Software Requirements Specification

for

Building Maintenance Manager

Version 2.0

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Revision History

Date	Description	Author	Comments
10/27/2014	V1.0	Brett Fielding, Bryan Anders, and Cord Rehn	Initial Version
11/21/2014	V1.1	Brett Fielding, Bryan Anders, and Cord Rehn	First Revision
3/15/2015	V2.0	Brett Fielding, Bryan Anders, and Cord Rehn	Final Revision

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1. Introduction

1.1 Purpose

To convert AutoCAD documents into a usable format capable of providing an interactive interface between building schematics, schematic layers, and current problems/work assignments (As well as implementing such an interface).

1.2 Scope

This project will seek to render buildings only in a two-dimensional way. Its inputs are limited to files derived from AutoCAD binaries. It is not being built for mobile interactivity, but instead as an interactive digital version of the book of architectural, structural, electrical and mechanical schematics that correspond to a building. It will allow the user to designate and monitor issues, but will not be capable of receiving those notifications from other programs or devices. The scope of this project will be focused on the AutoCAD files for Hargreaves Hall, and while it will be technically capable of using similarly formatted files, we will not get to testing and implementation of additional building schematics.

1.2.1 Wishlist (Outside the Scope of this Project)

- Implementing and testing the software on additional building schematics.
- Implement a changeable background color (to be stored in the config file for each document).
- Renaming and grouping layers by the user for better implementation.
- Porting of this Project to an Android mobile application to use with work crews on site.
- Capability to be linked to the mobile Android application, which can update work assignments, add new problem areas, and add photos to new and existing work assignments.
- Eventual linking of a vast network of devices with varying access dependent on the occupation of the user, from top-level management off site abroad to individual workers on site.

1.3 Definitions

- AutoCAD: A commercial software application for 2D and 3D computer-aided design (CAD) and drafting.
- .dwg file: The file format (saved as a collection of draw commands) for use in AutoCAD.
- Issue Handling: A layer on the schematic that denotes an area with a problem that is either in need of or has been assigned to a work crew to fix. The area is visually identified by a red area if identified but not yet assigned, yellow if it has been assigned and work is in progress, or green if it has been completed but not yet closed.
- Schematic layers: Layers applied to overlay the base schematic floor plan to show the running of electronics, mechanics, work assignments, etc. through the entire building.

2. General Description

Building Maintenance Manager will allow its users to use AutoCAD binaries of buildings to create an interactive building administration interface. This program is broken up into two modules. The first module extracts information from AutoCAD binaries to build the files required to generate the user display, while the second uses those files to present the user with a manipulable touch interface that displays selected features of a building's structure.

3. Specific Requirements

3.1 Building Maintenance Manager

3.1.1 User Interface

The user's display is broken down into 3 subviews under a main menu bar at the top. The top left and top right subviews will each cover roughly one sixth of the window and will display the options listed below for viewing within the main subview. The main subview will cover the remaining two thirds of the window and display all the selected base schematic and sub-layers selected in the other to subviews. The main menu bar at the top will display icons for primary operations of the interface, such as the open file, zoom, and select region options. The open file option will open an existing building solution (as created by the File Conversion Wizard) for use within the current Building Maintenance Manager instance. The zoom selector will allow a mouse drag-to-zoom selection within the main view. The select region toggle will allow a similar drag-to-select feature with the main view which will define an area with which to create a new problem area region upon the schematic. All windows will be adjustable to whatever proportions are desired by the user.

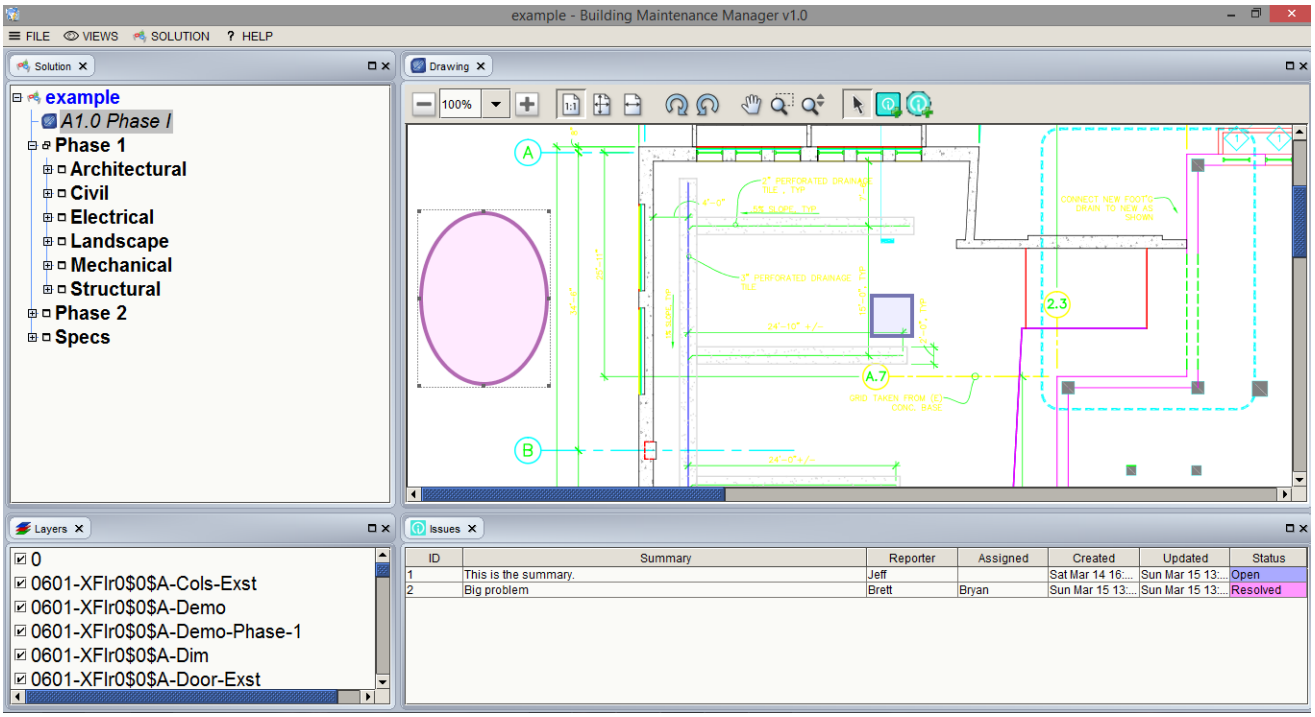

Image: Building Maintenance Manager's full display

3.1.1.1 Solution Panel

The solution panel contains a tree with whatever subtrees exist in the solution directory: Each of these subtrees can be expanded to display the PDFs which correspond to the drawings for that section. Any viewable documents will be selectable from any expanded subdirectory in this view.

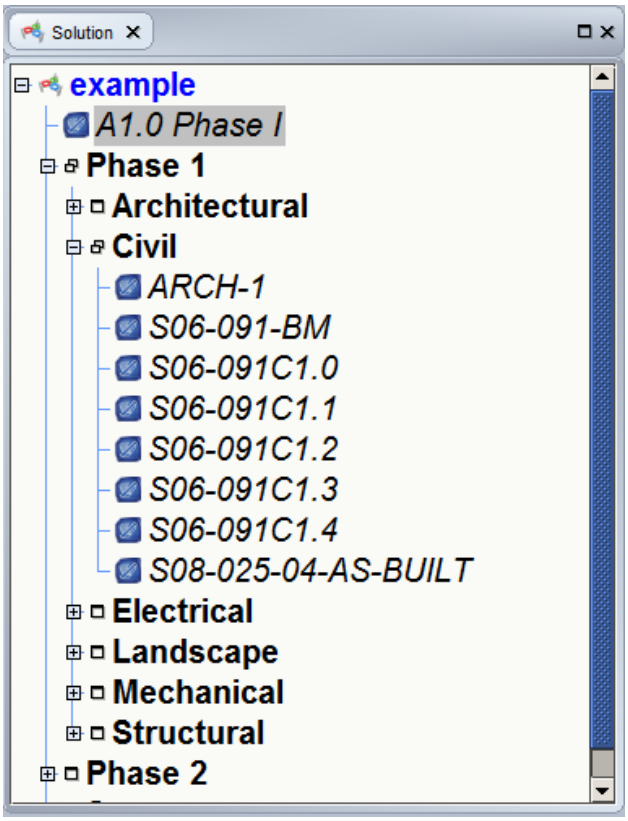

Image: The Solution Panel

3.1.1.2 Layers Panel

The Layer's Panel allows the user to toggle on or off schematics layers of infrastructure in the building so that they only view what they want to on a building at any given time. The available layers will depend on the content of the pdf currently being viewed in the Solution Panel. The layers are displayed as a tree.

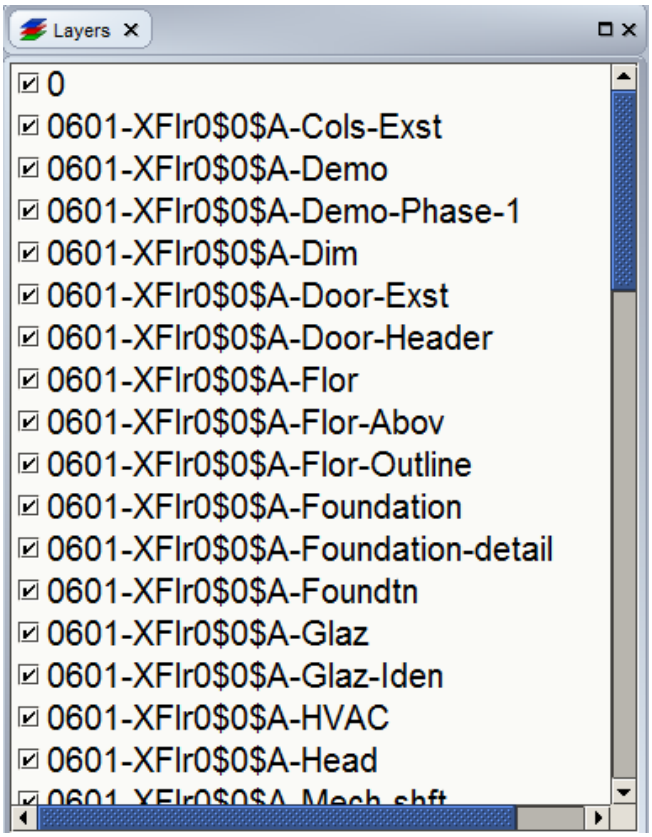

Image: The Layers Panel

3.1.1.3 Display Panel

The display panel will occupy the entire display below the menu bar and the toolbar. The other panels will partly cover it when they are open. The currently selected layers of the currently selected solution pdf are displayed in this panel..

3.1.1.4 Issues Panel

The Issues Panel will hold information on issues in a table with the following fields:

1. Issue number
2. Issue Summary
3. Name of the person who reported the issue
4. Name of the person assigned to the issue
5. Date the issue was created
6. Date the issue was last updated
7. Status of the issue

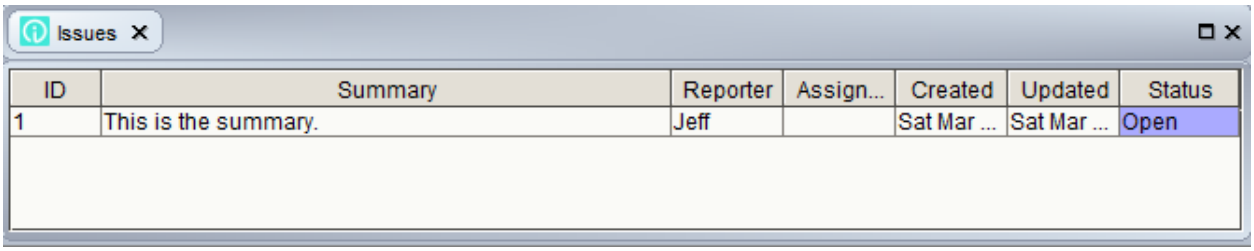

Image: The Issues Panel

3.1.2.5 File Menu

The File Menu resides at the top of the window and contains the following submenus:

1. File
   a. New, Open and Save commands
2. View
   a. Panel enabling and disabling commands
   b. Zoom and rotational commands
3. Issues
   a. New issue and delete issue commands
4. Help
   a. Text tutorials
   b. Information about this program

3.1.2.6 Toolbar

The toolbar resides between the File Menu and the Panel views and contains the following buttons:

1. Create new project
2. Open project
3. Save project
4. Create issue
5. Delete issue
6. Zoom in
7. Zoom out

3.1.2 Functional Requirements

3.1.2.1 Solution Panel

The Solution Panel contains a tree of PDFS, each of which corresponds to a DWG file that is converted by the AutoCAD image convertor. The user may select one PDF to display at any time. All but the base floorplan layer of the image are disabled by default, but the previous layer state of a PDF is preserved the next time it is displayed.

3.1.2.2 Layers Panel

The Layer's Panel contains a tree of toggleable layers that corresponds to the layers of images within the PDF selected in the Solution Pane. The user may toggle as many of the layers as they choose, but cannot toggle the base layer, which displays the floorplan of the building.

3.1.2.3 View Panel

The PDF layers displayed in the view panel will be rotatable within a two dimensional plane as well as zoomable. Issues corresponding to the currently selected PDF that have not been started, are works in progress or have been resolved will be displayed in the display view. These issues will be selectable.

3.1.2.4 Issues Panel

The Issues Panel will contain a table view with information about an issue. The status of an issue, the person assigned to it and the comments about it will be be able to be edited or appended by the user. The updated date will be updated whenever the issue is updated. The other fields cannot be edited.

3.1.2.5 File Menu

The File Menu contains submenus that address file, view and issue operations as well as help information information and information about the Building Maintenance Manager. The file operations will use a directory browser to allow the user to navigate easily to the directories where input files or projects reside. View operations are broken into two subgroups: toggles for the Solution, Layers and Issues panel and controls to manipulate the image in the Display Panel, notable zoom in and zoom out. The issues submenu contains options for the creation and deletion of new issues.

3.1.2.6 Toolbar

The toolbar contains buttons which act as gui shortcuts for program operations. The create new project and open project buttons will display a file browser with which to choose a directory from which to import pdfs and build a solution or open an existing solution, respectively. The save button will save the current state of the project, including rotation of images and the location of issues on solution PDF images. The create issue button allows the user to select an area in the Display Panel and designate it as a new issue, while the delete issue button allows them to select an existing issue on the Display Panel and delete it. Finally the zoom in and zoom out buttons let the user zoom in or out on the image by 50%, respectively.

3.2 AutoCAD File Converter

3.2.1 User Interface

Interface will include a Solution Creation Wizard within the viewer which details the file conversion process for the user and then sorts the converted documents into a proper solution directory.

3.2.2 Functional Requirements

We must convert AutoCAD binaries (.dwg) to a PDF format that can be easily displayed in layers (assuming that the PDF is properly converted). Common conversions that result from a “print to file” method result in a flat PDF with no layers which is unusable for our purpose. The final PDF file needs to keep the layers intact and be properly indexable by the original filename.

3.2.2.1 Implementation

AutoCAD has the built-in functionality to implement custom Virtual Basic scripts to control or automate its basic functions. Once the way to manually generate Sheet Sets into PDF documents is tested and approved for final implementation, a script will be created to automate the procedure into its most simple and basic execution as is possible for the ease of the end user. Research into the process has revealed that the scope of trying to perform such a conversion outside the AutoCAD environment is well beyond what can be accomplished within this project and--while possible in the future--would be a project in-and-of itself and might even be too large for a single Senior Capstone level project to complete. The best implementation in the time allowed has been determined to be a sheet set conversion within AutoCAD. A conversion manual has been created to walk the user through this process. This manual is displayed within the Solution Creation Wizard as part of the solution creation process.

4. Use Cases

4.1 Building Management

4.1.1 Building Schematic Viewing

The Building Maintenance Manager can be used as a reference by building managers looking to familiarize themselves with a building or investigate specific building properties. The solution and layers frames will make it easy for building managers to look only at the elements of a building’s structure that they want to at any time.

4.1.2 Issue Tracking

Building managers can use the Building Maintenance Manager to create, progress and resolve issues related to specific areas on individual building schematics. To create issues a building manager will click the create issue button on the toolbar then select an area on the Display Panel. This will allow the manager to input information about the issue and finalize issue creation. The issues the building manager

creates will have their information display in the Issues Panel and have a visual representation in the Display panel where the building manager created them. This will allow the building manager to more easily keep track of the issues which need resolving and to devote more resources to issues if they are proving intractable.

4.2 AutoCAD to PDF Conversion

AutoCAD to PDF conversion will be used to take the source .dwg files in AutoCAD and convert them into layered PDF documents in a proper directory structure with which the Building Manager can use in its own operation. This functionality will only be required when new or recently updated source files become available that the user wishes to use.

5. Deliverables

5.1 Building Management Viewer

- Source code for the Building Management Viewer software for use in later development of the software
- Indexed Javadocs for use with understanding the source code
- Complied executable files for running the Building Management Viewer within a Windows environment

5.2 AutoCAD PDF Exporter

- Detailed instructions on how the end user can execute of the file conversion from AutoCAD
- Exported PDF files from the Hargreaves Hall source .dwg files

6. Timeline

November 2014:

Investigate iText library for pdf layer toggling. - Bryan
Investigate AutoCAD scripting with Virtual Basic - Brett
Manual AutoCAD to layered PDF conversion exploration. - Cord

December 2014:

Manipulate PDF layers programmatically. -Bryan
AutoCAD scripting proof of concept - Brett
Completed extracted PDF prototype to work with. - Cord

January 2015

AutoCAD to PDF export process complete. -Brett
Viewer layout prototyped in Java. -Bryan
Implement Issue Creation - Cord

February 2015:

Viewer layer and building floor functionality. -Bryan
File sort after conversion functionality - Brett
Issue tracking functionality - Bryan and Cord

March 2015:
Final deliverables completion - Bryan, Brett and Cord
Final Viewer Completed and Delivered - Bryan, Brett and Cord

7. Revision Discrepancies

The largest discrepancy between SRS revisions is the failure to automate the conversion process, which exists due to the incompatibility of automated conversion files with our need to keep the DWG layers and filenames intact. Other processes have retained or surpassed our estimated expectations.