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 KNEAD 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.

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CHAPTER 1

Scope

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

1.1 Identification

The Garden Control System described in this document shall be known as GCS 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

The Garden Control System will be able to measure moisture levels and control irrigation in raised garden beds. The purpose for GCS is to maintain ideal gardening and growth conditions for fruits, vegetables, and other garden plants throughout a growing season. The goal for GCS is to automate the watering process for DIY gardeners. GCS will monitor temperature, moisture levels, and additionaly environmental factors to determine when to water the plants. Garden Control System is being developed by Zachary Steinberg and sponsored by University of Maryland Graduate Engineering. The operator and maintaner of GCS will also be Zachary Steinberg. The GCS will be operated outside along raised garden beds. GCS is designed to be used by home gardeners. It is not intended for industry. GCS will be controlled by a Raspberry Pi Pico W microcontroller board.

Figure 1 shows the development kit used for the GCS system. This is an image of different versions of the Raspberry Pi Pico microcontroller board. (This is a test image)

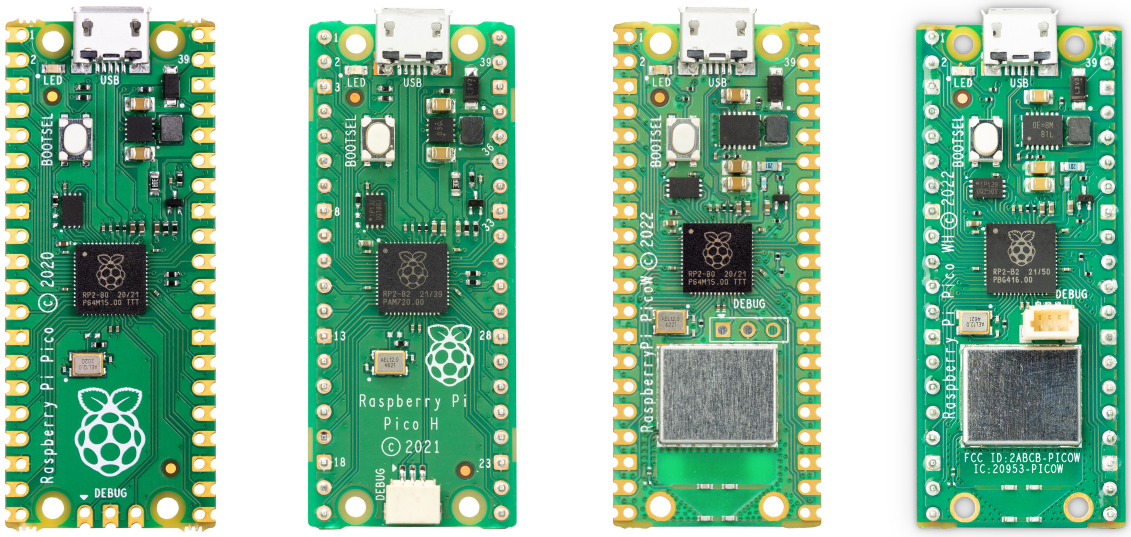

Figure 1: Raspberry Pi Pico W microcontroller board

1.3 Document Overview

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

This document format is based upon the guidance in the OCD DID [1]. The operational concept is documented following the guidelines of ISO-12207 [2] and MIL-STD-498 [3] (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.

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
GCS	Garden Control System
UMD	University of Maryland
MAGE	Maryland Applied Graduate Engineering
ENPM	Engineering Professional Masters
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
Communications	Communication is information transfer, among users or processes, according to agreed conventions.
Customer	The local government project lead who is acting as a general manager for the sponsor to ensure that the contractor team executes the project according to stakeholder goals.
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

[1] DI-IPSC-81430. *Data Item Description for Operational Concept Description (OCD)*. Dec. 31, 1994.

[2] IEEE and EIA. *Software life cycle processes*. Mar. 1998.

[3] MIL-STD-498. *Military Standard Software Development and Documentation*. Dec. 31, 1994.

2.3.2 Project Specific Documents

CHAPTER 3

Current system or situation

OCD-3.0 :: This section shall be divided into the following paragraphs to describe the system or situation as it currently exists. For existing 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....

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.

This section is ...TBD....

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.

This section is ...TBD....

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:

- The operational environment and its characteristics (3.2),
- Interfaces to external systems or procedures (3.2)
- 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),
- Capabilities/functions of the current system (3.3),
- Performance characteristics, such as speed, throughput, volume, and frequency (3.3),
- Major system components and the interconnections among these components (3.4 and 3.5),
- Quality attributes, such as reliability, maintainability, availability, flexibility, portability, usability, or efficiency, (3.11) and
- Provisions for safety, security, privacy, (3.7, 3.8) and continuity of operations in emergencies (3.11).

This section is ...TBD....

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.

This section is ...TBD....

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

OCD-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

OCD-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:

- The operational environment and its characteristics (3.2),
- Interfaces to external systems or procedures (3.2)
- 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),
- Capabilities/functions of the current system (3.3),
- Performance characteristics, such as speed, throughput, volume, and frequency (3.3),
- Major system components and the interconnections among these components (3.4 and 3.5),
- Quality attributes, such as reliability, maintainability, availability, flexibility, portability, usability, or efficiency, (3.11) and
- 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....

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.