

Paper SAS4357-2020

## Performance Do's and Don'ts for SAS® Visual Analytics

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### ABSTRACT

When you ask users of business intelligence applications what are the important factors that determine whether they accept the solution, usability and performance are frequent mentions. While usability is predefined by the design of the application, performance is determined by a variety of aspects. These range from tuning the compute server to optimizing data structures for reporting over adjusting report design to the choice of the browser that runs SAS® Visual Analytics. In this paper, I describe the most important adjusting screws that report authors and administrators should look at if they want to improve overall performance of SAS Visual Analytics.

### INTRODUCTION

If you are trying to define what report performance means from a report consumer perspective, you will end up looking at the time needed to start the reporting application plus the time needed to see the first results in your desired report. While the starting time of the application is a once-only procedure, opening reports will typically affect users multiple times a day depending on the intensity of their usage of the reporting application. This means that for occasional users of the reporting application, the startup time of the application is much more significant than for heavy users. In fact, they might not even differentiate between starting the application and opening a report as it appears to be one action for them. We will later have a closer look at these different usage patterns.

### GENERAL CONSIDERATIONS

If we are looking at adjustments to shorten the loading time of the application, the selection of the browser should be your first choice. SAS® Visual Analytics supports a large variety of different browsers. Although several 32-bit versions of the different browsers are supported, I strongly recommend using a 64-bit version to get the best application loading performance. The 64-bit versions of the browsers are much better in handling computing and memory requirements of web applications.

## HARDWARE REQUIREMENTS

The starting of the application requires some files to be downloaded from the server to the client running the browser. It is obvious that poor downloading capacities increase the startup time, so make sure that the download speed is reasonable. Keep in mind that these speeds may vary depending from where the clients are connecting to the server, so it should not be surprising if you are experiencing varying startup times.

Once the application is started and you are about to open your first report, additional computing resources will be needed. As a rule of thumb, I would recommend client PCs to have at least 6GB of RAM. This is not a hard limit where SAS Visual Analytics will not work if you have less, but knowing that report consumers usually have other applications running on their desktops concurrently, you should check if your **user's** hardware is meeting this requirement. I will touch on that topic later when we are looking at alternative ways of consuming reports.

## REPORT DESIGN RECOMMENDATIONS

### GENERAL COMMENTS

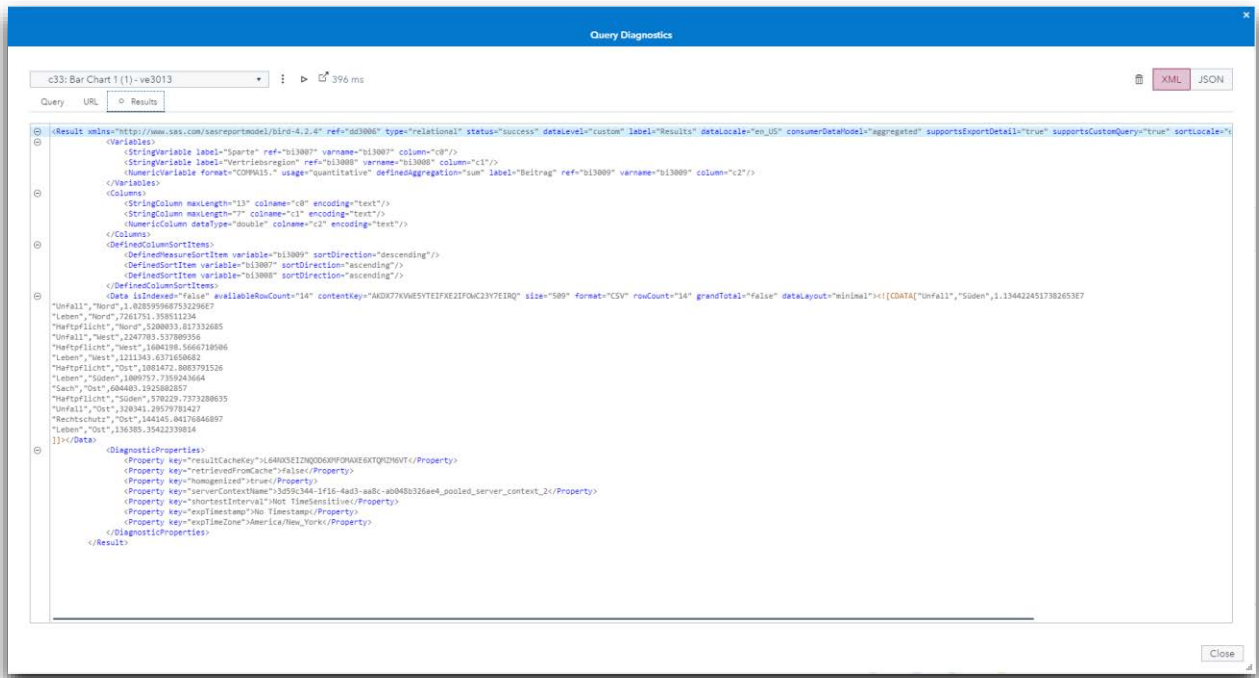
- Keep the report size reasonable. If the number of report pages exceeds a certain threshold (5-8 pages), consider if breaking up into 2 or more reports and connecting them via report linking might be a better solution.
- Avoid too many individual objects on one report page, it could also result in a loss of focus when consuming the report. Starting with SAS Visual Analytics 8.5, we are providing page templates that will give you guidance with regards to the number of objects fitting on one page if you are not yet an experienced report author.
- Avoid joining tables on the fly for production reports and try to handle it during data prep. The join facility within report designer is mainly targeted for ad-hoc exploration.
- Avoid custom sorts with high-cardinality data items and solve the requirement by using a hidden column.
- Avoid custom categories with a high cardinality and use a custom format instead. Keep in mind that you must create the custom format before you load the table into CAS.
- Nesting of containers might affect performance negatively.

## FILTERING

- Make sure you apply the filter at the right level to avoid unnecessary queries being fired
- If filters are static apply it on the data level
- Consider having separate (dimension) tables if you have a large number of filter objects. Keep in mind that populating filter objects that are based on large tables always must scan the full table in order to display all distinct category values.

## CALCULATIONS

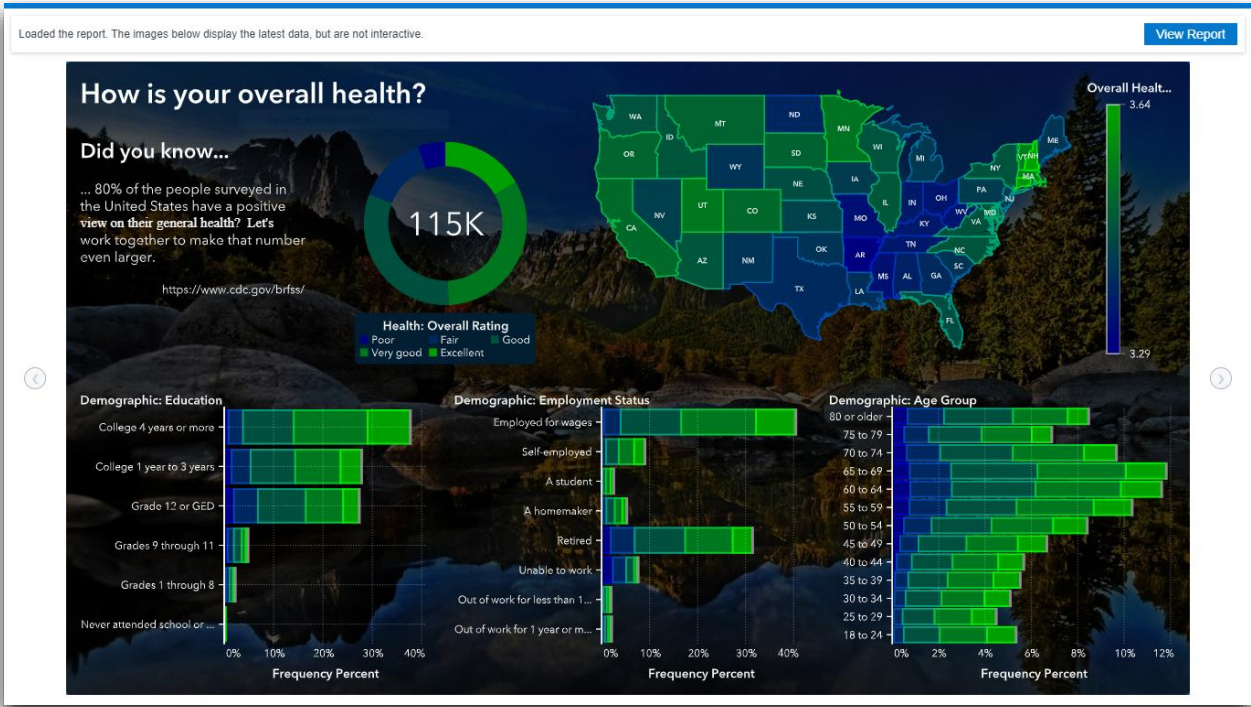
- Identify long-running queries in your report and try to push them to data prep if possible. You can check runtimes for individual objects by using the Query Diagnostic Window (Display 1). You can open this window by pressing Ctrl+Alt+Q. It allows you to select an individual object from your report and execute the corresponding query to check its runtime. By including/excluding calculated variables, you can identify which ones might cause the greatest negative impact on query runtimes.
- Reduce the number of calculations that are report specific. If you have several reports that have similar calculation requirements, consider pushing these calculations to data preparation or use a data view in SAS Visual Analytics.
- Check if you are using efficient operators to achieve the desired results as there might be different ways of calculating the same number. Avoid very complicated nested If-Then-Else constructions.



Display 1. The Query Diagnostic Window

# REPORT VIEWING

The choice of the browser not only has a significant impact on application loading performance, it also impacts report viewing, so please keep in line with recommendations. For specific dashboard-style reports, it is very important to minimize the time before the first results are displayed. In these cases where every second counts, there is a new option available when report links are created. If you chose to create a report link that shows a static report while loading, the time to display initial results might be significantly reduced (Display 2). As you can see from the screenshot below, the information that can be consumed is exactly the same. If there is no interaction defined in the report, there is even no need to switch to interactive mode by clicking on View Report in the top right corner.



Display 2. Showing a Static Report

If the operating system on your PC/Laptop is Windows 10, there is an alternative for viewing SAS Visual Analytics reports, the Windows 10 SAS® Visual Analytics App. Compared to viewing reports in a browser, the app has 3 main advantages:

Starting the app is faster than loading the application in a browser. The app is typically usable after 3 seconds whereas loading the application in the browser takes 15-20 seconds. The reason for this big difference is that the app does not download any HTML5 components from the server, they are already part of the installed application.

Using the SAS Visual Analytics App uses much less of the available memory to display the report. Thus, you might consider this alternative if your clients do not have enough RAM. You can see the difference in the screenshot below (Display 3) where we look at the memory consumption of Google Chrome compared to that of the SAS Visual Analytics App while viewing at the same report.

The screenshot shows the Windows Task Manager window with the 'Prozesse' tab selected. The 'Leistung' (Performance) sub-tab is active, displaying a table of running processes. The table columns are: Name, CPU, Arbeitsspeicher (Memory), Datenträger (Disk), Netzwerk (Network), GPU, and GPU-Modul. The 'Arbeitsspeicher' column is highlighted in blue, and a red box is drawn around the memory usage values for Google Chrome (914,8 MB) and SAS Visual Analytics App (201,6 MB).

Name	CPU	Arbeitsspeicher	Datenträger	Netzwerk	GPU	GPU-Modul
Google Chrome (11)	18,6%	914,8 MB	0 MB/s	0 MBit/s	5,2%	GPU 0 - 3D
SAS Visual Analytics App (2)	0%	201,6 MB	0 MB/s	0 MBit/s	0%	GPU 0 - 3D
Cortana (3)	0,3%	109,4 MB	0,1 MB/s	0 MBit/s	0%	GPU 0 - 3D
Desktopfenster-Manager	1,6%	85,6 MB	0 MB/s	0 MBit/s	0,2%	GPU 0 - 3D
WMI Provider Host	0%	65,7 MB	0 MB/s	0 MBit/s	0%	

### Display 3. Memory Usage

A unique capability of the SAS Visual Analytics App is the fact that administrators can allow offline viewing of reports without a valid server connection. In this case, the necessary data is stored encrypted on the client and results are displayed without any waiting time.

## COMING SOON

As an effort to make it easier for report authors to detect what might cause long report loading times SAS is developing a report review feature for a future SAS Visual Analytics release. The report review is designed to identify performance issues in your report and suggest ways to resolve those issues. The report review will run on demand and come up with a list of topics to check, categorized in high, medium and low priority. For example, the review informs you about any unused data sources, high page and object counts, high number of filter controls, any unused calculations to name only a few. The review can be exported as a PDF file and you can rerun the review at any time if necessary.

## CONCLUSION

Although creating reports is an easy task in SAS Visual Analytics, creating effective reports that both perform well and meet usability requirements from the consumer requires at least some experience. If you follow the recommendations in this paper, you avoid the most common mistakes with regards to report performance. If you are new to SAS Visual Analytics and are looking for some advice with regards to report design, you should have a look at report page templates as they have been designed with help from the usability team to provide examples of good report page structures.

## CONTACT INFORMATION

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