knowledge17

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Lab Guide

IoT Intelligence and Automation with ServiceNow

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Lab instance (1 per TEAM): https://clabs.link/iot-pnq

admin / Password: pnq-cc17

technician / pnq-cc17

[iot.webservice / pnq-cc17]

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Lab Overview

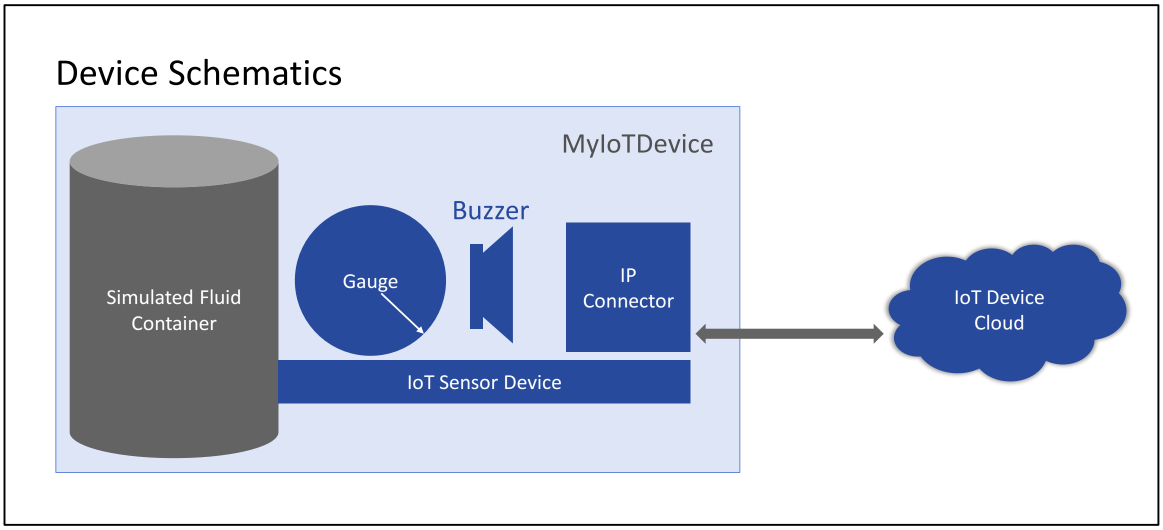
Lab Goal

In this lab, you'll learn how to build automation quickly and easily across the people and systems of the vast internet of things by using customizable REST integrations and workflows.

This lab explains the process of automating IoT related incident creation and remediation activities in three steps:

	Incident Creation	Remediation
Lab 1	Manual	Manual
Lab 2	Automatic	Manual
Lab 3	Automatic	Automatic

IoT devices in this lab measure a fluid level and indicate the current reading through a gauge. In case of a low reading, a sound alarm is generated by the device.



Device Schematics

Once this error state occurs, a team member must physically access the device and go through a procedure to return it to a normal working state. More about the actual procedure is described in the following pages.

The lab uses a team-based approach to go through its steps. Two roles are to be distinguished from each other:

- **Field technician:** can physically observe and access the IoT device
- **Servicedesk:** operates and administers the ServiceNow platform through its web-interface

Lab Goal

Lab 1 Manual Incident Creation and Resolution

This lab simulates that an error is detected at the IoT device level followed by a manual incident creation in ServiceNow.

- The IoT device detects a critical reading and a warning sound occurs, this is reported to the service desk agent
- Lab 1.1 – The service desk agent manually creates an incident in ServiceNow
- The field technician is assigned to resolve the incident
- Lab 1.2 – Instructions for resolution are contained in a knowledge base article
- After successful resolution, the incident is closed and the total resolution time is tracked

Get Familiar with the IoT Device

1. Locate the IoT sensor device in the lab room:
   - The visible gauge represents the current reading of a coolant level meter which again is part of an engine.
   - The buzzer sounds only when the current reading falls short of a defined threshold.
2. The button confirms a check-and-refill procedure to remediate error condition.

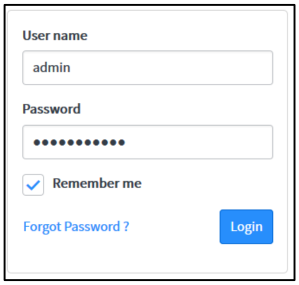
About the IoT device:

- The device uses an integrated Wi-Fi chip to establish IP-based connectivity.
- In our case, the device is powered by a 5V DC source.
- Several I/O ports are available and can be configured on device level for input vs. output and analog vs. digital. Some ports are PWM-capable. For this lab, I/O ports are pre-configured without the need to be changed.

Lab Instance

1. Navigate to your team's unique lab instance through the provided URL.

2. Log on using the credentials **admin / Knowledge17**



User name

admin

Password

•••••••••••

☑ Remember me

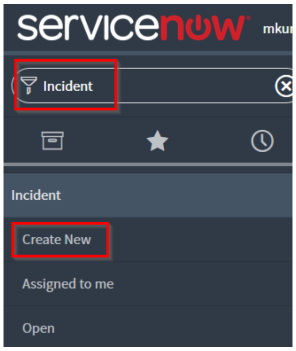
Monitor the IoT Device

1. A team member is positioned near the device.

2. Notify the service desk agent manually once the alarm occurs.

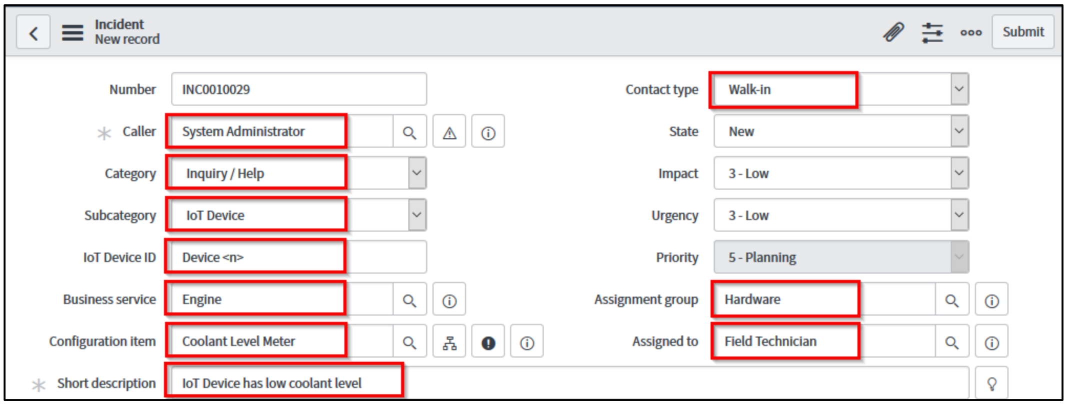
Service Desk Agent: Create Incident Manually

1. Navigate to **Incident > Create New**.



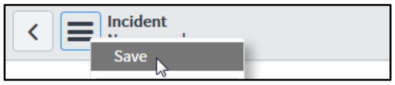
2. Fill out the relevant details of the incident form:

Caller: **System Administrator**	Contact Type: **Walk-in**
Category: **Inquiry / Help**	Assignment Group: **Hardware**
Subcategory: **IoT Device**	Assigned to: **Field Technician**
IoT Device ID: **Device <team number>**	
Business Service: **Engine**	
Configuration Item: **Coolant Level Meter**	
Short Description: **IoT Device has low coolant level**	

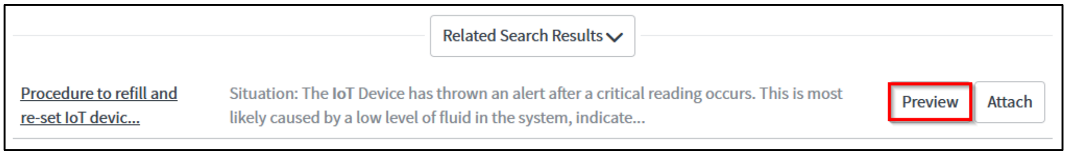


Number	INC0010029	Contact type	Walk-in
Caller	System Administrator	State	New
Category	Inquiry / Help	Impact	3 - Low
Subcategory	IoT Device	Urgency	3 - Low
IoT Device ID	Device <n>	Priority	5 - Planning
Business service	Engine	Assignment group	Hardware
Configuration item	Coolant Level Meter	Assigned to	Field Technician
Short description	IoT Device has low coolant level		

3. Save the incident record by selecting **Save** from the ☰ menu:



4. Scroll to the related search results section of the incident form and locate the Knowledge Base article that appears helpful for the incident's resolution. Click **Preview** to view the content of the article.

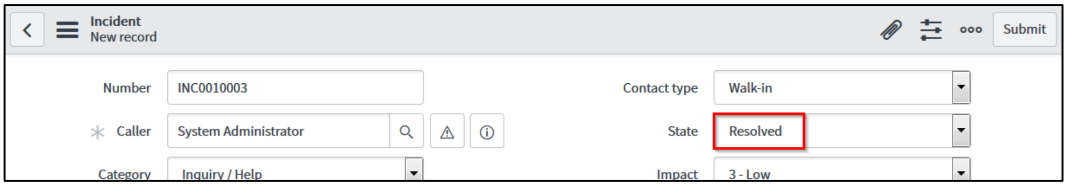


Procedure to refill and re-set IoT devic...

Situation: The **IoT** Device has thrown an alert after a critical reading occurs. This is most likely caused by a low level of fluid in the system, indicate...

5. Service Desk Agent provides details to Field technician, who performs the steps on the device needed to remediate the issue.

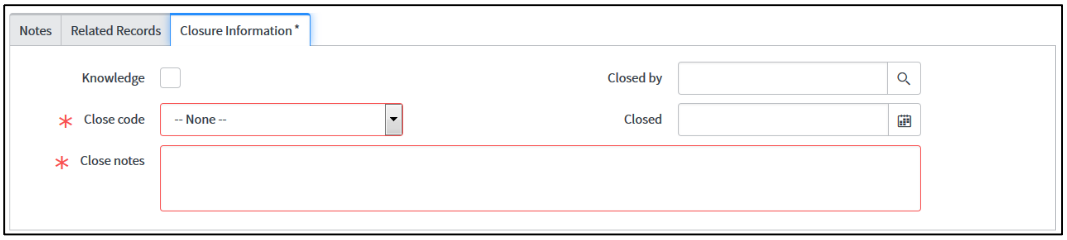
6. When the device indicates a normal state, return to the Service Desk Agent to let them know they can mark the Incident as **Resolved**.



Number	INC0010003	Contact type	Walk-in
* Caller	System Administrator	State	Resolved
Category	Inquiry / Help	Impact	3 - Low

7. By default in ServiceNow, the closure of a ticket requires close notes to be added for future reference. Fill in appropriate notes in the Closure Information section:

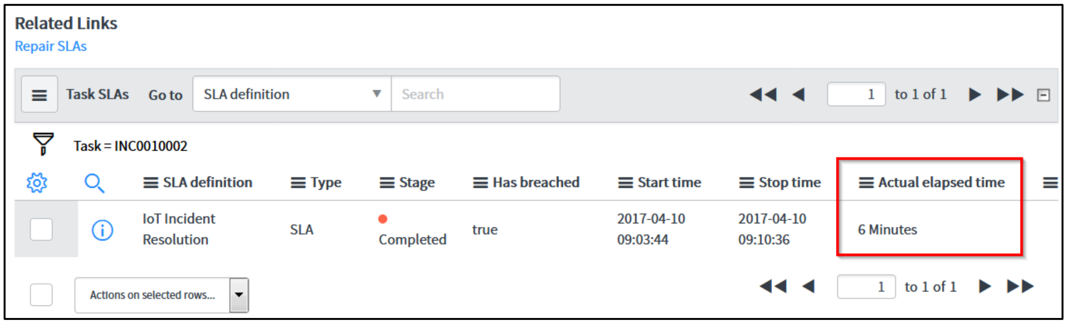
   Close code: **Solved (Permanently)**
   Close notes: **Coolant refilled**



Knowledge	□	Closed by	
* Close code	-- None --	Closed	
* Close notes			

8. Save the incident record by selecting **Save** from the ☰ menu.

9. Scroll down the Incident form and look at the SLA section. The SLA clock starts with the opening of the incident and stops when the incident is marked as resolved. The total processing time is recorded in the right column.



Task = INC0010002

SLA definition	Type	Stage	Has breached	Start time	Stop time	Actual elapsed time
IoT Incident Resolution	SLA	● Completed	true	2017-04-10 09:03:44	2017-04-10 09:10:36	6 Minutes

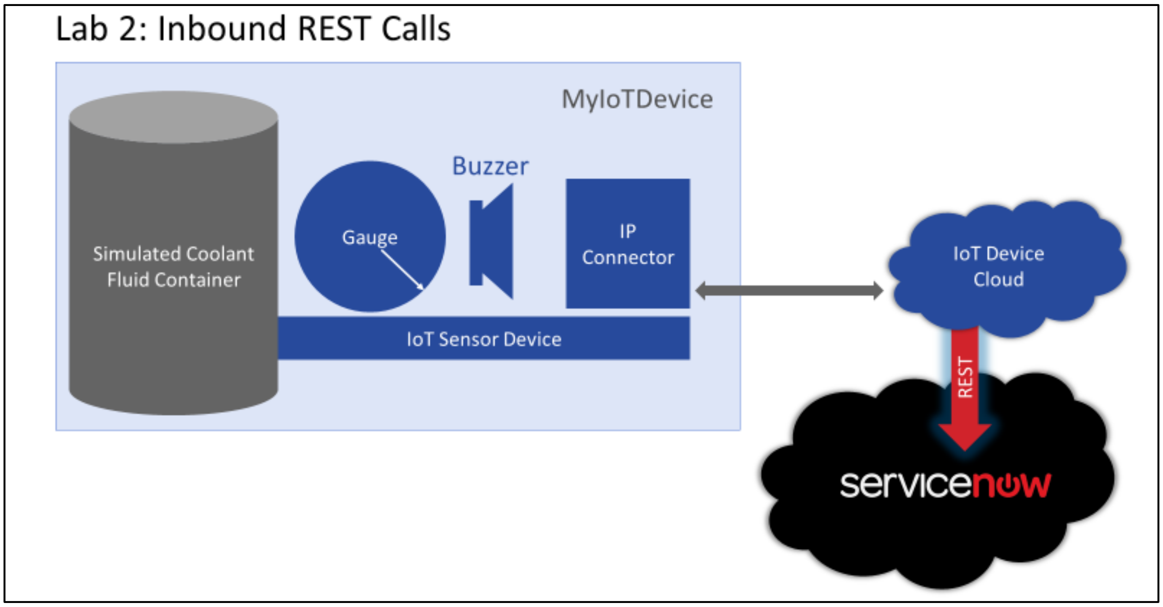
Lab Goal

Lab 2 Automated Incident Creation and Manual Resolution

As before, the device detects a critically low reading. In this lab, if a critical reading occurs, it is reported into the ServiceNow lab instance through a REST API call. Based on that, an incident is created through a business rule.

The process leverages the ServiceNow Table API, a web service that is available on every instance. Once appropriate credentials have been explicitly configured, the Table API allows external sources to gain access on a table specified through the URL.

Lab 2: Inbound REST Calls



- Lab 2.1 – Get familiar with the table structure where device critical readings are posted
- Lab 2.2 – Activate a business rule to create an incident when the threshold breach occurs
  - The field technician is assigned to resolve the incident
  - Look at the business service map
  - After successful resolution, the incident is closed and the total resolution time is tracked

Lab Goal

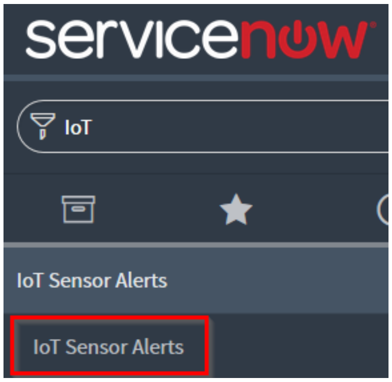
Lab 2.1 Sensor Readings Table

Get Familiar with the Table That Contains Sensor Data

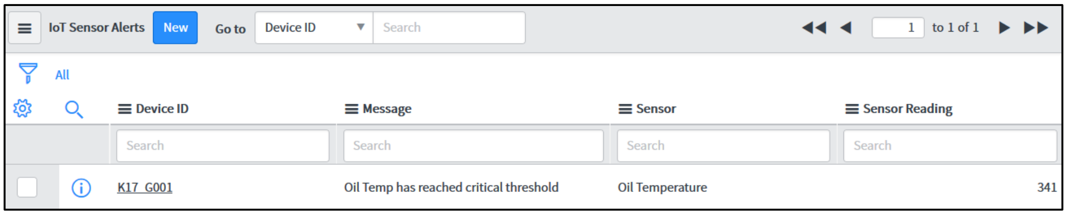
With the web service user access established, the lab instance can receive data from the IoT device. Once the sensor detects a critical level, a record is pushed into a custom table of the ServiceNow lab instance:

u_iot_sensor_alerts

1. Navigate to the table **IoT Sensor Alerts > IoT Sensor Alerts**.



2. Look at the readings that have already been transmitted. Please note, that for this lab only critical readings are reported from the device to ServiceNow.



Device ID	Message	Sensor	Sensor Reading
K17_G001	Oil Temp has reached critical threshold	Oil Temperature	341

Although the lab devices only transmit Coolant level readings, the table setup allows for a device to report data from different sensors like oil temperature, pressure, etc.

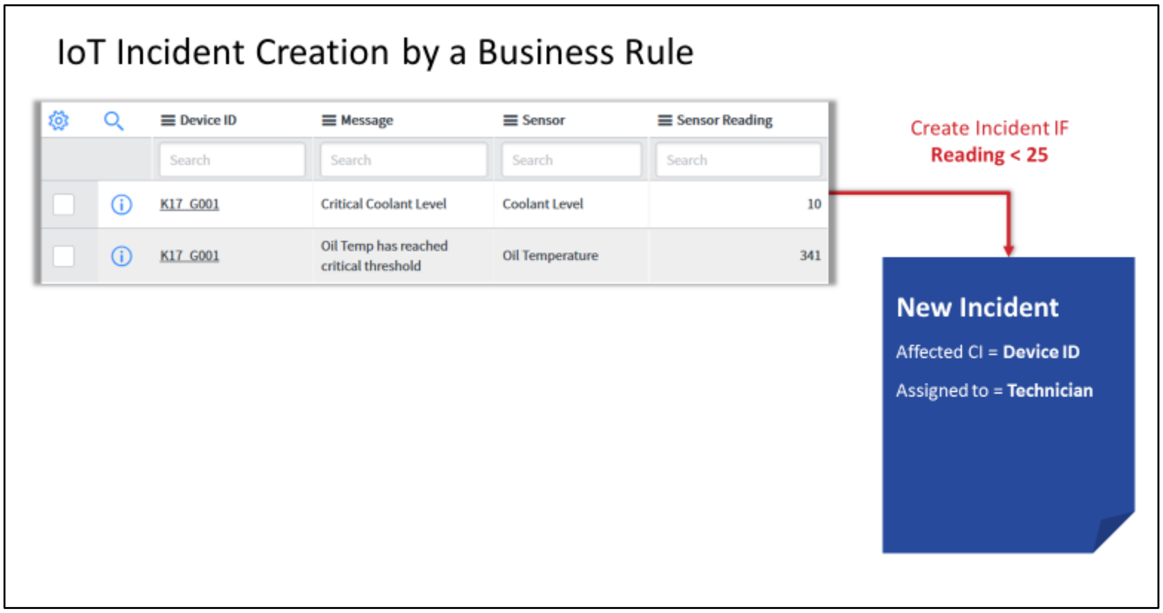
Lab Goal

This lab explains how to activate automatic incident creation.

Lab 2.2 Activate Automatic Incident creation

Automatic Incident Creation

In Lab 1, an incident had to be reported and entered manually. This lab explains how to activate a business rule that creates an incident upon any critical reading reported into ServiceNow.



IoT Incident Creation by a Business Rule

Device ID	Message	Sensor	Sensor Reading
K17_G001	Critical Coolant Level	Coolant Level	10
K17_G001	Oil Temp has reached critical threshold	Oil Temperature	341

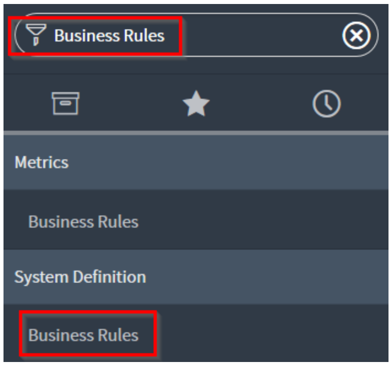
Create Incident IF **Reading < 25**

New Incident

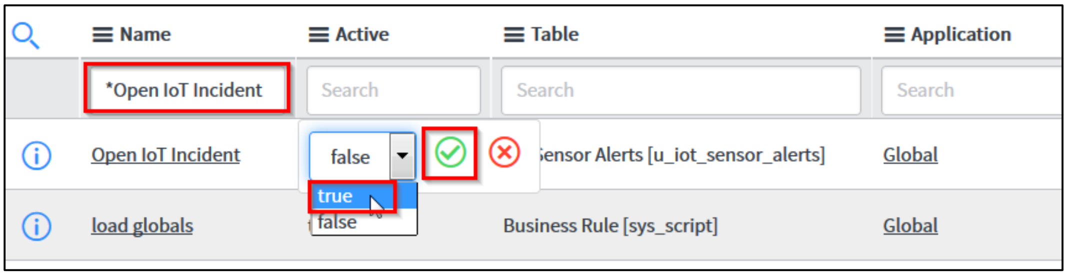
Affected CI = **Device ID**

Assigned to = **Technician**

1. Navigate to **System Definition > Business Rules**.



2. Locate the business rule named **Open IoT Incident** by clicking the magnifier icon 🔍 and entering the business rule's name. Set the field **active** from false to **true** and confirm the change by clicking the ✓ icon:



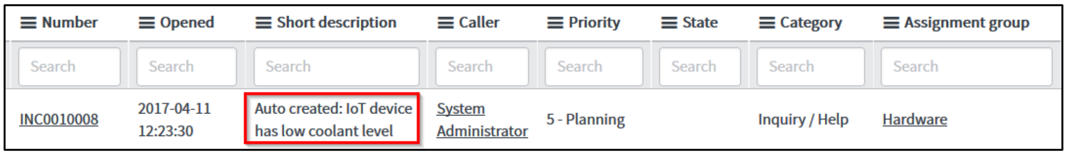
	Name	Active	Table	Application
	*Open IoT Incident	Search	Search	Search
ⓘ	Open IoT Incident	false ▾ ✓ ✕ true false	Sensor Alerts [u_iot_sensor_alerts]	Global
ⓘ	load globals		Business Rule [sys_script]	Global

3. After the activation of the business rule, wait for the device to report a critical reading. The critical state is also indicated by an alarm sound.

Analyze and Remediate Incident

An alarm sound occurs when the device detects the breach of the threshold. The condition is reported into the ServiceNow instance and the business rule is triggered, leading to the creation of an incident.

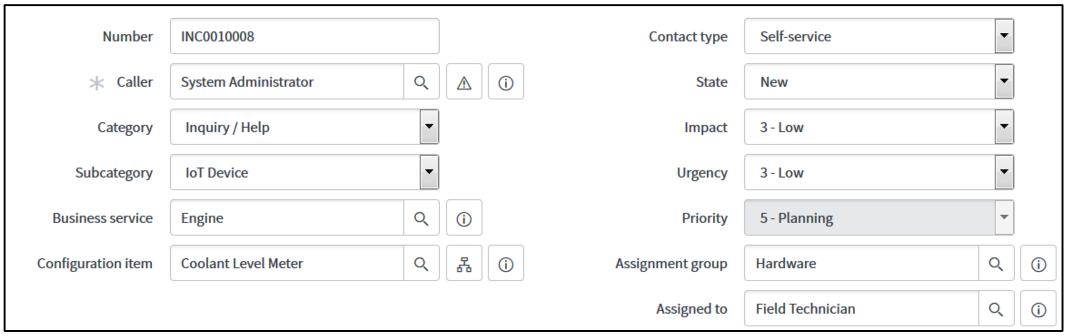
1. Monitor the list **Incident > Open.** If necessary, refresh the page through the browser.



Number	Opened	Short description	Caller	Priority	State	Category	Assignment group
Search	Search	Search	Search	Search	Search	Search	Search
INC0010008	2017-04-11 12:23:30	Auto created: IoT device has low coolant level	System Administrator	5 - Planning		Inquiry / Help	Hardware

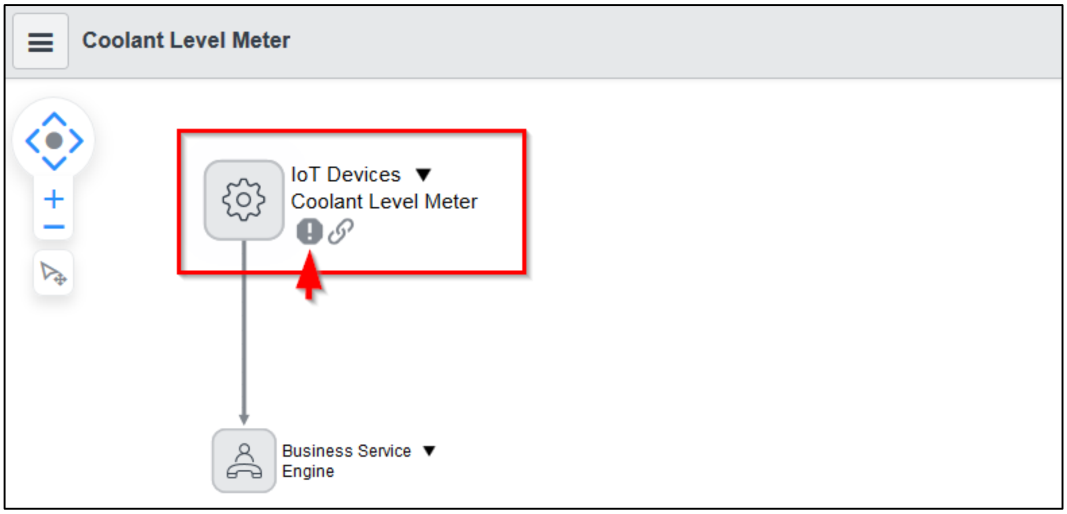
An incident tagged **Auto created: IoT device has low coolant level** is added.

2. Open the Incident by clicking on its number **INCxxxx** in the list view. In the incident form, the fields are populated automatically as far as information is available to the system.



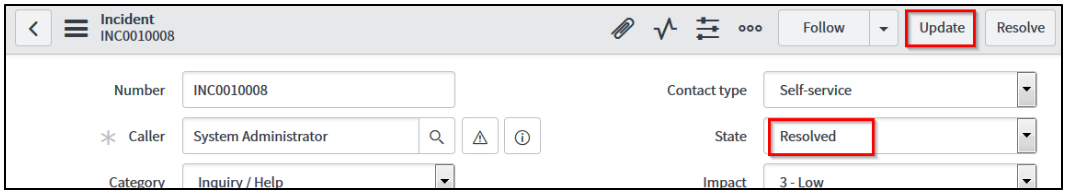
Number	INC0010008	Contact type	Self-service
* Caller	System Administrator	State	New
Category	Inquiry / Help	Impact	3 - Low
Subcategory	IoT Device	Urgency	3 - Low
Business service	Engine	Priority	5 - Planning
Configuration item	Coolant Level Meter	Assignment group	Hardware
		Assigned to	Field Technician

3. Click the 品 icon next to the Configuration item field. A new browser tab opens showing the business service and its dependencies on configuration items. In this case, the business service consists of the meter only. Note that mouse-hovering over the exclamation mark brings up additional details about incidents that are opened on this CI.



4. Go through the remediation process using the same methodology as in Lab 1 (goto Lab1 resolution):

   - Locate the device physically
   - Initiate the remediation procedure (refer to KB article if necessary) and wait until the device is back in normal operating state
   - Set the incident state to **Resolved**, add close notes and **Update** the incident record



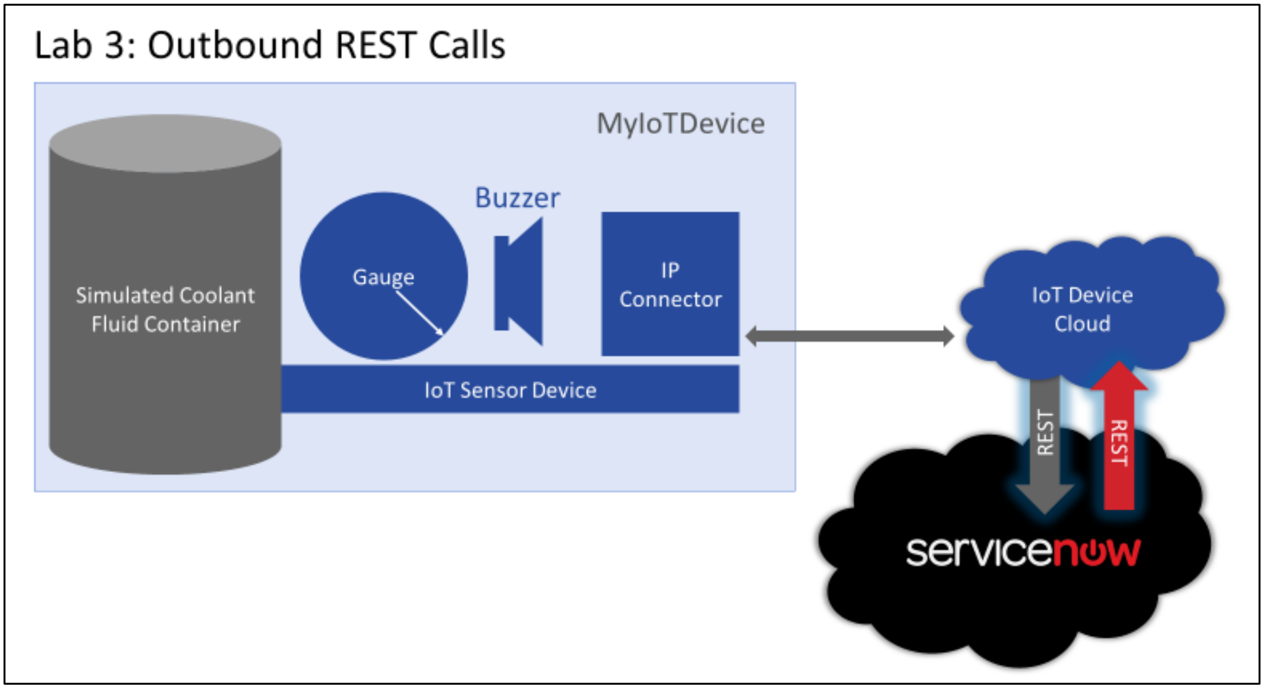
Number	INC0010008	Contact type	Self-service
Caller	System Administrator	State	Resolved
Category	Inquiry / Help	Impact	3 - Low

Lab Goal

Lab 3 Automatic Resolution

In this lab, the need to physically walk to the device and trigger the remediation procedure is replaced by an API call from ServiceNow to the IoT device.

The outbound message is sent by the ServiceNow lab instance towards the IoT device cloud, where it triggers the refill process for the device.



- Lab 3.1 – Take a look at the outbound REST-Message in ServiceNow
- Lab 3.2 – Set up a workflow based on automatically created Incident to trigger the outbound call if the incident qualifies

Lab Goal

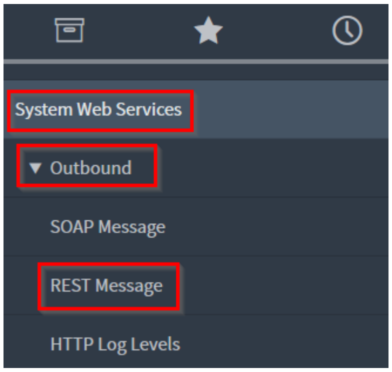
This lab explains the elements of an outbound REST-Message.

Lab 3.1 Outbound REST Message

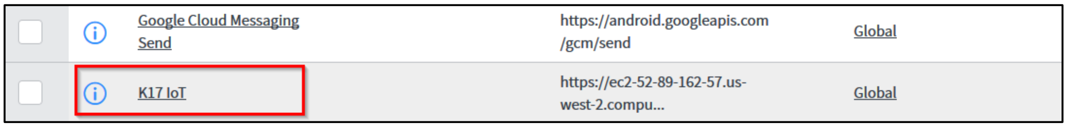
Outbound REST Message

An outbound REST message is already defined in the lab instance. For this lab, **thinger.io** is used as intermediary between ServiceNow and the IoT devices. Some elements of the REST message are specific to thinger.io but can be adjusted to other solutions and scenarios. Follow these steps to verify the setup of the REST message.

1. Navigate to **System Web Services > Outbound > REST Message**.



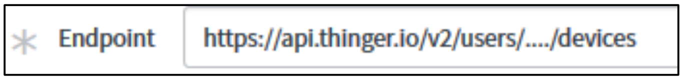
2. Click the record **K17 IoT** to open a predefined rest message.



□	ⓘ	Google Cloud Messaging Send	https://android.googleapis.com /gcm/send	Global
□	ⓘ	K17 IoT	https://ec2-52-89-162-57.us-west-2.compu...	Global

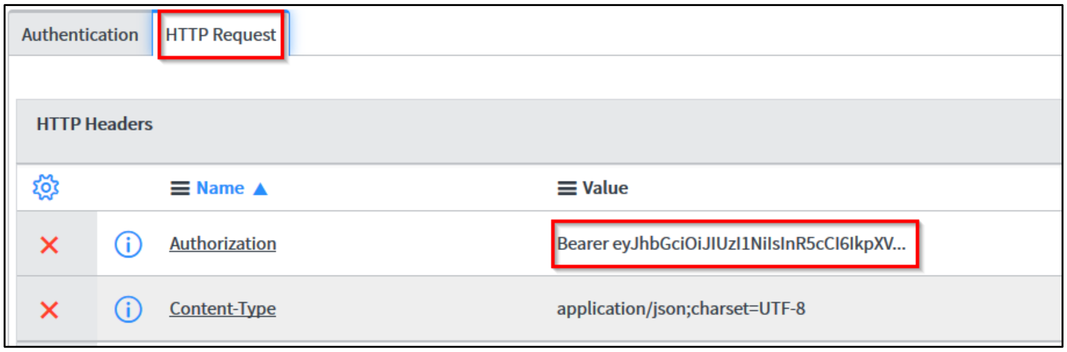
3. The REST message consists of the following elements:

Endpoint: The URL the message is sent to. Note that it includes a variable device-ID and sensor-ID which need to be replaced on each call of the message:



* Endpoint: https://api.thinger.io/v2/users/..../devices

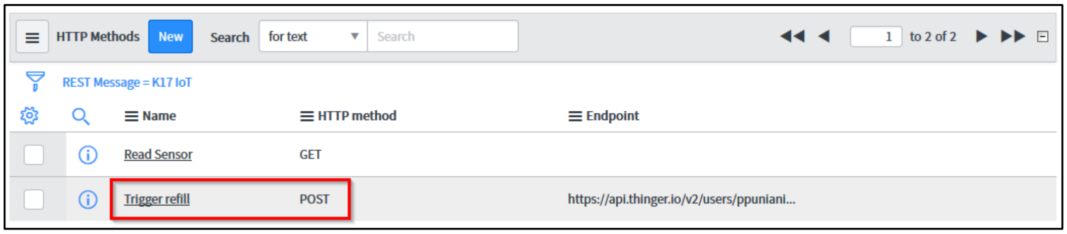
HTTP Request: The elements that get included into the HTTP request header. In the lab setup, an authorization token (**Bearer ……**) needs to be sent as part of the HTTP header.



HTTP Headers

Name ▲	Value
Authorization	Bearer eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXV...
Content-Type	application/json;charset=UTF-8

HTTP Methods: While two methods are defined, for this lab only the POST method is used to initiate an action on the device.



REST Message = K17 IoT

Name	HTTP method	Endpoint
Read Sensor	GET	
Trigger refill	POST	https://api.thinger.io/v2/users/ppuniani...

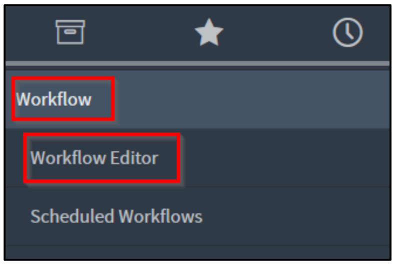
Lab Goal

Lab 3.2 Workflow to Trigger Outbound REST-Message

This lab explains how to create a workflow that leverages the Outbound REST message as defined in Lab 3.1. A call of that REST message simulates the remediation for this lab. The goal is to trigger the remediation process, when an Incident is opened for an IoT Device.

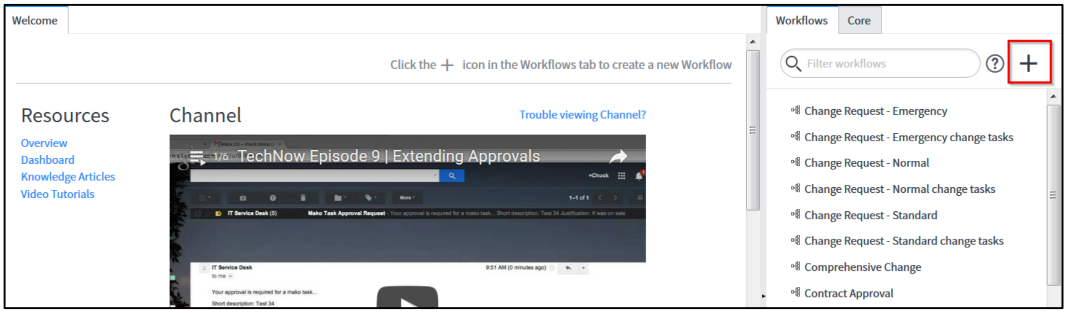
Workflow Editor

1. Navigate to **Workflow > Workflow Editor**.



Note: The Workflow Editor launches in a new browser tab / window.

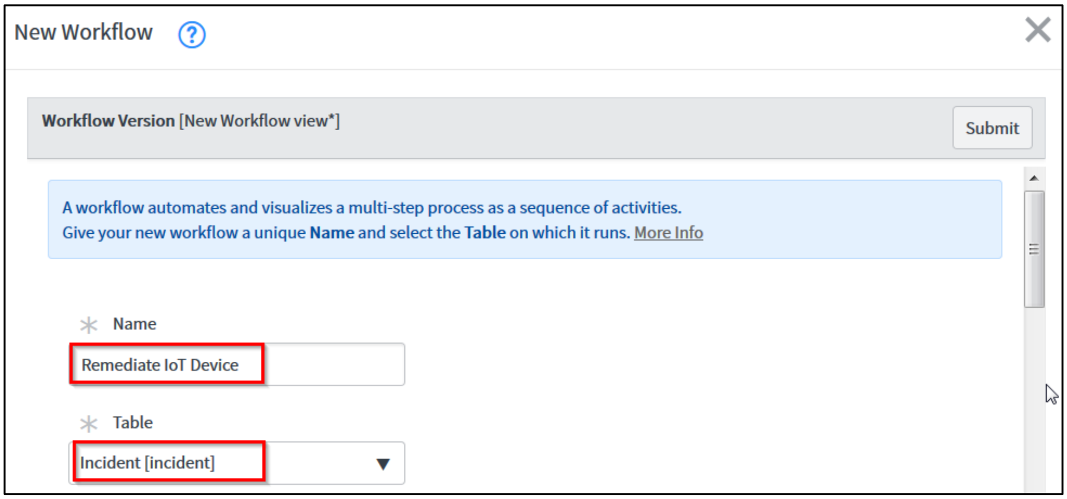
2. Initiate the creation of a new workflow by clicking the **+** icon to the right.


Click the + icon in the Workflows tab to create a new Workflow

Welcome
Resources
Overview
Dashboard
Knowledge Articles
Video Tutorials
Channel
Trouble viewing Channel?
1/6 TechNow Episode 9 | Extending Approvals
Workflows
Core
Filter workflows
?
+
Change Request - Emergency
Change Request - Emergency change tasks
Change Request - Normal
Change Request - Normal change tasks
Change Request - Standard
Change Request - Standard change tasks
Comprehensive Change
Contract Approval

3. Enter workflow-specific information into the form:

   Name: **Remediate IoT Device**
   Table: **Incident [incident]**



New Workflow

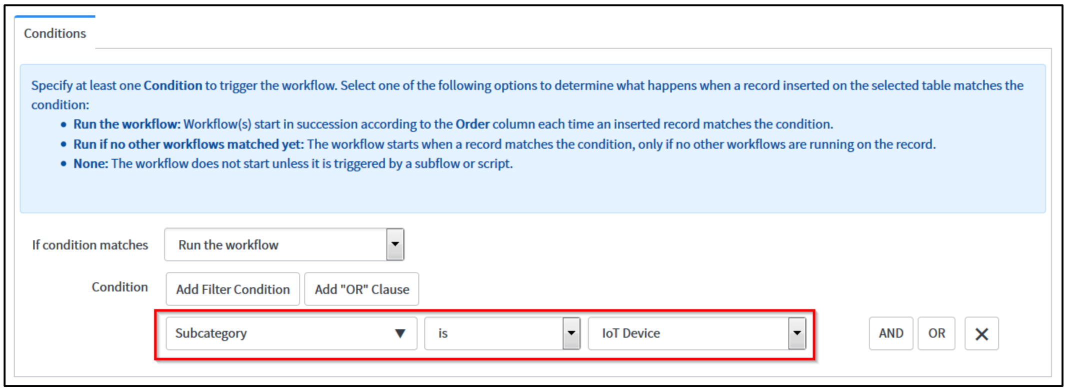
Workflow Version [New Workflow view*]

A workflow automates and visualizes a multi-step process as a sequence of activities.
Give your new workflow a unique **Name** and select the **Table** on which it runs. More Info

Name: Remediate IoT Device

Table: Incident [incident]

4. Scroll to the **Conditions** section and set the following condition:
   Subcategory – is – IoT Device



Conditions

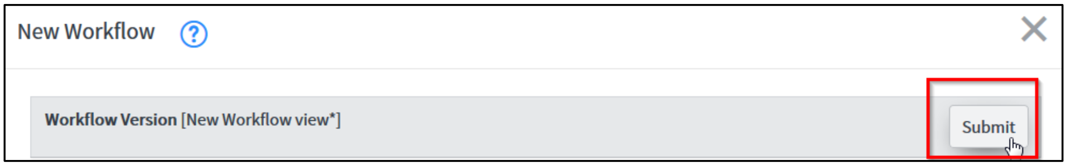
Specify at least one **Condition** to trigger the workflow. Select one of the following options to determine what happens when a record inserted on the selected table matches the condition:

- **Run the workflow:** Workflow(s) start in succession according to the **Order** column each time an inserted record matches the the condition.
- **Run if no other workflows matched yet:** The workflow starts when a record matches the condition, only if no other workflows are running on the record.
- **None:** The workflow does not start unless it is triggered by a subflow or script.

If condition matches: Run the workflow

Condition: Subcategory – is – IoT Device

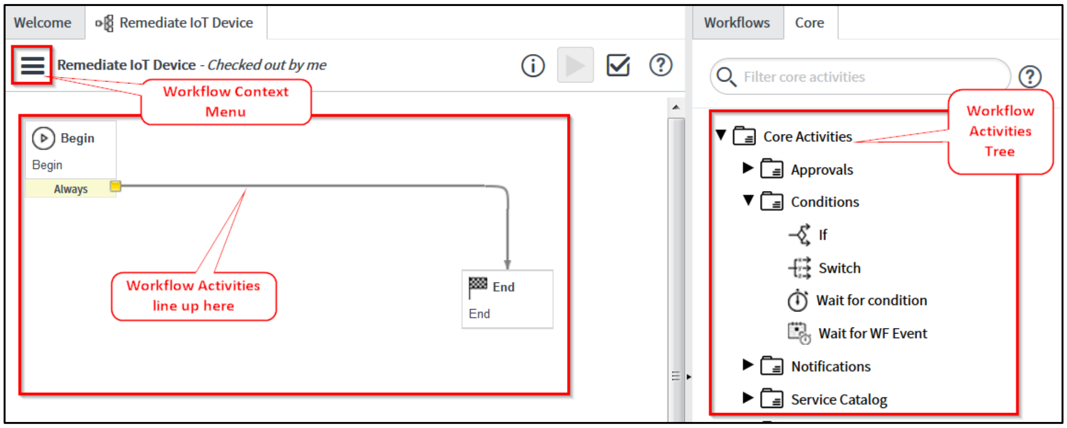
5. Click **Submit**.



New Workflow

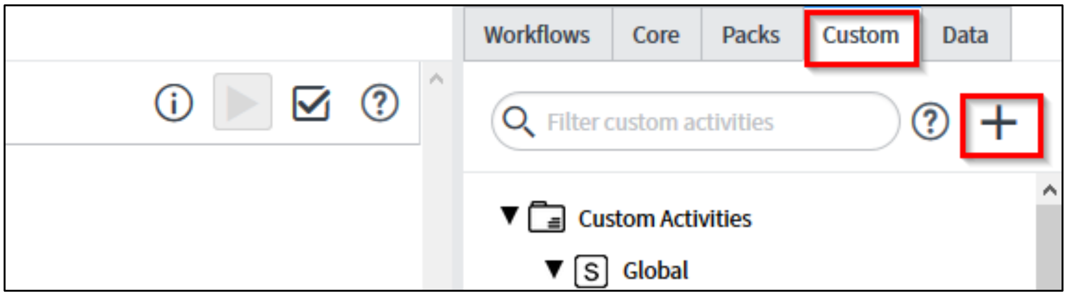
Workflow Version [New Workflow view*]

6. After submission, the drawing canvas appears with the following elements:

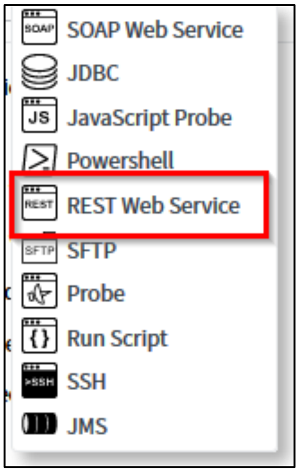


Note: Workflow Elements can be moved into and around the storyboard by drag and drop.

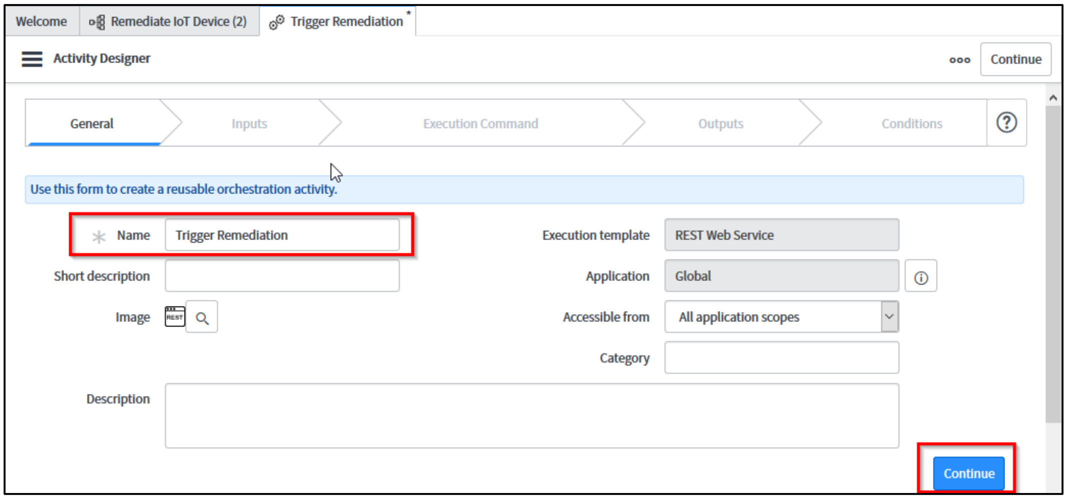
7. Locate the **Custom** tab and click the ⊞ icon to create a new custom activity from a template.



8. Select **REST Web Service** from the pop-up menu.



9. Add name **Trigger Remediation** for the activity and click **Continue**.

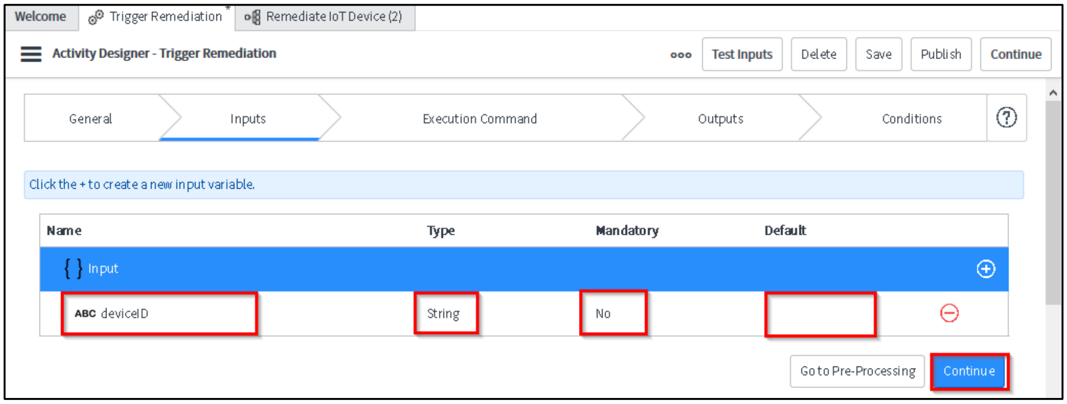


Use this form to create a reusable orchestration activity.

Name	Trigger Remediation	Execution template	REST Web Service
Short description		Application	Global
Image		Accessible from	All application scopes
		Category	
Description			

10. On the **Inputs** form, click the ⊕ icon to add an input variable and specify the fields.

Name: **deviceID**
Type: **String**
Mandatory: **No**
Default: **<<blank>>**



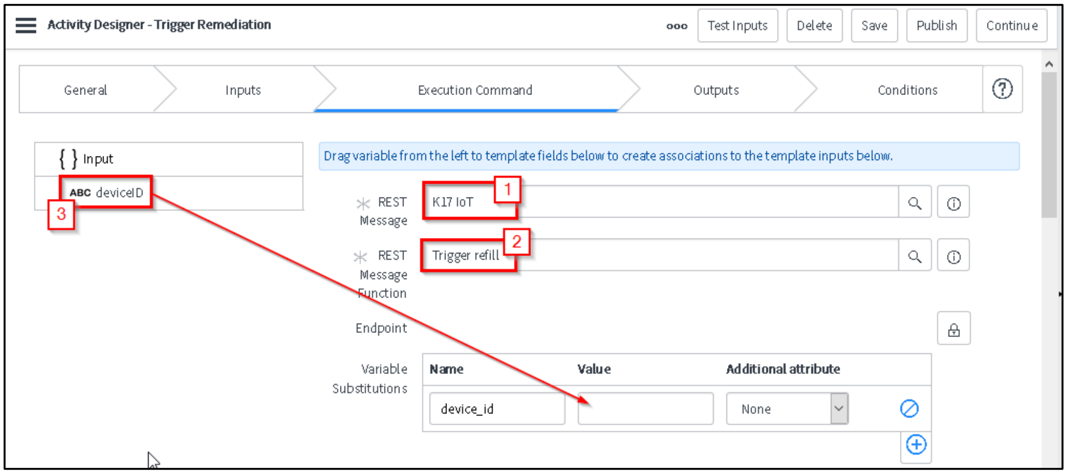
Click the + to create a new input variable.

Name	Type	Mandatory	Default
{ } Input			
ABC deviceID	String	No	

11. Click **Continue** to proceed to the next section.

12. In the Execution Command section, select the following REST Message and REST Message Function.

    REST Message: **K17 IoT**
    REST Message Function: **Trigger refill**
    In the **Variable Substitutions** section drag and drop the deviceID variable into **Value** field [3].



Drag variable from the left to template fields below to create associations to the template inputs below.

REST Message: K17 IoT

REST Message Function: Trigger refill

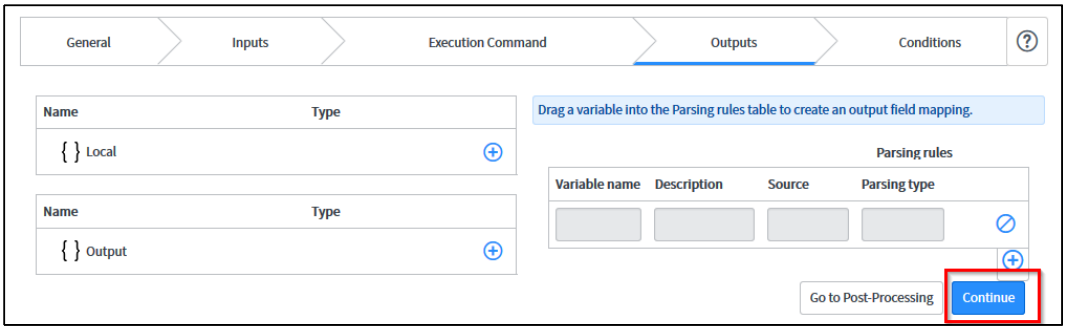
Endpoint

Variable Substitutions

Name	Value	Additional attribute
device_id		None

13. Click **Continue** to proceed to the next section.

14. No changes required in the Outputs section. Click **Continue**.



Name	Type
{ } Local	

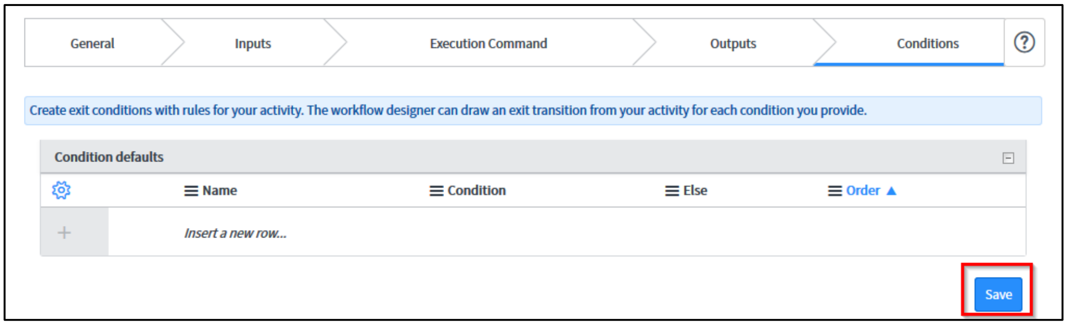
Name	Type
{ } Output	

Drag a variable into the Parsing rules table to create an output field mapping.

Parsing rules

Variable name	Description	Source	Parsing type

15. No changes required in the Conditions section. Click **Save**.

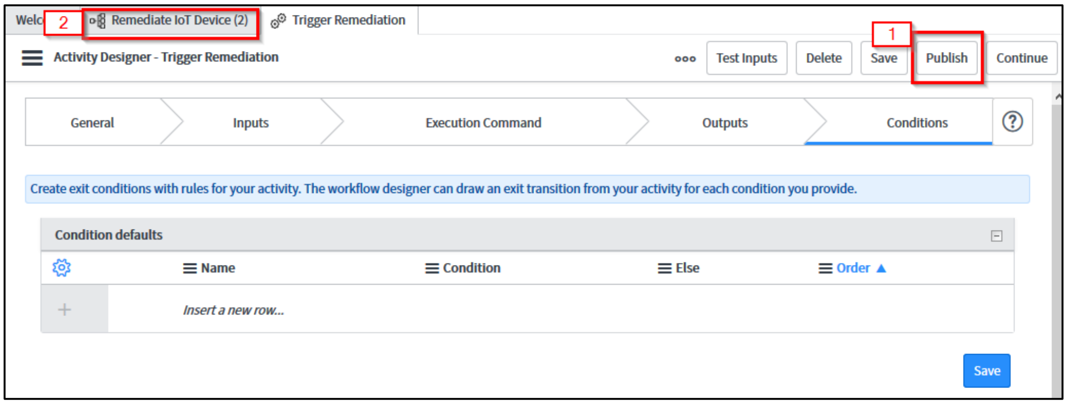


Create exit conditions with rules for your activity. The workflow designer can draw an exit transition from your activity for each condition you provide.

Condition defaults

	Name	Condition	Else	Order ▲
+	*Insert a new row...*			

16. Click **Publish** [1] to make the activity available as a workflow action and switch back to the workflow canvas tab **Remediate IoT Device** [2].

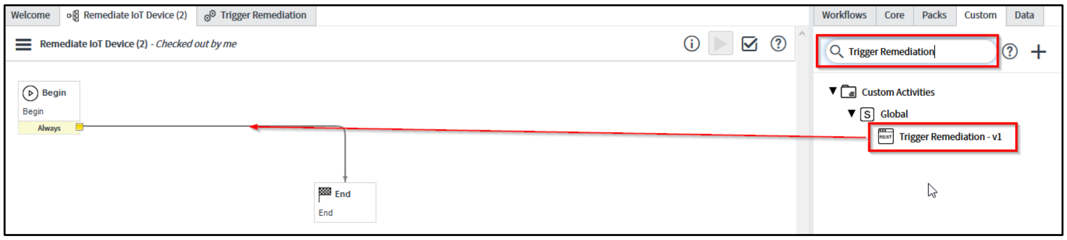


Create exit conditions with rules for your activity. The workflow designer can draw an exit transition from your activity for each condition you provide.

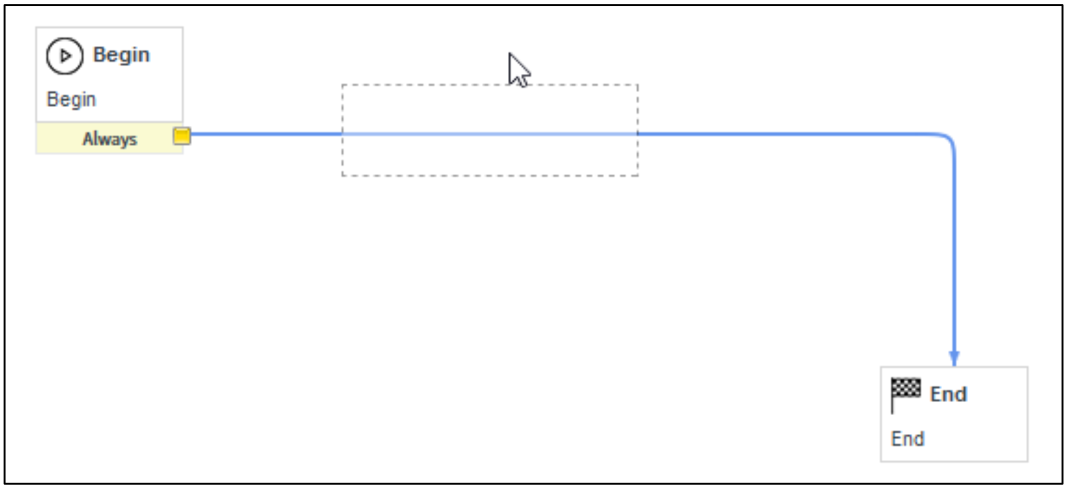
Condition defaults

	Name	Condition	Else	Order ▲
+	*Insert a new row...*			

17. Find the **Trigger Remediation** action by entering its name in the search field under **Custom** tab. Drag and drop the action into the workflow canvas and snap it in between the start and end position.

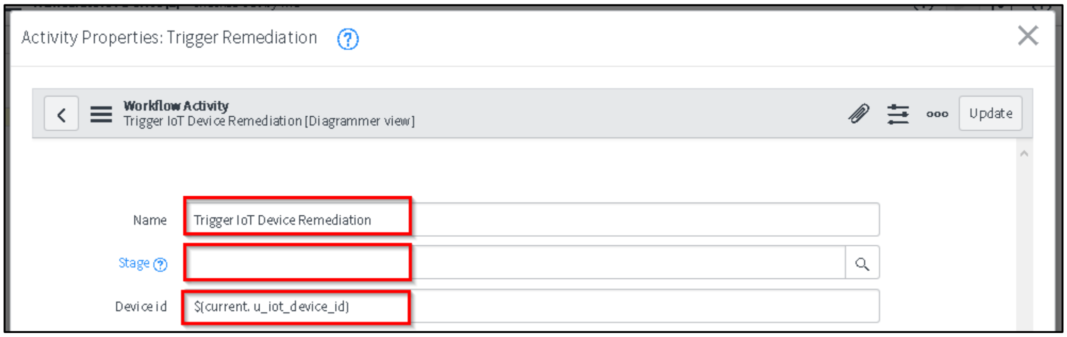


18. Note that the workflow activity line switches to a blue color once the activity is positioned correctly to snap in.



19. Fill out the workflow activity details:

Name: **Trigger IoT Device Remediation**
Stage: **<<blank>>**
Deviceid: **${current. u_iot_device_id}**
And click **Submit**

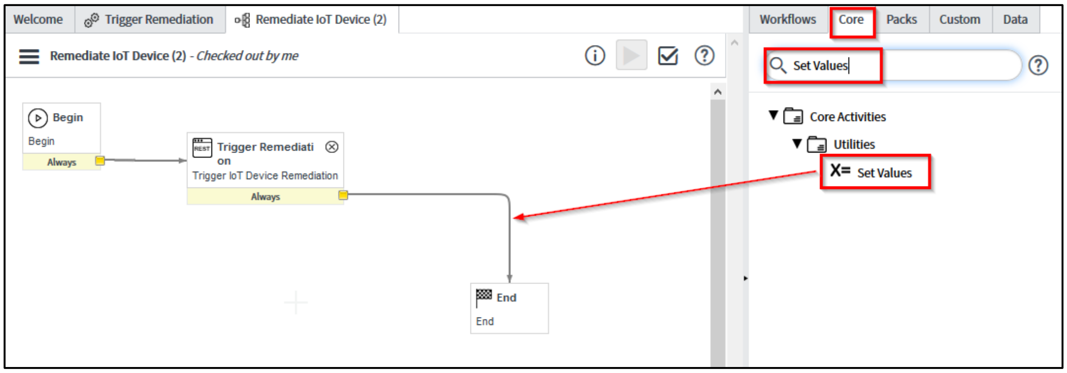


Activity Properties: Trigger Remediation

Name: Trigger IoT Device Remediation
Stage:
Device id: ${current. u_iot_device_id}

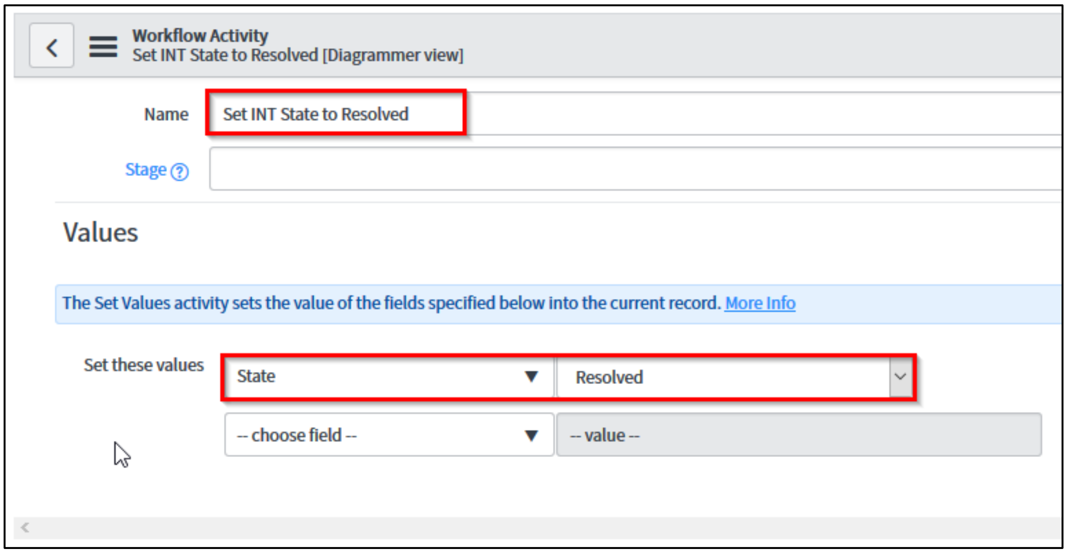
20. The Device ID is pulled from the current (incident) record’s field named u_iot_device_id.

21. The second step in the workflow is to set the incident to a resolved state, after the REST message has been submitted to the device. Find **Set Values** activity from the **Core** tab and pull it into the drawing canvas.



22. In the activity details window, set the following properties:

Name: **Set INT State to Resolved**
Stage: **<<blank>>**
Set these Values: **Incident State → Resolved**



Workflow Activity
Set INT State to Resolved [Diagrammer view]

Name: Set INT State to Resolved

Stage:

Values

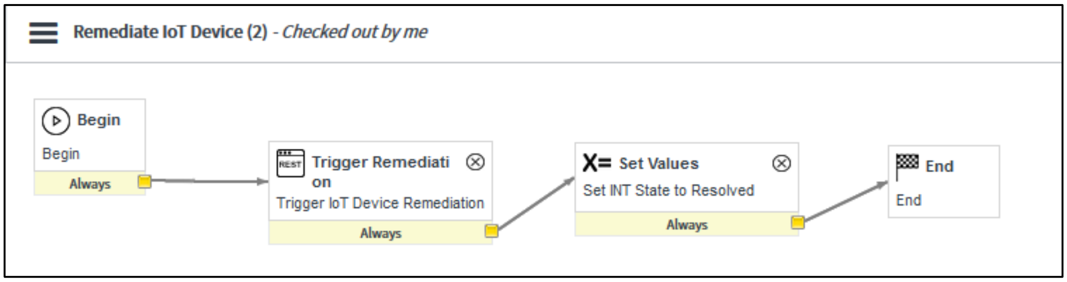
The Set Values activity sets the value of the fields specified below into the current record. More Info

Set these values: State ▼ Resolved

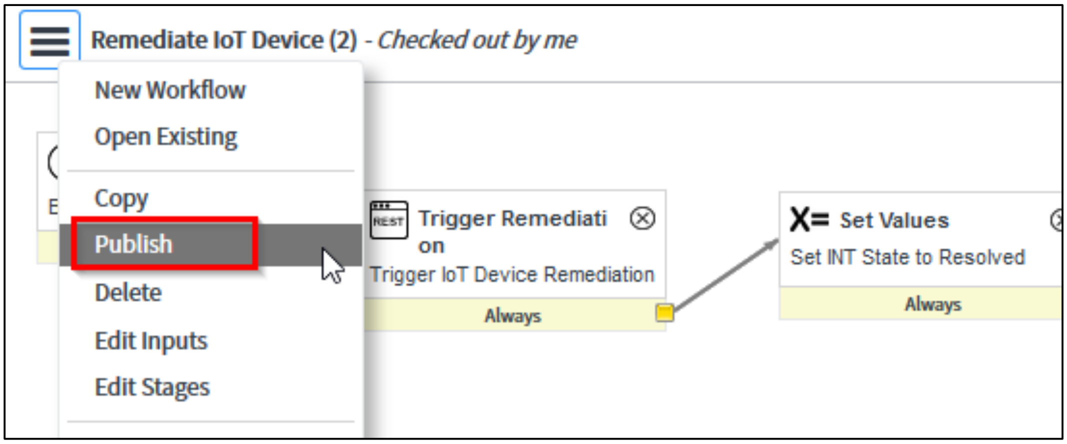
-- choose field -- ▼ -- value --

23. Click **Submit**.

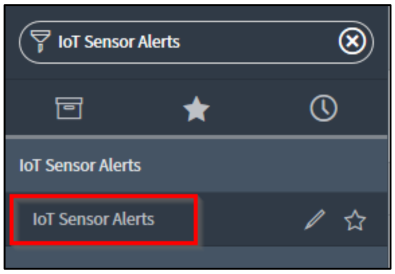
24. The resulting workflow should look like this example.


Remediate IoT Device (2) - *Checked out by me*
Begin
Begin
Always
Trigger Remediati on
Trigger IoT Device Remediation
Always
X= Set Values
Set INT State to Resolved
Always
End
End

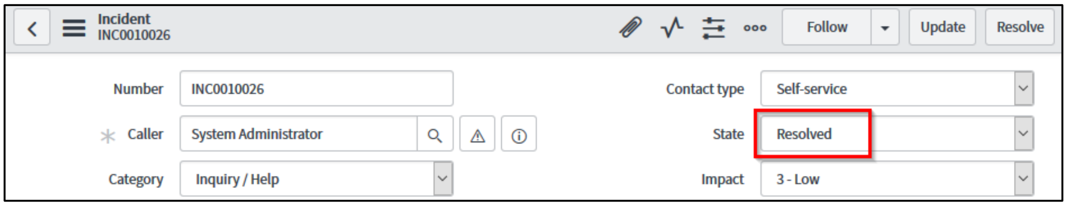
25. To publish the workflow, open the ☰ menu and click **Publish**. Once published the workflow runs whenever an incident is created matching the set criteria.



3. Monitor the IoT Sensor Alerts table.



26. When a new alert is received, it triggers a new incident. The workflow created in this chapter calls the procedure to remediate (refill) the device and sets the incident’s **State** to **Resolved** afterwards.



Number	INC0010026	Contact type	Self-service
Caller	System Administrator	State	Resolved
Category	Inquiry / Help	Impact	3 - Low

Conclusion

In the real world, capabilities in automatic remediation obviously vary depending on the ability to remotely perform the remediation process. This is applicable to such things as a device reset and a firmware upload.

In other scenarios, a physical interaction still is required. The refill of the fluid container, or other mechanical maintenance fall into this category.

For such scenarios, note that although in this lab, device errors raise Incidents, other areas of ServiceNow functionality can be linked. The detection of a critically low fluid level could, for example:

- Raise a case in Field Service Management
- Geo-locate the device
- Assign the refilling task to the preferred vendor that covers the geo-location
- Provide double check capabilities throughout an invoice audit with that vendor