D3.js Power BI visual

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Cognitive Convergence is Subject Matter Expert in Office 365, Dynamics 365, SharePoint, Project Server, Power Platform: Power Apps-Power BI-Power Automate-Power Virtual Agents.

We offer Power BI consulting services covering solution architecture refinement, customization, integration, transformation, visualization and analytics to uncover insights hidden within data and enhance data exploration.

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OBJECTIVES

This paper will discuss D3.js custom visual provided in AppSource based on javascript library. Its development patterns and usage along with its limitations will also discuss.

BACKGROUND

The ever-increasing variety of data and analytics has resulted in an ever-increasing need to build customized visualizations for diverse types of storytelling. D3.js is a JavaScript library for producing dynamic, interactive data visualizations in web browsers. It makes use of the widely implemented SVG, HTML5, and CSS standards. Power BI has a variety of built-in charts. There are a variety of custom visualizations that are created and used on web applications. There is often a need to have the same visualization in reports as well. This results in a need to display custom charts created using D3 library in Power BI.

D3.js

D3.js is a JavaScript library for manipulating documents based on data. D3 helps you bring data to life using HTML, SVG, and CSS. D3's emphasis on web standards gives you the full capabilities of modern browsers without tying yourself to a proprietary framework, combining powerful visualization components and a data-driven approach to DOM manipulation. D3.js is a JavaScript library of objects to produce sophisticated, interactive, dynamic data visualizations using modern web-based technologies. This means that D3 is the connection point between a user interaction and the data underneath, allowing a web page to dynamically change rather than remain static.

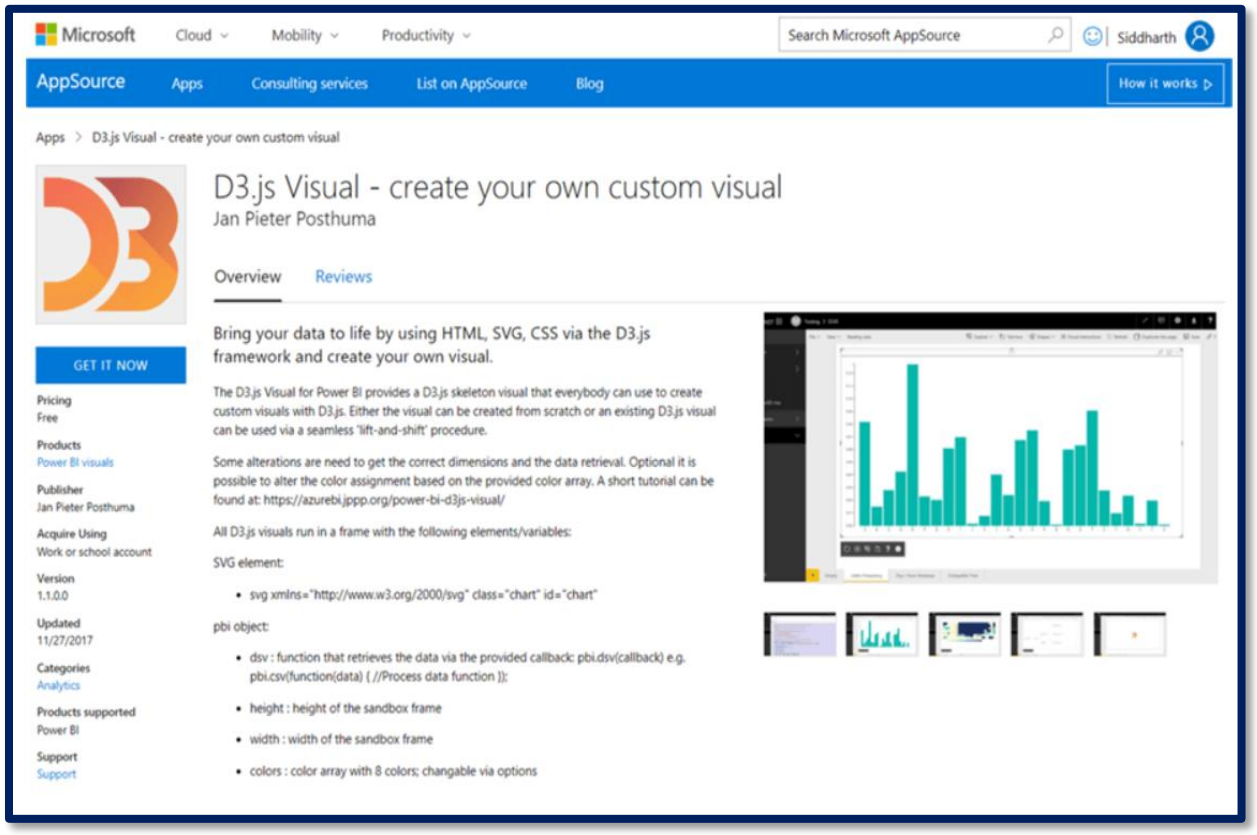
POWER BI D3.JS VISUAL

D3.js Visual is a control that is available in Power BI Visuals Gallery, which can be used to render custom D3 visualizations in Power BI Desktop. One needs to know D3 programming to develop custom visualizations. The D3.js Visual for Power BI provides a D3.js skeleton visual that everybody can use to create custom visuals with D3.js either the visual can be created from scratch or an existing D3.js visual can be used via a seamless 'lift-and-shift' procedure. D3.js visual require knowledge of following

- **HTML:** Structural elements for web pages. Power BI is using HTML5.
- **CSS:** Styling of web pages. Power BI is using CSS3.
- **Javascript:** An object-oriented programming language that allows display to change based on user interactions. This is code inside the HTML that will work with D3; everything ends up getting compiled down to Javascript.
- **SVG, Web GL, Canvas:** Graphics formats which support functionality such as interactivity and animation. Power BI is flexible with which graphical API prefer to use, but their op en source project is all D.

APPSOURCE VISUAL

The first step is to download the D3.js Visual control from AppSource, as it is not available by default in Power BI Desktop. It is available in the gallery from a third-party vendor, but free of cost. The visual allow to add D3 JavaScript and CSS directly in the Power BI interface. There are no developer tools required, and the learning curve is way lower than creating a custom visual from scratch.



Usage

The basic idea behind this visual is to 'lift and shift' an existing D3.js visual and use it with Power BI. Some alterations are need, of course, but basically the dimensions and the data retrieval. Optional it is possible to alter the color assignment based on the provided color array. All D3.js visuals run in a frame with the following elements/variables:

SVG element:

```
<svg xmlns="http://www.w3.org/2000/svg" class="chart" id="chart">
```

pbi object:

Method / Property	Description
dsv([accessor,] callback	function that retrieves the data via the provided callback: pbi.dsv(callback) e.g. pbi.dsv(function(data) { //Process data function });. Optional accessor function may be added.
height	height of the sandbox frame
width	width of the sandbox frame
colors	color array with 8 colors; changable via options

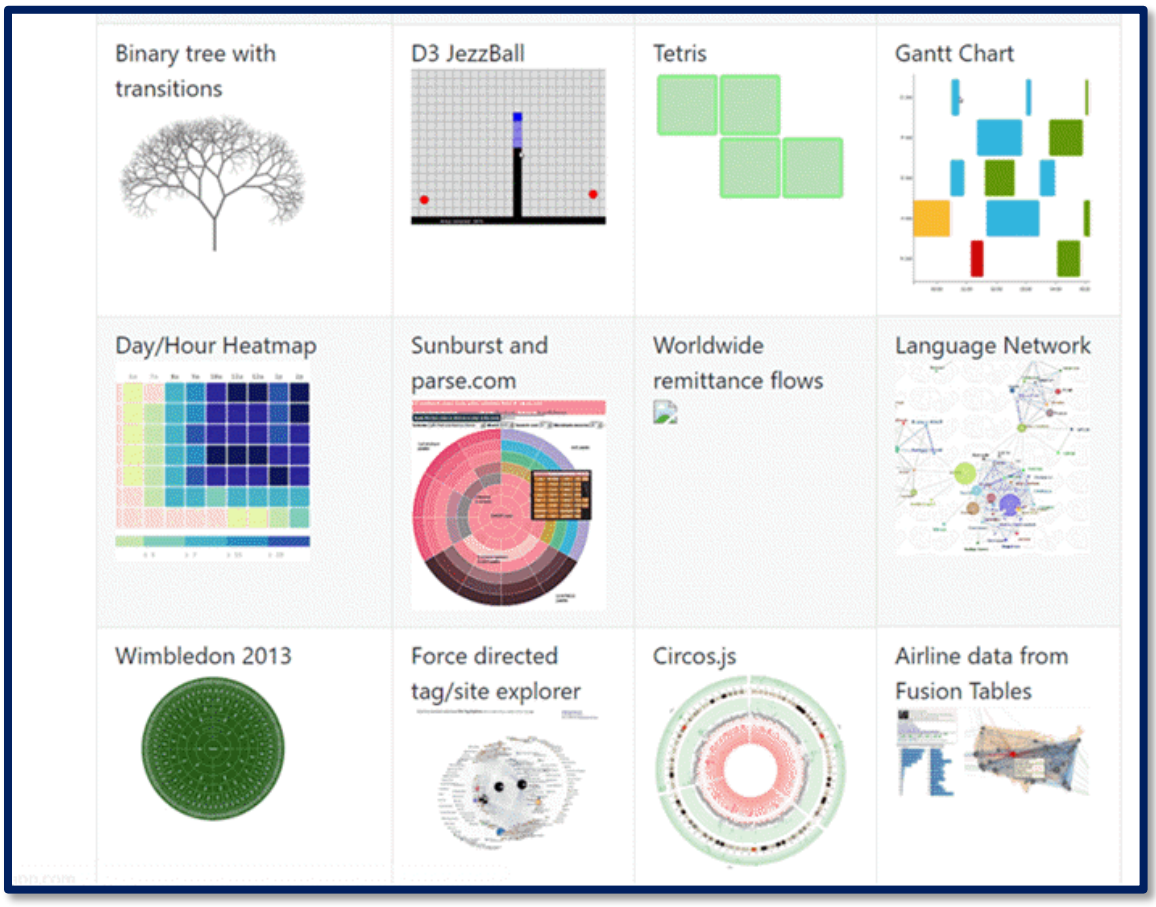
The structure of the data returned by the callback is based on the data fields that are assigned to the visual, but with some small changes:

- Spaces are removed from the names

- Names are converted to lowercase

For example a field called **Product Category** will be available for D3.js as **productcategory.**

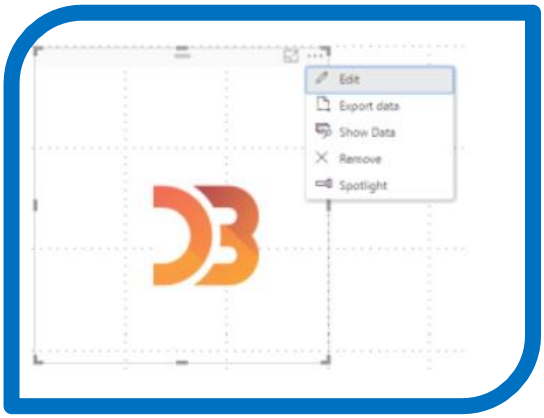
VISUAL EXAMPLES



DEVELOPMENT PATTERN

The development pattern of this D3.js visual is as follow

1. Import custom visual downloaded from AppSource in Power BI desktop.
2. Enter data in the value pane of the visual and
3. Click on the epilipse (...) menu of the visual and choose 'Edit'
4. There are 6 menu icons



Icon Name	Icon	Description
New		Clear the content for a new visual
Save		Saves the current content
Reload		Reloads the last saved version of the current content
Code		Toggle for the Code content view
Style		Toggle for the Style content view
Parse		Parse the javascript code to check for errors

5. Pressing the code icon will allow to write code to make a D3.js visual.

6. Few changes are required in D3.js code to use it in Power BI which are as follow

- Alter the lines related to the width and height of the visual as the height and width are fixed in the sample. And with Power BI this is not needed and can be change depending the size of the placeholder.

```
width = pbi.width - margin.left - margin.right,
```

- Replace the selection of the SVG element. Replace

```
var svg = d3.select("body").append("svg")
```

  - For

```
var svg = d3.select("#chart")
```

  - As this is the only supported way of setting the correct svg variable.

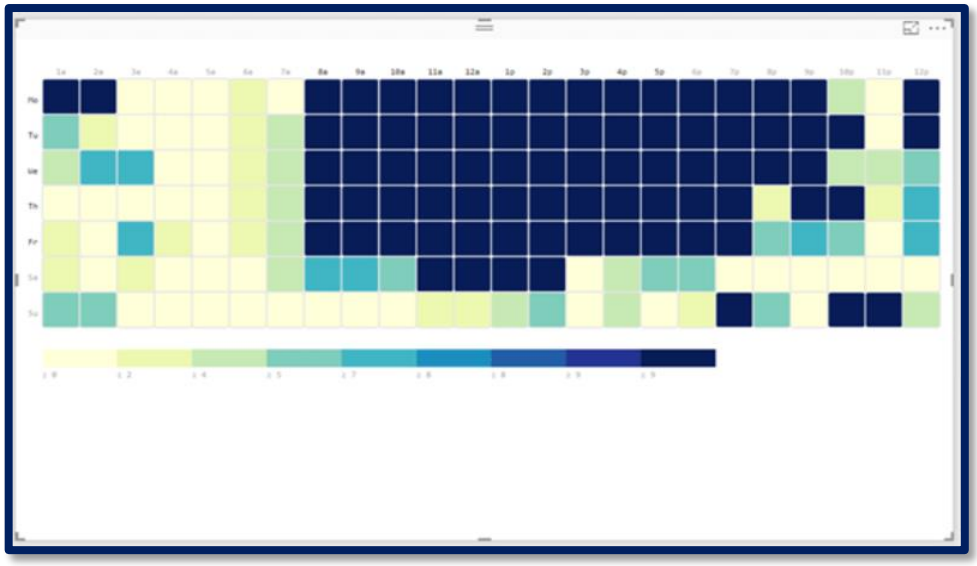
- Also the d3.tsv (or d3.csv) import function need to be changed as this option will not use the data from Power BI. Alter the corresponding line and replace it with the pbi.dsv() function. With this variant there is not reference to the data needed and also not a type conversion. So replace,

```
d3.tsv("letter-frequency.tsv", type, function(error, letters)
```

With

```
{ for pbi.dsv(type, function(letters) {
```

7. The visual will look like this



Important Notes

- When import any D3.js code into the Power BI visual, ensure that the schema of the dataset fed to the code remains the same by selecting relevant fields.
- Use pbi object instead of D3 object
- Remove references of static data and make calls to the data as explained above
- Ensure the data is of the same shape as used in the actual code

Limitations

Unfortunately the following limitations are valid for this visual:

- Available D3.js version is v3.5.17
- Maximum amount of datapoints is: 30,000
- Due to the way of the visual is rendered the main SVG element must be selected via the id, e.g. d3.select("#chart") and should not be created via code
- The JavaScript code should be ES5 code as that is the supported version by Power BI
- After editing the visual content and returning back to visual the edit option of the menu is sometimes not available any more. Refreshing the data/visuals will resolve this.
- There is no warning when the link 'Back to the report' is clicked and unsaved content is available in the editor. Please be advised and save regular.

CONCLUSION

This paper discussed D3.js custom visual provided in AppSource. Its development patterns and usage along with its limitations also discussed here. Creation of visuals either by from scratch or an existing D3.js visual can be used via a seamless 'lift-and-shift' procedure.

Cognitive Convergence will provide consulting services that help in designing, deploying, managing, enhancing or troubleshooting on-premises, cloud-based or hybrid Power BI environment. Cognitive Convergence will provide help to start fresh with Power BI to modernize current business analytics solution or revamp existing Power BI deployment by incorporating new data sources or adding new services.

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