Course Guide

IBM QRadar SIEM Advanced Topics

Course code BQ203 ERC 1.0

IBM Training

June 2018 edition

Contents

About this course

IBM QRadar SIEM provides deep visibility into network, user, and application activity. It provides collection, normalization, correlation, and secure storage of events, flows, asset profiles, and vulnerabilities. QRadar SIEM classifies suspected attacks and policy violations as offenses.

In this 2-day course, you learn how to perform the following tasks:

- Create and manage uncommon log source types
- Leverage reference data collections
- Develop and manage custom rules
- Develop and manage custom action scripts
- Develop and manage anomaly detection rules

Extensive lab exercises are provided to allow students an insight into some of the advanced tasks for operating the IBM QRadar SIEM platform. The exercises cover the following topics:

1. Creating a new log source type based on a physical access system
2. Leveraging reference data collections to maintain a watchlist of untrustworthy IP addresses to track suspicious activity
3. Developing custom rules to detect unauthorized services that are occasionally run in your organization
4. Developing a custom action script including creating a python script and testing the script using the QRadar Console
5. Developing an anomaly detection rule to test for the deviation of the number of events matching a grouped search from the moving average

The lab environment for this course uses the IBM QRadar SIEM 7.3 platform with a QRadar SIEM server and a Linux based client that provides web based access to the QRadar SIEM server.

	Details
Delivery method	Classroom or instructor-led online (ILO).
Course level	ERC 1.0
	This course is a new course.
Product and version	IBM QRadar SIEM 7.3
Skill level	Advanced

Audience

This course is designed for advanced QRadar administrators in the DevOps space, focusing on managing and enhancing the run-time environment of the overall IBM QRadar Security Intelligence deployment.

Prerequisites

Before taking this course, make sure that the students have the following skills:

- IT infrastructure
- IT security fundamentals
- Linux
- Windows
- TCP/IP networking
- Syslog
- Foundational skills for the IBM QRadar Security Intelligence Platform (at least the ones taught in the IBM QRadar SIEM Foundations - BQ103 course)

Course description

The course contains the following units:

1. Creating new log source types

   QRadar ships with a long list of supported log sources. However, many organizations have deployed systems and sensors for which no QRadar log source is available. In this case, a custom log source can be defined. In this unit you learn how to obtain and analyze sample raw events from your non-supported log source in their original format. You then create a new log source type using the DSM Editor where you configure property parsing. Finally you create new event categorization and mapping as well as custom properties.

2. Leveraging reference data collections

   Using reference data collections allow you to store and manage business data that you want to correlate against the events and flows in your IBM QRadar environment. You can add business data or data from external sources into a reference data collection, and then use the data in QRadar searches, filters, rule test conditions, and rule responses. In this unit you learn how to choose the right reference data collection along with how to manage and use them within QRadar rules.

3. Developing Custom Rules

   To detect indicators of compromise or concern, custom rules correlate events, flows, offenses, and other information. Custom rules use stateless, stateful and function tests. If the Custom Rules Engine evaluates a rule to be true, it executes its rule actions and rule responses. Using the skills taught in this module, you will be able to develop custom rules.

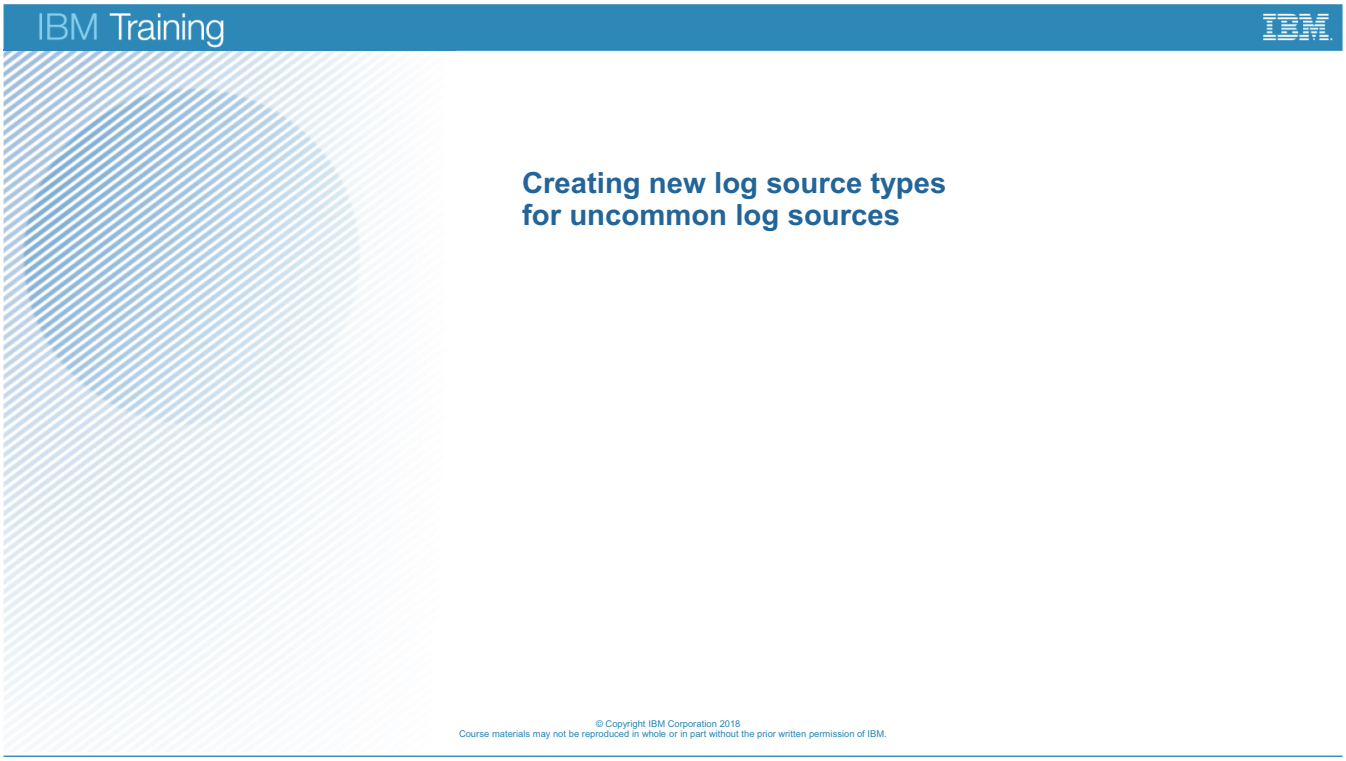
4. Introduction to custom action scripts

   Custom actions in QRadar provide the ability to execute scripted actions directly as a rule response for event, flow, and common rules. This capability allows a script to be executed on the Console or a Managed Host whenever a rule is triggered. In this unit you learn about the high-level steps needed to design and implement a custom action script, describe the use cases and requirements of a custom action script, and learn about best practices for creating and troubleshooting them.

5. Developing Anomaly Detection Rules

   Anomaly detection aims to alert to threats that are undocumented and therefore cannot be detected by methods that monitor for well defined indicators. Such threats can be detected by monitoring for an unusual volume of activities. Anomaly detection rules monitor for deviations from expected activities. Using the skills taught in this module, you will be able to develop anomaly detection rules.

Unit 1 Creating new log source types



QRadar ships with a long list of supported log sources. However, many organizations have deployed systems and sensors for which no QRadar log source is available. In this case, a custom log source can be defined. In this unit you learn how to obtain and analyze sample raw events from your non-supported log source in their original format. You then create a new log source type using the DSM Editor where you configure property parsing. Finally you create new event categorization and mapping as well as custom properties.

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Unit objectives

- Obtaining sample raw events in their original format
- Sending sample events to QRadar using logrun.pl
- Creating a new log source type using the DSM Editor
- Adding a new log source of the newly created type to collect the events
- Configuring property parsing
- Creating an event categorization and mapping
- Creating custom properties
- Considering next steps to benefit from the new log source type

Unit objectives

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Introduction

Log Source Types
- QRadar SIEM provides device support modules (DSMs) for the most widely used software and devices
- QRadar accepts events from devices that produce events in the Common Event Format (CEF) or in the Log Event Extended Format (LEEF)
- For log sources with uncommon formats new log source types can be configured in QRadar

Challenges for configuring new log source types
- You need to have knowledge of and access to the software or device they want to send raw events from
- You must be familiar with regular expressions (RegEx)

Benefits for configuring new log source types
- Your QRadar SIEM is able to process raw events from unsupported sources
- The DSM Editor supports the integration directly from the User Interface

Introduction

The LEEF event format is a proprietary event format, which allows hardware manufacturers and software product manufacturers to read and map device events specifically designed for QRadar integration.

The CEF event format is similar to LEEF. CEF is used for instance by ArcSight.

For further information please refer to the Universal LEEF Guide.

Also refer to the DSM Configuration Guide.

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Steps to configure QRadar SIEM for raw events from an unsupported source

To configure QRadar SIEM to identify, parse, normalize, name, rate, and categorize raw events from an unsupported source, perform the following steps

1. Obtaining sample raw events in their original format
2. Sending sample events to QRadar using logrun.pl
3. Creating a new log source type using the DSM Editor
4. Adding a log source of the newly created type to collect the events
5. Configuring property parsing
6. Creating an event categorization and mapping
7. Creating custom properties
8. Considering next steps to benefit from the new log source type

Let’s test these steps in a scenario.

Steps to configure QRadar SIEM for raw events from an unsupported source

You can use these steps like a cooking recipe when you create a new log source type from an unsupported log source.

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Scenario

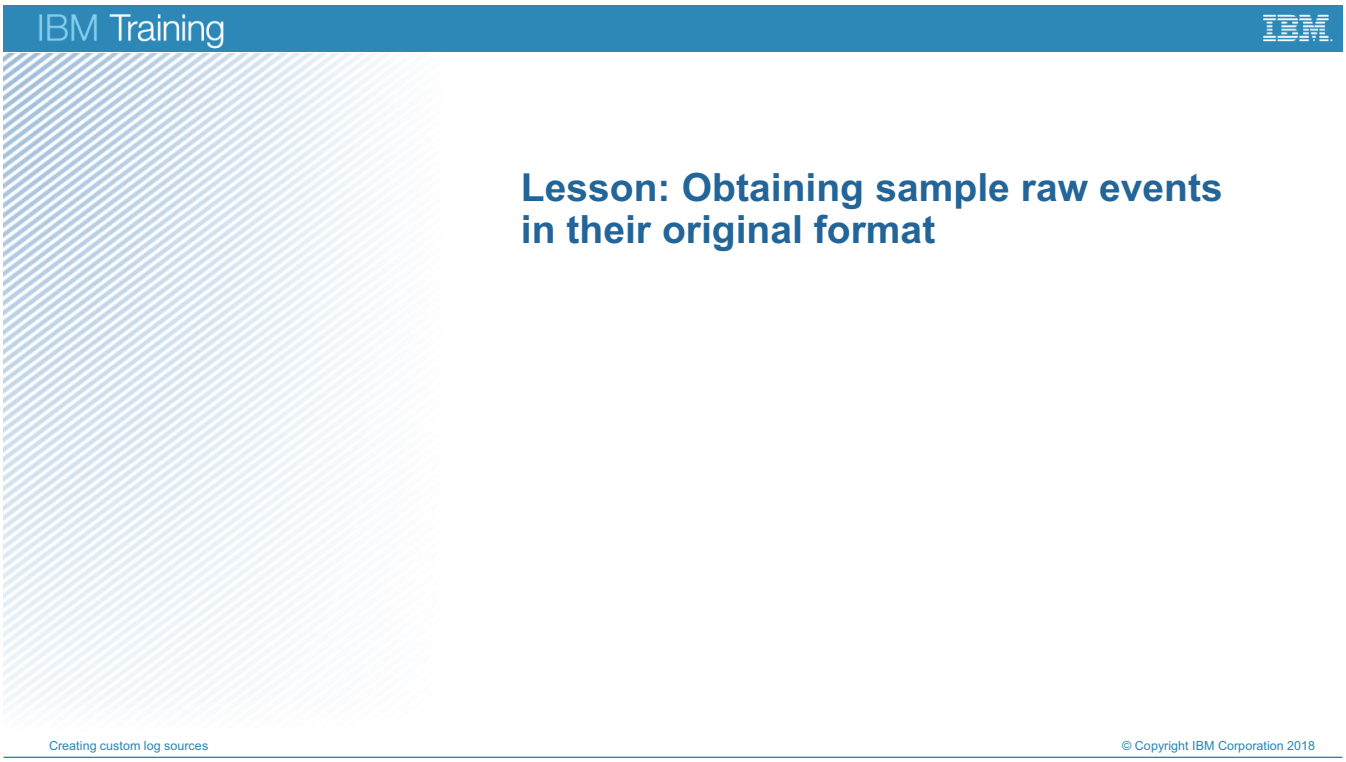
The government of California and Hawaii are facing threats caused by forest fires and volcanic eruptions. In order to protect the citizens and fire departments from being surprised by hazards, the government decided to invest in a monitoring system to detect smoke and heat sources.

The Technology Group developed a prototype of a sensor measuring temperature, smoke density, wind direction, and geo position. The sensor will be placed on the ground and is significant heat resistant. For a later release the sensor shall be attached on remote controlled vehicles or drones. In defined intervals each sensor sends events containing the above data to servers collecting these events. IBM volunteered to feed this data into an existing QRadar SIEM system to support the fire department headquarter.

Your team of QRadar specialists received a file with sample events from a sensor test. The task is to integrate a new log source type into QRadar, parse all relevant data and provide suggestions for further processing.

Scenario

Lesson 1 Obtaining sample raw events in their original format



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Steps to configure QRadar SIEM for raw events from an unsupported source

To configure QRadar SIEM to identify, parse, normalize, name, rate, and categorize raw events from an unsupported source, perform the following steps

1. **Obtaining sample raw events in their original format**
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Steps to configure QRadar SIEM for raw events from an unsupported source

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Obtain sample raw events in their original format

- Usually you receive the sample raw events from the owner or admin of the log source
- This can be a text file with the extracted payload like in our scenario:

```
May 20 02:30:18 10.0.120.17 20/may/2018:02:30:02        GPS:19.571722,-155.500861       Sensor-ID:4711
Temp[F]:68      Temp-level:normal       Smoke-level:normal      Wind-direction:NW       Risk-level:0

May 20 02:29:17 10.0.120.17 20/may/2018:02:29:01        GPS:19.571722,-155.500861       Sensor-ID:4711
Temp[F]:104     Temp-level:warning      Smoke-level:warning     Wind-direction:NW       Risk-level:2

May 20 02:28:17 10.0.120.17 20/may/2018:02:28:01        GPS:19.571722,-155.500861       Sensor-ID:4711
Temp[F]:140     Temp-level:critical     Smoke-level:critical    Wind-direction:W        Risk-level:5

May 20 02:27:16 10.0.120.17 20/may/2018:02:27:01        GPS:19.571722,-155.500861       Sensor-ID:4711
Temp[F]:451     Temp-level:lethal       Smoke-level:lethal      Wind-direction:SW       Risk-level:9
```

- Another option is to forward the sample events directly to the QRadar event collector
- Often the development of new log source types are performed on a test system
  Then it will be necessary to transfer events between QRadar deployments

Creating custom log sources

Obtain sample raw events in their original format

Understanding the structure and pattern of the logs is important. So make sure you receive available documentation about the log new log source and its functionality.

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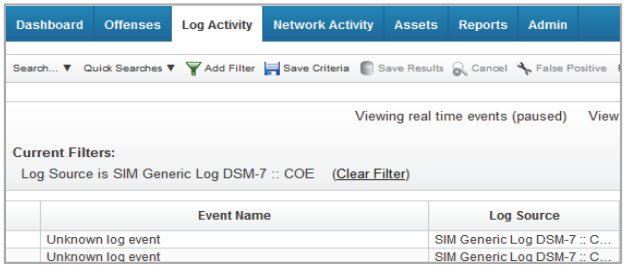
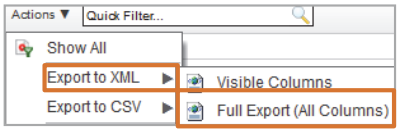
Transferring sample raw events between QRadar SIEM deployments

- Add a filter for **Log Source is SIM Generic Log DSM-7** on the **Log Activity** tab



- Export the search result to an XML file and copy it to the other QRadar SIEM console



- Extract the Base64 encoded raw events from the XML file

Transferring sample raw events between QRadar SIEM deployments

Lesson 2 Sending sample events to QRadar using logrun.pl

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Steps to configure QRadar SIEM for raw events from an unsupported source

To configure QRadar SIEM to identify, parse, normalize, name, rate, and categorize raw events from an unsupported source, perform the following steps

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Steps to configure QRadar SIEM for raw events from an unsupported source

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Send sample events to QRadar using logrun.pl

- Use the `/opt/qradar/bin/logrun.pl` script to send the sample raw events to QRadar SIEM
- **Example:** `/opt/qradar/bin/logrun.pl -f sensor_events_sample.txt -d 192.168.42.150 5`
- This command sends events from the file `sensor_events_sample.txt` to the QRadar Console IP `192.168.42.150` with the event rate of `5` eps

Event Name	Log Source	Event Count	Time	Low Level Category	Source IP
Unknown log event	SIM Generic Log DSM-7 :: vulmgr	1	May 28, 2018, 12:24:23 PM	Unknown Generic Log Event	10.0.120.17
Unknown log event	SIM Generic Log DSM-7 :: vulmgr	1	May 28, 2018, 12:24:23 PM	Unknown Generic Log Event	10.0.120.17
Unknown log event	SIM Generic Log DSM-7 :: vulmgr	1	May 28, 2018, 12:24:23 PM	Unknown Generic Log Event	10.0.120.17
Unknown log event	SIM Generic Log DSM-7 :: vulmgr	1	May 28, 2018, 12:24:23 PM	Unknown Generic Log Event	10.0.120.17

- Adding the option `-l` will loop the events indefinately with the choosen event rate

Send sample events to QRadar using logrun.pl

To follow the steps in the lab environment, use the following commands in CLI:

1. Change into the labfiles directory:
   `[root@vulmgr ~]# cd /labfiles`
2. Use `logrun.pl` to run the sample events:
   `[root@vulmgr labfiles]# /opt/qradar/bin/logrun.pl -f sensor_events_sample.txt -d 192.168.42.150 -5`

Take a look the options of the `logrun.pl` script

```
logrun.pl [-d <host>] [-p <port>] [-f filename] [-u <IP>] [-l] [-t] [-b] [-n NAME]
[-v] <messages per second>
```

Options:

-d : destination syslog host (default 127.0.0.1)

-p : destination port (default 514)

-f : filename to read (default readme.syslog)

-b : burst the same message for 20% of the delay time

-t : use TCP instead of UDP for sending syslogs

-v : verbose, display lines read in from file

-n : use NAME for object name in syslog header

-l : loop indefinately

-u : use this IP as spoofed sender (default is NOT to send IP header)

Lesson 3 Creating a new log source type using the DSM Editor

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Steps to configure QRadar SIEM for raw events from an unsupported source

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Steps to configure QRadar SIEM for raw events from an unsupported source

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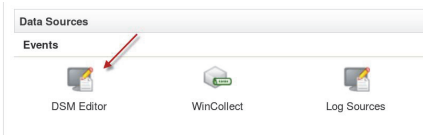
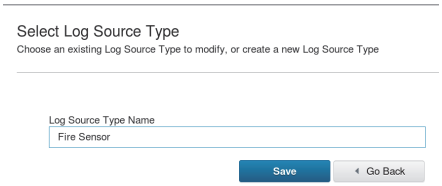
Using the DSM Editor to create a new log source type

- You can open the DSM Editor from the **Admin** tab by clicking on the icon



- The **Select Log Source Type** window opens
- Click **Create New** to add a new log source type
- Enter a name and click **Save**



- The new log source type can be used instantly

Creating custom log sources

Using the DSM Editor to create a new log source type

You can also access the DSM Editor from the Log Activity tab. As this step just creates the new log source type and the next step will be performed on the Admin tab as well it make sense to enter this way.

Lesson 4 Adding a new log source of the newly created type to collect the events

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Lesson: Adding a new log source of the newly created type to collect the events

Creating custom log sources

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Steps to configure QRadar SIEM for raw events from an unsupported source

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Steps to configure QRadar SIEM for raw events from an unsupported source

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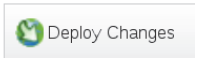
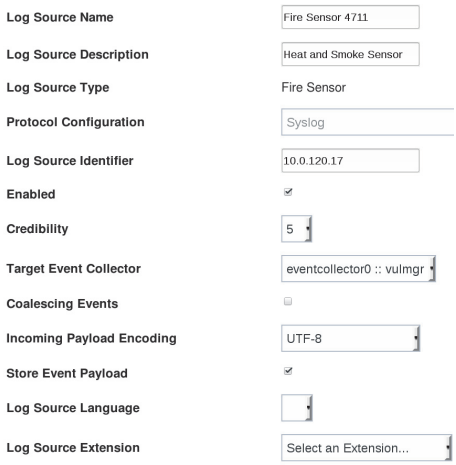
Add a log source of the newly created type to collect the events

- On the **Admin** tab add a log source
- Check the event payload for the correct identifier
- It can be the IP address or the hostname
- Disable **Coalescing Events**
- Do not forget to deploy the change



- Re-running the events will now show the log source name

Event Name	Log Source
Unknown	Fire Sensor 4711
Unknown	Fire Sensor 4711
Unknown	Fire Sensor 4711
Unknown	Fire Sensor 4711



Creating custom log sources

Add a log source of the newly created type to collect the events

The Coalescing Events option will only display the first 3 events within 10 seconds when the events appear with the same QID, Source IP, Destination IP, Destination port, and Username. The fourth event will be coalesced with all other events in the same appearance until the end of this 10 second interval. The events will be counted in the fourth event but the payload of the individual events will not be stored.

For configuring new log source types based on sample events this is mostly not useful because every sample event is important.

For further information about coalescing visit:

http://www.ibm.com/support/docview.wss?uid=swg21622709

Lesson 5 Configuring property parsing using regular expressions and the DSM Editor

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Steps to configure QRadar SIEM for raw events from an unsupported source

Common regular expressions

- IP Address \d{1,3}\.\d{1,3}\.\d{1,3}\.\d{1,3}
- Port Number \d{1,5}
- MAC Address (?:[0-9a-fA-F]{2}\:){5}[0-9a-fA-F]{2}
- Protocol (tcp|udp|icmp|gre)
- Device Time \w{3}\s\d{2}\s\d{2}:\d{2}:\d{2}
- White Space \s
- Tab \t
- Match Anything *? lazy
  * greedy

Common regular expressions

To configure property parsing you need to build regular expressions. Here are some common Regex that are frequently used in QRadar.

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Regular expression recommendations

- Use literal characters as much as possible
  For example, to match *"Windows EventLog"* or *"Windows DHCP"* including the double-quotes, use ⌈ **\"Windows\s(EventLog|DHCP)\"** ⌋
- Avoid using alternation ⌈ | ⌋ if possible, because backtracking is expensive for the pattern-matching engine
- If possible, indicate where in the string the pattern applies
  For example, use ⌈ ^ ⌋ or ⌈ $ ⌋
- Apply lazy or greedy quantifiers wisely
  In general, if what you are trying to match is in the beginning of the string, use the lazy quantifier; otherwise, use the greedy

Regular expression recommendations

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Analyze the sample events

- Lets take a closer look on the sample events:

```
May 20 02:30:18 10.0.120.17 20/may/2018:02:30:02        GPS:19.571722,-155.500861       Sensor-ID:4711
Temp[F]:68      Temp-level:normal       Smoke-level:normal      Wind-direction:NW       Risk-level:0

May 20 02:29:17 10.0.120.17 20/may/2018:02:29:01        GPS:19.571722,-155.500861       Sensor-ID:4711
Temp[F]:104     Temp-level:warning      Smoke-level:warning     Wind-direction:NW       Risk-level:2

May 20 02:28:17 10.0.120.17 20/may/2018:02:28:01        GPS:19.571722,-155.500861       Sensor-ID:4711
Temp[F]:140     Temp-level:critical     Smoke-level:critical    Wind-direction:W        Risk-level:5

May 20 02:27:16 10.0.120.17 20/may/2018:02:27:01        GPS:19.571722,-155.500861       Sensor-ID:4711
Temp[F]:451     Temp-level:lethal       Smoke-level:lethal      Wind-direction:SW       Risk-level:9
```

- Fields used in QRadar:
  - The syslog header begins with a date/time field, such as *May 20 02:30:18,* which by default is the **start time** in QRadar
  - Followed by the IP address *10.0.120.17,* already used as the log source identifier or source ip
  - Followed by another date/time field, such as *20/may/2018:02:30:02,* with values some seconds earlier identified as the **log source time**

- NONE of the following fields are used in QRadar. These are candidates for building the Event ID or custom properties (-> step8)
  - GPS data, Temperature in F, Sensor ID
  - Temp-level and Smoke-level with values: normal, warning, critical, lethal
  - Wind direction
  - Risk-level with values from 0 - 9

Analyze the sample events

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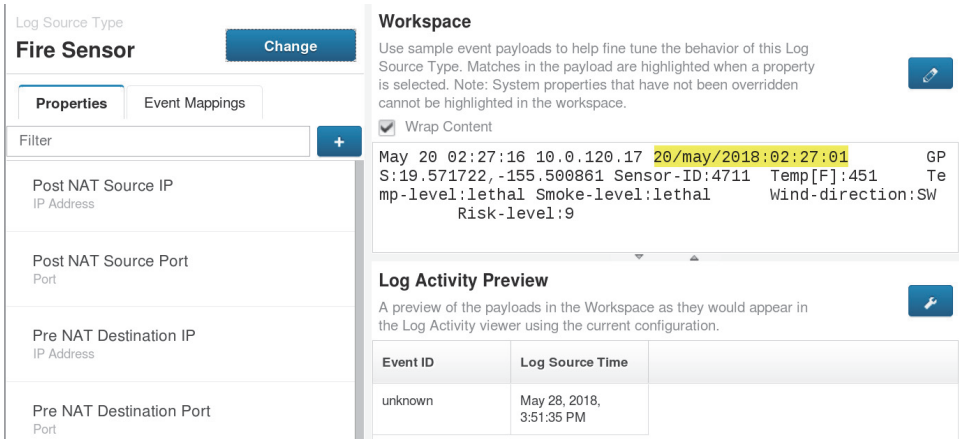
Preparing the DSM Editor

- Open the DSM Editor from the Log Activity tab:
  - Let the `logrun.pl` script run again
  - Pause the events and mark some events by right clicking while pressing the shift key to display these events in the preview
  - From the actions menu select DSM Editor
  - By using the wrench button, choose the properties to be displayed in the Log Activity Preview
  - Examine that the log source time is not correctly parsed



Preparing the DSM Editor

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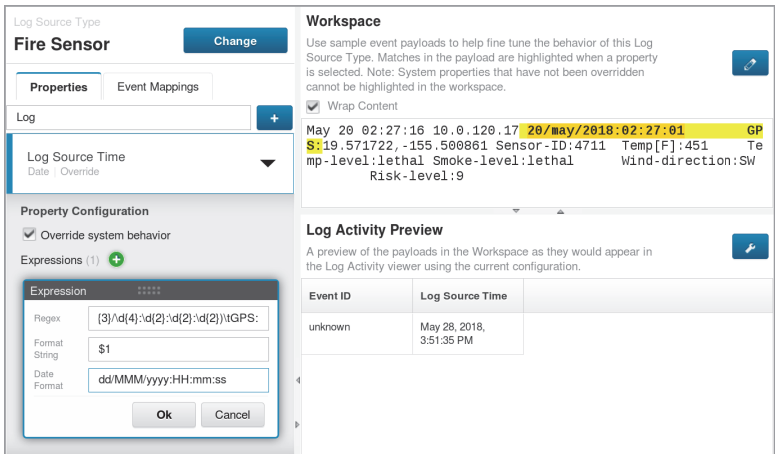
Start parsing properties using the DSM Editor

- Use the properties section on the left side of the DSM Editor to configure the log source time:
  - Select the property **Log Source Time**
  - Select **Override system behavior**
  - Enter the values in the fileds for: Regex, Format String and Date Format and click **Ok**
  - In the test field the whole Regex is highlighted yellow and the capture group in orange



Start parsing properties using the DSM Editor

Regex:

```
\s(\d{2}/\w{3}/\d{4}:\d{2}:\d{2}:\d{2})\tGPS:
```

The Capture group is highlighted in orange, the remaining part that matches the Regex is highlighted in yellow

Format String:

```
$1
```

Date Format:

```
dd/MMM/yyyy:HH:mm:ss
```

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Event time stamps

Event Information

Event Name	Unknown						
Low Level Category	Unknown						
Event Description	Unknown						
Magnitude	(6)	**Relevance**	9	**Severity**	3	**Credibility**	5
Username	N/A						
Start Time	May 28, 2018, 4:21:34 PM	**Storage Time**	May 28, 2018, 4:21:34 PM	**Log Source Time**	May 20, 2018, 2:27:01 AM		

- Every event in QRadar SIEM records three different time stamps
  - **Start Time:** The time stamp for when the Event Collector received the raw event
  - **Storage Time:** The time stamp for when the Event Processor stored the normalized event in its database
  - **Log Source Time:** The time stamp that the log source recorded in the raw event

Event time stamps

Event Collectors record the time, at which they receive a raw event, as the Start Time of the normalized event. From some log sources, raw events arrive together in bulk. Their normalized events get the same Start Time. Their Log Source Times usually differ because the bulk arrival included raw events created over a time range. The time related conditions in function tests use the Start Time of normalized events.

Therefore, a custom rule, that tests for three normalized events with the same user name within five minutes, fires even if the three raw events occurred over a longer time range but arrived together and therefore their normalized events have the same Start Time.

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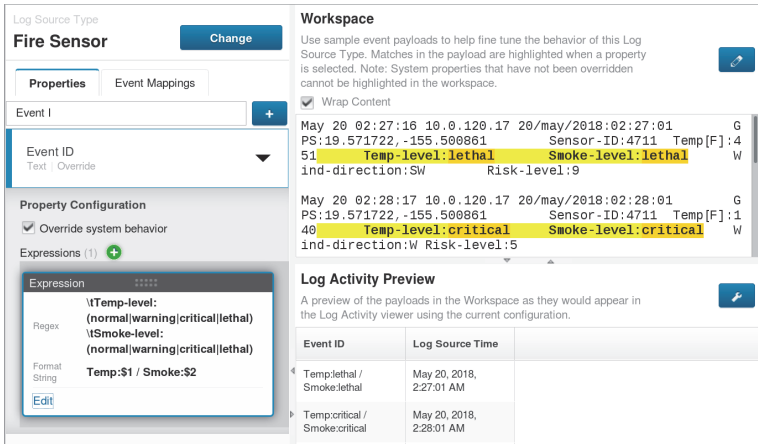
Parsing the Event ID

- The Event ID property is the bare minimum that need to be parsed in order to configure an event categorization and mapping:
  - Select the property **Event ID**
  - For Event ID select values that tell the analyst what kind of an event it is to assume the impact
  - In scenario 2, values are important. So the Regex contains 2 capture groups (Temp-level and Smoke-level)
  - The Format string helps to structure this information



Creating custom log sources

Parsing the Event ID

Regex:

```
\tTemp-level:(normal|warning|critical|lethal)\tSmoke-level:(normal|warning|critical|lethal)
```

Format String:

```
Temp:$1 / Smoke:$2
```

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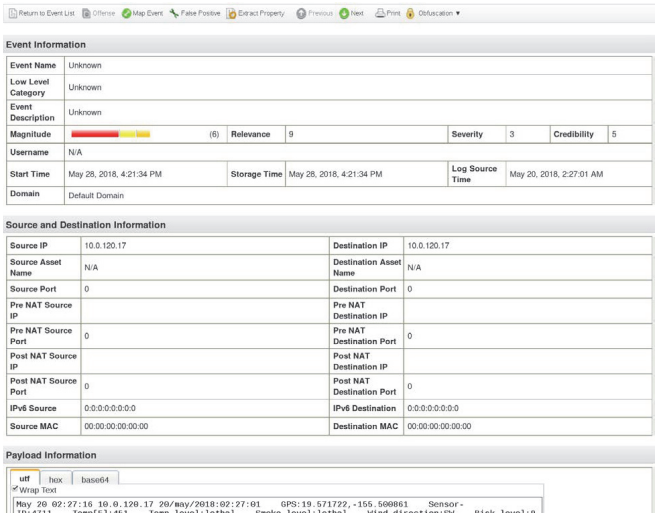
Looking at the event details in the Log Activity tab

- Double click the Log Activity tab and run the `logrun.pl` script again
  - Examine the Event information
  - The Log source time is now parsed correct
  - The Event Name field is still unknown as no event mapping is performed yet
  - Clicking on the Map Event button displays the Event ID

Log Source Type	FireSensorCustom
Log Source Event Category	unknown
Log Source Event ID	Temp:lethal / Smoke:lethal
Original QID	Unknown



Looking at the event details in the Log Activity tab

The Event ID is the value for the Event Name when the event mapping is performed.

Lesson 6 Creating an event categorization and mapping

IBM Training

Steps to configure QRadar SIEM for raw events from an unsupported source

To configure QRadar SIEM to identify, parse, normalize, name, rate, and categorize raw events from an unsupported source, perform the following steps

1. Obtaining sample raw events in their original format
2. Sending sample events to QRadar using logrun.pl
3. Creating a new log source type using the DSM Editor
4. Adding a log source of the newly created type to collect the events
5. Configuring property parsing
6. Creating an event categorization and mapping
7. Creating custom properties
8. Considering next steps to benefit from the new log source type

Steps to configure QRadar SIEM for raw events from an unsupported source

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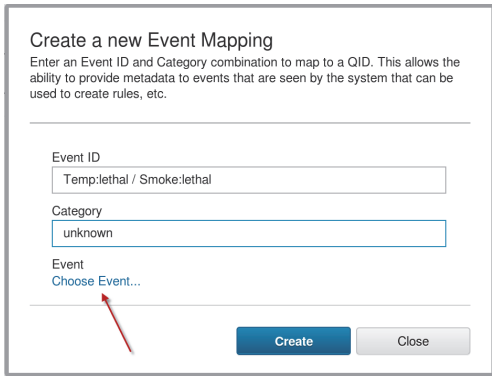
Creating a new event mapping

- From the Log Activity tab return to the event list
  - Right-click the first event and select DSM Editor and Event mappings
  - Leave the two event mappings for unknown untouched and click the **plus** icon to create a new mapping



  - **Choose Event** will open the Event Categorization window
  - Scroll to the bottom and click **Create New QID Record**

Creating custom log sources

Creating a new event mapping

This event will not fit to any existing Event Mapping and Categorization.

About QID maps

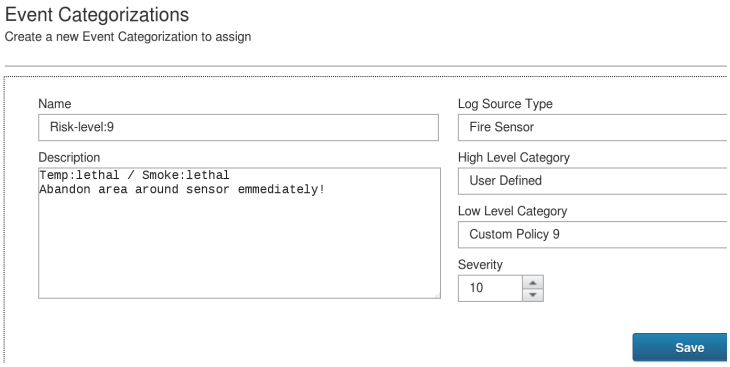
- A QID map identifies an action of a software system or network device that it logs as a raw event
- For this action, a QID map specifies the following properties for the normalized event
  - event name
  - event description
  - severity rating
  - low-level category (LLC), which implicitly specifies the high-level category (HLC)
- Usually, normalized events use the same name and other properties if they represent equivalent actions, even if the actions occurred on systems from different vendors and were logged differently; QRadar SIEM uses different QID maps to identify equivalent actions on systems from different vendors
  Example: Firewall deny events from two different vendors are identified by different QID maps but have the same event name, description, severity rating, and categorization
- If a suitable QID map is already available, you can use it; otherwise, create one

About QID maps

IBM Training

Creating a new event categorization

- Define a new Event Categorization
  - Select a HLC and LLC
  - Select a severity for this event



- Click **Save** to create the event categorization
- Select the Name (Risk-level:9) and click **Ok**
- The Event Categorization window closes
- To create the mapping between Event ID and the event categorization click **Create**
- Scroll down to the bottom and click **Save**
- Click **Cancel** to close the DSM Editor

Creating a new event categorization

Display events in Log Activity

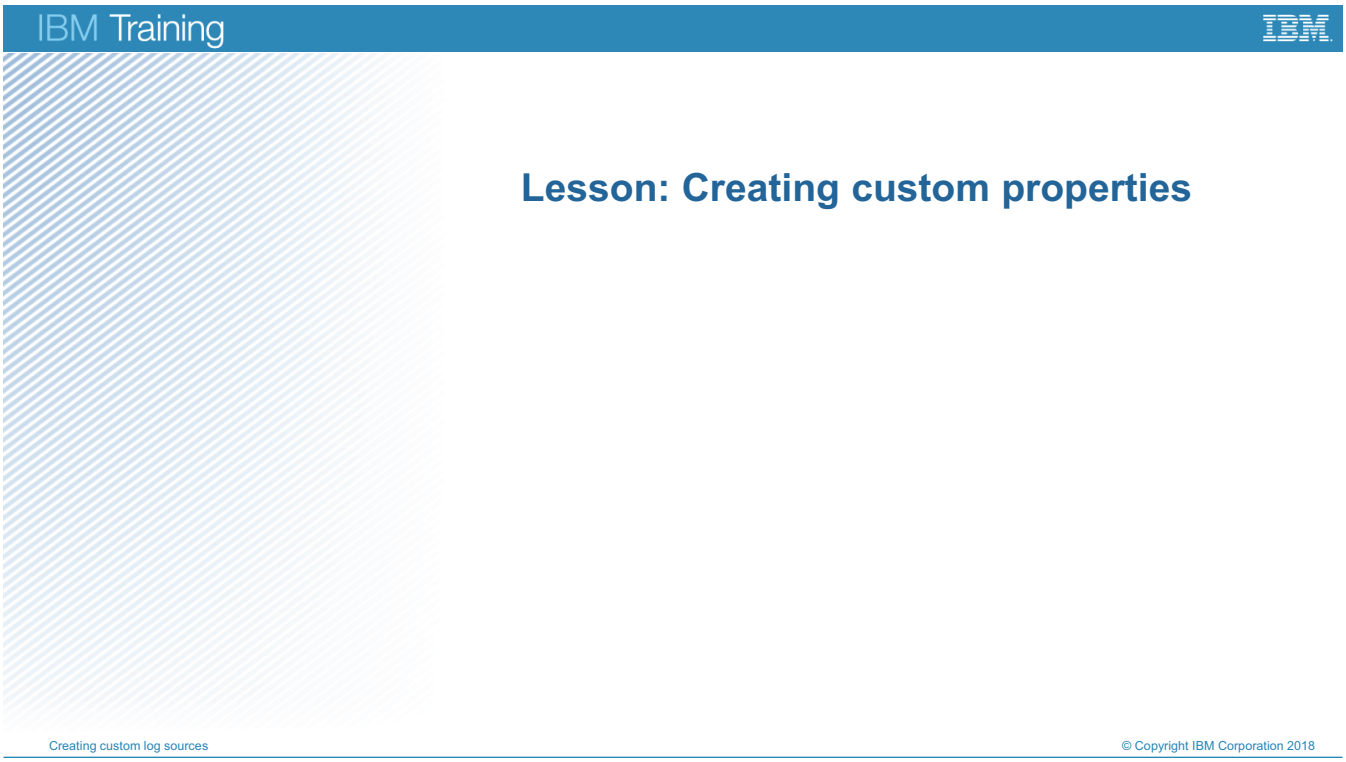
- The new events will now appear with the correct Event Name and LLC

Event Name	Log Source	Even Coun	Time	Low Level Category
Risk-level:9	Fire Sensor 4711	1	Jun 11, 2018, 5:24:22 AM	Custom Policy 9
Unknown	Fire Sensor 4711	1	Jun 11, 2018, 5:24:21 AM	Unknown
Unknown	Fire Sensor 4711	1	Jun 11, 2018, 5:24:22 AM	Unknown
Unknown	Fire Sensor 4711	1	Jun 11, 2018, 5:24:22 AM	Unknown

- For other events an event categorization and mapping can be performed accordingly

Display events in Log Activity

Lesson 7 Creating custom properties



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Steps to configure QRadar SIEM for raw events from an unsupported source

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7. Creating custom properties
8. Considering next steps to benefit from the new log source type

Steps to configure QRadar SIEM for raw events from an unsupported source

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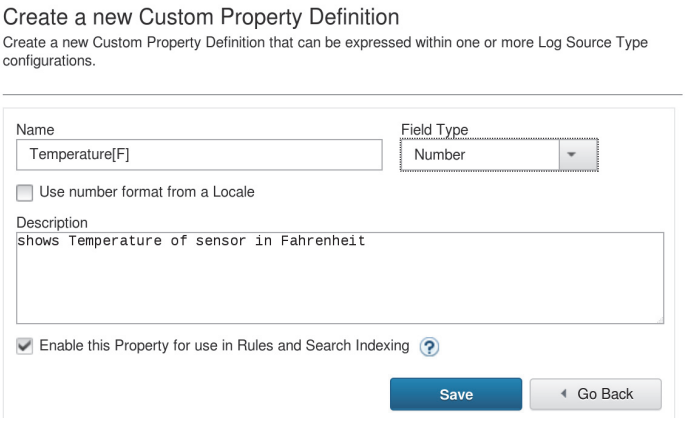
Creating custom properties

- Using the DSM Editor you can create additional custom properties that do not exist in QRadar yet
  - Clicking the **plus** symbol you can create a new Custom Property Definition
  - To make better use of it select Enable this Property for use in Rules and Search Indexing



  - To create the custom property definition, click **Save**
  - Scroll down and Click **Select.** The Choose a Custom Property to Express window closes.

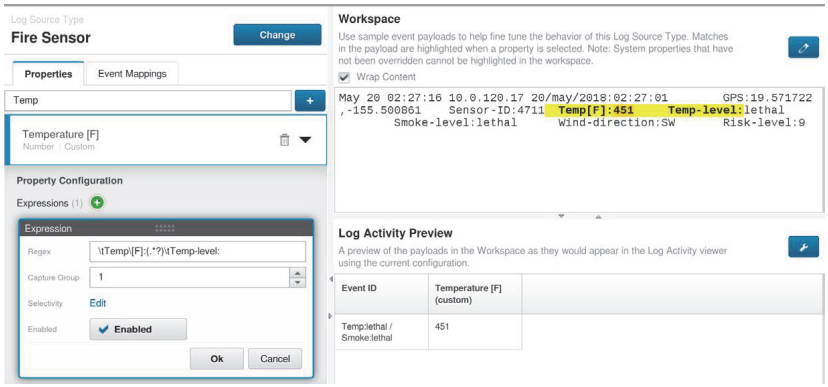
Creating custom log sources

Creating custom properties

IBM Training

Creating custom properties (continued)

- Click the **Temperture[F]** property to expand the property configuration
  - Enter the regular expression
  - Enter or select 1 for Capture Group



- Click **Ok** and then **Save**
- Close the DSM Editor with **Cancel**
- The custom property shows up on any event of the log source type **Fire Sensor**
- It can be used in Rules and Searches

Temperature[F] (custom)	451

Creating custom properties (continued)

Regex:

```
\tTemp\[F]:(\d{1,3})\tTemp-level:
```

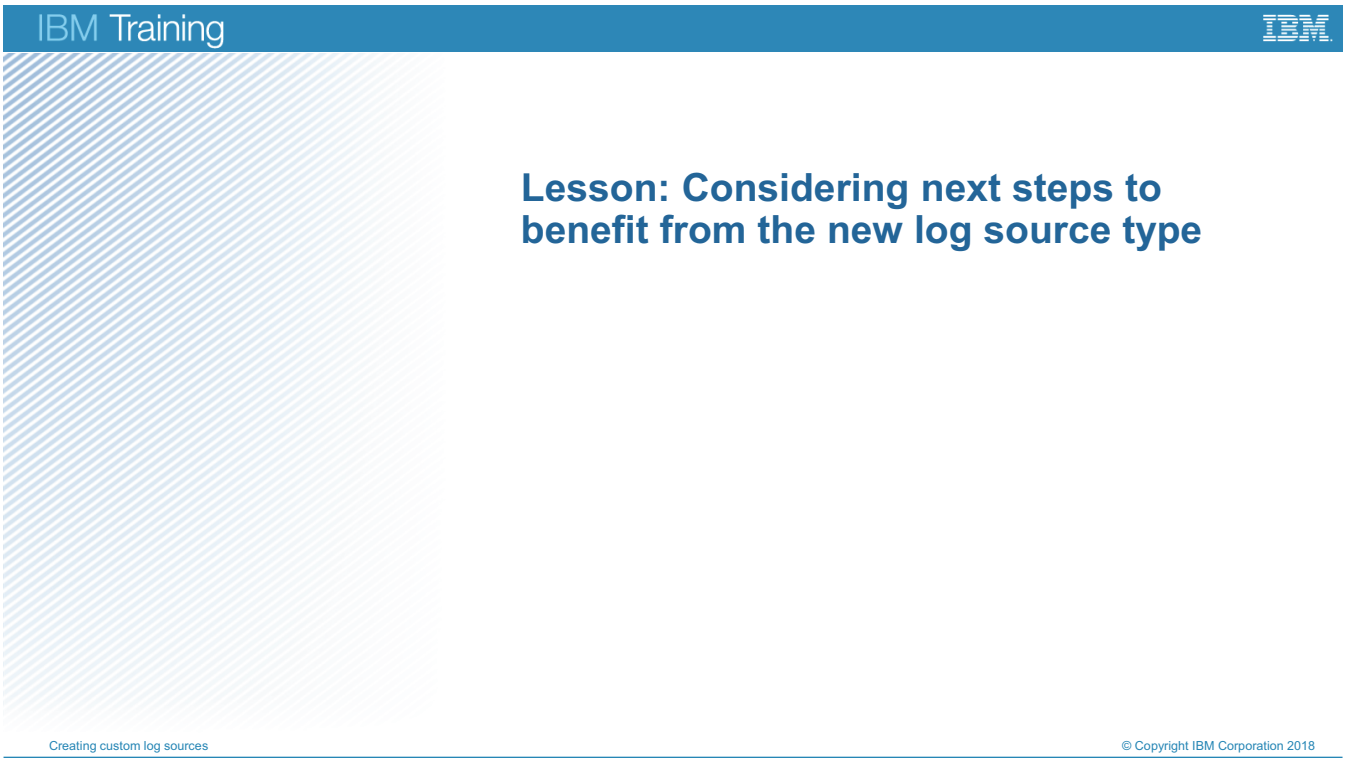
For Capture Group select 1

Quiz

1. What are the steps to integrate a new log source type?
2. Are there steps that can be moved to a later or earlier stage?
3. What is important when obtaining sample events from an unsupported log source?
4. How can you send sample events to QRadar?
5. Should you configure the new log source to coalesce events?
6. What actions can be performed by the DSM Editor?
7. What time stamps does QRadar record?
8. Why do you create custom properties?

Quiz

Lesson 8 Considering next steps to benefit from the new log source type



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Steps to configure QRadar SIEM for raw events from an unsupported source

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8. Considering next steps to benefit from the new log source type

Steps to configure QRadar SIEM for raw events from an unsupported source

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Considering next steps to benefit from the new log source type

Discuss in the team how QRadar can support the fire departments with the data from the configured Log Source Type

- How can the information of the events from the sensors be made available to the fire department headquarter?
- How can a rule look like to warn the operating units from hazards?
- Any other ideas?

Considering next steps to benefit from the new log source type

The government of California and Hawaii are facing threats caused by forest fires and volcanic eruptions. In order to protect the citizens and fire departments form being surprised by hazards the government decided to invest in a monitoring system to detect smoke and heat sources.

The Technology Group developed a prototype of a sensor measuring temperature, smoke density, wind direction and geo position. The sensor will be placed on the ground and is significantly heat resistant. For a later release the sensor shall be attached on remote controlled vehicles or drones. In defined intervals each sensor sends events containing the above data to servers collecting these events. IBM volunteered to feed these data into an existing QRadar SIEM system to support the fire department headquarter.

Your team of QRadar specialists received a file with sample events from a sensor test. The task is to integrate a new log source type into QRadar, parse all relevant data and provide suggestions for further processing.

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Exercise introduction

Complete the following exercises in the Course Exercise Guide

- Exercise 1: Sending unknown events to QRadar SIEM
- Exercise 2: Using the DSM Editor to create a new log source type
- Exercise 3: Adding a Physical Access log source
- Exercise 4: Starting the DSM Editor from the Log Activity tab
- Exercise 5: Configuring property parsing
- Exercise 6: Verifying the Log Source Extension for Log Source Type Physical Access
- Exercise 7: Verifying the Physical Access log source
- Exercise 8: Creating an event categorization and mapping
- Exercise 9: Verifying the event categorization and mapping
- Exercise 10: Creating more event categorizations and mappings
- Exercise 11: Creating a custom property
- Exercise 12: Filtering by a custom property in a search (optional)

Exercise introduction

For this exercise you can choose 2 versions how to perform it.

Version A is harder. It is designed for experienced QRadar users who want to perform the exercises on their own with basic instructions what to do.

Version B is easier. It is designed for QRadar users with limited experience who want to perform the exercises step by step following more detailed instructions what and how to do it.

Feel free to use the version of your choice. You can anytime flip between the versions for instance when you get stuck in the harder version or if you consider the easier version is not challenging enough.

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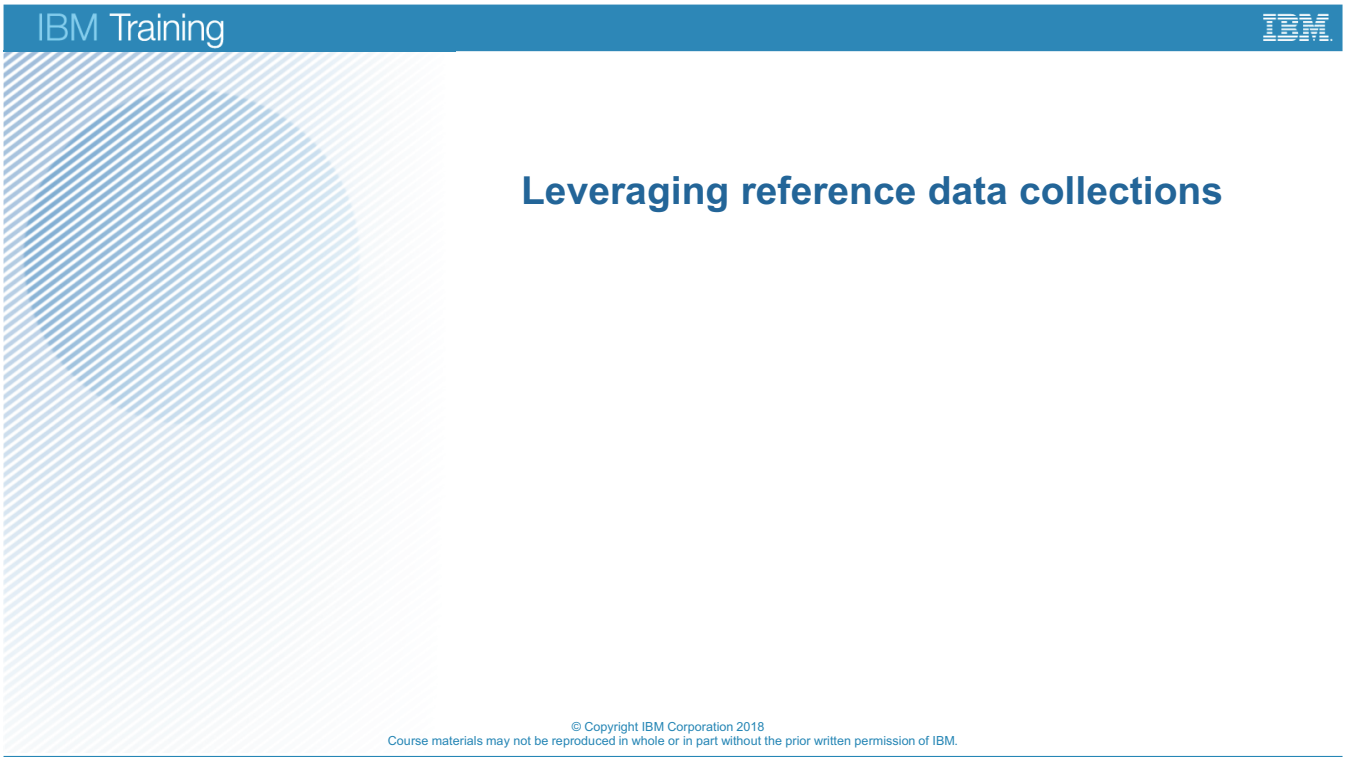
Unit summary

- Obtaining sample raw events in their original format
- Sending sample events to QRadar using logrun.pl
- Creating a new log source type using the DSM Editor
- Adding a new log source of the newly created type to collect the events
- Configuring property parsing
- Creating an event categorization and mapping
- Creating custom properties
- Considering next steps to benefit from the new log source type

Unit summary

Unit 2 Leveraging reference data collections



Using reference data collections allow you to store and manage business data that you want to correlate against the events and flows in your IBM QRadar environment. You can add business data or data from external sources into a reference data collection, and then use the data in QRadar searches, filters, rule test conditions, and rule responses. In this unit you learn how to choose the right reference data collection along with how to manage and use them within QRadar rules.

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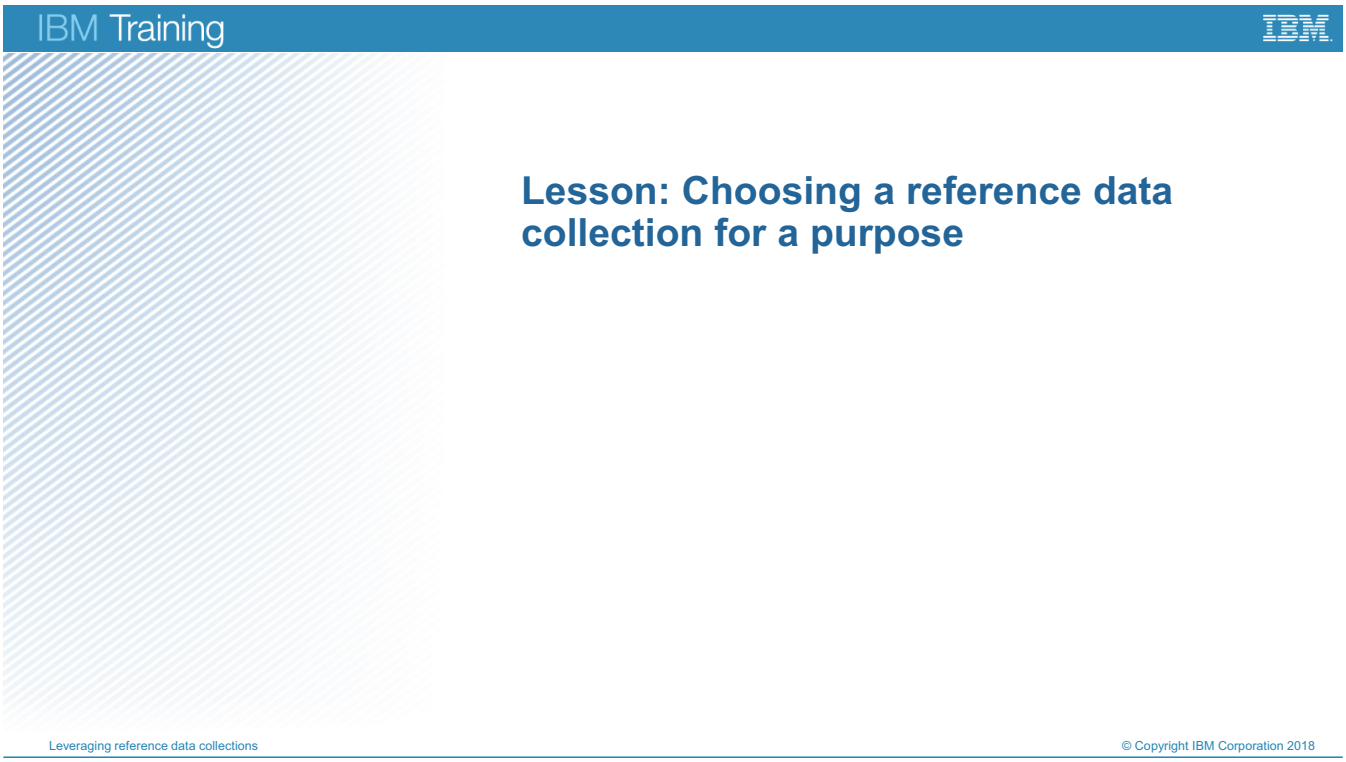
Unit objectives

- Choosing a reference data collection for a purpose
- Managing reference data collections
- Updating reference data collections from external sources
- Using reference data collections in rules

Unit objectives

Lesson 1 Choosing a reference data collection for a purpose



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Reference data collection types overview

QRadar SIEM supports the following reference data collection types

- A Reference Set is a collection of unique values in no particular order
- A Reference Map is a collection of key-value pairs where every key is unique
- A Reference Map of Sets is a collection in which every key is unique and maps to one Reference Set
- A Reference Map of Maps is a collection in which every key is unique and maps to one Reference Map
- A Reference Table is similar a Reference Maps of Maps, but it allows secondary keys of different types

Reference data collection types overview

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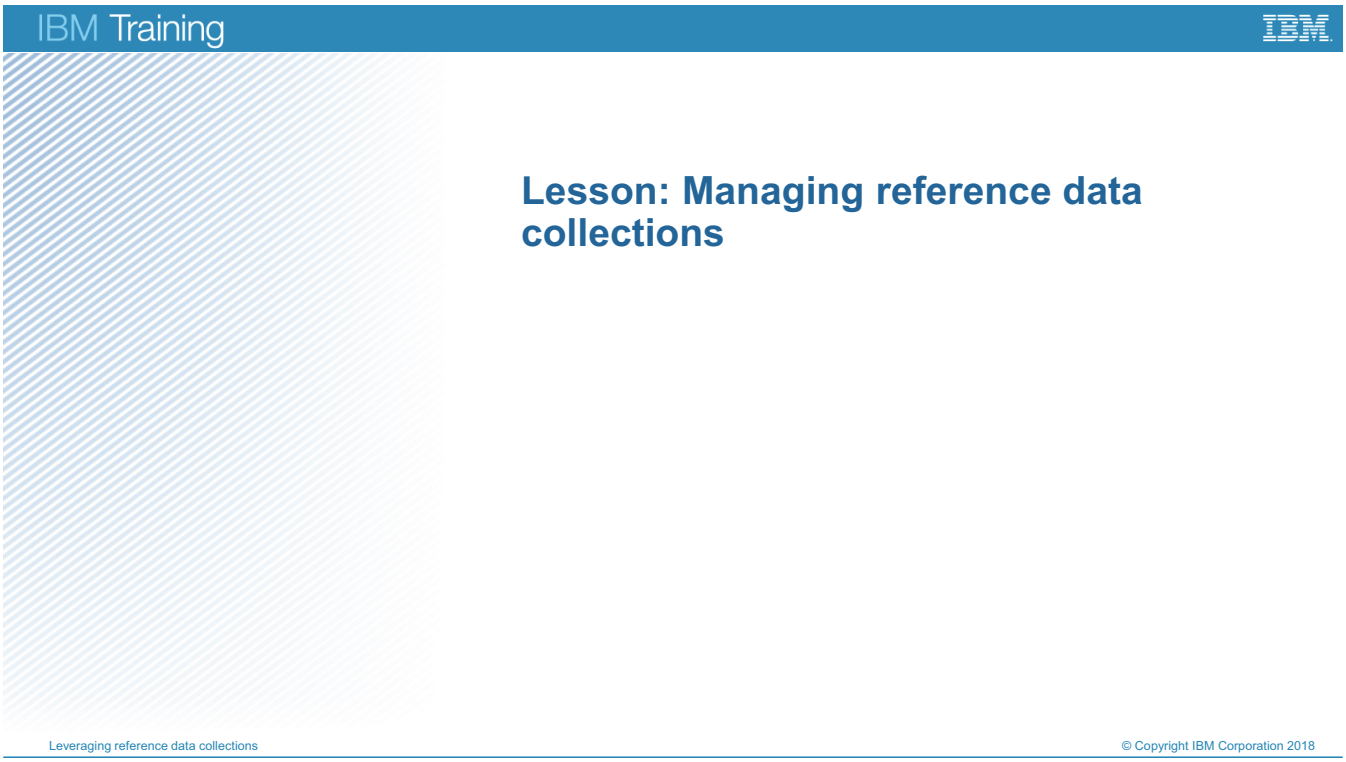
Reference data collection use cases

- Reference Set
  Verify a property value against a list; for example, verify whether the **logonid** used is a logon ID that was issued
- Reference Map
  Verify a unique combination of two property values; for example, verify whether the fixed IP address can use the FTP protocol
- Reference Map of Sets
  Verify a combination of two property values against a list; for example, verify whether the combination of **logonid** and **location** is approved
- Reference Map of Maps
  Verify a unique triplet of property values; for example, verify whether a person has used the valid **logonid** from an approved **location**
- Reference Table
  Verify a unique triplet of property values; for example, create a reference table that stores **Username** as the first key, **Source IP** as the second key with an assigned **cidr** data type, and **Source Port** as the value

Reference data collection use cases

For more information refer to IBM Knowledge Center article covering “Types of reference data collections”.

Lesson 2 Managing reference data collections



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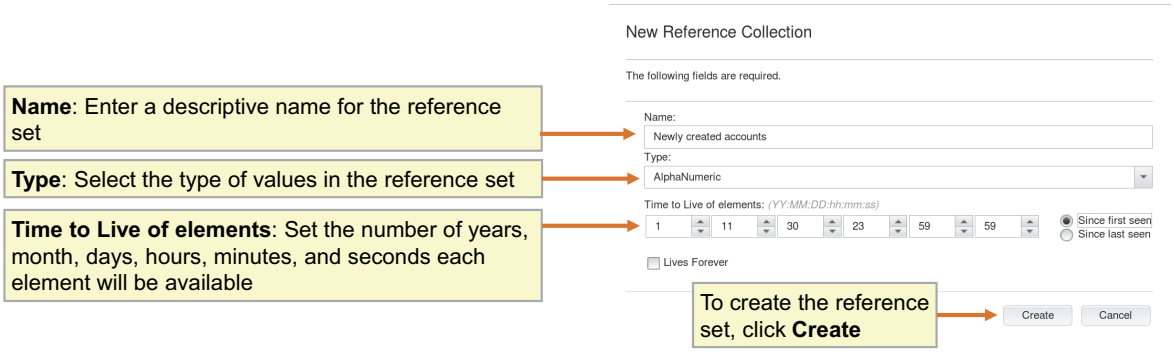
Reference set management

- A reference set is a collection of unique values, such as IP addresses or user names
- Rules can add data to or test property values of events and flows against the contents of a reference set



Reference set management

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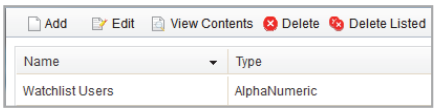
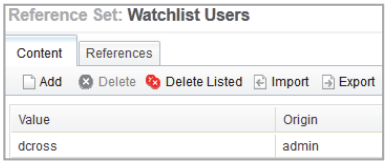
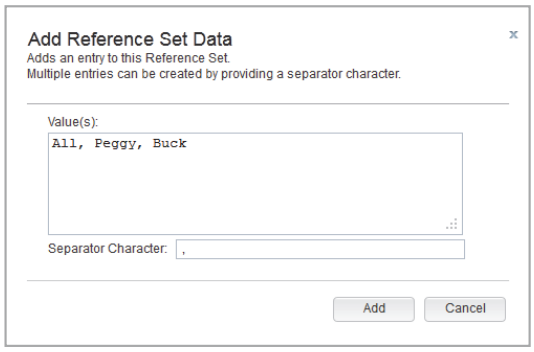
Reference set elements

- Use the **View Contents** button or double-click the reference set name to view and edit the contents of a reference set







- On the **Content** tab, add lists of items with a separator character or use bulk import and export functions
- The **References** tab displays the rules that use this reference set

Reference set elements

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Managing and using reference maps on the command line

Use the `/opt/QRadar/bin/ReferenceDataUtil.sh` script to perform the following tasks

- Create, update, and remove reference sets
- Add, delete, and look up elements
- Import and export elements

```
/opt/qradar/bin/ReferenceDataUtil.sh

create <name> <MAP | MAPofSETS | MAPofMAPS> [timeout_type]
[timeToLive] - NOTE: only alphanumeric maps are supported at the
moment.

update <name> [timeout_type] [timeToLive]

add <name> <value> <key1> [key2] [-sdf=" ... "]

delete <name> <value> <key1> [key2] [-sdf=" ... "]

remove <name>

purge <name> [memoryOnly]

list <name> [displayContents]

listall [displayContents]

load <name> <filename> [-encoding=...] [-sdf=" ... "]
```


Managing and using reference maps on the command line

Only reference sets can be managed within the QRadar SIEM GUI. All other forms of reference data has to be managed outside of the GUI.

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Using ReferenceDataUtil.sh

Command line options

```
The ReferenceDataUtil command line application has the following commands:
 create - used to create a new collection
 update - used to update an existing collection
 add - add a single value to a collection
 delete - deletes a single value from a collection
 remove - deletes an existing collection and its contents
 purge - delete the contents of a collection
 list - lists the metadata of a collection and optionally its contents
 listall - lists the metadata for each collection and optionally there contents
 load - load the content of a Comma Separated Values (CSV) file into the specified collection
```

- Notice the difference between
  - **Create** refers to a new collection
  - **Update** refers to an existing collection
  - **Add** refers to a single value added to a collection
  - **Delete** refers to a single value to be deleted from a collection
  - **Remove** refers to an existing collection **and** its content
  - **Purge** refers to content of a collection

Using ReferenceDataUtil.sh

IBM Training IBM

Using the REST API

- QRadar exposes a REST API that allows the management of reference data collections outside the GUI and CLI
- Administrators can call into the REST API using standard HTTP POST and GET requests using both text strings and JSON objects

Procedure:

1. Use a web browser to access https://<*Console IP*>/api_doc and log in as the administrator
2. Select the latest iteration of the IBM Security QRadar API
3. Select the `/reference_data` directory

Access to REST API in the lab environment
https://192.168.42.150/api_doc

Using the REST API

For more information refer to the IBM Knowledge Center article covering "Creating reference data collections with the APIs".

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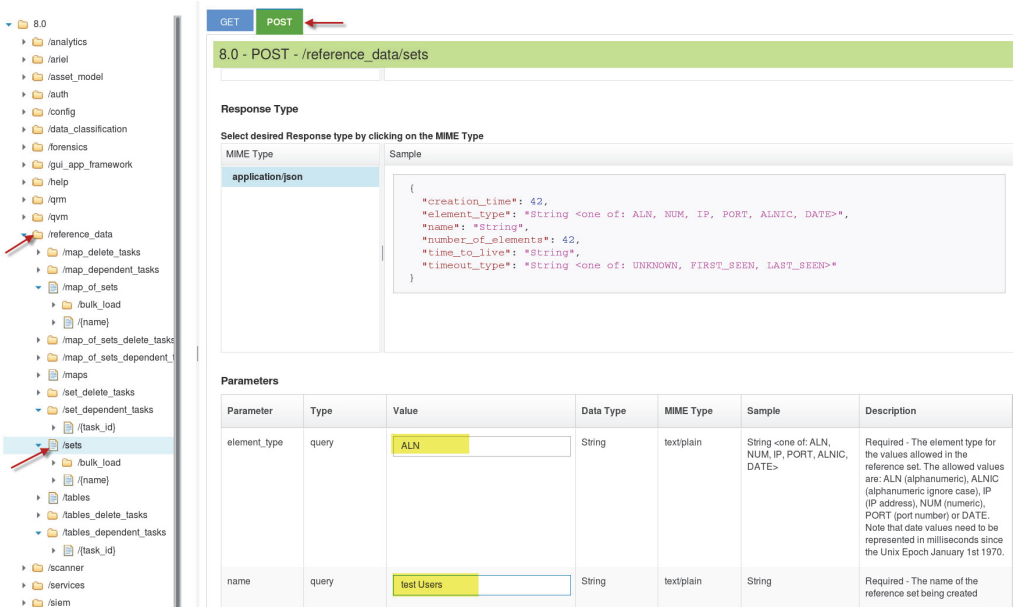
Using the REST API – Example for creating a reference set



Using the REST API – Example for creating a reference set

Example for creating a reference set „test Users“

1. Select the latest version of REST API
2. Expand `/reference_data`
3. Click `/sets`
4. Click request type POST
5. Enter the required values as documented
6. Scroll down and click **Try it out!**
7. The return code „201“ shows that the request was successful

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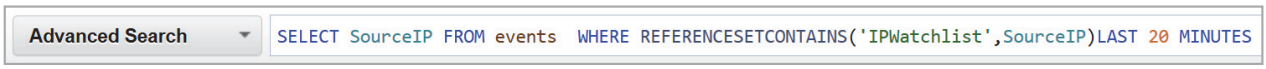
Using Ariel Query Language to build reference data searches

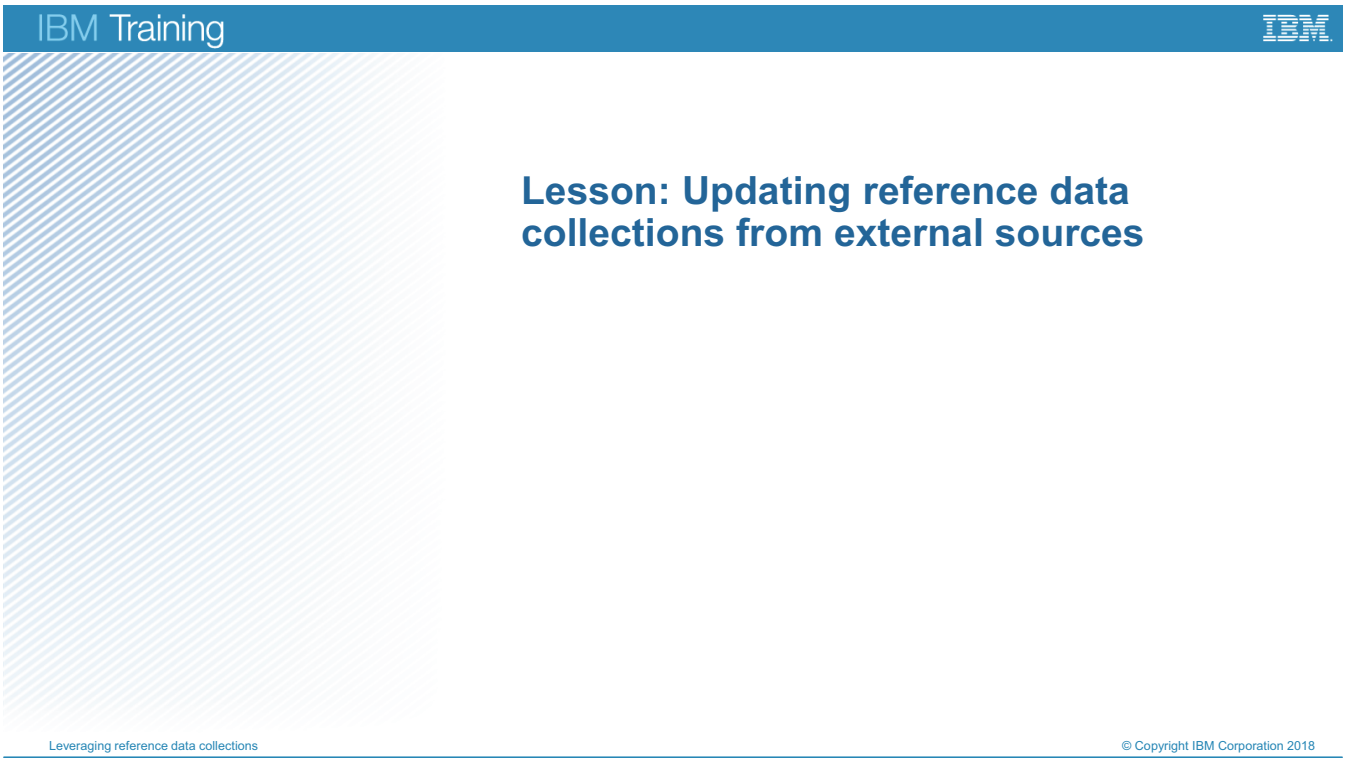
- Ariel Query Language (AQL) supports reference data in searches
- The example queries the Ariel database for events where the source IP address matches entries in the **IPWatchlist** reference set



- Use the following AQL functions for the various reference data collection types
  - REFERENCESETCONTAINS
  - REFERENCEMAPSETCONTAINS
  - REFERENCEMAP
  - REFERENCETABLE

Using Ariel Query Language to build reference data searches

Lesson 3 Updating reference data collections from external sources



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Sample use case of leveraging dynamic data in a reference set

- The building block *BB:HostDefinition: Web Servers* contains the IP addresses of all servers approved to provide HTTP and HTTPS service
- However, in some environments, the IP addresses of web servers are constantly in flux, so relying on the building block alone is not suitable
- The server deployment team maintains information about deployed servers in an externally accessible RDBMS

Sample use case of leveraging dynamic data in a reference set

Creating a reference set via the REST API

- The REST API requires authentication either via HTTP basic authentication using a user name and password or using a secure token created in the Authorized Services utility
- The following example shows how to use cURL to create a reference set called *webservers*, which will contain the IP addresses of approved web servers

```
curl -k --user admin:P@ssw0rd -X POST
"https://192.168.42.150/api/reference_data/sets?name=WebServers&element_type=IP"
```


Creating a reference set via the REST API

IBM Training

Managing reference data elements

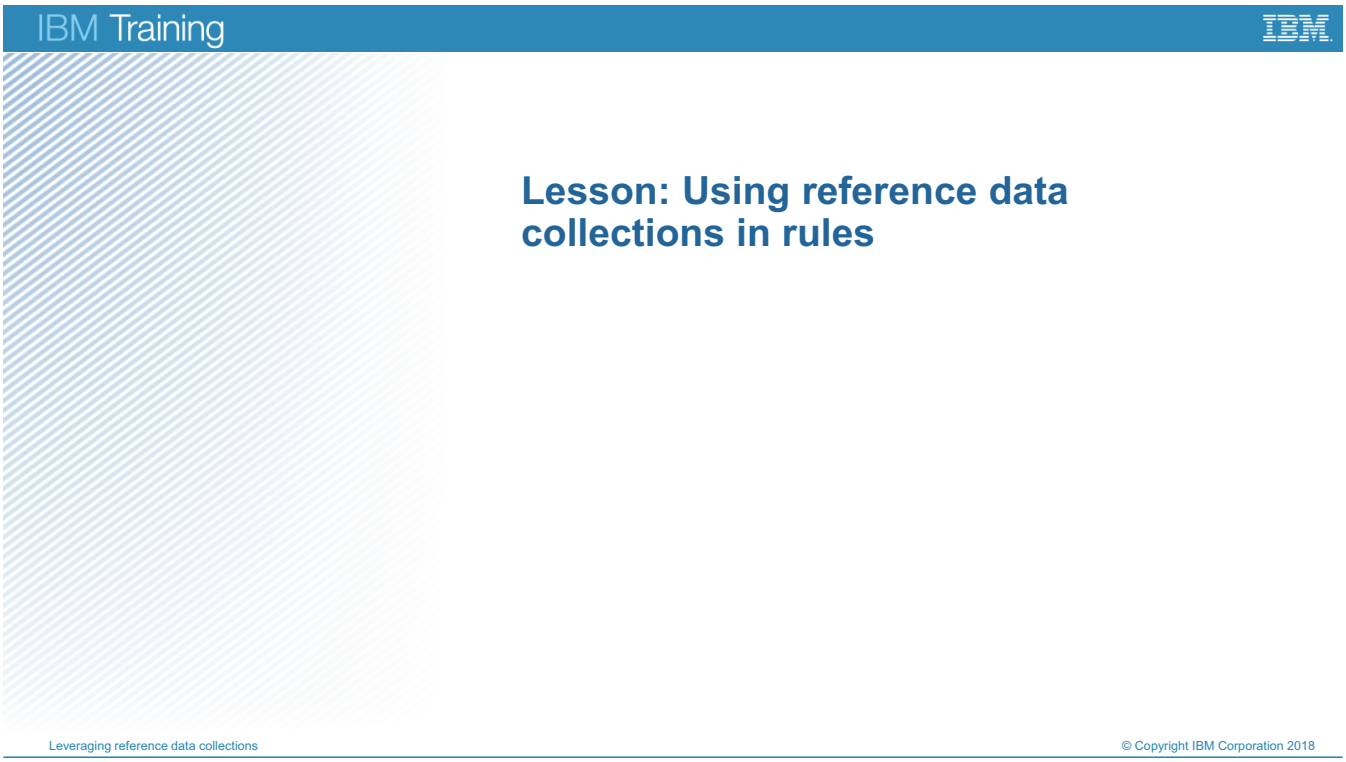
- To facilitate the integration with the external RDBMS, you must add elements to the newly created reference set; for example, use cURL to add a single IP address to the reference set

```
curl -k --user admin:P@ssw0rd -X POST
https://192.168.42.150/api/reference_data/sets/WebServers?value=192.168.10.12
```

- The API also supports the bulk loading of elements into reference data collections using JSON objects

Managing reference data elements

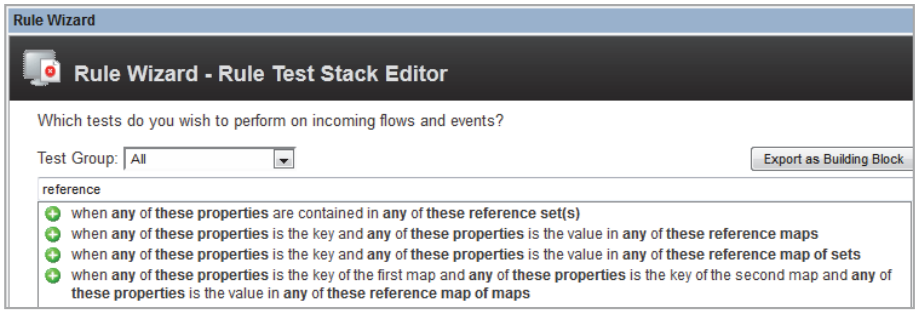
Lesson 4 Using reference data collections in rules



IBM Training

Using reference data collections in the custom rules

Custom rule tests with reference data collections



Using reference data collections in the custom rules

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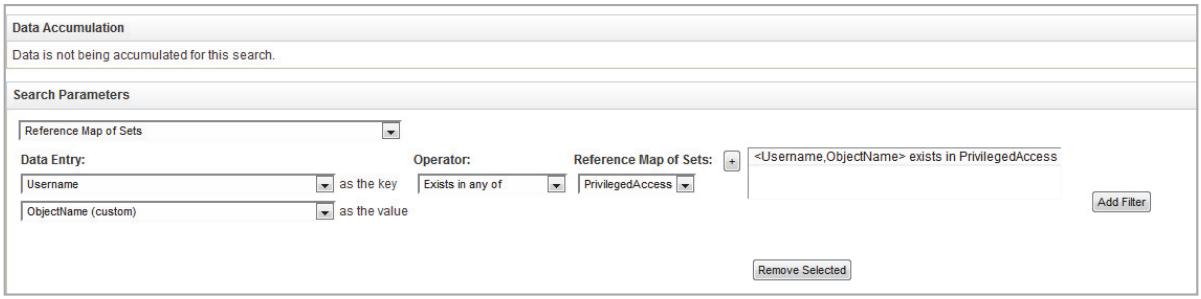
Using reference maps in searches

- You can match properties with reference map keys and values



- You cannot display the name of the reference set or map in the columns of the report when a match is found

Using reference maps in searches

IBM Training

Sample use case of reference map of sets

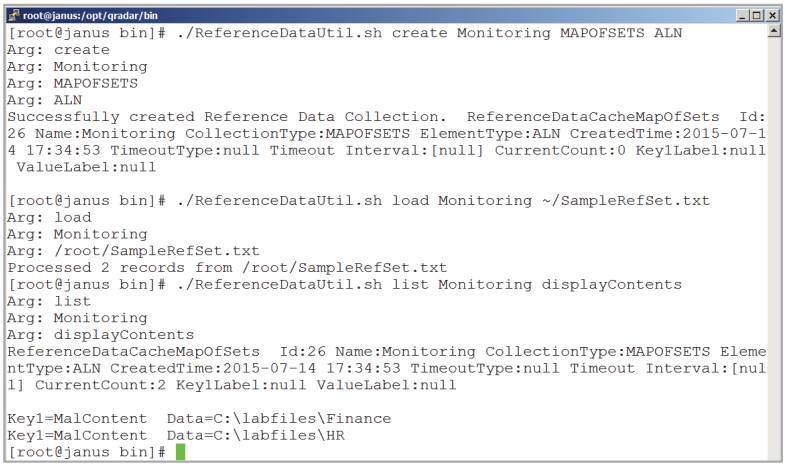
- Consider the requirement to monitor the access to secret data by privileged accounts
- Although these accounts are approved to access secret data, you want to be alerted when the usage of these privileges differs from expected behavior
- The next slides suggest how you might set up such a reference map of sets; the exercise analyzes the details

Sample use case of reference map of sets

IBM Training

Creating a reference map of sets

- Store the logon IDs with the data sets they are allowed to access in a reference map of sets
- The key is the logon ID
- The value is the data set



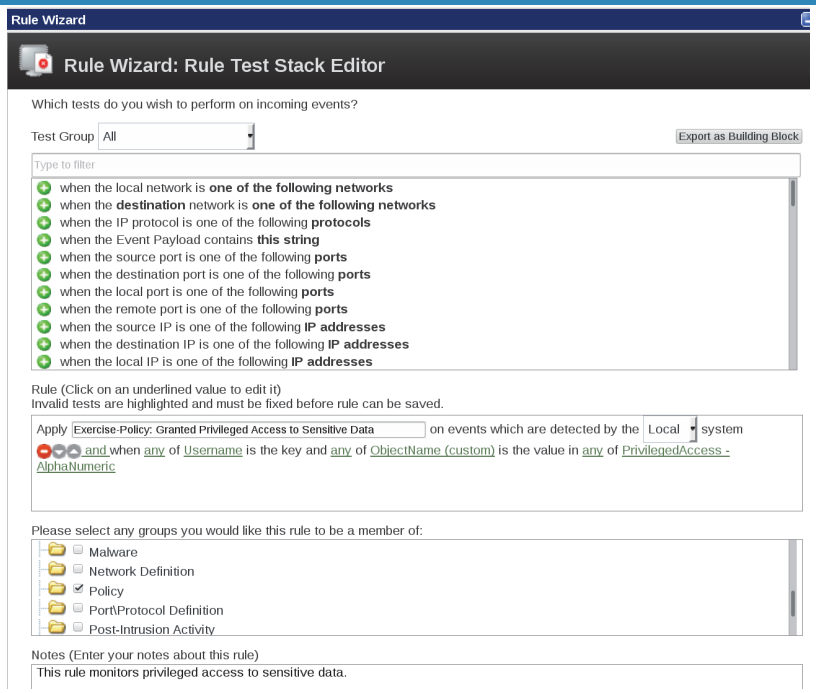

```
# The file contains a sample for a ReferenceSetOfMaps
# One key may refer to multiple values
# First non commented line must show the column order in the table
key1,data
MalContent,C:\labfiles\Finance
MalContent,C:\labfiles\HR
```


Creating a reference map of sets

IBM Training

Creating a custom rule

Create a custom rule to check every access attempt to sensitive data against the reference map of sets



Creating a custom rule

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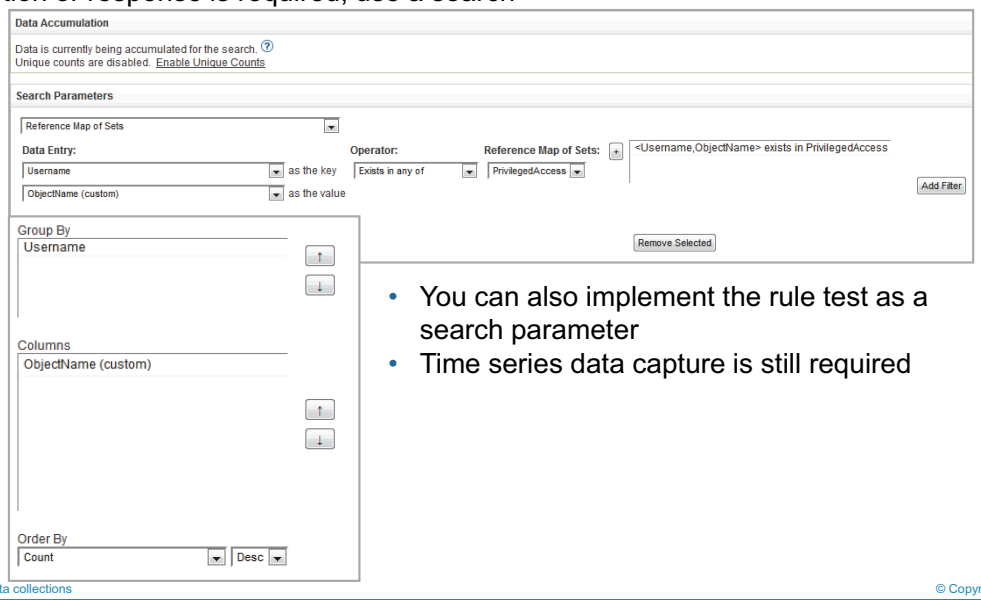
Alternative to a custom rule

If no rule action or response is required, use a search



- You can also implement the rule test as a search parameter
- Time series data capture is still required

Alternative to a custom rule

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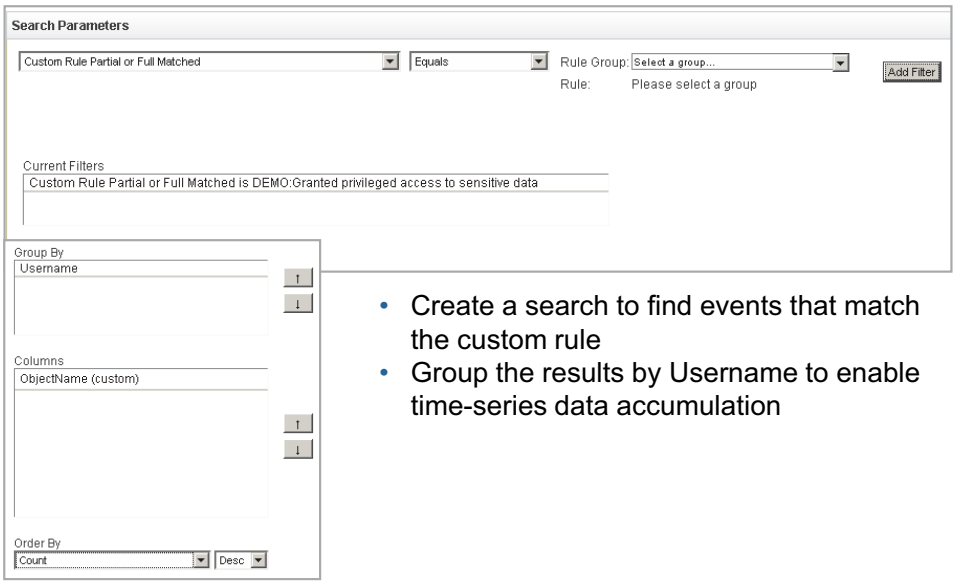
Creating a group by search



- Create a search to find events that match the custom rule
- Group the results by Username to enable time-series data accumulation

Creating a group by search

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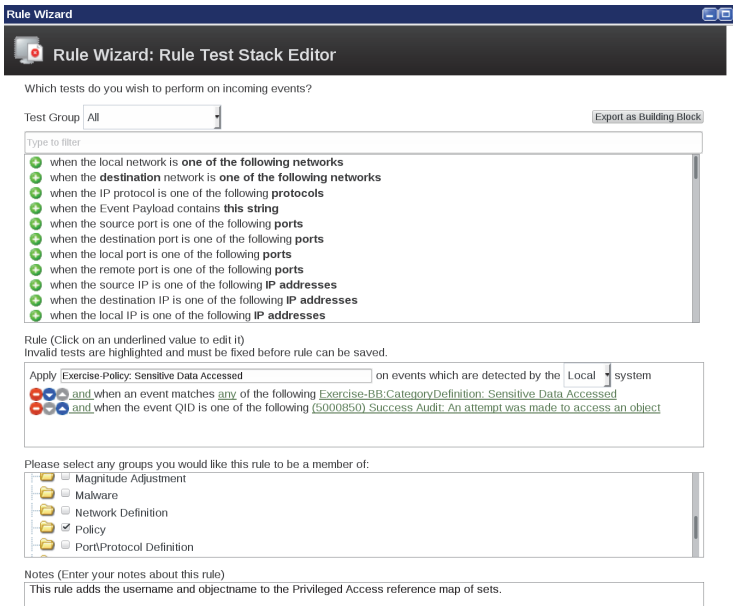
Managing the reference map of sets

Create another custom rule to add new elements to the reference map of sets



Managing the reference map of sets

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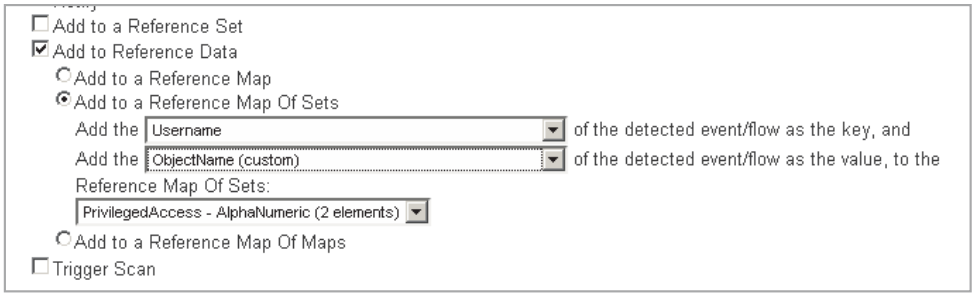
Using the rule response

When the the rule fires, add a key-value pair to the reference map of sets



Using the rule response

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Deleting elements on the command line

Use `ReferenceDataUtil.sh` to delete unwanted elements

Notice the escape character in the sample

```
[root@janus bin]# ./ReferenceDataUtil.sh list Monitoring displayContents
Arg: list
Arg: Monitoring
Arg: displayContents
ReferenceDataCacheMapOfSets  Id:26 Name:Monitoring CollectionType:MAPOFSETS Eleme
ntType:ALN CreatedTime:2015-07-14 17:34:53 TimeoutType:null Timeout Interval:[nul
l] CurrentCount:2 Key1Label:null ValueLabel:null

Key1=MalContent  Data=C:\labfiles\Finance
Key1=MalContent  Data=C:\labfiles\HR
[root@janus bin]# ./ReferenceDataUtil.sh delete Monitoring C:\\labfiles\\HR MalCo
ntent
Arg: delete
Arg: Monitoring
Arg: C:\labfiles\HR
Arg: MalContent
Successfully deleted from Reference Data Collection with name Monitoring
[root@janus bin]# ./ReferenceDataUtil.sh list Monitoring displayContents
Arg: list
Arg: Monitoring
Arg: displayContents
ReferenceDataCacheMapOfSets  Id:26 Name:Monitoring CollectionType:MAPOFSETS Eleme
ntType:ALN CreatedTime:2015-07-14 17:34:53 TimeoutType:null Timeout Interval:[nul
l] CurrentCount:1 Key1Label:null ValueLabel:null

Key1=MalContent  Data=C:\labfiles\Finance
[root@janus bin]#
```


Deleting elements on the command line

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Quiz

1. What kind reference data collections can be used in QRadar SIEM?
2. How are they structured?
3. How can the reference data collections be managed?
4. What is the REST API suitable for?
5. Where can reference data collections be used in QRadar SIEM?

Quiz

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Exercise introduction

Complete the following exercises in the Course Exercises book

- Exercise1: Using the REST API to manage reference data collections
- Exercise2: Using a reference map of sets

Exercise introduction

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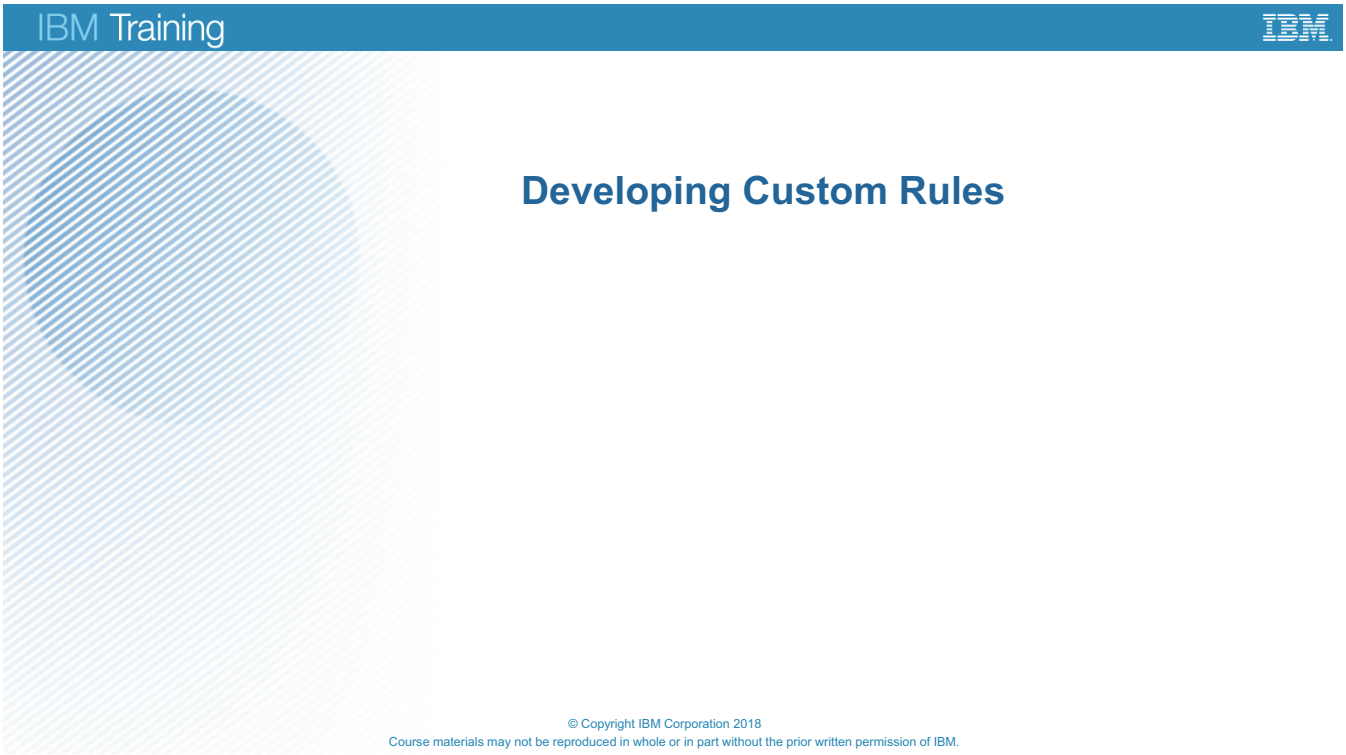
Unit summary

- Choosing a reference data collection for a purpose
- Managing reference data collections
- Updating reference data collections from external sources
- Using reference data collections in rules

Unit summary

Unit 3 Developing Custom Rules



To detect indicators of compromise or concern, custom rules correlate events, flows, offenses, and other information. Custom rules use stateless, stateful and function tests. If the Custom Rules Engine evaluates a rule to be true, it executes its rule actions and rule responses. Using the skills taught in this module, you will be able to develop custom rules.

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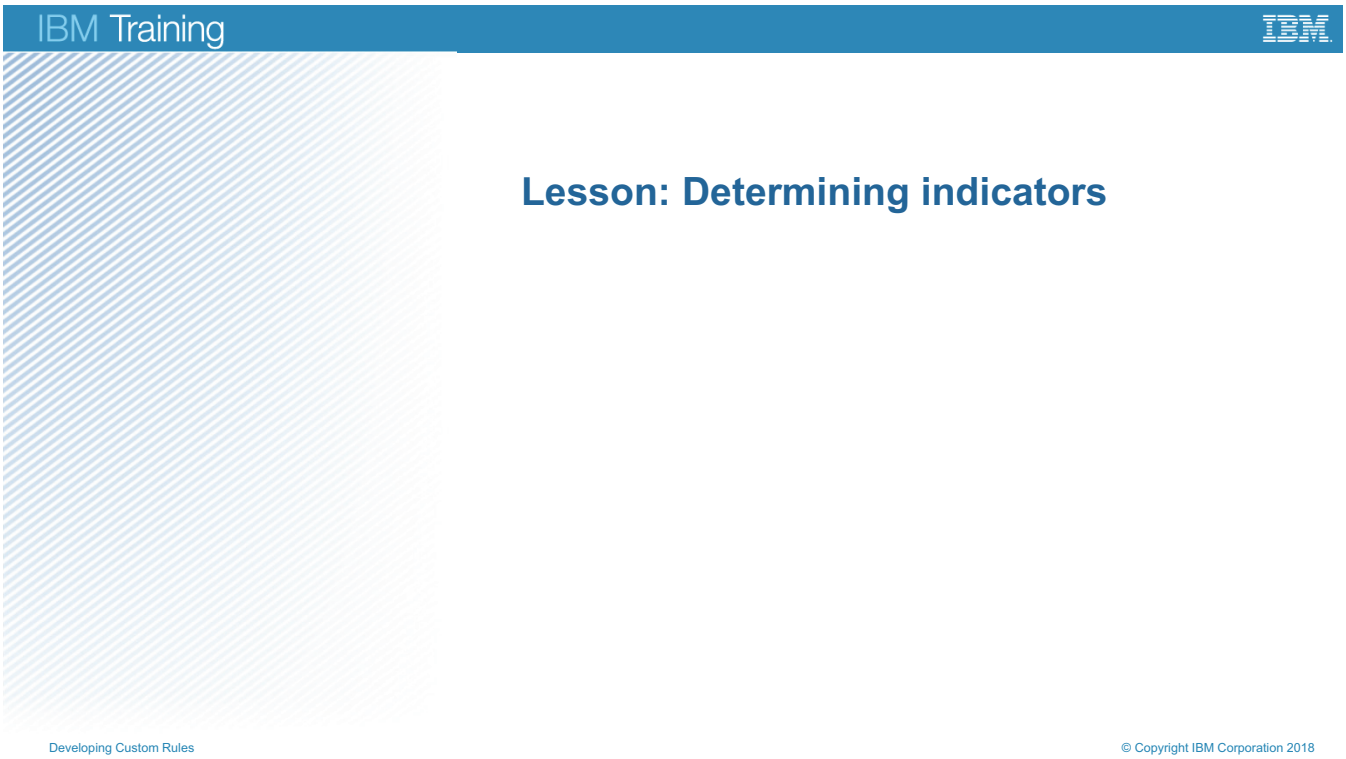
Objectives

- Determining indicators
- Custom rules overview
- Building blocks overview
- Using host definition and host reference building blocks
- Using stateless tests
- Using stateful tests
- Configuring rule actions
- Configuring rule responses
- Locating rules that matched

Objectives

Lesson 1 Determining indicators



The custom rules and building blocks of QRadar SIEM monitor for indicators that suggest a compromise or a concern. This lesson considers indicators and how to determine them.

Threat Modelling

- Threat Modelling is a structured process to identify, describe and prioritize possible attack vectors and their impact
- The **purpose of rules** is to alert to the alarming activities that the Threat Modeling determines
- Often used for Threat Modeling is the ATT@CK knowledge base and model of tactics and techniques of *The MITRE Corporation*
- Threat modeling includes identifying and prioritizing systems and data of your organization in order to provide context to rules
- Most importantly identify the crown jewels, that process, transfer and store the following kinds of data:
  - Customer
  - Employee
  - Financial
  - Intellectual property

Threat Modelling

Refer to *Adversarial Tactics, Techniques, and Common Knowledge* (ATT&CK™) at https://attack.mitre.org/wiki/Main_Page for information on the knowledge base and model of tactics and techniques provided by The MITRE Corporation.

Another approach for Threat Modelling are checklists following the STRIDE threat classification developed by Microsoft:

- Spoofing identity
- Tampering with data
- Repudiation
- Information disclosure
- Denial of Service (DoS)
- Elevation of privilege

Many indicators fall into more than one STRIDE threat category because they indicate reconnaissance or preparations that can lead to a variety of attacks.

Typically indicators for policy violations and mis-configurations also span several STRIDE threat categories. For example, an unauthorized file share opens the door to tampering, repudiation and information disclosure.

For more information on STRIDE refer to *The STRIDE Threat Model* at the following location: https://msdn.microsoft.com/en-us/library/ee823878(v=cs.20).aspx

For more information on threat modeling utilizing attack trees refer to *Toward A Secure System Engineering Methodology* (1998) by Bruce Schneier et al. at the following location: https://www.schneier.com/academic/archives/1998/09/toward_a_secure_syst.html

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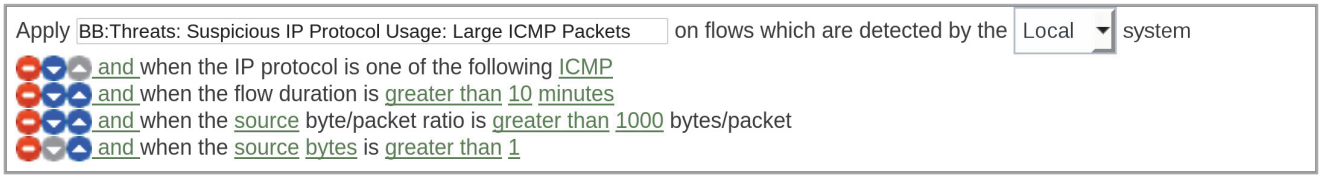
Indicators

- Rules test for **Indicators**
- Indicators combine **Observables,** the **Context** of your organization, and **External Data**
- Most tests use **Observables** from the event or flow that it tests
- **Observables** are properties of the event or flow being tested; examples include
  - Source IP address
  - Log Source Type
  - Category
  - Number of packets
  - Building block matched



Indicators

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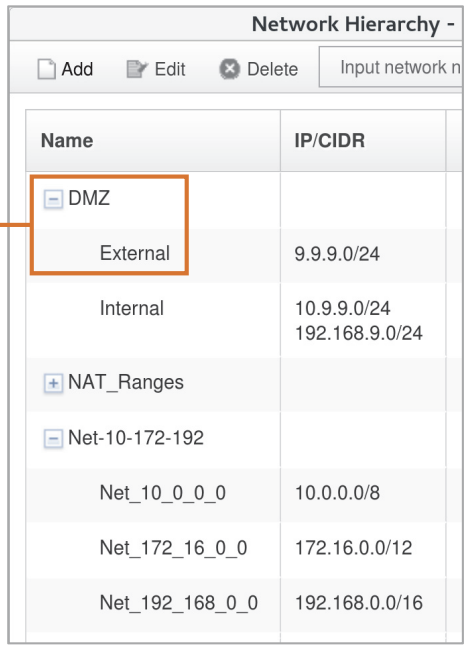
Context

- The Network Hierarchy provides essential Context
- It reflects the security properties and requirements of your organization's network, such as
  - Ranges of local IP addresses
  - Ranges of IP addresses used in DMZ
  - Ranges of IP addresses with compliance requirements
- Many rules test whether an IP address is part of a network configured in the Network Hierarchy

- QRadar SIEM uses the Network Hierarchy to determine the Flow Bias and Direction observables

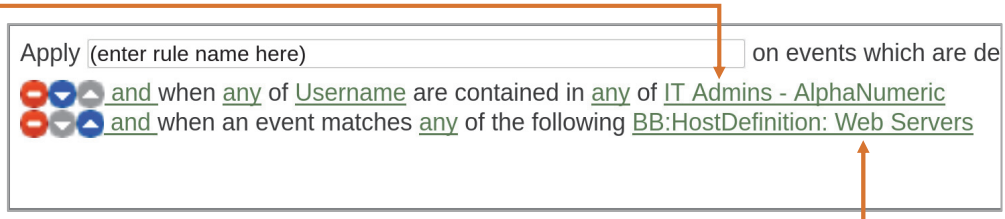


Context

While the Network Hierarchy tags IP addresses, custom rules and building blocks tag events and flows.

Context (continued)

- Usually QRadar administrators provide further Context in the following ways
  - Reference data collections with user names of security relevant user groups, such as
    - IT Admins
    - CFO team
  - Services approved by a QRadar administrator, such as
    - DNS on 9.9.9.9
    - Web on 10.10.10.10



- To perform effectively, it is a must to configure the Context during the tuning of a newly deployed QRadar SIEM
- Administrators need to keep the Context configurations up-to-date so that they always reflect the organization

Context (continued)

If a custom rule or building block, that tests an observable against the context, fires, it tags the tested event or flow. The tag is a directly accessible property of the event or flow and therefore the test result becomes an observable.

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External Data

- Rules can test observables against data that QRadar receives from sources outside your organization and that is not specific to your organization
- Threat intelligence feeds provide atomic data to detect indicators for known threats; common examples include
  - File hashes of malware
  - URLs
    - Botnet Command and Control (C&C)
    - Malware
  - IP addresses
    - Spam sender
    - Malware
    - Anonymizer

- Other feeds of atomic data that by itself does not indicate a threat but enables custom rules to test for adversarial activities
  - IP address ranges dynamically assigned by ISPs
  - IP geolocation

External Data

In *An introduction to threat intelligence* (2015) at https://www.ncsc.gov.uk/content/files/protected_files/guidance_files/An-introduction-to-threat-intelligence.pdf the UK-CERT, and in *Threat Intelligence: What it is, and how to use it effectively* (2016) at https://www.sans.org/reading-room/whitepapers/analyst/threat-intelligence-is-effectively-37282 the SANS Institute uses the following definition for **Threat Intelligence** from Gartner analyst Rob McMillan at https://www.gartner.com/doc/2487216/definition-threat-intelligence (2013):

> *Threat intelligence is evidence-based knowledge, including context, mechanisms, indicators, implications and actionable advice, about an existing or emerging menace or hazard to assets that can be used to inform decisions regarding the subject's response to that menace or hazard.*

According to this definition, threat intelligence has a much broader scope than just atomic data, as the term often refers to.

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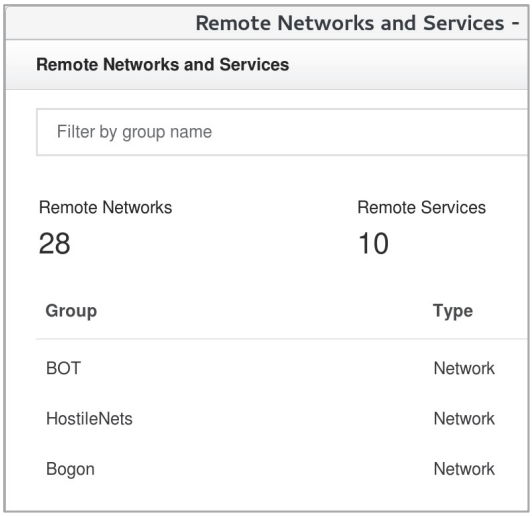
Built-in Remote Networks

- QRadar SIEM stores flagged CIDR ranges in the following Remote Networks
  - BOT
  - HostileNets
  - Bogon
- Autoupdate updates them automatically
- Click the *Remote Networks and Services* icon on the Admin tab to browse the Remote Networks
- Custom rules and building blocks can test whether one of the Remote Networks contains an IP address of an event or flow
- To add predefined custom rules and building blocks that use these Remote Networks, install the following content extensions
  - Content Extension for Threats
  - Content Extension for Intrusions



Built-in Remote Networks

Refer to *Default remote network groups* at https://www.ibm.com/support/knowledgecenter/en/SS42VS_7.3.0/com.ibm.qradar.doc/c_qradar_adm_def_rem_ntwk_grp.html for more information on the Default remote network groups.

Refer to the *QRadar: Content Extension for Threats* technote at http://www.ibm.com/support/docview.wss?uid=swg21973573 for more information on the Content Extension for Threats.

Refer to the *QRadar: Content Extension for Intrusions* technote at http://www.ibm.com/support/docview.wss?uid=swg21973571 for more information on the Content Extension for Intrusions.

X-Force Feeds

- The **Content Extension for Threats** adds X-Force custom rules to QRadar SIEM that use the following information from X-Force in tests
  - IP addresses
    - Spam sender
    - Malware
    - Anonymizer
  - URLs
    - Botnet Command and Control (C&C)
    - Malware
  - IP address ranges dynamically assigned by ISPs
- The BOT Remote Network and X-Force Botnet tagging often flag the same IP address but not always

X-Force Feeds

QRadar SIEM syncs its X-Force databases multiple times per day with the X-Force update server.

Remote Networks and Services on the Admin tab has X-Force Remote Networks. They are not related to these rules and should not be used.

Refer to the *QRadar: X-Force Frequently Asked Questions (FAQ)* technote at http://www.ibm.com/support/docview.wss?uid=swg21701213 for more information on X-Force Threat Intelligence.

Visit the IBM App Exchange for apps to use external data from other providers. The *Threat Intelligence* app at https://exchange.xforce.ibmcloud.com/hub/extension/IBMQRadar:ThreatIntelligence pulls in any external data that uses the open standard STIX and TAXII formats.

File Hashes from QRadar Network Insights

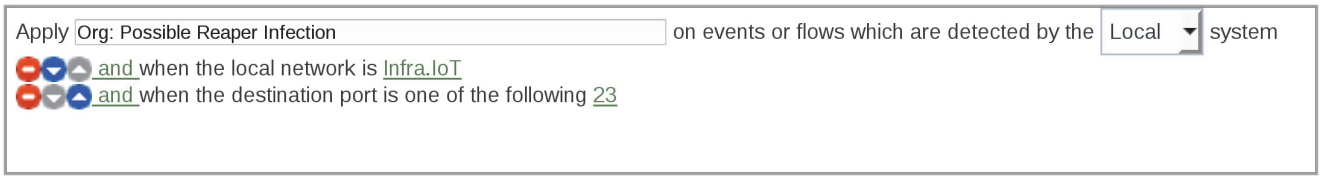
- IBM QRadar Network Insights computes hashes for files transferred in unencrypted network communications
- The Content Extension for QRadar Network Insights adds the following enhancements to QRadar SIEM
  - Adding file hash as observable property to flows
  - Adding rules that fire when the observable file hash of the tested flow equals the file hash of known malware

File Hashes from QRadar Network Insights

Refer to the *QRadar Network Insights: Content Extension for Analysis, Alerts, and Reports* technote at http://www.ibm.com/support/docview.wss?uid=swg21995771 for more information on the Content Extension for QRadar Network Insights.

Indicator for the Reaper malware

- Beyond data feeds, Threat Intelligence websites such as X-Force, provide indicators to detect specific threats
- For example the following indicator identifies the Reaper malware and botnet
  - Directly observable: Telnet server on port 23
  - Context: Infects IoT devices
  - External threat data: URLs to Command and Control (C&C)
  - External threat data: File hashes of known variants of the malware files
- A mutation of Reaper might use different URLs and files; if you want to detect possible Reaper mutations, create a rule that alerts to connections to port 23 on IoT devices



Indicator for the Reaper malware

Many organizations prohibit by policy unencrypted remote access protocols, and therefore might already have a rule alerting to Telnet traffic.

As of writing this guide, Reaper runs a Telnet server on the default port 23. To catch mutations that run a Telnet server on any port, replace the test for destination port 23 by the following test:

```
when the flow matches Application is RemoteAccess.Telnet
```

Custom rules of types flow, event and common allow the test for destination port 23, while only custom rules of type flow allow the test for the Telnet application protocol.

Only QFlow and QNI provide the first bytes of packets to QRadar SIEM in order to detect the application protocol. IPFIX/NetFlow, sFlow, J-Flow, Packeteer, and Flowlog file do not provide the first bytes of packets. Therefore, flow collectors can only look up which application protocol commonly uses the recorded destination port. Effectively QRadar SIEM would translate the test for *application is RemoteAccess.Telnet* to *destination port is 23*. So testing for application protocol is only more effective than testing for destination port if your organization uses QFlow or QNI.

For more information on the Reaper IoT Botnet, refer to *Reaper IoT Botnet* at the following link: https://exchange.xforce.ibmcloud.com/collection/XFTAS-MA-2017-00002-Reaper-IoT-Botnet-IoT_Reaper-aka-IoTroop-d49e53a7a512efed084117f0543fb5c2

Considerations about indicators

- Custom rules leveraging data from threat intelligence providers detect well documented artifacts, and therefore can be described with the following characteristics
  - reactive
  - high confidence
- Indicators for threats that are not yet documented or not detectable by data from threat intelligence providers monitor less conclusive evidence; they can be reactive or proactive
- Reactive indicators are commonly referred to as **Indicator of Compromise**
- Proactive indicators are commonly referred to as **Indicator of Concern**

Considerations about indicators

Considerations about indicators (continued)

With threat models as a background, consider the following kinds of indicators of compromise and concern

- Compliance requirements, such as
  - Clear text protocol traffic in PCI network
- Policy violations, such as
  - P2P usage
- Anything that should never happen, such as
  - Outbound communication from printer network
  - Authentication attempt by former employee
- Suspicious activities, such as
  - High event count on network of HR systems on weekend
  - Unusual flow bias for VOIP connection
- Statistical anomalies
  - Refer to Machine Learning capabilities of User Behavior Analytics app and Anomaly Detection rules which are beyond the scope of this module
- Motivation and tactics, techniques, and procedures (TTP) of previous attacks

Considerations about indicators (continued)

These kinds of indicators usually do not rely on data from threat intelligence providers.

The following list shows more examples of indicators:

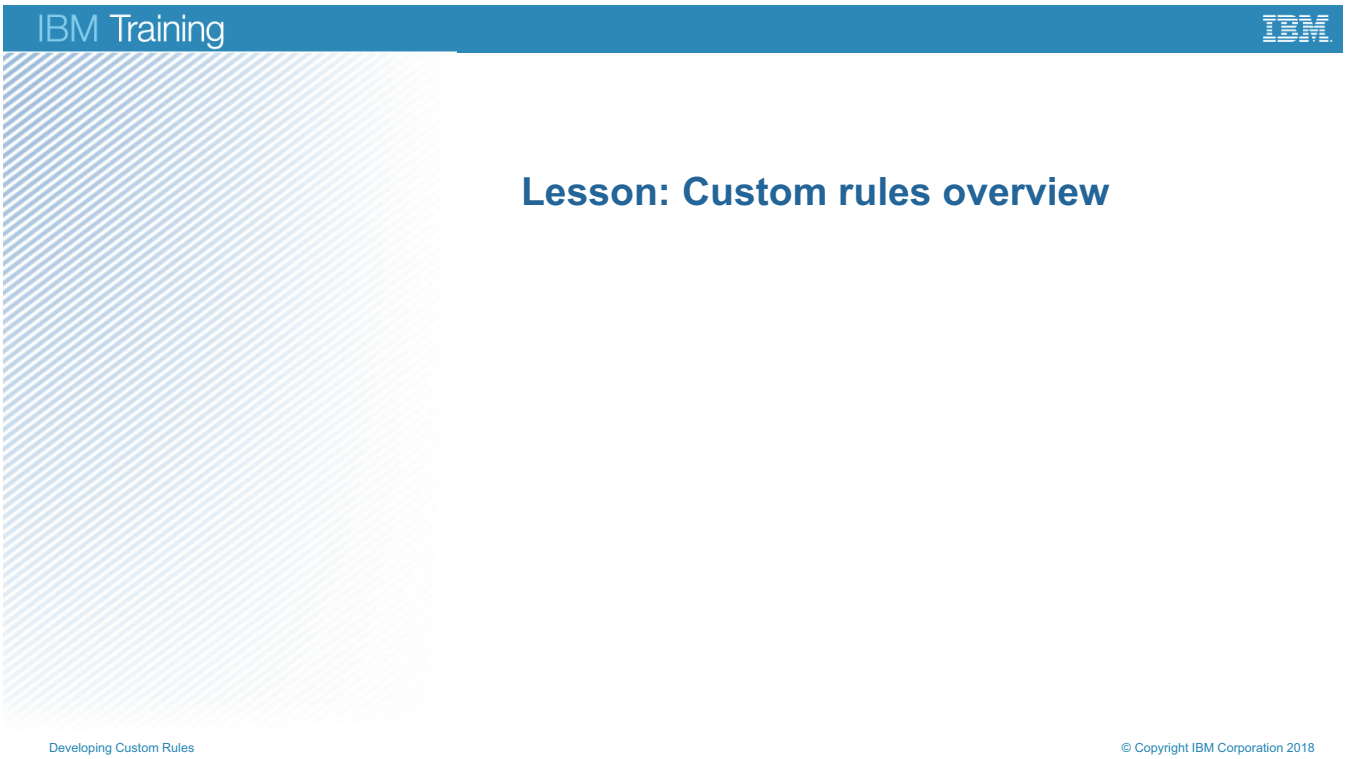
- Authentication from an unusual IP address to one of the few reseller accounts of a web service to exchange XML warehouse data indicates a compromised account.
- High-traffic volume to your support website from a country your organization does only little business with indicates reconnaissance or the beginning of a denial-of-service (DoS) attack.
- A previously stopped attack might be repeated with similar characteristics, such as beaconing using the same protocol at the same time of day from an end-user-machine in the same department.

Ongoing process

- Improve threat models, indicators, and rules iteratively
- Changing environments and new attack methods require new or changed threat models, indicators, and rules

Ongoing process

Lesson 2 Custom rules overview



In this lesson, you learn the options to add and organize custom rules.

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About custom rules

- A custom **rule tests for an indicator**, that is a sign of an attack or policy violation
- In this module the term **rule** refers to both custom rules and building blocks unless otherwise noted
- This module follows the common practice to use the following terms, instead of using *a rule evaluates to true*
  - a rule fires
  - a rule matches
  - a rule tags an event or flow
  - a rule adds an event or flow to an offense
  - a rule contributes an event or flow to an offense

About custom rules

Custom Rules Engine

- In QRadar SIEM, the following two engines execute rules
  - Anomaly Detection Engine (ADE) executes anomaly detection rules
    To learn more, refer to the separate module on anomaly detection rules
  - **Custom Rules Engine (CRE)** executes **Custom Rules** and **Building Blocks**
- CRE instances run on the Console appliance and on each event and flow processor appliance
- All CRE instances in a QRadar SIEM deployment share the same rules
- QRadar SIEM creates a log source for each CRE instance because the CRE dispatches events
- The number of rules is not limited
- The resource consumption of rules is limited by the resources available to the appliances running CRE instances
- This module follows the common practice to use the term *the CRE* to refer to the logical component that can run as many instances

Custom Rules Engine

This module follows the common practice to treat rules as active components in wording, such as a *rules tests* or a *rule tags*. In fact, rules are passive components. The CRE is the active component that executes the rule tests and performs tagging as well as Rule Actions and Rule Responses.

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Rule Actions and Rule Responses

- If a custom rule fires for an event or flow, the CRE performs the Rule Actions and Rule Responses configured for the custom rule, such as these examples
  - **Adding the event or flow to an offense**
    - **If an appropriate offense does not yet exist it is created**
  - Creating a new event
  - Adding an annotation
  - Sending an email
  - Generating system notifications
- Rule Actions and Rule Responses are introduced later in this module
- Like custom rules, building blocks test for indicators
- Unlike custom rules, building blocks do not have actions and responses
- Building blocks are introduced later in this module

Rule Actions and Rule Responses

All actions and responses of custom rules are optional. Some predefined custom rules do not have any actions and responses configured. You can configure them if needed. Examples include

- Single Merged Recon Events Remote Scanner
- Host Based Failures
- Critical System Events

Options to add testing for indicator

To add rules to QRadar SIEM, consider the following options in order of preference

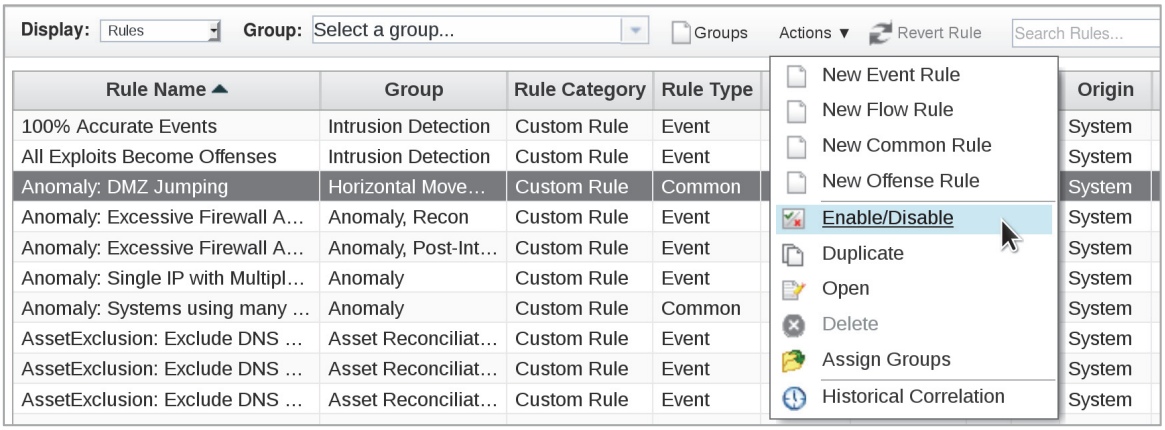
1. Enable a predefined rule that is disabled by default
2. Install an extension with additional rules
3. Change a predefined rule
4. Duplicate an existing rule
5. Create a new rule

This lesson introduces to these options aside from installing an extension

Options to add testing for indicator

Enabling and disabling a custom rule

To enable or disable a custom rule, select it and click **Actions > Enable/Disable**



Enabling and disabling a custom rule

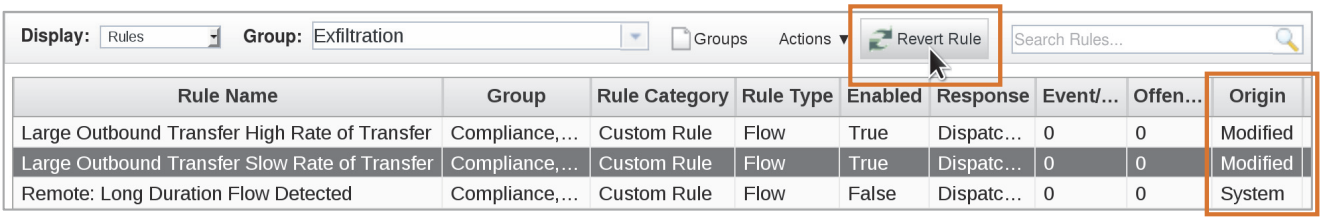
Enabling a custom rule enables it for all CRE instances. The same applies for disabling a custom rule.

The name of the rule, that is selected in the screen capture, starts with *Anomaly*, but it is a custom rule, not a anomaly detection rule.

To add the *Anomaly: DMZ Jumping* custom rule to QRadar SIEM, install the *Content Extension for Intrusions* Content extension. Refer to the *QRadar: Content Extension for Intrusions* technote at http://www.ibm.com/support/docview.wss?uid=swg21973571 for more information on the Content Extension for Intrusions.

Changing and reverting

- The **Origin** column displays **System** for unchanged predefined rules and building blocks
- The **Origin** column displays **Modified** for changed predefined rules and building blocks
- When you change a predefined rule, QRadar SIEM keeps the original and creates a new one
- Only the new rule is accessible in the user interface
- To restore the original, click the **Revert Rule** button in the toolbar
- If an extension provides an update to a rule that you have modified, the modified rule remains unchanged; clicking the Revert Rule button replaces the modified rule by the updated rule as provided by the extension

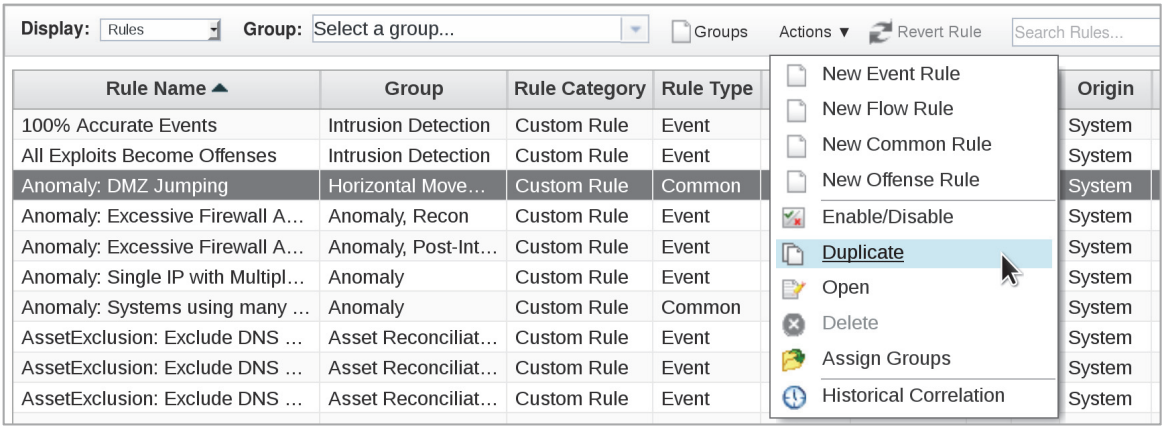


Changing and reverting

The new rule is sometimes referred to as override rule.

Duplicating a rule

- Duplicating a rule creates a new rule and copies the tests, actions and responses from the original rule
- The **Origin** column displays **User** as it does for all user created rules
- Reverting is not possible because the new rule is unrelated to the original



Duplicating a rule

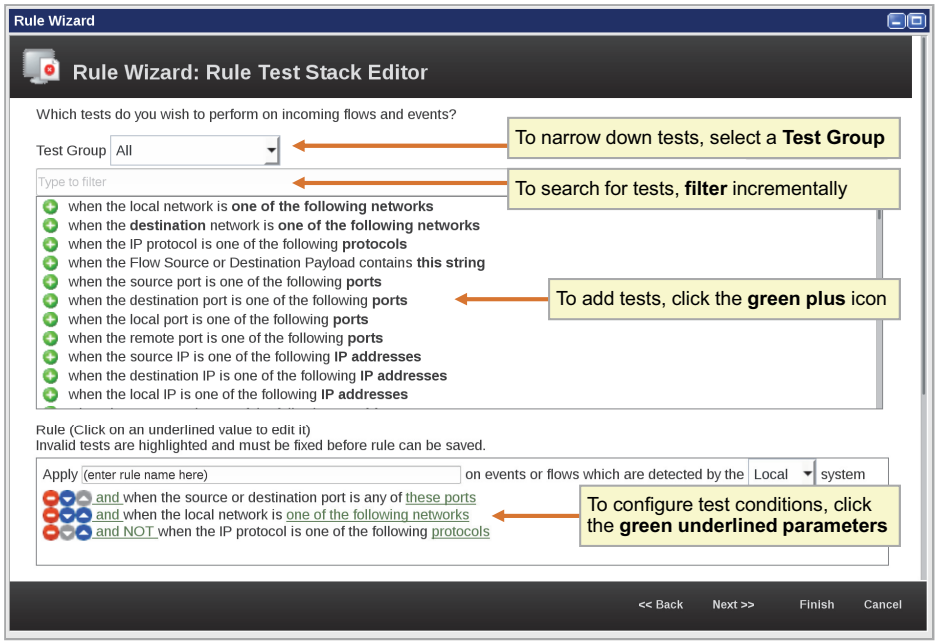
Creating a new rule

- First step for creating a rule is selecting its **rule type**
  - Event Rule
    - Test only incoming events
    - Example test: *when the events were detected by one or more of these log sources*
  - Flow Rule
    - Test only incoming flows
    - Example test: *when any of these properties are contained in any of these reference set(s)*
  - Common Rule
    - Test only incoming events and flows
    - Example test: *when the source is located in this geographic location*
  - Offense Rule
    - Test only offenses
    - Example test: *when the offenses occur after this time*
- After creating a rule, it is not possible to change its type

Creating a new rule

Rule Test Stack Editor

- After choosing a rule type, add tests to the rule in the Rule Test Stack Editor of the Rule Wizard
- To detect attacks and policy violations, the tests of a rule correlate events and flows that by themselves record only one unsuspicious action in your IT environment



Rule Test Stack Editor

Many policy violations can be detected without correlation by only a single event or flow, such as unencrypted telnet traffic. Also, an event from an IDS, IPS, or other security service can notify about an attack without further correlation.

In addition to events, flows. and offenses, rules can use information from reference data collections and asset profiles.

The Console records changes to rules in `/var/log/audit/audit.log`

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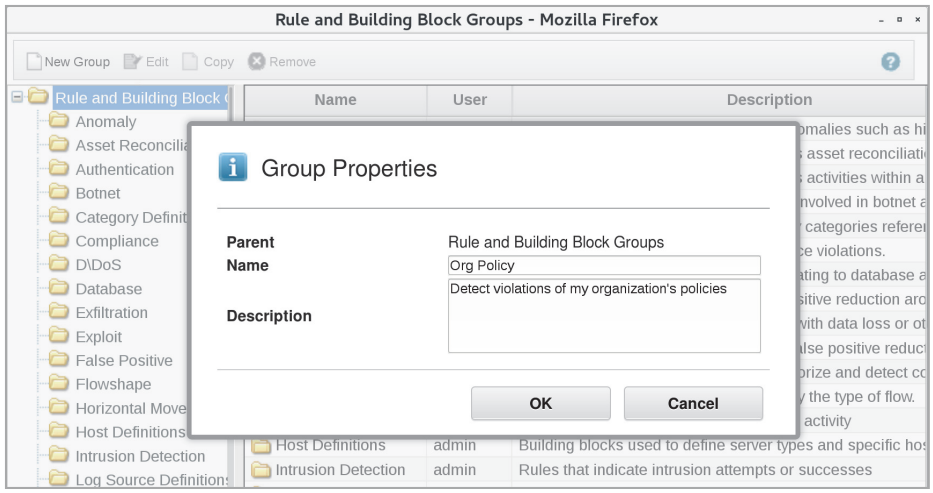
Organizing rules



- To easily distinguish predefined rules from your own development, establish a naming convention; many users use the name of their organization or department as a prefix, such as these examples
  - **Org:** Transfer to web-based File Hosting Service
  - BB:**Org-**CategoryDefinition: Successful Registry Modification
- To easily locate custom rules and building blocks that you develop for your organization, add them to groups that you create

Organizing rules

Organizing rules is the only purpose of groups. It is not possible to filter or test for the rule group, from which a member has fired for an event, flow or offense.

Extensions can add groups and rules. If you need to know the number of custom rules and building blocks before and after installing an extension, run the following command on the command line:

```
# psql -U qradar -c "SELECT COUNT(*) FROM custom_rule"
```

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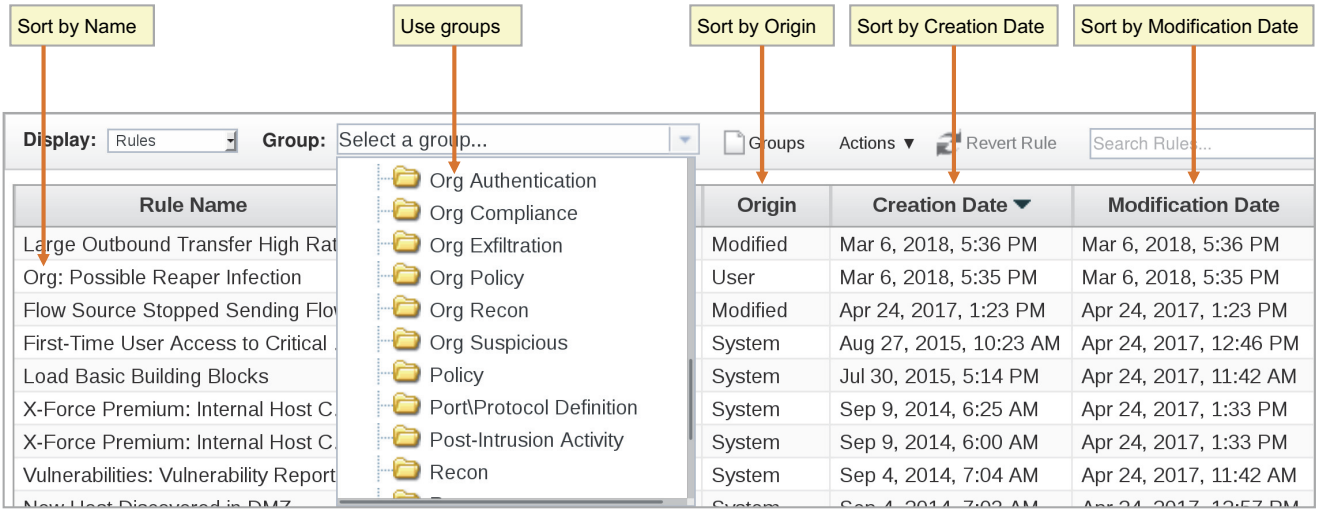
Locating your rules



Locating your rules

The date and time of your first change to a predefined rule becomes the Creation Date because that's when QRadar SIEM creates a new rule with your changes while keeping the original rule stored for possible future reverting.

Quiz 1

1. What do you provide to QRadar SIEM when you configure the Network Hierarchy, approve communication endpoints and manage user groups in reference data collections?
2. For which purpose can custom rules use threat intelligence feeds?
3. What does the *Revert Rule* button do?
4. What can you decide for a rule only during its creation, but not change afterwards?

Lesson 3 Building blocks overview

In this lesson, you learn about the purposes of building blocks and how to create one.

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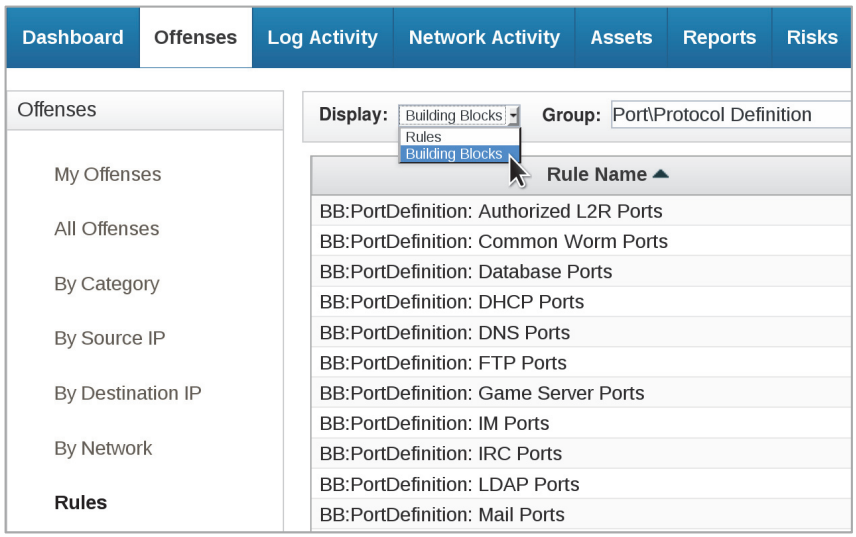
About building blocks

- Building blocks are the same as custom rules, but they do not perform Rule Actions or Rule Responses
- Select **Display > Building Blocks** to display them
- Reverting, Duplicating and locating a building block works in the same way as for custom rules
- Enabling and creating a building block works different and is introduced on the next slides



About building blocks

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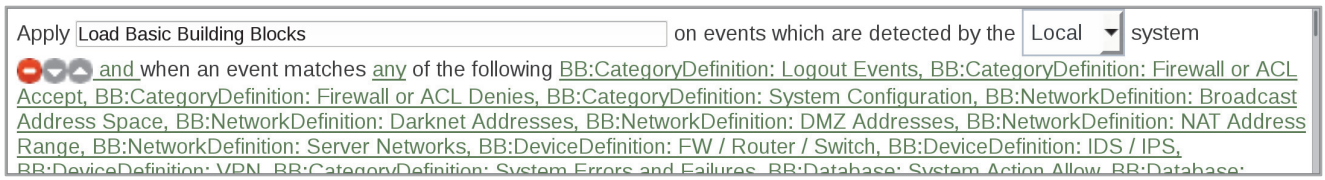
Enabling and disabling a building block

- The CRE evaluates a building block only if at least one test of an enabled custom rule uses it
- You cannot enable and disable building blocks directly in the UI
- Using a building block in an enabled rule enables the building block; not using a building block in any enabled rule disables it implicitly
- Add any unused building blocks required by searches used in report templates to the **Load Basic Building Blocks** custom rule



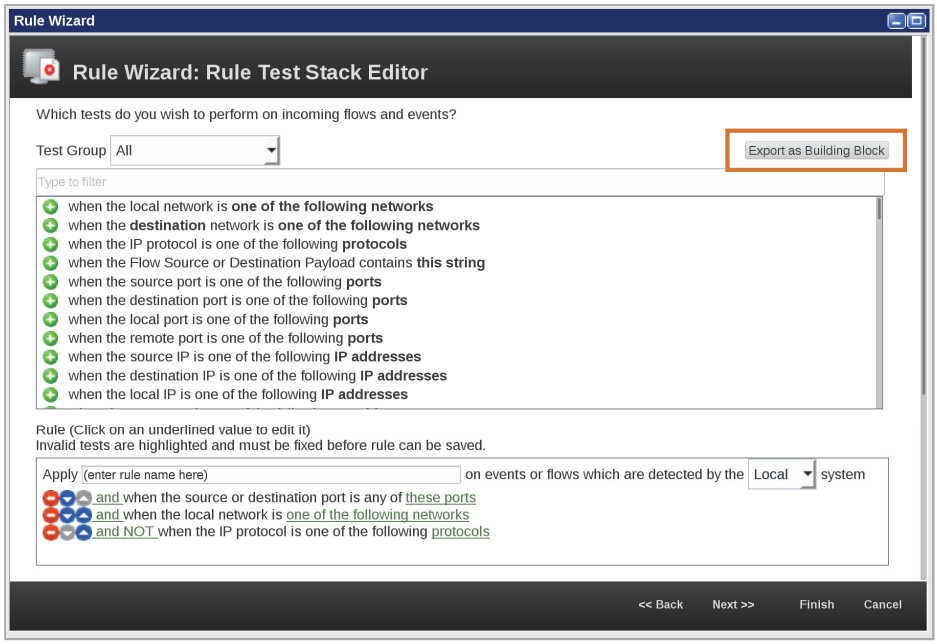
Enabling and disabling a building block

The following information pertains to the **Load Basic Building Blocks** rule:

- It does not have any actions or responses.
- It already contains many building blocks because many predefined report templates rely on saved searches that filter on matching custom rules and building blocks.
- It is of type *event*. Therefore, you can add building blocks of types *event* and *common*, but not building blocks of type *flow*.
- The CRE evaluates its building blocks of type *common* on both events and flows.

Rule Test Stack Editor

After adding tests in the Rule Test Stack Editor, click the **Export as Building Block** button to create the building block



Rule Test Stack Editor

Typically building blocks are of type *event*, *flow* or *common*. It is also possible to create building blocks of type *offense*.

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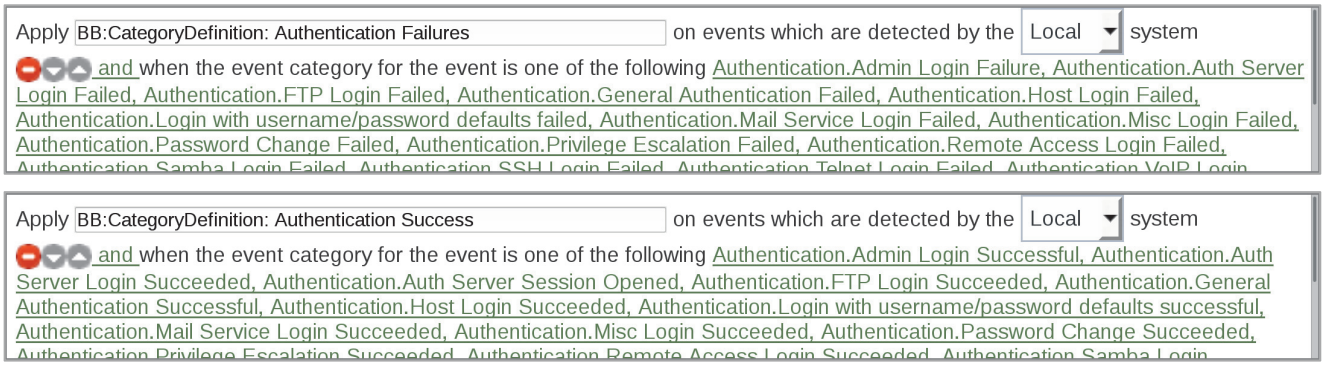
Building blocks can reduce complexity

- Rules can combine building blocks into more complex tests
- A building block **tags** matching events and flows; more complex tests can check whether a combination of specifically tagged events and flows occur in a certain time frame or sequence
- **Example**: Rules use the building blocks *BB:CategoryDefinition: Authentication Failures* and *BB:CategoryDefinition: Authentication Success* to detect when a number of failed login attempts is followed by a successful login



Building blocks can reduce complexity

Building blocks and custom rules can test on event categories and flow applications. For example, the predefined building blocks with names that begin with *BB:CategoryDefinition* usually contain one or more of the following kinds of tests:

- Does the event belong to a category, such as *Firewall Permit*?

  The QID maps of QRadar SIEM link normalized events to categories.

- Does the flow transport particular application data, such as DNS?

  QNI and QFlow inspect network packets to determine which kind of application is communicating. If QNI and QFlow cannot detect the application, QRadar SIEM determines the type of application from the destination port.

Categories and applications allow testing independent from technical implementation details. For example, a test can check whether an event is assigned to the *Firewall Deny* category regardless of which firewall model provided the raw event to QRadar SIEM.

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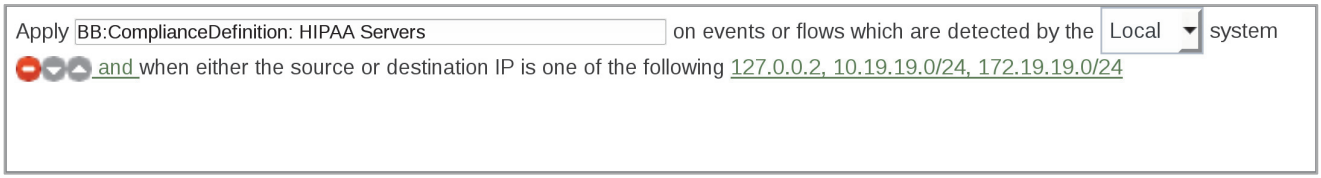
Building blocks can facilitate the reuse of functionality and information

- To avoid repetition, develop and maintain the same tests only in one single building block
- **Example**: Use the predefined building block *BB:ComplianceDefinition: HIPAA Servers* to test whether the destination of an event or flow is a communication endpoint that the context of your organization requires to be HIPAA compliant



Building blocks can facilitate the reuse of functionality and information

Usually all purposes to use building blocks overlap.

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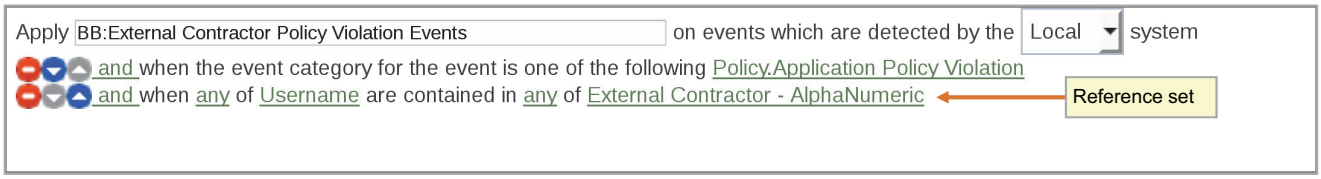
Building blocks can reduce resource consumption

- Multiple rules can use the same test; for each event or flow, the CRE executes this test as many times as it appears in rules
- To optimize resource consumption, replace each occurrence of the test with one building block containing the same test; the CRE executes the tests of a building block only once per event or flow, regardless of how many rules use the building block
- **Example**: Use the predefined building block *BB:IT Admin Events* instead of testing whether a legitimate administrator performs a configuration



Building blocks can reduce resource consumption

How to use evaluation results of building blocks in tests is introduced later in this course.

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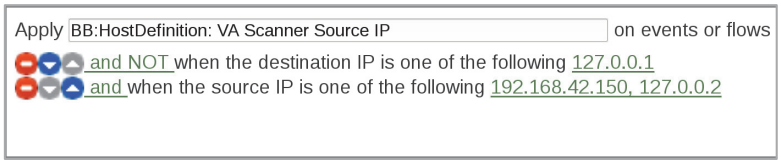
Building blocks can provide context

- Many building blocks provide the context of your organization to rule testing
- Tagging means that they attach context to an event or flow, such as the following examples
  - SNMP Port
  - PCI DSS Server
  - Server Network
- These building blocks test for port numbers, CIDR ranges and networks as defined in the network hierarchy
- Part of the tuning of a newly deployed QRadar SIEM is the configuration of building blocks according to the context of the organization
- Administrators need to keep them up-to-date so that they always reflect the context of the organization
- Usually building blocks with a name beginning with one of the following strings require configuration to reflect the context of your organization
  - BB:PortDefinition:
  - BB:HostDefinition:
  - BB:ComplianceDefinition:
  - BB:NetworkDefinition:



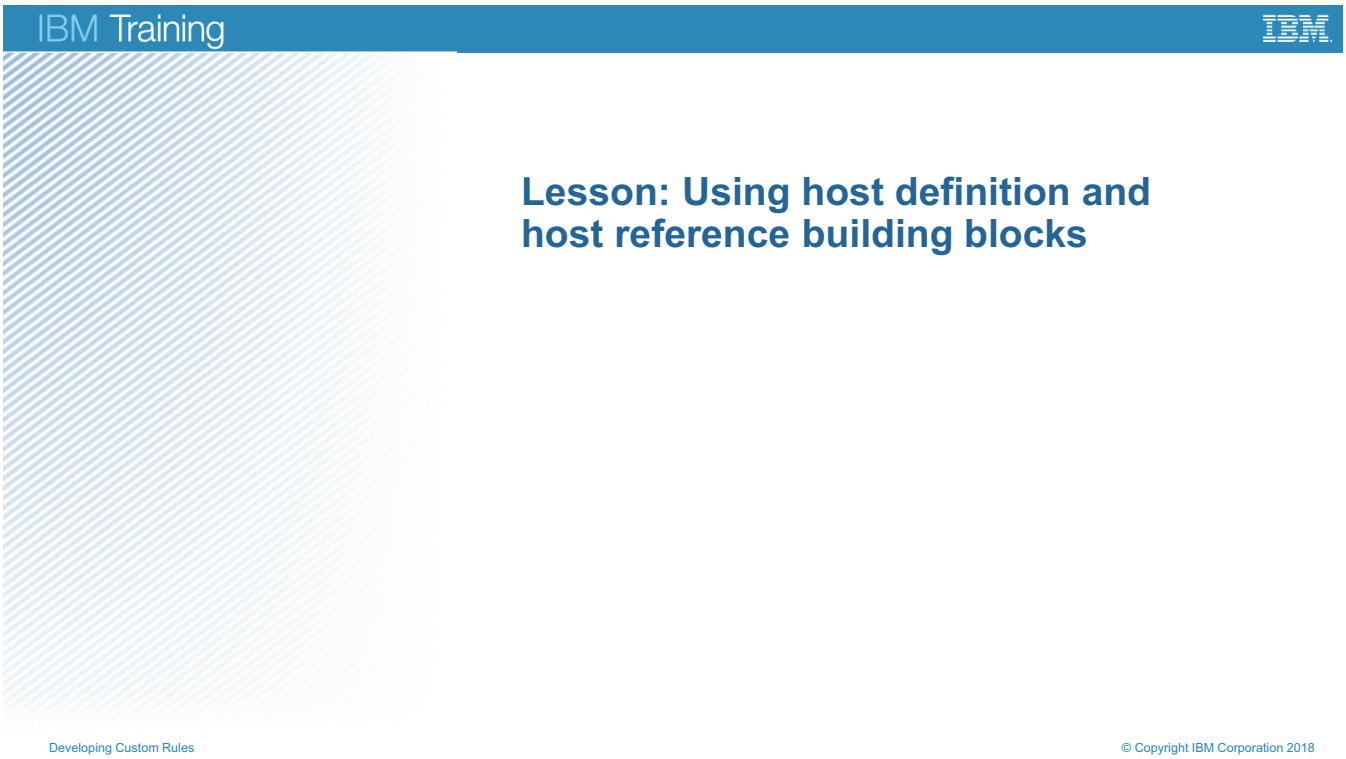
Building blocks can provide context

The example screen capture shows the *BB:HostDefinition: VA Scanner Source IP* building block. To provide context of your organization, this building block needs to tag all IP addresses that legitimately scan hosts of your organization. To avoid false positive offenses, add the IP addresses of your vulnerability and inventory scanners to *BB:HostDefinition: VA Scanner Source IP*. An equivalent HostReference building block is not available.

During installation, QRadar does not know whether you plan to use QRadar Vulnerability Manager. As a preparation for QRadar Vulnerability Manager, the installer automatically adds the IP addresses of all appliances, that can run the scanner of QRadar Vulnerability Manager, to *BB:HostDefinition: VA Scanner Source IP*. Therefore, on a freshly installed QRadar, *BB:HostDefinition: VA Scanner Source IP* is the only building block and custom rule with Modified in the Origin column.

Refer to *Tuning building blocks* at https://www.ibm.com/support/knowledgecenter/en/SS42VS_7.3.0/com.ibm.qradar.doc/t_tuning_guide_tuning_building_blocks.html for more information on configuring building blocks with your context.

Lesson 4 Using host definition and host reference building blocks



Many rules test whether the destination of an event or flow is an approved communication endpoint of your organization. In this lesson, you learn about the building blocks, that QRadar SIEM uses for this purpose, and how to approve communication endpoints.

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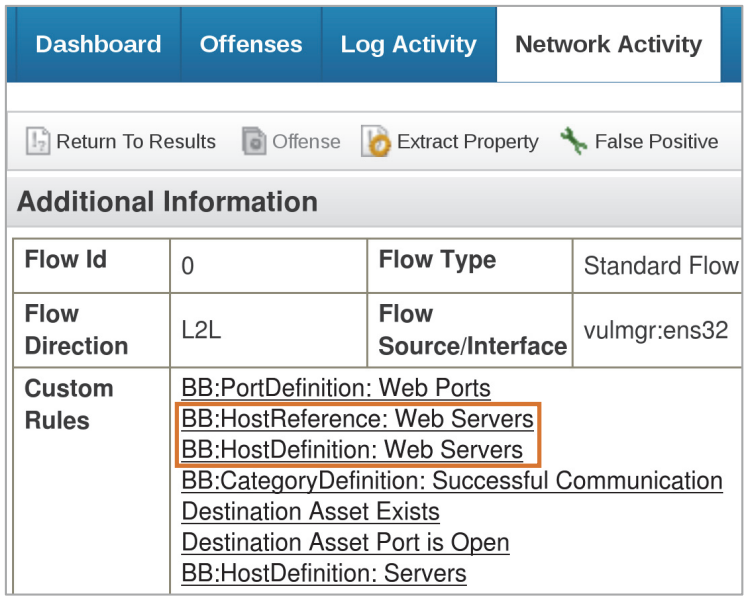
Tagging the usage of approved communication endpoint

- Building blocks with a name beginning with **BB:HostDefinition** and **BB:HostReference** provide **Context** of your environment to QRadar SIEM
- They tag events and flows whose combination of destination IP address and destination port number has been **approved** by a QRadar administrator as a communication endpoint
- While HostDefinition and HostReference building blocks serve the same purpose, they differ considerably
- This lesson first introduces to HostDefinition and then to HostReference building blocks



Developing Custom Rules

Tagging the usage of approved communication endpoint

Notice on the screen capture, that the *BB:PortDefinition: Web Ports* building block fired for the flow. Both *BB:HostDefinition: Web Servers* and *BB:HostReference Web Servers* test for *BB:PortDefinition: Web Ports* and fire only if this building block fires.

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Rule Test Stack Editor for HostDefinition building block

- For example, **BB:HostDefinition: Web Servers** tags an event or flow if both of the following two tests evaluate to true
  - Destination port number is one of the ports stored in **BB:PortDefinition: Web Ports**
  - Destination IP address is one of the IP addresses stored in **BB:HostDefinition: Web Servers**

Rule Test Stack Editor for HostDefinition building block

While the name of the HostDefinition and HostReference building blocks suggest that they tag asset profiles, they only tag events and flows.

Tagging by a HostDefinition and HostReference building block means, that the destination of the activity, that the event or flow represents, is an approved service. The tagging does not confirm, that the approved service uses the application protocol that commonly uses the ports configured in the PortDefinition building block.

For example, the HostDefinition building block on the slide tags events and flows that represent a connection to an FTP server listening on port 80 on 192.168.10.90.

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Configuring ports and IP addresses of approved services

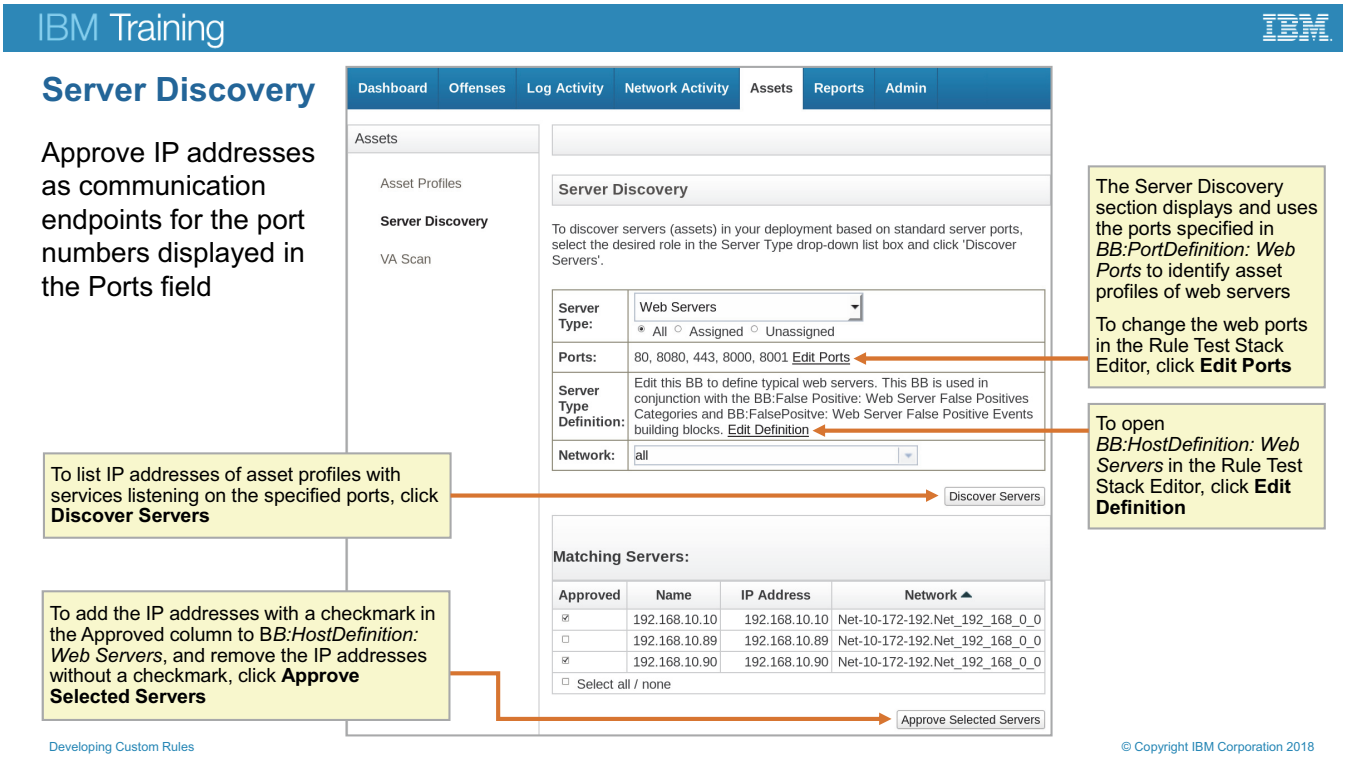
- To configure the destination port numbers that QRadar SIEM considers a web port, edit the **BB:PortDefinition: Web Ports** building block

- To configure the destination IP addresses that QRadar SIEM considers a web server, use the following two options
  - Edit the list of IP addresses in **BB:HostDefinition: Web Servers**
  - On the *Assets* tab, run **Server Discovery** for web servers

  You can use both options together; the IP addresses in the test of the building block are the approved web servers regardless of whether you added them manually or ran Server Discovery

Configuring ports and IP addresses of approved services

More rules use *BB:PortDefinition: Web Ports* than *BB:HostDefinition: Web Servers*.



Server Discovery

Under **Matching Servers**, the Server Discovery lists IP addresses with a service listening on one or more of the port numbers displayed in the Ports field. To retrieve this IP address list, the Server Discovery looks up the port numbers in the asset profile database.

The Server Discovery does not perform the following actions:

- It does not scan your organization's network for open ports.
- It does not search in stored events, flows, or vulnerability scan data.
- It does not verify whether the service listening on a port really uses the expected application protocol. In the example on the slide, the Server Discovery would list an IP address as possible Web Server even if someone runs an SSH server on port 80. Therefore, QRadar admins need to check each listed IP address before approving it for a service.

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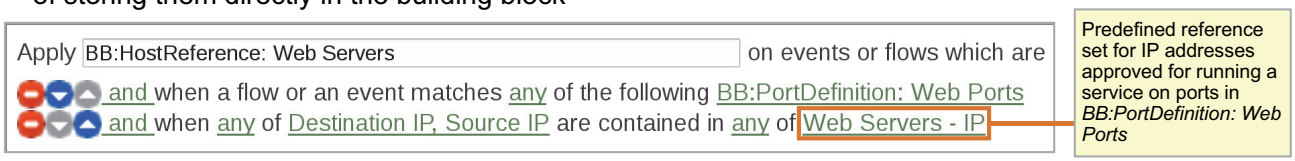
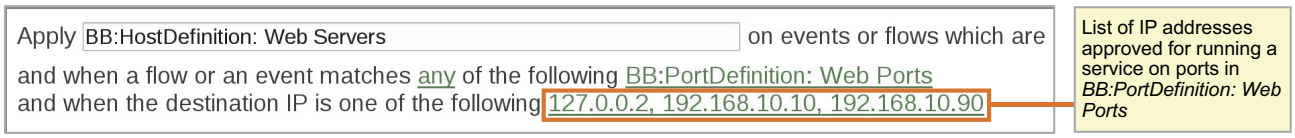
HostReference building blocks

- Instead or in addition to HostDefinition building blocks, you can use HostReference building blocks
- HostReference building blocks store the IP addresses of approved services in a reference set, instead of storing them directly in the building block



- To approve a service, add its IP address to the reference set that the HostReference building block uses
- The Server Discovery does not update HostReference building blocks or their reference sets
- Unlike building blocks, you can update reference sets from outside QRadar SIEM



HostReference building blocks

HostReference building blocks are a newer feature than HostDefinition building blocks. Many rules added by extensions use only HostDefinition building blocks. If you decide to use HostReference building blocks, add them to any rule that only uses HostDefinition building blocks.

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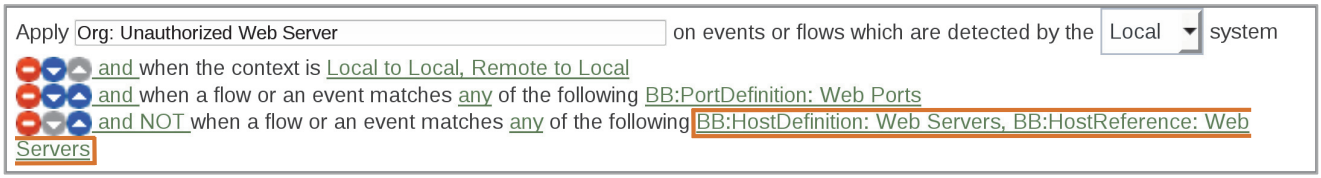
Detecting unapproved services

- Various predefined custom rules and building blocks rely on HostDefinition and HostReference building blocks
- Use HostDefinition and HostReference building blocks in your custom rules and building blocks, for example to detect unapproved services



Detecting unapproved services

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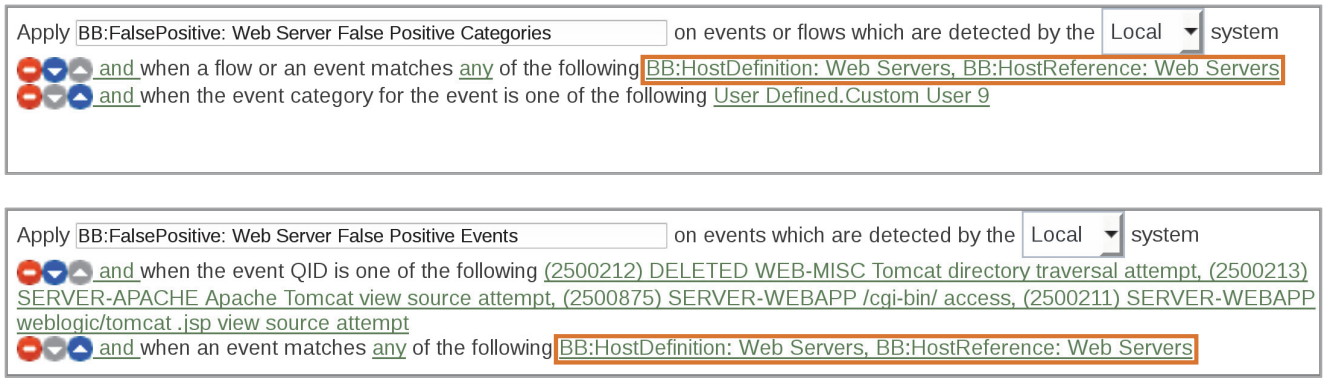
False Positive building blocks

The predefined False Positive building blocks rely on HostDefinition and HostReference building blocks; therefore, you need to keep them up to date



False Positive building blocks

Quiz 2

1. How do you enable a building block so that the CRE executes it?
2. Give some examples of the purpose of building blocks?
3. In addition to the destination IP address, what do BB:HostDefinition and BB:HostReference building blocks test for?
4. How does the Server Discovery obtain the IP addresses that it lists for approval?

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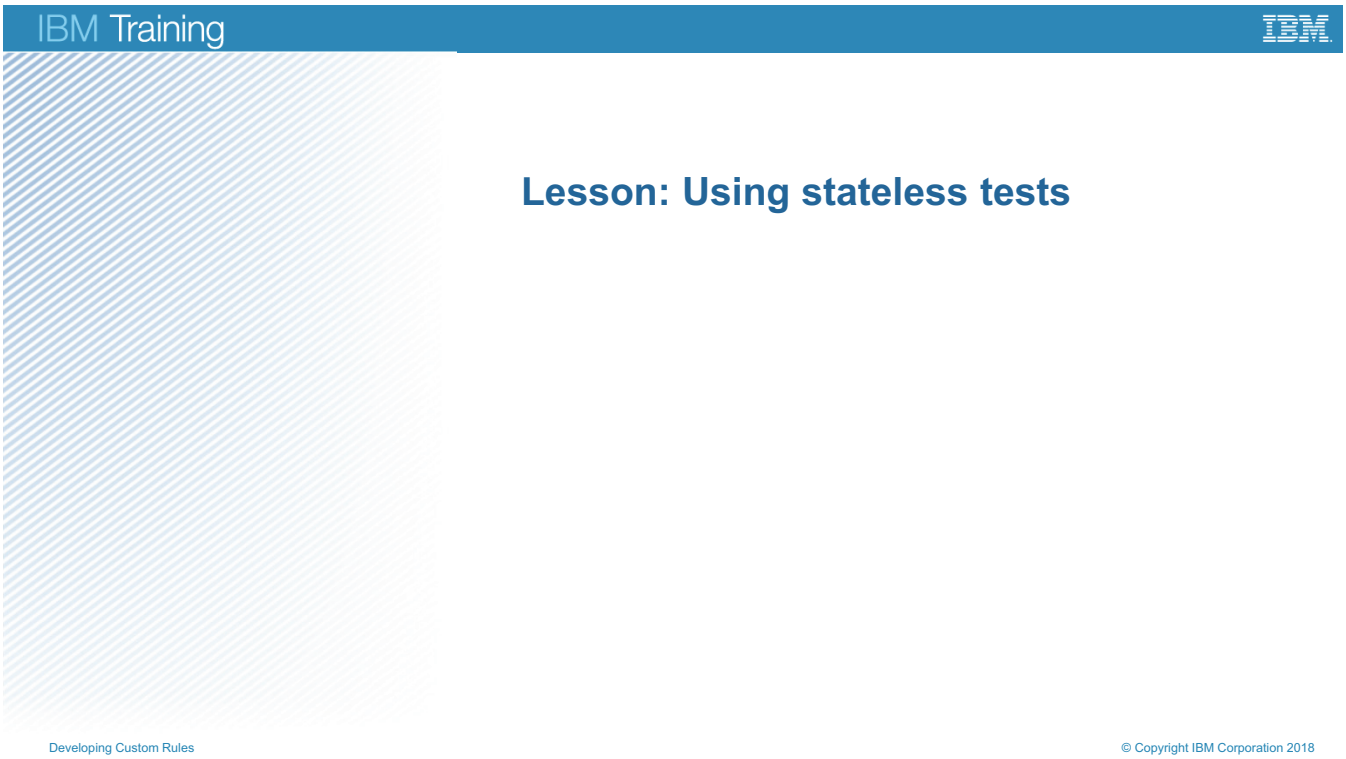
Lesson 5 Using stateless tests



In this lesson, you learn about stateless tests.

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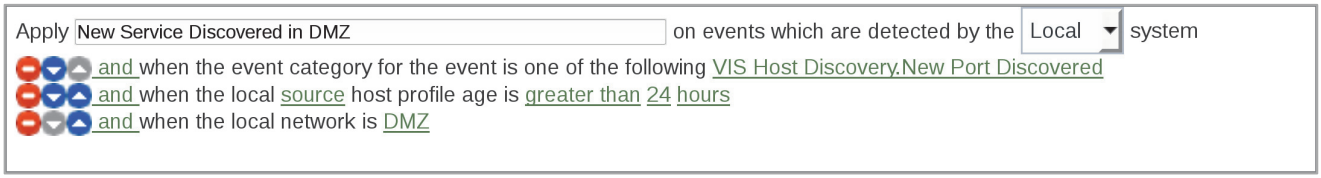
About stateless tests

- Stateless tests only operate on the event, flow, or offense that the CRE instance is currently testing
- Stateless tests do not use test results from previous events, flows, or offenses
- The Rule Test Stack Editor provides extensive possibilities to use stateless tests for indicator testing

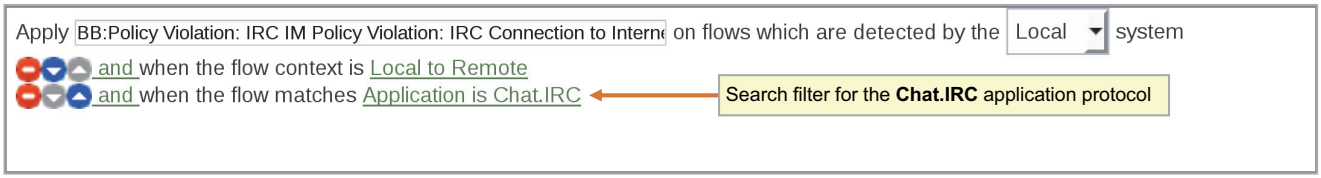


- Like the examples in the screen capture, most stateless tests are straightforward
- The remainder of this lesson introduces to less simple testing

About stateless tests

Search filter

- The following stateless tests allow you to use most of the search filters, that are available on the Log Activity and Network Activity tabs, in rules
  - Event rules
    when the event matches this this search filter
  - Flow rules
    when the flow matches this this search filter
  - Common rules
    when the event or flow matches this this search filter
- The CRE performs search filter test conditions highly efficient because it just matches the property value of the event or flow against the parameter configured in the test condition of the rule
- The CRE does not perform a search when testing search filters; therefore indexes are not used



Search filter

To test for the detected application protocol, many predefined rules of type flow use the search filter test.

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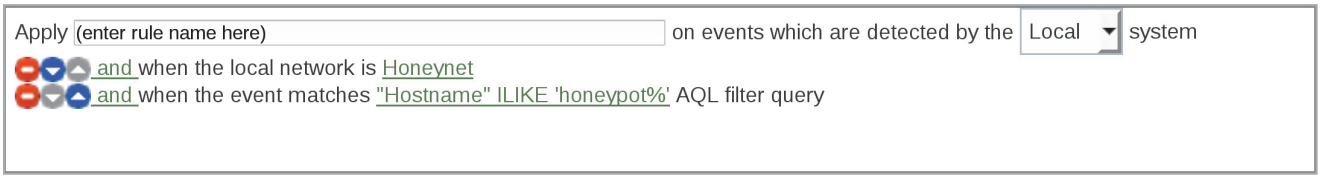
AQL WHERE clause

- The following stateless tests perform an AQL WHERE clause on events or flows
  - Event rules
    when the event matches this AQL filter query
  - Flow rules
    when the flow matches this AQL filter query
- The resource consumption of the entered AQL WHERE clause determines the efficiency of the test



- The AQL WHERE clause can use property values of the event or flow that the CRE currently tests
  - Also the AQL WHERE clause can use AQL functions that only operate on a single event or flow
- The AQL WHERE clause cannot query stored events or flows
  - Also the AQL WHERE clause cannot use AQL functions that operate on multiple events or flows, such as aggregation functions

AQL WHERE clause

The test using an AQL WHERE clause is only available for rules of types event and flow.

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Stateless function tests

- The previous lesson introduced to the purposes of building blocks
  - provide context
  - reduce complexity
  - facilitate the reuse
  - reduce resource consumption
- To leverage building blocks, use **stateless function tests**
- They use the evaluation result of other rules on the same event, flow or offense
- Typically stateless function tests use the result of building blocks but they can also use the result of custom rules
  Example: The following stateless test uses two custom rules and two building blocks

Stateless function tests

You cannot disable or delete a rule, that other rules use.

Stateless function tests (continued)

- The Rule Test Stack Editor provides one stateless function test per rule type
  - Event rules
    when an event matches any of the following rules
  - Flow rules
    when a flow matches any of the following rules
  - Common rules
    when a flow or an event matches any of the following rules
  - Offense rules
    when the offense matches any of the following offense rules
- All other function tests are stateful

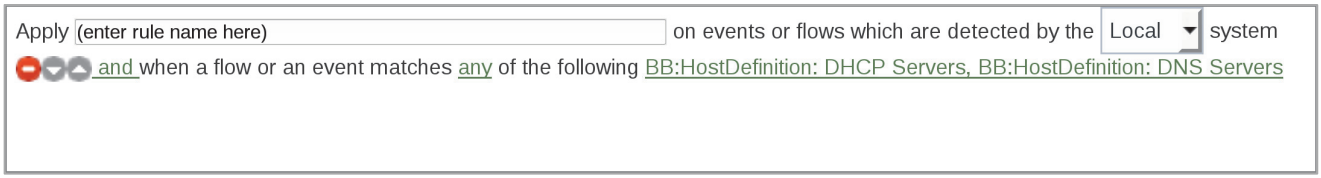
Stateless function tests (continued)

Not all stateful function tests use the evaluation results of other custom rules and building blocks

Composing the OR operator

- In terms of Boolean algebra, the tests of a rule are operands in a logical operation
- You can use the AND operator and the NOT operator
- To create an OR operation between two tests, perform the following steps
  1. Create a building block for each test
  2. Create a new custom rule or building block
  3. Add the stateless function test for the chosen rule type, such as **when a flow or an event matches** any **of the following** rules
  4. Add all of the building blocks that you created in step 1 to the rules parameter

Example: The following rule uses two predefined building blocks; it evaluates to true if the destination of the tested event or flow is a communication endpoint that is approved by a QRadar administrator as DNS server **or** DHCP server



Composing the OR operator

The example only works if you have added the IP addresses of your DNS and DHCP servers manually to the building blocks, or have used the Server Discovery for DNS and DHCP servers on the Assets tab.

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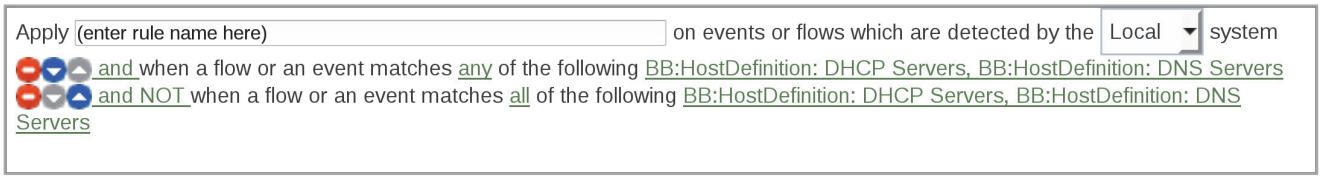
Composing the XOR operator

You can compose any other Boolean operation, such as EXCLUSIVE OR in the following example



Composing the XOR operator

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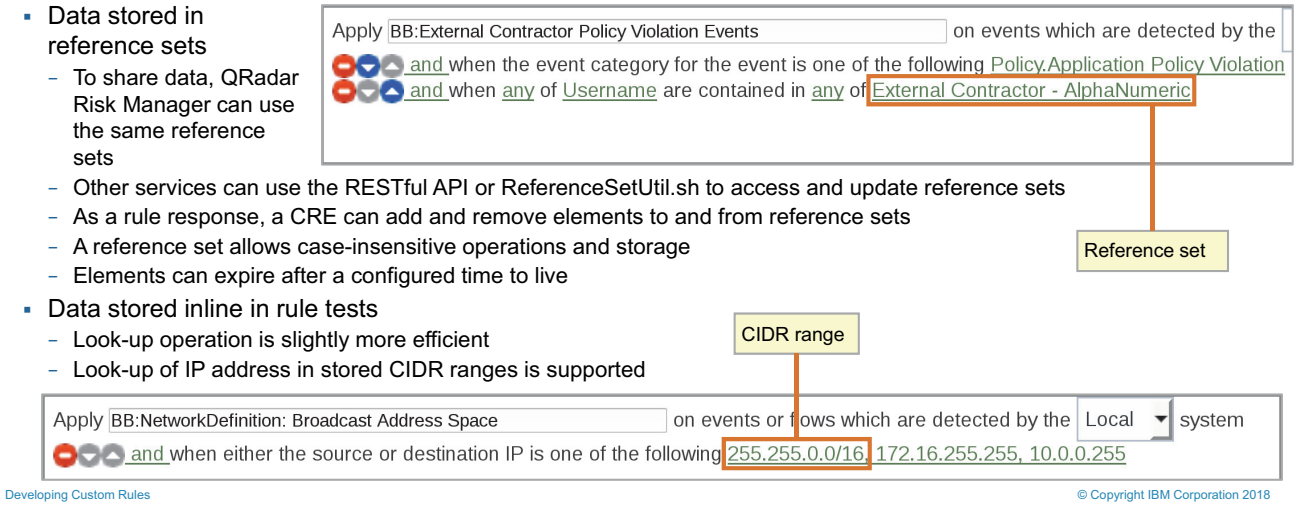
Comparison reference set and inline data

- Many indicators require to test whether a property value of the tested event or flow is contained in a data collection
- To accomplish this, choose between the following two options
  - Data stored in reference sets
    - To share data, QRadar Risk Manager can use the same reference sets
    - Other services can use the RESTful API or ReferenceSetUtil.sh to access and update reference sets
    - As a rule response, a CRE can add and remove elements to and from reference sets
    - A reference set allows case-insensitive operations and storage
    - Elements can expire after a configured time to live
  - Data stored inline in rule tests
    - Look-up operation is slightly more efficient
    - Look-up of IP address in stored CIDR ranges is supported

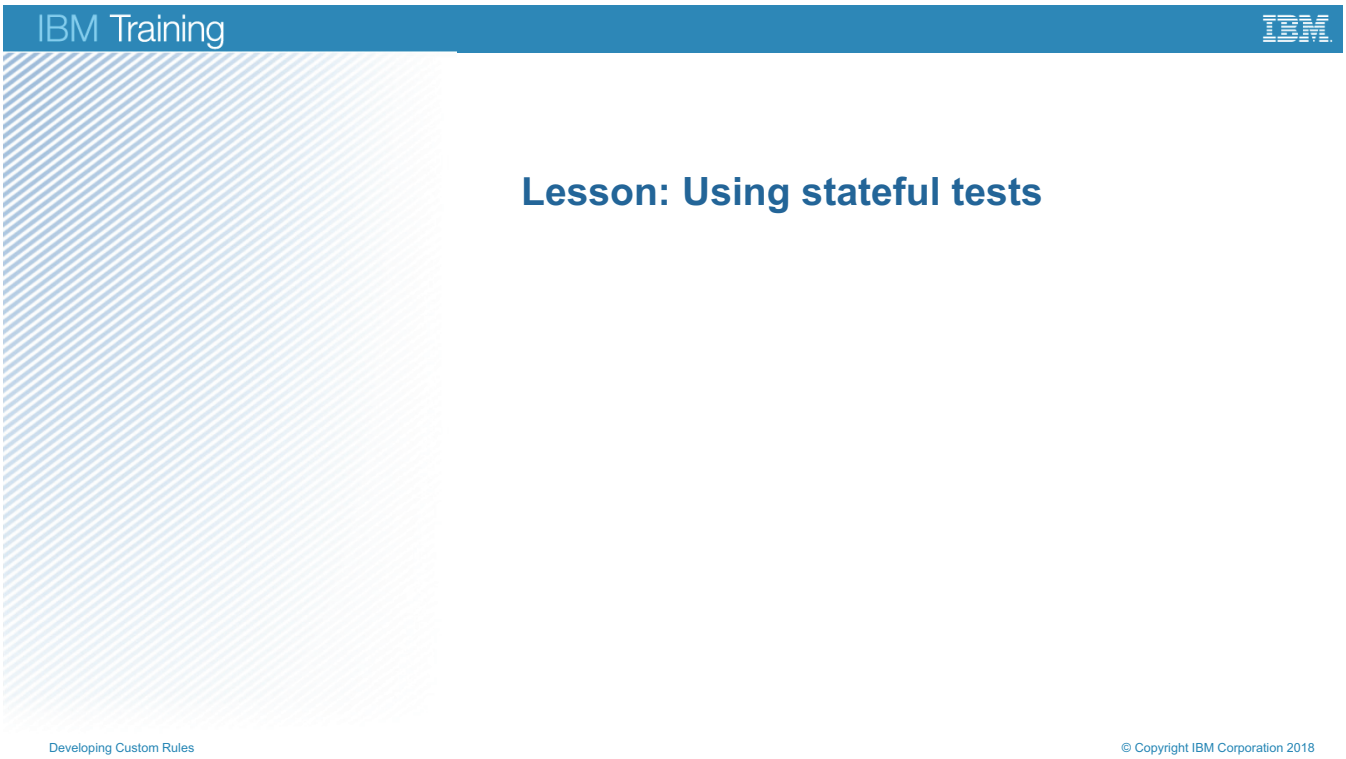


Comparison reference set and inline data

QRadar Risk Manager can use reference sets but not any other reference data collection types.

For the CRE, look-ups in reference data collections are stateless tests because the CRE does not need to maintain counters and timers. However, you can use reference data collections to maintain a state across events and flows.

Lesson 6 Using stateful tests



For stateful tests, the CRE keeps track of how often a test condition evaluates to true within a time frame. In this lesson, you learn when a rule with stateful tests fires, and the pros and cons for configuring a rule as local or global.

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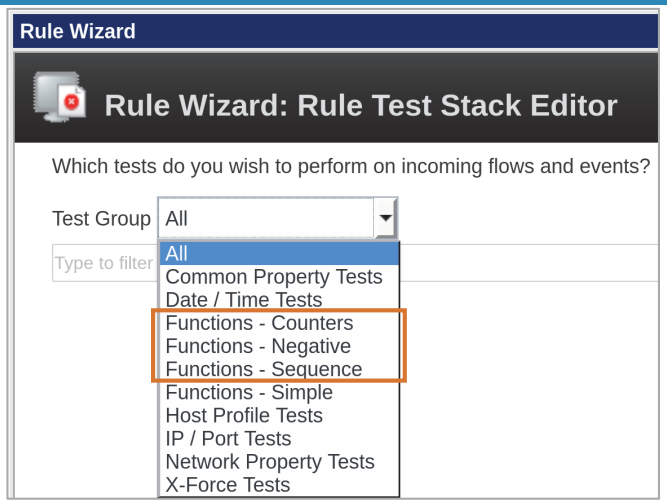
About stateful tests



- Stateful tests operate on the currently tested event or flow, and on counters for test results of previous events and flows
- The Rule Test Stack Editor provides all stateful tests in Test Groups with the term **Function** in their names
- Many stateful tests use the evaluation results of other rules that the CRE executes on the same event or flow
- Stateful tests are available for event and flow rules, but not for offense rules
- For stateful tests, the CRE keeps track of matches in a time window
- The state of a rule resets when you edit the rule
- The state of all rules reset when QRadar's ecs-ep service restarts; which happens any time you install a fixpack or select **Deploy Full Configuration** on the Admin tab

About stateful tests

If an indicator requires tracking information over a longer period of time, use reference data collections or anomaly detection rule.

In the screen capture on the slide, the Test Group drop-down list provides the **Functions - Simple** menu item. Its only test is the stateless function test for the chosen rule type, that the previous lesson introduced to.

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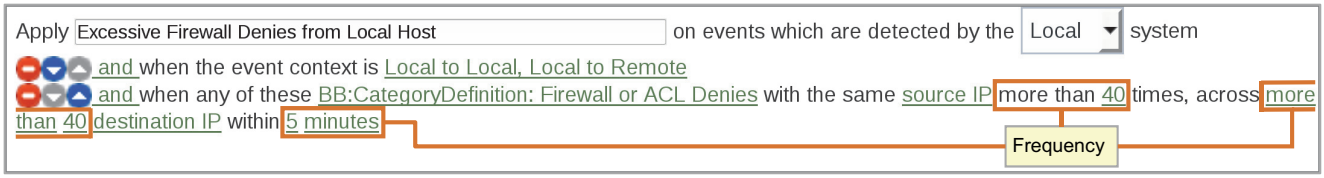
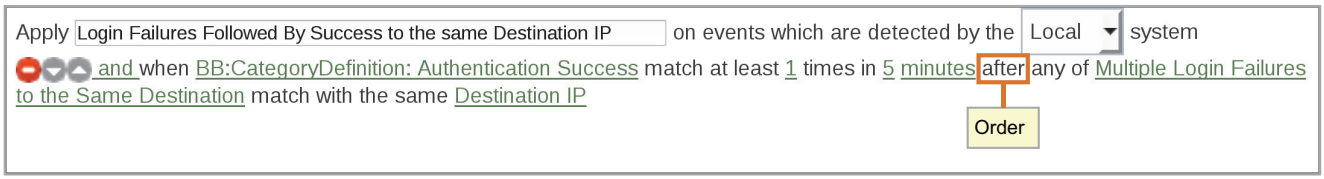
Purpose of stateful tests

- Stateful tests primarily serve the following two purposes
  - Monitoring **frequency**: Keep count whether conditions become true as many times as the configured triggering value in the configured time frame



Only if the stateless test evaluates to true is the stateful test evaluated and can increment counters

  - Monitoring **order**: Monitor whether conditions become true in a certain sequence and time frame



Purpose of stateful tests

Rule with one stateful test fires

- To track how often a test condition becomes true within a time frame, the CRE runs counters and timers for stateful tests
  - Counters that the CRE increments when the monitored test condition fires
  - Timers that decrement counters after a time frame has elapsed and cancel a counter entirely when it reaches zero
- The example in the table shows when a rule with only the following test fires

  when at least 3 events are seen with the same Username in 5 minutes

Time	Event with username fay	CRE updates counter	Rule fires
0:01	×	initialize with 1	
0:02	×	increment to 2	
0:03			
0:04	×	increment to 3	×

- If a stateful test is the only test of a rule and its counter for the test condition increments to the trigger value, the rule fires
- The CRE starts timers for a stateful test at the time that it evaluates the stateful test on an event or flow to true
- To use the *Start Time* or *Log Source Time* of events, use Historical Correlation which is beyond the scope of this module

Rule with one stateful test fires

From some log sources, raw events arrive together in bulk. Releasing events and flows from a temporary queue after a burst above the license limit can also cause them to arrive at the CRE in shorter succession than they originally occurred. Upon request by a stateful test, the CRE instance increments counters and starts timers at about the same time for each event. Therefore, stateful tests can reach their trigger value only because the events arrived in bulk and the CRE instance processed them at about the same time.

As an example, say a custom rule that tests for three events with the same user name within five minutes fires even if the three raw events occurred over a longer time range but arrived together at a CRE instance.

Rule with one stateful test fires again

- A rule with one stateful test does not fire again if the counter increments to values greater than the trigger value, or decrements to exactly the trigger value
- The rule can fire again only after the counter has decremented below the trigger value
- The CRE performs the Rule Action and Rule Response only for the events and flows, for which the rule fires

Time	Event with username fay	CRE updates counter	Rule fires
0:01	×	initialize with 1	
0:02	×	increment to 2	
0:03			
0:04	×	increment to 3	×
0:05	×	increment to 4	
0:06		decrement to 3	
0:07		decrement to 2	
0:08	×	increment to 3	×

Rule with one stateful test fires again

Rule with one stateful test adds events and flows to offense

- If a Rule Action or Rule Response requests to add an event or flow to an offense, the *Magistrate* running on the Console queries from the processor the events and flows, that had incremented counters, and adds them to the offense
  - In the example in the table, the Magistrate queries the events at 0:01 and 0:02 and adds them to the offense, after the event at 0:04 triggered the offense
- Once the Magistrate has created an offense, it adds every event or flow to it that increments a counter to the trigger value or above
  - In the example in the table, the Magistrate adds the events at 0:04 and 0:08 because they caused the CRE to increment the counter to the trigger value and fire the rule
  - The Magistrate adds the event at 0:05 to the offense because it caused the CRE to increment the counter above the trigger value

Time	Event with username fay	CRE updates counter	Rule fires
0:01	×	initialize with 1	
0:02	×	increment to 2	
0:03			
0:04	×	increment to 3	×
0:05	×	increment to 4	
0:06		decrement to 3	
0:07		decrement to 2	
0:08	×	increment to 3	×

Rule with one stateful test adds events and flows to offense

The Magistrate is introduced later in this module.

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Partial match

- The CRE tags events and flows with the rules, that fired for them or for which the CRE incremented a counter to a value above the trigger value
- Such matches are called a **Full Match** and recorded under **Custom Rules**
- The CRE tags events and flows with the rules, for which the CRE incremented a counter to a value below the trigger value
- Such matches are called a **Partial Match** and recorded under **Custom Rules Partially Matched**

Additional Information

Protocol	255
Log Source	WindowsAuthServer @ 10.0.120.11
Custom Rules	BB:CategoryDefinition: Authentication Failures Load Basic Building Blocks Source Asset Weight is Low Multiple Login Failures to the Same Destination Destination Asset Weight is Low Context is Local to Local
Custom Rules Partially Matched	Multiple Login Failures from the Same Source Multiple Login Failures for Single Username Login Failures Followed By Success to the same Destination IP

Developing Custom Rules

Partial match

In the example table on the previous slide, the events arriving at 0:01 and 0:02 are partial matches. The events arriving later are full matches. The Magistrate adds all partial and full matches to the offense.

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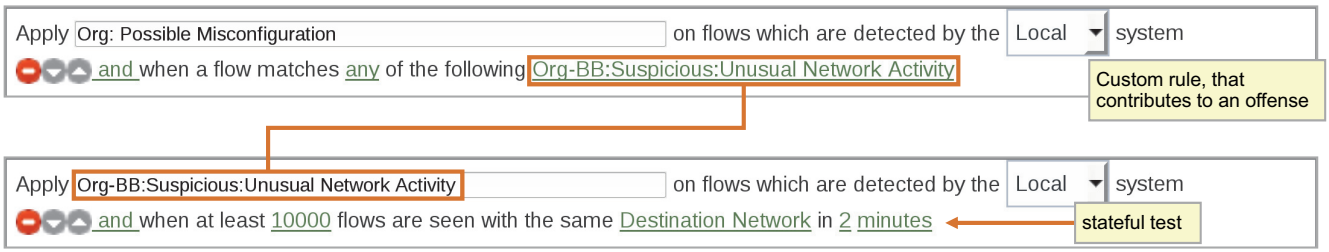
Adding partial matches to an offense

- When a rule with a stateful test triggers an offense, the Magistrate queries from the processor the events and flows, which had been partial matches in order to add them to the offense
- The Magistrate can only locate partial matches for the stateful tests directly used in the rule that fires
- The Magistrate cannot locate partial matches of stateful tests in rules, that the firing rule uses in tests
- Therefore, avoid using stateful tests in building blocks and custom rules that are used by other custom rules
- The test in the following custom rule uses a building block with a stateful test, and is therefore an example for how to **not** develop your rules



Adding partial matches to an offense

The missing partial matches are only a concern for rules that add events and flows to an offense.

The missing partial matches are not a concern for other Rule Actions and Rule Responses.

Local and Global rule configurations

- A QRadar SIEM deployment can run more than one CRE instance
- For most rules with a stateful test, it is sufficient that each CRE instance maintains counters separately
- A few rules with a stateful test require that the CRE instance on the Console appliance maintains the counters
  Example: If three failed login attempts are counted by one CRE instance and two more attempts are counted by another CRE instance, a rule to monitor the occurrence of five failed login attempts does not fire

Local and Global rule configurations

Mostly rules testing authentication events require rules configured as global.

For all-in-one and other deployments with only one CRE instance, the choice between Local and Global does not make a difference.

For offense rules, the Rule Test Stack Editor does not offer the choice between local and global because the CRE instance on the Console appliance evaluates all offense rules.

The term Global Cross Correlation (GCC) refers to global rules.

Location of tracking for stateful tests

In the Rule Test Stack Editor, configure which CRE instances track the results of stateful test

- **Local**: The CRE instance, that receives the event or flow, maintains counters for stateful tests and performs all Rule Actions and Rule Responses if it fires
- **Global**: Two CRE instances perform the following steps to execute a global rule for an event or flow
  - The local CRE instance, that receives the event or flow from a collector, performs the stateless tests one-by-one as long as none of the the results causes the whole rule to evaluate to false
  - If all stateless test conditions match, the local CRE instance sends the event or flow to the CRE instance on the Console
  - The CRE instance on the Console performs the stateful test conditions, updates counters and evaluates the rule
  - If the rule fires, the CRE instance on the Console performs all Rule Actions and Rule Responses

Location of tracking for stateful tests

Some large QRadar SIEM deployments use load balancers to distribute connections from collectors to processors. Best practice is to configure the load balancers for session affinity. If you do not configure session affinity, the load balancers spray the events and flows, that collectors send, across the available processors. In this case, configure all rules with stateful tests as Global because each CRE instance running on the processors maintains its state separately.

Local and Global considerations

	Advantage	Disadvantage
Local	Lower resource consumption on the Console appliance	Two CRE instances can evaluate a rule to false based on their separate test results, but the combined test results would evaluate to true
Global	Rule evaluation reflects the entire IT environment	Higher resource consumption on the Console appliance

- The CRE always treats a rule with only stateless tests as local, regardless of whether it is configured as global; therefore, the CRE instance that received an event or flow executes all rule tests and performs all responses
- Using a rule, that is configured as local, as parameter in a rule configured as global does not change which CRE instance tracks information for stateful tests

Local and Global considerations

A CRE instance performs the following rule responses on the appliance it is running on. If a rule with such a response can possibly fire on an appliance, the IT environment needs to allow the appliance to perform the following responses:

- Reach and use the mail server
- Reach and use the SNMP server
- Reach the forwarding destination
- Reach and use any service that the selected custom action script requires

A rule is configured to send to syslog, it sends to the local syslog server of the appliance that the CRE instance is running on. The location of the CRE instance is not a concern for the other response options.

Quiz 3

1. What is not available when using an AQL WHERE clause for testing?
2. Which test is possible with data stored inline in a custom rule or building block but not with a reference data collection?
3. Which kind of test uses other rules as test parameter?
4. What do stateful tests primarily test for?

Quiz 3

Exercise introduction

Complete the following exercises in the Course Exercises book

- Considering the evidence
- Creating custom event properties
- Creating a first solution using two building blocks and one custom rule
- Creating a second solution using one reference set and two custom rules
- Considering which solution to choose

Exercise introduction

Lesson 7 Configuring rule actions

Similar the if-then statement in programming languages, custom rules consist of a boolean operation and statements. If the CRE evaluates the boolean operation to true, then the CRE performs the configured Rule Actions and Rule Responses. This lesson teaches you Rule Actions.

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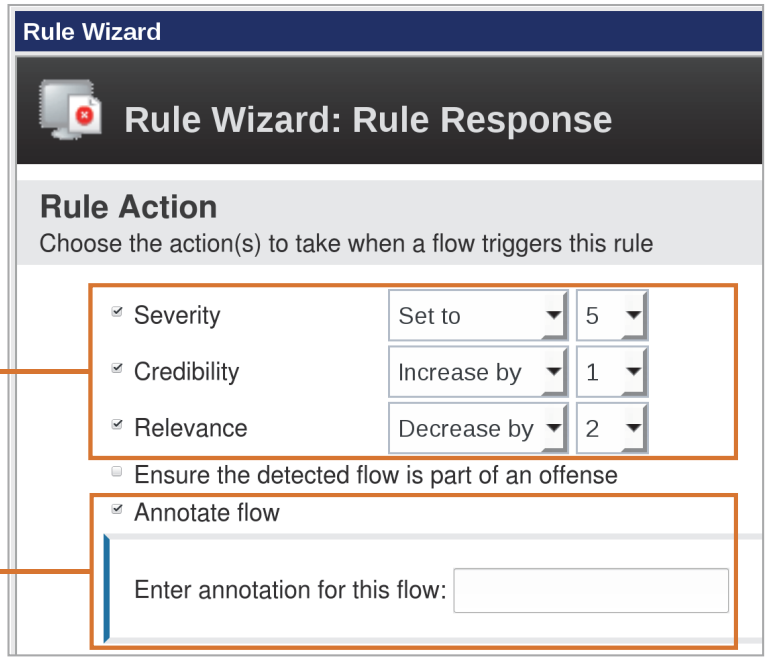
Changing property values

- If a rule fires, the CRE executes its Rule Action
- Only the options highlighted on this slide can change property values of the event or flow that the custom rule fired for; any other Rule Action or Rule Response does not change property values



Changing property values

The Rule Action of an offense rule can only change the offense name and annotate it.

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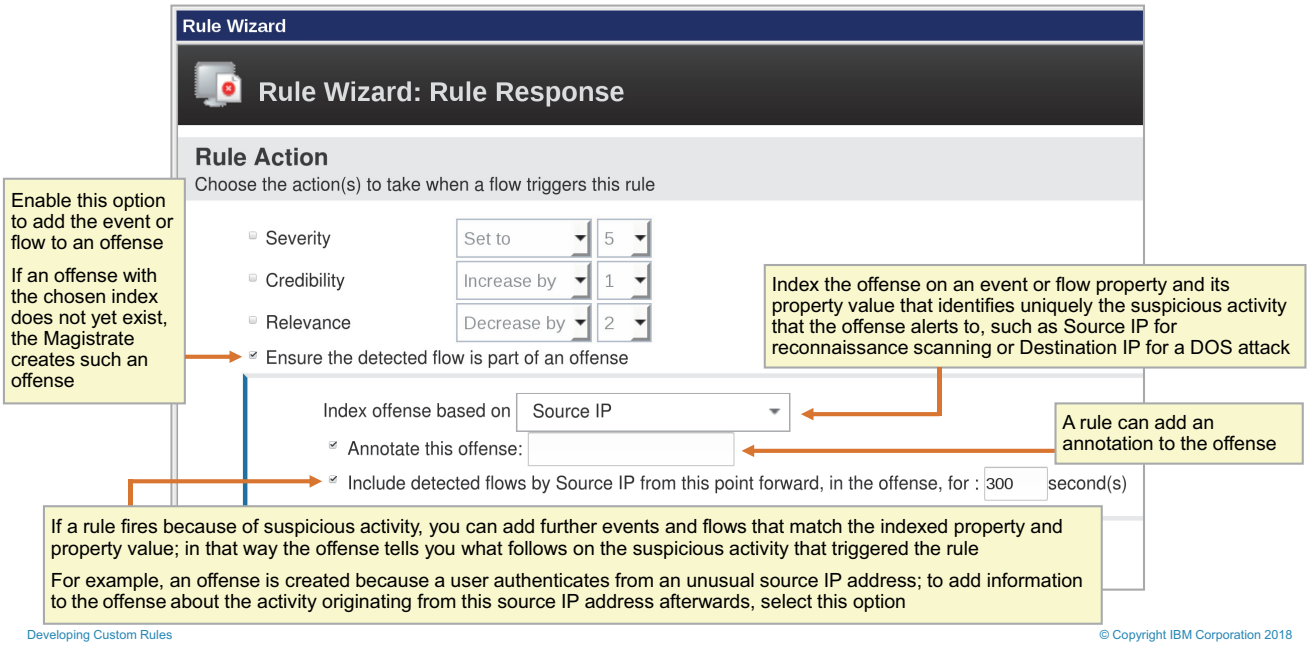
Adding to an offense



Adding to an offense

With the *Include detected* option enabled, the CRE adds many events and flows to the offense. Therefore, use this option only if the events or flows following the suspicious activity can really add valuable information to the offense.

The Rule Action of an offense rule cannot create a new offense.

Magistrate and Index

- The Magistrate component of QRadar SIEM maintains all offenses and determines whether to add an event or flow to an existing offense or create a new offense
- The Magistrate assumes that rules firing for the same index property and property value relate to the same security issue; therefore, the Magistrate maintains only one active offense indexed on the same property and property value at any given time

  Example: A rule fires and requests that the Magistrate adds the event or flow to an offense indexed on source IP address 192.168.10.10
  - If such an offense already exists, the Magistrate adds the event or flow to it
  - If such an offense does not exist, the Magistrate creates an offense indexed on the Source IP property and the 192.168.10.10 property value, and adds the event or flow to it
- The Magistrate only runs on the Console

Magistrate and Index

To identify an offense uniquely, the Magistrate requires both the property and its value. The value alone is not enough. For example, an offense can be indexed on the source IP address 192.168.10.10, and another offense can be indexed on the same IP address 192.168.10.10, but as the destination IP address. This happens when a compromised machine attacks other targets. QRadar SIEM chains such offenses.

Magistrate and Index (continued)

- Index a rule on the key property in its tests; for example, choose the **Username** property as the index for a rule that tests for 5 login failures with same user name
- More than one rule can fire for an event or flow
  - For rules firing with the same index property and property value, the Magistrate adds the event or flow to the same offense; therefore, more than one rule can add events and flows to one single offense
  - For each rule firing with different index properties or property values, the Magistrate adds the event or flow to each of the separate offenses

Magistrate and Index (continued)

The difference between the CRE and Magistrate is as follows:

- The CRE tests events and flows. It tags each event and flow with each custom rule and building block that fires for it, regardless of the Rule Action and Rule Response.
- The Magistrate maintains offenses. It adds events and flows to offenses if told so by the Rule Action and Rule Response.

Every CRE sends every event and flow, that a rule action wants to be part of an offense, to the Magistrate on the Console. The Console stores an event or flow that it received from a managed host as a duplicate only if the event or flow caused the Magistrate to create a new offense. The Console does not store events or flows that the Magistrate only added to an already existing offense.

Dropping event or flow

- Dropping an event or flow stops the CRE from executing any further rules that haven't already been executed
- At the point of dropping, some rules might have already fired and the CRE has executed their Rule Actions and Rule Responses
- Dropping an event or flow does not delete it
- A dropped event or flow is still stored and searchable; therefore, it shows up in search results and reports

Dropping event or flow

Events and flows dropped under Rule Action still count towards the license.

FalsePositive: False Positive Rules and Building Blocks

- The predefined custom rule **FalsePositive: False Positive Rules and Building Blocks** drops the events and flows that it fires for
- Its purpose is to prevent unwanted custom rule execution
- For any other custom rule, it is usually **inadvisable to drop events and flows**
- The CRE evaluates custom rules and building blocks in the following order:
  1. Enabled custom rules and building blocks that are used by another enabled custom rule
  2. The *FalsePositive: False Positive Rules and Building Blocks* custom rule that might drop the event or flow
  3. Enabled custom rules that are not used by another enabled custom rule
- It is not possible to configure the CRE to execute rules in a certain order during these execution phases

FalsePositive: False Positive Rules and Building Blocks

Events and flows dropped by the *FalsePositive: False Positive Rules and Building Blocks* custom rule are not tested by enabled custom rules, that are not used by another enabled custom, because the CRE runs them after *FalsePositive: False Positive Rules and Building Blocks*.

Enabled custom rules and building blocks, that are used by other enabled custom rules, execute on all events and flows because the CRE runs them before *FalsePositive: False Positive Rules and Building Blocks*. If custom rules fire for events and flows, for which also *FalsePositive: False Positive Rules and Building Blocks* fires, check which other enabled custom rules use these custom rules and therefore cause the CRE to run them before *FalsePositive: False Positive Rules and Building Blocks*.

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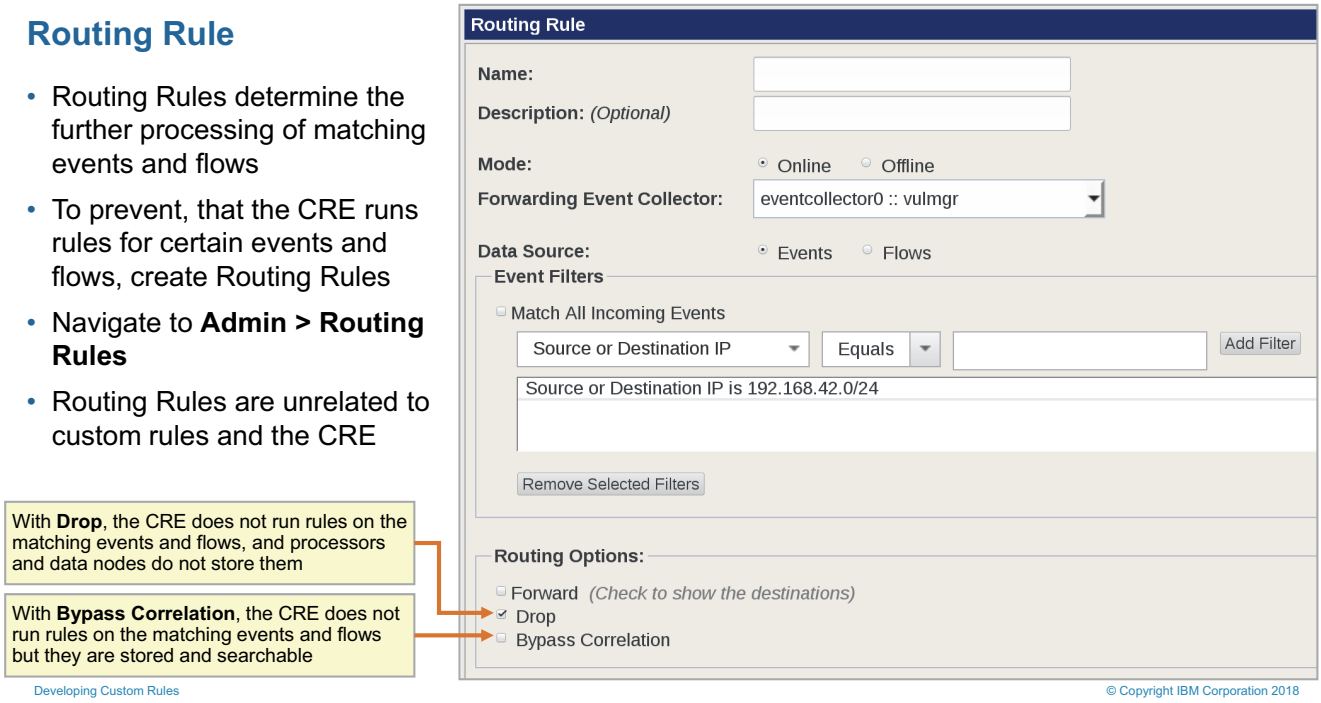
Routing Rule

- Routing Rules determine the further processing of matching events and flows
- To prevent, that the CRE runs rules for certain events and flows, create Routing Rules
- Navigate to **Admin > Routing Rules**
- Routing Rules are unrelated to custom rules and the CRE



Routing Rule

If you configure a routing rule to drop events, QRadar SIEM 7.3.0 credits the license 60% up to a maximum of 2,000 events per second (EPS) per appliance. Product version 7.3.1 credits 100% up to the EPS of the appliance license.

With both product versions, QRadar SIEM enforces the appliance limit as a upper maximum. So an appliance with a capacity of 20,000 EPS cannot receive more than 20,000 events even if you configure a routing rule that drops events.

Both *Drop* and *Bypass Correlation* options are only available for Online mode.

Collectors can only filter events and flows after they have parsed and normalized them. Therefore, dropping events and flows lowers resource consumption for processors but not for collectors.

Refer to *Configuring routing rules for bulk forwarding* at https://www.ibm.com/support/knowledgecenter/en/SS42VS_7.3.0/com.ibm.qradar.doc/t_qradar_adm_conf_blk_event_frwd.html for more information on Routing Rules.

Lesson 8 Configuring rule responses

Similar the if-then statement in programming languages, custom rules consist of a boolean operation and statements. If the CRE evaluates the boolean operation to true, then the CRE performs the configured Rule Actions and Rule Responses. This lesson teaches you Rule Responses.

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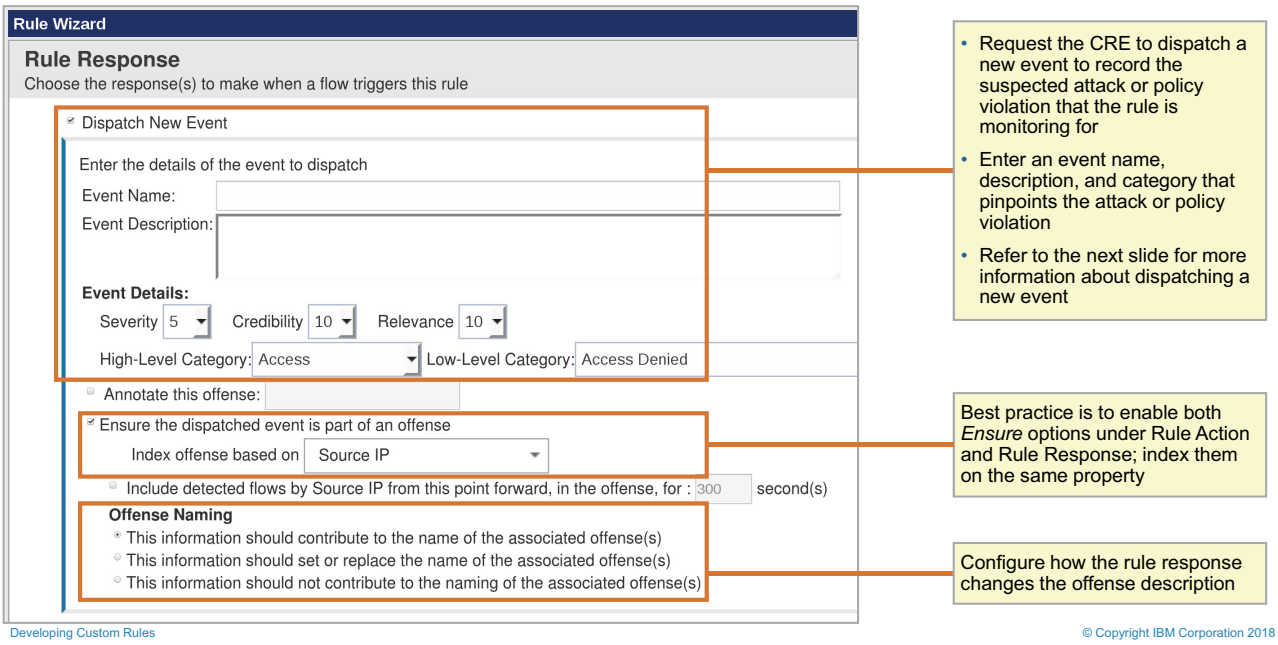
Dispatching new event and adding it to offense



Dispatching new event and adding it to offense

Notice the different wording of the two offense options:

- Rule Action: Ensure the **detected** flow is part of an offense
- Rule Response: Ensure the **dispatched** event is part of an offense

The CRE executes all rules on the newly dispatched event.

The CRE creates the new event already normalized. Therefore, these events do not run through a collector.

If you select *Log Source* as offense index under Rule Response, the offense is always indexed on the Custom Rule Engine log source of the CRE that dispatches the event. If you also select *Log Source* as offense index under Rule Action, the CRE adds the event or flow, that the rule fired for, to a separate offense unless this event or flow has been created by the same CRE instance.

Purpose for dispatching a new event

- The main purpose for dispatching a new event is to overwrite or add to the name of the offense that is created under the Rule Action
- A secondary purpose is to allow easy searching and reporting on the suspicious activity that the dispatched event records
- The detected event or flow, that the rule fired for, usually does not make clear which activity the rule monitors
- The detected event or flow only records one single action or network activity in your environment, which by itself often is not suspicious; the rule fires only by correlating with other events, flows, and additional information

  Example: A rule monitoring for unauthorized data access fires on the event with the name *SSH Login Succeeded;* to be more clear about what happened, dispatch an event with a name such as *Access to Sensitive Data*

Purpose for dispatching a new event

In addition to the two purposes, a rule can dispatch an event for a monitored indicator that other rules test for so that the other rules do not need to run the same tests. However, unless you need the dispatched event for searches and reports, use a building block.

If you enable *Ensure the detected* under Rule Action, but under Rule Response you do not configure a dispatched event to provide a helpful description to the offense, the CRE generates the offense description:

- If the rule fired for a detected event, the rule adds the name of the detected event to the offense description.
- If the rule fired for a detected flow, the rule adds the name of the application whose data QRadar detected in the flow.

The user interface often refers to the name of an offense as the description.

The newly dispatched event copies some of the property values from the original event or flow that triggered the custom rule, but it does not have its raw event or flow as the payload and it has none of the custom event or flow properties.

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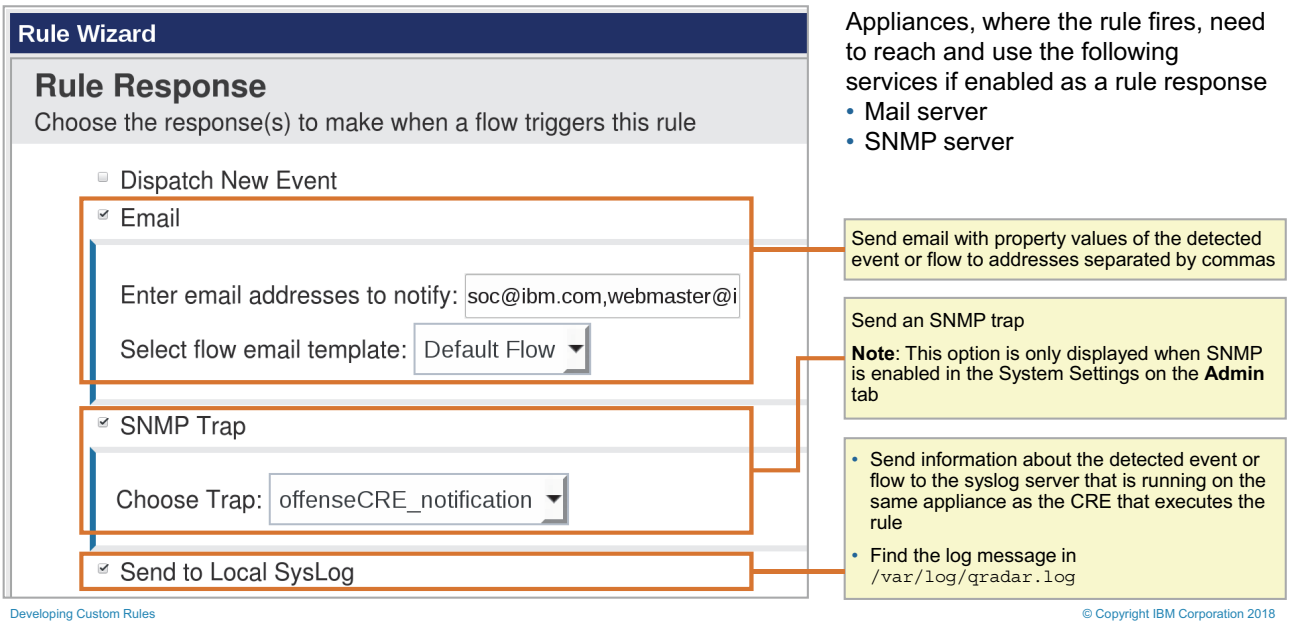
Sending email, SNMP trap or syslog message



Sending email, SNMP trap or syslog message

Email

The emails can contain detailed information.

Refer to *Configuring custom email notifications* at https://www.ibm.com/support/knowledgecenter/SS42VS_7.3.0/com.ibm.qradar.doc/t_CONFIGURING_CUSTOM_EMAIL_NOTIFICATIONS.html for more information.

The mail server of each appliance logs its activity to the following file:

`/var/log/maillog`

SNMP Trap

Refer to *SNMP trap configuration* at https://www.ibm.com/support/knowledgecenter/SS42VS_7.3.0/com.ibm.qradar.doc/c_qradar_adm_snmp_config.html for further information.

Refer to the following files for details about which information the two predefined SNMP traps provide:

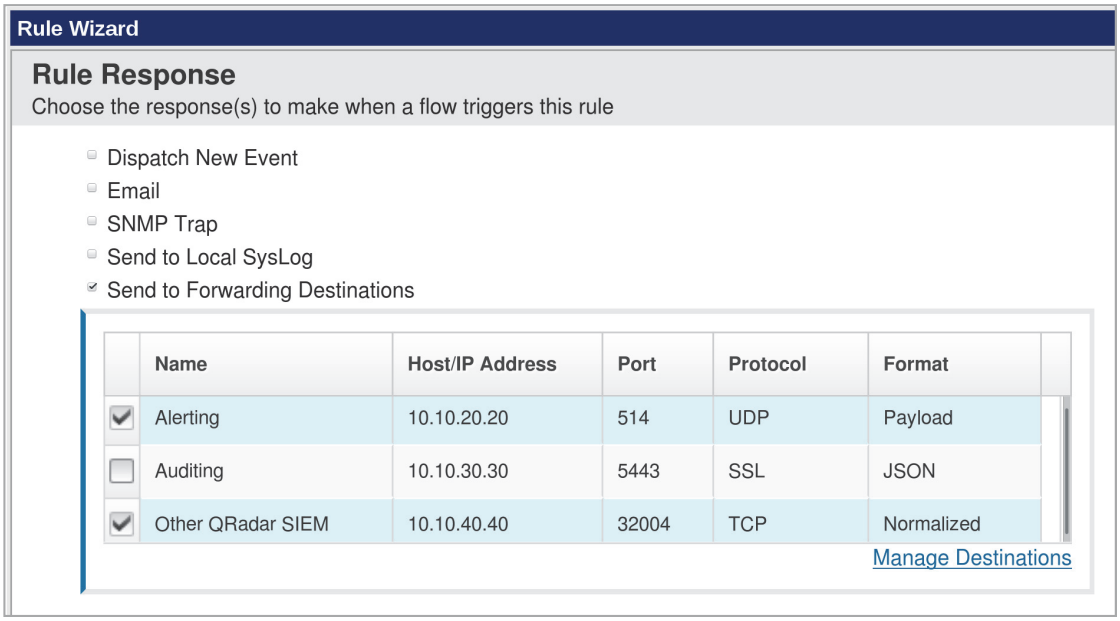
`/opt/qradar/conf/eventCRE.snmp.xml`

`/opt/qradar/conf/offenseCRE.snmp.xml`

Forwarding the detected event or flow

Typical forwarding destinations include SIEM, ticketing, and alerting systems

Appliances, where the rule fires, need to reach the selected forwarding destinations



Forwarding the detected event or flow

Forwarding destinations are configured for your whole QRadar SIEM deployment. However, only appliances where the rule fires need to be able to reach the selected forwarding destinations. For example, a processor appliance in the DMZ might never receive the events that fire the rules with a forwarding destination that is unreachable from the DMZ.

Refer to *Configuring QRadar systems to forward data to other systems* at https://www.ibm.com/support/knowledgecenter/en/SS42VS_7.3.0/com.ibm.qradar.doc/c_qradar_adm_frwd_event_data.html for further information.

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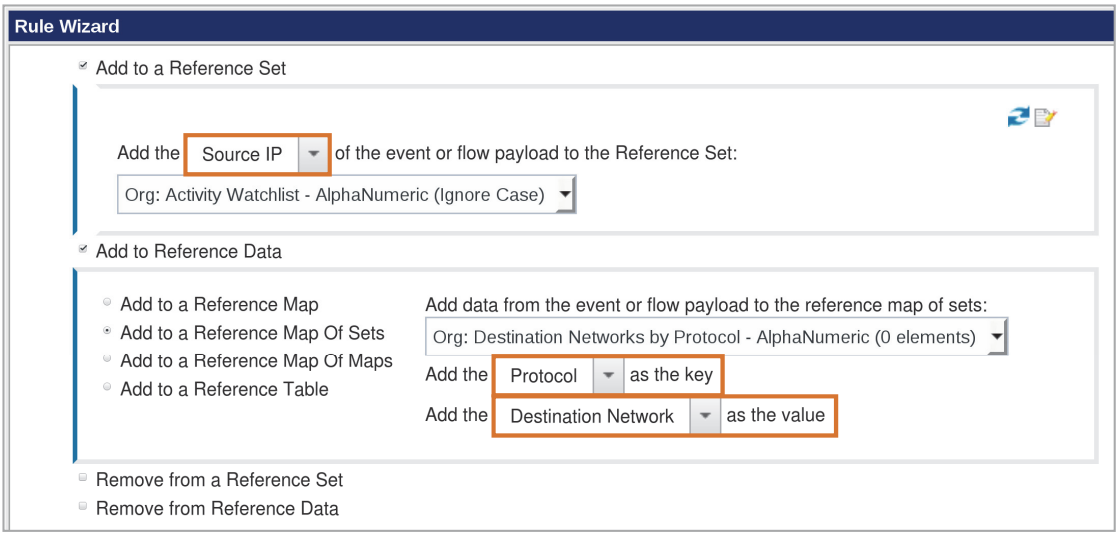
Adding to reference data collections

- The CRE can add property values of the detected event or flow as keys and values to reference data collections
- This option is useful for keeping watchlists



Adding to reference data collections

If the CRE adds an element to a reference set that already exists, QRadar SIEM updates its *Since last seen time stamp*.

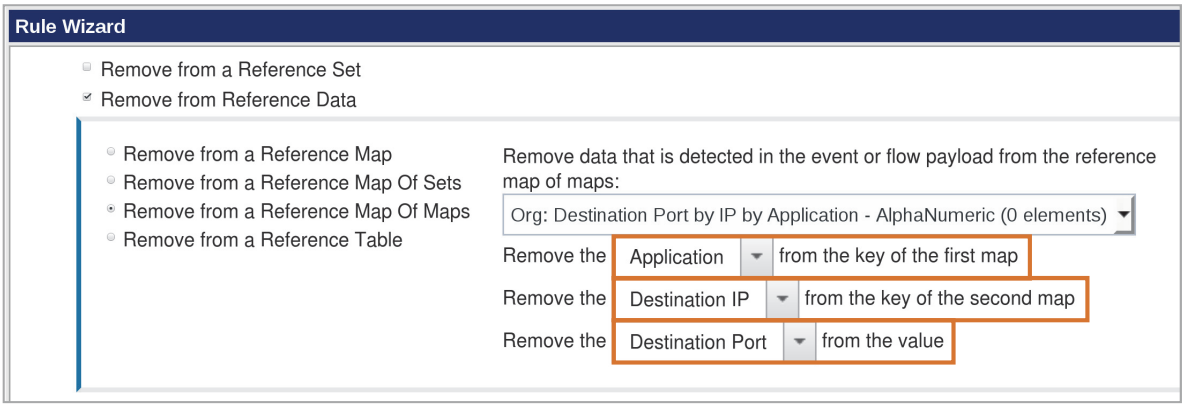
If the CRE adds an element to a reference data collection, that is not a reference set, and such an element already exists, QRadar SIEM updates its *Since last seen time stamp* and overwrites the element.

If a CRE instance running on processor appliance adds to or removes from a reference data collection, it takes up to a minute until the reference data collection is updated. To update reference data collections in a distributed deployment, QRadar SIEM performs the following steps:

1. Processor requests Console to change reference data collection
2. Console updates reference data collection
3. Console replicates to processor changes to reference data collection
4. Processor updates reference data collection

Removing from reference data collections

- To remove elements from reference data collections, the CRE can use property values of the detected event or flow as keys
- It is not an error if an element cannot be removed because a key does not exist in a reference data collection



Removing from reference data collections

Rule tests can look up elements in reference data collections.

Rule responses can add and delete elements in reference data collections.

Refer to the course module on reference data collections for further information.

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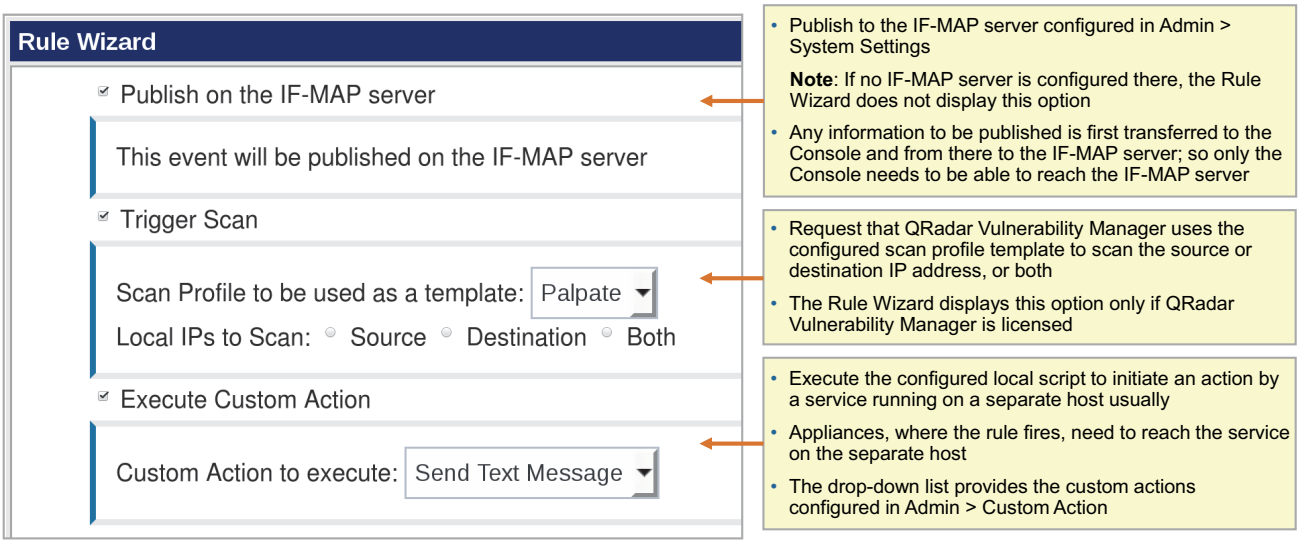
Configuring more rule responses



Configuring more rule responses

To add a scan profile to the drop-down menu in the Rule Wizard, select **On Demand Scanning** when creating or editing a scan profile on the Vulnerabilities tab.

Refer to the course module on custom action scripts for further information.

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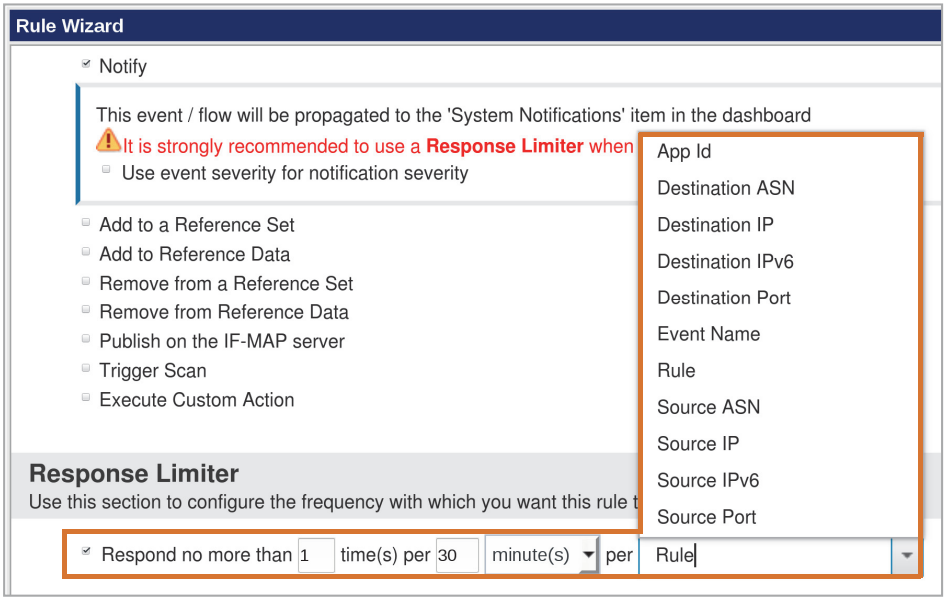
Configuring the frequency of responses

- Limit how often each CRE instance executes the configured rule responses
- A limit is especially advisable when you configure to receive an email or system notification
- Each CRE instance maintains the counter and timer separately; therefore, you can, for example, receive more emails than the configured limit if a rule fires with separate CRE instances



Developing Custom Rules

Configuring the frequency of responses

The Response Limiter configuration limits every option under Rule Response, including the frequency of dispatched or forwarded events.

The Response Limiter does not impact the Rule Action.

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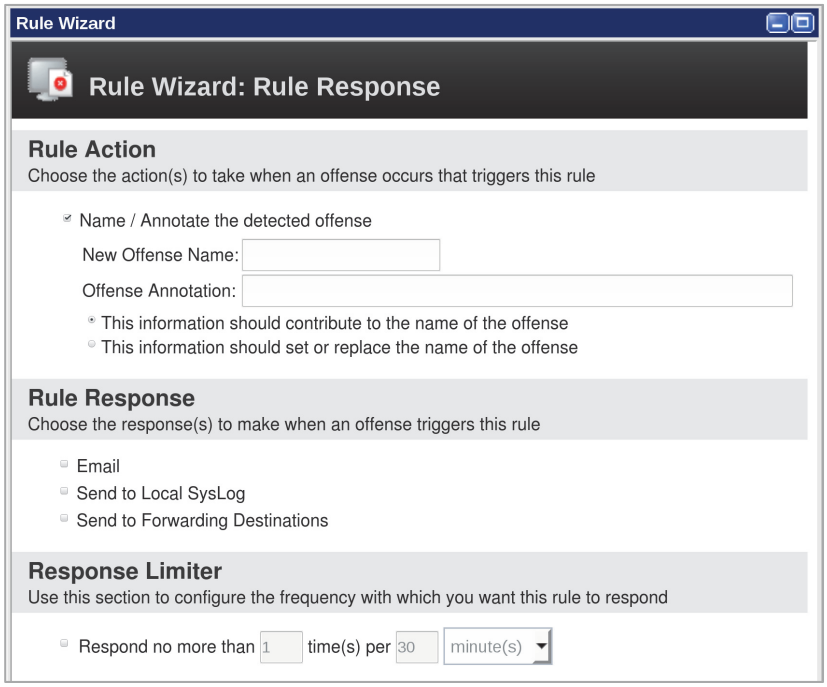
Offense rules

Rules of type offense allow fewer Rule Actions and Rule



Offense rules

The screen capture shows the default Rule Response for rules of type offense. In addition, the Rule Response provides the following options, if QRadar SIEM is configured accordingly:

- SNMP Trap
- Publish to IF-MAP server
- Trigger Scan

Lesson 9 Locating rules that matched

Determining the rules, that fire, provide a valuable insight into your environment and can provide guidance for rule development. In this lesson, you learn how to gain different perspectives on matching rules.

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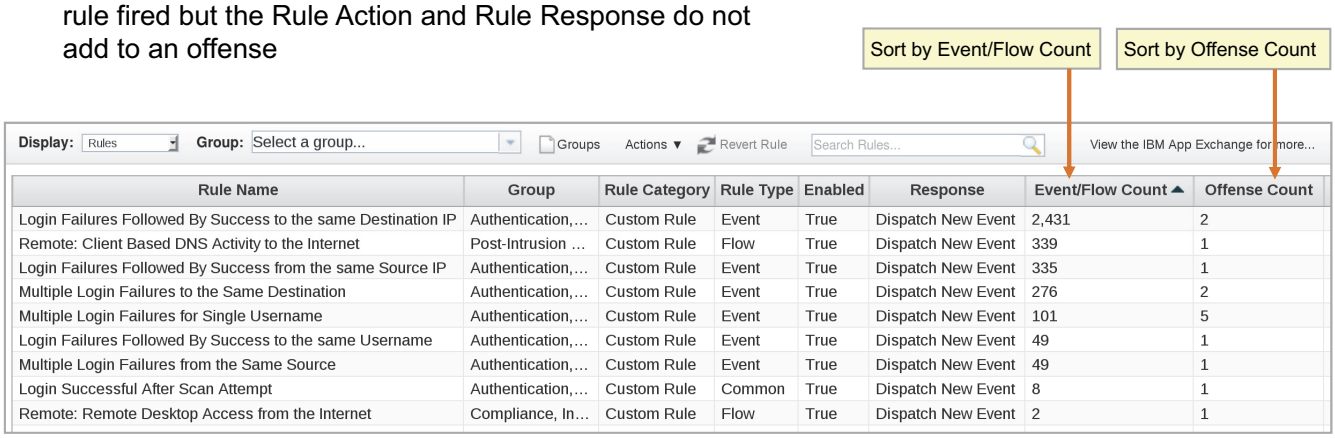
Sorting rules by their contribution to offenses

- Under Offenses > Rules, the **Event/Flow Count** column displays the number of events and flows that a custom rule has added to the number of offenses displayed in the **Offense Count** column
- It does not include events and flows, for which a custom rule fired but the Rule Action and Rule Response do not add to an offense



Sorting rules by their contribution to offenses

For building blocks the Event/Flow Count and Offense Count columns display always ‘0’ because they never contribute events and flows to an offense.

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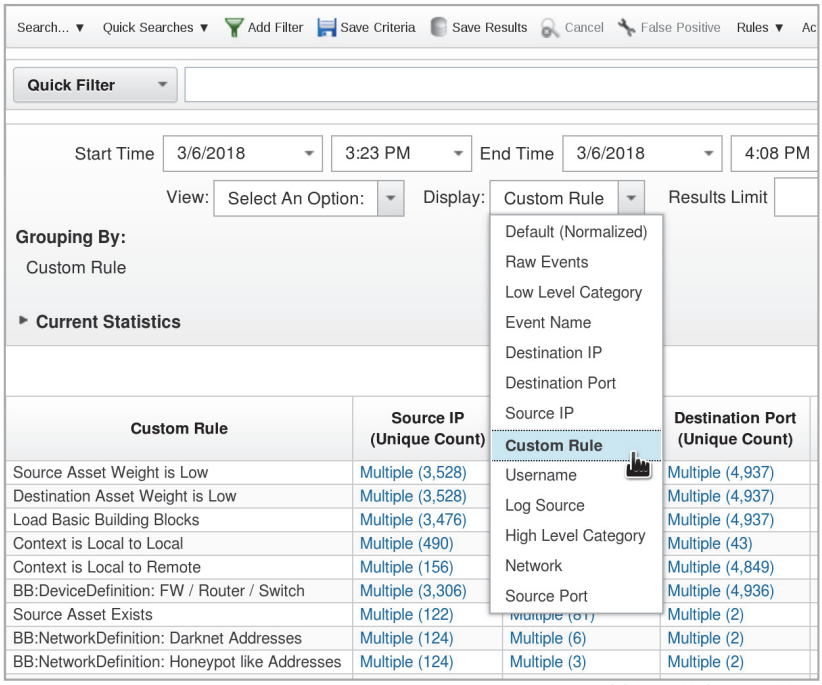
Grouping by matched rules

- To group by custom rules and building blocks, that have fired, select **Custom Rule** in the Display drop-down list on the Log Activity tab
- The counts include all rule matches regardless of whether they added an event to an offense



Developing Custom Rules

Grouping by matched rules

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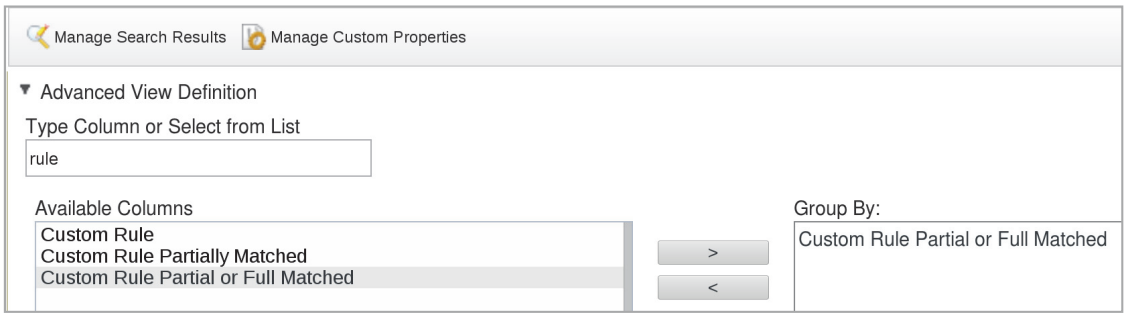
Grouping by partial and full matches

- The Display drop-down list on the Network Activity tab does not provide a menu item for grouping by rule matches
- However, on both the Network Activity tab and Log Activity tab, **New Search** and **Edit Search** provide the option to group by full or partial matches



Grouping by partial and full matches

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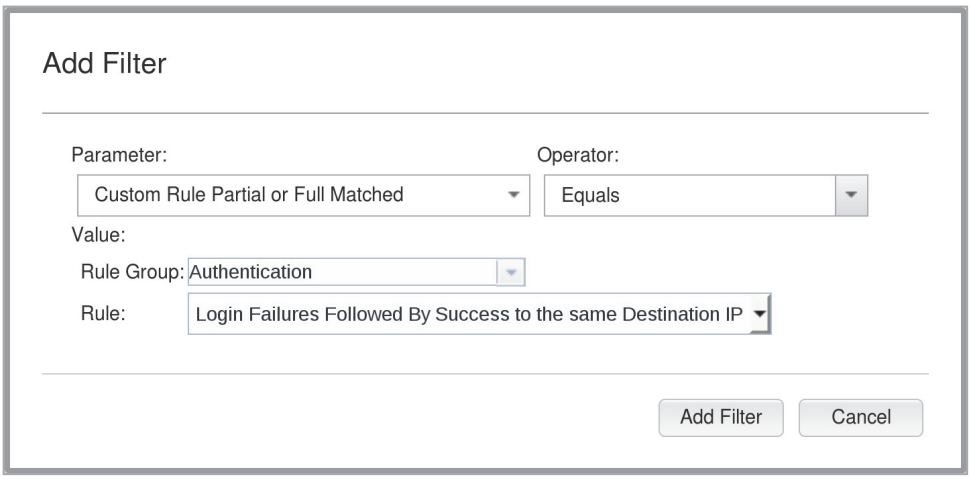
Filtering events and flows by partial and full matches

Find events and flows, which have caused the CRE to increment at least one counter for the selected rule



Filtering events and flows by partial and full matches

Quiz 4

1. If a rule tests for a distributed denial of service (DDOS) attack, on which property should you index the offense?
2. What is the impact if a Rule Action drops a detected event or flow?
3. What is the main purpose for dispatching a new event as Rule Response?
4. What causes the CRE instance on the Console to perform Rule Actions and Rule Responses for an event or flow, that originally a CRE instance on a processor had started working on?

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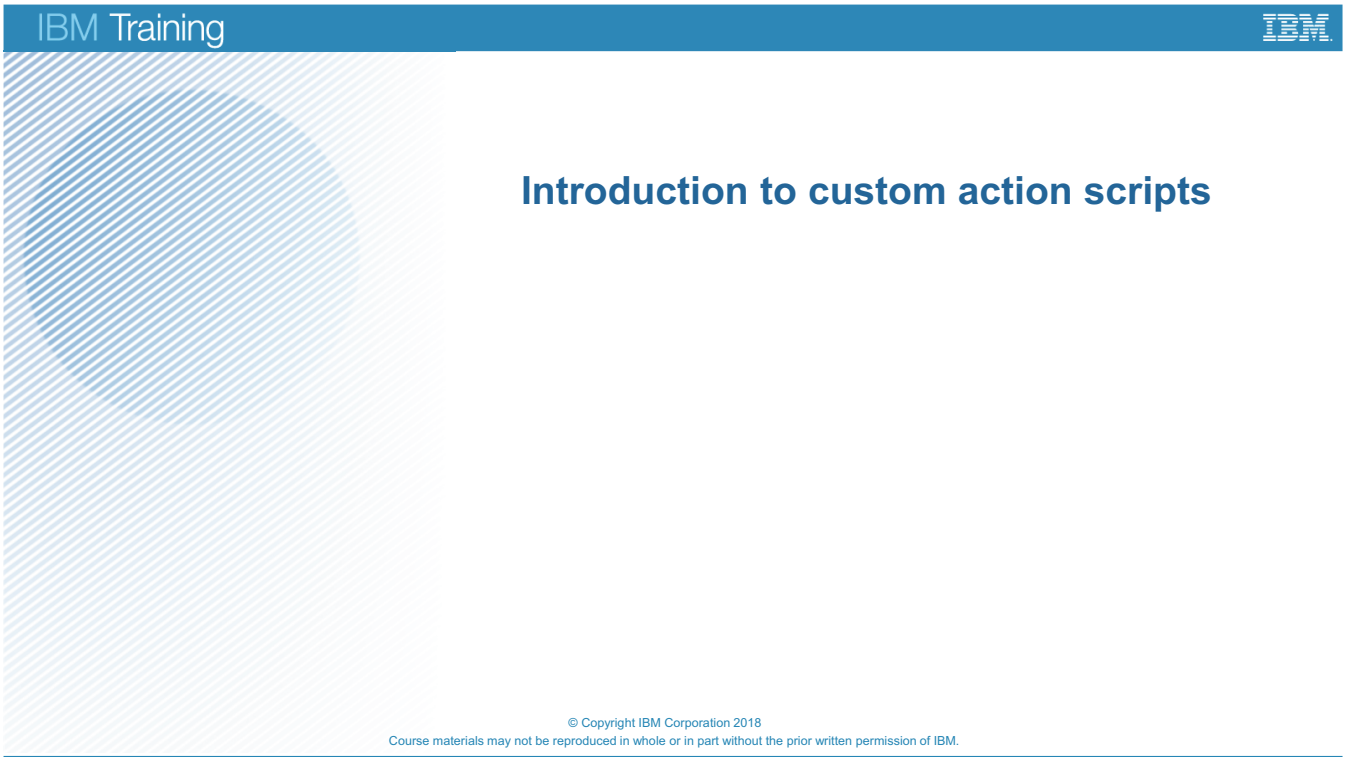
Summary

- Determining indicators
- Custom rules overview
- Building blocks overview
- Using host definition and host reference building blocks
- Using stateless tests
- Using stateful tests
- Configuring rule actions
- Configuring rule responses
- Locating rules that matched

Summary

Unit 4 Introduction to custom action scripts



Custom actions in QRadar provide the ability to execute scripted actions directly as a rule response for event, flow, and common rules. This capability allows a script to be executed on the Console or a Managed Host whenever a rule is triggered. In this unit you learn about the high-level steps needed to design and implement a custom action script, describe the use cases and requirements of a custom action script, and learn about best practices for creating and troubleshooting them.

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Objectives

- What is a custom action script?
- Configuring a custom action script
- Passing parameters to a custom action script
- Testing your custom action script
- Adding a custom action script to an event rule
- Best practices and considerations

Objectives

Lesson 1 What is a custom action script?

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Lesson: What is a custom action script?

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Custom action scripts (CAS)

- **Automate Custom Rules Actions**
  - Custom defined action from a rule
  - Execute a script as a rule response
  - Use the Custom Action window to manage custom action scripts
- **Define Custom Action**
  - From the Admin → Custom Action → Define Custom Action window, you can select or define the value that is passed to the script and the resulting action
- **Pass Data to a Script**
  - Based off a rule response from QRadar

Custom action scripts (CAS)

Custom Actions were introduced with QRadar v7.2.6. The ability to execute scripted actions directly as a rule response for event, flow and common rules was (re)introduced. This capability allows a script to be executed on the Console or a Managed Host whenever a rule is triggered.

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.

Create custom actions by using the Define Actions window on the Admin tab.

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.

Examples

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, such as, Help desk ticketing system, third party applications, and so on.
- Update TAXI servers with a Structured Threat Information eXpression (STIX) representation of a threat.

  QRadar SIEM consolidates log source event data from thousands of devices, endpoints, and applications distributed throughout a network. Using the optional Threat Intelligence application, QRadar allows ingestion of threat feeds containing cyber observables, expressed in STIX format via the TAXII protocol. These ingested threat feeds can be monitored for use in real-time correlation rules, as well as used in reports and searches of either log or flow data. QRadar also allows the real-time publishing of newly discovered cyber observables in QRadar, to any TAXII server).

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When to use custom action scripts

- Need to **automate responses** to actions
  - Triggered custom action scripts will execute in parallel (presumably with some limits)
  - Example: Change firewall rule via API (to block IP addresses)
- Want to **extend rules from QRadar** to external security devices or systems
- Communicate to all hosts via TCP/IP
- Communicate to the QRadar Host locally on port 443
- Run REST-API commands
- Want to store information on the filesystem in /home/customactionuser

*Design of custom action scripts was made with the intention of using it for **APIs***

When to use custom action scripts

When to use custom action scripts:

- Need to automate responses to actions

  All automated - Attach scripts to custom rules to perform specific actions in response to events. Execute actions in seconds instead of minutes, hours, or more if performed manually.

- Want to extend rules from QRadar to external security devices or systems

  Integration with other systems and third party vendors – for example, ticketing system such as Service now, use a QRadar event to call a custom action script, which in turn can insert a quarantine rule in QRadar Network Security (XGS) using its REST API.

You can also create custom actions by using the `/api/analytics/custom_actions` REST endpoints. The following is an example of a custom action JSON file that the `GET /api/analytics/custom_actions/actions` endpoint returns.

API Example

Most users who need to integrate with a ticketing system will call the API endpoint /siem/offenses to retrieve a list of offenses currently in the system, or filter against that list for specific data. This allows administrators to use the REST API to GET the following data related to offenses that are generated by QRadar:

You can:

- Communicate with all hosts via TCP/IP except the QRadar Host locally
- Communicate to the QRadar Host locally on port 443
- Run REST-API commands
  Although the samples at
  https://www.ibm.com/developerworks/community/forums/html/topic?id=19027124-50dc-4114-a3bf-57b927639f71&ps=25 require python v3.3 and so cannot be used
- Store information on the filesystem in `/home/customactionuser`

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When NOT to use custom action scripts

- Custom action scripts do not work against offense rules
  - A custom action script can only be used as a response for Event, Flow and Common rules (not Offense rules)
  - There is no “Execute Custom Action” check box in the Rule Response for Offense Rules
- Communicate to the QRadar Host locally via TCP/IP on any port except https (443)
- Access PSQL or SSH
- Run AQL queries directly
- Do things that last a long time (15 seconds is the timeout)
- Use “Expect”

When NOT to use custom action scripts

When NOT to use custom action scripts:

- Custom action scripts do not work on Offense rules (despite what the GUI shows)
- Communicate to the QRadar Host locally via TCP/IP on any port except https (443)
- Access PSQL or SSH
- Run AQL queries directly
- Do things that last a long time (15 seconds is the timeout)
- Use “Expect”

  “Expect” is a program that "talks" to other interactive programs according to a script. Following the script, Expect knows what can be expected from a program and what the correct response should be. An interpreted language provides branching and high-level control structures to direct the dialog. In addition, the user can take control and interact directly when desired, afterward returning control to the script.

  There are no dev/pty devices. A pseudoterminal, sometimes abbreviated "pty“, is a pair of virtual character devices that provide a bi-directional communication channel. One end of the channel is called the master; the other end is called the slave. The slave end of the pseudoterminal provides an interface that behaves exactly like a classical terminal. A process that expects to be connected to a terminal, can open the slave end of a pseudoterminal and then be driven by a program that has opened the master end. Anything that is written on the master end is provided to the process on the slave end as though it was input typed on a terminal.

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Environment – what is chroot jail?

- As the name implies, a `chroot` operation changes the apparent root directory for a running process and its children
- Intended to protect the QRadar Console from malicious scripts
- Designed to protect data
- Preserves the security of the Console
- Located in the `/opt/qradar/bin/ca_jail/` directory
  - Contains the `custom_action_scripts` folder for scripts
    All custom action scripts share a common chroot jail
  - Contains the `home/customactionuser` folder for log output

Environment – what is chroot jail?

As the name implies, a `chroot` operation changes the apparent root directory for a running process and its children. It allows you to run a program (process) with a root directory other than `/`. The program cannot see or access files outside the designated directory tree.

For the jail environment - we use a `ca_jail`. The jail shell is intended to protect the Console from malicious scripts and was designed with restrictions to protect data and preserve security for the Console. The design around custom action scripts was intended with APIs in mind.

When custom action scripts are run, a chroot jail is set up in the `/opt/qradar/bin/ca_jail/` directory. Any content in the `/opt/qradar/bin/ca_jail/` directory can be modified and written to by scripts, even the custom action user's home directory (`/home/customactionuser`) can be modified. There is no separation of information between custom action scripts.

A script can run only from inside the jail environment so that it does not interfere with the QRadar run environment. All custom action scripts can be used to run against rules in a jailshell, preventing the scripts from running functions that can impact QRadar core functionality. The core design of the custom action scripts allows users to leverage APIs and variables to exchange data to take automated actions.

The `sys.path` for the custom action jail includes `/custom_action_scripts` which is `/opt/qradar/bin/ca_jail/custom_action_scripts` on disk.

If you want to look at logs from your scripts or outputs, look in:
`/opt/qradar/bin/ca_jail/home/customactionuser`

For more information refer to the following IBM developerWorks article.

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Environment – customactionuser

- *Customactionuser* account is used for **running scripts** in the backend within rules
- Do not delete or modify this out-of-the-box account
- Custom action user's home directory (`/opt/qradar/bin/ca_jail/home/customactionuser`) can be modified
  - Use this path to write to disk
  - Contains log output files
- Restricted permissions

Environment – customactionuser

As of QRadar version 7.2.6, new system accounts, such as customactionuser, mysql (used for Forensics), openvpn (allows for connectivity between VPN servers and clients, and so on), were added. These accounts are not standard Linux accounts. They are separate system accounts integrated with the QRadar application.

These accounts should not be deleted, modified, assigned passwords (some of the accounts do not have passwords set), changed passwords, or expired. Any modifications to those accounts could potentially have a negative impact during a patch update or upgrade to a newer release.

If you are not using certain components of QRadar, you should be able to disable some accounts. We would not recommend deleting them, in case it is decided later on that another product or feature might be added to the environment using one ore more of these accounts.

If you want to look at logs from your scripts or outputs, look in:
`/opt/qradar/bin/ca_jail/home/customactionuser`

The custom action user account might not have permission to run follow-up commands, such as logging into a firewall and blocking an IP address. Test whether your script runs successfully before you associate it with a rule.

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Behind the CAS process

Step	Environment Details
Upload script in Define Custom Actions	• User designated name is assigned an ID • File is saved to: `/store/configservices/staging/globalconfig/custom_action_scripts/` • Filename is created as `customaction_ID.script` • A link is made in PSQL tables that links the Name to the ID to the script filename. The PSQL tables also contain the definitions of any parameters to be passed to the script.
Deploy script on Admin tab	• The `customaction_ID.script` file is copied to `/opt/qradar/conf/custom_action_scripts/` • The following bind links are set up:

'real' directory	'bind' directory
/bin	/opt/qradar/bin/ca_jail/bin
/lib	/opt/qradar/bin/ca_jail/lib
/lib64	/opt/qradar/bin/ca_jail/lib64
/usr/bin	/opt/qradar/bin/ca_jail/usr/bin
/usr/lib	/opt/qradar/bin/ca_jail/usr/lib
/usr/lib64	/opt/qradar/bin/ca_jail/usr/lib64
/usr/share	/opt/qradar/bin/ca_jail/usr/share
/opt/qradar/conf/custom_action_scripts	/opt/qradar/bin/ca_jail/custom_action_scripts

Behind the CAS process

When you upload a custom action script, you assign it a name and it is automatically assigned an ID. The script is placed in the `/store/configservices/staging/globalconfig/custom_action_scripts/` directory.

The filename is created as `customaction_ID.script`. A link is created in the PSQL tables that links the Name to the ID to the script filename. The PSQL tables also contain the definitions of any parameters to be passed to the script.

On the next “Deploy” action this file is copied to the `/opt/qradar/conf/custom_action_scripts/` directory.

The “bind” links, depicted in the table, are set up in `/etc/fstab`.

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Behind the CAS process (continued)

Step	Environment Details
Execute script using GUI	• A `chroot` environment is set up with the username set to "customactionuser" and the "/" filesystem set to `/opt/qradar/bin/ca_jail/` in a manner similar to issuing the command: `# chroot --userspec=customactionuser /opt/qradar/bin/ca_jail/` • Relevant interpreter (`/bin/bash`, `/usr/bin/perl` or `/usr/bin/python`) is called with the script name and the configured parameters

Behind the CAS process (continued)

When the custom action script is executed, a chroot environment is set up with the username set to "customactionuser" and the "/" filesystem set to `/opt/qradar/bin/ca_jail/` in a manner similar to issuing the command:

```
# chroot --userspec=customactionuser /opt/qradar/bin/ca_jail/
```

The relevant interpreter (`/bin/bash`, `/usr/bin/perl` or `/usr/bin/python`) is called with the script name and the configured parameters. NULL parameters (such as those that have no value) are passed with the string "null". There is no way to differentiate a NULL parameter from a parameter that has the value "null" in the called script.

If the script is executed by the "Test Execution" GUI mechanism, then all "Network Event Property" parameters will be set to "null". STDOUT and STDERR are shown in the Output window (you cannot copy or paste this for some unknown reason).

If the script is executed by a Rule Response, then STDOUT and STDERR are sent to `/dev/null`.

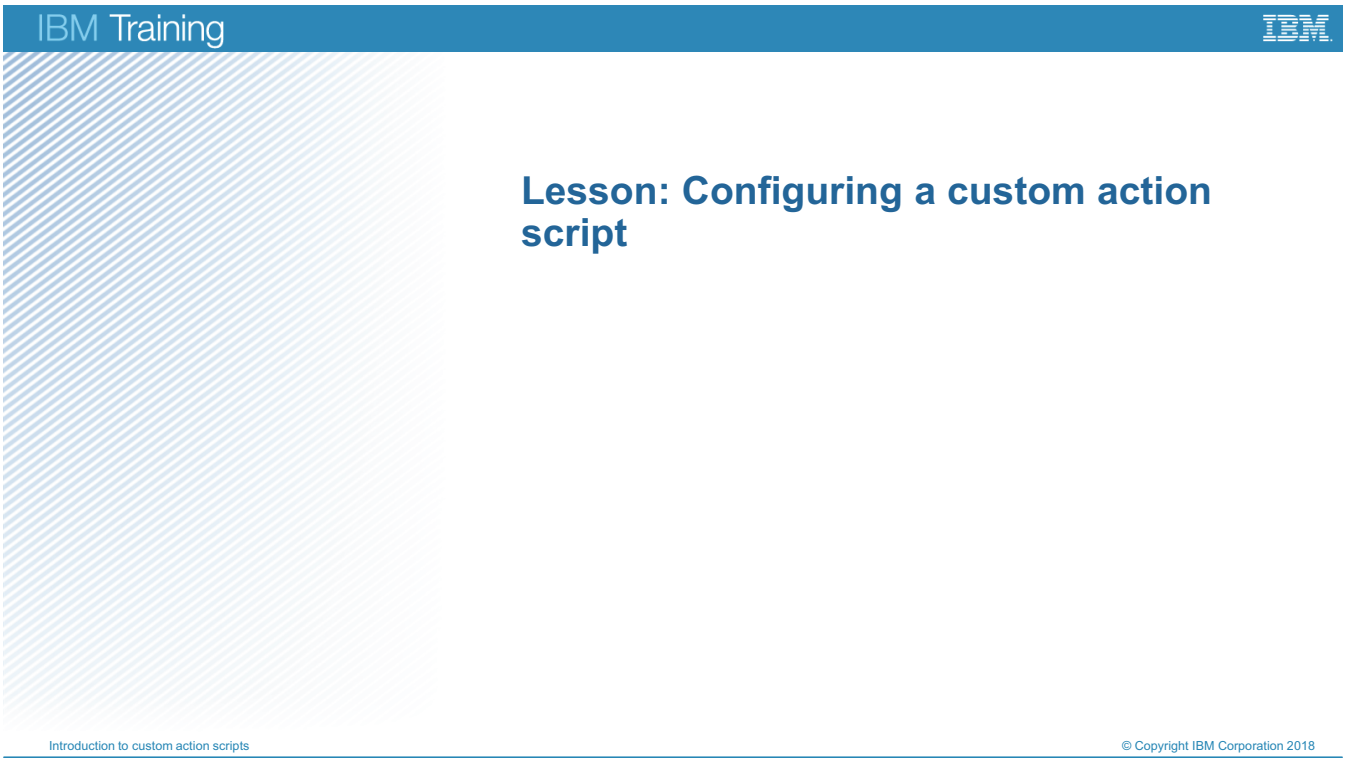
Custom action scripts will be terminated if they execute for longer than 15 seconds.

Quiz 1

1. Custom rules of any type can execute a custom action script as rules response. (T/F)
2. In the CA jail structure, where can I store new information from my script?
3. I can use CAS to change a firewall ____ to block an IP address via an ____ call.
4. What is the CAS name that will be stored on disk?
5. Which directory is it stored in?
6. I cannot run queries against the ariel database using CAS. (T/F)
7. Upon upload, the `customaction_ID.script` file is copied to `/opt/qradar/conf/custom_action_scripts` (T/F)
8. During test execution, a script will fail if it runs longer than ____ seconds.
9. What is the /opt/qradar/bin/ca_jail/ directory and why was it developed?
10. Can you change the configuration of the customactionuser?

Quiz 1

Lesson 2 Configuring a custom action script



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Software requirements

- The following programming language versions are supported:
  - Bash version 4.1.2
  - Perl version 5.10.1
  - Python version 2.7.9
- Note: For a current list of versions, navigate to
  Admin → Custom Action → Define Custom Action → Interpreter window

*For the security of your deployment, **QRadar does not support the full range of scripting functionality** that is provided by the Python, Perl, or Bash languages.*

Software requirements

You will notice that these are the exact same versions as delivered on the QRadar platform to a root shell.

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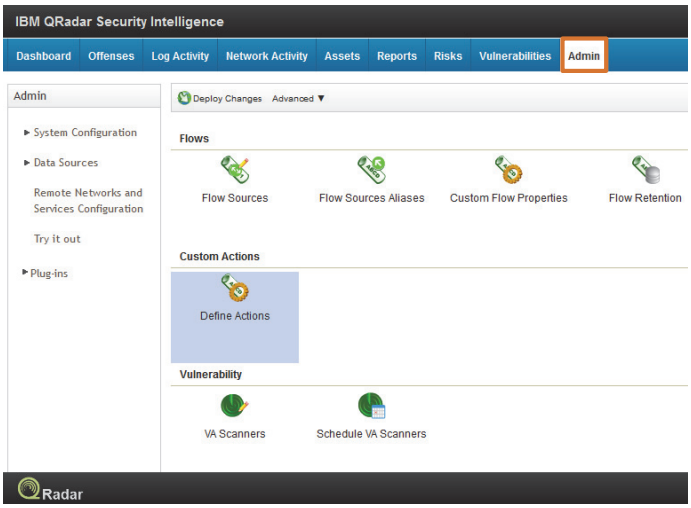
Adding a custom action script

1. Click the **Admin** tab
2. Navigate to **Data Sources** → **Custom Actions**
3. Select the **Define Action**s icon

   The Custom Action window appears
4. Click **Add** to upload scripts

   The Define Custom Action dialog box appears
5. Specify the **parameters** to pass to the script



Adding a custom action script

Custom actions work best with low volume custom rule events and with custom rules that have a low response limiter value. To add a custom action script follow the steps.

1. Click the **Admin** tab.
2. Navigate to **Data Sources** -> **Custom Actions**.
3. Under Custom Action, click **Define Custom Action**
4. To upload scripts, click **Add**. Programming language versions that the product supports are listed in the Interpreter list. For the security of your deployment, QRadar does not support the full range of scripting functionality that is provided by the Python, Perl, or Bash languages.
5. Specify the parameters to pass to the script that you uploaded (the parameters are discussed on the next slide).

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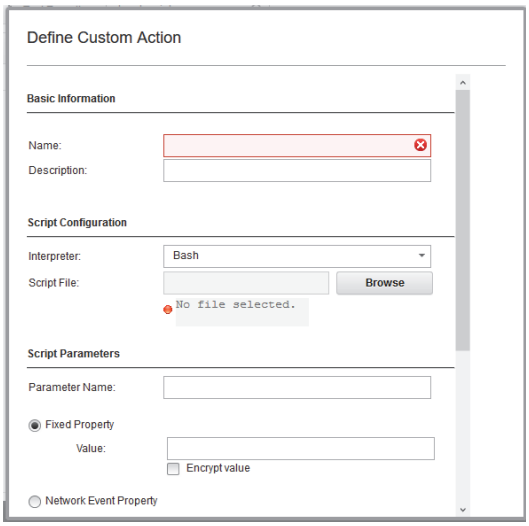
Defining a custom action script

- **Name** – Used in selection of action in rule response
- **Description** (optional)
- **Interpreter** – Designate your programming language
  - Bash
  - Perl
  - Python
- **Script File** – Select the file to upload
- **Script Parameters**
  - Parameter Name
  - Value
  - Fixed Property (such as, username or password)
  - Network Event Property (such as, sourceip)



Defining a custom action script

Basic Information:

- Name*

  Enter a unique name for the custom action within the QRadar deployment.
- Description*

  Enter an optional description for the custom action.

Script Configurations:

- Interpreter

  Select either the ash, Python, or Perl programming language.
- Script File

  Browse for and attach the coding script.

Script Parameters:

Custom action scripts can receive parameters when they are invoked, either fixed values or extracted properties. There is an option to encrypt fixed values, which means that they are not displayed in the GUI and are stored in PSQL in encrypted form.

- Fixed properties

Enter the values that are passed to the custom action script. These are not based on the events or flows, but on other defined values that you can use the script to act on.

For example, the fixed properties username and password for a third-party system can be passed to a script that results in sending an SMS alert, or other defined actions. You can encrypt fixed properties, such as passwords, by selecting the Encrypt value check box.

- Network event property

  This represents dynamic Ariel properties that are generated by events. Select them from the Property list. For example, the network event property sourceip provides a parameter that matches the source IP address of the triggered event.

* Definitions sourced from `/analytics/custom_actions/actions`

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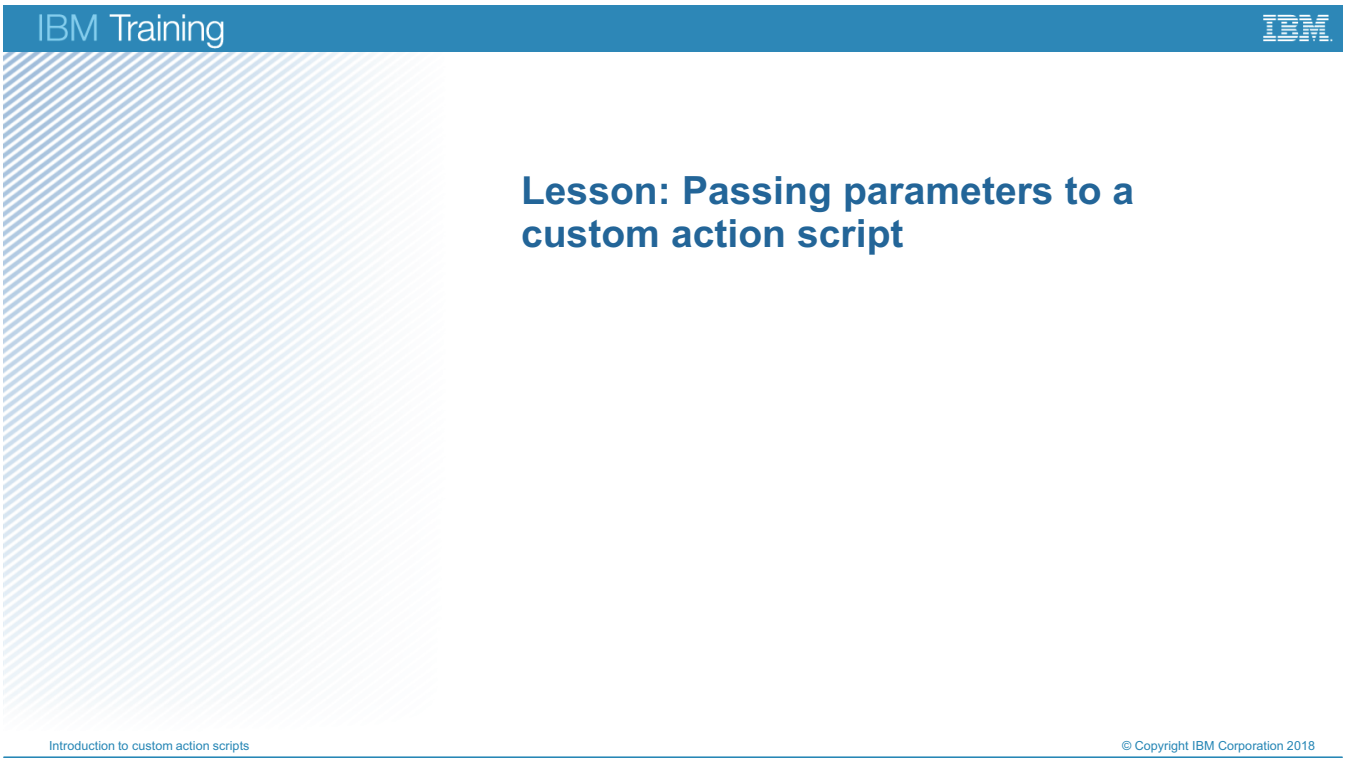
Updating a custom action script

- To modify the script, upload a new script and run “Deploy Changes”
- To modify the parameters for a script, a “Deploy Changes” is not required

Updating a custom action script

Lesson 3 Passing parameters to a custom action script



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Static and dynamic parameters

- Two types of information that can be passed as parameters:
  1. **Fixed Property** (such as, username or password)
     - Static value that is specific to the script
     - May be encrypted
  2. **Network Event Property** (such as, sourceip)
     - Dynamic Ariel properties that are generated by events
     - Extracted properties can be built-in or custom

Static and dynamic parameters

There are two types of information that can be passed as parameters, fixed values and “Network Event Property” values.

Fixed values can be encrypted, in which case their value will not appear on the “Edit Custom Action” screen and they are stored in PSQL in an encrypted form. The encrypted values are still visible in the output of “ps” when the script is executing. If it is critical that this is not the case then the value should be encrypted outside QRadar; passed as a fixed plain text value and the script should have the necessary mechanisms to decrypt it.

Extracted properties can be built-in or custom and do not need to be “optimized for rules, reports and searches”.

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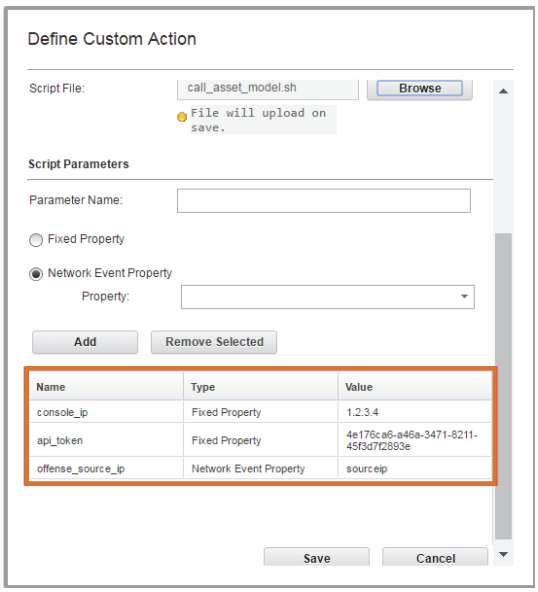
Example script parameters



Example bash script (call_asset_model.sh):

```
#!/bin/bash
console_ip=$1
api_token=$2
offense_source_ip=$3

auth_header="SEC:$api_token"

output=$(curl -k -H $auth_header
https://$console_ip/console/restapi/api/
asset_model/assets?filter=interfaces%20contains%20%
28%20ip_addresses
%20contains%20%28%20value%20%3D%20%22$offense_sourc
e_ip%22%29%29)

# Basic print out of the output of the command
echo $output
```


Example script parameters

Sample scripts in Bash, Python, and Perl show how to pass parameters to custom action scripts.

The sample script on the slide shows how to query the asset model API for an asset with the supplied offense source IP address. For this example, the script creates JSON output that is returned by the endpoint.

Each parameter is passed to the script in the order in which it was added in the Define Custom Action window, in this case:

```
console_ip
api_token
offense_source_ip
```

The variables that are defined at the beginning of each of the sample scripts use the sample parameter names that were added in the Define Custom Action window.

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Things to know about parameters

- All parameters are passed by position to the scripts in the **order they appear in the list**
- If a parameter evaluates to no value, then the string **null** will be used
- There is no way to differentiate between an empty value and the literal “null” in a custom action script
- If the script is executed by the “Test Execution” GUI mechanism, then all **Network Event Property** parameters will be set to “null”

Things to know about parameters

Lesson 4 Testing your custom action script

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Lesson: Testing your custom action script

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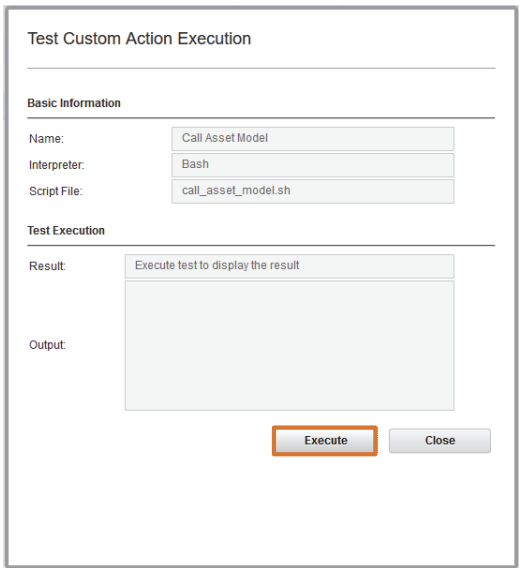
How to test your custom action script

1. Click the **Admin** tab
2. Select the **Define Action**s icon

   The Custom Action window appears
3. Click **Test Execution** → **Execute** to run the script
4. Debug custom action script as needed and repeat test until the result says “Execution Successful”



How to test your custom action script

Test whether your script runs successfully and has the intended result before you associate it with a rule.

- (Steps 1-2) On the **Admin** tab, click **Define Actions**.
- (Steps 3-4) Select a custom action from the list and click **Test Execution** > **Execute** to test your script.

The result of the test, and any output that is produced by the script, is returned. Debug the custom action script as needed and repeat the test until the result says “Execution Successful”. You will receive a “Build Failed” error message after executing the script if it has not been deployed off the Admin tab.

After you configured and tested your custom action, use the Rule Wizard to create a new event rule and associate the custom action with it.

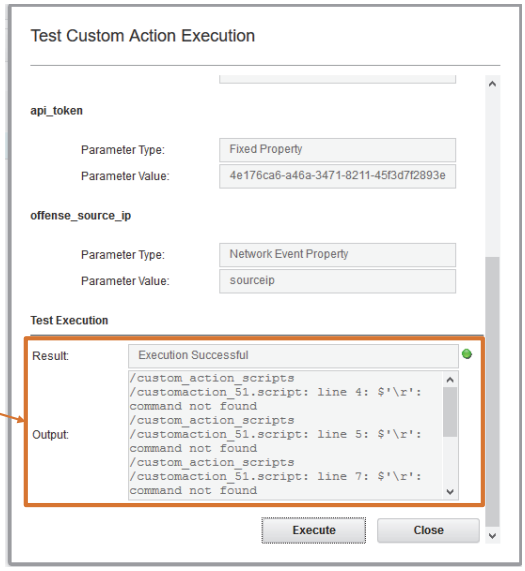
For more information about event rules, see the following IBM QRadar User Guide.

IBM Training

Result of executing script

Result
The outcome of the test

Output
Any output that is produced by the script is returned (displays stdout and stderr)



Introduction to custom action scripts

Result of executing script

The test will run the currently deployed script with the defined parameters on the QRadar Console and will show STDOUT and STDERR.

- STDOUT is the file into which the kernel writes its output and the process requesting it accesses the information from.
- STDERR is the file into which all the exceptions are written.

IBM Training

Results when executing custom action scripts

The results from executing a CAS can have one of the following outcomes:

- **Execution Successful**
  Example:
  ```
  Dec 23 13:05:33 ::ffff:          Thread-882 | [Action] [CustomAction]
  [CustomActionSuccessful] Custom Action: ZXZ-ACTION-BASH was executed successfully
  ```

- **Execution Failed**
  Example:
  ```
  Dec 23 11:59:57 ::ffff:          Thread-355 | [Action] [CustomAction]
  [CustomActionFailed] Custom Action: ZXZ-ACTION-BASH failed to execute.
  ```

- **Execution Time Out**
  Example:
  ```
  Dec 23 11:57:45 ::ffff:          Thread-344 | [Action] [CustomAction]
  [CustomActionTimeout] Custom Action: ZXZ-ACTION-BASH took too long to execute and
  was timed out.
  ```

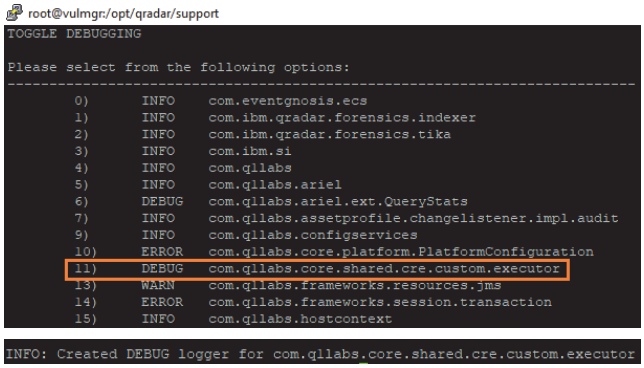

Results when executing custom action scripts

IBM Training

Debugging custom action scripts

Custom action script execution debugging can be done by performing the following tasks:

1. Use the with `/opt/qradar/support/`**`mod_log4j.pl`** debugging script
2. Set the logger for the classpath **`com.q1labs.core.shared.cre.custom.executor`** to DEBUG



3. Check `/var/log/qradar.java.debug` for output
4. Reset debugging when finished

Debugging custom action scripts

IBM Training

Audit records created for custom action scripts

The following audit logs are available:

- **Adding a CAS** – Uses **`Method=POST`** and **`PathInfo=/analytics/custom_actions/actions (/scripts)`**

Example:

```
Dec 23 13:14:40 ::ffff:[redacted] admin@[redacted] (8448)
/console/restapi/api/analytics/custom_actions/scripts | [Action] [RestAPI] [APISuccess]
[admin] [494ecab5-5972-4a91-8a23-c6bb63dd0edc] [SECURE] | ContextPath=/console |
Headers=[host: [redacted] [accept:
text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8][user-agent: Mozilla/5.0
(Windows NT 6.1; WOW64; rv:38.0) Gecko/20100101 Firefox/38.0] | Method=POST |
PathInfo=/analytics/custom_actions/scripts | Protocol=HTTP/1.1 | QueryString=null |
RemoteAddr=[redacted] | RemotePort=54876

Dec 23 13:14:40 ::ffff:[redacted] admin@[redacted] (8449)
/console/restapi/api/analytics/custom_actions/actions | [Action] [RestAPI] [APISuccess]
[admin] [75220ec3-4f35-481f-aaec-301ffa3a3bf6] [SECURE] | ContextPath=/console |
Headers=[host: [redacted][accept: application/javascript, application/json][user-agent:
Mozilla/5.0 (Windows NT 6.1; WOW64; rv:38.0) Gecko/20100101 Firefox/38.0] | Method=POST |
PathInfo=/analytics/custom_actions/actions | Protocol=HTTP/1.1 | QueryString=null |
RemoteAddr=[redacted] | RemotePort=54876
```

Introduction to custom action scripts

Audit records created for custom action scripts

When adding a new CAS script, the following RESTful API endpoint is called, using the POST method (POST - `/analytics/custom_actions/actions` and `/scripts`).

This log does not identify which script was uploaded, just that one was.

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Audit records created for custom action scripts (continued)

- **Uploading a CAS** – Uses **`Method=POST`** and **`PathInfo=/analytics/custom_actions/scripts/XYZ (/actions/XYZ)`**

Example:

```
Dec 23 13:21:51 ::ffff:[redacted] admin@[redacted] (9036)
/console/restapi/api/analytics/custom_actions/scripts/153 | [Action] [RestAPI] [APISuccess]
[admin] [14122ca7-e152-4370-916d-36faa9a883c1] [SECURE] | ContextPath=/console |
Headers=[host: [redacted] [accept:
text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8][user-agent: Mozilla/5.0
(Windows NT 6.1; WOW64; rv:38.0) Gecko/20100101 Firefox/38.0] | Method=POST |
PathInfo=/analytics/custom_actions/scripts/153 | Protocol=HTTP/1.1 | QueryString=null |
RemoteAddr=[redacted] | RemotePort=54945

Dec 23 13:21:51 ::ffff:[redacted] admin@[redacted] (9037)
/console/restapi/api/analytics/custom_actions/actions/153 | [Action] [RestAPI] [APISuccess]
[admin] [d56a5717-0eae-4b2f-a0e3-a93d92ffd918] [SECURE] | ContextPath=/console |
Headers=[host: [redacted] [accept: application/javascript, application/json][user-agent:
Mozilla/5.0 (Windows NT 6.1; WOW64; rv:38.0) Gecko/20100101 Firefox/38.0] | Method=POST |
PathInfo=/analytics/custom_actions/actions/153 | Protocol=HTTP/1.1 | QueryString=null |
RemoteAddr=[redacted] | RemotePort=54945
```


Audit records created for custom action scripts (continued)

When uploading a CAS script, the following RESTful API endpoint is called, using the POST method (POST - `/analytics/custom_actions/actions` and `/scripts`).

- XYZ is a specific script number
- The script ID (153), in this case, can be seen
- This cannot be distinguished from “Changing the Parameters of a custom action script”

IBM Training

Audit records created for custom action scripts (continued)

- **Changing CAS parameters**
  – Uses **`Method=POST`** and **`PathInfo=/analytics/custom_actions/actions/XYZ`**

Example:

```
Dec 23 13:20:08 ::ffff:[redacted] admin@[redacted] (8891)
/console/restapi/api/analytics/custom_actions/actions/153 | [Action] [RestAPI] [APISuccess]
[admin] [f26fa3da-faaf-4e8e-bac7-35e4198adea7] [SECURE] | ContextPath=/console |
Headers=[host: [redacted]][accept: application/javascript, application/json][user-agent:
Mozilla/5.0 (Windows NT 6.1; WOW64; rv:38.0) Gecko/20100101 Firefox/38.0] | Method=POST |
PathInfo=/analytics/custom_actions/actions/153 | Protocol=HTTP/1.1 | QueryString=null |
RemoteAddr=[redacted] | RemotePort=54945
```


Audit records created for custom action scripts (continued)

When changing the parameters of a CAS script, the following RESTful API endpoint is called, using the POST method (POST - `/analytics/custom_actions/scripts`).

- XYZ is a specific script number
- The script ID (153), in this case, can be seen
- This cannot be distinguished from “Uploading a new script file”

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Audit records created for custom action scripts (continued)

- **Deleting a CAS** – Uses **`Method=DELETE`** and **`PathInfo=/analytics/custom_actions/scripts/XYZ (/actions/XYZ)`**

Example:

```
Dec 23 13:26:26 ::ffff:[redacted]admin@[redacted] (9420)
/console/restapi/api/analytics/custom_actions/actions/153 | [Action] [RestAPI] [APISuccess] [admin]
[fcd0900b-47c6-48e9-a4d2-964474ed8cb5] [SECURE] | ContextPath=/console | Headers=[host:
[redacted]accept: application/javascript, application/json][user-agent: Mozilla/5.0 (Windows NT 6.1;
WOW64; rv:38.0) Gecko/20100101 Firefox/38.0] | Method=GET | PathInfo=/analytics/custom_actions/actions/153
| Protocol=HTTP/1.1 | QueryString=null | RemoteAddr=[redacted] RemotePort=54945

Dec 23 13:26:26 ::ffff:[redacted]admin@[redacted] (9421)
/console/restapi/api/analytics/custom_actions/actions/153 | [Action] [RestAPI] [APISuccess] [admin]
[22f7ddb3-9511-440b-ad91-3e1d14f9c38a] [SECURE] | ContextPath=/console | Headers=[host:
[redacted]accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8][user-agent:
Mozilla/5.0 (Windows NT 6.1; WOW64; rv:38.0) Gecko/20100101 Firefox/38.0] | Method=DELETE |
PathInfo=/analytics/custom_actions/actions/153 | Protocol=HTTP/1.1 | QueryString=null |
RemoteAddr=[redacted] RemotePort=54945

Dec 23 13:26:26 ::ffff:[redacted]admin@[redacted] (9422)
/console/restapi/api/analytics/custom_actions/scripts/153 | [Action] [RestAPI] [APISuccess] [admin]
[91ae509b-8efb-4cbf-a35c-365a1a38a40b] [SECURE] | ContextPath=/console | Headers=[host:
[redacted]accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8][user-agent:
Mozilla/5.0 (Windows NT 6.1; WOW64; rv:38.0) Gecko/20100101 Firefox/38.0] | Method=DELETE |
PathInfo=/analytics/custom_actions/scripts/153 | Protocol=HTTP/1.1 | QueryString=null |
RemoteAddr=[redacted] RemotePort=54945
```

Introduction to custom action scripts

Audit records created for custom action scripts (continued)

When deleting a CAS script, the following RESTful API endpoint is called, using the DELETE method (DELETE - `/analytics/custom_actions/actions` and `/scripts`).

- XYZ is a specific script number
- The script ID (153), in this case, can be seen

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Audit records created for custom action scripts (continued)

- **Testing a CAS** – Uses **`Method=POST`** and **`PathInfo=/system/task_management/tasks (internal_tasks)`**

Example:

```
Dec 23 13:04:33 ::ffff: configservices@ (7616) /console/restapi/api/system/task_management/tasks |
[Action] [RestAPI] [APISuccess] [configservices] [a8913caa-9565-4a0b-8de3-16210f738ab7] [SECURE] | ContextPath=/console |
Headers=[Version: 5.0][host: ][accept: text/html, image/gif, image/jpeg, *; q=.2, */*; q=.2][user-agent:
Java/1.7.0] | Method=POST | PathInfo=/system/task_management/tasks | Protocol=HTTP/1.1 |
QueryString=progress=0&created_by=admin&minimum=0&task_type=CustomActionTestTask&modified=1450875873606&task_name_local_info
=%7B%7D&status_uuid=605c7ea4-9241-4118-87ac-
425f14aa40cb&host_id=53&task_state=INITIALIZING&created=1450875873606&message_local_info=%7B%7D&maximum=0&retention=2_DAYS&a
pp_id=hostcontext&task_class=com.qllabs.core.api.impl.cre.custom.CustomActionTestTask | RemoteAddr= |
RemotePort=43744

Dec 23 13:04:33 ::ffff: configservices@ (7616) /console/restapi/api/system/task_management/tasks |
[Action] [TaskManagement] [TaskAdded] StatusId=108 HostId=53 ApplicationId=hostcontext CreatedBy=admin
TaskType=CustomActionTestTask

Dec 23 13:04:36 ::ffff: configservices@ (7623)
/console/restapi/api/system/task_management/internal_tasks/108 | [Action] [RestAPI] [APISuccess] [configservices] [4678a20c-
103a-4a4b-aa6f-8b7c1a9e1489] [SECURE] | ContextPath=/console | Headers=[Version: 5.0][host: [accept: text/html,
image/gif, image/jpeg, *; q=.2, */*; q=.2][user-agent: Java/1.7.0] | Method=POST |
PathInfo=/system/task_management/internal_tasks/108 | Protocol=HTTP/1.1 |
QueryString=progress=0&created_by=admin&minimum=0&is_cancel_requested=false&task_type=CustomActionTestTask&modified=14508758
76459&task_name_local_info=%7B%7D&status_uuid=605c7ea4-9241-4118-87ac-
425f14aa40cb&host_id=53&message_local_info=%7B%7D&created=1450875873606&maximum=0&retention=2_DAYS& ntext&starte
d=1450875873634&completed=1450875873689 | RemoteAddr= RemotePort=437

Dec 23 13:04:36 ::ffff: Thread-43778 | [Action] [TaskManagement] [TaskCompleted] StatusId=108 HostId=53
ApplicationId=hostcontext CreatedBy=admin TaskType=CustomActionTestTask
```


Audit records created for custom action scripts (continued)

When testing a CAS, the following RESTful API endpoint is called, using the POST method (POST - `/system/task_management/tasks` (`internal_tasks`).

Custom action script execution is audited in the audit log.

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Summary of REST API (/analytics/custom_actions)

URL	Method	Usage
actions	GET	Returns info about all custom action scripts
actions	POST	Creates a custom action script
actions/ID	GET	Returns info about a custom action scripts
actions/ID	POST	Updates a custom action script
actions/ID	DELETE	Deletes a custom action scripts
interpreters	GET	Returns info about all custom action script interpreters
interpreters/ID	GET	Returns info about a custom action script interpreter
scripts	GET	Returns info (the id and the original filename) about all custom action scripts
scripts	POST	Uploads a new custom action script file
scripts/ID	GET	Returns info (the original filename) about a custom action script
scripts/ID	POST	Uploads a custom action script file
scripts/ID	DELETE	Deletes a custom action script file (call after actions/ID:DELETE)

Summary of REST API (/analytics/custom_actions)

You can also create custom actions by using the `/api/analytics/custom_actions` REST endpoints.

Lesson 5 Adding a custom action script to an event rule

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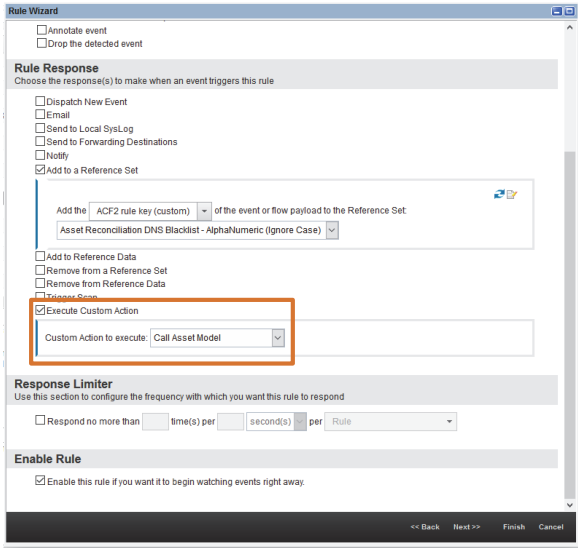
Lesson: Adding a custom action script to an event rule

How to trigger your custom action script



- Use the **Rule Wizard** to add a custom action script that runs in response to a custom rule event
  - In the Rule Response section, select the **Execute Custom Action** check box
  - Select your custom action script from the **Custom Action to execute** drop-down list

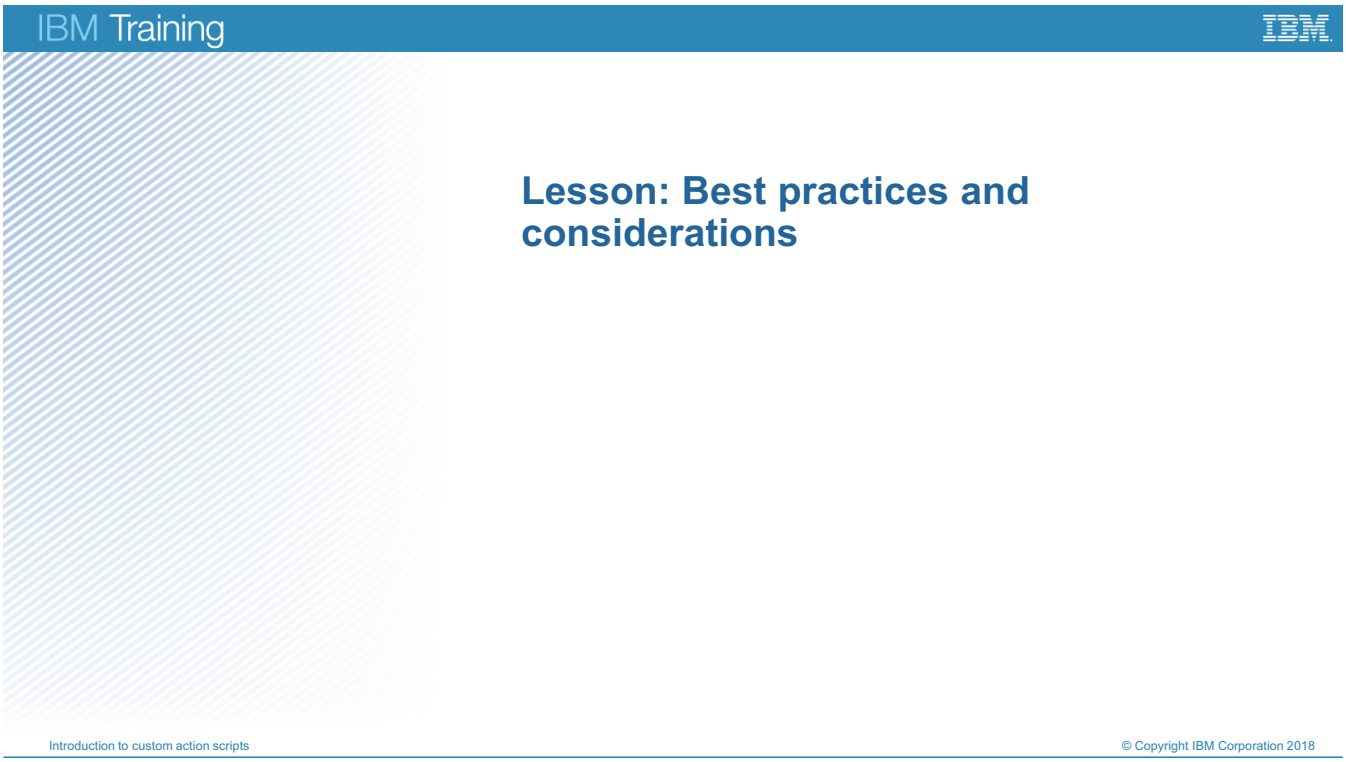
How to trigger your custom action script

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.

For more information about event rules, see the IBM QRadar User Guide.

Make sure to deploy the changes on the Admin tab after testing the script and prior to triggering it off of a rule.

Lesson 6 Best practices and considerations



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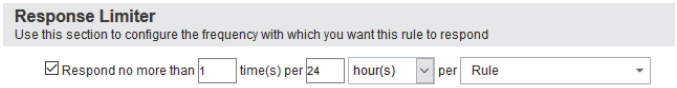
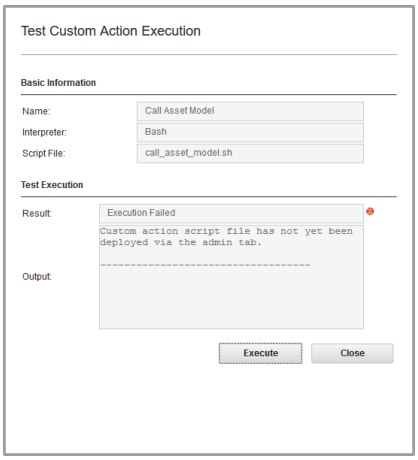
Best practices

- Custom actions work best with **low volume custom rule events** and with custom rules that have a **low response limiter value**
- Always remember to **deploy** your changes on the **Admin tab** after creating the new custom script
- You will receive a “Build Failed” error message after you execute a script that has not been deployed
- **Backup scripts –** When migrating scripts from development test to production, scripts must be kept in the same order to ensure rules that execute CAS scripts work properly





Best practices

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CAS development process

1. Modify your script on your system
2. Upload the script to the QRadar console
3. Perform “Deploy Changes”
4. Test your script with the “Test Execution” feature of the GUI or by triggering a rule that executes a CAS
5. Repeat until error free

OR

Run the script on the command line inside chroot environment

1. *Log in as root to edit script directly at:*
   `/opt/qradar/bin/ca_jail/custom_action_scripts/customaction_ID.script`
2. *Log in as root and then run:*
   `chroot --userspec=customactionuser /opt/qradar/bin/ca_jail/`
3. *Run the script*
4. *Repeat until error free*
5. *When final, copy script to the QRadar console to upload it*

CAS development process

CAS development process:

1. Modify your script on your system
2. Upload the script to the QRadar Console
3. Perform a “Deploy Changes”
4. Test your script with the “Test Execution” feature of the GUI or by triggering a rule which executes a custom action script.
5. Repeat until error free

This has a number of drawbacks:

- It is very slow
- It is very intrusive for the QRadar environment, deploying all the time for changes in your script
- The information returned is limited and cannot be copied
- It is difficult to see what changes are made by the script (if it writes to the file system for example)

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Limitations

- There is currently a **15 second timeout** when running scripts
- Not all **languages** are supported
  - QRadar custom action scripts do not support Java applications
  - No additional languages supported other than Bash, Python, and Perl
  - Recommend using another machine to run the non-supported code
- Event properties **cannot have spaces**
  - Parameters are passed as individual variables
  - Need to rebuild event properties that contain multiple parameters
- Changes to the **customactionuser** account are not supported
  - A separate system account integrated with the QRadar application used for custom actions scripting
  - No modifications should be made to this account
- Console does not support installation of **additional libraries**
  - You may want scripts to work in QRadar console using additional python libraries
  - You can request enhancements at: https://www.ibm.com/developerworks/rfe/execute?use_case=changeRequestLanding&BRAND_ID=301&PROD_ID=800

Limitations

- Each custom action script that runs is supposed to be terminated if they run longer than 15 seconds.
  - This is specifically to prevent long transaction times for scripts.
  - The 15 second timeout is not configurable on the UI.
  - For reference check the following IBM developerWorks article.
  - Support has set this limit so that system resources are not being taken up in the QRadar system.
  - Because the chroot environment of the CAS is so restricted, you may want the CAS to trigger an external system to do the actual integration rather than trying to do it all inside the CAS, in the 15 seconds you have before the CAS is terminated.
  - There is limited time to run a script if you are attempting to do something from an Event or Flow rule.
- Not all languages are supported.
  - QRadar custom action scripts do not support Java applications.
  - Programming language versions that the product supports are listed in the Interpreter list. For the security of your deployment, QRadar does not support the full range of scripting functionality that is provided by the Python, Perl, or Bash languages.
  - Have another machine with a Java Runtime and the custom action will just pass the parameters.

- Event properties cannot have spaces.
  - All event properties with spaces are cut off after the space. For example, an event property contains firstname and lastname, such as "Donald Duck". The resulting xml file only contains the value "Donald" in the name field.
  - Parameters are passed as individual variables.

    When you have first + last name being passed to the CAS, QRadar passes each as a variable, meaning that first name will be variable 1 and last name variable 2.
  - Need to rebuild event properties that contain multiple parameters.

    In order for you to combine both parts together, you need to pass each as a variable and "rebuild it". If your XML file has "Donald Duck", "Donald" will be $1 and "Duck" $2, meaning if you "echo" them into a file it will be something like: `echo ${1} ${2} > DonaldDuck.txt` instead of being `echo ${1}`.
  - For more information visit the following IBM developerWorks article.
- Changes to the customactionuser account are not supported.
  - The customactionuser account is used for running scripts in the backend within rules.
  - A separate system account integrated with the QRadar application used primarily for custom actions scripting.
  - No modifications should be made to this account.
  - For more information visit this IBM Support Technote.
- Unfortunately the installation of additional libraries is not something that is supported in QRadar. If this library is something you require, then you can raise an RFE to have this supported.

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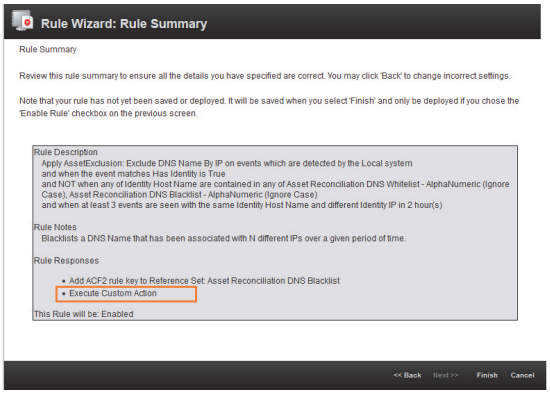
Known UI issues for rules with CAS

- There is no indication that a custom action script is to be executed in the **Response** column in the Rule summary

Rule Name ▲	Group	Rule Category	Rule Type	Enabled	Response
100% Accurate Events	Intrusion Detection	Custom Rule	Event	True	Dispatch New Event
All Exploits Become Offenses	Intrusion Detection	Custom Rule	Event	False	
Anomaly: DMZ Jumping	Horizontal Move...	Custom Rule	Common	False	Dispatch New Event
Anomaly: Excessive Firewall Accepts Across Multiple Hosts	Anomaly, Recon	Custom Rule	Event	False	Dispatch New Event
Anomaly: Excessive Firewall Accepts From Multiple Sourc...	Anomaly, Post-Int...	Custom Rule	Event	False	Dispatch New Event
Anomaly: Single IP with Multiple MAC Addresses	Anomaly	Custom Rule	Event	False	

- **Rules Wizard: Rule Summary** does not indicate which custom action script is to be executed



Known UI issues for rules with CAS

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Known UI issues in custom actions

- Unable to copy output from the Test Custom Action Execution window makes it difficult to research errors
- Unable to retrieve CAS scripts via the GUI or API
  However, CAS scripts are available via the command line

Known UI issues in custom actions

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Known development issues

- For prior versions to QRadar 7.3.0, custom action scripts **fail to resolve the DNS**
  - Some specific QRadar versions would not resolve DNS entries from a custom action script
  - Workaround is available (create a `resolv.conf` file under `/opt/qradar/bin/ca_jail/etc/resolv.conf` with dns settings in the file) at https://developer.ibm.com/answers/questions/373907/custom-actions-cant-resolve-dns/
- Custom action parameter **script ordering is not honored**
  - When more than one parameter is defined for a custom action script, the configured order of the parameters is not honored
  - No workaround available
  - https://www.ibm.com/support/entdocview.wss?uid=swg1IJ03208 (log in with IBM ID)

Known development issues

- Failure to resolve DNS information

  For prior versions to QRadar 7.3.0, custom action scripts fail to resolve the DNS. For more information refer to the following IBM developerWorks article.

  Scenario:

  We have a custom action that is trying to call an API on a remote system. When we use the hostname of this system inside a custom action script, the script fails. When we use the IP address of the system inside the custom action script, the script succeeds. We've confirmed that we can directly resolve the hostname of the system on all of our QRadar systems. The problem is that the IP address of the API in question changes frequently, so we are constantly having to re-deploy the script to fix this situation.

  Some specific QRadar versions do not resolve DNS entries from a custom action script.

  A workaround is available: create a `resolv.conf` file in the `/opt/qradar/bin/ca_jail/etc/` directory with DNS settings in the file.

- Custom action parameter script ordering is not honored

  It has been identified that when more than one parameter is defined for a custom action script, the configured order of the parameters is not honored. No workaround is available at this time.

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Best practices summary

- Custom actions work best with **low volume custom rule events**
- Remember to deploy your custom action script prior to testing
- **15 second timeout** when running scripts
- Use simple scripts to integrate
- Sometimes spaces can be an issue for parameters
- Backup your original script

Best practices summary

Quiz 2

1. Name two types of script parameters. Which one can be encrypted?
2. I can use java in CAS. (T/F)
3. Deploy changes are always required for every CAS revision. (T/F)
4. If a parameter evaluates to no value, then the blank will be used. (T/F)
5. ALL Network Event Property parameters will be set to ‘null’ during test. (T/F)
6. Which Rest API returns info about all custom action script interpreters?
7. On the rule response page, the _____ checkbox needs to be set to add the script.
8. Name 3 results when running the test execution on the UI
9. Which file do I modify to set debugging?
10. Where are supported Programming language versions listed?

Quiz 2

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Exercise introduction

Complete the following exercises in the Course Exercises book

- Create Hello World
- Define custom action script
- Test custom action script
- Create and define parameters
- Test parameters

Exercise introduction

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Summary

- What is a custom action script?
- Configuring a custom action script
- Passing parameters to a custom action script
- Testing your custom action script
- Adding a custom action script to an event rule
- Best practices and considerations

Summary

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Extra credit lab exercise

- Try running the scripts using the debugger
  - ✓ Turn debugger on
  - ✓ Review audit logs
- Post class exercise: XGS-Integration (Additional References)

Extra credit lab exercise

IBM Training

Additional references

- QRadar-XGS integration exercise: https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/W746177d414b9_4c5f_9095_5b8657ff8e9d/page/Use%20QRadar%20event%20to%20trigger%20a%20quarantine%20response%20in%20XGS%20using%20a%20Custom%20Action%20Script

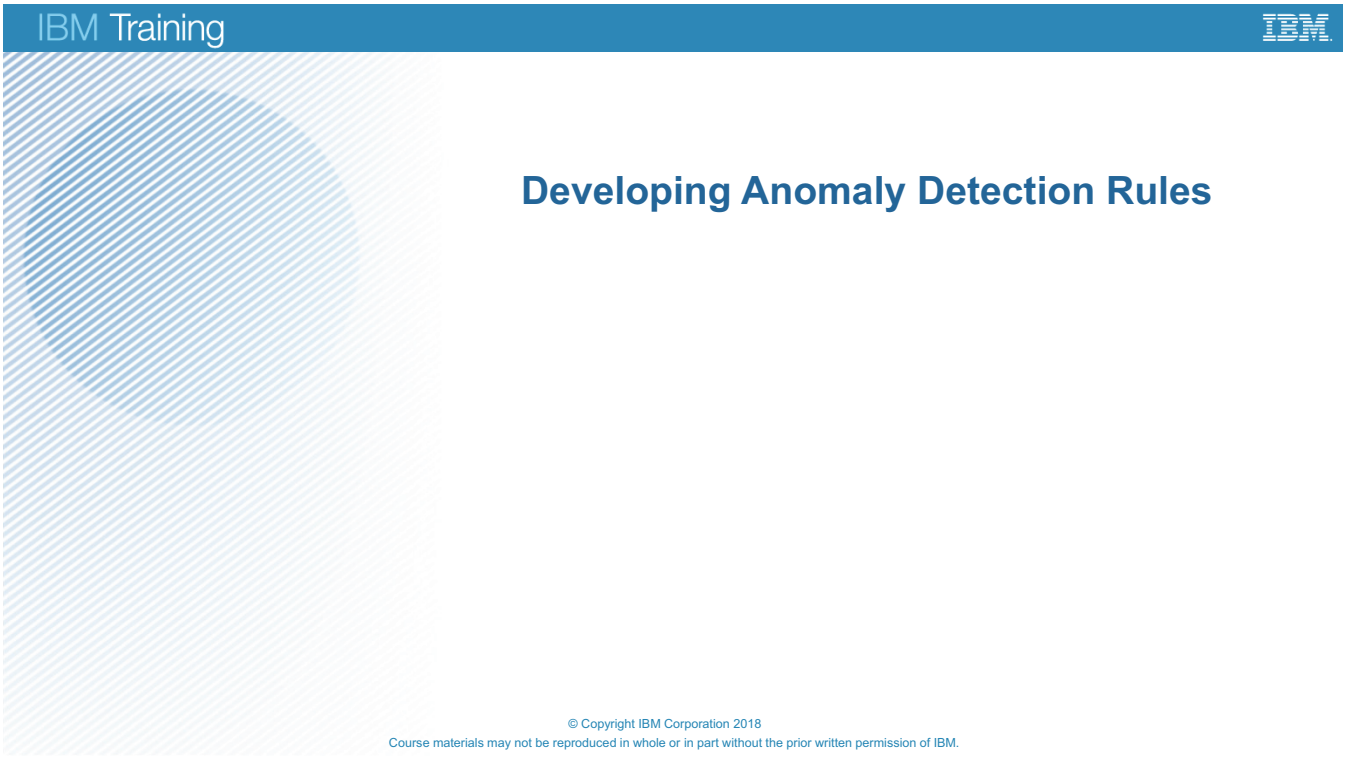
- MaaS360 and QRadar SIEM integration exercise : https://www.securitylearningacademy.com/course/view.php?id=1314

Additional references

Navigate to these links:

- QRadar-XGS integration exercise
- MaaS360 and QRadar SIEM integration exercise

Unit 5 Developing Anomaly Detection Rules



Anomaly detection aims to alert to threats that are undocumented and therefore cannot be detected by methods that monitor for well defined indicators. Such threats can be detected by monitoring for an unusual volume of activities. Anomaly detection rules monitor for deviations from expected activities. Using the skills taught in this module, you will be able to develop anomaly detection rules.

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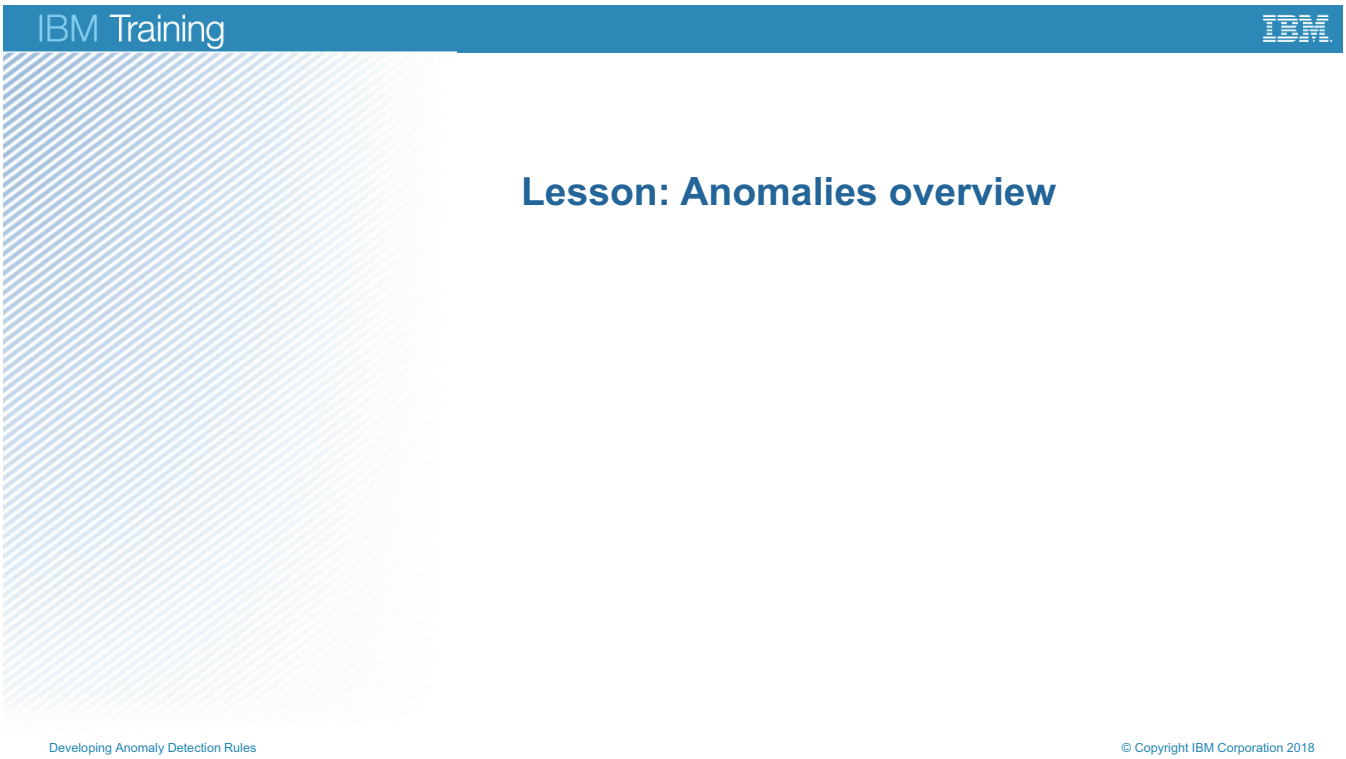
Objectives

- Anomalies overview
- Threshold rules
- Investigating an offense
- Observing the automatically created event rule
- Anomaly rules
- Behavioral rules
- Considerations about anomaly detection

Objectives

Lesson 1 Anomalies overview



Anomalous activities are a sign of an attack or policy breach. In this lesson, you learn about anomalies in general and on a high level options to detect them.

About anomalies

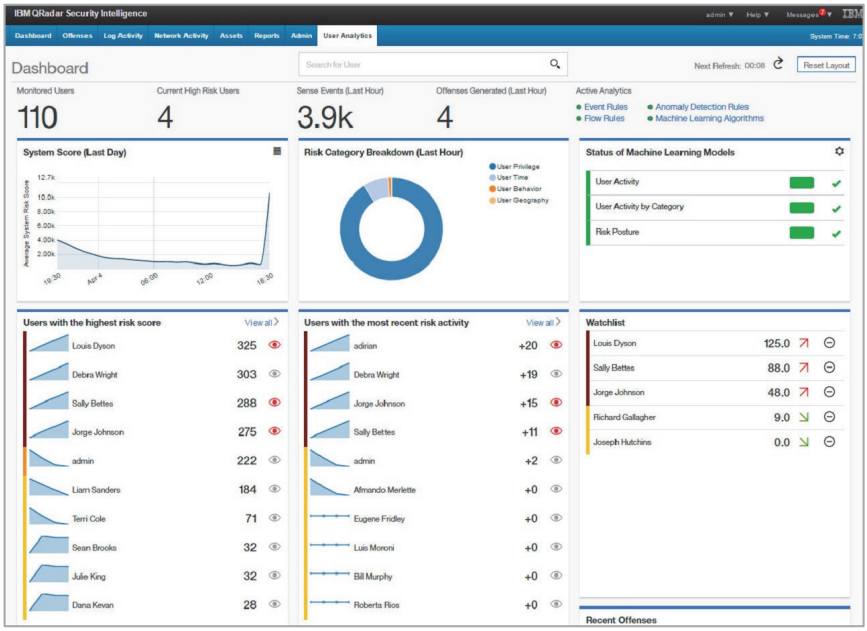
- Anomalies are **deviations** from expected activity as recorded in your events and flows
- To determine what qualifies as an anomaly in your organization, specify the **baseline** of expected activity
- Any activities falling outside the specified expectations are anomalies
- While a single outlier event or flow can be an anomaly, commonly anomaly detection looks for **volume** based deviations over time
- Examples for malicious activities that leave their traces as deviations of volumes include
  - Reconnaissance
  - Beaconing
  - Lateral movements
  - Data hoarding
  - Exfiltration
- To detect anomalies with QRadar SIEM, use rules

About anomalies

IBM Training

Using UBA to detect anomalies

- Anomaly detection rules can effectively detect deviations in activities including user behavior
- However, the IBM QRadar User Behavior Analytics (UBA) app provides far more options to collect user data and far-reaching threat detection approaches, such as peer groups
- Unlike UBA, anomaly detection rules can monitor for anomalous network activities
- UBA is beyond the scope of this module



Using UBA to detect anomalies

The UBA app adds anomaly detection rules to QRadar SIEM.

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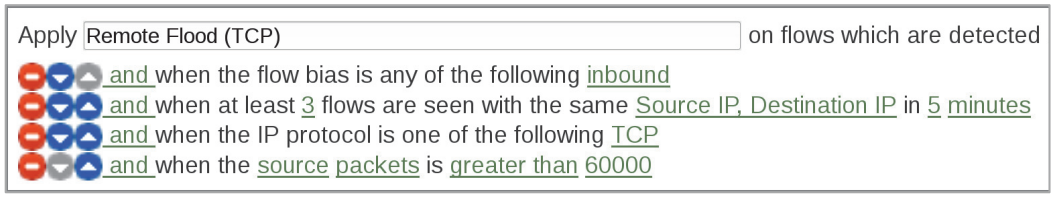
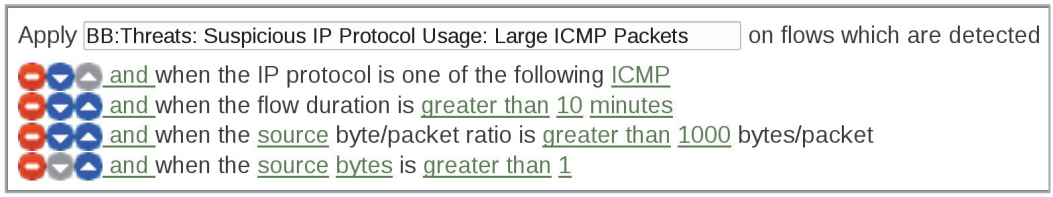
Using custom rules to detect anomalies

- Custom rules can detect deviations of simple measurements; refer to the screen captures for examples
- Stateful tests can take information from previous events and flows into consideration





Using custom rules to detect anomalies

The first test in the first example screen capture tests the flow bias. It marks the ratio between bytes leaving from and arriving at your organization's perimeter. Therefore, the flow bias is a simple statistical measure, that custom rules can use to test for anomalies.

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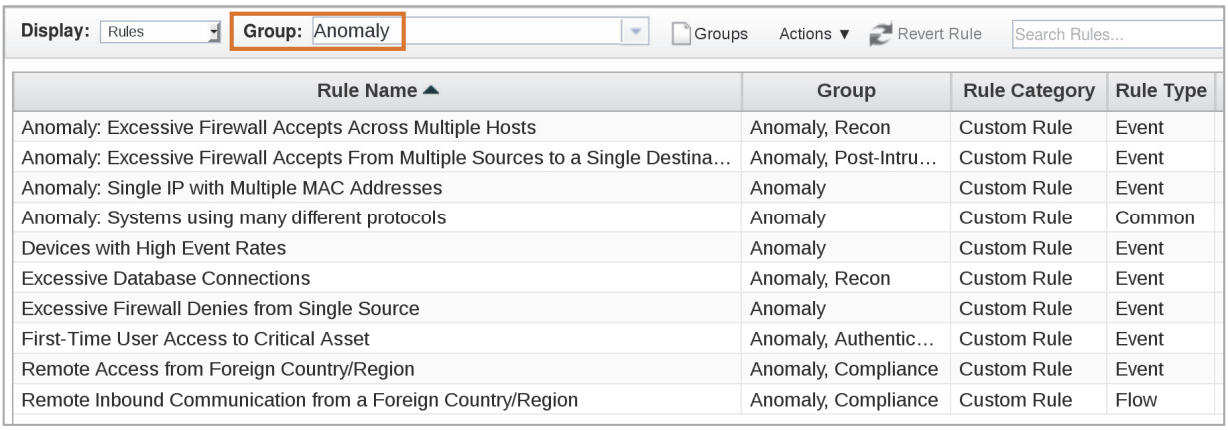
Using custom rules to detect anomalies (continued)

The predefined rule group with the name Anomaly contains predefined custom rules that alert to unexpected measurements



Rule Name	Group	Rule Category	Rule Type
Anomaly: Excessive Firewall Accepts Across Multiple Hosts	Anomaly, Recon	Custom Rule	Event
Anomaly: Excessive Firewall Accepts From Multiple Sources to a Single Destina…	Anomaly, Post-Intru…	Custom Rule	Event
Anomaly: Single IP with Multiple MAC Addresses	Anomaly	Custom Rule	Event
Anomaly: Systems using many different protocols	Anomaly	Custom Rule	Common
Devices with High Event Rates	Anomaly	Custom Rule	Event
Excessive Database Connections	Anomaly, Recon	Custom Rule	Event
Excessive Firewall Denies from Single Source	Anomaly	Custom Rule	Event
First-Time User Access to Critical Asset	Anomaly, Authentic…	Custom Rule	Event
Remote Access from Foreign Country/Region	Anomaly, Compliance	Custom Rule	Event
Remote Inbound Communication from a Foreign Country/Region	Anomaly, Compliance	Custom Rule	Flow

Using custom rules to detect anomalies (continued)

Rule groups can contain custom rules and anomaly detection rules. The predefined rule group with the name *Anomaly* is not restricted to anomaly detection rules.

Using anomaly detection rules to detect anomalies

- Anomaly detection rules monitor for statistical deviations from expected activities that build over time
- In essence, anomaly detection rules continuously sum up occurrences over a time interval and fire when the sum falls out of the expected range

  Examples include
  - Number of bounced emails
  - Number of successful or failed logins to admin accounts
  - Number of bytes uploaded as recorded by a streaming media proxy
  - Number of firewall permits or denies

- The **Anomaly Detection Engine (ADE)** executes the anomaly detection rules
- The ADE only runs on the Console

Using anomaly detection rules to detect anomalies

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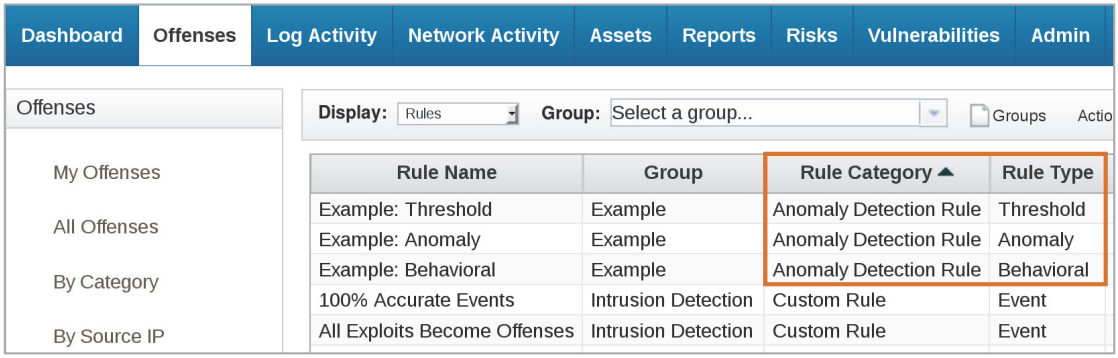
Navigating to anomaly detection rules

- The **Offenses** tab displays under **Rules** both anomaly detection rules and custom rules
- QRadar SIEM provides three types of anomaly detection rules
  - Threshold rules
  - Anomaly rules
  - Behavioral rules



Developing Anomaly Detection Rules

Navigating to anomaly detection rules

Anomaly detection rules cannot be duplicated.

Anomaly detection building blocks are not available.

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Continuously learning

- Unlike threshold rules and custom rules, anomaly and behavioral rules perform **auto-baselining** which means that they continuously learn which volume of activities to expect and adjust their triggering values accordingly
- Auto-baselining is a concept of **machine learning**

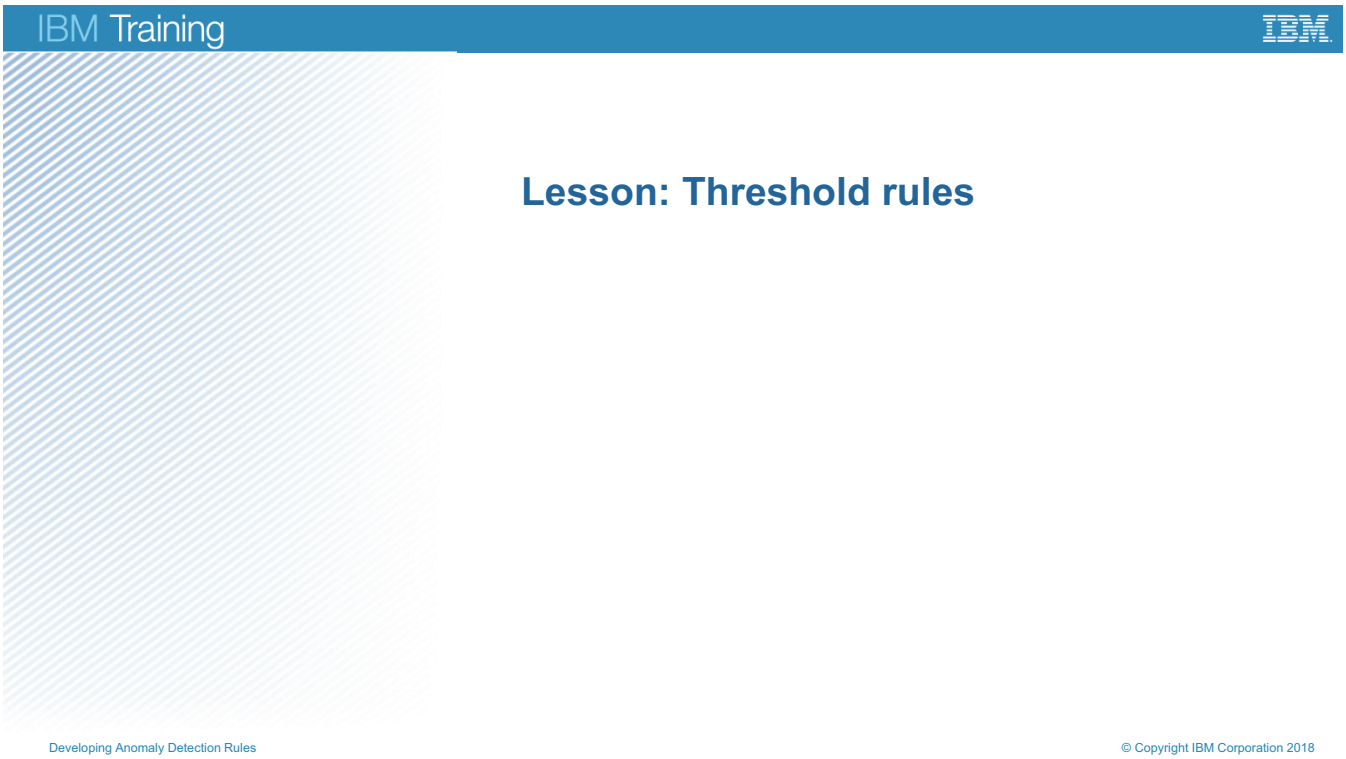
Continuously learning

When to use anomaly detection rules

- Instead of custom rules, use anomaly detection rules to monitor for deviations that become only visible after a considerable amount of time, such as advanced persistent threats (APT), for the following reasons
  - The counters and timers of stateful tests used in custom rules and building blocks reset when QRadar's ecs-ep service restarts, which happens any time you install a fixpack or select *Deploy Full Configuration* on the Admin tab
  - Only anomaly detection rules can monitor the accumulation of a property continuously; the next lesson introduces the *accumulated property*
- Anomaly detection rules are not useful to detect specific alarming actions, such as a network connection from the DMZ to an HR database
- Compliance requirements are rarely specified in statistical terms; therefore, custom rules are better equipped to monitor compliance typically

When to use anomaly detection rules

Lesson 2 Threshold rules



This lesson introduces you to anomaly detection rules of type threshold, that detect when the property count over a time span surpasses an upper or lower boundary.

Reference:

QRadar: How to properly create an AQL Search for a Threshold Rule:
http://www.ibm.com/support/docview.wss?uid=swg22007019

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Threshold rules

Test whether the count of the accumulated property surpasses an upper or lower boundary during a time span

Threshold rules

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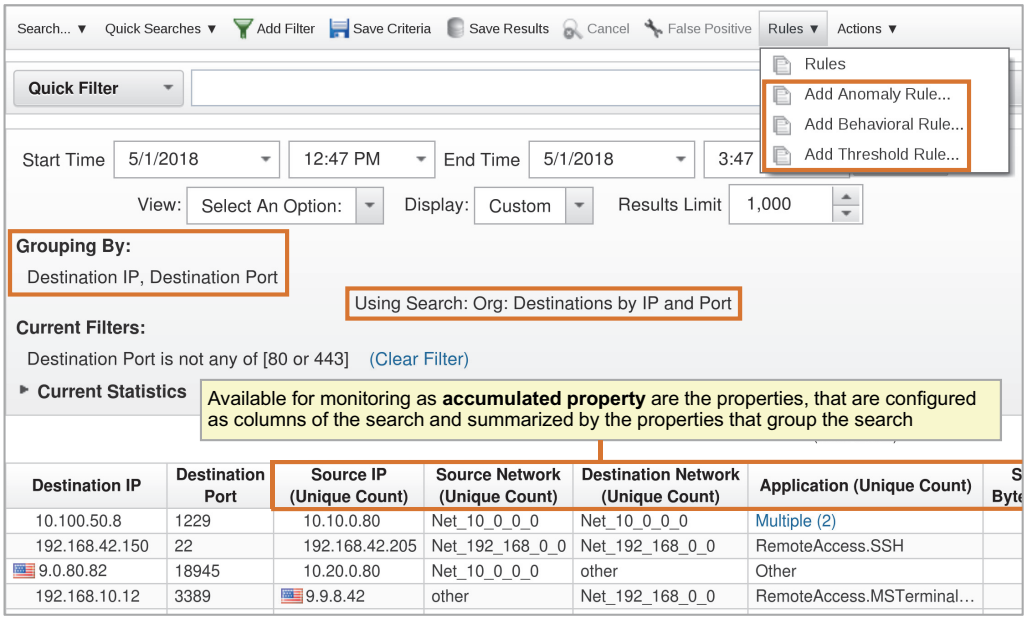
Based on saved grouped search

- A **saved event or flow search** with **grouping** specifies for anomaly detection rules which data to monitor
- Only when the Log or Network Activity tab displays the result of such a saved search, the menu items in the **Rules** drop-down list become available



Developing Anomaly Detection Rules

Based on saved grouped search

The first two displayed columns contain the properties that the search is grouped by. Therefore, they are not available to be selected as accumulated property.

Unlike custom rules and building blocks, it is not possible to create an anomaly detection rule on the Offenses tab under Rules.

The menu items to add an anomaly detection rule remain greyed out while the search is still running.

The three types of anomaly detection rules share the same requirements for the search that they can be based on. Therefore, the menu items to add an anomaly detection rule are either all three available or all three greyed out.

Continuously monitoring of a property accumulation

- The search has to be **grouped** in order to summarize the events or flows by one or more properties
- From the **columns** of the search, you later in this lesson select the property to monitor
- The user interface refers to this property as **accumulated property** because the ADE requests all instances of the accumulator to count occurrences of this property
  - An instance of QRadar SIEM's accumulator runs on each processor appliance and the Console
  - Time series charts cannot use these accumulations
- **Filters** are optional; they help to focus the search and lower resource consumption
- While tests perform for custom rules the filtering on which data to test, for anomaly detection rules the underlying saved search performs the filtering
- Anomaly detection rules do not provide tests for the **context** of your organization; therefore group and filter by building block match, network, direction, etc. to take the context into account

Continuously monitoring of a property accumulation

A saved AQL search with grouping can also be the base of an anomaly detection rule. Refer to the *QRadar: How to properly create an AQL Search for a Threshold Rule* technote at http://www.ibm.com/support/docview.wss?uid=swg22007019 for more information. Despite only mentioning threshold rules in its title, the technote pertains to all three types of anomaly detection rules.

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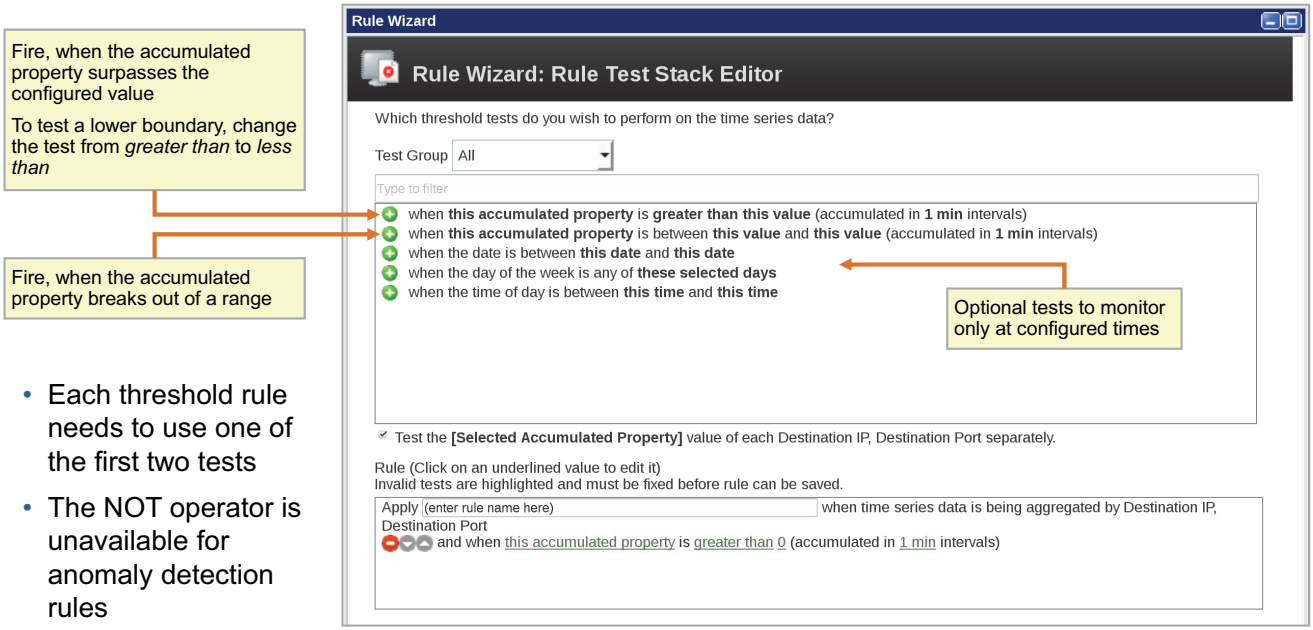
Tests for threshold rules



- Each threshold rule needs to use one of the first two tests
- The NOT operator is unavailable for anomaly detection rules

Developing Anomaly Detection Rules

Tests for threshold rules

For an threshold rule, the Rule Test Stack Editor opens with the first test already added as shown in the screen capture.

Function tests are not available for anomaly detection rules.

Exporting an anomaly detection rule as building block is not possible. Therefore, the *Export as Building Block* button is missing in the upper-right corner.

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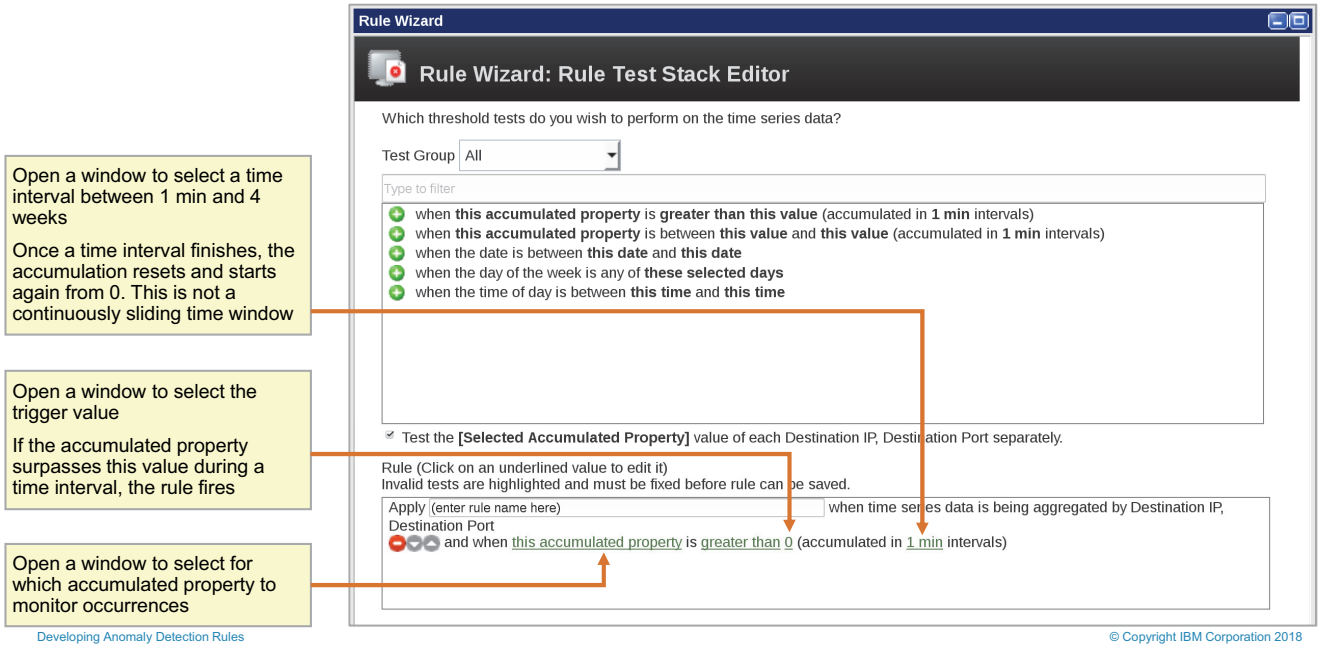
Tests for threshold rules (continued)



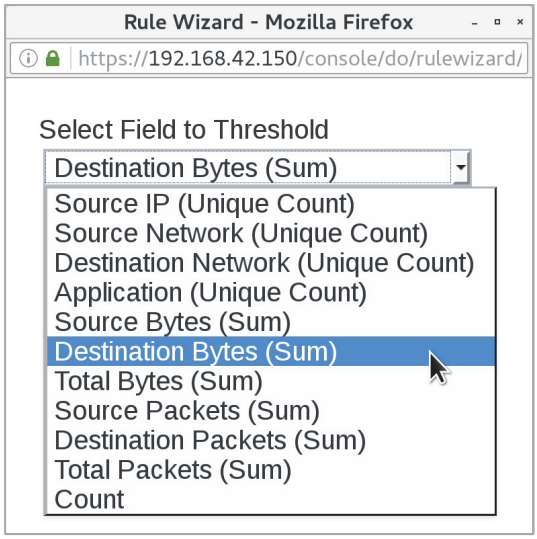
Tests for threshold rules (continued)

For a lower boundary as trigger value, the ADE knows only at the end of the time interval whether the number of occurrences was below the trigger value. Therefore, the ADE can fire the rule only after the time interval has finished. For an upper boundary as trigger value, the ADE fires the rule as soon as the occurrences surpass the trigger value.

The first time interval starts once the rule has been created and enabled. It does not go back in time to consider past occurrences.

Select property to test

- The window to select the property to test, lists all properties that are **columns** of the underlying saved search
- The same properties are available in the **Value to graph** drop-down list in the settings of a chart that visualizes the result of the saved search



Select property to test

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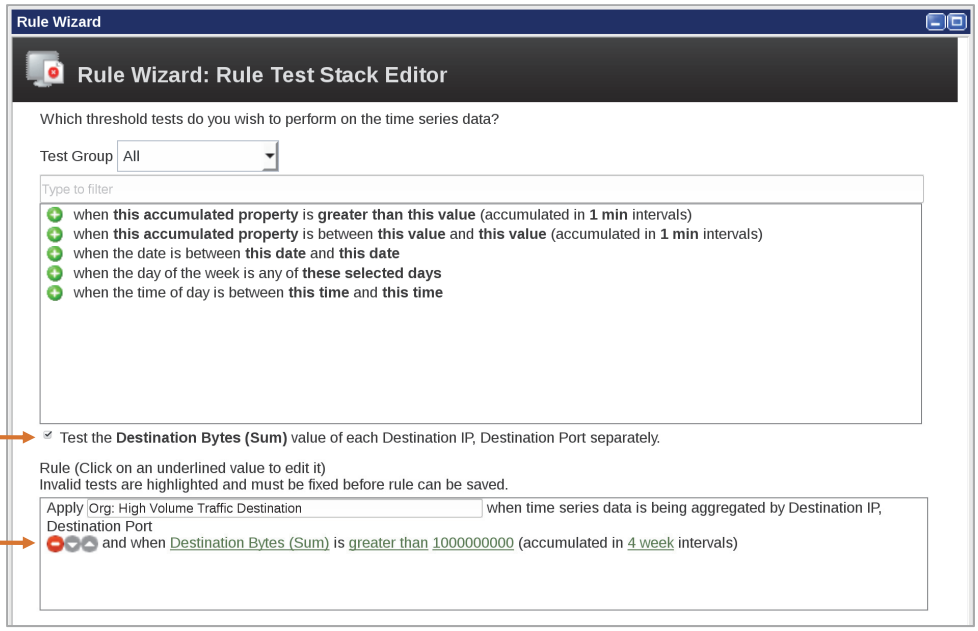
Threshold rule test example

With this option unselected, the accumulator sums up the destination bytes of every flow matching the underlying search in one single sum per time interval

With this option selected, the accumulator sums up the destination bytes of every flow matching the underlying search for each combination of *Destination IP* and *Destination Port,* that the underlying search is grouped by, separately

Example configuration of a threshold rule test

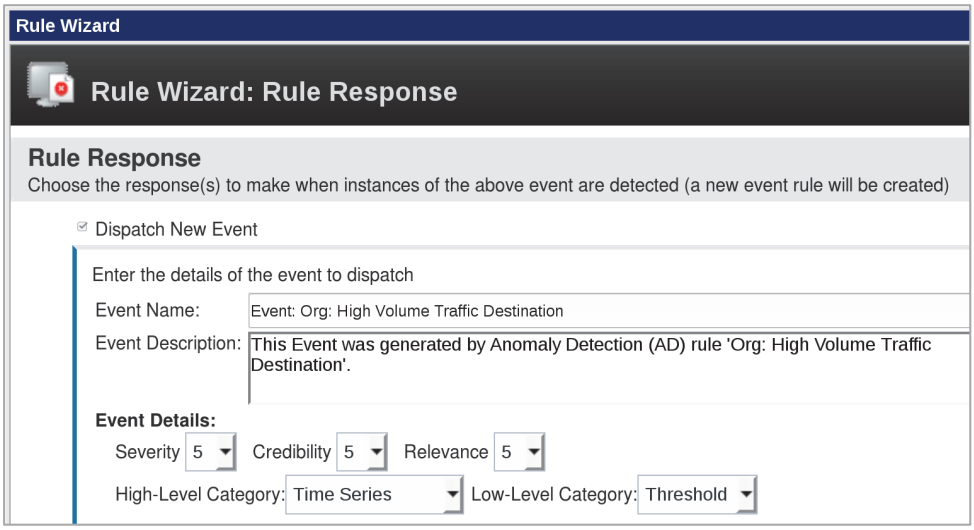


Developing Anomaly Detection Rules

Threshold rule test example

Dispatch New Event

- Anomaly detection rules only have a **Rule Response** but not a Rule Action because the Rule Action works on the triggering event or flow
- **Dispatch New Event** is automatically selected as rule response and cannot be unselected
- As in the example screen capture, the fields of the dispatched event are pre-filled; you can change them



Dispatch New Event

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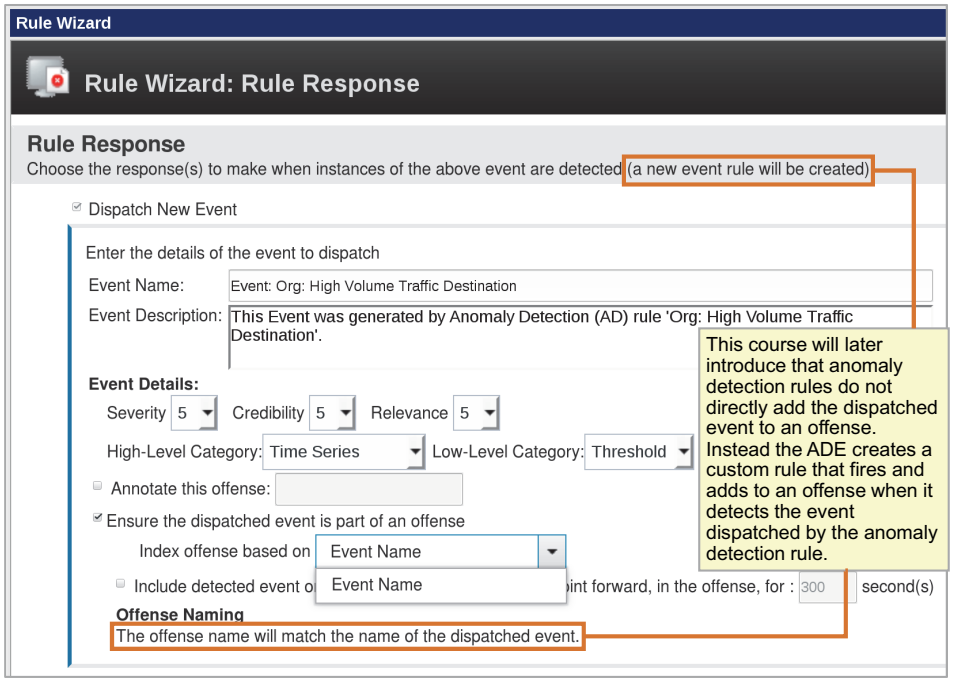
Add event to offense

- The option to add the dispatched event to an offense is pre-selected; you can unselect it
- The offense can only be indexed on the **Event Name** of the dispatched event
- Two rules indexing on the same Event Name add to two separate offenses because effectively **Event Name means QIDmap** of the dispatched event which is unique for each rule



Add event to offense

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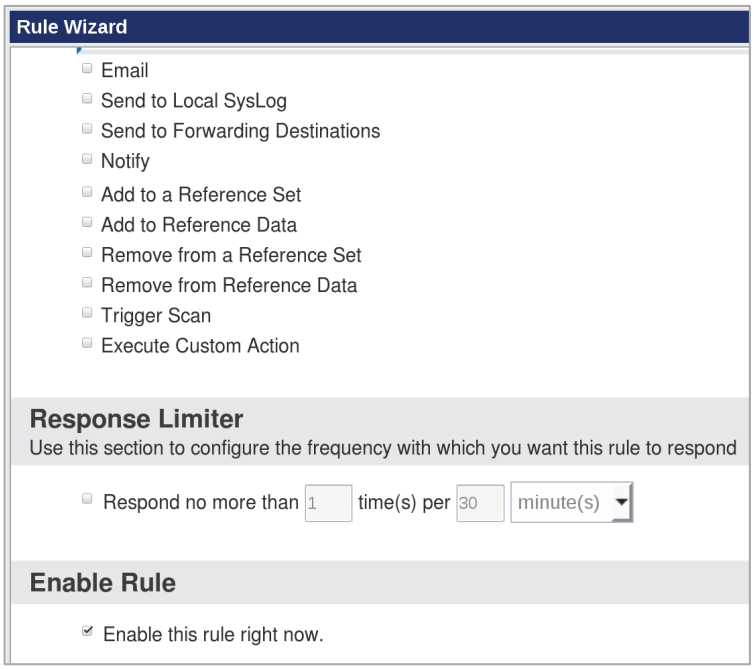
Other rule responses

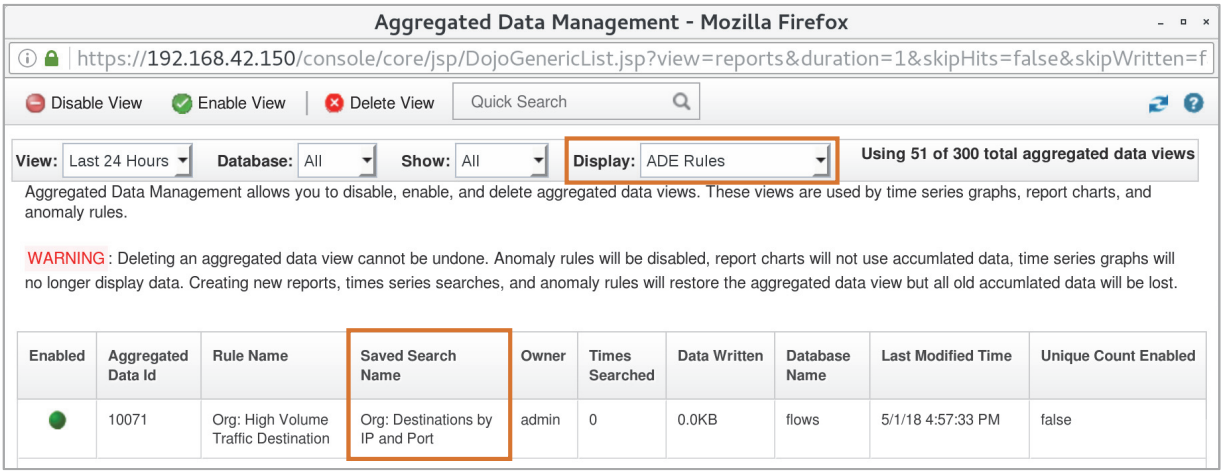
- None of the other rule responses of anomaly detection rules are pre-configured
- The ADE on the Console performs all rule responses because anomaly detection rules can only fire on the Console



Other rule responses

Aggregated Data Management

- To check on which searches your anomaly detection rules are based on, perform the following steps
  - On the **Admin** tab, open **Aggregated Data Management**
  - For **Display**, select **ADE Rules**

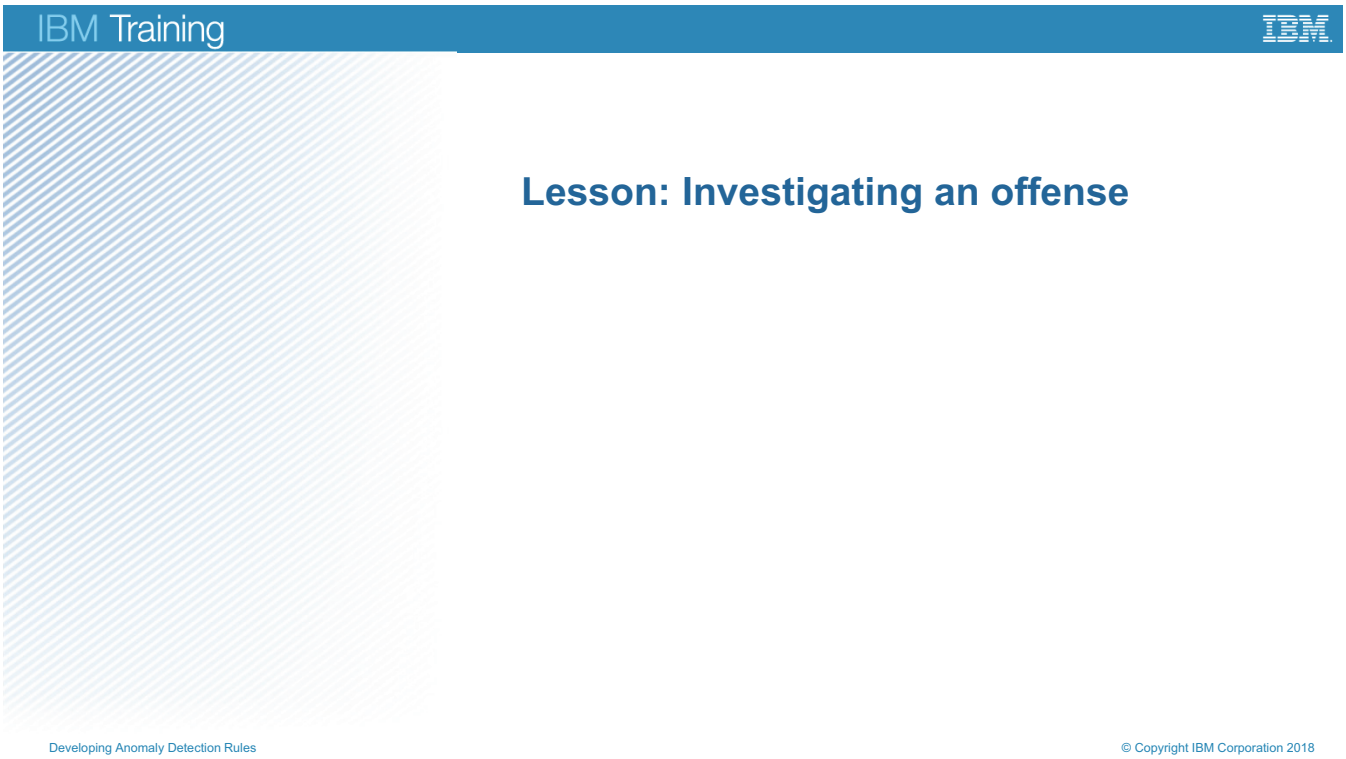


Aggregated Data Management

If an anomaly detection rule has triggered an offense, you can also observe the saved search name by clicking the Anomaly button which opens a window with the search result.

The Rule Test Stack Editor does not display the name of the saved search an anomaly detection rule is based on.

Lesson 3 Investigating an offense



An offense bundles a wealth of information about an unusual activity. In this lesson, you learn how to use offense summary information to begin investigating an offense.

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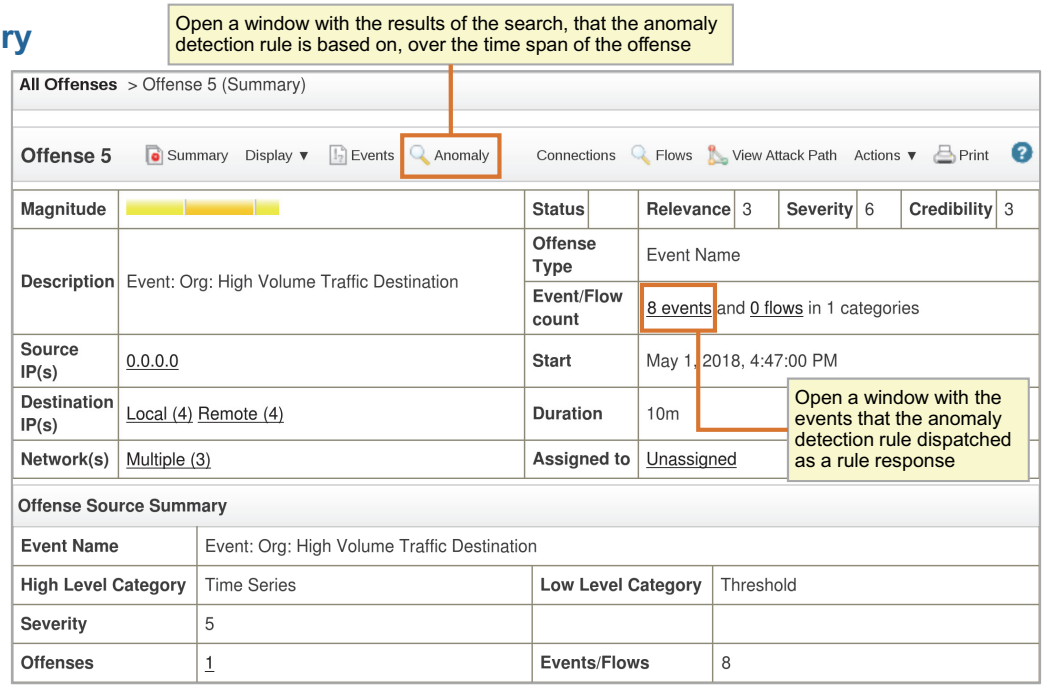
Offense Summary

The Offense Summaries of all three types of anomaly detection rules have the same fields



Developing Anomaly Detection Rules

Offense Summary

For all offenses created by anomaly detection rules, the number of flows in the field *Event/Flow count* is always 0 because only the events dispatched by the rule response are added to the offense but not the events or flows that caused the anomaly detection rule to fire.

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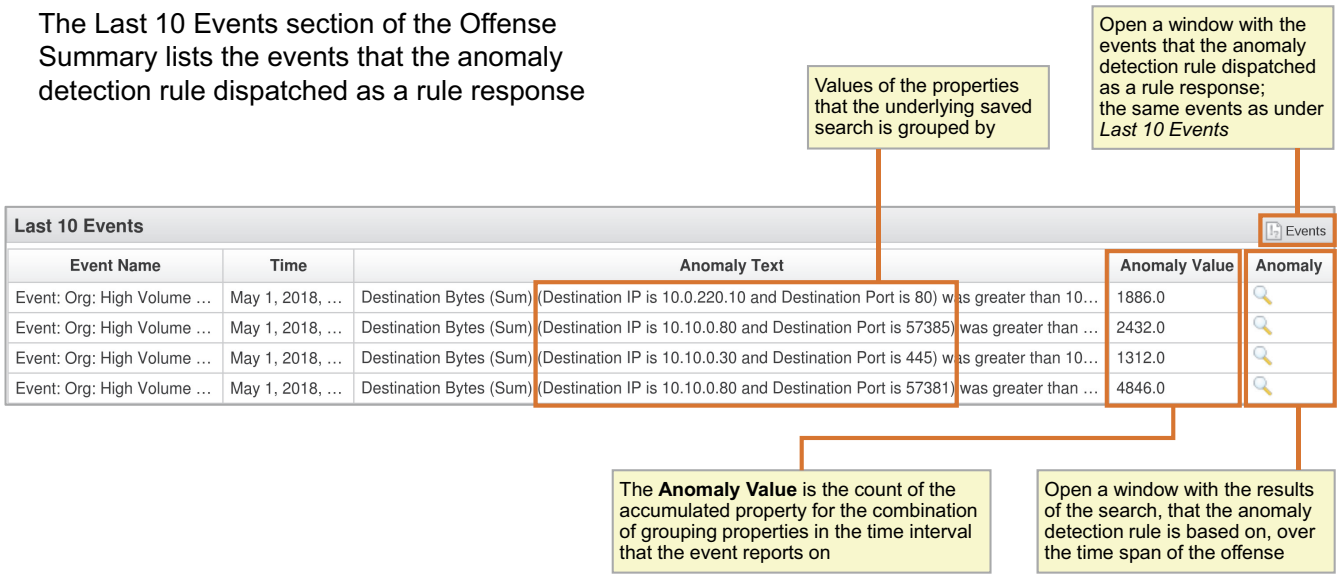
Last 10 Events in Offense Summary

The Last 10 Events section of the Offense Summary lists the events that the anomaly detection rule dispatched as a rule response

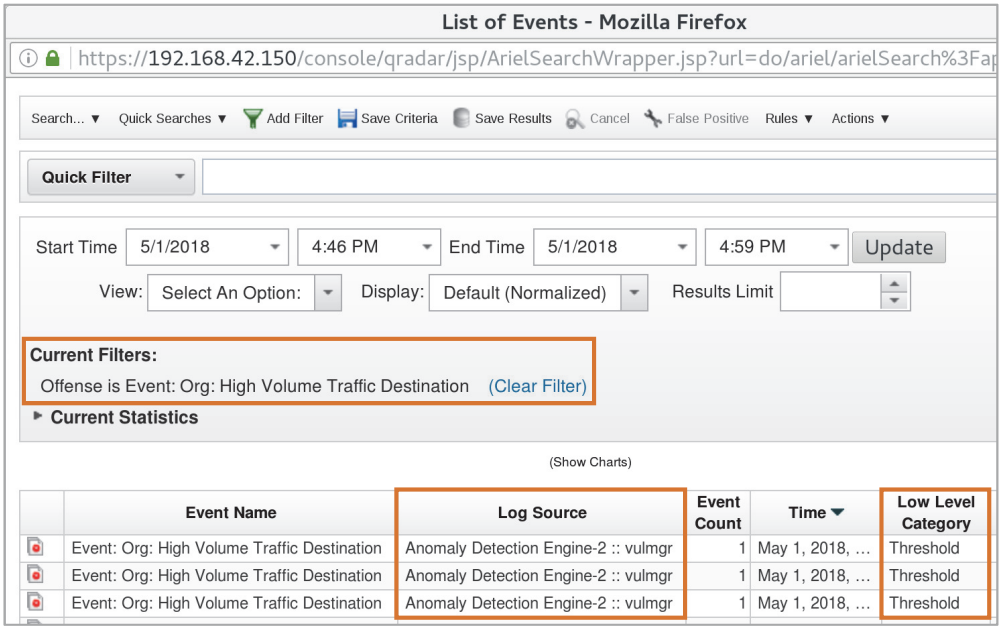


Last 10 Events in Offense Summary

The Anomaly Text is easier readable in the Event Details.

Events dispatched by rule response

Clicking **Events** in the Offense Summary opens a window with the events that the anomaly detection rule dispatched as a rule response



Events dispatched by rule response

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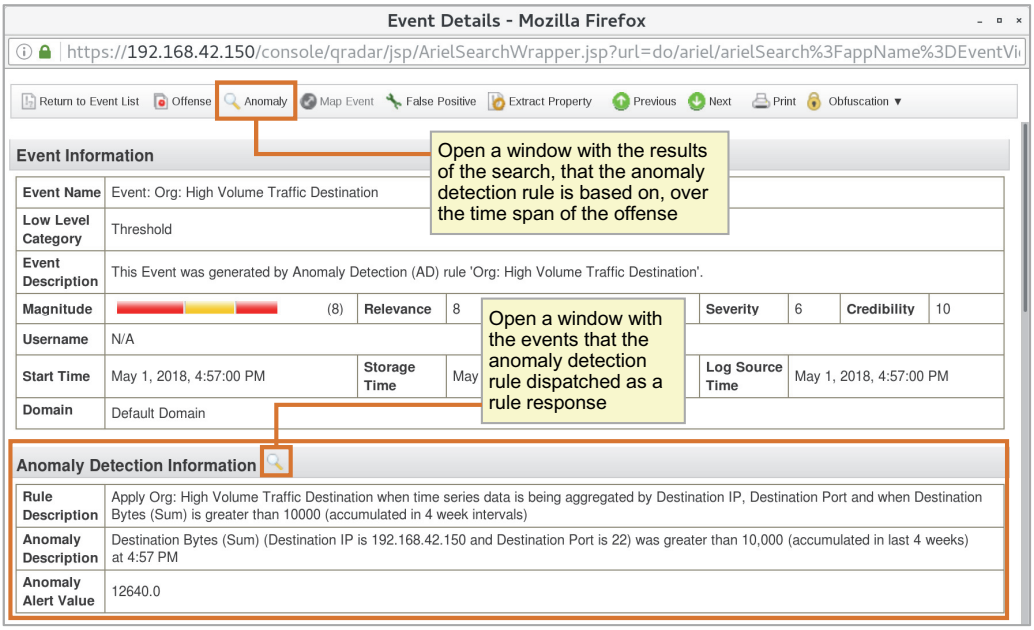
Anomaly Detection Information

Events dispatched by an anomaly detection rule explain under **Anomaly Detection Information** in the Event Details the characteristics of the deviation that they alert to



Anomaly Detection Information

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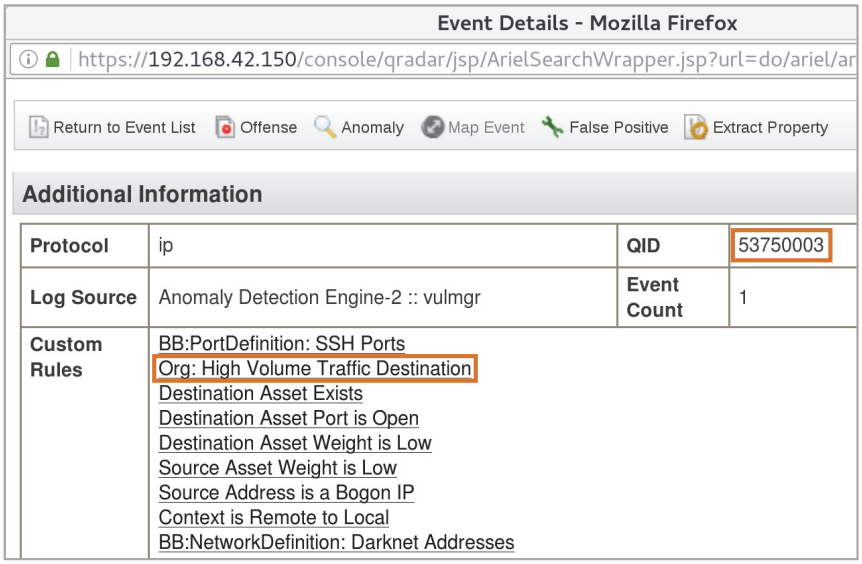
Observing additional information

- Under **Custom Rules**, the event is tagged by the name of the anomaly detection rule that fired and dispatched this event
- The events or flows that led the anomaly detection rule to firing, are not tagged
- The next lesson teaches about an automatically created custom rule that tests for the QID 53750003 of the event dispatched by this anomaly detection rule; the QID is unique to the example rule



Observing additional information

The QID on the slide is just an example. If you try the same, the QID will be different almost certainly. If you configure a Rule Response to dispatch an event, QRadar SIEM creates a QIDmap with an unique QID.

Quiz 1

1. What is the baseline?
2. Which QRadar SIEM features can you use to detect anomalies?
3. How do you configure the search underlying an anomaly detection rule so that you can select a property as the *accumulated property*?
4. What does an anomaly detection rule tag when it fires?

Quiz 1

Lesson 4 Observing the automatically created event rule

Technically anomaly detection rules cannot add events that they dispatch to an offense. In this lesson, you learn how an automatically created event rule adds events to an offense on behalf of its related anomaly detection rule.

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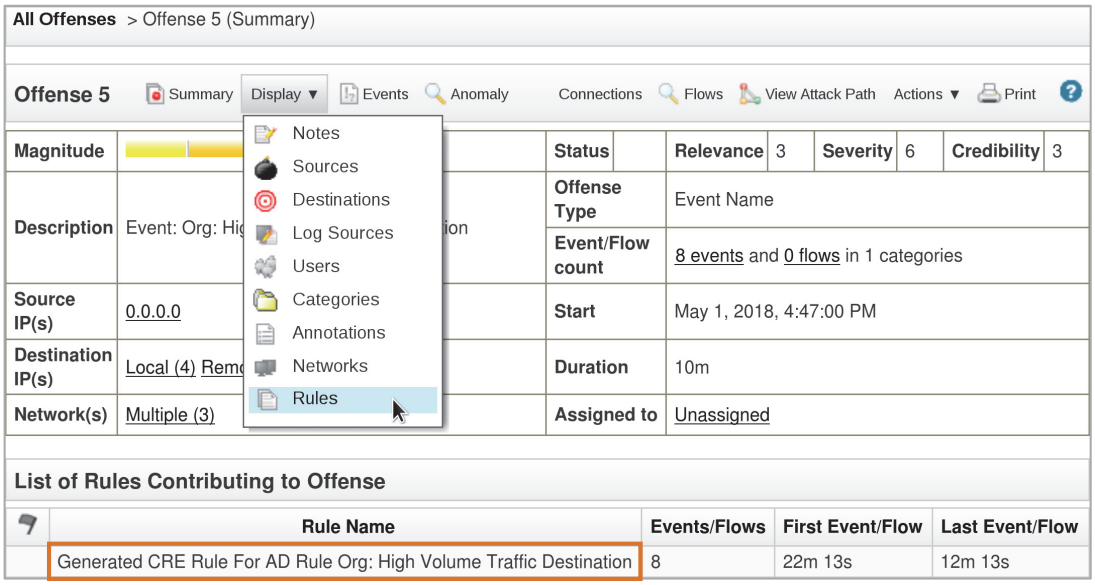
Locating event rule

For each anomaly detection rule, QRadar SIEM automatically creates an event rule

Instead of the anomaly detection rule, this event rule triggers the offense



Locating event rule

Normally you do need to open or change the automatically created event rule. It does not appear on the Offenses tab under Rules. In an Offense Summary, select **Rules** in the **Display** drop-down list to open the automatically created event rule. However, only change anything if really know what you are doing.

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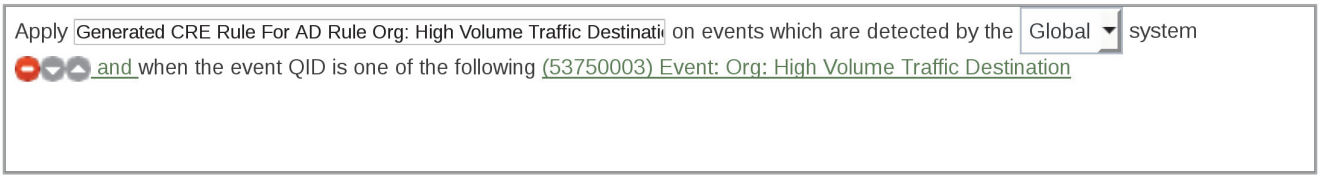
Testing for QID

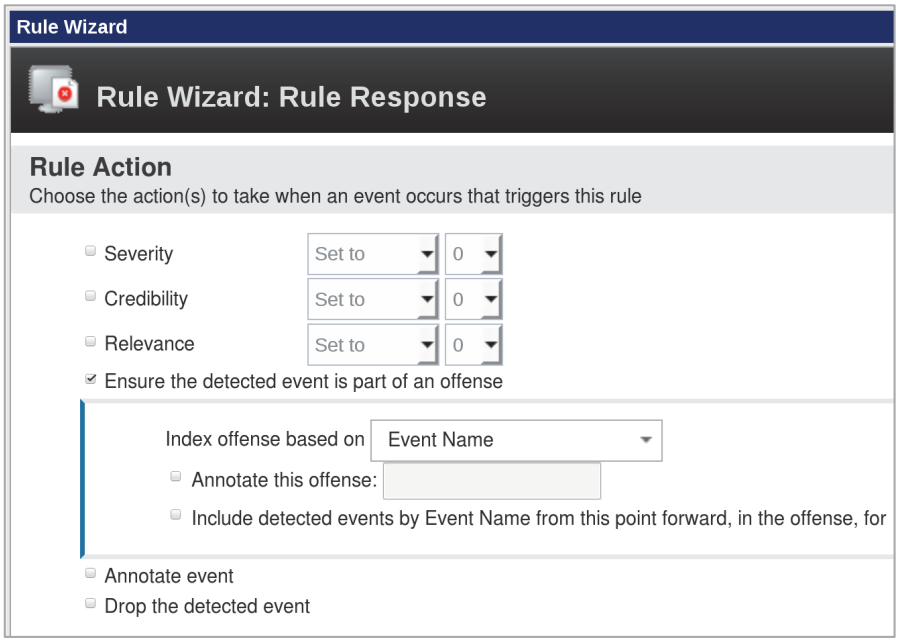
- Observe that the QIDs in the test of the automatically created event rule and of the event that the anomaly detection rule dispatches as a rule response in the previous lesson are the same
- The event rule, that QRadar SIEM automatically created along the anomaly detection rule, fires for the event dispatched by this anomaly detection rule



Testing for QID

Rule Action

- As a Rule Action the event rule adds to an offense the event, that originally the anomaly detection rule has dispatched
- The offense is indexed on the **QIDmap** of this event, which appears as **Event Name** in the user interface
- Therefore, the Magistrate adds any other event dispatched by the same anomaly detection rule to the same offense



Rule Action

Lesson 5 Anomaly rules

This lesson introduces you to anomaly detection rules of type anomaly, that detect deviations from a range above and below the weighted moving average.

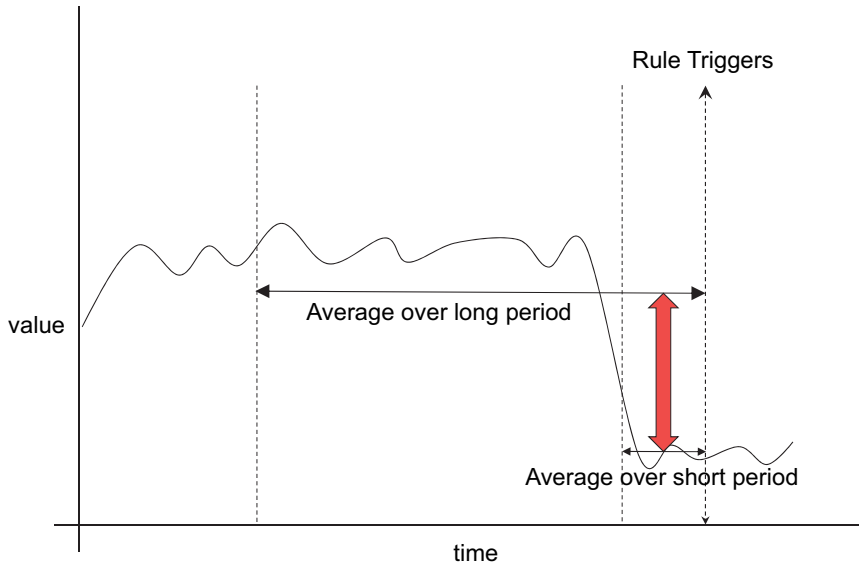
References:

QRadar: An Example of How an Anomaly Rule Triggers Over Time:
http://www.ibm.com/support/docview.wss?uid=swg21903306

What are Moving Average or Smoothing Techniques?:
https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc42.htm

About anomaly rules

Test whether the count of the accumulated property during the current time interval deviates by more than the configured percentage from the baseline weighted moving average of previous intervals



About anomaly rules

Refer to the *QRadar: An Example of How an Anomaly Rule Triggers Over Time* technote at http://www.ibm.com/support/docview.wss?uid=swg21903306 for more information.

About anomaly rules (continued)

- Use an anomaly rule for expected activities with fluctuations but any spike or sharp trend reversal is an indicator of compromise or concern
- **Smoothing** flattens random variations
- Anomaly rules use the **weighted moving average (WMA)**, which is a very commonly used smoothing method
- To compute the WMA value for an anomaly rule, the ADE performs the following steps for a number of previous intervals once the most recent interval completed
  - Multiply the property count of each interval with a factor so that intervals have the more weight the more recent they are
  - Sum up the results
  - Divide the sum by the number of intervals
- If the count of the current interval deviates by more than the configured percentage from the WMA value, the anomaly rule fires
- Consider WMA as a sliding window that shifts by the configured length of the time interval
- Do not use anomaly rules for activities with legitimate spikes, such as backup activity

About anomaly rules (continued)

Threshold rules do not need to use smoothing.

Refer to *What are Moving Average or Smoothing Techniques?* at https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc42.htm for more information on smoothing and moving average.

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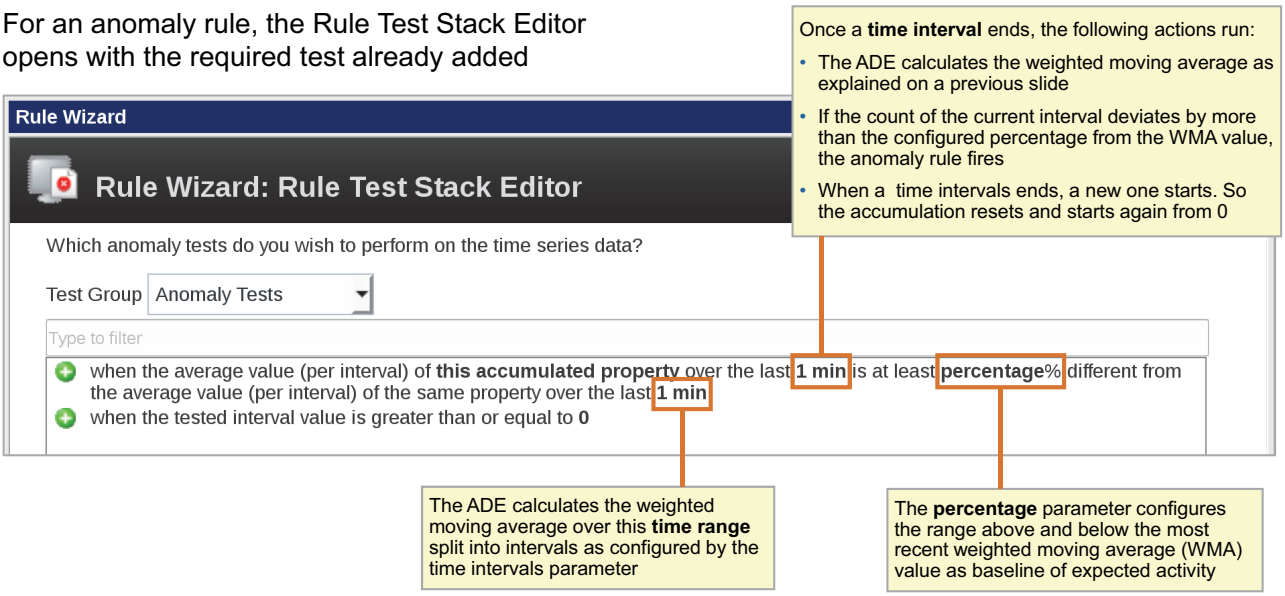
Required test for anomaly rules

For an anomaly rule, the Rule Test Stack Editor opens with the required test already added



Required test for anomaly rules

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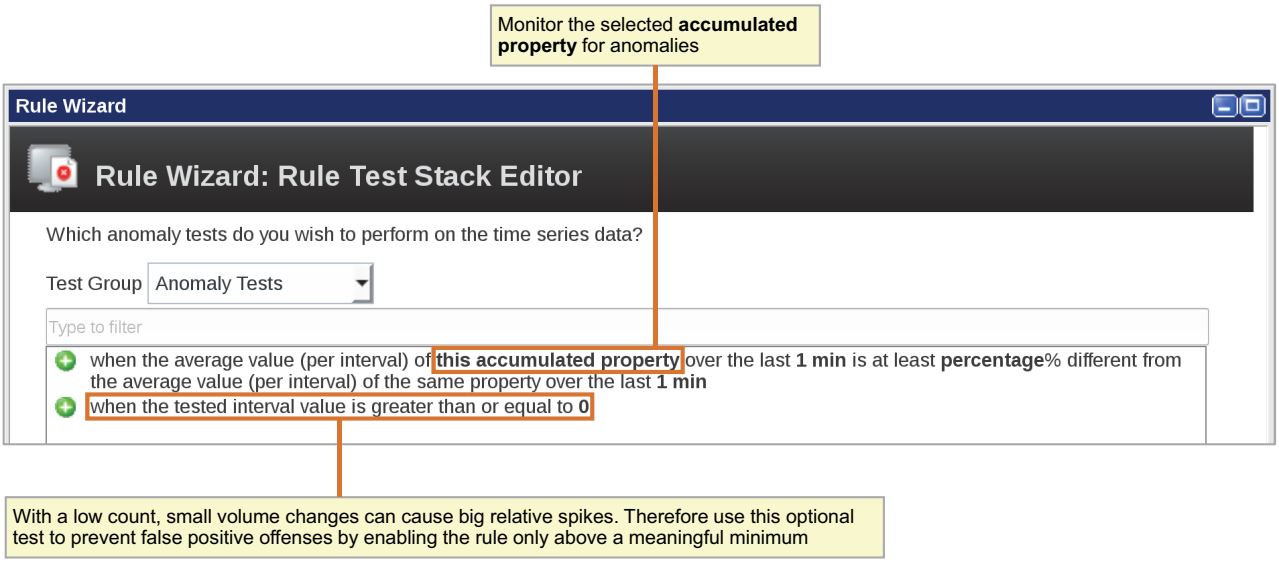
Required test for anomaly rules (continued)



Required test for anomaly rules (continued)

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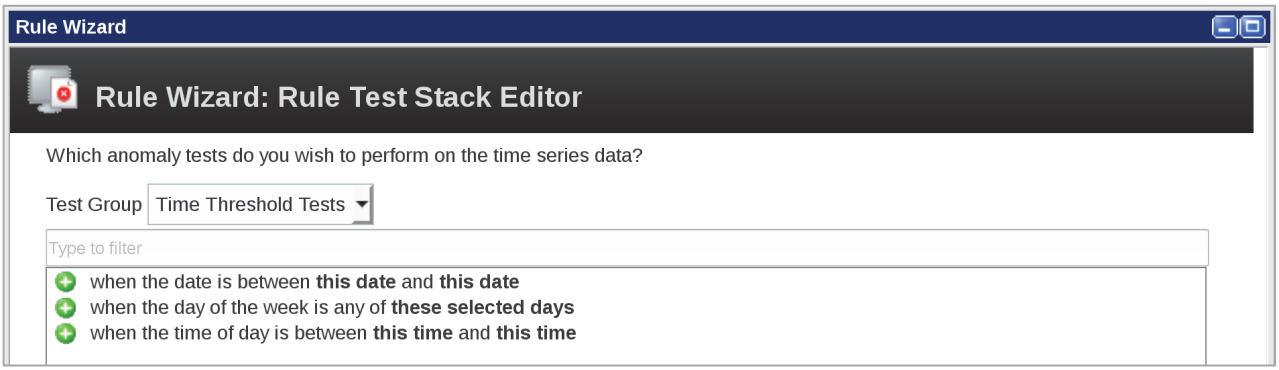
Optional tests for anomaly rules

- Many anomaly detections are only useful at certain times
- Use these tests to prevent false positive offenses



Optional tests for anomaly rules

Only the following test can be added more than once to an anomaly or behavioral rule:

`when the time of day is between this time and this time`

Lesson 6 Behavioral rules

This lesson introduces you to anomaly detection rules of type behavioral, that detect deviations from activities with a trend and seasons.

Reference:

Triple Exponential Smoothing: https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc435.htm

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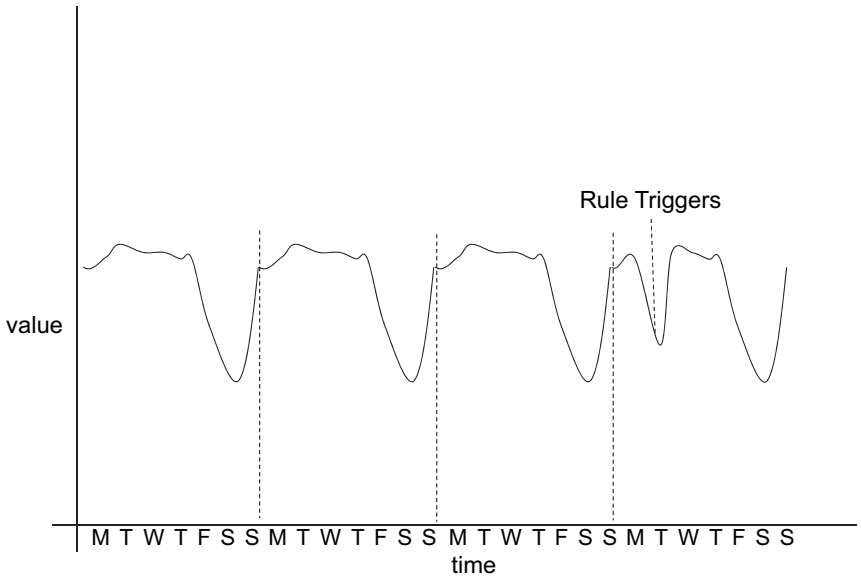
About behavioral rules

- Test whether the count of the accumulated property during the current time interval deviates from its trend and seasonal pattern
- A behavior rule learns the volume of the accumulated property over the configured time to establish a baseline



About behavioral rules

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About behavioral rules (continued)

- Use a behavioral rule for monitoring any activity with a **trend** and **seasons**
- Seasons are time intervals of the same length with activity fluctuations in a repetitive pattern
- Many activities have more than one seasonality in different season length; create one behavioral rule for each season length

  For example, number of authentications and general network usage typically have both 1 day and 1 week long seasons
- After a behavioral rule has been created or edited, at the earliest it can fire after one season has elapsed

About behavioral rules (continued)

Triple exponential smoothing

- For behavioral rules, the ADE performs **triple exponential smoothing** to account for variations caused by trends and seasons
- Often triple exponential smoothing is referred to as **Holt-Winters** method after the names of its inventors
- Consider triple exponential smoothing as a sliding window that shifts by the configured length of the season

Triple exponential smoothing

For more information on the Holt-Winters method refer to *Triple Exponential Smoothing* at https://www.itl.nist.gov/div898/handbook/pmc/section4/pmc435.htm

Triple exponential smoothing (continued)

- For behavioral rules, the ADE extrapolates the **forecast value** from the following three values:
  - **current level**
    Computed value of the selected property calculated by using the last observed value, and the previously computed level, trend and behavior
  - **current trend**
    Upward or downward change between successive expected values
  - **current behavior**
    Impact of the season at the current time
    In the context of triple exponential smoothing, behavior is commonly referred to as *seasonal component*
- The mathematical equations to extrapolate these values is beyond the scope of this module

Triple exponential smoothing (continued)

While the ADE calculates for anomaly rules one average per time interval, the ADE extrapolates the forecast value for each one-minute rollup provided by the accumulator regardless of the length of the season.

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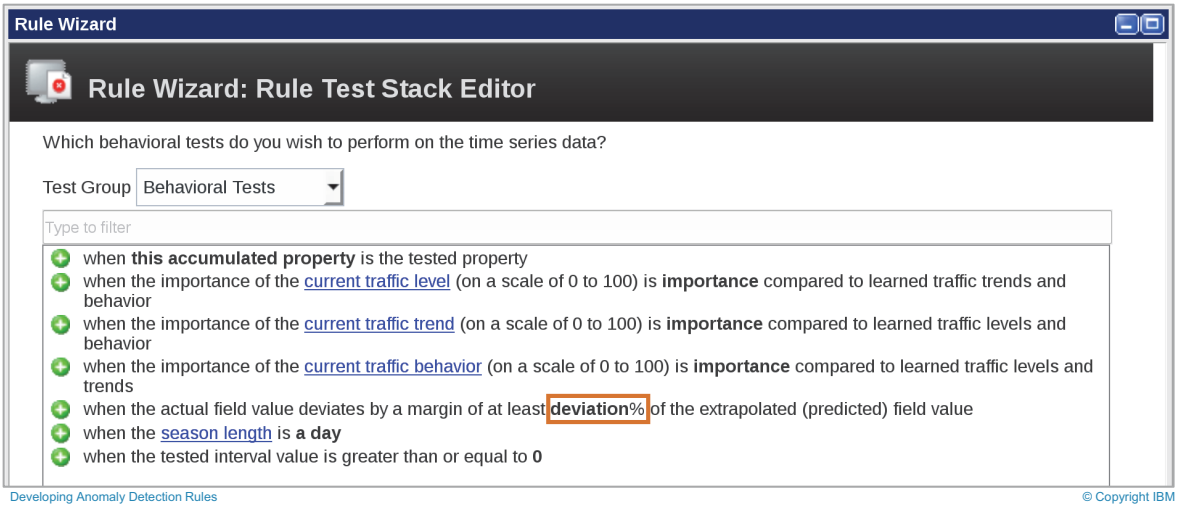
Required tests for behavioral rules

- For a behavioral rule, the Rule Test Stack Editor opens with the required tests already added
- The **deviation percentage** parameter configures the range above and below the most recent forecast value as baseline of expected activity



Required tests for behavioral rules

The blue underlined terms cannot be clicked. You cannot provide values for level, trend and behavior because the ADE computes them. However, you have configure their importance in the computation.

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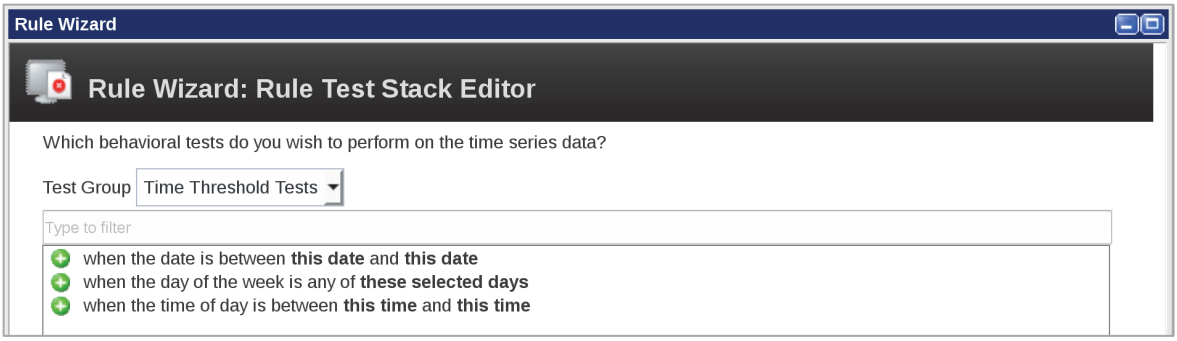
Optional tests for behavioral rules

- Many anomaly detections are only useful at certain times
- Use these tests to prevent false positive offenses

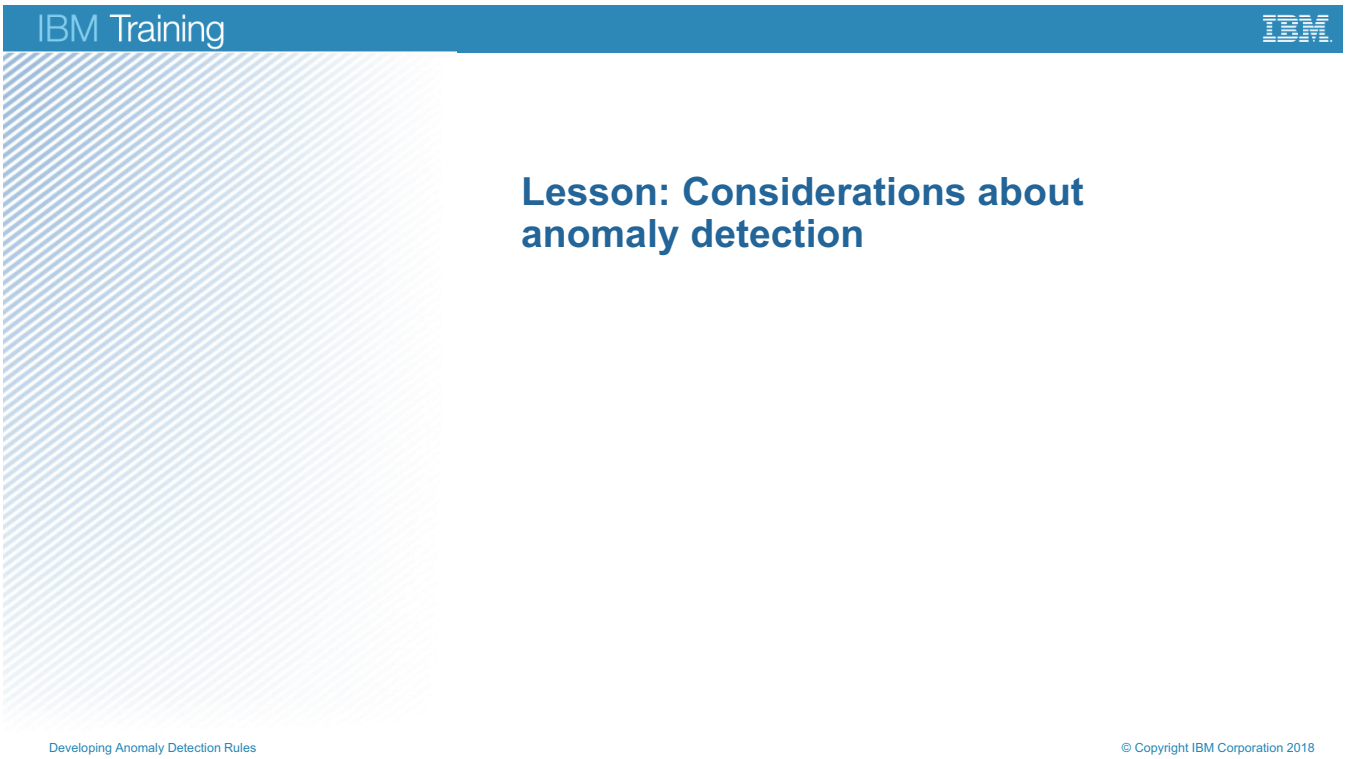


Optional tests for behavioral rules

Only the following test can be added more than once to an anomaly or behavioral rule:

```
when the time of day is between this time and this time
```

Lesson 7 Considerations about anomaly detection



This lesson sets expectation for anomaly detection in general.

Challenges for the architect and developer

- Anomaly detection in general faces the challenges considered in this lesson, not just QRadar
- Determining activities with expected patterns that are suitable for anomaly detection requires a comprehensive understanding of the activities in the IT environment of an organization
- Calibrating the parameters of anomaly detection rules stretches over a long timespan with trial and error in order to lower the number of false positives
- Development spans an unpredictable number of iterations which leads to uncertainties for time and budget planning
- Verifying a rule might be impossible because it often requires to perform actions never tried before
- The following best practices help the investigation by the security analyst
  - Using names, that can guide the investigation, for the rule and the dispatched event that names the offense
  - Creating separate rules if they can monitor more specifically and therefore narrow the possible causes for an offense

Challenges for the architect and developer

Challenges for the security analyst

- The deviation, that an anomaly detection rule triggers an offense for, often can have many causes
- Therefore, investigating such an offense requires more effort than for offenses triggered by custom rules typically
- Expect false positive offenses because activities out of the ordinary happen very often
- Many organizations write playbooks for selected offenses

  The playbooks suggest on how to act upon specific offenses

  The more an offense can point to the cause of its triggering, the more the playbook can predict its investigation and instruct on the steps to perform

  In general, anomaly detection hints less to the cause and therefore playbooks tend to be vague
- An anomaly detection rule only tags the event that it dispatches as a rule response but not the event or flow that triggered it

  Therefore, it is not possible to search and report on events and flows that an anomaly detection rule fired for

Challenges for the security analyst

Examples for legitimate deviations from expected activities:

- Unusual low overall activity during annual company outing
- Unusual high VPN usage on a snow day
- Unusual nightly database activity spike during an upgrade
- Unusual network path after app server failover to other data center
- Unusual time for high end-user activity because a team wants to meet a deadline
- Unusual outbound bandwidth due to a successful advertisement campaign

Quiz 2

1. What is the purpose of the event rule, that is automatically created with an anomaly detection rule?
2. Why does the ADE for anomaly rules compute the weighted moving average?
3. What are behavioral rules designed to monitor?
4. What is a challenge of anomaly detection in general (not only with QRadar)?

Quiz 2

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Exercise introduction

Complete the following exercises in the Course Exercises book

- Preparing for the anomaly rule
- Creating an anomaly rule
- Verifying the anomaly rule

Exercise introduction

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Summary

- Anomalies overview
- Threshold rules
- Investigating an offense
- Observing the automatically created event rule
- Anomaly rules
- Behavioral rules
- Considerations about anomaly detection

Summary

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