

IBM QRadar
7.4.0

Application Framework Guide



Note

Before you use this information and the product that it supports, read the information in [“Notices” on page 141](#).

Product information

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Chapter 1. Developing with the QRadar app framework

QRadar GUI application framework apps are stand-alone web applications that run on the Flask micro-framework, and are served from the Flask web server.

Note: Use this documentation for maintaining apps built using CentOS, Python 2, and the QRadar App Framework version 1. For newer apps built using [Red Hat Universal Base Image \(UBI\) 8](#) and Python 3, see the [App Framework version 2 documentation](#). IBM® X-Force® Exchange no longer accepts new apps using App Framework version 1.

What's new for the application framework in QRadar V.7.4.0

IBM QRadar V.7.4.0 introduces new features and enhancements.

Run apps in a multi-tenant environment

QRadar V.7.4.0 includes support for multi-tenanted apps. A number of out of the box apps, such as Pulse, Assistant, and Log source manager, can now be used in a multi-tenant environment.

App developers will now be able to mark that their app has been tested and works in a multi-tenanted environment. There are two forms of multi-tenancy support in apps:

1. The app is tested and works with multi-tenancy, but it is not multi-tenancy aware. When a user installs the app, they are presented with the option to create a default instance. Users can select this option if they only want a single instance of the app, or the app does not need to support multi-tenancy. If a user does not select the **Default Instance** option, they must create a separate instance for each customer and associate each instance with a security profile to keep all client data separate.
2. The app is tested and is multi-tenancy aware. In this case, only one instance of the app is necessary. This type of app is also beneficial if the app is designed to be used only by administrators.

QRadar apps

Use IBM QRadar apps to extend and enhance your current QRadar deployment with new data and ready-to-use use cases.

A QRadar app is a means to augment and enrich your current QRadar system with new data and functionality. You can download and install other shared apps that are created by IBM, its Business Partners, and other QRadar customers.

You create your own apps from QRadar by using the QRadar GUI Application Framework Software Development Kit (SDK). You can then package the app and reuse it in other QRadar deployments. You can share your app on the [IBM X-Force Exchange](https://exchange.xforce.ibmcloud.com/) portal (<https://exchange.xforce.ibmcloud.com/>).

Apps provide new tabs, API methods, dashboard items, pop-up menus, toolbar buttons, configuration pages, and more within the QRadar user interface. The functionality is entirely defined by Python Flask framework apps that serves the app endpoints from a secure container.

Important: The QRadar app framework does not support systems that are configured using the Security Technical Implementation Guide (STIG). Customers that use STIG hardened systems can not install apps in QRadar.

Download public apps

All apps and security product enhancements are hosted on the [IBM X-Force Exchange](https://exchange.xforce.ibmcloud.com/) portal (<https://exchange.xforce.ibmcloud.com/>).

You can see a list of available apps on the [IBM Security App Exchange \(https://exchange.xforce.ibmcloud.com/hub\)](https://exchange.xforce.ibmcloud.com/hub). Filter apps by selecting the **Application** check box.

Every download from the X-Force App Exchange is known as an extension. An extension can consist of an app or security product enhancement (content extension) that is packaged as an archive (.zip) file, which you can deploy on QRadar by using the **Extensions Management** tool on the **Admin** tab.

QRadar app development overview

Use the IBM QRadar GUI Application Framework to develop new application modules that integrate with QRadar and provide new capabilities.

Applications or apps are small plug-in modules to the GUI Application Framework. Apps serve endpoints from within a secure container to inject the content directly into the QRadar web interface.

Each app has its own dedicated memory allocation and a defined amount of CPU resources that are allocated to it.

The main web language that is used to author an application is Python, and the Flask framework is integrated and available for use by the application.

Note: If an app is running in an IPV6 environment and the app sends log messages to the QRadar host's Syslog (e.g. via the `qpylib.log` function), then the app container must be configured to use Python 2.7 in order for the Python SysLogHandler to successfully send the messages. For more information, see [“Use Python 2.7 in your app”](#) on page 40.

How an application runs and interacts with QRadar

QRadar applications run inside an isolated Python Flask environment that is independent of the QRadar user interface.

The application can also use static images, scripts, and HTML pages.

All interaction with the application is proxied through the QRadar user interface. No direct access to network ports or web services is usually permitted.

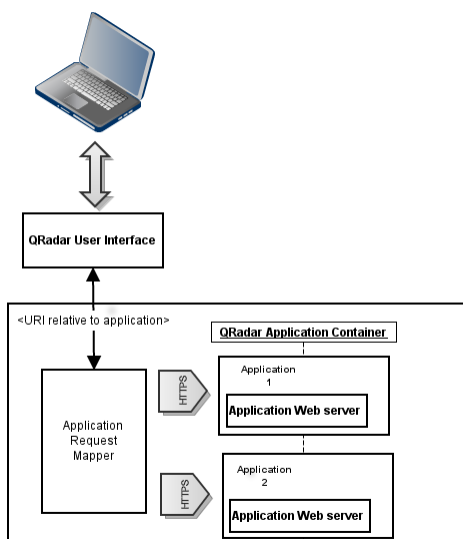


Figure 1. Application Framework

Note: The combined memory requirements of all the apps that are installed on a QRadar Console cannot exceed 10 per cent of the total available memory. If you install an app that causes the 10 per cent memory limit to be exceeded, the app does not work.

If your app requires a minimum memory allocation, you must provide information about it in your app's documentation.

Apps that require internet access

If the app that you develop requires internet access, you must implement proxy support in your app. Apps can't use the proxy support that is built into QRadar.

Types of app

The QRadar GUI Application Framework supports the following app types that are described in the following table.

Table 1. Types of app	
App Type	Description
Areas (or visualizations)	New screen that is presented in a new tab.
Right-click menus	New right click menu options available with the QRadar GUI.
Toolbar buttons	New toolbar buttons, with the enabling code that runs from the confines of the app.
Dashboard/Dashboard widgets	New dashboard widgets, with the HTML served from a particular app.
Administrative screens	New Admin tab, configuration, and setup screens.
Hover Over metadata	Injection of hover over metadata into existing hover over areas.
JavaScript page scripts	Injected browser JavaScript functionality specific to an existing QRadar GUI screen area.
Resource Bundles	Partial support of Java style key value pair properties files to provide some level of globalization support.
Custom fragments	Inject custom HTML fragments into the QRadar UI.
Custom columns	Add columns with custom content to tables in the QRadar

The app type content is dynamically injected back into the GUI display.

Apps are packaged as compressed archives (.zip), within the extension archive. You can install and uninstall apps by using RESTful endpoints. More RESTful endpoints exist to control the lifecycle of an app within QRadar.

Note: As a best practice, store your app configuration and data in /store because data in this directory is protected during app upgrades.

For more information about QRadar application framework REST API endpoints, see [“GUI Application Framework REST API endpoints”](#) on page 91.

GUI application framework fundamentals

QRadar GUI application framework apps are stand-alone web applications that run on the Flask micro-framework, and are served from the Flask web server.

Installation overview

Every app runs in its own unique Flask server. Each Flask server, in turn, runs within a secure Linux® container. Docker is the implementation stack for the secure containment of the Flask app codebase.

Each app is installed by using the RESTful API endpoints. The installation endpoint handles these tasks:

- Validates the manifest of the app.
- Automatically creates a Docker image (asynchronous) with the app code that is bundled within it.
- Registers the app (asynchronous) with QRadar to enable web traffic proxy and the HTTP request/response lifecycle from QRadar to the app.
- Automatically runs a Docker container from the Docker image (asynchronous), which is bound to a data-only secondary container that is used for persistent storage.

QRadar RESTful API endpoints

The key interface between lifecycle management of an app, during both its creation and running phases, is the QRadar GUI App Framework REST API endpoints.

The following table describes the QRadar RESTful API endpoints.

Table 2. GUI Application Framework REST API endpoints		
Endpoint	Parameters	Description
GET /gui_app_framework/application_creation_task	Application ID	Retrieves a list of status details for all asynchronous requests to create apps.
GET /gui_app_framework/application_creation_task/{application_id}	Application ID	Retrieves a list of status details of an asynchronous request to create apps.
POST /gui_app_framework/application_creation_task	Application (.zip) bundle file	Creates an app within the application framework, and registers it with QRadar. The app is created asynchronously. A reference to the application_id is returned and must be used in subsequent API calls to determine the status of the app installation.
POST /gui_app_framework/application_creation_task/{application_id}	Application ID, cancel status	Updates a new app installation within the application framework. The application_id and a status parameters are required.
GET /gui_app_framework/applications		Retrieves a list of apps that are installed on the QRadar console, and their manifest JSON structures and status.
GET /gui_app_framework/applications/{application_id}	Application ID	Retrieves a specific app that is installed on the console and its manifest JSON structure and status.
POST /gui_app_framework/applications/{application_id}	Application ID, start/stop status	Updates an app. Starts or stops an app by setting status to RUNNING or STOPPED respectively.
PUT /gui_app_framework/applications/{application_id}	Application ID	Upgrade an application.

Table 2. GUI Application Framework REST API endpoints (continued)

Endpoint	Parameters	Description
DELETE /gui_app_framework/applications/{application_id}	Application ID	Deletes an application.
GET /gui_app_framework/named_services		Retrieves a list of all named services registered with the Application Framework.
GET /gui_app_framework/named_services/{uuid}	uuid	Retrieves a named service registered with the Application Framework by using the supplied uuid.

Python

The main web language that is used to author an app is Python, and the Flask framework is integrated and available for use by the app.

For more information, go to the [Python](https://www.python.org/doc/) website (<https://www.python.org/doc/>).

Flask

Flask is a micro web application framework that is written in Python.

Flask is the web server from which the app-coded endpoints are served. You use Python functions to deliver use cases. You can use route annotations for each Python method in the Flask application. After the Flask web server starts, HTTP/HTTPS-bound requests are serviced by Flask for that route, and the Python functions are run.

Each Flask server that is run from within the Docker container uses port 5000. Outwardly from the container, Docker maps that internal port 5000 to the next free port from the 32768-60999 ephemeral range. During the registration phase, this outward mapped port is stored by QRadar so that web requests for an app, through QRadar are proxied to the correct container.

The following code is a sample Python route:

```
@app.route('/')
def hello_world():
    return 'Hello World!'
```

In a standalone Flask web server, a web request through a browser to <http://localhost:5000> returns: Hello World!

The following table outlines the specific version of Flask, and its dependencies:

Packages	Version	Description
Flask	0.10.1	Microframework, or micro web application framework
itsdangerous	0.24	Utility package for signing and encrypting data
jinja2	2.7.3	Template engine for python
markupsafe	0.23	Unicode escape library used alongside Jinja2
Werkzeug	0.96	WSGI (Web Server Gateway Interface) utility library for Python

For more information, see the [Flask](http://flask.pocoo.org/) website (<http://flask.pocoo.org/>).

Jinja2

Jinja2 is a Python library that enables you to create templates for various output formats from a core template text file. HTML is the format that is used for QRadar apps. Jinja2 has a rich API, and large array of syntactic directives (statements, expressions, variables, tags) that you use to dynamically inject content into the template file.

Flask's in-built `render_template()` method is the easiest way to inject data from a Python method, served by the route, into a Jinja2 HTML template, as shown in the following example.

```
@app.route('/')
def hello_world():
    return render_template('hello.html', title='QRadar')
```

The template `hello.html` contains the following code:

```
<!doctype html>
<title>Hello from Flask</title>
<h1>Hello {{ title }}!</h1>
```

The following HTML output is produced:

```
<!doctype html>
<title>Hello from Flask</title>
<h1>Hello QRadar!</h1>
```

For more information, see the [Jinja2](http://jinja.pocoo.org/docs/dev/) website (<http://jinja.pocoo.org/docs/dev/>).

HTTP request response lifecycle

When an app is successfully installed, requests to the app are proxied only by using an established connection to QRadar. The app cannot be directly accessed by using direct URL requests or any other method.

Apps can establish a secure authenticated and authorized session to QRadar. Any authorization tokens that are created to verify that the integrity of session can be reused. The app obtains all the capabilities, security, and authenticity facets of QRadar. The app can use the user session state to get access to all of QRadar RESTful API endpoints to pull or push data to or from the QRadar system.

Containerized apps and the network

With the GUI Application Framework, traffic flows from container to container, from container to host on its public IP address (not localhost), and from containers to the outside world.

When each app is passed as an archive (.zip file) of source code to the QRadar endpoints, QRadar builds the initial image specific to your app codebase. Each image runs as an individual container. As the container is run or started, QRadar maps the internal flask server port (5000) to an external ephemeral port. This external ephemeral port is registered to QRadar so that proxied requests to your app code are routed to the correct container.

/debug endpoints

All apps must include a `/debug` endpoint or route that runs locally on port 5000. If you use the default flask framework, this endpoint is automatically included in your `root_init.py` file. This endpoint is used to ensure live apps are active and reachable.

If you disable the default flask to allow the app to use its own web server, you must include a `/debug` endpoint on port 5000. If you do not include the endpoint, your app will restart once per minute, as a result of QRadar being unable to receive a response from the app.

App file structure

An IBM QRadar app that you create is distributed within a compressed file.

The Hello World sample app that is created when you set up your development environment is a basic template that you can use for your application. However, the application file structure can be more complex.

The following list outlines the layout of files and sub directories that you can add to the root directory of your app. It also outlines the required nomenclature for app files and sub directories:

<App Root Folder>

This is main directory for application files

`app/views.py`

The main entry point into the web app.

`app/templates`

An optional subdirectory that contains any Python Flask or Jinja templates that are required by the app.

`app/static`

An optional subdirectory that contains CSS, JavaScript, globalization, and other resource files.

- `css`
- `js`
- `resources`

The `application_<LANG>.properties` file is a Globalization resource bundle for the specified language code. Text strings for globalization are stored as key/value pairs in Java format properties files. If you configured text strings for globalization, they appear in QRadar when the user sets their preferences for the relevant locale.

`manifest.json`

The application manifest description file.

`src_deps`

An optional directory that contains source dependencies.

- `pip`

Optional subdirectory that contains any extra Python libraries that the app requires.

- `rpms`

Optional subdirectory that contains any RPM dependencies that the app requires. RPMs must be CentOS 6.7 x86_64 compatible.

- `init`

Optional subdirectory that contains any dependencies that the app requires that are not RPMs or Python libraries.

Application manifest structure

The manifest is a JSON file that describes to IBM QRadar the capabilities that the app provides.

The following table describes the fields that you can include in the `manifest.json` file.

Table 3. Application manifest fields

Field	Required	Type	Description
name	Yes	String	The user-readable name of the app. If the app is globalized This field can optionally point at a resource bundle key.
description	Yes	String	The user-readable description of the app. If the application is globalized, this field can optionally point at a resource bundle.
version	Yes	String	A version string for the app. You can use any format that you want here.
uuid	Yes	String	An RFC 4122-compliant universally unique identifier for the application. The create command uses the Python UUID package to generate a random 128-bit number for the uuid value. If you do not use the SDK to create the app manifest file, you must manually enter a unique value in the uuid field.
authentication	Yes	String	Authorization for the app to access QRadar. The only mandatory entry is "requested_capabilities": ["<capability>"]. For example, admin is a commonly used user capability. Enter at least one supported QRadar user capability. The installation fails if any of the requested_capabilities are not defined in QRadar.
load_flask	No	Boolean	Set to false when you don't want to make Python Flask framework available to your app. Typically, you might disable Flask when you want your app to use a different web application framework. If not specified, this field defaults to true. Supported by QRadar Console V7.3.0 and V7.3.1
node_only	No	Boolean	If you want your app to be installed on an app node only and not on the QRadar Console Console, set to true. Useful when your app is resource-intensive. When you use this field, inform your users that your app runs only on an app node appliance (unmanaged host). If not specified, this field defaults to false. Supported by QRadar Console V7.3.0 and later.
debugging	No	Boolean	Set to true to turn on logging for your app. If not specified, this field defaults to false.
areas	No	Array of Area Type	One or more Area objects describe new complete pages of the application. In QRadar, Area objects are represented as tabs.

Table 3. Application manifest fields (continued)

Field	Required	Type	Description
rest_methods	No	Array of REST Method Type	One or more REST Method objects describe REST methods that the app exposes. REST Method objects are required parameters for Dashboard Items and Metadata Providers, and are optional for Actions.
dashboard_items	No	Array of Dashboard Item Type	One or more Dashboard Item objects describe the contents of new items that you want to expose to the QRadar dashboard.
configuration_pages	No	Array of Configuration Page Type	One or more Configuration Page objects describe new complete pages of the app that represent configuration. In QRadar, configuration pages are opened from the Admin tab.
gui_actions	No	Array of GUI Action Type	One or more GUI Action objects describe new actions that can be performed on items in the user interface by page toolbars or by right-click menus.
page_scripts	No	Array of Page Script type	One or more Page Script objects describe new JavaScript files that you want included within an existing page in QRadar. By default, these scripts run in their own namespace.
metadata_providers	No	Array of Metadata Provider type	One or more Metadata Provider objects describe REST methods that can be called to fetch new metadata information for certain data types in QRadar. Metadata is shown in tooltips when a mouse is hovered-over an item.
resource_bundles	No	Array of Resource Bundle type	One or more Resource Bundle objects. You use these objects for language locales and locale properties file locations.
dev_opts	No	Array of Developer Options type	One or more Developer Option objects. You use these objects to specify values that are used when you develop locally.
resources	No	Integer	One or more Resource objects. You use these objects to configure the amount of memory in megabytes that is available for the app to use. Supported by QRadar V7.2.7 and later.
fragments	No	Array of Fragments type	Use these objects to determine the injection point in the QRadar UI where content is added and the rest endpoint that is used to retrieve the content. Supported by QRadar V7.2.8 and later.
custom_columns	No	Array of Custom Columns type	One or more Custom column objects. You use these objects to identify the context (the page and table in the QRadar UI) where a custom column is added, a label for the column header, the type of data to be added, and the rest endpoint that is used to add the column content. Supported by QRadar V7.2.8 and later.

Source dependencies

If your app requires dependencies, such as RPMs or Python libraries, you can add them in the `src_deps` sub directory of the app folder.

The `src_deps` directory can contain these optional sub directories:

pip

Use the `pip` folder to install extra Python libraries. For example, if your application requires the `observable-0.01.00` Python library, add the `observable-0.01.00.tar.gz` file to the `pip` folder.

Don't use `.tar` files for Python libraries that include extra C-based extensions. Instead, add libraries as Python wheel files (`.whl`), which have C-based extensions pre-compiled.

You must install Python wheel files on the same system architecture they were compiled upon. To work with IBM QRadar application framework, wheel files must be compiled on Centos 6.7 x86_64. If it uses compatible architecture, you can use the Python **`bdist_wheel`** command to create wheel files from a library's source code on your own system. The command `python setup.py sdist bdist_wheel` creates the wheel file when you run it from within the root directory of the Python library's source folder.

A useful alternative to manually downloading Python packages for your app is the `pip2pi` Python package. It requires `pip` and you can install it on your development computer by using the `pip install pip2pi` command. After you install this package, you run the following command:

```
pip2tgz <target-directory> <Python package>
```

For example, the following command downloads the package's wheel, along with its dependencies, into the specified folder.

```
pip2tgz python_packages/pytest/ pytest==2.8.2
```

The **`pytest`** parameter is optional and you can use it to download specific versions of a package.

For Python libraries that have dependencies, you can include an optional `ordering.txt` file in the `pip` folder to specify the order in which Python libraries are installed. This text file must include the names of files that are in the `/pip` folder. File names must be separated with a new line (UNIX line endings) in the order that you want them installed.

rpms

Use the `rpms` folder to install extra Red Hat Enterprise Linux (RHEL) RPMs. The RPMs must be CentOS 6.7 x86_64 compatible.

For RPMs that have dependencies, you can include an optional `ordering.txt` file in the `rpms` folder to specify the order in which RPMs are installed. This text file must include the names of files that are in the `rpms` folder. File names must be separated with a new line (UNIX line endings) in the order you want them installed.

init

Add dependencies files that do not fit into the `pip` or `rpms` folders to the `init` folder. You must also include an `ordering.txt` file in the `init` folder. The lines in this text file (UNIX line endings) are run as shell commands during the installation of the app.

For example, you might want to install a collection of RPMs that has a complex dependency chain that is not explicitly known. In this use case, you add a `.tar` file that is called `dependant_rpms.tar.gz` to the `init` folder. You add the following commands to the `ordering.txt` file:

```
mkdir /src_deps/init/dependant_rpms
```

```
cd /src_deps/init
```

```
tar -xzvf dependant_rpms.tar.gz
```

```
yum -y localinstall --disablerepo=* dependant_rpms/*.rpm
```

```
rm -rf dependant_rpms
```

Note: The `--disablerepo=*` switch in this example is used to prevent the **yum** from attempting to contact remote repositories on QRadar consoles that have no internet access.

This example uses **yum**'s RPM auto-dependency resolution that installs a set of specified RPMs in the required order. If the RPMs are included in the `rpms` folder, you must specify the installation order.

Installing Node.js as a source dependency

You can install Node.js as a web application framework to replace the Flask framework that is included with the QRadar GUI Application Framework SDK.

Procedure

1. Download the Node.js archive (.tar) that you want to use, and copy it to `app/src_deps/init` directory.
2. Create an installation script that is similar to the following example in the same folder that references the archive `node-v6.3.0-linux-x64.tar.gz` that you want to use (in this case):

```
#!/bin/bash
###
### install node and npm from source tarball, and make available on the path
###
cd /usr/local
tar --strip-components 1 -xzf /src_deps/init/node-v6.3.0-linux-x64.tar.gz
```

3. Create a file `ordering.txt` in the same folder as the following content:

```
/src_deps/init/install_nodejs_npm.sh
```

The `ordering.txt` notifies QRadar to run the Node.js installation script.

Manifest object types

You can define several objects types in the IBM QRadar Application Framework manifest.

Areas type

Use the Areas type to add a tab to the IBM QRadar.

The following table describes the areas block fields in the `manifest.json` file.

Table 4. Areas block fields			
Field	Required	Type	Description
id	Yes	String	A unique ID.
text	Yes	String	Concise text to display that describes the area. This field can optionally point at a resource bundle key if the application is globalized.
description	No	String	Detailed text to display that describes the area. This field can optionally point at a resource bundle key if the application is globalized.

Table 4. Areas block fields (continued)			
Field	Required	Type	Description
url	Yes	String	A URL to load, relative to the application root. Only URLs that live within the QRadar application can be referenced.
required_capabilities	No	Array of String	A set of capabilities that a user must affiliate with their user role to access this area.

The following code is a sample areas block from `manifest.json`:

```
...
areas: [
  {
    "id": "QHelloWorld",
    "text": "Hello World",
    "description": "A Hello World app",
    "url": "index",
    "required_capabilities": ["ADMIN"]
  },
  ...
]
```

REST method type

The REST method that the app provides. REST methods can be used by other objects in this manifest, including dashboard items, GUI actions, and metadata providers.

IBM QRadar expects the response of a REST method to be [RFC 4627](https://www.ietf.org/rfc/rfc4627.txt)-compliant JSON (<https://www.ietf.org/rfc/rfc4627.txt>). Arguments are passed to the method either as a query string argument or URI encoded parameters in the PUT or POST body.

REST methods are typically implemented in Python by using the Flask framework.

The following implementation of a REST method retrieves a type of metadata:

```
@app.route('/getMetaData', methods=['GET'])
def getMetaData():
    ip = request.args.get("ip")
    #Do something with this IP and populate a variable called 'value'
    return json.dumps({'key': 'myMetaData', 'label': 'Item Label', 'value': value})
```

This method is then exposed in the manifest in the following way:

```
...
rest_methods: [
  {
    "name": "getMetaData",
    "url": "/getMetaData",
    "method": "GET",
    "argument_names": ["context"]
  },
  ...
]
```

The following table describes the `Rest_methods` block fields in the `manifest.json` file.

Table 5. <i>Rest_methods</i> block fields			
Field	Required	Type	Description
name	Yes	String	A unique name for this REST method within the app.
method	Yes	String	An HTTP method on named endpoint (GET/POST/DELETE/PUT).
url	Yes	String	The URL to access the REST method, relative to the app root. Only URLs within the app are supported.
argument_names	No	String	The names of arguments that this method expects. Arguments that are passed to the method are URL-encoded, as either query string parameters or in the PUT or POST body.
required_capabilities	No	Array of String	A set of capabilities that a user must affiliate with their user role to access this method.

Dashboard items type

A new item on the IBM QRadar dashboard. These items are available to users, who must manually add the items to their dashboard.

The contents of the item come from the response of the REST method execution. The expected format of the response is outlined in the following way:

```
{
  id:"Unique ID of item"
  title:"Title text to display in the item",
  HTML:"Contents of dashboard item, including
        any HTML and JavaScript you want to use."
}
```

Each time the dashboard item is refreshed, the REST method runs, so methods have a short response time. The current default refresh rate for dashboard items in QRadar is 60 seconds.

The following table describes the `dashboard_items` block fields in the `manifest.json` file.

Table 6. <i>Dashboard_items</i> block fields			
Field	Required	Type	Description
text	Yes	String	A unique ID for this area.
description	Yes	String	Concise text to display that describes the area. Can optionally point at a resource bundle key if the application is globalized.
rest_method	Yes	String	Name of the REST method to load this item. Must be declared in the <code>rest_methods</code> section of the manifest.
required_capabilities	No	Array of String	A set of capabilities that a user must affiliate with their user role to have access to this item.

The following code is a sample `dashboard_items` block from the `manifest.json` file:

```
...
  "dashboard_items": [
    {
      "text": "Sample Item",
      "description": "Sample dashboard item that is a copy of most recent offenses",
      "rest_method": "sampleDashboardItem",
      "rest_arguments": null,
      "required_capabilities": ["ADMIN"]
    }
  ],
  ...
```

Configuration pages type

A new configuration page to be added to IBM QRadar. An app can define any user interaction that is required.

In QRadar, `configuration_pages` are represented as icons in the **Admin** tab.

The following table describes the `configuration_pages` block fields in the `manifest.json` file.

Table 7. <i>Configuration_pages</i> block fields			
Field	Type	Description	Required
text	String	Concise text to display that describes the configuration page. This field can optionally point at a resource bundle key if the application is globalized.	Yes
description	String	Detailed text to display that describes the area. This field can optionally point at a resource bundle key if the application is globalized.	Yes
icon	String	Path to the icon for your app on the Admin tab, relative to the application root. Icons must be 32x32 pixels.	Yes
url	String	A URL to load, relative to the application root. Only URLs that exist within the QRadar application can be referenced.	Yes
required_capabilities	Array of String	A set of capabilities that a user must affiliate with their user role to access this configuration page.	No

The following code is a sample `configuration_pages` block from the `manifest.json` file:

```
...
  "configuration_pages": [
    {
      "text": "Open mycompany.com",
      "description": "Loading mycompany.com in a new window",
      "icon": null,
      "url": "my_config_page",
      "named_service": "nodejsservice",
      "required_capabilities": ["ADMIN"]
    }
  ],
  ...
```

GUI Action type

An action that the user can do in IBM QRadar.

In QRadar, GUI Actions are represented as either buttons in page toolbars, or as right-click menu options. On touchscreen devices, GUI Actions are for items that are pressed for a long time.

When run, GUI Actions run a block of JavaScript, or invoke a REST method, or a combination of both. If you use both the **rest_method** and **javascript** attributes, the GUI Action invokes the server-side REST method within your app. It then runs the client-side JavaScript.

The following table describes the `gui_actions` block fields in the `manifest.json` file.

Table 8. GUI_Actions block fields			
Field	Required	Type	Description
id	Yes	String	A unique ID for this area within the application.
text	Yes	String	Concise text to display that describes the area. Can optionally point at a resource bundle key if the application is globalized.
description	No	String	Detailed text to display that describes the area. Can optionally point at a resource bundle key if the application is globalized.
icon	Yes	String	Path to the toolbar or right-click menu icon to load, relative to the application root. Icons must be 16x16 pixels. If you do not want to add an icon, set the value of this parameter to <code>null</code> .
rest_method	No	String	A REST method to call when this action is performed. The context parameter must be specified as an argument. The REST method is populated with whatever the context of the GUI Action group is. The GUI Action group context varies, depending on what GUI Action group the action is invoked from. As an example, on the right-click menu of an IP address, the context parameter contains the IP address. Either this argument or the JavaScript argument is required. If both are specified, then the REST method is run first, the results of which can be passed back into the JavaScript code block by using the <i>result</i> variable. This method must be declared in the rest_methods block of the manifest.

Table 8. GUI_Actions block fields (continued)

Field	Required	Type	Description
javascript	No	String	<p>A JavaScript code block to run when this action is performed. Either this argument or the REST method argument is required. If both are specified, then the REST method is executed first, the results of which are passed into the JavaScript code block that uses the <i>result</i> variable.</p> <p>If only the JavaScript argument is specified, a <i>context</i> variable that contains the <i>context</i> of the GUI action, is passed into the JavaScript code block.</p>
groups	Yes	Array of String	<p>A list of one or more GUI Action groups to install the action into (in other words, the identifier of the toolbar or right-click menu). You must provide at least 1 group.</p> <p>You can also use a group name in this format ariel:<FIELD_NAME>, where <FIELD_NAME> is the name of a field in the QRadar Event or Flow viewer. If this field is specified, the action is installed into the menu of that field, and the context parameter is the contents of the field.</p>
required_capabilities	No	Array of String	A set of capabilities that a user must affiliate with their user role to access this area.

The following code is a sample gui_actions block from the manifest.json file:

```
...
    "gui_actions": [
      {
        "id": "addToReferenceSet",
        "text": "Add To Reference Set",
        "description": "Adds to a reference set",
        "icon": "static/images/Btn1.png",

        "rest_method": "addToReferenceSet",
        "javascript": "alert(result)",
        "groups": [ "ipPopup" ],
        "required_capabilities": [ "ADMIN" ]
      },
      {
        "id": "sampleToolbarButton",
        "text": "Sample Toolbar Button",
        "description": "Sample toolbar button
          that calls a REST method,
          passing an offense ID along",
        "icon": "static/images/Btn2.png",

        "rest_method": "sampleToolbarMethod",
        "javascript": "alert(result)",
        "groups": [ "OffenseListToolbar" ],
        "required_capabilities": [ "ADMIN" ]
      }
    ],
  ..
```

Page scripts type

Describes a new JavaScript file that the app includes inside an existing IBM QRadar page.

Script files that are included by the QRadar GUI Application Framework are run from the root QRadar namespace context. Scripts can interact with each other within the same app and have access to top-level functions that are defined in QRadar.

The following table describes the `page_scripts` block fields in the `manifest.json` file.

Table 9. <i>Page_scripts</i> block fields			
Field	Type	Description	Required
app_name	String	The name of the QRadar app that you want to include the scripts in. The asterisk wildcard "*" is also supported if it is used with the page_id field. Use the wildcard to include a file on every QRadar page.	Yes
page_id	String	The page ID that includes the scripts. The asterisk wildcard character "*" is also supported if used with the app_name field. Use the wildcard to include a file on every QRadar page.	Yes
scripts	Array of String	The relative path to scripts that you want to include on the page. You can add more than one script to each page. Paths to each script must be separated by a comma.	Yes

The following code is a sample `page_scripts` block from `manifest.json`:

```
...
  "page_scripts": [
    {
      "app_name": "SEM",
      "page_id": "OffenseList",

      "scripts": ["/static/js/sampleScript1.js",
                  "/static/js/sampleScript2.js"]
    },
  ],
...

```

Metadata providers type

Describes metadata providers that are used to show context-sensitive information in IBM QRadar.

Metadata is shown when the user's mouse pointer hovers over an item in QRadar. The contents of the metadata comes from the response of the REST method. The following code example shows the expected format of the response:

```
{
  key: "Unique key for this metadata item",
  label: "Description of what this metadata is",
  value: "Plain-text context-sensitive data to be provided",
  html: "HTML context-sensitive data to be provided"
}
```

The following table describes the `metadata_providers` block fields in the `manifest.json` file.

Table 10. Metadata_providers block fields			
Field	Required	Type	Description
rest_method	Yes	String	Name of the REST method that is used to fetch the metadata. Must be declared in the rest_methods block of the manifest. Requires a context argument that specifies the item to fetch metadata for.
metadata_type	Yes	String	Type of metadata that can be fetched for. The following list provides the valid values for this field: <ul style="list-style-type: none"> • ip • userName - • ariel:<FIELD_NAME>, where <FIELD_NAME> is the name of a field in the QRadar Event or Flow viewer

The following code is a sample metadata_providers block from the manifest.json file:

```
...
"metadata_providers": [
  {
    "rest_method": "sampleIPInformation",
    "metadata_type": "ip"
  },
  {
    "rest_method": "sampleUserInformation",
    "metadata_type": "userName"
  },
  {
    "rest_method": "sampleURLInformation",
    "metadata_type": "ariel:URL"
  }
],
...
```

Resource bundles type

Describes the language locales and locations of the locale properties file locations that you use when you globalize your app.

The following table describes the Resource_bundles block fields in the manifest.json file.

Table 11. Resource_bundles block fields			
Field	Required	Type	Description
locale	Yes	String	Language locale code
bundles	Yes	String	Path to the globalization resource bundle properties files. Files are stored in the /app/static/resources/ folder. Properties files must use the following naming convention: application_<LANG>.properties.

The following code is a sample `resource_bundles` block from the `manifest.json` file:

```
...
  "resource_bundles": [
    {
      "locale": "en_US",
      "bundle": "resources/hello_en_US.properties"
    },
    {
      "locale": "es",
      "bundle": "resources/hello_es.properties"
    },
    {
      "locale": "fr",
      "bundle": "resources/hello_fr.properties"
    },
    {
      "locale": "en",
      "bundle": "resources/hello_en.properties"
    }
  ],
  ...
```

Text strings for globalization are stored as key/value pairs in Java format properties files. If you configured text strings for globalization, they appear in IBM QRadar when the user sets their preferences for the relevant locale.

Developer options type

Describes values that you use to develop and test your app locally.

The `dev_opts` object type is used only for local testing. Parameters in `dev_opts` blocks are not passed to the IBM QRadar Console when you deploy your app.

You use the `dev_opts` block in the `manifest.json` file to specify the IP address of a remote QRadar Console. If your application uses QRadar API endpoints, you can use the `dev_opts` object to contact the QRadar API and test the application locally before you upload to your QRadar production instance.

The following table describes the parameters of the `Dev_opts` block:

Table 12. <i>Dev_opts</i> block fields			
Field	Required	Type	Description
console_ip	Yes	String	The IP address of the remote QRadar Console that contacts the API endpoints that your app uses.

The following code is a sample `dev_opts` block from the `manifest.json` file:

```
...
  "dev_opts": [
    {
      "console_ip": "10.11.12.13",
    }
  ],
  ...
```

When you run your app, you are prompted for your QRadar user name and password. You can also store those credentials for your local development. Credentials are stored in clear text in the `<USER_HOME>/ .qradar_appfw .auth` file on Unix and Linux, and in the `C : \Users\<USER_HOME> \ .qradar_appfw .auth` file on Windows.

Resources type

Defines the memory resources to allocate to your app.

The Resources object is not an IBM QRadar app type. You use it to configure the amount of memory, in megabytes, that your app can use.

The following table describes the Resources block fields in the manifest.json file.

Table 13. Resources block fields			
Field	Required	Type	Description
memory	No	Integer	The amount of memory in megabytes that is available for the app to use. If the resources block is omitted from manifest.json, 200 megabytes of memory is allocated to your app by default.

The following code is a sample resources block from the manifest.json file:

```
...  
  "resources": {  
    "memory": 500  
  },  
...
```

Note: The combined memory requirements of all the apps that are installed on a QRadar Console cannot exceed 10 per cent of the total available memory. If you install an app that causes the 10 per cent memory limit to be exceeded, the app does not work.

If your app requires a minimum memory allocation, you must provide information about it in your app's documentation.

Fragments type

Use to inject custom content fragments into IBM QRadar.

The fragments block contains fields that define the tab, page, and page area where you want to inject custom content. It also defines the REST endpoint that QRadar uses to generate custom content. Different apps can inject content into the same page location. However, each app can insert only one set of HTML content for each location.

The following table describes the fragments block fields in the manifest.json file.

Table 14. Fragments block fields			
Field	Required	Type	Description
app_name	Yes	String	The QRadar app into which the content is to be injected.
page_id	Yes	String	The identifier of the page in QRadar UI into which the content is injected.

Table 14. Fragments block fields (continued)			
Field	Required	Type	Description
location	No	String	The location on the QRadar page where the custom content is injected. To inject content at the top of a page, if permitted, the value for this parameter is <code>header</code> . To inject content at the bottom of a page, if permitted, the value for this parameter is <code>footer</code> . If the page has only one injection point, don't include this field.
rest_endpoint	Yes	String	Identifies the REST API endpoint that QRadar invokes to retrieve the custom content. Can be any REST endpoint, not necessarily one that is provided by this app. An app's custom fragment REST endpoint must return a JSON response body.

The following example specifies content that is retrieved from the `/myoffensesheadercontent` endpoint to be injected into the header area of the **Offense List** page.

```
{
  ...
  "fragments": [
    {
      "app_name": "SEM",
      "page_id": "MyOffenseList",
      "location": "header",
      "rest_endpoint": "/myoffensesheadercontent"
    }
  ],
  ...
}
```

For more information about adding custom content fragments to the QRadar user interface, see [“Custom fragments example” on page 69](#).

Custom columns type

Adds custom columns to tables in IBM QRadar.

You can add columns in various locations in QRadar. Different apps can add a column to the same table. However, each app can add one column only for each table.

The following table describes the `custom_columns` block fields in the `manifest.json` file.

Table 15. Custom_columns block fields			
Field	Required	Type	Description
label	Yes	String	The name of the column. This string can also be a resource bundle key for globalization purposes.
rest_endpoint	Yes	String	Identifies the REST API endpoint that QRadar invokes to retrieve the custom content for the column. An app's custom fragment REST endpoint must return a JSON response body.

Table 15. Custom_columns block fields (continued)			
Field	Required	Type	Description
page_id	Yes	String	The ID of the page that contains the table where the column is to be added.

The following code sample shows how to configure the custom_columns block in the manifest file.

```
{
  ...
  "custom_columns": [
    {
      "label": "labelfrommanifest",
      "rest_endpoint": "test_method",
      "page_id": "AssetList"
    }
  ],
  ...
}
```

Related concepts

“Custom column example” on [page 71](#)

You can add columns that contain custom content to tables in QRadar.

Services type

Defines named services, service endpoints, and supervisord configuration parameters.

The parameters in your **services** block in your app's manifest file can be divided into these types:

Service definition parameters

The service name, version, and any endpoints that are defined for the service.

Endpoints field parameters

A breakdown of the **endpoints** subparameters.

Supervisord configuration parameters

A list of parameters that can be passed to supervisord to control the service process.

The following code sample lists the **services** block fields:

```
{
  ...
  "services": [
    {
      "name": "some_service",
      "version": "1.0",
      "endpoints": [
        {
          "name": "something",
          "path": "get_something/{id}",
          "http_method": "GET",
          "parameters": [
            {
              "location": "PATH",
              "name": "id",
              "definition": "String"
            }
          ]
        }
      ]
    },
    {
      "command": "/usr/bin/python loop.py",
      "process_name": "%(program_name)s",
      "numprocs": 1,
      "directory": "/src_deps/services/",
      "umask": "022",
      "priority": 999,
      "autostart": "true",
      "autorestart": "true",
      "startsecs": 1,
      "startretries": 3,
      "exitcodes": "0,2",
    }
  ]
}
```

```

        "stopwaitsecs":8,
        "user":"root",
        "redirect_stderr":"true",
        "stdout_logfile":"/store/log/pro.log",
        "stdout_logfile_maxbytes":"1MB",
        "stdout_logfile_backups":7,
        "stdout_capture_maxbytes":"0",
        "stdout_events_enabled":"false",
        "stderr_logfile":"/store/log/proerr.log",
        "stderr_logfile_maxbytes":"1MB",
        "stderr_logfile_backups":6,
        "stderr_capture_maxbytes":"0",
        "stderr_events_enabled":"false",
        "environment":["PY_HOME=/usr/bin/python"],
        "serverurl":"AUTO"
    },
    ...
}

```

The following tables provide details about the manifest fields for the **services** block.

Table 16. Service definition endpoints			
Field	Required	Type	Description
name	Yes	String	The name of the service instance.
version	Yes	String	Version of this named service that is supported by this instance. Only one version per named service definition is allowed.
endpoints	No	Array of Endpoints type	The endpoints that are defined for this service instance. You can define a number of parameters for each endpoint. For more information about endpoint parameters, see Table 17 on page 23

Endpoints field parameters

The **endpoints** field parameters are explained in more detail in the following table:

Table 17. Endpoints field parameters			
Parameter	Required	Type	Description
name	Yes	String	The name of the endpoint.
http_method	Yes	String	The HTTP method to use for the request: GET, POST, PUT, or DELETE.
path	Yes	String	The URL that is used to access endpoint.
request_mime_type	No	String	The mime type of request body. Provide this value when your request has a body (POST, PUT). Typical values include these strings: "application/json", "application/json+ld", "application/x-www-form-urlencoded".
request_body_type	No	Object	Provides a JSON object that defines the structure of your request body. If you use this parameter, do not set the location parameter to BODY.

Table 17. Endpoints field parameters (continued)

Parameter	Required	Type	Description
parameters	No	Array	<p>location (required) String. Can be one of these types:</p> <ul style="list-style-type: none"> • PATH • QUERY • BODY <p>Set the location parameter to BODY if the endpoint's request_mime_type field is set to application/x-www-form-urlencoded.</p> <p>The location parameter is required.</p> <p>name (required) String</p> <p>definition (optional) The type of the parameter.</p>
response	No	Object	<p>Definition of the expected response. If your endpoint does not return a response body, then omit this field.</p> <p>mime_type (required) String. The response mime type.</p> <p>body_type (required) Object. Provides a JSON object that defines the structure of your response body.</p>
error_mime_type	No	String	The mime type of error message body. Defaults to text/plain.

Supervisord configuration parameter fields

The QRadar Application Framework uses supervisord to monitor and control named services. You can specify supervisord configuration parameters as fields within the services block in your app's manifest file.

You can use the following supervisord parameters as fields in the **services** block. For more information about supervisord configuration parameters, see <http://supervisord.org/configuration.html> (<http://supervisord.org/configuration.html>).

Table 18. Supervisord configuration parameters

Field	Required	Type	Description
port	No	Integer	<p>A TCP host:port value, for example, 127.0.0.1:9001 on which supervisor listens for HTTP and XML-RPC requests.</p> <p>If no port is specified the service is treated as a headless background process that runs continuously.</p>
command	No	String	The command that runs when this program is started. The command can be either absolute, for example, /path/to/program or relative, for example, program. If it is relative, the supervisord's environment \$PATH is searched for the executable.
directory	No		The path to the directory that supervisord changes to before it executes the child process.

Table 18. Supervisord configuration parameters (continued)

Field	Required	Type	Description
autorestart	No	Enum	Specifies whether supervisord automatically restarts a process when it exits in the RUNNING state. Value is one of the following states: TRUE, FALSE, UNEXPECTED.
process_name	No	String	A Python string that is used for the supervisor process name.
numprocs	No	String	The number of instances of the program the supervisor starts.
umask	No	String	The octal number that represents the umask of the process.
autostart	No	Enum	Value is TRUE or FALSE. If TRUE, this program starts automatically when supervisord is started.
startsecs	No	Integer	The number of seconds that the program needs to stay running after startup to consider the start successful.
startretries	No	Integer	The number of serial failure attempts that supervisord allows when it attempts to start the program.
exitcodes	No	String	The list of expected exit codes for this program that are used with autorestart .
stopsignal	No	String	The signal that is used to kill the program when a stop is requested. Use any of the following: <ul style="list-style-type: none"> • TERM • HUP • INT • QUIT • KILL • USR1 • USR2
stopwaitsecs	No	Integer	The number of seconds to wait for the operating system to return a SIGCHLD to supervisord after the program is sent a stopsignal .
user	No	String	The UNIX user account that runs the program.

Table 18. Supervisord configuration parameters (continued)

Field	Required	Type	Description
redirect_stderr	No	Enum	Value is either TRUE or FALSE. If TRUE, causes the <i>StdErr</i> output to be sent back to supervisord on its <i>StdOut</i> file descriptor.
stdout_logfile	No	String	<i>StdOut</i> output is stored in this file. If redirect_stderr is TRUE, <i>StdErr</i> output is also stored in this file).
stdout_logfile_maxbytes	No	String	The maximum number of bytes that can be consumed by stdout_logfile before it is rotated and a new log file is started.
stdout_logfile_backups	No	Integer	The number of stdout_logfile backups to retain from the <i>StdOut</i> log file rotation.
stdout_capture_maxbytes	No	String	The maximum number of bytes that are written to capture FIFO (first in, first out) when the process is in <i>StdOut</i> capture mode.
stdout_events_enabled	No	Enum	Value is one of TRUE, FALSE. If TRUE, PROCESS_LOG_STDOUT events are emitted when the process writes to its <i>StdOut</i> file descriptor.
StdErr_logfile	No	String	Put process <i>StdErr</i> output in this file unless redirect_stderr is TRUE.
stderr_logfile_maxbytes	No	String	The maximum number of bytes before log file rotation for stderr_logfile .
stderr_logfile_backups	No	Integer	The number of stderr_logfile backups to retain from the <i>StdErr</i> log file rotation.
stderr_capture_maxbytes	No	String	The maximum number of bytes that are written to capture FIFO (first in, first out) when the process is in <i>StdErr</i> capture mode.
stderr_events_enabled	No	Enum	Value is either TRUE or FALSE. If TRUE, PROCESS_LOG_STDERR events are generated when the process writes to its <i>StdErr</i> file descriptor.
environment	No	String	A list of key/value pairs, in the form KEY="val1", KEY2="val2", that are placed in the child process' environment.
serverurl	No	String	The URL that is used to access the supervisord server, for example, http://localhost:9001

Environment variables type

Use the environment variables object type to define environment variables for your apps in your app's manifest file.

The environment variables object is not an IBM QRadar application type. The following four environment variables are set automatically by QRadar and are available to use in your app.

QRADAR_CONSOLE_HOST_NAME

The host name of the console where the app is installed.

QRADAR_CONSOLE_IP

The IP address of where the app is installed.

QRADAR_APPLICATION_BASE_URL

The web URL for the app.

LANG

The language code and character encoding that is used by the QRadar Console UI when the app is installed.

HTTP_PROXY / HTTPS_PROXY

If a proxy is configured, this environment variable is the IP address/hostname of the proxy server that QRadar uses.

PROXY_USERNAME

If a proxy is configured, this environment variable is the username of the HTTPS proxy server that QRadar uses.

PROXY_PASSWORD_DECRYPTED

If a proxy is configured, this environment variable is the decrypted password of the HTTPS proxy server that QRadar uses.

PROXY_URL

If a proxy is configured, this environment variable is the IP address/hostname of the proxy server that QRadar uses.

PROXY_PORT

If a proxy is configured, this environment variable is the port number of the proxy server that QRadar uses.

Environment variables that you define in an app's manifest file are specific to that app and haven't effect outside the app container.

The following code sample shows how to configure the **environment_variables** block in the manifest file.

```
{
  ...
  "environment_variables": [
    {
      "name": "ENV_VAR1",
      "value": "1"
    },
    {
      "name": "ENV_VAR2",
      "value": "2"
    },
    {
      "name": "ENV_VAR3",
      "value": "3"
    }
  ],
  ...
}
```

The following table explains the manifest fields for the **environment_variables** block.

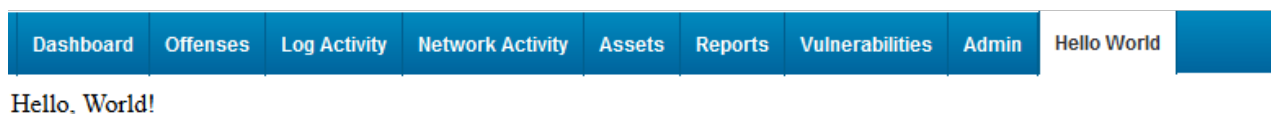
Field	Type	Description	Required
name	String	The name of the environment variable. Environment variable names cannot begin with a number, or contain an equals (=) sign.	Yes
value	String	The value of the environment variable.	Yes

The Hello World sample app

When you add an app in the **Application Development Manager** window, a simple "Hello World" sample app is also created.

The Hello World sample app adds a **Hello World** tab to QRadar.

The following image shows an example of the **Hello World** tab that is added to QRadar.



You can use this sample app as a simple template from which to build your own apps that require tabs. When you run the development environment script, the files that are described in the following table are added to your application development folder:

Table 19. Application development files	
Files/Folders	Description
app	The root directory contains the following files: qpylib contains the Python library files that your app uses to connect to the QRadar API endpoints. __init__.py a sample initialization file that creates a Flask instance, imports views from the views.py script and functions from the qpylib library. views.py the main entry point into the web application. This file and the manifest.json file are the only files that are required in every app. Contains sample code for the Hello World app.
qradar_appfw_venv	Contains the Python virtual environment where the dependencies are installed.
__init__.py	Creates an instance of the Flask micro-framework that is used to serve content to QRadar.
manifest.json	Describes to QRadar what the sample Hello World app does.
run.py	Contains instructions to run the code that is stored in the app sub directory.

manifest.json

The manifest.json file contains the following code:

```
{
  "name": "Hello World",
  "description": "Application to display hello world",
  "version": "1.0",
  "uuid": "558d7935-f00b-42da-a278-c82abdb12b34",
  "areas": [
    {
      "id": "QHelloWorld",
      "text": "Hello World",
      "description": "A Hello World app",
      "url": "index",
      "required_capabilities": ["ADMIN"]
    }
  ],
  "dev_opts": [
    {
      "console_ip": ""
    }
  ]
}
```

The first four objects, **name**, **description**, **version**, and **uuid** provide basic app information.

The areas object describes the capabilities of the Hello World app. The QRadar GUI Application Framework uses areas objects to describe new complete pages of the app. Areas objects are represented as tabs in the user interface.

The areas block contains the fields that are described in the following table:

Table 20. Areas block		
Name	Description	Value
id	The ID of the new tab	QHelloWorld
text	The name of the tab that is displayed in the user interface.	Hello World
description	A description of the tab that is displayed.	A Hello World app
url	Describes the route that is defined in the views.py script that QRadar uses so it can display the "Hello, World!" text in the body of the new tab.	index
required_capabilities	Instructs QRadar to display the Hello World tab only to users with Administrator privileges.	["ADMIN"]

The dev_opts block is used to provide the IP address of networked instance of QRadar Console for testing purposes. This block is not required for this sample app.

views.py

The views.py file contains the following code:

```
__author__ = 'IBM'

from app import app

@app.route('/')
@app.route('/index')
def index():
    return "Hello, World!"
```

The code creates the default '/' and '/index' routes, both of which return a simple string. The index route is declared in the **url** field of the `manifest.json` file.

Note: You do not have to include the `__author__` tag, but it is considered good practice to use it.

App startup

When QRadar starts your app, it calls the `run.py` and `_init_.py` scripts. The `_init_.py` file creates an instance of the Flask microframework environment that imports your views module. Your views modules define all the necessary endpoints and routes that serve content back to QRadar.

```
__author__ = 'IBM'

from flask import Flask

app = Flask(__name__)
from app import views
```

The `run.py` file creates a new Flask application (by starting the Flask web server), from the app directory.

```
__author__ = 'IBM'

from app import app
app.run(debug = True, host='0.0.0.0')
```

What can you do with the Hello World sample app?

You can use the Hello World sample app to test the QRadar SDK in these ways:

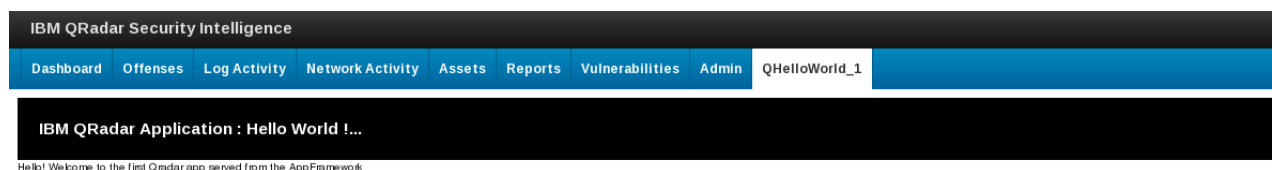
- Run the Hello World app locally.
- If you have a test instance of QRadar Console, you use the SDK to package and upload the Hello World app to it.

However, most importantly you can use the Hello World sample app files as a template to start developing your own QRadar apps.

New tab example

You can build on the Hello World sample app that the IBM QRadar SDK installs in your app workspace to add a tab to QRadar.

You can build an app that uses a Jinja2 template to serve HTML content to a new tab as shown in the following image.



The files and folders that are described in the following table are required for the tab example:

Files/Folders	Description
app	<p>The main directory for application files. The app folder contains the following files:</p> <p>qpylib remains unchanged from the Hello World sample app example.</p> <p>__init__.py remains unchanged from the Hello World sample app example.</p> <p>views.py updated to include code to render the Jinja2 template. Here's snippets of the additional code that is added to views.py that is used to return the render_template:</p> <pre>from flask import render_template</pre> <pre>def index(): return render_template("index.html", title = "QApp1 : Hello World !")</pre> <p>The Flask app route uses a Flask-Jinja2 templated HTML page to build the content for the Hello World tab.</p> <p>/templates/index.html - The Jinja2 template to render when requests are routed to app.route annotated endpoints.</p> <p>/static/css/style.css Renders the content that is served by the Jinja2 template, index.html.</p>
__init__.py	This file creates an instance of the Flask micro-framework that is used to serve content to QRadar. This file remains unchanged from the original Hello World example.
manifest.json	<p>Describes to QRadar that your app creates a new tab. Here's a snippet of the code, which is changed slightly from the Hello World sample app example.</p> <pre>"areas": [{ "id": "QHelloWorld", "text": "Hello World", "description": "A Hello World app", "url": "index", "required_capabilities": ["ADMIN"] }]</pre> <p>The dev_opts is removed and is needed only for testing the app on a networked QRadar Console.</p> <p>Functionally, this manifest file is identical to the manifest.json that is provided in the basic Hello World sample app example.</p>
run.py	Remains unchanged from the Hello World sample app example.

manifest.json

```
{
  "name": "QHelloWorld_1",
  "description": "Application to display QHelloWorld",
  "version": "1.0",
  "areas": [
    {
      "id": "QHelloWorld_1",
      "text": "QHelloWorld_1",
      "description": "An Hello World app with some styling",
      "url": "index",
      "required_capabilities": ["ADMIN"]
    }
  ]
}
```

```
]
}
```

Functionally, this manifest file is identical to the `manifest.json` that is provided in the basic "Hello World" sample. The fields that describe the app are updated and the **dev_opts** block is removed because it is not needed.

views.py

The `views.py` file contains the following code:

```
__author__ = 'IBM'

from flask import render_template
from app import app

@app.route('/')
@app.route('/index')
def index():
    return render_template("index.html", title = "QApp1 : Hello World !")
```

The `views.py` file imports the `render_template` method from Flask to render the `index.html` template.

Like the `views.py` file in the "Hello World" sample, the code creates default routes `'/'` and `'/index'`, both of which return a simple string. The index route is declared in the **url** field of `manifest.json`.

templates/index.html

This Jinja2 template contains the HTML content that is displayed on the new tab. It includes a variable that uses the value of the `title` parameter that is defined in `views.py` for the browser window title text.

```
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>{{title}} - Main</title>
  <link rel="stylesheet" href="static/css/style.css">
</head>
<body>
<div id="pageheader" class="pagebanner">
  IBM QRadar Application : Hello World !...
</div>

<div id="contentpane">
  Hello! Welcome to the first QRadar app served from the AppFramework
</div>

</body>
</html>
```

QRadar App Editor

Develop and edit apps directly in IBM QRadar by using the QRadar App Editor.

The QRadar App Editor is an easy-to-use editor that you start from the QRadar **Admin** tab. Any app developer can use the QRadar App Editor.

You can do any of the following tasks with the QRadar App Editor:

- Develop new apps from a template.
- Add, edit, and remove files and folders.
- Delete apps that you create with the App Editor.
- Import and edit existing apps.
- Clone an app from a Git repository.
- Deploy apps that you are editing and developing.

- Export apps.

What's new in the QRadar App Editor

Learn about new features in each version of the IBM QRadar App Editor.

Version 3.0

- Added a **New image** field for UBI Apps to the **New App** pane. The app uses the new image to install the UBI image.
- Changed the file structure in the App Development tab.

Important: Apps in QRadar App Editor 3.0 support QRadar App Framework V2 apps only. The QRadar App Editor does not provide any automatic migration tools. Instead, users can follow the instructions to migrate an app from QRadar App Framework V1 to V2. For more information, see https://www.ibm.com/support/knowledgecenter/SS42VS_SHR/com.ibm.appfw_md.doc/docs/tutorials/migrating_from_app_framework_v1_to_v2.html.

Version 2.2

- Fixed an issue that can cause CSRF errors when saving python files.
- Retain console host names during a redeployment.
- Fixed certificate issues on certain QRadar environments.
- Fixed an issue where dependencies are not correctly packaged during an export or redeployment.
- Improved support for long file names.
- Improved error handling for redeployments.
- Numerous other bug fixes and improvements.

Version 2.1

- Configure proxy settings to connect to a GIT repository.
- Download external app templates from [Github](https://github.com/ibm-security-intelligence/sample-apps) (<https://github.com/ibm-security-intelligence/sample-apps>). You can submit Github pull requests for your sample apps that you think are helpful to the development community.
- Search for files in the app folder navigation.
- Copy or move files in the app folder navigation.
- View gif, jpeg, bmp, and png images in the editor workspace.

Version 2.0

- Clone apps from a GIT repository.
- View app installation status.
- Upload files to your app.
- Delete apps.
- Help pages added.

Known issues

Learn about the known issues in each IBM QRadar App Editor release.

Version 3.0

The following problems and limitations are known to impact the QRadar App Editor 3.0.

- An error occurs if you move a file into the `/opt/app-root` root directory in the editor.
Tip: An error does not occur when you create, delete, and edit files in the directory.
- The App Editor does not fully support app dependencies. Errors might occur if you install an app with dependencies.
- The App Editor supports Flask apps only.
- The App Editor supports HTTP proxies in the bootstrapper only.
- Apps in version 3.0 must follow the Flask application factory method, their app's `__init__.py` file must include the function `create_app()` that returns a Flask instance. For more information, see <https://pythonise.com/series/learning-flask/application-factory-pattern-%7C-learning-flask-ep.-30>.
- Apps in version 3.0 support QRadar App Framework V2 apps only.

Tip: The QRadar App Editor does not provide any automatic migration tools. Instead, users can follow the instructions to migrate an app from QRadar App Framework V1 to V2. For more information, see https://www.ibm.com/support/knowledgecenter/SS42VS_SHR/com.ibm.appfw_md.doc/docs/tutorials/migrating_from_app_framework_v1_to_v2.html.

Installing the QRadar App Editor

Download and install the IBM QRadar App Editor from the IBM App Exchange.

Before you begin


You must have an IBM ID to access the [App Exchange](https://exchange.xforce.ibmcloud.com/) (<https://exchange.xforce.ibmcloud.com/>) and download the app. You can register for an IBM ID at [IBM id registration](https://www.ibm.com/account/profile/) (<https://www.ibm.com/account/profile/>). You must have internet access for the app to access other QRadar resources such as videos and information when it is installed.

Note:

To install the QRadar App Editor your installed version of QRadar must have Python V2.7, which is available with the following releases:

- IBM® Security QRadar® 7.2.8 software update 7 (7.2.8.20170530170730)
- IBM® Security QRadar® 7.3.0 software update 2 (7.3.0.20170620100024)
- IBM® Security QRadar® 7.3.1 GA (7.3.1.20171206222136)

Procedure

1. Download the QRadar App Editor extension from the [App Exchange](https://exchange.xforce.ibmcloud.com/) (<https://exchange.xforce.ibmcloud.com/>).
2. Open the **Admin** settings:
 - In IBM QRadar V7.3.0 or earlier, click the **Admin** tab.
 - In IBM QRadar V7.3.1 and later, click the navigation menu () , and then click **Admin** to open the admin tab.
3. Click **Extensions Management** and follow these steps:
 - a) Click **Add**.
 - b) In the **Add a New Extension** window, click **Browse** to find the app extension that you downloaded.
 - c) Select **Install immediately**, and then click **Add**.
 - d) Click **Install**.

The extension appears in the **Extensions Management** window after it is installed.

4. Refresh your browser to see the **Develop Applications** icon on the **Admin** tab.


Starting the QRadar App Editor

Start the IBM QRadar App Editor and edit an existing app, create a new app, or access helpful resources.

Procedure

1. Open the **Admin** settings:

- a) In IBM QRadar V7.3.0 or earlier, click the **Admin** tab.

- b) In IBM QRadar V7.3.1 and later, click the navigation menu () , and then click **Admin** to open the admin tab.

2. On the navigation menu, click **Apps**, and then click the **Develop Applications** icon.

The following table shows the tiles that you can select on the **IBM Application Development Manager** window.

Table 21. QRadar App Editor tiles	
Tile	Description
New App	Develop a new app by using the Hello World built-in template or by selecting one of the other templates that you clone from a Git repository.
Existing App	Edit or develop an existing app that you import into the QRadar App Editor, or clone from a Git repository.
Resources	Development resources
Getting Started Video	Learn to use the QRadar App Editor.

3. To develop a new app that uses the one of the available templates, click the **New App** tile.

- a) Select a template.

- b) Type a name, description, and version for your new app.

- c) Click **Install** to add the new app development tab that includes the editor to your QRadar Console.

- d) Refresh your browser to see the tab for the app in development mode in QRadar.

The Hello World app is an app that features a custom tab, so you can see a second tab that shows the app in live mode without the editor. You might have to wait for a short time before the tabs appear in the user interface. Any app that you install shows the development tab with the editor and whatever functionality the app brings with it, for example the app might show a custom column or a custom tab.

If you install the **Hello World** template, you can see the **Hello World** app in normal install mode without the editor on the first tab, and in development mode on the second tab. Use the App Editor to develop your app from the development tab.

Some app templates might not be QRadar tabs so you only get the development mode tab, for example, you only see one tab when you select the **dashboard_items** template.

The following screen capture shows an example of the Hello World app in the App Editor tab.

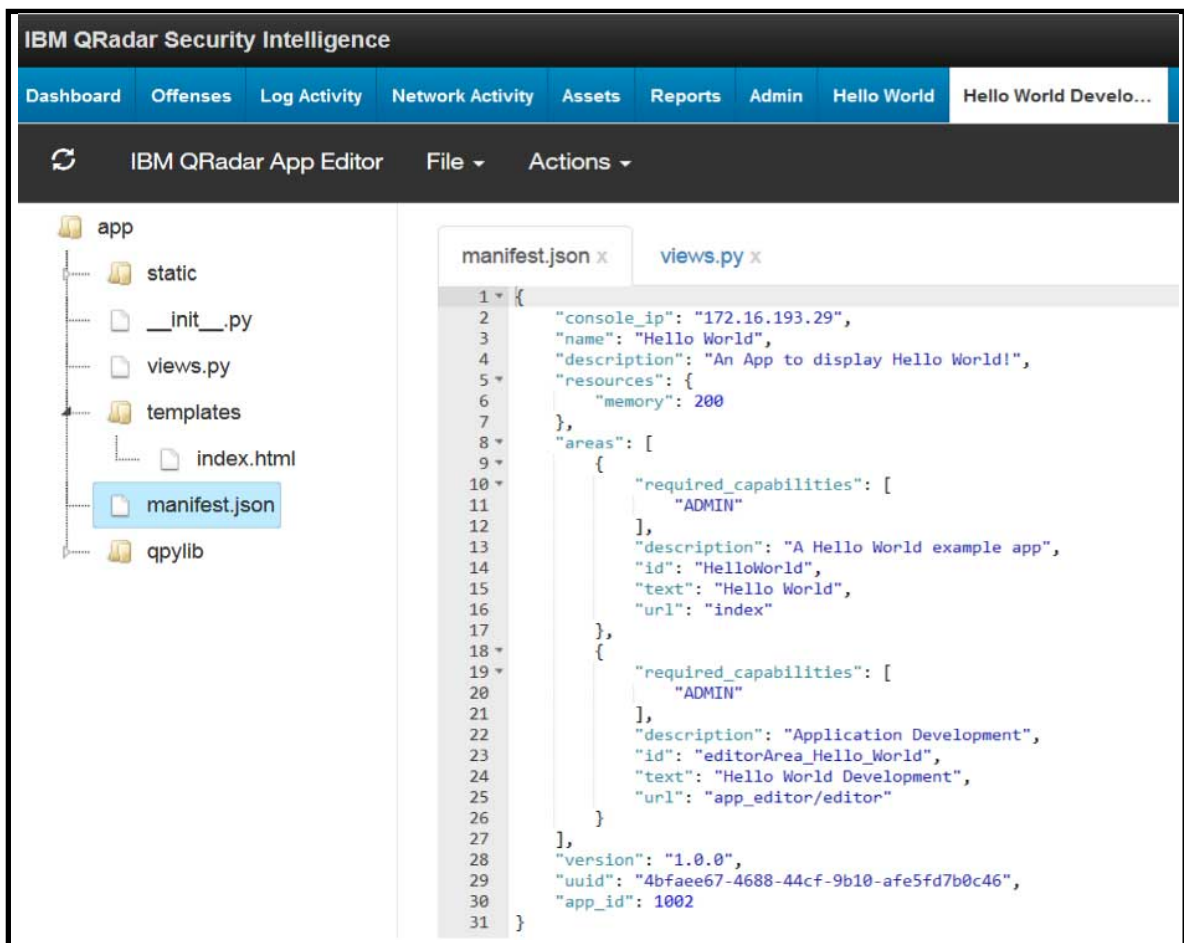


Figure 2. Hello World app in the editor

4. To edit and develop existing apps by importing the files into the QRadar App Editor, click the **Existing App** tile.

- To select an existing app (.zip file), click **Browse** to find the local app, or drag and drop an app into the app drop box.

Note: You can't import an app that is packaged as an extension that you download from the App Exchange. Apps that are packaged as extensions are only installed through the **Extensions Management** tool in the QRadar Console and are not editable in the App Editor. You can import and edit the app only in the app package (.zip) format.

- To clone an app from a Git repository, type the Git repository URL in the **Enter the git repository url** field that is shown in the following image:

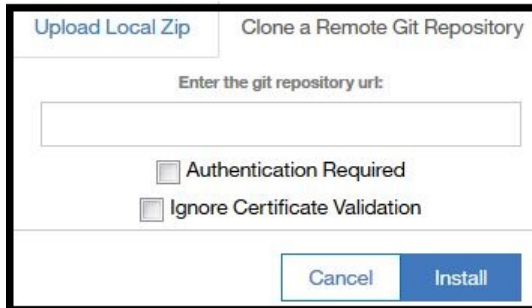


Figure 3. Clone a remote Git repository

- Select the **Authentication Required** check box if you are required to provide credentials to clone the app.
 - Select the **Ignore Certificate Validation** check box to turn off certificate validation when you download the app from the Git repository. This feature is useful when you're using a local repository that you trust and you know the certificates are not current but you want to turn off the warnings.
5. To configure a proxy to connect the App Editor to the GIT repository for sample apps or to clone apps, click **Proxy Settings**. Then, type a `http` address and a port number to connect to your proxy.
 6. Click **Install** to add the app development tab for the existing app to your QRadar user interface, and then refresh your browser to see the tab.

You might have to wait for a short time before the tab for the app appears in QRadar.

Editing apps in the editor

Edit and create files and folders in the app editor tab, which is created on the QRadar Console.

About this task

When you install a new app, the **Hello World** development tab that includes the editor is added to the Console, and a second tab shows the **Hello World** app in normal installed mode without the editor.

The following diagram shows the first **Hello World** app tab without the editor, and the **Hello World - Custom Tab Development** tab that includes the editor on QRadar.



Figure 4. Hello World tabs

Procedure

1. To edit files in the app folder, double-click a file, or right-click to view the File Edit menu.
2. To create files and folders, save files, and close files, click **File**, and then select an option from the menu.
3. To search for files in the app folder navigation, type the file name in the search box, and then click the search icon to search for your file.
4. Copy or move files from one folder to folder in the app folder navigation.

- a) To copy a file from one folder to another folder, select the file and press the CTRL key, and then use your mouse to drag the file to the destination folder.
 - b) To move a file from one folder to another folder, select the file by using your mouse, and drag the file to the destination folder.
5. To upload files to the app folder, use any of the following three ways to open the **Upload File** screen:
- Click > **File** > **Upload**, and then drag a file in the box, or browse to a file.
 - In the app folder navigation, select a folder, and then right-click to open the **Upload File** screen.
 - In the app folder navigation, select a folder, and then drag a file over the folder to open the **Upload File** screen.
6. To deploy an app or export an app, click the **Actions** menu and choose one of the following options:
- Click **Actions** > **Deploy App** > **in Development Mode** to deploy and upgrade the current app in development mode.
- When you make changes, such as editing the manifest or other files, you deploy and upgrade the app in development mode to apply your changes. The app version in the manifest file increments when you deploy an app.
- When you deploy your app in development mode, you have the option to save a copy of the current app in .zip format.
- Click **Actions** > **Deploy App** > **in Live Mode** to view the app in QRadar.
- Before, you deploy the app **in Live Mode**, it's good practice to save your app locally, otherwise you can't access your changes after the app is deployed because the editor tab is removed.
- The development mode tab that includes the App Editor is removed from the Console when you deploy the app **in Live Mode**. If you want to edit the app again, you must export it as a .zip file so that you can import it to QRadar and edit it at a later time.
- Click **Actions** > **Export App** > **as Zip** to save your app in a local folder.
- The app is saved as an archive (.zip) file, which you can import as an existing app later. The .zip file that you export is not an app extension that can be installed by using the **Extensions Management** tool on the **Admin** tab.
- When you export the app, the app version in the manifest displays in the export dialog box. When you change the version that appears in the export dialog box, the app version in the manifest file version is changed to the same version.
- Click **Actions** > **Delete App** to delete the app that you're editing. The app is removed from the QRadar Console.
- Note:** If you make changes to the app, ensure that you export the app so that your changes are saved in the exported zip file and you can install the app again later. The **File** > **Save** function saves the session only in QRadar, and does not write to the compressed file, so these changes are lost because the app files are removed when you delete the app.

Software development kit overview

The IBM QRadar application framework comes with its own software development kit (SDK).

Use the QRadar Application Framework software development kit (SDK) to do the following application development tasks:

You Download the SDK (<https://developer.ibm.com/qradar/>) and extract the QRadar Application Framework SDK archive (.zip file) from DeveloperWorks.

Create a development workspace

The QRadar Application Framework SDK installs a development workspace that has a sample application that you use as a template to build your own extension.

Run your app locally for test purposes

You don't need to upload your extension code to a live QRadar Console instance to test your app. The QRadar application framework SDK includes a virtual development environment that you can use to run your application locally.

If your app uses QRadar API endpoints, you can configure the virtual environment to connect to the API on the QRadar Console instance and test locally. You do not need to upload to QRadar Console.

Package your app

The QRadar Application Framework SDK includes a packaging utility that you use to create an archive (.zip file) that contains your extension files.

Deploy your app to QRadar Console

The QRadar Application Framework SDK includes a deployment utility that you can use to upload your packaged app directly to a live QRadar Console instance.

Optimize app memory usage

Tune the IBM QRadar Application Framework to optimize app memory usage.

Use any of the following methods to help prevent your app from using an excessive amount of memory.

- Avoid allocating large amounts of memory by chunking (or staggering) the work into small memory footprints.
- Change the memory model that is used by the Application Framework.
- Call for garbage collection when you're finished with code that uses large amounts of memory.

Changing the Application Framework memory model

By default, the Application Framework configures the Werkzeug WSGI web application server that Flask uses to run as a single process. Threads are used to handle each request. You can configure the application server to create a separate process to handle each new request. When the request is completed, the process is removed, and all of the memory that is allocated by the Python interpreter to process this request is released.

To override this behavior, edit the `run.py` file and add **`threaded=False`** and **`process=N`** where N is greater than 1. In the following example, a value of **`process=3`** allocates approximately 25 MB per interpreter and leaves some room for growth.

```
__author__ = 'IBM'

from app import app
from app.qpylib import qpylib

qpylib.create_log()
app.run(debug = True, host='0.0.0.0',
threaded=False,
process=3)
```

Include the source to the `run.py` in the `template` folder within your app archive file (.zip). The `run.py` file that is created during the installation is then overwritten with your settings.

Note: When you package an app with the SDK, the `run.py` is skipped and you must manually add it to your app archive file (.zip).

For more information about parameters that can be passed to the Werkzeug WSGI web application server, see <http://werkzeug.pocoo.org/docs/0.11/serving/>.

Calling for garbage collection

The Python interpreter might not know when to free the memory. You can speed up garbage collection by placing the following code right after sections where large amounts of memory are no longer needed:

```
import gc
gc.collect()
```

Note: Python does not ensure that any memory that your code uses gets returned to the OS. Garbage collection ensures that the memory used by an object is free to be used by another object at some future time. Changing the Application Framework memory model option is important for apps that run for a long time. Killing the process ensures the memory is freed for use by other components.

Tools

Some tools that can help you identify memory problems:

Memory Profiler

A Python module for monitoring memory consumption of a process. For more information, see https://pypi.python.org/pypi/memory_profiler.

Linux utilities

The command-line utility `top` can be used to monitor all Python processes running on the machine:

```
top -p $(pgrep -d', ' python)
```

You can also use the following command to get the total MB used by all Python interpreters on your system:

```
ps -e -o pid,comm,rss |
awk '/python/{sum+=$3} END {print sum}'
```

Resource Module

You can log the amount of memory your process uses by adding the following code to your module:

```
import resource
print 'Memory usage: %s (kb)' % resource.getrusage
(resource.RUSAGE_SELF).ru_maxrss
```

Related concepts

“Resources type” on page 20

Defines the memory resources to allocate to your app.

Installing the SDK

The IBM QRadar Application Framework comes with its own software development kit (SDK).

You can download the SDK from [IBM X-Force Exchange](#) and extract the QRadar Application Framework SDK archive (.zip file).

Please view the `README.html` from the extracted SDK archive for instructions on installing the SDK and creating applications.

Use Python 2.7 in your app

Use environmental variables to make your app use Python 2.7 instead of Python 2.6.

This feature was introduced in IBM QRadar 7.3.0 Patch 2 (7.3.0.20170620100024) SFS.

Add the following environmental variables to the manifest file to instruct the app to use Python 2.7:

```
"environment_variables": [
  {
    "name": "PATHSTART",
```

```

    "value": "\\usr\\local\\bin"
  },
],

```

The following manifest file example includes the environment variables that make the app use Python 2.7.

```

{
  "environment_variables": [
    {
      "name": "PATHSTART",
      "value": "\\usr\\local\\bin"
    }
  ],
  "console_ip": "10.11.12.13",
  "configuration_pages": [
    {
      "required_capabilities": [
        "ADMIN"
      ],
      "description": "Application Development",
      "text": "Develop Applications",
      "url": "bootstrapper"
    }
  ],
  "name": "Application Development",
  "log_level": "debug",
  "description": "Application for installing other applications in Development-mode.",
  "resources": {
    "memory": 200
  },
  "version": "1.0.2",
  "uuid": "ae1c83d0-be94-11e5-a837-0800200c9a66",
  "app_id": 1006
}

```

Creating your development environment

Use the QRadar GUI Application Framework SDK (Software Development Kit) to create a basic development environment for your app.

About this task

The SDK provides a sample template app that you use as a template to create your own app. Use Python 2.7.9 to develop your QRadar apps.

Procedure

1. Create a folder on your computer for the QRadar sample app. Name the directory according to the following format.

```
<Author Namespace>.<App_Name>.<App_Version>
```

For example, the following directory name is an example of a good naming convention:

```
com.me.myApp.1.0.0
```

2. Depending on your operating system, type the following command: `qradar_app_creator create -w <path_to_app_folder>/com.me.myApp.1.0.0`

- On UNIX and Linux operating systems, type the following command:

```
qradar_app_creator create -w <path_to_app_folder>/com.me.myApp.1.0.0
```

Important: On Linux operating systems, keep the absolute path to your workspace short. File paths might be truncated because of the `BINPRM_BUF_SIZE` kernel constant (79 or 127 characters, depending on kernel version), leading to failure of this command.

- On Windows operating systems, type the following command:

```
qradar_app_creator create -w <path_to_app_folder>\com.me.myApp.1.0.0
```

Important: Folder and file names in paths must not contain spaces.

Results

When you run the development environment script, the following folders and files that are described in the table are added to your app development folder.

Table 22. QRadar App files and folders in the development folder	
Files/Folders	Description
app	The root directory for application files. This directory contains the following files: The <code>qpylib</code> folder contains the Python library files that your app uses to run QRadar tasks. For example; you can use the <code>qpylib</code> library to connect to API endpoints, and get the storage path. The <code>__init__.py</code> sample initialization file for your app. Creates a Flask instance, imports views from <code>views.py</code> and functions from the <code>qpylib</code> library. The <code>views.py</code> file is the main entry point into the web app. This file and the <code>manifest.json</code> file are the only files that are required for every app. This file contains sample code for the "Hello World" application.
store	The directory where the app data is stored. It is not packaged into your app.
qradar_appfw_venv	Contains the Python virtual environment where the dependencies are installed.
<code>__init__.py</code>	Creates an instance of the Flask micro-framework that is used to serve content to QRadar.
<code>manifest.json</code>	Describes what the sample "Hello World" app does.
<code>run.py</code>	Contains instructions to run the code that is in the app subdirectory.

What to do next

You are now ready to begin coding your app. Familiarize yourself with the requirements for the app and manifest file structures.

Developing apps in Eclipse

After you set up your development environment, you import it into Eclipse to use that Eclipse integrated development environment (IDE) features to develop your app.

About this task

For Python development, install PyDev, the Eclipse IDE that is used in Python development. The latest version of Eclipse can be found on the Eclipse website <https://eclipse.org/downloads/> (<https://eclipse.org/downloads/>).

Procedure

1. Install PyDev into Eclipse.
 - To install from the Eclipse Marketplace, click **Help > Eclipse Marketplace** on the main Eclipse **Help** panel.
 - To install the PyDev repository from (<http://pydev.org/updates>), click **Help > Install New Software** on the main Eclipse **Help** panel.
2. After you install PyDev, switch the perspective to PyDev.

3. In the PyDev perspective, click **File > New > PyDev project** and do the following tasks in the **PyDev Project** dialog box.
 - a) Enter a project name.
 - b) Select **2.6** from the **Grammar Version** list.
 - c) Select **Create links to existing sources**
 - d) To configure the interpreter to use the virtual environment in the SDK, click **Click here to configure an interpreter not listed**.
 - e) Click **New** in the **Python Interpreters** dialog and enter a name and path to the Python executable file on your system.
 - f) Click **OK**.

Ensure that the **site-packages** folder path (.../<app_name>/qradar_appfw_venw/lib/python2.7/site-packages) check box is selected when you select the folders to be added to the system python path.

- g) Click **Apply**, and **OK** to return to the **PyDev Project** dialog.
- h) Click **Create links to existing sources**, and then click **Next**.
- i) Click **Add external source folder** and go to the root directory of your development environment, click **OK**, and then click **Finish**.

The new Eclipse PyDev project that contains your development environment appears in your **Package Explorer**.

Installing Python 2.7.9 on OSX

You must install Python 2.7.9 to run IBM QRadar Application Framework SDK on the OSX operating system.

About this task

OSX usually comes with Python 2.7.x. The QRadar app framework SDK requires Python 2.7.9.

Procedure

1. To install the HomeBrew package manager, type this command:

```
ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"
```
2. To install the Python version manager, pyenv, type this command:

```
brew install pyenv
```
3. To use pyenv to install Python 2.7.9, type this command:

```
pyenv install 2.7.9
```
4. To check that Python 2.7.9 was installed correctly, type this command:

```
pyenv versions
```
5. To use Python 2.7.9 locally, type this command:

```
pyenv global 2.7.9
```
6. To check your Python version, type this command:

```
python --version
```

If this command returns 2.7.9, the installation was successful.

If this command returns 2.7.x, it might indicate an issue with pyenv. To solve this problem, open or create the ~/.bash_profile file in a text editor and add the following lines:

```
export PATH=/usr/local/bin:$PATH
export PYENV_ROOT="$HOME/.pyenv"
export PATH="$PYENV_ROOT/shims:$PATH"
```

Type the `python --version` command to check that Python 2.7.9 was installed.

Packaging and deploying your app

Use the QRadar GUI Application Framework to package your app as an archive (.zip file) and deploy it to your IBM QRadar test environment.

Procedure

1. Open a shell prompt and use the **cd** command to go to the bin sub folder of your SDK installation folder.

2. Package your app by using the following command syntax:

```
qradar_app_creator package -w <path_to_app_folder>/<app_name_folder> -p
<app_name.zip>
```

- To package an app on UNIX or Linux computers, type the following command:

```
qradar_app_creator package -w <path_to_app_folder>/<app_name_folder> -p
<app_name.zip>
```

- To package an app on a Windows computer, type the following command:

```
qradar_app_creator package -w <path_to_app_folder>\<app_name_folder> -p
<app_name.zip>
```

3. Upload your app (extension) to your QRadar Console by using the following command, and then press **Enter**.

```
qradar_app_creator deploy -q <QRadar_console_IP> -u admin -p <app_name.zip>.
```

Here is an example of the command:

```
qradar_app_creator deploy -q 10.11.12.13 -u admin -p com.me.myapp.zip
```

Note: Make sure that you record the application ID for your app from **Application Creation Task state** output that is returned when you issue the **qradar_app_creator deploy** command. You need it when you export you app as a QRadar extension.

In the following example, the application ID is 1023.

```
Application Creation Task state: {u'status': u'COMPLETED',
u'application_id': u'1023', u'error_messages': u'[]'}
```

If you're viewing your QRadar Console user interface in a browser, refresh your browser to see your app running.

What to do next

After you successfully test your app, you can use the QRadar Content Management Tool to export the app as an extension. You then use the QRadar **Extensions Management** tool on the **Admin** settings page to install your extension on your QRadar Console.

Running your application locally

Rather than packaging and uploading your app every time you change something, you can test it by running it locally in a browser window.

About this task

The IBM QRadar GUI Application Framework includes a virtual environment that you can use to run your application locally for testing purposes.

If your app uses QRadar API endpoints, you must connect to a QRadar Console instance. You configure the IP address of the QRadar Console test instance in the **console_ip** field of the **dev_opts** object block in your app's `manifest.json` file.

Procedure

1. Run your app locally.
 - To run on Unix or Linux, type the following command:
`qradar_app_creator run -w <path_to_app_folder>/<app_folder_name>`
 - To run on Windows, type the following command:
`qradar_app_creator run -w <path_to_app_folder>\<app_folder_name>`
2. Open a browser and type `http://0.0.0.0:5000` in the address bar. If your browser does not support the `http://0.0.0.0` URL, type `http://127.0.0.1:5000`.

Your app is displayed in the browser window, and the application output is sent to the command line or to your terminal.

OAuth app authorization with QRadar

Apps use the OAuth authorization protocol to authorize the app to access QRadar resources.

Configure OAuth parameters in the authentication section of the manifest file. The only mandatory entry is for the `"requested_capabilities"`. When users install the app by using the **Extensions Management** tool in QRadar, they select a user that has the user capability that is defined in `"requested_capabilities"`. When this authorization is configured, the app can access QRadar resources.

The following example shows the authentication section in the manifest file.

```
"authentication":
  { "oauth2": {
    "authorisation_flow": "CLIENT_CREDENTIALS",
    "requested_capabilities": ["ADMIN"] } }
```

The `"authorisation_flow"` entry is optional. The only accepted value is `"CLIENT_CREDENTIALS"`.

If the authorization is not configured as `CLIENT_CREDENTIALS`, the installation fails and returns the following message:

`"OAuth flow type X is not currently supported".`

The `"requested_capabilities"` must contain at least one entry. It provides the capability or permissions that the app needs to function in QRadar. The app installation fails if the `requested_capabilities` capability that is configured is not listed in QRadar.

Enhancing security in app authorization by using the App Authorization Manager

The App Authorization Manager helps to enhance the security of your app authorization by providing the capability to edit or delete existing authorization tokens.

About this task

When you install an app that requests an OAuth authorization token to access QRadar resources, an OAuth authorization token is created and a record that represents the token is added to the **App Authorization Manager**. The record is identified by the **App Name** and **App ID** and includes the assigned user access level that is assigned to the app to access QRadar resources.

Procedure

1. Click **Main Menu > Admin** tab.
2. Click the **App Authorization Manager** app icon to open the app.
3. To change assigned users for the OAuth authorization token, click **Edit**, and then select any users that are available in the list. For example, if you don't want to use the Admin user and another user is available in the list, you can change to a user with the requested capabilities that are defined in the app manifest file.

Any users that appear in the list have the capability that the app requires to run.

4. To delete an OAuth authorization token, click **Delete** to remove a record. You might want to delete a token that is no longer in use or you might want to remove the app authorization.

OAuth bearer token

The OAuth bearer token is an access token that allows an app to access specific QRadar resources.

A QRadar OAuth app can make QRadar REST API calls by using an OAuth bearer token.

The following diagram shows the folder and file structure for the OAuth app that is used in the example.

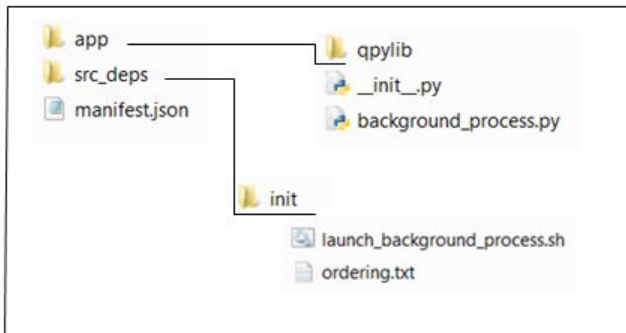


Figure 5. OAuth bearer token app

The following example shows how an app that is a background service gets and uses the bearer token for authorization to make QRadar REST API calls:

1. The `manifest.json` file includes an authentication entry to identify and configure the app as an OAuth app, and instructs the Flask web server not to load.

```
{
  "name": "OAuth background process",
  "version": "1.0",
  "description": "Simple background process app that calls QRadar REST API using OAuth",
  "uuid": "a7e67388-95e1-436e-bdbd-df9c53230728",
  "load_flask": "false",
  "authentication": {
    "oauth2": {
      "authorisation_flow": "CLIENT_CREDENTIALS",
      "requested_capabilities": ["ADMIN"]
    }
  }
}
```

```
}  
}
```

2. The `src_deps/init/launch_background_process.sh` script is run.

```
#!/bin/bash  
nohup python /app/background_process.py >/store/log/background_process.log 2>&1 &
```

3. The `src_deps/init/launch_background_process.sh` script calls the `app/background_process.py` Python module.

```
#!/usr/bin/python  
from qpylib import qpylib  
from qpylib import oauth_qpylib  
import requests  
import json  
import time  
qpylib.create_log()  
  
rest_url = 'https://' + qpylib.get_console_address() + '/api/ariel/databases'  
request_headers = {}  
oauth_qpylib.add_oauth_header(request_headers)  
  
while True:  
    time.sleep(30)  
    try:  
        response = requests.get(rest_url, headers=request_headers, verify=False)  
        qpylib.log('response=' + json.dumps(response.json()))  
    except Exception as e:  
        qpylib.log('Error: ' + str(e))
```

The `background_process.py` module runs a continuous loop where it calls a QRadar REST API endpoint, and then logs the result.

How the OAuth bearer token is retrieved

The `add_oauth_header` function takes a Python requests-ready headers object and adds an Authorization header that contains the application's OAuth bearer token.

To retrieve the token, `add_oauth_header` sends a GET token request to the QRadar OAuth service, which runs on a specific port at `https://qoauth.service.consul`.

The GET token request looks for the following details:

- The QRadar OAuth service port

The service port is identified by a call to the Python module `service_port_locator.py`, which is in the root directory of the Docker container.

Here's an example of the call to the Python module:

```
def get_qoauth_port():  
    p = subprocess.Popen(['/service_port_locator.py',  
        'qoauth.service.consul'], stdout=subprocess.PIPE)  
    return str(p.communicate()[0]).strip()
```

- The application's OAuth client ID and client secret.

The client ID and secret are available to the Python code as the `CLIENT_ID` and `CLIENT_SECRET` environment variables.

The following URL is an example of the GET token request to the OAuth service:

```
http://qoauth.service.consul:<Port_number>/token?  
grant_type=client_credentials&client_id=<Client_ID>&client_secret=<Client_secret>
```

The JSON response holds the bearer token in its `access_token` field, which is similar to the following example:

```
{ "access_token": "example_token_34j3fdde", "token_type": "Bearer", "scope": "ADMIN" }
```

When the token is retrieved, it can be used to make multiple QRadar REST API calls. The token is sent in a request header and the following format:

```
"Authorization" : "Bearer example_token_34j3fdde"
```

Encryption and secure data storage in app development

Use the QRadar Python encdec module to encrypt data in apps that you develop and prevent the transmission of secure data and passwords in clear text. The encdec module is built into the Application Framework Software Development Kit (SDK) to enable encryption and secure data storage in the apps that you develop.

How it works

In the following code snippet, the encdec module is used to encrypt and store a password and a key token. Then, the module is used to retrieve and decrypt those encrypted data items.

```
from qpylib.encdec import Encryption
app_password_handler = Encryption({
    'name': 'appPassword',
    'user': 238
})
app_password_handler.encrypt('clearTextPasswordSuppliedByUser')
key_token_handler = Encryption({
    'name': 'keyToken',
    'user': 238
})
key_token_handler.encrypt('773d3efcb4dd211c213ebf4c45cd81ae')
...
retrieved_password = app_password_handler.decrypt()
key_token = key_token_handler.decrypt()
```

How to use the code

Create a dedicated instance of the encryption object for each data item that you want to manage with the encdec module. For example, in the code snippet example, the `app_password_handler` object manages the password and the `key_token_handler` object manages the key token for the user who is identified as 238.

The following table describes the elements that you use to create an encryption object.

Encryption object elements	Description
name	Unique string that identifies the data item to manage.
user	Unique identifier for the user who owns the data item to manage.

For each user, the encdec module stores the user's secure data in the `/store/<user_ID>_e.db` file in the Docker container. For example, secure data for user 238 in the example code snippet is stored in the container's `/store/238_e.db` file.

When you create the encryption object, the `decrypt()` function is invoked to retrieve and decrypt a user-data item. You can use the same encryption object instance that was used for encryption. If that object is no longer in scope, you can instantiate a new encryption object by supplying the same initialization parameters that you used originally.

Add the PyCrypto module to your app

The encdec module depends on the PyCrypto module, which you can download from the Python website (<https://pypi.python.org/pypi/pycrypto>). Add the PyCrypto 2.6.1 package and its dependencies to your app's `src_deps/pip` directory.

Note: The PyCrypto libraries in your app are subject to US export classification laws. If the app that you develop is used outside of the US, you must ensure that you have an Export Control Classification Number (ECCN) to comply with United States Department of Commerce regulations.

Multitenancy support for apps

QRadar V7.4.0 and later includes support for multi-tenanted apps. A number of out of the box apps, such as Pulse, Assistant, and Log source manager, can now be used in a multitenant environment.

App developers are able to mark that their app is tested and works in a multi-tenanted environment. You can support multitenancy in your app in two ways:

1. The app is tested and works with multitenancy, but it is not multitenancy aware. When a user installs the app, they are presented with the option to create a default instance. Users can select this option if they only want a single instance of the app, or the app does not need to support multitenancy. If a user does not select the **Default Instance** option, they must create a separate instance for each customer and associate each instance with a security profile to keep all client data separate.
2. The app is tested and is multitenancy aware. In this case, only one instance of the app is necessary. This type of app is also beneficial if the app is used only by administrators.

Use the following new manifest flags indicate support for multitenancy in an app. By default, these flags are set to false.

Manifest key	Description
<code>multitenancy_safe</code>	If set to true, this key indicates that your application can work in a multitenant environment. If not set to true, it indicates that only one instance of your app can be created, and any user who is a member of a tenant is not able to see it.
<code>single_instance_only</code>	<p>If this key is set to true, only one instance of this app can be created. Typically, this indicates that this application can either provide multitenancy support itself, or that use of this application is meant only for administrators.</p> <p>If the <code>multitenancy_safe</code> key is not also set to true, then users who are a member of a tenant cannot see this app. If <code>multitenancy_safe</code> is also set to true, then all users can see the app.</p>

If the `multitenancy_safe` key is not set to true, then QRadar assumes that it cannot trust the app to run in a multitenant environment. This key indicates that only one instance of the app runs, and that a limited set of users can access it. This setting ensures that users who are in a tenant can't access other tenants' data.

The `single_instance_only` defines how your app can operate in a multitenant environment.

If the key is not set to true, users can create multiple instances of the app. Set this key to true if the app stores data locally, or if the app uses an API or other means of accessing QRadar that allows access to more than one tenant's data, and the app cannot segregate the data itself. In this case, QRadar allows administrators to create a new instance of this application that is tied to a specific security.

Example: A customer who installs your app has a small number of users that use two different security profiles: *Electricity Company* and *Water Works*. When an administrator creates a new instance of your app, they must assign this instance to a security profile, such as *Electricity Company*. Then, only users with the *Electricity Company* security profile are able to access this instance of your app.

Associating instances with security profiles instead of tenants gives users more control over which users can access tenant data. A tenant is expected to have one or more security profiles associated with it to define what data different users can see.

Tip: If your app uses an API key to autonomously access QRadar APIs, set up your application to request authentication through its manifest. You can then define the exact access capabilities that are required, and that key is delivered to your app securely as needed. For more information on app authentication, see [“OAuth app authorization with QRadar ” on page 45.](#)

For more information about managing multitenant apps with the QRadar Assistant app, see [Managing multitenanted apps.](#)

Creating an extension from your app

After you deploy and test your app, you must export it as an extension to deploy it in a production environment.

About this task

The IBM QRadar GUI Application Framework SDK **deploy** command is intended for use only in test environments. To create an extension that you can use in a production environment, you must use the QRadar Content Management Tool to export your application as an extension.

Procedure

1. Use the QRadar GUI Application Framework SDK to package and deploy your application to your QRadar Console test environment. Make sure that you obtain the application ID for your app from **Application Creation Task state** output that is returned when you issue the **qradar_app_creator deploy** command.
2. Use SSH to log in to QRadar Console where your app is running as root user.
3. Type the following command at the command line:

```
/opt/qradar/bin/contentManagement.pl --action export --content-type 100 --id <application_ID>
```

This example shows an app that has an ID of 1023.

```
/opt/qradar/bin/contentManagement.pl --action export --content-type 100 --id 1023
```

The extension is created as a .zip file in the /opt/qradar/bin folder. The file name has the following format:

```
installed_application-ContentExport-YYYYMMDDhhmmss.zip
```

Here is an example:

```
installed_application-ContentExport-20160911141607.zip
```

What to do next

Download the .zip file from the /opt/qradar/bin folder on your QRadar Console. You can then use QRadar **Extensions Management** on the **Admin** tab to install your extension on your QRadar Console.

For more information about exporting apps and content in extensions, and Extensions Management, see the QRadar *SIEM Administration Guide*.

Adding multiple apps in an extension

Package and export multiple apps and other content in an extension so users can download related apps or content in one file.

About this task

You can include multiple apps or content types in an extension, which you export as a compressed (.zip) file.

Procedure

1. Use SSH to log in to QRadar as the root user.
2. To get a list of the content types and search parameters, type the following command:

```
/opt/qradar/bin/contentManagement.pl -h export
```

In the following example, you search for apps that are represented by the content type ID of 100, and the regex .*, which matches everything.

```
/opt/qradar/bin/contentManagement.pl --action search -c 100 -r .*
```

You must specify the content type (-c) and a search regex (-r).

In the following example, you search for the custom content type "dashboard" that is represented by the content type ID of 4, and the regex .*, which matches everything for dashboards content.

```
/opt/qradar/bin/contentManagement.pl --action search -c 4 -r .*
```

Use regex to narrow your search, for example, you use the following search to find dashboards content that includes 'Threat' in the name.

```
/opt/qradar/bin/contentManagement.pl --action search -c 4 -r Threat
```

3. Add the content type IDs or string and the IDs of the apps or content in a text file. The content type can be represented by the string or ID. Use the following format:

```
<content_type_ID_or_string>,<Content_or_app_ID>  
<content_type_ID_or_string>,<Content_or_app_ID>
```

Use the following rules to create the package text file:

- Use a separate line for each content type.
- Make sure that the first value that you enter on a line is the content type.
- Make sure that the value that follows the content type is the ID of the app or the content.
- Use commas to separate values.

Here's an example of packaging an app that has a content type of 100 and a dashboard that has a content type of 4.

```
4,22  
100,1051
```

Here's the same example where the string is used instead of the content type ID to represent the content type.

```
dashboard,22  
installed_application,1051
```

In the following example, strings are used for the content type, which are followed by the content IDs.

```
installed_application,1001
customrule,1274,1275
dashboard,10
```

4. Save the text file as `<my_package>.txt`

5. Type the following command to assemble and export your content in an extension file:

```
/opt/qradar/bin/contentManagement.pl -a export -c package -f <mypackage>.txt.
```

The extension is created as a .zip file in the `/opt/qradar/bin` folder. The file name has the following format:

```
<file_name>-ContentExport-YYYYMMDDhhmmss.zip
```

What to do next

Download the compressed (.zip) file from the `/opt/qradar/bin` folder on your QRadar Console. You can then use QRadar **Extensions Management** on the **Admin** tab to install your extension on your QRadar Console.

For more information about using the `contentManagement.pl` script to export content, and about Extensions Management, see the QRadar *SIEM Administration Guide*.

QRadar content extensions

Use content extensions to update IBM QRadar security template information or add new content such as rules, reports, searches, logos, reference sets, custom properties.

Types of QRadar content extensions

All apps and content extensions are hosted on the IBM X-Force Exchange portal (<https://exchange.xforce.ibmcloud.com/>), where you can filter by content type such as custom AQL function or custom property. You can use content extensions can be used in conjunction with apps.

The following table describes the types of content extension that you can deploy in QRadar.

Content extension type	Enhancement type	Description
Dashboard	Data	An associated set of dashboard items, which you view on the Dashboard tab in QRadar. Dashboard items are widgets are visual representations of saved search results.
Reports	Data/ Functionality	Templates for reports that are built upon saved event or flow searches. Generate on-demand reports or schedule them to run at repeating intervals.
Saved searches	Data	A set of search criteria (filters, time window, columns to display or group data by). By saving the criteria of commonly run searches, you don't need to define them repeatedly. Saved searches are required for reports and dashboards.
FGroup	Data	A group of similar items by type, such as a group of log sources, a group of rules, a group of searches, or a group of report templates. FGroups are used as organizational units.

Content extension type	Enhancement type	Description
Custom rules	Data	A set of tests that are run against events or flows that enter the system. The rule is triggered when the tests match the input. Rules can have responses which are actions that are triggered when the rule is triggered. Responses can include actions such as generating an offense, generating a new event, sending an email, annotating the event, or adding data to a reference data collection.
Custom properties	Data	Defines a property that is extracted or derived from an inbound event or flow. Can be based on a regular expression that extracts a subset of a particular event or flow payload as a textual property. They can be based on calculations, and perform an arithmetic operation on existing numeric properties of the event or flow.
Log source	Data	A representation of a source of events such as a server, mainframe, workstation, firewall, router, application, or database. Any events that enter QRadar and originate from that source are attributed to the log source. Log sources contain the configuration information that is needed to receive inbound events, or to pull event data from the event source. Log sources contain information that is specific to your environment such as IP address or host name and other possible configuration parameters.
Log source extensions	Data	A parsing logic definition that is used to synthesize a custom DSM for an event source for which there is no existing DSM. Use log source extensions to enhance or override the parsing behavior of an existing DSM.
Custom QID map entries	Data	A combination of Event name, Event description, Severity, and Low-level category values that are used to represent a particular type of event that a log source might receive. Custom Qid map entries are created to supplement the default QID map that QRadar provides for events that are not officially supported by QRadar.
Reference Data Collection	Data	A container definition that is represented as either a set, a map, a map of sets, a map of maps, or a table for holding reference data. Searches and rules can reference Reference data collections.
Historical Correlation Profile	Data	A combination of a saved search and a set of one or more rules. Use historical correlation profiles to test rules by rerunning a set of historical events through an offline version of the custom rule engine that has a subset of rules enabled.
Custom Functions	Functionality	A SQL-like function (defined in JavaScript) that you can use in an Advanced search to enhance or manipulate data
Custom Actions	Functionality	A custom response for a rule to run, when the rule is triggered. Custom actions are defined by a Python, Perl, or Bash script that can accept arguments from the event or flow data that triggered the rule.

For more information about content management, see the *IBM QRadar Administration Guide*

Extensions management

Use the **Extensions Management** tool on the IBM QRadar Console **Admin** tab to manage your extensions in your deployment.

Use the QRadar Content Management Tool to export your application as an extension. Then, use the **Extensions Management** tool on the **Admin** tab to upload, install, uninstall, and delete it. For more information about content management and extensions, see the *IBM QRadar Administration Guide*.

About extensions

Before you install an extension, the content items are compared to content items that are already in the deployment. If the content items exist, you can choose to overwrite them or to keep the existing data.

When you uninstall an extension, apps that are included in the extension are automatically uninstalled. Content items that are included in the extension must be removed manually.

After the extension is added, a yellow caution icon in the **Status** column indicates potential issues with the digital signature. Hover the mouse over the triangle for more information. Extensions that are unsigned or are signed by the developer, but not validated by your vendor, might cause compatibility issues in your deployment.

Sample apps

Build apps in Python that integrate with, and add extra functions to, QRadar.

The mini-tutorials for the sample apps help to explain the basics of what you need to know to build and integrate your own apps into QRadar.

The following list describes some of the sample apps that are available:

- `com.ibm.AppMan.1.0.0.zip` creates an icon on the QRadar **Admin** tab, and opens an HTML page when you click it that shows all of the apps that are currently installed.
- `com.ibm.BugzillaOffenses.0.1.0.zip` polls QRadar for offenses and pushing those offenses as tickets to the Bugzilla REST API.
- `com.ibm.configpage-with-image.1.0.0.zip` creates an icon on the QRadar **Admin** tab and opens an HTML page when you click it.
- `com.ibm.HelloWorld.1.0.0.zip` creates a new tab in the QRadar UI with the text "Hello World!". This simple app is also created when you use the SDK to create a development environment.
- `com.ibm.si.HelloWorldG11n.1.0.0.zip` a globalized version of the simple Hello World app.
- `com.ibm.googlemaps.belfast.zip` creates a new tab and displays a map.
- `com.ibm.IPMetadataProvider.1.0.0.zip` demonstrates how to add IP metadata to QRadar tooltips.
- `com.ibm.IPMetadataProviderWithImage.1.0.0.zip` - an app that demonstrates how to add IP address metadata and images to QRadar tooltips.
- `com.ibm.memory.resources.zip` demonstrates how to use the manifest to request memory resource for an app.
- `com.ibm.MyFirstRESTApp.1.0.0.zip` calls a REST API and adds the data to a dashboard item. This app is included in the QRadar Software Development Kit.
- `com.ibm.oauthExample.zip` minimal example of how to set-up an app manifest to request to use OAuth authentication.
- `com.ibm.OffenseVisualizer.1.0.0.zip` displays offenses on the QRadar **Offenses** tab.
- `com.ibm.ReferenceDataManagerLite.zip` creates a configuration page for handling reference data.

- `com.ibm.si.dashboard-example.1.0.0.zip` adds a dashboard item to the QRadar **Dashboard** tab.
- `com.ibm.si.dashboard-with-images.1.0.0.zip` adds a dashboard item with images to the QRadar **Dashboard** tab.
- `com.ibm.si.multi-components-example.1.0.0.zip` adds a tab, a new toolbar button in QRadar, and an icon on the **Admin** tab.
- `com.ibm.si.offense-toolbar-button.1.0.1.zip` adds a button to the QRadar **Offenses** tab toolbar that opens a JavaScript alert dialog that contains offense data.
- `com.ibm.store.1.0.0.zip` creates a new tab in QRadar that saves the data that is entered in a database within the docker container.
- `com.QuickScan.zip` creates a tab that allows you to quickly kick off a scan in QRadar Vulnerability Manager.

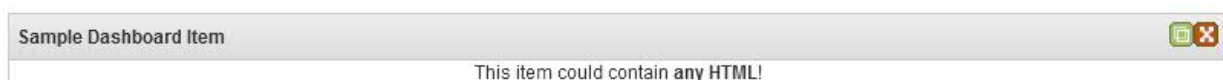
Dashboard item example

You can use IBM QRadar GUI Application Framework to add a dashboard item to your QRadar dashboard.

You might use dashboards to display data that you want to view or use often, for example, you might want to monitor disk usage on your QRadar appliances.

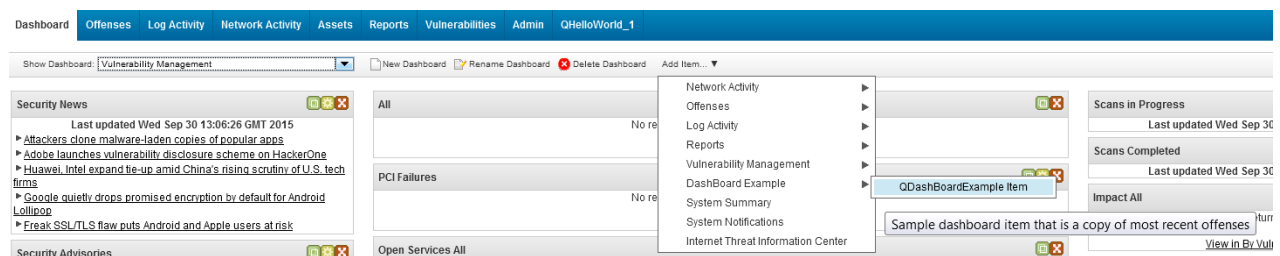
The sample dashboard item app adds a basic dashboard item to the QRadar **Dashboard** tab.

The following image is a dashboard example that is created by an app in QRadar.



On the **Dashboard** tab, the sample dashboard item is accessed by using the **Add Item** menu.

The following image shows the sample dashboard in the **Add Item** menu.



The dashboard sample app contains the files that are described in the following table:

Table 23. Dashboard sample app files	
Files/Folders	Description
app	<p>The root directory for application files. The app folder contains the following files:</p> <p><code>qpylib</code> contains the Python library files that your application uses to connect to the QRadar API endpoints.</p> <p><code>__init__.py</code> - a sample initialization that creates a Flask instance, imports views from <code>views.py</code> script and functions from the <code>qpylib</code> library.</p> <p><code>views.py</code> the main entry point into the web application. This file and the <code>manifest.json</code> file are the only files that are required in every app. Contains sample code for the Dashboard example app.</p> <p>The <code>/static/sampleDashboardItemResponse.json</code> file contains the JSON object that contains the dashboard ID, title, and HTML string.</p>

Table 23. Dashboard sample app files (continued)	
Files/Folders	Description
qradar_appfw_venv	Contains the Python virtual environment where the dependencies are installed.
__init__.py	Creates an instance of the Flask micro-framework that is used to serve content to QRadar.
manifest.json	Describes details about the sample Dashboard Example, which QRadar uses.
run.py	Contains instructions to run the code that is in the /app sub directory.

manifest.json

The manifest.json file contains the following code:

```
{
  "name": "DashBoard Example",
  "description": "Application to display a new dashboard item",
  "version": "1.0",
  "uuid": "558d7935-f00b-42da-a278-c82abdb12d21",

  "dashboard_items": [
    {
      "text": "QDashboardExample Item",
      "description": "Sample dashboard item that is a copy of most recent offenses",
      "rest_method": "sampleDashboardItem",
      "required_capabilities": ["ADMIN"]
    }
  ],
  "rest_methods": [
    {
      "name": "sampleDashboardItem",
      "url": "/static/sampleDashboardItemResponse.json",
      "method": "GET",
      "argument_names": [],
      "required_capabilities": ["ADMIN"]
    }
  ]
}
```

The first four objects, name, description, **version**, and **uuid**, provide basic application information.

The dashboard_items object describes a new item on the QRadar **Dashboard** tab. These items are available to users, who can manually add the items to their dashboard.

The dashboard_items block contains the fields that are described in the following table:

Table 24. Dashboard items block		
Name	Description	Value
text	The name of the dashboard item that is displayed.	QDashboardExample Item
description	A description of the dashboard item that is displayed when your mouse hovers over the dashboard item.	Sample dashboard item that is a copy of most recent offenses
rest_method	The name of the REST method to load this item. This method must be declared in the rest_methods section of the manifest.	sampleDashboardItem
required_capabilities	Instructs QRadar to display the Dashboard Example dashboard item only to users who have administrator privileges.	["ADMIN"]

The `rest_methods` block contains the fields that are described in the following table:

Table 25. REST methods block		
Name	Description	Value
name	A unique name for this REST method within the app.	sampleDashboardItem
url	The URL to access the REST method, relative to the application root. Only URLs within their own application are supported.	/static/sampleDashboardItemResponse.json
method	Concise text to display that describes the area. Can optionally point at a resource bundle key, if the application is globalized.	GET
argument_names	The names of arguments that this method supports. Arguments are passed to the method URL encoded, as either query string parameters or in the PUT/POST body.	[]
required_capabilities	This field instructs QRadar to display the Dashboard Example dashboard item only to users with Administrator privileges.	["ADMIN"]

views.py

For this sample app, creates the default routes `'/'` and `'/index'`, both of which return a simple string. The index route is declared in the **url** field of `manifest.json`.

```
__author__ = 'IBM'

from app import app

@app.route('/')
@app.route('/index')
def index():
    return ""
```

/app/static/sampleDashboardItemResponse.json

The `/app/static/sampleDashboardItemResponse.json` file contains the following code:

```
{
  "id": "sampleDashboardItem",
  "title": "Sample Dashboard Item",
  "HTML": "<div>This item could contain <b><u>any HTML</u></b>!!</div>"
}
```

The JSON object that is returned needs the following data:

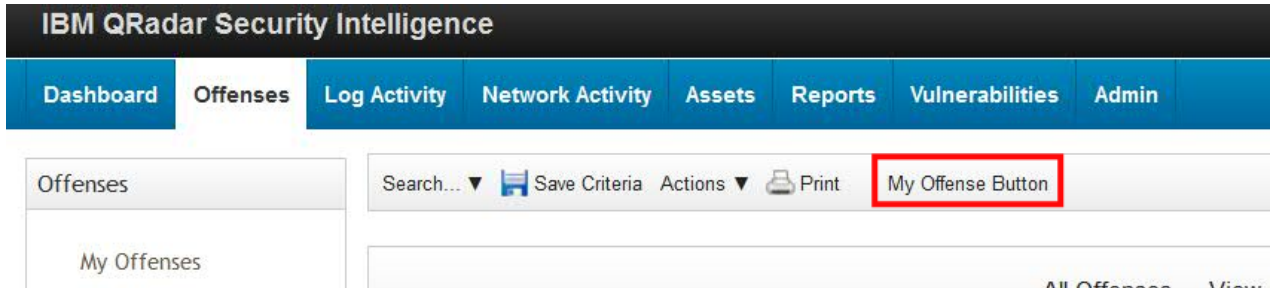
- An ID for the dashboard item you are creating
- A title for the dashboard item
- HTML to render the dashboard item

Page script / toolbar button example

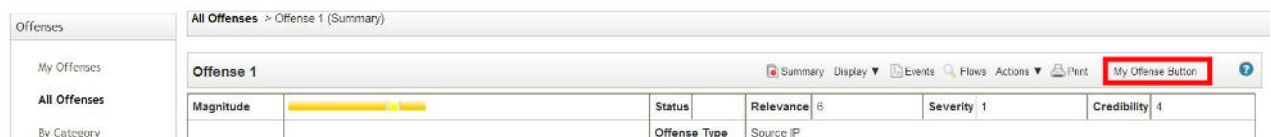
The page script / toolbar button example adds a button to the toolbar on the **Offenses** or **Offense Summary** tabs in IBM QRadar. The new button calls a page script when you click it.

When you select an offense in the **Offenses** or **Offense Summary** tab, and click the button, information about the selected offense is displayed in an alert.

The following image shows the **My Offense Button**.



The following image shows the output from using the **My Offense Button**.



The following table shows the files that are used for this sample app:

Table 26. Sample app files	
Files/Folders	Description
app	The root directory for application files. The app folder contains the following files: qpylib folder that contains the Python library files that your application can use to connect with QRadar API endpoints. __init__.py - a sample initialization file your app. It creates a Flask instance, imports views from views.py and functions from the qpylib library. views.py - The main entry point into the web application. This file and the manifest.json file are the only files that are required in every application. This file contains sample code for the sample application. The /static/js/custom_script.js script that is run when the button is clicked.
__init__.py	Creates an instance of the Flask micro-framework that is used to serve content to QRadar.
manifest.json	This file tells QRadar what the sample app does.

manifest.json

The manifest.json file contains the following code:

```
{
  "name": "Page script test App",
  "description": "An example of to test page scripts",
  "version": "1.0.1",
  "uuid": "4a5d50cc-b9f1-4526-b356-5cb2d60e9467",
}
```

```

"rest_methods": [
  {
    "name": "offenseListFunction",
    "url": "/offenseListFunction",
    "method": "GET",
    "argument_names": ["appContext"]
  }
],
"gui_actions": [
  {
    "id": "OffenseListToolbarButton",
    "text": "My Offense Button",
    "description": "My Offense Button",
    "icon": "",
    "rest_method": "offenseListFunction",
    "javascript": "my_offense_toolbar_button_action(result)",
    "groups": ["OffenseListToolbar"]
  },
  {
    "id": "OffenseSummaryToolbarButton",
    "text": "My Offense Button",
    "description": "My Offense Button",
    "icon": "",
    "rest_method": "offenseListFunction",
    "javascript": "my_offense_toolbar_button_action(result)",
    "groups": ["OffenseSummaryToolbar"]
  }
],
"page_scripts": [
  {
    "app_name": "SEM",
    "page_id": "OffenseList",
    "scripts": ["static/js/custom_script.js"]
  },
  {
    "app_name": "SEM",
    "page_id": "OffenseSummary",
    "scripts": ["static/js/custom_script.js"]
  }
],
}

```

The first three objects, name, description, and version, provide basic app information.

The `gui_actions` object describes a new GUI Action that the user can perform in the QRadar user interface. It is abstracted from the underlying representation.

GUI Actions are represented as buttons on page toolbars, or as right-click menu options.

GUI Actions can run a block of JavaScript, invoke a REST method, or both.

The `gui_actions` block contains sections for both the **Offenses** page toolbar and the **Offense Summary** page toolbar.

The **Offenses** page toolbar section contains the fields that are described in the following table:

Table 27. Offenses page toolbar fields		
Field	Description	Value
id	A unique ID for this area within the application	OffenseListToolbarButton
text	The name of the GUI Action that is displayed in the user interface.	My Offense Button
description	A description of the GUI Action that is displayed when your mouse hovers over the item.	My Offense Button
icon	A URL to load, relative to the application root. Only URLs that exist within the app can be referenced.	" "

Table 27. Offenses page toolbar fields (continued)

Field	Description	Value
rest_method	The name of the REST method to load this item. This method must be declared in the rest_methods block of the manifest.	offenseListFunction
javascript	A JavaScript code block to run when this action is performed. Either this argument or the REST method argument is required. If both are specified, then the REST method is run first, the results are then passed into the JavaScript code block by using the variable <i>result</i> . If only the JavaScript argument is specified, a <i>context</i> variable that contains the <i>context</i> of the GUI Action, is passed into the JavaScript code block.	<pre>my_offense_toolbar_button_action(result)</pre>
groups	A list of one or more GUI Action groups to install the action into. This string is the identifier of the toolbar or right-click menu in QRadar. At least one group must be provided. You can also use a group name in this format <code>ariel:<FIELD_NAME></code> , where <code><FIELD_NAME></code> is the name of a field in the QRadar Event or Flow viewer. If this field is specified, the action is installed into the menu of that field, and the context parameter is the contents of the field.	["OffenseListToolbar"]

The **Offenses Summary** page toolbar section contains the fields that are described in the following table:

Table 28. Offenses summary page toolbar fields

Field	Description	Value
id	A unique ID for this area within the application	OffenseSummaryToolbarButton
text	The name of the GUI Action that is displayed in the user interface.	My Offense Button
description	A description of the GUI Action that is displayed when your mouse hovers over the item.	My Offense Button
icon	A URL to load, relative to the application root. Only URLs that exist within the QRadar app can be referenced.	" "
javascript	A JavaScript code block to run when this action is performed. Either this argument or the REST method argument is required. If both are specified, then the REST method is run first, the results are then passed into the JavaScript code block by using the variable <i>result</i> . If only the JavaScript argument is specified, a <i>context</i> variable that contains the <i>context</i> of the GUI Action, is passed into the JavaScript code block.	<pre>my_offense_toolbar_button_action(context)</pre>

Table 28. Offenses summary page toolbar fields (continued)

Field	Description	Value
groups	<p>A list of one or more GUI Action groups to install the action into. This string is the identifier of the toolbar or right-click menu in QRadar. At least 1 group must be provided.</p> <p>You can also use a group name in this format <code>ariel:<FIELD_NAME></code>, where <code><FIELD_NAME></code> is the name of a field in the QRadar Event or Flow viewer. If this field is specified, the action is installed into the menu of that field, and the context parameter is the contents of the field.</p>	["OffenseSummaryToolbar"]

The `rest_methods` block contains the fields that are described in the following table:

Table 29. `rest_methods` block fields

Field	Description	Value
name	A unique name for this REST method within the application.	offenseListFunction
url	The URL to access the REST method, relative to the application root. Only URLs within the app are supported.	/offenseListFunction
method	The HTTP method on the named endpoint (GET/POST/DELETE).	GET
argument_names	The names of arguments that this method expects. Arguments that are passed to the method URL are encoded, as either query string parameters or in the PUT/POST body.	["context"]

The `page_scripts` block contains the fields that are described in the following table:

Table 30. `Page scripts` block fields

Name	Description	Value
app_name	The name of the QRadar application you want to include the script into. The wildcard "*" is also supported if it is used with the page_id field, to have a file included in every QRadar page.	SEM
page_id	The ID of the QRadar page where the script is included. The wildcard "*" is also supported when it is used with the app_name field. When the wildcard character is used, a file is included on every QRadar page.	OffenseList
scripts	The scripts that you want to include, relative to the application root.	["static/js/custom_script.js"]

views.py

The `views.py` for this example establishes the Flask routes that are used by the application. The script injects context information from the REST API endpoint into the *offense* variable. This content is used by the page script.

```
__author__ = 'IBM'

from flask import request
from app import app
from qpylib import qpylib
import json

@app.route('/offenseListFunction', methods=['GET'])
def offenseListFunction():
    qpylib.log("offenseListFunction", "info")
    offense = request.args.get("appContext")
    qpylib.log("appContext=" + offense, "info")

    #You can process the data and return any value here,
    #that will be passed into javascript
    return json.dumps({'context_passed_to_python_route':offense})
```

static/js/custom_script.js

Contains the function that turns the content of the offense variable into a string and displays it within a **JavaScript alert** dialog.

```
function my_offense_toolbar_button_action(offense)
{
    alert(JSON.stringify(offense));
}
```

Script files must be fragments and not fully formed HTML because they are injected in to a fully rendered page.

Note: Be careful how you name functions because apps can share scripts from QRadar. It is good practice to add a prefix to the JavaScript function such as the app name.

Page script samples

You can use page scripts to link between apps, select rows in a QRadar table, and get the IP address of an asset.

How to link between apps

You use the `setActiveTab(tabId,url)` function from the `qradar.js` library to link between two apps that are installed on the same QRadar Console.

For example, you want to link from MyApp1 to MyApp2. MyApp1 uses the following HTML template with a `div` tag that calls a JavaScript function:

```
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>myApp1</title>
  <script type="text/javascript" src="static/js/myApp2.js"></script>
</head>

<body>
<div onclick="somejs();">
  Link to myApp2</div>

</body>
</html>
```

The `somejs()` function in the `static/js/myApp2.js` file uses the `setActiveTab(tabId,url)` function from the `qradar.js` library:

```
function somejs() {
    alert('set active tab');
    top.setActiveTab("myApp2_1057","plugins/1057/app_proxy/index");
}
```

The **tabId** parameter uses the following format: `areasID_applicationID`. The areas ID is the value of the **id** field in the **areas** block of the `myApp2.manifest.json` file.

The **url** parameter uses the following format:

```
plugins/<applicationID>/app_proxy/<areasURL>
```

The *applicationID* is assigned when you install your app. You can use the `POST /gui_app_framework/application_creation_task` endpoint to retrieve the *applicationID*.

The *areasURL* is the value of the **url** field in the **areas** block of the following `myApp2.manifest.json` file.

```
"areas": [
  {
    "id": "myApp2",
    "text": "myApp2",
    "description": "The app I am linking to",
    "url": "index",
    "required_capabilities": ["ADMIN"]
  }
],
```

How to get the selected rows in a table

To get all the selected rows in a table on a QRadar page, use the following code in your page script:

```
var selectedIds = getSelectedRowIds();

var grid = getGrid();

var store = grid.store;
var row = grid.row(selectedIds[0], true );
```

How to get the IP address of the selected asset from the Asset page

To get the IP address of the selected asset from the QRadar **Asset** tab use the following code in your page script:

```
var assetId = selectedRows[0].id;
```

Passing context-specific information to a page script

You use a GUI Action to pass information about offenses, assets, vulnerabilities from a QRadar table to a page script.

For example, you can extract selected information from QRadar and pass it to a script for further processing. You can create a simple app that allows users to select offenses that are listed as rows in the table on the **Offenses** tab and pass that information to a page script. By clicking a button on the **Offenses** tab toolbar, a **JavaScript alert** that contains the extracted information is displayed.

You can also pass information about vulnerabilities, network activity, assets, and information from any table in most QRadar pages.

The following `manifest.json` file example shows details of entries that you make in this file:

manifest.json

In the app's `manifest.json` file, the REST method that is used by the `views.py` script is defined. The REST method also specifies that application name, page ID, and application context must be defined.

appName

The application name is defined in the **page_scripts** block and indicates to QRadar which tab contains the data to be passed to the script.

pageId

The page ID is defined in the **page_scripts** block and indicates to QRadar which page within the tab contains the data to be passed to the script.

appContext

The application context refers to the row or rows that are manually selected by the user on the tab and page that is defined by the application name and page ID. In this case, it is the table on the **Offense List** page on the **Offenses** tab. Each row contains data on a particular offense and it is this data that is passed to the custom script.

```
{
  "name": "offense log pass ids",
  "description": "An example of passing ids",
  "version": "1.0",
  "uuid": "a4095969-1c88-4e35-aecb-4eea7b061cd3",

  "rest_methods": [ 1
    {
      "name": "listFunction",
      "url": "/listFunction",
      "method": "GET",
      "argument_names": ["appName", "pageId", "appContext"] 2
    }
  ],

  "gui_actions": [ 3
    {
      "id": "OffenseListToolbarButton",
      "text": "Offense pass Ids !",
      "description": "Pass Ids for offenses !",
      "icon": "static/images/bookmarks_small.png",
      "rest_method": "listFunction", 4
      "javascript": "my_toolbar_button_action(result)", 5
      "groups": ["OffenseListToolbar"] 6
    }
  ],

  "page_scripts": [ 7
    {
      "app_name": "SEM",
      "page_id": "OffenseList",
      "scripts": ["static/js/custom_script.js"]
    }
  ]
}
```

The following list describes the contents in the code snippet from the `manifest.json` file.

1. Use the **rest_methods** block to define the API name, app . route URL, and API method that you add to `views.py`.
2. Use the argument names to precisely locate the data that is passed to the script. The app name and page ID values are defined in the QRadar tab and page. In this case, the **Offenses** tab and main **Offense List** page.

The `appContext` argument is a placeholder that holds the actual offense data that is selected when the user clicks a row or rows in the **Offense List** table. This data is passed to JavaScript for processing.
3. Use the **gui_action** block to define the button that passes data to the screen when the user clicks it.
4. Use the **rest_methods** block to define the REST methods that are used in the `views.py` script to list the data from each selected row.
5. Use the JavaScript function to create an alert dialog that displays the JSON string that is passed by the `appContext` argument from the `listFunction` method.

6. Use the GUI Action group location to define where the button appears. In this case, the button appears on the main **Offense List** page toolbar.
7. Use the **page_scripts** block for the `app_name` and `page_id` arguments that are passed to the REST API method, and for the location of the JavaScript file that processes the data.

app/views.py

The app's `app/views.py` defines the application route and function that retrieves the `appContext` data and passes it as JSON to the custom script.

```
__author__ = 'IBM'

from flask import render_template, request
from app import app
from qpylib import qpylib
import json

@app.route('/')
@app.route('/index')
def index():
    return render_template("index.html", title = "Offense Context App!")

@app.route('/listFunction', methods=['GET']) ❶
def listFunction():
    qpylib.log("listFunction", "info")
    rows = request.args.get("appContext") ❷
    qpylib.log("selectedRows=" + rows, "info")

    #You can process the data and return any value here,
    #It is passed into JavaScript.
    return json.dumps({'context_passed_to_python_route':rows}) ❸
```

The following list describes the contents in the code snippet from the `views.py` script.

1. The function URL and REST method that is defined in the **rest_methods** block of the app manifest file.
2. The row variable that gets the content of the selected rows by using the `appContext` argument.
3. The Flask `json.dumps` method formats the data that is contained in the `rows` variable as JSON. This data is passed to the `custom_script.js` file that displays it in a simple alert.

app/static/js/custom_script.js

The following short JavaScript creates an alert and formats the JSON content into strings for each row.

```
function my_toolbar_button_action(offense)
{
    alert(JSON.stringify(offense));
}
```

Context-specific metadata provider example

Metadata providers are used to show extra context-sensitive information in IBM QRadar.

Metadata is displayed when the user's mouse pointer hovers over an item in the user interface. For example, you might want to know the user name that is associated with an IP address, which you can view by hovering your mouse pointer over the IP address.

The following image shows an example of context-sensitive information that is displayed when you hover your mouse pointer over an IP address in the table.

within the app. This endpoint represents a GET request and expects an argument **context**. The context argument is appended to the GET request as a query string that contains the context-specific IP address (/ip_metadata_provider?context=127.0.0.1).

views.py

The views.py script contains the following code:

```
import json
from app import app
from flask import render_template
from flask import request
from qpylib import qpylib

@app.route('/ip_metadata_provider', methods=[ 'GET'])
def getIPMetadata():
    context = request.args.get('context')

    metadata_dict = {
        'key': 'exampleIPMetadataProvider',
        'label': ' Extra Metadata:',
        'value': 'Metadata value',
        'html': render_template('metadata_ip.html', ip_address=context)
    }

    return json.dumps(metadata_dict)
```

The views.py file shows a simple implementation for the getIPMetadata REST method that was defined previously in the manifest.json. As noted, the context is passed to the endpoint by a query string. Use the Flask request module to parse out the value of the context query. The value of the context query is parsed by using the script: `context = request.args.get('context')`. This variable contains the context-specific IP address.

Metadata providers are required to return JSON with the fields that are shown in the following table:

Table 32. Metadata providers fields	
Field	Description
key	Unique key for the metadata provider
label	Description of the metadata, which is displayed in a pop-up layer in QRadar.
value	Plain text context-sensitive data to be provided
html	HTML context-sensitive data to be provided.

In this example, a Python dictionary object is created to contain these fields. For the **html** field, a template file, `metadata_ip.html`, is created in the `/app/templates` directory. The context that is retrieved from the query string as the variable `ip_address` is passed to it.

metadata_ip.html

In this example, you render the context-specific IP address. The `metadata_ip.html` file contains a Jinja template string that is replaced with the value that is passed in from the `render_template` call in `views.py`.

```
{{ ip_address }}
```

Add right-click functionality

Add right-click functionality to a tab your app created in IBM QRadar.

Note: If you include the right-click GUI action in the manifest without adding an implementation of the action, the right-click menu fails to load.

This example shows how to use the right-click GUI Action to capture an IP address and pass the information to custom JavaScript. Use the right-click menu on the QRadar **Log Activity** tab to capture an IP address of an event. Pass the IP address to a custom tab. Use a button on the custom tab to initiate a search for events that contain the captured IP address.

manifest.json

```
...
"areas": [ 1
  {
    "url": "index",
    "text": "RtClick",
    "required_capabilities": ["ADMIN"],
    "id": "QRtClick",
    "description": "An app to POC Right Click"
  }
],
"gui_actions" : [ 2
  {
    "id" : "rtClickEventIP",
    "text" : "Get row info from right click",
    "description" : "Right click on a row, get all the info",
    "icon": null,
    "rest_method": "rtgetcontext", 3
    "javascript" : "clickme(result)",
    "groups" : ["ipPopup"], 4
    "required_capabilities" : ["ADMIN"]
  }
],
"rest_methods" : [ 5
  {
    "name": "rtgetcontext",
    "url": "/getcontext",
    "method": "GET",
    "argument_names": ["context"]
  }
],
"page_scripts" : [ 6
  {
    "app_name": "EventViewer",
    "page_id": "EventList",
    "scripts" : ["static/clickme.js"]
  }
]
...
```

app/views.py

```
__author__ = 'IBM'

from app import app
from flask import jsonify, request, render_template
import json
from qpylib import qpylib

@app.route('/')
@app.route('/index')
def index():
    other_data = request.args.get("otherdata");
    context = request.args.get("context");

    if context is None:
        context = ""

    if other_data is None:
        other_data = ""

    qpylib.log("Displaying context" + str(context));
```



```

        return render_template("index.html", context=context, other=other_data)

@app.route('/getcontext', methods=['GET'])
def get_context():
    context = request.args.get("context")

    qpylib.log("Setting the results to: " + context)

    return json.dumps({"app_id":qpylib.get_app_id(),"context":context})

```

app/static/clickme.js

```

function clickme(result) {

    var app_id = ""
    var context = ""

    if (result) {
        app_id = encodeURIComponent(result.app_id)
        context = encodeURIComponent(result.context)
    }

    var d = new Date();
    var n = d.getTime();

    var otherData = "Something passed from Javascript"

    console.log("Hey, you right clicked on me");
    console.log(result)
}

```

app/templates/index.html

```

<html>
<body>
<script>
    var gotoTab = function() {
        var url = "/console/do/ariel/arielSearch?appName=
        EventViewer&pageId=EventList&dispatch=performSearch&value(searchMode)=
        AQL&searchOrigin=SEARCH_RESULTS_AQL&value(timeRangeType)=
        aqlTime&value(interval)=300000&value(searchName)
        =&value(searchId)=null&value(aql)
        =select%20*%20from%20events%20where%20destinationip%20%3D%20%27" +
        "{{context}}" + "%27%20LAST%2012%20HOURS&value(aqlLines)
        =%5B%22select%20*%20from%20events%20where%20destinationip%20%3D%20%27" +
        "{{context}}" + "%27%20LAST%2012%20HOURS%22%5D&value(recordsLimit)="
        top.setActiveTab("EventViewer", url )
    }
</script>

<div>
<ul>
<li>Received context data from QRadar: {{context}}</li>
<li>Received other data from Javascript: {{other}}</li>
<li><button onclick="gotoTab()">Search for events with
        sourceip of {{context}}</button>
    </li>
</ul>
</div>
</body>
</html>

```

Custom fragments example

The custom fragments feature allows an app to inject its own content into QRadar tabs and pages. The application determines what the content is and how it is rendered. The injection points are fixed, predetermined locations within the QRadar page set.

The sample app that is presented here injects an HTML table that contains data for an offense on the **Offense Summary** page. This example uses app/qpylib/offense_qpylib.py library functions to retrieve offense details in JSON format.

The following image shows custom content at the top of the **Offense Summary** page:

The screenshot shows the IBM QRadar Security Intelligence interface. The top navigation bar includes 'Dashboard', 'Offenses', 'Log Activity', 'Network Ac...', 'Assets', 'Reports', 'Admin', and 'Hello World'. The 'Offenses' section is active, showing 'All Offenses > Offense 15 (Summary)'. The main content area displays a table for 'Offense 15' with fields like Magnitude, Status, Relevance, Severity, and Credibility. Below this is a table for 'Offense Source Summary' with fields like IP, Location, Vulnerabilities, and Asset Weight. A red box highlights the 'Offense Fragment New' section, which shows 'Offense ID 15', 'Source IP 10.101.138.200', and 'Severity 8'. Below this are sections for 'Last 5 Notes' and 'Last 5 Search Results'.

Figure 6. Custom content injection

The following sections describe the `manifest.json` and `app/views.py` code that is used to inject offense data into the **Offense Summary** page header.

manifest.json

Use the `fragments` block in the application manifest file to define the location where you want to inject the content. You also define the REST endpoint that is used to retrieve the content in the `fragments`.

```
{
  "name": "Offense Fragment New",
  "description": "Render offense using custom python",
  "version": "1.0",
  "uuid": "a4095969-1c88-4e35-aecb-4eea7b061ab4",
  "fragments": [
    {
      "app_name": "SEM",
      "page_id": "OffenseSummary",
      "rest_endpoint": "fragoffense"
    }
  ]
}
```

The following list describes the contents in the code snippet from the **fragments** block.

1. The **app_name** and **page_id** fields define the tab and page where the content is injected. As content can be injected into the header of the **Offense Summary** page only, no **location** field is required.
2. The `fragoffense` rest endpoint is defined in the `app/views.py` file.

app/views.py

```
__author__ = 'IBM'

from flask import Response
from app import app
from qpylib.qpylib import log
from qpylib.offense_qpylib import get_offense_json_html 1

@app.route('/fragoffense/<offense_id>', methods=['GET']) 2
def get_offense(offense_id):
    try:
        offense_json = get_offense_json_html(offense_id, custom_html_generator)
        return Response(response=offense_json, status=200, mimetype='application/json')
    except Exception as e:
        log('Error ' + str(e))
        raise

def custom_html_generator(offense_json): 3
    return ('<table><tbody>' +
        '<tr><td><strong>Offense ID</strong></td>' +
            '<td>' + str(offense_json['id']) + '</td></tr>' +
        '<tr><td><strong>Source IP</strong></td>' +
            '<td>' + offense_json['offense_source'] + '</td></tr>' +
        '<tr><td><strong>Severity</strong></td>' +
            '<td>' + str(offense_json['severity']) + '</td></tr>' +
        '</tbody></table>')
```

The following list describes the contents in the code snippet from the `views.py` script.

1. The `get_offense_json_html` function that is imported from the `app/qpylib/offense_qpylib.py` library retrieves the details of the offense ID in JSON format.
2. The `get_offense` function has an `@app.route` annotation that defines the endpoint's route. Its value is composed of the manifest's **rest_endpoint** field value `/fragoffense`, and the context information. In this case, the context information is the offense ID for the current offense on the **Offense Summary** page.
3. The `custom_html_generator` function formats the offense JSON that was retrieved into an HTML table.

Custom column example

You can add columns that contain custom content to tables in QRadar.

The following example describes how to add a column to the **Offenses** tab and to inject content into it. The content is in JSON LD format and is formatted by a custom JavaScript.

The following image shows an example of a custom column that is added to the **Offenses** tab.

IBM QRadar Security Intelligence

Dashboard Offenses Log Activity Network Activity Assets Reports Risks Vulnerabilities Admin QRadWorld_1

System Time: 15:25

Offenses

Search... Save Criteria Actions Print List Details User Details

Last Refresh: 00:01:50

My Offenses

All Offenses

By Category

By Source IP

By Destination IP

By Network

Rules

Current Search Parameters:

Exclude Hidden Offenses (Clear Filter) Exclude Closed Offenses (Clear Filter)

All Offenses View Offenses Select An Option:

	ID	Description	Offense Type	Offense Source	Magnitude	Source IPs	Dest IPs	Users	Log Sources	Events	Flows	Star Date	Last Ever	custom col custom javascript
37	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	36	119	9	12	id137.Source IP is
62	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	12	48	9	11	id182.Source IP is
57	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	24	96	9	2	id187.Source IP is
42	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	24	60	9	3	id184.Source IP is
36	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	35	107	9	19	id136.Source IP is
55	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	23	71	9	28	id155.Source IP is
32	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	24	120	9	11	id132.Source IP is
17	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	24	60	9	21	id117.Source IP is
5	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	23	83	9	21	id15.Source IP is11
25	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	12	12	9	31	id125.Source IP is
77	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	11	22	9	31	id177.Source IP is
73	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	11	11	9	31	id173.Source IP is
69	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	11	11	9	31	id169.Source IP is
71	Local IRC Server	Destination IP					N/A		Custom Rule Engine-8: dev...	11	11	9	31	id171.Source IP is
63	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	36	9	34	id183.Source IP is
59	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	12	9	11	id159.Source IP is
54	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	12	9	11	id154.Source IP is
81	Failure Audit Pre	Source IP					ig001009		WindowsAuthServer @ 10.10...	2	0	11	11	id181.Source IP is
80	Failure Audit Pre	Source IP					N/A		WindowsAuthServer @ 10.10...	2	0	11	11	id180.Source IP is
31	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	12	9	21	id131.Source IP is
75	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	33	9	31	id175.Source IP is
76	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	11	9	31	id176.Source IP is
72	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	11	9	31	id172.Source IP is
79	Failure Audit Pre	Source IP					netqadmin		WindowsAuthServer @ 10.10...	4	0	11	11	id179.Source IP is
24	Policy Remote Cl	Source IP					Re: N/A		Custom Rule Engine-8: dev...	36	267	9	11	id124.Source IP is
40	Policy Remote Cl	Source IP					Re: N/A		Custom Rule Engine-8: dev...	3	73	9	11	id140.Source IP is
78	New Host Discove	Source IP					M: Multiple (5)		Multiple (5)	124	0	11	11	id178.Source IP is
45	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	48	9	3	id145.Source IP is
21	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	263	9	3	id121.Source IP is
60	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	70	9	16	id180.Source IP is
23	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	95	9	17	id123.Source IP is
28	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	308	9	40	id128.Source IP is
61	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	12	9	46	id181.Source IP is
10	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	312	9	11	id110.Source IP is
48	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	24	9	11	id148.Source IP is
43	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	12	9	21	id143.Source IP is
6	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	24	9	31	id185.Source IP is11
20	Policy Remote Cl	Source IP					N/A		Custom Rule Engine-8: dev...	2	12	9	31	id140.Source IP is

Displaying 1 to 40 of 81 items (Elapsed time: 0:00:02.718)

Figure 7. Custom column on the Offenses tab.

The following manifest.json file example shows details of a **custom_columns** block.

manifest.json

Use the **custom_columns** block in the app's manifest.json file to define the injection point, column header, and rest endpoint that are used to retrieve content in JSON format for the new column.

In this example, the JSON content that is injected is formatted by using a custom JavaScript. The location of the script, and the tab and page on which it is run are defined in a **page_scripts** block.

```
{
  "name": "Custom column offenses list table",
  "description": "Render custom column offense using custom javascript",
  "uuid": "7191b673-3225-4d5d-97ba-a41d72cc65f0",
  "version": "1.0"

  "custom_columns": [
    {
      "label": "Custom col custom javascript", 1
      "rest_endpoint": "custom_column_method", 2
      "page_id": "OffenseList" 3
    }
  ],

  "page_scripts": [
    {
      "app_name": "SEM",
      "page_id": "OffenseList",
      "scripts": [
        "static/qjslib/custom_offense.js"
      ]
    }
  ]
}
```

The following list describes the contents in the code snippet from the custom_columns block.

1. The **label** field contains the column header content.
2. The custom_column_method REST endpoint is defined in the app/views.py script. This custom_column_method REST endpoint is used to retrieve the information that is injected into the custom column.

3. The **page_id** field defines the page in which the new table column is added. In this case, it is the **All Offenses** page.

app/views.py

```
__author__ = 'IBM'

from flask import Response
from app import app
from qpylib.qpylib import log
from qpylib.offense_qpylib import get_offense_json_ld 1
import json

@app.route('/custom_column_method/<offense_id>', methods=['GET']) 2
def get_offense(offense_id):
    try:
        log("get offense")
        offense_json = get_offense_json_ld(offense_id)
        return Response(response=offense_json, status=200, mimetype='application/json')
    except Exception as e:
        log('Error ' + str(e))
        raise
```

The following list describes the contents in the code snippet from the `views.py` script.

1. The `get_offense_json_ld` function that is imported from the `app/qpylib/offense_qpylib.py` library retrieves the details for the offense ID in JSON LD format.
2. The `get_offense` function includes an `@app.route` annotation that defines the endpoint's route. The `@app.route` includes the manifest's **rest_endpoint** field value `/custom_column_method`, and the context information. In this case, the context information is the offense ID.

static/qjslib/custom_offense.js

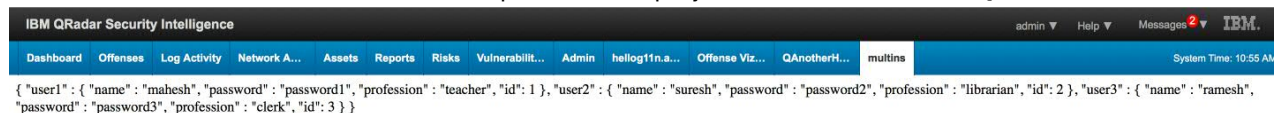
The `static/qjslib/custom_offense.js` script renders the JSON content for the Offense ID and its source IP address.

```
function renderJsonContent(jsonTagId, targetDivTagId)
{
    var jsonTagContent = $("#" + jsonTagId).html();
    var json = JSON.parse(jsonTagContent);
    $("#" + targetDivTagId).html(renderOffense(json));
}

function renderOffense(json)
{
    return 'id is' + json.data.id + ',' +
        'Source IP is' + json.data.offense_source;
}
```

Named service sample app

This example shows how to run a Node.js server as a named service with a single endpoint. The app takes data that is served from the service's endpoint and displays it on a new tab in the QRadar UI.



Because this example uses Node.js rather than Flask as the web application framework, the Node.js runtime environment is installed as a source dependency in the app's `/src_deps/init` folder. For more information about using source dependencies, see [“Installing Node.js as a source dependency”](#) on page 11.

manifest.json

The sample app's manifest file tells QRadar to run the web server script. It defines the port that the web server monitors from, and a service with an endpoint that retrieves the data resource.

For more information about the services object type, see [“Services type” on page 22](#)

```
{
  "name": "Named service example",
  "description": "Named service example",
  "version": "1.0",
  "load_flask": "false", 1
  "uuid": "ed9f7033-159b-4697-8c2a-0744010dcf49",

  "services": 2
  [
    {
      "command": "node /node_app/app/server.js", 3
      "directory": "/node_app", 4
      "endpoints": 5
      [
        {
          "name": "listusers",
          "path": "/list_users",
          "http_method": "GET"
        }
      ],
      "name": "nodejsservice", 6
      "path": "/list_users", 7
      "port": 5000, 8
      "version": "1"
    }
  ],

  "areas":
  [ 9
    {
      "id": "multins",
      "text": "multins",
      "description": "named service example",
      "url": "list_users",
      "named_service": "nodejsservice",
      "required_capabilities": ["ADMIN"]
    }
  ]
}
```

1. Flask is not loaded because the app uses Node.js to serve content.
 2. The **services** block defines the service name, version, and any endpoints it uses. In addition, supervisord configuration parameters can also be added here. For a full list of available parameters, see [Table 18 on page 24](#).
 3. This command is used by the Node.js runtime environment to run the web server script.
 4. The path to the directory that supervisord changes to before it executes the child process.
 5. The endpoint to be implemented by the service. The GET listusers endpoint retrieves a list of users that is stored in a JSON source file, `users.json`.
- For more information about the endpoints field configuration parameters, see [Table 17 on page 23](#).
6. The name of the service that must be referenced in the **name_service** fields of objects that want to use the service.
 7. The URL that is used to access the endpoint.
 8. The port number that the web server listens on. Because Flask is not being used here, the port must be set.
 9. The **area** block adds a tab to the QRadar UI that displays the list of users and their associated data that is retrieved by the service's `listusers` endpoint.

/node_app/server/server.js

As Flask is not being used in this example, no `views.py` is required for the app. The following section contains the web server code that serves the JSON content.

```
var express = require('express');
var app = express();
var fs = require("fs");

app.use(express.static('public')); 1

app.get('/list_users', function (req, res) { 2
  fs.readFile(__dirname + "/" + "users.json", 'utf8', function (err, data) {
    console.log( data );
    res.send( data );
  });
})

var server = app.listen(5000, function () { 3

  var host = server.address().address
  var port = server.address().port

  console.log("Example app listening at http://%s:%s", host, port)

})
```

1. This function notifies the Node.js server to serve the content from the `node_app/public` folder.
2. This function retrieves the content from the `/node_app/server/users.json` file.
3. The `app.listen` function sets the port that the server listens on. The port must be the same as you configured in the app's manifest.

/node_app/server/users.json

In this example, the `/node_app/server/users.json` file is used as the data source.

```
{
  "user1" : {
    "name" : "mahesh",
    "password" : "password1",
    "profession" : "teacher",
    "id": 1
  },
  "user2" : {
    "name" : "suresh",
    "password" : "password2",
    "profession" : "librarian",
    "id": 2
  },
  "user3" : {
    "name" : "ramesh",
    "password" : "password3",
    "profession" : "clerk",
    "id": 3
  }
}
```

Named services

Use the named services feature to define background processes for an app that other apps and IBM QRadar can communicate with in an asynchronous manner.

You can write apps that define services and REST API endpoints that other apps can interact with. QRadar data that is manipulated by one app can be accessed, and represented, or reworked by another app. Information that is generated by one app can be reused by other apps to add value to the original data. Your apps are no longer restricted to working with the data that is provided by the QRadar REST API alone.

The named services feature also provides developers with greater flexibility when they want to use web services frameworks. Named service processes do not need to run as part of the Flask web service that is

built into the QRadar application framework. You can choose to install and use a different method (for example, Node.js) to run the named service process from within the application container. The Flask process can be disabled by setting the **load_flask** field in your app's manifest file.

If your named service defines a process, it can also define a port through which QRadar can communicate with the service. If no port is defined, then the service is treated as a headless background process that runs continuously.

Note: Named-service-endpoint URIs are not constructed by using the console IP address. The named-service-endpoint URIs display a relative path with respect to the console, for example, `/console/plugins/1001/app_proxy:resourceservice/resource/{resource_id}`.

How named services are defined

The **services** object in an app's `manifest.json` file is used to define a named service. Fields within the **services** block are used to define:

- The service's name and version. These fields are mandatory.
- Optional REST API endpoints for the service.
- An optional port number to which your background processes binds internally. For example, port 80 if you are running an HTTP server.
- A command that starts the background process.
- Supervisord configuration options. The QRadar application framework uses supervisord to monitor and control service background processes.

For more information about named service definition in the app manifest, see [“Services type” on page 22](#).

For an example of how the **services** block is used to define a named service, see [“Named service sample app” on page 73](#).

How apps communicate with a named service

When you install an app that is configured with a named service, the service is registered with QRadar. Other apps and QRadar can now make calls to the background processes.

You can add a **named_service** field in any of the following app object configuration blocks in your app's manifest file to use the service:

- Area type
- Rest method type
- Configuration page type
- GUI action type
- Page script type
- Custom column type
- Fragments type

For an example of how the **named_service** field is used, see [“Named service sample app” on page 73](#).

If you use a JavaScript client, the first step in this process uses a JavaScript library (`app/static/qjslib/qappfw.js`) that is supplied in the SDK. The library queries QRadar for apps that implement the named service.

For information on the QRadar App Framework JavaScript library, see [“App Framework JavaScript library” on page 87](#).

After all the apps that match the named service and version are returned, the caller can decide which ones to call. Calls proxy through QRadar and call the named service either directly, or via a port.

QRadar uses the value in the **named_service** fields to locate and register the named service that an app object wants to interact with.

Services type

Defines named services, service endpoints, and supervisord configuration parameters.

The parameters in your **services** block in your app's manifest file can be divided into these types:

Service definition parameters

The service name, version, and any endpoints that are defined for the service.

Endpoints field parameters

A breakdown of the **endpoints** subparameters.

Supervisord configuration parameters

A list of parameters that can be passed to supervisord to control the service process.

The following code sample lists the **services** block fields:

```
{
  ...
  "services": [
    {
      "name": "some_service",
      "version": "1.0",
      "endpoints": [
        {
          "name": "something",
          "path": "get_something/{id}",
          "http_method": "GET",
          "parameters": [
            {
              "location": "PATH",
              "name": "id",
              "definition": "String"
            }
          ]
        }
      ]
    },
    {
      "command": "/usr/bin/python loop.py",
      "process_name": "%(program_name)s",
      "numprocs": 1,
      "directory": "/src_deps/services/",
      "umask": "022",
      "priority": 999,
      "autostart": "true",
      "autorestart": "true",
      "startsecs": 1,
      "startretries": 3,
      "exitcodes": "0,2",
      "stopsignal": "TERM",
      "stopwaitsecs": 8,
      "user": "root",
      "redirect_stderr": "true",
      "stdout_logfile": "/store/log/pro.log",
      "stdout_logfile_maxbytes": "1MB",
      "stdout_logfile_backups": 7,
      "stdout_capture_maxbytes": "0",
      "stdout_events_enabled": "false",
      "stderr_logfile": "/store/log/proerr.log",
      "stderr_logfile_maxbytes": "1MB",
      "stderr_logfile_backups": 6,
      "stderr_capture_maxbytes": "0",
      "stderr_events_enabled": "false",
      "environment": "PY_HOME=/usr/bin/python",
      "serverurl": "AUTO"
    }
  ],
  ...
}
```

The following tables provide details about the manifest fields for the **services** block.

Table 33. Service definition endpoints			
Field	Required	Type	Description
name	Yes	String	The name of the service instance.

Table 33. Service definition endpoints (continued)

Field	Required	Type	Description
version	Yes	String	Version of this named service that is supported by this instance. Only one version per named service definition is allowed.
endpoints	No	Array of Endpoints type	The endpoints that are defined for this service instance. You can define a number of parameters for each endpoint. For more information about endpoint parameters, see Table 34 on page 78

Endpoints field parameters

The **endpoints** field parameters are explained in more detail in the following table:

Table 34. Endpoints field parameters

Parameter	Required	Type	Description
name	Yes	String	The name of the endpoint.
http_method	Yes	String	The HTTP method to use for the request: GET, POST, PUT, or DELETE.
path	Yes	String	The URL that is used to access endpoint.
request_mime_type	No	String	The mime type of request body. Provide this value when your request has a body (POST, PUT). Typical values include these strings: "application/json", "application/json+ld", "application/x-www-form-urlencoded".
request_body_type	No	Object	Provides a JSON object that defines the structure of your request body. If you use this parameter, do not set the location parameter to BODY.
parameters	No	Array	<p>location (required) String. Can be one of these types:</p> <ul style="list-style-type: none"> • PATH • QUERY • BODY <p>Set the location parameter to BODY if the endpoint's request_mime_type field is set to application/x-www-form-urlencoded.</p> <p>The location parameter is required.</p> <p>name (required) String</p> <p>definition (optional) The type of the parameter.</p>
response	No	Object	<p>Definition of the expected response. If your endpoint does not return a response body, then omit this field.</p> <p>mime_type (required) String. The response mime type.</p> <p>body_type (required) Object. Provides a JSON object that defines the structure of your response body.</p>
error_mime_type	No	String	The mime type of error message body. Defaults to text/plain.

Supervisord configuration parameter fields

The QRadar Application Framework uses supervisord to monitor and control named services. You can specify supervisord configuration parameters as fields within the services block in your app's manifest file.

You can use the following supervisord parameters as fields in the **services** block. For more information about supervisord configuration parameters, see <http://supervisord.org/configuration.html> (<http://supervisord.org/configuration.html>).

Table 35. Supervisord configuration parameters			
Field	Required	Type	Description
port	No	Integer	A TCP host:port value, for example, 127.0.0.1:9001 on which supervisor listens for HTTP and XML-RPC requests. If no port is specified the service is treated as a headless background process that runs continuously.
command	No	String	The command that runs when this program is started. The command can be either absolute, for example, /path/to/program or relative, for example, program. If it is relative, the supervisord's environment \$PATH is searched for the executable.
directory	No		The path to the directory that supervisord changes to before it executes the child process.
autorestart	No	Enum	Specifies whether supervisord automatically restarts a process when it exits in the RUNNING state. Value is one of the following states: TRUE, FALSE, UNEXPECTED.
process_name	No	String	A Python string that is used for the supervisor process name.
numprocs	No	String	The number of instances of the program the supervisor starts.
umask	No	String	The octal number that represents the umask of the process.
autostart	No	Enum	Value is TRUE or FALSE. If TRUE, this program starts automatically when supervisord is started.
startsecs	No	Integer	The number of seconds that the program needs to stay running after startup to consider the start successful.
startretries	No	Integer	The number of serial failure attempts that supervisord allows when it attempts to start the program.

Table 35. Supervisord configuration parameters (continued)

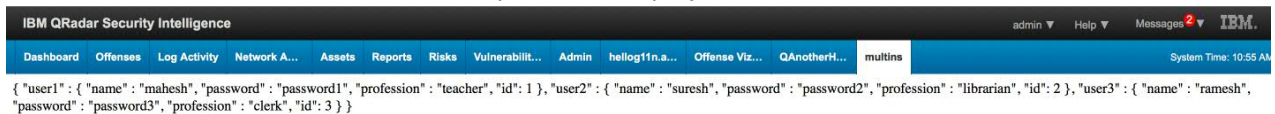
Field	Required	Type	Description
exitcodes	No	String	The list of expected exit codes for this program that are used with autorestart .
stopsignal	No	String	The signal that is used to kill the program when a stop is requested. Use any of the following: <ul style="list-style-type: none"> • TERM • HUP • INT • QUIT • KILL • USR1 • USR2
stopwaitsecs	No	Integer	The number of seconds to wait for the operating system to return a SIGCHLD to supervisord after the program is sent a stopsignal .
user	No	String	The UNIX user account that runs the program.
redirect_stderr	No	Enum	Value is either TRUE or FALSE. If TRUE, causes the <i>StdErr</i> output to be sent back to supervisord on its <i>StdOut</i> file descriptor.
stdout_logfile	No	String	<i>StdOut</i> output is stored in this file. If redirect_stderr is TRUE, <i>StdErr</i> output is also stored in this file).
stdout_logfile_maxbytes	No	String	The maximum number of bytes that can be consumed by stdout_logfile before it is rotated and a new log file is started.
stdout_logfile_backups	No	Integer	The number of stdout_logfile backups to retain from the <i>StdOut</i> log file rotation.
stdout_capture_maxbytes	No	String	The maximum number of bytes that are written to capture FIFO (first in, first out) when the process is in <i>StdOut</i> capture mode.
stdout_events_enabled	No	Enum	Value is one of TRUE, FALSE. If TRUE, PROCESS_LOG_STDOUT events are emitted when the process writes to its <i>StdOut</i> file descriptor.
StdErr_logfile	No	String	Put process <i>StdErr</i> output in this file unless redirect_stderr is TRUE.

Table 35. Supervisord configuration parameters (continued)

Field	Required	Type	Description
stderr_logfile_maxbytes	No	String	The maximum number of bytes before log file rotation for stderr_logfile .
stderr_logfile_backups	No	Integer	The number of stderr_logfile backups to retain from the <i>StdErr</i> log file rotation.
stderr_capture_maxbytes	No	String	The maximum number of bytes that are written to capture FIFO (first in, first out) when the process is in <i>StdErr</i> capture mode.
stderr_events_enabled	No	Enum	Value is either TRUE or FALSE. If TRUE, PROCESS_LOG_STDERR events are generated when the process writes to its <i>StdErr</i> file descriptor.
environment	No	String	A list of key/value pairs, in the form KEY="val", KEY2="val2", that are placed in the child process' environment.
serverurl	No	String	The URL that is used to access the supervisord server, for example, http://localhost:9001

Named service sample app

This example shows how to run a Node.js server as a named service with a single endpoint. The app takes data that is served from the service's endpoint and displays it on a new tab in the QRadar UI.



Because this example uses Node.js rather than Flask as the web application framework, the Node.js runtime environment is installed as a source dependency in the app's `/src_deps/init` folder. For more information about using source dependencies, see [“Installing Node.js as a source dependency”](#) on page 11.

manifest.json

The sample app's manifest file tells QRadar to run the web server script. It defines the port that the web server monitors from, and a service with an endpoint that retrieves the data resource.

For more information about the services object type, see [“Services type”](#) on page 22

```
{
  "name": "Named service example",
  "description": "Named service example",
  "version": "1.0",
  "load_flask": "false", 1
  "uuid": "ed9f7033-159b-4697-8c2a-0744010dcf49",

  "services": 2
  [
    {
      "command": "node /node_app/app/server.js", 3
      "directory": "/node_app", 4
      "endpoints": 5
```

```

        {
            "name": "listusers",
            "path": "/list_users",
            "http_method": "GET"
        },
        {
            "name": "nodejsservice",
            "path": "/list_users",
            "port": 5000,
            "version": "1"
        }
    ],
    "areas": [
        {
            "id": "multins",
            "text": "multins",
            "description": "named service example",
            "url": "list_users",
            "named_service": "nodejsservice",
            "required_capabilities": ["ADMIN"]
        }
    ]
}

```

1. Flask is not loaded because the app uses Node.js to serve content.
 2. The **services** block defines the service name, version, and any endpoints it uses. In addition, supervisord configuration parameters can also be added here. For a full list of available parameters, see [Table 18 on page 24](#).
 3. This command is used by the Node.js runtime environment to run the web server script.
 4. The path to the directory that supervisord changes to before it executes the child process.
 5. The endpoint to be implemented by the service. The GET listusers endpoint retrieves a list of users that is stored in a JSON source file, `users.json`.
- For more information about the endpoints field configuration parameters, see [Table 17 on page 23](#).
6. The name of the service that must be referenced in the **name_service** fields of objects that want to use the service.
 7. The URL that is used to access the endpoint.
 8. The port number that the web server listens on. Because Flask is not being used here, the port must be set.
 9. The **area** block adds a tab to the QRadar UI that displays the list of users and their associated data that is retrieved by the service's `listusers` endpoint.

/node_app/server/server.js

As Flask is not being used in this example, no `views.py` is required for the app. The following section contains the web server code that serves the JSON content.

```

var express = require('express');
var app = express();
var fs = require('fs');

app.use(express.static('public'));

app.get('/list_users', function (req, res) {
    fs.readFile(__dirname + "/" + "users.json", 'utf8', function (err, data) {
        console.log( data );
        res.send( data );
    });
});

var server = app.listen(5000, function () {
    var host = server.address().address
    var port = server.address().port

    console.log("Example app listening at http://%s:%s", host, port)
}

```

```
} )
```

1. This function notifies the Node.js server to serve the content from the `node_app/public` folder.
2. This function retrieves the content from the `/node_app/server/users.json` file.
3. The `app.listen` function sets the port that the server listens on. The port must be the same as you configured in the app's manifest.

`/node_app/server/users.json`

In this example, the `/node_app/server/users.json` file is used as the data source.

```
{
  "user1" : {
    "name" : "mahesh",
    "password" : "password1",
    "profession" : "teacher",
    "id": 1
  },
  "user2" : {
    "name" : "suresh",
    "password" : "password2",
    "profession" : "librarian",
    "id": 2
  },
  "user3" : {
    "name" : "ramesh",
    "password" : "password3",
    "profession" : "clerk",
    "id": 3
  }
}
```

Support functions

The IBM QRadar GUI Application Framework comes with several built-in routes, custom Jinja2 Flask functions, and other helper utilities that support app development.

Overview

All HTTP requests from client-side browsers that go to an app use the following format:

```
https://<console_ip>/console/plugins/{application_id}/app_proxy/{my_route}
```

The *application_id* is the integer value that is assigned during the process of using the installation RESTful endpoints for GUI app creation. The *application_id* value is recorded in the **Application Creation Task state** output that is returned when you run the **qradar_app_creator deploy** command.

In the following example, the application ID is 1023.

```
Application Creation Task state:
{'status': 'COMPLETED', 'application_id': '1023', 'error_messages': '[]'}
```

Routes

You can create your own targeted web requests to the app for the routes in the following table:

Table 36. Request routes		
Route	Format	Description
GET /debug	GET https://<console_ip>/console/plugins/{application_id}/app_proxy/debug	Download your <code>/store/log/app.log</code> file from inside the container for inspection.

Table 36. Request routes (continued)		
Route	Format	Description
GET /debug_view	GET https://<console_ip>/console/plugins/{application_id}/app_proxy/debug_view	Display the contents of the /store/log/app.log file inside your browser window.
POST /log_level	POST https://<console_ip>/console/plugins/{application_id}/app_proxy/log_level form body: level = 'INFO' 'DEBUG' 'ERROR' 'WARNING' 'CRITICAL'	Dynamically define the level of logging that you want your app to capture. Post a form, with an attribute level that is set to one of the log level values to this endpoint. QRadar dynamically reset the log collection levels in your /store/log/app.log file.

Accessing your Flask endpoints in views.py

You must use relative paths for your endpoints. Do not use the utility methods `q_url_for` and `get_console_ip` to create URLs to access your Flask endpoints. If a console uses a web URL instead of an IP address, all the Flask requests are denied because the request is cross-domain. In that case, your app might not work. If you want to access an endpoint from the main app template level, for an AJAX call, for example, to return some JSON data, use the following URL format:

```
url_cpu_data = 'cpu_data'
```

This format routes the method in `views.py`:

```
@app.route('/cpu_data', methods=['GET'])
```

If you are working from a folder at a deeper level, for example, use `../cpu_data` to go back a level to reach this endpoint.

Do not use the following format to create a URL to access your endpoint:

```
url_cpu_data = "{{ q_url_for('cpu_data') }}"
```

As before, if you go from a web URL to an IP address, this request might be denied because the request is cross-domain and so your app might not work.

If you begin the URL with a slash, it starts the URL from this root: `https://consoleIPaddress/`

Here's an example to open a page with the offense ID:

```
console/qradar/jsp/QRadar.jsp?appName=Sem&pageId=OffenseSummary&summaryId="
+ encodeURIComponent(offense_id)
```

Here's an example to open a page by running the AQL search query:

```
/console/do/ariel/arielSearch?appName=EventViewer&pageId=EventList&dispatch=performSearch&value(searchMode)
=AQL&value(timeRangeType)=aqlTime" + "&value(aql)=" + encodeURIComponent(aql_query
```

Custom Flask methods

The following table describes the Flask custom methods that you can use:

Method	Format	Description
q_url_for()	<pre>def q_url_for(endpoint, **values):</pre>	<p>Use this Python method inside your routes in your app's <code>views.py</code> or your Jinja2 templates. It hides and abstracts the QRadar proxy addresses that are needed to link together endpoints (routes) or resources (static files and images, for example).</p> <p>The method is essentially a wrapper around the Flask <code>url_for()</code> method. It applies a prefix that pertains to the correct application-specific proxy path URL portion to get to your app's endpoint.</p> <p>The following snippet shows how to use the method in a Jinja2 template to hide the QRadar proxy address of an image resource.</p> <pre></pre> <p>For more information about the Flask <code>url_for()</code> method, go to the Flask website.</p>
getAppBaseUrl()	<pre>def getAppBaseUrl():</pre>	<p>Function to get the full URL through QRadar, that will proxy any request to the appropriate application plug-in servlet. This routine returns a URL string that can be appended to create a URL to reference resources in the application. Typically, the <code>q_url_for()</code> function is used for this purpose but <code>getAppBaseUrl()</code> is also supplied for convenience.</p>

QRadar CSRF token

The QRadar CSRF (cross-site request forgery) token is generated by QRadar to prevent cross-site scripting attempts. For applications that are developed by using QRadar support libraries such as `qpylib` the use of the CSRF token is seamless.

If you create an app that does not use QRadar `qpylib` support, you must harvest the token from any application endpoints, or routes, and place it in your own HTTP headers before a REST or exported method call is made in QRadar.

Related information

QRadar Python helper library functions

The QRadar Python helper library (`qpylib`) contains several useful functions that you can use to add logging, make REST API calls, and convert JSON objects to Python dictionaries.

All functions that you import into your app's `views.py` file can be called globally.

The following table describes functions that you can import into your app's `views.py` file.

Function	Format	Description
log()	<pre>def log(message, level='info'):</pre> <p>Here's an example:</p> <pre>from qpylib import qpylib .. #in precedence order from lowest level to highest log('debug message' , 'debug') log('info message' , 'info') log('warning message' , 'warning') log('error message' , 'error') log('critical message' , 'critical')</pre>	<p>Import the <code>qpylib</code> helper library into your app's <code>views.py</code> to use the <code>log()</code> function. This function writes messages at your chosen log level to the <code>/store/log/app.log</code> file.</p> <p>By default, logging is turned on and set to INFO level. Lower level logging messages are ignored. Use the <code>POST /log_level</code> endpoint to change</p>
set_log_level(log_level)	<pre>def set_log_level(log_level='info'):</pre>	<p>Set the current log level. Used by the <code>POST /log_level</code> endpoint but can also be called programmatically.</p>

Table 38. Functions that you can import into your app (continued)

Function	Format	Description
REST()	<pre>def REST(RESTtype, requestURL, headers={}, data=None, params=None, json=None, version=None):</pre> <p>For example:</p> <pre>try: headers = {'content-type' : 'text/plain'} arielOptions = qpylib.REST('get', '/api/ariel/databases', headers = headers) except Exception as e: qpylib.log("Error " + str(e)) raise</pre>	Import the qpylib library to use this function to make calls to the QRadar REST API endpoints. The endpoint takes care of authentication and authorization by reusing the security tokens that are passed on the request from QRadar.
to_json_dict(JSON)	<pre>def to_json_dict(python_obj):</pre>	Converts a JSON object in to a Python dictionary.

Jinja2 templates

Jinja2 is a Python library that you can use to construct templates for various output formats from a core template text file. It can be used to create HTML templates for IBM QRadar applications.

Jinja2 has a rich API, and large array of syntactic directives (statements, expressions, variables, tags) that allow the dynamic injection of content into the templated file.

Use the Flask `render_template()` method in the app's `views.py` file to inject data from your Python method, served by the route, into a Jinja2 templated HTML file. For example:

```
__author__ = 'IBM'

from flask import render_template
from app import app

@app.route('/')
def hello_world():
    return render_template("hello.html", title = "QRadar")
```

The `hello.html` template must be stored in the `/app/templates` folder. The `hello.html` file is described in the following section:

```
<!doctype html>
<title>Hello from Flask</title>
<h1>Hello {{ title }}!</h1>
```

The template produces the following output:

```
<!doctype html>
<title>Hello from Flask</title>
<h1>Hello QRadar!</h1>
```

Note: Do not use the Flask-Jinja2-mandated `url_for` functionality within your app Jinja2 template. The QRadar GUI Application Framework uses relative addressing for request paths. If you use `url_for`, it creates an absolute request path from the container itself.

For more information about Jinja2 templates, see the [Jinja2 documentation](#).

Edit Jinja2 templates in Eclipse

You can use the Django template editor plug-in in Eclipse to develop Jinja2 templates.

PyDev Eclipse does not come with a Jinja2 template editor by default. The Django template editor plug-in offers useful features that you can employ to develop Jinja2 templates for your app.

Install the Django repository (<http://pydev.org/updates>) by clicking **Help > Install New Software** on the main Eclipse **Help** panel.

This plug-in offers useful syntax-highlighting and auto-completion features for Jinja2 template development.

Integrate JavaScript libraries into your template

Add CSS and JavaScript libraries to your HTML templates to style and enhance your apps user interface.

You can use the Dojo and JQuery JavaScript libraries that are integrated into IBM QRadar to add CSS styling, widgets, and other UI features to your app.

Dojo

To integrate the Dojo JavaScript toolkit into your app's HTML template, add the following tags to your template's HEAD element:

```
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>My app!</title>
  <link type="text/css" rel="stylesheet"
    href="/console/idt/dojo/resources/dojo.css"></link>
  <link type="text/css" rel="stylesheet"
    href="/console/idt/dijit/themes/dijit.css"></link>
  <link type="text/css" rel="stylesheet"
    href="/console/idt/dijit/themes/claro/claro.css"></link>
  <link type="text/css" rel="stylesheet"
    href="/console/idt/idx/themes/oneui/oneui.css"></link>
  <script type="text/javascript"
    src="/console/idt/dojo/dojo.js"
    data-dojo-config="async:true, parseOnLoad: true"></script>
</head>

<body></body>

</html>
```

QRadar uses Dojo 1.9.3.

JQuery

To integrate the JQuery JavaScript library into your app's HTML template, add the following tag to your template's HEAD element:

```
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>My app!</title>
  <script type="text/javascript"
    src="/console/core/js/jquery/jquery.min.js"></script>
</head>

<body></body>

</html>
```

App Framework JavaScript library

The App Framework JavaScript library provides helper functions for common QRadar calls that you can integrate into your own scripts.

The helper functions that are included in the App Framework JavaScript library (app/static/qjslib/qappfw.js) can be used to do the following tasks:

- Get information on the current application, user, item, or selected table rows.
- Open the **Details** page for an asset.
- Search for an event or flow by using a specified AQL query.

- Open the **Details** page for an offense.
- Call a REST method by using an XMLHttpRequest.
- Retrieve named services and named service endpoints.

You can view the HTML documentation for the JS library in the jsdoc directory after you unzip the SDK (.zip) file.

The helper functions in the App Framework JavaScript Library are described in the following table:

Table 39. App Framework JavaScript Library helper functions	
Function	Description
getApplicationBaseUrl(id)	Returns the base URL of an application.
getApplicationId()	Returns the ID of the current application. Note: The functions getApplicationId() and getApplicationBaseUrl (id) depend on a variable called <i>CURRENT_SCOPE</i> , which is injected into the JavaScript context by the app framework when it imports a JavaScript file that is defined in the page_scripts section of an app manifest file. The functions can only be used if you are using the page_scripts mechanism to pull in your custom JavaScript. For example, if you use a script tag in a Jinja template the functions won't work.
getCurrentUser()	Returns the current user.
getItemId()	Returns the ID of the item that is viewed (for example, an asset or offense).
getSelectedRows()	Returns the IDs of selected rows on a list page, such as the offense or asset list.
openAsset(assetId, openWindow)	Opens the Details page of an asset, either in a new window or in the Assets tab.
openAssetForIpAddress(ipAddress, openWindow)	Opens the Details page of an asset for an IP address, either in a new window or in the Assets tab.
openEventSearch(aql, openWindow)	Runs an event search with the specified AQL string, either in a new window or the Event Viewer tab.
openFlowSearch(aql, openWindow)	Runs a flow search with the specified AQL string, either in a new window or the Flow Viewer tab.
openOffense(offenseId, openWindow)	Opens the Details page of an offense, either in a new window or in the Offenses tab.
rest(args)	Calls a REST method by using an XMLHttpRequest.
buildNamedServiceEndpointRestArgs (restArgs, endpoint, parameterValues, bodyValue)	Populates an arguments object to be used in a QRadar.rest call to a named service endpoint.
callNamedServiceEndpoint (serviceName, serviceVersion, endpointName, restArgs, parameterValues, bodyValue)	A wrapper function that calls the / gui_app_framework/named_services REST API, selects the specified service endpoint, and invokes it by using the supplied parameters and values.
getNamedService (services, serviceName, serviceVersion)	Selects and returns a service from a list that is retrieved by a /gui_app_framework/named_services

Table 39. App Framework JavaScript Library helper functions (continued)	
Function	Description
<code>getNamedServiceEndpoint (service, endpointName)</code>	Selects and returns a service endpoint.

Communicating with QRadar hosts from Python

You can communicate with IBM QRadar Hosts from Python by using the REST endpoints that QRadar exposes.

As part of any communication from QRadar to an app, QRadar provides the following headers:

QRADAR-USER

This header contains the QRadar user name.

QRADAR-USER-ROLE

This header contains the user role assigned to the user.

QRADAR-SECURITY-PROFILE

This header contains the security profile that defines which networks, log sources, and domains that the user can access

qpylib library

The `qpylib` library provides functions that encapsulate much of the logic that is required to initiate this communication.

For REST API calls, use the `qpylib.REST(RESTtype, request_url, headers, data, json, params, version)` function. This function prepends the IP address of the host console to the request URL.

This REST function acts as a wrapper for the Python requests library. It returns a **`requests.Response`** object.

The following table describes the fields that you can access from this object:

Table 40. Response fields	
Field Name	Description
<code>status_code</code>	Status code for the response. Useful for determining the success of a request. For example, if you are checking for a 200 response.
<code>url</code>	URL of the request.
<code>headers</code>	Dictionary object that contains the response headers.
<code>text</code>	Raw text output of the response. Useful for debugging purposes.

The function parameters are explained in the following table:

Table 41. Function parameters	
Parameter Name	Explanation
<code>RESTtype</code>	String REST request type. Accepts 'GET', 'PUT', 'POST' and 'DELETE'.
<code>request_url</code>	URL of the REST endpoint. The <code>qpylib</code> library prepends the appropriate console IP address to the URL so that only the URL from <code>/api/</code> is needed. For example: <code>/api/gui_app_framework/applications</code> .

Table 41. Function parameters (continued)

Parameter Name	Explanation
headers (optional)	Optional headers to be added to the request. Headers must be contained within a Python dictionary object, for example, {'Accept': 'application/json'}.
data (optional)	Optional data that can be contained within a request's body. Data must be in the format that is appropriate to the REST endpoint. For example, data must be converted to a JSON string by using the JSON Python library (<code>json.dumps()</code>) when a REST endpoint accepts application/json .
json (optional)	Optional parameter that accepts Python dictionary objects that are converted to a JSON String that is included in the request's body.
params (optional)	Optional parameter that accepts Python dictionary objects that are converted to URL query parameters.
version (optional)	Optional parameter that specifies which version of the QRadar RESTful API to use. The value must be a string that matches a supported version of the QRadar RESTful API (for example, 5.0). If no version is specified, no version header is sent and the most recent version is used by default.

The Response object also contains functions that simplify access to the data contained in the response body. You can use the `json()` function to retrieve a dictionary object that contains the response body, or a list of dictionary objects if the endpoint returns a collection.

Example: Get QRadar Offenses

```
import qpylib
offenses_endpoint = '/api/siem/offenses'
headers = {'content-type': 'application/json'}
response = qpylib.REST('GET', offenses_endpoint, headers=headers)
offenses_json_list = response.json()
# List containing dictionary objects for each QRadar offense

# Iterate over each offense JSON in the list and print its id.
format_string = 'Found offense id [{0}].\n'
for offense_json in offenses_json_list:
    offense_id = str(offense_json['id']) # Access fields
    print(format_string.format(offense_id))
```

Example: Get QRadar Offenses With Queries

```
import qpylib
offenses_endpoint = '/api/siem/offenses'
headers = {'content-type': 'application/json'}
params = {'filter': 'inactive=false'}
response = qpylib.REST('GET', offenses_endpoint, headers=headers, params=params)
offenses_json_list = response.json()
```

Example: Post QRadar Offense Closing Reason

```
import qpylib
offense_closing_reasons_endpoint = '/api/siem/offense_closing_reasons'
headers = {'content-type': 'application/json'}
json_dict = {'reason': 'Demonstrating posting data to QRadar'}
response = qpylib.REST('POST', offense_closing_reasons_endpoint,
                      headers=headers, json=json_dict)
```

GUI Application Framework REST API endpoints

GUI Application Framework endpoints are available in the latest version of the IBM QRadar API that you can use to develop apps.

Apps are packaged as compressed archives (.zip), within the extension archive. Extensions can be installed or uninstalled by using RESTful endpoints. Apps within an extension (.zip) file use extra RESTful endpoints to control the lifecycle of an App with QRadar (install, delete, start, stop).

The following table lists the GUI Application Framework REST API endpoints:

Table 42. GUI Application Framework REST API endpoints		
Endpoint	Parameters	Description
GET /gui_app_framework/application_creation_task	Application ID	Retrieves a list of status details for all asynchronous requests to create apps.
GET /gui_app_framework/application_creation_task/{application_id}	Application ID	Retrieves a list of status details of an asynchronous request to create apps.
POST /gui_app_framework/application_creation_task	Application (.zip) bundle file	Creates an app within the application framework, and registers it with QRadar. The app is created asynchronously. A reference to the application_id is returned and must be used in subsequent API calls to determine the status of the app installation.
POST /gui_app_framework/application_creation_task/{application_id}	Application ID, cancel status	Updates a new app installation within the application framework. The application_id and a status parameters are required.
GET /gui_app_framework/applications		Retrieves a list of apps that are installed on the QRadar console, and their manifest JSON structures and status.
GET /gui_app_framework/applications/{application_id}	Application ID	Retrieves a specific app that is installed on the console and its manifest JSON structure and status.
POST /gui_app_framework/applications/{application_id}	Application ID, start/stop status	Updates an app. Starts or stops an app by setting status to RUNNING or STOPPED respectively.
PUT /gui_app_framework/applications/{application_id}	Application ID	Upgrade an application.
DELETE /gui_app_framework/applications/{application_id}	Application ID	Deletes an application.

Table 42. GUI Application Framework REST API endpoints (continued)

Endpoint	Parameters	Description
GET /gui_app_framework/named_services		Retrieves a list of all named services registered with the Application Framework.
GET /gui_app_framework/named_services/{uuid}	uuid	Retrieves a named service registered with the Application Framework by using the supplied uuid.

For more information, see the **API documentation** page on your QRadar Console: https://<Console_IP>/api_doc. Alternatively, see the *IBM QRadar API Guide*.

App logs

App logs are stored in the /store/log directory of your application's Docker container.

The /store/log directory contains 2 log files:

- `startup.log` is the initial start-up log for the application. This log is useful for checking the installation of dependencies added to your app's `app/src_deps/` folder.
- `app.log` is the log file that is created by the `qpylib` library. Logging calls to the `qpylib.log()` method are written in the `app.log` file.

Adding logging to your app

The IBM QRadar Python helper library (`qpylib`) contains two useful functions that you can use to add logging to your app.

The `log()` function

Import the `qpylib` helper library into your app's `views.py` to use the `log()` function. This function writes messages at your chosen log level to the `/store/log/app.log` file.

By default, logging is turned on and set to *INFO* level. Lower level logging messages are ignored. Use the `POST /log_level` endpoint to change log level.

The `log()` function uses the following format:

```
def log(message, level='info'):
```

For example:

```
from qpylib import qpylib
..
#in precedence order from lowest level to highest
qpylib.log('debug message' , 'debug')
qpylib.log('info message' , 'info')
qpylib.log('warning message' , 'warning')
qpylib.log('error message' , 'error')
qpylib.log('critical message' , 'critical')
```

Note:

All `qpylib` functions that you import into your app's `views.py` file can be called globally. For that reason, it is a good idea to add a namespace to the `qpylib` functions you import to prevent clashes with other functions.

The `set_log_level()` function

You can use this function to set the current log level. This function is used by the `POST /log_level` endpoint but can also be called programmatically.

```
def set_log_level(log_level='info'):
```

Viewing your app logs

Use built-in routes to create HTTP requests download, view, and set log collection levels.

You can create your own targeted web requests to the app for the following routes:

Table 43. Request routes		
Route	Format	Description
GET /debug	GET https://<console_ip>/console/plugins/{application_id}/app_proxy/debug	Download your <code>/store/log/app.log</code> file from inside the container for inspection.
GET /debug_view	GET https://<console_ip>/console/plugins/{application_id}/app_proxy/debug_view	Display the contents of the <code>/store/log/app.log</code> file inside your browser window.
POST /log_level	POST https://<console_ip>/console/plugins/{application_id}/app_proxy/log_level form body: level = 'INFO' 'DEBUG' 'ERROR' 'WARNING' 'CRITICAL'	Dynamically define the level of logging that you want your app to capture. Post a form, with an attribute level that is set to one of the log level values to this endpoint. QRadar dynamically reset the log collection levels in your <code>/store/log/app.log</code> file.

The `application_id` is the integer value that is assigned when you use the installation RESTful endpoints for GUI app creation. The `application_id` value is recorded in the Application Creation Task state output that is returned when you run the **qradar_app_creator deploy** command.

Viewing logs within the host directory

All logs are located in the `/store/log` directory of the container.

Stopping, restarting, and uninstalling an app

You can stop, restart, or uninstall your app by using the IBM QRadar GUI Application Framework REST API endpoints.

Stopping your app

You can disable your application that is running by sending the following empty POST request:

```
POST /api/gui_app_framework/applications/{app_id}?status="STOPPED"
```

Restarting your app

You can restart your app by sending the following POST request:

```
POST /api/gui_app_framework/applications/{app_id}?status="RUNNING"
```

Uninstalling your app

Use the following DELETE request to uninstall and remove an app:

```
DELETE /api/gui_app_framework/applications/{app_id}
```

Checking the status of your app

After starting or stopping your app, you can check the status of the app by sending the following GET request:

```
GET /api/gui_app_framework/application_definitions/{app_id}
```

App upgrades

Upgrade your app by using the IBM QRadar **Extensions Management**.

Note: As a best practice, store your app configuration and data in `/store` because data in this directory is protected during app upgrades.

Important: If you want to upgrade an installed app that uses a lot of memory, you might need to stop the app before you do the upgrade to avoid memory resource issues, and then restart the app after you complete the upgrade.

Available user role capabilities

Capabilities are sets of permissions that are tied to user roles that are defined in the IBM QRadar **Admin** tab.

The following table lists the capabilities that are supported by the QRadar GUI Application Framework. Use the values in the **Capability** column to define the user privileges for your app in the `required_capabilities` field of the object type block in your application's `manifest.json` file.

The following table describes supported user role capabilities.

Table 44. Supported user role capabilities	
Capability	Description
ADMIN	System administrator. Grants permission to access all areas of the user interface. Users who have this access cannot edit other administrator accounts.
VIEWADMIN	Remote networks and services configuration. Grants permission to configure remote networks and services on the Admin tab.
SEM	Offense management
SEM.VIEWRULES	View custom rules
SEM.RULECREATION	Maintain custom rules
SEM.ASSIGNOFFENSE	Assign offenses to users
SEM.MANAGECLOSINGREASONS	Close offenses, manage offense closing reasons
EventViewer	Event viewer
EventViewer.VIEWRULES	View custom rules
EventViewer.RULECREATION	Maintain custom rules

Table 44. Supported user role capabilities (continued)

Capability	Description
EventViewer.CUSTOMARIELPROPERTY	User-defined event properties
EventViewer.MANAGETIMESERIES	Manage time series
ASSETS	Asset management
ASSETS.VADATA	View VA data
ASSETS.VASCAN	Perform VA scans
ASSETS.SERVERDISCOVERY	Server discovery
ASSETS.REMOVEVULNS	Remove vulnerabilities
SURVEILLANCE	Network Surveillance
SURVEILLANCE.VIEWRULES	View custom rules
SURVEILLANCE.DATAMINECONTENT	View flow content
SURVEILLANCE.CUSTOMFLOWPROPERTY	User-defined flow properties
SURVEILLANCE.MANAGETIMESERIES	Manage time series
SURVEILLANCE.RULECREATION	Maintain custom rules
REPORTING	Reporting
REPORTING.MAINTAINTEMPLATES	Maintain templates
REPORTING.DISTRIBUTE	Distribute reports via email
FORENSICS	Incident Forensics
FORENSICS.CASECREATION	Create cases in Incident Forensics
QRM	QRM permission
QVM	QVM permissions
QVM.ASSIGNASSETOWNER	Assign asset owner
QVM.VULNERABILITY	Assign vulnerability permissions
QVM.EXCEPTION	Exception vulnerability permissions
QVM.SCANPOLICY	Scan policy permissions
QVM.SCANPROFILE	Scan profile permissions

For more information about capabilities and user roles in QRadar, see the *IBM QRadar Administration Guide*.

App names, GUI action groups, and page IDs

App names, GUI action groups, and page IDs are identifiers that IBM QRadar uses for QRadar products, GUI actions, and UI pages.

The following manifest blocks use these identifiers.

The groups field of the gui_actions block uses GUI action group identifiers to specify the toolbar or right-click menu where the GUI action is added:

```
...
"gui_actions": [
```

```

{
  "id": "sampleToolbarButton",
  "text": "Sample Toolbar Button",
  "description": "Sample toolbar button that
    calls a REST method, passing an offense ID along",
  "icon": null,
  "rest_method": "sampleToolbarMethod",
  "javascript": "alert(result)",
  "groups": [ "OffenseListToolbar" ],
  "required_capabilities": [ "ADMIN" ]
}
],
..

```

The **app_name** and **page_id** fields of the `page_scripts` block use the app name and page ID identifiers to specify the QRadar application tab and sub page into which the page script is added.

```

...
  "page_scripts": [
    {
      "app_name": "SEM",
      "page_id": "OffenseList",
      "scripts": [ "/static/sampleScriptInclude.js" ]
    }
  ],
...

```

Supported app names

The following table shows a list of supported app names with descriptions.

Table 45. Supported app names	
App Name	Description
assetprofile	Asset Profile (for example, Vulnerabilities: Manage Vulnerabilities, search)
Assets	Assets Manager
EventViewer	Event Viewer (for example, syslogdestination)
Forensics	Incident Forensics
QRadar	QRadar (for example, Reference Data)
QVM	QRadar Vulnerability Manager
Reports	Reports
Sem	Offense Management
SRM	QRadar Risk Manager
Surveillance	Network Surveillance (Flows)

Supported GUI Actions and corresponding page IDs

The following table describes the supported GUI Actions and corresponding page IDs.

Table 46. Supported GUI Actions and Page IDs			
GUI Action group	App name	Page ID	Location
AssetDetailsToolbar	Assets	AssetDetailsVulnList	Assets - click on IP Address/ Vulnerabilities - Manage Vulnerabilities - By Asset - click on IP Address
AssetListToolbar	Assets	AssetList	Asset tab list

Table 46. Supported GUI Actions and Page IDs (continued)

GUI Action group	App name	Page ID	Location
AssetOwnerToolbar	assetprofile	AssetOwner	Vulnerabilities tab - left panel - Vulnerability Assignment
AttackerList	SEM	OffenseSummary	Offense Tab - All Offenses - double-click offense row - right-click row in Top 5 Source IPs section
AttackerListSmallToolbar	SEM	OffenseAttackerList	Offenses tab - All Offenses - double-click offense row - click Sources button on Top 5 Source IPs toolbar
		NetworkAttackerList	Offenses tab - By Network - select row - click Sources button on toolbar to view List of Sources
		TargetAttackerList	Offenses tab - By Destination IP - select row, click Sources button on toolbar to view List of Sources
AttackerListToolbar	SEM	AttackerList	Offenses tab - By Source IP
ByAssetListFormToolbar	assetprofile	ByAssetListForm	Vulnerabilities tab - Manage vulnerabilities - by Asset
ByNetworkListToolbar	assetprofile	ByNetworkList	Vulnerabilities tab - Manage vulnerabilities - by Network
ByOpenServiceListToolbar	assetprofile	ByOpenServiceList	Vulnerabilities tab - Manage vulnerabilities - by Open Service
ByVulnerabilityInstanceListToolbar	assetprofile	ByVulnerabilityInstanceList	Vulnerabilities tab - Manage vulnerabilities - By vulnerability instance - main screen
ByVulnerabilityListToolbar	assetprofile	ByVulnerabilityList	Vulnerabilities tab - Manage vulnerabilities - By vulnerability
CategoryList	SEM	OffenseSummary	Offenses tab - All Offenses, - double-click row -Top 5 Categories table - right-click a row
CategoryListToolbar	SEM	OffenseCategoryList	Offenses Tab - All offenses - double-click row - click Display > Categories in toolbar - List of Event Categories table toolbar
DomainListToolbar	QRadar	DomainList	Admin tab - Domain Management
EventDetailsToolbar	Event Viewer	EventDetails	Log Activity tab - pause - click row - Events detail toolbar
ExceptionRulesListToolbar	assetprofile	ExceptionRulesList	Vulnerabilities tab - Vulnerability exception
FlowDetailsToolbar	Surveillance	FlowDetails	Network Activity - double-click on a flow.
FlowsourceListToolbar	Surveillance	FlowsourceList	Admin tab - Flow Sources
MyAssignedVulnerabilitiesListToolbar	assetprofile	MyAssignedVulnerabilitiesList	Vulnerability tab - My assigned vulnerabilities
NetworkHierarchyListToolbar	QRadar	NetworkHierarchyList	Admin tab - Network Hierarchy
NetworkListSmallToolbar	SEM	OffenseNetworkList	Offenses tab - All Offenses - double-click row - click Display in toolbar, Networks, Destination Networks table, toolbar, and right click
NetworkListToolbar	SEM	NetworkList	Offenses -By Network
NetworkSummaryToolbar	SEM	NetworkOffenseList	Offenses Tab - By Network - double-click an offense.
ObfuscationProfileContextMenu	QRadar	ObfuscationProfiles	Admin - Data Obfuscation Management
ObfuscationRightClick	QRadar		Deprecated
OffenseListSmallToolbar	SEM	AttackerOffenseList	Offenses - double-click a row in Offenses - double-click row in Top 5 SourceIPs - select a row and right click
	SEM	TargetOffenseList	Offenses - double-click a row in Offenses - double-click row in Top 5 SourceIPs - double-click a row - select a row and right click
OffenseListToolbar	SEM	OffenseList	Offenses tab main page
OffenseSummaryToolbar	SEM	OffenseSummary	Offenses tab, double-click Offense - toolbar
		OffenseDeviceList	Click Display > Log Sources
		OffenseUserList	Click Display > Users
		OffenseRuleList	Click Display > Rules

Table 46. Supported GUI Actions and Page IDs (continued)

GUI Action group	App name	Page ID	Location
OffenseSummaryToolbar		OffenseAttackerList Added in QRadar V.7.3.0	Offenses tab, double-click Offense - on toolbar, Click Display > Sources
		OffenseCategoryList Added in QRadar V.7.3.0	Offenses tab, double-click Offense - on toolbar, Click Display > Categories
		OffenseNetworkList Added in QRadar V.7.3.0	Offenses tab, double-click Offense - on toolbar, Click Display > Networks
OffenseSummaryToolbar	SEM	OffenseAnnotationList Added in QRadar V.7.3.2	Click Display > Annotations
OffenseSummaryToolbar	SEM	OffenseTargetList Added in QRadar V.7.3.2	Click Display > Destinations
OffenseSummaryToolbar	SEM	NotesList Added in QRadar V.7.3.2	Click Display > Notes
ReferenceSetElemsContextMenu	QRadar	ReferenceSetElems	Admin tab - Reference Set Management - View a reference set - Content tab, right-click row
ReferenceSetElemsToolbar	QRadar	ReferenceSetElems	Admin tab - Reference Set Management - View a reference set - Content tab
ReferenceSetRulesContextMenu	QRadar	ReferenceSetRules	Admin tab - Reference Set Management - View a reference set - References tab, right-click row
ReferenceSetRulesToolbar	QRadar	ReferenceSetRules	Admin tab - Reference Set Management - View a reference set - References tab, click row, click toolbar button
ReferenceSetsContextMenu	QRadar	ReferenceSets	Admin tab - Reference Set Management - right-click a reference set.
ReferenceSetsToolbar	QRadar	ReferenceSets	Admin tab -Reference Set Management
ReportTemplateListToolbar	Reports	ReportTemplateListAll	Reports tab toolbar
ScanPolicyVulnerabilityListToolbar	assetprofile	ScanPolicyVulnerabilityList	Vulnerabilities tab - Left panel - Administrative - Scan Policies - Add - Scan Type Patch - Vulnerabilities Tab - Add. GUI action appears in toolbar
ScanResultsListToolbar	QVM	ScanResultsList	Vulnerabilities Tab - Scan Results
SensorDeviceListToolbar	EventViewer	SensorDeviceList	Admin tab - Log Sources
TargetList	SEM	OffenseSummary	Offenses tab - double-click offense, Top 5 Destination IPs table, right-click row.
TargetListToolbar	SEM	TargetList	Offenses tab - By Destination IP.
TargetSummaryToolbar	SEM	TargetOffenseList	Offenses tab - By Destination IP - double-click offense
		TargetNotesList	Offenses tab - By Destination IP - double click offense - click Notes on toolbar
		TargetAttackerList	Offenses tab - By Destination IP - double click offense - click Sources on toolbar
TenantListToolbar	QRadar	TenantList	Admin tab - Tenant Management
VaScannerSchedulesListToolbar	Assets	VaScannerSchedulesList	Admin tab - Schedule VA Scanners
VaScannersListToolbar	Assets	VaScannersList	Admin tab - VA Scanners
ViewNotesToolbar	SEM	OffenseSummary	Offenses tab - double-click Offense, Last 5 Notes table toolbar
ViewOffenseDevicesToolbar	SEM	OffenseSummary	Offenses tab - double-click Offense - Top 5 Log Sources table toolbar
ViewoffenseusersToolbar	SEM	OffenseSummary	Offenses tab - double-click Offense, Top 5 Users table toolbar
VulnerabilityManagementListPopup	assetprofile	ByAssetListForm, ByNetworkList, ByOpenServiceList, ByVulnerabilityList, MyAssignedVulnerabilitiesList, ByVulnerabilityInstanceList	Vulnerabilities tab - Manage Vulnerabilities - By Network - By Asset - By Vulnerability - By Open Service - My Assigned Vulnerabilities

Table 46. Supported GUI Actions and Page IDs (continued)			
GUI Action group	App name	Page ID	Location
arielListToolbar	Surveillance	FlowList	Network Activity tab
customEventListToolbar	EventViewer	EventList	Log Activity tab
ipPopup	Assets assetprofile assetprofile assetprofile assetprofile	AssetList MyAssignedVulnerabilitiesList ByVulnerabilityInstanceList ByAssetListForm ExceptionRulesList	Right-click IP address on Assets tab, Vulnerability tab - Manage Vulnerabilities - Vulnerability Exception
userNamePopup	Assets	AssetDetailsVulnList	For example, Assets Tab, click IP Address to View Asset Details, select a row in Vulnerabilities table, right-click Technical User, see right-click View Assets /View Events Also used in Offenses, Log Activity.

Deprecated GUI actions

In QRadar V7.3.0 and later, the following GUI actions are deprecated:

- OffenseList
- NetworkList
- HistoricalCorrelationToolbar
- OffenseRuleList
- OffenseDeviceList
- OffenseUserList
- NotesList
- ByAssetListForm

Application globalization

Globalization refers to implementing multi-language support for your app that is built into the application without the need for further engineering efforts.

Consider two aspects when you globalize your app:

- Globalization of IBM QRadar specific elements such as tab labels, toolbar button text, and tooltip content.
- Globalization of application-specific content

Globalization of QRadar specific elements

QRadar elements are object types that can be defined in the application `manifest.json` file.

Globalization of QRadar elements includes the use of translated keys that are injected into your app's `manifest.json`, and ingested into the QRadar globalization store.

Globalization of application-specific content

The GUI Application Framework does not support any single pre-defined globalization approach nor does it provide an implementation stack for app developers to use for globalization. You can use common Flask and python packages and approaches to globalize your application-specific content.

Globalization of QRadar elements

Add language-specific text strings to your app to globalize IBM QRadar elements such as tab labels, toolbar button text, and tooltip content.

To globalize you app, you must create locale-specific properties files for the locales you want to use.

In the `manifest.json` file, you must configure the `resource_bundles` block to define the locales and the location of properties files that contains locale-specific text strings your app uses.

Globalization resource bundle properties files for the specified language code are stored in the app's `app/static/resources` folder. The string elements are displayed in the current IBM QRadar user's preferred locale, as defined within the QRadar GUI itself.

In the following example, the "Hello World" app includes locale-specific text.

`manifest.json`

```
{
  "name": "com.ibm.hellog11n.name",
  "description": "Application to display QHelloWorld",
  "version": "1.0.2",

  "areas": [
    {
      "id": "com.ibm.hellog11n.name",
      "text": "com.ibm.hellog11n.name",
      "description": "com.ibm.hellog11n.desc",
      "url": "index",
      "required_capabilities": ["ADMIN"]
    }
  ],

  "resource_bundles": [
    {
      "locale": "en_US",
      "bundle": "resources/hello_en_US.properties"
    },
    {
      "locale": "es",
      "bundle": "resources/hello_es.properties"
    },
    {
      "locale": "fr",
      "bundle": "resources/hello_fr.properties"
    },
    {
      "locale": "en",
      "bundle": "resources/hello_en.properties"
    },
    {
      "locale": "ja",
      "bundle": "resources/hello_ja.properties"
    }
  ]
}
```

Three globalization keys are referenced by the app manifest metadata definition file:

- `com.ibm.hellog11n.id`
- `com.ibm.hellog11n.name`
- `com.ibm.hellog11n.desc`

The `resource_bundles` block defines locales for standard English, American English, French, and Spanish. The **bundle** field points to the properties file for each language locale.

Globalization key naming conventions

Use a consistent naming format for any globalization keys that are made available by resources files within your app code. One useful approach is to employ a fully qualified company-app prefix to all your keys. This strategy prevents the replication of existing QRadar globalization store keys or keys made available by other apps.

Here's an example:

- `com.ibm.myapp.key1=value1`
- `com.ibm.myapp.key2=value2`

Properties files

The `resource_bundles` block defines locales for standard English, American English, French, Spanish and Japanese. The **bundle** field points to the properties file for each language locale.

The properties files are stored in the `app/static/resources` folder.

The **id**, **text**, and **description** fields in the **areas** block use the key that is defined in the properties files. The key contains the value that is used for the app's user interface tab name in each language.

Text strings for globalization are stored as key/value pairs in Java format properties files.

Language locale properties file must use the following naming convention:

`application_<LANG>.properties`. For the purposes of this example, four properties files were created.

These properties files are consumed by the main QRadar SIEM codebase, within a Java virtual machine (JVM). It must adhere to Java processing support for properties files. Currently, Latin-1 font characters, and Unicode characters are supported. Language sets that contain non-Latin-1 font characters must be represented by their Unicode equivalents. Install the Java 7 Java Development Kit (JDK) and use the Java Native-To-ASCII converter (`native2ascii`) to convert your content.

`static/resources/hello_en.properties:`

```
com.ibm.hello11n.name=Hello World
com.ibm.hello11n.id=Hello_World_G11n
com.ibm.hello11n.desc=A fully globalized Hello World App
```

`static/resources/hello_en_US.properties:`

```
com.ibm.hello11n.name=Hello World
com.ibm.hello11n.id=Hello_World_G11n
com.ibm.hello11n.desc=A fully globalized Hello World App
```

`static/resources/hello_es.properties:`

```
com.ibm.hello11n.name=Hola Mundo
com.ibm.hello11n.id=Hello_World_G11n
com.ibm.hello11n.desc=Un totalmente globalizado Hello World App
```

`static/resources/hello_fr.properties:`

```
com.ibm.hello11n.name=Bonjour Le Monde
com.ibm.hello11n.id=Hello_World_G11n
com.ibm.hello11n.desc=Un App World Bonjour totalement globalisé
```

`static/resources/hello_ja.properties:`

```
com.ibm.hello11n.name=\u3053\u3093\u306b\u3061\u306f\u4e16\u754c
com.ibm.hello11n.id=Hello_World_G11n
com.ibm.hello11n.desc=\u5b8c\u5168\u306b\u30b0\u30ed\u30fc\u30d0\u30eb\u306aHello
World\u30a2\u30d7\u30ea\u30fc\u30b7\u30e7\u30f3
```

Your Flask endpoint/services code: views.py

The `views.py` file defines a flask route, or service endpoint, that uses a Jinja2 template HTML page to build an HTML string that is to be returned from the service endpoint.

```
__author__ = 'IBM'

from flask import render_template, send_from_directory
from app import app
from qpylib import qpylib

@app.route('/')
@app.route('/index')
def index():
    return render_template("index.html", title = "QApp1 : Hello World !")
```

The rendered views: app/templates/index.html

The following Jinja2 template is a simple web page, a static HTML string that is returned by the endpoint. No globalization occurs within your view with the following example.

```
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>{{title}} - Main</title>
  <link rel="stylesheet" href="static/css/style.css">
</head>
<body>
<div id="pageheader" class="pagebanner">
  IBM QRadar Application : Hello World !...
</div>

<div id="contentpane">
  Hello! Welcome to the first Qradar app served from the AppFramework
</div>

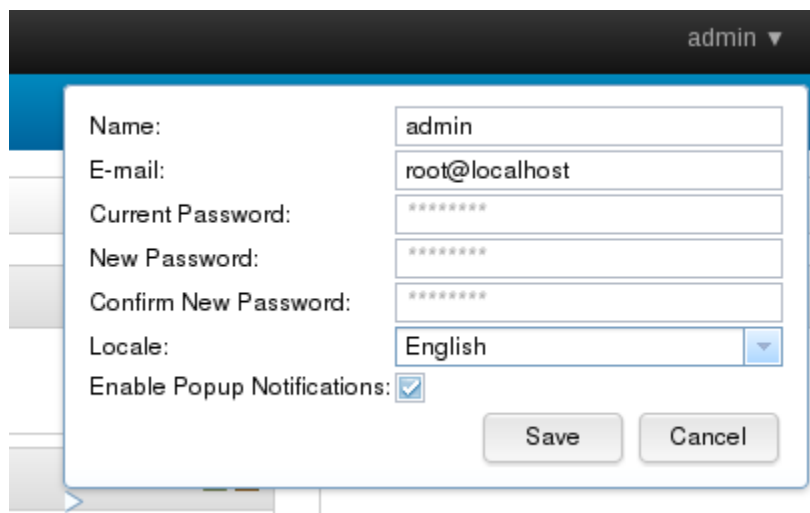
</body>
</html>
```

QRadar user locale preferences

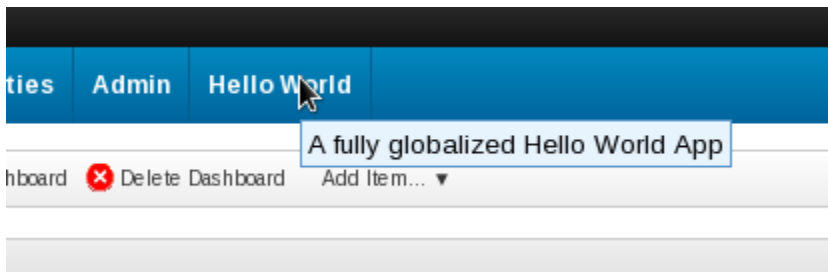
To view the locale-specific content in QRadar, you must set your locale preferences.

Click **Admin > User Preferences** on the upper left of the QRadar user interface, and then select your locale from the **Locale** menu.

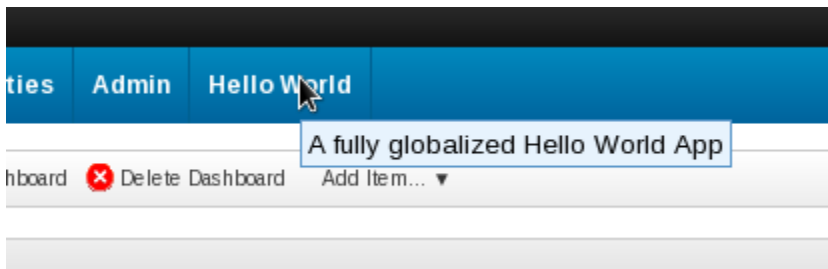
The following image shows the user locale preferences dialog.



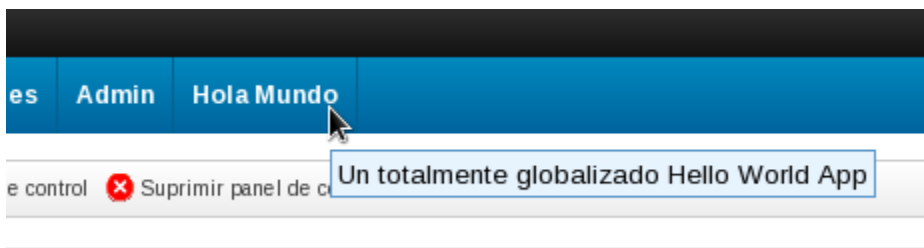
For the current example, if you choose any of the English language locales, you see:



For the current example, if you choose any of the Spanish language locales, you see:
You see the following image, if you choose any of the English language locales.



You see the following image, if you choose any of the Spanish language locales.



You see the following image, if you choose any of the Japanese language locales.



You can determine the following information from these globalized examples:

- The new tab uses the value in the `manifest.json` *name* field as the text value for the tab.
- The tab tooltip the value in the `manifest.json` *description* field as the text value for its content.
- Globalization resource files that are bundled with the app are ingested by the QRadar globalization store.
- QRadar user session preferences for each locale use key look-ups to reflect the language-specific text you want to display.

Globalization of application-specific content

Globalize application-specific content by using Python Babel, Flask Babel, and Jinja2 templates to .
Use the links to the following technologies to help you globalize your application-specific content:

- [Babel](http://babel.pocoo.org/) (<http://babel.pocoo.org/>) is the standard globalization package for Python.
- [Flask-Babel](https://pythonhosted.org/Flask-Babel/) (<https://pythonhosted.org/Flask-Babel/>) is an extension to Flask.
- [Jinja2/Babel integration](http://jinja.pocoo.org/docs/dev/integration/) (<http://jinja.pocoo.org/docs/dev/integration/>) provides instructions on how to use Babel with Jinja2 templates.

Key concepts

For this example, you install the Flask-Babel *pip* package and its dependents into your app's `src_deps/pip/` directory. The Flask-Babel package, provides the *pybabel* tool, which you can use to create translation files for your Flask-based app.

QRadar passes the user's preferred locale in the **Accept-Languages** header attribute through in the request header to your app.

To use the *Flask-Babel* package to create globalization text values that your app employs, use the following workflow:

1. Use the *pybabel* tool to extract out locale keys, typically to a `.pot` file.
2. Use the *pybabel* tool to build templated `.po` files for each language set you want to support.
3. Edit and complete the `.po` file. In other words, translate all the keys to the language-specific variant of the text value.
4. Use the *pybabel* tool to compile the completed `.po` files into a binary set of `.mo` files that can be employed by your Flask python code, or your Jinja2 templates.

Pre-requisites

To work through this example, you must install the following Python packages into your app's `src_deps/pip/` directory.

- `pytz-2015.6-py2.py3-none-any.whl`
- `Babel-2.1.1-py2.py3-none-any.whl`
- `speaklater-1.3.tar.gz`
- `Flask-Babel-0.9.tar.gz`

You must also create an `ordering.txt` file in the `src_deps/pip/` directory that contains the following content:

```
pytz-2015.6-py2.py3-none-any.whl
Babel-2.1.1-py2.py3-none-any.whl
speaklater-1.3.tar.gz
Flask-Babel-0.9.tar.gz
```

Note: Use the **`pip install -d src_deps/pip flask-babel`** command from within the virtual environment that the SDK provides to download the dependencies for Flask-Babel.

Bundle python wheel (*whl*) files instead of `.tar` file (`tar.gz`) source files wherever possible. Some raw python source package `.tar` files need to use the *gcc* compiler or other tools that the base docker container that hosts your app code might not have.

Build python wheel files from package source tarballs on your local system. Here's an example:

```
tar -xvzf some_package.tar.gz
python setup.py sdist bdist_wheel
```

Jinja2 template: app/templates/index.html

This example builds on the [HelloWorld](#) sample app. The original HTML template was built with hardcoded English language-specific text values. The following example wraps the English locale strings values with Jinja2 directives that use the `gettext` functions from Flask-Babel. Here's an example:

```
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>{{title}} - Main</title>
  <link rel="stylesheet" href="static/css/style.css">
</head>

<body>
<div id="pageheader" class="pagebanner">
<p>{{ _( 'IBM QRadar Application : Hello World' ) }}</p>
</div>

<div id="contentpane">
  <p>{{ _( 'Hello! and Welcome to the first Qradar app
            served from the AppFramework/Docker instance on your console' ) }}</p>
</div>

<div class="news-wrapper">
  <p class="quote">{{ _( 'Hello World' ) }}</p>
</div>

</body>
</html>
```

This example uses the shorthand alias for `gettext` function. You can also use the full form. For example:

```
{{ gettext( '...' ) }}
```

This method provides a useful mechanism to quickly build and prototype your app. You can return later to make it locale aware. By using the actual initial text as keys, you keep the template readable.

Note: Eliminate white space around the directive. For example, consider the use of an HTML ``, `<div>` or other element. The *pybabel* tool has some difficulties to extract all key values.

Configure pybabel

You must configure the *pybabel* tool so that it is aware of what source files to examine.

```
[python: **.py]
[jinja2: **/templates/**/*.html]
extensions=jinja2.ext.autoescape,jinja2.ext.with_
```

In this example, *pybabel* is configured to examine all Python source files in the `app/` folder, and all HTML files in any sub directory of the `app/templates/` folder.

The *pybabel* tool uses the `babel.pyfile` to know which directories or files to examine within your app for potential translatable entries. It looks for `gettext(. .)` and `_(. .)` entries in your `*.py` files and your Jinja2 templates to build into a local `.pot` file.

Create the .pot file

To create a `.pot` file, open a command line and type the following command from within the `app/` folder:

```
pybabel extract -F babel.cfg -o messages.pot
```

A `message.pot` file is created in the `app/` folder. Its content is similar to the following file:

```
# Translations template for PROJECT.
# Copyright (C) 2015 ORGANIZATION
# This file is distributed under the same license as the PROJECT project.
# FIRST AUTHOR <EMAIL@ADDRESS>, 2015.
#
#
```

```
msgid ""
msgstr ""
"Project-Id-Version: PROJECT VERSION\n"
"Report-Msgid-Bugs-To: EMAIL@ADDRESS\n"
"POT-Creation-Date: 2015-10-07 21:27+0100\n"
"PO-Revision-Date: YEAR-MO-DA HO:MI+ZONE\n"
"Last-Translator: FULL NAME <EMAIL@ADDRESS>\n"
"Language-Team: LANGUAGE <LL@li.org>\n"
"MIME-Version: 1.0\n"
"Content-Type: text/plain; charset=utf-8\n"
"Content-Transfer-Encoding: 8bit\n"
"Generated-By: Babel 1.3\n"

#: templates/index.html:11
msgid "IBM QRadar Application : Hello World"
msgstr ""

#: templates/index.html:15
msgid ""
"Hello! and Welcome to the first Qradar app served from the "
"AppFramework/Docker instance on your console"
msgstr ""

#: templates/index.html:19
msgid "Hello World"
msgstr ""
```

You can use the **msgid** entries as your keys.

Create the .po files

You create individual language-specific .po files for Spanish, French, and English. From a command line, type the following commands from within the app/ folder:

```
pybabel init -i messages.pot -d translations -l es
pybabel init -i messages.pot -d translations -l fr
pybabel init -i messages.pot -d translations -l en
pybabel init -i messages.pot -d translations -l ja
```

These commands are used to create the translation files in the following locations:

- app/translations/es/LC_Messages/messages.po
- app/translations/fr/LC_Messages/messages.po
- app/translations/en/LC_Messages/messages.po
- app/translations/ja/LC_Messages/messages.po

The following example is the app/translations/es/LC_Messages/messages.po file that is generated:

```
# Spanish translations for PROJECT.
# Copyright (C) 2015 ORGANIZATION
# This file is distributed under the same license as the PROJECT project.
# FIRST AUTHOR <EMAIL@ADDRESS>, 2015.
#
#
msgid ""
msgstr ""
"Project-Id-Version: PROJECT VERSION\n"
"Report-Msgid-Bugs-To: EMAIL@ADDRESS\n"
"POT-Creation-Date: 2015-10-07 16:02+0100\n"
"PO-Revision-Date: 2015-10-07 16:04+0100\n"
"Last-Translator: FULL NAME <EMAIL@ADDRESS>\n"
"Language-Team: es <LL@li.org>\n"
"Plural-Forms: nplurals=2; plural=(n != 1)\n"
"MIME-Version: 1.0\n"
"Content-Type: text/plain; charset=utf-8\n"
"Content-Transfer-Encoding: 8bit\n"
"Generated-By: Babel 1.3\n"

#: templates/index.html:11
msgid "IBM QRadar Application : Hello World"
msgstr ""

#: templates/index.html:15
```

```
msgid "Hello! and Welcome to the first QRadar app served from the "
"AppFramework/Docker instance on your console"
msgstr ""

#: templates/index.html:19
msgid "Hello World"
msgstr ""
```

Edit the .po files

You edit the .po files to add the language-specific text strings that QRadar uses to translate your app's content. For each **msgid** in the .po file, you must enter a corresponding **msgstr** value in the target language.

The following example is a code snippet from the app/translations/es/LC_Messages/messages.po file:

```
#: templates/index.html:19
msgid "Hello World"
msgstr "Hola Mundo"
```

Create the .mo files

To create the .mo files, open a command line and type the following command from within the app/ folder:

```
pybabel compile -d translation
```

This command compiles all your .po files into .mo files in the following locations:

- app/translations/es/LC_Messages/messages.mo
- app/translations/fr/LC_Messages/messages.mo
- app/translations/en/LC_Messages/messages.mo
- app/translations/ja/LC_Messages/messages.mo

The QRadar GUI app framework provides a default Flask environment that looks for locale-specific files in the sub directories of the app/translations/ folder.

To specify the UTF-8 encoded locales that your app supports, you can add a config.py file to the app/ folder. The file contains content similar to the following example:

```
# -*- coding: utf-8 -*-
# ...
# available languages
LANGUAGES = {
    'en': 'English',
    'es': 'Español',
    'fr': 'Français',
    'ja': '日本語'
}
```

This globalization support file helps QRadar to find the .mo file for each locale you specify.

After you create the .mo files, you can remove the .po, .pot, and babel.py files if you do not want these resources to be packaged with your app.

views.py

```
__author__ = 'IBM'

from flask import render_template, send_from_directory, request
from app import app
from flask.ext.babel import gettext 1
from config import LANGUAGES
from qpylib import qpylib
```

```

from flask.ext.babel import Babel
babel = Babel(app) 2

@babel.localeselector 3
def get_locale():
    return request.accept_languages.best_match(LANGUAGES.keys())

@app.route('/')
@app.route('/index')
def index():
    qpylib.log(request.headers.get('Accept-Language', ''))
    return render_template("index.html", title = "QApp1 : Hello World !")

```

The following list describes content from the `views.py` code snippet:

1. The `gettext` method is imported from the Babel package. This line is optional but it is useful if you want to use locale text away from the python tier. In the Jinja2 template for this example, the `gettext` methods were used to extract key values.
2. The Flask app is injected into a Babel context so that your app can render locale-specific text.
3. This code applies the Babel `localeselector` decorator pattern across all your routes (in other words, any request that comes in from QRadar). The decorator uses the locales that are defined in the `app/config.py` file to connect the best-fit language-specific keys file to the incoming request.

Custom fragments injection points

Use custom fragment injection points to display custom information in QRadar.

You add the injection point information to the **app_name**, **page_id**, and **location** fields in the `fragments` block in the manifest file. The following table lists the injection point locations that you use in the `fragments` block for each tab and page.

For some QRadar pages, HTML fragments can be injected at the top (header) or bottom (footer) of the page. If injection points are not specified in the injection point name, the content is injected at the top of the page (header). On the **Admin** tab, you can inject content at each section header.

The following table shows examples of custom fragments.

Table 47. Custom fragments injection point examples	
Tab and page	Sample manifest entry
Offenses > My Offenses header	<pre> "fragments": [{ "app_name": "SEM", "page_id": "MyOffenseList", "location": "header" "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > My Offenses footer	<pre> "fragments": [{ "app_name": "SEM", "page_id": "MyOffenseList", "location": "footer" "rest_endpoint": "/somerestendpoint" } </pre>

Table 47. Custom fragments injection point examples (continued)

Tab and page	Sample manifest entry
Offenses > All Offenses > header	<pre> "fragments": [{ "app_name": "SEM", "page_id": "OffenseList", "location": "header" "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > All Offenses footer	<pre> "fragments": [{ "app_name": "SEM", "page_id": "OffenseList", "location": "footer" "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > By Category header	<pre> "fragments": [{ "app_name": "SEM", "page_id": "CategoryTypeSummaryList", "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > By Source IP header	<pre> "fragments": [{ "app_name": "SEM", "page_id": "AttackerList", "location": "header" "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > By Source IP footer	<pre> "fragments": [{ "app_name": "SEM", "page_id": "AttackerList", "location": "footer" "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > By Destination IP header	<pre> "fragments": [{ "app_name": "SEM", "page_id": "TargetList", "location": "header" "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > By Destination IP footer	<pre> "fragments": [{ "app_name": "SEM", "page_id": "TargetList", "location": "footer" "rest_endpoint": "/somerestendpoint" } </pre>

Table 47. Custom fragments injection point examples (continued)

Tab and page	Sample manifest entry
Offenses > By Network header	<pre> "fragments": [{ "app_name": "SEM", "page_id": "NetworkList", "location": "header" "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > By Network footer	<pre> "fragments": [{ "app_name": "SEM", "page_id": "NetworkList", "location": "footer" "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > Rules header	<pre> "fragments": [{ "app_name": "QRadar", "page_id": "RulesWizardExistingRules", "rest_endpoint": "/somerestendpoint" } </pre>
Offenses > Offense Summary header	<pre> "fragments": [{ "app_name": "SEM", "page_id": "OffenseSummary", "rest_endpoint": "/somerestendpoint" } </pre>
Assets > Asset Profiles header	<pre> "fragments": [{ "app_name": "Assets", "page_id": "AssetList", "location": "header" "rest_endpoint": "/somerestendpoint" } </pre>
Assets > Asset Profiles footer	<pre> "fragments": [{ "app_name": "Assets", "page_id": "AssetList", "location": "footer" "rest_endpoint": "/somerestendpoint" } </pre>
Assets > Server Discovery header	<pre> "fragments": [{ "app_name": "Assets", "page_id": "ServerDiscovery", "rest_endpoint": "/somerestendpoint" } </pre>

Table 47. Custom fragments injection point examples (continued)

Tab and page	Sample manifest entry
Assets > VA Scan header	<pre> "fragments": [{ "app_name": "Assets", "page_id": "VaScannerSchedulesList", "location": "header" "rest_endpoint": "/somerestendpoint" } </pre>
Assets > VA Scan footer	<pre> "fragments": [{ "app_name": "Assets", "page_id": "VaScannerSchedulesList", "location": "footer" "rest_endpoint": "/somerestendpoint" } </pre>
Assets > Asset Profiles > Id > Asset Details dialog header	<pre> "fragments": [{ "app_name": "Assets", "page_id": "AssetDetailsVulnList", "location": "header" "rest_endpoint": "/somerestendpoint" } </pre>
Assets > Asset Profiles > Id > Asset Details dialog footer	<pre> "fragments": [{ "app_name": "Assets", "page_id": "AssetDetailsVulnList", "location": "footer" "rest_endpoint": "/somerestendpoint" }, </pre>
Admin > System Configuration header	<pre> "fragments": [{ "app_name": "QRadar", "page_id": "systemConfiguration", "rest_endpoint": "/somerestendpoint" } </pre>
Admin > Data Sources header	<pre> "fragments": [{ "app_name": "QRadar", "page_id": "dataSources", "rest_endpoint": "/somerestendpoint" } </pre>
Admin > Remote Networks & Services Configuration header	<pre> "fragments": [{ "app_name": "QRadar", "page_id": "viewConfiguration", "rest_endpoint": "/somerestendpoint" } </pre>

Table 47. Custom fragments injection point examples (continued)	
Tab and page	Sample manifest entry
Admin > Try it out header	<pre>"fragments": [{ "app_name": "QRadar", "page_id": "triallicense", "rest_endpoint": "/somerestendpoint" }]</pre>
Admin > Plug-ins header	<pre>"fragments": [{ "app_name": "QRadar", "page_id": "plugins", "rest_endpoint": "/somerestendpoint" }]</pre>

The following table describes custom fragments injection points that are not included in the Custom fragments injection points examples table.

Table 48. Custom fragments injection points	
Tab and page	Injection point
Admin	QRadar.allTabs
Asset Details dialog	Assets.AssetDetailsVulnList.header
	Assets.AssetDetailsVulnList.footer
Assets > Server Discovery	Assets.ServerDiscovery
Dashboard	QRadar.Dashboard
Log Activity	EventViewer.EventList.header
	EventViewer.EventList.footer
Network Activity	Surveillance.FlowList.footer
Reports > All	Reports.ReportTemplateListAll.header
	Reports.ReportTemplateListAll.footer
Reports > Daily	Reports.ReportTemplateListDaily.header
	Reports.ReportTemplateListDaily.footer

Table 48. Custom fragments injection points (continued)

Tab and page	Injection point
Reports > Hourly	<code>Reports.ReportTemplateListHourly.header</code> <code>Reports.ReportTemplateListHourly.footer</code>
Reports > Manual	<code>Reports.ReportTemplateListManual.header</code> <code>Reports.ReportTemplateListManual.footer</code>
Reports > Monthly	<code>Reports.ReportTemplateListMonthly.header</code> <code>Reports.ReportTemplateListMonthly.footer</code>
Reports > Weekly	<code>Reports.ReportTemplateListWeekly.header</code> <code>Reports.ReportTemplateListWeekly.footer</code>
Risks > Configuration Monitor	<code>SRM.ConfigDeviceList</code>
Risks > Connections	<code>QRadar.ArcList.header</code> <code>QRadar.ArcList.footer</code>
Risks > Policy Management > By Asset	<code>SRM.ByAssetList</code>
Risks > Policy > By Policy	<code>SRM.ByPolicyList</code>
Risks > Policy Management > By Policy Check	<code>SRM.ByPolicyCheckList</code>
Risks > Policy Monitor	<code>SRM.MaintainQuestions</code>
Risks > Simulation > Simulations	<code>SRM.SimulationList.header</code> <code>SRM.SimulationList.footer</code>
Risks > Simulation > Topology Models	<code>SRM.ModelList.header</code> <code>SRM.ModelList.footer</code>
Risks > Topology	<code>SRM.NetworkTopology</code>
Vulnerabilities > Administrative > Operational Window	<code>QVM.OperationalWindowList.header</code> <code>QVM.OperationalWindowList.footer</code>

Table 48. Custom fragments injection points (continued)

Tab and page	Injection point
Vulnerabilities > Administrative > Scan Exclusions	QVM.ExclusionList.header QVM.ExclusionList.footer
Vulnerabilities > Administrative > Scan Policies	QVM.ScanPolicies.header QVM.ScanPolicies.footer
Vulnerabilities > Administrative > Scan Profiles	QVM.ScanProfileList.header QVM.ScanProfileList.footer
Vulnerabilities > Administrative > Scanners	QVM.ScannersAdminList.header QVM.ScannersAdminList.footer
Vulnerabilities > Administrative > Scheduled Scans	QVM.ScheduledScans
Vulnerabilities > Manage	assetprofile.ByVulnerabilityInstanceList.header assetprofile.ByVulnerabilityInstanceList.footer
Vulnerabilities > Manage > By Asset	assetprofile.ByAssetListForm.header assetprofile.ByAssetListForm.footer
Vulnerabilities > Manage > By Network	assetprofile.ByNetworkList.header assetprofile.ByNetworkList.footer
Vulnerabilities > Manage > By Open Service	assetprofile.ByOpenServiceList.header assetprofile.ByOpenServiceList.footer
Vulnerabilities > Manage > By Vulnerability	assetprofile.ByVulnerabilityList.header assetprofile.ByVulnerabilityList.footer
Vulnerabilities > My Assigned	assetprofile .MyAssignedVulnerabilitiesList.header assetprofile .MyAssignedVulnerabilitiesList.footer

Table 48. Custom fragments injection points (continued)	
Tab and page	Injection point
Vulnerabilities > Research > Advisories	QVM.ResearchAdvisoriesList.header
	QVM.ResearchAdvisoriesList.footer
Vulnerabilities > Research > News	QVM.ResearchNewsList.header
	QVM .ResearchNewsList.footer
Vulnerabilities > Research > Vulnerabilities	assetprofile.ResearchVulnerabilityList.header
	assetprofile.ResearchVulnerabilityList.footer
Vulnerabilities > Scan Results	QVM.ScanResultsList.header
	QVM.ScanResultsList.footer
Vulnerabilities > Vulnerability Assignment	assetprofile.AssetOwner.header
	assetprofile.AssetOwner.footer
Vulnerabilities > Vulnerability Exception	assetprofile.ExceptionRulesList.header
	assetprofile.ExceptionRulesList.footer

Custom column injection points

Use custom column injection points to add custom columns in QRadar.

The following table lists the custom column injection points that you can use in your app. The page IDs are used in the **page_id** field in the custom_columns block in the app's manifest file.

Table 49. Custom column injection point examples	
Page ID	Table Location
AssetDetailsVulnList	Assets > IP Address column to open Asset Details page and Vulnerabilities table
AssetList	Asset tab list
AttackerList	Offenses > By Source IP
ByAssetListForm	Vulnerabilities > Manage vulnerabilities > by Asset
ByNetworkList	Vulnerabilities > Manage vulnerabilities > by Network
ByOpenServiceList	Vulnerabilities > Manage vulnerabilities > by Open Service
ByVulnerabilityInstanceList	Vulnerabilities > Manage vulnerabilities
ByVulnerabilityList	Vulnerabilities > Manage vulnerabilities > by Vulnerability
ExceptionRulesList	Vulnerabilities > Vulnerability Exception
FlowsourceList	Admin > Flow Sources
MyAssignedVulnerabilitiesList	Vulnerabilities > My Assigned Vulnerabilities

Table 49. Custom column injection point examples (continued)	
Page ID	Table Location
NetworkList	Offenses > By Network
NetworkOffenseList	Offenses > By Network Double-click an offense.
OffenseList	Offenses tab main page
ReferenceSetElems	Admin > Reference Set Management. Double-click row to open content window > Content tab.
ReferenceSetRules	Admin > Reference Set Management. Double-click row to open content window > References tab.
ReferenceSets	Admin > Reference Set Management
SensorDeviceList	Admin > Log Sources
TargetList	Offenses > By Destination IP
VaScannerSchedulesList	Admin > Schedule VA Scanners
VaScannersList	Admin > VA Scanners

Custom actions for CRE responses

You can add your own script that runs as a part of a custom action when a custom rules engine (CRE) rule is triggered.

The following scripting languages are supported:

- Bash version 4.1.2
- Perl version 5.10.1
- Python version 2.7.9

You can use base libraries in these languages to do custom operations that use data that is passed directly from the event that triggered the rule.

Create custom actions by using the **Define Actions** window on the **Admin** tab. You can also create custom actions by using the `/api/analytics/custom_actions` REST endpoints. The following sample is an example of a custom action JSON file that the GET `/api/analytics/custom_actions/actions` endpoint returns.

```
{
  "id": 1004,
  "interpreter": 1,
  "description": "Custom action containing two parameters",
  "name": "custom_action_1",
  "script": 43,
  "parameters": [
    {
      "encrypted": false,
      "name": "fixedParam",
      "value": "Hello World!",
      "parameter_type": "fixed"
    },
    {
      "encrypted": false,
      "name": "dynamicParam",
      "value": "sourceip",
      "parameter_type": "dynamic"
    }
  ]
}
```

The two JSON objects that are contained within the parameters field represent parameters, which are passed to your script when it is run. Two types of parameters are supported:

- *Fixed parameters* represent fixed values that are passed to your script as is. For example, if the **fixedParam** parameter has a value of "Hello World!" when accessed from your script, this parameter returns the value "Hello World!".
- *Dynamic parameters* and their corresponding **value** fields represent properties that are extracted from the event that triggered the CRE rule. For example, if the **dynamicParam** parameter has a value of "sourceip" when passed to your script, this value is replaced with the corresponding source IP address that is contained within the rule that triggers the event.

Parameters are passed to scripts in the order that they are defined within the custom action. These parameters can then be accessed by using the supported methods for each language:

Bash

```
param1=$1 # First parameter
param2=$2 # Second parameter
```

Perl

```
$param1 = $ARGV [ 0 ]
$param2 = $ARGV [ 1 ]
```

Python

```
import sys
param1 = sys.argv[1]
param2 = sys.argv[2]
```

Example: Making a REST call to an external server

To write a script that makes a REST call to an external server when a rule is triggered, create a script that passes the IP address to the external server. The following JSON file is an example custom action:

```
{
  "id": 1004,
  "interpreter": 1,
  "description": "Custom action containing two parameters",
  "name": "custom_action_1",
  "script": 43,
  "parameters": [
    {
      "encrypted": false,
      "name": "serverIP",
      "value": "10.100.78.11",
      "parameter_type": "fixed"
    },
    {
      "encrypted": false,
      "name": "username",
      "value": "admin",
      "parameter_type": "dynamic"
    },
    {
      "encrypted": true,
      "name": "password",
      "value": "ASDB231434DKSD#@SDA23SDD1",
      "parameter_type": "dynamic"
    },
    {
      "encrypted": false,
      "name": "offendingIP",
      "value": "sourceip",
      "parameter_type": "dynamic"
    }
  ]
}
```

The following Bash script uses these parameters to pass the IP address to an external server.

```
#!/bin/bash
# Assign parameters to variables.
serverAddress=$1
username=$2
password=$3
offendingIP=$4
# Call to an external server REST endpoint using the supplied parameters.
curl -u $username: $password -i -H "Accept: application/json" -X POST
    -d "ip= $offendingIP" "https://" $serverAddress/some_service
```

Defining custom actions

You can attach scripts to custom rules that do custom actions in response to network events. Use the **Custom Action** window to manage custom action scripts.

Use custom actions to select or define the value that is passed to the script and to define the resulting action.

For example, you can write a script to create a firewall rule that blocks a source IP address from your network in response to a rule that is triggered by a defined number of failed login attempts.

The following examples are custom actions that are the outcomes of passing values to a script:

- Block users and domains.
- Initiate work flows and updates in external systems.
- Update TAXI servers with a STIX representation of a threat.

Custom actions work best with a low volume of events and with custom rules that have a low response limiter value.

Take the following steps to define your custom actions:

1. From the Admin tab, click the **Define Actions** icon.
2. Click **Add** on the **Custom Action** window toolbar to open the **Define Custom Action** dialog where you can upload scripts that define custom actions.
3. Select a programming language version that the product supports from the **Interpreter** list.
4. Select and name a parameter from the following table to pass to the script that you upload.

Table 50. Custom action parameters	
Parameter	Description
Fixed property	<p>Values that are passed to the custom action script.</p> <p>Not based on the events or flows, but are based on other defined values that you can use the script to act on.</p> <p>For example, the fixed properties <i>username</i> and <i>password</i> for a third-party system are passed to a script that results in sending an SMS alert, or other defined action.</p> <p>You can encrypt fixed properties, such as passwords, by selecting the Encrypt value check box.</p>
Network event property	<p>Dynamic Ariel properties that are generated by events. Select from the Property list.</p> <p>For example, the network event property <i>sourceip</i> provides a parameter that matches the source IP address of the triggered event.</p>

In order to ensure the security of your deployment, the product does not support the full range of scripting functionality that is provided by the Python, Perl or Bash languages.

Parameters are passed into your script in the order in which you added them in the **Define Custom Action** dialog box.

Testing your custom action

You can test whether your script runs successfully before you associate it with a rule. Select a custom action and click **Test Execution > Execute** to test your script. The **Test custom action execution** dialog returns the result of the test and any output that is produced by the script.

Custom action scripts are executed inside a sand-boxed environment on your managed hosts. If you need to write to disk from a custom action script, you must use the following directory: `/home/customactionuser`. Custom action scripts execute on the managed host that runs the event processor that triggered the rule.

After you configure and test your custom action, use the **Rule Wizard** to create a new event rule and associate the custom action with it.

Testing your custom action

Test whether your script runs successfully before you associate it with a rule.

Procedure

1. From the **Admin** tab, click the **Define Actions** icon.
2. Select a custom action.
3. Click **Test Execution > Execute** to test your script.

Custom action scripts are run inside a sandbox environment on your managed hosts. If you write to disk from a custom action script, you must use the `/home/customactionuser` directory. Custom action scripts run on the managed host that runs the event processor that triggered the rule.

What to do next

After you configure and test your custom action, use the **Rule Wizard** to create a new event rule and associate the custom action with it.

Adding a custom action script to an event rule

You use the Rule Wizard to add a custom action script that runs in response to a custom rule event.

About this task

To create a new rule, you must have the **Offenses > Maintain Custom Rules** permission.

You can test rules locally or globally. A local test means that rule is tested on the local Event processor and not shared with the system. A global test means that the rule is shared and tested by any Event processor on the system. Global rules send events to the central Event processor, which might decrease performance on the central Event processor.

Procedure

1. Click the **Offenses** tab.
2. On the navigation menu, click **Rules**.
3. From the **Actions** list, select **New Event Rule**.
4. In the **Rule Test Stack Editor** page, type a unique name for this rule in the **enter rule name here** field in the **Rule** pane.
5. From the list box, select **Local** or **Global**.
6. Add one or more tests to a rule:

- a) To filter the options in the **Test Group** list box, type the text that you want to filter for in the Type to filter field.
- b) From the **Test Group** list box, select the type of test you want to add to this rule.
- c) For each test you want to add to the rule, select the plus (+) sign beside the test.
- d) To exclude a test, click **and** at the beginning of the test in the Rule pane.
The **and** is displayed as **and not**.
- e) Click the underlined configurable parameters to customize the variables of the test.
- f) From the dialog box, select values for the variable, and then click **Submit**.
7. To export the configured rule as a building block to use with other rules:
 - a) Click **Export as Building Block**.
 - b) Type a unique name for this building block.
 - c) Click **Save**.
8. On the **Groups** pane, select the check boxes of the groups to which you want to assign this rule.
9. In the **Notes** field, type a note that you want to include for this rule. Click **Next**.
10. On the **Rule Responses** page, click the **Execute Custom Action** check box and select your script from the **Custom Action to execute** drop-down list.
11. Click **Next**.
12. Review the **Rule Summary**, and then click **Finish**.

Custom action REST API endpoints

Custom action endpoints are available in the IBM QRadar API that you can use to aid application development.

Endpoint	Parameters	Description
GET /analytics/custom_actions/actions	fields, range, filter	Retrieves a list of available custom actions.
POST /analytics/custom_actions/actions	fields, custom_action	Creates a new custom action with the supplied fields.
GET /analytics/custom_actions/actions/{action_id}	action_id, fields	Retrieves a custom action based on the supplied action_id.
POST /analytics/custom_actions/actions/{action_id}	action_id, fields, custom_action	Updates an existing custom action.
DELETE /analytics/custom_actions/actions/{action_id}	action_id	Deletes an existing custom action.
GET /analytics/custom_actions/interpreters	fields, Range, filter	Retrieves a list of available custom action interpreters.
GET /analytics/custom_actions/interpreters/{interpreter_id}	interpreter_id, fields	Retrieves a custom action interpreter based on the interpreter ID.
GET /analytics/custom_actions/scripts	application id	Retrieves a list of meta-data for available custom action script files.

Endpoint	Parameters	Description
POST /analytics/custom_actions/scripts	fields, file	Creates a new custom action script file.
GET /analytics/custom_actions/scripts/{script_id}	script_id, fields	Retrieves meta-data of a custom action script file based on supplied script_id.
POST /analytics/custom_actions/scripts/{script_id}	script_id, fields, file	Updates an existing custom action script file.
DELETE /analytics/custom_actions/scripts/{script_id}	script_id	Deletes an existing custom action script file.

For more information, see the API documentation page on your QRadar Console: https://<Console_IP>/api_doc. Alternatively, see the *IBM QRadar API Guide*.

Custom action and QRadar rules

Use rule names and rule IDs as parameters in custom action scripts.

Pass the rule ID and rule name to custom action scripts by using the RULE_ID and RULE_NAME environmental variables.

The following Bash script example shows how to access the rule ID and rule name of the custom rule that triggers the custom action:

Bash script example

```
#!/bin/bash
# The following script shows how to access
# the id and name of the custom rule that triggered
# the custom action in bash

echo "Rule id: $RULE_ID"
echo "Rule name: $RULE_NAME"
```

The following Python script example shows how to access the rule ID and rule name of the custom rule that triggers the custom action:

Python script example

```
#!/usr/bin/python
# The following script shows how to access
# the id and name of the custom rule that triggered
# the custom action in python

import os
rule_id = os.environ.get('RULE_ID')
rule_name = os.environ.get('RULE_NAME')

print "Rule id: " + rule_id
print "Rule name: " + rule_name
```

The following Perl script example shows how to access the rule ID and rule name of the custom rule that triggers the custom action:

Perl script example

```
#!/bin/perl
# The following script shows how to access
# the id and name of the custom rule that triggered
```

```
# the custom action in perl

$ruleId = $ENV{'RULE_ID'};
$ruleName = $ENV{'RULE_NAME'};

print "Rule id: $ruleId\n";
print "Rule name: $ruleName\n";
```

Custom AQL functions

You can create IBM QRadar apps that use custom Ariel Query Language (AQL) functions.

After you upload the app, you can use these custom functions in AQL statements in advanced searches, API calls, and application apps. For more information about AQL, see the *IBM QRadar Ariel Query Language Guide*.

Coding tips

Before you implement custom AQL functions, consider these items:

- Scripts are not throttled and cannot be canceled. Be careful of infinite loops and resource leaks in your code.
- Deletion of custom functions is possible, but not supported.
- QRadar parses AQL strings much more than it needs to. Expensive `init_function_name` implementations that are combined with the use of your function in a literal context can be expensive. Use with caution.
- The `execute_function_name` implementation must be thread-safe. Use the `Utils.concurrent` library to ensure thread safety.

Custom AQL function management

Custom AQL functions are uploaded and updated by using the QRadar Extension Manager on the **Admin** tab. For more information about the QRadar Extension Manager, see the *IBM QRadar Administration Guide*.

The following XML file is an example of a QRadar extension that defines a custom AQL function.

```
<content>
  <custom_function>
    <namespace>application</namespace>
    <name>concat</name>
    <return_type>string</return_type>
    <parameter_types>string string</parameter_types>
    <execute_function_name>calculate</execute_function_name>
    <script_engine>javascript</script_engine>
    <varargs>false</varargs>
    <script>
      function calculate(input1, input2)
      {
        return input1 + input2;
      }
    </script>
    <username>user1</username>
  </custom_function>
</content>
```

You can also use the Content Management Tool, which is a command-line tool, to upload extensions:

```
/opt/qradar/bin/contentManagement.pl -a update -f my_bundle.xml
```

The following code samples provide examples of how you can create QRadar apps that define custom AQL functions for use in AQL statements.

Example: Custom functions in AQL statements

AQL statements that use custom functions use the following basic format:

```
SELECT <CUSTOM FUNCTION NAMESPACE>::<CUSTOM FUNCTION NAME>(<INPUTS>) FROM <TABLE>
```

```
SELECT application::concat('This is my IP: ', sourceip) FROM events LIMIT 20
```

Example: Simple addition

1. Create the following QRadar extension:

```
<content>
  <custom_function>
    <namespace>application</namespace>
    <name>add</name>
    <return_type>number</return_type>
    <parameter_types>number number</parameter_types>
    <execute_function_name>execute</execute_function_name>
    <script_engine>javascript</script_engine>
    <script>
      function execute(input1, input2)
      {
        return input1 + input2;
      }
    </script>
    <username>user1</username>
  </custom_function>
</content>
```

2. Use the QRadar Extensions Management to upload the extension to your QRadar Console. For more information about the QRadar Extensions Management, see [“Extensions management” on page 54](#).

If you have multiple hosts, wait up to 60 seconds for the function to propagate across your deployment.

You can use this function in AQL statements as follows:

```
SELECT application::add(eventcount, 5) FROM events
```

Example: Variable argument concatenation

1. Create the following QRadar extension:

```
<content>
  <custom_function>
    <namespace>application</namespace>
    <name>concat</name>
    <return_type>string</return_type>
    <parameter_types>string</parameter_types>
    <varargs>true</varargs>
    <execute_function_name>execute</execute_function_name>
    <script_engine>javascript</script_engine>
    <script>
      function execute()
      {
        var result = "";
        for(var i=0; i<arguments.length; i++)
          result = result + arguments[i];
        return result;
      }
    </script>
    <username>user1</username>
  </custom_function>
</content>
```

2. Use the QRadar Extension Manager to upload the extension to your QRadar Console. For more information about the QRadar Extension Manager, see [“Extensions management” on page 54](#).

If you have multiple hosts, wait up to 60 seconds for the function to propagate across your deployment.

You can use this function in AQL statements:

```
SELECT application::concat(sourceip, ':', sourceport) FROM events
```

Example: Complex initialization that uses a remote API

1. Create the following QRadar extension:

```
<content>
  <custom_function>
    <namespace>application</namespace>
    <name>isFlaggedIP</name>
    <return_type>boolean</return_type>
    <parameter_types>host</parameter_types>
    <execute_function_name>isFlaggedIP</execute_function_name>
    <init_function_name>onInit</init_function_name>
    <script_engine>javascript</script_engine>
    <script>
      var flaggedIPs;
      function onInit()
      {
        var properties = Utils.config.readNamespacePropertiesFile('my_api.properties');
        var ip = properties.get('ip');
        var url = 'https://' + ip + '/my_api/flagged_ips';
        var username = properties.get('username');
        var token = properties.get('token');
        var headers = {'SecurityToken': token};
        var jsonResponse = JSON.parse(Utils.http.invokeHTTP("GET", url, 200, headers, null,
null));
        flaggedIPs = [];
        for(var i in jsonResponse)
        {
          flaggedIPs.push(jsonResponse[i]);
        }
        function isFlaggedIP(ip)
        {
          return (flaggedIPs.indexOf(ip) >= 0);
        }
      }
    </script>
    <username>user1</username>
  </custom_function>
</content>
```

2. Use the QRadar Extension Manager on the **Admin** tab to upload the extension to your QRadar Console. For more information about the QRadar Extension Manager, see [“Extensions management” on page 54](#).

If you have multiple hosts, wait up to 60 seconds for the function to propagate across your deployment.

3. Create a properties file with the following content in the /store/custom_functions/namespaces/application/my_api.properties file.

```
ip=<ip for remote API server>
username=<your username for remote API server>
token=<your token for remote API server>
```

You can use this function in AQL statements:

```
SELECT application::isFlaggedIP(sourceip)
AS is_flagged_qradar_ip, sourceip FROM events
```

Custom AQL function fields

Multiple fields are available to custom AQL functions.

namespace and name

Required: Yes

Default:

Case-sensitive: No

Whitespace-sensitive: Yes

The following table describes the namespace and name fields for custom AQL functions.

Table 51. Namespace and name fields	
Field	Description
namespace	The first component that makes up the identifier of a custom AQL function.
name	The second component that makes up the identifier of a custom AQL function.

Both values are case-insensitive and must be unique from all other custom functions. The Ariel database uses a concatenation of these fields to expose the custom function through AQL. For example:

- namespace: :MyNamespace
- name::MyFunction
- AQL: MyNamespace: MyFunction

When you specify your custom function through AQL, you must employ double quotation marks when white space or special characters are used.

return_type

You use the `return_type` field to declare the script type that your custom function returns.

Required: Yes

Default:

Case-sensitive: No

Whitespace-sensitive: No

Example: String

The return value is automatically converted to the internal Java type that is interpreted by Ariel (QRadar_type).

The following table describes acceptable script types for the `return_type` field.

Table 52. return_type field acceptable script types		
Type	Script type	QRadar type
STRING	String	java.lang.String
NUMBER	Number	java.lang.Number
LONG	Number	java.lang.Long
HOST	String	com.q1labs.core.dao.util.Host
PORT	Number	com.q1labs.frameworks.nio.Port
BOOLEAN	Boolean	java.lang.Boolean

parameter_types

You use the `parameter_types` field to declare the type of each parameter that your custom function accepts.

Required: Yes

Default:

Case-sensitive: No

Whitespace- sensitive: No

Example: String, Number, Boolean

The incoming Java object is automatically converted to your declared script type.

The following table describes acceptable script types for the `parameter_types` field.

Table 53. <i>parameter_type</i> field acceptable script types		
Type	Script type	QRadar type
STRING	String	java.lang.String
NUMBER	Number	java.lang.Number
LONG	Number	java.lang.Long
HOST	String	com.q1labs.core.dao.util.Host
PORT	Number	com.q1labs.frameworks.nio.Port
BOOLEAN	Boolean	java.lang.Boolean

Generally, when you pass parameters from AQL, most values are interoperable. If you find they are not, you can use AQL casting functions such as `LONG` and `PORT`.

Note: You can use an empty string if you accept no parameters.

varargs

If "true", variable arguments are used with your `parameter_types` value. You can specify the last type in your `parameter_types` string zero or more times.

If your `parameter_types` value is empty, this value has no meaning.

Required: No

Default: false

Case-sensitive: Yes

Whitespace- sensitive: Yes

Example: true

The way that you handle variable arguments depends on the script engine that you use. For JavaScript, you can use the built-in `arguments` variable:

```
function myFunction() {
  for(var i=0; i<arguments.length; i++)
  {
    //Do something with arguments[i]
  }
}
```

execute_function_name

The value of this field maps to the execution function in your custom function script. The Java programming language uses the parameters in your AQL string to call this function. It then uses the value that is returned in the calculations.

The execution function is called concurrently. It must be thread-safe.

Required: Yes

Default:

Case-sensitive: Yes

Whitespace- sensitive: Yes

Example: calculate

init_function_name

The value of this optional field maps to the initialization function in your custom function script. The Java programming language must call this function only once for a search. Place your expensive initialization code in this function so that your execution function is faster. Because this function is called once, it does not need to be thread-safe.

Required: No

Default:

Case-sensitive: Yes

Whitespace-sensitive: Yes

Example: onInit

finish_function_name

The value of this optional field maps to the finish function in your custom function script. The Java programming language calls this function only once for a search. However, there might be some situations in which it is never called. Close any resources that you hold onto within your script to prevent resource leaks. Because this function is called only once, it does not need to be thread-safe.

Required: No

Default:

Case-sensitive: Yes

Whitespace-sensitive: Yes

Example: onFinish

script_engine

The value of this field indicates the script engine that is used to interpret and invoke your script. The only supported script engine is JavaScript.

Required: Yes

Default:

Case-sensitive: No

Whitespace-sensitive: No

Example: javascript

script

The value of this field is the code for your custom function. It is interpreted based on the `script_engine` that you specified.

You can place any code in here that you like, including other functions. However, the `execute_function_name` must exist and must be a valid function.

Required: Yes

Default:

Case-sensitive: Yes

Whitespace-sensitive: Yes

Example: `function addOne(value) {return value + 1;}`

username

The value of this field currently has no implementation. It makes reference to your IBM QRadar user name.

Required: Yes

Default:

Case-sensitive: Yes

Whitespace- sensitive: Yes

Example: administrator

Custom AQL function utilities

Use custom AQL function utilities.

Utils.concurrency.readLock

```
/**
 * Acquire a read lock against the global lock.
 *
 * If the write lock is not held by another thread, this returns immediately.
 * If the write lock is held by another thread then the current thread becomes
 * disabled for thread scheduling purposes and lies dormant until
 * the read lock has been acquired.
 */
void readLock()
```

JavaScript example:

```
Utils.concurrency.readLock();
try { /*Do something*/ }
finally { Utils.concurrency.readUnlock(); }
```

Utils.concurrency.readLock(String name)

```
/**
 * Acquire a read lock against the given name.
 * If a lock by the given name does not exist yet, it will be created.
 *
 * If the write lock is not held by another thread, this returns immediately.
 * If the write lock is held by another thread then the current thread becomes
 * disabled for threadscheduling purposes and lies dormant until
 * the read lock has been acquired.
 *
 * @param name The name of the lock to acquire a read lock against.
 * If null, global lock is used.
 */
void readLock(String name)
```

JavaScript example:

```
Utils.concurrency.readLock("my_lock");
try { /*Do something*/ }
finally { Utils.concurrency.readUnlock("my_lock"); }
```

Utils.concurrency.tryReadLock(long timeoutMsec)

```
/**
 * Attempts to acquire a read lock against the global lock.
 *
 * If the write lock is not held by another thread, this returns immediately.
 * If the write lock is held by another thread, this will wait
 * a maximum of timeoutMsec millisecondsto acquire the read lock.
 *
 * @param timeoutMsec The maximum time to wait (in milliseconds) to acquire the lock
 * <= 0 can be used to return immediately if the read lock can not be acquired.
 * @return True if the read lock has been acquired, false otherwise.
 */
boolean tryReadLock(long timeoutMsec)
```

JavaScript example:

```
if(Utils.concurrency.tryReadLock(1000))
{
    try { /* Lock acquired */ }
    finally { Utils.concurrency.readUnlock(); }
}
```

```
else
    throw "Failed to acquire lock in reasonable time";
```

Utils.concurrency.tryReadLock(String name, long timeoutMsec)

```
/**
 * Attempts to acquire a read lock against the given name.
 *
 * If the write lock is not held by another thread, this returns immediately.
 * If the write lock is held by another thread, this will
 * wait a maximum of timeoutMsec milliseconds to acquire the read lock.
 *
 * @param name The name of the lock to acquire a read lock against.
 * If null, global lock is used.
 *
 * @param timeoutMsec The maximum time to wait (in milliseconds)
 * to acquire the lock.
 * <= 0 can be used to return immediately if the read lock can not be acquired.
 *
 * @return True if the read lock has been acquired, false otherwise.
 */
boolean tryReadLock(String name, long timeoutMsec)
```

JavaScript example:

```
if(Utils.concurrency.tryReadLock("my_lock", 1000))
{
    try { /* Lock acquired */ }
    finally { Utils.concurrency.readUnlock("my_lock"); }
}
else
    throw "Failed to acquire lock in reasonable time";
```

Utils.concurrency.readUnlock()

```
/**
 * Releases the global read lock held by the current thread.
 * You must currently be holding the global read lock,
 * or an exception occurs.
 * If the number of read locks held by all threads is now 0,
 * then the lock is made available for write lock attempts.
 */
void readUnlock()
```

JavaScript example:

```
Utils.concurrency.readLock();
try { /*Do something*/ }
finally { Utils.concurrency.readUnlock(); }
```

Utils.concurrency.readUnlock(String name)

```
/**
 * Releases the read lock against the given name held by the current thread.
 * You must currently be holding the read lock by the given name,
 * or an exception occurs.
 * If the number of read locks held by all threads is now 0,
 * then the lock is made available for write lock attempts.
 *
 * @param name The name of the lock to acquire a read lock against.
 * If null, global lock is used.
 */
void readUnlock(String name)
```

JavaScript example:

```
Utils.concurrency.readLock("my_lock");
try { /*Do something*/ }
finally { Utils.concurrency.readUnlock("my_lock"); }
```

Utils.concurrency.writeLock()

```
/**
 * Acquire a write lock against the global lock.
 *
 * If neither the read nor write lock are held by another thread,
 * this returns immediately.
 *
 * If the write lock is held by another thread,
 * then the current thread becomes disabled for thread
 * scheduling purposes and lies dormant until
 * the read lock has been acquired.
 */
void writeLock()
```

JavaScript example:

```
Utils.concurrency.writeLock();
try { /*Do something*/ }
finally { Utils.concurrency.writeUnlock(); }
```

Utils.concurrency.writeLock(String name)

```
/**
 * Acquire a write lock against the given name.
 *
 * If neither the read nor write lock are held by another thread,
 * this returns immediately.
 * If the write lock is held by another thread then the current thread
 * becomes disabled for threadscheduling purposes and lies dormant
 * until the read lock has been acquired.
 *
 * @param name The name of the lock to acquire a write lock against.
 * If null, global lock is used.
 */
void writeLock(String name)
```

JavaScript example:

```
Utils.concurrency.writeLock("my_lock");
try { /*Do something*/ }
finally { Utils.concurrency.writeUnlock("my_lock"); }
```

Utils.concurrency.tryWriteLock(long timeoutMsec)

```
/**
 * Attempts to acquire a write lock against the global lock.
 *
 * If neither the read nor write lock are held by another thread,
 * this returns immediately.
 * If either the read or write lock is held by another thread,
 * this will wait a maximum of timeoutMsec milliseconds
 * to acquire the write lock.
 *
 * @param timeoutMsec The maximum time to wait (in milliseconds)
 * to acquire the lock
 * <= 0 can be used to return immediately,
 * if the write lock can not be acquired.
 *
 * @return True if the write lock has been acquired, false otherwise.
 */
boolean tryWriteLock(long timeoutMsec)
```

JavaScript example:

```
if(Utils.concurrency.tryWriteLock(1000))
{
    try { /* Lock acquired */ }
    finally { Utils.concurrency.writeUnlock(); }
}
```

```
else
    throw "Failed to acquire lock in reasonable time";
```

Utils.concurrency.tryWriteLock(String name, long timeoutMsec)

```
/**
 * Attempts to acquire a write lock against the given name.
 *
 * * If neither the read nor write lock are held by another thread
 * * this returns immediately.
 * * If either the read or write lock is held by another thread,
 * * this will wait a maximum of timeoutMsec milliseconds
 * * to acquire the write lock.
 *
 * * @param timeoutMsec The maximum time to wait (in milliseconds)
 * * to acquire the lock.
 * * <= 0 can be used to return immediately if the write lock can not be acquired.
 *
 * * @param name The name of the lock to acquire a write lock against.
 * * If null, global lock is used.
 *
 * * @return True if the write lock has been acquired, false otherwise.
 */
boolean tryWriteLock(String name, long timeoutMsec)
```

JavaScript example:

```
if(Utils.concurrency.tryWriteLock("my_lock", 1000))
{
    try { /* Lock acquired */ }
    finally { Utils.concurrency.writeUnlock("my_lock"); }
}
else
    throw "Failed to acquire lock in reasonable time";
```

Utils.concurrency.writeUnlock()

```
/**
 * Releases the global write lock held by the current thread.
 * You must currently be holding the global write lock, or an exception occurs.
 * If the number of write locks held by all threads is now 0,
 * then the lock is made available for write lock attempts.
 */
void writeUnlock()
```

JavaScript example:

```
Utils.concurrency.writeLock("my_lock");
try { /*Do something*/ }
finally { Utils.concurrency.writeUnlock("my_lock"); }
```

Utils.concurrency.createAtomicBoolean()

```
/**
 * @return A new instance of java.util.concurrent.atomic.AtomicBoolean
 */
java.util.concurrent.atomic.AtomicBoolean createAtomicBoolean()
```

JavaScript example:

```
var atomicBoolean = Utils.concurrency.createAtomicBoolean();
if(atomicBoolean.getAndSet(true))
    return "Value has not changed";
```

Utils.concurrency.createAtomicInteger()

```
/**
 * @return A new instance of java.util.concurrent.atomic.AtomicInteger
```

```
*/  
java.util.concurrent.atomic.AtomicInteger createAtomicInteger()
```

JavaScript example:

```
var atomicInt =  
    Utils.concurrency.createAtomicInteger();atomicInt.set(5);
```

Utils.concurrency.createAtomicLong()

```
/**  
 * @return A new instance of java.util.concurrent.atomic.AtomicLong  
 */  
java.util.concurrent.atomic.AtomicLong createAtomicLong()
```

JavaScript example:

```
var atomicLong =  
    Utils.concurrency.createAtomicLong();atomicLong.set(5)
```

Utils.concurrency.createAtomicDouble()

```
/**  
 * @return A new instance of java.util.concurrent.atomic.AtomicDouble  
 */  
java.util.concurrent.atomic.AtomicDouble createAtomicDouble()
```

JavaScript example:

```
var atomicDouble = Utils.concurrency.createAtomicDouble();  
atomicDouble.set(5);
```

Utils.concurrency.createAtomicIntegerArray(int size)

```
/**  
 * @param Size of the array. Must be >= 0  
 * @return A new instance of java.util.concurrent.atomic.AtomicIntegerArray  
 * with the given size  
 */  
java.util.concurrent.atomic.AtomicIntegerArray createAtomicIntegerArray(int size)
```

JavaScript example:

```
var atomicIntArray = Utils.concurrency.createAtomicIntegerArray(5);  
atomicIntArray.set(0, 25);
```

Utils.concurrency.createAtomicLongArray(int size)

```
/**  
 * @param Size of the array. Must be >= 0  
 * @return A new instance of java.util.concurrent.atomic.AtomicIntegerArray  
 * with the given size  
 */  
java.util.concurrent.atomic.AtomicIntegerArray createAtomicIntegerArray(int size)
```

JavaScript example:

```
var atomicLongArray = Utils.concurrency.createAtomicLongArray(5);  
atomicLongArray.set(0, 25);
```


Utils.concurrency.createAtomicDoubleArray(int size)

```
/**
 * @param Size of the array. Must be >= 0
 * @return A new instance of java.util.concurrent.atomic.AtomicDoubleArray
 * with the given size
 */
java.util.concurrent.atomic.AtomicDoubleArray createAtomicDoubleArray(int size)
```

JavaScript example:

```
var atomicDoubleArray = Utils.concurrency.createAtomicDoubleArray(5);
atomicDoubleArray.set(0, 25);
```

Utils.concurrency.createConcurrentMap()

```
/**
 * @return Returns a new instance of
 * java.util.concurrent.ConcurrentHashMap.ConcurrentHashMap,
 * which is a thread safe map that accepts any key or value
 */
java.util.concurrent.ConcurrentHashMap.ConcurrentHashMap createConcurrentMap()
```

JavaScript example:

```
var myMap = Utils.concurrency.createConcurrentMap();
myMap.put("some_key", "some_value");
myMap.put("some_other_key", 25);
```

Utils.concurrency.createConcurrentSet()

```
/**
 * @return Returns a new thread safe set that accepts any value,
 * backed by java.util.concurrent.ConcurrentHashMap.ConcurrentHashMap
 */
java.util.concurrent.ConcurrentHashMap.ConcurrentHashMap createConcurrentSet()
```

JavaScript example:

```
var mySet = Utils.concurrency.createConcurrentSet();
mySet.add("something");
mySet.add(25);
```

Utils.crypto.aesEncrypt(String data)

```
/**
 * Given a String, the frameworks AES encryption protocol will be invoked
 * to return an encrypted String.
 *
 * @param data The String that will be encrypted.
 * @return The encrypted String. Null if null data was provided.
 */
String aesEncrypt(String data)
```

JavaScript example:

```
var myEncryptedData = Utils.crypto.aesEncrypt
    ("my plaintext data,
     preferably not stored here as a string");
```

Utils.crypto.aesDecrypt(String data)

```
/**
 * Given an String that is encrypted by the frameworks AES encryption protocol,
 * return the decrypted value.
 */
```

```

    * @param data The String that was encrypted by the framework's
    * AES encryption protocol.
    * @return The decrypted String. Null if null data was provided.
    */
    String aesDecrypt(String data)

```

JavaScript example:

```
var myData = Utils.crypto.aesDecrypt("my encrypted data");
```

Utils.general.base64Decode(String value)

```

/**
 * Given a String encoded as base64, return the original value
 * @param value The base64 value to decode
 * @return The decoded value. Null if value was null
 */
String base64Decode(String value)

```

JavaScript example:

```
var myAuth = Utils.general.base64Decode("my base64 encoded auth
```

Utils.config.readNamespaceFile(String relPath)

```

/**
 * Given the path to a file relative to the namespace configuration
 * directory for the function assigned to this utility,
 * read it and return a String representation,
 * decoded using default character set of this JVM (typically UTF-8).
 * The file must exist, or an exception is thrown.
 * The file must be readable, or an exception is thrown.
 * If the relative path leads to a file that is not a child
 * of the proper configuration directory, an exception is thrown.
 *
 * The full path structure is:
 * /${CUSTOM_FUNCTION_CONFIG_DIR}/namespaces/${namespace}/${relPath}
 *
 * @param relPath The path to the file, relative to the namespace configuration
 * directory for the function assigned to this utility
 * @return A String representing the file's content in the default character set.
 */
String readNamespaceFile(String relPath)

```

JavaScript example:

```
var myFileContent = Utils.config.readNamespaceFile("test.txt");
```

Utils.config.readNamespaceFile(String relPath, boolean forceExist)

```

/**
 * Given the path to a file relative to the namespace configuration
 * directory for the function assigned to this utility,
 * read it and return a String representation,
 * decoded using default character set of this JVM (typically UTF-8).
 * The file must be readable, or an exception is thrown.
 * If the relative path leads to a file that is not a child
 * of the proper configuration directory, an exception is thrown.
 *
 * The full path structure is:
 * /${CUSTOM_FUNCTION_CONFIG_DIR}/namespaces/${namespace}/${relPath}
 *
 * @param relPath The path to the file, relative to the namespace configuration
 * directory for the function assigned to this utility
 *
 * @param forceExist If true, and the file does not exist, an exception is thrown.
 * If false, and the file does not exist, an empty Map is returned.
 * @return A String representing the file's content in the default character set.
 * An empty String if forceExist was false and the file does not exist.

```

```
*/
String readNamespaceFile(String relPath, boolean forceExist)
```

JavaScript example:

```
var myFileContent = Utils.config.readNamespaceFile("test.txt", false);
```

Utils.config.readNamespaceFile(String relPath, boolean forceExist, String charset)

```
/**
 * Given the path to a file relative to the namespace configuration
 * directory for the function assigned to this utility,
 * read it and return a String representation,
 * decoded using the given character set.
 * The file must be readable, or an exception is thrown.
 * If the relative path leads to a file that is not a child
 * of the proper configuration directory, an exception is thrown.
 *
 * The full path structure is:
 * /${CUSTOM_FUNCTION_CONFIG_DIR}/namespaces/${namespace}/${relPath}
 *
 * @param relPath The path to the file, relative to the
 * namespace configuration directory for the function assigned to this utility
 *
 * @param forceExist If true, and the file does not exist, an exception is thrown.
 * If false, and the file does not exist, an empty Map is returned.
 *
 * @param charset The character set (encoding) to use when reading the file.
 * If null, the JVM default is used, usually UTF-8.
 *
 * @return A String representing the files content in the given character set.
 * An empty String if forceExist was false and the file does not exist.
 */
String readNamespaceFile(String relPath, boolean forceExist, String charset)
```

JavaScript example:

```
var myFileContent = Utils.config.readNamespaceFile("test.txt", false, "UTF-8");
```

Utils.config.readNamespacePropertiesFile(String relPath)

```
/**
 * Given the path to a file relative to the namespace configuration
 * directory for the function assigned to this utility,
 * read it and return a Map of properties.
 * The format is assumed to be the Java compatible key/value pair format.
 * The file must exist, or an exception is thrown.
 * The file must be readable, or an exception is thrown.
 * If the relative path leads to a file that is not a child
 * of the proper configuration directory, an exception is thrown.
 *
 * The full path structure is:
 * /${CUSTOM_FUNCTION_CONFIG_DIR}/namespaces/${namespace}/${relPath}
 *
 * @param relPath The path to the file, relative to the namespace configuration
 * directory for the function assigned to this utility.
 *
 * @param forceExist If true, and the file does not exist, an exception is thrown.
 * If false, and the file does not exist, an empty Map is returned.
 *
 * @return A map of properties read from the file
 */
Map<String, String> readNamespacePropertiesFile(String relPath)
```

JavaScript example:

```
var myProperties = Utils.config.readNamespacePropertiesFile("test.properties");
var myValue = myProperties.get("my_key");
```

Utils.config.readNamespacePropertiesFile(String relPath, boolean forceExist)

```
/**
 * Given the path to a file relative to the namespace configuration
 * directory for the function assigned to this utility,
 * read it and return a Map of properties.
 * The format is assumed to be the Java compatible key/value pair format.
 * The file must be readable, or an exception is thrown.
 * If the relative path leads to a file that is not a child
 * of the proper configuration directory, an exception is thrown.
 *
 * The full path structure is:
 * /${CUSTOM_FUNCTION_CONFIG_DIR}/namespaces/${namespace}/${relPath}
 *
 * Charset used will be the default charset in this JVM
 *
 * @param relPath The path to the file, relative to the namespace configuration
 * directory for the function assigned to this utility.
 *
 * @param forceExist If true, and the file does not exist, an exception is thrown.
 * If false, and the file does not exist, an empty Map is returned.
 *
 * @return A map of properties read from the file.
 * An empty map if forceExist was false and the file does not exist.
 */
Map<String, String> readNamespacePropertiesFile(String relPath, boolean forceExist)
```

JavaScript example:

```
var myProperties =
    Utils.config.readNamespacePropertiesFile("test.properties", false);
var myValue = myProperties.get("my_key");
```

Utils.config.readNamespacePropertiesFile(String relPath, boolean forceExist, String charset)

```
/**
 * Given the path to a file relative to the namespace configuration
 * directory for the function assigned to this utility,
 * read it using the given character set and return a Map of properties.
 * The format is assumed to be the Java compatible key/value pair format.
 * The file must be readable, or an exception is thrown.
 * If the relative path leads to a file that is not a child
 * of the proper configuration directory, an exception is thrown.
 *
 * The full path structure is:
 * /${CUSTOM_FUNCTION_CONFIG_DIR}/namespaces/${namespace}/${relPath}
 *
 * @param relPath The path to the file, relative to the namespace configuration
 * directory for the function assigned to this utility.
 *
 * @param forceExist If true, and the file does not exist, an exception is thrown.
 * If false, and the file does not exist, an empty Map is returned.
 *
 * @param charset The character set (encoding) to use when reading the file.
 * If null, the JVM default is used, usually UTF-8.
 *
 * @return A map of properties read from the file.
 * An empty map if forceExist was false and the file does not exist.
 */
Map<String, String>
readNamespacePropertiesFile(String relPath, boolean forceExist, String charset)
```

JavaScript example:

```
var myProperties =
    Utils.config.readNamespacePropertiesFile
        ("test.properties", false, "UTF-8");
var myValue = myProperties.get("my_key");
```

Utils.http.urlEncode(String value)

```
/**
 * URL encodes the given value
 * @param value The value to encode. Null returns null
 * @return The URL encoded value
 */
String urlEncode(String value)
```

JavaScript example:

```
var myEncodedPathParam = Utils.http.urlEncode("my Path parameter");
```

Utils.http.invokeHTTP(String method, String uriStr, Integer expectedResponseCode, Map<String, String> headers, Map<String, Object> parameters, String body)

```
/**
 * This method is purposely monolithic. It will be deprecated when we provide
 * a proper (and reliable) HttpClient implementation directly
 *
 * Perform an HTTP request with the given parameters
 * and return the response body as a String.
 *
 * IMPORTANT: All request content (parameters, and body)
 * is assumed to be UTF-8.
 *
 * @param method The HTTP method to use:
 * [GET, PUT, POST, DELETE, OPTIONS, TRACE, HEAD, PATCH].
 * If null or empty, GET is used.
 * If not recognized, RuntimeException is thrown.
 *
 * @param uri The address, which is not already escaped.
 * Query parameters should only be provided as part of this address
 * if the parameters parameter is not specified.
 *
 * @param expectedResponseCode The response code you expect,
 * or null if you don't care.
 * Throws RuntimeException if response code does not match.
 *
 * @param headers A map of headers. Note that they are case
 * and whitespace insensitive.
 *
 * @param parameters A map of parameters.
 * If the request method does not support a request body,
 * they will be included in the URI.
 * If the request method does support a request body,
 * they will be translated to URLFormEncoded,
 * and use the application/x-www-form-urlencoded
 * content type; the payload will also be ignored.
 *
 * @param body The raw request body as a String.
 * Will only be used if the request supports a request body.
 * A Content-Type header should always be provided,
 * but Content-Length is automatically calculated.
 * IMPORTANT: This is not compatible with extremely large data sets.
 * No streaming implementation is provided either.
 *
 * @return Content The response body as a string.
 * The character encoding used to construct it will be that which was
 * specified by the response Content-Type header.
 * If none is available, it will default to UTF-8
 */
String invokeHTTP(String method, String uriStr, Integer expectedResponseCode,
                  Map<String, String> headers, Map<String, Object>
                  parameters, String body)
```

JavaScript example:

```
var responseBody = Utils.http.invokeHTTP
    ("GET", "https://myServer/api/my_endpoint",
     200, {"Token": "MyToken"}, {}, null);
```

Utils.concurrency.createConcurrentList()

```
/**
 * @return Returns a new thread safe list implemented by
 * java.util.concurrent.CopyOnWriteArrayList
 */
java.util.concurrent.CopyOnWriteArrayList createConcurrentList()
```

JavaScript example:

```
var myList
  = Utils.concurrency.createConcurrentList();  myList.add("something");
myList.add(25);
```

Utils.log.info()

```
/**
 * Log the given message through QRadar using a log level of INFO.
 * @param msg The message to log.
 * Will be prefixed with relevant state and script information.
 */
void info(String msg)
```

JavaScript example:

```
Utils.log.info("My message");
```

Utils.log.warn()

```
/**
 * Log the given message through QRadar using a log level of WARN.
 * @param msg The message to log.
 * Will be prefixed with relevant state and script information.
 */
void warn(String msg)
```

JavaScript example:

```
Utils.log.warn("My message");
```

Utils.log.error()

```
/**
 * Log the given message through QRadar using a log level of ERROR.
 * @param msg The message to log.
 * Will be prefixed with relevant state and script information.
 */
void error(String msg)
```

JavaScript example:

```
Utils.log.error("My message");
```

Utils.log.debug()

```
/**
 * Log the given message through QRadar using a log level of DEBUG.
 * Typically this log will be ignored unless enabled
 * through QRadar logging configuration.
 * @param msg The message to log.
 * Will be prefixed with relevant state and script information.
 */
void debug(String msg)
```

JavaScript example:

```
Utils.log.debug("My message");
```

Note:

When you use JavaScript, you also have access to standard ECMA utilities such as "JSON". For more information, see the [Mozilla Developer Network](https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/JSON/parse) (https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/JSON/parse).

Resources

Use various resources to help you to build apps with the IBM QRadar GUI Application Framework

QRadar documentation

- QRadar [SIEM](http://www-01.ibm.com/support/docview.wss?uid=swg27048741) (<http://www-01.ibm.com/support/docview.wss?uid=swg27048741>) documents in PDF format.
- QRadar [Vulnerability Manager](http://www-01.ibm.com/support/docview.wss?uid=swg27048729) (<http://www-01.ibm.com/support/docview.wss?uid=swg27048729>) documents in PDF format.
- QRadar [Risk Manager](http://www-01.ibm.com/support/docview.wss?uid=swg27048730) (<http://www-01.ibm.com/support/docview.wss?uid=swg27048730>) documents in PDF format.
- QRadar [Incident Forensics and Packet Capture](http://www-01.ibm.com/support/docview.wss?uid=swg2704873) (<http://www-01.ibm.com/support/docview.wss?uid=swg2704873>) documents in PDF format.

QRadar API resources

- QRadar [API Guide](http://public.dhe.ibm.com/software/security/products/qradar/documents/7.3.0/en/b_qradar_api.pdf) (http://public.dhe.ibm.com/software/security/products/qradar/documents/7.3.0/en/b_qradar_api.pdf) in PDF format
- QRadar API video tutorial: [Learn to use the QRadar API in six minutes](#).
- QRadar API samples on [Github](https://github.com/ibm-security-intelligence/api-samples) (<https://github.com/ibm-security-intelligence/api-samples>).

Flask API

- <http://www.flaskapi.org/> (<http://www.flaskapi.org/>)
- [Flask Tutorials](https://blog.miguelgrinberg.com/post/the-flask-mega-tutorial-part-i-hello-world) (<https://blog.miguelgrinberg.com/post/the-flask-mega-tutorial-part-i-hello-world>)

Jinja2 templates

- <http://jinja.pocoo.org/docs/dev/> (<http://jinja.pocoo.org/docs/dev/>)

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