# Operational Concept Description

for the

## KNEAD Example System

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## DOCUMENT CHANGE HISTORY

The following table is a simple list of released revisions sent for review. Records of reviews and the review artifacts are saved with reviewer information in the The Balance Projectartifact repository.

**Change Record**

| Date | Version | Author(s) | Change Reference |
|---|---|---|---|
| 03 Jan 2024 | P1 | Lewis Collier | Preliminary DRAFT version |

Each subsequent "section" outlines changes in each release.

Items in this version that are marked with change bars have been modified from the most recent previous version (e.g. P3 changes from P2) or are new as of the current revision. A list of all changed items may be found in the Index section under the heading "All Changes This Version".

**Draft P1** Preliminary version of this document.

1. Change 1
2. Change 2
3. ...
4. Change N

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# CHAPTER 1

## Scope

ALL-1.0 :: If applicable, each section has a summary of data item description (DID) information shown in this font. These are displayed in small capital font and are not part of the formal document. Display of these DID information notes can be turned off for formal releases, but are displayed here for reference.

This document provides the Operational Concept Description (**OCD**) for the Balance System. The system will be referred to as the Balance System.

### 1.1 Identification

ALL-1.1 :: This paragraph shall contain a full identification of the system to which this document applies, including, as applicable, identification number(s), title(s), abbreviation(s), version number(s), and release number(s).

The Balance System described in this document shall be known as Balance System version 1. However, the Operational Concept Description **OCD** described herein shall be applicable to pre-releases such as Beta-releases for a phased release as listed for each requirement. The major system interfaces and capabilities are fully specified in Chapter 3.

### 1.2 System Overview

ALL-1.2 :: This paragraph shall briefly state the purpose of the system to which this document applies. It shall describe the general nature of the system; summarize the history of system development, operation, and maintenance; identify the project sponsor, acquirer, user, developer, and support agencies; identify current and planned operating sites; and list other relevant documents.

This paragraph shall briefly state the purpose of the system to which this document applies. It shall describe the general nature of the system; summarize the history of system development, operation, and maintenance; identify the project sponsor, acquirer, user, developer, and support agencies; identify current and planned operating sites; and list other relevant documents.

The Balance System is a game that users an play a game.

Figure 1 shows the high-level architecture for the Balance System system. This diagram shows the major external interfaces that provide the capabilities of Balance System.

This system would be a game where the user would have to balance a ball on a LCD screen that is builtin on the STM32 board. The objective of the game is to balance the ball on the screen based on the way the board was tilted. Balance System would keep track of the current position of the ball and where the next updated move is. This helps keep track

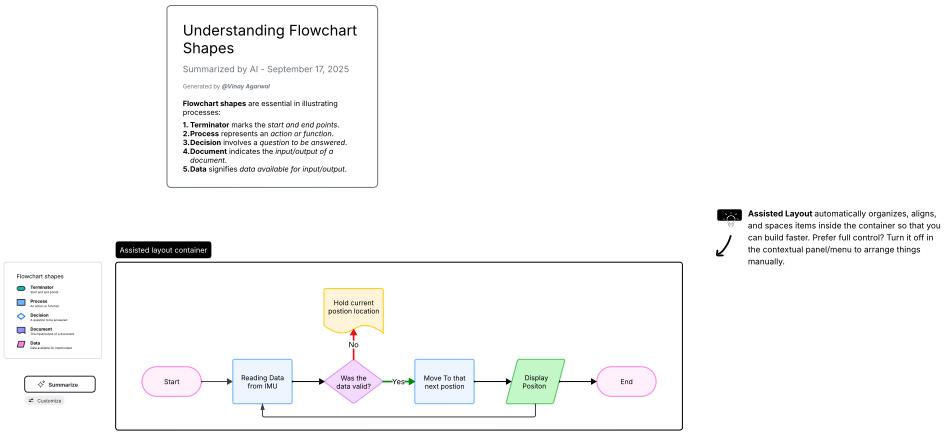


Figure 1: System Overview

of the system of where the ball is until a movement has occurred. Balance System shall process at a maximum 180 Hz. This would give the user enough time to process the current angle of the ball and be able to present on the LCD-TFT screen.

### 1.3 Document Overview

ALL-1.3 :: This paragraph shall summarize the purpose and contents of this document and shall describe any security or privacy considerations associated with its use.

This section provides information about this document's security/privacy considerations, contents, structure, and version information.

#### 1.3.1 Security and Privacy Considerations

This document is not subject to CUI restrictions.

#### 1.3.2 Artifact Format

This paragraph shall summarize the purpose and contents of this document and shall describe any security or privacy considerations associated with its use.

This document format is based upon the guidance in the **OCD DID** [**ref˙˙OCD˙DID**]. The operational concept is documented following the guidelines of ISO-12207 [**ref˙˙ISO˙12207**] and MIL-STD-498 [**ref˙˙MIL˙STD˙498**] (from which ISO-12207 originated). This document follows the listed **OCD** sub-section order.

**Section 1** provides an overview of the system and this document.

**Section 2** lists general and application-specific reference documents as well as glossary terms and acronyms.

**Section 3** summarizes the current status into which this system is to be situated.

**Section 4** justifies why change is needed.

**Section 5** describes the concept for a new or modified system.

**Section 6** illustrates operational scenarios for the new or modified system.

**Section 7** discusses a summary of impacts for the new system.

**Section 8** details analysis of the proposed system.

**Appendices** if needed, provide additional information as may be needed.

If this text is visible, the first instance of each section may display a summary of data item description (DID) information shown in this font. These are displayed in small capital font and are not part of the formal document.

#### 1.3.3 Document Version Information

This document was produced in LaTeX and *BibLaTeX/Biber*. The editing and document preparation were performed using MiKTeX version 2.9 with the build option [LaTeX ⇒ PS ⇒ PDF]. The LaTeX*svn-multi* package was used to glean SVN tracking information, when

files are stored in an "SVN" version control system. The style `KNEADdocument` was used to provide the LaTeX and *BibLaTeX/Biber* formatting details.

This revision of this document has the following properties:

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# CHAPTER 2

## References

This section provides a list of referenced items for this document.

### 2.1 Acronyms and Abbreviations

This section defines acronyms and abbreviations used in this and related documents.

Table 1: Acronym Definitions

| Acronym | Definition |
|---|---|
| **CONOP** | Concept of Operations |
| **DID** | Data Item Description |
| **OCD** | Operational Concept Description |
| **POC** | Point of Contact |
| **SPS** | System Performance Specification |
| **SSS** | System / Subsystem Specification |
| **...TBD...** | To Be Determined |
| **End of acronym definition table** | |

### 2.2 Glossary and Definitions

This section defines glossary terms used in this and related documents.

Table 2: Glossary Terms and Definitions

| Glossary Term | Definition |
|---|---|
| STM32F429I | Micro-controller board has all component fit onto one board. |
| Customer | The professor that is view the grading all assignments. |
| | |
| **End of glossary terms table** | |

### 2.3 Referenced Documents

This section lists the referenced documents for this document. The references are categorized into two categories:

**External** Documents not directly associated with this project.

**Project** Documents that are directly associated with this project.

#### 2.3.1 External Documents

#### 2.3.2 Project Specific Documents

# CHAPTER 3

## Current system or situation

### 3.1 Background, objectives, and scope

OCD-3.1 :: This paragraph shall describe the background, mission or objectives, and scope of the current system or situation. Note that this section basically summarizes the normal chapter 1 boilerplate material and system overview from existing documentation.

The system should be able to balance itself based off of how the system is leveled. The objectives are test each system seperatly.

### 3.2 Operational policies and constraints

OCD-3.2 :: This paragraph shall describe any operational policies and constraints that apply to the current system or situation.

Currently there are not policies and constraints.

### 3.3 Description of current system or situation

OCD-3.3 :: This paragraph shall provide a description of the current system or situation. Note that this is basically a summary of the detailed of **SPS** and/or **SSS** items. The description starts by identifying differences associated with different states or modes of operation (for example, regular, maintenance, training, degraded, emergency, alternative-site, wartime, peacetime). The distinction between states and modes is arbitrary. A system may be described in terms of states only, modes only, states within modes, modes within states, or any other scheme that is useful. If the system operates without states or modes, this paragraph shall so state, without the need to create artificial distinctions. The description shall include, as applicable:

(a) The operational environment and its characteristics (3.2),
(b) Interfaces to external systems or procedures (3.2)
(c) Charts and accompanying descriptions depicting inputs, outputs, data flow, and manual and automated processes sufficient to understand the current system or situation from the user's point of view (3.2),
(d) Capabilities/functions of the current system (3.3),
(e) Performance characteristics, such as speed, throughput, volume, and frequency (3.3),
(f) Major system components and the interconnections among these components (3.4 and 3.5),
(g) Quality attributes, such as reliability, maintainability, availability, flexibility, portability, usability, or efficiency, (3.11) and
(h) Provisions for safety, security, privacy, (3.7, 3.8) and continuity of operations in emergencies (3.11).

The current screen for the system contains information that is needed for movement of the embedded system. This allows users to have different types of approaches to balance the

system.

### 3.4 Users or involved personnel

OCD-3.4 :: This paragraph shall describe the types of users of the system, or personnel involved in the current situation, including, as applicable, organizational structures, training/skills, responsibilities, activities, and interactions with one another. Note that this section is a summary of items found in the security and privacy (3.8), personnel (3.13), and training (3.14) sections of an **SPS** or **SSS**.

Currently, there is only one user that is involved with this project.

### 3.5 Support concept

OCD-3.5 :: This paragraph shall provide an overview of the support concept for the current system, including, as applicable to this document, support agency(ies); facilities; equipment; support software; repair/replacement criteria; maintenance levels and cycles; and storage, distribution, and supply methods. Note that this is a summary of items found in the **SPS** or **SSS** logistics (3.15), other (3.16), and packaging (3.17) sections.

This section is **...TBD...**.

# CHAPTER 4

## Justification for and nature of changes

OCD-4.0 :: This section shall be divided into the following paragraphs to describe the justification for and nature of changes. An underlying goal here, for modified systems, is to describe what is wrong with the existing system, as described in Chapter 3, without actually listing what the new system needs to do, which is provided in Chapter 5.

This chapter is **...TBD...**.

### 4.1 Justification for change

OCD-4.1 :: This section shall: a. Describe new or modified aspects of user needs, threats, missions, objectives, environments, interfaces, personnel or other factors that require a new or modified system, and b. Summarize deficiencies or limitations in the current system or situation that make it unable to respond to these factors.

This section is **...TBD...**.

### 4.2 Description of needed changes

OCD-4.2 :: This section shall summarize new or modified capabilities/functions, processes, interfaces, or other changes needed to respond to the factors identified in 4.1. Again, just summarize new items here since Chapter 5 will "define" the new system.

This section is **...TBD...**.

### 4.3 Priorities among the changes

DIDINFOOCD-4.3 :: This paragraph shall identify priorities among the needed changes. It shall, for example, identify each change as essential, desirable, or optional, and prioritize the desirable and optional changes.

This section is **...TBD...**.

### 4.4 Changes considered but not included

OCD-4.4 :: This section shall identify new features or changes to existing capabilities that were considered but not included in 4.2, and the rationale for not including them.

This section is **...TBD...**.

### 4.5 Assumptions and constraints

OCD-4.5 :: This section shall identify any assumptions and constraints applicable to the changes identified in this chapter.

This section is **...TBD...**.

# CHAPTER 5

## Concept for a new or modified system

OCD-5.0 :: This chapter shall be divided into the following sections to describe the a new system or the expected modified system. For all systems, this chapter provides a summary of the performance (**SPS**) and/or segment capabilities (**SSS**) attributes; section numbers are shown in parenthesis in following DIDINFO blocks. For new systems, this chapter provides a summary of the problem that needs to be addressed by the new system.

This chapter is **...TBD...**.

### 5.1 Background, objectives, and scope

OCD-5.1 :: This paragraph shall describe the background, mission or objectives, and scope of the new or modified system. Note that this section basically summarizes the normal chapter 1 boilerplate material and system overview that will be used in new documentation.

This section is **...TBD...**.

### 5.2 Operational policies and constraints

OCD-5.2 :: This section shall describe any operational policies and constraints that apply to the new system.

This section is **...TBD...**.

### 5.3 Description of the new or modified system

DIDINFOOCD-5.3 :: This section shall provide a description of the new system. Note that this is basically a summary of the detailed of **SPS** and/or **SSS** items. The description starts by identifying differences associated with different states or modes of operation (for example, regular, maintenance, training, degraded, emergency, alternative-site, wartime, peacetime). The distinction between states and modes is arbitrary. A system may be described in terms of states only, modes only, states within modes, modes within states, or any other scheme that is useful. If the system operates without states or modes, this paragraph shall so state, without the need to create artificial distinctions. The description shall include, as applicable:

(a) The operational environment and its characteristics (3.2),

(b) Interfaces to external systems or procedures (3.2)

(c) Charts and accompanying descriptions depicting inputs, outputs, data flow, and manual and automated processes sufficient to understand the current system or situation from the user's point of view (3.2),

(d) Capabilities/functions of the current system (3.3),

(e) Performance characteristics, such as speed, throughput, volume, and frequency (3.3),

(f) Major system components and the interconnections among these components (3.4 and 3.5),

(g) Quality attributes, such as reliability, maintainability, availability, flexibility, portability, usability, or efficiency, (3.11) and

(h) Provisions for safety, security, privacy, (3.7, 3.8) and continuity of operations in emergencies (3.11).

This section is **...TBD...**.

### 5.4 Users/affected personnel

OCD-5.4 :: This section shall describe the types of users of the system, or personnel involved in the new system, including, as applicable, organizational structures, training/skills, responsibilities, activities, and interactions with one another. Note that this section is a summary of items found in the security and privacy (3.8), personnel (3.13), and training (3.14) sections of an **SPS** or **SSS**.

This section is **...TBD...**.

### 5.5 Support concept

OCD-5.5 :: This section shall provide an overview of the support concept for the new system, including, as applicable to this document, support agency(ies); facilities; equipment; support software; repair/replacement criteria; maintenance levels and cycles; and storage, distribution, and supply methods. Note that this is a summary of items found in the **SPS** or **SSS** logistics (3.15), other (3.16), and packaging (3.17) sections.

This section is **...TBD...**.

# CHAPTER 6

## Operational scenarios

OCD-6.0 :: This chapter shall describe one or more operational scenarios that illustrate the role of the new or modified system, its interaction with users, its interface to other systems, and all states or modes identified for the system. The scenarios shall include events, actions, stimuli, information, interactions, etc., as applicable. Reference may be made to other media, such as videos, to provide part or all of this information.

This chapter is **...TBD...**.

| Use Case 6.1 Test Use Case | |
|---|---|
| **Synopsis** | This is a Test Use Case. |
| **Actors** | **Actor 1** serves the actor 1 role.<br>**Actor 2** serves the actor 2 role. |
| **Steps** | Actor 1 performs yada yada yada.<br>Actor 2 performs etc. etc. etc. |
| **Traceability** | **Cite-1** Location-In-Cite-1.<br>**Cite-2** Location-In-Cite-2. |
| **Notes** | 1. Use Case Note 1.<br>2. There Are No Notes for This Item. (This is just to show the \NoNotes command.) |

### 6.1 Use Case 1

OCD-6.1 :: This section shall describe one operational scenario that illustrates the role of the new or modified system, its interaction with users, its interface to other systems, and all states or modes identified for the system. The scenarios shall include events, actions, stimuli, information, interactions, etc., as applicable. Reference may be made to other media, such as videos, to provide part or all of this information.

This section is **...TBD...**.

### 6.2 Use Case 2

This section is **...TBD...**.

# CHAPTER 7

## Summary of impacts

OCD-7.0 :: This chapter shall be divided into the following sections to describe the impacts of the new system or the expected modified system.

This chapter is **...TBD...**.

### 7.1 Operational impacts

OCD-7.1 :: This paragraph shall describe anticipated operational impacts on the user, acquirer, developer, and support agency(ies). These impacts may include changes in interfaces with computer operating centers; change in procedures; use of new data sources; changes in quantity, type, and timing of data to be input to the system; changes in data retention requirements; and new modes of operation based on peacetime, alert, wartime, or emergency conditions.

This section is **...TBD...**.

### 7.2 Organizational impacts

OCD-7.2 :: This paragraph shall describe anticipated organizational impacts on the user, acquirer, developer, and support agency(ies). These impacts may include modification of responsibilities; addition or elimination of responsibilities or positions; need for training or retraining; and changes in number, skill levels, position identifiers, or location of personnel in various modes of operation.

This section is **...TBD...**.

### 7.3 Impacts during development

OCD-7.3 :: This paragraph shall describe anticipated impacts on the user, acquirer, developer, and support agency(ies) during the development effort. These impacts may include meetings/discussions regarding the new system; development or modification of databases; training; parallel operation of the new and existing systems; impacts during testing of the new system; and other activities needed to aid or monitor development.

This section is **...TBD...**.

# CHAPTER 8

## Analysis of the proposed system

OCD-8.0 :: This chapter shall be divided into the following sections to describe the analysis of the new system or the expected modified system. This chapter can be considered to be an executive summary of the new/proposed systems. The contents somewhat follow the common NABC (need, approach, benefit, competition) way of presenting a short summary of an idea. The need, approach, and benefit are rolled up into the first section, while the competition is distributed in the final two sections.

This chapter is **...TBD...**.

### 8.1 Summary of advantages

OCD-8.1 :: This paragraph shall provide a qualitative and quantitative summary of the advantages to be obtained from the new or modified system. This summary shall include new capabilities, enhanced capabilities, and improved performance, as applicable, and their relationship to deficiencies identified in 4.1.

This section is **...TBD...**.

### 8.2 Summary of disadvantages/limitations

OCD-8.2 :: This paragraph shall provide a qualitative and quantitative summary of disadvantages or limitations of the new or modified system. These disadvantages and limitations shall include, as applicable, degraded or missing capabilities, degraded or less-than-desired performance, greater-than-desired use of computer hardware resources, undesirable operational impacts, conflicts with user assumptions, and other constraints.

This section is **...TBD...**.

### 8.3 Alternatives and trade-offs considered

OCD-8.3 :: This paragraph shall identify and describe major alternatives considered to the system or its characteristics, the trade-offs among them, and rationale for the decisions reached.

This section is **...TBD...**.

# APPENDIX

## Notes

OCD-9.0 :: This section shall contain any general information that aids in understanding this document.

This section provides notes, as necessary, to document the system segmentation specification.

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