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# VIRTUAL

SAS® GLOBAL FORUM 2021

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## Modernizing Scenario Analysis with SAS® Viya and Visual Analytics

Stu Sztukowski, Analytic Consultant, SAS Institute, Inc



Stu is an Analytical Consultant in SAS's US Professional Services division, helping implement end-to-end forecasting solutions in the areas of data intake, modeling, and visualization. In his free time, Stu loves to work on BMWs, detail cars, and turn spare electronics from around the house into occasionally useful tools.

<https://linkedin.com/in/StatsGuy>

[stu.sztukowski@sas.com](mailto:stu.sztukowski@sas.com)

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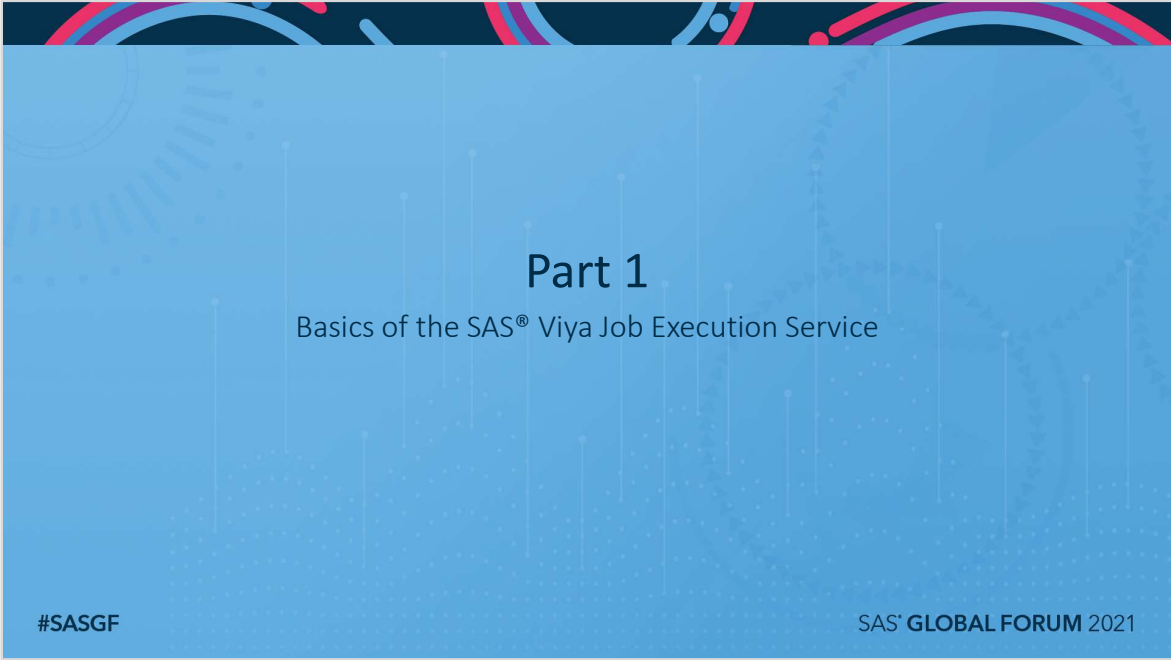
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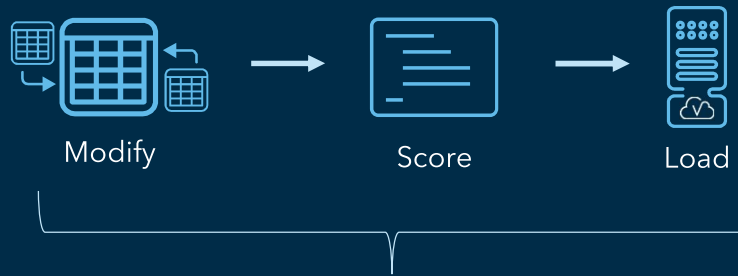


**Part 1**  
Basics of the SAS® Viya Job Execution Service

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## Implementing Scenario Analysis in SAS® Viya



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Scenario Analysis code must do three things: Modify the data, Score it, and load it to Cloud Analytic Services (CAS).

## Implementing Scenario Analysis in SAS® Viya



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The Viya Job Execution Service (JES) is SAS code that runs after users access a URL. This code can run other code. The code that runs can be modified using Job Input Parameters.

## The Viya Job Execution Service (JES) in a nutshell



A user accesses a URL on the  
Viya server and SAS code runs

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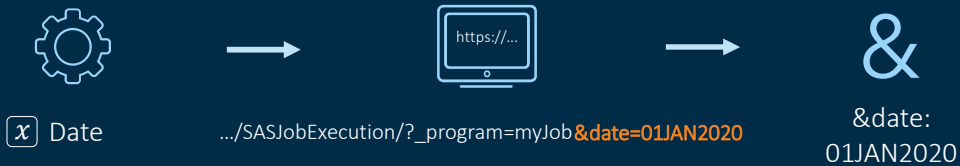
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## Job Input Parameters

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Job input parameters are user-defined values that translate into macro variables



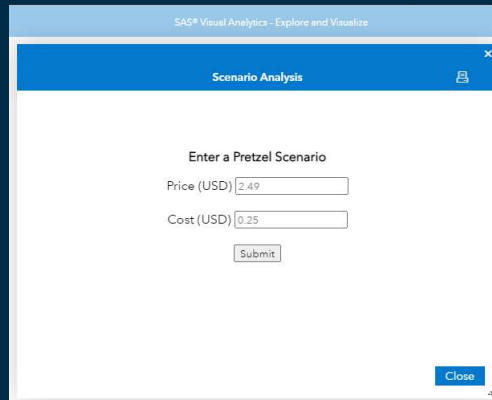
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Job Input Parameters are part of the Viya Job and translate into macro variables within the Job SAS code. Parameters are modified by supplying their values within the Job URL. These can be changed manually within the URL, or from a user interface such as an HTML input form.



## Job Forms and HTML Interfaces



The screenshot shows a web interface window titled "SAS Visual Analytics - Explore and Visualize". Inside the window, there is a sub-header "Scenario Analysis" with a close button (X) and a user icon. The main content area is titled "Enter a Pretzel Scenario" and contains two input fields: "Price (USD)" with the value "2.49" and "Cost (USD)" with the value "0.25". Below these fields is a "Submit" button. In the bottom right corner of the window, there is a "Close" button.

Job forms can be linked and displayed in a Visual Analytics Web Content object

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Jobs support adding HTML input forms that allow users to modify job parameters in a user-friendly way. These parameters can be used to alter underlying data, run code, and load the results to CAS.

## Part 1: Basics of the SAS Viya Job Execution Service

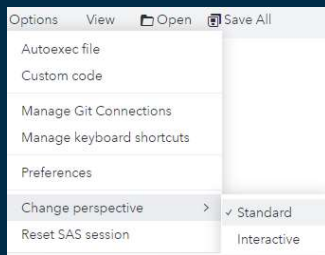
# Creating Jobs and Working with Job Parameters

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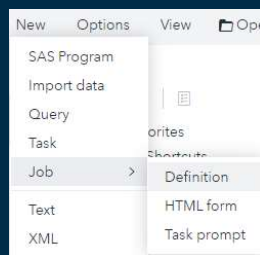
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## Creating Jobs in SAS Studio V



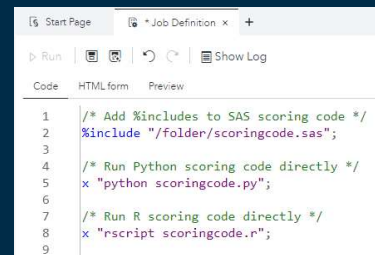
1

Ensure your perspective is in Standard mode



2

Create a new Job Definition



3

Add your code

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The easiest way to create and edit jobs is within SAS Studio V. All code is entered within the “Code” tab. Include SAS code by typing it directly or using %include. Python or R code can be run with x commands, systask, scoring code made from SAS Model Builder Open Source Code Node, or by importing the model into SAS Model Builder and running it within CAS (e.g. PMML, Pickle file). Ensure that you save your job in a folder in which others have access to it.

## Job Input Parameters

The screenshot displays the SAS Studio interface for a job named "Model Scoring Job". The main editor shows SAS code with the following content:

```
1 /* Add includes to SAS scoring code */  
2 %include "/folder/scoringcode.sas";  
3  
4 /* Run Python scoring code directly */  
5 x "python scoringcode.py";  
6  
7 /* Run R scoring code directly */  
8 x "rscript scoringcode.r";  
9  
10  
11  
12  
13  
14  
15
```

On the right side, the "Parameters" tab is active, showing a configuration form for a parameter named "\_action". The form includes the following fields:

- Name:** \_action
- Field type:** Character
- Default value:** form,execute
- Required:**

A "+ New parameter" button is visible at the top of the Parameters tab. A vertical label "Parameters Tab" is positioned to the right of the configuration form.

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Job Input Parameters can be added and edited on the “Parameters” tab. Any number of parameters can be added and accessed as macro variables when the program runs. There are some special job default parameters that can be used to control how the program runs. For open-source models being run with x commands or systask, macro variables can be passed as input arguments into the scoring code.

## Special Job Parameters

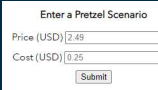
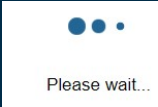
<u>Parameter</u>	<u>Description</u>	<u>Examples</u>
<code>_action</code>	What to do after accessing the job URL. Accepts multiple comma-separated values.	form,wait,execute execute
<code>_output_type</code>	Output type to display to the user, such as a webpage or ODS graphics	html ods_html5 pdf
<code>_debug</code>	Display the SAS log after the job runs	log

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Some special job input parameters can be used to control how the job runs and aid in debugging. Adding and editing the default values of these parameters can directly affect how the job runs.

## Special Job Parameters: `_action`

<u>Parameter Value</u>	<u>Description</u>	<u>Examples</u>
<code>form</code>	Display an input form for the user before running the job	
<code>wait</code>	Display an animated waiting page while the job is running	
<code>execute</code>	Run the job after the user submits the job or accesses the URL	

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The `_action` parameter can accept multiple comma-separated values. These are a few of the most common and important values that are used when executing scenarios in the Job Execution Service.

## Part 1: Basics of the SAS Viya Job Execution Service

# Job HTML Forms

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## Job Forms and HTML Interfaces

The screenshot displays the SAS Studio interface for a job named 'Model Scoring Job'. The 'Code' tab is active, showing the following HTML code:

```
1 <html lang="en">
2   <title>Pretzel Scenario</title>
3   <head>
4     <style type="text/css">
5       @font-face {
6         font-family: AvenirNext;
7         src: url("/SASJobExecution/im
8       }
9
10    body, input, select {
11      font-family: AvenirNext, Helv
12      text-rendering: optimizeLegi
13      -webkit-tap-highlight-color:
14      text-align: center
15
```

On the right side, the 'Associate a Form' panel is visible, with the following options:

- No embedded form
- HTML form
- Task prompt
- Existing form

Below these options is a text input field labeled '<path>' with a folder icon to its right. The 'Form Tab' label is positioned to the right of the interface.

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Job forms can be embedded within the job itself. In this case, we are embedding an HTML form within the job. When `_action=form`, the Job Execution Service will automatically display the form associated with the job instead of executing the job. A separate parameter within the form will execute the job only after a user submits the form.



# Job Form HTML

Create an upload form that adds URL parameters after "/SASJobExecution/"

Add these parameters to the URL when user submits the form, but do not display them to the user on the form (slide 18)

Add parameters named "price" and "cost" and allow the user to enter values for them

Create a submit button to run the job

```
<body>  
  <form id="upload" action="/SASJobExecution/" enctype="multipart/form-data" method="post">  
    <input type="hidden" name="_program" value="$PROGRAM$"/>  
    <input type="hidden" name="_action" value="execute,wait"/>  
    <input type="hidden" name="_csrf" value="$CSRF$"/>  
  
    <p><b>Enter a Pretzel Scenario</b></p>  
  
    <div class="wrapper">  
      <label>Price (USD) <input type="text" name="price" placeholder="2.49"/></label>  
    </div>  
    <div class="wrapper">  
      <label>Cost (USD) <input type="text" name="cost" placeholder="0.25"/></label>  
    </div>  
  
    <input type="submit" id="submit" value="Submit"/>  
  
  </form>  
</body>
```

The job input form is placed after the HTML tag and optional <head> tag.

## Job Form HTML Styling (Optional)

The following optional HTML code will make the form use the AvenirNextForSAS font and create a <div> wrapper to add whitespace between input values.

```
<head>
  <style type="text/css">
    @font-face {
      font-family:AvenirNext;
      src:url("/SASJobExecution/images/AvenirNextforSAS.woff") format("woff");
    }

    body {
      font-family: AvenirNext,Helvetica,Arial,sans-serif;
      text-rendering: optimizeLegibility;
      -webkit-tap-highlight-color: rgba(0,0,0,0);
      text-align: center
    }

    .wrapper{padding-bottom:10px;}
  </style>
</head>
```

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This is placed after the <html> tag, and makes the form have the same look/feel as Visual Analytics interfaces.

## Job Form HTML: Required Hidden Values

```
<input type="hidden" name="_program" value="$PROGRAM$"/>
```

After submitting the form, tell the Job Execution Service to run the job whose form we are currently reading. \$PROGRAM\$ is a shortcut for this job's location.

```
<input type="hidden" name="_action" value="execute,wait"/>
```

After submitting the form, execute the job located at `_program` and display a waiting page while it runs. Do not display any form associated with it.

```
<input type="hidden" name="_csrf" value="$CSRF$"/>
```

Give Viya a Cross Site Request Forgery token. This is a required value and ensures the job does not produce access errors. \$CSRF\$ is a shortcut for this token.

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Because we told the Job Execution Service to first load the form for the user, the job itself never executes. The `_action="execute,wait"` parameter in conjunction with the `"_program=$PROGRAM$"` parameter will cause the HTML form to generate a URL that runs this current job but bypasses the form. Parameters from this HTML form will be passed to the job.

## Job Form HTML

After changing values and hitting "Submit," the HTML form will generate a URL with all parameters from the form.

Enter a Pretzel Scenario

Price (USD)

Cost (USD)



[https://myviyaserver.com/SASJobExecution/?\\_program=/my/job  
&\\_action=execute,wait&\\_csrf=<csrf token here>&price=2.00&cost=0.25](https://myviyaserver.com/SASJobExecution/?_program=/my/job&_action=execute,wait&_csrf=<csrf token here>&price=2.00&cost=0.25)

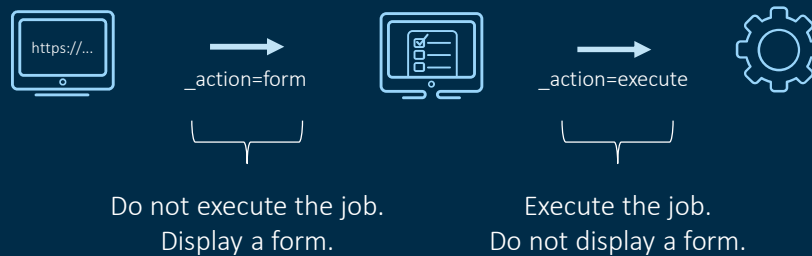
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## Order of Operations Overview

The `_action` parameter will dictate what the Job Execution Service does with the job.



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First, call the job but use the form action to display the form. Then, let users alter parameters. Next, call the job again but use the execute action to run the job.

## Part 1: Basics of the SAS Viya Job Execution Service

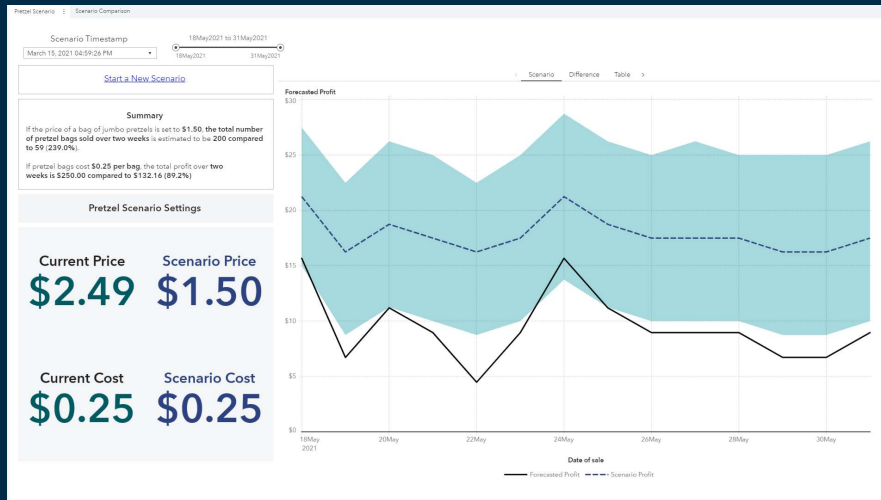
### Scenario Analysis with SAS Visual Analytics

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## Scenario Setup and Review Page



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Design your scenario dashboard around the ability to view and compare multiple scenarios. The main page should have information showing current values vs. scenario values and executive summaries that can help make interpreting results easier.

## New Scenario Pop-Up Window

[Start a New Scenario](#)

Start a new Scenario

Enter a Pretzel Scenario

Price (USD)

Cost (USD)

Web Content Object displaying the Job Execution Service scenario form

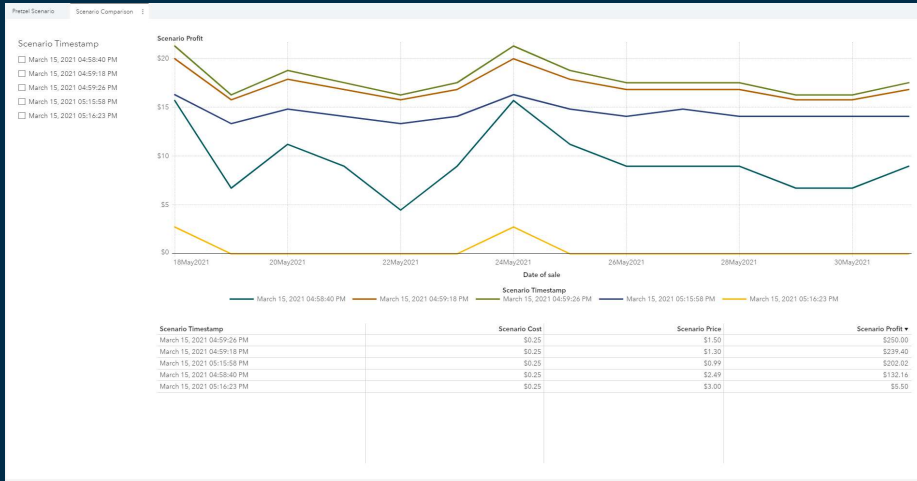
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Pop-up windows are an easy way to display scenario analysis controls for users while minimizing space on your main scenario analysis page.



# Scenario Comparison

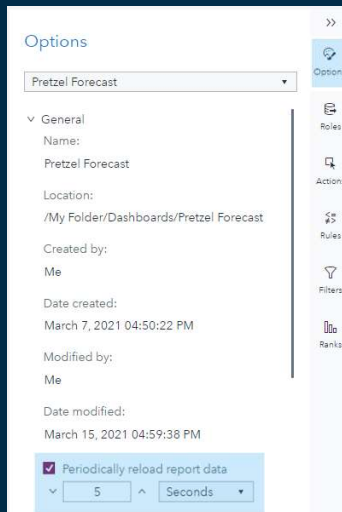


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Another helpful feature is to allow users to review multiple scenarios at the same time to identify which scenario has the highest effect on an outcome.

## Automatic Report Data Refresh

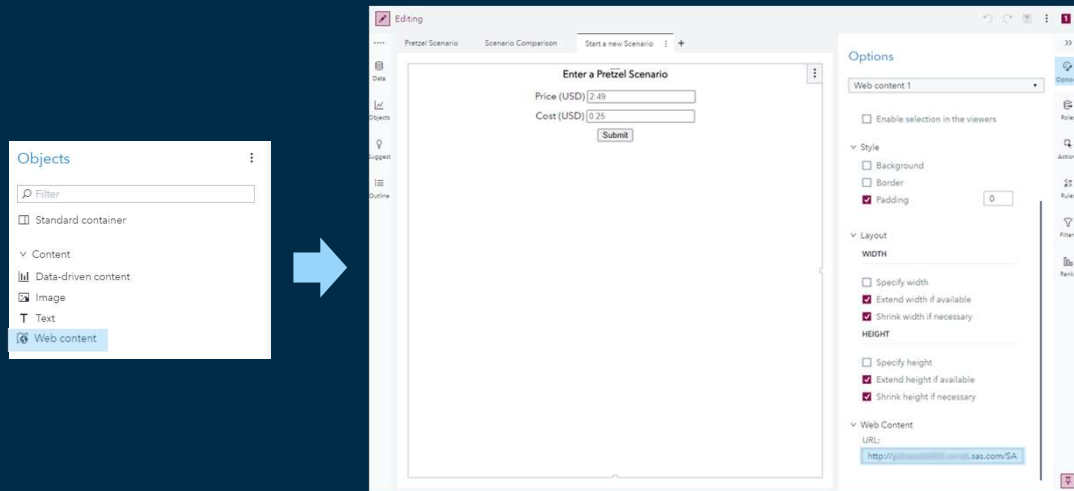


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Reloading report data every 5 seconds will let Visual Analytics seamlessly pick up new scenarios as they are run. Drop-down menus and filters will automatically populate with new values as new data arrives. This option can be enabled by clicking a report tab, selecting “Options,” and checking “Periodically reload report data.” Times faster than 5 seconds may interfere with report interactions.

## Adding the Scenario Job to Visual Analytics



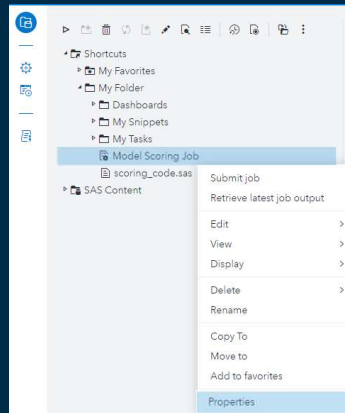
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Add a web content object to the Visual Analytics report and add the URL to the job in the "URL:" option of the Web Content object.

## Getting the Job URL

<https://yourviyaserver.com/SASJobExecution>

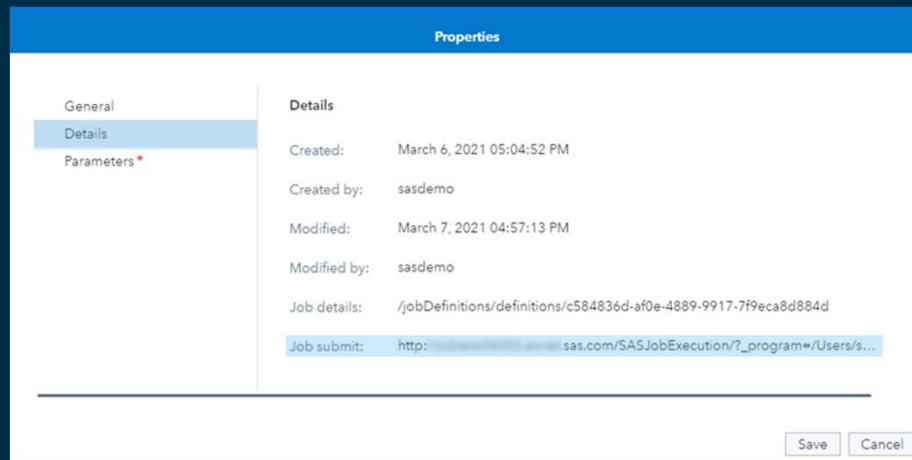


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The SASJobExecution web application is an easy way to get the job URL. Navigate to the location in which you have saved your job in Viya, right-click the job, and select “Properties.”

## Getting the Job URL



The screenshot shows a 'Properties' dialog box with a sidebar on the left containing 'General', 'Details', and 'Parameters \*'. The 'Details' tab is selected. The main area displays the following information:

Created:	March 6, 2021 05:04:52 PM
Created by:	sasdemo
Modified:	March 7, 2021 04:57:13 PM
Modified by:	sasdemo
Job details:	/jobDefinitions/definitions/c584836d-af0e-4889-9917-7f9eca8d884d
Job submit:	<a href="http://...sas.com/SASJobExecution/?_program=/Users/s...">http://...sas.com/SASJobExecution/?_program=/Users/s...</a>

At the bottom right of the dialog box are 'Save' and 'Cancel' buttons.

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The “Job submit:” link can be copied/pasted directly into the web content object in Visual Analytics to create the form. Because we have already set our default job parameters to display the form first, no other parameters need to be modified within the URL.

# Thank you!

## Contact Information

**Arne Cordes:** arne@campus.eae.es | <https://www.linkedin.com/in/arnecordesbcn/>  
**Stu Sztukowski:** stu.sztukowski@sas.com | <https://linkedin.com/in/StatsGuy>

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