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Powering Business Users with one-click insights and custom reports using SAS®

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ABSTRACT

One of the challenges which business users have is handling data of variety and size and then processing it to extract information to make business decision(s). SAS**®** Enterprise Guide (EG) can handle complex data files easily with different file formats coming from the various data sources. SAS Visual Analytics (VA) with its rich visuals can be used to develop business-friendly dashboards. Did you ever felt the need to publish/update the comments/insights while analyzing the results in the dashboard so that it's visible to others in real time? SAS VA has the unique capability to solve this use case using SAS stored procedure(s) by interacting with external URL(s). This paper explains how a user can enter their comments/insights to publish them real-time in the SAS VA dashboard. This paper also describes how to interact each record in a SAS VA List table object by linking it to an external link, each record in the SAS List table links to the PDF dashboards (created by Excel VBA) residing in the server which can be downloaded by clicking on the record in the SAS VA List table. Also, it includes a process to send customized emails to the end users using SAS EG. These emails are customized by the subject, body, and attachments (PDF dashboards).

INTRODUCTION

Today business would like to have everything at one place instead of accessing different applications to generate actionable insights. This paper explains a business case where a business user handling multiple customer accounts, is expected to generate customer-specific insights/dashboards and, list down the actions/comments to make business decisions based on the insights. The solution proposed in this paper helps business to get most of the information and insights at one place. First, it explains a process to link SAS VA List table object to an external link allowing the business user to download customer specific PDF dashboard(s). The PDF dashboard has been created by VBA and stored at a predefined directory in the server. Second, it highlights the process of how a business user can update comments at customer level using SAS PROC IMSTAT and SAS stored procedure(s). The comments are updated using a UI using SAS stored procedure by linking as an external link to a SAS VA list table object. On submission of comments by the user, the stored procedure updates the SAS VA LASR table on the fly by adding the user comments to a column in the LASR table.

PROBLEM

The use case discussed here is for business to business environment. For example, a manufacturer might want to track the performance of his customers through this solution. The objective is to develop and distribute customer performance report in a portable document format (PDF) across the years and distribute PDF reports to customers directly using an automatic email solution. It is also required to have an interactive SAS VA dashboard – to monitor current year performance of the customer with the ability to download customer level PDF dashboard and enter comments for each customer based on their performance.

SOLUTION

Large Scale reporting solution has been deployed using SAS EG, SAS VA and Microsoft Excel VBA. End to end process including data collection from source, data transformation, and data processing for reports & email distribution is discussed. Complete data processing has been done in SAS EG and, SAS VA is used to create a dashboard.
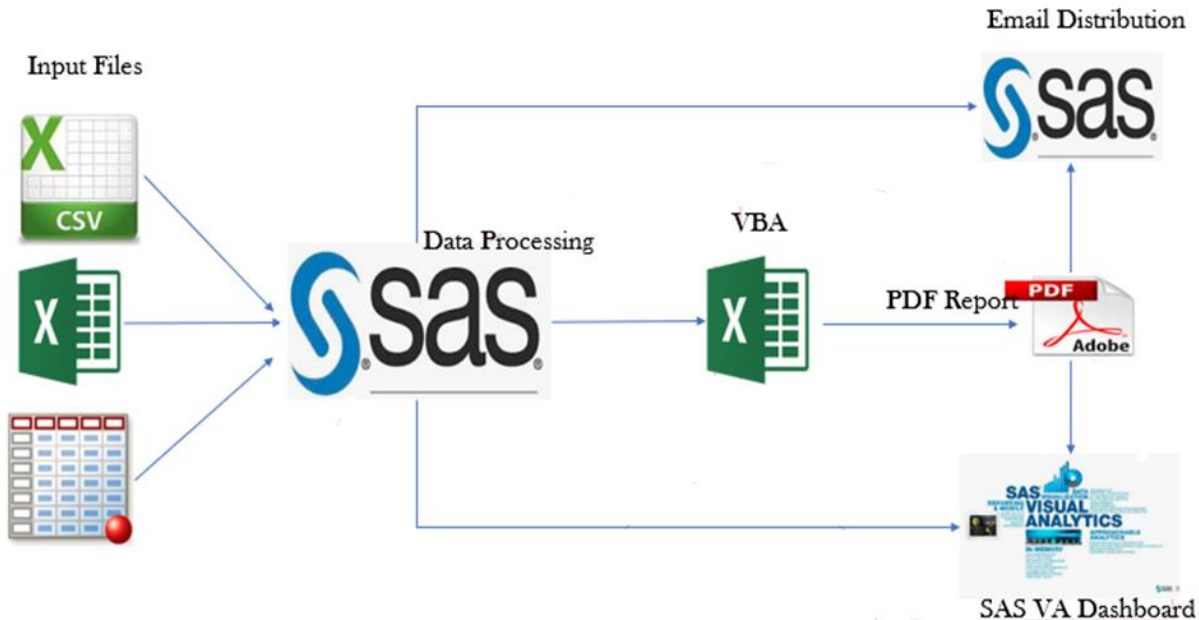

Figure 1**: Solution Design**

1. DATA PROCESSING

Input data is taken through SFTP server in Excel and CSV formats. Before importing data into the file system an automated process archives previous month files to a backup folder.

Data Processing process flow:
i)   Transfer the data from the landing area to the staging area.
ii) Transform the data in staging area and export it to an Excel file.
iii) Excel VBA programs read these Excel files and create PDF reports in a predefined template and
iv) A copy of these PDF dashboards is placed at a specified server location to allow the user to download from SAS VA. These dashboards are linked to the SAS VA List Table object (**Figure 2: Data Process Flow**) allows the user to download customer reports from SAS VA.
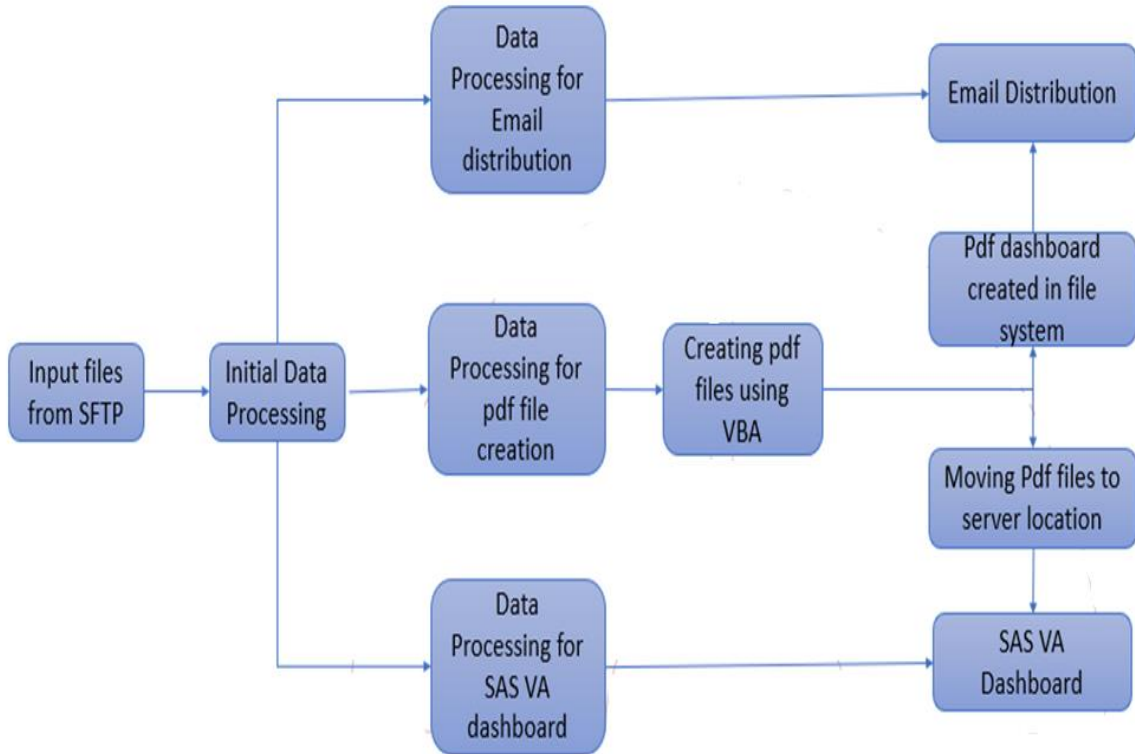
Figure 2: Data Process Flow

2. DOWNLOADING PDF REPORTS FROM SAS VA

i) **List Table Object**: List table Object is the most useful object in report designer as it enables the users to examine the raw data. List table displays data as text. The List table has features like sort, resize and re-arrange columns. The unique feature of List table is the ability to display trend lines.

List table is used in SAS VA report to display customer current year sales data. Each customer has one record and the customer name is the unique/primary key in the List table. Table 1 below is illustration of this

Table 1: Sample List Table

Customer Name ▲	Contract Start Date	Contract End Date	CY Target - CYTD	CY Actuals - CYTD	Pace	File Name	comments
Customer Name1	02/26/2018	02/25/2023	$266,411	$237,339	-10.9%	Customer Name1.Pdf	CoreCompete Test
Customer Name2	12/01/2016	11/30/2021	$30,343	$33,522	10.5%	Customer Name2.Pdf	
Customer Name3	10/23/2017	10/22/2022	$102,904	$132,837	29.1%	Customer Name3.Pdf	test 2 - GO
Customer Name4	12/10/2017	12/09/2022	$72,603	$88,296	21.6%	Customer Name4.Pdf	test 3 - GO
Customer Name5	12/08/2017	12/07/2022	$92,682	$89,900	-3.0%	Customer Name5.Pdf	

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ii) **External Link**: This is another good feature of SAS VA to add a link from a report object to an external URL. It also links text or images to an external URL.

The http:// part of the link should be provided, and the link would be relative to the current web application server. The External link feature is available in the right-hand side under the *Interactions* tab.
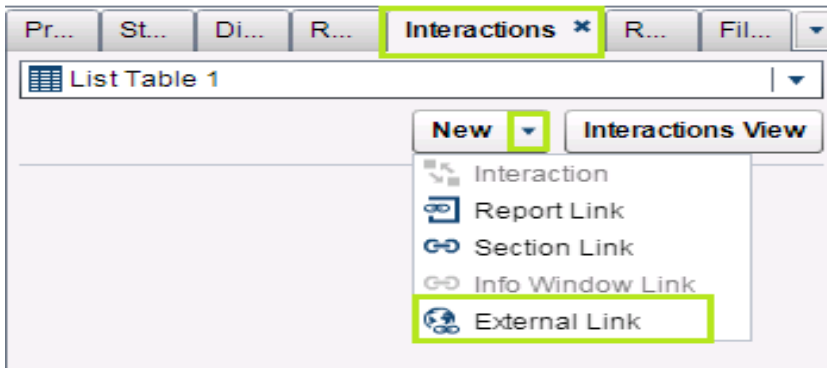

Figure 3: External Link

iii) **Linking List Table to Server using External Link**

During data processing PDF reports are moved to the server location or metadata server. Now, the external link is connected to the server location by providing the location path as an external URL using http:// instead of local metadata server path (**Figure 4: Linking List Table to External URL**). Parameters option on "Edit External Link" is used to map Source and Target, in our use case we mapped using parameter "FileName" to link with the PDF report on the server.

The parameters are the most important in the below External link screen. A parameter is a variable whose value can be changed and that can be referenced by the other report objects. The SAS Visual Analytics Designer (the designer) supports parameters for controls in reports. Here the source "FileName" is the file name from the object List table.
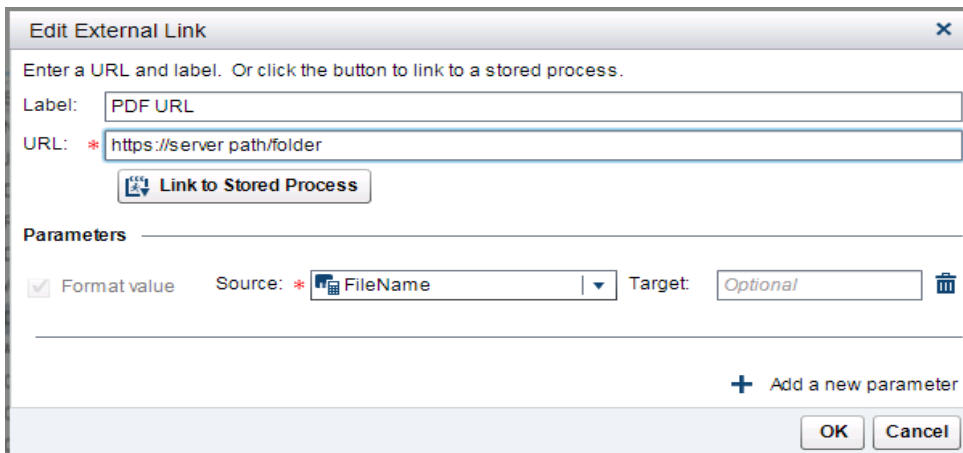

Figure 4: Linking List Table to External URL

iv)   Download customer reports

The connection has been established between SAS VA List table object and PDF dashboards in the server location. Now, if the user double-clicks on any of the customer name and select 'External link to PDF URL' then the PDF dashboard associated to that customer will open in a *New* tab and will be available to download as well.
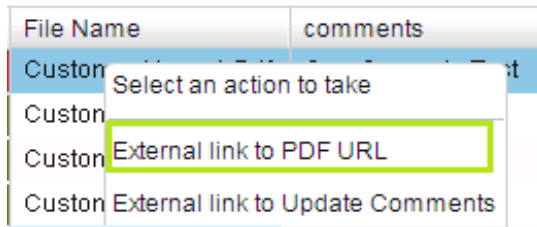

Figure 5: Selecting External Link from List Table

3. ENTERING COMMENTS IN SAS VA DASHBOARD

The SAS stored process is used to build this solution. A stored process is the SAS program that is stored on a server and can be executed as requested by the client application such as SAS VA. The embedded SAS code can contain instructions for displaying report elements including queries, prompted filters, images etc. You can add one or more stored processes to a report. The stored process output in a report is rendered as HTML regardless of the requested output type. In this solution, External link is used to call the stored process residing in the server.

We have used 2 stored procedures for enabling user to enter the comments – One stored process has the SAS code to create a user-friendly UI for the user to enter comments and Second stored process is to do actual processing of updating the SAS LASR tables on memory with the user entered comments. The Second stored process is called from the first stored process once the user clicks on submit button in the UI. The user can update one customer comments at a time.

Following steps can be used to enable on the fly commenting (updating) on SAS VA using Stored process.

i)   Linking List table to SAS Stored Process
The first stored process on the metadata server is linked using the "External link" option in SAS VA List table
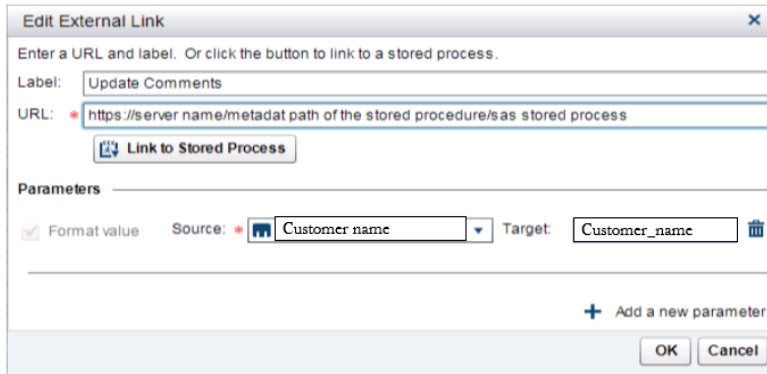
Figure 6: External Link connecting to a stored process

ii)   Trigger stored process using external link

Once the user double clicks on any record on the list table and selects the external link
'*External link to Update Comments*' (Customize to other text as well), the associated
stored process will be triggered to open a *New* tab on the browser with an UI to allow
the user to enter comments.

Figure 7: Trigger stored process using External Link

iii)   Enter comments on HTML UI

The UI has the customer name and the empty comments box to allow the user to add
comments (**Figure 8: HTML UI**). When the user clicks on the "Submit Comments" button,
the stored process will first check whether it is a valid user. If the user is a valid user,
then the comments entered by the user will be processed, otherwise it will display a
warning message stating the user is not authorized to enter comments.
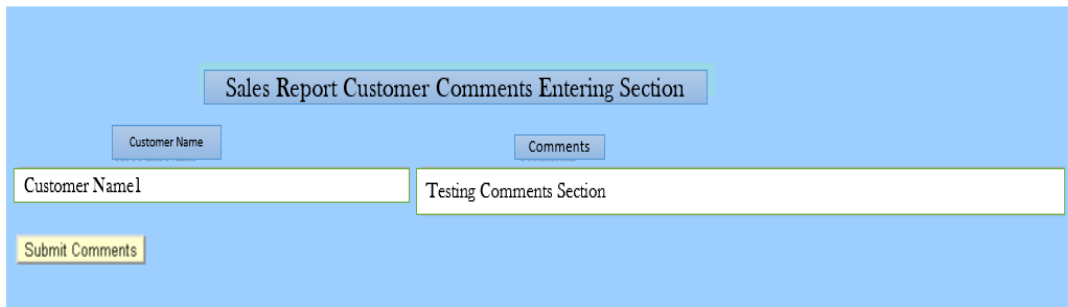
Figure 8: HTML UI

Figure 9: Submitting Comments page

Once the user clicks on the '*Submit Comments*' button, the second stored process is triggered. This stored process takes the customer name and comments from the above screen and updates the SAS LASR table using PROC IMSTAT with the user comments for the selected record (please see step ii of this process).

PROC IMSTAT procedure is used to do in-memory processing of table on SAS LASR server enabling the user to see the updated data in real-time on list table in SAS VA dashboard.

```
proc imstat;
table LASRLIB.strategic_data_VA;
where account_name="&account_name";  /*Checking customer name */
update comments = "&comments."; /* comments will be update*/
run;
quit;
```

4. BULK EMAIL DISTRIBUTION USING SAS EG

Once the email distribution of initial data processing is done, data is divided into different tables based on the email rules. It means that certain email rules like customers performing above expectation, etc. should get certain kind of message and vice versa.

The email message content (Subject and Body) is customized based on the email rules defined then emails are distributed in bulk to different customers by attaching PDF Dashboard(s) with custom messages.

FILENAME Statement with EMAIL (SMTP) Service

FILENAME enables you to send emails programmatically from SAS using SMTP as an interface. There are many options available in it like TO address, CC address, ATTACHMENT, and CONTENTTYPE, etc. DATA step is used with PUT statement to write the body of the email and it sends email electronically with FILE statement.

```sas
%macro emaildist();
    %do i=2 %to &n;
        data _null_;
        set to_cc;
        where account_name=%unquote(%nrbquote("&&name&i"));
        %LET ATTACH1=&filepath;
        %LET ATTACH2=&&name&i;
        FILENAME Mailbox EMAIL TO=(&&toemail&i)
        CC=(&&ccemail&i)
        Subject="Performance Report - &&name&i"
        Attach=("&ATTACH1.&ATTACH2.&pdf" CT="APPLICATION/PDF"
        EXT="PDF");
    DATA _NULL_;
    FILE Mailbox;
    Put "Hi";
    Put /;
    Put "Attached is the Performance Report file for &&name&i..
    for quarter &&quarter&i...";
    Put //;
    Put "Thanks & Regards";
    Put "&team_name";

    RUN;


        %end;
%mend;
%emaildist();
```

RESULTS AND CONCLUSION

Creating the PDF dashboards and SAS VA dashboard with great flexibility to download PDF dashboard from the List Table object, and then enter comments in SAS VA dashboard by the users, significantly reduces the business users time to look at the business at different levels and take decisions. It resolves the challenge of keeping the end customer(s) informed about their performance by attaching their report. This improves business credibility from a customer point of view. Especially, with SAS VA dashboard, business works efficiently and effectively as they need not look for PDF dashboard(s) in some directory and search for the specific customer. SAS VA dashboard brings everything in one place.

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