“TechMinds”

DATA CENTER AUTOMATED DRAWING

PROJECT REPORT

Project Sponsor:

Mr. Olivier BERTHET

Project Members:

Serge El Aramouny
Vijaya Srikar Poralla
Venkatesh Jeyaraj
Mohammed Zaid Syed
Thaiveena Parthasarathy

Table of Contents

Background information

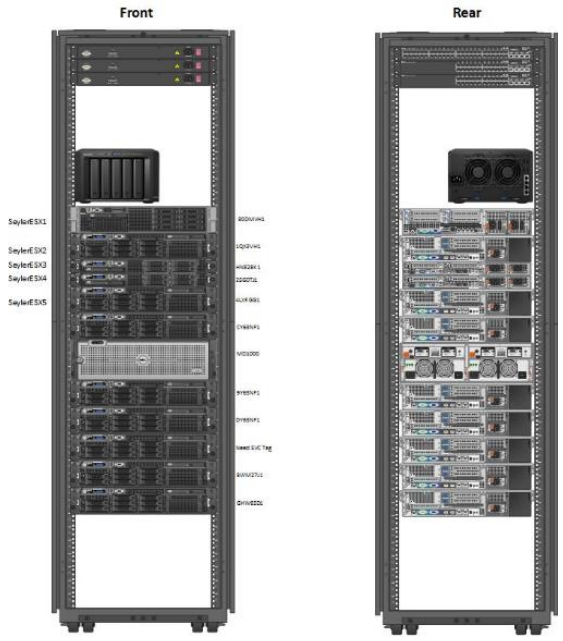
There is a huge need to store data. Every day 2.5 Quintillion bytes of data is getting produced by varied sources and it is necessary to store this coming data in some place. So, here data center works as the inventory or warehouse of data. Data center houses the coming large amount of digital information that can be accessible by us even after years and decades.

Objective

The objective of our project is to develop an automated computer assisted drawing module to represent visually, all the racks in a Data center with all their servers or storage units.

2D Visualization of Data Center

In 2D visualization the application uses the input data from CMDB in Excel format. It could either be .xls or .xlsx format. One of the important issues with the input data is the accuracy. It should not contain duplicate data incorrect information i.e. overlaps positioning equipment.



The tool 'Visio' allows 2D visualization of data centers in order to facilitate the management of the infrastructure. The following report explains how the product was built from conception to development.

Vocabulary

Datacenter - It stores the enormous amount of data coming from different sources.

CMDB - CMDB stands for Configuration Management Database. Every organization has its own CMDB where there store the data about their hardware and software assets.

Racks -A Rack is an IT equipment organizer like servers, network switches and all other electronics for making efficient use of space, proper airflow and standardized resources. Picking up the right rack and configuration with respect to your needs will ensure smooth functioning of IT equipment thus making them more reliable and efficient, also the organized resources will ensure to save on needless expenses.
There are three primary types of racks:
open frame racks, rack enclosures and wall-mount racks.

Servers - Servers are the units of the data center who handles the data & its processing.

Switches - Switches are used to connect multiple devices on the same network within the data center.

.

ITIL - ITIL is a framework of best practices for delivering IT services. ITIL's systematic approach to IT service management can help businesses manage risk, strengthen customer relations, establish cost-effective practices, and build a stable IT environment that allows for growth, scale and change.

Stencil: Visio stencils hold collections of shapes. The shapes in each stencil have something in common. The shapes can be a collection of shapes that you need to create a particular kind of diagram, or different versions of the same shape.

Visio: Microsoft Visio is a diagramming and vector graphics application and is part of the Microsoft Office family.

Research

We have studied about various data center visualization products in the market and understood the way they work. We compared merit and demerits of one product over the other.

This helped us to get the insights of data centers and the concepts of placing the servers and other components in the data rack. Then we gathered information about the Visio tool, Data center stencils in Visio, importing data into Visio and VBA programming language.

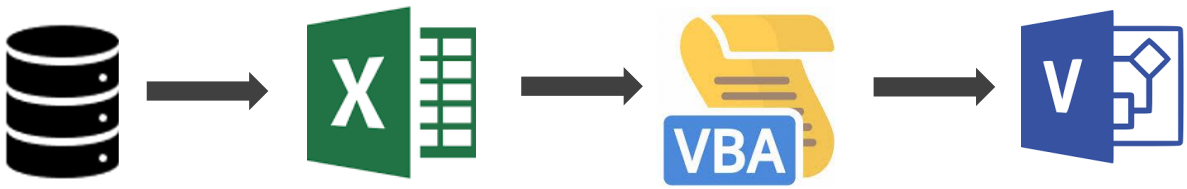
Product overview

Data center automated drawing tool is a product which allows 2D visualization of data centers in order to manage their infrastructure. Problem supposed to solve:

- Data quality issues
- Enclosure drawing with the bays and the right stencils for the blades in the bay
- Menu to color the components based on criticality, manufacturer and application
- Menu to display the number of racks per page based on user input

Project flow

The tool takes Excel file as an input, which is generated from the CMDB data center.
This excel file serves as an input file for Visio and Visio generates an output file with
Data centers and all the components are mapped correctly according to their corresponding data centers and data center racks.



Target market and users

- The technicians who manage the Data Centers
- The end users, who are capable enough to deal with Visio and physical objects of Data centers
- The general sectors as public, private, business, education, government who want to safeguard their hardware and software assets

Detailed product description

Content

The application takes the input data from CMDB in Excel format. It could either be .xls or .xlsx format. The number of field/columns and data type could be founded in the Annex. One of the important things with the input data is the accuracy. It should not contain duplicate data/incorrect information

Based on user's preference, the output will get displayed in 2D format. In the Visio, the user can select

- Number of Racks to be displayed
- Color code based on Criticality
- Color code based on Manufacturer
- Color code based on Application

Software

The software is a Windows application. It visualizes the data in 2D and allows the user to manage effectively the data center infrastructure physically and virtually. The application provides an interface for the user to select the file needed, the number of racks in each page (3 or 4 or 5), color codes based on criticality or manufacturer or application.

Administration tools

The application can be edited and managed by the visual basic code on Excel or the Visio file containing all the visual details about the application. Visio file is used for the 2D visuals.

Graphic design guidelines

For the design part, the user will have to select the number of racks needed (3,4 or 5) and color code based on criticality or manufacturer or application.

Accessibility

The software is usable on any Windows 7 to Windows 10, 32-bit or 64-bit.

Target platforms and configurations

The application is limited to work on Windows machines. The technology is advancing, and the mac users are increasing day by day. So, the further developments are made in such a way that mac users can also able to use it. For 2D visualization the application requires no configuration to use.

Performance

The performance of the application depends on the configuration of the PC where it is installed. The further development in application will increase quality as well as scope of the tool.

Testing and acceptance

The testing method involves taking few data racks randomly and to do subset file per rack. Then we have to compare the data in CMDB data file with manual Visio file and automated drawing system.

In the same way, color codes can be tested by selecting a particular rack in Visio against the same rack selected in Excel file.

Documentation and Source Code

Since the automated drawing is in 2D, the snippets of source code below is for different functionalities, we tried to implement using VBA.

1. Importing Excel sheet to Visio

```
Public Function GetExcelData()
    Dim xlApp As Object
    Set xlApp = CreateObject("Excel.Application")
    xlApp.Visible = False
    Dim strPath As String

    s = ActiveDocument.DocumentSheet.Data1
    If s = "" Then
        strPath = ""
        With xlApp.FileDialog(msoFileDialogOpen)
            .AllowMultiSelect = False
            .InitialFileName = ActiveDocument.Path
            intChoice = .Show
        End With
        If intChoice <> 0 Then  'int Choice == 0 This means the user clicked Cancel button in the Open Dialog box
        'COndition is true if user didnt click Cancel
            strPath = xlApp.FileDialog(msoFileDialogOpen).SelectedItems(1)
            ActiveDocument.DocumentSheet.Data1 = strPath
        End If
    Else
        strPath = s
    End If
    Set xlBook = xlApp.Workbooks.Open(strPath)

    Set xlSheet = xlBook.WorkSheets(1)
    arr1 = xlSheet.Range("a1").CurrentRegion

    xlBook.Close
    xlApp.Quit
    ss = ArrToStr
    ActiveDocument.DocumentSheet.Data2 = ss
End Function
```

2. Code snippets set for customizing the pages with definite set of racks (Here it is 3,4,5)

```
Private Sub InputNoOfRacks()
    sinputRacks = InputBox("Number of racks to be diplayed per page (3 or 4 or 5)", "Enter a value", 1)
    If sinputRacks = False Then
        Exit Sub
    End If
    If sinputRacks < 3 Or sinputRacks > 5 Then
        MsgBox ("You have entered wrong value")
        InputNoOfRacks
    End If
End Sub
```

Third step is all about applying colors to the rack components based on,
Criticality Level and ***Manufacturers.***

3(a) Applying Data Graphics (Coloring the Racks) to the racks.

```
Private Sub ApplyDataGraphicToDocument()
    sDGName = "DG_Criticality_Level"
    If sinputColor = 2 Then
        sDGName = "DG_Manufacturer"
    End If
    ActiveWindow.SelectAll
    Set shp = ActiveWindow.Selection.PrimaryItem
    shp.DataGraphic = ActiveDocument.Masters(sDGName)
    'Get the shapes DataGraphic master
    Set mstDG = shp.DataGraphic
    'Get the name of the first Shape Data row
    firstProp = "Prop." & _
        shp.CellsSRC(Visio.visSectionProp, 0, 0).RowNameU


     For Each pag In ActiveDocument.Pages
         If pag.Type = visTypeForeground Then
             For Each shp In pag.Shapes
                 'Check that the named Shape Data row exists
                 If shp.CellExistsU(firstProp, Visio.visExistsAnywhere) Then
                     'Set the DataGraphic
                     shp.DataGraphic = mstDG
                 End If
             Next
         End If
     Next
End Sub
```

3(b). Applying Colors to the rack components based on Criticality Level.

```
Private Sub SetPropCrit(ByVal oCel As Visio.Cell, Val As String)
    Select Case Val
    Case "1. High":
        n = 1
    Case "3. Medium":
        n = 2
    Case "5. Low":
        n = 3
    Case "2. Medium-High":
        n = 4
    Case "4. Medium-Low":
        n = 5
    Case Else:
        n = 0
    End Select
    oCel.Formula = Chr(34) & n & Chr(34)
End Sub
```

3(c). Applying Colors to the rack components based on Manufacturers.

```
Private Sub SetPropManufacturer(ByVal oCel As Visio.Cell, Val As String)
    Select Case Val
    Case "IBM":
        n = "IBM"
    Case "Cisco":
        n = "Cisco"
    Case "HP":
        n = "HP"
    Case "Juniper":
        n = "Juniper"
    Case "Palo Alto Networks":
        n = "Palo Alto"
    Case Else:
        n = "Others"
    End Select
    oCel.Formula = Chr(34) & n & Chr(34)
End Sub
```

Testing Flow

Unit testing

The code is checked from end to end by the team, before forwarding it to the release sprint.

Functional testing

Here the checking of all the requirement functionalities takes place to measure the effectiveness of the particular functionality.

System Testing

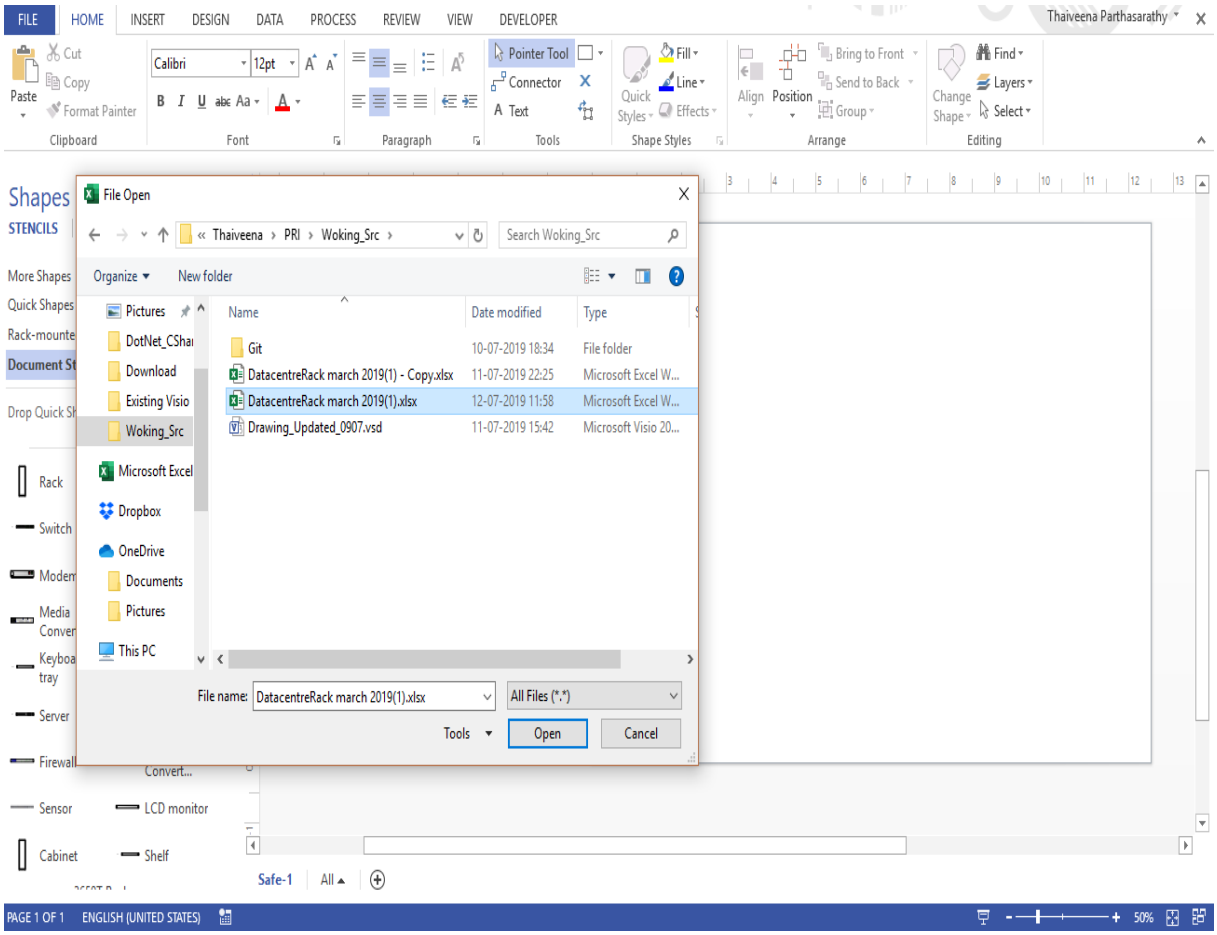
By putting the application in varied operational systems to check whether it works fine. Here we have tested our application in Windows 8/10.

Load Testing

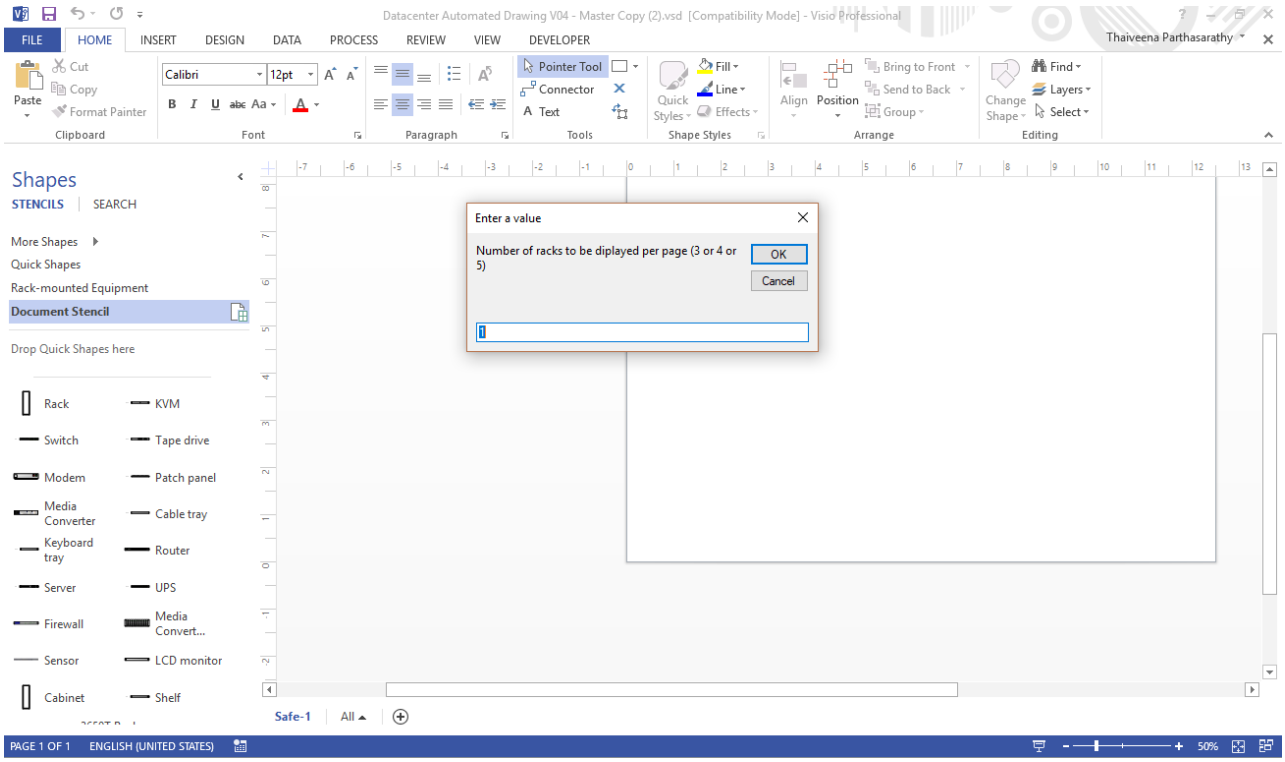
We have tried loading huge amounts of data using Excel worksheet in our application.

Results and Analysis

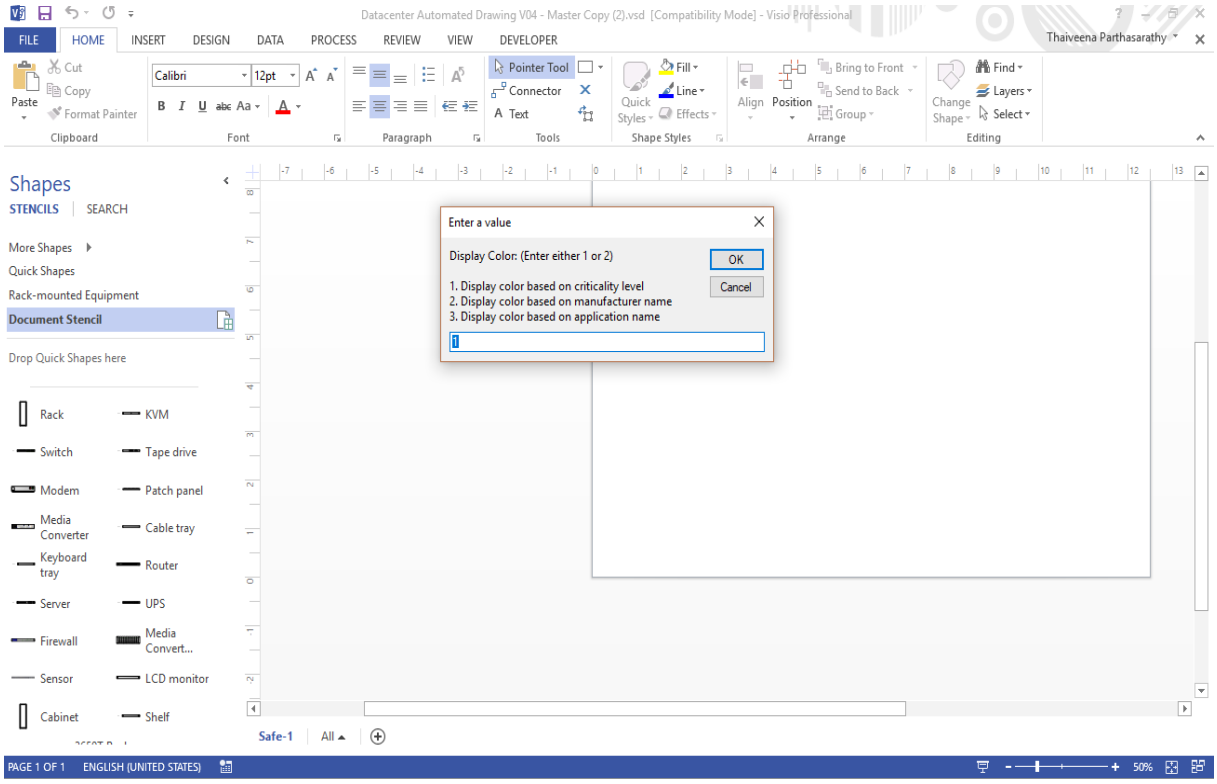
Dialog box to import the Excel file to the Visio. If you try to run the re-import macro, a pop-up box opens up asking for the input excel file.



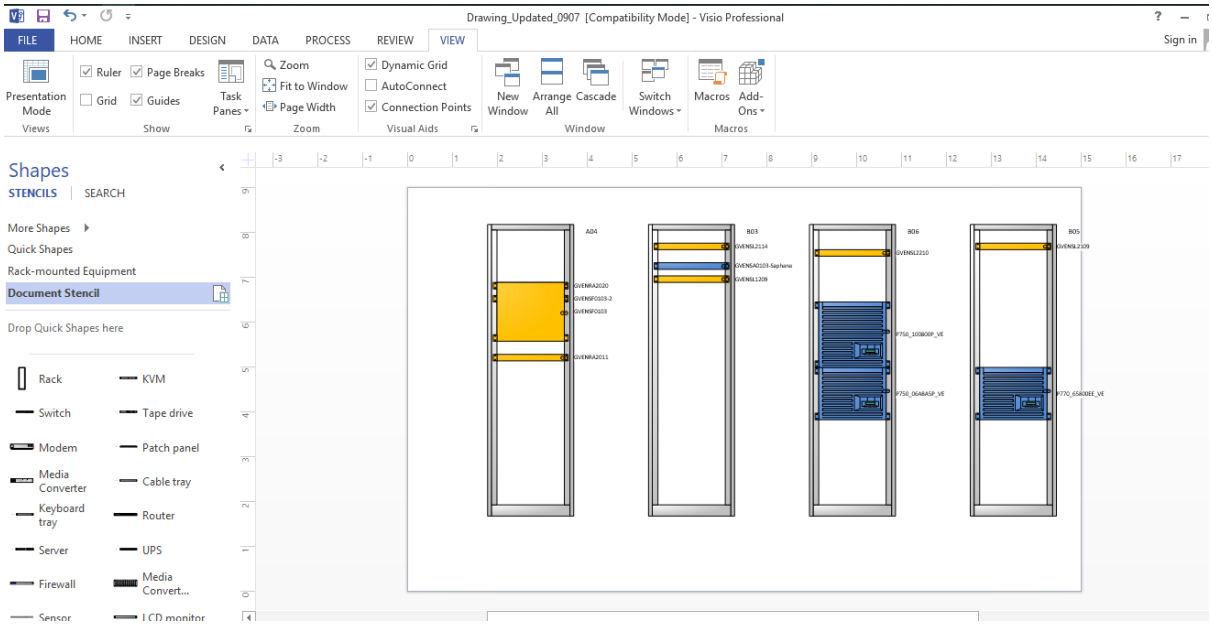
Menu Lookup to select number of racks.



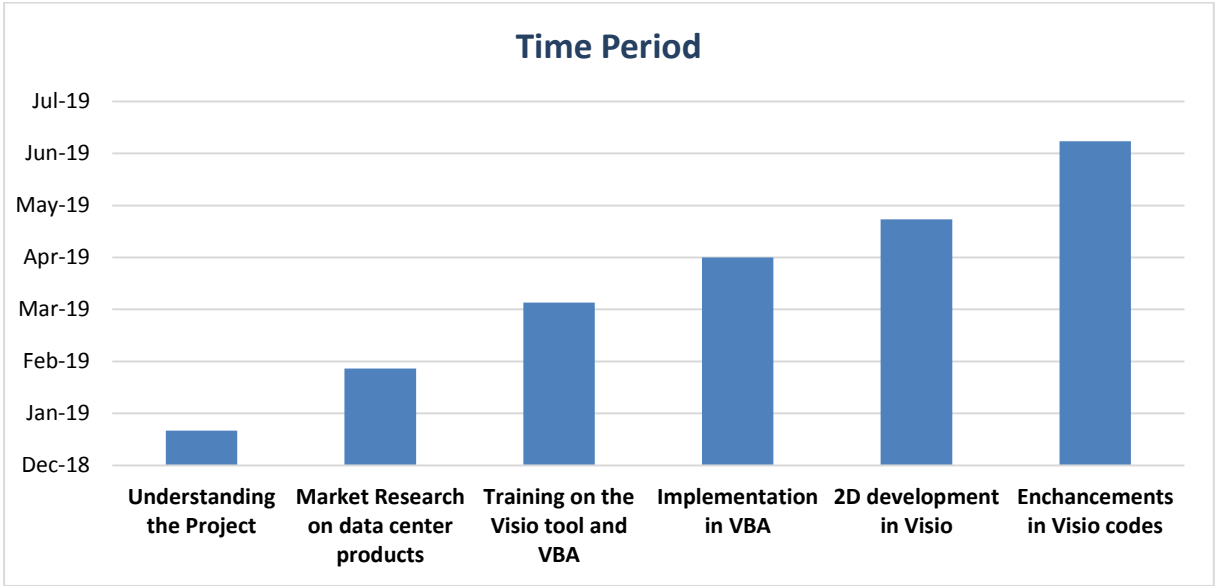
Menu for Color Classification of Racks based on ***Criticality*** and ***Manufacturers.***



Color's Classified Racks based on ***Criticality*** of the component.



Planning and time flow



Schedule and milestones

Phases	Schedule
Project kick off	09/03/2019
Market research	11/03/2019
Preprocessing of data	12/03/2019
Software requirement acknowledgement	14/03/2019
Development	14/05/2019
Testing	12/07/2019
Deployment	12/07/2019

Risks, dependencies and other issues

- Increasing the number of racks per view may leads to changes in the existing design which in turn affects the representation of the racks
- Creating/altering the existing code for the 2D model of the Data Racks

Conclusion

By using this tool, the user can see the 'Front Stencil' view of the data racks with all its components. The user of this tool may need a basic training on Visio, Excel and CMDB to load, import and visualize the data.

Progress Report:

Milestone 1:

After accepting our 'Motivation letter', we started to pursue further in our feasibility study of the project and its requirements. The project seemed to have quiet a few difficulties in terms of requirements, like the Visio tool, VBA language, concepts of Data Centre, working on Excel dataset. All these were new to our "TechMinds" team and we had to start the analysis and learn all new concepts and it was a very big challenge to the team.

We had our first meeting with Mr. Olivier on 21st Feb and he explained in detail about the project. With his guidance, we started analyzing how Data centers work and the way racks and servers are arranged in the Data Centers.

Milestone 2:

Since all the concepts and requirements for the project were new to us, we had divided the requirements as individual tasks and assigned the works amongst us.

- Venkatesh started to work on the Excel data analysis which is the foundation for the Project
- Thaiveena and Zaid started to learn VBA code to work on the automated drawing of the Data centers
- While Srikar and Serge started their analysis on the Manual drawing of the Data centers

Due to the major roadblock we had on the tool availability, we were unable to implement our analysis on the VBA coding. So, we faced difficulties in implementing the project in the short time period.

Milestone 3:

Once, the Excel data set was ready, Venkatesh started to focus on the VBA training.
By 25th March we were able to get a cracked version of Visio and started using it for our works.

We started our code work for the automated stencil drawing. We faced difficulties when issues occurred during the Debug. Since we are new to the VBA language, it took time for us to analyze the issue and come to a solution for it.

Meanwhile Srikar worked on the poster work for the project. Then we were able to finalize the technical specifications for the project and submitted the report as well.

We had to add Master shapes to be used while drawing. This was a very big challenge for us to overcome. A lot of time was spent on our part to accomplish this task.

So, finally we were successful in displaying all the racks and the shapes in the Visio by the end of June. We still were left with the requirements to display racks based on user input, color the shapes based on user input, 3D visualization of the Data center and floor maps.

Milestone 4:

It was a very short span for us to complete all the requirements in the stipulated time. We had our status update meeting with our Sponsor Mr. Olivier on 07th June and he understood our situation and had removed the 3D visualization and Floor map drawing.

So, we started focusing on getting the user input to decide the number of racks in a page and to decide on the color of the shapes.

We started working on the number of racks to display. It was tough for us to display more than 3 racks per page, but the racks were not displayed on a single row. The page alignment has to be changed each time. So, it was a challenge for us to align all the racks on the same row.

So, we had started working on the width and height of the page. Finally, we were able to display racks based on the user input.

Similarly, to color the shapes, we had to design the Data graphic for all the shapes. It was easy to create a Data graphic manually. But to automate them, there were so many issues thrown on debugging. So, it took us a lot of time, effort to research and come up with the automation of the Data graphic for all the shapes.