



Advanced Workshop:

Designing Efficient Workbooks

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17/10/2019



**My workbook
is slow!**



Why ???



Best Practices for Designing Efficient Tableau Workbooks

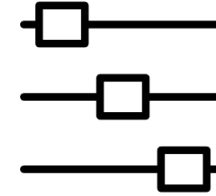
Tableau 10 Edition

Alan Eldridge
Tableau Software

<https://www.tableau.com/learn/whitepapers/designing-efficient-workbooks>

In a Nutshell...

Performance is **not** an after-thought



There is no one “Silver Bullet” ...

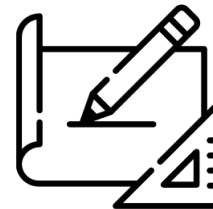


If it isn't fast in database, it won't be fast in Tableau

If it isn't fast in desktop, it won't be fast in Server



Design Choices correlate to Performance



Interpretation:

[“Avoid”, “Minimize”] ≠ “Do Not Use”

Key points – Look for this symbol!

>> ‘everything in moderation’

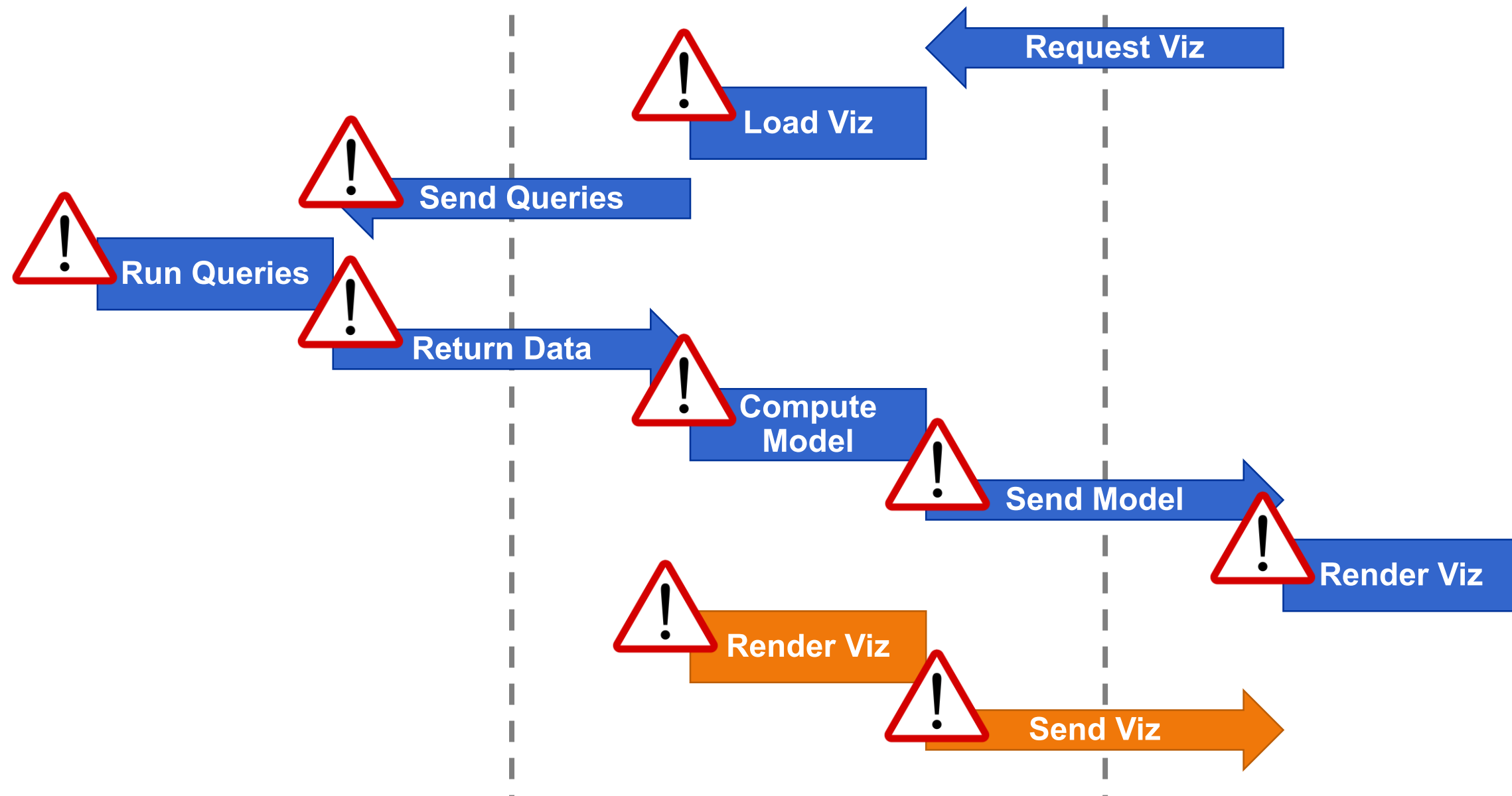


Why Is My Workbook Slow?

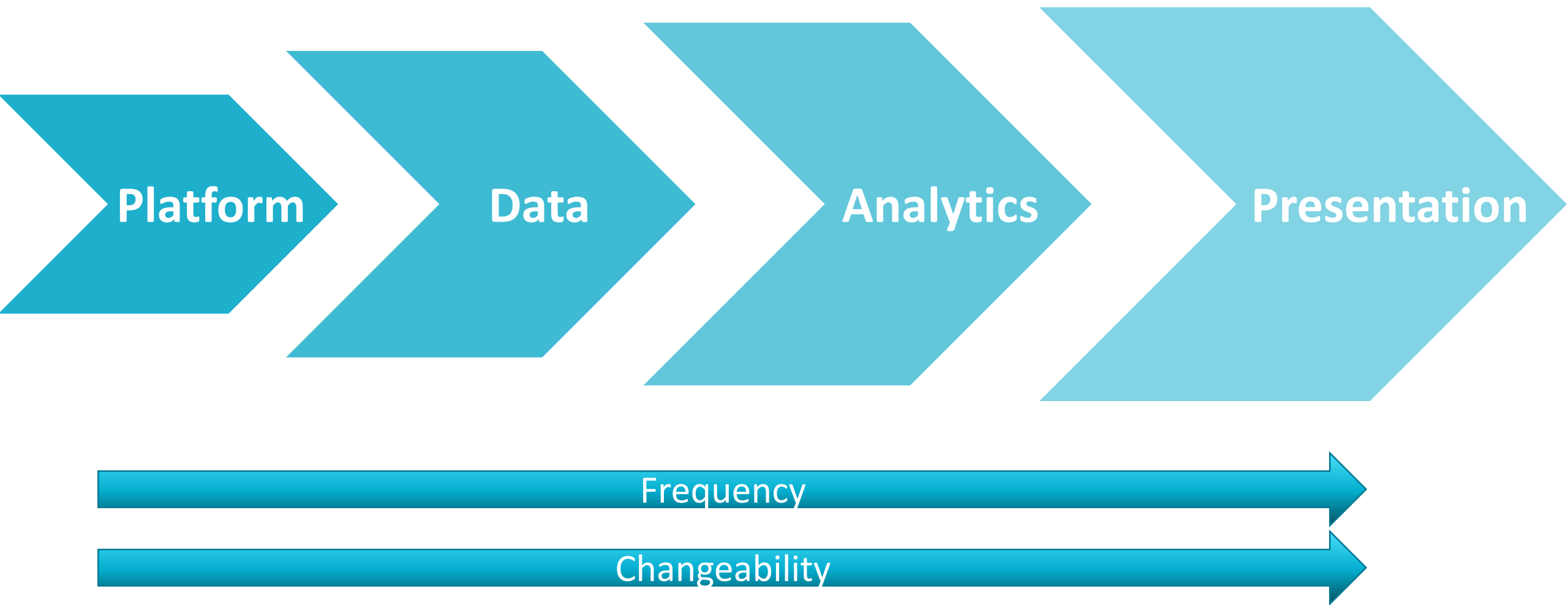
DATA

TABLEAU

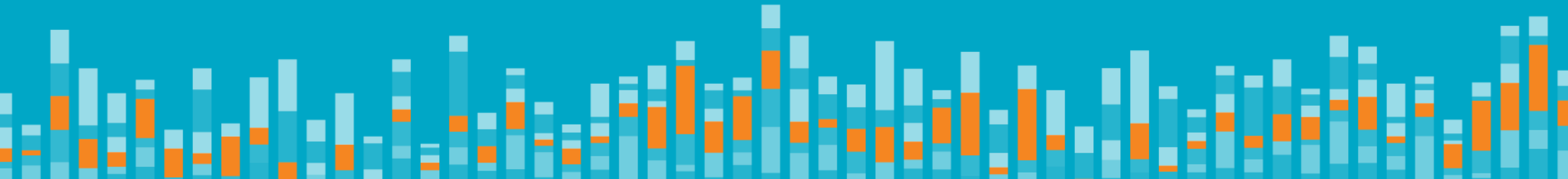
BROWSER



Concept: Visual Pipeline

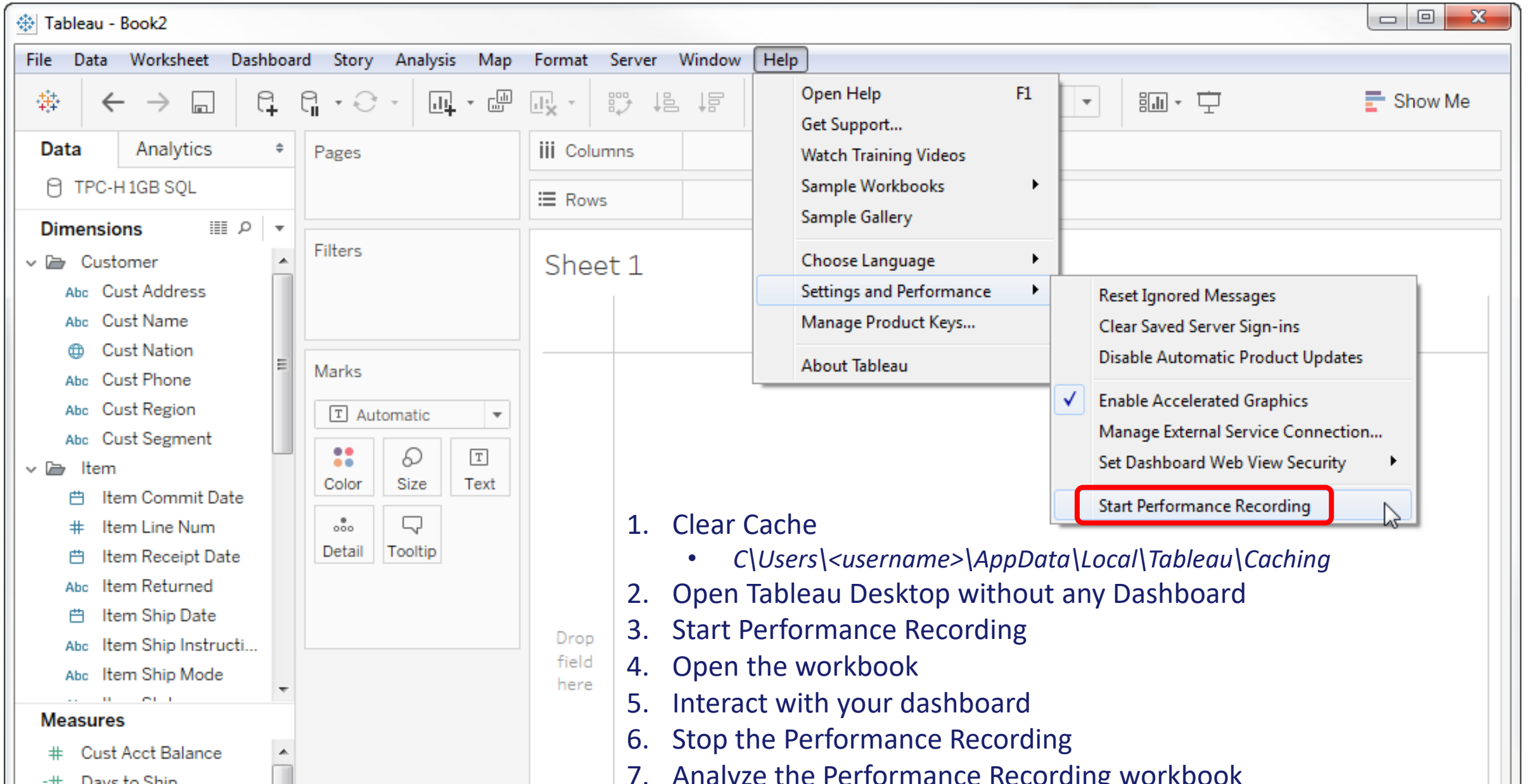


Finding the Problem



**When possible troubleshoot
using Tableau desktop even if
the complaint is about Server
;-)**

Performance Recorder



The screenshot shows the Tableau Desktop interface. The 'Help' menu is open, and the 'Start Performance Recording' option is highlighted with a red rectangle. The interface includes a menu bar (File, Data, Worksheet, Dashboard, Story, Analysis, Map, Format, Server, Window, Help), a toolbar, and a sidebar with 'Dimensions' and 'Measures' sections. The main workspace is labeled 'Sheet 1'.

1. Clear Cache

- `C:\Users\<username>\AppData\Local\Tableau\Caching`

2. Open Tableau Desktop without any Dashboard

3. Start Performance Recording

4. Open the workbook

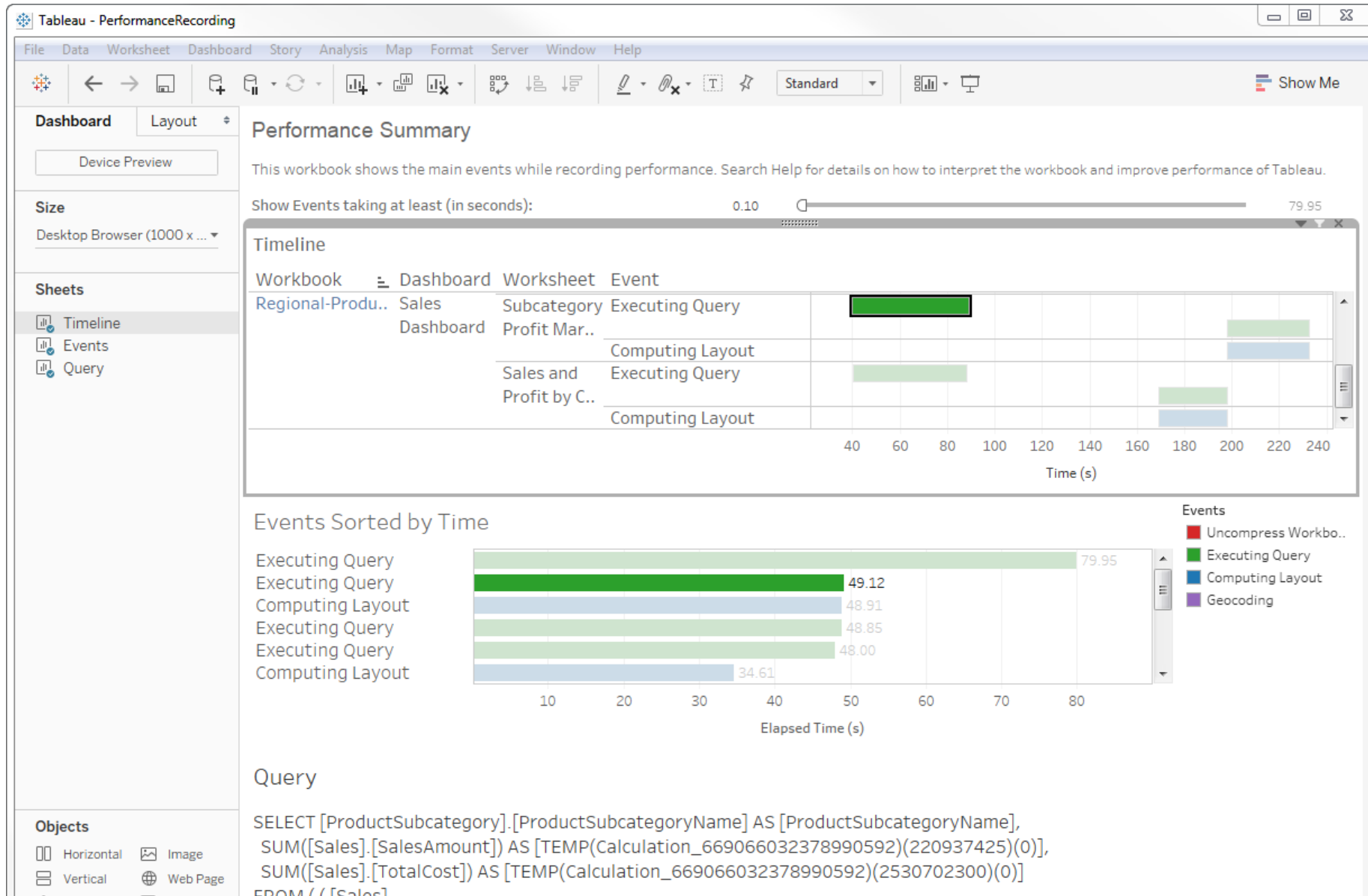
5. Interact with your dashboard

6. Stop the Performance Recording

7. Analyze the Performance Recording workbook

Performance Recorder

https://help.tableau.com/current/server/en-us/perf_record_interpret_server.htm



Performance Recorder

+ a b | e a u

Default | Content Users Groups Schedules ... | 🔍 ⚠️ ★ ⓘ Alan Eldridge ▾

General

Revert Save

☒ None ☐ Custom footer

Workbook Performance Metrics

Record performance information about key events as users interact with workbooks. View performance metrics in a workbook that Tableau creates automatically.

☒ Record workbook performance metrics

* <URL>?:record_performance=yes

Offline Snapshots

Snapshots are high-resolution images of favorite views that are available offline. When snapshots are not enabled, favorites appear as low-resolution images and are accessible only when the user is signed in to the server.

☒ Create offline snapshots of favorites (iOS only)

Email Notification

Email notification lets data source and workbook owners know when and why Tableau could not complete a scheduled refresh.

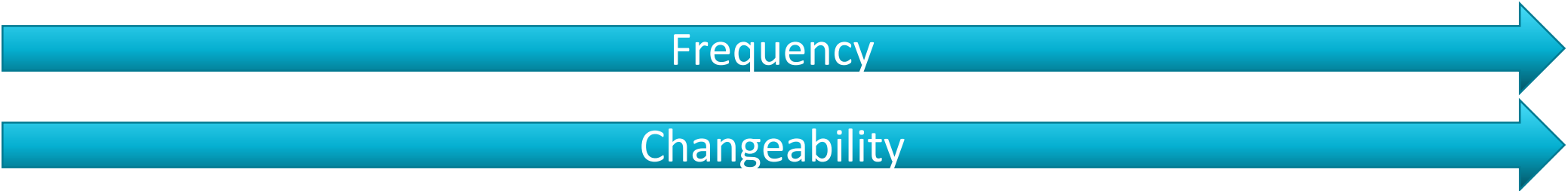
☒ Send email to data source and workbook owners when scheduled refreshes fail

Revert Save

Finding the problem ... after Performance Recorder

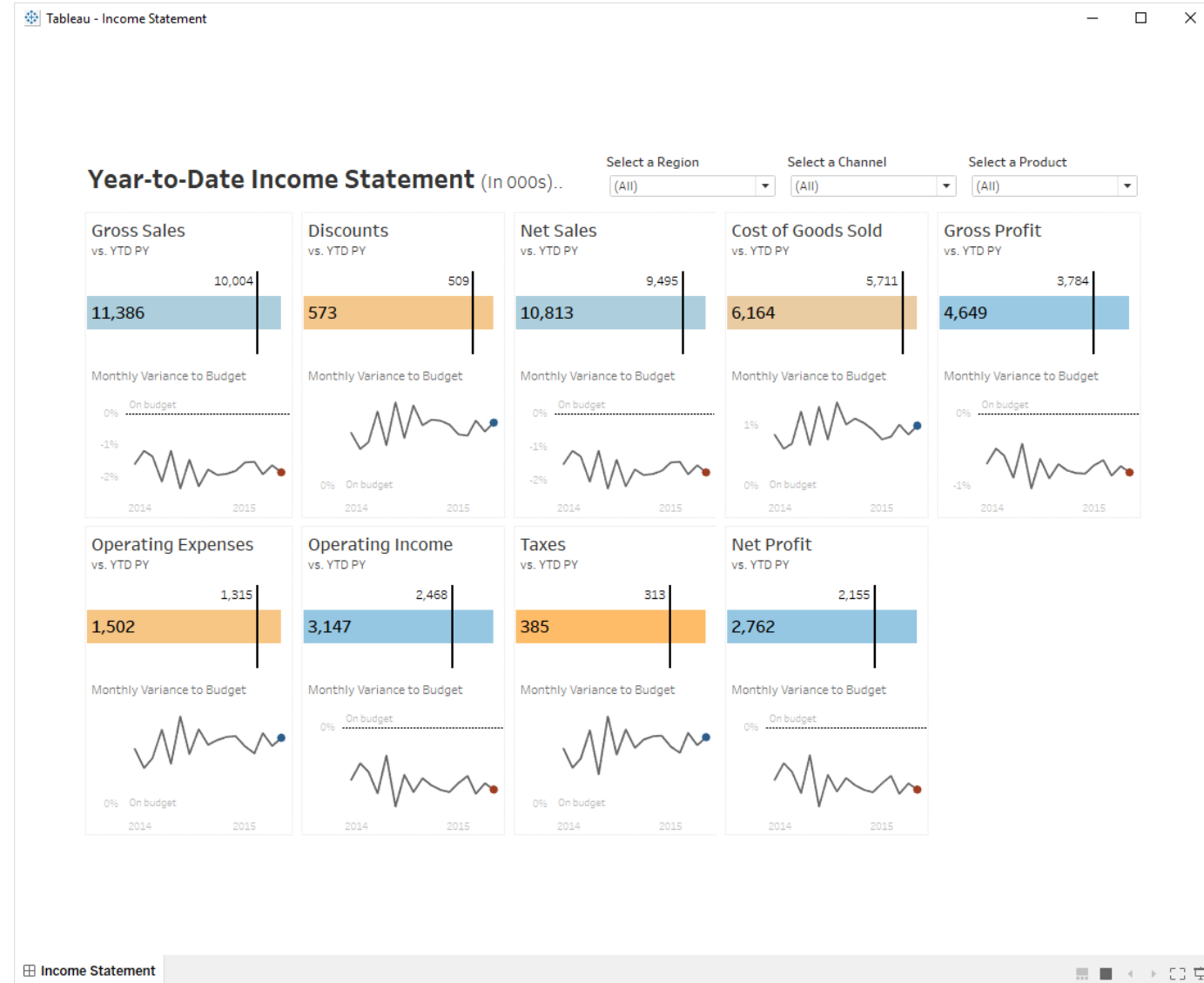
- Log files
 - Desktop Analysis
 - Tableau Log Viewer
 - Log Shark
 - Server Performance Views
 - Browser Tools / Network Tracers
 - TabMon
 - and
 - Tableau Server Management Add-On ☺
- Errors
- Usage
- Platform
- 360° View for Perf

Presentation



Presentation Layer

Concerned with Dashboards Worksheets



Dashboards

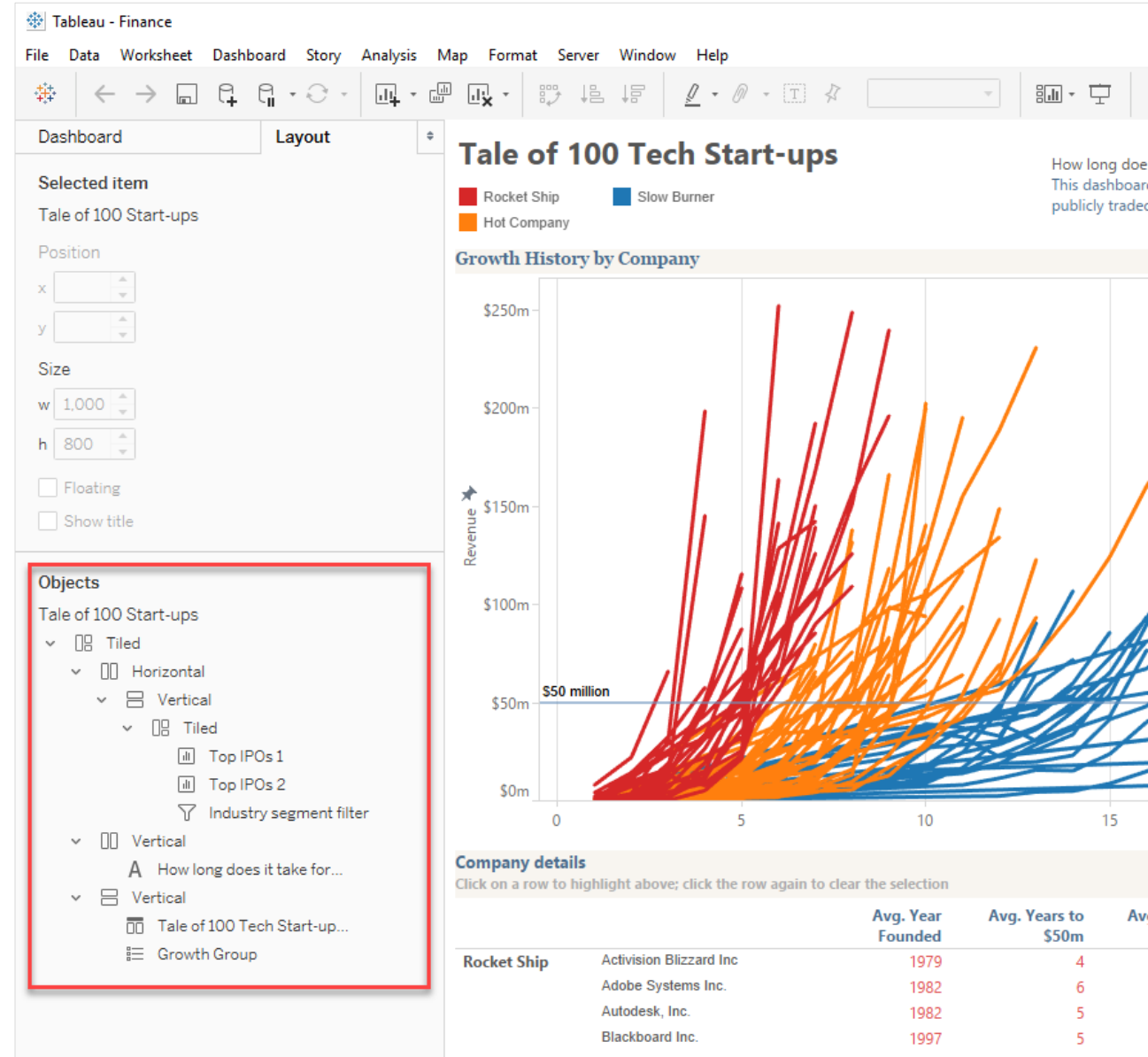
Made up of zones

Can be data driven

Worksheets, filters, parameters, page controls, legends

Or non-data driven

Text, images, web content, blanks, layout containers

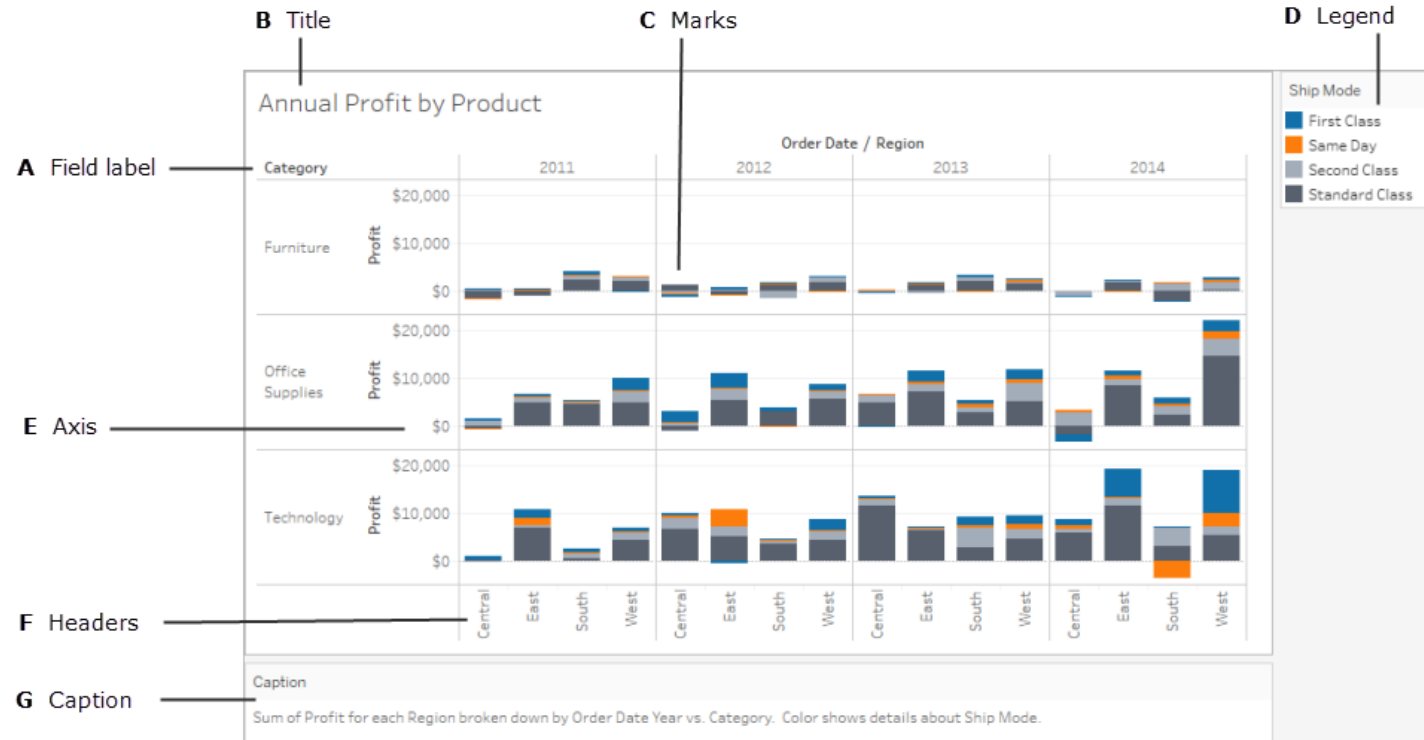


Worksheets

The main data driven zone is the worksheet

It's made up of

Headers, axes, panes, cells, marks, titles, captions, field labels, legends



Worksheets—Best Practice



Keep worksheets simple

Minimise the number of marks

Don't retrieve data you don't need
Don't render data you can't see

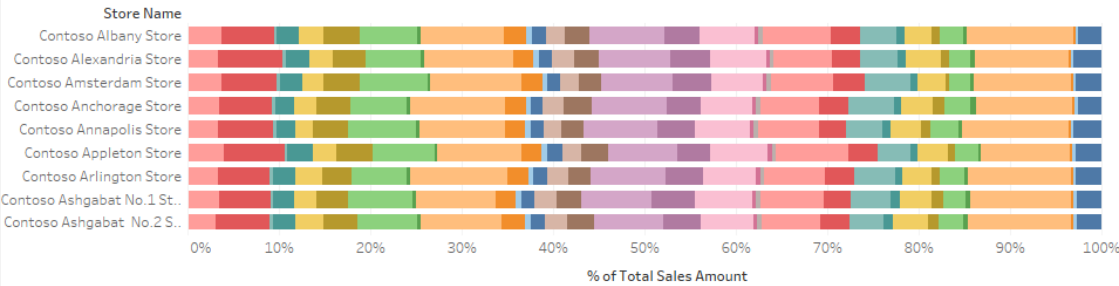
Data Source	Population	Health Indicators	Care Spend
208 marks	row by 1 column	SUM of AVG(Birth Rate): 429.6%	

Report

1 January 2007 to 31 December 2009

Country	State/Province	Manufacturer	Product Subcategory	Number of Recs	Discount Qty	Return Qty	Sales Qty	Sales Amount	Total Cost	
Armenia	Armenia	A. Datum Corporation	Digital Cameras	478	650	65	5,572	\$1,108,653.35	\$466,541.25	
			Digital SLR Cameras	168	213	25	1,800	\$787,512.60	\$301,312.61	
		Adventure Works	Coffee Machines	103	147	8	1,234	\$395,323.16	\$182,878.75	
			Desktops	132	175	17	2,688	\$1,180,397.13	\$573,141.84	
			Lamps	200	271	23	2,504	\$457,661.48	\$201,625.19	
			Laptops	147	149	17	1,655	\$1,063,995.11	\$466,333.34	
			Monitors	118	149	8	1,402	\$365,090.00	\$140,086.10	
			Televisions	192	223	22	2,188	\$1,012,333.39	\$422,717.62	
		Contoso, Ltd	Air Conditioners	169	246	21	1,944	\$644,426.55	\$288,255.79	
			Cameras & Camcord..	280	378	38	3,472	\$180,302.13	\$84,091.42	
			Cell phones Accesso..	136	178	19	36,660	\$382,150.71	\$188,036.20	
			Coffee Machines	121	180	18	1,376	\$482,541.26	\$213,484.69	
			Computers Accessori..	586	857	87	7,006	\$224,248.27	\$101,217.42	
			Digital SLR Cameras	146	207	24	1,619	\$726,252.40	\$278,736.55	
			Home & Office Phon..	463	659	66	5,029	\$144,073.31	\$63,894.04	
			Home Theater Syste..	230	349	33	2,592	\$1,083,322.30	\$496,309.57	

Store Name



Product Subcategory

- Water Heaters
- Washers & Drye..
- VCD & DVD
- Touch Screen Ph..
- Televisions
- Smart phones & ..
- Refrigerators
- Recording Pen
- Projectors & Scr..
- Printers, Scann..
- MP4&MP3
- Movie DVD
- Lamps
- Home Theater S..
- Home & Office P..
- Fans
- Download Games
- Digital SLR Cam..
- Digital Cameras
- Desktops
- Computers Acce..
- Coffee Machines
- Cell phones Acc..
- Car Video
- Cameras & Cam...
- Camcorders
- Boxed Games
- Bluetooth Head..
- Air Conditioners

Country

- ☒ Armenia
- ☒ Australia
- ☒ Bhutan
- ☒ Canada
- ☒ China
- ☒ Denmark
- ☒ France
- ☒ Germany
- ☒ Greece
- ☒ India

State/Province

- ☒ Ahal Province
- ☒ Alaska
- ☒ Alberta
- ☒ Alpes-Maritimes
- ☒ Armenia
- ☒ Bas-Rhin
- ☒ Bavaria
- ☒ Beijing
- ☒ Berlin
- ☒ Bern

Manufacturer

- ☒ A. Datum Corporation
- ☒ Adventure Works
- ☒ Contoso, Ltd
- ☒ Fabrikam, Inc.
- ☒ Litware, Inc.
- ☒ Northwind Traders
- ☒ Proseware, Inc.
- ☒ Southridge Video
- ☒ Tailspin Toys
- ☒ The Phone Company

Product Subcategory

- ☒ Air Conditioners
- ☒ Bluetooth Headphones
- ☒ Boxed Games
- ☒ Camcorders
- ☒ Cameras & Camcorde..
- ☒ Car Video
- ☒ Cell phones Accessori..
- ☒ Coffee Machines
- ☒ Computers Accessori..
- ☒ Desktops

Worksheets—Best Practice



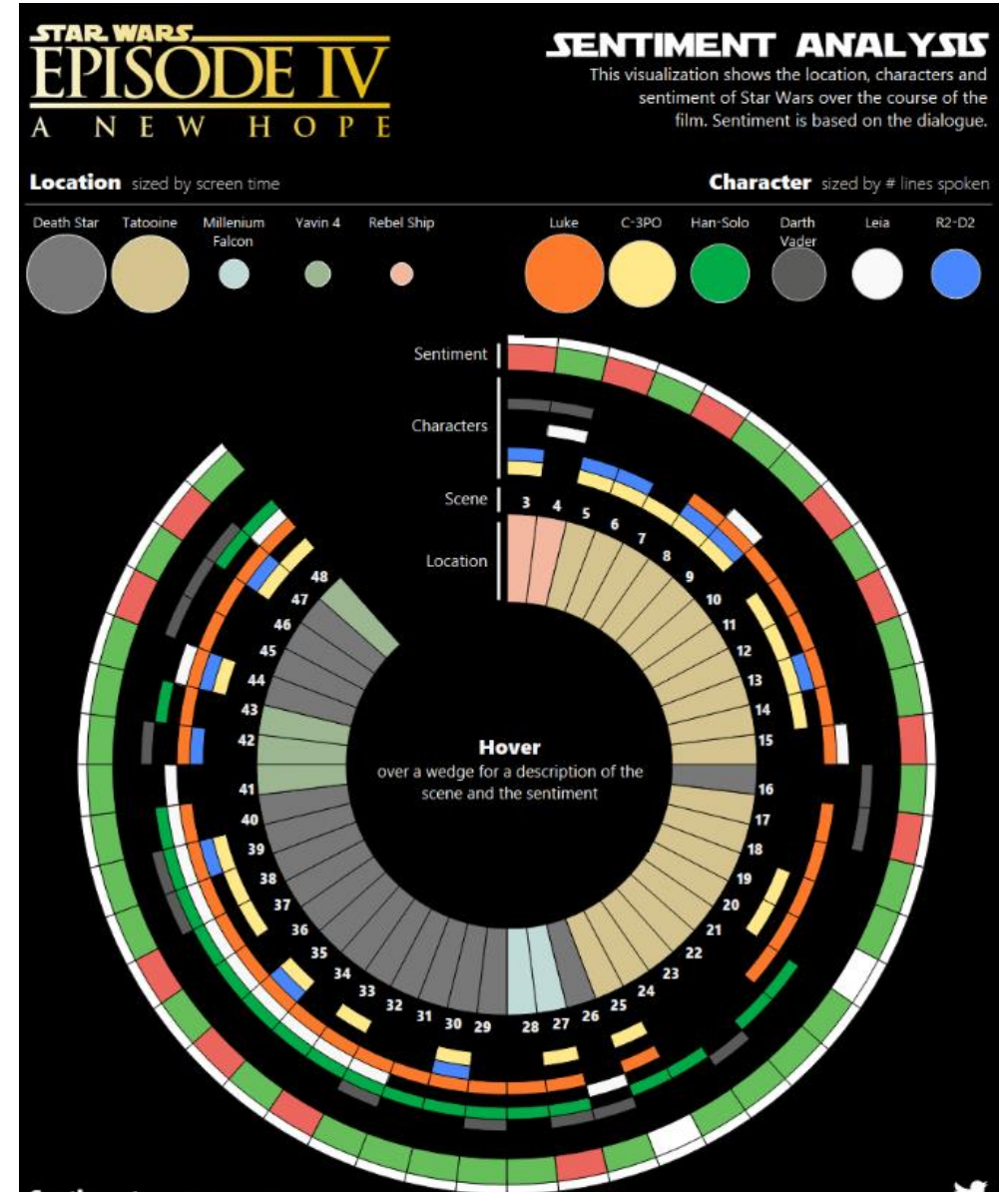
Not all marks are the same

Avoid:

Polygon marks

Manufactured chart styles like donut, Sankey, sigmoid curved lines, etc.

Maps, if you don't really need them—tiles can take time to load



Dashboards

Interacting with dashboard elements can trigger events

Filters

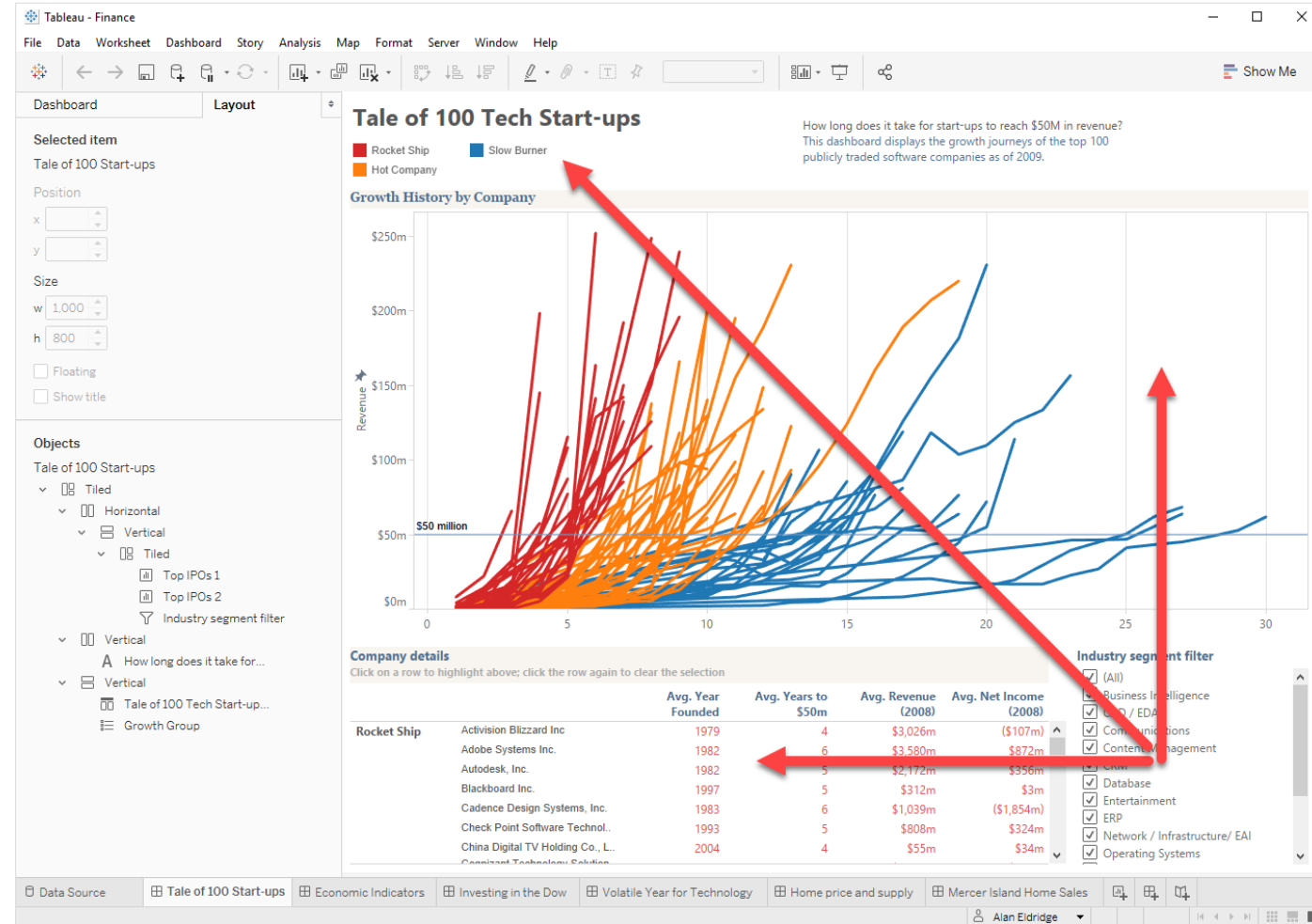
Parameters

Highlighting

Pages

Actions—filter, highlight, URL

Can cause other dashboard elements to update

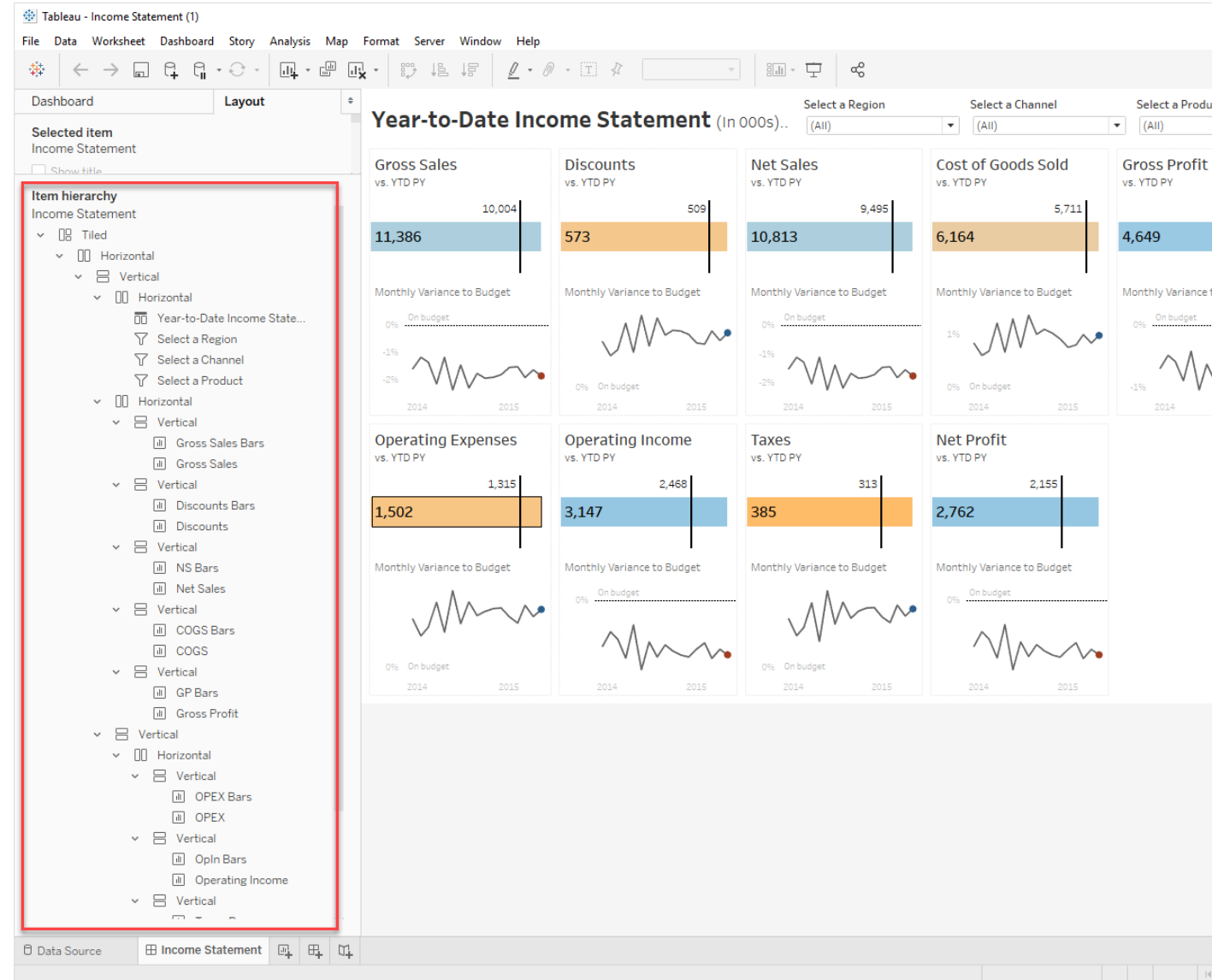


Dashboards—Best Practices



Minimise number of zones

Each data driven zone
= 1 query



Dashboards—Best Practices



Minimise the complexity of each zone

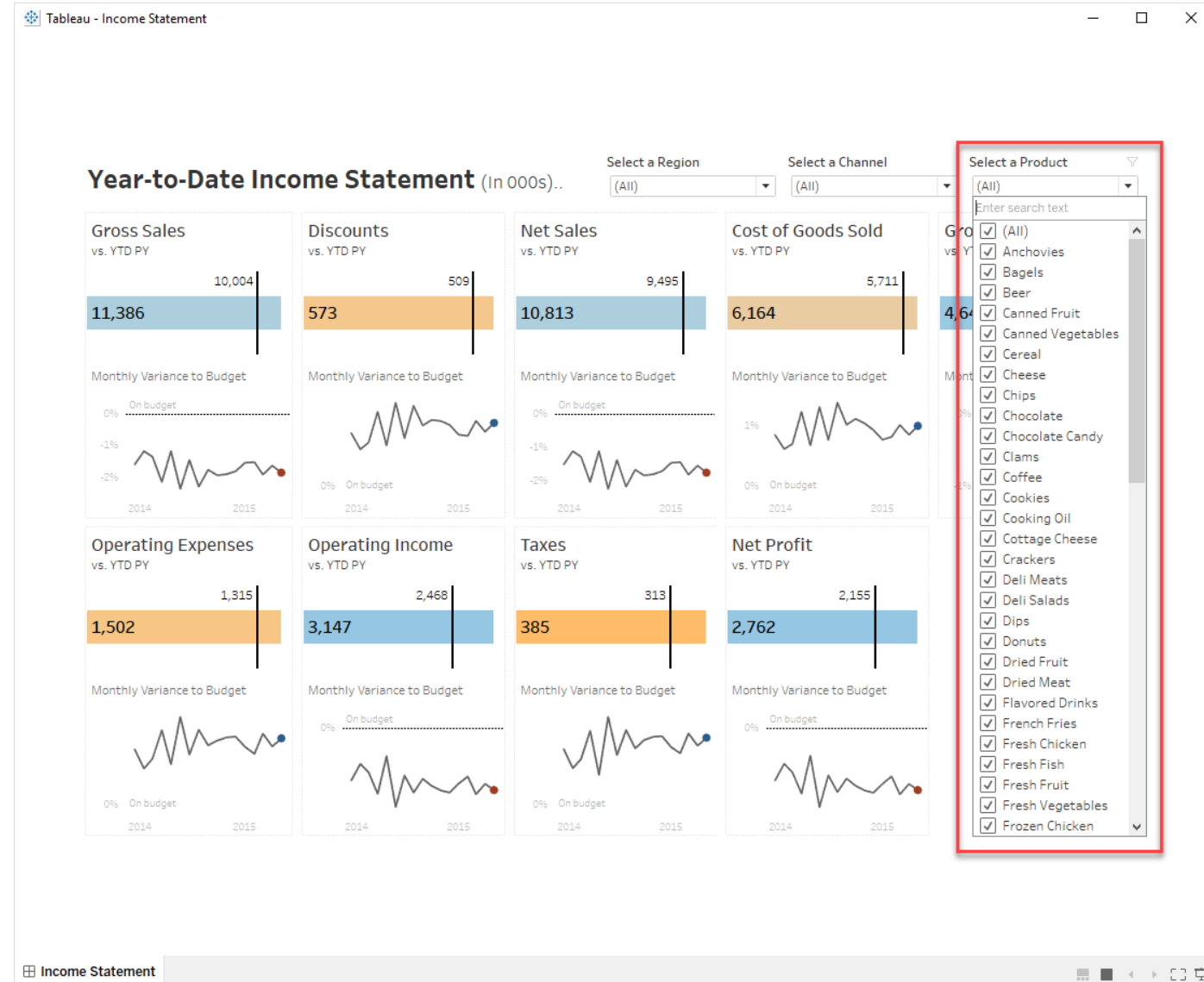
Keep worksheets as simple as possible

Avoid:

Large, enumerated filters,
parameter lists, legends

Large, high resolution images

Complex embedded web parts



Dashboards—Best Practices



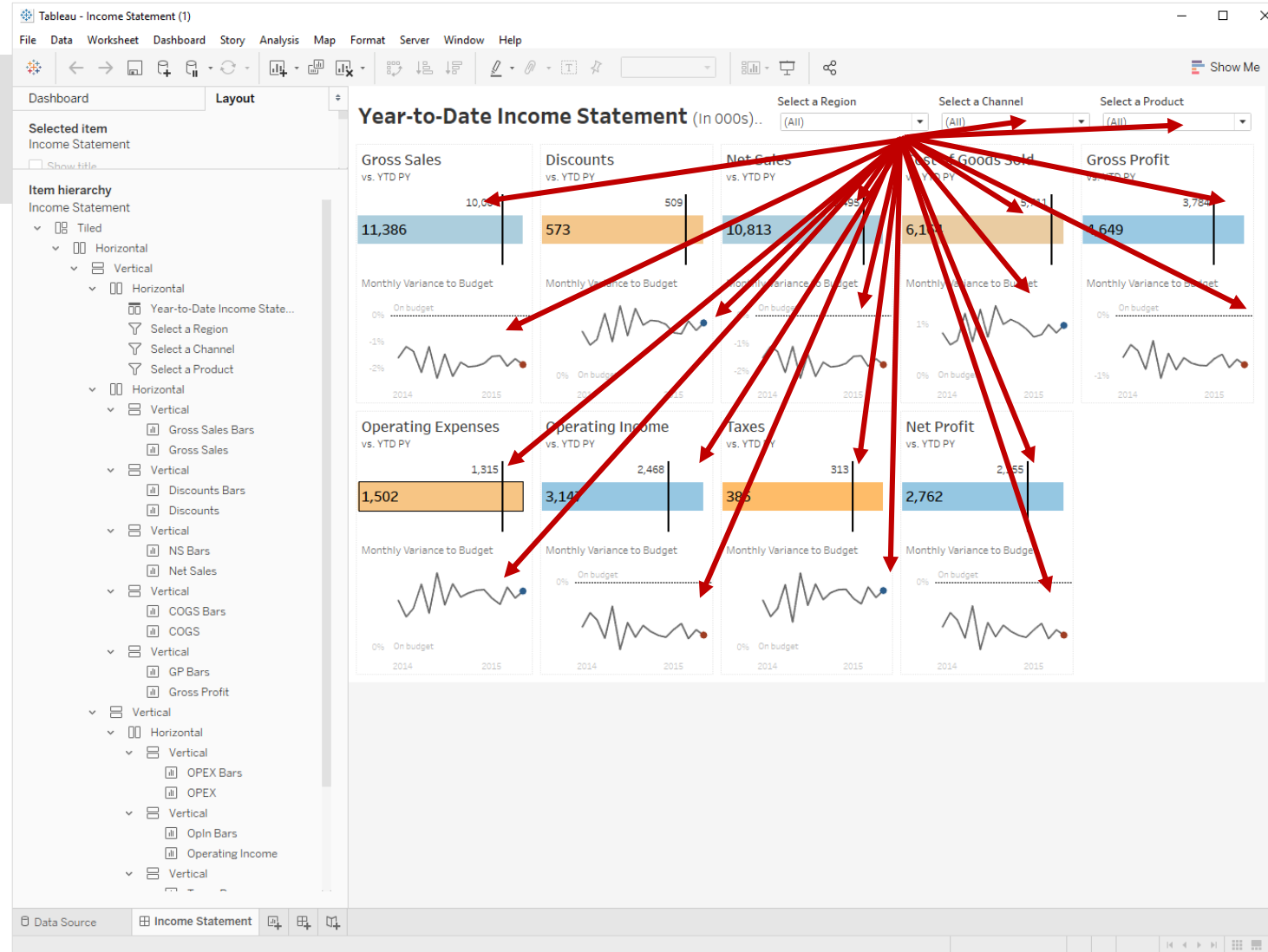
Minimise the scope and impact of updates

Be conscious of the impact of:

Global filters

Filters that apply to all sheets on a dashboard

Filters with “show relevant values”



Dashboards—Best Practices



Maximise the effectiveness of caches

Try to:

Set dashboards and stories to fixed size

Use client-side rendering where possible

SQL Editor		Graphical Query Builder
Previous queries		
<pre>select http_referer from http_requests where http_referer like '%size%'</pre>		
Output pane		
Data Output		Explain Messages History
http_referer character varying(255)		
1	http://localhost/vizql/showadminview/tabbed admin views/BackgroundTasksforNonExtracts?size=1272,1055&embed=	
2	http://localhost/vizql/showadminview/tabbed admin views/BackgroundTasksforNonExtracts?size=1272,1055&embed=	
3	http://localhost/vizql/showadminview/tabbed admin views/BackgroundTasksforNonExtracts?size=1272,1055&embed=	
4	http://localhost/vizql/showadminview/tabbed admin views/BackgroundTasksforNonExtracts?size=1272,1055&embed=	
5	http://localhost/vizql/showadminview/tabbed admin views/BackgroundTasksforNonExtracts?size=1272,1055&embed=	
6	http://localhost/vizql/showadminview/tabbed admin views/BackgroundTasksforNonExtracts?size=1272,1055&embed=	
7	http://localhost/vizql/showadminview/tabbed admin views/BackgroundTasksforNonExtracts?size=1272,1055&embed=	
8	http://localhost/vizql/showadminview/tabbed admin views/BackgroundTasksforNonExtracts?size=1272,1055&embed=	
9	http://localhost/views/Superstore/Overview?size=1263,531&embed=ys:showVizHome=ns:bootstrapWhenNotified=ys	
10	http://localhost/views/Superstore/Overview?size=1263,531&embed=ys:showVizHome=ns:bootstrapWhenNotified=ys	
11	http://localhost/views/Superstore/Overview?size=1263,531&embed=ys:showVizHome=ns:bootstrapWhenNotified=ys	
12	http://jswickard4/views/Attribute-Customer-Name/Sheet1?size=1247,521&embed=ys:showVizHome=ns:bootstrapWhe	
13	http://jswickard4/views/Attribute-Customer-Name/Sheet1?size=1247,521&embed=ys:showVizHome=ns:bootstrapWhe	
14	http://jswickard4/views/Attribute-Customer-Name/Sheet1?size=1247,521&embed=ys:showVizHome=ns:bootstrapWhe	
15	http://jswickard4/views/Attribute-Customer-Name/Sheet1?size=1247,521&embed=ys:showVizHome=ns:bootstrapWhe	
16	http://jswickard4/views/Attribute-Customer-Name/Sheet1?size=1247,521&embed=ys:showVizHome=ns:bootstrapWhe	
17	http://jswickard4/views/Attribute-Customer-Name/Sheet1?size=1903,931&embed=ys:showVizHome=ns:bootstrapWhe	
18	http://jswickard4/views/Attribute-Customer-Name/Sheet1?size=1903,931&embed=ys:showVizHome=ns:bootstrapWhe	
19	http://jswickard4/views/Attribute-Customer-Name/Sheet1?size=1903,931&embed=ys:showVizHome=ns:bootstrapWhe	
20	http://jswickard4/views/Attribute-Customer-Name/Sheet1?size=1903,931&embed=ys:showVizHome=ns:bootstrapWhe	

OK.

A Sidebar on Caching...

Tableau tries to reuse as much of its work as it can

There are many caches:

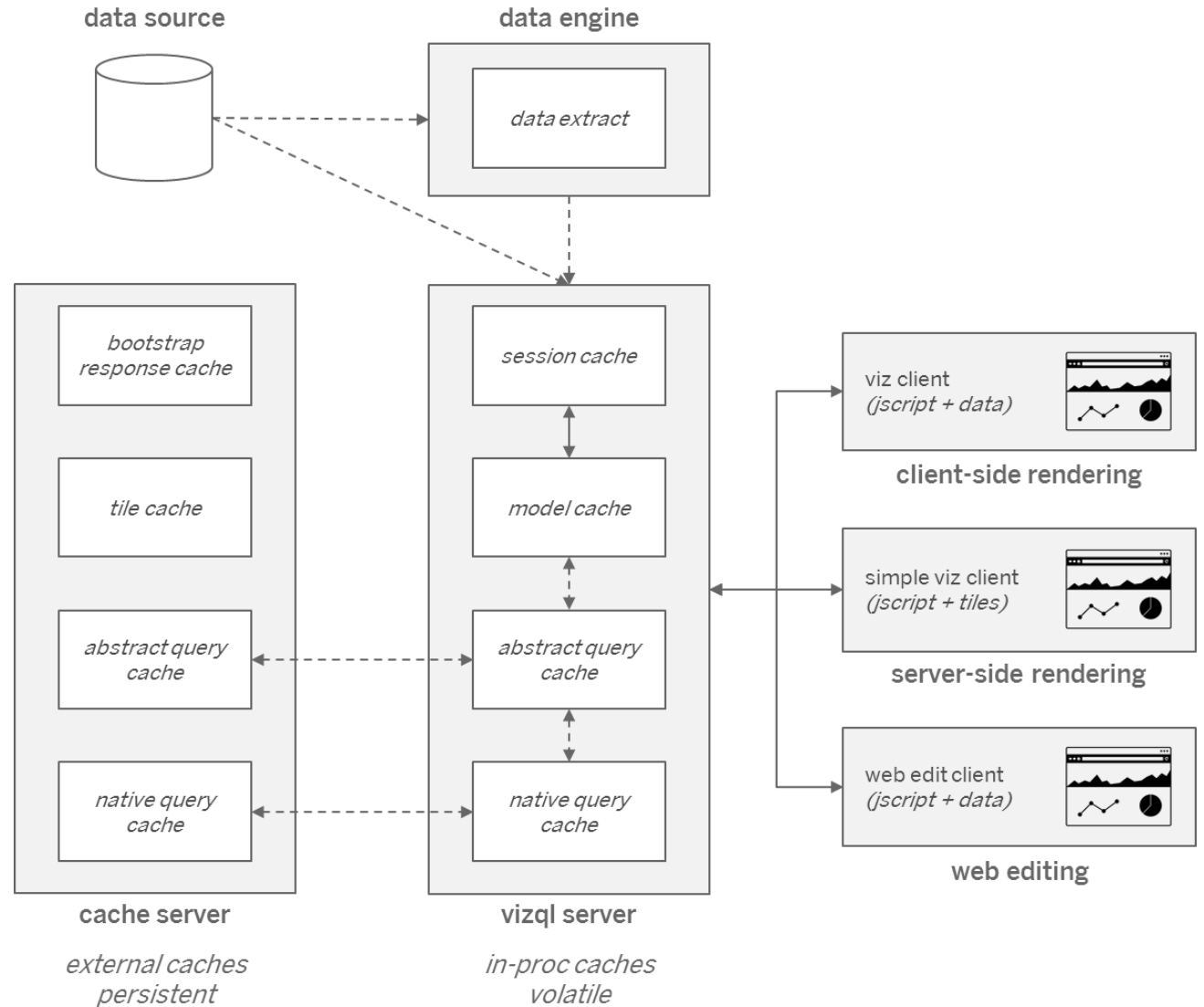
Browser data cache

Model cache

Tile cache

Query cache

Bootstrap response cache

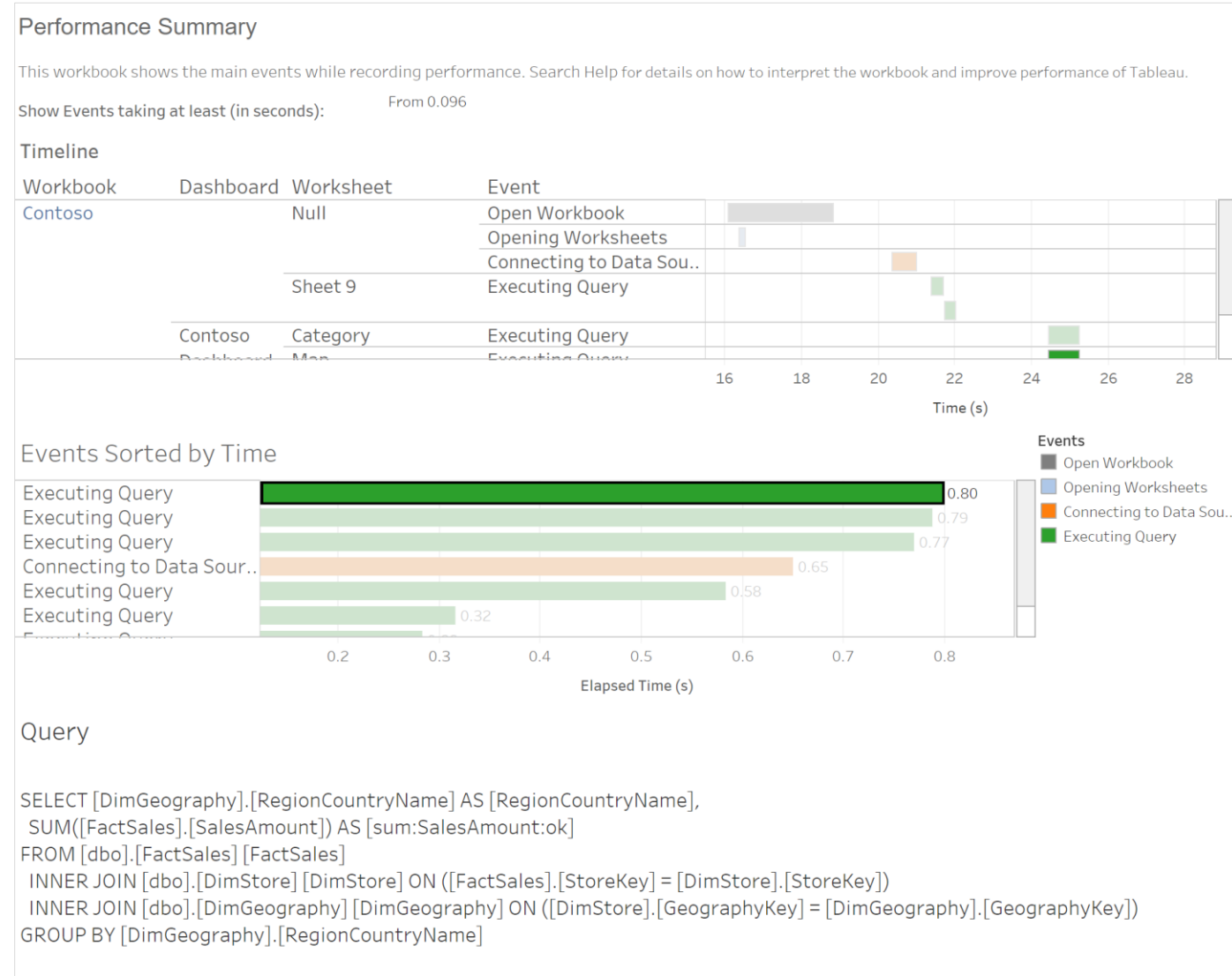


A Sidebar on Query Optimisation...

Tableau is very clever
and will try to reduce the
number and complexity
of queries it has to run

It uses:

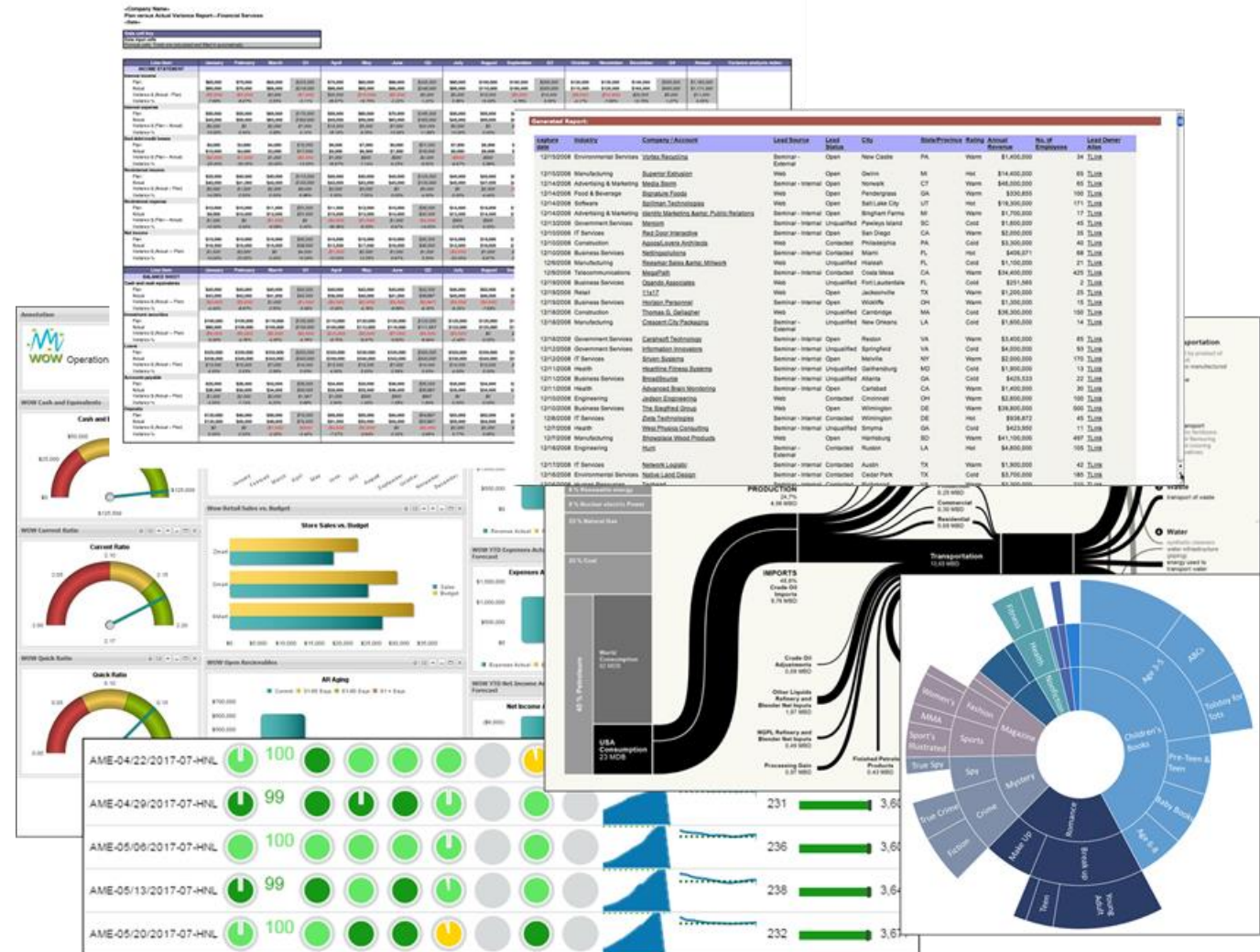
- Abstract queries
- Parallel queries
- Query fusion
- Constant folding
- ...



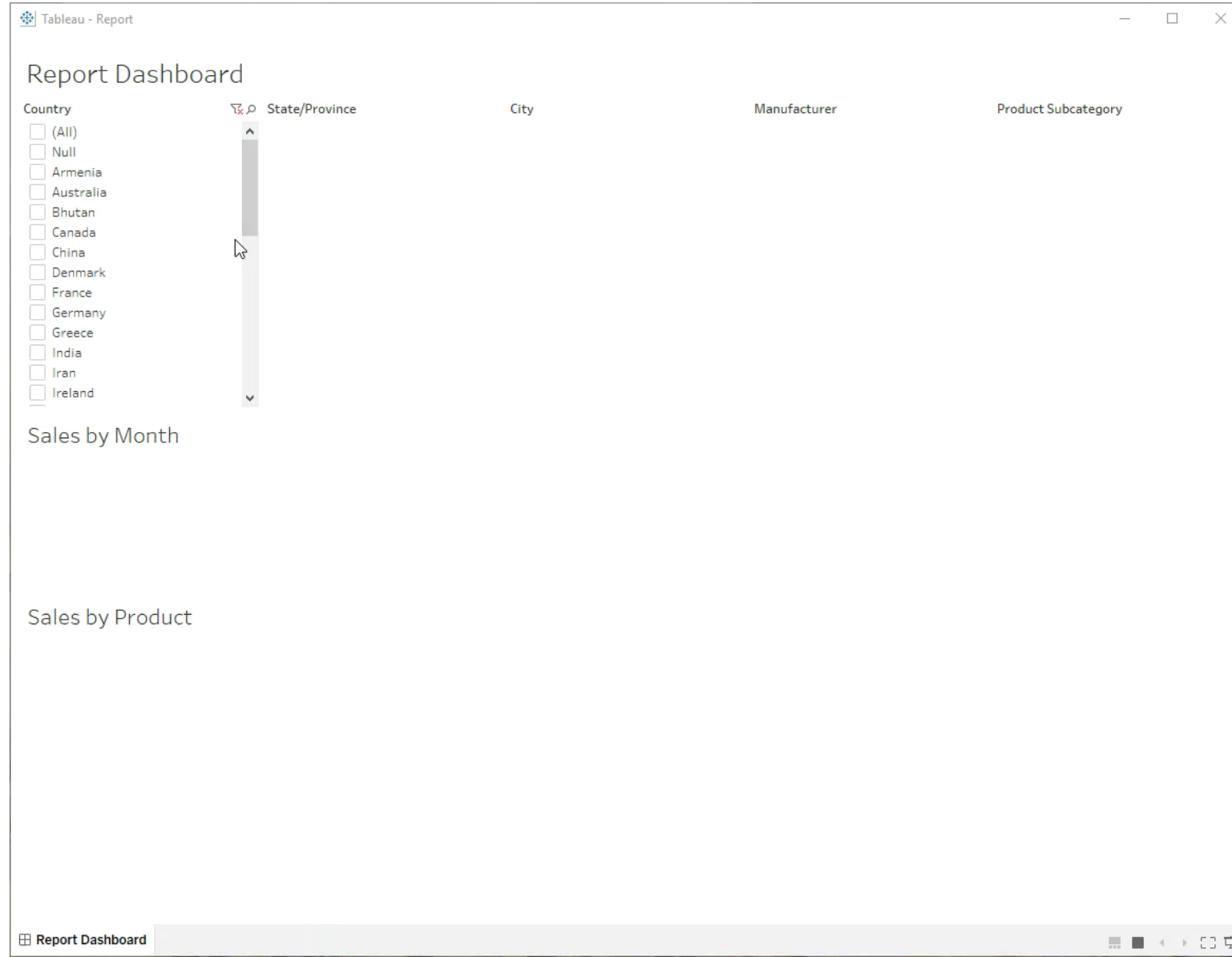
Dashboard Design: by the example

Poor choice in dashboard design is the most common cause of poor dashboard performance

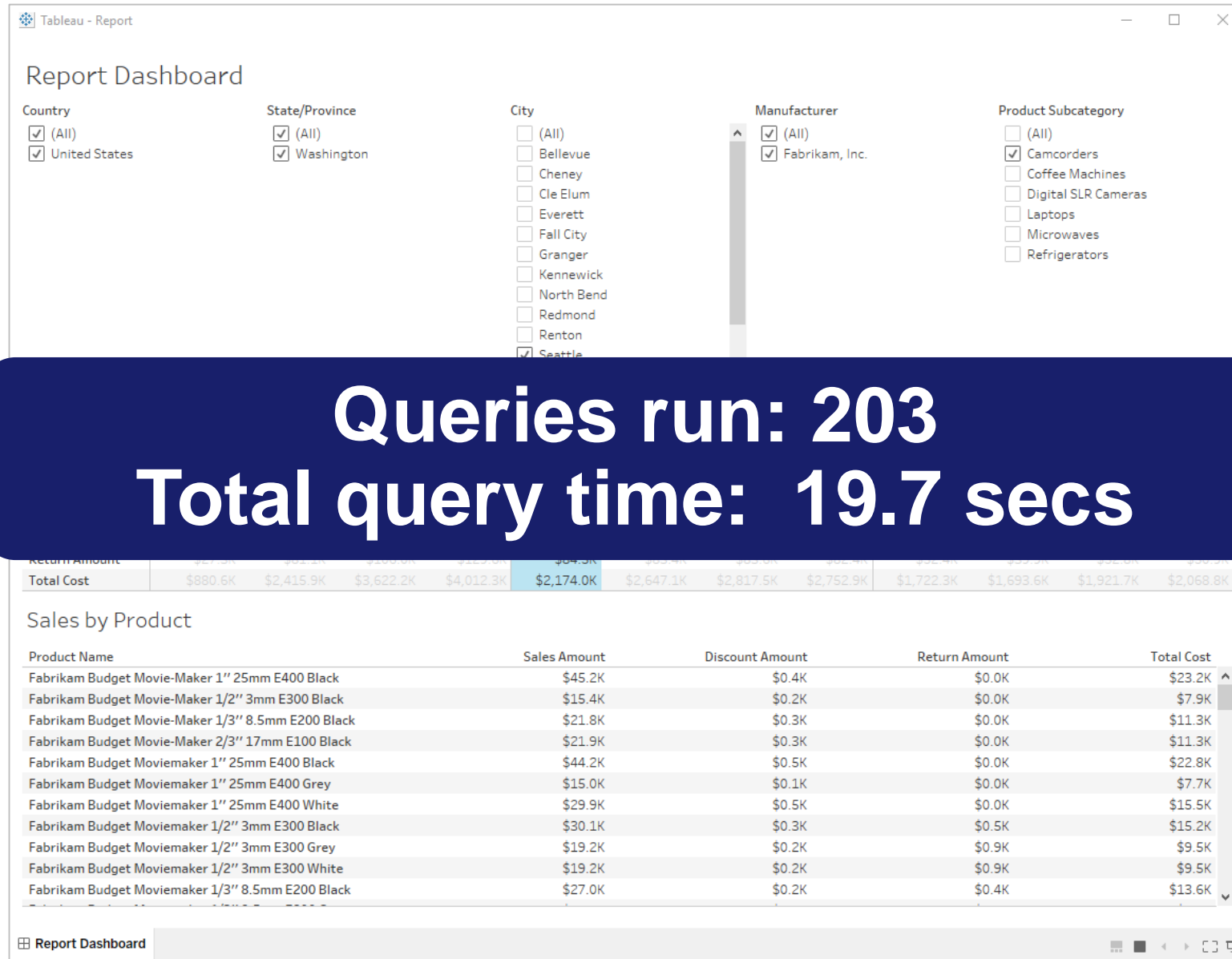
Fortunately, it's the easiest thing to fix (and avoid in future)



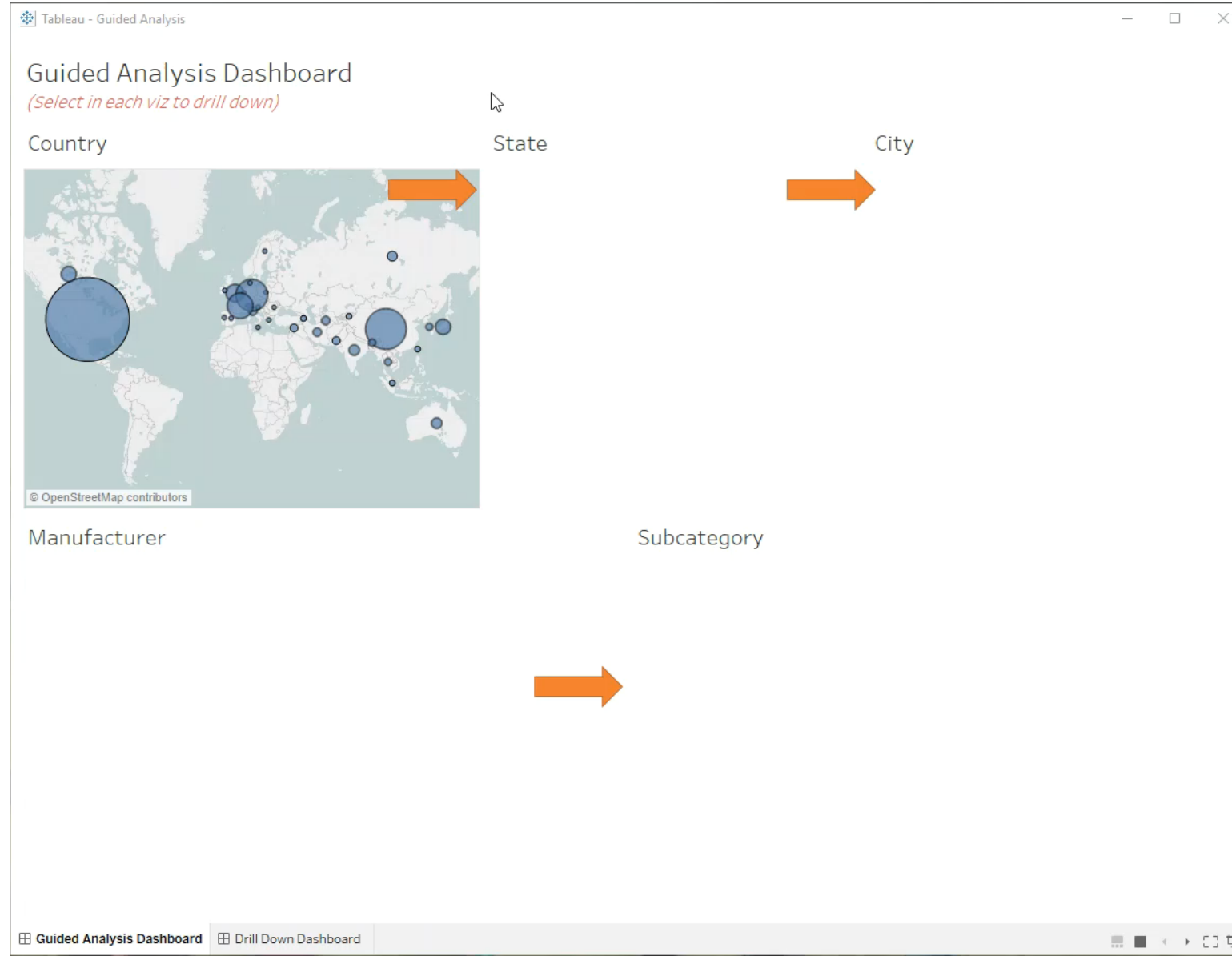
Dashboard Design: by the example



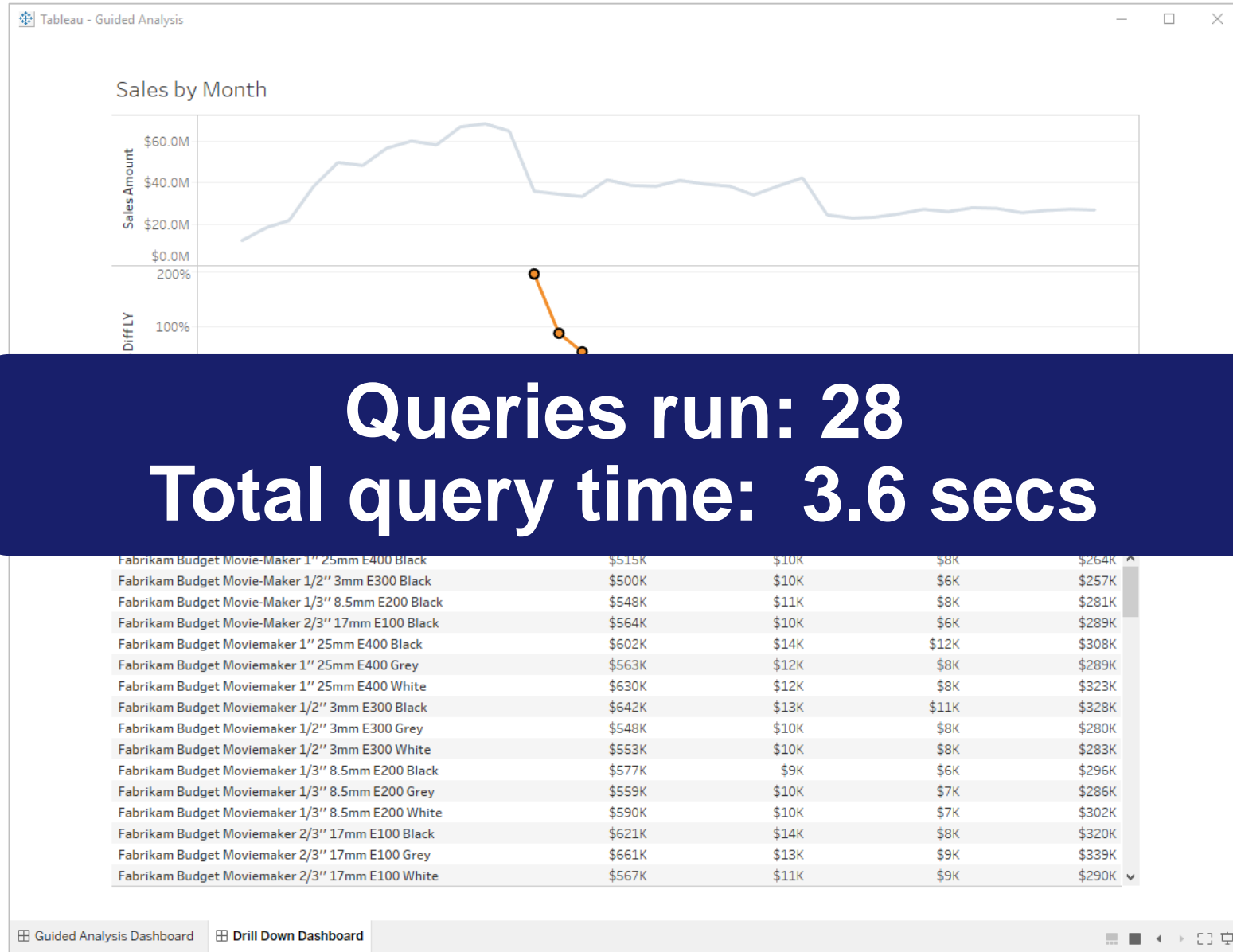
Dashboard Design: by the example



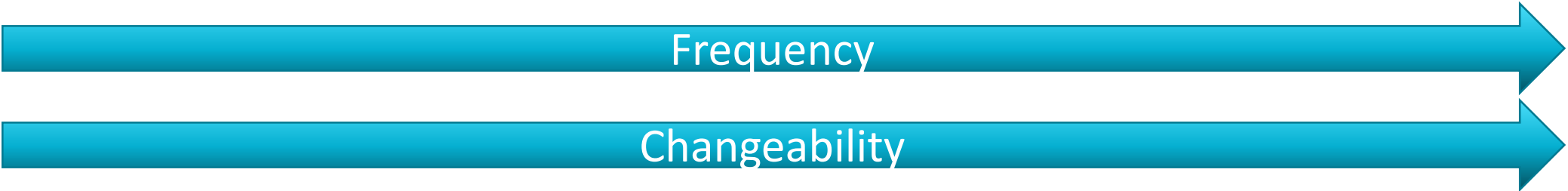
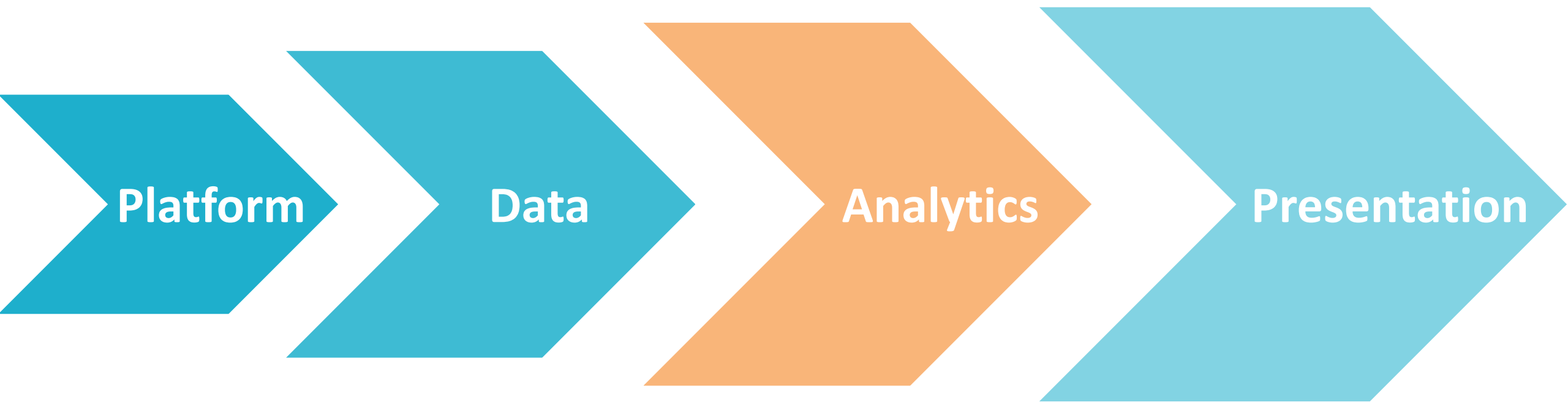
Dashboard Design: by the example



Dashboard Design: by the example



Analytics



Analytics Layer

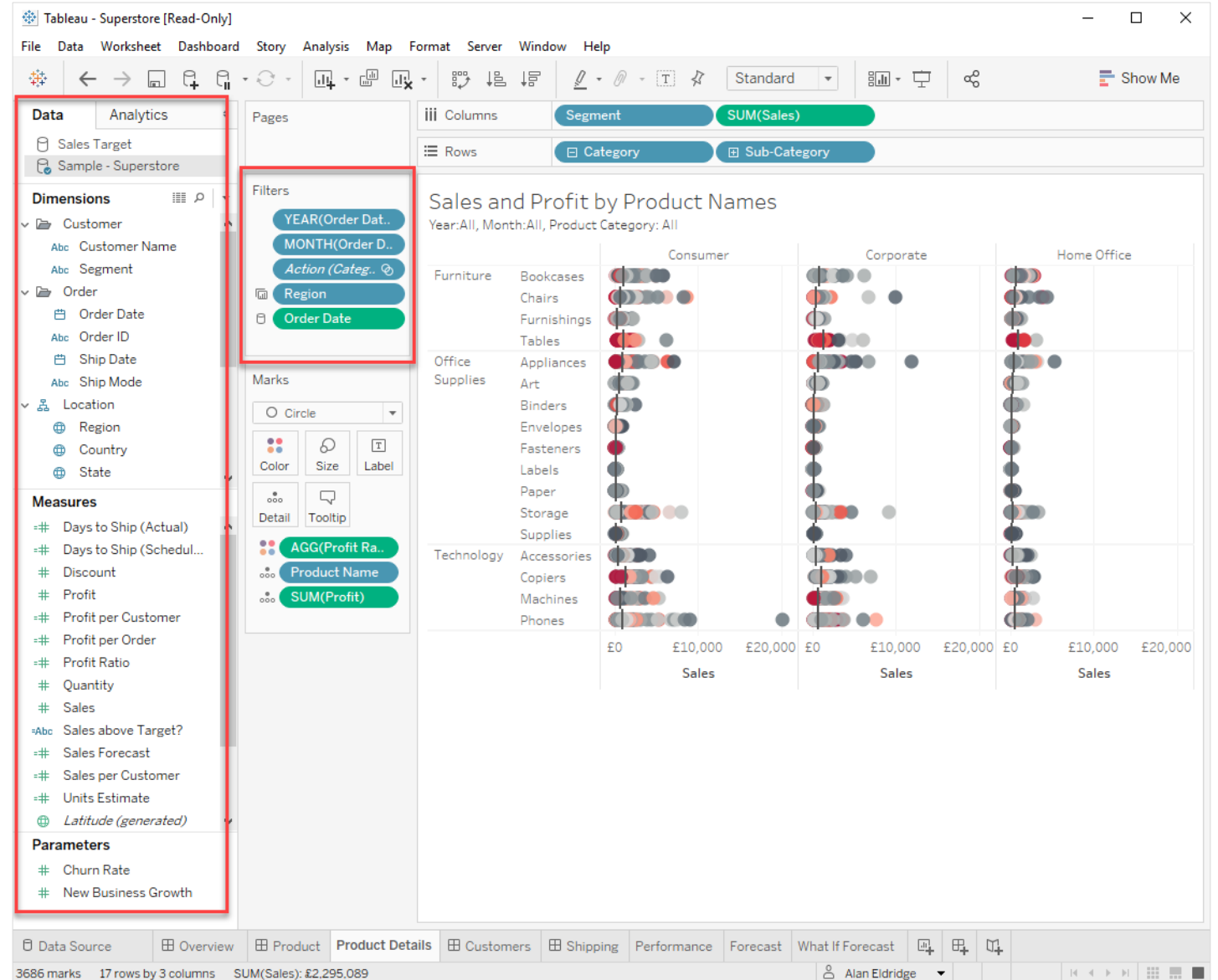
Concerned with:

Data elements

Filters

Calculations

Working across data sources



Data Elements



Native vs. Converted Type

Minimise data type casting

Convert at the data source if possible

Dimensions



Date Iso



Number (decimal)

Number (whole)

Date & Time



Date

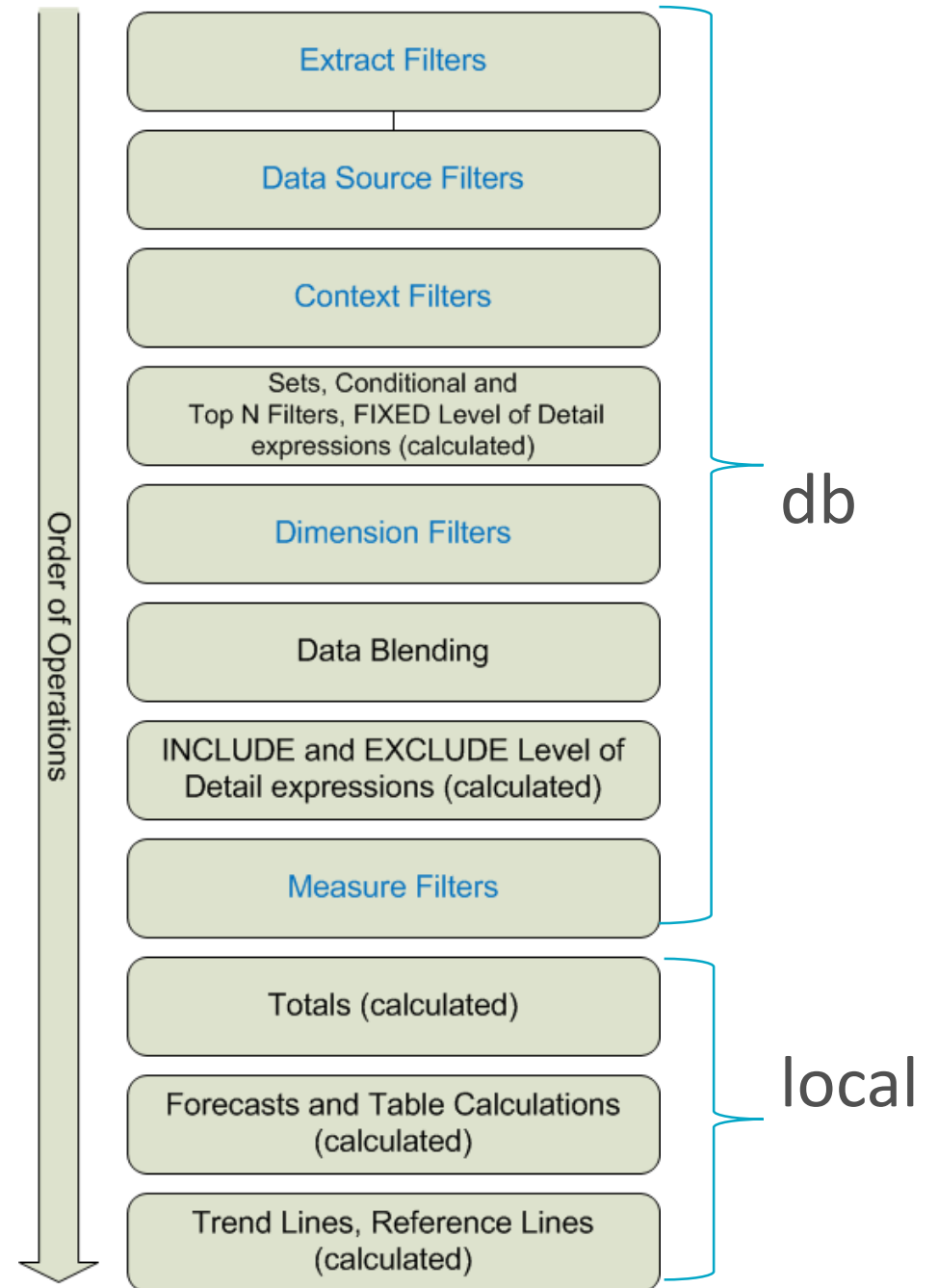
String

Default

Filters

Are applied at different stages within the computation pipeline

Some pass through to the data source, others are applied after



Filters



Use the most appropriate type of filters

Discrete vs. ranged

Enumerated vs. non-enumerated

Aggregate vs. row level

Dates!

Slicing filters

Sets

Cross data source

Customize > show “Apply” button

“Begin with the End in Mind”

Filter [Inclusions (Sa1 Main16, Ste Name16)]

General Condition

☒ Select from list ☐ Use all

Enter search text

- ☐ 10102100701, New South Wales
- ☐ 10102100702, New South Wales
- ☐ 10102100703, New South Wales
- ☐ 10102100704, New South Wales
- ☐ 10102100705, New South Wales
- ☐ 10102100706, New South Wales
- ☐ 10102100707, New South Wales
- ☐ 10102100708, New South Wales
- ☐ 10102100709, New South Wales
- ☐ 10102100710, New South Wales
- ☐ 10102100801, New South Wales

All None ☐ Exclude

Summary

Fields: [Sa1 Main16][Ste Name16]
Selection: Selected 5980 of 57523 values
Wildcard: All
Condition: None
Limit: None

Reset OK Cancel Apply

Filters

The screenshot displays the Tableau Desktop interface. The main view is a map of Western Australia, labeled "Discrete Attribute". The map is populated with numerous brown dots, representing data points. The interface includes a menu bar (File, Data, Worksheet, Dashboard, Story, Analysis, Map, Format, Server, Window, Help) and a toolbar. The left sidebar shows the "Data" pane with a list of dimensions and measures. The "Dimensions" list includes: Gcc Code16, Gcc Name16, Sa1 7Dig16, Sa1 Main16, Sa2 5Dig16, Sa2 Main16, Sa2 Name16, Sa3 Code16, Sa3 Name16, Sa4 Code16, Sa4 Name16, Ste Code16, Ste Name16, and Measure Names. The "Measures" list includes: Areasqkm16, Geometry, Latitude (generated), Longitude (generated), Number of Records, and Measure Values. The "Columns" shelf contains "Longitude (generated)" and the "Rows" shelf contains "Latitude (generated)". The "Marks" card is set to "Circle". The "Filters" shelf contains "Ste Name16: Wester...". A "Filter [Ste Name16]" dialog box is open, showing a list of Australian states and territories. The "General" tab is selected, and the "Select from list" option is chosen. The list includes: Australian Capital Territory, New South Wales, Northern Territory, Other Territories, Queensland, South Australia, Tasmania, Victoria, and Western Australia (which is checked). The "Summary" section shows: Field: [Ste Name16], Selection: Selected 1 of 9 values, Wildcard: All, Condition: None, Limit: None. The "OK" button is highlighted.

Tableau - Book1

File Data Worksheet Dashboard Story Analysis Map Format Server Window Help

Columns Longitude (generated)

Rows Latitude (generated)

Discrete Attribute

Ste Name16

Western Australia

Filter [Ste Name16]

General Wildcard Condition Top

Select from list Custom value list Use all

Enter search text

- ☐ Australian Capital Territory
- ☐ New South Wales
- ☐ Northern Territory
- ☐ Other Territories
- ☐ Queensland
- ☐ South Australia
- ☐ Tasmania
- ☐ Victoria
- ☒ Western Australia

All None Exclude

Summary

Field: [Ste Name16]

Selection: Selected 1 of 9 values

Wildcard: All

Condition: None

Limit: None

Reset OK Cancel Apply

Filters



Use “*Only Relevant Values*” Sparingly

Filter list is refreshed when any other filter is updated

Queries can span all tables in the model

Reduce effectiveness of Join Culling

Consider filtering from smaller data source

Apply to >> All Using Related Data Source

January 2018 feature: All Values in Hierarchy (Cascading Filters)

- All Using Related Data Sources
- All Using This Data Source
- Selected Worksheets...
- Only This Worksheet

- Only Relevant Values
- All Values in Hierarchy
- All Values in Database

- Edit Filter...
- Apply to Worksheets
- Format Filters...
- Customize
- ✓ Show Title
- Edit Title...
- Single Value (list)
- Single Value (dropdown)
- Single Value (slider)
- Multiple Values (list)
- Multiple Values (dropdown)
- Multiple Values (custom list)
- Wildcard Match
- Only Relevant Values
- All Values in Database
- Include Values
- Exclude Values
- Floating
- Fixed Height
- Edit Height...
- Select Layout Container
- Deselect
- Remove from Dashboard

Filters



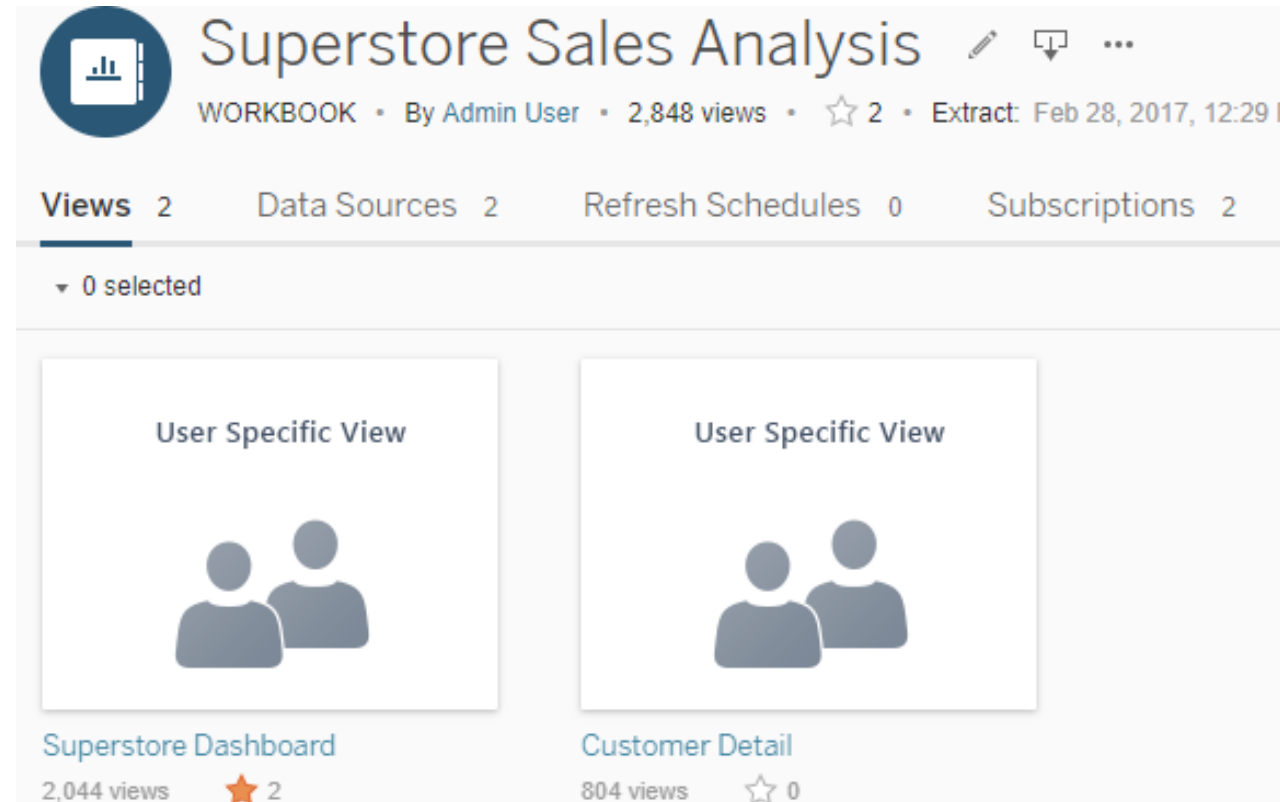
Understand impact of User Filters

Apply filters based on the user's identity

“Create user filter...”
or ISMEMBEROF()

Can have a dramatic effect on scalability as caching cannot be shared

Use prudently!



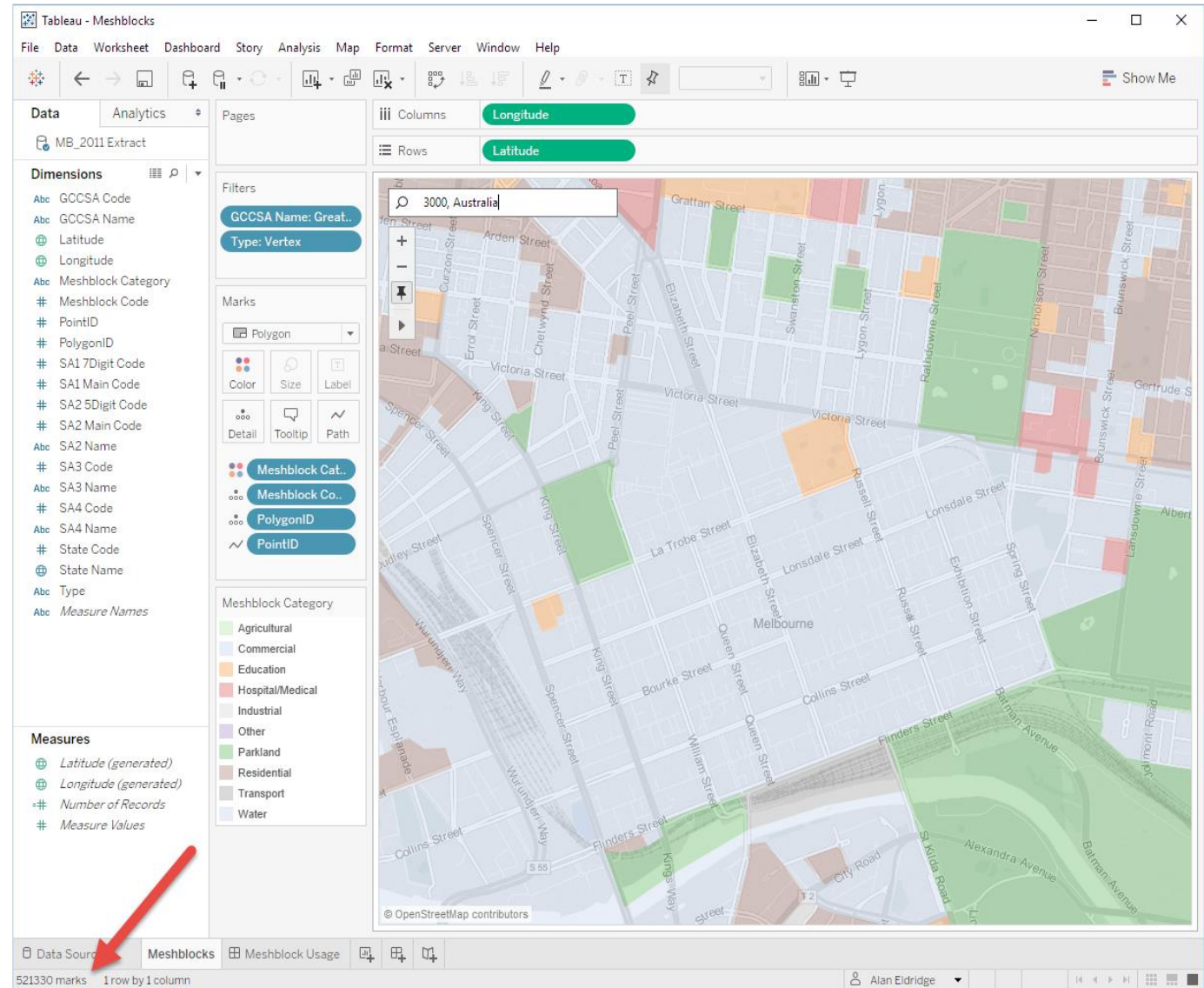
Filters

Filtering

Reduces the result set

Zooming

Doesn't change the result set, just the marks being rendered



Calculations



Understand where calculations are computed

Many types of calculations

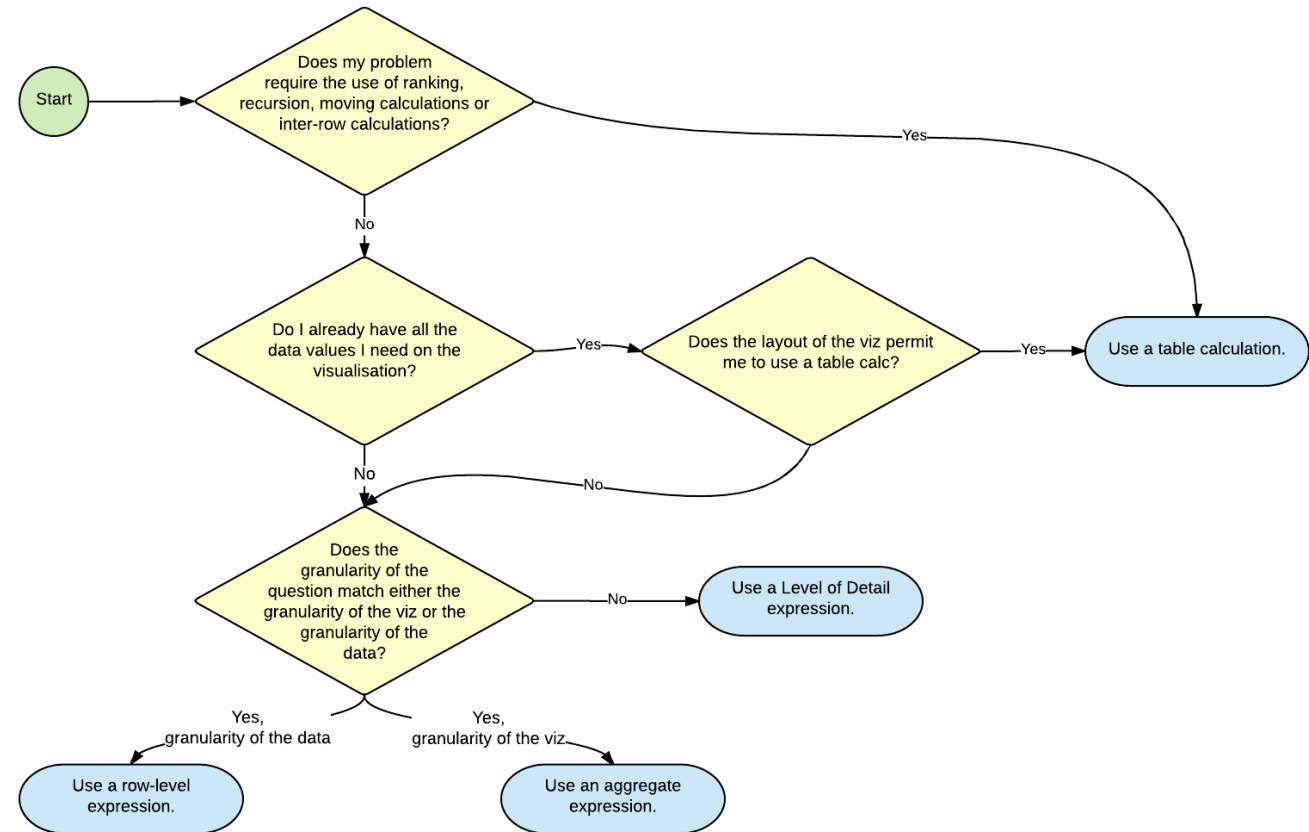
Row-level, aggregate, level-of-detail, table calcs

All apart from table calcs are passed to the underlying DB

External function calls (R/Python/MatLab) can be slow

Data is serialised to/from

Correct “compute using” can have dramatic impact



Calculations



Understand Impact of Data Types and Functions

Numbers > dates, Booleans > strings

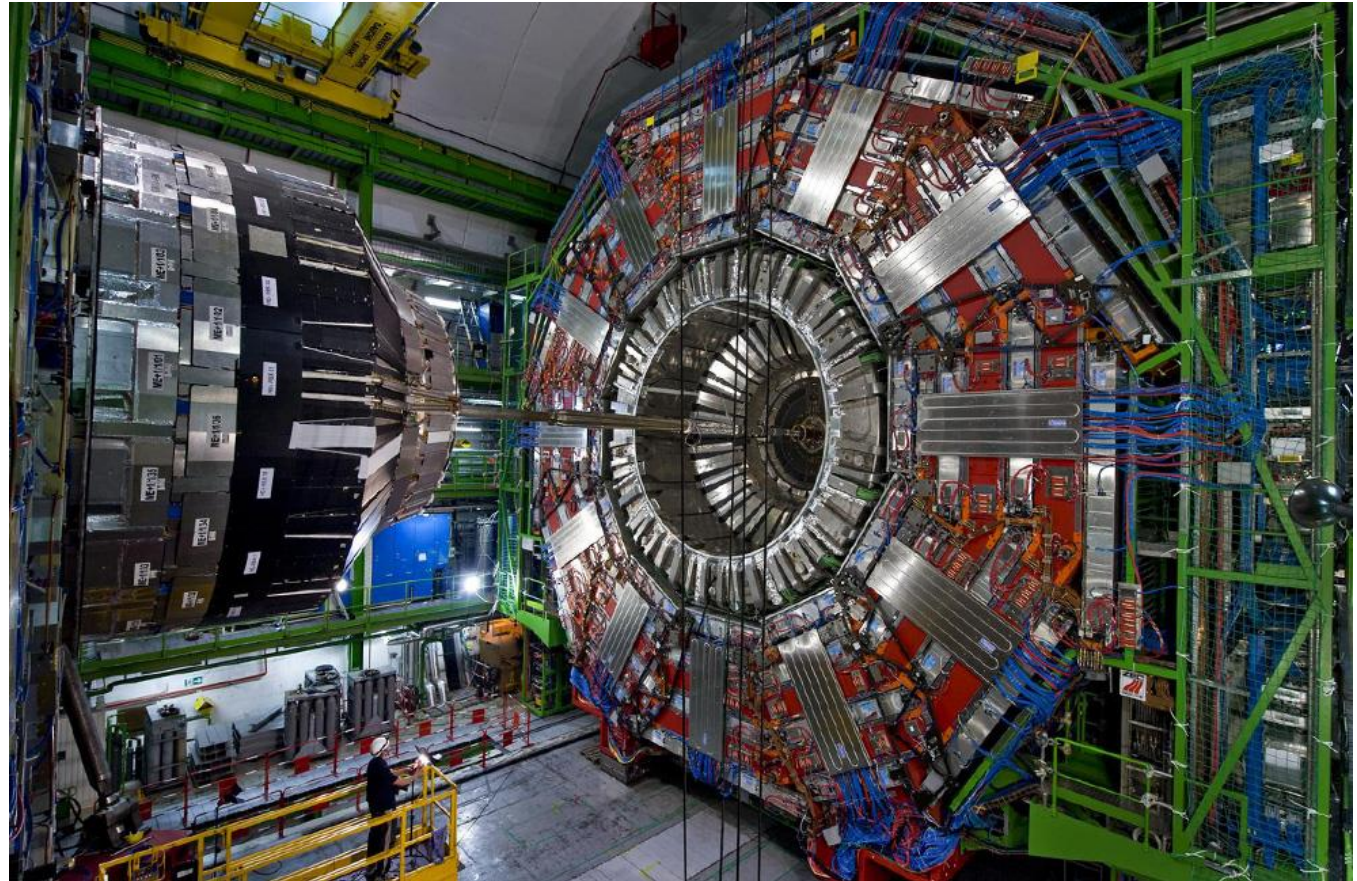
Expensive aggregation types:
`COUNTD()`, Percentile, etc.

`MIN()`, `MAX()` > `ATTR()`

LODs execute in the database

Create subqueries

Can be expensive over
large data



Calculations

Choice

×

```
case [Choose]
  when "A" then SUM([Sales Amount])
  when "B" then AVG([Discount Qty])
  when "C" then MIN([Sales Qty])
end
```

The calculation is valid.

Sheets Affected ▾

Apply

OK

We always
evaluate all
of them!

```
SELECT SUM([FactSales].[SalesAmount]) AS [TEMP(Calculation_2537215499680038912)],
(MIN([FactSales].[SalesQuantity])) AS [TEMP(Calculation_2537215499680038912)],
COUNT_BIG([FactSales].[DiscountQuantity]) AS [TEMP(Calculation_2537215499680038912)],
SUM(CAST([FactSales].[DiscountQuantity] as BIGINT)) AS
[TEMP(Calculation_2537215499680038912)]
FROM [dbo].[FactSales] [FactSales]
GROUP BY ()
```

Calculations

```
case [Parameters].[Data]
  when 'Enrollment (Headcount)' then [Count]
  when 'Enrollment (Seats)' then if count({Fixed [SurCl], [Sur P] :
max([Sur P]))> 10 then count({Include [SurCl], [Sur P]: max([Sur P]))}
END
  when 'Headcount (Running Sum)' then RUNNING_SUM(Sum(IF {Fixed [SurP (usv
FACT STDNT ENRL)], [Filter 3]: MIN([SurT (usv FACT STDNT ENRL)]} =
      {Fixed [SurT (usv FACT STDNT ENRL)], [Filter 3]: MIN([SurT
(usv FACT STDNT ENRL)]}) THEN 1 ELSE 0 END))
  when 'Class Sections' then countd([SurCl])
  when 'Instructors' then countd([Instructor ID])
  when 'FTE' then round(sum({Fixed [Sur PIYCT], [SurCl]: min([Units
Taken])/15}),1)
  when 'Weighted SCH' then round(sum({Fixed [Sur PIYCT], [SurCl]:
min([Weighted SCH]))},0)
  when 'Tuition and Fees' then round(sum({Fixed [Sur PIYCT]: min([Tuition
and Fees]))},0)
  when 'Tuition and Fees (Average)' then round(avg({Fixed [Sur PIYCT] :
min([Tuition and Fees]))},0)
  when 'FTE/Instructor' then round(sum({Fixed [Sur PIYCT], [SurCl]:
max([Units Taken])/15})/countd([Instructor ID]),1)
  when 'Age Value' then round(avg({Fixed [Sur PIYCT]: min([Age
Value]))},1)
  when 'FTE/Enrollment' then round(sum({Fixed [Sur PIYCT], [SurCl]:
min([Units Taken])/15})/[Count],3)
  when 'HS GPA' then round(avg({Fixed [Sur PIYCT] : min(case
[HS_GPA_Exists]
  when 'Y' then [HS GPA]end })),2)
  when 'ACT_COMP' then round(avg({Fixed [Sur PIYCT] : min(if [ACT_COMP] >
0 then [ACT_COMP] end })),2)
```

```
  when 'Full-time' then round(countd(case [Academic Load]
  when 'Full-time' then [Sur P] end)/[Count],3)  when 'Current Score'
then round(AVG([Cv Current Score]),2)
  when 'DFWI' then round(countd(case [Dfwi]
  when 1 then [Sur P] end)/[Count],3)
  when 'Math completion this year' then round (COUNTD(case [College Math
Completion]
  when 'Completed College Math this year' then [surp] end)/[Count],3)
  when 'CUR_GPA' then round(avg({Fixed [Sur PIYCT] : min([CUR_GPA]))},2)
  when 'Semester GPA Variance' then round(VARP({Fixed [Sur PIYCT]:
min([CUR_GPA]))},2)
  when 'Cum_GPA' then round(avg({Fixed [Sur PIYCT] : min([Cum_GPA]))},2)
  when 'Good Academic Standing' then round(countd(case [Academic Standing]
  when 'Good' then [Sur P] end)/[Count],3)
  when 'Financial Aid' then round(sum({Fixed [Sur PIYCT]:
min([Amount]))},0)
  when '1-term Retention' then round([Count 1-term ret]/[Count],3)
  when '1-term Retention or Graduation' then round([Count 1-term ret or
grad]/[Count],3)
  when '1-yr Retention' then round([Count 1-yr ret]/[Count],3)
  when '2-yr Retention' then round([Count 2-yr ret]/[Count],3)
  when '3-yr Retention' then round([Count 3-yr ret]/[Count],3)
  when '4-yr Retention' then round([Count 4-yr ret]/[Count],3)
  when '4-yr Graduation' then round([Count 4-yr grad]/[Count],3)
  when '5-yr Graduation' then round([Count 5-yr grad]/[Count],3)
  when '6-yr Graduation' then round([Count 6-yr grad]/[Count],3)
END
```

Calculations



Use native features over calculations

Groups

Sets

Bins

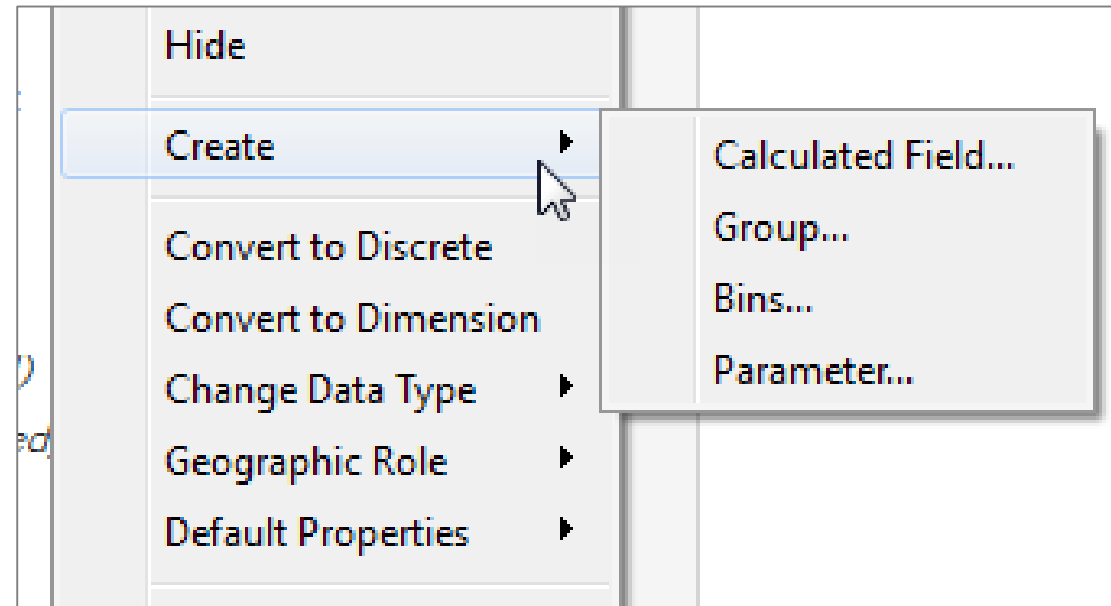
Custom date fields

Combined fields

Aliases

Reference lines

Analytics (clustering, trend lines, forecasts)



Calculations



Consider efficiency of your calculations

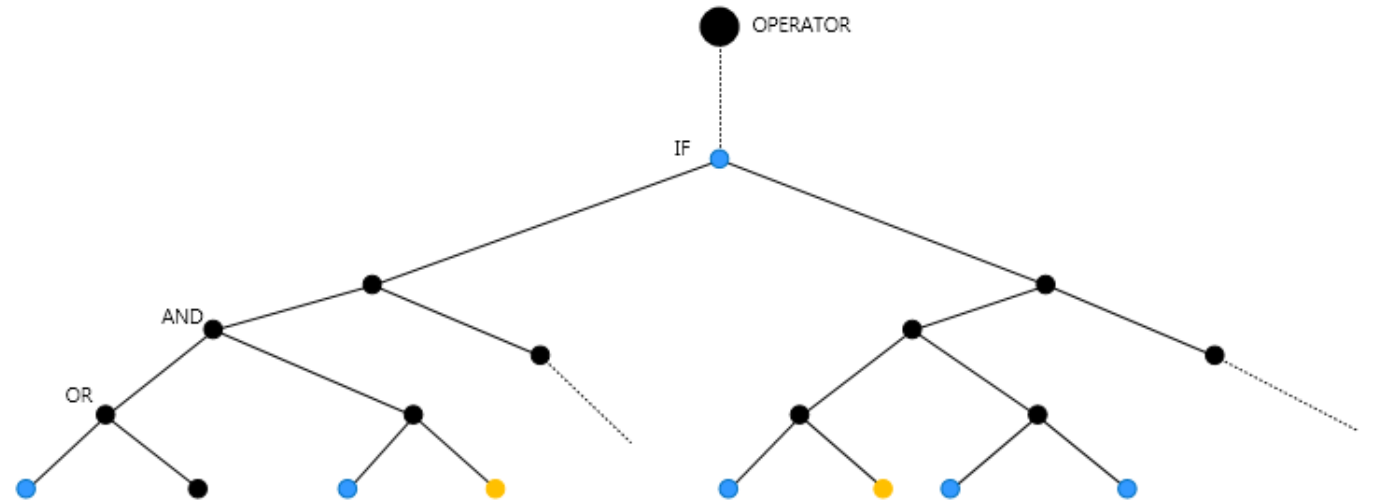
CASE or Groups > IF .. IF ... IF...

ELSEIF > ELSE IF

REGEX for strings!

Sets

Calculation “Explosion”



Calculations

Calculation “Explosion”

C:\Users\aelldridge\Documents\Dropbox\My Stuff\Hidden\Efficient 10.3\minecraft_servers.txt - Notepad++ [Administrator]

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

minecraft_servers.txt

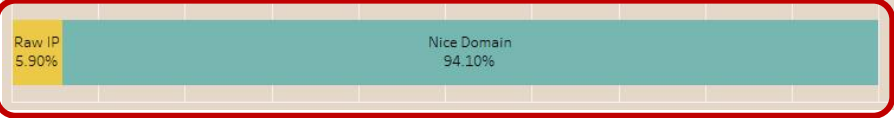
858 857|Laaksocraft|Laaksocraft.com|100|333|1.11.2|Finland
859 858|DrugLegends|druglegends.net|98|333|1.11.2|United States of America
860 859|MyFunCraft|play.myfuncraft.us:25565|100|332|1.11.2|United States of America
861 860|Asgard Ascension|play.asgard-mc.net|100|332|1.11.2|United States of America
862 861|DragCraft.EU|79.124.17.195:25565|100|332|1.11.2|Bulgaria
863 862|ModVortex - SkyFactory 3|play.modvortex.com|95|332|1.10.2|Canada
864 863|Zenith Legacy|Autismrealms.us|100|330|1.11.2|United States of America
865 864|ChaosOP|ChaosOP.net:25565|97|330|1.8.8|United States of America
866 865|Owl Academy|mc.owl.academy|100|329|1.11.2|United States of America
867 866|Mozartrealms|pvp.mozartrealms.com|98|329|1.11.2|United States of America
868 867|RetardedMc.tv|mc.retardedmc.tv:25565|89|329|1.11.2|Germany
869 868|AedisMC|mc.aedismc.nl|100|327|1.11.2|Netherlands
870 869|Citybuild.minecraft.gs|Citybuild.minecraft.gs:25565|94|327|1.10|Germany
871 870|Unlimited Network|unlimitedmc.net|93|326|1.11.2|United States of America
872 871|[AdventurePvP]- 1.8 Factions|mcmmo/auctions|play.adventurepvp.eu:25565|85|326|1.8|Bulgaria
873 872|Mineday.eu|5.62.98.70:25565|100|325|1.8.8|Germany
874 873|MithrandirCraft|play.mithrandircraft.us|100|324|1.11.2|Spain
875 874|direwolf20.goreacraft.com|direwolf.goreacraft.com|100|324|1.7.10|United Kingdom
876 875|Minecraft Bulgaria|play.minecraft-bg.com|100|323|1.11.2|Bulgaria
877 876|Rhapsodies Of Survival|rhapsodiesofsurvival.mcserver.ws:25565|100|321|1.11.2|United States of America
878 877|[ThriveMC] Christian Based! Shop|play.thrivemc.us|94|321|1.11.2|United States of America
879 878|LionMC.nitrado.net Faction/Rütbe/Editci 1.7.X-1.8.X|LionMC.nitrado.net:67|320|1.7.10|Turkey
880 879|Freebuilders|23.226.68.37:25565|100|319|1.11.2|United States of America
881 880|JeepCraft|play.jeepcraft.net|100|319|1.11.2|United States of America
882 881|Grydon Kingdom|grydonkingdom.dmch.nl:25617|93|319|1.8.8|Netherlands
883 882|Tanelorn|luckykingdom.ddns.net|100|318|1.11.2|United States of America
884 883|GalacticPvP|Play.GalacticPvP.Net|95|318|1.8.8|Netherlands
885 884|Mihion|mc.mihion.dk|93|318|1.11.2|Denmark
886 885|MomentCraft _ 1.5.x (jogar.momentcraft.com.br)|jogar.momentcraft.com.br:25565|100|317|1.5.2|United States
887 886|CombatCraft|pvp.combatcraft.com.br|96|317|1.11.2|Brazil

Normal text file length: 75,983 lines: 1,002 Ln: 1 Col: 1 Sel: 0|0 Unix (LF) UTF-8-BOM INS

Popular Server Distribution (fast)



Address type (fast)



AVG UpTime (fast)

98.00%

Calculations

Calculation “explosion”

The image illustrates a "calculation explosion" in Excel, showing multiple overlapping formula editor windows for the `minecraft_servers` sheet. The windows are titled as follows:

- `Address_IsValidIP`:

```
NOT(ISNULL([Address_Segment1_AsInt])) AND  
NOT(ISNULL([Address_Segment2_AsInt])) AND  
NOT(ISNULL([Address_Segment3_AsInt])) AND  
NOT(ISNULL([Address_Segment4_AsInt])) AND  
[Address_Segment1_AsInt] >= 0 AND  
[Address_Segment1_AsInt] <= 255 AND  
[Address_Segment2_AsInt] >= 0 AND  
[Address_Segment2_AsInt] <= 255 AND  
[Address_Segment3_AsInt] >= 0 AND  
[Address_Segment3_AsInt] <= 255 AND  
[Address_Segment4_AsInt] >= 0 AND  
[Address_Segment4_AsInt] <= 255 AND  
[Address_Segment5_IsMissing]
```
- `Address_Segment5`
- `Address_Segment4`
- `Address_Segment3`
- `Address_Segment2`
- `Address_Segment1`:

```
IF FIND([Address_RemoveProtocolAndPort], [Address_RemoveProtocolAndPort])  
ELSE  
MID([Address_RemoveProtocolAndPort], 1, LEN([Address_RemoveProtocolAndPort]) - 1)  
END
```
- `Address_RemoveProtocolAndPort`:

```
IF [Address_RemoveProtocolAndPort] <> "" THEN  
ELIF [Address_RemoveProtocolAndPort] <> "" THEN  
END
```
- `Address_RemoveProtocol`:

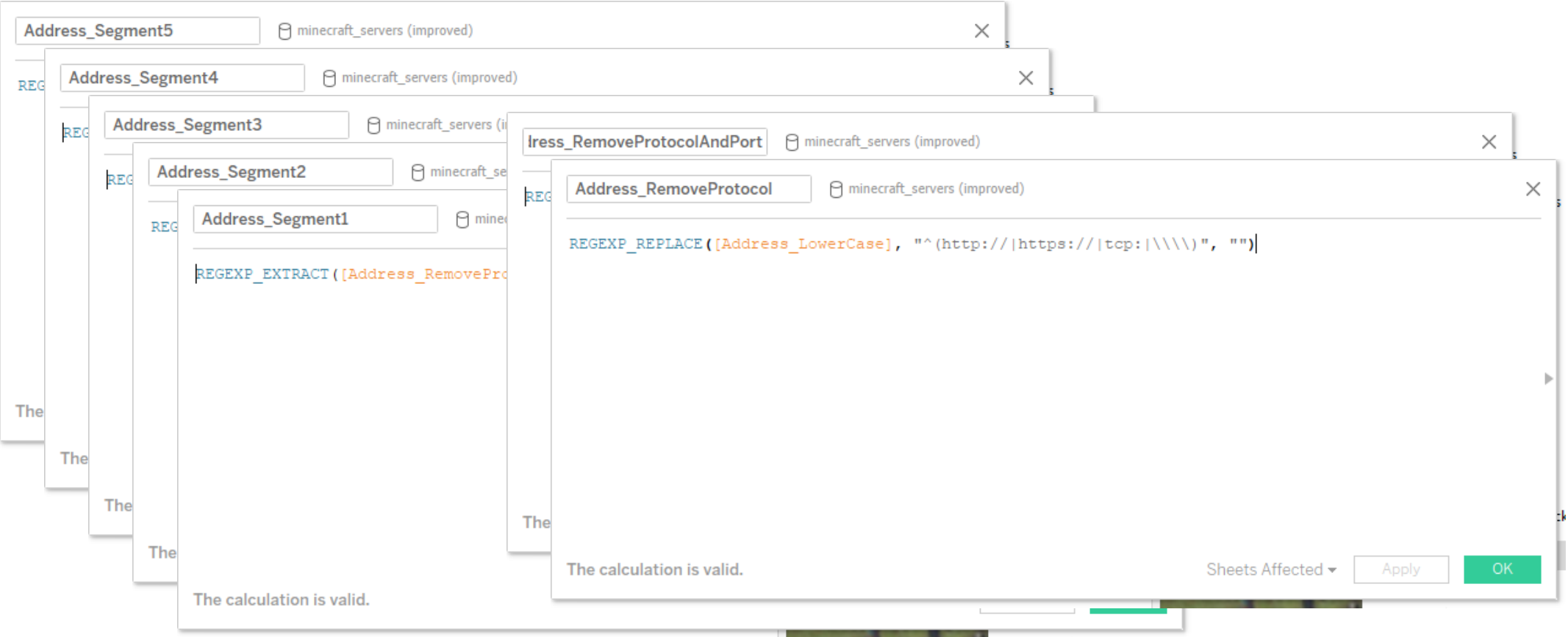
```
IF [Address_RemoveProtocol] <> "" THEN  
ELIF [Address_RemoveProtocol] <> "" THEN  
END
```
- `Address_LowerCase`:

```
IF STARTSWITH([Address], "{") AND ENDSWITH([Address], "}") THEN  
LOWER(MID([Address], 2, LEN([Address]) - 2))  
ELSEIF STARTSWITH([Address], "ip=") THEN  
LOWER(MID([Address], 4, LEN([Address]) - 4))  
ELSE  
LOWER([Address])  
END
```

Each window displays the message "The calculation is valid." and "Sheets Affected" (showing `minecraft_servers`). The bottom-most window also includes "Apply" and "OK" buttons.

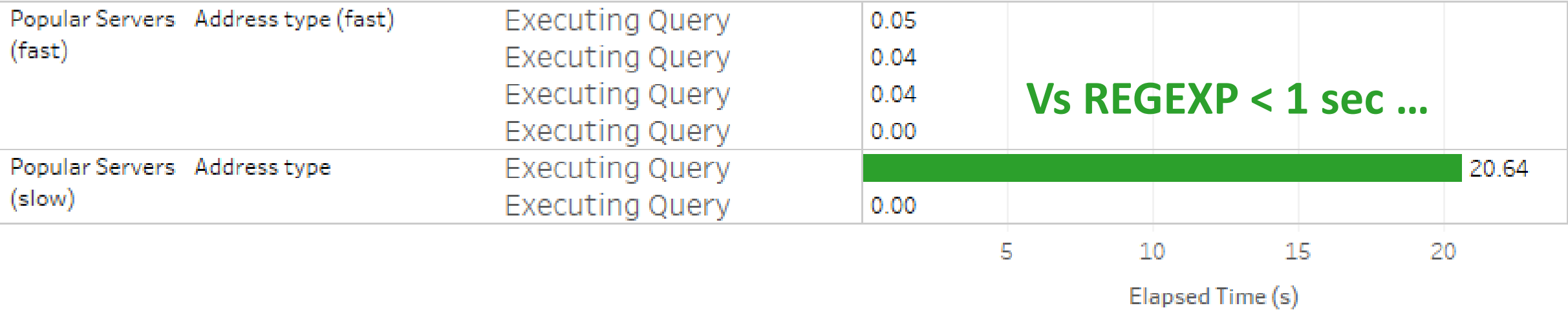
Calculations

Calculation efficiency



Calculations

Calculation efficiency



Working Across Data Sources



Use data blending wisely

Blending

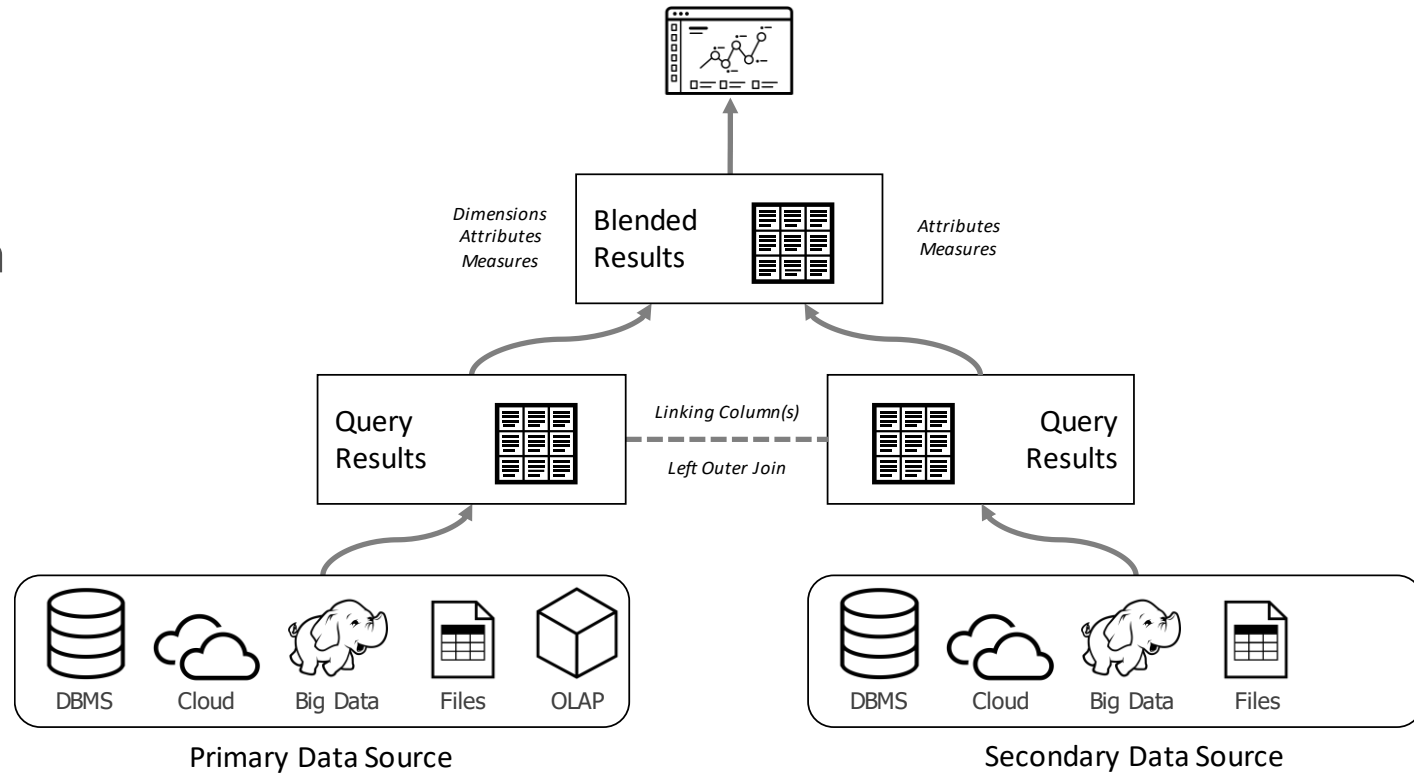
Aggregate, then join

Different to (cross-database) joins which are at the record level

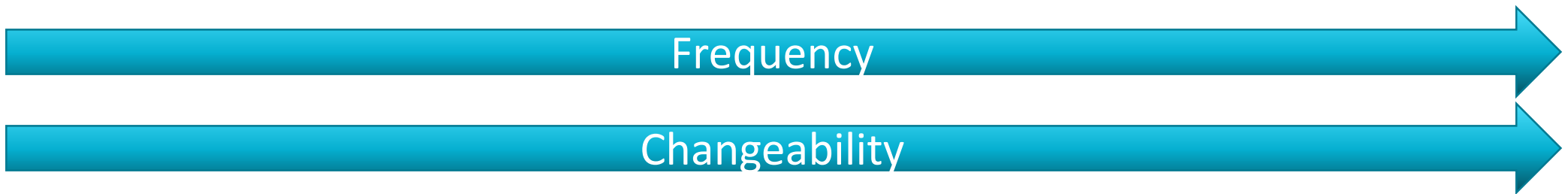
Don't blend on high-cardinality dimensions

Consider a cross-database join instead

Use primary groups/aliases to eliminate blending for label lookups



Data



Data Layer

Concerned with:

- Data connections
- Connection models
- Extracts

Tableau - Superstore [Read-Only]

FileDataServerWindowHelp

Connections

sql.databender.net,14333
Microsoft SQL Server

Superstore Returns
Text File

Add

Database

Superstore

Table

All 11Recommended

Enter table name

dimCustomer

dimDemographic

dimHoliday

dimLocation

dimPeople

dimProduct

dimSegment

dimShipMode

factOrders

Superstore APAC

vw_Superstore APAC

New Custom SQL

New Union

Superstore (SQL)

Connection

Live

Extract

factOrders

Superstore Returns.csv

dimCustomer

dimLocation

dimProduct

dimSegment

dimShipMode

dimDemographic

Sort fields

Data source order

Show aliases

Show

dimCustomer	dimDemographic	dimDemographic	dimDemographic	dimDemographic	dimDemographic
Customer Name	Gender	Marital Status	Department	Occupation	Education Level
Kunst Miller	Female	Married	Sales	Librarian	Undergraduate
Sandra Glassco	Male	Single	Engineering	Dental Hygienist	Postgrad
Scot Wooten	Male	Single	Human Resources	Staff Accountant II	Secondary
Chad Sievert	Male	Rather Not Say	Human Resources	Community Outreach ...	PHD
Toby Braunhardt	Female	Single	Support	Account Coordinator	Secondary

Connection Types



Connection type performance varies

Many data source types

Not all created equal

E.g., Native > ODBC

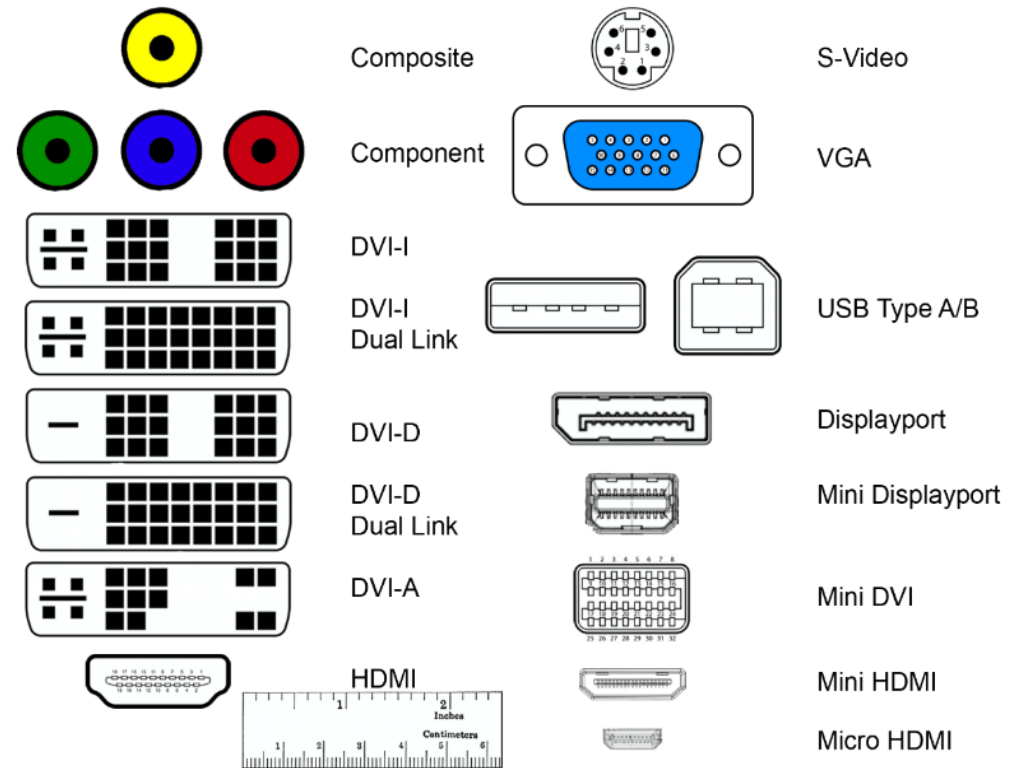
Embedded > published?

Embedded can be faster

Acceleration views

Direct vs. bridged (Online)

Query bridge can be extract or live
Data engine



Data Connections



Try not to move too much data

**Having your data in one place
is faster than pulling it from
multiple sources**

Joining

Blending

Data integration (cross-database joins)



Connection Models



Trust Tableau to do its job

Avoid custom SQL and stored procedures where possible

If you can, deconstruct monolithic custom SQL to be discrete, table-focused custom SQL statements

Use an extract to materialise them so the custom SQL is run only once



Custom SQL

Quarterly

Custom SQL Query

```
/* TYPE ABCD */
SELECT 'ABCD' AS CATEGORY, REGION, FLAG, YEAR, QUARTER, MEASURE,
MEASURE_ID, AMOUNT
FROM DB.FACT_TABLE
WHERE CATEGORY NOT IN ('Not available','Unknown','Not applicable')
AND (MEASURE_ID IN (301,604))
AND AS_AT_DATE = <Parameters.As At Date>
GROUP BY CATEGORY, REGION, FLAG, YEAR, QUARTER, MEASURE, MEASURE_ID

UNION ALL
```

```
SELECT 'ABCD' AS CATEGORY, REGION, FLAG, YEAR, QUARTER, 'AA ' ||
MEASURE, MEASURE_ID, AMOUNT
FROM DB.FACT_TABLE
WHERE CATEGORY IN (SELECT CATEGORY FROM DB.DIM_TABLE_A)
```

```
FROM DB.FACT_TABLE
WHERE CATEGORY IN (SELECT CATEGORY FROM DB.DIM_TABLE_B)
AND MEASURE_ID = 504
AND AS_AT_DATE = <Parameters.As At Date>
GROUP BY CATEGORY, REGION, FLAG, YEAR, QUARTER, 'BB ' || MEASURE,
MEASURE_ID

UNION ALL
```

```
/* TYPE WXYZ */
SELECT 'WXYZ' AS CATEGORY, REGION, FLAG, YEAR, QUARTER, MEASURE,
MEASURE_ID, AMOUNT
FROM DB.FACT_TABLE
WHERE CATEGORY NOT IN ('Not available','Unknown','Not applicable')
AND (MEASURE_ID = 302
OR MEASURE_ID = 605)
AND AS_AT_DATE = <Parameters.As At Date>
GROUP BY CATEGORY, REGION, FLAG, YEAR, QUARTER, MEASURE, MEASURE_ID
```

UNION ALL

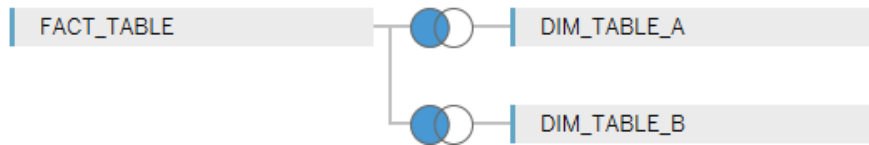
```
SELECT 'NWXYZ' AS CATEGORY, REGION, FLAG, YEAR, QUARTER, 'CC ' ||
MEASURE, MEASURE_ID, AMOUNT
```

```
FROM DB.DIM_TABLE_A)
AND AS_AT_DATE = <Parameters.As At Date>
GROUP BY CATEGORY, REGION, FLAG, YEAR, QUARTER, 'CC ' || MEASURE,
```

```
SELECT 'WXYZ' AS CATEGORY, REGION, FLAG, YEAR, QUARTER, 'DD ' ||
MEASURE, MEASURE_ID, AMOUNT
FROM DB.FACT_TABLE
WHERE CATEGORY IN (SELECT CATEGORY FROM DB.DIM_TABLE_B)
AND (MEASURE_ID = 505)
AND AS_AT_DATE = <Parameters.As At Date>
GROUP BY CATEGORY, REGION, FLAG, YEAR, QUARTER, 'DD ' || MEASURE,
MEASURE_ID
```

Time to open TWB: ~5 mins

Custom SQL

☐ Quarterly

Time to open TWB: < 10 secs (30x!)

Category 2

Measure 2

```

/**
if ([category] <> 'Not available' and [category] <> 'Unknown' and [category] <> 'Not applicable')
    and ([Measure Id] = 301 or [Measure Id] = 604)
    then [Measure]
elseif not ISNULL([category (DIM TABLE A)])
    and [Measure Id] = 504
    then 'AA ' + [Measure]
elseif not ISNULL([category (DIM TABLE B)])
    and [Measure Id] = 504
/**

```

TWB: < 10 secs (30x!)

and [Measure Id] = 303
then 'DD ' + [Measure]
end

The calculation is valid.

Apply OK

Connection Models



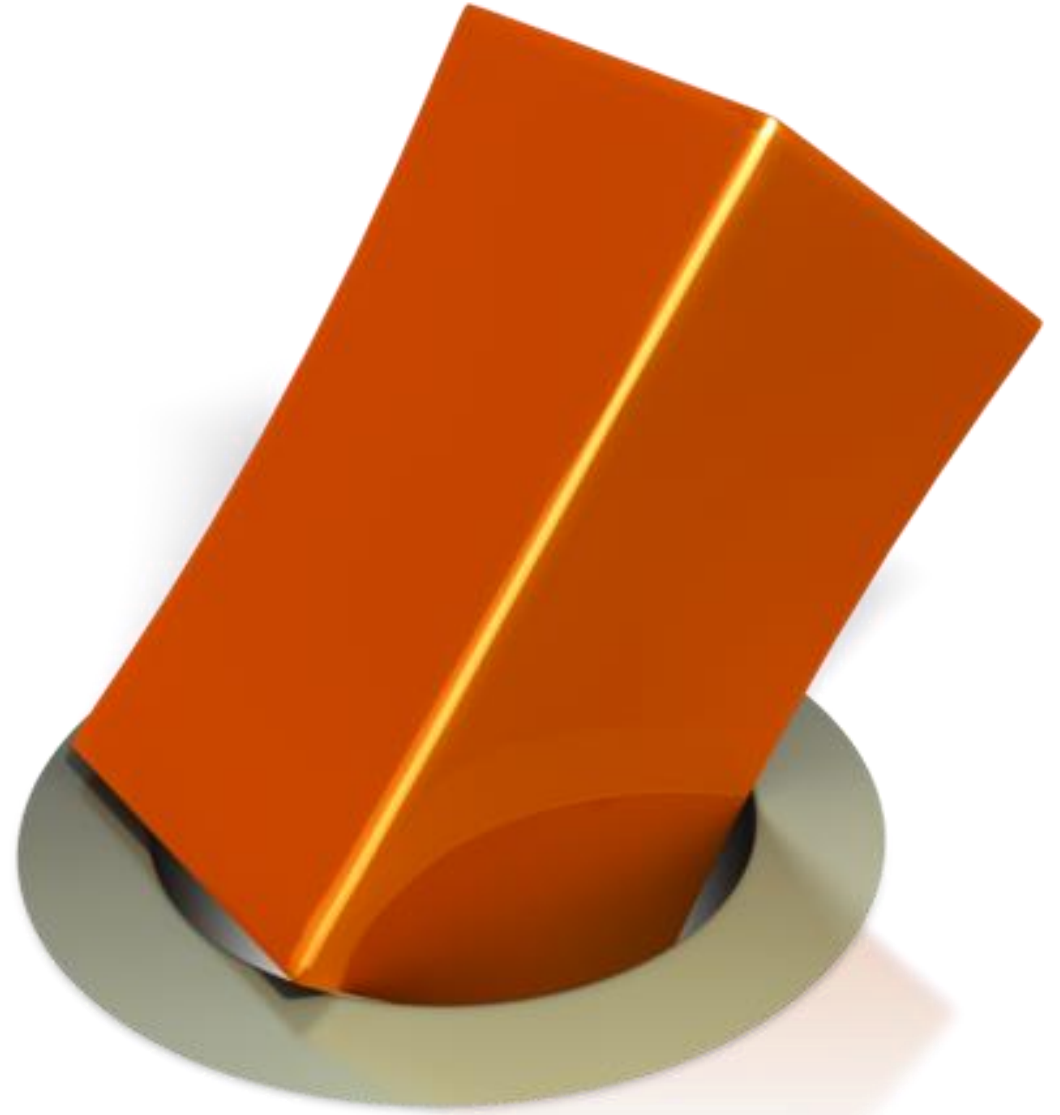
Try to have your data in the best “shape” for your analysis

**The less you have to
manipulate your data,
the faster it will be**

Union

Pivot

Calculations



Data Connections



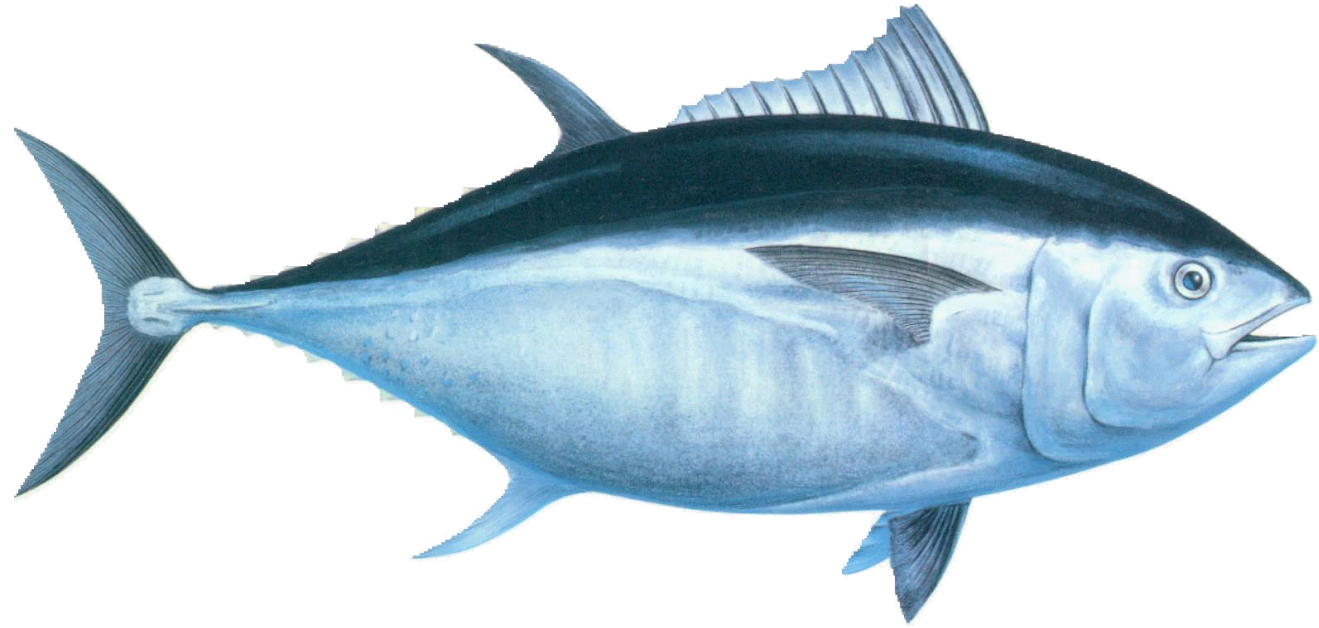
Tune your database for optimal performance

**Indexes on
joining/filtering dimensions**

**Define columns as NOT NULL
when possible**

**Referential integrity =
join culling**

**If no “hard” RI, then “Assume
Referential Integrity” on Data
menu**



Connection Models



Use Data Server for governance

Have data experts optimise the connections; share with business users as published data connections

Share extracts across multiple workbooks



Connection Models



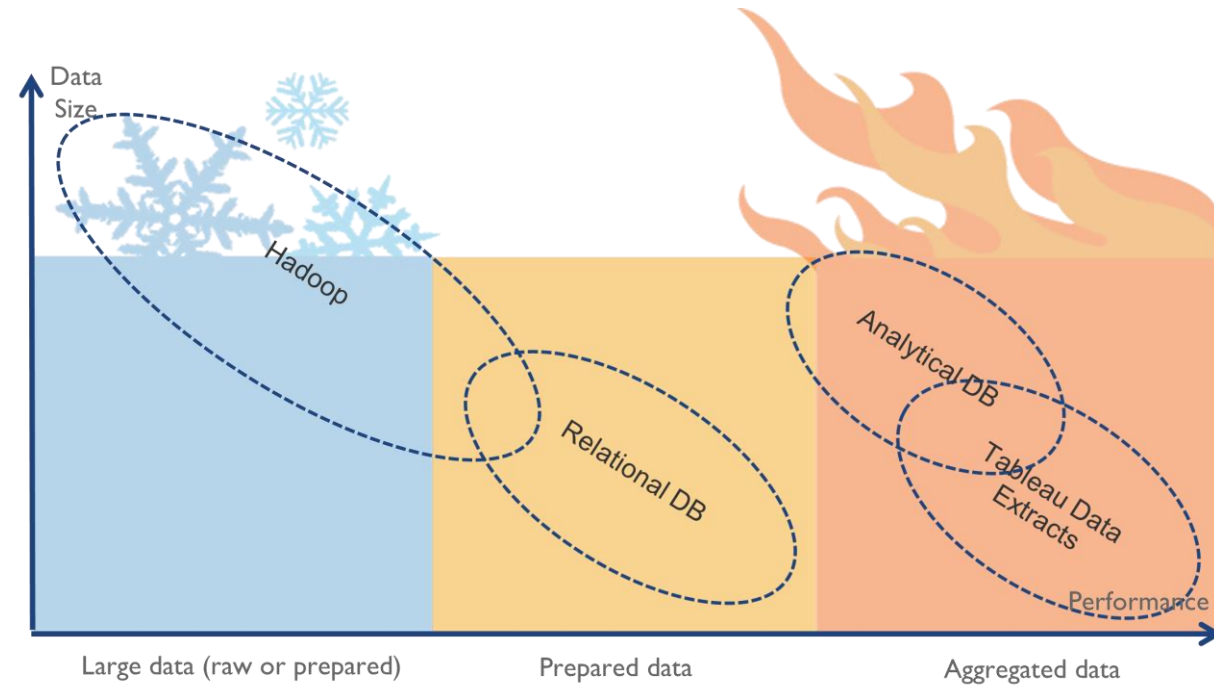
Use cold/warm/hot strategies for big data

Aggregated extracts for high-level analysis

Live/extract connection to DBMS for mid-level analysis

Live connection to Big Data for detail reports

Start at high level and drill down to detail



Extracts



Extracts are an easy way to make things go faster

Hide unused fields!
Aggregated
Filtered/sampled
Materialise row-level calculations



Extracts



Hyper data engine keeps getting better!

Faster extract creation and refresh

Larger extracts

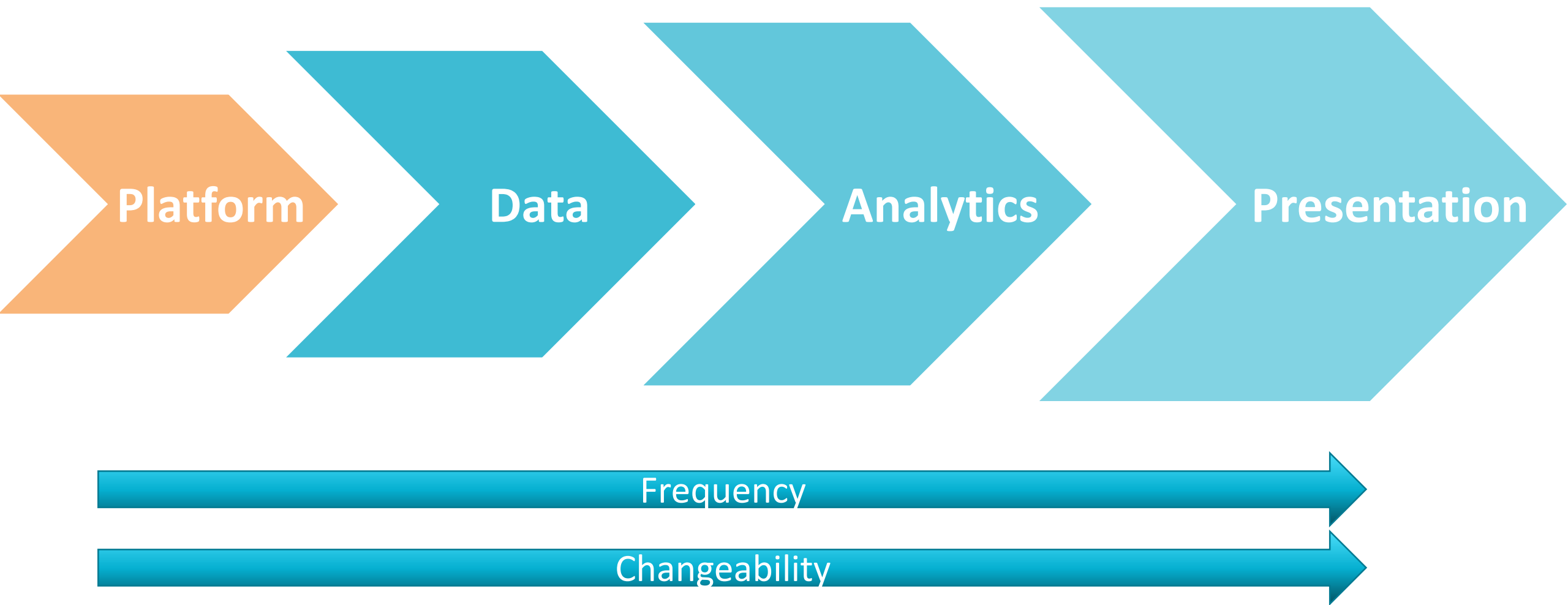
Improved query performance

Normalised extracts!



**KEEP
CALM
AND
GET
HYPER**

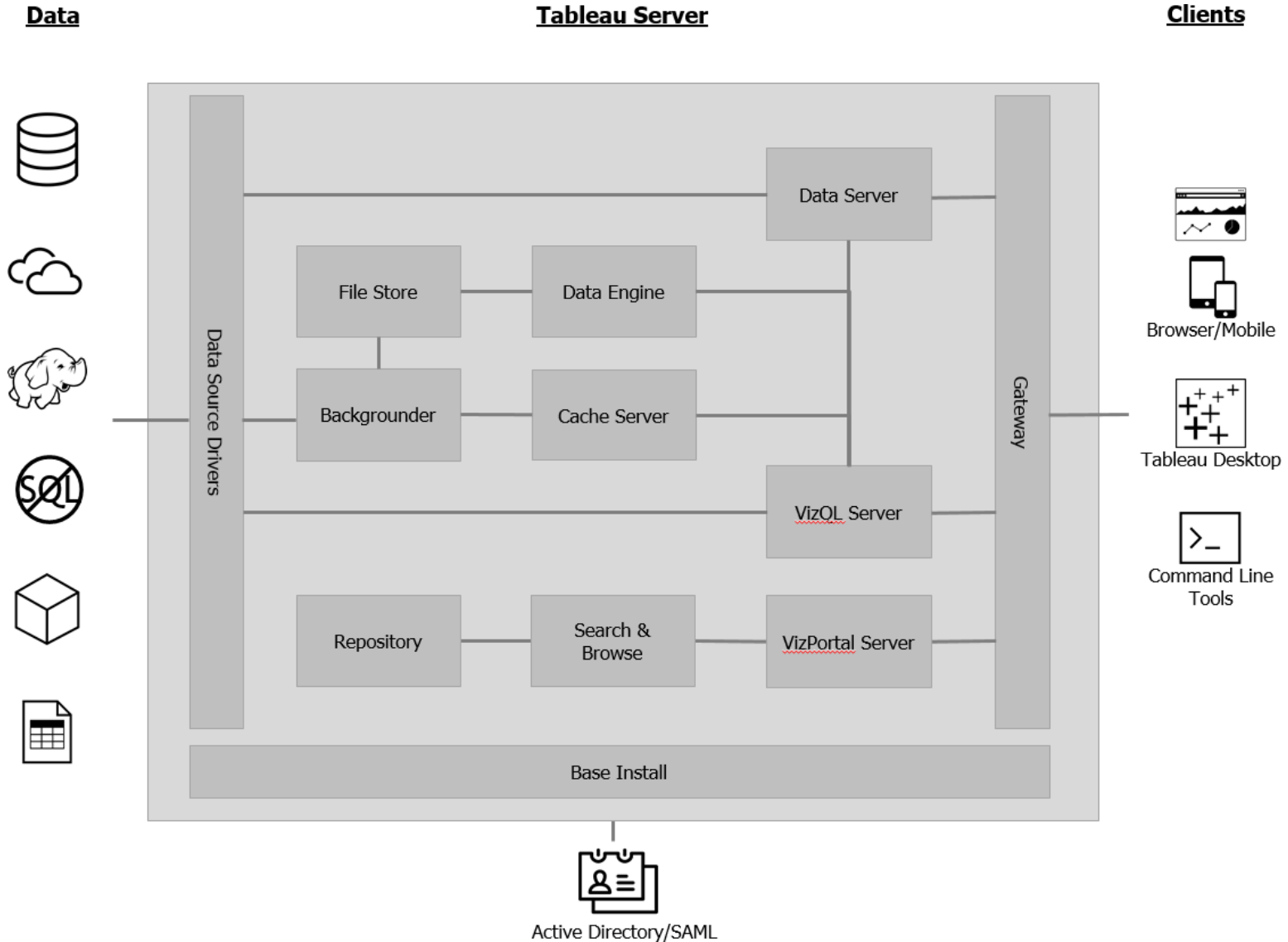
Concept: Visual Pipeline




Platform Layer

Concerned with:

Environment configuration
OS
Hardware



Environment



Monitor!

CPU Utilization By Service

Displays information about process-specific CPU utilization, as captured from PerfMon. The **Process - % Processor Utilization** PerfMon counters are scaled by # of logical cores on the system and can be amplified by multithreading, so these values should be used for relative system benchmarking only.

Machine

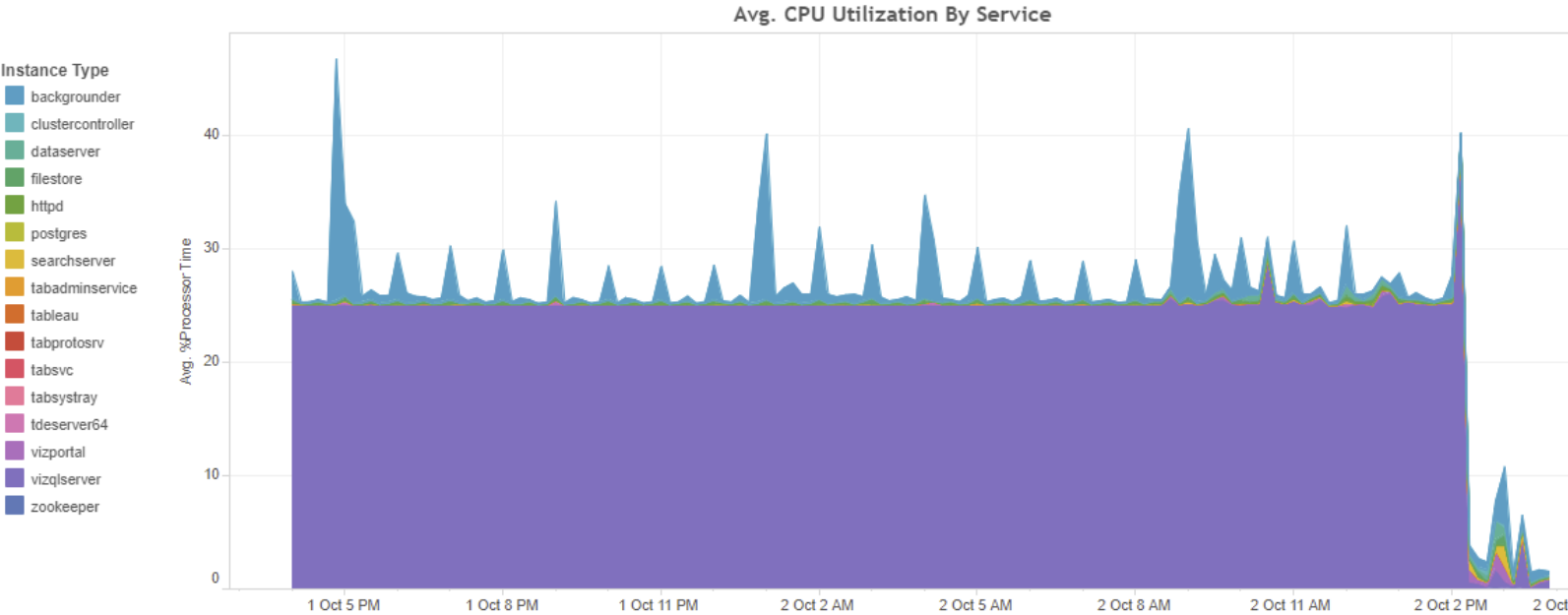
dellr610

Time to view

Last 24 hours

Minute Interval

10



Avg. CPU Utilization By Service - All Nodes

Histogram of the Tableau services that consume the most processor resources across all nodes.



Environment



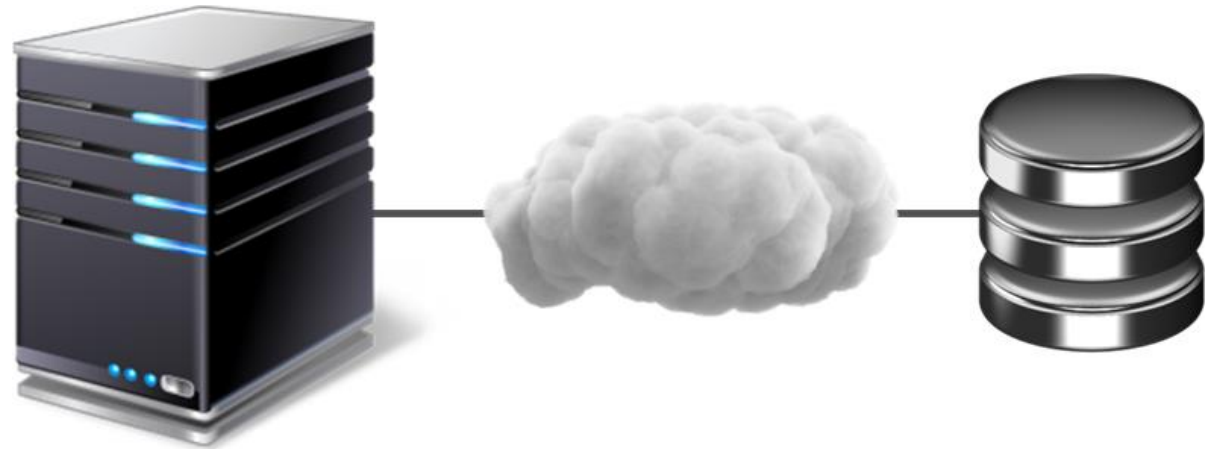
Be prepared to test both on the server and remotely

On the server:

- Closer to the data
- Find configuration, data and workbook design issues

Remote to the server:

- True end-user experience
- Find network issues



Slow on Desktop → Slow on Server

Environment



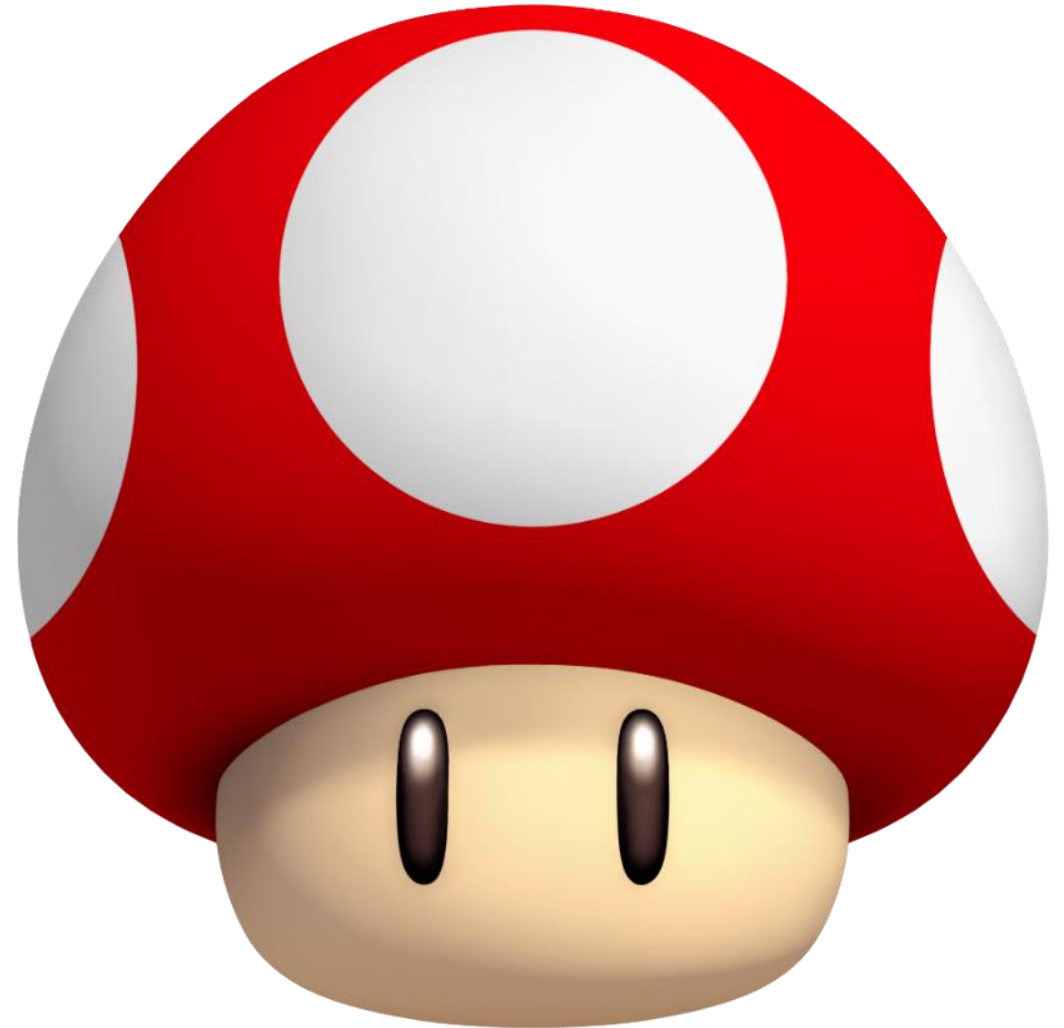
Upgrade!

Software:

- Desktop and Server
- Performance improvements
- Bug fixes

Hardware

- RAM, CPU
- Fast disk, esp. with extracts
- Fast network



Environment



You gotta keep 'em separated

**Keep interactive
users and extract
refreshes separated**

VizQL vs. backgrounder

Consider a dedicated extract
processing node



Environment



Know virtualisation

Don't run on oversubscribed virtual machines (CPU or RAM)

Virtual has a performance overhead (10-20%) vs physical infrastructure

If using cloud VMs (AWS, Azure, GCP) use the right instance and disk types





QUESTIONS?



Thank you !

Agenda

09:30 – 10:00 - Updates on the Tableau Community at BNP Paribas

10:00 – 10:30 - Newest and upcoming features of Tableau

10:30 – 10:45 - Break

10:45 – 12:15 - BNPP Testimonials: BNP Paribas Fortis, BDDF, Real Estate

12:15 – 13:30 - Lunch

13:30 – 14:45 - Workshop of your choice

Tableau Desktop Hands-on (beginner) **OR** Designing efficient workbooks (advanced)

15:00 – 16:15 - Workshop of your choice

Tableau Prep Hands-on (beginner) **OR** Data Modelling (advanced)



BNP PARIBAS

La banque d'un monde qui change