

# Customer Lifetime Value

## Low Level Design



**Project On:**

**Title : Customer Lifetime Value**

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# 1. Introduction

### 1.1 What is Low-Level design document?

The goal of the LDD or Low-level design document (LLDD) is to give the internal logic design of the actual program code for the Expenditure Data Analysis dashboard. LDD describes the class diagrams with the methods and relations between classes and programs specs. It describes the modules so that the programmer can directly code the program from the document.

### 1.2 Scope

Low-level design (LLD) is a component-level design process that follows a step-by step refinement process. The process can be used for designing data structures, required software architecture, source code and ultimately, performance algorithms. Overall, the data organization may be defined during requirement analysis and then refined during data design work.

Low Level Design (LLD)

## 2. Architecture

### Power BI Desktop Architecture

#### 1. Get Power BI Desktop

With Power BI Desktop, you can build advanced queries, models, and reports that visualize data. You can also build data models, create reports, and share your work by publishing to the Power BI service. Power BI Desktop is a free download.

#### 2. BI solution architecture in the Centre of Excellence

BI solution architecture can consist of:

- Data sources
- Data ingestion
- Big data / data preparation
- Data warehouse
- BI semantic models
- Reports

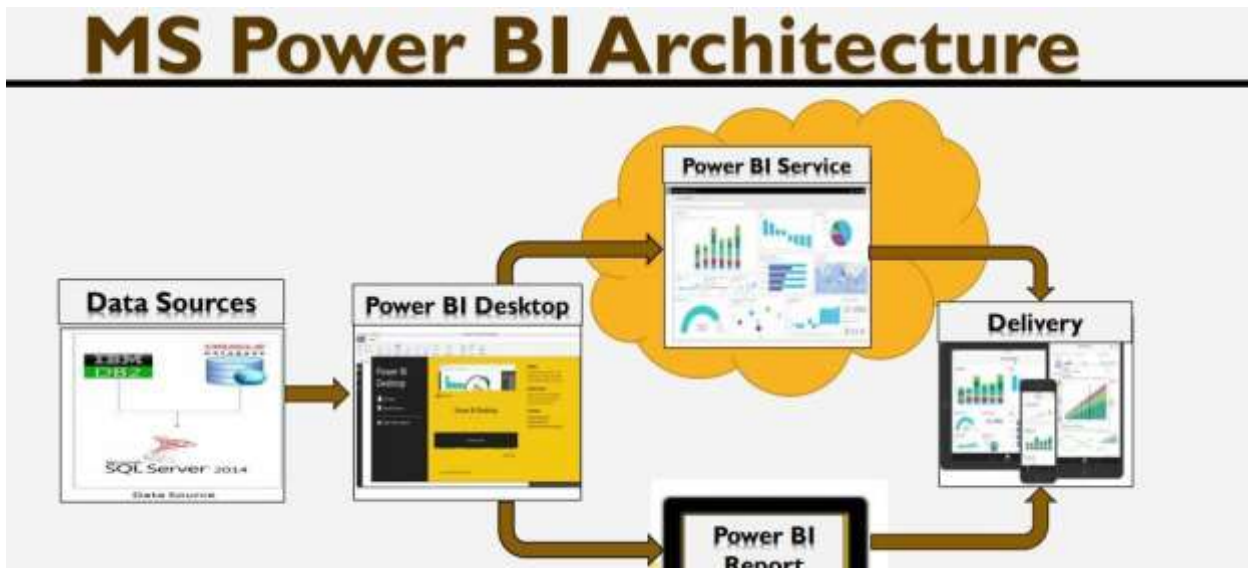


Fig: Power BI Architecture diagram

## Low Level Design (LLD)

### **Microsoft Power BI Desktop is a companion desktop application to Power BI.**

With Power BI Desktop, you can:

#### **1. Get data:**

The Power BI Desktop makes discovering data easy. You can import data from a wide variety of data sources. After you connect to a data source, you can shape the data to match your analysis and reporting needs.

#### **2. Create relationships and enrich your data model with new measures and data formats:**

When you import two or more tables, oftentimes you'll need to create relationships between those tables. The Power BI Desktop includes the Manage Relationships dialog and the Relationships view, where you can use Autodetect to let the Power BI Desktop find and create any relationships, or you can create them yourself. You can also very easily create your own measures and calculations or customize data formats and categories to enrich your data for additional insights.

#### **3. Create reports:**

The Power BI Desktop includes the Report View. Select the fields you want, add filters, choose from dozens of visualizations, format your reports with custom colours, gradients and several other options. The Report View gives you the same great report and visualizations tools just like when creating a report on PowerBI.com.

#### **4. Save your reports:**

With the Power BI Desktop, you can save your work as a Power BI Desktop file. Power BI Desktop files have a .pbix extension.

#### **5. Upload or Publish your reports:**

You can upload the reports you created and saved in the Desktop to your Power BI site. You can also publish them to Power BI right from Power BI Desktop.

## 3. Architecture Description

**3.1. Data Description:** The Dataset contains month wise Policies for 2011 for the following columns:

**1) Customer**

**2) State:**

Arizona  
California  
Nevada  
Oregon  
Washington

**3) Customer Lifetime Value**

**4) Response**

Yes  
No

**5) Coverage**

Basic  
Extended  
Premium

**6) Effective to date**

.

**7) Education:**

Bachelor  
College  
Doctor  
High School or Below  
Master

**8) Employment Status**

Disabled  
Employed  
Medical Leave  
Retired  
Unemployed

**9) Gender**

**10) Income**

**11) Location Code**

Rural  
Urban

## Low Level Design (LLD)

Suburban

### 12) Marital Status

Single  
Divorced  
Married

### 13) Monthly Premium Auto

### 14) Months Since Last Claim

### 15) Months Since Policy Inception

### 16) Number of Open Complaints

0  
1  
2  
3  
4  
5

### 17) Number of Policies

### 18) Policy Type

Corporate L1  
Corporate L2  
Corporate L3  
Personal L1  
Personal L2  
Personal L3  
Special L1  
Special L2  
Special L3

### 19) Policy

Corporate Auto  
Personal Auto  
Special Auto

### 20) Renew Offer Type

Offer 1  
Offer 2  
Offer 3  
Offer 4

### 21) Sales Channel

Agent  
Branch  
Call Center  
Web

## Low Level Design (LLD)

### 22) Total Claim Amount

### 23) Vehicle Class

Four Door Car

Luxury Car

Luxury SUV

Sports Car

SUV

Two Door Car

### 24) Vehicle Size

Small

Medsize

Large

### 25) Present Value of Customers

## 3.2 Export Data from Python

### Perform Exploratory Data Analysis Using Python:

1. Import Python Modules
2. Load Dataset
3. Data Preparation
4. EDA: Data Visualization

```
1 # import python libraries
2 import numpy as np
3 import pandas as pd
4 import matplotlib.pyplot as plt
5 %matplotlib inline
6 import seaborn as sns
7 import warnings
8 warnings.filterwarnings('ignore')
```

```
1 df = pd.read_csv("Data\Customer-Value-Analysis.csv")
2 df.head()
```

- After performing Pre-processing and cleaning dataset.
- After cleaned data, its exported into csv as a Final Customer Lifetime Value.csv.
- Now this cleaned dataset uses for creating dashboard in Power BI.



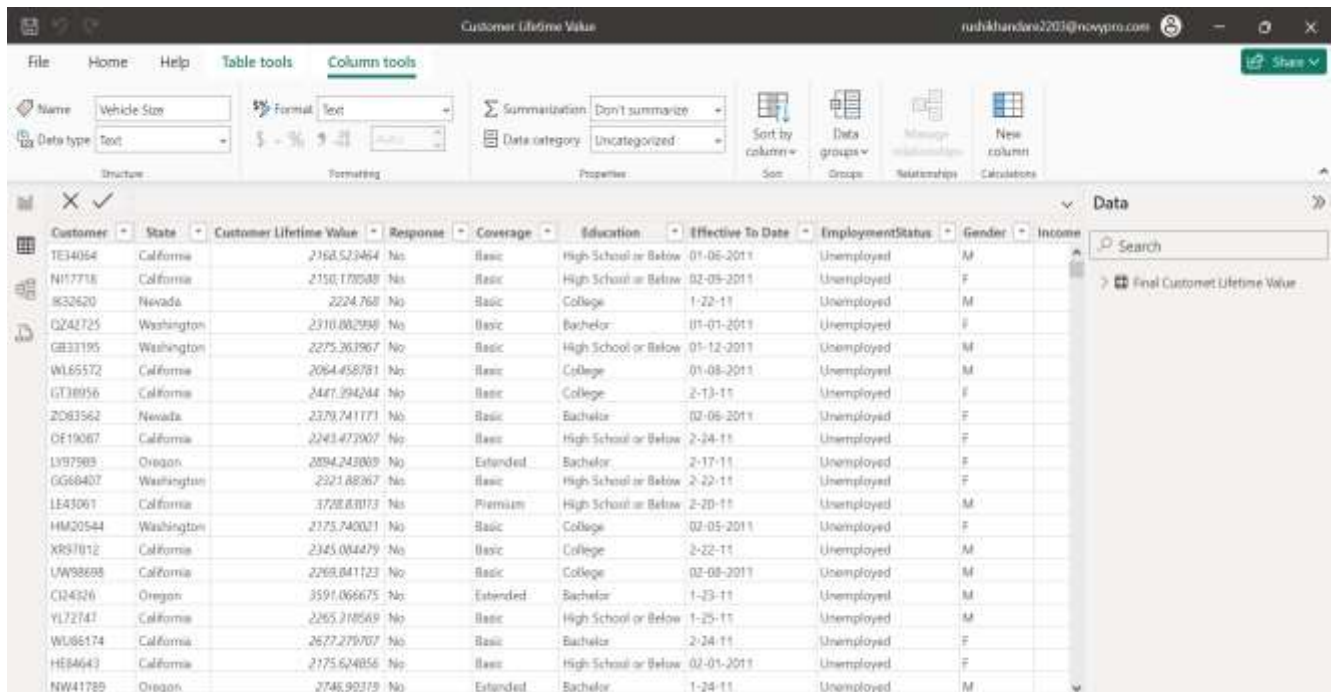
## Low Level Design (LLD)

```
1 df.to_csv('Final Customer Lifetime Value.csv',index=False)
```

[31]

### 3.3 Data Preparation:

- In the Preparation Process, we will convert our original datasets with other necessary attributes format.
- All the datasets is of same format as shown below: Original dataset.



The screenshot shows a data table with the following columns: Customer, State, Customer Lifetime Value, Response, Coverage, Education, Effective To Date, EmploymentStatus, Gender, and Income. The table contains 20 rows of data. The 'Customer Lifetime Value' column contains numerical values, and the 'Response' column contains 'Yes' or 'No' values. The 'Coverage' column contains 'Basic', 'Extended', or 'Premium' values. The 'Education' column contains 'High School or Below', 'College', or 'Bachelor' values. The 'Effective To Date' column contains dates in YYYY-MM format. The 'EmploymentStatus' column contains 'Unemployed' or 'Employed' values. The 'Gender' column contains 'M' or 'F' values. The 'Income' column is empty.

| Customer | State      | Customer Lifetime Value | Response | Coverage | Education            | Effective To Date | EmploymentStatus | Gender | Income |
|----------|------------|-------------------------|----------|----------|----------------------|-------------------|------------------|--------|--------|
| TE34054  | California | 2168.523464             | No       | Basic    | High School or Below | 01-06-2011        | Unemployed       | M      |        |
| NI17718  | California | 2130.170508             | No       | Basic    | High School or Below | 02-05-2011        | Unemployed       | F      |        |
| 832620   | Nevada     | 2224.768                | No       | Basic    | College              | 1-22-11           | Unemployed       | M      |        |
| D242725  | Washington | 2310.002988             | No       | Basic    | Bachelor             | 01-01-2011        | Unemployed       | F      |        |
| GB33195  | Washington | 2275.261967             | No       | Basic    | High School or Below | 01-12-2011        | Unemployed       | M      |        |
| WL65572  | California | 2064.458781             | No       | Basic    | College              | 01-08-2011        | Unemployed       | M      |        |
| GT38956  | California | 2441.394244             | No       | Basic    | College              | 2-13-11           | Unemployed       | F      |        |
| ZD83562  | Nevada     | 2379.741171             | No       | Basic    | Bachelor             | 02-06-2011        | Unemployed       | F      |        |
| DE19067  | California | 2243.472907             | No       | Basic    | High School or Below | 2-24-11           | Unemployed       | F      |        |
| LY97589  | Oregon     | 2894.243009             | No       | Extended | Bachelor             | 2-17-11           | Unemployed       | F      |        |
| GG68407  | Washington | 2321.88267              | No       | Basic    | High School or Below | 2-22-11           | Unemployed       | F      |        |
| LE43061  | California | 3728.83073              | No       | Premium  | High School or Below | 2-20-11           | Unemployed       | M      |        |
| HM20544  | Washington | 2175.740031             | No       | Basic    | College              | 02-05-2011        | Unemployed       | F      |        |
| XR97812  | California | 2345.004479             | No       | Basic    | College              | 2-22-11           | Unemployed       | M      |        |
| UW98698  | California | 2268.041123             | No       | Basic    | College              | 02-08-2011        | Unemployed       | M      |        |
| CJ43326  | Oregon     | 3591.066675             | No       | Extended | Bachelor             | 1-23-11           | Unemployed       | M      |        |
| YL72741  | California | 2265.210569             | No       | Basic    | High School or Below | 1-25-11           | Unemployed       | M      |        |
| WU86174  | California | 2672.279707             | No       | Basic    | Bachelor             | 2-24-11           | Unemployed       | F      |        |
| HE84643  | California | 2175.624856             | No       | Basic    | High School or Below | 02-01-2011        | Unemployed       | F      |        |
| NW41789  | Oregon     | 2746.90319              | No       | Extended | Bachelor             | 1-24-11           | Unemployed       | M      |        |

- As you all can notice that format of the data, we have is not good to analyse and visualize. So, we need to reconstruct the structure of the dataset.

## Low Level Design (LLD)

**We will be using only Power BI with power query for data restructuring and cleaning purpose.**

- Also We can upload csv data from Home section, click on Data tab, click on get data ,then from text or csv and upload dataset into Power query editor.
- Power Query Editor window will get popped up.

### Step 1) Home Section:

- Click on Transform tab in Number Column Section goto Rounding → Round UP.

The screenshot shows the Power Query Editor interface. The 'Transform' tab is active, and the 'Rounding' dropdown menu is open, with 'Round Up' selected. A tooltip explains: 'Round numbers in the selected columns to the next integer value.' The data table below shows columns: '1.2 Total Claim Amount', 'ALC Vehicle Class', 'ALC Vehicle Size', and '1.2 Present Value of Customer'. The 'Present Value of Customer' column contains values like -39.8111, 2816.5356, 3537.5277, etc.

| 1.2 Total Claim Amount | ALC Vehicle Class | ALC Vehicle Size | 1.2 Present Value of Customer |
|------------------------|-------------------|------------------|-------------------------------|
| 384.811147             | Two-Door Car      | Medsize          | -39.8111                      |
| 1131.464935            | Four-Door Car     | Medsize          | 2816.5356                     |
| 566.472247             | Two-Door Car      | Medsize          | 3537.5277                     |
| 529.881344             | SUV               | Medsize          | 6360.1186                     |
| 138.130829             | Four-Door Car     | Medsize          | 3073.8691                     |
| 159.383042             | Two-Door Car      | Medsize          | 6326.6169                     |
| 321.6                  | Four-Door Car     | Medsize          | 54                            |
| 363.02968              | Four-Door Car     | Medsize          | 6504.970                      |
| 511.2                  | Four-Door Car     | Medsize          | -29                           |

The screenshot shows the Power Query Editor with the formula bar containing: `= Table.TransformColumns(#"Replaced Value9",{{"Customer Lifetime Value", Number.RoundUp, Int64.Type}})`. The data table below shows columns: 'ALC Customer', 'ALC State', '1.2 Customer Lifetime Value', 'ALC Response', and 'ALC Coverage'. The 'Customer Lifetime Value' column contains values like 2764, 6980, 12888, etc.

| ALC Customer | ALC State  | 1.2 Customer Lifetime Value | ALC Response | ALC Coverage |
|--------------|------------|-----------------------------|--------------|--------------|
| 1 BU79786    | Washington | 2764                        | No           | Basic        |
| 2 QZ44356    | Arizona    | 6980                        | No           | Extended     |
| 3 AI49188    | Nevada     | 12888                       | No           | Premium      |
| 4 WW63253    | California | 7646                        | No           | Basic        |
| 5 HB64268    | Washington | 2814                        | No           | Basic        |
| 6 OCB3172    | Oregon     | 8257                        | Yes          | Basic        |
| 7 XZ87318    | Oregon     | 5381                        | Yes          | Basic        |
| 8 CF85061    | Arizona    | 7217                        | No           | Premium      |

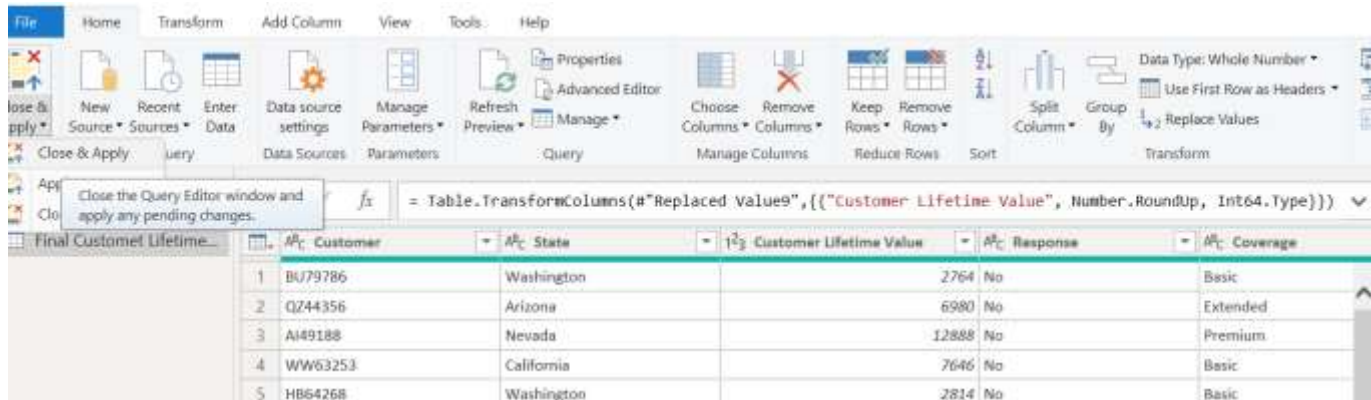
The screenshot shows the Power Query Editor with the formula bar containing: `= Table.TransformColumns(#"Replaced Value9",{{"Customer Lifetime Value", Number.RoundUp, Int64.Type}})`. The data table below shows columns: 'w Offer Type', 'ALC Sales Channel', '1.2 Total Claim Amount', 'ALC Vehicle Class', 'ALC Vehicle Size', and '1.2 Pre'. The 'Total Claim Amount' column contains values like 385, 1132, 567, etc.

| w Offer Type | ALC Sales Channel | 1.2 Total Claim Amount | ALC Vehicle Class | ALC Vehicle Size | 1.2 Pre |
|--------------|-------------------|------------------------|-------------------|------------------|---------|
| 1            | Agent             | 385                    | Two-Door Car      | Medsize          |         |
| 2            | Agent             | 1132                   | Four-Door Car     | Medsize          |         |
| 3            | Agent             | 567                    | Two-Door Car      | Medsize          |         |
| 4            | Call Center       | 530                    | SUV               | Medsize          |         |
| 5            | Agent             | 139                    | Four-Door Car     | Medsize          |         |
| 6            | Web               | 160                    | Two-Door Car      | Medsize          |         |
| 7            | Agent             | 322                    | Four-Door Car     | Medsize          |         |

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### Step 2) Close and save:

- Now go to Home section and click close and load.
- In such a way we preparing dataset and now we need to all these steps for all the others datasets we have.
- And save it into new folder as prepared data.



|   | Customer | State      | Customer Lifetime Value | Response | Coverage |
|---|----------|------------|-------------------------|----------|----------|
| 1 | BKJ79786 | Washington | 2764                    | No       | Basic    |
| 2 | QZ44356  | Arizona    | 6980                    | No       | Extended |
| 3 | AI49188  | Nevada     | 12888                   | No       | Premium  |
| 4 | WW63253  | California | 7646                    | No       | Basic    |
| 5 | HB64268  | Washington | 2814                    | No       | Basic    |

## 4. Deployment

### For Development I used Power BI and NovyPro

Once you've completed your dashboard, follow these steps:

1. Load dataset on Power BI in csv formats and creates visuals for dashboard.
2. After creating all visual, create insightful dashboard.
3. Then Login into Power BI Service by using Microsoft developer account.
4. Then create new project workspace for uploading dashboard and reports into this workspace.
5. Then login into NovyPro Power BI account.



6. Then share dashboard as embedded link as a web into NovyPro portfolio.

#### Embed code

Link you can send in email

<https://app.powerbi.com/view?r=eyJrljoIN>

Copy

HTML you can paste into a website

`<iframe title="Customer Lifetime Value" w`

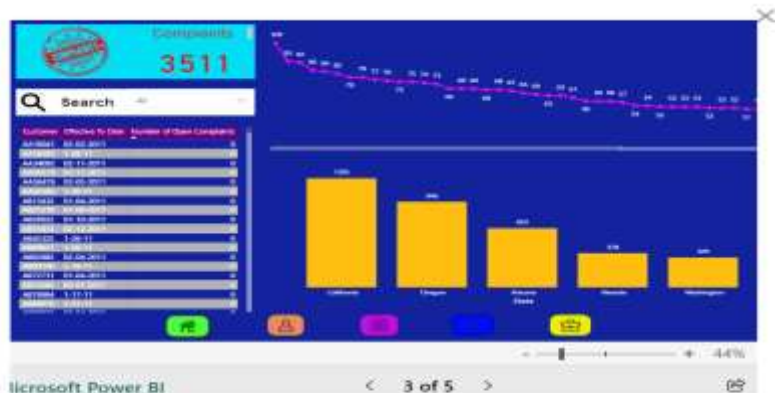
Copy

Size 600 x 373.5 px

Placeholder image

Upload  
Delete

Default Page Default



Microsoft Power BI

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