

GIS based Dashboard Development using Operations Dashboard for ArcGIS

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Abstract

A dashboard is a kind of a graphical user interface which is used to analyze and display the key performance indicators, metrics and important data points associated with a business process or an application. Geographic Information Systems (GIS) are computer based systems to collect, manage, analyze and present large amounts of geo-spatial data. Operations Dashboard for ArcGIS is a module which can be integrated in to the Portal for ArcGIS to build map based dashboards. It contains various widgets like home, zoom in/out, legend, pie chart, graph, map, indicator, gauge, list, details etc. The widgets can be connected and interlinked to each other using "actions". Operations Dashboard for ArcGIS is a simple application with the help of which a map enabled dashboard can be created in a short period of time and that to without any programming skills. This paper reviews a simple and easy to use methodology to create a dashboard using ArcGIS Enterprise tools like Operations Dashboard for ArcGIS, Portal for ArcGIS and Server for ArcGIS.

Keywords

Dashboard, Operations Dashboard for ArcGIS, PostgreSQL, Portal for ArcGIS, Server for ArcGIS.

I. Introduction

A dashboard is a kind of a graphical user interface which is used to analyze and display the key performance indicators, metrics and important data points associated with a business process or an application.

Development of a dashboard based web application is a complex job. Usually a dashboard is developed programmatically, so knowledge of some programming language is required. There can be different sections or elements in a dashboard like map, chart, graph, table etc. These sections can be implemented using Javascript, CSS, Python API's or HTML based scripts and code snippets. It is difficult for a non-programmer to integrate all the sections together on a single webpage and make them interact with each other. The arrangement or layout of the widgets on the page is also very intricate as complex web designing techniques may be involved. The developer should have knowledge of responsive design so that the application is viewed properly on various devices with different screen sizes.

The advantage of using the Operations Dashboard for ArcGIS is that even a non-programmer can develop feature rich customized dashboards in a short period of time. A dashboard is developed by combining various elements or widgets. A widget is a component or a building block of a dashboard. Widgets like home, zoom in/out, legend, pie chart, graph, map, indicator, gauge, list, detail are available in the application. The user has just to add the widget, configure its working and placement. The user can also configure how a widget can communicate with another widget or element e.g. on selection of particular district from a list of districts, the associated geographic extent of the selected district is shown in the map view. Common functions associated with the widgets are drag, configure, configure actions, duplicate, delete etc. The

application developed using the dashboard follows the responsive design principles and is viewed properly on devices with different screen sizes.

The process to create a dashboard is as follows:

- **Creation of a database and map services:** The process to create database in PostgreSQL and publish a map service in ArcMap is given in [1].
- **Creation of the dashboard:** In this step various widgets are added to the dashboard and their shape, size, placement location and actions are configured. The process to create a dashboard is reviewed in this paper.

Some examples of operations dashboards and resources are given in [2]

II. Objectives

This paper reviews a simple and easy to use methodology to create a dashboard using ArcGIS Enterprise tools like Operations Dashboard for ArcGIS, Portal for ArcGIS and Server for ArcGIS. The various elements/widgets included in this application are home, zoom in/out, legend, pie chart, graph, map, indicator, gauge, list, details etc. The GUI of the dashboard is such that all the widgets are visible on a single screen. These widgets can be easily configured and linked with each other for real time data visualization.

III. Tools & Methodology

Tools Used: ArcMap 10.4, PostgreSQL 9.4, ArcGIS Server 10.6, ArcGIS Portal 10.6 and Operations Dashboard for ArcGIS.

A. Setup and Deploy the Operations Dashboard for ArcGIS

1. Deploy Operations Dashboard to Portal for ArcGIS

- Download Operations Dashboard (.exe) from "My ESRI" Portal [3].
- Click My Organizations → Select Products → Click Downloads.
- Expand the Additional Products section
- Click on Download for the Operations Dashboard for ArcGIS

2. Create the Operations Dashboard files

- Double-click the downloaded .exe, Click OK to extract the files.
- Verify "Launch" the Utility check box, and click Close.
- Verify that the desired prerequisites for using the deployment utility has been met and then Click "Next" to Continue.
- Provide a location to store the generated Operations Dashboard files, and click "Next".
- Set the URL to your portal, example <https://host.domain.com/webadaptor> and click "Next".
- Provide the company's code signing certificate (.pfx file), create a password, and click Next. (Optional Step)

- Verify your settings and click “Next”.
- Finally the files required for Operations Dashboard for ArcGIS have been created.

3. Copy the files to the Portal for ArcGIS

- Browse to the location where the desired files were created.
- Copy the dashboard-win folder.
- Browse to <portal install directory>\arcgis\portal\apps and overwrite the dashboard-win folder.

B. Create an Operations Dashboard in Portal for ArcGIS

- Sign in to your ArcGIS Portal account.
- Click Create → Dashboard
- Click on Create Dashboard with title, tags and summary of the dashboard.
- Then, Click on create dashboard.

C. Configure the Operations Dashboard using Portal for ArcGIS

By default the dashboard is empty. There are main three icons on the dashboard. The first one is used to add elements in the dashboard e.g. header, left panel, map, serial chart, pie chart, indicator, gauge etc. The second icon is used to save the dashboard and the third provides the link to share the dashboard and also apply the theme (dark or light) to it.

Use the first icon to add the following widgets as given below to the dashboard. The widgets can be configured [5] for its display and action properties. Figure 1 shows the example of the configuration screen of the “Gauge” widget.

Some useful widgets/tools available to create a Dashboard are:

A. Map

This widget is used to add a map already created in ArcGIS online or Portal for ArcGIS. There are options to add the Zoom in/out, basemap gallery, pop-ups, legend etc. to the map. There can be multiple Map elements in a dashboard [6].

B. Header

Header is a reserved area along the top of your dashboard that can be used for giving your dashboard a unique identity, applying corporate branding standards, and providing links to additional content [7].

C. Side Panel

The side panel is used in interactive dashboards to host one or more selectors. A dashboard can only have one side panel, which has a fixed size and position along the dashboard’s edge, although it can be configured to be retractable at run time [8].

D. Serial Chart

A serial chart visualizes one or more series of data points along a horizontal (x) axis and a vertical (y) axis. Serial charts have the ability to show more than one series of data [9].

E. Pie Chart

A pie chart is a circular chart divided into sections. Each section is proportional to the quantity it represents [10].

F. Indicator

An indicator is a widget that can be added to the dashboard. It can

be used to show the numeric attributes of individual features, or it can be used to display a count, a sum, an average, a minimum, or a maximum summary statistic [11].

G. Gauge

Gauge is used to graphically display a single metric within a quantitative context defined by minimum and maximum values [12].

H. List

A list is used to show features or rows from a layer. When available, field formatting information in a list is based on information found in the layer’s pop-up [13].

I. Details

Details widget is used to provide the layer information with attributes. The details element is used to show information about features or rows from a layer. Its display is based on a layer’s pop-up information [14].

J. Rich Text

It is used to include any type of fixed text, instructions, organization information with hyperlinks etc. [15].

Final view of the dashboard after adding all the desired widgets/tools is as shown in Figure 2. All the widgets are interactive and interlinked to each other for real time visualization.

IV. Other Dashboard Development Tools

There are various open source, free and commercial dashboard development tools. Some popular tools are Freeboard, Quadigram, Dashbuilder, Dashku, Grafana and Tableau [16].

V. Conclusion

This study summarizes how a powerful dashboard can be developed in a short period of time and that too without any programming skills using Operations Dashboard for ArcGIS.

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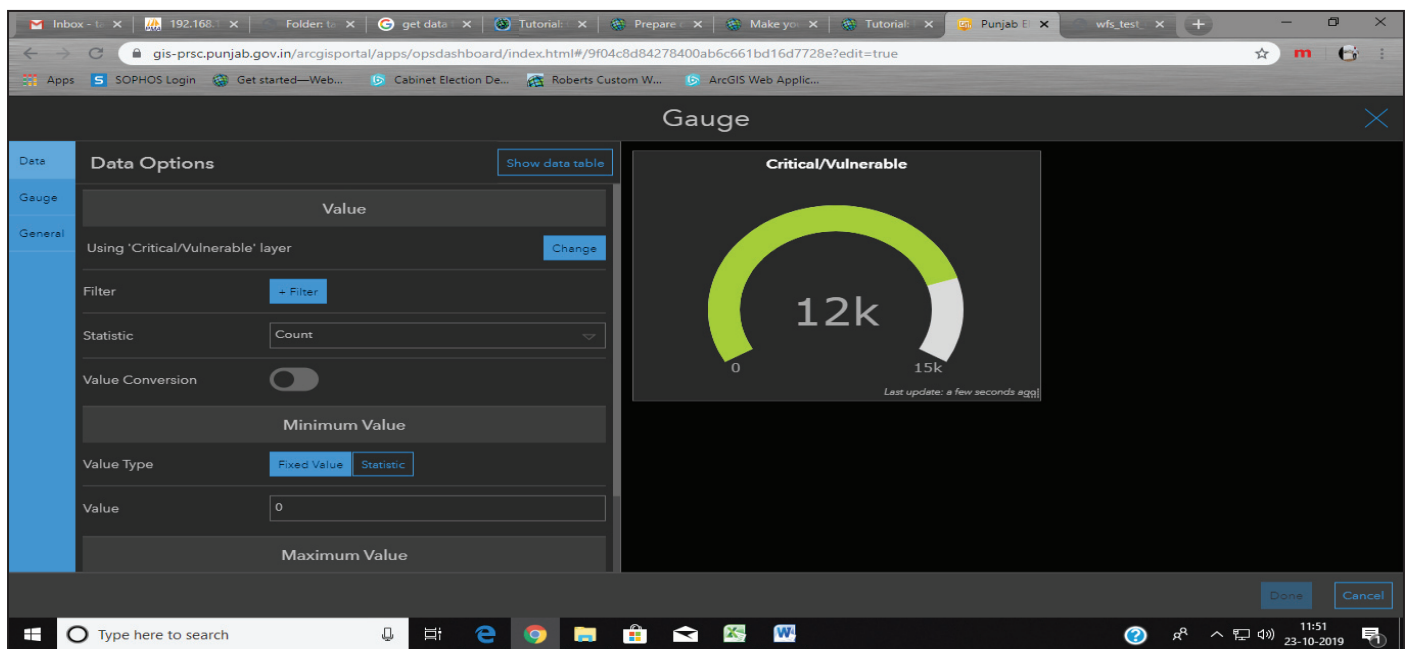


Fig. 1: Configuration of the Gauge Widget

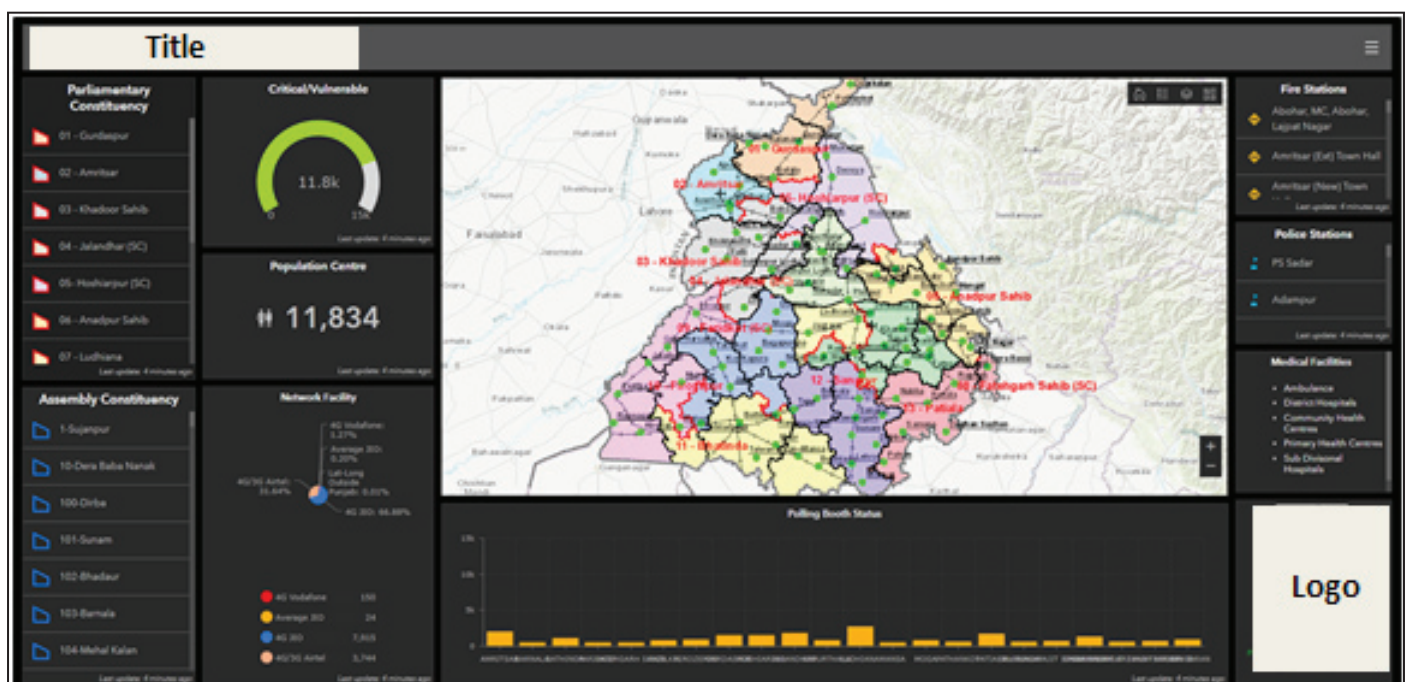


Fig. 2: Final View of the Dashboard