Functional Requirements Specification Guidelines

Fermilab, 08/01/2019

A Functional Requirements Specification (FRS) is the documentation that describes the programmatic needs or requested behavior of a system or component. The document typically outlines what is needed by the system user as well as the constraints, assumptions, technical requirements and requested properties of inputs and outputs. It details what the finished system or component will do and how a user will interact with it.

The Functional Requirements Specification is only one part of a broader set of engineering documentation that defines the component or system. Other important documents include the Technical Specification, design reports, engineering notes, white papers, detailed interface documents (if required), fabrication/acceptance plan, or possibly even a full Technical Design Report. The FRS is a reasonably short document with bulleted or numbered requirements clearly elaborated so that they can be referenced in later documents. It should not repeat but rather reference background material or overall project documents.

The Functional Requirements Specification does not define the inner workings of the proposed system or component; it does not include the specification for how the system functionality will be implemented. Instead, it focuses on what various outside agents might "observe" when interacting with the system. Once finalized and approved the FRS can be used to create a detailed technical specification and design.

Elements of the Functional Requirements Specification

A few sample questions are listed below for reference. They are not relevant for every component or system and should only be used as guide for the type of information captured.

1) Cover Page

a) Title, Document Tracking Numbers (Division specific), Date, Revision Number

b) Sign off area

The exact list of individuals that must sign off on the FRS varies by project but in all cases should include the Task Leader responsible for the work, Line Management, the SRF Program Office and the PX R&D Program Office.

2) Summary of Changes from Previous Revision

In order to keep track of what has been revised since the original document, provide a list of the major changes associated with a revision to the FRS. Since this is a controlled document, any revision must receive sign off of the interested parties including the SRF Program Office and the PX R&D Program Office.

3) Introduction

Provide a brief description of the work including any pertinent historical context.

- What is being built?
- Why is it being built?
- How will it be used?
- Where will it be used?

4) Scope of Work

Provide a brief description of what is being designed and fabricated.

- What is in and what is not in the project scope?

5) Key Assumptions, Interfaces and Constraints

List the assumptions that are made, relevant interfaces and constraints.

- What other systems does this work depend on or interact with?
- What are the assumed inputs or outputs?
- What assumptions are being made regarding the state of existing or future systems?
- Who are the other key stakeholders connected with this work?
- Are there any special constraints which apply to this work either physically or in terms of interfaces or timing of fabrication/installation? If so, are these absolute constraints or is there flexibility via some work-around?

6) Requirements

Provide a bulleted list of requirements or a table outlining the required technical parameters.

Technical Requirements

- What is the required functionality of the component or system?
- What are the technical requirements or acceptance parameters for the device?
- Are there requirements on the physical dimensions, power requirements or adjustability?
- For a facility, what throughput or capacity is required?

Safety Requirements

List any special requirements with regards to safety-related issues or interfaces.

- Are there any special radiation or magnetic shielding requirements?
- Is ODH or High Power RF a safety issue and will this system be part of an existing system?
- Are there specific cryogenic or pressure vessel concerns or requirements?

Quality Assurance Requirements

List any special requirements with regards to reliability, availability or maintainability.

Test/Commissioning Requirements

- What are the requirements for testing and commissioning?
- What are the metrics by which the component or system will be judged as successful or complete?

Operational Requirements

- What are the requirements for operation of the system or component?
- Are there specific “modes” of operation?
- How does it interact with the operation of existing equipment or systems?

7) References

Provide a brief list of reference documents that help better define or describe the component or system.