which sets out the end-to-end non-functional requirements for Central Data Services and Market Participant systems.

# Purpose and Characteristics of Non-Functional Requirements

The purpose of this product is to provide the non-functional requirements for the CSS solution as input to the D-7.2 Procurement Design document [7] product alongside other Service Management and Security requirements and non-functional requirements.

Non-Functional Requirements (NFRs) define quality attributes, and essentially specify how well a system or service should behave. Each requirement must be testable and all systems and services must provide facilities for demonstrating that they meet the requirements for the CSS solution, for example the provision of appropriate access logging that allows measurement of response times.

The complete list of non-functional requirements is contained in the form of a Microsoft Excel spreadsheet file that is embedded as a file object in Section 3 Non-Functional Requirements List. The spreadsheet assumes that the CSS solution will “go live” in 2020 and contains quantitative requirements that relate to the first year of operation together with estimated annual increases. It is expected that these requirements will be reviewed during the first year and adjustments made accordingly for the CSS solution and Switching Network.

## Non-Functional Requirement Categories

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.

Figure 1 below diagrammatically shows the categories and sub-categories from the International Standard - ISO/IEC 25010:2011 (Systems and Software Engineering - SQuaRE - System and Software Quality Models)[2] framework that is the basis of this product, alongside International Standard ISO/IEC 25030:2007 (Systems and Software Engineering - SQuaRE - Quality Requirements)[3].

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

The following sections provide the descriptions and definitions of these requirement categories used in the CSS Detailed Non-Functional Requirements.

### Performance Efficiency

Performance efficiency is performance relative to the amount of resources used under stated conditions.

| **Sub-Category** | **Definition** |
| --- | --- |
| Time-behaviour | Degree to which the response and processing times and throughput rates of a product or system, when performing its functions, meets requirements |
| Resource Utilisation | Degree to which the amounts and types of resources used by a product or system, when processing its functions, meets requirements |
| Capacity | Degree to which the maximum limits of the product or system, parameter meets requirements |

### Compatibility

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.

| **Sub-Category** | **Definition** |
| --- | --- |
| 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 |
| Interoperability | Degree to which two or more systems, products or components can exchange information and use the information that has been exchanged |

### Usability

Usability is the effectiveness, efficiency and satisfaction in a specified context of use. 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.

| **Sub-Category** | **Definition** |
| --- | --- |
| Appropriateness Recognisability | Degree to which users can recognise whether a product or system is appropriate for their needs |
| Learnability | Degree to which a product or system enables the user to learn how to use it with effectiveness, efficiency in emergency situations |
| Operability | Degree to which a product or system is easy to operate, control and appropriate to use |
| User Error Protection | Degree to which a product or system protects users against making errors |
| User Interface Aesthetics | Degree to which a user interface enables pleasing and satisfying interaction for the user. In the case of the Switching Programme, the term “user” refers to the system user, not a market participant, consumer, or other 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 |
| 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. Includes the concept of access control where specific users have limited access to system features and functions. |

### Reliability

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.

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.

| **Sub-Category** | **Definition** |
| --- | --- |
| Maturity | Degree to which a system, product or component meets needs for reliability under normal operation |
| Availability | Degree to which a product or system 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) |
| Fault Tolerance | Degree to which a system, product or component operates as intended despite the presence of hardware or software faults |
| 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 |

### Maintainability

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.

| **Sub-Category** | **Definition** |
| --- | --- |
| 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 |
| Reusability | Degree to which as asset can be used in more than one system, or in building other assets |
| Analysability | Degree of effectiveness and efficiency with which it is possible to assess the impact on a product or system of 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 |
| 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 |
| Testability | Degree of effectiveness and efficiency with which test criteria can be established for a system, product or component and tests can be performed to determine whether those criteria have been met |

### Portability

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.

| **Sub-Category** | **Definition** |
| --- | --- |
| Adaptability | 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  NOTE 1: Adaptability includes the scalability of internal capacity (e.g. screen fields, tables, transaction volumes, report formats, etc.).  NOTE 2: Adaptations include those carried out by specialized support staff, and those carried out by business or operational staff, or end users.  NOTE 3: If the system is to be adapted by the end user, adaptability corresponds to suitability for individualization |
| Installability | Degree of effectiveness and efficiency in which a product or system can be successfully installed and/or uninstalled in a specified environment |
| Replaceability | Degree to which a product can replace another specified software product for the same purpose in the same environment  NOTE 1: Replaceability of a new version of a software product is important to the user when upgrading  NOTE 2: Replaceability can include attributes of both installability and adaptability. The concept has been introduced as a Sub-Category of its own because of its importance  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 |

# Non-Functional Requirements List

The specific non-functional requirements that apply to the CSS solution (which includes the Switching Network) are stated in the requirements list found within the embedded spreadsheet file below:

|  |  |
| --- | --- |
| **Column Name** | **Definition** |
| NFR Category | The ISO/IEC 25010 category for this requirement |
| NFR Sub-Category | The ISO/IEC 25010 sub-category for this requirement |
| NFR Reference | Unique identifier for the non-functional requirement. The identifier is based on the ISO/IEC 25010 category, with a numeric suffix. References prefixed with “E2E” appear in the E2E NFRs Ref [06]. References with the Suffix –A apply to the Address Service only. |
| Requirement Description | A description of the requirement. The term “The system” is used where multiple components of CSS, Address Service, and the Switching Network are inferred. Individual service terms (CSS Registration Service, Address Service, and Switching Network) are used for specific services. |
| Applicable System or Service | This indicates the system components or service affected by this requirement. Note that the term CSS refers to all data services that make up CSS, such as Governance Data Services, unless explicitly noted. |
| DBT or Operate | **DBT:** requirement placed on organisation developing the solution up until go-live, notably capabilities which need to be delivered in the solution  **Operate:** requirement placed on organisation responsible for operating the live solution, notably features which require action on the part of the operator (which includes configuration activities necessary to ensure that sufficient system resources are available to meet the requirement)  **NOTE** neither of the above includes modification due to change management |
| MoSCoW Rating | MoSCoW rating is a technique for prioritising the implementation of requirements: M - MUST have S - SHOULD have C - COULD have W - WON'T have |
| Derivation of Requirement and Notes | The source of the requirement with any relevant notes |

For clarity, references to the term “Interaction Patterns” means a type of interface carrying out one of the following actions: Notification, Enquiry, Synchronisation, or Update. The term “Interfaces” is specific to the interfaces between systems, while the term “Messages” refers to data transmitted between systems.

**Complete List of CSS Non-Functional Requirements:**



# CSS Volumetric Analysis

A volumetric analysis has been performed for the CSS solution, which determines the required capabilities of CSS for data storage, as well as for the volume of data sent across interfaces. An Excel spreadsheet has been built and embedded in this section, which incorporates a number of worksheets that are explained below.

## Worksheet Definitions

The *Assumptions and Reference Data* worksheet - contains the variables and basis of the calculations. If different values are required for the variables, they can be entered in the spreadsheet and new volumetrics will be calculated. New values for the variables can be entered in the spreadsheet cells listed in brackets e.g., (C61).

Assumptions on the annual growth against certain variables and some basic derived values are also given within the *Assumptions and Reference Data* worksheet. These values could be changed and would impact the following worksheets.

The *Database Sizing* worksheet - the term database refers to persistent data stores in CSS – contains calculations of sizing estimates at initial population and at the end of the first year.

The *Network Sizing* worksheet - contains calculation of data passed between CSS and market participant Data Services over the Switching Network during the first year.

The *How we arrived at the ‘Bytes’* worksheet - to define the Object Class data sizing, estimates were made based on the Logical Data Model which is defined with attributes. For each attribute a possible, technology agnostic data type domain was identified and an estimate made for the data length, as documented in the URS. Data lengths across different database technology implementations (e.g., Oracle/ SQL Server/ MySQL/ MongoDB) were averaged to give a mean figure in Bytes.

## Assumptions

There have been several assumptions for numbers of transactions, data object sizes, and growth made in the spreadsheet.

Total volumes are generally given in gigabytes (Gb). The values should not be regarded as absolute, and totals have been rounded to three significant figures. Total required capacity will vary according to the database selected, installation parameters, and configuration.

The figure for Initial Registrations is based on new build growth only. These figures could be modified to account for changes in existing RMP status.

The CSS at rest volumes do not account for either Archiving or Operational Solutions, such as Indexing, that might significantly change the data at rest sizing. No allowance has been made for reporting requirements and there are no physical requirements for data in motion or the denormalisation of any database tables. No allowance has been made for in-flight switches at the time of CSS Go Live, as these volumes will be very small, only 12 days’ worth of data and will not include switches scheduled for after Go Live.

Peak values in both the NFRs and volumetrics refer to consumer-driven peaks of transactions, rather than system-driven processing peaks.

For simplicity, only one calculation has been used to approximate notifications and synchronisations. This is a reasonable approximation as once the Registration Request has been validated all parties continue to be notified of progress regardless of outcome (this includes withdrawals and annulments).

**Volumetrics Calculations and Summary**

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