The Galaxy Web Service Extensions, hereafter referred to as “wsextensions,” are a collection of Galaxy tools that let a user to use Web service operations as tools inside of Galaxy, both as standalone tools and in workflows. There are many Web services publicly available from places such as BioCatalogue1.

**NOTE:** If you are looking for instructions on how to install wsextensions on your own installation of Galaxy, then please see the “Galaxy Web Service Extensions Installation Guide” that is provided on the project’s website2.

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1 [https://www.biocatalogue.org/](https://www.biocatalogue.org/)

2 [http://mango.ctegd.uga.edu/jkissingLab/SWS/Galaxy/](http://mango.ctegd.uga.edu/jkissingLab/SWS/Galaxy/)
Before You Start

Please take a moment to read through the following sections before you begin reading the rest of the users guide.

Assumptions

This guide is intended for users who are familiar with using Galaxy and its collection of tools, both inside and outside of workflows. Primarily, users should understand, in general, how Galaxy tools are invoked, queued, and executed as well as how results are made available in Galaxy’s History pane.

Users who are not familiar with how Galaxy works should visit the “Learn Galaxy” page hosted on the Galaxy projects Wiki. The developers as well as many other contributors have done a great job providing learning resources such as screencasts and tutorials for users who are new to Galaxy.

Administrative Tasks

Currently, there are certain things that can only be done by the administrators of the Galaxy installation in which the wsextensions are installed. In this guide, sections related to actions that must be performed by administrators will be offset in a red box as follows:

NOTE: The following task(s) must be performed by a Galaxy administrator:

• Description of task.

Support and Contact Information

If you encounter any problems or errors while following this guide, then please feel free to contact one of the members of the UGA WS Annotations Group. Contact information for members is available on the group’s website.

3 https://wiki.galaxyproject.org/Learn
4 http://mango.ctegd.uga.edu/jkissinglab/SWS/
Using Galaxy Web Service Extensions

The following sections will detail how to perform certain tasks with wsextensions while providing examples that users can easily adapt in order to suit their individual needs.

Adding Web Service Operations to Galaxy as Tools

In order for a Web service operation to be added to Galaxy as a tool, it needs be made available as part of a SOAP\(^5\) Web service. In the future, the development team plans to support REST\(^6\) Web services as well. Once you’ve found a SOAP Web service that you would like to use, you need to determine the URL to its WSDL or SAWSDL document. WSDL/SAWSDL documents provide technical descriptions of the service’s operations, which are necessary in order to use the operations as tools.

For example, if you look at the BioCatalogue page for the WU-BLAST Web service\(^7\), a BLAST tool hosted by the European Bioinformatics Institute (EBI), then you’ll see that the following WSDL location is provided:

http://www.ebi.ac.uk/Tools/services/soap/wublast?wsdl

Once you have a URL to a WSDL or SAWSDL document for a Web service, adding its operations to Galaxy as tools can be accomplished by performing the following steps:

1. Make sure that you are logged into a Galaxy installation with the wsextensions tools installed.

2. Locate the various tools provided by wsextensions in Tools pane located on the left side of the Galaxy home screen and click on “Web Services.”


\(^{7}\) [https://www.biocatalogue.org/services/2181](https://www.biocatalogue.org/services/2181)
3. From the list of tools presented, click on “Step a: Enter the URL location.”

4. A page will appear where you can enter in the URL of the Web service’s WSDL or SAWSDL document. Enter the URL in the text field and then click the “Execute” button.

In the example below, we are using the URL for the WU-BLAST Web service hosted by EBI. If you would to follow along, enter in the following URL in to the text field:

http://www.ebi.ac.uk/Tools/services/soap/wublast?wsdl

5. Once the “Execute” button is pressed in the previous step, wsxtensions will start to execute a job in the Galaxy History pane that is located on the right side of the current page. Users should wait until the job is complete, indicated by the job turning green, before moving on to the next step in this process.
6. Once the job is complete, select the “Step b: Select desired Web Service Tools / Operations” from the “Web Services” section in the Tools pane located on the left side of the current screen:

7. On the page that appears, select the Web service operations that you would like to be made available as tools in Galaxy and then click the “Execute” button.
8. Once the “Execute” button is pressed in the previous step, wsxtensions will start to execute a job in the Galaxy History pane that is located on the right side of the current page. Users should wait until the job is complete, indicated by the job turning green, before moving on to the next step in this process.

9. Once the job is complete, the tool configuration files have been generated and are almost ready for use in Galaxy. Currently, since these tools were not added via a Galaxy Tool Shed (for technical reasons), the Galaxy installation must be reloaded in order to make the new tools appear in the Tools pane.

**NOTE:** The following task(s) must be performed by a Galaxy administrator:

- Restart the current Galaxy installation.

10. Once Galaxy has been reloaded, you can verify that the tools have been added to Galaxy by locating the “Web Service Tools” section in the Tools pane on the left side of the Galaxy home page and making sure that the operations that you selected are visible.

Now that you have added Web service tools, you probably would like to use them. This covered in the next two sections of this guide.
Using a Web Service Tool outside of a Galaxy Workflow

Once Web service operations have been added to Galaxy as tools, they can be used both inside and outside of Galaxy workflows. This section covers how to execute Web service tools in what is known as standalone mode, i.e., individually and outside of workflows. Since the guide assumes that users understand how to use Tools in Galaxy, the following set of instructions will follow an example based on tools created from WU-BLAST Web service provided by EBI. If you would like to add these tools in order to follow along, please see the “Adding Web Service Operations to Galaxy as Tools” section on page 3.

Using Web service tools individually and outside of a workflow can be accomplished by performing the following steps:

1. Make sure that you are logged into a Galaxy installation with the wsextensions tools installed and that you are not editing a workflow. The easiest way to make sure you are in the correct place is to click on the “Analyze Data” link at the top of the Galaxy page.

2. Locate the tool you wish to use in the “Web Service Tools” section located on the left side of the Galaxy home screen and click on it. For this example, click on “wublast run” in order to invoke the “run” operation of the WU-BLAST Web service provided by EBI.

On the page that appears, enter the inputs to Web service operation, and then click the “Execute” button.
Below is some example input for the “run” operation of the WU-BLAST Web service provided by EBI. Please be sure to use your own email address when actually executing the tool.

<table>
<thead>
<tr>
<th>Enter email:</th>
<th><a href="mailto:user@host.com">user@host.com</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter program:</td>
<td>blastp</td>
</tr>
<tr>
<td>Enter stype:</td>
<td>protein</td>
</tr>
<tr>
<td>Enter sequence:</td>
<td>MRKLYCVLLLSAFEFTYMINFGQNYWEPYQNSDYPINEHREHPKEYEYLPQGQTQYESGDENLQHAYPIDHEGAEPAPOEQMNLFSSIEIVERSYMNPWETYAKDIDEEVHGSQIRVQLGEDAEVAGTQYRPSGKCPVFGKGIIEENSNTTFLTPVATGNQYLDGGFAPPTPELMSPMTDLDEMRHYKDNKLYKNLDELTCSRHAHGNMIPDNKNSYKYPAVYDKDDKKCHILYIAAQENNPBYCNKDERSKNSMFCFPKDISFFQNYLTKLVNVNWEKPCRKLQNQFLWDDGCNEDIPHVNEFPAIDLFCNKLVFDLSADQPQYEQHLTDYIKEKIFGPKKNASMIKSAFLPTGAFKADRYSHKGGYNWGNYNTETQKEIFNVKPTCLINNSYIATLASHPIEVENNFPCSLYKDEIMEKIEREKRKLNDNDEGNKIIAPRIFISDDKDSLKCPCDPEMSVNSTCRFFVCKCVERRAEVTSNNEVVKKDEYADIEKITYDKMKIIASSAAVAVLILMVLYKRGNAEKYDKMDEPQDYKSNRNDMLPDEASFWGEKRASHTTPVLMEKPYY</td>
</tr>
</tbody>
</table>

[Optional, but Required] database/string: uniprotkb

3. Once the “Execute” button is pressed in the previous step, wsextensions will start to execute a job in the Galaxy History pane that is located on the right side of the current page. Users should wait until the job is complete, indicated by the job turning green. In this case, the result of the job will be a unique job ID produced by the WU-BLAST Web service. You can use the “wublastgetStatus” and “wublastgetResult” tools, if installed, to determine when your job is complete and get the...
actual job output. Please note that “wublast getResult” returns a base64 encoded version of the BLAST output. In order to make this output useable, you could feed it into another Web service that specifically designed to decode such encoded text. The UGA WS Annotations Group provides a Web service to do this called “WSConverter.” Information about this Web service as well as links to its WSDL and SAWSDL documents can be found at the group’s website.

It is important to note that not all web services operate the same way. For example, some Web services will return the results directly to you. Other, like the “run” operation of the WU-BLAST Web service provided by EBI, will give an ID that can be used with another operation in the future to get the results. Please be sure to read the documentation provided a Web service’s provider for information on what the expected inputs and outputs are for that particular web service.

8 http://mango.ctegd.uga.edu/jkissingLab/SWS/services.html
Using a Web Service Tool inside of a Galaxy Workflow

Once Web service operations have been added to Galaxy as tools, they can be used both inside and outside of Galaxy workflows. This section covers how to use Web service tools inside of Galaxy workflows. Since the guide assumes that users understand how to use Tools in Galaxy, the following set of instructions merely seeks to explain how to add Web service tools to a Galaxy workflow. For instructions on how to add these tools to Galaxy, please see the “Adding Web Service Operations to Galaxy as Tools” section on page 3.

Using Web service tools inside a Galaxy workflow can be accomplished by performing the following steps:

1. Make sure that you are logged into a Galaxy installation with the wsextensions tools installed and that you are editing a workflow. The easiest way to make sure you are in the correct place is to click on the “Workflow” link at the top of the Galaxy page. On this page, either create a new workflow and edit it or choose an existing workflow to edit.

2. On this page, you can select Web service tools from the “Web Service Workflow Tools” section in the “Tools” pane on the left of the page. Clicking on a tool name adds it to the current workflow canvas.

3. Continue editing your workflow.