**FleetControl   
Design Document**

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**Design Document**

**Paul M. Summitt**

**FleetControl**

Version: 0.1 Revision Date 18Aug2024

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**Document History**

Paper copies are valid only on the day they are printed. Contact the author if you are in any doubt about the accuracy of this document.

**Revision History**

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**Reference Documents**

Please see the following documents for more information:

| Document Name | Version | Author |
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# **Executive Summary**

Provide a brief introduction to the system for which this design is being undertaken.

## Purpose of this document

Describe the purpose of the document and its intended audience, for example:

*The purpose of this document is to describe in sufficient detail how the proposed system is to be constructed. The System Design Document translates the Requirement Specifications into a document from which the developers can create the actual system. It identifies the top-level system architecture, and identifies hardware, software, communication, and interface components.*

## Identification

Identify the system and software to which this document applies, including, identification number(s), title(s), abbreviation(s), version number(s), and release number(s). Identify all standards (ANSI, ISO, IEEE, etc) that apply to the design document.

## Scope

*The scope establishes the boundaries of the design document and should describe features outside of the scope, for example, if certain requirements were not included in the design due to budgetary or time constraints.*

| Includes |
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## Relationship to Other Plans

Describe this document’s relation to other plans, such as:

* Functional Requirements [version]
* Configuration Management Plan [version]
* Software Quality Assurance Plan [version]

## Methodology, Tools, and Techniques

Describe the software tools (or techniques) required for performing design documents tasks, e.g. software for managing changes requests that may be made during the development phase.

## Policies, Directives and Procedures

Identify any constraints or requirements placed on this document by policies, directives, or procedures.

# **Design Overview**

*Provide a brief introduction to the proposed system. Outline how the system will fit into the company’s business and technology environments, and discuss any strategic issues if appropriate.*

## Background Information

Outline any background information that is relevant to the propose design, for example, business drivers, such as the need for the company to offer customer’s new services or compliance issues, such as security controls that must be incorporated into the system design.

## System Evolution Description

[**Optional**] Describe how to migrate the existing system(s) to a more efficient system, or alternately moving an existing system to a future implementation.

## Current Process

[**Optional**] Describe the current processes that are in place (if applicable). This may help place the overall design in context.

## Proposed Process

[**Optional**] Describe the proposed process. Reference any supporting documents, if relevant.

## Technology Forecast

[**Optional**] Outline the emerging technologies that are expected to be available in a given timeframe(s), and how they may impact the future development of system the architecture.

## Constraints

Detail any constraints that are placed upon the system design, such as schedules, costs, or technical constrains, such as the company’s commitment to a specific development platform or programming language.

## Design Trade-offs

Discuss the tradeoffs involved with the design chosen and the reasons for your choices. For example, an increase in security controls will likely entail a decrease in ease-of-use; an increase in the flexibility of a system typically entails a decrease in the simplicity of that system. For this reason, the designer must decide to put a higher value on some attributes over others. Some areas to consider include:

* Flexibility
* Interoperability
* Performance
* Reliability and robustness
* Usability

## User Characteristics

Describe the features of the user community, and their proficiency with software systems etc.

### User Problem Statement

Describe the major problem(s) experienced by the user community.

### User Objectives

Outline the users’ objectives and requirements for the new system. Where appropriate, include a "wish list" of desirable features.

# **System Architecture**

*Describe the system and/or subsystem(s) architecture for the project. Discuss the general architectural decisions that have been approved. Include a graphical representation, where appropriate.*

## Hardware Architecture

Describe the system hardware architecture and indicate whether the processing system is distributed or centralized. List and describe the hardware modules with and diagrams showing the connectivity between the modules. If possible, identify the type/number/location of servers, workstations, processors, backup systems, output devices, etc.

## Software Architecture

Describe the overall system software and organization. List and describe the software modules (i.e. including functions, subroutines, or classes), programming languages, and development tools.

Describe all software required to support the system, and specify the physical location of all software systems. Identify database platforms, compilers, utilities, operating systems, communications software, etc.

1. Diagrams should map to the Functional Requirements Document’s data flow diagrams.

Provide diagrams that illustrate the segmentation levels down to the lowest level. Include names and reference numbers for all features on the diagrams. Include a narrative that expands on and enhances the understanding of the functional breakdown.

## Communications Architecture

Describe communications within the system, such as Local Area Networks (LANs), buses, etc. Include the communications architecture(s) being implemented, such as X.25, Token Ring, etc.

Provide a diagram depicting the communications path(s) between the system and subsystem modules.

# **Data Design**

This section outlines the design of the database management system (DBMS) and non-DBMS files associated with the system. For networks, detail the distribution of data and identify any changes to the logical data model that may occur due to software or hardware requirements.

1. Provide a Data Dictionary showing data element name, type, length, source, validation rules, maintenance, data stores, outputs, aliases, and description. Attach as an appendix.

## Database Management System Files

Describe how the database will be designed, including the following information, as appropriate:

* Logical model; provide normalized table layouts, entity relationship diagrams, and other logical design information
* DBMS schemas, sub-schemas, records, sets, tables, storage page sizes, etc.
* Access methods (such as indexed, via set, sequential, random access, sorted pointer array, etc.)
* Estimate the database file size or volume of data within the file, data pages, including overhead resulting from access methods and free space
* Definition of the update frequency of the database tables, views, files, areas, records, and sets
* Estimates on the number of transactions the database may have to process

## Non-Database Management System Files

Describe all non-DBMS files including narratives on the usage of each file. Identify if the file is used for input, output, or both; identify temporary files; which modules read and write the file, etc.

* Identify record structures, record keys, indexes, and reference data elements within the records
* Define record length and blocking factors
* Define file access method, such as, index sequential, virtual sequential, random access, etc
* Estimate the file size or volume of data within the file
* Define the update frequency of the file; if appropriate, provide the estimated number of transactions per unit time, and the statistical mean, mode, and distribution of those transactions

# **Detailed Design**

*This chapter describes the proposed design in detail. Provide the necessary information for the development team to integrate the hardware components, write the software code, so that the hardware and software components will provide a functional product.*

1. Every design item should map back to the Functional Requirements Document. These should be captured in the Requirements Traceability Matrix.

## Hardware Detailed Design

In this section, provide enough information for the developers to build and/or procure the system’s hardware.

1. If this section becomes too lengthy, consider placing it in the Appendix or reference it in a separate document. Add additional diagrams, if necessary, to describe each component and its functions.

Include the following information (as applicable):

* Cable type(s) and length(s)
* Connector specifications
* Details of hardware items, such as monitors, printers, servers, I/O devices, and the relationship to each other
* Hard drive/floppy drive/CD-ROM requirements
* Memory and/or storage space requirements
* Monitor resolution
* Power input requirements for each component
* Processor requirements
* Signal impedances and logic states

## Software Detailed Design

A software module is the lowest level of design granularity in the system. In this section, provide enough detailed information for the developers to write the source code for all modules in the system (and/or integrate COTS software programs).

For each module, provide the following information:

* Narrative introduction to each module, its function(s), the conditions under which it is used (called or scheduled), processing, logic, interfaces to other modules, interfaces to external systems, security requirements, etc.
* Graphical representation of the module processing, logic, flow of control, and algorithms, using charts, diagrams, flowcharts as appropriate
* Data elements, record structures, and file structures associated with module input and output
* Report layout
* For COTS packages, specify any call routines or bridging programs to integrate the package with the system and/or other COTS packages, such as DLLs (Dynamic Link Libraries)

Repeat this section for each module.

### Module [X]

Provide a detailed description of each software module.

#### Processing

Provide a processing narrative for each module.

Explain the process by which each module interacts with other parts of the system, including other modules. Describe the data elements and data structures which provide input to each module, how the module transforms the data, and the data elements or data structures which are output.

#### Local data structures

Describe the local data structures.

### Module [X]

Provide a detailed description of each software module.

#### Processing

Provide a processing narrative for each module.

#### Local data structures

Describe the local data structures.

## Communications Detailed Design

Provide enough detailed information about the communication requirements to build and/or procure the communications components for the system.

1. This section should provide enough detail to support the procurement of hardware for the system installation

Include the following information in the detailed designs (as appropriate):

* Details of servers and clients to be included on each area network
* Specifications for bus timing requirements and bus control
* Format(s) for data being exchanged between components
* Diagrams showing connectivity between components, data flow (if applicable), and distances between components;
* LAN topology

# **External Interface Design**

External systems are any systems that are not within the scope of the system under development, regardless whether the other systems are managed by the development company or its client.

In this chapter, describe the interface(s) between the system under development (i.e. this system) and other external systems and/or subsystem(s).

## Interface Architecture

Describe the interface(s) between the system being designed and other systems. Include the interface architecture(s) being implemented, such as wide area networks, gateways, etc. Provide diagrams showing the communications path(s) between this system and other systems.

## Interface Detailed Design

Provide sufficient detail about the interface requirements for the development team to format, transmit, and/or receive data across the interface.

Include the following information (as appropriate):

* Data format requirements; if data must be reformatted before it is transmitted or after incoming data is received. Describe the tools and/or methods for the reformat process
* Specifications for hand-shaking protocols between systems; content and format of hand-shake messages, timing for exchanging these messages, and errors handling
* Format(s) for reports exchanged between the systems
* Graphical representation of the connectivity between systems, showing the direction of data flow
* Query and response descriptions

Describe the individual data elements that the interfacing entity(s) will provide, store, send, access, and receive, such as:

1) Names/identifiers

Data Element Name

Data Format/Length

Data Type

Definition

Non-Technical Name

Non-Technical Synonyms

Specifications

Synonyms

2) Range or enumeration of possible values (e.g. 0-99)

3) Accuracy and precision (number of significant digits)

4) Priority, timing, frequency, sequencing, and other constraints

5) Security and privacy constraints

6) Sources (setting/sending entities) and recipients (using/receiving entities)

Describe the data element assemblies (records, messages, files etc.) that the interfacing entity(s) will provide, store, and send, such as:

1) Names/identifiers

Technical Name, e.g., data structure name

Non-technical Names, e.g. synonyms

2) Data elements

3) Medium/structure of data elements/assemblies

4) Visual characteristics (e.g. layouts, fonts, icons etc)

5) Relationships among assemblies

6) Security and privacy constraints

7) Sources and recipients

Describe the communication methods that the interfacing entity(s) will use for the interface, such as:

1) Communication links/bands/frequencies/media

2) Message formatting

3) Flow control (e.g. sequence numbering)

4) Data transfer rate

5) Routing

6) Transmission services

7) Safety

8) Security and privacy considerations

Describe characteristics of the protocols that the interfacing entity(s) will use for the interface, such as:

1) Priority/layer of the protocol

2) Packeting

3) Legality checks, error control

4) Recovery procedures

4) Synchronization

5) Status, identification, and other reporting features

Where appropriate describe other characteristics, such as physical compatibility of the interfacing entity(s) (dimensions, tolerances, loads, voltages, plug compatibility, etc.)

# **Human-Machine Interface**

Describe the Human Machine interface (i.e. user interface) relative to the user. Additional information may be added if the suggested headings are inadequate.

## Interface Design Rules

Identify conventions and standards for designing the user interface.

## Inputs

Identify the input media used by the user (i.e. operator) for providing information to the system, such as data entry screens, optical character readers, bar scanners, etc.

Identify the messages associated with operator inputs, including the following:

* Form(s) if the input data is keyed or scanned for data entry
* Access restrictions
* Security considerations

## Outputs

Describe the system output design relative to the user. System outputs include reports, data display screens, query results, etc.

Identify the following, if appropriate:

* Access restrictions or security considerations
* Description of the purpose of the output
* Report requirements, including frequency for periodic reports
* Screen contents (provide a graphic representation of each layout. Define all data elements associated with the layout)

## Navigation Hierarchy

Provide a diagram of the navigation hierarchy that shows how a user moves through the user interface.

### Screen [x.1]

Provide the layout of all input data screens or graphical user interfaces. Provide a graphic representation of each interface, for example, a low-resolution screenshot. Define all data elements associated with each screen or GUI, or reference the data dictionary.

1. Label each data input screens and/or graphical user interface.

### Screen [x.2]

Provide a graphic representation of each interface, for example, a low-resolution screenshot. Define all data elements associated with each screen or GUI, or reference the data dictionary.

### Screen [x.3]

Provide a graphic representation of each interface, for example, a low-resolution screenshot. Define all data elements associated with each screen or GUI, or reference the data dictionary.

# **System Integrity Controls**

System designers should give consideration to integrity controls in order to restrict the loss, misuse, modification of, or unauthorized access to information that could affect the company, client, or its customers.

With this in mind, ensure that the following minimum levels of control are included:

* Ability to identify audit information by user identification, network terminal identification, date, time, and data accessed or changed
* Audit procedures to meet control, reporting, and retention period requirements
* Controls to restrict access of critical data items
* Verification processes for additions, deletions, or updates of critical data

# **Appendix A**

Attach any addition information that supplements the design specification.

## Requirements Traceability Matrix

Include a Requirements Traceability Matrix that traces modules and data structures to the software requirements.

## Packaging and Installation

Outline any special considerations for software packaging and installation.

## Design Metrics

Describe all metrics to be used during the design activity.

## Glossary of Terms

Identify all terms that establish meaning within the context of the plan.

| Term | Meaning |
| --- | --- |
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Table 1 — Glossary of Terms