You are in the correct room if you are expecting this ,,,

Data visualization using Deneb (meaning Vega and Vega-Lite)

No matter what your data specialty is (data engineering, data modeling, etc.), in the end, data has to be "communicated" to the users of a Power BI report. Data visualizations are used when communicating data to users. Using Power BI, this can be done quickly because Power BI provides a large number of build-in data visualization types.
Sometimes, these built-in data visualizations are insufficient, whether a particular formatting requirement or a complex visual analytical method is required. But even then, these gaps can sometimes be filled using one of the many custom visuals available. One of my favorite custom visuals is Deneb (probably my most favorite custom visual). Deneb is not built to solve a specific data visualization task like a sunburst chart. Instead, Deneb has packaged two of the most powerful data visualization libraries, Vega and Vega-Lite.

Next to a short introduction to Deneb, Vega, and Vega-Lite, this session explains important concepts like layers (the superpower that allows layering bubbles on top of rectangles) and scales, the mapping of different value ranges or the mapping of a categorical variable like the product to a color. Practical examples and demos from this session, these examples will become available for downloading.



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Data visualization using Deneb
(meaning Vega and Vega-Lite)

Tom Martens @ SQL Konferenz 2025

2025-02-25

Agenda

- What to expect
- Who I am
- What is Deneb
- What are Vega and Vega-Lite
- Decomposition of a (not so simple) data visualization
- Concepts explained by examples
    - View compositions
    - Layers
    - Marks
    - Mappings





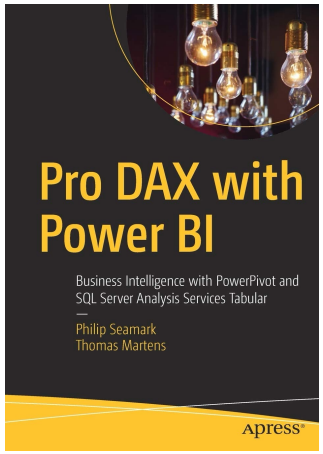
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Solution Architect @ Munich Re

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25+ years of experience designing analytical solutions using the MSFT data platform



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What is Deneb

A lot …

It’s not just packaging Vega and Vega-Lite;

it also provides interactions with all the visuals on the page and, of course, in both directions.

For example, Deneb brings the Power BI theme to Vega and Vega-Lite; next to that, the Power BI formatting can also be used inside the specifications.

Consider Deneb being the Visual Studio Code for Deneb inside our Power BI reports

Deneb is a CERTIFIED custom visual!



What are Vega and Vega-Lite

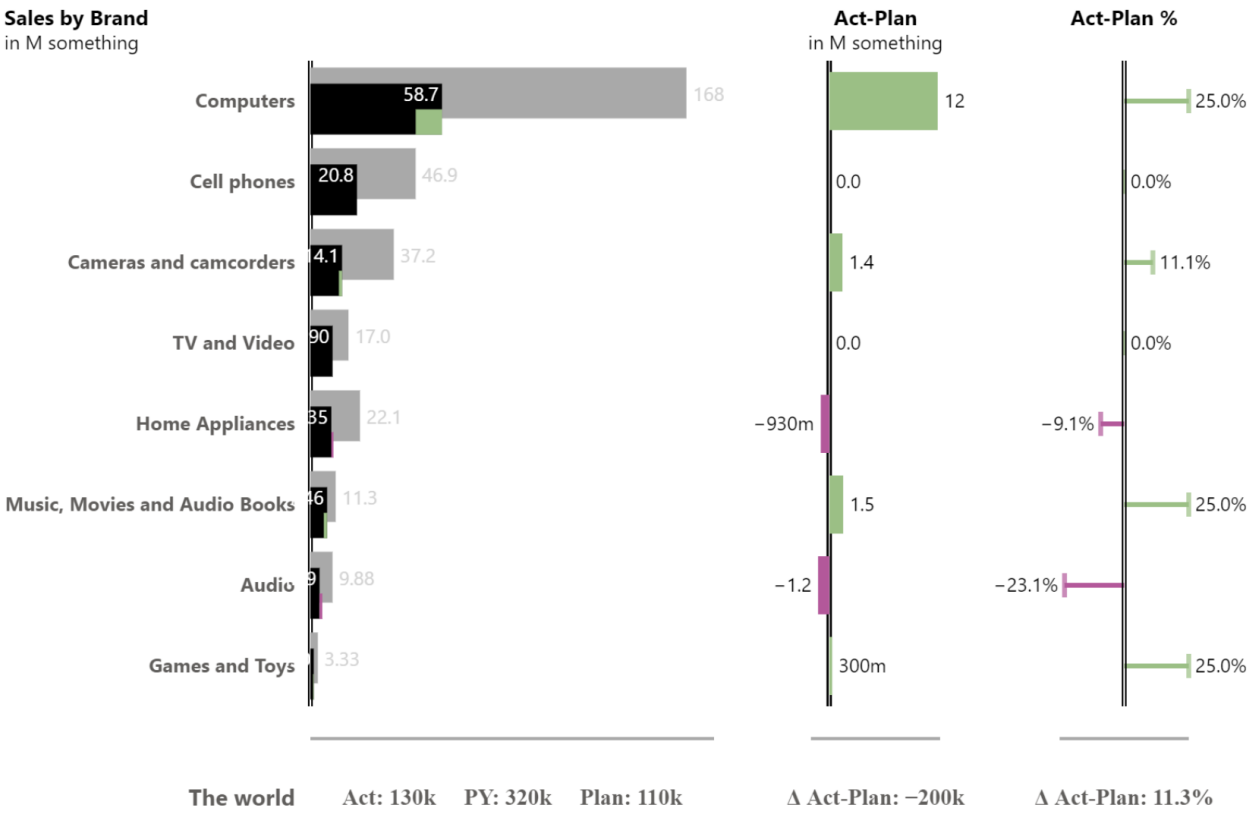
Vega-Lite
Vega-Lite can be considered a more „user-friendly“ top-level implementation of Vega following the building blocks of the „grammar of graphics“ developed by Leland Wilkinson.

Vega
Vega is the basis for Vega-Lite, it is more flexible than Vega-Lite but „harder“ to master.

The renderings of Vega and Vega-Lite are based on a json document that is called „specification.“



Decomposing a data visualization (inspired by IBCS)



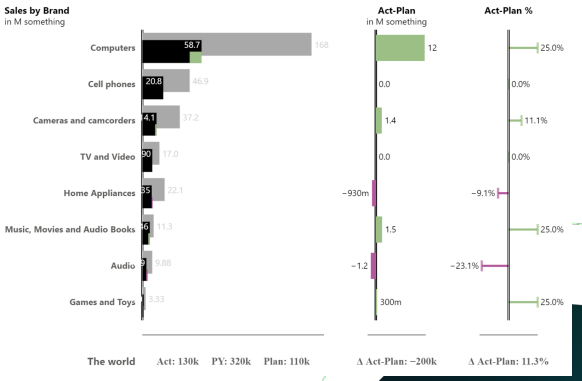


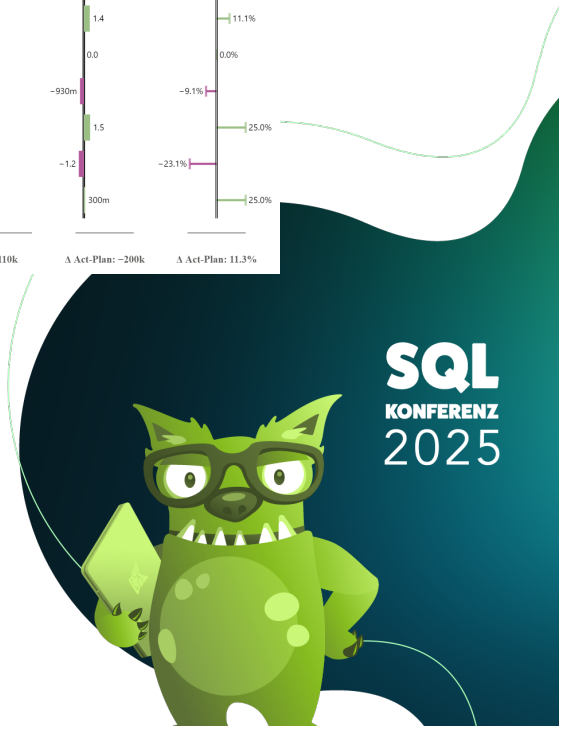
Decomposing a data visualization (inspired by IBCS) – some definitions

Before we start to decompose the data visualization into Vega/Vega-Lite's concepts its built by, we need to remember the definition of a data visualiaztion by Hadley Wickham (author of the R data visualization package ggplot and the book called ggplot2: ...):

... a statistical graphis is a mapping from data to aesthetic attributes (color, shape, size) of geometric objects (points, lines, bars) ...

In Vega and Vega-Lite, the mapping of data to aesthetic attributes happens inside of so-called channels in the encoding block, while the geometric objects are represented by marks (rect, line, text, ...).





Decomposing a data visualization (inspired by IBCS) – some definitions

In Vega and Vega-Lite a data visualization is called a view. There are different types of views:

- **Single view**: A view that uses a single mark (only one geometric object or text is used).
- **Layered view**: A view that uses more than one mark (a geometric representation of data), e.g., the mark „bar“ and the mark „text“ (using data labels next to the bar always leads to a layered view).
- **Multi view**: A view that combines multiple views into a single view, e.g., without deeper analyis of the example on the right, it looks like there are three (layered) views, that are horizontally aligned, …

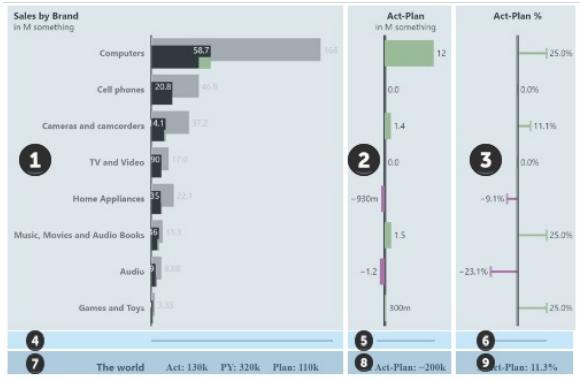


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Decomposing a data visualization (inspired by IBCS) – some definitions

…, but there are 9 views

1. **A layered view (marks: rule, bar, text, rect)**
2. **A layered view (marks: rule, bar, text)**
3. **A layered view (marks: rule, tick, text)**
4. **A single view (mark: rule)**
5. **A single view (mark: rule)**
6. **A single view (mark: rule)**
7. **A single view (mark: text)**
8. **A single view (mark: text)**
9. **A single view (mark: text)**





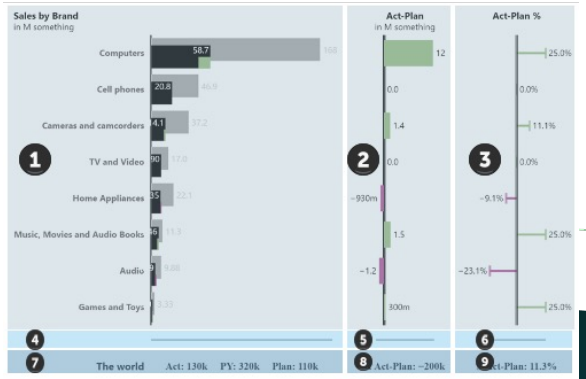
Whatever your first Deneb will be, …

…, start with counting the views.

Then, start counting the layers of each view.

Determine the sequence of the marks, circles on top of rectangles (bars) or rectangles over circles where the opacity of the fill color of a bar is less than 1.

Familiarize yourself with label placement, and remember to use the stack transform if you are creating a data visualization like a stacked bar chart.





Whatever your first Deneb will be, …

…, sooner or later, you have to shape the data to fit your current data visualization task.

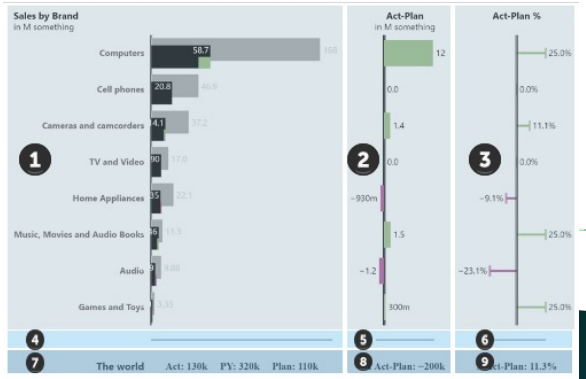
DAX can help shape your data, but from my experience, there is no „data engineering" task can that can not be tackled using the transform operations of Vega and Vega-Lite.

My advice:

If you are not in data modeling, use transform operations.

If you will create a Deneb data visualization task only every now and then use DAX (but do not convolute your model).

If you plan to create Deneb templates that you will share with your colleagues or customers, use transform operations





Readings

- Deneb, the official documentation site: https://deneb-viz.github.io/docs/getting-started
- A lengthy article (how I'm learned and still learning): https://publish.obsidian.md/minceddata/Blog/Data+Visualization/learning+Deneb
- My repo where you will find the pbix files: https://github.com/tomatminceddata/learningdeneb
- The repos that inspire and help me a lot
  - https://github.com/Giammaria/Vega-Visuals
  - https://github.com/PBI-David/Deneb-Showcase
- Vega-Lite documentation: https://vega.github.io/vega-lite/
- Vega documentation: https://vega.github.io/vega/
- International Business Communication Standards (IBCS): https://www.ibcs.com/



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Thank you!



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