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Vroom Vroom! Fast-Track Your Organization onto SAS® Visual Analytics in SAS Viya®

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ABSTRACT

As a business leader new to SAS® Visual Analytics in SAS® Viya®, you might be wondering, "How do I get my team up and running quickly so that we can uncover the insights that we need?" You might have some of these questions: How is data accessed and refreshed? How should the data be structured? What security is available? How would I implement a development process and workflow? How do I convert my team from what we are using now? What else do I need to be thinking about? Classes, documentation, and videos teach how to use the SAS Visual Analytics software, much like driver's education teaches how to drive a car. This session builds off that content. You learn how to plan your route, organize your trip, set up traffic rules, and even make your car "self-driving." Your driving instructor is a SAS® consultant who is on the road with new users every day. Although these best practices have been developed with government and public agencies, they apply to any businesses new to SAS Visual Analytics, especially those in small to medium enterprises.

INTRODUCTION

SAS Visual Analytics in SAS Viya offers many new features and benefits. However, those new features come with new technologies, new processes, and new practices. If you are not familiar with SAS, you might not know where to start. Even experienced SAS programmers and experienced SAS Visual Analytics on SAS 9 users need to learn key differences in SAS Viya. Yet, you want to get over that learning curve as quickly as possible and get to the business of discovering insights.

Think back to when you were learning to drive a car. Your instructor taught you the fundamentals and gave you some experience on the road. But, he probably didn't teach you everything you need to know. He probably didn't teach you how to maintain a car, determine what type of auto insurance you need, or explain the features of your specific car.

The same is true with SAS Visual Analytics in SAS Viya. Very extensive classes and documentation help you learn features and give you practical experience. However, you might also need a broad understanding of additional topics to move your team onto the software. This paper addresses that information.

You leave knowing what you need to manage SAS Visual Analytics in SAS Viya as super users and as a business lead or department head. Let's begin the journey.

THE CAR AND ITS DASHBOARD: SAS VISUAL ANALYTICS AND SAS ENVIRONMENT MANAGER

SAS VISUAL ANALYTICS IN SAS VIYA

Before learning how to drive, let's learn a little about the car that we are driving. The "car" is SAS Visual Analytics in SAS Viya. SAS Visual Analytics is a visualization tool used to build reports and dashboards. SAS Visual Analytics originally came out on SAS 9. Now, SAS Visual Analytics has been re-engineered and enhanced to run in SAS Viya, a new

architecture on the SAS Platform. Henceforth, **"SAS Visual Analytics in SAS Viya"** is referred **to as "SAS Visual Analytics." "SAS Viya" refer**s to the full suite of next-generation products that include SAS Visual Statistics, SAS Visual Data Mining and Machine Learning, and many more.
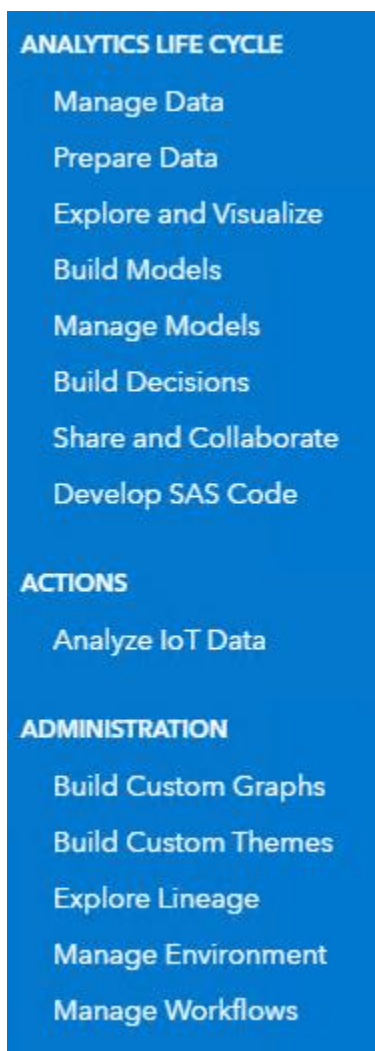
Gone are the days when SAS users were all hard-core programmers. Instead, SAS Visual Analytics is accessed through a web browser with an intuitive drag-and-drop interface. SAS Visual Analytics brings analytics to everyone in your organization, not just those trained in data science or programming. Under the covers, SAS Visual Analytics uses proven SAS analytics, re-**engineered to take advantage of today's technologies. In particular, the in**-memory engine called Cloud Analytic Services (CAS) allows for faster processing of huge amounts of data using the most complex analytics.

There are many other benefits of SAS Visual Analytics and SAS Viya that are beyond the scope of this paper. You can read about them at https://www.sas.com/viya. What this paper describes is how to get your organization up and running with SAS Visual Analytics as quickly and effectively as possible. Because SAS Visual Analytics is a prerequisite for many of the other SAS Viya products such as SAS Visual Statistics and SAS Visual Data Mining and Machine Learning, users of other SAS Viya products need this foundational information.

SAS ENVIRONMENT MANAGER

Many of the features a power user needs to manage SAS Visual Analytics are in SAS Environment Manager. If SAS Visual Analytics is the car, then SAS Environment Manager is **the car's dashboard and console. SAS Environment Manager replaces many of the activit**ies handled by SAS Management Console in SAS 9.

You can easily navigate between SAS Visual Analytics, SAS Environment Manager, and the other products in SAS Viya using the Applications menu (shown in Display 1). The Applications menu is accessed via the hamburger icon in the upper left corner. In the Applications menu, the products of SAS Viya that are available to the logged-on user are displayed, described as tasks and actions rather than product names. To access SAS Visual Analytics, select Explore and Visualize in the Analytics Life Cycle section. To access SAS Environment Manager, select Manage Environment in the Administration section.

Display 1. Application Menu

After accessing SAS Environment Manager, use the navigation bar in the left pane. Each page contains a topic that can be managed. Many of these topics are described in this paper. One handy but overlooked feature in SAS Environment Manager is the ability to expand the navigation bar using the icon at the bottom of the navigation bar. When expanded, the navigation bar displays page names next to their icons.

SAS REPORT VIEWER

Beginning in SAS Visual Analytics 8.5 (SAS Viya 3.5), users who only consume content also use **SAS Visual Analytics. These users are strictly "passengers" in your car**. They will never be driving the car or creating reports. However, these passengers now use the same interface as users that are creating content. In prior versions of SAS Visual Analytics, consumers used SAS Report Viewer.
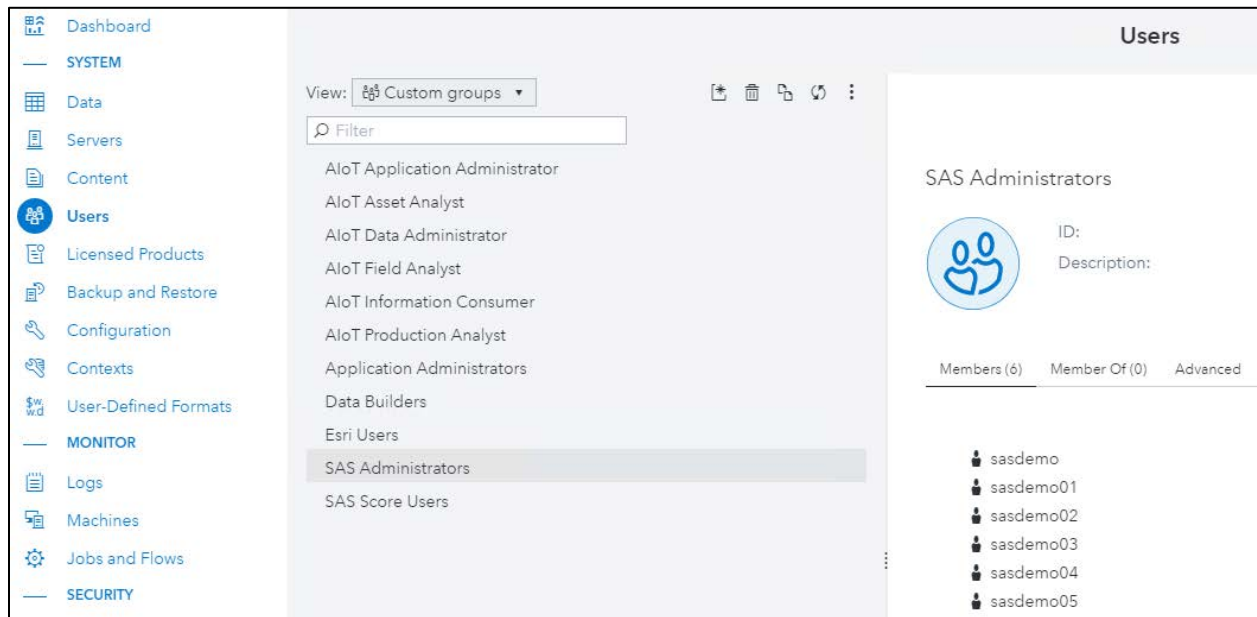
WHO'S DRIVING? USERS AND SUPER USERS

For now, or at least until cars are fully self-**driving, it's obvious who'**s driving a car. It is the person behind the steering wheel. In SAS Viya, the users who can log on and use the **software are imported from your organization's Active Directory service (or other directory** service based on the LDAP protocol). Groups from your directory service are imported as well.

To log on to SAS Visual Analytics, users provide their normal user names and passwords or other credentials. This is a difference from SAS 9, where user logons can be either created manually or imported from a directory service.

SAS ADMINISTRATORS

Super users managing SAS Visual Analytics in SAS Environment Manager do not need any special logons. This is an advantage over SAS 9, which requires special user IDs. Instead, in SAS Viya, an existing user name is added to the SAS Administrators custom group in SAS Environment Manager. Display 2 shows the Users page in SAS Environment Manager with six users (sasdemo, sasdemo01, sasdemo02, sasdemo03, sasdemo04, and sasdemo05) in the SAS Administrators custom group.

Display 2. SAS Administrators Custom Group

A user who has been added to the SAS Administrators custom group is given the choice of whether to operate as a SAS Administrator when they log on. This handy feature, new with SAS Viya, enables the user to choose to become a SAS Administrator only when performing tasks that require extra permission. To operate as a SAS Administrator, the user simply clicks Yes at logon when presented with a screen such as Display 3:

Display 3. Assumable Groups

As a business leader, think about who on your staff should be SAS administrators. These super users are often located in the organization with data analysts, business analysts, or data scientists. You might be a super user yourself, or you might want to appoint a few members of your staff. Whomever they are, they are the go-to people for your team, performing tasks on behalf of the team as outlined in this paper. They assist with troubleshooting and interact with IT for additional tasks. IT staff typically handles system administration on the SAS Viya server itself, such as applying hot fixes, upgrades, and other server command-line activities. However, if you and your team are super users in SAS Viya, you save time and have more control of how SAS Visual Analytics is used.

CUSTOM GROUPS

When identities are imported from Active Directory (or any other LDAP service), they are populated as users and groups in SAS Viya. A third type of identity called custom groups exists only in SAS Viya itself. The SAS Administrators group is an example of a custom group.

If additional groups are needed, there are two options. One option is to add them to your directory service, and then have them imported into SAS Viya as groups. This approach allows others in your organization to take advantage of the groups. However, creating groups might require IT staff assistance.

The second option is to add them directly as custom groups in SAS Environment Manager. This option gives you more control, but you are responsible for managing them. Custom groups might be appropriate for cross-**organizational teams that wouldn't normally be** created within a directory service, and for organizations whose LDAP groups or organizations change frequently.

As a business leader, think about the groups that you need and where you want to create and manage them. Both groups and custom groups are typically used to set up security on data and reports, so getting them correct is important.

ANONYMOUS ACCESS

SAS Viya can be configured for anonymous access (also called guest access), meaning that users can use SAS Viya products without logging on. Guest access is used by organizations and agencies that create reports for the general public to view. Several steps and security layers are required to ultimately make reports available to the public. Enabling guest access is just one of those layers. Public users also need access to SAS Visual Analytics (and to SAS Report Viewer prior to SAS Viya 3.5), to the data, and to the reports themselves. You should work closely with your IT staff to configure SAS Viya if you need this feature. For more information, see [Guest Access documentation](#).

MISSING SOME USERS AND GROUPS?

To add new users and groups to SAS Viya, add them to the directory service. They will be automatically imported according to your schedule. If you find that all the users and groups that you require are still not available, then the configuration to the directory service might need to be updated. This setup requires updating the Identities Service on the Configuration page in SAS Environment Manager. Unless you are well-versed in the details of your directory service, you will need someone from your IT staff to update the configuration to use an LDAP query that pulls the correct users and groups into SAS Viya.

However, as a business leader, it is your responsibility to clarify for IT staff which users and groups are needed in SAS Viya. Be careful not to include more users and groups than are required. Importing the entire directory service structure takes significantly more resources and might impact the performance of SAS Viya.

PAVE THE ROAD WITH DATA

Roads are the foundation to where you can go in a car. Similarly, data is the foundation to what you can do in SAS Visual Analytics. Therefore, some of the first things you need to consider are related to the data: How does it become visible to SAS Visual Analytics? How does it get into memory? How is it refreshed?

CASLIBS

In SAS Viya, data is organized into libraries that are called caslibs. A caslib points to two locations; the physical location where a permanent copy of the data is stored, and the in-memory location where the data is loaded. Data in the physical location such as a directory or database is referred to as a file, even if it is not really a file. Data in memory is referred to as a table. Initially, SAS Viya comes with a Public caslib, to which all users (except guest users) have access. Each user also has a personal caslib called Casuser, to which only that user has access.

The types of files that SAS Viya can read from a caslib depends on the products that are licensed. By default, you can access CSV, SAS data sets (SAS7BDAT and SASHDAT), and TXT files in SAS Viya. To access other file types, the appropriate SAS/ACCESS products need to be licensed and installed.

If your data is currently updated in a tool outside of SAS Viya, such as SAS Enterprise Guide or SAS Data Integration Studio, you can continue that process. You can make the updated data sets available to SAS Viya by sharing the drive containing data with your SAS Viya server, and then creating a caslib to a directory on that drive. Alternatively, if the data source is a database, you can create a caslib directly to the database if the corresponding SAS/ACCESS product is installed. Although you might need assistance from your IT staff to set up the caslibs to a shared drive or to access your database, as a super user, you should determine how the caslibs are organized.

After the shared drive has been made available to the server, create a path-based caslib using the following steps:

1. In SAS Environment Manager, **click to** navigate to the Data page.

2. On the Data Sources tab, click the Connect icon .

3. Fill in the connection settings. Display 4 shows the connection settings for a path-based caslib named Finance to a directory called /sasdata/finance. Note that the directory **path is from the server's perspective, not from the local machine of the web browser** accessing SAS Environment Manager.

Display 4. Connection Settings

Leave the check mark next to Persist this connection beyond the current session for the caslib to have global scope, meaning that the caslib and tables in it are permanently shared across sessions and users. Global scope allows for efficient use of the data so that only one copy of it is in memory. Unchecking the box results in the caslib having session scope, which means the caslib is not permanent. Any tables in it are not shared across users and are removed from memory when the session ends.

Select the Include subdirectories option if the caslib should access subdirectories within the path that you specified, such as /sasdata/finance/2019/. Otherwise, the caslib accesses only files within /sasdata/finance/.

A user can import data directly from their local file system into a caslib. However, if the data is going to be refreshed on a regular basis, you might find it more efficient to set up path-based or database caslibs with global scope.

CASLIB ORGANIZATION

You should carefully consider how to set up your caslibs. One or more of the following methods might work for your organization:

- Organize caslibs by project or team to enable only the users working on a project to access the data.

- Organize caslibs so that development data is separate from production data. If you use a single SAS Viya environment for both development and production, it is important to separate data that is used in production reports from data that is still being updated and restructured.

- Use the Public caslib for all data so that all users have access without further changes. This approach might be the easiest place to start. However, if you have many data sets and data sources, you might outgrow it over time.

- Separate public-facing data from internal data. If your environment enables guest users to access reports, you should carefully separate data that is to be used internally by your organization from data that is available for public reports.

Be aware that the more caslibs created, the more overhead is required to manage them. If **you aren't sure, start with a small number of caslibs**, and create more as needed.

LOADING AND REFRESHING DATA

Simply creating a caslib does not load the data into memory. SAS Viya operates only on data that is in memory. Tables in a caslib can be loaded manually into memory by selecting the load option in SAS Environment Manager. Tables are also loaded into memory when a report using that table is accessed, although a user might have to wait for the data to load. To eliminate manually loading data, you can set up a job so that data is refreshed on a regular schedule and after a system restart. Importing and loading jobs replace autoload in SAS Visual Analytics on SAS 9. In SAS Visual Analytics in SAS Viya, a separate folder is not needed to autoload data. Instead, data is autoloaded from the caslib itself.

To create jobs for a path-based caslib, perform the following steps. Note that for caslibs referencing databases or containing SASHDAT files, the Import job is not required.

1. Navigate to the Jobs page (or Jobs and Flows page if SAS Job Flow Scheduler is licensed) in SAS Environment Manager. Click the Scheduling tab.

2. Locate the job named Sample: Import cas-shared-default Public data. Copy it.

3. Specify the name and description for your new import job. Be aware that you cannot change the name and description after this point. Save the changes.

4. Open the properties for the new import job, click the Arguments tab, and edit them.

5. As Display 5 shows, select your caslib as both the Input Caslib and Output Caslib. Using the default filter, all files of type CSV, SAS7BDAT, and XLSX are imported. If different file types need to be loaded, update the filter as needed. If you want to move data from one caslib to another, specify different input and output caslibs. Save the changes.

Edit Argument

Server name:	cas-shared-default ▼
Input Caslib:	Finance ▼
Output Caslib:	Finance ▼
Filter:	or(endsWith(name,'.csv'), endsWith(name,'.CSV'),endsWith(name,'.sas7bdat'),endsWith(name,'.SAS7BDAT'),endsWith(name,'.xls'),endsWith(name,'.XLS'),endsWith(name,'.xlsx'),endsWith(name,'.XLSX'))

Settings   + 🗑 ⑦

Name	Type	Value	
varChars	BOOLEAN ▼	false	
getNames	BOOLEAN ▼	true	
allowTruncation	BOOLEAN ▼	true	
charMultiplier	NUMBER ▼	2	
stripBlanks	BOOLEAN ▼	false	
guessRows	NUMBER ▼	200	
encoding	STRING ▼	utf-8	

Save   Reset   Cancel
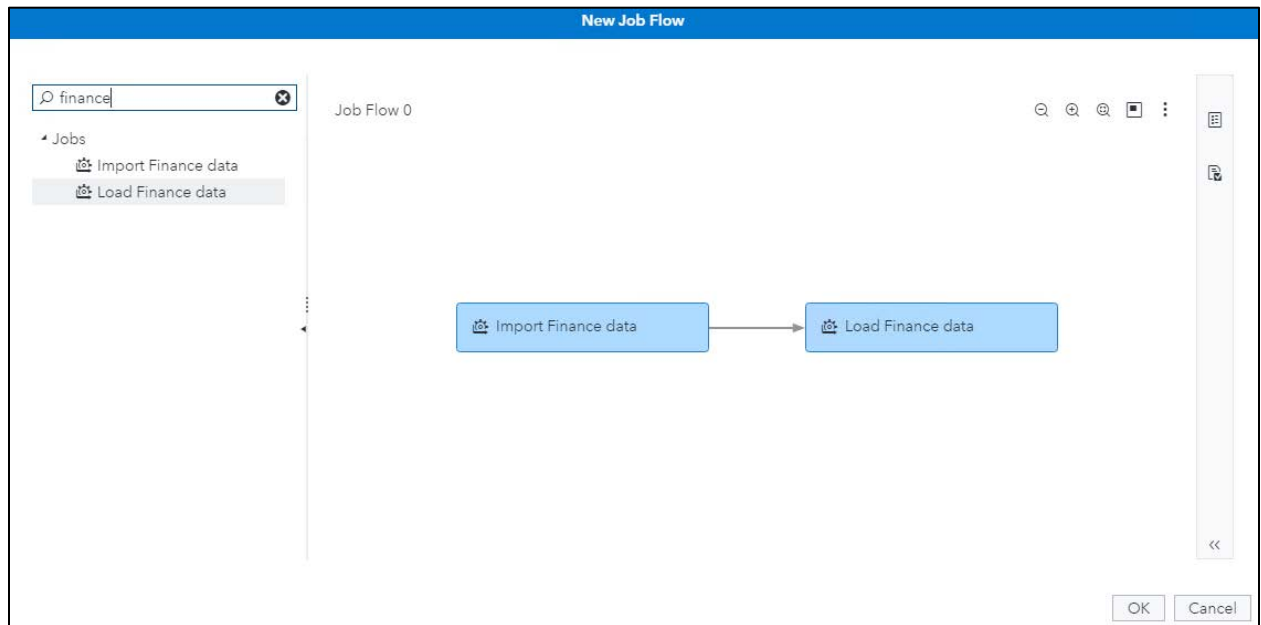
Display 5. Import Job Arguments

6. Repeat steps 2 through 6 for the job Sample: Load cas-shared-default Public data.

You have now created two jobs. The first job imports CSV, SAS7BDAT, and XLSX files into your caslib and converts them to file type SASHDAT. The second job loads the SASHDAT files into memory. The next step is to schedule the jobs to run on a regular basis.

Typically, you want to run these jobs sequentially so that the second job (which loads files into memory) runs immediately after the first import job completes successfully. If SAS Job Flow Scheduler is licensed and installed, you can create a job flow using these steps:

1. Navigate to the Jobs and Flows page in SAS Environment Manager.

2. Select New, then Job Flow.

3. Drag or add your two new jobs to the flow.

4. Draw an arrow so that the import job points to the load job as shown in Display 6:

Display 6. Job Flow

5. Name the job flow and save it.

If SAS Job Flow Scheduler is not installed, you can link the two jobs using these steps:

1. Open the properties of the load job. Copy the value of the ID field on the General tab, identified in Display 7.

Job Properties

| General | Properties | Arguments | Job Definition |

Name: Load Results data

Description: Loads data in Results caslib

ID: 5913433c-4acd-4205-a7d3-c5329b3a6e9c

Date created: January 8, 2020 10:41:48 AM

Date modified: January 8, 2020 10:42:05 AM

Created by: sasdemo

Modified by: sasdemo

Display 7. Job Properties of the Load Job

2. Open the properties of the import job. Click the Arguments tab, edit it, and copy the value into the successJobID field, as shown in Display 8. Save the changes. Now the two jobs are chained together, so that the second job runs immediately after the first job completes.

Display 8. Arguments for the Import Job

You can run the job flow or the sequenced jobs manually. Select the job flow or the first (import) job, and then select Execute. Or, you can schedule them to run on a regular basis by setting up a time trigger. Set up the time trigger on the job flow or the first (import) job. The Monitoring tab on the Jobs page shows the results of the jobs.

There is also a sample job for unloading data which can be handy during peak usage. The unload job forces tables to be removed from memory. Tables can be removed immediately or based on how frequently they were accessed in a specific time period, such as 7 days or 1 hour.

DETERMINE YOUR DESTINATION. WHAT CONTENT WILL YOU BE CREATING?

Now that your data is loaded, your team can get to the business of creating reports and dashboards. Ultimately that is your goal—your destination in the driving analogy. If you **haven't already, determine the types of content that** are initially created and the business areas or departments that create them. Consider how you will organize that content and whether you need to keep that content separate or if it can be combined.

When driving, you might use a map application to determine and remember frequent destinations that you visit. That map application helps you organize those destinations. Similarly, SAS Visual Analytics stores the destinations (content) in folders, which helps you easily access and organize them.

FOLDERS

Folders are virtual container**s, so you won't find corresponding directories on the SAS Viya** server. The reports themselves are also virtual. Custom graphs, data plans, models, and everything else except data are stored in folders.

Out of the box, each user has a My Folder folder that only that user and SAS Administrators can see. They also have access to the Public folder, which is initially available to all users.

Creating new folders is straightforward. Navigate to the Content page of SAS Environment Manager, select the folder that will be the parent of the new folder, create a new folder, and **specify the folder's name.**

FOLDER ORGANIZATION

Carefully consider how to set up folders. You might want to organize your folders to match the organization of caslibs. Or, you might want to expand it further since folders are completely managed in SAS Viya without requiring IT staff. You might want to consider organizing folders by one or more of these methods:

- Organize folders by project or team to enable only users on that project to access those reports.

- Organize folders so that development reports are separate from production reports. If you use a single SAS Viya environment for both development and production, it is important to separate production reports from reports in development.

- Separate public-facing reports from internal reports. If your environment enables guest users to access reports, you should separate reports that are to be used internally by your organization from reports that are available for the public. For users that are strictly report consumers, you might want to use a simpler folder structure so that they do not need to navigate through a lot of folders to get to content.

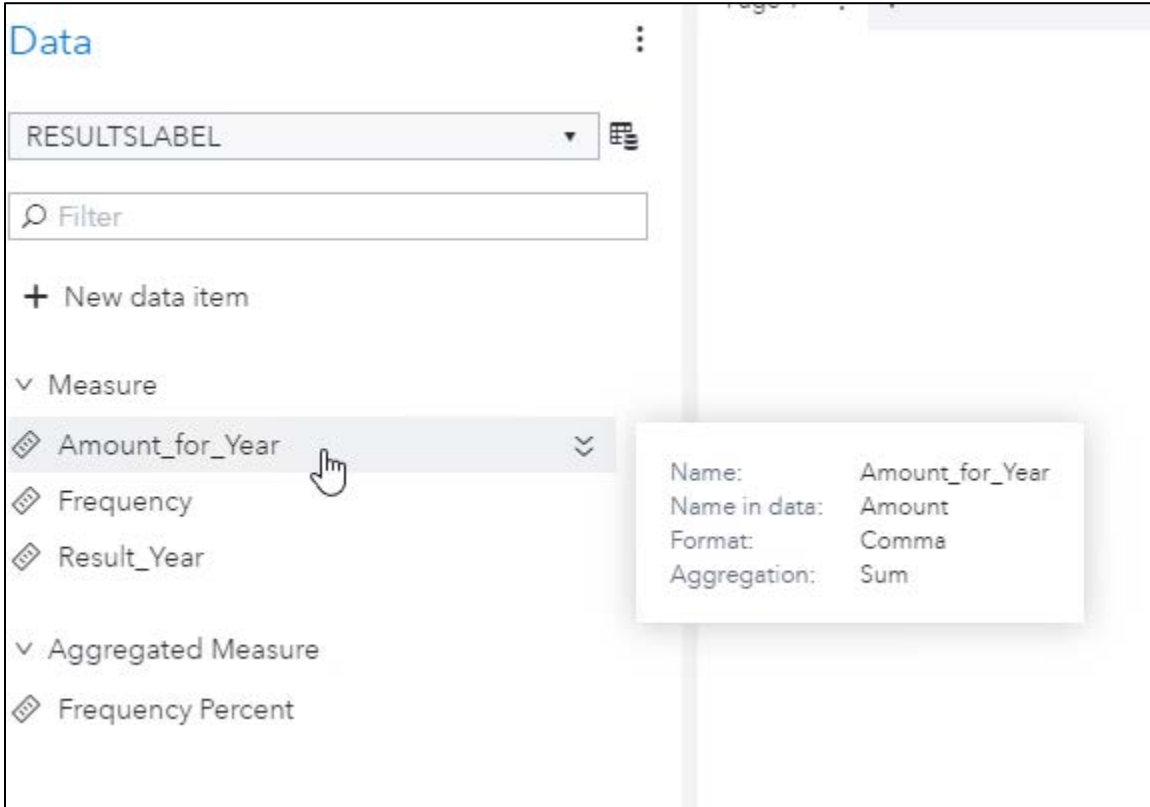As with caslibs, **if you aren't sure, start small**, and build it out as you go forward.

HOW SHOULD THE DATA BE STRUCTURED? DETERMINE YOUR ROUTE

The route to your destination influences the experience that you will have getting to that destination. Although **your phone's map app determine**s the best route, you still have some input, such as whether you want to drive on highways, toll roads, or two-lane roads. You might have a favorite stop along the way, requiring a specific route. The individual roads in your route matter because they impact the time to reach your destination and the experience that you have while driving.

Similarly, the structure and type of data you are using matter to SAS Visual Analytics. The structure of the data directly impacts how quickly you can create reports and dashboards as well as the experience that you have creating them. There is no single correct way to organize and structure the data. However, keep in mind the following considerations.

VARIABLE NAMES

Use descriptive names for the data variables (table columns) so that they are easier to find and use in SAS Visual Analytics. If you are using a SAS data set, it is the column labels, rather than the column names, that are displayed when viewing a table in SAS Visual Analytics. The column names are visible by positioning your mouse over a variable name. For example, in Display 9, the variable label is Amount_for_Year, and the variable name is Amount:

Display 9. Variable Names and Labels

NORMALIZED OR DENORMALIZED?

If the data for SAS Visual Analytics is coming from a data warehouse or data mart, it might be normalized into fact tables and dimension tables. Normalized data is split across multiple tables to eliminate redundancy. References, usually in the form of unique identifiers, are included in each table to identify relationships between tables. Joins are required across those tables to get a complete picture. Meanwhile, denormalized data has all the information ready in a single table so that no joins are required.

SAS Visual Analytics requires all the data for a single visualization to be contained in a single table in a denormalized format. If your data is not in that format, you can use SAS Visual Analytics or other products in SAS Viya to do the required joins. Alternatively, you can do the joins outside of SAS Viya. However, the data needs to be denormalized before creating the visualizations.

The tables in Display 10 contain data in a normalized format about students, teachers, schools, and classes. Although the normalized format might be an efficient format for storing data, the Classes table on its own does not contain very useful information about which students are in a class.

Students:

Student	Student_ID
Alan Anderson	111
Barbara Ball	112
Catherine Collins	113
Don Dixon	114

Schools:

School	School_ID
East Elementary	201
West Elementary	202
Central Elementary	203

Teachers:

Teacher Name	Teacher_ID
Mrs. Dodd	333
Mr. Wagner	334
Ms. Fletcher	335
Ms. Gilbert	336

Classes:

School_ID	Teacher_ID	Student_ID	Year	Grade
201	333	111	2018	2
201	333	112	2018	2
201	333	113	2018	2
201	333	114	2018	2
201	333	111	2019	3
201	334	112	2019	3
201	334	113	2019	3
201	334	114	2019	3

Display 10. Normalized Data

Display 11 shows a denormalized version of the Classes table with information from the Students, Schools, and Teachers tables. This denormalized format is what SAS Visual Analytics needs to create visualizations.

Classes Denormlized:

School_ID	School	Teacher_ID	Teacher Name	Student_ID	Student	Year	Grade
201	East Elementary	333	Mrs. Dodd	111	Alan Anderson	2018	2
201	East Elementary	333	Mrs. Dodd	112	Barbara Ball	2018	2
201	East Elementary	333	Mrs. Dodd	113	Catherine Collins	2018	2
201	East Elementary	333	Mrs. Dodd	114	Don Dixon	2018	2
201	East Elementary	333	Mrs. Dodd	111	Alan Anderson	2019	3
201	East Elementary	334	Mr. Wagner	112	Barbara Ball	2019	3
201	East Elementary	334	Mr. Wagner	113	Catherine Collins	2019	3
201	East Elementary	334	Mr. Wagner	114	Don Dixon	2019	3

Display 11. Denormalized Data

HOW MANY TABLES?

Although **denormalized data is required, you probably don't want one very large** denormalized table containing all the data on a single topic. Having one very large table with hundreds of columns is not only difficult to manage, but it could use more memory than is necessary. Instead, consider splitting your data into multiple tables, perhaps one table per subtopic, so that extra data is not being pulled in when creating a visualization. This method makes it easier to find and use columns in your tables. Eliminate any unused data columns or rows in your tables so that they are not taking up space in memory.

DETAIL AND/OR AGGREGATE DATA?

Consider whether you need detail data, aggregate data, or both. Next, consider whether all your users should have access to both detail and aggregate data. SAS Visual Analytics can perform aggregations on detail data if those aggregations are not already in place. However, sometimes you might find it easier to do the aggregations in another tool, depending on what needs to be aggregated.

MEASURE VERSUS CATEGORY

SAS Visual Analytics considers each data variable to be either a measure or a category. A measure has numeric values that can be used in computations. Everything else is a category. Be aware that if you have columns containing all numbers except a few text values such as NULL or NONE, SAS Visual Analytics treats that variable as a category and does not allow numeric operations to be performed on it. You need to remove or change those values for SAS Visual Analytics to perform calculations on that variable.

WHERE TO RESTRUCTURE DATA?

If your data needs to be restructured, there are several SAS tools available. If you are already using SAS Enterprise Guide, Base SAS, or SAS Data Integration Studio, you might find it easiest to continue using those tools. Other alternatives include using SAS Studio or SAS Data Preparation in SAS Viya to manipulate the data. Although you can do calculations, transforms, and joins in SAS Visual Analytics itself, you might find it easiest to make those data changes in one of the other tools mentioned here so that changes are made in a single location in a more repeatable process.

STAYING IN YOUR LANE. WHAT SECURITY IS AVAILABLE?

Drivers are expected to follow the rules of the road, obeying signs and traffic signals. In SAS Viya, the key security concepts for super users are authorizations and rules.

Authorization determines which resources are available to which users. In SAS Viya, there are two authorization systems: the CAS authorization system, which manages access to caslibs and tables; and the general authorization system, which manages access to folders and all content inside folders such as reports, data plans, and models. A user viewing a report needs access to the report itself, as well as the data used in the report.

The two authorization systems are similar, but they do have a few nuances. Both systems are managed from SAS Environment Manager. CAS authorization is managed from the Data page, and general authorization is managed from the Content page. To change authorization, both systems require users to be SAS Administrators or to have ManageAccess authority for data or Secure authority for content.

Finally, both authorization systems implicitly deny any access that is not granted. Therefore, there is no reason to add prohibit rules for all users (as that is the default state). Instead, you should grant access to the groups that should have access. Users not in those groups are automatically denied. This is a difference from SAS 9.4.

AUTHORIZATION ON DATA

When assigning authorizations on data, apply the authorization at the caslib level whenever possible to reduce the number of authorization settings that need to be maintained. Authorizations set on the caslib flow to all tables in that caslib. If needed, you can override the caslib authorization at the individual table level.

To set up authorization on a caslib, follow these steps:

1. Navigate to the Data page in SAS Environment Manager.
2. On the Data Sources tab, right-click on the caslib, and select Edit authorization.

3. Select the Add identities icon, and select the identities that should have access. Authorizations should be set up using groups or custom groups instead of individual users to reduce the maintenance required.

4. Move the slider bar in the Access Level column to specify the appropriate access. To reduce maintenance, try to use broad access levels whenever possible. If you find those levels are not granular enough, you can click an individual cell in the table to grant or deny access. Display 12 shows that the east group has been given Read access to the Finance caslib and all tables within it.

Display 12 also shows that Authenticated Users are denied access. Authenticated Users is predefined in SAS Viya and contains all users except guest. For this caslib, all users except sasdemo (the user who created the caslib) and those in the east group are prevented from accessing the caslib and the data within it.

Display 12. Data Authorizations

AUTHORIZATION ON CONTENT

When setting up authorizations on content, apply the authorization at the folder level whenever possible to reduce the number of authorization settings that need to be maintained. Authorizations set at the folder level can also apply to the content in that folder. If needed, you can override the folder authorization at the individual report level.

To set up authorization on a folder, navigate to the Content page in SAS Environment Manager. Right-click the folder, and select Edit authorization. Display 13 shows the authorization for this folder before any authorizations are added. As with caslibs, Authenticated Users are initially denied access to the folder and its contents. Similarly, sasdemo, the user who created the folder, has full access to it. Unlike caslibs, however, SAS Administrators are also given full access to every folder.

Looking carefully at Display 13, you see that the general authorization types are different from the CAS authorization types. In addition, there are two sets of similarly named roles, such as Read and Read (convey). The first set of authorizations apply to the object itself, the Finance folder in this case. The second set of authorizations apply or convey to the children of the object, which are the reports within the Finance folder as well as any subfolders. This flexibility enables you to assign different permissions on the folder than its children. This allows you, for example, to prevent users from changing the folder while allowing them to add content to it.

Edit Authorization

📁 Finance

☐ Show horizontal column headings

Principal	Read	Update	Delete	Secure	Add	Remove	Read (convey)	Update (convey)	Delete (convey)	Secure (convey)	Add (convey)	Remove (convey)
👥 Authenticated Users	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
👥 SAS Administrators	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
👤 sasdemo	⊘ ♦	⊘ ♦	⊘ ♦	⊘ ♦	⊘ ♦	⊘ ♦	⊘ ♦	⊘ ♦	⊘ ♦	⊘ ♦	⊘ ♦	⊘ ♦

Display 13. Initial Folder Authorization

To change authorization, select the Add identities icon, and choose the identities that should have access. As with caslibs, authorizations should be set up using groups or custom groups to reduce the maintenance required. For content authorizations, there is no slider bar that sets multiple permissions. Instead, click in an individual cell to grant or deny access to the folder or its content.

Display 14 shows two common permission assignments for report developers (the east group) and report consumers (the west group) on the Finance folder. The first set of permissions allows users in the east group to view, add, delete, and remove reports in the Finance folder, but not update or assign permissions on the Finance folder. The second set of permissions allows users in the east group to view, add, update, delete, and remove content in any subfolders, but not assign permissions to subfolders. Because a report is a child of a folder, these users can also update reports in the Finance folder. Meanwhile, the west group has permission only to view the Finance folder, reports in the folder, and any subfolders. Other common permission patterns are described in the blog Simple general authorization patterns.

Principal	Read	Update	Delete	Secure	Add	Remove	Read (convey)	Update (convey)	Delete (convey)	Secure (convey)	Add (convey)	Remove (convey)
Authenticated Users	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
east	✓ ♦	⊘	✓ ♦	⊘	✓ ♦	✓ ♦	✓ ♦	✓ ♦	✓ ♦	⊘	✓ ♦	✓ ♦
SAS Administrators	✓	✓	✓	✓	✓	✓	⊘	⊘	⊘	⊘	⊘	⊘
west	✓ ♦	⊘	⊘	⊘	⊘	⊘	✓ ♦	⊘	⊘	⊘	⊘	⊘
sasdemo	✓ ♦	✓ ♦	✓ ♦	✓ ♦	✓ ♦	✓ ♦	✓ ♦	✓ ♦	✓ ♦	✓ ♦	✓ ♦	✓ ♦

Display 14. Folder Authorizations After Changes

As with caslibs, consider starting simply by just using the Public folder and adding complexity only when needed. When you do create and set up authorizations on folders, strive to only grant access, instead of prohibiting access, because access is prohibited by default. Note that the Delete permission allows an object to be deleted, and Remove allows an object to be moved.

If you accidentally lock yourself out of access, you can go to the Servers page in SAS Environment Manager, right-click the server cas-shared-default, and select Assume the Superuser role. Then, you can undo the permissions that were just set up. **Don't forget to** relinquish the super user role as soon as you are done.

ROW-LEVEL SECURITY ON DATA

If granting access to an entire table is too broad, consider using row-level security to grant access to only specific rows of data. Row-level security is commonly configured using user names or group names. A user then has access to rows that match their user name or one of their group names. Row-level security can only be applied to a table, rather than an entire caslib.

Display 15 shows a data set called row_security_mine containing a column representative that corresponds to user names, and a column region that corresponds to group names.

Display 15. ROW_SECURITY_MINE Data Set Contents

To set up row-level security using this table, follow these steps:

1. Navigate to the Data page in SAS Environment Manager.

2. Find the table to authorize, and select Edit authorization. The Authenticated Users group previously was given access to read content in this caslib.

3. In the row with Authenticated Users, click the Select column.

4. Change Direct setting to Row-level Grant. Enter a Row-Level Filter expression. To filter on the values in the region column, use the following expression: region in ('SUB::SAS.IdentityGroups')

You see a diamond in the Select cell as shown in Display 16.

Display 16. Row-Level Security Authorization

The result is that users must be in a group that matches the values in the region column. Users see only rows with a matching value for their group name. For example, the user sasdemo04 is a member of the group east. Therefore, sasdemo04 can see only rows that have the value east in the region column as shown in Display 17.

region	representative	sales	year ▲
east	sasdemo04	$432.41	2015
east	sasdemo	$100.33	2015
east	sasdemo02	$90.99	2016
east	sasdemo04	$282.22	2017
east	sasdemo	$789.88	2017
east	sasdemo02	$654.66	2018
east	sasdemo	$234.34	2019
east	sasdemo04	$8,568.22	2019

Display 17. **User's** View of Content After First Row-Level Security Filter

To allow access to rows in the table based on both the representative and region in the table, change the filter to the following expression:

region in ('SUB::SAS.IdentityGroups') or representative in ('SUB::SAS.Userid')

After this change, the user sasdemo04 has access to rows that have the value east in the region column or rows that have the value sasdemo04 in the representative column. Display 18 shows the data that sasdemo04 can now see:

region	representative	sales	year ▲
east	sasdemo	$100.33	2015
east	sasdemo04	$432.41	2015
north	sasdemo04	$80.99	2016
east	sasdemo02	$90.99	2016
east	sasdemo04	$282.22	2017
east	sasdemo	$789.88	2017
east	sasdemo02	$654.66	2018
north	sasdemo04	$123.44	2018
east	sasdemo04	$8,568.22	2019
east	sasdemo	$234.34	2019

Display 18. **User's** View of Content After Second Row-Level Security Filter

Note that column-level security, which would grant access to select columns of data, is not supported in SAS Visual Analytics, though it is supported in other products in SAS Viya. If a user lacks access to a column in a table, no data for that table is available in SAS Visual Analytics.

RULES: AUTHORIZATION ON FEATURES

Authorization on features in SAS Viya can be established by setting up rules. Rules might be broad, specifying which users can access a SAS Viya product such as SAS Visual Analytics or SAS Studio. Or, they can be more specific by granting permission to specific features in a SAS Viya product. As with other types of security, try to use groups or custom groups in the rules. In the following example, a custom group named Report Developers has been created, and users have been added to that group.

To set up a rule to restrict who can create reports, navigate to the Rules page in SAS Environment Manager. Search for and edit the rule /SASVisualAnalytics_capabilties/edit. By default, all Authenticated Users are granted access to all of SAS Visual Analytics, which allows both viewing and creating reports in SAS Viya 3.5. To allow only users in the Report Developers group to create reports, change the Principal type to Group, and select ReportDevelopers as the principal as shown in Display 19. You might want to specify a message to prohibited users in the Reason field.

Display 19. Rule to Grant Access to Create Reports

As a result, only users in the ReportDevelopers group have access to create reports in SAS Visual Analytics. A user who is not in the ReportDevelopers custom group does not see the Edit icon in the top left corner when accessing a report. Note that prior to SAS Viya 3.5, the rule to create reports was called /SASVisualAnalytics/**.

Only one group can be specified in a rule. To specify multiple groups with access to a specific feature, you can copy a rule and use that rule to identify a second group that should have access.

Below is a list of commonly used rules:

- To create reports, modify the rule /SASVisualAnalytics_capabilities_edit.

- To export data from reports, modify the rule /reportData_capabilities/exportData.

- To export detail data from reports, modify the rule /reportData_capabilities/exportDetailData.

- To use SAS Studio, modify the rule /SASStudioV/**.

- To access the Import Data window, modify the rule /casManagement_capabilities/importData.

- To add a custom map, modify the rule /maps/providers/*.

For additional rules, see the [Access to Functionality: URI Reference](#) section of the *SAS Administration Guide*.

ADJUSTING TO YOUR NEW CAR. WHAT ELSE DO I NEED TO BE THINKING ABOUT?

When you get a new car, it takes time to learn how to use all the features. Your car might have features that **you didn't even know existed!** This section describes additional capabilities in SAS Visual Analytics and a few other pieces of advice for getting started.

MAKE SAS VISUAL ANALYTICS A PRIORITY

After identifying and training your super users, you need to get your entire team on board. Consider what type of training the team should receive—whether it is formal training from SAS or self-focused training. Either way, get your team using the product regularly as soon as possible to retain information learned. You might want to create a shared data set or two just for experiments. Encourage your team to take the time to play with SAS Visual Analytics daily to get up to speed.
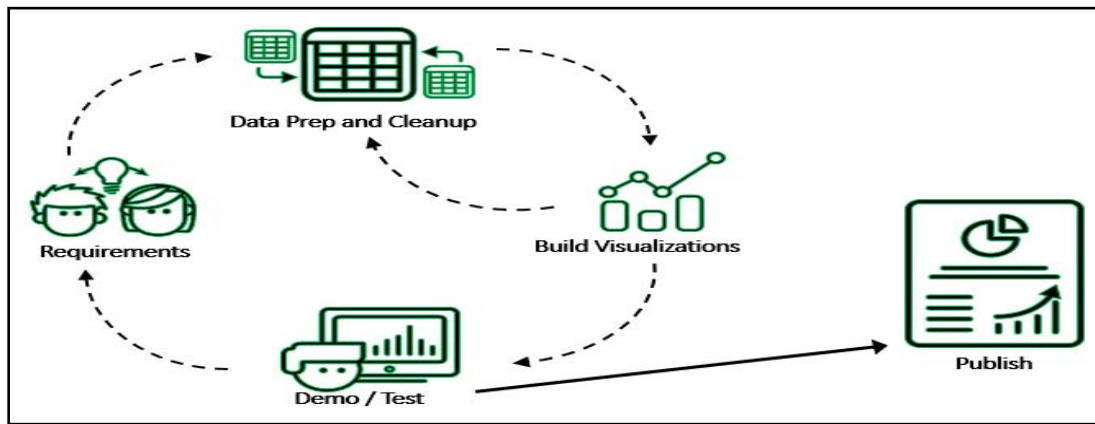
MAKE A MINDSET CHANGE

If your team is coming from an environment where spreadsheets or other table-based reports are the norm, recognize that there will be a learning curve to develop visual reports. Similarly, if you team creates reports through a traditional BI reporting tool based on pre-built specific and complex queries to a database, there will be a mindset change to the more interactive method of creating visualizations. With SAS Visual Analytics, much of the complex querying of data by report developers is unnecessary. Instead, data is manipulated and joined, and then loaded into memory upfront. SAS Visual Analytics is used to access the data, experiment and drill into the data, and create reports using the drag-and-drop interface. There is no need to continually go back to the database to generate new queries.

If your team is coming from one of these types of environments, there will be a mindset change. You and your super users need to lead your team in being willing to reassess how you do things to take advantage of the features of SAS Visual Analytics.

BECOME AGILE

Visual reports are best developed in an agile, iterative method. If your team is not already agile, consider moving in that direction. An agile approach, shown in Display 20, uses short cycles of development in combination with frequent communication with stakeholders.

Display 20. Agile Approach

Each iteration or cycle might be a week or two in duration. The iteration begins by discussing the report requirements with your stakeholders. Ask the stakeholders these questions: Who is the audience for the report? What is their purpose in using the report? What data is needed? How will the user interact with the report? Is filtering required? Will users use summary data, aggregate data, or both?

You might want to capture requirements as user stories so that they use a consistent format, ensuring that your requirements are user focused. User stories should be in the following format:

> As a [user type], I want to [perform a function], so that I can [reason for performing the function].

Here's an example of a completed user story:

> As a school district administrator, I want to see how much scholarship money was spent in my district, broken down at the school level, so that I can track against the budget.

Last, during requirements discussions, determine with your stakeholders what requirements are part of the iteration.

As your team begins work on the requirements, they might need to prepare the data by restructuring, joining, or cleansing it. Your team then starts creating reports with the data. That, in turn, might lead to a need for more data restructuring. You might go back and forth between restructuring data and designing reports several times during an iteration.

At the end of the iteration, you should be able to demonstrate the completed features to stakeholders or give them direct access to test. As a result, the feedback received will be the start of requirements for the next iteration. Add to that the next set of priorities for development. The entire process repeats until you have something that your stakeholders are ready to publish.

When it is time to publish the report, you might need to move data and content between environments or between caslibs and folders. Think through this process and test it out before you get too far. Ultimately, using an agile development process for your reports should enable you to deliver reports that delight your users.

SHARE REPORTS

Whether you are still developing reports or you are ready to publish them, you need to consider how the reports will be shared. Do you plan to publish via PDF? Will users have direct access to SAS Visual Analytics to view reports? Do you want to publish interactive

reports on your internal or public website? The following list outlines some of the more common methods for distributing reports:

1. **Share a direct HTTP link to the report:** If the report consumers have access to SAS Visual Analytics (or SAS Report Viewer prior to SAS Viya 3.5), either as a logged on user or as a guest user, then you can send them a link to the report. To obtain the link for a report, use the snowman icon in the upper right corner of SAS Visual Analytics, and select Copy link. Select options, and then select Copy Link. Display 21 contains an example. Users with the link who have access to view reports in SAS Visual Analytics can use and interact with the report.

Display 21. Copy Link to Report

2. **Embed your report into an HTML page using the SAS Visual Analytics SDK (SAS Visual Analytics 8.4 and above):** Often, you want to incorporate the reports into a website. A link to a report or object can be generated and included in an HTML page. To generate an embeddable link, follow the steps in the previous option. In addition, select Embeddable web component. The generated link is an embeddable HTML tag that can be included in your web page. The result is that users can interact with your reports seamlessly in the context of your web page.

There are a few other steps that are required for your web page to include the report. You need to consider whether users are required to supply their credentials or if the reports are open to the public via guest access. You need to include the SAS Visual Analytics SDK. For full details, see the post Embedded Insights with SAS Visual Analytics SDK.

3. Embed your report into an HTML page using an iframe HTML tag (SAS Visual Analytics 8.3 and earlier): For users on SAS Visual Analytics 8.3 and earlier, reports can be embedded into your web page using an IFRAME tag. The details are outlined in the paper Integrating SAS Analytics into Your Web Page.

4. Access reports via the SAS Visual Analytics App: Report consumers using mobile devices might want to access the reports using the SAS Visual Analytics Apps (formerly called SAS Mobile BI). You can set up blacklists or whitelists to determine which devices can access your reports. For more information, see the *SAS Viya Administration Guide.*

CREATE GEO MAPS

Out of the box, SAS Visual Analytics can create maps based on US state names and abbreviations, US ZIP codes, and country names or codes. However, you might want a map based on another shape, such as counties or floor plans. SAS Administrators can set this up for their teams in SAS Visual Analytics by creating a geographic data provider (formerly called custom polygon) from a SHP file. The details to set this up are described in the blog post Creating Custom Region Maps with SAS Visual Analytics. If you are using SAS Viya 3.5 or later, be sure to use a Geo region or Geo region-coordinate object in your report to display the regions.

CREATE DATA VIEWS

In addition to loading data, you might want your super users to create data views on frequently used data. Data views contain the names, formats, calculations, and aggregations that have been created for a table. Data views can be saved and reused by others in your organization. All the reports using that table can use those calculations, allowing them to be stored in a single place, saving time and enabling consistency.

CREATE THEMES

If you have specific colors or fonts to be used throughout your reports, then consider creating a theme. There are two types of themes: application themes and report themes. Application themes change the branding, colors, fonts, and banners of the SAS Viya applications themselves. Report themes change the colors, fonts, headers, and backgrounds within reports. Users must be a member of the Application Administrators custom group in order to create themes.

CONCLUSION

This paper describes the tasks that super users perform to get their organization up and running on SAS Visual Analytics. Following the guidance outlined here, your organization will have a solid foundation for using SAS Visual Analytics and other products in SAS Viya. Your organization will be on the road driving with SAS Visual Analytics quickly, so that you can get to your destination faster. Vroom, vroom!

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RECOMMENDED READING

- *SAS Viya 3.5 Administration*

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