Software Design Document for Auditor-Controller

Version 1.0 approved

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Table of Contents

1. Introduction ................................................................................................................ 5
   1.1. Purpose ................................................................................................................ 5
   1.2. Document Conventions .................................................................................... 5
   1.3. Intended Audience and Reading Suggestions ............................................... 5
   1.4. System Overview .............................................................................................. 5

2. Design Considerations .................................................................................................. 6
   2.1. Assumptions and dependencies ........................................................................ 6
   2.2. General Constraints .......................................................................................... 6
   2.3. Goals and Guidelines ....................................................................................... 6
   2.4. Development Methods ...................................................................................... 6

3. Architectural Strategies .................................................................................................. 6

4. System Architecture ...................................................................................................... 6
   4.1. ............................................................................................................................. 7
   4.2. ............................................................................................................................. 8

5. Policies and Tactics ....................................................................................................... 9
   5.1. Specific Products Used ...................................................................................... 9
   5.2. Requirements traceability ............................................................................... 9
   5.3. Testing the software ......................................................................................... 9
   5.4. Engineering trade-offs .................................................................................... 9
   5.5. Guidelines and conventions .......................................................................... 9
   5.6. Protocols .......................................................................................................... 9
   5.7. Maintaining the software ............................................................................... 9
   5.8. Interfaces ......................................................................................................... 9
   5.9. System's deliverables ...................................................................................... 9
   5.10. Abstraction ..................................................................................................... 9

6. Detailed System Design ................................................................................................ 9
   6.1. Current Budget Amount and Actual Expenditure ............................................. 10
      6.1.1 Responsibilities ............................................................................................ 10
      6.1.2 Constraints ................................................................................................ 10
      6.1.3 Composition ................................................................................................ 10
      6.1.4 Uses/Interactions ....................................................................................... 10
      6.1.5 Resources .................................................................................................. 11
      6.1.6 Interface/Exports ....................................................................................... 11
   6.2. Active Contract Count ...................................................................................... 11
      6.2.1 Responsibilities ............................................................................................ 11
      6.2.2 Constraints ................................................................................................ 11
      6.2.3 Composition ................................................................................................ 11
      6.2.4 Uses/Interactions ....................................................................................... 11
      6.2.5 Resources .................................................................................................. 12
6.2.6 Interface/Exports.................................................................................... 12

6.3 Current Budget Amount by Department and Vendors............................... 12

6.3.1 Responsibilities...................................................................................... 12
6.3.2 Constraints............................................................................................ 12
6.3.3 Composition........................................................................................... 12
6.3.4 Uses/Interactions.................................................................................... 12
6.3.5 Resources............................................................................................... 13
6.3.6 Interface/Exports.................................................................................... 13

6.4 Actual Expended vs Current Budget Meter.................................................. 13

6.4.1 Responsibilities...................................................................................... 13
6.4.2 Constraints............................................................................................ 13
6.4.3 Composition........................................................................................... 13
6.4.4 Uses/Interactions.................................................................................... 13
6.4.5 Resources............................................................................................... 14
6.4.6 Interface/Exports.................................................................................... 14

6.5 Contract Status.............................................................................................. 14

6.5.1 Responsibilities...................................................................................... 14
6.5.2 Constraints............................................................................................ 14
6.5.3 Composition........................................................................................... 14
6.5.4 Uses/Interactions.................................................................................... 14
6.5.5 Resources............................................................................................... 15
6.5.6 Interface/Exports.................................................................................... 15

6.6 Select Department.......................................................................................... 15

6.6.1 Responsibilities...................................................................................... 15
6.6.2 Constraints............................................................................................ 15
6.6.3 Composition........................................................................................... 15
6.6.4 Uses/Interactions.................................................................................... 15
6.6.5 Resources............................................................................................... 16
6.6.6 Interface/Exports.................................................................................... 16

6.7 Remaining Budget and Current Budget Amount by Department............... 16

6.7.1 Responsibilities...................................................................................... 16
6.7.2 Constraints............................................................................................ 16
6.7.3 Composition........................................................................................... 16
6.7.4 Uses/Interactions.................................................................................... 17
6.7.5 Resources............................................................................................... 17
6.7.6 Interface/Exports.................................................................................... 17

7. Detailed Lower Level Component Design.................................................. 18

7.x Name of Class or File...................................................................................... 18

7.x.1 Classification.......................................................................................... 18
7.x.2 Processing Narrative(PSPEC)................................................................ 18
7.x.3 Interface Description............................................................................... 18
7.x.4 Processing Detail.................................................................................... 18

7.x.4.1 Design Class Hierarchy...................................................................... 18
7.x.4.2 Restrictions/Limitations...................................................................... 18
## Revision History

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Reason For Changes</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Draft</td>
<td>2018-12-1</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
1. Introduction

1.1 Purpose

The purpose of this document is to identify the software requirements for the financial dashboard. The financial dashboard is comprised of data gathered from LA County contracts intended for LA County executives enterprise wide in efforts to display contract data per requirements.

1.2 Document Conventions

ATM - Azure Traffic Manager
CD - Code
CDN - Content Delivery Network
DNS - Domain Name System
KPI - Key Performance Indicator
LA - Los Angeles
RPT - Report
WFE - Web Front End

1.3 Intended Audience and Reading Suggestions

The intended audiences would be users, developers, and testers.

1. Users can refer to the following sections:
   a. Section 1
      i. Product Scope
   b. Section 2
      i. Overall Description of product in plain English

2. Developers and testers may refer to:
   a. Section 2
      i. Overall Description of product in plain English
      ii. Database information
   b. Section 4
      i. Functional Requirements

1.4 System Overview

The product will be a dashboard based on LA County’s contract data. The product is tailored to giving a simple and quick visual to the intended users. Future versions of this product may be implemented into LA County’s database to coincide with two other dashboards LA County is producing internally.
2. Design Considerations

2.1 Assumptions and Dependencies

This product depends on the County’s ability to input clean data to the dashboard. This product is constrained by not having access to the County database.

2.2 General Constraints

The dashboards will be built using Power BI. This version of the dashboards will not be required to connect to a database. However, the developers must keep in mind during development that future versions will be connected to a database.

2.3 Goals and Guidelines

Overall, some goals are updating the dashboards after updating current data, creating products alerts, adding forecasting to make specific predictions of contracts. Since every component above is dependent on data, currently the priority is updating the data and dashboards.

2.4 Development Methods

Hybrid Waterfall and Agile approach.

3. Architectural Strategies

The architecture of Power BI is the architecture of our products. The main strategy is reuse of Power BI to create reports and visualization on the dataset, including mechanisms such as drill down, drill through, filter, etc.

4. System Architecture

Each Power BI deployment consists of two clusters – a Web Front End (WFE) cluster, and a Back-End cluster.

The WFE cluster manages the initial connection and authentication process for Power BI, using
AAD to authenticate clients and provide tokens for subsequent client connections to the Power BI service. Power BI also uses the Azure Traffic Manager (ATM) to direct user traffic to the nearest datacenter, determined by the DNS record of the client attempting to connect, for the authentication process and to download static content and files. Power BI uses the Azure Content Delivery Network (CDN) to efficiently distribute the necessary static content and files to users based on geographical locale.

The Back-End cluster is how authenticated clients interact with the Power BI service. The Back-End cluster manages visualizations, user dashboards, datasets, reports, data storage, data connections, data refresh, and other aspects of interacting with the Power BI service. The Gateway Role acts as a gateway between user requests and the Power BI service. Users do not interact directly with any roles other than the Gateway Role. Azure API Management will eventually handle the Gateway Role.
5. Policies and Tactics

5.1 Choice of which specific products used
Microsoft Power BI

5.2 Plans for ensuring requirements traceability
This is a hybrid Waterfall and Agile approach so, to ensure requirements traceability, the LA County executives must approve each iteration of the product.

5.3 Plans for testing the software
To have the users-executives read and gather information from the dashboards.

5.4 How to build and/or generate the system’s deliverables (how to compile, link, load, etc.)
To load new flat files:
Open Power BI > Home > Get Data > Text/CSV
To link new tables:
Open Power BI > Home > Manage Relationships > New

6. Detailed System Design

6.1 Current Budget Amount and Actual Expenditure

6.1.1 Responsibilities
This component displays Current Budget Amount, Actual Expenditure Amount, and Departments. It’s role is to allow the user the visualize which departments are under and over budget.

6.1.2 Constraints
There is no drill down feature for this chart.

6.1.3 Composition
Current Budget Amount is the current budget amount from a contract.
Actual Expenditure Amount is the amount expended from a contract.
Department is which department the contract belongs to.

6.1.4 Uses/Interactions
The main use of this component is to allow the user to view the data per the requirements.

6.1.5  Resources

Not applicable

6.1.6  Interface/Exports

This component may be exported to Microsoft Excel.

6.2  Active Contract Count

6.2.1  Responsibilities

This component must display the amount of active contracts in the dataset.

6.2.2  Constraints

No drill down feature.

6.2.3  Composition

Active Flag determines if a contract is active.

6.2.4  Uses/Interaction
The main use of this component is to inform the user of how many contracts are active.

6.2.5 Resources

Not applicable

6.2.6 Interface/Exports

This component may be exported to Microsoft Excel.

6.3 Current Budget Amount by Department and Vendors

6.3.1 Responsibilities

This component must display the current budget amount by department and vendors.

6.3.2 Constraints

Not applicable

6.3.3 Composition

Current Budget Amount is the current budget from a contract.

Department is the department a contract belongs to.

Vendor is the vendor that was contracted for a specific contract.

6.3.4 Uses/Interaction
The main use of this component is for the user to see how much money they are spending with a certain vendor.

6.3.5 Resources

Not applicable

6.3.6 Interface/Exports

This component may be exported to Microsoft Excel.

6.4 Actual Expended vs Current Budget Meter

6.4.1 Responsibilities

This component must display the current budget amount and actual expended amount.

6.4.2 Constraints

No drill down feature.

6.4.3 Composition

Current Budget Amount is the current budget from a contract.

Actual Expended Amount is the expended amount from a contract.

6.4.4 Uses/Interaction
The main use of this component is to show the user when a contract has gone over budget by displaying the actual amount in red. The actual amount is displayed in green if a contract is under budget.

6.4.5 Resources
Not applicable

6.4.6 Interface/Exports
This component may be exported to Microsoft Excel.

6.5 Contract Status

6.5.1 Responsibilities
This component must filter the other components on the dashboard by active flag.

6.5.2 Constraints
No drill down feature. Will not work if it is not connected to another component via the entity relationship diagram.

6.5.3 Composition
Active Flag is whether a contract is active or expired.

6.5.4 Uses/Interaction
The main use of this component is to filter other components.

### 6.4.5 Resources

This component affects the following:

- 6.1
- 6.2
- 6.3
- 6.4
- 6.7

### 6.4.6 Interface/Exports

Not applicable

### 6.6 Select Department

#### 6.6.1 Responsibilities

This component filters other components by department.

#### 6.6.2 Constraints

No drill down feature.

#### 6.6.3 Composition

Department is which department a contract belongs to.

#### 6.6.4 Uses/Interaction
The main use of this component is to filter other components.

### 6.6.5 Resources

This component affects the following:

- 6.1
- 6.2
- 6.3
- 6.4
- 6.7

### 6.6.6 Interface/Exports

Not applicable

### 6.7 Remaining Budget and Current Budget Amount by Department

#### 6.7.1 Responsibilities

This component displays remaining budget and current budget amount by department.

#### 6.7.2 Constraints

No drill down feature.

#### 6.7.3 Composition

Remaining Budget is the current budget amount minus the actual expenditure amount. Current Budget Amount is the current budget amount from a contract.
Department is the department a contract belongs to.

6.7.4 Uses/Interaction

The main use of this component to allow the user to see the remaining budget amount from contracts listed in the SubReporting Contracts Table also referred to as Budget Level 2.

6.7.5 Resources

Not applicable

6.7.6 Interface/Exports

This component may be exported to Microsoft Excel.
7. Detailed Lower level Component Design

Not applicable.

7.x Name of Class or File

7.x.1 Classification

7.x.2 Processing Narrative (PSPEC)

7.x.3 Interface Description

7.x.4 Processing Detail

7.x.4.1 Design Class Hierarchy

7.x.4.2 Restrictions/Limitations

7.x.4.3 Performance Issues

7.x.4.4 Design Constraints

7.x.4.5 Processing Detail For Each Operation
8. Database Design

The first table on the left “Vendor_jrnl_actg” holds components such as Department code, Reporting code, Vendor Customer Code and Legal name. The second table in the middle “Budget_lvl1” holds components such as Department Code, Report Code, Start Date, End Date, Sum of Current Budget Amount, Sum of Encumbered Amount, Sum of Actual Expenditure Amount, Vendor Customer Code, Legal Name, Active Flag, Fiscal Year by Start Date, Quarter Date, Difference, Max Active Flag and Min Active Flag. The third table on the right “Budget_Lvl2” holds components such as Department code, Report Code, SubReport Code, Start Date, End Date, Sum of Current Budget Amount, Sum of Encumbered Amount, Sum of Actual Expenditure Amount, Vendor Customer Code, Legal Name, Sum of Remaining Budget, and Active Flag. The relationship between the Vendor_jrnl_actg Table and the Budget_lvl1 Table is the Report Code. The relationship between Budget_lvl1 Table and Budget_lvl2 Table are the Report Code and Active Flag.

9. User Interface

9.1 Overview of User Interface

The user class of our project are the executives. From our dashboards, the users are able to gather information such as expenditure and budget amount, vendor information, remaining budget and total budget amount for each department, and visually viewing the comparisons among different departments. In the future, the users are also able to see the prediction of expenditure amount or budget amount and receive notification by setting an alert.

9.2 Screen Frameworks or Images
9.3 User Interface Flow Model
## 10. Requirements Validation and Verification

<table>
<thead>
<tr>
<th>Functional Requirements</th>
<th>Component/Module</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4.1.1 Current Budget Amount and Actual Expenditure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.1.1 The system should utilize Report Code.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.1.2 The system shall display Current Budget Amount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.1.3 The system shall display Actual Expenditure Amount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.1.4 The system shall display Departments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.1.5 The system shall utilize the Line and Stacked Column Chart visualization.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4.1.2 Active Contract Count</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.2.1 The system should utilize Report Code.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.2.2 The system shall display count of Active Flag.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.2.3 The system shall utilize the Gauge visualization.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4.1.3 Current Budget Amount by Department and Vendors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.3.1 The system should utilize Report Code.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.3.2 The system shall display Current Budget Amount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.3.3 The system shall display Vendor Name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.3.4 The system shall display Department.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.3.5 The system shall display Actual Expenditure Amount.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.3.6 The system shall display Actual Start Date.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6.1 Current Budget Amount and Actual Expenditure</strong></td>
<td>Manual Testing</td>
<td></td>
</tr>
<tr>
<td><strong>6.2 Active Contract Count</strong></td>
<td>Manual Testing</td>
<td></td>
</tr>
<tr>
<td><strong>6.3 Current Budget Amount by Department and Vendors</strong></td>
<td>Manual Testing</td>
<td></td>
</tr>
<tr>
<td>4.1.3.7</td>
<td>The system shall utilize the Tree Map visualization.</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>4.1.4</strong> Actual Expended vs Current Budget Meter</td>
<td>6.4 Actual Expended vs Current Budget Meter</td>
<td></td>
</tr>
<tr>
<td>4.1.4.1</td>
<td>The system should utilize Report Code.</td>
<td></td>
</tr>
<tr>
<td>4.1.4.2</td>
<td>The system shall display Current Budget Amount.</td>
<td></td>
</tr>
<tr>
<td>4.1.4.3</td>
<td>The system shall display Actual Expended Amount.</td>
<td></td>
</tr>
<tr>
<td>4.1.4.4</td>
<td>The system shall utilize the KPI visualization.</td>
<td></td>
</tr>
<tr>
<td><strong>4.1.5</strong> Contract Status</td>
<td>6.5 Contract Status</td>
<td></td>
</tr>
<tr>
<td>4.1.5.1</td>
<td>The system shall display Active Flag.</td>
<td></td>
</tr>
<tr>
<td>4.1.5.2</td>
<td>The system shall utilize the Slicer visualization.</td>
<td></td>
</tr>
<tr>
<td><strong>4.1.6</strong> Select Department</td>
<td>6.6 Select Department</td>
<td></td>
</tr>
<tr>
<td>4.1.6.1</td>
<td>The system shall display Department.</td>
<td></td>
</tr>
<tr>
<td>4.1.6.2</td>
<td>The system shall utilize the Slicer visualization.</td>
<td></td>
</tr>
<tr>
<td><strong>4.1.7</strong> Remaining Budget and Current Budget Amount by Department</td>
<td>6.7 Remaining Budget and Current Budget Amount by Department</td>
<td></td>
</tr>
<tr>
<td>4.1.7.1</td>
<td>The system should utilize Report Code.</td>
<td></td>
</tr>
<tr>
<td>4.1.7.2</td>
<td>The system shall display Current Budget Amount.</td>
<td></td>
</tr>
<tr>
<td>4.1.7.3</td>
<td>The system shall display Remaining Budget.</td>
<td></td>
</tr>
<tr>
<td>4.1.7.4</td>
<td>The system shall utilize the Stacked Column Chart visualization.</td>
<td></td>
</tr>
</tbody>
</table>
### 4.1.8 Contract End Date Alert

| 4.1.8.1 The system should display End Date. |
| 4.1.8.2 The system should display Active Flag. |
| 4.1.8.3 The system should utilize Report Code. |
| 4.1.8.4 The system should utilize Microsoft Flow. |
| 4.1.8.5 The system should utilize Alerts. |

| TBD | Manual Testing |

### 4.1.9 Encumbrance Amount Alert

| 4.1.9.1 The system should display Encumbrance Amount. |
| 4.1.9.2 The system should display Fiscal Year. |
| 4.1.9.3 The system should utilize Active Flag. |
| 4.1.9.4 The system should utilize Report Code. |
| 4.1.9.5 The system should utilize Microsoft Flow |
| 4.1.9.6 The system should utilize Alerts. |

| TBD | Manual Testing |

### 4.1.10 Forecast Budget

| 4.1.10.1 The system should display Current Budget Amount. |
| 4.1.10.2 The system should display Departments. |
| 4.1.10.3 The system should utilize Report Code. |
| 4.1.10.4 The system should utilize Line Chart visualization. |
| 4.1.10.5 The system should utilize Forecast Line. |

| TBD | Manual Testing |
11. Glossary

Not Applicable

12. References

- SRS Document
  https://csns.calstatela.edu/department/cs/project/resource/view?projectId=6628828&resourceId=6885348
- Brad Appleton <brad@bradapp.net>  http://www.bradapp.net
  https://www.cs.purdue.edu/homes/cs307/ExampleDocs/DesignTemplate_Fall08.doc