HTTP API Testing

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Introduction

This document describes the options provided by NestedFlow tool for performing API testing. It provides means of executing multiple methods of HTTP APIs (SOAP, REST APIs). It also provides means of authenticating these requests and result parsing abilities.

Authentication Methodologies

NestedFlow tool provides authentication of the HTTP requests through following methodologies:
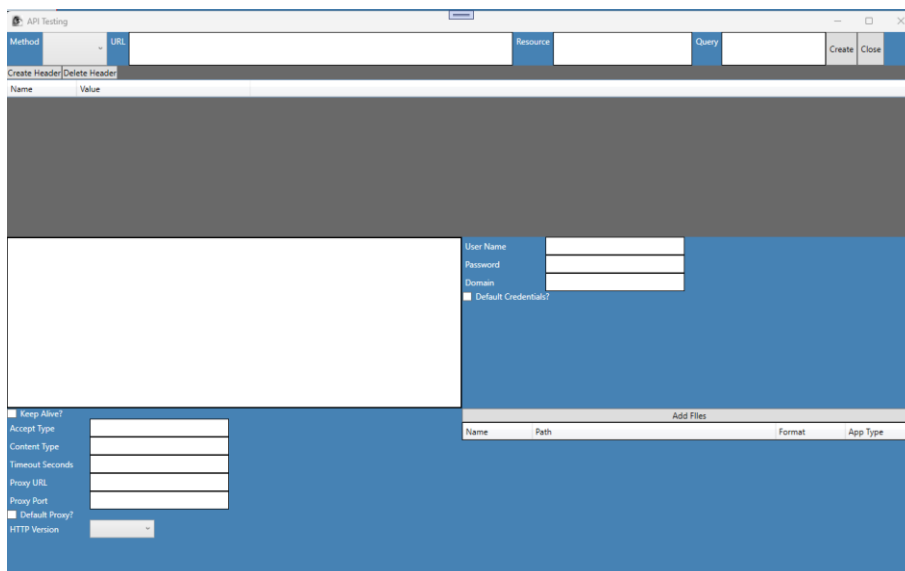
1. Basic Authentication
2. Default Authentication
3. NTLM
4. OAUTH 1.0
5. OAUTH 2.0
6. Also allows writing of C# dynamic code for other complex methodologies

Basic/NTLM/Default Authentication:

Basic, Default and NTLM authentications can be performed at the API build component which is available in the Network Components

Drag the component to the canvas panel and right click on it and choose menu option: **Add HTTP API Test**

The bottom right hand side provides authentication details.

For Default authorization (connected authorization) just click the checkbox **Default Credentials?**

Basic authentication usually contains user and password information which can be entered in **User Name** and **Password** boxes successfully

NTLM authentication involves extra **Domain** field which can be entered in the corresponding text field.

OAUTH 1.0

OAUTH 1.0 authentication exactly follows the link given below:

[OAuth Core 1.0]

OAuth 1.0 component is available in Network components. Upon dragging it and right clicking please choose **OAUTH 1.0 Options** menu option which will allow us to enter authentication details

Method, Consumer Key, Consumer Secret, Nonce Value, Token Secret and Token value and URL are basic details required for authentication. Timestamp is optional depending on implementation. Unless otherwise specified by the Service Provider, the timestamp is expressed in the number of seconds since January 1, 1970 00:00:00 GMT.

Parameters can be added (or deleted) if they are required to generate the token.

The interactive form will allow the various stages of data generation which can be used to tweak the values in case of errors. Click on **Create URL** button which will fill bigger URL box. Upon the creation of URL, create the Signkey by clicking **Create Signing Key** button. Finally click on the **Create Header** button to create API calling header token which is captured using component pass attribute and then used as header in the API call
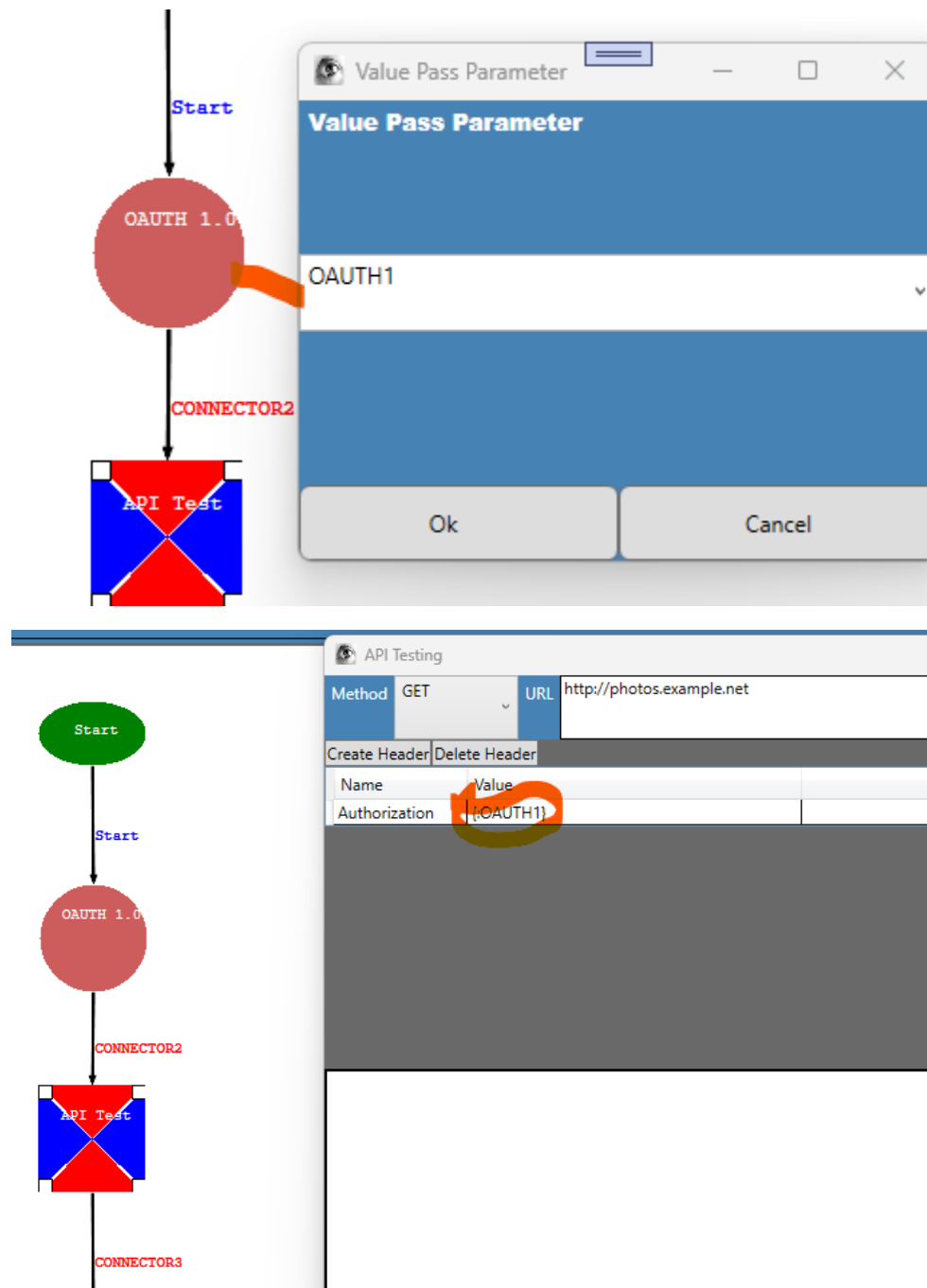
OAUTH 2.0
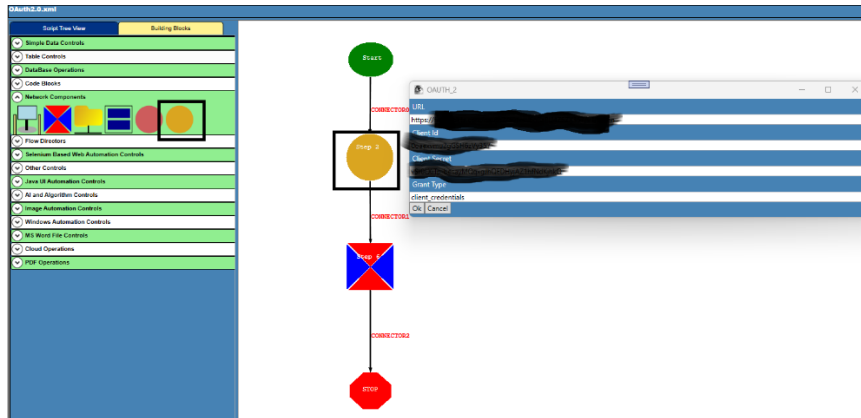
OAUTH 2.0 takes 4 variables:

URL, Client Id, Client Credentials, Grant Type

The result will be captured using the pass parameter and then will be used in API Header
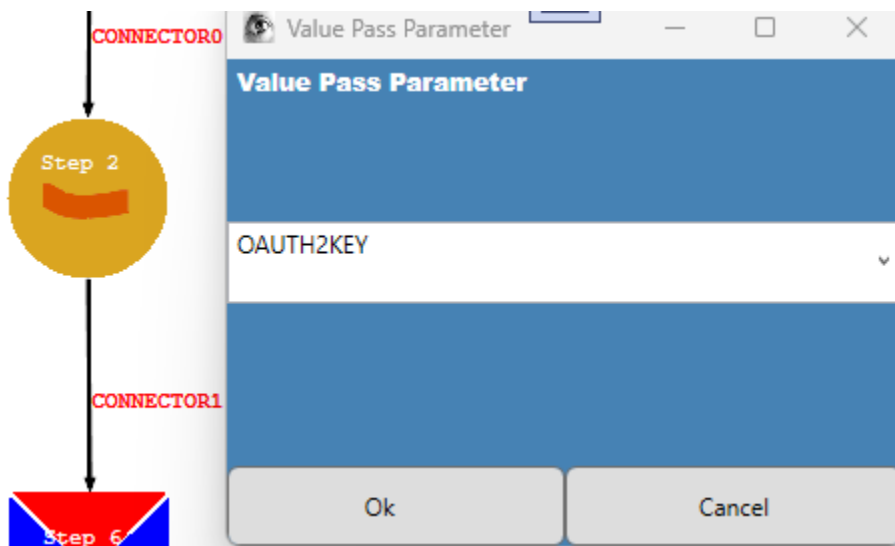
Custom Code For Authentication

OAUTH 2.0 will differ by some degree in case of various commercial implementations like Google OAUTH 2.0 or Amazon OAUTH 2.0. For such scenarios, the tool allows custom C# coding to determine authorization token. Below example explains how to implement Google OAUTH 2.0 (this is based on following reference: Login using Google OAuth 2.0 with C# - Stack Overflow)

Dlls:
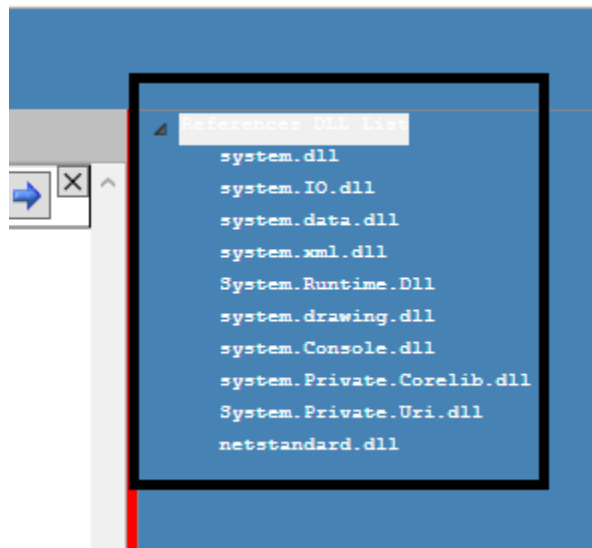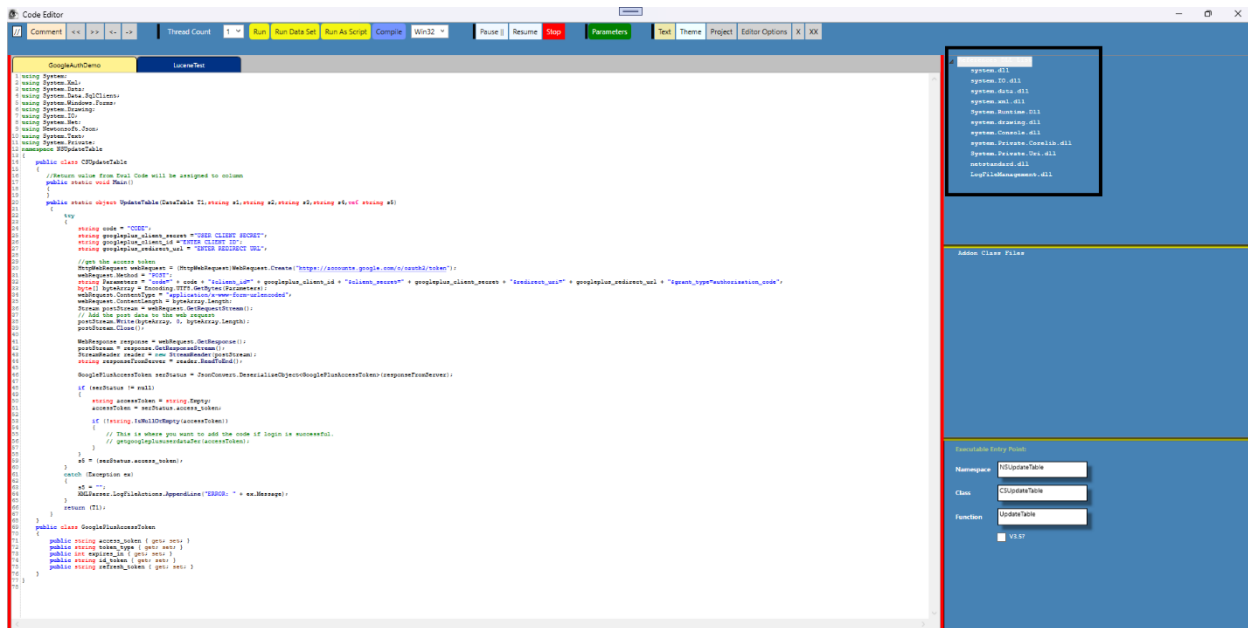
Code:

```csharp
using System;
using System.Xml;
using System.Data;
using System.Data.SqlClient;
using System.Windows.Forms;
using System.Drawing;
using System.IO;
using System.Net;
using Newtonsoft.Json;
using System.Text;
using System.Private;
namespace NSUpdateTable
{
    public class CSUpdateTable
    {
        //Return value from Eval Code will be assigned to column
        public static void Main()
        {
        }
        public static object UpdateTable(DataTable T1,string s1,string s2,string s3,string s4,ref string s5)
        {
            try
            {
                string code = "CODE";
                string googleplus_client_secret ="USER CLIENT SECRET";
                string googleplus_client_id ="ENTER CLIENT ID";
```

```csharp
        string googleplus_redirect_url = "ENTER REDIRECT URL";

        //get the access token
        HttpWebRequest webRequest =
(HttpWebRequest)WebRequest.Create("https://accounts.google.com/o/oauth2/token");
        webRequest.Method = "POST";
        string Parameters = "code=" + code + "&client_id=" + googleplus_client_id + "&client_secret="
+ googleplus_client_secret + "&redirect_uri=" + googleplus_redirect_url +
"&grant_type=authorization_code";
        byte[] byteArray = Encoding.UTF8.GetBytes(Parameters);
        webRequest.ContentType = "application/x-www-form-urlencoded";
        webRequest.ContentLength = byteArray.Length;
        Stream postStream = webRequest.GetRequestStream();
        // Add the post data to the web request
        postStream.Write(byteArray, 0, byteArray.Length);
        postStream.Close();

        WebResponse response = webRequest.GetResponse();
        postStream = response.GetResponseStream();
        StreamReader reader = new StreamReader(postStream);
        string responseFromServer = reader.ReadToEnd();

        GooglePlusAccessToken serStatus =
JsonConvert.DeserializeObject<GooglePlusAccessToken>(responseFromServer);

        if (serStatus != null)
        {
            string accessToken = string.Empty;
            accessToken = serStatus.access_token;

            if (!string.IsNullOrEmpty(accessToken))
            {
                // This is where you want to add the code if login is successful.
                // getgoogleplususerdataSer(accessToken);
            }
        }
        s5 = (serStatus.access_token);
    }
    catch (Exception ex)
    {
        s5 = "";
        XMLParser.LogFileActions.AppendLine("ERROR: " + ex.Message);
    }
    return (T1);
```

```
    }
  }
  public class GooglePlusAccessToken
  {
    public string access_token { get; set; }
    public string token_type { get; set; }
    public int expires_in { get; set; }
    public string id_token { get; set; }
    public string refresh_token { get; set; }
  }
}
```

Create a flow with code:
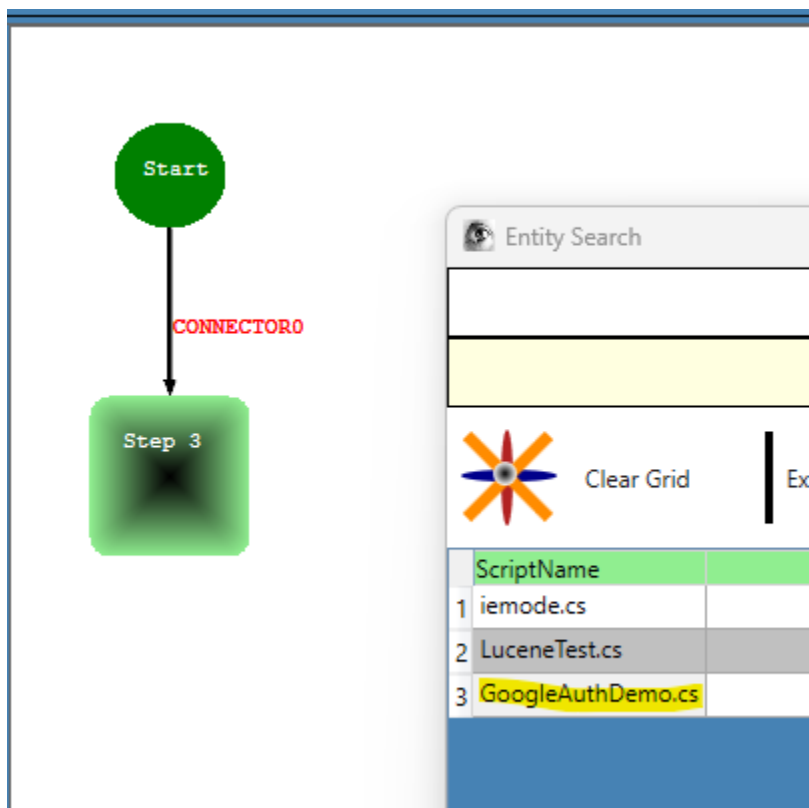
Choose the code we just created.
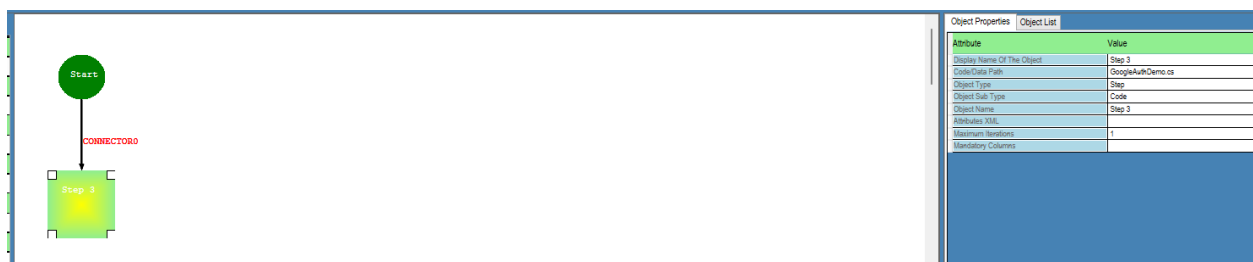
Pass return parameter from the code (s5) to a system variable using **Add Pass Attribute Name** component menu
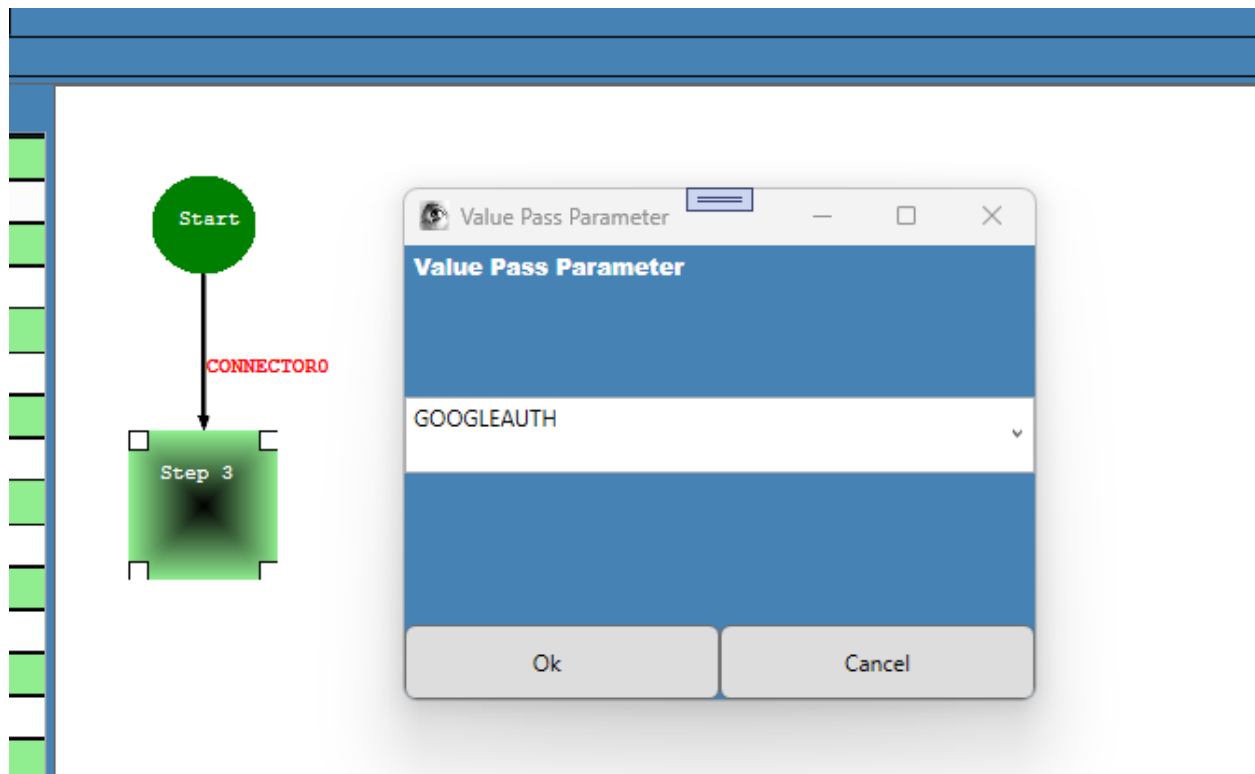
Click on **Ok** button

Once it is completed it is easy to use that in the API component

Request Body

Request Body is provided in the Request body field which is available in the API Testing form which is invoked from **Add HTTP API Test**

Headers
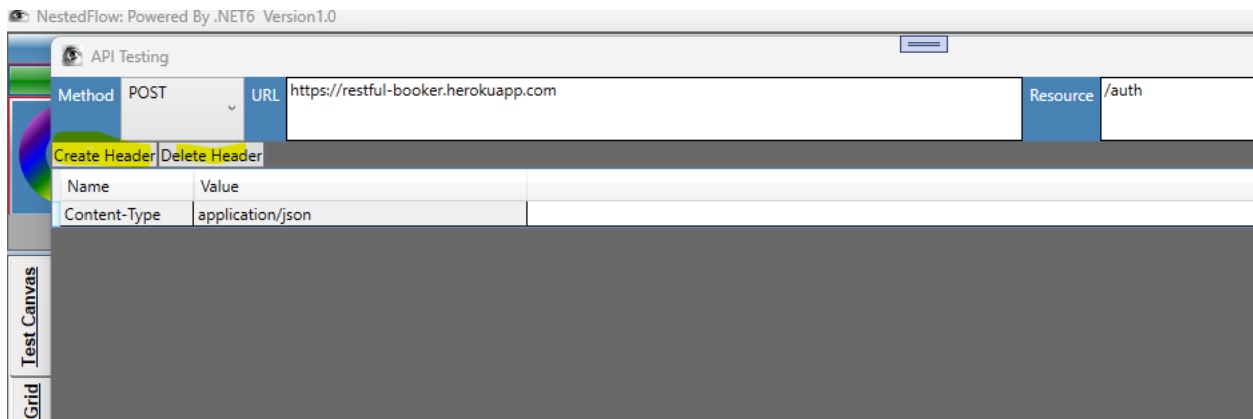
Create Header button will allow create the header
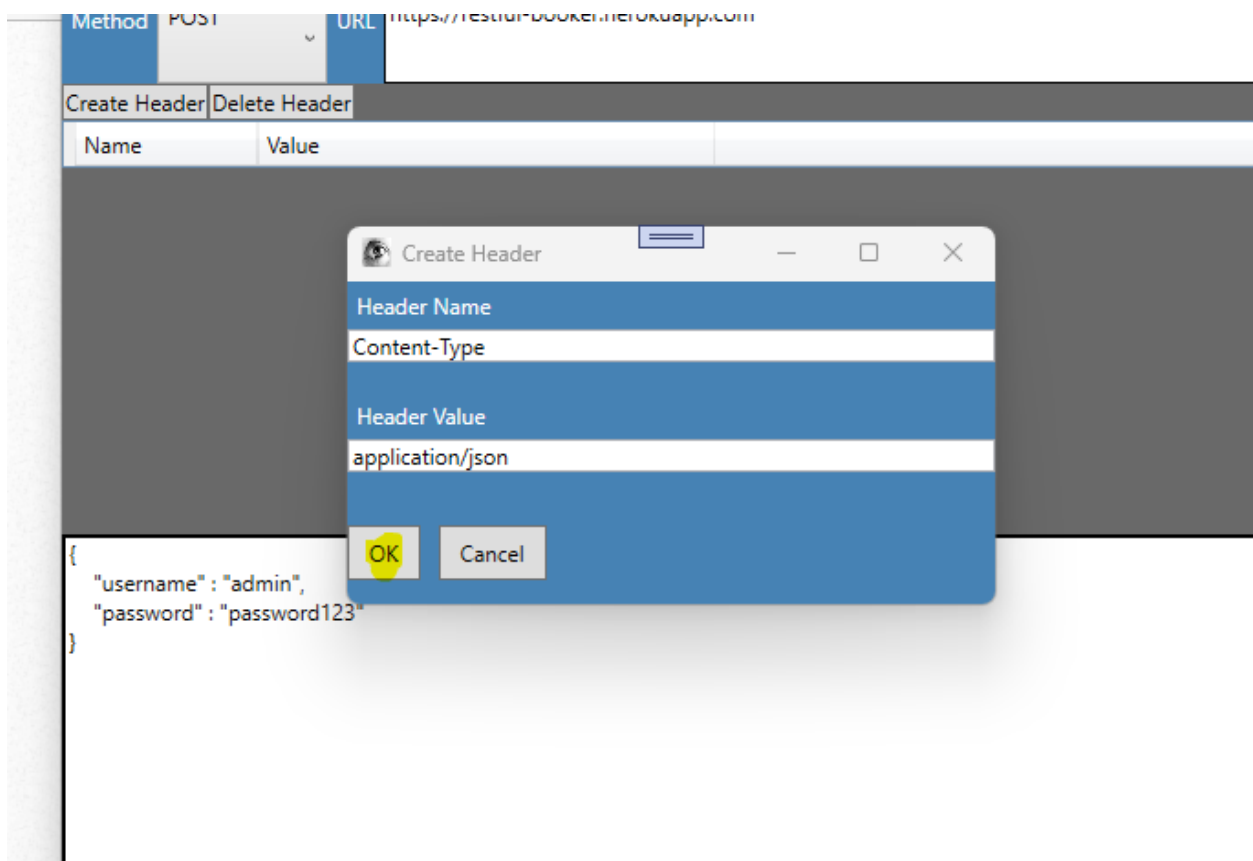
By clicking on the existing header, we can delete them by clicking **Delete Header** button

Other Attrubutes

Keep Alive: HTTP Keep-Alive is a feature that allows HTTP client (usually browser) and server (webserver) to send multiple request/response pairs over the same TCP connection.

Accept Type: The Accept request HTTP header indicates which content types, expressed as MIME types, the client can understand (output)

Content Type: The Content type request HTTP header indicates which content types, expressed as MIME types, the server can understand (request body)

Timeout Seconds: **Connection timeout** is a common error that occurs whenever the client is waiting for too long before getting a response from server

After entering all the information click on **Create** button on top right hand corner to create the API definitions

Beautify Output

The API response can be captured on to a parameter and then can be structured to a reader friendly format. To Achieve this tool provides both JSON and XML beautification components

Beautify XML
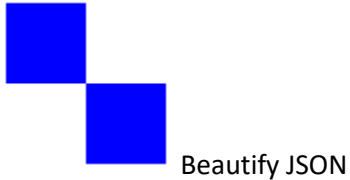
Beautify JSON

API block when executed, captures the output in pass parameter
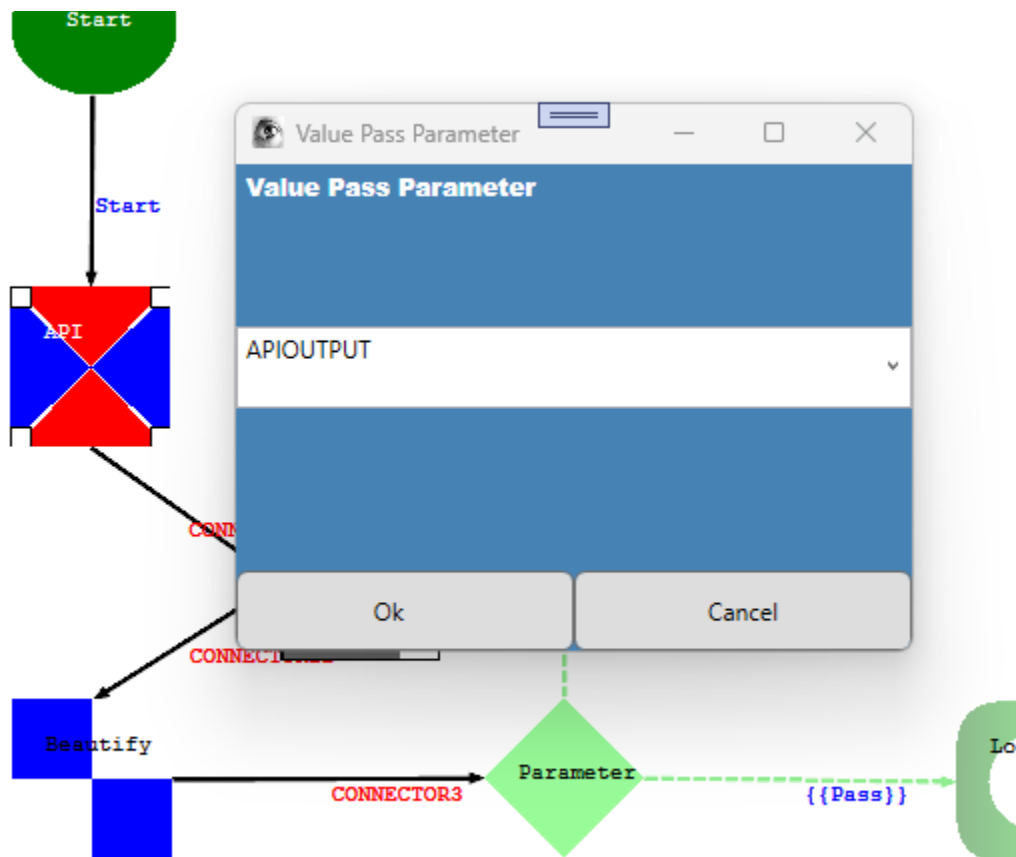
Which can be used to beautify using suitable components:
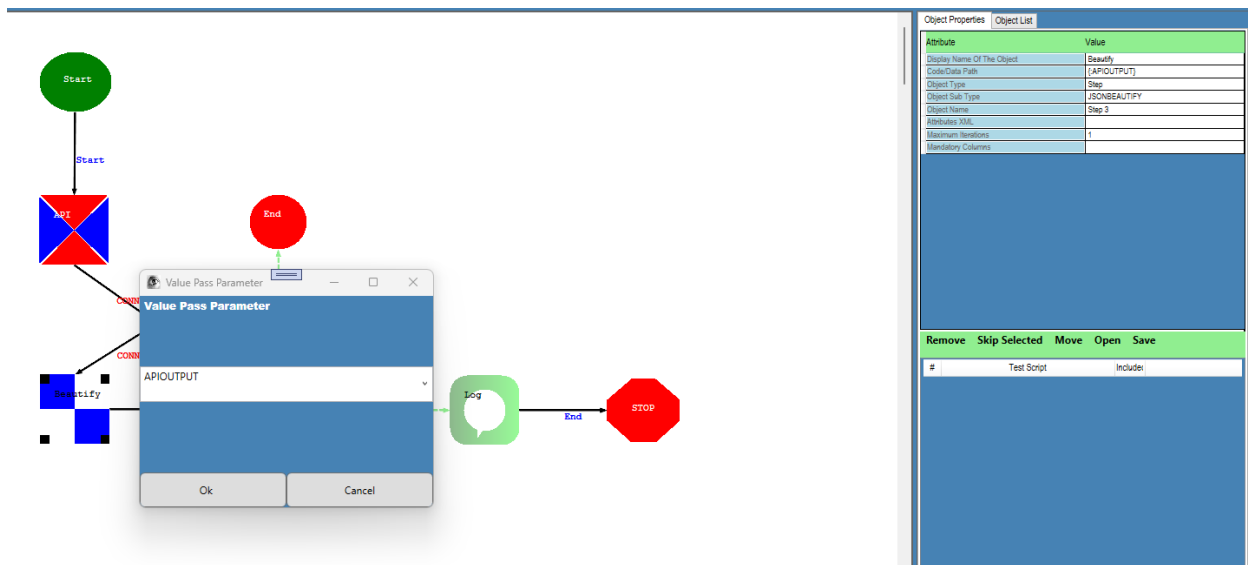
In this example, API block stores response in parameter: APIOUTPUT

It will be beautified and stored in same parameter again.

Original output:

{"abilities":[{"ability":{"name":"limber","url":"https://pokeapi.co/api/v2/ability/7/"},"is_hidden":false,"slot":1},{"ability":{"name":"imposter","url":"https://pokeapi.co/api/v2/ability/150/"},"is_hidden":true,"slot":3}],"base_experience":101,"forms":[{"name":"ditto","url":"https://pokeapi.co/api/v2/pokemon-form/132/"}],"game_indices":[{"game_index":76,"version":{"name":"red","url":"https://pokeapi.co/api/v2/version/1/"}},{"game_index":76,"version":{"name":"blue","url":"https://pokeapi.co/api/v2/version/2/"}},{"game_index":76,"version":{"name":"yellow","url":"https://pokeapi.co/api/v2/version/3/"}},{"game_index":132,"version":{"name":"gold","url":"https://pokeapi.co/api/v2/version/4/"}},{"game_index":132,"version":{"name":"silver","url":"https://pokeapi.co/api/v2/version/5/"}},{"game_index":132,"version":{"name":"crystal","url":"https://pokeapi.co/api/v2/version/6/"}},{"game_index":132,"version":{"name":"ruby","url":"https://pokeapi.co/api/v2/version/7/"}},{"game_index":132,"version":{"name":"sapphire","url":"https://pokeapi.co/api/v2/version/8/"}},{"game_index":132,"version":{"name":"emerald","url":"https://pokeapi.co/api/v2/version/9/"}},{"game_index":132,"version":{"name":"firered","url":"https://pokeapi.co/api/v2/version/10/"}},{"game_index":132,"version":{"name":"leafgreen","url":"https://pokeapi.co/api/v2/version/11/"}},{"game_index":132,"version":{"name":"diamond","url":"https://pokeapi.co/api/v2/version/12/"}},{"game_index":132,"version":{"name":"pearl","url":"https://pokeapi.co/api/v2/version/13/"}},{"game_index":132,"version":{"name":"platinum","url":"https://pokeapi.co/api/v2/version/14/"}},{"game_index":132,"version":{"name":"heartgold","url":"https://pokeapi.co/api/v2/version/15/"}},{"game_index":132,"version":{"name":"soulsilver","url":"https://pokeapi.co/api/v2/version/16/"}},{"game_index":132,"version":{"name":"black","url":"https://pokeapi.co/api/v2/version/17/"}},{"game_index":132,"version":{"name":"white","url":"https://pokeapi.co/api/v2/version/18/"}},{"game_index":132,"version":{"name":"black-2","url":"https://pokeapi.co/api/v2/version/21/"}},{"game_index":132,"version":{"name":"white-2","url":"https://pokeapi.co/api/v2/version/22/"}}],"height":3,"held_items":[{"item":{"name":"metal-powder","url":"https://pokeapi.co/api/v2/item/234/"},"version_details":[{"rarity":5,"version":{"name":"ruby","url":"https://pokeapi.co/api/v2/version/7/"}},{"rarity":5,"version":{"name":"sapphire","url":"https://pokeapi.co/api/v2/version/8/"}},{"rarity":5,"version":{"name":"emerald","url":"https://pokeapi.co/api/v2/version/9/"}},{"rarity":5,"version":{"name":"firered","url":"https://pokeapi.co/api/v2/version/10/"}},{"rarity":5,"version":{"name":"leafgreen","url":"https://pokeapi.co/api/v2/version/11/"}},{"rarity":5,"version":{"name":"diamond","url":"https://pokeapi.co/api/v2/version/12/"}},{"rarity":5,"version":{"name":"pearl","url":"https://pokeapi.co/api/v2/version/13/"}},{"rarity":5,"version":{"name":"platinum","url":"https://pokeapi.co/api/v2/version/14/"}},{"rarity":5,"version":{"name":"heartgold","url":"https://pokeapi.co/api/v2/version/15/"}},{"rarity":5,"version":{"name":"soulsilver","url":"https://pokeapi.co/api/v2/version/16/"}},{"rarity":5,"version":{"name":"black","url":"https://pokeapi.co/api/v2/version/17/"}},{"rarity":5,"version":{"name":"white","url":"https://pokeapi.co/api/v2/version/18/"}},{"rarity":5,"version":{"name":"black-2","url":"https://pokeapi.co/api/v2/version/21/"}},{"rarity":5,"version":{"name":"white-2","url":"https://pokeapi.co/api/v2/version/22/"}},{"rarity":5,"version":{"name":"x","url":"https://pokeapi.co/api/v2/version/23/"}},{"rarity":5,"version":{"name":"y","url":"https://pokeapi.co/api/v2/version/24/"}},{"rarity":5,"version":{"name":"omega-ruby","url":"https://pokeapi.co/api/v2/version/25/"}},{"rarity":5,"version":{"name":"alpha-sapphire","url":"https://pokeapi.co/api/v2/version/26/"}},{"rarity":5,"version":{"name":"sun","url":"https://pokeapi.co/api/v2/version/27/"}},{"rarity":5,"version":{"name":"moon","url":"https://pokeapi.co/api/v2/version/28/"}},{"rarity":5,"version":{"name":"ultra-sun","url":"https://pokeapi.co/api/v2/version/29/"}},{"rarity":5,"version":{"name":"ultra-moon","url":"https://pokeapi.co/api/v2/version/30/"}}]},{"item":{"name":"quick-powder","url":"https://pokeapi.co/api/v2/item/251/"},"version_details":[{"rarity":50,"version":{"name":"diamond","url":"https://pokeapi.co/api/v2/version/12/"}},{"rarity":50,"version":{"name":"pearl","url":"https://pokeapi.co/api/v2/version/13/"}},{"rarity":50,"version":{"name":"platinum","url":"https://pokeapi.co/api/v2/version/14/"}},{"rarity":50,"version":{"name":"heartgold","url":"https://pokeapi.co/api/v2/version/15/"}},{"rarity":5

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/api/v2/stat/5/"}},{"base_stat":48,"effort":0,"stat":{"name":"speed","url":"https://pokeapi.co/api/v2/stat/6/"}}],"types":[{"slot":1,"type":{"name":"normal","url":"https://pokeapi.co/api/v2/type/1/"}}],"weight":40}

Beautified output:

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{
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      "ability": {
        "name": "limber",
```

```
        "url": "https://pokeapi.co/api/v2/ability/7/"
      },
      "is_hidden": false,
      "slot": 1
    },
    {
      "ability": {
        "name": "imposter",
        "url": "https://pokeapi.co/api/v2/ability/150/"
      },
      "is_hidden": true,
      "slot": 3
    }
  ],
  "base_experience": 101,
  "forms": [
    {
      "name": "ditto",
      "url": "https://pokeapi.co/api/v2/pokemon-form/132/"
    }
  ],
  "game_indices": [
    {
      "game_index": 76,
      "version": {
        "name": "red",
        "url": "https://pokeapi.co/api/v2/version/1/"
      }
    },
    {
      "game_index": 76,
      "version": {
        "name": "blue",
        "url": "https://pokeapi.co/api/v2/version/2/"
      }
    },
    {
      "game_index": 76,
      "version": {
        "name": "yellow",
        "url": "https://pokeapi.co/api/v2/version/3/"
      }
    },
    {
      "game_index": 132,
      "version": {
        "name": "gold",
        "url": "https://pokeapi.co/api/v2/version/4/"
      }
    },
    {
      "game_index": 132,
      "version": {
        "name": "silver",
        "url": "https://pokeapi.co/api/v2/version/5/"
      }
    },
    {
      "game_index": 132,
      "version": {
        "name": "crystal",
        "url": "https://pokeapi.co/api/v2/version/6/"
      }
    },
```

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  "version": {
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  }
},
{
  "game_index": 132,
  "version": {
    "name": "sapphire",
    "url": "https://pokeapi.co/api/v2/version/8/"
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},
{
  "game_index": 132,
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    "name": "emerald",
    "url": "https://pokeapi.co/api/v2/version/9/"
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},
{
  "game_index": 132,
  "version": {
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},
{
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  "version": {
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    "url": "https://pokeapi.co/api/v2/version/11/"
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},
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  "version": {
    "name": "diamond",
    "url": "https://pokeapi.co/api/v2/version/12/"
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},
{
  "game_index": 132,
  "version": {
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},
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    "url": "https://pokeapi.co/api/v2/version/14/"
  }
},
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  "game_index": 132,
  "version": {
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  }
},
{
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        "game_index": 132,
        "version": {
          "name": "soulsilver",
          "url": "https://pokeapi.co/api/v2/version/16/"
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      },
      {
        "game_index": 132,
        "version": {
          "name": "black",
          "url": "https://pokeapi.co/api/v2/version/17/"
        }
      },
      {
        "game_index": 132,
        "version": {
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          "url": "https://pokeapi.co/api/v2/version/18/"
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      },
      {
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          "url": "https://pokeapi.co/api/v2/version/21/"
        }
      },
      {
        "game_index": 132,
        "version": {
          "name": "white-2",
          "url": "https://pokeapi.co/api/v2/version/22/"
        }
      }
    }
  ],
  "height": 3,
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        "url": "https://pokeapi.co/api/v2/item/234/"
      },
      "version_details": [
        {
          "rarity": 5,
          "version": {
            "name": "ruby",
            "url": "https://pokeapi.co/api/v2/version/7/"
          }
        },
        {
          "rarity": 5,
          "version": {
            "name": "sapphire",
            "url": "https://pokeapi.co/api/v2/version/8/"
          }
        },
        {
          "rarity": 5,
          "version": {
            "name": "emerald",
            "url": "https://pokeapi.co/api/v2/version/9/"
          }
        },
```

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{
  "rarity": 5,
  "version": {
    "name": "firered",
    "url": "https://pokeapi.co/api/v2/version/10/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "leafgreen",
    "url": "https://pokeapi.co/api/v2/version/11/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "diamond",
    "url": "https://pokeapi.co/api/v2/version/12/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "pearl",
    "url": "https://pokeapi.co/api/v2/version/13/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "platinum",
    "url": "https://pokeapi.co/api/v2/version/14/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "heartgold",
    "url": "https://pokeapi.co/api/v2/version/15/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "soulsilver",
    "url": "https://pokeapi.co/api/v2/version/16/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "black",
    "url": "https://pokeapi.co/api/v2/version/17/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "white",
    "url": "https://pokeapi.co/api/v2/version/18/"
  }
},
{
```

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  "rarity": 5,
  "version": {
    "name": "black-2",
    "url": "https://pokeapi.co/api/v2/version/21/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "white-2",
    "url": "https://pokeapi.co/api/v2/version/22/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "x",
    "url": "https://pokeapi.co/api/v2/version/23/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "y",
    "url": "https://pokeapi.co/api/v2/version/24/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "omega-ruby",
    "url": "https://pokeapi.co/api/v2/version/25/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "alpha-sapphire",
    "url": "https://pokeapi.co/api/v2/version/26/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "sun",
    "url": "https://pokeapi.co/api/v2/version/27/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "moon",
    "url": "https://pokeapi.co/api/v2/version/28/"
  }
},
{
  "rarity": 5,
  "version": {
    "name": "ultra-sun",
    "url": "https://pokeapi.co/api/v2/version/29/"
  }
},
{
  "rarity": 5,
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```json
      "version": {
        "name": "ultra-moon",
        "url": "https://pokeapi.co/api/v2/version/30/"
      }
    }
  ]
},
{
  "item": {
    "name": "quick-powder",
    "url": "https://pokeapi.co/api/v2/item/251/"
  },
  "version_details": [
    {
      "rarity": 50,
      "version": {
        "name": "diamond",
        "url": "https://pokeapi.co/api/v2/version/12/"
      }
    },
    {
      "rarity": 50,
      "version": {
        "name": "pearl",
        "url": "https://pokeapi.co/api/v2/version/13/"
      }
    },
    {
      "rarity": 50,
      "version": {
        "name": "platinum",
        "url": "https://pokeapi.co/api/v2/version/14/"
      }
    },
    {
      "rarity": 50,
      "version": {
        "name": "heartgold",
        "url": "https://pokeapi.co/api/v2/version/15/"
      }
    },
    {
      "rarity": 50,
      "version": {
        "name": "soulsilver",
        "url": "https://pokeapi.co/api/v2/version/16/"
      }
    },
    {
      "rarity": 50,
      "version": {
        "name": "black",
        "url": "https://pokeapi.co/api/v2/version/17/"
      }
    },
    {
      "rarity": 50,
      "version": {
        "name": "white",
        "url": "https://pokeapi.co/api/v2/version/18/"
      }
    },
    {
      "rarity": 50,
```

      "version": {
       "name": "black-2",
       "url": "https://pokeapi.co/api/v2/version/21/"
      }
     },
     {
      "rarity": 50,
      "version": {
       "name": "white-2",
       "url": "https://pokeapi.co/api/v2/version/22/"
      }
     },
     {
      "rarity": 50,
      "version": {
       "name": "x",
       "url": "https://pokeapi.co/api/v2/version/23/"
      }
     },
     {
      "rarity": 50,
      "version": {
       "name": "y",
       "url": "https://pokeapi.co/api/v2/version/24/"
      }
     },
     {
      "rarity": 50,
      "version": {
       "name": "omega-ruby",
       "url": "https://pokeapi.co/api/v2/version/25/"
      }
     },
     {
      "rarity": 50,
      "version": {
       "name": "alpha-sapphire",
       "url": "https://pokeapi.co/api/v2/version/26/"
      }
     },
     {
      "rarity": 50,
      "version": {
       "name": "sun",
       "url": "https://pokeapi.co/api/v2/version/27/"
      }
     },
     {
      "rarity": 50,
      "version": {
       "name": "moon",
       "url": "https://pokeapi.co/api/v2/version/28/"
      }
     },
     {
      "rarity": 50,
      "version": {
       "name": "ultra-sun",
       "url": "https://pokeapi.co/api/v2/version/29/"
      }
     },
     {
      "rarity": 50,
      "version": {

```json
        "name": "ultra-moon",
        "url": "https://pokeapi.co/api/v2/version/30/"
      }
    }
  ]
 }
],
"id": 132,
"is_default": true,
"location_area_encounters": "https://pokeapi.co/api/v2/pokemon/132/encounters",
"moves": [
 {
   "move": {
     "name": "transform",
     "url": "https://pokeapi.co/api/v2/move/144/"
   },
   "version_group_details": [
    {
      "level_learned_at": 1,
      "move_learn_method": {
        "name": "level-up",
        "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
      },
      "version_group": {
        "name": "red-blue",
        "url": "https://pokeapi.co/api/v2/version-group/1/"
      }
    },
    {
      "level_learned_at": 1,
      "move_learn_method": {
        "name": "level-up",
        "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
      },
      "version_group": {
        "name": "yellow",
        "url": "https://pokeapi.co/api/v2/version-group/2/"
      }
    },
    {
      "level_learned_at": 1,
      "move_learn_method": {
        "name": "level-up",
        "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
      },
      "version_group": {
        "name": "gold-silver",
        "url": "https://pokeapi.co/api/v2/version-group/3/"
      }
    },
    {
      "level_learned_at": 1,
      "move_learn_method": {
        "name": "level-up",
        "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
      },
      "version_group": {
        "name": "crystal",
        "url": "https://pokeapi.co/api/v2/version-group/4/"
      }
    },
    {
      "level_learned_at": 1,
      "move_learn_method": {
```

```json
     "name": "level-up",
     "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
    },
    "version_group": {
     "name": "ruby-sapphire",
     "url": "https://pokeapi.co/api/v2/version-group/5/"
    }
   },
   {
    "level_learned_at": 1,
    "move_learn_method": {
     "name": "level-up",
     "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
    },
    "version_group": {
     "name": "emerald",
     "url": "https://pokeapi.co/api/v2/version-group/6/"
    }
   },
   {
    "level_learned_at": 1,
    "move_learn_method": {
     "name": "level-up",
     "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
    },
    "version_group": {
     "name": "firered-leafgreen",
     "url": "https://pokeapi.co/api/v2/version-group/7/"
    }
   },
   {
    "level_learned_at": 1,
    "move_learn_method": {
     "name": "level-up",
     "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
    },
    "version_group": {
     "name": "diamond-pearl",
     "url": "https://pokeapi.co/api/v2/version-group/8/"
    }
   },
   {
    "level_learned_at": 1,
    "move_learn_method": {
     "name": "level-up",
     "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
    },
    "version_group": {
     "name": "platinum",
     "url": "https://pokeapi.co/api/v2/version-group/9/"
    }
   },
   {
    "level_learned_at": 1,
    "move_learn_method": {
     "name": "level-up",
     "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
    },
    "version_group": {
     "name": "heartgold-soulsilver",
     "url": "https://pokeapi.co/api/v2/version-group/10/"
    }
   },
   {
```

```
   "level_learned_at": 1,
   "move_learn_method": {
    "name": "level-up",
    "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
   },
   "version_group": {
    "name": "black-white",
    "url": "https://pokeapi.co/api/v2/version-group/11/"
   }
  },
  {
   "level_learned_at": 1,
   "move_learn_method": {
    "name": "level-up",
    "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
   },
   "version_group": {
    "name": "colosseum",
    "url": "https://pokeapi.co/api/v2/version-group/12/"
   }
  },
  {
   "level_learned_at": 1,
   "move_learn_method": {
    "name": "level-up",
    "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
   },
   "version_group": {
    "name": "xd",
    "url": "https://pokeapi.co/api/v2/version-group/13/"
   }
  },
  {
   "level_learned_at": 1,
   "move_learn_method": {
    "name": "level-up",
    "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
   },
   "version_group": {
    "name": "black-2-white-2",
    "url": "https://pokeapi.co/api/v2/version-group/14/"
   }
  },
  {
   "level_learned_at": 1,
   "move_learn_method": {
    "name": "level-up",
    "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
   },
   "version_group": {
    "name": "x-y",
    "url": "https://pokeapi.co/api/v2/version-group/15/"
   }
  },
  {
   "level_learned_at": 1,
   "move_learn_method": {
    "name": "level-up",
    "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
   },
   "version_group": {
    "name": "omega-ruby-alpha-sapphire",
    "url": "https://pokeapi.co/api/v2/version-group/16/"
   }
  }
```

```json
          },
          {
            "level_learned_at": 1,
            "move_learn_method": {
              "name": "level-up",
              "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
            },
            "version_group": {
              "name": "sun-moon",
              "url": "https://pokeapi.co/api/v2/version-group/17/"
            }
          },
          {
            "level_learned_at": 1,
            "move_learn_method": {
              "name": "level-up",
              "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
            },
            "version_group": {
              "name": "ultra-sun-ultra-moon",
              "url": "https://pokeapi.co/api/v2/version-group/18/"
            }
          },
          {
            "level_learned_at": 1,
            "move_learn_method": {
              "name": "level-up",
              "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
            },
            "version_group": {
              "name": "lets-go-pikachu-lets-go-eevee",
              "url": "https://pokeapi.co/api/v2/version-group/19/"
            }
          },
          {
            "level_learned_at": 1,
            "move_learn_method": {
              "name": "level-up",
              "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
            },
            "version_group": {
              "name": "sword-shield",
              "url": "https://pokeapi.co/api/v2/version-group/20/"
            }
          },
          {
            "level_learned_at": 1,
            "move_learn_method": {
              "name": "level-up",
              "url": "https://pokeapi.co/api/v2/move-learn-method/1/"
            },
            "version_group": {
              "name": "scarlet-violet",
              "url": "https://pokeapi.co/api/v2/version-group/25/"
            }
          }
        ]
      }
    ],
    "name": "ditto",
    "order": 214,
    "past_types": [],
    "species": {
      "name": "ditto",
```

```
    "url": "https://pokeapi.co/api/v2/pokemon-species/132/"
 },
 "sprites": {
  "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/back/132.png",
  "back_female": null,
  "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/back/shiny/132.png",
  "back_shiny_female": null,
  "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/132.png",
  "front_female": null,
  "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/shiny/132.png",
  "front_shiny_female": null,
  "other": {
   "dream_world": {
    "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/other/dream-world/132.svg",
    "front_female": null
   },
   "home": {
    "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/other/home/132.png",
    "front_female": null,
    "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/other/home/shiny/132.png",
    "front_shiny_female": null
   },
   "official-artwork": {
    "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/other/official-artwork/132.png",
    "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/other/official-artwork/shiny/132.png"
   }
  },
  "versions": {
   "generation-i": {
    "red-blue": {
     "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/red-blue/back/132.png",
     "back_gray": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/red-blue/back/gray/132.png",
     "back_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/red-blue/transparent/back/132.png",
     "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/red-blue/132.png",
     "front_gray": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/red-blue/gray/132.png",
     "front_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/red-blue/transparent/132.png"
    },
    "yellow": {
     "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/yellow/back/132.png",
     "back_gray": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/yellow/back/gray/132.png",
     "back_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/yellow/transparent/back/132.png",
     "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/yellow/132.png",
     "front_gray": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/yellow/gray/132.png",
     "front_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-i/yellow/transparent/132.png"
    }
   },
   "generation-ii": {
    "crystal": {
     "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-ii/crystal/back/132.png",
     "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-ii/crystal/back/shiny/132.png",
```

```
      "back_shiny_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/crystal/transparent/back/shiny/132.png",
      "back_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/crystal/transparent/back/132.png",
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-ii/crystal/132.png",
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/crystal/shiny/132.png",
      "front_shiny_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/crystal/transparent/shiny/132.png",
      "front_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/crystal/transparent/132.png"
    },
    "gold": {
      "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/gold/back/132.png",
      "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/gold/back/shiny/132.png",
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-ii/gold/132.png",
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/gold/shiny/132.png",
      "front_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/gold/transparent/132.png"
    },
    "silver": {
      "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/silver/back/132.png",
      "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/silver/back/shiny/132.png",
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-ii/silver/132.png",
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/silver/shiny/132.png",
      "front_transparent": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
ii/silver/transparent/132.png"
    }
  },
  "generation-iii": {
    "emerald": {
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
iii/emerald/132.png",
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-
iii/emerald/shiny/132.png"
    },
    "firered-leafgreen": {
      "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iii/firered-
leafgreen/back/132.png",
      "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iii/firered-
leafgreen/back/shiny/132.png",
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iii/firered-
leafgreen/132.png",
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iii/firered-
leafgreen/shiny/132.png"
    },
    "ruby-sapphire": {
      "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iii/ruby-
sapphire/back/132.png",
      "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iii/ruby-
sapphire/back/shiny/132.png",
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iii/ruby-
sapphire/132.png",
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iii/ruby-
sapphire/shiny/132.png"
    }
  },
  "generation-iv": {
```

```json
    "diamond-pearl": {
        "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/diamond-pearl/back/132.png",
        "back_female": null,
        "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/diamond-pearl/back/shiny/132.png",
        "back_shiny_female": null,
        "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/diamond-pearl/132.png",
        "front_female": null,
        "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/diamond-pearl/shiny/132.png",
        "front_shiny_female": null
    },
    "heartgold-soulsilver": {
        "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/heartgold-soulsilver/back/132.png",
        "back_female": null,
        "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/heartgold-soulsilver/back/shiny/132.png",
        "back_shiny_female": null,
        "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/heartgold-soulsilver/132.png",
        "front_female": null,
        "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/heartgold-soulsilver/shiny/132.png",
        "front_shiny_female": null
    },
    "platinum": {
        "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/platinum/back/132.png",
        "back_female": null,
        "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/platinum/back/shiny/132.png",
        "back_shiny_female": null,
        "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/platinum/132.png",
        "front_female": null,
        "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-iv/platinum/shiny/132.png",
        "front_shiny_female": null
    }
},
"generation-v": {
    "black-white": {
        "animated": {
            "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-v/black-white/animated/back/132.gif",
            "back_female": null,
            "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-v/black-white/animated/back/shiny/132.gif",
            "back_shiny_female": null,
            "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-v/black-white/animated/132.gif",
            "front_female": null,
            "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-v/black-white/animated/shiny/132.gif",
            "front_shiny_female": null
        },
        "back_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-v/black-white/back/132.png",
        "back_female": null,
        "back_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-v/black-white/back/shiny/132.png",
```

```
      "back_shiny_female": null,
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-v/black-
white/132.png",
      "front_female": null,
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-v/black-
white/shiny/132.png",
      "front_shiny_female": null
    }
  },
  "generation-vi": {
    "omegaruby-alphasapphire": {
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-vi/omegaruby-
alphasapphire/132.png",
      "front_female": null,
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-vi/omegaruby-
alphasapphire/shiny/132.png",
      "front_shiny_female": null
    },
    "x-y": {
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-vi/x-y/132.png",
      "front_female": null,
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-vi/x-y/shiny/132.png",
      "front_shiny_female": null
    }
  },
  "generation-vii": {
    "icons": {
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-vii/icons/132.png",
      "front_female": null
    },
    "ultra-sun-ultra-moon": {
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-vii/ultra-sun-ultra-
moon/132.png",
      "front_female": null,
      "front_shiny": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-vii/ultra-sun-ultra-
moon/shiny/132.png",
      "front_shiny_female": null
    }
  },
  "generation-viii": {
    "icons": {
      "front_default": "https://raw.githubusercontent.com/PokeAPI/sprites/master/sprites/pokemon/versions/generation-viii/icons/132.png",
      "front_female": null
    }
  }
 }
},
"stats": [
  {
    "base_stat": 48,
    "effort": 1,
    "stat": {
      "name": "hp",
      "url": "https://pokeapi.co/api/v2/stat/1/"
    }
  },
  {
    "base_stat": 48,
    "effort": 0,
    "stat": {
      "name": "attack",
      "url": "https://pokeapi.co/api/v2/stat/2/"
    }
  },
```

```json
    {
      "base_stat": 48,
      "effort": 0,
      "stat": {
        "name": "defense",
        "url": "https://pokeapi.co/api/v2/stat/3/"
      }
    },
    {
      "base_stat": 48,
      "effort": 0,
      "stat": {
        "name": "special-attack",
        "url": "https://pokeapi.co/api/v2/stat/4/"
      }
    },
    {
      "base_stat": 48,
      "effort": 0,
      "stat": {
        "name": "special-defense",
        "url": "https://pokeapi.co/api/v2/stat/5/"
      }
    },
    {
      "base_stat": 48,
      "effort": 0,
      "stat": {
        "name": "speed",
        "url": "https://pokeapi.co/api/v2/stat/6/"
      }
    }
  ],
  "types": [
    {
      "slot": 1,
      "type": {
        "name": "normal",
        "url": "https://pokeapi.co/api/v2/type/1/"
      }
    }
  ],
  "weight": 40
}
```

Output Attribute Capture

NestedFlow captures below attributes associated with the API response

HTTPAPI_ResponseContentEncoding	Response content encoding of the last API execution
HTTPAPI_ResponseContentType	Response content type of the last API execution
HTTPAPI_ResponseCharacterSet	Response content character set of the last API execution
HTTPAPI_ResponseServer	Response server of the last API execution
HTTPAPI_ResponseStatusDescription	Status description of last API execution
HTTPAPI_ResponseStatusCode	Execution status code of last API execution

Note: You can get all of them in **Tools → System Defined Variables** window

Capturing all of them in execution Log:
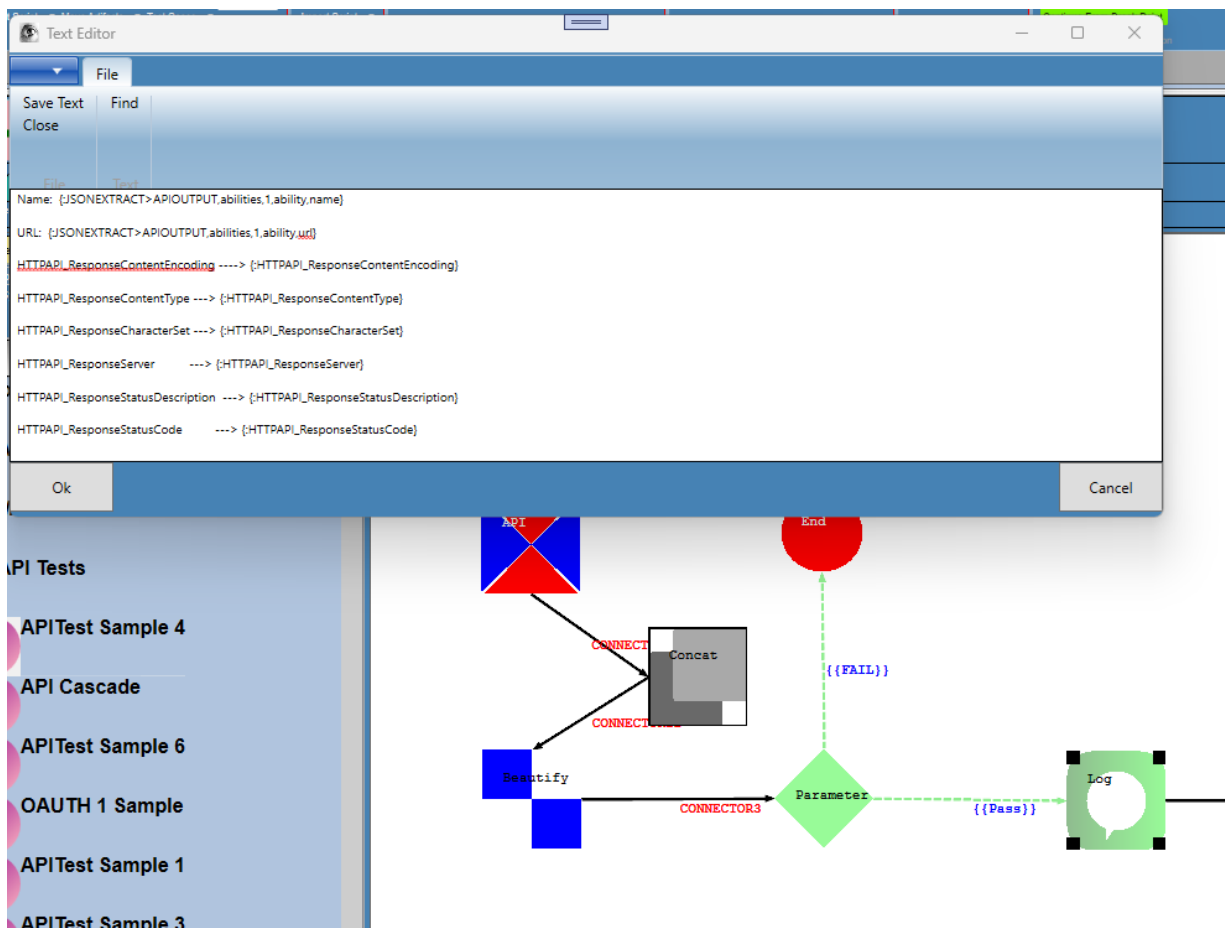
```
5-36:29 Name: imposter
        URL: https://pokeapi.co/api/v2/ability/150/
        HTTPAPI_ResponseContentEncoding ---->
        HTTPAPI_ResponseContentType ---> application/json; charset=utf-8
        HTTPAPI_ResponseCharacterSet ---> utf-8
        HTTPAPI_ResponseServer     ---> cloudflare
        HTTPAPI_ResponseStatusDescription ---> OK
        HTTPAPI_ResponseStatusCode   ---> 200
```

Reading Json Values

Also, we can capture the response nodes using dynamic variables.

For example, in the below HTTP response captured in parameter **APIOUTPUT**

```
{
  "abilities": [
    {
      "ability": {
        "name": "limber",
        "url": "https://pokeapi.co/api/v2/ability/7/"
      },
      "is_hidden": false,
      "slot": 1
    },
    {
      "ability": {
        "name": "imposter",
        "url": "https://pokeapi.co/api/v2/ability/150/"
      },
      "is_hidden": true,
      "slot": 3
    }
  ],
  "base_experience": 101,
  "forms": [
    {
      "name": "ditto"
```

In order to capture name **imposter** and corresponding URL, we can use below parameters

Name {:JSONEXTRACT>APIOUTPUT,abilities,1,ability,name}
URL: {:JSONEXTRACT>APIOUTPUT,abilities,1,ability,url}

```
{
  "abilities": [
    {
      "ability": {
        "name": "limber",
        "url": "https://pokeapi.co/api/v2/ability/7/"
      },
      "is_hidden": false,
      "slot": 1
    },
    {
      "ability": {
        "name": "imposter",
        "url": "https://pokeapi.co/api/v2/ability/150/"
      },
      "is_hidden": true,
      "slot": 3
    }
  ],
  "base_experience": 101,
  "forms": [
    {
```
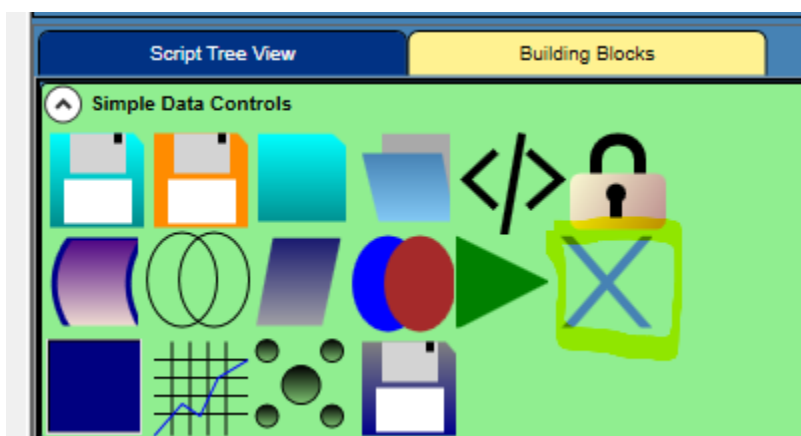
URL: {:JSONEXTRACT>APIOUTPUT,abilities,1,ability,url}

Parameter Type

parameter where json
output is stored

array components, here in the parent abilities array capture
1st element (index starts from 0) capture ability node and
capture url field which will return:
https://pokeapi.co/api/v2/ability/150/

Reading XML Values:

For reading XML values we can use XPATH control

In the sample XML

```
<bookstore>
  <book category="COOKING">
    <title lang="en">Everyday Italian</title>
    <author>Giada De Laurentiis</author>
    <year>2005</year>
    <price>30.00</price>
  </book>
  <book category="CHILDREN">
    <title lang="en">Harry Potter</title>
    <author>J K. Rowling</author>
    <year>2005</year>
    <price>29.99</price>
  </book>
  <book category="WEB">
    <title lang="en">Learning XML</title>
    <author>Erik T. Ray</author>
    <year>2003</year>
    <price>39.95</price>
  </book>
</bookstore>
```

author counter 1 (J K. Rowling) can be captured by XPATH:
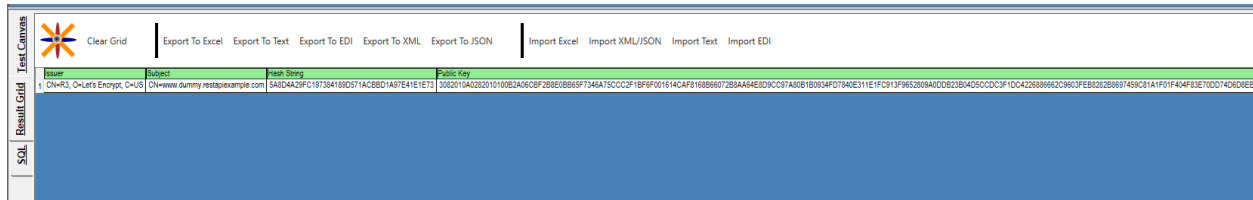
//bookstore/book/author,1

The component Attribute XML → is XPATH

Code/Data Path = either XML file name or string (Parameter with XML value)

Certificate Validation

The API execution also captures Client certificate details associated with the API. These values can be used to validate the license as well.

When An API is executed by the tool, a table is created by name "**Certificate Validation**" Which can be seen in result grid.

Details shown in the Table:

Issuer, Subject, Hash, public key, serial number, Effective date, Expiry date, policy errors associated etc. We can use these details to find issues with certificates e.g.: if the certificate is getting expired soon